

RACER Trust

PLANT 2 LNAPL COMPOSITION AND POTENTIAL RISKS

RACER Lansing, Plant 2, Lansing, Michigan

March 8, 2018

A large, solid orange geometric shape, resembling a right-angled triangle or a trapezoid, is positioned in the bottom right corner of the page. It is oriented with its hypotenuse facing upwards and to the right. A thin white diagonal line runs from the bottom-left corner of the shape towards the top-right corner. A thin white horizontal line crosses the shape near its base.

PLANT 2 LNAPL COMPOSITION AND POTENTIAL RISKS

RACER Lansing Plant 2, Lansing,
Michigan



Patrick Curry, PG, CPG
Principal Geologist

Prepared for:
RACER Trust

Prepared by:
Arcadis of Michigan, LLC
28550 Cabot Drive
Suite 500
Novi
Michigan 48377
Tel 248 994 2240
Fax 248 994 2241



Andy Pennington
Senior Environmental Scientist

Our Ref.:
B0064479.2018

Date:
March 8, 2018

This document is intended only for the use of the individual or entity for which it was prepared and may contain information that is privileged, confidential and exempt from disclosure under applicable law. Any dissemination, distribution or copying of this document is strictly prohibited.

CONTENTS

1	Introduction	1
2	Background	1
3	2017 LNAPL Sampling	2
3.1	Results and LNAPL Composition	3
3.1.1	TPH Fractions	3
3.1.2	Other Compounds	3
4	Discussion of LNAPL Risk	5
4.1	Dissolved Phase Risk for Other Compounds	6
5	Conclusions	6
6	References	8

TABLES

Table 1	Summary of LNAPL Results
---------	--------------------------

FIGURES

Figure 1	Plant 2 LNAPL Area Perched Monitoring Well Locations
Figure 2	Plant 2 LNAPL Area Cross-Section

APPENDICES

Appendix A	LNAPL Decision Tree – Plant 2
Appendix B	2017 LNAPL Laboratory Analytical Reports

1 INTRODUCTION

The following report summarizes the characterization activities and provides an evaluation of the light non-aqueous phase liquids (LNAPL) located in the central portion of Plant 2 (Plant 2 LNAPL area). The Plant 2 LNAPL was initially identified in 2011 during Phase 1 of the Resource Conservation and Recovery Act (RCRA) Facilities Investigation (RFI) (Arcadis 2012). Follow-up activities to characterize the nature and extent of the LNAPL were completed from 2012 through 2017. The purpose of this document is to give an overview of the Plant 2 LNAPL composition and provide a discussion of overall risk and potential long-term dissolved-phase impacts to groundwater.

2 BACKGROUND

LNAPL is present within the fill and interbedded zone in the central portion of Plant 2 (Area 5-2). Based on sample analytical results and historical operations, the LNAPL observed at Plant 2 is believed to primarily be a former cutting oil or lubricating oil. Previous investigations of this LNAPL have focused on delineation, mobility and recoverability, and LNAPL composition:

- LNAPL was initially observed during the 2011 Phase I Resource Conservation and Recovery Act Facility Investigation (RFI) (Arcadis 2012). A monitoring well was installed at soil boring P2-SB-37 to assess LNAPL observed in the soil. A sample from LNAPL monitoring well P2-SB-37 was analyzed via gas chromatography (GC/FID), and also fractionated to gasoline range/purgeable (GRO, C5-C10) and diesel-range/extractable (DRO) fractions (C10-C28 and C28-C34). Review of chromatograms suggests that the Plant 2 LNAPL is most likely a mixture of light lubrication and/or cutting oils with a small amount of diesel fuel. Analytical results also indicate that the LNAPL contains polychlorinated biphenyls (PCBs) and chlorinated volatile organic compounds (VOCs). The reported analytical results are summarized in **Table 1**. An LNAPL bail down test indicated a transmissivity of 0.003 feet squared per day (ft²/day) for P2-SB-37, two orders of magnitude below the 0.5 ft²/day typically used as the lower limit for practical LNAPL recoverability (MDEQ, 2014).
- Further evaluation of LNAPL mobility and recoverability was completed as part of the ongoing RFI and summarized in the LNAPL Mobility and Recoverability Evaluation, submitted as an attachment to the Phase 2 RFI Summary Report (Arcadis 2013, Appendix J). Results of the mobility analysis were consistent with the results of the bail down test conducted at P2-SB-37 and indicated the LNAPL plume is not migrating, and LNAPL recovery is not expected to provide significant mass reduction.
- The evaluation completed as part of the Phase 2 RFI Summary Report (Arcadis 2013) also delineated the lateral extent and vertical extent of the LNAPL and identified LNAPL under confined conditions in a deeper portion of the perched zone (approximately 18 to 25 feet below grade). Associated soil and groundwater impacts were also defined as part of the RFI Phase 2 work. The horizontal extent of LNAPL is included on **Figure 1** and vertical distribution is shown on **Figure 2**.
- From 2013 through 2015, further investigation, including the installation of additional deeper monitoring wells, LNAPL sampling, and transmissivity testing, were completed to further define and characterize the confined LNAPL. Results of the investigations for the confined LNAPL are summarized in the 2015 LNAPL Removal Workplan (Arcadis 2015a) as well as the Summary of

Plant 2 LNAPL Composition and Potential Risks

LNAPL Transmissivity Results (Arcadis 2015b). Elevated PCBs and chlorinated volatile organic compounds were detected in samples of the confined LNAPL. Transmissivity results for the confined LNAPL ranged from 0.004 ft²/day to 0.035 ft²/day, below the MDEQ threshold of 0.5 ft²/day.

- Further evaluation of the potential exposure pathways associated with VOCs and 1,4-dioxane that are co-incident with the LNAPL was provided to the MDEQ as part of the Plant 2 LNAPL Area 1,4-Dioxane Investigation (Arcadis 2017a). Target Compound List (TCL) VOCs represent a small fraction (approximately 2 percent or less) of the LNAPL and groundwater data collected to date show dissolved phase VOC migration is limited to the immediate vicinity surrounding the LNAPL within the perched zone. There is no evidence that suggests a significant risk of vertical migration of VOCs to the bedrock aquifer. As part of the approved Interim Groundwater Monitoring Plan (Arcadis 2017c), weathered bedrock wells in the vicinity of the Plant 2 LNAPL are sampled for VOCs on an annual basis.
- Sampling of LNAPL impacted soils have shown that 1,4-dioxane associated with the LNAPL is depleted with the majority of the 1,4-dioxane mass present as dissolved phase in surrounding perched groundwater (Arcadis 2017a). As described in the lower 1,4-dioxane toe reports (Arcadis 2016a, 2016b and 2017b), 1,4-dioxane leakage from the Plant 2 LNAPL area to weathered bedrock appears to occur in discrete areas. The proposed interim remedy for the lower 1,4-dioxane includes a propane biosparge system to treat 1,4-dioxane mass within the weathered bedrock. Further, an impermeable cap is being evaluated for the Plant 2 LNAPL area to reduce infiltration and recharge through the LNAPL area and help reduce leakage to the weathered bedrock.

All of these results, as well as the additional sampling results outlined below are considered when going through the LNAPL Remedial Decision Tree, which was developed in collaboration with the MDEQ Technical Assistance Program Support team, and as applied to this Site, was originally provided to MDEQ as part of the Draft 2014 Corrective Measures Study (Arcadis 2014). The LNAPL Decision Tree in its current form is included as **Appendix A**. The LNAPL Decision Tree will be updated as part of the revised Corrective Measures Study to account for the data provided below, as well as the results of additional investigation activities completed in 2017 (e.g. Arcadis 2017a). Based on the LNAPL composition and saturation concerns, institutional and engineered controls are currently being considered to address potential future risk associated with the LNAPL present at Plant 2.

3 2017 LNAPL SAMPLING

Additional sampling of the LNAPL at Plant 2 was completed in December 2017 to verify composition of the LNAPL and evaluate the potential risk to the underlying bedrock aquifer. Although the previous analytical results have established the concentrations and risk associated with specific compounds of interest (e.g. VOCs, PCBs, 1,4-dioxane), these results did not fully resolve the composition of the petroleum mixture. Therefore, the additional sampling was completed to group hydrocarbon compounds into total petroleum hydrocarbon (TPH) fractions to support further risk evaluation. LNAPL samples were collected from monitoring wells LMW-12-08, PMW-01, and MW-14-12D and analyzed for TPH fractions were using the Massachusetts VPH/EPH method (MassDEP 2004a/2004b), which quantifies specific carbon ranges of aliphatic and aromatic hydrocarbon compounds along with “target” VOCs and PAHs (e.g., benzene or benzo(a)pyrene). The GRO analysis is conducted by purging volatile compounds from the sample; in contrast, the DRO analysis is conducted by extracting compounds from the sample using a

solvent. This distinction in sample preparation methods corresponds to the terms “volatile petroleum hydrocarbons” (VPH) and “extractable petroleum hydrocarbons” (EPH), which generally refer to the same groups of hydrocarbons described as GRO and DRO, respectively. In addition to TPH fractions, the samples were also analyzed for VOCs, SVOCs and PCBs.

3.1 Results and LNAPL Composition

The results of the TPH fractionation analysis as well as laboratory analysis for other parameters are included on **Table 1**. The laboratory analytical reports for the 2017 samples are provided as **Appendix B**.

3.1.1 TPH Fractions

Like other refined petroleum products, cutting oils are a complex mixture of hydrocarbon compounds that are isolated from the wide range of compounds (extending from those with 2 carbon atoms, or C₂, to compounds C₄₀ and higher) in crude oil. Lubricating oils typically consist of compounds in the C₂₀ to C₃₂ range (Gustafson et al. 1999) and, while literature references to cutting oil composition are limited, cutting oils would generally be expected to exhibit similar characteristics and composition to lubricating oils – both are high-boiling-point, low-volatility liquids intended to provide heat transfer and lubrication in demanding mechanical settings. Lubricating oils and middle distillate oils are typically composed predominantly of aliphatic hydrocarbons; Gustafson et al. (1999) note that lubricating oils have high concentrations of cycloalkanes, an aliphatic group of compounds, and the California State Water Resources Control Board (2015) indicate that fresh diesel fuel is approximately 80% aliphatic (mainly in the C₁₂-C₂₁ range) and 20% aromatic hydrocarbons.

The TPH fractionation results from samples collected in 2017 confirm that the site LNAPL is predominantly longer-chain aliphatic compounds; aliphatic compounds in the C₁₉-C₃₆ range make up between 57 and 75 percent of the hydrocarbon compounds reported for the samples analyzed.

Additionally, the data indicate that the reported TPH fractions (extending up to carbon numbers C₃₆ for aliphatics and C₂₂ for aromatics) encompass roughly 360,000 to 550,000 mg/kg of the TPH mixture. While laboratory precision and analytical uncertainty contributes somewhat to this observation (e.g., reported fractions would not be expected to add up exactly to 1,000,000 mg/kg for any sample), the size of the remaining, unquantified fractions of the mixture suggested that a significant part of the LNAPL is heavier compounds that are likely to have very low water solubility and to pose low health risk overall. The 450,000 to 640,000 mg/kg portion of the mixture consists of compounds that were either (1) not volatilized during the VPH analysis and not captured through the solvent extraction process in the EPH analysis, or (2) extracted in the EPH analysis, but required longer time to elute than prescribed in the analytical method. In both cases, the compounds are likely to be heavy hydrocarbons above the upper carbon numbers (C₃₆/C₂₂) reported by the method.

3.1.2 Other Compounds

The analytical results for TCL VOCs, SVOCs and PCBs for the 2017 samples are consistent with previous findings. The results are included in **Table 1**. Based on the draft 2017 Michigan Part 201 Non-Residential Soil Direct Contact (DC) Criteria, the compounds listed below do not pose a DC risk, with the potential exception of PCBs, particularly in the deeper LNAPL saturated soils. The concentrations of

Plant 2 LNAPL Composition and Potential Risks

VOCs and SVOCs within LNAPL impacted soils would typically be one or more orders of magnitude below DC criteria. Potential DC exceedances for PCBs will be addressed by institutional controls (deed restrictions) including limiting future land use to nonresidential, prohibiting installing wells for extraction of groundwater, requiring proper precautions and safety measures for any excavation or other intrusive activity and management of impacted soil, and providing notification of the presence of PCB remediation waste. Exceedances of vapor inhalation (VI) criteria associated with elevated VOCs in LNAPL will be addressed by a deed restriction that requires a VI evaluation and/or engineered controls prior to construction of any building for human occupation.

Surrounding soil and groundwater results indicate dissolved phase VOC impacts are limited to the perched zone and attenuate rapidly, suggesting geochemical conditions are conducive to microbial reductive dechlorination (Arcadis 2017a). The VOCs historically detected in LNAPL above a concentration of 1.0 part per million include:

- 1,1,1-Trichloroethane
- 1,1-Dichloroethane
- 1,1-Dichloroethene
- 1,2-Dichlorobenzene
- 2-Methylnaphthalene
- Chloroethane
- m&p-Xylene
- o-Xylene
- Methyl cyclohexane
- Naphthalene
- N-Butylbenzene
- Tetrachloroethene
- Toluene

The SVOCs detected in the LNAPL, such as phenanthrene and fluorene, are common components of middle distillates. Surrounding soil and groundwater samples have indicated only limited SVOC impacts. The extent of dissolved phase SVOC impacts are typically limited by the lower solubility of these compounds. SVOCs detected in LNAPL include the following:

- 2-Methylnaphthalene
- Anthracene
- Fluoranthene
- Fluorene
- Phenanthrene

- Pyrene

The PCBs in LNAPL, although elevated, particularly within the deeper LNAPL zone, do not dissolve readily and do not present a dissolved phase risk to the perched zone or bedrock aquifer. PCB detections in soil and groundwater are limited and appear to be related to residual LNAPL impacts in soil, or LNAPL entrained within the groundwater sample. PCBs detected in the LNAPL include the following:

- Aroclor-1242
- Aroclor-1254

4 DISCUSSION OF LNAPL RISK

The U.S. EPA Regional Screening Level (RSL) tables provide risk-based screening-levels for specific fractions of complex hydrocarbon mixtures, covering different carbon ranges for both aliphatic and aromatic hydrocarbon fractions. These levels, presented below, account for ingestion, inhalation, and dermal/direct-contact pathways. In general, aromatic compounds are more toxic than aliphatic compounds. This is attributed to the toxicity of benzene- and pentene-type rings comprising their molecular backbone. Aliphatic compounds are typically saturated with hydrogen atoms and are less reactive due to their molecular configuration.

TPH Fractions	Carbon Range	Industrial Soil Screening Level (mg/kg)
Low aliphatic	C5-C8	2,200
Medium aliphatic	C9-C18	440
High aliphatic	C19-C32	3,500,000
Low aromatic	C6-C8	420
Medium aromatic	C9-C16	600
High aromatic	C17-C32	33,000

TPH fractions are not carcinogenic, and their toxicity is associated with non-cancer adverse health effects. The TPH fraction RSLs for industrial soil, corresponding to a target hazard quotient (THQ) of 1 are summarized in the table above. Note that these soil screening levels should not be compared directly to the LNAPL analytical results presented earlier, because the analytical results represent the composition of the pure-phase LNAPL rather than a concentration of TPH constituents in LNAPL-impacted soil, which would be significantly lower. Additionally, due to the nature of the laboratory purging/extraction processes and the requirements of the MassDEP VPH/EPH method, the TPH fraction ranges identified by the analysis do not correspond precisely to the ranges specified by the RSLs.

Nonetheless, the RSLs are useful for assessing the relative risk associated with each hydrocarbon fraction. The majority of hydrocarbon compounds detected in the LNAPL mixture are heavy, or high-

carbon-range, aliphatic hydrocarbons, which are the lowest-toxicity fraction for which RSLs are developed. Due to the low toxicity of these compounds, the RSL for this fraction is over 1,000,000 mg/kg, indicating that no possible concentration of heavy aliphatic hydrocarbons in soil poses an unacceptable human health risk for nonresidential soil exposure scenarios.

4.1 Dissolved Phase Risk for Other Compounds

TCL VOCs represent a small fraction (approximately 2 percent or less) of the LNAPL, and groundwater data collected to date show dissolved phase VOC migration is limited to the immediate vicinity surrounding the LNAPL within the perched zone. In addition, sampling of LNAPL impacted soils have shown that 1,4-dioxane associated with the LNAPL is depleted and the majority of the current 1,4-dioxane mass is present as dissolved phase in surrounding perched groundwater (Arcadis 2017b). As described in the lower 1,4-dioxane toe reports (Arcadis 2016a, 2016b and 2017b), 1,4-dioxane leakage from the Plant 2 LNAPL area to weathered bedrock appears to occur in discrete areas. The proposed remedy for the lower 1,4-dioxane includes a propane biosparge system to treat 1,4-dioxane mass within the weathered bedrock. A cap is being evaluated for the Plant 2 LNAPL area to reduce infiltration through the LNAPL area and help reduce leakage to the weathered bedrock.

Chlorinated VOCs detected within the LNAPL attenuate rapidly due to the geochemical conditions created by the presence of the LNAPL. A reducing geochemical environment present in the LNAPL area, generated by an abundance of organic material (including petroleum hydrocarbons) and the resulting depletion of oxygen and other electron acceptors, provides a suitable environment to support microbial reductive dechlorination (Wiedemeier et al. 1998). Therefore, a degradation mechanism for chlorinated VOCs that may dissolve from the LNAPL is readily available. Surrounding soil and groundwater results indicate these impacts are limited to the perched zone and attenuate rapidly supporting this conclusion (Arcadis 2017b).

SVOCs detected in the LNAPL samples consist of PAH compounds such as phenanthrene and fluorene, which are common components of middle distillates and are low in toxicity relative to other PAHs. The LNAPL does not contain detectable concentrations of carcinogenic PAHs (such as benzo(a)pyrene) or other SVOC compounds associated with significant health risk.

Although the LNAPL contains detectable concentrations of PCBs, observations of PCBs in nearby soil and groundwater are limited and have been associated with LNAPL entrained in the soil or groundwater sample (Arcadis 2013). The extremely low water solubility of these constituents limits the potential for any migration to groundwater or dissolved-phase risk.

5 CONCLUSIONS

Based on the 2014 LNAPL Decision Tree and the evaluation outlined above, the LNAPL remaining in place at the Site is not expected to pose a significant human health risk through direct-contact exposure pathways. Exceedances of vapor inhalation (VI) criteria associated with the elevated VOCs in LNAPL will be addressed by deed restriction that requires a VI evaluation and/or engineered controls prior to construction of any building for human occupation. The results of this evaluation and previous LNAPL investigation results support the following conclusions:

Plant 2 LNAPL Composition and Potential Risks

- Overall the LNAPL areas are stable, as indicated by LNAPL delineation, monitoring and transmissivity testing. The extent of VOCs in groundwater is limited and stable. The overall low volatility and solubility of heavier petroleum compounds that make up the majority of the LNAPL mixture suggest that migration of compounds in dissolved phase or vapor phase is minimal.
- The TPH fractionation results are consistent with the previous TPH GRO/DRO analytical data and indicate that the LNAPL consists primarily of heavier (longer-chain) aliphatic hydrocarbons characterized by low mobility and low toxicity.
- TCL VOCs make up only a small fraction of the LNAPL (<2%). Dissolved phase VOC migration is limited to the immediate vicinity of the LNAPL. Geochemical conditions support microbial reductive dechlorination as a degradation mechanism for chlorinated VOCs that may dissolve from the LNAPL (Wiedemeier et al. 1998). Surrounding soil and groundwater results indicate these impacts are limited to the perched zone and attenuate rapidly supporting this conclusion (Arcadis 2017b).
- Previous evaluations have demonstrated that the LNAPL has been depleted of any significant 1,4-dioxane mass and the majority of the 1,4-dioxane is present in the perched zone as dissolved phase. Although some comingling may occur with the main 1,4-dioxane plume west of the Plant 2 LNAPL area, the 1,4-dioxane mass in weathered bedrock beneath the Plant 2 LNAPL area appears primarily related to leakage from the perched zone beneath and immediately surrounding the LNAPL plume (Arcadis 2016a, 2016b and 2017b). The proposed remedy for the lower 1,4-dioxane includes a propane biosparge system to treat 1,4-dioxane mass within the weathered bedrock. Further, a cap is being evaluated for the Plant 2 LNAPL area to reduce infiltration and recharge through the LNAPL area and help reduce leakage to the weathered bedrock from the perched zone.
- VOC analytical results for the LNAPL consist of relatively low toxicity PAHs. Surrounding soil and groundwater samples have indicated only limited SVOC impacts. The extent of dissolved phase SVOC impacts are typically limited by the lower solubility of these compounds.
- Although elevated in the LNAPL, the observations of PCBs in nearby soil and groundwater are limited and generally associated with LNAPL entrained in the soil or groundwater samples (Arcadis 2013). The extremely low water solubility of these constituents limits the potential for any migration of PCBs in groundwater. Potential DC exceedances for PCBs will be addressed by institutional controls (deed restrictions) including limiting future land use to nonresidential, prohibiting installing wells for extraction of groundwater, requiring proper precautions and safety measures for any excavation or other intrusive activity and management of impacted soil, and providing notification of the presence of PCB remediation waste.

The results of this evaluation support institutional controls, engineered controls and natural source zone depletion (NSZD) as viable remedies for the Plant 2 LNAPL. RACER will submit a separate Natural Source Zone Depletion Work Plan which will allow for characterization of natural source zone depletion rate (with corresponding decreases in risk).

6 REFERENCES

- Arcadis. 2012. Resource Conservation and Recovery Act Facility Investigation (RFI), Phase I Activities Summary Report. RACER Trust, Lansing, Michigan Plants 2, 3, and 6. January 30.
- Arcadis. 2013. Resource Conservation and Recovery Act Facility Investigation (RFI), Phase II Activities Summary Report. RACER Trust, Lansing, Michigan Plants 2, 3, and 6. April 3.
- Arcadis. 2014. RCRA Corrective Action, Corrective Measures Study. Plants 2, 3 and 6 Industrial Land. June.
- Arcadis. 2015a. 2015 LNAPL Removal Workplan. RACER Trust, Lansing, Michigan Plant 2. March 4.
- Arcadis. 2015b. Summary of LNAPL Transmissivity Results. RACER Trust, Lansing, Michigan Plant 2. March 30.
- Arcadis. 2016a. Lower 1,4-Dioxane Plume Toe Investigation Report. RACER Trust Plant 2, Lansing, Michigan. March 11.
- Arcadis. 2016b. Supplemental Lower 1,4-Dioxane Plume Toe Investigation Report. RACER Trust Plant 2, Lansing, Michigan. September 21
- Arcadis. 2017a. 2017 Plant 2 LNAPL Area 1,4-Dioxane Investigation Summary. RACER Trust, Lansing, Michigan Plant 2. July 3.
- Arcadis. 2017b. Lower 1,4-Dioxane Plume Northeast Lobe Investigation. RACER Trust Plant 2, Lansing, Michigan. February 3.
- Arcadis. 2017c. Revised Interim Groundwater Monitoring Workplan. RACER Trust Plants 2, 3, and 6, Lansing, Michigan. January 30.
- American Petroleum Institute (API). 2006. API Interactive LNAPL Guide, Version 2.0.4. <http://www.api.org/oil-and-natural-gas/environment/clean-water/ground-water/lnapl/interactive-guide.aspx>. February.
- Gustafson, J.B., D. Vorhees, and W. Weisman. 1999. Human Health Risk-Based Evaluation of Petroleum Contaminated Sites: Implementation of the Working Group Approach. TPHCWG Series, Vol. 5. Amherst Scientific Publishers, MA.
- Massachusetts Department of Environmental Protection (MassDEP) Division of Environmental Analysis. 2004a. Method for the Determination of Extractable Petroleum Hydrocarbons (EPH). Revision 1.1. May.
- Massachusetts Department of Environmental Protection (MassDEP) Division of Environmental Analysis. 2004b. Method for the Determination of Volatile Petroleum Hydrocarbons (VPH). Revision 1.1. May.
- Michigan Department of Environmental Quality (MDEQ). 2014. Non-Aqueous Phase Liquid (NAPL) Characterization, Remediation, and Management for Petroleum Releases. RRD Resource Materials-25-2014-01. June.
- Oregon Department of Environmental Quality (ODEQ). 2003. Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites. September 22. <http://www.deq.state.or.us/lq/pubs/docs/RBDMGuidance.pdf>.

Plant 2 LNAPL Composition and Potential Risks

State Water Resources Control Board [California] (SWRCB). 2015. Leaking Underground Fuel Tank Guidance Manual. December. Washington State Department of Ecology (WA Ecology). 1997. Method for the determination of volatile petroleum hydrocarbon (VPH) fractions, and method for the determination of extractable petroleum hydrocarbon (EPH) fractions. Both in: Analytical Methods for Petroleum Hydrocarbons. WA Ecology Publication No. ECY 97-602. June.

Wiedemeier, T.H., M.A. Swanson, D.E. Moutoux, E.K. Gordon, J.T. Wilson, B.H. Wilson, D.H. Kampbell, P.E. Haas, R.N. Miller, J.E. Hansen, and F.H. Chapelle. 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water. EPA/600/R-98/128. <https://clu-in.org/download/remed/protocol.pdf>.

TABLES



Table 1
Summary of LNAPL Results
RACER Trust Plant 2
Lansing, Michigan

Location ID: Date Collected:	Units	LMW-12-03D 9/10/2014	LMW-12-03D 10/31/2014	LMW-12-08 11/25/2014	LMW-12-08 4/6/2017	LMW-12-08 12/7/2017	LMW-12-08 12/7/2017	LMW-14-12D 12/2/2014	LMW-14-12D 12/7/2017	LMW-14-12D 12/7/2017	LMW-14-15D 12/2/2014	LMW-14-15D 4/7/2017
Volatile Organics												
1,1,1,2-Tetrachloroethane	µg/kg	NA	NA	NA	NA	<500 X	NA	NA	<500 X	NA	NA	NA
1,1,1-Trichloroethane	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
1,1,2,2-Tetrachloroethane	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
1,1,2-Trichloroethane	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
1,1-Dichloroethane	µg/kg	800 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
1,1-Dichloroethene	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
1,2,3-Trichlorobenzene	µg/kg	NA	NA	NA	NA	<500 X	NA	NA	<500 X	NA	NA	NA
1,2,3-Trichloropropane	µg/kg	NA	NA	NA	NA	<500 X	NA	NA	<500 X	NA	NA	NA
1,2,3-Trimethylbenzene	µg/kg	NA	NA	NA	NA	600 X	NA	NA	1,100 X	NA	NA	NA
1,2,4-Trichlorobenzene	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
1,2,4-Trimethylbenzene	µg/kg	NA	NA	NA	NA	700 X	NA	NA	2,800 X	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
1,2-Dibromoethane (Ethylene dibromide)	µg/kg	<500 X	NA	<200 MX	NA	<500 X	NA	<2,000 MX	<500 X	NA	<2,000 MX	NA
1,2-Dichlorobenzene	µg/kg	<500 X	NA	1,300 X	NA	<1,000 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
1,2-Dichloroethane	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
1,2-Dichloropropane	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
1,3,5-Trimethylbenzene	µg/kg	NA	NA	NA	NA	<500 X	NA	NA	<500 X	NA	NA	NA
1,3-Dichlorobenzene	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
1,4-Dichlorobenzene	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
1,4-Dioxane	µg/kg	<3,000 X	NA	<3,000	<500	NA	NA	<30,000 X	NA	NA	<30,000 X	<500
2-Butanone (Methyl Ethyl Ketone)	µg/kg	<5,000 X	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (Methyl ethyl ketone) (MEK)	µg/kg	NA	NA	<5,000 X	NA	<5,000 X	NA	<50,000 X	<5,000 X	NA	<50,000 X	NA
2-Hexanone	µg/kg	<5,000 X	NA	<5,000 X	NA	<5,000 X	NA	<50,000 X	<5,000 X	NA	<50,000 X	NA
2-Methylnaphthalene	µg/kg	NA	NA	NA	NA	2,000 X	NA	NA	9,000 X	NA	NA	NA
2-Phenylbutane (sec-Butylbenzene)	µg/kg	NA	NA	NA	NA	800 X	NA	NA	600 X	NA	NA	NA
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	µg/kg	<5,000 X	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/kg	NA	NA	<5,000 X	NA	<5,000 X	NA	<50,000 X	<5,000 X	NA	<50,000 X	NA
Acetone	µg/kg	<5,000 X	NA	<5,000 X	NA	<5,000 X	NA	<50,000 X	<5,000 X	NA	<50,000 X	NA
Acrylonitrile	µg/kg	NA	NA	NA	NA	<500 X	NA	NA	<500 X	NA	NA	NA
Benzene	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Bromobenzene	µg/kg	NA	NA	NA	NA	<500 X	NA	NA	<500 X	NA	NA	NA
Bromodichloromethane	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Bromoform	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Bromomethane (Methyl bromide)	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Carbon disulfide	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Carbon tetrachloride	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Chlorobenzene	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Chlorobromomethane	µg/kg	NA	NA	NA	NA	<500 X	NA	NA	<500 X	NA	NA	NA
Chloroethane	µg/kg	8,000 X	NA	9,800 X	NA	3,900 X	NA	321,000 X	71,300 X	NA	282,000 X	NA
Chloroform (Trichloromethane)	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Chloromethane (Methyl chloride)	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
cis-1,2-Dichloroethene	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA

See notes on last page.

Table 1
Summary of LNAPL Results
RACER Trust Plant 2
Lansing, Michigan

Location ID: Date Collected:	Units	LMW-12-03D 9/10/2014	LMW-12-03D 10/31/2014	LMW-12-08 11/25/2014	LMW-12-08 4/6/2017	LMW-12-08 12/7/2017	LMW-12-08 12/7/2017	LMW-14-12D 12/2/2014	LMW-14-12D 12/7/2017	LMW-14-12D 12/7/2017	LMW-14-15D 12/2/2014	LMW-14-15D 4/7/2017
cis-1,3-Dichloropropene	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Cyclohexane	µg/kg	<5,000 X	NA	<500 X	NA	NA	NA	<5,000 X	NA	NA	<5,000 X	NA
Cymene (p-Isopropyltoluene)	µg/kg	NA	NA	NA	NA	<500 X	NA	NA	1,300 X	NA	NA	NA
Dibromochloromethane	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Dibromomethane	µg/kg	NA	NA	NA	NA	<500 X	NA	NA	<500 X	NA	NA	NA
Dichlorodifluoromethane (CFC-12)	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Ethyl ether	µg/kg	NA	NA	NA	NA	<500 X	NA	NA	<500 X	NA	NA	NA
Ethylbenzene	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Hexachloroethane	µg/kg	NA	NA	NA	NA	<500 X	NA	NA	<500 X	NA	NA	NA
Iodomethane	µg/kg	NA	NA	NA	NA	<500 X	NA	NA	<500 X	NA	NA	NA
Isopropyl benzene	µg/kg	NA	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Isopropylbenzene	µg/kg	<500 X	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m&p-Xylene	µg/kg	1,400 X	NA	<1,000 X	NA	<1,000 X	NA	<10,000 X	1,000 X	NA	<10,000 X	NA
Methyl acetate	µg/kg	<5,000 X	NA	<5,000 X	NA	NA	NA	<50,000 X	NA	NA	<50,000 X	NA
Methyl cyclohexane	µg/kg	<5,000 X	NA	<500 X	NA	NA	NA	<5,000 X	NA	NA	<5,000 X	NA
Methyl Tert Butyl Ether	µg/kg	<500 X	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl tert butyl ether (MTBE)	µg/kg	NA	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Methylene chloride	µg/kg	<500 X	NA	<500 X	NA	<1,000 X	NA	<5,000 X	<1,000 X	NA	<5,000 X	NA
Naphthalene	µg/kg	NA	NA	NA	NA	<1,000 X	NA	NA	4,000 X	NA	NA	NA
N-Butylbenzene	µg/kg	NA	NA	NA	NA	1,200 X	NA	NA	1,200 X	NA	NA	NA
N-Propylbenzene	µg/kg	NA	NA	NA	NA	<500 X	NA	NA	600 X	NA	NA	NA
o-Xylene	µg/kg	1,100 X	NA	<500 X	NA	<500 X	NA	<5,000 X	600 X	NA	<5,000 X	NA
Styrene	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
tert-Butylbenzene	µg/kg	NA	NA	NA	NA	<500 X	NA	NA	<500 X	NA	NA	NA
Tetrachloroethene	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Tetrahydrofuran	µg/kg	NA	NA	NA	NA	<10,000 X	NA	NA	<10,000 X	NA	NA	NA
Toluene	µg/kg	2,200 X	NA	<500 X	NA	<500 X	NA	<5,000 X	500 X	NA	<5,000 X	NA
trans-1,2-Dichloroethene	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
trans-1,3-Dichloropropene	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
trans-1,4-Dichloro-2-butene	µg/kg	NA	NA	NA	NA	<500 X	NA	NA	<500 X	NA	NA	NA
Trichloroethene	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Trichlorofluoromethane (CFC-11)	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Trifluorotrchloroethane (Freon 113)	µg/kg	<500 X	NA	<500 X	NA	NA	NA	<5,000 X	NA	NA	<5,000 X	NA
Vinyl chloride	µg/kg	<500 X	NA	<500 X	NA	<500 X	NA	<5,000 X	<500 X	NA	<5,000 X	NA
Semivolatile Organics												
1,2,4-Trichlorobenzene	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
1,2-Dichlorobenzene	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
1,2-Diphenylhydrazine	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
1,3-Dichlorobenzene	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
1,4-Dichlorobenzene	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
2,2'-Oxybis(1-chloropropane) (bis(2-Chloroisopropyl) ether)	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
2,4,5-Trichlorophenol	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
2,4,6-Trichlorophenol	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA

See notes on last page.

Table 1
Summary of LNAPL Results
RACER Trust Plant 2
Lansing, Michigan

Location ID: Date Collected:	Units	LMW-12-03D 9/10/2014	LMW-12-03D 10/31/2014	LMW-12-08 11/25/2014	LMW-12-08 4/6/2017	LMW-12-08 12/7/2017	LMW-12-08 12/7/2017	LMW-14-12D 12/2/2014	LMW-14-12D 12/7/2017	LMW-14-12D 12/7/2017	LMW-14-15D 12/2/2014	LMW-14-15D 4/7/2017
2,4-Dichlorophenol	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
2,4-Dimethylphenol	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
2,4-Dinitrophenol	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
2,4-Dinitrotoluene	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
2,6-Dinitrotoluene	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
2-Chloronaphthalene	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
2-Chlorophenol	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
2-Methylnaphthalene	µg/kg	NA	NA	NA	NA	<80,000 X	<19,000	NA	<79,000 X	19,000 J	NA	NA
2-Methylphenol	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
2-Nitroaniline	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
2-Nitrophenol	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
3&4-Methylphenol	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
3,3'-Dichlorobenzidine	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
3-Nitroaniline	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
4,6-Dinitro-2-methylphenol	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
4-Bromophenyl phenyl ether	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
4-Chloro-3-methylphenol	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
4-Chloroaniline	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
4-Chlorophenyl phenyl ether	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
4-Nitroaniline	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
4-Nitrophenol	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
Acenaphthene	µg/kg	NA	NA	NA	NA	<80,000 X	<19,000	NA	<79,000 X	<20,000	NA	NA
Acenaphthylene	µg/kg	NA	NA	NA	NA	<80,000 X	<19,000	NA	<79,000 X	<20,000	NA	NA
Anthracene	µg/kg	NA	NA	NA	NA	<80,000 X	<19,000	NA	<79,000 X	36,000	NA	NA
Benzo(a)anthracene	µg/kg	NA	NA	NA	NA	<80,000 X	<19,000	NA	<79,000 X	<20,000	NA	NA
Benzo(a)pyrene	µg/kg	NA	NA	NA	NA	<80,000 X	<19,000	NA	<79,000 X	<20,000	NA	NA
Benzo(b)fluoranthene	µg/kg	NA	NA	NA	NA	<80,000 X	<19,000	NA	<79,000 X	<20,000	NA	NA
Benzo(g,h,i)perylene	µg/kg	NA	NA	NA	NA	<80,000 X	<19,000	NA	<79,000 X	<20,000	NA	NA
Benzo(k)fluoranthene	µg/kg	NA	NA	NA	NA	<80,000 X	<19,000	NA	<79,000 X	<20,000	NA	NA
bis(2-Chloroethoxy)methane	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
bis(2-Chloroethyl)ether	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
bis(2-Ethylhexyl)phthalate (DEHP)	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
Butyl benzylphthalate (BBP)	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
Chrysene	µg/kg	NA	NA	NA	NA	<80,000 X	<19,000	NA	<79,000 X	<20,000	NA	NA
Dibenz(a,h)anthracene	µg/kg	NA	NA	NA	NA	<80,000 X	<19,000	NA	<79,000 X	<20,000	NA	NA
Dibenzofuran	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
Diethyl phthalate	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
Dimethyl phthalate	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
Di-n-butylphthalate (DBP)	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
Di-n-octyl phthalate (DnOP)	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
Fluoranthene	µg/kg	NA	NA	NA	NA	<80,000 X	14,000 J	NA	<79,000 X	18,000 J	NA	NA
Fluorene	µg/kg	NA	NA	NA	NA	<80,000 X	13,000 J	NA	<79,000 X	87,000	NA	NA
Hexachlorobenzene	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA

See notes on last page.

Table 1
Summary of LNAPL Results
RACER Trust Plant 2
Lansing, Michigan

Location ID: Date Collected:	Units	LMW-12-03D 9/10/2014	LMW-12-03D 10/31/2014	LMW-12-08 11/25/2014	LMW-12-08 4/6/2017	LMW-12-08 12/7/2017	LMW-12-08 12/7/2017	LMW-14-12D 12/2/2014	LMW-14-12D 12/7/2017	LMW-14-12D 12/7/2017	LMW-14-15D 12/2/2014	LMW-14-15D 4/7/2017
Hexachlorobutadiene	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
Hexachlorocyclopentadiene	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
Hexachloroethane	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
Indeno(1,2,3-cd)pyrene	µg/kg	NA	NA	NA	NA	<80,000 X	<19,000	NA	<79,000 X	<20,000	NA	NA
Isophorone	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
Naphthalene	µg/kg	NA	NA	NA	NA	<80,000 X	<19,000	NA	<79,000 X	<20,000	NA	NA
Nitrobenzene	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
N-Nitrosodi-n-propylamine	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
N-Nitrosodiphenylamine	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
Pentachlorophenol	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
Phenanthrene	µg/kg	NA	NA	NA	NA	<80,000 X	29,000	NA	<79,000 X	110,000	NA	NA
Phenol	µg/kg	NA	NA	NA	NA	<80,000 X	NA	NA	<79,000 X	NA	NA	NA
Pyrene	µg/kg	NA	NA	NA	NA	<80,000 X	26,000	NA	<79,000 X	33,000	NA	NA
Polychlorinated Biphenyls												
Aroclor-1016 (PCB-1016)	µg/kg	<100,000 Y	<67,000 Y	<2,000 Y	NA	<3,000 Y	NA	<33,000 Y	<33,000 Y	NA	<100,000 Y	NA
Aroclor-1221 (PCB-1221)	µg/kg	<100,000 Y	<67,000 Y	<2,000 Y	NA	<3,000 Y	NA	<33,000 Y	<33,000 Y	NA	<100,000 Y	NA
Aroclor-1232 (PCB-1232)	µg/kg	<100,000 Y	<67,000 Y	<2,000 Y	NA	<3,000 Y	NA	<33,000 Y	<33,000 Y	NA	<100,000 Y	NA
Aroclor-1242 (PCB-1242)	µg/kg	500,000 Y	546,000 Y	17,000 Y	NA	15,000 Y	NA	<33,000 Y	<33,000 Y	NA	532,000 Y	NA
Aroclor-1248 (PCB-1248)	µg/kg	<100,000 Y	<67,000 Y	<2,000 Y	NA	<3,000 Y	NA	<33,000 Y	<33,000 Y	NA	<100,000 Y	NA
Aroclor-1254 (PCB-1254)	µg/kg	<100,000 Y	<67,000 Y	<2,000 Y	NA	<3,000 Y	NA	227,000 Y	223,000 Y	NA	<100,000 Y	NA
Aroclor-1260 (PCB-1260)	µg/kg	<100,000 Y	<67,000 Y	<2,000 Y	NA	<3,000 Y	NA	<33,000 Y	<33,000 Y	NA	<100,000 Y	NA
Total PCBs	µg/kg	500,000 Y	546,000 Y	17,000 Y	NA	15,000 Y	NA	227,000 Y	223,000 Y	NA	532,000 Y	NA
Total Petroleum Hydrocarbons												
Total Petroleum Hydrocarbons (C10-C28) DRO	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons (C28-C34) DRO	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons (C5-C10) GRO	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Petroleum Hydrocarbons												
Volatile Petroleum Hydrocarbons (C5-C8 Aliphatics)	mg/kg	NA	NA	NA	NA	NA	28 J	NA	NA	120	NA	NA
Volatile Petroleum Hydrocarbons (C9-C12 Aliphatics)	mg/kg	NA	NA	NA	NA	NA	660	NA	NA	240	NA	NA
Extractable Petroleum Hydrocarbons												
Volatile Petroleum Hydrocarbons (C9-C18 Aliphatics)	mg/kg	NA	NA	NA	NA	NA	20,000	NA	NA	14,000	NA	NA
Volatile Petroleum Hydrocarbons (C19-C36 Aliphatics)	mg/kg	NA	NA	NA	NA	NA	210,000	NA	NA	410,000	NA	NA
Volatile Petroleum Hydrocarbons (C11-C22 Aromatics)	mg/kg	NA	NA	NA	NA	NA	120,000	NA	NA	110,000	NA	NA

Notes:
 < indicates result is less than the indicated reporting limit
Bold = Compound detected above laboratory reporting limit
 J = Result is an estimated value
 M = Result reported to method detection limit not reporting detection limit
 NA = not analyzed
 X = Elevated reporting limit due to matrix interference.
 Y = Elevated reporting limits due to high target concentrations

mg/kg = milligrams per kilogram
 µg/L = microgram per liter
 µg/kg = microgram per kilogram

Table 1
Summary of LNAPL Results
RACER Trust Plant 2
Lansing, Michigan

Location ID: Date Collected:	Units	P2-SB-37 9/6/2011	P2-SB-37 10/6/2011	P2-SB-37 5/31/2012	PMW-01 11/24/2014	PMW-01 4/7/2017	PMW-01 12/7/2017	PMW-01 12/7/2017	PMW-02 10/19/2012
Volatile Organics									
1,1,1,2-Tetrachloroethane	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
1,1,1-Trichloroethane	µg/kg	476,000	NA	NA	700,000 Y	NA	345,000 Y	NA	NA
1,1,2,2-Tetrachloroethane	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
1,1,2-Trichloroethane	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
1,1-Dichloroethane	µg/kg	277,000	NA	NA	230,000 Y	NA	162,000 Y	NA	NA
1,1-Dichloroethene	µg/kg	7,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
1,2,3-Trichlorobenzene	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
1,2,3-Trichloropropane	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
1,2,3-Trimethylbenzene	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
1,2,4-Trichlorobenzene	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
1,2,4-Trimethylbenzene	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	µg/kg	<5,000	NA	NA	<50,000 X	NA	<5,000 Y	NA	NA
1,2-Dibromoethane (Ethylene dibromide)	µg/kg	<5,000	NA	NA	<20,000 MX	NA	<5,000 Y	NA	NA
1,2-Dichlorobenzene	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
1,2-Dichloroethane	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
1,2-Dichloropropane	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
1,3,5-Trimethylbenzene	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
1,3-Dichlorobenzene	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
1,4-Dichlorobenzene	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
1,4-Dioxane	µg/kg	<3,000	NA	NA	<30,000 X	<500	NA	NA	NA
2-Butanone (Methyl Ethyl Ketone)	µg/kg	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (Methyl ethyl ketone) (MEK)	µg/kg	<50,000	NA	NA	<500,000 Y	NA	<50,000 Y	NA	NA
2-Hexanone	µg/kg	<50,000	NA	NA	<500,000 Y	NA	<50,000 Y	NA	NA
2-Methylnaphthalene	µg/kg	NA	NA	NA	NA	NA	20,000 Y	NA	NA
2-Phenylbutane (sec-Butylbenzene)	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	µg/kg	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/kg	<50,000	NA	NA	<500,000 Y	NA	<50,000 Y	NA	NA
Acetone	µg/kg	<50,000	NA	NA	<500,000 Y	NA	<50,000 Y	NA	NA
Acrylonitrile	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
Benzene	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Bromobenzene	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
Bromodichloromethane	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Bromoform	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Bromomethane (Methyl bromide)	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Carbon disulfide	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Carbon tetrachloride	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Chlorobenzene	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Chlorobromomethane	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
Chloroethane	µg/kg	181,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Chloroform (Trichloromethane)	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Chloromethane (Methyl chloride)	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
cis-1,2-Dichloroethene	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA

See notes on last page.

Table 1
Summary of LNAPL Results
RACER Trust Plant 2
Lansing, Michigan

Location ID: Date Collected:	Units	P2-SB-37 9/6/2011	P2-SB-37 10/6/2011	P2-SB-37 5/31/2012	PMW-01 11/24/2014	PMW-01 4/7/2017	PMW-01 12/7/2017	PMW-01 12/7/2017	PMW-02 10/19/2012
cis-1,3-Dichloropropene	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Cyclohexane	µg/kg	<5,000	NA	NA	<50,000 Y	NA	NA	NA	NA
Cymene (p-Isopropyltoluene)	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
Dibromochloromethane	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Dibromomethane	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
Dichlorodifluoromethane (CFC-12)	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Ethyl ether	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
Ethylbenzene	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Hexachloroethane	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
Iodomethane	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
Isopropyl benzene	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Isopropylbenzene	µg/kg	NA	NA	NA	NA	NA	NA	NA	NA
m&p-Xylene	µg/kg	<10,000	NA	NA	<100,000 Y	NA	<10,000 Y	NA	NA
Methyl acetate	µg/kg	<50,000	NA	NA	<500,000 Y	NA	NA	NA	NA
Methyl cyclohexane	µg/kg	6,000	NA	NA	<50,000 Y	NA	NA	NA	NA
Methyl Tert Butyl Ether	µg/kg	NA	NA	NA	NA	NA	NA	NA	NA
Methyl tert butyl ether (MTBE)	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Methylene chloride	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<10,000 Y	NA	NA
Naphthalene	µg/kg	NA	NA	NA	NA	NA	<10,000 Y	NA	NA
N-Butylbenzene	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
N-Propylbenzene	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
o-Xylene	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Styrene	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
tert-Butylbenzene	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
Tetrachloroethene	µg/kg	8,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Tetrahydrofuran	µg/kg	NA	NA	NA	NA	NA	<100,000 Y	NA	NA
Toluene	µg/kg	11,000	NA	NA	<50,000 Y	NA	7,000 Y	NA	NA
trans-1,2-Dichloroethene	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
trans-1,3-Dichloropropene	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
trans-1,4-Dichloro-2-butene	µg/kg	NA	NA	NA	NA	NA	<5,000 Y	NA	NA
Trichloroethene	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Trichlorofluoromethane (CFC-11)	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Trifluorotrchloroethane (Freon 113)	µg/kg	<5,000	NA	NA	<50,000 Y	NA	NA	NA	NA
Vinyl chloride	µg/kg	<5,000	NA	NA	<50,000 Y	NA	<5,000 Y	NA	NA
Semivolatile Organics									
1,2,4-Trichlorobenzene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
1,2-Dichlorobenzene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
1,2-Diphenylhydrazine	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
1,3-Dichlorobenzene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
1,4-Dichlorobenzene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
2,2'-Oxybis(1-chloropropane) (bis(2-Chloroisopropyl) ether)	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
2,4,5-Trichlorophenol	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
2,4,6-Trichlorophenol	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA

See notes on last page.

Table 1
Summary of LNAPL Results
RACER Trust Plant 2
Lansing, Michigan

Location ID: Date Collected:	Units	P2-SB-37 9/6/2011	P2-SB-37 10/6/2011	P2-SB-37 5/31/2012	PMW-01 11/24/2014	PMW-01 4/7/2017	PMW-01 12/7/2017	PMW-01 12/7/2017	PMW-02 10/19/2012
2,4-Dichlorophenol	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
2,4-Dimethylphenol	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
2,4-Dinitrophenol	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
2,4-Dinitrotoluene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
2,6-Dinitrotoluene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
2-Chloronaphthalene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
2-Chlorophenol	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
2-Methylnaphthalene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	24,000	NA
2-Methylphenol	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
2-Nitroaniline	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
2-Nitrophenol	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
3&4-Methylphenol	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
3,3'-Dichlorobenzidine	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
3-Nitroaniline	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
4,6-Dinitro-2-methylphenol	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
4-Bromophenyl phenyl ether	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
4-Chloro-3-methylphenol	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
4-Chloroaniline	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
4-Chlorophenyl phenyl ether	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
4-Nitroaniline	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
4-Nitrophenol	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
Acenaphthene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	<20,000	NA
Acenaphthylene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	<20,000	NA
Anthracene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	<20,000	NA
Benzo(a)anthracene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	<20,000	NA
Benzo(a)pyrene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	<20,000	NA
Benzo(b)fluoranthene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	<20,000	NA
Benzo(g,h,i)perylene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	<20,000	NA
Benzo(k)fluoranthene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	<20,000	NA
bis(2-Chloroethoxy)methane	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
bis(2-Chloroethyl)ether	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
bis(2-Ethylhexyl)phthalate (DEHP)	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
Butyl benzylphthalate (BBP)	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
Chrysene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	<20,000	NA
Dibenz(a,h)anthracene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	<20,000	NA
Dibenzofuran	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
Diethyl phthalate	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
Dimethyl phthalate	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
Di-n-butylphthalate (DBP)	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
Di-n-octyl phthalate (DnOP)	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
Fluoranthene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	35,000	NA
Fluorene	µg/kg	NA	NA	NA	NA	NA	165,000 X	270,000	NA
Hexachlorobenzene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA

See notes on last page.

Table 1
Summary of LNAPL Results
RACER Trust Plant 2
Lansing, Michigan

Location ID: Date Collected:	Units	P2-SB-37 9/6/2011	P2-SB-37 10/6/2011	P2-SB-37 5/31/2012	PMW-01 11/24/2014	PMW-01 4/7/2017	PMW-01 12/7/2017	PMW-01 12/7/2017	PMW-02 10/19/2012
Hexachlorobutadiene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
Hexachlorocyclopentadiene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
Hexachloroethane	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
Indeno(1,2,3-cd)pyrene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	<20,000	NA
Isophorone	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
Naphthalene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	<20,000	NA
Nitrobenzene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
N-Nitrosodi-n-propylamine	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
N-Nitrosodiphenylamine	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
Pentachlorophenol	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
Phenanthrene	µg/kg	NA	NA	NA	NA	NA	174,000 X	260,000	NA
Phenol	µg/kg	NA	NA	NA	NA	NA	<78,000 X	NA	NA
Pyrene	µg/kg	NA	NA	NA	NA	NA	<78,000 X	41,000	NA
Polychlorinated Biphenyls									
Aroclor-1016 (PCB-1016)	µg/kg	<7,000 J	NA	<7,000 J	<3,000 Y	NA	<3,000 Y	NA	<33,000 Y
Aroclor-1221 (PCB-1221)	µg/kg	<7,000 J	NA	<7,000 J	<3,000 Y	NA	<3,000 Y	NA	<33,000 Y
Aroclor-1232 (PCB-1232)	µg/kg	<7,000 J	NA	<7,000 J	<3,000 Y	NA	<3,000 Y	NA	<33,000 Y
Aroclor-1242 (PCB-1242)	µg/kg	52,000 J	NA	33,000 J	22,000 Y	NA	30,000 Y	NA	133,000 Y
Aroclor-1248 (PCB-1248)	µg/kg	<7,000 J	NA	<7,000 J	<3,000 Y	NA	<3,000 Y	NA	<33,000 Y
Aroclor-1254 (PCB-1254)	µg/kg	<7,000 J	NA	<7,000 J	<3,000 Y	NA	<3,000 Y	NA	<33,000 Y
Aroclor-1260 (PCB-1260)	µg/kg	<7,000 J	NA	<7,000 J	<3,000 Y	NA	<3,000 Y	NA	<33,000 Y
Total PCBs	µg/kg	52,000 J	NA	33,000 J	22,000 Y	NA	30,000 Y	NA	133,000 Y
Total Petroleum Hydrocarbons									
Total Petroleum Hydrocarbons (C10-C28) DRO	µg/L	NA	270,000,000 J	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons (C28-C34) DRO	µg/L	NA	190,000,000 J	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbons (C5-C10) GRO	µg/L	NA	1,100,000	NA	NA	NA	NA	NA	NA
Volatile Petroleum Hydrocarbons									
Volatile Petroleum Hydrocarbons (C5-C8 Aliphatics)	mg/kg	NA	NA	NA	NA	NA	NA	480	NA
Volatile Petroleum Hydrocarbons (C9-C12 Aliphatics)	mg/kg	NA	NA	NA	NA	NA	NA	200	NA
Extractable Petroleum Hydrocarbons									
Volatile Petroleum Hydrocarbons (C9-C18 Aliphatics)	mg/kg	NA	NA	NA	NA	NA	NA	22,000	NA
Volatile Petroleum Hydrocarbons (C19-C36 Aliphatics)	mg/kg	NA	NA	NA	NA	NA	NA	290,000	NA
Volatile Petroleum Hydrocarbons (C11-C22 Aromatics)	mg/kg	NA	NA	NA	NA	NA	NA	100,000	NA

Notes:

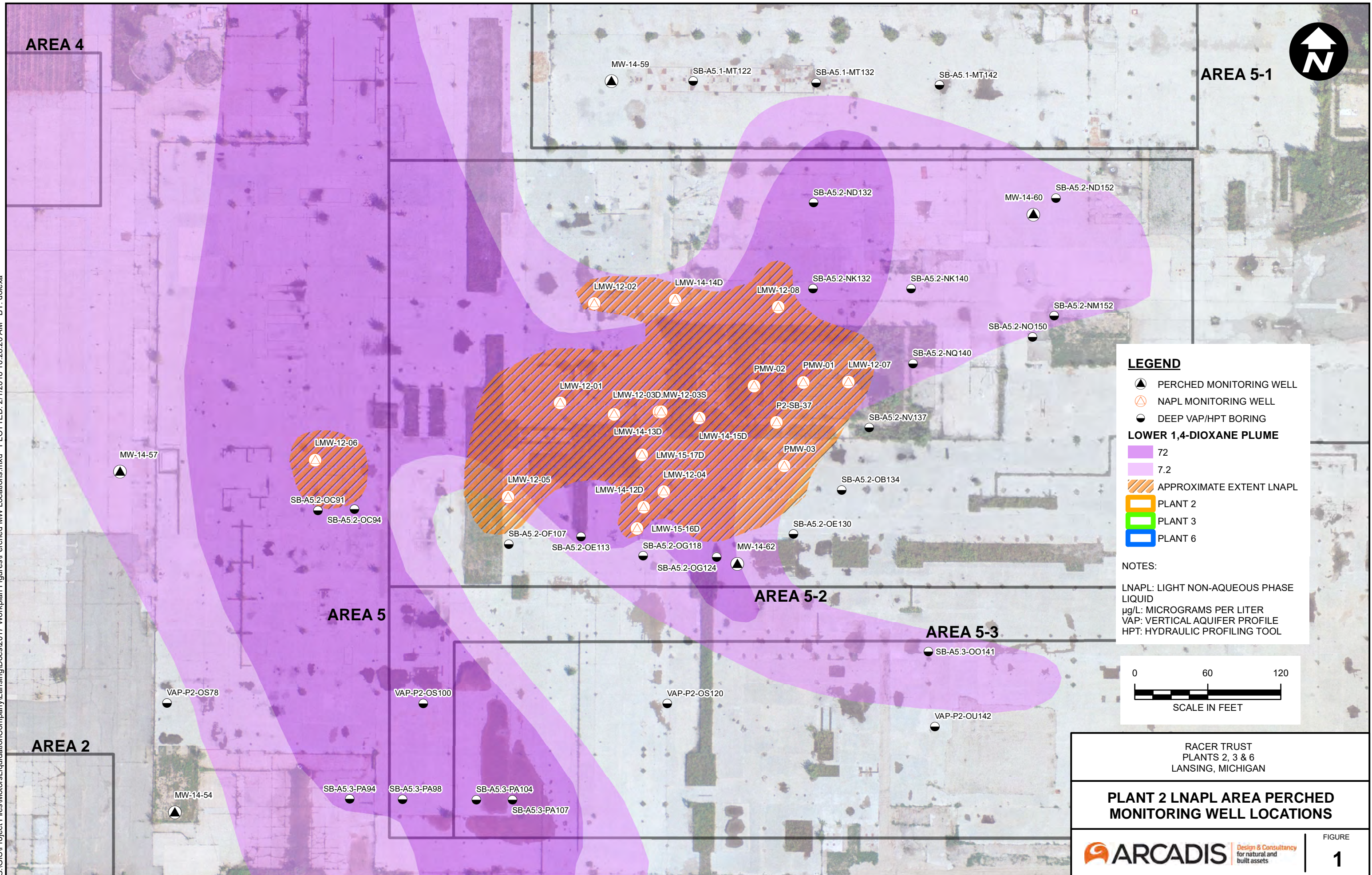
- < indicates result is less than the indicated reporting limit
- Bold** = Compound detected above laboratory reporting limit
- J = Result is an estimated value
- M = Result reported to method detection limit not reporting detection limit
- NA = not analyzed
- X = Elevated reporting limit due to matrix interference.
- Y = Elevated reporting limits due to high target concentrations

mg/kg = milligrams per kilogram
µg/L = microgram per liter
µg/kg = microgram per kilogram

FIGURES



CITY: Novi DIV: ENV DB: TRY PIC: PM: TM: TR: PROJECT NUMBER: COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl G:\GIS\Project Files\MotorsLiquidationCompany\Lansing\Does2017\Workplan Figures\Perched MW Locations.mxd PLOTTED: 2/1/2018 10:28:26 AM BY: dolexa



LEGEND

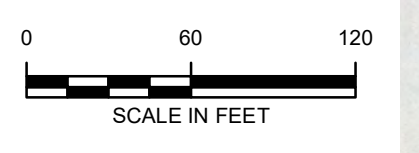
- ▲ PERCHED MONITORING WELL
- △ NAPL MONITORING WELL
- DEEP VAP/HPT BORING

LOWER 1,4-DIOXANE PLUME

- 72
- 7.2
- APPROXIMATE EXTENT LNAPL
- PLANT 2
- PLANT 3
- PLANT 6

NOTES:

LNAPL: LIGHT NON-AQUEOUS PHASE LIQUID
 µg/L: MICROGRAMS PER LITER
 VAP: VERTICAL AQUIFER PROFILE
 HPT: HYDRAULIC PROFILING TOOL

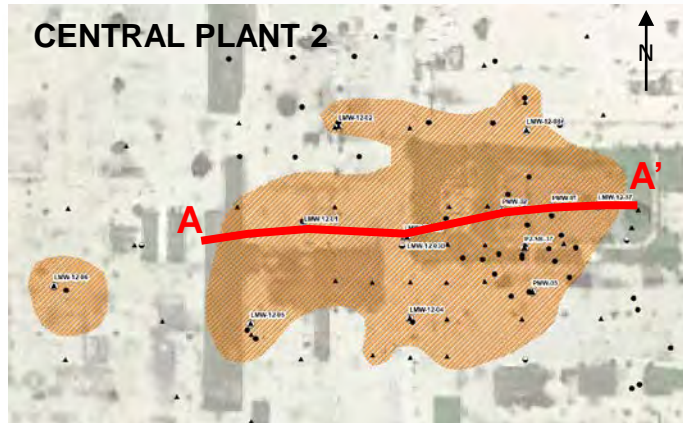


RACER TRUST
 PLANTS 2, 3 & 6
 LANSING, MICHIGAN

PLANT 2 LNAPL AREA PERCHED MONITORING WELL LOCATIONS

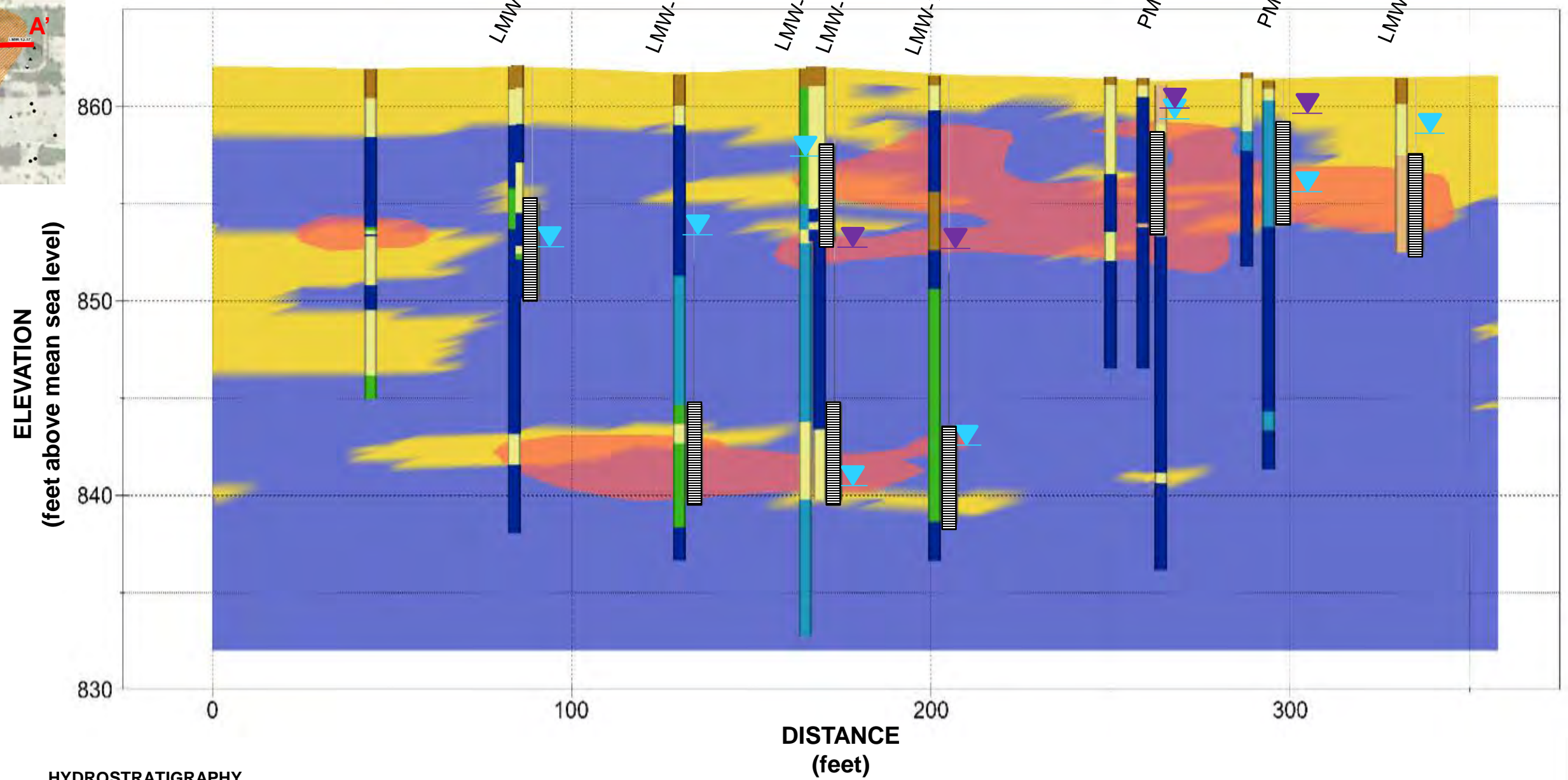
ARCADIS Design & Consultancy for natural and built assets

FIGURE 1



A
WEST

A'
EAST

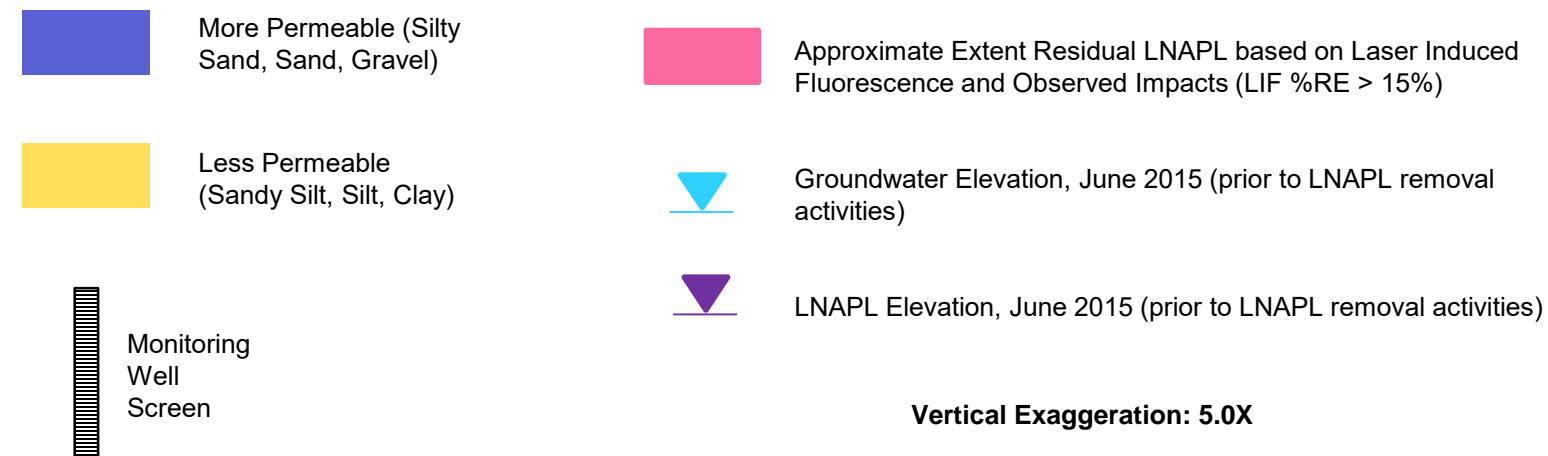


LEGEND

BOREHOLE STRATIGRAPHY



HYDROSTRATIGRAPHY



Vertical Exaggeration: 5.0X

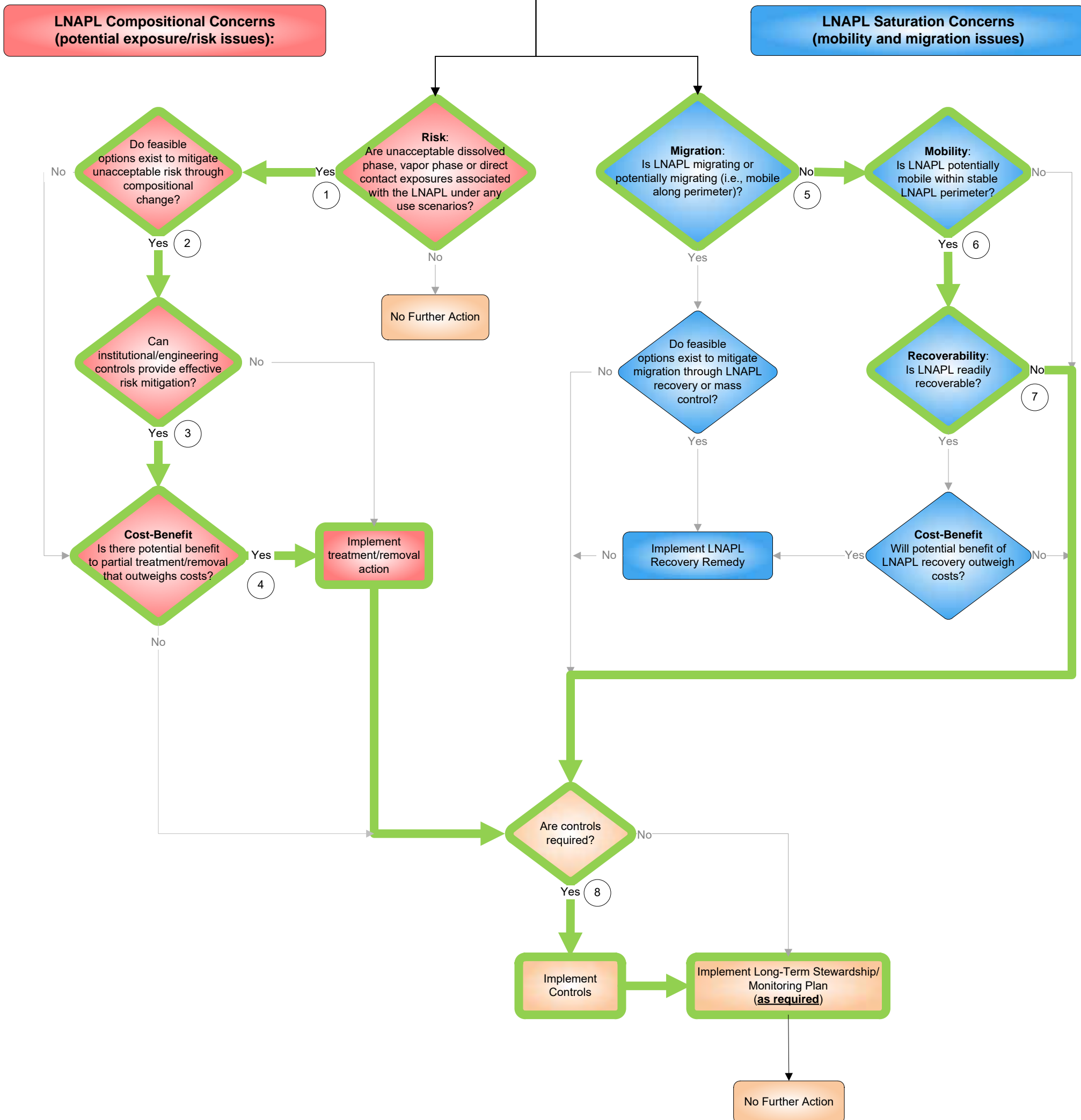
RACER TRUST PLANTS 2, 3 & 6 LANSING, MICHIGAN	
PLANT 2 LNAPL AREA CROSS-SECTION	
ARCADIS Design & Consultancy for natural and built assets	FIGURE 2

APPENDIX A

LNAPL Decision Tree



Attachment 1 LNAPL Remedial Decision Tree Plant 2: Area 5-2



Attachment 1 Notes

Plant 2: Area 5-2

Background:

LNAPL in Area 5-2 is present within the shallow fill and interbedded zone, and is thought to consist primarily of cutting oil. Elevated concentrations of polychlorinated biphenyls (PCBs) and chlorinated volatile organic compounds (1,1,1-trichloroethane [TCA]; 1,1-dichloroethane [DCA]; chloroethane; tetrachloroethene [PCE]; and 1,1-dichloroethene [DCE]) have been detected in LNAPL samples collected from Area 5-2. The LNAPL likely acts as a long-term source of volatile organic compounds (VOCs) to groundwater, and may also be associated with 1,4-dioxane in groundwater in the perched zone extending across Plant 2 onto Plant 6. 1,4-dioxane was used as a stabilizer and corrosion inhibitor in chlorinated solvents (USEPA 2006), particularly 1,1-TCA. 1,4-dioxane is miscible in water and has an octanol-water partition coefficient of approximately 0.27 (USEPA 2006), indicating that a significant fraction of the 1,4-dioxane mass may have partitioned out of the LNAPL and into the aqueous phase. Once dissolved, it is relatively unaffected by sorptive mechanisms, however, it can diffuse into static pore water (water that resides in the fraction of pore space that does not contribute to advective transport) where it can act as a long-term source of impacts through back-diffusion into migratory pore water. Thus, while the majority of 1,4-dioxane mass may be present in the aqueous phase in Area 5-2, there may still be significant concentrations in the LNAPL and in static pore water, and the LNAPL source area may act as an ongoing source of 1,4-dioxane impacts to groundwater in downgradient areas. A more comprehensive overview of the LNAPL conceptual site model for Area 5-2, including information on the significance of the VOCs detected in the LNAPL and the relationship between VOCs in LNAPL and groundwater quality at Plant 2 can be found in the *RFI Phase 1 Activities Summary Report* (ARCADIS 2012) and the *RFI Phase 2 Activities Summary Report* (ARCADIS 2013).

- 1) YES - the following potential risk/exposure concerns are acknowledged for LNAPL in Area 5-2:
 - Groundwater Concerns: Constituents associated with LNAPL have been detected in groundwater at concentrations exceeding relevant generic groundwater cleanup criteria (VOCs exceed residential drinking water and vapor intrusion criteria; 1,4-dioxane exceeds residential drinking water criteria; SVOCs and PCBs exceed residential drinking water and groundwater contact criteria). Additionally, there are aesthetic concerns associated with groundwater use from any areas of the Site where LNAPL is present. Groundwater quality results to date indicate that constituents associated with the LNAPL in Area 5-2 have not migrated off site, and an initial evaluation of groundwater sampling data collected over the past 2 to 3 years indicate that VOCs and 1,4-dioxane plumes are stable in the perched groundwater at the site (ARCADIS 2014a). Long term groundwater monitoring will be completed to continue evaluating the stability of the perched 1,4-dioxane and spatially limited VOC impacts (ARCADIS 2014b). A contingency remedy will be considered if groundwater use restrictions cannot be executed or the plume stability evaluation shows that the groundwater plume(s) is not stable and is migrating off site above applicable MDEQ cleanup criteria.
 - Volatilization Concerns: VOCs have been detected in soil at concentrations exceeding volatilization to indoor air inhalation criteria. Additionally, it is recognized that anaerobic biodegradation of hydrocarbons will generate methane. While there are currently no structures in the area, it is likely that the Site will be redeveloped in the future, and presence of VOCs and the potential for methane generation could result in indoor air quality concerns for future structures.
 - Direct Contact Concerns: LNAPL impacts in Area 5-2 have been identified at shallow depths in several locations (within the upper 4 ft of soil), and concentrations of PCBs in LNAPL and soil in some areas of Area 5-2 exceed TSCA limits. Under current site conditions, much of the ground surface where direct contact concerns are present is covered with concrete and/or asphalt. However, workers could be exposed to surface soils in areas not currently covered, or in covered areas in future use scenarios if cover were to be removed and left uncovered. Additionally, short-term exposures are possible for future construction or utility workers.
- 2) YES – a general discussion regarding feasibility of various compositional change remediation approaches considered for Area 5-2 is provided below:
 - Multi-phase extraction was considered as a potential corrective measure for Area 5-2. MPE was not proposed as a corrective measure for Area 5-2 on the basis that there is limited potential for LNAPL recoverability in Area 5-2 (see note 6, below), and anticipated implementation challenges associated with limited soil permeability and geologic heterogeneity.
 - A highly variable suite of constituents of concern (COCs) are present in LNAPL in Area 5-2, including chlorinated VOCs, 1,4-dioxane, SVOCs, and PCBs. Not all COCs in the LNAPL are volatile or biodegradable, rendering remedial technologies which rely primarily on vapor-phase partitioning or enhanced biodegradation, such as soil vapor extraction (SVE), ineffective for addressing all primary target COCs.
 - In situ chemical oxidation (ISCO) was not evaluated for area 5-2 on the basis that the desired chemical reactions occur within the aqueous phase only, and thus would be rate-limited by dissolution of contaminants from the non-aqueous to aqueous phase. ISCO is also infeasible from a cost perspective, given the relatively large quantities of reagent that would be required to address the mass of LNAPL in the subsurface.
- 3) YES – based on the current understanding of site conditions, institutional controls can provide effective risk mitigation on-site. The COCs in the LNAPL at Area 5-2 likely act as a long-term source of LNAPL constituents to groundwater in areas downgradient of Area 5-2. However, the data collected to date suggest that these constituents have not migrated off-site at concentrations exceeding applicable RBSLs, and thus can be controlled onsite. Additional groundwater monitoring and statistical trend analysis is currently underway to assess the long-term stability of the dissolved-phase plume(s) and to determine the potential for future off-site migration of COCs at concentrations exceeding applicable RBSLs. A contingency remedy will be considered if groundwater use restrictions cannot be executed or the plume stability evaluation shows that the groundwater plume(s) is not stable and is migrating off site above RBSLs.
- 4) YES - a targeted excavation within Area 5-2 is being completed as an interim corrective measure to remove a former concrete vault where concentrations of PCBs in LNAPL and soil exceed TSCA limits. There is some uncertainty regarding the potential benefit of additional partial treatment or excavation in the LNAPL source area beyond the planned removal of PCBs, particularly with respect to the 1,4-dioxane plume in perched groundwater. While the chlorinated solvent TCA, which is found in Area 5-2, was likely the historical source of the 1,4-dioxane in groundwater, the overall mass of 1,4-dioxane remaining in the source area is not known. 1,4-dioxane was not detected in soil or LNAPL from Area 5-2 due to elevated laboratory detection limits, and based on its chemical properties, it is likely that a significant fraction of the 1,4-dioxane mass may have partitioned out of the LNAPL and into the aqueous phase (see notes in background section, above). Based on this information, it is possible that the bulk of the 1,4-dioxane mass no longer resides in the source area, and additional partial treatment or mass removal in the source area may have little impact on the longevity of the 1,4-dioxane concentrations in groundwater located downgradient of Area 5-2. Given that all impacts associated with the LNAPL (including 1,4-dioxane) appear to be contained on-site and stable (not migrating), risks associated with these impacts can be effectively mitigated through institutional controls. Based on the present understanding of site conditions, additional remediation or excavation is not necessary and does not constitute an appropriate use of financial and natural resources. However, long term groundwater monitoring will be completed to continue evaluating the long-term stability of the perched 1,4-dioxane and spatially limited VOC impacts (ARCADIS 2014b). A contingency remedy will be considered if groundwater use restrictions cannot be executed or the plume stability evaluation shows that the groundwater plume(s) is not stable and is migrating off site above applicable MDEQ cleanup criteria.
- 5) NO - a comprehensive LNAPL mobility evaluation was completed in Area 5-2 in 2013 (ARCADIS 2013). The evaluation indicated that LNAPL is stable and not migrating, based on the following lines of evidence:
 - Pore velocity potentials were calculated based on API methodology at four soil core locations where field saturation exceeded residual saturation. All calculated LNAPL velocity potentials were less than 1.0×10^{-6} cm/s (the velocity criterion suggested by ASTM [2006]), indicating that LNAPL is functionally immobile in Area 5-2.
 - LNAPL pore-entry pressure analysis indicated that LNAPL thicknesses observed at the perimeter of the LNAPL body in Area 5-2 are below the threshold values required for LNAPL to migrate into soils not previously affected by LNAPL.
 - Operations at the Site were halted in 2006 and thus all LNAPL releases to the subsurface occurred at a minimum, seven years ago. LNAPL bodies typically stabilize 2 to 5 years after the release has stopped (ITRC 2012).

Fluid level gauging data collected through February 2014 indicate LNAPL accumulation in some of the monitoring wells in Area 5-2 (PMW-01, LMW-12-08, and LMW-12-03D). The observed LNAPL accumulation likely reflects gradual equilibration between LNAPL in the formation and the wells, rather than evidence of LNAPL migration. Long term fluid level gauging will be completed to continue evaluating LNAPL stability (ARCADIS 2014b).

- 6) YES - a comprehensive LNAPL mobility evaluation was completed in Area 5-2. The evaluation demonstrated that mobile LNAPL is present, based on the following lines of evidence:
- LNAPL accumulates in monitoring wells.
 - Laboratory petrophysical testing of undisturbed soil cores indicated that field LNAPL saturations exceeded residual.
- 7) NO - LNAPL recoverability was evaluated in Area 5-2 through field LNAPL transmissivity testing (ARCADIS 2013). The Michigan Department of Environmental Quality (MDEQ) has indicated that an LNAPL transmissivity of 0.5 ft²/day may be established as a standard threshold value for recovery to the maximum extent practicable (Swiger 2013), permitting the use of LNAPL transmissivity as a quantitative recoverability metric in the State of Michigan in the absence of risk-based LNAPL concerns. The LNAPL transmissivity values measured at Area 5-2 ranged from 0.005 to 0.01 ft²/day, and are well below this criterion. These data indicate that LNAPL is minimally recoverable at Area 5-2, and LNAPL recovery efforts (through hydraulically-based remediation methods) will not result in a beneficial reduction in overall LNAPL mass. Transmissivity testing could not be completed in 11 of the 13 wells in Area 5-2 due to insufficient LNAPL accumulation (<0.2 foot) during the LNAPL transmissivity testing event in 2013 (ARCADIS 2013). Fluid level gauging data collected since the LNAPL transmissivity testing activities completed in 2013 indicate LNAPL accumulation sufficient to facilitate LNAPL transmissivity testing in a few additional wells in Area 5-2. From a qualitative perspective, the slow rate of LNAPL accumulation observed in these wells suggests that LNAPL transmissivity is very low. However, long term fluid level gauging will be completed to evaluate equilibrium conditions in these wells and additional LNAPL transmissivity testing may be completed to re-evaluate LNAPL recoverability.

Given that LNAPL body at Area 5-2 appears stable, the risks associated with the LNAPL will not change appreciably as a result of active recovery efforts. While no formal assessment of NSZD rates has been completed for Area 5-2, based on recent literature publications (Lundegard and Johnson [2006], Sihota et al [2011]) and ARCADIS' experience, magnitudes of petroleum hydrocarbon-based LNAPL losses through NSZD typically fall within the range of hundreds to thousands of gallons per acre per year. Based on the limited LNAPL transmissivity values measured to date in Area 5-2, active LNAPL recovery is unlikely to yield significant additional mass by comparison to ongoing mass reduction through NSZD.

- 8) YES - the following controls are proposed for all LNAPL Area 5-2 to limit potential for future exposure:
- Land Use Restrictions:
 - Land use at the entire Site would be limited to industrial and/or commercial uses.
 - All site soils media and/or debris will be managed in accordance with applicable requirements of RCRA and all other relevant state and federal laws.
 - Construction of new structures will not be permitted unless construction incorporates engineering controls designed to eliminate the potential for subsurface vapor phase hazardous substances to migrate into the new structure at concentrations greater than applicable criteria, or unless prior to construction of any structure, an evaluation of the potential for any hazardous substances to volatilize into indoor air assures the protection of persons who may be present in the buildings and is in compliance with all relevant federal, state, and local laws.
 - Intrusive excavation activities will be conducted following a site-specific health and safety plan prepared by qualified professionals and intrusive activities are conducted by appropriately trained personnel.
 - Groundwater Use Restrictions: Groundwater use restrictions will be recorded on the deeds prohibiting the construction and use of wells or other devices on the Site to extract groundwater for consumption, irrigation, or any other purpose, except as provided below:
 - Wells and other devices constructed as part of a response activity for the purpose of evaluating groundwater quality or to remediate subsurface contamination associated with a release of hazardous substances into the environment are permitted provided the construction of the wells or devices complies with all applicable local, state, and federal laws and regulations and does not cause or result in a new release, exacerbation of existing contamination, or any other violation of local, state, or federal laws or regulations.
 - Short-term dewatering for construction purposes is permitted provided the dewatering, including management and disposal of the groundwater, is conducted in accordance with all applicable local, state, and federal laws and regulations and does not cause or result in a new release, exacerbation of existing contamination, or any other violation of local, state, and federal environmental laws and regulations.
 - Monitored Plume Stability: A groundwater monitoring program that provides data to verify dissolved phase plume stability and preserves the current conditions of the existing surface cover to minimize infiltration and maximize the potential for the groundwater plume to remain stable will be implemented.
 - Caps: Capping was incorporated into the proposed corrective measures for Area 5-2 to reduce the potential for direct contact risks associated with the LNAPL.

References:

- ARCADIS. 2012. Resource Conservation and Recovery Act Facility Investigation (RFI) Phase 1 Activities Summary Report. RACER Trust, Lansing, Michigan Plants 2, 3 & 6 Industrial Land. January 30.
- ARCADIS. 2013a. Resource Conservation and Recovery Act Facility Investigation (RFI) Phase 2 Activities Summary Report. Michigan Plants 2, 3 & 6 Industrial Land. April.
- ARCADIS, 2014a. Preliminary Geochemistry and Plume Stability Assessment. April.
- ARCADIS, 2014b. Revised Interim Monitoring Work Plan. May
- ASTM International. 2006. Standard Guide for Development of Conceptual Site Models and Remediation Strategies for Light Nonaqueous-Phase Liquids Released to the Subsurface. Document: E 2531-06.
- ITRC. 2012. LNAPL Training Part 1: An Improved Understanding of LNAPL Behavior in the Subsurface. Washington, D.C.: Interstate Technology & Regulatory Council, LNAPLs Team. www.itrcweb.org.
- Lundegard, P.D., and P.C. Johnson. 2006. Source zone natural attenuation at petroleum hydrocarbon spill sites-II: application to a former oil field. Ground Water Monitoring and Remediation 26, no. 4: 93–106.
- Sihota, N.J., O. Singurindy, and K.U. Mayer, 2011. CO₂-Efflux Measurements for Evaluating Source Zone Natural Attenuation Rates in a Petroleum Hydrocarbon Contaminated Aquifer, Environ. Sci. Technol., 45:482-488.
- Swiger, N., 2013. Nonaqueous Phase Liquids (NAPL) Management. Presentation at the American Institute of Professional Geologists (AIPG), Michigan Section, March 2013 Meeting.
- United States Environmental Protection Agency (USEPA). 2006. Treatment Technologies for 1,4-Dioxane: Fundamentals and Field Applications. Office of Solid Waste and Emergency Response. December 2006. Document number: EPA 542-R-06-009.

APPENDIX B

2017 LNAPL Laboratory Analytical Reports



TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-143466-1
Client Project/Site: RACER Lansing

For:
ARCADIS U.S., Inc.
28550 Cabot Drive
Suite 500
Novi, Michigan 48377

Attn: Randy Christensen



Authorized for release by:
1/3/2018 2:35:20 PM
Leah Klingensmith, Senior Project Manager
(615)301-5038
leah.klingensmith@testamericainc.com

Designee for
Denise Pohl, Project Manager II
(330)966-9789
denise.pohl@testamericainc.com

LINKS

Review your project
results through
TotalAccess

Have a Question?



Visit us at:
www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

1

2

3

4

5

6

7

8

9

10

11

12

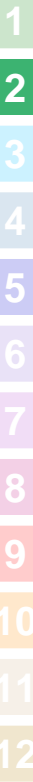


Table of Contents

Cover Page	1
Table of Contents	2
Sample Summary	3
Case Narrative	4
Definitions	5
Client Sample Results	6
QC Sample Results	12
QC Association	17
Chronicle	20
Method Summary	22
Certification Summary	23
Chain of Custody	25

Sample Summary

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-143466-1	LMW-12-08_12072017	Solid	12/07/17 08:10	12/20/17 10:35
490-143466-2	PMW-01_12072017	Solid	12/07/17 09:05	12/20/17 10:35
490-143466-3	MW-14-12D_12072017	Solid	12/07/17 09:25	12/20/17 10:35

1

2

3

4

5

6

7

8

9

10

11

12

Case Narrative

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

Job ID: 490-143466-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative 490-143466-1

Comments

No additional comments.

Receipt

The samples were received on 12/20/2017 10:35 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 5.5° C.

GC/MS Semi VOA

Method(s) 8270D: The laboratory control sample (LCS) and / or laboratory control sample duplicate (LCSD) for preparation batch 490-485083 and 490-485092 and analytical batch 490-486984 recovered outside control limits for several analytes. These analytes were biased high in the LCS and were 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 VOA

Method(s) MAVPH: Surrogate recovery for the following samples was outside control limits: LMW-12-08_12072017 (490-143466-1) and MW-14-12D_12072017 (490-143466-3). Evidence of matrix interference is present; therefore, re-extraction and/or re-analysis was not performed.

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

GC Semi VOA

Method(s) MA-EPH: There was zero percent breakthroughs of the aromatic analytes Naphthalene and 2-Methylnaphthalene associated with the following aliphatic laboratory control sample (LCS) and laboratory control sample duplicate (LCSD): (LCS 490-485083/2-B) and (LCSD 490-485083/3-B).

Method(s) MA-EPH: Surrogate recovery for the following samples was outside control limits: LMW-12-08_12072017 (490-143466-1), PMW-01_12072017 (490-143466-2) and MW-14-12D_12072017 (490-143466-3). Evidence of matrix interference is present; therefore, re-extraction and/or re-analysis was not performed.

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.

VOA Prep

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

Definitions/Glossary

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.
*	LCS or LCSD is outside acceptance limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

GC VOA

Qualifier	Qualifier Description
X	Surrogate is outside control limits
U	Indicates the analyte was analyzed for but not detected.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

GC Semi VOA

Qualifier	Qualifier Description
X	Surrogate is outside control limits
U	Indicates the analyte was analyzed for but not detected.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	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)

Client Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

Client Sample ID: LMW-12-08_12072017

Lab Sample ID: 490-143466-1

Date Collected: 12/07/17 08:10

Matrix: Solid

Date Received: 12/20/17 10:35

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthene	19	U	19	4.9	mg/Kg		12/21/17 13:02	12/31/17 16:16	1
Acenaphthylene	19	U	19	2.7	mg/Kg		12/21/17 13:02	12/31/17 16:16	1
Anthracene	19	U	19	4.2	mg/Kg		12/21/17 13:02	12/31/17 16:16	1
Benzo[a]anthracene	19	U	19	3.7	mg/Kg		12/21/17 13:02	12/31/17 16:16	1
Benzo[a]pyrene	19	U *	19	2.7	mg/Kg		12/21/17 13:02	12/31/17 16:16	1
Benzo[b]fluoranthene	19	U	19	4.0	mg/Kg		12/21/17 13:02	12/31/17 16:16	1
Benzo[g,h,i]perylene	19	U *	19	2.8	mg/Kg		12/21/17 13:02	12/31/17 16:16	1
Benzo[k]fluoranthene	19	U *	19	3.0	mg/Kg		12/21/17 13:02	12/31/17 16:16	1
Chrysene	19	U	19	4.8	mg/Kg		12/21/17 13:02	12/31/17 16:16	1
Dibenz(a,h)anthracene	19	U *	19	3.0	mg/Kg		12/21/17 13:02	12/31/17 16:16	1
Fluoranthene	14	J	19	3.6	mg/Kg		12/21/17 13:02	12/31/17 16:16	1
Fluorene	13	J	19	5.1	mg/Kg		12/21/17 13:02	12/31/17 16:16	1
Indeno[1,2,3-cd]pyrene	19	U *	19	2.7	mg/Kg		12/21/17 13:02	12/31/17 16:16	1
2-Methylnaphthalene	19	U	19	6.0	mg/Kg		12/21/17 13:02	12/31/17 16:16	1
Naphthalene	19	U	19	3.9	mg/Kg		12/21/17 13:02	12/31/17 16:16	1
Phenanthrene	29		19	4.1	mg/Kg		12/21/17 13:02	12/31/17 16:16	1
Pyrene	26		19	3.3	mg/Kg		12/21/17 13:02	12/31/17 16:16	1

Method: MA VPH - Massachusetts - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C8 Aliphatics (adjusted)	28	J	50	26	mg/Kg			12/28/17 16:23	1
C9-C12 Aliphatics (adjusted)	660		50	25	mg/Kg			12/28/17 16:23	1

Method: MAVPH - Massachusetts - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Methyl tert-butyl ether	0.50	U	0.50	0.12	mg/Kg		12/21/17 11:25	12/26/17 18:03	1
Benzene	0.50	U	0.50	0.18	mg/Kg		12/21/17 11:25	12/26/17 18:03	1
Toluene	0.28	J	1.5	0.17	mg/Kg		12/21/17 11:25	12/26/17 18:03	1
Ethylbenzene	4.0		0.50	0.19	mg/Kg		12/21/17 11:25	12/26/17 18:03	1
m-Xylene & p-Xylene	2.0	U	2.0	0.15	mg/Kg		12/21/17 11:25	12/26/17 18:03	1
o-Xylene	11		0.99	0.15	mg/Kg		12/21/17 11:25	12/26/17 18:03	1
Naphthalene	2.2	J	2.5	1.2	mg/Kg		12/21/17 11:25	12/26/17 18:03	1
C5-C8 Aliphatics (unadjusted)	28	J	50	26	mg/Kg		12/21/17 11:25	12/26/17 18:03	1
C9-C12 Aliphatics (unadjusted)	1400		500	250	mg/Kg		12/21/17 11:25	12/26/17 16:26	10
C9-C10 Aromatics	690		500	300	mg/Kg		12/21/17 11:25	12/26/17 16:26	10

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
2,5-Dibromotoluene (fid)	89		70 - 130	12/21/17 11:25	12/26/17 16:26	10
2,5-Dibromotoluene (fid)	89		70 - 130	12/21/17 11:25	12/26/17 18:03	1
2,5-Dibromotoluene (pid)	94		70 - 130	12/21/17 11:25	12/26/17 16:26	10
2,5-Dibromotoluene (pid)	39	X	70 - 130	12/21/17 11:25	12/26/17 18:03	1

Method: MA-EPH - Massachusetts - Extractable Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C9-C18 Aliphatics	20000		4900	1200	mg/Kg		12/21/17 13:02	12/23/17 04:03	5
C19-C36 Aliphatics	210000		49000	24000	mg/Kg		12/21/17 13:02	12/23/17 04:31	50
C11-C22 Aromatics (unadjusted)	130000		9700	4800	mg/Kg		12/21/17 13:02	12/22/17 10:35	10
C11-C22 Aromatics (Adjusted)	120000		10	7.0	mg/Kg			12/22/17 15:58	1

TestAmerica Nashville

Client Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

Client Sample ID: LMW-12-08_12072017

Lab Sample ID: 490-143466-1

Date Collected: 12/07/17 08:10

Matrix: Solid

Date Received: 12/20/17 10:35

<i>Surrogate</i>	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>	<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
2-Bromonaphthalene	79		40 - 140	12/21/17 13:02	12/22/17 10:35	10
1-Chlorooctadecane	0	X	40 - 140	12/21/17 13:02	12/23/17 04:03	5
2-Fluorobiphenyl	77		40 - 140	12/21/17 13:02	12/22/17 10:35	10
o-Terphenyl	339	X	40 - 140	12/21/17 13:02	12/22/17 10:35	10

Client Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

Client Sample ID: PMW-01_12072017

Lab Sample ID: 490-143466-2

Date Collected: 12/07/17 09:05

Matrix: Solid

Date Received: 12/20/17 10:35

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthene	16	J	20	4.9	mg/Kg		12/21/17 13:02	12/31/17 16:37	1
Acenaphthylene	20	U	20	2.7	mg/Kg		12/21/17 13:02	12/31/17 16:37	1
Anthracene	20	U	20	4.2	mg/Kg		12/21/17 13:02	12/31/17 16:37	1
Benzo[a]anthracene	20	U	20	3.7	mg/Kg		12/21/17 13:02	12/31/17 16:37	1
Benzo[a]pyrene	20	U *	20	2.7	mg/Kg		12/21/17 13:02	12/31/17 16:37	1
Benzo[b]fluoranthene	20	U	20	4.0	mg/Kg		12/21/17 13:02	12/31/17 16:37	1
Benzo[g,h,i]perylene	20	U *	20	2.8	mg/Kg		12/21/17 13:02	12/31/17 16:37	1
Benzo[k]fluoranthene	20	U *	20	3.0	mg/Kg		12/21/17 13:02	12/31/17 16:37	1
Chrysene	20	U	20	4.8	mg/Kg		12/21/17 13:02	12/31/17 16:37	1
Dibenz(a,h)anthracene	20	U *	20	3.0	mg/Kg		12/21/17 13:02	12/31/17 16:37	1
Fluoranthene	35		20	3.6	mg/Kg		12/21/17 13:02	12/31/17 16:37	1
Fluorene	270		20	5.2	mg/Kg		12/21/17 13:02	12/31/17 16:37	1
Indeno[1,2,3-cd]pyrene	20	U *	20	2.7	mg/Kg		12/21/17 13:02	12/31/17 16:37	1
2-Methylnaphthalene	24		20	6.1	mg/Kg		12/21/17 13:02	12/31/17 16:37	1
Naphthalene	20	U	20	3.9	mg/Kg		12/21/17 13:02	12/31/17 16:37	1
Phenanthrene	260		20	4.1	mg/Kg		12/21/17 13:02	12/31/17 16:37	1
Pyrene	41		20	3.3	mg/Kg		12/21/17 13:02	12/31/17 16:37	1

Method: MA VPH - Massachusetts - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C8 Aliphatics (adjusted)	480		49	25	mg/Kg			12/28/17 16:23	1
C9-C12 Aliphatics (adjusted)	200		49	24	mg/Kg			12/28/17 16:23	1

Method: MAVPH - Massachusetts - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Methyl tert-butyl ether	0.49	U	0.49	0.12	mg/Kg		12/21/17 11:25	12/26/17 19:40	1
Benzene	0.49	U	0.49	0.17	mg/Kg		12/21/17 11:25	12/26/17 19:40	1
Toluene	15		1.5	0.17	mg/Kg		12/21/17 11:25	12/26/17 19:40	1
Ethylbenzene	1.9		0.49	0.18	mg/Kg		12/21/17 11:25	12/26/17 19:40	1
m-Xylene & p-Xylene	1.5	J	1.9	0.15	mg/Kg		12/21/17 11:25	12/26/17 19:40	1
o-Xylene	0.97	U	0.97	0.15	mg/Kg		12/21/17 11:25	12/26/17 19:40	1
Naphthalene	11		2.4	1.2	mg/Kg		12/21/17 11:25	12/26/17 19:40	1
C5-C8 Aliphatics (unadjusted)	490		49	25	mg/Kg		12/21/17 11:25	12/26/17 19:40	1
C9-C12 Aliphatics (unadjusted)	460		49	24	mg/Kg		12/21/17 11:25	12/26/17 19:40	1
C9-C10 Aromatics	260		49	29	mg/Kg		12/21/17 11:25	12/26/17 19:40	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
2,5-Dibromotoluene (fid)	111		70 - 130	12/21/17 11:25	12/26/17 19:40	1
2,5-Dibromotoluene (pid)	111		70 - 130	12/21/17 11:25	12/26/17 19:40	1

Method: MA-EPH - Massachusetts - Extractable Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C9-C18 Aliphatics	22000		4900	1200	mg/Kg		12/21/17 13:02	12/23/17 05:00	5
C19-C36 Aliphatics	290000		49000	25000	mg/Kg		12/21/17 13:02	12/23/17 05:29	50
C11-C22 Aromatics (unadjusted)	110000		9800	4800	mg/Kg		12/21/17 13:02	12/22/17 11:01	10
C11-C22 Aromatics (Adjusted)	100000		10	7.0	mg/Kg			12/22/17 15:58	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
2-Bromonaphthalene	106		40 - 140	12/21/17 13:02	12/22/17 11:01	10
1-Chlorooctadecane	381	X	40 - 140	12/21/17 13:02	12/23/17 05:00	5

TestAmerica Nashville

Client Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

Client Sample ID: PMW-01_12072017

Lab Sample ID: 490-143466-2

Date Collected: 12/07/17 09:05

Matrix: Solid

Date Received: 12/20/17 10:35

Method: MA-EPH - Massachusetts - Extractable Petroleum Hydrocarbons (GC) (Continued)

<i>Surrogate</i>	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>	<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
2-Fluorobiphenyl	100		40 - 140	12/21/17 13:02	12/22/17 11:01	10
o-Terphenyl	186	X	40 - 140	12/21/17 13:02	12/22/17 11:01	10

Client Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

Client Sample ID: MW-14-12D_12072017

Lab Sample ID: 490-143466-3

Date Collected: 12/07/17 09:25

Matrix: Solid

Date Received: 12/20/17 10:35

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthene	20	U	20	4.9	mg/Kg		12/21/17 13:02	12/31/17 16:57	1
Acenaphthylene	20	U	20	2.7	mg/Kg		12/21/17 13:02	12/31/17 16:57	1
Anthracene	36		20	4.2	mg/Kg		12/21/17 13:02	12/31/17 16:57	1
Benzo[a]anthracene	20	U	20	3.7	mg/Kg		12/21/17 13:02	12/31/17 16:57	1
Benzo[a]pyrene	20	U *	20	2.7	mg/Kg		12/21/17 13:02	12/31/17 16:57	1
Benzo[b]fluoranthene	20	U	20	4.0	mg/Kg		12/21/17 13:02	12/31/17 16:57	1
Benzo[g,h,i]perylene	20	U *	20	2.8	mg/Kg		12/21/17 13:02	12/31/17 16:57	1
Benzo[k]fluoranthene	20	U *	20	3.0	mg/Kg		12/21/17 13:02	12/31/17 16:57	1
Chrysene	20	U	20	4.8	mg/Kg		12/21/17 13:02	12/31/17 16:57	1
Dibenz(a,h)anthracene	20	U *	20	3.0	mg/Kg		12/21/17 13:02	12/31/17 16:57	1
Fluoranthene	18	J	20	3.6	mg/Kg		12/21/17 13:02	12/31/17 16:57	1
Fluorene	87		20	5.2	mg/Kg		12/21/17 13:02	12/31/17 16:57	1
Indeno[1,2,3-cd]pyrene	20	U *	20	2.7	mg/Kg		12/21/17 13:02	12/31/17 16:57	1
2-Methylnaphthalene	19	J	20	6.1	mg/Kg		12/21/17 13:02	12/31/17 16:57	1
Naphthalene	20	U	20	3.9	mg/Kg		12/21/17 13:02	12/31/17 16:57	1
Phenanthrene	110		20	4.1	mg/Kg		12/21/17 13:02	12/31/17 16:57	1
Pyrene	33		20	3.3	mg/Kg		12/21/17 13:02	12/31/17 16:57	1

Method: MA VPH - Massachusetts - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C5-C8 Aliphatics (adjusted)	120		49	25	mg/Kg			12/28/17 16:23	1
C9-C12 Aliphatics (adjusted)	240		49	25	mg/Kg			12/28/17 16:23	1

Method: MAVPH - Massachusetts - Volatile Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Methyl tert-butyl ether	0.43	J	0.49	0.12	mg/Kg		12/21/17 11:25	12/26/17 21:17	1
Benzene	0.98		0.49	0.18	mg/Kg		12/21/17 11:25	12/26/17 21:17	1
Toluene	2.0		1.5	0.17	mg/Kg		12/21/17 11:25	12/26/17 21:17	1
Ethylbenzene	1.2		0.49	0.19	mg/Kg		12/21/17 11:25	12/26/17 21:17	1
m-Xylene & p-Xylene	1.9	J	2.0	0.15	mg/Kg		12/21/17 11:25	12/26/17 21:17	1
o-Xylene	0.64	J	0.98	0.15	mg/Kg		12/21/17 11:25	12/26/17 21:17	1
Naphthalene	10		2.5	1.2	mg/Kg		12/21/17 11:25	12/26/17 21:17	1
C5-C8 Aliphatics (unadjusted)	120		49	25	mg/Kg		12/21/17 11:25	12/26/17 21:17	1
C9-C12 Aliphatics (unadjusted)	750		490	250	mg/Kg		12/21/17 11:25	12/26/17 17:31	10
C9-C10 Aromatics	500		490	290	mg/Kg		12/21/17 11:25	12/26/17 17:31	10

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
2,5-Dibromotoluene (fid)	89		70 - 130	12/21/17 11:25	12/26/17 17:31	10
2,5-Dibromotoluene (fid)	93		70 - 130	12/21/17 11:25	12/26/17 21:17	1
2,5-Dibromotoluene (pid)	98		70 - 130	12/21/17 11:25	12/26/17 17:31	10
2,5-Dibromotoluene (pid)	49	X	70 - 130	12/21/17 11:25	12/26/17 21:17	1

Method: MA-EPH - Massachusetts - Extractable Petroleum Hydrocarbons (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C9-C18 Aliphatics	14000		4900	1200	mg/Kg		12/21/17 13:02	12/23/17 05:57	5
C19-C36 Aliphatics	410000		49000	25000	mg/Kg		12/21/17 13:02	12/23/17 06:25	50
C11-C22 Aromatics (unadjusted)	120000		9800	4800	mg/Kg		12/21/17 13:02	12/22/17 11:26	10
C11-C22 Aromatics (Adjusted)	110000		10	7.0	mg/Kg			12/22/17 15:58	1

TestAmerica Nashville

Client Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

Client Sample ID: MW-14-12D_12072017

Lab Sample ID: 490-143466-3

Date Collected: 12/07/17 09:25

Matrix: Solid

Date Received: 12/20/17 10:35

<i>Surrogate</i>	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>	<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
2-Bromonaphthalene	101		40 - 140	12/21/17 13:02	12/22/17 11:26	10
1-Chlorooctadecane	0	X	40 - 140	12/21/17 13:02	12/23/17 05:57	5
2-Fluorobiphenyl	98		40 - 140	12/21/17 13:02	12/22/17 11:26	10
o-Terphenyl	160	X	40 - 140	12/21/17 13:02	12/22/17 11:26	10

QC Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

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

Lab Sample ID: MB 490-485083/1-C
Matrix: Solid
Analysis Batch: 486984

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 485083

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthene	20	U	20	5.0	mg/Kg		12/21/17 13:02	12/31/17 22:26	1
Acenaphthylene	20	U	20	2.8	mg/Kg		12/21/17 13:02	12/31/17 22:26	1
Anthracene	20	U	20	4.3	mg/Kg		12/21/17 13:02	12/31/17 22:26	1
Benzo[a]anthracene	20	U	20	3.8	mg/Kg		12/21/17 13:02	12/31/17 22:26	1
Benzo[a]pyrene	20	U	20	2.8	mg/Kg		12/21/17 13:02	12/31/17 22:26	1
Benzo[b]fluoranthene	20	U	20	4.1	mg/Kg		12/21/17 13:02	12/31/17 22:26	1
Benzo[g,h,i]perylene	20	U	20	2.9	mg/Kg		12/21/17 13:02	12/31/17 22:26	1
Benzo[k]fluoranthene	20	U	20	3.1	mg/Kg		12/21/17 13:02	12/31/17 22:26	1
Chrysene	20	U	20	4.9	mg/Kg		12/21/17 13:02	12/31/17 22:26	1
Dibenz(a,h)anthracene	20	U	20	3.1	mg/Kg		12/21/17 13:02	12/31/17 22:26	1
Fluoranthene	20	U	20	3.7	mg/Kg		12/21/17 13:02	12/31/17 22:26	1
Fluorene	20	U	20	5.3	mg/Kg		12/21/17 13:02	12/31/17 22:26	1
Indeno[1,2,3-cd]pyrene	20	U	20	2.8	mg/Kg		12/21/17 13:02	12/31/17 22:26	1
2-Methylnaphthalene	20	U	20	6.2	mg/Kg		12/21/17 13:02	12/31/17 22:26	1
Naphthalene	20	U	20	4.0	mg/Kg		12/21/17 13:02	12/31/17 22:26	1
Phenanthrene	20	U	20	4.2	mg/Kg		12/21/17 13:02	12/31/17 22:26	1
Pyrene	20	U	20	3.4	mg/Kg		12/21/17 13:02	12/31/17 22:26	1

Lab Sample ID: LCS 490-485083/2-C
Matrix: Solid
Analysis Batch: 486984

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 485083

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Acenaphthene	25.0	29.1		mg/Kg		116	40 - 140
Acenaphthylene	25.0	34.7		mg/Kg		139	40 - 140
Anthracene	25.0	31.6		mg/Kg		126	40 - 140
Benzo[a]anthracene	25.0	30.3		mg/Kg		121	40 - 140
Benzo[a]pyrene	25.0	35.3	*	mg/Kg		141	40 - 140
Benzo[b]fluoranthene	25.0	32.4		mg/Kg		130	40 - 140
Benzo[g,h,i]perylene	25.0	41.9	*	mg/Kg		167	40 - 140
Benzo[k]fluoranthene	25.0	37.1	*	mg/Kg		149	40 - 140
Chrysene	25.0	30.7		mg/Kg		123	40 - 140
Dibenz(a,h)anthracene	25.0	41.9	*	mg/Kg		168	40 - 140
Fluoranthene	25.0	32.7		mg/Kg		131	40 - 140
Fluorene	25.0	31.7		mg/Kg		127	40 - 140
Indeno[1,2,3-cd]pyrene	25.0	46.9	*	mg/Kg		188	40 - 140
2-Methylnaphthalene	25.0	32.6		mg/Kg		130	40 - 140
Naphthalene	25.0	32.4		mg/Kg		130	40 - 140
Phenanthrene	25.0	32.9		mg/Kg		132	40 - 140
Pyrene	25.0	32.5		mg/Kg		130	40 - 140

Lab Sample ID: LCSD 490-485083/3-C
Matrix: Solid
Analysis Batch: 486984

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 485083

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	Limits	RPD	RPD Limit
Acenaphthene	25.0	28.0		mg/Kg		112	40 - 140	4	30
Acenaphthylene	25.0	30.4		mg/Kg		122	40 - 140	13	30

TestAmerica Nashville

QC Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

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

Lab Sample ID: LCSD 490-485083/3-C
Matrix: Solid
Analysis Batch: 486984

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 485083

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Anthracene	25.0	25.3		mg/Kg		101	40 - 140	22	30
Benzo[a]anthracene	25.0	26.1		mg/Kg		104	40 - 140	15	30
Benzo[a]pyrene	25.0	31.3		mg/Kg		125	40 - 140	12	30
Benzo[b]fluoranthene	25.0	32.6		mg/Kg		131	40 - 140	1	30
Benzo[g,h,i]perylene	25.0	38.9	*	mg/Kg		155	40 - 140	7	30
Benzo[k]fluoranthene	25.0	33.5		mg/Kg		134	40 - 140	10	30
Chrysene	25.0	26.8		mg/Kg		107	40 - 140	14	30
Dibenz(a,h)anthracene	25.0	38.4	*	mg/Kg		154	40 - 140	9	30
Fluoranthene	25.0	26.6		mg/Kg		106	40 - 140	21	30
Fluorene	25.0	28.9		mg/Kg		116	40 - 140	9	30
Indeno[1,2,3-cd]pyrene	25.0	39.5	*	mg/Kg		158	40 - 140	17	30
2-Methylnaphthalene	25.0	25.6		mg/Kg		102	40 - 140	24	30
Naphthalene	25.0	27.1		mg/Kg		108	40 - 140	18	30
Phenanthrene	25.0	27.6		mg/Kg		110	40 - 140	18	30
Pyrene	25.0	26.7		mg/Kg		107	40 - 140	20	30

Method: MAVPH - Massachusetts - Volatile Petroleum Hydrocarbons (GC)

Lab Sample ID: MB 490-485021/1-A
Matrix: Solid
Analysis Batch: 485854

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 485021

Analyte	MB MB		RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
Methyl tert-butyl ether	0.050	U	0.050	0.012	mg/Kg		12/21/17 11:21	12/26/17 15:54	1
Benzene	0.050	U	0.050	0.018	mg/Kg		12/21/17 11:21	12/26/17 15:54	1
Toluene	0.15	U	0.15	0.017	mg/Kg		12/21/17 11:21	12/26/17 15:54	1
Ethylbenzene	0.050	U	0.050	0.019	mg/Kg		12/21/17 11:21	12/26/17 15:54	1
m-Xylene & p-Xylene	0.20	U	0.20	0.015	mg/Kg		12/21/17 11:21	12/26/17 15:54	1
o-Xylene	0.10	U	0.10	0.015	mg/Kg		12/21/17 11:21	12/26/17 15:54	1
Naphthalene	0.25	U	0.25	0.12	mg/Kg		12/21/17 11:21	12/26/17 15:54	1
C5-C8 Aliphatics (unadjusted)	5.0	U	5.0	2.6	mg/Kg		12/21/17 11:21	12/26/17 15:54	1
C9-C12 Aliphatics (unadjusted)	5.0	U	5.0	2.5	mg/Kg		12/21/17 11:21	12/26/17 15:54	1
C9-C10 Aromatics	5.0	U	5.0	3.0	mg/Kg		12/21/17 11:21	12/26/17 15:54	1

Surrogate	MB MB		Limits	Prepared	Analyzed	Dil Fac
	%Recovery	Qualifier				
2,5-Dibromotoluene (fid)	96		70 - 130	12/21/17 11:21	12/26/17 15:54	1
2,5-Dibromotoluene (pid)	98		70 - 130	12/21/17 11:21	12/26/17 15:54	1

Lab Sample ID: LCS 490-485021/2-A
Matrix: Solid
Analysis Batch: 485854

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 485021

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Methyl tert-butyl ether	5.00	4.68		mg/Kg		94	70 - 130
Benzene	5.00	5.01		mg/Kg		100	70 - 130
Toluene	5.00	5.01		mg/Kg		100	70 - 130
Ethylbenzene	5.00	5.12		mg/Kg		102	70 - 130
m-Xylene & p-Xylene	10.0	10.2		mg/Kg		102	70 - 130

TestAmerica Nashville

QC Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

Method: MAVPH - Massachusetts - Volatile Petroleum Hydrocarbons (GC) (Continued)

Lab Sample ID: LCS 490-485021/2-A
Matrix: Solid
Analysis Batch: 485854

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 485021

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
o-Xylene	5.00	5.10		mg/Kg		102	70 - 130
Naphthalene	5.00	4.68		mg/Kg		94	70 - 130
C5-C8 Aliphatics (unadjusted)	15.0	14.8		mg/Kg		99	70 - 130
C9-C12 Aliphatics (unadjusted)	10.0	10.1		mg/Kg		101	70 - 130
C9-C10 Aromatics	5.00	5.34		mg/Kg		107	70 - 130

Surrogate	LCS %Recovery	LCS Qualifier	Limits
2,5-Dibromotoluene (fid)	101		70 - 130
2,5-Dibromotoluene (pid)	100		70 - 130

Lab Sample ID: LCSD 490-485021/3-A
Matrix: Solid
Analysis Batch: 485854

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 485021

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Methyl tert-butyl ether	5.00	4.56		mg/Kg		91	70 - 130	2	25
Benzene	5.00	4.90		mg/Kg		98	70 - 130	2	25
Toluene	5.00	4.91		mg/Kg		98	70 - 130	2	25
Ethylbenzene	5.00	5.04		mg/Kg		101	70 - 130	2	25
m-Xylene & p-Xylene	10.0	10.0		mg/Kg		100	70 - 130	2	25
o-Xylene	5.00	5.00		mg/Kg		100	70 - 130	2	25
Naphthalene	5.00	4.51		mg/Kg		90	70 - 130	4	25
C5-C8 Aliphatics (unadjusted)	15.0	14.3		mg/Kg		95	70 - 130	4	25
C9-C12 Aliphatics (unadjusted)	10.0	10.1		mg/Kg		101	70 - 130	0	25
C9-C10 Aromatics	5.00	5.26		mg/Kg		105	70 - 130	2	25

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
2,5-Dibromotoluene (fid)	96		70 - 130
2,5-Dibromotoluene (pid)	96		70 - 130

Method: MA-EPH - Massachusetts - Extractable Petroleum Hydrocarbons (GC)

Lab Sample ID: MB 490-485083/1-B
Matrix: Solid
Analysis Batch: 484995

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 485083

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C9-C18 Aliphatics	1000	U	1000	240	mg/Kg		12/21/17 13:02	12/22/17 06:57	1
C19-C36 Aliphatics	1000	U	1000	500	mg/Kg		12/21/17 13:02	12/22/17 06:57	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
1-Chlorooctadecane	95		40 - 140	12/21/17 13:02	12/22/17 06:57	1

TestAmerica Nashville

QC Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

Method: MA-EPH - Massachusetts - Extractable Petroleum Hydrocarbons (GC) (Continued)

Lab Sample ID: MB 490-485083/1-C
Matrix: Solid
Analysis Batch: 485108

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 485083

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C11-C22 Aromatics (unadjusted)	1000	U	1000	490	mg/Kg		12/21/17 13:02	12/21/17 16:41	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
2-Bromonaphthalene	118		40 - 140	12/21/17 13:02	12/21/17 16:41	1
2-Fluorobiphenyl	111		40 - 140	12/21/17 13:02	12/21/17 16:41	1
o-Terphenyl	116		40 - 140	12/21/17 13:02	12/21/17 16:41	1

Lab Sample ID: LCS 490-485083/2-B
Matrix: Solid
Analysis Batch: 484995

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 485083

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
C9-C18 Aliphatics	150	1000	U	mg/Kg		54	40 - 140
C19-C36 Aliphatics	200	1000	U	mg/Kg		81	40 - 140

Surrogate	LCS %Recovery	LCS Qualifier	Limits
1-Chlorooctadecane	84		40 - 140

Lab Sample ID: LCS 490-485083/2-C
Matrix: Solid
Analysis Batch: 485108

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 485083

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
C11-C22 Aromatics (unadjusted)	425	1000	U	mg/Kg		101	40 - 140
Acenaphthene	25.0	31.1	J	mg/Kg		124	40 - 140
Acenaphthylene	25.0	29.0	J	mg/Kg		116	40 - 140
Anthracene	25.0	27.6	J	mg/Kg		110	40 - 140
Benzo[a]anthracene	25.0	50	U	mg/Kg		83	40 - 140
Benzo[a]pyrene	25.0	26.3	J	mg/Kg		105	40 - 140
Benzo[b]fluoranthene	25.0	50	U	mg/Kg		90	40 - 140
Benzo[g,h,i]perylene	25.0	29.7	J	mg/Kg		119	40 - 140
Benzo[k]fluoranthene	25.0	31.2	J	mg/Kg		125	40 - 140
Chrysene	25.0	30.1	J	mg/Kg		120	40 - 140
Dibenz(a,h)anthracene	25.0	29.8	J	mg/Kg		119	40 - 140
Fluoranthene	25.0	30.1	J	mg/Kg		120	40 - 140
Fluorene	25.0	26.3	J	mg/Kg		105	40 - 140
Indeno[1,2,3-cd]pyrene	25.0	20.4	J	mg/Kg		82	40 - 140
2-Methylnaphthalene	25.0	28.1	J	mg/Kg		112	40 - 140
Naphthalene	25.0	25.1	J	mg/Kg		100	40 - 140
Phenanthrene	25.0	24.0	J	mg/Kg		96	40 - 140
Pyrene	25.0	29.6	J	mg/Kg		118	40 - 140

Surrogate	LCS %Recovery	LCS Qualifier	Limits
2-Bromonaphthalene	105		40 - 140
2-Fluorobiphenyl	99		40 - 140
o-Terphenyl	96		40 - 140

TestAmerica Nashville

QC Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

Method: MA-EPH - Massachusetts - Extractable Petroleum Hydrocarbons (GC) (Continued)

Lab Sample ID: LCSD 490-485083/3-B
Matrix: Solid
Analysis Batch: 484995

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 485083

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	Limits	RPD	RPD Limit
C9-C18 Aliphatics	150	1000	U	mg/Kg		44	40 - 140	20	25
C19-C36 Aliphatics	200	1000	U	mg/Kg		71	40 - 140	13	25

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
1-Chlorooctadecane	74		40 - 140

Lab Sample ID: LCSD 490-485083/3-C
Matrix: Solid
Analysis Batch: 485108

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 485083

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	Limits	RPD	RPD Limit
C11-C22 Aromatics (unadjusted)	425	1000	U	mg/Kg		82	40 - 140	20	25
Acenaphthene	25.0	29.4	J	mg/Kg		118	40 - 140	5	25
Acenaphthylene	25.0	27.8	J	mg/Kg		111	40 - 140	4	25
Anthracene	25.0	22.2	J	mg/Kg		89	40 - 140	22	25
Benzo[a]anthracene	25.0	50	U	mg/Kg		75	40 - 140	10	25
Benzo[a]pyrene	25.0	24.3	J	mg/Kg		97	40 - 140	8	25
Benzo[b]fluoranthene	25.0	50	U	mg/Kg		85	40 - 140	6	25
Benzo[g,h,i]perylene	25.0	27.1	J	mg/Kg		109	40 - 140	9	25
Benzo[k]fluoranthene	25.0	28.9	J	mg/Kg		116	40 - 140	7	25
Chrysene	25.0	27.9	J	mg/Kg		111	40 - 140	8	25
Dibenz(a,h)anthracene	25.0	26.6	J	mg/Kg		106	40 - 140	12	25
Fluoranthene	25.0	27.3	J	mg/Kg		109	40 - 140	10	25
Fluorene	25.0	26.7	J	mg/Kg		107	40 - 140	1	25
Indeno[1,2,3-cd]pyrene	25.0	50	U	mg/Kg		76	40 - 140	7	25
2-Methylnaphthalene	25.0	26.8	J	mg/Kg		107	40 - 140	5	25
Naphthalene	25.0	24.0	J	mg/Kg		96	40 - 140	5	25
Phenanthrene	25.0	22.4	J	mg/Kg		90	40 - 140	7	25
Pyrene	25.0	27.2	J	mg/Kg		109	40 - 140	8	25

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
2-Bromonaphthalene	95		40 - 140
2-Fluorobiphenyl	89		40 - 140
o-Terphenyl	90		40 - 140

QC Association Summary

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

GC/MS Semi VOA

Prep Batch: 485083

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-143466-1	LMW-12-08_12072017	Total/NA	Solid	3541	
490-143466-2	PMW-01_12072017	Total/NA	Solid	3541	
490-143466-3	MW-14-12D_12072017	Total/NA	Solid	3541	
MB 490-485083/1-C	Method Blank	Total/NA	Solid	3541	
LCS 490-485083/2-C	Lab Control Sample	Total/NA	Solid	3541	
LCSD 490-485083/3-C	Lab Control Sample Dup	Total/NA	Solid	3541	

Fraction Batch: 485092

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-143466-1	LMW-12-08_12072017	Total/NA	Solid	MA EPH Frac	485083
490-143466-2	PMW-01_12072017	Total/NA	Solid	MA EPH Frac	485083
490-143466-3	MW-14-12D_12072017	Total/NA	Solid	MA EPH Frac	485083
MB 490-485083/1-C	Method Blank	Total/NA	Solid	MA EPH Frac	485083
LCS 490-485083/2-C	Lab Control Sample	Total/NA	Solid	MA EPH Frac	485083
LCSD 490-485083/3-C	Lab Control Sample Dup	Total/NA	Solid	MA EPH Frac	485083

Analysis Batch: 486984

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-143466-1	LMW-12-08_12072017	Total/NA	Solid	8270D	485092
490-143466-2	PMW-01_12072017	Total/NA	Solid	8270D	485092
490-143466-3	MW-14-12D_12072017	Total/NA	Solid	8270D	485092
MB 490-485083/1-C	Method Blank	Total/NA	Solid	8270D	485092
LCS 490-485083/2-C	Lab Control Sample	Total/NA	Solid	8270D	485092
LCSD 490-485083/3-C	Lab Control Sample Dup	Total/NA	Solid	8270D	485092

GC VOA

Prep Batch: 485021

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-143466-1	LMW-12-08_12072017	Total/NA	Solid	5035	
490-143466-2	PMW-01_12072017	Total/NA	Solid	5035	
490-143466-3	MW-14-12D_12072017	Total/NA	Solid	5035	
MB 490-485021/1-A	Method Blank	Total/NA	Solid	5035	
LCS 490-485021/2-A	Lab Control Sample	Total/NA	Solid	5035	
LCSD 490-485021/3-A	Lab Control Sample Dup	Total/NA	Solid	5035	

Analysis Batch: 485854

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-143466-1	LMW-12-08_12072017	Total/NA	Solid	MAVPH	485021
490-143466-1	LMW-12-08_12072017	Total/NA	Solid	MAVPH	485021
490-143466-2	PMW-01_12072017	Total/NA	Solid	MAVPH	485021
490-143466-3	MW-14-12D_12072017	Total/NA	Solid	MAVPH	485021
490-143466-3	MW-14-12D_12072017	Total/NA	Solid	MAVPH	485021
MB 490-485021/1-A	Method Blank	Total/NA	Solid	MAVPH	485021
LCS 490-485021/2-A	Lab Control Sample	Total/NA	Solid	MAVPH	485021
LCSD 490-485021/3-A	Lab Control Sample Dup	Total/NA	Solid	MAVPH	485021

Analysis Batch: 486466

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-143466-1	LMW-12-08_12072017	Total/NA	Solid	MA VPH	

TestAmerica Nashville

QC Association Summary

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

GC VOA (Continued)

Analysis Batch: 486466 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-143466-2	PMW-01_12072017	Total/NA	Solid	MA VPH	
490-143466-3	MW-14-12D_12072017	Total/NA	Solid	MA VPH	

GC Semi VOA

Analysis Batch: 484995

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 490-485083/1-B	Method Blank	Total/NA	Solid	MA-EPH	485092
LCS 490-485083/2-B	Lab Control Sample	Total/NA	Solid	MA-EPH	485092
LCSD 490-485083/3-B	Lab Control Sample Dup	Total/NA	Solid	MA-EPH	485092

Prep Batch: 485083

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-143466-1	LMW-12-08_12072017	Total/NA	Solid	3541	
490-143466-2	PMW-01_12072017	Total/NA	Solid	3541	
490-143466-3	MW-14-12D_12072017	Total/NA	Solid	3541	
MB 490-485083/1-B	Method Blank	Total/NA	Solid	3541	
MB 490-485083/1-C	Method Blank	Total/NA	Solid	3541	
LCS 490-485083/2-B	Lab Control Sample	Total/NA	Solid	3541	
LCS 490-485083/2-C	Lab Control Sample	Total/NA	Solid	3541	
LCSD 490-485083/3-B	Lab Control Sample Dup	Total/NA	Solid	3541	
LCSD 490-485083/3-C	Lab Control Sample Dup	Total/NA	Solid	3541	

Fraction Batch: 485092

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-143466-1	LMW-12-08_12072017	Total/NA	Solid	MA EPH Frac	485083
490-143466-1	LMW-12-08_12072017	Total/NA	Solid	MA EPH Frac	485083
490-143466-2	PMW-01_12072017	Total/NA	Solid	MA EPH Frac	485083
490-143466-2	PMW-01_12072017	Total/NA	Solid	MA EPH Frac	485083
490-143466-3	MW-14-12D_12072017	Total/NA	Solid	MA EPH Frac	485083
490-143466-3	MW-14-12D_12072017	Total/NA	Solid	MA EPH Frac	485083
MB 490-485083/1-B	Method Blank	Total/NA	Solid	MA EPH Frac	485083
MB 490-485083/1-C	Method Blank	Total/NA	Solid	MA EPH Frac	485083
LCS 490-485083/2-B	Lab Control Sample	Total/NA	Solid	MA EPH Frac	485083
LCS 490-485083/2-C	Lab Control Sample	Total/NA	Solid	MA EPH Frac	485083
LCSD 490-485083/3-B	Lab Control Sample Dup	Total/NA	Solid	MA EPH Frac	485083
LCSD 490-485083/3-C	Lab Control Sample Dup	Total/NA	Solid	MA EPH Frac	485083

Analysis Batch: 485108

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-143466-1	LMW-12-08_12072017	Total/NA	Solid	MA-EPH	485092
490-143466-2	PMW-01_12072017	Total/NA	Solid	MA-EPH	485092
490-143466-3	MW-14-12D_12072017	Total/NA	Solid	MA-EPH	485092
MB 490-485083/1-C	Method Blank	Total/NA	Solid	MA-EPH	485092
LCS 490-485083/2-C	Lab Control Sample	Total/NA	Solid	MA-EPH	485092
LCSD 490-485083/3-C	Lab Control Sample Dup	Total/NA	Solid	MA-EPH	485092

Analysis Batch: 485451

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-143466-1	LMW-12-08_12072017	Total/NA	Solid	MA-EPH	485092

TestAmerica Nashville

QC Association Summary

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

GC Semi VOA (Continued)

Analysis Batch: 485451 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-143466-1	LMW-12-08_12072017	Total/NA	Solid	MA-EPH	485092
490-143466-2	PMW-01_12072017	Total/NA	Solid	MA-EPH	485092
490-143466-2	PMW-01_12072017	Total/NA	Solid	MA-EPH	485092
490-143466-3	MW-14-12D_12072017	Total/NA	Solid	MA-EPH	485092
490-143466-3	MW-14-12D_12072017	Total/NA	Solid	MA-EPH	485092

Analysis Batch: 485478

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-143466-1	LMW-12-08_12072017	Total/NA	Solid	MA-EPH	
490-143466-2	PMW-01_12072017	Total/NA	Solid	MA-EPH	
490-143466-3	MW-14-12D_12072017	Total/NA	Solid	MA-EPH	

Lab Chronicle

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

Client Sample ID: LMW-12-08_12072017

Lab Sample ID: 490-143466-1

Date Collected: 12/07/17 08:10

Matrix: Solid

Date Received: 12/20/17 10:35

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3541			1.03 g	10 mL	485083	12/21/17 13:02	ZXS	TAL NSH
Total/NA	Fraction	MA EPH Frac			1 mL	1 mL	485092	12/21/17 13:20	ZXS	TAL NSH
Total/NA	Analysis	8270D		1			486984	12/31/17 16:16	KME	TAL NSH
Total/NA	Analysis	MA VPH		1			486466	12/28/17 16:23	FKG	TAL NSH
Total/NA	Prep	5035			1.01 g	10.0 mL	485021	12/21/17 11:25	JLP	TAL NSH
Total/NA	Analysis	MAVPH		10	0.1 mL	5 mL	485854	12/26/17 16:26	AK1	TAL NSH
Total/NA	Prep	5035			1.01 g	10.0 mL	485021	12/21/17 11:25	JLP	TAL NSH
Total/NA	Analysis	MAVPH		1	0.1 mL	5 mL	485854	12/26/17 18:03	AK1	TAL NSH
Total/NA	Prep	3541			1.03 g	10 mL	485083	12/21/17 13:02	ZXS	TAL NSH
Total/NA	Fraction	MA EPH Frac			1 mL	1 mL	485092	12/21/17 13:20	ZXS	TAL NSH
Total/NA	Analysis	MA-EPH		10			485108	12/22/17 10:35	PRB	TAL NSH
Total/NA	Prep	3541			1.03 g	10 mL	485083	12/21/17 13:02	ZXS	TAL NSH
Total/NA	Fraction	MA EPH Frac			1 mL	1 mL	485092	12/21/17 13:20	ZXS	TAL NSH
Total/NA	Analysis	MA-EPH		5			485451	12/23/17 04:03	GMH	TAL NSH
Total/NA	Prep	3541			1.03 g	10 mL	485083	12/21/17 13:02	ZXS	TAL NSH
Total/NA	Fraction	MA EPH Frac			1 mL	1 mL	485092	12/21/17 13:20	ZXS	TAL NSH
Total/NA	Analysis	MA-EPH		50			485451	12/23/17 04:31	GMH	TAL NSH
Total/NA	Analysis	MA-EPH		1			485478	12/22/17 15:58	PRB	TAL NSH

Client Sample ID: PMW-01_12072017

Lab Sample ID: 490-143466-2

Date Collected: 12/07/17 09:05

Matrix: Solid

Date Received: 12/20/17 10:35

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3541			1.02 g	10 mL	485083	12/21/17 13:02	ZXS	TAL NSH
Total/NA	Fraction	MA EPH Frac			1 mL	1 mL	485092	12/21/17 13:20	ZXS	TAL NSH
Total/NA	Analysis	8270D		1			486984	12/31/17 16:37	KME	TAL NSH
Total/NA	Analysis	MA VPH		1			486466	12/28/17 16:23	FKG	TAL NSH
Total/NA	Prep	5035			1.03 g	10.0 mL	485021	12/21/17 11:25	JLP	TAL NSH
Total/NA	Analysis	MAVPH		1	0.1 mL	5 mL	485854	12/26/17 19:40	AK1	TAL NSH
Total/NA	Prep	3541			1.02 g	10 mL	485083	12/21/17 13:02	ZXS	TAL NSH
Total/NA	Fraction	MA EPH Frac			1 mL	1 mL	485092	12/21/17 13:20	ZXS	TAL NSH
Total/NA	Analysis	MA-EPH		10			485108	12/22/17 11:01	PRB	TAL NSH
Total/NA	Prep	3541			1.02 g	10 mL	485083	12/21/17 13:02	ZXS	TAL NSH
Total/NA	Fraction	MA EPH Frac			1 mL	1 mL	485092	12/21/17 13:20	ZXS	TAL NSH
Total/NA	Analysis	MA-EPH		5			485451	12/23/17 05:00	GMH	TAL NSH
Total/NA	Prep	3541			1.02 g	10 mL	485083	12/21/17 13:02	ZXS	TAL NSH
Total/NA	Fraction	MA EPH Frac			1 mL	1 mL	485092	12/21/17 13:20	ZXS	TAL NSH
Total/NA	Analysis	MA-EPH		50			485451	12/23/17 05:29	GMH	TAL NSH
Total/NA	Analysis	MA-EPH		1			485478	12/22/17 15:58	PRB	TAL NSH

Lab Chronicle

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

Client Sample ID: MW-14-12D_12072017

Lab Sample ID: 490-143466-3

Date Collected: 12/07/17 09:25

Matrix: Solid

Date Received: 12/20/17 10:35

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3541			1.02 g	10 mL	485083	12/21/17 13:02	ZXS	TAL NSH
Total/NA	Fraction	MA EPH Frac			1 mL	1 mL	485092	12/21/17 13:20	ZXS	TAL NSH
Total/NA	Analysis	8270D		1			486984	12/31/17 16:57	KME	TAL NSH
Total/NA	Analysis	MA VPH		1			486466	12/28/17 16:23	FKG	TAL NSH
Total/NA	Prep	5035			1.02 g	10.0 mL	485021	12/21/17 11:25	JLP	TAL NSH
Total/NA	Analysis	MAVPH		10	0.1 mL	5 mL	485854	12/26/17 17:31	AK1	TAL NSH
Total/NA	Prep	5035			1.02 g	10.0 mL	485021	12/21/17 11:25	JLP	TAL NSH
Total/NA	Analysis	MAVPH		1	0.1 mL	5 mL	485854	12/26/17 21:17	AK1	TAL NSH
Total/NA	Prep	3541			1.02 g	10 mL	485083	12/21/17 13:02	ZXS	TAL NSH
Total/NA	Fraction	MA EPH Frac			1 mL	1 mL	485092	12/21/17 13:20	ZXS	TAL NSH
Total/NA	Analysis	MA-EPH		10			485108	12/22/17 11:26	PRB	TAL NSH
Total/NA	Prep	3541			1.02 g	10 mL	485083	12/21/17 13:02	ZXS	TAL NSH
Total/NA	Fraction	MA EPH Frac			1 mL	1 mL	485092	12/21/17 13:20	ZXS	TAL NSH
Total/NA	Analysis	MA-EPH		5			485451	12/23/17 05:57	GMH	TAL NSH
Total/NA	Prep	3541			1.02 g	10 mL	485083	12/21/17 13:02	ZXS	TAL NSH
Total/NA	Fraction	MA EPH Frac			1 mL	1 mL	485092	12/21/17 13:20	ZXS	TAL NSH
Total/NA	Analysis	MA-EPH		50			485451	12/23/17 06:25	GMH	TAL NSH
Total/NA	Analysis	MA-EPH		1			485478	12/22/17 15:58	PRB	TAL NSH

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Method Summary

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

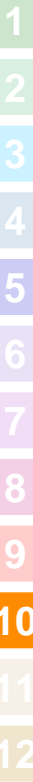
Method	Method Description	Protocol	Laboratory
8270D	Semivolatile Organic Compounds (GC/MS)	MA DEP	TAL NSH
MA VPH	Massachusetts - Volatile Petroleum Hydrocarbons (GC)	MA DEP	TAL NSH
MAVPH	Massachusetts - Volatile Petroleum Hydrocarbons (GC)	MA DEP	TAL NSH
MA-EPH	Massachusetts - Extractable Petroleum Hydrocarbons (GC)	MA DEP	TAL NSH

Protocol References:

MA DEP = Massachusetts Department Of Environmental Protection

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177



Accreditation/Certification Summary

Client: ARCADIS U.S., Inc.
Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

Laboratory: TestAmerica Nashville

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-19
A2LA	ISO/IEC 17025		0453.07	12-31-19
Alaska (UST)	State Program	10	UST-087	01-01-18 *
Arizona	State Program	9	AZ0473	05-05-18
Arkansas DEQ	State Program	6	88-0737	04-25-18
California	State Program	9	2938	10-31-18
Connecticut	State Program	1	PH-0220	12-31-19
Florida	NELAP	4	E87358	06-30-18
Georgia	State Program	4	E87358(FL)/453.07(A2L A)	06-30-18
Illinois	NELAP	5	200010	12-09-18
Iowa	State Program	7	131	04-01-18
Kansas	NELAP	7	E-10229	12-31-17 *
Kentucky (UST)	State Program	4	19	06-30-18
Kentucky (WW)	State Program	4	90038	12-31-18
Louisiana	NELAP	6	30613	06-30-18
Maine	State Program	1	TN00032	11-03-19
Maryland	State Program	3	316	03-31-18
Massachusetts	State Program	1	M-TN032	06-30-18
Minnesota	NELAP	5	047-999-345	12-31-18
Mississippi	State Program	4	N/A	06-30-18
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-18
New Hampshire	NELAP	1	2963	10-09-18
New Jersey	NELAP	2	TN965	06-30-18
New York	NELAP	2	11342	03-31-18
North Carolina (WW/SW)	State Program	4	387	12-31-18
North Dakota	State Program	8	R-146	06-30-18
Ohio VAP	State Program	5	CL0033	07-06-19
Oklahoma	State Program	6	9412	08-31-18
Oregon	NELAP	10	TN200001	04-27-18
Pennsylvania	NELAP	3	68-00585	06-30-18
Rhode Island	State Program	1	LAO00268	12-30-17 *
South Carolina	State Program	4	84009 (001)	02-28-18
Tennessee	State Program	4	2008	02-23-20
Texas	NELAP	6	T104704077	08-31-18
USDA	Federal		P330-13-00306	12-01-19
Utah	NELAP	8	TN00032	07-31-18
Virginia	NELAP	3	460152	06-14-18
Washington	State Program	10	C789	07-19-18
West Virginia DEP	State Program	3	219	02-28-18
Wisconsin	State Program	5	998020430	08-31-18
Wyoming (UST)	A2LA	8	453.07	12-31-19

Laboratory: TestAmerica Canton

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
California	State Program	9	2927	02-23-18
Connecticut	State Program	1	PH-0590	12-31-17 *
Florida	NELAP	4	E87225	06-30-18

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica Nashville

Accreditation/Certification Summary

Client: ARCADIS U.S., Inc.
 Project/Site: RACER Lansing

TestAmerica Job ID: 490-143466-1

Laboratory: TestAmerica Canton (Continued)

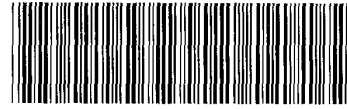
All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Illinois	NELAP	5	200004	07-31-18
Kansas	NELAP	7	E-10336	01-31-18 *
Kentucky (UST)	State Program	4	58	02-23-18
Kentucky (WW)	State Program	4	98016	12-31-17 *
Minnesota	NELAP	5	039-999-348	12-31-17 *
Minnesota (Petrofund)	State Program	1	3506	07-31-18
Nevada	State Program	9	OH-000482008A	07-31-18
New Jersey	NELAP	2	OH001	06-30-18
New York	NELAP	2	10975	03-31-18
Ohio VAP	State Program	5	CL0024	09-06-19
Oregon	NELAP	10	4062	02-23-18
Pennsylvania	NELAP	3	68-00340	08-31-18
Texas	NELAP	6	T104704517-17-9	08-31-18
USDA	Federal		P330-16-00404	12-28-19
Virginia	NELAP	3	460175	09-14-18
Washington	State Program	10	C971	01-12-18 *
West Virginia DEP	State Program	3	210	12-31-17 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.



COOLER RECEIPT FOR



490-143466 Chain of Custody

Cooler Received/Opened On 12/20/2017 @1035

Time Samples Removed From Cooler 17:07 Time Samples Placed In Storage 1719 (2 Hour Window)

1. Tracking # 62090773752D (last 4 digits, FedEx) Courier: FedEx
 IR Gun ID 14740456 pH Strip Lot N/A Chlorine Strip Lot N/A

2. Temperature of rep. sample or temp blank when opened: 5.5 Degrees Celsius

3. If item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO... NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 1 free

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (initial) es

7. Were custody seals on containers: YES NO and Intact YES...NO... NA

Were these signed and dated correctly? YES...NO... NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO... NA



14. Was there a Trip Blank in this cooler? YES NO...NA If multiple coolers, sequence # _____

I certify that I unloaded the cooler and answered questions 7-14 (initial) ADH

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO... NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO... NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (initial) ADH

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (initial) ADH

I certify that I attached a label with the unique LIMS number to each container (initial) ADH

21. Were there Non-Conformance issues at login? YES NO Was a NCM generated? YES NO...# _____



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

C.O.C. PAGE # 1 OF 1

REPORT TO CONTACT NAME: John Lavery
 COMPANY: Merit Laboratories
 ADDRESS: 2680 East Lansing Drive
 CITY: East Lansing STATE: MI ZIP CODE: 48823
 PHONE NO.: 517-332-0167 FAX NO.: 517-332-4034
 E-MAIL ADDRESS: johnlavery@meritlabs.com

CHAIN OF CUSTODY RECORD CONTACT NAME: Julie Teague
 COMPANY: [SAME]
 ADDRESS: STATE: ZIP CODE:
 CITY: E-MAIL ADDRESS:
 PHONE NO.:

PROJECT NO./NAME: S86083
 TURNAROUND TIME REQUIRED: 1 DAY 2 DAYS 3 DAYS STANDARD OTHER
 DELIVERABLES REQUIRED: STD LEVEL II LEVEL III LEVEL IV EDD OTHER
 ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MTRX CODE	GW-GROUNDWATER SL-SLUDGE	WW-WASTEWATER DW-DRINKING WATER	S-SOIL O-OIL	L-LIQUID WP=WIPE	SD=SOLID W=WASTE	A-AIR	SAMPLER(S) - PLEASE PRINT/SIGN NAME		MTRX	BOTTLES	# Containers & Preservatives	OTHER
							YEAR	TIME				
									0	1		
									0	1		
									0	1		

RELINQUISHED BY: [Signature] DATE: 12/18/17 TIME: 12:30
 RECEIVED BY: [Signature] DATE: 12/18/17 TIME: 12:30
 SEAL NO. [] SEAL INTACT [] INITIALS []
 SEAL NO. [] SEAL INTACT [] INITIALS []
 NOTES: []
 TEMP. ON ARRIVAL: []
 DATE: 12/18/17 TIME: 10:35
 Loc: 490
 143466

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

Rev. 4.18 '12



Klingensmith, Leah

From: Christensen, Randy <Randy.Christensen@arcadis.com>
Sent: Wednesday, January 03, 2018 1:45 PM
To: Klingensmith, Leah
Subject: RE: TestAmerica files from 490-143466-1 RACER Lansing
Attachments: Pages from RPT.COC.S86083.01(01)_B0064479.2017.00402__RACER_PLANT_2_LNAPL.pdf

-External Email-

No. The sample ID's should be as follows:

- Sample 86083.01 time 0810 = LMW-12-08_12072017
- Sample 86083.01 time 0905 = PMW-01_12072017
- Sample 86083.01 time 0925 = MW-14-12D_12072017

Make sense? See attached COC from Arcadis and the supporting COC from Merit for additional information.

Any questions let me know.

Thanks

Randy Christensen PE (MI) | Certified Project Manager 1 | Randy.Christensen@Arcadis.com
Arcadis | Arcadis of Michigan, LLC
28550 Cabot Drive, Suite 500, Novi, MI | 48377 | USA
T. +1 810 225 1940 | M. + 1 517 819 8800 | F. + 1 248 994 2241

Connect with us! www.arcadis.com | [LinkedIn](#) | [Twitter](#) | [Facebook](#)



Be green, leave it on the screen.

From: Klingensmith, Leah [<mailto:leah.klingensmith@testamericainc.com>]
Sent: Wednesday, January 3, 2018 2:25 PM
To: Christensen, Randy <Randy.Christensen@arcadis.com>
Subject: TestAmerica files from 490-143466-1 RACER Lansing

Hello Randy,

For this project, should the sample ID's all be the same with the different collection times?

Thank you.

Please let us know if we met your expectations by rating the service you received from TestAmerica on this project by visiting our website at: [Project Feedback](#)

LEAH KLINGENSMITH
Project Manager

TestAmerica Nashville
THE LEADER IN ENVIRONMENTAL TESTING

Tel: 615.301.5038

Reference: [419932]
Attachments: 1

This email and any files transmitted with it are the property of Arcadis and its affiliates. All rights, including without limitation copyright, are reserved. This email contains information that may be confidential and may also be privileged. It is for the exclusive use of the intended recipient(s). If you are not an intended recipient, please note that any form of distribution, copying or use of this communication or the information in it is strictly prohibited and may be unlawful. If you have received this communication in error, please return it to the sender and then delete the email and destroy any copies of it. While reasonable precautions have been taken to ensure that no software or viruses are present in our emails, we cannot guarantee that this email or any attachment is virus free or has not been intercepted or changed. Any opinions or other information in this email that do not relate to the official business of Arcadis are neither given nor endorsed by it.





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

CHAIN OF CUSTODY RECORD

C.O.C. PAGE # 1 OF 1
 105390

INVOICE TO

CONTACT NAME: Alex Villaverde
 COMPANY: Arcadis
 ADDRESS: 300 SOUTH WASHINGTON SQ, SUITE 315
 CITY: LAWSONG
 STATE: MI ZIP CODE: 48933
 PHONE NO.: 517 324 5036
 FAX NO.:
 E-MAIL ADDRESS: AVILLAV@ARCADIS.COM
 P.O. NO.: 80064479.2017.00402
 QUOTE NO.:

CONTACT NAME: [SAME]
 COMPANY:
 ADDRESS:
 CITY: STATE: ZIP CODE:
 PHONE NO.: E-MAIL ADDRESS:

PROJECT NO./NAME: 80064479.2017.00402/RCERL Hwy 2 WPA
 TURNAROUND TIME REQUIRED: 1 DAY 2 DAYS 3 DAYS
 DELIVERABLES REQUIRED: STD LEVEL II LEVEL III LEVEL IV OTHER

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

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)
 Certifications: OHIO VAP Drinking Water
 DOD NPDES
 Project Locations: Detroit New York
 Other
 Special Instructions:

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	DATE	YEAR	TIME	SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	# Containers & Preservatives						SVOES	TPH FRACTION	VOCs	PCBs	
							NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH					OTHER
8008321	12/7	0810		LMU-12-08_2012011	0	1											
R2		0965		PMW-01, 12012011	0	1											
R3		0925		MW-14-12D-12072011	0	1											

RELINQUISHED BY: [Signature] DATE: 12/9/17 TIME: [Blank]
 SIGNATURE/ORGANIZATION: PM Storage
 RECEIVED BY: [Signature] DATE: 12/8/17 TIME: 14:42
 SIGNATURE/ORGANIZATION: [Blank]

RELINQUISHED BY: [Signature] DATE: 12/8/17 TIME: 17:00
 SIGNATURE/ORGANIZATION: PM Storage
 RECEIVED BY: [Signature] DATE: 12/8/17 TIME: 14:00
 SIGNATURE/ORGANIZATION: [Blank]
 SEAL NO.: [Blank] SEAL IN CONTACT: YES NO
 INITIALS: [Blank]
 NOTES: [Blank]
 TEMP. ON ARRIVAL: 5.3

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



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

C.O.C. PAGE # 1 OF 1

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME: John Lavery
 COMPANY: Merit Laboratories
 ADDRESS: 2680 East Lansing Drive
 CITY: East Lansing
 PHONE NO.: 517-332-0167
 E-MAIL ADDRESS: johnlavery@meritlabs.com

CONTACT NAME: Julie Teague
 COMPANY: [] SAME
 ADDRESS: []
 CITY: []
 PHONE NO.: []
 E-MAIL ADDRESS: []

PROJECT NO./NAME: S86083
 TURNAROUND TIME REQUIRED: 1 DAY 2 DAYS 3 DAYS STANDARD OTHER
 DELIVERABLES REQUIRED: STD LEVEL II LEVEL III LEVEL IV EDD OTHER

MATRIX CODE: GW-GROUNDWATER SL-SLUDGE
 WW-WASTEWATER DW-DRINKING WATER
 S-SOIL O-OIL L-LIQUID WP-WIPE A-AIR SD-SOLID W-WASTE
 ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

MERIT LAB NO.	YEAR	DATE	TIME	IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MnOH	OTHER	TPH Fraction	Certifications	Project Locations	Special Instructions
	12/7/17	0810				1								✓	<input type="checkbox"/> OHIO VAP <input type="checkbox"/> Drinking Water	<input type="checkbox"/> DOD <input type="checkbox"/> NPDES	
	12/7/17	0905				1								✓	<input type="checkbox"/> Detroit <input type="checkbox"/> New York		
	12/7/17	0925				1								✓			

RELINQUISHED BY: [Signature] DATE: 12/18/17 TIME: 1230
 RECEIVED BY: [Signature] DATE: [] TIME: []
 SEAL NO. [] SEAL INTACT [] INITIALS [] NOTES: [] TEMP. ON ARRIVAL []

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



Analytical Laboratory Report

Report ID: S86083.01(01)
Generated on 12/21/2017

Report to

Attention: Alex Villhauer
Arcadis
300 South Washington Square
Suite 315
Lansing, MI 48933

Phone: 616-780-3277 FAX: 248-994-2241
Email: alex.villhauer@arcadis.com

Additional Contacts: Kristen Padron, Randy Christensen

Report produced by

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

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

Contacts for report questions:
John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S86083.01-S86083.03
Project: B0064479.2017.00402 / RACER Plant 2 LNAPL
Collected Date: 12/07/2017
Submitted Date/Time: 12/08/2017 14:42
Sampled by: Robert Hikade
P.O. #: B0064479.2017.00402

Table of Contents

- Cover Page (Page 1)
- General Report Notes (Page 2)
- Report Narrative (Page 2)
- Laboratory Certifications (Page 3)
- Qualifier Descriptions (Page 3)
- Glossary of Abbreviations (Page 3)
- Method Summary (Page 4)
- Sample Summary (Page 5)

Maya Murshak
Technical Director



Analytical Laboratory Report

General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis where applicable.

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

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

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

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

Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

Report Narrative

There is no additional narrative for this analytical report



Analytical Laboratory Report

Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001

Qualifier Descriptions

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

Glossary of Abbreviations

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



Analytical Laboratory Report

Method Summary

Method	Version
SW3550C	SW 846 Method 3550C Revision 3 February 2007
SW5035A/8260C	SW 846 Method 8260C Revision 3 August 2006 / 5035A Revision 1 July 2002
SW8082A	SW 846 Method 8082A Revision 1 February 2007
SW8270D	SW 846 Method 8270D Revision 4 February 2007



Analytical Laboratory Report

Sample Summary (3 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S86083.01	LMW-12-08_12072017	Oil	12/07/17 08:10
S86083.02	PMW-01_12072017	Oil	12/07/17 09:05
S86083.03	MW-14-12D_12072017	Oil	12/07/17 09:25



Analytical Laboratory Report

Lab Sample ID: S86083.01

Sample Tag: LMW-12-08_12072017

Collected Date/Time: 12/07/2017 08:10

Matrix: Oil

COC Reference: 105390

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	8oz Glass	None	Yes	5.3	IR
1	40ml Glass	None	Yes	5.3	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Tech	CAS #	Flags
Extraction / Prep.								
BNA Extraction*	Completed			SW3550C	12/18/17 16:00	PLB		
Extraction, PCB*	Completed			SW3550C	12/15/17 18:30	PLB		

Organics - PCBs/Pesticides

PCB List

PCB-1016*	Not detected	ug/kg	3,000	SW8082A	12/18/17 18:01	JAN	12674-11-2	Y
PCB-1242*	15,000	ug/kg	3,000	SW8082A	12/18/17 18:01	JAN	53469-21-9	Y
PCB-1221*	Not detected	ug/kg	3,000	SW8082A	12/18/17 18:01	JAN	11104-28-2	Y
PCB-1232*	Not detected	ug/kg	3,000	SW8082A	12/18/17 18:01	JAN	11141-16-5	Y
PCB-1248*	Not detected	ug/kg	3,000	SW8082A	12/18/17 18:01	JAN	12672-29-6	Y
PCB-1254*	Not detected	ug/kg	3,000	SW8082A	12/18/17 18:01	JAN	11097-69-1	Y
PCB-1260*	Not detected	ug/kg	3,000	SW8082A	12/18/17 18:01	JAN	11096-82-5	Y

Organics - Semi-Volatiles

Semi-Volatile Organics - MDEQ

Acenaphthene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	83-32-9	X
Acenaphthylene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	208-96-8	X
Anthracene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	120-12-7	X
Benzo(a)anthracene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	56-55-3	X
Benzo(b)fluoranthene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	205-99-2	X
Benzo(k)fluoranthene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	207-08-9	X
Benzo(ghi)perylene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	191-24-2	X
Benzo(a)pyrene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	50-32-8	X
bis(2-Chloroethoxy)methane*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	111-91-1	X
bis(2-Chloroethyl)ether*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	111-44-4	X
bis(2-Chloroisopropyl)ether*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	108-60-1	X
bis(2-Ethylhexyl)phthalate*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	117-81-7	X
4-Bromophenyl phenyl ether*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	101-55-3	X
Butyl benzyl phthalate*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	85-68-7	X
4-Chloroaniline*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	106-47-8	X
2-Chloronaphthalene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	91-58-7	X
4-Chloro-3-methylphenol*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	59-50-7	X
2-Chlorophenol*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	95-57-8	X
4-Chlorophenyl phenyl ether*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	7005-72-3	X
Chrysene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	218-01-9	X
p,m-Cresol*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	3/4-CRESOLX	
o-Cresol*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	95-48-7	X
Dibenzo(ah)anthracene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	53-70-3	X
Dibenzofuran*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	132-64-9	X
di-n-Butyl phthalate*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	84-74-2	X

Y-Elevated reporting limit due to high target concentration

X-Elevated reporting limit due to matrix interference



Analytical Laboratory Report

Lab Sample ID: S86083.01 (continued)

Sample Tag: LMW-12-08_12072017

Analysis	Results	Units	RL	Method	Run Date/Time	Tech	CAS #	Flags
Organics - Semi-Volatiles (continued)								
Semi-Volatile Organics - MDEQ (continued)								
1,2-Dichlorobenzene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	95-50-1	X
1,3-Dichlorobenzene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	541-73-1	X
1,4-Dichlorobenzene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	106-46-7	X
3,3'-Dichlorobenzidine*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	91-94-1	X
2,4-Dichlorophenol*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	120-83-2	X
Diethyl phthalate*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	84-66-2	X
2,4-Dimethylphenol*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	105-67-9	X
Dimethyl phthalate*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	131-11-3	X
4,6-Dinitro-2-methylphenol*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	534-52-1	X
2,4-Dinitrophenol*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	51-28-5	X
2,4-Dinitrotoluene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	121-14-2	X
2,6-Dinitrotoluene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	606-20-2	X
1,2-Diphenylhydrazine*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	122-66-7	X
di-n-Octyl phthalate*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	117-84-0	X
Fluoranthene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	206-44-0	X
Fluorene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	86-73-7	X
Hexachlorobenzene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	118-74-1	X
Hexachlorobutadiene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	87-68-3	X
Hexachlorocyclopentadiene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	77-47-4	X
Hexachloroethane*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	67-72-1	X
Indeno(1,2,3-cd)pyrene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	193-39-5	X
Isophorone*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	78-59-1	X
2-Methylnaphthalene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	91-57-6	X
Naphthalene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	91-20-3	X
2-Nitroaniline*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	88-74-4	X
3-Nitroaniline*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	99-09-2	X
4-Nitroaniline*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	100-01-6	X
Nitrobenzene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	98-95-3	X
2-Nitrophenol*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	88-75-5	X
4-Nitrophenol*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	100-02-7	X
N-Nitrosodiphenylamine*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	86-30-6	X
N-Nitrosodi-n-propylamine*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	621-64-7	X
Pentachlorophenol*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	87-86-5	X
Phenanthrene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	85-01-8	X
Phenol*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	108-95-2	X
Pyrene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	129-00-0	X
1,2,4-Trichlorobenzene*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	120-82-1	X
2,4,5-Trichlorophenol*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	95-95-4	X
2,4,6-Trichlorophenol*	Not detected	ug/kg	80,000	SW8270D	12/19/17 00:34	PL	88-06-2	X
Organics - Volatiles								
Volatile Organics								
Diethyl ether*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	60-29-7	X
Acetone*	Not detected	ug/kg	5,000	SW5035A/8260C	12/20/17 13:43	JML	67-64-1	X
Methyl iodide*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	74-88-4	X
Carbon disulfide*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	75-15-0	X
tert-Methyl butyl ether (MTBE)*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	1634-04-4	X
Acrylonitrile*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	107-13-1	X

X-Elevated reporting limit due to matrix interference



Analytical Laboratory Report

Lab Sample ID: S86083.01 (continued)

Sample Tag: LMW-12-08_12072017

Analysis	Results	Units	RL	Method	Run Date/Time	Tech	CAS #	Flags
Organics - Volatiles (continued)								
Volatile Organics (continued)								
2-Butanone (MEK)*	Not detected	ug/kg	5,000	SW5035A/8260C	12/20/17 13:43	JML	78-93-3	X
Dichlorodifluoromethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	75-71-8	X
Chloromethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	74-87-3	X
Vinyl chloride*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	75-01-4	X
Bromomethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	74-83-9	X
Chloroethane*	3,900	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	75-00-3	X
Trichlorofluoromethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	75-69-4	X
1,1-Dichloroethene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	75-35-4	X
Methylene chloride*	Not detected	ug/kg	1,000	SW5035A/8260C	12/20/17 13:43	JML	75-09-2	X
trans-1,2-Dichloroethene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	156-60-5	X
1,1-Dichloroethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	75-34-3	X
cis-1,2-Dichloroethene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	156-59-2	X
Tetrahydrofuran*	Not detected	ug/kg	10,000	SW5035A/8260C	12/20/17 13:43	JML	109-99-9	X
Chloroform*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	67-66-3	X
Bromochloromethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	74-97-5	X
1,1,1-Trichloroethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	71-55-6	X
4-Methyl-2-pentanone (MIBK)*	Not detected	ug/kg	5,000	SW5035A/8260C	12/20/17 13:43	JML	108-10-1	X
2-Hexanone*	Not detected	ug/kg	5,000	SW5035A/8260C	12/20/17 13:43	JML	591-78-6	X
Carbon tetrachloride*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	56-23-5	X
Benzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	71-43-2	X
1,2-Dichloroethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	107-06-2	X
Trichloroethene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	79-01-6	X
1,2-Dichloropropane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	78-87-5	X
Bromodichloromethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	75-27-4	X
Dibromomethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	74-95-3	X
cis-1,3-Dichloropropene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	10061-01-5	X
Toluene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	108-88-3	X
trans-1,3-Dichloropropene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	10061-02-6	X
1,1,2-Trichloroethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	79-00-5	X
Tetrachloroethene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	127-18-4	X
trans-1,4-Dichloro-2-butene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	110-57-6	X
Dibromochloromethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	124-48-1	X
1,2-Dibromoethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	106-93-4	X
Chlorobenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	108-90-7	X
1,1,1,2-Tetrachloroethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	630-20-6	X
Ethylbenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	100-41-4	X
p,m-Xylene*	Not detected	ug/kg	1,000	SW5035A/8260C	12/20/17 13:43	JML		X
o-Xylene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	95-47-6	X
Styrene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	100-42-5	X
Isopropylbenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	98-82-8	X
Bromoform*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	75-25-2	X
1,1,2,2-Tetrachloroethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	79-34-5	X
1,2,3-Trichloropropane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	96-18-4	X
n-Propylbenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	103-65-1	X
Bromobenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	108-86-1	X
1,3,5-Trimethylbenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	108-67-8	X
tert-Butylbenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	98-06-6	X
1,2,4-Trimethylbenzene*	700	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	95-63-6	X

X-Elevated reporting limit due to matrix interference



Analytical Laboratory Report

Lab Sample ID: S86083.01 (continued)

Sample Tag: LMW-12-08_12072017

Analysis	Results	Units	RL	Method	Run Date/Time	Tech	CAS #	Flags
Organics - Volatiles (continued)								
Volatile Organics (continued)								
sec-Butylbenzene*	800	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	135-98-8	X
p-Isopropyltoluene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	99-87-6	X
1,3-Dichlorobenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	541-73-1	X
1,4-Dichlorobenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	106-46-7	X
1,2-Dichlorobenzene*	Not detected	ug/kg	1,000	SW5035A/8260C	12/20/17 13:43	JML	95-50-1	X
1,2,3-Trimethylbenzene*	600	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	526-73-8	X
n-Butylbenzene*	1,200	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	104-51-8	X
Hexachloroethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	67-72-1	X
1,2-Dibromo-3-chloropropane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	96-12-8	X
1,2,4-Trichlorobenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	120-82-1	X
1,2,3-Trichlorobenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 13:43	JML	87-61-6	X
Naphthalene*	Not detected	ug/kg	1,000	SW5035A/8260C	12/20/17 13:43	JML	91-20-3	X
2-Methylnaphthalene*	2,000	ug/kg	1,000	SW5035A/8260C	12/20/17 13:43	JML	91-57-6	X

X-Elevated reporting limit due to matrix interference



Analytical Laboratory Report

Lab Sample ID: S86083.02

Sample Tag: PMW-01_12072017

Collected Date/Time: 12/07/2017 09:05

Matrix: Oil

COC Reference: 105390

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	8oz Glass	None	Yes	5.3	IR
1	40ml Glass	None	Yes	5.3	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Tech	CAS #	Flags
----------	---------	-------	----	--------	---------------	------	-------	-------

Extraction / Prep.

BNA Extraction*	Completed			SW3550C	12/18/17 16:00	PLB		
Extraction, PCB*	Completed			SW3550C	12/15/17 18:30	PLB		

Organics - PCBs/Pesticides

PCB List

PCB-1016*	Not detected	ug/kg	3,000	SW8082A	12/18/17 17:50	JAN	12674-11-2	Y
PCB-1242*	30,000	ug/kg	3,000	SW8082A	12/18/17 17:50	JAN	53469-21-9	Y
PCB-1221*	Not detected	ug/kg	3,000	SW8082A	12/18/17 17:50	JAN	11104-28-2	Y
PCB-1232*	Not detected	ug/kg	3,000	SW8082A	12/18/17 17:50	JAN	11141-16-5	Y
PCB-1248*	Not detected	ug/kg	3,000	SW8082A	12/18/17 17:50	JAN	12672-29-6	Y
PCB-1254*	Not detected	ug/kg	3,000	SW8082A	12/18/17 17:50	JAN	11097-69-1	Y
PCB-1260*	Not detected	ug/kg	3,000	SW8082A	12/18/17 17:50	JAN	11096-82-5	Y

Organics - Semi-Volatiles

Semi-Volatile Organics - MDEQ

Acenaphthene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	83-32-9	X
Acenaphthylene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	208-96-8	X
Anthracene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	120-12-7	X
Benzo(a)anthracene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	56-55-3	X
Benzo(b)fluoranthene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	205-99-2	X
Benzo(k)fluoranthene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	207-08-9	X
Benzo(ghi)perylene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	191-24-2	X
Benzo(a)pyrene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	50-32-8	X
bis(2-Chloroethoxy)methane*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	111-91-1	X
bis(2-Chloroethyl)ether*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	111-44-4	X
bis(2-Chloroisopropyl)ether*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	108-60-1	X
bis(2-Ethylhexyl)phthalate*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	117-81-7	X
4-Bromophenyl phenyl ether*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	101-55-3	X
Butyl benzyl phthalate*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	85-68-7	X
4-Chloroaniline*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	106-47-8	X
2-Chloronaphthalene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	91-58-7	X
4-Chloro-3-methylphenol*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	59-50-7	X
2-Chlorophenol*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	95-57-8	X
4-Chlorophenyl phenyl ether*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	7005-72-3	X
Chrysene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	218-01-9	X
p,m-Cresol*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	3/4-CRESOL	X
o-Cresol*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	95-48-7	X
Dibenzo(ah)anthracene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	53-70-3	X
Dibenzofuran*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	132-64-9	X
di-n-Butyl phthalate*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	84-74-2	X

Y-Elevated reporting limit due to high target concentration

X-Elevated reporting limit due to matrix interference



Analytical Laboratory Report

Lab Sample ID: S86083.02 (continued)

Sample Tag: PMW-01_12072017

Analysis	Results	Units	RL	Method	Run Date/Time	Tech	CAS #	Flags
Organics - Semi-Volatiles (continued)								
Semi-Volatile Organics - MDEQ (continued)								
1,2-Dichlorobenzene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	95-50-1	X
1,3-Dichlorobenzene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	541-73-1	X
1,4-Dichlorobenzene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	106-46-7	X
3,3'-Dichlorobenzidine*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	91-94-1	X
2,4-Dichlorophenol*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	120-83-2	X
Diethyl phthalate*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	84-66-2	X
2,4-Dimethylphenol*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	105-67-9	X
Dimethyl phthalate*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	131-11-3	X
4,6-Dinitro-2-methylphenol*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	534-52-1	X
2,4-Dinitrophenol*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	51-28-5	X
2,4-Dinitrotoluene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	121-14-2	X
2,6-Dinitrotoluene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	606-20-2	X
1,2-Diphenylhydrazine*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	122-66-7	X
di-n-Octyl phthalate*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	117-84-0	X
Fluoranthene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	206-44-0	X
Fluorene*	165,000	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	86-73-7	X
Hexachlorobenzene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	118-74-1	X
Hexachlorobutadiene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	87-68-3	X
Hexachlorocyclopentadiene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	77-47-4	X
Hexachloroethane*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	67-72-1	X
Indeno(1,2,3-cd)pyrene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	193-39-5	X
Isophorone*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	78-59-1	X
2-Methylnaphthalene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	91-57-6	X
Naphthalene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	91-20-3	X
2-Nitroaniline*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	88-74-4	X
3-Nitroaniline*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	99-09-2	X
4-Nitroaniline*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	100-01-6	X
Nitrobenzene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	98-95-3	X
2-Nitrophenol*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	88-75-5	X
4-Nitrophenol*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	100-02-7	X
N-Nitrosodiphenylamine*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	86-30-6	X
N-Nitrosodi-n-propylamine*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	621-64-7	X
Pentachlorophenol*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	87-86-5	X
Phenanthrene*	174,000	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	85-01-8	X
Phenol*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	108-95-2	X
Pyrene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	129-00-0	X
1,2,4-Trichlorobenzene*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	120-82-1	X
2,4,5-Trichlorophenol*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	95-95-4	X
2,4,6-Trichlorophenol*	Not detected	ug/kg	78,000	SW8270D	12/19/17 01:03	PL	88-06-2	X

Organics - Volatiles

Volatile Organics

Diethyl ether*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	60-29-7	Y
Acetone*	Not detected	ug/kg	50,000	SW5035A/8260C	12/19/17 18:59	JML	67-64-1	Y
Methyl iodide*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	74-88-4	Y
Carbon disulfide*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	75-15-0	Y
tert-Methyl butyl ether (MTBE)*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	1634-04-4	Y

X-Elevated reporting limit due to matrix interference

Y-Elevated reporting limit due to high target concentration



Analytical Laboratory Report

Lab Sample ID: S86083.02 (continued)

Sample Tag: PMW-01_12072017

Analysis	Results	Units	RL	Method	Run Date/Time	Tech	CAS #	Flags
Organics - Volatiles (continued)								
Volatile Organics (continued)								
Acrylonitrile*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	107-13-1	Y
2-Butanone (MEK)*	Not detected	ug/kg	50,000	SW5035A/8260C	12/19/17 18:59	JML	78-93-3	Y
Dichlorodifluoromethane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	75-71-8	Y
Chloromethane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	74-87-3	Y
Vinyl chloride*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	75-01-4	Y
Bromomethane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	74-83-9	Y
Chloroethane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	75-00-3	Y
Trichlorofluoromethane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	75-69-4	Y
1,1-Dichloroethene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	75-35-4	Y
Methylene chloride*	Not detected	ug/kg	10,000	SW5035A/8260C	12/19/17 18:59	JML	75-09-2	Y
trans-1,2-Dichloroethene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	156-60-5	Y
1,1-Dichloroethane*	162,000	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	75-34-3	Y
cis-1,2-Dichloroethene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	156-59-2	Y
Tetrahydrofuran*	Not detected	ug/kg	100,000	SW5035A/8260C	12/19/17 18:59	JML	109-99-9	Y
Chloroform*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	67-66-3	Y
Bromochloromethane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	74-97-5	Y
1,1,1-Trichloroethane*	345,000	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	71-55-6	Y
4-Methyl-2-pentanone (MIBK)*	Not detected	ug/kg	50,000	SW5035A/8260C	12/19/17 18:59	JML	108-10-1	Y
2-Hexanone*	Not detected	ug/kg	50,000	SW5035A/8260C	12/19/17 18:59	JML	591-78-6	Y
Carbon tetrachloride*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	56-23-5	Y
Benzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	71-43-2	Y
1,2-Dichloroethane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	107-06-2	Y
Trichloroethene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	79-01-6	Y
1,2-Dichloropropane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	78-87-5	Y
Bromodichloromethane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	75-27-4	Y
Dibromomethane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	74-95-3	Y
cis-1,3-Dichloropropene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	10061-01-5	Y
Toluene*	7,000	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	108-88-3	Y
trans-1,3-Dichloropropene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	10061-02-6	Y
1,1,2-Trichloroethane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	79-00-5	Y
Tetrachloroethene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	127-18-4	Y
trans-1,4-Dichloro-2-butene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	110-57-6	Y
Dibromochloromethane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	124-48-1	Y
1,2-Dibromoethane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	106-93-4	Y
Chlorobenzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	108-90-7	Y
1,1,1,2-Tetrachloroethane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	630-20-6	Y
Ethylbenzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	100-41-4	Y
p,m-Xylene*	Not detected	ug/kg	10,000	SW5035A/8260C	12/19/17 18:59	JML		Y
o-Xylene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	95-47-6	Y
Styrene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	100-42-5	Y
Isopropylbenzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	98-82-8	Y
Bromoform*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	75-25-2	Y
1,1,2,2-Tetrachloroethane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	79-34-5	Y
1,2,3-Trichloropropane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	96-18-4	Y
n-Propylbenzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	103-65-1	Y
Bromobenzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	108-86-1	Y
1,3,5-Trimethylbenzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	108-67-8	Y
tert-Butylbenzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	98-06-6	Y

Y-Elevated reporting limit due to high target concentration



Analytical Laboratory Report

Lab Sample ID: S86083.02 (continued)

Sample Tag: PMW-01_12072017

Analysis	Results	Units	RL	Method	Run Date/Time	Tech	CAS #	Flags
Organics - Volatiles (continued)								
Volatile Organics (continued)								
1,2,4-Trimethylbenzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	95-63-6	Y
sec-Butylbenzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	135-98-8	Y
p-Isopropyltoluene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	99-87-6	Y
1,3-Dichlorobenzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	541-73-1	Y
1,4-Dichlorobenzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	106-46-7	Y
1,2-Dichlorobenzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	95-50-1	Y
1,2,3-Trimethylbenzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	526-73-8	Y
n-Butylbenzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	104-51-8	Y
Hexachloroethane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	67-72-1	Y
1,2-Dibromo-3-chloropropane*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	96-12-8	Y
1,2,4-Trichlorobenzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	120-82-1	Y
1,2,3-Trichlorobenzene*	Not detected	ug/kg	5,000	SW5035A/8260C	12/19/17 18:59	JML	87-61-6	Y
Naphthalene*	Not detected	ug/kg	10,000	SW5035A/8260C	12/19/17 18:59	JML	91-20-3	Y
2-Methylnaphthalene*	20,000	ug/kg	10,000	SW5035A/8260C	12/19/17 18:59	JML	91-57-6	Y

Y-Elevated reporting limit due to high target concentration



Analytical Laboratory Report

Lab Sample ID: S86083.03

Sample Tag: MW-14-12D_12072017

Collected Date/Time: 12/07/2017 09:25

Matrix: Oil

COC Reference: 105390

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	8oz Glass	None	Yes	5.3	IR
1	40ml Glass	None	Yes	5.3	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Tech	CAS #	Flags
----------	---------	-------	----	--------	---------------	------	-------	-------

Extraction / Prep.

BNA Extraction*	Completed			SW3550C	12/18/17 16:00	PLB		
Extraction, PCB*	Completed			SW3550C	12/15/17 18:30	PLB		

Organics - PCBs/Pesticides

PCB List

PCB-1016*	Not detected	ug/kg	33,000	SW8082A	12/18/17 17:39	JAN	12674-11-2	Y
PCB-1242*	Not detected	ug/kg	33,000	SW8082A	12/18/17 17:39	JAN	53469-21-9	Y
PCB-1221*	Not detected	ug/kg	33,000	SW8082A	12/18/17 17:39	JAN	11104-28-2	Y
PCB-1232*	Not detected	ug/kg	33,000	SW8082A	12/18/17 17:39	JAN	11141-16-5	Y
PCB-1248*	Not detected	ug/kg	33,000	SW8082A	12/18/17 17:39	JAN	12672-29-6	Y
PCB-1254*	223,000	ug/kg	33,000	SW8082A	12/18/17 17:39	JAN	11097-69-1	Y
PCB-1260*	Not detected	ug/kg	33,000	SW8082A	12/18/17 17:39	JAN	11096-82-5	Y

Organics - Semi-Volatiles

Semi-Volatile Organics - MDEQ

Acenaphthene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	83-32-9	X
Acenaphthylene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	208-96-8	X
Anthracene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	120-12-7	X
Benzo(a)anthracene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	56-55-3	X
Benzo(b)fluoranthene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	205-99-2	X
Benzo(k)fluoranthene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	207-08-9	X
Benzo(ghi)perylene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	191-24-2	X
Benzo(a)pyrene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	50-32-8	X
bis(2-Chloroethoxy)methane*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	111-91-1	X
bis(2-Chloroethyl)ether*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	111-44-4	X
bis(2-Chloroisopropyl)ether*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	108-60-1	X
bis(2-Ethylhexyl)phthalate*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	117-81-7	X
4-Bromophenyl phenyl ether*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	101-55-3	X
Butyl benzyl phthalate*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	85-68-7	X
4-Chloroaniline*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	106-47-8	X
2-Chloronaphthalene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	91-58-7	X
4-Chloro-3-methylphenol*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	59-50-7	X
2-Chlorophenol*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	95-57-8	X
4-Chlorophenyl phenyl ether*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	7005-72-3	X
Chrysene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	218-01-9	X
p,m-Cresol*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	3/4-CRESOLX	
o-Cresol*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	95-48-7	X
Dibenzo(ah)anthracene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	53-70-3	X
Dibenzofuran*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	132-64-9	X
di-n-Butyl phthalate*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	84-74-2	X

Y-Elevated reporting limit due to high target concentration

X-Elevated reporting limit due to matrix interference



Analytical Laboratory Report

Lab Sample ID: S86083.03 (continued)

Sample Tag: MW-14-12D_12072017

Analysis	Results	Units	RL	Method	Run Date/Time	Tech	CAS #	Flags
Organics - Semi-Volatiles (continued)								
Semi-Volatile Organics - MDEQ (continued)								
1,2-Dichlorobenzene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	95-50-1	X
1,3-Dichlorobenzene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	541-73-1	X
1,4-Dichlorobenzene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	106-46-7	X
3,3'-Dichlorobenzidine*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	91-94-1	X
2,4-Dichlorophenol*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	120-83-2	X
Diethyl phthalate*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	84-66-2	X
2,4-Dimethylphenol*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	105-67-9	X
Dimethyl phthalate*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	131-11-3	X
4,6-Dinitro-2-methylphenol*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	534-52-1	X
2,4-Dinitrophenol*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	51-28-5	X
2,4-Dinitrotoluene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	121-14-2	X
2,6-Dinitrotoluene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	606-20-2	X
1,2-Diphenylhydrazine*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	122-66-7	X
di-n-Octyl phthalate*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	117-84-0	X
Fluoranthene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	206-44-0	X
Fluorene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	86-73-7	X
Hexachlorobenzene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	118-74-1	X
Hexachlorobutadiene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	87-68-3	X
Hexachlorocyclopentadiene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	77-47-4	X
Hexachloroethane*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	67-72-1	X
Indeno(1,2,3-cd)pyrene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	193-39-5	X
Isophorone*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	78-59-1	X
2-Methylnaphthalene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	91-57-6	X
Naphthalene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	91-20-3	X
2-Nitroaniline*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	88-74-4	X
3-Nitroaniline*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	99-09-2	X
4-Nitroaniline*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	100-01-6	X
Nitrobenzene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	98-95-3	X
2-Nitrophenol*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	88-75-5	X
4-Nitrophenol*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	100-02-7	X
N-Nitrosodiphenylamine*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	86-30-6	X
N-Nitrosodi-n-propylamine*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	621-64-7	X
Pentachlorophenol*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	87-86-5	X
Phenanthrene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	85-01-8	X
Phenol*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	108-95-2	X
Pyrene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	129-00-0	X
1,2,4-Trichlorobenzene*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	120-82-1	X
2,4,5-Trichlorophenol*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	95-95-4	X
2,4,6-Trichlorophenol*	Not detected	ug/kg	79,000	SW8270D	12/19/17 01:32	PL	88-06-2	X
Organics - Volatiles								
Volatile Organics								
Diethyl ether*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	60-29-7	X
Acetone*	Not detected	ug/kg	5,000	SW5035A/8260C	12/20/17 14:01	JML	67-64-1	X
Methyl iodide*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	74-88-4	X
Carbon disulfide*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	75-15-0	X
tert-Methyl butyl ether (MTBE)*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	1634-04-4	X
Acrylonitrile*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	107-13-1	X

X-Elevated reporting limit due to matrix interference



Analytical Laboratory Report

Lab Sample ID: S86083.03 (continued)

Sample Tag: MW-14-12D_12072017

Analysis	Results	Units	RL	Method	Run Date/Time	Tech	CAS #	Flags
Organics - Volatiles (continued)								
Volatile Organics (continued)								
2-Butanone (MEK)*	Not detected	ug/kg	5,000	SW5035A/8260C	12/20/17 14:01	JML	78-93-3	X
Dichlorodifluoromethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	75-71-8	X
Chloromethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	74-87-3	X
Vinyl chloride*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	75-01-4	X
Bromomethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	74-83-9	X
Chloroethane*	71,300	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	75-00-3	X
Trichlorofluoromethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	75-69-4	X
1,1-Dichloroethene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	75-35-4	X
Methylene chloride*	Not detected	ug/kg	1,000	SW5035A/8260C	12/20/17 14:01	JML	75-09-2	X
trans-1,2-Dichloroethene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	156-60-5	X
1,1-Dichloroethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	75-34-3	X
cis-1,2-Dichloroethene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	156-59-2	X
Tetrahydrofuran*	Not detected	ug/kg	10,000	SW5035A/8260C	12/20/17 14:01	JML	109-99-9	X
Chloroform*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	67-66-3	X
Bromochloromethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	74-97-5	X
1,1,1-Trichloroethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	71-55-6	X
4-Methyl-2-pentanone (MIBK)*	Not detected	ug/kg	5,000	SW5035A/8260C	12/20/17 14:01	JML	108-10-1	X
2-Hexanone*	Not detected	ug/kg	5,000	SW5035A/8260C	12/20/17 14:01	JML	591-78-6	X
Carbon tetrachloride*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	56-23-5	X
Benzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	71-43-2	X
1,2-Dichloroethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	107-06-2	X
Trichloroethene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	79-01-6	X
1,2-Dichloropropane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	78-87-5	X
Bromodichloromethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	75-27-4	X
Dibromomethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	74-95-3	X
cis-1,3-Dichloropropene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	10061-01-5	X
Toluene*	500	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	108-88-3	X
trans-1,3-Dichloropropene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	10061-02-6	X
1,1,2-Trichloroethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	79-00-5	X
Tetrachloroethene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	127-18-4	X
trans-1,4-Dichloro-2-butene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	110-57-6	X
Dibromochloromethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	124-48-1	X
1,2-Dibromoethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	106-93-4	X
Chlorobenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	108-90-7	X
1,1,1,2-Tetrachloroethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	630-20-6	X
Ethylbenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	100-41-4	X
p,m-Xylene*	1,000	ug/kg	1,000	SW5035A/8260C	12/20/17 14:01	JML		X
o-Xylene*	600	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	95-47-6	X
Styrene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	100-42-5	X
Isopropylbenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	98-82-8	X
Bromoform*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	75-25-2	X
1,1,2,2-Tetrachloroethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	79-34-5	X
1,2,3-Trichloropropane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	96-18-4	X
n-Propylbenzene*	600	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	103-65-1	X
Bromobenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	108-86-1	X
1,3,5-Trimethylbenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	108-67-8	X
tert-Butylbenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	98-06-6	X
1,2,4-Trimethylbenzene*	2,800	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	95-63-6	X

X-Elevated reporting limit due to matrix interference



Analytical Laboratory Report

Lab Sample ID: S86083.03 (continued)

Sample Tag: MW-14-12D_12072017

Analysis	Results	Units	RL	Method	Run Date/Time	Tech	CAS #	Flags
Organics - Volatiles (continued)								
Volatile Organics (continued)								
sec-Butylbenzene*	600	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	135-98-8	X
p-Isopropyltoluene*	1,300	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	99-87-6	X
1,3-Dichlorobenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	541-73-1	X
1,4-Dichlorobenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	106-46-7	X
1,2-Dichlorobenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	95-50-1	X
1,2,3-Trimethylbenzene*	1,100	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	526-73-8	X
n-Butylbenzene*	1,200	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	104-51-8	X
Hexachloroethane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	67-72-1	X
1,2-Dibromo-3-chloropropane*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	96-12-8	X
1,2,4-Trichlorobenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	120-82-1	X
1,2,3-Trichlorobenzene*	Not detected	ug/kg	500	SW5035A/8260C	12/20/17 14:01	JML	87-61-6	X
Naphthalene*	4,000	ug/kg	1,000	SW5035A/8260C	12/20/17 14:01	JML	91-20-3	X
2-Methylnaphthalene*	9,000	ug/kg	1,000	SW5035A/8260C	12/20/17 14:01	JML	91-57-6	X

X-Elevated reporting limit due to matrix interference



Merit
Laboratories, Inc.

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

C.O.C. PAGE # 1 OF 1

105390

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME: ALEX VILLHAVER
 COMPANY: ARCADIS
 ADDRESS: 300 SOUTH WASHINGTON SQ, SUITE 315
 CITY: LANSING STATE: MI ZIP CODE: 48930
 PHONE NO.: 517 324 5036 FAX NO.: _____ P.O. NO.: 30064479.2017.00402
 E-MAIL ADDRESS: ALEX.VILLHAVER@ARCADIS.COM QUOTE NO.: _____

CONTACT NAME: SAME
 COMPANY: _____
 ADDRESS: _____
 CITY: _____ STATE: _____ ZIP CODE: _____
 PHONE NO.: _____ E-MAIL ADDRESS: _____

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

PROJECT NO./NAME: 30064479.2017.00402/RACEX PLANT 2 WAPL SAMPLER(S) - PLEASE PRINT/SIGN NAME: ROBERT HILKADE/RMD
 TURNAROUND TIME REQUIRED: 1 DAY 2 DAYS 3 DAYS STANDARD OTHER _____
 DELIVERABLES REQUIRED: STD LEVEL II LEVEL III LEVEL IV EDD OTHER _____

SVOGS
 TPH FRACTION
 VOCs
 PCBs

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

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

Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	SVOGS	TPH FRACTION	VOCs	PCBs
	DATE	TIME														
<u>SL08301</u>	<u>12/7</u>	<u>0810</u>	<u>LMW-12-08_12072017</u>	<u>0</u>	<u>1</u>	<u>1</u>							<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>
<u>02</u>	<u>↓</u>	<u>0905</u>	<u>PMW-01_12072017</u>	<u>0</u>	<u>1</u>	<u>1</u>							<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>
<u>B</u>	<u>↓</u>	<u>0925</u>	<u>MW-14-12D_12072017</u>	<u>0</u>	<u>1</u>	<u>1</u>							<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>

RELINQUISHED BY: RMD Sampler DATE: 12/7 TIME: _____
 RECEIVED BY: PM STORAGE DATE: _____ TIME: _____
 RELINQUISHED BY: [Signature] DATE: 12/8/17 TIME: 14:42
 RECEIVED BY: [Signature] DATE: 12/18/17 TIME: 14:42

RELINQUISHED BY: PM Storage DATE: 12/8/17 TIME: 14:00
 RECEIVED BY: [Signature] DATE: 12/8/17 TIME: 14:00
 SEAL NO. SEAL INTACT YES NO INITIALS _____
 SEAL NO. SEAL INTACT YES NO INITIALS _____
 NOTES: TEMP. ON ARRIVAL: 5.3

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

Arcadis of Michigan, LLC

28550 Cabot Drive

Suite 500

Novi, Michigan 48377

Tel 248 994 2240

Fax 248 994 2241

www.arcadis.com