Semiannual Report and Alternate Remedy Recommendation

Penta Wood Products Superfund Site
WDNR BRRTS Activity #02-07-000532

Wisconsin Department of Natural Resources

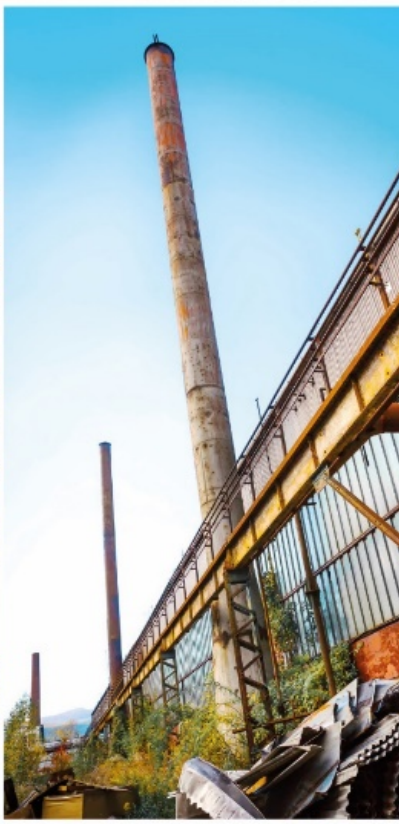

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Table of Contents

Table of Contents

Figure Index

Table Index

Appendix Index

1. Introduction

GHD Services Inc. (GHD) prepared this Semiannual Report and Alternate Remedy Recommendation (Report) for the Penta Wood Products Superfund Site (Site) in Siren, Wisconsin on behalf of Wisconsin Department of Natural Resources (WDNR). The Site location is shown on Figure 1.1, and the Site plan is shown on Figure 1.2.

In a letter dated December 16, 2015, United States Environmental Protection Agency (USEPA) approved the Remediation System Shutdown Pilot Study Work Plan (GHD; November 13, 2015). Following USEPA approval, the remediation system was shut down in November 2015 to initiate the pilot study. The system remained shut down during the entire monitoring period of the pilot study.

This Report presents the results of the activities conducted at the Site during July through December 2019, which represents the final monitoring period of the pilot study. This Report also provides a discussion of all pilot study results with lines of evidence to support an alternate long-term remedy of Monitored Natural Attenuation (MNA) for the Site. Lines of evidence that were evaluated include:

- Light non-aqueous phase liquid (LNAPL) body and dissolved plume limits expansion/migration
- Dissolved concentrations stability
- Contaminant degradation assessment through aerobic and/or anaerobic natural processes

1.1 Purpose

The Record of Decision (ROD) issued by the United States Environmental Protection Agency (USEPA, November 1998) established remedial objectives to address the principal threat (i.e., light non-aqueous phase liquid (LNAPL) and soil contamination) and reduce risk through groundwater remediation. The ROD anticipated a point in time when active remediation could transition to MNA. Extensive Site characterization data indicate that LNAPL has been remediated to the extent practicable and the residual LNAPL does not pose a principal threat. Natural attenuation can now effectively remediate residual contamination. GHD has reviewed the performance data and determined that active remediation has reached a point of diminishing returns and is no longer required. Remediation can continue to be effective through Natural Source Zone Depletion (NSZD) to remediate residual LNAPL and MNA to remediate the remaining dissolve constituent plume in the groundwater. Either an Explanation of Significant Differences (ESD) or ROD Amendment is required to make this change.

The purpose of this document is to provide information to justify and recommend a change of the selected remedial action for the Site. This recommendation is based on significant changes in Site conditions because the active remedy has accomplished the goal. Also, there have been significant advances in the science and technical understanding of LNAPL remediation since the ROD was issued.

2. Remedial Action Objectives

The ROD specifies the following statutory and regulatory requirements (remedial action objectives) for the remedial action at the Site:

- Reduce/eliminate the potential risks to human health and ecological receptors associated with exposure to pentachlorophenol (PCP) and fuel oil components in surface water and groundwater, and PCP/fuel oil components and metals in the soil and sediment.
- Reduce/control the source of contaminants.
- Reduce the concentrations of these compounds in the groundwater plume to PALs (WDNR Preventive Action Limits).
- Satisfy Applicable or Relevant and Appropriate Requirements (ARARs).

The performance goals of the remediation system have been identified as:

- Remove LNAPL, to the extent practicable, to reduce a source of PCP to the groundwater.
- Extract and treat the most concentrated portions of PCP in the groundwater (exceeding 1,000 micrograms per liter (µg/L)), and reduce concentrations to a level that allows natural attenuation to achieve the Ch. NR 140, Wis. Adm. Code standards in a reasonable period of time.
- Lower the water table, to the extent practicable, to allow bioventing to promote natural degradation of the residual diesel range organics and PCP in the LNAPL smear zone.
- Comply with WPDES discharge criteria.

3. Background

Historical pentachlorophenol (PCP) concentrations and LNAPL thickness data are presented in Appendix A of this report.

3.1 Site Setting

The Site is a former wood treatment facility on an 82-acre property. The property is located in a rural and agricultural setting with residences located to the east, west, and south. Forested and wetland areas border the property to the north/northeast. The residential properties contain drinking water wells. The Site is situated on a hill with approximately 110 feet of drop in elevation toward the north/northeast. The Site layout is shown on Figure 1.2.

Site use is controlled by continuing obligations and institutional controls (WDNR letter dated July 6, 2015).

3.2 Release History

Contaminants were released to the subsurface during operation from 1953 to 1992. Raw timber was treated with a 5 to 7 percent PCP solution in a fuel oil carrier or with a waterborne salt treatment

chemical. The facility discharged wastewater from an oil/water separator through a gully into a lagoon located at the northeast corner of the property. Process wastes were discharged onto a wood-chip pile in the northwestern portion of the property. Beginning in the 1970s, the WDNR observed several large spills, stained soils, fires, and poor operating practices.

3.3 Compounds of Concern and Cleanup Goals

The Record of Decision (ROD) (USEPA, November 1998) identifies the following as compounds of concern (COCs):

- PCP
- Naphthalene
- Benzene, toluene, ethylbenzene, and xylenes (BTEX)
- Chloride
- Metals – arsenic, copper, iron, manganese, and zinc

The ROD also specifies the groundwater cleanup goals as the Preventative Action Limits (PALs) identified in Ch. NR 140, Wis. Adm. Code. Following completion of this pilot study, WNDR may request a ROD amendment to modify the cleanup goals from the PALs to the Enforcement Standards (ESs) as identified in Ch. NR 140 Wis. Adm. Code. The COCs and respective cleanup goals are summarized in Table 1 of the ROD.

3.4 Remedial History

The USEPA conducted a removal action during 1994 through 1996, including the following:

- Buildings were demolished and the remaining chemicals and sludge were disposed offsite
- Highly contaminated soil was excavated and disposed offsite
- Erosion control measures were implemented in 1998 to reduce washout of the contaminated wood debris from the lagoon into the wetlands

Extensive remedial actions have been conducted at the Site since the USEPA issued the ROD in November 1998, including the following:

- Soil and sediment excavation and consolidation in an onsite corrective management unit (CAMU)
- Bioventing
- Groundwater extraction and treatment
- LNAPL recovery
- Monitored natural attenuation of the remaining dissolved contaminant plume outside of the groundwater capture area

Initial operation of the remediation system started in October 2000. Due to the presence of emulsified oil in the extracted groundwater, additional pretreatment studies, design, and facility

construction were conducted. The full treatment system operation, including additional pretreatment, began in March 2004 and operated through August 2014. In 2010, three additional dual phase extraction wells were installed in an effort to accelerate cleanup activities.

The WDNR took over remediation system operations at the Site on September 1, 2014. During October 2014, the remediation system operation was modified to exclude the pretreatment portion of the system. In addition, LNAPL recovery was performed manually on a periodic basis.

The treatment system was modified 2015 to eliminate the need for pretreatment of extracted groundwater prior to discharge while still achieving overall system performance objectives. The system was shut down in December 2015 to start the temporary remediation system shutdown pilot study.

Through all remedial actions, a substantial portion of the contaminant source has been removed. As such, there has been no on-going releases to drive further LNAPL migration at the Site for over 20 years. In addition, any residual LNAPL head that may have existed at the time of the previous actions would have long since dissipated or been eliminated through the various excavations and other remedial actions.

3.5 Hydrogeology

The subsurface at the Site consists of unconsolidated soil and has been characterized with two aquifers, the unconfined aquifer (upper portion) and semiconfined aquifer (lower portion). The upper aquifer consists of sand and gravel with silt and clay to depths of 90 to 120 feet below ground surface. A glacial till separates the upper aquifer from the lower aquifer and consists of silt, silty sand, and sandy silts with gravel with thickness ranging between 3 to 45 feet. The till is present under most of the Site. The lower aquifer consists of sand and gravel.

The general groundwater flow direction appears to be primarily toward the north-northwest based on measured groundwater elevations in wells at the Site. The dissolved PCP concentration distribution indicates that some groundwater may flow toward the east-southeast. The general horizontal hydraulic gradient across the source area is estimated to be approximately 0.0005 foot per foot (ft/ft), under non-pumping conditions.

3.6 LNAPL Body and Dissolved PCP Plume Extent

The areal extent of LNAPL based on measured in-well thicknesses is less than 2 acres in size within the property boundaries and limited to within the immediate vicinity of the onsite CAMU. The LNAPL remained stable (i.e., not expanding or migrating) from the time prior to implementing the remedy through more than 11 years of remediation system operation. The LNAPL is present within the unconfined aquifer at depths ranging between approximately 80 and 115 feet below ground surface. Based on historical groundwater level monitoring data and the observed groundwater level fluctuations, the LNAPL smear zone is approximately 7 feet thick and is located exclusively in the unconfined (upper) aquifer at the groundwater table. The plots of the well gauging data over time (Charts 1 and 2, Long-Term Remedial Action Report, CH2M HILL, November 2014) indicate that the predominant LNAPL behavior (i.e., how LNAPL thickness in wells changes with fluctuations in water

table depth) is consistent with unconfined conditions in that in-well LNAPL thickness decreases with a rising water table and vice versa.

The dissolved PCP plume was been reduced at the Site through operation of the remediation system. The dissolved PCP plume with concentrations exceeding 1,000 micrograms per liter (µg/L) is approximately 3 acres in the unconfined (upper) aquifer and approximately 1 acre in the semiconfined aquifer and is limited to the immediate vicinity of the LNAPL. The dissolved PCP plume with concentrations exceeding 1 µg/L is currently approximately 7 acres in the unconfined (upper) aquifer and approximately 9 acres in the semiconfined (lower) aquifer. The plume size has remained consistent since 2015.

3.7 Dry Well Removal

During August 2019, WDNR retained Cedar Corporation to remove two suspected underground storage tanks (USTs) from the Site. Upon removal of the overburden soil, it was determined that the suspected USTs were dry wells with piping between the structures, typical of older septic systems. The bottom of each structure was approximately 7 to 8 feet below ground surface. No staining or odors were observed in the soils beneath each structure. A soil sample was collected from the base of each structure and submitted for laboratory analysis of pentachlorophenol, volatile organic compounds, polynuclear aromatic compounds, and diesel range organics. Diesel range organics were detected at concentrations of 2.7 milligrams per kilogram (mg/kg) and 1.3 mg/kg. Both concentrations were estimated between the limit of detection and limit of quantitation. Cedar Corporation prepared a letter dated October 1, 2019 to document the work and results. A copy of the letter is included in Appendix B.

4. Groundwater Monitoring and Sampling – July through December 2019

The final remediation system shutdown pilot study monitoring was completed during July through December 2019. Groundwater monitoring was conducted at the Site in July and October 2019 and sampling was conducted at the Site in October 2019 based on the modified scope of work provided in a GHD letter to EPA dated June 30, 2016. Wells MW4 and MW14 were subsequently added to the sampling scope to assess semi-confined aquifer (lower portion) groundwater quality southeast of the LNAPL source area. Wells MW2 and MW5 were also added to the sampling scope to assess the groundwater quality in the vicinity of Well MW30. A new well (MW32) was installed in May 2019 and added to the sampling scope to assess groundwater quality along the eastern property boundary. The groundwater monitoring and sampling plan is summarized in Table 4.1. Sampling was completed in general accordance with the Field Sampling Plan (FSP) (CH2M HILL, November 1999 and November 2010) and Quality Assurance Project Plan (QAPP) (CH2M HILL, February 2005) with subsequent addendums (most recent is Addendum No. 6 dated July 2014). The objectives of the groundwater monitoring at the Site included:

- To monitor flow direction and hydraulic gradient through the measurement and assessment of groundwater levels

- To monitor the natural attenuation of the plume through collection and chemical analysis of groundwater samples from monitoring wells
- To monitor long term improvement in groundwater quality through the collection and chemical analysis of groundwater samples from monitoring wells
- To monitor compliance with groundwater cleanup standards for the Site (State of Wisconsin ch. NR 140 Enforcement Standards)
- To monitor potential impact to residential wells through collection and chemical analysis of water samples from targeted residential wells

4.1 Groundwater and LNAPL Level Monitoring

Groundwater and Light Non-Aqueous Phase Liquid (LNAPL) levels were measured in thirty-three (33) monitoring wells and twenty-two (22) extraction well casings at the Site on July 22, 2019 and October 2, 2019. The groundwater and LNAPL elevation data along with well survey data are summarized in Table 4.2. Historical LNAPL thickness data are included in Appendix A.

Groundwater elevation contours were inferred from the July and October 2019 measurement data. Unconfined aquifer (upper portion) contours are shown on Figures 4.1 and 4.4. Semiconfined aquifer (lower portion) groundwater contours are shown on Figure 4.2 and 4.5. The contours indicate that the groundwater gradient is relatively flat at less than 0.0005 ft/ft (as calculated between Wells MW2 and MW26) and represent non-pumping conditions following shutdown of the remediation system and groundwater extraction pumps (November 2015). The groundwater flow direction in both aquifers is primarily toward the west/northwest. During the July 2019 event, LNAPL was present in monitoring Wells MW18 and MW20 at measurable thicknesses, and LNAPL was not present in Wells MW10S, MW19, or MW29. LNAPL was present in extraction Wells EW06S , EW10S, EW12S, and EW14S with casings screened in the unconfined (upper) aquifer during the July 2019 monitoring event. During the October 2019 event, LNAPL was present in monitoring Wells MW18, MW19, and MW20 at measurable thicknesses, and LNAPL was not present in Wells MW10S or MW29. LNAPL was present in extraction Wells EW03S, EW05S, EW06S , EW10S, EW12S, and EW14S with casings screened in the unconfined (upper) aquifer during the October 2019 monitoring event. The general location of LNAPL is consistent with recent monitoring. During October 2019, a non-measureable amount of LNAPL (i.e., sheen) was potentially present at extraction Well EW04D in the semiconfined (lower) aquifer. LNAPL was not detected at all other wells in the semiconfined (lower) aquifer during the July and October monitoring events. LNAPL thickness measurements are shown on Figures 4.3 and 4.6.Vertical Gradients

Vertical hydraulic gradients were calculated between the semiconfined and unconfined aquifers to evaluate vertical flow between the two aquifers. The vertical gradient was calculated at monitoring Wells MW10/MW10S, MW12/MW16, and MW23/MW9 (see Figures 4.1, 4.2, 4.4 and 4.5). The vertical gradient was determined by taking the difference in groundwater elevations divided by the difference in mid screen elevations of the wells listed above.

Groundwater at the Site flows from the unconfined aquifer downward to the semiconfined aquifer. The vertical gradients at the site range from 0.002 ft/ft (MW10/MW10S) to 0.009 ft/ft (MW23/MW9). These values are consistent with recent monitoring events and represent non-pumping conditions.

4.2 Groundwater Sampling

This semiannual groundwater sampling event was conducted from October 14 through October 18, 2019 and consisted of collecting groundwater samples from twenty-one (21) monitoring wells (MW1, MW2, MW3, MW4, MW5, MW6S, MW10, MW10S, MW12, MW13, MW14, MW16, MW17, MW21, MW22, MW23, MW25, MW28, MW30, MW31, and MW32) and three (3) extraction wells (EW11D, EW11S, and EW13S). Well MW20 was not sampled due to the presence of LNAPL in the wells. Well MW29, which previously contained LNAPL, was inadvertently not sampled in October 2019 when LNAPL was not present. Groundwater samples were collected using low flow purge and sample protocol. As part of the well stabilization process, the groundwater was measured in the field for the following parameters: pH, temperature, specific conductance, dissolved oxygen (DO), oxidation-reduction potential (ORP), iron, and sulfide. The parameters DO, ORP, iron and sulfide are used to help evaluate the groundwater geochemical conditions at the well. The groundwater purging and sampling data are summarized in Table 4.3.

The groundwater samples were collected and analyzed for the following compounds: pentachlorophenol (PCP); naphthalene; benzene, toluene, ethylbenzene, and xylene (BTEX); natural attenuation parameters; and select dissolved metals. The natural attenuation parameters included alkalinity, chloride, hardness, nitrate, sulfate, total organic carbon, and methane. The results of the natural attenuation parameters were evaluated to confirm the groundwater reduction-oxidation conditions at the Site and if the groundwater conditions are favorable for biodegradation. The select dissolved metals included arsenic, copper, iron, manganese, and zinc. The metals samples were filtered in the field through a 0.45 micron filter. The groundwater sample analytical data are summarized in Table 4.4.

All groundwater samples were shipped via commercial courier under standard chain of custody procedures to TestAmerica Laboratories (TestAmerica) in University Park, Illinois for analysis. Copies of laboratory reports are included in Appendix C.

The following sections present a discussion of the groundwater sample analytical data and the Wisconsin Chapter NR140 preventative action limits (PAL) and enforcement standards (ES). Historical data are included in Appendix A.

4.2.1 Naphthalene and BTEX Analytical Data

The October 2019 naphthalene and BTEX analytical data are summarized in Table 4.4. Naphthalene was detected in three (3) wells (MW5, MW10S, and EW13S) at concentrations that exceeded the PAL of 10 micrograms per liter (µg/L) (Table 4.4). Naphthalene concentrations did not exceed the ES of 100 µg/L.

BTEX was not detected at concentrations that exceeded the ESs or PALs.

4.2.2 PCP Analytical Data

The October 2019 PCP analytical data are summarized in Table 4.4. PCP was detected in ten (10) wells (MW4, MW5, MW6S, MW10, MW10S, MW12, MW30, EW11D, EW11S, and EW13S) at concentrations exceeding the PAL of 0.1 µg/L. The PCP concentrations in all ten (10) wells (MW4, MW5, MW6S, MW10, MW10S, MW12, MW30, EW11D, EW11S, and EW13S) exceeded the ES of

1.0 µg/L. Figure 4.7 shows the PCP concentrations in the unconfined (upper) aquifer wells. Figure 4.8 shows the PCP concentrations in the semiconfined (lower) aquifer wells.

Consistent with baseline sampling in April 2016, elevated PCP concentrations (i.e., greater than 1,000 µg/L) are limited to the immediate vicinity of the LNAPL area in the unconfined and semiconfined aquifers, which indicates the plume remained stable during the remediation system shutdown pilot study monitoring period.

4.2.3 Dissolved Arsenic Analytical Data

The October 2019 dissolved arsenic analytical data are summarized in Table 4.4. Arsenic was detected in three (3) wells (MW10, MW13S, and MW14) at concentrations exceeding the PAL (1 µg/L). Arsenic concentrations did not exceed the ES of 10 µg/L. Figure 4.9 shows the arsenic concentrations in the unconfined (upper) aquifer wells. Figure 4.10 shows the arsenic concentrations in the semiconfined (lower) aquifer wells.

Consistent with all pilot study monitoring data, arsenic concentrations (i.e., greater than 1 µg/L) are limited to isolated areas within the Site property boundaries in the unconfined and semiconfined aquifers, which indicates the plume remained stable during the remediation system shutdown pilot study monitoring period.

4.2.4 Other Dissolved Metals Analytical Data

The October 2019 dissolved metals analytical data are summarized in Table 4.4. Zinc and copper were not detected above the PALs or ESs in any of the twenty-one (21) monitoring wells and three (3) extraction wells.

Iron was detected in ten (10) wells at concentrations exceeding the PAL (150 µg/L) and eight (8) wells at concentrations exceeding the ES (300 µg/L). Manganese was detected in nine (9) wells at concentrations exceeding the PAL (25 µg/L) and eight (8) wells at concentrations exceeding the ES (50 µg/L). The ES for iron and manganese are considered secondary health based standards that are based on aesthetics (i.e., odor and taste).

4.2.5 Natural Attenuation Parameters Analytical Data

The natural attenuation results are provided in Table 4.4. The results generally show elevated levels of nitrate and sulfate and low concentrations of TOC and methane. These results in combination with the field stabilization parameters of DO, ORP, iron, and sulfide (Table 4.3) show that the groundwater beneath the Site is aerobic to slightly anaerobic because DO values are greater than 1 mg/L and ORP values are positive at the majority of wells outside the immediate vicinity of the LNAPL area in both the unconfined and semiconfined aquifers.

4.3 Residential and Onsite Supply Well Sampling

On October 1, 2019, water samples were collected from seven residential wells located near the Site and the onsite water supply well (DW01) in general accordance with the FSP and QAPP. The residential wells included:

- 8713 Daniels 70 (RW1)

- 8627 Daniels 70 (RW2)
- 8454 Daniels 70 (RW3)
- 8526 Daniels 70 (RW4)
- 8783 Daniels 70 (RW5)
- 8542 West Doctor Lake Road (RW6 and RW6 Shop)
- (DW01)

The onsite water supply well serves the remediation equipment building. The water was previously used for sanitary facilities in the building and maintaining the remediation equipment but is not ingested by workers. During January 2018, the building heater malfunctioned, and the water supply pipes were damaged due to freezing. The water supply piping was subsequently disconnected at the building. The onsite water supply well no longer provides a water supply to the building and is currently only used as a supply for sampling equipment decontamination water.

The residential well and onsite water supply well locations are shown on Figure 4.11. The samples were analyzed for PCP, BTEX, and naphthalene.

4.3.1 Residential Well and Onsite Supply Well Sample Analytical Data

PCP, BTEX, and naphthalene were not detected at concentrations in the residential wells or onsite water supply well that exceed the respective PALs (Table 4.5).PCP was not detected in all residential wells. Semiannual sampling will continue at all residential wells to identify and track potential PCP concentration trends. These results are similar with historical data. The residential well and onsite supply well sample analytical data are summarized in Table 4.5. Copies of the laboratory reports are included in Appendix C, and the data validation memorandum is included in Appendix D. Historical residential and onsite water supply well PCP data are included in Appendix A.

4.4 Waste Management and Disposal

No waste was disposed during July through December 2019. GHD continues to collect and containerize PPE and other waste produced during sampling events onsite. Historical hazardous waste disposal is summarized in Appendix A.

4.5 Continuing Obligations and Inspections

The WDNR has implemented Institutional Controls (ICs) at the Site in the form of Continuing Obligations (COs). COs are legal requirements designed to protect public health and the environment in regard to contamination that remains on a property, and COs still apply after a property is sold. The Long-Term Response Action Operation and Maintenance Plan (OandM Plan) – Addendum No. 1 (GHD; November 9, 2015) effectively serves as an Institutional Control Implementation and Assurance Plan (ICIAP). This section documents the COs in addition to inspections required by the OandM Plan (GHD; July 22, 2015).

4.5.1 Continuing Obligations

On July 6, 2015 the WDNR provided a letter approving the Remedial Actions with Continuing Obligations (WDNR BRRTS Activity #02-07-000532, FID #: 807050310). That letter approved the remedies which have been implemented at the Site and specified the condition with which any current or future owner of the property must comply to ensure that the Site does not pose a threat. These conditions or COs meet the intent of the ICs required by the ROD for the Site.

CO maintenance consists of periodic monitoring and reporting to confirm that Site security is in place and providing protection as intended and that use of the land is restricted to maintain the integrity and functional effectiveness of the Site remedy.

Maintenance activities consist of periodic review of the property and COs by WDNR, notifications to new land owners or lessees, and continuing education for land owners and property users through annual updates and information.

To facilitate monitoring of the COs, roles and responsibilities, schedules, corrective actions, and reporting requirements were performed as follows:

1. Periodic monitoring was conducted whenever WDNR or its contractors or other representatives were present at the Site.
2. Prohibition of use of the Site real estate is evaluated and updated on an annual basis (minimum frequency). This evaluation determined:
   - The selected remedy (i.e. remediation system shutdown pilot study and associated monitoring) remains in place and remains effective
   - Site security remains effective and real estate use meets the stated objectives and performance goals and provides protection required by the response
3. Evidence was not observed of the following improper uses:
   - Removal of the existing barrier or cover
   - Replacement with another barrier or cover
   - Excavating or grading of the land surface
   - Filling on covered or paved areas
   - Plowing for agricultural cultivation
   - Construction or placement of a building or other structure
   - Changing the use or occupancy of the property to a residential exposure setting, which may include certain uses, such as single or multiple family residences, a school, day care, senior center, hospital, or similar residential exposure setting

An inspection of continuing obligations items was completed on October 2, 2019 and a copy of the continuing obligations inspection form is included in Appendix E. Site signage that had fallen off the fencing was re-attached during the inspection.

4.5.2 Inspections

Additional inspections required by the OandM Plan (GHD; July 22, 2015) were conducted during this monitoring period. The results of the inspections are as follows:

- The CAMU area fence is in satisfactory condition and does not require repairs; the CAMU fence gates remain closed and locked when GHD and/or WDNR are not at the Site.
- The CAMU area surface soils/vegetation were in good condition during this monitoring period and did not require repairs; erosion, subsidence, and ponding water were not observed on the CAMU.

A site well inspection was completed on October 2, 2019 and a copy of the well inspection form is included in Appendix E.

5. Microcosm and Bio-Trap Studies

Microcosm and BioTrap studies were conducted in accordance with the Remediation System Shutdown Pilot Study Work Plan (GHD; November 13, 2015). The objectives of the microcosm study were to gather the data necessary to:

- Determine whether natural attenuation of PCP is occurring at the Site
- Determine whether natural attenuation is occurring under aerobic conditions, anaerobic conditions, or both
- Determine a Site-specific biodegradation rate for PCP

The objectives of the BioTrap study were to gather the data necessary to:

- Determine whether bacteria capable of degrading PCP are present at the Site
- Demonstrate in situ biodegradation of PCP using a BioTrap

A technical memorandum presenting the results of the studies is included in Appendix F.

The results from the microcosm tests indicate that PCP and diesel range petroleum hydrocarbons (TPH(C_9-C_{36})) are readily degradable under aerobic conditions and that PCP and TPH(C_9-C_{36}) are also degradable under anaerobic conditions; however, the anaerobic process is much slower. The addition of emulsified vegetable oil (EVO) to optimize anaerobic conditions appears to increase the biodegradation rate of PCP. Based on the half-lives measured in the microcosms, the cleanup time for the aerobic area under aerobic conditions would be 6.3 months. The cleanup time for the anaerobic area without EVO enhancement would be 66 months (5.5 years). These estimated cleanup times assume that LNAPL is not present and there is no ongoing source of contamination.

These conclusions are supported by the data from the BioTraps. In the BioTraps deployed in the downgradient area in Wells MW9 and EW11S, the dominant class of organisms, the Proteobacteria degraded PCP and incorporated it into the biomass at a moderate rate. In the source area in Wells MW20 and MW29, the BioTrap data appears to indicate that Well MW20 may be in a transitional zone where some aerobic and some anaerobic processes are occurring. Although the BioTrap from MW20 contained the anaerobic Fimicutes, which were the dominant class of

organisms in MW29, Proteobacteria were the dominant class of organisms in MW20, and the rate of incorporation of PCP into biomass was similar to the aerobic wells. In MW29, which was likely highly anaerobic, the Fimicutes dominated, and slower incorporation of PCP into biomass was observed.

No mineralization of PCP (i.e., degradation into carbon dioxide) was observed in the BioTrap study; however, the BioTraps were deployed for only 32 days, which may not have been long enough for mineralization of PCP to occur.

Overall, the data suggests that MNA would be an effective treatment for the downgradient area, and biodegradation of PCP and TPH(C_9-C_{36}) is expected to occur at a moderate rate. MNA may be effective for the source area. The BioTrap and amended microcosm data show that PCP degradation does occur under anaerobic conditions; however, slower biodegradation rates are expected. Analysis of the unamended anaerobic microcosms after more time has elapsed would provide additional information about the rates that can be expected.

6. Groundwater Statistical Evaluation

Following shutdown of the remediation system in November 2015 and after allowing the subsurface conditions to stabilize, groundwater monitoring and sampling was conducted in April 2016 at all groundwater monitoring and extraction wells to determine baseline conditions at the Site. Subsequent quarterly and semiannual groundwater monitoring and sampling was conducted at selected wells through 2019 during the pilot study period.

A groundwater statistical evaluation was completed for the PCP concentration data obtained during the pilot study. The purpose of the evaluation was to assess whether PCP concentrations were stable or decreasing over the shutdown period as a line of evidence to support an alternate remedial action for the Site.

6.1 Statistical Trend Test Methods

Statistical methods for evaluating groundwater monitoring data are presented and in the United States Environmental Protection Agency's (USEPA's) guidance document *Statistical Analysis of Groundwater Monitoring data at RCRA Facilities – Unified Guidance* (USEPA, March 2009, EPA-530-R-09-007). Methods for evaluating temporal trends are discussed in Section 17.3 of the guidance. Additional information on trend testing of environmental quality data is found in Section 4.3 of *Data Quality Assessment: Statistical Methods for Practitioners* (USEPA, 2006), Chapter 12 of *Statistical Methods in Water Resources* (United States Geological Survey [USGS], 2002) and other relevant guidance and reference texts.

A suitable and commonly-applied procedure for trend assessment of environmental quality data is the Mann-Kendall trend test. The Mann-Kendall test is a non-parametric (rank-based) method that evaluates a set of data for a monotonic (unidirectional) trend. The procedure makes no assumptions regarding the shape of the trend (e.g., linear, loglinear), except that it is in a single direction (i.e., either consistently upward or downward). The test is a robust procedure suitable for general trend analysis.

In conducting the Mann-Kendall trend tests, a significance level of 0.05 (i.e., 95 percent confidence) was used for data sets with more than four samples. This confidence level (95 percent) is commonly utilized, and is frequently found in USEPA statistical guidance examples (e.g., Box 4-8 and Box 4-10 of USEPA, 2006). Performing the trend tests at a confidence level of 0.05 ensures a false positive rate (concluding a significant trend when none is present) of no more than 1 in 20. If a data set contained only four results, the Mann-Kendall test was interpreted at the 0.10 significant level (90 percent confidence), since the method is not mathematically capable of achieving 95 percent confidence with this few samples. Any data sets with fewer than 4 samples were not subjected to trend testing.

For the purposes of performing the Mann-Kendall trend test, non-detects were considered to be tied (i.e., equal) values with concentrations lower than the detected observations. A value of zero was used for the non-detects, although any value below the lowest detected result would yield identical ranking in the Mann-Kendall trend test (which as a non-parametric method considers only whether a certain observation is above or below another and not the magnitude of the difference). This assumption was made in order to prevent any variation in detection limits influencing the Mann-Kendall trend test results.

Any field duplicate results were averaged prior to carrying out trend analyses. If one field duplicate was a detected value and the other a non-detect, the detected result was conservatively retained to represent a maximum estimate of the analyte concentration.

Any individual observations with ambiguous rankings for the Mann-Kendall test (i.e., either a detected value - typically J-qualified - below other detection limits; or an elevated detection limit above other detected values) was dealt with on a case-by-case basis to obtain the most appropriate trend test. Specifically, to resolve such ambiguities an approach of maximizing the amount of usable data was taken:

- If a small proportion of non-detects with detection limits higher than some low detected values was present, these non-detects were removed from consideration, in order to remove ambiguous comparisons while retaining as many actual detected concentrations as possible. This was only done if a sufficient number of detected and estimated detected values remained (preferably 5 to 8 or more).
- When a data set contained only a small proportion of low estimated values below non-detects with higher detection limits, these low values were censored to the highest reporting/quantification limit (per USEPA's *ProUCL Version 5.1.02 Technical Guide*, 2015), as long as the resulting data set contained no more than 50 percent non-detects.
- If a data set contained non-detects with elevated (and varying) detection limits above detected concentrations (e.g., due to matrix interference), then the non-detects with elevated detection limits were removed from consideration (which is preferable to censoring all lower detected values and likely resulting in an untestable data set containing over 50 percent non-detects).

The Mann-Kendall procedure loses sensitivity when larger proportions of censored data (non-detect results) are present, and is not commonly applied for highly censored data sets (e.g., those comprised of more than 50 percent non-detects). Therefore, the Mann-Kendall trend test was

applied for data sets containing up to 50 percent non-detects and not for data sets in which parameters were non-detect in more than 50 percent of samples.

The Mann-Kendall trend test requires that sampling frequencies be consistent, at least approximately, over the time frame considered. This assumption was met in all data sets considered.

For the Mann-Kendall test, the Air Force Center for Environmental Excellence (AFCEE) (2007)[1] provides a decision matrix for the classification of trend results, given in the following table. Note that in the table below, the coefficient of variation (CoV) is the standard deviation of the untransformed data divided by the mean, which is a relative measure of variation.

Probability of Significance	Mann-Kendall Statistic (S)	Coefficient of Variation (CoV)	Classification of Concentration Trend
<0.05	Positive	--	Increasing
	Negative	--	Decreasing
0.05-0.10	Positive	--	Probably Increasing
	Negative	--	Probably Decreasing
>0.10	Positive	--	No Trend
	Negative or zero	≥ 1	No Trend
		< 1	Stable
		< 1	Stable

These recommendations were followed for interpreting the Mann-Kendall trend tests results.

The Mann-Kendall test was conducted for PCP concentrations on a per-well basis. It was also of interest to assess trends in PCP concentrations in groundwater across multiple wells. In particular, PCP concentrations in groundwater have previously been grouped into conditions under which anaerobic degradation zones (PCP>1,000 µg/L), aerobic degradation zones (PCP<1 µg/L), and mixed anaerobic/aerobic degradation zones (PCP between 1 and 1,000 µg/L. Considering these designations, the monitoring wells in the upper (unconfined) and lower (semiconfined) aquifers are grouped as follows:

Aquifer	PCP >1,000 µg/L (Anaerobic zone)	PCP 1-1,000 µg/L (Mixed zone)	PCP <1 µg/L (Aerobic zone)
Unconfined (Upper)	EW13S; MW5; MW10S; MW29;	EW11S; MW6S; MW30;	MW1; MW2; MW13; MW16; MW21; MW22; MW25; MW28; MW31; MW32;
Semiconfined (Lower)	MW10	EW11D; MW4; MW12;	MW3; MW14; MW17; MW23;

For the trend evaluation of PCP concentrations in groundwater for these groups of wells, two test approaches were conducted. The first was to use the Regional Kendall test (Helsel and Frans,

[1] AFCEE, 2007. Appendix A.2: Statistical Trend Analysis Methods. In Monitoring and Remediation Optimization System (MAROS) Software Version 2.2 User's Guide. Air Force Center for Environmental Excellence, San Antonio, TX.

2006)[2], which is an adaptation of the Seasonal Kendall test presented in Section 14.3.4 of the *Unified Guidance* (USEPA, 2009). In the Seasonal Kendall test, the Mann-Kendall test statistic (S) is computed separately for each location, and then these are combined to perform an overall regional test. This approach allows for spatial variation in concentrations to be accommodated while testing for a trend over time. That is, groundwater at one well may have a much higher PCP concentration than at another well, and by treating well location as a covariate in the statistical analysis a sensitive test for trend over time across a regional group may be accomplished.

The second group trend test approach used was to perform the Mann-Kendall test on group averages over time. This was accomplished by calculating the geometric mean PCP concentration for all samples within an area for each monitoring event, and then subjecting these means to the Mann-Kendall test. Note that the geometric mean is equivalent to the arithmetic mean of log-transformed data, and is used to mitigate the influence of extreme high concentrations in the mean calculations.

6.2 Results

The PCP concentration trends for the monitoring locations regularly sampled during the remediation system shutdown pilot test monitoring period, including 17 unconfined (upper) aquifer, 8 semiconfined (lower) aquifer, and 8 residential / water supply wells are shown on the plots in Appendix G. In the plots, all available sample data are illustrated (including those collected prior to and during treatment system operation), and the post-shutdown sample data are highlighted through the use of blue coloring. Additionally, the presence of censored results (non-detects) is indicated by plotting such data at their detection limit using an empty circle symbol (filled circles are detected values). The results of the per-well Mann-Kendall trend analyses are also included on the plots.

The results of the per-well Mann-Kendall trend tests are provided in Table 6.1. The vast majority of the wells included in post-shutdown sampling either did not exhibit a trend in PCP concentrations over time (i.e., stable or no-trend findings per the AFCEE decision matrix provided in Section 6.1 above) or had only too few PCP detections (in less than half of the samples collected) to perform the Mann-Kendall test. All of the residential / water supply wells either had no detections of PCP, or very rare low-level detections and again were not subjected to trend testing.

The following wells had statistically significant trends in PCP concentrations over time identified by the Mann-Kendall test:

Unconfined (upper) aquifer

- MW13 – Probably decreasing (90-95 percent confidence)
- MW28 – Decreasing (above 95 percent confidence)
- MW30 – Increasing
- EW13S – Increasing

[2] Helsel, D.R. and L.M. Frans, 2006. Regional Kendall Test for Trend. Environmental Science and Technology 40(13): 4066-4073.

Semiconfined (lower) aquifer

- MW12 – Increasing

Looking at the trend plots (Appendix G) for the data sets with increasing trends, PCP concentrations at MW30 were relatively low through 2017, had a high spike through 2018 and the first half of 2019, but were lower again at the end of 2019. Further sampling would provide additional information as to whether this was a transient peak in PCP concentrations, similar to that seen at several other wells (e.g., MW21; MW28; MW31; MW3; MW10). At EW13S, PCP concentrations have gradually increased during the post-shutdown period and may now be stabilizing. This pattern could be attributed to this well being utilized as a pumping well during system operation with groundwater drawdown returned to steady state conditions. At MW12 in the semiconfined (lower) aquifer, PCP concentrations have increased steadily over time and are presently at levels last seen in 2009, although still significantly lower than historic peak concentrations prior to remediation system operation. The two samples collected in 2019 were similar in magnitude (approximately 300 µg/L), and further sampling would provide more information on whether conditions are stabilizing or not.

One decreasing trend post-shutdown was noted for PCP at MW28. In this case the concentration had a rebound right after shutdown but has consistently decreased in subsequent samples.

Further considering the patterns in PCP concentrations on the trend plots in conjunction with the Mann-Kendall test results, there are some locations (with or without significant trends overall) where the PCP concentration rebounded following system shutdown (see Appendix G for illustration). These include:

- MW5 (no trend but now back to pre-remediation concentration)
- MW21 (briefly in 2017 but now back to non-detect)
- MW28 (in 2016-2017, but now back to pre-shutdown concentration)
- MW10 (back to 2005-2010 concentrations, may be decreasing again now)
- MW12 (increasing, back to pre-2010 concentrations)

The results of the regional (group) trend tests are presented in Table 6.2 and summarized in the table below.

Aquifer	Area Group	Regional Kendall Trend Test Result	Group Averages Mann-Kendall Test Result
Unconfined (Upper)	PCP >1000 µg/L (Anaerobic zone)	Probably Increasing	Stable
	PCP 1-1000 µg/L (Mixed zone)	No Trend	Increasing
	PCP <1 µg/L (Aerobic zone)	Decreasing	Decreasing
Semiconfined (Lower)	PCP >1000 µg/L (Anaerobic zone)	Stable	Stable
	PCP 1-1000 µg/L (Mixed zone)	No Trend	Probably Increasing
	PCP <1 µg/L (Aerobic zone)	Stable	Decreasing

The wells used for each of the area groups are discussed above. Note that for the semiconfined (lower) aquifer, there is only one well (MW10) in the PCP >1,000 µg/L (anaerobic) zone, and this the trend result for this data set is the same as for the individual well.

The trend findings for the two approaches to area group testing lack consistency, in that typically one of the tests found a trend (or probable trend) while the other did not. Conceptually, the group averages approach could be more susceptible to the influence of individual wells with higher PCP concentrations. That is, the higher concentration data would dominate the average calculations. For example this occurs at MW12, with concentrations now greater than 100 µg/L compared to concentrations below 10 µg/L at the other two wells in the same group. Since MW12 exhibits an increasing trend post-shutdown, it is not surprising that the area group averages have a probably increasing result regardless of the patterns in the wells with lower PCP concentrations. In contrast, the Regional Kendall tests provide more equal weighting of the individual wells, accommodating differences in magnitude of PCP concentrations in groundwater between wells.

6.3 Conclusions

The trend test results are somewhat mixed in terms of changes in groundwater PCP concentrations following remediation system shutdown in November 2015. In the unconfined (upper) aquifer, wells in the aerobic zone (PCP concentrations below 1 µg/L) appear to have fairly consistent decreasing concentration patterns, which is reflected in the overall area group tests results. In the mixed (1 to 1,000 µg/L) and anaerobic (>1000 µg/L) zones, some wells have exhibited increasing trends in PCP concentrations (EW13S, MW30), although concentrations may be stabilizing recently into more steady-state conditions.

In the semiconfined (lower) aquifer, PCP concentrations in groundwater post shutdown have appeared stable or decreasing in all of the wells sampled except MW12. Notably, PCP concentrations at MW10 (the lower aquifer well with highest PCP concentrations) appear to have stabilized at a level similar to that immediately following system shutdown. Considering the results overall, it appears that shutdown of the remediation system has not had any major impact on PCP concentrations in groundwater within the semiconfined (lower) aquifer.

Overall, evaluation of the statistical trend tests considering PCP concentrations in groundwater following shutdown of the treatment system at the end of 2015 provide mixed results. PCP concentrations have been stable or decreasing at the majority of the wells included in pilot study sampling but have increase at some others. The wells with groundwater having the highest PCP concentrations (MW5; MW10S, EW13S; MW10) do appear to be somewhat stable or decreasing most recently (based on inspection of the trend plots in Appendix G). Therefore, continued monitoring will allow observation of the longer term pattern in PCP concentrations in groundwater at the Site.

7. Significant Changes

Conditions at the Site have changed significantly since remedial alternatives were evaluated and one alternative was selected in the ROD. In addition, advances in the science and technical understanding have changed LNAPL remediation. This section discusses these issues below.

7.1 Advances in the Science of LNAPL Remediation

The understanding of the science and behavior of LNAPL in the subsurface has significantly evolved since the ROD (1998) in large part based on the following guidance documents:

- American Petroleum Institute (API). August 2003. Models for Design of Free-Product Recovery Systems for Petroleum Hydrocarbon Liquids. American Petroleum Institute Publication Number 4729.
- American Petroleum Institute (API). August, 2004. API Interactive LNAPL Guide, Version 2.0. American Petroleum Institute, Washington, District of Columbia.
- United States Environmental Protection Agency (USEPA). March 2005. EPA 542-R-04-011: A Decision-Making Framework for Cleanup of Sites Impacted with Light Non-Aqueous Phase Liquids (LNAPL).
- American Society for Testing and Materials (ASTM). February 2007. E 2531-06: Standard Guide for Development of Conceptual Site Models and Remediation Strategies for Light Nonaqueous-Phase Liquids Released to the Subsurface.
- The Interstate Technology and Regulatory Council (ITRC). April 2009. Evaluating Natural Source Zone Depletion at Sites with LNAPL.
- The Interstate Technology and Regulatory Council (ITRC). December 2009. Evaluating LNAPL Remedial Technologies for Achieving Project Goals.
- Wisconsin Department of Natural Resources (WDNR). February 2008. PUB-RR-787: Assessment Guidance for Sites with Residual Weathered Product.

As an example, the common understanding of LNAPL today is as follows:

- Most LNAPL bodies that have been in the ground for years (with no continuing source) are typically found to be stable (not migrating). The fraction of an LNAPL body that will be potentially mobile and/or recoverable will typically be quite low. API indicates that (API 2002): "*…for most of the hydraulic recovery cases evaluated from literature and in our own records, the total LNAPL recovery was less than 30% of the original volume in-place with the upper end being as high as 60%...The implication is that for most sites, recovery of more than 30% of the LNAPL in-place would be the exception rather than the rule.*" [underline added]. The longer the LNAPL is in the ground, the smaller the potentially recoverable fraction becomes as LNAPL becomes increasingly disconnected and NSZD[3] processes progress. At sites where LNAPL has been in the ground for a number of years, as with the Penta Wood Products Superfund Site, it is GHD's experience that 10% or less is a reasonable expectation for the fraction of the LNAPL in-place that might be recoverable.[4]
- Many LNAPL bodies will be found to produce levels of dissolved and/or vapor phase contamination that are either undetectable or within risk-based screening levels. Even where dissolved and/or vapor phase contamination is unacceptably elevated, LNAPL recovery will do

[3] See ITRC's Evaluating Natural Source Zone Depletion at Sites with LNAPL (April 2009)

[4] Based on soil/rock core petrophysical testing quantifying LNAPL saturations, residual saturations, and potentially recoverable fractions at numerous sites

relatively little in terms of risk reduction since the vast majority of the LNAPL will remain (see previous point) and the mole fractions of constituents of concern will remain unchanged (i.e., no effect on volatilization or dissolution rates).

- Most LNAPL bodies will self-stabilize in a relatively short period of time following the cessation of active releases; therefore, LNAPL recovery will very often provide no significant added benefit in the mitigation or migration at sites where LNAPL has been in the ground for many years.

7.2 System Performance

Approximately 242 million gallons of groundwater were extracted, treated, and discharged through operation of the remediation system. Approximately 42,000 gallons of LNAPL were reportedly recovered from the subsurface (Table 5-5, Long-Term Remedial Action Report, CH2M HILL, November 2014) through 2014. Bioventing contributed to the degradation of contaminants in the vadose zone. These remedial actions represent significant changes that have occurred at the Site since the remedy (Alternative 3) was selected and implemented and directly caused the change in conditions discussed in Section 7.3. LNAPL remediation was effective at reducing the mobility/recoverability of the LNAPL to de minimis levels and has accomplished the goal for remediation of reducing the principal threat to groundwater to the extent practicable.

7.3 Current Conditions

7.3.1 Dissolved PCP Plume

The source remedy has resulted in a dramatic improvement in groundwater quality (Appendix A).

As shown on Figures 8 through 11 of the Long-Term Remedial Action Report (CH2M HILL, November 2014), the dissolved PCP (primary constituent of concern at the Site) plume significantly decreased in size.

At the Site, the initial purpose of groundwater remediation was to aggressively dewater to recover LNAPL and increase the smear zone available to bioventing. This work has been completed. In terms of PCP dissolution from the source zone to groundwater, the rate of dissolved phase which partitions from the LNAPL is small enough that MNA is effective as a groundwater remedy.

PCP concentration contours shown on Figures 7.1 through 7.4 indicate that the plume did not migrate during the remediation system shutdown period and indicate overall plume stability.

7.3.2 LNAPL Body

Based on the presence of LNAPL in wells at the Site, the size of the LNAPL body has remained stable from the time prior to implementing the remedy through more than 11 years of remediation system operation. The size of the LNAPL body is approximately 2 acres and is limited to within the Site property boundaries. Once an LNAPL body stabilizes, it will typically remain so even if significant in-well LNAPL thicknesses are observed within the areal extent of LNAPL impacts.

LNAPL limits shown on Figure 7.5 indicate that the LNAPL did not migrate during the remediation system shutdown period and indicate overall stability of the LNAPL body.

7.3.3 Soil Excavation and Consolidation

Soil, wood chips, sediment, biopad debris, and other selected debris throughout the Site were excavated and consolidated into a CAMU in 2000, which will remain at the Site. Confirmation sampling documented residual soil contaminant concentrations met the target limits as reported by CH2M HILL (Remedial Action Report, September 2000). However, subsequent review of the confirmation sampling data and follow-up sampling data indicates that PCP concentrations in the wetland northeast of the Site property exceed applicable criteria. In cooperation with USEPA, WDNR is planning to excavate this area and place the material within an expanded portion of the CAMU to ensure that the criteria are met.

7.3.4 Surface Debris Mitigation

Surface debris located along the west and north Site property boundaries contains contaminants at concentrations exceeding the direct contact and groundwater protection Residual Contaminant Levels (RCLs) for arsenic, PCP, and other SVOCs. Subsequent soil sampling under the surface debris confirmed that contaminant concentrations meet the groundwater protection RCLs. To mitigate the direct contact exposure pathway and in cooperation with USEPA, WDNR is planning to cover the impacted debris in place with clean borrow soil from the Site.

7.4 LNAPL Mobility and Recoverability

During 2013 and 2014, CH2M HILL conducted a LNAPL mobility and recoverability evaluation at the Site as documented in the LNAPL Mobility and Recoverability Report (CH2M HILL, October 2014). Conclusions of this work included:

- The LNAPL extent has been delineated and is approximately the same as the dissolved PCP plume exceeding concentrations of 1,000 µg/L.
- The LNAPL body is stable and not migrating based on laboratory-measured low/residual LNAPL saturations.
- LNAPL is no longer recoverable using hydraulic and/or pneumatic means based on calculated LNAPL transmissivity values less than the ITRC minimum threshold required for recovery (0.1 to 0.8 square feet per day).

LNAPL recovery is no longer considered technically feasible or required to stabilize the LNAPL given its well-stabilized state and calculated LNAPL transmissivity values less. The remediation system has therefore achieved LNAPL recovery to the maximum extent practicable since a practical science-based end-point has been met.

During operation of the system from 2004 through August 2014, approximately 42,000 gallons of LNAPL were reportedly recovered at the Site (Long-Term Remedial Action Report, CH2M HILL, November 2014). A decline curve analysis estimates a total recoverable LNAPL quantity of approximately 50,000 gallons. This provides another line of evidence that LNAPL has effectively been recovered to the maximum extent practicable. Significant advances in the science, understanding and remedial approach to LNAPL have been made in recent years. In 2009, the ITRC established new guidance on the science of mobile versus residual LNAPL (ITRC, 2009a). It is now understood that the quantities of LNAPL recovered from the subsurface at most sites represents a

very small fraction of the overall LNAPL body and that the vast majority of the LNAPL remains in the aquifer formation as trapped/immobile/unrecoverable residual. This immobile LNAPL may or may not appear in monitoring wells depending on stratigraphy and hydraulic conditions. Also, in 2009, the ITRC established guidance on NSZD which recognizes that residual LNAPL can and in most cases will remain within the formation (ITRC, 2009b) and is compatible with MNA for groundwater remediation. Under a NSZD remedy, it is recognized that the threat of migration is no longer present. Further, NSZD studies have shown that on the order of 1,000 gallons per acre per year of LNAPL depletion is typically achieved via NSZD processes. At the Site, the LNAPL area is approximately 2 acres, which means that up to 2,000 gallons/year of LNAPL could conceivably be depleted by natural processes. Therefore, NSZD can replace active LNAPL removal and have similar effectiveness of the active remediation system at the Site. Since most of the LNAPL at old LNAPL sites will be present as unrecoverable residual, this strategy is simply an acknowledgement that NSZD can and will be the dominant remedial process at these sites.

8. Alternate Remedy Evaluation

8.1 Description of Remedial Action Alternatives

The ROD identified five potential remedial action alternatives (Alternatives 1 through 5). Alternative 3 was selected for the Site and consisted of the following components:

- Land use restrictions
- Building demolition
- Dismantle biopad and backfill onsite
- Grading, lagoon buttress, revegetation
- Excavation of hot spots, washout gully soils and sediments, and consolidation
- Soil cover over consolidated soils and sediments
- Insitu bioventing of vadose soils
- Insitu bioventing of dewatered smear zone
- LNAPL collection and offsite disposal
- Groundwater collection in LNAPL area
- Monitored natural attenuation – groundwater (outside of the LNAPL area)
- Granular activated carbon (GAC) adsorption
- Discharge of treated water via infiltration
- Environmental monitoring
- Maintenance of cover and erosion control
- Alternative water supply
- Five-year reviews

The recommended remedy (identified herein as Alternative 3A) includes:

- Land use restrictions through institutional controls
- MNA – groundwater
- NSZD – LNAPL
- Environmental monitoring
- Modified performance standards
- Maintenance of cover and erosion control
- Alternative water supply
- Five-year reviews

8.2 Nine-Criteria Evaluation

An evaluation against the Superfund nine criteria for remedy selection is presented below. The existing remedy (Alternative 3) and recommended remedy (Alternative 3A) are evaluated below. This evaluation does not include the contaminant concentrations in the wetland northeast of the Site or the impacted surface debris along the west and north Site property boundaries. In cooperation with USEPA, WDNR is planning to address the wetland and surface debris separately to mitigate and ensure that the applicable criteria are met.

8.2.1 Overall Protection of Human Health and the Environment

This criterion examines the risk remaining after the remediation has been conducted. Also, short-term risks associated with each remedy are evaluated. To compare the remedial actions with respect to the overall protection of human health and the environment, each pathway of exposure is discussed below:

Residential Ingestion

Residential ingestion of contamination involves the inadvertent intake of contamination by persons living at or near the Site. Both Alternatives 3 and 3A will leave a portion of the LNAPL in place. However, in both cases the residual LNAPL is located within the Site property boundaries. As a result this exposure pathway is incomplete for both remedies, and residents at adjacent properties will not be exposed to contamination at levels exceeding regulatory criteria. Alternatives 3 and 3A are equally protective with respect to the residential ingestion criterion.

Groundwater Use

Groundwater is used as a non-potable water supply at the Site. Concentrations in the onsite supply well meet the ES. Both alternatives require institutional controls to ensure that groundwater at the Site is not used as a drinking water source. Groundwater sample analytical data indicates that groundwater at the nearby residential properties meets the ES. Alternatives 3 and 3A are equally protective with respect to the groundwater use criterion.

Residential Inhalation

Residential inhalation involves an evaluation of the potential for organic compounds to volatilize and migrate into buildings. Under both alternatives, the Site cannot be developed as a residential property. LNAPL would be reduced but some LNAPL would remain. The potential for volatile organic compound (VOC) migration into any future onsite buildings outside of the CAMU is extremely low based on the presence of LNAPL at depths more than 80 feet below ground surface. Alternatives 3 and 3A are equally protective with respect to the residential inhalation criterion.

Future Construction Workers

The risk to future construction workers arises from potential dermal contact and/or inhalation of contaminants during construction activities. The most common post-remediation construction activity would be the excavation for utilities or building foundations. The historical data demonstrates the LNAPL and the LNAPL smear zone are located more than 80 feet below the ground surface and poses no risk to future construction workers outside of the CAMU. Alternatives 3 and 3A are equally protective with respect to the future construction worker criterion.

Ecological Risk

Ecological risk is associated with the release of contamination to the ground surface, wetlands or surface water. Given that the LNAPL is subsurface and is stable, there are no completed pathways to the ground surface, surface water or wetlands. The natural groundwater flow direction is primarily to the north-northwest. Groundwater monitoring data collected surrounding the LNAPL demonstrate that neither the LNAPL nor the dissolved constituents are migrating toward the wetland. Hence, the groundwater pathway to ecological receptors is not complete. Alternatives 3 and 3A are equally protective with respect to the ecological risk criterion.

8.2.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

As documented on page 44 in the ROD (USEPA, November 1998), USEPA determined that the current remedy complies with federal and state ARARs. The recommended remedy will meet federal and state ARARs through continued institutional controls and modified Performance Standards.

8.2.3 Long-Term Effectiveness and Permanence

Implementation of the selected remedy has permanently removed a portion of the contamination at the Site. Through advancement in LNAPL science and understanding, it is now recognized that it is not technically feasible to remove all LNAPL at remediation sites. Under either the current remedy or the recommended remedy, institutional controls in the form of groundwater use restrictions and land use restrictions would continue to be required to address risks associated with residual contamination at the Site. Institutional controls will make the remedy effective long-term.

Quantities of LNAPL recovered from the subsurface at most sites represents a very small fraction of the overall LNAPL body and that the vast majority of the LNAPL remains in the aquifer formation as trapped/immobile/unrecoverable residual. NSZD can have similar effectiveness of the remediation system at the Site. A reasonable period for a remedy relying natural attenuation is timeframe

comparable to that which could be achieved through active remediation. Alternatives 3 and 3A are comparable with respect to long-term effectiveness and permanence.

8.2.4 Reduction in Toxicity, Mobility, and Volume

As stated above (Section 4.0), the current remedy has significantly and permanently reduced the contamination in soil and groundwater at the Site. The recommended remedy will continue to reduce the toxicity, mobility, and volume at the Site. Through advancement in LNAPL science and understanding, it is now recognized that it is not technically feasible to remove all LNAPL at remediation sites. Accordingly, it is impracticable to reduce dissolved constituent concentrations to levels below the PAL or ES via engineered methods such as the current system or any other techniques that would typically be considered feasible at a site where there are no unacceptable exposure scenarios that cannot be effectively mitigated through continued institutional controls. As such, natural processes would be required to address residual contamination beyond what has been achieved to date and any other potential exposure scenarios would be managed through continued institutional controls.

8.2.5 Short-Term Effectiveness

Neither alternative has a short-term effectiveness impact since the alternatives do not require remedial construction. The remediation system shutdown pilot study monitoring period consistent with the recommended remedy confirmed that the short-term effectiveness will not be impacted.

8.2.6 Implementability

Continued implementation of the current remedy (Alternative 3) is possible. However, significant energy resources and manual labor would continue to be required to operate, maintain, and monitor the remediation system with much higher carbon footprint and little added remedial benefit expected over Alternative 3A. Implementation of the recommended remedy is also possible.

8.2.7 Cost

Annual remediation system operation and maintenance costs for the current remedy (Alternative 3) were approximately $1.1 million based on the summary table provided in Appendix A of the Five-Year Review Report (USEPA, January 2015). These actual costs are significantly more than estimated costs in the ROD, which were approximately $4.4 million (net present worth over a 30-year period). Following a modification of the remediation system operation in 2015, costs were reduced to less than $0.8 million per year. Costs associated with the recommended remedial action (Alternative 3A) are estimated to be less than $0.2 million. A comparison of the costs illustrates that the recommended remedial action can achieve remediation at a significantly lower cost.

8.2.8 WDNR Acceptance

WDNR has reviewed this evaluation and with submittal of this report documents concurrence with the recommended remedial action.

8.2.9 Community Acceptance

Community acceptance of Alternative 3 was evaluated in the ROD during the Public Meeting and public comment period. There were no comments and there was no opposition to Alternative 3. WDNR and GHD believe that the recommended remedy (Alternative 3A) would only require issuance of an Explanation of Significant Differences (ESD) by USEPA and would not require a ROD Amendment. If USEPA determines that only an ESD is required, public notice and a meeting with comment period would not be required.

9. Performance Standards

As discussed, below, the statutory and regulatory requirements (remedial action objectives) specified in the ROD (USEPA, November 1998) have been met through implementation of the selected remedy (Alternative 3) or will be met through implementation of the recommended remedy (Alternative 3A):

- Reduce/eliminate the potential risks to human health and ecological receptors associated with exposure to PCP and fuel oil components in surface water and groundwater, and PCP/fuel oil components and metals in the soil and sediment.
  - This requirement was met following the soil excavation and consolidation work as documented in the Remedial Action Report (CH2M HILL, September 2000).
- Reduce/control the source of contaminants.
  - This requirement was substantially met through operation of the remediation system.
- Reduce the concentrations of these compounds in the groundwater plume to PALs (WDNR Preventive Action Limits).
  - The performance standard for each constituent of concern is recommended to be modified from the Preventative Action Limit (PAL) to the Enforcement Standard (ES) as identified in Ch. NR 140, Wis. Adm. Code. Ch. NR 140, Wis. Adm. Code establishes two types of groundwater quality standards to serve as basis for site closure: PALs and ESs. PALs are the promulgated cleanup goals applicable to all Wisconsin cleanup sites, to the extent technically and economically feasible. This is codified in s. NR 140.22(1), Wis. Adm. Code, and in s. NR 722.09(2)(b), Wis. Adm. Code. The ESs are generally numerically equivalent to the maximum contaminant levels (MCLs) under the federal Safe Drinking Water Act.
  - WDNR indicates that it has used the ES as the basis for eligibility for site closure since the mid-1990s. This eligibility criterion has been adopted in Ch. NR 726, Wis. Adm. Code. WDNR has concluded that groundwater quality compliance with PALs at contaminant discharge sites in Wisconsin is in many cases not technically or economically feasible and has granted PAL exemptions under s. NR 140.28(2), Wis. Adm. Code, at the time of closure. A PAL exemption can be granted when it is shown that groundwater contamination is stable or decreasing and groundwater standards will be met within a reasonable period of time as a result of natural attenuation. It is recommended that a PAL exemption under s. NR 140.28(2), Wis. Adm. Code, is approved for this Site.

- Satisfy Applicable or Relevant and Appropriate Requirements (ARARs).
  - This requirement was met.

The performance goals of the remediation system have also been met as discussed below:

- Remove LNAPL, to the extent practicable, to reduce a source of PCP to the groundwater.
  - This goal was met by operation of the remediation system. LNAPL mobility and recoverability testing demonstrated that LNAPL has been recovered to the maximum extent practicable.
- Extract and treat the most concentrated portions (exceeding 1,000 micrograms per liter (µg/L)) of PCP in the groundwater, and reduce concentrations to a level that allows natural attenuation to achieve the NR 140 standards in a reasonable period of time.
  - This goal was substantially met by operation of the remediation system. The size of the dissolved plume has been significantly reduced. Dissolved concentrations will remain elevated in the immediate vicinity of the LNAPL body.
  - NSZD can have similar effectiveness of the remediation system at the Site. A reasonable period for a remedy relying natural attenuation is timeframe comparable to that which could be achieved through active remediation.
- Lower the water table, to the extent practicable, to allow bioventing to promote natural degradation of the residual diesel range organics and PCP in the LNAPL smear zone.
  - This goal was substantially met during operation of the remediation system.
- Comply with WPDES discharge criteria.
  - This goal was substantially met during operation of the remediation system.

10. Conclusions

Based on the pilot study data obtained since April 2016, the following conclusions are made and represent lines of evidence supporting selection of an alternate remedy:

- LNAPL limits indicate that the LNAPL did not migrate during the remediation system shutdown period and indicate overall stability of the LNAPL body
- NSZD is occurring within the LNAPL body at this Site
- PCP concentration contours indicate that the plume did not migrate during the remediation system shutdown period and indicate overall plume stability.
- Dissolved PCP concentrations greater than 1,000 µg/L are limited to the immediate vicinity of the LNAPL area
- Dissolved PCP degrades naturally in the aerobic zone outside of the LNAPL area, which helps stabilize the plume and prevent migration
- Dissolved PCP degrades in the anaerobic zone (LNAPL source area) at a slow rate

- The rate that dissolved PCP partitions from the LNAPL is slow enough and the rate of natural degradation is fast enough that migration would not likely occur beyond the property boundaries
- The current monitoring well network is sufficient to monitor plume conditions

The above lines of evidence support selection of MNA as an effective groundwater remedy at this Site. Although, the results of the groundwater statistical evaluation of the current Site data may provide mixed results of PCP concentration trends, the above lines of evidence provide strong support for MNA. As compared to the currently selected remedial alternative of active remediation, natural attenuation will achieve performance goals within a reasonable (i.e., comparable) period of time.

11. Alternate Remedy Recommendation

The recommended remedy (Alternative 3A) includes:

- Land use restrictions through institutional controls
- MNA – groundwater
- NSZD – LNAPL
- Environmental monitoring
- Modified performance standards
- Maintenance of cover and erosion control
- Alternative water supply
- Five-year reviews

The following actions are recommended for the Site:

- Keep the remediation system shut down
- Implement MNA performance monitoring and evaluation
- Implement a contingency remedy in the event that the recommended remedy fails to perform as anticipated
- Modify Performance Standards as presented in Section 9
- Continue institutional controls

The current monitoring and sampling scope will continue at the Site while USEPA makes a determination on the recommended alternative remedy.

11.1 MNA Performance Monitoring

The recommended scope of MNA performance monitoring includes:

- Annual groundwater and LNAPL level monitoring during April
- Annual groundwater monitoring and sampling during April

- Semiannual residential well sampling during April and October
- Annual report preparation and submittal in January

The recommended performance monitoring and sampling scope would be the same as during the remediation system pilot study and as summarized in Table 4.1. The frequency and scope for all monitoring and sampling would be assessed annually with recommendations included in each report. Performance monitoring would continue until remediation objectives have been achieved and verify that the Site no longer poses a threat to human health or the environment. The monitoring program is designed to:

- Demonstrate that natural attenuation is occurring according to expectations
- Detect changes in environmental conditions that may reduce the efficacy of any of the natural attenuation processes
- Verify that the plume is not expanding
- Verify no unacceptable impact to downgradient receptors
- Demonstrate the efficacy of institutional controls
- Verify attainment of remediation objectives and performance standards

11.2 Contingency Remedy

In the event that the recommended remedy fails to perform as anticipated, the recommended contingency remedy includes keeping the existing remediation system infrastructure in place for potential future groundwater and/or LNAPL extraction.

12. Certification

The current actions at the Site remain protective of human health and the environment based on an evaluation of the current data. Implementation of the contingency plan outlined in the Remediation System Pilot Study Work Plan (GHD; November 13, 2015) is not necessary at this time.

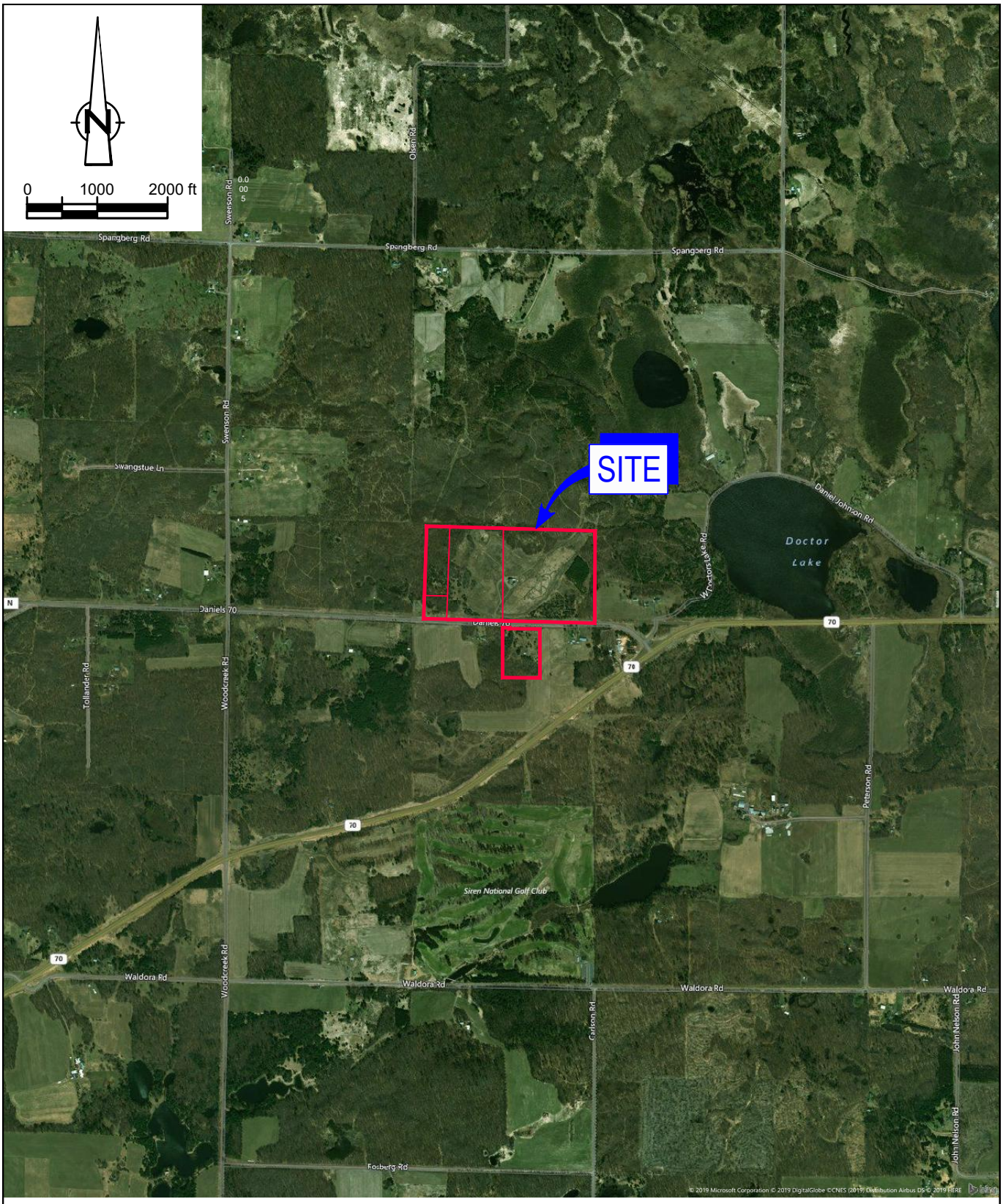
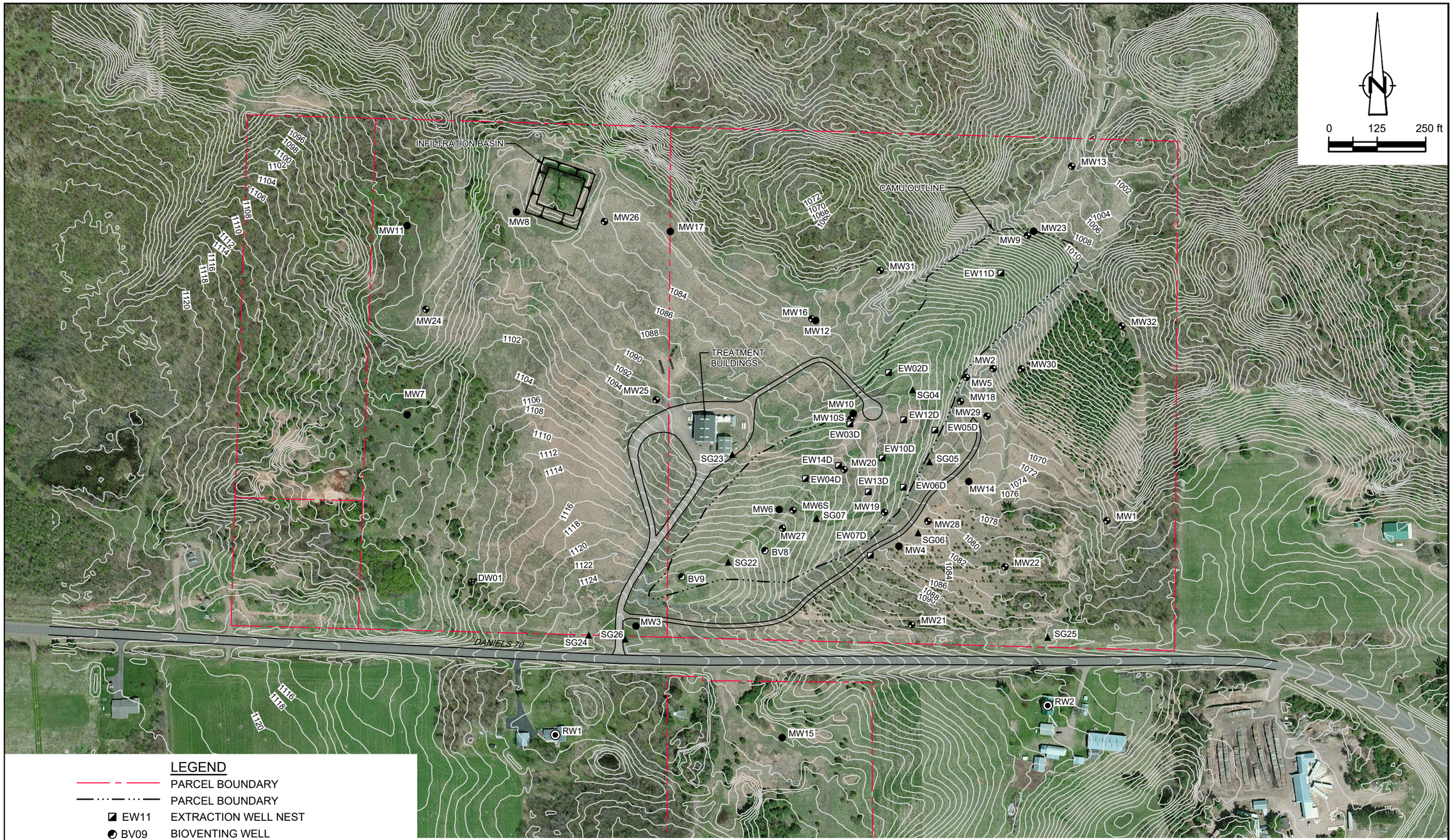


figure 1.1

SITE LOCATION
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA0014.DWG Plot Date: FEB 19, 2020



LEGEND

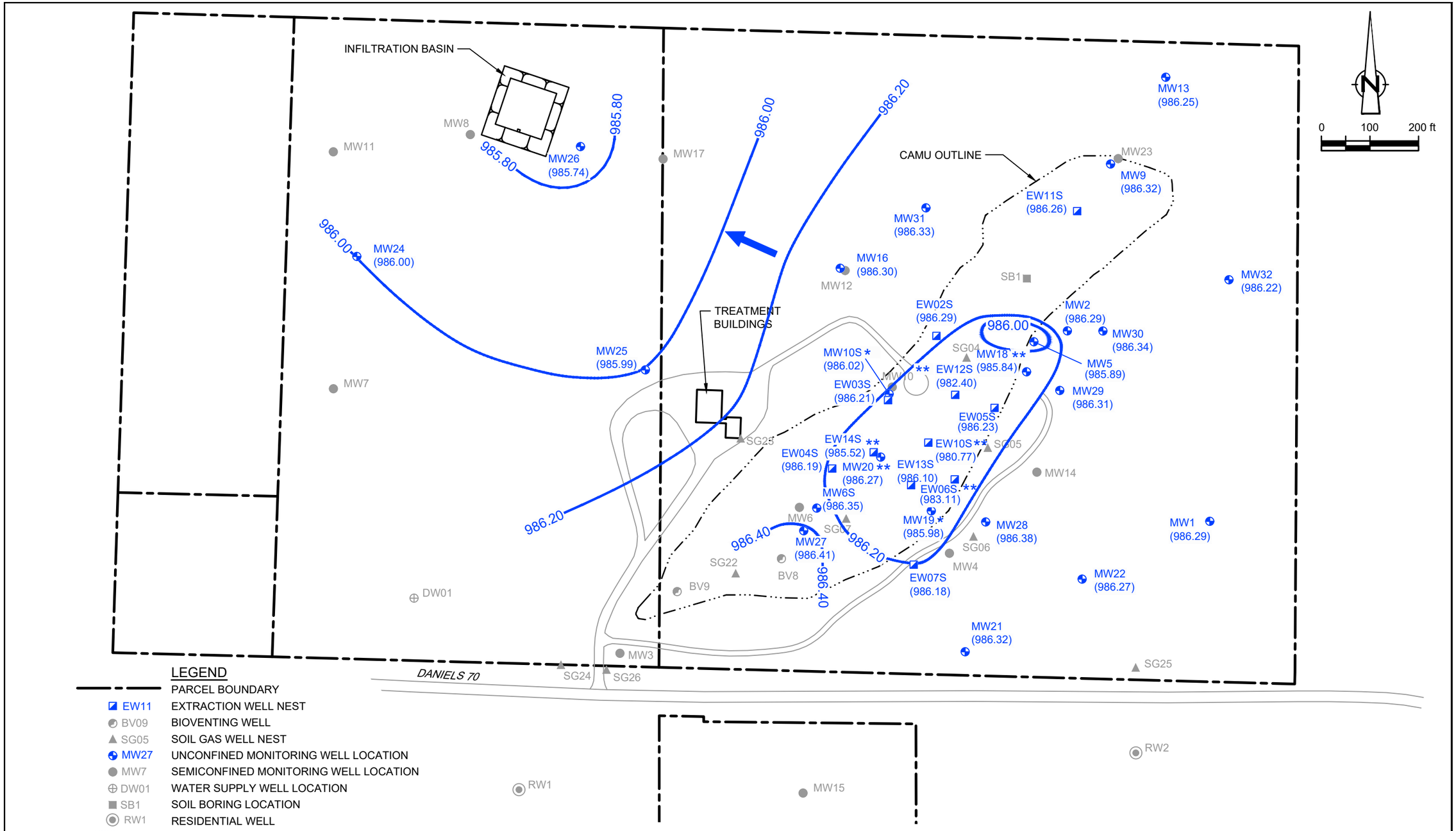
	PARCEL BOUNDARY
	PARCEL BOUNDARY
EW11	EXTRACTION WELL NEST
BV09	BIOVENTING WELL
SG05	SOIL GAS WELL NEST
MW27	UNCONFINED MONITORING WELL LOCATION
MW7	SEMICONFINED MONITORING WELL LOCATION
DW01	WATER SUPPLY WELL LOCATION
RW1	RESIDENTIAL WELL

SOURCE: KEMPER AND ASSOCIATES, INC. SURVEY DATED MAY 2016 (WISCONSIN BURNETT COUNTY COORDINATE SYSTEM NAD83, 1996). & Microsoft Corporation; Burnett County

figure 1.2

SITE PLAN
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA0015.DWG Plot Date: FEB 19, 2020



LEGEND

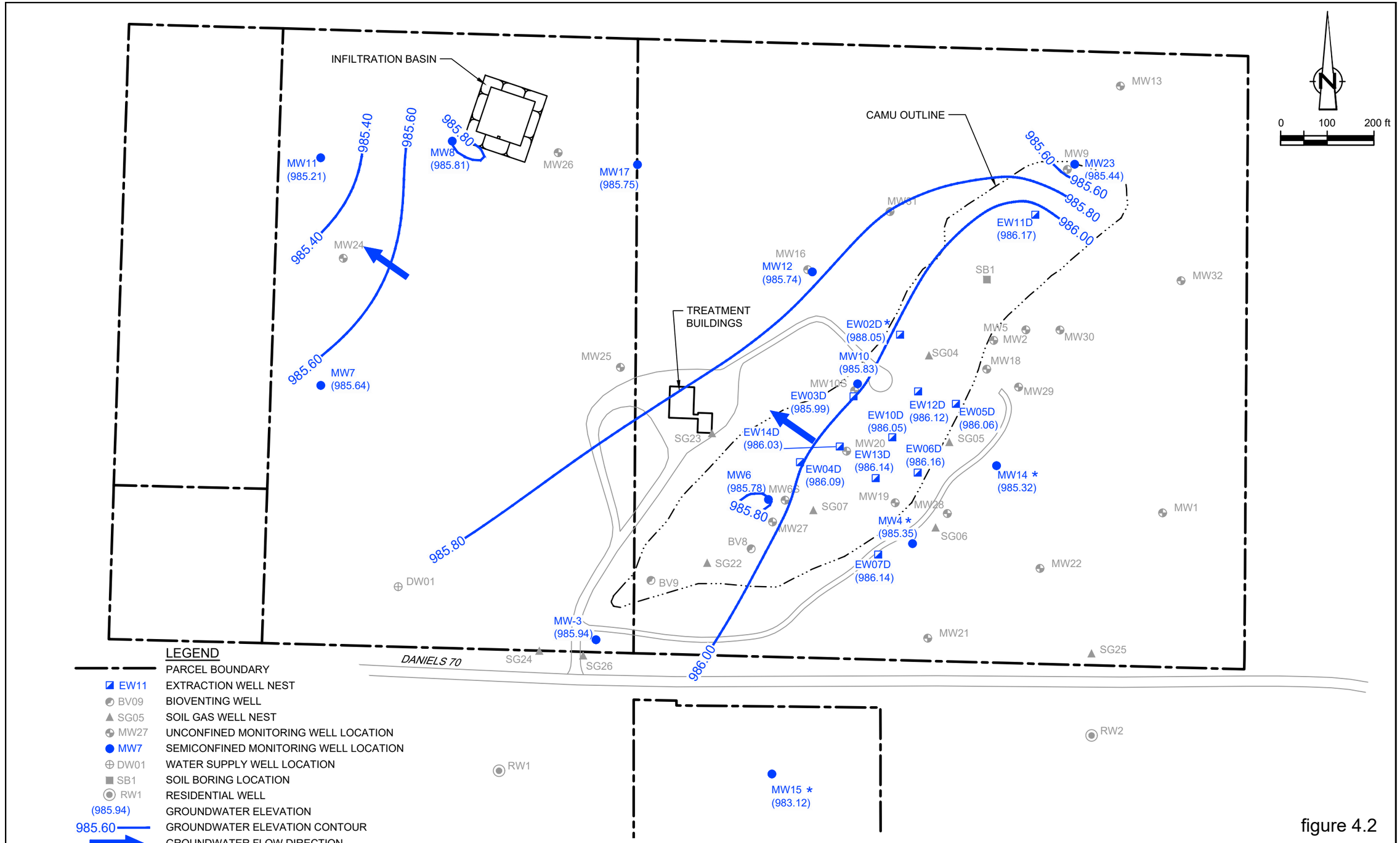
	PARCEL BOUNDARY
EW11	EXTRACTION WELL NEST
BV09	BIOVENTING WELL
SG05	SOIL GAS WELL NEST
MW27	UNCONFINED MONITORING WELL LOCATION
MW7	SEMICONFINED MONITORING WELL LOCATION
DW01	WATER SUPPLY WELL LOCATION
SB1	SOIL BORING LOCATION
RW1	RESIDENTIAL WELL
(986.41)	GROUNDWATER ELEVATION
986.00	GROUNDWATER ELEVATION CONTOUR
	GROUNDWATER FLOW DIRECTION
*	WELL NOT UTILIZED TO INFER GROUNDWATER ELEVATION CONTOURS
**	LNAPL PRESENT IN WELL, WELL NOT UTILIZED TO INFER GROUNDWATER ELEVATION CONTOURS

SOURCE: KEMPER AND ASSOCIATES, INC. SURVEY DATED MAY 2016 (WISCONSIN BURNETT COUNTY COORDINATE SYSTEM NAD83, 1996).

figure 4.1

UNCONFINED (UPPER) AQUIFER GROUNDWATER CONTOURS - JULY 2019
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA001.DWG Plot Date: FEB 21, 2020



LEGEND

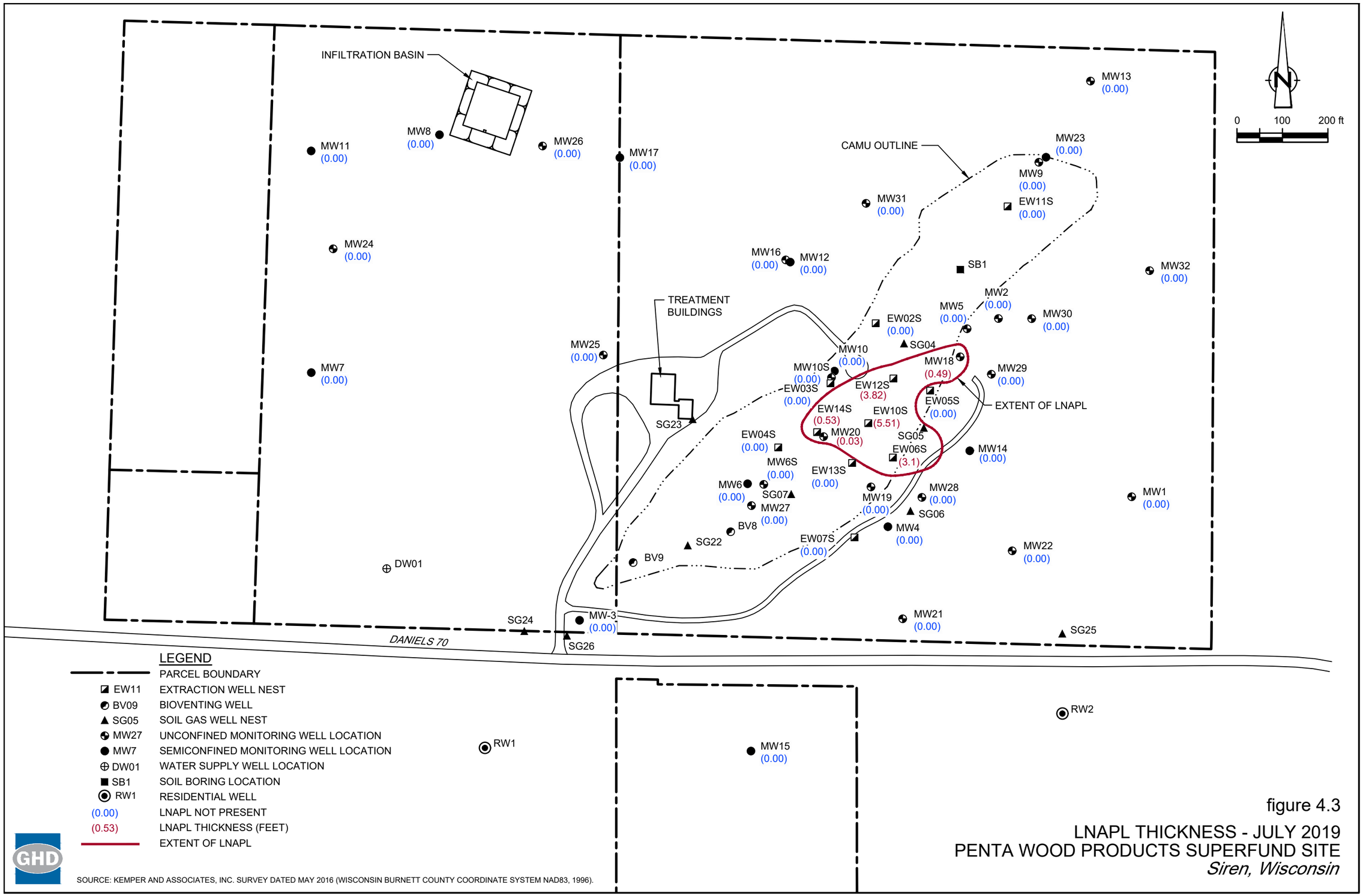
	PARCEL BOUNDARY
EW11	EXTRACTION WELL NEST
BV09	BIOVENTING WELL
SG05	SOIL GAS WELL NEST
MW27	UNCONFINED MONITORING WELL LOCATION
MW7	SEMICONFINED MONITORING WELL LOCATION
DW01	WATER SUPPLY WELL LOCATION
SB1	SOIL BORING LOCATION
RW1	RESIDENTIAL WELL
(985.94)	GROUNDWATER ELEVATION
985.60	GROUNDWATER ELEVATION CONTOUR
	GROUNDWATER FLOW DIRECTION
*	WELL NOT UTILIZED TO INFER GROUNDWATER ELEVATION CONTOURS

SOURCE: KEMPER AND ASSOCIATES, INC. SURVEY DATED MAY 2016 (WISCONSIN BURNETT COUNTY COORDINATE SYSTEM NAD83, 1996).

figure 4.2

SEMICONFINED (LOWER) AQUIFER GROUNDWATER CONTOURS - JULY 2019
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA002.DWG Plot Date: FEB 21, 2020



LEGEND

	PARCEL BOUNDARY
EW11	EXTRACTION WELL NEST
BV09	BIOVENTING WELL
SG05	SOIL GAS WELL NEST
MW27	UNCONFINED MONITORING WELL LOCATION
MW7	SEMICONFINED MONITORING WELL LOCATION
DW01	WATER SUPPLY WELL LOCATION
SB1	SOIL BORING LOCATION
RW1	RESIDENTIAL WELL
(0.00)	LNAPL NOT PRESENT
(0.53)	LNAPL THICKNESS (FEET)
	EXTENT OF LNAPL

SOURCE: KEMPER AND ASSOCIATES, INC. SURVEY DATED MAY 2016 (WISCONSIN BURNETT COUNTY COORDINATE SYSTEM NAD83, 1996).

figure 4.3

LNAPL THICKNESS - JULY 2019
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA003.DWG Plot Date: FEB 21, 2020

INFILTRATION BASIN

MW8

MW11

MW26
(985.81)

MW17

986.00

986.00

MW24
(986.02)

MW25
(986.03)

MW7

986.20

CAMU OUTLINE

MW13
(986.34)

MW23

MW9
(986.36)

EW11S
(986.32)

MW31
(986.37)

MW16
(986.38)

MW12

SB1

MW32
(986.22)

TREATMENT
BUILDINGS

EW02S
(986.27)

MW5
(985.93)

MW2
(986.32)

MW30
(986.35)

SG04

986.00

MW10S
(986.05)

MW10

EW12S
(982.48) **

MW18
(985.85) **

EW03S
(986.23) **

MW29
(986.34)

EW05S **
(986.25)

EW14S
(985.56) **

SG23

EW10S
(981.20) **

SG05

986.20

MW20
(986.27) **

MW14

EW04S
(986.22)

EW06S **
(983.28)

MW6S
(986.42)

EW13S
(986.17)

MW19 **
(986.00)

MW28
(986.42)

MW1
(986.34)

986.40

MW6

SG07

SG06

MW27
(986.49)

MW4

SG22

BV8

EW07S
(986.31)

MW22
(986.33)

BV9

DW01

MW21
(986.38)

986.40

MW3

SG25

SG24

SG26

DANIELS 70

RW2

RW1

MW15

0 100 200 ft

N

LEGEND

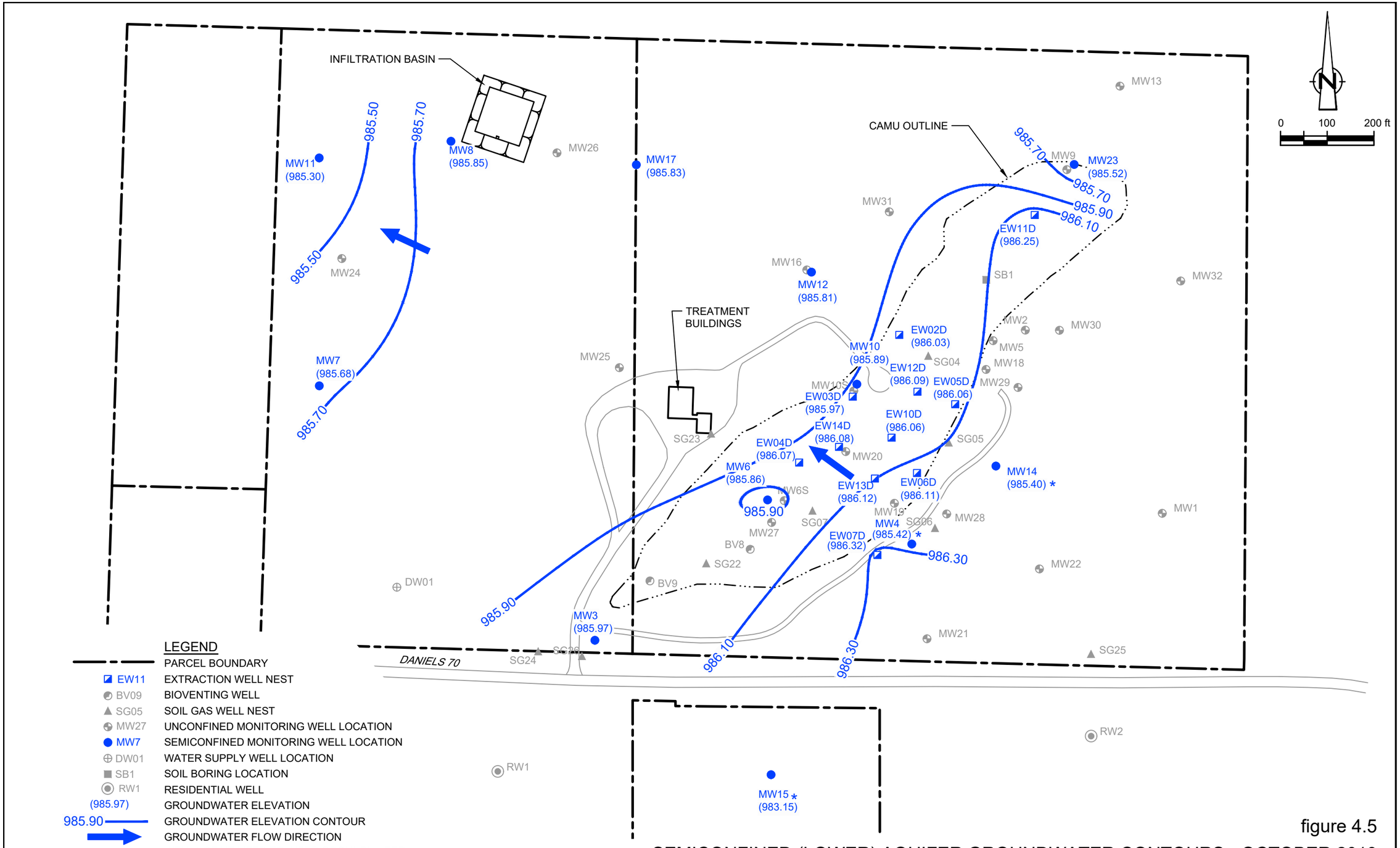
	PARCEL BOUNDARY
EW11	EXTRACTION WELL NEST
BV09	BIOVENTING WELL
SG05	SOIL GAS WELL NEST
MW27	UNCONFINED MONITORING WELL LOCATION
MW7	SEMICONFINED MONITORING WELL LOCATION
DW01	WATER SUPPLY WELL LOCATION
SB1	SOIL BORING LOCATION
RW1	RESIDENTIAL WELL
(986.49)	GROUNDWATER ELEVATION
986.00	GROUNDWATER ELEVATION CONTOUR
	GROUNDWATER FLOW DIRECTION
*	WELL NOT UTILIZED TO INFER GROUNDWATER ELEVATION CONTOURS
**	LNAPL PRESENT IN WELL, WELL NOT UTILIZED TO INFER GROUNDWATER ELEVATION CONTOURS

SOURCE: KEMPER AND ASSOCIATES, INC. SURVEY DATED MAY 2016 (WISCONSIN BURNETT COUNTY COORDINATE SYSTEM NAD83, 1996).

figure 4.4

UNCONFINED (UPPER) AQUIFER GROUNDWATER CONTOURS - OCTOBER 2019
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA004.DWG Plot Date: FEB 21, 2020



LEGEND

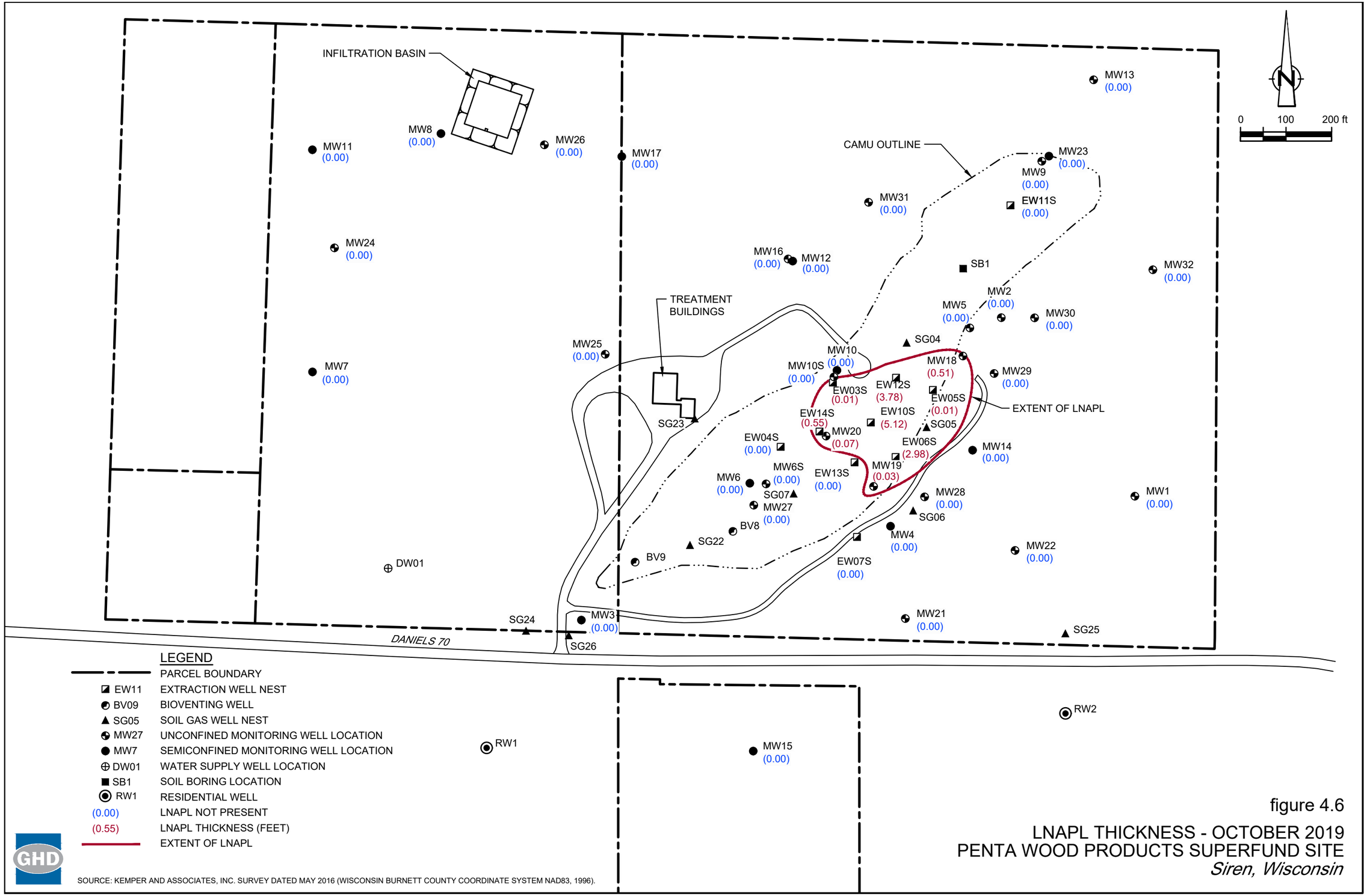
	PARCEL BOUNDARY
EW11	EXTRACTION WELL NEST
BV09	BIOVENTING WELL
SG05	SOIL GAS WELL NEST
MW27	UNCONFINED MONITORING WELL LOCATION
MW7	SEMICONFINED MONITORING WELL LOCATION
DW01	WATER SUPPLY WELL LOCATION
SB1	SOIL BORING LOCATION
RW1	RESIDENTIAL WELL
(985.97)	GROUNDWATER ELEVATION
985.90	GROUNDWATER ELEVATION CONTOUR
	GROUNDWATER FLOW DIRECTION
*	WELL NOT UTILIZED TO INFER GROUNDWATER ELEVATION CONTOURS

SOURCE: KEMPER AND ASSOCIATES, INC. SURVEY DATED MAY 2016 (WISCONSIN BURNETT COUNTY COORDINATE SYSTEM NAD83, 1996).

figure 4.5

SEMICONFINED (LOWER) AQUIFER GROUNDWATER CONTOURS - OCTOBER 2019
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA005.DWG Plot Date: FEB 21, 2020

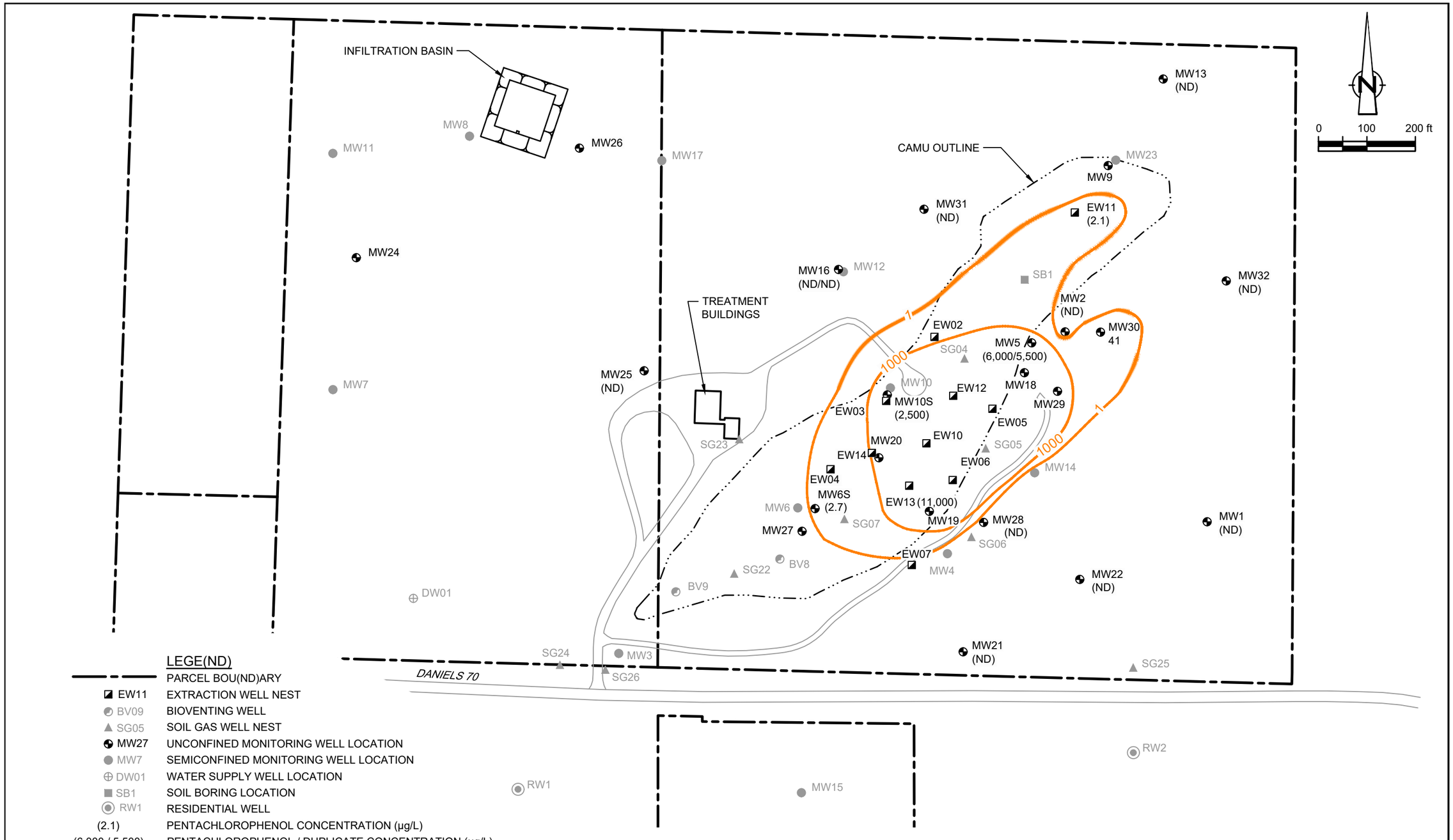


SOURCE: KEMPER AND ASSOCIATES, INC. SURVEY DATED MAY 2016 (WISCONSIN BURNETT COUNTY COORDINATE SYSTEM NAD83, 1996).

figure 4.6

LNAPL THICKNESS - OCTOBER 2019
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA006.DWG Plot Date: FEB 19, 2020



LEGE(ND)

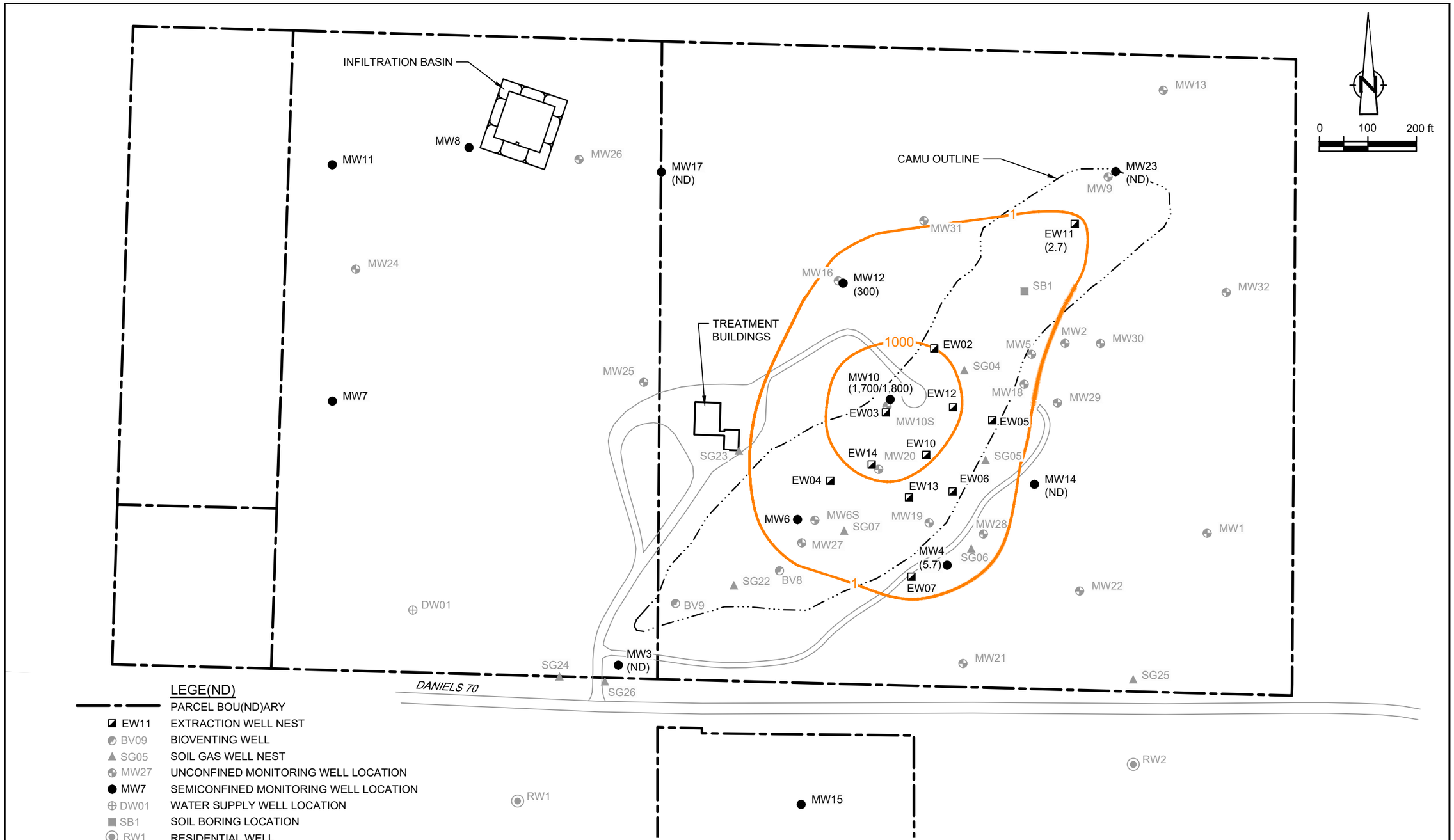
	PARCEL BOU(ND)ARY
EW11	EXTRACTION WELL NEST
BV09	BIOVENTING WELL
SG05	SOIL GAS WELL NEST
MW27	UNCONFINED MONITORING WELL LOCATION
MW7	SEMICONFINED MONITORING WELL LOCATION
DW01	WATER SUPPLY WELL LOCATION
SB1	SOIL BORING LOCATION
RW1	RESIDENTIAL WELL
(2.1)	PENTACHLOROPHENOL CONCENTRATION (µg/L)
(6,000 / 5,500)	PENTACHLOROPHENOL / DUPLICATE CONCENTRATION (µg/L)
1	PENTACHLOROPHENOL CONCENTRATION CONTOUR (µg/L)
(ND)	NOT DETECTED
J	CONCENTRATION WAS BETWEEN THE LIMIT OF DETECTION A(ND) LIMIT OF QUANTITATION

SOURCE: KEMPER A(ND) ASSOCIATES, INC. SURVEY DATED MAY 2016 (WISCONSIN BURNETT COUNTY COORDINATE SYSTEM NAD83, 1996).

figure 4.7

UNCONFINED (UPPER) AQUIFER PENTACHLOROPHENOL CONCENTRATIONS - OCTOBER 2019
PENTA WOOD PRODUCTS SUPERFU(ND) SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA007.DWG Plot Date: FEB 19, 2020



LEGE(ND)

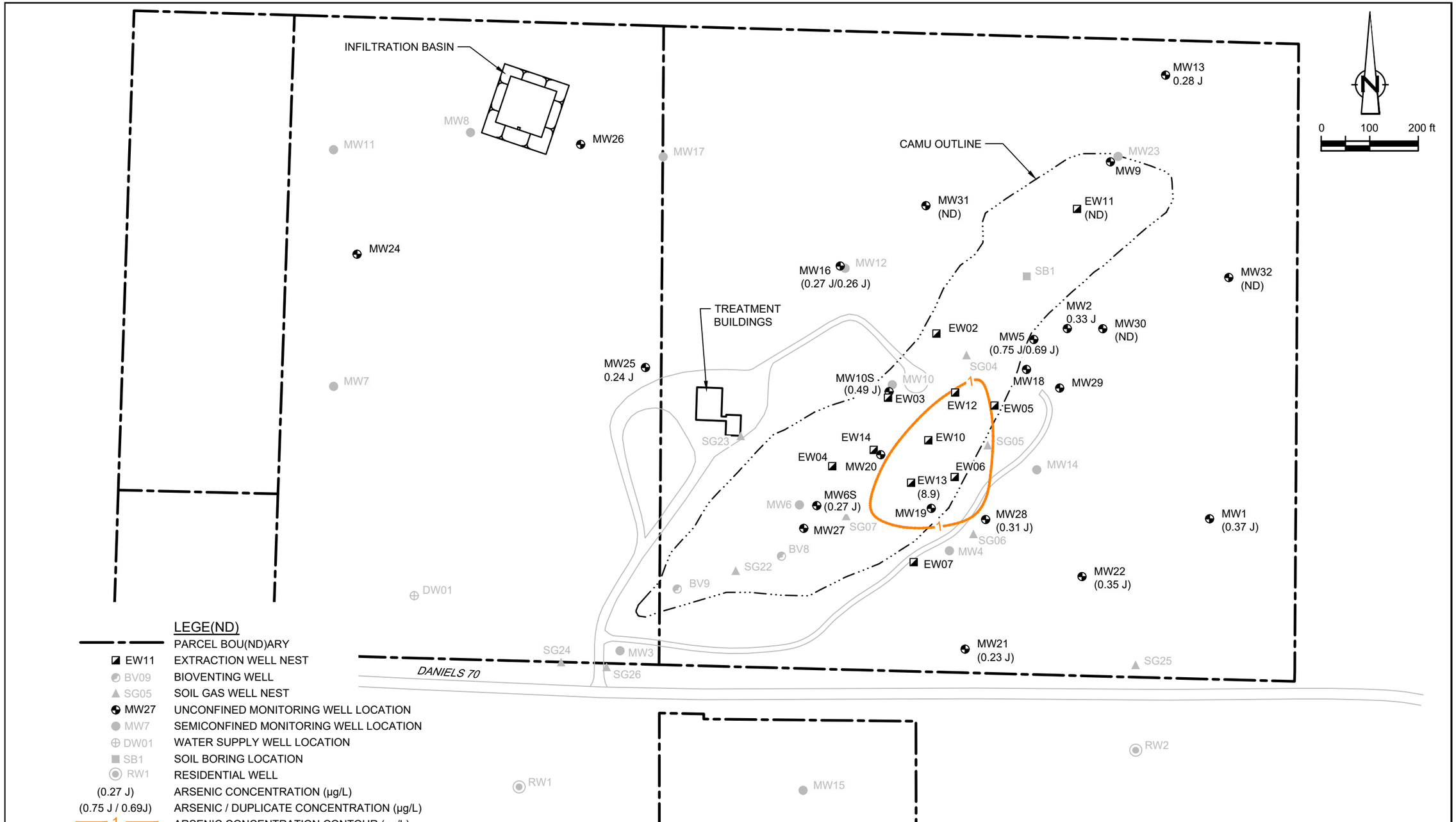
	PARCEL BOU(ND)ARY
EW11	EXTRACTION WELL NEST
BV09	BIOVENTING WELL
SG05	SOIL GAS WELL NEST
MW27	UNCONFINED MONITORING WELL LOCATION
MW7	SEMICONFINED MONITORING WELL LOCATION
DW01	WATER SUPPLY WELL LOCATION
SB1	SOIL BORING LOCATION
RW1	RESIDENTIAL WELL
(5.7)	PENTACHLOROPHENOL CONCENTRATION (µg/L)
(1,700 / 1,800)	PENTACHLOROPHENOL / DUPLICATE CONCENTRATION (µg/L)
1	PENTACHLOROPHENOL CONCENTRATION CONTOUR (µg/L)
(ND)	NOT DETECTED

SOURCE: KEMPER A(ND) ASSOCIATES, INC. SURVEY DATED MAY 2016 (WISCONSIN BURNETT COUNTY COORDINATE SYSTEM NAD83, 1996).

figure 4.8

SEMICONFINED (LOWER) AQUIFER PENTACHLOROPHENOL CONCENTRATIONS - OCTOBER 2019
PENTA WOOD PRODUCTS SUPERFU(ND) SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA008.DWG Plot Date: FEB 19, 2020



LEGE(ND)

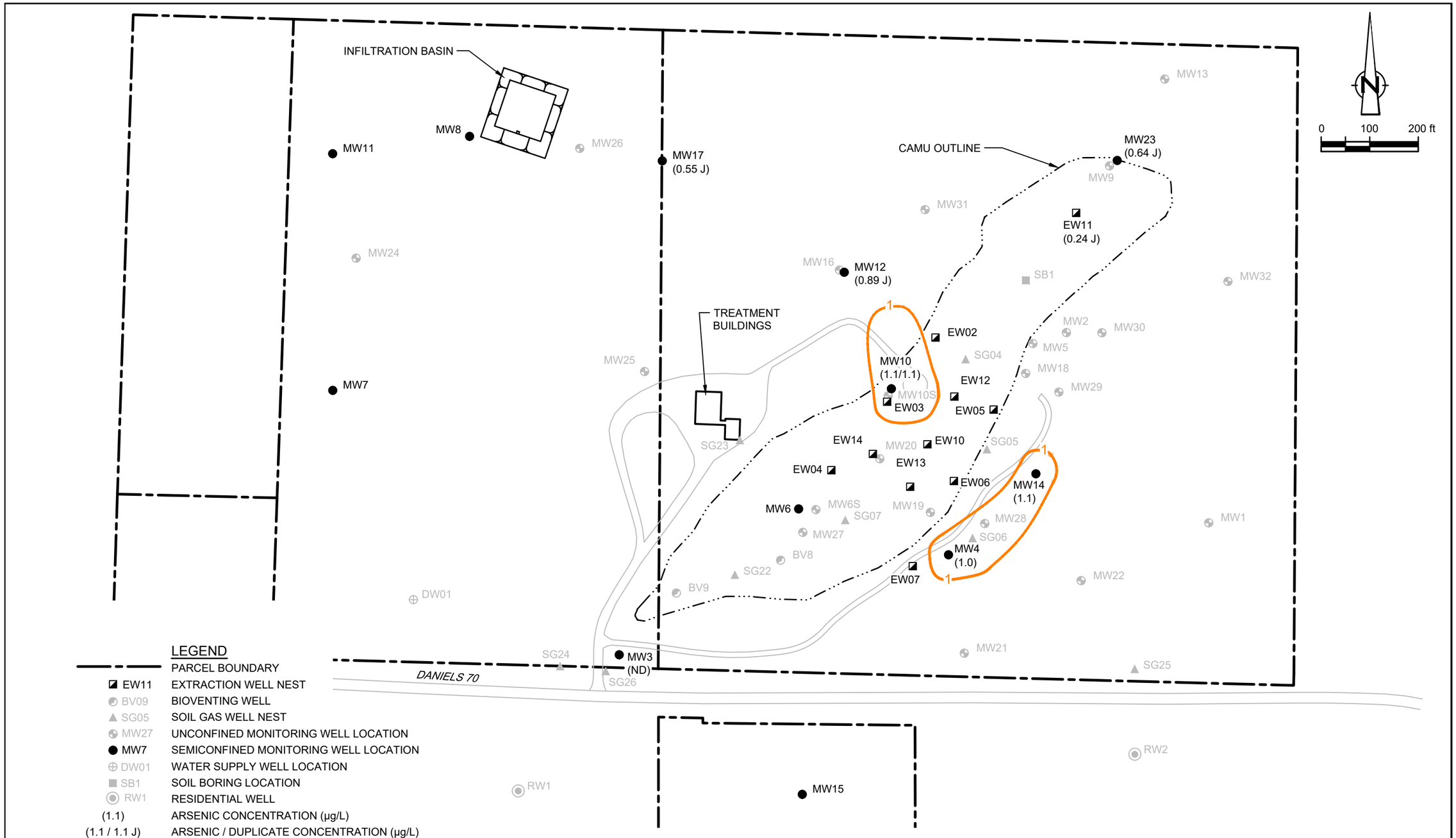
	PARCEL BOU(ND)ARY
EW11	EXTRACTION WELL NEST
BV09	BIOVENTING WELL
SG05	SOIL GAS WELL NEST
MW27	UNCONFINED MONITORING WELL LOCATION
MW7	SEMICONFINED MONITORING WELL LOCATION
DW01	WATER SUPPLY WELL LOCATION
SB1	SOIL BORING LOCATION
RW1	RESIDENTIAL WELL
(0.27 J)	ARSENIC CONCENTRATION (µg/L)
(0.75 J / 0.69J)	ARSENIC / DUPLICATE CONCENTRATION (µg/L)
1	ARSENIC CONCENTRATION CONTOUR (µg/L)
(ND)	NOT DETECTED
J	CONCENTRATION WAS BETWEEN THE LIMIT OF DETECTION A(ND) LIMIT OF QUANTITATION
*	CONCENTRATION WOULD BE CHANGED TO NOT DETECTED IF VALIDATED

SOURCE: KEMPER A(ND) ASSOCIATES, INC. SURVEY DATED MAY 2016 (WISCONSIN BURNETT COUNTY COORDINATE SYSTEM NAD83, 1996).

figure 4.9

UNCONFINED (UPPER) AQUIFER ARSENIC CONCENTRATIONS - OCTOBER 2019
PENTA WOOD PRODUCTS SUPERFU(ND) SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA009.DWG Plot Date: FEB 19, 2020



LEGEND

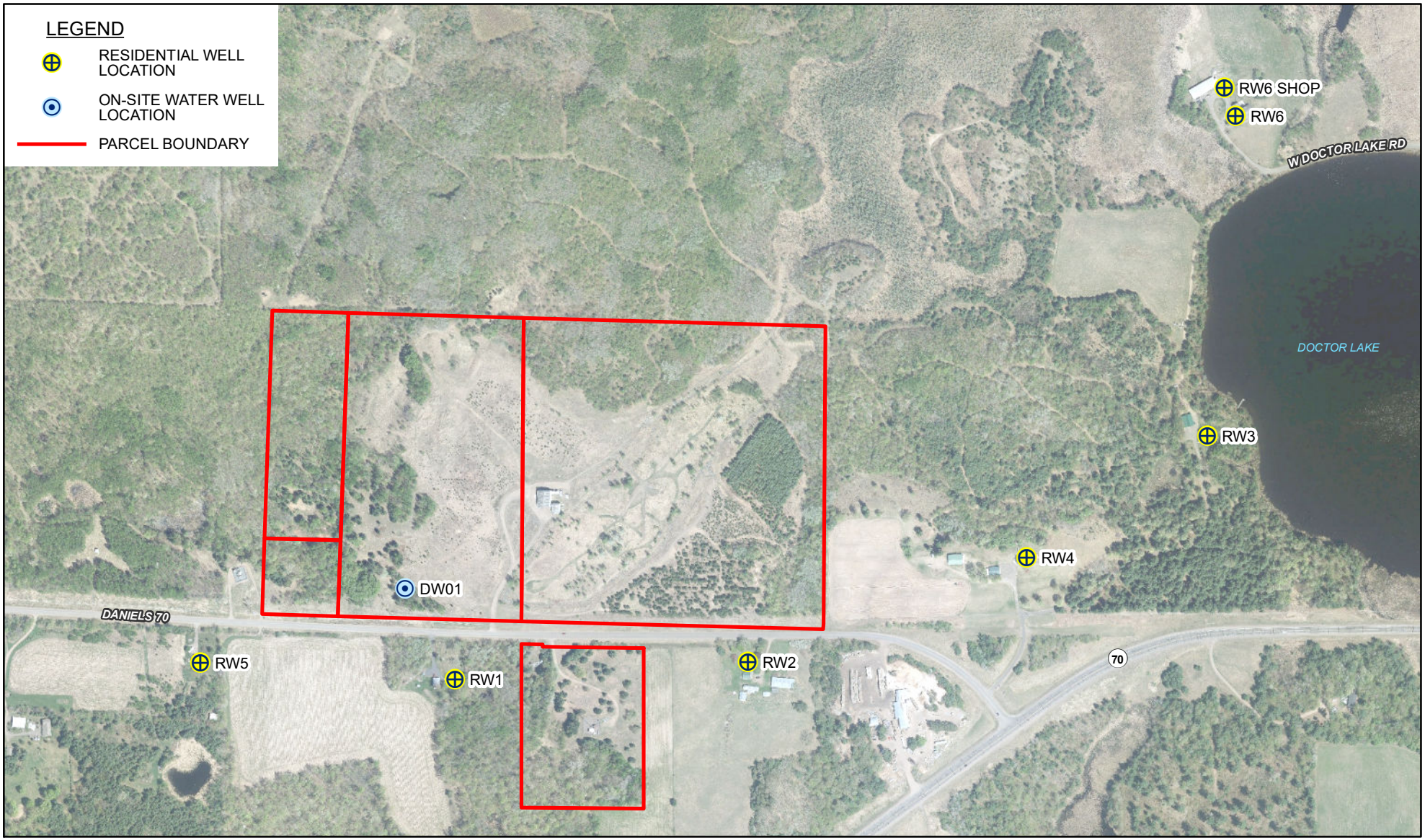
	PARCEL BOUNDARY
EW11	EXTRACTION WELL NEST
BV09	BIOVENTING WELL
SG05	SOIL GAS WELL NEST
MW27	UNCONFINED MONITORING WELL LOCATION
MW7	SEMICONFINED MONITORING WELL LOCATION
DW01	WATER SUPPLY WELL LOCATION
SB1	SOIL BORING LOCATION
RW1	RESIDENTIAL WELL
(1.1)	ARSENIC CONCENTRATION (µg/L)
(1.1 / 1.1 J)	ARSENIC / DUPLICATE CONCENTRATION (µg/L)
1	ARSENIC CONCENTRATION CONTOUR (µg/L)
ND	NOT DETECTED
J	CONCENTRATION WAS BETWEEN THE LIMIT OF DETECTION AND LIMIT OF QUANTITATION
*	CONCENTRATION WOULD BE CHANGED TO NOT DETECTED IF VALIDATED

SOURCE: KEMPER AND ASSOCIATES, INC. SURVEY DATED MAY 2016 (WISCONSIN BURNETT COUNTY COORDINATE SYSTEM NAD83, 1996).

figure 4.10

SEMICONFINED (LOWER) AQUIFER ARSENIC CONCENTRATIONS - OCTOBER 2019
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA010.DWG Plot Date: FEB 19, 2020



Source: Burnett County

0 200 400 600 ft

PENTA WOOD PRODUCTS SUPERFUND SITE
SIREN, WISCONSIN
SEMIANNUAL REPORT

086165-06-11
Jan 29, 2020

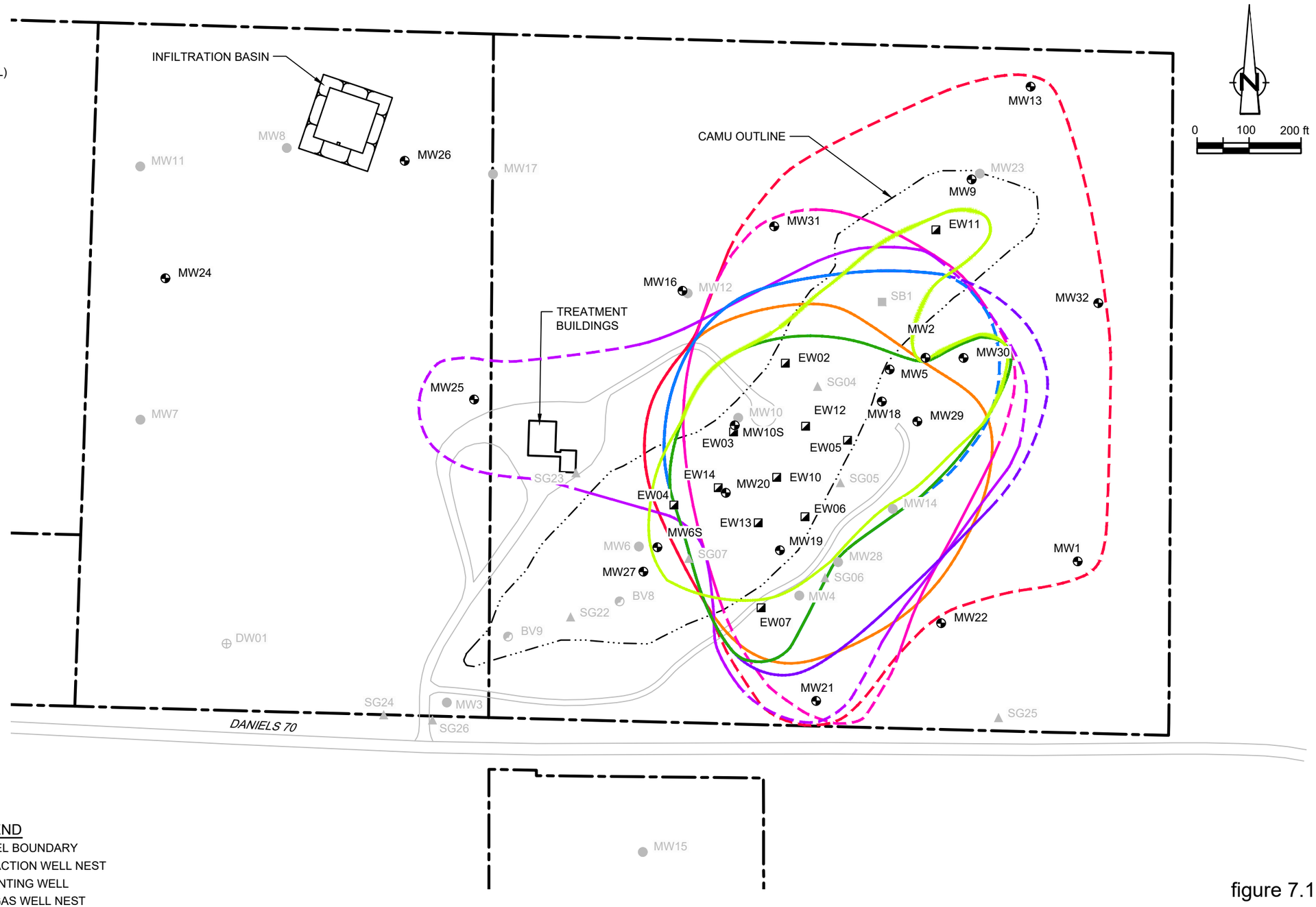
RESIDENTIAL WELL LOCATIONS

FIGURE 4.11

GIS File: I:\GIS\Projects\6-chars\08----\0861--\086165\086165-REPORTS\086165-06(020)\086165-06(020)GIS-SP003.mxd

PENTACHLOROPHENOL
CONCENTRATION CONTOUR (µg/L)

- 1 APRIL 2016
- 1 JULY 2016
- 1 OCTOBER 2016
- 1 JANUARY 2017
- 1 APRIL 2017
- 1 OCTOBER 2017
- 1 JUNE 2018
- 1 OCTOBER 2018
- 1 APRIL 2019
- 1 OCTOBER 2019



LEGEND

- PARCEL BOUNDARY
- EW11 EXTRACTION WELL NEST
- BV09 BIOVENTING WELL
- SG05 SOIL GAS WELL NEST
- MW27 UNCONFINED MONITORING WELL LOCATION
- MW7 SEMICONFINED MONITORING WELL LOCATION
- DW01 WATER SUPPLY WELL LOCATION
- SB1 SOIL BORING LOCATION

SOURCE: KEMPER AND ASSOCIATES, INC. SURVEY DATED MAY 2016 (WISCONSIN BURNETT COUNTY COORDINATE SYSTEM NAD83, 1996).

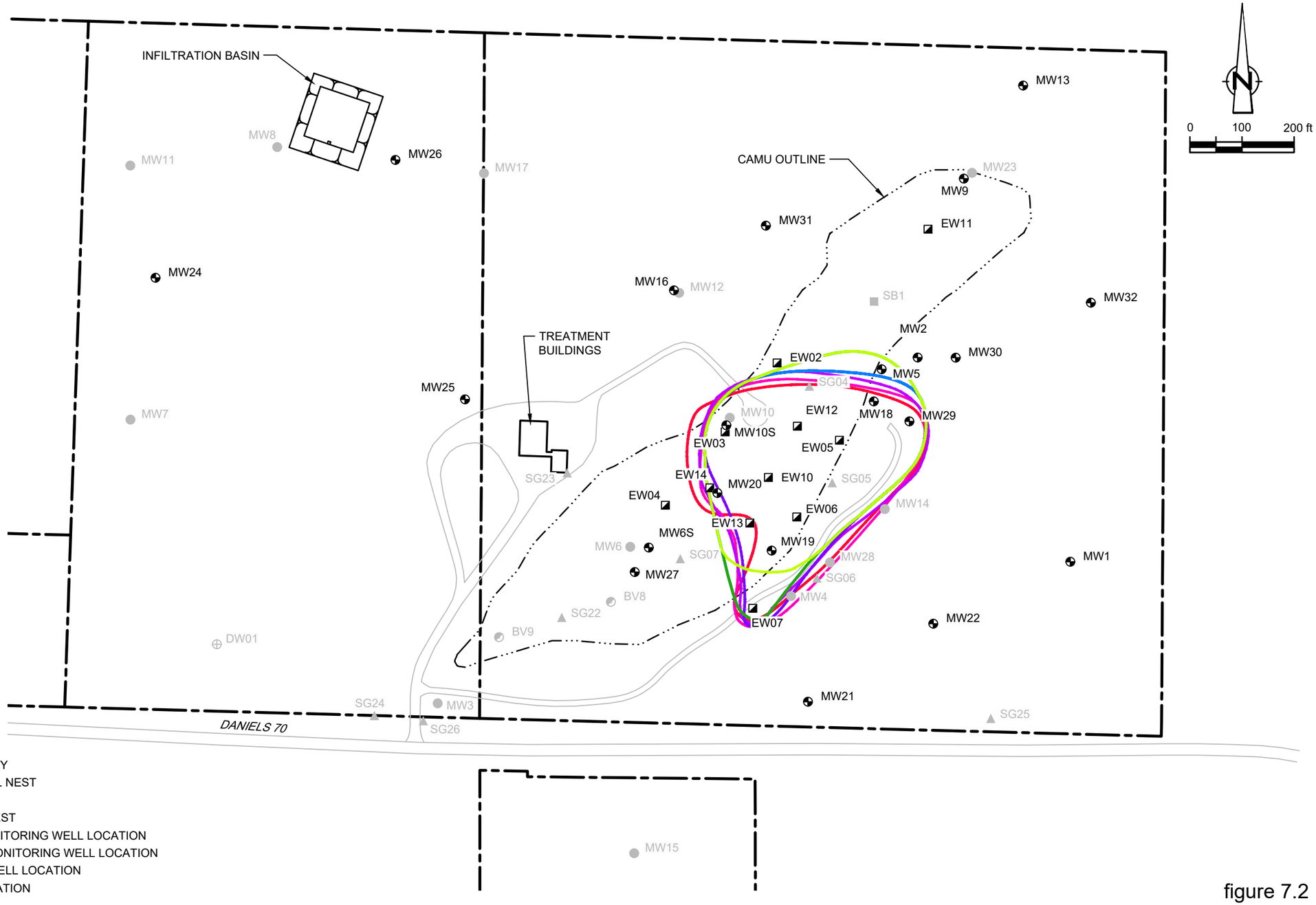
figure 7.1

UNCONFINED (UPPER) AQUIFER PENTACHLOROPHENOL CONCENTRATION CONTOURS - 1 µg/L
APRIL 2016 TO OCTOBER 2019
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA011.DWG Plot Date: FEB 21, 2020

PENTACHLOROPHENOL
CONCENTRATION CONTOUR (µg/L)

- 1,000 APRIL 2016
- 1,000 JULY 2016
- 1,000 OCTOBER 2016
- 1,000 JANUARY 2017
- 1,000 APRIL 2017
- 1,000 OCTOBER 2017
- 1,000 JUNE 2018
- 1,000 OCTOBER 2018
- 1,000 APRIL 2019
- 1,000 OCTOBER 2019



LEGEND

- PARCEL BOUNDARY
- EW11 EXTRACTION WELL NEST
- BV09 BIOVENTING WELL
- SG05 SOIL GAS WELL NEST
- MW27 UNCONFINED MONITORING WELL LOCATION
- MW7 SEMICONFINED MONITORING WELL LOCATION
- DW01 WATER SUPPLY WELL LOCATION
- SB1 SOIL BORING LOCATION

SOURCE: KEMPER AND ASSOCIATES, INC. SURVEY DATED MAY 2016 (WISCONSIN BURNETT COUNTY COORDINATE SYSTEM NAD83, 1996).

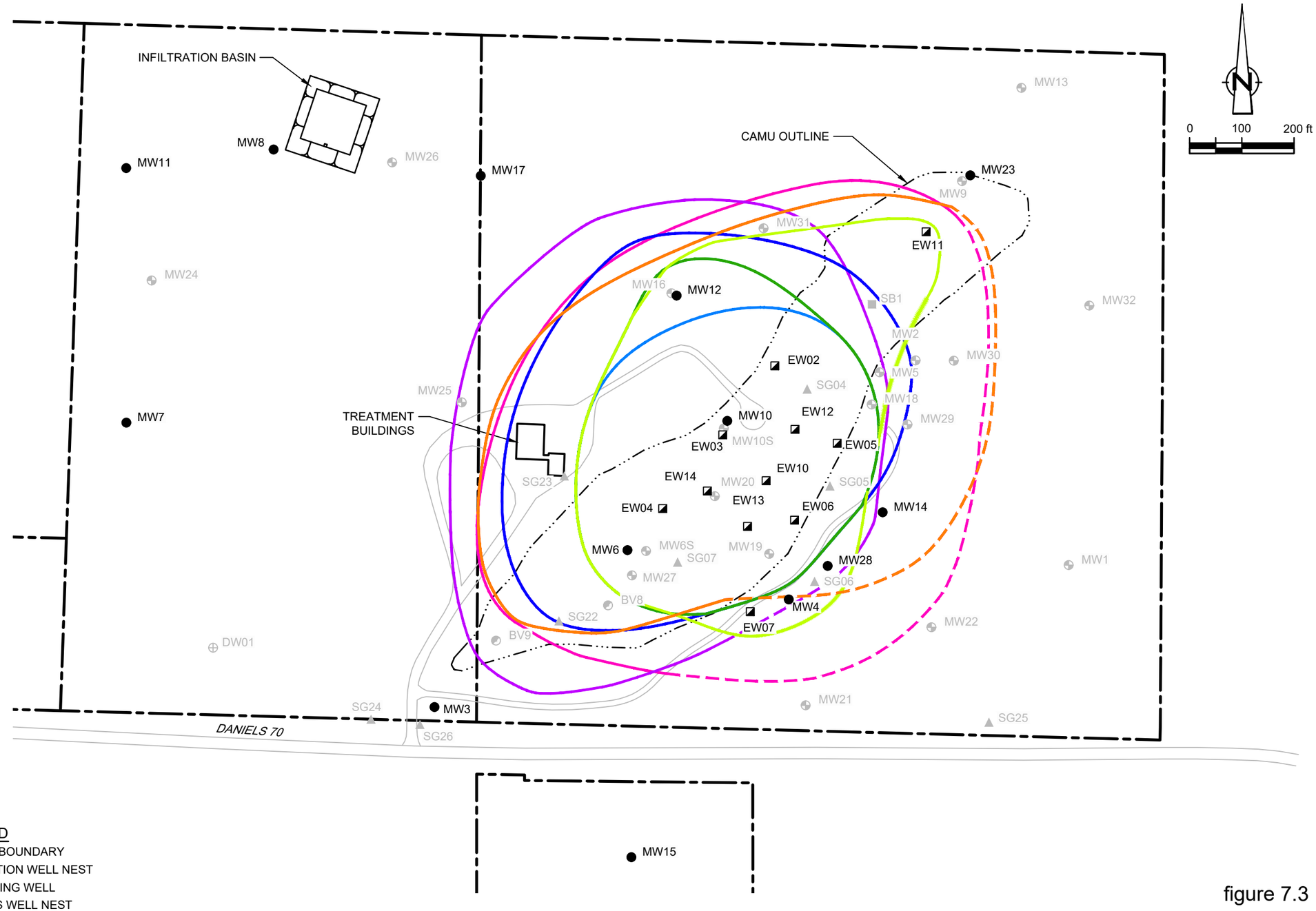
figure 7.2

UNCONFINED (UPPER) AQUIFER PENTACHLOROPHENOL CONCENTRATION CONTOURS - 1,000 µg/L
APRIL 2016 TO OCTOBER 2019
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA016.DWG Plot Date: FEB 21, 2020

PENTACHLOROPHENOL
CONCENTRATION CONTOUR (µg/L)

- 1 APRIL 2016
- 1 JULY 2016
- 1 OCTOBER 2016
- 1 JANUARY 2017
- 1 APRIL 2017
- 1 OCTOBER 2017
- 1 JUNE 2018
- 1 OCTOBER 2018
- 1 APRIL 2019
- 1 OCTOBER 2019



LEGEND

- PARCEL BOUNDARY
- EW11 EXTRACTION WELL NEST
- BV09 BIOVENTING WELL
- SG05 SOIL GAS WELL NEST
- MW27 UNCONFINED MONITORING WELL LOCATION
- MW7 SEMICONFINED MONITORING WELL LOCATION
- DW01 WATER SUPPLY WELL LOCATION
- SB1 SOIL BORING LOCATION

SOURCE: KEMPER AND ASSOCIATES, INC. SURVEY DATED MAY 2016 (WISCONSIN BURNETT COUNTY COORDINATE SYSTEM NAD83, 1996).

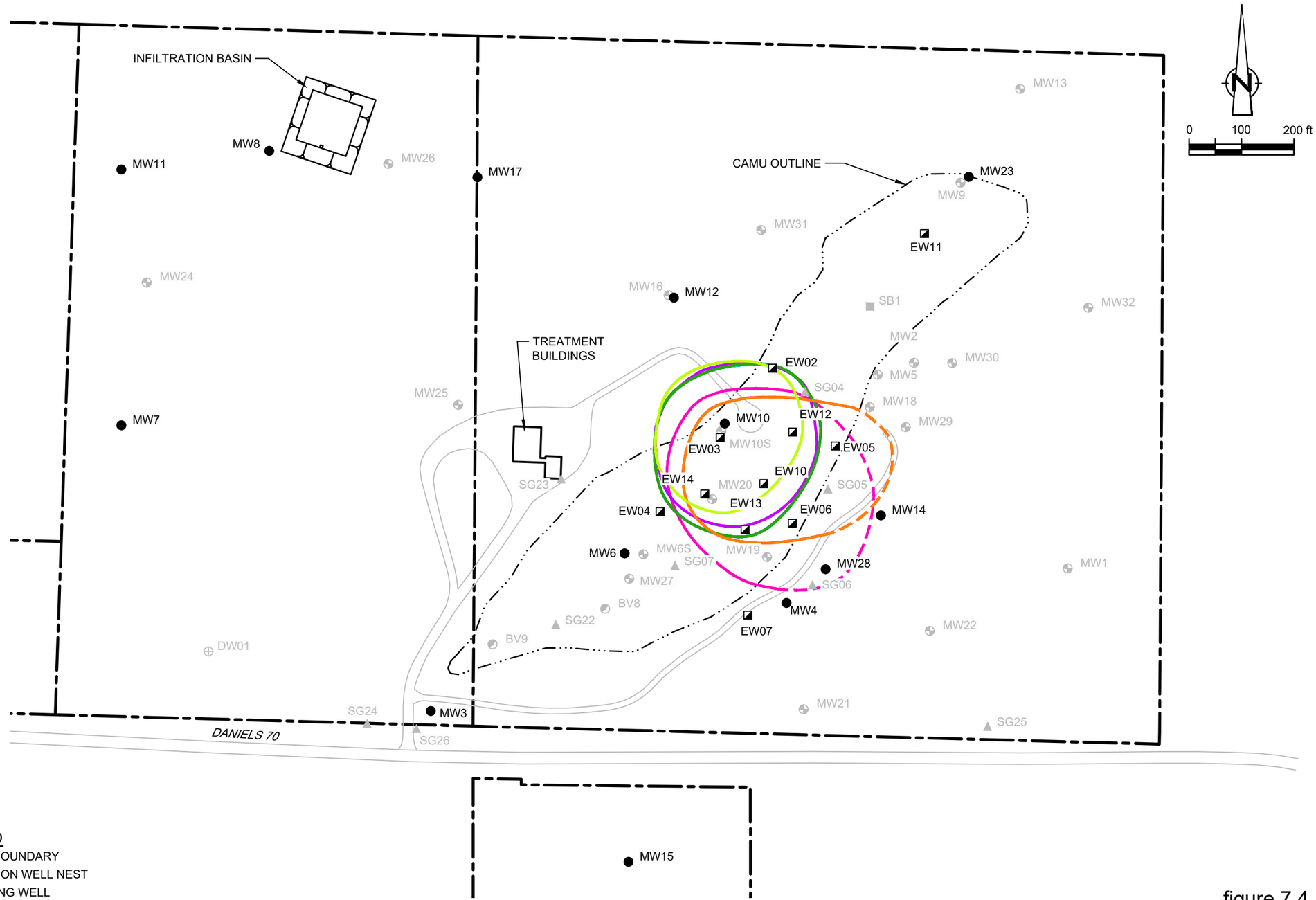
figure 7.3

SEMICONFINED (LOWER) AQUIFER PENTACHLOROPHENOL CONCENTRATION CONTOURS - 1 µg/L
APRIL 2016 TO OCTOBER 2019
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA012.DWG Plot Date: FEB 21, 2020

PENTACHLOROPHENOL
CONCENTRATION CONTOUR (µg/L)

- 1,000 APRIL 2016
- 1,000 JULY 2016
- 1,000 OCTOBER 2016
- 1,000 JANUARY 2017
- 1,000 APRIL 2017
- 1,000 OCTOBER 2017
- 1,000 JUNE 2018
- 1,000 OCTOBER 2018
- 1,000 APRIL 2019
- 1,000 OCTOBER 2019



LEGEND

- PARCEL BOUNDARY
- EW11 EXTRACTION WELL NEST
- BV09 BIOVENTING WELL
- SG05 SOIL GAS WELL NEST
- MW27 UNCONFINED MONITORING WELL LOCATION
- MW7 SEMICONFINED MONITORING WELL LOCATION
- DW01 WATER SUPPLY WELL LOCATION
- SB1 SOIL BORING LOCATION

SOURCE: KEMPER AND ASSOCIATES, INC. SURVEY DATED MAY 2016 (WISCONSIN BURNETT COUNTY COORDINATE SYSTEM NAD83, 1996).

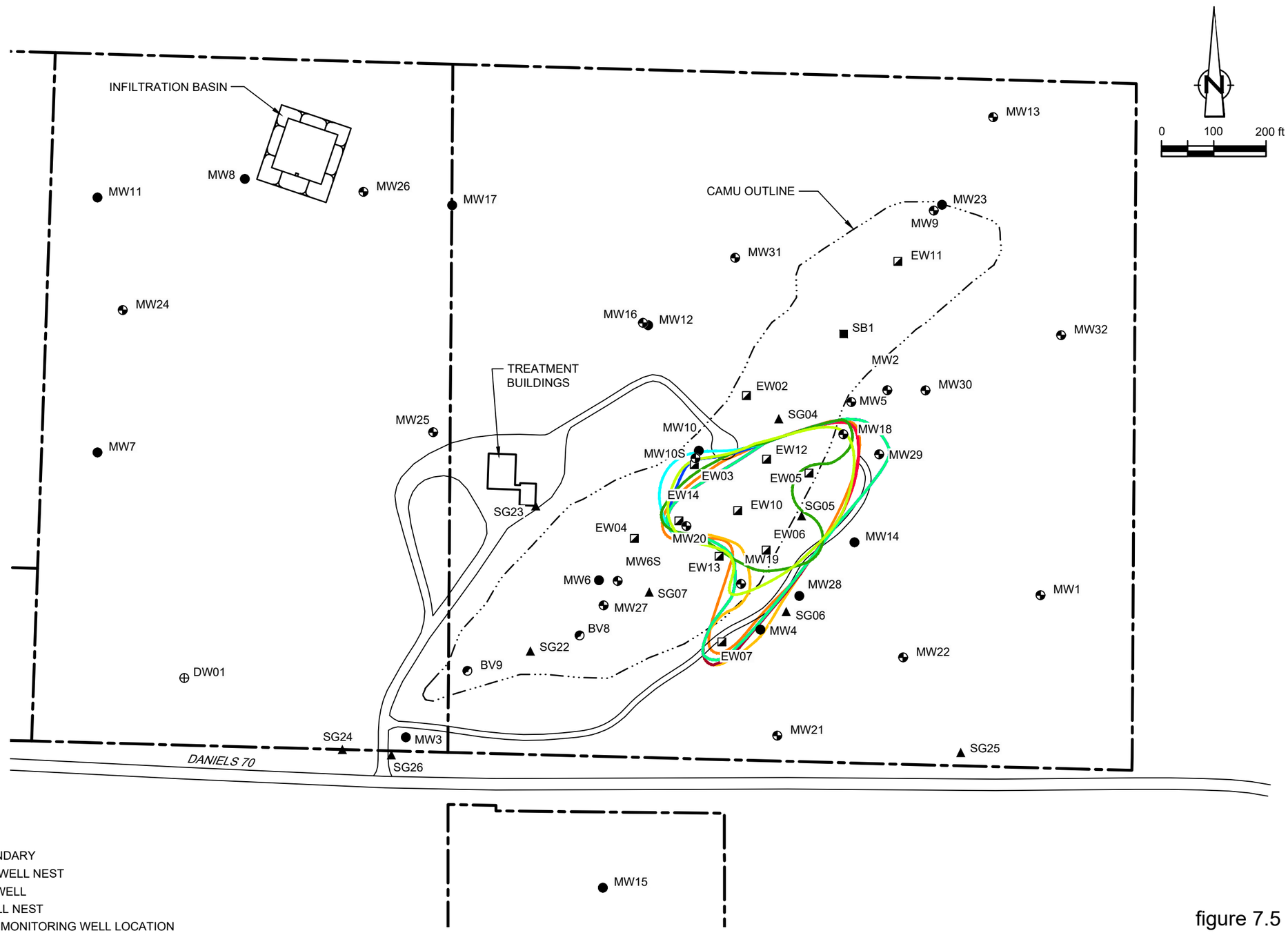
figure 7.4

SEMICONFINED (LOWER) AQUIFER PENTACHLOROPHENOL CONCENTRATION CONTOURS - 1,000 µg/L
APRIL 2016 TO OCTOBER 2019
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA017.DWG Plot Date: FEB 21, 2020

EXTENT OF LNAPL

- APRIL 2016
- JULY 2016
- OCTOBER 2016
- JANUARY 2017
- APRIL 2017
- JULY 2017
- SEPTEMBER 2017
- JANUARY 2018
- JUNE 2018
- JULY 2018
- OCTOBER 2018
- JANUARY 2019
- APRIL 2019
- JULY 2019
- OCTOBER 2019



LEGEND

PARCEL BOUNDARY	
EW11	EXTRACTION WELL NEST
BV09	BIOVENTING WELL
SG05	SOIL GAS WELL NEST
MW27	UNCONFINED MONITORING WELL LOCATION
MW7	SEMICONFINED MONITORING WELL LOCATION
DW01	WATER SUPPLY WELL LOCATION
SB1	SOIL BORING LOCATION

SOURCE: KEMPER AND ASSOCIATES, INC. SURVEY DATED MAY 2016 (WISCONSIN BURNETT COUNTY COORDINATE SYSTEM NAD83, 1996).

figure 7.5

LNAPL THICKNESS - APRIL 2016 TO OCTOBER 2019
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

N:\CA\Waterloo\Legacy\CAD\drawings\86000s\86165\86165-REPORTS\86165-06(020)\86165-06(020)GN\86165-06(020)GN-WA013.DWG Plot Date: FEB 21, 2020

Table 4.1

Groundwater Monitoring and Sampling Plan
Penta Wood Products Superfund Site
Siren, Wisconsin

Well ID	Quarterly Groundwater/LNAPL Level Monitoring [1]	Semiannual Groundwater Sampling [2, 3, 4]
Unconfined (Upper) Aquifer		
MW1	X	X
MW2	X	X
MW5	X	X
MW6S	X	X
MW9	X	
MW10S	X	X
MW13	X	X
MW16	X	X
MW18	X	
MW19	X	
MW20	X	X
MW21	X	X
MW22	X	X
MW24	X	
MW25	X	X
MW26	X	
MW27	X	
MW28	X	X
MW29	X	X
MW30	X	X
MW31	X	X
MW32	X	X
EW02S	X	
EW03S	X	

Table 4.1

Groundwater Monitoring and Sampling Plan
Penta Wood Products Superfund Site
Siren, Wisconsin

Well ID	Quarterly Groundwater/LNAPL Level Monitoring [1]	Semiannual Groundwater Sampling [2, 3, 4]
Unconfined (Upper) Aquifer		
EW04S	X	
EW05S	X	
EW06S	X	
EW07S	X	
EW10S	X	
EW11S	X	X
EW12S	X	
EW13S	X	X
EW14S	X	
Semiconfined (Lower) Aquifer		
MW3	X	X
MW4	X	X
MW6	X	
MW7	X	
MW8	X	
MW10	X	X
MW11	X	
MW12	X	X
MW14	X	X
MW15	X	
MW17	X	X
MW23	X	X
EW02D	X	

Groundwater Monitoring and Sampling Plan
Penta Wood Products Superfund Site
Siren, Wisconsin

Well ID	Quarterly Groundwater/LNAPL Level Monitoring [1]	Semiannual Groundwater Sampling [2, 3, 4]
Semiconfined (Lower) Aquifer		
EW03D	X	
EW04D	X	
EW05D	X	
EW06D	X	
EW07D	X	
EW10D	X	
EW11D	X	X
EW12D	X	
EW13D	X	
EW14D	X	

Notes:

1 Groundwater/LNAPL level monitoring conducted on a quarterly basis in January, April, July, and October

2 Groundwater sampling conducted on a semiannual basis in April and October

3 Groundwater sample laboratory analyses include the following parameters: Pentachlorphenol (PCP); naphthalene; benzene, toluene, ethylbenzene, and xylenes (BTEX); natural attenuation parameters (alkalinity, chloride, hardness, nitrate, sulfate, total organic carbon, and methane); and select dissolved metals (arsenic, copper, iron, manganese, and zinc). Field parameter measurements include the following parameters: pH, temperature, specific conductance, dissolved oxygen (DO), oxidation-reduction potential (ORP), iron, and sulfide.

4 Groundwater samples will not be collected if LNAPL is present in the well casing.

Table 4.2

Groundwater and LNAPL Level Monitoring Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Well ID	Date	Top of Casing Elevation (feet)	Depth to Groundwater (feet btoc)	Depth to LNAPL (feet btoc)	Groundwater Elevation (feet AMSL)	LNAPL Elevation (feet AMSL)	LNAPL Thickness (feet)
Semiconfined Aquifer (Lower)							
MW3	7/22/2019	1129.44	143.50	ND	985.94	NA	0.00
MW3	10/2/2019	1129.44	143.47	ND	985.97	NA	0.00
MW4	7/22/2019	1087.72	102.37	ND	985.35	NA	0.00
MW4	10/2/2019	1087.72	102.30	ND	985.42	NA	0.00
MW6	7/22/2019	1109.11	123.33	ND	985.78	NA	0.00
MW6	10/2/2019	1109.11	123.25	ND	985.86	NA	0.00
MW7	7/22/2019	1096.25	110.61	ND	985.64	NA	0.00
MW7	10/2/2019	1096.25	110.57	ND	985.68	NA	0.00
MW8	7/22/2019	1091.13	105.32	ND	985.81	NA	0.00
MW8	10/2/2019	1091.13	105.28	ND	985.85	NA	0.00
MW10	7/22/2019	1089.01	103.18	ND	985.83	NA	0.00
MW10	10/2/2019	1089.01	103.12	ND	985.89	NA	0.00
MW11	7/22/2019	1085.48	100.27	ND	985.21	NA	0.00
MW11	10/2/2019	1085.48	100.18	ND	985.30	NA	0.00
MW12	7/22/2019	1080.91	95.17	ND	985.74	NA	0.00
MW12	10/2/2019	1080.91	95.10	ND	985.81	NA	0.00
MW14	7/22/2019	1078.25	92.93	ND	985.32	NA	0.00
MW14	10/2/2019	1078.25	92.85	ND	985.40	NA	0.00
MW15	7/22/2019	1127.09	143.97	ND	983.12	NA	0.00
MW15	10/2/2019	1127.09	143.94	ND	983.15	NA	0.00
MW17	7/22/2019	1084.43	98.68	ND	985.75	NA	0.00
MW17	10/2/2019	1084.43	98.60	ND	985.83	NA	0.00
MW23	7/22/2019	1017.16	31.72	ND	985.44	NA	0.00
MW23	10/2/2019	1017.16	31.64	ND	985.52	NA	0.00
EW02D	7/22/2019	1083.00	94.95	ND	988.05	NA	0.00
EW02D	10/2/2019	1083.00	96.97	ND	986.03	NA	0.00
EW03D	7/22/2019	1089.48	103.49	ND	985.99	NA	0.00
EW03D	10/2/2019	1089.48	103.51	ND	985.97	NA	0.00
EW04D	7/22/2019	1101.09	115.00	ND	986.09	NA	0.00
EW04D	10/2/2019	1101.09	115.02	SH	986.07	NA	0.00
EW05D	7/22/2019	1076.99	90.93	ND	986.06	NA	0.00
EW05D	10/2/2019	1076.99	90.93	ND	986.06	NA	0.00
EW06D	7/22/2019	1083.39	97.23	ND	986.16	NA	0.00
EW06D	10/2/2019	1083.39	97.28	ND	986.11	NA	0.00
EW07D	7/22/2019	1087.52	101.38	ND	986.14	NA	0.00
EW07D	10/2/2019	1087.52	101.20	ND	986.32	NA	0.00
EW10D	7/22/2019	1088.55	102.50	ND	986.05	NA	0.00
EW10D	10/2/2019	1088.55	102.49	ND	986.06	NA	0.00
EW11D	7/22/2019	1048.19	62.02	ND	986.17	NA	0.00
EW11D	10/2/2019	1048.19	61.94	ND	986.25	NA	0.00
EW12D	7/22/2019	1086.41	100.29	ND	986.12	NA	0.00
EW12D	10/2/2019	1086.41	100.32	ND	986.09	NA	0.00

Table 4.2

Groundwater and LNAPL Level Monitoring Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Well ID	Date	Top of Casing Elevation (feet)	Depth to Groundwater (feet btoc)	Depth to LNAPL (feet btoc)	Groundwater Elevation (feet AMSL)	LNAPL Elevation (feet AMSL)	LNAPL Thickness (feet)
Semiconfined Aquifer (Lower) continued							
EW13D	7/22/2019	1092.88	106.74	ND	986.14	NA	0.00
EW13D	10/2/2019	1092.88	106.76	ND	986.12	NA	0.00
EW14D	7/22/2019	1098.28	112.25	ND	986.03	NA	0.00
EW14D	10/2/2019	1098.28	112.20	ND	986.08	NA	0.00
Unconfined Aquifer (Upper)							
MW1	7/22/2019	1072.27	85.98	ND	986.29	NA	0.00
MW1	10/2/2019	1072.27	85.93	ND	986.34	NA	0.00
MW2	7/22/2019	1065.03	78.74	ND	986.29	NA	0.00
MW2	10/2/2019	1065.03	78.71	ND	986.32	NA	0.00
MW5	7/22/2019	1071.42	85.53	ND	985.89	NA	0.00
MW5	10/2/2019	1071.42	85.49	ND	985.93	NA	0.00
MW6S	7/22/2019	1108.35	122.00	ND	986.35	NA	0.00
MW6S	10/2/2019	1108.35	121.93	ND	986.42	NA	0.00
MW9	7/22/2019	1019.58	33.26	ND	986.32	NA	0.00
MW9	10/2/2019	1019.58	33.22	ND	986.36	NA	0.00
MW10S	7/22/2019	1090.12	104.10	ND	986.02	NA	0.00
MW10S	10/2/2019	1090.12	104.07	ND	986.05	NA	0.00
MW13	7/22/2019	1005.81	19.56	ND	986.25	NA	0.00
MW13	10/2/2019	1005.81	19.47	ND	986.34	NA	0.00
MW16	7/22/2019	1081.95	95.65	ND	986.30	NA	0.00
MW16	10/2/2019	1081.95	95.57	ND	986.38	NA	0.00
MW18	7/22/2019	1071.96	86.12	85.63	985.84	986.33	0.49
MW18	10/2/2019	1071.96	86.11	85.60	985.85	986.36	0.51
MW19	7/22/2019	1087.96	101.98	ND	985.98	NA	0.00
MW19	10/2/2019	1087.96	101.96	101.93	986.00	986.03	0.03
MW20	7/22/2019	1098.16	111.89	111.86	986.27	986.30	0.03
MW20	10/2/2019	1098.16	111.89	111.82	986.27	986.34	0.07
MW21	7/22/2019	1095.82	109.50	ND	986.32	NA	0.00
MW21	10/2/2019	1095.82	109.44	ND	986.38	NA	0.00
MW22	7/22/2019	1084.65	98.38	ND	986.27	NA	0.00
MW22	10/2/2019	1084.65	98.32	ND	986.33	NA	0.00
MW24	7/22/2019	1084.04	98.04	ND	986.00	NA	0.00
MW24	10/2/2019	1084.04	98.02	ND	986.02	NA	0.00
MW25	7/22/2019	1095.25	109.26	ND	985.99	NA	0.00
MW25	10/2/2019	1095.25	109.22	ND	986.03	NA	0.00
MW26	7/22/2019	1086.87	101.13	ND	985.74	NA	0.00
MW26	10/2/2019	1086.87	101.06	ND	985.81	NA	0.00
MW27	7/22/2019	1110.96	124.55	ND	986.41	NA	0.00
MW27	10/2/2019	1110.96	124.47	ND	986.49	NA	0.00
MW28	7/22/2019	1083.52	97.14	ND	986.38	NA	0.00
MW28	10/2/2019	1083.52	97.10	ND	986.42	NA	0.00
MW29	7/22/2019	1070.24	83.93	ND	986.31	NA	0.00
MW29	10/2/2019	1070.24	83.90	ND	986.34	NA	0.00
MW30	7/22/2019	1048.98	62.64	ND	986.34	NA	0.00

Table 4.2

Groundwater and LNAPL Level Monitoring Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Well ID	Date	Top of Casing Elevation (feet)	Depth to Groundwater (feet btoc)	Depth to LNAPL (feet btoc)	Groundwater Elevation (feet AMSL)	LNAPL Elevation (feet AMSL)	LNAPL Thickness (feet)
Unconfined Aquifer (Upper) continued							
MW30	10/2/2019	1048.98	62.63	ND	986.35	NA	0.00
MW31	7/22/2019	1076.34	90.01	ND	986.33	NA	0.00
MW31	10/2/2019	1076.34	89.97	ND	986.37	NA	0.00
MW32	7/22/2019	1021.02	34.83	ND	986.19	NA	0.00
MW32	10/2/2019	1021.02	34.80	ND	986.22	NA	0.00
EW02S	7/22/2019	1082.25	95.96	ND	986.29	NA	0.00
EW02S	10/2/2019	1082.25	95.98	ND	986.27	NA	0.00
EW03S	7/22/2019	1088.66	102.45	ND	986.21	NA	0.00
EW03S	10/2/2019	1088.66	102.43	102.42	986.23	986.24	0.01
EW04S	7/22/2019	1101.01	114.82	ND	986.19	NA	0.00
EW04S	10/2/2019	1101.01	114.79	ND	986.22	NA	0.00
EW05S	7/22/2019	1077.04	90.81	ND	986.23	NA	0.00
EW05S	10/2/2019	1077.04	90.79	90.78	986.25	986.26	0.01
EW06S	7/22/2019	1083.61	100.50	97.40	983.11	986.21	3.10
EW06S	10/2/2019	1083.61	100.33	97.35	983.28	986.26	2.98
EW07S	7/22/2019	1087.49	101.31	ND	986.18	NA	0.00
EW07S	10/2/2019	1087.49	101.18	ND	986.31	NA	0.00
EW10S	7/22/2019	1088.72	107.95	102.44	980.77	986.28	5.51
EW10S	10/2/2019	1088.72	107.52	102.40	981.20	986.32	5.12
EW11S	7/22/2019	1047.23	60.97	ND	986.26	NA	0.00
EW11S	10/2/2019	1047.23	60.91	ND	986.32	NA	0.00
EW12S	7/22/2019	1086.31	103.91	100.09	982.40	986.22	3.82
EW12S	10/2/2019	1086.31	103.83	100.05	982.48	986.26	3.78
EW13S	7/22/2019	1092.88	106.78	ND	986.10	NA	0.00
EW13S	10/2/2019	1092.88	106.71	ND	986.17	NA	0.00
EW14S	7/22/2019	1098.32	112.80	112.27	985.52	986.05	0.53
EW14S	10/2/2019	1098.32	112.76	112.21	985.56	986.11	0.55

Notes:

btoc - Feet below top of casing
feet AMSL - Feet above mean sea level
NA - Not applicable
ND - LNAPL was not detected in a measurable quantity
SH - Potential LNAPL sheen detected

Table 4.3

Groundwater Purging and Sampling Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date	Sample Identification	Time	Purge Volume (gallons)	Temperature (°C)	Specific Conductance (µS)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	pH	ORP (mV)	Total Iron (mg/L)	Total Sulfide (mg/L)
MW12	10/14/2019	W-191014-RA-02	12:10	0.0	13.34	410	23.4	0	9.61	86	ND	ND
			12:15	0.3	13.71	413	25.1	0	9.55	85		
			12:20	0.5	14	416	27.2	0	9.49	84		
			12:25	0.8	14.23	420	25.3	0	9.41	83		
MW16	10/14/2019	W-191014-RA-04	12:44	0.0	15.38	123	40.5	2.77	8.81	35	ND	0.2
			12:49	0.3	15.79	123	36.9	2.83	8.87	40		
			12:54	0.5	15.65	123	36.5	2.86	8.72	40		
MW23	10/14/2019	W-191014-RA-06	13:31	0.0	9.44	452	42.9	0	8.53	128	ND	ND
			13:36	0.3	9.14	549	39.1	0	8.61	114		
			1:41	0.5	9.61	570	0	0	8.66	88		
			1:45	0.8	9.64	571	0	0	8.66	88		
			1:50	1.1	9.67	572	0	0	9.66	88		
MW32	10/14/2019	W-191014-RA-07	14:07	0.0	8.64	92	121	1.35	8.23	131	0.8	ND
			2:12	0.3	8.7	92	126	0.78	8.15	140		
			2:17	0.5	8.77	93	125	0.73	8.08	144		
			2:22	0.8	8.77	93	122	0.74	8.09	150		
MW13	10/14/2019	W191014-RA-08	14:50	0.0	11.43	97	77.2	0	7.4	183		
			14:55	0.3	11.43	109	24.9	0	7.01	190		
			15:00	0.5	11.44	109	24.1	0	6.95	192		
			3:05	0.8	11.45	110	23.9	0	6.97	194		
MW3	10/14/2019	W-191014-RA-01	15:33	0.0	10.73	540	165	0	7.74	130	8	ND
			3:38	0.3	13.02	539	156	0	7.98	-122		
			3:43	0.5	13.13	540	149	0	8.02	-121		
			3:48	0.8	13.11	540	141	0	8.03	-120		
MW-1	10/14/2019	W-191014-RA-09	16:07	0.0	12.55	282	14.8	2.94	8.39	91	5	ND
			16:12	0.3	12.43	278	14.4	2.93	8.38	93		
			16:17	0.5	12.21	276	14.3	2.88	8.35	100		

Table 4.3

Groundwater Purging and Sampling Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date	Sample Identification	Time	Purge Volume (gallons)	Temperature (°C)	Specific Conductance (µS)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	pH	ORP (mV)	Total Iron (mg/L)	Total Sulfide (mg/L)
EW13	10/15/2019	W-191015-RA-15	10:38	4	10.36	749	999	0	8.01	-176	10	ND
MW17	10/15/2019	W-191015-RA-14	10:54	0.0	10.73	701	5.3	0	8.43	-27	ND	ND
			10:59	0.3	12.59	700	19.5	0.11	8.42	-8		
			11:04	0.5	12.62	702	21.3	0.09	8.39	2		
			11:09	0.8	12.73	702	20.3	0.09	8.41	2		
MW25	10/15/2019	W-191015-RA-11	12:55	0.0	12.7	484	11.5	4.23	8.17	46	ND	ND
			13:00	0.3	13.12	484	19	4.58	8.16	44		
			13:05	0.5	13.95	483	38.5	4.68	7.95	36		
			13:10	0.8	13.9	483	37.3	4.5	7.95	37		
			13:15	1.1	13.92	484	36.6	4.52	7.94	38		
MW21	10/15/2019	W-191015-RA-13	12:27	0.0	9.88	426	3.8	4.24	7.91	88	ND	ND
			12:32	0.3	10.04	418	3.7	4.14	7.93	96		
			12:37	0.5	10.06	416	3.5	4.14	7.93	98		
MW31	10/15/2019	W-191015-RA-10	13:28	0.0	10.17	481	3.6	0	7.63	114	ND	ND
			1:33	0.3	10.17	482	3.3	0	7.69	115		
			13:38	0.5	10.17	482	3.4	0	7.68	116		
MW4	10/16/2019	W-191016-RA-16	9:42	0.0	9.67	374	57.3	0	9.18	-177	0.6	ND
			9:47	0.3	10.83	378	13.9	0	9.32	-266		
			9:52	0.5	10.83	378	13.3	0	9.32	-266		
			10:00	0.8	10.83	377	13	0	9.32	-266		
MW28	10/16/2019	W-191016-RA-20	10:23	0.0	10	313	46.3	3.5	8.97	2	ND	ND
			10:28	0.3	10.78	319	29.1	2.84	8.86	21		
			10:33	0.5	10.7	319	31.1	2.93	8.84	16		
			10:38	0.8	10.77	319	31.4	2.95	8.83	12		

Table 4.3

Groundwater Purging and Sampling Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date	Sample Identification	Time	Purge Volume (gallons)	Temperature (°C)	Specific Conductance (µS)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	pH	ORP (mV)	Total Iron (mg/L)	Total Sulfide (mg/L)
MW14	10/16/2019	W-191016-RA-18	11:03	0.0	10.37	282	43.1	0	8.97	-4	ND	ND
			11:08	0.3	11.71	337	6.4	0	8.87	-42		
			11:13	0.5	11.7	338	150	0	8.87	-42		
			11:18	0.8	11.72	339	2.3	0	8.87	-40		
MW22	10/16/2019	W-191016-RA-21	12:15	4	9.97	168	347	0	8.77	71	1.4	ND
MW2	10/16/2019	W-191016-RA-24	12:44	4	10.92	150	408	0	8.09	113	1	
MW10	10/16/2019	W-191016-RA-19	12:55	0.0	12.87	437	31.2	0	8.34	-181	2	ND
			13:00	0.3	13	437	31.7	0	8.34	-181		
			13:05	0.5	13.19	436	31.8	0	8.34	-181		
MW10S	10/16/2019	W-191016-RA-23	13:26	0.0	13.9	765	24.7	0	7.22	15	2	ND
			13:31	0.3	13.81	764	22.4	0	7.18	14		
			13:35	0.5	14.21	764	22.7	0	7.17	13		
MW30	10/17/2019	W-191017-RA-26	11:55	0.0	10.16	199	127	0	7.72	33	4	ND
			11:00	0.3	10.17	198	123	0	7.7	38		
			11:05	0.5	10.18	198	112	0	7.68	43		
			11:10	0.8	10.2	199	104	0	7.67	48		
			11:10	1.1	10.23	199	97.9	0	7.66	51		
			11:15	1.3	10.27	199	96	0	7.64	55		
MW5	10/17/2019	W-191017-RA-31	11:50	0.0	11.52	710	85.6	0	7.34	-118	4	ND
			12:55	0.3	11.67	709	83.6	0	7.3	-119		
			12:02	0.5	11.76	709	79.9	0	7.33	-120		
EW11D	10/17/2019	W-191017-RA-29	12:36	0.0	10.75	358	766	0	7.51	-46	8.2	ND
			12:41	0.3	10.72	366	723	0	7.52	-48		
			12:45	0.5	10.7	367	718	0	7.54	-51		

Table 4.3

Groundwater Purging and Sampling Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date	Sample Identification	Time	Purge Volume (gallons)	Temperature (°C)	Specific Conductance (µS)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	pH	ORP (mV)	Total Iron (mg/L)	Total Sulfide (mg/L)
EW11S	10/17/2019	W-191017-RA-28	13:06	0.0	10.33	352	9.7	0	7.26	72	2	ND
			13:11	0.3	10.35	351	9.9	0	7.25	74		
			13:16	0.5	10.3	346	9.2	0	7.23	78		
MW6S	10/17/2019	W-191017-RA-27	-	4	-	-	-	-	-	-	0.2	ND

Notes:

°C - Degrees Celcius
µS - Micro-Siemens
mg/L - Milligrams per liter
MS/MSD - Matrix Spike Sample & Matrix Spike Duplicate Sample
mV - Millivolts
ND - Not Detected
NM - Not Measured
NTU - National Turbidity Units
ORP - Oxidation Reduction Potential (ORP) reported in millivolts (mV)
Well MW20 was not sampled due to the presence of LNAPL; well MW29 was inadvertently not sampled

Table 4.4

Groundwater Analytical Data - Monitoring and Extraction Wells
Penta Wood Products Superfund Site
Siren, Wisconsin

Sample Location	Sample Idendification	Sample Date	Hardness, carbonate mg/L	Chloride[3] mg/L	Nitrate (as N) mg/L	Sulfate[3] mg/L	TOC averages mg/L	Alkalinity, total (as CaCO3) mg/L	Methane (dissolved) ug/L	Arsenic (dissolved) ug/L	Copper (dissolved) ug/L	Iron (dissolved) ug/L	Manganese (dissolved) ug/L	Zinc (dissolved) ug/L	Pentachlorophenol ug/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L
		ES[1]	-	250	10	250	-	-	-	10	1300	300	50	5000	1	100	5	700	800	2000
		PAL[2]	-	125	2	125	-	-	-	1	130	150	25	2500	0.1	10	0.5	140	160	400
Semiconfined Aquifer (Lower)																				
EW11D	W-191017-RA-29	10/17/2019	172	3.9	5.4	29.5	6.4	149 H	0.31 J	0.24 J	2.1	**1260**	**66.1**	15.2 J	**2.7**	0.24 U	0.15 U	0.18 U	0.15 J	0.22 U
MW3	W-191014-RA-01	10/14/2019	235	30.1	1.3 H	8.3	0.69 J	209	86	0.23 U	0.73 J	**482**	**52.1**	6.9 U	0.091 U	0.24 U	0.15 U	0.18 U	0.15 U	0.22 U
MW4	W-191016-RA-16	10/16/2019	147	50.4	0.090 J	13.6 B	0.47 U	80.3 H	25	1.0	0.50 U	214	**134**	6.9 U	**5.7**	0.25 U	0.15 U	0.18 U	0.15 U	0.22 U
MW10	W-191016-RA-19	10/16/2019	186	31.2	0.068 U	14.4 B	27.1	143 B	81	1.1	2.7	**1800**	**937**	6.9 U	**1700**	7.5	0.15 U	0.69	0.15 U	7.4
MW10 (duplicate)	W-191016-RA-25	10/16/2019	183	30.3	0.068 U	14.4 B	26.6	144 B	180	1.1	2.4	**1640**	**937**	6.9 U	**1800**	1800	0.15 U	0.18 U	0.98	7.7
MW12	W-191014-RA-02	10/14/2019	197	8.7	0.61 H	43.5	1.2	158	0.25 J	0.89 J	0.85 J	46.7 U	8.4	6.9 U	**300**	0.24 U	0.15 U	0.18 U	0.15 U	0.22 U
MW14	W-191016-RA-18	10/16/2019	146	17.5 F1	1.7	6.6 B	0.47 U	123 H	0.17 U	1.1	0.50 U	46.7 U	9.0 F2	6.9 U	0.086 U	0.25 U	0.15 U	0.18 U	0.15 U	0.22 U
MW17	W-191015-RA-14	10/15/2019	338	13.8	2.0	128	0.47 U	193	0.17 U	0.55 J	1.0 J	46.7 U	0.79 U	7.0 J	0.087 U	0.23 U	0.15 U	0.18 U	0.15 U	0.22 U
MW23	W-191014-RA-06	10/14/2019	250	46.2	2.1 H	8.1	0.47 U	195	6.4	0.64 J	0.67 J	46.7 U	2.6	6.9 U	0.085 U	0.65 J	0.15 U	0.18 U	0.15 U	0.22 U
Unconfined Aquifer (Upper)																				
EW11S	W-191017-RA-28	10/17/2019	128	3.2	7.3	22.0	3.6	93.6 H	0.21 J	0.23 J	2.0	46.7 U	24.6	6.9 U	**2.1**	0.24 U	0.15 U	0.18 U	0.15 J	0.22 U
EW13S	W-191015-RA-15	10/15/2019	268	33.1	0.068 U	15.5	36.6	265	6.3	8.9	2.2	19800	**3150**	6.9 U	**11000**	20	0.15 U	1.3	0.97	18
MW1	W-191014-RA-09	10/14/2019	116	14.7	3.7 H	5.7	0.55 J	99.1	0.17 U	0.27 J	1.5 J	76.5 J	4.7	6.9 U	0.085 U	0.23 U	0.15 U	0.18 U	0.15 U	0.22 U
MW2	W-191016-RA-24	10/18/2019	75.6	0.34	0.30	1.4 B	5.3	67.9 H	0.17 U	0.33 J	5.2	**1170**	40.9	12.1 J	0.094 U	0.26 U	0.15 U	0.18 U	0.15 U	0.22 U
MW5	W-191017-RA-31	10/17/2019	273	28.2	0.068 U	25.6	38.7	452	34	0.75 J	0.70 J	**22300**	**7140**	6.9 U	**6000**	22	0.15 U	0.62	0.46 J	6.3
MW5 (duplicate)	W-191017-RA-32	10/17/2019	283	25.7	0.068 U	24.4	38.4	265	32	0.69 J	0.84 J	**21900**	**6870**	6.9 U	**5500**	20	0.15 U	0.62	0.43 J	6.4
MW6S	W-191017-RA-27	10/17/2019	259	8.9	3.8	7.4	2.6	444 H	0.17 U	0.27 J	3.4	271	11.0	11.0 J	**2.7**	0.23 U	0.15 U	0.18 U	0.15 J	0.22 U
MW10S	W-191016-RA-23	10/16/2019	379	20.5	0.19 J	18.8	27.7	345 B	0.31 J	0.49 J	1.8 J	**551**	**3010**	6.9 U	**2500**	13	0.15 U	0.18 U	0.15 U	14
MW13	W-191014-RA-08	10/14/2019	40.1	1.2	0.29 H	1.8	1.9	44.7	0.17 U	0.28 J	2.3	149	4.3	6.9 J	0.086 U	0.25 U	0.15 U	0.18 U	0.15 U	0.22 U
MW16	W-191014-RA-04	10/14/2019	37.5	3.9	0.55 H	4.4	0.47 U	42.8	0.17 U	0.27 J	1.6 J	60.3 J	4.0	6.9 U	0.086 U	0.23 U	0.15 U	0.18 U	0.15 U	0.22 U
MW16 (duplicate)	W-191014-RA-05	10/14/2019	37.9	3.8	0.55 H	4.4	0.47 U	43.2	0.17 U	0.26 J	2.4	105	4.2	6.9 U	0.087 U	0.25 U	0.15 U	0.18 U	0.15 U	0.22 U
MW21	W-191015-RA-13	10/15/2019	83.1	87.1	1.6	5.9	0.47 U	35.1	0.17 U	0.23 J	0.72 J	46.7 U	0.79 U	7.0 J	0.088 U	0.23 U	0.15 U	0.18 U	0.15 U	0.22 U
MW22	W-191016-RA-21	10/16/2019	71.2	3.6	0.71	4.5 B	12.4	62.6 H	0.17 U	0.35 J	3.3	**509**	**99.0**	11.5 J	0.095 U	0.23 U	0.15 U	0.18 U	0.15 U	0.22 U
MW25	W-191015-RA-11	10/15/2019	205	20.2	2.1	3.9	0.47 U	404	0.17 U	0.24 J	1.5 J	46.7 U	0.79 U	7.6 J	0.088 U	0.24 U	0.15 U	0.18 U	0.15 U	0.22 U
MW28	W-191016-RA-20	10/16/2019	120	22.9	2.1	5.3 B	0.51 J	105 H	0.17 U	0.31 J	0.50 U	46.7 U	0.79 U	6.9 U	0.086 U	0.23 U	0.15 U	0.18 U	0.15 U	0.22 U

Table 4.4

Groundwater Analytical Data - Monitoring and Extraction Wells
Penta Wood Products Superfund Site
Siren, Wisconsin

Sample Location	Sample Idendification	Sample Date	Hardness, carbonate	Chloride[3]	Nitrate (as N)	Sulfate[3]	TOC averages	Alkalinity, total (as CaCO3)	Methane (dissolved)	Arsenic (dissolved)	Copper (dissolved)	Iron (dissolved)	Manganese (dissolved)	Zinc (dissolved)	Pentachlorophenol	Naphthalene	Benzene	Ethylbenzene	Toluene	Xylenes (total)
		ES[1]	-	250	10	250	-	-	-	10	1300	300	50	5000	1	100	5	700	800	2000
		PAL[2]	-	125	2	125	-	-	-	1	130	150	25	2500	0.1	10	0.5	140	160	400
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Unconfined Aquifer (Upper) continued																				
MW30	W-191017-RA-26	10/17/2019	92.0	0.62	0.53	2.4	0.85 J	88.8 H	0.17 U	0.23 U	1.2 J	46.7 U	22.6	6.9 U	41	0.24 U	0.15 U	0.18 U	0.15 U	0.28 J
MW31	W-191014-RA-10	10/14/2019	231	0.52	0.33	0.84	0.47 U	240	0.17 U	0.23 U	1.3 J	46.7 U	0.79 U	6.9 U	0.086 U	0.23 U	0.15 U	0.18 U	0.15 U	0.22 U
MW32	W-191014-RA-07	10/14/2019	35.7	0.74	0.64 H	3.8	0.69 J	33.3	0.17 U	0.23 U	0.77 J	134	14.8	6.9 U	0.088 U	0.24 U	0.15 U	0.18 U	0.15 U	0.22 U

Notes:

1 - Enforcement Standard (ES) criteria adapted from Table 1 referred to and incorporated by NR 140.10 with except of Iron, Manganese, Zinc, Chloride, and Sulfate (see note 3 below)
2 - Preventive Action Limit (PAL) criteria adapted from Table 1 referred to and incorporated by NR 140.10 with except of Iron, Manganese, Zinc, Chloride, and Sulfate (see note 3 below)
3 - Enforcement Standard (ES) and Preventive Action Limit (PAL) criteria adapted from Table 2 referred to and incorporated by NR 140.12
mg/L - Concentrations listed with units of milligrams per liter
ug/L - Concentrations listed with units of micrograms per liter
J - Concentration was between the limit of detection and the limit of quantitation
U - Compound was not detected above the limit of detection
B - Compound was found in the blank and sample
F1 - MS and/or MSD recovery is outside acceptance limits
F2 - MS/MSD RPD exceeds control limits
H -
NA - Not analyzed
- Concentration exceeds the ES
- Concentration exceeds the PAL
Well MW20 was not sampled due to the presence of LNAPL; well MW29 was inadvertently not sampled

Table 4.5

Groundwater Analytical Data - Residential Wells and Onsite Supply Well
Penta Wood Products Superfund Site
Siren, Wisconsin

Sample Location	Sample Identification	Date	Pentachlorophenol	Naphthalene	Benzene	Ethylbenzene	Toluene	Xylenes (total)
		ES[1]	1	100	5	700	800	2000
		PAL[2]	0.1	10	0.5	140	160	400
			ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
RW1	RW-191001-RA-01	10/1/2019	0.093 U	0.24 U	0.15 U	0.18 U	0.15 U	0.22 U
RW5	RW-191001-RA-02	10/1/2019	0.090 U	0.26 U	0.15 U	0.18 U	0.15 U	0.22 U
RW5 (Dup)	RW-191001-RA-03	10/1/2019	0.091 U	0.26 U	0.15 U	0.18 U	0.15 U	0.22 U
RW2	RW-191001-RA-05	10/1/2019	0.089 U	0.24 U	0.15 U	0.18 U	0.15 U	0.22 U
RW3	RW-191001-RA-06	10/1/2019	0.088 U	0.27 U	0.15 U	0.18 U	0.15 U	0.22 U
RW6 (shop)	RW-191001-RA-07	10/1/2019	0.086 U	0.25 U	0.15 U	0.18 U	0.15 U	0.22 U
RW6	RW-191001-RA-08	10/1/2019	0.086 U	0.24 U	0.15 U	0.18 U	0.15 U	0.22 U
RW4	RW-191001-RA-09	10/1/2019	0.085 U	0.24 U	0.15 U	0.18 U	0.15 U	0.22 U
DW01	RW-191001-RA-10	10/1/2019	0.087 U	0.26 U	0.15 U	0.18 U	0.15 U	0.23 J

Notes:

[1] - Enforcement Standard (ES) criteria adapted from Table 1 referred to and incorporated by NR 140.10
[2] - Preventive Action Limit (PAL) criteria adapted from Table 1 referred to and incorporated by NR 140.10
ug/L - Concentrations listed with units of micrograms per liter
J - Concentration was between the limit of detection and the limit of quantitation
U - Compound was not detected above the limit of detection
Dup - Duplicate sample
- Concentration exceeds the ES
- Concentration exceeds the PAL

Table 6.1

Trend Tests Results for Pentachlorophenol By Well - Post-Shutdown Period (2016-2019)
Penta Wood Products Superfund Site
Siren, Wisconsin

Well	Date Range	All Data N	All Data %ND	PCP Concentration Minimum (µg/L)	PCP Concentration Maximum (µg/L)	PCP Concentration Recent (µg/L)	Mann-Kendall Trend Test N	Mann-Kendall Trend Test %ND	Mann-Kendall Trend Test CoV	Mann-Kendall Trend Test Statistic	Mann-Kendall Trend Test Probability	Mann-Kendall Trend Test Conclusion
A) Unconfined (Upper) Aquifer												
MW01	4/2016 -- 10/2019	9	22%	0.085 U	1.1	0.085 U	9	22%	1.40	-16	0.120	No trend identified
MW02	4/2016 -- 10/2019	4	50%	0.080 J	0.37	0.094 U	4	50%	0.94	1	1.000	No trend identified
MW05	4/2016 -- 10/2019	4	0%	16.5	5750	6000/5500	4	0%	0.67	4	0.334	No trend identified
MW06S	4/2016 -- 10/2019	10	40%	0.059 J	2.7	2.7	10	40%	2.08	-6	0.664	No trend identified
MW10S	4/2016 -- 10/2019	10	0%	1450	9800	2500	10	0%	0.64	-19	0.108	Stable
MW13	4/2016 -- 10/2019	9	11%	0.086 U	1.1	0.086 U	9	11%	0.78	-18	0.076	Probably Decreasing
MW16	4/2016 -- 10/2019	9	67%	0.015	0.24	0.087 U/0.086 U	9	67%	0.95	--	--	>50% ND
MW20 (1)	4/2017 -- 4/2017	1	100%	ND(0.1)	0.10 U	0.10 U/0.10 U	1	100%	N/A	--	--	Insufficient data
MW21	4/2016 -- 10/2019	9	67%	0.016 J	7	0.088 U	9	67%	1.59	--	--	>50% ND
MW22 (2)	4/2016 -- 10/2017	9	33%	0.025 J	0.090 J	0.049 J	6	0%	0.48	11	0.056	No trend identified
MW25	4/2016 -- 10/2019	10	70%	0.024 J	4.9	0.088 U	10	70%	2.69	--	--	>50% ND
MW28	4/2016 -- 10/2019	9	22%	0.086 U	1550	0.086 U	9	22%	2.27	-21	0.034	**Decreasing Trend**
MW29	4/2016 -- 1/2017	4	0%	10050	61500	56000/67000	4	0%	0.90	4	0.334	No trend identified
MW30	4/2016 -- 10/2019	10	0%	0.72	800	41	10	0%	1.56	29	0.009	**Increasing Trend**
MW31	4/2016 -- 10/2019	9	67%	0.026 J	4.6	0.086 U	9	67%	1.76	--	--	>50% ND
MW32	5/2019 -- 10/2019	2	50%	0.088 U	0.14	0.088 U	2	50%	0.74	--	--	Insufficient data
EW11S	4/2016 -- 10/2019	10	10%	0.099 U	2.1	2.1	10	10%	1.03	-12	0.336	No trend identified
EW13S	4/2016 -- 10/2019	10	0%	770	11000	11000	10	0%	0.54	37	4E-04	**Increasing Trend**
B) Semiconfined (Lower) Aquifer												
MW03	4/2016 -- 10/2019	10	10%	0.091 U	0.93	0.091 U	10	10%	0.55	-9	0.484	Stable
MW04	1/2017 -- 10/2019	7	57%	ND(0.087)	5.7	5.7	7	57%	1.74	--	--	>50% ND
MW10	4/2016 -- 10/2019	10	0%	1600 H	7600	1800/1700	10	0%	0.65	-12	0.336	Stable
MW12	4/2016 -- 10/2019	9	0%	5.2	300	300	9	0%	1.37	31	0.001	**Increasing Trend**
MW14	1/2017 -- 10/2019	6	67%	0.086 U	0.14	0.086 U	6	67%	0.57	--	--	>50% ND
MW17	4/2016 -- 10/2019	10	90%	0.057	0.11 U	0.087 U	10	90%	0.09	--	--	>50% ND
MW23	4/2016 -- 10/2019	10	80%	0.015	0.31	0.085 U	10	80%	1.21	--	--	>50% ND
EW11D	4/2016 -- 10/2019	10	10%	0.096 U	8.4	2.7	10	10%	1.43	-13	0.292	No trend identified

Trend Tests Results for Pentachlorophenol By Well - Post-Shutdown Period (2016-2019)
Penta Wood Products Superfund Site
Siren, Wisconsin

Well	Date Range	All Data N	All Data %ND	PCP Concentration Minimum (µg/L)	PCP Concentration Maximum (µg/L)	PCP Concentration Recent (µg/L)	Mann-Kendall Trend Test N	Mann-Kendall Trend Test %ND	Mann-Kendall Trend Test CoV	Mann-Kendall Trend Test Statistic	Mann-Kendall Trend Test Probability	Mann-Kendall Trend Test Conclusion
C) Water Supply and Residential Wells												
DW01	4/2016 -- 10/2019	8	75%	0.021	0.10 U	0.087 U	8	75%	0.28	--	--	>50% ND
RW01	4/2016 -- 10/2019	8	75%	0.015 J	0.10 U	0.093 U	8	75%	0.35	--	--	>50% ND
RW02	4/2016 -- 10/2019	8	100%	0.024 U	0.10 U	0.089 U	8	100%	0.30	--	--	100% ND
RW03	4/2016 -- 10/2019	8	100%	0.025 U	0.098 U	0.088 U	8	100%	0.29	--	--	100% ND
RW04	4/2016 -- 10/2019	8	100%	0.024 U	0.11 U	0.085 U	8	100%	0.31	--	--	100% ND
RW05	4/2016 -- 10/2019	8	88%	ND(0.024)	0.16	0.090 U/0.091 U	8	88%	0.77	--	--	>50% ND
RW06	4/2016 -- 10/2019	8	100%	0.024 U	0.099 U	0.086 U	8	100%	0.29	--	--	100% ND
RW06 SHOP	4/2018 -- 10/2019	4	100%	0.024 U	0.095 U	0.086 U	4	100%	0.46	--	--	100% ND

Notes:

Trend tests were not performed for highly-censored data sets (>50% ND or 100% ND)
Probability: Values ≤ 0.05 are statistically significant at a 95 percent confidence level.
For small data sets with 4 observations, probabilities ≤ 0.10 (90 percent confidence) were considered significant.

(1) LNAPL present -- groundwater not sampled.

(2) Trend reported for data through 2017, since 2018 and 2019 results were ambiguous non-detect results (having detection limits higher than previous detected values).

Table 6.2

Trend Tests Results for Pentachlorophenol By Well Group - Post-Shutdown Period (2016-2019)
Penta Wood Products Superfund Site
Siren, Wisconsin

i) Regional Kendall Test

Well Group	Date Range	Number of Wells (m)	Test Statistic (S_R)	Group Std. Dev. (σ_R)	Significance Probability (P)	Conclusion
A) Unconfined (Upper) Aquifer [(1)] *:*						
>1000 µg/L PCP wells	4/2016 -- 10/2019	4	26	16.4	0.063	*Probably Increasing*
1-1000 µg/L PCP wells	4/2016 -- 10/2019	3	11	19.4	0.303	No trend identified
<1 µg/L PCP wells	4/2016 -- 10/2019	10	-87	14.1	5E-10	**Decreasing Trend**
B) Semiconfined (Lower) Aquifer [(2)] *:*						
>1000 µg/L PCP wells	4/2016 -- 10/2019	1	-12	CoV = 0.65	0.336	Stable
1-1000 µg/L PCP wells	4/2016 -- 10/2019	3	15	16.2	0.193	No trend identified
<1 µg/L PCP wells	4/2016 -- 10/2019	4	-17	20.1	0.213	Stable

ii) Mann-Kendall Test on Group Averages

Well Group	Date Range	Number of Averages	Test Statistic (S)	Coefficient of Variation (CoV)	Significance Probability (P)	Conclusion
A) Unconfined (Upper) Aquifer [(1)] *:*						
>1000 µg/L PCP wells	4/2016 -- 10/2019	10	-1	0.84	1.000	Stable
1-1000 µg/L PCP wells	4/2016 -- 10/2019	10	27	1.55	0.017	**Increasing Trend**
<1 µg/L PCP wells	4/2016 -- 10/2019	10	-25	2.38	0.028	**Decreasing Trend**
B) Semiconfined (Lower) Aquifer [(2)] *:*						
>1000 µg/L PCP wells	4/2016 -- 10/2019	10	-12	0.65	0.336	Stable
1-1000 µg/L PCP wells	4/2016 -- 10/2019	10	21	1.36	0.072	*Probably Increasing*
<1 µg/L PCP wells	4/2016 -- 10/2019	10	-25	0.35	0.028	**Decreasing Trend**

Notes:

Significance Probability (P) Values ≤ 0.05 are statistically significant at a 95 percent confidence level.

(1) Unconfined (Upper) Aquifer well groups are based on observed PCP concentrations in October 2019:
>1000 µg/L PCP wells = EW13S, MW5, MW10S, MW29
1-1000 µg/L PCP wells = EW11S, MW6S, MW30
<1 µg/L PCP wells = MW1, MW2, MW13, MW16, MW21, MW22, MW25, MW28, MW31, MW32

(2) Unconfined (Upper) Aquifer well groups are based on observed PCP concentrations in October 2019:
>1000 µg/L PCP wells = MW10
1-1000 µg/L PCP wells = EW1D, MW4, MW12
<1 µg/L PCP wells = MW3, MW14, MW17, MW23

Appendix A
Historical Site Data

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
DW01	9/24/03	N	0.5 U	0.05 J	1 U	2	50 UJ		5 UJ	30		1 U	0.25 U	2.5 U	2.5 U	2.5 U	250	66.9	110.8	1.48		2 U	1.5
DW01	9/24/03	N2	0.5 U		1 U	1 U	50 UJ		5 U	40													
DW01	5/4/04	N	10.0 U	0.102 UB	0.243 J	61.5 R	194 R	27300	108 R	2710 R		5.00 U	0.109 J	5.00 U	0.153 J	5.00 U	292	49 =	309	1.8 J		7.9 R	1.54 J
DW01	5/4/04	N2			0.280 J	49.5 R	29.2 R		58.0 R	2590 R													
DW01	9/22/04	N										5.00 U	0.500 U	5.00 U	5.00 U	5.00 U							
DW01	9/28/04	N		1.08 =																			
DW01	11/1/04	N		0.0962 U																			
DW01	5/11/05	N	2.0 U	0.033 J								0.93 U	0.50 U	5.0 U	5.0 U	5.0 U			260 J				
DW01	9/27/05	N		0.040 J								0.93 UJ	0.50 U	5.0 U	5.0 U	5.0 U							
DW01	5/31/06	N	2.0 U	0.039 J	1.0 UJ	140 J	50 UJ		4.0 UJ	1900 J		0.95 U	0.50 U	5.0 U	5.0 U	5.0 U	270 J	29 J	260 J	1.5 J		6.5	1.1 J
DW01	9/26/06	N	2.0 UJ	0.11 U	1.0 UJ	100	50 UJ		15 J	1500 J		0.93 U	0.50 U	5.0 U	5.0 U	5.0 U	230 J	21 J	230 J	0.67 J		13 J	2.1
DW01	5/10/07	N	2.0 UJ	0.074 J	1.0 UJ	100	100 UJ		10 UB	620 J		0.95 R	1.0 UJ	1.0 UJ	1.0 UJ	2.0 UJ	400 =	29	320	1.8		17 J	1.0 UB
DW01	9/19/07	N	2.0 UJ	0.093 UJ	0.63 J	89	100 UJ		2.4 J	1100		0.93 R	1.0 U	1.0 U	1.0 U	2.0 U	250 J	27	330 J	1.5 J		14 J	0.92 J
DW01	5/20/08	N		0.094 UJ								0.94 U	1.0 UJ	1.0 U	1.0 U	2.0 UJ							
DW01	10/23/08	N	2.0 UJ	0.1 U	2 UJ	205 J	642 J	33000 J	4.6 J	81.2 J		1 U	0.5 U	2.0 U	2.0 U	5.0 U	297 J	29.6	423 J	1.79 J		9.07	44.4
DW01	6/3/09	N		0.1 U								1.0 UJ	0.5 U	2.0 U	2.0 U	5.0 U							
DW01	10/8/09	N		0.1 UJ								0.994 UJ	0.1 UJ	0.4 UJ	0.4 UJ	1 UJ							
DW01	5/19/10	N		0.1 U								1.0 U	0.4 U	5 U	5 U	5 U							
DW01	10/7/10	N		0.1 UJ								0.995 UJ	0.1 U	0.4 U	0.4 U	1 U							
DW01	6/30/11	N		0.1 U								0.999 U	0.1 U	0.4 U	0.4 U	1 U							
DW01	10/18/11	N		0.032 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
DW01	5/23/12	N		0.028 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
DW01	10/18/12	N		0.032 J								0.19 U H	0.50 U	1.0 U	1.0 U	2.0 U							
DW01	5/21/13	N		0.029 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
DW01	10/8/13	N		0.027 J								0.20 U	0.50 U	1.0 U	1.0 U	2.0 U							
DW01	5/13/14	N		0.057 J																			
DW01	9/25/14	N		0.54 J								0.19 UJ											
DW01	4/21/15	N		0.023 J								0.19 U											
DW01	10/15/15	FD		0.096 U								0.19 U											
DW01	10/15/15	N		0.095 U								0.19 U											
DW01	4/5/16	FD		0.097 U								0.20 U	0.50 U	1.0 U	1.0 U	2.0 U							
DW01	4/5/16	N		0.095 U								0.14 J	0.50 U	1.0 U	1.0 U	2.0 U							

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
DW01	10/10/16	FD		0.024 J								0.20 U	0.50 U	1.0 U	1.0 U	2.0 U							
DW01	10/10/16	N		0.025 J								0.20 U	0.50 U	1.0 U	1.0 U	2.0 U							
DW01	4/18/17	FD		0.022 J								0.20 U	0.50 U	1.0 U	1.0 U	2.0 U							
DW01	4/18/17	N		0.020 J								0.20 U	0.50 U	1.0 U	1.0 U	2.0 U							
DW01	10/20/17	FD		0.10 U								0.88 U	0.50 U	0.50 U	0.50 U	1.0 U							
DW01	10/20/17	N		0.10 U								0.83 U	0.50 U	0.50 U	0.50 U	1.0 U							
DW01	6/5/18	N		0.095 U								0.77 U	0.50 U	0.50 U	0.50 U	1.0 U							
DW01	10/16/18	N		0.095 U								0.82 U	0.50 U	0.50 U	0.50 U	1.0 U							
DW01	4/22/19	N		0.099 U								0.26 U	0.15 U	0.18 U	0.15 U	0.22 U							
DW01	10/1/19	N		0.087 U								0.26 U	0.15 U	0.18 U	0.15 U	0.23 J							
EW02D	8/22/14	N		52							0.28										2.1 J		
EW02D	4/23/15	N		17																			
EW02D	4/14/16	N	0.15 J	370	0.49 J	3.8	299		384	46.7		1.7	0.50 U	1.0 U	1.0 U	2.0 U	55.0	12.1	70.6	0.70		8.7	4.8
EW02S	4/14/16	N	0.094 J	690	5.0 U	1.4 J	50.2 J		39.3	20.0 U		2.5	0.50 U	1.0 U	1.0 U	2.0 U	30.0	10.5	41.2	1.0		7.0	2.7
EW03D	8/22/14	N		260							0.87										1.6 J		
EW03D	4/18/16	N	1.3	3500	2.7 J	9.8	12500		1780	398		2.4	0.50 U	0.33 J	1.0 U	3.6	184	13.4	169	0.10 U		25.6	10
EW03S	4/18/16	N	0.15 J	14000	0.53 J	10.8	1050		3530	20.0 U		12	1.0 U	2.0 U	2.0 U	5.2	88.0	73.8	220	0.29		39.1	59.1
EW04D	8/22/14	N		150							0.65										4.8 U		
EW04D	2/3/15	N		200							0.71										4.9 U		
EW04D	4/23/15	N		430																			
EW04D	4/18/16	N	0.33 J	24	5.0 U	2.2	3060		316	172		0.16 J	0.50 U	1.0 U	1.0 U	2.0 U	129	16.5	131	1.9		6.0	5.3
EW04S	4/18/16	N	0.12 J	210	5.0 U	2.4	567		385	20.0 U		0.25	0.50 U	1.0 U	1.0 U	2.0 U	81.0	9.9	98.0	0.92		8.1	7.2
EW05D	8/22/14	N		4400							6.8										6.3		
EW05D	2/3/15	N		3100							11										2.0 J		
EW05D	4/20/16	N	0.44 J	7500	2.7 J	8.6	8430		1980	372		19	0.50 U	0.79 J	0.95 J	6.7	145	14.4	171	0.10 U		17.0	36.7
EW06D	8/22/14	N		910							1.8										1.9 J		
EW06D	2/3/15	N		4900							12										1.6 J		
EW06D	1/24/17	N	0.25 J	840	0.35	0.70 J	398		163	15.4 J		1.7	0.28	0.26	0.23	1.2 J	124	12.3	144	1.0		5.9	6.4
EW07D	8/22/14	N		280							0.68										1.3 J		
EW07D	2/3/15	N		170							0.28										4.9 U		
EW07D	4/23/15	N		2400																			
EW07D	4/12/16	N	0.59	0.31	5.0 U	1.1 J	122		210	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	127	23.7	174	6.6		8.4	1.2

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
EW10D	8/22/14	N		7000							11										11		
EW10D	2/3/15	N		2800							7.7										4.9 U		
EW10D	4/20/16	FD	1.3	4800	7.6	12.1	3720		2170	114		19	0.50 U	1.3	1.9	12	136	23.9	184	0.060 J		20.3	41.0
EW10D	4/20/16	N	1.1	5000	6.5	10.3	3350		2200	81.0		19	0.50 U	1.4	1.8	12	135	25.7	180	0.057 J		21.8	41.8
EW11D	4/14/16	FD	0.080 J	2.5	5.0 U	2.0 U	825		27.4	55.9		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	190	12.8	276	2.0		198	1.2
EW11D	4/14/16	N	0.50 U	3.4	5.0 U	1.1 J	657		22.6	46.4		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	187	12.7	282	2.0		155	1.0
EW11D	7/19/16	N	1.1	7.4	5.0 U	2.7	292		54.5	50.0		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	151	9.1	242	2.2		112	1.9
EW11D	10/10/16	N	3.2	8.4	5.0 U	0.67 J	793		23.6	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	190	13.6	272	2.7		159	1.0
EW11D	1/19/17	N	8.9	0.15	0.35	0.51 J	897		40.4	10.8 J		0.060	0.28	0.26	0.23	0.24	168	12.2	70.0	3.3		129	1.9
EW11D	4/19/17	N	35	0.13	5.0 U	0.58 J	2930		129	19.0 J		0.22 U	0.50 U	1.0 U	1.0 U	2.0 U	152	11.4	238	5.2		97.3	3.2
EW11D	10/4/17	N	14	0.18	0.31 J	1.4 J	1290		66.9	11.9 J		0.81 U	0.50 U	0.50 U	0.50 U	1.0 U	159	11.5	220	7.7		79.4	2.5
EW11D	5/31/18	FD	2.4	0.12	0.35 J	1.2 J	2690		126	10.2 J		0.78 U	0.50 U	0.50 U	0.50 U	1.0 U	137	8.9	204	13.4		51.7	3.4
EW11D	5/31/18	N	2.5	0.10 U	0.36 J	0.87 J	2600		124	10.2 J		0.82 U	0.50 U	0.50 U	0.50 U	1.0 U	137	9.0	202	13.0		49.5	3.4
EW11D	10/19/18	N	1.0 U	0.096 U	1.0 U	13.1	144		34.5	20.0 U		0.76 U	0.50 U	0.50 U	0.50 U	0.44 J	131	7.2	121	9.9		40.3	4.3
EW11D	4/24/19	N	0.17 U	0.20	1.1	7.0	23400		217	282		0.24 U	0.15 U	0.18 U	0.15 U	0.22 U	48.2	0.94	95.1	5.7		19.5 B	5.5
EW11D	10/17/19	N	0.31 J	2.7	0.24 J	2.1	1260		66.1	15.2 J		0.24 U	0.15 U	0.18 U	0.15 J	0.22 U	149 H	3.9	172	5.4		29.5	6.4
EW11S	4/14/16	N	0.50 U	0.37	5.0 U	3.4	451		63.5	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	48.6	7.0	100	8.9		45.1	5.2
EW11S	7/19/16	N	0.50 U	1.2	5.0 U	2.3	84.2 J		37.3	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	65.7	7.9	106	6.0		36.5	2.7
EW11S	10/10/16	N	0.50 U	0.70	0.40 J	3.0	114		97.9	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	64.7	7.9	118	7.9		39.1	4.7
EW11S	1/19/17	N	0.20 J	0.96	0.40 J	2.2	211		157	6.2		0.060	0.28	0.26	0.23	0.24	50.5	9.8	108	7.7		36.3	4.3
EW11S	4/19/17	N	0.26 J	0.20	5.0 U	1.8 J	445		185	20.0 U		0.23 U	0.50 U	1.0 U	1.0 U	2.0 U	45.9	9.2	122	8.6		36.8	3.5
EW11S	10/4/17	N	0.22 J	0.25	0.31 J	2.9	164		65.0	7.9 J		0.80 U	0.50 U	0.50 U	0.50 U	1.0 U	65.2	9.4	129	8.0		39.1	3.9
EW11S	6/1/18	N	1.0 U	0.25	0.24 J	2.7	242		74.7	20.0 U		0.76 U	0.50 U	0.50 U	0.50 U	1.0 U	53.5	10.6	127	13.2		36.3	3.3
EW11S	10/19/18	N	1.0 U	0.099 U	1.0 U	9.6	213		63.5	12.8 J		0.81 U	0.50 U	0.50 U	0.50 U	0.23 J	56.4	7.4	182	11.9		29.2	2.7
EW11S	4/24/19	N	0.17 U	0.16	0.23 U	2.2	94.7 J		10.7	8.2 J		0.24 U	0.15 U	0.18 U	0.15 U	0.22 U	53.0	2.7	96.5	6.0		23.7 B	2.5
EW11S	10/17/19	N	0.21 J	2.1	0.23 U	2	46.7 U		24.6	6.9 U		0.24 U	0.15 U	0.18 U	0.15 J	0.22 U	93.6 H	3.2	128	7.3		22	3.6
EW12D	8/22/14	N		4600							5.7										5.1		
EW12D	2/3/15	N		880							4.1										4.9 U		
EW12D	4/20/16	N	4.0	2500	2.2 J	1.3 J	3820		1620	20.0 U		12	0.50 U	0.58 J	0.50 J	7.2	90.0	5.4	80.4	0.10 U		6.4	15.7
EW13D	8/22/14	N		780							1.2										1.5 J		
EW13D	2/3/15	N		660							1.6										4.7 U		
EW13D	4/23/15	N		18000																			

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
EW13D	4/19/16	N	1100	2100	1.6 J	2.0 U	7660		956	11.7 J		13	0.50 U	0.27 J	0.32 J	4.8	180	15.1	167	0.093 J		2.0	20.7
EW13S	4/19/16	N	4.9	770	23.2	37.7	14100		2340	13.8 J		2.0	0.50 U	0.26 J	1.0 U	4.2	370	20.7	229	0.10 U		9.6	36.6
EW13S	7/26/16	N	20	1900	58.9	133	45600		2580	52.2		4.0	0.50 U	0.31 J	0.35 J	4.4	312	21.2	292	0.10 U		7.8	32.6
EW13S	10/14/16	N	40	4200	18.5	30.6	15600		2360	8.4 J		6.8	0.50 U	0.53 J	0.54 J	7.1	296	25.1	236	0.10 U		11.8	34.7
EW13S	1/24/17	N	48	6400	11.4	3.2	8700		2220	6.2		11	0.28	0.70 J	0.62 J	9.3	297	28.0	304	4.8		12.1	35.8
EW13S	4/20/17	N	32	5100	13.7	2.2	10600		2260	20.0 U		20	0.50 U	0.96 J	0.90 J	13	240	29.1	294	0.10 U		16.1	37.2
EW13S	10/5/17	N	52	8700	12.4	0.93 J	10400		2010	20.0 U		16	0.50 U	1.0	1.0	14	276	34.5	276	0.075 J		13.6	34.9
EW13S	6/1/18	N	24	6000	14.9	3.6	13400		2540	20.0 U		19	0.50 U	0.93	1.0	13	271	34.2	253	0.085 J		13.6	33.8
EW13S	10/19/18	FD	17	9800	16.3	17.3	16300		2610	20.0 U		33	0.50 U	1.3	1.3	19	241	32.6	255	0.20 U		17.0	34.7
EW13S	10/19/18	N	16	10000	16.0	12.5	16400		2620	11.5 J		34	0.23 J	1.2	1.2	21	242	33.4	251	0.20 U		17.4	35.3
EW13S	4/23/19	N	8.4	8900	5.5 B	1.8 JB	18700		3040 B	6.9 U		17	0.15 U	0.83	0.84	15	243	32.2	340	0.068 U		19.9	31.5
EW13S	10/15/19	N	6.3	11000	8.9	2.2	19800		3150	6.9 U		20	0.15 U	1.3	0.97	18	265	33.1	268	0.068 U		15.5	36.6
EW14D	8/22/14	N		290							0.99										1.4 J		
EW14D	2/3/15	N		660							1.5										4.9 U		
EW14D	4/23/15	N		2100																			
EW14D	4/19/16	FD	3.5	2700	5.0 U	2.0 U	292		77.8	17.2 J		3.1	0.50 U	1.0 U	1.0 U	2.4	136	11.9	145	0.48		7.1	6.3
EW14D	4/19/16	N	4.2	2800	5.0 U	3.4	301		77.4	17.5 J		3.5	0.50 U	1.0 U	1.0 U	2.4	137	12.0	139	0.48		7.2	6.5
MW1	10/9/97	FD	10 U	1	2.3	3.5 U	20 J		1180	3.8			0.1 U	1 U	1 U	1 U	190	16		4.5		5.8	43.5
MW1	10/9/97	FD2			2 U	70.9				36													
MW1	10/9/97	N	10 U	2	2 U	61.6	20 U		1070	32.8			0.1 U	1 U	1 U	1 U	190	18		6.5		6.3	20
MW1	10/9/97	N2		2	2 U	2 U				3			0.1 U	1 U	1 U	1 U							
MW1	4/24/01	N	0.11 U	0.1 U	2.4	33	9830		642	16		5.6 U	0.1 U	1 U	1 U	1 U	140	24	218	6.5 =		13	3.89
MW1	4/24/01	N2	0.11 U		1 U	25 U	25 U		15 U	25 U										6.5			
MW1	9/11/01	N	10 U	0.5	0.7 J	4 J	35 U		0.79 J	3.7 U		0.24 U	0.44 U	0.5 U	0.4 U	1.2 U	130	10	170	2.6		8.2 U	3.9
MW1	9/11/01	N2			1.3	25 U	4000		450	20													
MW1	5/14/02	N			1.4 U	1.6 J	11.2 U		0.48 J	5.4 J													
MW1	8/6/02	N	0.01 U	0.067	1.4 U	7.6 J	1700		180	5.8 J		5 U	1 U	5 U	5 U	5 U	170	7.4	190	0.15 U		7.9	2.6
MW1	8/6/02	N2	0.01 U	0.063	1.7 J	0.3 U	11 U		0.95 J	3.9 J		5 U	1 U	5 U	5 U	5 U	160	7.3	190	0.15 U		7.7	3.7
MW1	8/6/02	N3			1.8 J	9.5 J	2200		230	6.5 J													
MW1	8/6/02	N4			1.4 U	0.3 U	11 U		2.2 J	2.9 J													
MW1	4/29/03	N	0.5 U	0.1 U	1 U	14	3160		217	10 U		7.4 U	0.5 U	5 U	5 U	5 U	174	4.3	187	2.6		10	3.2
MW1	4/29/03	N2	0.5 U		1 U	1 U	25 U		5 U	10 U													

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MW1	9/24/03	N	0.5 U	0.13	1 J	21	7000 J		416	20 J		1 U	0.25 U	2.5 U	2.5 U	2.5 U	157	3.3	68.25	2.61		2 U	8.4
MW1	9/24/03	N2	0.5 U		1 U	1 J	100 J		36	10 U													
MW1	5/4/04	N	0.863 J	1.06 J	0.346 J	5.73 R	790 R	13900	135 R	7.43 R		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	147	4.3 R	158	2.1 J		2.0 R	6.37 J
MW1	5/4/04	N2			0.190 J	0.785 R	29.9 R		15.0 R	2.74 R													
MW1	9/21/04	FD	10.0 U	0.442	0.470 J	13.6 J	1210		158	13.4 J		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	140	2.7 =	1960	1.8 J		4.5 J	7.98
MW1	9/21/04	FD2			0.227 J	0.707 J	21.0 J		3.07 J	3.31 J													
MW1	9/21/04	N	10.0 U	0.348	0.353 J	8.41 J	838		103	17.1 J		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	130	2.7 =	776	1.8 J		5.2 J	6.75
MW1	9/21/04	N2			0.218 J	0.605 J	18.0 J		2.60 J	4.06 J													
MW1	5/10/05	N	2.0 U	0.12	1.0 U	18	3800		360	11 J		0.92 U	0.50 U	5.0 U	5.0 U	5.0 U	110 J	3.6 J	140 J	1.7 J		14 R	3.7 R
MW1	5/10/05	N2			1.0 U	10 U	50 U		10 U	20 U													
MW1	9/29/05	N	2.0 U	0.12	1.0 J	23 J	4800 J		400 J	14 J		1.0 U	0.50 U	5.0 U	5.0 U	5.0 U	110 J	6.2 J	160 J	1.9 J		16 R	2.4 J
MW1	9/29/05	N2			1.0 UJ	10 UJ	50 UJ		3.8 J	20 UJ													
MW1	5/31/06	N	2.0 U	0.049 J	1.0 UJ	10 UJ	50 UJ		10 UJ	20 UJ		1.0 U	0.50 U	5.0 U	5.0 U	5.0 U	110 J	2.3 J	100 J	1.6 J		17	1.7 J
MW1	5/8/07	N	2.0 UJ	0.11 J	1.0 UJ	10 UJ	100 UJ		6.3 J	20 UJ		1.0 R	1.0 U	1.0 U	1.0 U	2.0 U	190 =	2.2 J	130	1.9		15 J	1.9
MW1	9/18/07	N	2.0 UJ	0.093 UJ	1.0 UJ	10 UJ	100 UJ		10 UJ	20 UJ		0.93 R	1.0 U	1.0 U	1.0 U	2.0 U	110 J	9.4	170 J	3.0 J		12 J	1.1 J
MW1	10/21/08	N	2.0 UJ	0.42 UJ	2 U	10 UJ	388	21200	10 U	8.60 J		1.00 U	0.50 U	2.0 U	2.0 U	5.0 U	109	3.91	223 J	1.62 J		6.19	3.38 J
MW1	4/12/16	N	0.50 U	0.15	5.0 U	2.0 U	19.9 J		1.4 J	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	79.9	5.1	102	0.53		5.2	0.73 J
MW1	7/20/16	N	0.50 U	1.1	5.0 U	2.0 U	100 U		5.0 U	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	82.4	5.6	30.0	0.53		5.2	0.83 J
MW1	10/12/16	N	0.16 J	0.12	0.46 J	0.67 J	100 U		0.96 J	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	86.2	7.5	92.0	0.45		5.2	0.59 J
MW1	1/19/17	FD	0.080	0.30	0.51 J	0.73 J	5.7 J		0.25	6.2		0.061	0.28	0.26	0.23	0.24	71.9	6.8	88.0	0.54		4.8	0.73 J
MW1	1/19/17	N	0.080	0.19	0.77 J	0.76 J	8.1 J		0.25	6.2		0.063	0.28	0.26	0.23	0.24	71.9	6.7	88.0	0.54		4.7	0.65 J
MW1	4/18/17	N	0.50 U	0.12	0.37 J	2.0 U	100 U		5.0 U	20.0 U		0.22 U	0.50 U	1.0 U	1.0 U	2.0 U	64.4	3.9	84.0	0.39		5.5	0.91 J
MW1	10/4/17	N	0.15 J	0.17	1.0 U	1.1 J	100 U		2.5 U	20.0 U		0.77 U	0.50 U	0.50 U	0.50 U	1.0 U	78.5	8.1	81.3	1.1		5.5	0.63 J
MW1	10/18/18	N	1.0 U	0.096 U	0.34 J	1.3 J	100 U		2.5 U	8.8 J		0.81 U	0.50 U	0.50 U	0.50 U	1.0 U	85.5	13.1	109	2.9		5.9	1.0
MW1	4/24/19	FD	0.17 U	0.14	0.45 J	1.5 JB	69.1 J		3.7	7.3 J		0.25 U	0.15 U	0.18 U	0.15 U	0.22 U	84.0	10.7	116	3.4		6.0 B	0.89 J
MW1	4/24/19	N	0.17 U	0.12	0.24 J	1.2 JB	53.2 J		3.5	8.2 J		0.25 U	0.15 U	0.18 U	0.15 U	0.22 U	85.1	11.3	116	3.4		5.9 B	0.47 U
MW1	10/14/19	N	0.17 U	0.085 U	0.37 J	1.5 J	76.5 J		4.7	6.9 U		0.23 U	0.15 U	0.18 U	0.15 U	0.22 U	99.1	14.7	116	3.7 H		5.7	0.55 J
MW2	10/9/97	N	10 U	1 U	2 U	10.2 J	20 J		50.6	10			0.1 U	1 U	1 U	1 U	300	3.5		1.1		17	2.6
MW2	10/9/97	N2		1 U	2 U	11.4 J				10.7			0.1 U	1 U	1 U	1 U							
MW2	4/5/00	N		0.5 U								10 U											
MW2	6/18/01	N	0.14	0.1 U	0.37 J	25 U	24 U		8.3	25 U		5 U	0.1 U	1 U	1 U	1 U	36	5.73	66	38 =		105	5.57
MW2	6/18/01	N2	0.14		6.7	109	39900		1230	64										38			

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MW2	9/12/01	N	10 U	0.51	3.9	110	29000		1200	69		0.24 U	0.44 U	0.5 U	0.4 U	1.2 U	49	6.2	140	2.3		10	4.2
MW2	9/12/01	N2			0.29 U	2.2 U	35 U		57	5.2 J													
MW2	8/6/02	N	0.01 U	0.12	6.4	30	10000		420	26 J		5 U	1 U	5 U	5 U	5 U	66	3	98	0.15 U		10	3.2
MW2	8/6/02	N2			1.4 U	0.3 U	48		18	9.1 J													
MW2	9/24/03	N	0.5 U	0.28	8	100	41300 J		1180	80		0.99 U	0.25 U	2.5 U	2.5 U	2.5 U	80	1 J	106.2	2.02		3 J	2.3
MW2	9/24/03	N2	0.5 U		1 U	16	3030 J		443	20 J													
MW2	9/21/04	N	10.0 UJ	1.26	4.03 J	87.2 J	25800 J		972 J	64.2 J		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	110 J	12 J	921 J	1.4 J		4.0 R	5.23 R
MW2	9/21/04	N2			0.237 J	3.10 J	662		22.2 J	7.73 J													
MW2	9/28/05	N	2.0 U	2.2 =	6.7	140 J	40000 J		1300 J	82 J		0.98 U	0.50 U	5.0 U	5.0 U	5.0 U	150 J	5.6 J	270 J	0.10 UJ		27 R	2.5 J
MW2	9/28/05	N2			1.0 UJ	2.5 J	65 J		9.3 J	20 UJ													
MW2	9/26/06	N	2.0 UJ	2.3	1.0 U	10 UJ	50 U		2.6 UB	20 UJ		1.7 U	0.50 U	5.0 U	5.0 U	5.0 U	160 J	1.6 J	220	0.12 J		20 J	3.1
MW2	9/19/07	N	2.0 UJ	3.7 J	0.62 J	10 UJ	100 UJ		6.5 J	20 UJ		0.97 R	1.0 U	1.0 U	1.0 U	2.0 U	160 J	3.6	200 J	0.22 J		16 J	2.1 J
MW2	10/21/08	N	2.0 UJ	1.60 J	2 U	10 UJ	424 J	27900	5.20 J	20 U		1.00 U	0.5 U	2.0 U	2.0 U	5.0 U	138	3.17	276 J	1.10 J		12.90	2.59 J
MW2	10/6/09	N	0.83 UJ	2.21 J	2 UJ	10 UJ	129 J	19000 J	10 UJ	20 UJ		0.996 UJ	0.1 UJ	0.4 UJ	0.4 UJ	1 UJ	122 J	1.97 J	190.6 J	0.81 J		11.6 J	5.33 J
MW2	10/6/10	N	1.3 U	0.1 U	2 U	8 U	43 J	4680	9.4 J	20 U		1.0 U	0.1 U	0.4 U	0.4 U	1 U	62	0.6 J	52.5	1.01 J		4.2 J	24
MW2	10/19/11	N	0.50 U	0.097 U	2.0 U	2.2 J+	47 J	9400 B	3.7 J	10 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	63	7.7	93.60	0.50 J		33	1.0 U
MW2	10/16/12	N	0.50 U	0.33	0.82 J	6.2 J	810	8800 =	25	20 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	54	4.1	91.2	0.90 J		32 J	6.7
MW2	10/9/13	N	0.50 U	0.94 J	2.0 UJ	10.0 UJ	50 UJ	6900 J	10 UJ	20 UJ		0.21 U	0.50 U	1.0 U	1.0 U	2.0 U *	39 J	2.8		2.9 J		28	4.5 J
MW2	10/9/13	N2																		2.9 J			
MW2	9/24/14	N	0.50 U	0.32	5.0 U	2.0 U	100 U		1.4 J	20 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	62	0.69 J	68	0.73		2.4	1.0 U
MW2	10/14/15	N	0.50 U	0.13	5.0 U	0.75 J	56.7 J		2.9 J	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	50.7	0.55 J	60.3	0.63		2.1	1.3
MW2	4/14/16	N	0.50 U	0.080 J	1.3 J	20.1	6580		171	19.7 J		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	34.4	0.51 J	49.0	0.38		1.8	3.6
MW2	10/29/18	N	1.0 U	0.21	1.0 U	2.8	100 U		1.8 J	10.9 J		0.86 U	0.50 U	0.50 U	0.50 U	1.0 U	66.6	0.42	87.2	0.51		1.6	2.1
MW2	4/25/19	N	0.17 U	0.37	0.23 U	1.8 J	230		7.5	9.7 J		0.24 U	0.15 U	0.18 U	0.15 U	0.22 U	61.5	0.48	80.5	0.30		1.7 B	1.3
MW2	10/18/19	N	0.17 U	0.094 U	0.33 J	5.2	1170		40.9	12.1 J		0.26 U	0.15 U	0.18 U	0.15 U	0.22 U	67.9 H	0.34	75.6	0.3		1.4 B	5.3
MW3	10/8/97	N	10 U	1 U	2 U	2 U	257		10.9	2 U			0.1 U	1 U	1 U	1 U	370	42 J		4.4 J		16	1.2
MW3	10/8/97	N2		1 U									0.1 U	1 U	1 U	1 U							
MW3	4/4/00	N		0.6 U								12 U											
MW3	4/25/01	N		0.11 U	1 U	25 U	147		7.3	25 U		6.1 U	0.1 U	1 U	0.46	1 U	442	47	544	4.42		11	1 U
MW3	4/25/01	N2			1 U	25 U	142		7.9	25 U		6.1 U								4.42 =			
MW3	9/13/01	N	10 U	0.092 J	0.29 U	2.2 U	930		31	3.7 U		0.26 U	0.44 U	0.5 U	0.4 U	1.2 U	440	58	480	4		14	1.1
MW3	9/13/01	N2			0.35 J	2.2 U	2400		31	3.7 U													

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MW3	8/7/02	N	0.01 U	0.11	1.7 J	2.3 J	480		15 J	1.4 J		5 U	1 U	5 U	5 U	5 U	420	69	540	0.15 U		16	1.4
MW3	8/7/02	N2			1.9 J	0.58 J	160		12 J	4.8 J													
MW3	9/23/03	N	2.5	0.31	1 U	1 J	150		5 U	10 U		1.1 U	0.25 U	2.5 U	2.5 U	2.5 U	357	52.4	160	4.43		2 U	1.6
MW3	9/23/03	N2	2.5																				
MW3	9/24/03	N			1 U	1 U	1 U		8 J	10 U													
MW3	9/21/04	N	5.71 J	0.367	0.189 J	356 J	278 J		6.45 J	273 J		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	430 J	62 J	3250 J	3.5 J		8.9 R	2.16 R
MW3	9/21/04	N2			0.119 J	1.91 J	137 J		4.99 J	4.61 J													
MW3	9/28/05	FD											0.50 U	5.0 U	5.0 U	5.0 U							
MW3	9/28/05	N	2.0 U	0.20 J	1.0 U	4.9 J	23000 J		93 J	20 UJ		0.93 U	0.50 U	5.0 U	5.0 U	5.0 U	370 J	62 J	490 J	3.3 J		24 R	1.4 J
MW3	9/28/05	N2			1.0 U	3.0 J	120 J		6.7 J	20 UJ													
MW3	10/21/08	N	4.90 J	0.10 UJ	2.00 U	10 UJ	2140	58700	15.20 J	20 U		3.13 U	0.50 U	2.0 U	2.0 U	5.0 U	513	60.50	836	2.73 J		15.20	18 J
MW3	10/7/09	N	21 J	0.1 UJ	2 UJ	10 UJ	722 J	46000 J	12.4 J	20 UJ		0.997 UJ	0.1 UJ	0.4 UJ	0.4 UJ	1 UJ	482 J	53.8 J	581.46 J	2.55 J		11 J	3.42 J
MW3	10/5/10	N	1.6	0.1 U	2 U	10 U	805	69100	12 J	20 U		1.0 U	0.1 U	0.4 U	0.4 U	1 U	510	67.2	906	3.62		19.8 J	2.2 J
MW3	10/18/11	N	140	0.58	0.76 J	2 U	510	44000 B	41	10 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	510	64	531.00	3.3		16	2.9
MW3	10/16/12	N	13	0.46	0.59 J	10 U	260	41000 =	8.3 J	20 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	460	69	493	3.6 J		17 =	2.4
MW3	10/8/13	N	4.3	0.38	0.088 J	10.0 U	50 U	42000 B	8.3 J	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	390	70		3.5 J		16	1.6
MW3	9/25/14	N	15	0.35	5.0 U	2.0 U	160		7.6	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	290	72	360	2.1		12	0.91 J
MW3	10/15/15	FD	5.7	0.23	5.0 U	1.2 J	56.6 J		7.9	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	258	52.3	312	1.7		11.2	1.2
MW3	10/15/15	N	5.1	0.15	5.0 U	0.93 J	58.2 J		7.4	20.0 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	258	52.5	322	1.7		11.1	1.1
MW3	4/5/16	FD	4.2	0.40	5.0 U	0.99 J	514		18.6	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	221	48.6	283	1.4		10.0	0.94 J
MW3	4/5/16	N	4.4	0.46	5.0 U	1.4 J	716		20.4	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	224	48.2	299	1.4		10.1	0.98 J
MW3	7/21/16	N	2.5	0.35	5.0 U	2.0 U	317		16.2	20.0 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	215	45.5	248	1.4		9.2	1.0
MW3	10/11/16	N	1.5	0.45	5.0 U	1.7 J	171		14.8	20.0 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	233	46.8	268	1.8		12.7	1.1
MW3	1/20/17	N	1.9	0.93	0.35	2.0	812		16.4	6.2		0.060	0.28	0.26	0.23	0.24	230	47.3	284	1.9		14.5	1.6
MW3	4/20/17	N	1.3	0.47	5.0 U	1.7 J	83.6 J		23.0	20.0 U		0.22 U	0.50 U	1.0 U	1.0 U	2.0 U	232	45.5	358	1.8		15.0	1.4
MW3	10/13/17	N	2.1	0.55	1.0 U	2.0	59.7 J		12.5	20.0 U		0.79 U	0.50 U	0.50 U	0.50 U	1.0 U	272	50.1	298	2.0		13.9	1.4
MW3	6/1/18	N	1.0 U	0.25	0.29 J	1.7 J	50.6 J		9.4	20.0 U		0.78 U	0.50 U	0.50 U	0.50 U	1.0 U	698	31.5	246	1.9		10.8	1.2
MW3	10/18/18	N	1.0 U	0.50	1.0 U	1.7 J	77.2 J		9.2	20.0 U		0.79 U	0.50 U	0.50 U	0.50 U	1.0 U	227	23.9	231	1.7		10.2	1.3
MW3	4/25/19	N	200	0.27	0.23 U	2.0	372		21.7	9.7 J		0.24 U	0.24 J	0.18 U	0.15 U	0.22 U	200	35.4	215	1.5		7.8 B	1.0
MW3	10/14/19	N	86	0.091 U	0.23 U	0.73 J	482		52.1	6.9 U		0.24 U	0.15 U	0.18 U	0.15 U	0.22 U	209	30.1	235	1.3 H		8.3	0.69 J
MW4	10/9/97	N	139	1 U	2 J	2 U	35.9 J		55.9	2 U			2	3	1	3	94	7.3		0.1 U		6.3	12.3
MW4	10/9/97	N2		1 U	2 U	2.4 U				4.5			2	3	1	3							

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW4	4/4/00	N		0.5 U								10 U											
MW4	1/20/17	N	0.92	3.0	1.5 J	0.36	124		37.9	6.2		0.063	0.28	0.26	0.23	0.24	87.9	22.7	132	0.23		11.6	0.53 J
MW4	4/21/17	N	10	0.11	1.2 J	2.0 U	85.4 J		39.0	20.0 U		0.22 U	0.50 U	1.0 U	1.0 U	2.0 U	82.8	32.9	170	0.15		13.2	0.60 J
MW4	10/3/17	N	7.2	0.097 U	1.2	1.2 J	501		41.8	20.0 U		0.82 U	0.50 U	0.50 U	0.50 U	1.0 U	93.7	37.0	134	0.26		30.0	1.0 U
MW4	5/31/18	N	300	0.11 U	1.1	2.0 U	149		38.6	20.0 U		0.78 U	0.50 U	0.50 U	0.50 U	1.0 U	76.8	47.9	145	0.096 J		14.1	0.85 J
MW4	10/17/18	FD	6.7	0.10 U	1.2	2.0 U	100 U		36.0	6.9 J		0.82 U	0.50 U	0.50 U	0.50 U	1.0 U	87.1	40.3	138	0.22		13.1	0.68 J
MW4	10/17/18	N	5.9	0.097 U	1.2	2.0 U	100 U		33.8	20.0 U		0.55 U	0.50 U	0.50 U	0.50 U	1.0 U	86.5	40.9	138	0.20		13.0	0.72 J
MW4	4/24/19	FD	50	0.089 U	0.97 J	0.50 U	82.6 J		35.7	6.9 U		0.24 U	0.15 U	0.18 U	0.16 J	0.22 U	75.1	49.7	142	0.086 J		12.5 B	0.84 J
MW4	4/24/19	N	45	0.085 U	0.89 J	1.3 J	118		33.6	6.9 U		0.24 U	0.15 U	0.18 U	0.16 J	0.22 U	74.7	52.1	144	0.070 J		13.0 B	0.65 J
MW4	10/16/19	N	25	5.7	1	0.50 U	214		134	6.9 U		0.25 U	0.15 U	0.18 U	0.15 U	0.22 U	80.3 H	50.4	147	0.090 J		13.6 B	0.47 U
MW5	10/10/97	FD	10 U	31000 J	4.3	26.2 J	5070		15500	2			0.1 U	2	4	18	370	50		0.1 U		16	160
MW5	10/10/97	FD2			4.6	4835 J				2.7													
MW5	10/10/97	N	10 U	28000 J	3.8	48.5 J	4860		12900	3.7			0.1 U	3	5	21	370	50		0.1 U		15	115
MW5	10/10/97	N2		28000 E	3.2	24 J				2 J			0.1 U	3	5	21							
MW5	4/7/00	N		20600 =								76 U											
MW5	4/26/01	N	0.4	20600	5.6	74	20400		11200	25 U		38	0.22	0.84	1.8	8.1	352	42	349	0.13 U		28	43
MW5	4/26/01	N2	0.4		3.9	25 U	7630		11300	25 U													
MW5	9/13/01	N	10 U	6300	3.7	5.1 J	4100		8500	6.2 J		23	0.44 U	0.54 J	0.78 J	4.3	270	29	240	0.17 J		22	27
MW5	9/13/01	N2			8.2	100	26000		8500	4.2 J													
MW5	8/7/02	N		510 J	4.1	28	34500		8130	104		3.2 J	1 U	5 U	5 U	5 U	220	26	4 U	0.15 U		21	25
MW5	8/7/02	N2			2 J	1.5 J	7900		7840	26.9 J													
MW5	9/25/03	N	0.47 J	1100	4	50	35100		9450	10 U		2.5	0.25 U	2.5 U	2.5 U	2.5 U	228	22.1	78.48	0.05 U		20	6.2
MW5	9/25/03	N2	0.47 J		3	7	13400		8320	10 U													
MW5	9/22/04	N	10.0 UJ	194	0.488 J	17.3 J	30500		7150	13.7 J		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	250 J	29 J	1490 J	0.01 R		24 R	18.8 R
MW5	9/22/04	N2		214 E	0.612 J	1.44 J	7480 J		5650 J	5.91 J													
MW5	9/28/05	N	2.3	1100 =	1.0 UJ	6.0 J	18000 J		7600 J	20 UJ		1.8	0.50 U	5.0 U	5.0 U	5.0 U	260 J	18 J	480 J	0.10 UJ		35 R	7.4 J
MW5	9/28/05	N2			1.0 UJ	10 UJ	19000 J		7600 J	20 UJ													
MW5	9/26/06	N	8.7 J	460 =	1.0 UJ	10 UJ	23000 J		8000 J	20 UJ		1.4 U	0.50 U	5.0 U	5.0 U	5.0 U	290 J	16 J	370	0.10 J		27 J	6.6
MW5	9/20/07	N	9.8	31 J	1.0 UJ	10 UJ	25000		7600	20 UJ		0.74 R	1.0 U	1.0 U	1.0 U	2.0 U	230 J	13	270 J	0.10 U		39 J	4.1 J
MW5	10/22/08	N	11 J	206	2 UJ	10 UJ	10500 J	31400 J	9700 J	20 UJ		1 U	0.5 U	2.0 U	2.0 U	5.0 U	267 J	8.68	357 J	0.05 U		24.8	30.5
MW5	10/7/09	N	17 J	33.3 J	2 UJ	10 UJ	6000 J	33600 J	11800 J	20 UJ		0.998 UJ	0.1 UJ	0.4 UJ	0.4 UJ	0.14 J	256 J	8.59 J	344.62 J	0.05 UJ		55.1 J	3.5 J
MW5	10/6/10	N	4.1	39.8 J	3.36 J	8 U	3030	43600	12600	20 U		1.0 U	0.1 U	0.4 U	0.4 U	1 U	274	11.4 J	437	0.10 UJ		79.4	4.2

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Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW5	10/19/11	N	38 J	0.97	1.0 J	2 U	2600	40000 B	11000	20 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	260	15	397.00	0.10 U		150	2.6
MW5	10/17/12	N	17	0.59 J	0.57 J	10 U	2700	29000 =	7000	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	180	11	302	0.10 U H		130 =	1.8
MW5	10/10/13	N	19	0.60	0.39 J	10.0 UJ	2200 J	20000 J	4700 J	20 UJ		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	150 B	9.2 J		0.10 UJ		140 J	1.8
MW5	9/24/14	FD	10	12	0.42 J	2.0 U	1200		2200	20 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	97	4.3	150	0.12		48	1.0 U
MW5	9/24/14	N	12	12	0.41 J	2.0 U	1200		2200	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	100	4.3	150	0.14		48	2.3
MW5	10/14/15	N	1.8	64	5.0 U	2.0 U	954		2230	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	98.7	12.7	159	0.053 J		48.9	3.3
MW5	4/7/16	FD	4.9	16	5.0 U	2.0 U	940		2070	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	71.3	12.5	113	0.96		37.6	4.5
MW5	4/7/16	N	4.3	17	5.0 U	2.0 U	931		1990	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	72.0	12.7	113	0.97		38.0	4.6
MW5	10/29/18	N	15	5600	0.71 J	1.5 J	7920		6730	20.0 U		23	0.50 U	0.57	0.53	6.5	249	28.5	292	0.084 J		28.5	39.6
MW5	4/25/19	N	96	5100	0.79 J	0.97 J	10200		6250	6.9 U		24	0.15 U	0.47 J	0.52	5.8	262	27.0	305	0.068 U		27.7 B	33.3 F1
MW5	10/17/19	FD	32	5500	0.69 J	0.84 J	21900		6870	6.9 U		20	0.15 U	0.62	0.43 J	6.4	265	25.7	283	0.068 U		24.4	38.4
MW5	10/17/19	N	34	6000	0.75 J	0.70 J	22300		7140	6.9 U		22	0.15 U	0.62	0.46 J	6.3	452	28.2	273	0.068 U		25.6	38.7
MW6	4/19/16	FD		0.050 J	5.0 U	2.0 U	100 U		3.2 J	20.0 U		0.21 U	0.50 U	1.0 U	1.0 U	2.0 U							
MW6	4/19/16	N	0.78	170	5.0 U	5.2	282		5.6	9.0 J		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	183	35.0	245	10.2		26.3	6.2
MW6S	10/9/97	N	10 U	1 U	5.1	473	20 U		4720	258			0.1 U	1 U	1 U	1 U	62	72 J		4.5		0.9	1.6
MW6S	10/9/97	N2		1 U	2 U	2 U				2.2			0.1 U	1 U	1 U	1 U							
MW6S	4/26/01	N	0.12 U	2.5	15	202	82800		1950	131		5.4 U	0.1 U	1 U	1 U	1 U	148	14	285	0.87		12	5.29
MW6S	4/26/01	N2	0.12 U		0.26	25 U	25 U		347	25 U													
MW6S	9/12/01	N	10 U	1.1	7.4	190	42000		1900	110		0.24 U	0.44 U	0.5 U	0.4 U	1.2 U	160	12	290	1.1		16	6.3
MW6S	9/12/01	N2			0.58 J	3.1 J	35 U		800	5 J													
MW6S	8/7/02	N	0.27	88 J	5.5	69.1	7570		2210	18.3 J		5 U	1 U	5 U	5 U	5 U	270	17	4 U	0.15 U		18	5.8
MW6S	8/7/02	N2			2.7	9.9 J	3330		1790	9.7 J													
MW6S	9/25/03	N	130	0.33	1 J	22	5900		1190	10 J		1 U	0.25 U	2.5 U	2.5 U	2.5 U	282	23.9	104	1.01		17	8.2
MW6S	9/25/03	N2	130		1 J	9	1100		961	10 U													
MW6S	9/27/06	N	3.5 J	0.21	1.0 U	2.6 J	50 U		590	20 U		1.1 U	0.50 U	5.0 U	5.0 U	5.0 U	320 J	18	350	3.9 =		18	4.1
MW6S	9/20/07	FD	2.7	0.14 J	1.0 UJ	10 UJ	390		190	7.0 J		0.93 R	1.0 U	1.0 U	1.0 U	2.0 U	230 J	29	330 J	4.7		36 J	5.2 J
MW6S	9/20/07	N	3.0	0.099 J	1.0 UJ	10 UJ	510		200	7.0 J		0.93 R	1.0 U	1.0 U	1.0 U	2.0 U	230 J	30	320 J	4.7		34 J	4.7 J
MW6S	10/23/08	N	2.0 UJ	2.65	2 UJ	4.4 J	438 J	6260 J	65.3 J	20 UJ		1 U	0.5 U	2.0 U	2.0 U	5.0 U	4.98 J	28.3	90 J	7.11 J		11	8.3
MW6S	10/7/10	N	1.3 U	0.1 UJ	2 U	5 J	531	4780	19.7 J	20 U		1.0 UJ	0.5 UJ	2 U	2 U	5 U	11 UB	21.3	56.9	6.94 J		11 J	6.8
MW6S	10/19/11	N	0.50 U	0.10 U	2.0 U	3.7 J	50 U	4400 B	14	10 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	15	17	45.60	5.3		9.8	1.0 U
MW6S	10/17/12	N	0.50 U	0.10 U	0.54 J	10 U	50 U	4600 =	3.9 J	20 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	18	16	51.4	5.5 H		11 J	3.2
MW6S	10/9/13	N	0.50 U	0.52 J	2.0 UJ	10.0 UJ	1500 J	6000 J	32 J	20 UJ		0.21 U	0.50 U	1.0 U	1.0 U	2.0 U *	5.0 UJ	29		9.0 J		9.5	8.0 J

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Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW6S	10/9/13	N2																		8.9 J			
MW6S	9/24/14	N	0.082 J	0.27	1.3 J	27	6000		110	41		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	22	9.3	100	3.6		7.3	1.0 U
MW6S	10/14/15	N	0.50 U	0.17	5.0 U	2.5	16.8 J		1.4 J	20.0 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	12.5	10.8	76.4	3.6		6.7	3.4
MW6S	4/19/16	N	0.50 U	0.20	0.51 J	4.7	831		15.4	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	42.0	7.4	70.6	4.8		6.3	18.2
MW6S	7/25/16	N	0.50 U	0.19	5.0 U	3.4	118		6.1	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	49.4	13.8	86.0	7.0		8.0	3.7
MW6S	10/13/16	N	0.50 U	0.20	0.71 J	19.7	2290		52.7	11.7 J		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	126	14.5	152	6.9		8.1	4.2
MW6S	1/23/17	N	0.080	0.059 J	0.35	2.8	5.3		6.0	6.2		0.063	0.28	0.26	0.23	0.24	188	6.6	212	3.1		6.0	3.8
MW6S	4/24/17	N	0.089 J	0.13	5.0 U	3.3	8.3 J		7.4	20.0 U		0.23 U	0.50 U	1.0 U	1.0 U	2.0 U	198	6.5	268	3.8		8.1	2.3
MW6S	10/5/17	N	0.50 U	0.32	1.0 U	5.5	100 U		4.0	7.2 J		0.86 U	0.50 U	0.50 U	0.50 U	1.0 U	225	18.2	283	6.6		8.0	1.8
MW6S	6/1/18	N	1.0 U	0.11 U	0.37 J	3.1	58.6 J		4.7	20.0 U		0.80 U	0.50 U	0.50 U	0.50 U	1.0 U	250	14.1	320	11.6		11.9	2.3
MW6S	10/19/18	N	1.0 U	0.097 U	0.28 J	15.7	100 U		5.2	12.4 J		0.76 U	0.50 U	0.50 U	0.50 U	0.24 J	249	13.1	306	5.1		8.0	3.2
MW6S	4/25/19	N	0.17 U	0.095 U	0.27 J	2.6	121		4.8	10.3 J		0.23 U	0.15 U	0.18 U	0.15 U	0.22 U	275	12.1	336	10		13.2 B	2.0
MW6S	10/17/19	N	0.17 U	2.7	0.27 J	3.4	271		11	11.0 J		0.23 U	0.15 U	0.18 U	0.15 J	0.22 U	444 H	8.9	259	3.8		7.4	2.6
MW7	10/14/97	N	10 U	1 U	2 U	6.2	622		13.4	11.4			0.1 U	1 U	1 U	1 U	350	7.6		4.9		6	1.6
MW7	10/14/97	N2		1 U	2 U	2 U				3.5			0.1 U	1 U	1 U	1 U							
MW7	4/4/00	FD		0.5 U								10 U											
MW7	4/4/00	N		0.5 U								10 U											
MW7	4/25/01	N	4.65	0.1 U	1 U	25 U	352		5.4	25 U		5.2 U	0.1 U	1 U	1 U	1 U	352	8.36	388	3.63		6.54	2.8
MW7	4/25/01	N2	4.65		1 U	25 U	154		6.6	25 U		5.2 U								3.63 =			
MW7	9/11/01	N	12	0.083 J	0.4 J	2.2 U	560		6.4	3.7 U		0.24 U	0.44 U	0.5 U	0.4 U	1.2 U	340	23	410	3		10	2
MW7	9/11/01	N2	10 U	0.13 J	0.29 U	2.2 U	230		4.4	5.2 J		0.24 U	0.44 U	0.5 U	0.4 U	1.2 U	350	24	400	3		10	1.8
MW7	9/11/01	N3			0.47 J	2.2 U	560		5.7	4.8 J													
MW7	9/11/01	N4			0.29 U	2.2 U	230		4.6	3.9 J													
MW7	8/7/02	N	0.01 U	0.03 J	1.5 J	0.3 U	730		6.5 J	2.8 J		5 U	1 U	5 U	5 U	5 U	390	21	450	0.15 U		10	1.5
MW7	8/7/02	N2			1.4 U	0.3 U	300		4 J	0.98 U													
MW7	9/24/03	N	4.9	0.044 J	1 U	1 U	280 J		6 J	10 UJ		0.96 U	0.25 U	2.5 U	2.5 U	2.5 U	346	12.2	133.3	2.97		2 U	1.2
MW7	9/24/03	N2	4.9		1 U	1 U	90 J		5 U	10 UJ													
MW7	9/22/04	N	10.0 UJ	9.18 E	1.00 UJ	1.09 J	1640 J		9.86 J	4.06 J		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	300 J	7.2 J	1560 J	3.4 J		6.8 R	1.98 R
MW7	9/22/04	N2		5.75	0.108 J	0.847 J	25.0 UJ		9.75 J	2.96 J													
MW7	9/27/05	N	2.0 UJ	0.12 U	1.0 U	10 U	1300		18	20 U		0.91 UJ	0.50 U	5.0 U	5.0 U	5.0 U	260 J	18 J	450	1.8 J		130 J	0.96 J
MW7	9/27/05	N2			1.0 U	10 U	880		16 J	20 U													
MW7	9/26/06	N	4.3 J	0.087 J	1.0 U	10 U	50 U		68 J	20 U		0.92 U	0.50 U	5.0 U	5.0 U	5.0 U	280 J	15	390	1.8 =		110 =	2.4

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Type[3] / Units	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW7	9/20/07	N	3.7	0.093 U	1.0 UJ	10 UJ	260		22	5.9 J		0.93 R	1.0 U	1.0 U	1.0 U	2.0 U	270 J	16	370 J	1.5		170 J	1.1 J
MW7	10/22/08	N	110 J	0.1 U	2 UJ	4 J	926 J	37700 J	41.6 J	20 UJ		1 U	0.5 U	2.0 U	2.0 U	5 U	277 J	14.1	535 J	1.54 J		98.9	4.16
MW7	10/22/08	N2																					4.41
MW7	10/7/09	N	2.4 J	0.403 J	2 UJ	10 UJ	687 J	32600 J	109 J	20 UJ		0.999 UJ	0.1 UJ	0.4 UJ	0.4 UJ	0.14 J	245 J	12.2 J	396.43 J	1.91 J		152 J	14.5 J
MW7	10/6/10	N	28	0.1 U	2 U	8 U	989	38900	63.2	20 U		1.0 U	0.1 U	0.4 U	0.4 U	1 U	226	13.8 J	482	2.24 J		168	10.4
MW7	10/19/11	N	15	0.098 U	0.48 J	2 U	81	21000 B	21	10 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	230	12	249.00	1.9 J		92	1.5 J
MW7	10/17/12	N	2.2	0.096 U	2.0 U	10 U	230	21000 =	22	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	210	11	254	1.5 H		120 =	0.97 J
MW7	10/9/13	N	2.2 B	0.094 U	0.34 J	10.0 UJ	10000 J	21000 J	74 J	20 UJ		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U *	200 J	12		1.8 J		120	0.75 J
MW7	10/9/13	N2																		1.8 J			
MW7	9/23/14	N	15	0.034 J	0.28 J	2.0 U	260		33	30		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	200	9.0	240	1.9		110	0.96 J
MW7	10/12/15	N	6.5	0.094 U	0.88 J	1.6 J	100 U		423	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	228	8.3	229	1.5		46.2	0.85 J
MW7	4/6/16	N	13	0.098 U	5.0 U	1.9 J	5270		117	36.2		0.21 U	0.50 U	1.0 U	1.0 U	2.0 U	212	10.3	237	1.7		25.7	0.58 J
MW8	10/14/97	N	36.5	1 U	2 U	2 U	148		17.8	7.4			0.1 U	1 U	1 U	1 U	170	4.2		1.4		4.5	2.3
MW8	10/14/97	N2		1 U	2 J	2 U				4.6			0.1 U	1 U	1 U	1 U							
MW8	4/5/00	N		0.5 U								10 U											
MW8	4/25/01	N	11.6	0.2	0.99	25 U	829		32	25 U		5 U	0.1 U	1 U	1 U	1 U	154	3.25	181	1.52		7.47	1.46
MW8	4/25/01	N2	11.6		0.75	25 U	25 U		27	25 U													
MW8	4/25/01	N3			0.57	25 U	25 U		22	25 U													
MW8	9/11/01	N	10 U	0.062 J	1	2.2 U	70 J		18	4.3 J		0.24 U	0.44 U	0.5 U	0.4 U	1.2 U	150	3.8	170	1.5		7.6 U	1 J
MW8	9/11/01	N2			1.2	2.2 U	350		19	3.7 U													
MW8	8/8/02	N	0.01 U	0.04 U	1.4 U	0.3 U	98		6.4 J	12 J		5 U	1 U	5 U	5 U	5 U	180	4.2	310	0.15 U		6	1.1
MW8	8/8/02	N2			1.8 J	0.27 U	11 J		5.3 J	2.3 J													
MW8	9/25/03	N	8.9	0.047 J	1 U	1 U	140		8 J	10 U		0.95 U	0.25 U	2.5 U	2.5 U	2.5 U	182	11	69.57	2.61		2 U	1.7
MW8	9/25/03	N2	9.2	0.11 U	1 U	1 U	50 U		8 J	10 U		1 U	0.25 U	2.5 U	2.5 U	2.5 U	184	11	69.44	2.6		2 U	2.3
MW8	9/25/03	N3	9.2		1 U	1 U	240		8 J	10 U													
MW8	9/25/03	N4			1 U	1 U	50 U		6 J	10 U													
MW8	9/23/04	N	3.75 J	1.94 =	0.127 J	0.465 J	256		15.1	2.25 J		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	200	15	1160	2.4 J		5.8 J	1.40
MW8	9/23/04	N2			0.539 J	0.660 J	11.0 J		12.0 J	2.09 J													
MW8	9/28/05	FD	2.0 U	0.12 U	1.0 UJ	2.3 J	4500 J		56 J	20 UJ		0.93 U	0.50 U	5.0 U	5.0 U	5.0 U	160 J	19 J	200 J	2.0 J		19 R	1.0 J
MW8	9/28/05	FD2			1.0 UJ	10 UJ	120 J		13 J	20 UJ													
MW8	9/28/05	N	2.6	0.031 J	1.0 UJ	3.8 J	4700 J		63 J	20 UJ		0.93 U	0.50 U	5.0 U	5.0 U	5.0 U	160 J	20 J	240 J	2.0 J		19 R	1.2 J
MW8	9/28/05	N2			1.0 UJ	10 UJ	130 J		16 J	20 UJ													

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW8	9/20/07	N	2.0 UJ	0.093 U	0.61 J	10 UJ	210		13 J	20 UJ		0.93 U	1.0 U	1.0 U	1.0 U	2.0 U	180	21	260 J	1.5		76 J	1.1 J
MW8	10/22/08	N	0.78 J	0.1 U	2 UJ	10 UJ	707 J	40400 J	13.1 J	20 UJ		1 U	0.5 U	2.0 U	2.0 U	5 U	178 J	24.3	496 J	1.92 J		73.1	16.1
MW8	4/11/16	N	1.5	0.016 J	0.60 J	2.0 U	197		10.9	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	174	18.0	421	1.3		201	0.26 J
MW9	10/8/97	N	10 U	1 U	2 U	4.2 U	20 U		19.7	5.6			0.1 U	1 U	1 U	1 U	60	45		4.2		3.4	6.5
MW9	10/8/97	N2		1 U									0.1 U	1 U	1 U	1 U							
MW9	4/5/00	N		0.6 =								10 U											
MW9	4/23/01	N	0.12 U	0.12	0.38	25 U	470		46	25 U		5.3 U	0.1 U	1 U	1 U	1 U	60	3.22	59	2.46 =		27	9.94
MW9	4/23/01	N2	0.12 U																	2.46			
MW9	4/24/01	N			0.28	25 U	25 U		34	25 U													
MW9	9/12/01	N	10 U	0.76	0.43 J	6.1 J	300		27	11 J		0.24 U	0.44 U	0.5 U	0.4 U	1.2 U	62	6.5	64	3.3		6.8 U	5.1
MW9	9/12/01	N2			0.34 J	2.2 U	110		16	6.6 J													
MW9	8/6/02	N	0.01 U	0.54	1.4 U	1.6 J	200		14 J	6.4 J		5 U	1 U	5 U	5 U	5 U	64	11	95	0.15 U		22	8.4
MW9	8/6/02	N2			1.4 U	0.3 U	11 U		6.3 J	9.6 J													
MW9	9/25/03	N	0.5 U	2.3	1 J	20	7400		229	20 J		1 U	0.25 U	2.5 U	2.5 U	2.5 U	59	4.4	32.83	2.36		24	6.5
MW9	9/25/03	N2	0.5 U		1 U	1 U	240		16	10 U													
MW9	9/22/04	N	10.0 UJ	2.92	0.134 J	2.07 J	231 J		16.5 J	4.60 J		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	58 J	3.2 J	776 J	1.8 J		26 R	6.48 R
MW9	9/22/04	N2			0.265 J	2.88 J	125 U		8.51 J	14.9 J													
MW9	9/27/05	N	2.0 UJ		1.0 UJ	10 U	50 U		6.3 J	20 U		0.93 U	0.50 U	5.0 U	5.0 U	5.0 U	55 J	2.6 J	70	1.9 J		20 J	2.0
MW9	9/27/05	N2			1.0 UJ	10 U	50 U		5.4 J	20 U													
MW9	10/18/05	N		0.57																			
MW9	9/21/07	N	2.0 U	0.37 J	1.0 UJ	5.9 J	100 UJ		4.1 J	20 UJ		0.97 R	1.0 U	1.0 U	1.0 U	2.0 U	58 J	2.6	86 J	3.8		15 J	3.3 J
MW9	10/22/08	N	2.0 UJ	0.1 U	2 UJ	6 J	166 J	11600 J	10 UJ	20 UJ		1 U	0.5 U	2.0 U	2.0 U	5 U	55 J	3.44	113 J	2.48 J		14.9	11.2
MW9	5/18/10	N	1.3 U	0.073 J	2 UJ	10 UJ	120. UJ	6230. J	7.1 J	20 UJ		1.0 U	0.5 U	5 U	5 U	5 U	63 UB	2.63	67.9	2.42 J		11	25.7 UB
MW9	10/6/10	N	1.3 U	0.1 U	2 U	8 U	109 J	8540	16.7 U	20 U		1.0 U	0.1 U	0.4 U	0.4 U	1 U	27	3.3 J	88.1	3.35		14 J	7.6
MW9	10/19/11	N	0.50 U	0.098 U	2.0 U	3.5 J+	50 U	8400 B	2.9 J	10 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	69	1.0 U	82.00	3.1		8.9	1.0 U
MW9	10/16/12	N	0.50 U	0.39	0.91 J	10 U	50 U	8400 =	10 U	20 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	63	2.8 J	82	5.9 J		10 J	3.8
MW9	10/9/13	N	0.50 U	0.41 J	2.0 UJ	10.0 UJ	50 UJ	6200 J	10 UJ	20 UJ		0.21 U	0.50 U	1.0 U	1.0 U	2.0 U *	47 J	1.2		3.8 J		12	1.6 J
MW9	10/9/13	N2																		3.8 J			
MW9	9/24/14	N	0.50 U	1.6	5.0 U	2.0 U	100 U		5.0 U	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	14	1.1	41	2.4		10	2.5
MW9	10/13/15	N	0.50 U	0.17	5.0 U	1.3 J	21.1 J		5.0 U	20.0 U		0.21 U	0.50 U	1.0 U	1.0 U	2.0 U	31.0	0.70 J	40.2	1.5		7.4	4.4
MW9	4/13/16	N	0.50 U	0.28	5.0 U	1.4 J	33.6 J		1.5 J	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	26.6	0.99 J	37.2	1.4		7.3	30.2
MW10	10/15/97	N	13.5	8200 J	1.4	9.1	2190		2510 J	4.4			0.2	2	3	17	340	35		4.9		13	20

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Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW10	10/15/97	N2		8200 E	2 J	2.8 U				9.2			0.2	2	3	17							
MW10	4/6/00	N		9530 J								60 =											
MW10	4/6/00	N2		12900 =								5410 U											
MW10	4/26/01	N	2.9	22800	3.1	98	25200		2560	44		5.2 U	0.4	3.3	5.3	27	472	48	505	0.18		22	26
MW10	4/26/01	N2	2.9		2.4	5.9	5650		2380	25 U													
MW10	9/12/01	N	10 U	21000	3.9	3.9 J	2400		3200	9.5 J		130	0.44 U	6.3	10	55	540 J	61	630	0.13 J		23	64
MW10	9/12/01	N2			4.5	40	20000		3300	13													
MW10	8/7/02	N	0.011	22000 J	9.5	48.2	24400		2730	2.8 J		120	1 U	7	11	54	400	56	480	0.15 U		20	110
MW10	8/7/02	N2			7.3	10.1 J	10700		2540	6.1 J													
MW10	10/1/03	N	0.62	9000	2 J	30	5470		1960	10 J		18	0.25 U	2.5 U	2.5 U	13.5	287	22	93.58	0.05 U		3 J	25.3
MW10	10/1/03	N2	0.62		2 J	8	2590		1850	10 U													
MW10	9/23/04	N	10.0 U	38000 =	2.66	28.3	3550		2550	5.58 J		173 E	0.296 J	5.58 J	8.09 J	47.1	390	38	1640	0.0018 J		18 =	54.1
MW10	9/23/04	N2			3.01	12.4 J	24.1 J		1810	4.23 J		160											
MW10	9/27/06	N	2.0 UJ	23000 J	1.0 U	4.3 J	120		2600	20 U		50	0.50 U	2.0 J	1.7 J	16	450 J	14	440	0.10 U		24 =	21
MW10	9/21/07	N	2.4 J	1700 J	0.88 J	2.3 J	550		2700	20 UJ		12 J	1.0 U	1.3	1.0 U	7.2	380 J	20	420 J	0.68		25 J	12 J
MW10	10/23/08	FD	7 J	1720	2 UJ	10 UJ	1080	48600 J	2190 J	20 UJ		0.82 J	0.5 U	2.0 U	2.0 U	5.0 U	310 J	12.4	500 J	0.05 J		29.5	13.1
MW10	10/23/08	N	6 J	1630	2 UJ	10 UJ	1110 J	40000 J	2210 J	20 UJ		0.92 J	0.5 U	2.0 U	2.0 U	5.0 U	305 J	12.4	432 J	0.05 U		28.1	39.2
MW10	10/7/09	FD	23 J	214 J	2 UJ	10 UJ	704 J	36900 J	2310 J	20 UJ		0.996 UJ	0.1 UJ	0.094 J	0.083 J	0.49 J	282 J	9.84 J	347.47 J	0.05 UJ		59 J	2.13 J
MW10	10/7/09	N	17 J	220 J	2 UJ	8.2 J	1210 J	38800 J	2230 J	20 UJ		0.998 UJ	0.1 UJ	0.072 J	0.073 J	0.41 J	280 J	9.82 J	369.28 J	0.05 UJ		58.7 J	4.68 J
MW10	10/7/10	FD	2.3	77.1 J	2 U	8 U	396	37200	1820	20 U		1.0 UJ	0.1 U	0.4 U	0.074 J	1 U	272	7.3 J	346	0.10 UJ		47.7 J	1.8
MW10	10/7/10	N	1.8	92.4 J	2 U	8 U	488	41600	1780	20 U		1.0 UJ	0.1 U	0.4 U	0.051 J	1 U	308	7.2 J	390	0.10 UJ		48.2 J	2.2
MW10	10/20/11	FD	11 J	21	0.60 J	2 U	180	33000 B	1700	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	260	8.7	303.00	0.22		54	2.1
MW10	10/20/11	N	8.8 J	21	2.0 U	2 U	180	33000 B	1700	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	260	8.4	303.00	0.21		53	2.1
MW10	10/17/12	FD	12	14	0.50 J	10 U	180	31000 =	1600	20 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	230	8.0	292	0.067 J		69 J	1.7
MW10	10/17/12	N	12	8.7	0.55 J	10 U	190	32000 =	1600	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	240	7.8	304	0.075 J		68 J	1.7
MW10	10/10/13	FD	140 J	16	0.19 J	10.0 UJ	230 J	31000 J	1600 J	20 UJ		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	230 B	7.9		0.39 J		94	1.7
MW10	10/10/13	N	27 J	17	0.19 J	10.0 UJ	260 J	32000 J	1700 J	20 UJ		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	220 B	7.8		0.41 J		93	1.4
MW10	9/25/14	N	8.1	37	0.21 J	2.0 U	250		1300	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	180	6.1	270	0.10		77	1.0 U
MW10	10/15/15	N	8.2	150	5.0 U	1.0 J	188		861	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	178	6.5	244	0.10 U		71.8	1.8
MW10	4/7/16	N	290	1900	5.0 U	2.0 U	1350		719	20.0 U		4.8	0.50 U	0.46 J	0.53 J	2.9	162	9.8	189	0.10 U		46.1	8.6
MW10	7/25/16	N	8.6	1700	5.0 U	3.7	826		744	20.0 U		5.2	0.50 U	0.66 J	0.64 J	5.2	160	12.3	188	0.10 U		31.7	11.6
MW10	10/13/16	N	5.5	7300	0.46 J	1.7 J	434		777	20.0 U		6.2	0.50 U	0.79 J	0.79 J	5.7	156	14.6	186	0.10 U		24.3	11.1

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW10	1/24/17	N	8.5	6200	0.46 J	1.9 J	539		831	6.2		10	0.28	0.96 J	0.91 J	8.1	158	17.4	220	0.035		24.0	19.4
MW10	4/24/17	N	3.7	7600	0.76 J	5.9	756		897	20.0 U		20	0.50 U	1.6	1.8	14	142	19.1	234	0.10 U		25.0	27.9
MW10	10/5/17	FD	15	5000	0.53 J	3.7	609		898	20.0 U		19	0.50 U	1.3	1.5	9.5	157	25.9	182	0.081 J		20.1	32.0
MW10	10/5/17	N	13	4800	0.53 J	3.0	626		903	20.0 U		20	0.50 U	1.2	1.5	9.4	157	26.2	184	0.083 J		20.2	30.8
MW10	6/1/18	N	23	2500	1.0	3.6	796		951	20.0 U		24	0.50 U	1.4	1.5	10	470	27.6	197	0.084 J		19.9	2.1
MW10	10/19/18	N	40	2500	1.1	13.6	1310		907	20.0 U		21	0.50 U	1.2	1.1	8.6	146	19.9	182	0.20 U		15.3	26.2
MW10	4/22/19	N	550	1600 H	1.1 B	2.2 B	769		740 B	6.9 U		9.3	0.15 U	0.80	0.90	6.0	130	24.8	173	0.068 U		12.9	23.3
MW10	10/16/19	FD	180	1800	1.1	2.4	1640		937	6.9 U		7	0.15 U	0.18 U	0.98	7.7	144 B	30.3	183	0.068 U		14.4 B	26.6
MW10	10/16/19	N	81	1700	1.1	2.7	1800		937	6.9 U		7.5	0.15 U	0.69	0.15 U	7.4	143 B	31.2	186	0.068 U		14.4 B	27.1
MW10S	10/15/97	N	10 U	30000 E	2 U	28.5 J	45.4 J		10700 J	11.6			0.4	0.9 J	1	8	260	38		0.1 U		23	49.7
MW10S	10/15/97	N2		30000 J	2 J	10.9 J				8.4			0.4	0.9 J	1	8							
MW10S	4/7/00	N		56100 J								512 =											
MW10S	4/7/00	N2		34800 =								393 F											
MW10S	12/5/00	N	0.57	3810 B	0.74 J	13 J	610		6900	25 U		152	0.1 U	5.9	2.9	70	31	15	570	1		11	300
MW10S	12/5/00	N2	0.57	3810 J	9.36	160	11000		7100	35		152							570				
MW10S	4/25/01	N	0.55	49000	18	409	131000		7990	216		306	1 U	3.5	10 U	44	142	11	425	1.49 =		8.64	503
MW10S	4/25/01	N2	0.55		2.3	46	11300		6030	45			10 U	100 U	100 U	100 U				1.49			
MW10S	9/12/01	N	10 U	82000	5.1	170	35000		8600	100		75	0.44 U	0.94 J	0.41 J	15	270 J	10	260	4.7		13	19
MW10S	9/12/01	N2			0.29 U	3.2 J	48 J		7600	3.7 U													
MW10S	8/7/02	N	0.01 U	390 J	3.9	53.3	9490		7560	22.4 J		5 U	1 U	1 J	5 U	10	170	10	4 U	0.11 J		14	10
MW10S	8/7/02	N2			3.1	2.3 J	67.3		7070	0.98 U													
MW10S	9/25/03	N	0.5 U	2200	1 U	7	1760		5910	10 U		1 U	0.25 U	2.5 U	2.5 U	3.4 J	135	6.7	52.05	3.41		2 J	6.6
MW10S	9/25/03	N2	0.5 U		1 U	1 J	50 U		5900	10 U													
MW10S	9/22/04	N	10.0 UJ	9490	1.49 J	73.1 J	14500 J		5460 J	49.7 J		51.9	5.00 U	50.0 U	50.0 U	5.42 J	120 J	24 J	1220 J	3.6 J		15 R	7.54 R
MW10S	9/22/04	N2			0.190 J	1.79 J	22.7 J		3740 J	6.07 J													
MW10S	9/29/05	N	2.0 U	0.11 U	1.0 UJ	14 J	3600 J		4000 J	8.0 J		5.6	0.50 U	5.0 U	5.0 U	0.99 J	130 J	16 J	300 J	2.0 J		120 R	3.0 J
MW10S	9/29/05	N2			1.0 UJ	10 UJ	50 UJ		3900 J	20 UJ													
MW10S	9/26/06	N	2.0 UJ	2700 J	1.0 U	2.2 J	50 U		2500	20 U		1.2	0.50 U	5.0 U	5.0 U	2.6 J	180 J	8.6	310	1.2		79 =	6.5
MW10S	9/21/07	N	2.0 U	24 J	1.0 UJ	10 UJ	100 UJ		1300	20 UJ		2.4 R	1.0 U	1.0 U	1.0 U	2.0 U	170 J	8.7	240 J	1.3		69 J	2.9 J
MW10S	10/24/08	N	2.0 UJ									3.36	0.5 U	2.0 U	2.0 U	5.0 U							
MW10S	4/18/16	N	0.50 U	3500	0.59 J	2.6	190		388	20.0 U		4.7	0.50 U	1.0 U	1.0 U	2.7	102	7.8	92.1	0.10 U		9.1	9.5
MW10S	7/25/16	N	0.50 U	5200	0.68 J	9.2	183		315	20.0 U		13	0.50 U	0.39 J	1.0 U	5.6	107	7.7	124	0.10 U		11.8	15.6

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW10S	10/13/16	N	0.12 J	6600	0.44 J	4.6	124		399	20.0 U		9.6	0.50 U	0.30 J	1.0 U	4.6	83.7	6.1	100	0.10 U		11.9	12.3
MW10S	1/24/17	N	0.12 J	9800	0.80 J	2.5	254		624	6.2		10	0.28	0.40 J	0.23	5.7	164	12.3	220	0.035		17.3	23.4
MW10S	4/24/17	FD	0.36 J	3300	0.65 J	3.3	406		1380	20.0 U		10	0.50 U	0.40 J	1.0 U	5.8	195	25.7	350	0.082 J		23.1	32.1
MW10S	4/24/17	N	0.35 J	4300	0.74 J	3.3	394		1340	20.0 U		11	0.50 U	0.40 J	1.0 U	5.9	195	25.6	332	0.10 U		23.1	33.0
MW10S	10/5/17	N	0.29 J	4400	0.50 J	2.9	770		1260	8.1 J		9.9	0.50 U	0.46 J	0.50 U	6.0	314	41.1	378	0.13 J		26.7	29.8
MW10S	6/1/18	N	1.0 U	1500	0.91 J	5.2	1010		2880	20.0 U		11	0.50 U	0.42 J	0.22 J	5.2	322	69.8	456	0.083 J		39.7	5.5
MW10S	10/19/18	N	1.0 U	1900	0.51 J	8.2	716		2030	20.0 U		5.9 J	0.50 U	0.84	0.34 J	10	311	32.9	388	0.76		23.5	26.1
MW10S	4/23/19	FD	0.17 U	1500	2.1 B	6.0 B	886		3470 B	6.9 U		10	0.15 U	0.36 J	0.28 J	5.9	313	63.6	464	0.073 J		42.5	56.3
MW10S	4/23/19	N	0.17 U	1400 ^	0.67 JB	8.8 B	861		3450 B	6.9 U		10	0.15 U	0.38 J	0.30 J	6.1	312	64.8	471	0.074 J		43.1	60.9
MW10S	10/16/19	N	0.31 J	2500	0.49 J	1.8 J	551		3010	6.9 U		13	0.15 U	0.18 U	0.15 U	14	345 B	20.5	379	0.19 J		18.8	27.7
MW11	10/15/97	N	10 U	1 U	2 U	2 U	10 U		2 U	5.3			0.3	1 JB	0.2 J	0.5 J	190	7.5		5		12	1.3
MW11	10/15/97	N2		1 U	2 J	4.2 U				10.3			0.3	1 J	0.2 J	0.5 J							
MW11	4/4/00	N		0.6 U								11 U											
MW11	4/24/01	N	0.1 U	0.1 U	1.4	25 U	58		15 U	25		5.3 U	0.1 U	1 U	1 U	1 U	185	6.16	231	3.59 =		4.57	7.9
MW11	4/24/01	N2	0.11 U	0.11 U	1.2	25 U	25 U		15 U	20		5.3 U	0.1 U	1 U	1 U	1 U	225	6.25	231	3.59		3.48	4.67
MW11	4/24/01	N3	0.11 U		1.4	25 U	151		15 U	126		5.4 U								3.74 =			
MW11	4/24/01	N4			1.3	25 U	25 U		15 U	25 U		5.4 U								3.74			
MW11	9/10/01	N	10 U	0.091 J	1.4	2.9 J	66 J		1.9	9.1 J		0.24 U	0.44 U	0.5 U	0.4 U	1.2 U	190	8	220	3.1		7.4 U	4.2
MW11	9/10/01	N2			1.1	2.2 U	35 U		0.45 J	3.7 U													
MW11	8/6/02	N	0.01 U	0.04 U	4.7	0.83 J	46		2.3 J	6.4 J		5 U	1 U	5 U	5 U	5 U	210	7.8	230	0.15 U		7.6	18
MW11	8/6/02	N2	0.01 U		1.5 J	0.3 U	11.2 U		1.2 J	8.5 J													
MW11	9/23/03	N	0.5 U	0.11 U	1 U	2	160		5 U	10 U		0.98 U	0.25 U	2.5 U	2.5 U	2.5 U	187	6.7	72.14	2.94		2 U	2.3
MW11	9/23/03	N2	0.5 U		1 U	1 U	50 U		5 U	10 U													
MW11	9/21/04	N	10.0 U	0.0656 J	0.885 J	0.620 J	15.6 J		2.81 J	6.36 J		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	210	9.0 =	1020	3.0 J		6.2 J	14.1
MW11	9/21/04	N2			0.948 J	0.366 J	6.05 J		1.40 J	4.05 J													
MW11	9/29/05	N	2.0 U	740 =	1.0 UJ	10 UJ	50 UJ		1.6 J	20 UJ		0.95 U	0.50 U	5.0 U	5.0 U	5.0 U	200 J	14 J	280 J	2.4 J		9.7 R	1.2 J
MW11	9/29/05	N2			1.0 UJ	10 UJ	50 UJ		3.0 J	20 UJ													
MW11	9/27/06	N	2.0 UJ	0.11 U	1.0 UJ	10 UJ	50 UJ		10 UJ	20 UJ		0.93 U	0.50 U	5.0 U	5.0 U	5.0 U	220 J	16 J	240	0.53 J		8.8 J	2.3
MW11	9/20/07	N	2.0 UJ	0.093 U	1.2 J	10 UJ	100 UJ		10 UJ	20 UJ		0.93 U	1.0 U	1.0 U	1.0 U	2.0 U	220	20	260 J	2.4		19 J	1.2 J
MW11	10/22/08	N	2.0 UJ	0.27	2 UJ	10 UJ	533	33600 J	10 UJ	20 UJ		1 U	0.5 U	2.0 U	2.0 U	5 U	234 J	19.9	433 J	2.26 J		17.8	20.2
MW11	4/11/16	N	0.50 U	0.10 U	0.75 J	2.0 U	32.1 J		1.9 J	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	229	18.0	470	1.6		200	0.32 J
MW12	10/15/97	N	10 U	13000 E	2 U	5	267		1660	10.6			1	2	3	14	490	50		0.1 U		15	21.7

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Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW12	10/15/97	N2		13000 J	2 U	6.1 U				16.3			1	2	3	14							
MW12	4/6/00	FD		10600 J								45 =											
MW12	4/6/00	FD2		14100 =								5150 U											
MW12	4/6/00	N		15000 =								5210 U											
MW12	4/6/00	N2		10300 J								47 =											
MW12	4/26/01	N	0.99	1500	1	25 U	151		1540	25 U		44	0.34	2.5	4.1	22	564	48	556	0.43		16	23
MW12	4/26/01	N2	0.99		0.91	25 U	131		1570	25 U													
MW12	9/13/01	N	10 U	18000	1.1	5 J	770		1300	9.3 J		40	0.44 U	2.3 U	3.2 U	20	490	47	470	0.53 U		16	25
MW12	9/13/01	N2			0.95 U	6.8 J	740		1400	12													
MW12	5/14/02	FD		4000																			
MW12	5/14/02	N	10 U	4000	1.4 U	5.3 J	44.5		1670	7.4 J		33	1 U	2 J	2 J	14	490	39	520	0.68 H		16	31
MW12	5/14/02	N2		4300	1.5 J	5 J	11.2 U		1670	9.3 J									520				
MW12	5/14/02	N3			1.4 U	4.9 J	11.2 U		1680	12 J													
MW12	8/8/02	N	0.01 U	6400 J	2.8	5.6 J	123		1620	7.7 J		28	1 U	2 J	2 J	15	460	37	4 U	0.46		15	28
MW12	8/8/02	N2			1.4 U	2.9 J	105		1600	3.3 J													
MW12	4/29/03	N	0.5 U	3000	1 J	5	230		1640	10 U		17	0.5 U	1.3 J	1.3 J	11	470	31	442	0.8		20	19
MW12	4/29/03	N2	0.5 U		1 U	4	25 U		1560	10 U													
MW12	9/23/03	N	0.49 J	10000	1 U	4	70 J		1420	10 U		14	0.25 U	2.5 U	2.5 U	8.6	443	30.8	151.4	1.17		2 U	15.5
MW12	9/23/03	N2	0.49 J		1 U	3	50 U		1530	10 U			0.25 U	2.5 U	2.5 U	9.4	433	29.8	153.3	1.23		2 U	16
MW12	9/23/03	N3	0.64		1 U	4	80 J		1490	10 U													
MW12	9/23/03	N4			1 U	3	50 U		1490	10 U													
MW12	5/4/04	N	1.34 J	11200 J	0.564 J	5.50 R	52.7 R	45900	1730 R	10.8 R		22.9	0.124 J	1.39 J	1.03 J	11.2	446	29 =	443	1.1 J		14 R	20.2 J
MW12	5/4/04	N2			0.600 J	3.95 R	33.6 R		1480 R	8.80 R													
MW12	9/22/04	N	10.0 UJ	9060 J	1.00 UJ	5.09 J	53.9 J		1540 J	9.53 J		28.2 J	0.113 J	1.22 J	0.866 J	9.83	440 J	26 J	1660 J	1.1 J		12 R	18.2 R
MW12	9/22/04	N2		3730 E	0.672 J	3.91 J	22.7 J		1230 J	8.10 J													
MW12	5/10/05	N	2.0 U	8300 J	1.0 U	4.2 J	50 U		1500	8.9 J		6.1	0.50 U	0.93 J	5.0 U	5.6	390 J	23 J	360 J	1.3 J		16 R	9.9 R
MW12	5/10/05	N2			1.0 U	4.8 J	50 U		1400	20 U													
MW12	9/27/05	N	2.0 UJ	8500 J	1.0 UJ	10 U	50 U		1200	7.8 J		3.3	0.50 U	0.85 J	5.0 U	4.9 J	370 J	20 J	410	1.1 J		26 J	9.2
MW12	9/27/05	N2			1.0 UJ	3.9 J	50 U		1300	20 U													
MW12	6/7/06	N	2.0 U	6100 J	1.0 UJ	2.3 J	50 R		1100 J	20 UJ		0.94 U	0.50 U	0.67 J	5.0 U	3.4 J	400 J	21 J	400 J	2.1 J		32 =	7.2 J
MW12	9/26/06	FD	2.0 UJ	2000 =	1.0 UJ	2.5 UJ	46 J		1200 J	20 UJ		1.4	0.50 U	5.0 U	5.0 U	1.7 J	390 J	15 J	370	2.0 J		15 J	10
MW12	9/26/06	N	2.0 UJ	3100 =	1.0 UJ	3.2 J	50 UJ		1200 J	16 J		1.5	0.50 U	5.0 U	5.0 U	2.9 J	390 J	14 J	380	1.9 J		15 J	10

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Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW12	5/9/07	N	2.0 UJ	3000 J	1.0 UJ	2.1 J	100 UJ		1100	5.2 J		0.99 J	1.0 UJ	1.0 UJ	1.0 UJ	1.9 J	340 =	13	370	2.4		37 J	7.0 UB
MW12	9/19/07	FD	2.0 UJ	1000 J	1.1 J	1.7 J	100 R		790	20 UJ		0.74 J	1.0 U	1.0 U	1.0 U	2.0 U	340	14	350 J	2.2		2.7 J	5.7 J
MW12	9/19/07	N	2.0 UJ	1100 J	0.97 J	10 UJ	100 R		820	20 UJ		0.71 J	1.0 U	1.0 U	1.0 U	2.0 U	340	14	330 J	2.8		29 J	5.6 J
MW12	5/20/08	FD	2.0 UJ	2200 J	0.61 J	3.8	100 UJ		1000	4.2 J		0.95 U	1.0 UJ	1.0 U	1.0 U	1.6 J	360 =	12	380	2.1		25	4.5 J
MW12	5/20/08	N	2.0 UJ	2100 J	0.59 J	3.7	100 UJ		1000	4.6 J		0.96 U	1.0 UJ	1.0 U	1.0 U	1.5 J	360 =	12	350	2.0		25	4.7 J
MW12	10/21/08	FD	2.0 UJ	1300.00 J	2.00 U	3.70 J	936	45000	1120	20 U		1.00 U	0.5 U	2.0 U	2.0 U	5.0 U	322	14.50	465 J	2.95 J		31.70	11.80 J
MW12	10/21/08	N	2.0 UJ	1670.00 J	2 U	4 J	927	50200	1140	11 J		1.00 U	0.5 U	2.0 U	2.0 U	5.0 U	323	13.10	519 J	2.96 J		31.80	11.70 J
MW12	6/2/09	FD	0.8 UJ	489 J	2 U	10 UJ	292 =	40600 =	1020 =	20 U		1.0 UJ	0.5 U	0.31 J	2.0 U	0.96 J	302 J	12.4	429.3758	2.64 J		62.2	1.7 J
MW12	6/2/09	N	0.8 UJ	521 J	2 U	10 UJ	310 =	34400 =	1040 =	20 U		1.0 UJ	0.5 U	0.28 J	2.0 U	0.88 J	294 J	12.3	363.3928	2.65 J		59.9	3.6 J
MW12	10/6/09	FD	0.83 UJ	289 J	2 UJ	4 J	294 J	47600 J	982 J	20 UJ		0.997 UJ	0.1 UJ	0.069 J	0.4 UJ	0.28 J	294 J	13.7 J	468.19 J	1.83 J		84.7 J	3.25 J
MW12	10/6/09	N	0.83 UJ	295 J	2 UJ	4 J	307 J	51600 J	987 J	20 UJ		0.995 UJ	0.1 UJ	0.073 J	0.4 UJ	0.28 J	297 J	13.7 J	509.63 J	1.84 J		85.4 J	3.83 J
MW12	5/19/10	FD	1.3 U	81.9	2 UJ	3.8 J	225. J	41800. J	633. J	8.2 J		1.0 U	0.5 U	5 U	5 U	5 U	308	14.7	432	1.91 J		117	36.1 UB
MW12	5/19/10	N	1.3 U	70.3	1.9 J	3.5 J	228. J	47700. J	913. J	11. J		1.0 U	0.5 U	5 U	5 U	5 U	308	14.7	496	1.87 J		116	41.8 UB
MW12	10/5/10	FD	1.3 U	42.9	2 U	8 U	332	47500 R	859	20 U		1.0 U	0.1 U	0.4 U	0.4 U	1 U	316	14.4 J	483	1.72		119	22.9 J
MW12	10/5/10	N	1.3 U	43.7	2 U	8 U	358	41500 R	834	20 U		1.0 U	0.1 U	0.4 U	0.044	1 U	320	14.4 J	548	1.73		119	53.9 J
MW12	6/29/11	FD	0.9 U	35.1	2 UJ	10 U	291	56900	765	20 U		0.998 U	0.1 U	0.4 U	0.4 U	1 U	276	13.3 J	524.00	2.11 J		103 J	1.53 J+
MW12	6/29/11	N	0.9 U	37	1.8 J	10 U	314	62600	744	20 U		0.998 U	0.1 U	0.4 U	0.4 U	1 U	295	14.1 J	555.00	2.28		111	1.28 J+
MW12	10/18/11	FD	0.50 U	30	1.0 J	2.3 J+	50 U	42000 B	640	10 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	300	14	398.00	2.1		100	2.0
MW12	10/18/11	N	0.50 U	37	1.1 J	2.3 J+	50 U	42000 B	660	10 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	300	14	398.00	2.1		98	2.0
MW12	5/22/12	FD	0.50 U	16 J	2.0 U	4.3 J	50 U	43000 =	630	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	310	14 =	419.00	1.8		120	1.6
MW12	5/22/12	N	0.50 U	21 J	2.0 U	10 U	50 U	44000 =	670	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	300	14 =	431.00	1.8		120	1.5
MW12	10/16/12	FD	0.50 U	23	1.2 J	10 U	50 U	43000 =	420	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	290	13	424	2.0 J		130 =	1.3
MW12	10/16/12	N	0.50 U	26	0.98 J	10 U	50 U	42000 =	410	20 U		0.21 U	0.50 U	1.0 U	1.0 U	2.0 U	280	14	413	2.0 J		120 =	1.4
MW12	5/22/13	FD	0.50 U	24	2.0 U	10 U	50 UJ	39000 B	530 B	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	290	12		2.1 J		150	1.6
MW12	5/22/13	N	0.50 U	22	2.0 U	10 U	50 U	36000 B	460 B	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	280	12		2.0 J		150	1.6
MW12	10/8/13	FD	0.50 U	22	0.37 J	10.0 U	50 U	42000 B	710 B	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	260	12		2.1 J		120	1.3
MW12	10/8/13	N	0.50 U	28	0.37 J	10.0 U	50 U	41000 B	680 B	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	270	12		2.1 J		120	1.4
MW12	5/14/14	N		19																			
MW12	9/23/14	N	0.076 J	24	0.66 J	2.0 U	100 U		450	20 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	240	11	360	1.7		130	1.0 U
MW12	4/20/15	N	0.50 U	16	1.1 J	1.4 J	100 U		530	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	220	11	410	1.7		140	0.95 J
MW12	10/13/15	N	0.080 J	25	5.0 U	2.0 U	362		27.4	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	279	11.7	74.4	1.6		159	1.2
MW12	4/6/16	N	0.12 J	5.2	0.77 J	1.4 J	60.1 J		148	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	236	10.6	358	1.6		135	0.67 J

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW12	7/19/16	N	0.50 U	14	0.61 J	1.6 J	100 U		388	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	238	10.1	358	1.4		134	0.96 J
MW12	10/12/16	N	0.092 J	14	0.50 J	1.6 J	10 J		439	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	239	10.8	340	1.2		124	0.71 J
MW12	1/18/17	N	0.13 J	18	0.87 J	1.4 J	8.5 J		427	6.2		0.060	0.28	0.26	0.23	0.24	203	10.7	326	1.1		122	0.89 J
MW12	4/19/17	N	0.13 J	14	0.46 J	1.2 J	10.8 J		362	20.0 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	201	10.1	346	1.0		112	1.0
MW12	10/2/17	N	0.48 J	32	0.49 J	1.9 J	100 U		328	20.0 U		0.82 U	0.50 U	0.50 U	0.50 U	1.0 U	199	11.7	282	0.90		105	1.1
MW12	10/16/18	N	1.0 U	110	0.53 J	1.3 J	100 U		72.2	20.0 U		0.78 U	0.50 U	0.50 U	0.50 U	1.0 U	173	8.1	231	0.61		59.9	2.1
MW12	4/23/19	N	0.17 U	290	0.55 JB	1.5 JB	46.7 U		55.0 B	6.9 U		0.24 U	0.15 U	0.18 U	0.15 J	0.22 U	165	9.1	218	0.53		45.5	2.4
MW12	10/14/19	N	0.25 J	300	0.89 J	0.85 J	46.7 U		8.4	6.9 U		0.24 U	0.15 U	0.18 U	0.15 U	0.22 U	158	8.7	197	0.61 H		43.5	1.2
MW13	10/8/97	N	10 U	0.7 J	2 U	3.32 U	6.7 J		27.3	2.7			0.1 U	1 U	1 U	1 U	70	2.7		1.4		1.4	17.9
MW13	10/8/97	N2		0.7 J									0.1 U	1 U	1 U	1 U							
MW13	4/5/00	N		0.8 =								10 U											
MW13	12/5/00	N	0.58 U	114 J	1 U	25 U	230		66	25 U		5.5 U	0.1 U	1 U	1 U	1 U	72	4.2	140	0.45		8.2	7.9
MW13	12/5/00	N2	0.58 U			92	26000		870	52		5.5 U	0.1 U	1 U	1 U	1 U			140				
MW13	4/23/01	N	0.12 U	0.18	14	140	56300		1300	89		5.3 U	0.1 U	1 U	1 U	1 U	70	3.52	146	1.77		35	18
MW13	4/23/01	N2	0.12 U		0.24	25 U	25 U		110	25 U													
MW13	6/19/01	N	0.12 U	0.11 U	1.1	68	32800		848	45		5.3 U	0.12	1 U	1 U	1 U	68	5.73	112	2.87 =		11	13
MW13	6/19/01	N2	0.12 U		9.1	6.1 J	141		26	25 U										2.87			
MW13	9/10/01	N	10 U	0.69	3.9	49	14000		510	37		0.24 U	0.44 U	0.5 U	0.4 U	1.2 U	75	5.4	100	2.5		7.5 U	9.5
MW13	9/10/01	N2			0.54 J	2.8 J	52 J		27	4.7 J													
MW13	8/5/02	N	0.01 U	0.64	9.1	55.3	19000		580	39.5		5 U	1 U	5 U	5 U	5 U	86	6.8	110	0.15 U		8.4	6.3
MW13	8/5/02	N2			2.2 J	2.5 J	1300		45	9.1 J													
MW13	9/23/03	N	0.5 U	2.9	3	55	24600		687	50		1 U	0.25 U	2.5 U	2.5 U	2.5 U	78	5.1	35.04	1.86		7	6
MW13	9/23/03	N2	0.5 U		1 U	8	960		182	10 U													
MW13	9/21/04	N	10.0 UJ	4.67	1.52	32.4	8770		357	24.3 J		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	68 J	6.5 J	667 J	2.4 J		6.4 R	6.30 R
MW13	9/21/04	N2			0.259 J	1.96 J	125 UJ		3.67 J	5.28 J													
MW13	9/27/05	N	2.0 UJ	0.85	1.0 J	18	6200		200	18 J		0.97 U	0.50 U	5.0 U	5.0 U	5.0 U	67 J	3.1 J	68	0.60 J		19 J	4.3
MW13	9/27/05	N2			1.0 UJ	2.5 J	50 U		7.1 J	20 U													
MW13	9/18/07	N	2.0 UJ	0.53 J	1.0 UJ	10 UJ	100 UJ		6.3 J	5.2 J		0.93 R	1.0 U	1.0 U	1.0 U	2.0 U	71 J	2.9	100 J	0.31 J		29 J	4.1 J
MW13	10/21/08	N	2.0 UJ	0.31 UJ	2 U	10 UJ	207	10500 J	10 U	20 U		1.00 U	0.50 U	2.0 U	2.0 U	5.0 U	55	1.90	110 J	0.45 J		10.10	3.44 J
MW13	10/7/09	N	0.83 UJ	0.16 J	2 UJ	3.2 J	50 UJ	4430 J	10 UJ	20 UJ		0.996 UJ	0.1 UJ	0.4 UJ	0.4 UJ	1 UJ	30 J	2.12 J	45.46 J	0.77 J		9.71 J	13.9 J
MW13	4/13/16	N	0.50 U	0.34	5.0 U	3.2	449		13.4	20.0 U		0.21 U	0.50 U	1.0 U	1.0 U	2.0 U	51.0	1.4	54.9	0.70		3.4	4.2
MW13	7/20/16	N	0.50 U	1.1	5.0 U	1.5 J	19.4 J		5.0 U	20.0 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	39.5	0.91 J	86.0	1.0		2.2	2.1

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Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW13	10/10/16	N	0.50 U	0.37	0.87 J	2.3	23.2 J		0.94 J	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	49.3	0.98 J	56.0	0.58		3.1	1.9
MW13	1/19/17	N	0.080	0.33	0.35 J	3.1	17.1 J		1.1 J	6.2		0.064	0.28	0.26	0.23	0.24	50.8	0.71 J	52.0	0.49		3.6	2.2
MW13	4/19/17	N	0.50 U	0.24	5.0 U	1.1 J	100 U		0.28 J	20.0 U		0.21 U	0.50 U	1.0 U	1.0 U	2.0 U	53.7	0.76 J	60.0	0.50		4.4	2.2
MW13	9/29/17	N	0.25 J	0.27 J	1.0 U	1.6 J	53.5 J		1.4 J	20.0 U		0.79 U	0.50 U	0.50 U	0.50 U	1.0 U	59.0	1.4	47.6	0.56		3.3	2.0
MW13	10/16/18	N	1.0 U	0.35	1.0 U	1.8 J	100 U		3.2	20.0 U		0.79 U	0.50 U	0.50 U	0.15 J	1.0 U	54.9	0.83	47.7	0.41		2.8	2.4
MW13	4/23/19	N	0.17 U	0.30 ^	0.28 JB	2.3 B	46.7 U		1.6 JB	11.2 J		0.23 U	0.15 U	0.18 U	0.15 U	0.22 U	54.2	0.89	49.8	0.41		3.0	2.3
MW13	10/14/19	N	0.17 U	0.086 U	0.28 J	2.3	149		4.3	6.9 J		0.25 U	0.15 U	0.18 U	0.15 U	0.22 U	44.7	1.2	40.1	0.29 H		1.8	1.9
MW14	10/9/97	N	10 U	1 U	2 U	2 U	20 U		4 J	4			0.1 U	1 U	1 U	1 U	120	8		1.6		2.4	1 U
MW14	10/9/97	N2		1 U	2 U	2 U				2 U			0.1 U	1 U	1 U	1 U							
MW14	4/6/00	N		0.5 U								11 U											
MW14	6/19/01	N	0.11 U	0.96	1.4	5.4 J	1070		57	25 U		239	0.1 U	1 U	1 U	1 U	104	12	124	2.06		3.48 J	6.41
MW14	6/19/01	N2	0.11 U		2	25 U	25 U		4.4	25 U										2.06 =			
MW14	1/23/17	N	0.080	0.12	1.1 J	0.62 J	5.3		1.6 J	6.2		0.061	0.28	0.26	0.23	0.24	129	15.8	146	1.7		6.6	0.51 J
MW14	10/3/17	FD	0.11 J	0.099 U	1.0	0.74 J	100 U		0.93 J	20.0 U		0.80 U	0.50 U	0.50 U	0.50 U	1.0 U	128	17.1	148	1.9		6.7	1.0 U
MW14	10/3/17	N	0.087 J	0.098 U	0.95 J	0.72 J	100 U		1.1 J	20.0 U		0.76 U	0.50 U	0.50 U	0.50 U	1.0 U	129	16.1	166	1.9		6.9	0.47 J
MW14	5/31/18	N	1.0 U	0.10 U	1.2	0.79 J	100 U		3.1	20.0 U		0.82 U	0.50 U	0.50 U	0.50 U	1.0 U	585	16.4	143	1.7		6.3	0.71 J
MW14	10/17/18	N	1.0 U	0.097 U	1.1	2.0 U	100 U		1.3 J	20.0 U		0.78 U	0.50 U	0.50 U	0.50 U	1.0 U	122	15.6	142	1.8		6.4	0.68 J
MW14	4/25/19	N	0.17 U	0.14	1.1	0.95 J	46.7 U		6.3	6.9 U		0.24 U	0.15 U	0.18 U	0.15 U	0.22 U	122	15.0	140	1.5		6.0 B	0.64 J
MW14	10/16/19	N	0.17 U	0.086 U	1.1	0.50 U	46.7 U		9.0 F2	6.9 U		0.25 U	0.15 U	0.18 U	0.15 U	0.22 U	123 H	17.5 F1	146	1.7		6.6 B	0.47 U
MW15	10/16/97	N	10 U	1 U	2 U	2 U	8.2 J		62.2	2 U			0.1 U	1 U	1 U	1 U	190	6.5		4.1		6.3	1.2
MW15	10/16/97	N2		1 U	2 U	3.5 U				13.9			0.1 U	1 U	1 U	1 U							
MW15	4/4/00	N		0.5 U								11 U											
MW15	4/25/01	N	0.1 U	0.11 U	0.5	25 U	58		4.8	50		5.3 U	0.1 U	1 U	1 U	1 U	240	15	276	3.97		2.61	5.24
MW15	4/25/01	N2	0.1 U	0.11 U	0.31	25 U	25 U		15 U	15		5.6 U	0.1 U	1 U	1 U	1 U	246	16	276	3.97 =		4.05	3.7
MW15	4/25/01	N3	0.12 U		0.56	25 U	174		4.1	25 U		5.6 U								3.92			
MW15	4/25/01	N4			0.42	25 U	25 U		15 U	16										3.92 =			
MW15	9/12/01	N	10 U	0.077 J	0.95 U	2.9 J	35 U		0.31 J	35		0.24 U	0.44 U	0.5 U	0.4 U	1.2 U	240	17	270	3.7		4.5 U	4.5
MW15	9/12/01	N2			0.95 U	5.7 J	63 J		2.7	36													
MW15	8/6/02	N	0.01 U	0.04 U	3.7	1.6 J	130		2.8 J	17 J		5 U	1 U	5 U	5 U	5 U	230	16	250	0.15 U		4.7	53
MW15	8/6/02	N2			2.6	0.3 U	11 U		0.42 U	11 J													
MW15	9/23/03	N	0.5 U	0.1 U	1 U	1 J	280		9 J	10 J		0.99 U	0.25 U	2.5 U	2.5 U	2.5 U	213	17.4	88.57	3.8		2 U	1.8
MW15	9/23/03	N2	0.5 U		1 U	1 U	50 U		5 U	10 U													

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Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW15	9/21/04	N	10.0 U	0.279	0.468 J	1.74 J	36.7		3.15 J	20.8 J		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	230	16 =	1020	3.2 J		3.9 J	12.7
MW15	9/21/04	N2			0.482 J	0.648 J	5.57 J		0.976 J	8.97 J													
MW15	9/29/05	N	2.0 U	0.11 U	1.0 UJ	2.4 J	420 J		15 J	20 UJ		0.93 U	0.50 U	5.0 U	5.0 U	5.0 U	220 J	17 J	300 J	4.2 J		5.8 R	0.84 J
MW15	9/29/05	N2			1.0 UJ	10 UJ	50 UJ		1.6 J	20 UJ													
MW15	9/27/06	N	2.0 UJ	0.11 U	1.0 UJ	3.5 J	50 UJ		2.0 UB	13 J		0.91 U	0.50 U	5.0 U	5.0 U	5.0 U	260 J	14 J	250	4.7 J		5.9 J	2.1
MW15	9/19/07	N	2.0 UJ	0.10 U	0.68 J	10 UJ	100 UJ		10 UJ	20 UJ		1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	250	15	250 J	5.7		13 J	1.3 J
MW15	5/20/08	N	2.0 UJ	0.18 J	0.40 J	1.0 J	100 UJ		0.52 J	20 U		0.93 U	1.0 UJ	1.0 U	1.0 U	2.0 UJ	260 =	14	290	4.7		6.6	0.85 J
MW15	10/21/08	N	2.0 UJ	0.10 UJ	2 U	10 UJ	854	45400	10 U	20 U		1.00 U	0.5 U	2.0 U	2.0 U	5.00 U	265	14.60	567 J	6.05 J		6.99	13.60 J
MW15	6/2/09	N	0.8 UJ	0.1 UJ	2 U	10 UJ	301 =	30600 =	10 U	20 U		1.0 UJ	0.5 U	0.21 J	2.0 U	5.0 U	279 J	13.5	375.2114	5.33 J		6.42	1.7 UJ
MW15	10/7/09	N	0.83 UJ	0.1 UJ	2 UJ	3 J	293 J	25500 J	10 UJ	5.4 J		0.999 UJ	0.1 UJ	0.4 UJ	0.4 UJ	1 UJ	260 J	12.9 J	294.28 J	4.74 J		6.52 J	1.49 J
MW15	5/18/10	N	1.3 U	0.1 U	2 UJ	10 UJ	194. J	24400. J	10 UJ	20 UJ		1.0 U	0.5 U	5 U	5 U	5 U	300	10.7	342	4.57 J		6.3	26.7 UB
MW15	10/7/10	N	1.3 U	2.32 J	2 U	8 U	311	38400	16.7 U	20 U		1.0 UJ	0.5 UJ	2 UJ	2 UJ	5 UJ	252	13.2 J	430	5.49 J		6.9 J	1.0 U
MW15	6/28/11	N	0.9 U	0.1 U	2 UJ	10 U	205	23100	10 U	20 U		0.998 U	0.1 U	0.4 U	0.4 U	1 U	239	12.1 J	307.00	5.2 J		6.91	0.77 J
MW15	10/18/11	N	0.50 U	0.10 U	0.70 J	2.7 J+	50 U	24000 B	1.7 J	10 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	240	12	261.00	4.8 J		5.3	1.0 J
MW15	5/22/12	N	0.50 U	0.024 J	2.0 U	10 U	50 U	24000 =	10 U	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	260	11	266.00	4.6 J		5.1 J	1.2
MW15	10/16/12	N	0.50 U	0.094 U	0.97 J	10 U	50 U	24000 =	10 U	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	250	12	271	5.3 J		5.0 U	0.69 J
MW15	5/21/13	N	0.50 U	0.025 J	2.0 U	10 U	50 U	26000 B	10 U	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	280	9.8		4.7 J		5.9	0.82 J
MW15	10/8/13	N	0.50 U	0.095 U	0.36 J	10.0 U	50 U	23000 B	10 U	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	220	11		5.2 J		6.5	0.50 J
MW15	5/13/14	N		0.095 U																			
MW15	9/23/14	N	0.50 U	0.054 J	1.1 J	2.0 U	28 J		1.9 J	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	210	11	250	5.3		5.6	0.85 J
MW15	4/20/15	N	0.50 U	0.094 U	0.78 J	2.0 U	100 U		1.1 J	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	190	11	270	5.6		5.7	0.44 J
MW15	10/12/15	N	0.50 U	0.094 U	0.54 J	1.0 J	100 U		5.0 U	20.0 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	224	12.0	302	6.7		5.8	0.55 J
MW15	4/5/16	N	0.50 U	0.078 J	0.70 J	1.7 J	100 U		5.0 U	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	207	12.5	312	0.45		6.3	0.49 J
MW16	10/14/97	N	10 U	1 U	17.1	438	15.3 J		10300 J	210			0.1 U	1 U	1 U	1 U	170	6.1		2.6		8.1	3
MW16	10/14/97	N2		1 U	2 U	2.7 U				1.9 J			0.1 U	1 U	1 U	1 U							
MW16	4/6/00	N		0.5 U								10 U											
MW16	4/23/01	N	0.12 U	0.11 U	6.5	62	22300		1460	136		5.6 U	0.1 U	1 U	1 U	1 U	90	3.57	164	8.69 =		29	4.4
MW16	4/23/01	N2	0.12 U		1 U	25 U	26		9.4	23										8.69			
MW16	9/10/01	N	10 U	0.17	1.8	23 U	5500		520	19		0.24 U	0.44 U	0.5 U	0.4 U	1.2 U	79	1.8	120	5.8		11	0.34 U
MW16	9/10/01	N2			0.29 U	2.2 U	35 U		0.82 J	4.5 J													
MW16	8/6/02	N	0.01 U	0.035 J	3.5	25 J	6800		14	760 J		5 U	1 U	5 U	5 U	5 U	130	2	120	0.15 U		13	1.3
MW16	8/6/02	N2			1.4 U	0.3 U	78		9.1 J	13 J													

Appendix A.1

Historical Groundwater Analytical Data
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Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW16	9/23/03	N	0.5 U	0.089 J	2 J	18	7470		532	10 J		1.1 U	0.25 U	2.5 U	2.5 U	2.5 U	82	6.2	37.96	3.49		3 J	2.3
MW16	9/23/03	N2	0.5 U		1 U	1 U	50 U		5 U	10 U													
MW16	9/21/04	N	10.0 U	0.0962 J	0.277 J	4.07 J	570		74.7	8.71 J		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	82	3.7 =	1220	2.1 J		5.5 J	4.28
MW16	9/21/04	N2			0.135 J	0.509 J	25.0 U		0.617 J	2.79 J													
MW16	9/29/05	N	2.0 U	0.11 U	1.0 UJ	7.6 J	1000 J		130 J	8.1 J		1.0 U	0.50 U	5.0 U	5.0 U	5.0 U	82 J	11 J	190 J	1.5 J		71 R	0.83 J
MW16	9/29/05	N2			1.0 UJ	2.9 J	50 UJ		2.1 J	20 UJ													
MW16	9/27/06	N	2.0 UJ	0.046 J	1.0 UJ	10 UJ	50 UJ		0.59 UB	20 UJ		0.92 U	0.50 U	5.0 U	5.0 U	5.0 U	83 J	4.1 J	100	1.2 J		32 J	1.3
MW16	9/18/07	N	2.0 UJ	0.20 J	1.0 UJ	10 UJ	100 UJ		10 UJ	20 UJ		0.99 R	1.0 U	1.0 U	1.0 U	2.0 U	81 J	4.5	120 J	1.2 J		23 J	1.3 J
MW16	10/22/08	N	2.0 UJ	0.08 J	2 UJ	10 UJ	318 J	19400 J	20 J	20 UJ		1 U	0.5 U	2.0 U	2.0 U	5 U	51 J	7.51	175 J	0.99 J		43.2	92.3
MW16	10/6/09	N	0.83 UJ	0.1 UJ	2 UJ	6.6 J	458 J	8360 J	48.6 J	20 UJ		0.998 UJ	0.1 UJ	0.4 UJ	0.4 UJ	1 UJ	40 J	6.35 J	81.869 J	1.03 J		36.7 J	1 UJ
MW16	10/5/10	N	1.3 U	0.1 U	2 U	8 U	50 U	2910 R	16.7 U	20 U		1.0 U	0.1 U	0.4 U	0.4 U	1 U	39	5.7 J	29.3	0.63 J		6.3 J	15.7
MW16	10/19/11	N	0.50 U	0.095 U	0.44 J	2.2 J+	130	3200 B	14	10 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	32	4.2	30.70	0.63 J		12	1.0 U
MW16	10/16/12	N	0.50 U	0.099 U	0.66 J	10 U	180	3600 =	17	20 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	37	4.6	39.8	0.52 J		17 J	1.3
MW16	10/8/13	N	0.50 U	0.029 J	0.61 J	10.0 U	1500 B	3300 B	100 B	59 J		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	34	6.2		0.57 J		6.3	1.1
MW16	9/23/14	N	0.50 U	0.036 J	0.41 J	2.0 U	100 U		5.0 U	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	31	5.4	60	0.54		2.8	1.1
MW16	10/13/15	N	0.50 U	0.098 U	5.0 U	1.0 J	45.2 J		2.1 J	20.0 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	48.4	4.3	84.4	0.61		5.9	0.70 J
MW16	4/6/16	N	0.50 U	0.096 U	5.0 U	1.9 J	168		14.6	20.0 U		0.11 J	0.50 U	1.0 U	1.0 U	2.0 U	32.6	2.2	31.8	0.41		2.6	2.3
MW16	7/19/16	N	0.50 U	0.094 U	5.0 U	2.2	114		11.5	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	32.4	2.2	34.0	0.42		2.6	5.8
MW16	10/12/16	N	0.50 U	0.18	0.40 J	1.7 J	61.7 J		5.3	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	33.1	2.4	24.0	0.30		2.2	0.58 J
MW16	1/18/17	N	0.080	0.015	0.47 J	1.3 J	11.5 J		1.2 J	6.2		0.060	0.28	0.26	0.23	0.24	31.3	3.2	46.0	0.46		3.6	1.1
MW16	4/19/17	N	0.50 U	0.10 U	5.0 U	1.6 J	7.7 J		0.80 J	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	39.0	3.3	60.0	0.57		4.5	2.0
MW16	10/2/17	N	0.11 J	0.096 U	1.0 U	2.5	100 U		2.0 J	8.8 J		0.90 U	0.50 U	0.50 U	0.50 U	1.0 U	43.7	4.0	45.7	0.73		6.6	0.82 J
MW16	10/16/18	N	1.0 U	0.10 U	0.26 J	3.2	100 U		2.5 U	13.0 J		0.80 U	0.50 U	0.50 U	0.50 U	1.0 U	32.0	4.5	28.6	0.74		3.5	1.8
MW16	4/24/19	N	0.17 U	0.24	0.37 J	1.9 J	169		15.7	9.0 J		0.23 U	0.15 U	0.18 U	0.15 U	0.22 U	34.1	4.7	39.4	0.63		4.7 B	0.74 J
MW16	10/14/19	FD	0.17 U	0.087 U	0.26 J	2.4	105		4.2	6.9 U		0.25 U	0.15 U	0.18 U	0.15 U	0.22 U	43.2	3.8	37.9	0.55 H		4.4	0.47 U
MW16	10/14/19	N	0.17 U	0.086 U	0.27 J	1.6 J	60.3 J		4	6.9 U		0.23 U	0.15 U	0.18 U	0.15 U	0.22 U	42.8	3.9	37.5	0.55 H		4.4	0.47 U
MW17	10/15/97	N	10 U	1 U	2 U	2	10 U		2 U	17.6			0.1 U	1 JB	1 U	0.6 J	180	4.8		4.1		10	0.7 J
MW17	10/15/97	N2		1 U	2 U	2.3 U				2.5			0.1 U	1 J	1 U	0.6 J							
MW17	10/28/97	N		5																			
MW17	4/6/00	N		0.5 U								11 U											
MW17	4/26/01	N	0.12 U	0.72	0.6	25 U	33		15 U	12		54	0.1 U	1 U	1 U	1 U	202	4.12	228	4.98		6.82	1.57
MW17	4/26/01	N2	0.12 U		0.69	25 U	25 U		15 U	25 U										4.98 =			

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MW17	9/11/01	N	10 U	0.059 U	0.94	2.2 U	330		0.27 U	3.7 U		0.29 U	0.44 U	0.5 U	0.4 U	1.2 U	180	4.8	210	4.4		9.3 U	1 J
MW17	9/11/01	N2			1	2.2 U	310		0.27 U	3.7 U													
MW17	8/8/02	N	0.01 U	0.032 J	3	0.47 J	11 U		0.42 U	0.98 U		5 U	1 U	5 U	5 U	5 U	200	4.6	210	0.15 U		7.4	0.73
MW17	8/8/02	N2			1.9 J	0.3 U	11 U		0.42 U	15 J													
MW17	9/25/03	N	0.5 U	0.46	1 U	1 U	50 U		18	10 U		0.96 U	0.25 U	2.5 U	2.5 U	2.5 U	184	4.4	71.56	5.1		2 U	2.1
MW17	9/25/03	N2	0.5 U		1 U	1 U	50 U		5 U	10 U													
MW17	9/22/04	N	10.0 UJ	2.82	0.0787 J	0.774 J	11.5 UB		0.371 J	2.46 J		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	190 J	4.1 J	1100 J	4.8 J		8.6 R	1.67 R
MW17	9/22/04	N2			0.782 J	0.847 J	13.9 J		45.0 J	2.09 J													
MW17	9/27/05	N	2.0 UJ	0.054 J	1.0 UJ	10 U	50 U		0.44 J	20 U		0.92 U	0.50 U	5.0 U	5.0 U	5.0 U	160 J	3.9 J	180	5.1 J		7.8 J	0.91 J
MW17	9/27/05	N2			1.0 UJ	10 U	50 U		10 U	20 U													
MW17	9/26/06	N	2.0 UJ	0.11 U	1.0 UJ	10 UJ	50 UJ		10 UJ	7.5 J		0.91 U	0.50 U	5.0 U	5.0 U	5.0 U	170 J	2.9 J	170	5.5 J		6.5 J	1.1
MW17	9/19/07	N	2.0 UJ	0.099 U	1.0 J	10 UJ	100 UJ		10 UJ	20 UJ		0.94 U	1.0 U	1.0 U	1.0 U	2.0 U	160	4.7	160 J	5.6		14 J	1.2 J
MW17	10/22/08	N	2.0 UJ	0.1	2 UJ	10 UJ	374 J	29200 J	10 UJ	20 UJ		1 U	0.5 U	2.0 U	2.0 U	5 U	155 J	7.78	295 J	5.75 J		7.75	20.2
MW17	10/6/09	N	0.83 UJ	0.1 UJ	2 UJ	10 UJ	160 J	26700 J	10 UJ	20 UJ		0.995 UJ	0.1 UJ	0.4 UJ	0.4 UJ	1 UJ	60 J	6.54 J	295.228 J	1.65 J		6.86 J	1 UJ
MW17	10/5/10	N	1.3 U	0.1 U	2 U	10 U	163	20500	10 U	20 U		1.0 U	0.1 U	0.4 U	0.4 U	1 U	160	11.6 J	225	5.18		9.7 J	1.6
MW17	10/18/11	N	0.50 U	0.095 U	1.1 J	2 U	50 U	17000 B	10 U	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	140	16	180.00	3.9		24	0.89 J
MW17	10/16/12	N	0.50 U	0.095 U	1.2 J	10 U	50 U	17000 =	10 U	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	150	16	187	4.7		23 J	0.59 J
MW17	10/8/13	N	0.50 U	0.095 U	0.72 J	10.0 U	50 U	18000 B	10 U	20 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	140	16		4.5 J		36	0.40 J
MW17	9/24/14	N	0.50 U	0.097 U	0.83 J	2.0 U	100 U		1.3 J	20 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	150	15	250	4.8		40	0.72 J
MW17	10/13/15	N	0.50 U	0.095 U	1.1 J	2.0 U	100 U		5.0 U	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	184	14.8	265	4.2		45.3	0.59 J
MW17	4/5/16	N	0.50 U	0.095 U	0.81 J	1.8 J	100 U		5.0 U	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	173	13.6	289	3.5		85.4	0.46 J
MW17	7/19/16	N	0.50 U	0.095 U	0.84 J	1.4 J	100 U		5.0 U	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	195	14.7	336	2.8		142	0.52 J
MW17	10/11/16	N	0.50 U	0.094 U	0.80 J	0.76 J	100 U		0.28 J	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	208	17.0	348	2.7		136	0.36 J
MW17	1/23/17	FD	0.080	0.015	0.76 J	0.66 J	5.3		0.25	6.2		0.060	0.28	0.26	0.23	0.24	213	17.4	380	2.1		167	0.50 J
MW17	1/23/17	N	0.13 J	0.099	0.73 J	1.4 J	5.3		0.25	6.2		0.060	0.28	0.26	0.23	0.24	202	17.4	390	2.1		167	0.81 J
MW17	4/20/17	FD	0.50 U	0.10 U	0.68 J	0.65 J	100 U		0.58 J	20.0 U		0.24 U	0.50 U	1.0 U	1.0 U	2.0 U	223	16.1	470	2.2		165	0.43 J
MW17	4/20/17	N	0.50 U	0.10 U	0.71 J	0.77 J	100 U		0.45 J	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	201	16.1	460	2.2		164	0.48 J
MW17	10/3/17	N	0.096 J	0.099 U	0.74 J	1.8 J	100 U		2.5 U	20.0 U		0.85 U	0.50 U	0.50 U	0.50 U	1.0 U	212	17.2	390	3.5		125	1.0 U
MW17	5/31/18	N	1.0 U	0.096 U	0.79 J	1.7 J	100 U		2.5 U	20.0 U		0.77 U	0.50 U	0.50 U	0.50 U	1.0 U	194	14.9	311	3.3		98.2	0.77 J
MW17	10/17/18	N	1.0 U	0.11 U	0.63 J	1.1 J	100 U		2.5 U	20.0 U		0.81 U	0.50 U	0.50 U	0.15 J	1.0 U	185	13.6	317	2.9		106	0.61 J
MW17	4/22/19	N	0.17 U	0.087 U	0.80 JB	1.3 JB	46.7 U		1.2 JB	6.9 U		0.24 U	0.15 U	0.18 U	0.15 U	0.22 U	187	12.4	335	2.2		140	1.2
MW17	10/15/19	N	0.17 U	0.087 U	0.55 J	1.0 J	46.7 U		0.79 U	6.9 U		0.23 U	0.15 U	0.18 U	0.15 U	0.22 U	193	13.8	338	2		128	0.47 U

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW18	10/10/97	N	10 U	27000 J	8.2	43.5 J	32000 J		10600	2.6			0.1 U	2	16	19	260	49		0.1 U		11	154
MW18	10/10/97	N2		27000 E	8.9	62.5				5.3			0.1 U	2	16	19							
MW18	6/19/01	N	0.13 U	27400	4.9	21 J	13700		6650	25 U		5 U	1.1	14	10 U	20	168	19	182	0.13 U		33 J	6.63
MW18	6/19/01	N2	0.13 U		5	43	15200		6540	25 U													
MW19	10/16/97	N	10 U	19000 J	2 U	38 J	10 U		2690 J	46			0.2	1 U	1 U	0.2 J	180	47		3.8		19	32.8
MW19	10/16/97	N2		19000 E	2 U	3.4 U				2 U			0.2	1 U	1 U	0.2 J							
MW19	4/7/00	N		11800 =								5260 U											
MW19	4/7/00	N2		11000 J								22 =											
MW19	4/26/01	N	0.5	25600	2.2	38	10000		1840	27		325 =	1 U	10 U	10 U	10	236	39	323	3.37 =		47	33
MW19	4/26/01	N2	0.5		1 U	25 U	25 U		1790	25 U		325	10 U	100 U	100 U	100 U				3.37			
MW19	9/12/01	N	16	400000	0.29 U	6.4 J	71 J		1800	5.8 J		240	0.44 U	1.9 U	1.7 U	28	320 J	19	270	1.3		9.7 U	34
MW19	9/12/01	N2			1.7 J	44	5600		2100	53 J													
MW19	5/13/02	N		14000	1.4 U	5.1 J	11.2 U		2070	9.4 J		190											
MW19	8/8/02	N	0.01 U	11000 J	7	30.2	719		3100	290		210	1 U	2 J	1 J	29	130	22	4 U	0.16		16	65
MW19	8/8/02	N2			1.4 U	7.1 J	218		3110	5.7 J													
MW19	4/29/03	N	2.4	4900	2 J	24	2030		3670	10 U		1200	500 U	5000 U	5000 U	5000 U	118	19.6	162	3		27	53
MW19	4/29/03	N2	2.4		1 U	5	25 U		3590	10 U													
MW19	9/25/03	N	5.7	15000	1 U	27	950		2210	10 U		3200	1 U	10 U	10 U	46.6	160	17.5 J	71.57	2 J		90 J	129 J
MW19	9/25/03	N2	5.7		1 U	9	50 J		4470	10 U										2 J			
MW19	5/4/04	N	1.13 J	70000 J	0.284 J	22.2 R	892 R	17600	4040 R	11.6 R		201	2.50 U	2.13 J	1.98 J	30.0	144	25 =	176	0.71 J		16 R	43.7 J
MW19	5/4/04	N2			0.169 J	5.77 R	31.4		3360 R	6.93 R													
MW19	9/22/04	N	10.0 UJ	111000	1.00 UJ	13.5 J	402 J		3160 J	16.7 J		260	0.500 U	3.45 J	2.25 J	50.3	110 J	15 J	1120 J	1.5 J		23 R	31.3 R
MW19	9/22/04	N2			0.159 J	6.26 J	125 U		2650	16.0 J													
MW19	5/10/05	N	2.0 U	45000 J	1.0 U	6.3 J	50 U		2300	9.8 J		2300 =	100 UJ	1000 UJ	1000 UJ	1000 UJ	97 J	18 J	140 J	0.76 J		29 R	35 R
MW19	5/10/05	N2			1.0 U	15	630		2100	8.4 J													
MW19	9/29/05	N	2.0 U	13000 =	1.0 UJ	11 J	97 J		2600 J	20 UJ		78	0.50 U	1.2 J	1.1 J	18	140 J	19 J	5 UJ	0.75 J		40 R	32 J
MW19	9/29/05	N2			1.0 UJ	5.0 J	50 UJ		2700 J	20 UJ													
MW19	6/7/06	N	2.0 U	17000 J	1.0 UJ	4.4 J	50 UJ		2700 J	20 UJ		59	0.50 U	1.5 J	1.3 J	22	120 J	18 J	360 J	0.76 J		36 =	20 J
MW19	9/27/06	N	2.0 UJ	8200 J	1.0 U	6.4 J	50 U		3100	20 U		69	0.50 U	1.4 J	1.2 J	19	160 J	14	190	0.66 J		30 =	35
MW19	5/9/07	N	2.0 UJ	11000 J	1.0 UJ	3.7 J	100 UJ		2600	20 UJ		54 J	1.0 U	1.4	1.5	17	230 =	15	160	0.29		59 J	33 UB
MW19	9/21/07	N		3500 J	1.0 UJ	4.0 J	100 UJ		3100	20 UJ		47 R	1.0 U	1.8	2.0	21	190 J	17	240 J	0.28		42 J	38 J
MW19	5/20/08	N	2.0 U	23000 J	1.0 U	3.4	100 UJ		2900	2.3 J		140	1.0 UJ	5.0	4.8	54 J	220 =	16	260	0.44		42	18 J

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW19	10/24/08	N	2.1 J	27900	2 UJ	5 J	510 J	28700 J	4850 J	20 UJ		120	0.5 U	5.11	5.08 =	50.3	221 J	15.9	373 J	0.04 J		46.2	29.8
MW19	6/2/09	N	3.9 J	18600 J	2 U	10 UJ	222 =	29900 =	4050 =	20 U		110 J	0.5 U	7.93	6.66	74.6	249 J	12.8	317.6445	0.01 UB		44.7	13
MW19	10/7/09	N	2 J	31800 J	2 UJ	3.8 J	237 J	27400 J	3190 J	7.2 J		137 J	0.1 UJ	7.62 J	5.77 J	60.7 J	228 J	14.3 J	271.39 J	0.05 UJ		42 J	20.4 J
MW19	5/20/10	N	1.4	26000.	2 UJ	3.2 J	92.2 UJ	19900. J	1870. J	20 UJ		123.	0.5 U	7.95	5.65	64.3	136	21.5	199	0.05 UJ		32.4	50.4 UB
MW19	10/7/10	N	1.3 U	4470 J	2 U	2.9 J	114	7130	942	20 U		102 J	0.5 UJ	3.21 J	1.7 J	44.7 J	84	13.6 J	77.8	0.10 UJ		18.7 J	17.4
MW19	6/29/11	N	0.9 U	8880	2 UJ	14.8 J	131	9550	1300	20 U		42.1	0.1 U	1.12	1.09	22.7	43	16.6 J	90.00	0.26		20.1	85.4
MW19	10/20/11	N	0.33 J	13000	2.0 U	12 B	52 J+	8600 B	1700	14 J+		2.8	0.84 U	1.1 J	1.0 J	23	57	19	85.40	0.30		17	92
MW19	5/22/12	N	0.71	5300	2.0 U	7.6 J	50 U	7600 =	1300	20 U		50	2.0 U	0.88 J	0.76 J	16	51	15	76.20	1.1		12	38
MW19	10/17/12	N	0.50 U	8100	2.0 U	6.9 J	50 U	5800 =	900	20 U		8.4	2.0 U	4.0 U	0.67 J	9.7	36	12	66.3	1.4		11 J	27
MW19	5/22/13	N	0.84 J	5800	2.0 U	7.3 J	50 U	8700 B	1100 B	20 U		29 J	0.50 U	0.99 J	1.5	19	54	14		1.1 J		11	45
MW19	10/10/13	N	0.50 U	7900	0.26 J	10.0 UJ	50 UJ	5800 J	990 J	20 UJ		3.0	2.5 U	5.0 U	1.1 J	15	36 B	12		1.1 J		11	31
MW19	5/14/14	N		18000																			
MW20	10/15/97	N	10 U	29000 J									0.1 U	1 U	1 U	0.1 U							
MW20	4/26/01	N	2.73	36600	8.2	196	33200		3120	126		9970 =	1 U	10 U	10 U	29	198	24	301	0.13 U		67	478
MW20	4/26/01	N2	2.73		1.1	14	841		2250	23		9970	10 U	100 U	100 U	71							
MW20	9/12/01	N	10 U	83000	3.6	81	7900		3200	36		890	0.44 U	3.4 U	4.1 U	37	260 J	16	250	0.15 J		24	65
MW20	9/12/01	N2			1.5	15 U	35 U		2800	12 U													
MW20	8/7/02	N	0.01 U	30000 J	8.9	87.4	4910		3520	16.6 J		1400	1 U	12	9	120	220	22	4 U	0.15 U		25	71
MW20	8/7/02	N2			2.6	5.8 J	206		3280	15.4 J													
MW20	9/25/03	N	5.4	13000	2 J	58	7220		3310	20 J		830	1 U	10 U	10 U	60.9	233	19.4 J	86.67	1.25 U		80 J	150 J
MW20	9/25/03	N2	5.4		1 U	11	350		3250	10 J										1.25 U			
MW20	9/22/04	N	10.0 UJ	133000	1.00 UJ	30.4 J	1320 J		2770 J	18.7 J		282	2.50 U	3.01 J	3.21 J	40.3	190 J	24 J	1320 J	0.29 J		23 R	46.3 R
MW20	9/22/04	N2			0.498 J	35.2 J	2070		2320	47.0 J													
MW20	10/25/05	N	2.0 UJ	63000 =	1.0 U	16 J	780 J		2300 J	20 UJ			0.50 U	5.5	5.4	62	170 J	13 J	190 J	2.1 J		39 R	21 R
MW20	10/25/05	N2			1.0 UJ	2.7 UJ	140 J		2400 J	20 UJ													
MW20	9/27/06	FD	2.0 UJ	44000 J	1.0 UJ	4.8 J	94 J		4200	20 U		180 =	0.50 U	5.1	4.1 J	53	230 J	16	380	0.19		65 =	22
MW20	9/27/06	N	2.0 UJ	35000 J	1.0 U	3.8 J	48 J		4200	20 U		160 =	0.50 U	4.8 J	4.1 J	51	220 J	16	240	0.22		71 =	23
MW20	9/21/07	N	2.0 U	9500 J	1.0 UJ	10 UJ	100 UJ		4800	20 UJ		71 R	1.0 U	6.4	4.4	62	230 J	18	300 J	0.10 U		98 J	13 J
MW20	10/23/08	N	2.0 UJ	41000	2 UJ	17.3 J	462	31700 J	3400 J	20 UJ		1150	0.5 U	2.99 =	2.94 =	38.7	127 J	15.7	332 J	0.13 J		28.9	121
MW20	4/20/17	FD	0.50 U	0.10 U	0.99 J	2.0 U	100 U		0.64 J	20.0 U		0.22 U	0.50 U	1.0 U	1.0 U	2.0 U	133	14.7	188	1.7		7.0	0.49 J
MW20	4/20/17	N	0.50 U	0.10 U	1.0 J	0.37 J	100 U		0.33 J	20.0 U		0.21 U	0.50 U	1.0 U	1.0 U	2.0 U	131	14.8	186	3.5		7.0	0.47 J
MW21	2/9/98	FD	10	1	3.1	83.9	7.3 U		1380	98.9			0.1 U	1 U	1 U	1 U	196	67.3				8.9	0.47 U

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Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW21	2/9/98	FD2			2 U	9.5 U				33.8													
MW21	2/9/98	N	11	1 U	3	70.1	5.5 U		1210	113			0.1 U	1 U	1 U	1 U	176	70.6				9.1	0.47 U
MW21	2/9/98	N2		1 U	2 U	9.5 U				32.6 U			0.1 U	1 U	1 U	1 U							
MW21	5/14/02	N			1.9 J	1.3 J	130		9.7 J	11 J													
MW21	8/6/02	N		0.035 J	4.4	50	10000		930	29		5 U	1 U	5 U	5 U	5 U	120	49	150	0.15 U		9.6	8.3
MW21	8/6/02	N2			1.6 J	0.3 U	11 U		0.63 J	6.8 J													
MW21	4/29/03	N	0.5 U	0.15	1 U	12	3440		227	10 U		7.4 U	0.5 U	5 U	5 U	5 U	144	41	169	2.5		12	1.5
MW21	4/29/03	N2	0.5 U		1 U	1 U	25 U		5 U	10 U													
MW21	9/24/03	N	0.5 U	0.063 J	1 U	260	68400		3750	150		1 U	0.25 U	2.5 U	2.5 U	2.5 U	165	48	81.46	2.62		2 U	3.6
MW21	9/24/03	N2	0.5 U		1 U	1 U	50 UJ		5 U	10 U													
MW21	5/4/04	N	10.0 U	0.135 UB	2.31 J	72.5 R	14000 R	19300	1970 R	46.5 R		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	165	67 =	188	2.3 J		3.6 R	3.12 J
MW21	5/4/04	N2			0.122 J	1.28 R	28.6 R		0.718 R	4.48 R													
MW21	9/21/04	N	10.0 UJ	0.474	1.80 J	48.2 J	10300 J		983 J	32.6 J		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	150 J	63 J	1030 J	2.4 J		4.8 R	2.76 R
MW21	9/21/04	N2			0.130 J	0.955 J	25.0 UJ		0.484 J	3.30 J													
MW21	5/10/05	N	2.0 U	0.33	1.0 U	10 U	50 U		0.47 J	20 U		0.98 U	0.50 U	5.0 U	5.0 U	5.0 U	130 J	49 J	170 J	2.8 J		12 R	2.2 R
MW21	5/10/05	N2			1.0 U	25	6200		480	16 J													
MW21	9/27/05	N	2.0 UJ	0.046 J	7.1	230	56000		3400	110		0.91 U	0.50 U	5.0 U	5.0 U	5.0 U	130 J	47 J	370	2.4 J		17 J	1.2
MW21	9/27/05	N2			1.0 UJ	2.6 J	36 J		9.8 J	20 U													
MW21	6/1/06	N	2.0 U	0.023 J	1.0 UJ	10 UJ	47 J		17 J	20 UJ		0.99 U	0.50 U	5.0 U	5.0 U	5.0 U	140 J	65 J	140	2.7 J		20	1.5 J
MW21	5/8/07	N	2.0 UJ	0.098 UJ	1.0 UJ	10 UJ	100 UJ		10 UJ	4.2 J		1.0 R	1.0 U	1.0 U	1.0 U	2.0 U	210 =	33 J	120	4.2		9.3 J	1.7
MW21	9/18/07	N	2.0 UJ	0.13 J	1.0 UJ	10 UJ	100 UJ		10 UJ	20 UJ		0.98 R	1.0 U	1.0 U	1.0 U	2.0 U	110 J	29	120 J	3.7 J		12 J	1.2 J
MW21	10/21/08	N	2.0 UJ	0.10 UJ	2 U	10 UJ	294 J	14900 J	10 U	20 U		1.00 U	0.50 U	2.00 U	2.0 U	5.00 U	66	68.80	149 J	2.69 J		7.27 U	2.38 J
MW21	4/6/16	N	0.092 J	0.016 J	0.70 J	1.0 J	22.8 J		1.7 J	20.0 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	25.9	101	83.6	1.8		6.8	0.63 J
MW21	7/20/16	FD	0.50 U	5.5	5.0 U	0.86 J	23.5 J		5.0 U	20.0 U		0.24 U	0.50 U	1.0 U	1.0 U	2.0 U	29.9	84.9	78.0	1.7		6.6	0.90 J
MW21	7/20/16	N	0.11 J	8.5	5.0 U	1.3 J	29.4 J		5.0 U	20.0 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	29.4	84.5	84.0	1.7		6.8	0.93 J
MW21	10/11/16	N	0.50 U	5.7	0.38 J	1.8 J	6.2 J		0.44 J	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	30.5	74.4	82.0	1.8		6.6	0.61 J
MW21	1/18/17	N	0.080	2.9	0.39 J	2.2	6.8 J		0.25	6.2		0.060	0.28	0.26	0.23	0.24	25.4	86.8	88.0	1.8		7.4	0.75 J
MW21	4/18/17	N	0.50 U	0.017 J	5.0 U	0.44 J	100 U		5.0 U	20.0 U		0.22 U	0.50 U	1.0 U	1.0 U	2.0 U	26.7	78.6	92.0	1.8		7.5	0.77 J
MW21	10/3/17	N	0.082 J	0.096 U	0.28 J	1.2 J	100 U		2.5 U	20.0 U		0.76 U	0.50 U	0.50 U	0.50 U	1.0 U	35.2	72.6	70.5	1.8		7.1	0.76 J
MW21	10/17/18	N	1.0 U	0.099 U	1.0 U	1.2 J	100 U		2.5 U	20.0 U		0.80 U	0.50 U	0.50 U	0.50 U	1.0 U	35.4	66.6	65.6	1.9		6.0	1.1
MW21	4/24/19	N	0.17 U	0.086 U	0.23 J	1.5 J	46.7 U		0.79 U	6.9 U		0.23 U	0.15 U	0.18 U	0.15 U	0.22 U	32.6	78.4	72.8	1.6		6.4 B	0.94 J
MW21	10/15/19	N	0.17 U	0.088 U	0.23 J	0.72 J	46.7 U		0.79 U	7.0 J		0.23 U	0.15 U	0.18 U	0.15 U	0.22 U	35.1	87.1	83.1	1.6		5.9	0.47 U

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Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW22	2/9/98	N	13	1 U	4	255	5.5 U		3700	121			0.1 U	1 U	1 U	1 U	186	56.3				17.9	0.47 U
MW22	2/9/98	N2		1 U	2 U	9.5 U				12.6			0.1 U	1 U	1 U	1 U							
MW22	5/14/02	N			1.4 U	0.3 U	22.9 J		3.5 J	2.7 J													
MW22	8/6/02	N	0.01 U	0.078	2.2 J	9.8 J	2500		170	7.3 J		5 U	1 U	5 U	5 U	5 U	150	7.2	170	0.15 U		12	1.3
MW22	8/6/02	N2			1.4 U	0.3 U	25 J		0.42 U	4.9 J													
MW22	9/24/03	N	0.5 U	0.34	7	140	56900		2570	120 J		1 U	0.25 U	2.5 U	2.5 U	2.5 U	132	4.9	101.8	2.15		3 J	1.7
MW22	9/24/03	N2	0.5 U		1 U	20	2770		542	20 J													
MW22	9/21/04	N	10.0 UJ	0.220	2.76 J	71.6 J	13600 J		963 J	48.4 J		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	130 J	11 J	885 J	2.2 J		6.7 R	3.86 R
MW22	9/21/04	N2			0.164 J	0.473 J	25.0 UJ		15.0 UJ	2.31 J													
MW22	9/28/05	N	2.0 U	0.16 J	1.0 UJ	9.8 J	2100 J		130 J	8.0 J		1.0 U	0.50 U	5.0 U	5.0 U	5.0 U	91 J	9.6 J	130 J	1.7 J		18 R	0.94 J
MW22	9/28/05	N2			1.0 UJ	10 UJ	50 UJ		1.3 J	20 UJ													
MW22	9/18/07	N	2.0 UJ	0.13 J	1.0 UJ	10 UJ	100 UJ		10 UJ	20 UJ		0.99 R	1.0 U	1.0 U	1.0 U	2.0 U	110 J	8.2	160 J	2.5 J		10 J	1.0 J
MW22	5/20/08	N	2.0 UJ	0.77 J	1.0 U	0.98 J	100 UJ		3.6	5.4 J		0.95 U	1.0 UJ	1.0 U	1.0 U	2.0 UJ	110 =	8.4	200	2.3		12	3.0 J
MW22	10/21/08	N	2.0 UJ	0.09 UJ	2.60 J	10 UJ	303 J	11100 J	0.01 U	20 U		1.00 U	0.5 U	2.0 U	2.0 U	5.0 U	90	4.69	111 J	1.48 J		6.95	21.10 J
MW22	6/2/09	N	0.8 UJ	0.1 UJ	2 U	10 UJ	83.1 =	10000 J	10 U	20 U		1.0 UJ	0.5 U	0.22 J	2.0 U	5.0 U	70 J	6.92	99.6098	1.97 J		6.73	1.7 UJ
MW22	10/6/09	N	0.83 UJ	0.1 UJ	2 UJ	13.1 J	1560 J	11500 J	168 J	6.7 J		0.994 UJ	0.1 UJ	0.4 UJ	0.4 UJ	1 UJ	147 J	7 J	106.54 J	5.31 J		7.53 J	8.62 J
MW22	5/18/10	N	1.3 U	0.1 U									0.5 U	5 U	5 U	5 U	66 UB	9.21		1.9 J		6.9	58.8 UB
MW22	10/6/10	N	1.3 U	0.13 UB	2 U	4.1 J	74.2 J	3680	16.7 U	20 U		1.0 U	0.1 U	0.4 U	0.4 U	1 U	62	1.8 J	40.9	0.90 J		5.6 J	24.6
MW22	6/29/11	N	0.9 U	0.1 U	2 UJ	4.5 J	499	3700	27.6	20 U		0.999 U	0.1 U	0.4 U	0.4 U	1 U	32.	0.78 J+	34.10	0.46 J		3.9 J	11
MW22	10/18/11	N	0.50 U	0.098 U	0.45 J	2.1 J+	50 U	3600 B	2.7 J	10 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	43	1.0 U	37.30	0.50 J		3.5 J	1.0 U
MW22	5/22/12	N	0.50 U	0.084 J	2.0 U	2.3 J	160	5000 =	13	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	49	3.4	50.60	0.76 J		3.9 J	10
MW22	10/16/12	N	0.50 U	0.096 U	0.59 J	10 U	50 U	5000 =	5.7 J	20 U		0.19 U	2.5 UJ	5.0 UJ	5.0 UJ	10 UJ	48	4.1	53.1	0.48 J		5.0 U	36
MW22	5/22/13	N	0.50 U	0.11	2.0 U	10 U	50 U	4000 B	10 U	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	41	3.7		1.0 J		3.9	15
MW22	10/8/13	N	0.50 U	0.14	0.24 J	10.0 U	50 U	5200 B	2.8 J	20 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	45	7.2		1.4 J		4.7	10
MW22	5/14/14	N		0.093 J																			
MW22	9/24/14	N	0.50 U	0.27	0.22 J	2.0 U	25 J		19	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	51	1.7	60	0.69		3.6	0.71 J
MW22	4/21/15	N	0.50 U	0.072 J	0.60 J	2.8	390		23	20 U		0.21 U	0.50 U	1.0 U	1.0 U	2.0 U	42	1.9	57	0.69		3.7	0.57 J
MW22	10/13/15	N	0.50 U	0.041 J	5.0 U	1.2 J	100 U		5.0 U	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	46.3	1.7	52.3	0.65		2.8	0.74 J
MW22	4/6/16	N	0.50 U	0.025 J	5.0 U	0.92 J	17.5 J		2.2 J	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	50.8	1.3	57.7	0.61		2.9	5.3
MW22	7/20/16	N	0.50 U	0.030 J	5.0 U	3.4	235		10	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	58.6	1.2	64.0	0.60		3.1	1.7
MW22	10/12/16	N	0.50 U	0.043 J	0.41 J	1.7 J	85.4 J		5.4	20.0 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	67.2	1.7	70.0	0.53		3.5	0.96 J
MW22	1/18/17	N	0.080 J	0.058 J	0.44 J	3.4	186		10.6	6.2		0.060	0.28	0.26	0.23	0.24	58.4	2.1	94.0	0.65		3.8	1.1

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW22	4/21/17	N	0.50 U	0.090 J	5.0 U	2.6	100 U		0.31 J	20.0 U		0.23 U	0.50 U	1.0 U	1.0 U	2.0 U	62.9	2.8	110	0.77		4.4	0.93 J
MW22	10/4/17	N	0.39 J	0.049 J	1.0 U	2.6	198		11.9	8.5 J		0.89 U	0.50 U	0.50 U	0.50 U	1.0 U	74.1	2.7	77.9	0.71		3.7	0.90 J
MW22	10/17/18	N	1.0 U	0.10 U	1.0 U	3.2	100 U		2.5 U	16.3 J		0.81 U	0.50 U	0.50 U	0.50 U	1.0 U	61.7	2.5	70.2	0.71		3.8	0.78 J
MW22	4/24/19	N	0.17 U	0.085 U	0.27 J	1.8 J	166		9.6	9.6 J		0.28 U	0.15 U	0.18 U	0.15 U	0.22 U	60.3	4.1	102	0.75		4.1 B	0.84 J
MW22	10/16/19	N	0.17 U	0.095 U	0.35 J	3.3	509		99	11.5 J		0.23 U	0.15 U	0.18 U	0.15 U	0.22 U	62.6 H	3.6	71.2	0.71		4.5 B	12.4
MW23	2/26/98	N	57	1 U	2 U	17.6 U	5.5 U		128	43.6			2	1 U	77	2	120	8.7				7.6	0.47 U
MW23	2/26/98	N2		1 U	2 U	14.2 U				6.6			2 =	1 U	77 =	2 =							
MW23	9/11/01	N	10 U	0.49	1.2	6.3 J	630		140	37		0.24 U	0.44 U	0.5 U	0.4 U	1.2 U	110	10	140	0.13 U		8.2 U	5.6
MW23	9/11/01	N2			0.62 J	2.2 U	35 U		29	4.7 J													
MW23	4/13/16	N	0.50 U	0.095 U	0.58 J	2.0 U	35.1 J		5.0 U	20.0 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	197	29.5	255	1.8		7.1	0.62 J
MW23	7/20/16	N	0.50 U	0.31	0.70 J	2.0 U	100 U		5.0 U	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	195	30.6	230	1.8		7.2	0.66 J
MW23	10/11/16	N	0.50 U	0.094 U	0.71 J	0.90 J	100 U		0.38 J	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	194	32.3	230	1.9		8.1	0.54 J
MW23	1/19/17	N	0.080	0.015	0.75 J	0.64 J	5.3		0.25	6.2		0.061	0.28	0.26	0.23	0.24	177	35.1	238	1.8		8.2	0.81 J
MW23	4/19/17	N	0.50 U	0.095 U	0.59 J	2.0 U	100 U		5.0 U	20.0 U		0.22 U	0.50 U	1.0 U	1.0 U	2.0 U	179	34.7	304	1.9		9.1	0.76 J
MW23	10/2/17	N	0.50 U	0.098 U	0.66 J	1.5 J	100 U		2.5 U	20.0 U		0.81 U	0.50 U	0.50 U	0.50 U	1.0 U	197	40.3	240	2.0		9.1	0.68 J
MW23	6/1/18	N	1.0 U	0.10 U	0.74 J	0.90 J	100 U		2.5 U	20.0 U		0.77 U	0.50 U	0.50 U	0.50 U	1.0 U	194	42.3	256	2.0		8.8	0.81 J
MW23	10/17/18	N	1.0 U	0.099 U	0.58 J	0.82 J	100 U		2.5 U	20.0 U		0.79 U	0.50 U	0.50 U	0.18 J	1.0 U	191	39.7	239	2.1		8.7	0.90 J
MW23	4/23/19	N	0.17 U	0.087 U	0.65 JB	0.99 JB	46.7 U		0.79 U	6.9 U		0.24 U	0.15 U	0.18 U	0.15 U	0.22 U	187	44.6	255	2.1		9.0	0.86 J
MW23	10/14/19	N	6.4	0.085 U	0.64 J	0.67 J	46.7 U		2.6	6.9 U		0.65 J	0.15 U	0.18 U	0.15 U	0.22 U	195	46.2	250	2.1 H		8.1	0.47 U
MW24	2/8/98	N	10 U	4 U	4.3	53	5.5 U		1030	50.7			3 U	2 U	3 U	5 U	253	18.7				5.2	1.8
MW24	2/8/98	N2		4 U	2 U	9.5 U				23			3 U	2 U	3 U	5 U							
MW24	12/6/00	N	0.53 U	123 J	1.6	27	6500		530	11		5.9 U	0.1 U	1 U	0.29	1 U	180	21	310	2.3		7.1	5.5
MW24	12/6/00	N2	0.53 U		0.29	25 U	25 U		15 U	25 U		5.9 U	0.1 U	1 U	0.29	1 U							
MW24	4/24/01	N	0.1 U	0.11	2.4	30	7310		508	23		5.3 U	0.1 U	1 U	1 U	1 U	256	36	348	3.64 =		12	3.36
MW24	4/24/01	N2	0.1 U		0.29	5.2	25 U		2.4	11		5.3 U								3.64			
MW24	4/7/16	N	0.11 J	0.044 J	5.0 U	3.0	420		28.4	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	168	9.1	135	1.9		17.4	0.79 J
MW25	2/9/98	N	17	1	6.6	462	30.2 U		4480	321			0.1 U	1 U	1 U	1 U	455	15.6				9.9	0.47 U
MW25	2/9/98	N2		1 =	2 U	9.5 U				16.4			0.1 U	1 U	1 U	1 U							
MW25	4/11/16	N	0.50 U	0.024 J	1.1 J	17.6	6090		148	12.4 J		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	33.7	37.8	137	2.4		3.8	1.5
MW25	7/26/16	N	0.50 U	0.30	5.0 U	1.3 J	28.8 J		1.0 J	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	40.3	49.1	108	3.2		5.0	0.70 J
MW25	10/10/16	FD	0.50 U	0.17	5.0 U	0.71 J	100 U		0.27 J	20.0 U		0.21 U	0.50 U	1.0 U	1.0 U	2.0 U	31.1	16.9	54.0	1.6		2.7	0.44 J
MW25	10/10/16	N	0.50 U	0.23	5.0 U	0.62 J	5.4 J		0.46 J	20.0 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	31.1	17.5	52.0	1.6		2.8	0.44 J

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW25	1/18/17	N	0.080	4.9	0.35	1.2 J	28.2 J		0.70 J	6.2		0.063	0.28	0.26	0.23	0.24	46.0	45.2	112	2.8		4.9	0.78 J
MW25	4/18/17	N	0.50 U	0.094 U	5.0 U	1.4 J	100 U		5.0 U	20.0 U		0.21 U	0.50 U	1.0 U	1.0 U	2.0 U	81.3	29.0	108	2.9		7.3	0.82 J
MW25	10/13/17	N	1.0 U	0.051 J	1.0 U	1.3 J	100 U		2.5 U	20.0 U		0.78 U	0.50 U	0.50 U	0.50 U	1.0 U	79.5	36.1	125	3.2		7.0	0.84 J
MW25	10/13/17	N	1.0 U	0.083 J	1.0 U	1.1 J	100 U		2.5 U	20.0 U		0.80 U	0.50 U	0.50 U	0.50 U	1.0 U	78.7	35.0	122	3.2		7.0	0.81 J
MW25	5/31/18	N	1.0 U	0.096 U	0.28 J	1.3 J	100 U		2.5 U	20.0 U		0.84 U	0.50 U	0.50 U	0.50 U	1.0 U	112	12.5	123	2.4		6.0	1.1
MW25	10/19/18	N	1.0 U	0.095 U	1.0 U	4.7	100 U		1.3 J	20.0 U		0.80 U	0.50 U	0.50 U	0.50 U	0.41 J	98.2	30.1	138	2.8		5.9	0.95 J
MW25	4/24/19	N	5.0	0.091 U	0.27 J	1.3 J	46.7 U		0.79 U	6.9 U		0.23 U	0.15 U	0.18 U	0.15 U	0.22 U	92.3	27.2	117	2.6		5.5 B	1.7
MW25	10/15/19	N	0.17 U	0.088 U	0.24 J	1.5 J	46.7 U		0.79 U	7.6 J		0.24 U	0.15 U	0.18 U	0.15 U	0.22 U	404	20.2	205	2.1		3.9	0.47 U
MW26	12/6/00	N	0.65 U	118 J	1.1	21	25 U		94	17		5 U	0.1 U	1 U	1 U	1 U	230	29	350	2.8		540	8
MW26	12/6/00	N2	0.65 U	115 J	2.8	27	16000		300	35		5 U	0.1 U	1 U	1 U	1 U	270	28	330	2.8		770	6.1
MW26	12/6/00	N3	0.7 U		4	25 U	25 U		89	25 U		5 U	0.1 U	1 U	1 U	1 U							
MW26	12/6/00	N4			1.1	25	16000		290	33													
MW26	4/24/01	N	0.1 U	0.1 U	3	13	6980		132	24		5.4 U	0.1 U	1 U	1 U	1 U	240	22	294	5 =		10	2.79
MW26	4/24/01	N2	0.1 U		0.24	25 U	36		15 U	19700										5			
MW26	6/18/01	N	0.1 U	1	1.1	25 U	25 U		15 U	25 U		5 U	0.1 U	1 U	1 U	1 U	230	27	326	30		13	6.67
MW26	6/18/01	N2	0.1 U		3.6	18	9140		232	28										30 =			
MW26	9/10/01	N	10 U	0.16 J	1.5	10 U	2300		94	24		0.24 U	0.44 U	0.5 U	0.4 U	1.2 U	260	30	300	3.2		12	0.34 U
MW26	9/10/01	N2	10 U	0.16 J	0.8 J	4 J	100 J		4 U	3.8 J		0.24 U	0.44 U	0.5 U	0.4 U	1.2 U	260	29	310	3.2		12	2.7
MW26	9/10/01	N3			0.75 J	2.9 J	55 J		1.5 U	3.7 U													
MW26	9/10/01	N4			1.6	13	2500		96	24													
MW26	5/14/02	N		0.1	1.4 J	5 J	1530		57.2	9.7 J		5 U	1 U	5 U	5 U	5 U	260	27	300	3 H		15	5
MW26	5/14/02	N2			1.4 U	1.2 J	11.2 U		0.73 J	9.3 J									300				
MW26	8/5/02	N	0.01 U	0.03 J	3	2.5 J	385		17.2	16.3 J		5 U	1 U	5 U	5 U	5 U	270	18	310	0.15 U		14	4.5
MW26	8/5/02	N2	0.01 U	0.035 J	1.4 U	0.3 U	11.2 U		0.56 J	13.7 J		5 U	1 U	5 U	5 U	5 U	280	19	310	0.15 U		11	24
MW26	8/5/02	N3			2.7	3.9 J	728		26	18.7 J													
MW26	8/5/02	N4			3.2	0.3 U	11.2 U		0.42 U	7.4 J													
MW26	4/29/03	N	0.5 U	0.1 U	1 U	4	1290		46	10 U		7.1 U	0.5 U	5 U	5 U	5 U	248	18	262	3.5		14	7
MW26	4/29/03	N2	0.5 U	0.11 U	1 U	2 J	25 U		5 U	10 U		7.1 U	0.5 U	5 U	5 U	5 U	250	18.7	257	3.6		14	12
MW26	4/29/03	N3	0.5 U		2 J	5	1690		48	20													
MW26	4/29/03	N4			1 U	1 U	25 U		5 U	10 U													
MW26	9/23/03	N	0.5 U	0.11 U	1 U	1 J	740		29	10 U		1 U	0.25 U	2.5 U	2.5 U	2.5 U	250	11	90.28	3.74		2 U	6.4
MW26	9/23/03	N2	0.5 U		1 U	1 U	50 U		5 U	10 U													

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Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW26	5/4/04	FD	10.0 U	0.219 UB	0.295 J	2.37 R	399 R	27400	15.2 R	7.82 R		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	242	17 =	291	4.0 J		44 R	4.35 J
MW26	5/4/04	FD2			0.323 J	1.19 R	49.3 R		2.07 R	4.15 R													
MW26	5/4/04	N	10.0 U	0.242 UB	0.264 J	2.62 R	458 R	26700	17.8 R	10.5 R		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	242	17 =	284	3.9 J		42 R	3.75 J
MW26	5/4/04	N2			0.289 J	1.24 R	39.0 R		1.23 R	4.36 R													
MW26	9/23/04	FD	10.0 U	5.97 BE	1.00 U	3.10 J	542		22.2	6.95 J		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	280	28	1770	1.5 J		170 =	1.95
MW26	9/23/04	FD2		4.11 =	0.354 J	2.01 J	6.48 J		4.00 J	3.80 J													
MW26	9/23/04	N	10.0 U	0.393 =	1.00 U	3.73 J	620		24.8	7.86 J		5.00 U	0.500 U	5.00 U	5.00 U	5.00 U	280	28	1670	1.5 J		120 =	2.40
MW26	9/23/04	N2			0.314 J	1.57 J	8.81 J		19.3	4.70 J													
MW26	5/10/05	FD	2.0 U	0.11 U	1.0 U	10 U	50 U		0.59 J	20 U		0.93 U	0.50 U	5.0 U	5.0 U	5.0 U	240 J	26 J	370 J	2.2 J		180 R	1.1 R
MW26	5/10/05	FD2			1.0 U	2.2 J	510		14	17 J													
MW26	5/10/05	N	2.0 U	0.061 J	1.0 U	10 U	50 U		1.8 J	20 U		0.94 U	0.50 U	5.0 U	5.0 U	5.0 U	250 J	26 J	340 J	2.8 J		200 R	2.1 R
MW26	5/10/05	N2			1.0 U	2.4 J	680		18	7.5 J													
MW26	9/27/05	FD	2.0 UJ	0.024 J	1.0 UJ	10 U	50 U		1.7 J	20 U		0.92 U					250 J	25 J	380	2.0 J		160 J	0.68 J
MW26	9/27/05	FD2			1.0 UJ	2.6 J	50 UJ		10 U	20 U													
MW26	9/27/05	N	2.0 UJ	0.027 J	1.0 UJ	10 U	50 U		2.3 J	20 U		0.93 U	0.50 U	5.0 U	5.0 U	5.0 U	240 J	25 J	350	1.9 J		170 =	0.72 J
MW26	9/27/05	N2			1.0 UJ	2.2 J	50 U		10 U	20 U													
MW26	6/7/06	FD	2.0 U	0.091 J	1.0 UJ	10 UJ	50 UJ		1.0 UJ	20 UJ		0.94 U	0.50 U	5.0 U	5.0 U	5.0 U	250 J	29 J	350 J	1.8 J		150 =	0.94 J
MW26	6/7/06	N	2.0 U	0.11 UJ	1.0 UJ	10 UJ	50 UJ		2.5 UJ	20 UJ		0.95 U	0.50 U	5.0 U	5.0 U	5.0 U	260 J	29 J	320 J	1.8 J		140 =	1.4 J
MW26	9/26/06	N	2.0 UJ	0.11 U	1.0 UJ	10 UJ	50 UJ		10 UJ	20 UJ		0.91 U	0.50 U	5.0 U	5.0 U	5.0 U	270 J	23 J	350	1.5 J		87 J	2.0
MW26	5/8/07	FD	2.0 UJ	0.095 UJ	1.0 UJ	10 UJ	100 UJ		10 UJ	20 UJ		0.92 R	1.0 U	1.0 U	1.0 U	2.0 U	270 =	21 J	360	1.6		250 J	0.76 J
MW26	5/8/07	N	2.0 UJ	0.093 UJ	1.0 UJ	10 UJ	100 UJ		10 UJ	20 UJ		0.92 R	1.0 U	1.0 U	1.0 U	2.0 U	260 =	21 J	360	1.5		210 J	0.68 J
MW26	9/19/07	N	2.0 UJ	0.095 U	1.0 UJ	10 UJ	100 R		10 UJ	20 UJ		0.93 U	1.0 U	1.0 U	1.0 U	2.0 U	240	25	500 J	1.3		220 J	0.84 J
MW26	5/20/08	N	2.0 UJ	0.096 UJ	0.34 J	0.47 J	100 UJ		2.5 U	20 U		0.96 U	1.0 UJ	1.0 U	1.0 U	2.0 UJ	240 =	22	430	1.8		230	0.65 J
MW26	10/22/08	N	2.0 UJ	0.1 U	2 UJ	6.2 J	777 J	35100 J	10 UJ	20 UJ		1 U	0.5 U	2.0 U	2.0 U	5.0 U	256 J	21.7	432 J	2.36 J		235	18.6
MW26	6/2/09	N	0.8 UJ	0.1 UJ	2 U	10 UJ	341 =	33400 =	10 U	20 U		1.0 UJ	0.5 UB	0.3 J	2.0 UB	5.0 U	229 J	203	414.7082	1.83 J		2360	1.7 UJ
MW26	10/6/09	N	0.83 UJ	0.1 UJ	2 UJ	3.8 J	325 J	42900 J	10 UJ	20 UJ		0.997 UJ	0.1 UJ	0.4 UJ	0.4 UJ	1 UJ	227 J	20.7 J	491.28 J	1.7 J		212 J	1 UJ
MW26	5/19/10	N	1.3 U	0.13 J	1.8 J	10 UJ	236. J	39800. J	10 UJ	15. J		1.0 U	0.5 U	5 U	5 U	5 U	230	20.4	486	2.41 J		279	20.1 J
MW26	10/5/10	N	1.3 U	0.1 UJ	2 U	10 U	376	37900	10 U	20 U		1.0 U	0.1 U	0.4 U	0.4 U	1 U	236	20.0 J	478	1.77		232	0.6 J
MW26	6/29/11	N	0.9 U	0.1 U	2 UJ	10 U	274	41600	10 U	20 U		0.992 U	0.1 U	0.4 U	0.4 U	1 U	202	18.3 J	463.00	1.83 J		230	1 U
MW26	10/19/11	N	0.50 U	0.099 U	0.87 J	2 U	50 U	29000 B	10 U	10 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	230	19	329.00	1.6 J		200	0.88 J
MW26	5/22/12	N	0.50 U	0.10 U	2.0 U	10 U	50 U	28000 =	10 U	20 U		0.19 UJ	0.50 U	1.0 U	1.0 U	2.0 U	200	19	325.00	1.7		210	0.43 J
MW26	10/16/12	N	0.50 U	0.095 U	0.99 J	10 U	50 U	29000 =	10 U	20 U		0.19 U	0.50 U	1.0 U	1.0 UJ	2.0 U	190	19	344	1.8 J		200 =	0.30 J

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW26	5/22/13	N	0.50 U	0.094 U	2.0 U	10 U	50 U	25000 B	10 U	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	170	18		1.9 J		230	0.55 J
MW26	10/8/13	N	0.50 U	0.095 U	0.37 J	10.0 U	50 U	26000 B	10 U	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	160	18		1.5 J		110 J	1.0 U
MW26	5/14/14	N		0.095 U																			
MW26	9/24/14	FD	0.50 U	0.095 U	0.32 J	2.0 U	100 U		5.0 U	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	150	17	280	1.2		160	1.0 U
MW26	9/24/14	N	0.50 U	0.095 U	0.43 J	2.0 U	100 U		5.0 U	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	150	17	290	1.2		160	1.0 U
MW26	4/21/15	FD		0.094 U	0.76 J	2.0 U	100 U		5.0 U	20 U		0.19 U											
MW26	4/21/15	N	0.50 U	0.094 U	0.71 J	2.0 U	100 U		4.4 J	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	160	16	240	2.4		82	1.0 U
MW26	10/13/15	N	0.50 U	0.096 U	0.76 J	2.0 U	100 U		5.0 U	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	198	15.3	229	1.9		74.6	0.32 J
MW26	10/13/15	N	0.50 U	0.096 U	0.50 J	2.0 U	100 U		5.0 U	20.0 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	194	15.5	235	1.9		75.7	0.33 J
MW26	4/5/16	N	0.15 J	0.095 U	0.57 J	1.5 J	21.4 J		58.7	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	154	9.4	183	1.4		36.1	0.26 J
MW27	10/20/11	N	0.10 J	0.17	1.7 J	2.3 J+	50 U	2300 B	10 U	10 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	63	10	28.70	3.1		9.1	1.6
MW27	4/7/16	FD		0.094 U	5.0 U	2.0 U	29.9 J		2.3 J	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
MW27	4/7/16	N	0.092 J	0.15	0.59 J	1.9 J	21.1 J		5.0 U	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	137	20.0	113	6.5		14.2	1.9
MW28	10/20/11	N	0.19 J	690	0.55 J	2 U	50 U	12000 B	6.0 J	10 U		0.19 U	0.50 U	1.0 U	1.0 U	0.38 J	130	5.5	132.00	1.3		5.2	2.7
MW28	10/17/12	N	0.50 U	0.095 U	0.48 J	10 U	50 U	12000 =	10 U	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	120	11	134	1.8		5.0 U	0.81 J
MW28	10/9/13	N	0.50 U	0.049 J	2.0 UJ	10.0 UJ	50 UJ	12000 J	10 UJ	20 UJ		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U *	120 J	21		2.2 J		6.5	0.49 J
MW28	10/9/13	N2																		2.2 J			
MW28	9/25/14	N	0.50 U	0.099	0.31 J	2.0 U	100 U		5.0 U	20 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	120	18	150	1.3		5.1	0.85 J
MW28	10/14/15	N	0.50 U	0.32	5.0 U	2.0 U	100 U		5.0 U	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	126	15.5	155	2.0		5.4	0.69 J
MW28	4/6/16	N	0.20 J	47	5.0 U	0.76 J	29.7 J		2.7 J	20.0 U		0.21 U	0.50 U	1.0 U	1.0 U	2.0 U	122	9.4	125	1.2		4.8	1.6
MW28	7/21/16	N	0.10 J	100	0.49 J	2.0 U	25.9 J		10.8	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	127	11.4	138	1.9		5.4	1.9
MW28	10/13/16	FD	0.36 J	1200	0.38 J	0.61 J	100 U		7.9	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	1.4 J	125	11.4	142	1.7		5.6	12.3
MW28	10/13/16	N	0.28 J	1900	0.39 J	0.76 J	9.8 J		8.5	20.0 U		0.12 J	0.50 U	1.0 U	1.0 U	1.4 J	128	11.4	148	1.7		5.8	12.3
MW28	1/20/17	N	0.20 J	290	0.47 J	1.0 J	5.3		10.3	6.2		0.063	0.28	0.26	0.23	0.24	113	13.4	138	2.0		6.1	4.9
MW28	4/20/17	N	0.50 U	22	0.55 J	1.0 J	11.9 J		4.0 J	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	123	22.5	186	3.3		7.1	1.6
MW28	10/3/17	N	0.18 J	0.16	0.38 J	1.4 J	100 U		2.5 U	20.0 U		0.76 U	0.50 U	0.50 U	0.50 U	1.0 U	116	31.8	171	2.3		6.6	0.83 J
MW28	10/17/18	N	1.0 U	0.10 U	0.38 J	1.0 J	100 U		2.5 U	7.1 J		0.81 U	0.50 U	0.50 U	0.50 U	1.0 U	106	21.2	126	2.2		5.4	0.97 J
MW28	4/23/19	N	0.17 U	0.20 ^	0.39 JB	2.0 B	62.7 J		2.1 JB	6.9 U		0.25 U	0.15 U	0.18 U	0.15 U	0.22 U	106	19.3 F1	128	2.1		5.4	0.67 J
MW28	10/16/19	N	0.17 U	0.086 U	0.31 J	0.50 U	46.7 U		0.79 U	6.9 U		0.23 U	0.15 U	0.18 U	0.15 U	0.22 U	105 H	22.9	120	2.1		5.3 B	0.51 J
MW29	4/13/16	N	1.4	14000	5.0 U	6.7	1660		2270	20.0 U		34	0.50 U	0.58 J	0.90 J	7.2	87.0	4.5	120	0.10 U		6.4	70.2
MW29	7/21/16	FD	0.69	9100	5.0 U	2.1	1250		2740	20.0 U		30	0.50 U	0.83 J	1.2	9.3	83.8	9.2	110	0.10 U		10.5	51.6
MW29	7/21/16	N	0.67	11000	5.0 U	2.1	1290		2800	20.0 U		35	0.50 U	0.74 J	1.3	9.1	84.0	9.2	110	0.10 U		10.4	50.5

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
MW29	10/14/16	N	0.32 J	20000	0.35 J	2.6	1970		3220	20.0 U		32	0.50 U	0.98 J	1.6	11	83.0	15.9	124	0.10 U		16.3	56.9
MW29	1/24/17	FD	0.37 J	67000	0.35	3.3	1380		3170	6.2		41	0.28	0.90 J	1.3	12	112	4.3	122	0.035		6.9	49.9
MW29	1/24/17	N	0.40 J	56000	0.35	1.9 J	1400		3290	6.2		40	0.28	0.98 J	1.2	12	113	4.3	120	0.035		6.8	51.4
MW30	4/13/16	N	0.50 U	0.72	5.0 U	0.81 J	46.1 J		147	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	42.0	3.2	82.3	3.4		32.8	1.2
MW30	7/21/16	N	0.50 U	1.7	5.0 U	2.0 U	100 U		52.9	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	44.5	2.9	82.0	4.0		29.9	1.4
MW30	10/12/16	N	0.084 J	3.8	5.0 U	1.1 J	13.8 J		67.3	20.0 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	52.2	3.8	86.0	1.6		30.5	
MW30	1/20/17	N	0.080	5.5	0.35	1.0 J	9.4 J		52.8	6.2		0.060	0.28	0.26	0.23	0.24	45.9	2.4	60.0	0.80		9.9	1.4
MW30	4/21/17	N	0.50 U	3.6	5.0 U	0.95 J	8.1 J		37.7	20.0 U		0.21 U	0.50 U	1.0 U	1.0 U	2.0 U	46.2	0.57 J	250	1.1		5.4	0.93 J
MW30	10/5/17	N	0.11 J	2.1	1.0 U	1.1 J	49.4 J		31.5	20.0 U		0.80 U	0.50 U	0.50 U	0.50 U	1.0 U	48.4	0.55	52.3	2.0		4.6	1.6
MW30	5/31/18	N	1.0 U	630	1.0 U	1.1 J	100 U		23.3	20.0 U		1.7	0.50 U	0.50 U	0.50 U	0.39 J	67.3	0.66	69.1	1.6		3.7	1.7
MW30	10/18/18	N	1.0 U	640	1.0 U	0.94 J	100 U		15.4	7.9 J		1.3	0.50 U	0.50 U	0.50 U	1.0 U	77.5	1.7	82.9	2.2		3.7	2.6
MW30	4/25/19	N	0.17 U	800	0.23 U	1.1 J	46.7 U		25.1	6.9 U		0.24 U	0.15 U	0.18 U	0.15 U	0.22 U	66.9	1.4	69.9	0.55		3.8 B	5.3
MW30	10/17/19	N	0.17 U	41	0.23 U	1.2 J	46.7 U		22.6	6.9 U		0.24 U	0.15 U	0.18 U	0.15 U	0.28 J	88.8 H	0.62	92	0.53		2.4	0.85 J
MW31	4/12/16	N	0.50 U	0.030 J	5.0 U	2.0 U	20.9 J		7.7	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	122	0.99 J	125	0.68		4.0	0.59 J
MW31	7/20/16	N	0.50 U	4.6	5.0 U	0.86 J	100 U		2.2 J	20.0 U		0.20 U	0.50 U	1.0 U	1.0 U	2.0 U	105	0.76 J	100	0.49		1.9	0.68 J
MW31	10/13/16	N	0.11 J	3.7	5.0 U	0.76 J	100 U		5.0 U	20.0 U		0.19 U	0.50 U	1.0 U	1.0 U	2.0 U	110	0.63 J	104	0.46		1.5	0.29 J
MW31	1/17/17	N	0.20 J	0.69	0.59 J	1.4 J	10.5 J		0.52 J	6.2		0.061	0.28	0.26	0.23	0.24	113	0.53 J	118	0.51		1.7	0.74 J
MW31	4/18/17	N	0.21 J	0.026 J	5.0 U	0.58 J	100 U		0.63 J	20.0 U		0.22 U	0.50 U	1.0 U	1.0 U	2.0 U	111	0.68 J	136	0.73		2.8	0.72 J
MW31	10/2/17	N	1.9	0.095 U	0.51 J	5.0	1630		34.5	9.7 J		0.82 U	0.50 U	0.50 U	0.50 U	1.0 U	104	1.4	93.9	0.54		1.3	0.50 J
MW31	10/16/18	N	1.0 U	0.097 U	1.0 U	0.63 J	100 U		1.0 J	20.0 U		0.79 U	0.50 U	0.50 U	0.50 U	0.46 J	187	0.67	181	0.55		1.5	0.70 J
MW31	4/24/19	N	3.0	0.086 U	0.23 J	1.1 J	46.7 U		1.9 J	6.9 U		0.23 U	0.15 U	0.18 U	0.15 U	0.22 U	178	0.61	191	0.63		1.6 B	0.67 J
MW31	10/14/19	N	0.17 U	0.086 U	0.23 U	1.3 J	46.7 U		0.79 U	6.9 U		0.23 U	0.15 U	0.18 U	0.15 U	0.22 U	240	0.52	231	0.33 F1		0.84	0.47 U
MW32	5/17/19	N	0.17 U	0.14	0.23 U	1.6 J	46.8 J		135	17.0 J		0.23 U	0.15 U	0.18 U	0.15 U	0.22 U	35.9	1.7	40.3	1.3 H		11.3	1.1
MW32	10/14/19	N	0.17 U	0.088 U	0.23 U	0.77 J	134		14.8	6.9 U		0.24 U	0.15 U	0.18 U	0.15 U	0.22 U	33.3	0.74	35.7	0.64 H		3.8	0.69 J
RW01	10/9/97	N		1 U																			
RW01	4/23/01	N		0.1 U								5.3 U	0.5 U	5 U	5 U								
RW01	9/11/01	N		0.071 J								0.26 U	0.44 U	0.5 U	0.4 U	1.2 U							
RW01	9/28/01	N		0.1 U																			
RW01	9/28/01	N2		0.05 U																			
RW01	5/14/02	N		0.23								5 U	1 U	5 U	2 J	2 J							
RW01	8/6/02	N		0.04								5 U	1 U	5 U	5 U	5 U							
RW01	4/29/03	N		0.1 J								7.1 U	0.5 U	5 U	5 U	5 U							

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Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
RW01	9/23/03	N		0.28								0.97 U	0.25 U	2.5 U	2.5 U	2.5 U							
RW01	11/20/03	N		0.24																			
RW01	5/4/04	FD		0.134 UB								5.00 U	0.500 U	5.00 U	5.00 U	5.00 U							
RW01	5/4/04	N		0.140 UB								5.00 U	0.500 U	5.00 U	5.00 U	5.00 U							
RW01	9/22/04	FD		1.51								5.00 U	0.500 U	5.00 U	5.00 U	5.00 U							
RW01	9/22/04	N		0.201								5.00 U	0.500 U	5.00 U	5.00 U	5.00 U							
RW01	11/1/04	N		0.0952 U																			
RW01	5/10/05	FD		0.053 J								0.93 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW01	5/10/05	N		0.068 J								0.93 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW01	7/7/05	FD		0.035 J								0.96 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW01	7/7/05	N		0.043 J								0.95 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW01	9/27/05	FD		0.049 J								0.93 UJ	0.50 U	5.0 U	5.0 U	5.0 U							
RW01	9/27/05	N		0.050 J								0.92 UJ	0.50 U	5.0 U	5.0 U	5.0 U							
RW01	5/31/06	FD		0.055 J								0.94 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW01	5/31/06	N		0.048 J								0.93 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW01	9/25/06	FD		0.023 J								0.93 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW01	9/25/06	N		0.11 U								0.93 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW01	5/9/07	FD		0.048 J								0.95 R	1.0 U	1.0 U	1.0 U	2.0 U							
RW01	5/9/07	N		0.035 J								0.95 R	1.0 U	1.0 U	1.0 U	2.0 U							
RW01	9/18/07	FD		0.27 R								0.93 R	1.0 U	1.0 U	1.0 U	2.0 U							
RW01	9/18/07	N		0.093 UJ								0.93 R	1.0 U	1.0 U	1.0 U	2.0 U							
RW01	5/20/08	FD		0.066 J								0.95 U	1.0 UJ	1.0 U	1.0 U	2.0 UJ							
RW01	5/20/08	N		0.060 J								0.95 U	1.0 UJ	1.0 U	1.0 U	2.0 UJ							
RW01	10/23/08	FD										1 U											
RW01	10/23/08	N										1 U											
RW01	12/11/08	FD		0.1 U									0.1 U	0.4 U	0.4 U	1.0 U							
RW01	12/11/08	N		0.1 UJ									0.1 U	0.4 U	0.4 U	1.0 U							
RW01	6/2/09	FD		0.1 UJ								1.0 UJ	0.5 UB	2.0 UB	2.0 UB	5.0 UB							
RW01	6/2/09	N		0.1 UJ								1.0 UJ	0.5 UB	2.0 UB	2.0 UB	5.0 U							
RW01	7/6/09	FD											0.5 U	2.0 U	2.0 U	5.0 U							
RW01	7/6/09	N											0.5 U	2.0 U	2.0 U	5.0 U							
RW01	10/7/09	FD		0.1 UJ								0.997 UJ	0.1 UJ	0.4 UJ	0.4 UJ	1 UJ							

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
RW01	10/7/09	N		0.1 UJ								1 UJ	0.1 UJ	0.4 UJ	0.4 UJ	1 UJ							
RW01	5/19/10	FD		0.1 U								1.0 U	0.4 U	5 U	5 U	5 U							
RW01	5/19/10	N		0.1 U								1.0 U	0.4 UJ	5 UJ	5 UJ	5 UJ							
RW01	10/5/10	FD		0.1 U								1.0 U	0.1 U	0.4 U	0.4 U	1 U							
RW01	10/5/10	N		0.1 U								1.0 U	0.1 UJ	0.4 UJ	0.4 UJ	1 UJ							
RW01	11/30/10	N											0.1 U	0.4 U	0.4 U	1 U							
RW01	6/30/11	FD		0.1 U								1 U	0.1 U	0.4 U	0.4 U	1 U							
RW01	6/30/11	N		0.1 U								0.997 U	0.1 U	0.4 U	0.4 U	1 U							
RW01	10/20/11	FD		0.039 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW01	10/20/11	N		0.040 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW01	12/16/11	FD		0.031 R																			
RW01	12/16/11	N		0.096 UJ																			
RW01	5/23/12	FD		0.017 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW01	5/23/12	N		0.019 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW01	7/11/12	FD		0.035 J																			
RW01	7/11/12	FD2		0.033 J																			
RW01	7/11/12	N		0.027 J																			
RW01	10/17/12	FD		0.035 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW01	10/17/12	N		0.045 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW01	12/3/12	FD		0.094 UJ																			
RW01	12/3/12	FD2		0.095 U																			
RW01	12/3/12	N		0.094 UJ																			
RW01	12/3/12	N2		0.095 U																			
RW01	5/21/13	FD		0.029 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW01	5/21/13	N		0.031 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW01	10/8/13	N		0.040 J								0.20 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW01	10/8/13	N2		0.097 U								0.20 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW01	5/13/14	N		0.051 J																			
RW01	9/25/14	N		0.043 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW01	4/21/15	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW01	10/15/15	N		0.094 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW01	4/5/16	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
RW01	10/10/16	N		0.020 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW01	4/19/17	N		0.015 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW01	10/20/17	N		0.10 U								0.87 U	0.50 U	0.50 U	0.37 J	1.0 U							
RW01	6/5/18	N		0.095 U								0.75 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW01	10/15/18	N		0.10 U								0.79 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW01	4/22/19	N		0.087 U								0.23 U	0.15 U	0.18 U	0.15 U	0.22 U							
RW01	10/1/19	N		0.093 U								0.24 U	0.15 U	0.18 U	0.15 U	0.22 U							
RW02	10/9/97	FD		2																			
RW02	10/9/97	N		0.9 J																			
RW02	10/24/97	N		1 U																			
RW02	4/8/98	N		1 U																			
RW02	4/24/01	N		0.1 U								5.4 U	0.1 U	1 U	1 U	1 U							
RW02	9/11/01	N		9.5								0.25 U	0.44 U	0.5 U	0.4 U	1.2 U							
RW02	9/28/01	N		0.1 U																			
RW02	9/28/01	N2		0.1 U																			
RW02	9/28/01	N3		0.05 U																			
RW02	9/28/01	N4		0.05 U																			
RW02	5/14/02	N		0.1								5 U	1 U	5 U	5 U	5 U							
RW02	8/6/02	N		0.04 U								5 U	1 U	5 U	5 U	5 U							
RW02	8/6/02	N2		0.04 U								5 U	1 U	5 U	5 U	5 U							
RW02	4/29/03	N		0.11 U								6.8 U	0.5 U	5 U	5 U	5 U							
RW02	9/24/03	N		0.11 U								0.97 U	0.25 U	2.5 U	2.5 U	2.5 U							
RW02	9/24/03	N2		0.11 U								0.96 U	0.25 U	2.5 U	2.5 U	2.5 U							
RW02	5/4/04	N		0.0252 UB								5.00 U	0.500 U	5.00 U	5.00 U	5.00 U							
RW02	9/22/04	N		0.398								5.00 U	0.500 U	5.00 U	5.00 U	5.00 U							
RW02	11/1/04	N		0.0962 U																			
RW02	5/10/05	N		0.11 U								0.93 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW02	9/27/05	N		0.11 U								0.92 UJ	0.50 U	5.0 U	5.0 U	5.0 U							
RW02	5/31/06	N		0.11 UJ								0.93 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW02	9/25/06	N		0.11 U								0.93 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW02	5/9/07	N		0.092 UJ								0.97 R	1.0 U	1.0 U	1.0 U	2.0 U							
RW02	9/18/07	N		0.093 UJ								0.93 R	1.0 U	1.0 U	1.0 U	2.0 U							

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Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
RW02	5/20/08	N		0.095 UJ								0.95 U	1.0 UJ	1.0 U	1.0 U	2.0 UJ							
RW02	10/23/08	N										1.33 U											
RW02	12/10/08	N		0.1 U									0.1 U	0.4 U	0.4 U	1.0 U							
RW02	6/2/09	N		0.1 UJ								1.0 UJ	0.5 U	2.0 U	2.0 U	5.0 U							
RW02	10/7/09	N		0.1 UJ								0.997 UJ	0.1 UJ	0.4 UJ	0.4 UJ	1 UJ							
RW02	5/19/10	N		0.1 U								1.0 U	0.4 U	5 U	5 U	5 U							
RW02	10/5/10	N		0.1 U								1.0 U	0.1 U	0.4 U	0.4 U	1 U							
RW02	6/30/11	N		0.1 U								0.999 U	0.1 U	0.4 U	0.4 U	1 U							
RW02	10/20/11	N		0.095 U								0.20 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW02	5/23/12	N		0.097 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW02	10/17/12	N		0.037 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW02	10/17/12	N2		0.057 J																			
RW02	10/17/12	N3		0.094 UJ																			
RW02	12/3/12	N		0.095 U																			
RW02	12/3/12	N2		0.094 UJ																			
RW02	5/21/13	N		0.097 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW02	10/8/13	N		0.094 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW02	5/13/14	N		0.095 U																			
RW02	9/25/14	N		0.096 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW02	4/21/15	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW02	10/15/15	N		0.096 U								0.20 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW02	4/5/16	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW02	10/10/16	N		0.097 U								0.20 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW02	4/17/17	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW02	10/20/17	N		0.10 U								0.75 U	0.50 U	0.50 U	0.33 J	1.0 U							
RW02	4/17/18	N		0.024 U								0.79 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW02	10/16/18	FD		0.099 U								0.80 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW02	10/16/18	N		0.097 U								0.77 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW02	4/22/19	FD		0.085 U								0.23 U	0.15 U	0.18 U	0.15 U	0.22 U							
RW02	4/22/19	N		0.085 U								0.23 U	0.15 U	0.18 U	0.15 U	0.22 U							
RW02	10/1/19	N		0.089 U								0.24 U	0.15 U	0.18 U	0.15 U	0.22 U							
RW03	10/9/97	N		1 U																			

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
RW03	9/11/01	N		0.1 J								0.28 U	0.44 U	0.5 U	0.4 U	1.2 U							
RW03	9/28/01	N		0.1 U																			
RW03	9/28/01	N2		0.05 U																			
RW03	5/14/02	N		0.094 J								5 U	1 U	5 U	5 U	5 U							
RW03	8/6/02	N		0.04 U								5 U	1 U	5 U	5 U	5 U							
RW03	4/29/03	N		0.11 U								6.8 U	0.5 U	5 U	5 U	5 U							
RW03	9/23/03	N		0.11 U								0.96 U	0.25 U	2.5 U	2.5 U	2.5 U							
RW03	5/4/04	N		0.0952 U								5.00 U	0.500 U	5.00 U	5.00 U	5.00 U							
RW03	9/22/04	N		2.18								5.00 U	0.500 U	5.00 U	5.00 U	5.00 U							
RW03	11/1/04	N		0.0962 U																			
RW03	5/10/05	N		0.11 U								0.93 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW03	9/27/05	N		0.11 U								0.93 UJ	0.50 U	5.0 U	5.0 U	5.0 U							
RW03	5/31/06	N		0.11 UJ								0.94 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW03	9/25/06	N		0.11 U								0.93 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW03	5/9/07	N		0.092 UJ								0.95 R	1.0 U	1.0 U	1.0 U	2.0 U							
RW03	9/18/07	N		0.093 UJ								0.93 R	1.0 U	1.0 U	1.0 U	2.0 U							
RW03	5/20/08	N		0.097 UJ								0.96 U	1.0 UJ	1.0 U	1.0 U	2.0 UJ							
RW03	10/23/08	N										1 U											
RW03	12/10/08	N		0.1 U									0.1 U	0.4 U	0.4 U	1.0 U							
RW03	6/2/09	N		0.1 UJ								1.0 UJ	0.5 U	2.0 U	2.0 U	5.0 U							
RW03	10/7/09	N		0.1 UJ								0.997 UJ	0.1 UJ	0.4 UJ	0.4 UJ	1 UJ							
RW03	5/19/10	N		0.1 U								1.0 U	0.4 UJ	5 UJ	5 UJ	5 UJ							
RW03	10/5/10	N		0.1 U								1.0 U	0.1 U	0.4 U	0.4 U	1 U							
RW03	6/30/11	N		0.1 U								0.994 U	0.1 U	0.4 U	0.4 U	1 U							
RW03	10/20/11	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW03	5/23/12	N		0.097 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW03	10/17/12	N		0.015 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW03	12/3/12	N		0.095 U																			
RW03	12/3/12	N2		0.095 UJ																			
RW03	5/21/13	N		0.053 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW03	10/8/13	N		0.096 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW03	5/13/14	N		0.095 U																			

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
RW03	9/25/14	FD		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW03	9/25/14	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW03	4/21/15	N		0.097 U								0.20 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW03	10/15/15	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW03	4/5/16	N		0.094 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW03	10/10/16	N		0.095 U								0.20 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW03	4/17/17	N		0.095 U								0.20 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW03	10/20/17	N		0.096 U								0.79 U	0.50 U	0.50 U	0.29 J	1.0 U							
RW03	4/17/18	N		0.025 U								0.84 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW03	10/16/18	N		0.098 U								0.77 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW03	4/22/19	N		0.085 U								0.24 U	0.15 U	0.18 U	0.15 U	0.22 U							
RW03	10/1/19	N		0.088 U								0.27 U	0.15 U	0.18 U	0.15 U	0.22 U							
RW04	10/9/97	N		1 U																			
RW04	4/23/01	N		0.1 U								5 U	0.5 U	5 U	5 U								
RW04	9/11/01	N		0.073 J								0.25 U	0.44 U	0.5 U	0.4 U	1.2 U							
RW04	9/28/01	N		0.1 U																			
RW04	9/28/01	N2		0.05 U																			
RW04	5/14/02	N		0.13								5 U	1 U	5 U	5 U	5 U							
RW04	8/6/02	N		0.04 U								5 U	1 U	5 U	5 U	5 U							
RW04	4/29/03	N		0.11 U								7.4 U	0.5 U	5 U	5 U	5 U							
RW04	9/23/03	N		0.11 U								0.99 U	0.25 U	2.5 U	2.5 U	2.5 U							
RW04	5/4/04	N		0.100 U								5.00 U	0.500 U	5.00 U	5.00 U	5.00 U							
RW04	9/22/04	N		0.266								5.00 U	0.500 U	5.00 U	5.00 U	5.00 U							
RW04	10/1/04	N		0.0962 R																			
RW04	5/10/05	N		0.11 U								0.94 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW04	9/27/05	N		0.11 U								0.91 UJ	0.50 U	5.0 U	5.0 U	5.0 U							
RW04	5/31/06	N		0.11 UJ								0.97 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW04	9/25/06	N		0.11 U								0.93 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW04	5/9/07	N		0.093 UJ								0.96 R	1.0 U	1.0 U	1.0 U	2.0 U							
RW04	9/18/07	N		0.093 UJ								0.93 R	1.0 U	1.0 U	1.0 U	2.0 U							
RW04	5/20/08	N		0.093 UJ								0.96 U	1.0 UJ	1.0 U	1.0 U	2.0 UJ							
RW04	10/23/08	N										1 U											

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
RW04	12/10/08	N		0.1 U									0.1 U	0.4 U	0.4 U	1.0 U							
RW04	6/2/09	N		0.1 UJ								1.0 UJ	0.5 U	2.0 U	2.0 U	5.0 U							
RW04	10/7/09	N		0.15 J								0.994 UJ	0.1 UJ	0.4 UJ	0.4 UJ	1 UJ							
RW04	10/20/09	N		0.1 UJ																			
RW04	5/19/10	N		0.1 U								1.0 U	0.4 UJ	5 UJ	5 UJ	5 UJ							
RW04	10/5/10	N		0.1 U								1.0 U	0.1 U	0.4 U	0.4 U	1 U							
RW04	6/30/11	N		0.1 U								0.992 U	0.1 U	0.4 U	0.4 U	1 U							
RW04	10/20/11	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW04	5/23/12	N		0.094 U								0.20 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW04	10/17/12	N		0.071 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW04	12/3/12	N		0.095 U																			
RW04	12/3/12	N2		0.094 UJ																			
RW04	5/21/13	N		0.094 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW04	10/8/13	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW04	5/13/14	N		0.023 J																			
RW04	9/25/14	N		0.096 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW04	4/21/15	N		0.094 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW04	10/15/15	N		0.094 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW04	4/5/16	N		0.094 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW04	10/10/16	N		0.094 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW04	4/17/17	N		0.094 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW04	10/20/17	N		0.096 U								0.81 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW04	4/17/18	N		0.024 U								0.92 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW04	10/15/18	N		0.11 U								0.90 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW04	4/22/19	N		0.11 U								0.25 U	0.15 U	0.18 U	0.15 U	0.22 U							
RW04	10/1/19	N		0.085 U								0.24 U	0.15 U	0.18 U	0.15 U	0.29 J							
RW05	5/4/04	N		0.0935 U								5.00 U	0.500 U	5.00 U	5.00 U	5.00 U							
RW05	9/22/04	N		0.293								5.00 U	0.500 U	5.00 U	5.00 U	5.00 U							
RW05	11/1/04	N		0.0962 U																			
RW05	5/10/05	N		0.11 U								0.93 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW05	9/27/05	N		0.11 U								0.92 UJ	0.50 U	5.0 U	5.0 U	5.0 U							
RW05	5/31/06	N		0.11 UJ								0.94 U	0.50 U	5.0 U	5.0 U	5.0 U							

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
RW05	9/25/06	N		0.11 U								0.93 U	0.50 U	5.0 U	5.0 U	5.0 U							
RW05	5/9/07	N		0.092 UJ								0.93 R	1.0 U	1.0 U	1.0 U	2.0 U							
RW05	9/18/07	N		0.093 UJ								1.0 R	1.0 U	1.0 U	1.0 U	2.0 U							
RW05	5/20/08	N		0.095 UJ								0.95 U	1.0 UJ	1.0 U	1.0 U	2.0 UJ							
RW05	10/23/08	N										1 U											
RW05	12/10/08	N		0.1 U									0.1 U	0.4 U	0.4 U	1.0 U							
RW05	6/2/09	N		0.1 UJ								1.0 UJ	0.5 U	2.0 U	2.0 U	5.0 U							
RW05	10/7/09	N		0.1 UJ								0.997 UJ	0.1 UJ	0.4 UJ	0.4 UJ	1 UJ							
RW05	5/19/10	N		0.1 U								1.0 U	0.4 U	5 U	5 U	5 U							
RW05	10/5/10	N		0.1 U								1.0 U	0.1 U	0.4 U	0.4 U	1 U							
RW05	6/30/11	N		0.1 U								0.991 U	0.1 U	0.4 U	0.4 U	1 U							
RW05	10/20/11	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW05	5/23/12	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW05	10/17/12	N		0.030 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW05	12/4/12	N		0.095 UJ																			
RW05	12/4/12	N2		0.095 U																			
RW05	5/21/13	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW05	10/8/13	N		0.098 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW05	5/13/14	N		0.095 U																			
RW05	9/25/14	N		0.096 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW05	4/21/15	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW05	10/15/15	N		0.10 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW05	4/5/16	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW05	10/10/16	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW05	4/17/17	N		0.097 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW05	10/20/17	N		0.095 U								0.81 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW05	4/17/18	FD		0.024 U								0.75 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW05	4/17/18	N		0.024 U								0.75 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW05	10/15/18	N		0.16								0.87 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW05	4/22/19	N		0.085 U								0.25 U	0.15 U	0.18 U	0.15 U	0.22 U							
RW05	10/1/19	FD		0.091 U								0.26 U	0.15 U	0.18 U	0.15 U	0.22 U							
RW05	10/1/19	N		0.090 U								0.26 U	0.15 U	0.18 U	0.15 U	0.22 U							

Appendix A.1

Historical Groundwater Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Location	Date[2]	Compound [1] / Units / Type[3]	Methane ug/L	Pentachlorophenol ug/L	Arsenic ug/L	Copper ug/L	Iron ug/L	Magnesium ug/L	Manganese ug/L	Zinc ug/L	Total Petroleum Hydrocarbons (C10-C28) DRO mg/L	Naphthalene ug/L	Benzene ug/L	Ethylbenzene ug/L	Toluene ug/L	Xylenes (total) ug/L	Alkalinity, total (as CaCO3) mg/L	Chloride mg/L	Hardness mg/L	Nitrate (as N) mg/L	Oil and grease (HEM), polar mg/L	Sulfate mg/L	Total organic carbon (TOC) mg/L
RW06	9/25/14	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW06	4/21/15	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW06	10/15/15	N		0.018 J								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW06	4/5/16	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW06	10/10/16	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW06	4/18/17	N		0.095 U								0.19 U	0.50 U	1.0 U	1.0 U	2.0 U							
RW06	10/20/17	N		0.095 U								0.75 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW06	4/17/18	N		0.024 U								0.83 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW06	10/16/18	N		0.099 U								0.78 U	0.50 U	0.50 U	0.50 U	1.0 U							
RW06	4/22/19	N		0.086 U								0.24 U	0.15 U	0.18 U	0.15 U	0.22 U							
RW06	10/1/19	N		0.086 U								0.24 U	0.15 U	0.18 U	0.15 U	0.22 U							
RW06 SHOP	4/17/18	N		0.024 U								0.79 U	0.50 U	0.50 U	1.5	1.0 U							
RW06 SHOP	10/16/18	N		0.095 U								0.75 U	0.50 U	0.50 U	1.7	1.0 U							
RW06 SHOP	4/22/19	N		0.095 U								0.23 U	0.15 U	0.18 U	0.50 U	0.22 U							
RW06 SHOP	10/1/19	N		0.086 U								0.25 U	0.15 U	0.18 U	0.15 U	0.22 U							

Appendix A.1

Historical Groundwater Sampling Results
Penta Wood Products Superfund Site
Siren, Wisconsin

Notes:

[1]	Only compounds currently sampled are included on this table.
[2]	Samples collected before September 2014 were not collected by GHD. GHD has no ability to verify data or data qualifiers.
[3]	Sample type is listed for normal samples (N) and field duplicates (FD), numbers differentiate from multiple samples of similar sample type during the same sampling event.
mg/L	Concentrations listed with units of milligrams per liter.
ug/L	Concentrations listed with units of micrograms per liter.
*	LCS or LCSD exceeds the control limits.
B	Compound was detected in the method blank.
F1	MS and/or MSD Recovery exceeds the control limits
H	Analysis was performed after holding time.
J	Concentration was estimated below the reporting limit.
p	The %RPD between the primary and confirmation column/detector is >40%. The lower value has been reported.
U	Compound was not detected above the reporting limit.
UJ	Compound was not detected above the estimated reporting limit.

Appendix A.2

Historical LNAPL Thickness - Monitoring Wells
Penta Wood Products Superfund Site
Siren, Wisconsin

	Monitoring Well LNAPL Thickness (feet)				
Date	**MW10S**	**MW18**	**MW19**	**MW20**	**MW29**
Sep-01	0.01	0.27	0.51	0.11	NA
May-02	0.00	0.29	0.23	0.00	NA
Aug-02	0.00	0.33	0.22	0.00	NA
May-03	0.00	0.00	0.00	0.00	NA
Sep-03	0.00	0.32	0.24	0.04	NA
May-04	0.00	0.45	0.36	0.35	NA
Sep-04	0.21	0.54	0.67	0.52	NA
May-05	0.29	0.48	0.63	0.36	NA
Sep-05	0.87	0.06	0.83	1.15	NA
May-06	0.00	0.00	0.29	0.00	NA
Sep-06	0.00	0.05	0.80	0.69	NA
Apr-07	0.58	0.04	0.74	1.22	NA
May-07	0.58	0.03	0.54	1.20	NA
Sep-07	0.04	0.16	1.07	0.00	NA
May-08	0.40	1.19	0.90	1.71	NA
Oct-08	0.14	0.04	0.00	0.00	NA
Jun-09	0.54	1.58	1.60	1.45	NA
Oct-09	0.63	1.92	1.46	1.02	NA
May-10	0.51	2.01	1.10	0.85	NA
Oct-10	0.00	0.57	0.59	0.00	NA
Jun-11	0.00	0.42	0.79	0.00	NA
Oct-11	0.00	0.53	1.07	0.00	NA
May-12	0.69	0.79	0.80	2.17	NA
Aug-12	0.04	0.43	0.89	0.30	NA
Oct-12	0.00	0.45	0.91	0.88	NA
Dec-12	0.02	0.44	1.06	0.95	NA
May-13	0.17	0.53	0.94	1.08	NA
Oct-13	0.00	0.70	1.25	0.81	NA
May-14	0.00	0.79	0.22	0.22	NA
Sep-14	0.00	0.56	0.30	0.00	NA
2/13/15	0.00	0.56	0.24	0.00	NA
2/20/15	0.00	0.53	0.23	0.00	NA
3/24/15	0.00	0.34	0.52	0.00	NA
4/16/15	0.00	0.58	NM	0.00	NA
5/14/15	0.00	0.57	NM	0.00	NA
10/12/15	0.00	0.42	0.07	0.01	NA
4/4/16	0.00	0.66	0.25	0.01	0.00

Appendix A.2

Historical LNAPL Thickness - Monitoring Wells
Penta Wood Products Superfund Site
Siren, Wisconsin

	Monitoring Well LNAPL Thickness (feet)				
Date	**MW10S**	**MW18**	**MW19**	**MW20**	**MW29**
7/18/16	0.00	0.52	0.00	0.00	0.00
10/7/16	0.00	0.67	0.01	0.01	0.00
1/11/17	0.00	NM	0.18	0.02	0.00
4/17/17	0.00	0.53	0.27	0.01	0.47
7/13/17	0.00	0.51	0.10	0.01	0.15
9/28/17	0.00	NM	NM	0.01	0.45
1/3/18	0.00	0.45	0.26	0.01	0.70
5/25/18*	0.00	0.53	0.62	0.01	0.88
7/11/18	0.00	0.50	0.19	0.01	0.48
10/15/18	0.00	0.48	0.41	0.01	0.63
1/2/19	0.00	0.51	0.37	0.34	0.76
4/17/19	0.00	0.50	0.20	0.01	0.33
7/22/19	0.00	0.49	0.00	0.03	0.00
10/2/19	0.00	0.51	0.03	0.07	0.00

Notes:

NM - Not Measured
NA - Not Applicable
* - MW10S measured on 6/1/18 and MW29 measured on 5/24/18

Appendix A.3

Historical Groundwater Extraction Summary
Penta Wood Products Superfund Site
Siren, Wisconsin

Operation Period	Volume of Groundwater Extracted (gallons)
09/27/00 to 12/18/00	11,712,960
02/02/01 to 02/08/01	691,200
03/16/01 to 06/10/01	9,288,000
06/15/01 to 09/27/01	6,822,720
02/27/04 to 12/31/04	18,548,154
01/01/05 to 12/31/05	21,374,796
01/01/06 to 12/31/06	14,759,392
01/01/07 to 12/31/07	16,551,336
01/01/08 to 12/31/08	18,118,696
01/01/09 to 12/31/09	18,533,648
01/01/10 to 12/31/10	18,561,632
01/01/11 to 12/31/11	17,796,668
01/01/12 to 12/31/12	23,051,892
01/01/13 to 12/31/13	29,793,563
01/01/14 to 12/31/14	18,415,098
01/01/15 to 06/30/15	6,282,127
07/01/15 to 11/23/15	5,125,729
Total Gallons Extracted	255,427,611

Appendix A.4

Historical Influent Pentachlorophenol Concentrations
Penta Wood Products Superfund Site
Siren, Wisconsin

Date	Influent PCP Concentration (ug/L)
02/27/2004 to 12/31/2004*	9,227
01/01/2005 to 12/31/2005*	7,300
01/01/2006 to 12/31/2006*	6,425
01/01/2007 to 12/31/2007*	3,557
01/01/2008 to 12/31/2008*	3,255
March 2009	3,560
July 2009	3,140
September 2009	2,800
December 2009	2,030
March 2010	2050 J
June 2010	1,970
September 2010	1,830
December 2010	1,940
March 2011	2,470
June 2011	2,170
August 2011	1,700
October 2011	1,600
February 2012	2,600
May 2012	2,200
July 2012	1,900
October 2012	1,800
February 2013	1,100
May 2013	1,100
July 2013	1,800
October 2013	1,400
February 2014	1,800
May 2014	1,600
August 2014	2,100
September 2014	2,400
October 2014	2,400
November 2014	2,100
December 2014	4,600
January 2015	1,800
February 2015	480
March 2015	390
April 2015*	1,767
May 2015*	355
June 2015	550
July 2015*	1,100
August 2015	370
September 2015	750
October 2015	600
November 2015	1,100

Note:

* Average PCP influent concentration for that time period.

Appendix A.5

Historical Hazardous Waste Generation Summary
Penta Wood Products Superfund Site
Siren, Wisconsin

Date	Filter Cake (lb)	Misc. Debris (lb)	Carbon (lb)	LNAPL (lb)	Liquids‡ (gallons)	Yearly Total (lb)
2000	0	200	6,000	5,009*	0	11,209
2001	0	400	56,100	6,166*	0	62,666
2002	0	1,400	48,000	10,790*	27,756	87,946
2003	0	600	0	3,083*	1,376	5,059
2004	155,960	3,200	102,000	53,522*	0	314,682
2005	178,784	1,290	104,860	23,847*	0	308,924
2006	112,640	1,200	136,520	52,892*	0	303,252
2007	174,020	2,200	245,377	77,615*	0	517,387
2008	211,402	3,176	70,007	28,036	0	312,621
2009	233,840	1,116	49,757	35,659	0	320,372
2010	210,940	0	81,227	34,937	0	327,104
2011	292,903	0	74,247	0	0	367,150
2012	182,280	0	65,420	25,493	0	273,193
2013	156,760	0	46,571	27,252	0	230,582
2014	110,754	13,513	65,995	11,720	0	201,982
2015	0	0	22,248	0	0	22,248
2016	0	15,212†	34,877	14,374	0	49,251
2017	0	0	0	0	2,759	2,759
2018	0	0	0	0	0	0
2019	0	0	0	0	0	0

Note:

* - Volume shows the amount of waste disposed offsite and is estimated to be approximately 50 percent pure LNAPL and 50 percent mixture of water and emulsified LNAPL.

† - Miscellaneous debris includes sludge, filter cake, and drill cuttings from system decommissioning.

‡ - Prior to 2017, all liquids disposed were water. In 2017, liquids disposed were ferric sulfate water treatment chemicals.

lb - pounds

Appendix A.6

LNAPL Thickness and Recovery Summary - Extraction Wells
Penta Wood Products Superfund Site
Siren, Wisconsin

Well ID	Date	Depth to Water (feet) [1]	Depth to LNAPL (feet) [1]	LNAPL Thickness (feet)	Recovered LNAPL Volume (gallons)	Comments
EW02	2/18/2015	97.51	NP	0.00	NA	Groundwater extraction rate increased to 10 gpm
EW02	2/20/2015	97.52	NP	0.00	NA	
EW02	2/24/2015	97.59	NP	0.00	NA	
EW02	3/10/2015	97.67	NP	0.00	NA	
EW02	3/24/2015	97.76	NP	0.00	NA	
EW02	4/10/2015	97.79	NP	0.00	NA	
EW02	4/16/2015	97.76	NP	0.00	NA	
EW02	5/8/2015	97.77	NP	0.00	NA	Groundwater extraction rate increased to 12 gpm on 4/30/2015
EW02	5/21/2015	97.89	NP	0.00	NA	
EW02	6/3/2015	97.92	NP	0.00	NA	
EW02	6/16/2015	97.99	NP	0.00	NA	
EW02	7/8/2015	98.12	NP	0.00	NA	
EW02	7/21/2015	98.11	NP	0.00	NA	
EW02	7/29/2015	98.11	NP	0.00	NA	Groundwater extraction rate increased to 13.5 gpm
EW02	8/5/2015	98.18	NP	0.00	NA	
EW02	8/19/2015	98.11	NP	0.00	NA	
EW02	9/4/2015	97.83	NP	0.00	NA	
EW02	9/21/2015	97.76	NP	0.00	NA	
EW02	10/8/2015	97.72	NP	0.00	NA	
EW02	10/22/2015	97.64	NP	0.00	NA	
EW02	11/2/2015	97.58	NP	0.00	NA	
EW02	11/23/2015	NM	NM	NM	NA	Groundwater extraction pump turned off for pilot study
				Total LNAPL Recovered	0.0	

Appendix A.6

LNAPL Thickness and Recovery Summary - Extraction Wells
Penta Wood Products Superfund Site
Siren, Wisconsin

Well ID	Date	Depth to Water (feet) [1]	Depth to LNAPL (feet) [1]	LNAPL Thickness (feet)	Recovered LNAPL Volume (gallons)	Comments
EW04	11/4/2014	114.30	NP	0.00	NA	
EW04	12/11/2014	115.39	NP	0.00	NA	
EW04	12/23/2014	115.34	NP	0.00	NA	Groundwater extraction system shutdown pending carbon change-out
EW04	12/30/2014	115.26	NP	0.00	NA	Groundwater extraction system remained shutdown pending carbon change-out
EW04	1/8/2015	115.22	NP	0.00	NA	Groundwater extraction system remained shutdown pending carbon change-out
EW04	1/19/2015	115.23	NP	0.00	NA	Groundwater extraction system restarted after carbon change-out
EW04	1/22/2015	115.36	NP	0.00	NA	
EW04	1/30/2015	115.47	NP	0.00	NA	
EW04	2/3/2015	115.48	NP	0.00	NA	
EW04	2/13/2015	115.51	NP	0.00	NA	
EW04	2/17/2015	115.48	NP	0.00	NA	Groundwater extraction rate increased to 10 gpm
EW04	2/18/2015	115.51	NP	0.00	NA	
EW04	2/20/2015	115.43	NP	0.00	NA	
EW04	2/24/2015	115.53	NP	0.00	NA	
EW04	3/10/2015	115.58	NP	0.00	NA	
EW04	3/24/2015	115.67	NP	0.00	NA	
EW04	4/10/2015	115.69	NP	0.00	NA	
EW04	4/16/2015	115.69	NP	0.00	NA	
EW04	5/8/2015	115.69	NP	0.00	NA	Groundwater extraction rate increased to 12 gpm on 4/30/2015
EW04	5/21/2015	115.74	NP	0.00	NA	
EW04	6/3/2015	115.75	NP	0.00	NA	
EW04	6/16/2015	115.82	NP	0.00	NA	
EW04	7/8/2015	115.93	NP	0.00	NA	
EW04	7/21/2015	115.92	NP	0.00	NA	
EW04	7/29/2015	115.91	NP	0.00	NA	Groundwater extraction rate increased to 13.5 gpm
EW04	8/5/2015	115.97	NP	0.00	NA	
EW04	8/19/2015	115.95	NP	0.00	NA	
EW04	9/4/2015	115.78	NP	0.00	NA	
EW04	9/21/2015	115.61	NP	0.00	NA	
EW04	10/8/2015	115.58	NP	0.00	NA	
EW04	10/22/2015	115.58	NP	0.00	NA	
EW04	11/2/2015	115.45	NP	0.00	NA	
EW04	11/23/2015	NM	NM	NM	NA	Groundwater extraction pump turned off for pilot study
				Total LNAPL Recovered	0.0	

Appendix A.6

LNAPL Thickness and Recovery Summary - Extraction Wells
Penta Wood Products Superfund Site
Siren, Wisconsin

Well ID	Date	Depth to Water (feet) [1]	Depth to LNAPL (feet) [1]	LNAPL Thickness (feet)	Recovered LNAPL Volume (gallons)	Comments
EW05	11/4/2014	83.35	83.25	0.10	NA	
EW05	11/6/2014	NM	NM	NM	<0.1	
EW05	11/7/2014	91.51	91.44	0.07	NA	
EW05	11/11/2014	91.75	91.56	0.19	NA	
EW05	11/12/2014	91.65	91.48	0.17	NA	Temporary system shutdown due to alarm condition
EW05	11/17/2014	91.64	91.51	0.13	NA	
EW05	12/1/2014	91.58	91.46	0.12	NA	
EW05	12/8/2014	91.55	91.51	0.04	NA	
EW05	12/11/2014	91.65	91.52	0.13	NA	
EW05	12/23/2014	91.40	91.39	0.01	NA	Groundwater extraction system shutdown pending carbon change-out
EW05	12/30/2014	91.37	91.36	0.01	NA	Groundwater extraction system remained shutdown pending carbon change-out
EW05	1/8/2015	91.31	NP	0.00	NA	Groundwater extraction system remained shutdown pending carbon change-out
EW05	1/19/2015	91.32	NP	0.00	NA	Groundwater extraction system restarted after carbon change-out
EW05	1/22/2015	91.95	91.45	0.50	NA	
EW05	1/30/2015	92.00	91.49	0.51	0.1	Measurements recorded prior to LNAPL removal
EW05	2/3/2015	92.17	91.54	0.63	NA	
EW05	2/13/2015	92.14	91.54	0.60	NA	Groundwater extraction pump turned off
EW05	2/17/2015	91.72	91.49	0.23	NA	
EW05	2/20/2015	91.96	91.54	0.42	NA	
EW05	2/24/2015	91.91	91.56	0.35	NA	
EW05	2/27/2015	NM	NM	NM	0.3	Measurements recorded prior to LNAPL removal
EW05	3/10/2015	92.30	91.58	0.72	0.1	Measurements recorded prior to LNAPL removal
EW05	3/26/2015	92.42	91.62	0.80	NA	
EW05	3/31/2015	NM	NM	NM	0.5	
EW05	4/10/2015	92.50	91.71	0.79	NA	
EW05	4/16/2015	92.51	91.69	0.82	NA	
EW05	4/27/2015	NM	NM	NM	1.0	
EW05	5/8/2015	92.03	91.70	0.33	NA	
EW05	5/21/2015	92.34	91.76	0.58	1.0	
EW05	6/3/2015	92.29	91.79	0.50	0.4	
EW05	6/16/2015	92.40	91.86	0.54	0.3	
EW05	7/8/2015	92.34	91.95	0.39	NA	
EW05	7/10/2015	NM	NM	NM	0.5	
EW05	7/21/2015	92.58	91.93	0.65	NA	
EW05	7/23/2015	NM	NM	NM	0.5	
EW05	7/29/2015	92.69	91.96	0.73	NA	
EW05	8/5/2015	92.60	92.04	0.56	NA	
EW05	8/7/2015	NM	NM	NM	0.3	
EW05	8/19/2015	92.45	91.94	0.51	NA	
EW05	8/21/2015	NM	NM	NM	0.3	
EW05	9/4/2015	92.02	91.82	0.20	NA	
EW05	9/11/2015	NM	NM	NM	<0.1	
EW05	9/21/2015	91.67	91.66	0.01	NA	
EW05	10/8/2015	91.87	91.67	0.20	NA	
EW05	10/22/2015	91.66	91.65	0.01	NA	
EW05	11/2/2015	91.51	91.50	0.01	NA	
				Total LNAPL Recovered	5.5	

Appendix A.6

LNAPL Thickness and Recovery Summary - Extraction Wells
Penta Wood Products Superfund Site
Siren, Wisconsin

Well ID	Date	Depth to Water (feet) [1]	Depth to LNAPL (feet) [1]	LNAPL Thickness (feet)	Recovered LNAPL Volume (gallons)	Comments
EW06	11/5/2014	111.22	98.06	13.16	12.0	
EW06	11/12/2014	107.80	98.30	9.50	NA	Temporary system shutdown due to alarm condition
EW06	11/17/2014	110.34	98.52	11.82	NA	
EW06	11/24/2014	111.05	98.45	12.60	10.0	
EW06	11/25/2014	105.63	98.55	7.08	NA	
EW06	12/1/2014	108.60	98.53	10.07	NA	
EW06	12/4/2014	109.35	98.48	10.87	NA	
EW06	12/8/2014	101.90	97.89	4.01	NA	
EW06	12/11/2014	111.91	98.01	13.90	NA	Measurements recorded prior to LNAPL removal
EW06	12/11/2014	100.35	98.40	1.95	12.0	Measurements recorded immediately after LNAPL removal
EW06	12/15/2014	108.40	98.01	10.39	NA	
EW06	12/23/2014	109.35	98.01	11.34	NA	Measurements recorded prior to LNAPL removal
EW06	12/23/2014	99.50	98.35	1.15	13.0	Measurements recorded immediately after LNAPL removal, groundwater extraction system shutdown pending carbon change-out
EW06	12/30/2014	98.59	97.83	0.76	NA	Groundwater extraction system remained shutdown pending carbon change-out
EW06	1/8/2015	99.00	97.92	1.08	NA	Groundwater extraction system remained shutdown pending carbon change-out
EW06	1/19/2015	99.54	97.80	1.74	NA	Groundwater extraction system restarted after carbon change-out
EW06	1/22/2015	111.10	98.18	12.92	NA	
EW06	1/23/2015	98.90	98.50	0.40	12.0	Measurements recorded immediately after LNAPL removal
EW06	1/30/2015	109.35	98.22	11.13	NA	
EW06	2/3/2015	112.61	98.22	14.39	12.0	Measurements recorded prior to LNAPL removal
EW06	2/13/2015	112.44	98.22	14.22	14.0	Groundwater extraction pump turned off
EW06	2/17/2015	101.95	98.12	3.83	NA	
EW06	2/20/2015	105.20	98.18	7.02	NA	
EW06	2/24/2015	105.37	98.02	7.35	8.0	Measurements recorded prior to LNAPL removal
EW06	3/10/2015	108.36	98.22	10.14	8.0	Measurements recorded prior to LNAPL removal
EW06	3/24/2015	NM	NM	NM	8.0	Not measured due to equipment breakdown
EW06	3/26/2015	105.87	98.21	7.66	NA	
EW06	4/10/2015	105.55	98.39	7.16	10.0	
EW06	4/16/2015	106.02	98.36	7.66	10.0	
EW06	4/30/2015	106.33	98.47	7.86	8.0	Groundwater extraction rate increased to 6 gpm
EW06	5/8/2015	100.72	98.32	2.40	4.0	
EW06	5/21/2015	106.84	98.27	8.57	10.0	
EW06	6/3/2015	106.55	98.41	8.14	NA	
EW06	6/4/2015	NM	NM	NM	10.0	
EW06	6/16/2015	105.85	98.49	7.36	7.0	
EW06	7/8/2015	107.10	98.42	8.68	20.0	
EW06	7/10/2015	107.10	98.60	8.50	17.0	
EW06	7/21/2015	107.90	98.54	9.36	17.0	
EW06	7/29/2015	105.87	98.59	7.28	NA	Groundwater extraction rate decreased to 3 gpm
EW06	8/5/2015	105.98	98.65	7.33	14.0	
EW06	8/7/2015	NM	NM	NM	14.0	
EW06	8/19/2015	103.95	98.51	5.44	10.0	
EW06	9/4/2015	105.31	98.31	7.00	10.0	
EW06	9/21/2015	104.49	98.28	6.21	10.0	
EW06	10/8/2015	100.38	98.25	2.13	5.0	
EW06	10/22/2015	105.54	98.23	7.31	8.0	
EW06	11/2/2015	105.15	98.05	7.10	NA	
EW06	11/5/2015	NM	NM	NM	8.0	
EW06	11/23/2015	NM	NM	NM	NA	Groundwater extraction pump turned off for pilot study
				Total LNAPL Recovered	301.0	

Appendix A.6

LNAPL Thickness and Recovery Summary - Extraction Wells
Penta Wood Products Superfund Site
Siren, Wisconsin

Well ID	Date	Depth to Water (feet) [1]	Depth to LNAPL (feet) [1]	LNAPL Thickness (feet)	Recovered LNAPL Volume (gallons)	Comments
EW10	11/4/2014	108.20	103.92	4.28	NA	
EW10	11/5/2014	108.77	104.70	4.07	4.0	
EW10	11/18/2014	107.60	104.35	3.25	NA	
EW10	11/24/2014	107.45	103.94	3.51	0.0	LNAPL pump inoperable, unable to recover LNAPL
EW10	11/25/2014	107.50	103.91	3.59	NA	
EW10	12/1/2014	107.30	104.14	3.16	NA	
EW10	12/4/2014	107.33	104.11	3.22	NA	Measurements recorded prior to LNAPL removal
EW10	12/4/2014	105.35	104.05	1.30	2.0	Measurements recorded immediately after LNAPL removal
EW10	12/8/2014	104.29	103.17	1.12	NA	
EW10	12/11/2014	106.95	104.05	2.90	NA	Measurements recorded prior to LNAPL removal
EW10	12/11/2014	105.46	104.12	1.34	2.0	Measurements recorded immediately after LNAPL removal
EW10	12/15/2014	106.68	104.00	2.68	NA	
EW10	12/23/2014	107.25	103.91	3.34	NA	Measurements recorded prior to LNAPL removal
EW10	12/23/2014	104.75	104.06	0.69	4.0	Measurements recorded immediately after LNAPL removal, groundwater extraction system shutdown pending carbon change-out
EW10	12/30/2014	104.59	103.00	1.59	NA	Groundwater extraction system remained shutdown pending carbon change-out
EW10	1/8/2015	104.55	103.10	1.45	NA	Groundwater extraction system remained shutdown pending carbon change-out
EW10	1/19/2015	104.70	103.00	1.70	NA	Groundwater extraction system restarted after carbon change-out
EW10	1/22/2015	106.38	104.31	2.07	NA	
EW10	1/23/2015	104.40	104.38	0.02	2.0	Measurements recorded immediately after LNAPL removal
EW10	1/30/2015	105.76	104.28	1.48	NA	
EW10	2/3/2015	106.00	104.27	1.73	2.0	Measurements recorded prior to LNAPL removal
EW10	2/13/2015	106.82	104.24	2.58	3.0	Groundwater extraction pump turned off
EW10	2/17/2015	105.80	103.65	2.15	NA	
EW10	2/20/2015	106.40	103.81	2.59	NA	
EW10	2/24/2015	106.85	103.79	3.06	2.0	Measurements recorded prior to LNAPL removal
EW10	3/10/2015	107.80	103.81	3.99	2.0	Measurements recorded prior to LNAPL removal
EW10	3/24/2015	108.21	103.84	4.37	2.0	Measurements recorded prior to LNAPL removal
EW10	4/10/2015	108.96	103.86	5.10	3.0	
EW10	4/16/2015	108.18	103.90	4.28	2.0	
EW10	4/30/2015	107.81	103.84	3.97	2.0	
EW10	5/8/2015	106.84	103.46	3.38	2.5	
EW10	5/21/2015	107.46	103.62	3.84	2.5	
EW10	6/3/2015	107.51	103.60	3.91	NA	
EW10	6/4/2015	NM	NM	NM	2.5	
EW10	6/16/2015	108.20	103.85	4.35	2.0	
EW10	7/8/2015	108.53	103.96	4.57	3.0	
EW10	7/10/2015	107.85	103.97	3.88	NA	
EW10	7/21/2015	108.48	103.96	4.52	3.0	
EW10	7/29/2015	108.10	104.00	4.10	NA	
EW10	8/5/2015	108.85	104.00	4.85	2.5	
EW10	8/19/2015	108.57	103.74	4.83	3.0	
EW10	9/4/2015	108.91	103.60	5.31	3.0	
EW10	9/21/2015	108.35	103.62	4.73	3.0	
EW10	10/8/2015	107.72	103.33	4.39	2.5	
EW10	10/22/2015	109.10	103.56	5.54	3.0	
EW10	11/2/2015	109.50	103.27	6.23	NA	
EW10	11/5/2015	NM	NM	NM	3.0	
				Total LNAPL Recovered	67.5	

Appendix A.6

LNAPL Thickness and Recovery Summary - Extraction Wells
Penta Wood Products Superfund Site
Siren, Wisconsin

Well ID	Date	Depth to Water (feet) [1]	Depth to LNAPL (feet) [1]	LNAPL Thickness (feet)	Recovered LNAPL Volume (gallons)	Comments
EW12	11/4/2014	105.26	105.04	0.22	NA	
EW12	11/6/2014	NM	NM	NM	<0.1	
EW12	11/7/2014	108.26	108.15	0.11	NA	
EW12	11/11/2014	108.39	108.22	0.17	NA	
EW12	11/12/2014	101.16	101.14	0.02	NA	Temporary system shutdown due to alarm condition
EW12	11/17/2014	108.00	107.98	0.02	NA	
EW12	12/8/2014	100.99	NP	0.00	NA	
EW12	12/11/2014	108.98	108.97	0.01	NA	
EW12	12/23/2014	109.75	NP	0.00	NA	Groundwater extraction system shutdown pending carbon change-out
EW12	12/30/2014	101.10	100.88	0.22	NA	Groundwater extraction system remained shutdown pending carbon change-out
EW12	1/8/2015	101.20	100.84	0.36	NA	Groundwater extraction system remained shutdown pending carbon change-out
EW12	1/19/2015	101.35	100.85	0.50	NA	Groundwater extraction system restarted after carbon change-out
EW12	1/22/2015	108.16	108.15	0.01	NA	
EW12	1/30/2015	108.96	108.96	0.00	NA	
EW12	2/3/2015	109.13	109.13	0.00	NA	
EW12	2/13/2015	109.98	NP	0.00	NA	Groundwater extraction pump turned off
EW12	2/17/2015	101.56	101.08	0.48	NA	
EW12	2/20/2015	101.90	101.32	0.58	NA	
EW12	2/24/2015	102.01	101.31	0.70	NA	
EW12	2/27/2015	NM	NM	NM	0.1	Measurements recorded prior to LNAPL removal
EW12	3/10/2015	102.35	101.35	1.00	0.1	Measurements recorded prior to LNAPL removal
EW12	3/24/2015	102.45	101.33	1.12	NA	
EW12	3/31/2015	NM	NM	NM	1.0	
EW12	4/10/2015	102.22	101.36	0.86	NA	
EW12	4/16/2015	102.32	101.36	0.96	NA	
EW12	4/27/2015	NM	NM	NM	1.0	
EW12	5/8/2015	101.99	101.19	0.80	NA	
EW12	5/21/2015	102.39	101.40	0.99	1.0	
EW12	6/3/2015	102.34	101.45	0.89	0.4	
EW12	6/16/2015	102.27	101.50	0.77	0.3	
EW12	7/8/2015	102.26	101.54	0.72	NA	
EW12	7/10/2015	NM	NM	NM	0.5	
EW12	7/21/2015	102.10	101.61	0.49	NA	
EW12	7/23/2015	NM	NM	NM	0.5	
EW12	7/29/2015	102.11	101.65	0.46	NA	
EW12	8/5/2015	102.39	101.69	0.70	NA	
EW12	8/7/2015	NM	NM	NM	0.3	
EW12	8/19/2015	101.27	100.45	0.82	NA	
EW12	8/21/2015	NM	NM	NM	0.1	
EW12	9/4/2015	101.87	101.47	0.40	NA	
EW12	9/11/2015	NM	NM	NM	0.3	
EW12	9/21/2015	101.60	101.29	0.31	NA	
EW12	10/1/2015	NM	NM	NM	0.2	
EW12	10/8/2015	101.39	101.15	0.24	NA	
EW12	10/22/2015	101.52	101.23	0.29	NA	
EW12	11/2/2015	101.51	101.18	0.33	NA	
				Total LNAPL Recovered	5.9	

Appendix A.6

LNAPL Thickness and Recovery Summary - Extraction Wells
Penta Wood Products Superfund Site
Siren, Wisconsin

Well ID	Date	Depth to Water (feet) [1]	Depth to LNAPL (feet) [1]	LNAPL Thickness (feet)	Recovered LNAPL Volume (gallons)	Comments
EW13	11/4/2014	111.48	NP	0.00	NA	
EW13	12/11/2014	114.81	NP	0.00	NA	
EW13	12/23/2014	115.11	NP	0.00	NA	Groundwater extraction system shutdown pending carbon change-out
EW13	12/30/2014	107.34	NP	0.00	NA	Groundwater extraction system remained shutdown pending carbon change-out
EW13	1/8/2015	107.27	NP	0.00	NA	Groundwater extraction system remained shutdown pending carbon change-out
EW13	1/19/2015	107.33	NP	0.00	NA	Groundwater extraction system restarted after carbon change-out
EW13	1/22/2015	115.05	NP	0.00	NA	
EW13	1/30/2015	115.49	NP	0.00	NA	
EW13	2/3/2015	115.28	NP	0.00	NA	
EW13	2/13/2015	115.74	NP	0.00	NA	
EW13	2/17/2015	117.05	NP	0.00	NA	Groundwater extraction rate increased to 10 gpm
EW13	2/18/2015	119.19	NP	0.00	NA	
EW13	2/20/2015	119.37	NP	0.00	NA	
EW13	2/24/2015	119.50	NP	0.00	NA	
EW13	3/10/2015	120.13	NP	0.00	NA	
EW13	3/24/2015	116.72	NP	0.00	NA	
EW13	4/10/2015	118.55	NP	0.00	NA	
EW13	4/16/2015	120.92	NP	0.00	NA	
EW13	5/8/2015	107.18	NP	0.00	NA	Groundwater extraction pump turned off on 4/30/2015
EW13	5/21/2015	104.94	NP	0.00	NA	
EW13	6/3/2015	105.88	NP	0.00	NA	
EW13	6/16/2015	106.44	NP	0.00	NA	
EW13	7/8/2015	107.42	NP	0.00	NA	
EW13	7/21/2015	107.70	NP	0.00	NA	
EW13	7/29/2015	107.91	NP	0.00	NA	
EW13	8/5/2015	107.89	NP	0.00	NA	
EW13	8/19/2015	107.80	NP	0.00	NA	
EW13	9/4/2015	107.63	NP	0.00	NA	
EW13	9/21/2015	107.63	NP	0.00	NA	
EW13	10/8/2015	107.49	NP	0.00	NA	
EW13	10/22/2015	107.72	NP	0.00	NA	
EW13	11/2/2015	107.48	NP	0.00	NA	
				Total LNAPL Recovered	0.0	

Appendix A.6

LNAPL Thickness and Recovery Summary - Extraction Wells
Penta Wood Products Superfund Site
Siren, Wisconsin

Well ID	Date	Depth to Water (feet) [1]	Depth to LNAPL (feet) [1]	LNAPL Thickness (feet)	Recovered LNAPL Volume (gallons)	Comments
EW14	11/4/2014	112.55	112.45	0.10	NA	
EW14	11/6/2014	NM	NM	NM	<0.1	
EW14	11/7/2014	112.54	112.49	0.05	NA	
EW14	11/11/2014	112.68	112.60	0.08	NA	
EW14	11/12/2014	112.91	112.87	0.04	NA	Temporary system shutdown due to alarm condition
EW14	11/17/2014	111.82	111.55	0.27	NA	
EW14	12/8/2014	112.89	112.85	0.04	NA	
EW14	12/11/2014	113.83	113.75	0.08	NA	
EW14	12/23/2014	113.74	113.65	0.09	NA	Groundwater extraction system shutdown pending carbon change-out
EW14	12/30/2014	112.85	112.76	0.09	NA	Groundwater extraction system remained shutdown pending carbon change-out
EW14	1/8/2015	112.77	112.71	0.06	NA	Groundwater extraction system remained shutdown pending carbon change-out
EW14	1/19/2015	112.92	112.78	0.14	NA	Groundwater extraction system restarted after carbon change-out
EW14	1/22/2015	113.80	113.72	0.08	NA	
EW14	1/30/2015	113.79	113.66	0.13	<0.1	
EW14	2/3/2015	113.74	113.65	0.09	NA	
EW14	2/13/2015	113.90	113.68	0.22	NA	
EW14	2/17/2015	113.85	113.79	0.06	NA	Groundwater extraction rate increased to 10 gpm
EW14	2/18/2015	114.29	114.21	0.08	NA	
EW14	2/20/2015	114.26	114.18	0.08	NA	
EW14	2/24/2015	114.25	114.21	0.04	NA	
EW14	3/10/2015	114.36	114.30	0.06	NA	
EW14	3/24/2015	114.41	114.36	0.05	NA	
EW14	3/31/2015	NM	NM	NM	<0.1	
EW14	4/10/2015	114.43	114.42	0.01	NA	
EW14	4/16/2015	114.47	114.44	0.03	NA	
EW14	5/8/2015	113.30	113.14	0.16	NA	Groundwater extraction pump turned off on 4/30/2015
EW14	5/21/2015	113.71	113.49	0.22	NA	
EW14	6/3/2015	113.72	113.50	0.22	0.2	
EW14	6/16/2015	113.71	113.58	0.13	0.1	
EW14	7/8/2015	113.71	113.62	0.09	NA	
EW14	7/21/2015	113.78	113.68	0.10	NA	
EW14	7/29/2015	113.83	113.72	0.11	NA	
EW14	8/5/2015	113.84	113.72	0.12	NA	
EW14	8/7/2015	NM	NM	NM	<0.1	
EW14	8/19/2015	113.80	113.70	0.10	NA	
EW14	9/4/2015	113.68	113.59	0.09	NA	
EW14	9/11/2015	NM	NM	NM	<0.1	
EW14	9/21/2015	113.43	113.38	0.05	NA	
EW14	10/8/2015	113.12	113.06	0.06	NA	
EW14	10/22/2015	113.48	113.39	0.09	NA	
EW14	11/2/2015	113.44	113.32	0.12	NA	
				Total LNAPL Recovered	0.8	
			Total LNAPL Recovered (all wells)		380.7	Since system modification in October 2014; system shutdown and LNAPL recovery terminated in November 2015

Notes:

[1] Depth to water and depth to LNAPL measurements before December 2014 were not consistently recorded from the same benchmark location/elevation. Measurements were consistently recorded from the same benchmark location at the top of the well vault starting in December 2014.

NM - Not measured

NP - LNAPL was not present in a measurable quantity

NA - Not applicable

Appendix B
Dry Well Removal Documentation Letter

Cedar corporation

engineering | architecture | environmental | surveying
landscape architecture | planning | economic development

604 Wilson Avenue
Menomonie, WI 54751
715-235-9081
800-472-7372
FAX 715-235-2727
www.cedarcorp.com

October 1, 2019

Mr. Phil Richard
WDNR
875 South Fourth Avenue
Park Falls, WI 54552-1130

SUBJECT: Former Penta Wood Products – Siren, WI

Dear Mr. Richard,

On August 21, 2019, Cedar Corporation conducted field work at the former Penta Wood Products site at 8682 Daniels 70 in rural Siren, WI to remove two suspected underground storage tanks (Figure 1). Personnel on site during the field work included Cedar Corporation (Matt Taylor), WDNR (Phil Richard), Advanced Tank Service (Justin Peloquin - Certified Tank Remover/cleaner), and Hopkins Sand & Gravel (excavator).

Upon arrival, the excavator began removing overburden along the west end of the suspected UST location. It was quickly determined the suspected tank was a dry well typical of older septic systems. The east end of the suspected tank was similarly a dry well type structure. Typical sanitation piping was noted to run between the two structures. Both structures were buried approximately 1-2 feet and extended approximately 6 feet to their open bottoms. No staining or odors indicative of a release were observed in soils beneath either structure. Photos of the two structures and post restoration are attached. As the work determined no underground storage tank was present, the two structures were knocked in and backfilled by the excavator following collection of soil samples.

In order to document that no illicit discharges into the septic systems had occurred, soil samples were collected from the base of each dry well for laboratory analysis of Volatile Organic Compounds + Pentachloro Phenol, Polynuclear Aromatic Hydrocarbons, and Diesel Range Organics. The samples collected were immediately placed in laboratory supplied sampling containers and placed on ice. The samples were shipped on ice to Europhins Test America's facility in University Park, IL for analysis.

The lab reported detection of Diesel Range Organics in the ES (east sump) and WS (west sump) samples at 2.7 and 1.3 mg/Kg, respectively. Both results were "J" flagged as being reported between the laboratory's limit of detection and the limit of quantitation. All

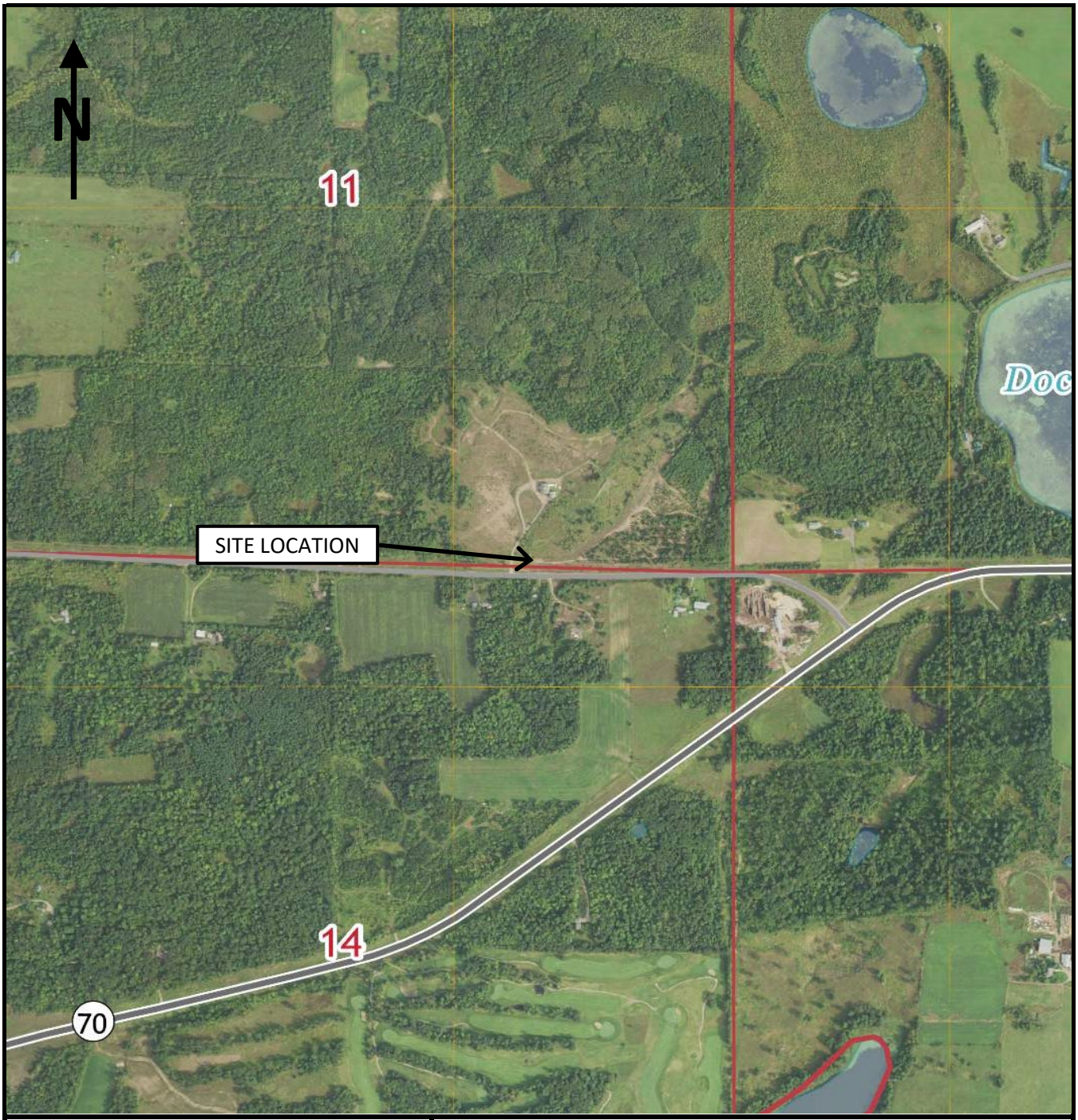
other compounds were reported to have no detections. A complete copy of the laboratory report is attached.

If there are any questions regarding this report please feel free to contact me at your convenience.

Sincerely;
CEDAR CORPORATION

Matthew A. Taylor, P.G.
Hydrogeologist

Att.



LEGEND

SIREN WEST, WI
USGS TOPOGRAPHIC QUADRANGLE
7.5 MINUTE SERIES, 2018

CONTOUR INTERVAL = 10
SE 1/4 OF THE SE 1/4 SECTION 11,
TOWNSHIP 38 N, RANGE 17 W,
BURNETT COUNTY, WI

Cedar corporation
604 Wilson Avenue
Menomonie, WI 54751
engineering | architecture | environmental | surveying
landscape architecture | planning | economic development

SOURCE	SITE LOCATION MAP	DRAWN BY
USGS	Former Penta Wood Products 8682 Daniels 70 Siren, WI	MAT
DATE		JOB NO.
10/19		W0590-0007
SCALE		FIGURE
1"=1000'		1

PHOTOGRAPH LOG

Client Name:	Site Location:	Project No.
WI Department of Natural Resources	Former Penta Wood Products, 8682 Daniels 70, Siren, WI	W0590-0007

Photo No.	Date:
1	8/21/19

Direction Photo Taken:

Description:

Looking into west dry well.

Photo No.	Date:
2	8/21/19

Direction Photo Taken:

Description:

Looking into east dry well.

PHOTOGRAPH LOG

Client Name:	Site Location:	Project No.
WI Department of Natural Resources	Former Penta Wood Products, 8682 Daniels 70, Siren, WI	W0590-0007

Photo No.	Date:
3	8/21/19

Direction Photo Taken:

Description:

Excavation along side of east dry well. .

Photo No.	Date:
4	8/21/19

Direction Photo Taken:

Description:

Pipe running between east and west dry wells.

PHOTOGRAPH LOG

Client Name:	Site Location:	Project No.
WI Department of Natural Resources	Former Penta Wood Products, 8682 Daniels 70, Siren, WI	W0590-0007

Photo No.	Date:
5	8/21/19

Direction Photo Taken:

Description:

Post restoration of area looking easterly with Daniels 70 to right side of photo.

Photo No.	Date:

Direction Photo Taken:

Description:

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Chicago
2417 Bond Street
University Park, IL 60484
Tel: (708)534-5200

Laboratory Job ID: 500-168860-1
Client Project/Site: Penta Wood

For:
Cedar Corporation
604 Wilson Avenue
Menomonie, Wisconsin 54751

Attn: Mitch Evenson

Authorized for release by:
9/9/2019 11:49:40 AM

Sandie Fredrick, Project Manager II
(920)261-1660
sandie.fredrick@testamericainc.com

Table of Contents

Job ID: 500-168860-1

Laboratory: Eurofins TestAmerica, Chicago

Narrative

Job Narrative
500-168860-1

Comments
No additional comments.

Receipt
The samples were received on 8/23/2019 8:45 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.2º C.

GC/MS VOA
Method(s) 8260B: The continuing calibration verification (CCV) associated with batch 501998 and 501999 recovered above the upper control limit for Bromoform. The samples associated with this CCV were non-detects for the affected analyte; therefore, the data have been reported. The following samples are impacted: ES (500-168860-1), WS (500-168860-2), TRIP BLANK (500-168860-3), (CCVIS 500-501998/7) and (CCVIS 500-501999/7).

Methylene chloride was detected in the following sample: TRIP BLANK (500-168860-3). The method blank associated with this sample was non-detect for Methylene chloride. Methylene chloride is known lab contaminant; therefore all low level detects for this compound should be suspected as lab contamination.

traction LCS associated with preparation batch 501507 had several analytes recoveries above control limits. The instrument LCS associated with analytical batch 501589 had all analytes within control limits; therefore re-analysis was not performed. The data have been reported and qualified. ES (500-168860-1) and WS (500-168860-2)

The matrix spike / matrix spike duplicate (MS/MSD) recoveries for 501998 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recoveries for Bromoform and 1,2-Dibromo-3-chloropropane were outside limit and all the other analytes were within acceptance limits.

The method blank for 501998 and 501999 contained Naphthalene above the method detection limit and below the Reporting limit (RL). This target analyte concentration were detected in the associated samples; therefore, re-analysis of samples was not performed. Naphthalene results have been flagged in the associated samples with a "B" flag denote the presence in the blank and possible lab contamination.

The laboratory control sample (LCS) for 501998 and 501999 recovered outside control limits for the following analytes: Bromoform and 1,2-Dibromo-3-chloropropane. These analytes were biased high in the LCS and was not detected in the associated samples; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GC/MS Semi VOA
Method(s) 8270D: The continuing calibration verification (CCVIS) analyzed in batch 500-503437 was outside the method criteria for Pentachlorophenol. A CCV standard at or below the reporting limit (RL) was analyzed with the affected samples and found to be acceptable. As indicated in the reference method, sample analysis may proceed; however, any detection for the affected analyte is considered estimated.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GC Semi VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: Cedar Corporation
Project/Site: Penta Wood

Job ID: 500-168860-1

Client Sample ID: ES — Lab Sample ID: 500-168860-1

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
WI Diesel Range Organics (C10-C28)	2.7	J	3.5	1.4	mg/Kg	1	☼	WI-DRO	Total/NA

Client Sample ID: WS — Lab Sample ID: 500-168860-2

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
WI Diesel Range Organics (C10-C28)	1.3	J	3.1	1.2	mg/Kg	1	☼	WI-DRO	Total/NA

Client Sample ID: TRIP BLANK — Lab Sample ID: 500-168860-3

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Methylene Chloride	3.3	J	5.0	1.6	ug/L	1		8260B	Total/NA
Naphthalene	0.41	J B	1.0	0.34	ug/L	1		8260B	Total/NA

This Detection Summary does not include radiochemical test results.

Method Summary

Client: Cedar Corporation
Project/Site: Penta Wood

Job ID: 500-168860-1

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL CHI
8270D	Semivolatile Organic Compounds (GC/MS)	SW846	TAL CHI
WI-DRO	Wisconsin - Diesel Range Organics (GC)	WI-DRO	TAL CHI
Moisture	Percent Moisture	EPA	TAL CHI
3541	Automated Soxhlet Extraction	SW846	TAL CHI
5030B	Purge and Trap	SW846	TAL CHI
5035	Closed System Purge and Trap	SW846	TAL CHI
WI DRO PREP	Wisconsin Extraction (Diesel Range Organics)	WI-DRO	TAL CHI

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

WI-DRO = "Modified DRO: Method For Determining Diesel Range Organics", Wisconsin DNR, Publ-SW-141, September, 1995.

Laboratory References:

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Sample Summary

Client: Cedar Corporation
Project/Site: Penta Wood

Job ID: 500-168860-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
500-168860-1	ES	Solid	08/21/19 13:30	08/23/19 08:45	
500-168860-2	WS	Solid	08/21/19 13:00	08/23/19 08:45	
500-168860-3	TRIP BLANK	Water	08/21/19 00:00	08/23/19 08:45	

Client: Cedar Corporation
Project/Site: Penta Wood

Job ID: 500-168860-1

Client Sample ID: ES
Date Collected: 08/21/19 13:30
Date Received: 08/23/19 08:45

Lab Sample ID: 500-168860-1
Matrix: Solid
Percent Solids: 97.1

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<7.2	*	12	7.2	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Bromobenzene	<18	*	49	18	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Bromochloromethane	<21		49	21	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Bromodichloromethane	<18	*	49	18	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Bromoform	<24	* ^c	49	24	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Bromomethane	<39		150	39	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
n-Butylbenzene	<19		49	19	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
sec-Butylbenzene	<20		49	20	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
tert-Butylbenzene	<20		49	20	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Carbon tetrachloride	<19		49	19	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Chlorobenzene	<19		49	19	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Dibromochloromethane	<24		49	24	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Chloroethane	<25		49	25	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Chloroform	<18	*	99	18	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Chloromethane	<16		49	16	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
2-Chlorotoluene	<15		49	15	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
4-Chlorotoluene	<17		49	17	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,2-Dibromo-3-Chloropropane	<98	*	250	98	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,2-Dibromoethane	<19		49	19	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Dibromomethane	<13	*	49	13	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,2-Dichlorobenzene	<16		49	16	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,3-Dichlorobenzene	<20		49	20	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,4-Dichlorobenzene	<18		49	18	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Dichlorodifluoromethane	<33		150	33	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,1-Dichloroethane	<20		49	20	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,2-Dichloroethane	<19	*	49	19	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,1-Dichloroethene	<19		49	19	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
cis-1,2-Dichloroethene	<20		49	20	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
trans-1,2-Dichloroethene	<17		49	17	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,2-Dichloropropane	<21		49	21	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,3-Dichloropropane	<18		49	18	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
2,2-Dichloropropane	<22		49	22	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,1-Dichloropropene	<15		49	15	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
cis-1,3-Dichloropropene	<21		49	21	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
trans-1,3-Dichloropropene	<18		49	18	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Isopropyl ether	<14		49	14	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Ethylbenzene	<9.0		12	9.0	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Hexachlorobutadiene	<22		49	22	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Isopropylbenzene	<19		49	19	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
p-Isopropyltoluene	<18		49	18	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Methylene Chloride	<80		250	80	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Methyl tert-butyl ether	<19		49	19	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Naphthalene	<16		49	16	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
N-Propylbenzene	<20		49	20	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Styrene	<19	*	49	19	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,1,1,2-Tetrachloroethane	<23		49	23	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,1,2,2-Tetrachloroethane	<20		49	20	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Tetrachloroethene	<18		49	18	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Toluene	<7.3		12	7.3	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50

Client: Cedar Corporation
Project/Site: Penta Wood

Job ID: 500-168860-1

Client Sample ID: ES
Date Collected: 08/21/19 13:30
Date Received: 08/23/19 08:45

Lab Sample ID: 500-168860-1
Matrix: Solid
Percent Solids: 97.1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,3-Trichlorobenzene	<23		49	23	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,2,4-Trichlorobenzene	<17		49	17	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,1,1-Trichloroethane	<19		49	19	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,1,2-Trichloroethane	<17		49	17	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Trichloroethene	<8.1		25	8.1	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Trichlorofluoromethane	<21		49	21	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,2,3-Trichloropropane	<20		99	20	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,2,4-Trimethylbenzene	<18		49	18	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
1,3,5-Trimethylbenzene	<19		49	19	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Vinyl chloride	<13		49	13	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50
Xylenes, Total	<11		25	11	ug/Kg	☼	08/21/19 13:30	08/28/19 17:21	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*105*		*75 - 126*	*08/21/19 13:30*	*08/28/19 17:21*	*50*
Toluene-d8 (Surr)	*94*		*75 - 120*	*08/21/19 13:30*	*08/28/19 17:21*	*50*
4-Bromofluorobenzene (Surr)	*92*		*72 - 124*	*08/21/19 13:30*	*08/28/19 17:21*	*50*
Dibromofluoromethane	*107*		*75 - 120*	*08/21/19 13:30*	*08/28/19 17:21*	*50*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	<8.0		66	8.0	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
2-Methylnaphthalene	<6.0		66	6.0	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Acenaphthene	<5.9		32	5.9	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Acenaphthylene	<4.3		32	4.3	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Anthracene	<5.5		32	5.5	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Benzo[a]anthracene	<4.4		32	4.4	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Benzo[a]pyrene	<6.3		32	6.3	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Benzo[b]fluoranthene	<7.0		32	7.0	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Benzo[g,h,i]perylene	<11		32	11	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Benzo[k]fluoranthene	<9.6		32	9.6	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Chrysene	<8.9		32	8.9	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Dibenz(a,h)anthracene	<6.3		32	6.3	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Fluoranthene	<6.1		32	6.1	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Fluorene	<4.6		32	4.6	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Indeno[1,2,3-cd]pyrene	<8.5		32	8.5	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Naphthalene	<5.0		32	5.0	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Pentachlorophenol	<520	^c	660	520	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Phenanthrene	<4.5		32	4.5	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1
Pyrene	<6.5		32	6.5	ug/Kg	☼	09/04/19 08:18	09/06/19 01:55	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol (Surr)	*73*		*31 - 143*	*09/04/19 08:18*	*09/06/19 01:55*	*1*
2-Fluorobiphenyl (Surr)	*78*		*43 - 145*	*09/04/19 08:18*	*09/06/19 01:55*	*1*
2-Fluorophenol (Surr)	*77*		*31 - 166*	*09/04/19 08:18*	*09/06/19 01:55*	*1*
Nitrobenzene-d5 (Surr)	*66*		*37 - 147*	*09/04/19 08:18*	*09/06/19 01:55*	*1*
Phenol-d5 (Surr)	*65*		*30 - 153*	*09/04/19 08:18*	*09/06/19 01:55*	*1*
Terphenyl-d14 (Surr)	*88*		*42 - 157*	*09/04/19 08:18*	*09/06/19 01:55*	*1*

Client Sample ID: ES

Lab Sample ID: 500-168860-1

Date Collected: 08/21/19 13:30
Matrix: Solid
Date Received: 08/23/19 08:45
Percent Solids: 97.1

Method: WI-DRO - Wisconsin - Diesel Range Organics (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
WI Diesel Range Organics (C10-C28)	2.7	J	3.5	1.4	mg/Kg	☼	08/28/19 10:17	08/28/19 17:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
n-Nonane	*71*		*44 - 148*	*08/28/19 10:17*	*08/28/19 17:14*	*1*

Client Sample ID: WS

Lab Sample ID: 500-168860-2

Date Collected: 08/21/19 13:00
Matrix: Solid
Date Received: 08/23/19 08:45
Percent Solids: 95.5

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<7.3	*	13	7.3	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Bromobenzene	<18	* F1	50	18	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Bromochloromethane	<21	F1	50	21	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Bromodichloromethane	<19	* F1	50	19	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Bromoform	<24	* ^c F1	50	24	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Bromomethane	<40		150	40	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
n-Butylbenzene	<19		50	19	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
sec-Butylbenzene	<20		50	20	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
tert-Butylbenzene	<20		50	20	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Carbon tetrachloride	<19		50	19	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Chlorobenzene	<19		50	19	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Dibromochloromethane	<24	F1	50	24	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Chloroethane	<25		50	25	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Chloroform	<19	* F1	100	19	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Chloromethane	<16		50	16	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
2-Chlorotoluene	<16		50	16	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
4-Chlorotoluene	<18		50	18	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,2-Dibromo-3-Chloropropane	<100	* F1	250	100	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,2-Dibromoethane	<19	F1	50	19	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Dibromomethane	<14	* F1	50	14	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,2-Dichlorobenzene	<17		50	17	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,3-Dichlorobenzene	<20		50	20	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,4-Dichlorobenzene	<18		50	18	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Dichlorodifluoromethane	<34		150	34	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,1-Dichloroethane	<21		50	21	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,2-Dichloroethane	<20	*	50	20	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,1-Dichloroethene	<20		50	20	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
cis-1,2-Dichloroethene	<20	F1	50	20	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
trans-1,2-Dichloroethene	<18		50	18	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,2-Dichloropropane	<21		50	21	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,3-Dichloropropane	<18		50	18	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
2,2-Dichloropropane	<22		50	22	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,1-Dichloropropene	<15		50	15	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
cis-1,3-Dichloropropene	<21		50	21	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
trans-1,3-Dichloropropene	<18		50	18	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Isopropyl ether	<14		50	14	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Ethylbenzene	<9.2		13	9.2	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Hexachlorobutadiene	<22		50	22	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50

Client Sample ID: WS
Date Collected: 08/21/19 13:00
Date Received: 08/23/19 08:45

Lab Sample ID: 500-168860-2
Matrix: Solid
Percent Solids: 95.5

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Isopropylbenzene	<19		50	19	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
p-Isopropyltoluene	<18		50	18	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Methylene Chloride	<82	F1	250	82	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Methyl tert-butyl ether	<20	F1	50	20	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Naphthalene	<17		50	17	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
N-Propylbenzene	<21		50	21	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Styrene	<19	*	50	19	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,1,1,2-Tetrachloroethane	<23	F1	50	23	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,1,2,2-Tetrachloroethane	<20	F1	50	20	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Tetrachloroethene	<19		50	19	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Toluene	<7.4		13	7.4	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,2,3-Trichlorobenzene	<23		50	23	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,2,4-Trichlorobenzene	<17		50	17	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,1,1-Trichloroethane	<19		50	19	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,1,2-Trichloroethane	<18	F1	50	18	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Trichloroethene	<8.2		25	8.2	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Trichlorofluoromethane	<21		50	21	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,2,3-Trichloropropane	<21	F1	100	21	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,2,4-Trimethylbenzene	<18		50	18	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
1,3,5-Trimethylbenzene	<19		50	19	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Vinyl chloride	<13		50	13	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50
Xylenes, Total	<11		25	11	ug/Kg	☼	08/21/19 13:00	08/28/19 17:48	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*106*		*75 - 126*	*08/21/19 13:00*	*08/28/19 17:48*	*50*
Toluene-d8 (Surr)	*96*		*75 - 120*	*08/21/19 13:00*	*08/28/19 17:48*	*50*
4-Bromofluorobenzene (Surr)	*95*		*72 - 124*	*08/21/19 13:00*	*08/28/19 17:48*	*50*
Dibromofluoromethane	*105*		*75 - 120*	*08/21/19 13:00*	*08/28/19 17:48*	*50*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	<8.1		67	8.1	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
2-Methylnaphthalene	<6.1		67	6.1	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Acenaphthene	<6.0		33	6.0	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Acenaphthylene	<4.4		33	4.4	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Anthracene	<5.6		33	5.6	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Benzo[a]anthracene	<4.5		33	4.5	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Benzo[a]pyrene	<6.5		33	6.5	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Benzo[b]fluoranthene	<7.2		33	7.2	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Benzo[g,h,i]perylene	<11		33	11	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Benzo[k]fluoranthene	<9.8		33	9.8	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Chrysene	<9.1		33	9.1	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Dibenz(a,h)anthracene	<6.4		33	6.4	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Fluoranthene	<6.2		33	6.2	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Fluorene	<4.7		33	4.7	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Indeno[1,2,3-cd]pyrene	<8.6		33	8.6	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Naphthalene	<5.1		33	5.1	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Pentachlorophenol	<530	^c	670	530	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Phenanthrene	<4.6		33	4.6	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1
Pyrene	<6.6		33	6.6	ug/Kg	☼	09/04/19 08:18	09/06/19 02:23	1

Client Sample ID: WS

Lab Sample ID: 500-168860-2

Date Collected: 08/21/19 13:00
Matrix: Solid
Date Received: 08/23/19 08:45
Percent Solids: 95.5

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
2,4,6-Tribromophenol (Surr)	51		31 - 143	09/04/19 08:18	09/06/19 02:23	1
2-Fluorobiphenyl (Surr)	73		43 - 145	09/04/19 08:18	09/06/19 02:23	1
2-Fluorophenol (Surr)	69		31 - 166	09/04/19 08:18	09/06/19 02:23	1
Nitrobenzene-d5 (Surr)	63		37 - 147	09/04/19 08:18	09/06/19 02:23	1
Phenol-d5 (Surr)	58		30 - 153	09/04/19 08:18	09/06/19 02:23	1
Terphenyl-d14 (Surr)	83		42 - 157	09/04/19 08:18	09/06/19 02:23	1

Method: WI-DRO - Wisconsin - Diesel Range Organics (GC)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
WI Diesel Range Organics (C10-C28)	1.3	J	3.1	1.2	mg/Kg	☼	08/28/19 10:17	08/28/19 17:40	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
n-Nonane	68		44 - 148	08/28/19 10:17	08/28/19 17:40	1

Client Sample ID: TRIP BLANK

Lab Sample ID: 500-168860-3

Date Collected: 08/21/19 00:00
Matrix: Water
Date Received: 08/23/19 08:45

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			08/28/19 11:30	1
Bromobenzene	<0.36		1.0	0.36	ug/L			08/28/19 11:30	1
Bromochloromethane	<0.43		1.0	0.43	ug/L			08/28/19 11:30	1
Bromodichloromethane	<0.37		1.0	0.37	ug/L			08/28/19 11:30	1
Bromoform	<0.48	* ^c	1.0	0.48	ug/L			08/28/19 11:30	1
Bromomethane	<0.80		3.0	0.80	ug/L			08/28/19 11:30	1
n-Butylbenzene	<0.39		1.0	0.39	ug/L			08/28/19 11:30	1
sec-Butylbenzene	<0.40		1.0	0.40	ug/L			08/28/19 11:30	1
tert-Butylbenzene	<0.40		1.0	0.40	ug/L			08/28/19 11:30	1
Carbon tetrachloride	<0.38		1.0	0.38	ug/L			08/28/19 11:30	1
Chlorobenzene	<0.39		1.0	0.39	ug/L			08/28/19 11:30	1
Dibromochloromethane	<0.49		1.0	0.49	ug/L			08/28/19 11:30	1
Chloroethane	<0.51		1.0	0.51	ug/L			08/28/19 11:30	1
Chloroform	<0.37		2.0	0.37	ug/L			08/28/19 11:30	1
Chloromethane	<0.32		1.0	0.32	ug/L			08/28/19 11:30	1
2-Chlorotoluene	<0.31		1.0	0.31	ug/L			08/28/19 11:30	1
4-Chlorotoluene	<0.35		1.0	0.35	ug/L			08/28/19 11:30	1
1,2-Dibromo-3-Chloropropane	<2.0	*	5.0	2.0	ug/L			08/28/19 11:30	1
1,2-Dibromoethane	<0.39		1.0	0.39	ug/L			08/28/19 11:30	1
Dibromomethane	<0.27		1.0	0.27	ug/L			08/28/19 11:30	1
1,2-Dichlorobenzene	<0.33		1.0	0.33	ug/L			08/28/19 11:30	1
1,3-Dichlorobenzene	<0.40		1.0	0.40	ug/L			08/28/19 11:30	1
1,4-Dichlorobenzene	<0.36		1.0	0.36	ug/L			08/28/19 11:30	1
Dichlorodifluoromethane	<0.67		3.0	0.67	ug/L			08/28/19 11:30	1
1,1-Dichloroethane	<0.41		1.0	0.41	ug/L			08/28/19 11:30	1
1,2-Dichloroethane	<0.39		1.0	0.39	ug/L			08/28/19 11:30	1
1,1-Dichloroethene	<0.39		1.0	0.39	ug/L			08/28/19 11:30	1
cis-1,2-Dichloroethene	<0.41		1.0	0.41	ug/L			08/28/19 11:30	1
trans-1,2-Dichloroethene	<0.35		1.0	0.35	ug/L			08/28/19 11:30	1
1,2-Dichloropropane	<0.43		1.0	0.43	ug/L			08/28/19 11:30	1

Client: Cedar Corporation
Project/Site: Penta Wood

Job ID: 500-168860-1

Client Sample ID: TRIP BLANK

Date Collected: 08/21/19 00:00
Date Received: 08/23/19 08:45

Lab Sample ID: 500-168860-3

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1,3-Dichloropropane	<0.36		1.0	0.36	ug/L			08/28/19 11:30	1
2,2-Dichloropropane	<0.44		1.0	0.44	ug/L			08/28/19 11:30	1
1,1-Dichloropropene	<0.30		1.0	0.30	ug/L			08/28/19 11:30	1
cis-1,3-Dichloropropene	<0.42		1.0	0.42	ug/L			08/28/19 11:30	1
trans-1,3-Dichloropropene	<0.36		1.0	0.36	ug/L			08/28/19 11:30	1
Isopropyl ether	<0.28		1.0	0.28	ug/L			08/28/19 11:30	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			08/28/19 11:30	1
Hexachlorobutadiene	<0.45		1.0	0.45	ug/L			08/28/19 11:30	1
Isopropylbenzene	<0.39		1.0	0.39	ug/L			08/28/19 11:30	1
p-Isopropyltoluene	<0.36		1.0	0.36	ug/L			08/28/19 11:30	1
Methylene Chloride	**3.3**	**J**	5.0	1.6	ug/L			08/28/19 11:30	1
Methyl tert-butyl ether	<0.39		1.0	0.39	ug/L			08/28/19 11:30	1
Naphthalene	**0.41**	**J B**	1.0	0.34	ug/L			08/28/19 11:30	1
N-Propylbenzene	<0.41		1.0	0.41	ug/L			08/28/19 11:30	1
Styrene	<0.39		1.0	0.39	ug/L			08/28/19 11:30	1
1,1,1,2-Tetrachloroethane	<0.46		1.0	0.46	ug/L			08/28/19 11:30	1
1,1,2,2-Tetrachloroethane	<0.40		1.0	0.40	ug/L			08/28/19 11:30	1
Tetrachloroethene	<0.37		1.0	0.37	ug/L			08/28/19 11:30	1
Toluene	<0.15		0.50	0.15	ug/L			08/28/19 11:30	1
1,2,3-Trichlorobenzene	<0.46		1.0	0.46	ug/L			08/28/19 11:30	1
1,2,4-Trichlorobenzene	<0.34		1.0	0.34	ug/L			08/28/19 11:30	1
1,1,1-Trichloroethane	<0.38		1.0	0.38	ug/L			08/28/19 11:30	1
1,1,2-Trichloroethane	<0.35		1.0	0.35	ug/L			08/28/19 11:30	1
Trichloroethene	<0.16		0.50	0.16	ug/L			08/28/19 11:30	1
Trichlorofluoromethane	<0.43		1.0	0.43	ug/L			08/28/19 11:30	1
1,2,3-Trichloropropane	<0.41		2.0	0.41	ug/L			08/28/19 11:30	1
1,2,4-Trimethylbenzene	<0.36		1.0	0.36	ug/L			08/28/19 11:30	1
1,3,5-Trimethylbenzene	<0.25		1.0	0.25	ug/L			08/28/19 11:30	1
Vinyl chloride	<0.20		1.0	0.20	ug/L			08/28/19 11:30	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			08/28/19 11:30	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*95*		*75 - 126*		*08/28/19 11:30*	*1*
Toluene-d8 (Surr)	*98*		*75 - 120*		*08/28/19 11:30*	*1*
4-Bromofluorobenzene (Surr)	*89*		*72 - 124*		*08/28/19 11:30*	*1*
Dibromofluoromethane	*101*		*75 - 120*		*08/28/19 11:30*	*1*

Definitions/Glossary

Client: Cedar Corporation
Project/Site: Penta Wood

Job ID: 500-168860-1

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.
^c	CCV Recovery is outside acceptance limits.
B	Compound was found in the blank and sample.
F1	MS and/or MSD Recovery is outside acceptance limits.
J	Reported value was between the limit of detection and the limit of quantitation.

GC/MS Semi VOA

Qualifier	Qualifier Description
^c	CCV Recovery is outside acceptance limits.

GC Semi VOA

Qualifier	Qualifier Description
J	Reported value was between the limit of detection and the limit of quantitation.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Association Summary

Client: Cedar Corporation
Project/Site: Penta Wood

Job ID: 500-168860-1

GC/MS VOA

Prep Batch: 501507

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-168860-1	ES	Total/NA	Solid	5035	
500-168860-2	WS	Total/NA	Solid	5035	
500-168860-2 MS	WS	Total/NA	Solid	5035	
500-168860-2 MSD	WS	Total/NA	Solid	5035	

Analysis Batch: 501998

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-168860-1	ES	Total/NA	Solid	8260B	501507
500-168860-2	WS	Total/NA	Solid	8260B	501507
MB 500-501998/6	Method Blank	Total/NA	Solid	8260B	
LCS 500-501998/4	Lab Control Sample	Total/NA	Solid	8260B	
500-168860-2 MS	WS	Total/NA	Solid	8260B	501507
500-168860-2 MSD	WS	Total/NA	Solid	8260B	501507

Analysis Batch: 501999

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-168860-3	TRIP BLANK	Total/NA	Water	8260B	
MB 500-501999/6	Method Blank	Total/NA	Water	8260B	
LCS 500-501999/4	Lab Control Sample	Total/NA	Water	8260B	

GC/MS Semi VOA

Prep Batch: 503055

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-168860-1	ES	Total/NA	Solid	3541	
500-168860-2	WS	Total/NA	Solid	3541	
MB 500-503055/1-A	Method Blank	Total/NA	Solid	3541	
LCS 500-503055/2-A	Lab Control Sample	Total/NA	Solid	3541	

Analysis Batch: 503141

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 500-503055/1-A	Method Blank	Total/NA	Solid	8270D	503055
LCS 500-503055/2-A	Lab Control Sample	Total/NA	Solid	8270D	503055

Analysis Batch: 503437

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-168860-1	ES	Total/NA	Solid	8270D	503055
500-168860-2	WS	Total/NA	Solid	8270D	503055

GC Semi VOA

Prep Batch: 502071

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-168860-1	ES	Total/NA	Solid	WI DRO PREP	
500-168860-2	WS	Total/NA	Solid	WI DRO PREP	
MB 500-502071/1-A	Method Blank	Total/NA	Solid	WI DRO PREP	
LCS 500-502071/2-A	Lab Control Sample	Total/NA	Solid	WI DRO PREP	
LCSD 500-502071/3-A	Lab Control Sample Dup	Total/NA	Solid	WI DRO PREP	

Analysis Batch: 502117

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-168860-1	ES	Total/NA	Solid	WI-DRO	502071

GC Semi VOA (Continued)

Analysis Batch: 502117 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-168860-2	WS	Total/NA	Solid	WI-DRO	502071
MB 500-502071/1-A	Method Blank	Total/NA	Solid	WI-DRO	502071
LCS 500-502071/2-A	Lab Control Sample	Total/NA	Solid	WI-DRO	502071
LCSD 500-502071/3-A	Lab Control Sample Dup	Total/NA	Solid	WI-DRO	502071

General Chemistry

Analysis Batch: 502065

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-168860-1	ES	Total/NA	Solid	Moisture	
500-168860-2	WS	Total/NA	Solid	Moisture	
500-168860-1 DU	ES	Total/NA	Solid	Moisture	

Surrogate Summary

Client: Cedar Corporation
Project/Site: Penta Wood

Job ID: 500-168860-1

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Solid — **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)			
		DCA	TOL	BFB	DBFM
Lab Sample ID	Client Sample ID	(75-126)	(75-120)	(72-124)	(75-120)
500-168860-1	ES	105	94	92	107
500-168860-2	WS	106	96	95	105
500-168860-2 MS	WS	105	94	94	108
500-168860-2 MSD	WS	108	94	91	108
LCS 500-501998/4	Lab Control Sample	95	100	94	98
MB 500-501998/6	Method Blank	103	95	91	107

Surrogate Legend

DCA = 1,2-Dichloroethane-d4 (Surr)
TOL = Toluene-d8 (Surr)
BFB = 4-Bromofluorobenzene (Surr)
DBFM = Dibromofluoromethane

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Water — **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)			
		DCA	TOL	BFB	DBFM
Lab Sample ID	Client Sample ID	(75-126)	(75-120)	(72-124)	(75-120)
500-168860-3	TRIP BLANK	95	98	89	101
LCS 500-501999/4	Lab Control Sample	95	100	94	98
MB 500-501999/6	Method Blank	103	95	91	107

Surrogate Legend

DCA = 1,2-Dichloroethane-d4 (Surr)
TOL = Toluene-d8 (Surr)
BFB = 4-Bromofluorobenzene (Surr)
DBFM = Dibromofluoromethane

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Matrix: Solid — **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)					
		TBP	FBP	2FP	NBZ	PHL	TPHL
Lab Sample ID	Client Sample ID	(31-143)	(43-145)	(31-166)	(37-147)	(30-153)	(42-157)
500-168860-1	ES	73	78	77	66	65	88
500-168860-2	WS	51	73	69	63	58	83
LCS 500-503055/2-A	Lab Control Sample	113	95	91	85	85	103
MB 500-503055/1-A	Method Blank	65	93	91	82	77	109

Surrogate Legend

TBP = 2,4,6-Tribromophenol (Surr)
FBP = 2-Fluorobiphenyl (Surr)
2FP = 2-Fluorophenol (Surr)
NBZ = Nitrobenzene-d5 (Surr)
PHL = Phenol-d5 (Surr)
TPHL = Terphenyl-d14 (Surr)

Surrogate Summary

Client: Cedar Corporation
Project/Site: Penta Wood

Job ID: 500-168860-1

Method: WI-DRO - Wisconsin - Diesel Range Organics (GC)

Matrix: Solid

Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)								
Lab Sample ID	Client Sample ID	C9 (44-148)								
500-168860-1	ES	71								
500-168860-2	WS	68								
LCS 500-502071/2-A	Lab Control Sample	79								
LCSD 500-502071/3-A	Lab Control Sample Dup	77								
MB 500-502071/1-A	Method Blank	81								

Surrogate Legend

C9 = n-Nonane

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: 500-168860-2 MS
Matrix: Solid
Analysis Batch: 501998

Client Sample ID: WS
Prep Type: Total/NA
Prep Batch: 501507

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	<7.3	*	2510	2510		ug/Kg	☼	100	70 - 120
Bromobenzene	<18	* F1	2510	2540		ug/Kg	☼	101	70 - 122
Bromochloromethane	<21	F1	2510	2910		ug/Kg	☼	116	65 - 122
Bromodichloromethane	<19	* F1	2510	2870		ug/Kg	☼	114	69 - 120
Bromoform	<24	* ^c F1	2510	3710	F1	ug/Kg	☼	148	56 - 132
Bromomethane	<40		2510	2400		ug/Kg	☼	96	40 - 152
n-Butylbenzene	<19		2510	2090		ug/Kg	☼	83	68 - 125
sec-Butylbenzene	<20		2510	2160		ug/Kg	☼	86	70 - 123
tert-Butylbenzene	<20		2510	2160		ug/Kg	☼	86	70 - 121
Carbon tetrachloride	<19		2510	2690		ug/Kg	☼	107	59 - 133
Chlorobenzene	<19		2510	2430		ug/Kg	☼	97	70 - 120
Dibromochloromethane	<24	F1	2510	3080		ug/Kg	☼	123	68 - 125
Chloroethane	<25		2510	1760		ug/Kg	☼	70	48 - 136
Chloroform	<19	* F1	2510	2540		ug/Kg	☼	101	70 - 120
Chloromethane	<16		2510	1640		ug/Kg	☼	65	56 - 152
2-Chlorotoluene	<16		2510	2260		ug/Kg	☼	90	70 - 125
4-Chlorotoluene	<18		2510	2280		ug/Kg	☼	91	68 - 124
1,2-Dibromo-3-Chloropropane	<100	* F1	2510	3140	F1	ug/Kg	☼	125	56 - 123
1,2-Dibromoethane	<19	F1	2510	2830		ug/Kg	☼	113	70 - 125
Dibromomethane	<14	* F1	2510	2950		ug/Kg	☼	118	70 - 120
1,2-Dichlorobenzene	<17		2510	2450		ug/Kg	☼	98	70 - 125
1,3-Dichlorobenzene	<20		2510	2430		ug/Kg	☼	97	70 - 125
1,4-Dichlorobenzene	<18		2510	2400		ug/Kg	☼	96	70 - 120
Dichlorodifluoromethane	<34		2510	1360		ug/Kg	☼	54	40 - 159
1,1-Dichloroethane	<21		2510	2290		ug/Kg	☼	91	70 - 125
1,2-Dichloroethane	<20	*	2510	2630		ug/Kg	☼	105	68 - 127
1,1-Dichloroethene	<20		2510	2330		ug/Kg	☼	93	67 - 122
cis-1,2-Dichloroethene	<20	F1	2510	2730		ug/Kg	☼	109	70 - 125
trans-1,2-Dichloroethene	<18		2510	2440		ug/Kg	☼	97	70 - 125
1,2-Dichloropropane	<21		2510	2460		ug/Kg	☼	98	67 - 130
1,3-Dichloropropane	<18		2510	2790		ug/Kg	☼	111	62 - 136
2,2-Dichloropropane	<22		2510	2150		ug/Kg	☼	86	58 - 139
1,1-Dichloropropene	<15		2510	2350		ug/Kg	☼	94	70 - 121
cis-1,3-Dichloropropene	<21		2510	2450		ug/Kg	☼	98	64 - 127
trans-1,3-Dichloropropene	<18		2510	2580		ug/Kg	☼	103	62 - 128
Ethylbenzene	<9.2		2510	2490		ug/Kg	☼	99	70 - 123
Hexachlorobutadiene	<22		2510	1880		ug/Kg	☼	75	51 - 150
Isopropylbenzene	<19		2510	2230		ug/Kg	☼	89	70 - 126
p-Isopropyltoluene	<18		2510	2190		ug/Kg	☼	87	70 - 125
Methylene Chloride	<82	F1	2510	2740		ug/Kg	☼	109	69 - 125
Methyl tert-butyl ether	<20	F1	2510	2760		ug/Kg	☼	110	55 - 123
Naphthalene	<17		2510	2570		ug/Kg	☼	103	53 - 144
N-Propylbenzene	<21		2510	2190		ug/Kg	☼	87	69 - 127
Styrene	<19	*	2510	2540		ug/Kg	☼	101	70 - 120
1,1,1,2-Tetrachloroethane	<23	F1	2510	2810		ug/Kg	☼	112	70 - 125
1,1,2,2-Tetrachloroethane	<20	F1	2510	2820		ug/Kg	☼	112	62 - 140
Tetrachloroethene	<19		2510	2410		ug/Kg	☼	96	70 - 128
Toluene	<7.4		2510	2260		ug/Kg	☼	90	70 - 125

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 500-168860-2 MS
Matrix: Solid
Analysis Batch: 501998

Client Sample ID: WS
Prep Type: Total/NA
Prep Batch: 501507

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,2,3-Trichlorobenzene	<23		2510	2280		ug/Kg	☼	91	51 - 145
1,2,4-Trichlorobenzene	<17		2510	2230		ug/Kg	☼	89	57 - 137
1,1,1-Trichloroethane	<19		2510	2460		ug/Kg	☼	98	70 - 125
1,1,2-Trichloroethane	<18	F1	2510	2780		ug/Kg	☼	111	71 - 130
Trichloroethene	<8.2		2510	2530		ug/Kg	☼	101	70 - 125
Trichlorofluoromethane	<21		2510	2130		ug/Kg	☼	85	55 - 128
1,2,3-Trichloropropane	<21	F1	2510	2910		ug/Kg	☼	116	50 - 133
1,2,4-Trimethylbenzene	<18		2510	2240		ug/Kg	☼	89	70 - 123
1,3,5-Trimethylbenzene	<19		2510	2260		ug/Kg	☼	90	70 - 123
Vinyl chloride	<13		2510	1820		ug/Kg	☼	72	64 - 126
Xylenes, Total	<11		5020	4860		ug/Kg	☼	97	70 - 125

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*105*		*75 - 126*
Toluene-d8 (Surr)	*94*		*75 - 120*
4-Bromofluorobenzene (Surr)	*94*		*72 - 124*
Dibromofluoromethane	*108*		*75 - 120*

Lab Sample ID: 500-168860-2 MSD
Matrix: Solid
Analysis Batch: 501998

Client Sample ID: WS
Prep Type: Total/NA
Prep Batch: 501507

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene	<7.3	*	2510	3020		ug/Kg	☼	120	70 - 120	18	30
Bromobenzene	<18	* F1	2510	3080	F1	ug/Kg	☼	123	70 - 122	19	30
Bromochloromethane	<21	F1	2510	3540	F1	ug/Kg	☼	141	65 - 122	19	30
Bromodichloromethane	<19	* F1	2510	3510	F1	ug/Kg	☼	140	69 - 120	20	30
Bromoform	<24	* ^c F1	2510	4650	F1	ug/Kg	☼	185	56 - 132	23	30
Bromomethane	<40		2510	2580		ug/Kg	☼	103	40 - 152	7	30
n-Butylbenzene	<19		2510	2480		ug/Kg	☼	99	68 - 125	17	30
sec-Butylbenzene	<20		2510	2580		ug/Kg	☼	103	70 - 123	18	30
tert-Butylbenzene	<20		2510	2590		ug/Kg	☼	103	70 - 121	18	30
Carbon tetrachloride	<19		2510	3180		ug/Kg	☼	127	59 - 133	17	30
Chlorobenzene	<19		2510	2940		ug/Kg	☼	117	70 - 120	19	30
Dibromochloromethane	<24	F1	2510	3840	F1	ug/Kg	☼	153	68 - 125	22	30
Chloroethane	<25		2510	2100		ug/Kg	☼	84	48 - 136	18	30
Chloroform	<19	* F1	2510	3090	F1	ug/Kg	☼	123	70 - 120	19	30
Chloromethane	<16		2510	1830		ug/Kg	☼	73	56 - 152	11	30
2-Chlorotoluene	<16		2510	2770		ug/Kg	☼	110	70 - 125	20	30
4-Chlorotoluene	<18		2510	2720		ug/Kg	☼	108	68 - 124	17	30
1,2-Dibromo-3-Chloropropane	<100	* F1	2510	3910	F1	ug/Kg	☼	156	56 - 123	22	30
1,2-Dibromoethane	<19	F1	2510	3600	F1	ug/Kg	☼	144	70 - 125	24	30
Dibromomethane	<14	* F1	2510	3570	F1	ug/Kg	☼	142	70 - 120	19	30
1,2-Dichlorobenzene	<17		2510	3000		ug/Kg	☼	120	70 - 125	20	30
1,3-Dichlorobenzene	<20		2510	2900		ug/Kg	☼	116	70 - 125	18	30
1,4-Dichlorobenzene	<18		2510	2910		ug/Kg	☼	116	70 - 120	19	30
Dichlorodifluoromethane	<34		2510	1490		ug/Kg	☼	60	40 - 159	10	30
1,1-Dichloroethane	<21		2510	2740		ug/Kg	☼	109	70 - 125	18	30

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 500-168860-2 MSD
Matrix: Solid
Analysis Batch: 501998

Client Sample ID: WS
Prep Type: Total/NA
Prep Batch: 501507

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,2-Dichloroethane	<20	*	2510	3110		ug/Kg	☼	124	68 - 127	17	30
1,1-Dichloroethene	<20		2510	2800		ug/Kg	☼	112	67 - 122	18	30
cis-1,2-Dichloroethene	<20	F1	2510	3190	F1	ug/Kg	☼	127	70 - 125	16	30
trans-1,2-Dichloroethene	<18		2510	2940		ug/Kg	☼	117	70 - 125	19	30
1,2-Dichloropropane	<21		2510	2910		ug/Kg	☼	116	67 - 130	17	30
1,3-Dichloropropane	<18		2510	3320		ug/Kg	☼	132	62 - 136	17	30
2,2-Dichloropropane	<22		2510	2520		ug/Kg	☼	100	58 - 139	16	30
1,1-Dichloropropene	<15		2510	2800		ug/Kg	☼	112	70 - 121	17	30
cis-1,3-Dichloropropene	<21		2510	3040		ug/Kg	☼	121	64 - 127	21	30
trans-1,3-Dichloropropene	<18		2510	3120		ug/Kg	☼	124	62 - 128	19	30
Ethylbenzene	<9.2		2510	2970		ug/Kg	☼	118	70 - 123	18	30
Hexachlorobutadiene	<22		2510	2270		ug/Kg	☼	90	51 - 150	19	30
Isopropylbenzene	<19		2510	2670		ug/Kg	☼	106	70 - 126	18	30
p-Isopropyltoluene	<18		2510	2620		ug/Kg	☼	105	70 - 125	18	30
Methylene Chloride	<82	F1	2510	3330	F1	ug/Kg	☼	133	69 - 125	19	30
Methyl tert-butyl ether	<20	F1	2510	3430	F1	ug/Kg	☼	137	55 - 123	21	30
Naphthalene	<17		2510	3370		ug/Kg	☼	134	53 - 144	27	30
N-Propylbenzene	<21		2510	2600		ug/Kg	☼	104	69 - 127	17	30
Styrene	<19	*	2510	3020		ug/Kg	☼	120	70 - 120	17	30
1,1,1,2-Tetrachloroethane	<23	F1	2510	3370	F1	ug/Kg	☼	134	70 - 125	18	30
1,1,2,2-Tetrachloroethane	<20	F1	2510	3630	F1	ug/Kg	☼	145	62 - 140	25	30
Tetrachloroethene	<19		2510	2820		ug/Kg	☼	112	70 - 128	16	30
Toluene	<7.4		2510	2670		ug/Kg	☼	106	70 - 125	16	30
1,2,3-Trichlorobenzene	<23		2510	2890		ug/Kg	☼	115	51 - 145	24	30
1,2,4-Trichlorobenzene	<17		2510	2740		ug/Kg	☼	109	57 - 137	21	30
1,1,1-Trichloroethane	<19		2510	2980		ug/Kg	☼	119	70 - 125	19	30
1,1,2-Trichloroethane	<18	F1	2510	3490	F1	ug/Kg	☼	139	71 - 130	23	30
Trichloroethene	<8.2		2510	3090		ug/Kg	☼	123	70 - 125	20	30
Trichlorofluoromethane	<21		2510	2400		ug/Kg	☼	96	55 - 128	12	30
1,2,3-Trichloropropane	<21	F1	2510	3880	F1	ug/Kg	☼	155	50 - 133	28	30
1,2,4-Trimethylbenzene	<18		2510	2680		ug/Kg	☼	107	70 - 123	18	30
1,3,5-Trimethylbenzene	<19		2510	2690		ug/Kg	☼	107	70 - 123	17	30
Vinyl chloride	<13		2510	1870		ug/Kg	☼	75	64 - 126	3	30
Xylenes, Total	<11		5020	5840		ug/Kg	☼	116	70 - 125	18	30

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*108*		*75 - 126*
Toluene-d8 (Surr)	*94*		*75 - 120*
4-Bromofluorobenzene (Surr)	*91*		*72 - 124*
Dibromofluoromethane	*108*		*75 - 120*

Lab Sample ID: MB 500-501998/6
Matrix: Solid
Analysis Batch: 501998

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.25	0.15	ug/Kg			08/28/19 11:03	1
Bromobenzene	<0.36		1.0	0.36	ug/Kg			08/28/19 11:03	1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 500-501998/6
Matrix: Solid
Analysis Batch: 501998

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Bromochloromethane	<0.43		1.0	0.43	ug/Kg			08/28/19 11:03	1
Bromodichloromethane	<0.37		1.0	0.37	ug/Kg			08/28/19 11:03	1
Bromoform	<0.48		1.0	0.48	ug/Kg			08/28/19 11:03	1
Bromomethane	<0.80		3.0	0.80	ug/Kg			08/28/19 11:03	1
n-Butylbenzene	<0.39		1.0	0.39	ug/Kg			08/28/19 11:03	1
sec-Butylbenzene	<0.40		1.0	0.40	ug/Kg			08/28/19 11:03	1
tert-Butylbenzene	<0.40		1.0	0.40	ug/Kg			08/28/19 11:03	1
Carbon tetrachloride	<0.38		1.0	0.38	ug/Kg			08/28/19 11:03	1
Chlorobenzene	<0.39		1.0	0.39	ug/Kg			08/28/19 11:03	1
Dibromochloromethane	<0.49		1.0	0.49	ug/Kg			08/28/19 11:03	1
Chloroethane	<0.50		1.0	0.50	ug/Kg			08/28/19 11:03	1
Chloroform	<0.37		2.0	0.37	ug/Kg			08/28/19 11:03	1
Chloromethane	<0.32		1.0	0.32	ug/Kg			08/28/19 11:03	1
2-Chlorotoluene	<0.31		1.0	0.31	ug/Kg			08/28/19 11:03	1
4-Chlorotoluene	<0.35		1.0	0.35	ug/Kg			08/28/19 11:03	1
1,2-Dibromo-3-Chloropropane	<2.0		5.0	2.0	ug/Kg			08/28/19 11:03	1
1,2-Dibromoethane	<0.39		1.0	0.39	ug/Kg			08/28/19 11:03	1
Dibromomethane	<0.27		1.0	0.27	ug/Kg			08/28/19 11:03	1
1,2-Dichlorobenzene	<0.33		1.0	0.33	ug/Kg			08/28/19 11:03	1
1,3-Dichlorobenzene	<0.40		1.0	0.40	ug/Kg			08/28/19 11:03	1
1,4-Dichlorobenzene	<0.36		1.0	0.36	ug/Kg			08/28/19 11:03	1
Dichlorodifluoromethane	<0.67		3.0	0.67	ug/Kg			08/28/19 11:03	1
1,1-Dichloroethane	<0.41		1.0	0.41	ug/Kg			08/28/19 11:03	1
1,2-Dichloroethane	<0.39		1.0	0.39	ug/Kg			08/28/19 11:03	1
1,1-Dichloroethene	<0.39		1.0	0.39	ug/Kg			08/28/19 11:03	1
cis-1,2-Dichloroethene	<0.41		1.0	0.41	ug/Kg			08/28/19 11:03	1
trans-1,2-Dichloroethene	<0.35		1.0	0.35	ug/Kg			08/28/19 11:03	1
1,2-Dichloropropane	<0.43		1.0	0.43	ug/Kg			08/28/19 11:03	1
1,3-Dichloropropane	<0.36		1.0	0.36	ug/Kg			08/28/19 11:03	1
2,2-Dichloropropane	<0.44		1.0	0.44	ug/Kg			08/28/19 11:03	1
1,1-Dichloropropene	<0.30		1.0	0.30	ug/Kg			08/28/19 11:03	1
cis-1,3-Dichloropropene	<0.42		1.0	0.42	ug/Kg			08/28/19 11:03	1
trans-1,3-Dichloropropene	<0.36		1.0	0.36	ug/Kg			08/28/19 11:03	1
Isopropyl ether	<0.28		1.0	0.28	ug/Kg			08/28/19 11:03	1
Ethylbenzene	<0.18		0.25	0.18	ug/Kg			08/28/19 11:03	1
Hexachlorobutadiene	<0.45		1.0	0.45	ug/Kg			08/28/19 11:03	1
Isopropylbenzene	<0.38		1.0	0.38	ug/Kg			08/28/19 11:03	1
p-Isopropyltoluene	<0.36		1.0	0.36	ug/Kg			08/28/19 11:03	1
Methylene Chloride	<1.6		5.0	1.6	ug/Kg			08/28/19 11:03	1
Methyl tert-butyl ether	<0.39		1.0	0.39	ug/Kg			08/28/19 11:03	1
Naphthalene	0.783	J	1.0	0.33	ug/Kg			08/28/19 11:03	1
N-Propylbenzene	<0.41		1.0	0.41	ug/Kg			08/28/19 11:03	1
Styrene	<0.39		1.0	0.39	ug/Kg			08/28/19 11:03	1
1,1,1,2-Tetrachloroethane	<0.46		1.0	0.46	ug/Kg			08/28/19 11:03	1
1,1,2,2-Tetrachloroethane	<0.40		1.0	0.40	ug/Kg			08/28/19 11:03	1
Tetrachloroethene	<0.37		1.0	0.37	ug/Kg			08/28/19 11:03	1
Toluene	<0.15		0.25	0.15	ug/Kg			08/28/19 11:03	1
1,2,3-Trichlorobenzene	<0.46		1.0	0.46	ug/Kg			08/28/19 11:03	1
1,2,4-Trichlorobenzene	<0.34		1.0	0.34	ug/Kg			08/28/19 11:03	1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 500-501998/6
Matrix: Solid
Analysis Batch: 501998

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	<0.38		1.0	0.38	ug/Kg			08/28/19 11:03	1
1,1,2-Trichloroethane	<0.35		1.0	0.35	ug/Kg			08/28/19 11:03	1
Trichloroethene	<0.16		0.50	0.16	ug/Kg			08/28/19 11:03	1
Trichlorofluoromethane	<0.43		1.0	0.43	ug/Kg			08/28/19 11:03	1
1,2,3-Trichloropropane	<0.41		2.0	0.41	ug/Kg			08/28/19 11:03	1
1,2,4-Trimethylbenzene	<0.36		1.0	0.36	ug/Kg			08/28/19 11:03	1
1,3,5-Trimethylbenzene	<0.38		1.0	0.38	ug/Kg			08/28/19 11:03	1
Vinyl chloride	<0.26		1.0	0.26	ug/Kg			08/28/19 11:03	1
Xylenes, Total	<0.22		0.50	0.22	ug/Kg			08/28/19 11:03	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*103*		*75 - 126*		*08/28/19 11:03*	*1*
Toluene-d8 (Surr)	*95*		*75 - 120*		*08/28/19 11:03*	*1*
4-Bromofluorobenzene (Surr)	*91*		*72 - 124*		*08/28/19 11:03*	*1*
Dibromofluoromethane	*107*		*75 - 120*		*08/28/19 11:03*	*1*

Lab Sample ID: LCS 500-501998/4
Matrix: Solid
Analysis Batch: 501998

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	50.0	51.9		ug/Kg		104	70 - 120
Bromobenzene	50.0	53.4		ug/Kg		107	70 - 122
Bromochloromethane	50.0	55.7		ug/Kg		111	65 - 122
Bromodichloromethane	50.0	55.4		ug/Kg		111	69 - 120
Bromoform	50.0	74.7	*	ug/Kg		149	56 - 132
Bromomethane	50.0	47.5		ug/Kg		95	40 - 152
n-Butylbenzene	50.0	51.6		ug/Kg		103	68 - 125
sec-Butylbenzene	50.0	53.7		ug/Kg		107	70 - 123
tert-Butylbenzene	50.0	52.3		ug/Kg		105	70 - 121
Carbon tetrachloride	50.0	66.1		ug/Kg		132	59 - 133
Chlorobenzene	50.0	51.6		ug/Kg		103	70 - 120
Dibromochloromethane	50.0	62.4		ug/Kg		125	68 - 125
Chloroethane	50.0	38.2		ug/Kg		76	48 - 136
Chloroform	50.0	51.3		ug/Kg		103	70 - 120
Chloromethane	50.0	33.0		ug/Kg		66	56 - 152
2-Chlorotoluene	50.0	51.1		ug/Kg		102	70 - 125
4-Chlorotoluene	50.0	50.4		ug/Kg		101	68 - 124
1,2-Dibromo-3-Chloropropane	50.0	63.5	*	ug/Kg		127	56 - 123
1,2-Dibromoethane	50.0	57.1		ug/Kg		114	70 - 125
Dibromomethane	50.0	53.6		ug/Kg		107	70 - 120
1,2-Dichlorobenzene	50.0	50.6		ug/Kg		101	70 - 125
1,3-Dichlorobenzene	50.0	52.5		ug/Kg		105	70 - 125
1,4-Dichlorobenzene	50.0	53.0		ug/Kg		106	70 - 120
Dichlorodifluoromethane	50.0	36.3		ug/Kg		73	40 - 159
1,1-Dichloroethane	50.0	47.7		ug/Kg		95	70 - 125
1,2-Dichloroethane	50.0	48.6		ug/Kg		97	68 - 127
1,1-Dichloroethene	50.0	55.9		ug/Kg		112	67 - 122

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 500-501998/4
Matrix: Solid
Analysis Batch: 501998

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
cis-1,2-Dichloroethene	50.0	53.7		ug/Kg		107	70 - 125
trans-1,2-Dichloroethene	50.0	54.2		ug/Kg		108	70 - 125
1,2-Dichloropropane	50.0	48.2		ug/Kg		96	67 - 130
1,3-Dichloropropane	50.0	54.6		ug/Kg		109	62 - 136
2,2-Dichloropropane	50.0	51.3		ug/Kg		103	58 - 139
1,1-Dichloropropene	50.0	55.1		ug/Kg		110	70 - 121
cis-1,3-Dichloropropene	50.0	52.1		ug/Kg		104	64 - 127
trans-1,3-Dichloropropene	50.0	53.8		ug/Kg		108	62 - 128
Ethylbenzene	50.0	57.1		ug/Kg		114	70 - 123
Hexachlorobutadiene	50.0	47.1		ug/Kg		94	51 - 150
Isopropylbenzene	50.0	53.9		ug/Kg		108	70 - 126
p-Isopropyltoluene	50.0	53.1		ug/Kg		106	70 - 125
Methylene Chloride	50.0	54.2		ug/Kg		108	69 - 125
Methyl tert-butyl ether	50.0	51.5		ug/Kg		103	55 - 123
Naphthalene	50.0	52.9		ug/Kg		106	53 - 144
N-Propylbenzene	50.0	52.6		ug/Kg		105	69 - 127
Styrene	50.0	53.1		ug/Kg		106	70 - 120
1,1,1,2-Tetrachloroethane	50.0	58.3		ug/Kg		117	70 - 125
1,1,2,2-Tetrachloroethane	50.0	57.6		ug/Kg		115	62 - 140
Tetrachloroethene	50.0	58.2		ug/Kg		116	70 - 128
Toluene	50.0	50.3		ug/Kg		101	70 - 125
1,2,3-Trichlorobenzene	50.0	48.9		ug/Kg		98	51 - 145
1,2,4-Trichlorobenzene	50.0	49.0		ug/Kg		98	57 - 137
1,1,1-Trichloroethane	50.0	56.9		ug/Kg		114	70 - 125
1,1,2-Trichloroethane	50.0	55.9		ug/Kg		112	71 - 130
Trichloroethene	50.0	56.2		ug/Kg		112	70 - 125
Trichlorofluoromethane	50.0	50.5		ug/Kg		101	55 - 128
1,2,3-Trichloropropane	50.0	58.0		ug/Kg		116	50 - 133
1,2,4-Trimethylbenzene	50.0	50.3		ug/Kg		101	70 - 123
1,3,5-Trimethylbenzene	50.0	52.1		ug/Kg		104	70 - 123
Vinyl chloride	50.0	37.9		ug/Kg		76	64 - 126
Xylenes, Total	100	108		ug/Kg		108	70 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*95*		*75 - 126*
Toluene-d8 (Surr)	*100*		*75 - 120*
4-Bromofluorobenzene (Surr)	*94*		*72 - 124*
Dibromofluoromethane	*98*		*75 - 120*

Lab Sample ID: MB 500-501999/6
Matrix: Water
Analysis Batch: 501999

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			08/28/19 11:03	1
Bromobenzene	<0.36		1.0	0.36	ug/L			08/28/19 11:03	1
Bromochloromethane	<0.43		1.0	0.43	ug/L			08/28/19 11:03	1
Bromodichloromethane	<0.37		1.0	0.37	ug/L			08/28/19 11:03	1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 500-501999/6
Matrix: Water
Analysis Batch: 501999

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Bromoform	<0.48		1.0	0.48	ug/L			08/28/19 11:03	1
Bromomethane	<0.80		3.0	0.80	ug/L			08/28/19 11:03	1
n-Butylbenzene	<0.39		1.0	0.39	ug/L			08/28/19 11:03	1
sec-Butylbenzene	<0.40		1.0	0.40	ug/L			08/28/19 11:03	1
tert-Butylbenzene	<0.40		1.0	0.40	ug/L			08/28/19 11:03	1
Carbon tetrachloride	<0.38		1.0	0.38	ug/L			08/28/19 11:03	1
Chlorobenzene	<0.39		1.0	0.39	ug/L			08/28/19 11:03	1
Dibromochloromethane	<0.49		1.0	0.49	ug/L			08/28/19 11:03	1
Chloroethane	<0.51		1.0	0.51	ug/L			08/28/19 11:03	1
Chloroform	<0.37		2.0	0.37	ug/L			08/28/19 11:03	1
Chloromethane	<0.32		1.0	0.32	ug/L			08/28/19 11:03	1
2-Chlorotoluene	<0.31		1.0	0.31	ug/L			08/28/19 11:03	1
4-Chlorotoluene	<0.35		1.0	0.35	ug/L			08/28/19 11:03	1
1,2-Dibromo-3-Chloropropane	<2.0		5.0	2.0	ug/L			08/28/19 11:03	1
1,2-Dibromoethane	<0.39		1.0	0.39	ug/L			08/28/19 11:03	1
Dibromomethane	<0.27		1.0	0.27	ug/L			08/28/19 11:03	1
1,2-Dichlorobenzene	<0.33		1.0	0.33	ug/L			08/28/19 11:03	1
1,3-Dichlorobenzene	<0.40		1.0	0.40	ug/L			08/28/19 11:03	1
1,4-Dichlorobenzene	<0.36		1.0	0.36	ug/L			08/28/19 11:03	1
Dichlorodifluoromethane	<0.67		3.0	0.67	ug/L			08/28/19 11:03	1
1,1-Dichloroethane	<0.41		1.0	0.41	ug/L			08/28/19 11:03	1
1,2-Dichloroethane	<0.39		1.0	0.39	ug/L			08/28/19 11:03	1
1,1-Dichloroethene	<0.39		1.0	0.39	ug/L			08/28/19 11:03	1
cis-1,2-Dichloroethene	<0.41		1.0	0.41	ug/L			08/28/19 11:03	1
trans-1,2-Dichloroethene	<0.35		1.0	0.35	ug/L			08/28/19 11:03	1
1,2-Dichloropropane	<0.43		1.0	0.43	ug/L			08/28/19 11:03	1
1,3-Dichloropropane	<0.36		1.0	0.36	ug/L			08/28/19 11:03	1
2,2-Dichloropropane	<0.44		1.0	0.44	ug/L			08/28/19 11:03	1
1,1-Dichloropropene	<0.30		1.0	0.30	ug/L			08/28/19 11:03	1
cis-1,3-Dichloropropene	<0.42		1.0	0.42	ug/L			08/28/19 11:03	1
trans-1,3-Dichloropropene	<0.36		1.0	0.36	ug/L			08/28/19 11:03	1
Isopropyl ether	<0.28		1.0	0.28	ug/L			08/28/19 11:03	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			08/28/19 11:03	1
Hexachlorobutadiene	<0.45		1.0	0.45	ug/L			08/28/19 11:03	1
Isopropylbenzene	<0.39		1.0	0.39	ug/L			08/28/19 11:03	1
p-Isopropyltoluene	<0.36		1.0	0.36	ug/L			08/28/19 11:03	1
Methylene Chloride	<1.6		5.0	1.6	ug/L			08/28/19 11:03	1
Methyl tert-butyl ether	<0.39		1.0	0.39	ug/L			08/28/19 11:03	1
Naphthalene	0.783	J	1.0	0.34	ug/L			08/28/19 11:03	1
N-Propylbenzene	<0.41		1.0	0.41	ug/L			08/28/19 11:03	1
Styrene	<0.39		1.0	0.39	ug/L			08/28/19 11:03	1
1,1,1,2-Tetrachloroethane	<0.46		1.0	0.46	ug/L			08/28/19 11:03	1
1,1,2,2-Tetrachloroethane	<0.40		1.0	0.40	ug/L			08/28/19 11:03	1
Tetrachloroethene	<0.37		1.0	0.37	ug/L			08/28/19 11:03	1
Toluene	<0.15		0.50	0.15	ug/L			08/28/19 11:03	1
1,2,3-Trichlorobenzene	<0.46		1.0	0.46	ug/L			08/28/19 11:03	1
1,2,4-Trichlorobenzene	<0.34		1.0	0.34	ug/L			08/28/19 11:03	1
1,1,1-Trichloroethane	<0.38		1.0	0.38	ug/L			08/28/19 11:03	1
1,1,2-Trichloroethane	<0.35		1.0	0.35	ug/L			08/28/19 11:03	1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 500-501999/6
Matrix: Water
Analysis Batch: 501999

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Trichloroethene	<0.16		0.50	0.16	ug/L			08/28/19 11:03	1
Trichlorofluoromethane	<0.43		1.0	0.43	ug/L			08/28/19 11:03	1
1,2,3-Trichloropropane	<0.41		2.0	0.41	ug/L			08/28/19 11:03	1
1,2,4-Trimethylbenzene	<0.36		1.0	0.36	ug/L			08/28/19 11:03	1
1,3,5-Trimethylbenzene	<0.25		1.0	0.25	ug/L			08/28/19 11:03	1
Vinyl chloride	<0.20		1.0	0.20	ug/L			08/28/19 11:03	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			08/28/19 11:03	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*103*		*75 - 126*		*08/28/19 11:03*	*1*
Toluene-d8 (Surr)	*95*		*75 - 120*		*08/28/19 11:03*	*1*
4-Bromofluorobenzene (Surr)	*91*		*72 - 124*		*08/28/19 11:03*	*1*
Dibromofluoromethane	*107*		*75 - 120*		*08/28/19 11:03*	*1*

Lab Sample ID: LCS 500-501999/4
Matrix: Water
Analysis Batch: 501999

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	50.0	51.9		ug/L		104	70 - 120
Bromobenzene	50.0	53.4		ug/L		107	70 - 122
Bromochloromethane	50.0	55.7		ug/L		111	65 - 122
Bromodichloromethane	50.0	55.4		ug/L		111	69 - 120
Bromoform	50.0	74.7	*	ug/L		149	56 - 132
Bromomethane	50.0	47.5		ug/L		95	40 - 152
n-Butylbenzene	50.0	51.6		ug/L		103	68 - 125
sec-Butylbenzene	50.0	53.7		ug/L		107	70 - 123
tert-Butylbenzene	50.0	52.3		ug/L		105	70 - 121
Carbon tetrachloride	50.0	66.1		ug/L		132	59 - 133
Chlorobenzene	50.0	51.6		ug/L		103	70 - 120
Dibromochloromethane	50.0	62.4		ug/L		125	68 - 125
Chloroethane	50.0	38.2		ug/L		76	48 - 136
Chloroform	50.0	51.3		ug/L		103	70 - 120
Chloromethane	50.0	33.0		ug/L		66	56 - 152
2-Chlorotoluene	50.0	51.1		ug/L		102	70 - 125
4-Chlorotoluene	50.0	50.4		ug/L		101	68 - 124
1,2-Dibromo-3-Chloropropane	50.0	63.5	*	ug/L		127	56 - 123
1,2-Dibromoethane	50.0	57.1		ug/L		114	70 - 125
Dibromomethane	50.0	53.6		ug/L		107	70 - 120
1,2-Dichlorobenzene	50.0	50.6		ug/L		101	70 - 125
1,3-Dichlorobenzene	50.0	52.5		ug/L		105	70 - 125
1,4-Dichlorobenzene	50.0	53.0		ug/L		106	70 - 120
Dichlorodifluoromethane	50.0	36.3		ug/L		73	40 - 159
1,1-Dichloroethane	50.0	47.7		ug/L		95	70 - 125
1,2-Dichloroethane	50.0	48.6		ug/L		97	68 - 127
1,1-Dichloroethene	50.0	55.9		ug/L		112	67 - 122
cis-1,2-Dichloroethene	50.0	53.7		ug/L		107	70 - 125
trans-1,2-Dichloroethene	50.0	54.2		ug/L		108	70 - 125

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 500-501999/4
Matrix: Water
Analysis Batch: 501999

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,2-Dichloropropane	50.0	48.2		ug/L		96	67 - 130
1,3-Dichloropropane	50.0	54.6		ug/L		109	62 - 136
2,2-Dichloropropane	50.0	51.3		ug/L		103	58 - 139
1,1-Dichloropropene	50.0	55.1		ug/L		110	70 - 121
cis-1,3-Dichloropropene	50.0	52.1		ug/L		104	64 - 127
trans-1,3-Dichloropropene	50.0	53.8		ug/L		108	62 - 128
Ethylbenzene	50.0	57.1		ug/L		114	70 - 123
Hexachlorobutadiene	50.0	47.1		ug/L		94	51 - 150
Isopropylbenzene	50.0	53.9		ug/L		108	70 - 126
p-Isopropyltoluene	50.0	53.1		ug/L		106	70 - 125
Methylene Chloride	50.0	54.2		ug/L		108	69 - 125
Methyl tert-butyl ether	50.0	51.5		ug/L		103	55 - 123
Naphthalene	50.0	52.9		ug/L		106	53 - 144
N-Propylbenzene	50.0	52.6		ug/L		105	69 - 127
Styrene	50.0	53.1		ug/L		106	70 - 120
1,1,1,2-Tetrachloroethane	50.0	58.3		ug/L		117	70 - 125
1,1,2,2-Tetrachloroethane	50.0	57.6		ug/L		115	62 - 140
Tetrachloroethene	50.0	58.2		ug/L		116	70 - 128
Toluene	50.0	50.3		ug/L		101	70 - 125
1,2,3-Trichlorobenzene	50.0	48.9		ug/L		98	51 - 145
1,2,4-Trichlorobenzene	50.0	49.0		ug/L		98	57 - 137
1,1,1-Trichloroethane	50.0	56.9		ug/L		114	70 - 125
1,1,2-Trichloroethane	50.0	55.9		ug/L		112	71 - 130
Trichloroethene	50.0	56.2		ug/L		112	70 - 125
Trichlorofluoromethane	50.0	50.5		ug/L		101	55 - 128
1,2,3-Trichloropropane	50.0	58.0		ug/L		116	50 - 133
1,2,4-Trimethylbenzene	50.0	50.3		ug/L		101	70 - 123
1,3,5-Trimethylbenzene	50.0	52.1		ug/L		104	70 - 123
Vinyl chloride	50.0	37.9		ug/L		76	64 - 126
Xylenes, Total	100	108		ug/L		108	70 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*95*		*75 - 126*
Toluene-d8 (Surr)	*100*		*75 - 120*
4-Bromofluorobenzene (Surr)	*94*		*72 - 124*
Dibromofluoromethane	*98*		*75 - 120*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Lab Sample ID: MB 500-503055/1-A
Matrix: Solid
Analysis Batch: 503141

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 503055

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	<8.1		67	8.1	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
2-Methylnaphthalene	<6.1		67	6.1	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
Acenaphthene	<6.0		33	6.0	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
Acenaphthylene	<4.4		33	4.4	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
Anthracene	<5.6		33	5.6	ug/Kg		09/04/19 08:18	09/04/19 21:44	1

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 500-503055/1-A
Matrix: Solid
Analysis Batch: 503141

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 503055

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Benzo[a]anthracene	<4.5		33	4.5	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
Benzo[a]pyrene	<6.4		33	6.4	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
Benzo[b]fluoranthene	<7.2		33	7.2	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
Benzo[g,h,i]perylene	<11		33	11	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
Benzo[k]fluoranthene	<9.8		33	9.8	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
Chrysene	<9.1		33	9.1	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
Dibenz(a,h)anthracene	<6.4		33	6.4	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
Fluoranthene	<6.2		33	6.2	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
Fluorene	<4.7		33	4.7	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
Indeno[1,2,3-cd]pyrene	<8.6		33	8.6	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
Naphthalene	<5.1		33	5.1	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
Pentachlorophenol	<530		670	530	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
Phenanthrene	<4.6		33	4.6	ug/Kg		09/04/19 08:18	09/04/19 21:44	1
Pyrene	<6.6		33	6.6	ug/Kg		09/04/19 08:18	09/04/19 21:44	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol (Surr)	*65*		*31 - 143*	*09/04/19 08:18*	*09/04/19 21:44*	*1*
2-Fluorobiphenyl (Surr)	*93*		*43 - 145*	*09/04/19 08:18*	*09/04/19 21:44*	*1*
2-Fluorophenol (Surr)	*91*		*31 - 166*	*09/04/19 08:18*	*09/04/19 21:44*	*1*
Nitrobenzene-d5 (Surr)	*82*		*37 - 147*	*09/04/19 08:18*	*09/04/19 21:44*	*1*
Phenol-d5 (Surr)	*77*		*30 - 153*	*09/04/19 08:18*	*09/04/19 21:44*	*1*
Terphenyl-d14 (Surr)	*109*		*42 - 157*	*09/04/19 08:18*	*09/04/19 21:44*	*1*

Lab Sample ID: LCS 500-503055/2-A
Matrix: Solid
Analysis Batch: 503141

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 503055

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1-Methylnaphthalene	1330	1230		ug/Kg		93	68 - 111
2-Methylnaphthalene	1330	1230		ug/Kg		92	69 - 112
Acenaphthene	1330	1240		ug/Kg		93	65 - 124
Acenaphthylene	1330	1220		ug/Kg		92	68 - 120
Anthracene	1330	1280		ug/Kg		96	70 - 114
Benzo[a]anthracene	1330	1260		ug/Kg		95	67 - 122
Benzo[a]pyrene	1330	1300		ug/Kg		97	65 - 133
Benzo[b]fluoranthene	1330	1240		ug/Kg		93	69 - 129
Benzo[g,h,i]perylene	1330	1310		ug/Kg		98	72 - 131
Benzo[k]fluoranthene	1330	1260		ug/Kg		94	68 - 127
Chrysene	1330	1310		ug/Kg		98	63 - 120
Dibenz(a,h)anthracene	1330	1320		ug/Kg		99	64 - 131
Fluoranthene	1330	1320		ug/Kg		99	62 - 120
Fluorene	1330	1270		ug/Kg		95	62 - 120
Indeno[1,2,3-cd]pyrene	1330	1310		ug/Kg		99	68 - 130
Naphthalene	1330	1220		ug/Kg		92	63 - 110
Pentachlorophenol	2670	1340		ug/Kg		50	13 - 112
Phenanthrene	1330	1250		ug/Kg		94	62 - 120
Pyrene	1330	1260		ug/Kg		94	61 - 128

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 500-503055/2-A
Matrix: Solid
Analysis Batch: 503141

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 503055

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2,4,6-Tribromophenol (Surr)	*113*		*31 - 143*
2-Fluorobiphenyl (Surr)	*95*		*43 - 145*
2-Fluorophenol (Surr)	*91*		*31 - 166*
Nitrobenzene-d5 (Surr)	*85*		*37 - 147*
Phenol-d5 (Surr)	*85*		*30 - 153*
Terphenyl-d14 (Surr)	*103*		*42 - 157*

Method: WI-DRO - Wisconsin - Diesel Range Organics (GC)

Lab Sample ID: MB 500-502071/1-A
Matrix: Solid
Analysis Batch: 502117

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 502071

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
WI Diesel Range Organics (C10-C28)	<1.6		4.0	1.6	mg/Kg		08/28/19 10:17	08/28/19 15:30	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
n-Nonane	*81*		*44 - 148*	*08/28/19 10:17*	*08/28/19 15:30*	*1*

Lab Sample ID: LCS 500-502071/2-A
Matrix: Solid
Analysis Batch: 502117

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 502071

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
WI Diesel Range Organics (C10-C28)			20.0	22.0		mg/Kg		110	70 - 120		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
n-Nonane	*79*		*44 - 148*

Lab Sample ID: LCSD 500-502071/3-A
Matrix: Solid
Analysis Batch: 502117

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 502071

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
WI Diesel Range Organics (C10-C28)			20.0	23.6		mg/Kg		118	70 - 120	7	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
n-Nonane	*77*		*44 - 148*

Lab Chronicle

Client: Cedar Corporation
Project/Site: Penta Wood

Job ID: 500-168860-1

Client Sample ID: ES
Lab Sample ID: 500-168860-1
Date Collected: 08/21/19 13:30
Matrix: Solid
Date Received: 08/23/19 08:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	502065	08/28/19 09:36	LWN	TAL CHI

Client Sample ID: ES
Lab Sample ID: 500-168860-1
Date Collected: 08/21/19 13:30
Matrix: Solid
Date Received: 08/23/19 08:45
Percent Solids: 97.1

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			501507	08/21/19 13:30	WRE	TAL CHI
Total/NA	Analysis	8260B		50	501998	08/28/19 17:21	JLC	TAL CHI
Total/NA	Prep	3541			503055	09/04/19 08:18	DX	TAL CHI
Total/NA	Analysis	8270D		1	503437	09/06/19 01:55	NRJ	TAL CHI
Total/NA	Prep	WI DRO PREP			502071	08/28/19 10:17	JVD	TAL CHI
Total/NA	Analysis	WI-DRO		1	502117	08/28/19 17:14	JBJ	TAL CHI

Client Sample ID: WS
Lab Sample ID: 500-168860-2
Date Collected: 08/21/19 13:00
Matrix: Solid
Date Received: 08/23/19 08:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	502065	08/28/19 09:36	LWN	TAL CHI

Client Sample ID: WS
Lab Sample ID: 500-168860-2
Date Collected: 08/21/19 13:00
Matrix: Solid
Date Received: 08/23/19 08:45
Percent Solids: 95.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			501507	08/21/19 13:00	WRE	TAL CHI
Total/NA	Analysis	8260B		50	501998	08/28/19 17:48	JLC	TAL CHI
Total/NA	Prep	3541			503055	09/04/19 08:18	DX	TAL CHI
Total/NA	Analysis	8270D		1	503437	09/06/19 02:23	NRJ	TAL CHI
Total/NA	Prep	WI DRO PREP			502071	08/28/19 10:17	JVD	TAL CHI
Total/NA	Analysis	WI-DRO		1	502117	08/28/19 17:40	JBJ	TAL CHI

Client Sample ID: TRIP BLANK
Lab Sample ID: 500-168860-3
Date Collected: 08/21/19 00:00
Matrix: Water
Date Received: 08/23/19 08:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	501999	08/28/19 11:30	JLC	TAL CHI

Laboratory References:

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Accreditation/Certification Summary

Client: Cedar Corporation
Project/Site: Penta Wood

Job ID: 500-168860-1

Laboratory: Eurofins TestAmerica, Chicago

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Wisconsin	State Program	999580010	08-31-20

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

2417 Bond Street, University Park, IL 60484
Phone: 708.534.5200 Fax: 708.534.5211

(optional)
Report To
Contact:
Company:
Address:
Address:
Phone:
Fax:
E-Mail:

(optional)
Bill To
Contact:
Company:
Address:
Address:
Phone:
Fax:
PO#/Reference#

500-168860 COC

Chain of Custody Record

Lab Job #: 500-168860

Chain of Custody Number:

Page ____ of ____

Temperature °C of Cooler: 3.2

Client	Client Project #	Preservative										
Cedar Corp.												
Project Name: Penta Wood		Parameter	VOC PCP, PAH, DRO									
Project Location/State: Siren / WI	Lab Project #											
Sampler: Matt Taylor	Lab PM											

Preservative Key
1. HCL, Cool to 4°
2. H2SO4, Cool to 4°
3. HNO3, Cool to 4°
4. NaOH, Cool to 4°
5. NaOH/Zn, Cool to 4°
6. NaHSO4
7. Cool to 4°
8. None
9. Other

Lab ID	MS/MSD	Sample ID	Sampling Date	Sampling Time	# of Containers	Matrix									Comments
1		ES	8/21	1330	4	S	X								
2		WS	8/21	1300	4	S	X								

Turnaround Time Required (Business Days)
___ 1 Day ___ 2 Days ___ 5 Days ___ 7 Days X 10 Days ___ 15 Days _____ Other
Requested Due Date _____

Sample Disposal
☐ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Relinquished By	Company	Date	Time	Received By	Company	Date	Time
M. Taylor	Cedar	8/22/19	830	[signature]	TA	8/23/19	0845
Relinquished By	Company	Date	Time	Received By	Company	Date	Time
Relinquished By	Company	Date	Time	Received By	Company	Date	Time

Lab Courier
Shipped
Hand Delivered

Matrix Key
WW – Wastewater
W – Water
S – Soil
SL – Sludge
MS – Miscellaneous
OL – Oil
A – Air
SE – Sediment
SO – Soil
L – Leachate
WI – Wipe
DW – Drinking Water
O – Other

Client Comments: PCP - pentachlorophenol

Lab Comments:

TAL-4124-500 (1209)

9/9/2019

Login Sample Receipt Checklist

Client: Cedar Corporation

Job Number: 500-168860-1

Login Number: 168860
List Number: 1
Creator: James, Jeff A

List Source: Eurofins TestAmerica, Chicago

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	3.2
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Appendix C
Groundwater Sample Laboratory Reports – Monitoring, Extraction, Residential, and Onsite Supply Wells

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Chicago
2417 Bond Street
University Park, IL 60484
Tel: (708)534-5200

Laboratory Job ID: 500-171016-1
Client Project/Site: Penta Wood 086165

For:
GHD Services Inc.
1801 Old Highway 8 NW
Suite 114
St. Paul, Minnesota 55112

Attn: Mr. Grant Anderson

Jodie Bracken

Authorized for release by:
10/15/2019 5:19:44 PM
Jodie Bracken, Project Management Assistant II
jodie.bracken@testamericainc.com

Designee for

Richard Wright, Senior Project Manager
(708)534-5200
richard.wright@testamericainc.com

Table of Contents

Job ID: 500-171016-1

Laboratory: Eurofins TestAmerica, Chicago

Narrative

Job Narrative
500-171016-1

Receipt
The samples were received on 10/2/2019 9:15 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 5 coolers at receipt time were 4.3º C, 5.6º C, 5.8º C, 5.9º C and 5.9º C.

Receipt Exceptions
A trip blank was received with the samples but it was not listed on the chain of custody. The trip blank was added to the COC by TestAmerica personnel and logged in for analysis.

GC/MS VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

GC/MS Semi VOA
Method 8270D: The continuing calibration verification (CCV) analyzed in 500-508241 was outside the method criteria for 2,4,6-Tribromophenol (Surr) and 2-Fluorobiphenyl (Surr). As indicated in the reference method, sample analysis may proceed; however, any detection for the affected analytes is considered estimated.

Method 8270D: The continuing calibration verification (CCV) analyzed in batch 500-508241 was above the method criteria for the following analyte: 2-Fluorobiphenyl (Surr). As indicated in the reference method, sample analysis may proceed; however, any detection for the affected analyte(s) is considered estimated.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GC Semi VOA
Method 8151A: Surrogate recovery for the following samples were outside the upper control limit: RW-191001-RA-01 (500-171016-1), RW-191001-RA-02 (500-171016-2), RW-191001-RA-03 (500-171016-3), RW-191001-RA-04 (500-171016-4), RW-191001-RA-05 (500-171016-5), RW-191001-RA-06 (500-171016-6), RW-191001-RA-07 (500-171016-7), RW-191001-RA-08 (500-171016-8), RW-191001-RA-08 (500-171016-8[MS]), RW-191001-RA-08 (500-171016-8[MSD]), RW-191001-RA-09 (500-171016-9), RW-191001-RA-10 (500-171016-10), (LCS 500-508411/2-A) and (MB 500-508411/1-A). This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.

Method 8151A: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 500-508411 and analytical batch 500-508618 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Client Sample ID: RW-191001-RA-01 — Lab Sample ID: 500-171016-1

No Detections.

Client Sample ID: RW-191001-RA-02 — Lab Sample ID: 500-171016-2

No Detections.

Client Sample ID: RW-191001-RA-03 — Lab Sample ID: 500-171016-3

No Detections.

Client Sample ID: RW-191001-RA-04 — Lab Sample ID: 500-171016-4

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Xylenes, Total	0.29	J	1.0	0.22	ug/L	1		8260B	Total/NA

Client Sample ID: RW-191001-RA-05 — Lab Sample ID: 500-171016-5

No Detections.

Client Sample ID: RW-191001-RA-06 — Lab Sample ID: 500-171016-6

No Detections.

Client Sample ID: RW-191001-RA-07 — Lab Sample ID: 500-171016-7

No Detections.

Client Sample ID: RW-191001-RA-08 — Lab Sample ID: 500-171016-8

No Detections.

Client Sample ID: RW-191001-RA-09 — Lab Sample ID: 500-171016-9

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Xylenes, Total	0.29	J	1.0	0.22	ug/L	1		8260B	Total/NA

Client Sample ID: RW-191001-RA-10 — Lab Sample ID: 500-171016-10

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Xylenes, Total	0.23	J	1.0	0.22	ug/L	1		8260B	Total/NA

Client Sample ID: Trip Blank — Lab Sample ID: 500-171016-11

No Detections.

This Detection Summary does not include radiochemical test results.

Method Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL CHI
8270D	Semivolatile Organic Compounds (GC/MS)	SW846	TAL CHI
8151A	Herbicides (GC)	SW846	TAL CHI
3510C	Liquid-Liquid Extraction (Separatory Funnel)	SW846	TAL CHI
5030B	Purge and Trap	SW846	TAL CHI
8151A	Extraction (Herbicides)	SW846	TAL CHI

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Sample Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
500-171016-1	RW-191001-RA-01	Water	10/01/19 11:05	10/02/19 09:15	
500-171016-2	RW-191001-RA-02	Water	10/01/19 11:20	10/02/19 09:15	
500-171016-3	RW-191001-RA-03	Water	10/01/19 11:20	10/02/19 09:15	
500-171016-4	RW-191001-RA-04	Water	10/01/19 11:30	10/02/19 09:15	
500-171016-5	RW-191001-RA-05	Water	10/01/19 11:42	10/02/19 09:15	
500-171016-6	RW-191001-RA-06	Water	10/01/19 11:48	10/02/19 09:15	
500-171016-7	RW-191001-RA-07	Water	10/01/19 12:17	10/02/19 09:15	
500-171016-8	RW-191001-RA-08	Water	10/01/19 12:22	10/02/19 09:15	
500-171016-9	RW-191001-RA-09	Water	10/01/19 13:05	10/02/19 09:15	
500-171016-10	RW-191001-RA-10	Water	10/01/19 13:30	10/02/19 09:15	
500-171016-11	Trip Blank	Water	10/01/19 00:00	10/02/19 09:15	

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Client Sample ID: RW-191001-RA-01

Lab Sample ID: 500-171016-1

Date Collected: 10/01/19 11:05

Matrix: Water

Date Received: 10/02/19 09:15

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/11/19 16:53	1
Toluene	<0.15		0.50	0.15	ug/L			10/11/19 16:53	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/11/19 16:53	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/11/19 16:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*97*		*75 - 126*		*10/11/19 16:53*	*1*
Toluene-d8 (Surr)	*101*		*75 - 120*		*10/11/19 16:53*	*1*
4-Bromofluorobenzene (Surr)	*99*		*72 - 124*		*10/11/19 16:53*	*1*
Dibromofluoromethane	*99*		*75 - 120*		*10/11/19 16:53*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.24		0.79	0.24	ug/L		10/03/19 07:39	10/03/19 19:41	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*66*		*36 - 120*	*10/03/19 07:39*	*10/03/19 19:41*	*1*
2-Fluorobiphenyl (Surr)	*77*	*^c*	*34 - 110*	*10/03/19 07:39*	*10/03/19 19:41*	*1*
Terphenyl-d14 (Surr)	*95*		*40 - 145*	*10/03/19 07:39*	*10/03/19 19:41*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.093		0.10	0.093	ug/L		10/04/19 10:20	10/06/19 19:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*145*	*X*	*25 - 130*	*10/04/19 10:20*	*10/06/19 19:16*	*1*

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Client Sample ID: RW-191001-RA-02

Lab Sample ID: 500-171016-2

Date Collected: 10/01/19 11:20

Matrix: Water

Date Received: 10/02/19 09:15

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/11/19 17:18	1
Toluene	<0.15		0.50	0.15	ug/L			10/11/19 17:18	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/11/19 17:18	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/11/19 17:18	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*98*		*75 - 126*		*10/11/19 17:18*	*1*
Toluene-d8 (Surr)	*102*		*75 - 120*		*10/11/19 17:18*	*1*
4-Bromofluorobenzene (Surr)	*98*		*72 - 124*		*10/11/19 17:18*	*1*
Dibromofluoromethane	*98*		*75 - 120*		*10/11/19 17:18*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.26		0.85	0.26	ug/L		10/03/19 07:39	10/03/19 20:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*73*		*36 - 120*	*10/03/19 07:39*	*10/03/19 20:08*	*1*
2-Fluorobiphenyl (Surr)	*83*	*^c*	*34 - 110*	*10/03/19 07:39*	*10/03/19 20:08*	*1*
Terphenyl-d14 (Surr)	*105*		*40 - 145*	*10/03/19 07:39*	*10/03/19 20:08*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.090		0.10	0.090	ug/L		10/04/19 10:20	10/06/19 19:36	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*193*	*X*	*25 - 130*	*10/04/19 10:20*	*10/06/19 19:36*	*1*

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Client Sample ID: RW-191001-RA-03

Lab Sample ID: 500-171016-3

Date Collected: 10/01/19 11:20

Matrix: Water

Date Received: 10/02/19 09:15

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/14/19 10:42	1
Toluene	<0.15		0.50	0.15	ug/L			10/14/19 10:42	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/14/19 10:42	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/14/19 10:42	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*87*		*75 - 126*		*10/14/19 10:42*	*1*
Toluene-d8 (Surr)	*99*		*75 - 120*		*10/14/19 10:42*	*1*
4-Bromofluorobenzene (Surr)	*106*		*72 - 124*		*10/14/19 10:42*	*1*
Dibromofluoromethane	*91*		*75 - 120*		*10/14/19 10:42*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.26		0.85	0.26	ug/L		10/03/19 07:39	10/03/19 20:34	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*75*		*36 - 120*	*10/03/19 07:39*	*10/03/19 20:34*	*1*
2-Fluorobiphenyl (Surr)	*89*	*^c*	*34 - 110*	*10/03/19 07:39*	*10/03/19 20:34*	*1*
Terphenyl-d14 (Surr)	*104*		*40 - 145*	*10/03/19 07:39*	*10/03/19 20:34*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.091		0.10	0.091	ug/L		10/04/19 10:20	10/06/19 19:56	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*185*	*X*	*25 - 130*	*10/04/19 10:20*	*10/06/19 19:56*	*1*

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Client Sample ID: RW-191001-RA-04

Lab Sample ID: 500-171016-4

Date Collected: 10/01/19 11:30

Matrix: Water

Date Received: 10/02/19 09:15

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/14/19 11:07	1
Toluene	<0.15		0.50	0.15	ug/L			10/14/19 11:07	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/14/19 11:07	1
Xylenes, Total	**0.29**	**J**	1.0	0.22	ug/L			10/14/19 11:07	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*89*		*75 - 126*		*10/14/19 11:07*	*1*
Toluene-d8 (Surr)	*98*		*75 - 120*		*10/14/19 11:07*	*1*
4-Bromofluorobenzene (Surr)	*106*		*72 - 124*		*10/14/19 11:07*	*1*
Dibromofluoromethane	*92*		*75 - 120*		*10/14/19 11:07*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.23		0.74	0.23	ug/L		10/03/19 07:39	10/03/19 21:01	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*72*		*36 - 120*	*10/03/19 07:39*	*10/03/19 21:01*	*1*
2-Fluorobiphenyl (Surr)	*86*	*^c*	*34 - 110*	*10/03/19 07:39*	*10/03/19 21:01*	*1*
Terphenyl-d14 (Surr)	*105*		*40 - 145*	*10/03/19 07:39*	*10/03/19 21:01*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.089		0.099	0.089	ug/L		10/04/19 10:20	10/06/19 20:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*198*	*X*	*25 - 130*	*10/04/19 10:20*	*10/06/19 20:16*	*1*

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Client Sample ID: RW-191001-RA-05

Date Collected: 10/01/19 11:42
Date Received: 10/02/19 09:15

Lab Sample ID: 500-171016-5

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/14/19 11:32	1
Toluene	<0.15		0.50	0.15	ug/L			10/14/19 11:32	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/14/19 11:32	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/14/19 11:32	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*86*		*75 - 126*		*10/14/19 11:32*	*1*
Toluene-d8 (Surr)	*99*		*75 - 120*		*10/14/19 11:32*	*1*
4-Bromofluorobenzene (Surr)	*105*		*72 - 124*		*10/14/19 11:32*	*1*
Dibromofluoromethane	*92*		*75 - 120*		*10/14/19 11:32*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.24		0.79	0.24	ug/L		10/03/19 07:39	10/03/19 21:28	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*73*		*36 - 120*	*10/03/19 07:39*	*10/03/19 21:28*	*1*
2-Fluorobiphenyl (Surr)	*88*	*^c*	*34 - 110*	*10/03/19 07:39*	*10/03/19 21:28*	*1*
Terphenyl-d14 (Surr)	*110*		*40 - 145*	*10/03/19 07:39*	*10/03/19 21:28*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.089		0.099	0.089	ug/L		10/04/19 10:20	10/06/19 20:36	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*172*	*X*	*25 - 130*	*10/04/19 10:20*	*10/06/19 20:36*	*1*

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Client Sample ID: RW-191001-RA-06

Date Collected: 10/01/19 11:48
Date Received: 10/02/19 09:15

Lab Sample ID: 500-171016-6

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/14/19 11:58	1
Toluene	<0.15		0.50	0.15	ug/L			10/14/19 11:58	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/14/19 11:58	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/14/19 11:58	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*84*		*75 - 126*		*10/14/19 11:58*	*1*
Toluene-d8 (Surr)	*100*		*75 - 120*		*10/14/19 11:58*	*1*
4-Bromofluorobenzene (Surr)	*105*		*72 - 124*		*10/14/19 11:58*	*1*
Dibromofluoromethane	*90*		*75 - 120*		*10/14/19 11:58*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.27		0.86	0.27	ug/L		10/03/19 07:39	10/03/19 21:54	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*69*		*36 - 120*	*10/03/19 07:39*	*10/03/19 21:54*	*1*
2-Fluorobiphenyl (Surr)	*78*	*^c*	*34 - 110*	*10/03/19 07:39*	*10/03/19 21:54*	*1*
Terphenyl-d14 (Surr)	*106*		*40 - 145*	*10/03/19 07:39*	*10/03/19 21:54*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.088		0.098	0.088	ug/L		10/04/19 10:20	10/06/19 20:56	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*188*	*X*	*25 - 130*	*10/04/19 10:20*	*10/06/19 20:56*	*1*

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Client Sample ID: RW-191001-RA-07

Lab Sample ID: 500-171016-7

Date Collected: 10/01/19 12:17

Matrix: Water

Date Received: 10/02/19 09:15

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/14/19 12:23	1
Toluene	<0.15		0.50	0.15	ug/L			10/14/19 12:23	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/14/19 12:23	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/14/19 12:23	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*85*		*75 - 126*		*10/14/19 12:23*	*1*
Toluene-d8 (Surr)	*101*		*75 - 120*		*10/14/19 12:23*	*1*
4-Bromofluorobenzene (Surr)	*112*		*72 - 124*		*10/14/19 12:23*	*1*
Dibromofluoromethane	*91*		*75 - 120*		*10/14/19 12:23*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.25		0.81	0.25	ug/L		10/03/19 07:39	10/03/19 22:21	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*71*		*36 - 120*	*10/03/19 07:39*	*10/03/19 22:21*	*1*
2-Fluorobiphenyl (Surr)	*90*	*^c*	*34 - 110*	*10/03/19 07:39*	*10/03/19 22:21*	*1*
Terphenyl-d14 (Surr)	*104*		*40 - 145*	*10/03/19 07:39*	*10/03/19 22:21*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.086		0.096	0.086	ug/L		10/04/19 10:20	10/06/19 21:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*210*	*X*	*25 - 130*	*10/04/19 10:20*	*10/06/19 21:16*	*1*

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Client Sample ID: RW-191001-RA-08

Lab Sample ID: 500-171016-8

Date Collected: 10/01/19 12:22

Matrix: Water

Date Received: 10/02/19 09:15

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/11/19 17:43	1
Toluene	<0.15		0.50	0.15	ug/L			10/11/19 17:43	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/11/19 17:43	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/11/19 17:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*97*		*75 - 126*		*10/11/19 17:43*	*1*
Toluene-d8 (Surr)	*100*		*75 - 120*		*10/11/19 17:43*	*1*
4-Bromofluorobenzene (Surr)	*98*		*72 - 124*		*10/11/19 17:43*	*1*
Dibromofluoromethane	*99*		*75 - 120*		*10/11/19 17:43*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.24		0.79	0.24	ug/L		10/03/19 07:39	10/03/19 22:48	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*66*		*36 - 120*	*10/03/19 07:39*	*10/03/19 22:48*	*1*
2-Fluorobiphenyl (Surr)	*79*	*^c*	*34 - 110*	*10/03/19 07:39*	*10/03/19 22:48*	*1*
Terphenyl-d14 (Surr)	*98*		*40 - 145*	*10/03/19 07:39*	*10/03/19 22:48*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.086		0.096	0.086	ug/L		10/04/19 10:20	10/06/19 22:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*198*	*X*	*25 - 130*	*10/04/19 10:20*	*10/06/19 22:16*	*1*

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Client Sample ID: RW-191001-RA-09

Date Collected: 10/01/19 13:05
Date Received: 10/02/19 09:15

Lab Sample ID: 500-171016-9

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/14/19 12:47	1
Toluene	<0.15		0.50	0.15	ug/L			10/14/19 12:47	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/14/19 12:47	1
Xylenes, Total	**0.29**	**J**	1.0	0.22	ug/L			10/14/19 12:47	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*84*		*75 - 126*		*10/14/19 12:47*	*1*
Toluene-d8 (Surr)	*98*		*75 - 120*		*10/14/19 12:47*	*1*
4-Bromofluorobenzene (Surr)	*109*		*72 - 124*		*10/14/19 12:47*	*1*
Dibromofluoromethane	*92*		*75 - 120*		*10/14/19 12:47*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.24		0.76	0.24	ug/L		10/03/19 07:39	10/03/19 23:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*67*		*36 - 120*	*10/03/19 07:39*	*10/03/19 23:14*	*1*
2-Fluorobiphenyl (Surr)	*82*	*^c*	*34 - 110*	*10/03/19 07:39*	*10/03/19 23:14*	*1*
Terphenyl-d14 (Surr)	*103*		*40 - 145*	*10/03/19 07:39*	*10/03/19 23:14*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.085		0.095	0.085	ug/L		10/04/19 10:20	10/06/19 23:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*221*	*X*	*25 - 130*	*10/04/19 10:20*	*10/06/19 23:17*	*1*

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Client Sample ID: RW-191001-RA-10

Lab Sample ID: 500-171016-10

Date Collected: 10/01/19 13:30

Matrix: Water

Date Received: 10/02/19 09:15

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/14/19 13:13	1
Toluene	<0.15		0.50	0.15	ug/L			10/14/19 13:13	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/14/19 13:13	1
Xylenes, Total	**0.23**	**J**	1.0	0.22	ug/L			10/14/19 13:13	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*81*		*75 - 126*		*10/14/19 13:13*	*1*
Toluene-d8 (Surr)	*102*		*75 - 120*		*10/14/19 13:13*	*1*
4-Bromofluorobenzene (Surr)	*110*		*72 - 124*		*10/14/19 13:13*	*1*
Dibromofluoromethane	*90*		*75 - 120*		*10/14/19 13:13*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.26		0.85	0.26	ug/L		10/03/19 07:39	10/03/19 23:41	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*66*		*36 - 120*	*10/03/19 07:39*	*10/03/19 23:41*	*1*
2-Fluorobiphenyl (Surr)	*80*	*^c*	*34 - 110*	*10/03/19 07:39*	*10/03/19 23:41*	*1*
Terphenyl-d14 (Surr)	*99*		*40 - 145*	*10/03/19 07:39*	*10/03/19 23:41*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.087		0.097	0.087	ug/L		10/04/19 10:20	10/06/19 23:37	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*215*	*X*	*25 - 130*	*10/04/19 10:20*	*10/06/19 23:37*	*1*

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Client Sample ID: Trip Blank

Date Collected: 10/01/19 00:00
Date Received: 10/02/19 09:15

Lab Sample ID: 500-171016-11

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/14/19 13:38	1
Toluene	<0.15		0.50	0.15	ug/L			10/14/19 13:38	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/14/19 13:38	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/14/19 13:38	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*85*		*75 - 126*		*10/14/19 13:38*	*1*
Toluene-d8 (Surr)	*99*		*75 - 120*		*10/14/19 13:38*	*1*
4-Bromofluorobenzene (Surr)	*110*		*72 - 124*		*10/14/19 13:38*	*1*
Dibromofluoromethane	*91*		*75 - 120*		*10/14/19 13:38*	*1*

Definitions/Glossary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
J	Reported value was between the limit of detection and the limit of quantitation.

GC/MS Semi VOA

Qualifier	Qualifier Description
^c	CCV Recovery is outside acceptance limits.

GC Semi VOA

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery is outside acceptance limits.
X	Surrogate is outside control limits

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Association Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

GC/MS VOA

Analysis Batch: 509587

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171016-1	RW-191001-RA-01	Total/NA	Water	8260B	
500-171016-2	RW-191001-RA-02	Total/NA	Water	8260B	
500-171016-8	RW-191001-RA-08	Total/NA	Water	8260B	
MB 500-509587/6	Method Blank	Total/NA	Water	8260B	
LCS 500-509587/4	Lab Control Sample	Total/NA	Water	8260B	
500-171016-8 MS	RW-191001-RA-08	Total/NA	Water	8260B	
500-171016-8 MSD	RW-191001-RA-08	Total/NA	Water	8260B	

Analysis Batch: 509833

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171016-3	RW-191001-RA-03	Total/NA	Water	8260B	
500-171016-4	RW-191001-RA-04	Total/NA	Water	8260B	
500-171016-5	RW-191001-RA-05	Total/NA	Water	8260B	
500-171016-6	RW-191001-RA-06	Total/NA	Water	8260B	
500-171016-7	RW-191001-RA-07	Total/NA	Water	8260B	
500-171016-9	RW-191001-RA-09	Total/NA	Water	8260B	
500-171016-10	RW-191001-RA-10	Total/NA	Water	8260B	
500-171016-11	Trip Blank	Total/NA	Water	8260B	
MB 500-509833/6	Method Blank	Total/NA	Water	8260B	
LCS 500-509833/4	Lab Control Sample	Total/NA	Water	8260B	

GC/MS Semi VOA

Prep Batch: 508120

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171016-1	RW-191001-RA-01	Total/NA	Water	3510C	
500-171016-2	RW-191001-RA-02	Total/NA	Water	3510C	
500-171016-3	RW-191001-RA-03	Total/NA	Water	3510C	
500-171016-4	RW-191001-RA-04	Total/NA	Water	3510C	
500-171016-5	RW-191001-RA-05	Total/NA	Water	3510C	
500-171016-6	RW-191001-RA-06	Total/NA	Water	3510C	
500-171016-7	RW-191001-RA-07	Total/NA	Water	3510C	
500-171016-8	RW-191001-RA-08	Total/NA	Water	3510C	
500-171016-9	RW-191001-RA-09	Total/NA	Water	3510C	
500-171016-10	RW-191001-RA-10	Total/NA	Water	3510C	
MB 500-508120/1-A	Method Blank	Total/NA	Water	3510C	
LCS 500-508120/2-A	Lab Control Sample	Total/NA	Water	3510C	
500-171016-8 MS	RW-191001-RA-08	Total/NA	Water	3510C	
500-171016-8 MSD	RW-191001-RA-08	Total/NA	Water	3510C	

Analysis Batch: 508165

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 500-508120/1-A	Method Blank	Total/NA	Water	8270D	508120
LCS 500-508120/2-A	Lab Control Sample	Total/NA	Water	8270D	508120

Analysis Batch: 508241

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171016-1	RW-191001-RA-01	Total/NA	Water	8270D	508120
500-171016-2	RW-191001-RA-02	Total/NA	Water	8270D	508120
500-171016-3	RW-191001-RA-03	Total/NA	Water	8270D	508120
500-171016-4	RW-191001-RA-04	Total/NA	Water	8270D	508120

GC/MS Semi VOA (Continued)

Analysis Batch: 508241 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171016-5	RW-191001-RA-05	Total/NA	Water	8270D	508120
500-171016-6	RW-191001-RA-06	Total/NA	Water	8270D	508120
500-171016-7	RW-191001-RA-07	Total/NA	Water	8270D	508120
500-171016-8	RW-191001-RA-08	Total/NA	Water	8270D	508120
500-171016-9	RW-191001-RA-09	Total/NA	Water	8270D	508120
500-171016-10	RW-191001-RA-10	Total/NA	Water	8270D	508120
500-171016-8 MS	RW-191001-RA-08	Total/NA	Water	8270D	508120
500-171016-8 MSD	RW-191001-RA-08	Total/NA	Water	8270D	508120

GC Semi VOA

Prep Batch: 508411

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171016-1	RW-191001-RA-01	Total/NA	Water	8151A	
500-171016-2	RW-191001-RA-02	Total/NA	Water	8151A	
500-171016-3	RW-191001-RA-03	Total/NA	Water	8151A	
500-171016-4	RW-191001-RA-04	Total/NA	Water	8151A	
500-171016-5	RW-191001-RA-05	Total/NA	Water	8151A	
500-171016-6	RW-191001-RA-06	Total/NA	Water	8151A	
500-171016-7	RW-191001-RA-07	Total/NA	Water	8151A	
500-171016-8	RW-191001-RA-08	Total/NA	Water	8151A	
500-171016-9	RW-191001-RA-09	Total/NA	Water	8151A	
500-171016-10	RW-191001-RA-10	Total/NA	Water	8151A	
MB 500-508411/1-A	Method Blank	Total/NA	Water	8151A	
LCS 500-508411/2-A	Lab Control Sample	Total/NA	Water	8151A	
500-171016-8 MS	RW-191001-RA-08	Total/NA	Water	8151A	
500-171016-8 MSD	RW-191001-RA-08	Total/NA	Water	8151A	

Analysis Batch: 508618

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171016-1	RW-191001-RA-01	Total/NA	Water	8151A	508411
500-171016-2	RW-191001-RA-02	Total/NA	Water	8151A	508411
500-171016-3	RW-191001-RA-03	Total/NA	Water	8151A	508411
500-171016-4	RW-191001-RA-04	Total/NA	Water	8151A	508411
500-171016-5	RW-191001-RA-05	Total/NA	Water	8151A	508411
500-171016-6	RW-191001-RA-06	Total/NA	Water	8151A	508411
500-171016-7	RW-191001-RA-07	Total/NA	Water	8151A	508411
500-171016-8	RW-191001-RA-08	Total/NA	Water	8151A	508411
500-171016-9	RW-191001-RA-09	Total/NA	Water	8151A	508411
500-171016-10	RW-191001-RA-10	Total/NA	Water	8151A	508411
MB 500-508411/1-A	Method Blank	Total/NA	Water	8151A	508411
LCS 500-508411/2-A	Lab Control Sample	Total/NA	Water	8151A	508411
500-171016-8 MS	RW-191001-RA-08	Total/NA	Water	8151A	508411
500-171016-8 MSD	RW-191001-RA-08	Total/NA	Water	8151A	508411

Surrogate Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Water **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)			
		DCA	TOL	BFB	DBFM
Lab Sample ID	Client Sample ID	(75-126)	(75-120)	(72-124)	(75-120)
500-171016-1	RW-191001-RA-01	97	101	99	99
500-171016-2	RW-191001-RA-02	98	102	98	98
500-171016-3	RW-191001-RA-03	87	99	106	91
500-171016-4	RW-191001-RA-04	89	98	106	92
500-171016-5	RW-191001-RA-05	86	99	105	92
500-171016-6	RW-191001-RA-06	84	100	105	90
500-171016-7	RW-191001-RA-07	85	101	112	91
500-171016-8	RW-191001-RA-08	97	100	98	99
500-171016-8 MS	RW-191001-RA-08	96	100	100	100
500-171016-8 MSD	RW-191001-RA-08	97	101	101	102
500-171016-9	RW-191001-RA-09	84	98	109	92
500-171016-10	RW-191001-RA-10	81	102	110	90
500-171016-11	Trip Blank	85	99	110	91
LCS 500-509587/4	Lab Control Sample	95	101	98	98
LCS 500-509833/4	Lab Control Sample	83	105	94	95
MB 500-509587/6	Method Blank	97	102	98	99
MB 500-509833/6	Method Blank	87	96	105	91

Surrogate Legend

DCA = 1,2-Dichloroethane-d4 (Surr)
TOL = Toluene-d8 (Surr)
BFB = 4-Bromofluorobenzene (Surr)
DBFM = Dibromofluoromethane

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Matrix: Water **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)		
		NBZ	FBP	TPHL
Lab Sample ID	Client Sample ID	(36-120)	(34-110)	(40-145)
500-171016-1	RW-191001-RA-01	66	77 ^c	95
500-171016-2	RW-191001-RA-02	73	83 ^c	105
500-171016-3	RW-191001-RA-03	75	89 ^c	104
500-171016-4	RW-191001-RA-04	72	86 ^c	105
500-171016-5	RW-191001-RA-05	73	88 ^c	110
500-171016-6	RW-191001-RA-06	69	78 ^c	106
500-171016-7	RW-191001-RA-07	71	90 ^c	104
500-171016-8	RW-191001-RA-08	66	79 ^c	98
500-171016-8 MS	RW-191001-RA-08	42	54	84
500-171016-8 MSD	RW-191001-RA-08	46	56	79
500-171016-9	RW-191001-RA-09	67	82 ^c	103
500-171016-10	RW-191001-RA-10	66	80 ^c	99
LCS 500-508120/2-A	Lab Control Sample	87	76	95
MB 500-508120/1-A	Method Blank	84	73	94

Surrogate Legend

NBZ = Nitrobenzene-d5 (Surr)
FBP = 2-Fluorobiphenyl (Surr)
TPHL = Terphenyl-d14 (Surr)

Surrogate Summary

Client: GHD Services Inc.
Job ID: 500-171016-1
Project/Site: Penta Wood 086165

Method: 8151A - Herbicides (GC)

Matrix: Water
Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)										
Lab Sample ID	Client Sample ID	DCPAA2 (25-130)										
500-171016-1	RW-191001-RA-01	145 X										
500-171016-2	RW-191001-RA-02	193 X										
500-171016-3	RW-191001-RA-03	185 X										
500-171016-4	RW-191001-RA-04	198 X										
500-171016-5	RW-191001-RA-05	172 X										
500-171016-6	RW-191001-RA-06	188 X										
500-171016-7	RW-191001-RA-07	210 X										
500-171016-8	RW-191001-RA-08	198 X										
500-171016-8 MS	RW-191001-RA-08	217 X										
500-171016-8 MSD	RW-191001-RA-08	209 X										
500-171016-9	RW-191001-RA-09	221 X										
500-171016-10	RW-191001-RA-10	215 X										
LCS 500-508411/2-A	Lab Control Sample	250 X										
MB 500-508411/1-A	Method Blank	154 X										

Surrogate Legend

DCPAA = DCAA

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 500-509587/6
Matrix: Water
Analysis Batch: 509587

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/11/19 12:41	1
Toluene	<0.15		0.50	0.15	ug/L			10/11/19 12:41	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/11/19 12:41	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/11/19 12:41	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*97*		*75 - 126*		*10/11/19 12:41*	*1*
Toluene-d8 (Surr)	*102*		*75 - 120*		*10/11/19 12:41*	*1*
4-Bromofluorobenzene (Surr)	*98*		*72 - 124*		*10/11/19 12:41*	*1*
Dibromofluoromethane	*99*		*75 - 120*		*10/11/19 12:41*	*1*

Lab Sample ID: LCS 500-509587/4
Matrix: Water
Analysis Batch: 509587

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	50.0	45.8		ug/L		92	70 - 120
Toluene	50.0	46.8		ug/L		94	70 - 125
Ethylbenzene	50.0	47.5		ug/L		95	70 - 123
Xylenes, Total	100	93.6		ug/L		94	70 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*95*		*75 - 126*
Toluene-d8 (Surr)	*101*		*75 - 120*
4-Bromofluorobenzene (Surr)	*98*		*72 - 124*
Dibromofluoromethane	*98*		*75 - 120*

Lab Sample ID: 500-171016-8 MS
Matrix: Water
Analysis Batch: 509587

Client Sample ID: RW-191001-RA-08
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	<0.15		50.0	44.8		ug/L		90	70 - 120
Toluene	<0.15		50.0	45.5		ug/L		91	70 - 125
Ethylbenzene	<0.18		50.0	46.0		ug/L		92	70 - 123
Xylenes, Total	<0.22		100	90.3		ug/L		90	70 - 125

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*96*		*75 - 126*
Toluene-d8 (Surr)	*100*		*75 - 120*
4-Bromofluorobenzene (Surr)	*100*		*72 - 124*
Dibromofluoromethane	*100*		*75 - 120*

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 500-171016-8 MSD
Matrix: Water
Analysis Batch: 509587

Client Sample ID: RW-191001-RA-08
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene	<0.15		50.0	41.3		ug/L		83	70 - 120	8	20
Toluene	<0.15		50.0	41.3		ug/L		83	70 - 125	10	20
Ethylbenzene	<0.18		50.0	42.4		ug/L		85	70 - 123	8	20
Xylenes, Total	<0.22		100	83.3		ug/L		83	70 - 125	8	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*97*		*75 - 126*
Toluene-d8 (Surr)	*101*		*75 - 120*
4-Bromofluorobenzene (Surr)	*101*		*72 - 124*
Dibromofluoromethane	*102*		*75 - 120*

Lab Sample ID: MB 500-509833/6
Matrix: Water
Analysis Batch: 509833

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/14/19 09:26	1
Toluene	<0.15		0.50	0.15	ug/L			10/14/19 09:26	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/14/19 09:26	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/14/19 09:26	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*87*		*75 - 126*		*10/14/19 09:26*	*1*
Toluene-d8 (Surr)	*96*		*75 - 120*		*10/14/19 09:26*	*1*
4-Bromofluorobenzene (Surr)	*105*		*72 - 124*		*10/14/19 09:26*	*1*
Dibromofluoromethane	*91*		*75 - 120*		*10/14/19 09:26*	*1*

Lab Sample ID: LCS 500-509833/4
Matrix: Water
Analysis Batch: 509833

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	50.0	49.3		ug/L		99	70 - 120
Toluene	50.0	49.5		ug/L		99	70 - 125
Ethylbenzene	50.0	53.1		ug/L		106	70 - 123
Xylenes, Total	100	97.1		ug/L		97	70 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*83*		*75 - 126*
Toluene-d8 (Surr)	*105*		*75 - 120*
4-Bromofluorobenzene (Surr)	*94*		*72 - 124*
Dibromofluoromethane	*95*		*75 - 120*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Lab Sample ID: MB 500-508120/1-A
Matrix: Water
Analysis Batch: 508165

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 508120

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.25		0.80	0.25	ug/L		10/03/19 07:39	10/03/19 13:23	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*84*		*36 - 120*	*10/03/19 07:39*	*10/03/19 13:23*	*1*
2-Fluorobiphenyl (Surr)	*73*		*34 - 110*	*10/03/19 07:39*	*10/03/19 13:23*	*1*
Terphenyl-d14 (Surr)	*94*		*40 - 145*	*10/03/19 07:39*	*10/03/19 13:23*	*1*

Lab Sample ID: LCS 500-508120/2-A
Matrix: Water
Analysis Batch: 508165

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 508120

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Naphthalene			32.0	20.8		ug/L		65	36 - 110		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Nitrobenzene-d5 (Surr)	*87*		*36 - 120*
2-Fluorobiphenyl (Surr)	*76*		*34 - 110*
Terphenyl-d14 (Surr)	*95*		*40 - 145*

Lab Sample ID: 500-171016-8 MS
Matrix: Water
Analysis Batch: 508241

Client Sample ID: RW-191001-RA-08
Prep Type: Total/NA
Prep Batch: 508120

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Naphthalene	<0.24		31.6	11.9		ug/L		38	36 - 110		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Nitrobenzene-d5 (Surr)	*42*		*36 - 120*
2-Fluorobiphenyl (Surr)	*54*		*34 - 110*
Terphenyl-d14 (Surr)	*84*		*40 - 145*

Lab Sample ID: 500-171016-8 MSD
Matrix: Water
Analysis Batch: 508241

Client Sample ID: RW-191001-RA-08
Prep Type: Total/NA
Prep Batch: 508120

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Naphthalene	<0.24		30.2	11.0		ug/L		36	36 - 110	8	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Nitrobenzene-d5 (Surr)	*46*		*36 - 120*
2-Fluorobiphenyl (Surr)	*56*		*34 - 110*
Terphenyl-d14 (Surr)	*79*		*40 - 145*

Method: 8151A - Herbicides (GC)

Lab Sample ID: MB 500-508411/1-A
Matrix: Water
Analysis Batch: 508618

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 508411

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.090		0.10	0.090	ug/L		10/04/19 10:20	10/06/19 18:16	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*154*	*X*	*25 - 130*	*10/04/19 10:20*	*10/06/19 18:16*	*1*

Lab Sample ID: LCS 500-508411/2-A
Matrix: Water
Analysis Batch: 508618

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 508411

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Pentachlorophenol			5.05	2.16		ug/L		43	40 - 122		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
DCAA	*250*	*X*	*25 - 130*

Lab Sample ID: 500-171016-8 MS
Matrix: Water
Analysis Batch: 508618

Client Sample ID: RW-191001-RA-08
Prep Type: Total/NA
Prep Batch: 508411

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Pentachlorophenol	<0.086		4.88	1.87	F1	ug/L		38	40 - 122		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
DCAA	*217*	*X*	*25 - 130*

Lab Sample ID: 500-171016-8 MSD
Matrix: Water
Analysis Batch: 508618

Client Sample ID: RW-191001-RA-08
Prep Type: Total/NA
Prep Batch: 508411

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Pentachlorophenol	<0.086		4.87	1.71	F1	ug/L		35	40 - 122	9	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
DCAA	*209*	*X*	*25 - 130*

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Client Sample ID: RW-191001-RA-01
Date Collected: 10/01/19 11:05
Date Received: 10/02/19 09:15

Lab Sample ID: 500-171016-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	509587	10/11/19 16:53	APL	TAL CHI
Total/NA	Prep	3510C			508120	10/03/19 07:39	CMC	TAL CHI
Total/NA	Analysis	8270D		1	508241	10/03/19 19:41	NRJ	TAL CHI
Total/NA	Prep	8151A			508411	10/04/19 10:20	DAK	TAL CHI
Total/NA	Analysis	8151A		1	508618	10/06/19 19:16	JBJ	TAL CHI

Client Sample ID: RW-191001-RA-02
Date Collected: 10/01/19 11:20
Date Received: 10/02/19 09:15

Lab Sample ID: 500-171016-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	509587	10/11/19 17:18	APL	TAL CHI
Total/NA	Prep	3510C			508120	10/03/19 07:39	CMC	TAL CHI
Total/NA	Analysis	8270D		1	508241	10/03/19 20:08	NRJ	TAL CHI
Total/NA	Prep	8151A			508411	10/04/19 10:20	DAK	TAL CHI
Total/NA	Analysis	8151A		1	508618	10/06/19 19:36	JBJ	TAL CHI

Client Sample ID: RW-191001-RA-03
Date Collected: 10/01/19 11:20
Date Received: 10/02/19 09:15

Lab Sample ID: 500-171016-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	509833	10/14/19 10:42	STW	TAL CHI
Total/NA	Prep	3510C			508120	10/03/19 07:39	CMC	TAL CHI
Total/NA	Analysis	8270D		1	508241	10/03/19 20:34	NRJ	TAL CHI
Total/NA	Prep	8151A			508411	10/04/19 10:20	DAK	TAL CHI
Total/NA	Analysis	8151A		1	508618	10/06/19 19:56	JBJ	TAL CHI

Client Sample ID: RW-191001-RA-04
Date Collected: 10/01/19 11:30
Date Received: 10/02/19 09:15

Lab Sample ID: 500-171016-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	509833	10/14/19 11:07	STW	TAL CHI
Total/NA	Prep	3510C			508120	10/03/19 07:39	CMC	TAL CHI
Total/NA	Analysis	8270D		1	508241	10/03/19 21:01	NRJ	TAL CHI
Total/NA	Prep	8151A			508411	10/04/19 10:20	DAK	TAL CHI
Total/NA	Analysis	8151A		1	508618	10/06/19 20:16	JBJ	TAL CHI

Client Sample ID: RW-191001-RA-05
Date Collected: 10/01/19 11:42
Date Received: 10/02/19 09:15

Lab Sample ID: 500-171016-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	509833	10/14/19 11:32	STW	TAL CHI

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Client Sample ID: RW-191001-RA-05
Date Collected: 10/01/19 11:42
Date Received: 10/02/19 09:15

Lab Sample ID: 500-171016-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3510C			508120	10/03/19 07:39	CMC	TAL CHI
Total/NA	Analysis	8270D		1	508241	10/03/19 21:28	NRJ	TAL CHI
Total/NA	Prep	8151A			508411	10/04/19 10:20	DAK	TAL CHI
Total/NA	Analysis	8151A		1	508618	10/06/19 20:36	JBJ	TAL CHI

Client Sample ID: RW-191001-RA-06
Date Collected: 10/01/19 11:48
Date Received: 10/02/19 09:15

Lab Sample ID: 500-171016-6
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	509833	10/14/19 11:58	STW	TAL CHI
Total/NA	Prep	3510C			508120	10/03/19 07:39	CMC	TAL CHI
Total/NA	Analysis	8270D		1	508241	10/03/19 21:54	NRJ	TAL CHI
Total/NA	Prep	8151A			508411	10/04/19 10:20	DAK	TAL CHI
Total/NA	Analysis	8151A		1	508618	10/06/19 20:56	JBJ	TAL CHI

Client Sample ID: RW-191001-RA-07
Date Collected: 10/01/19 12:17
Date Received: 10/02/19 09:15

Lab Sample ID: 500-171016-7
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	509833	10/14/19 12:23	STW	TAL CHI
Total/NA	Prep	3510C			508120	10/03/19 07:39	CMC	TAL CHI
Total/NA	Analysis	8270D		1	508241	10/03/19 22:21	NRJ	TAL CHI
Total/NA	Prep	8151A			508411	10/04/19 10:20	DAK	TAL CHI
Total/NA	Analysis	8151A		1	508618	10/06/19 21:16	JBJ	TAL CHI

Client Sample ID: RW-191001-RA-08
Date Collected: 10/01/19 12:22
Date Received: 10/02/19 09:15

Lab Sample ID: 500-171016-8
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	509587	10/11/19 17:43	APL	TAL CHI
Total/NA	Prep	3510C			508120	10/03/19 07:39	CMC	TAL CHI
Total/NA	Analysis	8270D		1	508241	10/03/19 22:48	NRJ	TAL CHI
Total/NA	Prep	8151A			508411	10/04/19 10:20	DAK	TAL CHI
Total/NA	Analysis	8151A		1	508618	10/06/19 22:16	JBJ	TAL CHI

Client Sample ID: RW-191001-RA-09
Date Collected: 10/01/19 13:05
Date Received: 10/02/19 09:15

Lab Sample ID: 500-171016-9
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	509833	10/14/19 12:47	STW	TAL CHI

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171016-1

Client Sample ID: RW-191001-RA-09

Lab Sample ID: 500-171016-9

Date Collected: 10/01/19 13:05

Matrix: Water

Date Received: 10/02/19 09:15

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3510C			508120	10/03/19 07:39	CMC	TAL CHI
Total/NA	Analysis	8270D		1	508241	10/03/19 23:14	NRJ	TAL CHI
Total/NA	Prep	8151A			508411	10/04/19 10:20	DAK	TAL CHI
Total/NA	Analysis	8151A		1	508618	10/06/19 23:17	JBJ	TAL CHI

Client Sample ID: RW-191001-RA-10

Lab Sample ID: 500-171016-10

Date Collected: 10/01/19 13:30

Matrix: Water

Date Received: 10/02/19 09:15

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	509833	10/14/19 13:13	STW	TAL CHI
Total/NA	Prep	3510C			508120	10/03/19 07:39	CMC	TAL CHI
Total/NA	Analysis	8270D		1	508241	10/03/19 23:41	NRJ	TAL CHI
Total/NA	Prep	8151A			508411	10/04/19 10:20	DAK	TAL CHI
Total/NA	Analysis	8151A		1	508618	10/06/19 23:37	JBJ	TAL CHI

Client Sample ID: Trip Blank

Lab Sample ID: 500-171016-11

Date Collected: 10/01/19 00:00

Matrix: Water

Date Received: 10/02/19 09:15

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	509833	10/14/19 13:38	STW	TAL CHI

Laboratory References:

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Accreditation/Certification Summary

Client: GHD Services Inc.
Job ID: 500-171016-1
Project/Site: Penta Wood 086165

Laboratory: Eurofins TestAmerica, Chicago

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Wisconsin	State Program	999580010	08-31-20

TestAmerica

THE LEADER IN ENVIRONMENTAL

2417 Bond Street, University Park, IL 60
Phone: 708.534.5200 Fax: 708.534.

500-171016 COC

(optional)

Report To
Contact: Grant Anderson
Company: GHD
Address:
Address:
Phone:
Fax:
E-Mail:

(optional)

Bill To
Contact:
Company:
Address:
Address:
Phone:
Fax:
PO#/Reference#

Chain of Custody Record

Lab Job #: 500-171016

Chain of Custody Number:

Page 1 of 1

Temperature °C of Cooler: 5.9, 5.8, 4.3, 5.9, 5.6

Client	Client Project #	Preservative	HCl									
GHD	08665											
Project Name		Parameter	BTEX	PCP	Naphthalene							
Pentwood												
Project Location/State	Lab Project #											
Sim, MI												
Sampler	Lab PM											
RAsmat												

Preservative Key
1. HCL, Cool to 4°
2. H2SO4, Cool to 4°
3. HNO3, Cool to 4°
4. NaOH, Cool to 4°
5. NaOH/Zn, Cool to 4°
6. NaHSO4
7. Cool to 4°
8. None
9. Other

Lab ID	MS/MSD	Sample ID	Sampling Date	Sampling Time	# of Containers	Matrix	Comments
1		RW-191001-RA-01	10/1/19	1105	7	GW	Please
2		RW-191001-RA-02		1120	7		analyze
3		RW-191001-RA-03	1120	~~1142~~	7		for
4		RW-191001-RA-04	1130	~~1148~~	7		blank
5		RW-191001-RA-05	1142	~~1217~~	7		
6		RW-191001-RA-06	1148	~~1222~~	7		
7		RW-191001-RA-07	1217	~~1305~~	7		
8	X	RW-191001-RA-08		1222	21		
9		RW-191001-RA-09		1305	7		
10		RW-191001-RA-10		1330	7		
11		Trip Blank					

Turnaround Time Requested (Business Days)
___ 1 Day ___ 2 Days ___ 5 Days ___ 7 Days ___ 10 Days ___ 15 Days _____ Other
Requested Due Date _____

Sample Disposal
☐ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Relinquished By	Company	Date	Time	Received By	Company	Date	Time
	GHD	10/1/19	1500		Test America	10/2/19	0915
Relinquished By	Company	Date	Time	Received By	Company	Date	Time
Relinquished By	Company	Date	Time	Received By	Company	Date	Time

Lab Courier
Shipped Fed X
Hand Delivered

Matrix Key
WW – Wastewater
W – Water
S – Soil
SL – Sludge
MS – Miscellaneous
OL – Oil
A – Air
SE – Sediment
SO – Soil
L – Leachate
WI – Wipe
DW – Drinking Water
O – Other

Client Comments

Lab Comments:

Login Sample Receipt Checklist

Client: GHD Services Inc.

Job Number: 500-171016-1

Login Number: 171016
List Number: 1
Creator: Scott, Sherri L

List Source: Eurofins TestAmerica, Chicago

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	5.9,5.8,4.3,5.9,5.6
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	False	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Chicago
2417 Bond Street
University Park, IL 60484
Tel: (708)534-5200

Laboratory Job ID: 500-171816-1
Client Project/Site: Penta Wood 086165

For:
GHD Services Inc.
1801 Old Highway 8 NW
Suite 114
St. Paul, Minnesota 55112

Attn: Mr. Grant Anderson

Authorized for release by:
10/31/2019 5:54:44 PM

Richard Wright, Senior Project Manager
(708)534-5200
richard.wright@testamericainc.com

Table of Contents

Job ID: 500-171816-1

Laboratory: Eurofins TestAmerica, Chicago

Narrative

Job Narrative
500-171816-1

Receipt
The samples were received on 10/16/2019 9:45 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 10 coolers at receipt time were 2.5º C, 2.9º C, 3.3º C, 3.5º C, 3.6º C, 4.0º C, 5.4º C, 5.6º C, 5.6º C and 5.8º C.

Method 8260B: A trip blank was submitted for analysis with these samples; however, it was not listed on the Chain of Custody (COC). The trip blank was added to the COC by TestAmerica personnel and logged in for analysis.

GC/MS VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

GC/MS Semi VOA
Method 8270D: The matrix spike / matrix spike duplicate (MS/MSD) precision for preparation batch 500-510510 and analytical batch 500-510672 were outside control limits for: Naphthalene. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample / laboratory sample control duplicate (LCS/LCSD) precision was within acceptance limits. W-191014-RA-01 (500-171816-1[MS]) and W-191014-RA-01 (500-171816-1[MSD])

Method 8270D: The continuing calibration verification (CCVIS) analyzed in batch 500-510672 was outside the method criteria for Nitrobenzene-d5 (Surr). A CCV standard at or below the reporting limit (RL) was analyzed with the affected samples and found to be acceptable. The recoveries for this surrogate were within limits for all the samples. As indicated in the reference method, sample analysis may proceed; however, any detection for the affected analyte is considered estimated.

Method 8270D: The continuing calibration verification (CCVIS) analyzed in batch 500-511235 was outside the method criteria for Nitrobenzene-d5 (Surr). A CCV standard at or below the reporting limit (RL) was analyzed with the affected samples and found to be acceptable. The recoveries for this surrogate were within limits for all the samples. As indicated in the reference method, sample analysis may proceed; however, any detection for the affected analyte is considered estimated.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GC VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

GC Semi VOA
Method 8151A: The following samples required a dilution due to the nature of the sample matrix: W-191014-RA-02 (500-171816-2) and W-191015-RA-15 (500-171816-14). Because of this dilution, the surrogate spike concentration in the sample was reduced to a level where the recovery calculation does not provide useful information.

Method 8151A: The continuing calibration verification (CCV) associated with batch 500-510718 recovered above the upper control limit for Pentachlorophenol and DCAA. The samples associated with this CCV were non-detects for the affected analytes; therefore, the data have been reported. The following samples are impacted: W-191014-RA-06 (500-171816-6), W-191014-RA-07 (500-171816-7), W-191014-RA-08 (500-171816-8), W-191014-RA-09 (500-171816-9), W-191015-RA-10 (500-171816-10), W-191015-RA-11 (500-171816-11), W-191015-RA-13 (500-171816-12), W-191015-RA-14 (500-171816-13) and (CCV 500-510718/43).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Metals
Method 6020A: The continuing calibration verification (CCV) associated with batch 500-512288 recovered above the upper control limit for Copper. The samples associated with this CCV were non-detect for the affected analyte; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
Method 300.0: The following samples were received with less than 8 hours remaining on a test with a holding time of 48 hours or less. As

Job ID: 500-171816-1 (Continued)

Laboratory: Eurofins TestAmerica, Chicago (Continued)

such, the laboratory had insufficient time remaining to perform the analysis for Nitrate as N within holding time: W-191014-RA-02 (500-171816-2), W-191014-RA-04 (500-171816-4), W-191014-RA-05 (500-171816-5), W-191014-RA-06 (500-171816-6), W-191014-RA-07 (500-171816-7), W-191014-RA-08 (500-171816-8), W-191014-RA-09 (500-171816-9), W-191015-RA-10 (500-171816-10), W-191015-RA-11 (500-171816-11), W-191015-RA-13 (500-171816-12), W-191015-RA-14 (500-171816-13) and W-191015-RA-15 (500-171816-14). In addition, the samples were analyzed several times to get all analytes within the calibration range.

Method 9060A: The CCV analyzed before the MB and LCS failed, however, the MB and the LCS met the method acceptance criteria. The samples were bracketed with passing QC. The data have been qualified and reported. (LCS 500-511720/33) and (MB 500-511720/32)

Method 300.0: Reanalysis of the following samples were performed outside of the analytical holding time due to MS/MSD failure: W-191014-RA-01 (500-171816-1), W-191014-RA-01 (500-171816-1[MS]) and W-191014-RA-01 (500-171816-1[MSD]). The original, in hold data is reported as secondary.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191014-RA-01 — Lab Sample ID: 500-171816-1

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Methane	86		1.0	0.17	ug/L	1		RSK-175	Total/NA
Copper	0.73	J ^	2.0	0.50	ug/L	1		6020A	Dissolved
Iron	482		100	46.7	ug/L	1		6020A	Dissolved
Manganese	52.1		2.5	0.79	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	235		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	30.1		2.0	1.7	mg/L	10		300.0	Total/NA
Nitrate as N	1.3	H	0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	8.3		0.20	0.095	mg/L	1		300.0	Total/NA
Total Organic Carbon - Duplicates	0.69	J	1.0	0.47	mg/L	1		9060A	Total/NA
Alkalinity	209		5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191014-RA-02 — Lab Sample ID: 500-171816-2

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Methane	0.25	J	1.0	0.17	ug/L	1		RSK-175	Total/NA
Pentachlorophenol	300		10	9.1	ug/L	100		8151A	Total/NA
Arsenic	0.89	J	1.0	0.23	ug/L	1		6020A	Dissolved
Copper	0.85	J ^	2.0	0.50	ug/L	1		6020A	Dissolved
Manganese	8.4		2.5	0.79	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	197		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	8.7		0.40	0.34	mg/L	2		300.0	Total/NA
Nitrate as N	0.61	H	0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	43.5		2.0	0.95	mg/L	10		300.0	Total/NA
Total Organic Carbon - Duplicates	1.2		1.0	0.47	mg/L	1		9060A	Total/NA
Alkalinity	158		5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191014-RA-03 — Lab Sample ID: 500-171816-3

No Detections.

Client Sample ID: W-191014-RA-04 — Lab Sample ID: 500-171816-4

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Arsenic	0.27	J	1.0	0.23	ug/L	1		6020A	Dissolved
Copper	1.6	J ^	2.0	0.50	ug/L	1		6020A	Dissolved
Iron	60.3	J	100	46.7	ug/L	1		6020A	Dissolved
Manganese	4.0		2.5	0.79	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	37.5		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	3.9		0.20	0.17	mg/L	1		300.0	Total/NA
Nitrate as N	0.55	H	0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	4.4		0.20	0.095	mg/L	1		300.0	Total/NA
Alkalinity	42.8		5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191014-RA-05 — Lab Sample ID: 500-171816-5

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Arsenic	0.26	J	1.0	0.23	ug/L	1		6020A	Dissolved
Copper	2.4		2.0	0.50	ug/L	1		6020A	Dissolved
Iron	105		100	46.7	ug/L	1		6020A	Dissolved
Manganese	4.2		2.5	0.79	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	37.9		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	3.8		0.20	0.17	mg/L	1		300.0	Total/NA
Nitrate as N	0.55	H	0.20	0.068	mg/L	1		300.0	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: W-191014-RA-05 (Continued) — Lab Sample ID: 500-171816-5

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Sulfate	4.4		0.20	0.095	mg/L	1		300.0	Total/NA
Alkalinity	43.2		5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191014-RA-06 — Lab Sample ID: 500-171816-6

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Naphthalene	0.65	J	0.79	0.24	ug/L	1		8270D	Total/NA
Methane	6.4		1.0	0.17	ug/L	1		RSK-175	Total/NA
Arsenic	0.64	J	1.0	0.23	ug/L	1		6020A	Dissolved
Copper	0.67	J	2.0	0.50	ug/L	1		6020A	Dissolved
Manganese	2.6		2.5	0.79	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	250		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	46.2		2.0	1.7	mg/L	10		300.0	Total/NA
Nitrate as N	2.1	H	0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	8.1		0.20	0.095	mg/L	1		300.0	Total/NA
Alkalinity	195		5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191014-RA-07 — Lab Sample ID: 500-171816-7

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Copper	0.77	J	2.0	0.50	ug/L	1		6020A	Dissolved
Iron	134		100	46.7	ug/L	1		6020A	Dissolved
Manganese	14.8		2.5	0.79	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	35.7		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	0.74		0.20	0.17	mg/L	1		300.0	Total/NA
Nitrate as N	0.64	H	0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	3.8		0.20	0.095	mg/L	1		300.0	Total/NA
Total Organic Carbon - Duplicates	0.69	J	1.0	0.47	mg/L	1		9060A	Total/NA
Alkalinity	33.3		5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191014-RA-08 — Lab Sample ID: 500-171816-8

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Arsenic	0.28	J	1.0	0.23	ug/L	1		6020A	Dissolved
Copper	2.3		2.0	0.50	ug/L	1		6020A	Dissolved
Iron	149		100	46.7	ug/L	1		6020A	Dissolved
Manganese	4.3		2.5	0.79	ug/L	1		6020A	Dissolved
Zinc	6.9	J	20.0	6.9	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	40.1		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	1.2		0.20	0.17	mg/L	1		300.0	Total/NA
Nitrate as N	0.29	H	0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	1.8		0.20	0.095	mg/L	1		300.0	Total/NA
Total Organic Carbon - Duplicates	1.9		1.0	0.47	mg/L	1		9060A	Total/NA
Alkalinity	44.7		5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191014-RA-09 — Lab Sample ID: 500-171816-9

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Arsenic	0.37	J	1.0	0.23	ug/L	1		6020A	Dissolved
Copper	1.5	J	2.0	0.50	ug/L	1		6020A	Dissolved
Iron	76.5	J	100	46.7	ug/L	1		6020A	Dissolved
Manganese	4.7		2.5	0.79	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	116		0.91	0.46	mg/L	1		SM 2340B	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: W-191014-RA-09 (Continued) — Lab Sample ID: 500-171816-9

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Chloride	14.7		2.0	1.7	mg/L	10		300.0	Total/NA
Nitrate as N	3.7	H	0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	5.7		0.20	0.095	mg/L	1		300.0	Total/NA
Total Organic Carbon - Duplicates	0.55	J	1.0	0.47	mg/L	1		9060A	Total/NA
Alkalinity	99.1		5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191015-RA-10 — Lab Sample ID: 500-171816-10

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Copper	1.3	J	2.0	0.50	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	231		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	0.52		0.20	0.17	mg/L	1		300.0	Total/NA
Nitrate as N	0.33	F1	0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	0.84		0.20	0.095	mg/L	1		300.0	Total/NA
Alkalinity	240		5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191015-RA-11 — Lab Sample ID: 500-171816-11

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Arsenic	0.24	J	1.0	0.23	ug/L	1		6020A	Dissolved
Copper	1.5	J	2.0	0.50	ug/L	1		6020A	Dissolved
Zinc	7.6	J	20.0	6.9	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	205		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	20.2		2.0	1.7	mg/L	10		300.0	Total/NA
Nitrate as N	2.1		0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	3.9		0.20	0.095	mg/L	1		300.0	Total/NA
Alkalinity	404		5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191015-RA-13 — Lab Sample ID: 500-171816-12

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Arsenic	0.23	J	1.0	0.23	ug/L	1		6020A	Dissolved
Copper	0.72	J	2.0	0.50	ug/L	1		6020A	Dissolved
Zinc	7.0	J	20.0	6.9	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	83.1		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	87.1		4.0	3.4	mg/L	20		300.0	Total/NA
Nitrate as N	1.6		0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	5.9		0.20	0.095	mg/L	1		300.0	Total/NA
Alkalinity	35.1		5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191015-RA-14 — Lab Sample ID: 500-171816-13

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Arsenic	0.55	J	1.0	0.23	ug/L	1		6020A	Dissolved
Copper	1.0	J	2.0	0.50	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	338		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	13.8		4.0	3.4	mg/L	20		300.0	Total/NA
Nitrate as N	2.0		0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	128		4.0	1.9	mg/L	20		300.0	Total/NA
Alkalinity	193		5.0	3.7	mg/L	1		SM 2320B	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191015-RA-15 — Lab Sample ID: 500-171816-14

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Toluene	0.97		0.50	0.15	ug/L	1		8260B	Total/NA
Ethylbenzene	1.3		0.50	0.18	ug/L	1		8260B	Total/NA
Xylenes, Total	18		1.0	0.22	ug/L	1		8260B	Total/NA
Naphthalene	20		0.77	0.24	ug/L	1		8270D	Total/NA
Methane	6.3		1.0	0.17	ug/L	1		RSK-175	Total/NA
Pentachlorophenol	11000		380	340	ug/L	4000		8151A	Total/NA
Arsenic	8.9		1.0	0.23	ug/L	1		6020A	Dissolved
Copper	2.2		2.0	0.50	ug/L	1		6020A	Dissolved
Iron	19800		100	46.7	ug/L	1		6020A	Dissolved
Manganese	3150		2.5	0.79	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	268		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	33.1		2.0	1.7	mg/L	10		300.0	Total/NA
Sulfate	15.5		2.0	0.95	mg/L	10		300.0	Total/NA
Total Organic Carbon - Duplicates	36.6		1.0	0.47	mg/L	1		9060A	Total/NA
Alkalinity	265		5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: Trip Blank (1) — Lab Sample ID: 500-171816-15

No Detections.

Client Sample ID: Trip Blank (2) — Lab Sample ID: 500-171816-16

No Detections.

Client Sample ID: Trip Blank (3) — Lab Sample ID: 500-171816-17

No Detections.

Client Sample ID: Trip Blank (4) — Lab Sample ID: 500-171816-18

No Detections.

This Detection Summary does not include radiochemical test results.

Method Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL CHI
8270D	Semivolatile Organic Compounds (GC/MS)	SW846	TAL CHI
RSK-175	Dissolved Gases (GC)	RSK	TAL CAN
8151A	Herbicides (GC)	SW846	TAL CHI
6020A	Metals (ICP/MS)	SW846	TAL CHI
SM 2340B	Total Hardness (as CaCO3) by calculation	SM	TAL CHI
300.0	Anions, Ion Chromatography	MCAWW	TAL CHI
9060A	Organic Carbon, Total (TOC)	SW846	TAL CHI
SM 2320B	Alkalinity	SM	TAL CHI
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	TAL CHI
3010A	Preparation, Total Metals	SW846	TAL CHI
3510C	Liquid-Liquid Extraction (Separatory Funnel)	SW846	TAL CHI
5030B	Purge and Trap	SW846	TAL CHI
8151A	Extraction (Herbicides)	SW846	TAL CHI

Protocol References:

MCAWW = "Methods For Chemical Analysis Of Water And Wastes", EPA-600/4-79-020, March 1983 And Subsequent Revisions.

RSK = Sample Prep And Calculations For Dissolved Gas Analysis In Water Samples Using A GC Headspace Equilibration Technique, RSKSOP-175, Rev. 0, 8/11/94, USEPA Research Lab

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CAN = Eurofins TestAmerica, Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Sample Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
500-171816-1	W-191014-RA-01	Water	10/14/19 15:48	10/16/19 09:45	
500-171816-2	W-191014-RA-02	Water	10/14/19 12:25	10/16/19 09:45	
500-171816-3	W-191014-RA-03	Water	10/14/19 12:25	10/16/19 09:45	
500-171816-4	W-191014-RA-04	Water	10/14/19 12:54	10/16/19 09:45	
500-171816-5	W-191014-RA-05	Water	10/14/19 12:54	10/16/19 09:45	
500-171816-6	W-191014-RA-06	Water	10/14/19 13:50	10/16/19 09:45	
500-171816-7	W-191014-RA-07	Water	10/14/19 14:22	10/16/19 09:45	
500-171816-8	W-191014-RA-08	Water	10/14/19 15:05	10/16/19 09:45	
500-171816-9	W-191014-RA-09	Water	10/14/19 16:17	10/16/19 09:45	
500-171816-10	W-191015-RA-10	Water	10/15/19 14:00	10/16/19 09:45	
500-171816-11	W-191015-RA-11	Water	10/15/19 13:45	10/16/19 09:45	
500-171816-12	W-191015-RA-13	Water	10/15/19 12:37	10/16/19 09:45	
500-171816-13	W-191015-RA-14	Water	10/15/19 11:09	10/16/19 09:45	
500-171816-14	W-191015-RA-15	Water	10/15/19 10:38	10/16/19 09:45	
500-171816-15	Trip Blank (1)	Water	10/14/19 00:00	10/16/19 09:45	
500-171816-16	Trip Blank (2)	Water	10/14/19 00:00	10/16/19 09:45	
500-171816-17	Trip Blank (3)	Water	10/14/19 00:00	10/16/19 09:45	
500-171816-18	Trip Blank (4)	Water	10/14/19 00:00	10/16/19 09:45	

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191014-RA-01

Date Collected: 10/14/19 15:48
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-1

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 13:09	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 13:09	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 13:09	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 13:09	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*88*		*75 - 126*		*10/21/19 13:09*	*1*
Toluene-d8 (Surr)	*96*		*75 - 120*		*10/21/19 13:09*	*1*
4-Bromofluorobenzene (Surr)	*88*		*72 - 124*		*10/21/19 13:09*	*1*
Dibromofluoromethane	*101*		*75 - 120*		*10/21/19 13:09*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.24		0.76	0.24	ug/L		10/17/19 09:25	10/18/19 15:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*52*	*^c*	*36 - 120*	*10/17/19 09:25*	*10/18/19 15:05*	*1*
2-Fluorobiphenyl (Surr)	*70*		*34 - 110*	*10/17/19 09:25*	*10/18/19 15:05*	*1*
Terphenyl-d14 (Surr)	*81*		*40 - 145*	*10/17/19 09:25*	*10/18/19 15:05*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	**86**		1.0	0.17	ug/L			10/18/19 14:26	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*91*		*60 - 140*		*10/18/19 14:26*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.091		0.10	0.091	ug/L		10/18/19 10:01	10/19/19 01:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*104*		*25 - 130*	*10/18/19 10:01*	*10/19/19 01:49*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.23		1.0	0.23	ug/L		10/25/19 17:28	10/28/19 11:43	1
Copper	**0.73**	**J ^**	2.0	0.50	ug/L		10/25/19 17:28	10/28/19 11:43	1
Iron	**482**		100	46.7	ug/L		10/25/19 17:28	10/28/19 11:43	1
Manganese	**52.1**		2.5	0.79	ug/L		10/25/19 17:28	10/28/19 14:40	1
Zinc	<6.9		20.0	6.9	ug/L		10/25/19 17:28	10/28/19 11:43	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**235**		0.91	0.46	mg/L		10/24/19 17:38	10/28/19 06:50	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**30.1**		2.0	1.7	mg/L			10/24/19 19:55	10
Nitrate as N	**1.3**	**H**	0.20	0.068	mg/L			10/24/19 19:18	1
Sulfate	**8.3**		0.20	0.095	mg/L			10/24/19 19:18	1
Total Organic Carbon - Duplicates	**0.69**	**J**	1.0	0.47	mg/L			10/24/19 19:31	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191014-RA-01
Date Collected: 10/14/19 15:48
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-1
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	209		5.0	3.7	mg/L			10/28/19 13:53	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191014-RA-02

Date Collected: 10/14/19 12:25
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-2

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 13:34	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 13:34	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 13:34	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 13:34	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*86*		*75 - 126*		*10/21/19 13:34*	*1*
Toluene-d8 (Surr)	*94*		*75 - 120*		*10/21/19 13:34*	*1*
4-Bromofluorobenzene (Surr)	*86*		*72 - 124*		*10/21/19 13:34*	*1*
Dibromofluoromethane	*98*		*75 - 120*		*10/21/19 13:34*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.24		0.78	0.24	ug/L		10/17/19 09:25	10/18/19 15:35	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*57*	*^c*	*36 - 120*	*10/17/19 09:25*	*10/18/19 15:35*	*1*
2-Fluorobiphenyl (Surr)	*74*		*34 - 110*	*10/17/19 09:25*	*10/18/19 15:35*	*1*
Terphenyl-d14 (Surr)	*81*		*40 - 145*	*10/17/19 09:25*	*10/18/19 15:35*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	**0.25**	**J**	1.0	0.17	ug/L			10/18/19 15:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*89*		*60 - 140*		*10/18/19 15:17*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	**300**		10	9.1	ug/L		10/18/19 10:01	10/21/19 10:01	100

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*0*	*D*	*25 - 130*	*10/18/19 10:01*	*10/21/19 10:01*	*100*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.89**	**J**	1.0	0.23	ug/L		10/25/19 17:28	10/28/19 11:53	1
Copper	**0.85**	**J ^**	2.0	0.50	ug/L		10/25/19 17:28	10/28/19 11:53	1
Iron	<46.7		100	46.7	ug/L		10/25/19 17:28	10/28/19 11:53	1
Manganese	**8.4**		2.5	0.79	ug/L		10/25/19 17:28	10/28/19 14:45	1
Zinc	<6.9		20.0	6.9	ug/L		10/25/19 17:28	10/28/19 11:53	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**197**		0.91	0.46	mg/L		10/24/19 17:38	10/28/19 06:50	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**8.7**		0.40	0.34	mg/L			10/22/19 08:13	2
Nitrate as N	**0.61**	**H**	0.20	0.068	mg/L			10/16/19 23:07	1
Sulfate	**43.5**		2.0	0.95	mg/L			10/22/19 08:25	10
Total Organic Carbon - Duplicates	**1.2**		1.0	0.47	mg/L			10/24/19 20:07	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191014-RA-02
Date Collected: 10/14/19 12:25
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-2
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	158		5.0	3.7	mg/L			10/28/19 14:06	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191014-RA-03

Date Collected: 10/14/19 12:25
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-3

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 13:58	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 13:58	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 13:58	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 13:58	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*87*		*75 - 126*		*10/21/19 13:58*	*1*
Toluene-d8 (Surr)	*94*		*75 - 120*		*10/21/19 13:58*	*1*
4-Bromofluorobenzene (Surr)	*88*		*72 - 124*		*10/21/19 13:58*	*1*
Dibromofluoromethane	*101*		*75 - 120*		*10/21/19 13:58*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.23		0.76	0.23	ug/L		10/17/19 09:25	10/18/19 16:02	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*44*	*^c*	*36 - 120*	*10/17/19 09:25*	*10/18/19 16:02*	*1*
2-Fluorobiphenyl (Surr)	*57*		*34 - 110*	*10/17/19 09:25*	*10/18/19 16:02*	*1*
Terphenyl-d14 (Surr)	*67*		*40 - 145*	*10/17/19 09:25*	*10/18/19 16:02*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.086		0.095	0.086	ug/L		10/18/19 10:01	10/19/19 03:19	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*101*		*25 - 130*	*10/18/19 10:01*	*10/19/19 03:19*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.23		1.0	0.23	ug/L		10/25/19 17:28	10/28/19 11:55	1
Copper	<0.50	^	2.0	0.50	ug/L		10/25/19 17:28	10/28/19 11:55	1
Iron	<46.7		100	46.7	ug/L		10/25/19 17:28	10/28/19 11:55	1
Manganese	<0.79		2.5	0.79	ug/L		10/25/19 17:28	10/28/19 14:46	1
Zinc	<6.9		20.0	6.9	ug/L		10/25/19 17:28	10/28/19 11:55	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191014-RA-04

Date Collected: 10/14/19 12:54
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-4

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 14:23	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 14:23	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 14:23	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 14:23	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*88*		*75 - 126*		*10/21/19 14:23*	*1*
Toluene-d8 (Surr)	*94*		*75 - 120*		*10/21/19 14:23*	*1*
4-Bromofluorobenzene (Surr)	*88*		*72 - 124*		*10/21/19 14:23*	*1*
Dibromofluoromethane	*100*		*75 - 120*		*10/21/19 14:23*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.23		0.76	0.23	ug/L		10/17/19 09:25	10/18/19 16:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*52*	*^c*	*36 - 120*	*10/17/19 09:25*	*10/18/19 16:29*	*1*
2-Fluorobiphenyl (Surr)	*65*		*34 - 110*	*10/17/19 09:25*	*10/18/19 16:29*	*1*
Terphenyl-d14 (Surr)	*82*		*40 - 145*	*10/17/19 09:25*	*10/18/19 16:29*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/18/19 15:34	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*91*		*60 - 140*		*10/18/19 15:34*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.086		0.096	0.086	ug/L		10/18/19 10:01	10/19/19 03:41	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*93*		*25 - 130*	*10/18/19 10:01*	*10/19/19 03:41*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.27**	**J**	1.0	0.23	ug/L		10/25/19 17:28	10/28/19 11:57	1
Copper	**1.6**	**J ^**	2.0	0.50	ug/L		10/25/19 17:28	10/28/19 11:57	1
Iron	**60.3**	**J**	100	46.7	ug/L		10/25/19 17:28	10/28/19 11:57	1
Manganese	**4.0**		2.5	0.79	ug/L		10/25/19 17:28	10/28/19 14:47	1
Zinc	<6.9		20.0	6.9	ug/L		10/25/19 17:28	10/28/19 11:57	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**37.5**		0.91	0.46	mg/L		10/24/19 17:38	10/28/19 06:50	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**3.9**		0.20	0.17	mg/L			10/30/19 00:38	1
Nitrate as N	**0.55**	**H**	0.20	0.068	mg/L			10/16/19 23:32	1
Sulfate	**4.4**		0.20	0.095	mg/L			10/28/19 22:25	1
Total Organic Carbon - Duplicates	<0.47		1.0	0.47	mg/L			10/24/19 00:08	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191014-RA-04
Date Collected: 10/14/19 12:54
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-4
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	42.8		5.0	3.7	mg/L			10/28/19 14:19	1

Client Sample ID: W-191014-RA-05

Lab Sample ID: 500-171816-5

Date Collected: 10/14/19 12:54

Matrix: Water

Date Received: 10/16/19 09:45

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 14:48	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 14:48	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 14:48	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 14:48	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*91*		*75 - 126*		*10/21/19 14:48*	*1*
Toluene-d8 (Surr)	*93*		*75 - 120*		*10/21/19 14:48*	*1*
4-Bromofluorobenzene (Surr)	*89*		*72 - 124*		*10/21/19 14:48*	*1*
Dibromofluoromethane	*103*		*75 - 120*		*10/21/19 14:48*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.25		0.80	0.25	ug/L		10/17/19 09:25	10/18/19 16:56	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*44*	*^c*	*36 - 120*	*10/17/19 09:25*	*10/18/19 16:56*	*1*
2-Fluorobiphenyl (Surr)	*58*		*34 - 110*	*10/17/19 09:25*	*10/18/19 16:56*	*1*
Terphenyl-d14 (Surr)	*71*		*40 - 145*	*10/17/19 09:25*	*10/18/19 16:56*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/18/19 15:51	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*91*		*60 - 140*		*10/18/19 15:51*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.087		0.097	0.087	ug/L		10/18/19 10:01	10/19/19 04:13	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*99*		*25 - 130*	*10/18/19 10:01*	*10/19/19 04:13*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.26**	**J**	1.0	0.23	ug/L		10/25/19 17:28	10/28/19 12:02	1
Copper	**2.4**		2.0	0.50	ug/L		10/25/19 17:28	10/28/19 12:02	1
Iron	**105**		100	46.7	ug/L		10/25/19 17:28	10/28/19 12:02	1
Manganese	**4.2**		2.5	0.79	ug/L		10/25/19 17:28	10/28/19 14:51	1
Zinc	<6.9		20.0	6.9	ug/L		10/25/19 17:28	10/28/19 12:02	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**37.9**		0.91	0.46	mg/L		10/24/19 17:38	10/28/19 06:50	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**3.8**		0.20	0.17	mg/L			10/30/19 00:51	1
Nitrate as N	**0.55**	**H**	0.20	0.068	mg/L			10/17/19 00:23	1
Sulfate	**4.4**		0.20	0.095	mg/L			10/28/19 22:37	1
Total Organic Carbon - Duplicates	<0.47		1.0	0.47	mg/L			10/24/19 00:24	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191014-RA-05
Date Collected: 10/14/19 12:54
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-5
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	43.2		5.0	3.7	mg/L			10/28/19 14:26	1

Client Sample ID: W-191014-RA-06

Date Collected: 10/14/19 13:50
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-6

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 15:12	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 15:12	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 15:12	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 15:12	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*89*		*75 - 126*		*10/21/19 15:12*	*1*
Toluene-d8 (Surr)	*92*		*75 - 120*		*10/21/19 15:12*	*1*
4-Bromofluorobenzene (Surr)	*88*		*72 - 124*		*10/21/19 15:12*	*1*
Dibromofluoromethane	*103*		*75 - 120*		*10/21/19 15:12*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	**0.65**	**J**	0.79	0.24	ug/L		10/17/19 09:25	10/18/19 17:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*53*	*^c*	*36 - 120*	*10/17/19 09:25*	*10/18/19 17:24*	*1*
2-Fluorobiphenyl (Surr)	*71*		*34 - 110*	*10/17/19 09:25*	*10/18/19 17:24*	*1*
Terphenyl-d14 (Surr)	*83*		*40 - 145*	*10/17/19 09:25*	*10/18/19 17:24*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	**6.4**		1.0	0.17	ug/L			10/18/19 16:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*89*		*60 - 140*		*10/18/19 16:08*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.085	^c	0.095	0.085	ug/L		10/18/19 10:01	10/19/19 05:19	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*91*	*^c*	*25 - 130*	*10/18/19 10:01*	*10/19/19 05:19*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.64**	**J**	1.0	0.23	ug/L		10/25/19 17:28	10/28/19 12:04	1
Copper	**0.67**	**J**	2.0	0.50	ug/L		10/25/19 17:28	10/28/19 12:04	1
Iron	<46.7		100	46.7	ug/L		10/25/19 17:28	10/28/19 12:04	1
Manganese	**2.6**		2.5	0.79	ug/L		10/25/19 17:28	10/28/19 14:52	1
Zinc	<6.9		20.0	6.9	ug/L		10/25/19 17:28	10/28/19 12:04	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**250**		0.91	0.46	mg/L		10/24/19 17:38	10/28/19 06:50	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**46.2**		2.0	1.7	mg/L			10/30/19 01:03	10
Nitrate as N	**2.1**	**H**	0.20	0.068	mg/L			10/17/19 00:48	1
Sulfate	**8.1**		0.20	0.095	mg/L			10/28/19 22:50	1
Total Organic Carbon - Duplicates	<0.47		1.0	0.47	mg/L			10/24/19 00:41	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191014-RA-06
Date Collected: 10/14/19 13:50
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-6
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	195		5.0	3.7	mg/L			10/28/19 14:34	1

Client Sample ID: W-191014-RA-07

Lab Sample ID: 500-171816-7

Date Collected: 10/14/19 14:22

Matrix: Water

Date Received: 10/16/19 09:45

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 15:37	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 15:37	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 15:37	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 15:37	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*91*		*75 - 126*		*10/21/19 15:37*	*1*
Toluene-d8 (Surr)	*91*		*75 - 120*		*10/21/19 15:37*	*1*
4-Bromofluorobenzene (Surr)	*84*		*72 - 124*		*10/21/19 15:37*	*1*
Dibromofluoromethane	*105*		*75 - 120*		*10/21/19 15:37*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.24		0.79	0.24	ug/L		10/17/19 09:25	10/18/19 17:51	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*53*	*^c*	*36 - 120*	*10/17/19 09:25*	*10/18/19 17:51*	*1*
2-Fluorobiphenyl (Surr)	*74*		*34 - 110*	*10/17/19 09:25*	*10/18/19 17:51*	*1*
Terphenyl-d14 (Surr)	*81*		*40 - 145*	*10/17/19 09:25*	*10/18/19 17:51*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/18/19 16:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*90*		*60 - 140*		*10/18/19 16:25*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.088	^c	0.098	0.088	ug/L		10/18/19 10:01	10/19/19 05:42	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*89*	*^c*	*25 - 130*	*10/18/19 10:01*	*10/19/19 05:42*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.23		1.0	0.23	ug/L		10/25/19 17:28	10/28/19 12:06	1
Copper	**0.77**	**J**	2.0	0.50	ug/L		10/25/19 17:28	10/28/19 12:06	1
Iron	**134**		100	46.7	ug/L		10/25/19 17:28	10/28/19 12:06	1
Manganese	**14.8**		2.5	0.79	ug/L		10/25/19 17:28	10/28/19 14:53	1
Zinc	<6.9		20.0	6.9	ug/L		10/25/19 17:28	10/28/19 12:06	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**35.7**		0.91	0.46	mg/L		10/24/19 17:38	10/28/19 06:50	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**0.74**		0.20	0.17	mg/L			10/30/19 01:16	1
Nitrate as N	**0.64**	**H**	0.20	0.068	mg/L			10/17/19 01:13	1
Sulfate	**3.8**		0.20	0.095	mg/L			10/28/19 23:14	1
Total Organic Carbon - Duplicates	**0.69**	**J**	1.0	0.47	mg/L			10/24/19 20:50	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191014-RA-07
Date Collected: 10/14/19 14:22
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-7
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	33.3		5.0	3.7	mg/L			10/28/19 13:59	1

Client Sample ID: W-191014-RA-08

Lab Sample ID: 500-171816-8

Date Collected: 10/14/19 15:05

Matrix: Water

Date Received: 10/16/19 09:45

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 16:01	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 16:01	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 16:01	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 16:01	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*92*		*75 - 126*		*10/21/19 16:01*	*1*
Toluene-d8 (Surr)	*91*		*75 - 120*		*10/21/19 16:01*	*1*
4-Bromofluorobenzene (Surr)	*89*		*72 - 124*		*10/21/19 16:01*	*1*
Dibromofluoromethane	*104*		*75 - 120*		*10/21/19 16:01*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.25		0.82	0.25	ug/L		10/17/19 09:25	10/22/19 13:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*57*	*^c*	*36 - 120*	*10/17/19 09:25*	*10/22/19 13:31*	*1*
2-Fluorobiphenyl (Surr)	*71*		*34 - 110*	*10/17/19 09:25*	*10/22/19 13:31*	*1*
Terphenyl-d14 (Surr)	*82*		*40 - 145*	*10/17/19 09:25*	*10/22/19 13:31*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/18/19 16:42	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*90*		*60 - 140*		*10/18/19 16:42*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.086	^c	0.096	0.086	ug/L		10/18/19 10:01	10/19/19 06:04	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*98*	*^c*	*25 - 130*	*10/18/19 10:01*	*10/19/19 06:04*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.28**	**J**	1.0	0.23	ug/L		10/25/19 17:28	10/28/19 12:08	1
Copper	**2.3**		2.0	0.50	ug/L		10/25/19 17:28	10/28/19 12:08	1
Iron	**149**		100	46.7	ug/L		10/25/19 17:28	10/28/19 12:08	1
Manganese	**4.3**		2.5	0.79	ug/L		10/25/19 17:28	10/28/19 14:54	1
Zinc	**6.9**	**J**	20.0	6.9	ug/L		10/25/19 17:28	10/28/19 12:08	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**40.1**		0.91	0.46	mg/L		10/24/19 17:38	10/28/19 06:50	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**1.2**		0.20	0.17	mg/L			10/30/19 01:29	1
Nitrate as N	**0.29**	**H**	0.20	0.068	mg/L			10/16/19 19:19	1
Sulfate	**1.8**		0.20	0.095	mg/L			10/28/19 23:26	1
Total Organic Carbon - Duplicates	**1.9**		1.0	0.47	mg/L			10/24/19 21:07	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191014-RA-08
Date Collected: 10/14/19 15:05
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-8
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	44.7		5.0	3.7	mg/L			10/28/19 14:39	1

Client Sample ID: W-191014-RA-09

Date Collected: 10/14/19 16:17
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-9

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 16:26	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 16:26	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 16:26	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 16:26	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*93*		*75 - 126*		*10/21/19 16:26*	*1*
Toluene-d8 (Surr)	*92*		*75 - 120*		*10/21/19 16:26*	*1*
4-Bromofluorobenzene (Surr)	*87*		*72 - 124*		*10/21/19 16:26*	*1*
Dibromofluoromethane	*105*		*75 - 120*		*10/21/19 16:26*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.23		0.76	0.23	ug/L		10/17/19 09:25	10/22/19 13:58	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*49*	*^c*	*36 - 120*	*10/17/19 09:25*	*10/22/19 13:58*	*1*
2-Fluorobiphenyl (Surr)	*60*		*34 - 110*	*10/17/19 09:25*	*10/22/19 13:58*	*1*
Terphenyl-d14 (Surr)	*77*		*40 - 145*	*10/17/19 09:25*	*10/22/19 13:58*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/18/19 16:59	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*90*		*60 - 140*		*10/18/19 16:59*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.085	^c	0.095	0.085	ug/L		10/18/19 10:01	10/19/19 06:27	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*102*	*^c*	*25 - 130*	*10/18/19 10:01*	*10/19/19 06:27*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.37**	**J**	1.0	0.23	ug/L		10/25/19 17:28	10/28/19 12:10	1
Copper	**1.5**	**J**	2.0	0.50	ug/L		10/25/19 17:28	10/28/19 12:10	1
Iron	**76.5**	**J**	100	46.7	ug/L		10/25/19 17:28	10/28/19 12:10	1
Manganese	**4.7**		2.5	0.79	ug/L		10/25/19 17:28	10/28/19 14:55	1
Zinc	<6.9		20.0	6.9	ug/L		10/25/19 17:28	10/28/19 12:10	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**116**		0.91	0.46	mg/L		10/24/19 17:38	10/28/19 06:50	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**14.7**		2.0	1.7	mg/L			10/30/19 01:41	10
Nitrate as N	**3.7**	**H**	0.20	0.068	mg/L			10/16/19 17:12	1
Sulfate	**5.7**		0.20	0.095	mg/L			10/28/19 23:39	1
Total Organic Carbon - Duplicates	**0.55**	**J**	1.0	0.47	mg/L			10/24/19 21:23	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191014-RA-09
Date Collected: 10/14/19 16:17
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-9
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	99.1		5.0	3.7	mg/L			10/28/19 14:46	1

Client Sample ID: W-191015-RA-10

Date Collected: 10/15/19 14:00
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-10

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 16:51	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 16:51	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 16:51	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 16:51	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*92*		*75 - 126*		*10/21/19 16:51*	*1*
Toluene-d8 (Surr)	*93*		*75 - 120*		*10/21/19 16:51*	*1*
4-Bromofluorobenzene (Surr)	*86*		*72 - 124*		*10/21/19 16:51*	*1*
Dibromofluoromethane	*105*		*75 - 120*		*10/21/19 16:51*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.23		0.76	0.23	ug/L		10/17/19 09:25	10/22/19 14:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*43*	*^c*	*36 - 120*	*10/17/19 09:25*	*10/22/19 14:25*	*1*
2-Fluorobiphenyl (Surr)	*55*		*34 - 110*	*10/17/19 09:25*	*10/22/19 14:25*	*1*
Terphenyl-d14 (Surr)	*72*		*40 - 145*	*10/17/19 09:25*	*10/22/19 14:25*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/18/19 17:50	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*89*		*60 - 140*		*10/18/19 17:50*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.086	^c	0.096	0.086	ug/L		10/18/19 10:01	10/19/19 06:48	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*109*	*^c*	*25 - 130*	*10/18/19 10:01*	*10/19/19 06:48*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.23		1.0	0.23	ug/L		10/25/19 17:28	10/28/19 12:12	1
Copper	**1.3**	**J**	2.0	0.50	ug/L		10/25/19 17:28	10/28/19 12:12	1
Iron	<46.7		100	46.7	ug/L		10/25/19 17:28	10/28/19 12:12	1
Manganese	<0.79		2.5	0.79	ug/L		10/25/19 17:28	10/28/19 14:56	1
Zinc	<6.9		20.0	6.9	ug/L		10/25/19 17:28	10/28/19 12:12	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**231**		0.91	0.46	mg/L		10/24/19 17:38	10/28/19 06:50	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**0.52**		0.20	0.17	mg/L			10/30/19 01:54	1
Nitrate as N	**0.33**	**F1**	0.20	0.068	mg/L			10/16/19 21:51	1
Sulfate	**0.84**		0.20	0.095	mg/L			10/29/19 00:28	1
Total Organic Carbon - Duplicates	<0.47		1.0	0.47	mg/L			10/24/19 02:06	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191015-RA-10
Date Collected: 10/15/19 14:00
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-10
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	240		5.0	3.7	mg/L			10/29/19 14:48	1

Client Sample ID: W-191015-RA-11

Date Collected: 10/15/19 13:45
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-11

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 17:16	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 17:16	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 17:16	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 17:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*92*		*75 - 126*		*10/21/19 17:16*	*1*
Toluene-d8 (Surr)	*92*		*75 - 120*		*10/21/19 17:16*	*1*
4-Bromofluorobenzene (Surr)	*86*		*72 - 124*		*10/21/19 17:16*	*1*
Dibromofluoromethane	*104*		*75 - 120*		*10/21/19 17:16*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.24		0.79	0.24	ug/L		10/17/19 09:25	10/22/19 14:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*47*	*^c*	*36 - 120*	*10/17/19 09:25*	*10/22/19 14:53*	*1*
2-Fluorobiphenyl (Surr)	*53*		*34 - 110*	*10/17/19 09:25*	*10/22/19 14:53*	*1*
Terphenyl-d14 (Surr)	*68*		*40 - 145*	*10/17/19 09:25*	*10/22/19 14:53*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/18/19 18:07	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*88*		*60 - 140*		*10/18/19 18:07*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.088	^c	0.097	0.088	ug/L		10/18/19 10:01	10/19/19 07:11	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*97*	*^c*	*25 - 130*	*10/18/19 10:01*	*10/19/19 07:11*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.24**	**J**	1.0	0.23	ug/L		10/25/19 17:28	10/28/19 12:14	1
Copper	**1.5**	**J**	2.0	0.50	ug/L		10/25/19 17:28	10/28/19 12:14	1
Iron	<46.7		100	46.7	ug/L		10/25/19 17:28	10/28/19 12:14	1
Manganese	<0.79		2.5	0.79	ug/L		10/25/19 17:28	10/28/19 14:57	1
Zinc	**7.6**	**J**	20.0	6.9	ug/L		10/25/19 17:28	10/28/19 12:14	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**205**		0.91	0.46	mg/L		10/24/19 17:38	10/28/19 06:50	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**20.2**		2.0	1.7	mg/L			10/30/19 02:07	10
Nitrate as N	**2.1**		0.20	0.068	mg/L			10/16/19 21:00	1
Sulfate	**3.9**		0.20	0.095	mg/L			10/29/19 00:40	1
Total Organic Carbon - Duplicates	<0.47		1.0	0.47	mg/L			10/24/19 02:23	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191015-RA-11
Date Collected: 10/15/19 13:45
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-11
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	404		5.0	3.7	mg/L			10/29/19 15:04	1

Client Sample ID: W-191015-RA-13

Lab Sample ID: 500-171816-12

Date Collected: 10/15/19 12:37

Matrix: Water

Date Received: 10/16/19 09:45

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 17:41	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 17:41	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 17:41	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 17:41	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*92*		*75 - 126*		*10/21/19 17:41*	*1*
Toluene-d8 (Surr)	*91*		*75 - 120*		*10/21/19 17:41*	*1*
4-Bromofluorobenzene (Surr)	*86*		*72 - 124*		*10/21/19 17:41*	*1*
Dibromofluoromethane	*104*		*75 - 120*		*10/21/19 17:41*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.23		0.75	0.23	ug/L		10/17/19 09:25	10/22/19 15:20	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*51*	*^c*	*36 - 120*	*10/17/19 09:25*	*10/22/19 15:20*	*1*
2-Fluorobiphenyl (Surr)	*62*		*34 - 110*	*10/17/19 09:25*	*10/22/19 15:20*	*1*
Terphenyl-d14 (Surr)	*78*		*40 - 145*	*10/17/19 09:25*	*10/22/19 15:20*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/18/19 18:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*92*		*60 - 140*		*10/18/19 18:24*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.088	^c	0.098	0.088	ug/L		10/18/19 10:01	10/19/19 07:33	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*104*	*^c*	*25 - 130*	*10/18/19 10:01*	*10/19/19 07:33*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.23**	**J**	1.0	0.23	ug/L		10/25/19 17:28	10/28/19 12:15	1
Copper	**0.72**	**J**	2.0	0.50	ug/L		10/25/19 17:28	10/28/19 12:15	1
Iron	<46.7		100	46.7	ug/L		10/25/19 17:28	10/28/19 12:15	1
Manganese	<0.79		2.5	0.79	ug/L		10/25/19 17:28	10/28/19 14:58	1
Zinc	**7.0**	**J**	20.0	6.9	ug/L		10/25/19 17:28	10/28/19 12:15	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**83.1**		0.91	0.46	mg/L		10/24/19 17:38	10/28/19 06:50	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**87.1**		4.0	3.4	mg/L			10/30/19 02:45	20
Nitrate as N	**1.6**		0.20	0.068	mg/L			10/16/19 20:35	1
Sulfate	**5.9**		0.20	0.095	mg/L			10/29/19 01:05	1
Total Organic Carbon - Duplicates	<0.47		1.0	0.47	mg/L			10/24/19 21:40	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191015-RA-13
Date Collected: 10/15/19 12:37
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-12
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	35.1		5.0	3.7	mg/L			10/29/19 15:10	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191015-RA-14

Date Collected: 10/15/19 11:09
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-13

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 18:06	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 18:06	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 18:06	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 18:06	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*93*		*75 - 126*		*10/21/19 18:06*	*1*
Toluene-d8 (Surr)	*90*		*75 - 120*		*10/21/19 18:06*	*1*
4-Bromofluorobenzene (Surr)	*88*		*72 - 124*		*10/21/19 18:06*	*1*
Dibromofluoromethane	*105*		*75 - 120*		*10/21/19 18:06*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.23		0.76	0.23	ug/L		10/17/19 09:25	10/22/19 15:54	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*56*	*^c*	*36 - 120*	*10/17/19 09:25*	*10/22/19 15:54*	*1*
2-Fluorobiphenyl (Surr)	*71*		*34 - 110*	*10/17/19 09:25*	*10/22/19 15:54*	*1*
Terphenyl-d14 (Surr)	*85*		*40 - 145*	*10/17/19 09:25*	*10/22/19 15:54*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/18/19 18:41	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*90*		*60 - 140*		*10/18/19 18:41*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.087	^c	0.097	0.087	ug/L		10/18/19 10:01	10/19/19 07:56	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*103*	*^c*	*25 - 130*	*10/18/19 10:01*	*10/19/19 07:56*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.55**	**J**	1.0	0.23	ug/L		10/25/19 17:28	10/28/19 12:17	1
Copper	**1.0**	**J**	2.0	0.50	ug/L		10/25/19 17:28	10/28/19 12:17	1
Iron	<46.7		100	46.7	ug/L		10/25/19 17:28	10/28/19 12:17	1
Manganese	<0.79		2.5	0.79	ug/L		10/25/19 17:28	10/28/19 14:59	1
Zinc	<6.9		20.0	6.9	ug/L		10/25/19 17:28	10/28/19 12:17	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**338**		0.91	0.46	mg/L		10/24/19 17:38	10/28/19 06:50	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**13.8**		4.0	3.4	mg/L			10/30/19 02:57	20
Nitrate as N	**2.0**		0.20	0.068	mg/L			10/16/19 20:09	1
Sulfate	**128**		4.0	1.9	mg/L			10/29/19 01:42	20
Total Organic Carbon - Duplicates	<0.47		1.0	0.47	mg/L			10/24/19 02:56	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191015-RA-14
Date Collected: 10/15/19 11:09
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-13
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	193		5.0	3.7	mg/L			10/29/19 15:17	1

Client Sample ID: W-191015-RA-15

Date Collected: 10/15/19 10:38
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-14

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 18:31	1
Toluene	**0.97**		0.50	0.15	ug/L			10/21/19 18:31	1
Ethylbenzene	**1.3**		0.50	0.18	ug/L			10/21/19 18:31	1
Xylenes, Total	**18**		1.0	0.22	ug/L			10/21/19 18:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*94*		*75 - 126*		*10/21/19 18:31*	*1*
Toluene-d8 (Surr)	*90*		*75 - 120*		*10/21/19 18:31*	*1*
4-Bromofluorobenzene (Surr)	*88*		*72 - 124*		*10/21/19 18:31*	*1*
Dibromofluoromethane	*108*		*75 - 120*		*10/21/19 18:31*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	**20**		0.77	0.24	ug/L		10/17/19 09:25	10/22/19 19:04	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*45*	*^c*	*36 - 120*	*10/17/19 09:25*	*10/22/19 19:04*	*1*
2-Fluorobiphenyl (Surr)	*61*		*34 - 110*	*10/17/19 09:25*	*10/22/19 19:04*	*1*
Terphenyl-d14 (Surr)	*77*		*40 - 145*	*10/17/19 09:25*	*10/22/19 19:04*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	**6.3**		1.0	0.17	ug/L			10/18/19 18:58	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*87*		*60 - 140*		*10/18/19 18:58*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	**11000**		380	340	ug/L		10/18/19 10:01	10/21/19 12:13	4000

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*0*	*D*	*25 - 130*	*10/18/19 10:01*	*10/21/19 12:13*	*4000*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**8.9**		1.0	0.23	ug/L		10/25/19 17:28	10/28/19 12:19	1
Copper	**2.2**		2.0	0.50	ug/L		10/25/19 17:28	10/28/19 12:19	1
Iron	**19800**		100	46.7	ug/L		10/25/19 17:28	10/28/19 12:19	1
Manganese	**3150**		2.5	0.79	ug/L		10/25/19 17:28	10/28/19 15:00	1
Zinc	<6.9		20.0	6.9	ug/L		10/25/19 17:28	10/28/19 12:19	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**268**		0.91	0.46	mg/L		10/24/19 17:38	10/28/19 06:50	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**33.1**		2.0	1.7	mg/L			10/30/19 03:10	10
Nitrate as N	<0.068		0.20	0.068	mg/L			10/16/19 19:44	1
Sulfate	**15.5**		2.0	0.95	mg/L			10/29/19 01:54	10
Total Organic Carbon - Duplicates	**36.6**		1.0	0.47	mg/L			10/24/19 21:56	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191015-RA-15
Date Collected: 10/15/19 10:38
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-14
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	265		5.0	3.7	mg/L			10/29/19 12:59	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: Trip Blank (1)

Date Collected: 10/14/19 00:00
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-15

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 11:30	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 11:30	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 11:30	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 11:30	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*85*		*75 - 126*		*10/21/19 11:30*	*1*
Toluene-d8 (Surr)	*96*		*75 - 120*		*10/21/19 11:30*	*1*
4-Bromofluorobenzene (Surr)	*87*		*72 - 124*		*10/21/19 11:30*	*1*
Dibromofluoromethane	*99*		*75 - 120*		*10/21/19 11:30*	*1*

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: Trip Blank (2)

Date Collected: 10/14/19 00:00
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-16

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 11:55	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 11:55	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 11:55	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 11:55	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*89*		*75 - 126*		*10/21/19 11:55*	*1*
Toluene-d8 (Surr)	*94*		*75 - 120*		*10/21/19 11:55*	*1*
4-Bromofluorobenzene (Surr)	*88*		*72 - 124*		*10/21/19 11:55*	*1*
Dibromofluoromethane	*99*		*75 - 120*		*10/21/19 11:55*	*1*

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: Trip Blank (3)

Date Collected: 10/14/19 00:00
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-17

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 12:20	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 12:20	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 12:20	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 12:20	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*88*		*75 - 126*		*10/21/19 12:20*	*1*
Toluene-d8 (Surr)	*93*		*75 - 120*		*10/21/19 12:20*	*1*
4-Bromofluorobenzene (Surr)	*88*		*72 - 124*		*10/21/19 12:20*	*1*
Dibromofluoromethane	*102*		*75 - 120*		*10/21/19 12:20*	*1*

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: Trip Blank (4)

Date Collected: 10/14/19 00:00
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-18

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 12:45	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 12:45	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 12:45	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 12:45	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*87*		*75 - 126*		*10/21/19 12:45*	*1*
Toluene-d8 (Surr)	*94*		*75 - 120*		*10/21/19 12:45*	*1*
4-Bromofluorobenzene (Surr)	*87*		*72 - 124*		*10/21/19 12:45*	*1*
Dibromofluoromethane	*99*		*75 - 120*		*10/21/19 12:45*	*1*

Definitions/Glossary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
^c	CCV Recovery is outside acceptance limits.
F2	MS/MSD RPD exceeds control limits
J	Reported value was between the limit of detection and the limit of quantitation.

GC VOA

Qualifier	Qualifier Description
J	Reported value was between the limit of detection and the limit of quantitation.

GC Semi VOA

Qualifier	Qualifier Description
^c	CCV Recovery is outside acceptance limits.
D	Surrogate or matrix spike recoveries were not obtained because the extract was diluted for analysis; also compounds analyzed at a dilution may be flagged with a D.

Metals

Qualifier	Qualifier Description
^	ICV,CCV,ICB,CCB, ISA, ISB, CRI, CRA, DLCK or MRL standard: Instrument related QC is outside acceptance limits.
F5	Duplicate RPD exceeds limit, and one or both sample results are less than 5 times RL. The data are considered valid because the absolute difference is less than the RL.
J	Reported value was between the limit of detection and the limit of quantitation.

General Chemistry

Qualifier	Qualifier Description
^	ICV,CCV,ICB,CCB, ISA, ISB, CRI, CRA, DLCK or MRL standard: Instrument related QC is outside acceptance limits.
E	Result exceeded calibration range.
F1	MS and/or MSD Recovery is outside acceptance limits.
H	Sample was prepped or analyzed beyond the specified holding time
J	Reported value was between the limit of detection and the limit of quantitation.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)

Glossary (Continued)

Abbreviation	These commonly used abbreviations may or may not be present in this report.
TEQ	Toxicity Equivalent Quotient (Dioxin)

GC/MS VOA

Analysis Batch: 511010

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-1	W-191014-RA-01	Total/NA	Water	8260B	
500-171816-2	W-191014-RA-02	Total/NA	Water	8260B	
500-171816-3	W-191014-RA-03	Total/NA	Water	8260B	
500-171816-4	W-191014-RA-04	Total/NA	Water	8260B	
500-171816-5	W-191014-RA-05	Total/NA	Water	8260B	
500-171816-6	W-191014-RA-06	Total/NA	Water	8260B	
500-171816-7	W-191014-RA-07	Total/NA	Water	8260B	
500-171816-8	W-191014-RA-08	Total/NA	Water	8260B	
500-171816-9	W-191014-RA-09	Total/NA	Water	8260B	
500-171816-10	W-191015-RA-10	Total/NA	Water	8260B	
500-171816-11	W-191015-RA-11	Total/NA	Water	8260B	
500-171816-12	W-191015-RA-13	Total/NA	Water	8260B	
500-171816-13	W-191015-RA-14	Total/NA	Water	8260B	
500-171816-14	W-191015-RA-15	Total/NA	Water	8260B	
500-171816-15	Trip Blank (1)	Total/NA	Water	8260B	
500-171816-16	Trip Blank (2)	Total/NA	Water	8260B	
500-171816-17	Trip Blank (3)	Total/NA	Water	8260B	
500-171816-18	Trip Blank (4)	Total/NA	Water	8260B	
MB 500-511010/6	Method Blank	Total/NA	Water	8260B	
LCS 500-511010/4	Lab Control Sample	Total/NA	Water	8260B	
500-171816-1 MS	W-191014-RA-01	Total/NA	Water	8260B	
500-171816-1 MSD	W-191014-RA-01	Total/NA	Water	8260B	

GC/MS Semi VOA

Prep Batch: 510510

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-1	W-191014-RA-01	Total/NA	Water	3510C	
500-171816-2	W-191014-RA-02	Total/NA	Water	3510C	
500-171816-3	W-191014-RA-03	Total/NA	Water	3510C	
500-171816-4	W-191014-RA-04	Total/NA	Water	3510C	
500-171816-5	W-191014-RA-05	Total/NA	Water	3510C	
500-171816-6	W-191014-RA-06	Total/NA	Water	3510C	
500-171816-7	W-191014-RA-07	Total/NA	Water	3510C	
500-171816-8	W-191014-RA-08	Total/NA	Water	3510C	
500-171816-9	W-191014-RA-09	Total/NA	Water	3510C	
500-171816-10	W-191015-RA-10	Total/NA	Water	3510C	
500-171816-11	W-191015-RA-11	Total/NA	Water	3510C	
500-171816-12	W-191015-RA-13	Total/NA	Water	3510C	
500-171816-13	W-191015-RA-14	Total/NA	Water	3510C	
500-171816-14	W-191015-RA-15	Total/NA	Water	3510C	
MB 500-510510/1-A	Method Blank	Total/NA	Water	3510C	
LCS 500-510510/2-A	Lab Control Sample	Total/NA	Water	3510C	
500-171816-1 MS	W-191014-RA-01	Total/NA	Water	3510C	
500-171816-1 MSD	W-191014-RA-01	Total/NA	Water	3510C	

Analysis Batch: 510623

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 500-510510/1-A	Method Blank	Total/NA	Water	8270D	510510
LCS 500-510510/2-A	Lab Control Sample	Total/NA	Water	8270D	510510

QC Association Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

GC/MS Semi VOA

Analysis Batch: 510672

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-1	W-191014-RA-01	Total/NA	Water	8270D	510510
500-171816-2	W-191014-RA-02	Total/NA	Water	8270D	510510
500-171816-3	W-191014-RA-03	Total/NA	Water	8270D	510510
500-171816-4	W-191014-RA-04	Total/NA	Water	8270D	510510
500-171816-5	W-191014-RA-05	Total/NA	Water	8270D	510510
500-171816-6	W-191014-RA-06	Total/NA	Water	8270D	510510
500-171816-7	W-191014-RA-07	Total/NA	Water	8270D	510510
500-171816-1 MS	W-191014-RA-01	Total/NA	Water	8270D	510510
500-171816-1 MSD	W-191014-RA-01	Total/NA	Water	8270D	510510

Analysis Batch: 511235

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-8	W-191014-RA-08	Total/NA	Water	8270D	510510
500-171816-9	W-191014-RA-09	Total/NA	Water	8270D	510510
500-171816-10	W-191015-RA-10	Total/NA	Water	8270D	510510
500-171816-11	W-191015-RA-11	Total/NA	Water	8270D	510510
500-171816-12	W-191015-RA-13	Total/NA	Water	8270D	510510
500-171816-13	W-191015-RA-14	Total/NA	Water	8270D	510510
500-171816-14	W-191015-RA-15	Total/NA	Water	8270D	510510

GC VOA

Analysis Batch: 406408

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-1	W-191014-RA-01	Total/NA	Water	RSK-175	
500-171816-2	W-191014-RA-02	Total/NA	Water	RSK-175	
500-171816-4	W-191014-RA-04	Total/NA	Water	RSK-175	
500-171816-5	W-191014-RA-05	Total/NA	Water	RSK-175	
500-171816-6	W-191014-RA-06	Total/NA	Water	RSK-175	
500-171816-7	W-191014-RA-07	Total/NA	Water	RSK-175	
500-171816-8	W-191014-RA-08	Total/NA	Water	RSK-175	
500-171816-9	W-191014-RA-09	Total/NA	Water	RSK-175	
500-171816-10	W-191015-RA-10	Total/NA	Water	RSK-175	
500-171816-11	W-191015-RA-11	Total/NA	Water	RSK-175	
500-171816-12	W-191015-RA-13	Total/NA	Water	RSK-175	
500-171816-13	W-191015-RA-14	Total/NA	Water	RSK-175	
500-171816-14	W-191015-RA-15	Total/NA	Water	RSK-175	
MB 240-406408/3	Method Blank	Total/NA	Water	RSK-175	
LCS 240-406408/4	Lab Control Sample	Total/NA	Water	RSK-175	
500-171816-1 MS	W-191014-RA-01	Total/NA	Water	RSK-175	
500-171816-1 MSD	W-191014-RA-01	Total/NA	Water	RSK-175	

GC Semi VOA

Analysis Batch: 510718

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-1	W-191014-RA-01	Total/NA	Water	8151A	510740
500-171816-2	W-191014-RA-02	Total/NA	Water	8151A	510740
500-171816-3	W-191014-RA-03	Total/NA	Water	8151A	510740
500-171816-4	W-191014-RA-04	Total/NA	Water	8151A	510740
500-171816-5	W-191014-RA-05	Total/NA	Water	8151A	510740
500-171816-6	W-191014-RA-06	Total/NA	Water	8151A	510740

GC Semi VOA (Continued)

Analysis Batch: 510718 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-7	W-191014-RA-07	Total/NA	Water	8151A	510740
500-171816-8	W-191014-RA-08	Total/NA	Water	8151A	510740
500-171816-9	W-191014-RA-09	Total/NA	Water	8151A	510740
500-171816-10	W-191015-RA-10	Total/NA	Water	8151A	510740
500-171816-11	W-191015-RA-11	Total/NA	Water	8151A	510740
500-171816-12	W-191015-RA-13	Total/NA	Water	8151A	510740
500-171816-13	W-191015-RA-14	Total/NA	Water	8151A	510740
500-171816-14	W-191015-RA-15	Total/NA	Water	8151A	510740
MB 500-510740/1-A	Method Blank	Total/NA	Water	8151A	510740
LCS 500-510740/2-A	Lab Control Sample	Total/NA	Water	8151A	510740
500-171816-1 MS	W-191014-RA-01	Total/NA	Water	8151A	510740
500-171816-1 MSD	W-191014-RA-01	Total/NA	Water	8151A	510740

Prep Batch: 510740

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-1	W-191014-RA-01	Total/NA	Water	8151A	
500-171816-2	W-191014-RA-02	Total/NA	Water	8151A	
500-171816-3	W-191014-RA-03	Total/NA	Water	8151A	
500-171816-4	W-191014-RA-04	Total/NA	Water	8151A	
500-171816-5	W-191014-RA-05	Total/NA	Water	8151A	
500-171816-6	W-191014-RA-06	Total/NA	Water	8151A	
500-171816-7	W-191014-RA-07	Total/NA	Water	8151A	
500-171816-8	W-191014-RA-08	Total/NA	Water	8151A	
500-171816-9	W-191014-RA-09	Total/NA	Water	8151A	
500-171816-10	W-191015-RA-10	Total/NA	Water	8151A	
500-171816-11	W-191015-RA-11	Total/NA	Water	8151A	
500-171816-12	W-191015-RA-13	Total/NA	Water	8151A	
500-171816-13	W-191015-RA-14	Total/NA	Water	8151A	
500-171816-14	W-191015-RA-15	Total/NA	Water	8151A	
MB 500-510740/1-A	Method Blank	Total/NA	Water	8151A	
LCS 500-510740/2-A	Lab Control Sample	Total/NA	Water	8151A	
500-171816-1 MS	W-191014-RA-01	Total/NA	Water	8151A	
500-171816-1 MSD	W-191014-RA-01	Total/NA	Water	8151A	

Metals

Prep Batch: 511812

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-1	W-191014-RA-01	Total/NA	Water	3010A	
500-171816-2	W-191014-RA-02	Total/NA	Water	3010A	
500-171816-4	W-191014-RA-04	Total/NA	Water	3010A	
500-171816-5	W-191014-RA-05	Total/NA	Water	3010A	
500-171816-6	W-191014-RA-06	Total/NA	Water	3010A	
500-171816-7	W-191014-RA-07	Total/NA	Water	3010A	
500-171816-8	W-191014-RA-08	Total/NA	Water	3010A	
500-171816-9	W-191014-RA-09	Total/NA	Water	3010A	
500-171816-10	W-191015-RA-10	Total/NA	Water	3010A	
500-171816-11	W-191015-RA-11	Total/NA	Water	3010A	
500-171816-12	W-191015-RA-13	Total/NA	Water	3010A	
500-171816-13	W-191015-RA-14	Total/NA	Water	3010A	
500-171816-14	W-191015-RA-15	Total/NA	Water	3010A	

Metals

Prep Batch: 512044

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-1	W-191014-RA-01	Dissolved	Water	3005A	
500-171816-2	W-191014-RA-02	Dissolved	Water	3005A	
500-171816-3	W-191014-RA-03	Dissolved	Water	3005A	
500-171816-4	W-191014-RA-04	Dissolved	Water	3005A	
500-171816-5	W-191014-RA-05	Dissolved	Water	3005A	
500-171816-6	W-191014-RA-06	Dissolved	Water	3005A	
500-171816-7	W-191014-RA-07	Dissolved	Water	3005A	
500-171816-8	W-191014-RA-08	Dissolved	Water	3005A	
500-171816-9	W-191014-RA-09	Dissolved	Water	3005A	
500-171816-10	W-191015-RA-10	Dissolved	Water	3005A	
500-171816-11	W-191015-RA-11	Dissolved	Water	3005A	
500-171816-12	W-191015-RA-13	Dissolved	Water	3005A	
500-171816-13	W-191015-RA-14	Dissolved	Water	3005A	
500-171816-14	W-191015-RA-15	Dissolved	Water	3005A	
MB 500-512044/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 500-512044/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
500-171816-1 MS	W-191014-RA-01	Dissolved	Water	3005A	
500-171816-1 MSD	W-191014-RA-01	Dissolved	Water	3005A	
500-171816-1 DU	W-191014-RA-01	Dissolved	Water	3005A	

Analysis Batch: 512147

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-1	W-191014-RA-01	Total/NA	Water	SM 2340B	511812
500-171816-2	W-191014-RA-02	Total/NA	Water	SM 2340B	511812
500-171816-4	W-191014-RA-04	Total/NA	Water	SM 2340B	511812
500-171816-5	W-191014-RA-05	Total/NA	Water	SM 2340B	511812
500-171816-6	W-191014-RA-06	Total/NA	Water	SM 2340B	511812
500-171816-7	W-191014-RA-07	Total/NA	Water	SM 2340B	511812
500-171816-8	W-191014-RA-08	Total/NA	Water	SM 2340B	511812
500-171816-9	W-191014-RA-09	Total/NA	Water	SM 2340B	511812
500-171816-10	W-191015-RA-10	Total/NA	Water	SM 2340B	511812
500-171816-11	W-191015-RA-11	Total/NA	Water	SM 2340B	511812
500-171816-12	W-191015-RA-13	Total/NA	Water	SM 2340B	511812
500-171816-13	W-191015-RA-14	Total/NA	Water	SM 2340B	511812
500-171816-14	W-191015-RA-15	Total/NA	Water	SM 2340B	511812

Analysis Batch: 512288

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-1	W-191014-RA-01	Dissolved	Water	6020A	512044
500-171816-2	W-191014-RA-02	Dissolved	Water	6020A	512044
500-171816-3	W-191014-RA-03	Dissolved	Water	6020A	512044
500-171816-4	W-191014-RA-04	Dissolved	Water	6020A	512044
500-171816-5	W-191014-RA-05	Dissolved	Water	6020A	512044
500-171816-6	W-191014-RA-06	Dissolved	Water	6020A	512044
500-171816-7	W-191014-RA-07	Dissolved	Water	6020A	512044
500-171816-8	W-191014-RA-08	Dissolved	Water	6020A	512044
500-171816-9	W-191014-RA-09	Dissolved	Water	6020A	512044
500-171816-10	W-191015-RA-10	Dissolved	Water	6020A	512044
500-171816-11	W-191015-RA-11	Dissolved	Water	6020A	512044
500-171816-12	W-191015-RA-13	Dissolved	Water	6020A	512044
500-171816-13	W-191015-RA-14	Dissolved	Water	6020A	512044

Metals (Continued)

Analysis Batch: 512288 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-14	W-191015-RA-15	Dissolved	Water	6020A	512044
MB 500-512044/1-A	Method Blank	Total Recoverable	Water	6020A	512044
LCS 500-512044/2-A	Lab Control Sample	Total Recoverable	Water	6020A	512044
500-171816-1 MS	W-191014-RA-01	Dissolved	Water	6020A	512044
500-171816-1 MSD	W-191014-RA-01	Dissolved	Water	6020A	512044
500-171816-1 DU	W-191014-RA-01	Dissolved	Water	6020A	512044

Analysis Batch: 512444

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-1	W-191014-RA-01	Dissolved	Water	6020A	512044
500-171816-2	W-191014-RA-02	Dissolved	Water	6020A	512044
500-171816-3	W-191014-RA-03	Dissolved	Water	6020A	512044
500-171816-4	W-191014-RA-04	Dissolved	Water	6020A	512044
500-171816-5	W-191014-RA-05	Dissolved	Water	6020A	512044
500-171816-6	W-191014-RA-06	Dissolved	Water	6020A	512044
500-171816-7	W-191014-RA-07	Dissolved	Water	6020A	512044
500-171816-8	W-191014-RA-08	Dissolved	Water	6020A	512044
500-171816-9	W-191014-RA-09	Dissolved	Water	6020A	512044
500-171816-10	W-191015-RA-10	Dissolved	Water	6020A	512044
500-171816-11	W-191015-RA-11	Dissolved	Water	6020A	512044
500-171816-12	W-191015-RA-13	Dissolved	Water	6020A	512044
500-171816-13	W-191015-RA-14	Dissolved	Water	6020A	512044
500-171816-14	W-191015-RA-15	Dissolved	Water	6020A	512044
MB 500-512044/1-A	Method Blank	Total Recoverable	Water	6020A	512044
LCS 500-512044/2-A	Lab Control Sample	Total Recoverable	Water	6020A	512044
500-171816-1 MS	W-191014-RA-01	Dissolved	Water	6020A	512044
500-171816-1 MSD	W-191014-RA-01	Dissolved	Water	6020A	512044
500-171816-1 DU	W-191014-RA-01	Dissolved	Water	6020A	512044

General Chemistry

Analysis Batch: 510394

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-2	W-191014-RA-02	Total/NA	Water	300.0	
500-171816-4	W-191014-RA-04	Total/NA	Water	300.0	
500-171816-5	W-191014-RA-05	Total/NA	Water	300.0	
500-171816-6	W-191014-RA-06	Total/NA	Water	300.0	
500-171816-7	W-191014-RA-07	Total/NA	Water	300.0	
500-171816-8	W-191014-RA-08	Total/NA	Water	300.0	
500-171816-9	W-191014-RA-09	Total/NA	Water	300.0	
500-171816-10	W-191015-RA-10	Total/NA	Water	300.0	
500-171816-11	W-191015-RA-11	Total/NA	Water	300.0	
500-171816-12	W-191015-RA-13	Total/NA	Water	300.0	
500-171816-13	W-191015-RA-14	Total/NA	Water	300.0	
500-171816-14	W-191015-RA-15	Total/NA	Water	300.0	
MB 500-510394/3	Method Blank	Total/NA	Water	300.0	
LCS 500-510394/4	Lab Control Sample	Total/NA	Water	300.0	
500-171816-10 MS	W-191015-RA-10	Total/NA	Water	300.0	
500-171816-10 MSD	W-191015-RA-10	Total/NA	Water	300.0	

General Chemistry

Analysis Batch: 511183

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-2	W-191014-RA-02	Total/NA	Water	300.0	
500-171816-2	W-191014-RA-02	Total/NA	Water	300.0	
MB 500-511183/3	Method Blank	Total/NA	Water	300.0	
LCS 500-511183/4	Lab Control Sample	Total/NA	Water	300.0	

Analysis Batch: 511720

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-4	W-191014-RA-04	Total/NA	Water	9060A	
500-171816-5	W-191014-RA-05	Total/NA	Water	9060A	
500-171816-6	W-191014-RA-06	Total/NA	Water	9060A	
500-171816-10	W-191015-RA-10	Total/NA	Water	9060A	
500-171816-11	W-191015-RA-11	Total/NA	Water	9060A	
500-171816-13	W-191015-RA-14	Total/NA	Water	9060A	
MB 500-511720/32	Method Blank	Total/NA	Water	9060A	
LCS 500-511720/33	Lab Control Sample	Total/NA	Water	9060A	

Analysis Batch: 511811

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-1	W-191014-RA-01	Total/NA	Water	300.0	
500-171816-1	W-191014-RA-01	Total/NA	Water	300.0	
MB 500-511811/3	Method Blank	Total/NA	Water	300.0	
LCS 500-511811/4	Lab Control Sample	Total/NA	Water	300.0	
500-171816-1 MS	W-191014-RA-01	Total/NA	Water	300.0	
500-171816-1 MS	W-191014-RA-01	Total/NA	Water	300.0	
500-171816-1 MSD	W-191014-RA-01	Total/NA	Water	300.0	
500-171816-1 MSD	W-191014-RA-01	Total/NA	Water	300.0	

Analysis Batch: 511960

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-1	W-191014-RA-01	Total/NA	Water	9060A	
500-171816-2	W-191014-RA-02	Total/NA	Water	9060A	
500-171816-7	W-191014-RA-07	Total/NA	Water	9060A	
500-171816-8	W-191014-RA-08	Total/NA	Water	9060A	
500-171816-9	W-191014-RA-09	Total/NA	Water	9060A	
500-171816-12	W-191015-RA-13	Total/NA	Water	9060A	
500-171816-14	W-191015-RA-15	Total/NA	Water	9060A	
MB 500-511960/32	Method Blank	Total/NA	Water	9060A	
LCS 500-511960/33	Lab Control Sample	Total/NA	Water	9060A	
500-171816-1 MS	W-191014-RA-01	Total/NA	Water	9060A	
500-171816-1 MSD	W-191014-RA-01	Total/NA	Water	9060A	

Analysis Batch: 512343

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-4	W-191014-RA-04	Total/NA	Water	300.0	
500-171816-5	W-191014-RA-05	Total/NA	Water	300.0	
500-171816-6	W-191014-RA-06	Total/NA	Water	300.0	
500-171816-7	W-191014-RA-07	Total/NA	Water	300.0	
500-171816-8	W-191014-RA-08	Total/NA	Water	300.0	
500-171816-9	W-191014-RA-09	Total/NA	Water	300.0	
500-171816-10	W-191015-RA-10	Total/NA	Water	300.0	
500-171816-11	W-191015-RA-11	Total/NA	Water	300.0	

General Chemistry (Continued)

Analysis Batch: 512343 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-12	W-191015-RA-13	Total/NA	Water	300.0	
500-171816-13	W-191015-RA-14	Total/NA	Water	300.0	
500-171816-14	W-191015-RA-15	Total/NA	Water	300.0	
MB 500-512343/3	Method Blank	Total/NA	Water	300.0	
LCS 500-512343/4	Lab Control Sample	Total/NA	Water	300.0	

Analysis Batch: 512410

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-1	W-191014-RA-01	Total/NA	Water	SM 2320B	
500-171816-2	W-191014-RA-02	Total/NA	Water	SM 2320B	
500-171816-4	W-191014-RA-04	Total/NA	Water	SM 2320B	
500-171816-5	W-191014-RA-05	Total/NA	Water	SM 2320B	
500-171816-6	W-191014-RA-06	Total/NA	Water	SM 2320B	
500-171816-7	W-191014-RA-07	Total/NA	Water	SM 2320B	
500-171816-8	W-191014-RA-08	Total/NA	Water	SM 2320B	
500-171816-9	W-191014-RA-09	Total/NA	Water	SM 2320B	
MB 500-512410/3	Method Blank	Total/NA	Water	SM 2320B	
LCS 500-512410/4	Lab Control Sample	Total/NA	Water	SM 2320B	
500-171816-2 DU	W-191014-RA-02	Total/NA	Water	SM 2320B	

Analysis Batch: 512545

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-4	W-191014-RA-04	Total/NA	Water	300.0	
500-171816-5	W-191014-RA-05	Total/NA	Water	300.0	
500-171816-6	W-191014-RA-06	Total/NA	Water	300.0	
500-171816-7	W-191014-RA-07	Total/NA	Water	300.0	
500-171816-8	W-191014-RA-08	Total/NA	Water	300.0	
500-171816-9	W-191014-RA-09	Total/NA	Water	300.0	
500-171816-10	W-191015-RA-10	Total/NA	Water	300.0	
500-171816-11	W-191015-RA-11	Total/NA	Water	300.0	
500-171816-12	W-191015-RA-13	Total/NA	Water	300.0	
500-171816-13	W-191015-RA-14	Total/NA	Water	300.0	
500-171816-14	W-191015-RA-15	Total/NA	Water	300.0	
MB 500-512545/3	Method Blank	Total/NA	Water	300.0	
LCS 500-512545/4	Lab Control Sample	Total/NA	Water	300.0	

Analysis Batch: 512596

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171816-10	W-191015-RA-10	Total/NA	Water	SM 2320B	
500-171816-11	W-191015-RA-11	Total/NA	Water	SM 2320B	
500-171816-12	W-191015-RA-13	Total/NA	Water	SM 2320B	
500-171816-13	W-191015-RA-14	Total/NA	Water	SM 2320B	
500-171816-14	W-191015-RA-15	Total/NA	Water	SM 2320B	
MB 500-512596/3	Method Blank	Total/NA	Water	SM 2320B	
LCS 500-512596/4	Lab Control Sample	Total/NA	Water	SM 2320B	
500-171816-10 DU	W-191015-RA-10	Total/NA	Water	SM 2320B	

Surrogate Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Water — **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)			
Lab Sample ID	Client Sample ID	DCA (75-126)	TOL (75-120)	BFB (72-124)	DBFM (75-120)
500-171816-1	W-191014-RA-01	88	96	88	101
500-171816-1 MS	W-191014-RA-01	94	90	91	108
500-171816-1 MSD	W-191014-RA-01	93	92	90	109
500-171816-2	W-191014-RA-02	86	94	86	98
500-171816-3	W-191014-RA-03	87	94	88	101
500-171816-4	W-191014-RA-04	88	94	88	100
500-171816-5	W-191014-RA-05	91	93	89	103
500-171816-6	W-191014-RA-06	89	92	88	103
500-171816-7	W-191014-RA-07	91	91	84	105
500-171816-8	W-191014-RA-08	92	91	89	104
500-171816-9	W-191014-RA-09	93	92	87	105
500-171816-10	W-191015-RA-10	92	93	86	105
500-171816-11	W-191015-RA-11	92	92	86	104
500-171816-12	W-191015-RA-13	92	91	86	104
500-171816-13	W-191015-RA-14	93	90	88	105
500-171816-14	W-191015-RA-15	94	90	88	108
500-171816-15	Trip Blank (1)	85	96	87	99
500-171816-16	Trip Blank (2)	89	94	88	99
500-171816-17	Trip Blank (3)	88	93	88	102
500-171816-18	Trip Blank (4)	87	94	87	99
LCS 500-511010/4	Lab Control Sample	84	94	91	99
MB 500-511010/6	Method Blank	92	93	86	103

Surrogate Legend

DCA = 1,2-Dichloroethane-d4 (Surr)
TOL = Toluene-d8 (Surr)
BFB = 4-Bromofluorobenzene (Surr)
DBFM = Dibromofluoromethane

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Matrix: Water — **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)		
Lab Sample ID	Client Sample ID	NBZ (36-120)	FBP (34-110)	TPHL (40-145)
500-171816-1	W-191014-RA-01	52 ^c	70	81
500-171816-1 MS	W-191014-RA-01	54	70	78
500-171816-1 MSD	W-191014-RA-01	53	68	80
500-171816-2	W-191014-RA-02	57 ^c	74	81
500-171816-3	W-191014-RA-03	44 ^c	57	67
500-171816-4	W-191014-RA-04	52 ^c	65	82
500-171816-5	W-191014-RA-05	44 ^c	58	71
500-171816-6	W-191014-RA-06	53 ^c	71	83
500-171816-7	W-191014-RA-07	53 ^c	74	81
500-171816-8	W-191014-RA-08	57 ^c	71	82
500-171816-9	W-191014-RA-09	49 ^c	60	77
500-171816-10	W-191015-RA-10	43 ^c	55	72
500-171816-11	W-191015-RA-11	47 ^c	53	68
500-171816-12	W-191015-RA-13	51 ^c	62	78
500-171816-13	W-191015-RA-14	56 ^c	71	85

Surrogate Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Matrix: Water **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)		
		NBZ	FBP	TPHL
Lab Sample ID	Client Sample ID	(36-120)	(34-110)	(40-145)
500-171816-14	W-191015-RA-15	45 ^c	61	77
LCS 500-510510/2-A	Lab Control Sample	70	75	93
MB 500-510510/1-A	Method Blank	70	70	100

Surrogate Legend

NBZ = Nitrobenzene-d5 (Surr)
FBP = 2-Fluorobiphenyl (Surr)
TPHL = Terphenyl-d14 (Surr)

Method: RSK-175 - Dissolved Gases (GC)

Matrix: Water **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)
		TFE2
Lab Sample ID	Client Sample ID	(60-140)
500-171816-1	W-191014-RA-01	91
500-171816-1 MS	W-191014-RA-01	90
500-171816-1 MSD	W-191014-RA-01	89
500-171816-2	W-191014-RA-02	89
500-171816-4	W-191014-RA-04	91
500-171816-5	W-191014-RA-05	91
500-171816-6	W-191014-RA-06	89
500-171816-7	W-191014-RA-07	90
500-171816-8	W-191014-RA-08	90
500-171816-9	W-191014-RA-09	90
500-171816-10	W-191015-RA-10	89
500-171816-11	W-191015-RA-11	88
500-171816-12	W-191015-RA-13	92
500-171816-13	W-191015-RA-14	90
500-171816-14	W-191015-RA-15	87
LCS 240-406408/4	Lab Control Sample	94
MB 240-406408/3	Method Blank	94

Surrogate Legend

TFE = 1,1,1-Trifluoroethane

Method: 8151A - Herbicides (GC)

Matrix: Water **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)
		DCPAA2
Lab Sample ID	Client Sample ID	(25-130)
500-171816-1	W-191014-RA-01	104
500-171816-1 MS	W-191014-RA-01	97
500-171816-1 MSD	W-191014-RA-01	115
500-171816-2	W-191014-RA-02	0 D
500-171816-3	W-191014-RA-03	101
500-171816-4	W-191014-RA-04	93
500-171816-5	W-191014-RA-05	99
500-171816-6	W-191014-RA-06	91 ^c
500-171816-7	W-191014-RA-07	89 ^c
500-171816-8	W-191014-RA-08	98 ^c

Surrogate Summary

Client: GHD Services Inc.
Job ID: 500-171816-1
Project/Site: Penta Wood 086165

Method: 8151A - Herbicides (GC) (Continued)

Matrix: Water
Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)
Lab Sample ID	**Client Sample ID**	**DCPAA2 (25-130)**
500-171816-9	W-191014-RA-09	102 ^c
500-171816-10	W-191015-RA-10	109 ^c
500-171816-11	W-191015-RA-11	97 ^c
500-171816-12	W-191015-RA-13	104 ^c
500-171816-13	W-191015-RA-14	103 ^c
500-171816-14	W-191015-RA-15	0 D
LCS 500-510740/2-A	Lab Control Sample	100
MB 500-510740/1-A	Method Blank	93

Surrogate Legend

DCPAA = DCAA

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 500-511010/6
Matrix: Water
Analysis Batch: 511010

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/21/19 11:06	1
Toluene	<0.15		0.50	0.15	ug/L			10/21/19 11:06	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/21/19 11:06	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/21/19 11:06	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*92*		*75 - 126*		*10/21/19 11:06*	*1*
Toluene-d8 (Surr)	*93*		*75 - 120*		*10/21/19 11:06*	*1*
4-Bromofluorobenzene (Surr)	*86*		*72 - 124*		*10/21/19 11:06*	*1*
Dibromofluoromethane	*103*		*75 - 120*		*10/21/19 11:06*	*1*

Lab Sample ID: LCS 500-511010/4
Matrix: Water
Analysis Batch: 511010

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	50.0	46.3		ug/L		93	70 - 120
Toluene	50.0	45.0		ug/L		90	70 - 125
Ethylbenzene	50.0	46.7		ug/L		93	70 - 123
Xylenes, Total	100	87.5		ug/L		87	70 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*84*		*75 - 126*
Toluene-d8 (Surr)	*94*		*75 - 120*
4-Bromofluorobenzene (Surr)	*91*		*72 - 124*
Dibromofluoromethane	*99*		*75 - 120*

Lab Sample ID: 500-171816-1 MS
Matrix: Water
Analysis Batch: 511010

Client Sample ID: W-191014-RA-01
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	<0.15		50.0	50.0		ug/L		100	70 - 120
Toluene	<0.15		50.0	45.4		ug/L		91	70 - 125
Ethylbenzene	<0.18		50.0	46.7		ug/L		93	70 - 123
Xylenes, Total	<0.22		100	88.1		ug/L		88	70 - 125

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*94*		*75 - 126*
Toluene-d8 (Surr)	*90*		*75 - 120*
4-Bromofluorobenzene (Surr)	*91*		*72 - 124*
Dibromofluoromethane	*108*		*75 - 120*

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 500-171816-1 MSD
Matrix: Water
Analysis Batch: 511010

Client Sample ID: W-191014-RA-01
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene	<0.15		50.0	46.7		ug/L		93	70 - 120	7	20
Toluene	<0.15		50.0	42.4		ug/L		85	70 - 125	7	20
Ethylbenzene	<0.18		50.0	43.6		ug/L		87	70 - 123	7	20
Xylenes, Total	<0.22		100	83.7		ug/L		84	70 - 125	5	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*93*		*75 - 126*
Toluene-d8 (Surr)	*92*		*75 - 120*
4-Bromofluorobenzene (Surr)	*90*		*72 - 124*
Dibromofluoromethane	*109*		*75 - 120*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Lab Sample ID: MB 500-510510/1-A
Matrix: Water
Analysis Batch: 510623

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 510510

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.25		0.80	0.25	ug/L		10/17/19 09:25	10/17/19 22:11	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*70*		*36 - 120*	*10/17/19 09:25*	*10/17/19 22:11*	*1*
2-Fluorobiphenyl (Surr)	*70*		*34 - 110*	*10/17/19 09:25*	*10/17/19 22:11*	*1*
Terphenyl-d14 (Surr)	*100*		*40 - 145*	*10/17/19 09:25*	*10/17/19 22:11*	*1*

Lab Sample ID: LCS 500-510510/2-A
Matrix: Water
Analysis Batch: 510623

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 510510

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Naphthalene	32.0	19.0		ug/L		59	36 - 110

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Nitrobenzene-d5 (Surr)	*70*		*36 - 120*
2-Fluorobiphenyl (Surr)	*75*		*34 - 110*
Terphenyl-d14 (Surr)	*93*		*40 - 145*

Lab Sample ID: 500-171816-1 MS
Matrix: Water
Analysis Batch: 510672

Client Sample ID: W-191014-RA-01
Prep Type: Total/NA
Prep Batch: 510510

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Naphthalene	<0.24		29.8	16.9		ug/L		57	36 - 110

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Nitrobenzene-d5 (Surr)	*54*		*36 - 120*
2-Fluorobiphenyl (Surr)	*70*		*34 - 110*

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 500-171816-1 MS
Matrix: Water
Analysis Batch: 510672

Client Sample ID: W-191014-RA-01
Prep Type: Total/NA
Prep Batch: 510510

Surrogate	MS %Recovery	MS Qualifier	Limits
Terphenyl-d14 (Surr)	*78*		*40 - 145*

Lab Sample ID: 500-171816-1 MSD
Matrix: Water
Analysis Batch: 510672

Client Sample ID: W-191014-RA-01
Prep Type: Total/NA
Prep Batch: 510510

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Naphthalene	<0.24		31.9	20.9	F2	ug/L		66	36 - 110	22	20

Surrogate	MSD %Recovery	MSD Qualifier	Limits
Nitrobenzene-d5 (Surr)	*53*		*36 - 120*
2-Fluorobiphenyl (Surr)	*68*		*34 - 110*
Terphenyl-d14 (Surr)	*80*		*40 - 145*

Method: RSK-175 - Dissolved Gases (GC)

Lab Sample ID: MB 240-406408/3
Matrix: Water
Analysis Batch: 406408

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/18/19 13:01	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
1,1,1-Trifluoroethane	*94*		*60 - 140*		*10/18/19 13:01*	*1*

Lab Sample ID: LCS 240-406408/4
Matrix: Water
Analysis Batch: 406408

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Methane			462	403		ug/L		87	80 - 120		

Surrogate	LCS %Recovery	LCS Qualifier	Limits
1,1,1-Trifluoroethane	*94*		*60 - 140*

Lab Sample ID: 500-171816-1 MS
Matrix: Water
Analysis Batch: 406408

Client Sample ID: W-191014-RA-01
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Methane	86		285	399		ug/L		110	50 - 150		

Surrogate	MS %Recovery	MS Qualifier	Limits
1,1,1-Trifluoroethane	*90*		*60 - 140*

Method: RSK-175 - Dissolved Gases (GC) (Continued)

Lab Sample ID: 500-171816-1 MSD
Matrix: Water
Analysis Batch: 406408

Client Sample ID: W-191014-RA-01
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Methane	86		285	411		ug/L		114	50 - 150	3	30

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,1,1-Trifluoroethane	*89*		*60 - 140*

Method: 8151A - Herbicides (GC)

Lab Sample ID: MB 500-510740/1-A
Matrix: Water
Analysis Batch: 510718

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 510740

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.090		0.10	0.090	ug/L		10/18/19 10:01	10/19/19 00:43	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*93*		*25 - 130*	*10/18/19 10:01*	*10/19/19 00:43*	*1*

Lab Sample ID: LCS 500-510740/2-A
Matrix: Water
Analysis Batch: 510718

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 510740

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Pentachlorophenol	2.53	1.75		ug/L		69	40 - 122

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
DCAA	*100*		*25 - 130*

Lab Sample ID: 500-171816-1 MS
Matrix: Water
Analysis Batch: 510718

Client Sample ID: W-191014-RA-01
Prep Type: Total/NA
Prep Batch: 510740

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Pentachlorophenol	<0.091		2.40	1.62		ug/L		68	40 - 122

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
DCAA	*97*		*25 - 130*

Lab Sample ID: 500-171816-1 MSD
Matrix: Water
Analysis Batch: 510718

Client Sample ID: W-191014-RA-01
Prep Type: Total/NA
Prep Batch: 510740

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Pentachlorophenol	<0.091		2.51	1.65		ug/L		66	40 - 122	2	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
DCAA	*115*		*25 - 130*

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 500-512044/1-A
Matrix: Water
Analysis Batch: 512288

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 512044

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.23		1.0	0.23	ug/L		10/25/19 17:28	10/28/19 11:40	1
Copper	<0.50	^	2.0	0.50	ug/L		10/25/19 17:28	10/28/19 11:40	1
Iron	<46.7		100	46.7	ug/L		10/25/19 17:28	10/28/19 11:40	1
Zinc	<6.9		20.0	6.9	ug/L		10/25/19 17:28	10/28/19 11:40	1

Lab Sample ID: MB 500-512044/1-A
Matrix: Water
Analysis Batch: 512444

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 512044

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	<0.79		2.5	0.79	ug/L		10/25/19 17:28	10/28/19 14:38	1

Lab Sample ID: LCS 500-512044/2-A
Matrix: Water
Analysis Batch: 512288

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 512044

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	100	102.0		ug/L		102	80 - 120
Copper	250	281.7	^	ug/L		113	80 - 120
Iron	1000	1138		ug/L		114	80 - 120
Zinc	500	551.2		ug/L		110	80 - 120

Lab Sample ID: LCS 500-512044/2-A
Matrix: Water
Analysis Batch: 512444

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 512044

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Manganese	500	505.1		ug/L		101	80 - 120

Lab Sample ID: 500-171816-1 MS
Matrix: Water
Analysis Batch: 512288

Client Sample ID: W-191014-RA-01
Prep Type: Dissolved
Prep Batch: 512044

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	<0.23		100	104.4		ug/L		104	75 - 125
Copper	0.73	J ^	250	275.4	^	ug/L		110	75 - 125
Iron	482		1000	1610		ug/L		113	75 - 125
Zinc	<6.9		500	538.0		ug/L		108	75 - 125

Lab Sample ID: 500-171816-1 MS
Matrix: Water
Analysis Batch: 512444

Client Sample ID: W-191014-RA-01
Prep Type: Dissolved
Prep Batch: 512044

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Manganese	52.1		500	555.0		ug/L		101	75 - 125

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: 500-171816-1 MSD
Matrix: Water
Analysis Batch: 512288

Client Sample ID: W-191014-RA-01
Prep Type: Dissolved
Prep Batch: 512044

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	<0.23		100	104.6		ug/L		105	75 - 125	0	20
Copper	0.73	J ^	250	276.7	^	ug/L		110	75 - 125	0	20
Iron	482		1000	1620		ug/L		114	75 - 125	1	20
Zinc	<6.9		500	542.6		ug/L		109	75 - 125	1	20

Lab Sample ID: 500-171816-1 MSD
Matrix: Water
Analysis Batch: 512444

Client Sample ID: W-191014-RA-01
Prep Type: Dissolved
Prep Batch: 512044

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Manganese	52.1		500	573.5		ug/L		104	75 - 125	3	20

Lab Sample ID: 500-171816-1 DU
Matrix: Water
Analysis Batch: 512288

Client Sample ID: W-191014-RA-01
Prep Type: Dissolved
Prep Batch: 512044

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Arsenic	<0.23		<0.23		ug/L				NC	20
Copper	0.73	J ^	1.43	J ^ F5	ug/L				65	20
Iron	482		466.6		ug/L				3	20
Zinc	<6.9		<6.9		ug/L				NC	20

Lab Sample ID: 500-171816-1 DU
Matrix: Water
Analysis Batch: 512444

Client Sample ID: W-191014-RA-01
Prep Type: Dissolved
Prep Batch: 512044

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Manganese	52.1		51.93		ug/L				0.2	20

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 500-510394/3
Matrix: Water
Analysis Batch: 510394

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	<0.068		0.20	0.068	mg/L			10/16/19 16:47	1

Lab Sample ID: LCS 500-510394/4
Matrix: Water
Analysis Batch: 510394

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Nitrate as N			2.00	2.04		mg/L		102	90 - 110		

Method: 300.0 - Anions, Ion Chromatography (Continued)

Lab Sample ID: 500-171816-10 MS
Matrix: Water
Analysis Batch: 510394

Client Sample ID: W-191015-RA-10
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Nitrate as N	0.33	F1	1.00	1.02	F1	mg/L		70	80 - 120		

Lab Sample ID: 500-171816-10 MSD
Matrix: Water
Analysis Batch: 510394

Client Sample ID: W-191015-RA-10
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Nitrate as N	0.33	F1	1.00	1.01	F1	mg/L		69	80 - 120	1	20

Lab Sample ID: MB 500-511183/3
Matrix: Water
Analysis Batch: 511183

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.17		0.20	0.17	mg/L			10/21/19 23:08	1
Nitrate as N	<0.068		0.20	0.068	mg/L			10/21/19 23:08	1
Sulfate	<0.095		0.20	0.095	mg/L			10/21/19 23:08	1

Lab Sample ID: LCS 500-511183/4
Matrix: Water
Analysis Batch: 511183

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	3.00	3.05		mg/L		102	90 - 110
Nitrate as N	2.00	2.05		mg/L		103	90 - 110
Sulfate	5.00	5.32		mg/L		106	90 - 110

Lab Sample ID: MB 500-511811/3
Matrix: Water
Analysis Batch: 511811

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.17		0.20	0.17	mg/L			10/24/19 18:29	1
Nitrate as N	<0.068		0.20	0.068	mg/L			10/24/19 18:29	1
Sulfate	<0.095		0.20	0.095	mg/L			10/24/19 18:29	1

Lab Sample ID: LCS 500-511811/4
Matrix: Water
Analysis Batch: 511811

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	3.00	2.82		mg/L		94	90 - 110
Nitrate as N	2.00	1.96		mg/L		98	90 - 110
Sulfate	5.00	4.80		mg/L		96	90 - 110

Method: 300.0 - Anions, Ion Chromatography (Continued)

Lab Sample ID: 500-171816-1 MS
Matrix: Water
Analysis Batch: 511811

Client Sample ID: W-191014-RA-01
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Nitrate as N	1.3	H	1.00	2.33	H	mg/L		99	80 - 120		
Sulfate	8.3		2.50	11.10	E	mg/L		112	80 - 120		

Lab Sample ID: 500-171816-1 MS
Matrix: Water
Analysis Batch: 511811

Client Sample ID: W-191014-RA-01
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Chloride	30.1		10.0	40.72		mg/L		106	80 - 120		

Lab Sample ID: 500-171816-1 MSD
Matrix: Water
Analysis Batch: 511811

Client Sample ID: W-191014-RA-01
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Nitrate as N	1.3	H	1.00	2.34	H	mg/L		99	80 - 120	0	20
Sulfate	8.3		2.50	11.01	E	mg/L		108	80 - 120	1	20

Lab Sample ID: 500-171816-1 MSD
Matrix: Water
Analysis Batch: 511811

Client Sample ID: W-191014-RA-01
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	30.1		10.0	40.92		mg/L		108	80 - 120	0	20

Lab Sample ID: MB 500-512343/3
Matrix: Water
Analysis Batch: 512343

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	<0.095		0.20	0.095	mg/L			10/28/19 22:00	1

Lab Sample ID: LCS 500-512343/4
Matrix: Water
Analysis Batch: 512343

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Sulfate			5.00	4.82		mg/L		96	90 - 110		

Lab Sample ID: MB 500-512545/3
Matrix: Water
Analysis Batch: 512545

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.17		0.20	0.17	mg/L			10/30/19 00:13	1

Method: 300.0 - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCS 500-512545/4
Matrix: Water
Analysis Batch: 512545

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Chloride			3.00	3.06		mg/L		102	90 - 110		

Method: 9060A - Organic Carbon, Total (TOC)

Lab Sample ID: MB 500-511720/32
Matrix: Water
Analysis Batch: 511720

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	<0.47	^	1.0	0.47	mg/L			10/23/19 21:16	1

Lab Sample ID: LCS 500-511720/33
Matrix: Water
Analysis Batch: 511720

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Organic Carbon - Duplicates			10.0	10.77	^	mg/L		108	80 - 120		

Lab Sample ID: MB 500-511960/32
Matrix: Water
Analysis Batch: 511960

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	<0.47		1.0	0.47	mg/L			10/24/19 18:58	1

Lab Sample ID: LCS 500-511960/33
Matrix: Water
Analysis Batch: 511960

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Organic Carbon - Duplicates			10.0	9.98		mg/L		100	80 - 120		

Lab Sample ID: 500-171816-1 MS
Matrix: Water
Analysis Batch: 511960

Client Sample ID: W-191014-RA-01
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Organic Carbon - Duplicates	0.69	J	10.0	10.62		mg/L		99	75 - 125		

Lab Sample ID: 500-171816-1 MSD
Matrix: Water
Analysis Batch: 511960

Client Sample ID: W-191014-RA-01
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Total Organic Carbon - Duplicates	0.69	J	10.0	10.68		mg/L		100	75 - 125	1	20

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 500-512410/3
Matrix: Water
Analysis Batch: 512410

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	<3.7		5.0	3.7	mg/L			10/28/19 12:21	1

Lab Sample ID: LCS 500-512410/4
Matrix: Water
Analysis Batch: 512410

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Alkalinity	100	100.7		mg/L		101	90 - 110

Lab Sample ID: 500-171816-2 DU
Matrix: Water
Analysis Batch: 512410

Client Sample ID: W-191014-RA-02
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Alkalinity	158		158.0		mg/L		0.2	20

Lab Sample ID: MB 500-512596/3
Matrix: Water
Analysis Batch: 512596

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	<3.7		5.0	3.7	mg/L			10/29/19 11:04	1

Lab Sample ID: LCS 500-512596/4
Matrix: Water
Analysis Batch: 512596

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Alkalinity	100	100.7		mg/L		101	90 - 110

Lab Sample ID: 500-171816-10 DU
Matrix: Water
Analysis Batch: 512596

Client Sample ID: W-191015-RA-10
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Alkalinity	240		241.2		mg/L		0.3	20

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191014-RA-01

Lab Sample ID: 500-171816-1

Date Collected: 10/14/19 15:48

Matrix: Water

Date Received: 10/16/19 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 13:09	JLC	TAL CHI
Total/NA	Prep	3510C			510510	10/17/19 09:25	CMC	TAL CHI
Total/NA	Analysis	8270D		1	510672	10/18/19 15:05	AJD	TAL CHI
Total/NA	Analysis	RSK-175		1	406408	10/18/19 14:26	JBN	TAL CAN
Total/NA	Prep	8151A			510740	10/18/19 10:01	CMC	TAL CHI
Total/NA	Analysis	8151A		1	510718	10/19/19 01:49	JBJ	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 11:43	FXG	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 14:40	FXG	TAL CHI
Total/NA	Prep	3010A			511812	10/24/19 17:38	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512147	10/28/19 06:50	EEN	TAL CHI
Total/NA	Analysis	300.0		1	511811	10/24/19 19:18	RES	TAL CHI
Total/NA	Analysis	300.0		10	511811	10/24/19 19:55	RES	TAL CHI
Total/NA	Analysis	9060A		1	511960	10/24/19 19:31	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512410	10/28/19 13:53	SMO	TAL CHI

Client Sample ID: W-191014-RA-02

Lab Sample ID: 500-171816-2

Date Collected: 10/14/19 12:25

Matrix: Water

Date Received: 10/16/19 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 13:34	JLC	TAL CHI
Total/NA	Prep	3510C			510510	10/17/19 09:25	CMC	TAL CHI
Total/NA	Analysis	8270D		1	510672	10/18/19 15:35	AJD	TAL CHI
Total/NA	Analysis	RSK-175		1	406408	10/18/19 15:17	JBN	TAL CAN
Total/NA	Prep	8151A			510740	10/18/19 10:01	CMC	TAL CHI
Total/NA	Analysis	8151A		100	510718	10/21/19 10:01	JBJ	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 11:53	FXG	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 14:45	FXG	TAL CHI
Total/NA	Prep	3010A			511812	10/24/19 17:38	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512147	10/28/19 06:50	EEN	TAL CHI
Total/NA	Analysis	300.0		1	510394	10/16/19 23:07	EAT	TAL CHI
Total/NA	Analysis	300.0		2	511183	10/22/19 08:13	EAT	TAL CHI
Total/NA	Analysis	300.0		10	511183	10/22/19 08:25	EAT	TAL CHI
Total/NA	Analysis	9060A		1	511960	10/24/19 20:07	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512410	10/28/19 14:06	SMO	TAL CHI

Client Sample ID: W-191014-RA-03

Lab Sample ID: 500-171816-3

Date Collected: 10/14/19 12:25

Matrix: Water

Date Received: 10/16/19 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 13:58	JLC	TAL CHI
Total/NA	Prep	3510C			510510	10/17/19 09:25	CMC	TAL CHI
Total/NA	Analysis	8270D		1	510672	10/18/19 16:02	AJD	TAL CHI
Total/NA	Prep	8151A			510740	10/18/19 10:01	CMC	TAL CHI
Total/NA	Analysis	8151A		1	510718	10/19/19 03:19	JBJ	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 11:55	FXG	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 14:46	FXG	TAL CHI

Client Sample ID: W-191014-RA-04

Lab Sample ID: 500-171816-4

Date Collected: 10/14/19 12:54

Matrix: Water

Date Received: 10/16/19 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 14:23	JLC	TAL CHI
Total/NA	Prep	3510C			510510	10/17/19 09:25	CMC	TAL CHI
Total/NA	Analysis	8270D		1	510672	10/18/19 16:29	AJD	TAL CHI
Total/NA	Analysis	RSK-175		1	406408	10/18/19 15:34	JBN	TAL CAN
Total/NA	Prep	8151A			510740	10/18/19 10:01	CMC	TAL CHI
Total/NA	Analysis	8151A		1	510718	10/19/19 03:41	JBJ	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 11:57	FXG	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 14:47	FXG	TAL CHI
Total/NA	Prep	3010A			511812	10/24/19 17:38	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512147	10/28/19 06:50	EEN	TAL CHI
Total/NA	Analysis	300.0		1	512343	10/28/19 22:25	EAT	TAL CHI
Total/NA	Analysis	300.0		1	510394	10/16/19 23:32	EAT	TAL CHI
Total/NA	Analysis	300.0		1	512545	10/30/19 00:38	EAT	TAL CHI
Total/NA	Analysis	9060A		1	511720	10/24/19 00:08	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512410	10/28/19 14:19	SMO	TAL CHI

Client Sample ID: W-191014-RA-05

Lab Sample ID: 500-171816-5

Date Collected: 10/14/19 12:54

Matrix: Water

Date Received: 10/16/19 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 14:48	JLC	TAL CHI
Total/NA	Prep	3510C			510510	10/17/19 09:25	CMC	TAL CHI
Total/NA	Analysis	8270D		1	510672	10/18/19 16:56	AJD	TAL CHI
Total/NA	Analysis	RSK-175		1	406408	10/18/19 15:51	JBN	TAL CAN
Total/NA	Prep	8151A			510740	10/18/19 10:01	CMC	TAL CHI
Total/NA	Analysis	8151A		1	510718	10/19/19 04:13	JBJ	TAL CHI

Client Sample ID: W-191014-RA-05

Lab Sample ID: 500-171816-5

Date Collected: 10/14/19 12:54

Matrix: Water

Date Received: 10/16/19 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:02	FXG	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 14:51	FXG	TAL CHI
Total/NA	Prep	3010A			511812	10/24/19 17:38	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512147	10/28/19 06:50	EEN	TAL CHI
Total/NA	Analysis	300.0		1	512343	10/28/19 22:37	EAT	TAL CHI
Total/NA	Analysis	300.0		1	510394	10/17/19 00:23	EAT	TAL CHI
Total/NA	Analysis	300.0		1	512545	10/30/19 00:51	EAT	TAL CHI
Total/NA	Analysis	9060A		1	511720	10/24/19 00:24	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512410	10/28/19 14:26	SMO	TAL CHI

Client Sample ID: W-191014-RA-06

Lab Sample ID: 500-171816-6

Date Collected: 10/14/19 13:50

Matrix: Water

Date Received: 10/16/19 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 15:12	JLC	TAL CHI
Total/NA	Prep	3510C			510510	10/17/19 09:25	CMC	TAL CHI
Total/NA	Analysis	8270D		1	510672	10/18/19 17:24	AJD	TAL CHI
Total/NA	Analysis	RSK-175		1	406408	10/18/19 16:08	JBN	TAL CAN
Total/NA	Prep	8151A			510740	10/18/19 10:01	CMC	TAL CHI
Total/NA	Analysis	8151A		1	510718	10/19/19 05:19	JBJ	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:04	FXG	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 14:52	FXG	TAL CHI
Total/NA	Prep	3010A			511812	10/24/19 17:38	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512147	10/28/19 06:50	EEN	TAL CHI
Total/NA	Analysis	300.0		1	512343	10/28/19 22:50	EAT	TAL CHI
Total/NA	Analysis	300.0		1	510394	10/17/19 00:48	EAT	TAL CHI
Total/NA	Analysis	300.0		10	512545	10/30/19 01:03	EAT	TAL CHI
Total/NA	Analysis	9060A		1	511720	10/24/19 00:41	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512410	10/28/19 14:34	SMO	TAL CHI

Client Sample ID: W-191014-RA-07

Lab Sample ID: 500-171816-7

Date Collected: 10/14/19 14:22

Matrix: Water

Date Received: 10/16/19 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 15:37	JLC	TAL CHI
Total/NA	Prep	3510C			510510	10/17/19 09:25	CMC	TAL CHI
Total/NA	Analysis	8270D		1	510672	10/18/19 17:51	AJD	TAL CHI

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191014-RA-07

Lab Sample ID: 500-171816-7

Date Collected: 10/14/19 14:22

Matrix: Water

Date Received: 10/16/19 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	RSK-175		1	406408	10/18/19 16:25	JBN	TAL CAN
Total/NA	Prep	8151A			510740	10/18/19 10:01	CMC	TAL CHI
Total/NA	Analysis	8151A		1	510718	10/19/19 05:42	JBJ	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:06	FXG	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 14:53	FXG	TAL CHI
Total/NA	Prep	3010A			511812	10/24/19 17:38	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512147	10/28/19 06:50	EEN	TAL CHI
Total/NA	Analysis	300.0		1	512343	10/28/19 23:14	EAT	TAL CHI
Total/NA	Analysis	300.0		1	510394	10/17/19 01:13	EAT	TAL CHI
Total/NA	Analysis	300.0		1	512545	10/30/19 01:16	EAT	TAL CHI
Total/NA	Analysis	9060A		1	511960	10/24/19 20:50	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512410	10/28/19 13:59	SMO	TAL CHI

Client Sample ID: W-191014-RA-08

Lab Sample ID: 500-171816-8

Date Collected: 10/14/19 15:05

Matrix: Water

Date Received: 10/16/19 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 16:01	JLC	TAL CHI
Total/NA	Prep	3510C			510510	10/17/19 09:25	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511235	10/22/19 13:31	AJD	TAL CHI
Total/NA	Analysis	RSK-175		1	406408	10/18/19 16:42	JBN	TAL CAN
Total/NA	Prep	8151A			510740	10/18/19 10:01	CMC	TAL CHI
Total/NA	Analysis	8151A		1	510718	10/19/19 06:04	JBJ	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:08	FXG	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 14:54	FXG	TAL CHI
Total/NA	Prep	3010A			511812	10/24/19 17:38	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512147	10/28/19 06:50	EEN	TAL CHI
Total/NA	Analysis	300.0		1	512343	10/28/19 23:26	EAT	TAL CHI
Total/NA	Analysis	300.0		1	510394	10/16/19 19:19	EAT	TAL CHI
Total/NA	Analysis	300.0		1	512545	10/30/19 01:29	EAT	TAL CHI
Total/NA	Analysis	9060A		1	511960	10/24/19 21:07	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512410	10/28/19 14:39	SMO	TAL CHI

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191014-RA-09

Lab Sample ID: 500-171816-9

Date Collected: 10/14/19 16:17

Matrix: Water

Date Received: 10/16/19 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 16:26	JLC	TAL CHI
Total/NA	Prep	3510C			510510	10/17/19 09:25	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511235	10/22/19 13:58	AJD	TAL CHI
Total/NA	Analysis	RSK-175		1	406408	10/18/19 16:59	JBN	TAL CAN
Total/NA	Prep	8151A			510740	10/18/19 10:01	CMC	TAL CHI
Total/NA	Analysis	8151A		1	510718	10/19/19 06:27	JBJ	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:10	FXG	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 14:55	FXG	TAL CHI
Total/NA	Prep	3010A			511812	10/24/19 17:38	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512147	10/28/19 06:50	EEN	TAL CHI
Total/NA	Analysis	300.0		1	512343	10/28/19 23:39	EAT	TAL CHI
Total/NA	Analysis	300.0		1	510394	10/16/19 17:12	EAT	TAL CHI
Total/NA	Analysis	300.0		10	512545	10/30/19 01:41	EAT	TAL CHI
Total/NA	Analysis	9060A		1	511960	10/24/19 21:23	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512410	10/28/19 14:46	SMO	TAL CHI

Client Sample ID: W-191015-RA-10

Lab Sample ID: 500-171816-10

Date Collected: 10/15/19 14:00

Matrix: Water

Date Received: 10/16/19 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 16:51	JLC	TAL CHI
Total/NA	Prep	3510C			510510	10/17/19 09:25	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511235	10/22/19 14:25	AJD	TAL CHI
Total/NA	Analysis	RSK-175		1	406408	10/18/19 17:50	JBN	TAL CAN
Total/NA	Prep	8151A			510740	10/18/19 10:01	CMC	TAL CHI
Total/NA	Analysis	8151A		1	510718	10/19/19 06:48	JBJ	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:12	FXG	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 14:56	FXG	TAL CHI
Total/NA	Prep	3010A			511812	10/24/19 17:38	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512147	10/28/19 06:50	EEN	TAL CHI
Total/NA	Analysis	300.0		1	512343	10/29/19 00:28	EAT	TAL CHI
Total/NA	Analysis	300.0		1	510394	10/16/19 21:51	EAT	TAL CHI
Total/NA	Analysis	300.0		1	512545	10/30/19 01:54	EAT	TAL CHI
Total/NA	Analysis	9060A		1	511720	10/24/19 02:06	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512596	10/29/19 14:48	SMO	TAL CHI

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191015-RA-11

Date Collected: 10/15/19 13:45
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-11

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 17:16	JLC	TAL CHI
Total/NA	Prep	3510C			510510	10/17/19 09:25	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511235	10/22/19 14:53	AJD	TAL CHI
Total/NA	Analysis	RSK-175		1	406408	10/18/19 18:07	JBN	TAL CAN
Total/NA	Prep	8151A			510740	10/18/19 10:01	CMC	TAL CHI
Total/NA	Analysis	8151A		1	510718	10/19/19 07:11	JBJ	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:14	FXG	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 14:57	FXG	TAL CHI
Total/NA	Prep	3010A			511812	10/24/19 17:38	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512147	10/28/19 06:50	EEN	TAL CHI
Total/NA	Analysis	300.0		1	512343	10/29/19 00:40	EAT	TAL CHI
Total/NA	Analysis	300.0		1	510394	10/16/19 21:00	EAT	TAL CHI
Total/NA	Analysis	300.0		10	512545	10/30/19 02:07	EAT	TAL CHI
Total/NA	Analysis	9060A		1	511720	10/24/19 02:23	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512596	10/29/19 15:04	SMO	TAL CHI

Client Sample ID: W-191015-RA-13

Date Collected: 10/15/19 12:37
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-12

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 17:41	JLC	TAL CHI
Total/NA	Prep	3510C			510510	10/17/19 09:25	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511235	10/22/19 15:20	AJD	TAL CHI
Total/NA	Analysis	RSK-175		1	406408	10/18/19 18:24	JBN	TAL CAN
Total/NA	Prep	8151A			510740	10/18/19 10:01	CMC	TAL CHI
Total/NA	Analysis	8151A		1	510718	10/19/19 07:33	JBJ	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:15	FXG	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 14:58	FXG	TAL CHI
Total/NA	Prep	3010A			511812	10/24/19 17:38	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512147	10/28/19 06:50	EEN	TAL CHI
Total/NA	Analysis	300.0		1	512343	10/29/19 01:05	EAT	TAL CHI
Total/NA	Analysis	300.0		1	510394	10/16/19 20:35	EAT	TAL CHI
Total/NA	Analysis	300.0		20	512545	10/30/19 02:45	EAT	TAL CHI
Total/NA	Analysis	9060A		1	511960	10/24/19 21:40	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512596	10/29/19 15:10	SMO	TAL CHI

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: W-191015-RA-14

Date Collected: 10/15/19 11:09
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-13

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 18:06	JLC	TAL CHI
Total/NA	Prep	3510C			510510	10/17/19 09:25	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511235	10/22/19 15:54	AJD	TAL CHI
Total/NA	Analysis	RSK-175		1	406408	10/18/19 18:41	JBN	TAL CAN
Total/NA	Prep	8151A			510740	10/18/19 10:01	CMC	TAL CHI
Total/NA	Analysis	8151A		1	510718	10/19/19 07:56	JBJ	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:17	FXG	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 14:59	FXG	TAL CHI
Total/NA	Prep	3010A			511812	10/24/19 17:38	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512147	10/28/19 06:50	EEN	TAL CHI
Total/NA	Analysis	300.0		20	512343	10/29/19 01:42	EAT	TAL CHI
Total/NA	Analysis	300.0		1	510394	10/16/19 20:09	EAT	TAL CHI
Total/NA	Analysis	300.0		20	512545	10/30/19 02:57	EAT	TAL CHI
Total/NA	Analysis	9060A		1	511720	10/24/19 02:56	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512596	10/29/19 15:17	SMO	TAL CHI

Client Sample ID: W-191015-RA-15

Date Collected: 10/15/19 10:38
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-14

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 18:31	JLC	TAL CHI
Total/NA	Prep	3510C			510510	10/17/19 09:25	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511235	10/22/19 19:04	AJD	TAL CHI
Total/NA	Analysis	RSK-175		1	406408	10/18/19 18:58	JBN	TAL CAN
Total/NA	Prep	8151A			510740	10/18/19 10:01	CMC	TAL CHI
Total/NA	Analysis	8151A		4000	510718	10/21/19 12:13	JBJ	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:19	FXG	TAL CHI
Dissolved	Prep	3005A			512044	10/25/19 17:28	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 15:00	FXG	TAL CHI
Total/NA	Prep	3010A			511812	10/24/19 17:38	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512147	10/28/19 06:50	EEN	TAL CHI
Total/NA	Analysis	300.0		10	512343	10/29/19 01:54	EAT	TAL CHI
Total/NA	Analysis	300.0		1	510394	10/16/19 19:44	EAT	TAL CHI
Total/NA	Analysis	300.0		10	512545	10/30/19 03:10	EAT	TAL CHI
Total/NA	Analysis	9060A		1	511960	10/24/19 21:56	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512596	10/29/19 12:59	SMO	TAL CHI

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Client Sample ID: Trip Blank (1)
Date Collected: 10/14/19 00:00
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-15
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 11:30	JLC	TAL CHI

Client Sample ID: Trip Blank (2)
Date Collected: 10/14/19 00:00
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-16
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 11:55	JLC	TAL CHI

Client Sample ID: Trip Blank (3)
Date Collected: 10/14/19 00:00
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-17
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 12:20	JLC	TAL CHI

Client Sample ID: Trip Blank (4)
Date Collected: 10/14/19 00:00
Date Received: 10/16/19 09:45

Lab Sample ID: 500-171816-18
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	511010	10/21/19 12:45	JLC	TAL CHI

Laboratory References:

TAL CAN = Eurofins TestAmerica, Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Accreditation/Certification Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171816-1

Laboratory: Eurofins TestAmerica, Chicago

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
Wisconsin	State Program	999580010	08-31-20

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
SM 2320B		Water	Alkalinity

Laboratory: Eurofins TestAmerica, Canton

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	State	2927	02-23-20
Connecticut	State	PH-0590	12-31-19
Florida	NELAP	E87225	06-30-20
Georgia	State	4062	02-23-20
Illinois	NELAP	004498	07-31-20
Iowa	State	421	06-01-20
Kansas	NELAP	E-10336	04-30-20
Kentucky (UST)	State	112225	02-23-20
Kentucky (WW)	State	KY98016	12-31-19
Minnesota	NELAP	OH00048	12-31-19
Minnesota (Petrofund)	State Program	3506	07-31-21
New Jersey	NELAP	OH001	06-30-20
New York	NELAP	10975	03-31-20
Ohio VAP	State	CL0024	06-05-21
Oregon	NELAP	4062	02-23-20
Pennsylvania	NELAP	68-00340	08-31-20
Texas	NELAP	T104704517-18-10	08-31-20
USDA	US Federal Programs	P330-16-00404	12-28-19
Virginia	NELAP	010101	09-14-20
Washington	State	C971	01-12-20
West Virginia DEP	State	210	12-31-19

TestAmerica

THE LEADER IN ENVIRONMENTAL

2417 Bond Street, University Park, IL 604
Phone: 708.534.5200 Fax: 708.534.

500-171816 COC

(optional)

Report To
Contact: Grant Anderson
Company: GHD
Address:
Address:
Phone:
Fax:
E-Mail: Grant.Anderson@GHD.com

(optional)

Bill To
Contact:
Company:
Address:
Address:
Phone:
Fax:
PO#/Reference#

Chain of Custody Record

Lab Job #: 500-171816

Chain of Custody Number:

Page 1 of 2

Temperature °C of Cooler: 25, 33, 56, 58, 35, 40, 54, 24, 36, 56

Client: GHD
Client Project #: 086165
Project Name: Penta Wood
Project Location/State: Siren, WI
Lab Project #:
Sampler: RA + KO
Lab PM:

Preservative Key
1. HCL, Cool to 4°
2. H2SO4, Cool to 4°
3. HNO3, Cool to 4°
4. NaOH, Cool to 4°
5. NaOH/Zn, Cool to 4°
6. NaHSO4
7. Cool to 4°
8. None
9. Other

Lab ID	MS/MSD	Sample ID	Sampling Date	Sampling Time	# of Containers	Matrix	Preservative	—	HCl	—	Nitric	—	Nitric	Sulfuric	HCl		Comments
							Parameter	Pentachlorophenol (MOD) 8151A	BTEX 8260B	Naphthalene 8270D	Dissolved metals TAL 6020A (Field Filtered)	Alkalinity, Anions 2320B	~~Total Acidity~~ Hardness SM 2340B + 6010B	Lead, Methyl-TCE 9060A	RSK_175 Methane		
1	X	W-191014-RA-01	10/14/19	1548	45	GW		X	X	X	X	X	X	X	X		*MS/MSD*
2		-02		1225	15			X	X	X	X	X	X	X	X		
3		-03		1225				X	X	X	X						
4		-04		1254				X	X	X	X	X	X	X	X		
5		-05		1254				X	X	X	X	X	X	X	X		
6		-06		1350				X	X	X	X	X	X	X	X		
7		-07		1422				X	X	X	X	X	X	X	X		
8		-08		1505				X	X	X	X	X	X	X	X		
9		-09		1617				X	X	X	X	X	X	X	X		
10		W-191015-RA-10	10/15/19	1400				X	X	X	X	X	X	X	X		

Turnaround Time Required (Business Days)
___ 1 Day ___ 2 Days ___ 5 Days ___ 7 Days ___ 10 Days ___ 15 Days _____ Other
Requested Due Date _____

Sample Disposal
☐ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Relinquished By	Company	Date	Time	Received By	Company	Date	Time
[signature]	GHD	10-15-19	1530	[signature]	[illegible]	10/16/19	0945
Relinquished By	Company	Date	Time	Received By	Company	Date	Time
Relinquished By	Company	Date	Time	Received By	Company	Date	Time

Lab Courier:
Shipped: Fedex
Hand Delivered:

Matrix Key
WW – Wastewater
W – Water
S – Soil
SL – Sludge
MS – Miscellaneous
OL – Oil
A – Air
SE – Sediment
SO – Soil
L – Leachate
WI – Wipe
DW – Drinking Water
O – Other

Client Comments:

Lab Comments:

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

2417 Bond Street, University Park, IL 60484
Phone: 708.534.5200 Fax: 708.534.5211

(optional)
Report To
Contact: Grant Anderson
Company: GHD
Address:
Address:
Phone:
Fax:
E-Mail: Grant.Anderson@GHD.com

(optional)
Bill To
Contact:
Company:
Address:
Address:
Phone:
Fax:
PO#/Reference#

Chain of Custody Record

Lab Job #: 500-171816
Chain of Custody Number:
Page 2 of 2
Temperature °C of Cooler:

Client: GHD
Client Project #: 086165
Project Name: Penta Wood
Project Location/State: Siren, WI
Lab Project #:
Sampler: RA + KS
Lab PM:

Lab ID	MS/MSD	Sample ID	Sampling Date	Sampling Time	# of Containers	Matrix	Pentachlorophenol 8151A (—)	BTEX 8260B (HCl)	Naphthalene 8270D (—)	Dissolved metals TAL 6020A (Field Filtered) (Nitric)	Alkalinity + Anions 2320B (—)	~~Total metals~~ Hardness SM2340B + 6010B (Nitric)	TOC - Lloyd method 9060A (Sulfuric)	RSK-175 methane (HCl)		Comments
11		W-191015-RA-11	10/15/19	1345	15	GW	X	X	X	X	X	X	X	X		
		~~-12~~		~~1315~~												
12		-13	10/15/19	1237	15	GW	X	X	X	X	X	X	X	X		
13		-14	↓	1109	15	GW	X	X	X	X	X	X	X	X		
14		-15	↓	1038	15	GW	X	X	X	X	X	X	X	X		
15		TRIP Blank (1)	—	—	2			X								
16		TRIP Blank (2)	—	—	2			X								
17		Trip Blank (3)														Added by TA
18		Trip Blank (4)														

Preservative Key
1. HCL, Cool to 4°
2. H2SO4, Cool to 4°
3. HNO3, Cool to 4°
4. NaOH, Cool to 4°
5. NaOH/Zn, Cool to 4°
6. NaHSO4
7. Cool to 4°
8. None
9. Other

Turnaround Time Required (Business Days)
___ 1 Day ___ 2 Days ___ 5 Days ___ 7 Days ___ 10 Days ___ 15 Days _______ Other
Requested Due Date ___________

Sample Disposal
☐ Return to Client ☐ Disposal by Lab ☐ Archive for _______ Months (A fee may be assessed if samples are retained longer than 1 month)

Relinquished By	Company	Date	Time	Received By	Company	Date	Time
[signature]	GHD	10-15-19	1530	[signature]	TA-CHI	10/16/19	0945
Relinquished By	Company	Date	Time	Received By	Company	Date	Time
Relinquished By	Company	Date	Time	Received By	Company	Date	Time

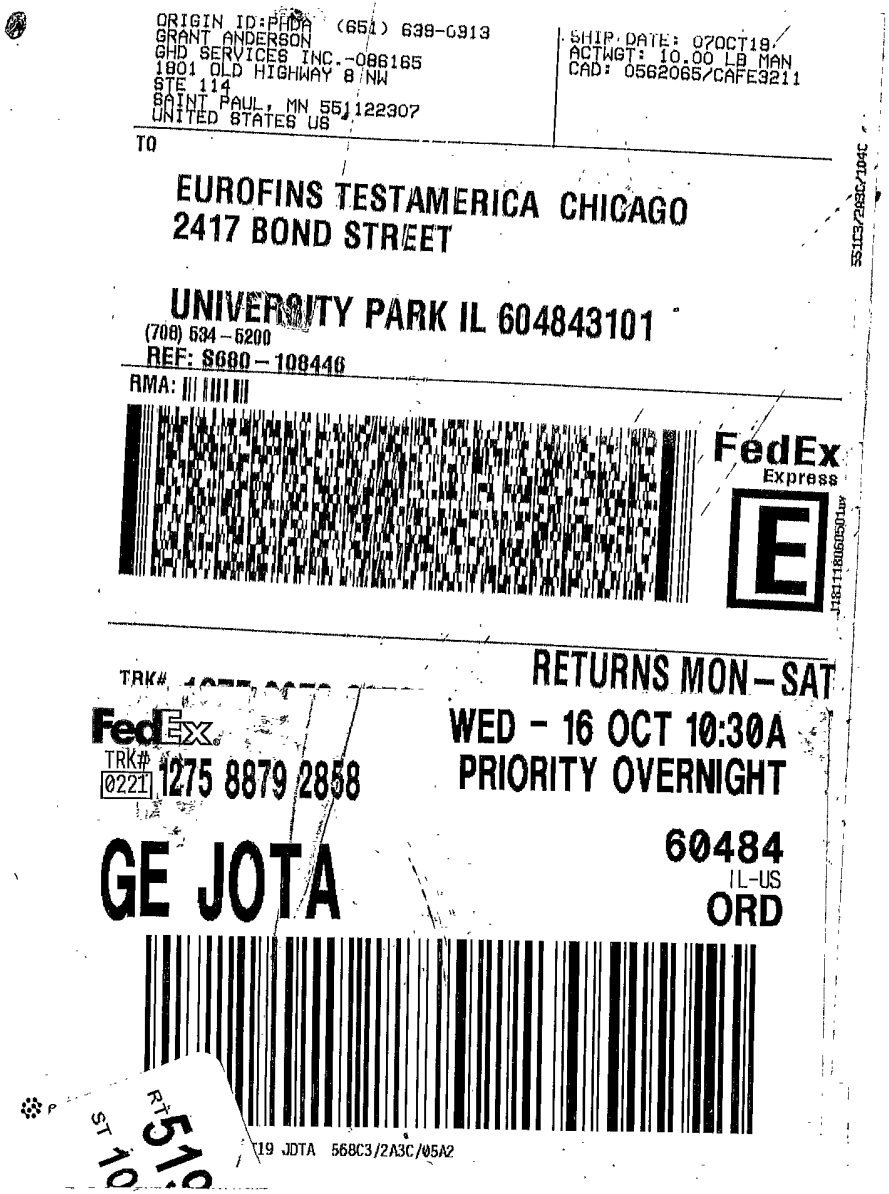
Lab Courier
Shipped: FedEx
Hand Delivered

Matrix Key
WW – Wastewater
W – Water
S – Soil
SL – Sludge
MS – Miscellaneous
OL – Oil
A – Air
SE – Sediment
SO – Soil
L – Leachate
WI – Wipe
DW – Drinking Water
O – Other

Client Comments

Lab Comments:


ORIGIN ID:PHDA (651) 638-0913
GRANT ANDERSON
GHD SERVICES INC.-086165
1801 OLD HIGHWAY 8 NW
STE 114
SAINT PAUL, MN 551122307
UNITED STATES US
SHIP DATE: 07OCT19
ACTWGT: 10.00 LB MAN
CAD: 0562065/CAFE3211
TO
EUROFINS TESTAMERICA CHICAGO
2417 BOND STREET
UNIVERSITY PARK IL 604843101
(708) 634-6200
REF: S680-108446
500-171816 Waybill
RMA:
FedEx Express
RETURNS MON-SAT
TRK# 1275 8879 2880
WED - 16 OCT 10:30A
PRIORITY OVERNIGHT
FedEx
TRK# 1275 8879 2880
60484
IL-US
ORD
GE JOTA
RT 519
ST 10
8C3/2A3C/05A2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GRANT ANDERSON
GHD SERVICES INC.-086165
1801 OLD HIGHWAY 8 NW
STE 114
SAINT PAUL, MN 551122307
UNITED STATES US
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TO
EUROFINS TESTAMERICA CHICAGO
2417 BOND STREET
UNIVERSITY PARK IL 604843101
(708) 634-6200
REF: S680-108446
RMA:
FedEx Express
RETURNS MON-SAT
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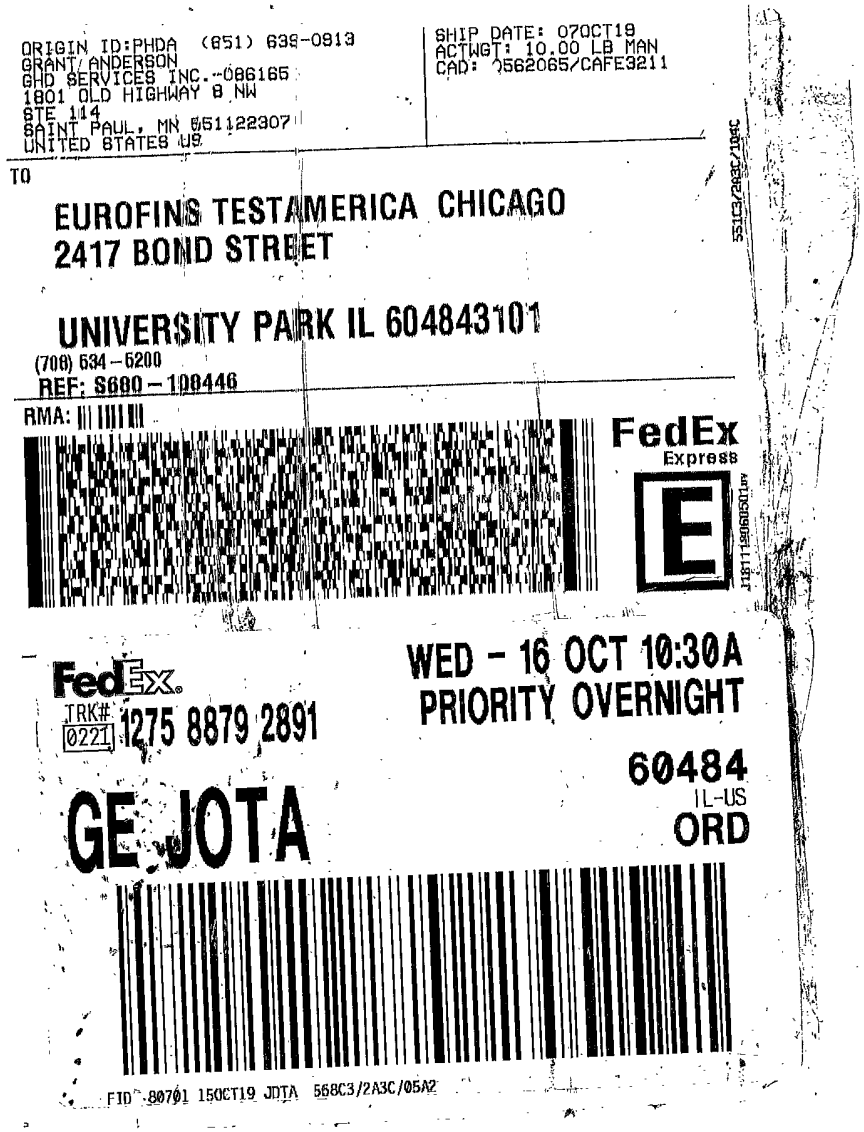
RT 519
ST 10
19 JDTA 568C3/2A3C/05A2


ORIGIN ID:PHDA (651) 639-0913
GRANT ANDERSON
GHD SERVICES INC.-086165
1801 OLD HIGHWAY 8 NW
STE 114
SAINT PAUL, MN 551122307
UNITED STATES US
SHIP DATE: 07OCT19
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CAD: 0562065/CAFE3211
TO
EUROFINS TESTAMERICA CHICAGO
2417 BOND STREET
UNIVERSITY PARK IL 604843101
(708) 534-6200
REF: S680-100446
RMA:
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FedEx
TRK# 0221 1275 8879 2891
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PRIORITY OVERNIGHT
60484
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GE JOTA
FID 80701 150CT19 JDTA 568C3/2A3C/05A2


ORIGIN ID:PHDA (651) 639-0913
GRANT ANDERSON
GHD SERVICES INC.-086165
1801 OLD HIGHWAY 8 NW
STE 114
SAINT PAUL, MN 551122307
UNITED STATES US
SHIP DATE: 07OCT19
ACTWGT: 10.00 LB MAN
CAD: 0562065/CAFE3211
TO
EUROFINS TESTAMERICA CHICAGO
2417 BOND STREET
UNIVERSITY PARK IL 604843101
(708) 534-6200
REF: S680-100446
RMA:
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FedEx
TRK# 0221 1275 8879 2870
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ORD
GE JOTA

ORIGIN ID:PHDA (651) 639-0913
GRANT ANDERSON
GHD SERVICES INC.-086165
1801 OLD HIGHWAY 8 NW
STE 114
SAINT PAUL, MN 551122307
UNITED STATES US

SHIP DATE: 07OCT19
ACTWGT: 10.00 LB MAN
CAD: 0562065/CAFE3211

TO

EUROFINS TESTAMERICA CHICAGO
2417 BOND STREET

UNIVERSITY PARK IL 604843101
(708) 634-6200
REF: $680-108446

RMA:

FedEx Express

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TRK# 0221 1275 8879 2917

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PRIORITY OVERNIGHT

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FID 80701 150CT19 JDTA 568C3/2A3C/05A2

ORIGIN ID:PHDA (651) 639-0913
GRANT ANDERSON
GHD SERVICES INC.-086165
1801 OLD HIGHWAY 8 NW
STE 114
SAINT PAUL, MN 551122307
UNITED STATES US

SHIP DATE: 07OCT19
ACTWGT: 10.00 LB MAN
CAD: 0562065/CAFE3211

TO

EUROFINS TESTAMERICA CHICAGO
2417 BOND STREET

UNIVERSITY PARK IL 604843101
(708) 634-6200
REF: $680-108446

RMA:

FedEx Express

TRK# 0221 1275 8879 2906

RETURNS MON-SAT
PRIORITY OVERNIGHT

60484

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TRK# 0221 1275 8879 2906

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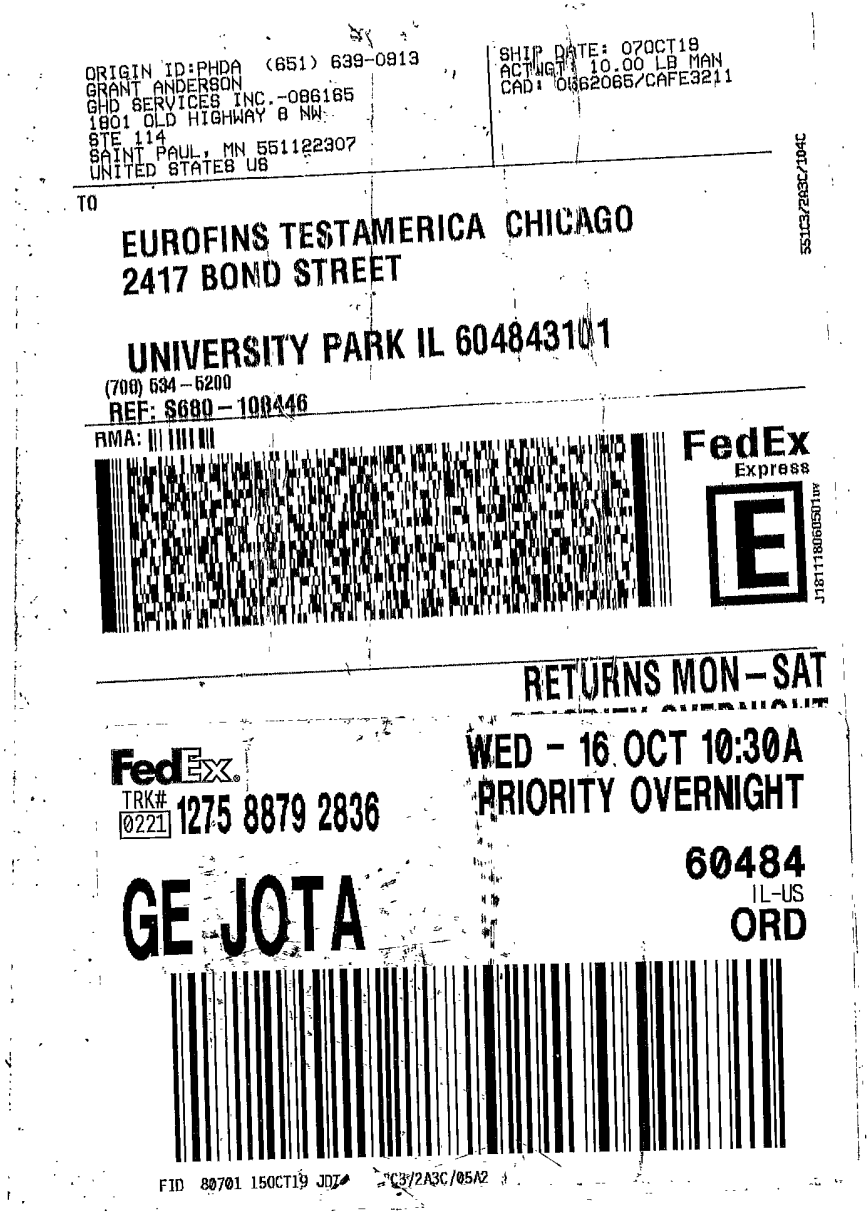
PRIORITY OVERNIGHT

GE JOTA

60484
IL-US
ORD

FID 80701 150CT19 JDTA 568C3/2A3C/05A2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GRANT ANDERSON
GHD SERVICES INC.-086165
1801 OLD HIGHWAY 8 NW
STE 114
SAINT PAUL, MN 551122307
UNITED STATES US
SHIP DATE: 07OCT19
ACTWGT: 10.00 LB MAN
CAD: 0562065/CAFE3211
TO
EUROFINS TESTAMERICA CHICAGO
2417 BOND STREET
UNIVERSITY PARK IL 604843101
(708) 534-6200
REF: S680-108446
RMA:
FedEx Express
RETURNS MON-SAT
FedEx
TRK# 0221 1275 8879 2836
WED - 16 OCT 10:30A
PRIORITY OVERNIGHT
60484
IL-US
ORD
GE JOTA
FID 80701 150CT19 JDT
C3/2A3C/05A2


ORIGIN ID:PHDA (651) 639-0913
GRANT ANDERSON
GHD SERVICES INC.-086165
1801 OLD HIGHWAY 8 NW
STE 114
SAINT PAUL, MN 551122307
UNITED STATES US
SHIP DATE: 07OCT19
ACTWGT: 10.00 LB MAN
CAD: 0562065/CAFE3211
TO
EUROFINS TESTAMERICA CHICAGO
2417 BOND STREET
UNIVERSITY PARK IL 604843101
(708) 534-6200
REF: S680-108446
RMA:
FedEx Express
RETURNS MON-SAT
FedEx
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PRIORITY OVERNIGHT
60484
IL-US
ORD
GE JOTA
FID 80701 150CT19 JDTA 568C3/2A3C/05A2
TestAmerica

ORIGIN ID:PHDA (651) 639-0913
GRANT ANDERSON
GHD SERVICES INC.-086165
1801 OLD HIGHWAY 8 NW
STE 114
SAINT PAUL, MN 551122307
UNITED STATES US

SHIP DATE: 07OCT19
ACTWGT: 10.00 LB MAN
CAD: 0562065/CAFE3211

TO

EUROFINS TESTAMERICA CHICAGO
2417 BOND STREET

UNIVERSITY PARK IL 604843101
(708) 534-5200
REF: S680-100446

RMA:

FedEx Express

TRK# 0221 1275 8879 2869

WED - 16 OCT 10:30A
PRIORITY OVERNIGHT

60484
IL-US
ORD

GE JOTA

FID# 80701 15OCT19 JDTA 568C3/2A3C/05A2

ORIGIN ID:PHDA (651) 639-0913
GRANT ANDERSON
GHD SERVICES INC.-086165
1801 OLD HIGHWAY 8 NW
STE 114
SAINT PAUL, MN 551122307
UNITED STATES US

SHIP DATE: 07OCT19
ACTWGT: 10.00 LB MAN
CAD: 0562065/CAFE3211

TO

EUROFINS TESTAMERICA CHICAGO
2417 BOND STREET

UNIVERSITY PARK IL 604843101
(708) 534-5200
REF: S680-100446

RMA:

FedEx Express

TRK# 0221 1275 8879 2928

RETURNS MON-SAT
PRIORITY OVERNIGHT

TRK# 0221 1275 8879 2928

WED - 16 OCT 10:30A
PRIORITY OVERNIGHT

60484
IL-US
ORD

GE JOTA

FID# 80701 15OCT19 JDTA 568C3/2A3C/05A2

0-511-2

Eurofins TestAmerica, Chicago
2417 Bond Street
University Park, IL 60484
Phone: 708-534-5200 Fax: 708-534-5211

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Wright, Richard	Carrier Tracking No(s):	COC No: 500-127257.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: richard.wright@testamericainc.com	State of Origin: Wisconsin	Page: Page 1 of 2
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Wisconsin		Job #: 500-171816-1
Address: 4101 Shuffel Street NW,	Due Date Requested: 10/29/2019			
City: North Canton	TAT Requested (days):			
State, Zip: OH, 44720				
Phone: 330-497-9396(Tel) 330-497-0772(Fax)	PO #:			
Email:	WO #:			
Project Name: Penta Wood 086165	Project #: 50013796			
Site:	SSOW#:			

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - other (specify)

Other:

RSK

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	RSK_175/ (MOD) Methane	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
W-191014-RA-01 (500-171816-1)	10/14/19	15:48 Central		Water			X	3	WI
W-191014-RA-01 (500-171816-1MS)	10/14/19	15:48 Central	MS	Water			X	3	WI
W-191014-RA-01 (500-171816-1MSD)	10/14/19	15:48 Central	MSD	Water			X	3	WI
W-191014-RA-02 (500-171816-2)	10/14/19	12:25 Central		Water			X	3	WI
W-191014-RA-04 (500-171816-4)	10/14/19	12:54 Central		Water			X	3	WI
W-191014-RA-05 (500-171816-5)	10/14/19	12:54 Central		Water			X	3	WI
W-191014-RA-06 (500-171816-6)	10/14/19	13:50 Central		Water			X	3	WI
W-191014-RA-07 (500-171816-7)	10/14/19	14:22 Central		Water			X	3	WI
W-191014-RA-08 (500-171816-8)	10/14/19	15:05 Central		Water			X	3	WI

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	*Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*
Unconfirmed	☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
[signature]	10/16/19 1700		[signature]	10-17-19 930	ETAC
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Eurofins TestAmerica, Chicago
2417 Bond Street
University Park, IL 60484
Phone: 708-534-5200 Fax: 708-534-5211

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Wright, Richard	Carrier Tracking No(s):	COC No: 500-127257.2
Client Contact: Shipping/Receiving	Phone:	E-Mail: richard.wright@testamericainc.com	State of Origin: Wisconsin	Page: Page 2 of 2
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Wisconsin		Job #: 500-171816-1
Address: 4101 Shuffel Street NW,	Due Date Requested: 10/29/2019			
City: North Canton	TAT Requested (days):			
State, Zip: OH, 44720				
Phone: 330-497-9396(Tel) 330-497-0772(Fax)	PO #:			
Email:	WO #:			
Project Name: Penta Wood 086165	Project #: 50013796			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)

Other:

RSK

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	RSK_175/ (MOD) Methane	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
W-191014-RA-09 (500-171816-9)	10/14/19	16:17 Central		Water			X	3	WI
W-191015-RA-10 (500-171816-10)	10/15/19	14:00 Central		Water			X	3	WI
W-191015-RA-11 (500-171816-11)	10/15/19	13:45 Central		Water			X	3	WI
W-191015-RA-13 (500-171816-12)	10/15/19	12:37 Central		Water			X	3	WI
W-191015-RA-14 (500-171816-13)	10/15/19	11:09 Central		Water			X	3	WI
W-191015-RA-15 (500-171816-14)	10/15/19	10:38 Central		Water			X	3	WI

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. I

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:			
Relinquished by:	Date/Time: 10/16/19 1700	Company	Received by:	Date/Time: 10-17-19 930	Company: EAC
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Eurofins TestAmerica Canton Sample Receipt Form/Narrative **Login # :** _____

Canton Facility

Client ETA Chicago Site Name _____ Cooler unpacked by: MM

Cooler Received on 10-17-19 Opened on 10-18-19

FedEx: 1st Grd (Exp) UPS FAS Clipper Client Drop Off TestAmerica Courier Other _____

Receipt After-hours: Drop-off Date/Time _____ Storage Location _____

TestAmerica Cooler # 14 Foam Box Client Cooler Box Other _____

Packing material used: Bubble Wrap Foam Plastic Bag None Other _____

COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form

IR GUN# IR-10 (CF +0.7 °C) Observed Cooler Temp._____°C Corrected Cooler Temp._____°C

IR GUN #IR-11 (CF +0.9°C) Observed Cooler Temp._____°C Corrected Cooler Temp._____°C

2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity 1	(Yes)	No
-Were the seals on the outside of the cooler(s) signed & dated?	(Yes)	No NA
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes	(No)
-Were tamper/custody seals intact and uncompromised?	(Yes)	No NA
3. Shippers' packing slip attached to the cooler(s)?	(Yes)	No
4. Did custody papers accompany the sample(s)?	(Yes)	No
5. Were the custody papers relinquished & signed in the appropriate place?	(Yes)	No
6. Was/were the person(s) who collected the samples clearly identified on the COC?	Yes	(No)
7. Did all bottles arrive in good condition (Unbroken)?	(Yes)	No
8. Could all bottle labels be reconciled with the COC?	(Yes)	No
9. Were correct bottle(s) used for the test(s) indicated?	(Yes)	No
10. Sufficient quantity received to perform indicated analyses?	(Yes)	No
11. Are these work share samples?	(Yes)	No
If yes, Questions 12-16 have been checked at the originating laboratory.		
12. Were all preserved sample(s) at the correct pH upon receipt?	Yes	No NA pH Strip Lot# **HC991818**
13. Were VOAs on the COC?	Yes	No
14. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this.	Yes	No NA
15. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot #_____	Yes	No
16. Was a LL Hg or Me Hg trip blank present? _____	Yes	No

Tests that are not checked for pH by Receiving:

VOAs
Oil and Grease
TOC

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other

Concerning _____

17. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES Samples processed by:

_____

_____

_____

_____

_____

18. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.

Sample(s) _____ were received in a broken container.

Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

19. SAMPLE PRESERVATION

Sample(s) _____ were further preserved in the laboratory.

Time preserved: _____ Preservative(s) added/Lot number(s): _____

VOA Sample Preservation - Date/Time VOAs Frozen: _____

Login Sample Receipt Checklist

Client: GHD Services Inc.

Job Number: 500-171816-1

Login Number: 171816
List Number: 1
Creator: Scott, Sherri L

List Source: Eurofins TestAmerica, Chicago

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.5,3.3,5.6,5.8,3.5,4.0,5.4,2.9,3.6,5.6
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

Eurofins TestAmerica, Chicago
2417 Bond Street
University Park, IL 60484
Tel: (708)534-5200

Laboratory Job ID: 500-171890-1
Client Project/Site: Penta Wood 086165

For:
GHD Services Inc.
1801 Old Highway 8 NW
Suite 114
St. Paul, Minnesota 55112

Attn: Mr. Grant Anderson

Authorized for release by:
11/1/2019 12:37:53 PM

Richard Wright, Senior Project Manager
(708)534-5200
richard.wright@testamericainc.com

Table of Contents

Job ID: 500-171890-1

Laboratory: Eurofins TestAmerica, Chicago

Narrative

Job Narrative
500-171890-1

Receipt
The samples were received on 10/17/2019 8:40 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 7 coolers at receipt time were 3.7º C, 4.4º C, 5.1º C, 5.1º C, 5.2º C, 5.8º C and 6.0º C.

GC/MS VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

GC/MS Semi VOA
Method 8270D: The continuing calibration verification (CCVIS) analyzed in batch 500-511646 was outside the method criteria for Nitrobenzene-d5 (Surr). A CCV standard at or below the reporting limit (RL) was analyzed with the affected samples and found to be acceptable. As indicated in the reference method, sample analysis may proceed; however, any detection for the affected analyte is considered estimated.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GC VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

GC Semi VOA
Method 8151A: Surrogate recovery for the following sample was outside the upper control limit: W-191016-RA-21 (500-171890-4). This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.

Method 8151A: The following samples were reported from the second column due to Pentachlorophenol recovery on primary column "cigar topping" and giving a result lower than the result found on column two. Column two has the better chromatography compared to column one.
W-191016-RA-16 (500-171890-1), W-191016-RA-19 (500-171890-6), W-191016-RA-25 (500-171890-7) and W-191016-RA-23 (500-171890-8)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Metals
Method 6020A: The continuing calibration verification (CCV) associated with batch 500-512288 recovered above the upper control limit for Magnesium. The samples associated with this CCV were non-detect for the affected analyte; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
Method 9060A: The CCV after the MB and LCS failed. The MB and LCS both passed (LCS 500-512257/33) and (MB 500-512257/32)

Method SM 2320B: Reanalysis of the following samples was performed outside of the analytical holding time due to instrument malfunction : W-191016-RA-16 (500-171890-1), W-191016-RA-20 (500-171890-2), W-191016-RA-18 (500-171890-3), W-191016-RA-21 (500-171890-4) and W-191016-RA-24 (500-171890-5).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-16 — Lab Sample ID: 500-171890-1

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Methane	25		1.0	0.17	ug/L	1		RSK-175	Total/NA
Pentachlorophenol	5.7		0.51	0.46	ug/L	5		8151A	Total/NA
Arsenic	1.0		1.0	0.23	ug/L	1		6020A	Dissolved
Iron	214		100	46.7	ug/L	1		6020A	Dissolved
Manganese	134		2.5	0.79	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	147		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	50.4		2.0	1.7	mg/L	10		300.0	Total/NA
Nitrate as N	0.090	J	0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	13.6	B	2.0	0.95	mg/L	10		300.0	Total/NA
Alkalinity	80.3	H	5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191016-RA-20 — Lab Sample ID: 500-171890-2

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Arsenic	0.31	J	1.0	0.23	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	120		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	22.9		1.0	0.85	mg/L	5		300.0	Total/NA
Nitrate as N	2.1		0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	5.3	B	0.20	0.095	mg/L	1		300.0	Total/NA
Total Organic Carbon - Duplicates	0.51	J	1.0	0.47	mg/L	1		9060A	Total/NA
Alkalinity	105	H	5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191016-RA-18 — Lab Sample ID: 500-171890-3

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Arsenic	1.1		1.0	0.23	ug/L	1		6020A	Dissolved
Manganese	9.0	F2	2.5	0.79	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	146		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	17.5	F1	1.0	0.85	mg/L	5		300.0	Total/NA
Nitrate as N	1.7		0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	6.6	B	0.20	0.095	mg/L	1		300.0	Total/NA
Alkalinity	123	H	5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191016-RA-21 — Lab Sample ID: 500-171890-4

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Arsenic	0.35	J	1.0	0.23	ug/L	1		6020A	Dissolved
Copper	3.3		2.0	0.50	ug/L	1		6020A	Dissolved
Iron	509		100	46.7	ug/L	1		6020A	Dissolved
Manganese	99.0		2.5	0.79	ug/L	1		6020A	Dissolved
Zinc	11.5	J	20.0	6.9	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	71.2		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	3.6		0.20	0.17	mg/L	1		300.0	Total/NA
Nitrate as N	0.71		0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	4.5	B	0.20	0.095	mg/L	1		300.0	Total/NA
Total Organic Carbon - Duplicates	12.4		1.0	0.47	mg/L	1		9060A	Total/NA
Alkalinity	62.6	H	5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191016-RA-24 — Lab Sample ID: 500-171890-5

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Arsenic	0.33	J	1.0	0.23	ug/L	1		6020A	Dissolved
Copper	5.2		2.0	0.50	ug/L	1		6020A	Dissolved

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-24 (Continued) — Lab Sample ID: 500-171890-5

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Iron	1170		100	46.7	ug/L	1		6020A	Dissolved
Manganese	40.9		2.5	0.79	ug/L	1		6020A	Dissolved
Zinc	12.1	J	20.0	6.9	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	75.6		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	0.34		0.20	0.17	mg/L	1		300.0	Total/NA
Nitrate as N	0.30		0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	1.4	B	0.20	0.095	mg/L	1		300.0	Total/NA
Total Organic Carbon - Duplicates	5.3		1.0	0.47	mg/L	1		9060A	Total/NA
Alkalinity	67.9	H	5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191016-RA-19 — Lab Sample ID: 500-171890-6

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Ethylbenzene	0.69		0.50	0.18	ug/L	1		8260B	Total/NA
Xylenes, Total	7.4		1.0	0.22	ug/L	1		8260B	Total/NA
Naphthalene	7.5		0.78	0.24	ug/L	1		8270D	Total/NA
Methane	81		1.0	0.17	ug/L	1		RSK-175	Total/NA
Pentachlorophenol	1700		39	35	ug/L	400		8151A	Total/NA
Arsenic	1.1		1.0	0.23	ug/L	1		6020A	Dissolved
Copper	2.7		2.0	0.50	ug/L	1		6020A	Dissolved
Iron	1800		100	46.7	ug/L	1		6020A	Dissolved
Manganese	937		2.5	0.79	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	186		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	31.2		2.0	1.7	mg/L	10		300.0	Total/NA
Sulfate	14.4	B	2.0	0.95	mg/L	10		300.0	Total/NA
Total Organic Carbon - Duplicates	27.1		1.0	0.47	mg/L	1		9060A	Total/NA
Alkalinity	143	B	5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191016-RA-25 — Lab Sample ID: 500-171890-7

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Toluene	0.98		0.50	0.15	ug/L	1		8260B	Total/NA
Xylenes, Total	7.7		1.0	0.22	ug/L	1		8260B	Total/NA
Naphthalene	7.0		0.79	0.24	ug/L	1		8270D	Total/NA
Methane	180		1.0	0.17	ug/L	1		RSK-175	Total/NA
Pentachlorophenol	1800		39	35	ug/L	400		8151A	Total/NA
Arsenic	1.1		1.0	0.23	ug/L	1		6020A	Dissolved
Copper	2.4		2.0	0.50	ug/L	1		6020A	Dissolved
Iron	1640		100	46.7	ug/L	1		6020A	Dissolved
Manganese	937		2.5	0.79	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	183		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	30.3		2.0	1.7	mg/L	10		300.0	Total/NA
Sulfate	14.4	B	2.0	0.95	mg/L	10		300.0	Total/NA
Total Organic Carbon - Duplicates	26.6		1.0	0.47	mg/L	1		9060A	Total/NA
Alkalinity	144	B	5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191016-RA-23 — Lab Sample ID: 500-171890-8

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Xylenes, Total	14		1.0	0.22	ug/L	1		8260B	Total/NA
Naphthalene	13		0.77	0.24	ug/L	1		8270D	Total/NA
Methane	0.31	J	1.0	0.17	ug/L	1		RSK-175	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Chicago

Client Sample ID: W-191016-RA-23 (Continued)

Lab Sample ID: 500-171890-8

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Pentachlorophenol	2500		77	69	ug/L	800		8151A	Total/NA
Arsenic	0.49	J	1.0	0.23	ug/L	1		6020A	Dissolved
Copper	1.8	J	2.0	0.50	ug/L	1		6020A	Dissolved
Iron	551		100	46.7	ug/L	1		6020A	Dissolved
Manganese	3010		2.5	0.79	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	379		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	20.5		1.0	0.85	mg/L	5		300.0	Total/NA
Nitrate as N	0.19	J	0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	18.8		1.0	0.48	mg/L	5		300.0	Total/NA
Total Organic Carbon - Duplicates	27.7		1.0	0.47	mg/L	1		9060A	Total/NA
Alkalinity	345	B	5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191016-RA-22

Lab Sample ID: 500-171890-9

No Detections.

Client Sample ID: Trip Blank

Lab Sample ID: 500-171890-10

No Detections.

This Detection Summary does not include radiochemical test results.

Method Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL CHI
8270D	Semivolatile Organic Compounds (GC/MS)	SW846	TAL CHI
RSK-175	Dissolved Gases (GC)	RSK	TAL CAN
8151A	Herbicides (GC)	SW846	TAL CHI
6020A	Metals (ICP/MS)	SW846	TAL CHI
SM 2340B	Total Hardness (as CaCO3) by calculation	SM	TAL CHI
300.0	Anions, Ion Chromatography	MCAWW	TAL CHI
9060A	Organic Carbon, Total (TOC)	SW846	TAL CHI
SM 2320B	Alkalinity	SM	TAL CHI
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	TAL CHI
3010A	Preparation, Total Metals	SW846	TAL CHI
3510C	Liquid-Liquid Extraction (Separatory Funnel)	SW846	TAL CHI
5030B	Purge and Trap	SW846	TAL CHI
8151A	Extraction (Herbicides)	SW846	TAL CHI

Protocol References:

MCAWW = "Methods For Chemical Analysis Of Water And Wastes", EPA-600/4-79-020, March 1983 And Subsequent Revisions.

RSK = Sample Prep And Calculations For Dissolved Gas Analysis In Water Samples Using A GC Headspace Equilibration Technique, RSKSOP-175, Rev. 0, 8/11/94, USEPA Research Lab

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CAN = Eurofins TestAmerica, Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Sample Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
500-171890-1	W-191016-RA-16	Water	10/16/19 10:00	10/17/19 08:40	
500-171890-2	W-191016-RA-20	Water	10/16/19 10:38	10/17/19 08:40	
500-171890-3	W-191016-RA-18	Water	10/16/19 11:18	10/17/19 08:40	
500-171890-4	W-191016-RA-21	Water	10/16/19 12:15	10/17/19 08:40	
500-171890-5	W-191016-RA-24	Water	10/16/19 12:44	10/17/19 08:40	
500-171890-6	W-191016-RA-19	Water	10/16/19 13:05	10/17/19 08:40	
500-171890-7	W-191016-RA-25	Water	10/16/19 13:05	10/17/19 08:40	
500-171890-8	W-191016-RA-23	Water	10/16/19 13:35	10/17/19 08:40	
500-171890-9	W-191016-RA-22	Water	10/16/19 13:35	10/17/19 08:40	
500-171890-10	Trip Blank	Water	10/16/19 00:00	10/17/19 08:40	

Client Sample ID: W-191016-RA-16

Date Collected: 10/16/19 10:00
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171890-1

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/28/19 12:16	1
Toluene	<0.15		0.50	0.15	ug/L			10/28/19 12:16	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/28/19 12:16	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/28/19 12:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*95*		*75 - 126*		*10/28/19 12:16*	*1*
Toluene-d8 (Surr)	*100*		*75 - 120*		*10/28/19 12:16*	*1*
4-Bromofluorobenzene (Surr)	*93*		*72 - 124*		*10/28/19 12:16*	*1*
Dibromofluoromethane	*106*		*75 - 120*		*10/28/19 12:16*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.25		0.81	0.25	ug/L		10/21/19 15:04	10/24/19 09:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*51*	*^c*	*36 - 120*	*10/21/19 15:04*	*10/24/19 09:29*	*1*
2-Fluorobiphenyl (Surr)	*64*		*34 - 110*	*10/21/19 15:04*	*10/24/19 09:29*	*1*
Terphenyl-d14 (Surr)	*119*		*40 - 145*	*10/21/19 15:04*	*10/24/19 09:29*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	**25**		1.0	0.17	ug/L			10/21/19 13:55	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*90*		*60 - 140*		*10/21/19 13:55*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	**5.7**		0.51	0.46	ug/L		10/23/19 10:37	10/24/19 09:02	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*112*		*25 - 130*	*10/23/19 10:37*	*10/24/19 09:02*	*5*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**1.0**		1.0	0.23	ug/L		10/26/19 19:54	10/28/19 12:31	1
Copper	<0.50		2.0	0.50	ug/L		10/26/19 19:54	10/28/19 12:31	1
Iron	**214**		100	46.7	ug/L		10/26/19 19:54	10/28/19 12:31	1
Manganese	**134**		2.5	0.79	ug/L		10/26/19 19:54	10/28/19 15:42	1
Zinc	<6.9		20.0	6.9	ug/L		10/26/19 19:54	10/28/19 12:31	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**147**		0.91	0.46	mg/L		10/25/19 17:27	10/29/19 08:41	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**50.4**		2.0	1.7	mg/L			10/28/19 23:08	10
Nitrate as N	**0.090**	**J**	0.20	0.068	mg/L			10/17/19 15:41	1
Sulfate	**13.6**	**B**	2.0	0.95	mg/L			10/18/19 02:07	10
Total Organic Carbon - Duplicates	<0.47		1.0	0.47	mg/L			10/28/19 15:47	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-16
Date Collected: 10/16/19 10:00
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171890-1
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	80.3	H	5.0	3.7	mg/L			10/31/19 13:08	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-20

Date Collected: 10/16/19 10:38
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171890-2

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/28/19 12:41	1
Toluene	<0.15		0.50	0.15	ug/L			10/28/19 12:41	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/28/19 12:41	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/28/19 12:41	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*96*		*75 - 126*		*10/28/19 12:41*	*1*
Toluene-d8 (Surr)	*102*		*75 - 120*		*10/28/19 12:41*	*1*
4-Bromofluorobenzene (Surr)	*94*		*72 - 124*		*10/28/19 12:41*	*1*
Dibromofluoromethane	*100*		*75 - 120*		*10/28/19 12:41*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.23		0.74	0.23	ug/L		10/21/19 15:04	10/24/19 09:56	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*63*	*^c*	*36 - 120*	*10/21/19 15:04*	*10/24/19 09:56*	*1*
2-Fluorobiphenyl (Surr)	*72*		*34 - 110*	*10/21/19 15:04*	*10/24/19 09:56*	*1*
Terphenyl-d14 (Surr)	*135*		*40 - 145*	*10/21/19 15:04*	*10/24/19 09:56*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/21/19 14:12	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*90*		*60 - 140*		*10/21/19 14:12*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.086		0.096	0.086	ug/L		10/23/19 10:37	10/24/19 01:56	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*107*		*25 - 130*	*10/23/19 10:37*	*10/24/19 01:56*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.31**	**J**	1.0	0.23	ug/L		10/26/19 19:54	10/28/19 12:33	1
Copper	<0.50		2.0	0.50	ug/L		10/26/19 19:54	10/28/19 12:33	1
Iron	<46.7		100	46.7	ug/L		10/26/19 19:54	10/28/19 12:33	1
Manganese	<0.79		2.5	0.79	ug/L		10/26/19 19:54	10/28/19 15:43	1
Zinc	<6.9		20.0	6.9	ug/L		10/26/19 19:54	10/28/19 12:33	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**120**		0.91	0.46	mg/L		10/25/19 17:27	10/29/19 08:41	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**22.9**		1.0	0.85	mg/L			10/28/19 23:20	5
Nitrate as N	**2.1**		0.20	0.068	mg/L			10/17/19 15:53	1
Sulfate	**5.3**	**B**	0.20	0.095	mg/L			10/17/19 15:53	1
Total Organic Carbon - Duplicates	**0.51**	**J**	1.0	0.47	mg/L			10/28/19 16:03	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-20
Date Collected: 10/16/19 10:38
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171890-2
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	105	H	5.0	3.7	mg/L			10/31/19 13:14	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-18

Date Collected: 10/16/19 11:18
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171890-3

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/28/19 13:05	1
Toluene	<0.15		0.50	0.15	ug/L			10/28/19 13:05	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/28/19 13:05	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/28/19 13:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*95*		*75 - 126*		*10/28/19 13:05*	*1*
Toluene-d8 (Surr)	*100*		*75 - 120*		*10/28/19 13:05*	*1*
4-Bromofluorobenzene (Surr)	*94*		*72 - 124*		*10/28/19 13:05*	*1*
Dibromofluoromethane	*102*		*75 - 120*		*10/28/19 13:05*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.25		0.81	0.25	ug/L		10/21/19 15:04	10/24/19 10:23	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*70*	*^c*	*36 - 120*	*10/21/19 15:04*	*10/24/19 10:23*	*1*
2-Fluorobiphenyl (Surr)	*89*		*34 - 110*	*10/21/19 15:04*	*10/24/19 10:23*	*1*
Terphenyl-d14 (Surr)	*131*		*40 - 145*	*10/21/19 15:04*	*10/24/19 10:23*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/21/19 14:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*89*		*60 - 140*		*10/21/19 14:29*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.086		0.096	0.086	ug/L		10/23/19 10:37	10/24/19 02:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*111*		*25 - 130*	*10/23/19 10:37*	*10/24/19 02:16*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**1.1**		1.0	0.23	ug/L		10/26/19 19:54	10/28/19 12:34	1
Copper	<0.50		2.0	0.50	ug/L		10/26/19 19:54	10/28/19 12:34	1
Iron	<46.7		100	46.7	ug/L		10/26/19 19:54	10/28/19 12:34	1
Manganese	**9.0**	**F2**	2.5	0.79	ug/L		10/26/19 19:54	10/28/19 15:44	1
Zinc	<6.9		20.0	6.9	ug/L		10/26/19 19:54	10/28/19 12:34	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**146**		0.91	0.46	mg/L		10/25/19 17:27	10/29/19 08:41	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**17.5**	**F1**	1.0	0.85	mg/L			10/30/19 07:49	5
Nitrate as N	**1.7**		0.20	0.068	mg/L			10/17/19 16:05	1
Sulfate	**6.6**	**B**	0.20	0.095	mg/L			10/17/19 16:05	1
Total Organic Carbon - Duplicates	<0.47		1.0	0.47	mg/L			10/28/19 16:19	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-18
Date Collected: 10/16/19 11:18
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171890-3
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	123	H	5.0	3.7	mg/L			10/31/19 13:22	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-21

Date Collected: 10/16/19 12:15
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171890-4

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/28/19 13:29	1
Toluene	<0.15		0.50	0.15	ug/L			10/28/19 13:29	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/28/19 13:29	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/28/19 13:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*97*		*75 - 126*		*10/28/19 13:29*	*1*
Toluene-d8 (Surr)	*102*		*75 - 120*		*10/28/19 13:29*	*1*
4-Bromofluorobenzene (Surr)	*94*		*72 - 124*		*10/28/19 13:29*	*1*
Dibromofluoromethane	*104*		*75 - 120*		*10/28/19 13:29*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.23		0.75	0.23	ug/L		10/21/19 15:04	10/24/19 10:50	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*47*	*^c*	*36 - 120*	*10/21/19 15:04*	*10/24/19 10:50*	*1*
2-Fluorobiphenyl (Surr)	*65*		*34 - 110*	*10/21/19 15:04*	*10/24/19 10:50*	*1*
Terphenyl-d14 (Surr)	*113*		*40 - 145*	*10/21/19 15:04*	*10/24/19 10:50*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/21/19 15:21	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*90*		*60 - 140*		*10/21/19 15:21*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.095		0.11	0.095	ug/L		10/23/19 10:37	10/24/19 03:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*133*	*X*	*25 - 130*	*10/23/19 10:37*	*10/24/19 03:17*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.35**	**J**	1.0	0.23	ug/L		10/26/19 19:54	10/28/19 12:44	1
Copper	**3.3**		2.0	0.50	ug/L		10/26/19 19:54	10/28/19 12:44	1
Iron	**509**		100	46.7	ug/L		10/26/19 19:54	10/28/19 12:44	1
Manganese	**99.0**		2.5	0.79	ug/L		10/26/19 19:54	10/28/19 15:52	1
Zinc	**11.5**	**J**	20.0	6.9	ug/L		10/26/19 19:54	10/28/19 12:44	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**71.2**		0.91	0.46	mg/L		10/25/19 17:27	10/29/19 08:41	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**3.6**		0.20	0.17	mg/L			10/29/19 01:14	1
Nitrate as N	**0.71**		0.20	0.068	mg/L			10/17/19 16:18	1
Sulfate	**4.5**	**B**	0.20	0.095	mg/L			10/17/19 16:18	1
Total Organic Carbon - Duplicates	**12.4**		1.0	0.47	mg/L			10/28/19 16:56	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-21
Date Collected: 10/16/19 12:15
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171890-4
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	62.6	H	5.0	3.7	mg/L			10/31/19 13:35	1

Client Sample ID: W-191016-RA-24

Lab Sample ID: 500-171890-5

Date Collected: 10/16/19 12:44

Matrix: Water

Date Received: 10/17/19 08:40

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/28/19 13:54	1
Toluene	<0.15		0.50	0.15	ug/L			10/28/19 13:54	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/28/19 13:54	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/28/19 13:54	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*95*		*75 - 126*		*10/28/19 13:54*	*1*
Toluene-d8 (Surr)	*99*		*75 - 120*		*10/28/19 13:54*	*1*
4-Bromofluorobenzene (Surr)	*94*		*72 - 124*		*10/28/19 13:54*	*1*
Dibromofluoromethane	*101*		*75 - 120*		*10/28/19 13:54*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.26		0.84	0.26	ug/L		10/21/19 15:04	10/24/19 11:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*59*	*^c*	*36 - 120*	*10/21/19 15:04*	*10/24/19 11:17*	*1*
2-Fluorobiphenyl (Surr)	*83*		*34 - 110*	*10/21/19 15:04*	*10/24/19 11:17*	*1*
Terphenyl-d14 (Surr)	*102*		*40 - 145*	*10/21/19 15:04*	*10/24/19 11:17*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/21/19 15:38	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*87*		*60 - 140*		*10/21/19 15:38*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.094		0.10	0.094	ug/L		10/23/19 10:37	10/24/19 03:37	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*118*		*25 - 130*	*10/23/19 10:37*	*10/24/19 03:37*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.33**	**J**	1.0	0.23	ug/L		10/26/19 19:54	10/28/19 12:50	1
Copper	**5.2**		2.0	0.50	ug/L		10/26/19 19:54	10/28/19 12:50	1
Iron	**1170**		100	46.7	ug/L		10/26/19 19:54	10/28/19 12:50	1
Manganese	**40.9**		2.5	0.79	ug/L		10/26/19 19:54	10/28/19 15:53	1
Zinc	**12.1**	**J**	20.0	6.9	ug/L		10/26/19 19:54	10/28/19 12:50	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**75.6**		0.91	0.46	mg/L		10/25/19 17:27	10/29/19 08:41	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**0.34**		0.20	0.17	mg/L			10/29/19 01:27	1
Nitrate as N	**0.30**		0.20	0.068	mg/L			10/17/19 16:30	1
Sulfate	**1.4**	**B**	0.20	0.095	mg/L			10/17/19 16:30	1
Total Organic Carbon - Duplicates	**5.3**		1.0	0.47	mg/L			10/28/19 17:12	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-24
Date Collected: 10/16/19 12:44
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171890-5
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	67.9	H	5.0	3.7	mg/L			10/31/19 13:41	1

Client Sample ID: W-191016-RA-19

Date Collected: 10/16/19 13:05
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171890-6

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/28/19 14:18	1
Toluene	<0.15		0.50	0.15	ug/L			10/28/19 14:18	1
Ethylbenzene	**0.69**		0.50	0.18	ug/L			10/28/19 14:18	1
Xylenes, Total	**7.4**		1.0	0.22	ug/L			10/28/19 14:18	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*97*		*75 - 126*		*10/28/19 14:18*	*1*
Toluene-d8 (Surr)	*100*		*75 - 120*		*10/28/19 14:18*	*1*
4-Bromofluorobenzene (Surr)	*94*		*72 - 124*		*10/28/19 14:18*	*1*
Dibromofluoromethane	*104*		*75 - 120*		*10/28/19 14:18*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	**7.5**		0.78	0.24	ug/L		10/21/19 15:04	10/24/19 14:26	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*62*	*^c*	*36 - 120*	*10/21/19 15:04*	*10/24/19 14:26*	*1*
2-Fluorobiphenyl (Surr)	*37*		*34 - 110*	*10/21/19 15:04*	*10/24/19 14:26*	*1*
Terphenyl-d14 (Surr)	*100*		*40 - 145*	*10/21/19 15:04*	*10/24/19 14:26*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	**81**		1.0	0.17	ug/L			10/21/19 15:55	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*88*		*60 - 140*		*10/21/19 15:55*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	**1700**		39	35	ug/L		10/23/19 10:37	10/24/19 13:26	400

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*0*	*D*	*25 - 130*	*10/23/19 10:37*	*10/24/19 13:26*	*400*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**1.1**		1.0	0.23	ug/L		10/26/19 19:54	10/28/19 12:52	1
Copper	**2.7**		2.0	0.50	ug/L		10/26/19 19:54	10/28/19 12:52	1
Iron	**1800**		100	46.7	ug/L		10/26/19 19:54	10/28/19 12:52	1
Manganese	**937**		2.5	0.79	ug/L		10/26/19 19:54	10/28/19 15:54	1
Zinc	<6.9		20.0	6.9	ug/L		10/26/19 19:54	10/28/19 12:52	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**186**		0.91	0.46	mg/L		10/25/19 17:27	10/29/19 08:41	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**31.2**		2.0	1.7	mg/L			10/29/19 02:05	10
Nitrate as N	<0.068		0.20	0.068	mg/L			10/17/19 16:42	1
Sulfate	**14.4**	**B**	2.0	0.95	mg/L			10/18/19 03:09	10
Total Organic Carbon - Duplicates	**27.1**		1.0	0.47	mg/L			10/28/19 17:28	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-19
Date Collected: 10/16/19 13:05
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171890-6
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	143	B	5.0	3.7	mg/L			10/30/19 16:19	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-25

Date Collected: 10/16/19 13:05
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171890-7

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/28/19 14:43	1
Toluene	**0.98**		0.50	0.15	ug/L			10/28/19 14:43	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/28/19 14:43	1
Xylenes, Total	**7.7**		1.0	0.22	ug/L			10/28/19 14:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*99*		*75 - 126*		*10/28/19 14:43*	*1*
Toluene-d8 (Surr)	*99*		*75 - 120*		*10/28/19 14:43*	*1*
4-Bromofluorobenzene (Surr)	*92*		*72 - 124*		*10/28/19 14:43*	*1*
Dibromofluoromethane	*109*		*75 - 120*		*10/28/19 14:43*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	**7.0**		0.79	0.24	ug/L		10/21/19 15:04	10/24/19 14:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*62*	*^c*	*36 - 120*	*10/21/19 15:04*	*10/24/19 14:53*	*1*
2-Fluorobiphenyl (Surr)	*38*		*34 - 110*	*10/21/19 15:04*	*10/24/19 14:53*	*1*
Terphenyl-d14 (Surr)	*101*		*40 - 145*	*10/21/19 15:04*	*10/24/19 14:53*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	**180**		1.0	0.17	ug/L			10/21/19 16:30	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*89*		*60 - 140*		*10/21/19 16:30*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	**1800**		39	35	ug/L		10/23/19 10:37	10/24/19 13:46	400

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*0*	*D*	*25 - 130*	*10/23/19 10:37*	*10/24/19 13:46*	*400*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**1.1**		1.0	0.23	ug/L		10/26/19 19:54	10/28/19 12:53	1
Copper	**2.4**		2.0	0.50	ug/L		10/26/19 19:54	10/28/19 12:53	1
Iron	**1640**		100	46.7	ug/L		10/26/19 19:54	10/28/19 12:53	1
Manganese	**937**		2.5	0.79	ug/L		10/26/19 19:54	10/28/19 15:55	1
Zinc	<6.9		20.0	6.9	ug/L		10/26/19 19:54	10/28/19 12:53	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**183**		0.91	0.46	mg/L		10/25/19 17:27	10/29/19 08:41	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**30.3**		2.0	1.7	mg/L			10/29/19 02:18	10
Nitrate as N	<0.068		0.20	0.068	mg/L			10/17/19 16:55	1
Sulfate	**14.4**	**B**	2.0	0.95	mg/L			10/18/19 03:21	10
Total Organic Carbon - Duplicates	**26.6**		1.0	0.47	mg/L			10/28/19 18:05	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-25
Date Collected: 10/16/19 13:05
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171890-7
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	144	B	5.0	3.7	mg/L			10/30/19 16:26	1

Client Sample ID: W-191016-RA-23

Date Collected: 10/16/19 13:35
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171890-8

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/28/19 15:07	1
Toluene	<0.15		0.50	0.15	ug/L			10/28/19 15:07	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/28/19 15:07	1
Xylenes, Total	**14**		1.0	0.22	ug/L			10/28/19 15:07	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*94*		*75 - 126*		*10/28/19 15:07*	*1*
Toluene-d8 (Surr)	*102*		*75 - 120*		*10/28/19 15:07*	*1*
4-Bromofluorobenzene (Surr)	*94*		*72 - 124*		*10/28/19 15:07*	*1*
Dibromofluoromethane	*105*		*75 - 120*		*10/28/19 15:07*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	**13**		0.77	0.24	ug/L		10/21/19 15:04	10/24/19 15:47	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*57*	*^c*	*36 - 120*	*10/21/19 15:04*	*10/24/19 15:47*	*1*
2-Fluorobiphenyl (Surr)	*80*		*34 - 110*	*10/21/19 15:04*	*10/24/19 15:47*	*1*
Terphenyl-d14 (Surr)	*95*		*40 - 145*	*10/21/19 15:04*	*10/24/19 15:47*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	**0.31**	**J**	1.0	0.17	ug/L			10/21/19 16:47	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*85*		*60 - 140*		*10/21/19 16:47*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	**2500**		77	69	ug/L		10/23/19 10:37	10/24/19 14:06	800

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*0*	*D*	*25 - 130*	*10/23/19 10:37*	*10/24/19 14:06*	*800*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.49**	**J**	1.0	0.23	ug/L		10/26/19 19:54	10/28/19 12:55	1
Copper	**1.8**	**J**	2.0	0.50	ug/L		10/26/19 19:54	10/28/19 12:55	1
Iron	**551**		100	46.7	ug/L		10/26/19 19:54	10/28/19 12:55	1
Manganese	**3010**		2.5	0.79	ug/L		10/26/19 19:54	10/28/19 15:56	1
Zinc	<6.9		20.0	6.9	ug/L		10/26/19 19:54	10/28/19 12:55	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**379**		0.91	0.46	mg/L		10/25/19 17:27	10/29/19 08:41	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**20.5**		1.0	0.85	mg/L			10/29/19 02:31	5
Nitrate as N	**0.19**	**J**	0.20	0.068	mg/L			10/17/19 17:07	1
Sulfate	**18.8**		1.0	0.48	mg/L			10/29/19 02:31	5
Total Organic Carbon - Duplicates	**27.7**		1.0	0.47	mg/L			10/28/19 18:21	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-23
Date Collected: 10/16/19 13:35
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171890-8
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	345	B	5.0	3.7	mg/L			10/30/19 16:34	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-22

Lab Sample ID: 500-171890-9

Date Collected: 10/16/19 13:35

Matrix: Water

Date Received: 10/17/19 08:40

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/28/19 15:32	1
Toluene	<0.15		0.50	0.15	ug/L			10/28/19 15:32	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/28/19 15:32	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/28/19 15:32	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*100*		*75 - 126*		*10/28/19 15:32*	*1*
Toluene-d8 (Surr)	*99*		*75 - 120*		*10/28/19 15:32*	*1*
4-Bromofluorobenzene (Surr)	*95*		*72 - 124*		*10/28/19 15:32*	*1*
Dibromofluoromethane	*109*		*75 - 120*		*10/28/19 15:32*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.28		0.91	0.28	ug/L		10/21/19 15:04	10/24/19 11:44	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*51*	*^c*	*36 - 120*	*10/21/19 15:04*	*10/24/19 11:44*	*1*
2-Fluorobiphenyl (Surr)	*65*		*34 - 110*	*10/21/19 15:04*	*10/24/19 11:44*	*1*
Terphenyl-d14 (Surr)	*114*		*40 - 145*	*10/21/19 15:04*	*10/24/19 11:44*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.093		0.10	0.093	ug/L		10/23/19 10:37	10/24/19 05:40	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*91*		*25 - 130*	*10/23/19 10:37*	*10/24/19 05:40*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.23		1.0	0.23	ug/L		10/26/19 19:54	10/28/19 12:57	1
Copper	<0.50		2.0	0.50	ug/L		10/26/19 19:54	10/28/19 12:57	1
Iron	<46.7		100	46.7	ug/L		10/26/19 19:54	10/28/19 12:57	1
Manganese	<0.79		2.5	0.79	ug/L		10/26/19 19:54	10/28/19 15:57	1
Zinc	<6.9		20.0	6.9	ug/L		10/26/19 19:54	10/28/19 12:57	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: Trip Blank

Date Collected: 10/16/19 00:00
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171890-10

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/28/19 11:51	1
Toluene	<0.15		0.50	0.15	ug/L			10/28/19 11:51	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/28/19 11:51	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/28/19 11:51	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*95*		*75 - 126*		*10/28/19 11:51*	*1*
Toluene-d8 (Surr)	*101*		*75 - 120*		*10/28/19 11:51*	*1*
4-Bromofluorobenzene (Surr)	*93*		*72 - 124*		*10/28/19 11:51*	*1*
Dibromofluoromethane	*102*		*75 - 120*		*10/28/19 11:51*	*1*

Definitions/Glossary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
^c	CCV Recovery is outside acceptance limits.

GC VOA

Qualifier	Qualifier Description
J	Reported value was between the limit of detection and the limit of quantitation.

GC Semi VOA

Qualifier	Qualifier Description
D	Surrogate or matrix spike recoveries were not obtained because the extract was diluted for analysis; also compounds analyzed at a dilution may be flagged with a D.
X	Surrogate is outside control limits

Metals

Qualifier	Qualifier Description
F2	MS/MSD RPD exceeds control limits
F3	Duplicate RPD exceeds the control limit
J	Reported value was between the limit of detection and the limit of quantitation.

General Chemistry

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
F1	MS and/or MSD Recovery is outside acceptance limits.
H	Sample was prepped or analyzed beyond the specified holding time
J	Reported value was between the limit of detection and the limit of quantitation.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Association Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

GC/MS VOA

Analysis Batch: 512162

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-1	W-191016-RA-16	Total/NA	Water	8260B	
500-171890-2	W-191016-RA-20	Total/NA	Water	8260B	
500-171890-3	W-191016-RA-18	Total/NA	Water	8260B	
500-171890-4	W-191016-RA-21	Total/NA	Water	8260B	
500-171890-5	W-191016-RA-24	Total/NA	Water	8260B	
500-171890-6	W-191016-RA-19	Total/NA	Water	8260B	
500-171890-7	W-191016-RA-25	Total/NA	Water	8260B	
500-171890-8	W-191016-RA-23	Total/NA	Water	8260B	
500-171890-9	W-191016-RA-22	Total/NA	Water	8260B	
500-171890-10	Trip Blank	Total/NA	Water	8260B	
MB 500-512162/6	Method Blank	Total/NA	Water	8260B	
LCS 500-512162/4	Lab Control Sample	Total/NA	Water	8260B	
500-171890-3 MS	W-191016-RA-18	Total/NA	Water	8260B	
500-171890-3 MSD	W-191016-RA-18	Total/NA	Water	8260B	

GC/MS Semi VOA

Prep Batch: 511122

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-1	W-191016-RA-16	Total/NA	Water	3510C	
500-171890-2	W-191016-RA-20	Total/NA	Water	3510C	
500-171890-3	W-191016-RA-18	Total/NA	Water	3510C	
500-171890-4	W-191016-RA-21	Total/NA	Water	3510C	
500-171890-5	W-191016-RA-24	Total/NA	Water	3510C	
500-171890-6	W-191016-RA-19	Total/NA	Water	3510C	
500-171890-7	W-191016-RA-25	Total/NA	Water	3510C	
500-171890-8	W-191016-RA-23	Total/NA	Water	3510C	
500-171890-9	W-191016-RA-22	Total/NA	Water	3510C	
MB 500-511122/1-A	Method Blank	Total/NA	Water	3510C	
LCS 500-511122/2-A	Lab Control Sample	Total/NA	Water	3510C	
500-171890-3 MS	W-191016-RA-18	Total/NA	Water	3510C	
500-171890-3 MSD	W-191016-RA-18	Total/NA	Water	3510C	

Analysis Batch: 511241

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 500-511122/1-A	Method Blank	Total/NA	Water	8270D	511122
LCS 500-511122/2-A	Lab Control Sample	Total/NA	Water	8270D	511122

Analysis Batch: 511646

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-1	W-191016-RA-16	Total/NA	Water	8270D	511122
500-171890-2	W-191016-RA-20	Total/NA	Water	8270D	511122
500-171890-3	W-191016-RA-18	Total/NA	Water	8270D	511122
500-171890-4	W-191016-RA-21	Total/NA	Water	8270D	511122
500-171890-5	W-191016-RA-24	Total/NA	Water	8270D	511122
500-171890-6	W-191016-RA-19	Total/NA	Water	8270D	511122
500-171890-7	W-191016-RA-25	Total/NA	Water	8270D	511122
500-171890-8	W-191016-RA-23	Total/NA	Water	8270D	511122
500-171890-9	W-191016-RA-22	Total/NA	Water	8270D	511122
500-171890-3 MS	W-191016-RA-18	Total/NA	Water	8270D	511122
500-171890-3 MSD	W-191016-RA-18	Total/NA	Water	8270D	511122

QC Association Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

GC VOA

Analysis Batch: 406658

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-1	W-191016-RA-16	Total/NA	Water	RSK-175	
500-171890-2	W-191016-RA-20	Total/NA	Water	RSK-175	
500-171890-3	W-191016-RA-18	Total/NA	Water	RSK-175	
500-171890-4	W-191016-RA-21	Total/NA	Water	RSK-175	
500-171890-5	W-191016-RA-24	Total/NA	Water	RSK-175	
500-171890-6	W-191016-RA-19	Total/NA	Water	RSK-175	
500-171890-7	W-191016-RA-25	Total/NA	Water	RSK-175	
500-171890-8	W-191016-RA-23	Total/NA	Water	RSK-175	
MB 240-406658/3	Method Blank	Total/NA	Water	RSK-175	
LCS 240-406658/4	Lab Control Sample	Total/NA	Water	RSK-175	
500-171890-3 MS	W-191016-RA-18	Total/NA	Water	RSK-175	
500-171890-3 MSD	W-191016-RA-18	Total/NA	Water	RSK-175	

GC Semi VOA

Prep Batch: 511511

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-1	W-191016-RA-16	Total/NA	Water	8151A	
500-171890-2	W-191016-RA-20	Total/NA	Water	8151A	
500-171890-3	W-191016-RA-18	Total/NA	Water	8151A	
500-171890-4	W-191016-RA-21	Total/NA	Water	8151A	
500-171890-5	W-191016-RA-24	Total/NA	Water	8151A	
500-171890-6	W-191016-RA-19	Total/NA	Water	8151A	
500-171890-7	W-191016-RA-25	Total/NA	Water	8151A	
500-171890-8	W-191016-RA-23	Total/NA	Water	8151A	
500-171890-9	W-191016-RA-22	Total/NA	Water	8151A	
MB 500-511511/1-A	Method Blank	Total/NA	Water	8151A	
LCS 500-511511/2-A	Lab Control Sample	Total/NA	Water	8151A	
500-171890-3 MS	W-191016-RA-18	Total/NA	Water	8151A	
500-171890-3 MSD	W-191016-RA-18	Total/NA	Water	8151A	

Analysis Batch: 511622

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-1	W-191016-RA-16	Total/NA	Water	8151A	511511
500-171890-2	W-191016-RA-20	Total/NA	Water	8151A	511511
500-171890-3	W-191016-RA-18	Total/NA	Water	8151A	511511
500-171890-4	W-191016-RA-21	Total/NA	Water	8151A	511511
500-171890-5	W-191016-RA-24	Total/NA	Water	8151A	511511
500-171890-6	W-191016-RA-19	Total/NA	Water	8151A	511511
500-171890-7	W-191016-RA-25	Total/NA	Water	8151A	511511
500-171890-8	W-191016-RA-23	Total/NA	Water	8151A	511511
500-171890-9	W-191016-RA-22	Total/NA	Water	8151A	511511
MB 500-511511/1-A	Method Blank	Total/NA	Water	8151A	511511
LCS 500-511511/2-A	Lab Control Sample	Total/NA	Water	8151A	511511
500-171890-3 MS	W-191016-RA-18	Total/NA	Water	8151A	511511
500-171890-3 MSD	W-191016-RA-18	Total/NA	Water	8151A	511511

Metals

Prep Batch: 512043

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-1	W-191016-RA-16	Total/NA	Water	3010A	

Metals (Continued)

Prep Batch: 512043 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-2	W-191016-RA-20	Total/NA	Water	3010A	
500-171890-3	W-191016-RA-18	Total/NA	Water	3010A	
500-171890-4	W-191016-RA-21	Total/NA	Water	3010A	
500-171890-5	W-191016-RA-24	Total/NA	Water	3010A	
500-171890-6	W-191016-RA-19	Total/NA	Water	3010A	
500-171890-7	W-191016-RA-25	Total/NA	Water	3010A	
500-171890-8	W-191016-RA-23	Total/NA	Water	3010A	

Prep Batch: 512081

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-1	W-191016-RA-16	Dissolved	Water	3005A	
500-171890-2	W-191016-RA-20	Dissolved	Water	3005A	
500-171890-3	W-191016-RA-18	Dissolved	Water	3005A	
500-171890-4	W-191016-RA-21	Dissolved	Water	3005A	
500-171890-5	W-191016-RA-24	Dissolved	Water	3005A	
500-171890-6	W-191016-RA-19	Dissolved	Water	3005A	
500-171890-7	W-191016-RA-25	Dissolved	Water	3005A	
500-171890-8	W-191016-RA-23	Dissolved	Water	3005A	
500-171890-9	W-191016-RA-22	Dissolved	Water	3005A	
MB 500-512081/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 500-512081/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
500-171890-3 MS	W-191016-RA-18	Dissolved	Water	3005A	
500-171890-3 MSD	W-191016-RA-18	Dissolved	Water	3005A	
500-171890-3 DU	W-191016-RA-18	Dissolved	Water	3005A	

Analysis Batch: 512288

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-1	W-191016-RA-16	Dissolved	Water	6020A	512081
500-171890-2	W-191016-RA-20	Dissolved	Water	6020A	512081
500-171890-3	W-191016-RA-18	Dissolved	Water	6020A	512081
500-171890-4	W-191016-RA-21	Dissolved	Water	6020A	512081
500-171890-5	W-191016-RA-24	Dissolved	Water	6020A	512081
500-171890-6	W-191016-RA-19	Dissolved	Water	6020A	512081
500-171890-7	W-191016-RA-25	Dissolved	Water	6020A	512081
500-171890-8	W-191016-RA-23	Dissolved	Water	6020A	512081
500-171890-9	W-191016-RA-22	Dissolved	Water	6020A	512081
MB 500-512081/1-A	Method Blank	Total Recoverable	Water	6020A	512081
LCS 500-512081/2-A	Lab Control Sample	Total Recoverable	Water	6020A	512081
500-171890-3 MS	W-191016-RA-18	Dissolved	Water	6020A	512081
500-171890-3 MSD	W-191016-RA-18	Dissolved	Water	6020A	512081
500-171890-3 DU	W-191016-RA-18	Dissolved	Water	6020A	512081

Analysis Batch: 512419

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-1	W-191016-RA-16	Total/NA	Water	SM 2340B	512043
500-171890-2	W-191016-RA-20	Total/NA	Water	SM 2340B	512043
500-171890-3	W-191016-RA-18	Total/NA	Water	SM 2340B	512043
500-171890-4	W-191016-RA-21	Total/NA	Water	SM 2340B	512043
500-171890-5	W-191016-RA-24	Total/NA	Water	SM 2340B	512043
500-171890-6	W-191016-RA-19	Total/NA	Water	SM 2340B	512043
500-171890-7	W-191016-RA-25	Total/NA	Water	SM 2340B	512043

Metals (Continued)

Analysis Batch: 512419 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-8	W-191016-RA-23	Total/NA	Water	SM 2340B	512043

Analysis Batch: 512444

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-1	W-191016-RA-16	Dissolved	Water	6020A	512081
500-171890-2	W-191016-RA-20	Dissolved	Water	6020A	512081
500-171890-3	W-191016-RA-18	Dissolved	Water	6020A	512081
500-171890-4	W-191016-RA-21	Dissolved	Water	6020A	512081
500-171890-5	W-191016-RA-24	Dissolved	Water	6020A	512081
500-171890-6	W-191016-RA-19	Dissolved	Water	6020A	512081
500-171890-7	W-191016-RA-25	Dissolved	Water	6020A	512081
500-171890-8	W-191016-RA-23	Dissolved	Water	6020A	512081
500-171890-9	W-191016-RA-22	Dissolved	Water	6020A	512081
MB 500-512081/1-A	Method Blank	Total Recoverable	Water	6020A	512081
LCS 500-512081/2-A	Lab Control Sample	Total Recoverable	Water	6020A	512081
500-171890-3 MS	W-191016-RA-18	Dissolved	Water	6020A	512081
500-171890-3 MSD	W-191016-RA-18	Dissolved	Water	6020A	512081
500-171890-3 DU	W-191016-RA-18	Dissolved	Water	6020A	512081

General Chemistry

Analysis Batch: 510583

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-1	W-191016-RA-16	Total/NA	Water	300.0	
500-171890-1	W-191016-RA-16	Total/NA	Water	300.0	
500-171890-2	W-191016-RA-20	Total/NA	Water	300.0	
500-171890-3	W-191016-RA-18	Total/NA	Water	300.0	
500-171890-4	W-191016-RA-21	Total/NA	Water	300.0	
500-171890-5	W-191016-RA-24	Total/NA	Water	300.0	
500-171890-6	W-191016-RA-19	Total/NA	Water	300.0	
500-171890-6	W-191016-RA-19	Total/NA	Water	300.0	
500-171890-7	W-191016-RA-25	Total/NA	Water	300.0	
500-171890-7	W-191016-RA-25	Total/NA	Water	300.0	
500-171890-8	W-191016-RA-23	Total/NA	Water	300.0	
MB 500-510583/23	Method Blank	Total/NA	Water	300.0	
LCS 500-510583/24	Lab Control Sample	Total/NA	Water	300.0	
500-171890-3 MS	W-191016-RA-18	Total/NA	Water	300.0	
500-171890-3 MSD	W-191016-RA-18	Total/NA	Water	300.0	

Analysis Batch: 512345

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-1	W-191016-RA-16	Total/NA	Water	300.0	
500-171890-2	W-191016-RA-20	Total/NA	Water	300.0	
500-171890-4	W-191016-RA-21	Total/NA	Water	300.0	
500-171890-5	W-191016-RA-24	Total/NA	Water	300.0	
500-171890-6	W-191016-RA-19	Total/NA	Water	300.0	
500-171890-7	W-191016-RA-25	Total/NA	Water	300.0	
500-171890-8	W-191016-RA-23	Total/NA	Water	300.0	
MB 500-512345/3	Method Blank	Total/NA	Water	300.0	
LCS 500-512345/4	Lab Control Sample	Total/NA	Water	300.0	
500-171890-5 MS	W-191016-RA-24	Total/NA	Water	300.0	

General Chemistry (Continued)

Analysis Batch: 512345 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-5 MSD	W-191016-RA-24	Total/NA	Water	300.0	

Analysis Batch: 512432

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-1	W-191016-RA-16	Total/NA	Water	9060A	
500-171890-2	W-191016-RA-20	Total/NA	Water	9060A	
500-171890-3	W-191016-RA-18	Total/NA	Water	9060A	
500-171890-4	W-191016-RA-21	Total/NA	Water	9060A	
500-171890-5	W-191016-RA-24	Total/NA	Water	9060A	
500-171890-6	W-191016-RA-19	Total/NA	Water	9060A	
500-171890-7	W-191016-RA-25	Total/NA	Water	9060A	
500-171890-8	W-191016-RA-23	Total/NA	Water	9060A	
MB 500-512432/4	Method Blank	Total/NA	Water	9060A	
LCS 500-512432/5	Lab Control Sample	Total/NA	Water	9060A	
500-171890-3 MS	W-191016-RA-18	Total/NA	Water	9060A	
500-171890-3 MSD	W-191016-RA-18	Total/NA	Water	9060A	

Analysis Batch: 512545

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-3	W-191016-RA-18	Total/NA	Water	300.0	
MB 500-512545/3	Method Blank	Total/NA	Water	300.0	
LCS 500-512545/4	Lab Control Sample	Total/NA	Water	300.0	
500-171890-3 MS	W-191016-RA-18	Total/NA	Water	300.0	
500-171890-3 MS	W-191016-RA-18	Total/NA	Water	300.0	
500-171890-3 MSD	W-191016-RA-18	Total/NA	Water	300.0	
500-171890-3 MSD	W-191016-RA-18	Total/NA	Water	300.0	

Analysis Batch: 512840

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-6	W-191016-RA-19	Total/NA	Water	SM 2320B	
500-171890-7	W-191016-RA-25	Total/NA	Water	SM 2320B	
500-171890-8	W-191016-RA-23	Total/NA	Water	SM 2320B	
MB 500-512840/2	Method Blank	Total/NA	Water	SM 2320B	
LCS 500-512840/4	Lab Control Sample	Total/NA	Water	SM 2320B	

Analysis Batch: 512978

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171890-1	W-191016-RA-16	Total/NA	Water	SM 2320B	
500-171890-2	W-191016-RA-20	Total/NA	Water	SM 2320B	
500-171890-3	W-191016-RA-18	Total/NA	Water	SM 2320B	
500-171890-4	W-191016-RA-21	Total/NA	Water	SM 2320B	
500-171890-5	W-191016-RA-24	Total/NA	Water	SM 2320B	
MB 500-512978/3	Method Blank	Total/NA	Water	SM 2320B	
LCS 500-512978/5	Lab Control Sample	Total/NA	Water	SM 2320B	
500-171890-3 DU	W-191016-RA-18	Total/NA	Water	SM 2320B	

Surrogate Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Water

Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)			
		DCA	TOL	BFB	DBFM
Lab Sample ID	Client Sample ID	(75-126)	(75-120)	(72-124)	(75-120)
500-171890-1	W-191016-RA-16	95	100	93	106
500-171890-2	W-191016-RA-20	96	102	94	100
500-171890-3	W-191016-RA-18	95	100	94	102
500-171890-3 MS	W-191016-RA-18	104	99	100	111
500-171890-3 MSD	W-191016-RA-18	107	97	99	112
500-171890-4	W-191016-RA-21	97	102	94	104
500-171890-5	W-191016-RA-24	95	99	94	101
500-171890-6	W-191016-RA-19	97	100	94	104
500-171890-7	W-191016-RA-25	99	99	92	109
500-171890-8	W-191016-RA-23	94	102	94	105
500-171890-9	W-191016-RA-22	100	99	95	109
500-171890-10	Trip Blank	95	101	93	102
LCS 500-512162/4	Lab Control Sample	99	100	98	105
MB 500-512162/6	Method Blank	100	98	97	108

Surrogate Legend

DCA = 1,2-Dichloroethane-d4 (Surr)
TOL = Toluene-d8 (Surr)
BFB = 4-Bromofluorobenzene (Surr)
DBFM = Dibromofluoromethane

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Matrix: Water

Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)		
		NBZ	FBP	TPHL
Lab Sample ID	Client Sample ID	(36-120)	(34-110)	(40-145)
500-171890-1	W-191016-RA-16	51 ^c	64	119
500-171890-2	W-191016-RA-20	63 ^c	72	135
500-171890-3	W-191016-RA-18	70 ^c	89	131
500-171890-3 MS	W-191016-RA-18	65	87	91
500-171890-3 MSD	W-191016-RA-18	64	90	95
500-171890-4	W-191016-RA-21	47 ^c	65	113
500-171890-5	W-191016-RA-24	59 ^c	83	102
500-171890-6	W-191016-RA-19	62 ^c	37	100
500-171890-7	W-191016-RA-25	62 ^c	38	101
500-171890-8	W-191016-RA-23	57 ^c	80	95
500-171890-9	W-191016-RA-22	51 ^c	65	114
LCS 500-511122/2-A	Lab Control Sample	85	83	102
MB 500-511122/1-A	Method Blank	96	101	126

Surrogate Legend

NBZ = Nitrobenzene-d5 (Surr)
FBP = 2-Fluorobiphenyl (Surr)
TPHL = Terphenyl-d14 (Surr)

Surrogate Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Method: RSK-175 - Dissolved Gases (GC)

Matrix: Water

Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)
Lab Sample ID	Client Sample ID	TFE2 (60-140)
500-171890-1	W-191016-RA-16	90
500-171890-2	W-191016-RA-20	90
500-171890-3	W-191016-RA-18	89
500-171890-3 MS	W-191016-RA-18	88
500-171890-3 MSD	W-191016-RA-18	88
500-171890-4	W-191016-RA-21	90
500-171890-5	W-191016-RA-24	87
500-171890-6	W-191016-RA-19	88
500-171890-7	W-191016-RA-25	89
500-171890-8	W-191016-RA-23	85
LCS 240-406658/4	Lab Control Sample	91
MB 240-406658/3	Method Blank	93

Surrogate Legend

TFE = 1,1,1-Trifluoroethane

Method: 8151A - Herbicides (GC)

Matrix: Water

Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)
Lab Sample ID	Client Sample ID	DCPAA2 (25-130)
500-171890-1	W-191016-RA-16	112
500-171890-2	W-191016-RA-20	107
500-171890-3	W-191016-RA-18	111
500-171890-3 MS	W-191016-RA-18	116
500-171890-3 MSD	W-191016-RA-18	110
500-171890-4	W-191016-RA-21	133 X
500-171890-5	W-191016-RA-24	118
500-171890-6	W-191016-RA-19	0 D
500-171890-7	W-191016-RA-25	0 D
500-171890-8	W-191016-RA-23	0 D
500-171890-9	W-191016-RA-22	91
LCS 500-511511/2-A	Lab Control Sample	126
MB 500-511511/1-A	Method Blank	104

Surrogate Legend

DCPAA = DCAA

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 500-512162/6
Matrix: Water
Analysis Batch: 512162

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/28/19 11:26	1
Toluene	<0.15		0.50	0.15	ug/L			10/28/19 11:26	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/28/19 11:26	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/28/19 11:26	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*100*		*75 - 126*		*10/28/19 11:26*	*1*
Toluene-d8 (Surr)	*98*		*75 - 120*		*10/28/19 11:26*	*1*
4-Bromofluorobenzene (Surr)	*97*		*72 - 124*		*10/28/19 11:26*	*1*
Dibromofluoromethane	*108*		*75 - 120*		*10/28/19 11:26*	*1*

Lab Sample ID: LCS 500-512162/4
Matrix: Water
Analysis Batch: 512162

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	50.0	49.4		ug/L		99	70 - 120
Toluene	50.0	51.1		ug/L		102	70 - 125
Ethylbenzene	50.0	49.6		ug/L		99	70 - 123
Xylenes, Total	100	102		ug/L		102	70 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*99*		*75 - 126*
Toluene-d8 (Surr)	*100*		*75 - 120*
4-Bromofluorobenzene (Surr)	*98*		*72 - 124*
Dibromofluoromethane	*105*		*75 - 120*

Lab Sample ID: 500-171890-3 MS
Matrix: Water
Analysis Batch: 512162

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	<0.15		50.0	54.9		ug/L		110	70 - 120
Toluene	<0.15		50.0	53.4		ug/L		107	70 - 125
Ethylbenzene	<0.18		50.0	51.7		ug/L		103	70 - 123
Xylenes, Total	<0.22		100	106		ug/L		106	70 - 125

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*104*		*75 - 126*
Toluene-d8 (Surr)	*99*		*75 - 120*
4-Bromofluorobenzene (Surr)	*100*		*72 - 124*
Dibromofluoromethane	*111*		*75 - 120*

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 500-171890-3 MSD
Matrix: Water
Analysis Batch: 512162

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene	<0.15		50.0	53.3		ug/L		107	70 - 120	3	20
Toluene	<0.15		50.0	51.7		ug/L		103	70 - 125	3	20
Ethylbenzene	<0.18		50.0	51.5		ug/L		103	70 - 123	0	20
Xylenes, Total	<0.22		100	104		ug/L		104	70 - 125	1	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*107*		*75 - 126*
Toluene-d8 (Surr)	*97*		*75 - 120*
4-Bromofluorobenzene (Surr)	*99*		*72 - 124*
Dibromofluoromethane	*112*		*75 - 120*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Lab Sample ID: MB 500-511122/1-A
Matrix: Water
Analysis Batch: 511241

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 511122

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.25		0.80	0.25	ug/L		10/21/19 15:04	10/22/19 14:18	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*96*		*36 - 120*	*10/21/19 15:04*	*10/22/19 14:18*	*1*
2-Fluorobiphenyl (Surr)	*101*		*34 - 110*	*10/21/19 15:04*	*10/22/19 14:18*	*1*
Terphenyl-d14 (Surr)	*126*		*40 - 145*	*10/21/19 15:04*	*10/22/19 14:18*	*1*

Lab Sample ID: LCS 500-511122/2-A
Matrix: Water
Analysis Batch: 511241

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 511122

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Naphthalene	32.0	23.0		ug/L		72	36 - 110

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Nitrobenzene-d5 (Surr)	*85*		*36 - 120*
2-Fluorobiphenyl (Surr)	*83*		*34 - 110*
Terphenyl-d14 (Surr)	*102*		*40 - 145*

Lab Sample ID: 500-171890-3 MS
Matrix: Water
Analysis Batch: 511646

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA
Prep Batch: 511122

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Naphthalene	<0.25		31.8	20.7		ug/L		65	36 - 110

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Nitrobenzene-d5 (Surr)	*65*		*36 - 120*
2-Fluorobiphenyl (Surr)	*87*		*34 - 110*

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 500-171890-3 MS
Matrix: Water
Analysis Batch: 511646

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA
Prep Batch: 511122

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Terphenyl-d14 (Surr)	*91*		*40 - 145*

Lab Sample ID: 500-171890-3 MSD
Matrix: Water
Analysis Batch: 511646

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA
Prep Batch: 511122

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Naphthalene	<0.25		30.7	20.2		ug/L		66	36 - 110	3	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Nitrobenzene-d5 (Surr)	*64*		*36 - 120*
2-Fluorobiphenyl (Surr)	*90*		*34 - 110*
Terphenyl-d14 (Surr)	*95*		*40 - 145*

Method: RSK-175 - Dissolved Gases (GC)

Lab Sample ID: MB 240-406658/3
Matrix: Water
Analysis Batch: 406658

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/21/19 12:30	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*93*		*60 - 140*		*10/21/19 12:30*	*1*

Lab Sample ID: LCS 240-406658/4
Matrix: Water
Analysis Batch: 406658

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Methane			462	416		ug/L		90	80 - 120		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,1,1-Trifluoroethane	*91*		*60 - 140*

Lab Sample ID: 500-171890-3 MS
Matrix: Water
Analysis Batch: 406658

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Methane	<0.17		285	276		ug/L		97	50 - 150		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,1,1-Trifluoroethane	*88*		*60 - 140*

Method: RSK-175 - Dissolved Gases (GC) (Continued)

Lab Sample ID: 500-171890-3 MSD
Matrix: Water
Analysis Batch: 406658

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Methane	<0.17		285	277		ug/L		97	50 - 150	0	30

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,1,1-Trifluoroethane	*88*		*60 - 140*

Method: 8151A - Herbicides (GC)

Lab Sample ID: MB 500-511511/1-A
Matrix: Water
Analysis Batch: 511622

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 511511

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.090		0.10	0.090	ug/L		10/23/19 10:37	10/24/19 00:34	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*104*		*25 - 130*	*10/23/19 10:37*	*10/24/19 00:34*	*1*

Lab Sample ID: LCS 500-511511/2-A
Matrix: Water
Analysis Batch: 511622

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 511511

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Pentachlorophenol	2.53	1.83		ug/L		73	40 - 122

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
DCAA	*126*		*25 - 130*

Lab Sample ID: 500-171890-3 MS
Matrix: Water
Analysis Batch: 511622

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA
Prep Batch: 511511

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Pentachlorophenol	<0.086		2.40	1.48		ug/L		62	40 - 122

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
DCAA	*116*		*25 - 130*

Lab Sample ID: 500-171890-3 MSD
Matrix: Water
Analysis Batch: 511622

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA
Prep Batch: 511511

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Pentachlorophenol	<0.086		2.43	1.59		ug/L		65	40 - 122	7	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
DCAA	*110*		*25 - 130*

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 500-512081/1-A
Matrix: Water
Analysis Batch: 512288

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 512081

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.23		1.0	0.23	ug/L		10/26/19 19:54	10/28/19 12:27	1
Copper	<0.50		2.0	0.50	ug/L		10/26/19 19:54	10/28/19 12:27	1
Iron	<46.7		100	46.7	ug/L		10/26/19 19:54	10/28/19 12:27	1
Zinc	<6.9		20.0	6.9	ug/L		10/26/19 19:54	10/28/19 12:27	1

Lab Sample ID: MB 500-512081/1-A
Matrix: Water
Analysis Batch: 512444

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 512081

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	<0.79		2.5	0.79	ug/L		10/26/19 19:54	10/28/19 15:40	1

Lab Sample ID: LCS 500-512081/2-A
Matrix: Water
Analysis Batch: 512288

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 512081

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	100	101.4		ug/L		101	80 - 120
Copper	250	281.7		ug/L		113	80 - 120
Iron	1000	1169		ug/L		117	80 - 120
Zinc	500	557.9		ug/L		112	80 - 120

Lab Sample ID: LCS 500-512081/2-A
Matrix: Water
Analysis Batch: 512444

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 512081

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Manganese	500	516.7		ug/L		103	80 - 120

Lab Sample ID: 500-171890-3 MS
Matrix: Water
Analysis Batch: 512288

Client Sample ID: W-191016-RA-18
Prep Type: Dissolved
Prep Batch: 512081

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	1.1		100	101.4		ug/L		100	75 - 125
Copper	<0.50		250	266.6		ug/L		107	75 - 125
Iron	<46.7		1000	1172		ug/L		117	75 - 125
Zinc	<6.9		500	531.4		ug/L		106	75 - 125

Lab Sample ID: 500-171890-3 MS
Matrix: Water
Analysis Batch: 512444

Client Sample ID: W-191016-RA-18
Prep Type: Dissolved
Prep Batch: 512081

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Manganese	9.0	F2	500	509.5		ug/L		100	75 - 125

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: 500-171890-3 MSD
Matrix: Water
Analysis Batch: 512288

Client Sample ID: W-191016-RA-18
Prep Type: Dissolved
Prep Batch: 512081

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	1.1		100	101.6		ug/L		101	75 - 125	0	20
Copper	<0.50		250	271.1		ug/L		108	75 - 125	2	20
Iron	<46.7		1000	1182		ug/L		118	75 - 125	1	20
Zinc	<6.9		500	537.4		ug/L		107	75 - 125	1	20

Lab Sample ID: 500-171890-3 MSD
Matrix: Water
Analysis Batch: 512444

Client Sample ID: W-191016-RA-18
Prep Type: Dissolved
Prep Batch: 512081

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Manganese	9.0	F2	500	515.1		ug/L		101	75 - 125	1	20

Lab Sample ID: 500-171890-3 DU
Matrix: Water
Analysis Batch: 512288

Client Sample ID: W-191016-RA-18
Prep Type: Dissolved
Prep Batch: 512081

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Arsenic	1.1		1.06		ug/L		3	20
Copper	<0.50		<0.50		ug/L		NC	20
Iron	<46.7		<46.7		ug/L		NC	20
Zinc	<6.9		<6.9		ug/L		NC	20

Lab Sample ID: 500-171890-3 DU
Matrix: Water
Analysis Batch: 512444

Client Sample ID: W-191016-RA-18
Prep Type: Dissolved
Prep Batch: 512081

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Manganese	9.0	F2	3.90	F3	ug/L		79	20

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 500-510583/23
Matrix: Water
Analysis Batch: 510583

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	<0.068		0.20	0.068	mg/L			10/17/19 17:19	1
Sulfate	0.130	J	0.20	0.095	mg/L			10/17/19 17:19	1

Lab Sample ID: LCS 500-510583/24
Matrix: Water
Analysis Batch: 510583

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate as N	2.00	2.19		mg/L		110	90 - 110
Sulfate	5.00	5.22		mg/L		104	90 - 110

Method: 300.0 - Anions, Ion Chromatography (Continued)

Lab Sample ID: 500-171890-3 MS
Matrix: Water
Analysis Batch: 510583

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Nitrate as N	1.7		1.00	2.74		mg/L		105	80 - 120		

Lab Sample ID: 500-171890-3 MSD
Matrix: Water
Analysis Batch: 510583

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Nitrate as N	1.7		1.00	2.77		mg/L		108	80 - 120	1	20

Lab Sample ID: MB 500-512345/3
Matrix: Water
Analysis Batch: 512345

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.17		0.20	0.17	mg/L			10/28/19 22:42	1
Sulfate	<0.095		0.20	0.095	mg/L			10/28/19 22:42	1

Lab Sample ID: LCS 500-512345/4
Matrix: Water
Analysis Batch: 512345

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	3.00	3.07		mg/L		102	90 - 110
Sulfate	5.00	5.08		mg/L		102	90 - 110

Lab Sample ID: 500-171890-5 MS
Matrix: Water
Analysis Batch: 512345

Client Sample ID: W-191016-RA-24
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Chloride	0.34		1.00	1.36		mg/L		101	80 - 120		

Lab Sample ID: 500-171890-5 MSD
Matrix: Water
Analysis Batch: 512345

Client Sample ID: W-191016-RA-24
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	0.34		1.00	1.36		mg/L		102	80 - 120	1	20

Lab Sample ID: MB 500-512545/3
Matrix: Water
Analysis Batch: 512545

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.17		0.20	0.17	mg/L			10/30/19 00:13	1
Sulfate	<0.095		0.20	0.095	mg/L			10/30/19 00:13	1

Method: 300.0 - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCS 500-512545/4
Matrix: Water
Analysis Batch: 512545

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	3.00	3.06		mg/L		102	90 - 110
Sulfate	5.00	5.33		mg/L		107	90 - 110

Lab Sample ID: 500-171890-3 MS
Matrix: Water
Analysis Batch: 512545

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfate	6.6	B	2.50	9.26		mg/L		108	80 - 120

Lab Sample ID: 500-171890-3 MS
Matrix: Water
Analysis Batch: 512545

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	17.5	F1	5.00	23.79	F1	mg/L		126	80 - 120

Lab Sample ID: 500-171890-3 MSD
Matrix: Water
Analysis Batch: 512545

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Sulfate	6.6	B	2.50	9.28		mg/L		109	80 - 120	0	20

Lab Sample ID: 500-171890-3 MSD
Matrix: Water
Analysis Batch: 512545

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	17.5	F1	5.00	23.75	F1	mg/L		125	80 - 120	0	20

Method: 9060A - Organic Carbon, Total (TOC)

Lab Sample ID: MB 500-512432/4
Matrix: Water
Analysis Batch: 512432

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	<0.47		1.0	0.47	mg/L			10/28/19 15:14	1

Lab Sample ID: LCS 500-512432/5
Matrix: Water
Analysis Batch: 512432

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Organic Carbon - Duplicates	10.0	9.65		mg/L		97	80 - 120

Method: 9060A - Organic Carbon, Total (TOC) (Continued)

Lab Sample ID: 500-171890-3 MS
Matrix: Water
Analysis Batch: 512432

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Organic Carbon - Duplicates	<0.47		10.0	10.33		mg/L		103	75 - 125		

Lab Sample ID: 500-171890-3 MSD
Matrix: Water
Analysis Batch: 512432

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Total Organic Carbon - Duplicates	<0.47		10.0	10.43		mg/L		104	75 - 125	1	20

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 500-512840/2
Matrix: Water
Analysis Batch: 512840

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	3.71	J	5.0	3.7	mg/L			10/30/19 15:35	1

Lab Sample ID: LCS 500-512840/4
Matrix: Water
Analysis Batch: 512840

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Alkalinity			100	100.3		mg/L		100	90 - 110		

Lab Sample ID: MB 500-512978/3
Matrix: Water
Analysis Batch: 512978

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	<3.7		5.0	3.7	mg/L			10/31/19 12:45	1

Lab Sample ID: LCS 500-512978/5
Matrix: Water
Analysis Batch: 512978

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Alkalinity			100	102.5		mg/L		103	90 - 110		

Lab Sample ID: 500-171890-3 DU
Matrix: Water
Analysis Batch: 512978

Client Sample ID: W-191016-RA-18
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Alkalinity	123	H		123.6		mg/L				0.6	20

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-16

Lab Sample ID: 500-171890-1

Date Collected: 10/16/19 10:00

Matrix: Water

Date Received: 10/17/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512162	10/28/19 12:16	JLC	TAL CHI
Total/NA	Prep	3510C			511122	10/21/19 15:04	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511646	10/24/19 09:29	GWB	TAL CHI
Total/NA	Analysis	RSK-175		1	406658	10/21/19 13:55	JBN	TAL CAN
Total/NA	Prep	8151A			511511	10/23/19 10:37	DAK	TAL CHI
Total/NA	Analysis	8151A		5	511622	10/24/19 09:02	JBJ	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:31	FXG	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 15:42	FXG	TAL CHI
Total/NA	Prep	3010A			512043	10/25/19 17:27	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512419	10/29/19 08:41	EEN	TAL CHI
Total/NA	Analysis	300.0		1	510583	10/17/19 15:41	EAT	TAL CHI
Total/NA	Analysis	300.0		10	510583	10/18/19 02:07	EAT	TAL CHI
Total/NA	Analysis	300.0		10	512345	10/28/19 23:08	EAT	TAL CHI
Total/NA	Analysis	9060A		1	512432	10/28/19 15:47	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512978	10/31/19 13:08	SMO	TAL CHI

Client Sample ID: W-191016-RA-20

Lab Sample ID: 500-171890-2

Date Collected: 10/16/19 10:38

Matrix: Water

Date Received: 10/17/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512162	10/28/19 12:41	JLC	TAL CHI
Total/NA	Prep	3510C			511122	10/21/19 15:04	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511646	10/24/19 09:56	GWB	TAL CHI
Total/NA	Analysis	RSK-175		1	406658	10/21/19 14:12	JBN	TAL CAN
Total/NA	Prep	8151A			511511	10/23/19 10:37	DAK	TAL CHI
Total/NA	Analysis	8151A		1	511622	10/24/19 01:56	JBJ	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:33	FXG	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 15:43	FXG	TAL CHI
Total/NA	Prep	3010A			512043	10/25/19 17:27	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512419	10/29/19 08:41	EEN	TAL CHI
Total/NA	Analysis	300.0		1	510583	10/17/19 15:53	EAT	TAL CHI
Total/NA	Analysis	300.0		5	512345	10/28/19 23:20	EAT	TAL CHI
Total/NA	Analysis	9060A		1	512432	10/28/19 16:03	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512978	10/31/19 13:14	SMO	TAL CHI

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-18

Lab Sample ID: 500-171890-3

Date Collected: 10/16/19 11:18

Matrix: Water

Date Received: 10/17/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512162	10/28/19 13:05	JLC	TAL CHI
Total/NA	Prep	3510C			511122	10/21/19 15:04	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511646	10/24/19 10:23	GWB	TAL CHI
Total/NA	Analysis	RSK-175		1	406658	10/21/19 14:29	JBN	TAL CAN
Total/NA	Prep	8151A			511511	10/23/19 10:37	DAK	TAL CHI
Total/NA	Analysis	8151A		1	511622	10/24/19 02:16	JBJ	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:34	FXG	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 15:44	FXG	TAL CHI
Total/NA	Prep	3010A			512043	10/25/19 17:27	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512419	10/29/19 08:41	EEN	TAL CHI
Total/NA	Analysis	300.0		1	510583	10/17/19 16:05	EAT	TAL CHI
Total/NA	Analysis	300.0		5	512545	10/30/19 07:49	EAT	TAL CHI
Total/NA	Analysis	9060A		1	512432	10/28/19 16:19	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512978	10/31/19 13:22	SMO	TAL CHI

Client Sample ID: W-191016-RA-21

Lab Sample ID: 500-171890-4

Date Collected: 10/16/19 12:15

Matrix: Water

Date Received: 10/17/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512162	10/28/19 13:29	JLC	TAL CHI
Total/NA	Prep	3510C			511122	10/21/19 15:04	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511646	10/24/19 10:50	GWB	TAL CHI
Total/NA	Analysis	RSK-175		1	406658	10/21/19 15:21	JBN	TAL CAN
Total/NA	Prep	8151A			511511	10/23/19 10:37	DAK	TAL CHI
Total/NA	Analysis	8151A		1	511622	10/24/19 03:17	JBJ	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:44	FXG	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 15:52	FXG	TAL CHI
Total/NA	Prep	3010A			512043	10/25/19 17:27	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512419	10/29/19 08:41	EEN	TAL CHI
Total/NA	Analysis	300.0		1	510583	10/17/19 16:18	EAT	TAL CHI
Total/NA	Analysis	300.0		1	512345	10/29/19 01:14	EAT	TAL CHI
Total/NA	Analysis	9060A		1	512432	10/28/19 16:56	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512978	10/31/19 13:35	SMO	TAL CHI

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-24

Lab Sample ID: 500-171890-5

Date Collected: 10/16/19 12:44
Date Received: 10/17/19 08:40

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512162	10/28/19 13:54	JLC	TAL CHI
Total/NA	Prep	3510C			511122	10/21/19 15:04	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511646	10/24/19 11:17	GWB	TAL CHI
Total/NA	Analysis	RSK-175		1	406658	10/21/19 15:38	JBN	TAL CAN
Total/NA	Prep	8151A			511511	10/23/19 10:37	DAK	TAL CHI
Total/NA	Analysis	8151A		1	511622	10/24/19 03:37	JBJ	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:50	FXG	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 15:53	FXG	TAL CHI
Total/NA	Prep	3010A			512043	10/25/19 17:27	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512419	10/29/19 08:41	EEN	TAL CHI
Total/NA	Analysis	300.0		1	510583	10/17/19 16:30	EAT	TAL CHI
Total/NA	Analysis	300.0		1	512345	10/29/19 01:27	EAT	TAL CHI
Total/NA	Analysis	9060A		1	512432	10/28/19 17:12	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512978	10/31/19 13:41	SMO	TAL CHI

Client Sample ID: W-191016-RA-19

Lab Sample ID: 500-171890-6

Date Collected: 10/16/19 13:05
Date Received: 10/17/19 08:40

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512162	10/28/19 14:18	JLC	TAL CHI
Total/NA	Prep	3510C			511122	10/21/19 15:04	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511646	10/24/19 14:26	GWB	TAL CHI
Total/NA	Analysis	RSK-175		1	406658	10/21/19 15:55	JBN	TAL CAN
Total/NA	Prep	8151A			511511	10/23/19 10:37	DAK	TAL CHI
Total/NA	Analysis	8151A		400	511622	10/24/19 13:26	JBJ	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:52	FXG	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 15:54	FXG	TAL CHI
Total/NA	Prep	3010A			512043	10/25/19 17:27	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512419	10/29/19 08:41	EEN	TAL CHI
Total/NA	Analysis	300.0		1	510583	10/17/19 16:42	EAT	TAL CHI
Total/NA	Analysis	300.0		10	510583	10/18/19 03:09	EAT	TAL CHI
Total/NA	Analysis	300.0		10	512345	10/29/19 02:05	EAT	TAL CHI
Total/NA	Analysis	9060A		1	512432	10/28/19 17:28	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512840	10/30/19 16:19	SMO	TAL CHI

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-25

Lab Sample ID: 500-171890-7

Date Collected: 10/16/19 13:05

Matrix: Water

Date Received: 10/17/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512162	10/28/19 14:43	JLC	TAL CHI
Total/NA	Prep	3510C			511122	10/21/19 15:04	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511646	10/24/19 14:53	GWB	TAL CHI
Total/NA	Analysis	RSK-175		1	406658	10/21/19 16:30	JBN	TAL CAN
Total/NA	Prep	8151A			511511	10/23/19 10:37	DAK	TAL CHI
Total/NA	Analysis	8151A		400	511622	10/24/19 13:46	JBJ	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:53	FXG	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 15:55	FXG	TAL CHI
Total/NA	Prep	3010A			512043	10/25/19 17:27	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512419	10/29/19 08:41	EEN	TAL CHI
Total/NA	Analysis	300.0		1	510583	10/17/19 16:55	EAT	TAL CHI
Total/NA	Analysis	300.0		10	510583	10/18/19 03:21	EAT	TAL CHI
Total/NA	Analysis	300.0		10	512345	10/29/19 02:18	EAT	TAL CHI
Total/NA	Analysis	9060A		1	512432	10/28/19 18:05	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512840	10/30/19 16:26	SMO	TAL CHI

Client Sample ID: W-191016-RA-23

Lab Sample ID: 500-171890-8

Date Collected: 10/16/19 13:35

Matrix: Water

Date Received: 10/17/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512162	10/28/19 15:07	JLC	TAL CHI
Total/NA	Prep	3510C			511122	10/21/19 15:04	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511646	10/24/19 15:47	GWB	TAL CHI
Total/NA	Analysis	RSK-175		1	406658	10/21/19 16:47	JBN	TAL CAN
Total/NA	Prep	8151A			511511	10/23/19 10:37	DAK	TAL CHI
Total/NA	Analysis	8151A		800	511622	10/24/19 14:06	JBJ	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:55	FXG	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 15:56	FXG	TAL CHI
Total/NA	Prep	3010A			512043	10/25/19 17:27	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512419	10/29/19 08:41	EEN	TAL CHI
Total/NA	Analysis	300.0		1	510583	10/17/19 17:07	EAT	TAL CHI
Total/NA	Analysis	300.0		5	512345	10/29/19 02:31	EAT	TAL CHI
Total/NA	Analysis	9060A		1	512432	10/28/19 18:21	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	512840	10/30/19 16:34	SMO	TAL CHI

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Client Sample ID: W-191016-RA-22

Lab Sample ID: 500-171890-9

Date Collected: 10/16/19 13:35

Matrix: Water

Date Received: 10/17/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512162	10/28/19 15:32	JLC	TAL CHI
Total/NA	Prep	3510C			511122	10/21/19 15:04	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511646	10/24/19 11:44	GWB	TAL CHI
Total/NA	Prep	8151A			511511	10/23/19 10:37	DAK	TAL CHI
Total/NA	Analysis	8151A		1	511622	10/24/19 05:40	JBJ	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512288	10/28/19 12:57	FXG	TAL CHI
Dissolved	Prep	3005A			512081	10/26/19 19:54	BDE	TAL CHI
Dissolved	Analysis	6020A		1	512444	10/28/19 15:57	FXG	TAL CHI

Client Sample ID: Trip Blank

Lab Sample ID: 500-171890-10

Date Collected: 10/16/19 00:00

Matrix: Water

Date Received: 10/17/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512162	10/28/19 11:51	JLC	TAL CHI

Laboratory References:

TAL CAN = Eurofins TestAmerica, Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Accreditation/Certification Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171890-1

Laboratory: Eurofins TestAmerica, Chicago

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
Wisconsin	State Program	999580010	08-31-20

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
SM 2320B		Water	Alkalinity

Laboratory: Eurofins TestAmerica, Canton

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	State	2927	02-23-20
Connecticut	State	PH-0590	12-31-19
Florida	NELAP	E87225	06-30-20
Georgia	State	4062	02-23-20
Illinois	NELAP	004498	07-31-20
Iowa	State	421	06-01-20
Kansas	NELAP	E-10336	04-30-20
Kentucky (UST)	State	112225	02-23-20
Kentucky (WW)	State	KY98016	12-31-19
Minnesota	NELAP	OH00048	12-31-19
Minnesota (Petrofund)	State Program	3506	07-31-21
New Jersey	NELAP	OH001	06-30-20
New York	NELAP	10975	03-31-20
Ohio VAP	State	CL0024	06-05-21
Oregon	NELAP	4062	02-23-20
Pennsylvania	NELAP	68-00340	08-31-20
Texas	NELAP	T104704517-18-10	08-31-20
USDA	US Federal Programs	P330-16-00404	12-28-19
Virginia	NELAP	010101	09-14-20
Washington	State	C971	01-12-20
West Virginia DEP	State	210	12-31-19

TestAmerica

THE LEADER IN ENVIRONMENTAL

2417 Bond Street, University Park, IL 604
Phone: 708.534.5200 Fax: 708.534.

500-171890 COC

(optional)

Report To Contact: Grant Anderson
Company: See Sow
Address:
Address:
Phone:
Fax:
E-Mail:

(optional)

Bill To
Contact:
Company:
Address:
Address:
Phone:
Fax:
PO#/Reference#

Chain of Custody Record

Lab Job #: 500-171890

Chain of Custody Number:

Page 1 of 1

Temperature °C of cooler: 4.4, 5.1, 3.7, 6.0, 5.8, 5.2, 5.1

Client	Client Project #	Preservative	HCl	—	—	HNO3	HNO3	H2SO4	HCl	—		Preservative Key
GHD	086165											1. HCL, Cool to 4°
Project Name: Pentwood		Parameter	BTEX	Pentachlorophenol	Naphthalene	TAL Dissolved Metals	Hardness	TOC	dissolved methane	Alk; Anions		2. H2SO4, Cool to 4°
Project Location/State: Siren, WI	Lab Project #											3. HNO3, Cool to 4°
Sampler: RA KP	Lab PM											4. NaOH, Cool to 4°
												5. NaOH/Zn, Cool to 4°
												6. NaHSO4
												7. Cool to 4°
												8. None
												9. Other

Lab ID	MS/MSD	Sample ID	Sampling Date	Sampling Time	# of Containers	Matrix										Comments
1		W-191016-RA-16	10/16/19	1000	15	GW	X	X	X	X	X	X	X	X		
2		W-191016-RA-20		1038	15	GW	X	X	X	X	X	X	X	X		
3	X	W-191016-RA-18		1118	45	GW	X	X	X	X	X	X	X	X		MS/MSD
4		W-191016-RA-21		1215	15	GW	X	X	X	X	X	X	X	X		
5		W-191016-RA-24		1244	15	GW	X	X	X	X	X	X	X	X		
6		W-191016-RA-19		805	15	GW	X	X	X	X	X	X	X	X		
7		W-191016-RA-25		1305	15	GW	X	X	X	X	X	X	X	X		
8		W-191016-RA-23		1335	15	GW	X	X	X	X	X	X	X	X		
9		W-191016-RA-22	↓	1335	15	GW	X	X	X	X				-		
10		trip blank					X									

Turnaround Time Required (Business Days)

___ 1 Day ___ 2 Days ___ 5 Days ___ 7 Days ___ 10 Days ___ 15 Days _____ Other

Requested Due Date _____

Sample Disposal

☐ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Relinquished By	Company	Date	Time	Received By	Company	Date	Time
[signature]	GHD	10/16/19	1530	[signature]	TA-Cart	10/17/19	0840
Relinquished By	Company	Date	Time	Received By	Company	Date	Time
Relinquished By	Company	Date	Time	Received By	Company	Date	Time

Lab Courier

Shipped Fed Ex

Hand Delivered

Matrix Key

WW – Wastewater	SE – Sediment
W – Water	SO – Soil
S – Soil	L – Leachate
SL – Sludge	WI – Wipe
MS – Miscellaneous	DW – Drinking Water
OL – Oil	O – Other
A – Air	

Client Comments

Lab Comments:

Login Sample Receipt Checklist

Client: GHD Services Inc.

Job Number: 500-171890-1

Login Number: 171890
List Number: 1
Creator: Scott, Sherri L

List Source: Eurofins TestAmerica, Chicago

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	4.4,5.1,3.7,6.0,5.8,5.2,5.1
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	False	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

Eurofins TestAmerica, Chicago
2417 Bond Street
University Park, IL 60484
Tel: (708)534-5200

Laboratory Job ID: 500-171960-1
Client Project/Site: Penta Wood 086165

For:
GHD Services Inc.
1801 Old Highway 8 NW
Suite 114
St. Paul, Minnesota 55112

Attn: Mr. Grant Anderson

Authorized for release by:
11/5/2019 2:03:08 PM

Richard Wright, Senior Project Manager
(708)534-5200
richard.wright@testamericainc.com

Table of Contents

Job ID: 500-171960-1

Laboratory: Eurofins TestAmerica, Chicago

Narrative

Job Narrative
500-171960-1

Receipt
The samples were received on 10/18/2019 8:40 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 4 coolers at receipt time were 0.9º C, 1.6º C, 5.2º C and 5.3º C.

GC/MS VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

GC/MS Semi VOA
Method 8270D: The continuing calibration verification (CCVIS) analyzed in batch 500-511646 was outside the method criteria for Nitrobenzene-d5 (Surr). A CCV standard at or below the reporting limit (RL) was analyzed with the affected samples and found to be acceptable. As indicated in the reference method, sample analysis may proceed; however, any detection for the affected analyte is considered estimated.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GC VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

GC Semi VOA
Method 8151A: The laboratory control sample (LCS) for preparation batch 500-511733 and analytical batch 500-511886 recovered outside control limits for the following analytes: DCAA. This analyte were within limits for the laboratory control sample duplicate (LCSD); therefore, the data have been reported.

Method 8151A: Surrogate recovery for the following sample was outside control limits: W-191017-RA-27 (500-171960-7). Evidence of matrix interference is present; therefore, re-extraction and/or re-analysis was not performed.

Method 8151A: The following samples were reported from the second column due to Pentachlorophenol recovery on primary column "cigar topping" and giving a result lower than the result found on column two. Column two has the better chromatography compared to column one.
W-191017-RA-26 (500-171960-1), W-191017-RA-30 (500-171960-2), W-191017-RA-29 (500-171960-5), W-191017-RA-28 (500-171960-6) and W-191017-RA-27 (500-171960-7)

Method 8151A: The following samples required a dilution due to the nature of the sample matrix: W-191017-RA-31 (500-171960-3) and W-191017-RA-32 (500-171960-4). Because of this dilution, the surrogate spike concentration in the sample was reduced to a level where the recovery calculation does not provide useful information.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
Method SM 2320B: Reanalysis of the following samples was performed outside of the analytical holding time due to instrument malfunction : W-191017-RA-26 (500-171960-1), W-191017-RA-29 (500-171960-5), W-191017-RA-28 (500-171960-6) and W-191017-RA-27 (500-171960-7).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Client Sample ID: W-191017-RA-26 — Lab Sample ID: 500-171960-1

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Xylenes, Total	0.28	J	1.0	0.22	ug/L	1		8260B	Total/NA
Pentachlorophenol	41		0.95	0.85	ug/L	10		8151A	Total/NA
Copper	1.2	J	2.0	0.50	ug/L	1		6020A	Dissolved
Manganese	22.6		2.5	0.79	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	92.0		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	0.62		0.20	0.17	mg/L	1		300.0	Total/NA
Nitrate as N	0.53		0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	2.4		0.20	0.095	mg/L	1		300.0	Total/NA
Total Organic Carbon - Duplicates	0.85	J	1.0	0.47	mg/L	1		9060A	Total/NA
Alkalinity	88.8	H	5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191017-RA-30 — Lab Sample ID: 500-171960-2

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Toluene	0.15	J	0.50	0.15	ug/L	1		8260B	Total/NA
Pentachlorophenol	1.8		0.096	0.086	ug/L	1		8151A	Total/NA

Client Sample ID: W-191017-RA-31 — Lab Sample ID: 500-171960-3

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Toluene	0.46	J	0.50	0.15	ug/L	1		8260B	Total/NA
Ethylbenzene	0.62		0.50	0.18	ug/L	1		8260B	Total/NA
Xylenes, Total	6.3		1.0	0.22	ug/L	1		8260B	Total/NA
Naphthalene	22		0.78	0.24	ug/L	1		8270D	Total/NA
Methane	34		1.0	0.17	ug/L	1		RSK-175	Total/NA
Pentachlorophenol	6000		190	170	ug/L	2000		8151A	Total/NA
Arsenic	0.75	J	1.0	0.23	ug/L	1		6020A	Dissolved
Copper	0.70	J	2.0	0.50	ug/L	1		6020A	Dissolved
Iron	22300		100	46.7	ug/L	1		6020A	Dissolved
Manganese	7140		25.0	7.9	ug/L	10		6020A	Dissolved
Hardness as calcium carbonate	273		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	28.2		2.0	1.7	mg/L	10		300.0	Total/NA
Sulfate	25.6		2.0	0.95	mg/L	10		300.0	Total/NA
Total Organic Carbon - Duplicates	38.7		2.0	0.94	mg/L	2		9060A	Total/NA
Alkalinity	452		5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191017-RA-32 — Lab Sample ID: 500-171960-4

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Toluene	0.43	J	0.50	0.15	ug/L	1		8260B	Total/NA
Ethylbenzene	0.62		0.50	0.18	ug/L	1		8260B	Total/NA
Xylenes, Total	6.4		1.0	0.22	ug/L	1		8260B	Total/NA
Naphthalene	20		0.75	0.23	ug/L	1		8270D	Total/NA
Methane	32		1.0	0.17	ug/L	1		RSK-175	Total/NA
Pentachlorophenol	5500		190	170	ug/L	2000		8151A	Total/NA
Arsenic	0.69	J	1.0	0.23	ug/L	1		6020A	Dissolved
Copper	0.84	J	2.0	0.50	ug/L	1		6020A	Dissolved
Iron	21900		100	46.7	ug/L	1		6020A	Dissolved
Manganese	6870		25.0	7.9	ug/L	10		6020A	Dissolved
Hardness as calcium carbonate	283		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	25.7		2.0	1.7	mg/L	10		300.0	Total/NA
Sulfate	24.4		2.0	0.95	mg/L	10		300.0	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Chicago

Detection Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Client Sample ID: W-191017-RA-32 (Continued) — Lab Sample ID: 500-171960-4

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Total Organic Carbon - Duplicates	38.4		2.0	0.94	mg/L	2		9060A	Total/NA
Alkalinity	265		5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191017-RA-29 — Lab Sample ID: 500-171960-5

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Methane	0.31	J	1.0	0.17	ug/L	1		RSK-175	Total/NA
Pentachlorophenol	2.7		0.096	0.086	ug/L	1		8151A	Total/NA
Arsenic	0.24	J	1.0	0.23	ug/L	1		6020A	Dissolved
Copper	2.1		2.0	0.50	ug/L	1		6020A	Dissolved
Iron	1260		100	46.7	ug/L	1		6020A	Dissolved
Manganese	66.1		2.5	0.79	ug/L	1		6020A	Dissolved
Zinc	15.2	J	20.0	6.9	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	172		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	3.9		0.20	0.17	mg/L	1		300.0	Total/NA
Nitrate as N	5.4		1.0	0.34	mg/L	5		300.0	Total/NA
Sulfate	29.5		1.0	0.48	mg/L	5		300.0	Total/NA
Total Organic Carbon - Duplicates	6.4		1.0	0.47	mg/L	1		9060A	Total/NA
Alkalinity	149	H	5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191017-RA-28 — Lab Sample ID: 500-171960-6

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Methane	0.21	J	1.0	0.17	ug/L	1		RSK-175	Total/NA
Pentachlorophenol	2.1		0.096	0.086	ug/L	1		8151A	Total/NA
Copper	2.0		2.0	0.50	ug/L	1		6020A	Dissolved
Manganese	24.6		2.5	0.79	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	128		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	3.2		0.20	0.17	mg/L	1		300.0	Total/NA
Nitrate as N	7.3		1.0	0.34	mg/L	5		300.0	Total/NA
Sulfate	22.0		1.0	0.48	mg/L	5		300.0	Total/NA
Total Organic Carbon - Duplicates	3.6		1.0	0.47	mg/L	1		9060A	Total/NA
Alkalinity	93.6	H	5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: W-191017-RA-27 — Lab Sample ID: 500-171960-7

Analyte	Result	Qualifier	LOQ	LOD	Unit	Dil Fac	D	Method	Prep Type
Pentachlorophenol	2.7		0.10	0.089	ug/L	1		8151A	Total/NA
Arsenic	0.27	J	1.0	0.23	ug/L	1		6020A	Dissolved
Copper	3.4		2.0	0.50	ug/L	1		6020A	Dissolved
Iron	271		100	46.7	ug/L	1		6020A	Dissolved
Manganese	11.0		2.5	0.79	ug/L	1		6020A	Dissolved
Zinc	11.0	J	20.0	6.9	ug/L	1		6020A	Dissolved
Hardness as calcium carbonate	259		0.91	0.46	mg/L	1		SM 2340B	Total/NA
Chloride	8.9		0.40	0.34	mg/L	2		300.0	Total/NA
Nitrate as N	3.8		0.20	0.068	mg/L	1		300.0	Total/NA
Sulfate	7.4		0.20	0.095	mg/L	1		300.0	Total/NA
Total Organic Carbon - Duplicates	2.6		1.0	0.47	mg/L	1		9060A	Total/NA
Alkalinity	444	H	5.0	3.7	mg/L	1		SM 2320B	Total/NA

Client Sample ID: Trip Blank — Lab Sample ID: 500-171960-8

No Detections.

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Chicago

Method Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL CHI
8270D	Semivolatile Organic Compounds (GC/MS)	SW846	TAL CHI
RSK-175	Dissolved Gases (GC)	RSK	TAL CAN
8151A	Herbicides (GC)	SW846	TAL CHI
6020A	Metals (ICP/MS)	SW846	TAL CHI
SM 2340B	Total Hardness (as CaCO3) by calculation	SM	TAL CHI
300.0	Anions, Ion Chromatography	MCAWW	TAL CHI
9060A	Organic Carbon, Total (TOC)	SW846	TAL CHI
SM 2320B	Alkalinity	SM	TAL CHI
3005A	Preparation, Total Recoverable or Dissolved Metals	SW846	TAL CHI
3010A	Preparation, Total Metals	SW846	TAL CHI
3510C	Liquid-Liquid Extraction (Separatory Funnel)	SW846	TAL CHI
5030B	Purge and Trap	SW846	TAL CHI
8151A	Extraction (Herbicides)	SW846	TAL CHI

Protocol References:

MCAWW = "Methods For Chemical Analysis Of Water And Wastes", EPA-600/4-79-020, March 1983 And Subsequent Revisions.

RSK = Sample Prep And Calculations For Dissolved Gas Analysis In Water Samples Using A GC Headspace Equilibration Technique, RSKSOP-175, Rev. 0, 8/11/94, USEPA Research Lab

SM = "Standard Methods For The Examination Of Water And Wastewater"

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CAN = Eurofins TestAmerica, Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Sample Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
500-171960-1	W-191017-RA-26	Water	10/17/19 11:15	10/18/19 08:40	
500-171960-2	W-191017-RA-30	Water	10/17/19 11:15	10/18/19 08:40	
500-171960-3	W-191017-RA-31	Water	10/17/19 12:02	10/18/19 08:40	
500-171960-4	W-191017-RA-32	Water	10/17/19 12:02	10/18/19 08:40	
500-171960-5	W-191017-RA-29	Water	10/17/19 12:45	10/18/19 08:40	
500-171960-6	W-191017-RA-28	Water	10/17/19 13:16	10/18/19 08:40	
500-171960-7	W-191017-RA-27	Water	10/17/19 14:15	10/18/19 08:40	
500-171960-8	Trip Blank	Water	10/17/19 00:00	10/18/19 08:40	

Client Sample ID: W-191017-RA-26

Lab Sample ID: 500-171960-1

Date Collected: 10/17/19 11:15

Matrix: Water

Date Received: 10/18/19 08:40

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/30/19 15:07	1
Toluene	<0.15		0.50	0.15	ug/L			10/30/19 15:07	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/30/19 15:07	1
Xylenes, Total	**0.28**	**J**	1.0	0.22	ug/L			10/30/19 15:07	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*96*		*75 - 126*		*10/30/19 15:07*	*1*
Toluene-d8 (Surr)	*97*		*75 - 120*		*10/30/19 15:07*	*1*
4-Bromofluorobenzene (Surr)	*92*		*72 - 124*		*10/30/19 15:07*	*1*
Dibromofluoromethane	*99*		*75 - 120*		*10/30/19 15:07*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.24		0.78	0.24	ug/L		10/21/19 15:04	10/24/19 12:11	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*65*	*^c*	*36 - 120*	*10/21/19 15:04*	*10/24/19 12:11*	*1*
2-Fluorobiphenyl (Surr)	*83*		*34 - 110*	*10/21/19 15:04*	*10/24/19 12:11*	*1*
Terphenyl-d14 (Surr)	*117*		*40 - 145*	*10/21/19 15:04*	*10/24/19 12:11*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/22/19 15:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*90*		*60 - 140*		*10/22/19 15:05*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	**41**		0.95	0.85	ug/L		10/24/19 10:43	10/25/19 16:55	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*117*		*25 - 130*	*10/24/19 10:43*	*10/25/19 16:55*	*10*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.23		1.0	0.23	ug/L		10/30/19 06:50	10/31/19 19:12	1
Copper	**1.2**	**J**	2.0	0.50	ug/L		10/30/19 06:50	10/31/19 19:12	1
Iron	<46.7		100	46.7	ug/L		10/30/19 06:50	10/31/19 19:12	1
Manganese	**22.6**		2.5	0.79	ug/L		10/30/19 06:50	10/31/19 19:12	1
Zinc	<6.9		20.0	6.9	ug/L		10/30/19 06:50	10/31/19 19:12	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**92.0**		0.91	0.46	mg/L		10/25/19 17:27	10/29/19 08:41	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**0.62**		0.20	0.17	mg/L			10/18/19 15:06	1
Nitrate as N	**0.53**		0.20	0.068	mg/L			10/18/19 15:06	1
Sulfate	**2.4**		0.20	0.095	mg/L			10/18/19 15:06	1
Total Organic Carbon - Duplicates	**0.85**	**J**	1.0	0.47	mg/L			10/29/19 22:13	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Client Sample ID: W-191017-RA-26
Date Collected: 10/17/19 11:15
Date Received: 10/18/19 08:40

Lab Sample ID: 500-171960-1
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	88.8	H	5.0	3.7	mg/L			11/01/19 14:46	1

Client Sample ID: W-191017-RA-30

Date Collected: 10/17/19 11:15
Date Received: 10/18/19 08:40

Lab Sample ID: 500-171960-2

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/30/19 15:33	1
Toluene	**0.15**	**J**	0.50	0.15	ug/L			10/30/19 15:33	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/30/19 15:33	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/30/19 15:33	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*97*		*75 - 126*		*10/30/19 15:33*	*1*
Toluene-d8 (Surr)	*98*		*75 - 120*		*10/30/19 15:33*	*1*
4-Bromofluorobenzene (Surr)	*94*		*72 - 124*		*10/30/19 15:33*	*1*
Dibromofluoromethane	*100*		*75 - 120*		*10/30/19 15:33*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.25		0.82	0.25	ug/L		10/21/19 15:04	10/24/19 12:38	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*61*	*^c*	*36 - 120*	*10/21/19 15:04*	*10/24/19 12:38*	*1*
2-Fluorobiphenyl (Surr)	*77*		*34 - 110*	*10/21/19 15:04*	*10/24/19 12:38*	*1*
Terphenyl-d14 (Surr)	*117*		*40 - 145*	*10/21/19 15:04*	*10/24/19 12:38*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	**1.8**		0.096	0.086	ug/L		10/24/19 10:43	10/25/19 09:38	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*121*		*25 - 130*	*10/24/19 10:43*	*10/25/19 09:38*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.23		1.0	0.23	ug/L		10/30/19 06:50	10/31/19 19:16	1
Copper	<0.50		2.0	0.50	ug/L		10/30/19 06:50	10/31/19 19:16	1
Iron	<46.7		100	46.7	ug/L		10/30/19 06:50	10/31/19 19:16	1
Manganese	<0.79		2.5	0.79	ug/L		10/30/19 06:50	10/31/19 19:16	1
Zinc	<6.9		20.0	6.9	ug/L		10/30/19 06:50	10/31/19 19:16	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Client Sample ID: W-191017-RA-31

Date Collected: 10/17/19 12:02
Date Received: 10/18/19 08:40

Lab Sample ID: 500-171960-3

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/30/19 15:59	1
Toluene	**0.46**	**J**	0.50	0.15	ug/L			10/30/19 15:59	1
Ethylbenzene	**0.62**		0.50	0.18	ug/L			10/30/19 15:59	1
Xylenes, Total	**6.3**		1.0	0.22	ug/L			10/30/19 15:59	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*96*		*75 - 126*		*10/30/19 15:59*	*1*
Toluene-d8 (Surr)	*98*		*75 - 120*		*10/30/19 15:59*	*1*
4-Bromofluorobenzene (Surr)	*93*		*72 - 124*		*10/30/19 15:59*	*1*
Dibromofluoromethane	*100*		*75 - 120*		*10/30/19 15:59*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	**22**		0.78	0.24	ug/L		10/21/19 15:04	10/24/19 16:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*64*	*^c*	*36 - 120*	*10/21/19 15:04*	*10/24/19 16:14*	*1*
2-Fluorobiphenyl (Surr)	*83*		*34 - 110*	*10/21/19 15:04*	*10/24/19 16:14*	*1*
Terphenyl-d14 (Surr)	*111*		*40 - 145*	*10/21/19 15:04*	*10/24/19 16:14*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	**34**		1.0	0.17	ug/L			10/22/19 15:22	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*87*		*60 - 140*		*10/22/19 15:22*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	**6000**		190	170	ug/L		10/24/19 10:43	10/28/19 12:39	2000

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*0*	*D*	*25 - 130*	*10/24/19 10:43*	*10/28/19 12:39*	*2000*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.75**	**J**	1.0	0.23	ug/L		10/30/19 06:50	10/31/19 19:20	1
Copper	**0.70**	**J**	2.0	0.50	ug/L		10/30/19 06:50	10/31/19 19:20	1
Iron	**22300**		100	46.7	ug/L		10/30/19 06:50	10/31/19 19:20	1
Manganese	**7140**		25.0	7.9	ug/L		10/30/19 06:50	11/01/19 14:48	10
Zinc	<6.9		20.0	6.9	ug/L		10/30/19 06:50	10/31/19 19:20	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**273**		0.91	0.46	mg/L		10/25/19 17:27	10/29/19 08:41	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**28.2**		2.0	1.7	mg/L			10/18/19 17:00	10
Nitrate as N	<0.068		0.20	0.068	mg/L			10/18/19 15:31	1
Sulfate	**25.6**		2.0	0.95	mg/L			10/18/19 17:00	10
Total Organic Carbon - Duplicates	**38.7**		2.0	0.94	mg/L			10/30/19 11:55	2

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Client Sample ID: W-191017-RA-31
Date Collected: 10/17/19 12:02
Date Received: 10/18/19 08:40

Lab Sample ID: 500-171960-3
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	452		5.0	3.7	mg/L			10/31/19 09:03	1

Client Sample ID: W-191017-RA-32

Date Collected: 10/17/19 12:02
Date Received: 10/18/19 08:40

Lab Sample ID: 500-171960-4

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/30/19 16:25	1
Toluene	**0.43**	**J**	0.50	0.15	ug/L			10/30/19 16:25	1
Ethylbenzene	**0.62**		0.50	0.18	ug/L			10/30/19 16:25	1
Xylenes, Total	**6.4**		1.0	0.22	ug/L			10/30/19 16:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*95*		*75 - 126*		*10/30/19 16:25*	*1*
Toluene-d8 (Surr)	*100*		*75 - 120*		*10/30/19 16:25*	*1*
4-Bromofluorobenzene (Surr)	*94*		*72 - 124*		*10/30/19 16:25*	*1*
Dibromofluoromethane	*99*		*75 - 120*		*10/30/19 16:25*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	**20**		0.75	0.23	ug/L		10/21/19 15:04	10/24/19 16:41	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*59*	*^c*	*36 - 120*	*10/21/19 15:04*	*10/24/19 16:41*	*1*
2-Fluorobiphenyl (Surr)	*75*		*34 - 110*	*10/21/19 15:04*	*10/24/19 16:41*	*1*
Terphenyl-d14 (Surr)	*109*		*40 - 145*	*10/21/19 15:04*	*10/24/19 16:41*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	**32**		1.0	0.17	ug/L			10/22/19 15:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*90*		*60 - 140*		*10/22/19 15:39*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	**5500**		190	170	ug/L		10/24/19 10:43	10/28/19 12:59	2000

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*0*	*D*	*25 - 130*	*10/24/19 10:43*	*10/28/19 12:59*	*2000*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.69**	**J**	1.0	0.23	ug/L		10/30/19 06:50	10/31/19 19:25	1
Copper	**0.84**	**J**	2.0	0.50	ug/L		10/30/19 06:50	10/31/19 19:25	1
Iron	**21900**		100	46.7	ug/L		10/30/19 06:50	10/31/19 19:25	1
Manganese	**6870**		25.0	7.9	ug/L		10/30/19 06:50	11/01/19 11:52	10
Zinc	<6.9		20.0	6.9	ug/L		10/30/19 06:50	10/31/19 19:25	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**283**		0.91	0.46	mg/L		10/25/19 17:27	10/29/19 08:41	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**25.7**		2.0	1.7	mg/L			10/18/19 17:13	10
Nitrate as N	<0.068		0.20	0.068	mg/L			10/18/19 15:44	1
Sulfate	**24.4**		2.0	0.95	mg/L			10/18/19 17:13	10
Total Organic Carbon - Duplicates	**38.4**		2.0	0.94	mg/L			10/30/19 12:11	2

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Client Sample ID: W-191017-RA-32
Date Collected: 10/17/19 12:02
Date Received: 10/18/19 08:40

Lab Sample ID: 500-171960-4
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	265		5.0	3.7	mg/L			10/31/19 09:03	1

Client Sample ID: W-191017-RA-29

Date Collected: 10/17/19 12:45
Date Received: 10/18/19 08:40

Lab Sample ID: 500-171960-5

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/30/19 16:51	1
Toluene	<0.15		0.50	0.15	ug/L			10/30/19 16:51	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/30/19 16:51	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/30/19 16:51	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*97*		*75 - 126*		*10/30/19 16:51*	*1*
Toluene-d8 (Surr)	*98*		*75 - 120*		*10/30/19 16:51*	*1*
4-Bromofluorobenzene (Surr)	*95*		*72 - 124*		*10/30/19 16:51*	*1*
Dibromofluoromethane	*100*		*75 - 120*		*10/30/19 16:51*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.24		0.79	0.24	ug/L		10/21/19 15:04	10/24/19 13:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*63*	*^c*	*36 - 120*	*10/21/19 15:04*	*10/24/19 13:05*	*1*
2-Fluorobiphenyl (Surr)	*90*		*34 - 110*	*10/21/19 15:04*	*10/24/19 13:05*	*1*
Terphenyl-d14 (Surr)	*130*		*40 - 145*	*10/21/19 15:04*	*10/24/19 13:05*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	**0.31**	**J**	1.0	0.17	ug/L			10/22/19 15:56	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*90*		*60 - 140*		*10/22/19 15:56*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	**2.7**		0.096	0.086	ug/L		10/24/19 10:43	10/25/19 10:38	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*121*		*25 - 130*	*10/24/19 10:43*	*10/25/19 10:38*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.24**	**J**	1.0	0.23	ug/L		10/30/19 06:50	10/31/19 19:29	1
Copper	**2.1**		2.0	0.50	ug/L		10/30/19 06:50	10/31/19 19:29	1
Iron	**1260**		100	46.7	ug/L		10/30/19 06:50	10/31/19 19:29	1
Manganese	**66.1**		2.5	0.79	ug/L		10/30/19 06:50	10/31/19 19:29	1
Zinc	**15.2**	**J**	20.0	6.9	ug/L		10/30/19 06:50	10/31/19 19:29	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**172**		0.91	0.46	mg/L		10/25/19 17:27	10/29/19 08:41	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**3.9**		0.20	0.17	mg/L			10/18/19 15:57	1
Nitrate as N	**5.4**		1.0	0.34	mg/L			10/18/19 17:26	5
Sulfate	**29.5**		1.0	0.48	mg/L			10/18/19 17:26	5
Total Organic Carbon - Duplicates	**6.4**		1.0	0.47	mg/L			10/29/19 23:59	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Client Sample ID: W-191017-RA-29
Date Collected: 10/17/19 12:45
Date Received: 10/18/19 08:40

Lab Sample ID: 500-171960-5
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	149	H	5.0	3.7	mg/L			11/01/19 14:57	1

Client Sample ID: W-191017-RA-28

Lab Sample ID: 500-171960-6

Date Collected: 10/17/19 13:16

Matrix: Water

Date Received: 10/18/19 08:40

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/30/19 17:17	1
Toluene	<0.15		0.50	0.15	ug/L			10/30/19 17:17	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/30/19 17:17	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/30/19 17:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*96*		*75 - 126*		*10/30/19 17:17*	*1*
Toluene-d8 (Surr)	*99*		*75 - 120*		*10/30/19 17:17*	*1*
4-Bromofluorobenzene (Surr)	*94*		*72 - 124*		*10/30/19 17:17*	*1*
Dibromofluoromethane	*100*		*75 - 120*		*10/30/19 17:17*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.24		0.77	0.24	ug/L		10/21/19 15:04	10/24/19 13:32	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*65*	*^c*	*36 - 120*	*10/21/19 15:04*	*10/24/19 13:32*	*1*
2-Fluorobiphenyl (Surr)	*88*		*34 - 110*	*10/21/19 15:04*	*10/24/19 13:32*	*1*
Terphenyl-d14 (Surr)	*123*		*40 - 145*	*10/21/19 15:04*	*10/24/19 13:32*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	**0.21**	**J**	1.0	0.17	ug/L			10/22/19 16:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*90*		*60 - 140*		*10/22/19 16:14*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	**2.1**		0.096	0.086	ug/L		10/24/19 10:43	10/25/19 10:58	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*115*		*25 - 130*	*10/24/19 10:43*	*10/25/19 10:58*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.23		1.0	0.23	ug/L		10/30/19 06:50	10/31/19 19:33	1
Copper	**2.0**		2.0	0.50	ug/L		10/30/19 06:50	10/31/19 19:33	1
Iron	<46.7		100	46.7	ug/L		10/30/19 06:50	10/31/19 19:33	1
Manganese	**24.6**		2.5	0.79	ug/L		10/30/19 06:50	10/31/19 19:33	1
Zinc	<6.9		20.0	6.9	ug/L		10/30/19 06:50	10/31/19 19:33	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**128**		0.91	0.46	mg/L		10/25/19 17:27	10/29/19 08:41	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**3.2**		0.20	0.17	mg/L			10/18/19 16:09	1
Nitrate as N	**7.3**		1.0	0.34	mg/L			10/18/19 17:38	5
Sulfate	**22.0**		1.0	0.48	mg/L			10/18/19 17:38	5
Total Organic Carbon - Duplicates	**3.6**		1.0	0.47	mg/L			10/30/19 00:16	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Client Sample ID: W-191017-RA-28
Date Collected: 10/17/19 13:16
Date Received: 10/18/19 08:40

Lab Sample ID: 500-171960-6
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	93.6	H	5.0	3.7	mg/L			11/01/19 15:04	1

Client Sample ID: W-191017-RA-27

Lab Sample ID: 500-171960-7

Date Collected: 10/17/19 14:15

Matrix: Water

Date Received: 10/18/19 08:40

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/30/19 17:42	1
Toluene	<0.15		0.50	0.15	ug/L			10/30/19 17:42	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/30/19 17:42	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/30/19 17:42	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*98*		*75 - 126*		*10/30/19 17:42*	*1*
Toluene-d8 (Surr)	*99*		*75 - 120*		*10/30/19 17:42*	*1*
4-Bromofluorobenzene (Surr)	*95*		*72 - 124*		*10/30/19 17:42*	*1*
Dibromofluoromethane	*101*		*75 - 120*		*10/30/19 17:42*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.23		0.76	0.23	ug/L		10/21/19 15:04	10/24/19 13:59	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*42*	*^c*	*36 - 120*	*10/21/19 15:04*	*10/24/19 13:59*	*1*
2-Fluorobiphenyl (Surr)	*58*		*34 - 110*	*10/21/19 15:04*	*10/24/19 13:59*	*1*
Terphenyl-d14 (Surr)	*102*		*40 - 145*	*10/21/19 15:04*	*10/24/19 13:59*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/22/19 16:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*87*		*60 - 140*		*10/22/19 16:31*	*1*

Method: 8151A - Herbicides (GC)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	**2.7**		0.10	0.089	ug/L		10/24/19 10:43	10/25/19 11:18	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*145*	*X*	*25 - 130*	*10/24/19 10:43*	*10/25/19 11:18*	*1*

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.27**	**J**	1.0	0.23	ug/L		10/30/19 06:50	10/31/19 19:38	1
Copper	**3.4**		2.0	0.50	ug/L		10/30/19 06:50	10/31/19 19:38	1
Iron	**271**		100	46.7	ug/L		10/30/19 06:50	10/31/19 19:38	1
Manganese	**11.0**		2.5	0.79	ug/L		10/30/19 06:50	10/31/19 19:38	1
Zinc	**11.0**	**J**	20.0	6.9	ug/L		10/30/19 06:50	10/31/19 19:38	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**259**		0.91	0.46	mg/L		10/25/19 17:27	10/29/19 08:41	1

General Chemistry

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**8.9**		0.40	0.34	mg/L			10/18/19 17:51	2
Nitrate as N	**3.8**		0.20	0.068	mg/L			10/18/19 16:47	1
Sulfate	**7.4**		0.20	0.095	mg/L			10/18/19 16:47	1
Total Organic Carbon - Duplicates	**2.6**		1.0	0.47	mg/L			10/30/19 00:32	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Client Sample ID: W-191017-RA-27
Date Collected: 10/17/19 14:15
Date Received: 10/18/19 08:40

Lab Sample ID: 500-171960-7
Matrix: Water

General Chemistry (Continued)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	444	H	5.0	3.7	mg/L			11/01/19 15:12	1

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Client Sample ID: Trip Blank

Date Collected: 10/17/19 00:00
Date Received: 10/18/19 08:40

Lab Sample ID: 500-171960-8

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/30/19 18:08	1
Toluene	<0.15		0.50	0.15	ug/L			10/30/19 18:08	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/30/19 18:08	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/30/19 18:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*96*		*75 - 126*		*10/30/19 18:08*	*1*
Toluene-d8 (Surr)	*99*		*75 - 120*		*10/30/19 18:08*	*1*
4-Bromofluorobenzene (Surr)	*95*		*72 - 124*		*10/30/19 18:08*	*1*
Dibromofluoromethane	*100*		*75 - 120*		*10/30/19 18:08*	*1*

Definitions/Glossary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
J	Reported value was between the limit of detection and the limit of quantitation.

GC/MS Semi VOA

Qualifier	Qualifier Description
^c	CCV Recovery is outside acceptance limits.

GC VOA

Qualifier	Qualifier Description
J	Reported value was between the limit of detection and the limit of quantitation.

GC Semi VOA

Qualifier	Qualifier Description
D	Surrogate or matrix spike recoveries were not obtained because the extract was diluted for analysis; also compounds analyzed at a dilution may be flagged with a D.
X	Surrogate is outside control limits

Metals

Qualifier	Qualifier Description
J	Reported value was between the limit of detection and the limit of quantitation.

General Chemistry

Qualifier	Qualifier Description
H	Sample was prepped or analyzed beyond the specified holding time
J	Reported value was between the limit of detection and the limit of quantitation.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

GC/MS VOA

Analysis Batch: 512636

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-1	W-191017-RA-26	Total/NA	Water	8260B	
500-171960-2	W-191017-RA-30	Total/NA	Water	8260B	
500-171960-3	W-191017-RA-31	Total/NA	Water	8260B	
500-171960-4	W-191017-RA-32	Total/NA	Water	8260B	
500-171960-5	W-191017-RA-29	Total/NA	Water	8260B	
500-171960-6	W-191017-RA-28	Total/NA	Water	8260B	
500-171960-7	W-191017-RA-27	Total/NA	Water	8260B	
500-171960-8	Trip Blank	Total/NA	Water	8260B	
MB 500-512636/6	Method Blank	Total/NA	Water	8260B	
LCS 500-512636/4	Lab Control Sample	Total/NA	Water	8260B	
500-171960-7 MS	W-191017-RA-27	Total/NA	Water	8260B	
500-171960-7 MSD	W-191017-RA-27	Total/NA	Water	8260B	

GC/MS Semi VOA

Prep Batch: 511122

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-1	W-191017-RA-26	Total/NA	Water	3510C	
500-171960-2	W-191017-RA-30	Total/NA	Water	3510C	
500-171960-3	W-191017-RA-31	Total/NA	Water	3510C	
500-171960-4	W-191017-RA-32	Total/NA	Water	3510C	
500-171960-5	W-191017-RA-29	Total/NA	Water	3510C	
500-171960-6	W-191017-RA-28	Total/NA	Water	3510C	
500-171960-7	W-191017-RA-27	Total/NA	Water	3510C	
MB 500-511122/1-A	Method Blank	Total/NA	Water	3510C	
LCS 500-511122/2-A	Lab Control Sample	Total/NA	Water	3510C	

Analysis Batch: 511241

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 500-511122/1-A	Method Blank	Total/NA	Water	8270D	511122
LCS 500-511122/2-A	Lab Control Sample	Total/NA	Water	8270D	511122

Analysis Batch: 511646

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-1	W-191017-RA-26	Total/NA	Water	8270D	511122
500-171960-2	W-191017-RA-30	Total/NA	Water	8270D	511122
500-171960-3	W-191017-RA-31	Total/NA	Water	8270D	511122
500-171960-4	W-191017-RA-32	Total/NA	Water	8270D	511122
500-171960-5	W-191017-RA-29	Total/NA	Water	8270D	511122
500-171960-6	W-191017-RA-28	Total/NA	Water	8270D	511122
500-171960-7	W-191017-RA-27	Total/NA	Water	8270D	511122

GC VOA

Analysis Batch: 406863

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-1	W-191017-RA-26	Total/NA	Water	RSK-175	
500-171960-3	W-191017-RA-31	Total/NA	Water	RSK-175	
500-171960-4	W-191017-RA-32	Total/NA	Water	RSK-175	
500-171960-5	W-191017-RA-29	Total/NA	Water	RSK-175	
500-171960-6	W-191017-RA-28	Total/NA	Water	RSK-175	
500-171960-7	W-191017-RA-27	Total/NA	Water	RSK-175	

GC VOA (Continued)

Analysis Batch: 406863 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 240-406863/3	Method Blank	Total/NA	Water	RSK-175	
LCS 240-406863/4	Lab Control Sample	Total/NA	Water	RSK-175	
LCSD 240-406863/5	Lab Control Sample Dup	Total/NA	Water	RSK-175	

GC Semi VOA

Prep Batch: 511733

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-1	W-191017-RA-26	Total/NA	Water	8151A	
500-171960-2	W-191017-RA-30	Total/NA	Water	8151A	
500-171960-3	W-191017-RA-31	Total/NA	Water	8151A	
500-171960-4	W-191017-RA-32	Total/NA	Water	8151A	
500-171960-5	W-191017-RA-29	Total/NA	Water	8151A	
500-171960-6	W-191017-RA-28	Total/NA	Water	8151A	
500-171960-7	W-191017-RA-27	Total/NA	Water	8151A	
MB 500-511733/1-A	Method Blank	Total/NA	Water	8151A	
LCS 500-511733/2-A	Lab Control Sample	Total/NA	Water	8151A	
LCSD 500-511733/3-A	Lab Control Sample Dup	Total/NA	Water	8151A	

Analysis Batch: 511886

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-1	W-191017-RA-26	Total/NA	Water	8151A	511733
500-171960-2	W-191017-RA-30	Total/NA	Water	8151A	511733
500-171960-5	W-191017-RA-29	Total/NA	Water	8151A	511733
500-171960-6	W-191017-RA-28	Total/NA	Water	8151A	511733
500-171960-7	W-191017-RA-27	Total/NA	Water	8151A	511733
MB 500-511733/1-A	Method Blank	Total/NA	Water	8151A	511733
LCS 500-511733/2-A	Lab Control Sample	Total/NA	Water	8151A	511733
LCSD 500-511733/3-A	Lab Control Sample Dup	Total/NA	Water	8151A	511733

Analysis Batch: 512183

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-3	W-191017-RA-31	Total/NA	Water	8151A	511733
500-171960-4	W-191017-RA-32	Total/NA	Water	8151A	511733

Metals

Prep Batch: 512043

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-1	W-191017-RA-26	Total/NA	Water	3010A	
500-171960-3	W-191017-RA-31	Total/NA	Water	3010A	
500-171960-4	W-191017-RA-32	Total/NA	Water	3010A	
500-171960-5	W-191017-RA-29	Total/NA	Water	3010A	
500-171960-6	W-191017-RA-28	Total/NA	Water	3010A	
500-171960-7	W-191017-RA-27	Total/NA	Water	3010A	

Analysis Batch: 512419

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-1	W-191017-RA-26	Total/NA	Water	SM 2340B	512043
500-171960-3	W-191017-RA-31	Total/NA	Water	SM 2340B	512043
500-171960-4	W-191017-RA-32	Total/NA	Water	SM 2340B	512043
500-171960-5	W-191017-RA-29	Total/NA	Water	SM 2340B	512043

Metals (Continued)

Analysis Batch: 512419 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-6	W-191017-RA-28	Total/NA	Water	SM 2340B	512043
500-171960-7	W-191017-RA-27	Total/NA	Water	SM 2340B	512043

Prep Batch: 512577

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-1	W-191017-RA-26	Dissolved	Water	3005A	
500-171960-2	W-191017-RA-30	Dissolved	Water	3005A	
500-171960-3	W-191017-RA-31	Dissolved	Water	3005A	
500-171960-4	W-191017-RA-32	Dissolved	Water	3005A	
500-171960-5	W-191017-RA-29	Dissolved	Water	3005A	
500-171960-6	W-191017-RA-28	Dissolved	Water	3005A	
500-171960-7	W-191017-RA-27	Dissolved	Water	3005A	
MB 500-512577/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 500-512577/2-A	Lab Control Sample	Total Recoverable	Water	3005A	

Analysis Batch: 513090

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-1	W-191017-RA-26	Dissolved	Water	6020A	512577
500-171960-2	W-191017-RA-30	Dissolved	Water	6020A	512577
500-171960-3	W-191017-RA-31	Dissolved	Water	6020A	512577
500-171960-4	W-191017-RA-32	Dissolved	Water	6020A	512577
500-171960-5	W-191017-RA-29	Dissolved	Water	6020A	512577
500-171960-6	W-191017-RA-28	Dissolved	Water	6020A	512577
500-171960-7	W-191017-RA-27	Dissolved	Water	6020A	512577
MB 500-512577/1-A	Method Blank	Total Recoverable	Water	6020A	512577
LCS 500-512577/2-A	Lab Control Sample	Total Recoverable	Water	6020A	512577

Analysis Batch: 513172

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-4	W-191017-RA-32	Dissolved	Water	6020A	512577

Analysis Batch: 513177

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-3	W-191017-RA-31	Dissolved	Water	6020A	512577

General Chemistry

Analysis Batch: 510822

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-1	W-191017-RA-26	Total/NA	Water	300.0	
500-171960-3	W-191017-RA-31	Total/NA	Water	300.0	
500-171960-3	W-191017-RA-31	Total/NA	Water	300.0	
500-171960-4	W-191017-RA-32	Total/NA	Water	300.0	
500-171960-4	W-191017-RA-32	Total/NA	Water	300.0	
500-171960-5	W-191017-RA-29	Total/NA	Water	300.0	
500-171960-5	W-191017-RA-29	Total/NA	Water	300.0	
500-171960-6	W-191017-RA-28	Total/NA	Water	300.0	
500-171960-6	W-191017-RA-28	Total/NA	Water	300.0	
500-171960-7	W-191017-RA-27	Total/NA	Water	300.0	
500-171960-7	W-191017-RA-27	Total/NA	Water	300.0	
MB 500-510822/3	Method Blank	Total/NA	Water	300.0	

General Chemistry (Continued)

Analysis Batch: 510822 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 500-510822/4	Lab Control Sample	Total/NA	Water	300.0	

Analysis Batch: 512666

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-1	W-191017-RA-26	Total/NA	Water	9060A	
500-171960-5	W-191017-RA-29	Total/NA	Water	9060A	
500-171960-6	W-191017-RA-28	Total/NA	Water	9060A	
500-171960-7	W-191017-RA-27	Total/NA	Water	9060A	
MB 500-512666/32	Method Blank	Total/NA	Water	9060A	
LCS 500-512666/33	Lab Control Sample	Total/NA	Water	9060A	

Analysis Batch: 512839

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-3	W-191017-RA-31	Total/NA	Water	9060A	
500-171960-4	W-191017-RA-32	Total/NA	Water	9060A	
MB 500-512839/4	Method Blank	Total/NA	Water	9060A	
LCS 500-512839/5	Lab Control Sample	Total/NA	Water	9060A	

Analysis Batch: 513075

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-3	W-191017-RA-31	Total/NA	Water	SM 2320B	
500-171960-4	W-191017-RA-32	Total/NA	Water	SM 2320B	
MB 500-513075/2	Method Blank	Total/NA	Water	SM 2320B	
LCS 500-513075/4	Lab Control Sample	Total/NA	Water	SM 2320B	

Analysis Batch: 513217

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171960-1	W-191017-RA-26	Total/NA	Water	SM 2320B	
500-171960-5	W-191017-RA-29	Total/NA	Water	SM 2320B	
500-171960-6	W-191017-RA-28	Total/NA	Water	SM 2320B	
500-171960-7	W-191017-RA-27	Total/NA	Water	SM 2320B	
MB 500-513217/3	Method Blank	Total/NA	Water	SM 2320B	
LCS 500-513217/5	Lab Control Sample	Total/NA	Water	SM 2320B	

Surrogate Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Water — **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)			
Lab Sample ID	Client Sample ID	DCA (75-126)	TOL (75-120)	BFB (72-124)	DBFM (75-120)
500-171960-1	W-191017-RA-26	96	97	92	99
500-171960-2	W-191017-RA-30	97	98	94	100
500-171960-3	W-191017-RA-31	96	98	93	100
500-171960-4	W-191017-RA-32	95	100	94	99
500-171960-5	W-191017-RA-29	97	98	95	100
500-171960-6	W-191017-RA-28	96	99	94	100
500-171960-7	W-191017-RA-27	98	99	95	101
500-171960-7 MS	W-191017-RA-27	97	100	97	102
500-171960-7 MSD	W-191017-RA-27	95	99	98	102
500-171960-8	Trip Blank	96	99	95	100
LCS 500-512636/4	Lab Control Sample	92	100	95	101
MB 500-512636/6	Method Blank	92	100	95	97

Surrogate Legend

DCA = 1,2-Dichloroethane-d4 (Surr)
TOL = Toluene-d8 (Surr)
BFB = 4-Bromofluorobenzene (Surr)
DBFM = Dibromofluoromethane

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Matrix: Water — **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)		
Lab Sample ID	Client Sample ID	NBZ (36-120)	FBP (34-110)	TPHL (40-145)
500-171960-1	W-191017-RA-26	65 ^c	83	117
500-171960-2	W-191017-RA-30	61 ^c	77	117
500-171960-3	W-191017-RA-31	64 ^c	83	111
500-171960-4	W-191017-RA-32	59 ^c	75	109
500-171960-5	W-191017-RA-29	63 ^c	90	130
500-171960-6	W-191017-RA-28	65 ^c	88	123
500-171960-7	W-191017-RA-27	42 ^c	58	102
LCS 500-511122/2-A	Lab Control Sample	85	83	102
MB 500-511122/1-A	Method Blank	96	101	126

Surrogate Legend

NBZ = Nitrobenzene-d5 (Surr)
FBP = 2-Fluorobiphenyl (Surr)
TPHL = Terphenyl-d14 (Surr)

Method: RSK-175 - Dissolved Gases (GC)

Matrix: Water — **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)
Lab Sample ID	Client Sample ID	TFE2 (60-140)
500-171960-1	W-191017-RA-26	90
500-171960-3	W-191017-RA-31	87
500-171960-4	W-191017-RA-32	90
500-171960-5	W-191017-RA-29	90
500-171960-6	W-191017-RA-28	90

Method: RSK-175 - Dissolved Gases (GC) (Continued)

Matrix: Water **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)
Lab Sample ID	Client Sample ID	TFE2 (60-140)
500-171960-7	W-191017-RA-27	87
LCS 240-406863/4	Lab Control Sample	91
LCSD 240-406863/5	Lab Control Sample Dup	91
MB 240-406863/3	Method Blank	91

Surrogate Legend

TFE = 1,1,1-Trifluoroethane

Method: 8151A - Herbicides (GC)

Matrix: Water **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)
Lab Sample ID	Client Sample ID	DCPAA2 (25-130)
500-171960-1	W-191017-RA-26	117
500-171960-2	W-191017-RA-30	121
500-171960-3	W-191017-RA-31	0 D
500-171960-4	W-191017-RA-32	0 D
500-171960-5	W-191017-RA-29	121
500-171960-6	W-191017-RA-28	115
500-171960-7	W-191017-RA-27	145 X
LCS 500-511733/2-A	Lab Control Sample	151 X
LCSD 500-511733/3-A	Lab Control Sample Dup	128
MB 500-511733/1-A	Method Blank	111

Surrogate Legend

DCPAA = DCAA

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 500-512636/6
Matrix: Water
Analysis Batch: 512636

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	<0.15		0.50	0.15	ug/L			10/30/19 11:39	1
Toluene	<0.15		0.50	0.15	ug/L			10/30/19 11:39	1
Ethylbenzene	<0.18		0.50	0.18	ug/L			10/30/19 11:39	1
Xylenes, Total	<0.22		1.0	0.22	ug/L			10/30/19 11:39	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*92*		*75 - 126*		*10/30/19 11:39*	*1*
Toluene-d8 (Surr)	*100*		*75 - 120*		*10/30/19 11:39*	*1*
4-Bromofluorobenzene (Surr)	*95*		*72 - 124*		*10/30/19 11:39*	*1*
Dibromofluoromethane	*97*		*75 - 120*		*10/30/19 11:39*	*1*

Lab Sample ID: LCS 500-512636/4
Matrix: Water
Analysis Batch: 512636

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	50.0	47.6		ug/L		95	70 - 120
Toluene	50.0	46.9		ug/L		94	70 - 125
Ethylbenzene	50.0	48.0		ug/L		96	70 - 123
Xylenes, Total	100	92.9		ug/L		93	70 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*92*		*75 - 126*
Toluene-d8 (Surr)	*100*		*75 - 120*
4-Bromofluorobenzene (Surr)	*95*		*72 - 124*
Dibromofluoromethane	*101*		*75 - 120*

Lab Sample ID: 500-171960-7 MS
Matrix: Water
Analysis Batch: 512636

Client Sample ID: W-191017-RA-27
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	<0.15		50.0	46.8		ug/L		94	70 - 120
Toluene	<0.15		50.0	46.7		ug/L		93	70 - 125
Ethylbenzene	<0.18		50.0	47.1		ug/L		94	70 - 123
Xylenes, Total	<0.22		100	92.2		ug/L		92	70 - 125

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*97*		*75 - 126*
Toluene-d8 (Surr)	*100*		*75 - 120*
4-Bromofluorobenzene (Surr)	*97*		*72 - 124*
Dibromofluoromethane	*102*		*75 - 120*

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 500-171960-7 MSD
Matrix: Water
Analysis Batch: 512636

Client Sample ID: W-191017-RA-27
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene	<0.15		50.0	47.3		ug/L		95	70 - 120	1	20
Toluene	<0.15		50.0	46.6		ug/L		93	70 - 125	0	20
Ethylbenzene	<0.18		50.0	47.1		ug/L		94	70 - 123	0	20
Xylenes, Total	<0.22		100	93.5		ug/L		93	70 - 125	1	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*95*		*75 - 126*
Toluene-d8 (Surr)	*99*		*75 - 120*
4-Bromofluorobenzene (Surr)	*98*		*72 - 124*
Dibromofluoromethane	*102*		*75 - 120*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Lab Sample ID: MB 500-511122/1-A
Matrix: Water
Analysis Batch: 511241

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 511122

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	<0.25		0.80	0.25	ug/L		10/21/19 15:04	10/22/19 14:18	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Nitrobenzene-d5 (Surr)	*96*		*36 - 120*	*10/21/19 15:04*	*10/22/19 14:18*	*1*
2-Fluorobiphenyl (Surr)	*101*		*34 - 110*	*10/21/19 15:04*	*10/22/19 14:18*	*1*
Terphenyl-d14 (Surr)	*126*		*40 - 145*	*10/21/19 15:04*	*10/22/19 14:18*	*1*

Lab Sample ID: LCS 500-511122/2-A
Matrix: Water
Analysis Batch: 511241

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 511122

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Naphthalene	32.0	23.0		ug/L		72	36 - 110

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Nitrobenzene-d5 (Surr)	*85*		*36 - 120*
2-Fluorobiphenyl (Surr)	*83*		*34 - 110*
Terphenyl-d14 (Surr)	*102*		*40 - 145*

Method: RSK-175 - Dissolved Gases (GC)

Lab Sample ID: MB 240-406863/3
Matrix: Water
Analysis Batch: 406863

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Methane	<0.17		1.0	0.17	ug/L			10/22/19 11:21	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,1,1-Trifluoroethane	*91*		*60 - 140*		*10/22/19 11:21*	*1*

Method: RSK-175 - Dissolved Gases (GC)

Lab Sample ID: LCS 240-406863/4
Matrix: Water
Analysis Batch: 406863

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Methane			462	418		ug/L		90	80 - 120		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,1,1-Trifluoroethane	*91*		*60 - 140*

Lab Sample ID: LCSD 240-406863/5
Matrix: Water
Analysis Batch: 406863

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Methane			462	394		ug/L		85	80 - 120	6	35

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
1,1,1-Trifluoroethane	*91*		*60 - 140*

Method: 8151A - Herbicides (GC)

Lab Sample ID: MB 500-511733/1-A
Matrix: Water
Analysis Batch: 511886

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 511733

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Pentachlorophenol	<0.090		0.10	0.090	ug/L		10/24/19 10:43	10/25/19 08:19	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCAA	*111*		*25 - 130*	*10/24/19 10:43*	*10/25/19 08:19*	*1*

Lab Sample ID: LCS 500-511733/2-A
Matrix: Water
Analysis Batch: 511886

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 511733

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Pentachlorophenol			2.53	1.86		ug/L		74	40 - 122		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
DCAA	*151*	*X*	*25 - 130*

Lab Sample ID: LCSD 500-511733/3-A
Matrix: Water
Analysis Batch: 511886

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 511733

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Pentachlorophenol			2.53	1.92		ug/L		76	40 - 122	3	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
DCAA	*128*		*25 - 130*

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 500-512577/1-A
Matrix: Water
Analysis Batch: 513090

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 512577

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.23		1.0	0.23	ug/L		10/30/19 06:50	10/31/19 19:03	1
Copper	<0.50		2.0	0.50	ug/L		10/30/19 06:50	10/31/19 19:03	1
Iron	<46.7		100	46.7	ug/L		10/30/19 06:50	10/31/19 19:03	1
Manganese	<0.79		2.5	0.79	ug/L		10/30/19 06:50	10/31/19 19:03	1
Zinc	<6.9		20.0	6.9	ug/L		10/30/19 06:50	10/31/19 19:03	1

Lab Sample ID: LCS 500-512577/2-A
Matrix: Water
Analysis Batch: 513090

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 512577

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	100	106.9		ug/L		107	80 - 120
Copper	250	256.1		ug/L		102	80 - 120
Iron	1000	1024		ug/L		102	80 - 120
Manganese	500	520.3		ug/L		104	80 - 120
Zinc	500	548.7		ug/L		110	80 - 120

Method: 300.0 - Anions, Ion Chromatography

Lab Sample ID: MB 500-510822/3
Matrix: Water
Analysis Batch: 510822

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.17		0.20	0.17	mg/L			10/18/19 14:15	1
Nitrate as N	<0.068		0.20	0.068	mg/L			10/18/19 14:15	1
Sulfate	<0.095		0.20	0.095	mg/L			10/18/19 14:15	1

Lab Sample ID: LCS 500-510822/4
Matrix: Water
Analysis Batch: 510822

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	3.00	3.08		mg/L		103	90 - 110
Nitrate as N	2.00	2.03		mg/L		102	90 - 110
Sulfate	5.00	5.11		mg/L		102	90 - 110

Method: 9060A - Organic Carbon, Total (TOC)

Lab Sample ID: MB 500-512666/32
Matrix: Water
Analysis Batch: 512666

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	<0.47		1.0	0.47	mg/L			10/29/19 18:03	1

Method: 9060A - Organic Carbon, Total (TOC) (Continued)

Lab Sample ID: LCS 500-512666/33
Matrix: Water
Analysis Batch: 512666

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Organic Carbon - Duplicates	10.0	8.04		mg/L		80	80 - 120

Lab Sample ID: MB 500-512839/4
Matrix: Water
Analysis Batch: 512839

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	<0.47		1.0	0.47	mg/L			10/30/19 11:22	1

Lab Sample ID: LCS 500-512839/5
Matrix: Water
Analysis Batch: 512839

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Organic Carbon - Duplicates	10.0	10.20		mg/L		102	80 - 120

Method: SM 2320B - Alkalinity

Lab Sample ID: MB 500-513075/2
Matrix: Water
Analysis Batch: 513075

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	<3.7		5.0	3.7	mg/L			10/31/19 09:03	1

Lab Sample ID: LCS 500-513075/4
Matrix: Water
Analysis Batch: 513075

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Alkalinity	100	100.6		mg/L		101	90 - 110

Lab Sample ID: MB 500-513217/3
Matrix: Water
Analysis Batch: 513217

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	LOQ	LOD	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity	<3.7		5.0	3.7	mg/L			11/01/19 11:52	1

Lab Sample ID: LCS 500-513217/5
Matrix: Water
Analysis Batch: 513217

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Alkalinity	100	102.5		mg/L		102	90 - 110

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Client Sample ID: W-191017-RA-26

Lab Sample ID: 500-171960-1
Date Collected: 10/17/19 11:15
Matrix: Water
Date Received: 10/18/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512636	10/30/19 15:07	APL	TAL CHI
Total/NA	Prep	3510C			511122	10/21/19 15:04	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511646	10/24/19 12:11	GWB	TAL CHI
Total/NA	Analysis	RSK-175		1	406863	10/22/19 15:05	JBN	TAL CAN
Total/NA	Prep	8151A			511733	10/24/19 10:43	DAK	TAL CHI
Total/NA	Analysis	8151A		10	511886	10/25/19 16:55	JBJ	TAL CHI
Dissolved	Prep	3005A			512577	10/30/19 06:50	JEF	TAL CHI
Dissolved	Analysis	6020A		1	513090	10/31/19 19:12	FXG	TAL CHI
Total/NA	Prep	3010A			512043	10/25/19 17:27	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512419	10/29/19 08:41	EEN	TAL CHI
Total/NA	Analysis	300.0		1	510822	10/18/19 15:06	EAT	TAL CHI
Total/NA	Analysis	9060A		1	512666	10/29/19 22:13	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	513217	11/01/19 14:46	SMO	TAL CHI

Client Sample ID: W-191017-RA-30

Lab Sample ID: 500-171960-2
Date Collected: 10/17/19 11:15
Matrix: Water
Date Received: 10/18/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512636	10/30/19 15:33	APL	TAL CHI
Total/NA	Prep	3510C			511122	10/21/19 15:04	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511646	10/24/19 12:38	GWB	TAL CHI
Total/NA	Prep	8151A			511733	10/24/19 10:43	DAK	TAL CHI
Total/NA	Analysis	8151A		1	511886	10/25/19 09:38	JBJ	TAL CHI
Dissolved	Prep	3005A			512577	10/30/19 06:50	JEF	TAL CHI
Dissolved	Analysis	6020A		1	513090	10/31/19 19:16	FXG	TAL CHI

Client Sample ID: W-191017-RA-31

Lab Sample ID: 500-171960-3
Date Collected: 10/17/19 12:02
Matrix: Water
Date Received: 10/18/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512636	10/30/19 15:59	APL	TAL CHI
Total/NA	Prep	3510C			511122	10/21/19 15:04	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511646	10/24/19 16:14	GWB	TAL CHI
Total/NA	Analysis	RSK-175		1	406863	10/22/19 15:22	JBN	TAL CAN
Total/NA	Prep	8151A			511733	10/24/19 10:43	DAK	TAL CHI
Total/NA	Analysis	8151A		2000	512183	10/28/19 12:39	JBJ	TAL CHI
Dissolved	Prep	3005A			512577	10/30/19 06:50	JEF	TAL CHI
Dissolved	Analysis	6020A		1	513090	10/31/19 19:20	FXG	TAL CHI
Dissolved	Prep	3005A			512577	10/30/19 06:50	JEF	TAL CHI
Dissolved	Analysis	6020A		10	513177	11/01/19 14:48	FXG	TAL CHI
Total/NA	Prep	3010A			512043	10/25/19 17:27	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512419	10/29/19 08:41	EEN	TAL CHI

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Client Sample ID: W-191017-RA-31
Date Collected: 10/17/19 12:02
Date Received: 10/18/19 08:40

Lab Sample ID: 500-171960-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		1	510822	10/18/19 15:31	EAT	TAL CHI
Total/NA	Analysis	300.0		10	510822	10/18/19 17:00	EAT	TAL CHI
Total/NA	Analysis	9060A		2	512839	10/30/19 11:55	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	513075	10/31/19 09:03	SMO	TAL CHI

Client Sample ID: W-191017-RA-32
Date Collected: 10/17/19 12:02
Date Received: 10/18/19 08:40

Lab Sample ID: 500-171960-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512636	10/30/19 16:25	APL	TAL CHI
Total/NA	Prep	3510C			511122	10/21/19 15:04	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511646	10/24/19 16:41	GWB	TAL CHI
Total/NA	Analysis	RSK-175		1	406863	10/22/19 15:39	JBN	TAL CAN
Total/NA	Prep	8151A			511733	10/24/19 10:43	DAK	TAL CHI
Total/NA	Analysis	8151A		2000	512183	10/28/19 12:59	JBJ	TAL CHI
Dissolved	Prep	3005A			512577	10/30/19 06:50	JEF	TAL CHI
Dissolved	Analysis	6020A		1	513090	10/31/19 19:25	FXG	TAL CHI
Dissolved	Prep	3005A			512577	10/30/19 06:50	JEF	TAL CHI
Dissolved	Analysis	6020A		10	513172	11/01/19 11:52	FXG	TAL CHI
Total/NA	Prep	3010A			512043	10/25/19 17:27	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512419	10/29/19 08:41	EEN	TAL CHI
Total/NA	Analysis	300.0		1	510822	10/18/19 15:44	EAT	TAL CHI
Total/NA	Analysis	300.0		10	510822	10/18/19 17:13	EAT	TAL CHI
Total/NA	Analysis	9060A		2	512839	10/30/19 12:11	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	513075	10/31/19 09:03	SMO	TAL CHI

Client Sample ID: W-191017-RA-29
Date Collected: 10/17/19 12:45
Date Received: 10/18/19 08:40

Lab Sample ID: 500-171960-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512636	10/30/19 16:51	APL	TAL CHI
Total/NA	Prep	3510C			511122	10/21/19 15:04	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511646	10/24/19 13:05	GWB	TAL CHI
Total/NA	Analysis	RSK-175		1	406863	10/22/19 15:56	JBN	TAL CAN
Total/NA	Prep	8151A			511733	10/24/19 10:43	DAK	TAL CHI
Total/NA	Analysis	8151A		1	511886	10/25/19 10:38	JBJ	TAL CHI
Dissolved	Prep	3005A			512577	10/30/19 06:50	JEF	TAL CHI
Dissolved	Analysis	6020A		1	513090	10/31/19 19:29	FXG	TAL CHI
Total/NA	Prep	3010A			512043	10/25/19 17:27	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512419	10/29/19 08:41	EEN	TAL CHI
Total/NA	Analysis	300.0		1	510822	10/18/19 15:57	EAT	TAL CHI

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Client Sample ID: W-191017-RA-29

Lab Sample ID: 500-171960-5

Date Collected: 10/17/19 12:45

Matrix: Water

Date Received: 10/18/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	300.0		5	510822	10/18/19 17:26	EAT	TAL CHI
Total/NA	Analysis	9060A		1	512666	10/29/19 23:59	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	513217	11/01/19 14:57	SMO	TAL CHI

Client Sample ID: W-191017-RA-28

Lab Sample ID: 500-171960-6

Date Collected: 10/17/19 13:16

Matrix: Water

Date Received: 10/18/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512636	10/30/19 17:17	APL	TAL CHI
Total/NA	Prep	3510C			511122	10/21/19 15:04	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511646	10/24/19 13:32	GWB	TAL CHI
Total/NA	Analysis	RSK-175		1	406863	10/22/19 16:14	JBN	TAL CAN
Total/NA	Prep	8151A			511733	10/24/19 10:43	DAK	TAL CHI
Total/NA	Analysis	8151A		1	511886	10/25/19 10:58	JBJ	TAL CHI
Dissolved	Prep	3005A			512577	10/30/19 06:50	JEF	TAL CHI
Dissolved	Analysis	6020A		1	513090	10/31/19 19:33	FXG	TAL CHI
Total/NA	Prep	3010A			512043	10/25/19 17:27	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512419	10/29/19 08:41	EEN	TAL CHI
Total/NA	Analysis	300.0		1	510822	10/18/19 16:09	EAT	TAL CHI
Total/NA	Analysis	300.0		5	510822	10/18/19 17:38	EAT	TAL CHI
Total/NA	Analysis	9060A		1	512666	10/30/19 00:16	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	513217	11/01/19 15:04	SMO	TAL CHI

Client Sample ID: W-191017-RA-27

Lab Sample ID: 500-171960-7

Date Collected: 10/17/19 14:15

Matrix: Water

Date Received: 10/18/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512636	10/30/19 17:42	APL	TAL CHI
Total/NA	Prep	3510C			511122	10/21/19 15:04	CMC	TAL CHI
Total/NA	Analysis	8270D		1	511646	10/24/19 13:59	GWB	TAL CHI
Total/NA	Analysis	RSK-175		1	406863	10/22/19 16:31	JBN	TAL CAN
Total/NA	Prep	8151A			511733	10/24/19 10:43	DAK	TAL CHI
Total/NA	Analysis	8151A		1	511886	10/25/19 11:18	JBJ	TAL CHI
Dissolved	Prep	3005A			512577	10/30/19 06:50	JEF	TAL CHI
Dissolved	Analysis	6020A		1	513090	10/31/19 19:38	FXG	TAL CHI
Total/NA	Prep	3010A			512043	10/25/19 17:27	BDE	TAL CHI
Total/NA	Analysis	SM 2340B		1	512419	10/29/19 08:41	EEN	TAL CHI
Total/NA	Analysis	300.0		1	510822	10/18/19 16:47	EAT	TAL CHI
Total/NA	Analysis	300.0		2	510822	10/18/19 17:51	EAT	TAL CHI
Total/NA	Analysis	9060A		1	512666	10/30/19 00:32	JJB	TAL CHI
Total/NA	Analysis	SM 2320B		1	513217	11/01/19 15:12	SMO	TAL CHI

Lab Chronicle

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Client Sample ID: Trip Blank

Date Collected: 10/17/19 00:00
Date Received: 10/18/19 08:40

Lab Sample ID: 500-171960-8

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	512636	10/30/19 18:08	APL	TAL CHI

Laboratory References:

TAL CAN = Eurofins TestAmerica, Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Accreditation/Certification Summary

Client: GHD Services Inc.
Project/Site: Penta Wood 086165

Job ID: 500-171960-1

Laboratory: Eurofins TestAmerica, Chicago

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
Wisconsin	State Program	999580010	08-31-20

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
SM 2320B		Water	Alkalinity

Laboratory: Eurofins TestAmerica, Canton

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	State	2927	02-23-20
Connecticut	State	PH-0590	12-31-19
Florida	NELAP	E87225	06-30-20
Georgia	State	4062	02-23-20
Illinois	NELAP	004498	07-31-20
Iowa	State	421	06-01-20
Kansas	NELAP	E-10336	04-30-20
Kentucky (UST)	State	112225	02-23-20
Kentucky (WW)	State	KY98016	12-31-19
Minnesota	NELAP	OH00048	12-31-19
Minnesota (Petrofund)	State Program	3506	07-31-21
New Jersey	NELAP	OH001	06-30-20
New York	NELAP	10975	03-31-20
Ohio VAP	State	CL0024	06-05-21
Oregon	NELAP	4062	02-23-20
Pennsylvania	NELAP	68-00340	08-31-20
Texas	NELAP	T104704517-18-10	08-31-20
USDA	US Federal Programs	P330-16-00404	12-28-19
Virginia	NELAP	010101	09-14-20
Washington	State	C971	01-12-20
West Virginia DEP	State	210	12-31-19

TestAmerica

THE LEADER IN ENVIRONMENTAL

2417 Bond Street, University Park, IL 60
Phone: 708.534.5200 Fax: 708.534

500-171960 COC

(optional)
Report To Contact: Grant Anderson
Company:
Address:
Address:
Phone:
Fax:
E-Mail:

(optional)
Bill To
Contact:
Company:
Address:
Address:
Phone:
Fax:
PO#/Reference#

Chain of Custody Record

Lab Job #: 500-171960

Chain of Custody Number:

Page 1 of 1

Temperature °C of Cooler: 0.6→16.6, -0.1→0.9, 5.3, 5.2

Client: GHD | Client Project #: 086165
Project Name: Penta Pad
Project Location/State: Siren, WI | Lab Project #:
Sampler: RA RC | Lab PM:

Lab ID	MS/MSD	Sample ID	Sampling Date	Sampling Time	# of Containers	Matrix	BTEX	Pentachlorophenol	Naphthalene	Dissolved TAL Metals	Hardness	TOC	Dissolved Methane	Alk; Anions		Comments
		Preservative	HCl	–	–	HNO_3	HNO_3	H_2SO_4	HCl	–		
		Parameter														
1		W-191017-RA-26	10/17/19	1115	15	WG	X	X	X	X	X	X	X	X		
2		W-1910 17-RA-30		1115	15		X	X	X	X						
3		W-1910 17-RA-31		1202	15		X	X	X	X	X	X	X	X		
4		W-191017-RA-32		1202	15		X	X	X	X	X	X	X	X		
5		W-1910 17-RA-29		1245	15		X	X	X	X	X	X	X	X		
6		W-1910 17-RA-28		1316	15		X	X	X	X	X	X	X	X		
7		W-1910 17-RA-27		1415	15		X	X	X	X	X	X	X	X		
8		trip blank					X	X	X	X	X	X	X	X		
												RA				

Preservative Key
1. HCL, Cool to 4°
2. H2SO4, Cool to 4°
3. HNO3, Cool to 4°
4. NaOH, Cool to 4°
5. NaOH/Zn, Cool to 4°
6. NaHSO4
7. Cool to 4°
8. None
9. Other

Turnaround Time Required (Business Days)
___ 1 Day ___ 2 Days ___ 5 Days ___ 7 Days ___ 10 Days ___ 15 Days _____ Other
Requested Due Date _____

Sample Disposal
☐ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Relinquished By	Company	Date	Time	Received By	Company	Date	Time
[signature]	GHD	10/17/19	1530	[signature]	TA-CHI	10/18/19	0840
Relinquished By	Company	Date	Time	Received By	Company	Date	Time
Relinquished By	Company	Date	Time	Received By	Company	Date	Time

Lab Courier
Shipped: FedEx
Hand Delivered

Matrix Key
WW – Wastewater
W – Water
S – Soil
SL – Sludge
MS – Miscellaneous
OL – Oil
A – Air
SE – Sediment
SO – Soil
L – Leachate
WI – Wipe
DW – Drinking Water
O – Other

Client Comments

Lab Comments:

TAL-4124-500 (1209)


ORIGIN ID:PHDA (651) 636-0913
GRANT ANDERSON
GHD SERVICES INC.-086165
1801 OLD HIGHWAY 8 NW
STE 114
SAINT PAUL, MN 551122307
UNITED STATES US
ACTWGT: 10.00 LB MAN
CAD: 0562065/CAFE3211
TO
EUROFINS TESTAMERICA CHICAGO
2417 BOND STREET
UNIVERSITY PARK IL 604843101
(708) 534-5200
REF: S680-108446
RMA:
500-171960 Waybill
FedEx Express
TRK# 0221 1275 8879 2744
RETURNS MON-SAT
PRIORITY OVERNIGHT
FRI - 18 OCT 10:30A
PRIORITY OVERNIGHT
60484
IL-US
ORD
GE JOTA
FID 80701 170CT19 JDTA 568C3/2A3C/05A2
Testin


ORIGIN ID:PHDA (651) 636-0913
GRANT ANDERSON
GHD SERVICES INC.-086165
1801 OLD HIGHWAY 8 NW
STE 114
SAINT PAUL, MN 551122307
UNITED STATES US
SHIP DATE: 070CT19
ACTWGT: 10.00 LB MAN
CAD: 0562065/CAFE3211
TO
EUROFINS TESTAMERICA CHICAGO
2417 BOND STREET
UNIVERSITY PARK IL 604843101
(708) 534-5200
REF: S680-108446
RMA:
FedEx Express
TRK# 0221 1275 8879 2722
RETURNS MON-SAT
FRI - 18 OCT 10:30A
PRIORITY OVERNIGHT
60484
IL-US
ORD
GE JOTA
FID 80701 170CT19 JDTA 568C3/2A3C/05A2

ORIGIN ID:PHDA (651) 639-0913
GRANT ANDERSON
GHD SERVICES INC.-086165
1801 OLD HIGHWAY 8 NW
STE 114
SAINT PAUL, MN 551122307
UNITED STATES US

SHIP DATE: 07OCT19
ACTWGT: 10.00 LB MAN
CAD: 0562065/CAFE3211

551C3/283C/104C

TO

EUROFINS TESTAMERICA CHICAGO
2417 BOND STREET

UNIVERSITY PARK IL 604843101
(708) 534-6200
REF: S680-108446

RMA:

FedEx Express

J181118060501nv

FedEx
TRK# 0221 1275 8879 2755

RETURNS MON-SAT
FRI - 18 OCT 10:30A
PRIORITY OVERNIGHT

GE JOTA

60484
IL-US
ORD

FID 80701 17OCT19 JDTA 568C3/2A3C/05A2

36 qt.

ORIGIN ID:PHDA (651) 639-0913
GRANT ANDERSON
GHD SERVICES INC.-086165
1801 OLD HIGHWAY 8 NW
STE 114
SAINT PAUL, MN 551122307
UNITED STATES US

SHIP DATE: (illegible)
ACTWGT: 10.(illegible)
CAD: 056206(illegible)

RT 5 ST 1

551C3/283C/104C

TO

EUROFINS TESTAMERICA CHICAGO
2417 BOND STREET

UNIVERSITY PARK IL 604843101
(708) 534-6200
REF: S680-108446

RMA:

FedEx Express

J181118060501nv

TRK# 0221 1275 8879 2733

RETURNS MON-SAT
PRIORITY OVERNIGHT

FedEx
TRK# 0221 1275 8879 2733

FRI - 18 OCT 10:30A
PRIORITY OVERNIGHT

GE JOTA

60484
IL-US
ORD

FID 80701 17OCT19 JDTA 568C3/2A3C/05A2

48 qts

Eurofins TestAmerica, Chicago
2417 Bond Street
University Park, IL 60484
Phone: 708-534-5200 Fax: 708-534-5211

2.2/2.9

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Wright, Richard	Carrier Tracking No(s):	COC No: 500-127392.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: richard.wright@testamericainc.com	State of Origin: Wisconsin	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): State Program - Wisconsin		Job #: 500-171960-1
Address: 4101 Shuffel Street NW, ,	Due Date Requested: 10/31/2019			
City: North Canton	TAT Requested (days):			
State, Zip: OH, 44720				
Phone: 330-497-9396(Tel) 330-497-0772(Fax)	PO #:			
Email:	WO #:			
Project Name: Penta Wood 086165	Project #: 50013796			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	RSK_175/ (MOD) Methane	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
W-191017-RA-26 (500-171960-1)	10/17/19	11:15 Central		Water			X	3	WI
W-191017-RA-30 (500-171960-2)	10/17/19	11:15 Central		Water			X	3	WI
W-191017-RA-31 (500-171960-3)	10/17/19	12:02 Central		Water			X	3	WI
W-191017-RA-32 (500-171960-4)	10/17/19	12:02 Central		Water			X	3	WI
W-191017-RA-29 (500-171960-5)	10/17/19	12:45 Central		Water			X	3	WI
W-191017-RA-28 (500-171960-6)	10/17/19	13:16 Central		Water			X	3	WI
W-191017-RA-27 (500-171960-7)	10/17/19	14:15 Central		Water			X	3	WI

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	*Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*
Unconfirmed	☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	10/18/19 1700	TA		10/19/19 940	TAL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Eurofins TestAmerica Canton Sample Receipt Form/Narrative **Login # :** _____
Canton Facility

Client TA Chicago Site Name _____ Cooler unpacked by:

Cooler Received on 10/19/19 Opened on 10/19/19

FedEx: 1st Grd Exp UPS FAS Clipper Client Drop Off TestAmerica Courier Other _____

Receipt After-hours: Drop-off Date/Time _____ Storage Location _____

TestAmerica Cooler # TA Foam Box Client Cooler Box Other _____

Packing material used: Bubble Wrap Foam Plastic Bag None Other _____

COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form
   IR GUN# IR-10 (CF +0.7 °C) Observed Cooler Temp. 2.2 °C Corrected Cooler Temp. 2.9 °C
   IR GUN #IR-11 (CF +0.9°C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C

2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity 1	Yes	No
-Were the seals on the outside of the cooler(s) signed & dated?	Yes	No NA
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes	No
-Were tamper/custody seals intact and uncompromised?	Yes	No NA
3. Shippers' packing slip attached to the cooler(s)?	Yes	No
4. Did custody papers accompany the sample(s)?	Yes	No
5. Were the custody papers relinquished & signed in the appropriate place?	Yes	No
6. Was/were the person(s) who collected the samples clearly identified on the COC?	Yes	No
7. Did all bottles arrive in good condition (Unbroken)?	Yes	No
8. Could all bottle labels be reconciled with the COC?	Yes	No
9. Were correct bottle(s) used for the test(s) indicated?	Yes	No
10. Sufficient quantity received to perform indicated analyses?	Yes	No
11. Are these work share samples?	Yes	No
If yes, Questions 12-16 have been checked at the originating laboratory.		
12. Were all preserved sample(s) at the correct pH upon receipt?	Yes	No NA pH Strip Lot# HC991818
13. Were VOAs on the COC?	Yes	No
14. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this.	Yes	No NA
15. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____	Yes	No
16. Was a LL Hg or Me Hg trip blank present? _____	Yes	No

Tests that are not checked for pH by Receiving:
VOAs
Oil and Grease
TOC

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other

Concerning _____

17. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES Samples processed by:

_____

_____

_____

_____

_____

18. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.
Sample(s) _____ were received in a broken container.
Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

19. SAMPLE PRESERVATION

Sample(s) _____ were further preserved in the laboratory.
Time preserved: _____ Preservative(s) added/Lot number(s): _____

VOA Sample Preservation - Date/Time VOAs Frozen: _____

Login Sample Receipt Checklist

Client: GHD Services Inc.

Job Number: 500-171960-1

Login Number: 171960
List Number: 1
Creator: Scott, Sherri L

List Source: Eurofins TestAmerica, Chicago

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	1.6,0.9,5.3,5.2
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Appendix D
Residential Well and Onsite Supply Well Water Sample Data Validation

Memorandum

October 29, 2019

To:	Tim Ree, GHD	Ref. No.:	086165-06-10
From:	Grant Anderson/sb/10	Tel:	651-639-0913
CC:	Ryan Aamot, GHD		

Subject: **Analytical Results and Reduced Validation**
Residential Water Sampling Event
Penta Wood Products Superfund Site
Siren, Wisconsin
October 2019

1. Introduction

This document details a reduced validation of analytical results for residential water samples collected at the Penta Wood Products Superfund Site during October 2019. Samples were submitted to Eurofins TestAmerica (TA) located in University Park, Illinois. A sample collection and analysis summary is presented in Table 1. The validated analytical results are summarized in Table 2. A summary of the analytical methodology is presented in Table 3.

Standard GHD Services, Inc. (GHD) report deliverables were submitted by the laboratory. The final results and supporting quality assurance/quality control (QA/QC) data were assessed. Evaluation of the data was based on information obtained from the chain of custody form, finished report forms, method blank data, recovery data from surrogate spikes, laboratory control samples (LCS), matrix spikes (MS), and field QA/QC samples.

The QA/QC criteria by which these data have been assessed are outlined in the analytical methods referenced in Table 3 and applicable guidance from the documents entitled:

i) "Quality Assurance Project Plan, Long Term Response Action", Rev. II, February 2005 with addendums

ii) "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", USEPA 540/R-99/008, October 1999

Item ii) will subsequently be referred to as the "Guidelines" in this Memorandum.

2. Sample Holding Time and Preservation

The sample holding time criteria for the analyses are summarized in Table 3. The sample chain of custody document and analytical report were used to determine sample holding times. All samples were prepared and analyzed within the required holding times.

All samples were properly preserved, delivered on ice, and stored by the laboratory at the required temperature (0-6°C).

3. Laboratory Method Blank Analyses

Method blanks are prepared from a purified matrix and analyzed with investigative samples to determine the existence and magnitude of sample contamination introduced during the analytical procedures.

Laboratory method blanks were analyzed at a minimum frequency of 1 per 20 investigative samples and/or 1 per analytical batch.

All method blank results were non-detect, indicating that laboratory contamination was not a factor for this investigation.

4. Surrogate Spike Recoveries

In accordance with the methods employed, all samples, blanks, and QC samples analyzed for organics are spiked with surrogate compounds prior to sample extraction and/or analysis. Surrogate recoveries provide a means to evaluate the effects of laboratory performance on individual sample matrices.

All samples submitted for benzene, toluene, ethylbenzene, and xylenes (BTEX), naphthalene, and pentachlorophenol analyses were spiked with the appropriate number of surrogate compounds prior to sample extraction or analysis.

Each individual surrogate compound is expected to meet the laboratory control limits with the exception of semi-volatile organic compound (SVOC) analyses. According to the "Guidelines" for SVOC analyses, up to one outlying surrogate in the base/neutral or acid fractions is acceptable as long as the recovery is at least 10 percent.

Surrogate recoveries were assessed against laboratory control limits. All surrogate recoveries met the above criteria.

5. Laboratory Control Sample Analyses

LCS are prepared and analyzed as samples to assess the analytical efficiencies of the methods employed, independent of sample matrix effects.

LCS were analyzed at a minimum frequency of 1 per 20 investigative samples and/or 1 per analytical batch.

The LCS contained all compounds of interest. All LCS recoveries were within the laboratory control limits, demonstrating acceptable analytical accuracy.

6. Matrix Spike/Matrix Spike Duplicate (MS/MSD) Analyses

To evaluate the effects of the sample preparation process, measurement procedures, and accuracy of a particular analysis, samples are spiked with a known concentration of the analyte of concern and analyzed as MS/MSD samples. The relative percent difference (RPD) between the MS and MSD is used to assess analytical precision. If the original sample concentration is significantly greater than the spike concentration, the recovery is not assessed.

MS/MSD analyses were performed as specified in Table 1.

The MS/MSD samples were spiked with all compounds of interest. With the exception of pentachlorophenol in sample RW-191001-RA-08, the percent recoveries and RPD values were within the laboratory control limits. Table 4 lists the outlying MS/MSD recoveries. The associated sample result is qualified as noted in the table.

7. Field QA/QC Samples

The field QA/QC consisted of one trip blank sample, one field blank sample and one field duplicate sample set.

Trip Blank Sample Analysis

To evaluate contamination from sample collection, transportation, storage, and analytical activities, one trip blank sample was submitted to the laboratory for BTEX analysis. All results were non-detect for the compounds of interest.

Field Blank Sample Analysis

To assess ambient conditions at the site and cleanliness of sample containers, a field blank was submitted for analysis, as identified in Table 1. Xylenes (total) was detected in the field blank. Table 5 lists the field blank detection. Associated sample data are qualified as noted in the table.

Field Duplicate Sample Analysis

To assess the analytical and sampling protocol precision, a field duplicate sample set was collected and submitted "blind" to the laboratory, as specified in Table 1. The RPDs associated with the duplicate samples must be less than 50 percent. If the reported concentration in either the investigative sample or its duplicate is less than five times the reporting limit (RL), the evaluation criteria is one times the RL value.

All field duplicate results were within acceptable agreement (all results were non-detect), demonstrating acceptable sampling and analytical precision.

8. Analyte Reporting

The laboratory reported detected results down to the laboratory's method detection limit (MDL) for each analyte. Positive analyte detections less than the RL but greater than the MDL were qualified as estimated (J) in Table 2 unless qualified otherwise in this memorandum (no positive analyte detections less than the RL

but greater than the MDL were reported). Non-detect results were presented as non-detect at the RL in Table 2.

9. Conclusion

Based on the assessment detailed in the foregoing, the data summarized in Table 2 are acceptable with the specific qualifications noted herein.

Table 1

Sample Collection and Analysis Summary
Residential Water Sampling Event
Penta Wood Site
Siren, Wisconsin
October 2019

					Analysis/Parameters			
Sample Identification	**Location**	**Matrix**	**Collection Date (mm/dd/yyyy)**	**Collection Time (hr:min)**	**BTEX**	**Naphthalene**	**Pentachlorophenol**	**Comments**
RW-191001-RA-01	RW01	water	10/01/2019	11:05	X	X	X	
RW-191001-RA-02	RW05	water	10/01/2019	11:20	X	X	X	
RW-191001-RA-03	RW05	water	10/01/2019	11:20	X	X	X	duplicate (RA-02)
RW-191001-RA-04	RW02	water	10/01/2019	11:30	X	X	X	field blank
RW-191001-RA-05	RW02	water	10/01/2019	11:42	X	X	X	
RW-191001-RA-06	RW03	water	10/01/2019	11:48	X	X	X	
RW-191001-RA-07	RW06 Shop	water	10/01/2019	12:17	X	X	X	
RW-191001-RA-08	RW06	water	10/01/2019	12:22	X	X	X	MS/MSD
RW-191001-RA-09	RW04	water	10/01/2019	13:05	X	X	X	
RW-191001-RA-10	DW01	water	10/01/2019	13:30	X	X	X	
Trip Blank	Lab	water	10/01/2019	00:00	X	-	-	trip blank

Notes:

MS/MSD - Matrix spike/matrix spike duplicate
BTEX - Benzene, toluene, ethylbenzene, and xylenes (total)

Table 2

Validated Analytical Results Summary
Residential Water Sampling Event
Penta Wood Site
Siren, Wisconsin
October 2019

Location ID:		DW01	RW01	RW02	RW03	RW04	RW05	RW05	RW06	RW06 Shop
Sample Name:		RW-191001-RA-10	RW-191001-RA-01	RW-191001-RA-05	RW-191001-RA-06	RW-191001-RA-09	RW-191001-RA-02	RW-191001-RA-03	RW-191001-RA-08	RW-191001-RA-07
Sample Date:		10/01/2019	10/01/2019	10/01/2019	10/01/2019	10/01/2019	10/01/2019	10/01/2019 duplicate	10/01/2019	10/01/2019
Parameters	**Unit**									
Volatile Organic Compounds, BTEX										
Benzene	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Xylenes (total)	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Semivolatile Organic Compounds										
Naphthalene	µg/L	0.85 U	0.79 U	0.79 U	0.86 U	0.76 U	0.85 U	0.85 U	0.79 U	0.81 U
Herbicides										
Pentachlorophenol	µg/L	0.097 U	0.10 U	0.099 U	0.098 U	0.095 U	0.10 U	0.10 U	0.096 UJ	0.096 U

Note:

U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated

Table 3

Analytical Methods and Holding Time Criteria
Residential Water Sampling Event
Penta Wood Site
Siren, Wisconsin
October 2019

			Holding Time	
Parameter	**Method**	**Matrix**	**Collection to Extraction (Days)**	**Collection or Extraction to Analysis (Days)**
BTEX	SW 8260B	Water	-	14
Naphthalene	SW 8270C	Water	7	40
Pentachlorophenol	SW 8151	Water	7	40

Notes:

Method References:
SW-846 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, 1986, with subsequent revisions
BTEX - Benzene, toluene, ethylbenzene, and xylenes (total)

Table 4

Qualified Sample Results Due to Outlying MS/MSD Results
Residential Water Sampling Event
Penta Wood Site
Siren, Wisconsin
October 2019

Parameter	Sample ID	Analyte	MS % Recovery	MSD % Recovery	RPD (percent)	Control Limits % Recovery	Control Limits RPD	Qualified Result	Units
Herbicides	RW-191001-RA-08	Pentachlorophenol	38	35	9	40-122	20	0.096 UJ	ug/L

Notes:

MS - Matrix Spike
MSD - Matrix Spike Duplicate
RPD - Relative Percent Difference
UJ - Not detected; associated reporting limit is estimated

Table 5

Qualified Sample Data Due to Analyte Concentrations in the Field Blank
Residential Water Sampling Event
Penta Wood Site
Siren, Wisconsin
October 2019

Parameter	Field Blank ID	Blank Date (dd/mm/yyyy)	Analyte	Blank Result	Associated Sample ID	Original Result	Qualified Result	Units
VOC	RW-191001-RA-04	10/1/2019	Xylenes (total)	0.29J	RW-191001-RA-10	0.23 J	1.0 U	ug/L
					RW-191001-RA-09	0.29 J	1.0 U	ug/L

Notes:

VOC - Volatile Organic Compounds
U - Not detected at the associated reporting limit
J - Estimated concentration

Appendix E
Site Inspection Forms

Continuing Obligations Inspection Form
Penta Wood Products Superfund Site
Siren, Wisconsin

086165

	Verified	Notes
Verify Site Conditions		
CAMU area fence condition is satisfactory	✓	
CAMU signage is present/visible at all fence gates	✓	
CAMU surface soil condition is satifactory and does not require erosion/settlement repairs	✓	
Perimeter area fence is satisfactory and does not require repairs	✓	
Perimeter signage is present/visible	✓	
Site access is limited and all perimeter fence locks in working order	✓	
NaOH tank condition is satisfactory with no signs of leaks	✓	
FeSO4 tank condition is satisfactory with no signs of leaks	✓	
Verify situations have not and are not occuring		
Removal of the existing barrier or cover	✓	
Replacement with another barrier or cover	✓	
Excavating or grading of the land surface	✓	
Filling on covered or paved areas	✓	
Plowing for agricultural cultivation	✓	
Construction or placement of a building or other structure	✓	
Change in use or occupancy of the property	✓	

Inspected By: Ryan Aamot

Date: 10/2/19

Well Inspection Form
Penta Wood Products Superfund Site
Siren, Wisconsin

086165

Monitoring Wells

	Protective Casing	Lock & Cover	J-Plug	Well Casing	Ground Surface	Notes
MW1						
MW2						
MW3						
MW4						
MW5						
MW6						
MW6S						
MW7						
MW8						
MW9						
MW10						
MW10S						
MW11						no iplug
MW12						
MW13						
MW14						
MW15						
MW16						
MW17						
MW18						
MW19						
MW20						
MW21						
MW22						
MW23						
MW24						
MW25						
MW26						
MW27						
MW28						
MW29						
MW30						
MW31						
32						

Extraction Wells

	Vault & Cover	Well Casings	Ground Surface	Notes
EW2				
EW3				
EW4				
EW5				
EW6				
EW7				
EW10				
EW12				
EW13				
EW14				

Gas Probes

	Protective Casing	Lock & Cover	Ground Surface	Inner Casing/Tubing	Notes
SG-04DIS					
SG-05DIS					
SG-06DIS					
SG-07DIS					
SG-22					
SG-23					
SG-24					
SG-25					
SG-26					

Inspected By: Ryan Aamio
Date: 10/21/15
Additonal Notes:

Appendix F
Memorandum – Evaluation of the Potential for Natural Attenuation of Pentachlorophenol Treatability Study

Memorandum

May 16, 2017
Revised July 7, 2017
Revised July 10, 2017

To:	Brian Sandberg	Ref. No.:	086165
From:	Sophia Dore/Christa Bucior/adh/5	Tel:	716-205-1978
cc:	Timothy Ree		

Subject: **Evaluation of the Potential for Natural Attenuation of Pentachlorophenol Treatability Study**
Penta Wood Products Superfund Site, Siren, Wisconsin

1. Introduction

Pentachlorophenol (PCP) and diesel fuel are present in groundwater at the Penta Wood Products Superfund Site, located in Siren, Wisconsin. Light Non-Aqueous Phase Liquid (LNAPL) present in some wells. The PCP concentrations range from 1,000 micrograms per liter (µg/L) (in the LNAPL wells) to 10 µg/L in the former release area. The remediation system operation was temporarily shut down at the Site for conducting a pilot study to evaluate whether monitored natural attenuation (MNA) will be an effective remedial action at the Site. A microcosm study and a BioTrap study were performed as lines of evidence that MNA is occurring at the Site. This memorandum contains the results of the microcosm and BioTrap studies. The studies were conducted in general accordance with the Remediation System Shutdown Pilot Study Work Plan (GHD, November 2015) Microcosm Study.

2. Microcosm Study

2.1 Objectives

The objectives of this microcosm laboratory study were to gather the data necessary to:

i) Determine whether natural attenuation of PCP is occurring at the Site

ii) Determine whether natural attenuation can occur under aerobic conditions, anaerobic conditions, or both

iii) Determine a Site-specific degradation rate for PCP

2.2 Sample Acquisition

The microcosm study was conducted using samples of soil and groundwater collected from the Site during drilling and well installation activities in November and December 2015. Four gallons of groundwater from the aerobic zone and 4 gallons of groundwater from the anaerobic zone were collected separately along with

5 pounds of soil from the aerobic zone and 5 pounds of soil from the anaerobic zone. The aerobic zone samples were collected at borehole SB1. The anaerobic zone samples were collected at well MW29. Borehole SB1 and well MW29 are shown on Figure 1. The soil samples from the aerobic and anaerobic zones and the groundwater from the aerobic zone were received by the GHD Innovative Technology Group (ITG) laboratory in Niagara Falls, New York on December 3, 2015. An additional four gallons of groundwater from the anaerobic zone were received on April 22, 2016.

2.3 Task 1: Initial Characterization

Upon arrival at the laboratory, the samples were analyzed for the following parameters to provide a characterization of baseline conditions for the study:

Groundwater

i) pH

ii) PCP

iii) Diesel range petroleum hydrocarbons (TPH[C_9-C_{36}])

iv) Ammonia-nitrogen

v) Orthophosphate-phosphorus

vi) Total and dissolved iron and manganese (groundwater)

Soil

i) pH

ii) PCP

iii) Diesel range petroleum hydrocarbons

iv) Ammonia-nitrogen

v) Orthophosphate-phosphorus

vi) Percent Moisture

vii) Percent Solids

viii) Total iron and manganese (soil)

The results from the initial analysis of groundwater SB1, the groundwater from the aerobic area, showed 87 µg/L of PCP and 0.176 milligram per liter (mg/L) of TPH(C_9-C_{36}). The pH was in the neutral range at 6.72, ammonia-nitrogen was below the analytical detection limit, and orthophosphate-phosphorus was present at 1.85 mg/L. Total iron was present at 27,600 µg/L and dissolved iron at 1,010 µg/L. Total manganese was present at 4,480 µg/L and dissolved manganese at 3,340 µg/L. These ratios of total to dissolved iron and manganese are consistent with the aerobic conditions known to exist in the area from which this sample was collected.

The results from the initial analysis of groundwater MW29, the groundwater from the anaerobic area, showed 1,430 µg/L of PCP and 1,540 mg/L of TPH(C_9-C_{36}). The pH was again in the neutral range at 6.71, ammonia-nitrogen was below the analytical detection limit, and orthophosphate-phosphorus was present at 1.45 mg/L. Total iron was present at 10,500 µg/L and dissolved iron was present at 270 µg/L. Total manganese was present at 2,530 µg/L and dissolved manganese at 2,350 µg/L. The manganese results are typical of anaerobic conditions; however, the dissolved iron concentration is lower than would be expected. These data are summarized in Table 1.

The results from the initial analysis of soil SB1, the soil sample collected from the aerobic area, showed 0.502 milligram per kilogram (mg/kg) of PCP and TPH(C_9-C_{36}) below the analytical detection limit. The pH of the soil was 7.14, ammonia-nitrogen was below the analytical detection limit, and orthophosphate-phosphorus was present at 27.8 mg/kg. The soil contained 6,880 mg/kg of total iron and 79.9 mg/kg of total manganese.

The results from the initial analysis of soil MW29, the soil sample collected from the anaerobic area, showed 61.0 mg/kg of PCP and 153 mg/kg of TPH(C_9-C_{36}). The pH of the soil was 6.65, ammonia-nitrogen was below the analytical detection limit, and orthophosphate-phosphorus was present at 20.5 mg/kg. The soil contained 8,330 mg/kg of total iron and 94.6 mg/kg of total manganese. These data are summarized in Table 2.

2.4 Task 2: Aerobic Microcosm Tests

Microcosms were set up to assess the potential for natural attenuation of PCP and petroleum hydrocarbons under aerobic conditions using soil and groundwater from borehole SB1. Forty grams of soil were placed in serum bottles along with 200 milliliters (mL) of groundwater.

The following treatments were performed:

1. Soil and groundwater only (biotic control)
2. Soil, groundwater, oxygen
3. Soil/sand, groundwater, oxygen, and sodium azide (abiotic control)

After 0, 3, 6, and 12 months, duplicate microcosms for each treatment were to be sacrificed and analyzed for PCP and petroleum hydrocarbons in the soil and groundwater. After 3 months, treatment of 94 percent of the PCP was observed in the microcosms that contained soil and groundwater, and TPH(C_9-C_{36}) was removed to non-detect levels. Ninety-five percent treatment of PCP was observed in microcosms that received oxygen. TPH(C_9-C_{36}) was also removed to non-detect levels in these microcosms. These data suggest that natural attenuation is effective for treatment of PCP and TPH in the aerobic zone of the Site. These data are summarized in Tables 3 and 4.

After 6 months, PCP and TPH(C_9-C_{36}) were not detected in any of the biological microcosms. These data show that natural attenuation is effective for treatment of PCP and TPH in the aerobic zone of the Site. These data are summarized in Tables 5 and 6.

PCP and TPH(C_9-C_{36}) concentrations did not decrease in the sodium azide treatment samples (abiotic control), which confirms that the decreased concentrations in the soil and groundwater (biotic control) and soil, groundwater, and oxygen treatments are due to biological degradation.

Since both PCP and TPH(C_9-C_{36}) had been reduced to non-detect levels, no further analyses of these microcosms were performed. The data were used to calculate first order rate constants and half lives for PCP. Under aerobic conditions, the half life for PCP was 0.7 month. These calculations are shown in Attachment A. Since TPH was removed to non-detect levels at the 3-month sampling event, the half life for TPH could not be calculated.

2.5 Task 3: Anaerobic Microcosm Tests

Microcosms were set up to assess the potential for natural attenuation of PCP and TPH(C_9-C_{36}) under anaerobic conditions using soil and groundwater collected from well MW29. Microcosms were set up in the anaerobic hood. Forty grams of soil were placed in serum bottles along with 200 mL of groundwater.

The following treatments were performed:

1. Soil and groundwater only (biotic control)
2. Soil, groundwater, and emulsified vegetable oil (EVO)
3. Soil/sand, groundwater, and sodium azide (abiotic control)

After 0, 3, 6, and 12 months, duplicate microcosms for each treatment were to be sacrificed and analyzed for PCP in the soil and groundwater.

After 3 months, no reduction in the concentration of PCP was observed in any of the microcosms. An increase in the aqueous concentration of PCP was observed in some of the microcosms, which is likely associated with PCP partitioning out of the soil into the groundwater. Treatment of TPH(C_9-C_{36}) was observed in all microcosms. In microcosms containing soil and groundwater, 37 percent removal of TPH(C_9-C_{36}) was observed and 30 percent removal of TPH(C_9-C_{36}) was observed in the microcosms that received EVO. These data suggest that anaerobic biodegradation of the TPH has occurred; however 3 months is not enough time for anaerobic biodegradation of PCP to occur. These data are shown in Tables 7 and 8.

After 6 months, 35 percent removal of PCP was observed in the microcosms that received EVO. No removal of PCP was observed in any of the other microcosms, and the increases in aqueous PCP combined with decreases in soil PCP were again observed suggesting that PCP is partitioning out of the soil. Treatment of TPH(C_9-C_{36}) was again observed in all microcosms. In microcosms containing soil and groundwater, treatment of TPH(C_9-C_{36}) had increased to 42 percent, and 51 percent removal of TPH(C_9-C_{36}) was observed in the microcosms that received EVO. These data suggest that after 6 months some anaerobic degradation of the PCP has occurred in microcosms where anaerobic conditions were optimized with EVO. Anaerobic degradation of the TPH is continuing but appears to be slow. These data are shown in Tables 9 and 10.

After 12 months, 93 percent removal of PCP and 64 percent removal of TPH(C_9-C_{36}) were observed in the microcosms that received EVO. Seventy percent removal of PCP and 56 percent removal of TPH(C_9-C_{36}) were observed in the microcosms that contained soil and groundwater only. Eighty-seven percent removal of PCP and 52 percent removal of TPH(C_9-C_{36}) observed in the azide control samples suggest that after 12 months, the azide is no longer suppressing microbial activity. These data suggest that anaerobic degradation of PCP and TPH is occurring, both in the microcosms where anaerobic conditions were optimized and in the unamended microcosms. Biodegradation of the PCP appears to have taken more than 6 months to start, but once started, biodegradation is proceeding fairly rapidly. Biodegradation of the TPH(C_9-C_{36}) continues to proceed slowly. These data are shown in Tables 11 and 12. Additional testing may be performed after 24 and 36 months.

The data were used to calculate first order rate constants and half lives for PCP. Under anaerobic conditions, the half life for PCP under unenhanced conditions was 5.5 months and with the addition of EVO was 2.9 months. The half life for TPH(C_9-C_{36}) under unenhanced conditions was 9.6 months and with the addition of EVO was 8.5 months. These calculations are shown in Attachment A.

3. BioTrap Study

BioTrap samplers are passive sampling tools that collect microbes over time for the purpose of better understanding biodegradation potential. BioTraps contain Bio-Sep® beads that are 2-4 millimeters (mm) in diameter and are made of Nomex® and powdered activated carbon (PAC). When a BioTrap sampler is deployed in a monitoring well, the beads absorb contaminants and nutrients present in the aquifer and become colonized by microorganisms. Once recovered from a monitoring well, Deoxyribose Nucleic Acid (DNA) and Ribose Nucleic Acid (RNA), or phospholipid fatty acids (PLFA) can be extracted from the beads for analysis to evaluate the microbial community. Most microbes prefer to be attached to a surface rather than free floating. The BioTrap provides a large surface area for the microbes to colonize and form biofilms. BioTrap samplers can be "baited" with various amendments or compounds to answer Site-specific questions and screen remedial alternatives. For example, BioTraps can be baited with specific contaminants of concern, such as PCP. They can also be baited with ^{13}C labeled compounds (stable isotope probing) to demonstrate conclusively that biodegradation is occurring.

3.1 Objectives

The objectives of the BioTrap study were to gather the data necessary to:

i) Determine whether bacteria capable of degrading PCP are present at the Site

ii) Demonstrate in situ biodegradation of PCP using a BioTrap

3.2 BioTrap Study

BioTraps baited with ^{13}C labelled PCP were obtained from Microbial Insights. During April and May 2016, they were installed in two wells in the source area (wells MW20 and MW29) and two wells in the downgradient area (wells MW9 and EW11S). The BioTraps were left in place for 32 days. After 32 days, the BioTraps were retrieved and analyzed for the following:

- ^{13}C PCP concentration
- PLFA
- Stable isotope probing
- Dissolved ^{13}C inorganic carbon

A copy of the laboratory report is included in Attachment B.

3.2.1 ^{13}C Pentachlorophenol Concentration

An attempt to quantify ^{13}C PCP in the BioTraps after deployment was made; however, the phenol group on the PCP has been found to chemisorb to the beads. Therefore, quantitative extraction of the PCP was not possible, and it was not possible to compare the concentration of PCP after the BioTraps were retrieved from the wells to the initial concentration of PCP in the BioTraps.

3.2.2 Phospholipid Fatty Acids

The biomass collected in the BioTraps was analyzed for PLFA. The biomass in the four BioTraps was similar with the source area. BioTraps from wells MW20 and MW29 having counts of 3.8×10^5 cells per bead and 1.9×10^6 cells per bead, respectively. BioTraps from downgradient wells MW9 and EW11S had counts of 2.3×10^6 cells per bead and 1.1×10^6 cells per bead, respectively.

The PLFA analysis showed that the dominant class of organism in the well MW20 BioTrap was Proteobacteria, which are fast growing gram negative bacteria, which utilize many carbon sources and adapt quickly to a variety of environments. The dominant class of organism in the well MW29 BioTrap was Firmicutes, which are anaerobic fermenting bacteria. The well MW20 BioTrap also contained Firmicutes.

The dominant type of organism in both downgradient wells MW9 and EW11S was the Proteobacteria with very low percentage of Firmicutes. These data show that anaerobic bacteria were dominant in well MW29 and also present in well MW20 but not present in the downgradient wells MW9 and EW11S. This is consistent with the source area being anaerobic while the downgradient area is more aerobic.

3.2.3 Stable Isotope Probing

Stable isotope probing demonstrated that ^{13}C was incorporated into the microbial biomass. The ^{13}C enriched biomass was between 1.1 and 2.0×10^4 cells per bead for wells MW9, MW29, and EW11S and 2.2×10^3 cells per bead for well MW20.

The ratio between the heavier and lighter isotopes is expressed as a delta value (δ). The δ value is calculated according to the following equation:

$\delta(‰) = (R(sample)/R(standard)-1)X1000$

R= ratio of heavy to light isotope

This ratio was calculated for the PLFA to determine the extent to which they were enriched in ^{13}C. The average $\delta^{13}C$ values for the PLFA in wells MW9 and EW11S, as well as well MW20, ranged from 257 to

360 percent, which is in the moderate range indicating a moderate incorporation of ^{13}C-labeled PCP into microbial biomass. The average $\delta^{13}C$ value for well MW29 was 94 percent, which is in the low range indicating low incorporation of ^{13}C-labeled PCP into microbial biomass. Well MW29 had the greatest concentration of Firmicutes, which are anaerobic bacteria and a lower concentration of Proteobacteria, which are bacteria that can utilize a wide range of carbon sources. It is possible that Proteobacteria have a greater capacity to degrade PCP than Firmicutes.

3.2.4 Dissolved ^{13}C Inorganic Carbon

$\delta^{13}C$ value for dissolved inorganic carbon was also measured in the BioTraps. If inorganic carbon was enriched in ^{13}C, it would indicate that complete mineralization of the PCP to carbon dioxide (CO_2) had occurred. The natural abundance of ^{13}C is approximately 1 percent, and the percent ^{13}C in the inorganic carbon in the four BioTraps ranged from 1.08 to 1.09, which is very close to the natural abundance. The $\delta^{13}C$ values ranged from -21 to -14 percent, which are near background levels; therefore, it appears that little to no PCP mineralization occurred during the 32 days in which the BioTraps were in place. PCP mineralization could have occurred if the BioTraps had been left in place for a longer duration.

The BioTrap data are summarized in Table 13. The Microbial Insights laboratory report is included in Attachment B.

4. Summary

Aerobic Microcosms

- After 3 months, PCP was reduced by 94-95 percent, and TPH(C_9-C_{36}) was reduced to non-detect levels in the biological microcosms.
- After 6 months, both PCP and TPH(C_9-C_{36}) were reduced to non-detect levels in the biological microcosms.
- The addition of oxygen to the microcosms did not increase biodegradation rates.
- Under aerobic conditions, the half life for PCP was 0.7 month. Since TPH was removed to non-detect levels at the 3-month sampling event, the half life for TPH could not be calculated.
- These data show that natural attenuation under aerobic conditions is effective for treatment of the PCP and TPH(C_9-C_{36}) in the aerobic area of the Site.

Anaerobic Microcosms

- After 3 months, no treatment of PCP was observed in any of the microcosms; however, treatment of 37 percent of the TPH(C_9-C_{36}) was observed in the unamended microcosms.
- After 6 months, treatment of PCP was not observed in the unamended microcosms; however, 35 percent removal of PCP was observed when anaerobic conditions were optimized by the addition of EVO.
- Treatment of TPH(C_9-C_{36}) was observed in both the unamended and amended microcosms.

- After 12 months, 93 percent removal of PCP and 64 percent removal of TPH(C_9-C_{36}) were observed in the microcosms that received EVO; and 70 percent removal of PCP and 56 percent removal of TPH(C_9-C_{36}) were shown in the unamended microcosms.
- Removal was observed in the azide kill controls, suggesting that after 12 months, azide is no longer suppressing microbial activity.
- Under anaerobic conditions, the half life for PCP under unenhanced conditions was 5.5 months and with the addition of EVO was 2.9 months. The half life for TPH(C_9-C_{36}) under unenhanced conditions was 9.6 months and with the addition of EVO was 8.5 months. Additional treatment of PCP and TPH(C_9-C_{36}) is expected over time.

BioTraps

- Total biomass in the BioTraps ranged from 3.8 x 10^5 cells per bead to 2.3 x 10^6 cells per bead.
- The PLFA analysis showed that the dominant class of organism in the downgradient well BioTraps and the BioTrap from well MW20, which is located in the source area, was Proteobacteria, which are fast growing gram negative bacteria that utilize many carbon sources. The dominant class of organism in the well MW29 BioTrap (source area) was Firmicutes, which are anaerobic fermenting bacteria. The well MW20 BioTrap also contained Firmicutes.
- Stable isotope probing demonstrated that ^{13}C was incorporated into the microbial biomass.
- The average $\delta^{13}C$ values for the PLFA in wells MW9 and EW11S and well MW20 ranged from 257 to 360 percent, which indicate a moderate rate of incorporation of ^{13}C-labeled PCP into microbial biomass. The average $\delta^{13}C$ value for well MW29 was 94 percent, which indicates a low rate of incorporation of ^{13}C-labeled PCP into microbial biomass.
- Mineralization of ^{13}C labeled PCP into CO_2 was not observed during the 32-day BioTrap study period.

5. Conclusions

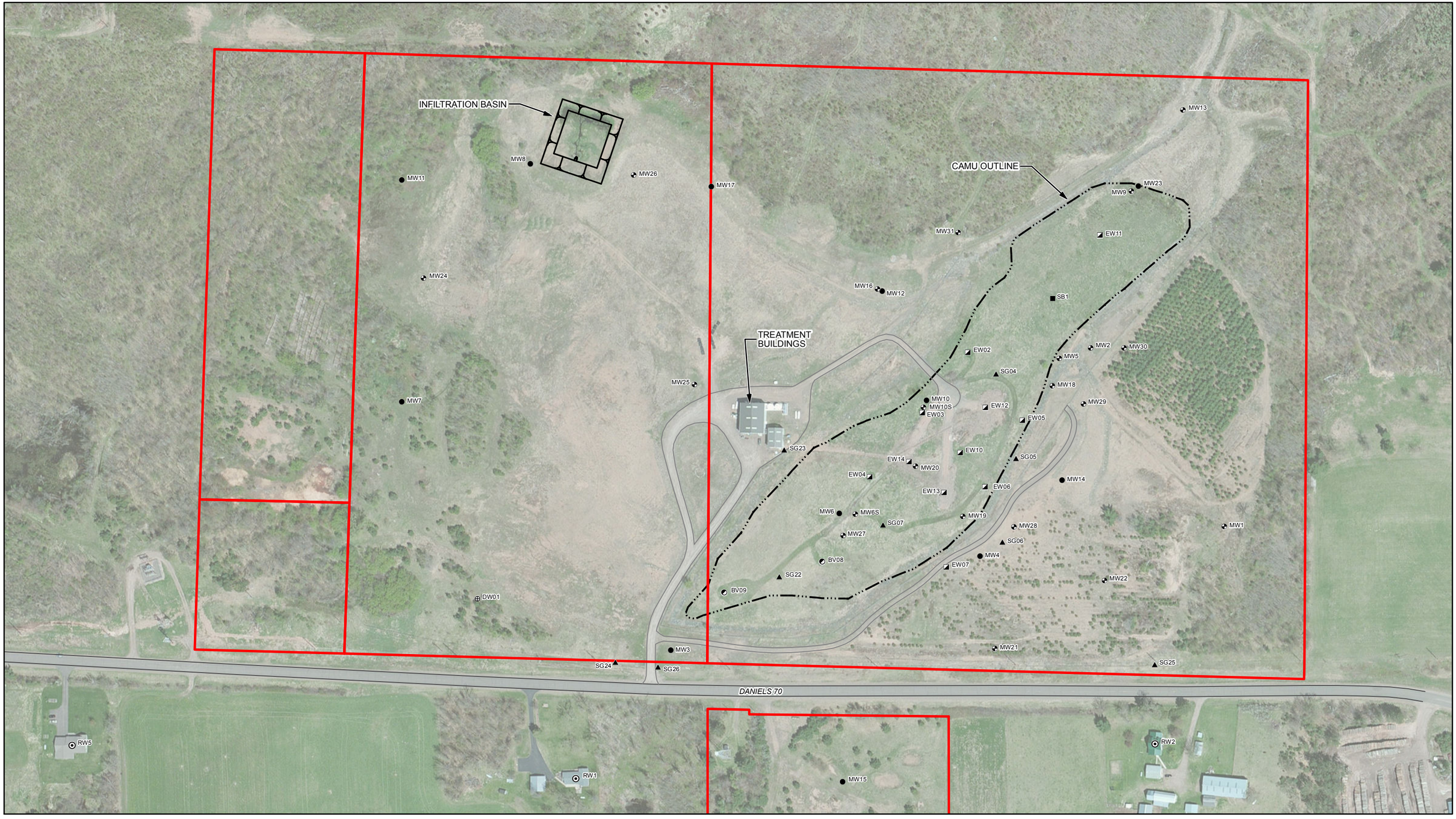
The results from the microcosm tests indicate that PCP and TPH(C_9-C_{36}) are readily degradable under aerobic conditions and that PCP and TPH(C_9-C_{36}) are also degradable under anaerobic conditions; however, this process is much slower. The addition of EVO to optimize anaerobic conditions appears to increase the biodegradation rate of PCP. Based on the half lives measured for the microcosms, the cleanup time for the aerobic area under aerobic conditions would be 6.3 months and for the anaerobic area without enhancement would be 66 months (5.5 years).

These conclusions are supported by the data from the BioTraps. In the BioTraps deployed in the downgradient area in wells MW9 and EW11S, the dominant class of organisms, the Proteobacteria, degraded PCP and incorporated it into their biomass at a moderate rate. In the source area in wells MW20 and MW29, the BioTrap data appears to indicate that well MW20 may be in a transitional zone where some aerobic and some anaerobic processes are occurring. Although the BioTrap from MW20 contained the anaerobic Firmicutes, which were the dominant class of organisms found in MW29, Proteobacteria were the

dominant class of organisms in MW20, and the rate of incorporation of PCP into biomass was similar to the aerobic wells. In MW29, which was likely highly anaerobic, the Firmicutes dominated, and slower incorporation of PCP into biomass was observed.

No mineralization of PCP (i.e., degradation into CO_2) was observed in the BioTrap study; however, the BioTraps were deployed for only 32 days, which may not be long enough for mineralization of PCP to occur.

Overall, it appears that MNA would be an effective treatment for the downgradient area, and biodegradation of PCP and TPH(C_9-C_{36}) is expected to occur at a moderate rate. MNA may be effective for the source area. The BioTrap and amended microcosm data show that PCP degradation does occur under anaerobic conditions; however, slower biodegradation rates are expected. Analysis of the unamended anaerobic microcosms after more time has elapsed would provide additional information about the rates that can be expected. Additional anaerobic microcosm testing may be performed after 24 and 36 months.



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LEGEND

- EXTRACTION WELL NEST
- UNCONFINED MONITORING WELL
- SEMICONFINED MONITORING WELL
- BIOVENTING WELL
- SOIL GAS WELL NEST
- WATER SUPPLY WELL
- RESIDENTIAL WELL
- APPROXIMATE CAMU LIMIT
- SITE PARCEL BOUNDARY

GHD

PENTA WOOD PRODUCTS SUPERFUND SITE
SIREN, WISCONSIN
EVALUATION OF THE POTENTIAL FOR NATURAL ATTENUATION OF PCP

086165-03-16
Jun 28, 2017

SITE PLAN

FIGURE 1

GIS File: I:\GIS\Projects\6-chars\08----\0861--\086165\086165-MEMO\086165-03(MEMO005)\086165-03(MEMO005)GIS-SP001.mxd

Table 1

Initial Groundwater Characterization Analytical Data - Microcosm Study
Penta Wood Products Superfund Site
Siren, Wisconsin

Parameters	Date Analyzed / Units	12/4/2015 SB1	4/28/2016 MW29
General Chemistry			
pH	S.U.	6.72	6.71
Ammonia-Nitrogen	mg/L	< 1.0	< 1.0
Orthophosphate-Phosphorus	mg/L	1.85	1.45
Semi-Volatile Organic Compounds			
Pentachlorophenol	µg/L	87	1430
Total Petroleum Hydrocarbons			
TPH(C_9-C_{36})	mg/L	0.176	1540
Total Metals			
Iron	µg/L	27600	10500
Manganese	µg/L	4480	2530
Dissolved Metals			
Dissolved Iron	µg/L	1010	270
Dissolved Manganese	µg/L	3340	2350

Notes:

< - Compound not detected above the reporting limit
S.U. - Standard units
µg/L - Micrograms per liter

Table 2

Initial Soil Characterization Analytical Data - Microcosm Study
Penta Wood Products Superfund Site
Siren, Wisconsin

Parameters	Date Analyzed / Units	12/3/2015 SB1	12/3/2015 MW29
General Chemistry			
pH	S.U.	7.14	6.65
Ammonia-Nitrogen	mg/kg	ND	ND
Orthophosphate-Phosphorus	mg/kg	27.8	20.5
Percent Moisture	%	7.77	4.45
Percent Solids	%	92.2	95.6
Semi-Volatile Organic Compounds			
Pentachlorophenol	mg/kg	0.502	61
Total Petroleum Hydrocarbons			
TPH(C_9-C_{36})	mg/kg	< 50	153
Total Metals			
Iron	mg/kg	6880	8330
Manganese	mg/kg	79.9	94.56

Notes:

ND - Not detected
< - Compound not detected above the reporting limit
J - Estimated value
S.U. - Standard units
mg/kg - Milligrams per kilogram
% - Percent

Table 3

Aerobic Biostudy SB1 Groundwater Analytical Data (3-Month Period) - Microcosm Study
Penta Wood Products Superfund Site
Siren, Wisconsin

			3-Month Period		
Parameters	**Date Analyzed / Units**	**1/11/2016 Start of Microcosm Study**	**4/11/2016 Soil and Groundwater**	**4/11/2016 Soil, Groundwater, and Oxygen**	**4/11/2016 Soil, Groundwater, Oxygen, and Azide**
Semi-Volatile Organic Compounds					
Pentachlorophenol	µg/L	289 / 302	9.29 J / < 50	3.10 J / < 50	362 / 282
Total Petroleum Hydrocarbons					
TPH(C_9-C_{36})	mg/L	4.61 / 5.10	< 0.5 / < 0.5	< 0.5 / < 0.5	4.45 / 4.28
Removal of Pentachlorophenol	%		94.2	95.2	-8.96
Removal of TPH(C_9-C_{36})	%		41.5	41.5	4.41

Notes:

< - Compound not detected above the reporting limit
µg/L - Micrograms per liter
mg/L - Milligrams per liter
J - Estimated value
All samples were analyzed in duplicate.

Table 4

Aerobic Biostudy SB1 Soil Analytical Data (3-Month Period) - Microcosm Study
Penta Wood Products Superfund Site
Siren, Wisconsin

			3-Month Period		
Parameters	**Date Analyzed / Units**	**1/11/2016 Start of Microcosm Study**	**4/11/2016 Soil and Groundwater**	**4/11/2016 Soil, Groundwater, and Oxygen**	**4/11/2016 Soil, Groundwater, Oxygen, and Azide**
Semi-Volatile Organic Compounds					
Pentachlorophenol	mg/kg	0.087 J / 0.094 J	< 0.1 / < 0.1	< 0.1 / < 0.1	< 0.1 / < 0.1
Total Petroleum Hydrocarbons					
TPH(C_9-C_{36})	mg/kg	< 50 / < 50	< 50 / < 50	< 50 / < 50	< 50 / < 50

Notes:

J - Estimated value
< - Compound not detected above the reporting limit
mg/kg - Milligrams per kilogram
All samples were analyzed in duplicate.

Table 5

Aerobic Biostudy SB1 Groundwater Analytical Data (6-Month Period) - Microcosm Study
Penta Wood Products Superfund Site
Siren, Wisconsin

			6-Month Period		
	Date Analyzed	**1/11/2016**	**8/1/2016**	**8/1/2016**	**8/1/2016**
Parameters	**Units**	**Start of Microcosm Study**	**Soil and Groundwater**	**Soil, Groundwater, and Oxygen**	**Soil, Groundwater, Oxygen, and Azide**
Semi-Volatile Organic Compounds					
Pentachlorophenol	µg/L	289 / 302	< 50 / < 50	< 50 / < 50	92.7 / 110
Total Petroleum Hydrocarbons					
TPH(C_9-C_{36})	mg/L	4.61 / 5.10	< 0.5 / < 0.5	< 0.5 / < 0.5	< 0.5 / < 0.5
Removal of Pentachlorophenol	%		91.5	91.5	65.7
Removal of TPH(C_9-C_{36})	%		41.5	41.5	41.5

Notes:

< - Compound not detected above the reporting limit
µg/L - Micrograms per liter
mg/L - Milligrams per liter
J - Estimated value
% - Percent
All samples were analyzed in duplicate.

Table 6

Aerobic Biostudy SB1 Soil Analytical Data (6-Month Period) - Microcosm Study
Penta Wood Products Superfund Site
Siren, Wisconsin

			6-Month Period		
Parameters	**Date Analyzed** / **Units**	**1/11/2016 Start of Microcosm Study**	**8/1/2016 Soil and Groundwater**	**8/1/2016 Soil, Groundwater, and Oxygen**	**8/1/2016 Soil, Groundwater, Oxygen, and Azide**
Semi-Volatile Organic Compounds					
Pentachlorophenol	mg/kg	0.087 J / 0.094 J	< 0.1 / < 0.1	< 0.1 / < 0.1	< 0.1 / < 0.1
Total Petroleum Hydrocarbons					
TPH(C_9-C_{36})	mg/kg	< 50 / < 50	< 50 / < 50	< 50 / < 50	< 50 / < 50

Notes:

J - Estimated value
< - Compound not detected above the reporting limit
mg/kg - Milligrams per kilogram
All samples were analyzed in duplicate.

Table 7

Anaerobic Biostudy MW29 Groundwater Analytical Data (3-Month Period) - Microcosm Study
Penta Wood Products Superfund Site
Siren, Wisconsin

Parameters	Units	Date Analyzed	3-Month Period		
		5/6/2016 Start of Microcosm Study	8/3/2016 Soil and Groundwater	8/3/2016 Soil, Groundwater, and EVO	8/3/2016 Soil, Groundwater, Oxygen, and Azide
Semi-Volatile Organic Compounds					
Pentachlorophenol	µg/L	2460 / 1580	8900 / 9600	3250 / 1240	8600 / 7900
Total Petroleum Hydrocarbons					
TPH(C_9-C_{36})	mg/L	464 / 501	224 / 224	470 / 308	430 / 428
Removal of Pentachlorophenol	%		<1	<1	<1
Removal of TPH(C_9-C_{36})	%		37.3	29.7	9.19

Notes:

µg/L - Micrograms per liter
mg/L - Milligrams per liter
EVO - Emulsified Vegetable Oil
% - Percent
< - Less than value listed
All samples were analyzed in duplicate.

Table 8

Anaerobic Biostudy MW29 Soil Analytical Data (3-Month Period) - Microcosm Study
Penta Wood Products Superfund Site
Siren, Wisconsin

			3-Month Period		
Parameters	**Date Analyzed** / **Units**	**5/6/2016 Start of Microcosm Study**	**8/3/2016** Soil and Groundwater	**8/3/2016** Soil, Groundwater, and EVO	**8/3/2016** Soil, Groundwater, Oxygen, and Azide
Semi-Volatile Organic Compounds					
Pentachlorophenol	mg/kg	23.3 / 38.1	3.60 / 2.63	3.20 / 1.68	< 0.1 / < 0.1
Total Petroleum Hydrocarbons					
TPH(C_9-C_{36})	mg/kg	919 / 2370	1250 / 1440	932 / 983	1400 / 1660

Notes:

< - Compound not detected above the reporting limit
mg/kg - Milligrams per kilogram
EVO - Emulsified Vegetable Oil
All samples were analyzed in duplicate.

Table 9

Anaerobic Biostudy MW29 Groundwater Analytical Data (6-Month Period) - Microcosm Study
Penta Wood Products Superfund Site
Siren, Wisconsin

Parameters	Units	Date Analyzed: 5/6/2016 Start of Microcosm Study	6-Month Period: 11/15/2016 Soil and Groundwater	11/15/2016 Soil, Groundwater, and EVO	11/15/2016 Soil, Groundwater, Oxygen, and Azide
Semi-Volatile Organic Compounds					
Pentachlorophenol	µg/L	2460 / 1580	15000 / 17800	1010 / 1610	6100 / 6500
Total Petroleum Hydrocarbons					
TPH(C_9-C_{36})	mg/L	464 / 501	105 / 237	149 / 264	295 / 213
Removal of Pentachlorophenol	%		<1	35.30	<1
Removal of TPH(C_9-C_{36})	%		42.3	51.0	25.40

Notes:

µg/L - Micrograms per liter
mg/L - Milligrams per liter
EVO - Emulsified Vegetable Oil
% - Percent
< - Less than value listed
All samples were analyzed in duplicate.

Table 10

Anaerobic Biostudy MW29 Soil Analytical Data (6-Month Period) - Microcosm Study
Penta Wood Products Superfund Site
Siren, Wisconsin

			6-Month Period		
Parameters	**Date Analyzed** / **Units**	**5/6/2016** **Start of Microcosm Study**	**11/15/2016** **Soil and Groundwater**	**11/15/2016** **Soil, Groundwater, and EVO**	**11/15/2016** **Soil, Groundwater, Oxygen, and Azide**
Semi-Volatile Organic Compounds					
Pentachlorophenol	mg/kg	23.3 / 38.1	18.3 / 22.4	11.0 / 10.5	4.69 / 9.53
Total Petroleum Hydrocarbons					
TPH(C_9-C_{36})	mg/kg	919 / 2370	1400 / 1360	1010 / 838	1950 / 1350

Notes:

< - Compound not detected above the reporting limit
mg/kg - Milligrams per kilogram
EVO - Emulsified Vegetable Oil
All samples were analyzed in duplicate.

Table 11

Anaerobic Biostudy MW29 Groundwater Analytical Data (12-Month Period) - Microcosm Study
Penta Wood Products Superfund Site
Siren, Wisconsin

Parameters	Date Analyzed / Units	5/6/2016 Start of Microcosm Study	6-Month Period 5/8/2017 Soil and Groundwater	5/8/2017 Soil, Groundwater, and EVO	5/8/2017 Soil, Groundwater, Oxygen, and Azide
Semi-Volatile Organic Compounds					
Pentachlorophenol	µg/L	2460 / 1580	872 / 353	69 / 205	182 / 344
Total Petroleum Hydrocarbons					
TPH(C_9-C_{36})	mg/L	464 / 501	194 / 169	169 / 208	173 / 141
Removal of Pentachlorophenol	%		70	93.20	87
Removal of TPH(C_9-C_{36})	%		55.6	63.5	52.20

Notes:

µg/L - Micrograms per liter
mg/L - Milligrams per liter
EVO - Emulsified Vegetable Oil
% - Percent
All samples were analyzed in duplicate.

Table 12

Anaerobic Biostudy MW29 Soil Analytical Data (12-Month Period) - Microcosm Study
Penta Wood Products Superfund Site
Siren, Wisconsin

			6-Month Period		
Parameters	**Date Analyzed** / **Units**	**5/6/2016** **Start of Microcosm Study**	**5/8/2017** **Soil and Groundwater**	**5/8/2017** **Soil, Groundwater, and EVO**	**5/8/2017** **Soil, Groundwater, Oxygen, and Azide**
Semi-Volatile Organic Compounds					
Pentachlorophenol	mg/kg	23.3 / 38	12 / 11.2	7.1 / 6.54	1.04 / 0.67
Total Petroleum Hydrocarbons					
TPH(C_9-C_{36})	mg/kg	919 / 2370	903 / 819	501 / 359	1070 / 1090

Notes:

mg/kg - Milligrams per kilogram
EVO - Emulsified Vegetable Oil
All samples were analyzed in duplicate.

Table 13

Bio-Trap Analytical Data
Penta Wood Products Superfund Site
Siren, Wisconsin

Parameters	Sample Date: Units	5/23/2016 MW9	5/23/2016 EW11S	5/23/2016 MW20	5/23/2016 MW29
Biomass and ^{13}C Incorporation					
Total Biomass	Cells/bead	2,280,000	1,100,000	380,000	1,920,000
^{13}C Enriched Biomass	Cells/bead	19,800	14,500	2,170	11,200
Average PLFA $\delta^{13}C$	‰	257	360	276	94
Maximum PLFA $\delta^{13}C$	‰	435	1192	399	232
^{13}C Mineralization					
Inorganic Carbon $\delta^{13}C$	‰	-17	-14	-21	-20
$\%^{13}C$	%	1.09	1.09	1.08	1.08
Community Structure (% Total PLFA)					
Firmicutes	%	0.7	2.68	16.17	52.88
Proteobacteria	%	63.6	65.59	49.44	31.17
Anaerobic Metal Reducers	%	0.18	1.02	6.32	0
Actinomycetes	%	0.34	0.36	1.48	4.4
General	%	34.29	29.85	25.96	11.56
Eukaryotes	%	0.88	0.52	0.64	0

Notes:

δ13C - Del Carbon 13
PLFA - Phospholipid Fatty Acids
‰ - Parts per thousand
% - Percent

Attachment A
Biodegradation Rates

Attachment A – Biodegradation Rates

Based on the treatability study, the half lives under the different conditions tested are shown in the table below. Since no target concentration exists for total petroleum hydrocarbons (TPH), 10 milligrams per liter (mg/L) were used to calculate a treatment time. Please note that these half lives assume that non-aqueous phase liquid (NAPL) is not present and that there is no ongoing source.

	First Order Degradation Rate Constant	Half Life	Initial Concentration	Target Concentration	Time to Reach Target
PCP Aerobic Conditions – not enhanced	0.948	0.7 month	295 µg/L	1 µg/L	6.3 months
PCP Aerobic Conditions - O_2 added	0.948	0.7 month	295 µg/L	1 µg/L	6.3 months
TPH Aerobic Conditions	n/a	Too fast to measure			
PCP Anaerobic Conditions – not enhanced	0.126	5.5 months	2,020 µg/L	1 µg/L	66 months
PCP Anaerobic Conditions – enhanced with EVO	0.238	2.9 months	2,020 µg/L	1 µg/L	34.8 months
TPH Anaerobic Conditions - not enhanced	0.072	9.6 months	483 mg/L	10 mg/L	57.6 months
TPH Anaerobic Conditions - not enhanced with EVO	0.082	8.5 months	483 mg/L	10 mg/L	51 months

Attachment B
Laboratory Report

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Knoxville, TN 37932
Phone: (865) 573-8188
Fax: (865) 573-8133

Client: Brian Sandberg
GHD Services Inc.
1801 Old Hwy 8
Suite 114
St. Paul, MN 55112

Phone:

Fax:

Identifier: 079NE **Date Rec:** 05/24/2016 **Report Date:** 08/12/2016

Client Project #: 086165 **Client Project Name:** PentaWood

Purchase Order #: 34005538

Analysis Requested: PLFA, Stable Isotope Probing

Reviewed By:

MICROBIAL INSIGHTS, INC.

10515 Research Dr., Knoxville, TN 37932
Tel. (865) 573-8188 Fax. (865) 573-8133

PLFA

Client: **GHD Services Inc.**
Project: PentaWood

MI Project Number: **079NE**
Date Received: 05/24/2016

Sample Information

Sample Name:	**MW9**	**MW20**	**MW29**	**EW11S**
Sample Date:	05/23/2016	05/23/2016	05/23/2016	05/23/2016
Sample Matrix:	Adv. Bio-Trap	Adv. Bio-Trap	Adv. Bio-Trap	Adv. Bio-Trap
Analyst:	JS	JS	JS	JS

Biomass Concentrations

Total Biomass (cells/bead)	**2.28E+06**	**3.80E+05**	**1.92E+06**	**1.10E+06**

Community Structure (% total PLFA)

Firmicutes (TerBrSats)	**0.70**	**16.17**	**52.88**	**2.68**
Proteobacteria (Monos)	**63.60**	**49.44**	**31.17**	**65.59**
Anaerobic metal reducers (BrMonos)	**0.18**	**6.32**	**0.00**	**1.02**
SRB/Actinomycetes (MidBrSats)	**0.34**	**1.48**	**4.40**	**0.36**
General (Nsats)	**34.29**	**25.96**	**11.56**	**29.85**
Eukaryotes (polyenoics)	**0.88**	**0.64**	**0.00**	**0.52**

Physiological Status (Proteobacteria only)

Slowed Growth	**2.79**	**0.86**	**1.19**	**2.65**
Decreased Permeability	**0.19**	**0.82**	**0.85**	**0.21**

Legend:
NA = Not Analyzed NS = Not Sampled

MICROBIAL INSIGHTS, INC.

10515 Research Dr., Knoxville, TN 37932
Tel. (865) 573-8188 Fax. (865) 573-8133

PLFA

Client: **GHD Services Inc.**
Project: PentaWood

MI Project Number: **079NE**
Date Received: 05/24/2016

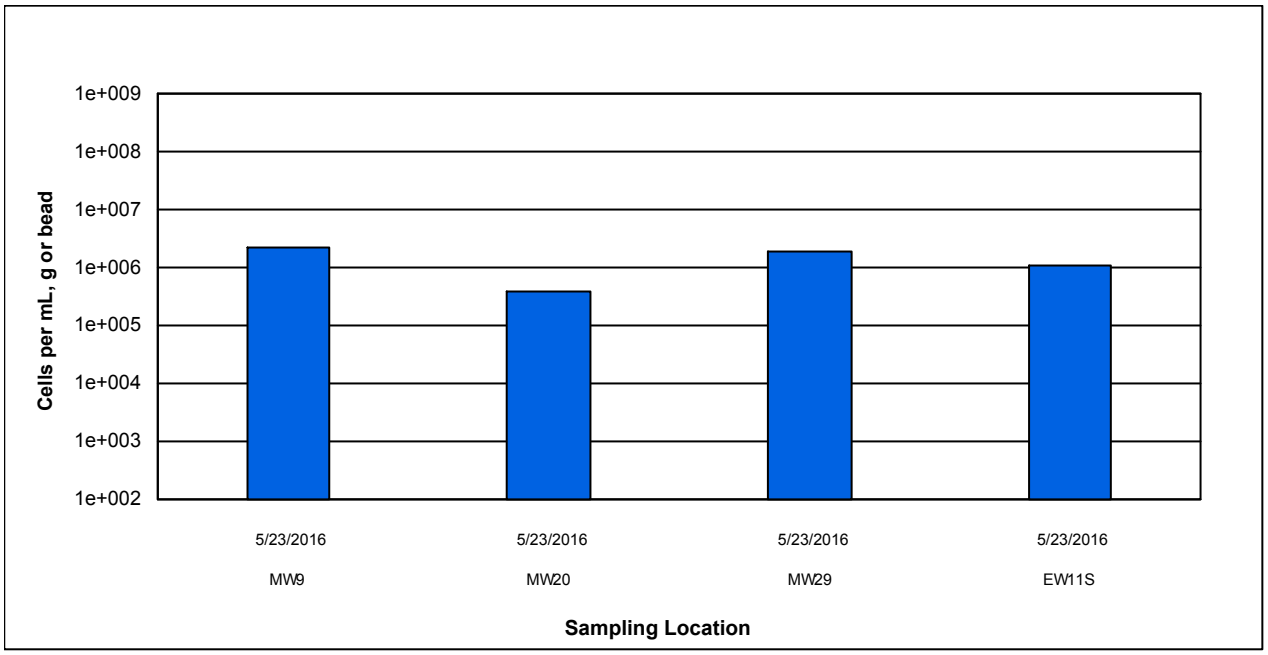

Figure 1. Biomass content is presented as a cell equivalent based on the total amount of phospholipid fatty acids (PLFA) extracted from a given sample. Total biomass is calculated based upon PLFA attributed to bacterial and eukaryotic biomass

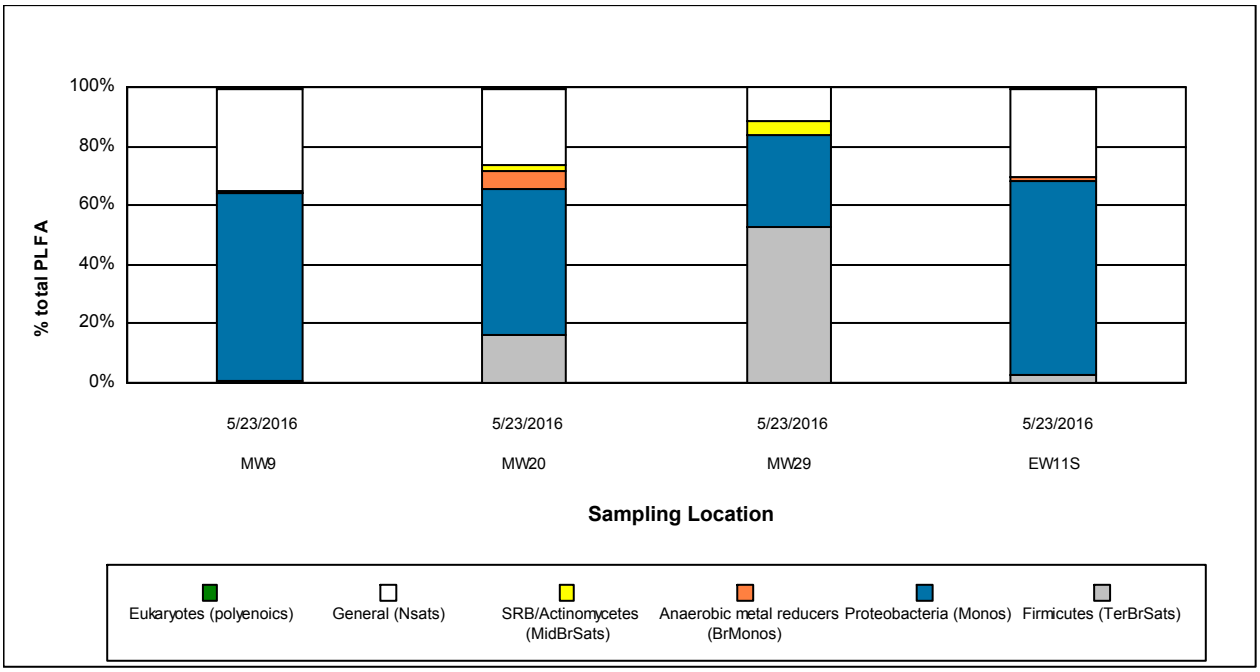

Figure 2. Relative percentages of total PLFA structural groups in the samples analyzed. Structural groups are assigned according to PLFA chemical structure, which is related to fatty acid biosynthesis.

Quality Assurance/Quality Control Data

Samples Received **5/24/2016**

Component	Date Prepared	Date Analyzed	Arrival Temperature	Positive Control	Extraction Blank	Negative Control
PLFA	05/24/2016	06/16/2016	4 °C	64%	non-detect	non-detect

10515 Research Drive
Knoxville, TN 37931
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SITE LOGIC Report

Stable Isotope Probing (SIP) Study

Contact: Brian Sandberg
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St. Paul, MN 55112

Phone: (651) 639-0913

Email: Brian.Sandberg@GHD.com

MI Identifier: 079NE

Report Date: 08-12-2016

Project: PentaWood, #086165

Comments:

Executive Summary

A Stable Isotope Probing (SIP) study was performed to determine whether biodegradation of pentachlorophenol (PCP) is occurring under existing site conditions. Bio-Trap® samplers baited with ^{13}C-labeled PCP were deployed in monitoring wells MW9, MW20, MW29, and EW11S. Following a 32-day deployment period, the Bio-Traps were recovered to quantify ^{13}C incorporation into biomass and dissolved inorganic carbon (DIC). A complete summary of the SIP results is provided in Table 1 and Figures 1 through 4. Following are the key observations from the results obtained for the monitoring wells.

Stable Isotope Probing Results

- The average DIC δ^{13}C values in MW9, MW20, MW29, and EW11S were near background levels, indicating little to no PCP mineralization during the deployment period.
- However, incorporation of ^{13}C into biomass in all wells conclusively demonstrated that PCP was metabolized at these locations under existing site conditions.
- For samples MW9, MW20, and EW11S the average PLFA δ^{13}C values fell within the moderate range indicating a moderate incorporation of ^{13}C-labeled PCP into microbial biomass.
- The average PLFA δ^{13}C value for sample MW29 fell below 100‰, indicating low incorporation of ^{13}C-labeled PCP into microbial biomass.
- Total PLFA biomass concentrations for all samples ranged from 10^5 to 10^6 cells/bead and were within the moderate range.
- The PLFA community structures were similar between MW9 and EW11S, which were primarily composed of monoenoics and normal saturates.
- The PLFA community structure in MW20 was composed of a large portion of monoenoics (49.44%) followed by normal saturates (25.96%), and firmicutes (16.17%). Indicators of anaerobic metal reducers, eukaryotes, and actinomycetes were also detected.
- The PLFA community structure in MW29 was composed primarily of firmicutes (52.88%). Monoenoics (31.17%) and normal saturates (11.56%) were the next most abundant groups. Indicators of actinomycetes were also detected.

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Overview of Approach

Stable Isotope Probing (SIP)

Stable isotope probing (SIP) is an innovative method to track the environmental fate of a "labeled" contaminant of concern to unambiguously demonstrate biodegradation. Two stable carbon isotopes exist in nature – carbon 12 (^{12}C) which accounts for 99% of carbon and carbon 13 (^{13}C) which is considerably less abundant (~1%). With the SIP method, the Bio-Trap® sampler is baited with a specially synthesized form of the contaminant containing ^{13}C labeled carbon. Since ^{13}C is rare, the labeled compound can be readily differentiated from the contaminants present at the site. Following deployment, the Bio-Trap® is recovered and three approaches are used to conclusively demonstrate biodegradation of the contaminant of concern.

- The loss of the labeled compound provides an estimate of the degradation rate (% loss of ^{13}C).
- Quantification of ^{13}C enriched phospholipid fatty acids (PLFA) indicates incorporation into microbial biomass.
- Quantification of ^{13}C enriched dissolved inorganic carbon (DIC) indicates contaminant mineralization.

Phospholipid Fatty Acids (PLFA)

PLFA are a primary component of the membrane of all living cells including bacteria. PLFA decomposes rapidly upon cell death (1, 2), so the total amount of PLFA present in a sample is indicative of the viable biomass. When combined with stable isotope probing (SIP), incorporation of ^{13}C into PLFA is a conclusive indicator of biodegradation.

Some organisms produce "signature" types of PLFA allowing quantification of important microbial functional groups (e.g. iron reducers, sulfate reducers, or fermenters). The relative proportions of the groups of PLFA provide a "fingerprint" of the microbial community. In addition, *Proteobacteria* modify specific PLFA during periods of slow growth or in response to environmental stress providing an index of their health and metabolic activity.

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Results

Table 1. Summary of the results obtained from the Bio-Trap® Units. Interpretation guidelines and definitions are found later in the document.

Sample Name	MW9	MW20	MW29	EW11S
Biomass & ^{13}C Incorporation				
Total Biomass (Cells/bead)	2.28E+06	3.80E+05	1.92E+06	1.10E+06
^{13}C Enriched Biomass (Cells/bead)	1.98E+04	2.17E+03	1.12E+04	1.45E+04
Average PLFA Del (‰)	257	276	94	360
Maximum PLFA Del (‰)	435	399	232	1192
^{13}C Mineralization				
DIC Del (‰)	-17	-21	-20	-14
% 13C	1.09	1.08	1.08	1.09
Community Structure (% total PLFA)				
Firmicutes (TerBrSats)	0.70	16.17	52.88	2.68
Proteobacteria (Monos)	63.60	49.44	31.17	65.59
Anaerobic metal reducers (BrMonos)	0.18	6.32	0.00	1.02
Actinomycetes (MidBrSats)	0.34	1.48	4.40	0.36
General (Nsats)	34.29	25.96	11.56	29.85
Eukaryotes (Polyenoics)	0.88	0.64	0.00	0.52
Physiological Status (Proteobacteria only)				
Slowed Growth	2.79	0.86	1.19	2.65
Decreased Permeability	0.19	0.82	0.85	0.21

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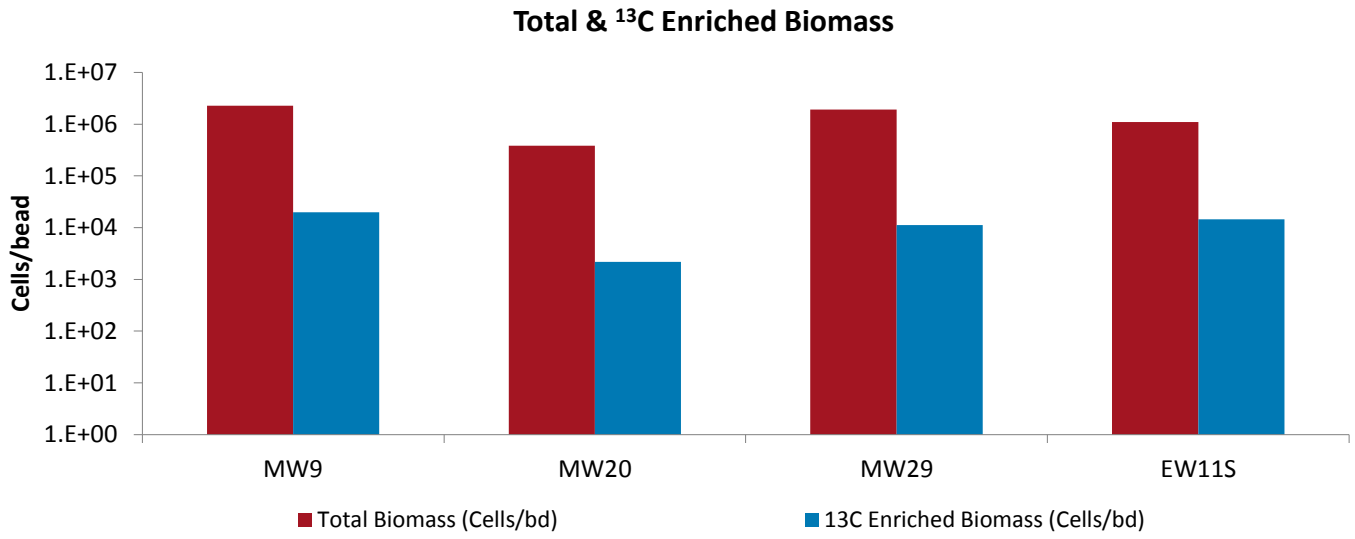

Figure 1. Biomass content is presented as a cell equivalent based on the total amount of phospholipid fatty acids (PLFA) extracted from a given sample. Total biomass is calculated based upon PLFA attributed to bacterial and eukaryotic biomass (associated with higher organisms).

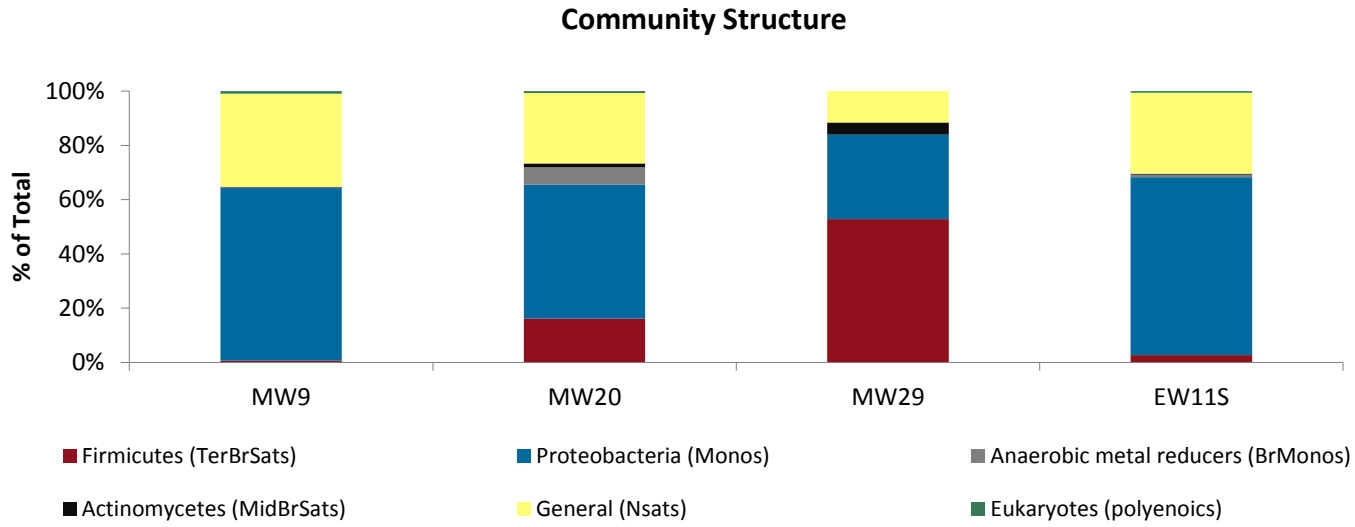

Figure 2. Relative percentages of total PLFA structural groups in the samples analyzed. Structural groups are assigned according to PLFA chemical structure, which is related to fatty acid biosynthesis. See the table in the interpretation section for detailed descriptions of the structural groups.

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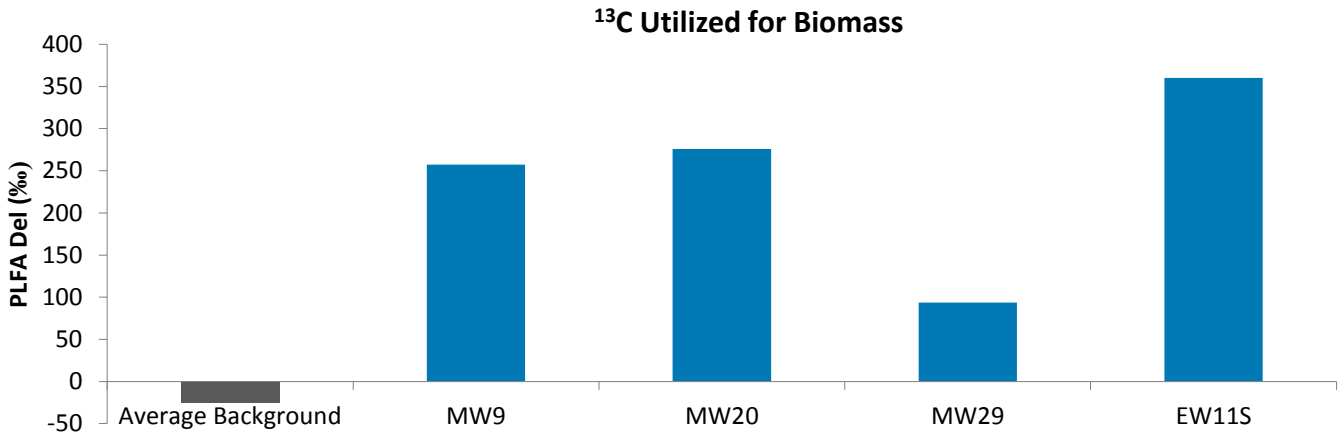

Figure 3. Comparison of the average Del value obtained from PLFA biomarkers from each Bio-Trap® unit to the average background Del observed in samples not exposed to ^{13}C enriched compounds.

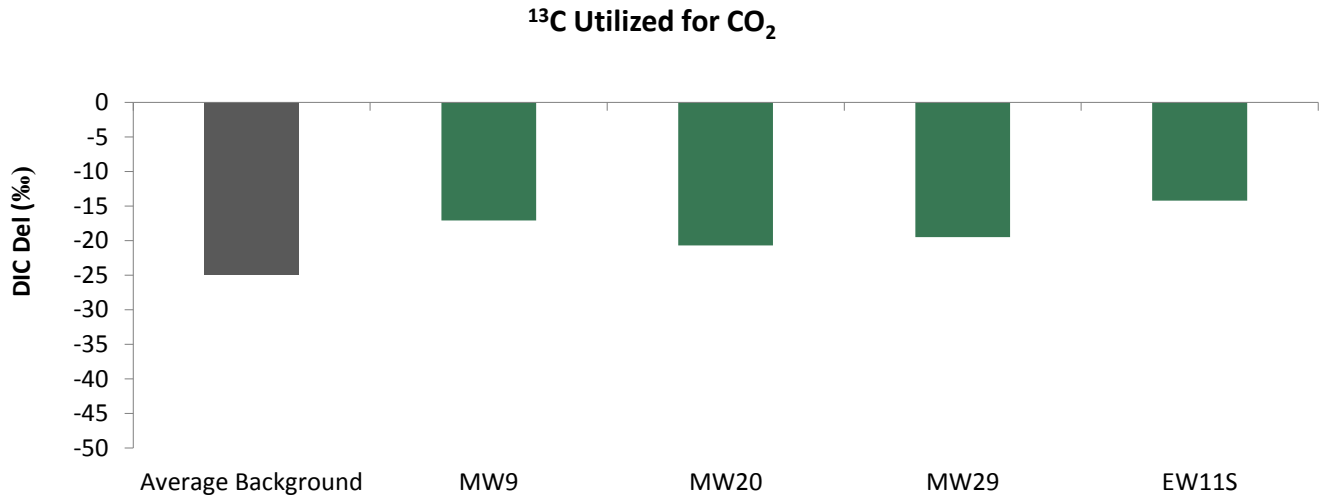

Figure 4. Comparison of the Del value obtained from DIC from each Bio-Trap® unit to the average background Del observed in samples not exposed to ^{13}C enriched compounds.

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Interpretation

Interpretation of the results of the SIP Bio-Trap® study must be performed with due consideration of site conditions, site activities, and the desired treatment mechanism. The following discussion describes interpretation of results in general terms and is meant to serve as a guide.

Contaminant Concentration: Bio-Traps® are baited with a ^{13}C labeled contaminant of concern and a pre-deployment concentration is determined prior to shipping. Following deployment, Bio-Traps® are recovered for analysis including measurement of the concentration of the ^{13}C labeled contaminant remaining. Pre- and post-deployment concentrations are used to calculate percent loss.

Biomass Concentrations: PLFA analysis is one of the most reliable and accurate methods available for the determination of viable (live) biomass. Phospholipids break down rapidly upon cell death, so biomass calculations based on PLFA content do not include "fossil" lipids from dead cells. Total biomass (cells/bead) is calculated from total PLFA using a conversion factor of 20,000 cells/pmole of PLFA. When making comparisons between wells, treatments, or over time, differences of one order of magnitude or more are considered significant.

Total Biomass		
Low	**Moderate**	**High**
10^3 to 10^4 cells	10^5 to 10^6 cells	10^7 to 10^8 cells

For SIP studies, the ^{13}C enriched PLFA is also determined to conclusively demonstrate contaminant biodegradation and quantify incorporation into biomass as a result of the ^{13}C being used for cellular growth. The % ^{13}C incorporation (^{13}C enriched biomass/total biomass) is also provided in the data summary table, but the value must be interpreted carefully especially when comparing wells or treatments. Typically, biodegradation of a contaminant of concern is performed by a small subset of the total microbial community. For Bio-Traps® with large total biomass, the % ^{13}C incorporation value could be low despite significant ^{13}C labeled biomass and loss of the compound. The % ^{13}C incorporation should be viewed in light of total biomass, percent loss, and dissolved inorganic carbon (DIC) results.

^{13}C enrichment data is often reported as a del value. The del value is the difference between the isotopic ratio ($^{13}C/^{12}C$) of the sample (R_x) and a standard (R_{std}) normalized to the isotopic ratio of the standard (R_{std}) and multiplied by 1,000 (units are parts per thousand, denoted ‰).

R_{std} is the naturally occurring isotopic ratio and is approximately 0.011180 (roughly 1% of naturally occurring carbon is ^{13}C). The isotopic ratio, R_x, of PLFA is typically less than the R_{std} under natural conditions, resulting in a del value between -20 and -30‰. For a SIP Bio-Trap® study, biodegradation and incorporation of the ^{13}C labeled compound into PLFA results in a larger $^{13}C/^{12}C$ ratio (R_x) and thus del values greater than under natural conditions. Typical PLFA del values are provided below.

PLFA Del (‰)		
Low	**Moderate**	**High**
0 to 100	100 to 1,000	>1,000

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Dissolved Inorganic Carbon (DIC): Often, bacteria can utilize the ^{13}C labeled compound as both a carbon and energy source. The ^{13}C portion used as a carbon source for growth can be incorporated into PLFA as discussed above, while the ^{13}C used for energy is oxidized to $^{13}CO_2$ (mineralized).

^{13}C enriched CO_2 data is often reported as a del value as described above for PLFA. Under natural conditions, the R_x of CO_2 is approximately the same as R_{std} (0.01118 or about 1.1% ^{13}C). For an SIP Bio-Trap® study, mineralization of the ^{13}C labeled contaminant of concern would lead to a greater value of R_x (increased $^{13}CO_2$ production) and thus a positive del value. As with PLFA, del values between 0 and 100‰ are considered low, values between 100 and 1,000‰ are considered moderate, and values greater than 1,000‰ are considered high. Thus DIC $\%^{13}C$ are considered low if the value is less than 1.23%, moderate if between 1.23 and 2.24%, and high if greater than 2.24%.

Dissolved Inorganic Carbon (DIC) Del and $\%^{13}C$		
Low	**Moderate**	**High**
0 to 100	100 to 1,000	>1,000
1.11 to 1.23%	1.23 to 2.24%	>2.24%

Community Structure (% total PLFA): Community structure data is presented as a percentage of PLFA structural groups normalized to the total PLFA biomass. The relative proportions of the PLFA structural groups provide a "fingerprint" of the types of microbial groups (e.g. anaerobes, sulfate reducers, etc.) present and therefore offer insight into the dominant metabolic processes occurring at the sample location. Thorough interpretation of the PLFA structural groups depends in part on an understanding of site conditions and the desired microbial biodegradation pathways. For example, an increase in mid chain branched saturated PLFA (MidBrSats), indicative of sulfate reducing bacteria (SRB) and *Actinomycetes*, may be desirable at a site where anaerobic BTEX biodegradation is the treatment mechanism, but would not be desirable for a corrective action promoting aerobic BTEX or MTBE biodegradation. The following table provides a brief summary of each PLFA structural group and its potential relevance to bioremediation.

Table 2. Description of PLFA structural groups.

PLFA Structural Group	General classification	Potential Relevance to Bioremediation Studies
Monoenoic (Monos)	Abundant in Proteobacteria (Gram negative bacteria), typically fast growing, utilize many carbon sources, and adapt quickly to a variety of environments.	Proteobacteria is one of the largest groups of bacteria and represents a wide variety of both aerobes and anaerobes. The majority of Hydrocarbon utilizing bacteria fall within the Proteobacteria
Terminally Branched Saturated (TerBrSats)	Characteristic of Firmicutes (Low G+C Gram-positive bacteria), and also found in Bacteriodes, and some Gram-negative bacteria (especially anaerobes).	Firmicutes are indicative of presence of anaerobic fermenting bacteria (mainly *Clostridia/Bacteriodes*-like), which produce the H_2 necessary for reductive dechlorination
Branched Monoenoic (BrMonos)	Found in the cell membranes of micro-aerophiles and anaerobes, such as sulfate- or iron-reducing bacteria	In contaminated environments high proportions are often associated with anaerobic sulfate and iron reducing bacteria
Mid-Chain Branched Saturated (MidBrSats)	Common in sulfate reducing bacteria and also Actinobacteria (High G+C Gram-positive bacteria).	In contaminated environments high proportions are often associated with anaerobic sulfate and iron reducing bacteria
Normal Saturated (Nsats)	Found in all organisms.	High proportions often indicate less diverse populations.
Polyenoic	Found in eukaryotes such as fungi, protozoa, algae, higher plants, and animals.	Eukaryotic scavengers will often rise up and prey on contaminant utilizing bacteria

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Physiological Status (*Proteobacteria*): Some *Proteobacteria* modify specific PLFA as a strategy to adapt to stressful environmental conditions (3, 4). For example, *cis* monounsaturated fatty acids may be modified to cyclopropyl fatty acids during periods of slowed growth or modified to *trans* monounsaturated fatty acids to decrease membrane permeability in response to environmental stress. The ratio of product to substrate fatty acid thus provides an index of their health and metabolic activity. In general, status ratios greater than 0.25 indicate a response to unfavorable environmental conditions.

Glossary

Del: A Del value is the difference between the isotopic ratio ($^{13}C/^{12}C$) of the sample (R_x) and a standard (R_{std}) normalized to the isotopic ratio of the standard (R_{std}) and multiplied by 1,000 (units are parts per thousand denoted ‰).

$$Del = (R_x - R_{std})/R_{std} \times 1000$$

References

1. White, D.C., W.M. Davis, J.S. Nickels, J.D. King, and R.J. Bobbie. 1979. Determination of the sedimentary microbial biomass by extractable lipid phosphate. Oecologia 40:51-62.
2. White, D.C. and D.B. Ringelberg. 1995. Utility of signature lipid biomarker analysis in determining in situ viable biomass. In P.S. Amy and D.L. Halderman (eds.) The microbiology of the terrestrial surface. CRC Press, Boca Raton.
3. Guckert, J.B., M.A. Hood, and D.C. White. 1986. Phospholipid ester-linked fatty acid profile changes during nutrient deprivation of *Vibrio chloerae*: increases in the trans/cis ratio and proportions of cyclopropyl fatty acids. Applied and Environmental Microbiology. 52:794-801.
4. Tsitko, I.V., G. M. Zaitsev, A. G. Lobanok, and M.S. Salkinoja-Salonen. 1999. Effect of aromatic compounds on cellular fatty acid composition of *Rhodococcus opacus*. Applied and Environmental Microbiology. 65:853-855.

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Phospholipid Fatty Acid Analysis

Interpretation Guidelines

Phospholipids fatty acids (PLFA) are a main component of the membrane (essentially the "skin") of microbes and provide a powerful tool for assessing microbial responses to changes in their environment. This type of analysis provides direct information for assessing and monitoring sites where bioremediation processes, including natural attenuation, are of interest. Analysis of the types and amount of PLFA provides a broad based understanding of the entire microbial community with information obtained in three key areas viable biomass, community structure and metabolic activity.

What is the detection limit for PLFA?

Our limit of detection for PLFA analysis is ~150 picomoles of total PLFA and our limit of quantification is ~500 picomoles of total PLFA. Samples which contain PLFA amounts at or below 150 pmol cannot be used to determine biomass, likewise samples with PLFA content below ~500 pmol are generally considered to contain too few fatty acids to discuss community composition.

How should I interpret the PLFA results?

Interpreting the results obtained from PLFA analysis can be somewhat difficult, so this document was designed to provide a technical guideline. For convenience, this guideline has been divided into the three key areas.

Viable Biomass

PLFA analysis is one of the most reliable and accurate methods available for the determination of viable microbial biomass. Phospholipids break down rapidly upon cell death (21, 23), so biomass calculations based on PLFA content do not contain 'fossil' lipids of dead cells.

How is biomass measured?

Viable biomass is determined from the total amount of PLFA detected in a given sample. Since, phospholipids are an essential part of intact cell membranes they provide an accurate measure of viable cells.

How is biomass calculated?

Biomass levels are reported as cells per gram, mL or bead, and are calculated using a conversion factor of 20,000 cells/pmole of PLFA. This conversation factor is based upon cells grown in laboratory media, and varies somewhat with the type of organism and environmental conditions.

What does the concentration of biomass mean?

The overall abundance of microbes within a given sample is often used as an indicator of the potential for bioremediation to occur, but understanding the levels of biomass within each sample can be cumbersome. The following are benchmarks that can be used to understand whether the biomass levels are low, moderate or high.

Low	Moderate	High
10^3 to 10^4 cells	10^5 to 10^6 cells	10^7 to 10^8 cells

How do I know if a change in biomass is significant?

One of the primary functions of using PLFA analysis at contaminated sites is to evaluate how a community responds following a given treatment, but how does one know if the changes observed between two events are significant? As a general rule, biomass levels which increase or decrease by at least an order of magnitude are considered to be significant. However, changes in biomass levels of less than an order of magnitude may still show a trend. It is important to remember that many factors can affect microbial growth, so factors other than the treatment could be influencing the changes observed between sampling events. Some of the factors to consider are: temperature, moisture, pH, etc. The following illustration depicts three types of changes that occurred over time and the conclusions that could be drawn.

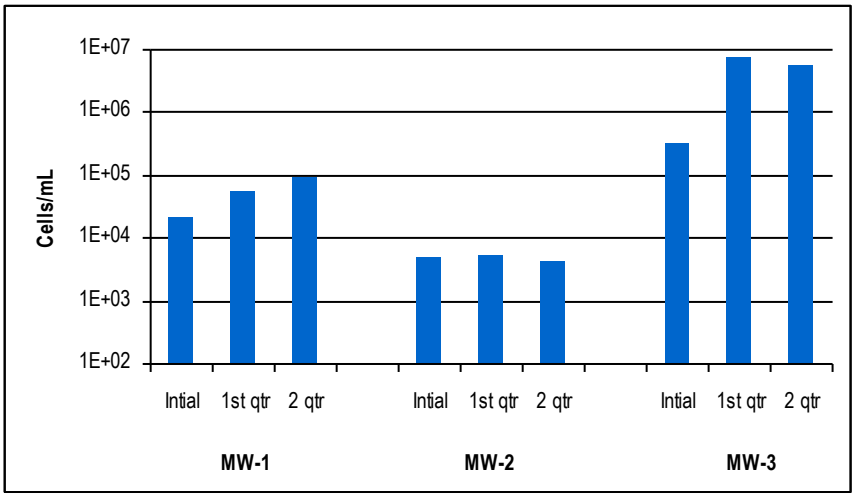

Figure 1. Biomass content is presented as a cell equivalent based on the total amount of phospholipid fatty acids (PLFA) extracted from a given sample. Total biomass is calculated based upon PLFA attributed to bacterial and eukaryotic biomass (associated with higher organisms).

Conclusions from graph above:

- MW-1 showed a trend of biomass levels increasing steadily over time, although cell concentrations were ~10^4 cells/mL at each sampling event.
- MW-2 showed no notable trends or significant changes in biomass concentrations.
- MW-3 showed a significant increase in biomass levels between the initial and 1st quarter sampling events (from ~10^5 to ~10^6 cells/mL).

Community Structure:

The PLFA in a sample can be separated into particular types, and the resulting PLFA "profile" reflects the proportions of the categories of organisms present in the sample. Because groups of bacteria differ in their metabolic capabilities, determining which bacterial groups are present and their relative distributions within the community can provide information on what metabolic processes are occurring at that location. This in turn can also provide information on the subsurface conditions (i.e oxidation/reduction status, etc.). Table 1 describes the six major structural groups used and their potential relevance to site specific projects.

Table 1. Description of PLFA structural groups.

PLFA Structural Group	General classification	Potential Relevance to Bioremediation Studies
Monoenoic (Monos)	Abundant in Proteobacteria (Gram negative bacteria), typically fast growing, utilize many carbon sources, and adapt quickly to a variety of environments.	Proteobacteria is one of the largest groups of bacteria and represents a wide variety of both aerobes and anaerobes. The majority of Hydrocarbon utilizing bacteria fall within the Proteobacteria
Terminally Branched Saturated (TerBrSats)	Characteristic of Firmicutes (Low G+C Gram-positive bacteria), and also found in Bacteriodes, and some Gram-negative bacteria (especially anaerobes).	Firmicutes are indicative of presence of anaerobic fermenting bacteria (mainly *Clostridia/Bacteriodes*-like), which produce the H_2 necessary for reductive dechlorination
Branched Monoenoic (BrMonos)	Found in the cell membranes of micro-aerophiles and anaerobes, such as sulfate- or iron-reducing bacteria	In contaminated environments high proportions are often associated with anaerobic sulfate and iron reducing bacteria
Mid-Chain Branched Saturated (MidBrSats)	Common in sulfate reducing bacteria and also Actinobacteria (High G+C Gram-positive bacteria).	In contaminated environments high proportions are often associated with anaerobic sulfate and iron reducing bacteria
Normal Saturated (Nsats)	Found in all organisms.	High proportions often indicate less diverse populations.
Polyenoic	Found in eukaryotes such as fungi, protozoa, algae, higher plants, and animals.	Eukaryotic scavengers will often rise up and prey on contaminant utilizing bacteria

Following are answers to some of the common questions about community composition and some detailed descriptions of some typical shifts which can be observed between sampling events.

How is the community structure data presented?

Community structure data is presented as percentage (%) of the total amount of PLFA. In order to relate the complex mixture of PLFA to the organisms present, the ratio of a specific PLFA group is determined (detailed in Table 1 above), and this corresponds to the proportion of the related bacterial classification within the overall community structure. Because normal saturated PLFA are found in both prokaryotes (bacteria) and eukaryotes (fungi, protozoa, diatoms etc), their distribution provides little insight into the types of microbes that are present at a sampling location. However, high proportions of normal saturates are often associated with less diverse microbial populations.

How can community structure data be used to manage my site?

It is important to understand that microbial communities are often a mixture of different types of bacteria (e.g. aerobes, sulfate reducers, methanogens, etc) with the abundance of each group behaving like a seesaw, i.e. as the population of one group increases, another is likely decreasing, mostly due to competition for available resources. The PLFA profile of a sample provides a "fingerprint" of the microbial community, showing relative proportions of the specific bacterial types at the time of sampling. This is a great tool for detecting shifts within the community over time and also to evaluate similarities/differences between sampling locations. It is important to note that PLFA analysis of community structure is analyzing the microbes directly, not just secondary breakdown products. So this provides evidence of how the entire microbial community is responding to the treatment.

How do I recognize community shifts and what they mean?

Shifts in the community structure are indications of changing conditions and their effect on the microbial community, and, by extension on the metabolic processes occurring at the sampling location. Some of the more commonly seen shifts within the community are illustrated and discussed below:

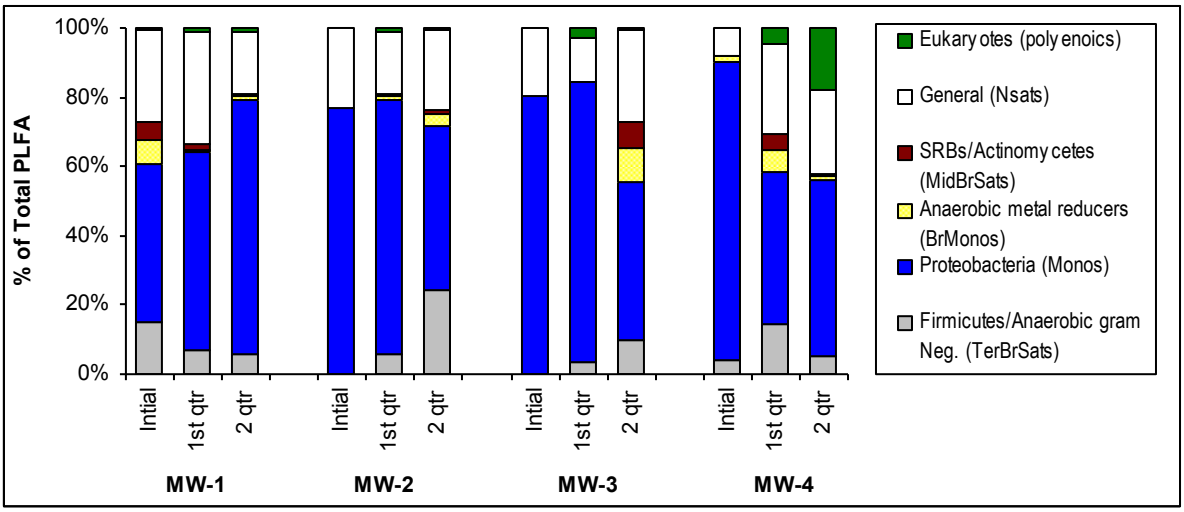

Figure 2. Relative percentages of total PLFA structural groups in the samples analyzed. Structural groups are assigned according to PLFA chemical structure, which is related to fatty acid biosynthesis. See Table 1 for detailed descriptions of structural groups.

- **Increased Proteobacteria**

Proportions of Proteobacteria are of interest because it is one of the largest groups of bacteria and represents a wide variety of both aerobe and anaerobes. The majority of hydrocarbons (including benzene and naphthalene) are metabolized by some member of Proteobacteria, mainly due to their ability to grow opportunistically, quickly taking advantage of available food (i.e. hydrocarbons), and adapting quickly to changes in the environment. The detection of increased proportions of Proteobacteria coupled with increased biomass suggests that the Proteobacteria are consuming something. In situations where it is important to determine the extent to which the Proteobacteria are utilizing anaerobic or aerobic pathways, it is possible to measure relative proportions of specific biomarkers that are associated with anaerobic or aerobic pathways thus separating the Proteobacteria into different groups, based on pathways used. Sample MW-1 from Figure 2 depicts a shift in community structure where the proportion of Proteobacteria has increased over time.

- **Increased Firmicutes/Anaerobic Gram negative bacteria**

Increased proportions of Firmicutes/Anaerobic Gram negative bacteria generally indicate that conditions are becoming more reductive (i.e. more anaerobic). Proportions of Firmicutes are of particular interest in sites contaminated with chlorinated hydrocarbons because Firmicutes include anaerobic fermenting bacteria (mainly *Clostridia/Bacteriodes*-like), which produce the H_2 necessary for reductive dechlorination.

Enhanced bioremediation of chlorinated solvents often employs the injection of fermentable substrates which, when utilized by fermenting bacteria, results in the release of H_2. Engineered shifts in the microbial community can be shown by observing increased proportions Firmicutes following an injection of fermentable substrate. Through long-term monitoring of the community structure it is possible to know when re-injection may be necessary or desirable. Sample MW-2 from Figure 2 depicts a shift in community structure where the proportion of Firmicutes has increased over time.

- **Increased anaerobic metal reducing bacteria (BrMonos) and SRB/Actinomycetes (MidBrSats)**

An increase in the proportions of metal and sulfate reducing bacterial groups, especially when combined with shifts in the other bacterial groups, can provide information helpful to monitoring bioremediation. Generally, an increase in metal and sulfate reducers points to more reduced (anaerobic) conditions at the sampled location. This is especially true if there is an increase in Firmicutes at the same time. Large increases in either metal and sulfate reducers, particularly if accompanied by a decrease in Firmicutes, may suggest that conditions are becoming increasingly reduced. In this situation the metal and sulfate reducers may be out-competing dechlorinators for available H_2, thereby limiting the potential for reductive dechlorination at that location. Sample MW-3 from Figure 2 depicts a shift in community structure where the proportion of metal reducing bacteria has increased over time.

- **Increased Eukaryotes**

Eukaryotes include organisms such as fungi, protozoa, and diatoms. At a contaminated location, an increase in eukaryotes, particularly if seen with a decrease in the contaminant utilizing bacteria, suggests that eukaryotic scavengers are preying upon what had been an abundance of bacteria which were consuming the contaminant. Sample MW-4 from Figure 2 depicts a shift in community structure where the proportion of eukaryotes has increased over time.

Physiological status of Proteobacteria

The membrane of a microbe adapts to the changing conditions of its environment, and these changes are reflected in the PLFA. Toxic compounds or environmental conditions may disrupt the membrane and some bacteria respond by making *trans* fatty acids instead of the usual *cis* fatty acids (7) in order to strengthen the cell membrane, making it less permeable. Many Proteobacteria respond to lack of available substrate or to highly toxic conditions by making cyclopropyl (7) or mid-chain branched fatty acids (20) which point to less energy expenditure and a slowed growth rate. The physiological status ratios for Decreased Permeability (trans/cis ratio) and for Slowed Growth (cy/cis ratio) are based on dividing the amount of the fatty acid induced by environmental conditions by the amount of its biosynthetic precursor.

What does slowed growth or decreased permeability mean?

Ratios for slowed growth and for decreased permeability of the cell membrane provide information on the "health" of the Gram negative community, that is, how this population is responding to the conditions present in the environment. It should be noted that one must be cautious when interpreting these measures from only one sampling event. The most effective way to use the physiological status indicators is in long term monitoring and comparing how these ratios increase/decrease over time.

A marked increase in either of these ratios suggests a change in environment which is less favorable to the Gram negative Proteobacteria population. The ratio for slowed growth is a relative measure, and does not directly correspond to log or stationary phases of growth, but is useful as a comparison of growth rates among sampling locations and also over time. An increase in this ratio (i.e. slower growth rate) suggests a change in conditions which is not as supportive of rapid, "healthy" growth of the Gram negative population, often due to reduced available substrate (food). A larger ratio for decreased permeability suggests that the environment has become more toxic to the Gram negative population, requiring energy expenditure to produce *trans* fatty acids in order to make the membrane more rigid.

References

1. Amann, R. I., W. Ludwig, and K.-H. Schleifer. 1995. Phylogenetic identification and in situ detection of individual microbial cells without cultivation. Microbiological Reviews 59:143-169.
2. Cottrell, MT and David L. Kirchman. Appl Environ Microbiol. 2000 April; 66 (4): 16921697.
3. Gillis, M., V. Tran Van, R. Bardin, M. Goor, P. Hebbar, A. Willems, P. Segers, K. Kerstens, T. Heulin, and M. P. Fernadez. 1995. Polyphasic taxonomy in the genus Burkholderia leading to an amended description of the genus and proposition of Burkholderia vietnamiensis sp. nov. for N2-fixing isolates from rice in Vietnam. Int. J. Syst. Bacteriol. 45:274-289.
4. Dowling, N. J. E., F. Widdel, and D. C. White. 1986. Phospholipid ester-linked fatty acid biomarkers of acetate-oxidizing sulfate reducers and other sulfide forming bacteria. Journal of General Microbiology 132:1815-1825.
5. Edlund, A., P. D. Nichols, R. Roffey, and D. C. White. 1985. Extractable and lipopolysaccharide fatty acid and hydroxy acid profiles from Desulfovibrio species. Journal of Lipid Research 26:982-988.
6. Guckert, J. B., C. P. Antworth, P. D. Nichols, and D. C. White. 1985. Phospholipid ester-linked fatty acid profiles as reproducible assays for changes in prokaryotic community structure of estuarine sediments. FEMS Microbiol. Ecol. 31:147-158.
7. Guckert, J. B., M. A. Hood, and D. C. White. 1986. Phospholipid ester-linked fatty acid profile changes during nutrient deprivation of Vibrio cholerae: increases in the trans/cis ratio and proportions of cyclopropyl fatty acids. Appl. Environ. Microbiol. 52:794–801.
8. Hedrick, D.B., A Peacock, J.R. Stephen, S.J. Macnaughton, Julia Brüggemann, and David C. White. 2000. Measuring soil microbial community diversity using polar lipid fatty acid and denatured gradient gel electrophoresis data. J. Microbiol. Methods, 41, 235-248.
9. ITRC Internet Training on Natural Attenuation of Chlorinated Solvents in Groundwater: Principles and Practices, Apr 00.
10. Löffler, F. E., Q. Sun, et al. (2000). "16S rRNA gene-based detection of tetrachloroethene-dechlorinating Desulfuromonas and Dehalococcoides species." Appl Environ Microbiol 66(4): 1369-1374.
11. Maymo-Gatell X, Chien Y, Gossett JM, Zinder SH. 1997. Isolation of a bacterium that reductively dechlorinates tetrachloroethene to ethene. Science 276(5318):1568-71.
12. Muyzer, G., E. C. De Waal, and A. G. Uitterlinden. 1993. Profiling of complex microbial populations by denaturing gradient gel electrophoresis analysis of polymerase chain reaction-amplified genes coding for 16S rRNA. Applied and Environmental Microbiology 59:695-700.
13. Ribosomal Database Project (http://rdp.cme.msu.edu. National Center for Biotechnology Information. (http://www.ncbi.nlm.nih.gov/)
14. Overman, J., "Family Chlorobiaceae," in M. Dworkin et al., eds., The Prokaryotes: An Evolving Electronic Resource for the Microbiological Community, 3rd edition, release 3.7, November 2, 2001, Springer-Verlag, New York, www.prokaryotes.com.
15. Ringelberg, D. B., G. T. Townsend, K. A. DeWeerd, J. M. Sulita, and D. C. White. 1994. Detection of the anaerobic dechlorinating microorganism Desulfomonile tiedjei in environmental matrices by its signature lipopolysaccharide branch-long-chain hydroxy fatty acids. FEMS Microbiol. Ecol. 14:9-18.
16. Schlötelburg, C. 2001. Mikrobielle Diversität und Dynamik einer 1,2-Dichlorpropan dechlorierenden Mischkultur (Microbial Diversity and Dynamics in a 1,2-Dichloropropane Dechlorinating Mixed Culture). Dissertation, Humbolt University, Berlin, Germany. In German: http://edoc.hu-berlin.de/dissertationen/schloetelburg-cord-2001-12-07/PDF/Schloetelburg.pdf
17. Sharp, R., D. Cossar, and R. Williams. 1995. Physiology and metabolism of Thermus. Biotechnol. Handb. 9:67-91.
18. Stephen, J. R., Y.-J. Chang, Y. D. Gan, A. Peacock, S. Pfiffner, M. Barcelona, D. C. White, and S. J. Macnaughton. 1999. Microbial characterization of a JP-4 fuel-contaminated site using a combined lipid biomarker/polymerase chain reaction-denaturing gradient gel electrophoresis (PCR-DGGE) based approach. Environmental Microbiology 1:231-241.
19. Tighe, S.W., de Lajudie, P., Dipietro, K., Lindström, K., Nick, G. & Jarvis, B.D.W. (2000). Analysis of cellular fatty acids and phenotypic relationships of Agrobacterium, Bradyrhizobium, Mesorhizobium, Rhizobium and Sinorhizobium species using the Sherlock Microbial Identification System. Int J Syst Evol Microbiol 50, 787-801.
20. Tsitko, I.V. Gennadi M. Zaitsev, Anatoli G. Lobanok, and Mirja S. Salkinoja-Salonen. 1999. Applied and Environmental Microbiology 65(2) 853-855.
21. White, D. C., W. M. Davis, J. S. Nickels, J. D. King, and R. J. Bobbie. 1979. Determination of the sedimentary microbial biomass by extractable lipid phosphate. Oecologia 40:51-62.
22. White, D. C., H. C. Pinkart, and D. B. Ringelberg. 1997. Biomass measurements: Biochemical approaches, p. 91-101. In C. J. Hurst, G. R. Knudsen, M. J. McInerney, L. D. Stetzenbach, and M. V. Walter (ed.), Manual of Environmental Microbiology. ASM Press, Washington.
23. White, D. C., and D. B. Ringelberg. 1995. Utility of signature lipid biomarker analysis in determining in situ viable biomass, community structure, and nutritional / physiological status of the deep subsurface microbiota. In P. S. Amy and D. L. Halderman (ed.), The microbiology of the terrestrial subsurface. CRC Press, Boca Raton.
24. White, D. C., J. O. Stair, and D. B. Ringelberg. 1996. Quantitative comparisons of in situ microbial biodiversity by signature biomarker analysis. Journal of Industrial Microbiology 17:185-196.
25. Vandamme P, Pot B, Gillis M, de Vos P, Kersters K, Swings J. Polyphasic taxonomy, a consensus approach to bacterial systematics. Microbiol Rev 1996 Jun;60(2):407-38.

REPORT TO:

Reports will be provided to the contact(s) listed below. Parties other than the contact(s) listed below will require prior approval.

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Project Name:	PentaWood
Project No.:	068165-03

INVOICE TO:

For Invoices **paid by a third party** it is imperative that contact information & corresponding reference No. be provided.

Name:	grant.anderson@ghd.com
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Address:	
email:	
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Fax:	
Purchase Order No.	
Subcontract No.	
MI Quote No.	

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Please Check One:

☐ More samples to follow

☒ No Additional Samples

Saturday Delivery

Please see sampling protocol for instructions

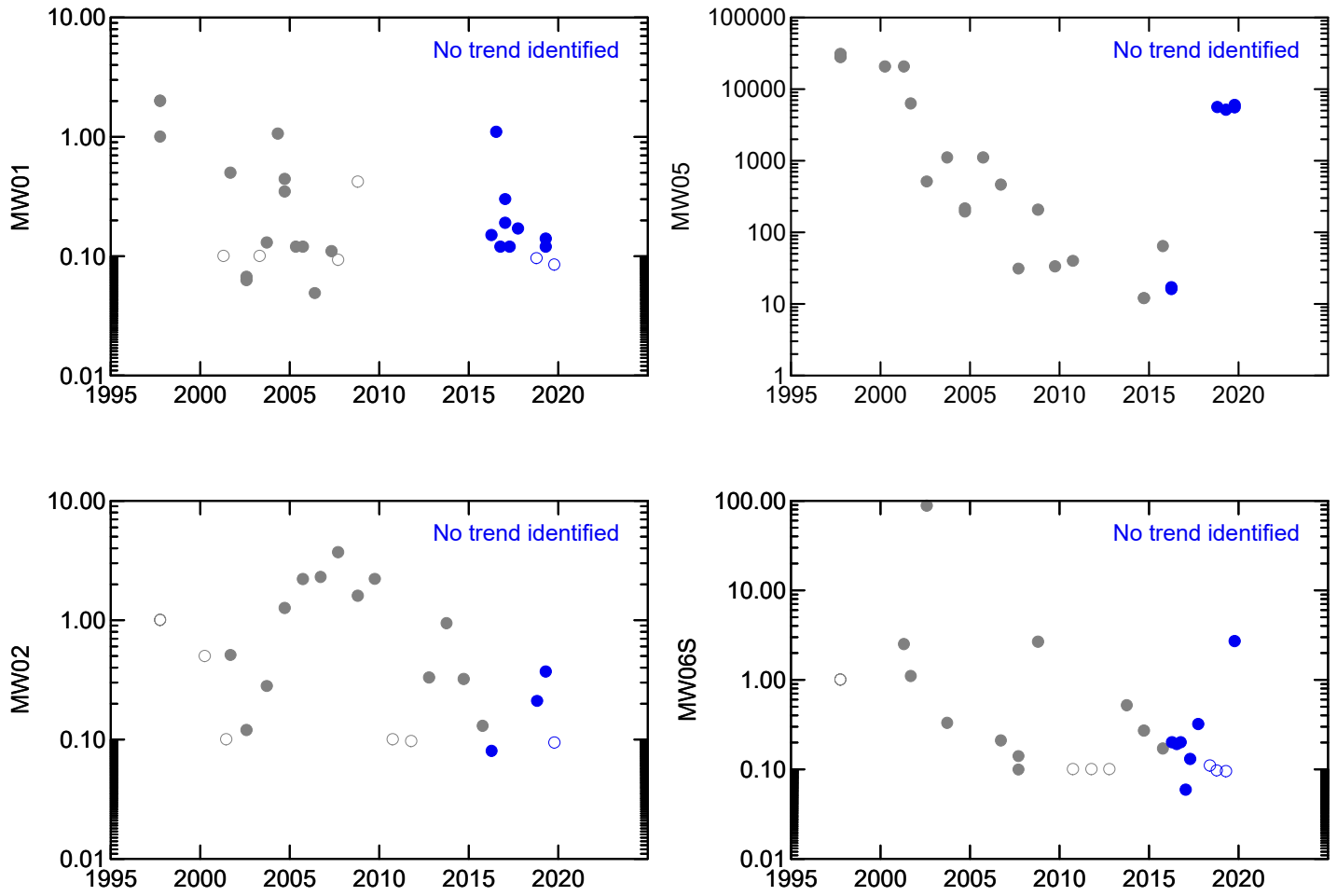
Please contact us prior to submitting samples regarding questions about the analyses you are requesting at (865) 573-8188 (8:00 am to 4:00 pm M-F). After these hours please email customerservice@microbe.com.

Sample Information					A					CENSUS: Please select the target organism/gene																						
MI ID (Laboratory Use Only)	Sample Name	13C Compound	Date Sampled	Matrix	PLFA + SIP	DIC	13C Compound Concentration		QuantArray-Petro	EBAC (Total)	APS (Sulfate Reducing Bacteria)	MGN (Methanogens)	MOB (Methanotrophs)	SMMO	DNF (Dentrifiers-nirS and nirK)	AOB (ammonia oxidizing bacteria)	PM1 (MTBE aerobic)	RMO (Toluene Monooxygenase)	RDEG (Toluene Monooxygenase)	PHE (Phenol Hydroxylase)	NAH (Napthalene-aerobic)	BSSA (Benzyl Succinate Synthase)	abcA (Benzene Carboxylase)	BCR (Benzoyl coenzyme A reductase)	NAH (Napthalene aerobic)	add. qPCR:	add. qPCR:	add. qPCR:	add. qPCR:	RNA (Expression Option)*	Other:	Other:	Other:
079NE1	MW9	PCP		SIP	X	X	X																									
2	MW20	PCP		SIP	X	X	X																									
3	MW29	PCP		SIP	X	X	X																									
4	EW11S	PCP		SIP	X	X	X																									

Relinquished by: (Peter Storlie. 5/22/16 - 1700) Received by: Date 5/24/16

In order for analysis to be completed correctly, it is vital that chain of custody is filled out correctly & that all relative information is provided. Failure to provide sufficient and/or correct information regarding reporting, invoicing & analyses requested information may result in delays for which MI will not be liable. * additional cost and sample preservation are associated with RNA samples.

Appendix G
Groundwater Concentration Trend Plots

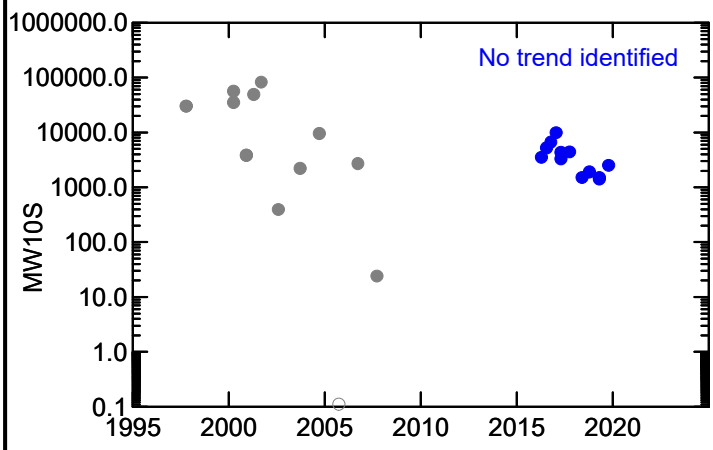


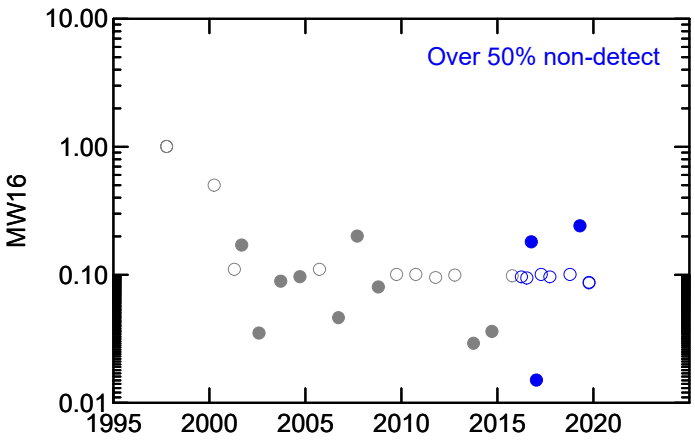
Legend:
- Detected result (Historical period)
- Non-detect (plotted at detection limit)
- Detected result (Post-shutdown period)
- Non-detect (plotted at detection limit)

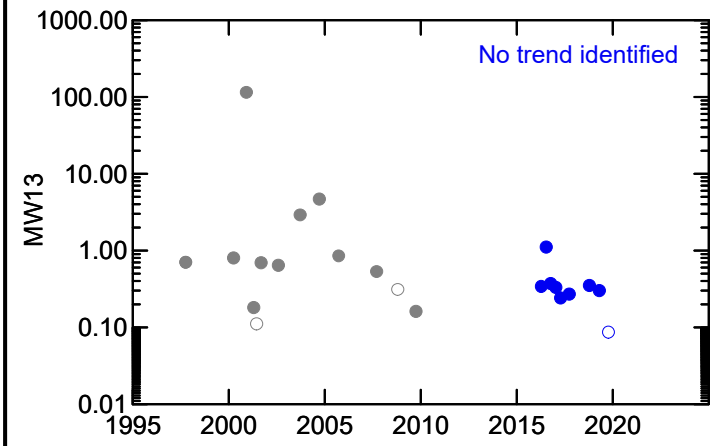
Notes:
1) Non-detects with detection limits above detected values were excluded from trends.
2) Trend analysis results are reported for the post-shutdown period.

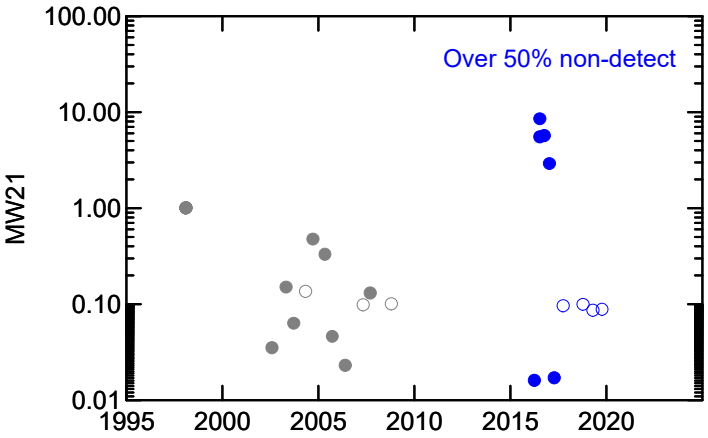
figure 1

UNCONFINED (UPPER) AQUIFER
PENTACHLOROPHENOL (µg/L) vs. TIME
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin







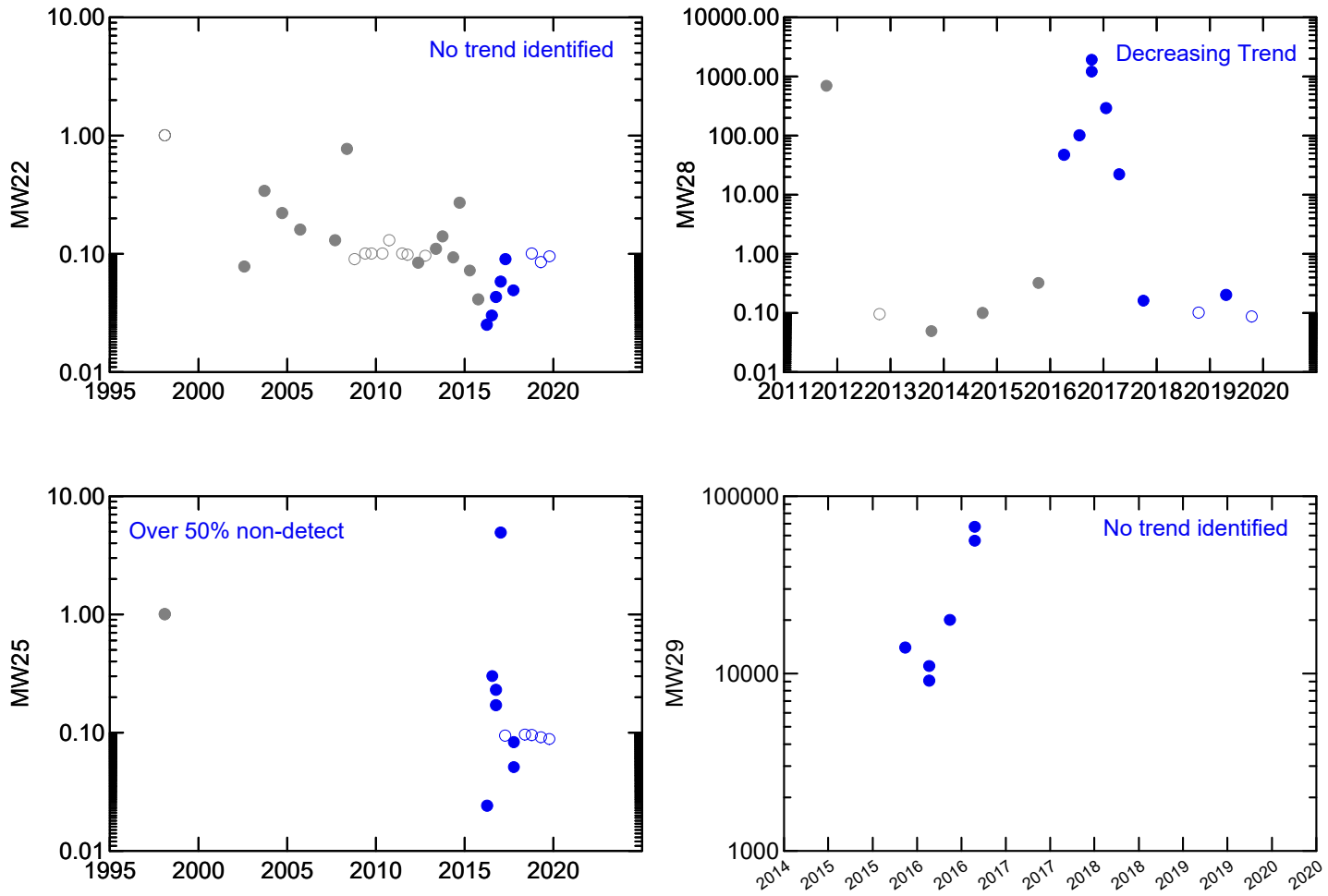


Legend:
- Detected result (Historical period)
- Non-detect (plotted at detection limit)
- Detected result (Post-shutdown period)
- Non-detect (plotted at detection limit)

Notes:
1) Non-detects with detection limits above detected values were excluded from trends.
2) Trend analysis results are reported for the post-shutdown period.

figure 2

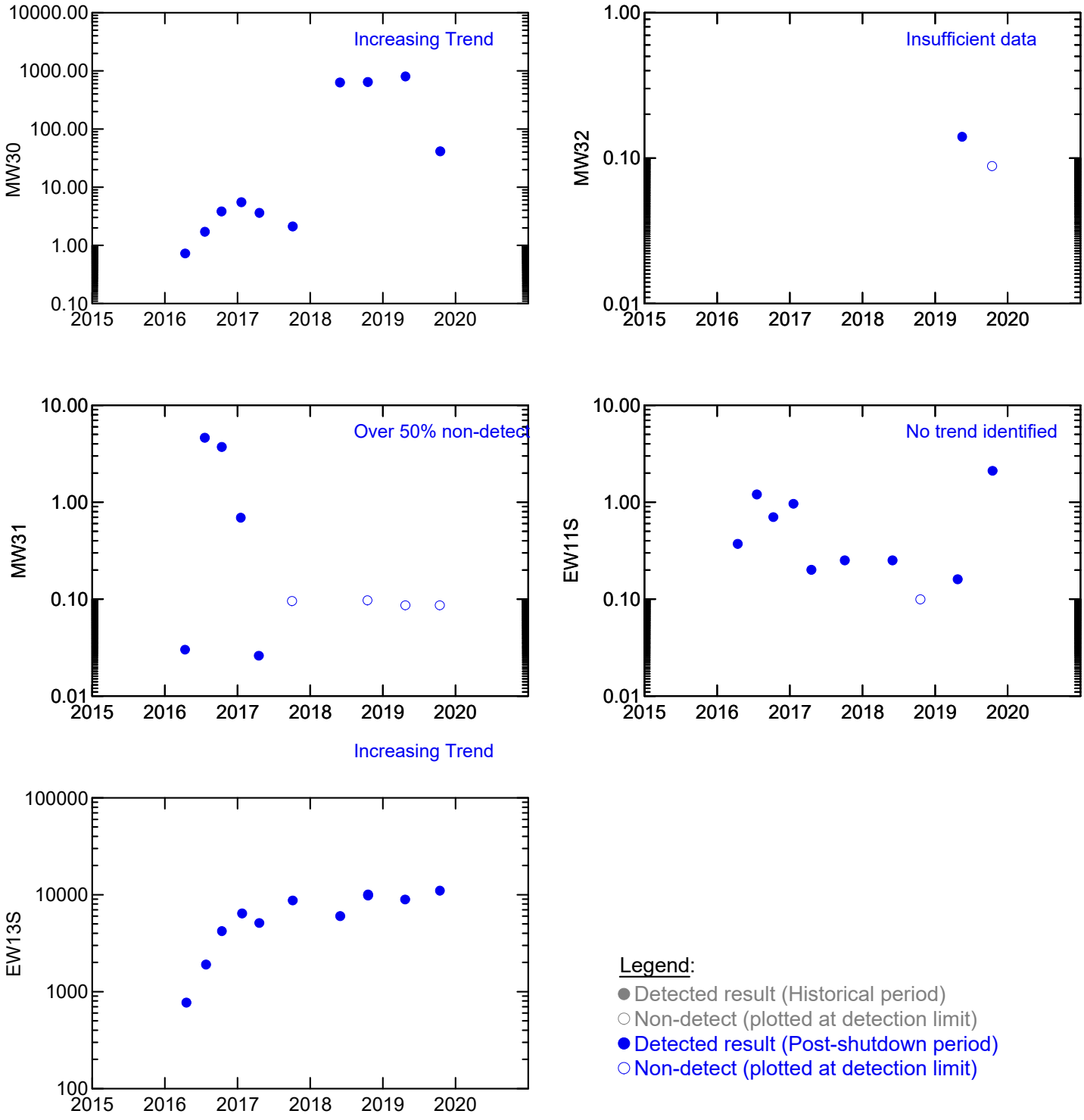
UNCONFINED (UPPER) AQUIFER
PENTACHLOROPHENOL (µg/L) vs. TIME
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin



Notes:
1) Non-detects with detection limits above detected values were excluded from trends.
2) Trend analysis results are reported for the post-shutdown period.

figure 3

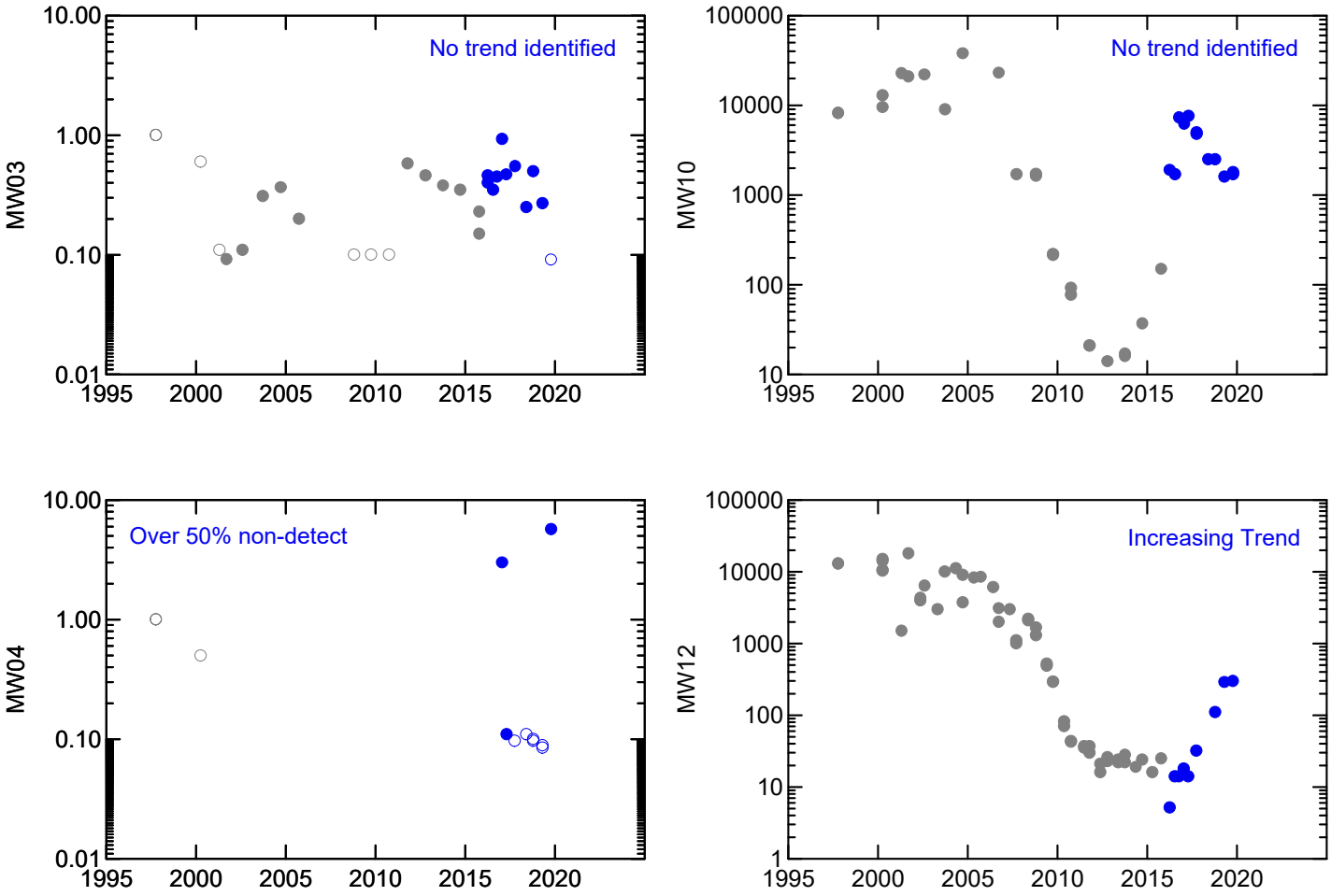
UNCONFINED (UPPER) AQUIFER
PENTACHLOROPHENOL (µg/L) vs. TIME
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin



Notes:
1) Non-detects with detection limits above detected values were excluded from trends.
2) Trend analysis results are reported for the post-shutdown period.

figure 4

UNCONFINED (UPPER) AQUIFER
PENTACHLOROPHENOL (µg/L) vs. TIME
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin



Legend:

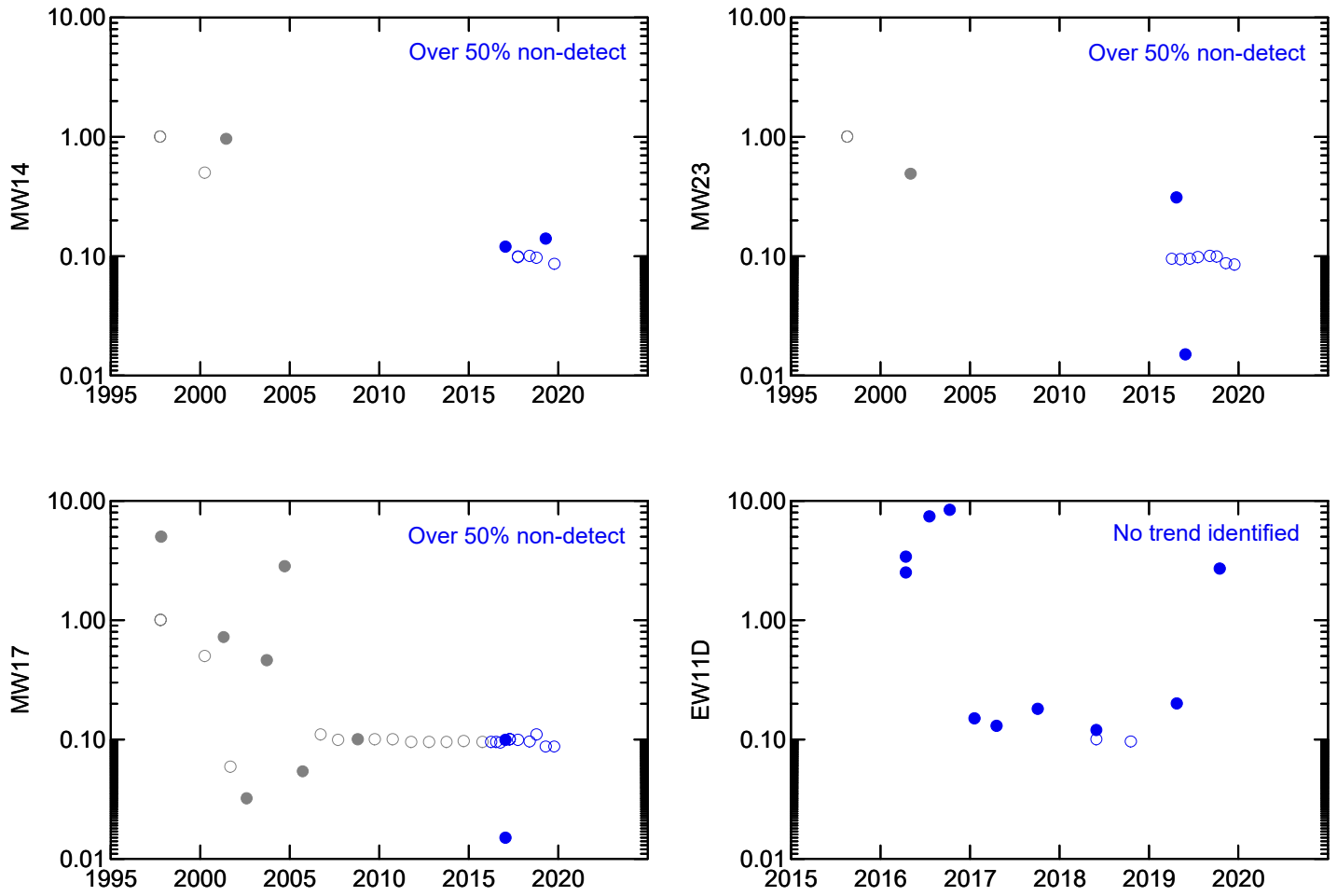
- Detected result (Historical period)
- Non-detect (plotted at detection limit)
- Detected result (Post-shutdown period)
- Non-detect (plotted at detection limit)

Notes:

1) Non-detects with detection limits above detected values were excluded from trends.
2) Trend analysis results are reported for the post-shutdown period.

figure 5

SEMICONFINED (LOWER) AQUIFER
PENTACHLOROPHENOL (µg/L) vs. TIME
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

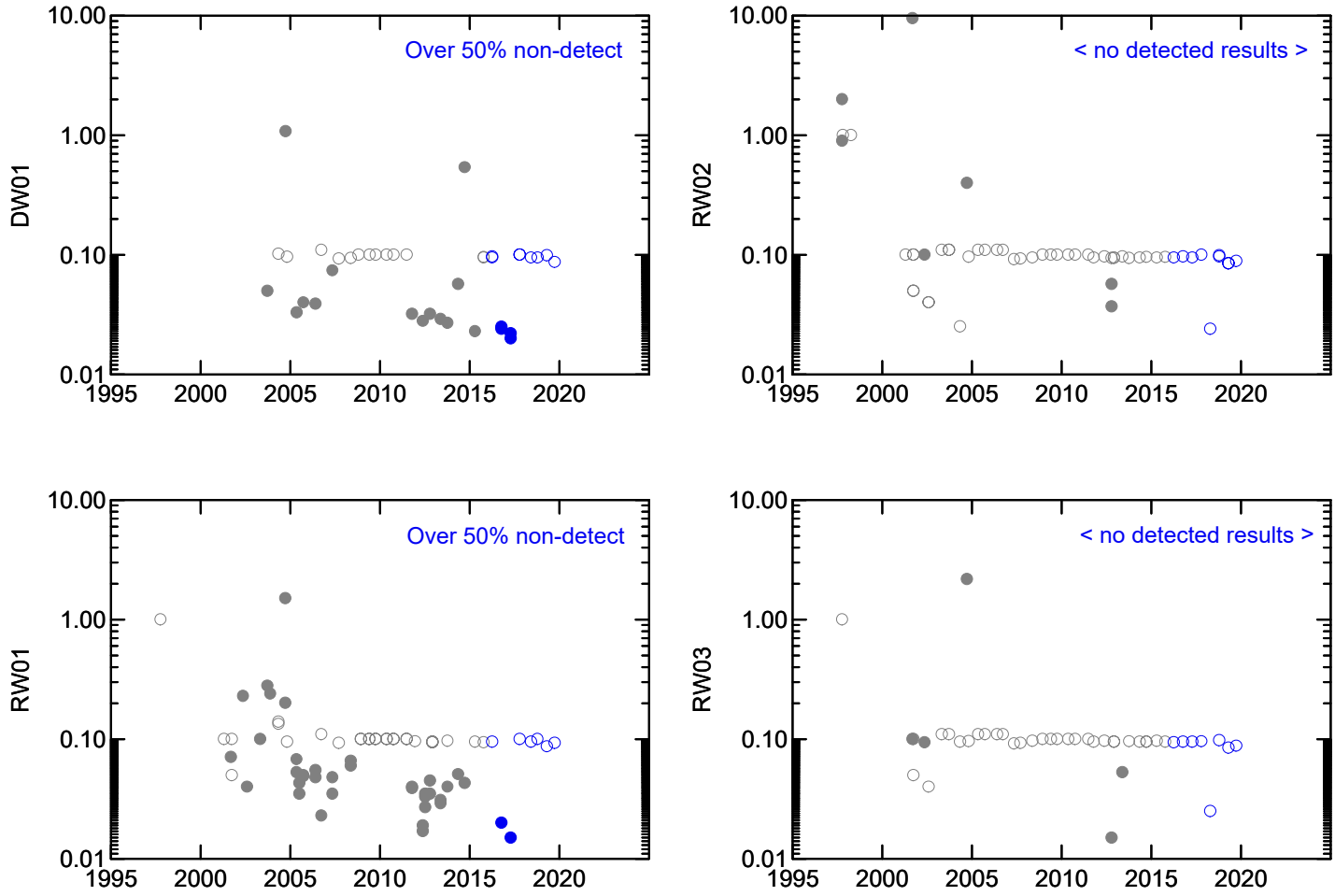


Legend:
- Detected result (Historical period)
- Non-detect (plotted at detection limit)
- Detected result (Post-shutdown period)
- Non-detect (plotted at detection limit)

Notes:
1) Non-detects with detection limits above detected values were excluded from trends.
2) Trend analysis results are reported for the post-shutdown period.

figure 6

SEMICONFINED (LOWER) AQUIFER
PENTACHLOROPHENOL (µg/L) vs. TIME
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

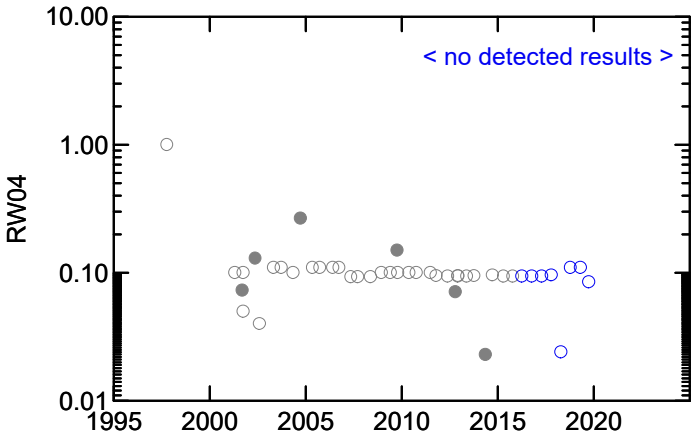


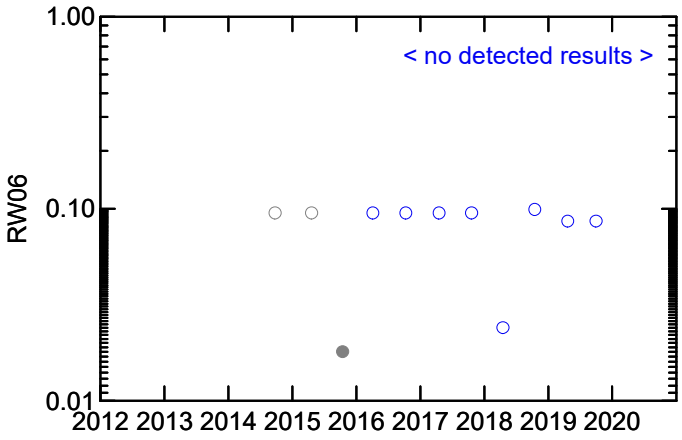
Legend:
- Detected result (Historical period)
- Non-detect (plotted at detection limit)
- Detected result (Post-shutdown period)
- Non-detect (plotted at detection limit)

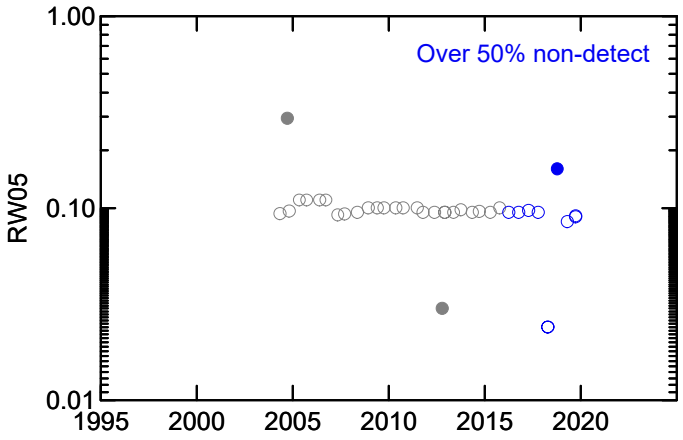
Notes:
1) Non-detects with detection limits above detected values were excluded from trends.
2) Trend analysis results are reported for the post-shutdown period.

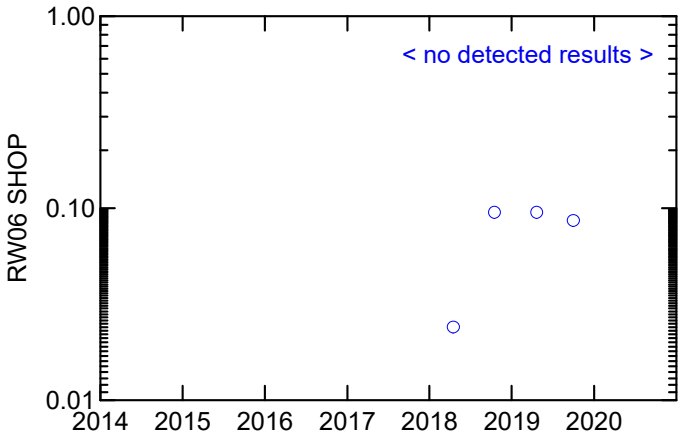
figure 7

WATER SUPPLY AND RESIDENTIAL WELLS
PENTACHLOROPHENOL (µg/L) vs. TIME
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin









Legend:
- Detected result (Historical period)
- Non-detect (plotted at detection limit)
- Detected result (Post-shutdown period)
- Non-detect (plotted at detection limit)

Notes:
1) Non-detects with detection limits above detected values were excluded from trends.
2) Trend analysis results are reported for the post-shutdown period.

figure 8

WATER SUPPLY AND RESIDENTIAL WELLS
PENTACHLOROPHENOL (µg/L) vs. TIME
PENTA WOOD PRODUCTS SUPERFUND SITE
Siren, Wisconsin

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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