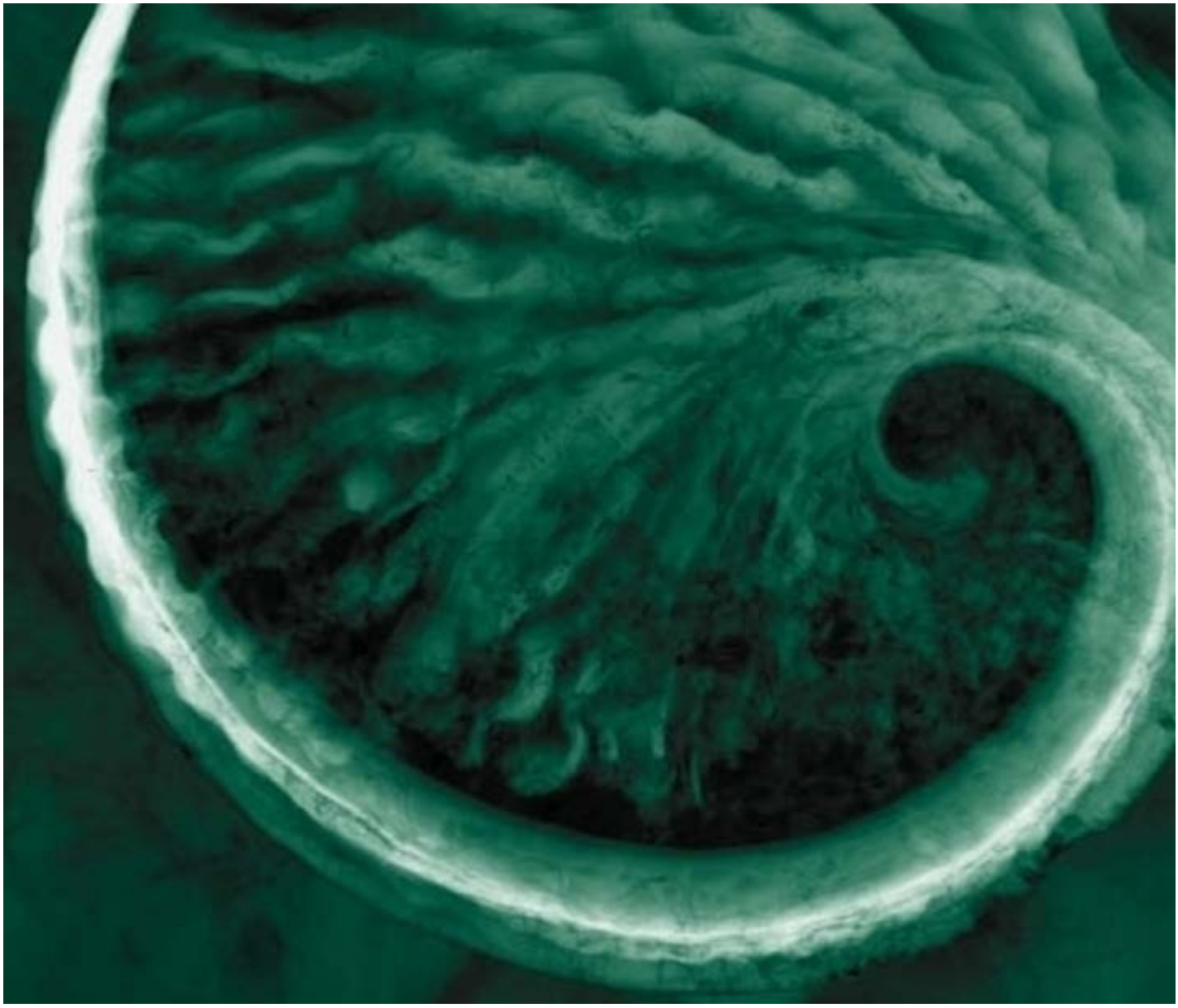

Prepared for:

Matson

2017 Long-Term Monitoring Report

Port of Anchorage Terminal Facility

January 2018

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ERM

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2017 Long-Term Monitoring Report
Port of Anchorage Terminal Facility

January 2018

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APPENDICES

ACRONYMS AND ABBREVIATIONS

AAC ..... Alaska Administrative Code
ADEC ..... Alaska Department of Environmental Conservation
AWQS..... Alaska Water Quality Standards
BTEX..... Benzene, toluene, ethylbenzene, and total xylenes
COC ..... Chain of custody
COI ..... Constituents of interest
CSM ..... Conceptual site model
DO..... Dissolved oxygen
DRO ..... Diesel-range organics
EPA ..... U.S. Environmental Protection Agency
ERM ..... ERM Alaska, Inc.
GCL..... Groundwater cleanup level
GRO ..... Gasoline-range organics
ICs ..... Institutional Controls
LCS..... Laboratory control sample
LCSD ..... Laboratory control sample duplicate
LNAPL ..... Light non-aqueous phase liquid
LOQ ..... Limit of Quantitation
mg/L ..... Milligrams per liter
mL ..... Milliliter
MRL ..... Method Reporting Limit
MS ..... Matrix spike
MSD ..... Matrix Spike Duplicate
ND..... Non detect
ORP..... Oxygen-reduction potential
PAH ..... Polycyclic aromatic hydrocarbons
QA..... Quality assurance
QC ..... Quality control
RL..... Reporting Limit
RPD..... Relative percent difference
TVH ..... Total volatile hydrocarbons
UST ..... Underground storage tank
VOC ..... Volatile organic compounds

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1. INTRODUCTION

ERM Alaska, Inc. (ERM), under contract to Matson, has been tasked with performing long-term monitoring at Matson's Port of Anchorage Terminal Facility. This report constitutes the third of three biennial reports as outlined by the work plan for long-term monitoring at the site (ERM 2013). The objective of this report is to present the results of the 2017 groundwater sampling event, and summarize the groundwater trends for the 2013-2017 bi-annual monitoring events. Figures 1 and 2 depict the site location.

1.1. Background

According to Hart Crower, Inc.'s (Hart Crowser's) Groundwater Monitoring Plan, dated October 2004 (Hart Crowser 2004), three underground storage tanks (USTs) located on the south side of the Maintenance Shop were upgraded in 1997 to meet current regulatory standards. During the upgrades, a 10,000-gallon UST was damaged, and an estimated 5,600 gallons of fuel were released. Response activities reportedly recovered all of the fuel and removed 50 cubic yards of impacted soil. Some impacted soil may remain in conjunction with two of the three tanks that were left in place. As part of the remedial solution, a passive bioventing system consisting of six underground, horizontal, slotted PVC lines were installed. The objective of the bioventing system is to promote in situ remediation through the passive removal of volatile hydrocarbons and the addition of oxygen, which supports aerobic degradation of hydrocarbons in the vadose (unsaturated) zone.

Hart Crowser conducted a release investigation in 2000 to assess the impact of documented releases from USTs located on the southern side of the Maintenance Shop. Four monitoring wells (HC-1, HC-2B, HC-3, and HC-4) were installed. Review of analytical results from the monitoring wells indicated that groundwater concentrations of benzene, gasoline-range organics (GRO), and diesel-range organics (DRO) exceeded the ADEC groundwater cleanup levels (GCLs). All wells contained petroleum hydrocarbon concentrations above GCLs with the exception of HC-4, located at the western side of the former fuel canopy.

In 2002, Hart Crowser installed two new monitoring wells (HC-5 and HC-6) along the Cherry Hill Storm Drain line to determine whether the storm sewer line was acting as a preferential pathway for contaminant migration from the USTs. All existing wells were sampled, with wells HC-1, HC-2B, HC-3, and HC-4 having similar results as in 2000. No compounds were detected above GCLs in HC-5 and HC-6. Hart Crowser conducted two more rounds of groundwater monitoring in November 2004 and March 2005.

In September 2005, OASIS Environmental, Inc. (OASIS) oversaw the removal of the three USTs and associated piping and dispensers. Based on a plan discussed with the ADEC, OASIS left visible petroleum contamination in place during the removal and placed contaminated soil back into the excavation above the water table (OASIS 2005). As part

of the removal, two monitoring wells (MW-8 and MW-9) were installed at the down-gradient edges of the UST excavation.

ERM (formerly OASIS) has completed six monitoring events since the removal of the three USTs in September 2005. Monitoring was performed on a semiannual basis from 2005 to 2008 and then reduced to an annual basis from 2009 to 2011, per the approval of the ADEC project manager. A complete summary of monitoring activities completed from 2005 to 2011 is provided in the document *2011 Long Term Monitoring Report, Port of Anchorage Terminal Facility* (OASIS 2011).

Review of groundwater monitoring results for the years 2005 through 2011 indicate that the contaminant plume continues to attenuate and is not migrating offsite. Groundwater hydrocarbon concentrations continued to exceed GCLs, especially in wells located in the vicinity of the former UST excavation. The monitoring data, which is available as far back as October 2000, show that groundwater contaminant concentrations continue to exhibit statistically significant decreasing trends. Stable or not increasing hydrocarbon concentrations at perimeter wells suggests that the plume is not migrating and that attenuation is occurring at the edges of the plume.

An analysis of the 2011 natural attenuation parameter results suggests that the site conditions are transitionally aerobic and reducing. Comparison of Fe (III), nitrate and sulfate concentrations in the background well to the plume wells provides no strong indications of a dominant attenuation process; however, decreasing concentrations in the source area indicate that attenuation is occurring.

In 2011, monitoring of the bioventing system continued to show that conditions support the aerobic biodegradation of volatile hydrocarbon in the vicinity of the passive bioventing system lines. Carbon dioxide was detected in the vadose zone at concentrations above 0.3 percent, which indicates that microbial activity is occurring. Because oxygen levels were not entirely depleted, there appears to be sufficient oxygen for additional microbial activity.

1.2. Purpose and Scope

The scope of work for long-term monitoring during 2017 is based on recommendations made in the *2015 Long Term Monitoring Report* (ERM 2015). The purpose of the 2017 biennial long-term monitoring event is to:

- Evaluate groundwater flow direction;
- Assess the current state and distribution of hydrocarbon constituents in groundwater monitoring wells;
- Monitor the bioventing system to determine if *in-situ* remediation is occurring;
- Refine the Terminal's conceptual site model based on input of additional data gathered from the execution of the LTM Plan (ERM2013); and

- Demonstrate over time that the combination of bioventing and monitored natural attenuation is reducing petroleum constituent concentrations to applicable Method 2 and Table C (18 Alaska Administrative Code [AAC] 75) cleanup levels for soil and groundwater, respectively (ADEC 2017a).

1.3. Project Organization

The property owner and sub-contractors for this project are listed below:

- Owner/Operator: Matson, 1717 Tidewater Road, Anchorage, Alaska, 99501.
- Third-Party Environmental Assessor: ERM, 825 W. 8th Avenue, Anchorage, Alaska, 99501.
- ADEC Certified Laboratory: TestAmerica, 5755 8th Street E, Tacoma, Washington, 98424.

1.4. Regulatory Framework

This report has been developed in accordance with regulatory policy and standard practices as outlined in:

- 18 AAC 75, *Oil and Other Hazardous Substances Pollution Control* (ADEC 2017a);
- *Underground Storage Tanks Procedure Manual* (ADEC 2014);
- *Policy Guidance on Developing Conceptual Site Models* (ADEC 2017b); and
- *Draft Field Sampling Guidance* (ADEC 2017c).

The constituents of interest associated with this project include benzene, toluene, ethylbenzene, and total xylenes (BTEX), gasoline range organics (GRO), diesel range organics (DRO), and polycyclic aromatic hydrocarbons (PAHs). Analytical results for groundwater samples are evaluated using ADEC's groundwater cleanup levels (GCL) as presented in Table C of 18 AAC 75.345. Table 1 presents the applicable GCLs.

TABLE 1. GROUNDWATER CLEANUP LEVELS

Analyte	GCL[1] [mg/L]
Benzene	0.0046
Toluene	1.1
Ethylbenzene	0.015
Xylenes	0.19
GRO	2.2
DRO	1.5
Naphthalene	0.0017
1-Methylnaphthalene	0.011
2-Methylnaphthalene	0.036
Benzo(a)pyrene	0.000034
Dibenzo(a,h)anthracene	0.000034

[1]GCLs per 18AAC75.345 (October 2017)

2. FIELD ACTIVITIES

During September of 2017, ERM performed the following activities at the terminal facility:

- Measured groundwater elevations using an oil-water interface probe;
- Evaluated water quality parameters;
- Collected groundwater samples using low-flow sampling techniques;
- Submitted groundwater samples to a commercial laboratory for analysis; and
- Monitored the bioventing system.

The work was performed in accordance with the 2013 work plan (ERM 2013), unless otherwise noted. Field notes and data sheets are included in Appendix A. All samples were collected by ERM personnel who meet the definition of qualified persons per 18 AAC 75.333(c).

2.1. Monitoring Well Repair and Survey

ERM personnel conducted the biennial groundwater monitoring effort 27 September 2017. ERM used a Trimble Spectra precision laser level LL200 to survey the height of each well casing relative to a benchmark (assumed elevation 100ft) located on the SE corner of the concrete pad housing a horizontal cylindrical aboveground fuel tank. The benchmark was previously established by professional surveyors, Bell and Associates. As part of the monitoring well survey, ERM recorded the total well depth of each well prior to sampling. The groundwater measurements were used with the results of the 2017 monitoring well survey to calculate relative groundwater elevation. No well repairs were necessary.

2.2. Groundwater Sampling

ERM sampled the wells using low-flow sampling techniques. This process included purging groundwater at less than 1 liter per minute using a peristaltic pump, passing groundwater through a flow-through cell, monitoring for water quality parameters using a YSI 556 water quality meter, and collecting samples after water quality parameter stabilization.

The wells that were sampled wells include: HC-1, HC-3, HC-6, MW-8, and MW-9. Previous sampling event results indicate that hydrocarbon concentrations in the remaining monitoring wells HC-2B, HC-4, HC-5 and MW-11 were either below GCLs or method detection limits in the final years they were sampled. Samples from the final year of monitoring from well HC-2B showed results below GCLs while samples from HC-4, HC-5, and MW-11 showed constituent concentrations below method detection limits, which were below the applicable GCLs. Although sampling at MW-9 was discontinued in 2013 due to statistically significant decreasing hydrocarbon trends, MW-

9 is in the direct vicinity of two other wells (MW-8 and HC-1) which have historically exhibited higher concentrations of the COIs. As a result, MW-9 was included in 2017 groundwater sampling.

MW-10 was not sampled in 2015 or 2017 because the well had been paved over. The location of the well was verified with a metal detector in 2015. Analytical results at MW-10 had not exceeded GCLs since 2006, with the exception of one exceedance of benzene with a concentration of 0.00503 mg/L in October of 2013 (GCL is 0.0046 mg/L). A summary of wells that were sampled is provided in Table 2, below.

TABLE 2. WELLS SAMPLED 09/27/17

Well	GRO/BTEX	DRO	PAHs
HC-1	X	X	-
HC-2B	-	-	-
HC-3	X	X	-
HC-4	-	-	-
HC-5	-	-	-
HC-6	X	X	-
MW-8	X	X	X
MW-9	X	X	-
MW-10	-	-	-
MW-11	-	-	-

The groundwater monitoring event sampling took place in accordance with sampling procedures outlined in ADEC's *Underground Storage Tanks Procedure Manual* (ADEC 2014). Monitoring wells were purged until at least three casing volumes of water were removed from the well, or until a minimum of three (four, if using temperature as an indicator) of the parameters listed on the Low-Flow Groundwater Sampling Worksheets (Appendix A) had stabilized. Water quality parameters (dissolved oxygen [DO], oxidation-reduction potential [ORP], pH, temperature, and conductivity) were measured using a YSI-556 water quality meter and flow through cell per ADEC field sampling guidance (2017c). Recording these parameters is important in determining the stability of a monitoring well prior to sampling. A depth-to-groundwater measurement and a total-well-depth measurement were recorded using an oil-water interface probe.

Water samples collected for laboratory analysis were immediately placed in a cooler along with frozen gel ice. Samples were delivered directly to TestAmerica in Anchorage, an ADEC-approved laboratory, and analyzed at TestAmerica Seattle for BTEX, GRO and DRO, and selected samples for PAHs.

2.3. Bioventing System Monitoring

The bioventing system is composed of six slotted PVC lines, which are buried horizontally in the footprints of the former USTs and filling stations. The lines daylight at the maintenance facility wall and extend up the exterior of the building to the outlet through fans on the roof.

During the 2017 monitoring event, ERM personnel inspected the system and monitored total volatile hydrocarbons, oxygen, and carbon dioxide levels. A sampling pump was connected to the sample port on each of the six lines via single-use polyethylene tubing. Approximately 0.25 cubic feet per minute (cfm) of soil gas was extracted from each line for approximately four minutes to allow thorough evacuation of any static vapors in the line. After sufficient evacuation, an RKI Eagle multi-gas meter (with LEL calibrated to oxygen, carbon dioxide, and hexane standards) was connected to the pump effluent to monitor the soil gas oxygen, carbon dioxide, and total volatile hydrocarbon (TVH) content.

Five of six of the roof-top passive bioventing system fans were observed spinning during the 2017 monitoring event. Lines one through six are installed in a row beginning on the southeast corner of the maintenance facility roof and run south to north. The in-line fan on line four was not spinning at the time of the monitoring event. Wind speed at the time of the event was moderate, and site personnel were notified of the need for maintenance on line four.

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3. RESULTS AND DISCUSSION

This section presents the findings from work performed as part of the long-term monitoring plan. Appendix B contains the analytical data reports.

3.1. Groundwater Elevation and Flow Direction

ERM recorded the total well depth and depth-to-water measurements prior to sampling. No light non-aqueous phase liquid (LNAPL) was observed or detected using the interface probe in any of the site wells. The groundwater elevation data is presented in Table 3 and Figure 3. The inferred groundwater flow direction is to the south at a gradient of 0.08 ft/ft, which is consistent with previous monitoring events.

3.2. Water Quality Results

Water quality parameter results are consistent with the results of recent monitoring events. Where applicable, water quality parameters were also compared to Alaska Water Quality Standards (AWQS) defined in 18 AAC 70.020 (ADEC 2017d).Temperature readings ranged from 9.78 to 12.20 degrees Celsius (49.60 to 54.00 degrees Fahrenheit). The DO readings from most wells ranged between 0.12 mg/L and 0.81 mg/L, falling below AWQS of ≥5 mg/L. In recent years wells have generally reported DO concentrations at or below 1.0 mg/L, which indicates that anaerobic biodegration is plays a role in the natural attenuation process at this site. Conductivity ranged from 1,604 to 4,190 microsiemens per centimeter. The groundwater pH levels were slightly acidic, ranging from 6.38 to 6.92 (outside the AWQS range of 6.5-8.5) but still considered normal. ORP results ranged from -113.4 to -37.2 millivolts. Conductivity and ORP are not regulated under the AWQS.

Table 4 summarizes the 2017 analytical sample results for the BTEX, GRO and DRO Figure 4 displays the 2017 groundwater sampling results by location. In summary, the results indicate that:

- Benzene concentrations exceeded the GCL in three wells: 0.7 mg/L at HC-1, 0.7 mg/L at MW-8 (1.5 mg/L at the MW-8 duplicate), and 0.73 mg/L at MW-9;
- Toluene concentrations did not exceed the GCL in any sampled wells;
- Ethylbenzene exceeded the GCL in three wells: 0.094 mg/L at HC-1, 1.3 mg/L at MW-8 (1.7 mg/L at the MW-8 duplicate), and 0.019 mg/L at MW-9;
- Total xylenes exceeded the GCL in one well: 8.42 mg/L at MW-8 (12 mg/L at the MW-8 duplicate);
- GRO concentrations exceeded the GCL in one well: 35 mg/L at MW-8 (36 mg/L at the MW-8 duplicate);
- DRO concentrations exceeded the GCL in three wells: 5.1 mg/L at HC-1, 13 mg/L at MW-8 (13 mg/L at the MW-8 duplicate), and 7.0 mg/L at MW-9;

Table 5 shows the analytical results for PAH concentrations in MW-8. In summary, PAH concentrations did not exceed ADEC cleanup levels in MW-8 or the MW-8 duplicate sample. Naphthalene, 1-Methylnaphthalene, and 2-Methylnaphthalene, were detected in excess of the screening level (one-tenth of the applicable cleanup level) at MW-8.

In general, sample concentrations are consistent with data from previous years. However, GCL concentrations were lowered by the ADEC between 2015 and 2017, and the revised GCLs were used for comparison to data collected in 2017, and to historical data presented in this report. Table 6 presents historical groundwater sample analytical results from 2000 to 2017 for BTEX, GRO, and DRO, with associated ADEC cleanup levels. Concentrations of benzene, GRO, and DRO at each well over time, as well as relative groundwater elevation trends, are illustrated on Figures 5 through 9. Appendix E tables show the trends for DRO, GRO, and BTEX over time, which are summarized below:

- DRO remained stable at HC-3 and HC-6, and decreased at HC-1, MW-8, and MW-9;
- GRO showed the same pattern as DRO at all wells except HC-6, where all results were non-detect and a trend was not calculated;
- Benzene showed decreasing trends at all wells except HC-6, where the concentration remained stable;
- Toluene showed decreasing trends at HC-1, MW-8, and MW-9, while trends were not calculated for HC-3 and HC-6 due to non-detect results at those locations;
- Ethylbenzene results showed decreasing trends at HC-1 and MW-9, with a stable trend at MW-8, and non-detect results at HC-3 and HC-6; and
- Finally, xylene trends were decreasing at HC-1 and MW-9 and stable at all other wells.

In general, wells located in the vicinity of the former USTs (HC-1, MW-8, and MW-9) contained constituent concentrations above GCLs. Constituent concentrations were reported below GCLs in the down-gradient and up-gradient wells.

DRO results for every sample collected from MW-8 since the well was installed in 2005 have exceeded the diesel solubility limit of 3.9 mg/L (American Petroleum Institute 2000). This observation suggests that groundwater in the source area is in contact with LNAPL; however, LNAPL has never been observed in this well and no product or sheen was observed during the UST removal.

3.3. Bioventing System Monitoring

Table 7 presents the cumulative monitoring results of the bioventing system including the results from the September 27, 2017 monitoring event. The level of carbon dioxide, which is produced as a by-product of the aerobic biodegradation of hydrocarbons, was

well above the atmospheric background of 0.038%, which suggests that respiration from microbial activity is occurring in the vadose zone. The carbon dioxide concentration was above average in 2017, indicating that respiration from microbial activity is occurring at a potentially higher rate than past years. Oxygen levels ranged from 11.0 to 15.1 percent indicating that microbial activity may be depleting some oxygen supply. Oxygen levels remain sufficient for aerobic biodegradation. Oxygen levels were slightly lower than historic average oxygen levels since 2006 in all of the lines, suggesting more aerobic biodegradation is taking place. Although TVH were not detected 2017, fluctuating results over the past 6 years indicate that contaminant vapors may remain in the vadose zone soil.

3.4. Mann-Kendall Trend Analysis

ERM performed a trend analysis using historical monitoring results to evaluate the stability of groundwater constituents at the site. ERM compared the analytical data using the nonparametric Mann-Kendall test (Gilbert 1987) to analyze whether or not concentrations of benzene, toluene, ethylbenzene, xylene, GRO, and DRO exhibit an increasing or decreasing trend over time in a given well. The test was run with the statistical program, R (R Core Team 2016). Appendix E presents individual Mann Kendall calculation tables and graphs.

The Mann-Kendall test is a widely used and accepted non-parametric method to determine if the general trend in concentration over time is increasing, decreasing, or stable (USEPA 2009; Gilbert 1987). The Mann-Kendall is not dependent on the magnitude of the data, assumptions of distribution, the presence of non-detects, or irregularly spaced monitoring periods. As such, the Mann-Kendall test is ideal for testing trends when many locations and analytes need to be tested (Helsel and Hirsch 2002).

The Mann-Kendall test is based on the idea that the lack of trend should correspond to a time series plot fluctuating randomly about a constant mean with no visually apparent upward or downward pattern. If a decreasing trend exists, for example, the sample taken first from any randomly selected pair of measurements should, on average, have a higher concentration than the measurement taken at the later point. The Mann-Kendall statistic is computed by examining all possible pairs of measurements in the dataset and scoring each pair. The scores are summed to create the Mann-Kendall statistic (S) (USEPA 2009).

For this evaluation, an error ($\alpha = 0.05$) is considered ideal when determining if a significant trend exists for a sample size of eight or more events. The Mann-Kendall determines if a trend exists and provides the correlation coefficient (tau) and the level of significance (p).

The results of the Mann-Kendall test will be interpreted as follows:

- An increasing trend is defined where tau is positive and $p \leq 0.05$;

- A decreasing trend is defined where tau is negative and $p \leq 0.05$; and
- A stable trend is defined where tau is positive or negative and $p > 0.05$

A non-parametric regression, Theil Sen Line, was appropriately paired with the non-parametric Mann-Kendall Test. The Theil Sen estimates the magnitude of the slope and the y-intercept (USEPA 2009). The Mann-Kendall test and the Theil Sen Line give the equivalent to a standard linear regression. Since the tau value is analogous to Pearson's coefficient (R), tau^2 gives the equivalent to R^2. The R^2 value indicates the fit of the data, or distance of data points from the regression line.

Appendix E shows the results of the regression analyses and the Mann-Kendall tests for benzene, toluene, ethylbenzene, xylene, GRO, and DRO concentrations. The table lists the trend as NA, for not applicable, for sample locations with all non-detect values.

Of the location-analyte combinations evaluated, all of the combinations showed either decreasing or stable trends. Scatterplots and the results of the Mann Kendall analysis are located in Appendix E.

4. QUALITY ASSURANCE REPORT

An ADEC Laboratory Data Review Checklist was completed to evaluate the quality of laboratory reports of analytical data for the samples collected during the 2017 monitoring activities. The ADEC Laboratory Data Review Checklist (ADEC 2017e) is provided in Appendix C. Per ADEC's *Technical Memorandum on Environmental Laboratory Data and Quality Assurance Requirements*, the quality assurance summary (below) describes quality assurance parameters and the impact that any discrepancies have on the quality and usability of the data collected in 2017.

Groundwater samples were analyzed for the following COIs:

- DRO by AK102
- GRO by AK101
- BTEX by EPA 8260C
- PAHs by 8270 SIM

4.1. Precision and Accuracy

Precision criteria monitor analytical reproducibility. Accuracy criteria monitor agreement of measured results with "true values" established by spiking applicable samples with a known quantity of analyte or surrogate. Precision and accuracy were evaluated by comparing LCS/LCSDs and field duplicate pairs for this project, with exceptions noted in above sections. Field duplicate samples were collected in accordance with sampling plan specifications. Field duplicate relative percent differences (RPDs) met applicable control limits, with any exceptions noted in the Quality Assurance Report. Recoveries and RPDs for all LCS/LSCD samples were within required limits, any exceptions noted in the Quality Assurance Report.

4.2. Representativeness

Data representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or environmental condition. The number and selection of samples were specified in the proposal and verified in the field to accurately account for site variations and sample matrices. The data quality objective (DQO) for representativeness was met.

4.3. Completeness

Data completeness is defined as the percentage of usable data (usable data divided by the total possible data). The overall project completeness goal is 90%:

$$\% \text{ completeness} = \frac{\text{number of valid (i.e., non-R flagged) results}}{\text{number of possible results}}$$

All requested analyses were performed in accordance with the work plan (ERM 2013) and proposal specifications (ERM 2017). No sample results were rejected, noting that sample results for sample 17-HLA-MW8MSD-1011 should not be used due to the laboratory reporting results for submitted MS/MSD sample. All primary samples that were submitted were analyzed; therefore, completeness for this project is 100%.

4.4. Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data produced for this project followed applicable field sampling techniques and specific analytical methodology. The DQO for comparability was met.

4.5. Data Summary

In general, the overall quality of the data was acceptable. The USEPA National Functional Guidelines (USEPA 2008) were used to evaluate the acceptability of the data. The data quality was individually determined as acceptable or estimated. Acceptable data are associated with QC data that meet all QC criteria or with QC samples that did not meet QC criteria but data quality objectives were not affected. Estimated results, flagged with J, are considered inaccurate due to a bias created by matrix interference or QC acceptance criteria which were not met. No reported results were rejected. The data are suitable for their intended use.

5. CONCEPTUAL SITE MODEL

The data from the 2017 monitoring event was evaluated in order to update the conceptual site model (CSM) for the site. The CSM was completed in accordance with the ADEC Policy Guidance on Developing Conceptual Site Models, updated in January 2017 No new receptors or exposure pathways were identified in 2017. The revised Conceptual Site Model is provided in Appendix D. The CSM scoping form in Appendix D outlines the current and future receptors for the property. Access to the site is restricted to Matson personnel and approved visitors. The current and future receptors of all completed pathways at the site consist of commercial or industrial workers, site visitors or trespassers, and construction workers.

The source area includes the petroleum contaminated soil and groundwater in the vicinity of the three USTs that historically supplied fuel to the fueling canopy. The complete exposure pathways are:

- Incidental soil ingestion,
- Dermal absorption of contaminants from soil,
- Dermal absorption of contaminants from groundwater,
- Ingestion of groundwater, and
- Inhalation of indoor and outdoor air.

The site is paved with asphalt, which prevents current contact with the subsurface soil, groundwater and soil gas. The incidental ingestion, dermal absorption and inhalation of outdoor air pathways could potentially affect future receptors in the case that the asphalt were removed.

Naphthalene, 1-Methylnaphthalene, and 2-Methylnaphthalene, constituents found in diesel fuel are included in the chemicals noted for potential dermal absorption exposure (Appendix B of the Policy Guidance on Developing Conceptual Site Models, ADEC 2010). These three chemicals were detected in excess of the screening level (one-tenth of the applicable cleanup level) at MW-8. Therefore, the dermal exposure pathway is considered complete at the site.

The nearest surface water body, the Cook Inlet, is not recognized as a current or potential future drinking water source, so the ingestion of surface water pathway is considered incomplete. The ingestion of wild foods pathway does not exist because the site is industrial and secured, which prevents the harvest and ingestion of wild foods.

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6. CONCLUSIONS AND RECOMMENDATIONS

Although groundwater hydrocarbon concentrations continue to exceed GCLs, especially in wells located in the vicinity of the former UST excavation, evaluation of the results of the 2013-2017 groundwater monitoring events do not indicate offsite migration of the contaminant plume is occurring. Across the site (including both upgradient and downgradient wells), DRO concentrations were higher in 2015 than they had been in recent years, but have since lowered in 2017. Benzene concentrations remained consistent with recent years.

According to the Mann-Kendall statistical analysis, used to evaluate the natural attenuation process for the COIs all constituents show either decreasing or stable trends in all site monitoring wells where constituents were monitored.

Monitoring of the bioventing system continues to show that in the vicinity of the passive bioventing system lines, conditions support the aerobic biodegradation of volatile hydrocarbons. The carbon dioxide concentrations remain above background levels and oxygen concentrations remain sufficient to support aerobic biodegradation in the vadose zone soils. The depleted dissolved oxygen levels in groundwater, within the area of impact, suggests anaerobic biodegradation processes are also active at the site.

Based on the results of bioventing system and biennial groundwater monitoring from 2013 through 2017, as well as multiple decreasing statistical trends in the wells of interest, ERM recommends ADEC consider conditional closure of the site with Institutional Controls (ICs), reduction in the scope of the groundwater monitoring program, and conclusion of the bioventing system monitoring.

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TABLES

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TABLE 3: GROUNDWATER ELEVATION MEASUREMENTS
2017 LONG-TERM GROUNDWATER MONITORING REPORT
MATSON
PORT OF ANCHORAGE TERMINAL FACILITY

Monitoring Well	Relative TOC[1,2] Elevation (Feet)	Depth to Groundwater (Feet)	Relative Groundwater Elevation (Feet)
HC-1	96.13	6.70	89.43
HC-3	98.45	7.08	91.37
HC-6	96.39	9.63	86.76
MW-8	96.79	6.43	90.36
MW-9	95.96	5.59	90.37

Notes:

1. Relative TOC established by ERM on 9/27/2017.
2. TOC = top of casing
3. MW-10 has been paved over and is not included in the 2017 study results.

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TABLE 4: GROUNDWATER ANALYTICAL RESULTS FOR PETROLEUM HYDROCARBONS
2017 LONG-TERM GROUNDWATER MONITORING REPORT
MATSON
PORT OF ANCHORAGE TERMINAL FACILITY

Monitoring Well	Petroleum Hydrocarbon Concentration [mg/L]					
	8260 C				AK 101	AK 102
	Benzene	Toluene	Ethylbenzene	Xylenes	GRO	DRO
ADEC Groundwater Cleanup Level[2]	0.0047	1.1	0.015	0.19	2.2	1.5
HC-1	**0.7**	ND (0.002)	**0.094**	0.094	1.5	**5.1**
HC-3	0.002	ND (0.002)	ND (0.003)	ND (0.003)	ND (1.0)	0.99
HC-6	ND (0.0002)	ND (0.002)	ND (0.003)	ND (0.003)	ND (1.0)	1.2
MW-8	**0.7 J-D**	0.071	**1.3 J, J-D**	**8.42 J-D**	**35 J-S**	**13**
HC-Z (Duplicate of MW-8)	**1.5 J-D**	0.068	**1.7 J-D**	**12 J-D**	**36 J-S**	**13**
MW-9	**0.73 J-H**	.0047	**0.019**	0.0482	1.6 J-S	**7.0**

Notes:
1. Value in parantheses is the laboratory reporting limit.
2. Groundwater cleanup Levels from 18 AAC 75.345, Table C (2017)
3. MW-10 has been paved over and is not included in the 2017 study results.

Key:
ADEC = Alaska Department of Environmental Conservation
Bold = Concentrations above ADEC Groundwater Cleanup Levels (18 AAC 75)
DRO = Diesel range organics
GRO = Gasoline range organics
mg/L = milligrams per liter
ND = Not detected above the reporting limit shown in parentheses
J-P = Estimated due to preservation not meeting quality control criteria
UJ-P = Not detected result is estimated due to preservation not meeting quality control criteria
J-D = Result is estimated due to duplicate comparison not meeting quality control criteria
J-S = Result is estimated due to surrogate percent recovery not meeting quality control criteria
J = Result is estimated; value between the method detection limit and the reporting limit
J-H = Estimated due to holding time exceedance

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TABLE 5: GROUNDWATER ANALYTICAL RESULTS FOR PAHs
2017 LONG-TERM GROUNDWATER MONITORING REPORT
MATSON
PORT OF ANCHORAGE TERMINAL FACILITY

Analyte	PAH Concentration[2] (mg/L)		ADEC Cleanup Level[1] (mg/L)	1/10th Screening Level
	MW-8	MW-Z (Duplicate of MW-8)		
Acenaphthene	0.00015	0.00015	0.53	0.053
Acenaphthylene	ND (0.0002)	ND (0.0002)	0.26	0.026
Benzo[a]anthracene	ND (0.00002)	ND (0.00002)	0.0012	0.00012
Benzo[a]pyrene	ND (0.00002)	ND (0.00002)	0.000034	0.0000034
Benzo[b]fluoranthene	ND (0.00002)	ND (0.00002)	0.00034	0.000034
Benzo[g,h,i]perylene	ND (0.00002)	ND (0.00002)	0.00026	0.000026
Benzo[k]fluoranthene	ND (0.00002)	ND (0.00002)	0.0008	0.00008
Chrysene	ND (0.00002)	ND (0.00002)	0.002	0.0002
Dibenz(a,h)anthracene	ND (0.00002)	ND (0.00002)	0.000034	0.0000034
Fluoranthene	ND (0.00002)	ND (0.00002)	0.26	0.026
Fluorene	0.00032	0.00034	0.29	0.029
Indeno[1,2,3-cd]pyrene	ND (0.00002)	ND (0.00002)	0.00019	0.000019
Phenanthrene	0.00072	0.00088	0.17	0.017
Pyrene	ND (0.00002)	ND (0.00002)	0.12	0.012
Anthracene	0.000033	0.000037	0.043	0.0043
1-Methylnaphthalene	0.024	0.0031	0.011	**0.0011**
2-Methylnaphthalene	0.032 J-D	0.0049 J-D	0.036	**0.0036**
Naphthalene	0.12	0.14	0.0017	**0.00017**

Notes:
1. Groundwater cleanup levels from 18 AAC 75.345, Table C (2017)
2. Samples were analyzed by method 8270D SIM
3. Value in parantheses is the method reporting limit (MRL)

Key:
ADEC = Alaska Department of Environmental Conservation
Bold = Concentrations above ADEC Groundwater Cleanup Levels (18 AAC 75)
mg/L = milligrams per liter
ND = Not detected above the reporting limit shown in parentheses
PAH = Polyaromatic hydrocarbon
J-D = Reported value is considered estimated due to the primary and duplicate sample results not meeting quality control criteria.

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TABLE 6: CUMULATIVE GROUNDWATER ANALYTICAL RESULTS
2017 LONG-TERM GROUNDWATER MONITORING REPORT
MATSON
PORT OF ANCHORAGE TERMINAL FACILITY

Monitoring Well	Date of Sample	Hydrocarbon Concentrations (mg/L)					
		Benzene	Toluene	Ethylbenzene	Xylenes	GRO	DRO
ADEC GW Cleanup Level	2013/2017[3]	0.005/.0047	1.0/1.1	0.7/0.015	10/0.19	2.2/2.2	1.5/1.5
G-1-96	Nov-02	ND (0.0005)	ND (0.002)	ND (0.002)	ND (0.004)	ND (0.09)	ND (0.556)
HC-1	Oct-2000	**8.06**	0.567	0.678	3.865	**27.7**	**6.27**
	Nov-2002	**7.55 J**	0.021 J	**0.916 J**	4.081 J	**24.8 J**	**6.78**
	Nov-2004	**6.42**	0.023	**0.816**	3.03	**21.6**	**10.7**
	Mar-2005	**3.76**	0.009	0.507	1.76	**14.3**	**7.64**
	Nov-2005	**2.34**	0.00581	0.307	1.08	**11.1**	**6.53**
	Apr-2006	**1.94**	0.00597 J	0.305	1.04	**8.25**	**4.94**
	Nov-2006	**2.21**	ND (0.025)	0.269	0.604	**9.35**	**6.85**
	Apr-2007	**1.7**	ND (0.005)	0.228	0.527	**6.62**	**4.88**
	Oct-2007	**1.25**	ND (0.005)	0.157	0.232	**4.39**	**6.05**
	Apr-2008	**0.653**	ND (0.005)	0.0758	0.165	1.73	1.31
	Jun-2009	**0.734**	0.00275 J	0.19	0.282	**2.73 J**	**3.86**
	Oct-2010	**1.05**	0.0037	0.600	4.76	**1.93**	**2.70**
	Aug-2011	**0.875**	0.000827	0.146	0.228	**3.650**	**2.51**
	Oct-2013	**0.737**	ND (0.005)	0.0893	0.159	**2.26**	**2.95**
	Sept-2015	**1.10**	0.0011	0.140	0.310	**3.80**	**7.50**
	Sept-2017	**0.7**	ND (0.002)	**0.094**	0.094	1.5	**5.1**
HC-2B	Oct-00	0.0012	ND (0.002)	0.005	0.069	0.310	**3.61**
	Nov-02	0.0006	ND (0.002)	0.004	0.049	0.310	**1.55**
	Nov-04	0.0016	ND (0.0005)	0.0049	0.079	0.280	**2.5**
	Mar-05	0.0005	ND (0.0005)	0.0021	0.014	0.110	**1.55**
	Nov-05	0.000904	ND (0.0005)	0.00399	0.0499	0.232	1.36
	Apr-06	ND (0.0005)	ND (0.0005)	0.00201	0.0233	0.138	1.11
	Nov-06	ND (0.0005)	ND (0.0005)	0.000871	0.0169	0.159	1.29
	Apr-07	ND (0.0005)	ND (0.0005)	0.0011	0.013	0.111	0.863
	Oct-2007	NS	NS	NS	NS	NS	**1.57**
	Apr-2008	NS	NS	NS	NS	NS	1.06
	Jun-2009	NS	NS	NS	NS	NS	1.14
HC-3	Oct-00	**0.0244**	ND (0.002)	ND (0.002)	0.003	0.21	**2.18**
	Nov-02	**0.0107**	ND (0.002)	ND (0.002)	ND (0.0004)	ND (0.09)	0.82
	Nov-04	0.004	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	0.726
	Mar-05	**0.0068**	ND (0.0005)	ND (0.0005)	ND (0.0015)	0.06	ND (0.394)
	Nov-05	**0.00566**	ND (0.0005)	ND (0.0005)	ND (0.0015)	0.0665	0.68
	Apr-06	0.00315	ND (0.0005)	ND (0.0005)	ND (0.0015)	0.0568	1.25
	Nov-2006	**0.00855**	ND (0.0005)	ND (0.0005)	ND (0.0015)	4	1.09
	Apr-2007	0.00322	ND (0.0005)	ND (0.0005)	ND (0.0015)	0.0654	0.640
	Oct-2007	0.00262	ND (0.0005)	ND (0.0005)	ND (0.0015)	0.0577	1.14
	Apr-2008	0.00432	ND (0.0005)	ND (0.0005)	ND (0.0015)	0.205	1.05
	Jun-2009	**0.0088**	ND (0.001)	ND (0.001)	0.00677	0.207	**2.20**
	Oct-2010	0.00301	ND (0.001)	ND (0.001)	ND (0.003)	ND (0.050)	0.603
	Aug-2011	**0.00604**	ND (0.0005)	ND (0.0005)	ND (0.0015)	0.0552	0.931
	Oct-2013	0.002	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	0.848
	Sept-2015	0.0031	ND (0.001)	ND (0.001)	ND (0.003)	ND (0.1)	**2.5**
	Sept-2017	0.002	ND (0.002)	ND (0.003)	ND (0.003)	ND (1.0)	0.99

TABLE 6: CUMULATIVE GROUNDWATER ANALYTICAL RESULTS
2017 LONG-TERM GROUNDWATER MONITORING REPORT
MATSON
PORT OF ANCHORAGE TERMINAL FACILITY

Monitoring Well	Date of Sample	Hydrocarbon Concentrations (mg/L)					
		Benzene	Toluene	Ethylbenzene	Xylenes	GRO	DRO
ADEC GW Cleanup Level	2013/2017[3]	0.005/.0047	1.0/1.1	0.7/0.015	10/0.19	2.2/2.2	1.5/1.5
HC-4	Aug-2011	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.050)	ND (0.385)
HC-5	Nov-02	ND (0.0005)	ND (0.0002)	ND (0.0002)	ND (0.0004)	ND (0.09)	0.668
	Nov-04	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	ND (0.431)
	Mar-05	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	**2.67**
	Nov-05	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	ND (0.391)
	Apr-06	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	ND (0.391)
HC-6	Nov-02	ND (0.0005)	ND (0.0002)	ND (0.0002)	ND (0.0004)	ND (0.09)	ND (0.581)
	Nov-04	0.004	ND (0.0005)	ND (0.0005)	0.002	ND (0.05)	0.949
	Mar-05	**0.0144**	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	**1.74**
	Nov-05	0.000502	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	0.468
	Apr-06	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	ND (0.417)
	Nov-06	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	**1.78**
	Apr-07	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	0.870
	Oct-07	NS	NS	NS	NS	NS	**2.86**
	Apr-08	NS	NS	NS	NS	NS	0.715
	Jun-09	NS	NS	NS	NS	NS	0.842
	Oct-10	NS	NS	NS	NS	NS	0.586
	Aug-2011	NS	NS	NS	NS	NS	1.40
	Oct-2013	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	**1.54**
	Sept-2015	ND (0.0002)	ND (0.001)	ND (0.001)	ND (0.003)	ND (0.1)	**2.8**
	Sept-2017	ND (0.0002)	ND (0.002)	ND (0.003)	ND (0.003)	ND (1.0)	1.2
MW-8	Nov-2005	**5.55**	**9.45**	**1.54**	**13.7**	**91.5**	**33.8**
	Apr-2006	**6.66**	**15.6**	**2.2**	**17.8**	**107**	**47.6**
	Nov-2006	NS	NS	NS	NS	NS	NS
	Apr-2007	**5.87**	**12.6**	**2.29**	**19**	**114**	**29.7**
	Oct-2007	**4.9**	**9.85**	**1.5**	**17.9**	**106**	**32.1**
	Apr-2008	**2.68**	**12.5**	**2.44**	**20.3**	**82.8**	**25.1**
	Jun-2009	**2.41**	**4.35**	**2.06**	**15.3**	**101**	**25.4 J-B**
	Oct-2010	**1.82**	**2**	**2.2**	**18.1**	**98.1**	**17.7**
	Aug-2011	**1.8**	0.3	**1.8**	**14.1**	**59.0**	**16.6**
	Aug-2011[1]	**1.8**	0.3	**1.8**	**13.7**	**59.6**	**20.4**
	Oct-2013	**1.38**	0.13	**1.51**	**11**	**24.1**	**17.7**
	Oct-2013[1]	**1.43**	0.138	**1.63**	**12**	**27.4**	**15.2**
	Sept-2015[1]	**1.9**	ND (0.2)	**1.6**	**12**	**48**	**23**
	Sept-2017[1]	**0.7 J-D**	0.071	**1.3 J, J-D**	**8.42 J-D**	**35 J-S**	**13**
MW-9	Nov-05	**5.20**	**1.02**	**1.63**	**10.1**	**56.2**	**33.3**
	Apr-06	**7.94**	0.742	**2.47**	**12.9**	**66**	**35.6**
	Nov-06	**7.40**	0.369	**2.2**	9.90	**61.1**	**21.9**
	Apr-07	**7.42**	ND (0.25)	**1.99**	9.54	**56.3**	**24.2**
	Oct-07	**8.16**	0.114	**1.36**	6.20	**45.6**	**21.0**
	Apr-08	**5.69**	0.062	**0.713**	3.19	**18.0**	**11.0**
	Jun-09	**1.90**	0.0137	0.0638	0.318	**3.77**	**9.00 J-B**
	Oct-10	**1.92**	0.017	0.54	4.46	**3.95**	**6.53**
	Aug-2011	**0.104**	0.00133	0.00607	0.0283	0.447	**2.08**
	Sept-2017	**0.73 J-H**	.0047	**0.019**	0.0482	1.6 J-S	**7.0**

TABLE 6: CUMULATIVE GROUNDWATER ANALYTICAL RESULTS
2017 LONG-TERM GROUNDWATER MONITORING REPORT
MATSON
PORT OF ANCHORAGE TERMINAL FACILITY

Monitoring Well	Date of Sample	Hydrocarbon Concentrations (mg/L)					
		Benzene	Toluene	Ethylbenzene	Xylenes	GRO	DRO
ADEC GW Cleanup Level	2013/2017[3]	0.005/.0047	1.0/1.1	0.7/0.015	10/0.19	2.2/2.2	1.5/1.5
MW-10	Nov-06	0.00427	0.0017	0.0054	0.0322	0.133	0.761
	Apr-07	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	**2.03**
	Oct-07	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	ND (0.394)
	Apr-08	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	ND (0.427)
	Oct-2013	**0.00503**	0.00115	0.00857	0.0707	0.137	NS
MW-11	Nov-06	**0.00629**	0.00136	0.00433	0.027	0.126	1.00
	Apr-07	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	1.06
	Oct-07	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.05)	0.779
	Apr-08	NS	NS	NS	NS	NS	NS
	Jun-09	NS	NS	NS	NS	NS	ND (0.397) J-B

Notes:
1. Duplicate Sample
2. Value in parantheses is the laboratory reporting limit.
3. The ADEC lowered GCL in 2017.

Key:
ADEC = Alaska Department of Environmental Conservation
Bold = Concentrations above ADEC Groundwater Cleanup Levels (18 AAC 75)
DRO = Diesel range organics
GRO = Gasoline range organics
mg/L = milligrams per liter
ND = Not detected above the reporting limit shown in parentheses
J-P = Estimated due to preservation not meeting quality control criteria
UJ-P = Not detected result is estimated due to preservation not meeting quality control criteria
J-D = Result is estimated due to duplicate comparison not meeting quality control criteria
J-S = Result is estimated due to surrogate percent recovery not meeting quality control criteria
J = Result is estimated; value between the method detection limit and the reporting limit
J-H = Estimated due to holding time exceedance

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TABLE 7: BIOVENTING SYSTEM MEASUREMENTS
2017 LONG-TERM GROUNDWATER MONITORING REPORT
MATSON
PORT OF ANCHORAGE TERMINAL FACILITY

Line	Nov-06	Apr-07	Oct-07	Aug-09	Oct-10	Aug-11	Oct-13	Sep-15	Sep-17	Average
Oxygen [%]										
1	20.1	17.6	16	19.1	19	20.3	20.6	16.6	15.1	18.3
2	18.3	15.1	12.8	15.3	15.2	17.3	19.4	16.5	10.6	15.6
3	16.4	16.4	14.5	17.4	16.6	18.7	20.9	18.5	13.5	17.0
4	20.9	20.9	13.6	16.6	16.5	18.1	20.9	17.6	11	17.3
5	20.9	14.5	12.5	15.3	16.2	16.2	19.5	16.6	12.3	16.0
6	13.5	18.1	17.9	16.5	18.2	17.8	20.1	18.5	14.3	17.2
Carbon Dioxide [%]										
1	0.3	1.8	3.4	1.3	1.3	1.5	1.2	2.2	2.5	1.7
2	2	3	5.5	4	4.1	3.7	1.7	2.46	5	3.5
3	3.2	2.2	4.3	2.4	3.2	2.5	0.4	1.02	3.92	2.6
4	0.3	0	4.6	2.9	3.6	3	1.24	0.74	5	2.4
5	0.9	3	5.7	4	3.8	4.7	1.6	2.6	4.78	3.5
6	4.5	1.6	1.9	3.4	2.1	3.3	1.4	1.86	2.82	2.5
Total Volatile Hydrocarbons [ppm]										
1	10	160	160	0	0	55	25	5	0	46.1
2	25	780	110	0	0	20	0	0	0	116.9
3	0	420	120	0	0	35	15	0	0	73.8
4	15	0	110	0	0	25	0	0	0	18.8
5	20	320	90	0	0	0	0	25	0	56.9
6	50	110	100	0	0	15	0	0	0	34.4

Key:
ppm = parts per million
NA = Not Available

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FIGURES

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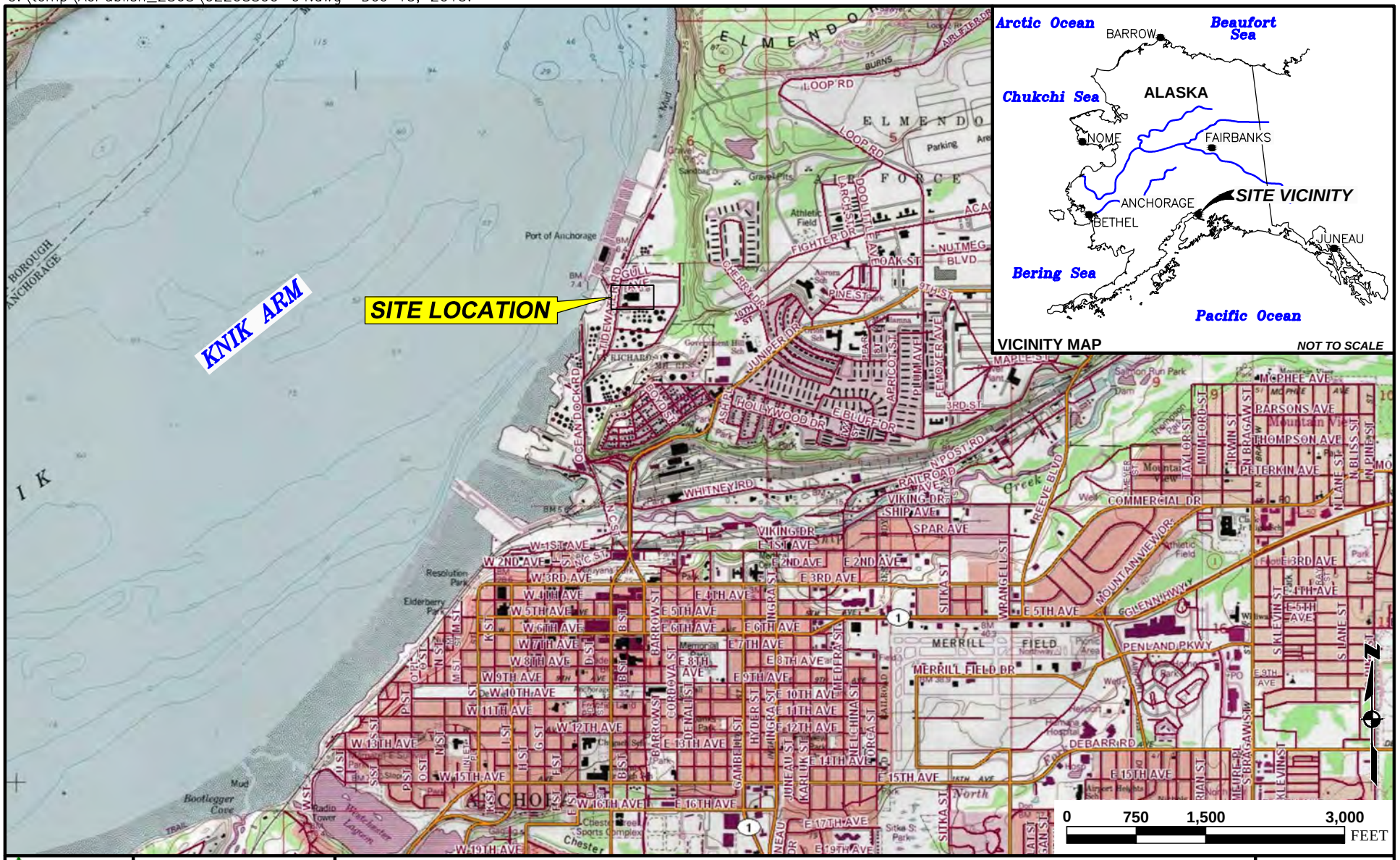

DATE:	DEC. 2017
CHKD:	K.J.
DRAWN:	J.S.E.
PROJ. No.:	0420038

ERM

825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

SITE LOCATION MAP

LONG-TERM MONITORING REPORT
Matson
Anchorage, Alaska

FIGURE

1

SOURCE: TOPO IMAGE FROM NATIONAL GEOGRAPHIC SOFTWARE 2006.

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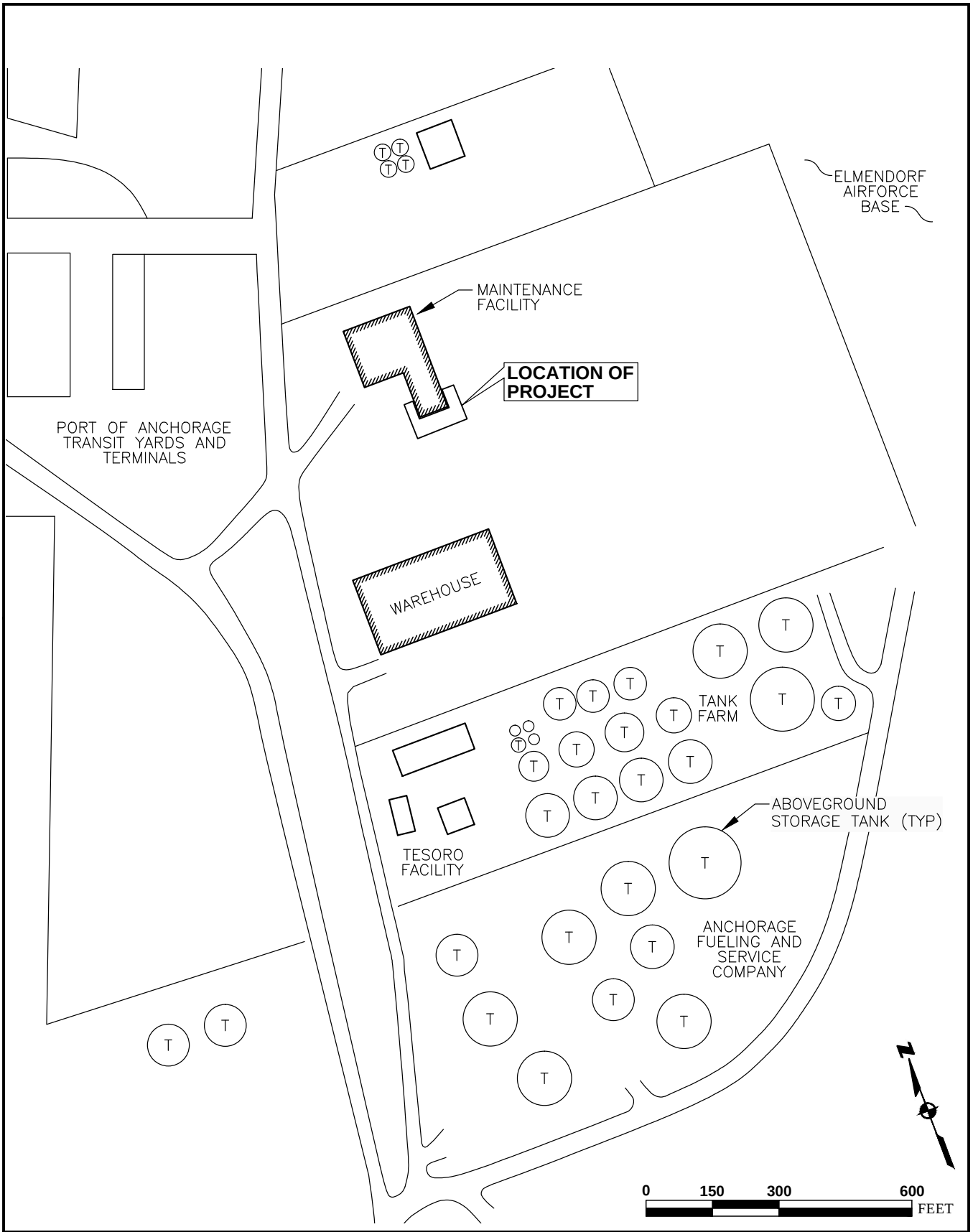

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ERM

825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

DATE: DEC. 2017
CHKD: K.M.A.
DRWN: N.W.C.
PROJ. No.: 0420038

SITE PLAN

LONG-TERM MONITORING REPORT
MATSON
Anchorage, Alaska

FIGURE
2

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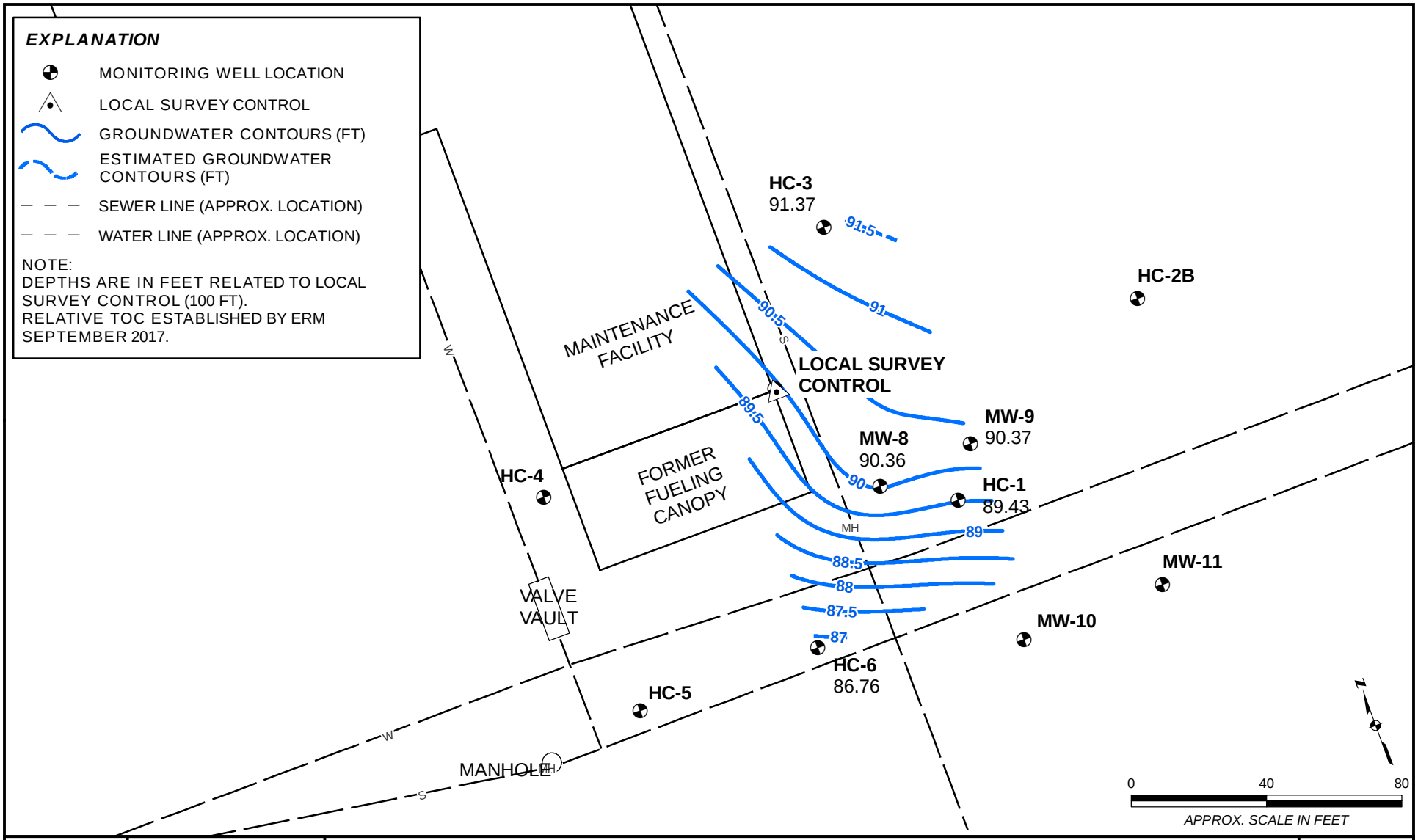

ERM

DATE: DEC. 2017
CHKD: K.M.A.
DRWN: N.W.C.
PROJ. No.: 0420038

825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

PIEZOMETRIC SURFACE MAP (09/27/2017)

LONG-TERM-MONITORING REPORT
MATSON
Anchorage, Alaska

FIGURE
3

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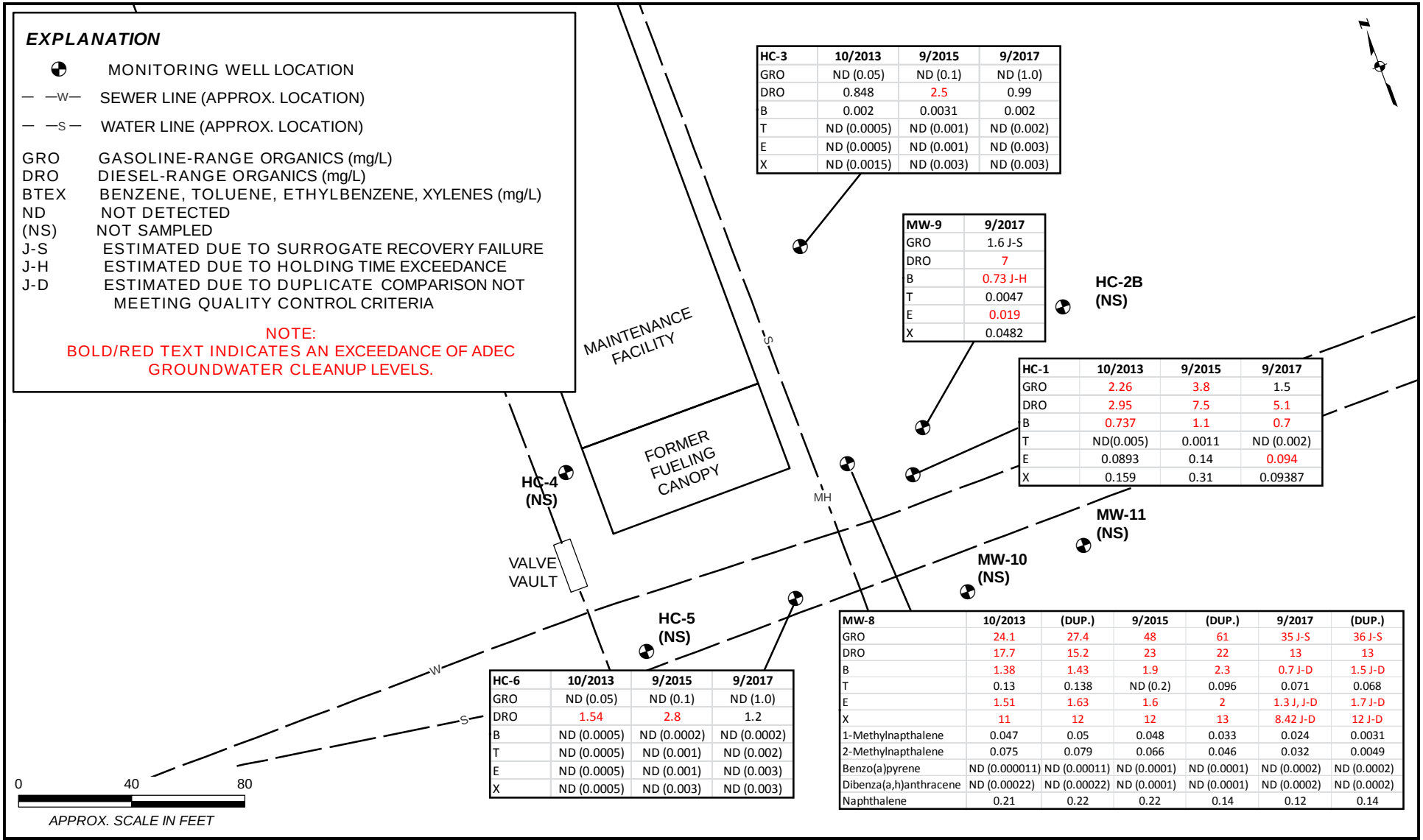

HC-3	10/2013	9/2015	9/2017
GRO	ND (0.05)	ND (0.1)	ND (1.0)
DRO	0.848	2.5	0.99
B	0.002	0.0031	0.002
T	ND (0.0005)	ND (0.001)	ND (0.002)
E	ND (0.0005)	ND (0.001)	ND (0.003)
X	ND (0.0015)	ND (0.003)	ND (0.003)

MW-9	9/2017
GRO	1.6 J-S
DRO	7
B	0.73 J-H
T	0.0047
E	0.019
X	0.0482

HC-1	10/2013	9/2015	9/2017
GRO	2.26	3.8	1.5
DRO	2.95	7.5	5.1
B	0.737	1.1	0.7
T	ND(0.005)	0.0011	ND (0.002)
E	0.0893	0.14	0.094
X	0.159	0.31	0.09387

HC-6	10/2013	9/2015	9/2017
GRO	ND (0.05)	ND (0.1)	ND (1.0)
DRO	1.54	2.8	1.2
B	ND (0.0005)	ND (0.0002)	ND (0.0002)
T	ND (0.0005)	ND (0.001)	ND (0.002)
E	ND (0.0005)	ND (0.001)	ND (0.003)
X	ND (0.0005)	ND (0.003)	ND (0.003)

MW-8	10/2013	(DUP.)	9/2015	(DUP.)	9/2017	(DUP.)
GRO	24.1	27.4	48	61	35 J-S	36 J-S
DRO	17.7	15.2	23	22	13	13
B	1.38	1.43	1.9	2.3	0.7 J-D	1.5 J-D
T	0.13	0.138	ND (0.2)	0.096	0.071	0.068
E	1.51	1.63	1.6	2	1.3 J, J-D	1.7 J-D
X	11	12	12	13	8.42 J-D	12 J-D
1-Methylnapthalene	0.047	0.05	0.048	0.033	0.024	0.0031
2-Methylnapthalene	0.075	0.079	0.066	0.046	0.032	0.0049
Benzo(a)pyrene	ND (0.000011)	ND (0.00011)	ND (0.0001)	ND (0.0001)	ND (0.0002)	ND (0.0002)
Dibenza(a,h)anthracene	ND (0.00022)	ND (0.00022)	ND (0.0001)	ND (0.0001)	ND (0.0002)	ND (0.0002)
Naphthalene	0.21	0.22	0.22	0.14	0.12	0.14

ERM

DATE: DEC. 2017
CHKD: K.M.A.
DRWN: N.W.C.
PROJ. No.: 0420038

825 W. 8th Ave., Anchorage, AK 99501, (907) 258-4880

ANALYTICAL RESULTS

LONG-TERM-MONITORING REPORT
MATSON
Anchorage, Alaska

FIGURE
4

P:\Projects\0420038 Matson Diesel Release Support.KJ\Report\GIS\mxd\Matson_Results_2017_REV1.mxd

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Figure 5: HC-1 Concentrations and Groundwater Elevation

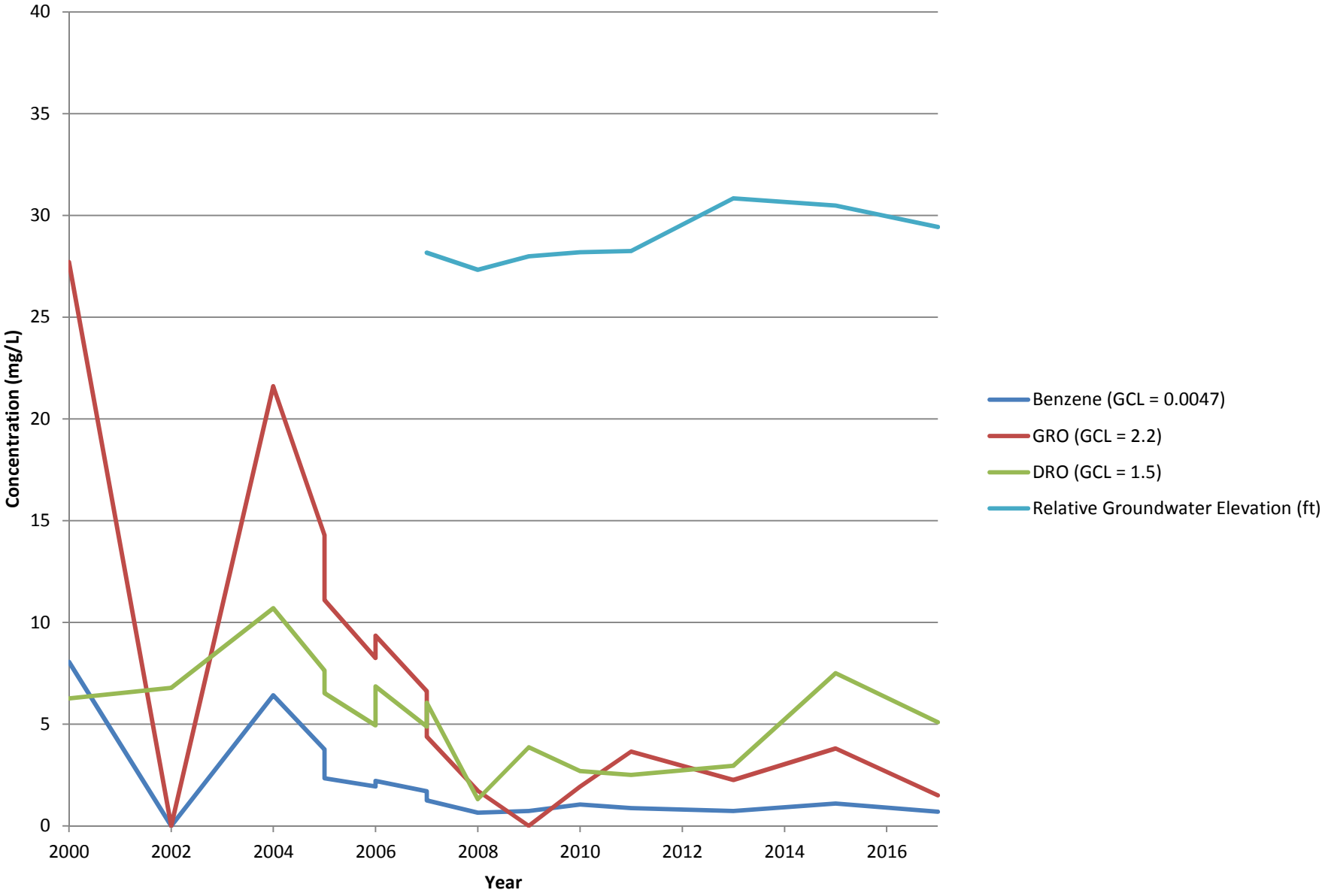

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Figure 6: HC-3 Concentrations and Groundwater Elevation

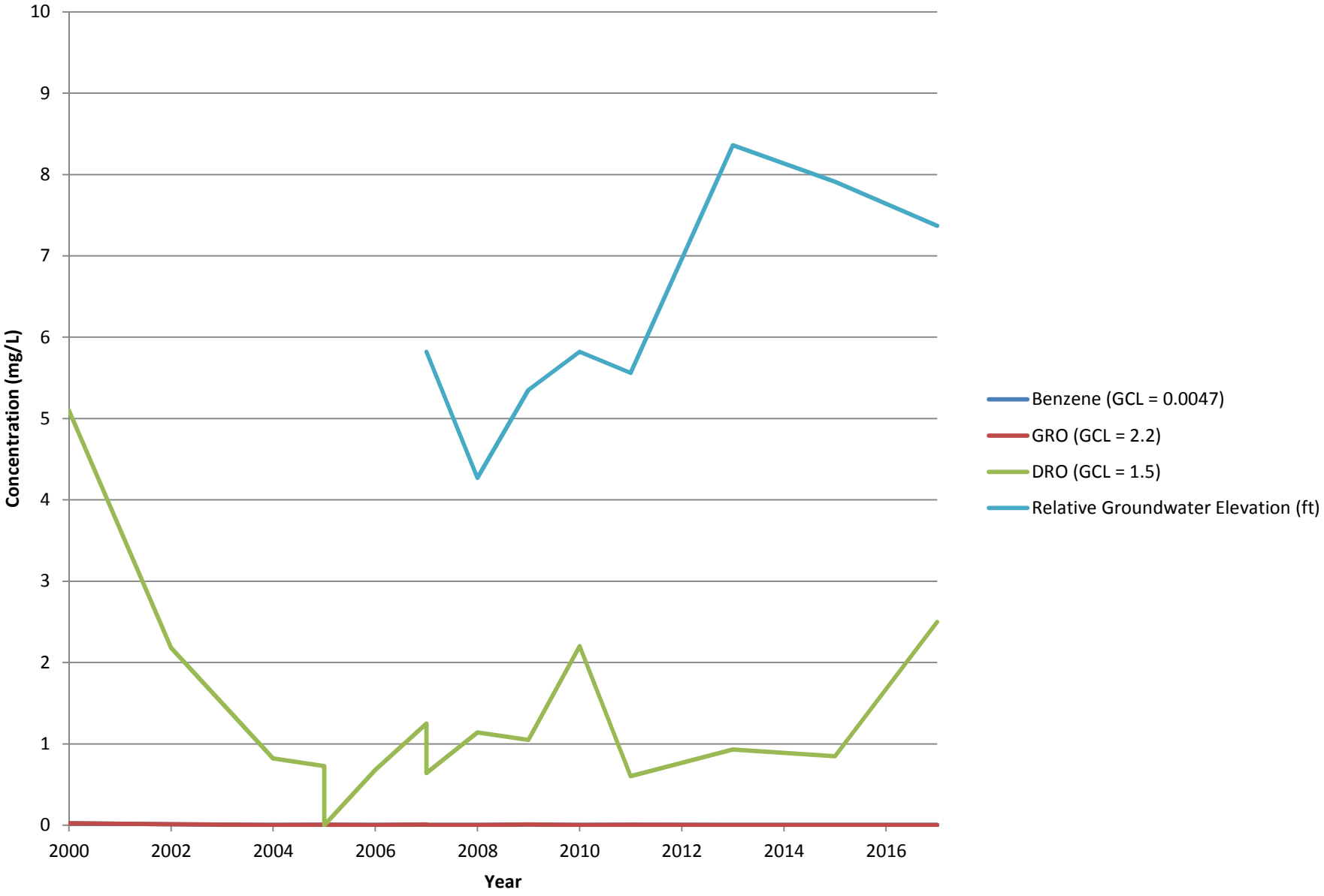

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Figure 7: HC-6 Concentrations and Groundwater Elevation

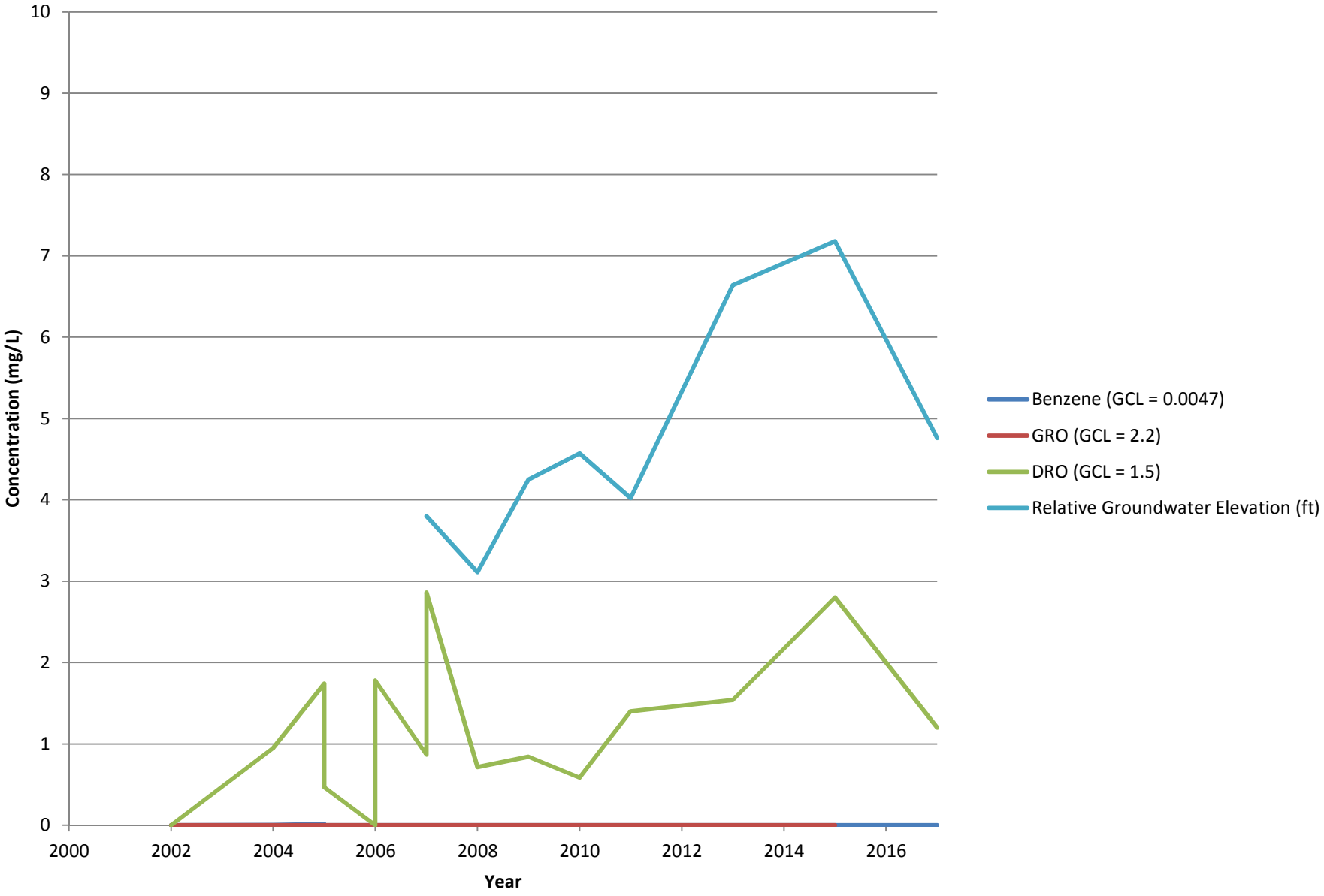

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Figure 8: MW-8 Concentrations and Groundwater Elevation

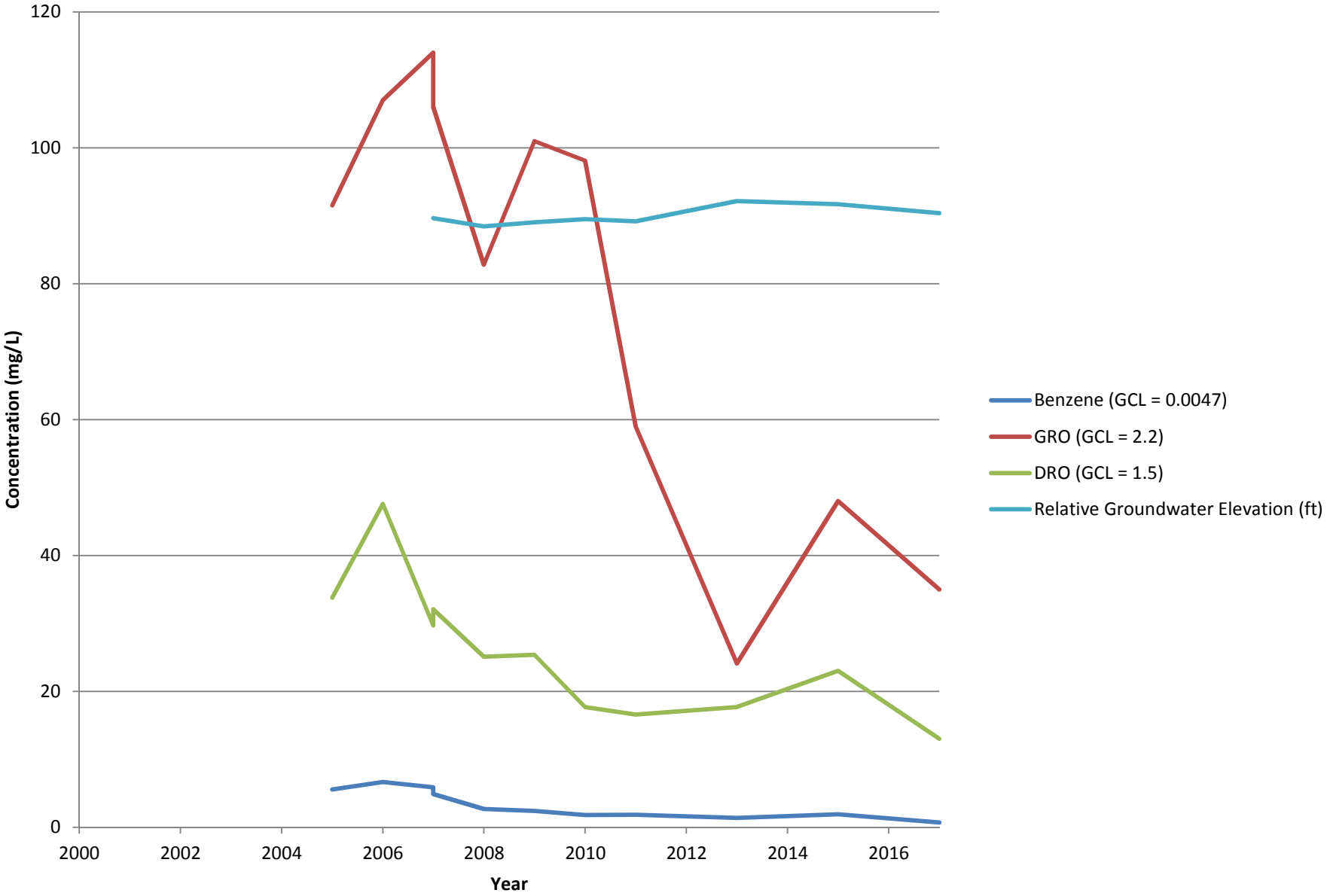

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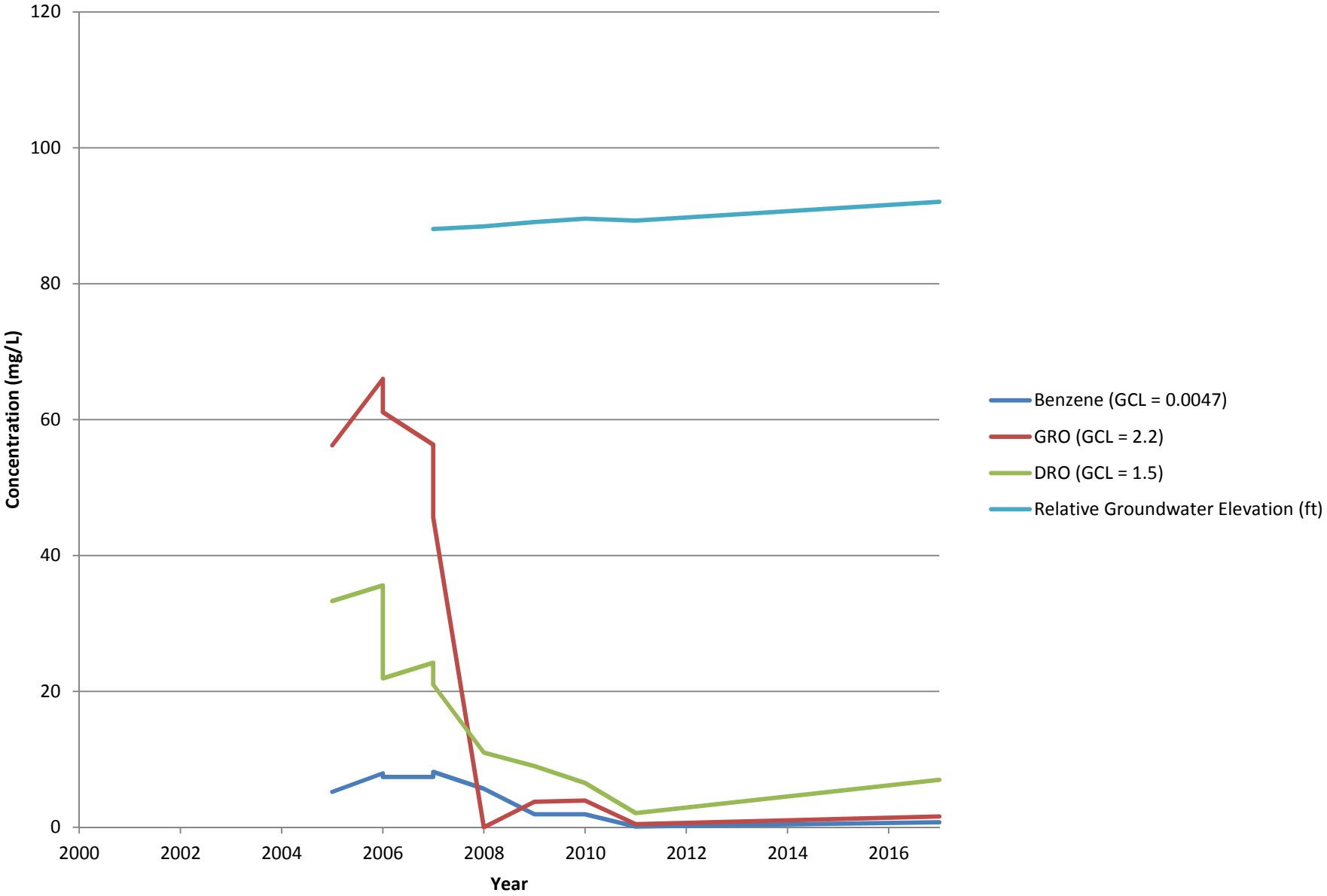
Figure 9: MW-9 Concentrations and Groundwater Elevation



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APPENDIX A

Field Notes and Groundwater Data Sheets

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0146958

New file #
022080
2013 Proj #

Horizon Lines
GW Monitoring
Anchorage, AK
OASIS # 271-001

4 5/8" x 7" - 64 Pages

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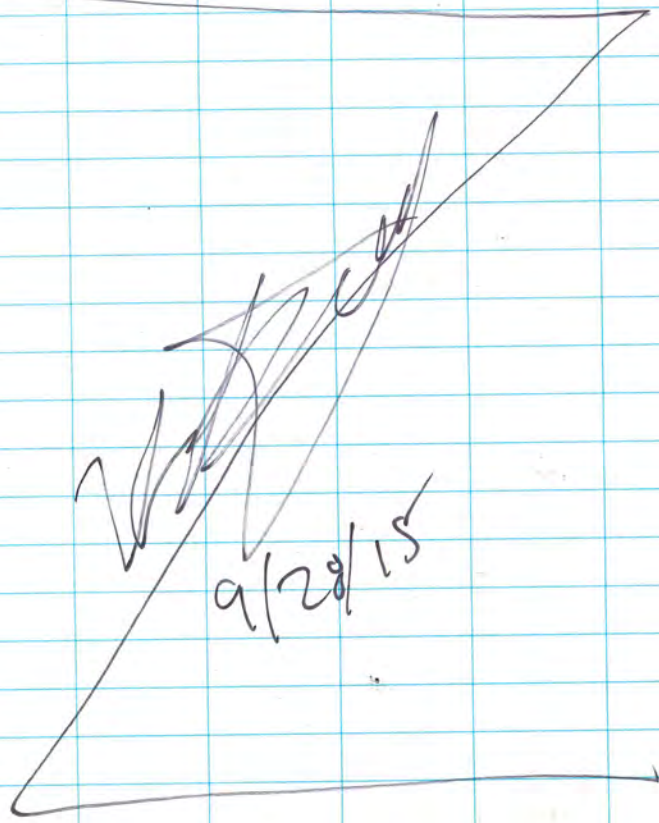
(While KB samples bivent,
KJ samples MW-8)
15:00 set up at MW-8
stabilize parameters
1545 sample MW-8 & MW-2(dup)
@ MW-8
1615 collect MS/MSD @ MW-8



Level D A. Smatt 45°F overcast
27Sept 2017 N. Crane Matson

0715 meet at ERM office
0730 load truck
note: RKI, 24SI, and PID calibrated at 1700 on 9/26/17
0745 drive to Port of Anchorage
0800 arrive on site
0830 safety meeting
0845 unload truck
0900 set up at bivent monitoring
0935 check that rate is 0.25 cfm

Lines (1 to 6)	Hex (ppm)	O_2 (%)	CO_2 (%)	sample time
1	0	15.1	2.50	0940
2	0	10.6	5.00	0947
3	0	13.5	3.92	0954
4	0	11.0	5.00	1000
5	0	12.3	4.78	1010
6	0	14.3	2.82	1017

photos on camera F-2
photos 104-4003 → 104-4005
1005 N. Crane begins to purge He-3
1030 3 fans for bivent system spinning with slight breeze. If no breeze, no fans spin.

Amir Smatt

Level D A. Surratt 45°F overcast
27 Sept 2017 N. Crone Matson

1032 4 fans spinning
1035 N. Crone samples HC-3
notes on biovent monitoring - need:
- rubber stopper w/ hole drilled in it
- about 1" diameter stopper
- air pump
- extension cord
- poly tubing and silicone tubing
- RKI instrument
- wrench, flow rate adjuster
- put poly tubing through opening at biovent, through stopper, attach to pump, check flow rate of pump with ziploc bag, attach to RKI, turn plastic handle on biovent system perpendicular
- wait for stabilization

1118 A. Surratt begins purging MW-9
1110 N. Crone begins purging HC-1
1145 N. Crone samples HC-1
1150 A. Surratt samples MW-9
1245 N. Crone begins purging MW-8
1250 A. Surratt begins purging HC-6
1300 N. Crone samples MW-8 (dup=MS/MSD)

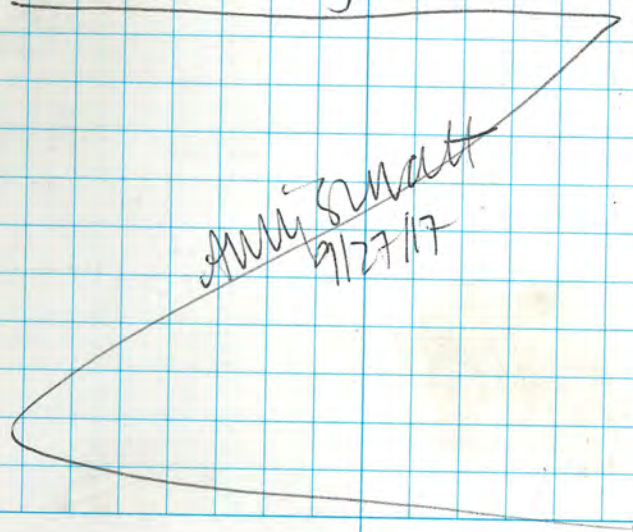
Amy Surratt

Level D A. Surratt 45°F overcast
27 September 2017 N. Crone Matson

1315 A. Surratt samples HC-6
1500 Begin survey
~~BM-1~~ mc. 9/27/17

STA	BS (+)	HI	FS (-)	Elev (Ft)
BM-1	1.77	101.46'		100.00
MW9	~~4.04~~		4.04	
HC-1			3.87	
MW-8			3.21	
HC-6			3.61	
HC-3			1.55	

1515 Fill out COC, label bottles
1530 clean up
1615 done for day



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Low-Flow Groundwater Sampling with Minimal Drawdown Worksheet

Well ID: HC-1
Project #: 0420038
Date: 9/27/17
Project Name: Matson
Start Time: 1100
Site:
End Time: 1155
Field Team: N. Crone A. Surratt
Sample ID: 17-HLA-HC1-1008 Time: 1145 (primary) dup split ms/msd
Sample ID: Time: primary dup split ms/msd

Weather Conditions: partly cloudy 53°F 5 mph wind NW

Depth to Top of Product (ft BTOC): No product
Depth to Oil/Water Interface* (ft BTOC): 6.70
* Note: Same as depth to water
Depth to Water (ft BTOC): 6.70
Total Depth (ft BTOC): 12.94
Final Depth (ft BTOC): 7.79

Criteria for Stable Parameters

Parameter	Working Range	Stability Criteria	Notes
Temperature	>0.00 °C	± 0.5 °C	
pH	0-14	± 0.1	
Conductivity	0-99999 µS/cm	± 5%	
ORP	± 1999 mV		
Dissolved Oxygen	0-19.99 mg/L	± 10%	
Turbidity	0-800 NTU		

Sensory Observations

Color: (Clear) Amber, Tan, Brown, Grey, Milky White, Other:
Odor: (None) Low, Medium, High, Very Strong, H2S, Fuel Like, Chemical ?, Unknown
Turbidity: None, (Low), Medium, High, Very Turbid, Heavy Silts

Instrument Observations

gallons purged	Flow Rate (ml/min)	Time	Temp °C	Spec. Cond. (mS/cm^C)	Conductivity (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color	Odor	Water Level (ft BTOC)	Draw-down
0.186	140	1110	11.27	3.754	2769	5.35	6.37	-76.9	clear	none	6.82	
0.37	140	1115	11.28	3.722	2747	0.34	6.48	-89.7	clear	none	7.14	
0.56	140	1120	11.40	3.700	2739	0.30	6.48	-90.1	clear	none	7.26	
0.74	140	1125	11.65	3.676	2738	0.58	6.46	-92.9	clear	none	7.50	
0.93	140	1130	11.67	3.647	2715	0.48	6.49	-104.4	clear	none	7.61	
1.11	140	1135	11.70	3.619	2700	0.43	6.51	-110.4	clear	none	7.75	
	140	1140	11.72	3.574	2667	0.38	6.49	-100.4	clear	none	7.79	
				Parameters		Stabilized						
						Nelson Crone						
											9/27/17	

Notes: Drawdown ~~should be~~ less than 0.3 feet while sampling. Minimal drawdown shall be achieved and measured by pumping at a low rate (approximately 0.1 to 0.5 liter/minute) and continually measuring water levels in the well. Note that site's hyrogeology may make it difficult to achieve this specification.

Analyses	# of Bottles Collected	Bottle Type (preservative)	Comments:
GRO	3	40 mL VOA (HCl)	Well volume 1.01 gal
BTEX	3	40 mL VOA (HCl)	3x well volume 3.03 gal
DRO	2	250 mL Amber (HCl)	
			photo number 104-4008 F-2

Signed: Nelson V. Crone Date: 9/27/17
Signed/reviewer: Amy Surratt Date: 9/27/17

Low-Flow Groundwater Sampling with Minimal Drawdown Worksheet

Well ID: HC-3
Project #: 0426038
Date: 9/27/17
Project Name: Matson
Start Time: 0965
Site:
End Time: 1045
Field Team: N. Crone A. Surratt
Sample ID: 17-HLA-HC3-1009 Time: 1035 primary dup split ms/msd
Sample ID: Time: primary dup split ms/msd

Weather Conditions: Cloudy 50°F No wind

Depth to Top of Product (ft BTOC): - No product
Depth to Oil/Water Interface* (ft BTOC): 7.08
* Note: Same as depth to water

Depth to Water (ft BTOC): 7.08
Total Depth (ft BTOC): 13.27
Final Depth (ft BTOC): 7.44

Criteria for Stable Parameters

Parameter	Working Range	Stability Criteria	Notes
Temperature	>0.00 °C	± 0.5 °C	
pH	0-14	± 0.1	
Conductivity	0-99999 µS/cm	± 5%	
ORP	± 1999 mV		
Dissolved Oxygen	0-19.99 mg/L	± 10%	
Turbidity	0-800 NTU		

Sensory Observations

Color: (Clear) Amber, Tan, Brown, Grey, Milky White, Other:
Odor: (None) Low, Medium, High, Very Strong, H2S, Fuel Like, Chemical ?, Unknown
Turbidity: (None) Low, Medium, High, Very Turbid, Heavy Silts

Instrument Observations

Flow Rate (ml/min)	Time	Temp °C	Spec. Cond. (mS/cm^C)	Conductivity (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color	Odor	Water Level (ft BTOC)	Draw-down
(gal) 0.2 150	1005	9.15	6.082	4234	7.41	5.83	-35.9	clear	none	17.20	
0.4 150	1010	9.16	6.055	4225	6.64	6.21	-62.5	clear	none	7.31	
0.6 150	1015	9.48	6.075	4275	0.84	6.30	-64.5	clear	none	7.38	
0.8	1020	9.66	6.043	4273	0.87	6.33	-60.4	clear	none	7.42	
1.0	1025	9.78	5.904	4190	0.81	6.38	-74.2	clear	none	7.44	
1.2	1030		Parameters		Stabilized						
1.4											
1.6											
1.8					Melissa N. Crone 9/27/17						
2.0											
2.2											
2.4											

Notes: Drawdown should be less than 0.3 feet while sampling. Minimal drawdown shall be achieved and measured by pumping at a low rate (approximately 0.1 to 0.5 liter/minute) and continually measuring water levels in the well. Note that site's hyrogeology may make it difficult to achieve this specification.

Analyses	# of Bottles Collected	Bottle Type (preservative)
GRO	3	40mL VOA (HCl)
BTEX	3	40mL VOA (HCl)
DRO	2	250mL amber (HCl)

Comments:
Well Dia. = 0.167' Water column = 6.19'
well volume = 1.001 gal
3 volumes = 3.003 gal
photo number - 104-4006 camera F-2

Signed: Melissa N. Crone Date: 9/27/17
Signed/reviewer: Anna Surratt Date: 9/27/17

Low-Flow Groundwater Sampling with Minimal Drawdown Worksheet

Well ID: HC-6
Project #: 0420038
Date: 9/27/17
Project Name: Matson
Start Time: 1233
Site: Port of Anchorage
End Time:
Field Team: A. Swatt / N. Crowe
Sample ID: 17-HLA-HC6-1010 Time: 1315 (primary) dup split ms/msd
Sample ID: Time: primary dup split ms/msd

Weather Conditions: 45°F overcast 5mph winds

Depth to Top of Product (ft BTOC): N/A
Depth to Oil/Water Interface* (ft BTOC): N/A
* Note: Same as depth to water

Depth to Water (ft BTOC): 9.63
Total Depth (ft BTOC): 13.72
Final Depth (ft BTOC): 9.67

Criteria for Stable Parameters

Parameter	Working Range	Stability Criteria	Notes
Temperature	>0.00 °C	± 0.5 °C	
pH	0-14	± 0.1	
Conductivity	0-99999 µS/cm	± 5%	
ORP	± 1999 mV		
Dissolved Oxygen	0-19.99 mg/L	± 10%	
Turbidity	0-800 NTU		

Sensory Observations

Color: (Clear), Amber, Tan, Brown, Grey, Milky White, Other:
Odor: None, Low, Medium, High, Very Strong, H2S, (Fuel Like), Chemical ?, Unknown
Turbidity: (None), Low, Medium, High, Very Turbid, Heavy Silts

Instrument Observations

Flow Rate (ml/min)	Time	Temp °C	Spec. Cond. (mS/cm[C])	Conductivity (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color	Odor	Water Level (ft BTOC)	Draw-down
150	1252	10.07	2.408	1508	2.41	6.860	-51.7	orange	fuel	9.67	
↓	1257	10.47	2.316	1675	0.33	6.860	-69.9	clear	"	9.67	
	1302	10.42	2.482	1792	0.24	6.860	-78.8	"	"	9.67	
	1307	10.49	2.585	1870	0.33	6.860	-82.1	"	"	9.67	
V	1312	10.50	2.635	1906	0.37	6.860	-83.8	"	"	9.67	
			parameters stabilized								
					A Swatt 9/27/17						

Notes: Drawdown should be less than 0.3 feet while sampling. Minimal drawdown shall be achieved and measured by pumping at a low rate (approximately 0.1 to 0.5 liter/minute) and continually measuring water levels in the well. Note that site's hyrogeology may make it difficult to achieve this specification.

Analyses	# of Bottles Collected	Bottle Type (preservative)	Comments:
GRO	3	40mL VOA (HCl)	3 well volumes = 1.99 gal
BTEX	3	40mL VOA (HCl)	Flow rate = 0.2 gal/5 min.
DRO	2	250mL amber (HCl)	
			Photo # 104-4009 camera F-2

Signed: Ani Swatt Date: 9/27/17
Signed/reviewer: Nelson W. Crowe Date: 9/28/17

Low-Flow Groundwater Sampling with Minimal Drawdown Worksheet

Well ID: MW-8
Project # : 0420038
Date: 9/27/17
Project Name: Matson
Start Time: 1235
Site:
End Time: 1340
Field Team: N. Crone A. Surratt
Sample ID: 17-HLA-MW8-1012/17-HLA-MW8MSD-1011 Time: 1300 primary dup split ms/msd
Sample ID: 17-HLA-HC7-1013 Time: 1305 primary dup split ms/msd

Weather Conditions: Mostly cloudy 53°F

Depth to Top of Product (ft BTOC):	No product	Depth to Water (ft BTOC):	6.43
Depth to Oil/Water Interface* (ft BTOC):	6.43	Total Depth (ft BTOC):	10.01
* Note: Same as depth to water		Final Depth (ft BTOC):	6.44

Criteria for Stable Parameters

Parameter	Working Range	Stability Criteria	Notes
Temperature	>0.00 °C	± 0.5 °C	
pH	0-14	± 0.1	
Conductivity	0-99999 µS/cm	± 5%	
ORP	± 1999 mV		
Dissolved Oxygen	0-19.99 mg/L	± 10%	
Turbidity	0-800 NTU		

Sensory Observations

Color: Clear, Amber, (Tan), Brown, Grey, Milky White, Other:
Odor: (None), Low, Medium, High, Very Strong, H2S, Fuel Like, Chemical ?, Unknown
Turbidity: None, Low, (Medium), High, Very Turbid, Heavy Silts

Instrument Observations

Flow Rate (ml/min)	Time	Temp °C	Spec. Cond. (mS/cm^C)	Conductivity (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color	Odor	Water Level (ft BTOC)	Draw-down
150	1245	11.45	3.084	2286	0.31	6.86	-104.9	tan	none	6.44	
150	1250	11.61	3.012	2241	0.17	6.90	-107.0	tan	none	6.44	
150	1255	11.62	2.960	2202	0.12	6.92	-113.7	clear	none	6.44	
				Parameters stabilized							
					Nelson W Crone 9/27/17						

Notes: Drawdown should be less than 0.3 feet while sampling. Minimal drawdown shall be achieved and measured by pumping at a low rate (approximately 0.1 to 0.5 liter/minute) and continually measuring water levels in the well. Note that site's hyrogeology may make it difficult to achieve this specification.

Analyses	# of Bottles Collected	Bottle Type (preservative)	Comments:
DRO	4	250 mL amber (HCl)	Well volume 0.57 gal
GRO	12	40 mL VOA (HCl)	3x well volume 1.74 gal
BTEX	12	40 mL VOA (HCl)	
PAH	8	1 L amber	photo 104-4010 F-2.

DUP, MS/MSD

Signed: Nelson W. Crone Date: 9/27/17
Signed/reviewer: Amy Surratt Date: 9/27/17

Low-Flow Groundwater Sampling with Minimal Drawdown Worksheet

Well ID: MW-9
Project # : 0420028
Date: 9/27/17
Project Name: Matson
Start Time: 1118
Site: Port of Anchorage
End Time: 1212
Field Team: A. Sumatt / N. Crone
Sample ID: 17-MA-MW9-1014 Time: 1150 (primary) dup split ms/msd
Sample ID: Time: primary dup split ms/msd

Weather Conditions: 45°F overcast 5mph winds

Depth to Top of Product (ft BTOC): N/A
Depth to Oil/Water Interface* (ft BTOC): N/A
* Note: Same as depth to water

Depth to Water (ft BTOC): 5.59
Total Depth (ft BTOC): water column: 1.28 10.87
Final Depth (ft BTOC): 5.85

Criteria for Stable Parameters

Parameter	Working Range	Stability Criteria	Notes
Temperature	>0.00 °C	± 0.5 °C	
pH	0-14	± 0.1	
Conductivity	0-99999 µS/cm	± 5%	
ORP	± 1999 mV		
Dissolved Oxygen	0-19.99 mg/L	± 10%	
Turbidity	0-800 NTU		

Sensory Observations

Color: (Clear), Amber, Tan, Brown, Grey, Milky White, Other:
Odor: (None), Low, Medium, High, Very Strong, H2S, Fuel Like, Chemical ?, Unknown
Turbidity: (None), Low, Medium, High, Very Turbid, Heavy Silts

Instrument Observations

Flow Rate (ml/min)	Time	Temp °C	Spec. Cond. (mS/cm^C)	Conductivity (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color	Odor	Water Level (ft BTOC)	Draw-down
150	1125	12.24	1.816	1373	0.71	6.26	-31.3	yellow	none	5.90	
	1130	12.21	2.017	1525	0.46	6.32	-30.8	"	"	5.86	
	1135	12.13	2.177	1642	0.44	6.37	-41.2	clear	"	5.85	
	1140	12.18	2.150	1622	0.41	6.38	-40.2	"	"	5.85	
	1145	12.20	2.122	1604	0.39	6.39	-37.3	"	"	5.85	
			parameters stabilized								
							A Sumatt				
							9/27				

Notes: Drawdown should be less than 0.3 feet while sampling. Minimal drawdown shall be achieved and measured by pumping at a low rate (approximately 0.1 to 0.5 liter/minute) and continually measuring water levels in the well. Note that site's hyrogeology may make it difficult to achieve this specification.

Analyses	# of Bottles Collected	Bottle Type (preservative)	Comments:
GRO	3	40 mL VOA (HCl)	3 well volumes = 0.62 gallons
BTEX	3	40 mL VOA (HCl)	flow rate = 0.2 gal/5 min
DRO	2	250 mL amber (HCl)	photo # 104-4007 camera F-2

Signed: Alexis Sumatt Date: 9/27/17
Signed/reviewer: Melissa W. Crone Date: 9/27/17

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APPENDIX B

Laboratory Analytical Reports

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TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

TestAmerica Job ID: 580-71716-1
Client Project/Site: Alaska Horizon
Revision: 1

For:
ERM Alaska, Inc.
825 W 8th Ave, Suite 200
Anchorage, Alaska 99501-4427

Attn: Stephen Witzmann

Kayse Zalmai

Authorized for release by:
10/19/2017 2:51:42 PM

Kayse Zalmai, Project Manager I
(253)922-2310
kayse.zalmai@testamericainc.com

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.

Table of Contents

Job ID: 580-71716-1

Laboratory: TestAmerica Seattle

Narrative

Job Narrative
580-71716-1

Receipt
The samples were received on 9/29/2017 12:30 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 0.3º C and 3.0º C.

Receipt Exceptions
The container label for the following samples did not match the information listed on the Chain-of-Custody (COC): 17-HLA-HC3-1009 (580-71716-2). The container labels list 17-HLA-MW8-1011 while the COC lists 17-HLA-MW8-1012.

The reference method requires samples to be preserved to a pH of 2 or below. The following samples was received with insufficient preservation at a pH of 7: 17-HLA-HC3-1009 (580-71716-2). The samples was preserved to the appropriate pH in the laboratory using HCl lot# 55320.

GC/MS VOA
Method(s) 8260C: The laboratory control sample (LCS) and / or laboratory control sample duplicate (LCSD) for analytical batch 580-258051 recovered outside control limits for the following analytes: Acetone, Carbon tetrachloride and Methyl tert-butyl ether. These analytes were biased high in the LCS and were not detected in the associated samples; therefore, the data have been reported.

Method(s) 8260C: The continuing calibration verification (CCV) associated with batch 580-258051 recovered above the upper control limit for Carbon tetrachloride and Acetone. The samples associated with this CCV were non-detects for the affected analytes; therefore, the data have been reported. The following samples are impacted: 17-HLA-HC1-1008 (580-71716-1), 17-HLA-HC3-1009 (580-71716-2), 17-HLA-HC6-1010 (580-71716-3), 17-HLA-MW8-1012 (580-71716-4), 17-HLA-HCZ-1013 (580-71716-5), 17-HLA-MW8MSD-1011 (580-71716-6), 17-HLA-TB-1000 (580-71716-7), 17-HLA-MW9-1014 (580-71716-8) and (CCVIS 580-258051/3).

Method(s) 8260C: The minimum response factor (RF) criteria for the continuing calibration verification (CCV) analyzed in batch 580-258051 was outside criteria for the following analyte(s): Chloroethane. As indicated in the reference method, sample analysis may proceed; however, any detection or non-detection for the affected analyte(s) is considered estimated.

Method(s) 8260C: The following samples was diluted to bring the concentration of target analytes within the calibration range: 17-HLA-HC1-1008 (580-71716-1), 17-HLA-MW8-1012 (580-71716-4), 17-HLA-HCZ-1013 (580-71716-5) and 17-HLA-MW8MSD-1011 (580-71716-6). Elevated reporting limits (RLs) are provided.

Method(s) 8260C: Reanalysis of the following sample(s) was performed outside of the analytical holding time due to client request. Original run was logged in for everything except benzene.This sample was the only one that required a dilution. : 17-HLA-MW9-1014 (580-71716-8).

Method(s) AK101: The surrogate recovery for the blank associated with analytical batch 580-258157 was outside the upper control limits.

Method(s) AK101: The following samples was analyzed at reduced volume due to high concentrations of target analytes: 17-HLA-MW8-1012 (580-71716-4), 17-HLA-HCZ-1013 (580-71716-5) and 17-HLA-MW8MSD-1011 (580-71716-6). The calculation was done using an initial volume adjustment rather than a dilution factor. The reporting limits have been elevated by the appropriate factor.

Method(s) AK101: Surrogate recovery for the following samples was outside the upper control limit: (MB 580-258157/6) and (580-71780-C-1). This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.

Method(s) AK101: Surrogate recovery for the following samples was outside control limits: 17-HLA-MW8-1012 (580-71716-4), 17-HLA-HCZ-1013 (580-71716-5), 17-HLA-MW8MSD-1011 (580-71716-6), 17-HLA-MW9-1014 (580-71716-8), (580-71780-E-1 MS) and (580-71780-D-1 MSD). 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/MS Semi VOA

Job ID: 580-71716-1 (Continued)

Laboratory: TestAmerica Seattle (Continued)

Method(s) 8270D SIM: The method blank for preparation batch 580-258025 and analytical batch 580-258069 contained Benzo(a)anthracene, Fluoranthene and Phenanthrene above the method detection limit. This target analyte concentration was less than half the reporting limit (1/2RL); therefore, re-extraction and/or re-analysis of samples was not warranted.

Method(s) 8270D SIM: The following samples was diluted to bring the concentration of target analytes within the calibration range: 17-HLA-MW8-1012 (580-71716-4), 17-HLA-HCZ-1013 (580-71716-5) and 17-HLA-MW8MSD-1011 (580-71716-6). Elevated reporting limits (RLs) are provided.

Method(s) 8270D SIM: Due to sample matrix effect on the internal standard (ISTD), a dilution was required for the following samples: 17-HLA-MW8-1012 (580-71716-4), 17-HLA-HCZ-1013 (580-71716-5) and 17-HLA-MW8MSD-1011 (580-71716-6).

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

GC Semi VOA

Method(s) AK102 & 103: The method blank for preparation batch 580-258457 and analytical batch 580-258559 contained DRO (nC10-<nC25) above the method detection limit. This target analyte concentration was less than the reporting limit (RL); therefore, re-extraction and/or re-analysis of samples was not performed.

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

Organic Prep

Method(s) 3510C: A deviation from the Standard Operating Procedure (SOP) occurred. Details are as follows: samples received preserved in HCl. Did not add acid in separatory funnel as directed by SOP.

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

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
H	Sample was prepped or analyzed beyond the specified holding time

GC/MS Semi VOA

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
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
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
B	Compound was found in the blank and sample.
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.
¤	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 ID: 17-HLA-HC1-1008

Date Collected: 09/27/17 11:45
Date Received: 09/29/17 12:30

Lab Sample ID: 580-71716-1

Matrix: Water

Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylbenzene	**94**		3.0	0.21	ug/L			10/04/17 17:51	1
o-Xylene	**0.87**	**J**	2.0	0.15	ug/L			10/04/17 17:51	1
Toluene	ND		2.0	0.24	ug/L			10/04/17 17:51	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*100*		*80 - 126*		*10/04/17 17:51*	*1*
4-Bromofluorobenzene (Surr)	*100*		*75 - 125*		*10/04/17 17:51*	*1*
Dibromofluoromethane (Surr)	*105*		*77 - 120*		*10/04/17 17:51*	*1*
Toluene-d8 (Surr)	*101*		*80 - 122*		*10/04/17 17:51*	*1*
Trifluorotoluene (Surr)	*107*		*80 - 120*		*10/04/17 17:51*	*1*

Method: 8260C - Volatile Organic Compounds by GC/MS - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
m-Xylene & p-Xylene	**93**		30	7.2	ug/L			10/05/17 20:29	10
Benzene	**700**		20	4.2	ug/L			10/05/17 20:29	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*92*		*80 - 126*		*10/05/17 20:29*	*10*
4-Bromofluorobenzene (Surr)	*103*		*75 - 125*		*10/05/17 20:29*	*10*
Dibromofluoromethane (Surr)	*104*		*77 - 120*		*10/05/17 20:29*	*10*
Toluene-d8 (Surr)	*90*		*80 - 122*		*10/05/17 20:29*	*10*
Trifluorotoluene (Surr)	*116*		*80 - 120*		*10/05/17 20:29*	*10*

Method: AK101 - Alaska - Gasoline Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO) -C6-C10	**1.5**		1.0	0.33	mg/L			10/04/17 02:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Trifluorotoluene (Surr)	*95*		*75 - 120*		*10/04/17 02:08*	*1*
4-Bromofluorobenzene (Surr)	*92*		*68 - 119*		*10/04/17 02:08*	*1*

Method: AK102 & 103 - Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
DRO (nC10-<nC25)	**5.1**	**B**	0.10	0.022	mg/L		10/10/17 09:08	10/11/17 17:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*85*		*50 - 150*	*10/10/17 09:08*	*10/11/17 17:43*	*1*

Client Sample ID: 17-HLA-HC3-1009

Date Collected: 09/27/17 10:35
Date Received: 09/29/17 12:30

Lab Sample ID: 580-71716-2

Matrix: Water

Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylbenzene	ND		3.0	0.21	ug/L			10/04/17 18:17	1
m-Xylene & p-Xylene	ND		3.0	0.72	ug/L			10/04/17 18:17	1
o-Xylene	ND		2.0	0.15	ug/L			10/04/17 18:17	1
Toluene	ND		2.0	0.24	ug/L			10/04/17 18:17	1
Benzene	**2.0**		2.0	0.42	ug/L			10/04/17 18:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*102*		*80 - 126*		*10/04/17 18:17*	*1*
4-Bromofluorobenzene (Surr)	*106*		*75 - 125*		*10/04/17 18:17*	*1*
Dibromofluoromethane (Surr)	*109*		*77 - 120*		*10/04/17 18:17*	*1*
Toluene-d8 (Surr)	*98*		*80 - 122*		*10/04/17 18:17*	*1*
Trifluorotoluene (Surr)	*105*		*80 - 120*		*10/04/17 18:17*	*1*

Method: AK101 - Alaska - Gasoline Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO) -C6-C10	ND		1.0	0.33	mg/L			10/04/17 02:40	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Trifluorotoluene (Surr)	*99*		*75 - 120*		*10/04/17 02:40*	*1*
4-Bromofluorobenzene (Surr)	*83*		*68 - 119*		*10/04/17 02:40*	*1*

Method: AK102 & 103 - Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
DRO (nC10-<nC25)	**0.99**	**B**	0.10	0.022	mg/L		10/10/17 09:08	10/11/17 18:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*74*		*50 - 150*	*10/10/17 09:08*	*10/11/17 18:05*	*1*

Client Sample ID: 17-HLA-HC6-1010

Date Collected: 09/27/17 13:15
Date Received: 09/29/17 12:30

Lab Sample ID: 580-71716-3

Matrix: Water

Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylbenzene	ND		3.0	0.21	ug/L			10/04/17 18:44	1
m-Xylene & p-Xylene	ND		3.0	0.72	ug/L			10/04/17 18:44	1
o-Xylene	ND		2.0	0.15	ug/L			10/04/17 18:44	1
Toluene	ND		2.0	0.24	ug/L			10/04/17 18:44	1
Benzene	ND		2.0	0.42	ug/L			10/04/17 18:44	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*103*		*80 - 126*		*10/04/17 18:44*	*1*
4-Bromofluorobenzene (Surr)	*102*		*75 - 125*		*10/04/17 18:44*	*1*
Dibromofluoromethane (Surr)	*105*		*77 - 120*		*10/04/17 18:44*	*1*
Toluene-d8 (Surr)	*101*		*80 - 122*		*10/04/17 18:44*	*1*
Trifluorotoluene (Surr)	*108*		*80 - 120*		*10/04/17 18:44*	*1*

Method: AK101 - Alaska - Gasoline Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO) -C6-C10	ND		1.0	0.33	mg/L			10/04/17 03:44	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Trifluorotoluene (Surr)	*105*		*75 - 120*		*10/04/17 03:44*	*1*
4-Bromofluorobenzene (Surr)	*89*		*68 - 119*		*10/04/17 03:44*	*1*

Method: AK102 & 103 - Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
DRO (nC10-<nC25)	**1.2**	**B**	0.10	0.022	mg/L		10/10/17 09:08	10/11/17 18:27	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*83*		*50 - 150*	*10/10/17 09:08*	*10/11/17 18:27*	*1*

Client Sample ID: 17-HLA-MW8-1012

Date Collected: 09/27/17 13:00
Date Received: 09/29/17 12:30

Lab Sample ID: 580-71716-4

Matrix: Water

Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Toluene	**71**		2.0	0.24	ug/L			10/04/17 19:09	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*97*		*80 - 126*		*10/04/17 19:09*	*1*
4-Bromofluorobenzene (Surr)	*105*		*75 - 125*		*10/04/17 19:09*	*1*
Dibromofluoromethane (Surr)	*105*		*77 - 120*		*10/04/17 19:09*	*1*
Toluene-d8 (Surr)	*100*		*80 - 122*		*10/04/17 19:09*	*1*
Trifluorotoluene (Surr)	*108*		*80 - 120*		*10/04/17 19:09*	*1*

Method: 8260C - Volatile Organic Compounds by GC/MS - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylbenzene	**1300**	**J**	3000	210	ug/L			10/06/17 21:36	1000
m-Xylene & p-Xylene	**7700**		3000	720	ug/L			10/06/17 21:36	1000
o-Xylene	**720**	**J**	2000	150	ug/L			10/06/17 21:36	1000
Benzene	**700**		200	42	ug/L			10/05/17 20:54	100

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*93*		*80 - 126*		*10/05/17 20:54*	*100*
1,2-Dichloroethane-d4 (Surr)	*93*		*80 - 126*		*10/06/17 21:36*	*1000*
4-Bromofluorobenzene (Surr)	*102*		*75 - 125*		*10/05/17 20:54*	*100*
4-Bromofluorobenzene (Surr)	*102*		*75 - 125*		*10/06/17 21:36*	*1000*
Dibromofluoromethane (Surr)	*105*		*77 - 120*		*10/05/17 20:54*	*100*
Dibromofluoromethane (Surr)	*107*		*77 - 120*		*10/06/17 21:36*	*1000*
Toluene-d8 (Surr)	*90*		*80 - 122*		*10/05/17 20:54*	*100*
Toluene-d8 (Surr)	*90*		*80 - 122*		*10/06/17 21:36*	*1000*
Trifluorotoluene (Surr)	*118*		*80 - 120*		*10/05/17 20:54*	*100*
Trifluorotoluene (Surr)	*118*		*80 - 120*		*10/06/17 21:36*	*1000*

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	**24**		0.020	0.0061	ug/L		10/04/17 09:31	10/04/17 23:30	1
2-Methylnaphthalene	**32**		0.030	0.0091	ug/L		10/04/17 09:31	10/04/17 23:30	1
Anthracene	**0.033**		0.020	0.0030	ug/L		10/04/17 09:31	10/04/17 23:30	1
Benzo[a]anthracene	ND		0.020	0.0020	ug/L		10/04/17 09:31	10/04/17 23:30	1
Benzo[a]pyrene	ND		0.020	0.0030	ug/L		10/04/17 09:31	10/04/17 23:30	1
Benzo[b]fluoranthene	ND		0.020	0.0081	ug/L		10/04/17 09:31	10/04/17 23:30	1
Benzo[g,h,i]perylene	ND		0.020	0.0030	ug/L		10/04/17 09:31	10/04/17 23:30	1
Benzo[k]fluoranthene	ND		0.030	0.0091	ug/L		10/04/17 09:31	10/04/17 23:30	1
Chrysene	ND		0.020	0.0061	ug/L		10/04/17 09:31	10/04/17 23:30	1
Dibenz(a,h)anthracene	ND		0.020	0.0020	ug/L		10/04/17 09:31	10/04/17 23:30	1
Fluoranthene	ND		0.020	0.0020	ug/L		10/04/17 09:31	10/04/17 23:30	1
Indeno[1,2,3-cd]pyrene	ND		0.020	0.0071	ug/L		10/04/17 09:31	10/04/17 23:30	1
Phenanthrene	**0.72**	**B**	0.020	0.0041	ug/L		10/04/17 09:31	10/04/17 23:30	1
Pyrene	ND		0.020	0.0041	ug/L		10/04/17 09:31	10/04/17 23:30	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*64*		*53 - 112*	*10/04/17 09:31*	*10/04/17 23:30*	*1*

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthene	**0.15**	**J**	0.20	0.020	ug/L		10/04/17 09:31	10/05/17 14:46	10

Client Sample ID: 17-HLA-MW8-1012
Date Collected: 09/27/17 13:00
Date Received: 09/29/17 12:30

Lab Sample ID: 580-71716-4
Matrix: Water

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthylene	ND		0.20	0.020	ug/L		10/04/17 09:31	10/05/17 14:46	10
Fluorene	**0.32**		0.20	0.030	ug/L		10/04/17 09:31	10/05/17 14:46	10
Naphthalene	**120**		0.41	0.13	ug/L		10/04/17 09:31	10/05/17 14:46	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*69*		*53 - 112*	*10/04/17 09:31*	*10/05/17 14:46*	*10*

Method: AK101 - Alaska - Gasoline Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO) -C6-C10	**35**		10	3.3	mg/L			10/05/17 15:39	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Trifluorotoluene (Surr)	*127*	*X*	*75 - 120*		*10/05/17 15:39*	*10*
4-Bromofluorobenzene (Surr)	*119*		*68 - 119*		*10/05/17 15:39*	*10*

Method: AK102 & 103 - Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
DRO (nC10-<nC25)	**13**	**B**	0.10	0.022	mg/L		10/10/17 09:08	10/11/17 19:11	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*90*		*50 - 150*	*10/10/17 09:08*	*10/11/17 19:11*	*1*

Client Sample ID: 17-HLA-HCZ-1013

Date Collected: 09/27/17 13:05
Date Received: 09/29/17 12:30

Lab Sample ID: 580-71716-5

Matrix: Water

Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Toluene	**68**		2.0	0.24	ug/L			10/04/17 19:35	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*100*		*80 - 126*		*10/04/17 19:35*	*1*
4-Bromofluorobenzene (Surr)	*105*		*75 - 125*		*10/04/17 19:35*	*1*
Dibromofluoromethane (Surr)	*103*		*77 - 120*		*10/04/17 19:35*	*1*
Toluene-d8 (Surr)	*96*		*80 - 122*		*10/04/17 19:35*	*1*
Trifluorotoluene (Surr)	*110*		*80 - 120*		*10/04/17 19:35*	*1*

Method: 8260C - Volatile Organic Compounds by GC/MS - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylbenzene	**1700**		300	21	ug/L			10/05/17 21:19	100
m-Xylene & p-Xylene	**11000**		3000	720	ug/L			10/06/17 22:02	1000
o-Xylene	**1000**		200	15	ug/L			10/05/17 21:19	100
Benzene	**1500**		200	42	ug/L			10/05/17 21:19	100

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*91*		*80 - 126*		*10/05/17 21:19*	*100*
1,2-Dichloroethane-d4 (Surr)	*92*		*80 - 126*		*10/06/17 22:02*	*1000*
4-Bromofluorobenzene (Surr)	*104*		*75 - 125*		*10/05/17 21:19*	*100*
4-Bromofluorobenzene (Surr)	*102*		*75 - 125*		*10/06/17 22:02*	*1000*
Dibromofluoromethane (Surr)	*106*		*77 - 120*		*10/05/17 21:19*	*100*
Dibromofluoromethane (Surr)	*104*		*77 - 120*		*10/06/17 22:02*	*1000*
Toluene-d8 (Surr)	*89*		*80 - 122*		*10/05/17 21:19*	*100*
Toluene-d8 (Surr)	*90*		*80 - 122*		*10/06/17 22:02*	*1000*
Trifluorotoluene (Surr)	*118*		*80 - 120*		*10/05/17 21:19*	*100*
Trifluorotoluene (Surr)	*118*		*80 - 120*		*10/06/17 22:02*	*1000*

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	**31**		0.020	0.0061	ug/L		10/04/17 09:31	10/04/17 23:52	1
Anthracene	**0.037**		0.020	0.0030	ug/L		10/04/17 09:31	10/04/17 23:52	1
Benzo[a]anthracene	ND		0.020	0.0020	ug/L		10/04/17 09:31	10/04/17 23:52	1
Benzo[a]pyrene	ND		0.020	0.0030	ug/L		10/04/17 09:31	10/04/17 23:52	1
Benzo[b]fluoranthene	ND		0.020	0.0081	ug/L		10/04/17 09:31	10/04/17 23:52	1
Benzo[g,h,i]perylene	ND		0.020	0.0030	ug/L		10/04/17 09:31	10/04/17 23:52	1
Benzo[k]fluoranthene	ND		0.030	0.0091	ug/L		10/04/17 09:31	10/04/17 23:52	1
Chrysene	ND		0.020	0.0061	ug/L		10/04/17 09:31	10/04/17 23:52	1
Dibenz(a,h)anthracene	ND		0.020	0.0020	ug/L		10/04/17 09:31	10/04/17 23:52	1
Fluoranthene	ND		0.020	0.0020	ug/L		10/04/17 09:31	10/04/17 23:52	1
Indeno[1,2,3-cd]pyrene	ND		0.020	0.0071	ug/L		10/04/17 09:31	10/04/17 23:52	1
Phenanthrene	**0.88**	**B**	0.020	0.0040	ug/L		10/04/17 09:31	10/04/17 23:52	1
Pyrene	ND		0.020	0.0040	ug/L		10/04/17 09:31	10/04/17 23:52	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*70*		*53 - 112*	*10/04/17 09:31*	*10/04/17 23:52*	*1*

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Methylnaphthalene	**49**		0.30	0.091	ug/L		10/04/17 09:31	10/05/17 15:08	10
Acenaphthene	**0.15**	**J**	0.20	0.020	ug/L		10/04/17 09:31	10/05/17 15:08	10

Client Sample ID: 17-HLA-HCZ-1013
Date Collected: 09/27/17 13:05
Date Received: 09/29/17 12:30

Lab Sample ID: 580-71716-5
Matrix: Water

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthylene	ND		0.20	0.020	ug/L		10/04/17 09:31	10/05/17 15:08	10
Fluorene	**0.34**		0.20	0.030	ug/L		10/04/17 09:31	10/05/17 15:08	10
Naphthalene	**140**		0.40	0.13	ug/L		10/04/17 09:31	10/05/17 15:08	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*73*		*53 - 112*	*10/04/17 09:31*	*10/05/17 15:08*	*10*

Method: AK101 - Alaska - Gasoline Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO) -C6-C10	**36**		10	3.3	mg/L			10/05/17 16:09	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Trifluorotoluene (Surr)	*126*	*X*	*75 - 120*		*10/05/17 16:09*	*10*
4-Bromofluorobenzene (Surr)	*121*	*X*	*68 - 119*		*10/05/17 16:09*	*10*

Method: AK102 & 103 - Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
DRO (nC10-<nC25)	**13**	**B**	0.10	0.022	mg/L		10/10/17 09:08	10/11/17 19:33	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*85*		*50 - 150*	*10/10/17 09:08*	*10/11/17 19:33*	*1*

Client Sample ID: 17-HLA-MW8MSD-1011

Lab Sample ID: 580-71716-6

Date Collected: 09/27/17 13:00

Matrix: Water

Date Received: 09/29/17 12:30

Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Toluene	**68**		2.0	0.24	ug/L			10/04/17 20:02	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*100*		*80 - 126*		*10/04/17 20:02*	*1*
4-Bromofluorobenzene (Surr)	*107*		*75 - 125*		*10/04/17 20:02*	*1*
Dibromofluoromethane (Surr)	*105*		*77 - 120*		*10/04/17 20:02*	*1*
Toluene-d8 (Surr)	*96*		*80 - 122*		*10/04/17 20:02*	*1*
Trifluorotoluene (Surr)	*111*		*80 - 120*		*10/04/17 20:02*	*1*

Method: 8260C - Volatile Organic Compounds by GC/MS - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylbenzene	**1800**		300	21	ug/L			10/05/17 21:44	100
m-Xylene & p-Xylene	**10000**		3000	720	ug/L			10/06/17 22:27	1000
o-Xylene	**890**		200	15	ug/L			10/05/17 21:44	100
Benzene	**1700**		200	42	ug/L			10/05/17 21:44	100

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*92*		*80 - 126*		*10/05/17 21:44*	*100*
1,2-Dichloroethane-d4 (Surr)	*94*		*80 - 126*		*10/06/17 22:27*	*1000*
4-Bromofluorobenzene (Surr)	*104*		*75 - 125*		*10/05/17 21:44*	*100*
4-Bromofluorobenzene (Surr)	*100*		*75 - 125*		*10/06/17 22:27*	*1000*
Dibromofluoromethane (Surr)	*105*		*77 - 120*		*10/05/17 21:44*	*100*
Dibromofluoromethane (Surr)	*105*		*77 - 120*		*10/06/17 22:27*	*1000*
Toluene-d8 (Surr)	*89*		*80 - 122*		*10/05/17 21:44*	*100*
Toluene-d8 (Surr)	*91*		*80 - 122*		*10/06/17 22:27*	*1000*
Trifluorotoluene (Surr)	*117*		*80 - 120*		*10/05/17 21:44*	*100*
Trifluorotoluene (Surr)	*119*		*80 - 120*		*10/06/17 22:27*	*1000*

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	**28**		0.021	0.0062	ug/L		10/04/17 09:31	10/05/17 00:14	1
2-Methylnaphthalene	**38**		0.031	0.0092	ug/L		10/04/17 09:31	10/05/17 00:14	1
Anthracene	**0.030**		0.021	0.0031	ug/L		10/04/17 09:31	10/05/17 00:14	1
Benzo[a]anthracene	ND		0.021	0.0021	ug/L		10/04/17 09:31	10/05/17 00:14	1
Benzo[a]pyrene	ND		0.021	0.0031	ug/L		10/04/17 09:31	10/05/17 00:14	1
Benzo[b]fluoranthene	ND		0.021	0.0082	ug/L		10/04/17 09:31	10/05/17 00:14	1
Benzo[g,h,i]perylene	ND		0.021	0.0031	ug/L		10/04/17 09:31	10/05/17 00:14	1
Benzo[k]fluoranthene	ND		0.031	0.0092	ug/L		10/04/17 09:31	10/05/17 00:14	1
Chrysene	ND		0.021	0.0062	ug/L		10/04/17 09:31	10/05/17 00:14	1
Dibenz(a,h)anthracene	ND		0.021	0.0021	ug/L		10/04/17 09:31	10/05/17 00:14	1
Fluoranthene	ND		0.021	0.0021	ug/L		10/04/17 09:31	10/05/17 00:14	1
Indeno[1,2,3-cd]pyrene	ND		0.021	0.0072	ug/L		10/04/17 09:31	10/05/17 00:14	1
Phenanthrene	**0.84**	**B**	0.021	0.0041	ug/L		10/04/17 09:31	10/05/17 00:14	1
Pyrene	ND		0.021	0.0041	ug/L		10/04/17 09:31	10/05/17 00:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*69*		*53 - 112*	*10/04/17 09:31*	*10/05/17 00:14*	*1*

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthene	**0.24**		0.21	0.021	ug/L		10/04/17 09:31	10/05/17 15:30	10

Client: ERM Alaska, Inc.
Project/Site: Alaska Horizon

TestAmerica Job ID: 580-71716-1

Client Sample ID: 17-HLA-MW8MSD-1011
Date Collected: 09/27/17 13:00
Date Received: 09/29/17 12:30

Lab Sample ID: 580-71716-6
Matrix: Water

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthylene	0.088	J	0.21	0.021	ug/L		10/04/17 09:31	10/05/17 15:30	10
Fluorene	0.53		0.21	0.031	ug/L		10/04/17 09:31	10/05/17 15:30	10
Naphthalene	150		0.41	0.13	ug/L		10/04/17 09:31	10/05/17 15:30	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*77*		*53 - 112*	*10/04/17 09:31*	*10/05/17 15:30*	*10*

Method: AK101 - Alaska - Gasoline Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO) -C6-C10	31		10	3.3	mg/L			10/05/17 16:40	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Trifluorotoluene (Surr)	*121*	*X*	*75 - 120*		*10/05/17 16:40*	*10*
4-Bromofluorobenzene (Surr)	*118*		*68 - 119*		*10/05/17 16:40*	*10*

Method: AK102 & 103 - Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
DRO (nC10-<nC25)	12	B	0.10	0.022	mg/L		10/10/17 09:08	10/11/17 19:55	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*78*		*50 - 150*	*10/10/17 09:08*	*10/11/17 19:55*	*1*

Client Sample ID: 17-HLA-TB-1000

Date Collected: 09/27/17 10:30
Date Received: 09/29/17 12:30

Lab Sample ID: 580-71716-7

Matrix: Water

Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylbenzene	ND		3.0	0.21	ug/L			10/04/17 17:25	1
m-Xylene & p-Xylene	ND		3.0	0.72	ug/L			10/04/17 17:25	1
o-Xylene	ND		2.0	0.15	ug/L			10/04/17 17:25	1
Toluene	ND		2.0	0.24	ug/L			10/04/17 17:25	1
Benzene	ND		2.0	0.42	ug/L			10/04/17 17:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*100*		*80 - 126*		*10/04/17 17:25*	*1*
4-Bromofluorobenzene (Surr)	*104*		*75 - 125*		*10/04/17 17:25*	*1*
Dibromofluoromethane (Surr)	*106*		*77 - 120*		*10/04/17 17:25*	*1*
Toluene-d8 (Surr)	*97*		*80 - 122*		*10/04/17 17:25*	*1*
Trifluorotoluene (Surr)	*108*		*80 - 120*		*10/04/17 17:25*	*1*

Method: AK101 - Alaska - Gasoline Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO) -C6-C10	ND		1.0	0.33	mg/L			10/03/17 22:57	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Trifluorotoluene (Surr)	*108*		*75 - 120*		*10/03/17 22:57*	*1*
4-Bromofluorobenzene (Surr)	*88*		*68 - 119*		*10/03/17 22:57*	*1*

Client Sample ID: 17-HLA-MW9-1014
Date Collected: 09/27/17 11:50
Date Received: 09/29/17 12:30

Lab Sample ID: 580-71716-8
Matrix: Water

Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Toluene	4.7		2.0	0.24	ug/L			10/04/17 20:28	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	101		80 - 126		10/04/17 20:28	1
4-Bromofluorobenzene (Surr)	108		75 - 125		10/04/17 20:28	1
Dibromofluoromethane (Surr)	106		77 - 120		10/04/17 20:28	1
Toluene-d8 (Surr)	99		80 - 122		10/04/17 20:28	1
Trifluorotoluene (Surr)	108		80 - 120		10/04/17 20:28	1

Method: 8260C - Volatile Organic Compounds by GC/MS - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	730	H	50	11	ug/L			10/18/17 17:58	25

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	94		80 - 126		10/18/17 17:58	25
4-Bromofluorobenzene (Surr)	105		75 - 125		10/18/17 17:58	25
Dibromofluoromethane (Surr)	98		77 - 120		10/18/17 17:58	25
Toluene-d8 (Surr)	99		80 - 122		10/18/17 17:58	25
Trifluorotoluene (Surr)	107		80 - 120		10/18/17 17:58	25

Method: 8260C - Volatile Organic Compounds by GC/MS - RA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylbenzene	19		3.0	0.21	ug/L			10/05/17 18:22	1
m-Xylene & p-Xylene	47		3.0	0.72	ug/L			10/05/17 18:22	1
o-Xylene	1.2	J	2.0	0.15	ug/L			10/05/17 18:22	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	89		80 - 126		10/05/17 18:22	1
4-Bromofluorobenzene (Surr)	102		75 - 125		10/05/17 18:22	1
Dibromofluoromethane (Surr)	102		77 - 120		10/05/17 18:22	1
Toluene-d8 (Surr)	89		80 - 122		10/05/17 18:22	1
Trifluorotoluene (Surr)	116		80 - 120		10/05/17 18:22	1

Method: AK101 - Alaska - Gasoline Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO) -C6-C10	1.6		1.0	0.33	mg/L			10/05/17 17:10	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Trifluorotoluene (Surr)	127	X	75 - 120		10/05/17 17:10	1
4-Bromofluorobenzene (Surr)	106		68 - 119		10/05/17 17:10	1

Method: AK102 & 103 - Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
DRO (nC10-<nC25)	7.0	B	0.10	0.023	mg/L		10/10/17 09:08	10/11/17 20:18	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
o-Terphenyl	76		50 - 150	10/10/17 09:08	10/11/17 20:18	1

Method: 8260C - Volatile Organic Compounds by GC/MS

Lab Sample ID: MB 580-258051/5
Matrix: Water
Analysis Batch: 258051

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylbenzene	ND		3.0	0.21	ug/L			10/04/17 12:37	1
m-Xylene & p-Xylene	ND		3.0	0.72	ug/L			10/04/17 12:37	1
o-Xylene	ND		2.0	0.15	ug/L			10/04/17 12:37	1
Toluene	ND		2.0	0.24	ug/L			10/04/17 12:37	1
Benzene	ND		2.0	0.42	ug/L			10/04/17 12:37	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*101*		*80 - 126*		*10/04/17 12:37*	*1*
4-Bromofluorobenzene (Surr)	*103*		*75 - 125*		*10/04/17 12:37*	*1*
Dibromofluoromethane (Surr)	*106*		*77 - 120*		*10/04/17 12:37*	*1*
Toluene-d8 (Surr)	*101*		*80 - 122*		*10/04/17 12:37*	*1*
Trifluorotoluene (Surr)	*106*		*80 - 120*		*10/04/17 12:37*	*1*

Lab Sample ID: LCS 580-258051/6
Matrix: Water
Analysis Batch: 258051

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Ethylbenzene	10.0	10.3		ug/L		103	75 - 120
m-Xylene & p-Xylene	10.0	10.4		ug/L		104	75 - 120
o-Xylene	10.0	10.5		ug/L		105	74 - 120
Toluene	10.0	10.4		ug/L		104	75 - 120
Benzene	10.0	10.4		ug/L		104	75 - 120

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*102*		*80 - 126*
4-Bromofluorobenzene (Surr)	*105*		*75 - 125*
Dibromofluoromethane (Surr)	*112*		*77 - 120*
Toluene-d8 (Surr)	*98*		*80 - 122*
Trifluorotoluene (Surr)	*107*		*80 - 120*

Lab Sample ID: LCSD 580-258051/7
Matrix: Water
Analysis Batch: 258051

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Ethylbenzene	10.0	9.94		ug/L		99	75 - 120	4	14
m-Xylene & p-Xylene	10.0	9.92		ug/L		99	75 - 120	5	14
o-Xylene	10.0	9.80		ug/L		98	74 - 120	7	16
Toluene	10.0	10.4		ug/L		104	75 - 120	0	13
Benzene	10.0	10.1		ug/L		101	75 - 120	2	14

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*102*		*80 - 126*
4-Bromofluorobenzene (Surr)	*99*		*75 - 125*
Dibromofluoromethane (Surr)	*106*		*77 - 120*
Toluene-d8 (Surr)	*99*		*80 - 122*

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

Lab Sample ID: LCSD 580-258051/7
Matrix: Water
Analysis Batch: 258051

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

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
Trifluorotoluene (Surr)	*108*		*80 - 120*

Lab Sample ID: MB 580-257968/1-A
Matrix: Water
Analysis Batch: 258077

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylbenzene	ND		300	21	ug/L			10/05/17 13:03	100
m-Xylene & p-Xylene	ND		300	72	ug/L			10/05/17 13:03	100
o-Xylene	ND		200	15	ug/L			10/05/17 13:03	100
Toluene	ND		200	24	ug/L			10/05/17 13:03	100
Benzene	ND		200	42	ug/L			10/05/17 13:03	100

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	*92*		*80 - 126*		*10/05/17 13:03*	*100*
4-Bromofluorobenzene (Surr)	*104*		*75 - 125*		*10/05/17 13:03*	*100*
Dibromofluoromethane (Surr)	*104*		*77 - 120*		*10/05/17 13:03*	*100*
Toluene-d8 (Surr)	*89*		*80 - 122*		*10/05/17 13:03*	*100*
Trifluorotoluene (Surr)	*118*		*80 - 120*		*10/05/17 13:03*	*100*

Lab Sample ID: LCS 580-257968/2-A
Matrix: Water
Analysis Batch: 258077

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Ethylbenzene	1000	932		ug/L		93	75 - 120
m-Xylene & p-Xylene	1000	945		ug/L		94	75 - 120
o-Xylene	1000	930		ug/L		93	74 - 120
Toluene	1000	950		ug/L		95	75 - 120
Benzene	1000	1080		ug/L		108	75 - 120

Surrogate	LCS %Recovery	LCS Qualifier	Limits
1,2-Dichloroethane-d4 (Surr)	*90*		*80 - 126*
4-Bromofluorobenzene (Surr)	*101*		*75 - 125*
Dibromofluoromethane (Surr)	*106*		*77 - 120*
Toluene-d8 (Surr)	*88*		*80 - 122*
Trifluorotoluene (Surr)	*117*		*80 - 120*

Lab Sample ID: LCSD 580-257968/3-A
Matrix: Water
Analysis Batch: 258077

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

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Ethylbenzene	1000	934		ug/L		93	75 - 120	0	14
m-Xylene & p-Xylene	1000	927		ug/L		93	75 - 120	2	14
o-Xylene	1000	928		ug/L		93	74 - 120	0	16
Toluene	1000	939		ug/L		94	75 - 120	1	13

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

Lab Sample ID: LCSD 580-257968/3-A
Matrix: Water
Analysis Batch: 258077

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

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene			1000	1050		ug/L		105	75 - 120	2	14

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*91*		*80 - 126*
4-Bromofluorobenzene (Surr)	*103*		*75 - 125*
Dibromofluoromethane (Surr)	*104*		*77 - 120*
Toluene-d8 (Surr)	*88*		*80 - 122*
Trifluorotoluene (Surr)	*119*		*80 - 120*

Lab Sample ID: MB 580-258333/5
Matrix: Water
Analysis Batch: 258333

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylbenzene	ND		3.0	0.21	ug/L			10/06/17 19:05	1
m-Xylene & p-Xylene	ND		3.0	0.72	ug/L			10/06/17 19:05	1
o-Xylene	ND		2.0	0.15	ug/L			10/06/17 19:05	1
Toluene	ND		2.0	0.24	ug/L			10/06/17 19:05	1
Benzene	ND		2.0	0.42	ug/L			10/06/17 19:05	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*93*		*80 - 126*		*10/06/17 19:05*	*1*
4-Bromofluorobenzene (Surr)	*100*		*75 - 125*		*10/06/17 19:05*	*1*
Dibromofluoromethane (Surr)	*105*		*77 - 120*		*10/06/17 19:05*	*1*
Toluene-d8 (Surr)	*91*		*80 - 122*		*10/06/17 19:05*	*1*
Trifluorotoluene (Surr)	*118*		*80 - 120*		*10/06/17 19:05*	*1*

Lab Sample ID: LCS 580-258333/6
Matrix: Water
Analysis Batch: 258333

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Ethylbenzene			10.0	9.59		ug/L		96	75 - 120
m-Xylene & p-Xylene			10.0	9.51		ug/L		95	75 - 120
o-Xylene			10.0	9.57		ug/L		96	74 - 120
Benzene			10.0	11.3		ug/L		113	75 - 120

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*91*		*80 - 126*
4-Bromofluorobenzene (Surr)	*100*		*75 - 125*
Dibromofluoromethane (Surr)	*107*		*77 - 120*
Toluene-d8 (Surr)	*88*		*80 - 122*
Trifluorotoluene (Surr)	*117*		*80 - 120*

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

Lab Sample ID: LCSD 580-258333/7
Matrix: Water
Analysis Batch: 258333

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

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Ethylbenzene			10.0	9.38		ug/L		94	75 - 120	2	14
m-Xylene & p-Xylene			10.0	9.36		ug/L		94	75 - 120	2	14
o-Xylene			10.0	9.29		ug/L		93	74 - 120	3	16
Benzene			10.0	10.8		ug/L		108	75 - 120	4	14

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*91*		*80 - 126*
4-Bromofluorobenzene (Surr)	*101*		*75 - 125*
Dibromofluoromethane (Surr)	*105*		*77 - 120*
Toluene-d8 (Surr)	*88*		*80 - 122*
Trifluorotoluene (Surr)	*116*		*80 - 120*

Lab Sample ID: MB 580-259177/5
Matrix: Water
Analysis Batch: 259177

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		2.0	0.42	ug/L			10/18/17 11:39	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*109*		*80 - 126*		*10/18/17 11:39*	*1*
4-Bromofluorobenzene (Surr)	*100*		*75 - 125*		*10/18/17 11:39*	*1*
Dibromofluoromethane (Surr)	*101*		*77 - 120*		*10/18/17 11:39*	*1*
Toluene-d8 (Surr)	*102*		*80 - 122*		*10/18/17 11:39*	*1*
Trifluorotoluene (Surr)	*99*		*80 - 120*		*10/18/17 11:39*	*1*

Lab Sample ID: LCS 580-259177/6
Matrix: Water
Analysis Batch: 259177

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

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene			10.0	10.2		ug/L		102	75 - 120

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*109*		*80 - 126*
4-Bromofluorobenzene (Surr)	*98*		*75 - 125*
Dibromofluoromethane (Surr)	*101*		*77 - 120*
Toluene-d8 (Surr)	*101*		*80 - 122*
Trifluorotoluene (Surr)	*100*		*80 - 120*

Lab Sample ID: LCSD 580-259177/7
Matrix: Water
Analysis Batch: 259177

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

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene			10.0	9.92		ug/L		99	75 - 120	3	14

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

Lab Sample ID: LCSD 580-259177/7
Matrix: Water
Analysis Batch: 259177

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

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*100*		*80 - 126*
4-Bromofluorobenzene (Surr)	*103*		*75 - 125*
Dibromofluoromethane (Surr)	*98*		*77 - 120*
Toluene-d8 (Surr)	*99*		*80 - 122*
Trifluorotoluene (Surr)	*102*		*80 - 120*

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

Lab Sample ID: MB 580-258025/1-A
Matrix: Water
Analysis Batch: 258069

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 258025

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1-Methylnaphthalene	ND		0.020	0.0060	ug/L		10/04/17 09:31	10/04/17 15:44	1
2-Methylnaphthalene	ND		0.030	0.0090	ug/L		10/04/17 09:31	10/04/17 15:44	1
Acenaphthene	ND		0.020	0.0020	ug/L		10/04/17 09:31	10/04/17 15:44	1
Acenaphthylene	ND		0.020	0.0020	ug/L		10/04/17 09:31	10/04/17 15:44	1
Anthracene	ND		0.020	0.0030	ug/L		10/04/17 09:31	10/04/17 15:44	1
Benzo[a]anthracene	0.00233	J	0.020	0.0020	ug/L		10/04/17 09:31	10/04/17 15:44	1
Benzo[a]pyrene	ND		0.020	0.0030	ug/L		10/04/17 09:31	10/04/17 15:44	1
Benzo[b]fluoranthene	ND		0.020	0.0080	ug/L		10/04/17 09:31	10/04/17 15:44	1
Benzo[g,h,i]perylene	ND		0.020	0.0030	ug/L		10/04/17 09:31	10/04/17 15:44	1
Benzo[k]fluoranthene	ND		0.030	0.0090	ug/L		10/04/17 09:31	10/04/17 15:44	1
Chrysene	ND		0.020	0.0060	ug/L		10/04/17 09:31	10/04/17 15:44	1
Dibenz(a,h)anthracene	ND		0.020	0.0020	ug/L		10/04/17 09:31	10/04/17 15:44	1
Fluoranthene	0.00255	J	0.020	0.0020	ug/L		10/04/17 09:31	10/04/17 15:44	1
Fluorene	ND		0.020	0.0030	ug/L		10/04/17 09:31	10/04/17 15:44	1
Indeno[1,2,3-cd]pyrene	ND		0.020	0.0070	ug/L		10/04/17 09:31	10/04/17 15:44	1
Naphthalene	ND		0.040	0.013	ug/L		10/04/17 09:31	10/04/17 15:44	1
Phenanthrene	0.00621	J	0.020	0.0040	ug/L		10/04/17 09:31	10/04/17 15:44	1
Pyrene	ND		0.020	0.0040	ug/L		10/04/17 09:31	10/04/17 15:44	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14	*89*		*53 - 112*	*10/04/17 09:31*	*10/04/17 15:44*	*1*

Lab Sample ID: LCS 580-258025/2-A
Matrix: Water
Analysis Batch: 258069

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 258025

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1-Methylnaphthalene	4.00	2.77		ug/L		69	57 - 120
2-Methylnaphthalene	4.00	2.67		ug/L		67	61 - 120
Acenaphthene	4.00	2.86		ug/L		71	62 - 120
Acenaphthylene	4.00	3.06		ug/L		76	63 - 120
Anthracene	4.00	3.36		ug/L		84	69 - 120
Benzo[a]anthracene	4.00	3.10		ug/L		78	71 - 120
Benzo[a]pyrene	4.00	3.41		ug/L		85	76 - 120

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

Lab Sample ID: LCS 580-258025/2-A
Matrix: Water
Analysis Batch: 258069

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 258025

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Benzo[b]fluoranthene			4.00	3.15		ug/L		79	66 - 120		
Benzo[g,h,i]perylene			4.00	3.13		ug/L		78	61 - 120		
Benzo[k]fluoranthene			4.00	3.33		ug/L		83	68 - 120		
Chrysene			4.00	3.24		ug/L		81	64 - 120		
Dibenz(a,h)anthracene			4.00	3.30		ug/L		83	60 - 125		
Fluoranthene			4.00	3.72		ug/L		93	70 - 120		
Fluorene			4.00	3.03		ug/L		76	68 - 120		
Indeno[1,2,3-cd]pyrene			4.00	3.20		ug/L		80	63 - 120		
Naphthalene			4.00	2.77		ug/L		69	62 - 120		
Phenanthrene			4.00	3.08		ug/L		77	65 - 120		
Pyrene			4.00	3.66		ug/L		91	69 - 120		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Terphenyl-d14	*83*		*53 - 112*

Lab Sample ID: LCSD 580-258025/3-A
Matrix: Water
Analysis Batch: 258069

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 258025

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1-Methylnaphthalene			4.00	2.80		ug/L		70	57 - 120	1	17
2-Methylnaphthalene			4.00	2.72		ug/L		68	61 - 120	2	16
Acenaphthene			4.00	2.91		ug/L		73	62 - 120	2	13
Acenaphthylene			4.00	3.11		ug/L		78	63 - 120	2	13
Anthracene			4.00	3.53		ug/L		88	69 - 120	5	17
Benzo[a]anthracene			4.00	3.27		ug/L		82	71 - 120	5	16
Benzo[a]pyrene			4.00	3.48		ug/L		87	76 - 120	2	17
Benzo[b]fluoranthene			4.00	3.19		ug/L		80	66 - 120	1	20
Benzo[g,h,i]perylene			4.00	3.19		ug/L		80	61 - 120	2	16
Benzo[k]fluoranthene			4.00	3.48		ug/L		87	68 - 120	4	20
Chrysene			4.00	3.27		ug/L		82	64 - 120	1	16
Dibenz(a,h)anthracene			4.00	3.42		ug/L		86	60 - 125	3	15
Fluoranthene			4.00	3.83		ug/L		96	70 - 120	3	20
Fluorene			4.00	3.13		ug/L		78	68 - 120	3	12
Indeno[1,2,3-cd]pyrene			4.00	3.28		ug/L		82	63 - 120	2	15
Naphthalene			4.00	2.79		ug/L		70	62 - 120	1	15
Phenanthrene			4.00	3.21		ug/L		80	65 - 120	4	15
Pyrene			4.00	3.78		ug/L		94	69 - 120	3	17

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Terphenyl-d14	*81*		*53 - 112*

Method: AK101 - Alaska - Gasoline Range Organics (GC)

Lab Sample ID: MB 580-257914/5
Matrix: Water
Analysis Batch: 257914

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO) -C6-C10	ND		1.0	0.33	mg/L			10/03/17 21:53	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Trifluorotoluene (Surr)	*103*		*75 - 120*		*10/03/17 21:53*	*1*
4-Bromofluorobenzene (Surr)	*88*		*68 - 119*		*10/03/17 21:53*	*1*

Lab Sample ID: LCS 580-257914/6
Matrix: Water
Analysis Batch: 257914

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Gasoline Range Organics (GRO) -C6-C10	1.00	0.996	J	mg/L		100	77 - 123

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Trifluorotoluene (Surr)	*98*		*75 - 120*
4-Bromofluorobenzene (Surr)	*94*		*68 - 119*

Lab Sample ID: MB 580-258157/6
Matrix: Water
Analysis Batch: 258157

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Gasoline Range Organics (GRO) -C6-C10	ND		1.0	0.33	mg/L			10/05/17 13:36	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Trifluorotoluene (Surr)	*126*	*X*	*75 - 120*		*10/05/17 13:36*	*1*
4-Bromofluorobenzene (Surr)	*101*		*68 - 119*		*10/05/17 13:36*	*1*

Lab Sample ID: LCS 580-258157/7
Matrix: Water
Analysis Batch: 258157

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Gasoline Range Organics (GRO) -C6-C10	1.00	0.982	J	mg/L		98	77 - 123

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Trifluorotoluene (Surr)	*107*		*75 - 120*
4-Bromofluorobenzene (Surr)	*106*		*68 - 119*

Method: AK101 - Alaska - Gasoline Range Organics (GC) (Continued)

Lab Sample ID: LCSD 580-258157/8
Matrix: Water
Analysis Batch: 258157

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

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Gasoline Range Organics (GRO) -C6-C10			1.00	0.962	J	mg/L		96	77 - 123	2	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Trifluorotoluene (Surr)	*107*		*75 - 120*
4-Bromofluorobenzene (Surr)	*106*		*68 - 119*

Method: AK102 & 103 - Alaska - Diesel Range Organics & Residual Range Organics (GC)

Lab Sample ID: MB 580-258457/1-A
Matrix: Water
Analysis Batch: 258559

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 258457

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
DRO (nC10-<nC25)	0.0523	J	0.10	0.022	mg/L		10/10/17 09:08	10/11/17 15:08	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*86*		*50 - 150*	*10/10/17 09:08*	*10/11/17 15:08*	*1*

Lab Sample ID: LCS 580-258457/2-A
Matrix: Water
Analysis Batch: 258559

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 258457

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
DRO (nC10-<nC25)			2.00	1.60		mg/L		80	75 - 125

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
o-Terphenyl	*94*		*50 - 150*

Lab Sample ID: LCSD 580-258457/3-A
Matrix: Water
Analysis Batch: 258559

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 258457

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
DRO (nC10-<nC25)			2.00	1.68		mg/L		84	75 - 125	5	16

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
o-Terphenyl	*99*		*50 - 150*

Client Sample ID: 17-HLA-HC1-1008

Lab Sample ID: 580-71716-1
Date Collected: 09/27/17 11:45
Matrix: Water
Date Received: 09/29/17 12:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260C	DL	10	258077	10/05/17 20:29	W1T	TAL SEA
Total/NA	Analysis	8260C		1	258051	10/04/17 17:51	W1T	TAL SEA
Total/NA	Analysis	AK101		1	257914	10/04/17 02:08	RSB	TAL SEA
Total/NA	Prep	3510C			258457	10/10/17 09:08	NDB	TAL SEA
Total/NA	Analysis	AK102 & 103		1	258559	10/11/17 17:43	TL1	TAL SEA

Client Sample ID: 17-HLA-HC3-1009

Lab Sample ID: 580-71716-2
Date Collected: 09/27/17 10:35
Matrix: Water
Date Received: 09/29/17 12:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260C		1	258051	10/04/17 18:17	W1T	TAL SEA
Total/NA	Analysis	AK101		1	257914	10/04/17 02:40	RSB	TAL SEA
Total/NA	Prep	3510C			258457	10/10/17 09:08	NDB	TAL SEA
Total/NA	Analysis	AK102 & 103		1	258559	10/11/17 18:05	TL1	TAL SEA

Client Sample ID: 17-HLA-HC6-1010

Lab Sample ID: 580-71716-3
Date Collected: 09/27/17 13:15
Matrix: Water
Date Received: 09/29/17 12:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260C		1	258051	10/04/17 18:44	W1T	TAL SEA
Total/NA	Analysis	AK101		1	257914	10/04/17 03:44	RSB	TAL SEA
Total/NA	Prep	3510C			258457	10/10/17 09:08	NDB	TAL SEA
Total/NA	Analysis	AK102 & 103		1	258559	10/11/17 18:27	TL1	TAL SEA

Client Sample ID: 17-HLA-MW8-1012

Lab Sample ID: 580-71716-4
Date Collected: 09/27/17 13:00
Matrix: Water
Date Received: 09/29/17 12:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260C	DL	100	258077	10/05/17 20:54	W1T	TAL SEA
Total/NA	Analysis	8260C	DL	1000	258333	10/06/17 21:36	CJ	TAL SEA
Total/NA	Analysis	8260C		1	258051	10/04/17 19:09	W1T	TAL SEA
Total/NA	Prep	3510C			258025	10/04/17 09:31	NDB	TAL SEA
Total/NA	Analysis	8270D SIM		1	258069	10/04/17 23:30	TL1	TAL SEA
Total/NA	Prep	3510C	DL		258025	10/04/17 09:31	NDB	TAL SEA
Total/NA	Analysis	8270D SIM	DL	10	258195	10/05/17 14:46	CJ	TAL SEA
Total/NA	Analysis	AK101		10	258157	10/05/17 15:39	JCV	TAL SEA
Total/NA	Prep	3510C			258457	10/10/17 09:08	NDB	TAL SEA
Total/NA	Analysis	AK102 & 103		1	258559	10/11/17 19:11	TL1	TAL SEA

Client Sample ID: 17-HLA-HCZ-1013

Lab Sample ID: 580-71716-5

Date Collected: 09/27/17 13:05

Matrix: Water

Date Received: 09/29/17 12:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260C	DL	100	258077	10/05/17 21:19	W1T	TAL SEA
Total/NA	Analysis	8260C	DL	1000	258333	10/06/17 22:02	CJ	TAL SEA
Total/NA	Analysis	8260C		1	258051	10/04/17 19:35	W1T	TAL SEA
Total/NA	Prep	3510C			258025	10/04/17 09:31	NDB	TAL SEA
Total/NA	Analysis	8270D SIM		1	258069	10/04/17 23:52	TL1	TAL SEA
Total/NA	Prep	3510C	DL		258025	10/04/17 09:31	NDB	TAL SEA
Total/NA	Analysis	8270D SIM	DL	10	258195	10/05/17 15:08	CJ	TAL SEA
Total/NA	Analysis	AK101		10	258157	10/05/17 16:09	JCV	TAL SEA
Total/NA	Prep	3510C			258457	10/10/17 09:08	NDB	TAL SEA
Total/NA	Analysis	AK102 & 103		1	258559	10/11/17 19:33	TL1	TAL SEA

Client Sample ID: 17-HLA-MW8MSD-1011

Lab Sample ID: 580-71716-6

Date Collected: 09/27/17 13:00

Matrix: Water

Date Received: 09/29/17 12:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260C	DL	100	258077	10/05/17 21:44	W1T	TAL SEA
Total/NA	Analysis	8260C	DL	1000	258333	10/06/17 22:27	CJ	TAL SEA
Total/NA	Analysis	8260C		1	258051	10/04/17 20:02	W1T	TAL SEA
Total/NA	Prep	3510C			258025	10/04/17 09:31	NDB	TAL SEA
Total/NA	Analysis	8270D SIM		1	258069	10/05/17 00:14	TL1	TAL SEA
Total/NA	Prep	3510C	DL		258025	10/04/17 09:31	NDB	TAL SEA
Total/NA	Analysis	8270D SIM	DL	10	258195	10/05/17 15:30	CJ	TAL SEA
Total/NA	Analysis	AK101		10	258157	10/05/17 16:40	JCV	TAL SEA
Total/NA	Prep	3510C			258457	10/10/17 09:08	NDB	TAL SEA
Total/NA	Analysis	AK102 & 103		1	258559	10/11/17 19:55	TL1	TAL SEA

Client Sample ID: 17-HLA-TB-1000

Lab Sample ID: 580-71716-7

Date Collected: 09/27/17 10:30

Matrix: Water

Date Received: 09/29/17 12:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260C		1	258051	10/04/17 17:25	W1T	TAL SEA
Total/NA	Analysis	AK101		1	257914	10/03/17 22:57	RSB	TAL SEA

Client Sample ID: 17-HLA-MW9-1014

Lab Sample ID: 580-71716-8

Date Collected: 09/27/17 11:50

Matrix: Water

Date Received: 09/29/17 12:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260C	RA	1	258077	10/05/17 18:22	W1T	TAL SEA
Total/NA	Analysis	8260C	DL	25	259177	10/18/17 17:58	P1P	TAL SEA

Lab Chronicle

Client: ERM Alaska, Inc.
Project/Site: Alaska Horizon

TestAmerica Job ID: 580-71716-1

Client Sample ID: 17-HLA-MW9-1014

Date Collected: 09/27/17 11:50
Date Received: 09/29/17 12:30

Lab Sample ID: 580-71716-8

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260C		1	258051	10/04/17 20:28	W1T	TAL SEA
Total/NA	Analysis	AK101		1	258157	10/05/17 17:10	JCV	TAL SEA
Total/NA	Prep	3510C			258457	10/10/17 09:08	NDB	TAL SEA
Total/NA	Analysis	AK102 & 103		1	258559	10/11/17 20:18	TL1	TAL SEA

Laboratory References:

TAL SEA = TestAmerica Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: ERM Alaska, Inc.
Project/Site: Alaska Horizon

TestAmerica Job ID: 580-71716-1

Laboratory: TestAmerica Seattle

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
Alaska (UST)	State Program	10	UST-022	03-02-18
California	State Program	9	2901	01-31-18
L-A-B	DoD ELAP		L2236	01-19-19
L-A-B	ISO/IEC 17025		L2236	01-19-19
Montana (UST)	State Program	8	N/A	04-30-20
Oregon	NELAP	10	WA100007	11-05-17
US Fish & Wildlife	Federal		LE058448-0	10-31-18
USDA	Federal		P330-14-00126	02-10-20
Washington	State Program	10	C553	02-17-18

Sample Summary

Client: ERM Alaska, Inc.
Project/Site: Alaska Horizon

TestAmerica Job ID: 580-71716-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-71716-1	17-HLA-HC1-1008	Water	09/27/17 11:45	09/29/17 12:30
580-71716-2	17-HLA-HC3-1009	Water	09/27/17 10:35	09/29/17 12:30
580-71716-3	17-HLA-HC6-1010	Water	09/27/17 13:15	09/29/17 12:30
580-71716-4	17-HLA-MW8-1012	Water	09/27/17 13:00	09/29/17 12:30
580-71716-5	17-HLA-HCZ-1013	Water	09/27/17 13:05	09/29/17 12:30
580-71716-6	17-HLA-MW8MSD-1011	Water	09/27/17 13:00	09/29/17 12:30
580-71716-7	17-HLA-TB-1000	Water	09/27/17 10:30	09/29/17 12:30
580-71716-8	17-HLA-MW9-1014	Water	09/27/17 11:50	09/29/17 12:30

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Loc: 580
71716

TB AZ Cooler ___ Cor 3.0 Unc 3.7
Cooler Dsc Lg Blue @Lab ___
Wet/Packs Packing Bubble

TB AZ Cooler ___ Cor 0.3 Unc 1.0
Cooler Dsc Lg Blue @Lab ___
Wet/Packs Packing Bubble

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

9405 SW Nimbus Ave., Beaverton, OR 97008-7145 509-924-9200 FAX 924-9290
503-906-9200 FAX 906-9210
2000 W International Airport Rd Ste A10, Anchorage, AK 99502-1119 907-563-9200 FAX 563-9210

CHAIN OF CUSTODY REPORT

Work Order #:

CLIENT: Horizon/Matson
REPORT TO: ERM AK
ADDRESS: 825 W. 8th Ave
Anchorage AK 99501
PHONE: 907 2584580 FAX:

INVOICE TO: ERM AK
825 W. 8th Ave
Anchorage AK 99501
P.O. NUMBER: 0420038

PROJECT NAME: Horizon
PROJECT NUMBER: 0420038
SAMPLED BY: AS and NC

TURNAROUND REQUEST in Business Days *
Organic & Inorganic Analyses: 10 STD. | 7 | 5 | 4 | 3 | 2 | 1 | <1
Petroleum Hydrocarbon Analyses: 5 STD. | 4 | 3 | 2 | 1 | <1
OTHER Specify:
* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	PRESERVATIVE	AK101	AK102	8260B	8270 SIM	MATRIX (W, S, O)	# OF CONT.	LOCATION/ COMMENTS	TA WO ID
				HCl	HCl	HCl					
1	17-HLA-HC1-1008	27Sept2017/1145		3	2	3	—				
2	17-HLA-HC3-1009	27Sept2017/1035		3	2	3	—				
3	17-HLA-HC6-1010	27Sept2017/1315		3	2	3	—				
4	17-HLA-MW8-1012	27 AS 28Sept2017/1300		3	2	3	2				
5	17-HLA-HC2-1013	27Sept2017/1305		3	2	3	2				
6	17-HLA-MW8MSD-101	27Sept2017/1300		6	4	6	4				
7	17-HLA-TB-1000	27Sept2017/1030		3	—	3	—			trip blank	
8	17-HLA-MW9-1014	27Sept2017/1150		3	2	3	—				
9											
10											

580-71716 Chain of Custody

RELEASED BY:	Annie Swatt	DATE:	9/28/17	RECEIVED BY:	Kaitlin Strang	DATE: 9/28/17
PRINT NAME:	Annie Swatt FIRM: ERM	TIME:	0955	PRINT NAME:	Kaitlin Strang FIRM: ERM	TIME: 0955
RELEASED BY:	Kaitlin Strang	DATE:	9/28/17	RECEIVED BY:		DATE: 9/28/17
PRINT NAME:	Kaitlin Strang FIRM: ERM	TIME:	1020	PRINT NAME:	Andrew Pilg FIRM: TA-AK	TIME: 10:20

ADDITIONAL REMARKS: TA-AK 9/28/17 16:00
Dennis Beam Dennis Beam TestAmerica 9/29/2017 1230
TEMP: 4.9 PAGE OF

5.5 TAL-1000 (0714)

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Login Sample Receipt Checklist

Client: ERM Alaska, Inc.

Job Number: 580-71716-1

Login Number: 71716
List Number: 1
Creator: Hobbs, Kenneth F

List Source: TestAmerica Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	Sample ID's do not read exactly as they do on the COC
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	Preserved in lab with HCl lot# 55320
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	False	Headspace larger than 1/4".
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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APPENDIX C

Quality Assurance Report, ADEC Laboratory Checklist

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1. QUALITY ASSURANCE REPORT

Laboratory quality assurance/quality control (QA/QC) data associated with the analysis of project samples has been reviewed to evaluate the usability of the analytical data generated during the September 2017 water sampling for the Port of Anchorage Terminal Facility site.

Samples were collected, reported and shipped in general accordance with an ADEC-approved work plan (ERM, 2013). Sample analysis was performed by an Alaska Department of Environmental Conservation (ADEC) certified laboratory for applicable analytical methods.

Samples were analyzed for the following constituents:

- Gasoline range organics (GRO), Alaska (AK) Method 101;
- Diesel range organics (DRO), AK Method 102;
- Volatile organic compounds (benzene; toluene; ethylbenzene; m&p-xylene, and o-xylene), USEPA Method 8260C.
- Poly-cyclic aromatic hydrocarbons (PAH) compounds, USEPA 8270D-SIM, MW-8 samples only.

A completeness check and electronic data review was performed by the Environmental Resources Management (ERM) Project Chemist. The ADEC laboratory data checklists were also completed for this project. ERM qualifiers were added to provide further detail to the report tables in order to provide the reader/reviewer with easy access to additional details on why the result was estimated, rejected or considered not detected.

All results are considered usable for project objectives. There were a total of 103 primary and field duplicate results reported. No reported results were rejected. Some results are considered estimated due to quality control criteria not being met. The completeness for this project is 100%.

The details of this review and qualification of the data are summarized in the following sections.

1.1. Sample Handling and Chain of Custody

All sample coolers were shipped with custody seals intact. Chain of custody (CoC) forms, laboratory sample receipt forms, and case narratives were reviewed to evaluate the integrity of the samples and the quality of the associated data. All sample containers in the sample coolers were received at the laboratory intact and within the specified temperature range of 4 degrees Celsius (°C) +/- 2°C.

One sample (17-HLA-HC3-1009) was received with insufficient preservation (pH=7). This was most likely due to overfilling of the sample vial in the field to ensure zero

headspace. This sample was preserved to the appropriate pH in the laboratory within holding time compliance and before testing. No data flags were necessary.

One of six VOA vials (sample 17-HLA-HC1-1008) was received at the lab with headspace greater than ¼". When this occurs, the laboratory will use other VOA vials collected from the same location with headspace <¼" to analyze GRO and BTEX. The laboratory specified one vial was received with headspace and was not used for analyses. Laboratories have been reporting leaks in VOA vials after airplane travel as a result of firm lid septa. The Matson VOA vials left the work site with either no headspace, or headspace <¼". Many laboratories are looking into replacing these containers to minimize this issue.

One container label did not exactly match the information listed on the COC for the following samples: 17-HLA-HC3-1009 and 17-HLA-MW8-1012. One of the three VOA vials collected for sample 17-HLA-HC3-1009 did not include the hand written sample identification. Due to the packaging as a group, the laboratory successfully labeled the unlabeled sample vial. Additionally, one VOA vial in a set of three for sample 17-HLA-MW8-1012 was labeled 17-HLA-MW8-1011, by mistake. Again, due to the packaging as a group, the laboratory successfully relabeled the vial as "1012".

Samples were delivered to TestAmerica, Inc. located in Anchorage, Alaska. Samples were then subcontracted to TestAmerica, Inc. located in Tacoma, Washington. Results were reported in one job ID, 580-71716-1.

1.2. Holding Time Compliance

All samples were extracted, digested and analyzed within the holding time criteria for the applicable analytical methods and in accordance with work plan specifications, with the following exception.

The first draft of the laboratory report did not list all volatiles of interest. The second draft of the report revealed that benzene analysis was missed by TestAmerica for the sample 17-HLA-MW9-1014 during the sample analysis. ERM requested this analyte reported after receiving the report. As a result, benzene was analyzed out of holding time. Results were flagged J-H and may be biased low.

1.3. Field QA/QC

Field QA/QC protocols are designed to monitor for possible contamination during collection and transport of samples collected in the field. Collection and analysis of field duplicates facilitates an evaluation of precision that takes into account potential variables associated with sampling procedures, site heterogeneity and laboratory analyses. Trip blanks are used to monitor sample containers and possible cross-contamination of samples. Equipment blanks are used to assess potential cross-contamination by sampling equipment. Storage blanks are used to assess potential

cross-contamination during storage prior to shipment to the laboratory for analysis. During this sample event a field duplicate and a trip blank were submitted for analysis.

1.3.1. Trip Blanks

A trip blank was prepared by the laboratory, shipped to the site with the empty sample bottles/containers, stored with sample containers during the field event, and transported with the collected samples back to the laboratory for analysis. A trip blank was placed in the cooler with associated matrix specific volatile organics samples (GRO/BTEX). One trip blank was submitted for analysis. Target analytes were not detected in the trip blank.

1.3.2. Field Duplicates

There were seven primary samples submitted and one field duplicate – primary 17-HLA-MW8-1012 with duplicate 17-HLA-HCZ-1013. The primary sample and duplicate relative percent differences (RPDs) met ADEC applicable control limits of <30% between water samples, with the following exceptions noted below.

The RPD between the primary and duplicate sample exceeded the limits in Benzene (72%); Ethylbenzene (90%); o-Xylene (133%); m&p Xylene (175%); Anthracene (199%); and 1-Methylnaphthalene (161%). Results were qualified as estimated (J-D).

1.4. Laboratory QA/QC

1.4.1. Laboratory Blanks

Laboratory method blanks were analyzed concurrent with an analytical batch of 20 or fewer primary samples for each of the analytical methods performed on project samples. Target analytes were not detected (U) in the laboratory blanks, with exceptions noted below.

Benzo[a]anthracene, fluoranthene, and phenanthrene were present in the method blank (above method detection limits, but below reporting limits). This method blank was associated with samples: 17-HLA-MW8-1012, 17-HLA-HCZ-1013, and 17-HLA-MW8MSD-1011. The analytes were detected at concentrations higher than five times the method blank concentration and therefore were not flagged.

The GRO sample (17-HLA-MW9-1014, 17-HLA-MW8MSD-1011, and 17-HLA-HCZ-1013) method blank surrogate trifluorotoluene was outside of control limits (126%). GRO results for these samples were flagged J-S.

DRO was present in the method blank (above method detection limits, but below reporting limits). This method blank was associated with all samples. DRO was detected at concentrations higher than five times the method blank concentration and therefore did not warrant flags.

1.4.2. Laboratory Control Samples

The laboratory monitors internal precision and accuracy for each analytical batch with a set of laboratory control samples (LCS/LCSD). A known quantity of target analytes are added to blank laboratory control samples before extraction and analysis and recoveries are calculated. Acceptable recovery criteria vary with each analytical method and matrix. LCS/LCSD samples met laboratory and project QC goals for target analytes.

1.4.3. Matrix Spikes

Extra volumes of primary field samples were collected and submitted to the laboratory for matrix spike/matrix spike duplicate (MS/MSD) analyses. Matrix spikes have a known quantity of target analytes are added (spiked) to field samples. Spike recoveries are calculated and are used to evaluate both site conditions and laboratory quality control.

Due to field inaccuracy, the MS/MSD was recorded on the COC form and was listed as a sample, instead of designating additional sample volume submitted for MS/MSD analysis at MW8. Therefore, the laboratory reported sample results for 17-HLA-MW8MSD-1011 as a primary client sample, and not just as additional volume submitted for MS/MSD analysis. Therefore, the laboratory reported results for client sample 17-HLA-MW8MSD-1011 within the 'client sample results' section of the laboratory report should not be used. ADEC sampling guidance does not require an MS/MSD

1.4.4. Surrogates

System Monitoring Compounds (Surrogates) are specified for organic chromatographic analytical procedures. Surrogates are compounds similar to target analytes and are added to each sample prior to collection or extraction. Subsequent surrogate recovery indicates overall method performance. Surrogate recoveries were within prescribed control limits for all primary samples, method blanks, LCS/LCSD, MS/MSD, and other QA/QC samples, with the following exceptions.

The method blank surrogate trifluorotoluene was outside of control limits (126%) for samples 17-HLA-MW9-1014, 17-HLA-MW8MSD-1011, and 17-HLA-HCZ-1013. GRO results for these samples have been flagged J-S.

The GRO sample (17-HLA-MW9-1014) surrogate trifluorotoluene was outside of control limits (127%). The GRO sample (17-HLA-MW8-1012) surrogate trifluorotoluene was outside of control limits (127%). The GRO sample (17-HLA-HCZ-1013) surrogate trifluorotoluene was outside of control limits (126%). The GRO sample (17-HLA- HCZ-1013) surrogate 4-Bromofluorobenzene was outside of control limits (121%). The GRO sample (17-HLA-MW8MSD-1011) surrogate trifluorotoluene was outside of control limits (121%). Detected GRO values for these samples were flagged J-S.

1.4.5. Reporting Limits (Sensitivity)

Reporting Limits (RL) provided adequate sensitivity needed to meet project objectives.

In accordance with reporting conventions, reported positive results below the sample specific reporting limit (RL; adjusted for sample volume and dilution factors) should be considered estimated and have been flagged J on the data tables.

1.5. Precision and Accuracy

Precision criteria monitor analytical reproducibility. Precision and accuracy were evaluated by comparing LCS/LCSDs and field duplicate pairs for this project. Field duplicate samples were collected in accordance with work plan specifications. Field duplicate RPDs met applicable control limits. Recoveries and RPDs for all LCS/LSCD samples were within required limits.

1.5.1. Completeness

Data completeness is defined as the percentage of usable data (usable data divided by the total possible data). The overall project completeness goal is 90%:

$$\% \text{ completeness} = \frac{\text{number of valid (i.e., non-R flagged) results}}{\text{number of possible results}}$$

All requested analyses were performed in accordance with Work Plan specifications. No sample results were rejected, noting that sample results for sample 17-HLA-MW8MSD-1011 should not be used due to the laboratory reporting results for submitted MS/MSD sample. All primary samples that were submitted were analyzed; therefore, completeness for this project is 100%.

1.5.2. Representativeness

Data representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or environmental condition. The number and selection of samples were specified in the work plan and verified in the field to accurately account for site variations and sample matrices. The data quality objective (DQO) for representativeness was met.

1.5.3. Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data produced for this project followed applicable field sampling techniques and specific analytical methodology. The DQO for comparability was met.

1.6. Data Summary

In general, the overall quality of the data was acceptable. The USEPA National Functional Guidelines (USEPA 2008) were used to evaluate the acceptability of the data. The data quality was individually determined as acceptable or estimated. Acceptable data are associated with QC data that meet all QC criteria or with QC samples that did not meet QC criteria but data quality objectives were not affected. Estimated results,

flagged with J, are considered inaccurate due to a bias created by matrix interference or QC acceptance criteria which were not met. No reported results were rejected. The data are suitable for their intended use.

2. REFERENCES

ADEC. 2009. *Technical Memorandum: Environmental Laboratory Data and Quality Assurance Requirements.* March 2009.

ADEC. 2017. *Laboratory Data Review Checklist.* July 2017.

ADEC. 2012. *Technical Memorandum: Guidelines for Data Reporting, Data Reduction, and Treatment of Non-detect Values.* June.

ADEC. 2017. *Field Sampling Guidance.* Alaska Department of Environmental Conservation. August 2017.

USEPA. 2008. *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA 540-R-08-01). June 2008.

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Laboratory Data Review Checklist

Completed By:

Annie Surratt

Title:

ERM Staff Scientist

Date:

October 20, 2017

CS Report Name:

2017 Long – Term Monitoring Report, Port of Anchorage Terminal Facility, Horizon Lines of Alaska, LLC.

Report Date:

December 2017

Consultant Firm:

ERM Alaska, Inc.

Laboratory Name:

TestAmerica, Inc.

Laboratory Report Number:

580-71716-1

ADEC File Number:

2100.26.238

Hazard Identification Number:

23666

580-71716-1

1. Laboratory

   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

   ☉ Yes ○ No Comments:

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?

   ☉ Yes ○ No Comments:

   All samples were transferred from TestAmerica Anchorage to TestAmerica Seattle and analyzed by TestAmerica Seattle.

2. Chain of Custody (CoC)

   a. CoC information completed, signed, and dated (including released/received by)?

   ☉ Yes ○ No Comments:

   b. Correct Analyses requested?

   ☉ Yes ○ No Comments:

3. Laboratory Sample Receipt Documentation

   a. Sample/cooler temperature documented and within range at receipt (0° to 6° C)?

   ☉ Yes ○ No Comments:

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

   ○ Yes ☉ No Comments:

   One sample (17-HLA-HC3-1009) was received with insufficient preservation (pH=7). This was most likely due to overfilling the sample vial in the field to ensure zero headspace. The sample was preserved to the appropriate pH in the laboratory within holding time compliance and before testing. No data flags were necessary.

   c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?

   ☉ Yes ○ No Comments:

   The samples arrived in good condition and were unbroken. One VOA vial (sample 17-HLA-HC1-1008) was received at the lab with headspace greater than ¼". The laboratory confirmed they did not use this vial in analyses.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

◉ Yes ○ No Comments:

Container labels did not exactly match the information listed in the COC for the following samples: 17-HLA-HC3-1009 and 17-HLA-MW8-1012. The laboratory successfully sorted the samples despite the label discrepancy and the correct tests were performed.

e. Data quality or usability affected?

Comments:

Data quality or usability was not affected.

4. Case Narrative

a. Present and understandable?

◉ Yes ○ No Comments:

b. Discrepancies, errors, or QC failures identified by the lab?

◉ Yes ○ No Comments:

c. Were all corrective actions documented?

◉ Yes ○ No Comments:

d. What is the effect on data quality/usability according to the case narrative?

Comments:

Data quality and usability were not affected.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

◉ Yes ○ No Comments:

The first draft of the report did not include all VOCs. The second draft of the report revealed that benzene analysis was missed for the sample 17-HLA-MW9-1014 until ERM requested this analyte reported. As a result, benzene was analyzed out of holding time. Results were flagged J-H.

b. All applicable holding times met?

○ Yes ◉ No Comments:

Benzene was analyzed outside of holding time in sample 17-HLA-MW9-1014 and flagged J-H.

c. All soils reported on a dry weight basis?

○ Yes ○ No Comments:

NA. There were no soils in this data package.

d. Are the reported LOQs less than the Cleanup Level or the minimum required detection level for the project?

◉ Yes ○ No Comments:

e. Data quality or usability affected?

○ Yes ○ No Comments:

Data quality and usability were not affected.

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

◉ Yes ○ No Comments:

ii. All method blank results less than limit of quantitation (LOQ)?

◉ Yes ○ No Comments:

iii. If above LOQ, what samples are affected?

Comments:

NA. All method blank results were below LOQ.

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

◉ Yes ○ No Comments:

NA. All method blank results were below LOQ.

v. Data quality or usability affected?

Comments:

Data quality and usability is somewhat affected with respect to the reported method blank results. Benzo[a]anthracene, fluoranthene, and phenanthrene were present in the method blank (above the MDL, but below the RL). This method blank was associated with samples: 17-HLA-MW8-1012, 17-HLA-HCZ-1013, and 17-HLA-MW8MSD-1011. The analytes were detected at concentrations higher than 5 times the method blank concentration and therefore do not warrant flags.

The GRO sample (17-HLA-MW9-1014, 17-HLA-MW8MSD-1011, and 17-HLA-HCZ-1013) method blank surrogate trifluorotoluene was outside of control limits (126%). GRO results for these samples were flagged J-S.

DRO was present in the method blank (above the MDL, but below the RL). This method blank was associated with all samples. DRO was detected at concentrations higher than 5 times the method blank concentration and therefore did not warrant flags.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

◉ Yes ○ No Comments:

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

○ Yes ○ No Comments:

NA. No metals/inorganics analyses requested.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

◉ Yes ○ No Comments:

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

◉ Yes ○ No Comments:

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

NA. LCS/LCSD %R and RPD are within acceptable limits.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

○ Yes ○ No Comments:

NA. LCS/LCSD %R and RPD are within acceptable limits.

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

Data quality and usability was not affected. The LCS/LCSD was used to assess accuracy.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?

● Yes ○ No Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

○ Yes ● No Comments:

The method blank surrogate trifluorotoluene was outside of control limits (126%). Lab sample ID MB 580-258157/6. The GRO sample (17-HLA-MW9-1014) surrogate trifluorotoluene was outside of control limits (127%). The GRO sample (17-HLA-MW8-1012) surrogate trifluorotoluene was outside of control limits (127%). The GRO sample (17-HLA-HCZ-1013) surrogate trifluorotoluene was outside of control limits (126%). The GRO sample (17-HLA- HCZ-1013) surrogate 4-Bromofluorobenzene was outside of control limits (121%). The GRO sample (17-HLA-MW8MSD-1011) surrogate trifluorotoluene was outside of control limits (121%). Detected GRO values for these samples were flagged J-S.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

● Yes ○ No Comments:

iv. Data quality or usability affected?

Comments:

Data quality and usability was somewhat affected. As mentioned above, GRO results with associated high surrogate percent recoveries were flagged J-S.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples?
(If not, enter explanation below.)

◉ Yes ○ No Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

◉ Yes ○ No Comments:

iii. All results less than LOQ?

◉ Yes ○ No Comments:

iv. If above LOQ, what samples are affected?

Comments:

NA. All results were below LOQ.

v. Data quality or usability affected?

Comments:

Data quality and usability were not affected.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

◉ Yes ○ No Comments:

Primary 17-HLA-MW8-1012 and FD 17-HLA-HCZ-1013.

ii. Submitted blind to lab?

◉ Yes ○ No Comments:

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

RPD (%) = Absolute value of: $\frac{(R_1-R_2)}{((R_1+R_2)/2)} \times 100$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☐ Yes ☒ No Comments:

Benzene (72%), ethylbenzene (90%), o-xylene (133%), m & p-xylene (175%), anthracene (199%), 1-methylnapthalene (161%). These samples were flagged J-D. Only those with detected values were calculated.

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

Data quality and usability is somewhat affected, with some results qualified as estimated (J-D).

f. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below).

☐ Yes ☐ No ☒ Not Applicable

i. All results less than LOQ?

☐ Yes ☐ No Comments:

NA. Decontamination or equipment blanks were not required.

ii. If above LOQ, what samples are affected?

Comments:

NA. Decontamination or equipment blanks were not required.

iii. Data quality or usability affected?

Comments:

NA. Decontamination or equipment blanks were not required.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

☒ Yes ☐ No Comments:

Lab specific qualifiers are defined within the qualifier section of the laboratory report.

APPENDIX D

Conceptual Site Model

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Print Form

Appendix D - Human Health Conceptual Site Model Scoping Form and Standardized Graphic

Site Name: CSX Lines, LLC - formerly Sealand Freight Services Inc.

File Number: 2100.26.238

Completed by: Kate Acker

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources *(check potential sources at the site)*

- ☒ USTs
- ☐ ASTs
- ☐ Dispensers/fuel loading racks
- ☐ Drums
- ☐ Vehicles
- ☐ Landfills
- ☐ Transformers
- ☐ Other:

Release Mechanisms *(check potential release mechanisms at the site)*

- ☒ Spills
- ☒ Leaks
- ☐ Direct discharge
- ☐ Burning
- ☐ Other:

Impacted Media *(check potentially-impacted media at the site)*

- ☐ Surface soil (0-2 feet bgs*)
- ☒ Subsurface soil (>2 feet bgs)
- ☐ Air
- ☐ Sediment
- ☒ Groundwater
- ☐ Surface water
- ☐ Biota
- ☐ Other:

Receptors *(check receptors that could be affected by contamination at the site)*

- ☐ Residents (adult or child)
- ☒ Commercial or industrial worker
- ☒ Construction worker
- ☐ Subsistence harvester (i.e. gathers wild foods)
- ☐ Subsistence consumer (i.e. eats wild foods)
- ☒ Site visitor
- ☒ Trespasser
- ☐ Recreational user
- ☐ Farmer
- ☐ Other:

* bgs - below ground surface

2. Exposure Pathways: *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) Direct Contact -

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.) ☒

If the box is checked, label this pathway complete: Complete

Comments:

Contamination is present between 0-15 feet below ground surface. However, the area of contamination is under a paved parking lot and road-way. For incidental soil ingestion to occur the asphalt would have to be removed or disturbed.

2. Dermal Absorption of Contaminants from Soil

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☒

Can the soil contaminants permeate the skin (see Appendix B in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

Several constituents of diesel fuel are recognized as a potential risk for dermal exposure. Naphthalene, 1-Methylnaphthalene, and 2-Methylnaphthaleneand are present in groundwater at the site, below the 18 AAC 75, Table C criteria, but above the screening level of 1/10th. Acenaphthene, Fluorene, and Phenanthrene exist below the ADEC screening level. The soil concentrations for these constituents are

b) Ingestion -

1. Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, or are contaminants expected to migrate to groundwater in the future? ☒

Could the potentially affected groundwater be used as a current or future drinking water source? Please note, only leave the box unchecked if DEC has determined the ground-water is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350. ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future? ☐

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities). ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

The nearest surface water body, Cook Inlet, could not be used as a current or future drinking water source, due to salinity.

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods? ☐

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)? ☒

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.) ☒

If all of the boxes are checked, label this pathway complete: Incomplete

Comments:

Phenanthrene was detected above the ADEC 1/10 screening level and below the 18 AAC 75.345, Table C groundwater cleanup levels. Benzo[a]pyrene, Benzo[b]fluoranthene, and Benzo[k]fluoranthene were not detected, however the method detection limits were below the 1/10th screening level.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☒

Are the contaminants in soil volatile (see Appendix D in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

The area of contamination is paved and located adjacent to a building which is used as an auto shop, warehouse and for vehicle fueling.

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures) ☒

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

The adjacent building is used as an auto shop, warehouse and for vehicle fueling.

3. **Additional Exposure Pathways:** *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are deemed protective of this pathway because dermal absorption is incorporated into the groundwater exposure equation for residential uses.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Exposure to groundwater could occur during construction activities. Contaminant concentrations in groundwater exceed the ADEC groundwater cleanup levels in 18 AAC 75, Table C.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

DEC groundwater cleanup levels in 18 AAC 75, Table C are protective of this pathway because the inhalation of vapors during normal household activities is incorporated into the groundwater exposure equation.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

The contaminants of concern are volatile but are not used for household purposes.

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers (Particulate Matter - PM_{10}). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.

DEC human health soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because the inhalation of particulates is incorporated into the soil exposure equation.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Nonvolatile compounds are not found in the top 2 centimeters of soil. The area is currently paved.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- Climate permits recreational activities around sediment.
- The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Sediment is not present at the site.

4. Other Comments *(Provide other comments as necessary to support the information provided in this form.)*

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HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: CSX Lines, LLC - Formerly Sealand Freight Services, Inc.

Completed By: Kate Acker

Date Completed: 12/22/2017

***Instructions*: Follow the numbered directions below. Do not consider contaminant concentrations or engineering/land use controls when describing pathways.**

(1) *Check the media that could be directly affected by the release.*

(2) *For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Check additional media under (1) if the media acts as a secondary source.*

Media	Transport Mechanisms	check
☐ Surface Soil (0-2 ft bgs)	Direct release to surface soil	check soil
	☐ Migration to subsurface	check soil
	☐ Migration to groundwater	check groundwater
	☐ Volatilization	check air
	☐ Runoff or erosion	check surface water
	☐ Uptake by plants or animals	check biota
	☐ Other (list):	
☑ Subsurface Soil (2-15 ft bgs)	Direct release to subsurface soil	check soil
	☑ Migration to groundwater	check groundwater
	☑ Volatilization	check air
	☐ Uptake by plants or animals	check biota
	☐ Other (list):	
☑ Ground-water	Direct release to groundwater	check groundwater
	☑ Volatilization	check air
	☐ Flow to surface water body	check surface water
	☐ Flow to sediment	check sediment
	☐ Uptake by plants or animals	check biota
	☐ Other (list):	
☐ Surface Water	Direct release to surface water	check surface water
	☐ Volatilization	check air
	☐ Sedimentation	check sediment
	☐ Uptake by plants or animals	check biota
	☐ Other (list):	
☐ Sediment	Direct release to sediment	check sediment
	☐ Resuspension, runoff, or erosion	check surface water
	☐ Uptake by plants or animals	check biota
	☐ Other (list):	

(3) *Check all exposure media identified in (2).*

(4) *Check all pathways that could be complete. The pathways identified in this column **must** agree with Sections 2 and 3 of the Human Health CSM Scoping Form.*

(5) *Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors, "F" for future receptors, "C/F" for both current and future receptors, or "I" for insignificant exposure.*

Current & Future Receptors

Exposure Media	Exposure Pathway/Route	Residents (adults or children)	Commercial or industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
☑ soil	☑ Incidental Soil Ingestion				F			
	☑ Dermal Absorption of Contaminants from Soil				F			
	☐ Inhalation of Fugitive Dust							
☑ groundwater	☑ Ingestion of Groundwater				F			
	☑ Dermal Absorption of Contaminants in Groundwater				F			
	☐ Inhalation of Volatile Compounds in Tap Water							
☑ air	☑ Inhalation of Outdoor Air		F	F	F			
	☑ Inhalation of Indoor Air		C/F	C/F	C/F			
	☐ Inhalation of Fugitive Dust							
☐ surface water	☐ Ingestion of Surface Water							
	☐ Dermal Absorption of Contaminants in Surface Water							
	☐ Inhalation of Volatile Compounds in Tap Water							
☐ sediment	☐ Direct Contact with Sediment							
☐ biota	☐ Ingestion of Wild or Farmed Foods							

Revised, 10/01/2010

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APPENDIX E

Mann Kendall Analysis

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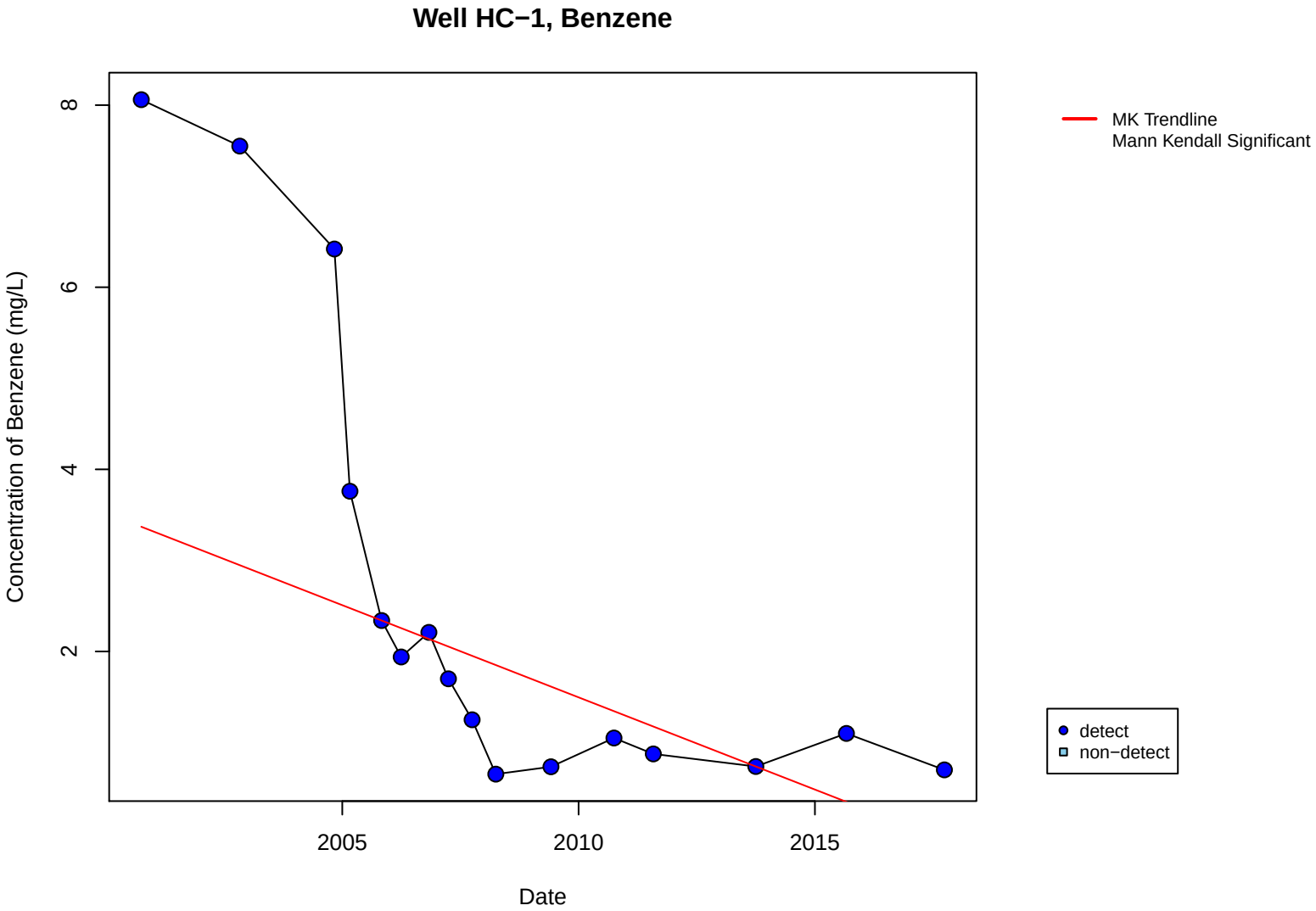
Well HC−1, Benzene
Concentration of Benzene (mg/L)
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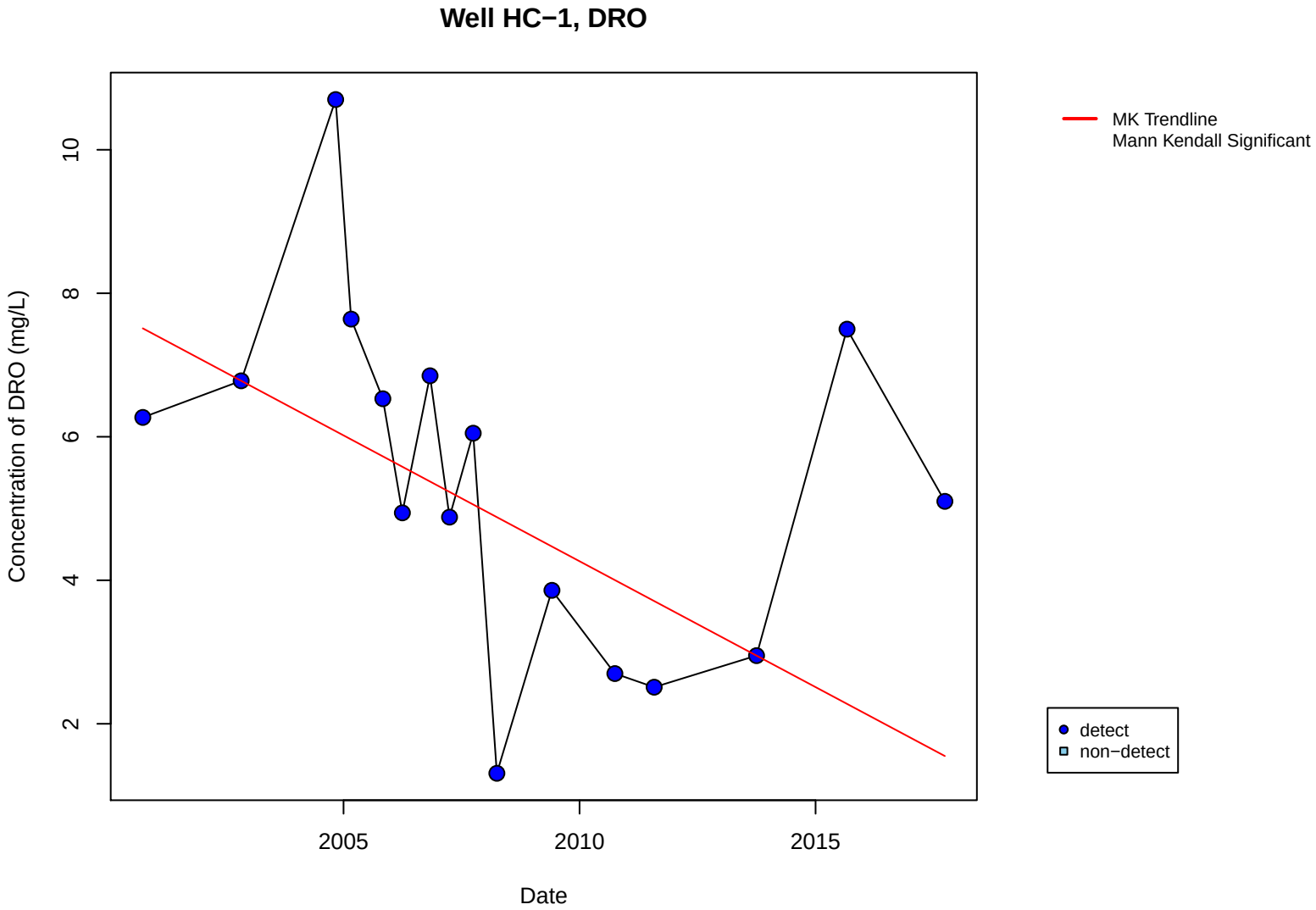
4
6
8
2005
2010
2015
Date
MK Trendline
Mann Kendall Significant
detect
non−detect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Concentration of DRO (mg/L)
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4
6
8
10
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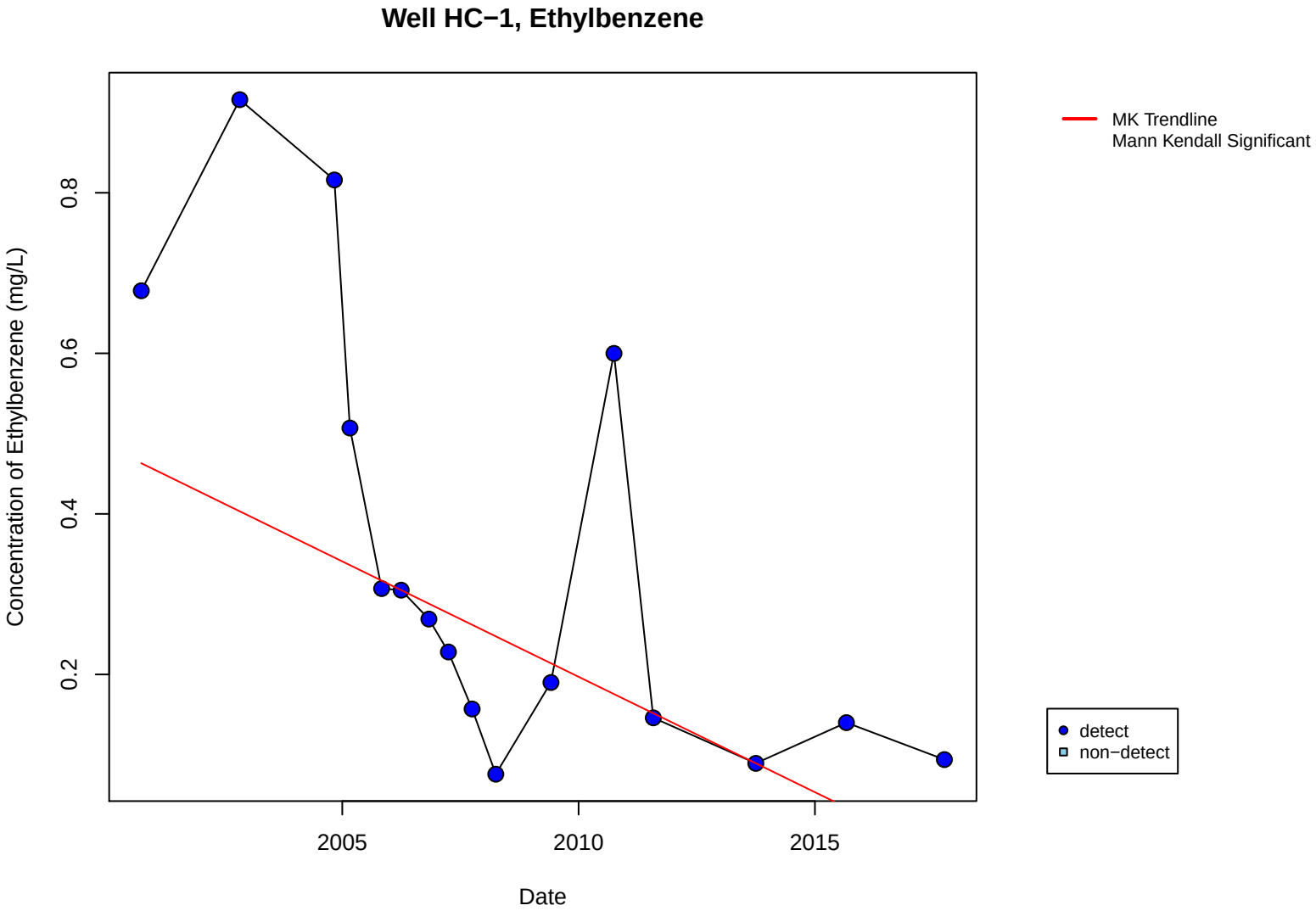
2010
2015
Date
MK Trendline
Mann Kendall Significant
detect
non−detect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Concentration of Ethylbenzene (mg/L)
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0.4
0.6
0.8
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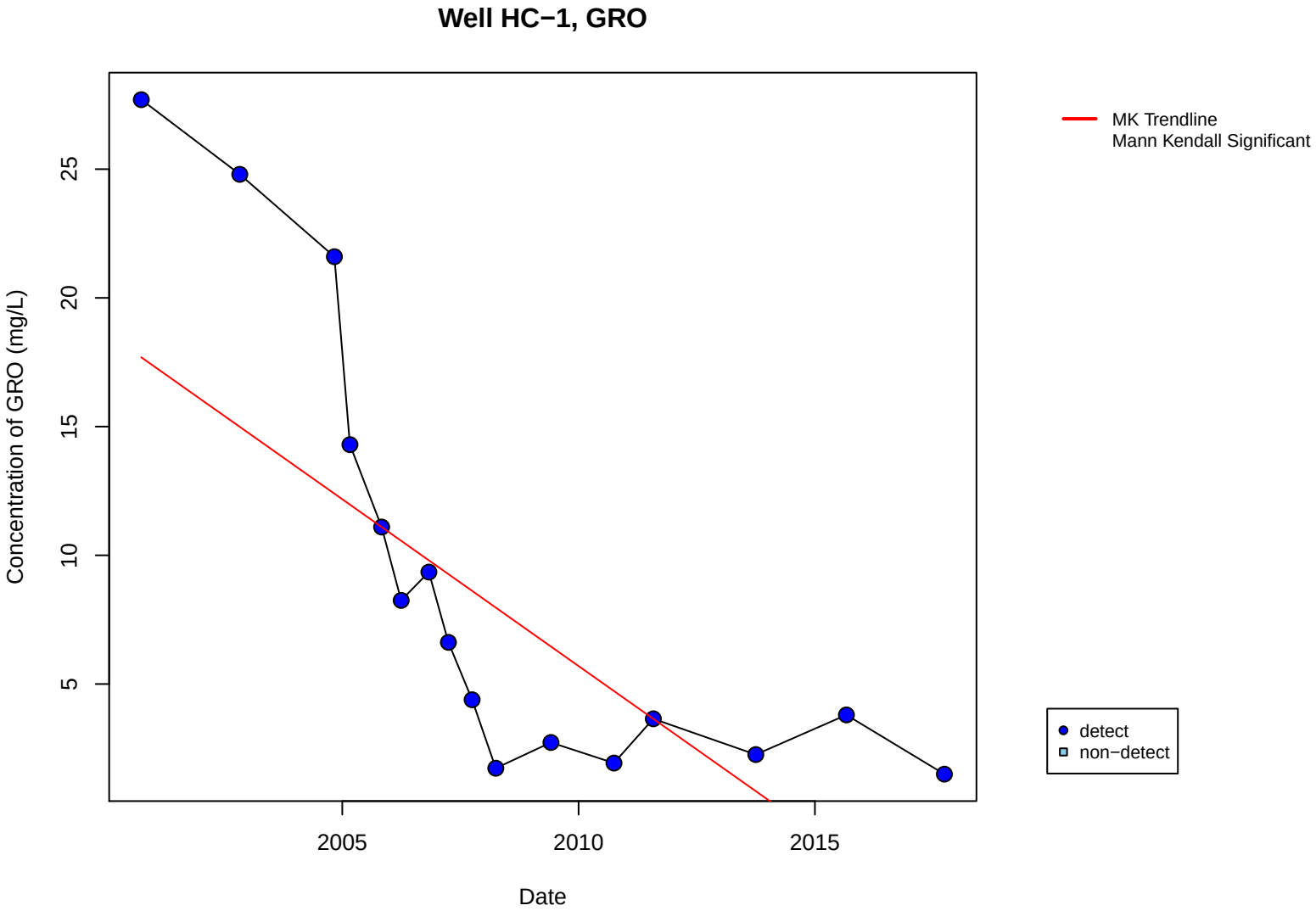
2010
2015
Date
MK Trendline
Mann Kendall Significant
detect
non−detect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10
15
20
25
2005
2010
2015
Date
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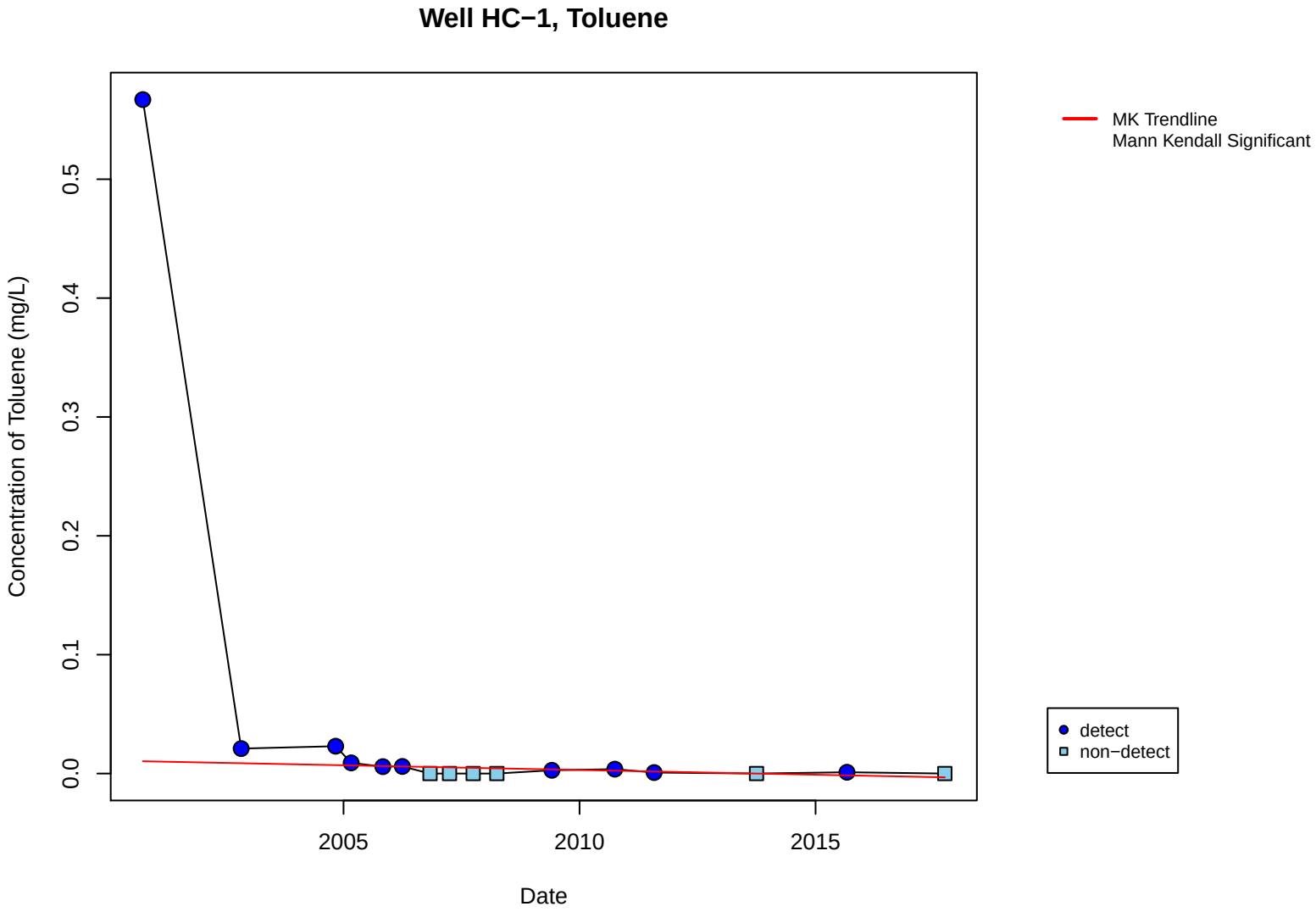
Mann Kendall Significant
detect
non−detect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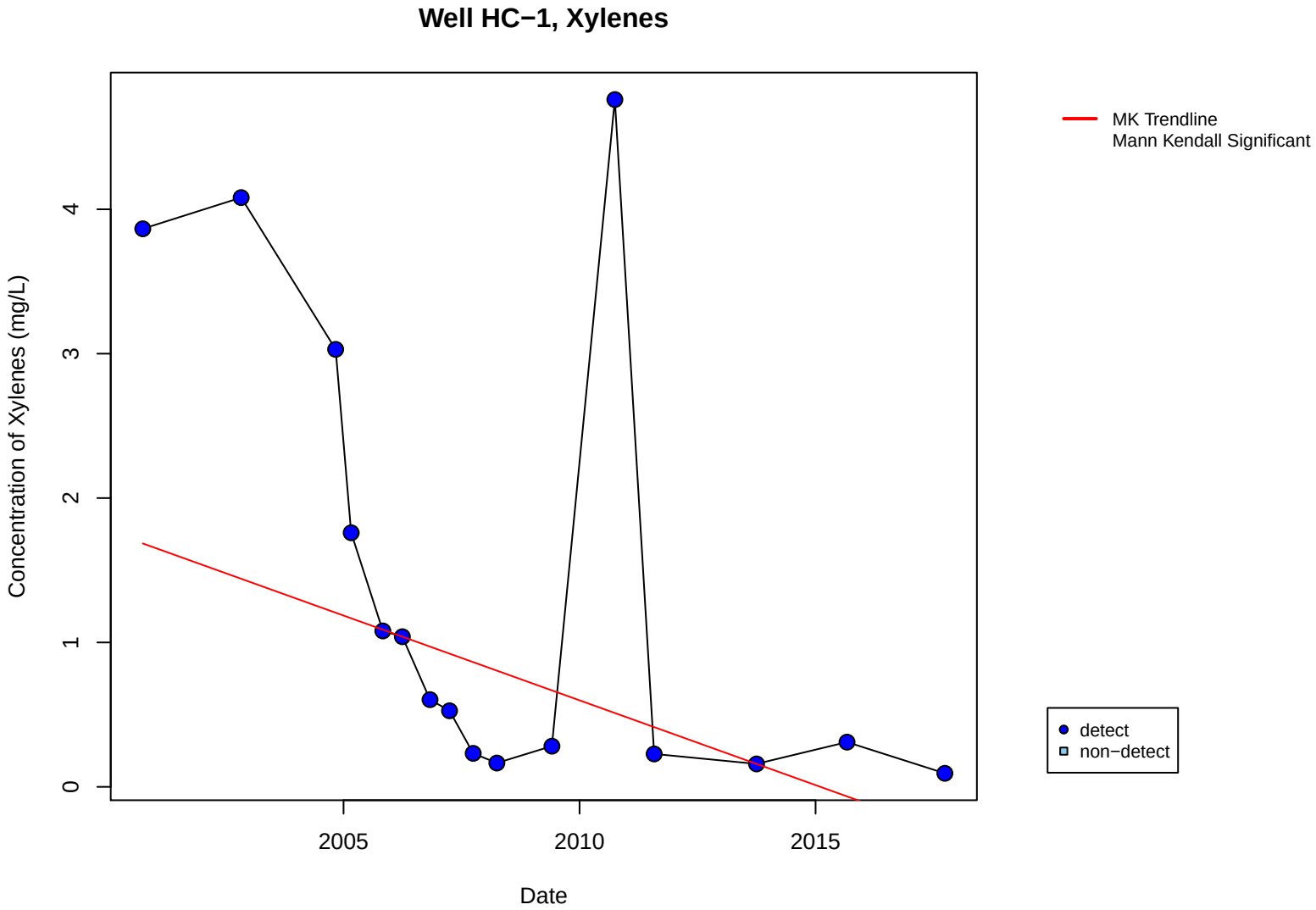
0.3
0.4
0.5
2005
2010
2015
Date
MK Trendline
Mann Kendall Significant
detect
non−detect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2
3
4
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2010
2015
Date
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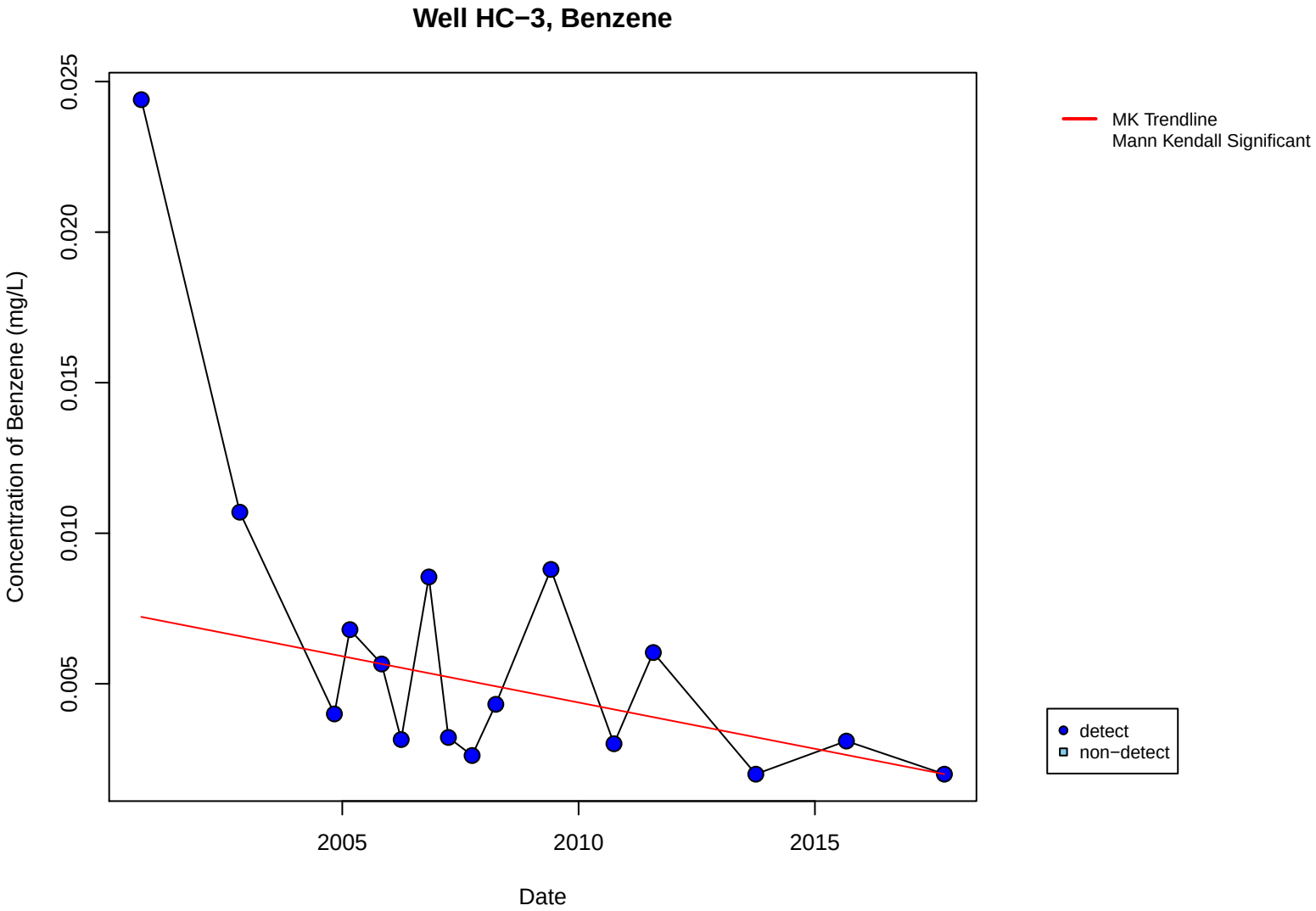
Mann Kendall Significant
detect
non−detect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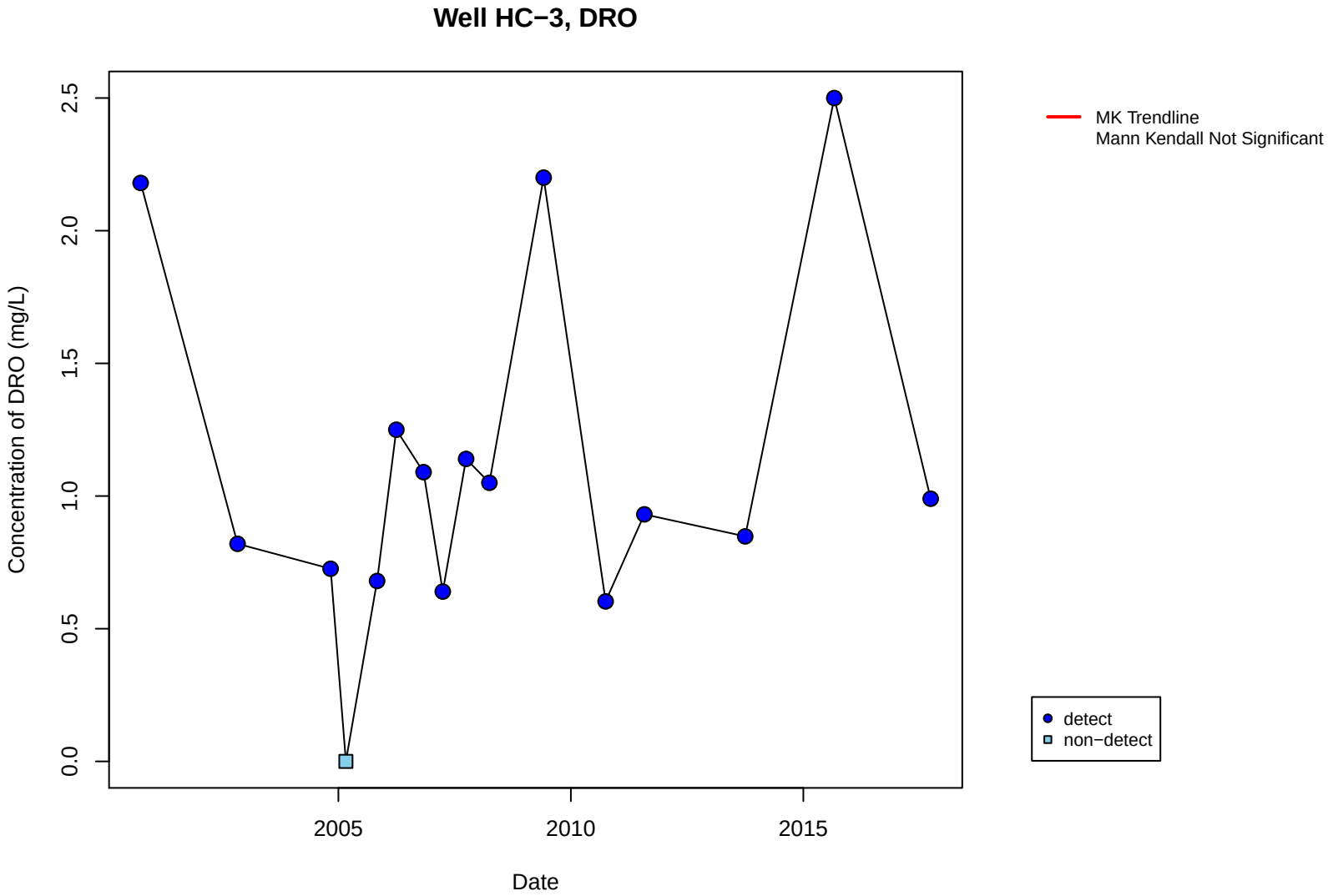
2010
2015
Date
MK Trendline
Mann Kendall Significant
detect
non−detect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Concentration of DRO (mg/L)
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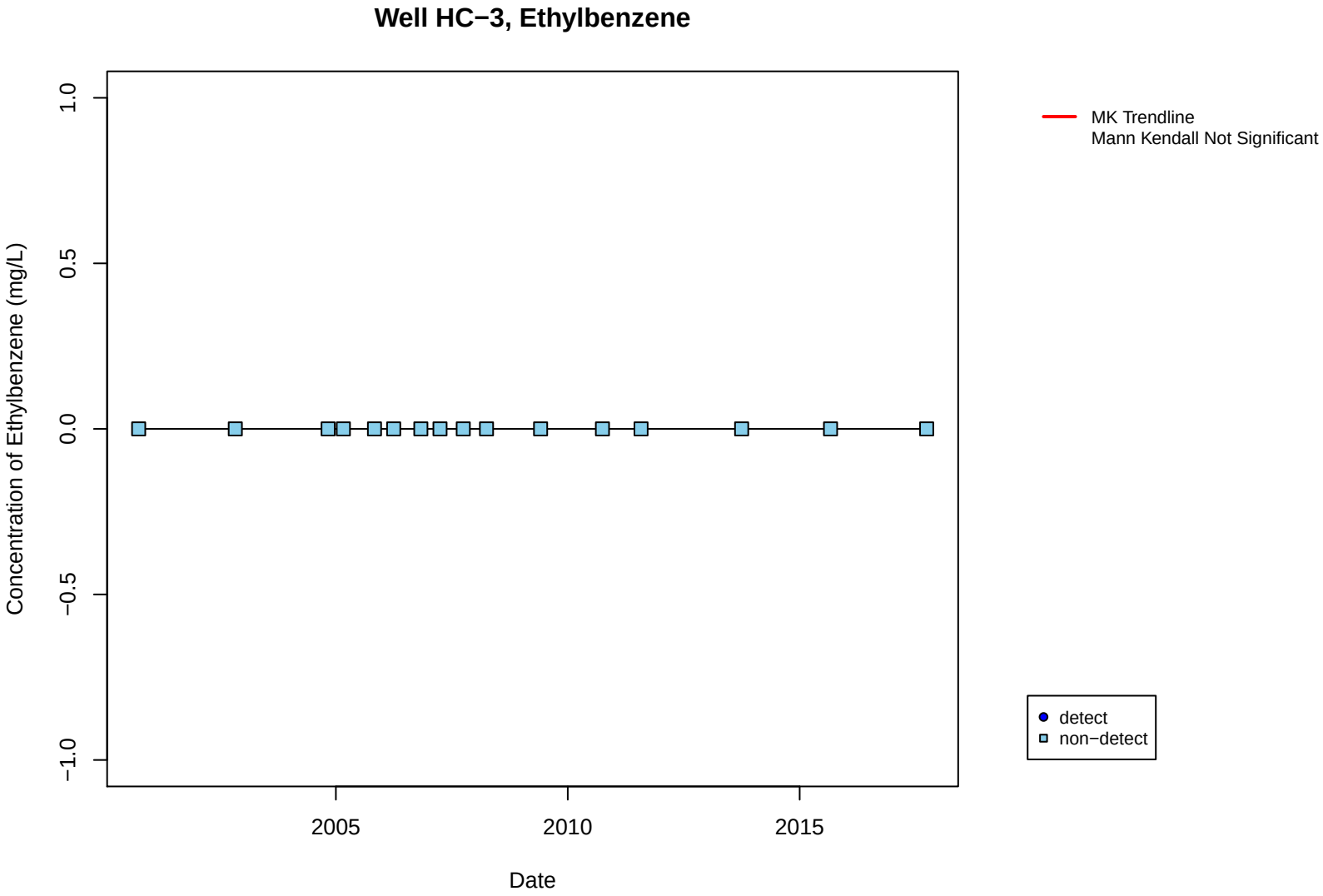
2.0
2.5
2005
2010
2015
Date
MK Trendline
Mann Kendall Not Significant
detect
non−detect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Concentration of Ethylbenzene (mg/L)
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−0.5
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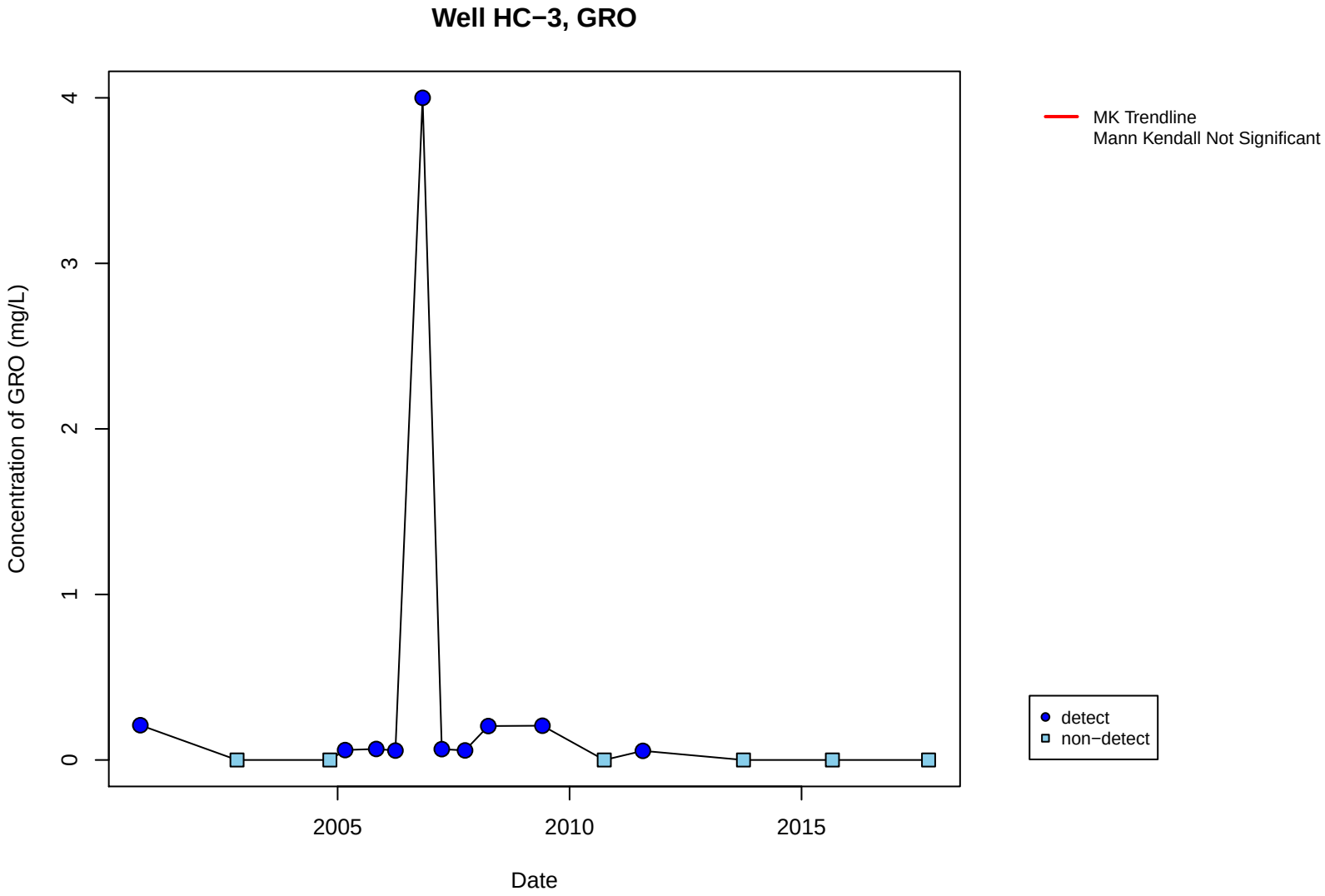
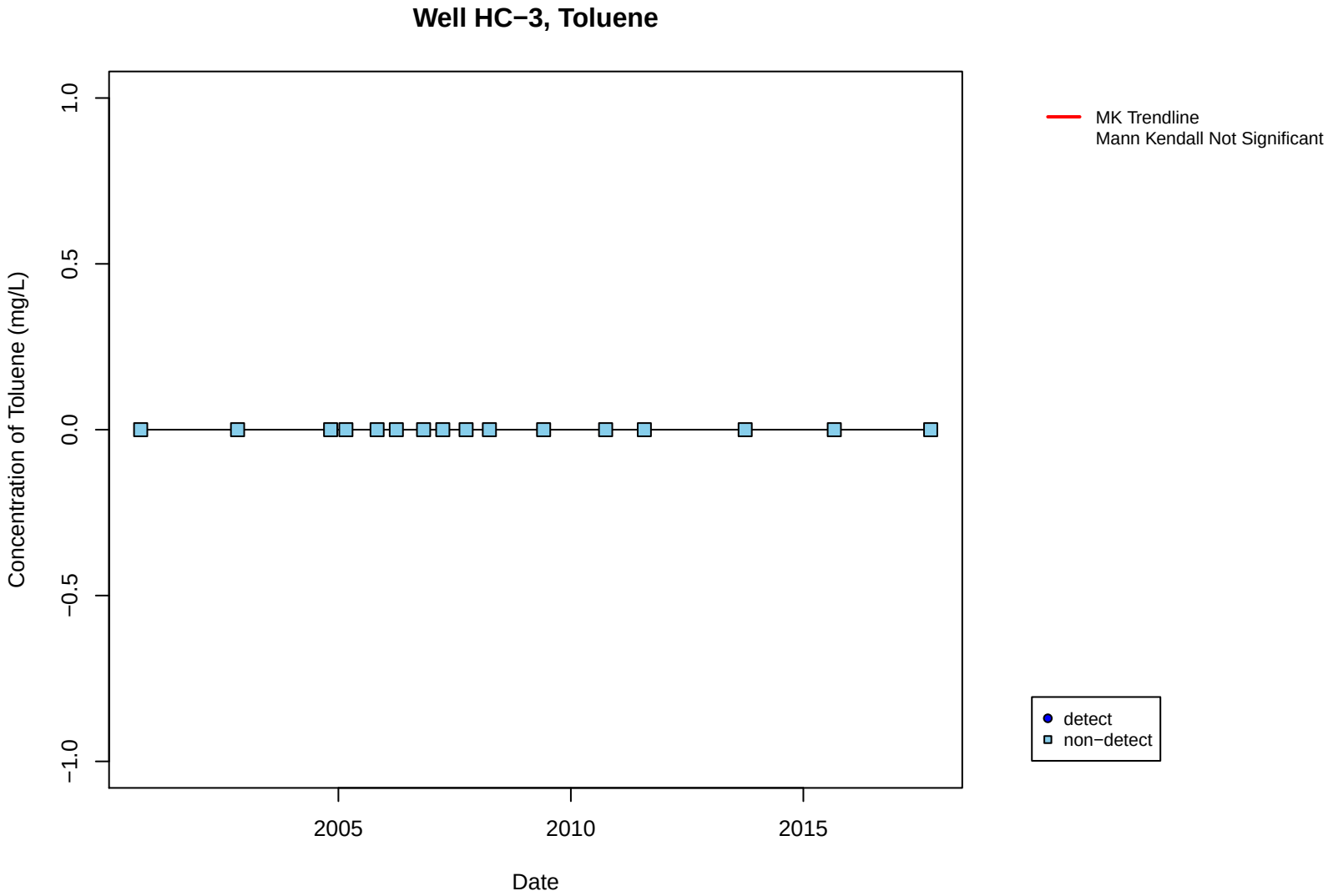
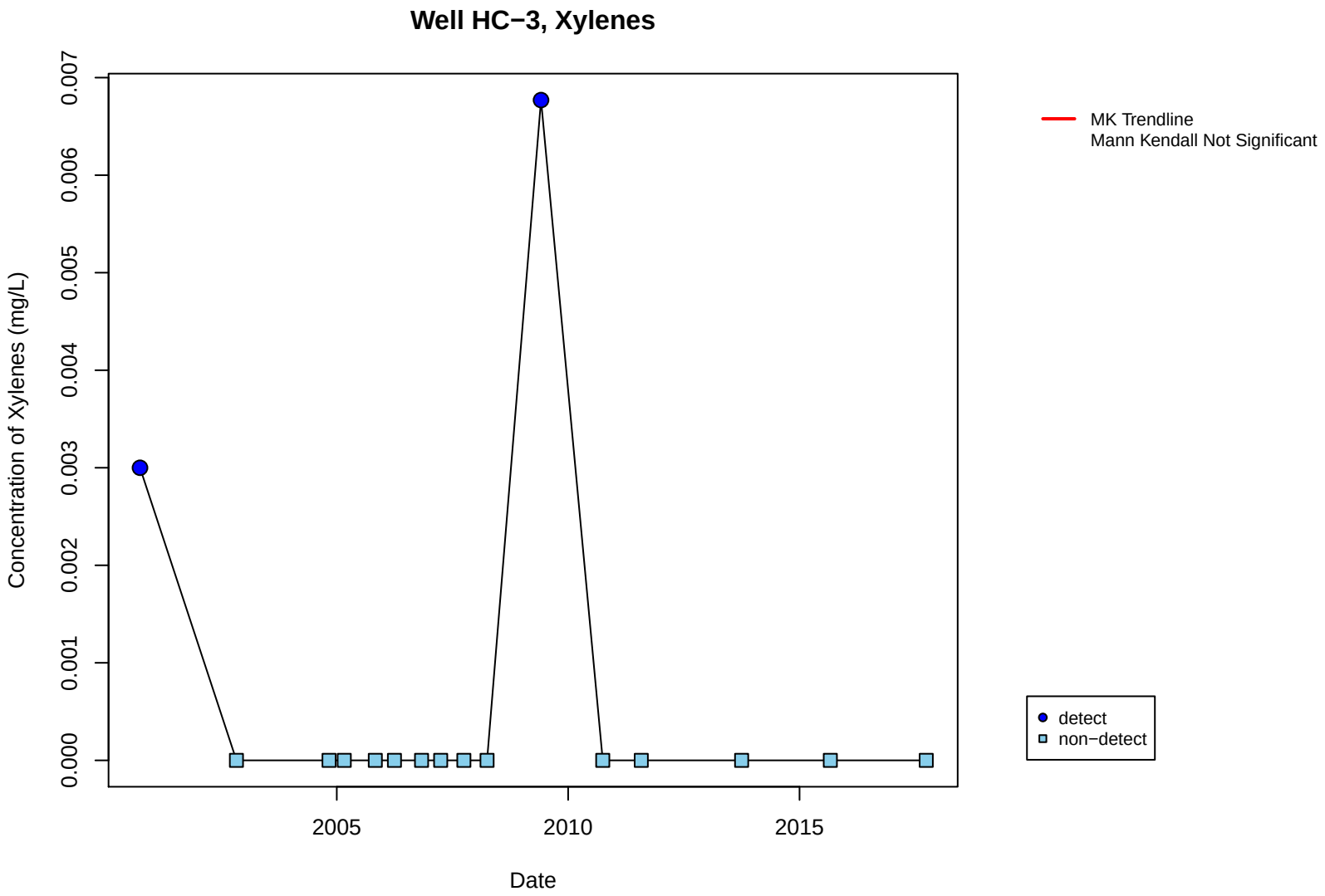
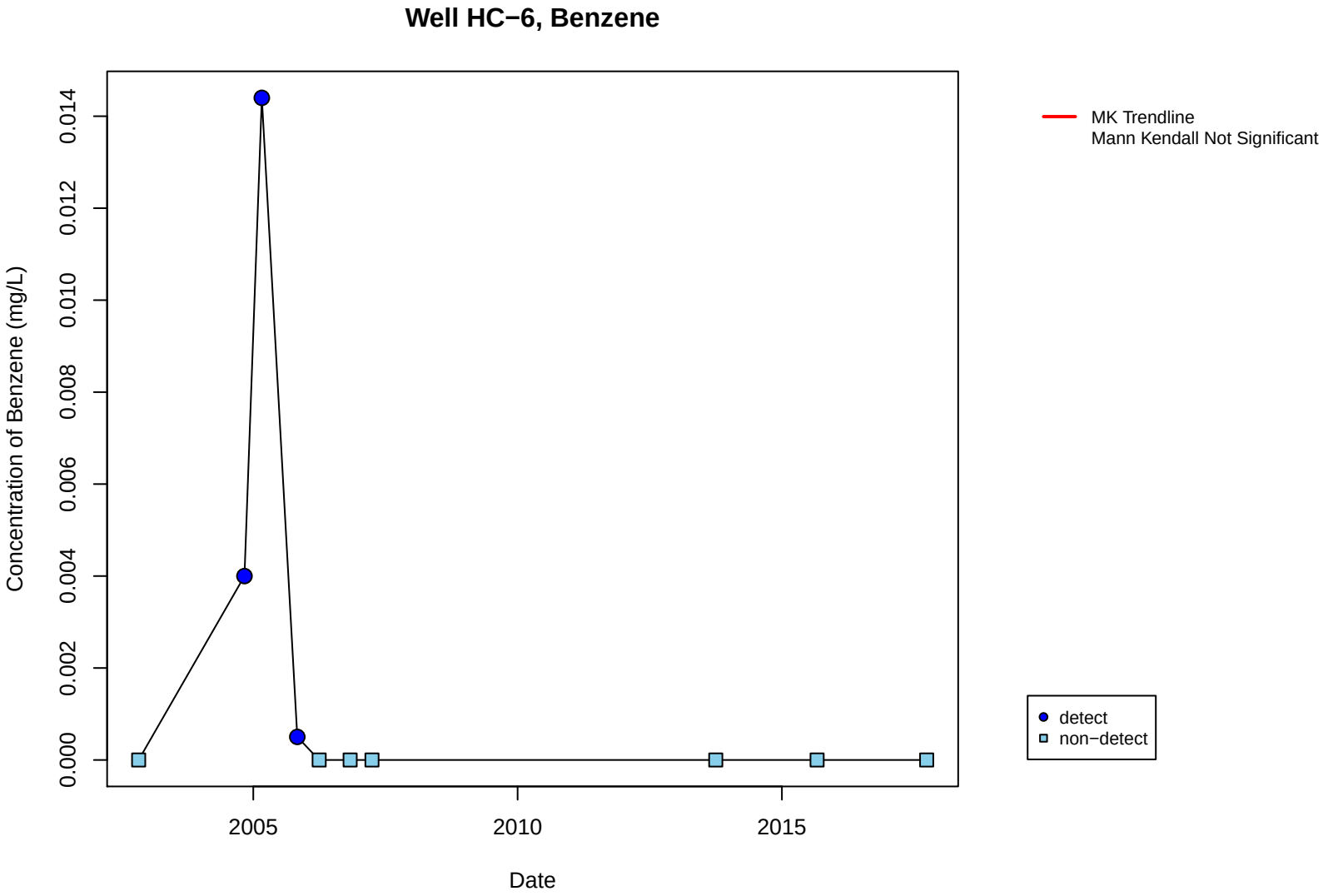
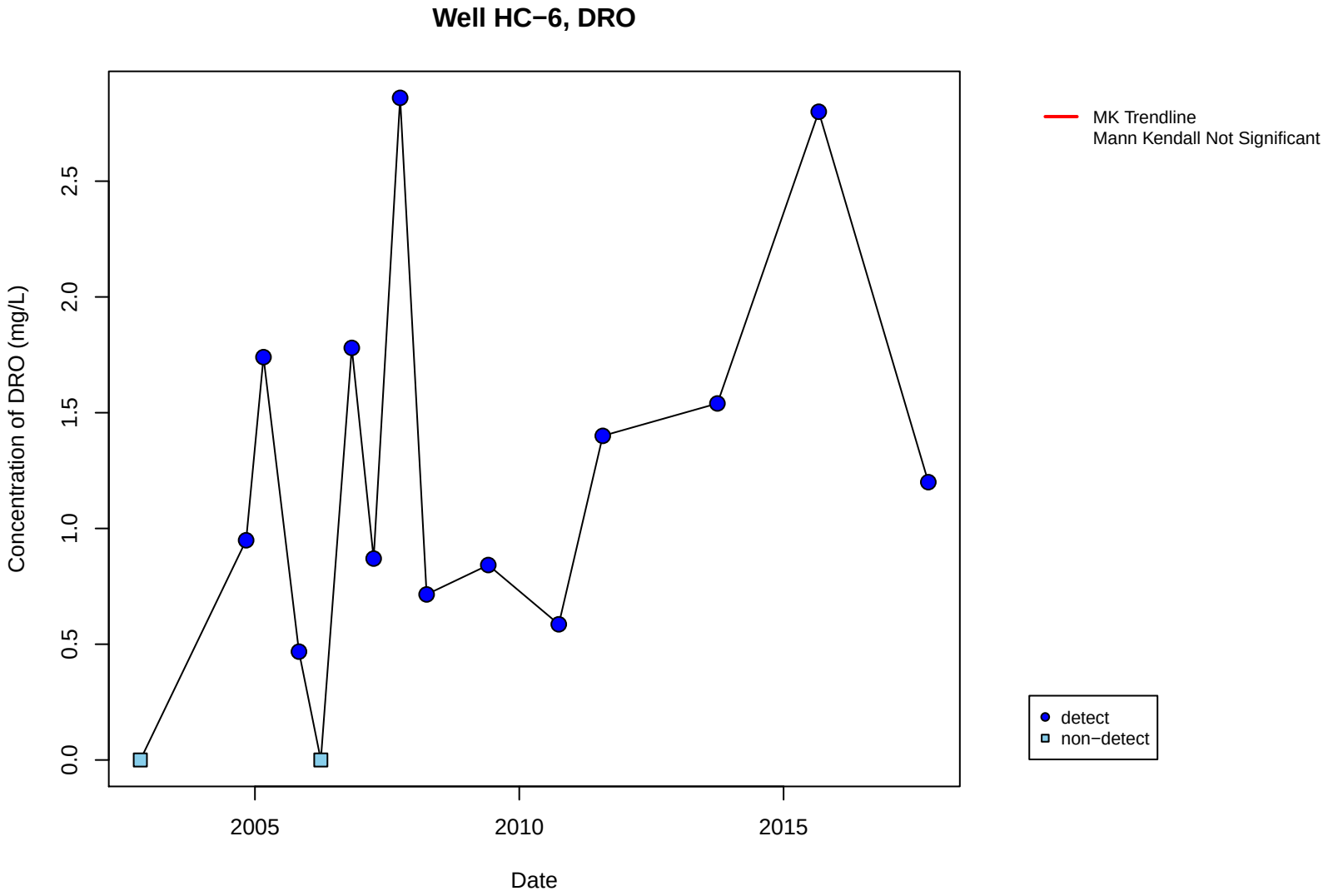
2005
2010
2015
Date
MK Trendline
Mann Kendall Not Significant
detect
non−detect

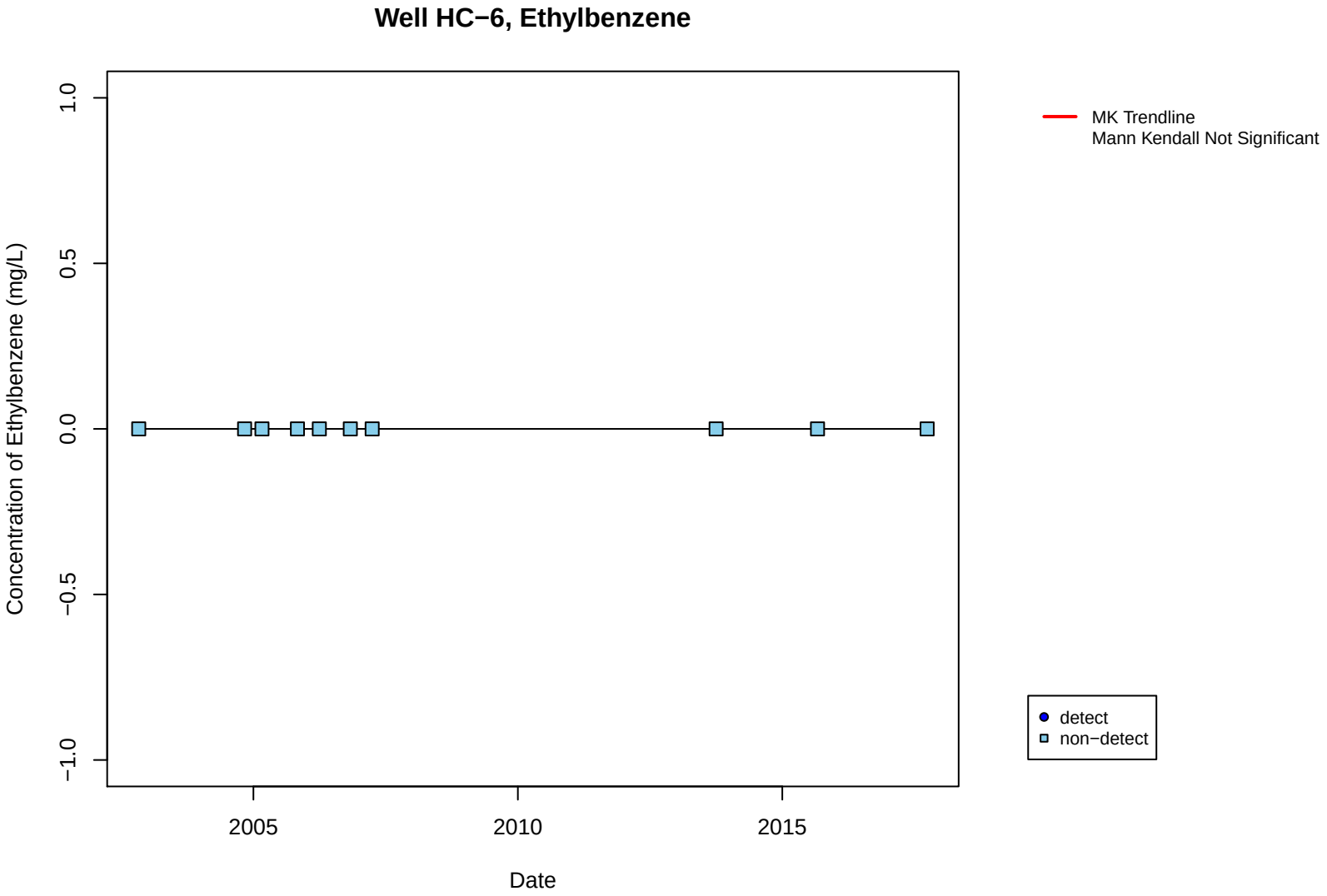

Well HC−3, GRO
Concentration of GRO (mg/L)
0
1
2
3
4
2005
2010
2015
Date
MK Trendline
Mann Kendall Not Significant
detect
non−detect

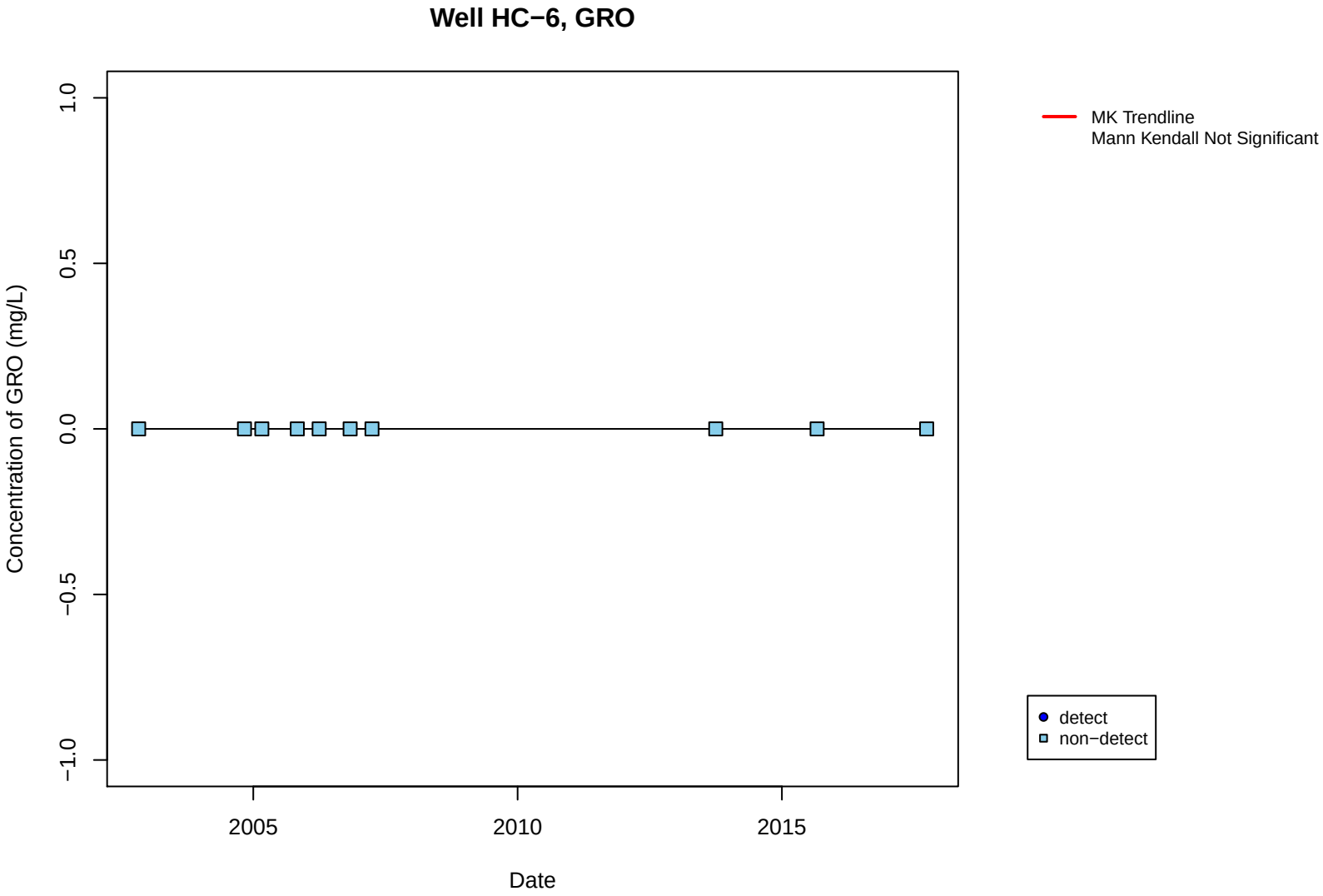

Well HC−3, Toluene
Concentration of Toluene (mg/L)
1.0
0.5
0.0
−0.5
−1.0
2005
2010
2015
Date
MK Trendline
Mann Kendall Not Significant
detect
non−detect

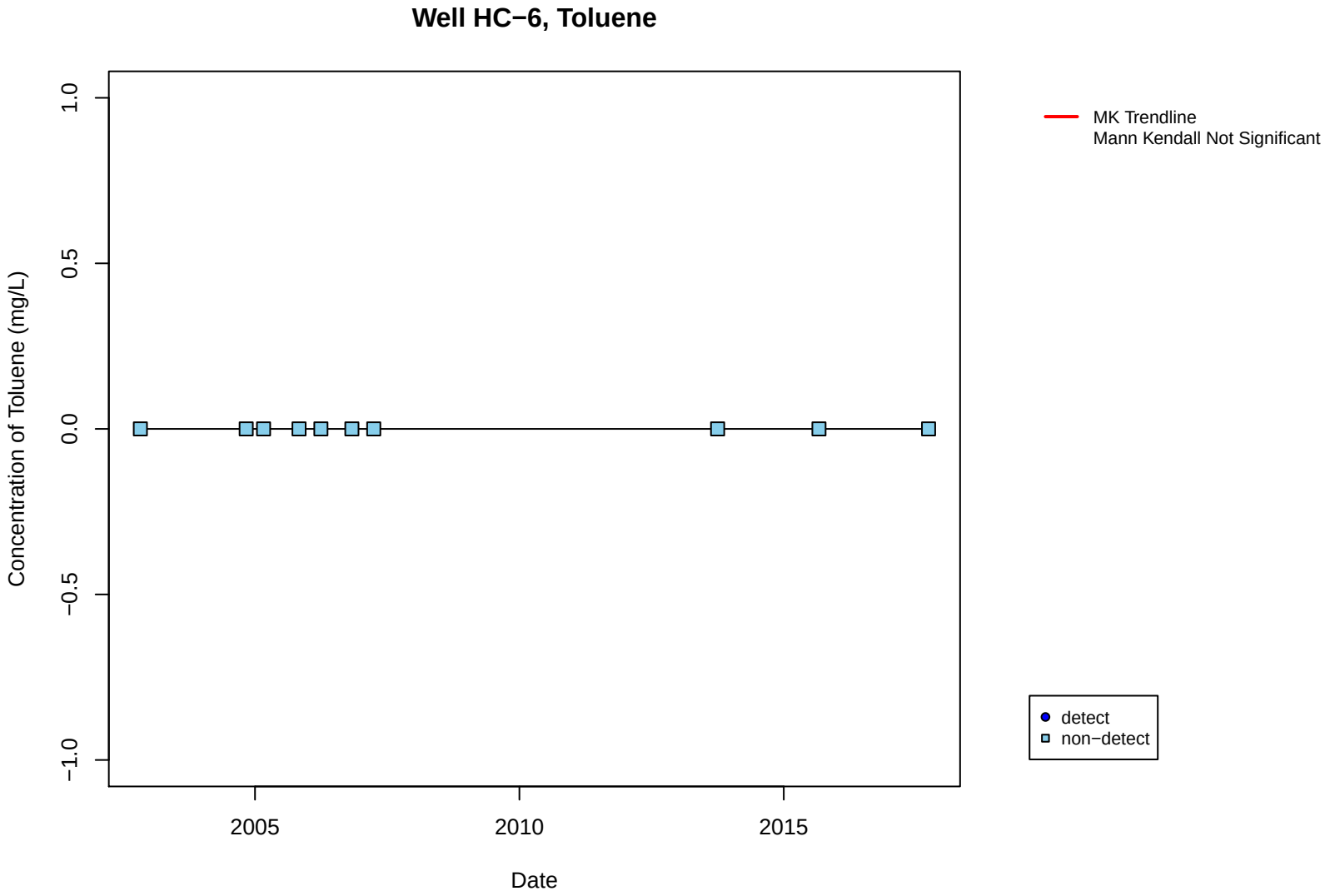

Well HC−3, Xylenes
Concentration of Xylenes (mg/L)
0.000
0.001
0.002
0.003
0.004
0.005
0.006
0.007
2005
2010
2015
Date
MK Trendline
Mann Kendall Not Significant
detect
non−detect

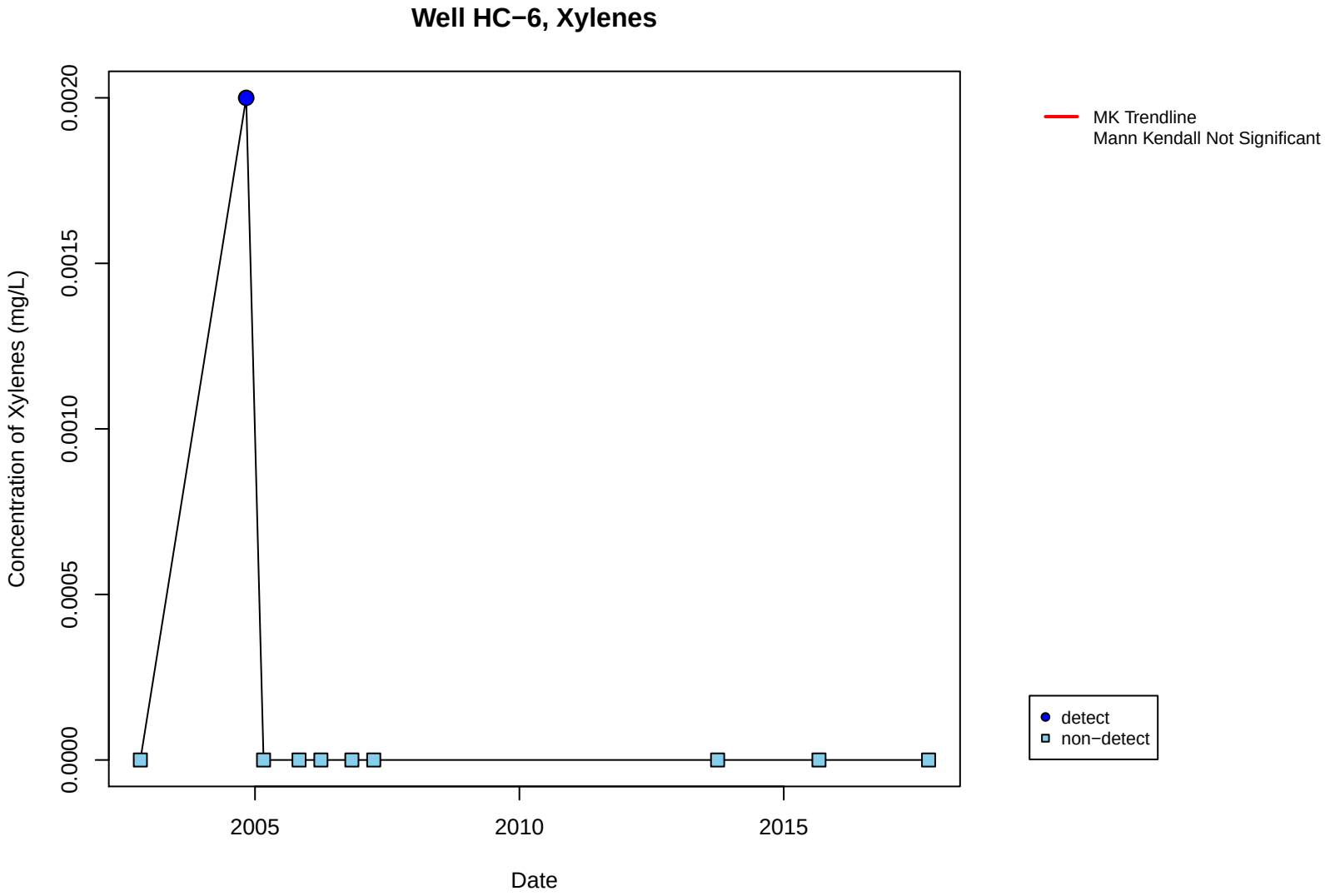

Well HC−6, Benzene
Concentration of Benzene (mg/L)
0.000
0.002
0.004
0.006
0.008
0.010
0.012
0.014
2005
2010
2015
Date
MK Trendline
Mann Kendall Not Significant
detect
non−detect

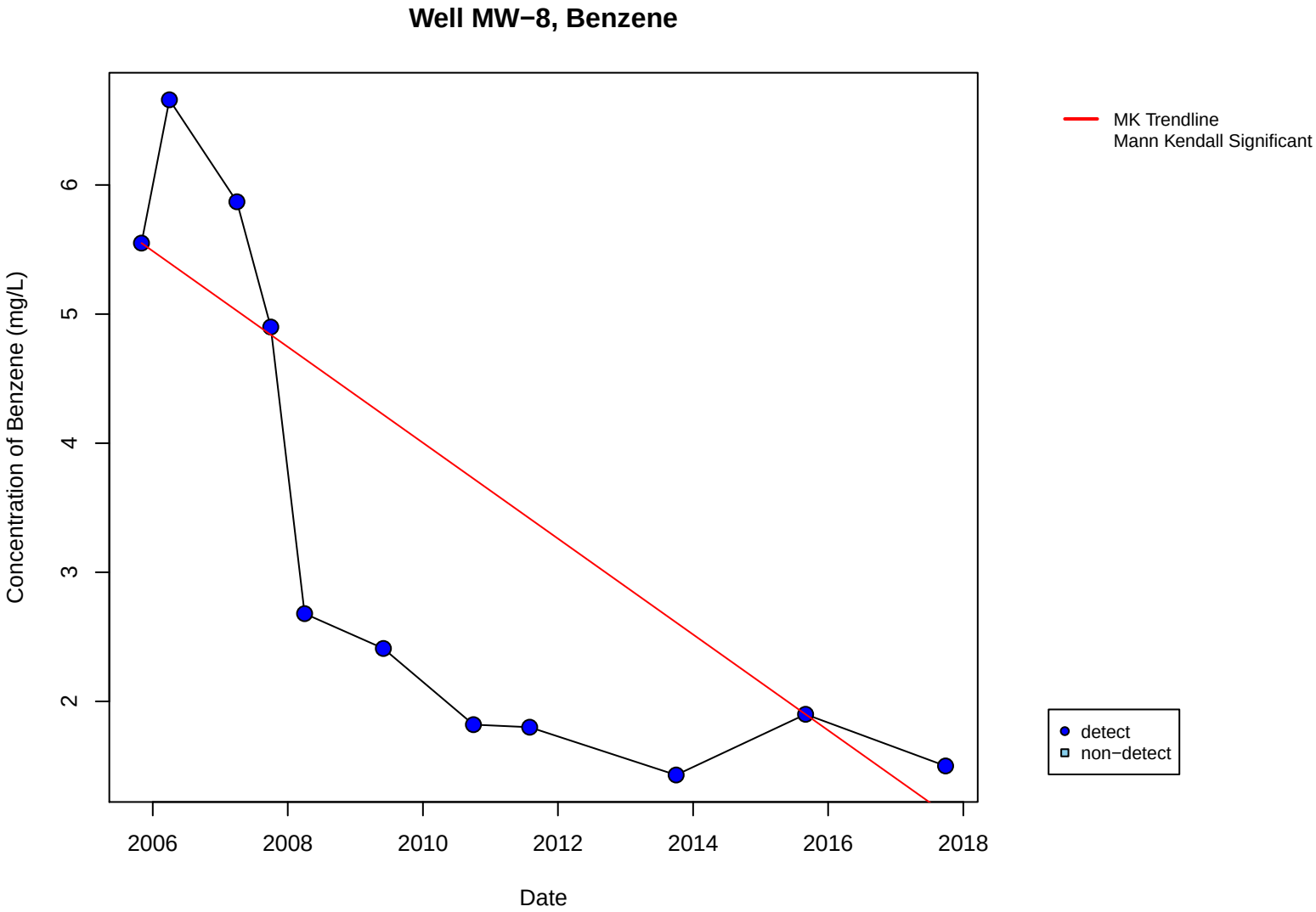

Well HC−6, DRO
Concentration of DRO (mg/L)
0.0
0.5
1.0
1.5
2.0
2.5
2005
2010
2015
Date
MK Trendline
Mann Kendall Not Significant
detect
non−detect

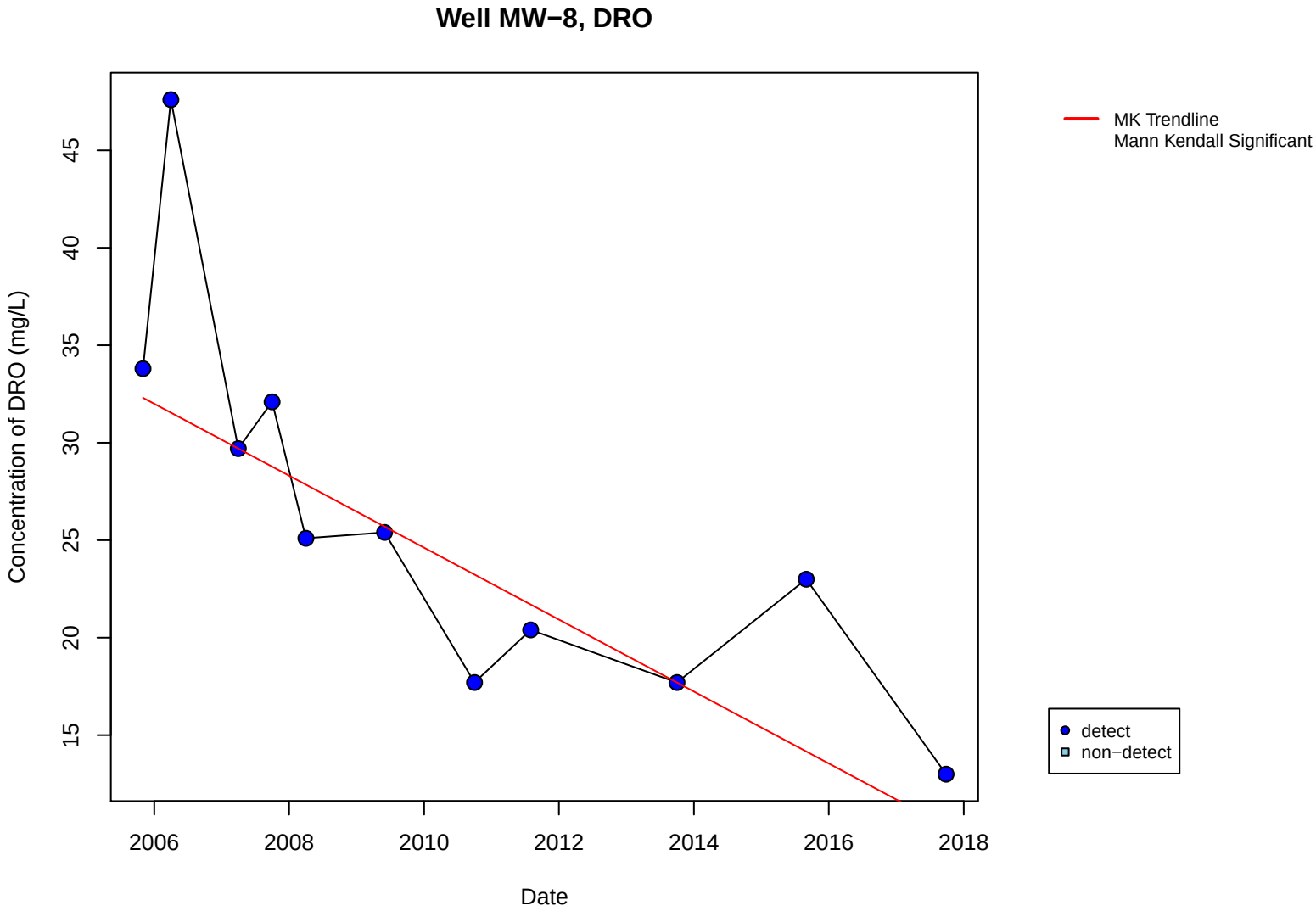

Well HC−6, Ethylbenzene
Concentration of Ethylbenzene (mg/L)
1.0
0.5
0.0
−0.5
−1.0
2005
2010
2015
Date
MK Trendline
Mann Kendall Not Significant
detect
non−detect

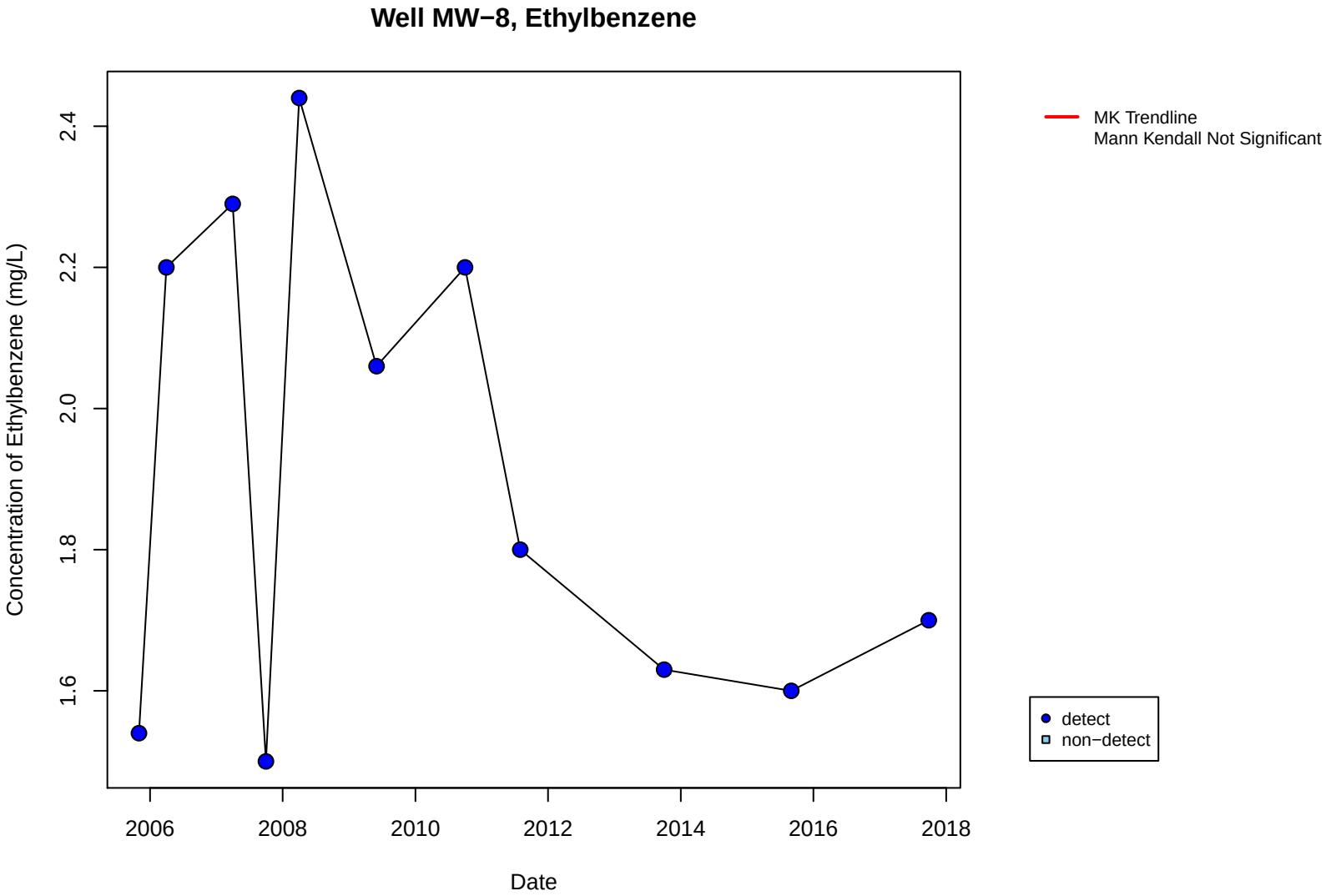

Well HC−6, GRO
Concentration of GRO (mg/L)
1.0
0.5
0.0
−0.5
−1.0
2005
2010
2015
Date
MK Trendline
Mann Kendall Not Significant
detect
non−detect

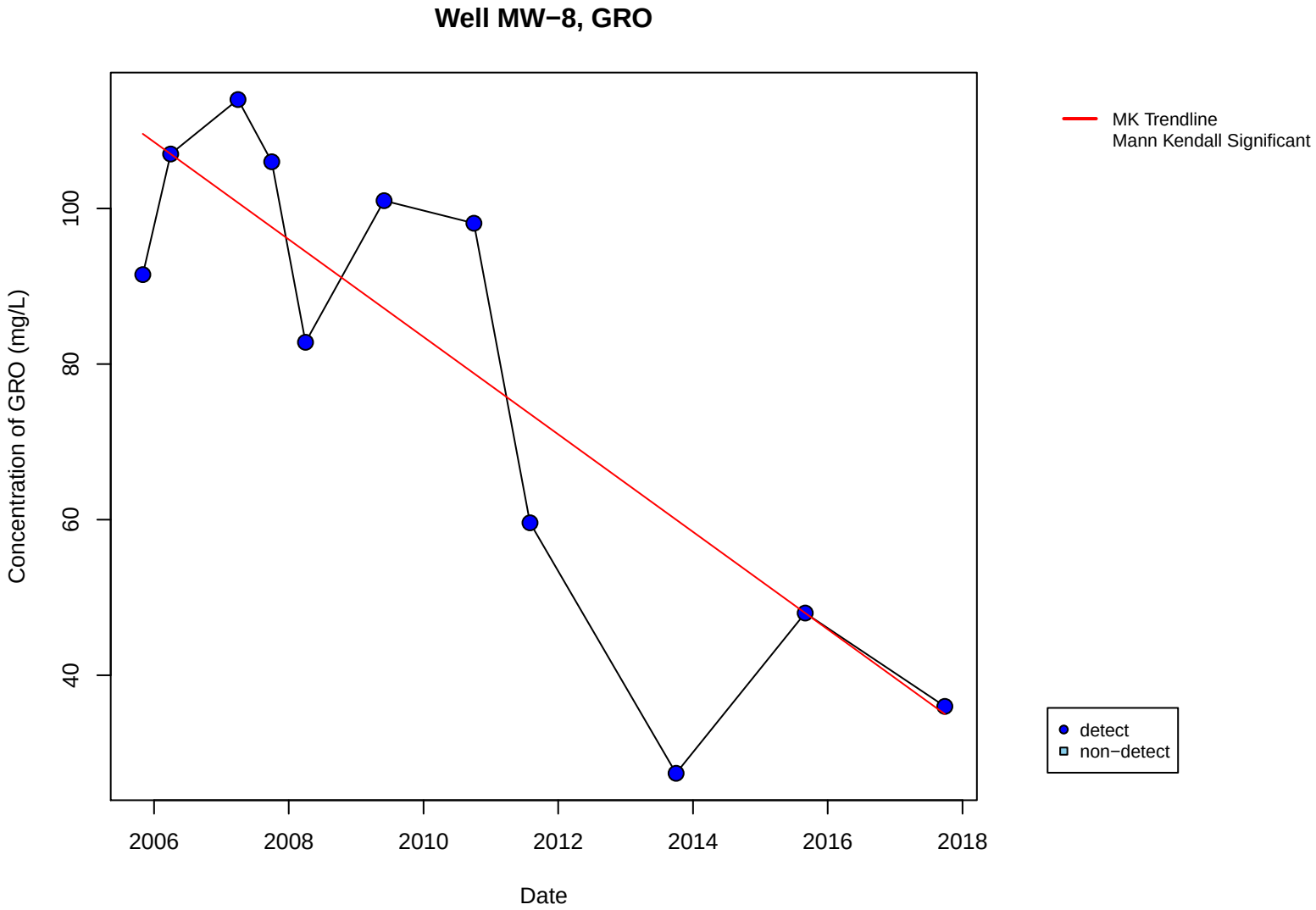

Well HC−6, Toluene
Concentration of Toluene (mg/L)
1.0
0.5
0.0
−0.5
−1.0
2005
2010
2015
Date
MK Trendline
Mann Kendall Not Significant
detect
non−detect

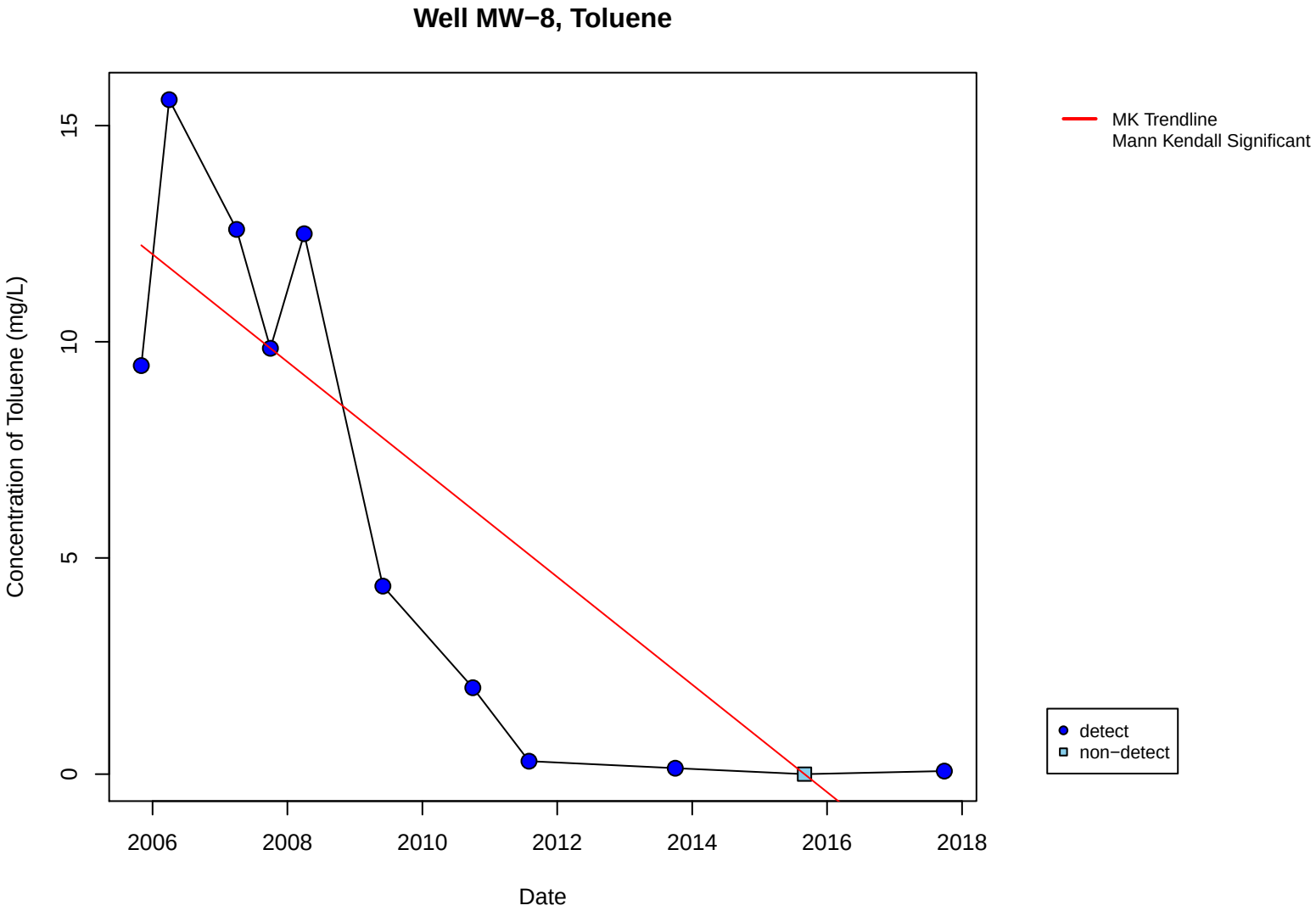

Well HC−6, Xylenes
Concentration of Xylenes (mg/L)
0.0000
0.0005
0.0010
0.0015
0.0020
2005
2010
2015
Date
MK Trendline
Mann Kendall Not Significant
detect
non−detect

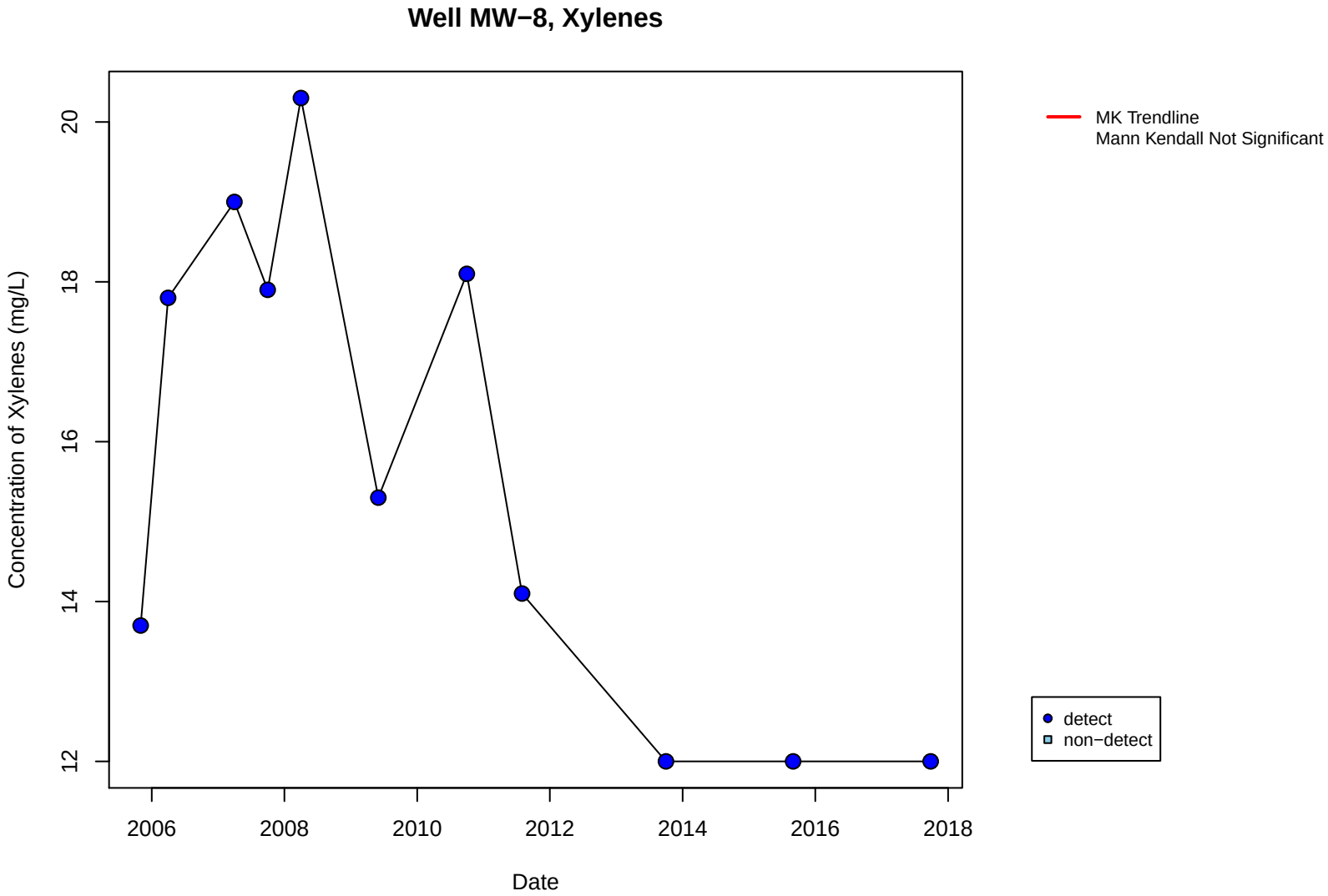

Well MW−8, Benzene
Concentration of Benzene (mg/L)
2
3
4
5
6
2006
2008
2010
2012
2014
2016
2018
Date
MK Trendline
Mann Kendall Significant
detect
non−detect

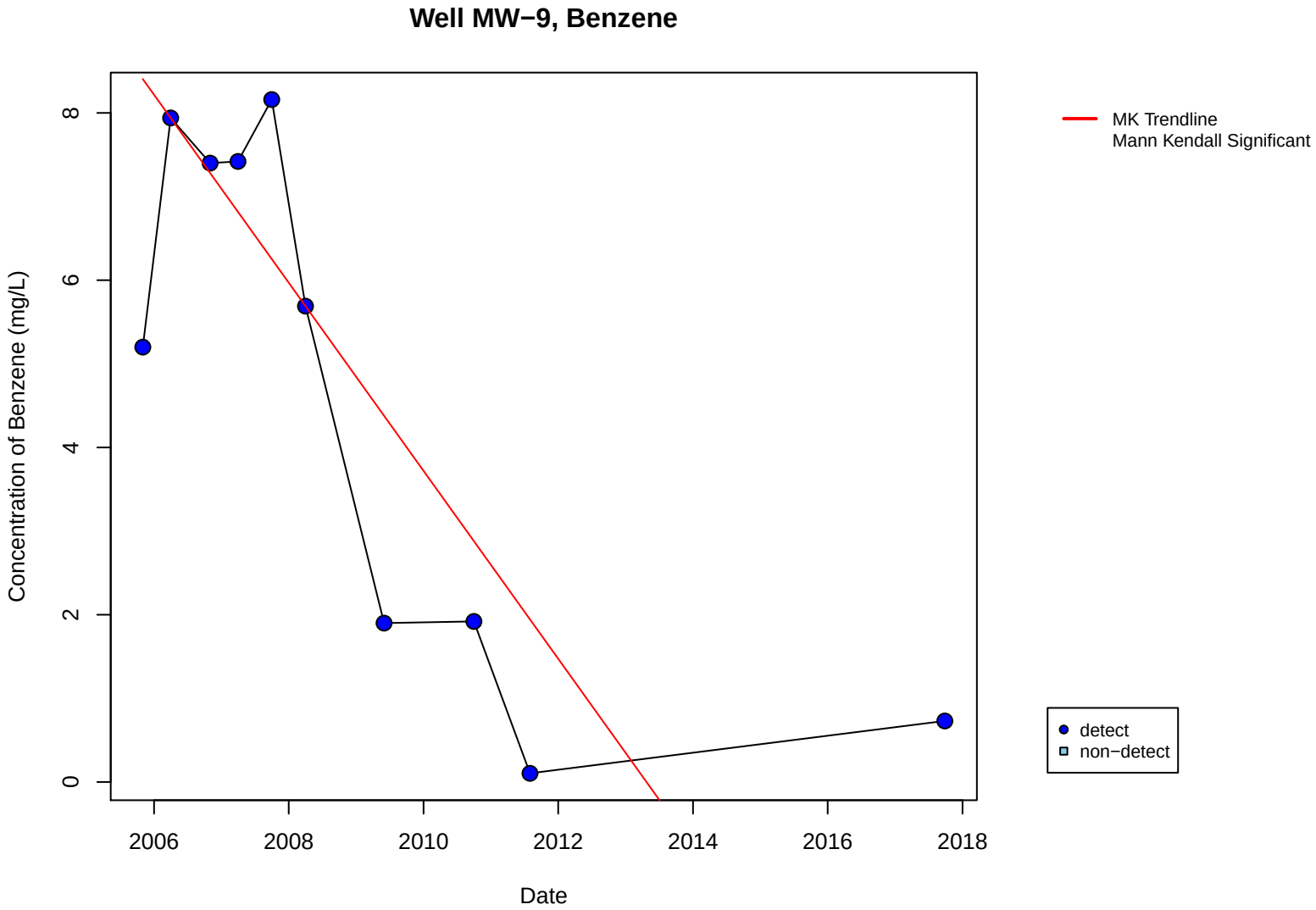

Well MW−8, DRO
Concentration of DRO (mg/L)
15
20
25
30
35
40
45
2006
2008
2010
2012
2014
2016
2018
Date
MK Trendline
Mann Kendall Significant
detect
non−detect

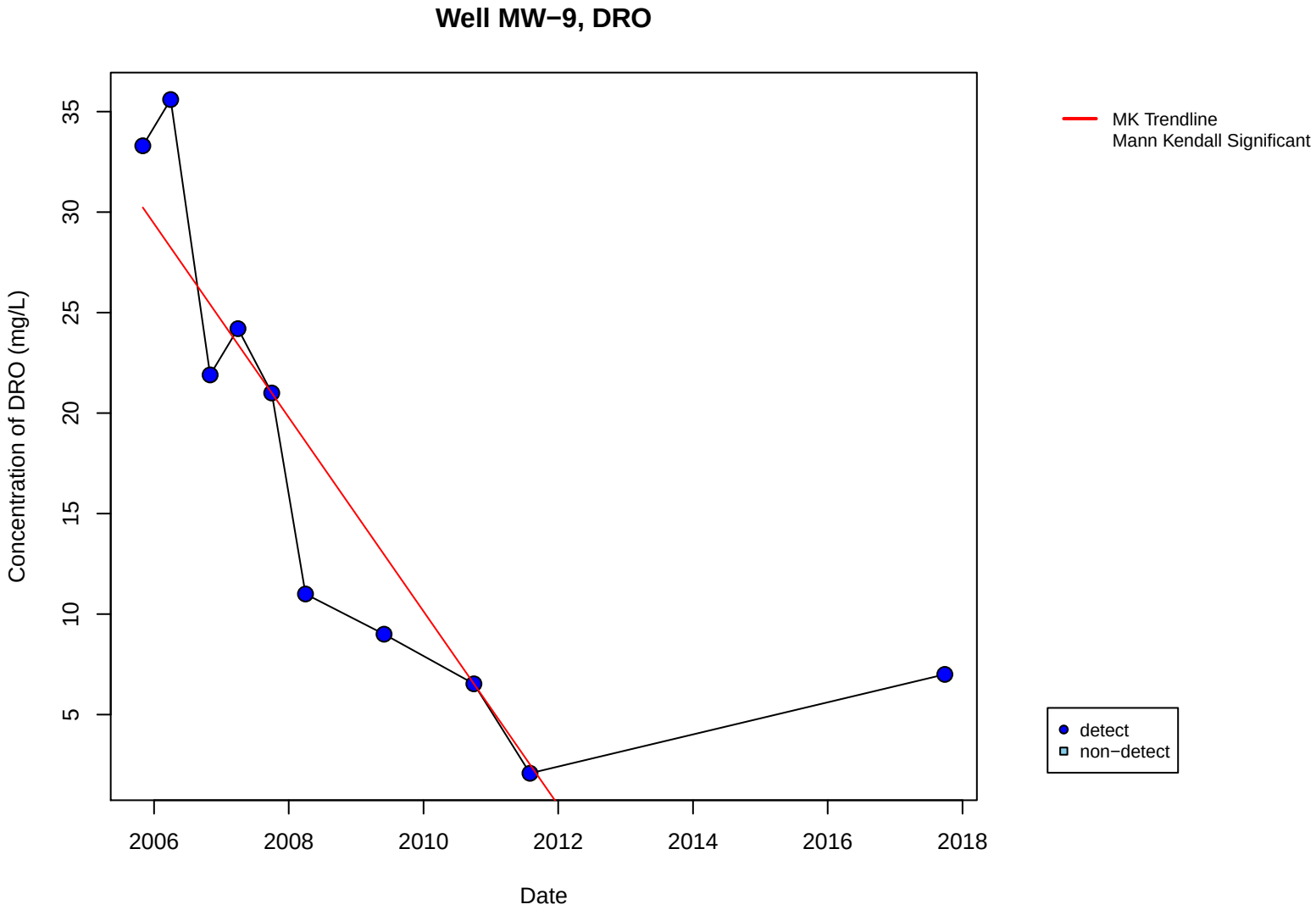

Well MW−8, Ethylbenzene
Concentration of Ethylbenzene (mg/L)
1.6
1.8
2.0
2.2
2.4
2006
2008
2010
2012
2014
2016
2018
Date
MK Trendline
Mann Kendall Not Significant
detect
non−detect

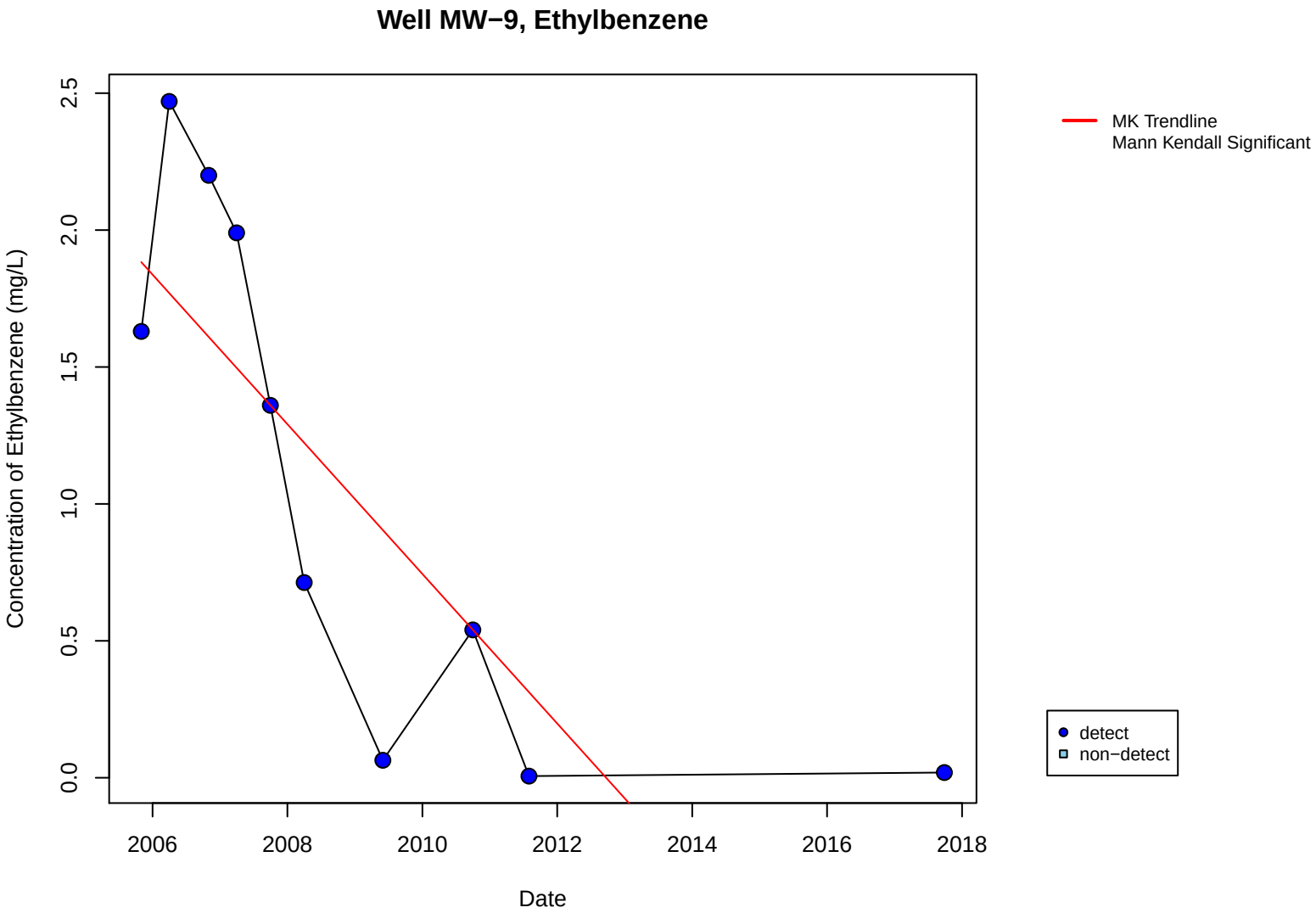

Well MW−8, GRO
Concentration of GRO (mg/L)
40
60
80
100
2006
2008
2010
2012
2014
2016
2018
Date
MK Trendline
Mann Kendall Significant
detect
non−detect

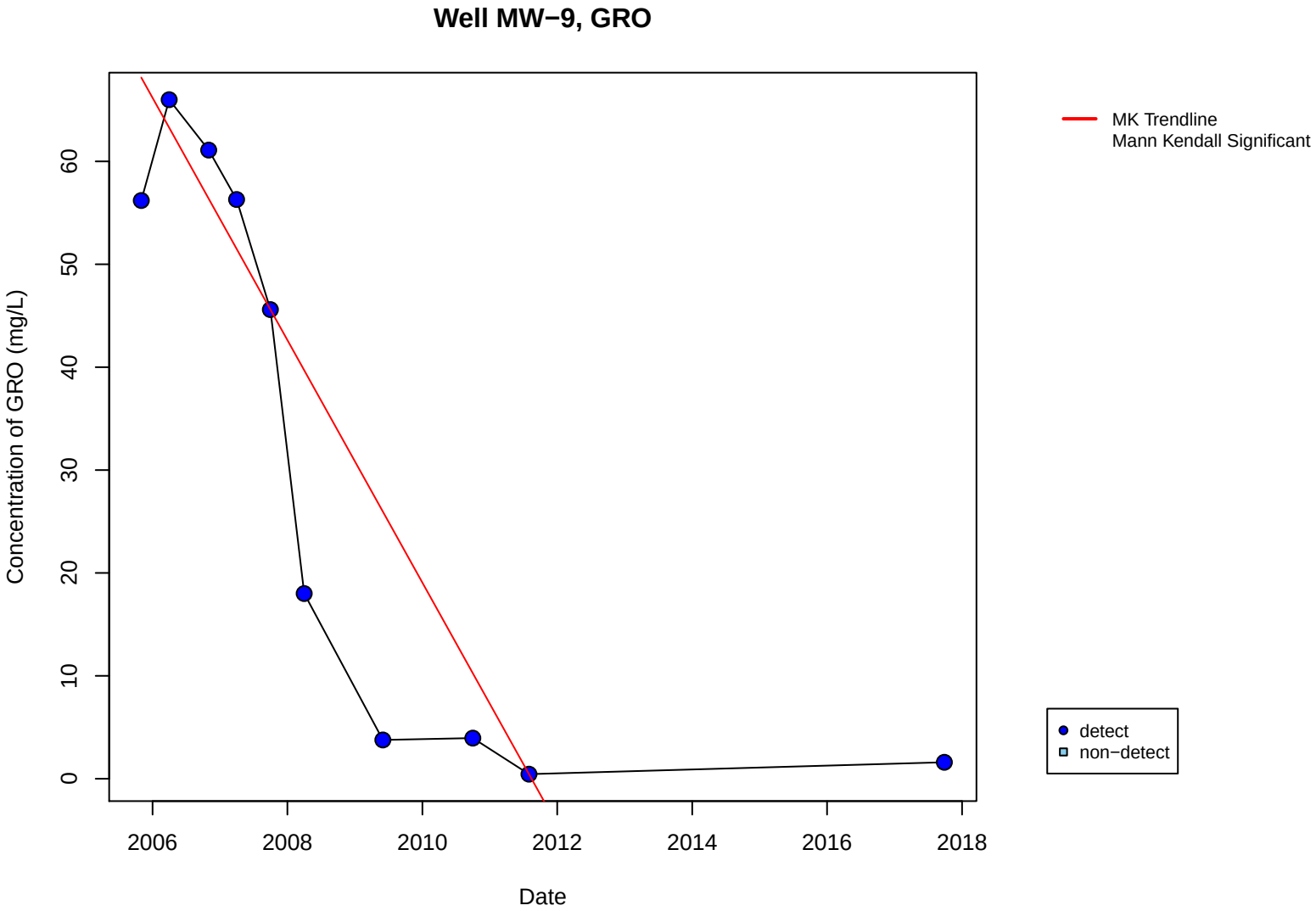

Well MW−8, Toluene
Concentration of Toluene (mg/L)
0
5
10
15
2006
2008
2010
2012
2014
2016
2018
Date
MK Trendline
Mann Kendall Significant
detect
non−detect

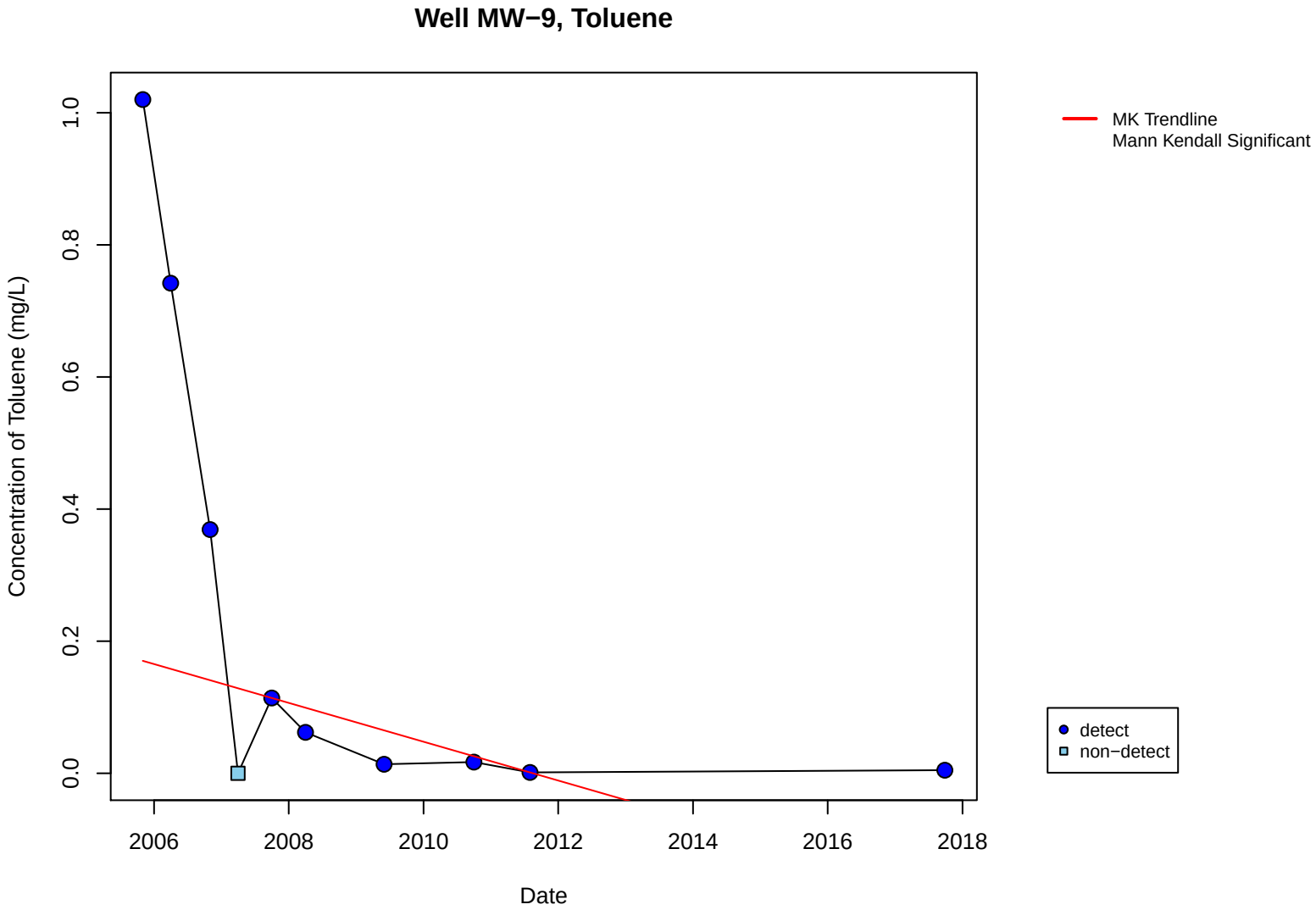

Well MW−8, Xylenes
Concentration of Xylenes (mg/L)
12
14
16
18
20
2006
2008
2010
2012
2014
2016
2018
Date
MK Trendline
Mann Kendall Not Significant
detect
non−detect

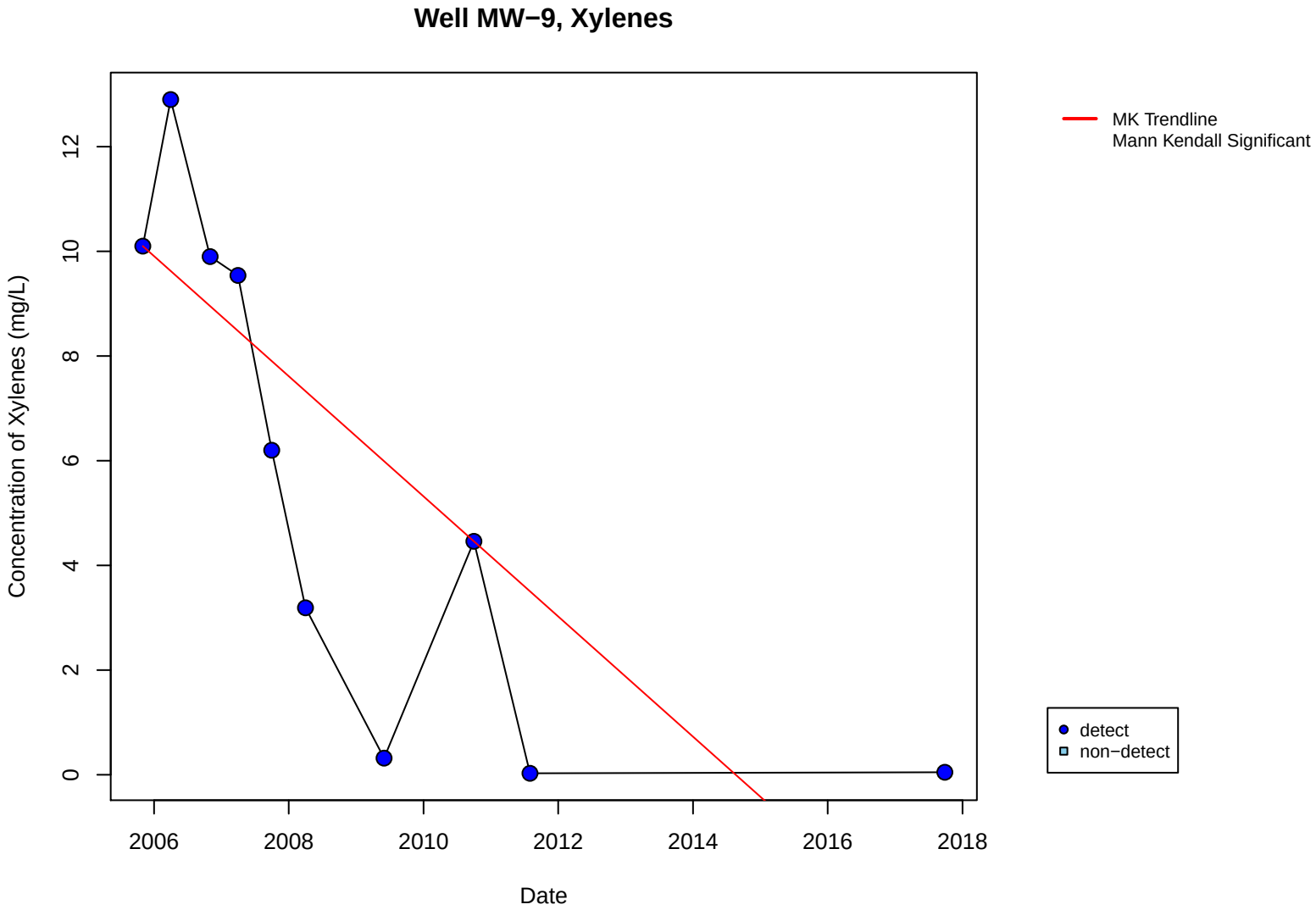

Well MW−9, Benzene
Concentration of Benzene (mg/L)
0
2
4
6
8
2006
2008
2010
2012
2014
2016
2018
Date
MK Trendline
Mann Kendall Significant
detect
non−detect


Well MW−9, DRO
Concentration of DRO (mg/L)
5
10
15
20
25
30
35
2006
2008
2010
2012
2014
2016
2018
Date
MK Trendline
Mann Kendall Significant
detect
non−detect


Well MW−9, Ethylbenzene
Concentration of Ethylbenzene (mg/L)
0.0
0.5
1.0
1.5
2.0
2.5
2006
2008
2010
2012
2014
2016
2018
Date
MK Trendline
Mann Kendall Significant
detect
non−detect


Well MW−9, GRO
Concentration of GRO (mg/L)
0
10
20
30
40
50
60
2006
2008
2010
2012
2014
2016
2018
Date
MK Trendline
Mann Kendall Significant
detect
non−detect


Well MW−9, Toluene
Concentration of Toluene (mg/L)
0.0
0.2
0.4
0.6
0.8
1.0
2006
2008
2010
2012
2014
2016
2018
Date
MK Trendline
Mann Kendall Significant
detect
non−detect


Well MW−9, Xylenes
Concentration of Xylenes (mg/L)
0
2
4
6
8
10
12
2006
2008
2010
2012
2014
2016
2018
Date
MK Trendline
Mann Kendall Significant
detect
non−detect

TABLES ACRONYM KEY
2017 LONG-TERM GROUNDWATER MONITORING REPORT
MATSON
PORT OF ANCHORAGE TERMINAL FACILITY

Notes:
A minimum of five (8) independent sampling events are required for the Mann Kendall test to be valid
The Confidence Level for all analyses is 95%
The Theil Sen line determines that magnitude of the slope where a trend exists in the data

Acronym	Definition
N	Sample size
p	The probablility of obtaining a result equal to or "more extreme" than what was actually observed
tau	A non-parametric measure of correlation between two variables
TS	Theil Sen
R^2	A statistical measure of how close the data are to the fitted (TS) line
S	Mann Kendall statistic
VarS	Variance of the Mann Kendall statistic

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TABLE E1: MANN KENDALL TRENDS
2017 LONG-TERM GROUNDWATER MONITORING REPORT
MATSON
PORT OF ANCHORAGE TERMINAL FACILITY

Location	Benzene	Toluene	Ethylbenzene	Xylene	DRO	GRO
HC-1	Decreasing	Decreasing	Decreasing	Decreasing	Decreasing	Decreasing
HC-3	Decreasing	NA	NA	Stable	Stable	Stable
HC-6	Stable	NA	NA	Stable	Stable	NA
MW-8	Decreasing	Decreasing	Stable	Stable	Decreasing	Decreasing
MW-9	Decreasing	Decreasing	Decreasing	Decreasing	Decreasing	Decreasing

Note:
NA = All non-detect values, unable to perform test

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TABLE E2: BENZENE MANN KENDALL TREND SUMMARY
2017 LONG-TERM GROUNDWATER MONITORING REPORT
MATSON
PORT OF ANCHORAGE TERMINAL FACILITY

Location	N	tau	p	S	VarS	Trend	TS Intercept	TS slope	R^2
HC-1	16	-0.767	4.18E-05	-92	493	Decreasing	18.6	-0.00124	0.59
HC-3	16	-0.494	0.00895	-59	492	Decreasing	0.0163	-8.82E-07	0.24
HC-6	10	-0.487	0.0949	-16	80.7	Stable	0	0	0.24
MW-8	11	-0.782	0.00108	-43	165	Decreasing	16.7	-0.000991	0.61
MW-9	10	-0.511	0.0491	-23	125	Decreasing	41.3	-0.00252	0.26

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TABLE E3: TOLUENE MANN KENDALL TREND SUMMARY
2017 LONG-TERM GROUNDWATER MONITORING REPORT
MATSON
PORT OF ANCHORAGE TERMINAL FACILITY

Location	N	tau	p	S	VarS	Trend	TS Intercept	TS slope	R^2
HC-1	16	-0.561	0.00404	-63	465	Decreasing	0.0278	-1.74E-06	0.31
HC-3	16	NA	NA	NA	NA	NA	NA	NA	NA
HC-6	10	NA	NA	NA	NA	NA	NA	NA	NA
MW-8	11	-0.782	0.00108	-43	165	Decreasing	75.9	-0.00497	0.61
MW-9	10	-0.644	0.0123	-29	125	Decreasing	1.65	-0.000113	0.41

Note:
NA = All non-detect values, unable to perform test

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TABLE E4: ETHYLBENZENE MANN KENDALL TREND SUMMARY
2017 LONG-TERM GROUNDWATER MONITORING REPORT
MATSON
PORT OF ANCHORAGE TERMINAL FACILITY

Location	N	tau	p	S	VarS	Trend	TS Intercept	TS slope	R^2
HC-1	16	-0.7	0.000186	-84	493	Decreasing	2.36	-0.000151	0.49
HC-3	16	NA	NA	NA	NA	NA	NA	NA	NA
HC-6	10	NA	NA	NA	NA	NA	NA	NA	NA
MW-8	11	-0.183	0.482	-10	164	Stable	4.18	-0.000154	0.03
MW-9	10	-0.778	0.00236	-35	125	Decreasing	19.2	-0.00127	0.61

Note:
NA = All non-detect values, unable to perform test

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TABLE E5: TOTAL XYLENE MANN KENDALL TREND SUMMARY
2017 LONG-TERM GROUNDWATER MONITORING REPORT
MATSON
PORT OF ANCHORAGE TERMINAL FACILITY

Location	N	tau	p	S	VarS	Trend	TS Intercept	TS slope	R^2
HC-1	16	-0.667	0.000375	-80	493	Decreasing	13	-0.000919	0.44
HC-3	16	-0.153	0.527	-9	160	Stable	0	0	0.02
HC-6	10	-0.348	0.296	-7	33	Stable	0	0	0.12
MW-8	11	-0.411	0.0983	-22	161	Stable	41.2	-0.0018	0.17
MW-9	10	-0.822	0.00128	-37	125	Decreasing	88.9	-0.00585	0.68

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TABLE E6: DRO MANN KENDALL TREND SUMMARY
2017 LONG-TERM GROUNDWATER MONITORING REPORT
MATSON
PORT OF ANCHORAGE TERMINAL FACILITY

Location	N	tau	p	S	VarS	Trend	TS Intercept	TS slope	R^2
HC-1	16	-0.383	0.0428	-46	493	Decreasing	22.6	-0.00131	0.15
HC-3	16	0.1	0.62	12	493	Stable	0.489	2.87E-05	0.01
HC-6	15	0.268	0.181	28	407	Stable	-2.22	0.00021	0.07
MW-8	11	-0.734	0.00232	-40	164	Decreasing	109	-0.00588	0.54
MW-9	10	-0.822	0.00128	-37	125	Decreasing	235	-0.0156	0.68

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TABLE E7: GRO MANN KENDALL TREND SUMMARY
2017 LONG-TERM GROUNDWATER MONITORING REPORT
MATSON
PORT OF ANCHORAGE TERMINAL FACILITY

Location	N	tau	p	S	VarS	Trend	TS Intercept	TS slope	R^2
HC-1	16	-0.783	2.83E-05	-94	493	Decreasing	110	-0.00745	0.61
HC-3	16	-0.258	0.194	-29	465	Stable	0.153	-6.44E-06	0.07
HC-6	10	NA	NA	NA	NA	NA	NA	NA	NA
MW-8	11	-0.636	0.00812	-35	165	Decreasing	322	-0.0164	0.40
MW-9	10	-0.778	0.00236	-35	125	Decreasing	522	-0.0343	0.61

Note:
NA = All non-detect values, unable to perform test

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