



**Semi-Annual Groundwater Monitoring Report –
July through December 2018
NuStar Vancouver Facility
2565 NW Harborside Drive, Port of Vancouver
Vancouver, Washington**

Prepared for:

NuStar Terminals Services, Inc.

Prepared by:

**Cascadia Associates, LLC
6915 SW Macadam Avenue, Suite 250
Portland, Oregon 97219**

**Project No. 0060-001-002
February 2019**

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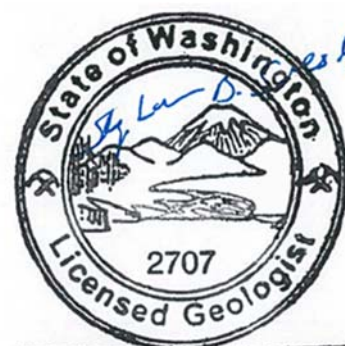
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Prepared by:



Lindsay Wallis
Senior Staff Scientist, Cascadia Associates



Stephanie Bosze Salisbury

Stephanie Bosze Salisbury, L.G.
Senior Associate Geologist, Cascadia Associates

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1.0 INTRODUCTION

This semi-annual groundwater monitoring report was prepared by Cascadia Associates, LLC (Cascadia) on behalf of NuStar Terminals Services, Inc. (NuStar) for the NuStar Vancouver Facility (Facility) in Vancouver, Washington (Figure 1). This report presents the results of the groundwater monitoring activities completed at the Facility during the third and fourth quarters of 2018. Additionally, the report includes a summary and evaluation of interim action monitoring data for the reporting period.

The Facility is located at the Port of Vancouver (POV) Terminal No. 2 in Vancouver, Washington (Figure 1). The Facility Site Plan is shown on Figure 2. The property address is 2565 NW Harborside Drive, Port of Vancouver, Vancouver, Washington 98660 (Latitude: N45° 38.26', Longitude: W122° 42.20'). The property is owned by POV and leased by NuStar; the current extent of the leasehold is shown on Figure 2. The Facility is on the north shore of the Columbia River. Land on all other sides is industrial property also owned by POV. The Facility is approximately 19 acres in size located on Clark County Tax Lot Nos.: 151979-000, 502010-002, 502010-000, and a portion of 502020-000, as well as a portion of the Washington Department of Natural Resources tideland area managed by POV.

2.0 GROUNDWATER MONITORING FIELD ACTIVITIES

The groundwater monitoring was performed in general accordance with the *Groundwater Monitoring Plan* (GWMP; Ash Creek, 2008), which was approved by the Washington State Department of Ecology (Ecology) in a letter to NuStar dated July 30, 2009. The monitoring program for the third and fourth quarters of 2018 is summarized in Table 1.

Two monitoring events were conducted during this period: the third quarter 2018 groundwater monitoring event was conducted from September 24 through 28, 2018, and the fourth quarter 2018 event was conducted from December 3 to 10, 2018

2.1 WATER LEVEL MEASUREMENTS

Third quarter 2018 groundwater levels were measured on September 24, 2018, and fourth quarter 2018 groundwater levels were measured on December 3, 2018. Monitoring well locations are shown on Figure 2. Depth to groundwater and groundwater elevation data are summarized in Table 2. The wells are screened in three different groundwater zones: Shallow, Intermediate, and Deep. The depth to groundwater was measured at Facility monitoring wells, multi-level groundwater monitoring (MGMS) wells, and selected off-site wells (MW-14, MW-17, MW-23i, MW-25i, MW-26, MW-F, S-1, and S-2).

2.2 MONITORING WELL SAMPLING AND ANALYSIS

The sampling and analysis program for third and fourth quarter 2018 is summarized in Table 1. Groundwater monitoring data sheets for the sampling events are included in Appendix A. For quality assurance/quality control (QA/QC), field blanks and equipment blanks were prepared, and sample duplicates were collected from wells MW-7, MW-12, and MW-19 during third and fourth quarter 2018 sampling events.

For both sampling events, the samples were uniquely labeled, stored in insulated coolers with ice, and transported under chain-of-custody protocol to Apex Laboratories of Tigard, Oregon for laboratory analysis. Samples were analyzed for halogenated volatile organic compounds (HVOCs) by U.S. Environmental Protection Agency (EPA) Method 8260B. Select samples were also analyzed for total organic carbon (TOC) by method SM5310C. Groundwater analytical results for both events are shown in Table 3. Historical data are tabulated in Appendix B.

The terminal currently handles and distributes bulk fertilizer products, primarily urea but also mono-ammonium phosphate. Urea cannot be directly measured in water but can be estimated by analysis of the primary urea constituents: ammonia, nitrate, and nitrite. To evaluate for urea in groundwater during the third and fourth quarter 2018 monitoring events, Facility monitoring wells were sampled for nitrate as nitrogen and nitrite as nitrogen by EPA Method 300.0 and ammonia as nitrogen by EPA Method 350.1.

Apex Laboratories also subcontracted to Air Technology Laboratories of City of Industry, California, using chain-of-custody protocols, for laboratory analysis of ethene, ethane, and methane by RSK 175.

3.0 GROUNDWATER ELEVATIONS

Groundwater elevations and estimated elevation contours for the Shallow and Intermediate Zone wells for the third quarter 2018 are shown on Figures 3 and 4, respectively. Groundwater elevations and estimated elevation contours for the Shallow and Intermediate Zone wells for the fourth quarter 2018 are shown on Figures 5 and 6, respectively.

3.1 THIRD QUARTER 2018

Shallow Zone. On September 24, 2018, depth-to-groundwater measurements were made at Shallow Zone monitoring wells in accordance with the groundwater monitoring plan provided in Table 1. The observed depths to groundwater in these wells ranged from 27.55 to 34.00 feet below the top of casing (BTOC), and the corresponding groundwater elevations in these wells ranged from 1.93 to 6.43 feet above mean sea level (MSL; Table 2).

During the third quarter 2018 monitoring event, gauging of the Shallow Zone wells was completed between 10:00 am and 12:49 p.m. During that time interval, the water level in the adjacent Columbia River increased by 2.19 feet. River stage data were obtained from the nearest National

Oceanographic and Atmospheric Administration (NOAA) tide station (Columbia River – Vancouver), which is located approximately 0.5 mile upstream of the Facility.

As shown in Table 2, groundwater elevations on average were four feet lower in September 2018 than during the previous monitoring event in June 2018. During the third quarter 2018 gauging event, groundwater elevations in the Shallow Zone were variable, with groundwater highs in the northwest and southeastern corners of the terminal, near wells MW-10 and MW-6, respectively (Figure 3). Between wells MW-10 and MW-6 there was a groundwater divide; to the south/southwest of the divide groundwater flow was to the river; and to the north/northeast of the divide, groundwater flow was away from the river to the east/northeast. From the groundwater high at well MW-10, groundwater flow was to the southwest and east at gradients of 0.008 foot/foot (ft/ft) and 0.004 ft/ft, respectively. There was also an isolated groundwater low around well MW-2 that is inconsistent with the divide that trends from the northwest to the southeast across the Facility.

Intermediate Zone. On September 24, 2018, depth-to-groundwater measurements were made at Intermediate Zone monitoring wells in accordance with the groundwater monitoring plan provided in Table 1. Groundwater levels in Intermediate Zone wells were measured during a predicted tidal inflection to minimize the magnitude of tidal influence on water levels during the gauging event. Water levels were measured from Intermediate Zone wells within a 35-minute period on September 24, 2018 (between 12:54 and 1:27 pm). During the time interval in which Intermediate Zone wells were gauged, water levels in the adjacent Columbia River decreased by 0.15 feet.

During the September 24, 2018 water level measurements, the observed depths to groundwater in the Intermediate Zone wells ranged from 30.19 to 31.56 feet BTOC, and groundwater elevations in these wells ranged from 2.56 to 3.05 feet above MSL (Table 2). As shown in Table 2, groundwater elevations in the Intermediate Zone were about 4.5 feet lower in September 2018 than during the previous monitoring event in March 2018. During the September 24, 2018 gauging event, groundwater flow was towards the southwest with a gradient of approximately 0.007 ft/ft (Figure 4).

Deep Zone. Depth to groundwater was measured in well MW-24d, which is screened from 210 to 230 feet below ground surface (bgs), within the Troutdale Formation. Depth to water in well MW-24d was 30.60 feet BTOC, corresponding to an elevation of 3.31 feet above MSL. A groundwater potentiometric map was not prepared for Deep Zone groundwater.

3.2 FOURTH QUARTER 2018

Shallow Zone. On December 3, 2018, depth-to-groundwater measurements were made at Shallow Zone monitoring wells in accordance with the groundwater monitoring plan provided in Table 1. The observed depths to groundwater in these wells ranged from 26.20 to 33.39 feet BTOC, with groundwater elevations ranging from 4.04 to 6.13 feet above MSL (Table 2).

During the fourth quarter 2018 monitoring event gauging of the Shallow Zone wells was completed between 10:32 am and 12:39 pm with the exception of the Shallow Zone ports of the multi-port wells. During the gauging activities, the water level in the adjacent Columbia River increased by

2.02 feet. As shown in Table 2, groundwater elevations on average were around 1 foot higher in December 2018 than the previous monitoring event in September 2018.

A northwest to southeast trending groundwater divide was observed across the property, with groundwater highs in the vicinity of wells MW-10 and MW-3, as shown on Figure 5. At the northwestern corner of the Facility, groundwater flow was to the southwest and southeast at gradients of 0.007 ft/ft and 0.001 ft/ft, respectively. At the southeast part of the Facility, near MW-5, the shallow groundwater flow directions were to the southwest and southeast at gradients of 0.005 ft/ft and 0.007 ft/ft, respectively. There was also an isolated groundwater high around well MW-3 that is inconsistent with the divide that trends from the northwest to the southeast across the Facility.

Intermediate Zone. During the December 3, 2018 gauging event, depth-to-groundwater was measured in Intermediate Zone wells between 9:15 a.m. and 10:23 a.m. During the December 3, 2018 gauging event, water levels in the adjacent Columbia River decreased by 0.07 foot. The observed depths to groundwater in Intermediate Zone wells ranged from 27.50 to 31.32 feet BTOC, and groundwater elevations in these wells ranged from 2.26 to 5.09 feet above MSL (Table 2). During the December 3, 2018 gauging event, groundwater flow was towards the north and northeast at a gradient of approximately 0.001 ft/ft (Figure 6).

Deep Zone. Depth to water in Deep Zone well MW-24d was 29.09 feet BTOC, corresponding to an elevation of 4.82 feet above MSL (Table 2).

4.0 GROUNDWATER SAMPLE ANALYTICAL RESULTS

Complete copies of the laboratory reports for the third and fourth quarter 2018 groundwater monitoring events, including the quality assurance evaluation report and chain-of-custody documentation, are included in Appendix C.

4.1 THIRD QUARTER 2018

The September 2018 monitoring program included the collection of groundwater samples from the wells as shown in Table 1. Groundwater samples from these wells were analyzed for nitrate as nitrogen, nitrite as nitrogen, and ammonia as nitrogen, in addition to HVOCs. The HVOC and nitrate/nitrite/ammonia results for third quarter 2018 are summarized in Tables 3 and 4, respectively; select VOC data are shown on Figure 7, and nitrate and ammonia results are shown on Figure 8.

4.2 FOURTH QUARTER 2018

The December 2018 monitoring program included the collection of groundwater samples from the wells listed in the second column of Table 1. These wells were analyzed for nitrate as nitrogen, nitrite as nitrogen, and ammonia as nitrogen, in addition to HVOCs. The sample results for fourth

quarter 2018 are summarized in Tables 3 and 4; select VOC data are shown on Figure 9, and nitrate and ammonia results are shown on Figure 10.

4.3 EVALUATION OF RESULTS

VOC concentration trend plots for each monitoring well are provided in Appendix D. Monitoring results demonstrate decreasing VOC concentration trends in Shallow and Intermediate Zone groundwater in 30 of 33 monitoring wells. VOC concentration trends were slightly increasing for trichloroethene (TCE) in wells MW-17, MW-19, and MGMS3-132 and tetrachloroethene (PCE) in well MGMS3-132. The concentrations of PCE and TCE in wells MW-17 and MGMS3-132 have always been variable and relatively low (i.e., PCE ranging from less than 1 microgram per liter [$\mu\text{g}/\text{L}$] to 16.3 $\mu\text{g}/\text{L}$ for MGMS3-132 and TCE ranging from less than 0.5 $\mu\text{g}/\text{L}$ to 28.2 $\mu\text{g}/\text{L}$ for MW-17) and therefore it is difficult to identify a discernable concentration trend for the wells. While concentrations of PCE have declined in well MW-19, concentration trends for TCE have been predominately stable to slightly increasing. The increase in TCE may be the result of the conversion of chlorinated hydrocarbon mass from PCE to TCE during reductive dechlorination. A discussion of reductive dechlorination and total molar ethene mass is discussed in Section 5.3.

Ammonia, nitrate and nitrite results are provided in Table 4 and on Figures 8 and 10. The highest concentration of ammonia and nitrate were found in the western area of the property both in Shallow and Intermediate Zone groundwater. Fertilizer products have historically been stored at the terminal, although the specific products and storage areas have changed over time. Historical fertilizer handling operations ceased in late August 2008. The Facility obtained a new contract in 2014, and at that time, resumed fertilizer handling and distribution processes. Historical nitrate results are also provided in Table 4. For wells in which historical data are available, the concentrations of nitrate and ammonia in September and December 2018 are generally within an order of magnitude or less than historical results. The only exceptions are wells EX-1 and MW-21i-105. Ammonia in groundwater from those wells increased one to two orders of magnitude between 2007/2008 and 2018.

5.0 INTERIM ACTION MEASURE ACTIVITIES

Several interim actions have been implemented at the Facility, including:

- Between 2000 and 2005, a remediation system operated at the Facility that included (1) a re-circulating system to treat groundwater and (2) vapor extraction to treat soil. The interim action system pumped groundwater from extraction wells installed near the river), treated the pumped water with potassium permanganate, and then filtered and pumped the water into a series of injection wells along the railroad tracks. For soil, a soil vapor extraction (SVE) system withdrew soil vapors from wells IW-1, IN-2, IN-3, IN-4, EX-1, EX-3, EX-4, and EX-5.

- Bioremediation injections for remediation of Facility groundwater and the installation of a SVE system for the remediation of VOCs in vadose-zone soils in the spring/summer of 2008. These activities are herein referred to as the 2008 interim action.
- Expanding the SVE system and performing additional bioremediation injections during the summer of 2011, which is referred to herein as the 2011 interim action. The 2011 interim action included 17 additional SVE well locations (involving shallow and deeper SVE well pairs at each location) for a total of 34 wells, and additional bioremediation injections in and around the 2008 interim action area (shown on Figure 11). Details of the 2008 and 2011 interim actions are provided in the Interim Action Installation Report (Ash Creek, 2009b) and the 2011 Interim Action Evaluation Report (Ash Creek, 2012), respectively.
- Additional bioremediation injections adjacent to the seawall at the Facility in accordance with the 2015 Interim Action Work Plan (Apex, 2016). This work is referred to as the 2016 interim action. The Interim Action Summary Report (Apex, 2017) describes the scope and preliminary results of the interim action.

These interim actions and results to date are described in the following subsections.

5.1 SUMMARY OF 2008 AND 2011 INTERIM ACTIONS

The 2008 interim action consisted of SVE in the vadose zone and enhanced anaerobic bioremediation of the Shallow Zone groundwater. The 2008 enhanced bioremediation locations and the SVE system layout are shown in Appendix E. The 2008 SVE system removed approximately 3,150 pounds of VOCs between startup in September 2008 and the expansion in 2011. The mass removal rate at startup in 2008 was 58.8 pounds per day (lbs/day). The removal rate decreased to an average of 1.7 lbs/day by the third quarter of 2011. Historical monitoring tables and a mass removal chart are provided in Appendix E.

A soil and groundwater investigation in 2010 indicated that the 2008 interim action had reduced VOCs in vadose-zone soils by 90 percent for PCE and 98 percent for TCE and had reduced total molar ethene concentrations in source area groundwater by 77 percent (Ash Creek, 2011). The investigation results were summarized in an appendix to the *2011 Interim Action Work Plan* (Work Plan; Ash Creek, 2011) that was submitted to Ecology on March 25, 2011. The Work Plan included a proposal for the expansion of the SVE system to include 17 additional SVE well locations, additional bioremediation injections in the 2008 interim action area, and bioremediation injections in an expanded interim action area. On May 23, 2011, Ecology approved the Work Plan. The bioinjection activities were conducted from July 21 through August 31, 2011, and the SVE installation activities were conducted from August 2 through 5, 2011, and August 29 through October 3, 2011. The 2008 and 2011 bioremediation injection locations are shown on Figure 11.

The initial Facility SVE system installed in 2008, herein referred to as the 2008 SVE system, was comprised of 17 wells, divided among five branches, which were connected by a network of underground piping as shown on drawings provided in Appendix E. As part of the 2011 SVE system

expansion, Branches 4 and 5 were disconnected from the other System branches and were connected to a new blower unit located approximately 150 feet to the northeast of the railroad tracks (Figure 13). The wells and piping associated with Branches 4 and 5 and the associated blower unit are herein referred to as the “North System”.

From August 2 through 5, 2011, 17 additional SVE well pairs (for a total of 34 additional SVE wells) were installed within and to the south of Warehouse No. 13 (a.k.a. the Butler building), in general accordance with the *2011 Interim Action Work Plan* (Ash Creek, 2011; Figure 13). For each well pair, one well is screened in vadose-zone soils from 10 to 15 feet bgs and the second well is screened in vadose-zone soils from 15 to 25 feet bgs. These 17 well pairs, along with the Branch 1 through 3 wells from the 2008 SVE system, are piped underground to a blower unit located outside of the southeast corner of Warehouse No. 13. These SVE wells, associated underground piping, and the blower unit are herein referred to as the “South System”.

5.2 SUMMARY OF 2016 INTERIM ACTION

NuStar and POV submitted a joint Feasibility Study (FS) to Ecology in March 2014 (Apex and Parametrix, 2014). To avoid potential delays in groundwater treatment while working through the FS and the associated regulatory approval process, NuStar proposed to implement a portion of the recommended remedial action for the NuStar source area as an interim action. The details of the proposed interim action were submitted to Ecology in an *Interim Action Work Plan* on September 15, 2015. After a 30-day public comment period from May 12 to June 10, 2016, the work plan was approved on June 14, 2016. The interim action consisted of bioremediation injections along the southern portion of the NuStar terminal near the seawall. Per Ecology’s request, the interim action also included baseline sediment and surface water sampling in the Columbia River. Additionally, enhanced bioremediation injections were implemented in an isolated area to the northwest of the NuStar terminal (the “Northwest (NW) Area”) which has been less responsive to monitored natural attenuation than at the NuStar terminal. The NW Area bioremediation injections were completed as a joint project between NuStar and POV.

The NW Area injections were completed in July 2016 and included the injection of 52,000 gallons of bioremediation oil substrate (EosPro; diluted with water) into the shallow zone groundwater through 30 boreholes in the vicinity of and between (NuStar) monitoring wells MW-14 and MW-26. Figure 12 illustrates the approximate boring locations in the NW Area. The same substrate material was injected at the NuStar terminal in August and September 2016 and included the injection of 100,000 gallons of EosPro (diluted with water) into 72 borings along the southern portion of the Facility, adjacent to the seawall. Figure 12 identifies the approximate locations of the injection borings near the NuStar seawall. In accordance with the approved *Interim Action Work Plan*, a summary of the groundwater injection and surface/water sampling activities was provided to Ecology in an *Interim Action Summary Report* on June 29, 2017 (Apex, 2017). The report included the results of the baseline surface water and sediment sampling as well as the results of two quarters of post interim action groundwater monitoring. A brief evaluation of the groundwater monitoring results from the interim action area is summarized in Section 5.3 below.

5.3 INTERIM ACTION MONITORING AND EVALUATION

This section summarizes the scope and results of groundwater monitoring that has been performed to evaluate the effectiveness of interim actions. Effectiveness is evaluated by reviewing HVOC and ethene concentration trends as well as TOC concentrations in groundwater. Effectiveness of the SVE system is evaluated based on the mass removal rate.

5.3.1 Enhanced Bioremediation Injections

Groundwater samples collected from wells MP-1, EX, MW-12, MW-13, MW-14, MW-19, MW-26, MGMS1-43, MGMS2-40 and MGMS3-43 during the third and fourth quarter 2018 event were analyzed for total organic carbon (TOC) by EPA Method 5310 D and ethene by EPA Method RSK-175M, to evaluate the performance of the bioremediation injections.

In addition to the laboratory analysis of groundwater samples, field measurements of oxidation-reduction potential (ORP) and dissolved oxygen (DO) were collected from the monitoring wells during the third and fourth quarter 2018 monitoring events. Table 5 shows the results of interim action groundwater monitoring from the February 2007 baseline event through the fourth quarter 2018 monitoring event. Wells MW-24i and MGMS2-40 are not located within the 2008 interim action injection area but are located within the footprint of the 2011 and 2016 interim action areas; therefore, interim action monitoring data for these wells are only presented from the second quarter 2011 baseline event through fourth quarter 2018. Wells MW-13, MW-14, MW-19, MW-26, MGMS-1, and MGMS-3 are not located within the 2008 or 2011 interim action areas but are within the 2016 interim action area; therefore, monitoring data for those wells are only presented from September 2016 through December 2018.

A discussion of reductive dechlorination of VOCs in groundwater from prior to the 2008 interim action through fourth quarter 2018 is provided below.

5.3.1.1 VOC Concentrations Evaluation

Bioremediation injections in the primary source area at the Facility were initiated in 2008 and expanded in 2011¹; bioremediation injections along the riverbank and in the NW Area were completed in 2016. Additionally, seven injection boreholes were advanced in 2016 in the area of wells MP-1 and EX, located on the western side of the (former) primary source area. The following paragraphs evaluate the results to date in each of these areas.

Primary Source Area. Concentration trend plots for PCE, TCE, total dichloroethene (DCE), and vinyl chloride (VC) in 2008/2011 interim action area wells MW-7, EX, MP-1, and MGMS2-40 are provided in Appendix F. VOC data are included from the baseline monitoring event that was completed prior to the 2008 interim action (first quarter 2007; second quarter 2007 for well

¹ The description of the primary source area or “source area” is detailed in the Remedial Investigation Report (Ash Creek, 2013); the location is identified on Figure 2 of this report.

MGMS2-40) through December 2018. The concentration of PCE and TCE has decreased in each well. The concentrations of PCE and TCE in wells MW-7, EX, and MGMS2-40 have been reduced by more than 95% since the interim measures were initiated. The concentrations of PCE and TCE in well MP-1 have decreased by about 78% and 82%, respectively, between the February 2007 baseline event and the December 2018 monitoring event. Well MW-7 is located in the previously identified primary source area, and groundwater concentrations in well MW-7 have decreased dramatically since the 2008 interim action.

Another indicator of effective treatment of chlorinated ethenes is a decrease in the total molar chloroethene concentration (the molar concentration of PCE, TCE, DCE, and VC combined). The use of total molar concentrations allows an assessment of changes in the total number of related contaminant molecules as the reductive dechlorination process transitions from the relatively heavy PCE to the progressively lighter TCE, DCE, and VC. Molar concentration trend plots for wells MW-7, EX, MP-1, and MGMS2-40 are provided in Appendix F. Between the February 2007 baseline event and the December 2018 monitoring event, total molar concentrations in wells MP-1, MW-7, EX and MGMS2-40 decreased between 75 percent (well MP-1) to over 90 percent (wells MW-7, EX, and MGMS2-40).

Riverbank Area. Wells MW-12, MW-13, MW-19, MGMS1-43, and MGMS3-40 are located within the 2016 riverbank interim action area and, therefore, are useful for evaluating the effectiveness of the interim action. Concentration trend plots for PCE, TCE, DCE, and VC in these wells are provided in Appendix F. As shown on the trend plots, monitoring results from the 2016 interim action area indicate reductions in concentrations of PCE and TCE of over 99 percent in groundwater from wells MW-12, MW-13, and MGMS3-40 after the 2016 enhanced bioremediation injections. For example, concentrations of PCE and TCE in well MW-13 in June 2016, prior to the injection event, were 2,470 and 1,820 µg/L, respectively. By December 2018, PCE concentrations in well MW-13 had been reduced to 0.567 µg/L and TCE had been reduced to 0.413 µg/L. DCE concentrations have also decreased. The DCE concentrations in wells MW-12, MW-13, MGMS1-43, and MGMS3-40 have been reduced by approximately 96 percent, 99 percent, 80 percent, and 99 percent, respectively. PCE, TCE, and DCE concentrations were observed at the upper end of the historical range in well MW-19; however, VC and ethene concentrations were also higher, suggesting reductive dichlorination is occurring near the well.

NW Area. Wells MW-14 and MW-26 are located within the 2016 NW Area interim action area and, therefore, are useful for evaluating the effectiveness of the interim action. Concentration trend plots for PCE, TCE, DCE, and VC in these wells are provided in Appendix F. Response to the 2016 interim action injections has been delayed in these wells, likely due to the typically flat or north/northwest groundwater gradient slowing the spread of the oil substrate. These wells are located on the periphery of the injection area, limiting their utility in monitoring the effectiveness of the injections. Continued quarterly groundwater monitoring will be conducted to further evaluate concentration trends.

5.3.1.2 Ethene Evaluation

Ethene is an end product of the reductive dechlorination process. The detection of ethene confirms the completion of the reductive dechlorination pathway and the destruction of the target VOCs at the Facility. Ethene degrades quickly in most natural environments, therefore, observing increases in ethene concentration can be difficult. During the second semi-annual 2018 monitoring period, ethene was detected in five of the ten 2016 interim action area monitoring wells (MW-12, MW-13, MW-19, MGMS2-40, and MGMS3-40). Further discussion of ethene results is provided below.

Primary Source Area. While the focus of the 2016 interim actions was not located in the area historically identified as the “primary source area”, there was some overlap between the 2008/2011 interim action injection areas and the 2016 interim action injection area, namely in the vicinity of wells MP-1 and EX. Concentrations of ethene in well MP-1 reached a maximum of 328 µg/L in March 2017, decreased to 83.2 µg/L in June 2017, and then decreased further to below reporting limits (1.0 to 13 µg/L) in samples collected between September 2017 and December 2018. These data suggest that the 2016 bioremediation substrate injected near well MP-1 was effective for stimulating reductive dechlorination; however, the mass of substrate may be diminished. Ethene has been detected in well EX, with the highest concentration measured in June 2018 (99.2 µg/L); however, ethene was not detected in well EX during the December 2018 monitoring event. Monitoring well MGMS2-40 is located near, but outside of, the 2016 interim action injection area, and within the footprint of the 2011 interim action injection area. Ethene concentrations in well MGMS2-40 increased in response to the 2011 injections and remained elevated and relatively stable through March 2018. Ethene was not detected in well MGMS2-40 in the July 2018 sample but was detected again in the September and December 2018 monitoring event samples. The presence of ethene in several interim action area wells, along with decreasing PCE and TCE concentrations, indicate that reductive dechlorination has been ongoing near this well since the 2011 injections.

Ethene has not been detected in groundwater in well MW-7 since 2014. The lack of ethene in well MW-7, coupled with low VOC concentrations in this well, suggests that there is little residual chlorinated hydrocarbon mass in what was historically the most impacted portion of the primary source area.

Riverbank Area. Prior to the 2016 interim action injections, ethene was not present in groundwater in wells located in the interim action area, including wells MW-12, MW-13, MW-19, and MGMS3-40. Since the completion of the 2016 interim action injections, ethene has been detected in all four interim action area wells. The presence of ethene suggests that the 2016 injections have successfully resulted in the complete degradation of chlorinated hydrocarbon mass. However, as detailed below, while ethene was still detected in the riverbank area wells in September and December 2018, the concentrations are decreasing concentrations, suggesting that the oil substrate is becoming depleted and enhanced reductive dechlorination has slowed in response.

A summary of the presence and persistence of ethene in each riverbank area interim action well is provided below:

- Ethene concentrations in well MW-12 increased from non-detect prior to the 2016 interim action, to 75.2 µg/L in March 2017, and remained elevated between March 2017 and September 2017. Concentrations of ethene in well MW-12 have been below the reporting limit (10.0-13.0 µg/L) since September 2017.
- PCE and TCE concentrations in MW-13 have decreased significantly between September 2016 and December 2018 (from 5,090 µg/L and 951 µg/L, respectively, to 0.567 µg/L and 0.413 µg/L, respectively), but it was not until November 2017 that ethene was detected in the well. Since then, concentrations of ethene continued to rise to 500 µg/L by July 2018 and then decreasing to 7.1 µg/L in December 2018.
- Ethene was first detected in well MW-19 during the September 2017 monitoring event and has been detected in every sampling event since, with the highest concentration (271 µg/L) detected during the June 2018 sampling event. Concentrations have since decreased to 2.1 µg/L by the December 2018 sampling event. As previously stated, VC concentrations in groundwater samples collected from well MW-19 in the June 2018 monitoring event were the highest since the well was first sampled in 2002. Collectively, these data confirm reductive dechlorination around well MW-19 and that chlorinated VOC mass is being completely degraded in the process.
- Ethene was detected in well MGMS3-40 during the first monitoring event after the 2016 injections (December 2016) and has been detected during each subsequent monitoring event through December 2018, at concentrations ranging from 4.9 µg/L to 242 µg/L.

NW Area. Ethene concentrations in wells MW-14 and MW-26 have not been detected above the reporting limit (1.0 to 13 µg/L) since ethene monitoring was initiated in September 2016. As stated above, these wells are located on the periphery of the injection area, limiting their utility in monitoring the effectiveness of the injections.

5.3.1.3 Total Organic Carbon Evaluation

The presence of elevated TOC indicates that the bioremediation injections have increased the electron donor carbon source needed to reductively dechlorinate the VOCs present in groundwater at the Facility. While a baseline monitoring event was not conducted prior to the 2016 injection event, TOC data are available for wells MP-1 and MW-12 (riverbank area) for the event prior to the injections (June 2016) and the two events concurrent with and following the injections (September and December 2016). TOC was further analyzed between March 2017 and December 2018 at select wells. A discussion of the TOC results is provided below.

Primary Source Area. Seven bioremediation injection points were located near well MP-1 during the 2016 interim action. In well MP-1, TOC values increased by over three orders of magnitude

between June and September 2016, with concentrations remaining elevated during the December 2016 event. During the March 2017 event, the TOC value remained stable; however, TOC values decreased in June 2017 by an order of magnitude and further decreased in September 2017 by another order of magnitude before remaining stable through 2018. At well EX, the TOC concentration increased by two orders of magnitude following the 2016 interim action injections and then decreased an order of magnitude during June 2017 and has remained consistent since that time at concentrations ranging between 11 and 26 mg/L. These results indicate utilization of the oil substrate in the dechlorination of VOCs, supporting the significant decreases in VOC concentrations observed following the 2016 bioremediation injections in this area.

Riverbank Area. The following describes TOC results in the riverbank portion of the 2016 interim action area (wells MW-12, MW-13, MW-19, MGMS3-40, and MGMS1-43).

- In groundwater collected from well MW-12, TOC concentrations increased by over three orders of magnitude between June and September 2016, with concentrations remaining elevated during the December 2016 monitoring event. Between December 2016 and March 2017, the TOC concentration in well MW-12 decreased by an order of magnitude and then gradually decreased another order of magnitude between June 2017 and June 2018. It has remained stable to slightly decreasing from June 2018 to December 2018.
- At well MW-13, TOC concentrations were elevated during the September 2016 sampling event, and then decreased by three orders of magnitude by the November 2017 event. TOC concentrations have remained relatively stable in well MW-13 through the December 2018 sampling event.
- At well MW-19, TOC values were low (one to two orders of magnitude below concentrations observed in wells MP-1 and MW-12) from September 2016 through November 2017, then increased by an order of magnitude in the March 2018 through June 2018 results. TOC concentrations have been steadily decreasing from June through December 2018.
- At well MGMS3-40, TOC concentrations increased during the September and December 2016 groundwater monitoring events, then decreased by an order of magnitude during the March 2017 event, and has remained stable through December 2018.
- At well MGMS1-43 the TOC concentration in groundwater has remained relatively low and steady from September 2016 through December 2018, and do not yet appear to be significantly influenced from the oil injections in 2016

With the exception of well MGMS1-43, TOC concentrations in riverbank area wells indicate utilization of the oil substrate in the dechlorination of VOCs, which is supported by decreasing VOC concentrations in most riverbank area wells.

NW Area. In wells MW-14 and MW-26, TOC concentrations did not increase after the September 2016 injections. TOC levels in these wells remain low and stable.

Summary of Enhanced Bioremediation Results Following the 2016 Interim Action. The 2016 groundwater interim action was implemented in July through September 2016 and included over 72 bioremediation injections at the Facility and 30 bioremediation injections at the off-facility NW Area. Since implementation, groundwater in the 2016 interim action area has been monitored for eight quarters for indicators of reductive dechlorination. The results from the third and fourth quarter 2018 sampling events are consistent with previous events and indicate that reductive dechlorination is occurring. Specifically:

- Up to three orders of magnitude reduction of PCE and TCE concentrations have been observed between the September 2016 and June/July 2018 monitoring events in some of the 2016 interim action area wells.
- Observed trends in breakdown product concentrations are consistent with reductive dechlorination of chlorinated ethene compounds.
- PCE, TCE, and DCE concentrations are decreasing in wells MW-26 and MW-14 in the NW Area but increases in TOC due to the injections were not observed in these wells suggesting the decreasing trends in these wells are due to natural attenuation. Ethene concentrations generally increased or stayed approximately the same in the interim action evaluation wells. These data indicate that dechlorination of PCE and TCE is occurring within the treatment zone.
- After the 2016 injections, ethene was first detected in four riverbank interim action monitoring wells in March 2017. Detections of ethene in Facility wells have continued through December 2018 although concentrations are starting to taper off in many of the wells. TOC concentrations are also decreasing and are below 25 mg/L in most wells, indicating that an additional injection event may be needed in the area to further reduce VOC concentrations and achieve site goals.

5.3.2 SVE Systems – Monitoring and Mass Removal Evaluation

The following paragraphs summarize the monitoring and analytical results as well as the total VOC mass removal for the North and South SVE Systems at the Facility. Field vapor measurements were collected with a photoionization detector (PID). Effluent vapor samples from the SVE systems were collected into Summa™ canisters and submitted to TestAmerica Laboratories (Test America) in West Sacramento, California, for analysis of VOCs by method TO-15.

The North SVE System has been non-operational since May 2017 due to the blower motor failing. The rotor is locked and blown fuses were noted on two of the three legs. A replacement blower is required to return the North SVE system to operation. The terminal is planning modifications to the rail alignment at the Facility to accommodate modifications to one of its storage areas; part of the planned work will require the abandonment and potential relocation of several of the SVE wells in the North system. As of February 2019, the modifications to the terminal infrastructure have not been initiated and the North SVE system remains non-operational.

Starting in May 2018, SVE monitoring events have occurred on a bi-monthly, rather than monthly basis after it was deemed frequent enough to sufficiently maintain the system and quantify mass removal. SVE monitoring events (limited to the South SVE system) occurred on July 23, 2018 and November 7, 2018 during this reporting period. North SVE System operating and analytical data are provided in Tables 6 and 7, respectively. As discussed above, the North SVE system was not operational during this reporting period; therefore, data are from the period prior to May 2017. South SVE System operating and analytical data are provided in Tables 8 and 9, respectively.

SVE System Mass Removal. The approximate VOC mass removed by the North and South SVE Systems is presented in Tables 10 and 11 and on Figures 14 and 15, respectively. The North and South Systems have removed approximately 232 and 3,989 pounds of VOCs, respectively, since startup in October 2011. Including the mass removed from the 2008 SVE System, the total mass removal by SVE at the Facility to date is approximately 7,371 pounds. The next SVE monitoring event is scheduled for March 2019.

6.0 INFRASTRUCTURE MAINTENANCE

During a non-routine site visit in May 2018, abnormal noise could be heard in the vicinity the South SVE well vault VE-1-2. Apex field staff opened the vault and noted the horizontal piping in the vault had separated drawing ambient air into the SVE system. The valve for that well was turned off and field staff attempted to repair the well. The piping repair was unsuccessful; the SVE installation contractor was contacted to repair the piping during November 2018. The piping in the vault was reconnected and the valve for that well was re-opened. Also, during this time, the bolts of several SVE well vaults that were corroded and/or seized up were drilled out, re-threaded, and new bolts were inserted, re-established accessibility to these vaults. Two SVE well vaults remain inaccessible.

During the December 2018 groundwater monitoring event, Cascadia field staff noticed that the SVE knockout drum contained blue water consistent with the water observed in November 2017. To determine the cause, all accessible SVE vaults were opened and examined for any breaches in the system. It was noted that SVE well vault VE-9-4 contained a break in the pipe and water appeared to be getting into the system. The individual well was not able to be closed; therefore, the entire branch was shut off, leaving wells VE-9-1, VE-9-2, VE-9-3, VE-9-4, VE-10-1, VE-10-2, and VE-10-3 offline. The knockout drum was emptied at this time.

During the January 4, 2019 SVE monitoring event, Cascadia field staff again observed blue water in the knockout drum; the drum was emptied. Cascadia field staff opened all accessible vaults and determined that there was water potentially getting into the system at VE-1-2. This well was closed off again. To confirm if the closure of wells VE-1-2 and VE-9-4 was sufficient for preventing water from entering the SVE system, Cascadia field staff returned to the Facility on January 9, 2019, to check for the presence of blue water in the knockout drum. Several gallons of blue water had accumulated in the knockout drum despite wells VE-1-2 and VE-9-4 both being offline. The SVE knockout drum IDW was emptied again. Troubleshooting to identify the source of the blue water is ongoing and the results will be reported in the next semi-annual report.

7.0 FUTURE ACTIVITIES

NuStar has been sampling groundwater at the Facility for VOCs on a quarterly basis and reporting on a semi-annual basis, since the existing Groundwater Monitoring Plan was approved by Ecology in 2008 (Ash Creek, 2008). Since that time, over 1,700 samples have been collected from 44 wells, over a total of 40 monitoring events. There is a robust set of historical VOC monitoring data to understand concentration trends and to indicate that a less frequent sampling frequency would be appropriate for meeting remedial goals; therefore, we propose modifying the monitoring program to reduce the sampling frequency to semi-annually and to reduce the reporting frequency to annually. This will serve to align the NuStar monitoring program with the Ports sampling program for the Swan Manufacturing and Cadet sites. In addition to revising the monitoring scope for HVOCs, NuStar also proposes to abandon some of the wells associated with the former remediation system installed by SECOR in 1999. These wells are not being used for remediation or monitoring purposes and are located in areas with sufficient monitoring well network coverage. NuStar will send Ecology a proposed monitoring program and abandonment plan for review.

SVE operations and maintenance will occur bi-monthly in accordance with the schedule proposed in the *2011 Interim Action Evaluation Report* (Ash Creek, 2012) at the South SVE system only until the North SVE system is repaired.

As noted in Section 5.3, ethene concentrations in most of the 2016 interim action evaluation wells are low to non-detect and TOC concentrations are below 25 mg/L. These results suggest that the majority of the oil substrate has been utilized and it may be advantageous to perform additional focused oil injections in 2019 in areas where VOC concentrations have stabilized above goals.

As proposed and agreed upon in the February 2018 joint NuStar, POV, and Ecology meeting, the sampling of Facility wells for nitrate, nitrite, and ammonia was conducted on a quarterly basis for four quarters initiated in November 2017. The September 2018 monitoring event was the fourth of four quarters of monitoring for nitrate, nitrite and ammonia. NuStar continued to sample for nitrate and ammonia in December 2018 and will continue to do so while preparing a work plan for additional assessments requested by Ecology to addend the Final 2013 Remedial Investigation report. The nitrate and ammonia results, a description of current and historical products handled at the Facility, as well as the timing and implementation of “best management” practices for handling such products, will be included in the work plan.

8.0 REFERENCES

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TABLES

Table 1
Groundwater Monitoring Plan: Third and Fourth Quarters 2018
NuStar Vancouver Facility
Vancouver, Washington

Monitoring Program	Well ID	Groundwater Zone	Included Monitoring Wells	
			Third Quarter	Fourth Quarter
Groundwater monitoring includes depth-to-water measurement.	MW-1	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-2	Shallow	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	MW-3	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-5	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-6	Shallow	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	MW-7	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-8	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-9	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-10	Shallow	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	MW-12	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-13	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-14	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-15	Shallow	<input type="checkbox"/>	<input type="checkbox"/>
	MW-16	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-17	Shallow	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	MW-18i	Intermediate	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-19	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-19i	Intermediate	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-20i	Intermediate	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-21i-40	Intermediate	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-21i-105	Intermediate	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-22i	Intermediate	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-23i	Intermediate	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-24i	Intermediate	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-24d	Deep	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-25i	Intermediate	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-26	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-30i	Intermediate	<input type="checkbox"/>	<input type="checkbox"/>
	MW-31i	Intermediate	<input type="checkbox"/>	<input type="checkbox"/>
	MW-32s	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MW-32i	Intermediate	<input type="checkbox"/>	<input type="checkbox"/>
	MGMS1-3(43)	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MGMS1-2 (60)	Intermediate	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
MGMS1-1(110)	Lower Intermediate	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
MGMS2-4(40)	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
MGMS2-3 (60)	Intermediate	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
MGMS2-2(110)	Lower Intermediate	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
MGMS2-1(132)	Lower Intermediate	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
MGMS3-4(40)	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Please refer to notes at end of table.

Table 1
Groundwater Monitoring Plan: Third and Fourth Quarters 2018
NuStar Vancouver Facility
Vancouver, Washington

Monitoring Program	Well ID	Groundwater Zone	Included Monitoring Wells	
			Third Quarter	Fourth Quarter
Groundwater monitoring includes depth-to-water measurement.	MGMS3-3(60)	Intermediate	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MGMS3-2(101)	Lower Intermediate	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	MGMS3-1(132)	Lower Intermediate	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	MW-E	Shallow	<input type="checkbox"/>	<input type="checkbox"/>
	MW-F	Shallow	<input type="checkbox"/>	<input type="checkbox"/>
	MW-G	Shallow	<input type="checkbox"/>	<input type="checkbox"/>
	EW-1	Shallow	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	EX-1	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MP-1	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	MP-2	Shallow	<input type="checkbox"/>	<input type="checkbox"/>
	MP-3	Shallow	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	MP-4	Shallow	<input type="checkbox"/>	<input type="checkbox"/>
	S-1	Intermediate	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	S-2	Shallow	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Notes:

- = Included in sampling program represented in this report.
- = Not included in sampling program represented in this report: water level measurement only.
- Wells MW-E, MW-G, MW-30i, MW-31i, and MW-32i are sampled by the Port of Vancouver.

Table 2
Groundwater Elevation Data: 2018
NuStar Vancouver Facility
Vancouver, Washington

Well Number/ (TOC Elevation)	Date of Measurement	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
<i>Groundwater Monitoring Wells</i>			
MW-1 (32.60)	03/19/18	24.65	7.95
	6/27/2018	24.31	8.29
	09/24/18	28.83	3.77
	12/3/2018	27.78	4.82
MW-2 (34.04)	03/19/18	26.06	7.98
	6/27/2018	25.76	8.28
	09/24/18	30.50	3.54
	12/3/2018	29.59	4.45
MW-3 (34.41)	03/19/18	26.28	8.13
	6/27/2018	25.93	8.48
	09/24/18	30.49	3.92
	12/3/2018	28.28	6.13
MW-5 (33.86)	03/19/18	25.72	8.14
	6/27/2018	24.46	9.40
	09/24/18	29.52	4.34
	12/3/2018	28.52	5.34
MW-6 (32.83)	03/19/18	24.58	8.25
	6/27/2018	23.59	9.24
	09/24/18	28.43	4.40
	12/3/2018	27.26	5.57
MW-7 (33.74)	03/19/18	25.53	8.21
	6/27/2018	24.20	9.54
	09/24/18	29.15	4.59
	12/3/2018	28.56	5.18
MW-8 (33.97)	03/19/18	25.36	8.61
	6/27/2018	23.76	10.21
	09/24/18	28.56	5.41
	12/3/2018	28.35	5.62
MW-9 (33.86)	03/19/18	25.69	8.17
	6/27/2018	24.12	9.74
	09/24/18	29.20	4.66
	12/3/2018	28.76	5.10
MW-10 (34.83)	03/19/18	26.14	8.69
	6/27/2018 ⁶	24.19	10.64
	9/24/2018 ⁶	28.40	6.43
	12/3/2018 ⁶	28.75	6.08

Please refer to notes at end of table.

Table 2
Groundwater Elevation Data: 2018
NuStar Vancouver Facility
Vancouver, Washington

Well Number/ (TOC Elevation)	Date of Measurement	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
MW-12 (31.43)	03/19/18	23.48	7.95
	6/27/2018	23.04	8.39
	09/24/18	27.55	3.88
	12/3/2018	26.50	4.93
MW-13 (33.15)	03/19/18	25.17	7.98
	6/27/2018	24.30	8.85
	09/24/18	28.85	4.30
	12/3/2018	28.00	5.15
MW-14 (33.81)	03/19/18	25.74	8.07
	6/27/2018	24.24	9.57
	09/24/18	29.27	4.54
	12/3/2018	28.75	5.06
MW-15 (39.13)	03/19/18	30.95	8.18
	6/27/2018	29.75	9.38
	09/24/18	34.00	5.13
	12/3/2018	33.39	5.74
MW-16 (33.05)	03/19/18	24.97	8.08
	6/27/2018	25.86	7.19
	09/24/18	29.81	3.24
	12/3/2018	27.90	5.15
MW-17 (32.65)	03/19/18	24.64	8.01
	6/27/2018	23.82	8.83
	09/24/18	28.50	4.15
	12/3/2018	27.68	4.97
MW-18i (33.40)	03/19/18	25.22	8.18
	6/27/2018	25.78	7.62
	09/24/18	30.56	2.84
	12/3/2018	29.04	4.36
MW-19 (33.59)	03/19/18	25.54	8.05
	6/27/2018	24.56	9.03
	09/24/18	29.24	4.35
	12/3/2018	28.55	5.04
MW-19i (33.62)	03/19/18	25.45	8.17
	6/27/2018	26.05	7.57
	09/24/18	30.91	2.71
	12/3/2018	29.38	4.24

Please refer to notes at end of table.

Table 2
Groundwater Elevation Data: 2018
NuStar Vancouver Facility
Vancouver, Washington

Well Number/ (TOC Elevation)	Date of Measurement	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
MW-20i (33.14)	03/19/18	25.01	8.13
	6/27/2018	25.57	7.57
	09/24/18	30.36	2.78
	12/3/2018	28.82	4.32
MW21i-40 (34.10)	03/19/18	25.98	8.12
	6/27/2018	26.49	7.61
	09/24/18	31.29	2.81
	12/3/2018	29.71	4.39
MW-21i-105 (33.99)	03/19/18	25.87	8.12
	6/27/2018	26.39	7.60
	09/24/18	31.12	2.87
	12/3/2018	29.53	4.46
MW-22i (34.39)	03/19/18	26.25	8.14
	6/27/2018	26.79	7.60
	09/24/18	31.56	2.83
	12/3/2018	30.08	4.31
MW-23i (33.80)	03/19/18	25.59	8.21
	6/27/2018	26.23	7.57
	09/24/18	31.22	2.58
	12/3/2018	32.50	1.30
MW-24i (33.47)	03/19/18	25.21	8.26
	6/27/2018	25.91	7.56
	09/24/18	30.91	2.56
	12/3/2018	28.63	4.84
MW-25i (33.58)	03/19/18	25.45	8.13
	6/27/2018	26.03	7.55
	09/24/18	30.95	2.63
	12/3/2018	31.32	2.26
MW-26 (33.73)	03/19/18	25.61	8.12
	6/27/2018	23.81	9.92
	09/24/18	29.06	4.67
	12/3/2018	28.75	4.98
MW-24d (33.91)	03/19/18	26.19	7.72
	6/27/2018	25.80	8.11
	09/24/18	30.60	3.31
	12/3/2018	29.09	4.82

Please refer to notes at end of table.

Table 2
Groundwater Elevation Data: 2018
NuStar Vancouver Facility
Vancouver, Washington

Well Number/ (TOC Elevation)	Date of Measurement	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
EW-1 (31.40)	03/19/18	23.39	8.01
	6/27/2018	23.18	8.22
	09/24/18	27.72	3.68
	12/3/2018	26.20	5.20
<i>Secor Interim Action Pilot Study Wells</i>			
S-1 (33.24)	03/19/18	25.08	8.16
	6/27/2018	25.23	8.01
	09/24/18	30.19	3.05
	12/3/2018	28.58	4.66
S-2 (33.15)	03/19/18	25.21	7.94
	6/27/2018	25.05	8.10
	09/24/18	29.93	3.22
	12/3/2018	28.80	4.35
<i>Multi-Level Monitoring Wells</i>			
MGMS1-3 (43)* (32.86)	03/19/18	24.86	8.00
	6/27/2018	24.33	8.53
	09/24/18	NM	NM
	12/3/2018	27.78	5.08
MGMS1-2(60)* (32.86)	03/19/18	23.44	9.42
	6/27/2018	25.51	7.35
	09/24/18	NM	NM
	12/3/2018	28.68	4.18
MGMS1-1(110)* (32.86)	03/19/18	23.43	9.43
	6/27/2018	25.53	7.33
	09/24/18	NM	NM
	12/3/2018	29.65	3.21
MGMS2-4(40)* (32.59)	03/19/18	24.48	8.11
	6/27/2018	23.52	9.07
	09/24/18	NM	NM
	12/3/2018	28.55	4.04
MGMS2-3(60)* (32.59)	03/19/18	24.79	7.80
	6/27/2018	25.01	7.58
	09/24/18	NM	NM
	12/3/2018	27.50	5.09
MGMS2-2(110)* (32.59)	03/19/18	24.82	7.77
	6/27/2018	24.95	7.64
	09/24/18	NM	NM
	12/3/2018	28.50	4.09

Please refer to notes at end of table.

Table 2
Groundwater Elevation Data: 2018
NuStar Vancouver Facility
Vancouver, Washington

Well Number/ (TOC Elevation)	Date of Measurement	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
MGMS2-1(132)* (32.59)	03/19/18	24.82	7.77
	6/27/2018	24.99	7.60
	09/24/18	NM	NM
	12/3/2018	28.50	4.09
MGMS3-4(40)* (31.65)	03/19/18	23.93	7.72
	6/27/2018	23.86	7.79
	09/24/18	NM	NM
	12/3/2018	27.25	4.40
MGMS3-3(60)* (31.65)	03/19/18	23.99	7.66
	6/27/2018	24.17	7.48
	09/24/18	NM	NM
	12/3/2018	27.71	3.94
MGMS3-2(101)* (31.65)	03/19/18	24.00	7.65
	6/27/2018	24.15	7.50
	09/24/18	NM	NM
	12/3/2018	27.75	3.90
MGMS3-1(132)* (31.65)	03/19/18	24.02	7.63
	6/27/2018	24.19	7.46
	09/24/18	NM	NM
	12/3/2018	27.79	3.86
<i>Port of Vancouver Wells</i>			
MW-30i (29.77)	03/27/17	11.42	18.35
	06/12/17	15.55	14.22
	09/25/17	26.36	3.41
	11/06/17	Well Abandoned	
MW-31i** (31.33)	03/19/18	26.46	4.87
	6/28/2018	28.13	3.20
	09/24/18	NM	NM
	12/3/2018	NM	NM
MW-32s (34.34)	03/19/18	26.38	7.96
	6/27/2018	26.33	8.01
	09/24/18	30.45	3.89
	12/3/2018	28.81	5.53
MW-32i (34.41)	03/19/18	36.65	-2.24
	6/27/2018	26.67	7.74
	09/24/18	31.54	2.87
	12/3/2018	30.08	4.33

Please refer to notes at end of table.

Table 2
Groundwater Elevation Data: 2018
NuStar Vancouver Facility
Vancouver, Washington

Well Number/ (TOC Elevation)	Date of Measurement	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
MW-E ** (30.64)	03/19/18	24.85	5.79
	6/27/2018	24.83	5.81
	09/24/18	NM	NM
	12/3/2018	NM	NM
MW-F (33.48)	03/19/18	26.24	7.24
	6/27/2018	26.18	7.30
	09/24/18	31.04	2.44
	12/3/2018	DRY*	--
MW-G (31.50)	03/19/18	24.58	6.92
	6/27/2018	24.58	6.92
	09/24/18	29.52	1.98
	12/3/2018	NM	NM

Notes:

1. TOC = Top of casing; BTOC = Below top of casing.
2. Utilizes new survey information from June 2010. NGVD29 datum (ft MSL).
3. * Water levels measurement points are located at the top of the plastic fittings mounted on the well covers.
4. NM = Not measured.
5. ** The casing has been modified at Port of Vancouver wells MW-E and MW-31i. The TOC elevation has not yet been re-surveyed, so groundwater elevation data for these wells is likely inaccurate.
6. The casing for well MW-10 was lowered during a recent monument replacement event. Top of casing information will be updated once the well is resurveyed.
7. DRY* Well dry or dedicated bladder obstructing ability to measure water levels

Table 3
Groundwater Analytical Results: 2017/2018
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,2-Dichloropropane	Tetrachloroethene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Trichloroethene	Vinyl Chloride
		Concentrations in µg/L (ppb)										
MW-1	3/20/2018	4.84	<0.500	<0.500	6.13	<0.500	0.322 J	2.49	<0.500	<0.500	2.06	<0.500
	7/1/2018	6.70	<0.500	0.204 J	16.1	0.303 J	0.427 J	0.530	<0.500	<0.500	1.63	10.5
	9/25/2018	7.33	<0.400	0.740	44.9	0.610	0.510	4.24	<0.400	<0.500	8.09	3.19
	12/4/2018	4.73	<0.400	<0.400	22.7	<0.400	<0.500	15.7	<0.400	<0.500	9.04	2.57
MW-2	9/25/2017	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/6/2017	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	7/2/2018	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	9/25/2018	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-3	3/20/2018	2.03	0.144 J	<0.500	77.8	2.22	1.99	194	3.40	<0.500	48.6	<0.500
	7/2/2018	<0.500	3.22	<0.500	64.5	1.62	1.07	180	2.58	<0.500	43.1	<0.500
	9/26/2018	6.41	<0.400	<0.400	75.6	0.73	1.18	145	1.18	<0.500	36.3	<0.400
	12/7/2018	3.09	<0.800	<0.800	44.2	1.00	<1.00	96.1	0.992	<1.00	27.8	<0.800
MW-5	3/21/2018	<0.500	<0.500	<0.500	1.86	<0.500	<0.500	10.6	0.199 J	<0.500	2.36	0.260 J
	6/29/2018	0.561	<0.500	<0.500	45.5	0.174 J	<0.500	21.3	<0.500	<0.500	11.8	1.17
	9/27/2018	<0.400	<0.400	<0.400	0.562	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/7/2018	1.03	<0.400	<0.400	129	<0.400	<0.500	4.69	<0.400	<0.500	11.7	4.80
MW-6	9/28/2017	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/7/2017	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	7/1/2018	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	9/25/2018	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-7	3/21/2018	0.495 J	<0.500	<0.500	17.6	<0.500	<0.500	0.228 J	<0.500	<0.500	2.86	4.93
	3/21/2018 DUP	0.551	<0.500	<0.500	17.2	<0.500	<0.500	0.284 J	<0.500	<0.500	2.99	4.87
	6/29/2018	0.461 J	<0.500	<0.500	5.50	<0.500	<0.500	9.89	<0.500	<0.500	3.53	1.47
	6/29/2018 DUP	0.437 J	<0.500	<0.500	5.41	<0.500	<0.500	8.94	<0.500	<0.500	3.48	1.55
	9/27/2018	1.23	<0.400	<0.400	8.48	<0.400	<0.500	6.50	<0.400	<0.500	10.8	2.08
	12/7/2018	3.97	<0.400	0.428	15.4	<0.400	<0.500	30.4	<0.400	<0.500	18.1	1.62
	12/7/2018 DUP	3.84	<0.400	0.472	17.7	<0.400	<0.500	26.6	<0.400	<0.500	16.4	1.06
MW-8	3/19/2018	<0.500	<0.500	<0.500	0.562	<0.500	<0.500	4.22	<0.500	<0.500	<0.500	<0.500
	6/29/2018	0.139 J	<0.500	<0.500	2.57	<0.500	<0.500	5.36	<0.500	<0.500	0.368 J	<0.500
	9/25/2018	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	3.76	<0.400	<0.500	<0.400	<0.400
	12/7/2018	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	2.95	<0.400	<0.500	<0.400	<0.400

Please refer to notes at end of table.

Table 3
Groundwater Analytical Results: 2017/2018
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,2-Dichloropropane	Tetrachloroethene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Trichloroethene	Vinyl Chloride
		Concentrations in µg/L (ppb)										
MW-9	3/21/2018	<0.500	<0.500	<0.500	1.20	<0.500	<0.500	39.0	1.14	<0.500	14.9	<0.500
	6/29/2018	6.86	<0.500	1.63	169	8.28	<0.500	332	3.46	<0.500	182	2.42 J
	9/27/2018	5.69	<0.400	1.59	219	7.54	<0.500	243	3.96	<0.500	168	3.90
	12/7/2018	0.748	<0.400	<0.400	20.0	0.800	<0.500	178	3.36	<0.500	66.5	0.545
MW-10	9/27/2017	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	3.7	<0.50	<0.50	2.4	<0.50
	11/6/2017	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	<0.50	1.1	<0.50
	6/29/2018	0.161 J	<0.500	<0.500	0.782	<0.500	<0.500	5.69	0.145 J	<0.500	5.82	<0.500
	9/25/2018	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	1.74	<0.400	<0.500	1.45	<0.400
	9/25/2018 DUP	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	1.76	<0.400	<0.500	1.54	<0.400
MW-12	3/20/2018	0.522	<0.500	<0.500	5.64	1.33	<0.500	<0.500	<0.500	<0.500	0.271 J	2.77
	3/20/2018 DUP	0.550 J	<0.500 J	<0.500	5.58	1.29 J	<0.500 J	0.203 J	<0.500 J	<0.500 J	0.261 J	2.60
	7/1/2018	0.913	<0.500	<0.500	4.02	1.57	<0.500	0.304 J	<0.500	<0.500	0.996	1.45
	7/1/2018 DUP	0.829	<0.500	<0.500	3.86	1.56	<0.500	0.289 J	<0.500	<0.500	0.977	1.30
	9/25/2018	0.730	<0.400	<0.400	1.46	0.520	<0.500	<0.400	<0.400	<0.500	<0.400	1.23
	9/25/2018 DUP	0.670	<0.400	<0.400	1.31	0.500	<0.500	<0.400	<0.400	<0.500	<0.400	1.21
	12/4/2018	<0.400	<0.400	<0.400	4.30	0.415	<0.500	1.29	<0.400	<0.500	1.29	1.69
	12/4/2018 DUP	0.470	<0.400	<0.400	3.95	0.400	<0.500	0.998	<0.400	<0.500	1.02	1.58
MW-13	3/20/2018	0.879	<0.500	2.55	1,730	5.20	<0.500	0.396 J	<0.500	<0.500	2.19	211
	7/1/2018	18.3	0.148 J	5.98	1,680	26.9	<0.500	<0.500	<0.500	<0.500	0.781	2,030
	9/25/2018	1.91	<0.400	<0.400	9.78	1.26	<0.500	0.410	<0.400	<0.500	0.800	113
	12/5/2018	<0.400	<0.400	<0.400	6.17	0.682	<0.500	0.567	<0.400	<0.500	0.413	55.2
MW-14	3/20/2018	5.42	<0.500	3.64	500	2.56	<0.500	36.0	0.579	<0.500	150	1.35 J
	6/28/2018	10.5	<0.500	2.54	255	2.52	<0.500	34.9	1.57	<0.500	247	0.687
	9/26/2018	12.1	<4.00	4.40	361	4.50	<5.00	84.3	<4.00	<5.00	484	<4.00
	12/5/2018	5.43	<4.00	<4.00	333	<4.00	<5.00	83.4	<4.00	<5.00	260	<4.00
MW-15	3/28/2017	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/28/2017	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/6/2017	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.64	<0.50	<0.50	<0.50	<0.50
	7/2/2018	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.596	<0.500	<0.500	<0.500	<0.500
MW-16	3/19/2018	0.232 J	<0.500	0.190 J	3.82	<0.500	<0.500	99.7	0.819	<0.500	12.6	<0.500
	7/2/2018	0.500 J	<0.500	0.209 J	9.61	<0.500	<0.500	72.5	0.855	<0.500	7.36	<0.500
	9/25/2018	<0.400	<0.400	<0.400	15.8	<0.400	<0.500	171	0.580	<0.500	33.9	<0.400
	12/6/2018	<0.400	<0.400	<0.400	4.54	<0.400	<0.500	130	0.761	<0.500	20.8	<0.400

Please refer to notes at end of table.

Table 3
Groundwater Analytical Results: 2017/2018
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,2-Dichloropropane	Tetrachloroethene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Trichloroethene	Vinyl Chloride
		Concentrations in µg/L (ppb)										
MW-17	9/29/2017	<0.50	<1.0	<0.50	2.7	<0.50	<0.50	4.6	<0.50	<0.50	11.4	<0.50
	11/8/2017	<0.50	<0.50	<0.50	9.3	<0.50	<0.50	9.9	<0.50	<0.50	21.9	<0.50
	6/28/2018	0.516	<0.500	<0.500	2.66	<0.500	<0.500	3.73	<0.500	<0.500	9.00	<0.500
	9/26/2018	<0.400	<0.400	<0.400	1.57	<0.400	<0.500	2.23	<0.400	<0.500	4.62	<0.400
MW-18i	3/21/2018	<0.500	<0.500	<0.500	1.43	<0.500	<0.500	1.47	<0.500	<0.500	0.818	<0.500
	7/2/2018	<0.500	<0.500	<0.500	0.626	<0.500	<0.500	0.557	0.320 J	<0.500	<0.500	<0.500
	9/27/2018	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	0.674	<0.400	<0.500	<0.400	<0.400
	12/6/2018	<0.400	<0.400	<0.400	0.959	<0.400	<0.500	1.34	<0.400	<0.500	0.698	<0.400
MW-19	3/21/2018	59.0	0.225 J	31.4	2,430	11.2	<0.500	1,250	17.0	0.339 J	1,340	413
	3/21/2018 DUP	58.2	0.242 J	30.7	2,470	10.8	<0.500	996	17.0	0.277 J	1,180	412
	6/28/2018	81.6	<0.500	35.6	3890	16.4	<0.500	163	10.9	0.210 J	148	773
	6/28/2018 DUP	80.2	<0.500	36.3	4190	18.4	<0.500	177	11.7	0.244 J	191	799
	9/25/2018	<0.400	<0.400	<0.400	1,900	<0.400	<0.500	3,720	<0.400	<0.500	2,190	115
	9/25/2018 DUP	<0.400	<0.400	<0.400	1,960	<0.400	<0.500	3,830	<0.400	<0.500	2,270	116
	12/5/2018	91.8	0.453	39.3	1,750	18.2	<0.500	3,090	21.8	0.669	1,490	79.0
	12/5/2018 DUP	90.1	<0.400	39.2	1,610	18.4	<0.500	2,460	21.3	0.670	1,290	77.1
MW-19i	3/20/2018	<0.500	<0.500	<0.500	0.228 J	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	7/2/2018	<0.500	<0.500	<0.500	0.212 J	<0.500	<0.500	0.223 J	<0.500	<0.500	<0.500	<0.500
	9/27/2018	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/6/2018	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-20i	3/21/2018	0.303 J	<0.500	<0.500	5.65	<0.500	<0.500	1.38	<0.500	<0.500	0.903	<0.500
	7/2/2018	0.436 J	<0.500	<0.500	9.72	<0.500	<0.500	2.27	<0.500	<0.500	1.60	<0.500
	9/25/2018	<0.400	<0.400	<0.400	7.66	<0.400	<0.500	2.09	<0.400	<0.500	1.39	<0.400
	12/6/2018	0.433	<0.400	<0.400	10.7	<0.400	<0.500	2.18	<0.400	<0.500	1.55	<0.400
MW-21i-105	3/22/2018	<0.500	<0.500	<0.500	0.661	<0.500	<0.500	0.504	<0.500	<0.500	0.477 J	<0.500
	6/29/2018	<0.500	<0.500	<0.500	1.92	<0.500	<0.500	1.76	<0.500	<0.500	1.28	<0.500
	9/26/2018	0.820	<0.400	<0.400	36.4	<0.400	<0.500	8.61	<0.400	<0.500	11.0	<0.400
	12/6/2018	<0.400	<0.400	<0.400	8.64	<0.400	<0.500	9.54	<0.400	<0.500	5.87	<0.400
MW-21i-40	3/22/2018	2.07	<0.500	0.643	55.1	0.391 J	<0.500	22.5	<0.500	<0.500	16.5	<0.500
	6/28/2018	2.55	<0.500	0.747	63.2	0.526	<0.500	26.0	0.145 J	<0.500	17.0	<0.500
	9/27/2018	2.46	<0.400	0.700	62.1	0.690	<0.500	24.5	<0.400	<0.500	17.1	<0.400
	12/6/2018	2.44	<0.400	0.666	59.1	0.483	<0.500	32.7	<0.400	<0.500	19.3	<0.400

Please refer to notes at end of table.

Table 3
Groundwater Analytical Results: 2017/2018
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,2-Dichloropropane	Tetrachloroethene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Trichloroethene	Vinyl Chloride
		Concentrations in µg/L (ppb)										
MW-22i	3/22/2018	0.330 J	<0.500	<0.500	9.59	<0.500	<0.500	1.76	<0.500	<0.500	7.79	<0.500
	6/29/2018	0.516	<0.500	<0.500	12.4	<0.500	<0.500	2.77	<0.500	<0.500	8.11	<0.500
	9/26/2018	0.42	<0.400	<0.400	12.5	<0.400	<0.500	2.42	<0.400	<0.500	6.76	<0.400
	12/5/2018	0.474	<0.400	<0.400	11.7	<0.400	<0.500	3.34	<0.400	<0.500	8.19	<0.400
MW-23i	3/21/2018	<0.500	<0.500	<0.500	0.207 J	<0.500	<0.500	0.402 J	<0.500	<0.500	0.215 J	<0.500
	6/28/2018	<0.500	<0.500	<0.500	0.202 J	<0.500	<0.500	0.247 J	<0.500	<0.500	0.212 J	<0.500
	9/27/2018	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/6/2018	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-24i	3/21/2018	1.42	<0.500	<0.500	13.5	<0.500	<0.500	19.1	<0.500	<0.500	10.2	<0.500
	6/28/2018	1.44	<0.500	<0.500	13.6	1.09	<0.500	10.3	<0.500	<0.500	5.93	<0.500
	9/27/2018	2.18	<0.400	<0.400	25.0	<0.400	<0.500	24.8	<0.400	<0.500	14.3	<0.400
	12/4/2018	0.800	<0.400	<0.400	5.13	<0.400	<0.500	10.2	<0.400	<0.500	3.76	<0.400
MW-24d	3/20/2018	<0.500	<0.500	<0.500	0.259 J	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.199 J
	6/27/2018	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.275 J
	9/28/2018	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/10/2018	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-25i	3/21/2018	<0.500	<0.500	<0.500	0.245 J	<0.500	<0.500	0.248 J	<0.500	<0.500	<0.500	<0.500
	6/29/2018	<0.500	<0.500	<0.500	0.274 B J	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	9/27/2018	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/6/2018	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
MW-26	3/20/2018	4.85	<0.500	1.35	157	1.85	<0.500	108	1.20	<0.500	190	1.75
	6/29/2018	5.05	<0.500	1.46	114	1.88	<0.500	138	1.94	<0.500	221	1.02
	9/24/2018	4.24	<0.400	1.24	141	2.14	<0.500	117	1.19	<0.500	233	1.18
	12/5/2018	3.02	<0.800	1.09	147	1.89	<1.00	139	0.846	<1.00	210	0.848
MW-32s	11/10/2017	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/22/2018	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	10/1/2018	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/10/2018	0.860	<0.400	<0.400	16.5	<0.400	<0.500	14.7	<0.400	<0.500	5.99	<0.400
EW-1	9/28/2017	<0.50	<1.0	<0.50	1.8	<0.50	<0.50	32.4	<0.50	<0.50	7.2	<0.50
	11/9/2017	<0.50	<0.50	<0.50	3.3	<0.50	<0.50	33.0	0.66	<0.50	7.3	<0.50
	7/1/2018	0.134 J	<0.500	<0.500	1.15 B	<0.500	<0.500	30.7	0.559	<0.500	7.59	<0.500
	9/27/2018	0.410	1.03	<0.400	3.18	<0.400	<0.500	29.7	0.410	<0.500	8.39	<0.400

Please refer to notes at end of table.

Table 3
Groundwater Analytical Results: 2017/2018
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,2-Dichloropropane	Tetrachloroethene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Trichloroethene	Vinyl Chloride
		Concentrations in µg/L (ppb)										
S-1	3/20/2018	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	6/28/2018	1.01	<0.500	0.336 J	3.62	<0.500	<0.500	3.16	0.901	<0.500	24.2	<0.500
	9/26/2018	0.511	<0.400	<0.400	2.58	<4.00	<0.500	2.11	0.408	<0.500	10.4	<0.400
	12/5/2018	<0.400	<0.400	<0.400	1.10	<4.00	<0.500	1.94	<0.400	<0.500	7.39	<0.400
S-2	3/20/2018	3.70	<0.500	<0.500	5.88	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	6/28/2018	4.13	<0.500	<0.500	23.2	0.562	<0.500	<0.500	1.00	<0.500	2.34	<0.500
	9/26/2018	9.97	<0.400	<0.400	50.9	0.695	<0.500	<4.00	1.74	<0.500	4.00	0.417
	12/5/2018	7.04	<0.400	<0.400	28.5	<4.00	<0.500	<0.400	<0.400	<0.500	2.18	<0.400
MGMS1-3(43)	3/22/2018	192	<0.500	18.0	2,450	34.9	<0.500	80.1	0.780	0.200 J	278	236
	7/1/2018	116	<0.500	13.8	1,880	32.8	<0.500	107	0.588	<0.500	246	118
	9/28/2018	141	<8.00	27.8	3,150	47.4	<10.0	252	<8.00	<10.0	528	134
	12/4/2018	148	<0.400	22.5	2,750	48.1	<0.500	146	1.08	<0.500	388	129
MGMS1-2(60)	3/22/2018	1.30	<0.500	<0.500	13.4	<0.500	<0.500	23.3	<0.500	<0.500	13.9	<0.500
	7/1/2018	0.894	<0.500	<0.500	11.8	<0.500	<0.500	18.4	<0.500	<0.500	8.45	<0.500
	10/1/2018	6.66	<0.400	<0.400	23.9	<0.400	<0.500	29.4	<0.400	<0.500	16.6	20.0
	12/4/2018	0.666	<0.400	<0.400	9.64	<0.400	<0.500	14.4	<0.400	<0.500	8.20	<0.400
MGMS1-1(110)	9/29/2017	5.9	<1.0	0.54	173	<0.50	<0.50	9.0	<0.50	<0.50	32.8	0.56
	11/7/2017	10.5	<0.50	0.91	257	0.67	<0.50	11.5	<0.50	<0.50	41.8	0.89
	7/1/2018	3.30	<0.500	0.462 J	104	0.357 J	<0.500	18.5	0.132 J	<0.500	36.6	0.556
	10/1/2018	6.12	<0.400	0.723	153	0.485	<0.500	13.0	<0.400	<0.500	39.3	0.657
MGMS2-4(40)	3/22/2018	25.9	<0.500	4.22	109	0.571	<0.500	46.0	0.259 J	<0.500	27.3	122
	7/1/2018	12.7	<0.500	5.93	151	0.971	<0.500	62.1	1.04	<0.500	48.9	38.2
	9/28/2018	8.74	<0.800	1.44	140	<0.800	<1.00	66.9	<0.800	<1.00	43.3	106
	12/10/2018	20.9	<0.400	0.563	24.9	<0.400	<0.500	18.7	<0.400	<0.500	12.0	123
MGMS2-3(60)	9/29/2017	2.3	<1.0	<0.50	30.4	<0.50	<0.50	17.5	<0.50	<0.50	12.0	6.7
	3/22/2018	0.818	<0.500	0.244 J	17.3	0.164 J	<0.500	20.6	0.205 J	<0.500	11.6	1.21
	7/1/2018	0.726	<0.500	<0.500	14.1	<0.500	<0.500	19.6	0.200	<0.500	10.1	1.58
	12/10/2018	2.26	<0.500	0.432	41.7	0.431	<0.500	36.1	<0.400	<0.500	20.7	4.35
MGMS2-2(110)	9/29/2017	2.80	<1.0	<0.50	63.5	<0.50	<0.50	2.2	<0.50	<0.50	5.3	25.0
	11/9/2017	<0.50	<0.50	<0.50	6.3	<0.50	<0.50	3.9	<0.50	<0.50	3.1	1.9
	7/1/2018	0.446 J	<0.500	<0.500	<0.500	6.74	<0.500	4.40	0.175 J	<0.500	3.42	3.87
	9/28/2018	0.410	<0.400	<0.400	11.3	<0.400	<0.500	4.98	<0.400	<0.500	4.27	4.63
MGMS2-1(132)	9/29/2017	2.2	<1.0	<0.50	64.9	<0.50	<0.50	2.4	0.59	<0.50	6.3	19.4
	11/9/2017	<0.50	<0.50	<0.50	14.3	<0.50	<0.50	3.6	<0.50	<0.50	4.5	5.0
	7/1/2018	0.531	<0.500	<0.500	13.8	<0.500	<0.500	4.47	0.191 J	<0.500	4.85	4.6
	9/28/2018	0.520	<0.400	<0.400	17.8	<0.400	<0.500	4.82	<0.400	<0.500	5.63	6.71

Please refer to notes at end of table.

Table 3
Groundwater Analytical Results: 2017/2018
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	1,2-Dichloropropane	Tetrachloroethene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Trichloroethene	Vinyl Chloride
		Concentrations in µg/L (ppb)										
MGMS3-4(40)	3/22/2018	8.57	<0.500	<0.500	9.81	0.179 J	0.632	1.45	<0.500	<0.500	0.528	39.8
	7/1/2018	1.39	<0.500	<0.500	7.58	<0.500	0.279 J	0.498 J	<0.500	<0.500	0.169 J	8.98 D
	7/1/2018 DUP	1.96	<0.500	<0.500	9.43	<0.500	0.318 J	0.630	<0.500	<0.500	0.163 J	17.3 D
	9/28/2018	6.74	<0.400	<0.400	116	<0.400	<0.500	0.970	<0.400	<0.500	<0.400	129
	9/28/2018 DUP	9.08	<0.400	0.560	143	<0.400	<0.500	0.686	<0.400	<0.500	<0.400	129
12/10/2018	1.54	<0.400	<0.400	1.77	<0.400	<0.500	0.603	<0.400	<0.500	<0.400	5.44	
MGMS3-3(60)	3/22/2018	0.757	<0.500	<0.500	15.6	<0.500	<0.500	2.16	<0.500	<0.500	1.76	5.89
	7/2/2018	0.671	<0.500	<0.500	12.7	<0.500	<0.500	2.70	<0.500	<0.500	1.92	3.36
	9/28/2018	<0.400	<0.400	<0.400	9.26	<0.400	<0.500	3.25	<0.400	<0.500	2.31	<0.400
	12/10/2018	1.21	<0.400	<0.400	17.7	<0.400	<0.500	0.919	<0.400	<0.500	1.16	0.857
MGMS3-2(110)	9/26/2017	<0.50	<1.0	<0.50	4.8	<0.50	<0.50	0.96	<0.50	<0.50	0.80	0.92
	11/10/2017	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	2.5	<0.50	<0.50	1.5	<0.50
	7/1/2018	<0.500	<0.500	<0.500	1.71	<0.500	<0.500	1.82	<0.500	<0.500	1.04	0.359 J
	9/28/2018	<0.400	<0.400	<0.400	1.52	<0.400	<0.500	1.98	<0.400	<0.500	1.11	<0.400
MGMS3-1(132)	9/26/2017	<0.50	<1.0	<0.50	3.4	<0.50	<0.50	3.0	<0.50	<0.50	2.8	<0.50
	11/10/2017	<0.50	<0.50	<0.50	3.3	<0.50	<0.50	5.1	<0.50	<0.50	3.8	<0.50
	7/1/2018	0.247 J	<0.500	<0.500	3.98	<0.500	<0.500	5.63	<0.500	<0.500	4.06	0.359 J
	9/28/2018	<0.400	<0.400	<0.400	3.45	<0.400	<0.500	3.82	<0.400	<0.500	3.24	<0.400
EX-1	3/21/2018	1.34	<0.500	<0.500	22.6	<0.500	<0.500	1.48	<0.500	<0.500	2.72	10.8
	6/28/2018	4.55	<0.500	1.11	722	8.72	<0.500	1.91	<0.500	<0.500	0.758	424
	9/24/2018	1.42	<0.400	<0.400	3.38	0.751	<0.500	3.07	<0.400	<0.500	2.42	7.56
	12/4/2018	0.876	<0.400	<0.400	8.18	<0.400	<0.500	6.35	<0.400	<0.500	3.60	1.88
MP-1	3/21/2018	3.17	<0.500	4.04	151	1.02	<0.500	245	<0.500	<0.500	64.5	1.63
	6/28/2018	10.2	<0.500	9.34	353	1.74	<0.500	747	0.555	<0.500	140	5.26
	9/26/2018	<8.00	<8.00	<8.00	60.2	<8.00	<10.0	322	<8.00	<10.0	57.0	<8.00
	12/4/2018	<0.400	2.79	6.59	130	0.836	<0.500	355	<0.400	<0.500	76.7	1.24
MP-3	6/28/2018	5.24	<0.500	1.78	203	1.31	<0.500	398	1.82	<0.500	65.1	8.96
	9/27/2018	4.06	<0.400	3.52	187	1.60	<0.500	721	0.950	<0.500	148	0.730

Notes:

1. µg/L (ppb) = Micrograms per liter (parts per billion).
2. **Bold** values represents detected concentration of listed analyte.
3. < = Not detected at or above the specified laboratory method reporting limit (MRL).
4. D = Relative percent difference (RPD) between sample and duplicate is outside of the acceptable range of +/- 30%.
5. J = Estimated concentration above the method detection limit and below the reporting limit.
6. B= Analyte was detected in the associated method blank.
7. Halogenated volatile organic compounds (HVOCs) analysis by U.S. Environmental Protection Agency (EPA) Method 8260B.

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
EX-1	2/6/2007	26.7	108	0.49
	3/23/2009	14	43	0.54
	3/16/2010	3.4	89	0.71
	6/7/2011	--	150	<0.10
	12/9/2011	--	<0.50	<0.10
	3/21/2018	302	1.22	0.47
	6/28/2018	119	<0.10	<0.050
	9/24/2018	132	0.461	<0.250
	12/4/2018	117	24.1	<0.250
MW-1	11/9/2017	3.96	46.4	<1.0
	3/20/2018	6.2	1.84	<0.10
	7/1/2018	1.47	<0.10	<0.10
	9/25/2018	5.79	<0.250	<0.250
	12/4/2018	3.38	79.4	<0.250
MW-2	11/6/2017	6.34	0.26	<0.10
	7/2/2018	9.85	<0.10	<0.10
MW-3	11/8/2017	1.68	2.7	<1.0
	3/20/2018	<0.40	19.7	<0.10
	7/2/2018	0.569	15.4	1.49
	9/26/2018	1.56	5.64	<0.250
	12/7/2018	1.18	10.2	<0.250
MW-5	11/7/2017	2.86	<0.10	<0.10
	3/21/2018	<0.05	2.63	<0.10
	6/29/2018	0.819	<0.10	<0.10
	9/27/2018	9.55	<0.250	<0.250
	12/7/2018	1.22	<0.250	<0.250
MW-6	11/7/2017	0.608	0.35	<0.10
	7/1/2018	4.17	<0.10	<0.10
	9/25/2018	4.30	<0.250	<0.250

Please refer to notes at end of table

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MW-7	2/6/2007	3.00	60.7	< 0.100
	6/10/2008	4.89	67.5	0.1
	3/23/2009	11	56	<0.10
	3/16/2010	2.4	99	<0.50
	6/7/2011	--	140	<0.10
	12/9/2011	--	<0.50	<0.10
	11/7/2017	9.09	<0.10	<0.10
	3/21/2018	13.4	<0.10	<0.10
	3/21/2018 DUP	16.9	<0.10	<0.10
	6/29/2018	7.9	10.8	0.10
	9/27/2018	16.7	<0.250	<0.250
	12/7/2018	22.4	13.3	<0.250
	12/7/2018 DUP	22.1	13.5	<0.250
	MW-8	6/10/2008	<0.0500	167
11/6/2017		<0.050	207	<0.10
3/19/2018		<0.40	284	<0.10
6/29/2018		<0.050	333	<0.10
9/25/2018		<0.0200	235	<0.250
12/7/2018		0.0230	260	<0.250
MW-9	9/21/2010	1.4	89	<0.10
	11/9/2017	17.4	559	<0.10
	3/21/2018	<0.050	230	<0.10
	6/29/2018	14.2	382	0.61
	9/27/2018	17.0	468	<0.250
	12/7/2018	5.60	311	<0.250
MW-10	11/6/2017	35.6	333	0.270
	6/29/2018	29.0	486	<0.10
	9/25/2018	37.2	413	<0.250
	9/25/2018 DUP	38.0	412	<0.250

Please refer to notes at end of table

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MW-12	10/19/2010	--	59	--
	6/7/2011	--	1.1	<0.10
	12/7/2011	--	67	<0.10
	11/9/2017	55.4	0.57	<0.25
	3/20/2018	39.4	<0.10	<0.10
	3/20/2018 DUP	39.9	<0.10	<0.10
	7/1/2018	33.0	<0.10	<0.10
	9/25/2018	126	<0.250	<0.250
	9/25/2018 DUP	129	<0.250	<0.250
	12/4/2018	37.2	82.2	0.487
	12/4/2018 DUP	37.1	80.0	0.526
	MW-13	11/7/2017	35.0	0.52
3/20/2018		191	<0.10	<0.10
7/1/2018		23.5	<0.10	<0.10
9/25/2018		37.7	<0.250	<0.250
12/5/2018		49.8	<0.250	<0.250
MW-14	11/8/2017	34.7	50.3	<1.0
	3/20/2018	50.7	17.1	<0.10
	6/28/2018	31.6	104	<2.5
	9/26/2018	41.0	150	<0.250
	12/5/2018	53.7	75.5	<0.250
MW-15	11/6/2017	<0.050	9.78	<0.10
	7/2/2018	<0.050	6.06	<0.10
MW-16	11/6/2017	<0.050	9.95	<0.10
	3/19/2018	<0.40	15.7	<0.10
	7/2/2018	<0.050	19.4	<0.10
	9/25/2018	<0.0200	6.10	<0.250
	12/6/2018	<0.0200	10.2	<0.250
MW-17	11/8/2017	0.634	43.4	<1.0
	6/28/2018	<0.050	7.84	<0.10
	9/26/2018	2.13	0.760	<0.250

Please refer to notes at end of table

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MW-18i	6/10/2008	<0.0500	0.35	<0.1
	11/7/2017	<0.050	1.07	<0.10
	3/21/2018	<0.050	0.75	<0.10
	7/2/2018	<0.050	1.13	<0.10
	9/27/2018	<0.0200	1.00	<0.250
	12/6/2018	<0.0200	0.715	<0.250
MW-19	10/19/2010	--	19	--
	11/9/2017	80	41	<1.0
	3/21/2018	150	47.8	<0.10
	3/21/2018 DUP	152	46.5	<0.10
	6/28/2018	194	<0.10	<0.10
	9/25/2018	122	120	<0.250
	9/25/2018 DUP	125	121	<0.250
	12/5/2018	188	118	<0.250
	12/5/2018 DUP	188	119	<0.250
	MW-19i	11/8/2017	0.236	<0.10
3/20/2018		<0.40	<0.10	<0.10
7/2/2018		0.158	<0.10	<0.10
9/27/2018		0.213	<0.250	<0.250
12/6/2018		0.240	<0.250	<0.250
MW-20i	11/7/2017	0.125	0.28	<0.10
	3/21/2018	1.01	1.06	<0.10
	7/2/2018	0.115	0.37	<0.10
	9/25/2018	0.244	1.11	<0.250
	12/6/2018	<0.0200	<0.250	<0.250
MW-21i-40	6/10/2008	0.0594	<0.100	<0.100
	11/8/2017	<0.050	1.90	<1.0
	3/22/2018	0.071	1.70	<0.10
	6/29/2018	<0.050	5.12	<1.0
	9/27/2018	<0.0200	3.61	<0.250
	12/6/2018	<0.0200	3.16	<0.250

Please refer to notes at end of table

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MW-21i-105	6/10/2008	0.0645	<0.100	<0.100
	11/8/2017	<0.050	1.6	<1.0
	3/22/2018	13.0	15.8	0.10
	6/29/2018	12.3	13.1	<0.10
	9/26/2018	0.409	0.759	<0.250
	12/6/2018	3.05	5.29	<0.250
MW-22i	11/7/2017	0.354	<1.0	<1.0
	3/22/2018	1.25	0.63	<0.10
	6/29/2018	0.469	<1.0	<1.0
	9/26/2018	0.369	<0.250	<0.250
	12/5/2018	0.378	<0.250	<0.250
MW-23i	6/10/2008	<0.0500	0.440	<0.100
	11/8/2017	<0.050	0.78	<0.10
	3/21/2018	<0.050	0.72	<0.10
	6/28/2018	<0.050	0.53	<0.10
	9/27/2018	<0.0200	1.04	<0.250
	12/6/2018	<0.0200	0.520	<0.250
MW-24i	6/7/2011	--	0.50	<0.10
	12/7/2011	--	1.6	<0.10
	11/9/2017	<0.050	3.09	<0.10
	3/21/2018	0.687	7.36	<0.10
	6/28/2018	<0.050	2.37	<0.050
	9/27/2018	<0.0200	7.56	<0.250
	12/4/2018	0.0670	2.97	<0.250
MW-24d	11/6/2017	0.153	<0.10	<0.10
	3/20/2018	<0.40	<0.10	<0.10
	6/27/2018	0.160	<0.10	<0.050
	9/28/2018	0.145	<0.250	<0.250
	12/10/2018	0.993	<0.250	<0.250
MW-25i	11/8/2017	0.138	0.53	<0.25
	3/21/2018	<0.050	0.40	<0.10
	6/29/2018	<0.050	0.27	<0.10
	9/27/2018	<0.0200	0.775	<0.250
	12/6/2018	<0.0200	0.541	<0.250

Please refer to notes at end of table

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MW-26	11/8/2017	34.1	101	<2.5
	3/20/2018	30.0	271	<0.25
	6/29/2018	22.4	213	<0.10
	9/24/2018	30.2	212	<0.250
	12/5/2018	35.3	152	<0.250
MW-32i	11/10/2017	<0.050	1.33	<0.10
MW-32s	11/10/2017	0.235	0.58	<0.10
	3/22/2018	<0.050	0.16	<0.10
	10/1/2018	<0.0200	<0.250	<0.250
	12/10/2018	0.0690	1.81	<0.250
EW-1	11/9/2017	<0.050	0.50	<0.10
	7/1/2018	<0.050	2.91	<0.10
	9/27/2018	<0.0200	0.686	<0.250
S-1	11/8/2017	7.13	4.14	<0.10
	3/20/2018	35.5	11.4	0.24
	6/28/2018	<1.3	3.02	<0.10
	9/26/2018	0.259	3.03	<0.250
	12/5/2018	<0.0200	2.16	<0.250
S-2	11/8/2017	5.64	1.05	<0.10
	3/20/2018	6.1	1.25	<0.10
	6/28/2018	8.05	3.28	0.054
	9/26/2018	7.55	5.93	<0.250
	12/5/2018	7.76	<0.250	<0.250
MGMS1-3(43)	10/19/2010	--	390	--
	11/7/2017	217	120	<1.0
	3/22/2018	214	<0.10	<0.10
	7/1/2018	198	<0.10	<0.10
	9/28/2018	240	75.8	<0.250
	12/4/2018	246	30.6	<0.250
MGMS1-2(60)	11/7/2017	<0.050	1.91	<0.10
	3/22/2018	0.054	3.18	<0.10
	7/1/2018	<0.050	1.83	<0.10
	10/1/2018	<0.0200	3.65	<0.250
	12/4/2018	0.104	0.697	<0.250

Please refer to notes at end of table

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MGMS1-1(110)	11/7/2017	0.822	0.73	<0.10
	7/1/2018	0.134	0.11	<0.10
	10/1/2018	0.595	0.898	<0.250
MGMS2-4(40)	9/21/2010	130	560	<0.10
	6/7/2011	--	200	<0.10
	12/7/2011	--	8.0	<0.10
	11/9/2017	87.1	<0.10	<0.10
	3/22/2018	84.2	<0.10	<0.10
	7/1/2018	83.6	0.76	<0.10
	9/28/2018	85.2	9.38	<0.250
	12/10/2018	80.7	<0.250	<0.250
MGMS2-3(60)	11/9/2017	1.03	0.12	<0.10
	3/22/2018	0.153	0.68	<0.10
	7/1/2018	<0.050	0.77	<0.10
	12/10/2018	1.39	<0.250	<0.250
MGMS2-2(110)	11/9/2017	<0.050	0.37	<0.10
	7/1/2018	0.050	0.28	<0.10
	9/28/2018	<0.0200	0.412	<0.250
MGMS2-1(132)	11/9/2017	<0.050	<0.10	<0.10
	7/1/2018	<0.050	<0.10	<0.10
	9/28/2018	0.0500	<0.250	<0.250
MGMS3-4(40)	11/10/2017	1.71	<0.10	<0.10
	3/22/2018	1.55	<0.10	<0.10
	7/1/2018	0.971	<0.10	<0.10
	9/28/2018	1.71	<0.250	<0.250
	9/28/2018 DUP	1.68	<0.250	<0.250
	12/10/2018	1.04	<0.250	<0.250
MGMS3-3(60)	11/10/2017	<0.050	<0.10	<0.10
	3/22/2018	0.272	0.39	<0.10
	7/1/2018	0.100	0.29	<0.10
	9/28/2018	<0.0200	0.393	<0.250
	12/10/2018	<0.0200	<0.250	<0.250

Please refer to notes at end of table

Table 4
Groundwater Analytical Results - Ammonia, Nitrate, and Nitrite
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Ammonia (as Nitrogen)	Nitrate-Nitrogen	Nitrite-Nitrogen
		Concentrations in mg/L (ppm)		
MGMS3-2(110)	11/10/2017	<0.050	0.48	<0.10
	7/1/2018	<0.050	0.43	<0.10
	9/28/2018	<0.0200	0.506	<0.250
MGMS3-1(132)	11/10/2017	<0.050	0.52	<0.10
	7/1/2018	<0.050	0.46	<0.10
	9/28/2018	<0.0200	0.468	<0.250
MP-1	2/6/2007	42.4	247	0.18
	3/23/2009	35	210	1.2
	3/16/2010	37	990	0.76
	6/7/2011	--	160	<0.10
	12/9/2011	--	120	0.91
	11/9/2017	12.2	23.0	<0.50
	3/21/2018	7.13	37.8	<0.10
	6/28/2018	8.71	38.2	<0.10
	9/26/2018	10.9	113	<0.250
	12/4/2018	6.01	80.8	<0.250
MP-3	6/28/2018	18.8	138	0.42

Notes:

1. Milligrams per liter (mg/L) = parts per million (ppm).
2. **Bold** value represents detected concentration of listed analyte.
3. -- = Not sampled or not analyzed.
4. < = Not detected at or above the specified laboratory method reporting limit (MRL).
5. Ammonia as nitrogen by Method 350.1
6. Nitrate as nitrogen and nitrite as nitrogen by Method 300.0

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters	
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential
Concentrations in µg/L												Concentrations in mg/L	(mg/L)	(mV)
MW-7	2/6/2007	31,500	352	<100	<100	<100	N/A	<100	<100	<100	<100	<1.0	1.20	245.7
	12/16/2008	15,000	450	130	<50	<50	N/A	<50	<50	<50	<50	2.4	0.72	-103.2
	3/23/2009	3,300	270	420	<15.0	<15.0	N/A	<15.0	<15.0	<0.50	<15.0	6.7	0.69	-614.5
	6/18/2009	890	350	520	<3.0	<3.0	N/A	<3.0	3.7	<3.0	5.2	N/A	6.97	-16.4
	9/18/2009	2,600	250	930	<3.0	<3.0	<1.0	5.5	9.8	<3.0	10	4.1	0.59	121.7
	12/18/2009	1,600	160	330	<5.0	<5.0	<1.0	<5.0	6.7	<5.0	6.7	2.5	1.23	162.1
	3/16/2010	550	56	180	<2.0	<2.0	<1.0	<2.0	<2.0	<2.0	2.0	2.6	1.37	147.7
	6/17/2010	200	72	360	<1.5	<1.5	<1.0	<1.5	<1.5	<1.5	2.7	2.8	1.86	240.0
	9/23/2010	750	110	690	<3.0	4.8	<1.0	<3.0	3.3	<3.0	3.5	8.2	0.64	-483.4
	12/10/2010	220	36	94	<0.90	1.7	1.19	<0.90	1.8	<0.90	1.6	0.84	6.29	111.6
	3/11/2011	420	82	150	0.91	9.3	7.76	1.6	6.6	<0.90	5.1	1.10	6.65	132.3
	6/7/2011	430	110	1,400	3.3	7.9	<1.0	3.4	4.8	<2.5	4.0	4.7	0.45	108.6
	9/19/2011	410	84	1,300	<5.0	78	N/A	<5.0	<5.0	<5.0	<5.0	3,400	4.53	695.8
	12/9/2011	200	32	3,400	6.8	110	38.7	6.9	8.0	<5.0	<5.0	1,600	1.19	-117.5
	3/12/2012	41	8.6	1,600	<5.0	600	71	<5.0	9.2	<5.0	<5.0	1,000	2.97	96.8
	06/22/2012	25	5.2	500	<2.0	290	130	<2.0	9.0	<2.0	<2.0	790	6.28	-137.9
	9/14/2012	28	5.2	180	0.70	80	47	0.54	3.8	<0.50	<0.50	790	2.29	93.3
	12/14/2012	11	6.8	130	<0.50	18	19.5	<0.50	1.9	<0.50	<0.50	550	0.34	24.1
	3/15/2013	1.6	0.78	110	<0.50	11	13.3	<0.50	0.69	<0.50	<0.50	250	1.02	53.3
	6/14/2013	1.6	<0.50	58	<0.50	16	5.86	<0.50	0.51	<0.50	<0.50	220	0.29	47.9
	9/20/2013	<0.50	<0.50	56	<0.50	10	18.6	<0.50	1.5	<0.50	<0.50	270	0.45	-189.3
	12/16/2013	0.51	<0.50	6.9	<0.50	9.1	5.0	<0.50	2.9	<0.50	<0.50	250	0.44	-66.1
	3/24/2014	9.8	2.6	13	<0.50	7.6	220	<0.50	1.6	<0.50	<0.50	77	0.43	76.9
6/25/2014	<0.50	<0.50	0.62	<0.50	1.4	21.9	<0.50	0.19	<0.50	<0.50	120	0.6	-90.5	
9/30/2014	<0.50	<0.50	4.5	<0.50	9.8	<1.0	<0.50	2.7	<0.50	<0.50	160	1.93	-112.0	
12/15/2014	0.61	1.5	16	<0.50	21	<1.0	<0.50	4.5	<0.50	<0.50	28.5	1.61	-34.0	
3/20/2015	<0.50	1.1	8.4	<0.50	1.0	<6.2	<0.50	1.0	<0.50	<0.50	23.5	1.19	-76.8	
6/17/2015	1.2	1.0	12	<0.50	12.6	<10.0	<0.50	2.6	<0.50	<0.50	46	0.81	-4.9	
9/23/2015	4.5	4.2	12.7	<0.50	4.8	<10.0	<0.50	1.8	<0.50	<0.50	40.6	0.87	-30.5	
12/8/2015	0.94	1.7	4.1	<0.50	1.9	<10.0	<0.50	<0.50	<0.50	<0.50	9.8	1.98	84.1	

Please refer to notes at end of table.

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters		
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential	
		Concentrations in µg/L										Concentrations in mg/L		(mg/L)	(mV)
MW-7 (continued)	6/17/2016	0.69	2.1	10.9	<0.50	5.4	<10.0	<0.50	0.60	<0.50	<0.50	18.9	1.67	-120.1	
	9/29/2016	<0.50	6.0	10.9	<0.50	5.5	N/A	<0.50	1.1	<0.50	<0.50	N/A	0.96	164.1	
	12/14/2016	0.78	<0.50	9.4	<0.50	1.0	N/A	<0.50	<0.50	<0.50	<0.50	N/A	1.13	5.6	
	3/28/2017	1.2	0.73	<0.50	<0.50	<0.50	N/A	<0.50	<0.50	<0.50	<0.50	N/A	0.89	-25.4	
	6/14/2017	<0.50	0.55	2.5	<0.50	2.5	<10.0	<0.50	<0.50	<1.0	<0.50	9.1	1.08	-60.5	
	9/27/2017	2.6	1.60	1.7	<0.50	1.7	<10.0	<0.50	<0.50	<1.0	<0.50	7.8	1.75	110.2	
	11/7/2017	6.3	7.8	2.6	<0.50	1.5	<10.0	<0.50	<0.50	<0.50	<0.50	3.1	2.65	68.6	
	3/21/2018	0.228 J	2.86	17.6	<0.500	4.93	<13.0	<0.500	0.495 J	<0.500	<0.500	9.96	6.03	10.5	
	6/29/2018	9.89	3.53	5.50	<0.500	1.47	<10.0	<0.500	0.461 J	<0.500	<0.500	5.0	0.56	187.5	
	9/27/2018	6.50	10.8	8.48	<0.400	2.08	N/A	<0.400	1.23	<0.400	<0.400	N/A	1.21	-9.0	
12/7/2018	30.4	18.1	17.70	<0.400	1.62	N/A	0.472	3.97	<0.400	<0.400	N/A	1.89	18.5		
MP-1	2/6/2007	1,610	421	347	8.5	23.6	N/A	<5.0	18.4	<5.0	11.2	< 1.00	0.39	208.9	
	12/16/2008	1,600	230	70	<5.0	<5.0	N/A	<5.0	<5.0	<5.0	10	1.80	1.37	-78.5	
	3/23/2009	1,200	180	89	<4.0	<4.0	N/A	<4.0	6.0	<4.0	10	2.0	1.05	127.3	
	6/18/2009	1,500	180	43	<4.0	<4.0	N/A	<4.0	4.3	<4.0	12	N/A	3.65	-43.7	
	9/18/2009	1,100	310	240	8.9	7.3	<1.0	<0.40	14	<4.0	8.2	1.50	0.48	99.7	
	12/18/2009	1,000	180	58	<4.0	<4.0	<1.0	<4.0	<4.0	<4.0	7.1	1.60	0.78	155.3	
	3/16/2010	1,500	400	410	13	10	2.47	4.7	22	<3.0	8.6	2.4	0.89	83.2	
	6/17/2010	800	140	120	<3.0	<3.0	<1.0	<3.0	3.2	<3.0	5.4	2.4	3.22	228.3	
	9/23/2010	730	120	41	<3.0	<3.0	<1.0	<3.0	<3.0	<3.0	4.0	2.0	0.53	-464.0	
	12/10/2010	1,000	150	27	<3.0	<3.0	<1.0	<3.0	<3.0	<3.0	4.5	1.0	0.52	-4.6	
	3/14/2011	1,200	180	150	<3.0	5.9	<0.0010	<3.0	7.1	<3.0	6.4	0.96	1.35	159.6	
	6/7/2011	640	130	75	<2.5	<2.5	<1.0	<2.5	4.9	<2.5	3.3	1.6	0.52	48.9	
	9/19/2011	30	72	4.1	<1.5	1.6	NA	<1.5	2.4	<1.5	1.9	3.7	0.69	913.5	
	12/9/2011	640	120	49	3.1	<2.5	3.28	<2.5	2.6	<2.5	3.1	8.3	0.83	-51.7	
	3/9/2012	490	140	440	6.3	21	15.9	2.8	9.4	<1.5	3.5	16	0.23	77.7	
	6/22/2012	690	120	530	2.9	48	66.6	2.8	5.6	<2.5	12	26	0.83	-51.7	
9/14/2012	340	83	170	2.2	4.5	16	<1.5	4.0	<1.5	2.0	23	0.43	98.2		
12/14/2012	230	48	170	1.7	1.8	21.1	<0.90	2.0	<0.90	1.0	18	0.28	-15.2		

Please refer to notes at end of table.

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters		
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential	
		Concentrations in µg/L										Concentrations in mg/L		(mg/L)	(mV)
MP-1 (continued)	3/15/2013	230	69	140	2.5	1.8	5.86	0.94	5.1	<0.90	1.0	35	0.44	60.4	
	6/14/2013	330	70	190	1.6	1.8	2.96	1.4	4.5	<0.90	1.4	28	0.34	187.2	
	9/20/2013	260	66	77	1.5	<0.90	3.17	<0.90	2.9	<0.90	0.95	35	0.44	1.2	
	12/16/2013	290	70	67	0.92	<0.90	<1.0	1.1	1.7	<0.90	1.2	26	1.10	10.3	
	3/24/2014	360	54	240	<1.5	<1.5	33	<1.5	2.2	<1.5	1.8	38	0.69	-18.7	
	6/23/2014	1,200	130	290	1.7	5.0	19.6	2.3	4.9	<1.5	9.5	34	3.00	-14.0	
	9/30/2014	360	63	110	<2.0	16	<1.0	<2.0	2.8	<2.0	<2.0	29	4.09	42.3	
	12/15/2014	320	59	58	<1.5	<1.5	<1.0	<1.5	1.7	<1.5	<1.5	2.4	0.88	-28.6	
	3/20/2015	570	96	190	1.5	25	<6.2	1.5	3.6	<1.0	1.0	7.8	1.04	29.8	
	6/18/2015	376	80.8	91	0.87	<0.84	<10.0	1.5	2.9	<0.84	<0.84	6.0	1.75	-148.5	
	9/22/2015	343	68.3	38.3	<1.2	<1.2	<1.0	1.4	1.8	<1.2	<1.2	2.2	1.66	105.5	
	12/8/2015	308	62.6	50.9	<1.2	<1.2	<1.0	1.5	1.8	<1.2	<1.2	9.9	1.20	82.8	
	3/8/2016	433	100	148	1.2	<0.84	<1.0	2.1	7.5	<0.84	<0.84	5.1	1.13	29.5	
	6/17/2016	206	67.3	125	0.97	<0.50	<10.0	1.5	5.0	<0.50	<0.50	<1.0	3.71	-8.6	
	9/28/2016	99.4	35.5	40.5	<0.50	3.3	<10.0	3.1	1.3	<0.50	<0.50	2620	1.32	135.2	
	12/13/2016	2.9	1.0	209	0.55	4.3	<10.0	0.92	0.64	<0.50	<0.50	130	3.57	12.1	
	3/30/2017	<0.50	0.79	177	6.0	186	328	<0.50	7.5	<0.50	<0.50	137	0.79	-137.7	
	6/14/2017	16.2	8.5	143	1.9	29.4	83.2	<0.50	2.3	<1.0	<0.50	38.9	0.87	-53.2	
9/26/2017	307	65.9	83.0	0.83	2.3	<10.0	3.4	4.5	<1.0	<0.50	4.3	0.93	80.5		
11/9/2017	198	74.0	105	0.91	2.6	<10.0	4.3	3.3	<0.50	<0.50	3.7	0.66	-104.8		
3/21/2018	245	64.5	151	1.02	1.63	<13.0	4.04	3.17	<0.500	<0.500	8.3	0.36	175.8		
6/28/2018	747	140	353	1.74	5.26	<10.0	9.34	10.2	<0.500	0.555	8.2	0.45	159.1		
9/26/2018	322	57	60.2	<8.00	<8.00	<1.0	<8.00	<8.00	<8.00	<8.00	3.12	0.99	126.4		
12/4/2018	355	76.7	130	0.836	1.24	<1.0	6.59	<0.400	2.79	<0.400	6.09	2.28	-22.7		

Please refer to notes at end of table.

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters	
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential
Concentrations in µg/L												Concentrations in mg/L	(mg/L)	(mV)
EX	2/6/2007	2,810	564	68.2	<10.0	<10.0	N/A	<10.0	<10.0	<10.0	40	1.45	0.24	164.8
	12/16/2008	4,500	830	490	<15.0	<15.0	N/A	<15.0	54	<15.0	71	3.30	0.74	-174.5
	3/23/2009	1,400	420	50	<5.0	<5.0	N/A	<5.0	<5.0	<5.0	43	3.0	0.47	68.8
	6/18/2009	24	11	4.2	<0.50	<0.50	N/A	<0.50	<0.50	<0.50	1.1	N/A	0.37	-9.3
	9/18/2009	2,100	380	120	0.76	1.1	<1.0	3.3	4.1	<0.50	38	4.9	0.60	109.0
	12/18/2009	700	56	5.6	<2.5	<2.5	55.6	<2.5	<2.5	<2.5	3.7	1.8	2.13	170.1
	3/16/2010	150	33	20	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.2	2.4	0.88	102.6
	6/17/2010	150	39	92	<0.50	2.2	<1.0	<0.50	0.97	<0.50	2.3	3.3	0.84	239.5
	9/23/2010	2,400	220	90	0.53	1.8	<1.0	1.6	1.5	<0.50	20	3.6	0.93	-521.6
	12/21/2010	900	99	30	<0.50	0.71	<1.0	0.59	0.83	<0.50	6.7	<0.50	0.91	131.7
	3/31/2011	6,800	910	240	<4.0	5.1	1.91	8.1	8.2	<4.0	110	1.9	--	--
	6/7/2011	1,400	170	140	<4.0	<4.0	<1.0	<4.0	<4.0	<4.0	15	3.5	0.70	115.2
	9/19/2011	4,100	460	290	<5.0	14	N/A	11	7.9	<5.0	73	560	0.63	907.9
	12/9/2011	<50	<50	12,000	9.3	140	11.4	19	16	<5.0	17	320	1.23	-68.3
	3/9/2012	33	10	1,400	8.6	290	24.2	<4.0	5.0	<4.0	<4.0	89	0.14	-33.6
	6/22/2012	3.0	1.1	170	1.3	120	150	0.68	3.4	<0.50	0.59	110	1.23	-68.3
	9/14/2012	3.0	<1.5	320	<1.5	42	47.2	<1.5	1.5	<1.5	<1.5	77	0.15	-29.5
	12/14/2012	0.87	<0.50	26	<0.50	12	5.92	<0.50	<0.50	<0.50	<0.50	59	0.25	3.3
	3/15/2013	1.2	<0.50	<0.50	<0.50	4.4	<1.0	<0.50	<0.50	<0.50	<0.50	64	0.37	67.0
	6/14/2013	0.79	<0.50	1.6	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	12	0.54	158.8
	9/20/2013	4.1	2.6	71	0.68	30	35.4	0.54	1.9	<0.50	<0.50	42	0.43	-175.4
	12/16/2013	2.0	1.4	34	<0.50	28	45.3	<0.50	3.8	<0.50	<0.50	46	1.66	11.9
	3/24/2014	20	7.5	30	<0.50	11	91.1	<0.50	0.80	<0.50	<0.50	35	0.51	158.7
	6/23/2014	29	15	160	0.97	38	81.5	1.1	2.9	<0.50	<0.50	34	0.41	-50
	9/30/2014	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	12/15/2014	22	2.7	10	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	158	2.41	-52.2
	3/19/2015	170	56	690	1.9	2.8	<6.2	2.1	3.5	<0.50	2.5	<5.0	1.05	18.2
	6/18/2015	186	42	420	1.6	3.2	<10.0	2.6	2.6	<0.50	0.88	7.5	2.29	-35.2
	9/22/2015	302	61.9	543	2.6	24.4	<1.0	3.7	2.9	<0.50	0.65	22.6	0.90	23.7
	12/8/2015	94.4	21.3	427	<0.50	2.1	<1.0	<0.50	<0.50	<0.50	<0.50	7.5	--	--

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Table 5
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Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters		
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential	
		Concentrations in µg/L										Concentrations in mg/L		(mg/L)	(mV)
EX (continued)	3/8/2016	274	71.1	1,160	3.6	13.3	<1.0	2.9	4.0	<1.2	5.0	22	0.36	113.3	
	6/17/2016	592	90.8	1,040	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	1.2	2.72	4.8	
	9/28/2016	39.4	549	2,230	3.8	128	N/A	3.5	4.6	<1.7	2.5	N/A	1.61	138.1	
	12/12/2016	4.3	0.96	8.1	<0.50	51.9	N/A	<0.50	<0.50	<0.50	<0.50	N/A	2.00	-24	
	3/28/2017	6.1	1.9	5.2	<0.50	<0.50	23.5	<0.50	<0.50	<0.50	<0.50	347	1.50	89.9	
	6/14/2017	9.5	3.0	11.7	0.56	1.3	11.2	<0.50	10.7	<1.0	<0.50	14.0	3.48	-12.4	
	9/26/2017	0.82	0.63	6.9	<0.50	10.1	17.5	<0.50	8.8	<1.0	<0.50	25.5	1.18	-140.5	
	3/21/2018	1.48	2.72	22.6	<0.500	10.8	28.3	<0.500	1.34	<0.500	<0.500	15.4	0.19	74.4	
	6/28/2018	1.91	0.758	722	8.72	424	99.2	1.11	4.55	<0.500	<0.500	43.6	0.39	-62.6	
	9/24/2018	3.07	2.42	3.38	0.751	7.56	2.9	<0.400	1.42	<0.400	<0.400	13.2	1.55	150.7	
	12/4/2018	6.35	3.60	8.18	<0.400	1.88	<1.0	<0.400	0.876	<0.400	<0.400	11.0	5.80	-10.0	
MW-12	6/7/2011	53	25	59	1.0	<0.50	<1.0	<0.50	1.8	<0.50	0.70	0.94	3.16	110.4	
	9/19/2011	860	690	4,700	55	63	NA	45	240	2.5	65	8.3	0.84	906.3	
	12/7/2011	520	380	2,900	33	40	6.15	28	130	1.3	34	59	1.00	109.0	
	3/12/2012	770	540	3,800	45	46	<1.0	44	210	<15.0	48	65	1	45.3	
	6/22/2012	270	200	1,700	39	22	<1.0	16	100	<5.0	13	56	0.66	117.1	
	9/14/2012	1,100	730	5,400	73	84	<1.0	58	270	<15.0	76	100	0.43	140.7	
	12/13/2012	38	23	62	0.97	<0.50	<1.0	<0.50	1.0	<0.50	0.53	4.9	1.07	128.6	
	3/15/2013	760	540	4,300	56	54	<1.0	40	200	1.8	53	95	0.62	117.3	
	6/13/2013	610	500	4,800	53	59	<1.0	39	240	<15.0	46	62	0.39	205.2	
	9/20/2013	510	400	3,400	49	50	<1.0	37	170	1.6	37	110	0.59	-10.7	
	12/16/2014	150	110	800	10	9.8	<1.0	7.6	36	<2.5	5.8	23	1.22	40.4	
	3/24/2014	180	170	1,900	25	47	<1.0	18	110	0.77	8.6	41	1.94	29.1	
	6/24/2014	42	34	310	2.3	<1.5	<1.0	1.9	14	<1.5	1.6	13	3.68	1.5	
	9/30/2014	680	480	3,500	45	42	<1.0	39	190	<15.0	36	93	6.09	47.1	
	12/11/2014	25	15	34	0.64	<0.50	<1.0	<0.50	0.73	<0.50	<0.50	1.9	0.65	-110.0	
	3/20/2015	580	340	2,110	29	37	<6.2	25	102	<5.0	18	4	0.89	75.7	
	6/19/2015	514	356	2,570	25	31.1	<10.0	28.2	151	<10.0	23.6	4.8	0.71	10.2	
9/22/2015	343	239	2,250	23.4	22.5	<1.0	16.9	120	<8.3	15.7	4.4	1.06	65.3		
12/8/2015	44.9	22	40.1	0.72	<0.50	<10.0	<0.50	0.84	<0.50	0.52	16.5	0.99	28.1		

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Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters		
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential	
		Concentrations in µg/L										Concentrations in mg/L		(mg/L)	(mV)
MW-12 (continued)	3/8/2016	325	209	1,380	16.2	21.3	<10.0	15.4	79.9	<3.6	7.7	5.5	0.71	62.2	
	6/16/2016	314	288	3,310	31.6	52.3	<10.0	29.9	174	<8.4	12.8	3.7	2.68	59.7	
	9/27/2016	387	163	867	11.4	14.8	<10.0	11.5	44	<10.0	3.9	5240	0.98	252.5	
	12/14/2016	62.3	42.2	744	2.3	20.5	<10.0	4.7	16.5	<10.0	<10.0	1930	0.46	-91.3	
	3/30/2017	55.9	29.6	1,120	6.1	28.3	75.2	3.8	11.4	<2.5	<2.5	490	2.92	-17.9	
	6/12/2017	42.4	18.1	893 J	7.6	48.4	120	4.7	14.0	<3.1	<3.1	530	0.91	-34.2	
	9/28/2017	<1.7	<1.7	457	5.4	47.7	16.0	<1.7	19.5	<1.7	<1.7	243	1.19	-87.4	
	11/9/2017	<0.50	<0.50	22.2	1.6	49.1	<10.0	<0.50	4.5	<0.50	<0.50	326 J	1.61	-119.0	
	3/20/2018	<0.500	0.271 J	5.64	1.33	2.77	<13.0	<0.500	0.522	<0.500	<0.500	89.1	8.95	-136.3	
	7/1/2018	0.304 J	0.996	4.02	1.57	1.45	<10.0	<0.500	0.913	<0.500	<0.500	66.0	1.77	114.3	
	9/25/2018	<0.400	<0.400	1.46	0.520	1.23	<1.0	<0.400	0.730	<0.400	<0.400	79.5	1.27	-174.0	
	12/4/2018	1.29	1.29	4.30	0.415	1.69	<1.0	<0.400	0.470	<0.400	<0.400	36.4	5.51	-30.5	
MW-24i	6/7/2011	6.6	1.4	2.0	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	1.2	6.40	59.0	
	9/16/2011	27	24	270	1.7	19	NA	2.5	13	<0.50	5.6	7.0	0.61	646.9	
	12/7/2011	19	14	100	<0.50	7.5	2.29	0.84	5.0	<0.50	2.9	290	3.50	-147.5	
	3/12/2012	30	11	79	<0.50	4.5	2.03	<0.50	5.9	<0.50	2.3	33	2.11	-1.2	
	6/22/2012	0.85	<0.50	14	<0.50	2.6	1.52	<0.50	1.8	<0.50	<0.50	44	3.50	-147.5	
	9/14/2012	31	20	58	<0.50	<0.50	<1.0	0.87	4.4	<0.50	0.79	15	0.40	-54.0	
	12/14/2012	2.1	0.65	51	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	16	2.11	6.3	
	3/15/2013	23	15	48	<0.50	<0.50	<1.0	<0.50	2.8	<0.50	0.57	9.5	0.79	13.1	
	6/14/2013	6.2	3.6	28	<0.50	<0.80	<1.0	<0.50	2.7	<0.50	<0.50	11	0.39	130.2	
	9/20/2013	15	5.9	15	<0.50	<0.80	<1.0	<0.50	1.0	<0.50	<0.50	11	1.92	-31.2	
	12/16/2013	6.7	3.4	8.4	<0.50	<0.50	<1.0	<0.50	1.3	<0.50	<0.50	7.9	3.08	16.9	
	3/24/2014	10	5.5	16	<0.50	<0.80	<1.0	<0.50	1.3	<0.50	<0.50	9.4	3.16	-55.4	
	6/23/2014	1.3	5.2	13	<0.50	2.1	29.1	<0.50	1.2	<0.50	<0.50	8.4	4.70	-49.7	
	9/30/2014	20	10	21	<0.50	<0.50	<1.0	<0.50	1.8	<0.50	<0.50	12.0	2.01	129.7	
	12/15/2014	2.4	1.1	12	<0.50	<0.50	<1.0	<0.50	0.60	<0.50	<0.50	<1.0	6.27	-13.9	

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Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters		
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential	
		Concentrations in µg/L										Concentrations in mg/L		(mg/L)	(mV)
MW-24i (continued)	3/20/2015	6.1	3.1	5.9	<0.50	<0.50	<6.2	<0.50	0.58	<0.50	<0.50	<0.50	<1.0	10.28	38.6
	6/18/2015	<0.50	<0.50	3.4	<0.50	<0.50	<10.0	<0.50	<0.50	<0.50	<0.50	<0.50	1.6	1.08	-158.7
	9/22/2015	2.2	0.8	4.7	<0.50	<0.50	<1.0	<0.50	1.9	<0.50	<0.50	<0.50	2.3	1.85	99.4
	12/8/2015	189	36.4	18	<0.50	<0.50	<1.0	<0.50	0.74	<0.50	<0.50	<0.50	3.5	1.36	99.2
	3/8/2016	4.1	1.6	3.5	<0.50	<0.50	<10.0	<0.50	<0.50	<0.50	<0.50	<0.50	1.0	1.75	47.8
	6/17/2016	11.5	6.3	7.8	<0.50	<0.50	<10.0	<0.50	0.99	<0.50	<0.50	<0.50	<1.0	3.12	14.0
	9/28/2016	5.8	3.1	5.4	<0.50	<0.50	<10.0	<0.50	0.53	<0.50	<0.50	<0.50	5.3	2.58	123.9
	12/12/2016	1.1	<0.50	<0.50	<0.50	<0.50	<10.0	<0.50	<0.50	<0.50	<0.50	<0.50	1.5	5.64	2.6
	3/30/2017	1.0	<0.50	0.70	<0.50	<0.50	<10.0	<0.50	<0.50	<0.50	<0.50	<0.50	3.4	5.24	14.3
	6/15/2017	6.6	2.8	3.2	<0.50	<0.50	<10.0	<0.50	<0.50	<1.0	<0.50	<0.50	1.2	3.72	-13.4
	9/26/2017	30.1	16.6	24.5	<0.50	<0.50	<10.0	<0.50	2.1	<1.0	<0.50	<0.50	1.2	1.21	-10.7
	11/9/2017	12.7	5.9	9.6	<0.50	<0.50	<10.0	<0.50	1.1	<0.50	<0.50	<0.50	1.3	3.11	-100.1
	3/21/2018	19.1	10.2	13.5	<0.500	<0.500	<13.0	<0.500	1.42	<0.500	<0.500	<0.500	0.734 B J	0.95	129.6
	6/28/2018	10.3	5.93	13.6	1.09	<0.500	<10.0	<0.500	1.44	<0.500	<0.500	<0.500	<1.0	2.69	129.9
9/27/2018	24.8	14.3	25.0	<0.400	<0.400	N/A	<0.400	2.18	<0.400	<0.400	<0.400	N/A	1.67	106.3	
12/4/2018	10.2	3.76	5.13	<0.400	<0.400	N/A	<0.400	0.800	<0.400	<0.400	<0.400	N/A	5.24	-6.9	
MGMS2-40	6/7/2011	4,400	1,400	1,600	17	48	<1.0	30	65	<15.0	57	2.2	0.86	49.5	
	9/12/2011	790	380	7,400	20	58	NA	28	44	<15.0	48	110	2.63	338.9	
	12/7/2011	61	39	5,300	<15.0	460	14.5	<15.0	35	<15.0	<15.0	300	6.28	-137.9	
	3/8/2012	9.9	5.4	470	2.8	260	368	2.3	38	<2.0	5.2	290	1.22	-73.6	
	6/19/2012	7.2	2.5	20	1.3	63	566	<0.50	53	<0.50	<0.50	500	6.28	-137.9	
	9/12/2012	89	80	310	3.2	440	264	2.8	39	<1.5	5.0	140	1.16	-40.1	
	12/11/2012	10	3.4	33	1.3	4.0	110	<0.50	4.8	<0.50	<0.50	280	0.55	-82.3	
	3/15/2013	5.6	2.2	300	2.0	270	121	1.9	28	<0.50	2.5	81	0.33	-24.3	
	6/11/2013	0.94	<0.50	7.9	<0.50	4.8	55.6	<0.50	8.3	<0.50	<0.50	110	0.42	-116.7	
	9/17/2013	16	17	290	1.4	330	143	4.8	28	<0.50	1.6	98	0.27	-209.9	
	12/16/2013	2.4	1.4	8.4	<0.50	3.4	33.3	<0.50	9.7	<0.50	<0.50	110	1.19	-41.9	
	3/24/2014	2.6	1.8	84	<0.50	270	930	2.9	45	<0.50	<0.50	120	1.06	-126.1	
	6/26/2014	21	22	88	0.84	90	207	10	31	<0.50	<0.50	120	2.22	-23.7	
	9/23/2014	170	110	590	2.4	800	12.1	30	30	<0.50	3.2	94	1.31	-119.0	
12/12/2014	3.4	2.3	10	<0.50	18	34	<0.50	35	<0.50	<0.50	7.9	1.41	-162.1		

Please refer to notes at end of table.

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters		
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential	
		Concentrations in µg/L										Concentrations in mg/L		(mg/L)	(mV)
MGMS2-40 (continued)	3/20/2015	31	22	47	<0.50	17	8.1	3.9	4.3	<0.50	<0.50	8	20.02	-83.7	
	6/19/2015	18.4	12.8	53.8	<0.50	48.3	33.7	1.3	13.8	<0.50	<0.50	11	13.5	-117.5	
	9/25/2015	67.4	45.9	105	0.61	57.8	<10.0	4.2	12.3	<0.50	0.92	10.9	9.67	-145.1	
	12/8/2015	4.0	2.8	7.2	<0.50	3.3	22.8	<0.50	13.5	<0.50	<0.50	7.9	6.14	-96.9	
	3/8/2016	6.5	6.2	36.0	<0.50	36	63.7	1.6	20.6	<0.50	<0.50	7.4	5.52	-161.7	
	6/17/2016	223	146	744	2.8	227	31	26.4	24.9	<0.50	3.1	3.8	1.60	-72.2	
	9/29/2016	33.3	24.8	115	<0.50	142	N/A	<0.50	12.1	<0.50	<0.50	N/A	5.16	194.5	
	12/16/2016	2.6	1.9	5.2	<0.50	2.0	N/A	<0.50	10.3	<0.50	<0.50	N/A	0.80	-28.1	
	3/31/2017	4.3	14.4	236	0.60	235	N/A	14.3	57.6	<0.50	<0.50	N/A	0.68	-92.2	
	6/15/2017	5.1	4.9	46.2	<0.50	98.9	128	3.5	38.6	<0.50	<0.50	7.0	1.29	-109.6	
	9/29/2017	41.5	31.3	195	0.74	428	47.4	6.8	21.7	<1.0	0.67	6.4	1.03	-43.7	
	11/9/2017	13.2	9.2	61.6	0.52	170	95.7	0.86	21.3	<0.50	<0.50	6.2	1.24	-113.3	
	3/22/2018	46.0	27.3	109	0.571	122	32.7	4.22	25.9	<0.500	0.259 J	9.58	6.89	-112.9	
7/1/2018	62.1	48.9	151	0.971	38.2	<10.0	5.93	12.7	<0.500	1.04	5.2	3.15	-50.8		
9/28/2018	66.9	43.3	140	<0.800	106	3.6	1.44	8.74	<0.800	<0.800	5.91	1.50	97.3		
12/10/2018	18.7	12.0	24.9	<0.400	123	78	0.563	20.9	<0.400	<0.400	5.08	2.05	-111.4		
MW-13	9/28/2016	5,090	951	148	<2.5	<2.5	<10.0	<2.5	<2.5	<2.5	<2.5	33,600	2.71	158.7	
	12/16/2016	1,020	394	509	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	2220	0.66	-111.4	
	3/30/2017	176	57.6	101	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	341	4.36	-61.8	
	6/15/2017	97.7	56.3	272	1.6	4.1	NA	1.2	<1.0	<1.0	<1.0	N/A	1.41	-105.7	
	9/27/2017	3.3	1.3	3220	7.3	25.0	<10.0	5.0	<1.0	<1.0	<1.0	55.8	2.16	-103.9	
	11/7/2017	<4.2	<4.2	1,360	5.4	25.0	11.6	<4.2	<4.2	<4.2	<4.2	85.5	2.19	-89.2	
	3/20/2018	0.396 J	2.19	1,730	5.20	211	191	2.55	0.879	<0.500	<0.500	73.7	5.79	-114.8	
	7/1/2018	<0.500	0.781	1680	26.9	2030	500	5.98	18.3	0.148 J	<0.500	52.9	1.13	-31.0	
	9/25/2018	0.410	0.800	9.78	1.26	113	61	<0.400	1.91	<0.400	<0.400	20.8	1.22	-146.8	
	12/5/2018	0.567	0.413	6.17	0.682	55.2	7.1	<0.400	<0.400	<0.400	<0.400	51.7	7.71	-130.6	
MW-14	9/27/2016	100	218	61.8	0.94	<0.50	<10.0	2.1	7.2	<0.50	1.7	8.8	8.1	221.2	
	12/13/2016	0.56	0.97	1.3	<0.50	<0.50	<10.0	<0.50	<0.50	<0.50	<0.50	5.1	3.1	55.0	
	3/27/2017	14.7	33.4	69.2	<0.50	0.62	<10.0	0.57	<0.50	<0.50	<0.50	5.1	3.1	55.0	
	6/13/2017	58.3	204	432	2.7	2.5	NA	5.3	10	<1.0	2.1	N/A	0.94	61.3	
	9/26/2017	62.4	265	279	2.8	<0.84	<10.0	2.6	6.2	<0.84	1.1	3.8	1.89	80.6	
	11/8/2017	39.3	160	306	2.2	0.91	<10.0	2.1	4.5	<0.84	<0.84	8.5	1.85	106.9	

Please refer to notes at end of table.

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters		
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential	
		Concentrations in µg/L										Concentrations in mg/L		(mg/L)	(mV)
MW-14 (continued)	3/20/2018	36.0	150	500	2.56	1.35	<13.0	3.64	5.42	<0.500	0.579	8.76	0.58	21.7	
	6/28/2018	34.9	247	255	2.52	0.687	<10.0	2.54	10.5	<0.500	1.57	6.6	6.59	203.6	
	9/26/2018	84.3	484	361	4.50	<4.00	<1.0	4.40	12.1	<4.00	<4.00	4.56	1.55	100.1	
	12/5/2018	83.4	260	333	<4.00	<4.00	<1.0	<4.00	5.43	<4.00	<4.00	13.4	4.40	55.3	
MW-19	9/26/2016	1,520	592	235	<5.0	10.1	<10.0	11.0	10.4	<5.0	14.5	1.9	3.27	174.4	
	12/12/2016	1,730	975	1,030	11.6	31.9	<10.0	14.2	78.7	<5.0	15.5	8.1	9.22	175.2	
	3/28/2017	755	896	1,990	21.5	63.2	<10.0	26.7	214	<5.0	19.9	4.8	2.5	35.8	
	6/14/2017	566	506	486	6.2	17.2	NA	15.8	41.8	<2.5	8.2	N/A	1.54	-22.7	
	9/26/2017	3,710	1,480	1160	5.4	111	44.3	28.9	11.1	<2.5	40.4	8.1	1.92	185.2	
	11/9/2017	1,530	1,020	1,660	24.0	115	11.8	24.9	104	0.75 J	20.2	6.9	2.26	-75.2	
	3/21/2018	1,250	1,340	2,430	11.2	413	32.3	31.4	59.0	0.225 J	17.0	29.9	1.43	135.6	
	6/28/2018	177	191	4190	18.4	799	271	36.3	81.6	<0.500	11.7	58.2	2.18	-30.8	
	9/25/2018	3,830	2,270	1,960	<0.400	116	9.8	<0.400	<0.400	<0.400	<0.400	16.8	1.30	57.4	
	12/5/2018	3,090	1,490	1,750	18.4	79.0	2.1	39.3	91.8	0.453	21.8	10.5	5.11	-29.9	
MW-26	9/26/2016	160	288	61.1	1.6	<0.50	N/A	1.1	3.9	<0.50	2.4	N/A	1.64	236.7	
	12/13/2016	167	410	85.9	2.0	<0.50	<10.0	2.4	8.9	<0.50	3.3	2.4	0.88	102.4	
	3/29/2017	214	452	170	<0.50	<0.50	<10.0	<0.50	<0.50	<0.50	<0.50	1.3	1.34	165.2	
	6/13/2017	160	311 E, J	113	2.0	0.65	NA	1.9	6.7	<1.0	2.1	N/A	3.80	74.6	
	9/26/2017	68.4	192	192	2.1	0.98	<10.0	1.0	5.1	<1.0	0.83	7.1	5.56	77.3	
	11/8/2017	88.1	170	204	2.3	1.8	<10.0	1.5	4.8	<0.50	1.0	5.9	1.75	99.8	
	3/20/2018	108	190	157	1.85	1.75	<13.0	1.35	4.85	<0.500	1.20	5.84	7.28	156.4	
	6/29/2018	138	221	114	1.88	1.02	<10.0	1.46	5.05	<0.500	1.94	3.9	0.88	224.6	
	9/24/2018	117	233	141	2.14	1.18	<1.0	1.24	4.24	<0.400	1.19	5.13	4.17	152.8	
	12/5/2018	139	210	147	1.89	0.85	<1.0	1.09	3.02	<0.400	0.846	<1.00	4.16	36.5	

Please refer to notes at end of table.

Table 5
Interim Action: Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Volatile Organic Compounds										Attenuation Chemistry	Field Parameters		
		Tetrachloro ethene	Trichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	Vinyl chloride	Ethene	1,1-Dichloro ethene	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1,1-Trichloro ethane	Total Organic Carbon	Dissolved Oxygen	Oxidation Reduction Potential	
		Concentrations in µg/L										Concentrations in mg/L		(mg/L)	(mV)
MGMS1-43	9/26/2016	230	366	1,980	24.2	52	<10.0	13.5	81.9	<8.3	<8.3	9.0	5.09	184.2	
	12/16/2016	64.1	171	1,810	20.1	239	<10.0	9.5	92.6	<8.4	<8.4	6.2	6.06	-17.5	
	3/31/2017	45.8	119	1,430	15.2	348	14.8	12.5	90.8	<8.4	<8.4	7.0	3.02	-40.7	
	6/12/2017	24.4	116	2,620	18.7	681	NA	16.7	173	<8.3	<8.3	N/A	1.17	-109.8	
	9/29/2017	70.7	126	901	12.9	117	<10.0	6.9	60.1	<2.5	<2.5	6.1	8.73	90.7	
	11/7/2017	108	211	2,350 J	26.6	181	<10.0	13.7	153	<2.5	<2.5	5.6	2.04	74.5	
	3/22/2018	80.1	278	2,450	34.9	236	<13.0	18.0	192	<0.500	0.780	13.8	10.71	-11.7	
	7/1/2018	107	246	1,880	32.8	118	<10.0	13.8	116	<0.500	0.588	7.5	3.48	-1.6	
	9/28/2018	252	528	3,150	47.4	134	<1.0	27.8	141	<8.00	<8.00	5.52	1.98	97.4	
	12/4/2018	146	388	2,750	48.1	129	<1.0	22.5	148	<0.400	1.08	6.06	8.31	-2.0	
MGMS3-40	9/26/2016	1.7	1.4	226	2.0	52.1	<10.0	0.60	4.5	<0.50	<0.50	36.2	2.7	165.3	
	12/16/2016	0.63	<0.50	1.3	0.97	0.88	55.2	<0.50	1.0	<0.50	<0.50	86.9	5.95	-9.20	
	3/28/2017	1.4	0.60	1,050	6.0	323	68.1	3.3	22.5	0.68	<0.50	5.0	1.57	-125.8	
	6/12/2017	0.97	<0.50	1.7	<0.50	<0.50	NA	<0.50	3.3	<0.50	<0.50	N/A	5.22	-94.1	
	9/26/2017	0.79	<0.50	0.69	<0.50	<0.50	22.8	<0.50	1.1	<1.0	<0.50	3.8	10.02	-82.8	
	11/10/2017	0.85	<0.50	8.0	<0.50	15.8	54.8	<0.50	4.3	<0.50	<0.50	6.5	0.93	-111.6	
	3/22/2018	1.45	0.528	9.81	0.179 J	39.8	242	<0.500	8.57	<0.500	<0.500	8.74	6.95	-130.8	
	7/1/2018	0.498 J	0.169 J	7.58	<0.500	8.98	27.4	<0.500	1.39	<0.500	<0.500	4.6	3.18	-28.6	
	9/28/2018	0.970	<0.400	143	<0.400	129	33	0.560	9.08	<0.400	<0.400	4.38	6.62	-61.7	
	12/10/2018	0.603	<0.400	1.77	<0.400	5.44	4.9	<0.400	1.54	<0.400	<0.400	3.42	1.05	-122.9	

Notes:

1. µg/L (ppb) = Micrograms per liter (parts per billion).
2. N/A = Not analyzed.
3. B = The analyte was found in the associated method blank.
4. J = Value is estimated.
5. Ethene is analyzed by EPA Method RSK-175M. All other VOCs were analyzed by EPA Method 8260.
6. **Bold value** represents detected concentration of listed analyte.
7. < = Not detected at or above the specified laboratory method reporting limit (MRL).
8. E = Analyte concentration exceeded the calibration range. Reported result is estimated.

Table 6
North SVE System – Operation Monitoring
NuStar Vancouver Facility
Vancouver, Washington

Date	Branch 4		Branch 5		Post Blower		Notes
	PID	Pressure	PID	Pressure	PID	Pressure	
10/12/2011	0.0	-13.0	0.0	-12.0	7.2	0.1	--
11/2/2011	--*	-25.0	6.7	-25.0	--	--	--
11/17/2011	0.8	-16.0	6.9	-16.0	7.0	0.1	PID complications; Routinely reported error code. Potential moisture issues.
12/5/2011	--	--	--	--	--	--	System off on arrival and would not restart. Contractor identified electrical issues. Blower removed for replacement.
12/14/2011	--	--	--	--	--	--	System not operating, pending blower replacement. Blower reinstalled January 10, 2012.
1/23/2012	--	-15.0	6.5	-15.0	3.9	0.1	Water in sample port of Branch 4, could not get PID reading.
2/17/2012	0.1	-11.0	0.9	-11.0	2.9	1.0	--
3/22/2012	6.8	-12.0	5.4	-12.0	1.3	0.05	--
4/26/2012	1.3	-4.2	6.4	-4.0	1.0	0.05	--
5/23/2012	0.1	-3.4	3.2	-3.4	0.4	--	--
6/20/2012	0.0	-2.8	0.0	-2.7	0.1	0.2	--
7/24/2012	3.2	-3.2	9.2	-3.2	0.2	0.4	Used Rental PID.
8/22/2012	0.4	-2.4	1.0	-2.4	0.0	0.2	--
9/25/2012	0.1	-1.7	0.5	-1.7	0.0	0.2	Used ACA PID #3.
10/29/2012	--	--	--	--	--	--	System not operating.
11/26/2012	8.4	-4.0	9.2	-4.0	3.0	0.05	Used ACA PID #3.
12/21/2012	0.1	-0.63	0.0	-0.62	0.0	0.1	Used ACA PID #3.
1/24/2013	10.4	-0.45	0.0	-0.15	0.5	0.1	Used ACA PID #3.
2/28/2013	37.1	-0.22	2.1	-0.15	1.3	0.1	Used ACA PID #3.
3/25/2013	--	--	--	--	--	--	System not operating.
4/29/2013	--	--	--	--	--	--	System not operating.
5/24/2013	0.4	-23.0	0.1	-23.0	7.9	0.1	Used APEX PID #3.
6/25/2013	--	-20.0	--	-20.0	--	0.1	--
7/25/2013	6.6	-20.0	13.3	-20.0	6.1	0.1	Used APEX PID #3.
8/27/2013	1.9	-18.0	16.9	-18.0	6.8	0.1	Used APEX PID #3.
9/30/2013	0.0	-20.0	0.0	-20.0	2.1	0.1	Used APEX PID #3.
10/24/2013	1.3	-20.0	1.2	-20.0	2.3	0.1	Used APEX PID #3.
11/25/2013	0.3	-23.0	0.2	-23.0	1.1	0.1	Used APEX PID #3.
12/27/2013	1.0	-21.0	0.6	-21.0	2.6	0.1	Used APEX PID #1

Please refer to notes at end of table.

Table 6
North SVE System – Operation Monitoring
NuStar Vancouver Facility
Vancouver, Washington

Date	Branch 4		Branch 5		Post Blower		Notes
	PID	Pressure	PID	Pressure	PID	Pressure	
1/29/2014	0.2	-20.0	0.1	-20.0	0.0	3.0	--
2/24/2014	2.4	-20.0	2.6	-20.0	2.6	9.0	Used APEX PID #3.
3/31/2014	0.3	-20.0	1.0	-20.0	0.2	1.0	Used APEX PID #4
4/29/2014	2.0	-20.0	1.4	-20.0	0.0	2.0	--
5/27/2014	2.0	-20.0	1.3	-20.0	0.9	2.0	--
7/3/2014	0.5	-20.0	0.3	-18.0	0.4	4.0	--
7/28/2014	4.0	-20.0	2.6	-19.0	0.1	3.0	Used APEX PID #3.
8/25/2014	--	-20.0	--	-19.0	3.7	3.5	Used APEX PID #3.
9/30/2014	2.1	-17.0	0.6	-17.0	1.7	--	--
10/27/2014	0.4	-26.0	1.4	-26.0	2.3	2.0	Used APEX PID #3.
11/25/2014	0.3	-21.0	1.5	-20.0	0.5	--	Used APEX PID #3.
12/29/2014	20.2	-25.0	32.1	-25.0	--	2.0	Used APEX PID #3.
1/26/2015	2.0	-25.0	3.2	-25.0	0.7	3.0	Used APEX PID #3. Knockout drum emptied.
2/26/2015	0.0	-22.0	0.0	-25.0	0.0	0.1	--
3/30/2015	0.0	-23.0	0.2	-27.0	0.0	0.4	Used APEX PID #3.
4/24/2015	0.0	-23.0	0.2	-27.0	0.0	0.4	--
5/28/2015	5.5	-26.0	4.8	-26.0	5.5	0.05	--
7/29/2015	7.5	-17.0	0.3	-17.0	0.5	0.10	Used APEX PID #3.
8/31/2015	0.0	-11.0	0.0	-10.0	0.9	0.05	Used APEX PID #3.
9/28/2015	0.6	-12.0	2.4	-12.0	1.8	0.00	Used APEX PID #3.
10/29/2015	0.5	-12.0	0.3	-13.0	2.9	1.00	Used APEX PID #3.
11/30/2015	0.0	-13.0	0.2	-13.0	0.0	2.00	Used APEX PID #3.
12/28/2015	0.0	-17.0	9.0	-18.0	0.0	0.10	Used APEX PID #3.
2/1/2016	30.4	-28.0	0.0	-25.0	2.6	3.00	Used APEX PID #3.
2/29/2016	0.0	-13.0	0.0	-13.0	0.0	0.10	Used APEX PID #3.
3/29/2016	0.0	-12.0	0.0	-12.0	0.0	0.20	Used APEX PID #3.
4/27/2016	0.2	-11.0	0.0	-5.0	0.0	1.00	Used APEX PID #3. North SVE system turned off.
5/25/2016	--	--	--	--	--	--	North SVE system intentionally turned off for approx . 60 days to evaluate system efficiency.
6/28/2016	20.4	-23.0	14.3	-23.0	0.9	0.10	Used APEX PID #3.

Please refer to notes at end of table.

Table 6
North SVE System – Operation Monitoring
NuStar Vancouver Facility
Vancouver, Washington

Date	Branch 4		Branch 5		Post Blower		Notes
	PID	Pressure	PID	Pressure	PID	Pressure	
7/26/2016	0.0	-20.0	0.4	-20.0	0.6	1.20	Used APEX PID #3.
9/29/2016	1.0	-16.0	0.0	-15.0	0.0	0.10	Used APEX PID #3.
10/25/2016	0.4	-14.0	0.0	-14.0	0.0	0.10	Used APEX PID #3.
11/28/2016	0.0	-12.0	0.0	-12.0	0.0	0.10	Used APEX PID #3.
12/28/2016	0.0	-12.0	0.0	-12.0	0.0	0.10	Used APEX PID #3.
1/30/2017	0.0	-5.0	0.0	-5.0	0.0	0.10	Used APEX PID #3.
2/28/2017	12.5	-15.0	8.7	-14.0	1.0	0.10	--
3/28/2017	0.0	-20.0	0.0	-20.0	0.1	0.00	Used Mini Rae 3000.
4/24/2017	0.8	-20.0	0.0	-20.0	2.0	0.10	Used APEX PID #3.

Notes:

1. PID readings in parts per million (ppm), calibrated to 100 ppm isobutylene.
2. Pressure readings in inches of water, measured with magnahelic gauge.
3. -- = Not available; branch not in use or no measurement collected during the site visit.
4. * = During the 11/2/2011 monitoring event, PID malfunctioned while monitoring Branch 4. Instrument readings would not stabilize.

Table 7
North SVE System – Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Sampling Location	Sample ID	Date	1,1,1- Trichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	Methylene Chloride	Tetrachloro- ethene	Toluene	Trichloro- ethene	Vinyl Chloride
			Concentrations in µg/m3								
System Effluent	North_EFF-20111012	10/12/2011	69	<16	160	<16	<14	9,500	16	700	<10
System Effluent	Post Blower_North_012312	1/23/2012	<170	<120	<120	<120	<110	16,000	<120	530	<79
System Effluent	North_Effluent_0121712	2/17/2012	<140	<100	<100	<100	<91	11,000	<99	300	<67
System Effluent	North Effluent-032212	3/22/2012	<28	<54	<27	<27	<23	6,600	<25	140	<8.6
System Effluent	North_Effluent_062012	6/20/2012	<1.6	<3.2	<1.6	<1.6	5.3	250	<1.5	15	<0.51
System Effluent	North_Effluent_082212	8/22/2012	<1.6	<3.2	<1.6	<1.6	<1.4	140	<1.5	11	<0.51
System Effluent	North_Effluent_112612	11/26/2012	39	<14	52	<7.1	<6.2	22,000	<6.8	510	<4.6
System Effluent	North_Effluent_122112	12/21/2012	<31	<59	<30	<30	<26	3,500	<28	61	<19
System Effluent	North_Effluent_022813	2/28/2013	<36	<70	<35	<35	<31	4,400	<33	160	<22
System Effluent	SVE North	5/24/2013	<240	<170	280	<170	<380	23,000	<160	1,100	<110
System Effluent	SVE North	6/25/2013	76	<51	88	<51	<110	13,000	<49	730	<33
System Effluent	SVE North	8/27/2013	<150	<110	<110	<110	<230	17,000	<100	800	<69
System Effluent	SVE North Effluent	10/24/2013	<82	<60	<60	<60	<130	10,000	<57	570	<39
System Effluent	SVE North Effluent	12/27/2013	<44	<32	<32	<32	<69	7,000	<30	470	<20
System Effluent	SVE North Effluent	1/29/2014	<10	<40	22	<40	<87	1,300	<38	110	<26
System Effluent	SVE_North_Post Carbon	2/24/2014	55	<83	68	<41	<36	8,700	<39	760	<27
System Effluent	SVE North Post Carbon	3/5/2014	25	<39	29	<20	<17	4,600	<19	300	<13
System Effluent	VCP_North_Effluent	3/31/2014	19	<13	18	<13	<28	3,500	<12	200	<8.2
System Effluent	North_SVE_Effluent_042914	4/29/2014	22	<15	17	<15	<33	3,500	<14	220	<9.8
System Effluent	North_SVE_Effluent_052714	5/27/2014	<31	<23	<23	<23	<50	4,100	<22	280	<15
System Effluent	North_VCP_Effluent	7/3/2014	<23	<17	20	<17	<37	4,500	<16	290	<11
System Effluent	SVE North	7/28/2014	<120	<88	<88	<88	<190	7,200	<84	460	<22
System Effluent	North SVE	9/30/2014	<48	<35	48	<35	<76	7,300	<33	480	<22
System Effluent	SVE North Effluent	10/27/2014	<110	<80	<80	<80	<180	15,000	<76	410	<52
System Effluent	SVE North 11.25.14	11/25/2014	<39	<28	<28	<28	<62	7,100	<27	390	<18
System Effluent	SVENorth122914	12/29/2014	<140	<99	<99	<99	<220	15,000	<94	290	<64
System Effluent	SVE North	1/26/2015	16	<31	<16	<16	<14	1,500	<15	130	<10
System Effluent	SVE North	2/26/2015	<1.6	<3.2	<1.6	<1.6	<1.5	32	<1.5	<2.1	<1.0
System Effluent	SVE North	3/30/2015	15	<9.6	9.5	<4.8	<4.2	1,700	<4.6	130	<3.1
System Effluent	SVE N	4/24/2015	<8.5	<16	<8.2	<8.2	<7.2	550	<7.8	50	<5.3

Please refer to notes at end of table.

Table 7
North SVE System – Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Sampling Location	Sample ID	Date	1,1,1- Trichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	Methylene Chloride	Tetrachloro- ethene	Toluene	Trichloro- ethene	Vinyl Chloride
			Concentrations in µg/m3								
System Effluent	SVE North	5/14/2015	<1.6	<3.2	<1.6	<1.6	<1.4	<2.7	<1.5	<2.1	<1.0
System Effluent	SVE North	5/28/2015	<3.8	<7.3	<3.6	<3.6	<3.2	360	3.6	8.0	<2.4
System Effluent	SVE North	7/29/2015	19	<33	21	<16	<14	2,000	<16	210	<11
System Effluent	SVE North	8/31/2015	65	<65	62	<33	<28	7,100	<31	600	<21
System Effluent	SVE North	9/28/2015	21	<22	<11	<11	<9.7	1,400	<11	190	<7.1
System Effluent	SVE North	10/29/2015	<56	<110	59	<55	<48	6,300	<52	550	<35
System Effluent	SVE_North_Effluent_113015	11/30/2015	<54	<140	<72	<72	<72	2,300	<72	86	<72
System Effluent	SVE_North_Effluent_122815	12/28/2015	<32	<62	<31	<31	<27	5,600	<30	110	<20
System Effluent	North_Effluent_020116	2/1/2016	<53	<100	<51	<51	<45	11,000	<48	150	<33
System Effluent	SVE_North_Effluent_022916	2/29/2016	30	<33	29	<16	<14	7,800	<16	160	<11
System Effluent	SVE_North_Effluent_032916	3/29/2016	19	<14	<7.2	<7.2	<6.3	920	<6.9	19	<4.7
System Effluent	North_Effluent	4/27/2016	<15	<29	<14	<14	<13	1,500	<14	75	<9.2
System Effluent	North_Effluent_62816	6/28/2016	<11	<22	<11	<13	<9.6	1,800	<10	83	<7.1
System Effluent	SVE-North-Effluent 72616	7/26/2016	<1.6	<3.2	<1.6	<1.6	<1.4	84	2.0	6	<1.0
System Effluent	SVE-North-Effluent 83016	8/30/2016	<0.30	<0.80	<0.40	<0.40	<0.40	54	<0.40	2	<0.40
System Effluent	SVE_North_Effluent_092916	9/29/2016	<1.6	<3.2	<1.6	<1.6	<1.4	15	<1.5	<2.1	<1.0
System Effluent	SVE_North_Effluent_102516	10/25/2016	<1.6	<3.2	<1.6	<1.6	<1.4	7.9	3.0	<2.1	<1.0
System Effluent	SVE_North_Effluent_112816	11/28/2016	<1.6	<3.2	<1.6	<1.6	<1.4	2.8	3.9	<2.1	<1.0
System Effluent	SVE_North_Effluent_122816	12/28/2016	<1.6	<3.2	<1.6	<1.6	<1.4	<2.7	1.7	<2.1	<1.0
System Effluent	SVE_North_Effluent_013017	1/30/2017	<1.6	<3.2	<1.6	<1.6	<1.4	<2.7	4.6	<2.1	<1.0
System Effluent	SVE_North_Effluent_022817	2/28/2017	<1.6	<3.2	<1.6	<1.6	<1.4	5.9	<1.5	<2.1	<1.0
System Effluent	SVE_North_Effluent_032817	3/28/2017	<1.6	<3.2	<1.6	<1.6	<1.4	3.2	2.9	<2.1	<1.0
System Effluent	SVE_North_Effluent	4/24/2017	<1.6	<3.2	<1.6	<1.6	<1.4	3.9	3.7	<2.1	<1.0

Notes:

1. µg/m³ = Micrograms per cubic meter.
2. Samples analyzed by Modified EPA Method TO-15.
3. Only analytes detected in at least one sample are presented in this table.
4. **Bold** value represents detected concentration of listed analyte.
5. < = Not detected at or above the specified laboratory method reporting limit (MRL).

Table 8
South SVE System – Operation Monitoring
NuStar Vancouver Facility
Vancouver, Washington

Date	Pre-Blower		Post Blower (Pre-Carbon)		Post Carbon 1		Post Carbon 2		Notes
	PID	Pressure	PID	Pressure	PID	Pressure	PID	Pressure	
10/12/2011	--	-14.0	17.1	24.0	0	12.0	0.2	4.0	--
10/18/2011	--	-14.0	15.5	--	15.5	14.0	0.5	3.0	Pre-carbon, post blower tap is now covered by noise suppression panels.
11/2/2011	--	-15.0	18.2	26.0	0.0	26.0	2.0	7.0	--
11/17/2011	--	-18.0	8.9	27.0	--*	15.0	--*	6.8	--
12/5/2011	8.3	-18.0	10.7	39.0	0.0	19.0	2.2	6.1	System switch off upon arrival. System restarted. Monitoring event conducted approximately 3 hours after restart.
12/14/2011	11.8	-19.0	21.0	28.0	0.0	18.0	0.7	6.2	--
1/9/2012	7.3	-17.0	8.3	29.0	0.0	18.0	0.0	6.2	--
1/23/2012	7.0	-17.0	8.9	29.0	0.0	17.0	0.0	6.9	--
2/17/2012	6.0	-18.0	11.2	29.0	0.0	18.0	0.0	6.0	--
3/22/2012	13.3	-16.0	10.7	27.0	0.0	15.0	0.0	6.5	--
4/26/2012	10.3	-17.0	11.6	27.0	0.0	16.0	0.0	6.4	--
5/23/2012	10.4	-20.0	10.6	31.0	0.0	19.0	0.0	6.6	--
6/20/2012	7.3	-21.0	7.5	33.0	0.5	20.0	0.0	6.3	--
7/24/2012	19.8	-20.0	41.5	32.0	226.3	20.0	98.8	6.2	Used rental PID.
8/22/2012	8.0	-48.0	10.1	29.0	5.5	18.0	1.1	4.6	--
9/25/2012	10.0	-46.0	13.7	29.0	9.5	15.0	12.8	4.3	Used ACA PID #3.
10/29/2012	8.4	-34.0	18.6	47.0	0.3	28.0	12.9	4.3	Used ACA PID #3; Carbon change-out on 10/29/2012
11/26/2012	13.7	<-100	1.6	18.0	0.1	6.6	3.1	0.66	Used ACA PID #3.
12/21/2012	0.5	-107	0.5	17.0	0.0	6.1	0.0	0.49	Used ACA PID #3.
1/24/2013	5.1	-105	0.5	10.0	0.0	6.5	0.0	0.61	Used ACA PID #3.
2/28/2013	2.8	-105	0.1	18.0	0.0	7.0	0.0	0.60	Used ACA PID #3.
3/25/2013	8.4	-102	0.9	16.0	0.1	7.0	0.0	0.58	Used Apex PID #3
4/29/2013	0.2	-98	0.4	15.0	0.0	6.3	0.1	0.49	Used Apex PID #3
5/24/2013	41.0	-18	49.7	47.0	0.2	26	0.7	5.0	Used Apex PID #3
6/25/2013	--	-15	--	51.0	--	31	--	5.1	--
7/25/2013	12.3	-16	13.9	50.0	0.7	32	0.5	6.0	Used Apex PID #3
8/27/2013	13.2	-16	12.1	52.0	3.8	31	1.2	5.2	Used Apex PID #3
9/30/2013	5.2	-15	15.4	45.0	27.4	30	0.4	5.2	Used Apex PID #3
10/24/2013	3.1	-14	13.2	50.0	6.8	32	1.5	5.2	Used Apex PID #3
11/25/2013	1.4	-19	19.3	51.0	12.4	35	2.8	5.3	Used Apex PID #3
12/27/2013	0.3	-19	7.7	55.0	3.1	32	0.0	5.4	Used Apex PID #1
1/29/2014	2.4	-19	6.7	50.0	5.7	30	0.2	10.0	--
2/24/2014	7.7	-19	19.7	50.0	2.4	30	1.4	10.0	Used Apex PID #3
3/31/2014	2.6	-15	4.6	46.0	5.4	30	0.0	8.0	Used APEX PID #4
4/29/2014	2.0	-14	3.4	48.8	9.7	30	0.0	8.0	--
5/27/2014	3.5	-14	5.0	49.0	10.2	28	0.1	7.0	--

Please refer to notes at end of table.

Table 8
South SVE System – Operation Monitoring
NuStar Vancouver Facility
Vancouver, Washington

Date	Pre-Blower		Post Blower (Pre-Carbon)		Post Carbon 1		Post Carbon 2		Notes
	PID	Pressure	PID	Pressure	PID	Pressure	PID	Pressure	
7/3/2014	1.6	-18	2.4	50.0	1.4	30	0.1	10.0	--
7/28/2014	8.5	-19	9.0	50.0	11.0	30	8.7	8.0	Used Apex PID #3
8/25/2014	4.6	-17	7.5	49.0	15.8	26	11.0	7.0	Used Apex PID #3
9/30/2014	0.5	-14	5.2	40.0	4.0	28	2.7	5.0	--
10/27/2014	--	--	--	--	--	--	--	--	System off upon arrival. Unable to turn back on.
11/3/2014	5.0	-20	23.0	50.0	13.1	20	14.6	8.0	Used Apex PID #3
11/25/2014	--	--	--	--	--	--	--	--	System off for drum replacement.
12/29/2014	--	--	--	--	--	--	--	--	System off.
1/26/2015	27.1	-25	34.6	20.0	1.0	17	0.0	10.0	Used Apex PID #3
2/26/2015	0.8	-20	12.9	30.0	0.2	19	0.1	8.0	--
3/30/2015	0.4	-20	14.2	29.0	0.1	20	0.1	8.0	Used Apex PID #3
4/24/2015	0.4	-20	14.2	29.0	0.1	20	0.1	8.0	--
5/28/2015	1.0	-20	57.5	28.0	63.6	17	33.0	7.0	--
7/29/2015	0.0	-16	14.1	25.0	9.6	14	1.2	5.0	Used Apex PID #3
8/31/2015	0.0	-20	1.2	26.0	6.9	14	1.8	6.0	Used Apex PID #3
9/28/2015	3.0	-20	7.4	26.0	3.8	16	1.1	6.0	Used Apex PID #3
10/29/2015	9.0	-22	11.2	27.0	7.6	16	0.2	8.0	Used Apex PID #3
11/30/2015	--	-18	7.0	30.0	33.6	18	0.4	6.0	Used Apex PID #3
12/28/2015	--	-18	12.5	29.0	1.3	18	0.4	8.0	Used Apex PID #3
2/1/2016	0.1	-24	0.3	19.0	9.2	16	0.0	7.0	Used Apex PID #3
2/29/2016	0.2	-18	25.2	30.0	8.5	17	2.3	6.0	Used Apex PID #3
3/29/2016	0.0	-19	54.0	28.0	13.2	16	3.4	7.0	Used Apex PID #3
4/27/2016	5.0	-28	32.0	50.0	21.3	0.2	22.3	1.0	Used Apex PID #3
5/25/2016	0.2	-100	0.3	3.0	23.2	2	9.7	0.6	Used Apex PID #3
6/28/2016	--	--	--	--	--	--	--	--	System shut down
7/26/2016	8.1	-20	30.4	30.0	26.2	20	18.1	10.0	Used Apex PID #3
9/29/2016	26.3	-18	27.4	28.0	36.7	16	35.7	6.0	Used Apex PID #3
10/25/2016	0.8	-18	13.3	30.0	58.0	18	7.7	8.0	Used Apex PID #3
11/28/2016	0.0	-22	70.1	30.0	78.0	18	54.2	8.0	Used Apex PID #3
12/28/2016	0.0	-100	0.0	2.0	0.4	1.0	1.0	1.0	departure.
1/30/2017	0.0	-22	52.3	33.0	0.0	20.0	0.0	10.0	Used Apex PID #3
2/28/2017	--	--	--	--	--	--	--	--	No sample collected.
3/28/2017	--	--	--	--	--	--	--	--	System not working properly. Knock out drum valve was pulled down and sucking in ambient air. No sample collected.
4/24/2017	--	--	--	--	--	--	--	--	Could not get valve to operate properly. System pulling in ambient air.
7/31/2017	0.0	-18	31.8	31.0	31.2	18.0	27.2	8.0	Used Apex PID #3
8/28/2017	0.0	-18	75.0	32.0	60.0	18.0	50.1	9.0	Used Apex PID #3
9/25/2017	39.2	-18	32.7	30.0	19.7	18.0	20.6	7.5	Used Apex PID #3
10/26/2017	2.8	-22	27.7	30.0	19.0	18.0	17.4	7.0	Used Apex PID #3
11/29/2017	5.2	-20	68.0	30.0	54.0	18.0	56.0	7.0	Used Apex PID #3
12/21/2017	0.3	-20	12.4	30.0	6.7	18.0	5.6	8.0	Pre-Carbon was not sampled due to sampling canister malfunction.

Please refer to notes at end of table.

Table 8
South SVE System – Operation Monitoring
NuStar Vancouver Facility
Vancouver, Washington

Date	Pre-Blower		Post Blower (Pre-Carbon)		Post Carbon 1		Post Carbon 2		Notes
	PID	Pressure	PID	Pressure	PID	Pressure	PID	Pressure	
1/22/2018	0.0	-20	13.6	30.0	10.2	18.0	7.2	7.0	Used Apex PID #3 PID was not within calibration and readings were not recorded. Used Apex PID #3 Used Apex PID #3
2/28/2018	--	-20	--	30.0	--	18.0	--	7.0	
3/29/2018	--	-20	19.0	31.0	28.0	19.0	19.0	8.0	
4/24/2018	2.2	-20	26.8	31.0	29.2	19.0	18.8	8.0	
5/16/2018	13.8	-20	26.6	30.0	40.2	18.0	26.8	8.0	
7/23/2018	30.0	-18	34.5	29.0	37.5	17.0	37.3	7.0	
11/7/2018	3.0	-18	22.9	30.0	20.7	17.0	19.3	6.0	
1/4/2019	0.5	-24	27.3	28.0	23.4	16.0	22.4	6.0	

Notes:

1. PID readings in parts per million (ppm), calibrated to 100 ppm isobutylene.
2. Pressure readings in inches of water, measured with magnahelic gauge.
3. -- = Not available or not applicable.

Table 9
South SVE System – Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Sampling Location	Sample ID	Date	1,1-Dichloroethane	1,1-Dichloroethane	cis-1,2-Dichloroethane	trans-1,2-Dichloroethane	Methylene Chloride	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Vinyl chloride	Total Xylenes
			Concentrations in µg/m ³										
Pre Carbon	INF 1006	10/6/2011	<330	<320	470	<320	<280	40,000	<300	520	5,100	<210	<350
Post Carbon	EFF 1006	10/6/2011	<16	<16	390	<16	<14	<27	<15	140	50	<10	<17
Pre Carbon	Post Blower 110211	11/2/2011	<290	<280	430	<280	<250	26,000	<270	<390	2,100	<180	<310
Pre Carbon	SOUTHSVE_PRECARBON_121411	12/14/2011	<580	<570	620	<570	<500	54,000	<540	<780	2,800	<360	<620
Post Carbon	SOUTHSVE_POSTCARBON_121411	12/14/2011	<16	35	23	<16	17	1,600	<15	78	1,300	12	<17
Post Carbon	POST CARBON_SOUTH_012312	1/23/2012	<16	<16	<16	<16	<14	<27	<15	<22	<21	<10	<17
Pre Carbon	South_PreCarbon_021712	2/17/2012	<300	<300	460	<300	<260	28,000	<280	<410	1,200	<190	<330
Post Carbon	South_PostCarbon_021712	2/17/2012	<16	<16	<16	<16	<14	<27	<15	<22	<21	<17	<10
Pre Carbon	South Influent - 032212	3/22/2012	<190	<190	310	<95	<84	30,000	<91	99	960	<31	<100
Post Carbon	South Effluent - 032212	3/22/2012	<1.2	<3.2	<1.6	<1.6	4	<2.7	<1.5	<1.6	<2.1	6.4	<3.5
Pre Carbon	South_SVE_PRECARBON	4/26/2012	<210	<560	<280	<280	<240	32,000 S	<270	<290	640 S	<90	<610
Post Carbon	South_SVE_POSTCARBON	4/26/2012	<1.2	<3.2	<1.6	<1.6	4	<2.7	<1.5	<1.6	<2.1	2.4	<3.5
Pre Carbon	SOUTH_SVE_PRECARBON	5/23/2012	<100	<260	200	<130	<120	19,000	<130	<140	780	<43	<290
Post Carbon	South_SVE_PRECARBON	5/23/2012	<1.2	<3.2	<1.6	<1.6	3	<2.7	<1.5	<1.6	<2.1	3.7	<3.5
Pre Carbon	South_PreCarbon_062012	6/20/2012	<240	<630	360	<320	<280	35,000	<300	<330	1,400	<100	<1040
Post Carbon	South_PostCarbon_062012	6/20/2012	<0.30	<0.80	<0.40	<0.40	1.0	<0.40	<0.40	<0.30	<0.40	1.2	<1.2
Pre Carbon	South_PreCarbon_072412	7/24/2012	<150	<390	240	<200	<170	33,000	<190	<200	1,100	<63	<640
Post Carbon	South_PostCarbon_072412	7/24/2012	<1.2	11	<1.6	<1.6	3.0	<2.7	2.2	<1.6	<2.1	3.9	<5.2
Pre Carbon	South_PreCarbon_082212	8/22/2012	<250	<660	760	<330	<290	47,000	<310	<340	2,000	<110	1,080
Post Carbon	South_PostCarbon_082212	8/22/2012	<21	<55	<27	<27	<24	<47	<26	<28	<37	<8.8	<90
Pre Carbon	South_PreCarbon_092512	9/25/2012	<270	<700	500	<400	<310	50,000	<330	<360	1,900	<230	<770
Post Carbon	South_PostCarbon_092512	9/25/2012	13	18	1,200	11	5.7	<2.7	<1.5	<1.6	<2.1	6.2	<3.5
Pre Carbon	South_PreCarbon_102912	10/29/2012	<320	<850	440	<480	<370	60,000	<400	<440	2,200	<270	<930
Post Carbon	South_PostCarbon_102912	10/29/2012	<5.3	<14	<7	<7	<7	<7	<7	<7	<7	<7	<14
Pre Carbon	South_PreCarbon_112612	11/26/2012	<95	<250	<120	<120	<110	10,000	<120	<130	530	<80	<410
Post Carbon	South_PostCarbon_112612	11/26/2012	<2.7	<7.2	<3.6	<3.6	<3.6	<3.6	<3.6	<2.7	<3.6	<3.6	<10.8
Pre Carbon	South_PreCarbon_122112	12/21/2012	<71	<190	110	<93	<82	14,000	<89	<96	600	<60	<300
Post Carbon	South_PostCarbon_122112	12/21/2012	<1.2	<3.2	<1.6	<1.6	1.6	<2.7	<1.5	<1.6	<2.1	3.0	<5.2
Pre Carbon	South_PreCarbon_012413	1/24/2013	<9.2	<24	14	<12	<11	1,700	<11	<12	100	<7.8	<39
Post Carbon	South_PostCarbon_012413	1/24/2013	<1.2	<3.2	<1.6	<1.6	3.3	<2.7	<1.5	<1.6	<2.1	3.7	<5.2
Pre Carbon	South_PreCarbon_022813	2/28/2013	<5.9	<15	8.5	<7.7	<6.7	940	<7.3	<7.9	84	<5.0	<25.4
Post Carbon	South_PostCarbon_022813	2/28/2013	<1.2	<3.2	<1.6	<1.6	8.1	<2.7	<1.5	<1.6	<2.1	<1.0	<5.2
Pre Carbon	South_PreCarbon_032513	3/25/2013	<29	<75	<38	<38	<33	3,700	<36	<39	160	<24	<123
Post Carbon	South_PostCarbon_032513	3/25/2013	<1.2	<3.2	<1.6	<1.6	2.0	<2.7	<1.5	<1.6	<2.1	2.0	<5.2
Pre Carbon	SVE South Pre Carbon	4/29/2013	<6.3	<16	10	<8.2	<7.2	950	<7.8	<8.4	48	<5.3	<26.9
Post Carbon	SVE South Post Carbon	4/29/2013	<0.30	<0.80	<0.40	<0.40	<0.40	<0.40	<0.40	<0.30	<0.40	0.93	<1.2
Pre Carbon	SVE South Pre Carbon	5/24/2013	<1,100	<1,100	2,400	<1,100	<2,400	240,000	<1,100	<1,500	8,400	<720	<4,300
Post Carbon	SVE South Post Carbon	5/24/2013	<0.81	<0.79	<0.79	<0.79	<1.7	<1.4	<0.75	<1.1	<1.1	<0.51	<3.1

Please refer to notes at end of table.

Table 9
South SVE System – Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Sampling Location	Sample ID	Date	1,1-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Methylene Chloride	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Vinyl chloride	Total Xylenes
			Concentrations in µg/m ³										
Pre Carbon	SVE South Pre Carbon	6/25/2013	<150	<150	630	<150	<330	39,000	<140	<210	1,800	<97	<570
Post Carbon	SVE South Post Carbon	6/25/2013	<0.81	8.1	3.8	<0.79	5.6	<1.4	<0.75	<1.1	<1.1	3.1	<3.1
Pre Carbon	SVE South Pre Carbon	7/25/2013	<120	<120	380	<120	<260	22,000	<110	<160	1,200	<77	<460
Post Carbon	SVE South Post Carbon	7/25/2013	<0.81	17	65	2.1	3.4	<1.4	1.2	<1.1	<1.1	2.6	1.4
Pre Carbon	SVE South Pre Carbon	8/27/2013	<150	<150	520	<150	<330	28,000	<140	<210	1,500	<97	<580
Post Carbon	SVE South Post Carbon	8/27/2013	3.3	13	270	7.0	4.7	<2.7	<1.5	<2.2	<2.1	3.7	<6.0
Pre Carbon	SVE South Precarbon	9/30/2013	<110	<110	450	<110	<240	26,000	<110	<150	1,400	<72	<420
Pre Carbon	SVE South Pre Carbon	10/24/2013	<140	<140	430	<140	<310	27,000	<130	<190	1,100	<90	<530
Post Carbon	SVE South Post Carbon	10/24/2013	3.8	4.9	390	3.3	<5.2	4.3	<2.3	5.4	<3.2	2.6	<5.1
Pre Carbon	SVE South Pre Carbon	11/25/2013	<100	<98	250	<98	<220	21,000	<93	<140	840	<63	<380
Post Carbon	SVE South Post Carbon	11/25/2013	<2.8	4.1	250	<2.8	7.3	<4.8	<2.6	17	56	<1.8	<10.6
Pre Carbon	SVE South Pre Carbon	12/27/2013	<110	<110	270	<110	<240	20,000	<100	<150	900	<70	<420
Post Carbon	SVE South Post Carbon	12/27/2013	2.5	4.5	220	2.4	3.8	3.5	<1.1	6.8	62	<0.77	<4.6
Pre Carbon	SVE South Pre-Carbon	1/29/2014	<80	<79	260	<79	<170	20,000	<75	<110	800	<51	<306
Post Carbon	SVE South Post-Carbon	1/29/2014	4.5	7.2	330	4.8	<8.7	7.9	<3.8	13	98	3.1	<15.3
Pre Carbon	SVE_South_Pre_Carbon	2/24/2014	<190	<490	430	<240	240.0	34,000	600	<250	1,500	<160	<800
Post Carbon	SVE_South_Effluent	2/24/2014	<1.2	<3.2	41	<1.6	<1.4	<2.7	<1.5	<1.6	<2.1	<1.0	<5.2
Pre Carbon	SVE South Pre Carbon	3/5/2014	<110	<280	270	<140	<120	16,000	660	<140	660	<90	1,090
Post Carbon	SVE South Effluent	3/5/2014	3.7	<8.3	310	4.2	4.4	<7.1	<4.0	<4.3	21	<2.7	<13.7
Pre Carbon	VCP_South_Post_Blower	3/31/2014	<83	<82	260	<82	<180	20,000	<78	<110	630	<53	<309
Post Carbon	VCP_South_Effluent	3/31/2014	3.3	4.9	290	4.2	<4.3	<3.4	<1.9	3.3	21	1.4	<7.6
Pre Carbon	South_SVE_Postblower_042914	4/29/2014	<47	<46	180	<46	<100	13,000	<44	<63	550	<30	<180
Post Carbon	South_SVE_Effluent_042914	4/29/2014	5.1	5.0	540	<4.8	<11	<8.2	<4.6	<6.6	37	<3.1	<18.3
Pre Carbon	South_SVE_Postblower_052714	5/27/2014	<57	<55	160	<55	<120	12,000	<53	<76	490	<36	<201
Post Carbon	South_SVE_PostCarbon_052714	5/27/2014	5.0	<4.8	530	<4.8	<11	<8.2	<4.6	14	8.1	<3.1	<18.3
Pre Carbon	South_VCP_Post Blower	7/3/2014	<18	<18	56	<18	<45	2,800	<18	<18	150	<18	<63
Post Carbon	South_VCP_Post Carbon	7/3/2014	<16	<16	760	<16	<35	55	<15	430	3,200	<10	<60
Pre Carbon	South SVE Pre Carbon	7/28/2014	<69	<67	200	<67	<150	15,000	<64	<93	750	<43	<254
Post Carbon	SVE Post Carbon	7/28/2014	<68	<67	270	<67	<150	13,000	<63	530	12,000	<43	<253
Pre Carbon	South SVE Pre Carbon	8/25/2014	<140	<130	340	<130	<290	20,000	<130	<180	1,100	<86	<520
Post Carbon	South SVE Post Carbon	8/25/2014	<140	<130	270	<130	<290	9,600	<130	<180	2,700	<86	<520
Pre Carbon	South SVE_Pre Carbon	9/30/2014	<110	<110	250	<110	<230	17,000	<100	<150	930	<69	<410
Post Carbon	South SVE_Post Carbon	9/30/2014	<130	<120	280	<120	<270	23,000	<120	<170	620	<80	<480
Pre Carbon	SVE South Post Blower	11/3/2014	<130	<130	320	<130	<280	24,000	<120	<170	1,100	<81	<490
Post Carbon	SVE South Post Carbon	11/3/2014	<81	<81	130	<81	<180	12,000	<77	<110	290	<52	<309
Pre Carbon	SVE South Pre Carbon	1/26/2015	<190	<500	420	<250	<220	21,000	240	<260	860	<160	<820
Post Carbon	SVE South Post Carbon	1/26/2015	<78	<200	<100	<100	<90	<170	190	<110	<140	<66	<330

Please refer to notes at end of table.

Table 9
South SVE System – Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Sampling Location	Sample ID	Date	1,1-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Methylene Chloride	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Vinyl chloride	Total Xylenes
			Concentrations in $\mu\text{g}/\text{m}^3$										
Pre Carbon	SVE South Pre Carbon	2/26/2015	<150	<390	260	<200	<170	18,000	280	<200	660	<130	<650
Post Carbon	SVE South Post Carbon	2/26/2015	<1.2	<3.2	<1.6	<1.6	3.2	<2.7	<1.5	<1.6	<2.1	2.5	<5.2
Pre Carbon	SVE South Pre Carbon	3/30/2015	<61	<160	200	<79	160	17,000	180	<82	570	<51	<257
Post Carbon	SVE South Post Carbon	3/30/2015	<1.2	<3.2	<1.6	<1.6	2.8	<2.7	2.7	<1.6	51	2.5	<5.2
Pre Carbon	SVE S Pre Carbon	4/24/2015	<37	<97	170	<49	<43	5,400	<46	<50	410	<31	<163
Post Carbon	SVE S Post Carbon	4/24/2015	<6.2	<16	<8.1	<8.1	<7.1	660	<7.7	<8.3	19	<5.2	18
Pre Carbon	SVE South Pre Carbon	5/28/2015	<60	<160	140	<79	92	8,000	240	<81	460	<51	<256
Post Carbon	SVE South Post Carbon	5/28/2015	<4.9	<13	<6.3	<6.3	<5.6	650	<6.0	<6.5	16	<4.1	22.1
Pre Carbon	SVE South Pre Carbon	7/29/2015	<65	<170	190	<85	<75	12,000	<81	<88	790	<55	<183
Post Carbon	SVE South Post Carbon	7/29/2015	10	<27	960	16	<12	440	<13	<14	<18	<8.7	<45
Pre Carbon	SVE South Pre Carbon	8/31/2015	<64	<170	160	<83	<73	12,000	<79	<86	780	<54	<171
Post Carbon	SVE South Post Carbon	8/31/2015	<21	<55	530	<27	<24	3,400	<26	<28	94	<18	<90
Pre Carbon	SVE South Pre Carbon	9/28/2015	<83	<220	170	<110	<94	9,900	<100	<110	660	<70	<360
Post Carbon	SVE South Post Carbon	9/28/2015	3.4	<6.0	340	3.6	<2.6	300	<2.8	39	59	<1.9	<9.8
Pre Carbon	SVE South Pre Carbon	10/29/2015	<130	<350	230	<170	<150	18,000	<170	<180	790	<110	<570
Post Carbon	SVE South Post Carbon	10/29/2015	4.2	5.2	340	4.5	2.6	26	<1.5	67	310	1.7	<5.2
Pre Carbon	SVE_South_Precarbon_113015	11/30/2015	<29	<77	54	<38	<38	3,000	<38	<29	300	<38	<77
Post Carbon	SVE_South_Postcarbon_113015	11/30/2015	<0.80	<0.80	27	0.60	<0.40	<0.40	<0.40	6	11	<0.40	<0.80
Pre Carbon	SVE_SOUTH_PRE CARBON_12/28/15	12/28/2015	<120	<320	180	<160	<140	35,000	<150	<170	1,200	<100	<530
Post Carbon	SVE_SOUTH_POST CARBON_12/28/15	12/28/2015	<1.2	<3.2	28	<1.6	<1.4	<2.7	1.5	2	6.5	<1.0	<4.2
Pre Carbon	SVE_SOUTH_PRE CARBON	2/1/2016	<8.6	<22	20	<11	<9.8	2,900	<11	14	120	<7.2	<37
Post Carbon	SVE_SOUTH_POST CARBON	2/1/2016	2.2	<3.2	160	2.90	<1.4	<2.7	<1.5	92	260	<1.0	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON	3/29/2016	<230	<610	710	<300	<270	71,000	<290	520	2,800	<200	<670
Post Carbon	SVE_SOUTH_POST CARBON	3/29/2016	<69	<180	490	<23	<79	9,300	<86	1500	9,300	<58	<200
Pre Carbon	SVE_SOUTH_PRE CARBON	4/27/2016	<6.4	<17	12	<8.4	<7.4	910	<8.0	<8.7	23	<5.4	<18
Post Carbon	SVE_SOUTH_POST CARBON	4/27/2016	<63	<160	180	<82	<72	11,000	<78	110	2,200	<53	<180
Pre Carbon	SVE_SOUTH_PRE CARBON	5/25/2016	<1.2	<3.2	4	<1.6	<1.4	550	2.9	3	22	<1.0	3.9
Post Carbon	SVE_SOUTH_POST CARBON	5/25/2016	<16	<41	2300	30.00	<18	14,000	<19	130	3,300	<13	<45
Pre Carbon	SVE_SOUTH_PRE CARBON	7/26/2016	<98	<260	340	<130	<110	18,000	<120	<130	970	<83	<420
Post Carbon	SVE_SOUTH_POST CARBON	7/26/2016	<78	<200	760	<120	<89	15,000	<97	220	1,400	<66	<330
Pre Carbon	SVE_SOUTH_PRE CARBON	8/30/2016	<86	<230	340	<110	<99	28,000	<110	<120	1,400	<73	<370
Post Carbon	SVE_SOUTH_POST CARBON	8/30/2016	<81	<210	370	<110	<93	19,000	<100	210	910	<68	<350
Pre Carbon	SVE_SOUTH_PRE CARBON	9/29/2016	<73	<190	340	<95	<83	25,000	<90	110	1,300	<61	<310
Post Carbon	SVE_SOUTH_POST CARBON	9/29/2016	<46	<120	410	<60	<53	14,000	<57	140	1,900	<39	<196

Please refer to notes at end of table.

Table 9
South SVE System – Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Sampling Location	Sample ID	Date	1,1-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Methylene Chloride	Tetrachloroethene	Toluene	1,1,1-Trichloroethane	Trichloroethene	Vinyl chloride	Total Xylenes
			Concentrations in µg/m ³										
Pre Carbon	SVE-SOUTH_PRE CARBON_102516	10/25/2016	<150	<390	380	<190	<170	32,000	<180	<200	1,500	<120	<630
Post Carbon	SVE-SOUTH_POST CARBON_102516	10/25/2016	<100	<260	530	<130	<120	19,000	<130	180	2,700	<85	<430
Pre Carbon	SVE_SOUTH_PRE CARBON_112816	11/28/2016	<260	<670	420	<340	<290	52,000	<320	<350	2,100	<220	<1110
Post Carbon	SVE_SOUTH_POST CARBON_112816	11/28/2016	<79	<210	<100	<100	<90	18,000	<98	360	3,200	<66	<340
Pre Carbon	SVE_SOUTH_PRE CARBON_013017	1/30/2017	<260	<690	660	<340	<300	61,000	<330	400	2,400	<220	<1130
Post Carbon	SVE_SOUTH_POST CARBON_013017	1/30/2017	<1.2	<3.2	<1.6	<1.6	<1.4	24	1.8	<1.6	<2.1	<1.0	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON_073117	7/31/2017	<100	<260	400	<130	<110	17,000	340	<130	1,000	<84	<430
Post Carbon	SVE_SOUTH_POST CARBON_073117	7/31/2017	<1.2	<3.2	<1.6	<1.6	2.4	6.5	8.2	<1.6	3.9	2.4	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON_082817	8/28/2017	<60	<160	320	<79	<69	32,000	<75	90	1,100	<51	<256
Post Carbon	SVE_SOUTH_POST CARBON_082817	8/28/2017	<1.2	5.8	2	<1.6	2.4	160	2.3	<1.6	3.9	2.2	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON_092517	9/25/2017	<21	<55	200	<27	<24	23,000	<26	45	460	<18	<90
Post Carbon	SVE_SOUTH_POST CARBON_092517	9/25/2017	<1.2	8.0	16	<1.6	5.3	6.8	<1.5	<1.6	<2.1	2.2	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON_102617	10/26/2017	<40	<100	230	<52	<45	13,000	<49	64	700	<33	<167
Post Carbon	SVE_SOUTH_POST CARBON_102617	10/26/2017	2.0	15	98	2.1	1.6	9.7	<1.5	3.9	<2.1	1.5	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON_112917	11/29/2017	<140	<370	280	<180	<160	22,000	<170	<190	820	<120	<600
Post Carbon	SVE_SOUTH_POST CARBON_112917	11/29/2017	3.8	8.5	220	4.0	<2.0	<4.0	<2.2	12	<3.2	2.5	<5.7
Pre Carbon	SVE_SOUTH_PRE CARBON_122117	12/21/2017	--	--	--	--	--	--	--	--	--	--	--
Post Carbon	SVE_SOUTH_POST CARBON_122117	12/21/2017	4.6	4.9	300	5.2	1.7	<2.7	<1.5	20	7.2	1.8	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON_012218	1/22/2018	<110	<290	150	<150	<130	13,000	<140	<150	390	<95	<480
Post Carbon	SVE_SOUTH_POST CARBON_012218	1/22/2018	4.3	<6.5	380	<3.2	<2.8	8.1	<3.1	11	16	2.1	<10.6
Pre Carbon	SVE_SOUTH_PRE CARBON_022818	2/28/2018	<19	<49	200	<25	<22	13,000	<23	52	440	<16	<81
Post Carbon	SVE_SOUTH_POST CARBON_022818	2/28/2018	2.8	<3.2	300	4.0	<1.4	<2.7	<1.5	14	51	5.1	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON_032918	3/29/2018	<23	<60	180	<30	<26	13,000	<28	46	470	<19	<98
Post Carbon	SVE_SOUTH_POST CARBON_032918	3/29/2018	4.2	5.2	500	7.4	1.5	7.8	<1.5	15	110	1.7	<5.2
Pre Carbon	SVE_SOUTH_PRE CARBON_042418	4/24/2018	<69	<180	140	<90	<79	12,000	<86	<58	350	<58	<299
Post Carbon	SVE_SOUTH_POST CARBON_042418	4/24/2018	3.4	4.2	470	7.6	1.5	6.6	3.1	8.4	76	1.4	17.9
Pre Carbon	SVE_SOUTH_PRE CARBON_051618	5/16/2018	<50	<130	160	<65	<57	7,800	<62	<68	370	<42	<212
Post Carbon	SVE_SOUTH_POST CARBON_051618	5/16/2018	<4.7	<12	480	6.6	<0.97	<1.3	<0.75	7.1	33	<4	<19.7
Pre Carbon	SVE_South_72318-Pre Carbon	7/23/2018	<63	<170	170	<83	<73	18,000	<79	<85	770	<53	<271
Post Carbon	SVE_South_Post Carbon-72318	7/23/2018	<25	<65	230	<33	<29	8,300	<31	520	6,400	<21	<108
Pre Carbon	SVE_South_PreCarbon_110718	11/7/2018	<64	<170	310	<84	<74	31,000	<80	91	1,300	<54	<180
Post Carbon	SVE_South_PostCarbon_110718	11/7/2018	<1.2	<3.2	<1.6	<1.6	<1.4	15	<1.5	<1.6	<2.1	1.6	<3.5
Pre Carbon	SVE_South_PreCarbon_010419	1/4/2019	<64	<160	280	<82	<71	32,000	<77	84	920	<53	<180
Post Carbon	SVE_South_PostCarbon_010419	1/4/2019	<1.2	<3.2	<1.6	<1.6	2.1	<2.7	2.3	<1.6	<2.1	1.5	7.3

Notes:

1. µg/m³ = Micrograms per cubic meter.
2. Samples analyzed by Modified EPA Method TO-15.
3. Only analytes detected in at least one sample are presented in this table.
4. S= Surrogate recoveries were above acceptable recovery limits. Results may be biased high.
5. **Bold** values represents detected concentration of listed analyte.
6. -- = Not sampled.

Table 10
North SVE System – VOC Mass Removal
NuStar Vancouver Facility
Vancouver, Washington

Sample Date	Post-Blower Pressure (in H ₂ O)	Air Flow Rate ⁽¹⁾ (cfm)	Total VOCs (mg/m ³)	VOC Removal (lb/day)
10/12/2011	0.1	250	10.5	0.2
1/23/2012	0.1	361	16.5	0.5
2/17/2012	0.05	215	11.3	0.2
3/22/2012	--	210	6.7	0.1
6/20/2012	0.2	217.8	0.3	0.005
8/22/2012	0.2	216	0.2	0.003
11/26/2012	0.05	215	22.6	0.436
12/21/2012	0.1	215	3.6	0.069
2/28/2013	0.1	215	4.6	0.088
5/24/2013	0.1	215	24.4	0.471
6/25/2013	0.1	215	13.8	0.267
8/27/2013	0.1	215	17.8	0.344
10/24/2013	0.1	215	10.6	0.204
12/27/2013	0.1	215	7.5	0.144
1/29/2014	3.0	215	1.4	0.028
2/24/2014	9.0	215	9.5	0.184
3/31/2014	1.0	215	3.7	0.072
4/29/2014	2.0	215	3.7	0.072
5/27/2014	2.0	215	4.4	0.085
7/3/2014	4.0	215	4.8	0.093
7/28/2014	3.0	215	7.7	0.148
9/30/2014	--	215	7.8	0.151
10/27/2014	2.0	215	15.4	0.298
11/25/2014	--	215	7.5	0.145
12/29/2014	2.0	215	15.3	0.296
1/26/2015	3.0	215	1.6	0.032
2/26/2015	0.1	215	0.0	0.001
3/30/2015	0.4	215	1.8	0.036
4/24/2015	0.4	215	0.6	0.012
5/14/2015	--	215	0.0	0.000
5/28/2015	0.05	215	0.4	0.007
7/29/2015	0.10	215	2.2	0.043
8/31/2015	0.05	215	7.8	0.150
9/28/2015	0.00	215	1.6	0.031
10/29/2015	1.00	215	6.9	0.134
11/30/2015	2.00	215	2.4	0.046
12/28/2015	0.10	215	5.7	0.110
2/1/2016	3.00	215	11.2	0.215
2/29/2016	0.10	215	8.0	0.154
3/29/2016	0.20	215	0.9	0.018
4/27/2016	1.00	215	1.6	0.030
5/25/2016	--*	--*	--*	--*
6/28/2016	0.10	215	1.8830	0.036
7/26/2016	1.20	215	0.0916	0.00177
9/29/2016	0.10	215	0.0150	0.00029
10/25/2016	0.10	215	0.0109	0.000211
11/28/2016	0.10	215	0.0067	0.000129
12/28/2016	0.10	215	0.0017	0.0000329
1/30/2017	0.10	215	0.0046	0.0000889
2/28/2017	0.10	215	0.0059	0.000114
3/28/2017	0.10	215	0.0061	0.000118
4/24/2017	0.10	215	0.0076	0.000147

Please refer to notes at end of table.

Table 10
North SVE System – VOC Mass Removal
NuStar Vancouver Facility
Vancouver, Washington

Date	Activity	VOC Removal Rate (lb/day)	Days of Operation	Approximate VOCs Removed (lbs)	Approximate Cumulative VOCs Removed (lbs)
10/10/2011	Startup	--	--	--	--
10/12/2011	Sample	0.2	37	9	9
1/23/2012	Sample	0.5	31	17	26
2/17/2012	Sample	0.2	25	6	32
3/22/2012	Sample	0.1	34	5	37
6/20/2012	Sample	0.005	90	1	38
8/22/2012	Sample	0.003	63	1	39
11/26/2012	Sample	0.436	66	29	68
12/21/2012	Sample	0.069	25	2	70
2/28/2013	Sample	0.088	69	7	77
5/24/2013	Sample	0.471	--	--	77
6/25/2013	Sample	0.267	32	9	86
8/27/2013	Sample	0.344	63	22	108
10/24/2013	Sample	0.204	58	12	120
12/27/2013	Sample	0.144	64	10	130
1/29/2014	Sample	0.028	33	1	131
2/24/2014	Sample	0.184	--	--	131
3/31/2014	Sample	0.072	35	3	134
4/29/2014	Sample	0.072	29	3	137
5/27/2014	Sample	0.085	28	3	140
7/3/2014	Sample	0.093	37	4	144
7/28/2014	Sample	0.148	25	4	148
9/30/2014	Sample	0.151	64	10	158
10/27/2014	Sample	0.298	27	9	167
11/25/2014	Sample	0.145	29	5	172
12/29/2014	Sample	0.296	34	11	183
1/26/2015	Sample	0.032	28	1	184
2/26/2015	Sample	0.001	31	1	185
3/30/2015	Sample	0.036	32	2	187
4/24/2015	Sample	0.012	25	1	188
5/14/2015	Sample	0.000	20	0	188
5/28/2015	Sample	0.007	14	1	189
6/30/2015	Estimate	0.007	33	1	190
6/30/2015	Estimate	0.000	0	0	190
7/29/2015	Sample	0.043	29	2	192
8/31/2015	Sample	0.150	33	5	197
9/28/2015	Sample	0.031	28	1	198
10/29/2015	Sample	0.134	31	5	203
11/30/2015	Sample	0.046	32	2	205
12/28/2015	Sample	0.110	28	4	209
2/1/2016	Sample	0.215	35	8	217
2/29/2016	Sample	0.154	28	5	222
3/29/2016	Sample	0.018	29	1	223
4/27/2016	Sample	0.030	29	1	224
5/25/2016	Sample	--*	28	--*	221
6/28/2016	Sample	0.0364	34	2	223
7/26/2016	Sample	0.00177	28	1	224
9/29/2016	Sample	0.00029	65	1	225
10/25/2016	Sample	0.000211	26	1	226
11/28/2016	Sample	0.000129	34	1	227
12/28/2016	Sample	0.0000329	30	1	228
1/30/2017	Sample	0.0000889	33	1	229
2/28/2017	Sample	0.000114	29	1	230
3/28/2017	Sample	0.000118	28	1	231
4/24/2017	Sample	0.000147	27	1	232

Notes:

1. Air flow rate read from system gauge.
2. cfm = Cubic feet per minute.
3. mg/m³ = Milligrams per cubic meter.
4. lb/day = Pounds per day.
5. lbs = Pounds.
6. * = Not measured/sampled; system intentionally shut down to evaluate system efficiency.
7. -- = not measured/sampled.

Table 11
South SVE System – VOC Mass Removal
NuStar Vancouver Facility
Vancouver, Washington

Sample Date	Post-Blower Pressure (in H ₂ O)	Air Flow Rate ⁽¹⁾ (cfm)	Total VOCs (mg/m ³)	VOC Removal (lb/day)
10/6/2011	33.0	590	46	2.4
11/2/2011	27.0	590	29	1.5
12/14/2011	27.0	590	57	3.0
2/17/2012	29.0	-- ⁶	30	1.6
3/22/2012	27.0	658	31	1.9
4/26/2012	27.0	--	0	0.0
5/23/2012	31.0	--	20	1.2
6/20/2012	33.0	--	37	2.2
7/24/2012	32.0	--	34	2.0
8/22/2012	29.0	--	51	3.0
9/25/2012	29.0	--	52	3.1
10/29/2012	47.0	--	63	3.7
11/26/2012	18.0	--	11	0.6
12/21/2012	17.0	--	15	0.9
1/24/2013	10.0	--	2	0.1
2/28/2013	18.0	--	1	0.1
3/25/2013	16.0	--	4	0.2
4/29/2013	15.0	--	1	0.1
5/24/2013	47.0	--	251	14.8
6/25/2013	51.0	--	41	2.5
7/25/2013	50.0	--	24	1.4
8/27/2013	52.0	--	30	1.8
9/30/2013	45.0	--	28	1.6
10/24/2013	50.0	--	29	1.7
11/25/2013	51.0	--	22	1.3
12/27/2013	55.0	--	21	1.3
1/29/2014	50.0	--	21	1.2
2/24/2014	50.0	--	37	2.2
3/31/2014	46.0	--	21	1.2
4/29/2014	48.8	--	14	0.8
5/27/2014	49.0	--	13	0.7
7/3/2014	50.0	--	3	0.2
7/28/2014	50.0	--	16	0.9
8/25/2014	49.0	--	21	1.2
9/30/2014	40.0	--	18	1.1
11/3/2014	50.0	--	25	1.5
1/26/2015	20.0	--	23	1.3
2/26/2015	30.0	--	19	1.1
3/30/2015	29.0	--	18	1.1
4/24/2015	29.0	--	6	0.4
5/28/2015	28.0	--	9	0.5
7/29/2015	25.0	--	13	0.8
8/31/2015	26.0	--	13	0.8
9/28/2015	26.0	--	11	0.6
10/29/2015	27.0	--	19	1.1
11/30/2015	30.0	--	3	0.2
12/28/2015	29.0	--	36	2.2

Please refer to notes at end of table.

Table 11
South SVE System – VOC Mass Removal
NuStar Vancouver Facility
Vancouver, Washington

Sample Date	Post-Blower Pressure (in H ₂ O)	Air Flow Rate ⁽¹⁾ (cfm)	Total VOCs (mg/m ³)	VOC Removal (lb/day)
2/1/2016	19.0	--	3	0.2
2/29/2016	30.0	--	3	0.2
3/29/2016	28.0	--	75	4.4
4/27/2016	5.0	--	1	0.1
5/25/2016	3.0	--	1	0.03
6/28/2016	-- *	-- *	-- *	-- *
7/26/2016	30.0	--	19	1.1
9/29/2016	28.0	--	27	1.6
10/25/2016	30.0	--	34	2.0
11/28/2016	30.0	--	55	3.3
12/28/2016	2.0	No Sample Collected.		
1/30/2017	33.0	--	64	3.8
3/28/2017	**System Not Working Properly -- No Data or Samples**			
9/25/2017	30.0	--	24	1.4
10/26/2017	30.0	--	14	0.8
11/29/2017	30.0	--	23	1.4
12/21/2017	30.0	--	23	1.4
1/22/2018	30.0	--	14	0.8
2/28/2018	30.0	--	14	0.8
3/29/2018	31.0	--	14	0.8
4/24/2018	31.0	--	12	0.7
5/16/2018	30.0	--	8	0.5
7/23/2018	29.0	--	19	1.1
11/7/2018	30.0	--	33	1.9
1/4/2019	28.0	--	33	2.0

Please refer to notes at end of table.

Table 11
South SVE System – VOC Mass Removal
NuStar Vancouver Facility
Vancouver, Washington

Date	Activity	VOC Removal Rate (lb/day)	Days of Operation	Approximate VOCs Removed (lbs)	Approximate Cumulative VOCs Removed (lbs)
10/6/2011	Startup	2.4	0.5	2	2
11/2/2011	Sample	1.5	27	41	43
12/14/2011	Sample	3.0	42	96	139
2/17/2012	Sample	1.6	65	151	290
3/22/2012	Sample	1.9	34	59	349
4/26/2012	Sample	0.0	35	33	382
5/23/2012	Sample	1.2	29	18	400
6/20/2012	Sample	2.2	28	47	447
7/24/2012	Sample	2.0	34	72	519
8/22/2012	Sample	3.0	29	74	593
9/25/2012	Sample	3.1	34	104	697
10/29/2012	Sample	3.7	34	116	813
11/26/2012	Sample	0.6	28	61	874
12/21/2012	Sample	0.9	25	19	893
1/24/2013	Sample	0.1	34	17	910
2/28/2013	Sample	0.1	35	3	913
3/25/2013	Sample	0.2	25	4	917
4/29/2013	Sample	0.1	35	6	923
5/24/2013	Sample	14.8	--	--	996
6/25/2013	Sample	2.5	32	277	1273
7/25/2013	Sample	1.4	30	58	1331
8/27/2013	Sample	1.8	33	53	1384
9/30/2013	Sample	1.6	34	59	1443
10/24/2013	Sample	1.7	24	41	1484
11/25/2013	Sample	1.3	32	48	1532
12/27/2013	Sample	1.2	32	41	1573
1/29/2014	Sample	1.2	33	41	1614
2/24/2014	Sample	2.2	--	--	1614
3/31/2014	Sample	1.2	35	60	1674
4/29/2014	Sample	0.8	29	30	1704
5/27/2014	Sample	0.7	28	22	1726
7/3/2014	Sample	0.2	37	18	1744
7/28/2014	Sample	0.9	25	15	1759
8/25/2014	Sample	1.2	28	31	1790
9/30/2014	Sample	1.1	36	42	1832
11/3/2014	Sample	1.5	30	39	1871
12/31/2014	Estimated	1.5	22	33	1904
1/26/2015	Sample	1.3	26	37	1941
2/26/2015	Sample	1.1	31	39	1980
3/30/2015	Sample	1.1	32	36	2016
4/24/2015	Sample	0.4	25	18	2034
5/28/2015	Sample	0.5	34	15	2049
7/29/2015	Sample	0.8	62	41	2090
8/31/2015	Sample	0.8	33	26	2116
9/28/2015	Sample	0.6	28	20	2136
10/29/2015	Sample	1.1	31	28	2164
11/30/2015	Sample	0.2	32	22	2186
12/28/2015	Sample	2.2	28	33	2219

Please refer to notes at end of table.

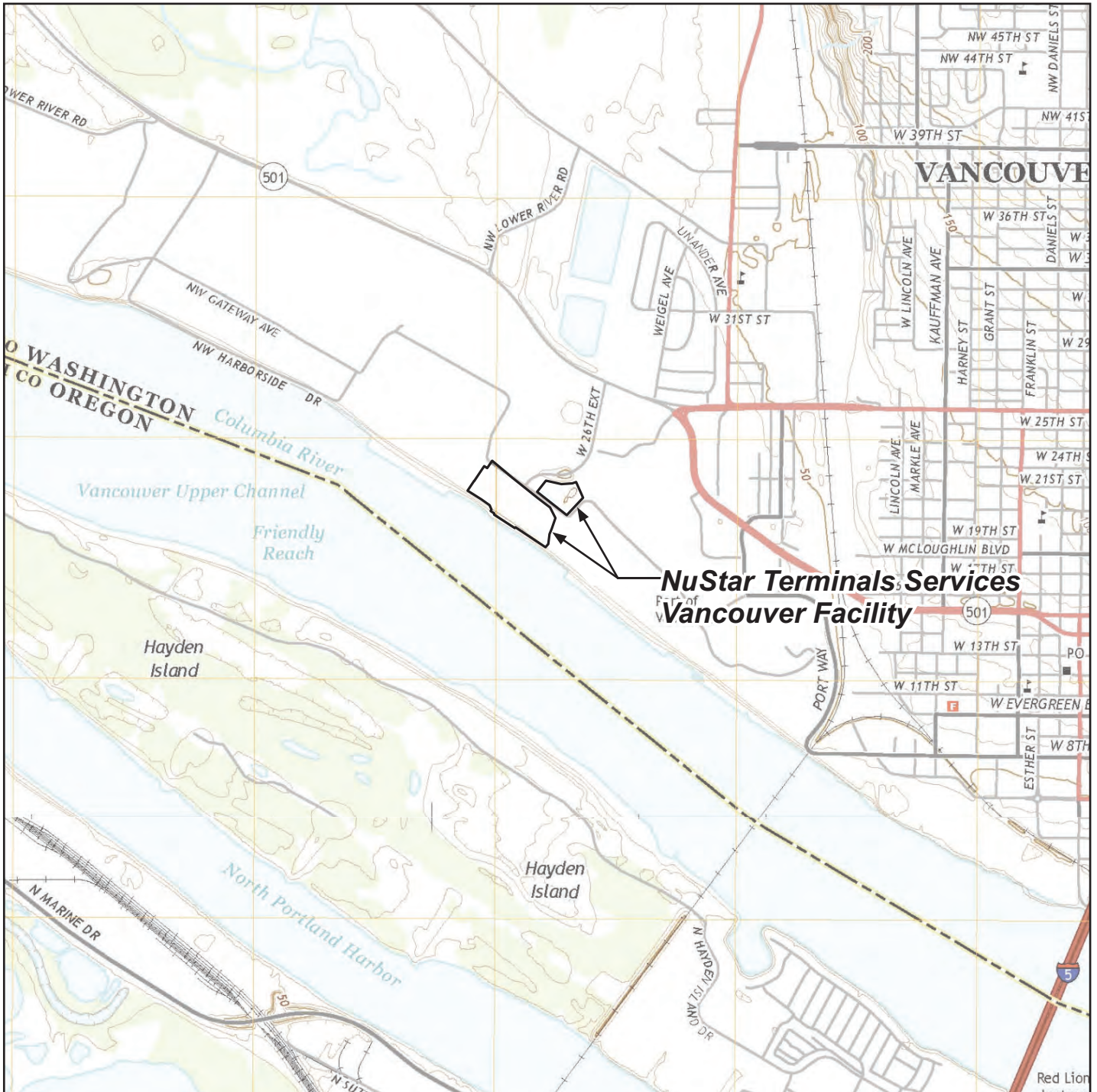
Table 11
South SVE System – VOC Mass Removal
NuStar Vancouver Facility
Vancouver, Washington

Date	Activity	VOC Removal Rate (lb/day)	Days of Operation	Approximate VOCs Removed (lbs)	Approximate Cumulative VOCs Removed (lbs)
2/1/2016	Sample	0.2	35	41	2260
2/29/2016	Sample	0.2	28	6	2266
3/29/2016	Sample	4.4	29	67	2333
4/27/2016	Sample	0.1	29	66	2399
5/25/2016	Sample	0.03	28	2	2401
7/26/2016	Sample	1.1	62	36	2437
9/29/2016	Sample	1.6	65	89	2526
10/25/2016	Sample	2.0	26	47	2573
11/28/2016	Sample	3.3	34	90	2663
1/30/2017	Sample	3.8	63	223	2886
7/31/2017	Sample	1.1	182	449	3335
8/28/2017	Sample	2.0	28	44	3379
9/25/2017	Sample	1.4	28	48	3427
10/26/2017	Sample	0.8	31	35	3462
11/29/2017	Sample	1.4	34	38	3500
12/21/2017	estimated (using November effluent data)	1.4	22	30	3530
1/22/2018	Sample	0.8	32	36	3566
2/28/2018	Sample	0.8	37	31	3597
3/29/2018	Sample	0.8	29	24	3621
4/24/2018	Sample	0.7	26	21	3642
5/16/2018	Sample	0.5	22	14	3656
7/23/2018	Sample	1.1	68	55	3711
11/7/2018	Sample	1.9	107	164	3875
1/4/2019	Sample	2.0	58	114	3989

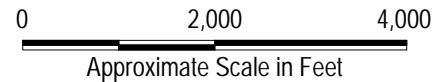
Notes:

1. Air flow rate read from system gauge.
2. cfm = cubic feet per minute.
3. mg/m³ = Milligrams per cubic meter.
4. lb/day = Pounds per day.
5. lbs = Pounds.
6. Flow rate was not measured on dates with dashes (--). For calculations, rate is assumed to be the same as measured the date before.
7. System was down during the October 27, 2014 monitoring event and was restarted on October 29, 2014. It is assumed that the system was down for a total of four days, although the exact duration of shutdown is unknown.
8. * = system was off for part replacement.

FIGURES



Note: Base map prepared from USGS 7.5-minute quadrangles of Vancouver, WA and Portland, OR-WA, dated 2014 as provided by USGS.gov.



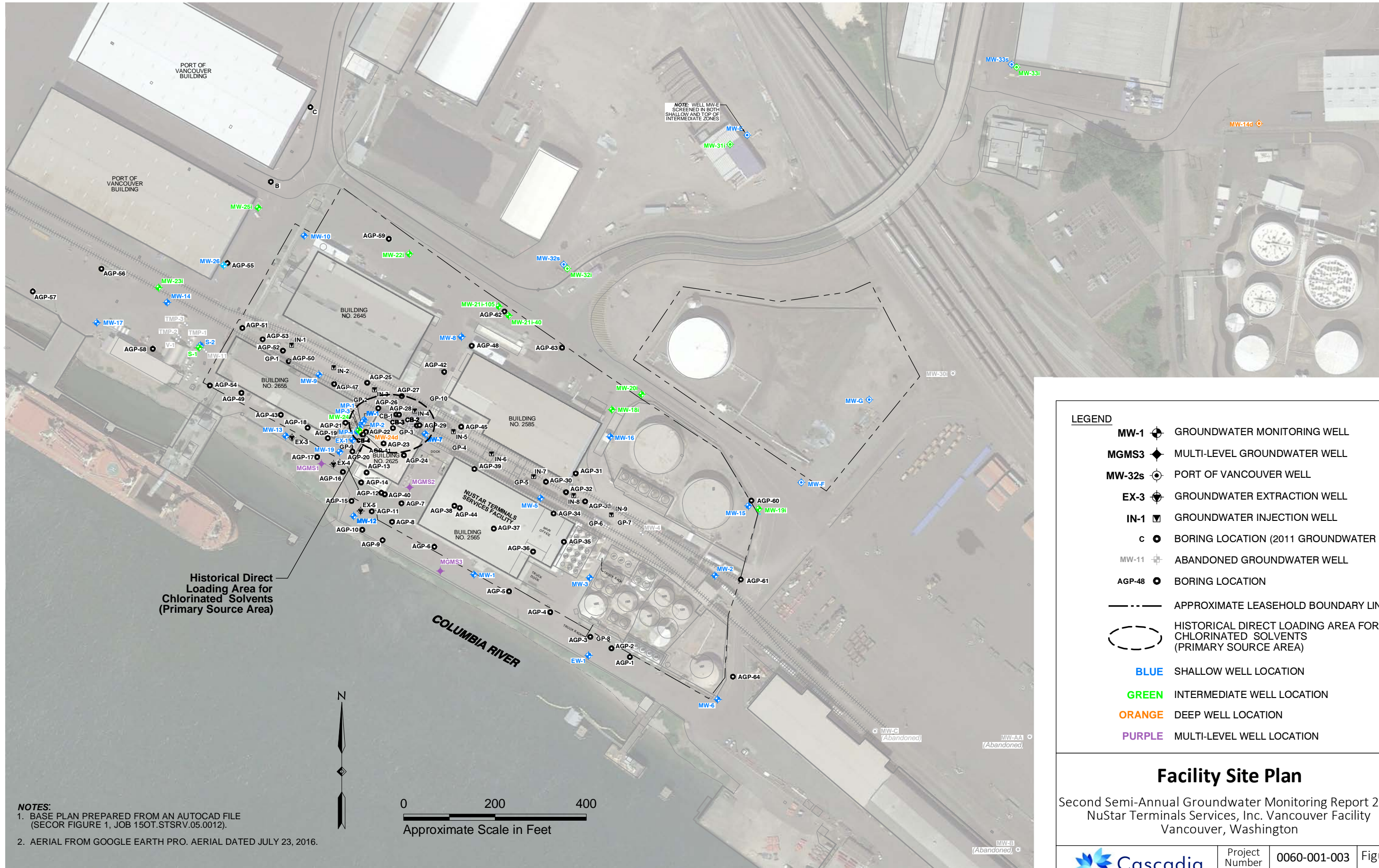
Facility Location Map

Second Semi-Annual Groundwater Monitoring Report 2018
 NuStar Terminals Services, Inc. Vancouver Facility
 Vancouver, Washington

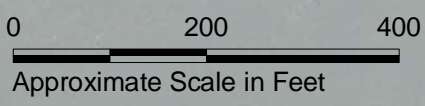


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Figure
1



NOTES:
 1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 150T.STSRV.05.0012).
 2. AERIAL FROM GOOGLE EARTH PRO. AERIAL DATED JULY 23, 2016.



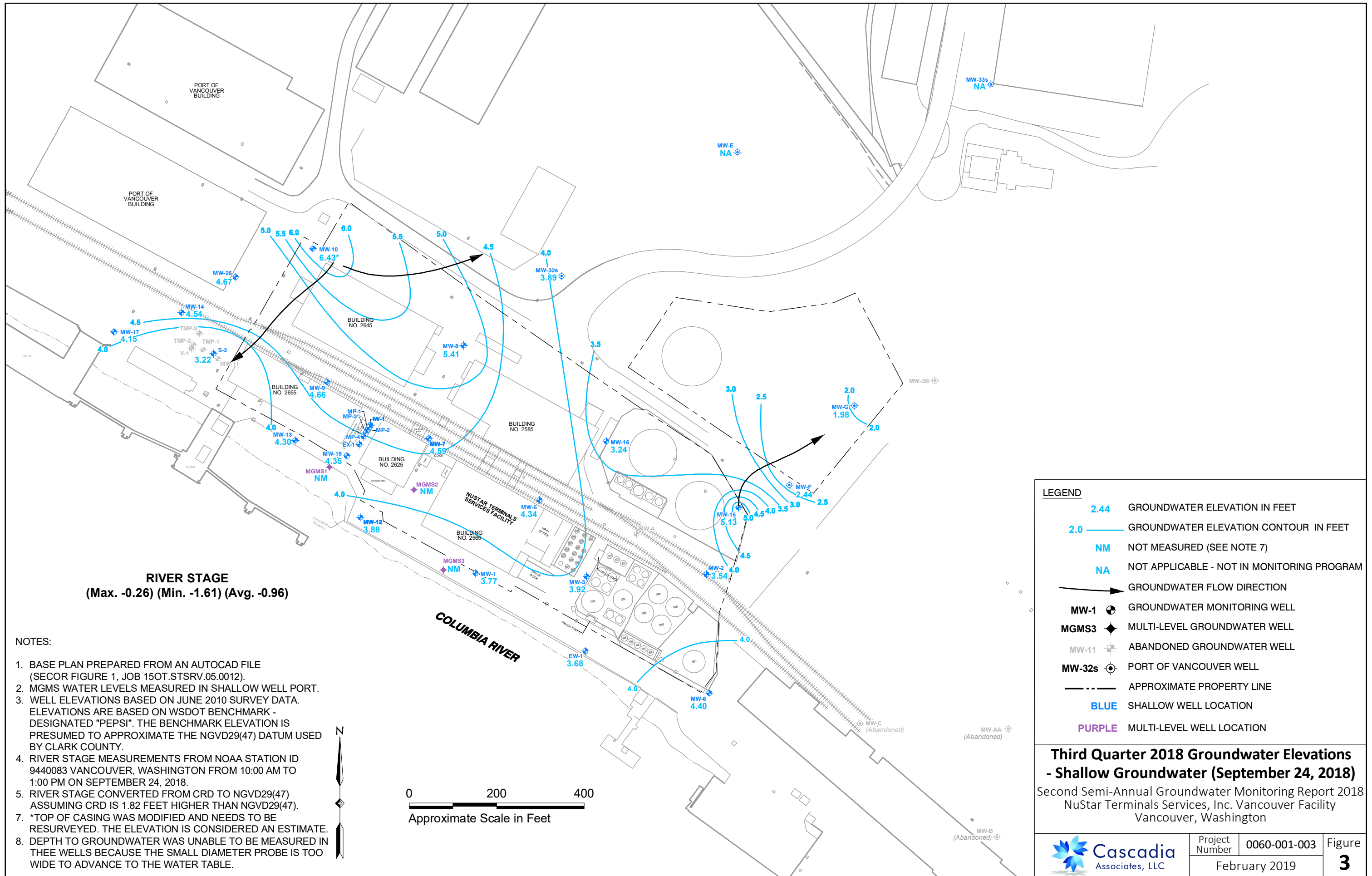
LEGEND

MW-1	GROUNDWATER MONITORING WELL
MGMS3	MULTI-LEVEL GROUNDWATER WELL
MW-32s	PORT OF VANCOUVER WELL
EX-3	GROUNDWATER EXTRACTION WELL
IN-1	GROUNDWATER INJECTION WELL
c	BORING LOCATION (2011 GROUNDWATER INV.)
MW-11	ABANDONED GROUNDWATER WELL
AGP-48	BORING LOCATION
	APPROXIMATE LEASEHOLD BOUNDARY LINE
	HISTORICAL DIRECT LOADING AREA FOR CHLORINATED SOLVENTS (PRIMARY SOURCE AREA)
BLUE	SHALLOW WELL LOCATION
GREEN	INTERMEDIATE WELL LOCATION
ORANGE	DEEP WELL LOCATION
PURPLE	MULTI-LEVEL WELL LOCATION

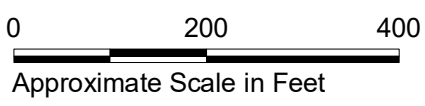
Facility Site Plan

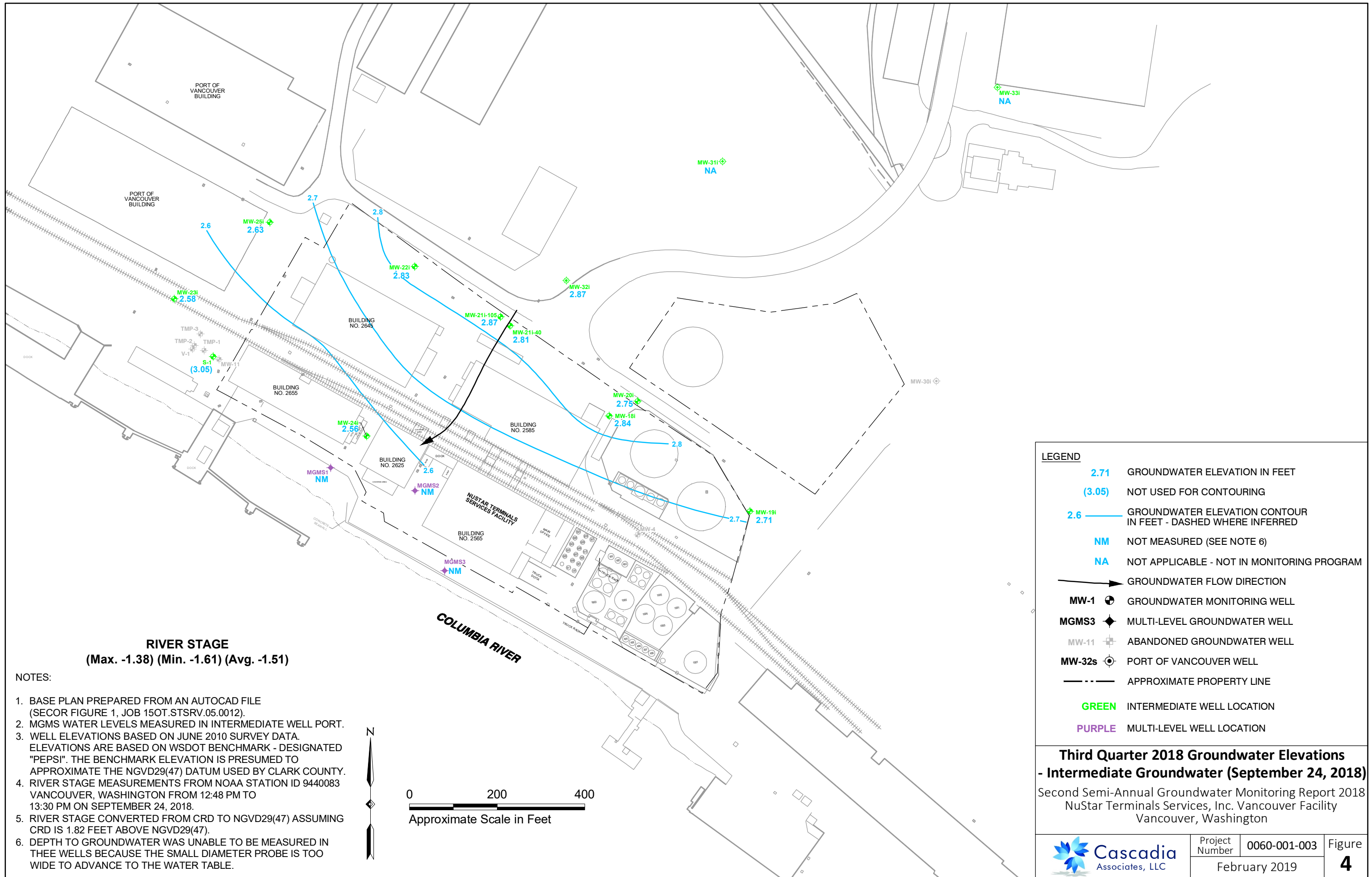
Second Semi-Annual Groundwater Monitoring Report 2018
 NuStar Terminals Services, Inc. Vancouver Facility
 Vancouver, Washington

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		February 2019	2



- NOTES:
1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 150T.STSRV.05.0012).
 2. MGMS WATER LEVELS MEASURED IN SHALLOW WELL PORT.
 3. WELL ELEVATIONS BASED ON JUNE 2010 SURVEY DATA. ELEVATIONS ARE BASED ON WSDOT BENCHMARK - DESIGNATED "PEPSI". THE BENCHMARK ELEVATION IS PRESUMED TO APPROXIMATE THE NGVD29(47) DATUM USED BY CLARK COUNTY.
 4. RIVER STAGE MEASUREMENTS FROM NOAA STATION ID 9440083 VANCOUVER, WASHINGTON FROM 10:00 AM TO 1:00 PM ON SEPTEMBER 24, 2018.
 5. RIVER STAGE CONVERTED FROM CRD TO NGVD29(47) ASSUMING CRD IS 1.82 FEET HIGHER THAN NGVD29(47).
 6. *TOP OF CASING WAS MODIFIED AND NEEDS TO BE RESURVEYED. THE ELEVATION IS CONSIDERED AN ESTIMATE.
 7. DEPTH TO GROUNDWATER WAS UNABLE TO BE MEASURED IN THREE WELLS BECAUSE THE SMALL DIAMETER PROBE IS TOO WIDE TO ADVANCE TO THE WATER TABLE.





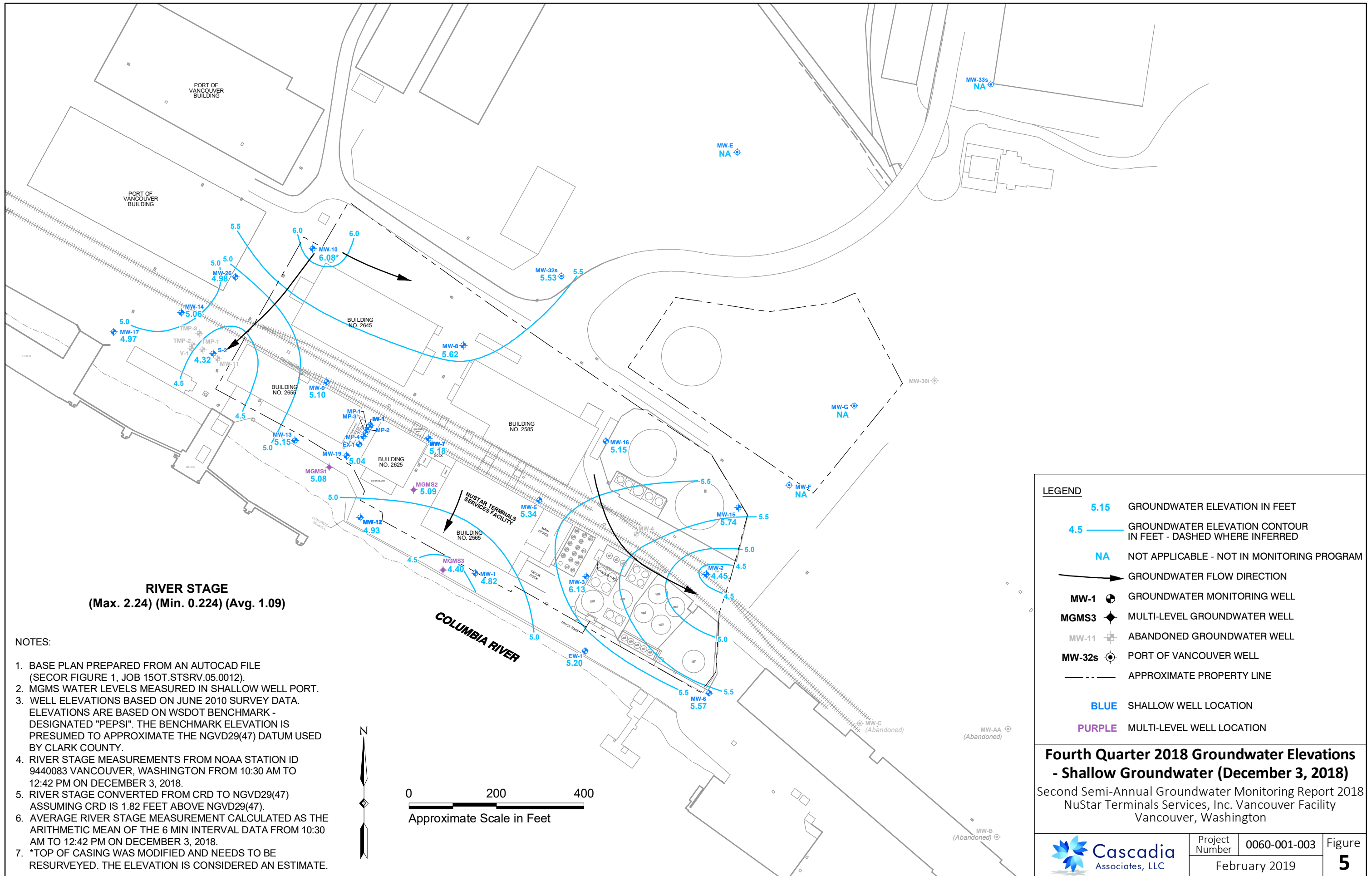
RIVER STAGE
 (Max. -1.38) (Min. -1.61) (Avg. -1.51)

- NOTES:
1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 150T.STSRV.05.0012).
 2. MGMS WATER LEVELS MEASURED IN INTERMEDIATE WELL PORT.
 3. WELL ELEVATIONS BASED ON JUNE 2010 SURVEY DATA. ELEVATIONS ARE BASED ON WSDOT BENCHMARK - DESIGNATED "PEPSI". THE BENCHMARK ELEVATION IS PRESUMED TO APPROXIMATE THE NGVD29(47) DATUM USED BY CLARK COUNTY.
 4. RIVER STAGE MEASUREMENTS FROM NOAA STATION ID 9440083 VANCOUVER, WASHINGTON FROM 12:48 PM TO 13:30 PM ON SEPTEMBER 24, 2018.
 5. RIVER STAGE CONVERTED FROM CRD TO NGVD29(47) ASSUMING CRD IS 1.82 FEET ABOVE NGVD29(47).
 6. DEPTH TO GROUNDWATER WAS UNABLE TO BE MEASURED IN THREE WELLS BECAUSE THE SMALL DIAMETER PROBE IS TOO WIDE TO ADVANCE TO THE WATER TABLE.

LEGEND

2.71	GROUNDWATER ELEVATION IN FEET
(3.05)	NOT USED FOR CONTOURING
2.6	GROUNDWATER ELEVATION CONTOUR IN FEET - DASHED WHERE INFERRED
NM	NOT MEASURED (SEE NOTE 6)
NA	NOT APPLICABLE - NOT IN MONITORING PROGRAM
→	GROUNDWATER FLOW DIRECTION
MW-1	GROUNDWATER MONITORING WELL
MGMS3	MULTI-LEVEL GROUNDWATER WELL
MW-11	ABANDONED GROUNDWATER WELL
MW-32s	PORT OF VANCOUVER WELL
---	APPROXIMATE PROPERTY LINE
GREEN	INTERMEDIATE WELL LOCATION
PURPLE	MULTI-LEVEL WELL LOCATION

Third Quarter 2018 Groundwater Elevations - Intermediate Groundwater (September 24, 2018)
 Second Semi-Annual Groundwater Monitoring Report 2018
 NuStar Terminals Services, Inc. Vancouver Facility
 Vancouver, Washington



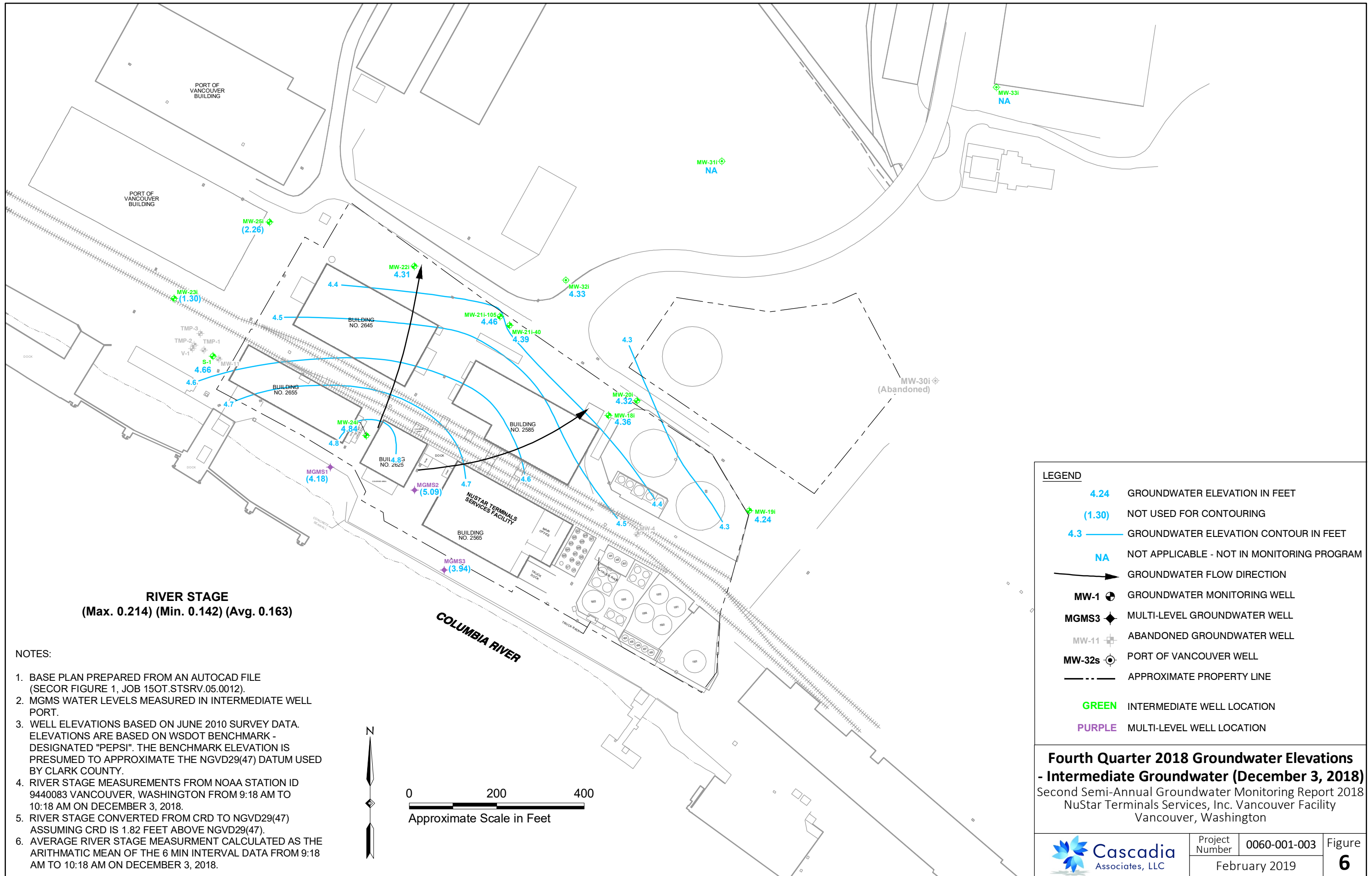
RIVER STAGE
 (Max. 2.24) (Min. 0.224) (Avg. 1.09)

- NOTES:
1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 150T.STSRV.05.0012).
 2. MGMS WATER LEVELS MEASURED IN SHALLOW WELL PORT.
 3. WELL ELEVATIONS BASED ON JUNE 2010 SURVEY DATA. ELEVATIONS ARE BASED ON WSDOT BENCHMARK - DESIGNATED "PEPSI". THE BENCHMARK ELEVATION IS PRESUMED TO APPROXIMATE THE NGVD29(47) DATUM USED BY CLARK COUNTY.
 4. RIVER STAGE MEASUREMENTS FROM NOAA STATION ID 9440083 VANCOUVER, WASHINGTON FROM 10:30 AM TO 12:42 PM ON DECEMBER 3, 2018.
 5. RIVER STAGE CONVERTED FROM CRD TO NGVD29(47) ASSUMING CRD IS 1.82 FEET ABOVE NGVD29(47).
 6. AVERAGE RIVER STAGE MEASUREMENT CALCULATED AS THE ARITHMETIC MEAN OF THE 6 MIN INTERVAL DATA FROM 10:30 AM TO 12:42 PM ON DECEMBER 3, 2018.
 7. *TOP OF CASING WAS MODIFIED AND NEEDS TO BE RESURVEYED. THE ELEVATION IS CONSIDERED AN ESTIMATE.

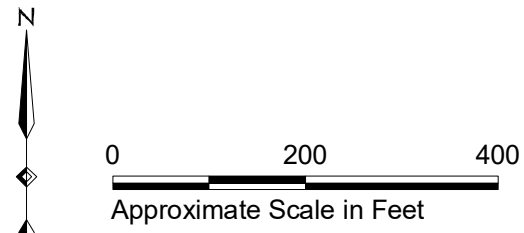
LEGEND

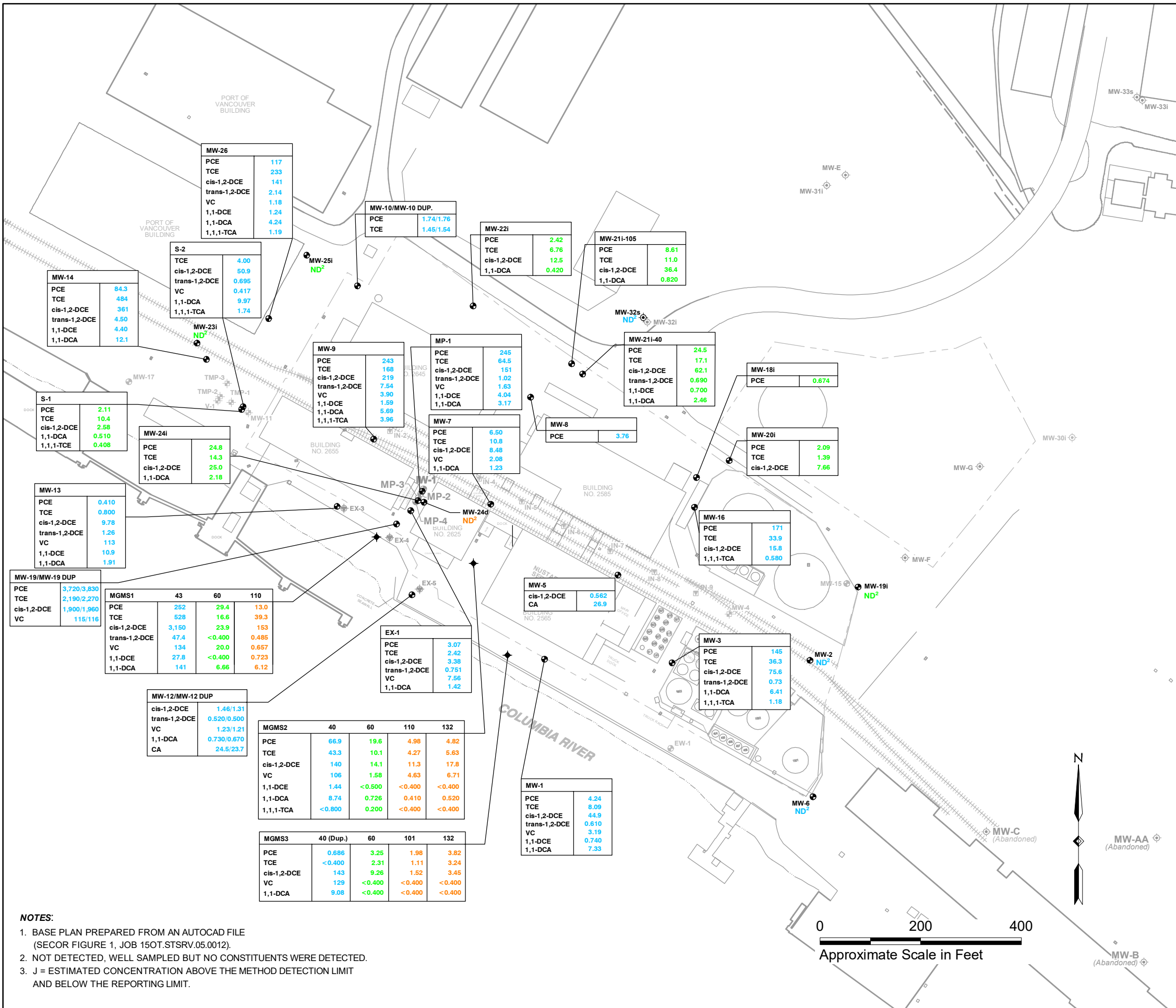
- 5.15 GROUNDWATER ELEVATION IN FEET
- 4.5 GROUNDWATER ELEVATION CONTOUR IN FEET - DASHED WHERE INFERRED
- NA NOT APPLICABLE - NOT IN MONITORING PROGRAM
- GROUNDWATER FLOW DIRECTION
- MW-1 GROUNDWATER MONITORING WELL
- MGMS3 MULTI-LEVEL GROUNDWATER WELL
- MW-11 ABANDONED GROUNDWATER WELL
- MW-32s PORT OF VANCOUVER WELL
- APPROXIMATE PROPERTY LINE
- BLUE SHALLOW WELL LOCATION
- PURPLE MULTI-LEVEL WELL LOCATION

Fourth Quarter 2018 Groundwater Elevations - Shallow Groundwater (December 3, 2018)
 Second Semi-Annual Groundwater Monitoring Report 2018
 NuStar Terminals Services, Inc. Vancouver Facility
 Vancouver, Washington



- NOTES:
1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 150T.STSRV.05.0012).
 2. MGMS WATER LEVELS MEASURED IN INTERMEDIATE WELL PORT.
 3. WELL ELEVATIONS BASED ON JUNE 2010 SURVEY DATA. ELEVATIONS ARE BASED ON WSDOT BENCHMARK - DESIGNATED "PEPSI". THE BENCHMARK ELEVATION IS PRESUMED TO APPROXIMATE THE NGVD29(47) DATUM USED BY CLARK COUNTY.
 4. RIVER STAGE MEASUREMENTS FROM NOAA STATION ID 9440083 VANCOUVER, WASHINGTON FROM 9:18 AM TO 10:18 AM ON DECEMBER 3, 2018.
 5. RIVER STAGE CONVERTED FROM CRD TO NGVD29(47) ASSUMING CRD IS 1.82 FEET ABOVE NGVD29(47).
 6. AVERAGE RIVER STAGE MEASUREMENT CALCULATED AS THE ARITHMETIC MEAN OF THE 6 MIN INTERVAL DATA FROM 9:18 AM TO 10:18 AM ON DECEMBER 3, 2018.





LEGEND

WELL IDENTIFICATION

DEPTH OF PORT SAMPLED (IF NOT SPECIFIED - SINGLE PORT WELL)

CHEMICAL CONCENTRATION IN µg/L (ONLY DETECTED COMPOUNDS ARE SHOWN)

MGMS1	60
PCE	29.4
TCE	16.6
cis-1,2-DCE	23.9
trans-1,2-DCE	<0.400
VC	20.0
1,1-DCE	<0.400
1,1-DCA	6.66

ANALYTE

- EX-3 GROUNDWATER EXTRACTION WELL
- IN-1 GROUNDWATER INJECTION WELL
- MW-1 GROUNDWATER MONITORING WELL
- MGMS3 MULTI-LEVEL GROUNDWATER WELL
- MW-11 ABANDONED GROUNDWATER WELL
- MW-32s PORT OF VANCOUVER WELL

- BLUE** SHALLOW ZONE CONCENTRATION DATA (DEPTHS OF 0 TO 45 FEET)
- GREEN** INTERMEDIATE ZONE CONCENTRATION DATA (DEPTHS OF 45 TO 100 FEET)
- ORANGE** DEEP ZONE CONCENTRATION DATA (DEPTHS OVER 100 FEET)

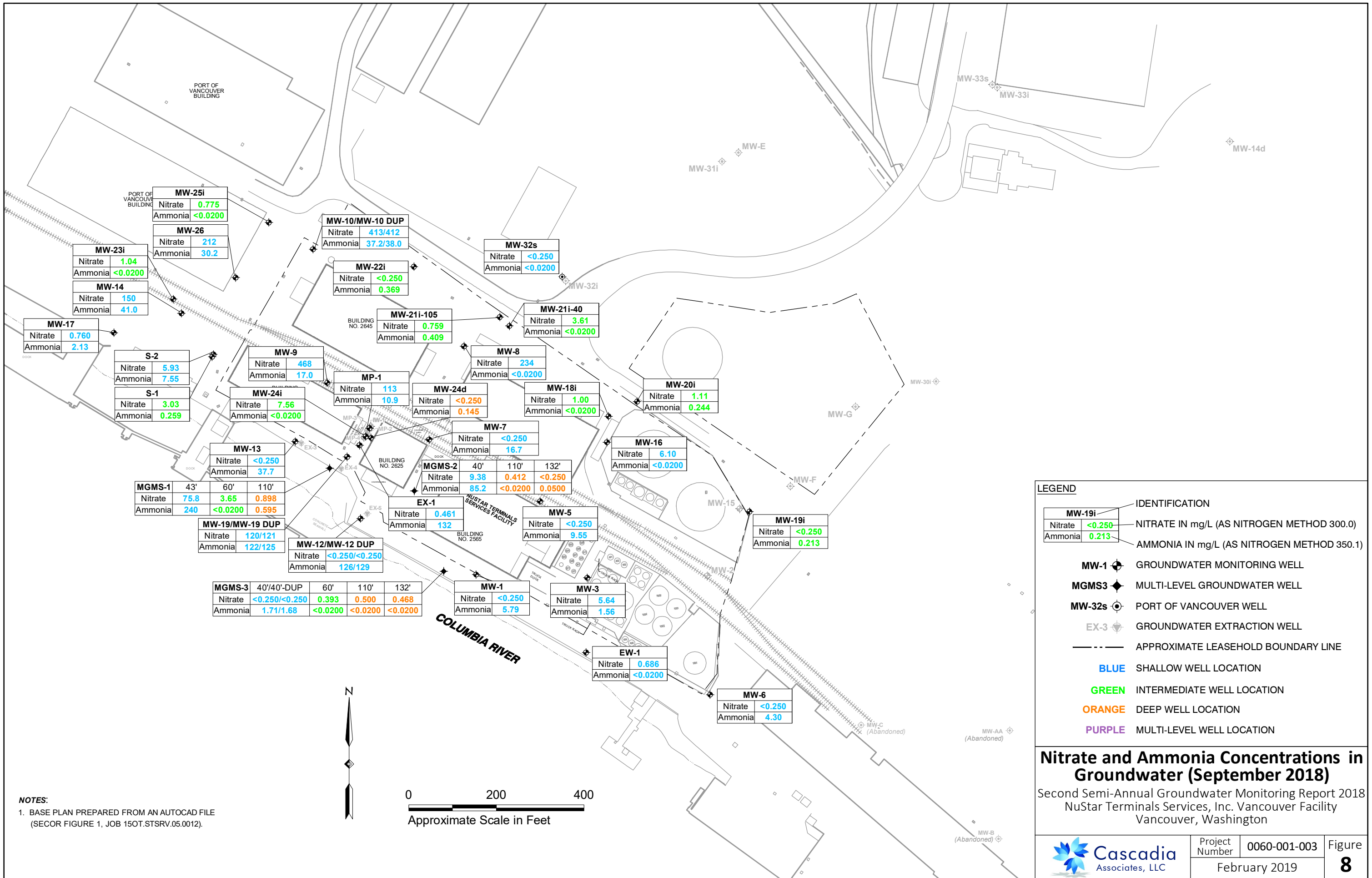
ABBREVIATIONS

PCE	TETRACHLOROETHENE
TCE	TRICHLOROETHENE
cis-1,2-DCE	CIS-1,2-DICHLOROETHENE
trans-1,2-DCE	TRANS-1,2-DICHLOROETHENE
VC	VINYL CHLORIDE
1,1-DCE	1,1-DICHLOROETHENE
1,1-DCA	1,1-DICHLOROETHANE
1,1,1-TCA	1,1,1-TRICHLOROETHANE
CF	CHLOROFORM
CA	CHLOROETHANE

- NOTES:**
1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 150T.STSRV.05.0012).
 2. NOT DETECTED, WELL SAMPLED BUT NO CONSTITUENTS WERE DETECTED.
 3. J = ESTIMATED CONCENTRATION ABOVE THE METHOD DETECTION LIMIT AND BELOW THE REPORTING LIMIT.

VOC Concentrations in Groundwater (September 2018)

Second Semi-Annual Groundwater Monitoring Report 2018
NuStar Terminals Services, Inc. Vancouver Facility
Vancouver, Washington



MW-25i	
Nitrate	0.775
Ammonia	<0.0200

MW-26	
Nitrate	212
Ammonia	30.2

MW-23i	
Nitrate	1.04
Ammonia	<0.0200

MW-14	
Nitrate	150
Ammonia	41.0

MW-17	
Nitrate	0.760
Ammonia	2.13

S-2	
Nitrate	5.93
Ammonia	7.55

S-1	
Nitrate	3.03
Ammonia	0.259

MW-9	
Nitrate	468
Ammonia	17.0

MW-24i	
Nitrate	7.56
Ammonia	<0.0200

MP-1	
Nitrate	113
Ammonia	10.9

MW-21i-105	
Nitrate	0.759
Ammonia	0.409

MW-8	
Nitrate	234
Ammonia	<0.0200

MW-21i-40	
Nitrate	3.61
Ammonia	<0.0200

MW-18i	
Nitrate	1.00
Ammonia	<0.0200

MW-20i	
Nitrate	1.11
Ammonia	0.244

MW-13	
Nitrate	<0.250
Ammonia	37.7

MGMS-1			
43'	60'	110'	
Nitrate	75.8	3.65	0.898
Ammonia	240	<0.0200	0.595

MW-19/MW-19 DUP	
Nitrate	120/121
Ammonia	122/125

MW-12/MW-12 DUP	
Nitrate	<0.250/<0.250
Ammonia	126/129

MGMS-2			
40'	110'	132'	
Nitrate	9.38	0.412	<0.250
Ammonia	85.2	<0.0200	0.0500

EX-1	
Nitrate	0.461
Ammonia	132

MW-5	
Nitrate	<0.250
Ammonia	9.55

MW-19i	
Nitrate	<0.250
Ammonia	0.213

MGMS-3				
40'/40'-DUP	60'	110'	132'	
Nitrate	<0.250/<0.250	0.393	0.500	0.468
Ammonia	1.71/1.68	<0.0200	<0.0200	<0.0200

MW-1	
Nitrate	<0.250
Ammonia	5.79

MW-3	
Nitrate	5.64
Ammonia	1.56

EW-1	
Nitrate	0.686
Ammonia	<0.0200

MW-6	
Nitrate	<0.250
Ammonia	4.30

LEGEND

IDENTIFICATION

MW-19i	—	IDENTIFICATION
Nitrate	<0.250	NITRATE IN mg/L (AS NITROGEN METHOD 300.0)
Ammonia	0.213	AMMONIA IN mg/L (AS NITROGEN METHOD 350.1)

MW-1 — GROUNDWATER MONITORING WELL

MGMS3 — MULTI-LEVEL GROUNDWATER WELL

MW-32s — PORT OF VANCOUVER WELL

EX-3 — GROUNDWATER EXTRACTION WELL

--- APPROXIMATE LEASEHOLD BOUNDARY LINE

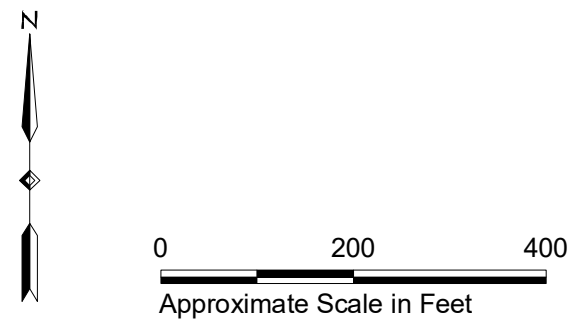
BLUE SHALLOW WELL LOCATION

GREEN INTERMEDIATE WELL LOCATION

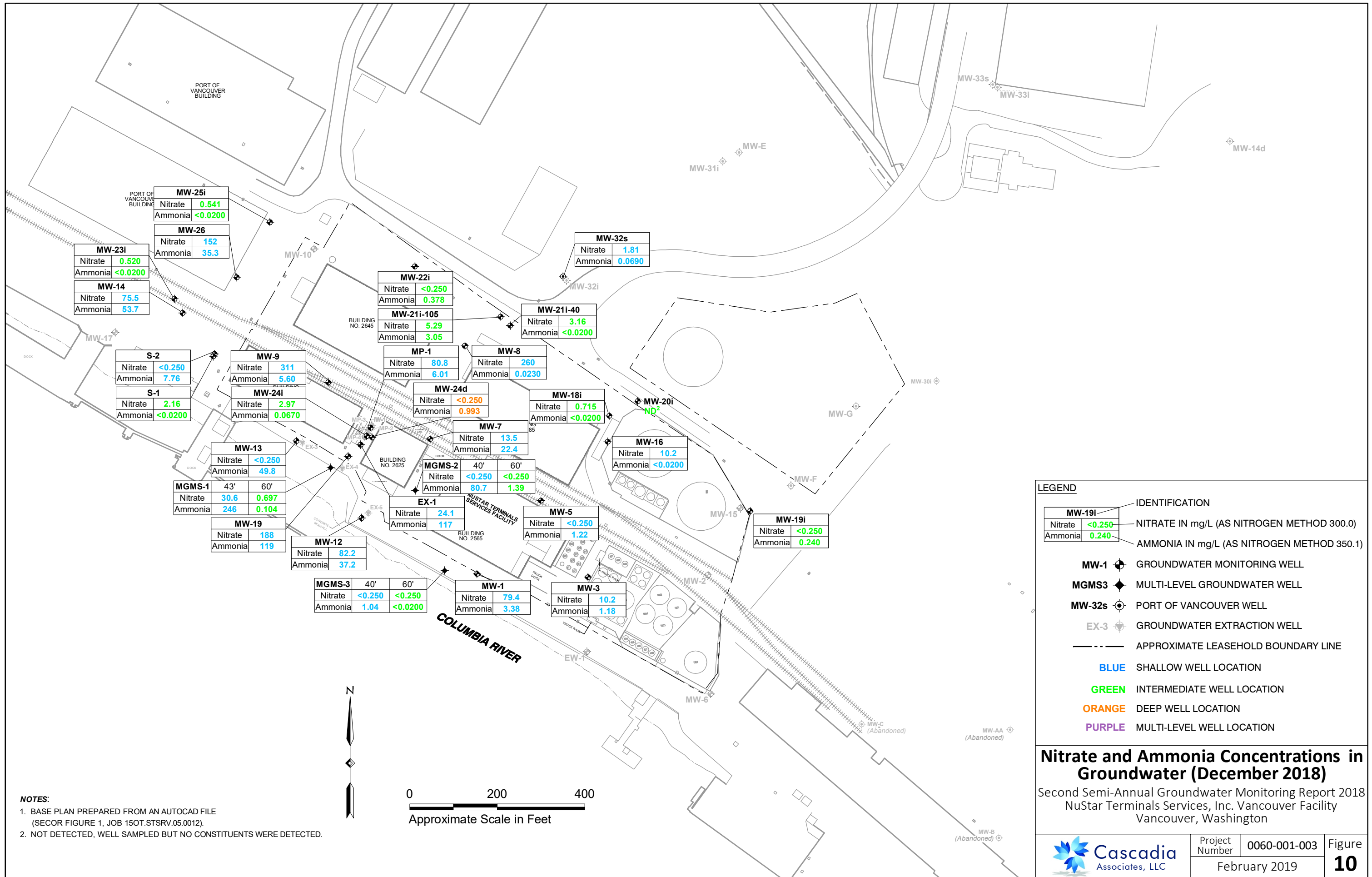
ORANGE DEEP WELL LOCATION

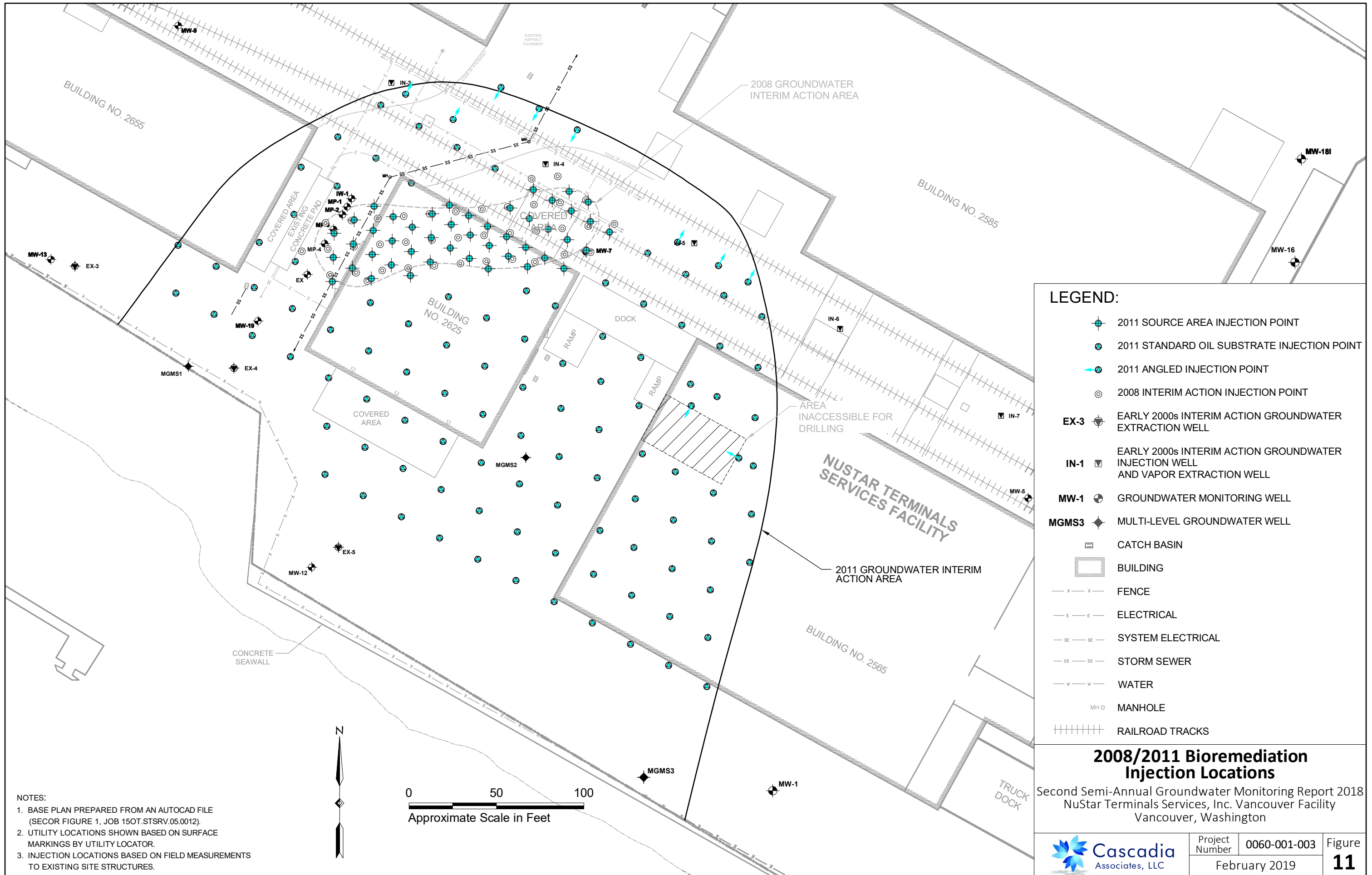
PURPLE MULTI-LEVEL WELL LOCATION

NOTES:
 1. BASE PLAN PREPARED FROM AN AUTOCAD FILE
 (SECOR FIGURE 1, JOB 150T.STSRV.05.0012).



Nitrate and Ammonia Concentrations in Groundwater (September 2018)
 Second Semi-Annual Groundwater Monitoring Report 2018
 NuStar Terminals Services, Inc. Vancouver Facility
 Vancouver, Washington







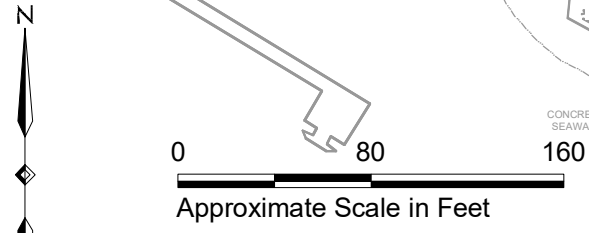
LEGEND:

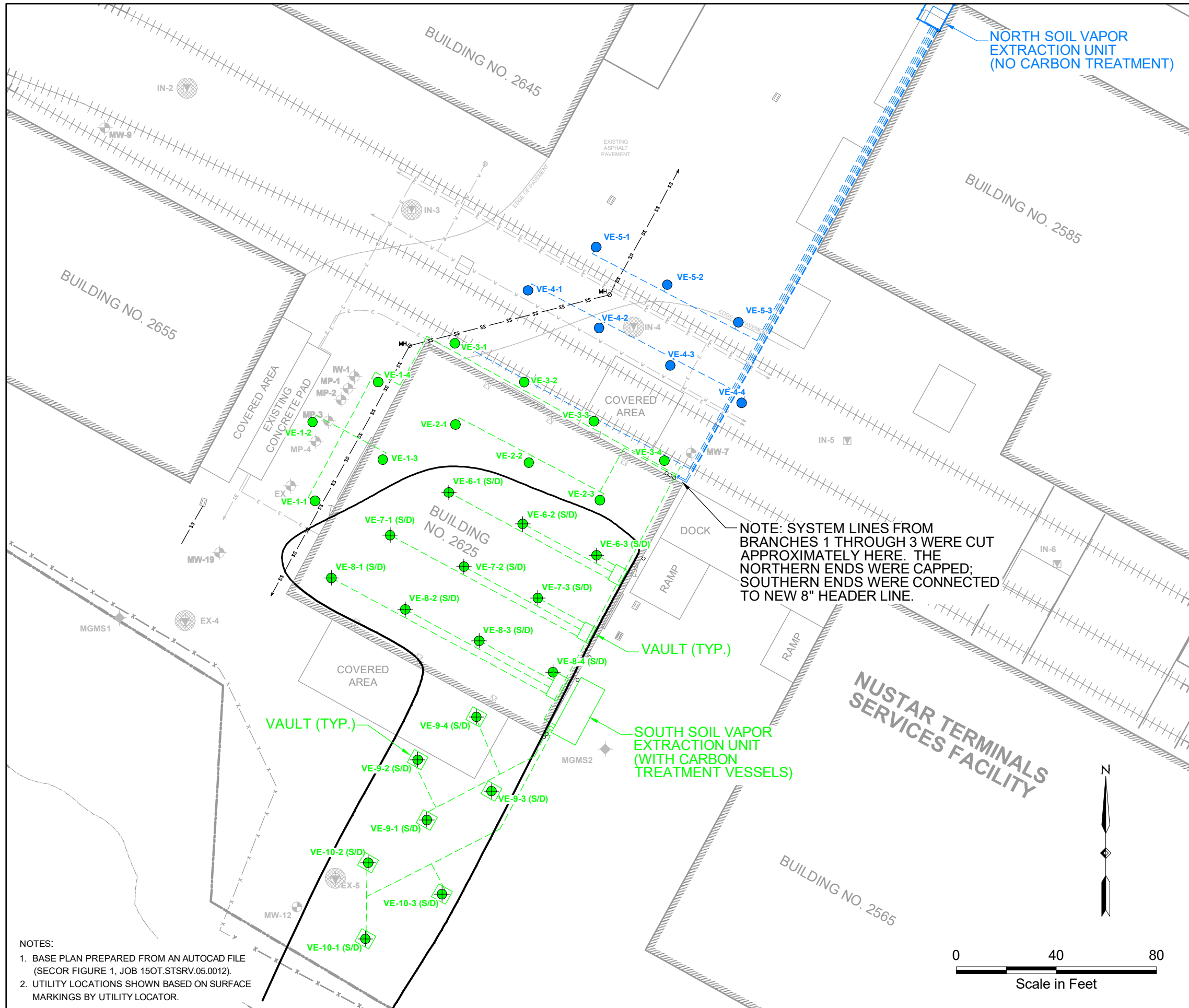
- ENHANCED BIOREMEDIATION INJECTION POINT
- EX-3 EARLY 2000s INTERIM ACTION GROUNDWATER EXTRACTION WELL
- MW-1 GROUNDWATER MONITORING WELL
- MGMS3 MULTI-LEVEL GROUNDWATER WELL
- CATCH BASIN
- BUILDING
- FENCE
- ELECTRICAL
- SYSTEM ELECTRICAL
- STORM SEWER
- WATER
- MANHOLE
- RAILROAD TRACKS

2016 Bioremediation Injection Locations
 Second Semi-Annual Groundwater Monitoring Report 2018
 NuStar Terminals Services, Inc. Vancouver Facility
 Vancouver, Washington

NOTES:

1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 150T.STSRV.05.0012).
2. INJECTION LOCATIONS BASED ON FIELD MEASUREMENTS TO EXISTING SITE STRUCTURES.
3. NORTHWEST AREA INJECTION POINT LOCATIONS ARE APPROXIMATE. NUSTAR SOURCE AREA LOCATIONS ARE BASED ON GPS COORDINATES AND HAVE BEEN MODIFIED SLIGHTLY FROM THE INTERIM ACTION WORK PLAN TO AVOID ENCOUNTERING BURIED INFRASTRUCTURE.



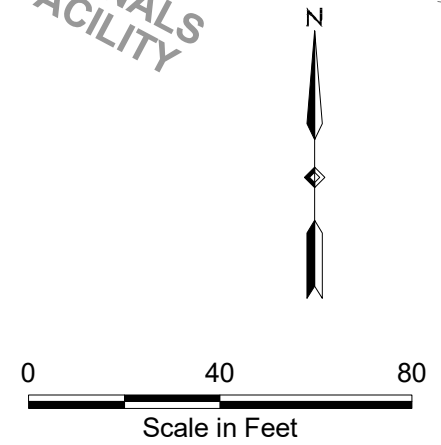


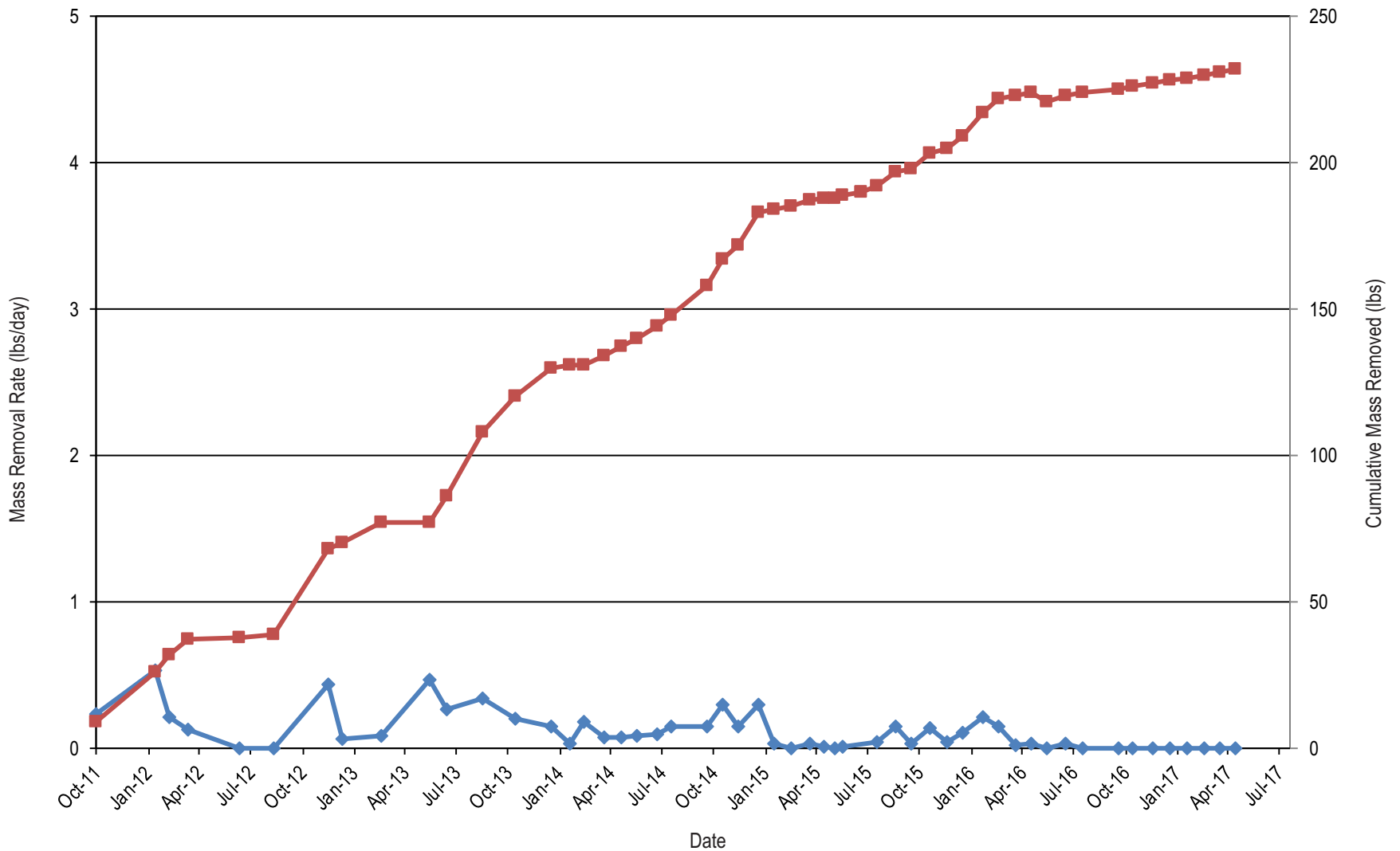
LEGEND:

- VE-6-2 (S/D) 2011 WELL PAIR LOCATION (SHALLOW SCREENED FROM 5-15 FEET BGS) (DEEP SCREENED 15-25 FEET BGS)
- VE-1-2 2008 INTERIM ACTION VAPOR EXTRACTION WELL LOCATION
- VAPOR EXTRACTION WELL (2000-2005)
- EX-3 EARLY 2000s INTERIM ACTION GROUNDWATER EXTRACTION WELL
- IN-1 EARLY 2000s INTERIM ACTION GROUNDWATER INJECTION WELL AND VAPOR EXTRACTION WELL
- MW-1 GROUNDWATER MONITORING WELL
- MGMS3 MULTI-LEVEL GROUNDWATER WELL
- CATCH BASIN
- BUILDING
- FENCE
- ELECTRICAL
- SYSTEM ELECTRICAL
- STORM SEWER
- WATER
- MANHOLE
- RAILROAD TRACKS
- UNDERGROUND SOIL VAPOR EXTRACTION (SVE) PIPING
- BLUE NORTH VAPOR EXTRACTION UNIT
- GREEN SOUTH VAPOR EXTRACTION UNIT

NOTE: SYSTEM LINES FROM BRANCHES 1 THROUGH 3 WERE CUT APPROXIMATELY HERE. THE NORTHERN ENDS WERE CAPPED; SOUTHERN ENDS WERE CONNECTED TO NEW 8" HEADER LINE.

NOTES:
 1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 150T.STSRV.05.0012).
 2. UTILITY LOCATIONS SHOWN BASED ON SURFACE MARKINGS BY UTILITY LOCATOR.





Legend:

- ◆ Volatile Organic Compound (VOC) Removal Rate (lbs/day)
- Approximate Cumulative VOCs Removed (lbs)

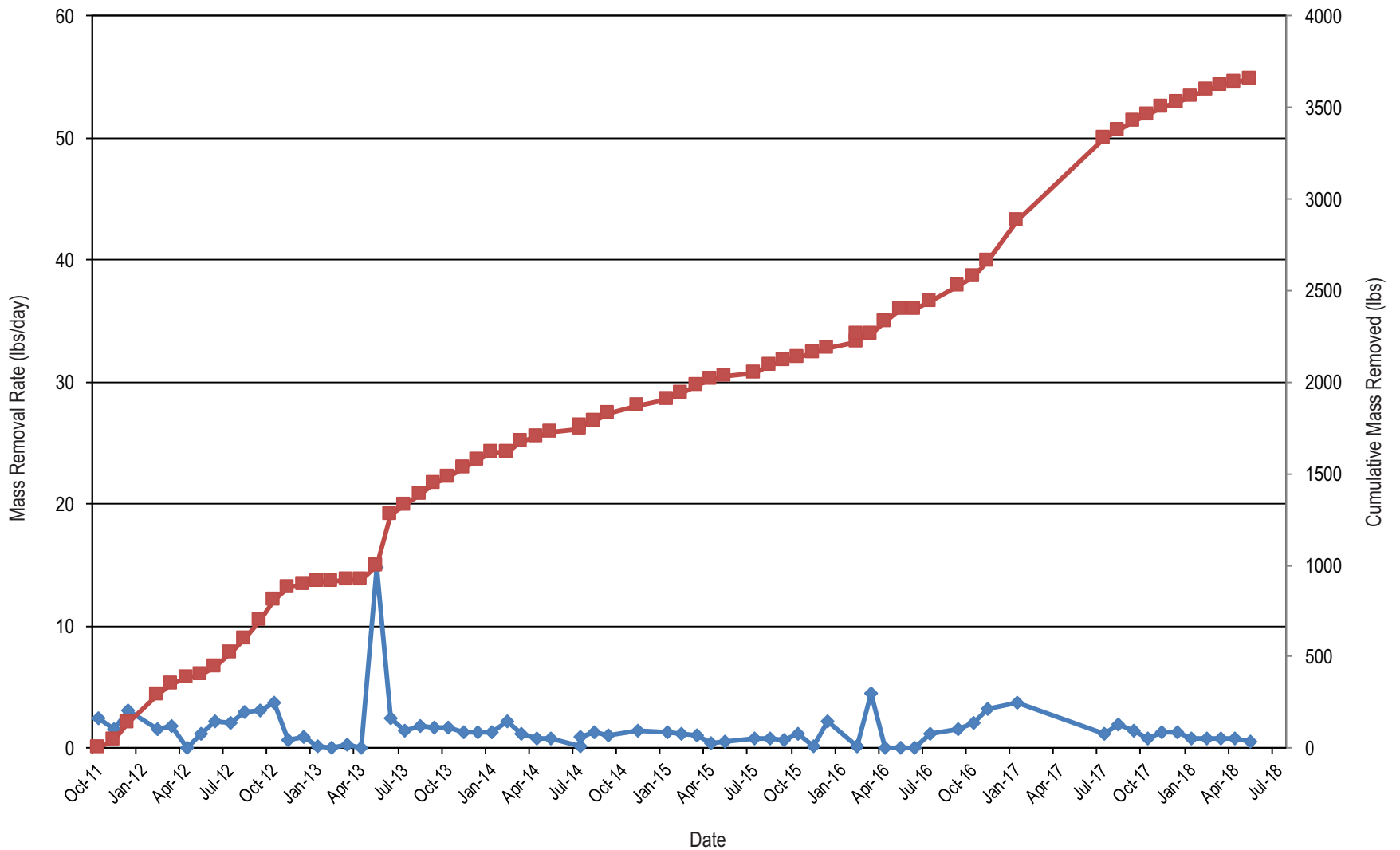
North SVE System – VOC Mass Removal

First Semi-Annual Groundwater Monitoring Report 2018
 NuStar Terminals Services, Inc. Vancouver Facility
 Vancouver, Washington



Project Number	0060-001-003
August 2018	

Figure
14



Legend:

- ◆ Volatile Organic Compound (VOC) Removal Rate (lbs/day)
- Approximate Cumulative VOCs Removed (lbs)

South SVE System – VOC Mass Removal

First Semi-Annual Groundwater Monitoring Report 2018
 NuStar Terminals Services, Inc. Vancouver Facility
 Vancouver, Washington



Project Number	0060-001-003
August 2018	

Figure
15

APPENDIX A
FIELD SAMPLING DATA SHEETS



DAILY FIELD REPORT

Job No.			
Report By: LW			
Date of Work: 9/26/18			
Project Name and Address NuStar Vancouver		Client/Owner:	Page of 1
		Project Manager: Stephanie Salisbury	Weather Sunny
Description of Work: GWM			
Field Staff: Lindsay Wallis / Joel M			
Report: 0650 - LW / JM onsite			
0700 - Safety Meeting			
0720 - Received work permit - 254070			
0740 - Began GW sampling			
0915 - Saw cloud coming from KM ship loading			
1000 - KM contractor ran over compressor for bladder pump Waited for new one.			
1100 - Walked around site to look for wells that are planning on being abandoned. Located and was able to open IN-1, MP-1, MP-2, MP-3, MP-4, EX-1, EX-3, EX-4, EX-5 Not located (buried under gravel in RR tracks): IN-3, IN-5, IN-6, IN-7, IN-8 IN-8 and IN-9 located but partially buried. IN-4, IN-2, and IN-1 located but can't open. IN-1 missing access handle.			
1210 - KM contractor back with compressor - back to GW sampling (~2h total waiting time).			
Continue sampling			
1600 wait for Apex courier			

Project: 3Q 2018 GWM
 Client: Nustar Vancouver
 Sampler: Joel M / Lindsay W

Date: 9/24/18
 Permit:

Well ID:	Time:	DTP:	DTW:	Product Thickness:	Notes:
MW-1	1000	-	28.83		34.70 DTB bottom
MGMS3-40					MGMS Wells couldn't be gauged b/c of pulse dia
MW3-MW-2	1032	-	27.55		41.60 DTB
MW-19	1037	-	29.24		44.10 DTB
EX-1	1039	-	29.14		39.12 DTB
MP-4	1040	-	29.32		32.70 DTB
MP-3	1043	-	29.30		34.00 DTB
MP-2	1046	-	30.60		DTB over 200 ft - couldn't gauge
MP-2	1051	-	29.46		DTB - 35.00 (No tabs)
MP-1	1056	-	29.41		DTB - 35.55 (one tab missing)
MW-13	1120	-	28.85		DTB - 41.00
S-2	1127	-	29.93		DTB - 50.49
MW-17	1135	-	28.50		DTB - 40.3.
MW-14	1140	-	29.27		DTB - 42
MW-26	1142	-	29.06		DTB - 39
MW-10	1146	-	28.40		DTB - 39.5
MW-8	1151	-	28.56		DTB - 42
MW-16	1159	-	29.81		DTB - 41.8
MW-15	1205	-	34.00		DTB - 44.50
MW-F	1209	-	31.04		DTB - 37.40
MW-G	1212	-	29.52		DTB - 38.00
MW-2	1217	-	30.50		DTB - 39.50
MW-6	1220	-	28.43		DTB - 35 -
EW-1	1223	-	27.72		DTB - 29.1
MW-3	1227	-	30.49		DTB - 35 -
MW-9	1231	-	29.20		DTB - 41.60

1W-24d

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MGMS1-60	Job Number:	—
Client:	Nuster	Date:	10/1/18
Project:	3Q 2018	Sampler:	JM
Weather:	Overcast	Time In/Out:	0930

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	—	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—
Comments:					
Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)					
Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters					

PURGING DATA

Purge Method:		BP/PP			Pump Intake Depth:		MS			
Sampling Method:		LF			Tubing Material & Type:				NEW / <u>DEDICATED</u>	
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0930	—	—	—	0.10	6.45	16.77	338	3.47	220.8	Clear
0933	—	—	—	↓	6.07	16.23	389	2.38	241.0	↓
0936	—	—	—	↓	5.60	16.02	385	1.76	287.0	↓
0939	—	—	—	↓	5.64	15.85	376	1.35	297.1	↓
0942	—	—	—	↓	5.64	15.82	375	1.34	297.9	↓

PURGING DATA

Sample ID:	MGMS1-60	Sampling Flow Rate:	0.10	Analytical Laboratory:	Apcx	
Sample Time:	0950	Final Depth to Water:	—	Did Well Dewater:	No	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1x250	—	NIL				
1x250	H2SO4	Hm				
3x40	HCl	HUOC				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MW-325	Job Number:	-
Client:	Nuster	Date:	10/1/18
Project:	3Q 2018	Sampler:	JM
Weather:	Overcast	Time In/Out:	0800

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	-	Depth to Free Product:	-
	Other:	Well Depth:	-	Free Product Thickness:	-
Monument Condition:	good (3/3)	Depth to Water:	29.94	Water Column Length:	-
Well Cap Lock Present:	Yes No	Screened Interval:	-	Purge Volume:	-

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	BP	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	NEW / <u>DEDICATED</u>

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0800	-	-	29.94	0.20	5.81	16.30	487	4.07	205.0	Clear
0803	-	-	29.97	↓	5.49	16.17	487	3.13	216.4	↓
0806	-	-	29.99		5.56	16.15	487	3.10	215.4	
0809	-	-	30.01		5.50	16.06	486	3.19	206.2	

PURGING DATA

Sample ID:	MW-325	Sampling Flow Rate:	0.20	Analytical Laboratory:	Apea	
Sample Time:	0815	Final Depth to Water:	29.98	Did Well Dewater:	No	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1 x 250	-	NIT				
1 x 250	H ₂ SO ₄	Am.				
3 x 40	HCl	HOC				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MGMS1-110	Job Number:	
Client:	Nusker	Date:	10/1/18
Project:	3Q 2018	Sampler:	Jim
Weather:	Overcast	Time In/Out:	0850

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	-	Depth to Free Product:	-
	Other:	Well Depth:	-	Free Product Thickness:	-
Monument Condition:		Depth to Water:	-	Water Column Length:	-
Well Cap Lock Present:	Yes No	Screened Interval:	-	Purge Volume:	-

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
---------------------------------	---------------------	----------------	----------------	----------------------

PURGING DATA

Purge Method:		BP/PP		Pump Intake Depth:		MS		NEW <u>DEDICATED</u>		
Sampling Method:		LF		Tubing Material & Type:						
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0853	-	-	-	0.10	6.62	17.32	192	4.62	184.2	Clear
0856	-	-	-		6.46	17.44	195	1.67	196.3	
0859	-	-	-		6.08	16.28	189	1.44	142.1	
0902	-	-	-		5.95	16.14	188	1.36	230.0	
0905	-	-	-		5.89	16.15	187	1.114	236.0	
0908	-	-	-		5.90	16.08	187	1.07	233.0	

PURGING DATA

Sample ID:	MGMS1-110	Sampling Flow Rate:	0.15	Analytical Laboratory:	Apex	
Sample Time:	0910	Final Depth to Water:		Did Well Dewater:	No	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1x250	-	Nit				
1x250	H2SO4	HM				
3x40	HCl	HVOC				

NOTES/ADDITIONAL COMMENTS



Cascadia
Associates, LLC

WELL MONITORING DATA SHEET

Well ID:	MW-240	Job Number:	-
Client:	Nuster Van	Date:	9/28/18
Project:	3Q 2018	Sampler:	JM
Weather:	Sunny	Time In/Out:	0750

Monument Type:	Push-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	-
Monument Condition:	Other: Good	Well Depth:	-	Free Product Thickness:	-
Well Cap Lock Present:	Yes No	Depth to Water:	29.92	Water Column Length:	-
Comments:		Screened Interval:	-	Purge Volume:	-

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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Purge Method:	BP	Pump Intake Depth:	MS
Sampling Method:	LI	Tubing Material & Type:	SB

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	NEW / DEDICATED	
										Clarity/Color	Other Remarks
0750	-	-	29.92	0.20	6.30	15.56	318	4.00	116.8		
0753	-	-	29.87		6.13	14.57	310	2.71	109.6		clear
0756	-	-	29.88		6.20	14.05	310	1.41	75.6		
0759	-	-	29.86		6.24	13.97	310	1.28	56.5		
0802	-	-	29.84		6.28	13.88	310	1.18	34.0		
0805	-	-	29.87		6.39	13.72	310	1.10	32.1		
0808	-	-	29.89		6.40	13.73	310	1.11	30.2		

Sample ID:	MW-240	Sampling Flow Rate:	0.20	Analytical Laboratory:	Hper
Sample Time:	0810	Final Depth to Water:	29.92	Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD Duplicate ID
1 x 250	-	Nit			X
1 x 250	H ₂ SO ₄	AM			X
3 x 40	Hcl	HVOC			X

NOTES/ADDITIONAL COMMENTS

MW-240 MS @ 0810 (Full set)

MW-240 MSD @ 0810 (Full set)

WELL MONITORING DATA SHEET



Cascadia Associates, LLC

Well ID:	MGMS1-43	Job Number:	-
Client:	Kuster Jan	Date:	9/25/17
Project:	3Q 2017	Sampler:	JM
Weather:	Sunny	Time In/Out:	0913

WELL DATA

Monument Type:	Flush-mount/Stick-up Other:	Well Diameter:	-	Depth to Free Product:	-
Monument Condition:		Well Depth:	No Gauge	Free Product Thickness:	-
Well Cap Lock Present:	Yes No	Depth to Water:	-	Water Column Length:	-
		Screened Interval:	-	Purge Volume:	-

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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PURGING DATA

Purge Method:	BP				Pump Intake Depth:	MS				
Sampling Method:	LP				Tubing Material & Type:	NEW / DEDICATED				
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0915	-	-	-	0.15	6.56	17.78	2690	7.00	105.0	clear
0918	-	-	-	↓	6.50	18.45	2806	4.02	106.0	↓
0921	-	-	-	↓	6.57	19.10	2921	2.60	97.5	↓
0924	-	-	-	↓	6.60	19.17	2942	2.37	94.0	↓
0927	-	-	-	↓	6.58	19.09	2949	1.97	96.1	↓
0927	-	-	-	↓	6.58	19.14	2960	1.98	97.4	↓

PURGING DATA

Sample ID:	MGMS1-43	Sampling Flow Rate:	0.15	Analytical Laboratory:	Apex	
Sample Time:	0930	Final Depth to Water:		Did Well Dewater:	No	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1 x 250	-	AM				
1 x 250	H2SO4	Nit.				
3 x 40ml	Hcl	HVOC				
2 x 40ml	Hcl	RSK				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	M6M52-132	Job Number:	-
Client:	V SA 2018	Date:	9/28/18
Project:	Nuster Vann	Sampler:	Jim
Weather:	Sunny	Time In/Out:	1000

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	—	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:		BP			Pump Intake Depth:		MS			
Sampling Method:		LF			Tubing Material & Type:				NEW / <u>DEDICATED</u>	
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1003	—	—	—	0.15	5.59	21.42	312	3.00	117.4	clear
1006	—	—	—	↓	5.64	21.06	250	1.62	99.5	↓
1009	—	—	—		5.73	21.01	243	1.25	89.2	
1012	—	—	—		5.78	20.99	240	1.29	86.1	

PURGING DATA

Sample ID:	M6M52-132	Sampling Flow Rate:	0.15	Analytical Laboratory:	Aper	
Sample Time:	1015	Final Depth to Water:	—	Did Well Dewater:	NO	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1x250	—	Nit.				
1x250	H2SO4	Am.				
3x40	HCl	MOVOC				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Well ID:	M6MS2-110	Job Number:	—
Client:	Wustar Van	Date:	9/28/18
Project:	BA 2018	Sampler:	Jan
Weather:	Sunny	Time In/Out:	1023

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	—	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	BP			Pump Intake Depth:	MS					
Sampling Method:	LF			Tubing Material & Type:	NEW / <u>DEDICATED</u>					
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1026	—	—	—	0.15	5.92	20.72	198	3.00	59.0	Clear
1029	—	—	—	↓	5.52	20.01	188	1.96	95.8	↓
1032	—	—	—	↓	5.56	19.98	188	2.22	88.2	↓
1035	—	—	—	↓	5.54	19.85	187	2.20	80.1	↓

PURGING DATA

Sample ID:	M6MS2-110	Sampling Flow Rate:	0.15	Analytical Laboratory:	Apco	
Sample Time:	1040	Final Depth to Water:	—	Did Well Dewater:	No	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1 x 250	—	Nit,				
1 x 250	H2SO4	Am				
3 x 40	HCl	Huoc				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MGMS 2-46	Job Number:	—
Client:	Nustar Jan	Date:	9/28/18
Project:	3Q 2018	Sampler:	JM
Weather:	Sunny	Time In/Out:	1112

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	—	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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PURGING DATA

Purge Method:	BP				Pump Intake Depth:	MS				
Sampling Method:	LP				Tubing Material & Type:	NEW / <u>DEDICATED</u>				
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1125	—	—	—	0.15	7.45	18.00	1705	2.00	96.4	clear
1128	—	—	—		7.46	18.01	1706	1.62	96.7	
1131	—	—	—		7.46	18.03	1708	1.51	97.1	
1134	—	—	—		7.46	18.02	1706	1.50	97.3	
				↓						↓

PURGING DATA

Sample ID:	MGMS 2-46	Sampling Flow Rate:	0.15	Analytical Laboratory:	Apex	
Sample Time:	1140	Final Depth to Water:	—	Did Well Dewater:	No	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1 x 250	—	Nit				
1 x 250	H ₂ SO ₄	Am				
3 x 40	Hcl	Hvoc				
2 x 40	Hcl	Bsk				

NOTES/ADDITIONAL COMMENTS

(Needs Repair)

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MGMS 3-132	Job Number:	-
Client:	Nuster Jan.	Date:	9/28/18
Project:	3Q 2018 GWM	Sampler:	JM
Weather:	Sunny	Time In/Out:	1157

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	-	Depth to Free Product:	-
	Other:	Well Depth:	-	Free Product Thickness:	-
Monument Condition:		Depth to Water:	-	Water Column Length:	-
Well Cap Lock Present:	Yes No	Screened Interval:	-	Purge Volume:	-

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	BP (Dea)	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	NEW / <u>DEDICATED</u>

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1200	-	-	-	0.20	5.80	19.47	224	1.32	102.5	clear
1203	-	-	-	↓	5.90	18.90	203	0.70	91.7	↓
1206	-	-	-		5.90	18.91	202	0.69	96.8	
1209	-	-	-		5.91	18.91	203	0.70	97.1	

PURGING DATA

Sample ID:	MGMS 3-132	Sampling Flow Rate:	0.20	Analytical Laboratory:	Apco	
Sample Time:	1215	Final Depth to Water:	0.50	Did Well Dewater:	No	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1x250	-	Nit.				
1x250	H2SO4	Am				
3x40ml	Hcl	HuOC				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MGMS 3-60	Job Number:	-
Client:	Nuster Van	Date:	9/28/18
Project:	30 GWM	Sampler:	JM
Weather:	Sunny	Time In/Out:	1230

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	—	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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PURGING DATA

Purge Method:	BP				Pump Intake Depth:	MS				
Sampling Method:	LF				Tubing Material & Type:	NEW / <u>DEDICATED</u>				
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1230	—	—	—	0.20	7.29	17.62	212	1.53	-0.7	clear
1233	—	—	—	↓	7.20	17.61	212	1.53	-1.7	↓
1236	—	—	—		7.12	17.63	210	1.48	-0.9	
1239	—	—	—		7.14	17.63	210	1.44	-1.0	

PURGING DATA

Sample ID:	MGMS 3-60	Sampling Flow Rate:	0.20	Analytical Laboratory:	Apur	
Sample Time:	1250	Final Depth to Water:	—	Did Well Dewater:	NO	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1x250	—	Nit				
1x250	H ₂ SO ₄	AM				
3x40	Hcl	AVOC				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MGMS 3-40	Job Number:	-
Client:	Nustar Van	Date:	9/18/18
Project:	32 2018	Sampler:	JM
Weather:	Sunny	Time In/Out:	1250

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	—	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	BP	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	NEW / <u>DEDICATED</u>

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1250	—	—	—	0.25	5.98	17.97	620	6.36	-48.8	Clear
1253	—	—	—	↓	5.96	17.35	642	6.63	-52.4	↓
1256	—	—	5.96		17.29	647	6.60	-60.1		
1259	—	—	5.96		17.28	645	6.62	-61.7		
1301	—	—								


PURGING DATA

Sample ID:	MGMS 3-40	Sampling Flow Rate:	0.25	Analytical Laboratory:	Aper	
Sample Time:	1310	Final Depth to Water:		Did Well Dewater:	Yes	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1x250	NIT	—				X
1x250	Am	H ₂ SO ₄				X
3x40	H ₂ O ₂	HCl				X
2x40	RSK	HCl				X

NOTES/ADDITIONAL COMMENTS

MGMS 3-40 Dup (Full Dup @ 1310)

WELL MONITORING DATA SHEET

 Cascadia Associates, LLC	Well ID: <u>MGMS3-101</u>	Job Number: <u>—</u>
	Client: <u>Nustar</u>	Date: <u>9/28/18</u>
	Project: <u>3Q 2018</u>	Sampler: <u>Jim</u>
	Weather: <u>Sunny</u>	Time In/Out: <u>1320</u>

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	—	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:		<u>BP</u>			Pump Intake Depth:		<u>MS</u>			
Sampling Method:		<u>LE</u>			Tubing Material & Type:		<u>SB</u>			
							NEW / <u>DEDICATED</u>			
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					±0.1	±0.5 °C	±5%	±0.5 ppm	±20 mV	
<u>1320</u>	—	—	—	<u>0.20</u>	<u>6.83</u>	<u>18.00</u>	<u>391</u>	<u>2.92</u>	<u>-92.0</u>	<u>Clear</u>
<u>1323</u>	—	—	—	↓	<u>6.86</u>	<u>18.00</u>	<u>303</u>	<u>2.52</u>	<u>-92.0</u>	↓
<u>1326</u>	—	—	—	↓	<u>6.88</u>	<u>18.00</u>	<u>189</u>	<u>2.92</u>	<u>-60.7</u>	↓
<u>1329</u>	—	—	—	↓	<u>6.87</u>	<u>18.01</u>	<u>187</u>	<u>2.91</u>	<u>-59.8</u>	↓
<u>1332</u>	—	—	—	↓	<u>6.86</u>	<u>18.02</u>	<u>188</u>	<u>2.90</u>	<u>-63.1</u>	↓

PURGING DATA

Sample ID:	<u>MGMS3-101</u>	Sampling Flow Rate:	<u>0.20</u>	Analytical Laboratory:	<u>Apco</u>	
Sample Time:	<u>1340</u>	Final Depth to Water:	—	Did Well Dewater:	<u>NO</u>	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
<u>1x250</u>	—	<u>NIL</u>				
<u>1x250</u>	<u>H2SO4</u>	<u>AM</u>				
<u>3x40</u>	<u>HCl</u>	<u>HVOC</u>				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID: <i>MW-9</i>	Job Number:
Client: <i>Nuster Jan</i>	Date: <i>9/27/18</i>
Project: <i>3Q 2018</i>	Sampler: <i>Jim</i>
Weather: <i>Sunny</i>	Time In/Out: <i>0737</i>

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	<i>4"</i>	Depth to Free Product:	<i>—</i>
	Other:	Well Depth:	<i>—</i>	Free Product Thickness:	<i>—</i>
Monument Condition:	<i>good</i>	Depth to Water:	<i>29.22</i>	Water Column Length:	<i>—</i>
Well Cap Lock Present:	Yes <i>8/3</i> No	Screened Interval:	<i>—</i>	Purge Volume:	<i>—</i>

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	<i>BP</i>				Pump Intake Depth:	<i>MS Ded</i>				
Sampling Method:	<i>LF</i>				Tubing Material & Type:	NEW / <u>DEDICATED</u>				
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
<i>0741</i>	<i>—</i>	<i>—</i>	<i>29.22</i>	<i>0.20</i>	<i>6.05</i>	<i>15.16</i>	<i>3128</i>	<i>4.00</i>	<i>120.6</i>	<i>Clear</i>
<i>0744</i>	<i>—</i>	<i>—</i>	<i>29.24</i>	<i> </i>	<i>6.03</i>	<i>14.16</i>	<i>3719</i>	<i>1.41</i>	<i>122.1</i>	<i> </i>
<i>0747</i>	<i>—</i>	<i>—</i>	<i>29.24</i>	<i> </i>	<i>6.05</i>	<i>13.96</i>	<i>3533</i>	<i>1.11</i>	<i>116.0</i>	<i> </i>
<i>0750</i>	<i>—</i>	<i>—</i>	<i>29.23</i>	<i> </i>	<i>6.04</i>	<i>13.93</i>	<i>3436</i>	<i>1.11</i>	<i>114.9</i>	<i> </i>

PURGING DATA

Sample ID: <i>MW-9</i>	Sampling Flow Rate: <i>0.20</i>	Analytical Laboratory: <i>Apex</i>				
Sample Time: <i>0800</i>	Final Depth to Water: <i>29.24</i>	Did Well Dewater: <i>No</i>				
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
<i>1x250</i>	<i>—</i>	<i>Nitrate/trik</i>				
<i>1x250</i>	<i>H₂SO₄</i>	<i>Ammonia</i>				
<i>3x40ml</i>	<i>HCl</i>	<i>Huoc</i>				

NOTES/ADDITIONAL COMMENTS

(Antra) 0755 - 0800

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MW-7	Job Number:	
Client:	Muster Van	Date:	9/27/18
Project:	3Q 2018	Sampler:	JM
Weather:	Sunny	Time In/Out:	0820

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other:	Well Depth:	29.02	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	↓	Water Column Length:	—
Well Cap Lock Present:	<input checked="" type="checkbox"/> No 3/3	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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PURGING DATA

Purge Method:	BF	Pump Intake Depth:	Mg
Sampling Method:	LF	Tubing Material & Type:	5/8 NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0823	—	—	29.02	0.25	6.50	15.10	506	2.90	43.0	clear
0826	—	—	29.92	↓	6.47	15.44	468	1.26	-6.1	↓
0829	—	—	29.51		6.46	15.46	465	1.19	-8.0	
0832	—	—	29.64		6.44	15.49	456	1.21	-9.0	


PURGING DATA

Sample ID:	MW-7	Sampling Flow Rate:	0.25	Analytical Laboratory:	Apex	
Sample Time:	0840	Final Depth to Water:	30.10	Did Well Dewater:	NO	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1 x 250	H ₂ SO ₄	Amon				
1 x 250	—	& Nit,				
3 x 40	HCl	HVOCs				

NOTES/ADDITIONAL COMMENTS

Antea : 0840 - 0850

WELL MONITORING DATA SHEET

 Cascadia Associates, LLC	Well ID: <u>MW-21i-40</u>	Job Number:
	Client: <u>Wuster Van</u>	Date: <u>9/24/18</u>
	Project: <u>3Q 2018</u>	Sampler: <u>JJA</u>
	Weather: <u>Sunny</u>	Time In/Out: <u>0955</u>

WELL DATA

Monument Type:	<input checked="" type="checkbox"/> Flush-mount/Stick-up Other:	Well Diameter:	24	Depth to Free Product:	—
Monument Condition:	good	Well Depth:	—	Free Product Thickness:	—
Well Cap Lock Present:	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> (low clear)	Depth to Water:	29.80	Water Column Length:	—
Comments:	313				

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):
 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	BP	Pump Intake Depth:	MS	NEW / <input checked="" type="checkbox"/> DEDICATED
Sampling Method:	LF	Tubing Material & Type:	SB	

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0959	—	—	29.80	0.25	6.76	18.00	285	4.00	20.9	clear
1002	—	—	29.80	↓	5.70	17.72	272	1.59	60.1	↓
1005	—	—	29.70		5.60	17.50	269	1.04	64.2	
1008	—	—	29.79		5.58	17.52	269	0.95	64.8	
1011	—	—	29.80		5.56	17.50	268	0.88	64.0	

PURGING DATA

Sample ID:	MW-21i-40	Sampling Flow Rate:	0.25	Analytical Laboratory:	Apex
Sample Time:	1015	Final Depth to Water:	29.80	Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD Duplicate ID
1x250	—	Nit.			
1x250	H ₂ SO ₄	Am.			
3x40	HCl	HVOC			

NOTES/ADDITIONAL COMMENTS

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WELL MONITORING DATA SHEET



Well ID:	MW-18i	Job Number:	
Client:	Nuster Van	Date:	9/27/18
Project:	3Q 2018	Sampler:	Jim
Weather:	Sunny	Time In/Out:	1130

WELL DATA

Monument Type:	Flush-mount/Stick-up Other:	Well Diameter:	2"	Depth to Free Product:	—
Monument Condition:	good	Well Depth:	—	Free Product Thickness:	—
Well Cap Lock Present:	<input checked="" type="checkbox"/> No <i>2/2</i>	Depth to Water:	29.35	Water Column Length:	—
Screened Interval:	—	Purge Volume:	—		

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	BP	Pump Intake Depth:	UG
Sampling Method:	LF	Tubing Material & Type:	5/8" NEW / <u>DEDICATED</u>


Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1130	—	—	29.35	0.20	6.27	20.10	203	7.96	89.7	clear
1133	—	—	29.40		5.61	18.34	179	6.10	100.0	
1136	—	—	29.42		5.60	18.29	180	5.96	101.1	
1139	—	—	29.40		5.56	17.69	176	4.99	100.2	
1142	—	—	29.41		5.57	17.69	176	4.96	100.1	
1145	—	—	29.42		5.59	17.53	175	4.71	98.0	
			29.42							

PURGING DATA

Sample ID:	MW-18i	Sampling Flow Rate:	0.20	Analytical Laboratory:	Apex	
Sample Time:	1150	Final Depth to Water:	29.46	Did Well Dewater:	No	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1 x 250	—	Nit				
1 x 250	AMP H ₂ SO ₄	Am.				
3 x 40ml	HCl	H ₂ O ₂				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

 Cascadia Associates, LLC	Well ID: <u>MW-19i</u>	Job Number: <u>-</u>
	Client: <u>Nustar Van</u>	Date: <u>9/27/18</u>
	Project: <u>3Q 2018</u>	Sampler: <u>Jim</u>
	Weather: <u>Sunny</u>	Time In/Out: <u>1213</u>

WELL DATA

Monument Type:	<u>Flush mount/Stick-up</u> Other: _____	Well Diameter:	<u>24</u>	Depth to Free Product:	<u>-</u>
Monument Condition:	<u>Good</u>	Well Depth:	<u>-</u>	Free Product Thickness:	<u>-</u>
Well Cap Lock Present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <u>3/3</u>	Depth to Water:	<u>29.86</u>	Water Column Length:	<u>-</u>
		Screened Interval:	<u>-</u>	Purge Volume:	<u>-</u>

Comments: _____

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4 inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	<u>BP</u>	Pump Intake Depth:	<u>MS</u>
Sampling Method:	<u>LF</u>	Tubing Material & Type:	<u>3B</u> NEW / <u>DEDICATED</u>

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
<u>1213</u>	<u>-</u>	<u>-</u>	<u>29.80</u>	<u>0.25</u>	<u>6.04</u>	<u>18.24</u>	<u>222</u>	<u>8.00</u>	<u>97.0</u>	<u>clear</u>
<u>1216</u>	<u>-</u>	<u>-</u>	<u>29.82</u>	<u> </u>	<u>5.76</u>	<u>17.56</u>	<u>221</u>	<u>3.30</u>	<u>101.7</u>	<u> </u>
<u>1219</u>	<u>-</u>	<u>-</u>	<u>29.84</u>	<u> </u>	<u>5.57</u>	<u>16.30</u>	<u>216</u>	<u>1.36</u>	<u>97.4</u>	<u> </u>
<u>1222</u>	<u>-</u>	<u>-</u>	<u>29.86</u>	<u> </u>	<u>5.51</u>	<u>16.05</u>	<u>214</u>	<u>1.12</u>	<u>96.8</u>	<u> </u>
<u>1225</u>	<u>-</u>	<u>-</u>	<u>29.89</u>	<u> </u>	<u>5.48</u>	<u>15.96</u>	<u>213</u>	<u>1.00</u>	<u>96.0</u>	<u> </u>

PURGING DATA

Sample ID:	<u>MW-19i</u>	Sampling Flow Rate:	<u>0.25</u>	Analytical Laboratory:	<u>Apex</u>
Sample Time:	<u>1230</u>	Final Depth to Water:	<u>29.87</u>	Did Well Dewater:	<u>No</u>
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD Duplicate ID
<u>1x250</u>	<u>-</u>	<u>Nit.</u>			
<u>1x250</u>	<u>H2SO4</u>	<u>Am.</u>			
<u>3x40</u>	<u>HCl</u>	<u>H JOE</u>			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MW-241	Job Number:	-
Client:	Nistar Inc	Date:	9/27/18
Project:	BQ 2018 GWH	Sampler:	Jay
Weather:	Summer	Time In/Out:	1345

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2 1/2"	Depth to Free Product:	-
	Other:	Well Depth:	65'	Free Product Thickness:	-
Monument Condition:	good	Depth to Water:	30.05'	Water Column Length:	-
Well Cap Lock Present:	Yes No <u>No Tabs</u>	Screened Interval:	-	Purge Volume:	-

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	BP	Pump Intake Depth:	M5
Sampling Method:	CF	Tubing Material & Type:	SB NEW / <u>DEDICATED</u>

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks	
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV		
1345	-	-	30.05	0.25	5.35	20.80	291	4.00	106.7	clear	
1348	-	-	30.08	↓	5.63	18.00	270	4.00	108.6	↓	
1351	-	-	30.10		5.53	18.01	272	3.10	109.1		
1354	-	-	30.09		5.44	18.00	272	1.82	108.6		
1357	-	-	30.12		5.46	18.00	272	1.70	107.2		
1400	-	-	30.12		5.45	18.00	272	1.67	106.3		
1403	-	-									
1406	-	-									

PURGING DATA

Sample ID:	MW-241	Sampling Flow Rate:	0.25	Analytical Laboratory:	Apex
Sample Time:	1405 1410	Final Depth to Water:	30.21	Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD Duplicate ID
1x250	-	Nit.			
1x250	H2SO4	Am.			
3x40	HCl	HVOC			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MP-3	Job Number:	-
Client:	Nuster Vanc	Date:	9/27/18
Project:	3A 2018	Sampler:	SM
Weather:	SUNNY	Time In/Out:	1420

WELL DATA

Monument Type:	Flush-mount/Stick-up Other:	Well Diameter:	24	Depth to Free Product:	-
Monument Condition:	good 3/3	Well Depth:	-	Free Product Thickness:	-
Well Cap Lock Present:	Yes No	Depth to Water:	29.25	Water Column Length:	-
		Screened Interval:	-	Purge Volume:	-

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	BP				Pump Intake Depth:	MS				
Sampling Method:	LF				Tubing Material & Type:	SB			NEW DEDICATED	
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1420	-	-	29.25	0.15	6.39	18.06	1340	1.24	137.6	Clear
1423	-	-	29.23	↓	6.31	18.00	1325	0.93	142.9	↓
1426	-	-	29.23	↓	6.30	18.00	1332	0.76	141.9	↓
1429	-	-	29.26	↓	6.31	18.01	1331	0.74	140.2	↓

PURGING DATA

Sample ID:	MP-3	Sampling Flow Rate:	0.15	Analytical Laboratory:	Apex
Sample Time:	1430	Final Depth to Water:	29.22	Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD Duplicate ID
1 x 250	-	Am.			
1 x 250	H ₂ SO ₄	Nit.			
3 x 40	HCl	HVSC			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MW-14	Job Number:	
Client:	Nustar van	Date:	9/26/18
Project:	3 Q 2018	Sampler:	JML/w
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up Other:	Well Diameter:	4"	Depth to Free Product:	-
Monument Condition:	good	Well Depth:		Free Product Thickness:	-
Well Cap Lock Present:	<input checked="" type="checkbox"/> No	Depth to Water:	29.35	Water Column Length:	
Comments:		Screened Interval:		Purge Volume:	

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)				
Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters

PURGING DATA

Purge Method:	BP				Pump Intake Depth:	MS				
Sampling Method:	LF				Tubing Material & Type:	SB		NEW / <u>DEDICATED</u>		
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5°C	+/-5%	+/-0.5 ppm	+/-20 mV	
0833	-	-	29.37	0.3	6.22	14.57	2225	8.80	111.8	cloudy
0836	-	-	29.35	↓	6.21	14.94	2381	3.24	113.5	clear
0839	-	-	29.30	↓	6.31	15.00	2421	2.64	108.3	↓
0842	-	-	29.30	↓	6.37	14.95	2445	2.13	105.3	↓
0845	-	-	29.30	↓	6.39	15.13	2455	1.82	104.1	↓
0848	-	-	29.31	↓	6.47	15.32	2479	1.55	100.1	↓


PURGING DATA

Sample ID:	MW-14	Sampling Flow Rate:	0.3	Analytical Laboratory:	Apex	
Sample Time:	0850	Final Depth to Water:	29.35	Did Well Dewater:		
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3 X 40mL	HCl	HVOCs				
2 X 40mL	HCl	RBK-175 (ethane, ethene) + TOC				
1 X 250mL	-	Nitrate/Nitrite				
1 X 7.5mL	H2SO4	Ammonia				

NOTES/ADDITIONAL COMMENTS

Ante 0853 - 0900

WELL MONITORING DATA SHEET

	Well ID: <u>S-2</u>	Job Number:
	Client: <u>Nustar Van</u>	Date: <u>9/26/18</u>
	Project: <u>3Q2018</u>	Sampler: <u>JM/LW</u>
	Weather: <u>Sunny</u>	Time In/Out:

WELL DATA

Monument Type:	Flush Mount/Stick-up	Well Diameter: <u>2"</u>	Depth to Free Product: <u>—</u>
	Other:	Well Depth:	Free Product Thickness: <u>—</u>
Monument Condition:	<u>good</u>	Depth to Water: <u>29.48</u>	Water Column Length:
Well Cap Lock Present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Screened Interval:	Purge Volume:

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	<u>BP</u>	Pump Intake Depth:	<u>ms</u>
Sampling Method:	<u>LF</u>	Tubing Material & Type:	<u>SB</u> NEW / <u>DEDICATED</u>

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
1213	—	—	29.55	0.25	6.60	19.77	2026	6.39	88.0	Redish
1216	—	—	29.45	0.2	6.26	16.83	1933	2.88	89.9	↓
1219	—	—	29.44		6.09	17.81	1962	1.97	89.7	
1222	—	—	29.41		6.10	17.97	1970	1.74	85.8	
1225	—	—	29.50		6.23	18.01	1974	1.40	68.6	
1228	—	—	29.42		6.27	17.88	1970	6.35	64.1	
1231	—	—	29.44	↓	6.33	18.21	1979	1.21	55.2	

PURGING DATA

Sample ID: <u>S-2</u>	Sampling Flow Rate: <u>0.2 L/min</u>	Analytical Laboratory: <u>Kier</u>
Sample Time: <u>1230</u>	Final Depth to Water: <u>29.47</u>	Did Well Dewater: <u>N/O</u>
No. of Containers/Type	Preservative	Analysis/Method
<u>3 X 40 mL</u>	<u>H21</u>	<u>HVOCs</u>
<u>1 X 250 mL</u>	<u>—</u>	<u>Nitrate/Nitrite</u>
<u>1 X 250 mL</u>	<u>H2504</u>	<u>Ammonia</u>

NOTES/ADDITIONAL COMMENTS

Antea: 1235 - 1243

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MW-22i	Job Number:	
Client:	NVStar Van	Date:	9/26/18
Project:	3@2018	Sampler:	
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	
	Other:	Well Depth:		Free Product Thickness:	
Monument Condition:	good missing 1 washer	Depth to Water:	30.60	Water Column Length:	
Well Cap Lock Present:	Yes No	Screened Interval:		Purge Volume:	

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	ISD	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	SR NEW / <u>DEDICATED</u>

12580
1301
1304
1307
1310
1313

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
12580/58	-	-	30.61	0.2	7.26	22.23	471	9.01	-9.3	Redish
1301/1001	-	-	30.63	1	6.34	20.49	447	2.44	-17.0	
1304/1004	-	-	30.64	1	5.90	20.55	435	1.28	-7.0	
1307/1007	-	-	30.66	1	5.82	20.36	426	0.93	-9.9	
1310/1010	-	-	30.65	1	5.82	20.08	426	0.86	-11.6	
1313/1013	-	-	30.67	1	5.80	20.00	420	0.83	-11.2	

PURGING DATA

Sample ID:	MW-22i	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex
Sample Time:	1320	Final Depth to Water:	30.69	Did Well Dewater:	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD Duplicate ID
3 x 40 mL	H2O	HVOCs			
1 x 250 mL	-	N. Nitrate/Nitrate			
1 x 250 mL	H2SO4	Ammonia			

NOTES/ADDITIONAL COMMENTS

Antea 1321 - 1326

WELL MONITORING DATA SHEET



Well ID:	MW-211-105	Job Number:	
Client:	Nustar Van	Date:	9/26/18
Project:	SR2018	Sampler:	JM/LW
Weather:	Sunny	Time In/Out:	1345

WELL DATA

Monument Type:	Flush-mount / Stick-up	Well Diameter:	2"	Depth to Free Product:	-
	Other:	Well Depth:		Free Product Thickness:	-
Monument Condition:	good missing / water	Depth to Water:	30.35	Water Column Length:	
Well Cap Lock Present:	Yes No	Screened Interval:		Purge Volume:	

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	RP	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	SB NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1350	-	-	20.40	0.2	5.07	21.65	290	3.92	108.4	clear
1353	-	-	30.35		5.25	20.00	301	2.21	115.7	
1356	-	-	30.36		5.49	19.23	368	1.40	114.4	
1359	-	-	30.40		5.65	19.01	383	1.14	105.8	
1402	-	-	30.42		5.78	18.75	381	1.00	98.7	
1405	-	-	30.44		5.75	18.42	579	0.96	99.7	


PURGING DATA

Sample ID:	MW-211-105	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex
Sample Time:	1405	Final Depth to Water:	36.12	Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD Duplicate ID
3 X 40 mL	HCl	HVOCs			
1 X 250 mL	-	Nitrate/Nitrite			
1 X 250 mL	H2SO4	Ammonia			

NOTES/ADDITIONAL COMMENTS

Antea 1410 - 1419

WELL MONITORING DATA SHEET

 Cascadia Associates, LLC	Well ID: <u>MW-3</u>	Job Number:
	Client: <u>Nustad Van</u>	Date: <u>9/26/18</u>
	Project: <u>302018</u>	Sampler: <u>JML/LW</u>
	Weather: <u>Sunny</u>	Time In/Out:

WELL DATA

Monument Type:	<input checked="" type="checkbox"/> Flush-mount/Stick-up Other:	Well Diameter:	2"	Depth to Free Product:	-
Monument Condition:	Missing 2 tabs	Well Depth:		Free Product Thickness:	
Well Cap Lock Present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Depth to Water:	30.50	Water Column Length:	
Comments:		Screened Interval:		Purge Volume:	

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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PURGING DATA

Purge Method:		<u>BP</u>			Pump Intake Depth:		<u>MS</u>			
Sampling Method:		<u>LF</u>			Tubing Material & Type:		<u>SB</u>		NEW / <input checked="" type="checkbox"/> DEDICATED	
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1435	-	-	30.94	0.2	5.87	19.68	586	4.62	65.4	clear
1438	-	-	31.05		5.37	18.60	560	2.81	94.9	
1441	-	-	-		5.26	18.83	560	2.56	101.7	
1444	-	-	-		5.20	18.77	557	2.47	103.8	
1447	-	-	-		5.21	18.70	552	2.32	103.6	

PURGING DATA

Sample ID:	<u>MW-3</u>	Sampling Flow Rate:	<u>0.2</u>	Analytical Laboratory:	<u>AAPX</u>
Sample Time:	<u>1450</u>	Final Depth to Water:	<u>32.30</u>	Did Well Dewater:	<u>NO</u>
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD Duplicate ID
3 X 40mL	<u>HCl</u>	<u>HVOLS</u>			
1 X 250mL	-	<u>Nitrate/Nitrite</u>			
1 X 250mL	<u>H2SO4</u>	<u>Ammonia</u>			

NOTES/ADDITIONAL COMMENTS

Antea 1452 - 1507

WELL MONITORING DATA SHEET



Well ID:	MW-26	Job Number:	
Client:	NuStar Jan	Date:	9/24/18
Project:		Sampler:	LW/JAN
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:		Free Product Thickness:	—
Monument Condition:	good 3/3	Depth to Water:	29.04	Water Column Length:	
Well Cap Lock Present:	Yes No	Screened Interval:		Purge Volume:	

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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PURGING DATA


Purge Method:	Per. P				Pump Intake Depth:	MS				
Sampling Method:	LF				Tubing Material & Type:	LDPE NEW / DEDICATED				
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1350			29.04	0.2	6.21	17.79	1992	12.81	136.7	clear
1353			29.04	0.2	5.87	17.35	2039	7.89	156.0	" "
1356			29.04	0.2	5.88	17.45	2055	6.61	155.4	" "
1359			29.05	0.20	5.99	17.50	2273	4.87	153.5	" "
1402			29.06	0.20	6.07	17.60	2372	4.15	150.9	" "
1405			29.07	0.20	6.08	17.60	2378	4.20	151.6	" "
1408			29.06	0.20	6.07	17.59	2392	4.17	152.8	" "

PURGING DATA

Sample ID:	MW-26	Sampling Flow Rate:	0.20	Analytical Laboratory:	Apex	
Sample Time:	1410	Final Depth to Water:	29.06	Did Well Dewater:	No	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3 x 40ml	Hcl	HVOCs				
2 x 40 ml	Hcl	RSk-175 (TOC, ethene, ethane, methane)				
1 x 250	—	Nitrate/Nitrite				
1 x 250	H2SO4	Ammonia				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

	Well ID:	EX-1	Job Number:	
	Client:	Nustar Van	Date:	9/24/18
	Project:	302018	Sampler:	JM/LW
	Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	-
	Other:	Well Depth:		Free Product Thickness:	-
Monument Condition:	good	Depth to Water:	29.10	Water Column Length:	
Well Cap Lock Present:	Yes <input type="radio"/> No <input checked="" type="radio"/>	Screened Interval:		Purge Volume:	

Comments: _____

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):
 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA


Purge Method:	peri p LF				Pump Intake Depth:	MS		NEW / DEDICATED		
Sampling Method:					Tubing Material & Type:	LDPE				
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1450			29.38	0.2	6.78	19.38	1325	14.01	145.8	cloudy
1453			29.39	0.2	6.53	19.41	1310	5.90	159.9	" "
1456			29.40	0.2	6.37	19.49	1298	3.20	170.8	" "
1459			29.40	0.2	6.40	19.44	1295	2.85	172.2	" "
1502			29.39	0.2	6.42	19.54	1296	2.40	169.7	" "
1505			29.39	0.2	6.46	19.47	1295	1.66	164.0	" "
1508			29.42	0.2	6.49	19.21	1291	1.55	150.7	" "

PURGING DATA

Sample ID:	EX-1	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex	
Sample Time:	1515	Final Depth to Water:	29.43	Did Well Dewater:	No	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3 X 40mL	HCl	HVOCs				
2 X 40mL	HCl	RSK-175 (Toc, ethene, ethane, methane)				
1 X 250 mL	-	Nitrate / Nitrite				
1 X 250 mL	H ₂ SO ₄	Ammonia				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

	Well ID: <u>MW-8</u>	Job Number:
	Client: <u>Nustar Vancouver</u>	Date: <u>7/25/18</u>
	Project:	Sampler: <u>JM/LW</u>
	Weather: <u>Sunny</u>	Time In/Out:

WELL DATA

Monument Type:	Push-mount/Stick-up Other:	Well Diameter: <u>4"</u>	Depth to Free Product: <u>—</u>
Monument Condition:	<u>good 3/3</u>	Well Depth:	Free Product Thickness: <u>—</u>
Well Cap Lock Present:	<input checked="" type="radio"/> Yes <input type="radio"/> No	Depth to Water: <u>28.42</u>	Water Column Length:
Comments:		Screened Interval:	Purge Volume:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)			
Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653
			1 gal = 3.785 liters

PURGING DATA


Purge Method: <u>PER. D</u>		Pump Intake Depth: <u>MS</u>								
Sampling Method: <u>LF</u>		Tubing Material & Type: <u>LDPE</u>								
		<u>NEW</u> / DEDICATED								
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					±0.1	±0.5 °C	±5%	±0.5 ppm	±20 mV	
<u>0801</u>			<u>28.51</u>	<u>0.2</u>	<u>6.58</u>	<u>16.24</u>	<u>1722</u>	<u>7.84</u>	<u>105.2</u>	<u>clear</u>
<u>0804</u>			<u>28.55</u>	<u>0.2</u>	<u>6.19</u>	<u>15.99</u>	<u>1712</u>	<u>4.38</u>	<u>74.5</u>	" "
<u>0807</u>			<u>28.55</u>	<u>0.2</u>	<u>6.15</u>	<u>16.04</u>	<u>1716</u>	<u>3.80</u>	<u>66.7</u>	" "
<u>0810</u>			<u>28.60</u>	<u>0.2</u>	<u>6.15</u>	<u>16.11</u>	<u>1720</u>	<u>3.33</u>	<u>61.1</u>	" "
<u>0813</u>			<u>28.62</u>	<u>0.2</u>	<u>6.14</u>	<u>16.16</u>	<u>1721</u>	<u>3.10</u>	<u>57.5</u>	" "
<u>0816</u>			<u>28.66</u>	<u>0.2</u>	<u>6.14</u>	<u>16.01</u>	<u>1720</u>	<u>2.94</u>	<u>55.7</u>	" "

PURGING DATA

Sample ID: <u>MW-8</u>	Sampling Flow Rate: <u>0.2 L/min</u>	Analytical Laboratory: <u>Apex</u>				
Sample Time: <u>0815</u>	Final Depth to Water: <u>28.65</u>	Did Well Dewater: <u>No</u>				
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
<u>3x40mL</u>	<u>HCl</u>	<u>HVOCs</u>				
<u>1x250mL</u>	<u>—</u>	<u>Nitrate/Nitrite</u>				
<u>1x250mL</u>	<u>H2SO4</u>	<u>Ammonia</u>				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

 Cascadia Associates, LLC	Well ID: <u>MW-10</u>	Job Number:
	Client: <u>Nustar Van</u>	Date: <u>9/25/18</u>
	Project:	Sampler: <u>JM/LW</u>
	Weather: <u>Sunny</u>	Time In/Out:

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter: <u>4"</u>	Depth to Free Product: <u>—</u>
	Other:	Well Depth:	Free Product Thickness: <u>—</u>
Monument Condition:	<u>good</u>	Depth to Water: <u>28.45</u>	Water Column Length:
Well Cap Lock Present:	Yes <input type="radio"/> No <input checked="" type="radio"/>	Screened Interval:	Purge Volume:

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method: <u>peri p</u>		Pump Intake Depth:		MS		DO		NEW / DEDICATED		
Sampling Method: <u>LF</u>		Tubing Material & Type: <u>LDPE</u>								
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
<u>0840</u>			<u>28.54</u>	<u>0.15</u>	<u>5.66</u>	<u>16.46</u>	<u>2881</u>	<u>7.01</u>	<u>111.9</u>	<u>clear</u>
<u>0843</u>			<u>28.59</u>	<u>0.15</u>	<u>5.51</u>	<u>16.28</u>	<u>2891</u>	<u>3.74</u>	<u>121.6</u>	<u>" "</u>
<u>0847</u>			<u>28.64</u>	<u>0.15</u>	<u>5.51</u>	<u>16.32</u>	<u>2899</u>	<u>2.84</u>	<u>122.9</u>	<u>" "</u>
<u>0850</u>			<u>28.70</u>	<u>0.15</u>	<u>5.55</u>	<u>16.30</u>	<u>2900</u>	<u>2.47</u>	<u>121.1</u>	<u>" "</u>
<u>0853</u>			<u>28.75</u>	<u>0.15</u>	<u>5.56</u>	<u>16.35</u>	<u>2903</u>	<u>2.20</u>	<u>120.9</u>	<u>" "</u>
<u>0856</u>			<u>28.79</u>	<u>0.15</u>	<u>5.56</u>	<u>16.25</u>	<u>2909</u>	<u>2.07</u>	<u>120.9</u>	<u>" "</u>


PURGING DATA

Sample ID: <u>MW-10</u>	Sampling Flow Rate: <u>0.15</u>	Analytical Laboratory: <u>Apex</u>				
Sample Time: <u>0900</u>	Final Depth to Water: <u>28.95</u>	Did Well Dewater: <u>No</u>				
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
<u>3 X 40 mL</u>	<u>HCl</u>	<u>HVOCs</u>				<u>X</u>
<u>1 X 250 mL</u>	<u>—</u>	<u>Nitrate/Nitrite</u>				<u>X</u>
<u>1 X 250 mL</u>	<u>H2SO4</u>	<u>Ammonia</u>				<u>X</u>

NOTES/ADDITIONAL COMMENTS

Antec Collects Samples (0912 - 0924)

WELL MONITORING DATA SHEET

	Well ID: <u>MW-12</u>	Job Number:
	Client: <u>Nustar Van</u>	Date: <u>9/25/18</u>
	Project:	Sampler: <u>JM/LW</u>
	Weather: <u>Spring</u>	Time In/Out:

WELL DATA

Monument Type:	<input checked="" type="checkbox"/> Flush-mount/Stick-up	Well Diameter:	<u>4"</u>	Depth to Free Product:	—
	<input type="checkbox"/> Other:	Well Depth:		Free Product Thickness:	—
Monument Condition:	<u>good</u>	Depth to Water:	<u>27.39</u>	Water Column Length:	
Well Cap Lock Present:	<input checked="" type="checkbox"/> No	Screened Interval:		Purge Volume:	

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:		<u>peri. P LF</u>			Pump Intake Depth:		<u>MS</u>			
Sampling Method:					Tubing Material & Type:		<u>LDPE</u>		<input checked="" type="checkbox"/> NEW / DEDICATED	
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
<u>0943</u>			<u>27.57</u>	<u>0.1</u>	<u>6.70</u>	<u>17.98</u>	<u>2476</u>	<u>5.01</u>	<u>-135.9</u>	<u>clear</u>
<u>0946</u>			<u>27.64</u>	<u>0.15</u>	<u>6.71</u>	<u>18.02</u>	<u>2472</u>	<u>3.99</u>	<u>-152.3</u>	" "
<u>0949</u>			<u>27.69</u>	<u>0.15</u>	<u>6.70</u>	<u>18.21</u>	<u>2484</u>	<u>3.04</u>	<u>-159.9</u>	" "
<u>0952</u>			<u>27.70</u>	<u>0.15</u>	<u>6.68</u>	<u>18.25</u>	<u>2479</u>	<u>2.41</u>	<u>-166.8</u>	" "
<u>0955</u>			<u>27.79</u>	<u>0.15</u>	<u>6.68</u>	<u>18.52</u>	<u>2502</u>	<u>1.98</u>	<u>-170.0</u>	" "
<u>0958</u>			<u>27.85</u>	<u>0.15</u>	<u>6.69</u>	<u>18.74</u>	<u>2517</u>	<u>1.66</u>	<u>-171.2</u>	" "
<u>1001</u>			<u>27.91</u>	<u>0.15</u>	<u>6.70</u>	<u>18.87</u>	<u>2529</u>	<u>1.42</u>	<u>-170.0</u>	" "
<u>1004</u>			<u>27.95</u>	<u>0.15</u>	<u>6.70</u>	<u>18.97</u>	<u>2538</u>	<u>1.27</u>	<u>-174.0</u>	" "

PURGING DATA

Sample ID:	<u>MW-12</u>	Sampling Flow Rate:	<u>0.15 L/min</u>	Analytical Laboratory:	<u>Apex</u>	
Sample Time:	<u>1005</u>	Final Depth to Water:	<u>28.39</u>	Did Well Dewater:	<u>NO</u>	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
<u>3 x 40 mL</u>	<u>HCl</u>	<u>HVOCs</u>				<u>X</u> <u>MW-12 Dup</u>
<u>2 x 40 mL</u>	<u>HCl</u>	<u>RSK-175 (TOC, ethane, ethene)</u>				
<u>1 x 250 mL</u>	<u>-</u>	<u>Nitrate/Nitrite</u>				<u>X</u> <u>MW-12 Dup</u>
<u>1 x 250 mL</u>	<u>H2SO4</u>	<u>Ammonia</u>				<u>X</u> <u>MW-12 Dup</u>

NOTES/ADDITIONAL COMMENTS

Antea collects samples 1023 - 1032

WELL MONITORING DATA SHEET



Well ID:	MW-19	Job Number:	
Client:	NWStar Van	Date:	9/25/18
Project:		Sampler:	JM LW
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:		Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	29.12	Water Column Length:	
Well Cap Lock Present:	Yes No	Screened Interval:		Purge Volume:	

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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PURGING DATA

Purge Method:	perip LF	Pump Intake Depth:	MS
Sampling Method:		Tubing Material & Type:	LDPE
			NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1045			29.66	0.2	6.50	17.34	2382	5.23	40.4	clear
1048			29.66	0.2	6.36	17.00	2397	4.16	46.1	" "
1051			29.68	0.2	6.32	16.81	2393	2.62	56.7	" "
1054			29.71	0.2	6.32	16.71	2332	2.04	52.9	" "
1057			29.71	0.2	6.33	16.62	2225	1.67	54.7	" "
1100			29.70	0.2	6.35	16.65	2165	1.44	56.6	" "
1103			29.70	0.2	6.37	16.68	2158	1.30	57.4	" "

PURGING DATA

Sample ID:	MW-19	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex
Sample Time:	1105	Final Depth to Water:	29.70	Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD Duplicate ID
3x40mL	H2I	HVOCs			X MW-19 Dup
2x40mL	H2I	RSK-175 (TOL, ethane, ethene)			
1x250 mL	-	Nitrate/Nitrite			X MW-19 Dup
1x250mL	H2SO4	Ammonia			X MW-19 Dup

NOTES/ADDITIONAL COMMENTS

Atkes (1112-1122)

WELL MONITORING DATA SHEET



Well ID:	MW-13	Job Number:	1
Client:	Mustar Van	Date:	9/25/18
Project:		Sampler:	LW/JM
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	-
	Other:	Well Depth:		Free Product Thickness:	-
Monument Condition:	grind	Depth to Water:	28.90	Water Column Length:	
Well Cap Lock Present:	Yes No	Screened Interval:		Purge Volume:	

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	Peri P LF				Pump Intake Depth:	MS				
Sampling Method:					Tubing Material & Type:	LDPE		(NEW) / DEDICATED		
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1134			29.10	0.15	6.44	19.00	1333	3.45	-111.1	clear
1137			29.20	0.15	6.41	19.00	1319	2.24	-120.9	" "
1140			29.29	0.15	6.50	19.20	1320	1.81	-127.9	" "
1143			29.40	0.15	6.59	19.49	1325	1.54	-138.9	" "
1146			29.59	0.15	6.61	19.46	1326	1.36	-144.1	" "
1149			29.64	0.15	6.61	19.50	1328	1.22	-146.8	" "

PURGING DATA

Sample ID:	MW-13	Sampling Flow Rate:	0.15	Analytical Laboratory:	Apco	
Sample Time:	1150	Final Depth to Water:	20.00	Did Well Dewater:	No	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40mL	HCl	HVOCs				
2x40mL	HCl	RSK-175 (Tol, ethane, ethene)				
1x250mL	-	Nitrite/Nitrate				
1x250mL	H2SO4	Ammonia				

NOTES/ADDITIONAL COMMENTS

Antea 1158-1208

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	<u>MW-6</u>	Job Number:	
Client:	<u>Nuster Van</u>	Date:	<u>7/25/18</u>
Project:	<u>3D 2018</u>	Sampler:	<u>JM/LW</u>
Weather:	<u>Sunny</u>	Time In/Out:	

WELL DATA

Monument Type:	<input checked="" type="checkbox"/> Flush-mount/Stick-up	Well Diameter:	<u>2"</u>	Depth to Free Product:	<u>—</u>
	Other:	Well Depth:		Free Product Thickness:	<u>—</u>
Monument Condition:	<u>good 3/3</u>	Depth to Water:	<u>28.40</u>	Water Column Length:	
Well Cap Lock Present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Screened Interval:		Purge Volume:	

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	<u>Bladder P</u>			Pump Intake Depth:	<u>MS</u>					
Sampling Method:	<u>LF</u>			Tubing Material & Type:	<u>SB</u>			NEW / <input checked="" type="checkbox"/> BEDIATED		
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
<u>1317</u>	<u>—</u>	<u>—</u>	<u>28.40</u>	<u>0.3</u>	<u>5.96</u>	<u>18.76</u>	<u>1016</u>	<u>3.77</u>	<u>-47.0</u>	<u>clear</u>
<u>1320</u>	<u>—</u>	<u>—</u>	<u>28.49</u>	<u>0.3</u>	<u>5.48</u>	<u>16.94</u>	<u>871</u>	<u>2.34</u>	<u>-28.0</u>	<u>" "</u>
<u>1323</u>	<u>—</u>	<u>—</u>	<u>28.46</u>	<u>0.3</u>	<u>5.20</u>	<u>16.08</u>	<u>675</u>	<u>2.00</u>	<u>-15.9</u>	<u>" "</u>
<u>1326</u>	<u>—</u>	<u>—</u>	<u>28.45</u>	<u>0.3</u>	<u>5.21</u>	<u>15.89</u>	<u>594</u>	<u>1.77</u>	<u>-13.4</u>	<u>" "</u>
<u>1329</u>	<u>—</u>	<u>—</u>	<u>28.50</u>	<u>0.3</u>	<u>5.25</u>	<u>15.86</u>	<u>526</u>	<u>1.60</u>	<u>-13.5</u>	<u>" "</u>
<u>1332</u>	<u>—</u>	<u>—</u>	<u>28.45</u>	<u>0.3</u>	<u>5.26</u>	<u>15.74</u>	<u>480</u>	<u>1.42</u>	<u>-12.8</u>	<u>" "</u>
<u>1335</u>	<u>—</u>	<u>—</u>	<u>28.50</u>	<u>0.3</u>	<u>5.27</u>	<u>15.79</u>	<u>450</u>	<u>1.28</u>	<u>-14.0</u>	<u>" "</u>

PURGING DATA

Sample ID:	<u>MW-6</u>	Sampling Flow Rate:	<u>0.3 L/min</u>	Analytical Laboratory:	<u>Apex</u>
Sample Time:	<u>1330</u>	Final Depth to Water:	<u>28.45</u>	Did Well Dewater:	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD Duplicate ID
<u>3 x 40 mL</u>	<u>HCl</u>	<u>HVOCs</u>			
<u>1 x 250 mL</u>	<u>—</u>	<u>Nitrate / Nitrite</u>			
<u>1 x 250 mL</u>	<u>H2SO4</u>	<u>Ammonia</u>			

NOTES/ADDITIONAL COMMENTS

Antea 1338 - 1342

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MW-16	Job Number:	
Client:	Naitar Jan	Date:	9/25/18
Project:	302018	Sampler:	JM/LW
Weather:	Sunny	Time In/Out:	1940

WELL DATA

Monument Type:	Flush-mount/stick-up	Well Diameter:	4"	Depth to Free Product:	
	Other:	Well Depth:		Free Product Thickness:	
Monument Condition:	good 2/3	Depth to Water:	29.80	Water Column Length:	
Well Cap Lock Present:	Yes No	Screened Interval:		Purge Volume:	

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:		Pump Intake Depth:		M3		NEW / DEDICATED				
Sampling Method:		Tubing Material & Type:		SB						
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1445	-	-	29.80	0.25	5.72	17.80	477	4.60	38.4	clear
1448	=	-	29.82	0.25	5.45	17.40	457	2.37	62.4	" "
1457	-	-	29.83	0.25	5.36	17.04	449	1.97	70.2	" "
1454	-	-	29.85	0.25	5.31	17.01	457	1.72	73.6	" "
1457	-	-	29.88	0.25	5.31	16.94	457	1.66	74.2	" "

PURGING DATA

Sample ID:	MW-16	Sampling Flow Rate:	0.25	Analytical Laboratory:	Apex	
Sample Time:	1500	Final Depth to Water:	29.89	Did Well Dewater:	NO	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3 x 40 mL	HCl	1xVols				
1 x 250 mL	-	Nitrate/Nitrite				
1 x 250 mL	H2SO4	Ammonia				

NOTES/ADDITIONAL COMMENTS

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

PO# _____

Company: ASAC Project Mgr: Stephen & Selibany Project Name: AluStar 302018 Project # _____

Address: 6915 SW Maradea Ave, S1 250 Phone: 503 906 6577 Fax: _____ Email: Sel.Selibany@asac.com

Sampled by: Joe M / Labur W ANALYSIS REQUEST

Site Location: OR WA
Other: _____

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	8260 VOCs Full List	8260 RBDM VOCs	8260 HVOCs	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TTO	RCRA Metals (8)	TCLP Metals (8)	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Hg, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Tl, V, Zn	TOTAL DISS TCLP	1200- COLS	1200-Z	Urate/Nitrate	Ammonia	SK-175		
1		9/25/18	1415	GW	5						<input checked="" type="checkbox"/>																
2		9/25/18	1500	GW	5						<input checked="" type="checkbox"/>																
3		9/25/18	1530	GW	5						<input checked="" type="checkbox"/>																
4		9/25/18	1540	GW	2						<input checked="" type="checkbox"/>																
5		-	-	W	1						<input checked="" type="checkbox"/>																
6																											
7																											
8																											
9																											
10																											

Normal Turn Around Time (TAT) = 10 Business Days

TAT Requested (circle): 1 Day 2 Day 3 Day 4 DAY 5 DAY Other: _____

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY: _____ RECEIVED BY: _____

Signature: _____ Date: 9/25/18 Signature: _____ Date: 9/25/18

Printed Name: Joe M / Labur W Printed Name: Charles H Time: 1600

Company: ASAC Company: Apex

SPECIAL INSTRUCTIONS: * RSI-175 = 700. Alkane, ethane

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

PO# _____

Company: <u>Cascadia Associates</u>	Project Mgr: <u>Stephanie Salisbury</u>	Project Name: <u>Nster Vancouver</u>
Address: <u>6915 SW Luncadam Av, Ste 250</u>	Phone: <u>503 900 6577</u>	Fax: _____
Sampled by: <u>Joel W.</u>	ANALYSIS REQUEST	
Email: <u>Sbsalisbury@cascadia.com</u>		

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWT PH-HCID	NWT PH-Dx	NWT PH-Gx	8260 VOCs Full List	8260 RBDM VOCs	8260 HVOCs	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TTO	RCRA Metals (8)	TCLP Metals (8)	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Hg, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Tl, V, Zn TOTAL DISS TCLP	1200- COLS	1200-Z	ANALYSIS REQUEST					
																						Nitrate/Nitrite	Ammonia				
MM-25		9/27/18	1530	GM	5						X												X	X			
Trip Blank		9/27/18	-	W	1																						

Normal Turn Around Time (TAT) = 10 Business Days YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>	SPECIAL INSTRUCTIONS:
TAT Requested (circle) 1 Day 2 Day 3 Day 4 DAY 5 DAY Other: _____	SAMPLES ARE HELD FOR 30 DAYS
RELINQUISHED BY: _____ Signature: _____ Date: 9/27/18	RECEIVED BY: _____ Signature: _____ Date: 9/27/18
Printed Name: <u>Joel W. Verdier</u> Time: <u>16:00</u>	Printed Name: _____ Time: _____
Company: <u>Cascadia</u>	Company: <u>Apex Labs</u>

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

PO# _____

 Company: Cascadia Associates Project Mgr: Stephonic Salisbur Project Name: Nuske Vancouver Project # _____

 Address: 6915 SW Macadam Ave Ste 256 Phone: 5039066577 Fax: _____ Email: SSalisbury@cascadia

 Sampled by: Joel M. ANALYSIS REQUEST: ASSOCIATES.COM

 Site Location: OR WA
 Other: _____

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	8260 VOCs Full List	8260 RBDM VOCs	8260 HVOCs	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TTO	RCRA Metals (8)	TCLP Metals (8)	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Hg, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Tl, V, Zn	TOTAL DISS TCLP	1200- COLS	1200-Z	Nitrate/Nitrite	Ammonia	
1 MW-9		9/29/18	0800	Gw	5						X											X	X		
2 MW-7		9/27/18	0840	Gw	5						X											X	X		
3 MW-5		9/27/18	0920	Gw	5						X											X	X		
4 MW-21-40		9/27/18	1015	Gw	5						X											X	X		
5 MW-23		9/27/18	1100	Gw	5						X											X	X		
6 MW-18		9/27/18	1150	Gw	5						X											X	X		
7 MW-19		9/27/18	1230	Gw	5						X											X	X		
8 EW-1		9/27/18	1320	Gw	5						X											X	X		
9 MW-24		9/27/18	1410	Gw	5						X											X	X		
10 MP-3		9/27/18	1430	Gw	5						X											X	X		

 Normal Turn Around Time (TAT) = 10 Business Days YES NO
 TAT Requested (circle) **4 DAY** 5 DAY Other: _____

SAMPLES ARE HELD FOR 30 DAYS

 RELINQUISHED BY: _____ RECEIVED BY: _____
 Signature: _____ Date: _____ Signature: _____ Date: _____

Printed Name: _____ Time: _____ Printed Name: _____ Time: _____

 Company: Cascadia Company: Apex Labs

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

PO# _____

Company: Cascade Associates

Project Mgr: Stephanie Selis

Project Name: Nestor Vancouver

Project # _____

Address: 6915 SW Macadam Ave, Ste 856

Phone: 503 966 5777

Fax: _____

Email: Sbsel@sbw.com

Sampled by: Joel M.

ANALYSIS REQUEST

cascade.com

Site Location: OR

WA

Other: _____

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	8260 VOCs Full List	8260 RBDM VOCs	8260 HVOCs	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TTO	RCRA Metals (8)	TCLP Metals (8)	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Hg, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Tl, V, Zn	TOTAL DISS TCLP	1200- COLS	1200-Z	Nitrate/Nitrite	Ammonia	RSk-175	TOC	
1 MW-240		9/28/18	0810	GW	5						X											X	X				
2 MW-240 MS		9/28/18	0810	GW	5						X											X	X				
3 M2-240 MSO		9/28/18	0810	GW	5						X											X	X				
4 M6MS1-43		9/28/18	0930	GW	7						X											X	X			X	
5 M6MS2-132		9/28/18	1615	GW	5						X											X	X				
6 M6MS2-110		9/28/18	1040	GW	5						X											X	X				
7 M6MS2-416		9/28/18	1140	GW	7						X											X	X			X	
8 M6MS3-132		9/28/18	1215	GW	5						X											X	X				
9 M6MS3-66		9/28/18	1256	GW	5						X											X	X				
10 M6MS3-40		9/28/18	1310	GW	7						X											X	X				

SPECIAL INSTRUCTIONS:

RSk-175 = ethanol, ethanol, methanol

Normal Turn Around Time (TAT) = 10 Business Days

1 Day 2 Day 3 Day

TAT Requested (circle) 4 DAY 5 DAY Other: _____

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

Signature: _____

Date: _____

Signature: _____

Date: _____

Signature: _____

Date: _____

Signature: _____

Date: _____

Printed Name: _____

Time: _____

Printed Name: _____

Time: _____

Printed Name: _____

Time: _____

Printed Name: _____

Time: _____

Company: _____

Company: _____

Company: _____

Company: _____

Company: _____

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

PO# _____

Company: Cascadia Associates Project Mgr: Stephanie Salisbury Project Name: Norster Linn Center Project # _____

Address: 6915 SW Macarham Ave Site # 256 Phone: 503 906 6577 Fax: _____ Email: ssalisbury@cascadia

Sampled by: Joel W. ANALYSIS REQUEST 0550@CAS.AS.COM

Site Location: OR WA Other: _____

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	8260 VOCs Full List	8260 RBDM VOCs	8260 HVOCs	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TTO	RCRA Metals (8)	TCLP Metals (8)	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Hg, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Ti, V, Zn	TOTAL DISS TCLP	1200- COLS	1200-Z						
1		9/28/18	1310	Gw	7						X											X	X	Ni104/Ni114				
2		9/28/18	1340	Gw	7						X											X	X	Ammonia				
3											X																	
3																												
4																												
5																												
6																												
7																												
8																												
9																												
10																												

Normal Turn Around Time (TAT) = 10 Business Days YES NO

TAT Requested (circle)
 1 Day
 2 Day
 3 Day
 4 DAY
 5 DAY
 Other: _____

SPECIAL INSTRUCTIONS:
151-175 = Methan, ethan, ethan

RELINQUISHED BY: _____ RECEIVED BY: _____
 Signature: _____ Date: 9/28/18 Signature: Dave Pender Date: 9/28/18
 Printed Name: Soel M. Hebeck Time: 1535 Printed Name: _____ Time: 1535

RELINQUISHED BY: _____ RECEIVED BY: _____
 Signature: _____ Date: _____ Signature: _____ Date: _____
 Printed Name: _____ Time: _____ Printed Name: _____ Time: _____

Company: Cascadia Company: APEX LABS Company: _____

Project: 4Q18 GWM
 Client: Nustar Vancouver
 Sampler: JM / LW

Date: 12/3/18
 Permit: 274563

Intermediate

Well ID:	Time:	DTP:	DTW:	Product Thickness:	Notes:
MW-21-40	0915	-	29.71	-	
MW-21-105	0917	-	29.53	-	
MW-32i	0920	-	30.08	-	
MW-22i	0922	-	30.08	-	
MW-25i	0927	-	31.32	-	
MW-23i	0930	-	32.50	-	
S-1	0934	-	28.58	-	
MW-24i	0938	-	28.63	-	
MW-19i	0948	-	29.38	-	
MW-20i	0951	-	28.82	-	
MW-18i	0954	-	29.04	-	
MGMS1-132	1001	-	29.65	-	
MGMS1- 40 1003	1003	-	27.78	-	
MGMS1-60	1005	-	28.68	-	
MGMS2-110	1011	-	28.50	-	
MGMS2-132	1012	-	28.50	-	
MGMS2-60	1013	-	27.50	-	
MGMS2-40	1015	-	28.55	-	
MGMS3-40	1019	-	27.25	-	
MGMS3-60	1020	-	27.71	-	

Project: 4Q18 GWM
 Client: Nustar Vancouver
 Sampler: JM/LW

Date: 12/3/18
 Permit: 274563

Well ID:	Time:	DTP:	DTW:	Product Thickness:	Notes:
Mqms3-110	1021	-	27.75	-	
Mqms3-132	1023	-	27.79	-	
MW-3	1032	-	28.28	-	
EW-1	1034	-	26.20	-	
MW-6	1039	-	27.26	-	
MW-2	1043	-	29.59	-	
MW-1	1049	-	27.78	-	
MW-12	1052	-	26.50	-	
MW-19	1057	-	28.55	-	
EX-1	1059	-	28.42	-	
MP-4	1101	-	28.62	-	
MP-3	1103	-	29.69	-	
MP-2	1105	-	28.84	-	
MP-1	1107	-	28.78	-	
MW-24d	1110	-	29.09	-	
MW-13	1113	-	28.00	-	
S-2	1118	-	28.80	-	
MW-14	1121	-	28.75	-	
MW-17	1124	-	27.68	-	
MW-26	1146	-	28.75	-	

WELL MONITORING DATA SHEET



Well ID:	MW-325	Job Number:	
Client:	Nuster VAN	Date:	12/10
Project:	UQIF	Sampler:	LW/SM
Weather:	overcast	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	28.89	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	Dedicated BP	Pump Intake Depth:	MS
Sampling Method:	LP	Tubing Material & Type:	LDPE NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0827			28.89	0.2	7.82	13.68	254	14.02	-69.3	clear
0830			28.89	↓	7.62	13.76	221	5.70	-23.1	↓
0833			28.89	↓	7.02	13.59	216	4.10	-7.0	↓
0836			28.89	↓	6.90	13.55	215	3.56	-2.4	↓
0839			28.89	↓	6.88	13.56	215	3.50	-2.1	↓
0842			28.89	↓	6.87	13.55	215	3.45	-1.6	↓

PURGING DATA

Sample ID:	MW-325	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex
Sample Time:	0840	Final Depth to Water:	28.89	Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD Duplicate ID
3x46mL	H2O				
1x250	H2SO4				
1x250	—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MGM32-40	Job Number:	
Client:	MUSTER VAN	Date:	12/10
Project:	4Q18	Sampler:	JM/LW
Weather:	overcast	Time In/Out:	

WELL DATA

Monument Type:	Flush-noup/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	Good	Depth to Water:	27.51	Water Column Length:	—
Well Cap Lock Present:	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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PURGING DATA

Purge Method:		Dedicated Pump		Pump Intake Depth:		MS				
Sampling Method:		LP		Tubing Material & Type:		LDPE		NEW / DEDICATED		
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0858			27.51	0.2	6.77	14.01	1281	5.70	-100.0	clear
0901			28.20	↓	6.95	14.87	1534	6.33	-117.8	↓
0904			27.76	↓	6.92	14.73	1543	5.30	-112.4	↓
0907			27.52	↓	6.86	14.56	1541	3.01	-107.2	↓
0910			27.96	↓	6.83	14.66	1545	2.27	-110.3	↓
0913			27.76	↓	6.83	14.51	1538	2.09	-111.3	↓
0916			27.86	↓	6.83	14.48	1536	2.05	-111.4	↓

PURGING DATA

Sample ID:	MGM32-40	Sampling Flow Rate:	0.2	Analytical Laboratory:	AAEX	
Sample Time:	0915	Final Depth to Water:	27.39	Did Well Dewater:	NO	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
5 X 40ml	HCl		N			
1 X 250	H2SO4		↓			
1 X 250	—					

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MGM52-60	Job Number:	
Client:	Nustar UAN	Date:	12/10
Project:	4018	Sampler:	LW/SM
Weather:	overcast	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	27.37	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:		Def. pump LF			Pump Intake Depth:		MS			
Sampling Method:		LF			Tubing Material & Type:		LDPE NEW / RELOCATED			
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0928			27.37	0.2	6.87	13.89	921	2.88	-78.4	clear
0931			27.16	↓	6.93	14.33	391	1.41	-69.7	↓
0933			27.04	↓	7.01	14.46	318	0.98	-57.4	↓
0936			27.01	↓	6.98	14.40	250	0.95	-49.6	↓
0940			26.98	↓	6.96	14.55	228	0.85	-38.2	↓

PURGING DATA

Sample ID:	MGM52-60	Sampling Flow Rate:	0.2	Analytical Laboratory:	APLY	
Sample Time:	0940	Final Depth to Water:	27.11	Did Well Dewater:	X/10	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40mL	H21		N			
1x750	H2504		↓			
1x750	—					

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia Associates, LLC

Well ID:	MGM13-60	Job Number:	
Client:	Mustang VAN	Date:	12/10
Project:	4 GIG	Sampler:	LW/SM
Weather:	overcast	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:		Depth to Water:	26.30	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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PURGING DATA

Purge Method:	DED. PUMP				Pump Intake Depth:	MS		NEW / DEDICATED		
Sampling Method:	LF				Tubing Material & Type:	LDPE				
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1030			26.29	0.2	6.82	13.90	204	3.66	-94.9	clear
1033			26.28	↓	6.81	14.12	157	1.29	-59.6	↓
1036			26.44	↓	6.80	14.30	151	1.03	-40.3	↓
1039			26.45	↓	6.79	14.36	150	1.21	-35.1	↓

PURGING DATA

Sample ID:	MGM13-60	Sampling Flow Rate:	0.2	Analytical Laboratory:	APX	
Sample Time:	1040	Final Depth to Water:	26.47	Did Well Dewater:	NO	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3X40	H21		N			
1X250	H2504		↓			
1X250	—					

NOTES/ADDITIONAL COMMENTS

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WELL MONITORING DATA SHEET



Well ID:	MW-9	Job Number:	
Client:	NUSTAR VAN	Date:	12/7
Project:	4018	Sampler:	LOW
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	-
	Other:	Well Depth:	-	Free Product Thickness:	-
Monument Condition:		Depth to Water:	28.73	Water Column Length:	-
Well Cap Lock Present:	Yes No	Screened Interval:	-	Purge Volume:	-

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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PURGING DATA

Purge Method:	BP				Pump Intake Depth:	ms				
Sampling Method:	LF				Tubing Material & Type:	LDPE			NEW / DEDICATED	
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0830			28.73	0.2	6.20	10.30	1716	5.74	83.2	clear
0833			28.73	0.2	6.04	11.29	1856	3.12	77.6	↓
0836			28.74	↓	5.99	11.73	1952	2.18	72.0	↓
0839			28.73	↓	5.98	11.84	1989	2.08	68.4	↓
0842			28.73	↓	5.96	12.00	1994	1.90	63.9	↓

PURGING DATA

Sample ID:	MW-9	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex
Sample Time:	0845	Final Depth to Water:	28.73	Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD Duplicate ID
3 x 400 L	HCl		N		
1 x 250 mL	H2SO4		↓		
1 x 250 mL	Zn		↓		

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MW-7	Job Number:	
Client:	MUSTAR VAN	Date:	12/7
Project:	4218	Sampler:	LW
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush Mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	-
	Other:	Well Depth:	-	Free Product Thickness:	-
Monument Condition:	good	Depth to Water:	28.48	Water Column Length:	-
Well Cap Lock Present:	(Yes) No	Screened Interval:	-	Purge Volume:	-

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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PURGING DATA

Purge Method:	BP	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	LDPE NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0911			28.80	0.2	6.51	11.73	807	2.88	28.3	clear
0914			28.89	↓	6.48	12.32	642	3.88	28.1	↓
0917			28.96	↓	6.44	11.95	607	3.10	28.0	↓
0920			29.05	↓	6.42	11.96	588	2.60	26.3	↓
0923			29.14	↓	6.41	11.96	572	2.23	23.8	↓
0926			29.24	↓	6.40	12.00	566	2.06	21.5	↓
0929			29.30	↓	6.40	11.91	561	1.89	19.5	↓

PURGING DATA

Sample ID:	MW-7	Sampling Flow Rate:	0.2	Analytical Laboratory:	Appx
Sample Time:	0930	Final Depth to Water:	29.52	Did Well Dewater:	No
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD Duplicate ID
2 X 250mL	-		N		✓ MW-7 DUP
2 X 250mL	H2SO4		↓		✓ MW-7 DUP
6 X 40mL	HCl		↓		✓ MW-7 DUP

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MW-5	Job Number:	
Client:	Mustard VAN	Date:	12/17
Project:	4018	Sampler:	LW
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	1	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	Soil	Depth to Water:	28.59	Water Column Length:	—
Well Cap Lock Present:	<input checked="" type="checkbox"/> No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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PURGING DATA

Purge Method:	BP	Pump Intake Depth:	MS
Sampling Method:	LF	Tubing Material & Type:	LDPE NEW / DELETED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1012			28.59	0.2	6.49	12.37	454	8.60	-36.3	clear
1015			28.61	↓	6.48	14.40	339	8.97	-70.4	↓
1018			28.60	↓	6.44	14.88	327	9.44	-66.7	↓
1021			28.60	↓	6.43	14.22	322	10.55	-60.0	↓
1024			28.60	↓	6.42	14.78	321	10.20	-57.6	↓
1027			28.60	↓	6.43	14.99	322	10.41	-55.0	↓
1030			28.60	↓	6.46	15.12	322	10.60	-54.0	↓

PURGING DATA

Sample ID:	MW-5	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex
Sample Time:	1030	Final Depth to Water:	28.60	Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD Duplicate ID
3 X 40mL	H2O		✓		
1 X 250mL	H2SO4		↓		
1 X 250mL	—				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MW-8	Job Number:	
Client:	Nurstar USA	Date:	12/17
Project:	4Q18	Sampler:	LW
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	good	Depth to Water:	28.13	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:		Sampling Method:			Pump Intake Depth:		Tubing Material & Type:		NEW / DEDICATED	
TSP		LP			MS		LDPE		NEW / DEDICATED	
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1207			28.38	0.3	6.54	11.17	1653	12.51	192.2	clear
1210			28.60	0.3	6.56	13.86	1827	10.66	134.2	
1213			28.72	0.2	6.50	14.13	1847	9.57	109.6	
1216			28.80	↓	6.44	13.98	1844	8.49	92.9	
1219			28.86	↓	6.41	13.93	1836	8.11	83.0	
1222			28.90	↓	6.39	14.00	1832	7.79	76.1	↓
1225			28.95	↓	6.38	14.08	1836	7.63	71.8	↓

PURGING DATA

Sample ID:	MW-8	Sampling Flow Rate:	28.79	Analytical Laboratory:	Apex	
Sample Time:	1220	Final Depth to Water:	0.2	Did Well Dewater:	N/D	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x40ml	HCl		N			
1x250						
1x250	H2SO4		↓			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MW-3	Job Number:	
Client:	Nustar VAN	Date:	12/7
Project:	4Q18	Sampler:	LW
Weather:	SUNNY	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	Depth to Free Product:
	Other:	Well Depth:	Free Product Thickness:
Monument Condition:	Good	Depth to Water:	Water Column Length:
Well Cap Lock Present:	Yes No	Screened Interval:	Purge Volume:

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:		BP			Pump Intake Depth:		MS			
Sampling Method:		LF			Tubing Material & Type:		LDPE		NEW / DECONTAMINATED	
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1303			28.95	0.2	6.74	11.50	997	16.02	34.7	clear
1306			29.05		6.58	11.85	782	8.84	31.3	
1309			29.35		6.52	11.76	619	7.57	31.4	
1312			29.57		6.50	11.60	557	7.36	31.2	
1315			29.79		6.50	11.84	510	7.22	33.0	

PURGING DATA

Sample ID:	MW-3	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex	
Sample Time:	1320	Final Depth to Water:	30.02	Did Well Dewater:	NO	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x60ml	HCL		N			
1x250	-					
1x250	H2SO4					

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Well ID:	MW-24d	Job Number:	
Client:	Nustae VAN	Date:	12/10
Project:	4Q18	Sampler:	LW/JM
Weather:	Foggy / overcast	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	8' d	Depth to Water:	28.30	Water Column Length:	—
Well Cap Lock Present:	Yes No	Screened Interval:		Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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PURGING DATA


Purge Method:	BP				Pump Intake Depth:	MS				
Sampling Method:	LF				Tubing Material & Type:	LDPE			NEW / CREDITED	
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0745			28.80	0.25	7.71	12.06	297	9.17	-3.1	clear
0748			28.89	↓	7.60	12.96	301	3.02	-152.1	↓
0751			28.90	↓	7.72	12.91	303	2.05	-165.1	↓
0754			28.79	↓	7.82	12.87	305	1.60	-146.1	↓
0757			28.80		7.80	12.57	305	1.55	-171.2	

PURGING DATA

Sample ID:	MW-24d	Sampling Flow Rate:	0.25	Analytical Laboratory:	Apex	
Sample Time:	0800	Final Depth to Water:	28.80	Did Well Dewater:	NO	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3 X 40ml	HCl		N			
1 X 250	H2SO4		↓			
1 X 250	-		↓			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

	Well ID:	MW-211-105	Job Number:	
	Client:	Mustar Van	Date:	12/6
	Project:	4Q18	Sampler:	LW
	Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	<input checked="" type="radio"/> Flush-mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	-
	<input type="radio"/> Other:	Well Depth:	-	Free Product Thickness:	-
Monument Condition:		Depth to Water:	29.34	Water Column Length:	-
Well Cap Lock Present:	<input checked="" type="radio"/> Yes <input type="radio"/> No	Screened Interval:	-	Purge Volume:	-

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:		BP		Pump Intake Depth:		MS		NEW / <input checked="" type="radio"/> RELOCATED		
Sampling Method:		LF		Tubing Material & Type:		LDPE				
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1041			29.34	0.2	6.90	8.78	277	7.54	35.5	clear
1044			29.35		7.05	9.87	301	7.61	27.6	
1047			29.34		7.05	10.72	278	7.67	40.2	
1050			29.35		6.70	10.98	249	4.83	49.2	
1051			29.36		6.16	12.48	239	2.30	73.5	
1053			29.38		6.27	12.72	238	1.37	61.4	
1056			29.39		6.49	12.71	240	1.31	43.8	
1059			29.41		6.53	12.71	240	1.28	41.6	

PURGING DATA

Sample ID:	MW-211-105	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex	
Sample Time:	1050	Final Depth to Water:	29.43	Did Well Dewater:	No	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3x 100mL	HCl		N			
1x 250mL	H2SO4					
1x 250mL	-					

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	MW-19i	Job Number:	
Client:	NUNSTAR VAN	Date:	12/6
Project:	LQ18	Sampler:	LV
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush mount/Stick-up	Well Diameter:	2"	Depth to Free Product:	-
	Other:	Well Depth:	-	Free Product Thickness:	-
Monument Condition:	Good	Depth to Water:	29.18	Water Column Length:	-
Well Cap Lock Present:	Yes No	Screened Interval:	-	Purge Volume:	-

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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PURGING DATA

Purge Method:	BP	Pump Intake Depth:	M.S
Sampling Method:	LF	Tubing Material & Type:	LDPE NEW / DEDICATED

Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1147			29.18	0.2	6.92	11.32	214	9.33	21.5	clear
1150			29.19	↓	6.87	10.51	199	5.56	23.1	↓
1153			29.21	↓	6.75	11.56	194	4.34	17.1	
1156			29.21	↓	6.86	11.83	194	2.05	-43.8	
1159			29.21	↓	6.86	11.92	194	1.60	-19.1	
1202			29.21	↓	6.85	11.90	194	1.21	-26.7	
1205			29.21	↓	6.86	11.92	194	1.10	-28.2	

PURGING DATA

Sample ID:	MW-19i	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex	
Sample Time:	12/10	Final Depth to Water:	29.21	Did Well Dewater:	NO	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3 X 40mL	H21		N			
1 X 200mL	H2504		↓			
1 X 200mL	-					

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Cascadia
Associates, LLC

Well ID:	<i>mw-20i</i>	Job Number:	
Client:	<i>Nw State VAN</i>	Date:	<i>12/16</i>
Project:	<i>4018</i>	Sampler:	<i>LW</i>
Weather:	<i>Sunny</i>	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	<i>2"</i>	Depth to Free Product:	<i>-</i>
	Other:	Well Depth:	<i>-</i>	Free Product Thickness:	<i>-</i>
Monument Condition:	<i>good</i>	Depth to Water:	<i>28.43</i>	Water Column Length:	<i>-</i>
Well Cap Lock Present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Screened Interval:	<i>-</i>	Purge Volume:	<i>-</i>

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):
 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA


Purge Method:	<i>BP</i>				Pump Intake Depth:	<i>MS</i>					
Sampling Method:	<i>LP</i>				Tubing Material & Type:	<i>LDPE</i>			NEW / DEDICATED		
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks	
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV		
<i>1340</i>			<i>28.42</i>	<i>0.2</i>	<i>6.77</i>	<i>12.34</i>	<i>190</i>	<i>5.07</i>	<i>18.3</i>	<i>clear</i>	
<i>1343</i>			<i>28.41</i>	↓	<i>6.80</i>	<i>12.97</i>	<i>207</i>	<i>1.80</i>	<i>7.2</i>	↓	
<i>1346</i>			<i>28.40</i>	↓	<i>6.79</i>	<i>13.07</i>	<i>210</i>	<i>1.11</i>	<i>5.8</i>	↓	
<i>1349</i>			<i>28.34</i>	↓	<i>6.79</i>	<i>13.03</i>	<i>210</i>	<i>0.98</i>	<i>2.3</i>	↓	
<i>1352</i>			<i>28.31</i>	↓	<i>6.77</i>	<i>13.21</i>	<i>212</i>	<i>0.90</i>	<i>1.4</i>	↓	

PURGING DATA

Sample ID:	<i>mw-20i</i>	Sampling Flow Rate:	<i>0.2</i>	Analytical Laboratory:	<i>Apix</i>	
Sample Time:	<i>1350</i>	Final Depth to Water:	<i>28.28</i>	Did Well Dewater:	<i>NO</i>	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
<i>3x40</i>	<i>H2O</i>		<i>N</i>			
<i>1x250</i>	<i>H2SO4</i>		↓			
<i>1x250</i>	<i>-</i>		↓			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

 Cascadia Associates, LLC	Well ID:	MW-16	Job Number:	
	Client:	Nustar VAN	Date:	12/6
	Project:	4018	Sampler:	LW
	Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	-
	Other:	Well Depth:	-	Free Product Thickness:	-
Monument Condition:	good	Depth to Water:	27.87	Water Column Length:	-
Well Cap Lock Present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Screened Interval:	-	Purge Volume:	-

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:		BP		Pump Intake Depth:		NS				
Sampling Method:		LF		Tubing Material & Type:		HDPE		NEW / <input checked="" type="checkbox"/> DEDICATED		
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1438			27.89	0.2	6.56	11.57	511	4.72	17.6	clear
1441			27.85	↓	6.42	11.52	526	3.32	22.8	↓
1444			27.80	↓	6.37	11.48	516	2.59	24.1	↓
1447			27.80	↓	6.37	11.33	502	2.84	25.3	↓
1450			27.80	↓	6.37	11.17	501	2.94	25.1	↓

PURGING DATA

Sample ID:	MW-16	Sampling Flow Rate:	0.2	Analytical Laboratory:	Agave
Sample Time:	1500	Final Depth to Water:	27.80	Did Well Dewater:	NO
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD
3x40 mL	HCl				
1x250	H2SO4				
1x250	-				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Well ID:	MW-23i	Job Number:	
Client:	Nuster VAA	Date:	12/16
Project:	4018	Sampler:	LW
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush mount/Stick-up	Well Diameter:	24	Depth to Free Product:	-
	Other:	Well Depth:	-	Free Product Thickness:	-
Monument Condition:	Good	Depth to Water:	28.83	Water Column Length:	-
Well Cap Lock Present:	Yes No	Screened Interval:	-	Purge Volume:	-

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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PURGING DATA

Purge Method:		Sampling Method:			Pump Intake Depth:		NEW / DEDICATED			
DP		LF			MS		LDPE			
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0810			28.80	0.2	8.68	8.67	129	16.90	66.8	clear
0813			28.81	↓	9.50	9.50	134	14.67	59.2	↓
0816			28.81		7.19	10.48	140	12.70	47.4	
0819			28.82		7.18	10.66	141	12.41	46.1	
0822			28.84		7.13	11.12	144	11.90	40.5	
0825			28.86		7.12	11.57	147	11.49	36.5	
0828			28.86		7.11	11.55	149	11.42	32.6	
0831			28.86		7.11	11.56	149	11.26	30.9	

PURGING DATA

Sample ID:	MW-23i	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex	
Sample Time:	0830	Final Depth to Water:	28.86	Did Well Dewater:	N/O	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3 X 40mL	H21		N			
1 X 250mL	H2504		N			
1 X 250mL	-		N			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Well ID:	S-1	Job Number:	
Client:	WUSTAR VAN	Date:	12/5/18
Project:	0018	Sampler:	LV
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush mount/Stick-up	Well Diameter:		Depth to Free Product:	
	Other:	Well Depth:		Free Product Thickness:	
Monument Condition:	gouge	Depth to Water:	28.25	Water Column Length:	
Well Cap Lock Present:	Yes No	Screened Interval:		Purge Volume:	

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA


Purge Method:	BP				Pump Intake Depth:	MS				
Sampling Method:	LF				Tubing Material & Type:	LDPE			NEW / DEDICATED	
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1025			28.31	0.2	7.16	12.88	180	13.39	81.7	clear
1028			28.31	↓	7.03	12.81	177	9.95	83.5	↓
1031			↓	↓	6.95	12.74	176	9.02	83.4	↓
1034			↓	↓	6.90	12.74	174	8.75	82.7	↓
1037			↓	↓	6.88	12.80	173	8.72	81.5	↓

PURGING DATA

Sample ID:	S-1	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex	
Sample Time:	1040	Final Depth to Water:	28.31	Did Well Dewater:	NO	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3X40ml	HCl					
1X250						
1X250	H2SO4					

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

	Well ID: MW-19	Job Number:	
	Client: Mustang View	Date: 12/15/18	
	Project: 4Q18	Sampler: LW	
	Weather: Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:		Depth to Free Product:	
	Other:	Well Depth:	—	Free Product Thickness:	
Monument Condition:	Sound	Depth to Water:	28.49	Water Column Length:	
Well Cap Lock Present:	Yes No	Screened Interval:	—	Purge Volume:	

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:		BSF		Pump Intake Depth:		MS		NEW / DEDICATED			
Sampling Method:		LP		Tubing Material & Type: LDPE							
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks	
						+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0821			28.94	0.25	6.71	13.39	2005	9.04	-18.1	cloudy	
0824			28.96		6.85	13.86	2083	9.13	-27.5		
0827			28.98		6.87	14.38	2175	6.68	-23.7		
0830			28.99		6.86	14.32	2218	6.02	-32.9		
0833			28.99		6.85	14.30	2295	5.27	-30.5		
0836			28.99		6.85	14.29	2305	5.18	-30.1		
0839			28.99		6.84	14.31	2312	5.11	-29.9		

PURGING DATA

Sample ID: MW-19	Sampling Flow Rate: 0.3	Analytical Laboratory: Apex	
Sample Time: 0835	Final Depth to Water: 28.91	Did Well Dewater: No	
No. of Containers/Type	Preservative	Analysis/Method	Duplicate ID
2 x 250 mL	H ₂ SO ₄		MW-19 DuP
2 x 250 mL			MW-19 DuP
6 x 40 mL	H ₂ O		MW-19 DuP
2 x 40 mL	H ₂ O		

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Well ID:	MW-13	Job Number:	
Client:	Nustar Ken	Date:	12/5/18
Project:	4018	Sampler:	LN
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4.11	Depth to Free Product:	-
	Other:	Well Depth:	-	Free Product Thickness:	-
Monument Condition:	Soot	Depth to Water:	28.11	Water Column Length:	-
Well Cap Lock Present:	Yes No	Screened Interval:	-	Purge Volume:	-

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA


Purge Method:		BP			Pump Intake Depth:		MS			
Sampling Method:		LF			Tubing Material & Type:		LDPE NEW / REPLICATED			
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0922			28.11	0.3	6.80	11.74	1169	15.78	-141.9	cloudy
0925			28.41	0.3	6.65	13.00	1201	10.17	-144.2	cloudy
0928			28.64	0.3	6.57	13.47	1183	8.25	-140.1	cloudy
0931			28.71	0.2	6.53	11.75	1140	8.57	-137.1	
0934			28.74		6.51	11.18	1097	8.16	-133.3	
0937			28.79		6.50	11.30	1091	7.74	-131.1	
0940			28.83		6.50	11.36	1092	7.71	-130.6	

PURGING DATA

Sample ID:	MW-13	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex	
Sample Time:	0940	Final Depth to Water:	29.09	Did Well Dewater:	NO	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
5X 40mL	H2I		N			
1X 750mL	H2SO4		N			
1X 750mL	-		N			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

 Cascadia Associates, LLC	Well ID: <u>MW-26</u>	Job Number:	
	Client: <u>Nectar VAN</u>	Date: <u>12.15</u>	
	Project: <u>4018</u>	Sampler: <u>LW</u>	
	Weather: <u>Sunny</u>	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up <u>Other:</u>	Well Diameter: <u>2"</u>	Depth to Free Product: <u>—</u>
Monument Condition:	<u>good</u>	Well Depth: <u>28.70</u>	Free Product Thickness: <u>—</u>
Well Cap Lock Present:	<u>Yes</u> No	Depth to Water: <u>28.70</u>	Water Column Length: <u>—</u>
		Screened Interval: <u>—</u>	Purge Volume: <u>—</u>

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA


Purge Method:		<u>BP</u>		Pump Intake Depth:		<u>M/S</u>				
Sampling Method:		<u>LF</u>		Tubing Material & Type:		<u>LDPE</u>				
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1320			28.70	0.25	6.69	14.52	3112	11.29	55.4	clear
1323			28.74		6.60	14.83	3163	7.61	51.4	↓
1326			28.72		6.53	14.81	2727	6.03	45.6	
1329			28.74		6.50	14.73	2464	5.15	41.1	
1332			28.74		6.48	14.82	2365	4.70	39.1	
1335			28.71		6.45	14.86	2284	4.40	37.5	
1338			28.72		6.45	15.02	2263	4.25	36.6	
1341			28.71		6.44	15.07	2257	4.16	36.5	

PURGING DATA

Sample ID: <u>MW-26</u>	Sampling Flow Rate: <u>0.25</u>	Analytical Laboratory: <u>APEX</u>				
Sample Time: <u>1340</u>	Final Depth to Water: <u>28.71</u>	Did Well Dewater: <u>No</u>				
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
<u>5 x 40ml</u>	<u>HCl</u>		<u>N</u>			
<u>1 x 250ml</u>	<u>—</u>		<u>N</u>			
<u>1 x 250ml</u>	<u>H2SO4</u>		<u>N</u>			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

 Cascadia Associates, LLC	Well ID: <i>MW-22i</i>	Job Number:
	Client: <i>Nuster VAN</i>	Date: <i>12/15</i>
	Project: <i>4018</i>	Sampler: <i>LM</i>
	Weather: <i>sunny</i>	Time In/Out:

WELL DATA

Monument Type:	Flush mount /Stick-up	Well Diameter:	<i>2"</i>	Depth to Free Product:	<i>—</i>
	Other:	Well Depth:	<i>—</i>	Free Product Thickness:	<i>—</i>
Monument Condition:	<i>good</i>	Depth to Water:	<i>29.06</i>	Water Column Length:	<i>—</i>
Well Cap Lock Present:	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Screened Interval:		Purge Volume:	<i>—</i>

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA


Purge Method: <i>BP</i>				Pump Intake Depth:				NEW / DEDICATED			
Sampling Method: <i>LF</i>				Tubing Material & Type: <i>LDPE</i>							
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks	
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV		
<i>1410</i>			<i>29.06</i>	<i>0.25</i>	<i>6.72</i>	<i>12.14</i>	<i>1211</i>	<i>15.82</i>	<i>34.7</i>	<i>clear</i>	
<i>1413</i>			<i>29.06</i>		<i>6.79</i>	<i>13.25</i>	<i>489</i>	<i>12.23</i>	<i>9.3</i>		
<i>1416</i>			<i>29.04</i>		<i>6.70</i>	<i>13.57</i>	<i>421</i>	<i>10.02</i>	<i>-7.0</i>		
<i>1419</i>			<i>29.01</i>		<i>6.67</i>	<i>14.07</i>	<i>363</i>	<i>4.70</i>	<i>-19.0</i>		
<i>1422</i>			<i>28.99</i>		<i>6.60</i>	<i>14.41</i>	<i>357</i>	<i>3.37</i>	<i>-37.5</i>		
<i>1425</i>			<i>28.99</i>	↓	<i>6.58</i>	<i>14.40</i>	<i>358</i>	<i>2.81</i>	<i>-39.6</i>		
<i>1428</i>			<i>28.98</i>	↓	<i>6.56</i>	<i>14.41</i>	<i>358</i>	<i>2.74</i>	<i>-43.2</i>		
<i>1431</i>			<i>28.99</i>	↓	<i>6.55</i>	<i>14.51</i>	<i>360</i>	<i>2.63</i>	<i>-46.6</i>		

PURGING DATA

Sample ID:	<i>MW-22i</i>	Sampling Flow Rate:	<i>0.25</i>	Analytical Laboratory:	<i>APX</i>
Sample Time:	<i>1430</i>	Final Depth to Water:	<i>28.94</i>	Did Well Dewater:	<i>NO</i>
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD
<i>3x40mL</i>	<i>HCl</i>				
<i>1x7.50mL</i>	<i>H2SO4</i>				
<i>1x7.50mL</i>	<i>—</i>				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

	Well ID: <u>MW-24i</u>	Job Number:	
	Client: <u>NuStar Van</u>	Date: <u>12/4/18</u>	
	Project: <u>4Q18</u>	Sampler: <u>JMLW</u>	
	Weather: <u>Sunny</u>	Time In/Out:	

WELL DATA

Monument Type:	<u>Flush-mount/Stick-up</u>	Well Diameter:	<u>2"</u>	Depth to Free Product:	-
	Other:	Well Depth:	-	Free Product Thickness:	-
Monument Condition:	<u>good</u>	Depth to Water:	<u>28.89</u>	Water Column Length:	-
Well Cap Lock Present:	<input checked="" type="radio"/> Yes <input type="radio"/> No	Screened Interval:	-	Purge Volume:	-

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:		<u>BP</u>			Pump Intake Depth:		<u>MS</u>			
Sampling Method:		<u>LF</u>			Tubing Material & Type:		<u>Ded. LDPE</u>		NEW / <u>DEDICATED</u>	
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
<u>0804</u>			<u>28.72</u>	<u>0.2</u>	<u>7.60</u>	<u>11.04</u>	<u>251</u>	<u>10.80</u>	<u>31.8</u>	<u>clear</u>
<u>0807</u>			<u>28.85</u>		<u>7.01</u>	<u>12.77</u>	<u>205</u>	<u>6.72</u>	<u>-9.5</u>	
<u>0810</u>			<u>28.87</u>		<u>6.95</u>	<u>13.07</u>	<u>187</u>	<u>6.18</u>	<u>-13.2</u>	
<u>0813</u>			<u>28.87</u>		<u>6.91</u>	<u>13.05</u>	<u>178</u>	<u>5.74</u>	<u>-7.7</u>	
<u>0816</u>			<u>28.90</u>		<u>6.88</u>	<u>13.13</u>	<u>173</u>	<u>5.28</u>	<u>-7.6</u>	
<u>0819</u>			<u>28.91</u>	↓	<u>6.87</u>	<u>12.96</u>	<u>170</u>	<u>5.24</u>	<u>-6.9</u>	↓

PURGING DATA

Sample ID:	<u>MW-24i</u>	Sampling Flow Rate:	<u>0.2</u>	Analytical Laboratory:	<u>Apex</u>
Sample Time:	<u>0820</u>	Final Depth to Water:	<u>29.00</u>	Did Well Dewater:	<u>NO</u>
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD
<u>3 X 40mL</u>	<u>HCl</u>	<u>VOCs</u>	<u>N</u>		
<u>1 X 250</u>	-	<u>Nitrate/Nitrite</u>	<u>N</u>		
<u>1 X 250</u>	<u>H2SO4</u>	<u>Ammonia</u>	<u>N</u>		

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Well ID:	MP-1	Job Number:	
Client:	NuStar Jan	Date:	12/4/18
Project:	4Q18	Sampler:	JMILN
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick up	Well Diameter:	2"	Depth to Free Product:	
	Other: good	Well Depth:		Free Product Thickness:	
Monument Condition:		Depth to Water:	28.74	Water Column Length:	
Well Cap Lock Present:	(Yes) No	Screened Interval:		Purge Volume:	

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal):	1-inch well = 0.041	2-inch = 0.162	4-inch = 0.653	1 gal = 3.785 liters
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PURGING DATA

Purge Method:	BP				Pump Intake Depth:	MS				
Sampling Method:	LF				Tubing Material & Type:	LDPE		NEW / DEDICATED		
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
0844			28.74	0.2	6.74	10.54	168	5.08	12.7	clear
0847			29.05		6.64	13.04	669	3.36	41.1	
0850			28.96		7.00	14.01	870	2.28	2.9	
0853			28.99		7.02	14.27	991	2.12	-16.8	
0856			29.02		7.01	14.35	998	2.26	-20.0	
0859			29.02		7.01	14.41	1020	2.28	-22.7	

PURGING DATA

Sample ID:	MP-1	Sampling Flow Rate:	0.2	Analytical Laboratory:	APX	
Sample Time:	0900	Final Depth to Water:	28.90	Did Well Dewater:	NO	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
1X250	H2SO4	Ammonia	N			
1X250	-	Nitrate	N			
3X40	H2I	VOLs	N			
2X40	H2I	ethene	N			

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET



Well ID:	EX-1	Job Number:	
Client:	Master Van	Date:	12/4
Project:	4018	Sampler:	JM/LW
Weather:	Sunny	Time In/Out:	

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	4"	Depth to Free Product:	
	Other:	Well Depth:		Free Product Thickness:	
Monument Condition:	Good	Depth to Water:	28.40	Water Column Length:	
Well Cap Lock Present:	Yes <input checked="" type="checkbox"/>	Screened Interval:		Purge Volume:	

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:	BP	Pump Intake Depth:	ms
Sampling Method:	LF	Tubing Material & Type:	LDAE


Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
0925			28.60	0.2	7.10	12.07	1205	5.73	171.1	clear
0928			28.81		7.26	15.82	1473	4.47	118.0	
0931			28.90		7.30	16.42	1491	4.80	108.8	
0934			28.99		7.36	16.89	1542	5.46	26.0	
0937			29.01		7.36	16.95	1552	5.58	152.0	
0940			28.90	↓	7.37	16.93	1562	5.80	10.0	↓

PURGING DATA

Sample ID:	EX-1	Sampling Flow Rate:	0.2	Analytical Laboratory:	Apex	
Sample Time:	0940	Final Depth to Water:	28.90	Did Well Dewater:	NO	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3 X 40mL	HCl	VOCS	N			
1 X 250		Nitrate/N, mp				
1 X 250	H2SO4	Ammonia TOL				
2 X 40mL	HCl	Ethanolene				

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

 Cascadia Associates, LLC	Well ID: <u>MGMS1-40</u>	Job Number:	
	Client: <u>Nustare Jan</u>	Date: <u>12/14</u>	
	Project: <u>4018</u>	Sampler: <u>JMLW</u>	
	Weather: <u>Sunny</u>	Time In/Out:	

WELL DATA

Monument Type:	<input checked="" type="checkbox"/> Flush mount/Stick-up	Well Diameter:	—	Depth to Free Product:	—
	Other:	Well Depth:	—	Free Product Thickness:	—
Monument Condition:	<u>good</u>	Depth to Water:	<u>28.20</u>	Water Column Length:	—
Well Cap Lock Present:	Yes <input checked="" type="checkbox"/> No	Screened Interval:		Purge Volume:	—

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA


Purge Method:		<u>BP/PP</u>			Pump Intake Depth:		<u>MS</u>			
Sampling Method:		<u>LF</u>			Tubing Material & Type:		<u>LDPE</u> NEW / <input checked="" type="checkbox"/> DEDICATED			
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
<u>1025</u>			<u>28.30</u>	<u>0.2</u>	<u>6.90</u>	<u>11.93</u>	<u>2374</u>	<u>11.04</u>	<u>20.1</u>	<u>clear</u>
<u>1028</u>			<u>28.08</u>		<u>6.75</u>	<u>12.37</u>	<u>2472</u>	<u>9.33</u>	<u>2.4</u>	
<u>1031</u>			<u>28.26</u>		<u>6.71</u>	<u>12.63</u>	<u>2526</u>	<u>8.75</u>	<u>-2.1</u>	
<u>1034</u>			<u>28.30</u>	<u>0.15</u>	<u>6.70</u>	<u>12.59</u>	<u>2527</u>	<u>8.54</u>	<u>-1.5</u>	
<u>1037</u>			<u>28.11</u>	↓	<u>6.69</u>	<u>12.59</u>	<u>2530</u>	<u>8.31</u>	<u>-2.0</u>	↓

PURGING DATA

Sample ID:	<u>MGMS1-40</u>	Sampling Flow Rate:	<u>0.15</u>	Analytical Laboratory:	<u>Apex</u>	
Sample Time:	<u>1040</u>	Final Depth to Water:	<u>28.06</u>	Did Well Dewater:	<u>No</u>	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
<u>3x40ml</u>	<u>H2O1</u>	<u>VUCS</u>	<u>N</u>			
<u>1x250ml</u>	<u>H2504</u>					
<u>1x250ml</u>	—					
<u>2x40ml</u>	<u>H2O1</u>					

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

	Well ID: <u>M4ms1-60</u>	Job Number:
	Client: <u>Nystrae Van</u>	Date: <u>12/14</u>
	Project: <u>4Q18</u>	Sampler: <u>LW GJM</u>
	Weather: <u>Sunny</u>	Time In/Out:

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	-	Depth to Free Product:	-
	Other:	Well Depth:		Free Product Thickness:	-
Monument Condition:	<u>Good</u>	Depth to Water:	<u>28.85</u>	Water Column Length:	-
Well Cap Lock Present:	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Screened Interval:	-	Purge Volume:	

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA


Purge Method: <u>Ded. PP PP</u>		Pump Intake Depth: <u>MS</u>								
Sampling Method: <u>LC</u>		Tubing Material & Type: <u>LDPE</u>								
		NEW / DEDICATED								
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5 °C	+/-5%	+/-0.5 ppm	+/-20 mV	
1056			28.85	0.15	7.54	10.12	12	22.15	113.5	clear
1059			28.85		7.52	9.90	11	21.92	135.9	
1102			28.84		7.51	9.68	11	21.50	134.0	
1105			28.82		7.63	12.71	307	16.78	109.3	
1108			28.87		7.45	12.88	194	8.05	25.0	
1111			28.91		7.35	13.19	162	7.05	2.5	
1114			28.93		7.24	13.19	154	6.70	-2.0	
1117			28.95		7.24	13.26	153	6.56	-3.3	

PURGING DATA

Sample ID: <u>M4ms1-60</u>	Sampling Flow Rate: <u>0.15</u>	Analytical Laboratory: <u>APLX</u>				
Sample Time: <u>1110</u>	Final Depth to Water: <u>28.95</u>	Did Well Dewater: <u>No</u>				
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
3X40L	H2I		<u>N</u>			
1X250	H2SO4					
1X250	-					

NOTES/ADDITIONAL COMMENTS

WELL MONITORING DATA SHEET

	Well ID: <u>MW-12</u>	Job Number:
	Client: <u>Nustar JAW</u>	Date: <u>12/4</u>
	Project: <u>UQIP</u>	Sampler: <u>LW</u>
	Weather: <u>Sunny</u>	Time In/Out:

WELL DATA

Monument Type:	Flush-mount/Stick-up	Well Diameter:	<u>4"</u>	Depth to Free Product:	<u>—</u>
	Other:	Well Depth:	<u>—</u>	Free Product Thickness:	<u>—</u>
Monument Condition:		Depth to Water:	<u>26.5</u>	Water Column Length:	<u>—</u>
Well Cap Lock Present:	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Screened Interval:	<u>—</u>	Purge Volume:	<u>—</u>

Comments:

Purge Volume = (Water Height) X (Multiplier) X (# Casing Volumes)

Water height multipliers (gal): 1-inch well = 0.041 2-inch = 0.162 4-inch = 0.653 1 gal = 3.785 liters

PURGING DATA

Purge Method:		Tubing Material & Type:		NEW / DEDICATED						
Time	Volume Purged (liters)	Cumulative Volume Purged (liters)	DTW (btc)	Purge Rate (L/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5°C	+/-5%	+/-0.5 ppm	+/-20 mV	
1356			26.71	0.25	6.65	15.65	1778	12.76	-36.6	Cloudy
1359			26.74		6.47	15.48	1852	7.49	-31.5	
1402			26.80		6.44	15.44	1858	7.05	-29.6	
1405			26.83		6.45	15.38	1869	6.01	-29.6	
1408			26.88		6.46	15.26	1869	5.55	-30.8	
1411			26.95	↓	6.46	15.32	1869	5.51	-30.5	↓

PURGING DATA

Sample ID:	<u>MW-12</u>	Sampling Flow Rate:	<u>0.25</u>	Analytical Laboratory:	<u>Apex</u>	
Sample Time:	<u>1410</u>	Final Depth to Water:	<u>27.57</u>	Did Well Dewater:	<u>—</u>	
No. of Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
<u>6x40mL</u>	<u>H2I</u>		<u>N</u>		<u>✓</u>	<u>MW-12 Dup</u>
<u>4x40mL</u>	<u>H2I</u>				<u>✓</u>	
<u>2x250</u>	<u>H2SO4</u>				<u>✓</u>	
<u>2x250</u>	<u>—</u>				<u>✓</u>	

NOTES/ADDITIONAL COMMENTS

VOCS, Ammonia, nitrate, ethane,

7/23/18 NuStar Vancouver

OAM

Joel M + Lindsay W

0700: Orientation / Safety / work permits

0830: OAM & SVE measurements

Pressures:

	PID
Pre Blower:	-18 30.0
Post Blower:	29 34.5
Post Carbon 1:	17 37.5
Post Carbon 2:	7 37.3

No Water in Knock out drum
Knock out drum inspected for holes/
material deteriorations.

SVE - South - pre-carbon - ~~72318~~

Int. Vac: -30

Final Vac: -1

Time: 0845

Can #: 0845

SVE - Su.H. - 72318 - Pre Carbon

SVE - South - Post Carbon - 72318

Int. Vac: -30

Final Vac: -5

Time: 0855

Can: 0124

~~System Running & departure~~

Y. Tolson
10. Tolson
11. Tolson
12. Tolson
13. Tolson
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29. Tolson
30. Tolson



DAILY FIELD REPORT

Job No. 0060-001-003			
Report By: Lindsay Wallis			
Date of Work: 11/7/18			
Project Name and Address Nustar Vancouver	Client/Owner: Nustar	Page	of 1 / 1
	Project Manager: Stephanie S	Weather	Overcast
Description of Work: SVE O&M			
Field Staff: LW			
Report: 0645 - LW arrived on site			
0700 - Safety meeting			
0720 - Got work permit			
0730 - Collected pressure & PID readings from pre blower, post blower, post Carbon 1, post Carbon 2			
0815 - Collected samples: SVE-South-Pre Carbon-110718 and SVE-South-Post Carbon-110718			
0900 - Collected IDW sample for VOC analysis from 55 gal drum in Haz waste area			
0915 - Turned in work permit, signed out			
0920 - LW off site			
Site Status:			
Drum Inventory (Quantity, Media, Location On-Site):			
Time of Arrival On-Site: 0645	Total Mileage:		
Time of Departure from Site: 0920			
Attachments: —			

Nustar Vancouver SVE System Monitoring

11/7, overcast, LW

South SVE system:
system running on arrival (0730)

	Pressure	PID(+)	PID(-)
Pre Blower	-18	-	3.0
Post blower-Pre C	30	22.9	-
Post Carbon 1	17	20.7	-
Post Carbon 2	6	19.6	-

Knockout drum inspected - no holes or
deteriorations.

Sampling Info:

SVE South - Pre Carbon - 10718, Δ -1062,
 $P_i = -30$ $T_i = 0805$ $P_f = -1$
 $T_f = 0820$

SVE South - Post Carbon - 110718, Δ 8234,
 $P_i = -30$ $T_i = 0828$ $P_f = -5$
 $T_f = 0829$



DAILY FIELD REPORT

Job No.			
Report By: <i>LW</i>			
Date of Work: <i>1/4/19</i>			
Project Name and Address <i>Nustar VANCOUVER</i>		Client/Owner: <i>Nustar</i>	Page of <i>1 2</i>
		Project Manager: <i>Stephanie S</i>	Weather <i>overcast</i>

Description of Work: *SVE O+M*

Field Staff: *LW*

Report: *0645-LW arrived onsite*
0700-Safety meeting; received work permit (274546)
0730- Collected Pressure & PID readings site

	Pressure	PID (+)	PID (-)
Pre Blower	-24	-	0.5
Post Blower-Pre C	28	27.3	-
Post Carbon 1	16	27.4 23.4	-
Post Carbon 2	6	24.3 22.4	-

*Knock out drum: Blue water present (~15 gals).
 Emptied and put into new 55-gal drum in the
 waste disposal area at Facility.*

Site Status:

Drum Inventory (Quantity, Media, Location On-Site):

Time of Arrival On-Site:	Total Mileage:
Time of Departure from Site:	

Attachments:



DAILY FIELD REPORT

Job No.			
Report By: LW			
Date of Work: 1/4/19			
Project Name and Address Nustar Van		Client/Owner: Nustar	Page of 2 2
		Project Manager: Stephanie S	Weather Overcast
Description of Work: SVE O&M (cont.)			
Field Staff: LW			
Report: 0800- Took samples:			
SVE - South-Pre Carbon - 010419 (34000426)			
Pi = -30, Ti = 0814, Pf = -1, Tf = 0815			
SVE - South-Post Carbon - 010419 (34000477)			
Pi = -30, Ti = 0804, Pf = -5, Tf = 0805			
0830 - Checked SVE vaults for source of water in knockout drum.			
VE-9-4: Former gurgling, standing water present.			
VE-1-2: Standing water, sloshing sand in flexible pipe			
VE-10-1 & VE-10-2: Cant access - bolts stripped			
VE-1-1, VE-1-3, VE-1-4, VE-3-1, VE-3-2, VE-3-3, VE-3-4:			
Vault dry - no standing water.			
VE-9-2, VE-9-3, VE-9-1, VE-10-3: Some standing water			
but below horizontal pipe; no gurgling when system on.			
1045 - Left system as it was upon arrival - on except			
1100 - Turn for VE-9-4 branch off. Also closed VE-1-2			
individually but left that side of system on.			
1100 - Turned in work permit, left site			

APPENDIX B

HISTORICAL GROUNDWATER ANALYTICAL DATA

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-1	11/17/93	--	500	--	--	<250	<250	--	14,000	--	--	750	<250	--	1,400	<500
	09/01/95	<250	<500	<250	<250	<250	<250	<250	13,000	<250	<250	620	<250	--	890	610
	09/24/96	<5	<20	<2	<2	54	<2	8.4	11,000	83	17	2,600	68	--	1,800	420
	12/02/96	0.8	<0.50	<0.50	<0.20	6.7	<0.50	0.3	1,500	4.4	<0.20	1,200	7.3	--	310	1.6
	11/12/97	<125	<250	<125	<125	<125	<125	<125	11,600	<125	<125	6,330	<125	--	2,880	<250
	08/11/99	<50	<250	<25	<250	43.1	<25	<25	8,590	86	<25	2,520	52.5	--	1,210	408
	11/16/99	<50	<125	<25	<50	38	<25	<25	6,250	47.5	<25	2,400	28	--	829	148
	02/29/00	<100	<500	<50	<50	<50	<50	<50	6,720	60.9	<50	1,370	<100	--	590	438
	06/27/00	<100	<500	<50	<50	<50	<50	<50	6,480	65.1	<50	1,780	<100	--	795	284
	08/31/00	<100	<500	<50	<50	<50	<50	<50	5,160	<50	<50	1,960	<100	--	720	<50
	11/30/00	<20	<100	<10	<10	15	<10	<10	1,550	12.7	<10	660	<20	--	234	<10
	02/27/01	<100	<100	<50	<50	<50	<50	<50	4,990	<50	<50	1,140	<100	--	440	190
	05/29/01	<50	<250	<25	<25	<25	<25	<25	4,050	<25	<25	1,040	<50	--	407	91
	09/25/01	<50	<50	<50	<50	<50	<50	<50	5,000	<50	<50	890	<50	--	440	240
	12/17/01	<2	<10	<1	<1	<1	<1	<1	109	1.26	<1	164	<2	--	42.9	<1
	03/19/02	<50	<25	<25	<50	35	<25	<25	4,120	35	<25	710	<25	--	349	170
	05/30/02	<10	<5	<5	<10	10.8	<5	<5	1,140	6.6	<5	307	<5	--	101	22.3
	11/08/02	<20	<10	<10	<20	22.8	<10	<10	1,980	20.2	<10	367	<10	--	174	14.4
	05/30/03	<20	<10	<10	<20	21.2	<10	<10	2,180	<10	<10	1,200	14.2	--	340	22.6
	11/02/04	<20	<10	<10	<20	22.4	<10	<10	2,130	23.6	<10	335	<10	--	169	22.8
	11/16/04	<12	<12	<12	<12	15	<12	<12	1,300	<12	<12	310	<12	--	130	<12
	05/18/05	<5	<2.5	<2.5	<5	12	<2.5	<2.5	773	14.1	<2.5	193	<2.5	--	87.6	3.8
	05/23/07	<10	<10	<10	<10	15.5	<10	<10	1,110	<10	<10	58.5	<10	--	45.4	11.7
	09/11/07	<50	<25	<25	<50	<25	<25	<25	916	<25	<25	34	<25	--	34	62.5
	12/13/07	<10	<5	<5	<10	9.7	<5	<5	526	5	<5	81.9	<5	--	45.4	8.8
	03/05/08	<1	<0.500	<0.500	<1	16.1	<0.500	1.66	826	9.18	2.3	49.7	0.88	<0.500	45.6	58.8
	09/19/08	<20	<10	<10	<20	20.4	<10	<10	633	<10	<10	108	<10	<10	74.8	<10
	12/10/08	<2.5	<2.5	<2.5	<2.5	15	<2.5	<2.5	570	6.2	<2.5	28	<2.5	<2.5	25	48
	03/27/09	<2.5	<2.5	<2.5	<2.5	17	<0.50	<2.5	580	5.7	<2.5	39	<2.5	<2.5	42	4.4
	06/17/09	<0.90	<0.90	<0.90	<0.90	6.3	<0.90	<0.90	310	3.6	0.99	21	<0.90	<0.90	14	9.7
	09/18/09	<0.80	<0.80	<0.80	<0.80	19	<0.80	<0.80	590	4.2	1.9	29	<0.80	<0.80	27	8.1
	12/17/09	<0.50	<0.50	<0.50	<0.50	4.8	<0.50	<0.50	170	0.72	0.67	53	0.53	<0.50	26	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-1	03/19/10	<0.50	<0.50	<0.50	<0.50	9.3	<0.50	0.61	300	3.6	1.4	22	<0.50	<0.50	21	26
(continued)	06/15/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.6	<0.50	<0.50	22	<0.50	<0.50	6.6	<0.50
	09/23/10	<0.90	<0.90	<0.90	<0.90	12	<0.90	<0.90	380	3.4	1.6	25	<0.90	<0.90	27	7.1
	12/09/10	<1.5	<1.5	<1.5	<1.5	7.1	1.5	<1.5	250	2.2	<1.5	25	<1.5	<1.5	17	8
	03/10/11	<1.5	<1.5	<1.5	<1.5	7.5	<1.5	<1.5	250	3	<1.5	16	<1.5	<1.5	16	18
	06/09/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	4.4	<0.5	<0.5	11	<0.5	<0.5	3.4	<0.5
	09/19/11	<1.5	<1.5	<1.5	<1.5	12	<1.5	<1.5	300	3.2	<1.5	5.2	<1.5	<1.5	13	30
	12/09/11	<1.5	<1.5	<1.5	<1.5	11	<1.5	<1.5	260	2.9	<1.5	6.2	<1.5	<1.5	8.4	40
	03/09/12	<0.50	<0.50	<0.50	<0.50	7.8	<0.50	<0.50	200	2.4	1	3.1	<0.50	<0.50	9.5	19
	06/22/12	<0.5	<0.5	<0.5	<0.5	4.8	<0.5	<0.5	140	1.7	0.53	17	<0.5	<0.5	13	14
	09/13/12	<1.5	<1.5	<1.5	<1.5	10	<1.5	<1.5	260	2.4	<1.5	<1.5	<1.5	<1.5	7	25
	12/13/12	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	47	0.64	<0.50	26	<0.50	<0.50	14	<0.50
	03/15/13	<0.50	<0.50	<0.50	<0.50	5.8	<0.50	<0.50	140	1.6	0.8	0.83	<0.50	<0.50	6	0.98
	06/13/13	<0.50	<0.50	<0.50	<0.50	7.2	<0.50	<0.50	130	1.9	0.63	1.1	<0.50	<0.50	2.4	28
	09/19/13	<0.50	<0.50	<0.50	<0.50	11	<0.50	<0.50	180	1.6	1	3.2	<0.50	<0.50	5.6	0.92
	12/16/13	<0.50	<0.50	<0.50	<0.50	7.8	<0.50	<0.50	110	1.8	<0.50	8.5	<0.50	<0.50	5.9	13
	3/21/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.1	<0.50	<0.50	10	<0.50	<0.50	4.3	<0.50
	6/25/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.6	45	1	<0.50	<0.50	<0.50	<0.50	0.65	5.9
	9/30/2014	<0.50	<0.50	<0.50	<0.50	11	<0.50	<0.50	170	1.3	0.83	12	<0.50	<0.50	9.7	3.3
	12/11/2014	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	<0.50	30	<0.50	<0.50	17	<0.50	<0.50	9.4	<0.50
	3/19/2015	<0.50	<0.50	<0.50	<0.50	6.2	<0.50	<0.50	47.4	0.67	<0.50	1.1	<0.50	<0.50	1.9	<5
	6/17/2015	<0.50	<0.50	<0.50	<0.50	9.5	<0.50	<0.50	75	0.8	<0.50	4.3	<0.50	<0.50	4.6	4.9
	9/24/2015	<0.50	<0.50	<0.50	<0.50	8.4	<0.50	<0.50	39.1	0.65	<0.50	2.8	<0.50	<0.50	2.4	32.7
	12/8/2015	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	25.2	<0.50	<0.50	18	<0.50	<0.50	8.9	<0.50
	3/7/2016	<0.50	<2	<5	<0.50	4.4	<0.50	<0.50	51.9	<0.50	<0.50	18	<0.50	<0.50	10.3	0.57
	6/15/2016	<0.50	<2	<0.50	<0.50	3.7	<0.50	<0.50	13.1	<0.50	<0.50	0.67	<0.50	<0.50	1.2	5.3
	9/27/2016	<0.50	<2	<0.50	<0.50	8.6	<0.50	<0.50	25.2	<0.50	<0.50	2.3	<0.50	<0.50	3.1	23.9
	12/16/2016	<0.50	<2	<0.50	<0.50	3.4	<0.50	<0.50	22.5	<0.50	<0.50	8	<0.50	<0.50	5.8	0.86
	3/30/2017	<0.50	<2	<0.50	<0.50	<0.5	<0.5	<0.50	1.6	<0.50	<0.50	4.6	<0.50	<0.50	1.6	<0.50
	6/12/2017	<2.0	<2.0	<0.50	<0.50	2.1	<1.0	<0.50	9.9	<0.50	<0.50	4.4	<0.50	<0.50	3.1	<0.50
	9/26/2017	<2.0	<2.0	<0.50	<0.50	6.8	<1.0	<0.50	6.7	<0.50	<0.50	1.5	<0.50	<0.50	1.6	22.6
	11/9/2017	<2.0	<2.0	<0.50	<0.50	5.00	<0.50	<0.50	22.80	<0.50	<0.50	9.50	<0.50	<0.50	6.50	1.1
	3/20/2018	<0.500	<2.50	<0.500	<0.500	4.84	<0.500	<0.500	6.13	<0.500	0.322 J	2.49	<0.500	<0.500	2.06	<0.500
	7/1/2018	<0.500	<2.50	<0.500	<0.500	6.70	<0.500	0.204 J	16.1	0.303 J	0.427 J	0.530	<0.500	<0.500	1.63	10.5
	9/25/2018	<1.00	<5.00	<1.00	<1.00	7.33	<0.400	0.740	44.9	0.610	0.510	4.24	<0.400	<0.500	8.09	3.19
	12/4/2018	<1.00	<5.00	<1.00	<1.00	4.73	<0.400	<0.400	22.7	<0.400	<0.500	15.700	<0.400	<0.500	9.04	2.57

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-2	11/17/93	--	51	--	--	12	<0.50	--	10	--	--	<0.50	<0.50	--	<0.50	<0.10
	09/01/95	<0.50	16	<0.50	<0.20	8.2	<0.50	<0.50	2.5	<0.50	<0.50	<0.50	<0.50	--	<0.50	2.2
	09/24/96	<0.50	19	<0.20	<0.20	9.6	0.5	<0.20	9.4	<0.20	<0.20	<0.20	<0.50	--	0.3	5.1
	12/02/96	<0.50	8.8	<0.50	<0.20	6.9	0.6	<0.20	11	<1	<0.20	<0.50	<1	--	<0.30	7.2
	11/13/97	<0.50	<1	<0.50	<0.50	5.32	0.571	<0.50	7.9	<0.50	<0.50	<0.50	<0.50	--	<0.50	<1
	08/11/99	<1	18.3	<0.50	<0.50	6.38	<0.50	<0.50	20	<0.50	<0.50	<0.50	<1	--	10.4	1.64
	02/29/00	<1	16	<0.50	<0.50	5.68	<0.50	<0.50	23.5	<0.50	<0.50	<0.50	<1	--	4.52	1.21
	06/27/00	<1	18.3	<0.50	<0.50	5.34	<0.50	1.27	23.4	<0.50	<0.50	12.8	<1	--	16.6	<0.50
	05/30/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1	--	<0.50	<0.50
	05/30/02	<1	1.68	<0.50	<1	2.65	<0.50	<0.50	0.51	<0.50	<0.50	0.61	<0.50	--	<0.50	<0.50
	11/08/02	<1	10.4	<0.50	<1	3.13	<0.50	<0.50	1.84	<0.50	<0.50	1.05	<0.50	--	0.98	<0.50
	05/30/03	<1	3.64	<0.50	<1	1.95	<0.50	<0.50	0.59	<0.50	<0.50	6.6	<0.50	--	1.13	<0.50
	09/12/07	<1	5.9	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	03/07/08	<1	7.86	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.5	<0.500	<0.500	<0.500	<0.500
	09/18/08	<1	5.93	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	03/24/09	<0.50	4.8	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/16/09	<0.50	5.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	0.85	<0.50
	03/19/10	<0.50	5.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/23/10	<0.5	3.8	<0.50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	03/09/11	<0.50	4.8	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/16/11	<0.50	4.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/09/12	<0.50	4.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/13/12	<0.50	3.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/14/13	<0.50	3.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/19/13	<0.50	2.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/21/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/30/2014	<0.50	2.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/19/2015	<0.50	0.96	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/23/2015	<0.50	2.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/7/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/29/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/28/2017	<0.50	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/25/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/6/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	7/2/2018	<0.500	3.0	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	9/25/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-3	11/17/93	--	210	--	--	27	4	--	240	--	--	190	20	--	97	130
	09/01/95	<50	<100	<50	<50	<50	<50	<50	2,700	<50	<50	1,300	<50	--	140	730
	09/24/96	<5	<20	7.9	<2	12	<2	<2	1,100	9.5	4	1,800	21	--	330	82
	12/02/96	<50	<50	<50	<20	<30	<50	<20	650	<100	<20	2,100	<100	--	470	<50
	11/12/97	<25	<50	<25	<25	<25	<25	<25	464	<25	<25	2,000	<25	--	241	<50
	08/11/99	<20	<100	<10	<10	<10	<10	<10	500	<10	<10	1,760	25.4	--	247	<10
	11/16/99	<20	<50	<10	<20	14	<10	<10	628	15.2	<10	700	<10	--	132	<10
	02/29/00	<20	<100	<10	<10	<10	<10	<10	473	<10	<10	1,890	25.4	--	356	<10
	06/27/00	<20	<100	<10	<10	<10	<10	<10	410	<10	10.2	1,460	<20	--	241	<10
	08/31/00	<20	<100	<10	<10	52.2	<10	<10	2,580	25.5	<10	399	<20	--	100	171
	11/30/00	<5	<25	<2.5	<2.5	13.3	<2.5	<2.5	374	3.73	<2.5	366	<5	--	80.3	3.1
	02/27/01	<5	<25	3.64	<2.5	5.78	<2.5	<2.5	153	<2.5	2.5	358	<5	--	76.1	<2.5
	05/29/01	<5	<25	2.8	<2.5	<2.5	<2.5	<2.5	112	<2.5	<2.5	647	5.12	--	93.3	<2.5
	09/25/01	<1.3	3.1	2.4	<1.3	10	2	<1.3	210	3	1.7	550	7.2	--	90	4.9
	12/17/01	<10	<50	<5	<5	<5	<5	<5	164	<5	<5	826	16.9	--	155	<5
	03/19/02	<5	<2.5	2.75	<5	<2.5	<2.5	<2.5	138	4.1	<2.5	758	9.6	--	107	<2.5
	05/30/02	<10	7.8	<5	<10	27.8	<5	<5	1,380	42.6	6	302	11.5	--	55.1	96.7
	11/08/02	<5	15	<2.5	<5	29.4	3.55	<2.5	399	9.05	5.7	359	5.8	--	67.1	19.4
	05/30/03	<5	<2.5	6.45	<5	<2.5	<2.5	<2.5	50.1	3.65	<2.5	706	4.95	--	72.6	<2.5
	11/16/04	<10	<5	<5	<10	15	<5	<5	440	5.9	<5	270	<5	--	72	<5
	03/23/05	<2	2.26	4.16 B	<2	8.92	<1	<1	246	8.4	2.86	329	5.04	--	71.9	3.84
	05/18/05	<2	<1	3.86	<2	5.74	<1	<1	188	4.72	3.02	304	5.06	--	88.5	<1
	05/23/07	<2	<2	<2	<2	<2	<2	<2	110	6.3	<2	349	4.54	--	70.6	<2
	09/11/07	<5	9.95	14.4	<5	43	6.1	<2.50	950	28.2	12	601	31	--	223	6.1
	12/12/07	<10	<5	<5	<10	<5	<5	<5	95.7	<5	<5	254	<5	--	63.2	<5
	03/06/08	<1	<0.500	2.10 J	<1	1.32	<0.500	<0.500	127	8.49	2.37	144	5.66	<0.500	94.7	<0.500
	09/19/08	<5	3.7	2.65 J	<5	10.6	<2.50	<2.50	187	5.85	2.95	283	6.6	<2.50	75	<2.50
	12/10/08	<0.90	1.5	1.9	<0.90	5.3	1.2	<0.90	120	4.3	1.5	200	3.8	<0.90	54	<0.90
	03/26/09	<0.50	<0.50	1.4	<0.50	1.6	<0.50	<0.50	83	4.3	1.2	180	3.6	<0.50	46	<0.50
	06/17/09	<0.50	<0.50	1.1	<0.50	0.89	<0.50	<0.50	76	4.7	0.71	190	3.4	<0.50	49	<0.50
	09/18/09	<0.50	<0.50	3.3	<0.50	10	<0.50	<0.50	180	6.2	2.2	270	7.3	<0.50	62	1.2
	12/17/09	<0.90	<0.90	0.96	<0.90	<0.90	<0.90	<0.90	50	3.2	<0.90	180	3.2	<0.90	47	<0.90
	03/19/10	<0.90	<0.90	1 BE	<0.90	<0.90	<0.90	<0.90	77	5.4	<0.90	280	4.1	<0.90	49	<0.90
	06/16/10	<0.50	<0.50	2.3	<0.50	1.6	0.9	<0.50	42	1.7	<0.50	180	1.9	<0.50	30	<0.50
	09/23/10	<0.5	<0.5	2.8 BE	<0.5	0.56	<0.5	<0.5	75	4.4	0.51	220	3	<0.5	39	<0.5
	12/09/10	<0.5	<0.5	2.7	<0.5	<0.5	<0.5	<0.5	39	3.4	<0.5	210	3	<0.5	35	<0.5

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-3 (continued)	03/10/11	<0.50	<0.50	5.4	<0.50	<0.50	<0.50	<0.50	8.9	1.1	<0.50	110	1.6	<0.50	15	<0.50
	06/10/11	<0.5	<0.5	1.6	<0.5	2.2	0.76	<0.5	36	1.1	0.54	99	1.6	<0.5	30	<0.5
	09/16/11	<0.50	<0.50	2	<0.50	3	0.59	<0.50	70	1.7	0.91	130	2.4	<0.50	31	<0.50
	12/09/11	<0.50	<0.50	2.2	<0.50	2.9	0.54	<0.50	62	1.6	0.83	190	2.6	<0.50	45	<0.50
	03/12/12	<0.50	<0.50	2.4	<0.50	0.83	<0.50	<0.50	52	2.8	1	140	3.1	<0.50	45	<0.50
	06/21/12	<0.5	<0.5	2.3	<0.5	0.9	<0.5	<0.5	45	2.7	0.56	170	2.7	<0.5	37	<0.5
	09/13/12	<0.50	<0.50	1.7	<0.50	4.1	<0.50	<0.50	100	2.1	1.4	140	3.3	<0.50	45	<0.50
	12/13/12	<0.50	<0.50	1.3	<0.50	0.78	<0.50	<0.50	27	1.6	<0.50	170	2	<0.50	36	<0.50
	03/14/13	<0.50	<0.50	1.8	<0.50	1	<0.50	<0.50	64	2.5	1.4	160	3.2	<0.50	53	<0.50
	06/14/13	<0.90	<0.90	1.4	<0.90	1.1	<0.90	<0.90	68	3.1	1.3	210	3.3	<0.90	48	<0.90
	09/19/13	<0.50	<0.50	1.1	<0.50	1.1	<0.50	<0.50	99	1.5	1.4	86	1.7	<0.50	30	<0.50
	12/16/13	<0.50	<0.50	1.4	<0.50	1.3	<0.50	<0.50	47	2.1	0.81	170	2.4	<0.50	38	<0.50
	3/21/2014	<0.50	<0.50	1.3	<0.50	0.64	<0.50	<0.50	27	1.6	<0.50	150	2	<0.50	30	<0.50
	6/24/2014	<0.50	0.86	0.86	<0.50	1.4	<0.50	<0.50	65	3.2	1.3	180	3.2	<0.50	44	<0.50
	9/30/2014	<0.50	<0.50	1	<0.50	6.7	0.7	<0.50	110	2.1	1.3	180	2.8	<0.50	47	<0.50
	12/11/2014	<0.50	<0.50	1.2	<0.50	0.8	<0.50	<0.50	28	1.7	<0.50	150	2.2	<0.50	37	<0.50
	3/19/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/15/2015	<0.50	<0.50	0.86	<0.50	1.1	<0.50	<0.50	49	2	0.88	160	2.8	<0.50	44	<0.50
	12/9/2015	<0.50	<0.50	0.66	<0.50	4.9	<0.50	<0.50	72	1.8	1.1	145	1.8	<0.50	33.6	<0.50
	3/7/2016	<0.50	<2	0.76	<0.50	2.2	<0.50	<0.50	61.8	2.5	1.3	199	3.6	<0.50	45.1	<0.50
6/16/2016	<0.50	<2	<0.50	<0.50	1.1	<0.50	<0.50	50.2	0.82	<0.50	49.5	0.77	<0.50	17.4	<0.50	
9/30/2016	<0.50	<2	0.67	<0.50	8.2	0.73	<0.50	95.3	1.5	1.6	145	2	<0.50	40.1	<0.50	
12/16/2016	<0.50	<2	0.52	<0.50	1.1	<0.50	<0.50	26.8	0.9	0.57	86.2	1.2	<0.50	23.9	<0.50	
3/29/2017	<0.50	<2	<0.50	<0.50	7.1	1.3	<0.50	77.9	1.2	<0.50	67.6	0.64	<0.50	20.2	2.5	
6/14/2017	<2.0	<2.0	1.0	<0.50	2.1	<1.0	<0.50	39.0	1.5	<0.50	163	1.7	<0.50	30.4	<0.50	
9/25/2017	<2.0	<2.0	<0.50	<0.50	5.6	<1.0	<0.50	73.3	1.3	<0.50	127	1.5	<0.50	29.5	<0.50	
11/8/2017	<2.0	<2.0	<0.50	<0.50	5.0	<0.50	<0.50	59.5	0.6	<0.50	67	0.6	<0.50	16.1	0.7	
3/20/2018	<0.500	<2.50	0.380 J	<0.500	2.0	0.144 J	<0.500	77.8	2.2	1.99	194	3.4	<0.500	48.6	<0.500	
7/2/2018	<0.500	<2.50	0.439 J	<0.500	<0.500	3.2	<0.500	64.5	1.6	1.07	180	2.6	<0.500	43.1	<0.500	
9/26/2018	<1.00	<5.00	<1.00	<1.00	6.41	<0.400	<0.400	75.6	0.73	1.18	145	1.18	<0.500	36.3	<0.400	
12/7/2018	<2.00	<10.0	<2.00	<2.00	3.1	<0.800	<0.800	44.2	1.0	<1.00	96	1.0	<1.00	27.8	<0.800	
MW-4	11/17/93	--	850	--	--	12	<50	--	20	--	--	40	<50	--	5.4	<10
	09/01/95	<5	340	<5	<5	5.2	<50	<5	14	<5	<5	<50	<50	--	<50	30
	09/24/96	<0.50	300	<0.20	<0.20	7.1	1.4	<0.20	3.2	<0.20	1	0.5	<0.50	--	0.8	4.7
	12/02/96	<0.50	310	<0.50	0.3	3.8	1	<0.20	19	<1	0.3	<0.50	<1	--	<0.30	39
	11/13/97	<0.50	252	<0.50	<0.50	4.22	1.23	<0.50	6.91	<0.50	0.688	<0.50	<0.50	--	<0.50	<1

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-4 (continued)	08/11/99	<2	144	<1	<1	1.21	<1	<1	<1	<1	<1	3.6	<2	--	<1	<1
	11/16/99	<1	26.3	<0.50	<1	2.3	<0.50	<0.50	4.18	<0.50	<0.50	1.2	<0.50	--	0.88	2.07
	02/29/00	<2	119	<1	<1	2.84	<1	<1	4.1	<1	<1	<1	<2	--	<1	5.72
	06/28/00	<5	59.4	<2.5	<2.5	3.89	<2.5	<2.5	2.5	<2.5	<2.5	<2.5	<5	--	<2.5	<2.5
	07/05/00	Well Abandoned														
MW-5	11/17/93	--	1,900	--	--	<25	<25	--	100	--	--	1,200	<25	--	52	<50
	09/01/95	<1	<2	<1	<2	<1	<1	<1	1,300	<1	<1	60,000	<1	--	<1	<2
	09/24/96	<5	140	<2	<2	35	<2	7.5	2,600	80	5.3	16,000	64	--	670	370
	12/02/96	71	<50	<50	27	<30	<50	<20	5,600	<100	<20	27,000	110	--	1,700	340
	11/12/97	<500	<1	<500	<500	<500	<500	<500	<500	<500	<500	28,000	<500	--	1,250	<1
	08/11/99	<200	<1	<100	<100	<100	<100	<100	1,750	<100	<100	25,100	<200	--	862	238
	02/29/00	<100	<500	<50	<50	<50	<50	<50	126	<50	<50	5,250	<100	--	135	<50
	08/31/00	<50	<250	<25	<25	41.4	<25	<25	1,860	<25	<25	5,660	<50	--	347	280
	11/30/00	<50	<250	<25	<25	27.3	<25	<25	3,850	26.8	<25	6,150	<50	--	511	189
	02/27/01	<50	<250	<25	<25	<25	<25	<25	1,370	<25	<25	7,350	<50	--	445	127
	05/30/01	<50	<250	<25	<25	<25	<25	<25	2,410	<25	<25	5,560	<50	--	439	129
	09/25/01	<25	200	<25	<25	34	<25	<25	1,800	<25	<25	2,200	<25	--	180	180
	12/17/01	<100	<500	<50	<50	<50	<50	<50	1,480	<50	<50	10,100	<100	--	646	<50
	03/19/02	<50	<25	<25	<50	<25	<25	<25	360	<25	<25	4,640	<25	--	221	114
	05/29/02	<50	46	<25	<50	<25	<25	<25	916	<25	<25	4,330	<25	--	238	39.5
	08/29/02	<50	<25	<25	<50	<25	<25	<25	1,160	<25	<25	4,090	<25	--	288	310
	11/08/02	<5	178	<2.5	<5	8.3	<2.5	<2.5	385	3.25	<2.5	603	<2.5	--	63.4	66
	01/23/03	<50	<25	<25	<50	<25	<25	<25	582	<25	<25	4,090	<25	--	349	<25
	05/30/03	<10	14.1	<5	<10	<5	<5	<5	382	<5	<5	1,450	7.9	--	140	67
	11/10/03	<1	84.2	<1	<1	1.06	<1	<1	90.7	<1	<1	161	<1	--	30.8	9.42
01/26/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
05/04/04	<20	<20	<20	<20	<20	<20	<20	432	<20	<20	2,440	<20	--	178	188	
08/17/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/02/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/16/04	<50	<50	<50	<50	<50	<50	<50	6,300	<50	<50	1,800	<50	--	370	990	
03/23/05	<20	<10	<10	<20	26.2	<10	<10	2,350	27.6	<10	511	<10	--	147	604	
05/18/05	<5	<2.5	<2.5	<5	9.25	<2.5	6.45	817	10.2	<2.5	611	<2.5	--	156	329	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-5	08/18/05	<5	5.15	<2.50	<5	14.4	<2.50	<2.50	397	4.7	<2.50	169 B	<2.50	--	81.8	278
(continued)	11/15/05	<20	<10	<10	<20	36.2	<10	<10	2,790	14	<10	408	<10	--	177	615
	02/21/06	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	72.7	1.06	<0.500	184	0.78	--	31.5	5.05
	06/05/06	<20	<20	<20	<20	<20	<20	<20	2,800	<20	<20	157	<20	--	75	199
	09/06/06	<2	10.6	<1	<2	8.3	<1	<1	377	3.66	<1	104	<1	--	45	29.9
	12/06/06	<2	<1	<1	<2	1.32	<1	1.34	113	1.28	1.52	240	1.6	--	58	43.3
	02/07/07	<10	<5	<5	<10	<5	<5	<5	1,220	18	<5	124	<5	--	26.9	600
	05/22/07	<5	<5	<5	<5	<5	<5	<5	634	8.45	<5	102	<5	--	40.8	59.4
	09/12/07	<1	67.5	<0.50	<1	<0.50	<0.50	<0.50	16.2	<0.50	<0.50	0.89	<0.50	--	1.38	1.86
	12/13/07	<1	<0.50	<0.50	<1	7.1	<0.50	4.67	2,420	9.22	1.14	180	<0.50	--	179	416
	03/07/08	<1	<0.500	<0.500	<1	2.18	<0.500	1.33	411	3.21	<0.500	86.4	<0.500	<0.500	26.1	105
	09/18/08	<1	101	<0.500	<1	0.79	<0.500	<0.500	11.2	<0.500	<0.500	1.14	<0.500	<0.500	1.27	1.74
	12/10/08	<2	<2	<2	<2	3.7	<2	<2	360	2.3	<2	49	<2	<2	53	150
	03/27/09	<0.50	4.2	<0.50	<0.50	4	<0.50	<0.50	170	1	<0.50	0.59	<0.50	<0.50	<0.50	64
	06/17/09	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	0.6	160	2.5	<0.50	11	<0.50	<0.50	12	11
	09/18/09	<0.50	65 BE	<0.50	<0.50	<0.50	<0.50	<0.50	3.6	<0.50	<0.50	<0.50	<0.50	<0.50	0.5	1.2
	12/17/09	<0.50	<0.80	<0.50	<0.50	2.1	<0.50	1.4	340	2	<0.50	19	<0.50	<0.50	37	93
	03/19/10	<0.50	1.4	<0.50	<0.50	4.4	<0.50	<0.50	72	<0.50	<0.50	24	<0.50	<0.50	14	21
	06/16/10	<0.50	<0.50	<0.50	<0.50	3.6	<0.50	0.83	94	0.65	0.54	4.1	<0.50	<0.50	10	23
	09/23/10	<0.5	59	<0.5	<0.5	0.84	<0.5	<0.5	9.7	<0.5	<0.5	<0.5	<0.5	<0.5	0.97	1.3
	12/09/10	<0.5	<0.5	<0.5	<0.5	0.84	<0.5	<0.5	140	0.73	<0.5	5.6	<0.5	<0.5	8.8	15
	03/11/11	<0.50	<0.50	<0.50	<0.50	0.96	<0.50	<0.50	34	<0.50	<0.50	8.4	<0.50	<0.50	7.6	4.7
	06/10/11	<0.5	<0.5	<0.5	<0.5	5	<0.5	<0.5	40	<0.5	0.63	2.2	<0.5	<0.5	3.8	26
	09/19/11	<0.50	2.3	<0.50	<0.50	2.8	<0.50	<0.50	97	<0.50	<0.50	1.3	<0.50	<0.50	11	6.3
	12/09/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	47	<0.50	<0.50	2.7	<0.50	<0.50	7.7	2.8
	03/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.4
	06/22/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	13	<0.5	<0.5	0.54	<0.5	<0.5	2.9	3
	09/14/12	<0.50	20	<0.50	<0.50	0.75	<0.50	<0.50	26	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.4
	12/13/12	<0.50	<0.50	<0.50	<0.50	0.72	<0.50	<0.50	67	0.65	<0.50	<0.50	<0.50	<0.50	1.7	6.6
	03/15/13	<0.50	7.4	<0.50	<0.50	1.5	<0.50	<0.50	48	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	6.6

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)															
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride	
MW-5 (continued)	06/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.5	<0.50	<0.50	7.2	<0.50	<0.50	7.2	1.7	
	09/19/13	<0.50	23	<0.50	<0.50	<0.50	<0.50	<0.50	4.6	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	0.61	
	12/16/13	<0.50	<0.50	<0.50	<0.50	0.88	<0.50	<0.50	180	<0.50	<0.50	<0.50	<0.50	<0.50	0.8	71	
	3/21/2014	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	39	<0.50	<0.50	<0.50	<0.50	<0.50	3.4	10	
	6/25/2014	<0.50	<0.50	<0.50	<0.50	<5	<0.50	<0.50	14	<0.50	<0.50	1.3	<0.50	<0.50	8	2.3	
	9/30/2014	<0.50	28	<0.50	<0.50	<5	<0.50	<0.50	20	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.6	
	12/16/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	33	<0.50	<0.50	<0.50	<0.50	<0.50	2.2	1.9	
	3/19/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	26.5	<0.50	<0.50	8.4	<0.50	<0.50	5.8	5.6	
	6/17/2015	<0.50	2.2	<0.50	<0.50	<0.50	<0.50	<0.50	3.2	<0.50	<0.50	0.63	<0.50	<0.50	0.64	<0.50	
	9/24/2015	<0.50	24.6	<0.50	<0.50	<0.50	<0.50	<0.50	4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	
	12/8/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.73	199	<0.50	<0.50	29.5	<0.50	<0.50	43.2	32.3
	12/8/2015 DUP	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.68	175	<0.50	<0.50	27.1	<0.50	<0.50	38.5	28.4
	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	4	<0.50	<0.50	9.9	<0.50	<0.50	3.1	<0.50	
	6/17/2016	<0.50	7.5	<0.50	<0.50	<0.50	<0.50	<0.50	23.3	<0.50	<0.50	7.3	<0.50	<0.50	3.2	<0.50	
	9/29/2016	<5	<20	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
	12/14/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	4.3	<0.50	<0.50	11.5	<0.50	<0.50	2.5	1.1	
	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	8.4	<0.5	<0.5	6.5	<0.5	<0.5	5.8	<0.5	
	6/14/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	4.2	<0.50	<0.50	16.3	<0.50	<0.50	6.8	<0.50	
	9/27/2017	<2.0	<2.0	<0.50	<0.50	1.60	<1.0	<0.50	15.6	<0.50	<0.50	26.7	<0.50	<0.50	15.6	0.64	
	11/7/2017	<2.0	<2.0	<0.50	<0.50	0.99	<0.50	<0.50	35.6	<0.50	<0.50	3.5	<0.50	<0.50	9.7	5.30	
3/21/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	1.9	<0.500	<0.500	10.6	0.199 J	<0.500	2.4	0.260 J		
6/29/2018	<0.500	<2.50	<0.500	<0.500	0.56	<0.500	<0.500	45.5	0.174 J	<0.500	21.3	<0.500	<0.500	11.8	1.17		
9/27/2018	<1.00	26.9	<1.00	<1.00	<0.400	<0.400	<0.400	0.562	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400		
12/7/2018	<1.00	<5.00	<1.00	<1.00	1.03	<0.400	<0.400	129.0	<0.400	<0.500	4.7	<0.400	<0.500	11.7	4.80		
MW-6	11/17/93	--	<1	--	--	<0.50	<0.50	--	1.2	--	--	2.1	<0.50	--	0.54	<1	
	09/01/95	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<1	
	09/24/96	<0.50	<2	<0.20	<0.20	<0.20	<0.20	<0.20	0.3	<0.20	<0.20	<0.20	<0.50	--	<0.20	<1	
	12/02/96	<0.50	<0.50	<0.50	<0.20	<0.20	<0.50	<0.20	<0.20	<1	<0.20	<0.50	<1	--	<0.20	<0.20	
	11/12/97	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.03	<0.50	--	<0.50	<1	
	08/11/99	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1	--	1.37	<0.50	
	11/16/99	<1	<2.5	<0.50	<1	<0.50	<0.50	<0.50	0.51	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50	
	02/29/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.654	<1	--	<0.50	<0.50	
	06/27/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1	--	<0.50	<0.50	
	05/29/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1	--	<0.50	<0.50	
	05/30/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	1.51	<0.50	<0.50	1.31	<0.50	--	<0.50	<0.50	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-6 (continued)	08/28/02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/08/02	<1	<0.50	<0.50	<1	0.51	<0.50	<0.50	2.55	<0.50	<0.50	0.97	<0.50	--	0.55	0.52
	01/23/03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/30/03	<0.50	<0.50	<0.50	<1	<0.50	<0.50	<0.50	1.5	<0.50	<0.50	3.73	<0.50	--	0.99	<0.50
	11/17/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	0.88	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	05/17/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	09/12/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	03/06/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	1.16	<0.500	<0.500	<0.500	<0.500
	09/19/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	03/24/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/19/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/23/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	03/09/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/15/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/05/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/13/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/14/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/19/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/21/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
10/2/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
3/19/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
9/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
3/7/2016	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
9/28/2016	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
3/30/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
9/28/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
11/7/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
7/1/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	
9/25/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	
MW-7	12/02/96	81	<50	<50	39	<30	<50	110	110	<100	<20	73,000	1,900	--	7,600	<50
	11/12/97	<500	<1	<500	<500	<500	<500	<500	<500	<500	<500	36,400	<500	--	7,670	<1
	08/11/99	<1	<5	<500	<500	<500	<500	<500	<500	<500	<500	49,000	1,210	--	4,650	<500
	11/16/99	<100	<250	<50	<100	<50	<50	92	353	<50	<50	54,800	914	--	5,320	<50
	02/28/00	<1	<5	<500	<500	<500	<500	<500	<500	<500	<500	52,400	<1	--	4,060	<500
	06/28/00	<1	<5	<500	<500	<500	<500	<500	<500	<500	<500	54,300	<1	--	3,390	<500

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-7 (continued)	08/31/00	<500	<2	<250	<250	<250	<250	<250	<250	<250	<250	50,900	824	--	3,960	<250
	11/30/00	<500	<2	<250	<250	<250	<250	<250	<250	<250	<250	33,500	520	--	3,560	<250
	02/27/01	<500	<2	<250	<250	<250	<250	<250	386	<250	<250	26,700	<500	--	3,290	<250
	05/30/01	<200	<1,000	<100	<100	<100	<100	<100	374	<100	<100	20,400	214	--	2,820	<100
	09/25/01	<25	<25	<25	<25	28	<25	35	350	<25	<25	19,000	260	--	2,500	<25
	12/17/01	<100	<50	<50	<50	84.6	<50	<50	506	<50	<50	10,100	200	--	1,960	<50
	03/18/02	<50	<25	<25	<50	<25	<25	<25	206	<25	<25	7,250	71	--	1,020	<25
	05/31/02	<50	<25	<25	<50	<25	<25	<25	42.5	<25	<25	5,500	<25	--	311	<25
	08/29/02	<50	<25	<25	<50	<25	<25	50.5	93	<25	<25	4,940	44.5	--	634	<25
	11/07/02	<50	<25	<25	<50	<25	<25	<25	123	<25	<25	5,810	43	--	758	<25
	01/23/03	<20	<10	<10	<20	<10	<10	<10	59.8	<10	<10	2,010	14	--	282	<10
	05/28/03	<10	<5	<5	<5	6.3	<5	<5	<5	<5	<5	1,080	10.9	--	67.9	<5
	11/11/03	<20	<20	<20	<20	40.2	<20	<20	246	<20	<20	2,460	62	--	599	<20
	01/27/04	<20	<10	<10	<20	17	<10	<10	105	<10	<10	3,510	33	--	380	<10
	05/04/04	<20	<20	<20	<20	<20	<20	<20	72.4	<20	<20	3,940	22	--	323	<20
	11/16/04	<50	<50	<50	<50	<50	<50	<50	99	<50	<50	8,000	<50	--	520	<50
	03/24/05	<50	<25	<25	<50	<25	<25	<25	98.5	<25	<25	3,930	26	--	404	<25
	05/18/05	<10	<5	<5	<10	<5	<5	<5	72.7	<5	<5	1,310	12.4	--	180	<5
	05/18/05 DUP	<10	<5	<5	<10	<5	<5	<5	69.4	<5	<5	1,250	12.4	--	179	<5
	08/18/05	<20	<10	<10	<20	<10	<10	<10	54.8	<10	<10	1,800	<10	--	237	<10
	11/15/05	<20	<10	<10	<20	15.2	<10	<10	107	<10	<10	1,960	29.6	--	333	<10
	02/21/06	<20	<10	<10	<20	<10	<10	<10	<10	<10	<10	2,640	<10	--	139	<10
	06/05/06	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	26,100	<200	--	568	<200
	09/06/06	<100	<50	<50	<100	<50	<50	<50	56	<50	<50	12,800	<50	--	422	<50
	12/06/06	<200	<100	<100	<200	<100	<100	<100	<100	<100	<100	24,600	<100	--	408	<100
	02/07/07	<200	<100	<100	<200	<100	<100	<100	<100	<100	<100	31,500	<100	--	352	<100
	05/22/07	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	29,100	<200	--	450	<200
	09/12/07	<200	<100	<100	<200	<100	<100	<100	<100	<100	<100	21,300	<100	--	366	<100
	12/13/07	<500	<250	<250	<500	<250	<250	<250	345	<250	<250	18,700	<250	--	1,040	280
	03/06/08 ²	<1	<0.500	<0.500	<1	5.06	2.57	3.99	42.3	2.9	<0.500	26,300	38.7	<0.500	430	<0.500
06/10/08	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	27,000	<500	<500	575	<500	
09/18/08	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	23,200	<500	<500	530	<500	
12/11/08	<50	<50	<50	<50	<50	<50	<50	130	<50	<50	15,000	<50	<50	450	<50	
12/11/08 DUP	<50	<50	<50	<50	<50	<50	<50	120	<50	<50	14,000	<50	<50	430	<50	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-7 (continued)	03/23/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	420	<0.50	<0.50	3,330	<0.50	<0.50	270	<0.50
	06/18/09	<3	<3	<3	<3	3.7	<3	<3	520	<3	<3	890	5.2	<3	350	<3
	06/18/09 DUP	<2.5	<2.5	<2.5	<2.5	3.8	<2.5	<2.5	520	<2.5	<2.5	910	5.6	<2.5	360	<2.5
	09/18/09	<3	<3	<3	<3	9.8	<3	5.5	930	<3	<3	2,600	10	<3	250	<3
	09/18/09 DUP	<3	<3	<3	<3	8.7	<3	4.8	850	<3	<3	2,600	9.3	<3	240	<3
	12/18/09	<5	<5	<5	<5	6.7	<5	<5	330	<5	<5	1,600	6.7	<5	160	<5
	12/18/09 DUP	<5	<5	<5	<5	6.6	<5	<5	320	<5	<5	1,500	6.6	<5	160	<5
	03/16/10	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	180	<2.5	<2.5	510	<2.5	<2.5	52	<2.5
	03/16/10 DUP	<2	<2	<2	<2	<2	<2	<2	180	<2	<2	560	<2	<2	55	<2
	06/17/10	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	360	<1.5	<1.5	200	2.7	<1.5	72	<1.5
	06/17/10 DUP	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	360	<1.5	<1.5	200	2.8	<1.5	72	<1.5
	09/23/10	<3	<3	<3	<3	3.3	<3	<3	690	<3	<3	750	3.5	<3	110	4.8
	09/23/10 DUP	<3	<3	<3	<3	3.1	<3	<3	700	<3	<3	740	3.8	<3	100	4.1
	12/10/10	<0.9	<0.9	<0.9	<0.9	1.8	<0.9	<0.9	94	<0.9	<0.9	220	1.6	<0.9	36	1.7
	12/10/10 DUP	<0.9	<0.9	<0.9	<0.9	1.7	<0.9	<0.9	98	<0.9	<0.9	230	1.7	<0.9	36	1.8
	03/11/11	<0.90	<0.90	<0.90	<0.90	6.6	<0.90	1.6	150	0.91	<0.90	420	5.1	<0.90	82	9.3
	03/11/11 DUP	<0.90	<0.90	<0.90	<0.90	6.5	<0.90	1.9	150	1.1	<0.90	400	5.2	<0.90	80	9.7
	06/07/11	<2.5	<2.5	<2.5	<2.5	4.8	<2.5	3.4	1,400	3.3	<2.5	430	4	<2.5	110	7.9
	06/07/11 DUP	<6	<6	<6	<6	<6	<6	<6	1,400	<6	<6	400	<6	<6	110	7.8
	09/19/11	<5	<5	<5	<5	<5	<5	<5	1,300	<5	<5	410	<5	<5	84	78
	09/19/11 DUP	<7	<7	<7	<7	<7	<7	<7	1,300	<7	<7	420	<7	<7	87	81
	12/07/11	<5	<5	<5	<5	8	<5	6.9	3,400	6.8	<5	200	<5	<5	32	110
	12/07/11 DUP	<6	<6	<6	<6	7.6	<6	7.8	3,400	6.8	<6	210	<6	<6	32	110
	03/12/12	<5	<5	<5	<5	9.2	<5	<5	1,600	<5	<5	41	<5	<5	8.6	600
	03/12/12 DUP	<7	<7	<7	<7	9.5	<7	<7	1,600	<7	<7	42	<7	<7	8.9	660
	06/22/2012	<2	9.2	<2	<2	9.8	<2	<2	540	<2	<2	24	<2	<2	5.1	300
	06/22/12 DUP	<2	8.1	<2	<2	9	<2	<2	500	<2	<2	25	<2	<2	5.2	290
	09/14/12	<0.50	6.3	<0.50	<0.50	3.8	<0.50	0.54	180	0.7	<0.50	28	<0.50	0.52	5.2	80
	09/14/12 DUP	<0.50	5.7	<0.50	<0.50	3.8	<0.50	<0.50	180	0.78	<0.50	28	<0.50	<0.50	5.3	79
	12/14/12	<0.50	6.3	<0.50	<0.50	1.9	<0.50	<0.50	130	<0.50	<0.50	8.2	<0.50	<0.50	5.3	16
12/14/12 DUP	<0.50	5.6	<0.50	<0.50	1.8	<0.50	<0.50	130	<0.50	<0.50	11	<0.50	<0.50	6.8	18	
03/15/13	<0.50	5.2	<0.50	<0.50	0.68	<0.50	<0.50	110	<0.50	<0.50	1.5	<0.50	<0.50	0.75	11	
03/15/13 DUP	<0.50	5.4	<0.50	<0.50	0.69	<0.50	<0.50	110	<0.50	<0.50	1.6	<0.50	<0.50	0.78	11	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-7	06/14/13	<0.50	2	<0.50	<0.50	<0.50	<0.50	<0.50	57	<0.50	<0.50	1.6	<0.50	<0.50	<0.50	15
(continued)	06/14/13 DUP	<0.50	2	<0.50	<0.50	0.51	<0.50	<0.50	58	<0.50	<0.50	1.5	<0.50	<0.50	<0.50	16
	09/20/13	<0.50	3	<0.50	<0.50	1.5	<0.50	<0.50	56	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10
	09/20/13 DUP	<0.50	3	<0.50	<0.50	1.5	<0.50	<0.50	56	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10
	12/16/13	<0.50	2.4	<0.50	<0.50	2.9	<0.50	<0.50	6.9	<0.50	<0.50	0.51	<0.50	<0.50	<0.50	9.1
	12/16/13 DUP	<0.50	2.4	<0.50	<0.50	2.4	<0.50	<0.50	6.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.9
	3/24/2014	<0.50	0.97	<0.50	<0.50	1.6	<0.50	<0.50	13	<0.50	<0.50	9.8	<0.50	<0.50	2.6	7.6
	3/24/2014 DUP	<0.50	1	<0.50	<0.50	1.6	<0.50	<0.50	13	<0.50	<0.50	9.4	<0.50	<0.50	2.5	7.7
	6/25/2014	<0.50	1.3	<0.50	<0.50	0.17	<0.50	<0.50	0.59	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3
	6/25/14 DUP	<0.50	0.15	<0.50	<0.50	0.19	<0.50	<0.50	0.62	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.4
	9/30/2014	<0.50	1.9	<0.50	<0.50	2.7	<0.50	<0.50	4.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.8
	9/30/2014 DUP	<0.50	1.7	<0.50	<0.50	2.6	<0.50	<0.50	4.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.8
	12/15/2014	<0.50	1.2	<0.50	<0.50	3.4	<0.50	<0.50	12	<0.50	<0.50	<0.50	<0.50	<0.50	1	15
	12/15/2014 DUP	<0.50	1.6	<0.50	<0.50	4.5	<0.50	<0.50	16	<0.50	<0.50	0.61	<0.50	<0.50	1.5	21
	3/20/2015	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	8.4	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	1
	3/20/15 DUP	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	7.7	<0.50	<0.50	0.53	<0.50	<0.50	1	10.4
	6/17/2015	<0.50	0.72	<0.50	<0.50	2.6	<0.50	<0.50	12	<0.50	<0.50	1.2	<0.50	<0.50	1	12.6
	6/17/2015 DUP	<0.50	0.71	<0.50	<0.50	2.6	<0.50	<0.50	12.2	<0.50	<0.50	0.96	<0.50	<0.50	1	12.3
	9/24/2015	<0.50	<0.50	<0.50	<0.50	1.7	<0.50	<0.50	12.4	<0.50	<0.50	4.5	<0.50	<0.50	4.2	4.6
	9/24/2015 DUP	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	12.7	<0.50	<0.50	4.5	<0.50	<0.50	4.2	4.8
	12/8/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	<0.50	9.4	<0.50	<0.50	1.7	1.9
	6/17/2016	<0.50	<2	<0.50	<0.50	0.6	<0.50	<0.50	10.9	<0.50	<0.50	0.69	<0.50	<0.50	2.1	5.4
	6/17/16 DUP	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	11	<0.50	<0.50	0.62	<0.50	<0.50	2	5.4
	9/29/2016	<0.50	<2	<0.50	<0.50	1.1	<0.50	<0.50	10.9	<0.50	<0.50	<0.50	<0.50	<0.50	5.5	5.5
	9/29/2016 DUP	<0.50	<2	<0.50	<0.50	1.1	<0.50	<0.50	10.9	<0.50	<0.50	<0.50	<0.50	<0.50	6	5.5
	12/14/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	9.2	<0.50	<0.50	0.65	<0.50	<0.50	<0.50	0.98
	12/14/2016 DUP	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	9.4	<0.50	<0.50	0.78	<0.50	<0.50	<0.50	1
	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	<0.5	<0.5
	3/28/2017 DUP	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	0.69	<0.5
	6/14/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	0.55	2.5
	6/14/2017 DUP	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	2.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.5
	9/27/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	1.7	<0.50	<0.50	2.60	<0.50	<0.50	1.60	1.6
	9/27/2017 DUP	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	1.7	<0.50	<0.50	2.60	<0.50	<0.50	1.60	1.7
	11/7/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	2.6	<0.50	<0.50	6.30	<0.50	<0.50	7.80	1.4
	11/7/2017 DUP	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	<0.50	3.80	<0.50	<0.50	6.40	1.5
	3/21/2018	<0.500	<2.50	<0.500	<0.500	0.495 J	<0.500	<0.500	17.6	<0.500	<0.500	0.228 J	<0.500	<0.500	2.86	4.9
	3/21/2018 DUP	<0.500	<2.50	<0.500	<0.500	0.55	<0.500	<0.500	17.2	<0.500	<0.500	0.284 J	<0.500	<0.500	2.99	4.9
	6/29/2018	<0.500	<2.50	<0.500	<0.500	0.461 J	<0.500	<0.500	5.5	<0.500	<0.500	9.89	<0.500	<0.500	3.53	1.5
	6/29/2018 DUP	<0.500	<2.50	<0.500	<0.500	0.437 J	<0.500	<0.500	5.4	<0.500	<0.500	8.94	<0.500	<0.500	3.48	1.6
	9/27/2018	<1.00	<5.00	<1.00	<1.00	1.23	<0.400	<0.400	8.48	<0.400	<0.500	6.50	<0.400	<0.500	10.8	2.08
	12/7/2018	<1.00	<5.00	<1.00	<1.00	3.97	<0.400	0.43	15.4	<0.400	<0.500	30.40	<0.400	<0.500	18.10	1.6
	12/7/2018 DUP	<1.00	<5.00	<1.00	<1.00	3.84	<0.400	0.47	17.7	<0.400	<0.500	26.60	<0.400	<0.500	16.40	1.1

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-8	12/02/96	<0.50	<0.50	<0.50	<0.20	1	<0.50	0.2	6.5	<1	<0.20	2.3	<1	--	12	<0.50
	11/13/97	<1	<2	<1	<1	1.72	<1	2.44	9.32	<1	<1	52.4	4	--	38.6	<2
	08/11/99	<1	<5	<0.50	<0.50	0.75	<0.50	<0.50	1.82	<0.50	<0.50	46.2	4.79	--	24.3	<0.50
	11/16/99	<1	<2.5	<0.50	<1	1.22	<0.50	<0.50	2.11	<0.50	<0.50	39.8	1.55	--	15.5	<0.50
	02/28/00	<1	<5	<0.50	<0.50	0.929	<0.50	0.721	2.38	<0.50	<0.50	41.8	3.7	--	20.5	<0.50
	06/27/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	1.46	<0.50	<0.50	33.7	2.88	--	17.5	<0.50
	05/30/01	<100	<5	<0.50	<0.50	0.611	<0.50	<0.50	0.601	<0.50	<0.50	11.8	<1	--	5.46	<0.50
	05/30/02	<1	<0.50	<0.50	<1	1.09	<0.50	<0.50	2.02	<0.50	<0.50	12.1	<0.50	--	4.47	<0.50
	05/28/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	0.84	<0.50	<0.50	40.4	1.55	--	11.2	<0.50
	11/02/04	<1	<0.50	<0.50	<1	1.02	<0.50	<0.50	1.99	<0.50	<0.50	8.88	<0.50	--	2.4	<0.50
	11/16/04	<0.50	<0.50	<0.50	<0.50	0.9	<0.50	<0.50	1.6	<0.50	<0.50	0.6	<0.50	--	3.1	<0.50
	03/23/05	<1	<0.50	<0.50	<1	0.78	<0.50	<0.50	1.82	<0.50	<0.50	13.5	0.53	--	2.41	<0.50
	05/17/05	<1	<0.50	<0.50	<1	1.1	<0.50	<0.50	6.45	<0.50	<0.50	13.2	<0.50	--	6.92	<0.50
	05/17/05 DUP	<1	<0.50	<0.50	<1	1.19	<0.50	<0.50	6.97	<0.50	<0.50	11.4	<0.50	--	6.39	<0.50
	11/16/05	<1	<0.500	<0.500	<1	0.78	<0.500	<0.500	4.19	<0.500	<0.500	14.8	0.65	--	2.99	<0.500
	06/05/06	<1	<1	<1	<1	1.26	<1	<1	19.8	<1	<1	20.7	<1	--	11.4	<1
	12/06/06	<1	<0.50	<0.50	<1	1.11	<0.50	<0.50	14.2	<0.50	<0.50	18.3	<0.50	--	5.08	<0.50
	05/23/07	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	22.8	<1	--	2.32	<1
	09/12/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	0.52	<0.50	<0.50	12.4	0.6	--	0.65	<0.50
	12/12/07	<1	<0.50	<0.50	<1	1.03	<0.50	<0.50	13.7	<0.50	<0.50	8.27	<0.50	--	2.71	<0.50
	03/06/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	1.64	<0.500	<0.500	19.1 J	<0.500	<0.500	1.4	<0.500
	6/10/08 ⁷	<1	<1	<1	<1	1.07	<1	<1	10.5	<1	<1	10.8	<1	<1	3.87	<1
	09/18/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	1.58	<0.500	<0.500	13.2	0.5	<0.500	1.21	<0.500
	12/09/08	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	9.1	<0.50	<0.50	0.57	<0.50
	12/09/08 DUP	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	<0.50	9.7	<0.50	<0.50	0.59	<0.50
	03/26/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2	<0.50	<0.50	8	<0.50	<0.50	0.56	<0.50
	06/17/09	<0.50	<0.50	<0.50	<0.50	0.77	<0.50	<0.50	12	<0.50	<0.50	4.8	<0.50	<0.50	1.4	<0.50
	09/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	11	<0.50	<0.50	<0.50	<0.50
	12/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.2	<0.50	<0.50	8.4	<0.50	<0.50	0.51	<0.50
	03/18/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2	<0.50	<0.50	11	<0.50	<0.50	<0.50	<0.50
	06/14/10	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	20	0.52	<0.50	4.2	<0.50	<0.50	1.1	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	8.1	<0.5	<0.5	<0.5	<0.5
	12/08/10	<0.5	<0.5	<0.5	<0.5	1.4	<0.5	<0.5	20	1.1	<0.5	2.5	<0.5	<0.5	0.6	<0.5
	03/11/11	<0.50	<0.50	<0.50	<0.50	0.93	<0.50	<0.50	20	0.58	<0.50	7.9	<0.50	<0.50	0.95	<0.50
	06/08/11	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	40	0.82	<0.5	4	<0.5	<0.5	1.1	<0.5
	09/15/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	10	<0.50	<0.50	0.54	<0.50
	12/08/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.54	<0.50	<0.50	10	<0.50	<0.50	<0.50	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-8 (continued)	03/06/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	7.5	<0.50	<0.50	6.8	<0.50	<0.50	0.56	<0.50
	06/20/12	<0.5	<0.5	<0.5	<0.5	0.89	<0.5	<0.5	22	<0.5	<0.5	6.1	<0.5	<0.5	1.4	<0.5
	09/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	7	<0.50	<0.50	<0.50	<0.50
	12/12/12	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	36	1	<0.50	4.8	<0.50	<0.50	1	<0.80
	03/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.94	<0.50	<0.50	7.2	<0.50	<0.50	<0.50	<0.50
	06/13/13	<0.50	<0.50	<0.50	<0.50	0.84	<0.50	<0.50	18	0.64	<0.50	6.2	<0.50	<0.50	0.76	<0.50
	09/19/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.6	<0.50	<0.50	4.8	<0.50	<0.50	<0.50	<0.50
	12/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.5	0.54	<0.50	4	<0.50	<0.50	<0.50	<0.50
	3/19/2014	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	21	1.1	<0.50	2.3	<0.50	<0.50	0.85	<0.50
	6/24/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	<0.50	5.6	<0.50	<0.50	<0.50	<0.50
	9/26/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.8	<0.50	<0.50	6.1	<0.50	<0.50	<0.50	<0.50
	12/10/2014	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	13	0.86	<0.50	2.3	<0.50	<0.50	0.62	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	7.6	<0.50	<0.50	<0.50	<0.50
	6/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.9	<0.50	<0.50	<0.50	<0.50
	9/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2	<0.50	<0.50	6.3	<0.50	<0.50	<0.50	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2	<0.50	<0.50	1.1	<0.50	<0.50	<0.50	<0.50
	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	6.4	<0.50	<0.50	<0.50	<0.50
	6/15/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	<0.50	<0.50	<0.50
	9/27/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.3	<0.50	<0.50	<0.50	<0.50
	12/14/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	<0.50	3.8	<0.50	<0.50	<0.50	<0.50
	3/30/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	35.7	0.96	<0.5	2.3	<0.5	<0.5	0.57	<0.5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	14.3	<0.50	<0.50	4.3	<0.50	<0.50	0.56	<0.50
	9/25/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	4.3	<0.50	<0.50	<0.50	<0.50
	11/6/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	4.4	<0.50	<0.50	<0.50	<0.50
	3/19/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.6	<0.500	<0.500	4.2	<0.500	<0.500	<0.500	<0.500
	6/29/2018	<0.500	<2.50	<0.500	<0.500	0.139 J	<0.500	<0.500	2.6	<0.500	<0.500	5.4	<0.500	<0.500	0.368 J	<0.500
9/25/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	3.76	<0.400	<0.500	<0.400	<0.400	
12/7/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	3.0	<0.400	<0.500	<0.400	<0.400	
MW-9	12/02/96	<50	<50	<50	<20	<30	<50	<20	<20	<100	<20	5,000	200	--	1,600	<50
	11/13/97	<50	<100	<50	<50	<50	<50	<50	487	<50	<50	2,890	<50	--	1,840	<100
	08/11/99	<20	<100	<10	<10	<10	<10	<10	54	<10	<10	1,490	43.2	--	517	<10
	11/16/99	<20	<50	<10	<20	<10	<10	<10	103	<10	<10	1,730	32	--	305	<10
	02/28/00	<20	<100	<10	<10	<10	<10	<10	<10	<10	<10	2,040	36.4	--	315	<10
	06/27/00	<50	<250	<25	<25	<25	<25	<25	<25	<25	<25	1,300	<50	--	298	<25
	08/31/00	<10	<50	<5	<5	<5	<5	<5	<5	<5	<5	1,560	31.3	--	229	<5
	11/30/00	<10	<50	<5	<5	21.7	<5	10.5	1,330	11.7	<5	823	26.6	--	528	8.15
	09/25/01	<2.5	<2.5	<2.5	<2.5	3.8	<2.5	<2.5	9.1	<2.5	<2.5	680	16	--	140	<2.5
	12/17/01	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	306	<5	--	74.2	<2.5

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-9 (continued)	03/18/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	113	<0.50	--	19.1	<0.50
	05/31/02	<2	<1	<1	<2	<1	<1	<1	1.22	<1	<1	296	1.44	--	44	<1
	08/29/02	<2	<1	<1	<2	<1	<1	<1	1.88	<1	<1	294	2.12	--	67.4	<1
	11/07/02	<5	<2.5	<2.5	<5	<2.5	<2.5	<2.5	17.2	<2.5	<2.5	453	4	--	145	<2.5
	01/23/03	<2	<1	<1	<2	<1	<1	<1	1.66	<1	<1	205	2.74	--	59.5	<1
	05/28/03	<1	<0.50	<0.50	<1	1.81	<0.50	<0.50	0.97	<0.50	<0.50	141	2.85	--	27.4	<0.50
	11/11/03	<5	<5	<5	<5	<5	<5	<5	23.7	<5	<5	401	6.25	--	91.4	<5
	01/27/04	<2	<1	<1	<2	<1	<1	<1	2.58	<1	<1	179	2.54	--	58.1	<1
	05/04/04	<1	<1	<1	<1	<1	<1	<1	1.09	<1	<1	178	2.56	--	51.9	<1
	11/15/04	<25	<25	<25	<25	28	<25	<25	1,200	27	<25	1,800	<25	--	1,000	<25
	03/24/05	<5	<2.5	<2.5	<5	3.3	<2.5	<2.5	54.2	<2.5	<2.5	675	8	--	239	<2.5
	05/18/05	<2	<1	<1	<2	<1	<1	<1	2.68	<1	<1	2.41	2.08	--	62.4	<1
	08/18/05	<5	<2.50	<2.50	<5	<2.50	<2.50	<2.50	20.5 B	<2.50	<2.50	551	7.6	--	209	<2.50
	11/15/05	<10	<5	<5	<10	27.1	<5	6.8	1,020	18.6	<5	1,040	14.1	--	633	21.2
	02/21/06	<10	<5	<5	<10	<5	<5	<5	16.7	<5	<5	534	<5	--	165	<5
	06/05/06	<1	<1	<1	<1	<1	<1	<1	1.47	<1	<1	151	2.6	--	57.3	<1
	09/05/06	<5	<2.50	<2.50	<5	5.5	<2.50	<2.50	117	3.15	<2.50	698	6.8	--	314	<2.50
	12/06/06	<5	<2.50	<2.50	<5	2.95	<2.50	<2.50	59	<2.50	<2.50	578	5.55	--	237	<2.50
	02/07/07	<5	<2.50	<2.50	<5	3.15	<2.50	<2.50	72.6	<2.50	<2.50	591	6.1	--	239	2.65
	05/23/07	<2	<2	<2	<2	<2	<2	<2	6.32	<2	<2	210	3	--	90.4	<2
	09/12/07	<2	<1	<1	<2	2.34	<1	<1	47.1	1.44	<1	282	5.12	--	184	<1
	12/13/07	<5	<2.50	<2.50	<5	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	253	4.45	--	78.4	<2.50
	03/06/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	1.92	<0.500	<0.500	138	3.77	<0.500	61.5	<0.500
	06/10/08	<1	<1	<1	<1	<1	<1	<1	2.73	<1	<1	297	5.16	<1	87.7	<1
	09/18/08	<5	<2.50	<2.50	<5	7.05	<2.50	<2.50	172	3.8	<0.5000	524	5.35	<0.500	315	4.15
	12/09/08	<0.90	<0.90	<0.90	<0.90	3.8	<0.90	1.3	130	2.5	<0.90	270	5.1	<0.90	140	2.3
	03/26/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.4	<0.50	<0.50	170	4	<0.50	56	<0.50
	06/17/09	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	1.1	72	2.8	<0.50	420	4.9	<0.50	180	1.8
	09/17/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	<0.50	170	4.4	<0.50	60	<0.50
	12/17/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.57	<0.50	<0.50	120	2.5	<0.50	43	<0.50
03/19/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.8	<0.50	<0.50	160	3	<0.50	48	<0.50	
06/16/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	100	1.4	<0.50	36	<0.50	
09/21/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	140	2.9	<0.5	50	<0.5	
12/10/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	100	1.3	<0.5	330	<0.5	
03/11/11	<0.50	<0.50	<0.50	<0.50	0.66	<0.50	<0.50	17	0.82	<0.50	190	2.7	<0.50	81	0.52	
03/11/11 DUP	<0.50	<0.50	<0.50	<0.50	0.67	<0.50	<0.50	17	0.85	<0.50	200	2.8	<0.50	84	0.51	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-9 (continued)	06/10/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.3	<0.5	<0.5	53	1.9	<0.5	31	<0.5
	09/19/11	<0.50	<0.50	<0.50	<0.50	2.1	<0.50	<0.50	72	2.3	<0.50	230	3.1	<0.50	120	0.78
	12/09/11	<0.90	<0.90	<0.90	<0.90	53	<0.90	11	1,800	40	<0.90	600	10	<0.90	590	26
	03/12/12	<0.50	<0.50	<0.50	<0.50	0.66	<0.50	<0.50	20	0.57	<0.50	140	2	<0.50	56	<0.50
	06/22/12	<0.5	<0.5	<0.5	<0.5	3.3	<0.5	1.1	140	4.3	<0.5	220	3.3	<0.5	180	2.3
	09/14/12	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	17	<0.90	<0.90	210	2.4	<0.90	78	<0.90
	12/13/12	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	29	0.96	<0.50	110	1.1	<0.50	49	<0.50
	03/15/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5	<0.50	<0.50	86	1.8	<0.50	34	<0.50
	06/13/13	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	1	100	3.7	<0.50	240	3.1	<0.50	150	2.2
	09/20/13	<0.50	<0.50	<0.50	<0.50	2	<0.50	0.51	74	2.2	<0.50	160	2	<0.50	87	0.82
	12/16/13	<0.50	<0.50	<0.50	<0.50	6.5	<0.50	1.4	230	6.4	<0.50	210	3.5	<0.50	180	2.8
	3/21/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	39	0.57	<0.50	19	<0.50
	6/25/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.68	41	1.6	<0.50	190	2.3	<0.50	91	1.1
	9/30/2014	<0.90	<0.90	<0.90	<0.90	2.3	<0.90	<0.90	77	2.3	<0.90	230	2.9	<0.90	110	1.3
	12/15/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	35	0.64	<0.50	18	<0.50
	3/19/2015	<0.50	<0.50	<0.50	<0.50	0.77	<0.50	<0.50	18.9	0.6	<0.50	155	2	<0.50	59.5	<0.50
	6/17/2015	<0.50	<0.50	<0.50	<0.50	0.93	<0.50	0.54	12.5	0.78	<0.50	160	1.9	<0.50	61.8	1.6
	9/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	<0.50	74.3	2.2	<0.50	31.6	<0.50
	12/8/2015	<0.50	<0.50	<0.50	<0.50	3.5	<0.50	0.85	145	4.2	<0.50	199	2.4	<0.50	113	2
	12/8/2015 DUP	<0.50	<0.50	<0.50	<0.50	3.7	<0.50	0.93	153	4.4	<0.50	198	2.5	<0.50	118	2.1
	3/8/2016	<1	<4	<1	<1	4.1	<1	<1	117	3.8	<1	164	2.3	<1	94.6	3.4
	6/17/2016	<0.50	<2	<0.50	<0.50	1.8	<0.50	0.58	60.7	2.4	<0.50	116	1.7	<0.50	68.3	0.89
	9/29/2016	<0.50	<2	<0.50	<0.50	1.2	<0.50	<0.50	39.3	1.8	<0.50	192	2.5	<0.50	91.9	0.76
	12/14/2016	<0.50	<2	<0.50	<0.50	1.3	<0.50	<0.50	59.7	1.6	<0.50	75.8	1.1	<0.50	44.9	0.52
	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	0.77	<0.5	<0.5	27.9	0.89	<0.5	12.5	<0.5
	6/14/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	17.5	0.60	<0.50	104	1.3	<0.50	47.2	<0.50
	9/27/2017	<2.0	<2.0	<0.50	<0.50	2.80	<1.0	<0.50	83.1	2.50	<0.50	102	2.4	<0.50	66.7	0.99
	11/7/2017	<2.0	<2.0	<0.50	<0.50	20.30	<0.50	3.30	569.0	15.20	<0.50	205	4.5	<0.50	167.0	7.80
	3/21/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	1.2	<0.500	<0.500	39	1.1	<0.500	14.9	<0.500
	6/29/2018	<0.500	<2.50	<0.500	<0.500	6.86	<0.500	1.63	169.0	8.28	<0.500	332	3.5	<0.500	182.0	2.42 J
9/27/2018	<1.00	<5.00	<1.00	<1.00	5.69	<0.400	1.59	219	7.54	<0.500	243	3.96	<0.500	168	3.90	
12/7/2018	<1.00	<5.00	<1.00	<1.00	0.75	<0.400	<0.400	210	0.80	<0.500	178	3.4	<0.500	66.5	0.55	
MW-10	12/02/96	<0.50	<0.50	<0.50	<0.20	<0.30	<0.50	<0.20	<0.20	<1	<0.20	2.7	<1	--	0.4	<0.50
	11/13/97	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.53	<0.50	--	3.65	<1
	08/11/99	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.02	<1	--	1.24	<0.50
	11/16/99	<1	<2.5	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	69.6	1.89	--	10.3	<0.50
	02/28/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.63	<1	--	1.16	<0.50
	06/27/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.72	<1	--	3.74	<0.50
	05/30/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.25	<1	--	2.52	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-10	05/30/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.05	<0.50	--	1.43	<0.50
	05/28/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	0.86	<0.50	<0.50	2.21	<0.50	--	1.28	<0.50
	11/02/04	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.93	<0.50	--	0.98	<0.50
	11/16/04	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	--	3.4	<0.50
	03/23/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.02	<0.50	--	1.21	<0.50
	05/17/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.26	<0.50	--	1.19	<0.50
	09/12/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.59 J	<0.50	--	0.83	<0.50
	03/05/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	1.66	<0.500	<0.500	1.67	<0.500
	09/18/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	1.13	<0.500	<0.500	1.4	<0.500
	03/25/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	<0.50	1.6	<0.50
	09/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	2	<0.50
	03/18/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	1.6	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	1.4	<0.5
	03/09/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	0.8	<0.50
	09/14/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	2.1	<0.50
	03/06/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	2	<0.50
	09/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.98	<0.50	<0.50	1.4	<0.50
	03/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.6	<0.50	<0.50	3.1	<0.50
	09/18/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	1.4	<0.50
	3/19/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	8.8	<0.50	<0.50	16	<0.50
	9/26/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2	<0.50	<0.50	2	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.7	<0.50	<0.50	1.8	<0.50
	9/21/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	<0.50	1.6	<0.50
	3/7/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.98	<0.50
	9/27/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	1.4	<0.50
	3/30/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.4	<0.5	<0.5	1.5	<0.5
	9/27/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	3.7	<0.50	<0.50	2.4	<0.50
11/6/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	<0.50	1.1	<0.50	
6/29/2018	<0.500	<2.50	<0.500	<0.500	0.161 J	<0.500	<0.500	0.8	<0.500	<0.500	5.7	0.145 J	<0.500	5.8	<0.500	
9/25/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	1.74	<0.400	<0.500	1.45	<0.400	
9/25/2018 DUP	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	1.76	<0.400	<0.500	1.54	<0.400	
MW-11	12/02/96	<50	<50	<50	<20	<30	<50	52	140	<100	<20	2,200	550	--	5,900	<50
	11/13/97	<50	<100	<50	<50	<50	<50	<50	<50	<50	<50	686	90.3	--	2,720	<100
	08/10/99	<5	<25	<2.5	<2.5	13.7	<2.5	22.8	14.4	<2.5	<2.5	259	112	--	1,300	<2.5
	11/16/99	<20	<50	<10	<20	12	<10	16.8	18.8	<10	<10	478	94.8	--	1,500	<10
	02/28/00	<5	<25	<2.5	<2.5	2.71	<2.5	7.9	5.05	<2.5	<2.5	247	30.2	--	473	<2.5
	06/27/00	<10	<50	<5	<5	12.1	<5	28.9	14.8	<5	<5	337	108	--	1,390	<5
	08/31/00	<20	<100	<10	<10	15.4	<10	28	24.8	<10	<10	646	159	--	1,690	<10
	11/30/00	<20	<100	<10	<10	12.2	<10	26.4	19.3	<10	<10	342	125	--	1,550	<10
	02/27/01	<5	<25	<2.5	<2.5	3.65	<2.5	7.82	7.1	<2.5	<2.5	198	35.1	--	468	<2.5
	05/30/01	<10	<50	<5	<5	5.2	<5	13.6	9.09	<5	<5	256	48.8	--	858	<5
	09/25/01	<13	<13	<13	<13	<13	<13	<13	<13	<13	<13	260	57	--	820	<13
	12/17/01	<10	<50	<5	<5	<5	<5	15.4	25.9	<5	<5	983	40.9	--	1,390	<5

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-11 (continued)	03/18/02	<10	<5	<5	<10	11.9	<5	19.4	17.1	<5	<5	433	79.8	--	1,370	<5
	05/30/02	<10	<5	<5	<10	5.9	<5	10.9	15.6	<5	<5	571	45.6	--	965	<5
	11/07/02	<10	<5	<5	<10	15	<5	19.3	18.9	<5	<5	347	112	--	1,640	<5
	01/23/03	<5	<2.5	<2.5	<5	3.35	<2.5	4.3	5.35	<2.5	<2.5	265	24.1	--	534	<2.5
	05/28/03	<10	<5	<5	<10	13.3	<5	17.9	17.6	<5	<5	305	105	--	1,580	<5
	11/11/03	<5	<5	<5	<5	5	<5	5.15	9.15	<5	<5	191	38.8	--	504	<5
	01/26/04	<10	<5	<5	<10	9.6	<5	11.5	13.5	<5	<5	369	73.3	--	1,070	<5
	03/22/04	Well Abandoned														
MW-12	12/02/96	<50	<50	<50	<20	<30	<50	<20	29	<100	<20	2,500	<100	--	950	<50
	11/12/97	<250	<500	<250	<250	<250	<250	<250	2,710	<250	<250	12,900	645	--	5,400	<500
	08/11/99	<200	<1	<100	<100	120	<100	<100	2,680	<100	<100	11,300	758	--	3,520	<100
	11/16/99	<200	<500	<100	<200	<100	<100	<100	160	<100	<100	18,200	922	--	4,630	<100
	02/28/00	<200	<1	<100	<100	<100	<100	<100	908	<100	<100	3,780	<200	--	1,210	<100
	06/27/00	<100	<500	<50	<50	161	<50	<50	2,880	<50	<50	12,000	712	--	3,180	<50
	05/30/01	<50	<250	<25	<25	64.8	<25	54	1,650	<25	<25	4,990	298	--	1,810	<25
	05/30/02	<5	<2.5	<2.5	<5	4.25	<2.5	<2.5	101	<2.5	<2.5	344	6.6	--	81.6	<2.5
	05/29/03	<5	<2.5	<2.5	<5	28.4	<2.5	8	601	5.7	<2.5	362	18.2	--	199	<2.5
	11/16/04	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	59	<2.5	<2.5	410	3.5	--	96	<2.5
	03/23/05	<20	<10	<10	<20	247	<10	53	3,640	40.2	<10	1,080	49.8	--	639	14.2
	05/18/05	<1	<0.50	<0.50	<1	0.96	<0.50	0.98	30.1	0.57	<0.50	51.1	0.92	--	21.4	<0.50
	05/22/07	<5	<5	<5	<5	35.6	<5	7.45	785	11.1	<5	233	7.8	--	139	<5
	09/11/07	<100	<50	<50	<100	316	<50	57	6,700	53	<50	431	<50	--	516	<50
	12/12/07	<2	<1	<1	<2	1.1	<1	<1	43.8	<1	<1	106	3.16	--	39.6	<1
	03/05/08	<1	4.97	<0.500	<1	156	2.01	46.2	3,170	41.8	<0.500	440	21.2	<0.500	329	18.5
	09/19/08	<50	<25	<25	<50	394	<25	66	7,650	69	<25	968	45	<25	924	58
	12/10/08	<4	<4	<4	<4	33	<4	6.6	670	8.7	<4	99	5	<4	80	<4
	03/27/09	<4	4.8	<4	<4	230	<4	39	4,800	46	<4	540	28	<4	440	31
	03/27/09 DUP	<4	5	<4	<4	250	<4	44	4,700	51	<4	600	32	<4	490	35
06/18/09	<15	<15	<15	<15	170	<15	32	3,500	36	<15	270	<15	<15	230	26	
06/18/09 DUP	<15	<15	<15	<15	170	<15	32	3,600	37	<15	310	<15	<15	250	25	
09/18/09	<15	<15	<15	<15	240	<15	46	4,200	50	<15	540	26	<15	440	51	
09/18/09 DUP	<15	<15	<15	<15	260	<15	49	4,600	52	<15	590	28	<15	470	56	
12/18/09	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	<0.50	100	1.1	1.3	170	2.2	<0.50	65	<0.50	
12/18/09 DUP	<0.50	<0.50	<0.50	<0.50	2.2	<0.50	<0.50	96	1.1	1.3	160	2.1	<0.50	62	<0.50	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-12	03/19/10	<0.50	4.1	<0.50	<0.50	220	2.6	48	4,400	53	<0.50	480	28	0.7	380	37
(continued)	03/19/10 DUP	<15	<15	<15	<15	270	<15	44	4,900	54	<15	600	29	<15	460	39
	06/16/10	<0.50	<0.50	<0.50	<0.50	0.56	<0.50	<0.50	19	<0.50	<0.50	38	<0.50	<0.50	17	<0.50
	06/16/10 DUP	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	18	0.54	<0.50	37	<0.50	<0.50	16	<0.50
	09/23/10	<15	<15	<15	<15	260	<15	47	4,800	56	<15	780	38	<15	560	68
	9/23/10 DUP	<15	<15	<15	<15	260	<15	49	4,800	57	<15	800	41	<15	580	65
	12/09/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.5	<0.5	<0.5	5.1	<0.5	<0.5	2.1	<0.5
	12/09/10 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	4.4	<0.5	<0.5	5.8	<0.5	<0.5	2	<0.5
	03/10/11	<0.50	0.67	<0.50	<0.50	94	0.96	17	1,900	19	0.55	340	12	<0.50	220	11
	03/10/11 DUP	<0.50	0.87	<0.50	<0.50	93	1	17	1,600	19	0.55	260	13	<0.50	180	11
	06/07/11	<0.5	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	59	1	<0.5	53	0.7	<0.5	25	<0.5
	06/07/11 DUP	<0.5	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	60	1	<0.5	58	0.69	<0.5	27	<0.5
	09/19/11	<0.50	3	<0.50	<0.50	240	2.5	45	4,700	55	<0.50	860	65	0.94	690	63
	09/19/11 DUP	<20	<20	<20	<20	240	<20	53	4,700	60	<20	860	60	<20	680	68
	12/07/11	<0.50	<0.50	<0.50	<0.50	130	1.3	28	2,900	33	<0.50	520	34	0.54	380	40
	12/07/11 DUP	<0.50	<15	<0.50	<0.50	140	1.3	29	2,900	33	<0.50	580	34	0.55	400	41
	03/12/12	<15	<15	<15	<15	210	<15	44	3,800	45	<15	770	48	<15	540	46
	03/12/12 DUP	<20	<20	<20	<20	220	<20	44	4,000	47	<20	740	50	<20	540	45
	06/22/2012	<5	<5	<5	<5	100	<5	16	1,700	39	<5	270	13	<5	200	22
	06/22/12 DUP	<5	<5	<5	<5	100	<5	16	1,700	39	<5	270	13	<5	190	22
	09/14/12	<5	<5	<5	<5	220	<5	45	4,700	56	<5	890	61	<5	590	58
	09/14/12 DUP	<15	<15	<15	<15	270	<15	58	5,400	73	<15	1,100	76	<15	730	84
	12/13/12	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	62	0.97	<0.50	38	0.52	<0.50	22	<0.50
	12/13/12 DUP	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	62	0.92	<0.50	38	0.53	<0.50	23	<0.50
	03/15/13	<0.50	1	<0.50	<0.50	200	1.7	40	4,300	55	<0.50	760	53	0.71	540	53
	03/15/13 DUP	<0.50	1	<0.50	<0.50	200	1.8	40	4,200	56	<0.50	750	52	0.66	520	54
	06/13/13	<15	<15	<15	<15	230	<15	38	4,700	53	<15	590	44	<15	480	55
	06/13/13 DUP	<15	<15	<15	<15	240	<15	39	4,800	53	<15	610	46	<15	500	59
	09/20/13	<0.50	<0.50	<0.50	<0.50	170	1.6	37	3,400	49	<0.50	510	37	0.66	400	50
	09/20/13 DUP	<0.50	<0.50	<0.50	<0.50	180	1.7	36	3,400	48	<0.50	520	37	0.63	400	49
	12/16/13	<2.5	<2.5	<2.5	<2.5	36	<2.5	7.5	800	10	<2.5	150	5.7	<2.5	110	9.6
	12/16/13 DUP	<2.5	<2.5	<2.5	<2.5	35	<2.5	7.6	770	9.6	<2.5	140	5.8	<2.5	110	9.8
	3/24/2014	<0.50	<0.50	<0.50	<0.50	110	0.77	18	1,900	25	<0.50	180	8.6	<0.50	170	47
	3/24/2014 DUP	<7	<7	<7	<7	97	<7	16	1,900	22	<7	170	7.5	<7	140	35

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-12	6/24/2014	<1.5	<1.5	<1.5	<1.5	14	<1.5	1.7	300	2.1	<1.5	42	<1.5	<1.5	32	<1.5
(continued)	6/24/2014 DUP	<1.5	<1.5	<1.5	<1.5	14	<1.5	1.9	310	2.3	<1.5	42	1.6	<1.5	34	<1.5
	9/30/2014	<15	<15	<15	<15	190	<15	39	3,500	45	<15	670	36	<15	480	42
	9/30/2014 DUP	<15	<15	<15	<15	180	<15	39	3,500	45	<15	680	35	<15	460	42
	12/11/2014	<0.50	<0.50	<0.50	<0.50	0.72	<0.50	<0.50	34	0.64	<0.50	25	<0.50	<0.50	15	<0.50
	12/11/2014 DUP	<0.50	<0.50	<0.50	<0.50	0.73	<0.50	<0.50	32	0.6	<0.50	24	<0.50	<0.50	14	<0.50
	3/20/2015	<5	<5	<5	<5	102	<5	25.4	2,110	29.4	<5	584	17.8	<5	344	36.8
	3/20/15 DUP	<12.5	<12.5	<12.5	<12.5	143	<12.5	25.8	2,490	28.8	<12.5	495	21.7	<12.5	340	29
	6/19/2015	<10	<10	<10	<10	151	<10	28.2	2,570	25	<10	514	23.6	<10	356	31.1
	6/19/2015 DUP	<10	<10	<10	<10	157	<10	31	2,680	30	<10	516	23.4	<10	362	33.2
	9/22/2015	<8.3	<8.3	<8.3	<8.3	120	<8.3	16.9	2,250	23.4	<8.3	343	15.7	<8.3	239	22.5
	9/22/2015 DUP	<8.3	<8.3	<8.3	<8.3	134	<8.3	21.4	2,490	25.7	<8.3	425	20.1	<8.3	282	26.5
	12/8/2015	<5	<5	<5	<5	8	<5	<5	40	0.7	<5	45	0.5	<5	22	<5
	3/8/2016	<3.6	<14.3	<3.6	<3.6	79.9	<3.6	15.4	1,380	16.2	<3.6	325	7.7	<3.6	209	21.3
	3/8/16 DUP	<3.6	<14.3	<3.6	<3.6	82	<3.6	16.6	1,390	15.6	<3.6	336	7.7	<3.6	210	21.2
	6/16/2016	<8.4	<33.4	<8.4	<8.4	174	<8.4	29.9	3,310	31.6	<8.4	314	12.8	<8.4	288	52.3
	6/16/16 DUP	<8.4	<33.4	<8.4	<8.4	192	<8.4	31.9	3,420	37.4	<8.4	367	15.4	<8.4	311	67
	9/27/2016	<10	<40	<10	<10	26	<10	<10	525	<10	<10	67.6	<10	<10	45.4	14.8
	9/27/2016 DUP	<2.5	<10	<2.5	<2.5	44.4	<2.5	11.5	867	11.4	<2.5	387	3.9	<2.5	163	22.6
	12/14/2016	<1	<4	<1	<1	<1	<1	<1	6.9	2.3	<1	<1	<1	<1	<1	20.5
	12/14/2016 DUP	<2.5	29.1	<2.5	<2.5	16.5	<2.5	4.7	744	<2.5	<2.5	62.3	<2.5	<2.5	42.2	21.2
	3/30/2017	<10	<40	<10	<10	<10	<10	<10	1,120	<10	<10	55.9	<10	<10	29.6	37.8
	3/30/2017 DUP	<2.5	<10	<2.5	<2.5	11.4	<2.5	3.8	853	6.1	<2.5	49	<2.5	<2.5	26	28.3
	6/12/2017	<125	<12.5	<3.1	<3.1	14.0	<3.1	4.7	893	7.6	<3.1	42.4	<3.1	<3.1	18.1	48.4
	6/12/2017 DUP	<3.1	<12.5	<3.1	<3.1	12.8	<3.1	<3.1	860	7.1	<3.1	40.0	<3.1	<3.1	16.5	47.4
	9/28/2017	<3.1	17.4	<3.1	<3.1	19.5	<3.1	<3.1	457	5.4	<3.1	<3.1	<3.1	<3.1	<3.1	47.7
	9/28/2017 DUP	<1.7	16.3	<1.7	<1.7	17.3	<1.7	<1.7	428	5.2	<1.7	<1.7	<1.7	<1.7	<1.7	45.1
	11/9/2017	<2.0	15.4	<0.50	<0.50	4.5	<0.50	<0.50	22	1.4	<0.50	<0.50	<0.50	<0.50	<0.50	49.1
	11/9/2017 DUP	<2.0	12.6	<0.50	<0.50	4.5	<0.50	<0.50	21	1.6	<0.50	<0.50	<0.50	<0.50	<0.50	36.4
	3/20/2018	<0.500	7.50	<0.500	<0.500	0.5	<0.500	<0.500	6	1.3	<0.500	<0.500	<0.500	<0.500	0.271 J	2.8
	3/20/2018 DUP	<0.500	8.18	<0.500	<0.500	0.550 J	<0.500	<0.500	6	1.29 J	<0.500	0.203 J	<0.500	<0.500	0.261 J	2.6
	7/1/2018	<0.500	9.73	<0.500	<0.500	0.9	<0.500	<0.500	4	1.6	<0.500	0.304 J	<0.500	<0.500	1.0	1.5
	7/1/2018 DUP	<0.500	8.34	<0.500	<0.500	0.8	<0.500	<0.500	4	1.6	<0.500	0.289 J	<0.500	<0.500	1.0	1.3
	9/25/2018	<1.00	24.5	<1.00	<1.00	0.730	<0.400	<0.400	1.46	0.520	<0.500	<0.400	<0.400	<0.500	<0.400	1.23
	9/25/2018 DUP	<1.00	23.7	<1.00	<1.00	0.670	<0.400	<0.400	1.31	0.500	<0.500	<0.400	<0.400	<0.500	<0.400	1.21
	12/4/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	4	0.4	<0.500	1.3	<0.400	<0.500	1.3	1.7
	12/4/2018 DUP	<1.00	6.03	<1.00	<1.00	0.5	<0.400	<0.400	4	0.4	<0.500	1.0	<0.400	<0.500	1.0	1.6

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-13	12/02/96	0.7	<0.50	<0.50	<0.20	<0.30	<0.50	0.3	9.1	<1	<0.20	750	6.6	--	82	<0.50
	11/12/97	<250	<500	<250	<250	291	<250	<250	5,050	<250	<250	18,100	<250	--	9,050	<500
	08/11/99	<200	<1	<100	<100	<100	<100	<100	2,280	<100	<100	9,590	<200	--	3,920	<100
	11/16/99	<50	<125	<25	<50	108	<25	51	2,620	<25	<25	7,210	67.5	--	3,050	--
	02/28/00	<200	<1	<100	<100	<100	<100	<100	562	<100	<100	1,340	<200	--	602	<100
	06/28/00	<100	<500	<50	<50	132	<50	142	4,210	<50	<50	14,700	155	--	6,360	<50
	05/30/01	<200	<1,000	<100	<100	<100	<100	<100	2,460	<100	<100	10,300	<200	--	4,620	<100
	05/30/02	<2	<1	<1	<2	1.44	<1	1.28	60.4	<1	<1	241	1.68	--	86.4	<1
	05/28/03	<1	<0.50	<0.50	<1	1.71	<0.50	1.75	79.6	1.26	<0.50	121	1.58	--	130	<0.50
	11/16/04	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12	1,200	<12	--	230	<12
	05/18/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	3.14	<0.50	<0.50	71.2	<0.50	--	10.3	<0.50
	09/12/07	<50	<25	<25	<50	55	<25	28	1,290	<25	<25	2,730	29.5	--	2,020	<25
	12/12/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	3.36	<0.50	<0.50	51.3	0.64	--	19.5	<0.50
	03/05/08	<1	<0.500	<0.500	<1	8.32	<0.500	4.46	174	4.52	<0.500	383	4.21	<0.500	337	0.96
	06/25/08	<5	<5	<5	<5	15.2	<5	<5	320	10.4	<5	132	<5	--	160	<5
	09/19/08	<5	<2.50	<2.50	<5	5.6	<2.50	<2.50	116	2.65	<2.50	266	<2.50	<2.50	187	<2.50
	12/10/08	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	0.62	32	0.69	<0.50	25	0.6	<0.50	39	<0.50
	03/27/09	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	15	<0.50	<0.50	25	<0.50	<0.50	17	<0.50
	03/27/09 DUP	<0.50	<0.50	<0.50	<0.50	0.79	<0.50	<0.50	15	<0.50	<0.50	25	<0.50	<0.50	17	<0.50
	06/18/09	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	0.8	58	1.8	<0.50	16	<0.50	<0.50	42	<0.50
	09/17/09	<0.50	<0.50	<0.50	<0.50	5.8	<0.50	3.3	130	2.9	<0.50	430	4	<0.50	270	1
	12/18/09	<0.50	<0.50	<0.50	<0.50	0.62	<0.50	<0.50	16	<0.50	<0.50	66	0.61	<0.50	45	<0.50
	03/19/10	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	1.4	64	1.2	<0.50	130	1.3	<0.50	110	<0.50
	06/16/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.1	<0.50	<0.50	14	<0.50	<0.50	7.6	<0.50
	09/23/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.7	<0.5	<0.5	45	<0.5	<0.5	12	<0.5
	12/21/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	03/11/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	<0.50	0.65	<0.50
	06/09/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	6.1	<0.5	<0.5	4.2	<0.5
	09/19/11	<0.50	0.54	<0.50	<0.50	35	<0.50	17	700	20	<0.50	2,200	17	0.63	1,300	3.6
	12/09/11	<9	<9	<9	<9	23	<9	11	530	18	<9	2,800	12	<9	1,400	<9
	03/12/12	<9	<9	<9	<9	24	<9	14	600	14	<9	1,800	11	<9	1,200	<9
	06/22/12	<4	<4	<4	<4	40	<4	13	940	30	<4	1,300	8.6	<4	1,000	4.5
	09/14/12	<4	<4	<4	<4	38	<4	21	900	22	<4	3,100	16	<4	1,800	<4
	12/13/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	13	0.62	<0.50	88	<0.50	<0.50	51	<0.50
	03/15/13	<0.50	<0.50	<0.50	<0.50	34	<0.50	21	890	20	<0.50	2,400	14	0.68	1,700	3.2
	06/14/13	<4	<4	<4	<4	19	<4	9.4	520	15	<4	1,100	6	<4	920	<4
	09/20/13	<0.50	<0.50	<0.50	<0.50	40	<0.50	20	770	19	<0.50	2,600	13	0.74	1,700	3.4
	12/13/13	<4	<4	<4	<4	11	<4	6.6	280	5.8	<4	1,300	4.9	<4	720	<4
	3/21/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	14	<0.50	<0.50	100	<0.50	<0.50	54	<0.50
	6/24/2014	<0.50	<0.50	<0.50	<0.50	12	<0.50	<0.50	880	33	<0.50	1,500	12	0.67	1,300	3.2
	09/30/14	<4	<4	<4	<4	38	<4	20	890	19	<4	3,100	13	<4	2,000	<4
	12/11/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	18	0.66	<0.50	91	<0.50	<0.50	65	<0.50

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Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)															
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride	
MW-13 (continued)	3/18/2015	<1.6	<1.6	<1.6	<1.6	19	<1.6	3.1	515	7.4	<1.6	551	2.4	<1.6	609	<1.6	
	6/18/2015	<0.50	<0.50	<0.50	<0.50	33.9	<0.50	15.9	615	15.3	<0.50	1,960	10.4	<0.50	1,390	2	
	9/22/2015	<0.50	<0.50	<0.50	<0.50	33.9	<0.50	21	754	15.6	<0.50	2,370	10.4	<0.50	1,740	2.4	
	12/8/2015	<0.50	<0.50	<0.50	<0.50	0.89	<0.50	0.64	30.5	0.88	<0.50	185	0.7	<0.50	121	<0.50	
	3/8/2016	<2.5	<10	<2.5	<2.5	14.3	<2.5	6.4	336	4.6	<2.5	839	3.7	<2.5	736	<2.5	
	6/16/2016	<8.4	<33.4	<8.4	<8.4	41.3	<8.4	17.8	841	19.2	<8.4	2,470	10.1	<8.4	1,820	<8.4	
	9/28/2016	<2.5	<10	<2.5	<2.5	<2.5	<2.5	<2.5	148	<2.5	<2.5	4,840	<2.5	<2.5	895	<2.5	
	9/28/16 DUP	<2.5	<10	<2.5	<2.5	<2.5	<2.5	<2.5	145	<2.5	<2.5	5,090	<2.5	<2.5	951	<2.5	
	12/16/2016	<5	<20	<5	<5	<5	<5	<5	509	<5	<5	1,020	<5	<5	394	<5	
	3/30/2017	<5	<20	<5	<5	<5	<5	<5	101	<5	<5	176	<5	<5	57.6	<5	
	6/15/2017	<1.0	<4.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.2	272	1.6	<1.0	97.7	<1.0	<1.0	56.3	4.1
	9/27/2017	<1.0	<4.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.0	3,220	7.3	<1.0	3.3	<1.0	<1.0	1.3	25.0
	11/7/2017	<16.7	<16.7	<4.2	<4.2	<4.2	<4.2	<4.2	1,360	5.4	<4.2	<4.2	<4.2	<4.2	<4.2	<4.2	25.0
	3/20/2018	<0.500	3.29	<0.500	<0.500	0.879	<0.500	2.55	1,730	5.20	<0.500	0.396 J	<0.500	<0.500	2.19	211	
	7/1/2018	<0.500	<2.50	<0.500	<0.500	18.3	0.148 J	5.98	1680	26.9	<0.500	<0.500	<0.500	<0.500	0.781	2030	
	9/25/2018	<1.00	10.9	<1.00	<1.00	1.91	<0.400	<0.400	9.78	1.26	<0.500	0.410	<0.400	<0.500	0.800	113	
12/5/2018	<1.00	6.7	<1.00	<1.00	<0.400	<0.400	<0.400	6.17	0.682	<0.500	0.567	<0.400	<0.500	0.413	55.2		
MW-14	11/12/97	<5	<10	<5	<5	5.01	<5	<5	<5	<5	<5	42.6	<5	--	394	<10	
	08/10/99	<20	<100	<10	<10	<10	<10	<10	15.1	<10	<10	121	35.6	--	853	<10	
	11/16/99	<2	<5	<1	<2	2.48	<1	2.48	4.2	<1	<1	186	10.8	--	313	<1	
	02/28/00	<100	<500	<50	<50	<50	<50	83.2	85.1	<50	<50	711	190	--	5,300	<50	
	06/27/00	<10	<50	<5	<5	10.1	<5	18.9	219	<5	<5	207	46.2	--	1,150	<5	
	11/30/00	<2	<10	<1	<1	1.08	<1	1.88	2.27	<1	<1	21.3	5.54	--	157	<1	
	05/30/01	<1	<50	<5	<5	6.16	<5	13.8	30.4	<5	<5	268	28.2	--	1,280	<5	
	05/30/02	<10	<5	<5	<10	<5	<5	<5	8.4	<5	<5	78.3	11.9	--	303	<5	
	05/28/03	<1	<0.50	<0.50	<1	0.9	<0.50	1.47	4.15	<0.50	<0.50	80.6	4.99	--	188	<0.50	
	11/15/04	<25	<25	<25	<25	<25	<25	<25	96	<25	<25	480	<25	--	1,200	<25	
	05/17/05	<2	<1	<1	<2	4.64	<1	2.3	41.1	<1	<1	127	9.28	--	367	<1	
	09/12/07	<20	<10	<10	<20	21.6	<10	<10	162	<10	<10	180	22.2	--	963	<10	
	03/05/08	<1	<0.500	0.850 J	<1	24.3	<0.500	13.9	217	3.86	<0.500	549	27.2	<0.500	1,770	<0.500	
	06/25/08	<5	<5	<5	<5	15.2	<5	10.2	113	<5	<5	360	18.2	--	1,290	<5	
	09/19/08	<5	<2.50	<2.50	<5	19.1	<2.50	8.6	173	<2.50	<2.50	425	16.6	<2.50	1,320	<2.50	
	12/10/08	<5	<5	<5	<5	17	<5	9.6	160	<5	<5	330	17	<5	1,200	<5	
	03/27/09	<2.5	<2.5	<2.5	<2.5	16	<2.5	6.7	160	2.5	<2.5	320	14	<2.5	980	<2.5	
	06/17/09	<2.5	<2.5	<2.5	<2.5	21	<2.5	12	150	<2.5	<2.5	400	21	<2.5	1,400	<2.5	
	09/18/09	<0.50	<0.50	0.74	<0.50	19	<0.50	8.8	150	2	<0.50	440	17	<0.50	1,300	<0.50	
	12/15/09	<2.5	<2.5	<2.5	<2.5	11	<2.5	4.7	120	<2.5	<2.5	410	7.6	<2.5	820	<2.5	
03/17/10	<2.5	<2.5	<2.5	<2.5	22	<2.5	9.5	140	<2.5	<2.5	320	15	<2.5	1,300	<2.5		
07/02/10	<2.5	<2.5	<2.5	<2.5	7	<2.5	4.8	52	<2.5	<2.5	220	5.9	<2.5	610	<2.5		
09/22/10	<3	<3	<3	<3	16	<3	6.5	140	<3	<3	230	10	<3	800	<3		
12/08/10	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	0.7	11	<0.5	<0.5	82	1.5	<0.5	150	<0.5		

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-14 (continued)	03/09/11	<3	<3	<3	<3	6.8	<3	3.8	55	<3	<3	200	5	<3	540	<3
	06/08/11	<0.5	<0.5	<0.5	<0.5	0.64	<0.5	<0.5	1.8	<0.5	<0.5	27	1.1	<0.5	66	<0.5
	09/14/11	<2.5	<2.5	<2.5	<2.5	12	<2.5	5.7	120	<2.5	<2.5	300	8	<2.5	850	<2.5
	12/06/11	<2.5	<2.5	<2.5	<2.5	8.4	<2.5	3.9	88	<2.5	<2.5	320	5.7	<2.5	740	<2.5
	03/07/12	<2.5	<2.5	<2.5	<2.5	9.3	<2.5	4.6	87	<2.5	<2.5	270	6.1	<2.5	760	<2.5
	06/19/12	<2.5	<2.5	<2.5	<2.5	11	<2.5	5.6	70	<2.5	<2.5	200	7.4	<2.5	730	<2.5
	09/11/12	<2.5	<2.5	<2.5	<2.5	11	<2.5	5.1	110	<2.5	<2.5	280	6.6	<2.5	730	<2.5
	12/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	<0.50	16	<0.50	<0.50	27	<0.50
	03/12/13	<0.50	<0.50	0.56	<0.50	12	<0.50	4.4	100	1.7	<0.50	230	7.2	<0.50	670	<0.50
	06/12/13	<3	<3	<3	<3	11	<3	5	84	<3	<3	260	6.6	<3	770	<3
	09/18/13	<0.50	<0.50	<0.50	<0.50	13	<0.50	4.6	130	2	<0.50	240	5.9	<0.50	640	<0.50
	12/11/13	<1.5	<1.5	<1.5	<1.5	8.4	<1.5	2.8	83	<1.5	<1.5	180	3.7	<1.5	460	<1.5
	3/18/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	11	<0.50	<0.50	20	<0.50
	6/24/2014	<0.50	<0.50	<0.50	<0.50	17	<0.50	7	120	1.8	<0.50	210	0.87	<0.50	670	<0.50
	9/24/2014	<2.5	<2.5	<2.5	<2.5	10	<2.5	4	120	<2.5	<2.5	240	4	<2.5	640	<2.5
	12/9/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.7	<0.50	<0.50	29	0.61	<0.50	63	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	15.4	<0.50	5.9	128	2.2	<0.50	312	5.9	<0.50	912	<0.50
	6/16/2015	<3.1	<3.1	<3.1	<3.1	14.7	<3.1	4.9	117	<3.1	<3.1	248	4.4	<3.1	792	<3.1
	9/21/2015	<0.50	<0.50	<0.50	<0.50	15.2	<0.50	5.6	116	2.1	<0.50	201	4.7	<0.50	654	<0.50
	12/8/2015	Not sampled; well monument under water.														
	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	4.2	<0.50	<0.50	12.5	<0.50	<0.50	29.2	<0.50
	9/27/2016	<0.50	<2	<0.50	<0.50	7.2	<0.50	2.1	61.8	0.94	<0.50	100	1.7	<0.50	218	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	0.56	<0.50	<0.50	0.97	<0.50
	3/27/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	0.57	69.2	<0.5	<0.5	14.7	<0.5	<0.5	33.4	0.62
	6/13/2017	<2.0	<2.0	<0.50	<0.50	10	<1.0	5.3	432	2.7	<0.50	58.3	2.1	<0.50	204	2.5
	9/26/2017	<0.84	<3.3	<0.84	<0.84	6	<0.84	2.6	279	2.8	<0.84	62.4	<0.84	<0.84	265	<0.84
	11/8/2017	<3.3	<3.3	<0.84	<0.84	5	<0.84	2.1	306	2.2	<0.84	39.3	<0.84	<0.84	160	0.9
	3/20/2018	<0.500	1.67 J	<0.500	<0.500	5	<0.500	3.6	500	2.6	<0.500	36.0	0.6	<0.500	150	1.35 J
6/28/2018	<0.500	<2.50	<0.500	<0.500	11	<0.500	2.5	255	2.5	<0.500	34.9	1.6	<0.500	247	0.7	
9/26/2018	<10.0	<50.0	<10.0	<10.0	12.1	<4.00	4.40	361	4.50	<5.00	84.3	<4.00	<5.00	484	<4.00	
12/5/2018	<10.0	<50.0	<10.0	<10.0	5	<4.00	<4.00	333	<4.00	<5.00	83.4	<4.00	<5.00	260	<4.00	
MW-15	11/13/97	<0.50	<1	<0.50	<0.50	<0.50	1.1	<0.50	6.78	<0.50	<0.50	2.38	1.68	--	1.81	<1
	11/16/99	<1	<2.5	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	967	13.7	--	63.4	<0.50
	02/28/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	17.9	1.55	--	1.01	<0.50
	06/27/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.44	1.03	--	0.565	<0.50
	05/30/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.32	<1	--	<0.50	<0.50
	05/31/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.59	0.63	--	<0.50	<0.50
	05/29/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	0.53	<0.50	<0.50	4.42	<0.50	--	1.3	<0.50
	11/02/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.9	<0.50	--	<0.50	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-15 (continued)	11/16/04	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.73	<0.50	<0.50	12	<0.50	--	3.1	<0.50
	03/24/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	0.74	<0.50	--	1.49	<0.50	
	05/17/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	1.54	<0.50	--	0.58	<0.50	
	09/13/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	0.54 J	<0.50	--	<0.50	<0.50	
	03/07/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	2.63 J	<0.500	<0.500	<0.500	<0.500	
	09/18/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	0.86	<0.500	<0.500	<0.500	<0.500	
	03/25/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	<0.50	<0.50	
	09/17/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.81	<0.50	<0.50	<0.50	<0.50	
	03/18/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	<0.50	<0.50	
	09/23/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.76	<0.5	<0.5	<0.5	<0.5	
	03/09/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
	09/16/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.64	<0.50	<0.50	<0.50	<0.50	
	03/09/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	<0.50	<0.50	
	09/10/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.5	<0.50	<0.50	<0.50	<0.50	
	03/14/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.58	<0.50	<0.50	<0.50	<0.50	
	09/19/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.56	<0.50	<0.50	<0.50	<0.50	
	3/21/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
	9/30/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.87	<0.50	<0.50	<0.50	<0.50	
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.5	<0.50	<0.50	<0.50	<0.50	
	9/23/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.62	<0.50	<0.50	<0.50	<0.50	
	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.59	<0.50	<0.50	<0.50	<0.50	
	9/30/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	<0.50	<0.50	<0.50	
	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
9/28/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50		
11/6/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.6	<0.50	<0.50	<0.50	<0.50		
7/2/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.60	<0.500	<0.500	<0.500	<0.500		
MW-16	11/12/97	<5	<10	<5	<5	19.8	<5	27.8	23.6	<5	<5	328	57.5	--	142	<10
	08/11/99	<5	<25	<2.5	<2.5	15.2	<2.5	<2.5	7.2	<2.5	<2.5	205	55.6	--	85.6	<2.5
	02/28/00	<2	<10	<1	<1	10.4	<1	12	7.4	<1	<1	523	54.5	--	112	<1
	06/27/00	<10	<50	<5	<5	12.4	<5	13.9	8.39	<5	<5	236	45	--	93.8	<5
	05/30/01	<10	<50	<5	<5	9.28	<5	12	8.95	<5	<5	302	30.1	--	110	<5
	05/30/02	<5	<2.5	<2.5	<5	13.5	<2.5	10.6	8.65	<2.5	<2.5	467	24	--	119	<2.5
	05/29/03	<5	<2.5	<2.5	<5	3.6	<2.5	3.35	2.85	<2.5	<2.5	412	13.4	--	76	<2.5
	11/02/04	<2	<10	<1	<1	<1	<1	<1	1.66	<1	<1	260	6.9	--	25.4	<1
	11/16/04	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	300	7.8	--	26	<2.5
	03/24/05	<2	<1	<1	<2	1.8	<1	1.34	1.96	<1	<1	373	11.8	--	49.4	<1
	05/17/05	<1	<0.50	<0.50	<1	4.39	<0.50	3.14	9.25	<0.50	<0.50	120	9.09	--	41.5	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-16	11/15/05	<1	<0.500	<0.500	<1	2.75	<0.500	1.86	2.5	<0.500	<0.500	152	8.94	--	33.4	<0.500
(continued)	02/21/06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	06/06/06	<2	<2	<2	<2	12.2	<2	3.38	210	<2	<2	84.6	2.56	--	25.2	5.64
	12/06/06	<2	<1	<1	<2	4.2	<1	2.12	16.7	<1	<1	176	5.88	--	45.6	<1
	05/23/07	<1	<1	<1	<1	2.57	<1	<1	14	<1	<1	98.8	3.35	--	23.8	<1
	09/13/07	<1	<0.50	<0.50	<1	3.15	<0.50	1.08	6.6	<0.50	<0.50	163	5.87	--	49.2	<0.50
	12/12/07	<2	<1	<1	<1	2.32	<1	1.44	5.9	<1	<1	110	5.92	--	28.2	<1
	03/07/08	<1	<0.500	<0.500	<1	3	<0.500	1.86	5.93	<0.500	<0.500	280	6.12	<0.500	73.3	<0.500
	09/18/08	<5	<2.50	<2.50	<5	2.7	<2.50	<2.50	5.15	<2.50	<2.50	300	6.2	<2.50	65.2	<2.50
	12/09/08	<1	<1	<1	<1	2.6	<1	1.8	5.5	<1	<1	300	5.7	<1	67	<1
	03/26/09	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	0.82	3.2	<0.50	<0.50	150	5.2	<0.50	28	<0.50
	06/17/09	<0.50	<0.50	<0.50	<0.50	5	<0.50	0.95	29	<0.50	<0.50	54	1.8	<0.50	16	0.68
	09/17/09	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	1.1	2	<0.50	<0.50	220	4.8	<0.50	33	<0.50
	12/17/09	<0.50	<0.50	<0.50	<0.50	0.87	<0.50	0.6	1.4	<0.50	<0.50	100	3.2	<0.50	19	<0.50
	03/19/10	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	1	2	<0.50	<0.50	110	4.5	<0.50	36	<0.50
	06/16/10	<0.50	<0.50	<0.50	<0.50	4.9	<0.50	0.91	37	<0.50	<0.50	39	0.94	<0.50	9.9	1.6
	09/23/10	<0.5	<0.5	<0.5	<0.5	1.4	<0.5	0.94	2.8	<0.5	<0.5	240	4.2	<0.5	43	<0.5
	12/10/10	<0.5	<0.5	<0.5	<0.5	0.85	<0.5	0.54	1.6	<0.5	<0.5	94	2.4	<0.5	18	<0.5
	03/10/11	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	0.5	6.2	<0.50	<0.50	110	1.9	<0.50	21	<0.50
	06/09/11	<0.5	<0.5	<0.5	<0.5	4.9	<0.5	1.2	63	<0.5	<0.5	28	<0.5	<0.5	7.1	2.2
	09/19/11	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	5.1	<0.50	<0.50	160	2.7	<0.50	13	<0.50
	12/08/11	<0.50	<0.50	<0.50	<0.50	0.92	<0.50	0.61	2.2	<0.50	<0.50	210	2.9	<0.50	38	<0.50
	06/20/12	<0.5	<0.5	<0.5	<0.5	3.6	<0.5	0.56	24	<0.5	<0.5	60	0.98	<0.5	14	0.62
	09/13/12	<0.50	<0.50	<0.50	<0.50	1.7	<0.50	0.61	6.5	<0.50	<0.50	190	2.4	<0.50	35	<0.50
	12/13/12	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	0.68	5.7	<0.50	<0.50	110	1.1	<0.50	24	<0.50
	03/14/13	<0.50	<0.50	<0.50	<0.50	0.98	<0.50	0.7	4.7	<0.50	<0.50	200	2	<0.50	50	<0.50
	06/14/13	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	6	<0.50	<0.50	84	0.96	<0.50	18	<0.50
	09/19/13	<0.50	<0.50	<0.50	<0.50	0.92	<0.50	0.75	7.1	<0.50	<0.50	180	1.4	<0.50	57	<0.50
	12/13/13	<0.50	<0.50	<0.50	<0.50	0.8	<0.50	0.68	5.9	<0.50	<0.50	160	1.4	<0.50	52	<0.50
	3/20/2014	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	0.89	19	<0.50	<0.50	52	<0.50	<0.50	13	0.55
	6/24/2014	<0.50	<0.50	<0.50	<0.50	2	<0.50	<0.50	10	<0.50	<0.50	70	0.7	<0.50	12	<0.50
	9/27/2014	<0.50	<0.50	<0.50	<0.50	0.77	<0.50	0.66	8.8	<0.50	<0.50	200	1.4	<0.50	47	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)															
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride	
MW-16 (continued)	12/11/2014	<0.50	<0.50	<0.50	<0.50	0.64	<0.50	<0.50	4	<0.50	<0.50	76	0.96	<0.50	17	<0.50	
	3/18/2015	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	6	<0.50	<0.50	157	0.94	<0.50	31	<0.50	
	6/17/2015	<0.50	<0.50	<0.50	<0.50	0.61	<0.50	<0.50	10.5	<0.50	<0.50	179	1	<0.50	41.6	<0.50	
	9/23/2015	<0.50	<0.50	<0.50	<0.50	0.56	<0.50	<0.50	0.65	10.4	<0.50	<0.50	173	1.2	<0.50	43.5	<0.50
	12/7/2015	Not sampled; well monument under water.															
	9/28/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	9.5	<0.50	<0.50	144	0.66	<0.50	35.6	<0.50	
	12/14/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	<0.50	51.5	<0.50	<0.50	11.6	<0.50	
	3/29/2017	<0.5	<2	<0.5	<0.5	1.6	<0.5	<0.5	19	<0.5	<0.5	27	<0.5	<0.5	6.4	<0.5	
	6/14/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	6.4	<0.50	<0.50	53.7	0.66	<0.50	5.4	<0.50	
	9/25/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	1.3	<0.50	<0.50	148.0	1.00	<0.50	11.1	<0.50	
	11/6/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	3.8	<0.50	<0.50	150.0	0.96	<0.50	17.4	<0.50	
	3/19/2018	<0.500	<2.50	<0.500	<0.500	0.232 J	<0.500	0.190 J	3.8	<0.500	<0.500	99.7	0.82	<0.500	12.6	<0.500	
	7/2/2018	<0.500	<2.50	<0.500	<0.500	0.500 J	<0.500	0.209 J	9.6	<0.500	<0.500	72.5	0.86	<0.500	7.4	<0.500	
	9/25/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	15.8	<0.400	<0.500	171	0.580	<0.500	33.9	<0.400	
	12/6/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	4.5	<0.400	<0.500	130.0	0.76	<0.500	20.8	<0.400	
MW-17	11/13/97	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.9	<0.50	--	<0.50	<1	
	11/16/99	<1	<2.5	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	127	1.5	--	9.54	<0.50	
	02/28/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.85	<1	--	2.51	<0.50	
	06/27/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.27	<1	--	<0.50	<0.50	
	05/30/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<1	--	<0.50	<0.50	
	05/30/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.82	<0.50	--	<0.50	<0.50	
	05/28/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.75	<0.50	--	0.92	<0.50	
	11/15/04	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	--	<0.50	<0.50	
	05/17/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.06	<0.50	--	6.68	<0.50	
	05/23/07	<1	<1	<1	<1	<1	<1	<1	8.82	<1	<1	37.8	<1	--	28.2	<1	
	09/11/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50 J	<0.50	--	<0.50	<0.50	
	03/05/08	<1	<0.500	<0.500	<1	0.9	<0.500	<0.500	0.96	<0.500	<0.500	1.05	<0.500	<0.500	3.62	<0.500	
	09/19/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.8	<0.500	
	03/25/09	<0.50	<0.50	<0.50	<0.50	0.57	<0.50	<0.50	1	<0.50	<0.50	0.69	<0.50	<0.50	3	<0.50	
	09/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.8	<0.50	<0.50	0.72	<0.50	<0.50	3.2	<0.50	
	03/23/10	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	3.9	<0.50	<0.50	3.2	0.58	<0.50	18	<0.50	
	09/20/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.69	<0.5	<0.5	0.71	<0.5	<0.5	3	<0.5	
	03/09/11	<0.50	<0.50	<0.50	<0.50	0.65	<0.50	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	<0.50	8.2	<0.50	
	09/13/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.96	<0.50	<0.50	0.71	<0.50	<0.50	3.1	<0.50	
	03/07/12	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	5.4	<0.50	<0.50	6.8	0.56	<0.50	25	<0.50	
09/11/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.73	<0.50	<0.50	0.66	<0.50	<0.50	2.5	<0.50		
03/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.9	<0.50	<0.50	4.1	<0.50	<0.50	11	<0.50		
09/17/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	4.2	<0.50	<0.50	8.9	<0.50		

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-17 (continued)	3/18/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/24/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	<0.50	3.2	<0.50	<0.50	6.8
	3/18/2015	<0.50	<0.50	<0.50	<0.50	0.71	<0.50	<0.50	2.4	<0.50	<0.50	3.9	<0.50	<0.50	12.6	<0.50
	9/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.53	<0.50	<0.50	2.5	<0.50	<0.50	4.2	<0.50
	3/8/2016	<0.50	<2	<0.50	<0.50	0.83	<0.50	<0.50	3.3	<0.50	<0.50	9.4	<0.50	<0.50	22.7	<0.50
	9/27/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	<0.50	4.2	<0.50	<0.50	10.4	<0.50
	3/29/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	9/29/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	2.7	<0.50	<0.50	4.6	<0.50	<0.50	11.4	<0.50
	11/8/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	9.3	<0.50	<0.50	9.9	<0.50	<0.50	21.9	<0.50
	6/28/2018	<0.500	<2.50	<0.500	<0.500	0.516	<0.500	<0.500	2.7	<0.500	<0.500	3.7	<0.500	<0.500	9.0	<0.500
	9/26/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	1.6	<0.400	<0.500	2.2	<0.400	<0.500	4.6	<0.400
MW-18i	09/29/00	ND	ND	0.694	ND	0.843	ND	ND	16.5	ND	ND	11.7	ND	--	8.32	ND
	11/30/00	<1	<5	<0.50	<0.50	0.907	<0.50	<0.50	11.6	<0.50	<0.50	12.4	<1	--	17.6	<0.50
	02/27/01	<5	<25	<2.5	<2.5	<2.5	<2.5	<2.5	10.2	<2.5	<2.5	15.2	<5	--	10	<2.5
	05/30/01	<5	<25	<2.5	<2.5	<2.5	<2.5	<2.5	6.47	<2.5	<2.5	29.5	<5	--	8.06	<2.5
	09/25/01	<1	<1	<1	<1	1.8	<1	<1	23	<1	<1	62	2.3	--	39	<1
	03/29/02	<1	<0.50	<0.50	<1	1.2	<0.50	<0.50	17.3	<0.50	<0.50	71.1	1.22	--	31	<0.50
	05/30/02	<1	<0.50	<0.50	<1	1.18	<0.50	<0.50	18.6	<0.50	<0.50	53.2	1.14	--	19.3	<0.50
	08/29/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	6.91	<0.50	<0.50	18.2	<0.50	--	7.34	<0.50
	11/07/02	<1	<0.50	<0.50	<1	0.56	<0.50	<0.50	10.1	<0.50	<0.50	23.3	<0.50	--	9.7	<0.50
	01/23/03	<1	<0.50	<0.50	<1	0.68	<0.50	<0.50	12.3	<0.50	<0.50	27.6	0.5	--	12.5	<0.50
	05/29/03	<1	<0.50	<0.50	<1	0.59	<0.50	<0.50	10.4	<0.50	<0.50	23.9	0.5	--	10.8	<0.50
	11/11/03	<1	<1	<1	<1	<1	<1	<1	16.1	<1	<1	31.5	<1	--	16.3	<1
	01/27/04	<1	<0.50	<0.50	<1	0.67	<0.50	<0.50	14.2	<0.50	<0.50	69.7	0.53	--	12	<0.50
	05/04/04	<1	<1	<1	<1	<1	<1	<1	15.6	<1	<1	112	<1	--	12.1	<1
	08/17/04	<1	<0.50	3.76	<0.50	0.81	1.86	<0.50	22.6	0.78	<0.50	43.8	0.96	--	24	<1
	11/02/04	<0.50	<0.50	<0.50	<0.50	1.09	<0.50	<0.50	21.8	<0.50	<0.50	32.2	0.6	--	17.8	<0.50
	11/16/04	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	24	<0.50	<0.50	42	0.69	--	21	<0.50
	02/01/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	8.92	<0.50	<0.50	13	<0.50	--	6.01	<0.50
	05/18/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	11	<0.50	<0.50	9.69	<0.50	--	7.3	<0.50
	08/18/05	<1	<0.500	<0.500	<1	1.17	<0.500	<0.500	18 B	<0.500	<0.500	21.4 B	0.58	--	16.3 B	<0.500
08/18/05 DUP	<1	<0.500	<0.500	<1	1.17	<0.500	<0.500	18.5 B	<0.500	<0.500	21.8 B	0.57	--	16.2 B	<0.500	
11/15/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	7.31	<0.500	<0.500	11.4	<0.500	--	6.31	<0.500	
02/21/06	<1	<0.500	<0.500	<1	0.93	<0.500	<0.500	14.8	<0.500	<0.500	24.3	0.52	--	15.2	<0.500	
06/06/06	<1	<1	<1	<1	<1	<1	<1	5.88	<1	<1	8.46	<1	--	4.47	<1	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-18i	09/06/06	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	5.79	<0.50	<0.50	7.89	<0.50	--	4.23	<0.50
(continued)	12/06/06	<1	<0.50	<0.50	<1	0.56	<0.50	<0.50	11.6	<0.50	<0.50	11.2	<0.50	--	6.91	<0.50
	02/07/07	<1	<0.50	<0.50	<1	0.68	<0.50	<0.50	12	<0.50	<0.50	15	<0.50	--	9.32	<0.50
	05/23/07	<1	<1	<1	<1	<1	<1	<1	14.6	<1	<1	17.2	<1	--	11.3	<1
	09/11/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	4.87	<0.50	<0.50	1.13	<0.50	--	1.46	<0.50
	12/13/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	2.99	<0.50	<0.50	5.57	<0.50	--	3.32	<0.50
	03/06/08	<1	<0.500	<0.500	<1	0.82	<0.500	<0.500	13.2	<0.500	<0.500	13.2	<0.500	<0.500	9.78	<0.500
	06/10/08	<1	1	1	<1	<1	<1	<1	4.17	<1	<1	4.31	<1	--	2.18	<1
	09/17/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	3.95	<0.500	<0.500	3.1	<0.500	<0.500	2.55	<0.500
	12/09/08	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	12	<0.50	<0.50	8.5	<0.50	<0.50	7.4	<0.50
	03/26/09	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	<0.50	8	<0.50	<0.50	4.8	<0.50	<0.50	4.7	<0.50
	06/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.3	<0.50	<0.50	2.5	<0.50	<0.50	1.7	<0.50
	09/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.2	<0.50	<0.50	5.9	<0.50	<0.50	4.5	<0.50
	12/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	2.5	<0.50	<0.50	1.6	<0.50
	03/18/10	<0.50	<0.50	<0.50	<0.50	0.52	<0.50	<0.50	11	<0.50	<0.50	9.7	<0.50	<0.50	6	<0.50
	06/15/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3	<0.50	<0.50	3.6	<0.50	<0.50	1.8	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	0.71	<0.5	0.5	15	<0.5	<0.5	9.8	<0.5	<0.5	7.4	<0.5
	12/09/10	<0.5	<0.5	<0.5	<0.5	0.66	<0.5	0.5	15	<0.5	<0.5	12	<0.5	<0.5	8	<0.5
	03/10/11	<0.50	<0.50	<0.50	<0.50	0.5	<0.50	<0.50	12	<0.50	<0.50	9.4	<0.50	<0.50	5.2	<0.50
	06/09/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2	<0.5	<0.5	2.1	<0.5	<0.5	1	<0.5
	09/15/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.3	<0.50	<0.50	2.9	<0.50	<0.50	1.9	<0.50
	12/08/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.8	<0.50	<0.50	8.5	<0.50	<0.50	4.8	<0.50
	03/07/12	<0.50	<0.50	<0.50	<0.50	0.62	<0.50	<0.50	15	<0.50	<0.50	12	<0.50	<0.50	6.4	<0.50
	06/21/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.7	<0.5	<0.5	1.5	<0.5	<0.5	0.97	<0.5
	09/13/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.2	<0.50	<0.50	1.7	<0.50	<0.50	1	<0.50
	12/13/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.3	<0.50	<0.50	3.9	<0.50	<0.50	2.1	<0.50
	03/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.2	<0.50	<0.50	3.8	<0.50	<0.50	2.1	<0.50
	06/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.9	<0.50	<0.50	2.4	<0.50	<0.50	1.3	<0.50
	09/19/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	<0.50	2.2	<0.50	<0.50	1.3	<0.50
	12/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	11	<0.50	<0.50	5.3	<0.50	<0.50	3.6	<0.50
	3/20/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	1	<0.50	<0.50	0.7	<0.50
	6/26/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.63	<0.50	<0.50	0.19	<0.50	<0.50	1	<0.50
	9/26/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	<0.50	1.5	<0.50	<0.50	0.93	<0.50
	12/10/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.9	<0.50	<0.50	2	<0.50	<0.50	1.3	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-18i (continued)	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.3	<0.50	<0.50	2	<0.50	<0.50	1.1	<0.50
	6/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	2	<0.50	<0.50	1.1	<0.50
	9/23/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.5	<0.50	<0.50	3.4	<0.50	<0.50	1.8	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.5	<0.50	<0.50	4	<0.50	<0.50	2.6	<0.50
	3/9/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	1	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.98	<0.50	<0.50	0.73	<0.50
	9/28/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	0.85	<0.50
	12/14/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	2.8	<0.50	<0.50	1.5	<0.50	<0.50	1.2	<0.50
	3/29/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	1.4	<0.5	<0.5	1.2	<0.5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	0.66	<0.50
	9/27/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	6.40	<0.50	<0.50	1.9	<0.50	<0.50	1.30	<0.50
	11/7/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.9	<0.50	<0.50	0.50	<0.50
	3/21/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	1.43	<0.500	<0.500	1.5	<0.500	<0.500	0.82	<0.500
	7/2/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.63	<0.500	<0.500	0.6	0.320 J	<0.500	<0.500	<0.500
	9/27/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	0.7	<0.400	<0.500	<0.400	<0.400
12/6/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	0.96	<0.400	<0.500	1.3	<0.400	<0.500	0.70	<0.400	
MW-19	11/07/02	<20	<10	<10	<20	252	<10	66.2	2,450	23	<10	3,100	139	--	1,810	79.2
	05/30/03	<50	<25	<25	<50	109	<25	36	1,300	<25	<25	7,160	104	--	2,070	35.5
	11/16/04	<50	<50	<50	<50	<50	65	<50	490	<50	<50	7,300	130	--	1,400	<50
	05/18/05	<10	<5	<5	<10	19.3	<5	<5	161	<5	<5	1,500	33.8	--	205	24.6
	11/15/05	<20	<10	<10	<20	27	<10	18.8	230	<10	<10	3,080	67.2	--	785	14.6
	11/15/05 DUP	<20	<10	<10	<20	25	<10	20.2	221	<10	<10	2,860	64.4	--	762	15.2
	06/05/06	<10	<10	<10	<10	<10	<10	<10	80.9	<10	<10	1,280	13.1	--	237	<10
	12/06/06	<20	<10	<10	<20	<10	<10	<10	76.2	<10	<10	2,060	17.2	--	304	<10
	05/22/07	<20	<20	<20	<20	<20	<20	<20	114	<20	<20	2,720	51.4	--	504	<20
	09/11/07	<50	<25	<25	<50	<25	<25	<25	85.5	<25	<25	3,370	62.5	--	608	<25
	12/12/07	<50	<25	<25	<50	<25	<25	<25	80	<25	<25	2,070	38.5	--	326	<25
	03/05/08 ⁷	<1	<0.500	<0.500	<1	12.5	<0.500	20.5	149	4.53	<0.500	4,060	66	<0.500	1,030	6.41
	06/25/08	<20	<20	<20	<20	45.8	<20	29.6	435	<20	<20	2,790	46.6	--	1,410	<20
	09/19/08	<50	<25	<25	<50	62	<25	37.5	715	<25	<25	4,990	56.5	<25	2,870	39.5
	12/10/08	<25	<25	<25	<25	51	<25	<25	500	<25	<25	6,600	110	<25	1,100	<25
	03/27/09	<15	<15	<15	<15	53	<15	39	650	<15	<15	4,500	120	<15	1,900	25
	03/27/09 DUP	<15	<15	<15	<15	56	<15	39	670	<15	<15	4,800	130	<15	1,900	25
	06/18/09	<2.5	<2.5	<2.5	<2.5	5.4	<2.5	5.3	82	<2.5	<2.5	680	8.6	<2.5	240	<2.5
	06/18/09 DUP	<2.5	<2.5	<2.5	<2.5	5.1	<2.5	5.4	80	<2.5	<2.5	660	8.4	<2.5	240	<2.5
	09/18/09	<2.5	<2.5	<2.5	<2.5	12	<2.5	36	170	4.6	<2.5	9,400	140	<2.5	2,000	11
	09/18/09 DUP	<2.5	<2.5	<2.5	<2.5	12	<2.5	36	170	4.4	<2.5	9,700	140	<2.5	2,000	12
	12/18/09	<10	<10	<10	<10	87	<10	29	780	13	<10	3,200	57	<10	1,200	35
	12/18/09 DUP	<10	<10	<10	<10	84	<10	27	740	12	<10	3,100	53	<10	1,200	32
03/19/10	<5	<5	<5	<5	<5	<5	<5	8.3	45	<5	1,900	19	<5	380	<5	
03/19/10 DUP	<7	<7	<7	<7	<7	<7	<7	8.3	44	<7	1,800	18	<7	360	<7	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-19 (continued)	06/17/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.7	<0.50	<0.50	67	<0.50	<0.50	25	<0.50
	06/17/10 DUP	<0.50	<0.50	<0.50	<0.50	0.53	<0.50	<0.50	6.9	<0.50	<0.50	65	0.52	<0.50	24	<0.50
	09/23/10	<2.5	<2.5	<2.5	<2.5	8.7	<2.5	21	110	3.6	<2.5	3,400	50	<2.5	920	12
	09/23/10 DUP	<2.5	<2.5	<2.5	<2.5	8.5	<2.5	21	110	3.4	<2.5	3,700	49	<0.25	890	13
	12/09/10	<15	<15	<15	<15	59	<15	38	590	<15	<15	6,200	68	<15	1,500	48
	12/09/10 DUP	<1.5	<1.5	<1.5	<1.5	58	<1.5	37	590	<1.5	<1.5	6,000	67	<1.5	1,500	48
	03/08/11	<5	<5	<5	<5	23	<5	12	280	<5	<5	1,500	18	<5	590	13
	06/10/11	<0.9	<0.9	<0.9	<0.9	22	<0.9	2.7	160	1.4	<0.9	240	3.6	<0.9	130	5.6
	06/10/11 DUP	<0.9	<0.9	<0.9	<0.9	19	<0.9	2.3	140	1.3	<0.9	220	3.3	<0.9	120	5
	09/19/11	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	53	<1.5	<1.5	400	3	<1.5	78	<1.5
	09/19/11 DUP	<2	<2	<2	<2	<2	<2	<2	53	<2	<2	410	3.2	<2	80	<2
	12/09/11	<1.5	<1.5	<1.5	<1.5	5	<1.5	4.3	110	<1.5	<1.5	730	10	<1.5	220	3.9
	12/09/2011 DUP	<2	<2	<2	<2	5.4	<2	4.7	120	<2	<2	770	10	<2	230	3.9
	03/09/12	<2.5	<2.5	<2.5	<2.5	46	<2.5	26	820	1	<2.5	2,400	50	<2.5	1,200	67
	03/09/12 DUP	<4	<4	<4	<4	43	<4	24	770	8.8	<4	2,400	46	<4	1,200	62
	06/22/2012	<5	<5	<5	<5	74	<5	17	1,000	14	<5	1,300	21	<5	1,000	57
	06/22/12 DUP	<5	<5	<5	<5	74	<5	18	1,000	13	<5	1,300	22	<5	1,000	57
	09/14/12	<5	<5	<5	<5	<5	<5	5.7	300	<5	<5	2,200	31	<5	340	8
	09/14/12 DUP	<5	<5	<5	<5	<5	<5	5.9	300	<5	<5	2,300	31	<5	340	<5
	12/14/12	<1.5	9.8	<1.5	<1.5	21	<1.5	1.8	330	3.6	<1.5	290	3.2	<1.5	140	3.1
	12/14/12 DUP	<1	9.3	<1	<1	21	<1	1.7	340	3.7	<1	300	3.1	<1	140	3
	03/15/13	<1.5	4.7	<1.5	<1.5	29	<1.5	21	870	5.5	<1.5	3,200	67	<1.5	1,600	9
	03/15/13 DUP	<1.5	4.7	<1.5	<1.5	30	<1.5	20	820	6.1	<1.5	3,200	68	<1.5	1,500	9.2
	06/14/13	<9	<9	<9	<9	25	<9	13	730	<9	<9	2,500	29	<9	1,000	<9
	06/14/13 DUP	<9	<9	<9	<9	25	<9	11	720	<9	<9	2,400	26	<9	1,000	<9
	09/20/13	<0.50	1.2	<0.50	<0.50	14	<0.50	25	520	4.5	<0.50	3,000	61	<0.50	1,100	10
	09/20/13 DUP	<1	1.1	<1	<1	12	<1	21	490	3.8	<1	3,200	52	<1	1,200	9
	12/16/13	<15	<15	<15	<15	37	<15	22	680	<15	<15	3,000	36	<15	1,100	<15
	12/16/13 DUP	<15	<15	<15	<15	36	<15	22	660	<15	<15	2,900	37	<15	1,100	<15
	3/21/2014	<0.50	1.4	<0.50	<0.50	4.8	<0.50	2.4	130	1.2	<0.50	180	1.6	<0.50	51	4.3
	3/21/2014 DUP	<0.50	1.4	<0.50	<0.50	4.8	<0.50	2.2	130	1.1	<0.50	180	1.6	<0.50	51	4.3

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-19	6/26/2014	<5	0.89	<0.50	<0.50	0.54	110	38	2,000	21	<0.50	1,900	36	0.8	1,500	6.2
(continued)	6/26/14 DUP	<5	1.1	<0.50	<0.50	110	<0.50	38	1,900	21	<0.50	1,900	36	0.74	1,600	6.1
	9/30/2014	<15	<15	<15	<15	18	<15	38	520	<15	<15	4,400	61	<15	1,700	32
	9/30/2014 DUP	<15	<15	<15	<15	18	<15	37	510	<15	<15	4,400	60	<15	1,700	30
	12/12/2014	<5	<5	<5	<5	96	<5	20	1,500	12	<5	1,400	19	<5	790	60
	12/12/2014 DUP	<5	<5	<5	<5	110	<5	21	1,500	14	<5	1,500	21	<5	890	68
	3/18/2015	<4.2	<4.2	<4.2	<4.2	72.5	<4.2	48	1,460	17.5	<4.2	5,920	56.5	<4.2	3,970	53.7
	3/18/2015 DUP	<4.2	<4.2	<4.2	<4.2	82.9	<4.2	47.9	1,410	17.8	<4.2	4,930	56.2	<4.2	3,500	46.6
	6/18/2015	<0.50	<0.50	<0.50	<0.50	21.5	<0.5	48.5	628	6.6	<0.50	8,080	94.3	<0.50	2,200	28
	6/18/2015 DUP	<0.50	<0.50	<0.50	<0.50	22.7	<0.50	48.8	614	7.5	<0.50	7,990	985	<0.50	2,090	30.7
	9/22/2015	<0.50	<0.50	<0.50	<0.50	4.9	<0.5	31.7	185	2	<0.50	7,200	74.8	<0.50	791	6.8
	12/8/2015	<0.50	<0.50	<0.50	<0.50	150	<0.5	33.5	1,640	16.4	<0.50	2,900	36	<0.50	1,550	87.3
	12/8/15 DUP	<0.50	<0.50	<0.50	<0.50	155	<0.50	35.1	1,680	17.2	<0.50	3,020	37.1	<0.50	1,600	89.8
	3/8/2016	<10	<40	<10	<10	96.6	<10	42	1,520	20.2	<10	4,080	40.8	<10	2,610	64.8
	3/8/16 DUP	<10	<40	<10	<10	93	<10	42.8	1,460	18.2	<10	3,760	40.4	<10	2,560	72.4
	6/16/2016	<10	<40	<10	<10	<10	<10	22.2	507	<10	<10	3,250	29.2	<10	1,030	18.3
	6/16/2016 DUP	<12.5	<50	<12.5	<12.5	19.5	<12.5	23.8	505	<12.5	<12.5	3,460	28.1	<12.5	1,020	17.6
	9/26/2016	<5	<20	<5	<5	10.4	<5	11	235	<5	<5	1,520	14.5	<5	592	10.1
	12/12/2016	<5	<20	<5	<5	72.8	<5	11.2	1,030	10.7	<5	1,730	10.9	<5	812	28.2
	12/12/2016 DUP	<2.5	<10	<2.5	<2.5	78.7	<2.5	14.2	1,010	11.6	<2.5	1,530	15.5	<2.5	975	31.9
	3/28/2017	<5	<20	<5	<5	197	<5	25.5	1,930	19.7	<5	664	17	<5	826	58.5
	3/28/2017 DUP	<5	<20	<5	<5	214	<5	26.7	1,990	21.5	<5	755	19.9	<5	896	63.2
	6/14/2017	<2.5	<10	<2.5	<2.5	40.6	<2.5	15.4	481	6.1	<2.5	531	8.1	<2.5	481	16.5
	6/14/2017 DUP	<2.5	<10	<2.5	<2.5	41.8	<2.5	15.8	486	6.2	<2.5	566	8.2	<2.5	506	17.2
	9/26/2017	<2.5	<10	<2.5	<2.5	<2.5	<2.5	26.5	1,160	5.4	<2.5	3,620	38.9	<2.5	1,450	111.0
	9/26/2017 DUP	<2.5	<10	<2.5	<2.5	11.1	<2.5	28.9	1,150	5.4	<2.5	3,710	40.4	<2.5	1,480	111.0
	11/9/2017	<20	<20	<5.0	<5.0	104.0	<5.0	24.9	1,660	24.0	<5.0	1,530	20.2	<5.0	1,020	109.0
	11/9/2017 DUP	<2.0	<2.0	<0.50	<0.50	56.5	<0.50	14.7	1,040	14.7	<0.50	970	13.0	0.75	790	115.0
	3/21/2018	<0.500	3.90	<0.500	<0.500	59.0	0.225 J	31.4	2,430	11.2	<0.500	1,250	17.0	0.339 J	1,340	413.0
	3/21/2018 DUP	<0.500	4.26	<0.500	<0.500	58.2	0.242 J	30.7	2,470	10.8	<0.500	996	17.0	0.277 J	1,180	412.0
	6/28/2018	<0.500	<2.50	<0.500	<0.500	81.6	<0.500	35.6	3,890	16.4	<0.500	163	10.9	0.210 J	148	773.0
	6/28/2018 DUP	<0.500	<2.50	<0.500	<0.500	80.2	<0.500	36.3	4,190	18.4	<0.500	177	11.7	0.244 J	191	799.0
	9/25/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	1,900	<0.400	<0.500	3,720	<0.400	<0.500	2,190	115.0
	9/25/2018 DUP	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	1,960	<0.400	<0.500	3,830	<0.400	<0.500	2,270	116.0
	12/5/2018	<1.00	<500	<1.00	<1.00	91.8	0.453	39.3	1,750	18.2	<0.500	3,090	21.8	0.67	1,490	79.0
	12/5/2018 DUP	<1.00	<500	<1.00	<1.00	90.1	<0.400	39.2	1,610	18.4	<0.500	2,460	21.3	0.67	1,290	77.1

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-19i	06/10/08	<1	<1	<1	<1	<1	<1	<1	8.46	<1	<1	<1	<1	<1	1.28	<1
	09/17/08	<1	<0.500	<0.500	<1	1.93	0.53	<0.500	27.1	<0.500	<0.500	1.72	<0.500	<0.500	5.77	<0.500
	12/10/08	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	28	<0.50	<0.50	<0.50	<0.50	<0.50	5.6	<0.50
	03/26/09	<0.50	<0.50	<0.50	<0.50	1.7	<0.50	<0.50	25	<0.50	<0.50	<0.50	<0.50	<0.50	3.3	<0.50
	06/17/09	<0.50	<0.50	<0.50	<0.50	0.9	<0.50	<0.50	10	<0.50	<0.50	0.67	<0.50	<0.50	1.5	<0.50
	09/16/09	<0.50	<0.50	<0.50	<0.50	1.7	0.64	<0.50	28	<0.50	<0.50	<0.50	<0.50	<0.50	1.8	0.79
	12/15/09	<0.50	<0.50	<0.50	<0.50	0.87	<0.50	<0.50	10	<0.50	<0.50	<0.50	<0.50	<0.50	0.7	<0.50
	03/18/10	<0.50	<0.50	<0.50	<0.50	1.1	0.53	<0.50	15	<0.50	<0.50	<0.50	<0.50	<0.50	1.9	<0.50
	06/15/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	1.2	0.58	<0.5	20	<0.5	<0.5	<0.5	<0.5	<0.5	2.4	<0.5
	12/09/10	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5	14	<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5
	03/09/11	<0.50	<0.50	<0.50	<0.50	0.94	<0.50	<0.50	14	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50
	06/09/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.88	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	09/15/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	<0.50	<0.50	<0.50	<0.50	0.73	<0.50
	12/09/11	<0.50	<0.50	<0.50	<0.50	0.72	<0.50	<0.50	8.8	<0.50	<0.50	<0.50	<0.50	<0.50	1	<0.50
	03/12/12	<0.50	<0.50	<0.50	<0.50	0.86	<0.50	<0.50	13	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50
	06/21/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	09/13/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.2	<0.50	<0.50	<0.50	<0.50	<0.50	0.65	<0.50
	12/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/14/13	<0.50	<0.50	<0.50	<0.50	0.65	<0.50	<0.50	9.5	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	<0.50
	06/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/19/13	<0.50	<0.50	<0.50	<0.50	0.56	<0.50	<0.50	6.8	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/13/13	<0.50	<0.50	<0.50	<0.50	0.6	<0.50	<0.50	6.6	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/20/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/24/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.1	<0.50	<0.50	0.83	<0.50	<0.50	1.6	<0.50
	9/27/2014	<0.50	<0.50	<0.50	<0.50	0.56	<0.50	<0.50	6.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/10/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/23/2015	<0.50	<0.50	<0.50	<0.50	0.75	<0.50	<0.50	11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	5.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	3.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/28/2016	<5	<2	<0.50	<0.50	<0.50	<0.50	<0.50	5.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/14/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/29/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	6/14/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/28/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	0.83	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/8/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	0.57	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-19i (continued)	3/20/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.228 J	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	7/2/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.212 J	<0.500	<0.500	0.223 J	<0.500	<0.500	<0.500
	9/27/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400
	12/6/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400
MW-20i	06/10/08	<1	<1	<1	<1	<1	<1	<1	18	<1	<1	5.77	<1	<1	3.2	<1
	09/17/08	<1	<0.500	<0.500	<1	2.12	<0.500	<0.500	42.3	<0.500	<0.500	12.8	<0.500	<0.500	11	<0.500
	12/11/08	<0.50	<0.50	<0.50	<0.50	2.1	<0.50	<0.50	47	<0.50	<0.50	11	<0.50	<0.50	9.3	<0.50
	03/25/09	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	36	<0.50	<0.50	8.4	<0.50	<0.50	6.4	<0.50
	06/16/09	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	30	<0.50	<0.50	6.3	<0.50	<0.50	5.1	<0.50
	09/17/09	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	34	<0.50	<0.50	7.4	<0.50	<0.50	5	<0.50
	12/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.3	<0.50	<0.50	1.1	<0.50	<0.50	0.69	<0.50
	03/18/10	<0.50	<0.50	<0.50	<0.50	2.1	<0.50	<0.50	47	<0.50	<0.50	11	<0.50	<0.50	6.9	<0.50
	06/15/10	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	<0.50	13	<0.50	<0.50	4.3	<0.50	<0.50	2.3	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	43	<0.5	<0.5	17	<0.5	<0.5	10	<0.5
	12/09/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	13	<0.5	<0.5	3.7	<0.5	<0.5	2	<0.5
	03/11/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.6	<0.50	<0.50	2.4	<0.50	<0.50	2.3	<0.50
	06/08/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	09/15/11	<0.50	<0.50	<0.50	<0.50	0.96	<0.50	<0.50	21	<0.50	<0.50	7.6	<0.50	<0.50	4.5	<0.50
	12/08/11	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	26	<0.50	<0.50	6.4	<0.50	<0.50	4.2	<0.50
	03/07/12	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	32	<0.50	<0.50	11	<0.50	<0.50	5.9	<0.50
	06/21/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	8.3	<0.5	<0.5	2.6	<0.5	<0.5	1.5	<0.5
	09/13/12	<0.50	<0.50	<0.50	<0.50	0.83	<0.50	<0.50	18	<0.50	<0.50	6.1	<0.50	<0.50	3.8	<0.50
	12/13/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.9	<0.50	<0.50	1.4	<0.50	<0.50	0.84	<0.50
	03/14/13	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	28	<0.50	<0.50	9.2	<0.50	<0.50	6	<0.50
	06/13/13	<0.50	<0.50	<0.50	<0.50	0.72	<0.50	<0.50	14	<0.50	<0.50	7.3	<0.50	<0.50	3.7	<0.50
	09/19/13	<0.50	<0.50	<0.50	<0.50	0.64	<0.50	<0.50	11	<0.50	<0.50	3.9	<0.50	<0.50	2.4	<0.50
	12/13/13	<0.50	<0.50	<0.50	<0.50	0.9	<0.50	<0.50	16	<0.50	<0.50	2.4	<0.50	<0.50	1.9	<0.50
	3/20/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.4	<0.50	<0.50	0.56	<0.50	<0.50	<0.50	<0.50
	6/30/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4	<0.50	<0.50	1.1	<0.50	<0.50	0.58	<0.50
	9/27/2014	<0.50	<0.50	<0.50	<0.50	0.68	<0.50	<0.50	12	<0.50	<0.50	4.3	<0.50	<0.50	2.6	<0.50
	12/12/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.1	<0.50	<0.50	0.68	<0.50	<0.50	<0.50	<0.50
3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10.3	<0.50	<0.50	3	<0.50	<0.50	1.7	<0.50	
6/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10.8	<0.50	<0.50	3.7	<0.50	<0.50	2.2	<0.50	
9/23/2015	<0.50	<0.50	<0.50	<0.50	0.69	<0.50	<0.50	13.8	<0.50	<0.50	4.1	<0.50	<0.50	2.1	<0.50	
12/7/2015	Not sampled; well monument under water.															

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-20i (continued)	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	6.8	<0.50	<0.50	3.4	<0.50	<5	1.8	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	7.4	<0.50	<0.50	2.1	<0.50	<0.50	1.5	<0.50
	9/28/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	8.7	<0.50	<0.50	4	<0.50	<0.50	2.2	<0.50
	12/14/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	<0.50	0.54	<0.50	<0.50	<0.50	<0.50
	3/30/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	6/14/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	5.6	<0.50	<0.50	1.5	<0.50	<0.50	0.84	<0.50
	9/27/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	<0.50	<0.50
	11/7/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	7.7	<0.50	<0.50	2.8	<0.50	<0.50	1.50	<0.50
	3/21/2018	<0.500	<2.50	<0.500	<0.500	0.303 J	<0.500	<0.500	5.7	<0.500	<0.500	1.4	<0.500	<0.500	0.90	<0.500
	7/2/2018	<0.500	<2.50	<0.500	<0.500	0.436 J	<0.500	<0.500	9.7	<0.500	<0.500	2.3	<0.500	<0.500	1.60	<0.500
	9/25/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	7.7	<0.400	<0.500	2.1	<0.400	<0.500	1.39	<0.400
	12/6/2018	<1.00	<5.00	<1.00	<1.00	0.43	<0.400	<0.400	10.7	<0.400	<0.500	2.2	<0.400	<0.500	1.55	<0.400
	MW-21i-105	06/10/08	<2	<2	<2	<2	2	<2	<2	15.8	<2	<2	53.2	<2	<0.50	25.1
09/18/08		<1	<0.500	<0.500	<1	0.78	<0.500	<0.500	5.42	<0.500	<0.500	2.97	<0.500	<0.50	1.77	<0.500
12/11/08		<0.50	<0.50	<0.50	<0.50	2.2	<0.50	0.88	61	<0.50	<0.50	33	0.87	<0.50	17	<0.50
03/26/09		<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	61	<0.50	<0.50	0.76	<0.50	<0.50	0.7	<0.50
06/17/09		<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	76	<0.50	<0.50	4.3	0.6	<0.50	3.4	<0.50
09/17/09		<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	73	<0.50	<0.50	11	0.59	<0.50	6.7	<0.50
12/16/09		<0.50	<0.50	<0.50	<0.50	1.5	<0.50	<0.50	60	<0.50	<0.50	14	0.65	<0.50	9.3	<0.50
03/18/10		<0.50	<0.50	<0.50	<0.50	1.7	<0.50	<0.50	64	<0.50	<0.50	6.2	0.58	<0.50	7.6	<0.50
06/15/10		<0.50	<0.50	<0.50	<0.50	1.7	<0.50	0.63	60	<0.50	<0.80	29	0.84	<0.50	22	<0.50
09/22/10		<0.5	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	75	<0.5	<0.5	5.2	0.55	<0.50	5.1	<0.5
12/08/10		<0.5	<0.5	<0.5	<0.5	2	<0.5	0.52	72	<0.5	<0.5	27	0.91	<0.50	14	<0.50
03/09/11		<0.50	<0.50	<0.50	<0.50	1.9	<0.50	0.69	61	<0.50	<0.50	32	1.1	<0.50	17	<0.50
06/09/11		<0.5	<0.5	<0.5	<0.5	1.6	<0.5	0.61	63	<0.5	<0.5	29	0.7	<0.5	17	<0.5
09/15/11		<0.50	<0.50	<0.50	<0.50	1.9	<0.50	<0.50	88	<0.50	<0.50	12	0.59	<0.50	12	<0.50
12/08/11		<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	73	<0.50	<0.50	15	0.58	<0.50	9.3	<0.50
03/07/12		<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	38	<0.50	<0.50	5.6	<0.50	<0.50	5.7	<0.50
06/20/12		<0.5	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	52	<0.5	<0.5	1.4	<0.5	<0.5	3	<0.5
09/12/12		<0.50	<0.50	<0.50	<0.50	0.82	<0.50	<0.50	34	<0.50	<0.50	5	<0.50	<0.50	6.3	<0.50
12/12/12		<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	60	1	<0.50	13	<0.50	<0.50	15	<0.50
03/13/13		<0.50	<0.50	<0.50	<0.50	0.9	<0.50	<0.50	42	<0.50	<0.50	2.4	<0.50	<0.50	3.7	<0.50
06/13/13		<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	48	<0.50	<0.50	1.2	<0.50	<0.50	9.9	<0.50
09/18/13		<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	51	<0.50	<0.50	2.8	<0.50	<0.50	4.2	<0.50
12/12/13		<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	61	1.6	<0.50	4	<0.50	<0.50	5.4	<0.50
3/20/2014	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	52	<0.50	<0.50	4.4	<0.50	<0.50	6.8	<0.50	
6/25/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-21i-105 (continued)	9/26/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.8	<0.50	<0.50	5.4	<0.50	<0.50	3.3	<0.50
	12/10/2014	<0.50	<0.50	<0.50	<0.50	0.94	<0.50	<0.50	37	<0.50	<0.50	5.4	<0.50	<0.50	9.6	<0.50
	3/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	13.3	<0.50	<0.50	6.6	<0.50	<0.50	5.4	<0.50
	6/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	20.8	<0.50	<0.50	3.5	<0.50	<0.50	4	<0.50
	9/23/2015	<0.50	<0.50	<0.50	<0.50	0.91	<0.50	<0.50	41.4	<0.50	<0.50	3.4	<0.50	<0.50	5.4	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	0.79	<0.50	<0.50	28.5	<0.50	<0.50	4.9	<0.50	<0.50	8.1	<0.50
	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/26/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	11.7	<0.50	<0.50	5.8	<0.50	<0.50	5.1	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/29/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	4.8	<0.5	<0.5	5.7	<0.5	<0.5	2.9	<0.5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	4.7	<0.50	<0.50	7.6	<0.50	<0.50	4.1	<0.50
	9/27/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	4.3	<0.50	<0.50	5.7	<0.50	<0.50	3.9	<0.50
	11/8/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	13.0	<0.50	<0.50	7.4	<0.50	<0.50	6.4	<0.50
	3/22/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.7	<0.500	<0.500	0.5	<0.500	<0.500	0.477 J	<0.500
	6/29/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	1.9	<0.500	<0.500	1.8	<0.500	<0.500	1.3	<0.500
	9/26/2018	<1.00	<5.00	<1.00	<1.00	0.82	<0.400	<0.400	36.4	<0.400	<0.500	8.6	<0.400	<0.500	11.0	<0.400
12/6/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	8.6	<0.400	<0.500	9.5	<0.400	<0.500	5.9	<0.400	
MW-21i-40	09/18/08	<1	<0.500	<0.500	<1	7.48	<0.500	4.38	124	0.77	<0.500	107	2.01	<0.500	133	<0.500
	12/11/08	<0.50	<0.50	<0.50	<0.50	6.6	<0.50	3.6	130	0.84	<0.50	100	1.6	<0.50	110	<0.50
	03/26/09	<0.50	<0.50	<0.50	<0.50	6.2	<0.50	3.6	130	0.63	<0.50	77	1.3	<0.50	88	<0.50
	06/17/09	<0.50	<0.50	<0.50	<0.50	6.6	<0.50	3.1	120	0.79	<0.50	71	1.5	<0.50	88	<0.50
	09/18/09	<0.50	<0.50	<0.50	<0.50	5.9	<0.50	3.2	120	1	<0.50	75	1.3	<0.50	92	0.55
	12/16/09	<0.50	<0.50	<0.50	<0.50	5.7	<0.50	2.6	120	1	<0.50	90	1.2	<0.50	89	<0.50
	03/18/10	<0.50	<0.50	<0.50	<0.50	5.5	<0.50	2.8	120	0.74	<0.50	84	1.1	<0.50	91	<0.50
	06/15/10	<0.50	<0.50	<0.50	<0.50	5.4	<0.50	2.4	120	0.89	<0.50	62	1.2	<0.50	64	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	4.9	<0.5	2.2	110	0.73	<0.5	68	0.93	<0.5	75	<0.5
	12/08/10	<0.5	<0.5	<0.5	<0.5	5.1	<0.5	2.3	110	0.77	<0.5	72	1	<0.5	69	<0.5
	03/10/11	<0.50	<0.50	<0.50	<0.50	4.6	<0.50	1.9	100	0.64	<0.50	53	1	<0.50	57	<0.50
	06/09/11	<0.5	<0.5	<0.5	<0.5	4.7	<0.5	2.1	110	0.7	<0.5	50	0.96	<0.5	55	<0.5
	09/15/11	<0.50	<0.50	<0.50	<0.50	5	<0.50	1.9	110	0.65	<0.50	54	1.1	<0.50	57	<0.50
	12/08/11	<0.50	<0.50	<0.50	<0.50	4.8	<0.50	2.1	110	0.66	<0.50	61	0.96	<0.50	60	<0.50
	03/07/12	<0.50	<0.50	<0.50	<0.50	5.3	<0.50	2.1	110	0.76	<0.50	74	1.5	<0.50	58	<0.50
	06/20/12	<0.5	<0.5	<0.5	<0.5	5	<0.5	2	160	0.84	<0.5	19	0.81	<0.5	23	<0.5
	09/12/12	<0.50	<0.50	<0.50	<0.50	5	<0.50	1.8	110	0.63	<0.50	50	1.1	<0.50	48	<0.50
12/12/12	<0.50	<0.50	<0.50	<0.50	5.3	<0.50	2	120	0.69	<0.50	74	1.1	<0.50	53	<0.50	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-21i-40 (continued)	03/13/13	<0.50	<0.50	<0.50	<0.50	4.6	<0.50	1.8	120	0.6	<0.50	43	0.83	<0.50	42	<0.50
	06/13/13	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	48	<0.50	<0.50	12	<0.50	<0.50	9.9	<0.50
	09/18/13	<0.50	<0.50	<0.50	<0.50	4.7	<0.50	1.4	100	0.53	<0.50	38	0.68	<0.50	33	<0.50
	12/12/13	<0.50	<0.50	<0.50	<0.50	4.6	<0.50	1.3	100	1	<0.50	41	0.73	<0.50	37	<0.50
	3/20/2014	<0.50	<0.50	<0.50	<0.50	4.5	<0.50	1.5	100	0.61	<0.50	40	0.76	<0.50	34	<0.50
	6/25/2014	<0.50	<0.50	<0.50	<0.50	4.3	<0.50	1.3	100	0.51	<0.50	33	0.65	<0.50	29	<0.50
	9/26/2014	<0.50	<0.50	<0.50	<0.50	4	<0.50	1.4	100	86	<0.50	31	0.51	<0.50	32	<0.50
	12/10/2014	<0.50	<0.50	<0.50	<0.50	4.2	<0.50	1.4	100	0.6	<0.50	30	0.51	<0.50	32	<0.50
	3/17/2015	<0.50	<0.50	<0.50	<0.50	3.8	<0.50	1.5	102	0.51	<0.50	43.6	<0.50	<0.50	37.2	<0.50
	6/19/2015	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	0.76	61.6	<0.50	<0.50	24.7	<0.50	<0.50	21.8	<0.50
	9/23/2015	<0.50	<0.50	<0.50	<0.50	3.3	<0.50	0.95	84.2	<0.50	<0.50	26.3	<0.50	<0.50	26.6	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	2.8	<0.50	0.7	63.6	<0.50	<0.50	24.7	<0.50	<0.50	21.1	<0.50
	3/9/2016	<0.50	<2	<0.50	<0.50	2.1	<0.50	<0.50	58.6	<0.50	<0.50	14.2	<0.50	<0.50	15.1	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	2.3	<0.50	0.8	67.8	<0.50	<0.50	18.1	<0.50	<0.50	17.1	<0.50
	9/26/2016	<0.50	<2	<0.50	<0.50	2.6	<0.50	0.87	77.2	<0.50	<0.50	20.1	<0.50	<0.50	19.8	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	2.4	<0.50	0.83	74.2	<0.50	<0.50	21.4	<0.50	<0.50	19.4	<0.50
	3/29/2017	<0.5	<2	<0.5	<0.5	2.6	<0.5	0.91	87.6	0.58	<0.5	21.8	<0.5	<0.5	16.2	<0.5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	2.3	<1.0	0.63	63.6	0.56	<0.50	24.1	<0.50	<0.50	15.1	<0.50
	9/27/2017	<2.0	<2.0	<0.50	<0.50	2.3	<1.0	0.70	60.0	<0.50	<0.50	18.1	<0.50	<0.50	15.0	<0.50
	11/8/2017	<2.0	<2.0	<0.50	<0.50	2.6	<0.50	0.84	65.4	0.63	<0.50	17.4	<0.50	<0.50	14.6	<0.50
3/22/2018	<0.500	<2.50	<0.500	<0.500	2.1	<0.500	0.64	55.1	0.391 J	<0.500	22.5	<0.500	<0.500	16.5	<0.500	
6/28/2018	<0.500	<2.50	<0.500	<0.500	2.6	<0.500	0.75	63.2	0.53	<0.500	26.0	0.145 J	<0.500	17.0	<0.500	
9/27/2018	<1.00	<5.00	<1.00	<1.00	2.5	<0.400	0.70	62.1	0.69	<0.500	24.5	<0.400	<0.500	17.1	<0.400	
12/6/2018	<1.00	<5.00	<1.00	<1.00	2.4	<0.400	0.67	59.1	0.48	<0.500	32.7	<0.400	<0.500	19.3	<0.400	
MW-22i	06/10/08	<1	<1	<1	<1	1.02	<1	<1	30	<1	<1	10.3	<1	<1	30	<1
	09/17/08	<1	<0.500	<0.500	<1	7.48	<0.500	4.38	124	0.77	<0.500	107	2.01	<0.500	133	<0.500
	12/11/08	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	0.73	63	<0.50	<0.50	1.1	<0.50	<0.50	6.8	<0.50
	03/25/09	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	0.64	50	<0.50	<0.50	2.5	<0.50	<0.50	14	<0.50
	06/16/09	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	0.52	39	<0.50	<0.50	8.5	<0.50	<0.50	24	<0.50
	09/17/09	<0.50	<0.50	<0.50	<0.50	1	<0.50	0.57	40	<0.50	<0.50	3.3	<0.50	<0.50	21	<0.50
	12/15/09	<0.50	<0.50	<0.50	<0.50	0.8	<0.50	<0.50	28	<0.50	<0.50	3.8	<0.50	<0.50	20	<0.50
	03/18/10	<0.50	<0.50	<0.50	<0.50	0.86	<0.50	<0.50	34	<0.50	<0.50	2.6	<0.50	<0.50	16	<0.50
	06/14/10	<0.50	<0.50	<0.50	<0.50	0.6	<0.50	<0.50	17	<0.50	<0.50	4	<0.50	<0.50	18	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	0.75	<0.5	<0.5	24	<0.5	<0.5	3.6	<0.5	<0.5	18	<0.5
	12/08/10	<0.5	<0.5	<0.5	<0.5	0.73	<0.5	<0.5	21	<0.5	<0.5	3.5	<0.5	<0.5	18	<0.5
	03/11/11	<0.50	<0.50	<0.50	<0.50	0.67	<0.50	<0.50	17	<0.50	<0.50	3.6	<0.50	<0.50	17	<0.50
	06/08/11	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	18	<0.5	<0.5	1.8	<0.5	<0.5	12	<0.5

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-22i (continued)	09/14/11	<0.50	<0.50	<0.50	<0.50	0.55	<0.50	<0.50	18	<0.50	<0.50	1.3	<0.50	<0.50	11	<0.50
	12/08/11	<0.50	<0.50	<0.50	<0.50	0.58	<0.50	<0.50	17	<0.50	<0.50	2.5	<0.50	<0.50	14	<0.50
	03/06/12	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	<0.50	13	<0.50	<0.50	2.4	<0.50	<0.50	13	<0.50
	06/20/12	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	12	<0.5	<0.5	1.9	<0.5	<0.5	11	<0.5
	09/12/12	<0.50	<0.50	<0.50	<0.50	0.52	<0.50	<0.50	16	<0.50	<0.50	1.5	<0.50	<0.50	10	<0.50
	12/13/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	13	<0.50	<0.50	1.8	<0.50	<0.50	11	<0.50
	03/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	12	<0.50	<0.50	2.2	<0.50	<0.50	11	<0.50
	06/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	14	<0.50	<0.50	1.1	<0.50	<0.50	9.6	<0.50
	09/18/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10	<0.50	<0.50	2.1	<0.50	<0.50	11	<0.50
	12/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.3	<0.50	<0.50	1.4	<0.50	<0.50	8.2	<0.50
	3/19/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10	<0.50	<0.50	1.3	<0.50	<0.50	9.6	<0.50
	6/25/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9	<0.50	<0.50	1.1	<0.50	<0.50	5.7	<0.50
	9/26/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.8	<0.50	<0.50	1.7	<0.50	<0.50	9.8	<0.50
	12/10/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.2	<0.50	<0.50	2.1	<0.50	<0.50	11	<0.50
	3/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.2	<0.50	<0.50	1.8	<0.50	<0.50	8.7	<0.50
	6/16/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.6	<0.50	<0.50	1.6	<0.50	<0.50	9	<0.50
	9/23/2015	<0.50	<0.50	<0.50	<0.50	0.5	<0.50	<0.50	10	<0.50	<0.50	2.1	<0.50	<0.50	1.15	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8	<0.50	<0.50	2.1	<0.50	<0.50	11	<0.50
	3/9/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	8	<0.50	<0.50	2.2	<0.50	<0.50	12	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	6.5	<0.50	<0.50	1	<0.50	<0.50	7.9	<0.50
	9/28/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	8.1	<0.50	<0.50	1.3	<0.50	<0.50	9	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	8.6	<0.50	<0.50	2	<0.50	<0.50	10.2	<0.50
	3/29/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	10	<0.5	<0.5	1.1	<0.5	<0.5	9.7	<0.5
6/13/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	9.6	<0.50	<0.50	0.63	<0.50	<0.50	6.2	<0.50	
9/27/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	8.8	<0.50	<0.50	0.88	<0.50	<0.50	6.3	<0.50	
11/7/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	9.7	<0.50	<0.50	1.20	<0.50	<0.50	6.4	<0.50	
3/22/2018	<0.500	<2.50	<0.500	<0.500	0.330 J	<0.500	<0.500	9.6	<0.500	<0.500	1.76	<0.500	<0.500	7.8	<0.500	
6/29/2018	<0.500	<2.50	<0.500	<0.500	0.52	<0.500	<0.500	12.4	<0.500	<0.500	2.77	<0.500	<0.500	8.1	<0.500	
9/26/2018	<1.00	<5.00	<1.00	<1.00	0.42	<0.400	<0.400	12.5	<0.400	<0.500	2.42	<0.400	<0.500	6.8	<0.400	
12/5/2018	<1.00	<5.00	<1.00	<1.00	0.47	<0.400	<0.400	11.7	<0.400	<0.500	3.34	<0.400	<0.500	8.2	<0.400	
MW-23i	06/10/08	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	06/10/08 DUP	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	09/17/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	12/09/08	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/25/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.54	<0.50	<0.50	<0.50	<0.50
	09/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
12/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-23i	03/17/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
(continued)	07/02/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	12/08/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	03/09/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/08/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	09/13/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/06/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/07/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/19/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	09/11/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.67	<0.50	<0.50	<0.50	<0.50
	12/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/18/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/11/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/19/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/25/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/24/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/9/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.78	<0.50
	6/16/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/27/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/27/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/26/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/8/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/21/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.207 J	<0.500	<0.500	0.402 J	<0.500	<0.500	0.215 J	<0.500
	6/28/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.202 J	<0.500	<0.500	0.247 J	<0.500	<0.500	0.212 J	<0.500
	9/27/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
	12/6/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-24i	10/01/10	<0.50	<0.50	<0.50	<0.50	3.3	<0.50	0.94	52	<0.50	<0.50	52	1.9	<0.50	29	<0.50
	12/10/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.5	<0.5	<0.5	6.3	<0.5	<0.5	2	<0.5
	03/14/11	<0.50	<0.50	<0.50	<0.50	0.88	<0.50	<0.50	15	<0.50	<0.50	23	1	<0.50	7.4	<0.50
	06/07/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2	<0.5	<0.5	6.6	<0.5	<0.5	1.4	<0.5
	09/16/11	<0.50	<0.50	<0.50	<0.50	13	<0.50	2.5	270	1.7	<0.50	27	5.6	<0.50	24	19
	12/07/11	<0.50	<0.50	<0.50	<0.50	5	<0.50	0.84	100	<0.50	<0.50	19	2.9	<0.50	14	7.5
	03/12/12	<0.50	<0.50	<0.50	<0.50	5.9	<0.50	<0.50	79	<0.50	<0.50	30	2.3	<0.50	11	4.5
	06/22/12	<0.5	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	14	<0.5	<0.5	0.85	<0.5	<0.5	<0.5	2.6
	09/14/12	<0.50	<0.50	<0.50	<0.50	4.4	<0.50	0.87	58	<0.50	<0.50	31	0.79	<0.50	20	<0.50
	12/14/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.1	<0.50	<0.50	2.1	<0.50	<0.50	0.65	<0.50
	03/15/13	<0.50	<0.50	<0.50	<0.50	2.8	<0.50	<0.50	48	<0.50	<0.50	23	0.57	<0.50	15	<0.50
	06/14/13	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	<0.50	28	<0.50	<0.50	6.2	<0.50	<0.50	3.6	<0.80
	09/20/13	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	15	<0.50	<0.50	15	<0.50	<0.50	5.9	<0.80
	12/16/13	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	8.4	<0.50	<0.50	6.7	<0.50	<0.50	3.4	<0.50
	3/24/2014	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	16	<0.50	<0.50	10	<0.50	<0.50	5.5	<0.80
	6/23/2014	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	13	<0.50	<0.50	1.3	<0.50	<0.50	5.2	2.1
	9/30/2014	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	21	<0.50	<0.50	20	<0.50	<0.50	10	<0.50
	12/15/2014	<0.50	<0.50	<0.50	<0.50	0.6	<0.50	<0.50	12	<0.50	<0.50	2.4	<0.50	<0.50	1.1	<0.50
	3/20/2015	<0.50	<0.50	<0.50	<0.50	0.58	<0.50	<0.50	5.9	<0.50	<0.50	6.1	<0.50	<0.50	3.1	<0.50
	6/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/22/2015	<0.50	<0.50	<0.50	<0.50	1.9	<0.50	<0.50	4.7	<0.50	<0.50	2.2	<0.50	<0.50	0.8	<0.50
	12/8/2015	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	18	<0.50	<0.50	189	<0.50	<0.50	36.4	<0.50
	3/8/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	3.5	<0.50	<0.50	4.1	<0.50	<0.50	1.6	<0.50
	6/17/2016	<0.50	<2	<0.50	<0.50	0.99	<0.50	<0.50	7.8	<0.50	<0.50	11.5	<0.50	<0.50	6.3	<0.50
	9/28/2016	<0.50	<2	<0.50	<0.50	0.53	<0.50	<0.50	5.4	<0.50	<0.50	5.8	<0.50	<0.50	3.1	<0.50
	12/12/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	<0.50	<0.50
	3/30/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	1	<0.5	<0.5	<0.5	<0.5
	6/15/2017	<0.50	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	3.2	<0.50	<0.50	6.6	<0.50	<0.50	2.8	<0.50
	9/26/2017	<2.0	<2.0	<0.50	<0.50	2.10	<1.0	<0.50	24.5	<0.50	<0.50	30.1	<0.50	<0.50	16.6	<0.50
	11/9/2017	<2.0	<2.0	<0.50	<0.50	1.10	<0.50	<0.50	9.6	<0.50	<0.50	12.7	<0.50	<0.50	5.9	<0.50
3/21/2018	<0.500	<2.50	<0.500	<0.500	1.42	<0.500	<0.500	13.5	<0.500	<0.500	19.1	<0.500	<0.500	10.2	<0.500	
6/28/2018	<0.500	<2.50	<0.500	<0.500	1.44	<0.500	<0.500	13.6	1.09	<0.500	10.3	<0.500	<0.500	5.9	<0.500	
9/27/2018	<1.00	<5.00	<1.00	<1.00	2.18	<0.400	<0.400	25.0	<0.400	<0.500	24.8	<0.400	<0.500	14.3	<0.400	
12/4/2018	<1.00	<5.00	<1.00	<1.00	0.80	<0.400	<0.400	5.1	<0.400	<0.500	10.2	<0.400	<0.500	3.8	<0.400	
MW-24d	09/14/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/09/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/08/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/21/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-24d (continued)	09/14/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/14/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/15/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/14/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/20/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/16/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/24/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	12	<0.50	<0.50	4	<0.50	<0.50	1.6
	6/23/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	10/2/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/15/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.8	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.8	<0.50	<0.50	3.8	<0.50	<0.50	1.7
	9/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/9/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/9/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/17/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.87	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/30/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.62	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/12/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	6/15/2017	<0.50	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
9/25/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
11/6/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
3/20/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.259 J	<0.500	<0.500	<0.500	<0.500	<0.500	0.199 J	
6/27/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.275 J	
9/28/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400	
12/10/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400	
MW-25i	09/16/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
	12/08/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
	03/06/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
	06/20/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	09/11/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
	12/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
	03/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
	06/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/18/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/11/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/19/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/25/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-25i (continued)	9/24/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/9/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/21/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.75	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/9/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/9/2016 DUP	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/15/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/29/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.81	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	0.77	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/29/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	6/15/2017	<0.50	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/27/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/8/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/21/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.245 J	<0.500	<0.500	0.248 J	<0.500	<0.500	<0.500	<0.500
	6/29/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	0.274 B J	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	9/27/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400
12/6/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	<0.400	<0.400	<0.500	<0.400	<0.400	<0.500	<0.400	<0.400	
MW-26	09/16/11	<2	<2	<2	<2	7	<2	2.2	120	2.6	<2	250	5.7	<2	490	<2
	12/08/11	<2	<2	<2	<2	7.1	<2	2.5	110	2.2	<2	300	5.8	<2	500	<2
	03/06/12	<2	<2	<2	<2	8.2	<2	2.2	99	<2	<2	210	4.6	<2	450	<2
	06/19/12	<2	<2	<2	<2	14	<2	3	90	<2	<2	160	5.2	<2	460	<2
	09/11/12	<2	<2	<2	<2	6.3	<2	2.3	110	3	<2	280	4.3	<2	460	<2
	12/12/12	<2	<2	<2	<2	5.6	<2	<2	120	3.7	<2	300	3.8	<2	470	<2
	03/13/13	<2	<2	<2	<2	4.9	<2	<2	83	<2	<2	210	2.9	<2	390	<2
	06/12/13	<2	<2	<2	<2	8.2	<2	<2	80	<2	<2	170	4.5	<2	360	<2
	09/18/13	<2	<2	<2	<2	5.7	<2	<2	96	2.4	<2	210	3.2	<2	410	<2
	12/11/13	<2	<2	<2	<2	7.8	<2	<2	75	<2	<2	150	3.9	<2	370	<2
	3/19/2014	<2	<2	<2	<2	4.9	<2	<2	95	2.1	<2	220	2.9	<2	350	<2
	6/24/2014	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	6.4	49	0.86	<0.50	150	2.1	<0.50	200	<0.50
	9/24/2014	<2	<2	<2	<2	3.9	<2	<2	68	<2	<2	220	3.1	<2	340	<2
	12/9/2014	<0.90	<0.90	<0.90	<0.90	3.8	<0.90	0.96	55	1.3	<0.90	160	2.8	<0.90	280	<0.90
	3/17/2015	<1	<1	<1	<1	5.8	<1	1.7	75.7	1.8	<1	265	3.7	<1	458	<1
	6/16/2015	<1.7	<1.7	<1.7	<1.7	5	<1.7	<1.7	77.9	<1.7	<1.7	205	2.8	<1.7	385	<1.7
	9/21/2015	<1.7	<1.7	<1.7	<1.7	4.3	<1.7	<1.7	72.4	1.7	<1.7	176	2.7	<1.7	326	<1.7
12/7/2015	<1.2	<1.2	<1.2	<1.2	8.5	<1.2	1.7	75	1.6	<1.2	179	3.5	<1.2	393	<1.2	
3/8/2016	<1.2	<5	<1.2	<1.2	8	<1.2	1.5	76.1	1.8	<1.2	171	3.7	<1.2	370	<1.2	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-26 (continued)	6/15/2016	<1	<4	<1	<1	4.6	<1	1.4	83.1	2.2	<1	192	2.2	<1	343	<1
	9/27/2016	<0.50	<2	<0.50	<0.50	3.9	<0.50	1.1	61.1	1.6	<0.50	160	2.4	<0.50	288	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	8.9	<0.50	2.4	85.9	2	<0.50	167	3.3	<0.50	410	<0.50
	3/29/2017	<5	<20	<5	<5	<5	<5	<5	170	<5	<5	214	<5	<5	452	<5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	6.7	<1.0	1.9	113	2.0	<0.50	160	2.1	<0.50	311 E, J	0.65
	9/26/2017	<2.0	<2.0	<0.50	<0.50	5.1	<1.0	1.0	192	2.1	<0.50	68	0.8	<0.50	192	0.98
	11/8/2017	<2.0	2	<0.50	<0.50	4.8	<0.50	1.5	204	2.3	<0.50	88	1.0	<0.50	170	1.80
	3/20/2018	<0.500	0.633 J	0.149 J	<0.500	4.9	<0.500	1.4	157	1.9	<0.500	108	1.2	<0.500	190	1.75
	6/29/2018	<0.500	<2.50	<0.500	<0.500	5.1	<0.500	1.5	114	1.9	<0.500	138	1.9	<0.500	221	1.02
	9/24/2018	<1.00	<5.00	<1.00	<1.00	4.2	<0.400	1.2	141	2.1	<0.500	117	1.2	<0.500	233	1.18
	12/5/2018	<2.00	<10.0	<2.00	<2.00	3.0	<0.800	1.1	147	1.9	<1.00	139	0.8	<1.00	210	0.85
	MW-32s	03/24/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.79	<0.50	--	<0.50
08/18/05		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/14/05		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
03/06/08		<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
09/17/08		<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
12/09/08		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
06/16/09		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
12/15/09		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
07/02/10		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
09/22/10		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
12/07/10		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
06/09/11		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.4	<0.5	<0.5	0.94	<0.5	<0.5	1.1	<0.5
09/15/11		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
12/08/11		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
06/21/12		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
09/13/12		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
12/11/12		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
03/14/13		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
06/11/13		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
09/20/13		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
12/16/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
3/24/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
6/25/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
6/25/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
12/11/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MW-32s (continued)	3/19/2015	<0.50	<0.50	0.77	<0.50	1.5	<0.50	<0.50	73.5	2.5	<0.50	<0.50	3.5	<0.50	52	<0.50
	6/17/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/7/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/14/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/14/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/10/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/22/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	11/10/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
3/22/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	
MW-32i	11/10/17	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	7	<0.50	<0.50	8.2	<0.50	<0.50	3.4	<0.50
MW-F	06/14/95	--	<10	<5	<5	<5	5	<5	15	<5	--	<5	<5	--	<5	<10
	02/27/01	<1	<5	<0.50	<0.50	0.754	<0.50	<0.50	5.99	<0.50	<0.50	0.506	<1	--	1.18	<0.50
	05/29/01	<1	<5	<0.50	<0.50	0.58	<0.50	<0.50	6.47	<0.50	<0.50	<0.50	<1	--	0.585	<0.50
	09/24/01	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	6.5	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	12/18/01	<1	<5	<0.50	<0.50	1.44	<0.50	<0.50	17.9	<0.50	<0.50	<0.50	<1	--	0.709	<0.50
	03/18/02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/31/02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/28/02	<1	<0.50	<0.50	<1	1.12	0.65	<0.50	9.54	<0.50	<0.50	<0.50	<0.50	--	0.69	<0.50
	11/08/02	<1	<0.50	<0.50	<1	1.15	0.81	<0.50	9.86	<0.50	<0.50	<0.50	<0.50	--	0.65	<0.50
	01/23/03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/29/03	<1	<0.50	<0.50	<1	1.11	0.83	<0.50	10.6	<0.50	<0.50	<0.50	<0.50	--	0.62	<0.50
	11/10/03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	01/26/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	05/04/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	08/17/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/02/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/15/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	03/24/05	<1	<0.50	<0.50	<1	0.87	0.64	<0.50	8.31	<0.50	<0.50	0.52	<0.50	--	0.74	<0.50
05/17/05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
08/18/05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
11/14/05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
12/13/07	<1	<0.50	<0.50	<1	0.5	0.52	<0.50	5.93	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50	
09/18/08	<1	<0.500	<0.500	<1	0.85	0.72	<0.500	8.57	<0.500	<0.500	<0.500	<0.500	<0.500	0.57	<0.500	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
EW-1	04/25/91	--	<2	--	--	35	20	--	750	--	--	9,100	280	--	440	9.3
	11/17/93	--	<200	---	--	<100	<100	--	1,700	--	--	8,600	<100	--	480	<200
	09/01/95	<25	<50	<25	<25	<25	<25	<25	140	<25	<25	2,400	74	--	340	<50
	09/24/96	<1	<4	3	<0.4	8.5	2.1	<0.40	260	6.2	<0.40	49	34	--	29	89
	12/02/96	0.7	<0.50	1.9	<0.20	5.7	5	1	530	3.3	<0.20	310	86	--	98	10
	11/12/97	<2.5	<5	<2.5	<2.5	5.05	3.38	<2.5	68.5	4.91	<2.5	111	5.1	--	47.4	9.2
	08/11/99	<10	<50	<5	<5	<5	<5	<5	14.5	<5	<5	369	<10	--	39.9	<5
	11/16/99	<5	<12.5	<2.5	<5	<2.5	3.15	<2.5	41.7	3	<2.5	314	6.9	--	35.5	5.1
	02/29/00	<2	<10	<1	<1	<1	6.42	<1	13.7	<1	<1	97.3	3.48	--	20.8	<1
	06/27/00	<2	<10	2.12	<1	<1	6.42	<1	17.5	<1	<1	293	5.37	--	35.1	<1
	08/31/00	<5	<25	<2.5	<2.5	<2.5	<2.5	<2.5	31.9	<2.5	<2.5	325	<5	--	38.4	<2.5
	01/30/00	<5	<25	<2.5	<2.5	<2.5	<2.5	<2.5	45.6	<2.5	<2.5	380	5.86	--	53.9	<2.5
	02/27/01	<2	<10	1.42	<1	2.51	2.83	<1	35	<1	<1	240	7.98	--	47.5	2.43
	05/29/01	<10	<50	<5	<5	<5	<5	<5	22.4	<5	<5	338	<10	--	61.1	<5
	09/25/01	<5	<5	<5	<5	<5	<5	<5	14	<5	<5	320	9.5	--	61	<5
	12/17/01	<2	<10	<1	<1	1.19	<1	<1	25.8	<1	<1	217	12.8	--	47.1	<1
	03/19/02	<2	<1	<1	<2	1.04	<1	<1	17.5	<1	<1	323	5.66	--	46.1	<1
	05/30/02	<2	<1	1.38	<2	1	1.68	<1	23.5	<1	<1	319	6.46	--	39.9	<1
	08/29/02	<2	<1	1.36	<2	2.44	1.24	<1	20.4	<1	<1	307	3.38	--	37.8	<1
	11/08/02	<2	<1	1.46	<2	3.02	3.96	<1	28.4	<1	<1	274	5.54	--	50.2	<1
	01/23/03	<2	<1	1.36	<2	2.34	<1	<1	17	<1	<1	252	5.06	--	51.9	<1
	05/30/03	<2	<1	5.22	<2	<1	<1	<1	6.12	<1	<1	255	5.06	--	41.1	<1
	11/10/03	<5	<5	<5	<5	<5	<5	<5	9	<5	<5	85.8	<5	--	16.2	<5
	01/27/04	<1	<0.50	2.07	<1	0.87	0.78	<0.50	5.2	<0.50	<0.50	151	4.26	--	37.6	<0.50
	05/04/04	<1	<1	4.73	<1	<1	1.25	<1	4.36	<1	<1	168	3.09	--	30.8	<1
	08/17/04	<1	<0.50	3.76	<0.50	0.81	1.86	<0.50	6.83	<0.50	<0.50	144	1.73	--	23.2	<0.50
	11/17/04	<2.5	<2.5	4	<2.5	<2.5	<2.5	<2.5	9.6	<2.5	<2.5	180	3.6	--	33	<2.5
	05/18/05	<2	<1	<1	<2	<1	<1	<1	8.28	<1	<1	207	<1	--	23.2	2.3
	11/14/05	<2	<1	1.06	<2	1.36	2.7	<1	11.1	<1	<1	187	<1	--	26.1	<1
	06/05/06	<1	<1	2.4	<1	<1	<1	<1	6.18	<1	<1	102	3.55	--	19.1	<1
	12/06/06	<1	<0.50	2.07	<1	1.13	<0.50	<0.50	8.98	<0.50	<0.50	133	2.1	--	28.3	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
EW-1 (continued)	09/12/07	<1	<0.50	2.66	<1	0.51	1.14	<0.50	6.28	<0.50	<0.50	76.9	1.47	--	18.3	<0.50
	03/06/08	<1	<0.500	1.71 J	<1	0.64	1.04	<0.500	5.75	<0.500	<0.500	80.9	1.45	<0.500	19.9	<0.500
	09/19/08	<5	<2.50	<2.50	<5	<2.50	<2.50	<2.50	14.6	<2.50	<2.50	86.1	<2.50	<2.50	20.8	<2.50
	03/26/09	<0.50	<0.50	3.6	<0.50	<0.50	0.76	<0.50	3.8	<0.50	<0.50	81	1	<0.50	14	<0.50
	09/17/09	<0.50	<0.50	3.4	<0.50	0.63	<0.50	<0.50	8.3	<0.50	<0.50	100	0.74	<0.50	17	<0.50
	03/19/10	<0.50	<0.50	3.5 BE	<0.50	<0.50	<0.50	0.52	4.1	<0.50	<0.50	89	1.5	<0.50	22	<0.50
	09/23/10	<0.50	<0.50	1.7 BE	<0.50	0.86	0.94	<0.50	10	<0.50	<0.50	87	0.64	<0.50	17	<0.50
	03/10/11	<0.50	<0.50	5.2	<0.50	<0.50	<0.50	<0.50	2.9	<0.50	<0.50	67	0.89	<0.50	13	<0.50
	09/16/11	<0.50	<0.50	2.7	<0.50	<0.50	<0.50	<0.50	2.1	<0.50	<0.50	75	0.69	<0.50	9.9	<0.50
	03/12/12	<0.50	<0.50	4.4	<0.50	<0.50	<0.50	<0.50	3	<0.50	<0.50	52	0.68	<0.50	13	<0.50
	09/13/12	<0.50	<0.50	1.7	<0.50	<0.50	<0.50	<0.50	2.1	<0.50	<0.50	60	0.58	<0.50	8.6	<0.50
	03/15/12	<0.50	<0.50	2.4	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	<0.50	78	0.63	<0.50	12	<0.50
	09/19/13	<0.50	<0.50	2.2	<0.50	<0.50	<0.50	<0.50	5.3	<0.50	<0.50	63	0.57	<0.50	14	<0.50
	3/20/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.3	<0.50	<0.50	32	1.6	<0.50	12	<0.50
	9/27/2014	Insufficient water for sampling during monitoring event.														
	9/21/2015	<0.50	<0.50	2	<0.50	<0.50	<0.50	<0.50	3.9	<0.50	<0.50	45.3	0.56	<0.50	12.5	<0.50
	3/8/2016	<0.50	<2	2	<0.50	<0.50	<0.50	<0.50	2.9	<0.50	<0.50	62.6	0.83	<0.50	14.3	<0.50
	9/29/2016	<0.50	<2	1.1	<0.50	<0.50	1.5	<0.50	5.4	<0.50	<0.50	38.6	<0.50	<0.50	10.5	<0.50
	3/30/2017	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10.7	<0.50	<0.50	2.4	<0.50
	9/28/2017	<2.0	<2.0	2.4	<0.50	<0.50	<1.0	<0.50	1.8	<0.50	<0.50	32.4	<0.50	<0.50	7.2	<0.50
11/9/2017	<2.0	<2.0	0.91	<0.50	<0.50	<0.50	<0.50	3.30	<0.50	<0.50	33.0	0.66	<0.50	7.3	<0.50	
7/1/2018	<0.500	<2.50	1.94	<0.500	0.134 J	<0.500	<0.500	1.15 B	<0.500	<0.500	30.7	0.56	<0.500	7.6	<0.500	
9/27/2018	<1.00	<5.00	1.15	<1.00	0.41	1.03	<0.400	3.18	<0.400	<0.500	29.7	0.41	<0.500	8.4	<0.400	
S-1	08/10/99	<1	<5	<0.50	<1	<0.50	<0.50	<0.50	2.63	<0.50	<0.50	7.81	1.3	--	20.6	<0.50
	02/29/00	<1	<5	<0.50	<0.50	0.761	<0.50	<0.50	2.21	<0.50	<0.50	60.6	2.98	--	24.4	<0.50
	06/28/00	<5	<25	<2.5	<2.5	<2.5	<2.5	2.7	58.2	<2.5	<2.5	749	14.5	--	232	<2.5
	08/31/00	<5	<25	<2.5	<2.5	<2.5	<2.5	<2.5	4.98	<2.5	<2.5	313	5.14	--	60.4	<2.5
	11/30/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	1.61	<0.50	<0.50	9.78	1.95	--	29.8	<0.50
	02/27/01	<1	<5	<0.50	<0.50	<0.50	<0.50	0.551	1.66	<0.50	<0.50	13.5	2.26	--	45.2	<0.50
	05/30/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	0.974	<0.50	<0.50	7.38	<1	--	12.6	<0.50
	09/25/01	<2.5	<2.5	<2.5	<2.5	2.6	<2.5	4	2.7	<2.5	<2.5	39	18	--	210	<2.5
	03/19/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.21	<0.50	--	3.73	<0.50
	05/30/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.45	<0.50	--	10.4	<0.50
	11/07/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	2.34	<0.50	<0.50	8.71	1.02	--	19.7	<0.50
	01/23/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	0.78	<0.50	<0.50	6.15	0.56	--	13	<0.50
	05/28/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.2	<0.500	--	8.67	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
S-1 (continued)	11/11/03	<1	<1	<1	<1	<1	<1	<1	1.85	<1	<1	4.22	<1	--	13.2	<1
	01/26/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.57	0.67	--	15.5	<0.50
	05/04/04	<1	<1	<1	<1	<1	<1	<1	1.17	<1	<1	4.07	<1	--	10.6	<1
	11/15/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	2.8	<0.50	<0.50	8.4	0.82	--	18	<0.50
	02/01/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	0.75	<0.50	<0.50	1.89	<0.50	--	2.87	<0.50
	05/18/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	2.24	<0.50	<0.50	3.73	<0.50	--	8.39	<0.50
	05/23/07	<1	<1	<1	<1	<1	<1	<1	3.63	<1	<1	4.02	<1	--	6.85	<1
	12/13/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	4.61	<0.50	<0.50	4.87	<0.50	--	8.44	<0.50
	03/05/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	5.15	<0.500	<0.500	<0.500	4.14	<0.500	<0.500	<0.500
	06/25/08	<1	<1	<1	<1	<1	<1	<1	1.67	<1	<1	<1	1.37	<1	<1	<1
	09/17/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	5.55	<0.500	<0.500	2.81	<0.500	<0.500	6.07	<0.500
	12/09/08	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	0.62	<0.50	<0.50	1.4	<0.50
	03/25/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.3	<0.50	<0.50	1.4	<0.50	<0.50	2.7	<0.50
	06/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.91	<0.50	<0.50	0.81	<0.50	<0.50	1.8	<0.50
	09/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	<0.50	1.7	<0.50	<0.50	5	<0.50
	12/16/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	<0.50	1.7	<0.50	<0.50	6.1	<0.50
	03/17/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	1	<0.50
	07/02/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/22/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.66	<0.5	<0.5	<0.5	<0.5	<0.5	1.5	<0.5
	12/08/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	0.77	<0.5	<0.5	3	<0.5
	03/09/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	<0.50
	06/08/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.66	<0.5
	09/14/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	1.4	<0.50	<0.50	4	<0.50
	12/06/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	1.3	<0.50	<0.50	3.1	<0.50
	03/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.59	<0.50	<0.50	0.74	<0.50	<0.50	1.8	<0.50
	06/21/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.98	<0.5	<0.5	0.94	<0.5	<0.5	3.5	<0.5
	09/14/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.88	<0.50	<0.50	0.88	<0.50	<0.50	2.6	<0.50
	12/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	0.96	<0.50	<0.50	3.8	<0.50
03/13/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.78	<0.50	<0.50	1.5	<0.50	
06/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.74	<0.50	<0.50	2.2	<0.50	
09/20/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	<0.50	1.8	<0.50	<0.50	5.4	<0.50	
12/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	1.2	<0.50	<0.50	5.1	<0.50	
3/20/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1	<0.50	
6/24/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.82	<0.50	<0.50	2.1	<0.50	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
S-1 (continued)	9/27/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	1.3	<0.50	<0.50	4.3	<0.50
	12/9/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	1.3	<0.50	<0.50	4.9	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.73	<0.50	<0.50	1.4	<0.50
	6/16/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.8	<0.50
	9/21/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	1.6	<0.50	<0.50	5.1	<0.50
	12/8/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.6	<0.50
	3/9/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/27/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	0.73	<0.50	<0.50	3	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	0.57	<0.50	<0.50	0.54	<0.50	<0.50	1.6	<0.50
	3/27/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/28/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	11/8/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/20/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
	6/28/2018	<0.500	<2.50	<0.500	<0.500	1.01	<0.500	0.336 J	3.62	<0.500	<0.500	3.16	0.90	<0.500	24.20	<0.500
9/26/2018	<1.00	<5.00	<1.00	<1.00	0.51	<0.400	<0.400	2.58	<4.00	<0.500	2.11	0.41	<0.500	10.40	<0.400	
12/5/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	1.10	<4.00	<0.500	1.94	<0.400	<0.500	7.39	<0.400	
S-2	08/11/99	<1	<5	<0.50	<0.50	2.37	<0.50	<0.50	<0.50	<0.50	1.7	<1	--	0.843	<0.50	
	11/15/04	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.52	<0.50	<0.50	4.4	<0.50	--	1.6	<0.50
	12/12/12	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	<0.50	1.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	03/13/13	<0.50	<0.50	<0.50	<0.50	3.4	<0.50	<0.50	2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	06/12/13	<0.50	<0.50	<0.50	<0.50	2.3	<0.50	<0.50	1.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	09/20/13	<0.50	<0.50	<0.50	<0.50	3.7	<0.50	<0.50	3.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/12/13	<0.50	<0.50	<0.50	<0.50	3	<0.50	<0.50	2.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/20/2014	<0.50	<0.50	<0.50	<0.50	1.9	<0.50	<0.50	2.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/24/2014	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	<0.50	3.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/27/2014	<0.50	<0.50	<0.50	<0.50	4.5	<0.50	<0.50	4.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/9/2014	<0.50	<0.50	<0.50	<0.50	3.9	<0.50	<0.50	4.6	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	4.5	<0.50	<0.50	5.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2015	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	<0.50	3.8	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/8/2015	<0.50	<0.50	<0.50	<0.50	3	<0.50	<0.50	3.2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	6/16/2016	<0.50	<2	<0.50	<0.50	4.3	<0.50	<0.50	6	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/26/2016	<0.50	<2	<0.50	<0.50	6.2	<0.50	<0.50	11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	12/13/2016	<0.50	<2	<0.50	<0.50	3.5	<0.50	<0.50	4.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	3/27/2017	<0.5	<2	<0.5	<0.5	2.6	<0.5	<0.5	4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	6/13/2017	<2.0	<2.0	<0.50	<0.50	3.3	<1.0	<0.50	4.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	9/28/2017	<2.0	<2.0	<0.50	<0.50	8.0	<1.0	<0.50	13.2	<0.50	<0.50	<0.50	0.86	<0.50	0.51	<0.50
11/8/2017	<2.0	<2.0	<0.50	<0.50	7.1	<0.50	<0.50	12.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
3/20/2018	<0.500	<2.50	<0.500	<0.500	3.7	<0.500	<0.500	5.9	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	
6/28/2018	<0.500	<2.50	<0.500	<0.500	4.1	<0.500	<0.500	23.2	0.56	<0.500	<0.500	1.00	<0.500	2.34	<0.500	
9/26/2018	<1.00	<5.00	<1.00	<1.00	10.0	<0.400	<0.400	50.9	0.70	<0.500	<4.00	1.74	<0.500	4.00	0.42	
12/5/2018	<1.00	<5.00	<1.00	<1.00	7.0	<0.400	<0.400	28.5	<4.00	<0.500	<0.400	<0.400	<0.500	2.18	<0.400	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MGMS1-3(43)	06/28/00	<50	<250	<25	<25	278	<25	55.9	4,270	<25	<25	734	<50	--	1,840	<25
	08/30/00	<200	<1	<100	<100	420	<100	116	8,850	<100	<100	5,940	<200	--	3,040	<100
	11/29/00	<100	<50	<50	<50	249	<50	76.2	4,560	<50	<50	1,210	<100	--	1,140	<50
	02/27/01	<100	<500	<50	<50	697	<50	164	14,000	<50	<50	148	<100	--	1,390	133
	05/31/01	<100	<500	<50	<50	<50	<50	<50	5,870	<50	<50	130	<100	--	599	<50
	09/24/01	<13	<13	<13	<13	150	<13	32	4,700	<13	<13	310	<13	--	450	25
	12/18/01	<50	<250	<25	<25	153	<25	33.3	3,600	<25	<25	276	<50	--	568	<25
	03/19/02	<100	<50	<50	<100	310	<50	103	6,700	<50	<50	2,090	<50	--	1,720	86
	05/29/02	<50	<25	<25	<50	188	<25	39	4,700	<25	<25	470	<25	--	624	37.5
	08/29/02	<1	<0.50	<0.50	<1	3.72	<0.50	0.84	94.7	0.54	<0.50	34.9	0.75	--	35.7	1.46
	11/11/02	<100	<50	<50	<100	183	<50	<50	4,810	<50	<50	757	<50	--	831	51
	01/23/03	<100	<50	<50	<100	378	<50	76	10,500	<50	<50	782	<50	--	1,290	109
	05/28/03	<100	<50	<50	<100	402	<50	72	9,510	<50	<50	270	<50	--	841	114
	11/11/03	<50	<50	<50	<50	252	<50	<50	9,710	<50	<50	516	<50	--	1,020	58
	01/27/04	<50	<25	<25	<50	290	<25	54.5	8,160	53.5	<25	393	<25	--	808	95
	05/03/04	<100	<100	<100	<100	370	<100	<100	12,300	<100	<100	830	<100	--	1,520	111
	08/17/04	<100	<50	<50	<100	401	<50	114	12,700	109	<50	1,540	<50	--	2,340	151
	11/15/04	<120	<120	<120	<120	270	<120	<120	9,600	<120	<120	1,400	<120	--	1,600	<120
	03/24/05	<100	<50	<50	<100	481	<50	148	15,600	135	<50	1,390	<50	--	2,090	266
	05/16/05	<50	<25	<25	<50	327	<25	89	9,670	83	<25	802	<25	--	1,410	157
	05/17/05	<100	<50	<50	<100	353	<50	86	10,600	94	<50	920	<50	--	1,660	173
	11/17/05	<100	<50	<50	<100	392	<50	121	13,400	133	<50	1,310	<50	--	2,280	186
	06/06/06	<100	<100	<100	<100	385	<100	<100	11,800	115	<100	628	<100	--	1,370	192
	12/06/06	<100	<50	<50	<100	256	<50	72	9,960	92	<50	843	<50	--	1,260	155
	05/22/07	<100	<100	<100	<100	439	<100	119	14,200	152	<100	910	<100	--	1,920	245
	09/11/07	<100	<50	<50	<100	303	<50	109	11,700	128	<50	1,100	<50	--	2,060	189
	12/12/07	<100	<50	<50	<100	270	<50	75	8,740	93	<50	1,010	<50	--	1,540	167
	03/05/08	<50	<25	<25	<50	370	<25	128	6,740	220	<25	1,480	36	<25	2,350	234
	09/16/08	<100	<50	<50	<100	302	<50	112	10,400	139	<50	2,700	<50	<50	2,500	171
	12/08/08	<4	<4	<4	<4	190	<4	63	6,000	78	<4	1,300	19	<4	1,200	100
	03/25/09	<15	<15	<15	<15	110	<15	66	3,500	34	<15	3,600	49	<15	2,100	49
	09/15/09	<15	<15	<15	<15	140	<15	74	4,200	45	<15	4,300	44	<15	2,300	84
	12/14/09	<15	<15	<15	<15	140	<15	46	4,000	55	<15	1,500	15	<15	1,100	67
	03/17/10	<15	<15	<15	<15	160	<15	63	4,600	44	<15	2,800	32	<15	1,900	78

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MGMS1-3(43) (continued)	06/14/10	<25	<25	<25	<25	220	<25	46	5,400	69	<25	790	<25	<25	900	85
	09/21/10	<15	<15	<15	<15	130	<15	55	3,800	43	<15	2,900	37	<15	1,900	68
	12/07/10	<15	<15	<15	<15	190	<15	63	5,500	69	<15	2,500	23	<15	1,800	96
	03/08/11	<20	<20	<20	<20	170	<20	52	4,600	56	<20	1,400	<20	<20	1,300	86
	06/06/11	<15	<15	<15	<15	190	<15	36	4,700	71	<15	610	<15	<15	790	97
	09/13/11	<20	<20	<20	<20	290	<20	78	8,000	160	<20	900	<20	<20	1,800	160
	03/08/12	<4	<40	<40	<40	340	<40	62	9,500	150	<40	240	<40	<40	690	890
	06/21/12	<20	<20	<20	<20	220	<20	25	4,400	76	<20	74	<20	<20	260	1,100
	09/12/12	<20	<20	<20	<20	280	<20	72	8,800	180	<20	360	<20	<20	970	890
	12/11/12	<20	<20	<20	<20	220	<20	40	6,100	110	<20	160	<20	<20	430	680
	03/12/13	<20	<20	<20	<20	220	<20	21	4,700	74	<20	110	<20	<20	340	1,600
	06/11/13	<20	<20	<20	<20	190	<20	<20	3,900	56	<20	78	<20	<20	260	1,100
	09/17/13	<15	<15	<15	<15	190	<15	21	4,600	66	<15	100	<15	<15	350	1,100
	12/10/13	<15	<15	<15	<15	210	<15	18	3,600	54	<15	95	<15	<15	270	1,800
	3/18/2014	<20	<20	<20	<20	150	<20	<20	3,600	40	<20	93	<20	<20	260	440
	6/26/2014	<7	<7	<7	<7	120	<7	14	2,000	14	<7	21	<7	<7	57	480
	9/23/2014	<15	<15	<15	<15	190	<15	35	4,700	69	<15	120	<15	<15	420	550
	12/12/2014	<7	<7	<7	<7	200	<7	23	4,000	52	<7	100	<7	<7	350	810
	3/19/2015	<12.5	<12.5	<12.5	<12.5	131	<12.5	<12.5	2,450	16.6	<12.5	31.7	<12.5	<12.5	129	249
	6/18/2015	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	<0.50	59.1	<0.50	<0.50	0.84	<0.50	<0.50	2.8	3.1
	9/21/2015	<10	<10	<10	<10	124	<10	14.1	2,810	24.8	<10	53.5	<10	<10	171	129
	12/8/2015	<0.50	<0.50	<0.50	<0.50	92	<0.50	<0.50	1,580	11.5	<0.50	26.2	<0.50	<0.50	88	230
	3/9/2016	<10	<40	<10	<10	93.9	<10	<10	1,700	12.4	<10	24.1	<10	<10	81.9	209
	6/17/2016	<8.3	<33.3	<8.3	<8.3	163	<8.3	26.6	3,130	36.1	<8.3	64.6	<8.3	<8.3	248	288
	9/30/2016	<8.3	<33.3	<8.3	<8.3	81.9	<8.3	13.5	1,980	24.2	<8.3	230	<8.3	<8.3	366	52
	12/16/2016	<8.4	<33.4	<8.4	<8.4	92.6	<8.4	9.5	1,810	20.1	<8.4	64.1	<8.4	<8.4	171	239
3/31/2017	<8.4	<33.4	<8.4	<8.4	90.8	<8.4	12.5	1,430	15.2	<8.4	45.8	<8.4	<8.4	119	348	
6/12/2017	<8.3	<33.3	<8.3	<8.3	173	<8.3	16.7	2,620	18.7	<8.3	24.4	<8.3	<8.3	116	681	
9/29/2017	<2.5	<10.0	<2.5	<2.5	60	<2.5	6.9	901	12.9	<2.5	70.7	<2.5	<2.5	126	117	
11/7/2017	<10.0	<10.0	<2.5	<2.5	153	<2.5	13.7	2,350 J-	26.6	<2.5	108	<2.5	<2.5	211	181	
3/22/2018	<0.500	<2.50	<0.500	<0.500	192	<0.500	18.0	2,450	34.9	<0.500	80	0.8	0.200 J	278	236	
7/1/2018	<0.500	<2.50 J3	<0.500	<0.500	116	<0.500	13.8	1,880	32.8	<0.500	107	0.6	<0.500	246	118	
9/28/2018	<20.0	<100	<20.0	<20.0	141	<8.00	27.8	3,150	47.4	<10.0	252	<8.00	<10.0	528	134	
12/4/2018	<1.00	<5.00	<1.00	<1.00	148	<0.400	22.5	2,750	48.1	<0.500	146	1.1	<0.500	388	129	
MGMS1-2(60)	06/28/00	<10	<50	<5	<5	53.6	<5	<5	369	<5	<5	658	19.7	--	240	<5
	08/30/00	<20	<100	<10	<10	21.7	<10	13.1	267	<10	<10	2,590	108	--	586	<10
	11/29/00	<2	<10	<1	<1	1.58	<1	1.09	57.7	<1	<1	121	4.58	--	40.3	<1

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)															
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride	
MGMS1-2(60) (continued)	02/27/01	<1	<5	<0.5	<0.5	0.838	<0.5	0.686	32.9	<0.5	<0.5	54.6	2.06	--	24.7	<0.5	
	05/31/01	<1	<5	<0.50	<0.50	0.662	<0.50	0.581	39	<0.50	<0.50	69.4	<1	--	27.8	0.52	
	09/24/01	<13	<13	<13	<13	<13	<13	<13	89	<13	<13	830	14	--	150	<13	
	12/18/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	20.4	<0.50	<0.50	12.8	<1	--	15.7	<0.50	
	03/19/02	<1	<0.50	<0.50	<1	2.52	<0.50	0.99	68	<0.50	<0.50	62.9	1.2	--	34	3.48	
	05/29/02	<1	<0.50	<0.50	<1	0.78	<0.50	<0.50	22.8	<0.50	<0.50	23.4	<0.50	--	14.2	0.6	
	08/29/02	<10	<5	<5	<10	30.6	<5	5.1	661	<5	<5	138	<5	--	116	<5	
	11/11/02	<1	<0.50	<0.50	<1	2.99	<0.50	0.83	86	<0.50	<0.50	38.2	1.16	--	38.9	<0.50	
	01/23/03	<1	<0.50	<0.50	<1	1.53	<0.50	0.74	42.6	<0.50	<0.50	42.8	0.78	--	34.2	1.04	
	05/28/03	<1	<0.50	<0.50	<1	2.87	<0.50	1.21	72	<0.50	<0.50	51.1	1.18	--	47.6	0.63	
	11/11/03	<1	<1	<1	<1	1.84	<1	<1	48.8	<1	<1	45.9	<1	--	36	<1	
	01/27/04	<1	<0.50	<0.50	<1	2.06	<0.50	1.06	72.3	0.69	<0.50	40.9	0.66	--	43.1	0.63	
	05/03/04	<1	<1	<1	<1	4.07	<1	1.22	70.7	<1	<1	54.8	1.36	--	43.5	2.53	
	08/17/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/02/04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11/15/04	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	0.68	39	<0.50	<0.50	31	<0.50	--	28	0.67	
	02/01/05	<1	<0.50	<0.50	<1	1.31	<0.50	<0.50	37.5	0.56	<0.50	33.2	<0.50	--	21.7	1.3	
	05/16/05	<1	<0.50	<0.50	<1	0.95	<0.50	<0.50	40.6	<0.50	<0.50	21.7	<0.50	--	19.8	<0.50	
	05/16/05 DUP	<1	<0.50	<0.50	<1	1.02	<0.50	<0.50	42.1	<0.50	<0.50	21.4	<0.50	--	20.5	<0.50	
	08/18/05	<1	<0.500	<0.500	<1	7.28	<0.500	2.41	145	1.2	<0.500	76.5 B	1.46	--	65.6	5.16 B	
	11/17/05	<1	<0.500	<0.500	<1	2.53	<0.500	0.99	87	0.59	<0.500	34.8	<0.500	--	26.4	0.93	
	02/20/06	<1	<0.500	<0.500	<1	6.17	<0.500	1.93	136	1.1	<0.500	61.9	0.93	--	45.5	4.17	
	06/06/06	<1	<1	<1	<1	1.02	<1	<1	33.7	<1	<1	23.4	<1	--	18.7	<1	
	09/05/06	<1	<0.50	<0.50	<1	5.37	<0.50	1.75	115	0.84	<0.50	55.9	0.8	--	37.5	4.79	
	12/06/06	<1	<0.50	<0.50	<1	3.39	<0.50	1.12	90.9	0.62	<0.50	39.5	<0.50	--	28.3	2.15	
	02/07/07	<1	<0.50	<0.50	<1	4.37	<0.50	1.37	116	0.93	<0.50	55.9	0.58	--	40.7	3	
	05/22/07	<1	<1	<1	<1	1.18	<1	<1	38.5	<1	<1	31.6	<1	--	25.2	<1	
	09/11/07	<5	<2.50	<2.50	<5	26.6	<2.50	8.75	711	7.2	<2.50	81.4	2.95	--	216	11.9	
	12/12/07	<1	<0.50	<0.50	<1	1.83	<0.50	0.79	64.9	0.65	<0.50	28.1	<0.50	--	24.9	0.67	
	03/04/08	<1	<0.500	<0.500	<1	6.65	<0.500	2.22	166	2.92	<0.500	75.4	0.81	<0.500	60.5	2.79	
09/16/08	<5	<2.50	<2.50	<2.50	5.5	<2.50	<2.50	160	<2.50	<2.50	38.8	<2.50	<2.50	65.5	<2.50		
12/08/08	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	1.2	88	1.1	<0.50	40	0.51	<0.50	38	1.3		
12/08/08 DUP	<0.50	<0.50	<0.50	<0.50	3.9	<0.50	1.2	84	1.1	<0.50	42	0.52	<0.50	38	1.3		

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MGMS1-2(60) (continued)	03/25/09	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	1.3	71	0.75	<0.50	40	0.65	<0.50	37	0.54
	06/15/09	<0.50	<0.50	<0.50	<0.50	1	<0.50	0.8	47	0.9	<0.50	26	<0.50	<0.50	30	0.55
	09/15/09	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	0.82	44	0.58	<0.50	42	<0.50	<0.50	30	0.82
	12/14/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	17	<0.50	<0.50	18	<0.50	<0.50	16	<0.50
	03/17/10	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	0.96	61	0.68	<0.50	40	0.51	<0.50	38	<0.50
	06/14/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	20	<0.50	<0.50	17	<0.50	<0.50	15	<0.50
	09/21/10	<0.5	<0.5	<0.5	<0.5	2.1	<0.5	0.57	46	<0.5	<0.5	42	<0.5	<0.5	32	0.8
	12/07/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	16	<0.5	<0.5	19	<0.5	<0.5	15	<0.5
	03/08/11	<0.50	<0.50	<0.50	<0.50	0.54	<0.50	<0.50	19	<0.50	<0.50	27	<0.50	<0.50	16	<0.50
	06/06/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	8.3	<0.5	<0.5	16	<0.5	<0.5	11	<0.5
	09/13/11	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	0.73	42	0.5	<0.50	42	0.89	<0.50	30	0.74
	12/06/11	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	30	<0.50	<0.50	33	<0.50	<0.50	22	0.6
	03/08/12	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	32	<0.50	<0.50	36	<0.50	<0.50	21	<0.5
	06/19/12	<0.5	<0.5	<0.5	<0.5	0.71	<0.5	<0.5	28	<0.5	<0.5	22	<0.5	<0.5	16	<0.5
	09/12/12	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	0.66	36	<0.50	<0.50	33	<0.50	<0.50	20	1.1
	12/11/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	20	<0.50	<0.50	19	<0.50	<0.50	11	<0.50
	03/12/13	<0.50	<0.50	<0.50	<0.50	1.8	<0.50	0.56	38	<0.50	<0.50	35	<0.50	<0.50	20	0.66
	06/11/13	<0.50	<0.50	<0.50	<0.50	0.66	<0.50	<0.50	29	<0.50	<0.50	27	<0.50	<0.50	18	<0.50
	09/17/13	<0.50	<0.50	<0.50	<0.50	0.89	<0.50	<0.50	20	<0.50	<0.50	32	<0.50	<0.50	16	0.54
	12/10/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	16	<0.50	<0.50	17	<0.50	<0.50	11	<0.50
	3/18/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	8.5	<0.50	<0.50	10	<0.50	<0.50	5.8	<0.50
	6/26/2014	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	33	<0.50	<0.50	21	<0.50	<0.50	20	<0.50
	9/23/2014	<0.50	<0.50	<0.50	<0.50	2.3	<0.50	<0.50	26	<0.50	<0.50	34	<0.50	<0.50	20	12
	12/12/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	22	<0.50	<0.50	20	<0.50	<0.50	14	<0.50
	3/19/2015	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	26.1	<0.50	<0.50	22.7	<0.50	<0.50	16.1	<0.50
	6/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.95	<0.50	<0.50	17.7	<0.50	<0.50	9.1	<0.50
	9/21/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.3	<0.50	<0.50	1.6	<0.50
	12/8/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	18.8	<0.50	<0.50	13.8	<0.50	<0.50	12.4	<0.50
	3/9/2016	<0.50	<0.50	<0.50	<0.50	0.5	<0.50	<0.50	17.5	<0.50	<0.50	16.9	<0.50	<0.50	14	<0.50
	6/17/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	11.8	<0.50	<0.50	18	<0.50	<0.50	11.1	<0.50
9/30/2016	<0.50	<2	<0.50	<0.50	0.89	<0.50	<0.50	17.7	<0.50	<0.50	22.5	<0.50	<0.50	17.6	<0.50	
12/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	5.1	<0.50	<0.50	7.6	<0.50	<0.50	4.7	<0.50	
3/31/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	15.6	<0.5	<0.5	13.6	<0.5	<0.5	13.2	<0.5	
6/12/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	6.0	<0.50	<0.50	12.8	<0.50	<0.50	7.1	<0.50	
9/29/2017	<2.0	<2.0	<0.50	<0.50	2.00	<1.0	<0.50	18.3	<0.50	<0.50	18.3	<0.50	<0.50	13.4	<0.50	
11/7/2017	<2.0	<2.0	<0.50	<0.50	1.60	<0.50	<0.50	24.9	<0.50	<0.50	14.0	<0.50	<0.50	14.7	<0.50	
3/22/2018	<0.500	<2.50	<0.500	<0.500	1.30	<0.500	<0.500	13.4	<0.500	<0.500	23.3	<0.500	<0.500	13.9	<0.500	
7/1/2018	<0.500	<2.50	<0.500	<0.500	0.89	<0.500	<0.500	11.8	<0.500	<0.500	18.4	<0.500	<0.500	8.5	<0.500	
10/1/2018	<1.00	<5.00	<1.00	<1.00	6.66	<0.400	<0.400	23.9	<0.400	<0.500	29.4	<0.400	<0.500	16.6	20.00	
12/4/2018	<1.00	<5.00	<1.00	<1.00	0.67	<0.400	<0.400	9.6	<0.400	<0.500	14.4	<0.400	<0.500	8.2	<0.400	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MGMS1-1(110)	06/28/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	3.78	<0.50	<0.50	3.9	<1	--	3.35	<0.50
	08/30/00	<5	<25	<2.5	<2.5	3.7	<2.5	3.32	55	<2.5	<2.5	510	24	--	130	<2.5
	11/29/00	<5	<25	<2.5	<2.5	4.21	<2.5	4.59	51	<2.5	<2.5	583	23.2	--	166	<2.5
	02/27/01	<5	<25	<2.5	<2.5	5.21	<2.5	3.39	47.5	<2.5	<2.5	385	16.5	--	105	<2.5
	05/31/01	<10	<50	<5	<5	<5	<5	<5	55.8	<5	<5	639	13.8	--	141	<5
	09/24/01	<1.3	<1.3	<1.3	<1.3	6.1	<1.3	2.9	57	<1.3	<1.3	580	20	--	120	<1.3
	12/18/01	<5	<25	<2.5	<2.5	5.04	<2.5	2.68	54.8	<2.5	<2.5	527	20.2	--	131	<2.5
	03/19/02	<5	<2.5	<2.5	<5	5.25	<2.5	<2.5	54	<2.5	<2.5	454	10.8	--	98	<2.5
	05/29/02	<5	<2.5	<2.5	<5	4.9	<2.5	<2.5	62.3	<2.5	<2.5	299	9.7	--	65.1	<2.5
	08/29/02	<1	<0.50	<0.50	<1	5.43	<0.50	1.32	110	0.8	<0.50	60.2	3.62	--	47.8	<0.50
	11/11/02	<2	<1	<1	<2	4.74	<1	1.2	46.1	<1	<1	208	7.84	--	66.1	<1
	01/23/03	<2	<1	<1	<2	4.44	<1	1.24	65.3	<1	<1	210	6.54	--	74.1	<1
	05/28/03	<2	<1	<1	<2	3.96	<1	<1	69.2	<1	<1	109	2.48	--	57.5	<1
	11/11/03	<2	<2	<2	<2	4.14	<2	<2	44.8	<2	<2	256	3.6	--	60.2	<2
	01/27/04	<2	<1	<1	<2	4.22	<1	1.1	67.1	<1	<1	167	4.16	--	69.7	<1
	05/03/04	<1	<1	<1	<1	3.66	<1	<1	47.2	<1	<1	190	2.18	--	55.9	<1
	11/15/04	<2.5	<2.5	<2.5	<2.5	3.7	<2.5	<2.5	95	<2.5	<2.5	76	<2.5	--	64	<2.5
	06/20/05	<2	<1	<1	<2	9.22	<1	2.58	283	1.8	<1	23.6	1.62	--	70	1.24
	11/17/05	<1	<0.500	<0.500	<1	2.93	<0.500	<0.500	51.3	<0.500	<0.500	102	1.95	--	76.1	<0.500
	06/06/06	<1	<1	<1	<1	2.15	<1	<1	44	<1	<1	94.4	1.36	--	66.8	<1
	12/06/06	<1	<0.50	<0.50	<1	5.81	<0.50	0.6	142	<0.50	<0.50	53.8	0.88	--	74.6	0.57
	09/11/07	<2	<1	<1	<2	3.78	<1	1.2	189	<1	<1	31.6	<1	--	61.1	<1
	03/04/08	<1	<0.500	<0.500	<1	3.73	<0.500	0.91	242	2.37	<0.500	32.7	0.64	<0.500	44.4	<0.500
	03/25/09	<0.50	<0.50	<0.50	<0.50	2.6	<0.50	0.87	160	0.9	<0.50	25	<0.50	<0.50	39	<0.50
	06/15/09	<0.50	<0.50	<0.50	<0.50	2.3	<0.50	0.74	130	1	<0.50	24	<0.50	<0.50	39	<0.50
	09/15/09	<2.5	<2.5	<2.5	<2.5	20	<2.5	2.7	620	3.6	<2.5	24	<2.5	<2.5	75	<2.5
	03/17/10	<2.5	<2.5	<2.5	<2.5	20	<2.5	4.3	720	3.7	<2.5	20	<2.5	<2.5	79	<2.5
	09/21/10	<0.5	<0.5	<0.5	<0.5	2.5	<0.5	1.1	150	1	<0.5	28	<0.5	<0.5	53	<0.5
	03/10/11	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	0.57	83	0.52	<0.50	26	<0.50	<0.50	31	<0.50
	09/13/11	<0.50	<0.50	<0.50	<0.50	1.9	<0.50	1.2	110	0.96	<0.50	30	<0.50	<0.50	59	<0.50
03/08/12	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	62	<0.50	<0.50	22	<0.50	<0.50	21	<0.50	
09/12/12	<0.50	<0.50	<0.50	<0.50	0.93	<0.50	0.53	60	<0.50	<0.50	22	<0.50	<0.50	25	<0.50	
03/12/13	<0.50	<0.50	<0.50	<0.50	0.95	<0.50	<0.50	65	<0.50	<0.50	23	<0.50	<0.50	24	<0.50	
09/17/13	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	0.56	68	<0.50	<0.50	26	<0.50	<0.50	32	<0.50	
3/18/2014	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	63	<0.50	<0.50	23	<0.50	<0.50	27	0.65	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)															
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride	
MGMS1-1(110) (continued)	9/24/2014	Not sampled; 60-foot port accidentally sampled twice.															
	3/19/2015	<0.50	<0.50	<0.50	<0.50	2.7	<0.50	0.69	126	<0.50	<0.50	23.7	<0.50	<0.50	41.5	0.82	
	9/21/2015	<0.50	<0.50	<0.50	<0.50	1.1	<0.50	<0.50	49	<0.50	<0.50	19.4	<0.50	<0.50	20.4	<0.50	
	9/30/2016	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	<0.50	56.7	<0.50	<0.50	18.4	<0.50	<0.50	28.7	<0.50	
	3/31/2017	<0.50	<2.0	<0.50	<0.50	13.3	<0.50	1.1	328	0.7	<0.50	20.1	<0.50	<0.50	62	6.5	
	9/29/2017	<2.0	<2.0	<0.50	<0.50	5.9	<1.0	0.5	173	<0.50	<0.50	9.0	<0.50	<0.50	33	0.6	
	11/7/2017	<2.0	<2.0	<0.50	<0.50	10.5	<0.50	0.9	257	0.7	<0.50	11.5	<0.50	<0.50	42	0.9	
	7/1/2018	<0.500	<2.50	<0.500	<0.500	3.3	<0.500	0.462 J	104	0.357 J	<0.500	18.5	0.132 J	<0.500	37	0.6	
	10/1/2018	<1.00	<5.00	<1.00	<1.00	6.1	<0.400	0.7	153	0.5	<0.500	13.0	<0.400	<0.500	39	0.7	
	MGMS2-4(40)	06/28/00	<50	<250	<25	<25	44.9	<25	<25	1,210	<25	<25	5,030	215	--	3,090	<25
08/30/00		<10	<50	<5	<5	23.4	<5	31.3	644	7.28	<5	2,980	152	--	1,850	<5	
11/29/00		<100	<500	<50	<50	51.3	<50	94	1,420	<50	<50	8,740	424	--	3,980	<50	
02/27/01		<50	<250	<25	<25	35.6	<25	66.2	753	<25	<25	7,360	280	--	3,360	<25	
05/31/01		<50	<250	<25	<25	<25	<25	<25	604	<25	<25	3,610	94.4	--	2,050	<25	
09/24/01		<5	<5	<5	<5	28	<5	26	780	13	<5	2,600	170	--	1,700	<5	
12/18/01		<50	<250	<25	<25	175	<25	77	1,350	<25	<25	5,590	374	--	3,220	<25	
03/19/02		<50	<25	<25	<50	36	<25	36	868	<25	<25	6,240	180	--	3,040	<25	
05/29/02		<50	<25	<25	<50	76	<25	53	1,330	<25	<25	6,580	230	--	2,530	<25	
11/11/02		<20	<10	<10	<20	19.8	<10	13.6	639	<10	<10	3,080	89.4	--	1,820	<10	
01/23/03		<20	<10	<10	<20	13.4	<10	<10	353	<10	<10	2,290	52.6	--	1,480	<10	
05/28/03		<10	<5	<5	<10	5.4	<5	<5	110	<5	<5	1,190	19.1	--	474	<5	
11/11/03		<10	<10	<10	<10	<10	<10	<10	54.1	<10	<10	1,820	14	--	398	<10	
01/27/04		<20	<10	<10	<20	45.2	<10	10	397	<10	<10	1,740	55.8	--	688	<10	
05/03/04		<10	<10	<10	<10	<10	<10	<10	41.2	<10	<10	599	<10	--	200	<10	
08/17/04		<10	<5	<5	<10	9.7	<5	<5	6.1	158	<5	<5	1,530	30.7	--	705	<5
11/15/04		<25	<25	<25	<25	<25	<25	<25	310	<25	<25	2,900	<25	--	1,300	<25	
03/24/05		<20	<10	<10	<20	10.8	<10	<10	159	<10	<10	1,900	25.8	--	834	<10	
05/16/05		<20	<10	<10	<20	34.2	<10	28.2	489	<10	<10	2,540	52.2	--	1,150	<10	
11/16/05		<50	<25	<25	<50	43.5	<25	<25	396	<25	<25	4,240	82.5	--	1,750	<25	
06/06/06		<50	<50	<50	<50	62	<50	<50	917	<50	<50	4,820	55	--	1,770	<50	
12/05/06		<50	<25	<25	<50	<25	<25	<25	370	<25	<25	3,090	31.5	--	1,200	<25	
05/21/07		<20	<20	<20	<20	27.4	<20	<20	359	<20	<20	2,880	38.2	--	1,080	<20	
09/10/07	<50	<25	<25	<50	<25	<25	<25	402	<25	<25	2,010	52.5	--	1,600	<25		
12/12/07	<50	<25	<25	<50	26	<25	<25	330	<25	<25	2,080	35.5	--	914	<25		
03/04/08 ⁷	<1	<0.500	<0.500	<1	20.4	<0.500	16.1	181	7.71	<0.500	1,810	53.7	0.51	950	4.68		
09/16/08	<50	<25	<25	<25	<25	<25	<25	208	<25	<25	2,330	32	<25	1,130	<25		
12/08/08	Not sampled. Air leak in sampling point prohibited the collection of the sample.																
03/24/09	<2	<2	<2	<2	8.4	<2	3.6	100	2	<2	990	14	<2	430	<2		

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MGMS2-4(40) (continued)	09/15/09	<1.5	<1.5	<1.5	<1.5	3.1	<1.5	<1.5	52	<1.5	<1.5	440	4.1	<1.5	200	<1.5
	12/14/09	<1.5	<1.5	<1.5	<1.5	54	<1.5	16	360	6.9	<1.5	2,400	62	<1.5	1,000	2.6
	03/16/10	<7	<7	<7	<7	16	<7	<7	140	<7	<7	1,800	19	<7	810	<7
	06/14/10	<25	<25	<25	<25	72	<25	41	1,400	<25	<25	6,400	68	<25	1,500	43
	09/21/10	<2.5	<2.5	<2.5	<2.5	35	<2.5	17	480	9	<2.5	3,500	48	<2.5	1,500	5.4
	12/07/10	<15	<15	<15	<15	69	<15	26	700	<15	<15	4,100	83	<15	1,600	<15
	03/07/11	<15	<15	<15	<15	88	<15	30	930	<15	<15	3,700	91	<15	1,600	<15
	06/07/11	<15	<15	<15	<15	65	<15	30	1,600	17	<15	4,400	57	<15	1,400	48
	09/12/11	<15	<15	<15	<15	44	<15	28	7,400	20	<15	790	48	<15	380	58
	12/07/11	<15	<15	<15	<15	35	<15	<15	5,300	<15	<15	61	<15	<15	39	460
	03/08/12	<2	<2	<2	<2	38	<2	2.3	470	2.8	<2	9.9	5.2	<2	5.4	260
	06/19/12	<0.5	3.9	<0.5	<0.5	53	<0.5	<0.5	20	1.3	<0.5	7.2	<0.5	<0.5	2.5	63
	09/13/12	<1.5	1.8	<1.5	<1.5	39	<1.5	2.8	310	3.2	<1.5	89	5	<1.5	80	440
	12/11/12	<0.50	30	<0.50	<0.50	4.8	<0.50	<0.50	33	1.3	<0.50	10	<0.50	<0.50	3.4	4
	03/12/13	<0.50	8.2	<0.50	<0.50	28	<0.50	1.9	300	2	<0.50	5.6	2.5	<0.50	2.2	270
	06/11/13	<0.50	15	<0.50	<0.50	8.3	<0.50	<0.50	7.9	<0.50	<0.50	0.94	<0.50	<0.50	<0.50	4.8
	09/17/13	<0.50	9.4	<0.50	<0.50	28	<0.50	4.8	290	1.4	<0.50	16	1.6	<0.50	17	330
	12/16/13	<0.50	6.9	<0.50	<0.50	9.7	<0.50	<0.50	8.4	<0.50	<0.50	2.4	<0.50	<0.50	1.4	3.4
	3/24/2014	<0.50	2.4	<0.50	<0.50	45	<0.50	2.9	84	<0.50	<0.50	2.6	<0.50	<0.50	1.8	270
	6/26/2014	<0.50	6.1	<0.50	<0.50	31	<0.50	10	88	0.84	<0.50	21	<0.50	<0.50	22	90
	9/23/2014	<0.50	2.5	<0.50	<0.50	30	<0.50	30	590	2.4	<0.50	170	3.2	<0.50	110	800
	12/12/2014	<0.50	12	<0.50	<0.50	35	<0.50	<0.50	10	<0.50	<0.50	3.4	<0.50	<0.50	2.3	18
	3/20/2015	<0.50	<0.50	<0.50	<0.50	4.3	<0.50	3.9	47	<0.50	<0.50	30.6	<0.50	<0.50	22.1	17.3
	6/19/2015	<0.50	<0.50	<0.50	<0.50	13.8	<0.50	1.3	53.8	<0.50	<0.50	18.4	<0.50	<0.50	12.8	48.3
	9/25/2015	<0.50	<0.50	<0.50	<0.50	12.3	<0.50	4.2	105	0.61	<0.50	67.4	0.92	<0.50	45.9	57.8
	12/8/2015	<0.50	3.8	<0.50	<0.50	13.5	<0.50	<0.50	7	<0.50	<0.50	4	<0.50	<0.50	2.8	3.3
	3/9/2016	<0.50	<2	<0.50	<0.50	20.6	<0.50	1.6	36	<0.50	<0.50	6.5	<0.50	<0.50	6.2	36
	6/17/2016	<0.50	<2	<0.50	<0.50	24.9	<0.50	26.4	744	2.8	<0.50	223	3.1	<0.50	146	227
	9/29/2016	<0.50	<2	<0.50	<0.50	12.1	<0.50	<0.50	115	<0.50	<0.50	33.3	<0.50	<0.50	24.8	142
	12/16/2016	<0.50	<2	<0.50	<0.50	10.3	<0.50	<0.50	5.2	<0.50	<0.50	2.6	<0.50	<0.50	1.9	2
3/31/2017	<0.5	<2	<0.5	<0.5	57.6	<0.5	14.3	236	0.6	<0.5	4.3	<0.5	<0.5	14.4	235	
6/15/2017	<0.50	<2.0	<0.50	<0.50	38.6	<0.50	3.5	46.2	<0.50	<0.50	5.1	<0.50	<0.50	4.9	98.9	
9/29/2017	<2.0	<2.0	<0.50	<0.50	21.7	<1.0	6.8	195.0	0.74	<0.50	41.5	0.67	<0.50	31.3	428.0	
11/9/2017	<2.0	<2.0	<0.50	<0.50	21.3	<0.50	0.9	61.6	0.52	<0.50	13.2	<0.50	<0.50	9.2	170.0	
3/22/2018	<0.500	<2.50	<0.500	<0.500	25.9	<0.500	4.2	109.0	0.57	<0.500	46.0	0.259 J	<0.500	27.3	122.0	
7/1/2018	<0.500	<2.50	<0.500	<0.500	12.7	<0.500	5.9	151.0	0.97	<0.500	62.1	1.04	<0.500	48.9	38.2	
9/28/2018	<2.00	<10.00	<2.00	<2.00	8.7	<0.800	1.4	140.0	<0.800	<1.00	66.9	<0.800	<1.00	43.3	106.0	
12/10/2018	<1.00	<5.00	<1.00	<1.00	20.9	<0.400	0.6	24.9	<0.400	<0.500	18.7	<0.400	<0.500	12.0	123.0	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MGMS2-3(60)	06/28/00	<5	<25	<2.5	<2.5	35.6	<2.5	8.3	433	<2.5	<2.5	110	22.3	--	198	<2.5
	08/30/00	<10	<50	<5	<5	36	<5	13	1,120	<5	<5	164	32	--	136	<5
	11/29/00	<5	<25	<2.5	<2.5	5.08	<2.5	3.88	279	<2.5	<2.5	26.8	<5	--	38	<2.5
	02/27/01	<2	<10	<1	<1	40.2	<1	2.65	46.6	<1	<1	20.7	12.4	--	27	173
	05/31/01	<1	<5	<0.50	<0.50	2.47	<0.50	2.3	39.1	<0.50	<0.50	113	3.44	--	75.6	5.06
	09/24/01	<2.5	<2.5	<2.5	<2.5	14	<2.5	11	180	3.6	<2.5	340	11	--	220	48
	12/18/01	<1	<5	<0.50	<0.50	0.607	<0.50	1.01	15	<0.50	<0.50	64.4	2.06	--	47.7	<0.50
	03/19/02	<1	<0.50	<0.50	<1	5.4	<0.50	2.96	62.9	0.81	<0.50	91.9	5.78	--	80.1	15.2
	05/29/02	<1	<0.50	<0.50	<1	2.55	<0.50	2.02	59.7	0.82	<0.50	119	4.8	--	67.6	1.06
	01/23/03	<1	<0.50	<0.50	<1	10.1	<0.50	2.7	114	1.12	<0.50	111	6.06	--	96	22.8
	05/28/03	<2	<1	<1	<2	15	<1	3.28	178	1.48	<1	131	9.3	--	126	15.6
	11/11/03	<2	<2	<2	<2	21.3	<2	4.56	208	<2	<2	223	9.06	--	139	20.6
	01/27/04	<1	<0.50	<0.50	<1	17.2	<0.50	2.83	117	1.57	<0.50	96.3	5.38	--	92.2	17.7
	05/03/04	<1	<1	<1	<1	4.79	<1	1.96	86.4	<1	<1	121	3.31	--	84	<1
	11/15/04	<2.5	<2.5	<2.5	<2.5	<2.5	13	4.4	220	2.8	<2.5	170	6.4	--	140	11
	02/01/05	<1	<0.50	<0.50	<1	2.49	<0.50	1.47	92	2.46	<0.50	97.7	2.41	--	73.9	0.6
	05/16/05	<1	<0.50	<0.50	<1	1.49	<0.50	1.51	45.2	0.59	<0.50	74.1	1.61	--	41.5	<0.50
	08/18/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	27.6 B	<0.500	<0.500	23.5 B	<0.500	--	13 B	<0.500
	11/16/05	<1	<0.500	<0.500	<1	7.5	<0.500	2.05	90.9	1.16	<0.500	107	3.1	--	78.3	2.68
	02/20/06	<1	<0.500	<0.500	<1	3.35	<0.500	1.6	65	0.82	<0.500	99.5	1.55	--	62.3	1.27
	06/06/06	<1	<1	<1	<1	<1	<1	<1	55	<1	<1	76.3	1.01	--	36.2	<1
	09/05/06	<1	<0.50	<0.50	<1	2.85	<0.50	1.13	75.1	0.73	<0.50	73	1.11	--	45.6	0.83
	12/05/06	<1	<0.50	<0.50	<1	2.58	<0.50	1.44	77	0.75	<0.50	98.7	1.27	--	61.2	0.79
	02/07/07	<1	<0.50	<0.50	<1	3.36	<0.50	1.3	96.5	0.79	<0.50	76.3	1.64	--	55	1.51
	05/21/07	<1	<1	<1	<1	2.45	<1	1.33	73.7	<1	<1	99.1	1.51	--	54.5	<1
	09/10/07	<10	<5	<5	<10	31.2	<5	8.2	559	<5	<5	221	10.8	--	192	26.7
	12/12/07	<1	<0.50	<0.50	<1	1.49	<0.50	0.88	78.6	0.56	<0.50	66.1	0.98	--	36.8	1.75
	03/04/08	<1	<0.500	<0.500	<1	4.46	<0.500	2.19	164	1.37	<0.500	89.7	2.32	<0.500	72.2	6.88
	09/16/08	<5	<2.50	<2.50	<5	10.4	<2.50	3.65	166	<2.50	<2.50	111	3.85	<2.50	96.4	7.15
	12/08/08	<0.80	<0.80	<0.80	<0.80	11	<0.80	3	160	1.7	<0.80	110	3.2	<0.80	80	10
03/24/09	<0.50	<0.50	<0.50	<0.50	5.8	<0.50	1.6	110	1	<0.50	84	2.2	<0.50	53	3.7	
09/15/09	<0.50	<0.50	<0.50	<0.50	6.4	<0.50	2.3	91	1.2	<0.50	110	2.4	<0.50	72	4.2	
12/14/09	<0.50	<0.50	<0.50	<0.50	2.1	<0.50	1.1	61	0.75	<0.50	84	1.1	<0.50	54	0.96	
03/16/10	<0.50	<0.50	<0.50	<0.50	15	<0.50	3.6	140	1.6	<0.50	160	8.2	<0.50	110	12	
06/14/10	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	0.75	46	0.55	<0.50	73	0.86	<0.50	38	0.88	
09/21/10	<0.5	<0.5	<0.5	<0.5	11	<0.5	3	130	1.5	<0.5	150	5.8	<0.5	100	6.8	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MGMS2-3(60) (continued)	12/07/10	<0.5	<0.5	<0.5	<0.5	4.1	<0.5	1.8	86	1.2	<0.5	120	1.7	<0.5	77	1.6
	03/07/11	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	0.86	73	0.62	<0.50	61	1.2	<0.50	34	1.4
	06/06/11	<0.5	<0.5	<0.5	<0.5	0.64	<0.5	<0.5	22	<0.5	<0.5	64	0.54	<0.5	27	<0.5
	09/12/11	<0.50	<0.50	<0.50	<0.50	10	<0.50	3.2	110	1.4	<0.50	170	6	<0.50	100	2
	12/05/11	<0.50	<0.50	<0.50	<0.50	2.6	<0.50	0.95	51	0.54	<0.50	84	1	<0.50	41	<0.50
	03/08/12	<0.50	<0.50	<0.50	<0.50	10	<0.50	2.9	300	1.9	<0.50	71	1.5	<0.50	45	43
	06/19/12	<0.5	<0.5	<0.5	<0.5	2	<0.5	1	79	0.87	<0.5	78	0.78	<0.5	45	5.3
	09/12/12	<0.50	<0.50	<0.50	<0.50	1.5	<0.50	0.56	48	<0.50	<0.50	44	<0.50	<0.50	20	2.7
	12/11/12	<0.50	<0.50	<0.50	<0.50	2.6	<0.50	2.5	59	1.5	<0.50	57	0.62	<0.50	36	16
	03/12/13	<0.50	<0.50	<0.50	<0.50	0.74	<0.50	<0.50	22	<0.50	<0.50	16	<0.50	<0.50	9	<0.50
	06/11/13	<0.50	<0.50	<0.50	<0.50	2.4	<0.50	1.5	53	0.58	<0.50	29	0.55	<0.50	21	12
	09/17/13	<0.50	<0.50	<0.50	<0.50	5.4	<0.50	0.98	73	0.66	<0.50	24	0.6	<0.50	13	29
	12/10/13	<0.50	<0.50	<0.50	<0.50	3	<0.50	1	88	0.88	<0.50	23	0.6	<0.50	18	13
	3/18/2014	<0.50	<0.50	<0.50	<0.50	0.96	<0.50	<0.50	28	<0.50	<0.50	33	<0.50	<0.50	13	1.7
	9/23/2014	Insufficient air pressure to inflate dedicated bladder; no sample collected.														
	12/12/2014	Insufficient air pressure to inflate dedicated bladder; no sample collected.														
	3/20/2015	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	29.4	<0.50	<0.50	41.4	<0.50	<0.50	24.3	5.2
	6/19/2015	<0.50	<0.50	<0.50	<0.50	2	<0.50	0.56	38.1	<0.50	<0.50	35.1	<0.50	<0.50	23.5	7.9
	9/25/2015	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	0.5	51.6	<0.50	<0.50	18.4	<0.50	<0.50	15.8	9.7
	12/8/2015	Well Damaged, Unable to Sample														
	6/17/2016	<0.50	<2	<0.50	<0.50	1.1	<0.50	<0.50	19.4	<0.50	<0.50	17.2	<0.50	<0.50	11.8	3.4
	9/30/2016	<0.50	<2	<0.50	<0.50	2	<0.50	<0.50	40	<0.50	<0.50	9.6	<0.50	<0.50	11.5	9.6
	12/16/2016	<0.50	<2	<0.50	<0.50	1.7	<0.50	<0.50	35.3	<0.50	<0.50	40.7	<0.50	<0.50	24.8	1.4
	3/31/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	18.5	<0.5	<0.5	26	<0.5	<0.5	11.2	0.75
	6/15/2017	<2.0	<2.0	<0.50	<0.50	0.88	<1.0	<0.50	20.7	<0.50	<0.50	40.4	<0.50	<0.50	17.3	1.3
	9/29/2017	<2.0	<2.0	<0.50	<0.50	2.30	<1.0	<0.50	30.4	<0.50	<0.50	17.5	<0.50	<0.50	12.0	6.7
	11/9/2017	<2.0	<2.0	<0.50	<0.50	1.80	<0.50	<0.50	30.2	<0.50	<0.50	34.2	<0.50	<0.50	20.1	1.1
3/22/2018	<0.500	<2.50	<0.500	<0.500	0.82	<0.500	0.244 J	17.3	0.164 J	<0.500	20.6	0.205 J	<0.500	11.6	1.2	
7/1/2018	<0.500	<2.50	<0.500	<0.500	0.73	<0.500	<0.500	14.1	<0.500	<0.500	19.6	0.20	<0.500	10.1	1.6	
12/10/2018	<0.500	<2.50	<0.500	<0.500	2.26	<0.500	0.43	41.7	0.43	<0.500	36.1	<0.400	<0.500	20.7	4.4	
MGMS2-2(110)	06/28/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	12.2	<0.50	<0.50	6.04	<1	--	17.1	<0.50
	08/30/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	4.41	<0.50	<0.50	16.4	<1	--	14.7	<0.50
	11/29/00	<1	<5	<0.50	<0.50	<0.50	<0.50	0.717	8.23	<0.50	<0.50	13	<1	--	19.3	<0.50
	02/27/01	<1	<5	<0.50	<0.50	<0.50	<0.50	0.756	7.31	<0.50	<0.50	15.2	<1	--	21.6	<0.50
	05/31/01	<1	<5	<0.50	<0.50	<0.50	<0.50	0.938	10.7	<0.50	<0.50	24.4	1.14	--	29.1	<0.50
	09/24/01	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.6	6.8	<0.50	<0.50	37	1.1	--	34	<0.50

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MGMS2-2(110) (continued)	12/18/01	<1	<5	<0.50	<0.50	<0.50	<0.50	0.62	4.91	<0.50	<0.50	35.1	<1	--	27.5	<0.50
	03/19/02	<1	<0.50	<0.50	<1	<0.50	<0.50	0.61	9.97	<0.50	<0.50	35.6	1.23	--	24.6	<0.50
	05/29/02	<1	<0.50	<0.50	<1	<0.50	<0.50	1.21	31.9	<0.50	<0.50	114	2.39	--	51	0.61
	01/23/03	<1	<0.50	<0.50	<1	<0.50	<0.50	1.01	57.1	<0.50	<0.50	47.8	2.79	--	44.1	2.98
	05/28/03	<1	<0.50	<0.50	<1	0.61	<0.50	0.73	63.9	<0.50	<0.50	54.6	1.98	--	43.1	1.13
	11/11/03	<1	<1	<1	<1	1.14	<1	<1	76.7	1.07	<1	32.4	2.19	--	30.8	2.03
	01/27/04	<1	<0.50	<0.50	<1	0.63	<0.50	<0.50	49	<0.50	<0.50	67.9	1.17	--	30	1
	05/03/04	<1	<1	<1	<1	<1	<1	<1	14	<1	<1	28	<1	--	13.6	<1
	11/15/04	<0.50	<0.50	<0.50	<0.50	<0.50	0.7	0.62	60	<0.50	<0.50	50	1.6	--	30	<0.50
	05/16/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	27.9	<0.50	<0.50	21.5	0.52	--	10.9	<0.50
	11/16/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	15.1	<0.500	<0.500	18	<0.500	--	8.42	<0.500
	06/06/06	<1	<1	<1	<1	<1	<1	<1	30.9	<1	<1	13.9	<1	--	6.59	<1
	12/05/06	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	36.2	<0.50	<0.50	17.9	<0.50	--	8.27	<0.50
	09/10/07	<5	<2.50	<2.50	<5	<2.50	<2.50	3.2	512	<2.50	<2.50	146	5.65	--	94.4	14.9
	03/04/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	59.5	<0.500	<0.500	33.4	0.75	<0.500	16.7	2.82
	09/16/08	<1	<0.500	<0.500	<1	<0.500	<0.500	0.71	77	<0.500	<0.500	44	1.18	<0.500	23.8	3.45
	03/24/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	40	<0.50	<0.50	27	<0.50	<0.50	11	2.5
	06/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	31	<0.50	<0.50	20	0.57	<0.50	8.9	2.3
	09/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	26	<0.50	<0.50	16	<0.50	<0.50	6.7	1.8
	03/15/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	28	<0.50	<0.50	21	<0.50	<0.50	8.1	1.6
	09/21/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	33	<0.5	<0.5	34	0.6	<0.5	14	1.3
	03/07/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	24	<0.50	<0.50	26	<0.50	<0.50	8.6	1
	09/12/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	15	<0.50	<0.50	22	<0.50	<0.50	8.3	<0.50
	03/08/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	31	<0.50	<0.50	23	<0.50	<0.50	9.3	2.4
	09/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	18	<0.50	<0.50	20	<0.50	<0.50	8.3	1.4
	03/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	34	<0.50	<0.50	23	0.52	<0.50	10	2.7
	09/17/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	30	<0.50	<0.50	18	<0.50	<0.50	8.7	2.2
	3/18/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	21	<0.50	<0.50	13	<0.50	<0.50	6.2	2.5
	9/23/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	25	<0.50	<0.50	12	<0.50	<0.50	7.3	4.9
	3/19/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	18.3	<0.50	<0.50	7.9	<0.50	<0.50	4.8	4.6
9/25/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	15.3	<0.50	<0.50	9.4	<0.50	<0.50	5.9	4.1	
3/9/2016	<0.50	<2	<0.50	<0.50	0.73	<0.50	<0.50	22.6	<0.50	<0.50	7.1	<0.50	<0.50	8	10	
9/29/2016	<0.50	<2	<0.50	<0.50	0.62	<0.50	<0.50	16.8	<0.50	<0.50	6.5	<0.50	<0.50	6.3	5.8	
3/31/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	19.5	<0.5	<0.5	6.4	<0.5	<0.5	6.6	6.4	
9/29/2017	<2.0	<2.0	<0.50	<0.50	2.8	<1.0	<0.50	63.5	<0.50	<0.50	2.2	<0.50	<0.50	5.3	25.0	
11/9/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	6.3	<0.50	<0.50	3.9	<0.50	<0.50	3.1	1.9	
7/1/2018	<0.500	<2.50	<0.500	<0.500	0.446 J	<0.500	<0.500	<0.500	6.7	<0.500	4.4	0.175 J	<0.500	3.4	3.87	
9/28/2018	<1.00	<5.00	<1.00	<1.00	0.4	<0.400	<0.400	11.3	<0.400	<0.500	5.0	<0.400	<0.500	4.3	4.63	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MGMS2-1(132)	06/28/00	<1	<5	<0.50	<0.50	1.25	<0.50	1.77	27.6	<0.50	<0.50	27.5	2.06	--	54.3	<0.50
	08/30/00	<1	<5	<0.50	<0.50	0.903	<0.50	<0.50	23	<0.50	<0.50	77.8	2.47	--	52.9	<0.50
	11/29/00	<1	<5	<0.50	<0.50	<0.50	<0.50	0.569	12.4	<0.50	<0.50	25.3	<1	--	27.8	<0.50
	02/27/01	<1	<5	<0.50	<0.50	0.537	<0.50	0.605	11.4	<0.50	<0.50	25.2	<1	--	24.4	2.6
	05/31/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	8.86	<0.50	<0.50	25.5	<1	--	24.4	<0.50
	09/24/01	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.76	7.6	<0.50	<0.50	29	1.1	--	30	<0.50
	12/18/01	<1	<5	<0.50	<0.50	<0.50	<0.50	0.773	6.81	<0.50	<0.50	26.8	1.36	--	23.8	<0.50
	03/19/02	<1	<0.50	<0.50	<1	<0.50	<0.50	0.53	8.62	<0.50	<0.50	33.5	0.77	--	24.2	<0.50
	05/29/02	<1	<0.50	<0.50	<1	<0.50	<0.50	1.29	35.4	0.52	<0.50	117	2.5	--	53.6	0.62
	01/23/03	<1	<0.50	<0.50	<1	<0.50	<0.50	0.96	57.4	<0.50	<0.50	49.9	2.35	--	46.2	3.19
	05/28/03	<1	<0.50	<0.50	<1	<0.50	<0.50	0.53	27.2	<0.50	<0.50	29.3	0.98	--	24	1.07
	11/11/03	<1	<1	<1	<1	<1	<1	<1	46.3	<1	<1	28.8	1.56	--	29.7	1.49
	01/27/04	<1	<0.50	<0.50	<1	0.63	<0.50	0.56	37.6	<0.50	<0.50	28	0.96	--	22.2	1.51
	05/04/04	<1	<1	<1	<1	<1	<1	<1	38.2	<1	<1	7.55	<1	--	5.22	<1
	11/15/04	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.58	62	<0.50	<0.50	38	1.1	--	26	0.85
	05/16/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	29.5	<0.50	<0.50	23.7	0.56	--	15.2	0.86
	11/16/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	8.85	<0.500	<0.500	13	<0.500	--	6.06	<0.500
	06/06/06	<1	<1	<1	<1	<1	<1	<1	23.1	<1	<1	14.8	<1	--	6.71	<1
	12/05/06	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	27.6	<0.50	<0.50	14.9	<0.50	--	7.89	<0.50
	09/10/07	<5	<2.50	<2.50	<5	4.55	<2.50	3	615	<2.50	<2.50	93.2	5.5	--	61	21.5
	03/04/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	37.3 J	<0.500	<0.500	22.6 J	0.59	<0.500	12.9 J	2.4
	09/16/08	<1	<0.500	<0.500	<1	0.53	<0.500	1	101	0.56	<0.500	38.3	1.37	<0.500	26.1	6.11
	03/24/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	32	<0.50	<0.50	24	0.57	<0.50	11	1.5
	06/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	32	<0.50	<0.50	24	<0.50	<0.50	12	1.6
	09/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	26	<0.50	<0.50	18	<0.50	<0.50	8	1.5
	03/15/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	28	<0.50	<0.50	23	<0.50	<0.50	9.9	1.6
	09/21/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	28	<0.5	<0.5	31	<0.5	<0.5	12	1.1
	03/07/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	30	<0.50	<0.50	41	0.56	<0.50	13	0.97
	03/08/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	26	<0.50	<0.50	24	<0.50	<0.50	9.4	1.8
	09/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	22	<0.50	<0.50	22	<0.50	<0.50	9	2
03/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	24	<0.50	<0.50	19	<0.50	<0.50	8.3	1.9	
09/17/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	35	<0.50	<0.50	15	<0.50	<0.50	8.1	2.7	
3/18/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	22	<0.50	<0.50	12	<0.50	<0.50	5.4	2.6	
9/23/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	32	<0.50	<0.50	9.8	<0.50	<0.50	6	5.5	
3/19/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10.5	<0.50	<0.50	9.4	<0.50	<0.50	4.4	0.75	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MGMS2-1(132) (continued)	3/9/2016	<0.50	<0.50	<0.50	<0.50	0.86	<0.50	<0.50	36.8	<0.50	<0.50	7.9	0.69	<0.50	10.7	12.4
	9/29/2016	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	<0.50	31.4	<0.50	<0.50	6.4	<0.50	<0.50	7.9	8.2
	3/31/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	15.6	<0.5	<0.5	5.2	<0.5	<0.5	4.7	4.8
	9/29/2017	<2.0	<2.0	<0.50	<0.50	2.2	<1.0	<0.50	64.9	<0.50	<0.50	2.4	0.6	<0.50	6.3	19.4
	11/9/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	14.3	<0.50	<0.50	3.6	<0.50	<0.50	4.5	5.0
	7/1/2018	<0.500	<2.50	<0.500	<0.500	0.5	<0.500	<0.500	13.8	<0.500	<0.500	4.5	0.191 J	<0.500	4.9	4.6
	9/28/2018	<1.00	<5.00	<1.00	<1.00	0.5	<0.400	<0.400	17.8	<0.400	<0.500	4.8	<0.400	<0.500	5.6	6.7
MGMS3-4(40)	08/30/00	<10	<50	<5	<5	13.2	<5	5.01	858	14.1	<5	580	10.8	--	205	6.65
	11/29/00	<20	<100	<10	<10	<10	<10	<10	820	10.6	<10	2,810	<20	--	395	<10
	02/27/01	<50	<250	<25	<25	39.4	<25	29.2	4,570	<25	<25	2,970	<50	--	756	79.3
	05/31/01	<50	<250	<25	<25	<25	<25	<25	2,920	38.5	<25	3,960	<50	--	716	<25
	09/24/01	<2.5	<2.5	<2.5	<2.5	5.8	<2.5	<2.5	730	5.4	<2.5	1,400	9.2	--	230	3.5
	12/18/01	<50	<250	<25	<25	<25	<25	<25	2,550	<25	<25	3,310	<50	--	631	31
	03/19/02	<20	<10	<10	<20	34.6	<10	15.4	3,370	30.2	<10	3,560	23.8	--	707	57
	05/29/02	<50	<25	<25	<50	71.5	<25	26	5,180	38.5	<25	2,470	33.5	--	728	86
	11/11/02	<50	<25	<25	<50	<25	<25	<25	1,520	<25	<25	2,750	<25	--	309	<25
	01/23/03	<20	<10	<10	<20	137	<10	38.4	3,530	32.6	<10	2,380	118	--	1,400	83.6
	05/28/03	<50	<25	<25	<50	56	<25	28.5	1,720	<25	<25	3,560	<25	--	1,470	<25
	11/11/03	<10	<10	<10	<10	<10	<10	<10	672	<10	<10	58.3	<10	--	32.4	<10
	01/27/04	<20	<10	<10	<20	20	<10	<10	1,900	19.4	<10	1,350	10	--	246	20
	05/03/04	<20	<20	<20	<20	50	<20	<20	1,420	<20	<20	2,700	34.2	--	913	24.8
	08/17/04	<20	<10	<10	<20	71.6	<10	17	3,300	31	<10	1,360	29.2	--	569	45.2
	11/15/04	<25	<25	<25	<25	<25	<25	<25	1,400	<25	<25	1,600	<25	--	290	<25
	03/24/05	<20	<10	<10	<20	79.4	<10	30	3,440	34.2	<10	2,330	43.8	--	1,080	60.2
	03/24/05 DUP	<20	<10	<10	<20	83.2	<10	29.2	3,450	34	<10	2,150	44	--	1,040	58.6
	05/16/05	<10	<5	<5	<10	7	<5	<5	657	11.3	<5	1,130	8.1	--	224	<5
	11/16/05	<10	<5	<5	<10	5.8	<5	<5	794	8.4	<5	1,180	7.6	--	210	<5
	03/14/06	<50	<50	<50	<50	51	<50	<50	4,130	<50	<50	1,410	<50	--	484	<50
	06/06/06	<20	<20	<20	<20	20.4	<20	<20	2,290	32.2	<20	1,410	<20	--	401	23.6
	12/05/06	<20	<10	<10	<20	29.8	<10	<10	3,570	29	<10	1,020	<10	--	360	95.4
	05/22/07	<20	<20	<20	<20	20.8	<20	<20	2,640	20.2	<20	952	<20	--	349	22.6
	09/10/07	<50	<25	<25	<50	<25	<25	<25	2,340	<25	<25	499	<25	--	215	25.5
	12/12/07	<50	<25	<25	<50	<25	<25	<25	723	<25	<25	536	<25	--	133	<25
	03/04/08	<1	<0.500	<0.500	<1	32.4	3.08	22	2,280	25.4	3.86	1,580	27.5	<0.500	972	85.1
09/16/08	<50	<25	<25	<50	64.5	<25	<25	2,700	<25	<25	714	<25	<25	462	47	
12/08/08	<9	<9	<9	<9	24	<9	<9	1,800	20	<9	350	<9	<9	160	90	
03/24/09	<7	<7	<7	<7	36	<7	7.9	1,600	12	<7	600	11	<7	280	33	
09/15/09	<5	<5	<5	<5	15	<5	<5	1,500	13	<5	550	<5	<5	180	8.2	
09/15/09 DUP	<5	<5	<5	<5	15	<5	<5	1,400	13	<5	540	<5	<5	170	9.8	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MGMS3-4(40) (continued)	12/14/09	<2.5	<2.5	<2.5	<2.5	8.1	<2.5	<2.5	750	5.3	<2.5	180	<2.5	<2.5	74	19
	03/17/10	<2.5	<2.5	<2.5	<2.5	52	<2.5	14	1,800	18	2.9	810	16	<2.5	490	41
	03/17/10 DUP	<5	<5	<5	<5	51	<5	14	1,600	18	<5	780	16	<5	470	39
	06/14/10	<0.90	<0.90	<0.90	<0.90	2.4	<0.90	<0.90	230	2.3	<0.90	300	2.2	<0.90	88	1.5
	09/20/10	<7	<7	<7	<7	32	<7	8.6	1,800	16	<7	530	7.9	<7	230	31
	09/20/10 DUP	<6	<6	<6	<6	31	<6	7.4	1,700	15	<6	510	7.4	<6	220	29
	12/07/10	<2	<2	<2	<2	5.3	<2	<2	460	3.9	<2	330	2.2	<2	95	3.2
	03/07/11	<2	<2	<2	<2	20	<2	4.7	1,300	10	<2	330	4	<2	140	53
	03/07/11 DUP	<4	<4	<4	<4	19	<4	4.9	1,200	10	<4	320	<4	<4	140	46
	06/06/11	<3	<3	<3	<3	6.5	<3	4.1	780	7	<3	370	5.4	<3	150	8.5
	09/13/11	<5	<5	<5	<5	45	<5	13	1,800	19	<5	560	15	<5	380	29
	09/13/11 DUP	<7	<7	<7	<7	40	<7	12	1,700	16	<7	570	12	<7	330	23
	12/06/11	<5	<5	<5	<5	14	<5	<5	1,000	9.3	<5	140	<5	<5	64	44
	03/08/12	<5	<5	<5	<5	33	<5	13	1,400	14	<5	930	17	<5	450	28
	03/08/12 DUP	<6	<6	<6	<6	35	<6	14	1,400	14	<6	990	18	<6	480	30
	06/21/2012	<5	<5	<5	<5	22	<5	5.6	1,300	11	<5	220	<5	<5	140	44
	09/12/12	<5	<5	<5	<5	23	<5	6.2	1,400	13	<5	220	<5	<5	120	85
	09/12/12 DUP	<5	<5	<5	<5	23	<5	5.3	1,400	13	<5	230	<5	<5	120	86
	12/11/12	<2	<2	<2	<2	7.1	<2	<2	510	6.5	<2	180	<2	<2	72	6.5
	03/12/13	<2	<2	<2	<2	30	<2	8.4	1,400	12	<2	510	8.7	<2	260	35
	03/12/13 DUP	<2	<2	<2	<2	29	<2	8.8	1,300	12	<2	470	8.4	<2	250	35
	06/11/13	<2.5	<2.5	<2.5	<2.5	11	<2.5	<2.5	740	7.1	<2.5	110	<2.5	<2.5	58	34
	09/16/13	<2	<2	<2	<2	7.7	<2	<2	360	4.6	<2	100	<2	<2	48	24
	09/16/13 DUP	<2	<2	<2	<2	8.5	<2	<2	380	5.1	<2	100	<2	<2	49	25
	12/10/13	<0.90	<0.90	<0.90	<0.90	4.7	<0.90	<0.90	230	2.8	<0.90	60	<0.90	<0.90	29	2
	12/10/13 DUP	<0.90	<0.90	<0.90	<0.90	4.6	<0.90	<0.90	230	2.7	<0.90	61	<0.90	<0.90	29	1.9
	3/18/2014	<0.90	<0.90	<0.90	<0.90	2.7	<0.90	0.98	280	1.8	0.91	84	<0.90	<0.90	38	<0.90
3/18/2014 DUP	<0.90	<0.90	<0.90	<0.90	2.6	<0.90	<0.90	280	1.9	0.93	86	<0.90	<0.90	39	<0.90	
6/26/2014	<0.90	<0.90	<0.90	<0.90	12	<0.90	3.5	690	5.7	<0.90	180	1.3	<0.90	100	20	
6/26/14 DUP	<0.90	<0.90	<0.90	<0.90	11	<0.90	2.8	490	5	<0.90	160	1.1	<0.90	930	14	
9/23/2014	<0.90	<0.90	<0.90	<0.90	10	<0.90	1.7	410	5.8	<0.90	72	<0.90	<0.90	55	74	
9/23/2014 DUP	<0.20	<0.20	<0.20	<0.20	11	<0.20	<0.20	430	5.5	<0.20	70	<0.20	<0.20	53	75	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MGMS3-4(40) (continued)	12/12/2014	<2	<2	<2	<2	7.9	<2	490	4.2	<2	36	<2	<2	28	20	
	3/18/2015	<1.6	<1.6	<1.6	<1.6	20	<1.6	3.2	896	7.3	<1.6	249	<1.6	<1.6	159	21.7
	3/18/2015 DUP	<0.50	<0.50	<0.50	<0.50	17	<0.50	2.4	713	5.5	<0.50	194	<0.50	<0.50	124	16.8
	6/19/2015	<0.84	<0.84	<0.84	<0.84	7.2	<0.84	<0.84	339	3.2	<0.84	34.4	<0.84	<0.84	32.8	73.3
	9/22/2015	<0.50	<0.50	<0.50	<0.50	2.8	<0.50	<0.50	164	<0.50	<0.50	2.5	<0.50	<0.50	8.6	61.9
	9/22/2015 DUP	<0.50	<0.50	<0.50	<0.50	2.5	<0.50	<0.50	151	1.2	<0.50	2.3	<0.50	<0.50	7.8	51.9
	12/7/2015	<0.50	<0.50	<0.50	<0.50	9.1	<0.50	2	370	3.1	<0.50	109	<0.50	<0.50	94.8	4
	3/9/2016	<2.5	<10	<2.5	<2.5	11.6	<2.5	<2.5	610	4	<2.5	86.7	<2.5	<2.5	89.7	22.9
	3/8/2016 DUP	<2.5	<10	<2.5	<2.5	12.4	<2.5	<2.5	643	5.4	<2.5	97.4	<2.5	<2.5	102	28
	6/17/2016	<1.2	<5	<1.2	<1.2	24.5	<1.2	6	955	9.1	<1.2	232	<1.2	<1.2	209	85.9
	9/30/2016	<0.50	<2	<0.50	<0.50	4.1	<0.50	0.54	226	1.8	<0.50	1.7	<0.50	<0.50	1.3	45.8
	9/30/2016 DUP	<0.50	<2	<0.50	<0.50	4.5	<0.50	0.6	219	2	<0.50	1.5	<0.50	<0.50	1.4	52.1
	12/16/2016	<0.50	<2	<0.50	<0.50	1	<0.50	<0.50	1.3	0.97	<0.50	0.63	<0.50	<0.50	<0.50	0.88
	3/28/2017	<0.5	<2	<0.5	<0.5	22.5	0.68	2.8	979	5.5	<0.5	1.4	<0.5	<0.5	0.6	257
	3/28/2017 DUP	<2.5	<10	<2.5	<2.5	20.7	<2.5	3.3	1,050	6	<2.5	<2.5	<2.5	<2.5	<2.5	323
	6/12/2017	<0.50	<2.0	<0.50	<0.50	3.3	<0.50	<0.50	1.7	<0.50	<0.50	0.97	<0.50	<0.50	<0.50	<0.50
	9/26/2017	<2.0	<2.0	<0.50	<0.50	1.1	<1.0	<0.50	0.7	<0.50	<0.50	0.79	<0.50	<0.50	<0.50	<0.50
	9/26/2017 DUP	<2.0	<2.0	<0.50	<0.50	1.1	<1.0	<0.50	0.8	<0.50	<0.50	0.86	<0.50	<0.50	<0.50	<0.50
	11/10/2017	<2.0	<2.0	<0.50	<0.50	4.2	<0.50	<0.50	7.6	<0.50	<0.50	0.85	<0.50	<0.50	<0.50	12.80
	11/10/2017 DUP	<2.0	<2.0	<0.50	<0.50	4.3	<0.50	<0.50	8.0	<0.50	<0.50	0.71	<0.50	<0.50	<0.50	15.80
	3/22/2018	<0.500	<2.50	<0.500	<0.500	8.6	<0.500	<0.500	9.8	0.179 J	0.63	1.45	<0.500	<0.500	0.53	39.80
	7/1/2018	<0.500	<2.50	<0.500	<0.500	1.4	<0.500	<0.500	7.6	<0.500	0.279 J	0.498 J	<0.500	<0.500	0.169 J	8.98
	7/1/2018 DUP	<0.500	<2.50	<0.500	<0.500	2.0	<0.500	<0.500	9.4	<0.500	0.318 J	0.63	<0.500	<0.500	0.163 J	17.30
9/28/2018	<1.00	<5.00	<1.00	<1.00	6.7	<0.400	<0.400	116.0	<0.400	<0.500	0.97	<0.400	<0.500	<0.400	129.0	
9/28/2018 DUP	<1.00	<5.00	<1.00	<1.00	9.1	<0.400	0.56	143.0	<0.400	<0.500	0.69	<0.400	<0.500	<0.400	129.0	
12/10/2018	<1.00	<5.00	<1.00	<1.00	1.5	<0.400	<0.400	1.8	<0.400	<0.500	0.60	<0.400	<0.500	<0.400	5.44	
MGMS3-3(60)	08/30/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	7.7	<0.50	<0.50	7.03	<1	--	3.31	<0.50
	11/29/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	3.11	<0.50	<0.50	2.8	<1	--	1.28	<0.50
	02/27/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	21.5	<0.50	<0.50	14.9	<1	--	7.32	<0.50
	05/31/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	10.1	<0.50	<0.50	9.84	<1	--	4.76	<0.50
	09/24/01	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	7.1	<0.50	<0.50	9.7	<0.50	--	3.7	<0.50
	12/18/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	3.26	<0.50	<0.50	17	<1	--	3.84	<0.50
	03/19/02	<1	<0.50	<0.50	<1	0.68	<0.50	<0.50	17.6	<0.50	<0.50	32.3	0.5	--	14	<0.50
	05/29/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	40.5	<0.50	<0.50	20.8	<0.50	--	7.92	<0.50
	01/23/03	<1	<0.50	<0.50	<1	0.5	<0.50	<0.50	33.9	<0.50	<0.50	20.3	<0.50	--	12.7	<0.50
	05/28/03	<1	<0.50	<0.50	<1	0.58	<0.50	<0.50	88.3	0.53	<0.50	16.9	<0.50	--	11.9	0.7
	11/11/03	<2	<2	<2	<2	<2	<2	<2	298	<2	<2	36.1	<2	--	23	<2
	01/27/04	<2	<1	<1	<2	1.2	<1	<1	274	1.24	<1	25.2	<1	--	23.4	1.28
	05/03/04	<2	<2	<2	<2	<2	<2	<2	274	<2	<2	46.6	<2	--	27	<2
	11/15/04	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	43	<0.50	<0.50	8.8	<0.50	--	3.4	<0.50
	02/01/05	<2	<1	<1	<2	<1	<1	<1	179	1.72	<1	15.6	<1	--	7.9	<1
	05/16/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	33.8	<0.50	<0.50	5.7	<0.50	--	2.39	<0.50
	08/18/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	47.9	<0.500	<0.500	4.39	<0.500	--	1.96	0.66

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MGMS3-3(60) (continued)	11/16/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	8.39	<0.500	<0.500	2.59	<0.500	--	0.83	<0.500
	02/21/06	<5	<2.50	<2.50	<5	2.65	<2.50	<2.50	558	<2.50	<2.50	25	<2.50	--	14.4	21.6
	03/14/06	<1	<1	<1	<1	2.92	<1	1.37	97.1	<1	<1	50.6	<1	--	39.2	<1
	06/06/06	<1	<1	<1	<1	<1	<1	<1	7.97	<1	<1	2.84	<1	--	1.04	<1
	09/05/06	<1	<0.50	<0.50	<1	2.75	<0.50	1.17	108	0.78	<0.50	47.3	0.93	--	34.2	0.65
	12/05/06	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	19.8	<0.50	<0.50	10.5	<0.50	--	5.57	<0.50
	02/07/07	<1	<0.50	<0.50	<1	1.08	<0.50	<0.50	44.3	<0.50	<0.50	21.5	<0.50	--	15.4	<0.50
	05/22/07	<1	<1	<1	<1	<1	<1	<1	32.5	<1	<1	45.2	<1	--	18.2	<1
	09/10/07	<2	<1	<1	<2	2.98	<1	<1	148	<1	<1	28.8	<1	--	31.6	1.67
	12/12/07	<2	<1	<1	<2	<1	<1	<1	11.5	<1	<1	4.22	<1	--	1.9	1.18
	03/04/08	<1	<0.500	<0.500	<1	1.58	<0.500	0.68	72.1	0.6	<0.500	27.2	0.5	<0.500	22.7	2.33
	12/08/08	<0.50	<0.50	<0.50	<0.50	0.73	<0.50	<0.50	44	<0.50	<0.50	12	<0.50	<0.50	9.2	1.3
	03/24/09	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	42	<0.50	<0.50	21	<0.50	<0.50	14	0.91
	09/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	15	<0.50	<0.50	8.5	<0.50	<0.50	4.3	0.84
	12/14/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.8	<0.50	<0.50	2	<0.50	<0.50	0.85	<0.50
	03/17/10	<0.50	<0.50	<0.50	<0.50	0.69	<0.50	<0.50	25	<0.50	<0.50	17	<0.50	<0.50	10	0.57
	06/14/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.8	<0.50	<0.50	2.4	<0.50	<0.50	1.1	0.69
	09/20/10	<0.5	<0.5	<0.5	<0.5	0.81	<0.5	<0.5	28	<0.5	<0.5	18	<0.5	<0.5	11	0.52
	12/07/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	9	<0.5	<0.5	3.4	<0.5	<0.5	1.5	0.94
	03/07/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	17	<0.50	<0.50	10	<0.50	<0.50	4.6	0.67
	06/06/11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.9	<0.5	<0.5	2	<0.5	<0.5	0.73	<0.5
	09/13/11	<0.50	<0.50	<0.50	<0.50	0.94	<0.50	<0.50	34	<0.50	<0.50	17	<0.50	<0.50	12	<0.50
	12/05/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	14	<0.50	<0.50	14	<0.50	<0.50	7.3	<0.50
	03/08/12	<0.50	<0.50	<0.50	<0.50	0.58	<0.50	<0.50	21	<0.50	<0.50	15	<0.50	<0.50	9	<0.50
	06/21/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.9	<0.5	<0.5	3	<0.5	<0.5	1.2	<0.5
	09/12/12	<0.50	<0.50	<0.50	<0.50	1	<0.50	<0.50	39	<0.50	<0.50	18	<0.50	<0.50	12	<0.50
	12/11/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.1	<0.50	<0.50	2.3	<0.50	<0.50	0.9	<0.50
	03/12/13	<0.50	<0.50	<0.50	<0.50	0.74	<0.50	<0.50	22	<0.50	<0.50	16	<0.50	<0.50	9	<0.50
	06/11/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	16	<0.50	<0.50	11	<0.50	<0.50	5.4	<0.50
	09/16/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	11	<0.50	<0.50	6.8	<0.50	<0.50	3.3	<0.50
12/10/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.1	<0.50	<0.50	3.6	<0.50	<0.50	1.5	<0.50	
3/18/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4	<0.50	<0.50	2.5	<0.50	<0.50	0.89	<0.50	
6/26/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.5	<0.50	<0.50	3.4	<0.50	<0.50	1.4	<0.50	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MGMS3-3(60) (continued)	9/23/2014	<0.50	<0.50	<0.50	<0.50	0.71	<0.50	<0.50	2	<0.50	<0.50	8.8	<0.50	<0.50	4.7	<0.50
	12/12/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.9	<0.50	<0.50	2.2	<0.50	<0.50	0.72	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	12.2	<0.50	<0.50	6	<0.50	<0.50	3.7	<0.50
	6/19/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6	<0.50	<0.50	3.5	<0.50	<0.50	1.6	<0.50
	9/22/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	7.7	<0.50	<0.50	3.9	<0.50	<0.50	2	0.6
	12/7/2015	<0.50	<0.50	<0.50	<0.50	0.75	<0.50	<0.50	13.9	<0.50	<0.50	4.2	<0.50	<0.50	2.5	16.7
	3/9/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	2.8	<0.50	<0.50	0.78	<0.50
	6/17/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	17.4	<0.50	<0.50	5.8	<0.50	<0.50	5	<0.50
	9/30/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	7.7	<0.50	<0.50	3.7	<0.50	<0.50	1.9	<0.50
	12/16/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	1.4	<0.50	<0.50	1.7	<0.50	<0.50	0.68	<0.50
	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	0.62	<0.5	<0.5	1.1	<0.5	<0.5	<0.5	<0.5
	6/12/2017	<0.50	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	2.3	<0.50	<0.50	1.3	<0.50	<0.50	0.64	<0.50
	9/26/2017	<2.0	<2.0	<0.50	<0.50	1.20	<1.0	<0.50	34.2	<0.50	<0.50	8.6	<0.50	<0.50	7.80	<0.50
	11/10/2017	<2.0	<2.0	<0.50	<0.50	1.70	<0.50	<0.50	37.6	<0.50	<0.50	0.8	<0.50	<0.50	1.50	13.90
	3/22/2018	<0.500	<2.50	<0.500	<0.500	0.76	<0.500	<0.500	15.6	<0.500	<0.500	2.2	<0.500	<0.500	1.76	5.89
	7/2/2018	<0.500	<2.50	<0.500	<0.500	0.67	<0.500	<0.500	12.7	<0.500	<0.500	2.7	<0.500	<0.500	1.92	3.36
	9/28/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	9.3	<0.400	<0.500	3.3	<0.400	<0.500	2.31	<0.400
12/10/2018	<1.00	<5.00	<1.00	<1.00	1.21	<0.400	<0.400	17.7	<0.400	<0.500	0.9	<0.400	<0.500	1.16	0.86	
MGMS3-2(101)	08/30/00	<10	<50	<5	<5	7.28	<5	<5	120	<5	<5	154	12.1	--	98.2	<5
	11/29/00	<5	<25	<2.5	<2.5	<2.5	<2.5	<2.5	11.4	<2.5	<2.5	11.5	<5	--	13	<2.5
	02/27/01	<2	<10	<1	<1	<1	<1	<1	2.4	<1	<1	3.36	<2	--	1.98	<1
	05/31/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	4.24	<0.50	<0.50	3.07	<1	--	1.85	<0.50
	09/24/01	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.6	<0.50	<0.50	5.3	<0.50	--	2.4	<0.50
	12/18/01	<1	<5	<0.50	<0.50	0.864	<0.50	0.913	10.3	<0.50	<0.50	50.9	2.98	--	23.9	<0.50
	03/19/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	4.02	<0.50	<0.50	6.88	<0.50	--	2.54	<0.50
	05/29/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	8.19	<0.50	<0.50	11.5	<0.50	--	3.9	<0.50
	01/23/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	21.2	<0.50	<0.50	17.2	<0.50	--	8.38	<0.50
	05/28/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	28.6	<0.50	<0.50	18.4	<0.50	--	8.76	<0.50
	11/11/03	<1	<1	<1	<1	<1	<1	<1	53.7	<1	<1	18.3	<1	--	9.3	<1
	01/27/04	<1	<0.50	<0.50	<1	0.53	<0.50	<0.50	114	0.8	<0.50	24	<0.50	--	15.1	<0.50
	05/03/04	<1	<1	<1	<1	<1	<1	<1	22.1	<1	<1	6.74	<1	--	4.21	<1
	11/15/04	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	47	<0.50	<0.50	6.3	<0.50	--	2.9	<0.50
	05/16/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	66.5	<0.50	<0.50	3.59	<0.50	--	1.48	0.77
	11/16/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	25.3	<0.500	<0.500	4.93	<0.500	--	1.66	0.66
	03/14/06	<1	<1	<1	<1	<1	<1	<1	23.1	<1	<1	2.91	<1	--	1.14	1.06
06/06/06	<1	<1	<1	<1	<1	<1	<1	15.9	<1	<1	3.56	<1	--	1.88	1.06	
12/05/06	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	32.6	<0.50	<0.50	2.84	<0.50	--	1.17	2.85	
09/10/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	40.4	<0.50	<0.50	6.32	<0.50	--	3.7	13.2	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MGMS3-2(101) (continued)	03/04/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	18.1	<0.500	<0.500	3.4	<0.500	<0.500	1.47	5.64
	09/16/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	20.4	<0.500	<0.500	6.34	<0.500	<0.500	3.5	4.24
	03/24/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	15	<0.50	<0.50	3	<0.50	<0.50	1.5	2.3
	06/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.8	<0.50	<0.50	2.4	<0.50	<0.50	1.2	2.2
	09/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	14	<0.50	<0.50	3.8	<0.50	<0.50	2.1	3.2
	03/17/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	7	<0.50	<0.50	3.1	<0.50	<0.50	1.8	1.2
	09/20/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5.5	<0.5	<0.5	3	<0.5	<0.5	1.4	1.2
	03/07/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.8	<0.50	<0.50	3.7	<0.50	<0.50	2.2	0.86
	03/08/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.9	<0.50	<0.50	5.9	<0.50	<0.50	4.5	<0.50
	09/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	<0.50	2.7	<0.50	<0.50	1.3	<0.50
	03/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.9	<0.50	<0.50	5.6	<0.50	<0.50	4.4	0.59
	09/16/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.9	<0.50	<0.50	3.6	<0.50	<0.50	2.1	<0.50
	3/18/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.8	<0.50	<0.50	9.1	<0.50	<0.50	6.5	<0.50
	9/23/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.7	<0.50	<0.50	3	<0.50	<0.50	1.5	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.1	<0.50	<0.50	4.4	<0.50	<0.50	2.8	<0.50
	9/22/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.3	<0.50	<0.50	3.8	<0.50	<0.50	2.6	1.2
	3/9/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	7.3	<0.50	<0.50	7.5	<0.50	<0.50	6.1	<0.50
	9/30/2016	<0.50	<2	<0.50	<0.50	<0.50	<0.50	<0.50	6.5	<0.50	<0.50	4.4	<0.50	<0.50	3	<0.50
	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	7	<0.5	<0.5	7	<0.5	<0.5	6	<0.5
	9/26/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	5	<0.50	<0.50	0.96	<0.50	<0.50	1	0.9
11/10/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	2	<0.50	<0.50	2.50	<0.50	<0.50	2	<0.50	
7/1/2018	<0.500	<2.50	<0.500	<0.500	<0.500	<0.500	<0.500	2	<0.500	<0.500	1.82	<0.500	<0.500	1	0.359 J	
9/28/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	2	<0.400	<0.500	1.98	<0.400	<0.500	1	<0.400	
MGMS3-1(132)	08/30/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	0.53	<0.50	<0.50	5.58	<1	--	0.746	<0.50
	11/29/00	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	2.04	<0.50	<0.50	0.754	<1	--	<0.50	<0.50
	02/27/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	1.08	<0.50	<0.50	2.62	<1	--	0.722	<0.50
	05/31/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	6.67	<0.50	<0.50	3.13	<1	--	1.44	<0.50
	09/24/01	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	3.8	<0.50	<0.50	6.1	<0.50	--	1.9	<0.50
	12/18/01	<1	<5	<0.50	<0.50	<0.50	<0.50	<0.50	4.11	<0.50	<0.50	8.75	<1	--	2.24	<0.50
	03/19/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	4.88	<0.50	<0.50	9.63	<0.50	--	3.02	<0.50
	05/29/02	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	11.8	<0.50	<0.50	14.6	<0.50	--	4.28	<0.50
	01/23/03	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	16.8	<0.50	<0.50	11.4	<0.50	--	6.04	<0.50
	05/28/03	<1	<0.50	<0.50	<1	0.59	<0.50	<0.50	93.3	0.76	<0.50	16.3	<0.50	--	10.1	0.83
	11/11/03	<1	<1	<1	<1	<1	<1	<1	72.4	<1	<1	12.2	<1	--	8	<1
	01/27/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	34.9	0.61	<0.50	12.7	<0.50	--	9.47	<0.50
	05/03/04	<1	<1	<1	<1	<1	<1	<1	11.9	<1	<1	<1	<1	--	14.2	<1
	11/15/04	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	200	<2.5	<2.5	6.2	<2.5	--	3.4	<2.5

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MGMS3-1(132) (continued)	05/16/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	42.6	0.79	<0.50	4.42	<0.50	--	2.23	<0.50
	11/16/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	19.9	<0.500	<0.500	2.41	<0.500	--	0.8	<0.500
	03/14/06	<1	<1	<1	<1	<1	<1	<1	20.3	<1	<1	2.13	<1	--	<1	<1
	06/06/06	<1	<1	<1	<1	<1	<1	<1	18.6	<1	<1	1.57	<1	--	<1	1.36
	12/05/06	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	24.1	<0.50	<0.50	3.05	<0.50	--	1.08	4.68
	09/10/07	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	36.5	<0.50	<0.50	4.69	<0.50	--	3.17	16.8
	03/04/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	21.8	<0.500	<0.500	3.37	<0.500	<0.500	1.64	6.83
	09/16/08	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	26	<0.500	<0.500	4.86	<0.500	<0.500	3.52	4.96
	03/24/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6.3	<0.50	<0.50	1.8	<0.50	<0.50	0.79	2.4
	03/24/09 DUP	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.8	<0.50	<0.50	1.6	<0.50	<0.50	0.78	2.3
	06/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	12	<0.50	<0.50	4.3	<0.50	<0.50	1.9	1.6
	09/15/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	7.7	<0.50	<0.50	2.1	<0.50	<0.50	1.2	2
	03/17/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	7.2	<0.50	<0.50	2.6	<0.50	<0.50	1.9	0.92
	09/20/10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	6.5	<0.5	<0.5	2.9	<0.5	<0.5	2.3	1.3
	03/07/11	<0.50	<0.50	<0.50	<0.50	0.64	<0.50	<0.50	18	<0.50	<0.50	4	<0.50	<0.50	3.8	4.3
	09/13/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	5.6	<0.50	<0.50	3.8	<0.50	<0.50	3.4	0.55
	03/08/12	<0.50	<0.50	<0.50	<0.50	0.5	<0.50	<0.50	9.3	<0.50	<0.50	7	<0.50	<0.50	6.9	0.67
	09/12/12	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6	<0.50	<0.50	4.9	<0.50	<0.50	4	<0.50
	03/12/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	9.4	<0.50	<0.50	8.1	<0.50	<0.50	7.2	0.98
	09/16/13	<0.50	<0.50	<0.50	<0.50	0.58	<0.50	<0.50	9.8	<0.50	<0.50	7.9	<0.50	<0.50	8.1	0.84
	3/18/2014	<0.50	<0.50	<0.50	<0.50	0.62	<0.50	0.51	11	<0.50	<0.50	13	<0.50	<0.50	11	0.76
	9/23/2014	<0.50	<0.50	<0.50	<0.50	0.54	<0.50	<0.50	8.9	<0.50	<0.50	9	<0.50	<0.50	7.9	<0.50
	3/18/2015	<0.50	<0.50	<0.50	<0.50	0.53	<0.50	<0.50	9.3	<0.50	<0.50	6.3	<0.50	<0.50	6	0.56
	9/22/2015	<0.50	<0.50	<0.50	<0.50	0.74	<0.50	<0.50	13.3	<0.50	<0.50	8.1	<0.50	<0.50	8.2	1.2
	3/9/2016	<0.50	<2	<0.50	<0.50	1	<0.50	0.56	14.4	<0.50	<0.50	13.5	0.56	<0.50	12.7	0.8
	9/30/2016	<0.50	<2	<0.50	<0.50	0.84	<0.50	0.54	12.9	<0.50	<0.50	13.8	<0.50	<0.50	11.9	<0.50
	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	7.9	<0.5	<0.5	13.8	<0.5	<0.5	9.6	<0.5
9/26/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<1.0	<0.50	3.4	<0.50	<0.50	3.0	<0.50	<0.50	2.8	<0.50	
11/10/2017	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50	<0.50	3.3	<0.50	<0.50	5.1	<0.50	<0.50	3.8	<0.50	
7/1/2018	<0.500	<2.50	<0.500	<0.500	0.247 J	<0.500	<0.500	4.0	<0.500	<0.500	5.6	<0.500	<0.500	4.1	0.359 J	
9/28/2018	<1.00	<5.00	<1.00	<1.00	<0.400	<0.400	<0.400	3.5	<0.400	<0.500	3.8	<0.400	<0.500	3.2	<0.400	
CMT1-1	11/11/03	<1	<1	2.87	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	<1	<1
	01/26/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	05/03/04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	<1	<1
	08/19/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	11/17/04	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	--	<5	<5

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
CMT1-1 (continued)	03/23/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	05/17/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	11/17/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500
	05/26/06	Well Abandoned														
CMT1-2	11/11/03	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	<1	<1
	01/26/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.75	<0.50	--	1.03	<0.50
	05/03/04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	<1	<1
	08/19/04	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
	11/17/04	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.7	<0.50	--	0.88	<0.50
	02/01/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.37	<0.50	--	0.99	<0.50
	05/16/05	<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.77	<0.50	--	0.69	<0.50
	11/17/05	<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.6	<0.500	--	<0.500	<0.500
	05/26/06	Well Abandoned														
	CMT1-3	11/11/03	<2	<2	3.56	<2	<2	<2	<2	<2	<2	<2	<2	<2	--	<2
01/26/04		<1	<0.50	1.1	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
05/03/04		<1	<1	2.97	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	<1	<1
08/19/04		<1	<0.50	2.16	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	--	<0.50	<0.50
11/17/04		<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	--	<25	<25
05/16/05		<1	<0.50	<0.50	<1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.6	<0.50	--	<0.50	<0.50
11/17/05		<1	<0.500	<0.500	<1	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	--	<0.500	<0.500
05/26/06	Well Abandoned															
EX	03/23/09	<5	<5	<5	<5	<5	<5	<5	50	<5	<5	1,400	43	<5	420	<5
	06/18/09	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	4.2	<0.50	<0.50	24	1.1	<0.50	11	<0.50
	09/18/09	<0.50	<0.50	<0.50	<0.50	4.1	<0.50	3.3	120	0.76	<0.50	2,100	38	<0.50	380	1.1
	12/18/09	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	5.6	<2.5	<2.5	700	3.7	<2.5	56	<2.5
	03/16/10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	20	<0.50	<0.50	150	3.2	<0.50	33	<0.50
	06/17/10	<0.50	<0.50	<0.50	<0.50	0.97	<0.50	<0.50	92	<0.50	<0.50	150	2.3	<0.50	39	2.2
	09/23/10	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	1.6	90	0.53	<0.5	2,400	20	<0.5	220	1.8
	12/21/10	<0.5	<0.5	<0.5	<0.5	0.83	<0.5	0.59	30	<0.50	<0.5	900	6.7	<0.5	99	0.71
	03/31/11	<4	<4	<4	<4	8.2	<4	8.1	240	<4	<4	6,800	110	<4	910	5.1
	06/07/11	<4	<4	<4	<4	<4	<4	<4	140	<4	<4	1,400	15	<4	170	<4

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
EX (continued)	09/19/11	<5	<5	<5	<5	7.9	<5	11	290	<5	<5	4,100	73	<5	460	14
	12/07/11	<5	<5	<5	<5	16	<5	19	12,000	9.3	<5	<50	17	<5	<50	140
	03/09/12	<4	<4	<4	<4	5	<4	<4	1,400	8.6	<4	33	<4	<4	10	290
	06/22/12	<0.5	5.5	<0.5	<0.5	3.4	<0.5	0.68	170	1.3	<0.5	3	0.59	<0.5	1.1	120
	09/14/12	<1.5	2.7	<1.5	<1.5	1.5	<1.5	<1.5	320	<1.5	<1.5	3	<1.5	<1.5	<1.5	42
	12/14/12	<0.50	1.4	<0.50	<0.50	<0.50	<0.50	<0.50	26	<0.50	<0.50	0.87	<0.50	<0.50	<0.50	12
	03/15/13	<0.50	2.8	<0.50	<0.50	<0.50	<0.50	<0.50	9.5	<0.50	<0.50	1.2	<0.50	<0.50	<0.50	4.4
	06/14/13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	1.6	<0.50	<0.50	0.79	<0.50	<0.50	<0.50	<0.50
	09/20/13	<0.50	1.9	<0.50	<0.50	1.9	<0.50	0.54	71	0.68	<0.50	4.1	<0.50	<0.50	2.6	30
	12/16/13	<0.50	1.4	<0.50	<0.50	3.8	<0.50	<0.50	34	<0.50	<0.50	2	<0.50	<0.50	1.4	28
	3/24/2014	<0.50	<0.50	<0.50	<0.50	0.8	<0.50	<0.50	30	<0.50	<0.50	20	<0.50	<0.50	7.5	11
	6/23/2014	<0.50	<0.50	<0.50	<0.50	2.9	<0.50	1.1	160	0.97	<0.50	29	<0.50	<0.50	15	38
	9/30/2014	Insufficient water for sampling .														
	12/15/2014	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	10	<0.50	<0.50	22	<0.50	<0.50	2.7	<0.50
	3/19/2015	<0.50	<0.50	<0.50	<0.50	3.5	<0.50	2.1	688	1.9	<0.50	168	2.5	<0.50	55.8	2.8
	6/18/2015	<0.50	<0.50	<0.50	<0.50	2.6	<0.50	2.6	420	1.6	<0.50	186	0.88	<0.50	42	3.2
	9/22/2015	<0.50	<0.50	<0.50	<0.50	2.9	<0.50	3.7	543	2.6	<0.50	302	0.65	<0.50	61.9	24.4
	12/8/2015	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	427	<0.50	<0.50	94	<0.50	<0.50	21.3	2.1
	3/8/2016	<1.2	<5	<1.2	<1.2	4	<1.2	2.9	1,160	3.6	<1.2	274	5	<1.2	71.1	13.3
	6/17/2016	<5	<20	<5	<5	<5	<5	<5	1,040	<5	<5	592	<5	<5	90.8	<5
	9/28/2016	<1.7	<6.7	<1.7	<1.7	4.6	<1.7	3.5	2,230	3.8	<1.7	39.4	2.5	<1.7	549	128
	12/12/2016	<0.50	3.7	<0.50	<0.50	<0.50	<0.50	<0.50	8.1	<0.50	<0.50	4.3	<0.50	<0.50	0.96	51.9
	3/28/2017	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	5.2	<0.5	<0.5	6.1	<0.5	<0.5	1.9	<0.5
	6/14/2017	<2.0	10.2	<0.50	<0.50	10.7	<1.0	<0.50	11.7	0.56	<0.50	9.5	<0.50	<0.50	3.0	1.3
	9/26/2017	<2.0	3.4	<0.50	<0.50	8.8	<1.0	<0.50	6.9	<0.50	<0.50	0.8	<0.50	<0.50	0.6	10.1
	3/21/2018	<0.500	1.45 J	<0.500	<0.500	1.3	<0.500	<0.500	22.6	<0.500	<0.500	1.5	<0.500	<0.500	2.7	10.8
	6/28/2018	<0.500	42.9	<0.500	<0.500	4.6	<0.500	1.11	722.0	8.72	<0.500	1.9	<0.500	<0.500	0.8	424.0
9/24/2018	<1.00	<5.00	<1.00	<1.00	1.4	<0.400	<0.400	3.4	0.75	<0.500	3.1	<0.400	<0.500	2.4	7.6	
12/4/2018	<1.00	<5.00	<1.00	<1.00	0.9	<0.400	<0.400	8.2	<0.400	<0.500	6.4	<0.400	<0.500	3.6	1.9	
MP-1	03/23/09	<4	<4	<4	<4	6	<4	<4	89	<4	<4	1,200	10	<4	180	<4
	06/18/09	<4	<4	<4	<4	4.3	<4	<4	43	<4	<4	1,500	12	<4	180	<4
	09/18/09	<4	<4	<4	<4	14	<4	<4	240	8.9	<4	1,100	8.2	<4	310	7.3
	12/18/09	<4	<4	<4	<4	<4	<4	<4	58	<4	<4	1,000	7.1	<4	180	<4
	03/16/10	<3	<3	<3	<3	22	<3	<3	410	13	<3	1,500	8.6	<3	400	10
	06/17/10	<3	<3	<3	<3	3.2	<3	<3	120	<3	<3	800	5.4	<3	140	<3
	09/23/10	<3	<3	<3	<3	<3	<3	<3	41	<3	<3	730	4	<3	120	<3

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MP-1 (continued)	12/10/10	<3	<3	<3	<3	<3	<3	<3	27	<3	<3	1,000	4.5	<3	150	<3
	03/14/11	<3	<3	<3	<3	7.1	<3	<3	150	<3	<3	1,200	6.4	<3	180	5.9
	06/07/11	<2.5	<2.5	<2.5	<2.5	4.9	<2.5	<2.5	75	<2.5	<2.5	640	3.3	<2.5	130	<2.5
	09/19/11	<1.5	<1.5	<1.5	<1.5	2.4	<1.5	<1.5	41	<1.5	<1.5	300	1.9	<1.5	72	1.6
	12/07/11	<2.5	<2.5	<2.5	<2.5	2.6	<2.5	<2.5	49	3.1	<2.5	640	3.1	<2.5	120	<2.5
	03/09/12	<1.5	<1.5	<1.5	<1.5	9.4	<1.5	2.8	440	6.3	<1.5	490	3.5	<1.5	140	21
	06/22/12	<2.5	<2.5	<2.5	<2.5	5.6	<2.5	2.8	530	2.9	<2.5	690	12	<2.5	120	48
	09/14/12	<1.5	<1.5	<1.5	<1.5	4	<1.5	<1.5	170	2.2	<1.5	340	2	<1.5	83	4.5
	12/14/12	<0.90	<0.90	<0.90	<0.90	2	<0.90	<0.90	170	1.7	<0.90	230	1	<0.90	48	1.8
	03/15/13	<0.90	<0.90	<0.90	<0.90	5.1	<0.90	0.94	140	2.5	<0.90	230	1	<0.90	69	1.8
	06/14/13	<0.90	<0.90	<0.90	<0.90	4.5	<0.90	1.4	190	1.6	<0.90	330	1.4	<0.90	70	1.8
	09/20/13	<0.90	<0.90	<0.90	<0.90	2.9	<0.90	<0.90	77	1.5	<0.90	260	0.95	<0.90	66	<0.90
	12/16/13	<0.90	<0.90	<0.90	<0.90	1.7	<0.90	1.1	67	0.92	<0.90	290	1.2	<0.90	70	<0.90
	3/24/2014	<1.5	<1.5	<1.5	<1.5	2.2	<1.5	<1.5	240	<1.5	<1.5	360	1.8	<1.5	54	<1.5
	6/23/2014	<1.5	<1.5	<1.5	<1.5	4.9	<1.5	2.3	290	1.7	<1.5	1,200	9.5	<1.5	130	5
	9/30/2014	<2	<2	<2	<2	2.8	<2	<2	110	<2	<2	360	<2	<2	63	16
	12/15/2014	<1.5	<1.5	<1.5	<1.5	1.7	<1.5	<1.5	58	<1.5	<1.5	320	<1.5	<1.5	59	<1.5
	3/20/2015	<1	<1	<1	<1	3.6	<1	1.5	188	1.5	<1	565	1	<1	95.6	24.8
	6/18/2015	<0.84	<0.84	<0.84	<0.84	2.9	<0.84	1.5	91	0.87	<0.84	376	<0.84	<0.84	80.8	<0.84
	9/22/2015	<1.2	<1.2	<1.2	<1.2	1.8	<1.2	1.4	38.3	<1.2	<1.2	343	<1.2	<1.2	68.3	<1.2
12/8/2015	<1.2	<1.2	<1.2	<1.2	1.8	<1.2	1.5	50.9	<1.2	<1.2	308	<1.2	<1.2	62.6	<1.2	
3/8/2016	<0.84	<3.3	<0.84	<0.84	7.5	<0.84	2.1	148	1.2	<0.84	433	<0.84	<0.84	100	<0.84	
6/17/2016	<0.50	<2	<0.50	<0.50	5	<0.50	1.5	125	0.97	<0.50	206	<0.50	<0.50	67.3	<0.50	

Please refer to notes at end of table.

Appendix B
Historical Groundwater Analytical Results
NuStar Vancouver Facility
Vancouver, Washington

Well Number	Sample Date	Concentrations in µg/L (ppb)														
		Bromo- form	Chloro- ethane	Chloro- form	Dibromo- chloro- methane	1,1- Dichloro- ethane	1,2- Dichloro- ethane	1,1- Dichloro- ethene	cis-1,2- Dichloro- ethene	trans-1,2- Dichloro- ethene	1,2- Dichloro- propane	Tetra- chloro- ethene	1,1,1- Trichloro- ethane	1,1,2- Trichloro- ethane	Trichloro- ethene	Vinyl Chloride
MP-1 (continued)	9/28/2016	<0.50	<2	<0.50	<0.50	1.3	<0.50	3.1	40.5	<0.50	<0.50	99.4	<0.50	<0.50	35.5	3.3
	12/13/2016	<0.50	<2	<0.50	<0.50	0.64	<0.50	0.92	209	0.55	<0.50	2.9	<0.50	<0.50	1	4.3
	3/30/2017	<0.5	71.4	<0.5	<0.5	7.5	<0.5	<0.5	177	6	<0.5	<0.5	<0.5	<0.5	0.79	186
	6/14/2017	<2.0	4.0	<0.50	<0.50	2.3	<1.0	<0.50	143	1.9	<0.50	16.2	<0.50	<0.50	8.5	29.4
	9/26/2017	<2.0	<2.0	<0.50	<0.50	3.4	<1.0	4.50	83	0.8	<0.50	307.0	<0.50	<0.50	65.9	2.3
	11/9/2017	<2.0	<2.0	<0.50	<0.50	3.3	<0.50	4.30	105	0.9	<0.50	198.0	<0.50	<0.50	74.0	2.6
	3/21/2018	<0.500	<2.50	<0.500	<0.500	3.2	<0.500	4.04	151	1.0	<0.500	245.0	<0.500	<0.500	64.5	1.6
	6/28/2018	<0.500	<2.50	<0.500	<0.500	10.2	<0.500	9.34	353	1.7	<0.500	747.0	0.56	<0.500	140.0	5.3
	9/26/2018	<20.0	<100	<20.0	<20.0	<8.00	<8.00	<8.00	60	<8.00	<10.0	322.0	<8.00	<10.0	57.0	<8.00
	12/4/2018	<1.00	<5.00	<1.00	<1.00	<0.400	2.79	6.59	130	0.8	<0.500	355.0	<0.400	<0.500	76.7	1.2
MP-3	6/28/2018	<0.500	<2.50	<0.500	<0.500	5.24	<0.500	1.78	203	1.31	<0.500	398	1.82	<0.500	65.1	8.96
	9/27/2018	<1.00	<5.00	<1.00	<1.00	4.06	<0.400	3.52	187	1.60	<0.500	721	0.950	<0.500	148	0.730

Notes:

1. HVOCs = Halogenated volatile organic compounds analysis by U.S. Environmental Protection Agency (EPA) Method 8260B; results reported in micrograms per liter (µg/L).
2. TPH = Total petroleum hydrocarbons in the diesel and heavy oil range analysis by Washington Department of Ecology (WDOE) Method TPH-418.1 Results reported in milligrams per liter (mg/L).
3. -- = Not sampled or not analyzed.
4. < = Not detected at or above the specified laboratory method reporting limit (MRL).
5. B = Estimated concentration based on data quality review - similar detection in associated field blank/equipment blanks (less than 5x difference).
6. J = Estimated concentration based on data quality review.
7. n-Propylbenzene, 1,1,1,2-Tetrachloro-ethane, and 1,1,2-Trichloroethane were detected during the first semi-annual 2008 monitoring event. Refer to Table 3 of the *First Semi-Annual 2008 Groundwater Monitoring Report* for detection concentrations.
8. ND = Not detected and no reporting limit specified.
10. E = Chloroform was detected in the equipment blank during the March 2010 and September 2010 sampling events. Chloroform was flagged with an "E" in samples where the concentration was five times or less than the maximum detection in the equipment blank.

APPENDIX C
LABORATORY ANALYTICAL REPORTS AND
DATA QUALITY REVIEW (ON CD)

1.0 INTRODUCTION

This appendix documents the results of a quality assurance/quality control (QA/QC) review of the analytical data for groundwater samples collected during the September and December 2018 groundwater sampling events, and air samples collected during the November 2018 and January 2019 soil vapor extraction (SVE) effluent sampling events. The samples were collected at the NuStar Terminals Services, Inc. (NuStar) Vancouver Facility (Facility) in Vancouver, Washington, and submitted to TestAmerica Laboratories in West Sacramento, California, and Apex Labs in Tigard, Oregon. A list of the laboratory reports is presented below. A copy of each analytical laboratory report is included in this appendix.

Report	Report Date	Sampling Event
A8I0793	October 11, 2018	Third Quarter Groundwater Monitoring
A8J0009	October 11, 2018	Third Quarter Groundwater Monitoring
A8I0682	October 12, 2018	Third Quarter Groundwater Monitoring
A8I0737	October 12, 2018	Third Quarter Groundwater Monitoring
A8I0645	October 12, 2018	Third Quarter Groundwater Monitoring
A8I0823	October 19, 2018	Third Quarter Groundwater Monitoring
A8L0188	December 19, 2018	Fourth Quarter Groundwater Monitoring
A8L0222	December 19, 2018	Fourth Quarter Groundwater Monitoring
A8L0089	December 31, 2018	Fourth Quarter Groundwater Monitoring
A8L0249	December 31, 2018	Fourth Quarter Groundwater Monitoring
A8L0148	January 8, 2019	Fourth Quarter Groundwater Monitoring
320-45096-1	November 20, 2018	November 2018 SVE Monitoring
J46633-1	January 21, 2019	January 2019 SVE Monitoring

2.0 DATA VALIDATION

The QA review outlines the applicable quality control criteria utilized during the data review process, as well as any deviations from those criteria. Examination and validation of the laboratory summary reports include:

- Analytical preparation and quantitation methods
- Analytical method holding times
- Sample handling
- Chain of custody handling
- Detection and reporting limits
- Method blank, field blank, equipment blank and trip blank detections
- Laboratory control samples, matrix spikes and surrogates to assess laboratory accuracy
- Laboratory control sample duplicates, matrix spike duplicates and laboratory duplicates to assess laboratory precision
- Field duplicates to assess sampling and laboratory precision

The QA review did not include a review of raw data.

3.0 ANALYTICAL METHODS

Chemical analyses for water samples consisted of volatile organic compounds (VOCs) by U.S. Environmental Protection Agency (EPA) Method 8260B. Select groundwater samples were also analyzed for total organic carbon (TOC) by EPA Method 5310, ethene by EPA Method RSK-175M, ammonia as nitrogen by EPA Method 350.1 and nitrate as nitrogen and nitrite as nitrogen by EPA Method 300.0. SVE effluent vapor samples were analyzed for VOCs using EPA Method TO-15.

4.0 QUALITY ASSURANCE OBJECTIVES AND REVIEW

The general QA objectives for this project were to develop and implement procedures for obtaining, evaluating, and confirming the usability of data of a specified quality for monitoring groundwater quality trends and SVE monitoring data at the Facility. To collect such information, analytical data must have an appropriate degree of accuracy and reproducibility, samples collected must be representative of actual field conditions, and samples must be collected and analyzed using unbroken chain-of-custody procedures.

Reporting limits and analytical results were compared to action levels for each parameter in the media of concern. Precision, accuracy, representativeness, completeness, and comparability parameters used to indicate data quality are defined below.

Sample Receipt. Samples were received by the laboratory in good condition and on ice. VOA containers for VOC analysis arrived without headspace.

Reporting Limits. Detection limits are set by the laboratory and are based on instrumentation abilities, sample matrix, and suggested detection limits by the EPA or the Washington State Department of Ecology (Ecology). In some cases, the detection limits may be raised due to high concentrations of analytes in the samples or matrix interferences. Detection limits were generally consistent with industry standards and below promulgated regulatory standards when possible (if not raised, as previously discussed). Reporting limits were reviewed and are generally acceptable for this project. Reporting limits for individual samples are varied based on the magnitude of the chemical impact. It is not expected that any of the raised detection limits compromise the usability of the data.

Holding Times. Samples were analyzed within the recommended method holding time.

Calibration and Analysis. Calibration verification was outside of acceptable limits for select VOCs in each sample batch. As the corresponding sample results are all below method reporting limits, and are not considered COCs for this project, no data were flagged. All other calibrations were within the control limits for analytes presented in Table 3.

Method Blanks. A method, or laboratory, blank is a sample prepared in the laboratory along with the actual samples and analyzed for the same parameters at the same time. It is used to assess if detected contaminants may have been the result of contamination of the samples in the laboratory. No analytes were detected in the laboratory method blanks for the groundwater or air analyses.

Laboratory Control Samples and Laboratory Control Sample Duplicate. Laboratory Control Samples (LCS) and Laboratory Control Sample Duplicates (LCSD) were analyzed to assess the accuracy of the analytical equipment and methods. LCS are prepared from an analyte-free matrix that is then spiked with known levels of the constituents of interest (COI; i.e., a standard). The concentrations are measured, and the results compared to the known spiked levels. This comparison is expressed as percent recovery. The LCS and LCSD recovery for each quality control batch were within acceptable recovery limits.

The LCS is then compared to the LCSD of the same batch and expressed as a relative percent difference (RPD) value. The percent recovery and RPD values are then compared to control limits to assess data quality. The RPD between the LCS and LCSD were within an acceptable range.

Matrix Spike Analyses. A matrix spike QC sample is used to assess the performance of the analytical method by determining potential matrix interferences. Matrix spike (MS) and matrix spike duplicate (MSD) analyses are performed on one environmental sample per analytical batch. A matrix spike sample uses an environmental sample that is spiked with known concentrations of analytes of interest. The matrix spike is then prepared and analyzed with the same analytical procedures as environmental samples in the analytical batch. The resulting concentration of the matrix spike is then compared to the known - or true - values plus the non-spiked environmental sample concentration. This comparison is expressed as a percent recovery. The matrix spike duplicate is then compared to the matrix spike of the same batch and expressed as an RPD value. The percent recovery and RPD values are then compared to control limits to assess data quality.

The recovery from the following matrix spike and matrix spike duplicate samples were outside of control limits:

- Report A8I0823. The matrix spike recovery (using sample MW-24d for the spike) was above acceptable limits for chloroethane. The RPD between the MS and MSD for the same analyte was slightly low.
- Report A8I0793. The matrix spike recovery (using sample MP-3 for the spike) was above acceptable limits for bromochloride and cis 1,2 dichloroethene and below acceptable limits for PCE and TCE. With the exception of bromochloride, the other analytes were outside of acceptable limits due to high concentrations in the spiked sample.
- Report A8I0682. The matrix spike recovery (using sample MW-20i for the spike) was above acceptable limits for chloroethane.

The RPD between the corresponding LCS and LCSD samples was within an acceptable range, indicating that the precision of the analysis process was acceptable. Therefore, no data were flagged.

No MS or MSD samples were analyzed as part of the air sample QC batch.

Surrogate Recovery. Surrogates are organic compounds that are similar in chemical composition to the COI and spiked into environmental and batch quality control samples prior to sample preparation and analysis. Surrogate recoveries for environmental samples are used to evaluate matrix interference on a sample-specific basis. Surrogate recoveries were within acceptable control limits.

Laboratory Duplicate. A laboratory duplicate is a second analysis of an environmental sample received by the laboratory, which serves as an internal check on laboratory quality as well as potential variability of the sample matrix. The laboratory duplicate concentration is compared to the primary sample concentration to assess the precision of the analytical method. This comparison

can be expressed by the RPD between the original and duplicate samples. With the exception of trans 1,2 dichloroethene in the laboratory duplicate analysis presented in report A8I0645, the laboratory duplicate sample RPD values were within recommended control limits.

Field Duplicate. A field duplicate is a second field sample collected from a selected monitoring point. Field duplicate samples serve as a check on laboratory quality as well as potential variability of the sample matrix. The field duplicate is analyzed and compared with the primary sample to assess the precision of the analytical method. This comparison can be expressed by the RPD between the primary and duplicate samples. With the exception of 1,1, dichloroethane and PCE in the duplicate sample for MGMS3-4 (40), which was collected during the September 2018 sampling event, the field duplicate sample RPD values were within recommended limits. The RPDs between analyte concentrations in the associated LCS and LCSD samples are within recommended limits, suggesting that the precision of the analysis is acceptable. No data were flagged.

Trip Blank. A trip blank is a sample of analyte-free water that is transported from the laboratory to the sampling site and transported back to the laboratory without having been exposed to sampling procedures. Trip blanks assess contamination introduced during shipping and field-handling activities. Trip blank samples did not contain analytes above the laboratory reporting limit.

Conclusion. In conclusion, the overall QA objectives have been met, and the data are of adequate quality for use in this project.



Friday, October 12, 2018

Stephanie Salisbury
Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

RE: A810645 - Shore Terminal-Vancouver - Shore Terminal-Vancouver

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A810645, which was received by the laboratory on 9/24/2018 at 4:32:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of final reporting, unless prior arrangements have been made.

Cooler Receipt Info

(See Cooler Receipt Form for Details)

TB 1.4 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.

All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.



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Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

<u>Cascadia Associates</u> 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: <u>Shore Terminal-Vancouver</u> Project Number: <u>Shore Terminal-Vancouver</u> Project Manager: <u>Stephanie Salisbury</u>	Report ID: A810645 - 10 12 18 1036
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ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-26	A810645-01	Water	09/24/18 14:10	09/24/18 16:32
EX-1	A810645-02	Water	09/24/18 15:15	09/24/18 16:32
Trip Blank	A810645-03	Water	09/24/18 00:00	09/24/18 16:32

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Cascadia Associates

6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver

Project Number: Shore Terminal-Vancouver

Project Manager: Stephanie Salisbury

Report ID:

A810645 - 10 12 18 1036

ANALYTICAL CASE NARRATIVE

Work Order: A810645

Subcontract

This report is complete only if it includes the attached subcontract laboratory report from Air Technology for RSK 175.

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A810645 - 10 12 18 1036
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-26 (A810645-01RE1)				Matrix: Water		Batch: 8091140		
Bromobenzene	ND	---	1.00	ug/L	2	09/26/18	EPA 8260C	
Bromochloromethane	ND	---	2.00	ug/L	2	09/26/18	EPA 8260C	
Bromodichloromethane	ND	---	2.00	ug/L	2	09/26/18	EPA 8260C	
Bromoform	ND	---	2.00	ug/L	2	09/26/18	EPA 8260C	
Bromomethane	ND	---	10.0	ug/L	2	09/26/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	2.00	ug/L	2	09/26/18	EPA 8260C	
Chlorobenzene	ND	---	1.00	ug/L	2	09/26/18	EPA 8260C	
Chloroethane	ND	---	10.0	ug/L	2	09/26/18	EPA 8260C	
Chloroform	ND	---	2.00	ug/L	2	09/26/18	EPA 8260C	
Chloromethane	ND	---	10.0	ug/L	2	09/26/18	EPA 8260C	
2-Chlorotoluene	ND	---	2.00	ug/L	2	09/26/18	EPA 8260C	
4-Chlorotoluene	ND	---	2.00	ug/L	2	09/26/18	EPA 8260C	
Dibromochloromethane	ND	---	2.00	ug/L	2	09/26/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	10.0	ug/L	2	09/26/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	1.00	ug/L	2	09/26/18	EPA 8260C	
Dibromomethane	ND	---	2.00	ug/L	2	09/26/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	1.00	ug/L	2	09/26/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	1.00	ug/L	2	09/26/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	1.00	ug/L	2	09/26/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	2.00	ug/L	2	09/26/18	EPA 8260C	
1,1-Dichloroethane	4.24	---	0.800	ug/L	2	09/26/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.800	ug/L	2	09/26/18	EPA 8260C	
1,1-Dichloroethene	1.24	---	0.800	ug/L	2	09/26/18	EPA 8260C	
cis-1,2-Dichloroethene	141	---	0.800	ug/L	2	09/26/18	EPA 8260C	
trans-1,2-Dichloroethene	2.14	---	0.800	ug/L	2	09/26/18	EPA 8260C	
1,2-Dichloropropane	ND	---	1.00	ug/L	2	09/26/18	EPA 8260C	
1,3-Dichloropropane	ND	---	2.00	ug/L	2	09/26/18	EPA 8260C	
2,2-Dichloropropane	ND	---	2.00	ug/L	2	09/26/18	EPA 8260C	
1,1-Dichloropropene	ND	---	2.00	ug/L	2	09/26/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	2.00	ug/L	2	09/26/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	2.00	ug/L	2	09/26/18	EPA 8260C	
Hexachlorobutadiene	ND	---	10.0	ug/L	2	09/26/18	EPA 8260C	
Methylene chloride	ND	---	6.00	ug/L	2	09/26/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.800	ug/L	2	09/26/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	1.00	ug/L	2	09/26/18	EPA 8260C	
Tetrachloroethene (PCE)	117	---	0.800	ug/L	2	09/26/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	4.00	ug/L	2	09/26/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	4.00	ug/L	2	09/26/18	EPA 8260C	
1,1,1-Trichloroethane	1.19	---	0.800	ug/L	2	09/26/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-26 (A810645-01RE1)			Matrix: Water		Batch: 8091140			
1,1,2-Trichloroethane	ND	---	1.00	ug/L	2	09/26/18	EPA 8260C	
Trichloroethene (TCE)	233	---	0.800	ug/L	2	09/26/18	EPA 8260C	
Trichlorofluoromethane	ND	---	4.00	ug/L	2	09/26/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	2.00	ug/L	2	09/26/18	EPA 8260C	
Vinyl chloride	1.18	---	0.800	ug/L	2	09/26/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 115 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/26/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/26/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/26/18</i>	<i>EPA 8260C</i>

EX-1 (A810645-02RE1)			Matrix: Water		Batch: 8091140			
Bromobenzene	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/26/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/26/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/26/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/26/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
1,1-Dichloroethane	1.42	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
cis-1,2-Dichloroethene	3.38	---	0.400	ug/L	1	09/26/18	EPA 8260C	
trans-1,2-Dichloroethene	0.751	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
EX-1 (A810645-02RE1)			Matrix: Water		Batch: 8091140			
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/26/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/26/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Tetrachloroethene (PCE)	3.07	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/26/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/26/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Trichloroethene (TCE)	2.42	---	0.400	ug/L	1	09/26/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/26/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Vinyl chloride	7.56	---	0.400	ug/L	1	09/26/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/26/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/26/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/26/18</i>	<i>EPA 8260C</i>

Trip Blank (A810645-03)			Matrix: Water		Batch: 8091087			
Bromobenzene	ND	---	0.500	ug/L	1	09/25/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/25/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/25/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/25/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/25/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/25/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/25/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/25/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/25/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/25/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/25/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/25/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/25/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/25/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/25/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/25/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/25/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A810645-03)				Matrix: Water		Batch: 8091087		
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/25/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/25/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/25/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/25/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/25/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/25/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/25/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/25/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/25/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/25/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/25/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/25/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/25/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/25/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/25/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/25/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/25/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/25/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	09/25/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/25/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/25/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/25/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/25/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/25/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/25/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/25/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/25/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery:</i>	<i>104 %</i>	<i>Limits:</i>	<i>80-120 %</i>	<i>1</i>	<i>09/25/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>			<i>104 %</i>		<i>80-120 %</i>	<i>1</i>	<i>09/25/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>			<i>105 %</i>		<i>80-120 %</i>	<i>1</i>	<i>09/25/18</i>	<i>EPA 8260C</i>

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Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

<u>Cascadia Associates</u> 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: <u>Shore Terminal-Vancouver</u> Project Number: <u>Shore Terminal-Vancouver</u> Project Manager: <u>Stephanie Salisbury</u>	Report ID: A810645 - 10 12 18 1036
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ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-26 (A810645-01RE1)				Matrix: Water			Batch: 8091195	
Ammonia as N	30.2	---	0.200	mg/L	10	09/27/18	SM 4500-NH3 G	
EX-1 (A810645-02RE1)				Matrix: Water			Batch: 8091195	
Ammonia as N	132	---	1.00	mg/L	50	09/27/18	SM 4500-NH3 G	

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-26 (A810645-01)				Matrix: Water				
Batch: 8091098								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/25/18	EPA 300.0	
MW-26 (A810645-01RE1)				Matrix: Water				
Batch: 8091098								
Nitrate-Nitrogen	212	---	12.5	mg/L	50	09/25/18	EPA 300.0	
EX-1 (A810645-02)				Matrix: Water				
Batch: 8091098								
Nitrate-Nitrogen	0.461	---	0.250	mg/L	1	09/25/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/25/18	EPA 300.0	



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A810645 - 10 12 18 1036
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ANALYTICAL SAMPLE RESULTS

Demand Parameters

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-26 (A810645-01RE1)				Matrix: Water				
Batch: 8091225								
Total Organic Carbon	5.13	---	1.00	mg/L	1	09/27/18	SM 5310 C	
EX-1 (A810645-02RE1)				Matrix: Water				
Batch: 8091225								
Total Organic Carbon	13.2	---	1.00	mg/L	1	09/28/18	SM 5310 C	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091087 - EPA 5030B						Water						
Blank (8091087-BLK1)	Prepared: 09/25/18 09:48					Analyzed: 09/25/18 11:13						
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A810645 - 10 12 18 1036
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091087 - EPA 5030B												
Water												
Blank (8091087-BLK1)	Prepared: 09/25/18 09:48 Analyzed: 09/25/18 11:13											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>	<i>Recovery:</i>		<i>104 %</i>	<i>Limits:</i>	<i>80-120 %</i>		<i>Dilution:</i>	<i>1x</i>				
<i>Toluene-d8 (Surr)</i>			<i>105 %</i>	<i>Limits:</i>	<i>80-120 %</i>			<i>"</i>				
<i>4-Bromofluorobenzene (Surr)</i>			<i>107 %</i>	<i>Limits:</i>	<i>80-120 %</i>			<i>"</i>				

LCS (8091087-BS1)												
Prepared: 09/25/18 09:48 Analyzed: 09/25/18 10:16												
EPA 8260C												
Bromobenzene	20.1	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Bromochloromethane	20.1	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Bromodichloromethane	19.1	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
Bromoform	22.4	---	1.00	ug/L	1	20.0	---	112	80-120%	---	---	
Bromomethane	17.9	---	5.00	ug/L	1	20.0	---	90	80-120%	---	---	EST
Carbon tetrachloride	19.0	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
Chlorobenzene	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Chloroethane	17.7	---	5.00	ug/L	1	20.0	---	89	80-120%	---	---	
Chloroform	18.8	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
Chloromethane	12.8	---	5.00	ug/L	1	20.0	---	64	80-120%	---	---	Q-55
2-Chlorotoluene	22.1	---	1.00	ug/L	1	20.0	---	111	80-120%	---	---	
4-Chlorotoluene	21.3	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
Dibromochloromethane	21.4	---	1.00	ug/L	1	20.0	---	107	80-120%	---	---	
1,2-Dibromo-3-chloropropane	20.8	---	5.00	ug/L	1	20.0	---	104	80-120%	---	---	
1,2-Dibromoethane (EDB)	21.1	---	0.500	ug/L	1	20.0	---	106	80-120%	---	---	
Dibromomethane	19.7	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
1,2-Dichlorobenzene	20.4	---	0.500	ug/L	1	20.0	---	102	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Shore Terminal-Vancouver**
Project Manager: **Stephanie Salisbury**

Report ID:
A810645 - 10 12 18 1036

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091087 - EPA 5030B												
Water												
LCS (8091087-BS1)												
			Prepared: 09/25/18 09:48			Analyzed: 09/25/18 10:16						
1,3-Dichlorobenzene	20.8	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
1,4-Dichlorobenzene	19.6	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
Dichlorodifluoromethane	18.2	---	1.00	ug/L	1	20.0	---	91	80-120%	---	---	
1,1-Dichloroethane	18.1	---	0.400	ug/L	1	20.0	---	90	80-120%	---	---	
1,2-Dichloroethane (EDC)	17.4	---	0.400	ug/L	1	20.0	---	87	80-120%	---	---	
1,1-Dichloroethene	17.8	---	0.400	ug/L	1	20.0	---	89	80-120%	---	---	
cis-1,2-Dichloroethene	17.8	---	0.400	ug/L	1	20.0	---	89	80-120%	---	---	
trans-1,2-Dichloroethene	17.7	---	0.400	ug/L	1	20.0	---	88	80-120%	---	---	
1,2-Dichloropropane	17.8	---	0.500	ug/L	1	20.0	---	89	80-120%	---	---	
1,3-Dichloropropane	19.4	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
2,2-Dichloropropane	20.9	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
1,1-Dichloropropene	18.8	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
cis-1,3-Dichloropropene	20.0	---	1.00	ug/L	1	20.0	---	100	80-120%	---	---	
trans-1,3-Dichloropropene	20.9	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Hexachlorobutadiene	20.4	---	5.00	ug/L	1	20.0	---	102	80-120%	---	---	
Methylene chloride	17.8	---	3.00	ug/L	1	20.0	---	89	80-120%	---	---	
1,1,1,2-Tetrachloroethane	20.7	---	0.400	ug/L	1	20.0	---	104	80-120%	---	---	
1,1,2,2-Tetrachloroethane	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Tetrachloroethene (PCE)	18.6	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
1,2,3-Trichlorobenzene	21.6	---	2.00	ug/L	1	20.0	---	108	80-120%	---	---	
1,2,4-Trichlorobenzene	21.0	---	2.00	ug/L	1	20.0	---	105	80-120%	---	---	
1,1,1-Trichloroethane	19.0	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
1,1,2-Trichloroethane	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Trichloroethene (TCE)	18.7	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
Trichlorofluoromethane	17.1	---	2.00	ug/L	1	20.0	---	85	80-120%	---	---	
1,2,3-Trichloropropane	20.5	---	1.00	ug/L	1	20.0	---	103	80-120%	---	---	
Vinyl chloride	18.4	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr) Recovery: 96 % Limits: 80-120 % Dilution: 1x</i>												
<i>Toluene-d8 (Surr) 101 % 80-120 % "</i>												
<i>4-Bromofluorobenzene (Surr) 101 % 80-120 % "</i>												

Duplicate (8091087-DUP1) Prepared: 09/25/18 10:49 Analyzed: 09/25/18 18:48

QC Source Sample: MW-26 (A810645-01)

EPA 8260C

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Lisa Domenighini, Client Services Manager



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Shore Terminal-Vancouver**
Project Manager: **Stephanie Salisbury**

Report ID:
A810645 - 10 12 18 1036

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091087 - EPA 5030B												
Water												
Duplicate (8091087-DUP1)			Prepared: 09/25/18 10:49 Analyzed: 09/25/18 18:48									
QC Source Sample: MW-26 (A810645-01)												
Bromobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Bromoform	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Bromomethane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	EST
Carbon tetrachloride	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Chloroethane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
Chloroform	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Chloromethane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Dibromomethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,1-Dichloroethane	4.33	---	4.00	ug/L	10	---	4.17	---	---	4	30%	
1,2-Dichloroethane (EDC)	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
1,1-Dichloroethene	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
cis-1,2-Dichloroethene	116	---	4.00	ug/L	10	---	122	---	---	5	30%	
trans-1,2-Dichloroethene	ND	---	4.00	ug/L	10	---	2.32	---	---	***	30%	Q-17
1,2-Dichloropropane	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
Methylene chloride	ND	---	30.0	ug/L	10	---	ND	---	---	---	30%	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A810645 - 10 12 18 1036
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091087 - EPA 5030B						Water						
Duplicate (8091087-DUP1)			Prepared: 09/25/18 10:49 Analyzed: 09/25/18 18:48									
QC Source Sample: MW-26 (A810645-01)												
1,1,1,2-Tetrachloroethane	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	106	---	4.00	ug/L	10	---	110	---	---	4	30%	
1,2,3-Trichlorobenzene	ND	---	20.0	ug/L	10	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	20.0	ug/L	10	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
1,1,2-Trichloroethane	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Trichloroethene (TCE)	204	---	4.00	ug/L	10	---	210	---	---	3	30%	
Trichlorofluoromethane	ND	---	20.0	ug/L	10	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Vinyl chloride	ND	---	4.00	ug/L	10	---	2.41	---	---	***	30%	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 110 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>"</i>						



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A810645 - 10 12 18 1036
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091140 - EPA 5030B						Water						
Blank (8091140-BLK1)		Prepared: 09/26/18 11:01		Analyzed: 09/26/18 12:26								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Shore Terminal-Vancouver**
Project Manager: **Stephanie Salisbury**

Report ID:
A810645 - 10 12 18 1036

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091140 - EPA 5030B												
Water												
Blank (8091140-BLK1)	Prepared: 09/26/18 11:01 Analyzed: 09/26/18 12:26											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery:		105 %	Limits: 80-120 %		Dilution: 1x						
Toluene-d8 (Surr)			106 %	80-120 %		"						
4-Bromofluorobenzene (Surr)			106 %	80-120 %		"						

LCS (8091140-BS1)												
Prepared: 09/26/18 11:01 Analyzed: 09/26/18 11:29												
EPA 8260C												
Bromobenzene	20.2	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Bromochloromethane	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Bromodichloromethane	20.8	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
Bromoform	22.5	---	1.00	ug/L	1	20.0	---	113	80-120%	---	---	
Bromomethane	22.7	---	5.00	ug/L	1	20.0	---	114	80-120%	---	---	EST
Carbon tetrachloride	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Chlorobenzene	19.5	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
Chloroethane	19.5	---	5.00	ug/L	1	20.0	---	98	80-120%	---	---	
Chloroform	20.2	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Chloromethane	14.9	---	5.00	ug/L	1	20.0	---	74	80-120%	---	---	Q-55
2-Chlorotoluene	22.7	---	1.00	ug/L	1	20.0	---	113	80-120%	---	---	
4-Chlorotoluene	22.1	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
Dibromochloromethane	22.0	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
1,2-Dibromo-3-chloropropane	23.2	---	5.00	ug/L	1	20.0	---	116	80-120%	---	---	
1,2-Dibromoethane (EDB)	21.5	---	0.500	ug/L	1	20.0	---	108	80-120%	---	---	
Dibromomethane	21.2	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
1,2-Dichlorobenzene	20.6	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Shore Terminal-Vancouver**
Project Manager: **Stephanie Salisbury**

Report ID:
A810645 - 10 12 18 1036

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091140 - EPA 5030B												
Water												
LCS (8091140-BS1)	Prepared: 09/26/18 11:01 Analyzed: 09/26/18 11:29											
1,3-Dichlorobenzene	21.3	---	0.500	ug/L	1	20.0	---	106	80-120%	---	---	
1,4-Dichlorobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Dichlorodifluoromethane	18.7	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
1,1-Dichloroethane	19.4	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
1,2-Dichloroethane (EDC)	18.9	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
1,1-Dichloroethene	19.1	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
cis-1,2-Dichloroethene	19.6	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
trans-1,2-Dichloroethene	19.4	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
1,2-Dichloropropane	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
1,3-Dichloropropane	20.1	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
2,2-Dichloropropane	22.1	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
1,1-Dichloropropene	20.0	---	1.00	ug/L	1	20.0	---	100	80-120%	---	---	
cis-1,3-Dichloropropene	21.3	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
trans-1,3-Dichloropropene	22.2	---	1.00	ug/L	1	20.0	---	111	80-120%	---	---	
Hexachlorobutadiene	19.6	---	5.00	ug/L	1	20.0	---	98	80-120%	---	---	
Methylene chloride	18.5	---	3.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1,1,2-Tetrachloroethane	20.8	---	0.400	ug/L	1	20.0	---	104	80-120%	---	---	
1,1,2,2-Tetrachloroethane	22.1	---	0.500	ug/L	1	20.0	---	110	80-120%	---	---	
Tetrachloroethene (PCE)	18.1	---	0.400	ug/L	1	20.0	---	90	80-120%	---	---	
1,2,3-Trichlorobenzene	22.2	---	2.00	ug/L	1	20.0	---	111	80-120%	---	---	
1,2,4-Trichlorobenzene	20.9	---	2.00	ug/L	1	20.0	---	104	80-120%	---	---	
1,1,1-Trichloroethane	20.0	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,1,2-Trichloroethane	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Trichloroethene (TCE)	18.8	---	0.400	ug/L	1	20.0	---	94	80-120%	---	---	
Trichlorofluoromethane	18.5	---	2.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,2,3-Trichloropropane	22.4	---	1.00	ug/L	1	20.0	---	112	80-120%	---	---	
Vinyl chloride	19.1	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 101 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	102 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	101 %		80-120 %		"							

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Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A810645 - 10 12 18 1036
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QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091195 - Method Prep: Aq						Water						
Blank (8091195-BLK1)		Prepared: 09/27/18 10:27 Analyzed: 09/27/18 14:52										
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (8091195-BS1)		Prepared: 09/27/18 10:27 Analyzed: 09/27/18 14:54										
SM 4500-NH3 G												
Ammonia as N	2.11	---	0.0200	mg/L	1	2.00	---	105	90-110%	---	---	



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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091098 - Method Prep: Aq						Water						
Blank (8091098-BLK1)		Prepared: 09/25/18 11:17 Analyzed: 09/25/18 13:19										
<u>EPA 300.0</u>												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
LCS (8091098-BS1)		Prepared: 09/25/18 11:17 Analyzed: 09/25/18 13:40										
<u>EPA 300.0</u>												
Nitrate-Nitrogen	1.99	---	0.250	mg/L	1	2.00	---	100	90-110%	---	---	---
Nitrite-Nitrogen	1.94	---	0.250	mg/L	1	2.00	---	97	90-110%	---	---	---



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Shore Terminal-Vancouver**
Project Manager: **Stephanie Salisbury**

Report ID:
A810645 - 10 12 18 1036

QUALITY CONTROL (QC) SAMPLE RESULTS

Demand Parameters

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091150 - Method Prep: Aq						Water						
Blank (8091150-BLK1)		Prepared: 09/26/18 11:30 Analyzed: 09/26/18 15:08										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	---
LCS (8091150-BS1)		Prepared: 09/26/18 11:30 Analyzed: 09/26/18 15:37										
SM 5310 C												
Total Organic Carbon	10.4	---	1.00	mg/L	1	10.0	---	104	85-115%	---	---	---
LCS (8091150-BS2)		Prepared: 09/26/18 11:30 Analyzed: 09/26/18 16:06										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	0.00	---		85-115%	---	---	TOC_I



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A810645 - 10 12 18 1036
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QUALITY CONTROL (QC) SAMPLE RESULTS

Demand Parameters

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091225 - Method Prep: Aq						Water						
Blank (8091225-BLK1)		Prepared: 09/27/18 15:10 Analyzed: 09/27/18 18:18										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	---
LCS (8091225-BS1)		Prepared: 09/27/18 15:10 Analyzed: 09/27/18 18:47										
SM 5310 C												
Total Organic Carbon	10.8	---	1.00	mg/L	1	10.0	---	108	85-115%	---	---	---
LCS (8091225-BS2)		Prepared: 09/27/18 15:10 Analyzed: 09/27/18 19:17										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	0.00	---		85-115%	---	---	TOC_I
Duplicate (8091225-DUP1)		Prepared: 09/27/18 15:10 Analyzed: 09/27/18 20:16										
QC Source Sample: MW-26 (A810645-01RE1)												
SM 5310 C												
Total Organic Carbon	5.20	---	1.00	mg/L	1	---	5.13	---	---	1	10%	---
Matrix Spike (8091225-MS1)		Prepared: 09/27/18 15:10 Analyzed: 09/27/18 20:45										
QC Source Sample: MW-26 (A810645-01RE1)												
SM 5310 C												
Total Organic Carbon	15.1	---	1.01	mg/L	1	10.0	5.13	99	85-115%	---	---	---



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A8I0645 - 10 12 18 1036
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SAMPLE PREPARATION INFORMATION

Halogenated Volatile Organic Compounds by EPA 8260C

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 8091087							
A8I0645-03	Water	EPA 8260C	09/24/18 00:00	09/25/18 10:49	5mL/5mL	5mL/5mL	1.00
Batch: 8091140							
A8I0645-01RE1	Water	EPA 8260C	09/24/18 14:10	09/26/18 12:19	5mL/5mL	5mL/5mL	1.00
A8I0645-02RE1	Water	EPA 8260C	09/24/18 15:15	09/26/18 12:19	5mL/5mL	5mL/5mL	1.00

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 8091195							
A8I0645-01RE1	Water	SM 4500-NH3 G	09/24/18 14:10	09/27/18 10:27	10mL/10mL	10mL/10mL	1.00
A8I0645-02RE1	Water	SM 4500-NH3 G	09/24/18 15:15	09/27/18 10:27	10mL/10mL	10mL/10mL	1.00

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 8091098							
A8I0645-01	Water	EPA 300.0	09/24/18 14:10	09/25/18 11:17	5mL/5mL	5mL/5mL	1.00
A8I0645-01RE1	Water	EPA 300.0	09/24/18 14:10	09/25/18 11:17	5mL/5mL	5mL/5mL	1.00
A8I0645-02	Water	EPA 300.0	09/24/18 15:15	09/25/18 11:17	5mL/5mL	5mL/5mL	1.00

Demand Parameters

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 8091225							
A8I0645-01RE1	Water	SM 5310 C	09/24/18 14:10	09/27/18 15:10	40mL/40mL	40mL/40mL	1.00
A8I0645-02RE1	Water	SM 5310 C	09/24/18 15:15	09/27/18 15:10	40mL/40mL	40mL/40mL	1.00



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates

6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**

Project Number: **Shore Terminal-Vancouver**

Project Manager: **Stephanie Salisbury**

Report ID:

A810645 - 10 12 18 1036

QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

Apex Laboratories

- EST** Result reported as an Estimated Value. Compound failed initial calibration criteria.
- Q-17** RPD between original and duplicate sample is outside of established control limits.
- Q-55** Daily CCV/LCS recovery for this analyte was below the +/-20% criteria listed in EPA 8260C, however there is adequate sensitivity to ensure detection at the reporting level.
- TOC_I** Inorganic Carbon Spike Check. Results are valid if Non Detect (No Inorganic Carbon detected.)

Apex Laboratories

Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A810645 - 10 12 18 1036
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REPORTING NOTES AND CONVENTIONS:

Abbreviations:

- DET Analyte DETECTED at or above the detection or reporting limit.
- ND Analyte NOT DETECTED at or above the detection or reporting limit.
- NR Result Not Reported
- RPD Relative Percent Difference

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

- Basis: Results for soil samples are generally reported on a 100% dry weight basis. The Result Basis is listed following the units as "dry", "wet", or "" (blank) designation.
 - "dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.
 - "wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.
 - "" Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) are not included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

- " --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.
- " *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to 1/2 the Reporting Limit (RL).
-For Blank hits falling between 1/2 the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a 'B' qualifier, per Apex Laboratories' Blank Policy.
For further details, please request a copy of this document.



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A810645 - 10 12 18 1036
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REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the blank results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A810645 - 10 12 18 1036
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LABORATORY ACCREDITATION INFORMATION

TNI Certification ID: OR100062 (Primary Accreditation) - EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation
<u>All reported analytes are included in Apex Laboratories' current ORELAP scope.</u>					

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation. Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provided by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver
Project Number: Shore Terminal-Vancouver
Project Manager: Stephanie Salisbury

Report ID:
A810645 - 10 12 18 1036

CHAIN OF CUSTODY

Lab # A810645 PO# _____
COC ___ of ___

Company: Cascadia Project Mgr: Stephanie Salisbury Project Name: Shore Terminal-Vancouver Project # _____
Address: 6915 SW Macadam Ave, Ste 250, Portland OR 97219 Phone: 503-906-6578 Fax: 503-906-6577 Email: SbSalisbury@casclab.com
Sampled by: Joel W Lambert

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-CID	NWTPH-DX	NWTPH-GX	8260 VOCs Full List	8260 RBDM VOCs	8260 HVOCs	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TIO	RCRA Metals (8)	TCLP Metals (8)	AL, Sb, As, Ba, Be, Cd, Cr, Cs, Cu, Fe, Pb, Hg, Mn, Mo, Ni, Zn, Se, Ag, Na, Ti, V, Zn	1200-COLS	1200-Z	
MW-26	9/24/18	1410	GW	7						✓										✓	Ammons
EX-1	9/24/18	1515	GW	7						✓										✓	Ni/trite/M/TH
Trip blank	9/24/18	-	W	1						✓										✓	Rsk-175*

Normal Turn Around Time (TAT) = 10 Business Days
TAT Requested (circle): 1 Day 2 Day 3 Day 4 DAY 5 DAY Other: _____

SPECIAL INSTRUCTIONS:
*Rsk-175: TOL, ethene, ethane, methane

RELINQUISHED BY: _____ RECEIVED BY: _____
Signature: _____ Date: _____ Signature: _____ Date: _____
Printed Name: Joel Lambert Printed Name: Christina Horton
Time: _____ Time: 1630
Company: Cascadia Company: Apex Labs

Apex Laboratories

Joia A Domenighini

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Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A810645 - 10 12 18 1036
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APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A8 I00645
 Project/Project #: Shore Terminals Vanc.

Delivery info:
 Date/Time Received: 9/24/18 @ 1632 By: CFH
 Delivered by: Apex Client ESS FedEx UPS Swift Seavoy SDS Other

Cooler Inspection Inspected by: CFH : 9/24/18 @ 1742
 Chain of Custody Included? Yes No Custody Seals? Yes No
 Signed/Dated by Client? Yes No
 Signed/Dated by Apex? Yes No

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (deg. C)	<u>1.4</u>						
Received on Ice? (Y/N)	<u>Y</u>						
Temp. Blanks? (Y/N)	<u>Y</u>						
Ice Type: (Gel/Real/Other)	<u>Real</u>						
Condition:	<u>Good</u>						

Cooler out of temp? (Y/N) Possible reason why: _____
 If some coolers are in temp and some out, were green dot applied to out of temperature samples? Yes/No/NA

Samples Inspection: Inspected by: MS : 9/25/18 @ 8:04
 All Samples Intact? Yes No Comments: _____
 Bottle Labels/COCs agree? Yes No Comments: _____
 Containers/Volumes Received Appropriate for Analysis? Yes No Comments: _____
 Do VOA Vials have Visible Headspace? Yes No NA
 Comments: Sediment in 5/5 VOAs
 Water Samples: pH Checked and Appropriate (except VOAs): Yes No NA
 Comments: _____
 Additional Information: TB# 1375

Labeled by: MS Witness: [Signature] Cooler Inspected by: CFH See Project Contact Form: Y

Lisa Domenighini

October 11, 2018

Apex Laboratories
ATTN: Lisa Domenighini
12232 S.W. Garden Place
Tigard, OR 97223



LA Cert #04140
EPA Methods TO3, TO14A, TO15, 25C/3C,
RSK-175

TX Cert T104704450-14-6
EPA Methods TO14A, TO15

UT Cert CA0133332015-3
EPA Methods TO3, TO14A, TO15, RSK-175

LABORATORY TEST RESULTS

Project Reference: A8I0645
Lab Number: J092603-01/02

Enclosed are results for sample(s) received 9/26/18 by Air Technology Laboratories. Samples were received intact and properly chilled. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the TNI Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

A handwritten signature in blue ink that appears to read "Mark Johnson".

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Note: The cover letter is an integral part of this analytical report.

10/25/18

9/25/18

SUBCONTRACT ORDER

**Apex Laboratories
A810645**

J092603-01/02

SENDING LABORATORY:

Apex Laboratories
12232 S.W. Garden Place
Tigard, OR 97223
Phone: (503) 718-2323
Fax: (503) 718-0333
Project Manager: Lisa Domenighini

RECEIVING LABORATORY:

Air Technology Laboratories, Inc
18501 E. Gale Ave Suite 130
City of Industry, CA 91748
Phone : (626) 964-4032
Fax: (626) 964-5832

Sample Name: MW-26 **Water** **Sampled: 09/24/18 14:10** (A810645-01)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub) <i>Containers Supplied:</i> (D)40 mL VOA - HCL (E)40 mL VOA - HCL	10/05/18 17:00	10/08/18 14:10	

-01

Sample Name: EX-1 **Water** **Sampled: 09/24/18 15:15** (A810645-02)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub) <i>Containers Supplied:</i> (D)40 mL VOA - HCL (E)40 mL VOA - HCL	10/05/18 17:00	10/08/18 15:15	Sediment in 5/5 Voas.

-02

Standard TAT

5°C

Released By [Signature] Date 9/25/18 Received By J. Kang Date 9/26/18 10:00


Released By _____ Date _____ Received By _____ Date _____

Client: Apex Laboratories
Attn: Lisa Domenighini
Project Name: NA
Project No.: A8I0645
Date Received: 09/26/18
Matrix: Water
Reporting Units: ug/L

RSK175

Lab No.:	J092603-01	J092603-02						
Client Sample I.D.:	MW-26 (A8I0645-01)	EX-1 (A8I0645-02)						
Date/Time Sampled:	9/24/18 14:10	9/24/18 15:15						
Date/Time Analyzed:	9/27/18 15:14	9/27/18 15:27						
QC Batch No.:	180927GC8A1	180927GC8A1						
Analyst Initials:	AS	AS						
Dilution Factor:	1.0	1.0						
ANALYTE	Result ug/L	RL ug/L	Result ug/L	RL ug/L				
Ethene	ND	1.0	2.9	1.0				
Ethane	ND	1.0	17	1.0				
Methane	3,600	1.0	3,300	1.0				

MDL = Method Detection Limit
 ND= Not Detected (below MDL)
 RL = Reporting Limit

Reviewed/Approved By: 
 Mark Johnson
 Operations Manager

Date 10-10-18

The cover letter is an integral part of this analytical report



LCS/LCSD Recovery and RPD Summary Report

QC Batch #: 180927GC8A1

Matrix: Air

Reporting Units: ug/L

RSK175
LABORATORY CONTROL SAMPLE SUMMARY

Lab No.:	METHOD BLANK			LCS		LCSD					
Date/Time Analyzed:	9/27/18 10:47			9/27/18 10:12		9/27/18 10:26					
Analyst Initials:	AS			AS		AS					
Dilution Factor:	1.0			1.0		1.0					
ANALYTE	Result ug/L	RL ug/L	SPIKE AMT. ug/L	Result ug/L	% Rec.	Result ug/L	% Rec.	RPD	Low %Rec	High %Rec	Max. RPD
Ethene	ND	1.0	1,150	1,280	111	1,160	101	9.6	70	130	30.0
Ethane	ND	1.0	1,230	1,360	111	1,290	105	5.1	70	130	30.0
Methane	ND	1.0	650	713	109	694	106	2.6	70	130	30.0

ND= Not Detected (below RL)

RL = Reporting Limit

Reviewed/Approved By:



Mark Johnson
Operations Manager

Date

10-10-18

The cover letter is an integral part of this analytical report





Friday, October 12, 2018

Stephanie Salisbury
Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

RE: A8I0682 - Shore Terminal-Vancouver - Nustar 3Q2018

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A8I0682, which was received by the laboratory on 9/25/2018 at 4:20:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of final reporting, unless prior arrangements have been made.

Cooler Receipt Info

(See Cooler Receipt Form for Details)

TB 4.4 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.

All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.



Apex Laboratories

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Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar 3Q2018**
Project Manager: **Stephanie Salisbury**

Report ID:
A8I0682 - 10 12 18 1056

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-8	A8I0682-01	Water	09/25/18 08:15	09/25/18 16:20
MW-10	A8I0682-02	Water	09/25/18 09:00	09/25/18 16:20
MW-12	A8I0682-03	Water	09/25/18 10:05	09/25/18 16:20
MW-19	A8I0682-04	Water	09/25/18 11:05	09/25/18 16:20
MW-13	A8I0682-05	Water	09/25/18 11:50	09/25/18 16:20
MW-10 DUP	A8I0682-06	Water	09/25/18 09:00	09/25/18 16:20
MW-12 DUP	A8I0682-07	Water	09/25/18 10:05	09/25/18 16:20
MW-19 DUP	A8I0682-08	Water	09/25/18 11:05	09/25/18 16:20
MW-1	A8I0682-09	Water	09/25/18 12:40	09/25/18 16:20
MW-6	A8I0682-10	Water	09/25/18 13:30	09/25/18 16:20
MW-2	A8I0682-11	Water	09/25/18 14:15	09/25/18 16:20
MW-16	A8I0682-12	Water	09/25/18 15:00	09/25/18 16:20
MW-20i	A8I0682-13	Water	09/25/18 15:30	09/25/18 16:20
EQ Blank	A8I0682-14	Water	09/25/18 15:40	09/25/18 16:20
Trip Blank	A8I0682-15	Water	09/25/18 00:00	09/25/18 16:20

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates

6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver

Project Number: Nustar 3Q2018

Project Manager: Stephanie Salisbury

Report ID:

A810682 - 10 12 18 1056

ANALYTICAL CASE NARRATIVE

Work Order: A810682

Subcontract

This report is complete only if it includes the attached subcontract laboratory report from Air Technology for RSK 175.

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-8 (A810682-01)			Matrix: Water		Batch: 8091152			
Bromobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/27/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Tetrachloroethene (PCE)	3.76	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-8 (A810682-01)			Matrix: Water		Batch: 8091152			
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>

MW-10 (A810682-02)			Matrix: Water		Batch: 8091152			
Bromobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-10 (A810682-02)				Matrix: Water		Batch: 8091152		
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/27/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Tetrachloroethene (PCE)	1.74	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Trichloroethene (TCE)	1.45	---	0.400	ug/L	1	09/27/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>

MW-12 (A810682-03RE1)				Matrix: Water		Batch: 8091289		
Bromobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12 (A810682-03RE1)				Matrix: Water		Batch: 8091289		
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloroethane	0.730	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
cis-1,2-Dichloroethene	1.46	---	0.400	ug/L	1	09/28/18	EPA 8260C	
trans-1,2-Dichloroethene	0.520	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/28/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Vinyl chloride	1.23	---	0.400	ug/L	1	09/28/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>

MW-12 (A810682-03RE2)				Matrix: Water		Batch: 8100454		
Chloroethane	24.5	---	5.00	ug/L	1	10/01/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>

MW-19 (A810682-04)				Matrix: Water		Batch: 8091184		
Bromobenzene	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19 (A810682-04)				Matrix: Water		Batch: 8091184		
Bromochloromethane	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
Bromodichloromethane	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
Bromoform	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
Bromomethane	ND	---	500	ug/L	100	09/27/18	EPA 8260C	
Carbon tetrachloride	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
Chlorobenzene	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	
Chloroethane	ND	---	500	ug/L	100	09/27/18	EPA 8260C	
Chloroform	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
Chloromethane	ND	---	500	ug/L	100	09/27/18	EPA 8260C	
2-Chlorotoluene	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
4-Chlorotoluene	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
Dibromochloromethane	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	500	ug/L	100	09/27/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	
Dibromomethane	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
1,1-Dichloroethane	ND	---	40.0	ug/L	100	09/27/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	40.0	ug/L	100	09/27/18	EPA 8260C	
1,1-Dichloroethene	ND	---	40.0	ug/L	100	09/27/18	EPA 8260C	
cis-1,2-Dichloroethene	1900	---	40.0	ug/L	100	09/27/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	40.0	ug/L	100	09/27/18	EPA 8260C	
1,2-Dichloropropane	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	
1,3-Dichloropropane	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
2,2-Dichloropropane	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
1,1-Dichloropropene	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
Hexachlorobutadiene	ND	---	500	ug/L	100	09/27/18	EPA 8260C	
Methylene chloride	ND	---	300	ug/L	100	09/27/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	40.0	ug/L	100	09/27/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	
Tetrachloroethene (PCE)	3720	---	40.0	ug/L	100	09/27/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	200	ug/L	100	09/27/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	200	ug/L	100	09/27/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	40.0	ug/L	100	09/27/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19 (A810682-04)			Matrix: Water		Batch: 8091184			
Trichloroethene (TCE)	2190	---	40.0	ug/L	100	09/27/18	EPA 8260C	
Trichlorofluoromethane	ND	---	200	ug/L	100	09/27/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
Vinyl chloride	115	---	40.0	ug/L	100	09/27/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>

MW-13 (A810682-05RE1)			Matrix: Water		Batch: 8091289			
Bromobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethane	1.91	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
cis-1,2-Dichloroethene	9.78	---	0.400	ug/L	1	09/29/18	EPA 8260C	
trans-1,2-Dichloroethene	1.26	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	

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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-13 (A810682-05RE1)				Matrix: Water		Batch: 8091289		
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Tetrachloroethene (PCE)	0.410	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Trichloroethene (TCE)	0.800	---	0.400	ug/L	1	09/29/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Vinyl chloride	113	---	0.400	ug/L	1	09/29/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>

MW-13 (A810682-05RE2)				Matrix: Water		Batch: 8100454		
Chloroethane	10.9	---	5.00	ug/L	1	10/01/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>106 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>

MW-10 DUP (A810682-06RE1)				Matrix: Water		Batch: 8091289		
Bromobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-10 DUP (A810682-06RE1)				Matrix: Water		Batch: 8091289		
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/28/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Tetrachloroethene (PCE)	1.76	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Trichloroethene (TCE)	1.54	---	0.400	ug/L	1	09/28/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>

MW-12 DUP (A810682-07RE1)				Matrix: Water		Batch: 8091289		
Bromobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12 DUP (A810682-07RE1)				Matrix: Water		Batch: 8091289		
Bromodichloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloroethane	0.670	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
cis-1,2-Dichloroethene	1.31	---	0.400	ug/L	1	09/28/18	EPA 8260C	
trans-1,2-Dichloroethene	0.500	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/28/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12 DUP (A810682-07RE1)			Matrix: Water		Batch: 8091289			
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Vinyl chloride	1.21	---	0.400	ug/L	1	09/28/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 105 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>
MW-12 DUP (A810682-07RE2)			Matrix: Water		Batch: 8100454			
Chloroethane	23.7	---	5.00	ug/L	1	10/01/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
MW-19 DUP (A810682-08)			Matrix: Water		Batch: 8091184			
Bromobenzene	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	
Bromochloromethane	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
Bromodichloromethane	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
Bromoform	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
Bromomethane	ND	---	500	ug/L	100	09/27/18	EPA 8260C	
Carbon tetrachloride	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
Chlorobenzene	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	
Chloroethane	ND	---	500	ug/L	100	09/27/18	EPA 8260C	
Chloroform	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
Chloromethane	ND	---	500	ug/L	100	09/27/18	EPA 8260C	
2-Chlorotoluene	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
4-Chlorotoluene	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
Dibromochloromethane	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	500	ug/L	100	09/27/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	
Dibromomethane	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
1,1-Dichloroethane	ND	---	40.0	ug/L	100	09/27/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	40.0	ug/L	100	09/27/18	EPA 8260C	
1,1-Dichloroethene	ND	---	40.0	ug/L	100	09/27/18	EPA 8260C	
cis-1,2-Dichloroethene	1960	---	40.0	ug/L	100	09/27/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	40.0	ug/L	100	09/27/18	EPA 8260C	

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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19 DUP (A810682-08)				Matrix: Water		Batch: 8091184		
1,2-Dichloropropane	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	
1,3-Dichloropropane	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
2,2-Dichloropropane	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
1,1-Dichloropropene	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
Hexachlorobutadiene	ND	---	500	ug/L	100	09/27/18	EPA 8260C	
Methylene chloride	ND	---	300	ug/L	100	09/27/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	40.0	ug/L	100	09/27/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	
Tetrachloroethene (PCE)	3830	---	40.0	ug/L	100	09/27/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	200	ug/L	100	09/27/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	200	ug/L	100	09/27/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	40.0	ug/L	100	09/27/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	50.0	ug/L	100	09/27/18	EPA 8260C	
Trichloroethene (TCE)	2270	---	40.0	ug/L	100	09/27/18	EPA 8260C	
Trichlorofluoromethane	ND	---	200	ug/L	100	09/27/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	100	ug/L	100	09/27/18	EPA 8260C	
Vinyl chloride	116	---	40.0	ug/L	100	09/27/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>

MW-1 (A810682-09)				Matrix: Water		Batch: 8091184		
Bromobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-1 (A810682-09)				Matrix: Water		Batch: 8091184		
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,1-Dichloroethane	7.33	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1-Dichloroethene	0.740	---	0.400	ug/L	1	09/27/18	EPA 8260C	
cis-1,2-Dichloroethene	44.9	---	0.400	ug/L	1	09/27/18	EPA 8260C	
trans-1,2-Dichloroethene	0.610	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichloropropane	0.510	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/27/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Tetrachloroethene (PCE)	4.24	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Trichloroethene (TCE)	8.09	---	0.400	ug/L	1	09/27/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Vinyl chloride	3.19	---	0.400	ug/L	1	09/27/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>

MW-6 (A810682-10)				Matrix: Water		Batch: 8091184		
Bromobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-6 (A810682-10)				Matrix: Water		Batch: 8091184		
Bromoform	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/27/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-6 (A810682-10)			Matrix: Water		Batch: 8091184			
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>

MW-2 (A810682-11)			Matrix: Water		Batch: 8091184			
Bromobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-2 (A810682-11)			Matrix: Water		Batch: 8091184			
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/27/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery:</i>	<i>106 %</i>	<i>Limits:</i>	<i>80-120 %</i>	<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>			<i>97 %</i>		<i>80-120 %</i>	<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>			<i>100 %</i>		<i>80-120 %</i>	<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>

MW-16 (A810682-12)			Matrix: Water		Batch: 8091184			
Bromobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	

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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-16 (A810682-12)				Matrix: Water		Batch: 8091184		
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
cis-1,2-Dichloroethene	15.8	---	0.400	ug/L	1	09/27/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/27/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/27/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Tetrachloroethene (PCE)	171	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,1,1-Trichloroethane	0.580	---	0.400	ug/L	1	09/27/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/27/18	EPA 8260C	
Trichloroethene (TCE)	33.9	---	0.400	ug/L	1	09/27/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/27/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/27/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/27/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>	<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>	
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>	<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>	
<i>4-Bromofluorobenzene (Surr)</i>		<i>101 %</i>		<i>80-120 %</i>	<i>1</i>	<i>09/27/18</i>	<i>EPA 8260C</i>	

MW-20i (A810682-13RE1)				Matrix: Water		Batch: 8091289		
Bromobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-20i (A810682-13RE1)				Matrix: Water		Batch: 8091289		
Chloromethane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
cis-1,2-Dichloroethene	7.66	---	0.400	ug/L	1	09/28/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/28/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Tetrachloroethene (PCE)	2.09	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Trichloroethene (TCE)	1.39	---	0.400	ug/L	1	09/28/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
EQ Blank (A810682-14)				Matrix: Water			Batch: 8091140	
Bromobenzene	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/26/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/26/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/26/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/26/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/26/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/26/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/26/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/26/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
EQ Blank (A810682-14)				Matrix: Water		Batch: 8091140		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/26/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/26/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/26/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/26/18</i>	<i>EPA 8260C</i>

Trip Blank (A810682-15)				Matrix: Water		Batch: 8091140		
Bromobenzene	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/26/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/26/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/26/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/26/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A810682-15)				Matrix: Water		Batch: 8091140		
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/26/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/26/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/26/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/26/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/26/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/26/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/26/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/26/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 109 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/26/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/26/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/26/18</i>	<i>EPA 8260C</i>



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ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-8 (A810682-01)				Matrix: Water		Batch: 8091195		
Ammonia as N	ND	---	0.0200	mg/L	1	09/27/18	SM 4500-NH3 G	
MW-10 (A810682-02RE1)				Matrix: Water		Batch: 8091195		
Ammonia as N	37.2	---	1.00	mg/L	50	09/27/18	SM 4500-NH3 G	
MW-12 (A810682-03RE1)				Matrix: Water		Batch: 8091195		
Ammonia as N	126	---	1.00	mg/L	50	09/27/18	SM 4500-NH3 G	
MW-19 (A810682-04RE1)				Matrix: Water		Batch: 8091195		
Ammonia as N	122	---	1.00	mg/L	50	09/27/18	SM 4500-NH3 G	
MW-13 (A810682-05)				Matrix: Water		Batch: 8091195		
Ammonia as N	37.7	---	0.200	mg/L	10	09/27/18	SM 4500-NH3 G	
MW-10 DUP (A810682-06RE1)				Matrix: Water		Batch: 8091195		
Ammonia as N	38.0	---	1.00	mg/L	50	09/27/18	SM 4500-NH3 G	
MW-12 DUP (A810682-07RE1)				Matrix: Water		Batch: 8091195		
Ammonia as N	129	---	1.00	mg/L	50	09/27/18	SM 4500-NH3 G	
MW-19 DUP (A810682-08RE1)				Matrix: Water		Batch: 8091195		
Ammonia as N	125	---	1.00	mg/L	50	09/27/18	SM 4500-NH3 G	
MW-1 (A810682-09RE1)				Matrix: Water		Batch: 8091195		
Ammonia as N	5.79	---	0.0400	mg/L	2	09/27/18	SM 4500-NH3 G	
MW-6 (A810682-10)				Matrix: Water		Batch: 8091195		
Ammonia as N	4.30	---	0.0200	mg/L	1	09/27/18	SM 4500-NH3 G	
MW-2 (A810682-11RE1)				Matrix: Water		Batch: 8091195		
Ammonia as N	9.87	---	0.100	mg/L	5	09/27/18	SM 4500-NH3 G	
MW-16 (A810682-12)				Matrix: Water		Batch: 8091195		
Ammonia as N	ND	---	0.0200	mg/L	1	09/27/18	SM 4500-NH3 G	
MW-20i (A810682-13)				Matrix: Water		Batch: 8091195		

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Lisa Domenighini, Client Services Manager

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12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

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ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-20i (A810682-13)				Matrix: Water		Batch: 8091195		
Ammonia as N	0.244	---	0.0200	mg/L	1	09/27/18	SM 4500-NH3 G	

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-8 (A810682-01)				Matrix: Water				
Batch: 8091146								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	
MW-8 (A810682-01RE1)				Matrix: Water				
Batch: 8091146								
Nitrate-Nitrogen	235	---	12.5	mg/L	50	09/26/18	EPA 300.0	
MW-10 (A810682-02)				Matrix: Water				
Batch: 8091146								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	
MW-10 (A810682-02RE1)				Matrix: Water				
Batch: 8091146								
Nitrate-Nitrogen	413	---	12.5	mg/L	50	09/26/18	EPA 300.0	
MW-12 (A810682-03)				Matrix: Water				
Batch: 8091146								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	
MW-19 (A810682-04)				Matrix: Water				
Batch: 8091146								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	
MW-19 (A810682-04RE1)				Matrix: Water				
Batch: 8091146								
Nitrate-Nitrogen	120	---	12.5	mg/L	50	09/26/18	EPA 300.0	
MW-13 (A810682-05)				Matrix: Water				
Batch: 8091146								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	
MW-10 DUP (A810682-06)				Matrix: Water				
Batch: 8091146								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-10 DUP (A810682-06RE1)				Matrix: Water				
Batch: 8091146								
Nitrate-Nitrogen	412	---	12.5	mg/L	50	09/27/18	EPA 300.0	
MW-12 DUP (A810682-07)				Matrix: Water				
Batch: 8091146								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	
MW-19 DUP (A810682-08)				Matrix: Water				
Batch: 8091146								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	
MW-19 DUP (A810682-08RE1)				Matrix: Water				
Batch: 8091146								
Nitrate-Nitrogen	121	---	12.5	mg/L	50	09/27/18	EPA 300.0	
MW-1 (A810682-09)				Matrix: Water				
Batch: 8091146								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	
MW-6 (A810682-10)				Matrix: Water				
Batch: 8091146								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	
MW-2 (A810682-11)				Matrix: Water				
Batch: 8091146								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	
MW-16 (A810682-12)				Matrix: Water				
Batch: 8091146								
Nitrate-Nitrogen	6.10	---	0.250	mg/L	1	09/26/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	

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Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-20i (A810682-13)				Matrix: Water				
Batch: 8091146								
Nitrate-Nitrogen	1.11	---	0.250	mg/L	1	09/26/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/26/18	EPA 300.0	

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ANALYTICAL SAMPLE RESULTS

Demand Parameters

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12 (A810682-03RE2)				Matrix: Water				
Batch: 8091225								
Total Organic Carbon	79.5	---	10.0	mg/L	10	09/28/18	SM 5310 C	
MW-19 (A810682-04RE1)				Matrix: Water				
Batch: 8091225								
Total Organic Carbon	16.8	---	1.00	mg/L	1	09/28/18	SM 5310 C	
MW-13 (A810682-05RE2)				Matrix: Water				
Batch: 8091225								
Total Organic Carbon	20.8	---	2.00	mg/L	2	09/28/18	SM 5310 C	



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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091140 - EPA 5030B						Water						
Blank (8091140-BLK1)		Prepared: 09/26/18 11:01		Analyzed: 09/26/18 12:26								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar 3Q2018**
Project Manager: **Stephanie Salisbury**

Report ID:
A810682 - 10 12 18 1056

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091140 - EPA 5030B												
Water												
Blank (8091140-BLK1)	Prepared: 09/26/18 11:01 Analyzed: 09/26/18 12:26											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 105 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	106 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	106 %		80-120 %		"							

LCS (8091140-BS1)												
Prepared: 09/26/18 11:01 Analyzed: 09/26/18 11:29												
EPA 8260C												
Bromobenzene	20.2	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Bromochloromethane	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Bromodichloromethane	20.8	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
Bromoform	22.5	---	1.00	ug/L	1	20.0	---	113	80-120%	---	---	
Bromomethane	22.7	---	5.00	ug/L	1	20.0	---	114	80-120%	---	---	EST
Carbon tetrachloride	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Chlorobenzene	19.5	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
Chloroethane	19.5	---	5.00	ug/L	1	20.0	---	98	80-120%	---	---	
Chloroform	20.2	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Chloromethane	14.9	---	5.00	ug/L	1	20.0	---	74	80-120%	---	---	Q-55
2-Chlorotoluene	22.7	---	1.00	ug/L	1	20.0	---	113	80-120%	---	---	
4-Chlorotoluene	22.1	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
Dibromochloromethane	22.0	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
1,2-Dibromo-3-chloropropane	23.2	---	5.00	ug/L	1	20.0	---	116	80-120%	---	---	
1,2-Dibromoethane (EDB)	21.5	---	0.500	ug/L	1	20.0	---	108	80-120%	---	---	
Dibromomethane	21.2	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
1,2-Dichlorobenzene	20.6	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091140 - EPA 5030B												
Water												
LCS (8091140-BS1)	Prepared: 09/26/18 11:01 Analyzed: 09/26/18 11:29											
1,3-Dichlorobenzene	21.3	---	0.500	ug/L	1	20.0	---	106	80-120%	---	---	
1,4-Dichlorobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Dichlorodifluoromethane	18.7	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
1,1-Dichloroethane	19.4	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
1,2-Dichloroethane (EDC)	18.9	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
1,1-Dichloroethene	19.1	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
cis-1,2-Dichloroethene	19.6	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
trans-1,2-Dichloroethene	19.4	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
1,2-Dichloropropane	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
1,3-Dichloropropane	20.1	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
2,2-Dichloropropane	22.1	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
1,1-Dichloropropene	20.0	---	1.00	ug/L	1	20.0	---	100	80-120%	---	---	
cis-1,3-Dichloropropene	21.3	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
trans-1,3-Dichloropropene	22.2	---	1.00	ug/L	1	20.0	---	111	80-120%	---	---	
Hexachlorobutadiene	19.6	---	5.00	ug/L	1	20.0	---	98	80-120%	---	---	
Methylene chloride	18.5	---	3.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1,1,2-Tetrachloroethane	20.8	---	0.400	ug/L	1	20.0	---	104	80-120%	---	---	
1,1,2,2-Tetrachloroethane	22.1	---	0.500	ug/L	1	20.0	---	110	80-120%	---	---	
Tetrachloroethene (PCE)	18.1	---	0.400	ug/L	1	20.0	---	90	80-120%	---	---	
1,2,3-Trichlorobenzene	22.2	---	2.00	ug/L	1	20.0	---	111	80-120%	---	---	
1,2,4-Trichlorobenzene	20.9	---	2.00	ug/L	1	20.0	---	104	80-120%	---	---	
1,1,1-Trichloroethane	20.0	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,1,2-Trichloroethane	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Trichloroethene (TCE)	18.8	---	0.400	ug/L	1	20.0	---	94	80-120%	---	---	
Trichlorofluoromethane	18.5	---	2.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,2,3-Trichloropropane	22.4	---	1.00	ug/L	1	20.0	---	112	80-120%	---	---	
Vinyl chloride	19.1	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 101 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	102 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	101 %		80-120 %		"							

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091152 - EPA 5030B						Water						
Blank (8091152-BLK1)		Prepared: 09/26/18 13:01		Analyzed: 09/26/18 15:19								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091152 - EPA 5030B												
Water												
Blank (8091152-BLK1)	Prepared: 09/26/18 13:01 Analyzed: 09/26/18 15:19											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 103 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	98 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	97 %		80-120 %		"							

LCS (8091152-BS3)												
Prepared: 09/26/18 13:01 Analyzed: 09/26/18 14:24												
EPA 8260C												
Bromobenzene	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Bromochloromethane	21.5	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
Bromodichloromethane	17.9	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
Bromoform	14.4	---	1.00	ug/L	1	20.0	---	72	80-120%	---	---	Q-55
Bromomethane	22.9	---	5.00	ug/L	1	20.0	---	115	80-120%	---	---	
Carbon tetrachloride	16.7	---	1.00	ug/L	1	20.0	---	84	80-120%	---	---	
Chlorobenzene	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Chloroethane	26.9	---	5.00	ug/L	1	20.0	---	134	80-120%	---	---	Q-56
Chloroform	19.2	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
Chloromethane	17.7	---	5.00	ug/L	1	20.0	---	89	80-120%	---	---	
2-Chlorotoluene	19.1	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
4-Chlorotoluene	18.0	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
Dibromochloromethane	17.0	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
1,2-Dibromo-3-chloropropane	17.0	---	5.00	ug/L	1	20.0	---	85	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.6	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
Dibromomethane	20.4	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
1,2-Dichlorobenzene	19.7	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091152 - EPA 5030B						Water						
LCS (8091152-BS3)			Prepared: 09/26/18 13:01		Analyzed: 09/26/18 14:24							
1,3-Dichlorobenzene	19.3	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
1,4-Dichlorobenzene	19.0	---	0.500	ug/L	1	20.0	---	95	80-120%	---	---	
Dichlorodifluoromethane	20.7	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
1,1-Dichloroethane	18.9	---	0.400	ug/L	1	20.0	---	94	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.7	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
1,1-Dichloroethene	20.1	---	0.400	ug/L	1	20.0	---	101	80-120%	---	---	
cis-1,2-Dichloroethene	19.5	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
trans-1,2-Dichloroethene	19.0	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
1,2-Dichloropropane	19.0	---	0.500	ug/L	1	20.0	---	95	80-120%	---	---	
1,3-Dichloropropane	19.4	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
2,2-Dichloropropane	13.7	---	1.00	ug/L	1	20.0	---	69	80-120%	---	---	Q-55
1,1-Dichloropropene	19.5	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
cis-1,3-Dichloropropene	15.8	---	1.00	ug/L	1	20.0	---	79	80-120%	---	---	Q-55
trans-1,3-Dichloropropene	15.2	---	1.00	ug/L	1	20.0	---	76	80-120%	---	---	Q-55
Hexachlorobutadiene	19.0	---	5.00	ug/L	1	20.0	---	95	80-120%	---	---	
Methylene chloride	18.7	---	3.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1,1,2-Tetrachloroethane	17.5	---	0.400	ug/L	1	20.0	---	87	80-120%	---	---	
1,1,2,2-Tetrachloroethane	21.0	---	0.500	ug/L	1	20.0	---	105	80-120%	---	---	
Tetrachloroethene (PCE)	19.7	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
1,2,3-Trichlorobenzene	20.2	---	2.00	ug/L	1	20.0	---	101	80-120%	---	---	
1,2,4-Trichlorobenzene	19.6	---	2.00	ug/L	1	20.0	---	98	80-120%	---	---	
1,1,1-Trichloroethane	17.2	---	0.400	ug/L	1	20.0	---	86	80-120%	---	---	
1,1,2-Trichloroethane	18.9	---	0.500	ug/L	1	20.0	---	94	80-120%	---	---	
Trichloroethene (TCE)	20.3	---	0.400	ug/L	1	20.0	---	101	80-120%	---	---	
Trichlorofluoromethane	22.3	---	2.00	ug/L	1	20.0	---	112	80-120%	---	---	
1,2,3-Trichloropropane	20.5	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
Vinyl chloride	19.0	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 105 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>"</i>						



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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091184 - EPA 5030B						Water						
Blank (8091184-BLK1)	Prepared: 09/27/18 09:00					Analyzed: 09/27/18 13:39						
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091184 - EPA 5030B												
Water												
Blank (8091184-BLK1)	Prepared: 09/27/18 09:00 Analyzed: 09/27/18 13:39											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 106 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	99 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	100 %		80-120 %		"							

LCS (8091184-BS4)												
Prepared: 09/27/18 09:00 Analyzed: 09/27/18 12:42												
EPA 8260C												
Bromobenzene	19.7	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
Bromochloromethane	21.8	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Bromodichloromethane	18.0	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
Bromoform	15.4	---	1.00	ug/L	1	20.0	---	77	80-120%	---	---	Q-55
Bromomethane	20.9	---	5.00	ug/L	1	20.0	---	105	80-120%	---	---	
Carbon tetrachloride	16.9	---	1.00	ug/L	1	20.0	---	84	80-120%	---	---	
Chlorobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Chloroethane	23.9	---	5.00	ug/L	1	20.0	---	119	80-120%	---	---	
Chloroform	19.4	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
Chloromethane	20.7	---	5.00	ug/L	1	20.0	---	103	80-120%	---	---	
2-Chlorotoluene	19.7	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
4-Chlorotoluene	18.1	---	1.00	ug/L	1	20.0	---	91	80-120%	---	---	
Dibromochloromethane	17.2	---	1.00	ug/L	1	20.0	---	86	80-120%	---	---	
1,2-Dibromo-3-chloropropane	18.6	---	5.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.6	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
Dibromomethane	20.8	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
1,2-Dichlorobenzene	20.4	---	0.500	ug/L	1	20.0	---	102	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091184 - EPA 5030B												
Water												
LCS (8091184-BS4)												
			Prepared: 09/27/18 09:00			Analyzed: 09/27/18 12:42						
1,3-Dichlorobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
1,4-Dichlorobenzene	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Dichlorodifluoromethane	20.1	---	1.00	ug/L	1	20.0	---	100	80-120%	---	---	
1,1-Dichloroethane	18.8	---	0.400	ug/L	1	20.0	---	94	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
1,1-Dichloroethene	19.7	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
cis-1,2-Dichloroethene	19.4	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
trans-1,2-Dichloroethene	18.6	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
1,2-Dichloropropane	19.0	---	0.500	ug/L	1	20.0	---	95	80-120%	---	---	
1,3-Dichloropropane	19.4	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
2,2-Dichloropropane	12.8	---	1.00	ug/L	1	20.0	---	64	80-120%	---	---	Q-55
1,1-Dichloropropene	19.4	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
cis-1,3-Dichloropropene	15.4	---	1.00	ug/L	1	20.0	---	77	80-120%	---	---	Q-55
trans-1,3-Dichloropropene	14.6	---	1.00	ug/L	1	20.0	---	73	80-120%	---	---	Q-55
Hexachlorobutadiene	19.6	---	5.00	ug/L	1	20.0	---	98	80-120%	---	---	
Methylene chloride	19.0	---	3.00	ug/L	1	20.0	---	95	80-120%	---	---	
1,1,1,2-Tetrachloroethane	18.0	---	0.400	ug/L	1	20.0	---	90	80-120%	---	---	
1,1,2,2-Tetrachloroethane	21.0	---	0.500	ug/L	1	20.0	---	105	80-120%	---	---	
Tetrachloroethene (PCE)	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
1,2,3-Trichlorobenzene	21.0	---	2.00	ug/L	1	20.0	---	105	80-120%	---	---	
1,2,4-Trichlorobenzene	20.2	---	2.00	ug/L	1	20.0	---	101	80-120%	---	---	
1,1,1-Trichloroethane	17.1	---	0.400	ug/L	1	20.0	---	85	80-120%	---	---	
1,1,2-Trichloroethane	19.1	---	0.500	ug/L	1	20.0	---	95	80-120%	---	---	
Trichloroethene (TCE)	20.7	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
Trichlorofluoromethane	23.3	---	2.00	ug/L	1	20.0	---	117	80-120%	---	---	
1,2,3-Trichloropropane	20.1	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Vinyl chloride	19.7	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr) Recovery: 104 % Limits: 80-120 % Dilution: 1x												
Toluene-d8 (Surr) 97 % 80-120 % "												
4-Bromofluorobenzene (Surr) 97 % 80-120 % "												

Duplicate (8091184-DUP1) Prepared: 09/27/18 14:57 Analyzed: 09/27/18 19:45

QC Source Sample: MW-19 (A810682-04)

EPA 8260C

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091184 - EPA 5030B												
Water												
Duplicate (8091184-DUP1)			Prepared: 09/27/18 14:57 Analyzed: 09/27/18 19:45									
QC Source Sample: MW-19 (A810682-04)												
Bromobenzene	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
Bromoform	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
Bromomethane	ND	---	500	ug/L	100	---	ND	---	---	---	30%	
Carbon tetrachloride	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
Chloroethane	ND	---	500	ug/L	100	---	ND	---	---	---	30%	
Chloroform	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
Chloromethane	ND	---	500	ug/L	100	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	500	ug/L	100	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
Dibromomethane	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
1,1-Dichloroethane	ND	---	40.0	ug/L	100	---	26.0	---	---	***	30%	
1,2-Dichloroethane (EDC)	ND	---	40.0	ug/L	100	---	ND	---	---	---	30%	
1,1-Dichloroethene	ND	---	40.0	ug/L	100	---	35.0	---	---	***	30%	
cis-1,2-Dichloroethene	1730	---	40.0	ug/L	100	---	1900	---	---	10	30%	
trans-1,2-Dichloroethene	ND	---	40.0	ug/L	100	---	ND	---	---	---	30%	
1,2-Dichloropropane	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	500	ug/L	100	---	ND	---	---	---	30%	
Methylene chloride	ND	---	300	ug/L	100	---	ND	---	---	---	30%	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091184 - EPA 5030B												
Water												
Duplicate (8091184-DUP1)												
Prepared: 09/27/18 14:57 Analyzed: 09/27/18 19:45												
QC Source Sample: MW-19 (A810682-04)												
1,1,1,2-Tetrachloroethane	ND	---	40.0	ug/L	100	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	3530	---	40.0	ug/L	100	---	3720	---	---	5	30%	
1,2,3-Trichlorobenzene	ND	---	200	ug/L	100	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	200	ug/L	100	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	ND	---	40.0	ug/L	100	---	26.0	---	---	***	30%	
1,1,2-Trichloroethane	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
Trichloroethene (TCE)	2040	---	40.0	ug/L	100	---	2190	---	---	7	30%	
Trichlorofluoromethane	ND	---	200	ug/L	100	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
Vinyl chloride	108	---	40.0	ug/L	100	---	115	---	---	6	30%	

Surr: 1,4-Difluorobenzene (Surr)	Recovery: 107 %	Limits: 80-120 %	Dilution: 1x
Toluene-d8 (Surr)	98 %	80-120 %	"
4-Bromofluorobenzene (Surr)	99 %	80-120 %	"

Matrix Spike (8091184-MS1) Prepared: 09/27/18 14:57 Analyzed: 09/27/18 17:54

QC Source Sample: MW-20i (A810682-13)												
EPA 8260C												
Bromobenzene	19.8	---	0.500	ug/L	1	20.0	ND	99	80-120%	---	---	
Bromochloromethane	20.7	---	1.00	ug/L	1	20.0	ND	104	78-123%	---	---	
Bromodichloromethane	17.3	---	1.00	ug/L	1	20.0	ND	87	79-125%	---	---	
Bromoform	13.8	---	1.00	ug/L	1	20.0	ND	69	66-130%	---	---	Q-54i
Bromomethane	22.7	---	5.00	ug/L	1	20.0	ND	114	53-141%	---	---	
Carbon tetrachloride	17.3	---	1.00	ug/L	1	20.0	ND	86	72-136%	---	---	
Chlorobenzene	19.9	---	0.500	ug/L	1	20.0	ND	99	80-120%	---	---	
Chloroethane	41.2	---	5.00	ug/L	1	20.0	ND	206	60-138%	---	---	Q-01
Chloroform	19.1	---	1.00	ug/L	1	20.0	ND	95	79-124%	---	---	
Chloromethane	19.4	---	5.00	ug/L	1	20.0	ND	97	50-139%	---	---	
2-Chlorotoluene	19.7	---	1.00	ug/L	1	20.0	ND	98	79-122%	---	---	
4-Chlorotoluene	17.8	---	1.00	ug/L	1	20.0	ND	89	78-122%	---	---	
Dibromochloromethane	16.5	---	1.00	ug/L	1	20.0	ND	83	74-126%	---	---	
1,2-Dibromo-3-chloropropane	13.7	---	5.00	ug/L	1	20.0	ND	69	62-128%	---	---	
1,2-Dibromoethane (EDB)	18.2	---	0.500	ug/L	1	20.0	ND	91	77-121%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC % REC	% REC Limits	RPD RPD	RPD Limit	Notes
Batch 8091184 - EPA 5030B						Water						
Matrix Spike (8091184-MS1)			Prepared: 09/27/18 14:57 Analyzed: 09/27/18 17:54									
QC Source Sample: MW-20i (A810682-13)												
Dibromomethane	19.0	---	1.00	ug/L	1	20.0	ND	95	79-123%	---	---	
1,2-Dichlorobenzene	19.8	---	0.500	ug/L	1	20.0	ND	99	80-120%	---	---	
1,3-Dichlorobenzene	19.7	---	0.500	ug/L	1	20.0	ND	99	80-120%	---	---	
1,4-Dichlorobenzene	19.3	---	0.500	ug/L	1	20.0	ND	97	79-120%	---	---	
Dichlorodifluoromethane	20.0	---	1.00	ug/L	1	20.0	ND	100	32-152%	---	---	
1,1-Dichloroethane	18.6	---	0.400	ug/L	1	20.0	0.320	91	77-125%	---	---	
1,2-Dichloroethane (EDC)	18.4	---	0.400	ug/L	1	20.0	ND	92	73-128%	---	---	
1,1-Dichloroethene	17.7	---	0.400	ug/L	1	20.0	ND	88	71-131%	---	---	
cis-1,2-Dichloroethene	25.8	---	0.400	ug/L	1	20.0	7.24	93	78-123%	---	---	
trans-1,2-Dichloroethene	18.4	---	0.400	ug/L	1	20.0	ND	92	75-124%	---	---	
1,2-Dichloropropane	18.1	---	0.500	ug/L	1	20.0	ND	91	78-122%	---	---	
1,3-Dichloropropane	18.2	---	1.00	ug/L	1	20.0	ND	91	80-120%	---	---	
2,2-Dichloropropane	12.1	---	1.00	ug/L	1	20.0	ND	60	60-139%	---	---	Q-54f
1,1-Dichloropropene	18.9	---	1.00	ug/L	1	20.0	ND	94	79-125%	---	---	
cis-1,3-Dichloropropene	14.1	---	1.00	ug/L	1	20.0	ND	70	75-124%	---	---	Q-54j
trans-1,3-Dichloropropene	13.6	---	1.00	ug/L	1	20.0	ND	68	73-127%	---	---	Q-54n
Hexachlorobutadiene	18.9	---	5.00	ug/L	1	20.0	ND	95	66-134%	---	---	
Methylene chloride	18.1	---	3.00	ug/L	1	20.0	ND	90	74-124%	---	---	
1,1,1,2-Tetrachloroethane	18.0	---	0.400	ug/L	1	20.0	ND	90	78-124%	---	---	
1,1,2,2-Tetrachloroethane	19.4	---	0.500	ug/L	1	20.0	ND	97	71-121%	---	---	
Tetrachloroethene (PCE)	22.7	---	0.400	ug/L	1	20.0	2.67	100	74-129%	---	---	
1,2,3-Trichlorobenzene	20.7	---	2.00	ug/L	1	20.0	ND	103	69-129%	---	---	
1,2,4-Trichlorobenzene	19.9	---	2.00	ug/L	1	20.0	ND	100	69-130%	---	---	
1,1,1-Trichloroethane	17.0	---	0.400	ug/L	1	20.0	ND	85	74-131%	---	---	
1,1,2-Trichloroethane	18.0	---	0.500	ug/L	1	20.0	ND	90	80-120%	---	---	
Trichloroethene (TCE)	21.8	---	0.400	ug/L	1	20.0	1.42	102	79-123%	---	---	
Trichlorofluoromethane	22.2	---	2.00	ug/L	1	20.0	ND	111	65-141%	---	---	
1,2,3-Trichloropropane	18.1	---	1.00	ug/L	1	20.0	ND	91	73-122%	---	---	
Vinyl chloride	18.9	---	0.400	ug/L	1	20.0	ND	94	58-137%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		Recovery: 103 %		Limits: 80-120 %		Dilution: 1x						
Toluene-d8 (Surr)		98 %		80-120 %		"						
4-Bromofluorobenzene (Surr)		98 %		80-120 %		"						

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091289 - EPA 5030B						Water						
Blank (8091289-BLK1)		Prepared: 09/28/18 15:29			Analyzed: 09/28/18 17:03							
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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Lisa Domenighini, Client Services Manager



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar 3Q2018**
Project Manager: **Stephanie Salisbury**

Report ID:
A810682 - 10 12 18 1056

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091289 - EPA 5030B												
Water												
Blank (8091289-BLK1)	Prepared: 09/28/18 15:29 Analyzed: 09/28/18 17:03											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 106 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	98 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	100 %		80-120 %		"							

LCS (8091289-BS1)												
Prepared: 09/28/18 15:29 Analyzed: 09/28/18 16:06												
EPA 8260C												
Bromobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Bromochloromethane	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Bromodichloromethane	18.1	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
Bromoform	15.3	---	1.00	ug/L	1	20.0	---	76	80-120%	---	---	Q-55
Bromomethane	23.4	---	5.00	ug/L	1	20.0	---	117	80-120%	---	---	
Carbon tetrachloride	16.2	---	1.00	ug/L	1	20.0	---	81	80-120%	---	---	
Chlorobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Chloroethane	24.5	---	5.00	ug/L	1	20.0	---	122	80-120%	---	---	Q-56
Chloroform	19.3	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
Chloromethane	19.7	---	5.00	ug/L	1	20.0	---	98	80-120%	---	---	
2-Chlorotoluene	18.6	---	1.00	ug/L	1	20.0	---	93	80-120%	---	---	
4-Chlorotoluene	17.2	---	1.00	ug/L	1	20.0	---	86	80-120%	---	---	
Dibromochloromethane	17.1	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
1,2-Dibromo-3-chloropropane	17.8	---	5.00	ug/L	1	20.0	---	89	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Dibromomethane	20.8	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
1,2-Dichlorobenzene	19.5	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	

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Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091289 - EPA 5030B												
						Water						
LCS (8091289-BS1)												
			Prepared: 09/28/18 15:29			Analyzed: 09/28/18 16:06						
1,3-Dichlorobenzene	19.0	---	0.500	ug/L	1	20.0	---	95	80-120%	---	---	
1,4-Dichlorobenzene	18.8	---	0.500	ug/L	1	20.0	---	94	80-120%	---	---	
Dichlorodifluoromethane	18.6	---	1.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1-Dichloroethane	18.1	---	0.400	ug/L	1	20.0	---	90	80-120%	---	---	
1,2-Dichloroethane (EDC)	20.1	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,1-Dichloroethene	18.5	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
cis-1,2-Dichloroethene	18.9	---	0.400	ug/L	1	20.0	---	94	80-120%	---	---	
trans-1,2-Dichloroethene	18.0	---	0.400	ug/L	1	20.0	---	90	80-120%	---	---	
1,2-Dichloropropane	18.6	---	0.500	ug/L	1	20.0	---	93	80-120%	---	---	
1,3-Dichloropropane	19.2	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
2,2-Dichloropropane	11.9	---	1.00	ug/L	1	20.0	---	59	80-120%	---	---	Q-55
1,1-Dichloropropene	18.4	---	1.00	ug/L	1	20.0	---	92	80-120%	---	---	
cis-1,3-Dichloropropene	14.6	---	1.00	ug/L	1	20.0	---	73	80-120%	---	---	Q-55
trans-1,3-Dichloropropene	14.1	---	1.00	ug/L	1	20.0	---	70	80-120%	---	---	Q-55
Hexachlorobutadiene	18.4	---	5.00	ug/L	1	20.0	---	92	80-120%	---	---	
Methylene chloride	18.7	---	3.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1,1,2-Tetrachloroethane	17.7	---	0.400	ug/L	1	20.0	---	88	80-120%	---	---	
1,1,2,2-Tetrachloroethane	20.7	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
Tetrachloroethene (PCE)	18.5	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
1,2,3-Trichlorobenzene	20.6	---	2.00	ug/L	1	20.0	---	103	80-120%	---	---	
1,2,4-Trichlorobenzene	19.6	---	2.00	ug/L	1	20.0	---	98	80-120%	---	---	
1,1,1-Trichloroethane	16.4	---	0.400	ug/L	1	20.0	---	82	80-120%	---	---	
1,1,2-Trichloroethane	18.8	---	0.500	ug/L	1	20.0	---	94	80-120%	---	---	
Trichloroethene (TCE)	20.4	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
Trichlorofluoromethane	22.6	---	2.00	ug/L	1	20.0	---	113	80-120%	---	---	
1,2,3-Trichloropropane	20.8	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
Vinyl chloride	18.8	---	0.400	ug/L	1	20.0	---	94	80-120%	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 105 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>96 %</i>		<i>80-120 %</i>		<i>"</i>						

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Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100454 - EPA 5030B						Water						
Blank (8100454-BLK1)		Prepared: 10/01/18 10:37 Analyzed: 10/01/18 12:59										
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar 3Q2018**
Project Manager: **Stephanie Salisbury**

Report ID:
A810682 - 10 12 18 1056

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100454 - EPA 5030B												
Water												
Blank (8100454-BLK1)	Prepared: 10/01/18 10:37 Analyzed: 10/01/18 12:59											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 110 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>"</i>						

LCS (8100454-BS2)												
Prepared: 10/01/18 10:37 Analyzed: 10/01/18 11:34												
EPA 8260C												
Bromobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Bromochloromethane	23.5	---	1.00	ug/L	1	20.0	---	118	80-120%	---	---	
Bromodichloromethane	21.6	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
Bromoform	22.3	---	1.00	ug/L	1	20.0	---	112	80-120%	---	---	
Bromomethane	29.6	---	5.00	ug/L	1	20.0	---	148	80-120%	---	---	EST, Q-56
Carbon tetrachloride	20.9	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Chlorobenzene	20.1	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Chloroethane	21.1	---	5.00	ug/L	1	20.0	---	106	80-120%	---	---	
Chloroform	20.9	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Chloromethane	15.6	---	5.00	ug/L	1	20.0	---	78	80-120%	---	---	Q-55
2-Chlorotoluene	22.1	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
4-Chlorotoluene	21.8	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Dibromochloromethane	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
1,2-Dibromo-3-chloropropane	21.2	---	5.00	ug/L	1	20.0	---	106	80-120%	---	---	
1,2-Dibromoethane (EDB)	20.9	---	0.500	ug/L	1	20.0	---	105	80-120%	---	---	
Dibromomethane	21.6	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
1,2-Dichlorobenzene	20.6	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100454 - EPA 5030B												
Water												
LCS (8100454-BS2)	Prepared: 10/01/18 10:37 Analyzed: 10/01/18 11:34											
1,3-Dichlorobenzene	21.2	---	0.500	ug/L	1	20.0	---	106	80-120%	---	---	
1,4-Dichlorobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Dichlorodifluoromethane	17.0	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
1,1-Dichloroethane	20.6	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.9	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
1,1-Dichloroethene	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
cis-1,2-Dichloroethene	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
trans-1,2-Dichloroethene	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
1,2-Dichloropropane	20.3	---	0.500	ug/L	1	20.0	---	102	80-120%	---	---	
1,3-Dichloropropane	19.7	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
2,2-Dichloropropane	23.2	---	1.00	ug/L	1	20.0	---	116	80-120%	---	---	
1,1-Dichloropropene	20.4	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
cis-1,3-Dichloropropene	20.2	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
trans-1,3-Dichloropropene	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Hexachlorobutadiene	19.7	---	5.00	ug/L	1	20.0	---	98	80-120%	---	---	
Methylene chloride	19.9	---	3.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,1,1,2-Tetrachloroethane	21.4	---	0.400	ug/L	1	20.0	---	107	80-120%	---	---	
1,1,2,2-Tetrachloroethane	21.3	---	0.500	ug/L	1	20.0	---	107	80-120%	---	---	
Tetrachloroethene (PCE)	18.6	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
1,2,3-Trichlorobenzene	21.3	---	2.00	ug/L	1	20.0	---	107	80-120%	---	---	
1,2,4-Trichlorobenzene	19.8	---	2.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,1,1-Trichloroethane	21.5	---	0.400	ug/L	1	20.0	---	107	80-120%	---	---	
1,1,2-Trichloroethane	20.3	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Trichloroethene (TCE)	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
Trichlorofluoromethane	20.3	---	2.00	ug/L	1	20.0	---	101	80-120%	---	---	
1,2,3-Trichloropropane	21.0	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Vinyl chloride	20.5	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 100 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	100 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	97 %		80-120 %		"							



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QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091195 - Method Prep: Aq						Water						
Blank (8091195-BLK1)		Prepared: 09/27/18 10:27 Analyzed: 09/27/18 14:52										
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (8091195-BS1)		Prepared: 09/27/18 10:27 Analyzed: 09/27/18 14:54										
SM 4500-NH3 G												
Ammonia as N	2.11	---	0.0200	mg/L	1	2.00	---	105	90-110%	---	---	



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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091146 - Method Prep: Aq						Water						
Blank (8091146-BLK1)			Prepared: 09/26/18 11:10		Analyzed: 09/26/18 13:20							
<u>EPA 300.0</u>												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
LCS (8091146-BS1)			Prepared: 09/26/18 11:10		Analyzed: 09/26/18 13:41							
<u>EPA 300.0</u>												
Nitrate-Nitrogen	1.99	---	0.250	mg/L	1	2.00	---	99	90-110%	---	---	
Nitrite-Nitrogen	1.94	---	0.250	mg/L	1	2.00	---	97	90-110%	---	---	
Duplicate (8091146-DUP1)			Prepared: 09/26/18 11:10		Analyzed: 09/26/18 14:25							
<u>QC Source Sample: MW-8 (A810682-01)</u>												
<u>EPA 300.0</u>												
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	15%	
Duplicate (8091146-DUP2)			Prepared: 09/26/18 11:10		Analyzed: 09/26/18 15:30							
<u>QC Source Sample: MW-10 (A810682-02)</u>												
<u>EPA 300.0</u>												
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	15%	
Duplicate (8091146-DUP3)			Prepared: 09/26/18 11:10		Analyzed: 09/26/18 22:02							
<u>QC Source Sample: MW-8 (A810682-01RE1)</u>												
<u>EPA 300.0</u>												
Nitrate-Nitrogen	236	---	12.5	mg/L	50	---	235	---	---	0.3	10%	Q-16
Duplicate (8091146-DUP4)			Prepared: 09/26/18 11:10		Analyzed: 09/26/18 23:07							
<u>QC Source Sample: MW-10 (A810682-02RE1)</u>												
<u>EPA 300.0</u>												
Nitrate-Nitrogen	417	---	12.5	mg/L	50	---	413	---	---	1	10%	Q-16
Matrix Spike (8091146-MS1)			Prepared: 09/26/18 11:10		Analyzed: 09/26/18 14:47							
<u>QC Source Sample: MW-8 (A810682-01)</u>												
<u>EPA 300.0</u>												
Nitrite-Nitrogen	2.30	---	0.312	mg/L	1	2.50	ND	92	80-120%	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091146 - Method Prep: Aq						Water						
Matrix Spike (8091146-MS2)			Prepared: 09/26/18 11:10 Analyzed: 09/26/18 15:52									
<u>QC Source Sample: MW-10 (A810682-02)</u>												
<u>EPA 300.0</u>												
Nitrite-Nitrogen	2.25	---	0.312	mg/L	1	2.50	ND	90	80-120%	---	---	
Matrix Spike (8091146-MS3)			Prepared: 09/26/18 11:10 Analyzed: 09/26/18 22:24									
<u>QC Source Sample: MW-8 (A810682-01RE1)</u>												
<u>EPA 300.0</u>												
Nitrate-Nitrogen	332	---	12.5	mg/L	50	100	235	96	80-120%	---	---	Q-16
Matrix Spike (8091146-MS5)			Prepared: 09/26/18 11:10 Analyzed: 09/27/18 07:54									
<u>QC Source Sample: MW-10 (A810682-02RE1)</u>												
<u>EPA 300.0</u>												
Nitrate-Nitrogen	611	---	25.0	mg/L	100	200	413	99	80-120%	---	---	Q-16



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QUALITY CONTROL (QC) SAMPLE RESULTS

Demand Parameters

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091150 - Method Prep: Aq						Water						
Blank (8091150-BLK1)		Prepared: 09/26/18 11:30 Analyzed: 09/26/18 15:08										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	---
LCS (8091150-BS1)		Prepared: 09/26/18 11:30 Analyzed: 09/26/18 15:37										
SM 5310 C												
Total Organic Carbon	10.4	---	1.00	mg/L	1	10.0	---	104	85-115%	---	---	---
LCS (8091150-BS2)		Prepared: 09/26/18 11:30 Analyzed: 09/26/18 16:06										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	0.00	---		85-115%	---	---	TOC_I



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QUALITY CONTROL (QC) SAMPLE RESULTS

Demand Parameters

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091225 - Method Prep: Aq						Water						
Blank (8091225-BLK1)		Prepared: 09/27/18 15:10 Analyzed: 09/27/18 18:18										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	---
LCS (8091225-BS1)		Prepared: 09/27/18 15:10 Analyzed: 09/27/18 18:47										
SM 5310 C												
Total Organic Carbon	10.8	---	1.00	mg/L	1	10.0	---	108	85-115%	---	---	---
LCS (8091225-BS2)		Prepared: 09/27/18 15:10 Analyzed: 09/27/18 19:17										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	0.00	---		85-115%	---	---	TOC_1



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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SAMPLE PREPARATION INFORMATION

Halogenated Volatile Organic Compounds by EPA 8260C

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8091140</u>							
A8I0682-14	Water	EPA 8260C	09/25/18 15:40	09/26/18 12:19	5mL/5mL	5mL/5mL	1.00
A8I0682-15	Water	EPA 8260C	09/25/18 00:00	09/26/18 12:19	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8091152</u>							
A8I0682-01	Water	EPA 8260C	09/25/18 08:15	09/26/18 14:53	5mL/5mL	5mL/5mL	1.00
A8I0682-02	Water	EPA 8260C	09/25/18 09:00	09/26/18 14:53	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8091184</u>							
A8I0682-04	Water	EPA 8260C	09/25/18 11:05	09/27/18 14:57	5mL/5mL	5mL/5mL	1.00
A8I0682-08	Water	EPA 8260C	09/25/18 11:05	09/27/18 14:57	5mL/5mL	5mL/5mL	1.00
A8I0682-09	Water	EPA 8260C	09/25/18 12:40	09/27/18 14:57	5mL/5mL	5mL/5mL	1.00
A8I0682-10	Water	EPA 8260C	09/25/18 13:30	09/27/18 14:57	5mL/5mL	5mL/5mL	1.00
A8I0682-11	Water	EPA 8260C	09/25/18 14:15	09/27/18 14:57	5mL/5mL	5mL/5mL	1.00
A8I0682-12	Water	EPA 8260C	09/25/18 15:00	09/27/18 14:57	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8091289</u>							
A8I0682-03RE1	Water	EPA 8260C	09/25/18 10:05	09/27/18 15:29	5mL/5mL	5mL/5mL	1.00
A8I0682-05RE1	Water	EPA 8260C	09/25/18 11:50	09/27/18 15:29	5mL/5mL	5mL/5mL	1.00
A8I0682-06RE1	Water	EPA 8260C	09/25/18 09:00	09/27/18 15:29	5mL/5mL	5mL/5mL	1.00
A8I0682-07RE1	Water	EPA 8260C	09/25/18 10:05	09/27/18 15:29	5mL/5mL	5mL/5mL	1.00
A8I0682-13RE1	Water	EPA 8260C	09/25/18 15:30	09/27/18 15:29	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8100454</u>							
A8I0682-03RE2	Water	EPA 8260C	09/25/18 10:05	10/01/18 10:56	5mL/5mL	5mL/5mL	1.00
A8I0682-05RE2	Water	EPA 8260C	09/25/18 11:50	10/01/18 10:56	5mL/5mL	5mL/5mL	1.00
A8I0682-07RE2	Water	EPA 8260C	09/25/18 10:05	10/01/18 10:56	5mL/5mL	5mL/5mL	1.00

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8091195</u>							
A8I0682-01	Water	SM 4500-NH3 G	09/25/18 08:15	09/27/18 10:27	10mL/10mL	10mL/10mL	1.00
A8I0682-02RE1	Water	SM 4500-NH3 G	09/25/18 09:00	09/27/18 10:27	10mL/10mL	10mL/10mL	1.00
A8I0682-03RE1	Water	SM 4500-NH3 G	09/25/18 10:05	09/27/18 10:27	10mL/10mL	10mL/10mL	1.00
A8I0682-04RE1	Water	SM 4500-NH3 G	09/25/18 11:05	09/27/18 10:27	10mL/10mL	10mL/10mL	1.00
A8I0682-05	Water	SM 4500-NH3 G	09/25/18 11:50	09/27/18 10:27	10mL/10mL	10mL/10mL	1.00
A8I0682-06RE1	Water	SM 4500-NH3 G	09/25/18 09:00	09/27/18 10:27	10mL/10mL	10mL/10mL	1.00
A8I0682-07RE1	Water	SM 4500-NH3 G	09/25/18 10:05	09/27/18 10:27	10mL/10mL	10mL/10mL	1.00

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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SAMPLE PREPARATION INFORMATION

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq					Sample	Default	RL Prep
Lab Number	Matrix	Method	Sampled	Prepared	Initial/Final	Initial/Final	Factor
A810682-08RE1	Water	SM 4500-NH3 G	09/25/18 11:05	09/27/18 10:27	10mL/10mL	10mL/10mL	1.00
A810682-09RE1	Water	SM 4500-NH3 G	09/25/18 12:40	09/27/18 10:27	10mL/10mL	10mL/10mL	1.00
A810682-10	Water	SM 4500-NH3 G	09/25/18 13:30	09/27/18 10:27	10mL/10mL	10mL/10mL	1.00
A810682-11RE1	Water	SM 4500-NH3 G	09/25/18 14:15	09/27/18 10:27	10mL/10mL	10mL/10mL	1.00
A810682-12	Water	SM 4500-NH3 G	09/25/18 15:00	09/27/18 10:27	10mL/10mL	10mL/10mL	1.00
A810682-13	Water	SM 4500-NH3 G	09/25/18 15:30	09/27/18 10:27	10mL/10mL	10mL/10mL	1.00

Anions by Ion Chromatography

Prep: Method Prep: Aq					Sample	Default	RL Prep
Lab Number	Matrix	Method	Sampled	Prepared	Initial/Final	Initial/Final	Factor
Batch: 8091146							
A810682-01	Water	EPA 300.0	09/25/18 08:15	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-01RE1	Water	EPA 300.0	09/25/18 08:15	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-02	Water	EPA 300.0	09/25/18 09:00	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-02RE1	Water	EPA 300.0	09/25/18 09:00	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-03	Water	EPA 300.0	09/25/18 10:05	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-04	Water	EPA 300.0	09/25/18 11:05	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-04RE1	Water	EPA 300.0	09/25/18 11:05	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-05	Water	EPA 300.0	09/25/18 11:50	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-06	Water	EPA 300.0	09/25/18 09:00	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-06RE1	Water	EPA 300.0	09/25/18 09:00	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-07	Water	EPA 300.0	09/25/18 10:05	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-08	Water	EPA 300.0	09/25/18 11:05	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-08RE1	Water	EPA 300.0	09/25/18 11:05	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-09	Water	EPA 300.0	09/25/18 12:40	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-10	Water	EPA 300.0	09/25/18 13:30	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-11	Water	EPA 300.0	09/25/18 14:15	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-12	Water	EPA 300.0	09/25/18 15:00	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00
A810682-13	Water	EPA 300.0	09/25/18 15:30	09/26/18 11:10	5mL/5mL	5mL/5mL	1.00

Demand Parameters

Prep: Method Prep: Aq					Sample	Default	RL Prep
Lab Number	Matrix	Method	Sampled	Prepared	Initial/Final	Initial/Final	Factor
Batch: 8091225							
A810682-03RE2	Water	SM 5310 C	09/25/18 10:05	09/27/18 15:10	40mL/40mL	40mL/40mL	1.00

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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SAMPLE PREPARATION INFORMATION

Demand Parameters

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A810682-04RE1	Water	SM 5310 C	09/25/18 11:05	09/27/18 15:10	40mL/40mL	40mL/40mL	1.00
A810682-05RE2	Water	SM 5310 C	09/25/18 11:50	09/27/18 15:10	40mL/40mL	40mL/40mL	1.00

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

Apex Laboratories

- EST** Result reported as an Estimated Value. Compound failed initial calibration criteria.
- Q-01** Spike recovery and/or RPD is outside acceptance limits.
- Q-16** Reanalysis of an original Batch QC sample.
- Q-54f** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -16.0%. The results are reported as Estimated Values.
- Q-54i** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -3.0%. The results are reported as Estimated Values.
- Q-54j** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -3.2%. The results are reported as Estimated Values.
- Q-54n** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -7.1%. The results are reported as Estimated Values.
- Q-55** Daily CCV/LCS recovery for this analyte was below the +/-20% criteria listed in EPA 8260C, however there is adequate sensitivity to ensure detection at the reporting level.
- Q-56** Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C
- TOC_I** Inorganic Carbon Spike Check. Results are valid if Non Detect (No Inorganic Carbon detected.)

Apex Laboratories

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REPORTING NOTES AND CONVENTIONS:

Abbreviations:

- DET Analyte DETECTED at or above the detection or reporting limit.
- ND Analyte NOT DETECTED at or above the detection or reporting limit.
- NR Result Not Reported
- RPD Relative Percent Difference

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

- Basis: Results for soil samples are generally reported on a 100% dry weight basis. The Result Basis is listed following the units as "dry", "wet", or "" (blank) designation.
 - "dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.
 - "wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.
 - "" Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) are not included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

- " --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.
- " *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to 1/2 the Reporting Limit (RL).
-For Blank hits falling between 1/2 the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a 'B' qualifier, per Apex Laboratories' Blank Policy.
For further details, please request a copy of this document.



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the blank results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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LABORATORY ACCREDITATION INFORMATION

TNI Certification ID: OR100062 (Primary Accreditation) - EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation
<u>All reported analytes are included in Apex Laboratories' current ORELAP scope.</u>					

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation. Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provided by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver
Project Number: Nustar 3Q2018
Project Manager: Stephanie Salisbury

Report ID:
A810682 - 10 12 18 1056

CHAIN OF CUSTODY

COC 1 of 2

Lab # A810682 PO# _____ Project # _____

Company: Cascadia Project Mgr: Stephanie Salisbury Project Name: Nustar 3Q2018 Email: ssalisbury@cascadiaassociates.com

Address: 6915 SW Macadam Ave, Suite 250 Phone: 503 718 6571 Fax: _____

Sampled by: Joel M. / Lindsay W.

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	ANALYSIS REQUEST	
						RCRA Metals (8)	TCLP Metals (8)
MW-8		9/15/19	1815	GW	5		
MW-10		9/15/19	0900	GW	5		
MW-12		9/15/19	1005	GW	7		
MW-19		9/15/19	1105	GW	7		
MW-13		9/15/19	1150	GW	7		
MW-10 DWP		9/15/19	0900	GW	5		
MW-12 DWP		9/15/19	1005	GW	5		
MW-19 DWP		9/15/19	1105	GW	5		
MW-1		9/15/19	1240	GW	5		
MW-6		9/15/19	1330	GW	5		

Site Location: OR (WA) Other: _____

Normal Turn Around Time (TAT) = 10 Business Days

TAT Requested (circle): 1 Day 2 Day 3 Day 4 DAY 5 DAY Other: _____

SPECIAL INSTRUCTIONS:
* PSK-175 = TOC, ethane, ethene

RELINQUISHED BY:	RECEIVED BY:
Signature: <u>Joel M. / Lindsay W.</u> Date: <u>9/15/19</u>	Signature: _____ Date: _____
Printed Name: <u>Joel M. / Lindsay W.</u> Time: <u>1000</u>	Printed Name: _____ Time: _____
Company: <u>Cascadia</u>	Company: _____

SAMPLES ARE HELD FOR 30 DAYS

Joel M. / Lindsay W.

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver
Project Number: Nustar 3Q2018
Project Manager: Stephanie Salisbury

Report ID:
A810682 - 10 12 18 1056

CHAIN OF CUSTODY

APEX LABS 12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

Company: Cascadia Project Mgr: Stephanie Salisbury Project Name: Nustar 3Q 2018 PO# _____ Project # _____

Address: 6915 SW Macadam Ave, St 250 Phone: 503 906 6571 Fax: _____ Email: Sb.Salisbury@CascadiaAssoc.com

Sampled by: Joel Mathewick

Site Location: OR Other: (AWA)

LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-CID	NWTPH-Dx	NWTPH-Gx	8260 VOCs Full List	8260 RBDM VOCs	8260 HVOCS	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TIO	R CRA Metals (8)	TCLP Metals (8)	Al, Sb, As, Ba, Be, Cd, Cr, Cu, Fe, Pb, Se, Ag, Na, Ti, V, Zn, Hg, Mg, Mn, Mo, Ni, K, Ni, Zn	TOTAL DISS TCLP	1200-COLS	1200-Z		
MW-2	9/25/18	1415 GW	S	5					✓														
MW-14	9/25/18	1500 GW	S	5					✓														
MW-20c	9/25/18	1530 GW	S	5					✓														
EQ Blank	9/25/18	1540 W	W	2					✓														
Trip Blank	-	-	W	1					✓														

ANALYSIS REQUEST

SPECIAL INSTRUCTIONS: *RSK-175 = TOC, Ethane, ethene

Normal Turn Around Time (TAT) = 10 Business Days YES NO

TAT Requested (circle): 1 Day 2 Day 3 Day 4 DAY 5 DAY Other: _____

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY: Joel Mathewick Date: 9/25/18 Signature: [Signature] Date: _____ Signature: _____

RECEIVED BY: _____ Date: _____ Signature: _____

Printed Name: Joel Mathewick Printed Name: Charles Kegan Time: 1620 Time: 1630

Company: CASCADIA Company: Apex

Apex Laboratories

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Joia A Domenighini

Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar 3Q2018 Project Manager: Stephanie Salisbury	Report ID: A810682 - 10 12 18 1056
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APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A810682

Project/Project #: Nustar 3Q 2018

Delivery info:

Date/Time Received: 9/25/18 @ 1620 By: CPH

Delivered by: Apex Client ESS FedEx UPS Swift Senvoy SDS Other

Cooler Inspection Inspected by: CPH : 9/25/18 @ 1800

Chain of Custody Included? Yes No Custody Seals? Yes No

Signed/Dated by Client? Yes No

Signed/Dated by Apex? Yes No

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (deg. C)	<u>4.4</u>						
Received on Ice? (Y/N)	<u>Y</u>						
Temp. Blanks? (Y/N)	<u>Y</u>						
Ice Type: (Gel/Real/Other)	<u>Real</u>						
Condition:	<u>Good</u>						

Cooler out of temp? (Y/N) Possible reason why: _____
If some coolers are in temp and some out, were green dot applied to out of temperature samples? Yes/No/NA

Samples Inspection: Inspected by: (Signature) : 9/26/18 @ 1025

All Samples Intact? Yes No Comments: _____

Bottle Labels/COCs agree? Yes No Comments: H2SO4 poly MW-8 reads 0815, no info on Trip Blank @ 9/26

Containers/Volumes Received Appropriate for Analysis? Yes No Comments: No info on Trip Blank @ 9/26

Do VOA Vials have Visible Headspace? Yes No NA

Comments: 1/5 MW-13 + 1/3 MW-12 Trip have vls

Water Samples: pH Checked and Appropriate (except VOAs): Yes No NA

Comments: _____

Additional Information: TB#1875

Labeled by: (Signature) Witness: (Signature) Cooler Inspected by: MK See Project Contact Form: Y

Lisa Domenighini

October 11, 2018

Apex Laboratories
ATTN: Lisa Domenighini
12232 S.W. Garden Place
Tigard, OR 97223



LA Cert #04140
EPA Methods TO3, TO14A, TO15, 25C/3C,
RSK-175

TX Cert T104704450-14-6
EPA Methods TO14A, TO15

UT Cert CA0133332015-3
EPA Methods TO3, TO14A, TO15, RSK-175

LABORATORY TEST RESULTS

Project Reference: A8I0682
Lab Number: J092703-01/03

Enclosed are results for sample(s) received 9/27/18 by Air Technology Laboratories. Samples were received intact and properly chilled. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the TNI Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

A handwritten signature in blue ink that reads "mjohnson 1".

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Note: The cover letter is an integral part of this analytical report.

SUBCONTRACT ORDER

Apex Laboratories

A8I0682

J092703-8/03
9/26/18

SENDING LABORATORY:

Apex Laboratories
12232 S.W. Garden Place
Tigard, OR 97223
Phone: (503) 718-2323
Fax: (503) 718-0333
Project Manager: Lisa Domenighini

RECEIVING LABORATORY:

Air Technology Laboratories, Inc
18501 E. Gale Ave Suite 130
City of Industry, CA 91748
Phone : (626) 964-4032
Fax: (626) 964-5832

NAE

Sample Name: MW-12 Water Sampled: 09/25/18 10:05 (A8I0682-03)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	10/08/18 17:00	10/09/18 10:05	
<i>Containers Supplied:</i>			
(D)40 mL VOA - HCL			
(E)40 mL VOA - HCL			

Sample Name: MW-19 Water Sampled: 09/25/18 11:05 (A8I0682-04)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	10/08/18 17:00	10/09/18 11:05	
<i>Containers Supplied:</i>			
(D)40 mL VOA - HCL			
(E)40 mL VOA - HCL			

HS in 1/5 voas

Sample Name: MW-13 Water Sampled: 09/25/18 11:50 (A8I0682-05)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	10/08/18 17:00	10/09/18 11:50	
<i>Containers Supplied:</i>			
(D)40 mL VOA - HCL			
(E)40 mL VOA - HCL			

Standard TAT

4°C

Released By: [Signature] Date: 9/26/18 Received By: UPS Shipper Date: 9/27/18


Released By: UPS/Shipper Date: [Signature] Date: 9/27/18

Client: Apex Laboratories
Attn: Lisa Domenighini
Project Name: NA
Project No.: A8I0682
Date Received: 09/27/18
Matrix: Water
Reporting Units: ug/L

RSK175

Lab No.:	J092703-01	J092703-02	J092703-03					
Client Sample I.D.:	MW-12 (A8I0682-03)	MW-19 (A8I0682-04)	MW-13 (A8I0682-05)					
Date/Time Sampled:	9/25/18 10:05	9/25/18 11:05	9/25/18 11:50					
Date/Time Analyzed:	10/4/18 15:31	10/4/18 15:45	10/4/18 15:58					
QC Batch No.:	181004GC8A1	181004GC8A1	181004GC8A1					
Analyst Initials:	AS	AS	AS					
Dilution Factor:	1.0	1.0	1.0					
ANALYTE	Result ug/L	RL ug/L	Result ug/L	RL ug/L	Result ug/L	RL ug/L		
Ethene	ND	1.0	9.8	1.0	61	1.0		
Ethane	10	1.0	13	1.0	6.9	1.0		
Methane	3,700	1.0	4,400	1.0	2,300	1.0		

MDL = Method Detection Limit
 ND= Not Detected (below MDL)
 RL = Reporting Limit

Reviewed/Approved By: 
 Mark Johnson
 Operations Manager

Date 10-10-18

The cover letter is an integral part of this analytical report



LCS/LCSD Recovery and RPD Summary Report

QC Batch #: 181004GC8A2

Matrix: Air

Reporting Units: ug/L


RSK175 LABORATORY CONTROL SAMPLE SUMMARY

Lab No.:	METHOD BLANK	LCS		LCSD							
Date/Time Analyzed:	10/4/18 15:17	10/4/18 14:31		10/4/18 14:44							
Analyst Initials:	AS	AS		AS							
Dilution Factor:	1.0	1.0		1.0							
ANALYTE	Result ug/L	RL ug/L	SPIKE AMT. ug/L	Result ug/L	% Rec.	Result ug/L	% Rec.	RPD	Low %Rec	High %Rec	Max. RPD
Ethene	ND	1.0	1,150	1,050	91.9	1,140	99.9	8.3	70	130	30
Ethane	ND	1.0	1,230	1,180	96.5	1,290	105	8.5	70	130	30
Methane	ND	1.0	654	638	97.5	697	107	8.9	70	130	30

ND= Not Detected (below RL)

RL = Reporting Limit

Reviewed/Approved By: _____


Mark Johnson
 Operations Manager

Date: _____

10-10-18

The cover letter is an integral part of this analytical report





AMENDED REPORT

Thursday, October 25, 2018

Stephanie Salisbury
Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

RE: A810737 - Shore Terminal-Vancouver - 3Q 2018

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A810737, which was received by the laboratory on 9/26/2018 at 4:33:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of final reporting, unless prior arrangements have been made.

Cooler Receipt Info (See Cooler Receipt Form for Details)
Temp Blank 3.2 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.
All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.



Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **3Q 2018**
Project Manager: **Stephanie Salisbury**

Report ID:
A8I0737 - 10 25 18 1425

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-17	A8I0737-01	Water	09/26/18 08:10	09/26/18 16:33
MW-14	A8I0737-02	Water	09/26/18 08:50	09/26/18 16:33
S-1	A8I0737-03	Water	09/26/18 09:35	09/26/18 16:33
S-2	A8I0737-04	Water	09/26/18 12:30	09/26/18 16:33
MW-22i	A8I0737-05	Water	09/26/18 13:20	09/26/18 16:33
MW-21i-105	A8I0737-06	Water	09/26/18 14:05	09/26/18 16:33
MW-3	A8I0737-07	Water	09/26/18 14:50	09/26/18 16:33
Trip Blank	A8I0737-08	Water	09/26/18 00:00	09/26/18 16:33
MP-1	A8I0737-09	Water	09/26/18 15:40	09/26/18 16:33

Apex Laboratories

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **3Q 2018**
Project Manager: **Stephanie Salisbury**

Report ID:
A810737 - 10 25 18 1425

ANALYTICAL CASE NARRATIVE

Work Order: A810737

Amended Report Revision 1.

This report supersedes all previous reports.

Due to a laboratory oversight, two results for sample MP-1 (Apex Laboratories ID A810737-09) were reported for Ammonia by SM 4500-NH3 G. This oversight has been resolved and the correct result reported here.

Dean Strom
Inorganics Manager
10/25/2018

Subcontract

This report is complete only if it includes the attached subcontract laboratory report from Air Technology for RSK 175.



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-17 (A810737-01)				Matrix: Water		Batch: 8091289		
Bromobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
cis-1,2-Dichloroethene	1.57	---	0.400	ug/L	1	09/29/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Tetrachloroethene (PCE)	2.23	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	

Apex Laboratories

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-17 (A810737-01)				Matrix: Water		Batch: 8091289		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Trichloroethene (TCE)	4.62	---	0.400	ug/L	1	09/29/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>

MW-14 (A810737-02)				Matrix: Water		Batch: 8091289		
Bromobenzene	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
Bromochloromethane	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
Bromodichloromethane	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
Bromoform	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
Bromomethane	ND	---	50.0	ug/L	10	09/29/18	EPA 8260C	
Carbon tetrachloride	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
Chlorobenzene	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
Chloroethane	ND	---	50.0	ug/L	10	09/29/18	EPA 8260C	
Chloroform	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
Chloromethane	ND	---	50.0	ug/L	10	09/29/18	EPA 8260C	
2-Chlorotoluene	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
4-Chlorotoluene	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
Dibromochloromethane	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	50.0	ug/L	10	09/29/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
Dibromomethane	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
1,1-Dichloroethane	12.1	---	4.00	ug/L	10	09/29/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	4.00	ug/L	10	09/29/18	EPA 8260C	
1,1-Dichloroethene	4.40	---	4.00	ug/L	10	09/29/18	EPA 8260C	
cis-1,2-Dichloroethene	361	---	4.00	ug/L	10	09/29/18	EPA 8260C	
trans-1,2-Dichloroethene	4.50	---	4.00	ug/L	10	09/29/18	EPA 8260C	
1,2-Dichloropropane	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
1,3-Dichloropropane	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
2,2-Dichloropropane	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	

Apex Laboratories

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-14 (A810737-02)				Matrix: Water		Batch: 8091289		
1,1-Dichloropropene	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
Hexachlorobutadiene	ND	---	50.0	ug/L	10	09/29/18	EPA 8260C	
Methylene chloride	ND	---	30.0	ug/L	10	09/29/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	4.00	ug/L	10	09/29/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
Tetrachloroethene (PCE)	84.3	---	4.00	ug/L	10	09/29/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	20.0	ug/L	10	09/29/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	20.0	ug/L	10	09/29/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	4.00	ug/L	10	09/29/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
Trichloroethene (TCE)	484	---	4.00	ug/L	10	09/29/18	EPA 8260C	
Trichlorofluoromethane	ND	---	20.0	ug/L	10	09/29/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
Vinyl chloride	ND	---	4.00	ug/L	10	09/29/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 110 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>

S-1 (A810737-03)				Matrix: Water		Batch: 8100454		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	

Apex Laboratories

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
S-1 (A810737-03)				Matrix: Water		Batch: 8100454		
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethane	0.511	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
cis-1,2-Dichloroethene	2.58	---	0.400	ug/L	1	10/01/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Tetrachloroethene (PCE)	2.11	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1-Trichloroethane	0.408	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Trichloroethene (TCE)	10.4	---	0.400	ug/L	1	10/01/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 113 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>

S-2 (A810737-04)				Matrix: Water		Batch: 8100454		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
S-2 (A810737-04)				Matrix: Water		Batch: 8100454		
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethane	9.97	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
cis-1,2-Dichloroethene	50.9	---	0.400	ug/L	1	10/01/18	EPA 8260C	
trans-1,2-Dichloroethene	0.695	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1-Trichloroethane	1.74	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Trichloroethene (TCE)	4.00	---	0.400	ug/L	1	10/01/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Vinyl chloride	0.417	---	0.400	ug/L	1	10/01/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
S-2 (A810737-04)				Matrix: Water		Batch: 8100454		
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>	<i>Limits: 80-120 %</i>	<i>1</i>	<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>	
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>	<i>80-120 %</i>	<i>1</i>	<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>	
<i>4-Bromofluorobenzene (Surr)</i>		<i>102 %</i>	<i>80-120 %</i>	<i>1</i>	<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>	
MW-22i (A810737-05)				Matrix: Water		Batch: 8100460		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethane	0.420	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
cis-1,2-Dichloroethene	12.5	---	0.400	ug/L	1	10/01/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/01/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-22i (A810737-05)				Matrix: Water		Batch: 8100460		
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Tetrachloroethene (PCE)	2.42	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Trichloroethene (TCE)	6.76	---	0.400	ug/L	1	10/01/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>

MW-21i-105 (A810737-06)				Matrix: Water		Batch: 8100460		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethane	0.820	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21i-105 (A810737-06)				Matrix: Water		Batch: 8100460		
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
cis-1,2-Dichloroethene	36.4	---	0.400	ug/L	1	10/01/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Tetrachloroethene (PCE)	8.61	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Trichloroethene (TCE)	11.0	---	0.400	ug/L	1	10/01/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>

MW-3 (A810737-07)				Matrix: Water		Batch: 8091289		
Bromobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-3 (A810737-07)				Matrix: Water		Batch: 8091289		
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethane	6.41	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
cis-1,2-Dichloroethene	75.6	---	0.400	ug/L	1	09/29/18	EPA 8260C	
trans-1,2-Dichloroethene	0.730	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloropropane	1.18	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Tetrachloroethene (PCE)	145	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1-Trichloroethane	1.18	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Trichloroethene (TCE)	36.3	---	0.400	ug/L	1	09/29/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>

Trip Blank (A810737-08)

Matrix: Water

Batch: 8091289

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A810737-08)				Matrix: Water		Batch: 8091289		
Bromobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/28/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A810737-08)			Matrix: Water			Batch: 8091289		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>

MP-1 (A810737-09)			Matrix: Water			Batch: 8091289		
Bromobenzene	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
Bromochloromethane	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
Bromodichloromethane	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
Bromoform	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
Bromomethane	ND	---	100	ug/L	20	09/29/18	EPA 8260C	
Carbon tetrachloride	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
Chlorobenzene	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
Chloroethane	ND	---	100	ug/L	20	09/29/18	EPA 8260C	
Chloroform	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
Chloromethane	ND	---	100	ug/L	20	09/29/18	EPA 8260C	
2-Chlorotoluene	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
4-Chlorotoluene	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
Dibromochloromethane	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	100	ug/L	20	09/29/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
Dibromomethane	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
1,1-Dichloroethane	ND	---	8.00	ug/L	20	09/29/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	8.00	ug/L	20	09/29/18	EPA 8260C	
1,1-Dichloroethene	ND	---	8.00	ug/L	20	09/29/18	EPA 8260C	
cis-1,2-Dichloroethene	60.2	---	8.00	ug/L	20	09/29/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	8.00	ug/L	20	09/29/18	EPA 8260C	
1,2-Dichloropropane	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
1,3-Dichloropropane	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
2,2-Dichloropropane	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
			Matrix: Water			Batch: 8091289		
MP-1 (A810737-09)								
1,1-Dichloropropene	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
Hexachlorobutadiene	ND	---	100	ug/L	20	09/29/18	EPA 8260C	
Methylene chloride	ND	---	60.0	ug/L	20	09/29/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	8.00	ug/L	20	09/29/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
Tetrachloroethene (PCE)	322	---	8.00	ug/L	20	09/29/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	40.0	ug/L	20	09/29/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	40.0	ug/L	20	09/29/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	8.00	ug/L	20	09/29/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
Trichloroethene (TCE)	57.0	---	8.00	ug/L	20	09/29/18	EPA 8260C	
Trichlorofluoromethane	ND	---	40.0	ug/L	20	09/29/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
Vinyl chloride	ND	---	8.00	ug/L	20	09/29/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>			<i>Recovery: 107 %</i>	<i>Limits: 80-120 %</i>	<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>	
<i>Toluene-d8 (Surr)</i>			<i>98 %</i>	<i>80-120 %</i>	<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>	
<i>4-Bromofluorobenzene (Surr)</i>			<i>97 %</i>	<i>80-120 %</i>	<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>	



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-17 (A810737-01)				Matrix: Water		Batch: 8091197		
Ammonia as N	2.13	---	0.0200	mg/L	1	09/27/18	SM 4500-NH3 G	
MW-14 (A810737-02RE1)				Matrix: Water		Batch: 8091197		
Ammonia as N	41.0	---	1.00	mg/L	50	09/27/18	SM 4500-NH3 G	
S-1 (A810737-03)				Matrix: Water		Batch: 8091197		
Ammonia as N	0.259	---	0.0200	mg/L	1	09/27/18	SM 4500-NH3 G	
S-2 (A810737-04RE1)				Matrix: Water		Batch: 8091197		
Ammonia as N	7.55	---	0.0400	mg/L	2	09/27/18	SM 4500-NH3 G	
MW-22i (A810737-05)				Matrix: Water		Batch: 8091197		
Ammonia as N	0.369	---	0.0200	mg/L	1	09/27/18	SM 4500-NH3 G	
MW-21i-105 (A810737-06)				Matrix: Water		Batch: 8091197		
Ammonia as N	0.409	---	0.0200	mg/L	1	09/27/18	SM 4500-NH3 G	
MW-3 (A810737-07)				Matrix: Water		Batch: 8091197		
Ammonia as N	1.56	---	0.0200	mg/L	1	09/27/18	SM 4500-NH3 G	
MP-1 (A810737-09RE2)				Matrix: Water		Batch: 8091197		
Ammonia as N	10.9	---	0.100	mg/L	5	09/27/18	SM 4500-NH3 G	

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AMENDED REPORT

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-17 (A810737-01) Matrix: Water								
Batch: 8091182								
Nitrate-Nitrogen	0.760	---	0.250	mg/L	1	09/27/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	
MW-14 (A810737-02) Matrix: Water								
Batch: 8091182								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	
MW-14 (A810737-02RE1) Matrix: Water								
Batch: 8091182								
Nitrate-Nitrogen	150	---	12.5	mg/L	50	09/27/18	EPA 300.0	
S-1 (A810737-03) Matrix: Water								
Batch: 8091182								
Nitrate-Nitrogen	3.03	---	0.250	mg/L	1	09/27/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	
S-2 (A810737-04) Matrix: Water								
Batch: 8091182								
Nitrate-Nitrogen	5.93	---	0.250	mg/L	1	09/27/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	
MW-22i (A810737-05) Matrix: Water								
Batch: 8091182								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	
MW-21i-105 (A810737-06) Matrix: Water								
Batch: 8091182								
Nitrate-Nitrogen	0.759	---	0.250	mg/L	1	09/27/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	
MW-3 (A810737-07) Matrix: Water								
Batch: 8091182								
Nitrate-Nitrogen	5.64	---	0.250	mg/L	1	09/27/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MP-1 (A810737-09)				Matrix: Water				
Batch: 8091182								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	
MP-1 (A810737-09RE1)				Matrix: Water				
Batch: 8091239								
Nitrate-Nitrogen	113	---	12.5	mg/L	50	09/28/18	EPA 300.0	



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **3Q 2018**
Project Manager: **Stephanie Salisbury**

Report ID:
A810737 - 10 25 18 1425

ANALYTICAL SAMPLE RESULTS

Demand Parameters

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-14 (A810737-02)				Matrix: Water				
Batch: 8091225								
Total Organic Carbon	4.56	---	1.00	mg/L	1	09/28/18	SM 5310 C	
MP-1 (A810737-09)				Matrix: Water				
Batch: 8091225								
Total Organic Carbon	3.12	---	1.00	mg/L	1	09/28/18	SM 5310 C	



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091289 - EPA 5030B						Water						
Blank (8091289-BLK1)		Prepared: 09/28/18 15:29			Analyzed: 09/28/18 17:03							
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091289 - EPA 5030B						Water						
Blank (8091289-BLK1)		Prepared: 09/28/18 15:29			Analyzed: 09/28/18 17:03							
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>"</i>						

LCS (8091289-BS1)		Prepared: 09/28/18 15:29			Analyzed: 09/28/18 16:06							
EPA 8260C												
Bromobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Bromochloromethane	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Bromodichloromethane	18.1	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
Bromoform	15.3	---	1.00	ug/L	1	20.0	---	76	80-120%	---	---	Q-55
Bromomethane	23.4	---	5.00	ug/L	1	20.0	---	117	80-120%	---	---	
Carbon tetrachloride	16.2	---	1.00	ug/L	1	20.0	---	81	80-120%	---	---	
Chlorobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Chloroethane	24.5	---	5.00	ug/L	1	20.0	---	122	80-120%	---	---	Q-56
Chloroform	19.3	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
Chloromethane	19.7	---	5.00	ug/L	1	20.0	---	98	80-120%	---	---	
2-Chlorotoluene	18.6	---	1.00	ug/L	1	20.0	---	93	80-120%	---	---	
4-Chlorotoluene	17.2	---	1.00	ug/L	1	20.0	---	86	80-120%	---	---	
Dibromochloromethane	17.1	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
1,2-Dibromo-3-chloropropane	17.8	---	5.00	ug/L	1	20.0	---	89	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Dibromomethane	20.8	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
1,2-Dichlorobenzene	19.5	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091289 - EPA 5030B												
						Water						
LCS (8091289-BS1)	Prepared: 09/28/18 15:29					Analyzed: 09/28/18 16:06						
1,3-Dichlorobenzene	19.0	---	0.500	ug/L	1	20.0	---	95	80-120%	---	---	
1,4-Dichlorobenzene	18.8	---	0.500	ug/L	1	20.0	---	94	80-120%	---	---	
Dichlorodifluoromethane	18.6	---	1.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1-Dichloroethane	18.1	---	0.400	ug/L	1	20.0	---	90	80-120%	---	---	
1,2-Dichloroethane (EDC)	20.1	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,1-Dichloroethene	18.5	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
cis-1,2-Dichloroethene	18.9	---	0.400	ug/L	1	20.0	---	94	80-120%	---	---	
trans-1,2-Dichloroethene	18.0	---	0.400	ug/L	1	20.0	---	90	80-120%	---	---	
1,2-Dichloropropane	18.6	---	0.500	ug/L	1	20.0	---	93	80-120%	---	---	
1,3-Dichloropropane	19.2	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
2,2-Dichloropropane	11.9	---	1.00	ug/L	1	20.0	---	59	80-120%	---	---	Q-55
1,1-Dichloropropene	18.4	---	1.00	ug/L	1	20.0	---	92	80-120%	---	---	
cis-1,3-Dichloropropene	14.6	---	1.00	ug/L	1	20.0	---	73	80-120%	---	---	Q-55
trans-1,3-Dichloropropene	14.1	---	1.00	ug/L	1	20.0	---	70	80-120%	---	---	Q-55
Hexachlorobutadiene	18.4	---	5.00	ug/L	1	20.0	---	92	80-120%	---	---	
Methylene chloride	18.7	---	3.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1,1,2-Tetrachloroethane	17.7	---	0.400	ug/L	1	20.0	---	88	80-120%	---	---	
1,1,2,2-Tetrachloroethane	20.7	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
Tetrachloroethene (PCE)	18.5	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
1,2,3-Trichlorobenzene	20.6	---	2.00	ug/L	1	20.0	---	103	80-120%	---	---	
1,2,4-Trichlorobenzene	19.6	---	2.00	ug/L	1	20.0	---	98	80-120%	---	---	
1,1,1-Trichloroethane	16.4	---	0.400	ug/L	1	20.0	---	82	80-120%	---	---	
1,1,2-Trichloroethane	18.8	---	0.500	ug/L	1	20.0	---	94	80-120%	---	---	
Trichloroethene (TCE)	20.4	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
Trichlorofluoromethane	22.6	---	2.00	ug/L	1	20.0	---	113	80-120%	---	---	
1,2,3-Trichloropropane	20.8	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
Vinyl chloride	18.8	---	0.400	ug/L	1	20.0	---	94	80-120%	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr) Recovery: 105 % Limits: 80-120 % Dilution: 1x</i>												
<i>Toluene-d8 (Surr) 97 % 80-120 % "</i>												
<i>4-Bromofluorobenzene (Surr) 96 % 80-120 % "</i>												

Duplicate (8091289-DUP1) Prepared: 09/28/18 15:29 Analyzed: 09/29/18 02:40

QC Source Sample: MW-14 (A810737-02)
EPA 8260C

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091289 - EPA 5030B						Water						
Duplicate (8091289-DUP1)		Prepared: 09/28/18 15:29 Analyzed: 09/29/18 02:40										
QC Source Sample: MW-14 (A810737-02)												
Bromobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Bromoform	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Bromomethane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
Carbon tetrachloride	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Chloroethane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
Chloroform	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Chloromethane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Dibromomethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,1-Dichloroethane	11.1	---	4.00	ug/L	10	---	12.1	---	---	9	30%	
1,2-Dichloroethane (EDC)	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
1,1-Dichloroethene	4.10	---	4.00	ug/L	10	---	4.40	---	---	7	30%	
cis-1,2-Dichloroethene	333	---	4.00	ug/L	10	---	361	---	---	8	30%	
trans-1,2-Dichloroethene	4.30	---	4.00	ug/L	10	---	4.50	---	---	5	30%	
1,2-Dichloropropane	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
Methylene chloride	ND	---	30.0	ug/L	10	---	ND	---	---	---	30%	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **3Q 2018**
Project Manager: **Stephanie Salisbury**

Report ID:
A810737 - 10 25 18 1425

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091289 - EPA 5030B												
Water												
Duplicate (8091289-DUP1)			Prepared: 09/28/18 15:29			Analyzed: 09/29/18 02:40						
QC Source Sample: MW-14 (A810737-02)												
1,1,1,2-Tetrachloroethane	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	84.8	---	4.00	ug/L	10	---	84.3	---	---	0.6	30%	
1,2,3-Trichlorobenzene	ND	---	20.0	ug/L	10	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	20.0	ug/L	10	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
1,1,2-Trichloroethane	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Trichloroethene (TCE)	462	---	4.00	ug/L	10	---	484	---	---	5	30%	
Trichlorofluoromethane	ND	---	20.0	ug/L	10	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Vinyl chloride	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>"</i>						

Matrix Spike (8091289-MS1) Prepared: 09/28/18 15:29 Analyzed: 09/29/18 03:33

QC Source Sample: MW-3 (A810737-07)

EPA 8260C												
Bromobenzene	18.6	---	0.500	ug/L	1	20.0	ND	93	80-120%	---	---	
Bromochloromethane	21.2	---	1.00	ug/L	1	20.0	ND	106	78-123%	---	---	
Bromodichloromethane	17.2	---	1.00	ug/L	1	20.0	ND	86	79-125%	---	---	
Bromoform	13.9	---	1.00	ug/L	1	20.0	ND	70	66-130%	---	---	Q-54f
Bromomethane	20.6	---	5.00	ug/L	1	20.0	ND	103	53-141%	---	---	
Carbon tetrachloride	17.2	---	1.00	ug/L	1	20.0	ND	86	72-136%	---	---	
Chlorobenzene	19.0	---	0.500	ug/L	1	20.0	ND	95	80-120%	---	---	
Chloroethane	34.9	---	5.00	ug/L	1	20.0	ND	174	60-138%	---	---	Q-54
Chloroform	19.4	---	1.00	ug/L	1	20.0	ND	97	79-124%	---	---	
Chloromethane	18.4	---	5.00	ug/L	1	20.0	ND	92	50-139%	---	---	
2-Chlorotoluene	18.7	---	1.00	ug/L	1	20.0	ND	94	79-122%	---	---	
4-Chlorotoluene	17.1	---	1.00	ug/L	1	20.0	ND	86	78-122%	---	---	
Dibromochloromethane	16.6	---	1.00	ug/L	1	20.0	ND	83	74-126%	---	---	
1,2-Dibromo-3-chloropropane	14.7	---	5.00	ug/L	1	20.0	ND	73	62-128%	---	---	
1,2-Dibromoethane (EDB)	18.2	---	0.500	ug/L	1	20.0	ND	91	77-121%	---	---	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **3Q 2018**
Project Manager: **Stephanie Salisbury**

Report ID:
A810737 - 10 25 18 1425

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091289 - EPA 5030B												
Water												
Matrix Spike (8091289-MS1)			Prepared: 09/28/18 15:29 Analyzed: 09/29/18 03:33									
QC Source Sample: MW-3 (A810737-07)												
Dibromomethane	19.6	---	1.00	ug/L	1	20.0	ND	98	79-123%	---	---	
1,2-Dichlorobenzene	18.9	---	0.500	ug/L	1	20.0	ND	95	80-120%	---	---	
1,3-Dichlorobenzene	18.8	---	0.500	ug/L	1	20.0	ND	94	80-120%	---	---	
1,4-Dichlorobenzene	18.6	---	0.500	ug/L	1	20.0	ND	93	79-120%	---	---	
Dichlorodifluoromethane	19.5	---	1.00	ug/L	1	20.0	ND	97	32-152%	---	---	
1,1-Dichloroethane	24.8	---	0.400	ug/L	1	20.0	6.41	92	77-125%	---	---	
1,2-Dichloroethane (EDC)	19.2	---	0.400	ug/L	1	20.0	0.310	95	73-128%	---	---	
1,1-Dichloroethene	18.9	---	0.400	ug/L	1	20.0	ND	95	71-131%	---	---	
cis-1,2-Dichloroethene	96.0	---	0.400	ug/L	1	20.0	75.6	102	78-123%	---	---	
trans-1,2-Dichloroethene	18.8	---	0.400	ug/L	1	20.0	0.730	90	75-124%	---	---	
1,2-Dichloropropane	19.1	---	0.500	ug/L	1	20.0	1.18	90	78-122%	---	---	
1,3-Dichloropropane	18.3	---	1.00	ug/L	1	20.0	ND	91	80-120%	---	---	
2,2-Dichloropropane	9.41	---	1.00	ug/L	1	20.0	ND	47	60-139%	---	---	Q-54e
1,1-Dichloropropene	18.3	---	1.00	ug/L	1	20.0	ND	92	79-125%	---	---	
cis-1,3-Dichloropropene	13.3	---	1.00	ug/L	1	20.0	ND	67	75-124%	---	---	Q-54g
trans-1,3-Dichloropropene	13.2	---	1.00	ug/L	1	20.0	ND	66	73-127%	---	---	Q-54c
Hexachlorobutadiene	17.3	---	5.00	ug/L	1	20.0	ND	87	66-134%	---	---	
Methylene chloride	18.3	---	3.00	ug/L	1	20.0	ND	92	74-124%	---	---	
1,1,1,2-Tetrachloroethane	17.6	---	0.400	ug/L	1	20.0	ND	88	78-124%	---	---	
1,1,2,2-Tetrachloroethane	20.3	---	0.500	ug/L	1	20.0	ND	102	71-121%	---	---	
Tetrachloroethene (PCE)	165	---	0.400	ug/L	1	20.0	145	97	74-129%	---	---	
1,2,3-Trichlorobenzene	18.8	---	2.00	ug/L	1	20.0	ND	94	69-129%	---	---	
1,2,4-Trichlorobenzene	18.2	---	2.00	ug/L	1	20.0	ND	91	69-130%	---	---	
1,1,1-Trichloroethane	17.8	---	0.400	ug/L	1	20.0	1.18	83	74-131%	---	---	
1,1,2-Trichloroethane	18.0	---	0.500	ug/L	1	20.0	ND	90	80-120%	---	---	
Trichloroethene (TCE)	55.4	---	0.400	ug/L	1	20.0	36.3	95	79-123%	---	---	
Trichlorofluoromethane	23.6	---	2.00	ug/L	1	20.0	ND	118	65-141%	---	---	
1,2,3-Trichloropropane	18.8	---	1.00	ug/L	1	20.0	ND	94	73-122%	---	---	
Vinyl chloride	19.2	---	0.400	ug/L	1	20.0	ND	96	58-137%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		Recovery: 105 %		Limits: 80-120 %		Dilution: 1x						
Toluene-d8 (Surr)		97 %		80-120 %		"						
4-Bromofluorobenzene (Surr)		96 %		80-120 %		"						

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
--	---	---

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100454 - EPA 5030B						Water						
Blank (8100454-BLK1)		Prepared: 10/01/18 10:37 Analyzed: 10/01/18 12:59										
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
--	---	---

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100454 - EPA 5030B												
Water												
Blank (8100454-BLK1)	Prepared: 10/01/18 10:37 Analyzed: 10/01/18 12:59											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>	<i>Recovery: 110 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>							
<i>Toluene-d8 (Surr)</i>	<i>104 %</i>		<i>80-120 %</i>		<i>"</i>							
<i>4-Bromofluorobenzene (Surr)</i>	<i>104 %</i>		<i>80-120 %</i>		<i>"</i>							

LCS (8100454-BS2)												
Prepared: 10/01/18 10:37 Analyzed: 10/01/18 11:34												
EPA 8260C												
Bromobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Bromochloromethane	23.5	---	1.00	ug/L	1	20.0	---	118	80-120%	---	---	
Bromodichloromethane	21.6	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
Bromoform	22.3	---	1.00	ug/L	1	20.0	---	112	80-120%	---	---	
Bromomethane	29.6	---	5.00	ug/L	1	20.0	---	148	80-120%	---	---	EST, Q-56
Carbon tetrachloride	20.9	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Chlorobenzene	20.1	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Chloroethane	21.1	---	5.00	ug/L	1	20.0	---	106	80-120%	---	---	
Chloroform	20.9	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Chloromethane	15.6	---	5.00	ug/L	1	20.0	---	78	80-120%	---	---	Q-55
2-Chlorotoluene	22.1	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
4-Chlorotoluene	21.8	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Dibromochloromethane	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
1,2-Dibromo-3-chloropropane	21.2	---	5.00	ug/L	1	20.0	---	106	80-120%	---	---	
1,2-Dibromoethane (EDB)	20.9	---	0.500	ug/L	1	20.0	---	105	80-120%	---	---	
Dibromomethane	21.6	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
1,2-Dichlorobenzene	20.6	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
--	---	--

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100454 - EPA 5030B						Water						
LCS (8100454-BS2)			Prepared: 10/01/18 10:37		Analyzed: 10/01/18 11:34							
1,3-Dichlorobenzene	21.2	---	0.500	ug/L	1	20.0	---	106	80-120%	---	---	
1,4-Dichlorobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Dichlorodifluoromethane	17.0	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
1,1-Dichloroethane	20.6	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.9	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
1,1-Dichloroethene	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
cis-1,2-Dichloroethene	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
trans-1,2-Dichloroethene	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
1,2-Dichloropropane	20.3	---	0.500	ug/L	1	20.0	---	102	80-120%	---	---	
1,3-Dichloropropane	19.7	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
2,2-Dichloropropane	23.2	---	1.00	ug/L	1	20.0	---	116	80-120%	---	---	
1,1-Dichloropropene	20.4	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
cis-1,3-Dichloropropene	20.2	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
trans-1,3-Dichloropropene	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Hexachlorobutadiene	19.7	---	5.00	ug/L	1	20.0	---	98	80-120%	---	---	
Methylene chloride	19.9	---	3.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,1,1,2-Tetrachloroethane	21.4	---	0.400	ug/L	1	20.0	---	107	80-120%	---	---	
1,1,2,2-Tetrachloroethane	21.3	---	0.500	ug/L	1	20.0	---	107	80-120%	---	---	
Tetrachloroethene (PCE)	18.6	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
1,2,3-Trichlorobenzene	21.3	---	2.00	ug/L	1	20.0	---	107	80-120%	---	---	
1,2,4-Trichlorobenzene	19.8	---	2.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,1,1-Trichloroethane	21.5	---	0.400	ug/L	1	20.0	---	107	80-120%	---	---	
1,1,2-Trichloroethane	20.3	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Trichloroethene (TCE)	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
Trichlorofluoromethane	20.3	---	2.00	ug/L	1	20.0	---	101	80-120%	---	---	
1,2,3-Trichloropropane	21.0	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Vinyl chloride	20.5	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr) Recovery: 100 % Limits: 80-120 % Dilution: 1x												
Toluene-d8 (Surr) 100 % 80-120 % "												
4-Bromofluorobenzene (Surr) 97 % 80-120 % "												

Duplicate (8100454-DUP1)	Prepared: 10/01/18 12:10	Analyzed: 10/01/18 21:32
QC Source Sample: S-2 (A810737-04)		
EPA 8260C		

Apex Laboratories

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **3Q 2018**
Project Manager: **Stephanie Salisbury**

Report ID:
A810737 - 10 25 18 1425

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100454 - EPA 5030B						Water						
Duplicate (8100454-DUP1)		Prepared: 10/01/18 12:10 Analyzed: 10/01/18 21:32										
QC Source Sample: S-2 (A810737-04)												
Bromobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromoform	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromomethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Chloroethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Chloroform	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Chloromethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Dibromomethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloroethane	10.1	---	0.400	ug/L	1	---	9.97	---	---	0.9	30%	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	0.329	---	---	***	30%	
cis-1,2-Dichloroethene	50.2	---	0.400	ug/L	1	---	50.9	---	---	1	30%	
trans-1,2-Dichloroethene	0.714	---	0.400	ug/L	1	---	0.695	---	---	3	30%	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Methylene chloride	ND	---	3.00	ug/L	1	---	ND	---	---	---	30%	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **3Q 2018**
Project Manager: **Stephanie Salisbury**

Report ID:
A810737 - 10 25 18 1425

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100454 - EPA 5030B						Water						
Duplicate (8100454-DUP1)			Prepared: 10/01/18 12:10 Analyzed: 10/01/18 21:32									
QC Source Sample: S-2 (A810737-04)												
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	1.83	---	0.400	ug/L	1	---	1.74	---	---	5	30%	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Trichloroethene (TCE)	4.16	---	0.400	ug/L	1	---	4.00	---	---	4	30%	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Vinyl chloride	0.415	---	0.400	ug/L	1	---	0.417	---	---	0.5	30%	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>			<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>					
<i>Toluene-d8 (Surr)</i>			<i>104 %</i>		<i>80-120 %</i>		<i>"</i>					
<i>4-Bromofluorobenzene (Surr)</i>			<i>100 %</i>		<i>80-120 %</i>		<i>"</i>					



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **3Q 2018**
Project Manager: **Stephanie Salisbury**

Report ID:
A810737 - 10 25 18 1425

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100460 - EPA 5030B						Water						
Blank (8100460-BLK1)		Prepared: 10/01/18 11:15			Analyzed: 10/01/18 12:38							
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver
Project Number: 3Q 2018
Project Manager: Stephanie Salisbury

Report ID:
A810737 - 10 25 18 1425

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100460 - EPA 5030B												
Water												
Blank (8100460-BLK1)												
			Prepared: 10/01/18 11:15			Analyzed: 10/01/18 12:38						
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		Recovery: 106 %		Limits: 80-120 %		Dilution: 1x						
Toluene-d8 (Surr)		98 %		80-120 %		"						
4-Bromofluorobenzene (Surr)		98 %		80-120 %		"						

LCS (8100460-BS1)												
			Prepared: 10/01/18 11:15			Analyzed: 10/01/18 11:43						
EPA 8260C												
Bromobenzene	20.8	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
Bromochloromethane	21.8	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Bromodichloromethane	19.9	---	1.00	ug/L	1	20.0	---	100	80-120%	---	---	
Bromoform	16.8	---	1.00	ug/L	1	20.0	---	84	80-120%	---	---	
Bromomethane	21.4	---	5.00	ug/L	1	20.0	---	107	80-120%	---	---	
Carbon tetrachloride	19.5	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
Chlorobenzene	20.2	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Chloroethane	39.3	---	5.00	ug/L	1	20.0	---	197	80-120%	---	---	Q-56
Chloroform	20.3	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Chloromethane	16.1	---	5.00	ug/L	1	20.0	---	81	80-120%	---	---	
2-Chlorotoluene	20.4	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
4-Chlorotoluene	19.0	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
Dibromochloromethane	19.0	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
1,2-Dibromo-3-chloropropane	17.4	---	5.00	ug/L	1	20.0	---	87	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Dibromomethane	20.9	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
1,2-Dichlorobenzene	21.2	---	0.500	ug/L	1	20.0	---	106	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver
Project Number: 3Q 2018
Project Manager: Stephanie Salisbury

Report ID:
A810737 - 10 25 18 1425

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100460 - EPA 5030B												
						Water						
LCS (8100460-BS1)			Prepared: 10/01/18 11:15			Analyzed: 10/01/18 11:43						
1,3-Dichlorobenzene	20.6	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	
1,4-Dichlorobenzene	20.4	---	0.500	ug/L	1	20.0	---	102	80-120%	---	---	
Dichlorodifluoromethane	17.5	---	1.00	ug/L	1	20.0	---	88	80-120%	---	---	
1,1-Dichloroethane	19.2	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
1,2-Dichloroethane (EDC)	20.3	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
1,1-Dichloroethene	16.6	---	0.400	ug/L	1	20.0	---	83	80-120%	---	---	
cis-1,2-Dichloroethene	19.6	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
trans-1,2-Dichloroethene	19.0	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
1,2-Dichloropropane	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
1,3-Dichloropropane	19.8	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
2,2-Dichloropropane	14.5	---	1.00	ug/L	1	20.0	---	72	80-120%	---	---	Q-55
1,1-Dichloropropene	19.2	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
cis-1,3-Dichloropropene	16.9	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
trans-1,3-Dichloropropene	16.7	---	1.00	ug/L	1	20.0	---	83	80-120%	---	---	
Hexachlorobutadiene	20.2	---	5.00	ug/L	1	20.0	---	101	80-120%	---	---	
Methylene chloride	18.6	---	3.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1,1,2-Tetrachloroethane	20.3	---	0.400	ug/L	1	20.0	---	101	80-120%	---	---	
1,1,2,2-Tetrachloroethane	22.0	---	0.500	ug/L	1	20.0	---	110	80-120%	---	---	
Tetrachloroethene (PCE)	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,2,3-Trichlorobenzene	22.1	---	2.00	ug/L	1	20.0	---	111	80-120%	---	---	
1,2,4-Trichlorobenzene	20.9	---	2.00	ug/L	1	20.0	---	105	80-120%	---	---	
1,1,1-Trichloroethane	18.3	---	0.400	ug/L	1	20.0	---	91	80-120%	---	---	
1,1,2-Trichloroethane	19.1	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Trichloroethene (TCE)	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
Trichlorofluoromethane	22.0	---	2.00	ug/L	1	20.0	---	110	80-120%	---	---	
1,2,3-Trichloropropane	20.3	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Vinyl chloride	17.9	---	0.400	ug/L	1	20.0	---	90	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		Recovery: 103 %		Limits: 80-120 %		Dilution: 1x						
Toluene-d8 (Surr)		99 %		80-120 %		"						
4-Bromofluorobenzene (Surr)		98 %		80-120 %		"						

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091197 - Method Prep: Aq						Water						
Blank (8091197-BLK1)		Prepared: 09/27/18 10:33 Analyzed: 09/27/18 15:40										
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (8091197-BS1)		Prepared: 09/27/18 10:33 Analyzed: 09/27/18 15:42										
SM 4500-NH3 G												
Ammonia as N	2.05	---	0.0200	mg/L	1	2.00	---	102	90-110%	---	---	



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091182 - Method Prep: Aq						Water						
Blank (8091182-BLK1)		Prepared: 09/27/18 08:31 Analyzed: 09/27/18 10:41										
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
LCS (8091182-BS1)		Prepared: 09/27/18 08:31 Analyzed: 09/27/18 11:02										
EPA 300.0												
Nitrate-Nitrogen	2.09	---	0.250	mg/L	1	2.00	---	104	90-110%	---	---	---
Nitrite-Nitrogen	1.95	---	0.250	mg/L	1	2.00	---	97	90-110%	---	---	---

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091239 - Method Prep: Aq						Water						
Blank (8091239-BLK1)		Prepared: 09/28/18 07:08		Analyzed: 09/28/18 08:18								
<u>EPA 300.0</u>												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	
LCS (8091239-BS1)		Prepared: 09/28/18 07:08		Analyzed: 09/28/18 08:39								
<u>EPA 300.0</u>												
Nitrate-Nitrogen	2.04	---	0.250	mg/L	1	2.00	---	102	90-110%	---	---	



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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QUALITY CONTROL (QC) SAMPLE RESULTS

Demand Parameters

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091225 - Method Prep: Aq						Water						
Blank (8091225-BLK1)		Prepared: 09/27/18 15:10 Analyzed: 09/27/18 18:18										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	---
LCS (8091225-BS1)		Prepared: 09/27/18 15:10 Analyzed: 09/27/18 18:47										
SM 5310 C												
Total Organic Carbon	10.8	---	1.00	mg/L	1	10.0	---	108	85-115%	---	---	---
LCS (8091225-BS2)		Prepared: 09/27/18 15:10 Analyzed: 09/27/18 19:17										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	0.00	---		85-115%	---	---	TOC_I



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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SAMPLE PREPARATION INFORMATION

Halogenated Volatile Organic Compounds by EPA 8260C

Prep: EPA 5030B					Sample	Default	RL Prep
Lab Number	Matrix	Method	Sampled	Prepared	Initial/Final	Initial/Final	Factor
<u>Batch: 8091289</u>							
A810737-01	Water	EPA 8260C	09/26/18 08:10	09/27/18 15:29	5mL/5mL	5mL/5mL	1.00
A810737-02	Water	EPA 8260C	09/26/18 08:50	09/27/18 15:29	5mL/5mL	5mL/5mL	1.00
A810737-07	Water	EPA 8260C	09/26/18 14:50	09/27/18 15:29	5mL/5mL	5mL/5mL	1.00
A810737-08	Water	EPA 8260C	09/26/18 00:00	09/27/18 15:29	5mL/5mL	5mL/5mL	1.00
A810737-09	Water	EPA 8260C	09/26/18 15:40	09/27/18 15:29	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8100454</u>							
A810737-03	Water	EPA 8260C	09/26/18 09:35	10/01/18 10:56	5mL/5mL	5mL/5mL	1.00
A810737-04	Water	EPA 8260C	09/26/18 12:30	10/01/18 12:10	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8100460</u>							
A810737-05	Water	EPA 8260C	09/26/18 13:20	10/01/18 14:00	5mL/5mL	5mL/5mL	1.00
A810737-06	Water	EPA 8260C	09/26/18 14:05	10/01/18 14:27	5mL/5mL	5mL/5mL	1.00

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq					Sample	Default	RL Prep
Lab Number	Matrix	Method	Sampled	Prepared	Initial/Final	Initial/Final	Factor
<u>Batch: 8091197</u>							
A810737-01	Water	SM 4500-NH3 G	09/26/18 08:10	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00
A810737-02RE1	Water	SM 4500-NH3 G	09/26/18 08:50	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00
A810737-03	Water	SM 4500-NH3 G	09/26/18 09:35	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00
A810737-04RE1	Water	SM 4500-NH3 G	09/26/18 12:30	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00
A810737-05	Water	SM 4500-NH3 G	09/26/18 13:20	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00
A810737-06	Water	SM 4500-NH3 G	09/26/18 14:05	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00
A810737-07	Water	SM 4500-NH3 G	09/26/18 14:50	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00
A810737-09RE2	Water	SM 4500-NH3 G	09/26/18 15:40	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00

Anions by Ion Chromatography

Prep: Method Prep: Aq					Sample	Default	RL Prep
Lab Number	Matrix	Method	Sampled	Prepared	Initial/Final	Initial/Final	Factor
<u>Batch: 8091182</u>							
A810737-01	Water	EPA 300.0	09/26/18 08:10	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00
A810737-02	Water	EPA 300.0	09/26/18 08:50	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00
A810737-02RE1	Water	EPA 300.0	09/26/18 08:50	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00
A810737-03	Water	EPA 300.0	09/26/18 09:35	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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SAMPLE PREPARATION INFORMATION

Anions by Ion Chromatography

<u>Prep: Method Prep: Aq</u>					Sample	Default	RL Prep
Lab Number	Matrix	Method	Sampled	Prepared	Initial/Final	Initial/Final	Factor
A810737-04	Water	EPA 300.0	09/26/18 12:30	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00
A810737-05	Water	EPA 300.0	09/26/18 13:20	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00
A810737-06	Water	EPA 300.0	09/26/18 14:05	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00
A810737-07	Water	EPA 300.0	09/26/18 14:50	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00
A810737-09	Water	EPA 300.0	09/26/18 15:40	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8091239</u>							
A810737-09RE1	Water	EPA 300.0	09/26/18 15:40	09/28/18 07:08	5mL/5mL	5mL/5mL	1.00

Demand Parameters

<u>Prep: Method Prep: Aq</u>					Sample	Default	RL Prep
Lab Number	Matrix	Method	Sampled	Prepared	Initial/Final	Initial/Final	Factor
<u>Batch: 8091225</u>							
A810737-02	Water	SM 5310 C	09/26/18 08:50	09/27/18 15:10	40mL/40mL	40mL/40mL	1.00
A810737-09	Water	SM 5310 C	09/26/18 15:40	09/27/18 15:10	40mL/40mL	40mL/40mL	1.00



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **3Q 2018**
Project Manager: **Stephanie Salisbury**

Report ID:
A810737 - 10 25 18 1425

QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

Apex Laboratories

- EST** Result reported as an Estimated Value. Compound failed initial calibration criteria.
- Q-54** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +2%. The results are reported as Estimated Values.
- Q-54c** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -10%. The results are reported as Estimated Values.
- Q-54e** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -21%. The results are reported as Estimated Values.
- Q-54f** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -4%. The results are reported as Estimated Values.
- Q-54g** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -7%. The results are reported as Estimated Values.
- Q-55** Daily CCV/LCS recovery for this analyte was below the +/-20% criteria listed in EPA 8260C, however there is adequate sensitivity to ensure detection at the reporting level.
- Q-56** Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C
- TOC_I** Inorganic Carbon Spike Check. Results are valid if Non Detect (No Inorganic Carbon detected.)

Apex Laboratories

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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REPORTING NOTES AND CONVENTIONS:

Abbreviations:

- DET Analyte DETECTED at or above the detection or reporting limit.
- ND Analyte NOT DETECTED at or above the detection or reporting limit.
- NR Result Not Reported
- RPD Relative Percent Difference

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

- Basis:** Results for soil samples are generally reported on a 100% dry weight basis. The Result Basis is listed following the units as "dry", "wet", or "" (blank) designation.
 - "dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.
 - "wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.
 - "" Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) are not included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

- " --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.
- " *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to 1/2 the Reporting Limit (RL).
-For Blank hits falling between 1/2 the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.

Apex Laboratories

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the blank results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.

Apex Laboratories maintains detailed records on sample receipt, including client label verification, cooler temperature, sample preservation, hold



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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LABORATORY ACCREDITATION INFORMATION

TNI Certification ID: OR100062 (Primary Accreditation) - EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation
<u>All reported analytes are included in Apex Laboratories' current ORELAP scope.</u>					

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation. Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provided by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.

Apex Laboratories

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Lisa Domenighini, Client Services Manager

AMENDED REPORT

Cascadia Associates Project: Shore Terminal-Vancouver
 6915 SW Macadam, Suite 250 Project Number: 3Q 2018
 Portland, OR 97219 Project Manager: Stephanie Salisbury Report ID:
 A810737 - 10 25 18 1425

CHAIN OF CUSTODY

Lab # A810737 PO# _____

Project Name: 3Q 2018 Project # _____

Project Mgr: Stephanie Salisbury Email: StepSalisbury@CascadiaAssociates.com

Address: 6915 SW Macadam Ave, SI 250 Phone: 503-966-6571 Fax: _____

Sampled by: Joel W. Lindberg

Company: Cascadia

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-DX	NWTPH-GX	8260 VOCs Full List	8260 RBDM VOCs	8260 HVOCs	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TTO	RCRA Metals (8)	TCLP Metals (8)	Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Fe, Ni, Pb, Hg, Mn, Mo, Se, Zn	TOTAL DISS TCLP	1200-COLS	1200-Z	Nitrate/Nitrite	Arsenic	PSX-175*	TOC	
1	9/26/18	0810	GW	5																						
2	9/26/18	0850	GW	7																						
3	9/26/18	0935	GW	5																						
4	9/26/18	1230	GW	5																						
5	9/26/18	1520	GW	5																						
6	9/26/18	1405	GW	5																						
7	9/26/18	1405	GW	5																						
8				1																						
9	9/26/18	1540	GW	7																						
10																										

SPECIAL INSTRUCTIONS: *PSX - 175 = ethane, ethene, methane

Normal Turn Around Time (TAT) = 10 Business Days (YES) NO

TAT Requested (circle): 1 Day 2 Day 3 Day 4 DAY 5 DAY Other: _____

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY: [Signature] Date: 9/26/18 Signature: _____ Date: 9/26/18

Printed Name: Joel W. Lindberg Printed Name: Stephanie Salisbury Time: 1633 Time: _____

Company: Cascadia Company: Apex Labs

Joia A. Domenighini



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 25 18 1425
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APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A8 I0737

Project/Project #: 3Q2018

Delivery info:
Date/Time Received: 9/26/18 @ 1633 By: CFH
Delivered by: Apex Client ESS FedEx UPS Swift Senvoy SDS Other

Cooler Inspection Inspected by: CFH : 9/26/18 @ 1823
Chain of Custody Included? Yes No Custody Seals? Yes No
Signed/Dated by Client? Yes No
Signed/Dated by Apex? Yes No

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (deg. C)	<u>3.2</u>						
Received on Ice? (Y/N)	<u>Y</u>						
Temp. Blanks? (Y/N)	<u>Y</u>						
Ice Type: (Gel/Real/Other)	<u>Real</u>						
Condition:	<u>Good</u>						

Cooler out of temp? (Y/N) Possible reason why: _____
If some coolers are in temp and some out, were green dot applied to out of temperature samples? Yes/No/NA

Samples Inspection: Inspected by: (Signature) : 9/27/18 @ 903

All Samples Intact? Yes No Comments: _____
Bottle Labels/COCs agree? Yes No Comments: _____
Containers/Volumes Received Appropriate for Analysis? Yes No Comments: _____

Do VOA Vials have Visible Headspace? Yes No NA
Comments: Sediment in 5/5 MW-14, 3/3 S-2 + 3/3 MW-22i
Water Samples: pH Checked and Appropriate (except VOAs): Yes No NA
Comments: _____
Additional Information: Trip Blank # 18795

Labeled by: (Signature) Witness: (Signature) Cooler Inspected by: COB See Project Contact Form: Y

Lisa Domenighini

October 11, 2018

Apex Laboratories
ATTN: Lisa Domenighini
12232 S.W. Garden Place
Tigard, OR 97223



LA Cert #04140
EPA Methods TO3, TO14A, TO15, 25C/3C,
RSK-175
TX Cert T104704450-14-6
EPA Methods TO14A, TO15
UT Cert CA0133332015-3
EPA Methods TO3, TO14A, TO15, RSK-175

LABORATORY TEST RESULTS

Project Reference: A8I0737
Lab Number: J092803-01/02

Enclosed are results for sample(s) received 9/28/18 by Air Technology Laboratories. Samples were received intact and properly chilled. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the TNI Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

A handwritten signature in blue ink, appearing to read "Mark Johnson".

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Note: The cover letter is an integral part of this analytical report.

W 9/27

SUBCONTRACT ORDER

Apex Laboratories

A810737

J092803-01/02
W 9/27/18

SENDING LABORATORY:

Apex Laboratories
12232 S.W. Garden Place
Tigard, OR 97223
Phone: (503) 718-2323
Fax: (503) 718-0333
Project Manager: Lisa Domenighini

RECEIVING LABORATORY:

Air Technology Laboratories, Inc
18501 E. Gale Ave Suite 130
City of Industry, CA 91748
Phone : (626) 964-4032
Fax: (626) 964-5832

Sample Name: MW-14 ✓ Water Sampled: 09/26/18 08:50 (A810737-02) ✓

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	10/09/18 17:00	10/10/18 08:50	
Containers Supplied:			
(D)40 mL VOA - HCL ✓			
(E)40 mL VOA - HCL ✓			

Sample Name: MP-1 ✓ Water Sampled: 09/26/18 15:40 (A810737-09) ✓

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	10/09/18 17:00	10/10/18 15:40	
Containers Supplied:			
(D)40 mL VOA - HCL ✓			
(E)40 mL VOA - HCL ✓			

Standard TAT

Released By: *[Signature]* Date: 9/27/18
 Received By: *[Signature]* Date: 9/28/18
 Released By: *WRS* Date: _____
 Received By: _____ Date: _____

1°C
1009



Friday, October 12, 2018

Stephanie Salisbury
Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

RE: A810737 - Shore Terminal-Vancouver - 3Q 2018

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A810737, which was received by the laboratory on 9/26/2018 at 4:33:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of final reporting, unless prior arrangements have been made.

Cooler Receipt Info

(See Cooler Receipt Form for Details)

Temp Blank 3.2 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.

All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.



Apex Laboratories

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Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **3Q 2018**
Project Manager: **Stephanie Salisbury**

Report ID:
A810737 - 10 12 18 1155

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-17	A810737-01	Water	09/26/18 08:10	09/26/18 16:33
MW-14	A810737-02	Water	09/26/18 08:50	09/26/18 16:33
S-1	A810737-03	Water	09/26/18 09:35	09/26/18 16:33
S-2	A810737-04	Water	09/26/18 12:30	09/26/18 16:33
MW-22i	A810737-05	Water	09/26/18 13:20	09/26/18 16:33
MW-21i-105	A810737-06	Water	09/26/18 14:05	09/26/18 16:33
MW-3	A810737-07	Water	09/26/18 14:50	09/26/18 16:33
Trip Blank	A810737-08	Water	09/26/18 00:00	09/26/18 16:33
MP-1	A810737-09	Water	09/26/18 15:40	09/26/18 16:33

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver
Project Number: **3Q 2018**
Project Manager: **Stephanie Salisbury**

Report ID:
A810737 - 10 12 18 1155

ANALYTICAL CASE NARRATIVE

Work Order: A810737

Subcontract

This report is complete only if it includes the attached subcontract laboratory report from Air Technology for RSK 175.

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-17 (A810737-01)				Matrix: Water		Batch: 8091289		
Bromobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
cis-1,2-Dichloroethene	1.57	---	0.400	ug/L	1	09/29/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Tetrachloroethene (PCE)	2.23	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
			Matrix: Water			Batch: 8091289		
MW-17 (A810737-01)								
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Trichloroethene (TCE)	4.62	---	0.400	ug/L	1	09/29/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>

			Matrix: Water			Batch: 8091289		
MW-14 (A810737-02)								
Bromobenzene	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
Bromochloromethane	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
Bromodichloromethane	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
Bromoform	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
Bromomethane	ND	---	50.0	ug/L	10	09/29/18	EPA 8260C	
Carbon tetrachloride	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
Chlorobenzene	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
Chloroethane	ND	---	50.0	ug/L	10	09/29/18	EPA 8260C	
Chloroform	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
Chloromethane	ND	---	50.0	ug/L	10	09/29/18	EPA 8260C	
2-Chlorotoluene	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
4-Chlorotoluene	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
Dibromochloromethane	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	50.0	ug/L	10	09/29/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
Dibromomethane	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
1,1-Dichloroethane	12.1	---	4.00	ug/L	10	09/29/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	4.00	ug/L	10	09/29/18	EPA 8260C	
1,1-Dichloroethene	4.40	---	4.00	ug/L	10	09/29/18	EPA 8260C	
cis-1,2-Dichloroethene	361	---	4.00	ug/L	10	09/29/18	EPA 8260C	
trans-1,2-Dichloroethene	4.50	---	4.00	ug/L	10	09/29/18	EPA 8260C	
1,2-Dichloropropane	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
1,3-Dichloropropane	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
2,2-Dichloropropane	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-14 (A810737-02)				Matrix: Water		Batch: 8091289		
1,1-Dichloropropene	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
Hexachlorobutadiene	ND	---	50.0	ug/L	10	09/29/18	EPA 8260C	
Methylene chloride	ND	---	30.0	ug/L	10	09/29/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	4.00	ug/L	10	09/29/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
Tetrachloroethene (PCE)	84.3	---	4.00	ug/L	10	09/29/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	20.0	ug/L	10	09/29/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	20.0	ug/L	10	09/29/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	4.00	ug/L	10	09/29/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	5.00	ug/L	10	09/29/18	EPA 8260C	
Trichloroethene (TCE)	484	---	4.00	ug/L	10	09/29/18	EPA 8260C	
Trichlorofluoromethane	ND	---	20.0	ug/L	10	09/29/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	10.0	ug/L	10	09/29/18	EPA 8260C	
Vinyl chloride	ND	---	4.00	ug/L	10	09/29/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 110 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>

S-1 (A810737-03)				Matrix: Water		Batch: 8100454		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
S-1 (A810737-03)				Matrix: Water		Batch: 8100454		
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethane	0.511	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
cis-1,2-Dichloroethene	2.58	---	0.400	ug/L	1	10/01/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Tetrachloroethene (PCE)	2.11	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1-Trichloroethane	0.408	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Trichloroethene (TCE)	10.4	---	0.400	ug/L	1	10/01/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 113 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>

S-2 (A810737-04)				Matrix: Water		Batch: 8100454		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
S-2 (A810737-04)				Matrix: Water		Batch: 8100454		
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethane	9.97	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
cis-1,2-Dichloroethene	50.9	---	0.400	ug/L	1	10/01/18	EPA 8260C	
trans-1,2-Dichloroethene	0.695	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1-Trichloroethane	1.74	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Trichloroethene (TCE)	4.00	---	0.400	ug/L	1	10/01/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Vinyl chloride	0.417	---	0.400	ug/L	1	10/01/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
S-2 (A810737-04)				Matrix: Water		Batch: 8100454		
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>	<i>Limits: 80-120 %</i>	<i>1</i>	<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>	
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>	<i>80-120 %</i>	<i>1</i>	<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>	
<i>4-Bromofluorobenzene (Surr)</i>		<i>102 %</i>	<i>80-120 %</i>	<i>1</i>	<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>	

MW-22i (A810737-05)				Matrix: Water		Batch: 8100460		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethane	0.420	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
cis-1,2-Dichloroethene	12.5	---	0.400	ug/L	1	10/01/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/01/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-22i (A810737-05)			Matrix: Water		Batch: 8100460			
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Tetrachloroethene (PCE)	2.42	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Trichloroethene (TCE)	6.76	---	0.400	ug/L	1	10/01/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>

MW-21i-105 (A810737-06)			Matrix: Water		Batch: 8100460			
Bromobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethane	0.820	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21i-105 (A810737-06)				Matrix: Water		Batch: 8100460		
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
cis-1,2-Dichloroethene	36.4	---	0.400	ug/L	1	10/01/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Tetrachloroethene (PCE)	8.61	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Trichloroethene (TCE)	11.0	---	0.400	ug/L	1	10/01/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>

MW-3 (A810737-07)				Matrix: Water		Batch: 8091289		
Bromobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-3 (A810737-07)				Matrix: Water		Batch: 8091289		
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethane	6.41	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
cis-1,2-Dichloroethene	75.6	---	0.400	ug/L	1	09/29/18	EPA 8260C	
trans-1,2-Dichloroethene	0.730	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloropropane	1.18	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Tetrachloroethene (PCE)	145	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1-Trichloroethane	1.18	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Trichloroethene (TCE)	36.3	---	0.400	ug/L	1	09/29/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>

Trip Blank (A810737-08) Matrix: Water Batch: 8091289

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A810737-08)				Matrix: Water		Batch: 8091289		
Bromobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/28/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/28/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A810737-08)			Matrix: Water			Batch: 8091289		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/28/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/28/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/28/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/28/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/28/18</i>	<i>EPA 8260C</i>

MP-1 (A810737-09)			Matrix: Water			Batch: 8091289		
Bromobenzene	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
Bromochloromethane	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
Bromodichloromethane	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
Bromoform	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
Bromomethane	ND	---	100	ug/L	20	09/29/18	EPA 8260C	
Carbon tetrachloride	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
Chlorobenzene	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
Chloroethane	ND	---	100	ug/L	20	09/29/18	EPA 8260C	
Chloroform	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
Chloromethane	ND	---	100	ug/L	20	09/29/18	EPA 8260C	
2-Chlorotoluene	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
4-Chlorotoluene	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
Dibromochloromethane	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	100	ug/L	20	09/29/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
Dibromomethane	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
1,1-Dichloroethane	ND	---	8.00	ug/L	20	09/29/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	8.00	ug/L	20	09/29/18	EPA 8260C	
1,1-Dichloroethene	ND	---	8.00	ug/L	20	09/29/18	EPA 8260C	
cis-1,2-Dichloroethene	60.2	---	8.00	ug/L	20	09/29/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	8.00	ug/L	20	09/29/18	EPA 8260C	
1,2-Dichloropropane	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
1,3-Dichloropropane	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
2,2-Dichloropropane	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MP-1 (A810737-09)				Matrix: Water		Batch: 8091289		
1,1-Dichloropropene	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
Hexachlorobutadiene	ND	---	100	ug/L	20	09/29/18	EPA 8260C	
Methylene chloride	ND	---	60.0	ug/L	20	09/29/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	8.00	ug/L	20	09/29/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
Tetrachloroethene (PCE)	322	---	8.00	ug/L	20	09/29/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	40.0	ug/L	20	09/29/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	40.0	ug/L	20	09/29/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	8.00	ug/L	20	09/29/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	10.0	ug/L	20	09/29/18	EPA 8260C	
Trichloroethene (TCE)	57.0	---	8.00	ug/L	20	09/29/18	EPA 8260C	
Trichlorofluoromethane	ND	---	40.0	ug/L	20	09/29/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	20.0	ug/L	20	09/29/18	EPA 8260C	
Vinyl chloride	ND	---	8.00	ug/L	20	09/29/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>



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ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-17 (A810737-01)				Matrix: Water		Batch: 8091197		
Ammonia as N	2.13	---	0.0200	mg/L	1	09/27/18	SM 4500-NH3 G	
MW-14 (A810737-02RE1)				Matrix: Water		Batch: 8091197		
Ammonia as N	41.0	---	1.00	mg/L	50	09/27/18	SM 4500-NH3 G	
S-1 (A810737-03)				Matrix: Water		Batch: 8091197		
Ammonia as N	0.259	---	0.0200	mg/L	1	09/27/18	SM 4500-NH3 G	
S-2 (A810737-04RE1)				Matrix: Water		Batch: 8091197		
Ammonia as N	7.55	---	0.0400	mg/L	2	09/27/18	SM 4500-NH3 G	
MW-22i (A810737-05)				Matrix: Water		Batch: 8091197		
Ammonia as N	0.369	---	0.0200	mg/L	1	09/27/18	SM 4500-NH3 G	
MW-21i-105 (A810737-06)				Matrix: Water		Batch: 8091197		
Ammonia as N	0.409	---	0.0200	mg/L	1	09/27/18	SM 4500-NH3 G	
MW-3 (A810737-07)				Matrix: Water		Batch: 8091197		
Ammonia as N	1.56	---	0.0200	mg/L	1	09/27/18	SM 4500-NH3 G	
MP-1 (A810737-09RE1)				Matrix: Water		Batch: 8091197		
Ammonia as N	10.2	---	0.0400	mg/L	2	09/27/18	SM 4500-NH3 G	
MP-1 (A810737-09RE2)				Matrix: Water		Batch: 8091197		
Ammonia as N	10.9	---	0.100	mg/L	5	09/27/18	SM 4500-NH3 G	

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-17 (A810737-01) Matrix: Water								
Batch: 8091182								
Nitrate-Nitrogen	0.760	---	0.250	mg/L	1	09/27/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	
MW-14 (A810737-02) Matrix: Water								
Batch: 8091182								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	
MW-14 (A810737-02RE1) Matrix: Water								
Batch: 8091182								
Nitrate-Nitrogen	150	---	12.5	mg/L	50	09/27/18	EPA 300.0	
S-1 (A810737-03) Matrix: Water								
Batch: 8091182								
Nitrate-Nitrogen	3.03	---	0.250	mg/L	1	09/27/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	
S-2 (A810737-04) Matrix: Water								
Batch: 8091182								
Nitrate-Nitrogen	5.93	---	0.250	mg/L	1	09/27/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	
MW-22i (A810737-05) Matrix: Water								
Batch: 8091182								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	
MW-21i-105 (A810737-06) Matrix: Water								
Batch: 8091182								
Nitrate-Nitrogen	0.759	---	0.250	mg/L	1	09/27/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	
MW-3 (A810737-07) Matrix: Water								
Batch: 8091182								
Nitrate-Nitrogen	5.64	---	0.250	mg/L	1	09/27/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	

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Tigard, OR 97223
503-718-2323
EPA ID: OR01039

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MP-1 (A810737-09)				Matrix: Water				
Batch: 8091182								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/27/18	EPA 300.0	
MP-1 (A810737-09RE1)				Matrix: Water				
Batch: 8091239								
Nitrate-Nitrogen	113	---	12.5	mg/L	50	09/28/18	EPA 300.0	

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ANALYTICAL SAMPLE RESULTS

Demand Parameters

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-14 (A810737-02)				Matrix: Water				
Batch: 8091225								
Total Organic Carbon	4.56	---	1.00	mg/L	1	09/28/18	SM 5310 C	
MP-1 (A810737-09)				Matrix: Water				
Batch: 8091225								
Total Organic Carbon	3.12	---	1.00	mg/L	1	09/28/18	SM 5310 C	



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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091289 - EPA 5030B						Water						
Blank (8091289-BLK1)		Prepared: 09/28/18 15:29		Analyzed: 09/28/18 17:03								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091289 - EPA 5030B												
Water												
Blank (8091289-BLK1)	Prepared: 09/28/18 15:29 Analyzed: 09/28/18 17:03											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 106 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	98 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	100 %		80-120 %		"							

LCS (8091289-BS1)												
Prepared: 09/28/18 15:29 Analyzed: 09/28/18 16:06												
EPA 8260C												
Bromobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Bromochloromethane	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Bromodichloromethane	18.1	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
Bromoform	15.3	---	1.00	ug/L	1	20.0	---	76	80-120%	---	---	Q-55
Bromomethane	23.4	---	5.00	ug/L	1	20.0	---	117	80-120%	---	---	
Carbon tetrachloride	16.2	---	1.00	ug/L	1	20.0	---	81	80-120%	---	---	
Chlorobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Chloroethane	24.5	---	5.00	ug/L	1	20.0	---	122	80-120%	---	---	Q-56
Chloroform	19.3	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
Chloromethane	19.7	---	5.00	ug/L	1	20.0	---	98	80-120%	---	---	
2-Chlorotoluene	18.6	---	1.00	ug/L	1	20.0	---	93	80-120%	---	---	
4-Chlorotoluene	17.2	---	1.00	ug/L	1	20.0	---	86	80-120%	---	---	
Dibromochloromethane	17.1	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
1,2-Dibromo-3-chloropropane	17.8	---	5.00	ug/L	1	20.0	---	89	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Dibromomethane	20.8	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
1,2-Dichlorobenzene	19.5	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091289 - EPA 5030B												
						Water						
LCS (8091289-BS1)			Prepared: 09/28/18 15:29			Analyzed: 09/28/18 16:06						
1,3-Dichlorobenzene	19.0	---	0.500	ug/L	1	20.0	---	95	80-120%	---	---	
1,4-Dichlorobenzene	18.8	---	0.500	ug/L	1	20.0	---	94	80-120%	---	---	
Dichlorodifluoromethane	18.6	---	1.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1-Dichloroethane	18.1	---	0.400	ug/L	1	20.0	---	90	80-120%	---	---	
1,2-Dichloroethane (EDC)	20.1	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,1-Dichloroethene	18.5	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
cis-1,2-Dichloroethene	18.9	---	0.400	ug/L	1	20.0	---	94	80-120%	---	---	
trans-1,2-Dichloroethene	18.0	---	0.400	ug/L	1	20.0	---	90	80-120%	---	---	
1,2-Dichloropropane	18.6	---	0.500	ug/L	1	20.0	---	93	80-120%	---	---	
1,3-Dichloropropane	19.2	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
2,2-Dichloropropane	11.9	---	1.00	ug/L	1	20.0	---	59	80-120%	---	---	Q-55
1,1-Dichloropropene	18.4	---	1.00	ug/L	1	20.0	---	92	80-120%	---	---	
cis-1,3-Dichloropropene	14.6	---	1.00	ug/L	1	20.0	---	73	80-120%	---	---	Q-55
trans-1,3-Dichloropropene	14.1	---	1.00	ug/L	1	20.0	---	70	80-120%	---	---	Q-55
Hexachlorobutadiene	18.4	---	5.00	ug/L	1	20.0	---	92	80-120%	---	---	
Methylene chloride	18.7	---	3.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1,1,2-Tetrachloroethane	17.7	---	0.400	ug/L	1	20.0	---	88	80-120%	---	---	
1,1,2,2-Tetrachloroethane	20.7	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
Tetrachloroethene (PCE)	18.5	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
1,2,3-Trichlorobenzene	20.6	---	2.00	ug/L	1	20.0	---	103	80-120%	---	---	
1,2,4-Trichlorobenzene	19.6	---	2.00	ug/L	1	20.0	---	98	80-120%	---	---	
1,1,1-Trichloroethane	16.4	---	0.400	ug/L	1	20.0	---	82	80-120%	---	---	
1,1,2-Trichloroethane	18.8	---	0.500	ug/L	1	20.0	---	94	80-120%	---	---	
Trichloroethene (TCE)	20.4	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
Trichlorofluoromethane	22.6	---	2.00	ug/L	1	20.0	---	113	80-120%	---	---	
1,2,3-Trichloropropane	20.8	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
Vinyl chloride	18.8	---	0.400	ug/L	1	20.0	---	94	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr) Recovery: 105 % Limits: 80-120 % Dilution: 1x												
Toluene-d8 (Surr) 97 % 80-120 % "												
4-Bromofluorobenzene (Surr) 96 % 80-120 % "												

Duplicate (8091289-DUP1) Prepared: 09/28/18 15:29 Analyzed: 09/29/18 02:40

QC Source Sample: MW-14 (A810737-02)

EPA 8260C

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091289 - EPA 5030B						Water						
Duplicate (8091289-DUP1)		Prepared: 09/28/18 15:29 Analyzed: 09/29/18 02:40										
QC Source Sample: MW-14 (A810737-02)												
Bromobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Bromoform	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Bromomethane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
Carbon tetrachloride	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Chloroethane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
Chloroform	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Chloromethane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Dibromomethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,1-Dichloroethane	11.1	---	4.00	ug/L	10	---	12.1	---	---	9	30%	
1,2-Dichloroethane (EDC)	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
1,1-Dichloroethene	4.10	---	4.00	ug/L	10	---	4.40	---	---	7	30%	
cis-1,2-Dichloroethene	333	---	4.00	ug/L	10	---	361	---	---	8	30%	
trans-1,2-Dichloroethene	4.30	---	4.00	ug/L	10	---	4.50	---	---	5	30%	
1,2-Dichloropropane	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	50.0	ug/L	10	---	ND	---	---	---	30%	
Methylene chloride	ND	---	30.0	ug/L	10	---	ND	---	---	---	30%	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091289 - EPA 5030B												
Water												
Duplicate (8091289-DUP1)			Prepared: 09/28/18 15:29 Analyzed: 09/29/18 02:40									
QC Source Sample: MW-14 (A810737-02)												
1,1,1,2-Tetrachloroethane	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	84.8	---	4.00	ug/L	10	---	84.3	---	---	0.6	30%	
1,2,3-Trichlorobenzene	ND	---	20.0	ug/L	10	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	20.0	ug/L	10	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
1,1,2-Trichloroethane	ND	---	5.00	ug/L	10	---	ND	---	---	---	30%	
Trichloroethene (TCE)	462	---	4.00	ug/L	10	---	484	---	---	5	30%	
Trichlorofluoromethane	ND	---	20.0	ug/L	10	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	10.0	ug/L	10	---	ND	---	---	---	30%	
Vinyl chloride	ND	---	4.00	ug/L	10	---	ND	---	---	---	30%	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>			<i>Recovery: 108 %</i>				<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>			
<i>Toluene-d8 (Surr)</i>			<i>99 %</i>				<i>80-120 %</i>		<i>"</i>			
<i>4-Bromofluorobenzene (Surr)</i>			<i>98 %</i>				<i>80-120 %</i>		<i>"</i>			

Matrix Spike (8091289-MS1)												
Prepared: 09/28/18 15:29 Analyzed: 09/29/18 03:33												
QC Source Sample: MW-3 (A810737-07)												
EPA 8260C												
Bromobenzene	18.6	---	0.500	ug/L	1	20.0	ND	93	80-120%	---	---	
Bromochloromethane	21.2	---	1.00	ug/L	1	20.0	ND	106	78-123%	---	---	
Bromodichloromethane	17.2	---	1.00	ug/L	1	20.0	ND	86	79-125%	---	---	
Bromoform	13.9	---	1.00	ug/L	1	20.0	ND	70	66-130%	---	---	Q-54f
Bromomethane	20.6	---	5.00	ug/L	1	20.0	ND	103	53-141%	---	---	
Carbon tetrachloride	17.2	---	1.00	ug/L	1	20.0	ND	86	72-136%	---	---	
Chlorobenzene	19.0	---	0.500	ug/L	1	20.0	ND	95	80-120%	---	---	
Chloroethane	34.9	---	5.00	ug/L	1	20.0	ND	174	60-138%	---	---	Q-54
Chloroform	19.4	---	1.00	ug/L	1	20.0	ND	97	79-124%	---	---	
Chloromethane	18.4	---	5.00	ug/L	1	20.0	ND	92	50-139%	---	---	
2-Chlorotoluene	18.7	---	1.00	ug/L	1	20.0	ND	94	79-122%	---	---	
4-Chlorotoluene	17.1	---	1.00	ug/L	1	20.0	ND	86	78-122%	---	---	
Dibromochloromethane	16.6	---	1.00	ug/L	1	20.0	ND	83	74-126%	---	---	
1,2-Dibromo-3-chloropropane	14.7	---	5.00	ug/L	1	20.0	ND	73	62-128%	---	---	
1,2-Dibromoethane (EDB)	18.2	---	0.500	ug/L	1	20.0	ND	91	77-121%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC % REC	% REC Limits	RPD RPD	RPD Limit	Notes
Batch 8091289 - EPA 5030B												
Water												
Matrix Spike (8091289-MS1)			Prepared: 09/28/18 15:29 Analyzed: 09/29/18 03:33									
QC Source Sample: MW-3 (A810737-07)												
Dibromomethane	19.6	---	1.00	ug/L	1	20.0	ND	98	79-123%	---	---	
1,2-Dichlorobenzene	18.9	---	0.500	ug/L	1	20.0	ND	95	80-120%	---	---	
1,3-Dichlorobenzene	18.8	---	0.500	ug/L	1	20.0	ND	94	80-120%	---	---	
1,4-Dichlorobenzene	18.6	---	0.500	ug/L	1	20.0	ND	93	79-120%	---	---	
Dichlorodifluoromethane	19.5	---	1.00	ug/L	1	20.0	ND	97	32-152%	---	---	
1,1-Dichloroethane	24.8	---	0.400	ug/L	1	20.0	6.41	92	77-125%	---	---	
1,2-Dichloroethane (EDC)	19.2	---	0.400	ug/L	1	20.0	0.310	95	73-128%	---	---	
1,1-Dichloroethene	18.9	---	0.400	ug/L	1	20.0	ND	95	71-131%	---	---	
cis-1,2-Dichloroethene	96.0	---	0.400	ug/L	1	20.0	75.6	102	78-123%	---	---	
trans-1,2-Dichloroethene	18.8	---	0.400	ug/L	1	20.0	0.730	90	75-124%	---	---	
1,2-Dichloropropane	19.1	---	0.500	ug/L	1	20.0	1.18	90	78-122%	---	---	
1,3-Dichloropropane	18.3	---	1.00	ug/L	1	20.0	ND	91	80-120%	---	---	
2,2-Dichloropropane	9.41	---	1.00	ug/L	1	20.0	ND	47	60-139%	---	---	Q-54e
1,1-Dichloropropene	18.3	---	1.00	ug/L	1	20.0	ND	92	79-125%	---	---	
cis-1,3-Dichloropropene	13.3	---	1.00	ug/L	1	20.0	ND	67	75-124%	---	---	Q-54g
trans-1,3-Dichloropropene	13.2	---	1.00	ug/L	1	20.0	ND	66	73-127%	---	---	Q-54c
Hexachlorobutadiene	17.3	---	5.00	ug/L	1	20.0	ND	87	66-134%	---	---	
Methylene chloride	18.3	---	3.00	ug/L	1	20.0	ND	92	74-124%	---	---	
1,1,1,2-Tetrachloroethane	17.6	---	0.400	ug/L	1	20.0	ND	88	78-124%	---	---	
1,1,2,2-Tetrachloroethane	20.3	---	0.500	ug/L	1	20.0	ND	102	71-121%	---	---	
Tetrachloroethene (PCE)	165	---	0.400	ug/L	1	20.0	145	97	74-129%	---	---	
1,2,3-Trichlorobenzene	18.8	---	2.00	ug/L	1	20.0	ND	94	69-129%	---	---	
1,2,4-Trichlorobenzene	18.2	---	2.00	ug/L	1	20.0	ND	91	69-130%	---	---	
1,1,1-Trichloroethane	17.8	---	0.400	ug/L	1	20.0	1.18	83	74-131%	---	---	
1,1,2-Trichloroethane	18.0	---	0.500	ug/L	1	20.0	ND	90	80-120%	---	---	
Trichloroethene (TCE)	55.4	---	0.400	ug/L	1	20.0	36.3	95	79-123%	---	---	
Trichlorofluoromethane	23.6	---	2.00	ug/L	1	20.0	ND	118	65-141%	---	---	
1,2,3-Trichloropropane	18.8	---	1.00	ug/L	1	20.0	ND	94	73-122%	---	---	
Vinyl chloride	19.2	---	0.400	ug/L	1	20.0	ND	96	58-137%	---	---	
Surr: 1,4-Difluorobenzene (Surr) Recovery: 105 % Limits: 80-120 % Dilution: 1x												
Toluene-d8 (Surr) 97 % 80-120 % "												
4-Bromofluorobenzene (Surr) 96 % 80-120 % "												

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100454 - EPA 5030B						Water						
Blank (8100454-BLK1)		Prepared: 10/01/18 10:37 Analyzed: 10/01/18 12:59										
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100454 - EPA 5030B												
Water												
Blank (8100454-BLK1)	Prepared: 10/01/18 10:37 Analyzed: 10/01/18 12:59											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 110 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	104 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	104 %		80-120 %		"							

LCS (8100454-BS2)	Prepared: 10/01/18 10:37 Analyzed: 10/01/18 11:34											
EPA 8260C												
Bromobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Bromochloromethane	23.5	---	1.00	ug/L	1	20.0	---	118	80-120%	---	---	
Bromodichloromethane	21.6	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
Bromoform	22.3	---	1.00	ug/L	1	20.0	---	112	80-120%	---	---	
Bromomethane	29.6	---	5.00	ug/L	1	20.0	---	148	80-120%	---	---	EST, Q-56
Carbon tetrachloride	20.9	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Chlorobenzene	20.1	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Chloroethane	21.1	---	5.00	ug/L	1	20.0	---	106	80-120%	---	---	
Chloroform	20.9	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Chloromethane	15.6	---	5.00	ug/L	1	20.0	---	78	80-120%	---	---	Q-55
2-Chlorotoluene	22.1	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
4-Chlorotoluene	21.8	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Dibromochloromethane	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
1,2-Dibromo-3-chloropropane	21.2	---	5.00	ug/L	1	20.0	---	106	80-120%	---	---	
1,2-Dibromoethane (EDB)	20.9	---	0.500	ug/L	1	20.0	---	105	80-120%	---	---	
Dibromomethane	21.6	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
1,2-Dichlorobenzene	20.6	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100454 - EPA 5030B												
Water												
LCS (8100454-BS2)												
			Prepared: 10/01/18 10:37			Analyzed: 10/01/18 11:34						
1,3-Dichlorobenzene	21.2	---	0.500	ug/L	1	20.0	---	106	80-120%	---	---	
1,4-Dichlorobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Dichlorodifluoromethane	17.0	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
1,1-Dichloroethane	20.6	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.9	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
1,1-Dichloroethene	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
cis-1,2-Dichloroethene	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
trans-1,2-Dichloroethene	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
1,2-Dichloropropane	20.3	---	0.500	ug/L	1	20.0	---	102	80-120%	---	---	
1,3-Dichloropropane	19.7	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
2,2-Dichloropropane	23.2	---	1.00	ug/L	1	20.0	---	116	80-120%	---	---	
1,1-Dichloropropene	20.4	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
cis-1,3-Dichloropropene	20.2	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
trans-1,3-Dichloropropene	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Hexachlorobutadiene	19.7	---	5.00	ug/L	1	20.0	---	98	80-120%	---	---	
Methylene chloride	19.9	---	3.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,1,1,2-Tetrachloroethane	21.4	---	0.400	ug/L	1	20.0	---	107	80-120%	---	---	
1,1,2,2-Tetrachloroethane	21.3	---	0.500	ug/L	1	20.0	---	107	80-120%	---	---	
Tetrachloroethene (PCE)	18.6	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
1,2,3-Trichlorobenzene	21.3	---	2.00	ug/L	1	20.0	---	107	80-120%	---	---	
1,2,4-Trichlorobenzene	19.8	---	2.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,1,1-Trichloroethane	21.5	---	0.400	ug/L	1	20.0	---	107	80-120%	---	---	
1,1,2-Trichloroethane	20.3	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Trichloroethene (TCE)	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
Trichlorofluoromethane	20.3	---	2.00	ug/L	1	20.0	---	101	80-120%	---	---	
1,2,3-Trichloropropane	21.0	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Vinyl chloride	20.5	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)												
		Recovery: 100 %		Limits: 80-120 %		Dilution: 1x						
Toluene-d8 (Surr)												
		100 %		80-120 %		"						
4-Bromofluorobenzene (Surr)												
		97 %		80-120 %		"						

Duplicate (8100454-DUP1) Prepared: 10/01/18 12:10 Analyzed: 10/01/18 21:32

QC Source Sample: S-2 (A810737-04)

EPA 8260C

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100454 - EPA 5030B												
Water												
Duplicate (8100454-DUP1)			Prepared: 10/01/18 12:10 Analyzed: 10/01/18 21:32									
QC Source Sample: S-2 (A810737-04)												
Bromobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromoform	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromomethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Chloroethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Chloroform	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Chloromethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Dibromomethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloroethane	10.1	---	0.400	ug/L	1	---	9.97	---	---	0.9	30%	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	0.329	---	---	***	30%	
cis-1,2-Dichloroethene	50.2	---	0.400	ug/L	1	---	50.9	---	---	1	30%	
trans-1,2-Dichloroethene	0.714	---	0.400	ug/L	1	---	0.695	---	---	3	30%	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Methylene chloride	ND	---	3.00	ug/L	1	---	ND	---	---	---	30%	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100454 - EPA 5030B						Water						
Duplicate (8100454-DUP1)			Prepared: 10/01/18 12:10 Analyzed: 10/01/18 21:32									
QC Source Sample: S-2 (A810737-04)												
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	1.83	---	0.400	ug/L	1	---	1.74	---	---	5	30%	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Trichloroethene (TCE)	4.16	---	0.400	ug/L	1	---	4.00	---	---	4	30%	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Vinyl chloride	0.415	---	0.400	ug/L	1	---	0.417	---	---	0.5	30%	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>			<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>					
<i>Toluene-d8 (Surr)</i>			<i>104 %</i>		<i>80-120 %</i>		<i>"</i>					
<i>4-Bromofluorobenzene (Surr)</i>			<i>100 %</i>		<i>80-120 %</i>		<i>"</i>					



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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100460 - EPA 5030B						Water						
Blank (8100460-BLK1)		Prepared: 10/01/18 11:15			Analyzed: 10/01/18 12:38							
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100460 - EPA 5030B												
Water												
Blank (8100460-BLK1)	Prepared: 10/01/18 11:15 Analyzed: 10/01/18 12:38											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 106 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	98 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	98 %		80-120 %		"							

LCS (8100460-BS1)												
Prepared: 10/01/18 11:15 Analyzed: 10/01/18 11:43												
EPA 8260C												
Bromobenzene	20.8	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
Bromochloromethane	21.8	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Bromodichloromethane	19.9	---	1.00	ug/L	1	20.0	---	100	80-120%	---	---	
Bromoform	16.8	---	1.00	ug/L	1	20.0	---	84	80-120%	---	---	
Bromomethane	21.4	---	5.00	ug/L	1	20.0	---	107	80-120%	---	---	
Carbon tetrachloride	19.5	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
Chlorobenzene	20.2	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Chloroethane	39.3	---	5.00	ug/L	1	20.0	---	197	80-120%	---	---	Q-56
Chloroform	20.3	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Chloromethane	16.1	---	5.00	ug/L	1	20.0	---	81	80-120%	---	---	
2-Chlorotoluene	20.4	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
4-Chlorotoluene	19.0	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
Dibromochloromethane	19.0	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
1,2-Dibromo-3-chloropropane	17.4	---	5.00	ug/L	1	20.0	---	87	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Dibromomethane	20.9	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
1,2-Dichlorobenzene	21.2	---	0.500	ug/L	1	20.0	---	106	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100460 - EPA 5030B						Water						
LCS (8100460-BS1)			Prepared: 10/01/18 11:15		Analyzed: 10/01/18 11:43							
1,3-Dichlorobenzene	20.6	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	
1,4-Dichlorobenzene	20.4	---	0.500	ug/L	1	20.0	---	102	80-120%	---	---	
Dichlorodifluoromethane	17.5	---	1.00	ug/L	1	20.0	---	88	80-120%	---	---	
1,1-Dichloroethane	19.2	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
1,2-Dichloroethane (EDC)	20.3	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
1,1-Dichloroethene	16.6	---	0.400	ug/L	1	20.0	---	83	80-120%	---	---	
cis-1,2-Dichloroethene	19.6	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
trans-1,2-Dichloroethene	19.0	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
1,2-Dichloropropane	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
1,3-Dichloropropane	19.8	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
2,2-Dichloropropane	14.5	---	1.00	ug/L	1	20.0	---	72	80-120%	---	---	Q-55
1,1-Dichloropropene	19.2	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
cis-1,3-Dichloropropene	16.9	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
trans-1,3-Dichloropropene	16.7	---	1.00	ug/L	1	20.0	---	83	80-120%	---	---	
Hexachlorobutadiene	20.2	---	5.00	ug/L	1	20.0	---	101	80-120%	---	---	
Methylene chloride	18.6	---	3.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1,1,2-Tetrachloroethane	20.3	---	0.400	ug/L	1	20.0	---	101	80-120%	---	---	
1,1,2,2-Tetrachloroethane	22.0	---	0.500	ug/L	1	20.0	---	110	80-120%	---	---	
Tetrachloroethene (PCE)	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,2,3-Trichlorobenzene	22.1	---	2.00	ug/L	1	20.0	---	111	80-120%	---	---	
1,2,4-Trichlorobenzene	20.9	---	2.00	ug/L	1	20.0	---	105	80-120%	---	---	
1,1,1-Trichloroethane	18.3	---	0.400	ug/L	1	20.0	---	91	80-120%	---	---	
1,1,2-Trichloroethane	19.1	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Trichloroethene (TCE)	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
Trichlorofluoromethane	22.0	---	2.00	ug/L	1	20.0	---	110	80-120%	---	---	
1,2,3-Trichloropropane	20.3	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Vinyl chloride	17.9	---	0.400	ug/L	1	20.0	---	90	80-120%	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 103 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>"</i>						



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QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091197 - Method Prep: Aq						Water						
Blank (8091197-BLK1)		Prepared: 09/27/18 10:33 Analyzed: 09/27/18 15:40										
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	---
LCS (8091197-BS1)		Prepared: 09/27/18 10:33 Analyzed: 09/27/18 15:42										
SM 4500-NH3 G												
Ammonia as N	2.05	---	0.0200	mg/L	1	2.00	---	102	90-110%	---	---	---



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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091182 - Method Prep: Aq						Water						
Blank (8091182-BLK1)		Prepared: 09/27/18 08:31		Analyzed: 09/27/18 10:41								
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
LCS (8091182-BS1)		Prepared: 09/27/18 08:31		Analyzed: 09/27/18 11:02								
EPA 300.0												
Nitrate-Nitrogen	2.09	---	0.250	mg/L	1	2.00	---	104	90-110%	---	---	---
Nitrite-Nitrogen	1.95	---	0.250	mg/L	1	2.00	---	97	90-110%	---	---	---



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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091239 - Method Prep: Aq						Water						
Blank (8091239-BLK1)		Prepared: 09/28/18 07:08 Analyzed: 09/28/18 08:18										
<u>EPA 300.0</u>												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
LCS (8091239-BS1)		Prepared: 09/28/18 07:08 Analyzed: 09/28/18 08:39										
<u>EPA 300.0</u>												
Nitrate-Nitrogen	2.04	---	0.250	mg/L	1	2.00	---	102	90-110%	---	---	---



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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QUALITY CONTROL (QC) SAMPLE RESULTS

Demand Parameters

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091225 - Method Prep: Aq						Water						
Blank (8091225-BLK1)		Prepared: 09/27/18 15:10 Analyzed: 09/27/18 18:18										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	---
LCS (8091225-BS1)		Prepared: 09/27/18 15:10 Analyzed: 09/27/18 18:47										
SM 5310 C												
Total Organic Carbon	10.8	---	1.00	mg/L	1	10.0	---	108	85-115%	---	---	---
LCS (8091225-BS2)		Prepared: 09/27/18 15:10 Analyzed: 09/27/18 19:17										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	0.00	---		85-115%	---	---	TOC_I



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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SAMPLE PREPARATION INFORMATION

Halogenated Volatile Organic Compounds by EPA 8260C

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8091289</u>							
A810737-01	Water	EPA 8260C	09/26/18 08:10	09/27/18 15:29	5mL/5mL	5mL/5mL	1.00
A810737-02	Water	EPA 8260C	09/26/18 08:50	09/27/18 15:29	5mL/5mL	5mL/5mL	1.00
A810737-07	Water	EPA 8260C	09/26/18 14:50	09/27/18 15:29	5mL/5mL	5mL/5mL	1.00
A810737-08	Water	EPA 8260C	09/26/18 00:00	09/27/18 15:29	5mL/5mL	5mL/5mL	1.00
A810737-09	Water	EPA 8260C	09/26/18 15:40	09/27/18 15:29	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8100454</u>							
A810737-03	Water	EPA 8260C	09/26/18 09:35	10/01/18 10:56	5mL/5mL	5mL/5mL	1.00
A810737-04	Water	EPA 8260C	09/26/18 12:30	10/01/18 12:10	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8100460</u>							
A810737-05	Water	EPA 8260C	09/26/18 13:20	10/01/18 14:00	5mL/5mL	5mL/5mL	1.00
A810737-06	Water	EPA 8260C	09/26/18 14:05	10/01/18 14:27	5mL/5mL	5mL/5mL	1.00

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8091197</u>							
A810737-01	Water	SM 4500-NH3 G	09/26/18 08:10	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00
A810737-02RE1	Water	SM 4500-NH3 G	09/26/18 08:50	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00
A810737-03	Water	SM 4500-NH3 G	09/26/18 09:35	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00
A810737-04RE1	Water	SM 4500-NH3 G	09/26/18 12:30	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00
A810737-05	Water	SM 4500-NH3 G	09/26/18 13:20	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00
A810737-06	Water	SM 4500-NH3 G	09/26/18 14:05	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00
A810737-07	Water	SM 4500-NH3 G	09/26/18 14:50	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00
A810737-09RE1	Water	SM 4500-NH3 G	09/26/18 15:40	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00
A810737-09RE2	Water	SM 4500-NH3 G	09/26/18 15:40	09/27/18 10:33	10mL/10mL	10mL/10mL	1.00

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8091182</u>							
A810737-01	Water	EPA 300.0	09/26/18 08:10	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00
A810737-02	Water	EPA 300.0	09/26/18 08:50	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00
A810737-02RE1	Water	EPA 300.0	09/26/18 08:50	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00

Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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SAMPLE PREPARATION INFORMATION

Anions by Ion Chromatography

<u>Prep: Method Prep: Aq</u>					Sample	Default	RL Prep
Lab Number	Matrix	Method	Sampled	Prepared	Initial/Final	Initial/Final	Factor
A810737-03	Water	EPA 300.0	09/26/18 09:35	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00
A810737-04	Water	EPA 300.0	09/26/18 12:30	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00
A810737-05	Water	EPA 300.0	09/26/18 13:20	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00
A810737-06	Water	EPA 300.0	09/26/18 14:05	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00
A810737-07	Water	EPA 300.0	09/26/18 14:50	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00
A810737-09	Water	EPA 300.0	09/26/18 15:40	09/27/18 08:31	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8091239</u>							
A810737-09RE1	Water	EPA 300.0	09/26/18 15:40	09/28/18 07:08	5mL/5mL	5mL/5mL	1.00

Demand Parameters

<u>Prep: Method Prep: Aq</u>					Sample	Default	RL Prep
Lab Number	Matrix	Method	Sampled	Prepared	Initial/Final	Initial/Final	Factor
<u>Batch: 8091225</u>							
A810737-02	Water	SM 5310 C	09/26/18 08:50	09/27/18 15:10	40mL/40mL	40mL/40mL	1.00
A810737-09	Water	SM 5310 C	09/26/18 15:40	09/27/18 15:10	40mL/40mL	40mL/40mL	1.00



<u>Cascadia Associates</u> 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: <u>Shore Terminal-Vancouver</u> Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

Apex Laboratories

- EST** Result reported as an Estimated Value. Compound failed initial calibration criteria.
- Q-54** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +2%. The results are reported as Estimated Values.
- Q-54c** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -10%. The results are reported as Estimated Values.
- Q-54e** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -21%. The results are reported as Estimated Values.
- Q-54f** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -4%. The results are reported as Estimated Values.
- Q-54g** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -7%. The results are reported as Estimated Values.
- Q-55** Daily CCV/LCS recovery for this analyte was below the +/-20% criteria listed in EPA 8260C, however there is adequate sensitivity to ensure detection at the reporting level.
- Q-56** Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C
- TOC_I** Inorganic Carbon Spike Check. Results are valid if Non Detect (No Inorganic Carbon detected.)

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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REPORTING NOTES AND CONVENTIONS:

Abbreviations:

- DET Analyte DETECTED at or above the detection or reporting limit.
- ND Analyte NOT DETECTED at or above the detection or reporting limit.
- NR Result Not Reported
- RPD Relative Percent Difference

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

- Basis: Results for soil samples are generally reported on a 100% dry weight basis. The Result Basis is listed following the units as "dry", "wet", or "" (blank) designation.
 - "dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.
 - "wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.
 - "" Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) are not included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

- " --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.
- " *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to 1/2 the Reporting Limit (RL).
-For Blank hits falling between 1/2 the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a 'B' qualifier, per Apex Laboratories' Blank Policy.
For further details, please request a copy of this document.



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the blank results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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LABORATORY ACCREDITATION INFORMATION

TNI Certification ID: OR100062 (Primary Accreditation) - EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation
<u>All reported analytes are included in Apex Laboratories' current ORELAP scope.</u>					

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation. Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provided by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver
Project Number: 3Q 2018
Project Manager: Stephanie Salisbury

Report ID:
A810737 - 10 12 18 1155

CHAIN OF CUSTODY

Lab # A810737 PO# _____

Project Name: 3Q 2018 Project # _____

Project Mgr: Stephanie Salisbury Email: Stephanie.Salisbury@Cascadia.associates.com

Address: 6915 SW Macadam Ave, SI 250 Phone: 503-966-6571 Fax: _____

Sampled by: Joel W. Lindberg

Company: Cascadia (WA)

LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-DX	NWTPH-GX	8260 VOCs Full List	8260 RBDM VOCs	8260 HVOCs	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TTO	RCRA Metals (8)	TCLP Metals (8)	Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Fe, Ni, Pb, Hg, Mn, Mo, Se, Zn	TOTAL DISS TCLP	1200-COLS	1200-Z	Nitrate/Nitrite	Ammonia	PSX-175 X	TOC	
1	9/26/18	0810	GW	5																						
2	9/26/18	0850	GW	7																						
3	9/26/18	0935	GW	5																						
4	9/26/18	1230	GW	5																						
5	9/26/18	1520	GW	5																						
6	9/26/18	1405	GW	5																						
7	9/26/18	1410	GW	5																						
8				1																						
9	9/26/18	1540	GW	7																						
10																										

SPECIAL INSTRUCTIONS: *PSX - 175 = ethane, ethene, methane

Normal Turn Around Time (TAT) = 10 Business Days (YES) NO

TAT Requested (circle): 1 Day 2 Day 3 Day 4 DAY 5 DAY Other: _____

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY: [Signature] Date: 9/26/18 Signature: _____ Date: 9/26/18

Printed Name: Joel W. Lindberg Printed Name: Stephanie Salisbury Time: 1633 Time: _____

Company: Cascadia Company: Apex Labs

Joia A. Domenighini



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: 3Q 2018 Project Manager: Stephanie Salisbury	Report ID: A810737 - 10 12 18 1155
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APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A8 I0737

Project/Project #: 3Q2018

Delivery info:

Date/Time Received: 9/26/18 @ 1633 By: CFH

Delivered by: Apex Client ESS FedEx UPS Swift Senvoy SDS Other

Cooler Inspection Inspected by: CFH : 9/26/18 @ 1823

Chain of Custody Included? Yes No Custody Seals? Yes No

Signed/Dated by Client? Yes No

Signed/Dated by Apex? Yes No

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (deg. C)	<u>3.2</u>						
Received on Ice? (Y/N)	<u>Y</u>						
Temp. Blanks? (Y/N)	<u>Y</u>						
Ice Type: (Gel/Real/Other)	<u>Real</u>						
Condition:	<u>Good</u>						

Cooler out of temp? (Y/N) Possible reason why: _____
If some coolers are in temp and some out, were green dot applied to out of temperature samples? Yes/No/NA

Samples Inspection: Inspected by: (Signature) : 9/27/18 @ 903

All Samples Intact? Yes No Comments: _____

Bottle Labels/COCs agree? Yes No Comments: _____

Containers/Volumes Received Appropriate for Analysis? Yes No Comments: _____

Do VOA Vials have Visible Headspace? Yes No NA

Comments: Sediment in 5/5 MW-14, 3/3 S-2 + 3/3 MW-22i

Water Samples: pH Checked and Appropriate (except VOAs): Yes No NA

Comments: _____

Additional Information: Trip Blank # 18795

Labeled by: _____ Witness: _____ Cooler Inspected by: _____ See Project Contact Form: Y

(Signature)

(Signature)

COB

Lisa Domenighini

October 11, 2018

Apex Laboratories
ATTN: Lisa Domenighini
12232 S.W. Garden Place
Tigard, OR 97223



LA Cert #04140
EPA Methods TO3, TO14A, TO15, 25C/3C,
RSK-175
TX Cert T104704450-14-6
EPA Methods TO14A, TO15
UT Cert CA0133332015-3
EPA Methods TO3, TO14A, TO15, RSK-175

LABORATORY TEST RESULTS

Project Reference: A8I0737
Lab Number: J092803-01/02

Enclosed are results for sample(s) received 9/28/18 by Air Technology Laboratories. Samples were received intact and properly chilled. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the TNI Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

A handwritten signature in blue ink, appearing to read "Mark Johnson".

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Note: The cover letter is an integral part of this analytical report.

W 9/27

SUBCONTRACT ORDER

Apex Laboratories

A810737

J092803-01/02
W 9/27/18

SENDING LABORATORY:

Apex Laboratories
12232 S.W. Garden Place
Tigard, OR 97223
Phone: (503) 718-2323
Fax: (503) 718-0333
Project Manager: Lisa Domenighini

RECEIVING LABORATORY:

Air Technology Laboratories, Inc
18501 E. Gale Ave Suite 130
City of Industry, CA 91748
Phone : (626) 964-4032
Fax: (626) 964-5832

Sample Name: MW-14 ✓ Water Sampled: 09/26/18 08:50 (A810737-02) ✓

Analysis Due Expires Comments

RSK 175 Preserved (Meth, Eth, Eth) (Sub) 10/09/18 17:00 10/10/18 08:50

51 Containers Supplied:
✓ (D)40 mL VOA - HCL ✓
✓ (E)40 mL VOA - HCL ✓

Sample Name: MP-1 ✓ Water Sampled: 09/26/18 15:40 (A810737-09) ✓

Analysis Due Expires Comments

RSK 175 Preserved (Meth, Eth, Eth) (Sub) 10/09/18 17:00 10/10/18 15:40

62 Containers Supplied:
✓ (D)40 mL VOA - HCL ✓
✓ (E)40 mL VOA - HCL ✓

Standard TAT

Released By [Signature] Date 9/27/18 Received By [Signature] Date 9/28/18
Released By WRS Date Received By Date 1009

1°C


Client: Apex Laboratories
Attn: Lisa Domenighini
Project Name: NA
Project No.: A8I0737
Date Received: 09/28/18
Matrix: Water
Reporting Units: ug/L

RSK175

Lab No.:	J092803-01	J092803-02						
Client Sample I.D.:	MW-14 (A8I0737-02)	MP-1 (A8I0737-09)						
Date/Time Sampled:	9/26/18 8:50	9/26/18 15:40						
Date/Time Analyzed:	10/4/18 16:17	10/5/18 8:30						
QC Batch No.:	181004GC8A2	181004GC8A2						
Analyst Initials:	AS	AS						
Dilution Factor:	1.0	1.0						
ANALYTE	Result ug/L	RL ug/L	Result ug/L	RL ug/L				
Ethene	ND	1.0	ND	1.0				
Ethane	ND	1.0	7.3	1.0				
Methane	11	1.0	5,300	1.0				

ND = Not Detected (below RL)
 RL = Reporting Limit

Reviewed/Approved By: _____


 Mark Johnson
 Operations Manager

Date _____

10/11/18

The cover letter is an integral part of this analytical report





Thursday, October 11, 2018

Stephanie Salisbury
Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

RE: A810793 - Shore Terminal-Vancouver - Nustar Vancouver

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A810793, which was received by the laboratory on 9/28/2018 at 4:20:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of final reporting, unless prior arrangements have been made.

Cooler Receipt Info

(See Cooler Receipt Form for Details)

Default Cooler 3.3 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.

All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.



Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Vancouver**
Project Manager: **Stephanie Salisbury**

Report ID:
A810793 - 10 11 18 0956

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-9	A810793-01	Water	09/27/18 08:00	09/28/18 16:20
MW-7	A810793-02	Water	09/27/18 08:40	09/28/18 16:20
MW-5	A810793-03	Water	09/27/18 09:20	09/28/18 16:20
MW-21i-40	A810793-04	Water	09/27/18 10:15	09/28/18 16:20
MW-23i	A810793-05	Water	09/27/18 11:00	09/28/18 16:20
MW-18i	A810793-06	Water	09/27/18 11:50	09/28/18 16:20
MW-19i	A810793-07	Water	09/27/18 12:30	09/28/18 16:20
EW-1	A810793-08	Water	09/27/18 13:20	09/28/18 16:20
MW-24i	A810793-09	Water	09/27/18 14:10	09/28/18 16:20
MP-3	A810793-10	Water	09/27/18 14:30	09/28/18 16:20
MW-25i	A810793-11	Water	09/27/18 15:30	09/28/18 16:20
Trip Blank	A810793-12	Water	09/27/18 00:00	09/28/18 16:20

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-9 (A810793-01)				Matrix: Water		Batch: 8091299		
Bromobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethane	5.69	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethene	1.59	---	0.400	ug/L	1	09/29/18	EPA 8260C	
trans-1,2-Dichloroethene	7.54	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1-Trichloroethane	3.96	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Trichloroethene (TCE)	168	---	0.400	ug/L	1	09/29/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-9 (A810793-01)				Matrix: Water		Batch: 8091299		
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Vinyl chloride	3.90	---	0.400	ug/L	1	09/29/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 109 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>101 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
MW-9 (A810793-01RE1)				Matrix: Water		Batch: 8100454		
cis-1,2-Dichloroethene	219	---	4.00	ug/L	10	10/01/18	EPA 8260C	
Tetrachloroethene (PCE)	243	---	4.00	ug/L	10	10/01/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
MW-7 (A810793-02RE1)				Matrix: Water		Batch: 8100454		
Bromobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethane	1.23	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-7 (A810793-02RE1)				Matrix: Water		Batch: 8100454		
cis-1,2-Dichloroethene	8.48	---	0.400	ug/L	1	10/01/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Tetrachloroethene (PCE)	6.50	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Trichloroethene (TCE)	10.8	---	0.400	ug/L	1	10/01/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Vinyl chloride	2.08	---	0.400	ug/L	1	10/01/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 111 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>

MW-5 (A810793-03)				Matrix: Water		Batch: 8100508		
Bromobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Chloroethane	26.9	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-5 (A810793-03)				Matrix: Water		Batch: 8100508		
Dibromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
cis-1,2-Dichloroethene	0.562	---	0.400	ug/L	1	10/02/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 111 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>101 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>

MW-21i-40 (A810793-04)				Matrix: Water		Batch: 8091299		
Bromobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21i-40 (A810793-04)				Matrix: Water		Batch: 8091299		
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethane	2.46	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethene	0.700	---	0.400	ug/L	1	09/29/18	EPA 8260C	
cis-1,2-Dichloroethene	62.1	---	0.400	ug/L	1	09/29/18	EPA 8260C	
trans-1,2-Dichloroethene	0.690	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Tetrachloroethene (PCE)	24.5	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21i-40 (A810793-04)				Matrix: Water		Batch: 8091299		
Trichloroethene (TCE)	17.1	---	0.400	ug/L	1	09/29/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>

MW-23i (A810793-05RE1)				Matrix: Water		Batch: 8100508		
Bromobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-23i (A810793-05RE1)				Matrix: Water		Batch: 8100508		
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 110 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>

MW-18i (A810793-06RE1)				Matrix: Water		Batch: 8100508		
Bromobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-18i (A810793-06RE1)				Matrix: Water		Batch: 8100508		
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Tetrachloroethene (PCE)	0.674	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 112 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>

MW-19i (A810793-07)				Matrix: Water		Batch: 8091299		
Bromobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19i (A810793-07)				Matrix: Water		Batch: 8091299		
Chloroethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 110 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19i (A810793-07)			Matrix: Water		Batch: 8091299			
<i>Surrogate: Toluene-d8 (Surr)</i>		<i>Recovery: 104 %</i>	<i>Limits: 80-120 %</i>	<i>1</i>		<i>09/29/18</i>	<i>EPA 8260C</i>	
<i>4-Bromofluorobenzene (Surr)</i>		<i>104 %</i>	<i>80-120 %</i>	<i>1</i>		<i>09/29/18</i>	<i>EPA 8260C</i>	
EW-1 (A810793-08)			Matrix: Water		Batch: 8091299			
Bromobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Chloroform	1.15	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethane	0.410	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloroethane (EDC)	1.03	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
cis-1,2-Dichloroethene	3.18	---	0.400	ug/L	1	09/29/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
EW-1 (A810793-08)			Matrix: Water		Batch: 8091299			
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Tetrachloroethene (PCE)	29.7	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1-Trichloroethane	0.410	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Trichloroethene (TCE)	8.39	---	0.400	ug/L	1	09/29/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 110 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>106 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>

MW-24i (A810793-09RE1)			Matrix: Water		Batch: 8100454			
Bromobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethane	2.18	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24i (A810793-09RE1)				Matrix: Water		Batch: 8100454		
cis-1,2-Dichloroethene	25.0	---	0.400	ug/L	1	10/01/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/01/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Tetrachloroethene (PCE)	24.8	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/01/18	EPA 8260C	
Trichloroethene (TCE)	14.3	---	0.400	ug/L	1	10/01/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/01/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/01/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/01/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 110 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>101 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>

MP-3 (A810793-10)				Matrix: Water		Batch: 8091299		
Bromobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MP-3 (A810793-10)				Matrix: Water		Batch: 8091299		
Dibromochloromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethane	4.06	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloroethene	3.52	---	0.400	ug/L	1	09/29/18	EPA 8260C	
trans-1,2-Dichloroethene	1.60	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	09/29/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,1,1-Trichloroethane	0.950	---	0.400	ug/L	1	09/29/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	09/29/18	EPA 8260C	
Trichloroethene (TCE)	148	---	0.400	ug/L	1	09/29/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	09/29/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	09/29/18	EPA 8260C	
Vinyl chloride	0.730	---	0.400	ug/L	1	09/29/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 115 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>09/29/18</i>	<i>EPA 8260C</i>

MP-3 (A810793-10RE1)				Matrix: Water		Batch: 8100454		
cis-1,2-Dichloroethene	187	---	8.00	ug/L	20	10/01/18	EPA 8260C	
Tetrachloroethene (PCE)	721	---	8.00	ug/L	20	10/01/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 111 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MP-3 (A810793-10RE1)				Matrix: Water		Batch: 8100454		
<i>Surrogate: Toluene-d8 (Surr)</i>		<i>Recovery: 103 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/01/18</i>	<i>EPA 8260C</i>
MW-25i (A810793-11)				Matrix: Water		Batch: 8100508		
Bromobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-25i (A810793-11)				Matrix: Water		Batch: 8100508		
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 112 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>106 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
Trip Blank (A810793-12)				Matrix: Water		Batch: 8100508		
Bromobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A810793-12)			Matrix: Water			Batch: 8100508		
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 111 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>



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ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-9 (A810793-01RE1)				Matrix: Water		Batch: 8100505		
Ammonia as N	17.0	---	0.200	mg/L	10	10/02/18	SM 4500-NH3 G	
MW-7 (A810793-02RE1)				Matrix: Water		Batch: 8100505		
Ammonia as N	16.7	---	0.200	mg/L	10	10/02/18	SM 4500-NH3 G	
MW-5 (A810793-03RE1)				Matrix: Water		Batch: 8100505		
Ammonia as N	9.55	---	0.200	mg/L	10	10/02/18	SM 4500-NH3 G	
MW-21i-40 (A810793-04)				Matrix: Water		Batch: 8100505		
Ammonia as N	ND	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	
MW-23i (A810793-05)				Matrix: Water		Batch: 8100505		
Ammonia as N	ND	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	
MW-18i (A810793-06)				Matrix: Water		Batch: 8100505		
Ammonia as N	ND	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	
MW-19i (A810793-07)				Matrix: Water		Batch: 8100505		
Ammonia as N	0.213	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	
EW-1 (A810793-08)				Matrix: Water		Batch: 8100505		
Ammonia as N	ND	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	
MW-24i (A810793-09)				Matrix: Water		Batch: 8100505		
Ammonia as N	ND	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	
MP-3 (A810793-10RE1)				Matrix: Water		Batch: 8100505		
Ammonia as N	31.2	---	0.200	mg/L	10	10/02/18	SM 4500-NH3 G	
MW-25i (A810793-11RE1)				Matrix: Water		Batch: 8100512		
Ammonia as N	ND	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-9 (A810793-01)				Matrix: Water				
Batch: 8091239								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
MW-9 (A810793-01RE1)				Matrix: Water				
Batch: 8091239								
Nitrate-Nitrogen	468	---	12.5	mg/L	50	09/28/18	EPA 300.0	
MW-7 (A810793-02)				Matrix: Water				
Batch: 8091239								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
MW-5 (A810793-03)				Matrix: Water				
Batch: 8091239								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
MW-21i-40 (A810793-04)				Matrix: Water				
Batch: 8091239								
Nitrate-Nitrogen	3.61	---	0.250	mg/L	1	09/28/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
MW-23i (A810793-05)				Matrix: Water				
Batch: 8091239								
Nitrate-Nitrogen	1.04	---	0.250	mg/L	1	09/28/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
MW-18i (A810793-06)				Matrix: Water				
Batch: 8091239								
Nitrate-Nitrogen	1.00	---	0.250	mg/L	1	09/28/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
MW-19i (A810793-07)				Matrix: Water				
Batch: 8091239								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
EW-1 (A810793-08)				Matrix: Water				
Batch: 8091239								
Nitrate-Nitrogen	0.686	---	0.250	mg/L	1	09/28/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
MW-24i (A810793-09)				Matrix: Water				
Batch: 8091239								
Nitrate-Nitrogen	7.56	---	0.250	mg/L	1	09/28/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
MP-3 (A810793-10)				Matrix: Water				
Batch: 8091239								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
MP-3 (A810793-10RE1)				Matrix: Water				
Batch: 8091239								
Nitrate-Nitrogen	95.9	---	5.00	mg/L	20	09/29/18	EPA 300.0	
MW-25i (A810793-11)				Matrix: Water				
Batch: 8091239								
Nitrate-Nitrogen	0.775	---	0.250	mg/L	1	09/28/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	



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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091299 - EPA 5030B						Water						
Blank (8091299-BLK1)		Prepared: 09/29/18 10:18			Analyzed: 09/29/18 14:12							
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091299 - EPA 5030B												
Water												
Blank (8091299-BLK1)	Prepared: 09/29/18 10:18 Analyzed: 09/29/18 14:12											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 106 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	103 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	104 %		80-120 %		"							

LCS (8091299-BS1)												
Prepared: 09/29/18 10:18 Analyzed: 09/29/18 13:16												
EPA 8260C												
Bromobenzene	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Bromochloromethane	22.6	---	1.00	ug/L	1	20.0	---	113	80-120%	---	---	
Bromodichloromethane	20.1	---	1.00	ug/L	1	20.0	---	100	80-120%	---	---	
Bromoform	22.1	---	1.00	ug/L	1	20.0	---	111	80-120%	---	---	
Bromomethane	27.6	---	5.00	ug/L	1	20.0	---	138	80-120%	---	---	EST, Q-56
Carbon tetrachloride	19.3	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
Chlorobenzene	19.0	---	0.500	ug/L	1	20.0	---	95	80-120%	---	---	
Chloroethane	19.0	---	5.00	ug/L	1	20.0	---	95	80-120%	---	---	
Chloroform	19.8	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
Chloromethane	14.0	---	5.00	ug/L	1	20.0	---	70	80-120%	---	---	Q-55
2-Chlorotoluene	21.7	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
4-Chlorotoluene	21.3	---	1.00	ug/L	1	20.0	---	107	80-120%	---	---	
Dibromochloromethane	21.4	---	1.00	ug/L	1	20.0	---	107	80-120%	---	---	
1,2-Dibromo-3-chloropropane	22.8	---	5.00	ug/L	1	20.0	---	114	80-120%	---	---	
1,2-Dibromoethane (EDB)	21.1	---	0.500	ug/L	1	20.0	---	105	80-120%	---	---	
Dibromomethane	20.8	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
1,2-Dichlorobenzene	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091299 - EPA 5030B												
						Water						
LCS (8091299-BS1)			Prepared: 09/29/18 10:18			Analyzed: 09/29/18 13:16						
1,3-Dichlorobenzene	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
1,4-Dichlorobenzene	19.0	---	0.500	ug/L	1	20.0	---	95	80-120%	---	---	
Dichlorodifluoromethane	16.9	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
1,1-Dichloroethane	19.3	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
1,2-Dichloroethane (EDC)	18.9	---	0.400	ug/L	1	20.0	---	94	80-120%	---	---	
1,1-Dichloroethene	18.9	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
cis-1,2-Dichloroethene	19.1	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
trans-1,2-Dichloroethene	18.6	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
1,2-Dichloropropane	18.7	---	0.500	ug/L	1	20.0	---	94	80-120%	---	---	
1,3-Dichloropropane	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
2,2-Dichloropropane	21.6	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
1,1-Dichloropropene	19.8	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
cis-1,3-Dichloropropene	20.5	---	1.00	ug/L	1	20.0	---	103	80-120%	---	---	
trans-1,3-Dichloropropene	21.4	---	1.00	ug/L	1	20.0	---	107	80-120%	---	---	
Hexachlorobutadiene	17.6	---	5.00	ug/L	1	20.0	---	88	80-120%	---	---	
Methylene chloride	18.5	---	3.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1,1,2-Tetrachloroethane	20.3	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
1,1,2,2-Tetrachloroethane	21.0	---	0.500	ug/L	1	20.0	---	105	80-120%	---	---	
Tetrachloroethene (PCE)	17.5	---	0.400	ug/L	1	20.0	---	88	80-120%	---	---	
1,2,3-Trichlorobenzene	20.5	---	2.00	ug/L	1	20.0	---	103	80-120%	---	---	
1,2,4-Trichlorobenzene	19.9	---	2.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,1,1-Trichloroethane	20.0	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,1,2-Trichloroethane	19.7	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
Trichloroethene (TCE)	19.0	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
Trichlorofluoromethane	17.8	---	2.00	ug/L	1	20.0	---	89	80-120%	---	---	
1,2,3-Trichloropropane	21.8	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Vinyl chloride	19.1	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr) Recovery: 100 % Limits: 80-120 % Dilution: 1x												
Toluene-d8 (Surr) 101 % 80-120 % "												
4-Bromofluorobenzene (Surr) 101 % 80-120 % "												

Matrix Spike (8091299-MS1) Prepared: 09/29/18 14:18 Analyzed: 09/29/18 23:12

QC Source Sample: MP-3 (A810793-10)
EPA 8260C

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091299 - EPA 5030B												
Water												
Matrix Spike (8091299-MS1)			Prepared: 09/29/18 14:18 Analyzed: 09/29/18 23:12									
QC Source Sample: MP-3 (A810793-10)												
Bromobenzene	19.5	---	0.500	ug/L	1	20.0	ND	97	80-120%	---	---	
Bromochloromethane	25.0	---	1.00	ug/L	1	20.0	ND	125	78-123%	---	---	Q-01
Bromodichloromethane	21.8	---	1.00	ug/L	1	20.0	ND	109	79-125%	---	---	
Bromoform	22.6	---	1.00	ug/L	1	20.0	ND	113	66-130%	---	---	
Bromomethane	29.3	---	5.00	ug/L	1	20.0	ND	147	53-141%	---	---	EST, Q-54
Carbon tetrachloride	21.4	---	1.00	ug/L	1	20.0	ND	107	72-136%	---	---	
Chlorobenzene	19.7	---	0.500	ug/L	1	20.0	ND	98	80-120%	---	---	
Chloroethane	22.4	---	5.00	ug/L	1	20.0	ND	112	60-138%	---	---	
Chloroform	21.3	---	1.00	ug/L	1	20.0	ND	106	79-124%	---	---	
Chloromethane	17.0	---	5.00	ug/L	1	20.0	ND	85	50-139%	---	---	Q-54c
2-Chlorotoluene	21.5	---	1.00	ug/L	1	20.0	ND	108	79-122%	---	---	
4-Chlorotoluene	21.3	---	1.00	ug/L	1	20.0	ND	106	78-122%	---	---	
Dibromochloromethane	21.2	---	1.00	ug/L	1	20.0	ND	106	74-126%	---	---	
1,2-Dibromo-3-chloropropane	23.1	---	5.00	ug/L	1	20.0	ND	116	62-128%	---	---	
1,2-Dibromoethane (EDB)	20.6	---	0.500	ug/L	1	20.0	ND	103	77-121%	---	---	
Dibromomethane	22.1	---	1.00	ug/L	1	20.0	ND	110	79-123%	---	---	
1,2-Dichlorobenzene	20.0	---	0.500	ug/L	1	20.0	ND	100	80-120%	---	---	
1,3-Dichlorobenzene	20.4	---	0.500	ug/L	1	20.0	ND	102	80-120%	---	---	
1,4-Dichlorobenzene	19.4	---	0.500	ug/L	1	20.0	ND	97	79-120%	---	---	
Dichlorodifluoromethane	18.9	---	1.00	ug/L	1	20.0	ND	95	32-152%	---	---	
1,1-Dichloroethane	24.8	---	0.400	ug/L	1	20.0	4.06	104	77-125%	---	---	
1,2-Dichloroethane (EDC)	20.1	---	0.400	ug/L	1	20.0	ND	100	73-128%	---	---	
1,1-Dichloroethene	24.4	---	0.400	ug/L	1	20.0	3.52	104	71-131%	---	---	
cis-1,2-Dichloroethene	227	---	0.400	ug/L	1	20.0	215	60	78-123%	---	---	E, Q-03
trans-1,2-Dichloroethene	21.6	---	0.400	ug/L	1	20.0	1.60	100	75-124%	---	---	
1,2-Dichloropropane	20.6	---	0.500	ug/L	1	20.0	ND	103	78-122%	---	---	
1,3-Dichloropropane	20.1	---	1.00	ug/L	1	20.0	ND	101	80-120%	---	---	
2,2-Dichloropropane	18.7	---	1.00	ug/L	1	20.0	ND	93	60-139%	---	---	
1,1-Dichloropropene	21.0	---	1.00	ug/L	1	20.0	ND	105	79-125%	---	---	
cis-1,3-Dichloropropene	16.7	---	1.00	ug/L	1	20.0	ND	83	75-124%	---	---	
trans-1,3-Dichloropropene	21.1	---	1.00	ug/L	1	20.0	ND	106	73-127%	---	---	
Hexachlorobutadiene	18.4	---	5.00	ug/L	1	20.0	ND	92	66-134%	---	---	
Methylene chloride	20.1	---	3.00	ug/L	1	20.0	ND	100	74-124%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091299 - EPA 5030B						Water						
Matrix Spike (8091299-MS1)		Prepared: 09/29/18 14:18		Analyzed: 09/29/18 23:12								
QC Source Sample: MP-3 (A810793-10)												
1,1,1,2-Tetrachloroethane	20.7	---	0.400	ug/L	1	20.0	ND	104	78-124%	---	---	
1,1,2,2-Tetrachloroethane	22.1	---	0.500	ug/L	1	20.0	ND	110	71-121%	---	---	
Tetrachloroethene (PCE)	928	---	0.400	ug/L	1	20.0	1030	-495	74-129%	---	---	E, Q-03
1,2,3-Trichlorobenzene	21.6	---	2.00	ug/L	1	20.0	ND	108	69-129%	---	---	
1,2,4-Trichlorobenzene	19.5	---	2.00	ug/L	1	20.0	ND	97	69-130%	---	---	
1,1,1-Trichloroethane	23.0	---	0.400	ug/L	1	20.0	0.950	110	74-131%	---	---	
1,1,2-Trichloroethane	20.0	---	0.500	ug/L	1	20.0	ND	100	80-120%	---	---	
Trichloroethene (TCE)	161	---	0.400	ug/L	1	20.0	148	63	79-123%	---	---	Q-03
Trichlorofluoromethane	20.5	---	2.00	ug/L	1	20.0	ND	102	65-141%	---	---	
1,2,3-Trichloropropane	22.4	---	1.00	ug/L	1	20.0	ND	112	73-122%	---	---	
Vinyl chloride	22.2	---	0.400	ug/L	1	20.0	0.730	108	58-137%	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>96 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>96 %</i>		<i>80-120 %</i>		<i>"</i>						



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100454 - EPA 5030B						Water						
Blank (8100454-BLK1)		Prepared: 10/01/18 10:37 Analyzed: 10/01/18 12:59										
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100454 - EPA 5030B						Water						
Blank (8100454-BLK1)	Prepared: 10/01/18 10:37					Analyzed: 10/01/18 12:59						
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 110 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>"</i>						

LCS (8100454-BS2)						Prepared: 10/01/18 10:37 Analyzed: 10/01/18 11:34						
EPA 8260C												
Bromobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Bromochloromethane	23.5	---	1.00	ug/L	1	20.0	---	118	80-120%	---	---	
Bromodichloromethane	21.6	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
Bromoform	22.3	---	1.00	ug/L	1	20.0	---	112	80-120%	---	---	
Bromomethane	29.6	---	5.00	ug/L	1	20.0	---	148	80-120%	---	---	EST, Q-56
Carbon tetrachloride	20.9	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Chlorobenzene	20.1	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Chloroethane	21.1	---	5.00	ug/L	1	20.0	---	106	80-120%	---	---	
Chloroform	20.9	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Chloromethane	15.6	---	5.00	ug/L	1	20.0	---	78	80-120%	---	---	Q-55
2-Chlorotoluene	22.1	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
4-Chlorotoluene	21.8	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Dibromochloromethane	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
1,2-Dibromo-3-chloropropane	21.2	---	5.00	ug/L	1	20.0	---	106	80-120%	---	---	
1,2-Dibromoethane (EDB)	20.9	---	0.500	ug/L	1	20.0	---	105	80-120%	---	---	
Dibromomethane	21.6	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
1,2-Dichlorobenzene	20.6	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100454 - EPA 5030B												
Water												
LCS (8100454-BS2)	Prepared: 10/01/18 10:37 Analyzed: 10/01/18 11:34											
1,3-Dichlorobenzene	21.2	---	0.500	ug/L	1	20.0	---	106	80-120%	---	---	
1,4-Dichlorobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Dichlorodifluoromethane	17.0	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
1,1-Dichloroethane	20.6	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.9	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
1,1-Dichloroethene	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
cis-1,2-Dichloroethene	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
trans-1,2-Dichloroethene	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
1,2-Dichloropropane	20.3	---	0.500	ug/L	1	20.0	---	102	80-120%	---	---	
1,3-Dichloropropane	19.7	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
2,2-Dichloropropane	23.2	---	1.00	ug/L	1	20.0	---	116	80-120%	---	---	
1,1-Dichloropropene	20.4	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
cis-1,3-Dichloropropene	20.2	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
trans-1,3-Dichloropropene	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Hexachlorobutadiene	19.7	---	5.00	ug/L	1	20.0	---	98	80-120%	---	---	
Methylene chloride	19.9	---	3.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,1,1,2-Tetrachloroethane	21.4	---	0.400	ug/L	1	20.0	---	107	80-120%	---	---	
1,1,2,2-Tetrachloroethane	21.3	---	0.500	ug/L	1	20.0	---	107	80-120%	---	---	
Tetrachloroethene (PCE)	18.6	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
1,2,3-Trichlorobenzene	21.3	---	2.00	ug/L	1	20.0	---	107	80-120%	---	---	
1,2,4-Trichlorobenzene	19.8	---	2.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,1,1-Trichloroethane	21.5	---	0.400	ug/L	1	20.0	---	107	80-120%	---	---	
1,1,2-Trichloroethane	20.3	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Trichloroethene (TCE)	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
Trichlorofluoromethane	20.3	---	2.00	ug/L	1	20.0	---	101	80-120%	---	---	
1,2,3-Trichloropropane	21.0	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Vinyl chloride	20.5	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr) Recovery: 100 % Limits: 80-120 % Dilution: 1x												
Toluene-d8 (Surr) 100 % 80-120 % "												
4-Bromofluorobenzene (Surr) 97 % 80-120 % "												



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100508 - EPA 5030B						Water						
Blank (8100508-BLK1)		Prepared: 10/02/18 10:37 Analyzed: 10/02/18 12:31										
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100508 - EPA 5030B												
Water												
Blank (8100508-BLK1)	Prepared: 10/02/18 10:37 Analyzed: 10/02/18 12:31											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 109 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	106 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	101 %		80-120 %		"							

LCS (8100508-BS2)												
Prepared: 10/02/18 10:37 Analyzed: 10/02/18 11:34												
EPA 8260C												
Bromobenzene	20.2	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Bromochloromethane	22.7	---	1.00	ug/L	1	20.0	---	113	80-120%	---	---	
Bromodichloromethane	21.2	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
Bromoform	22.7	---	1.00	ug/L	1	20.0	---	114	80-120%	---	---	
Bromomethane	32.1	---	5.00	ug/L	1	20.0	---	160	80-120%	---	---	EST, Q-56
Carbon tetrachloride	20.2	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Chlorobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Chloroethane	20.2	---	5.00	ug/L	1	20.0	---	101	80-120%	---	---	
Chloroform	20.2	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Chloromethane	15.3	---	5.00	ug/L	1	20.0	---	76	80-120%	---	---	Q-55
2-Chlorotoluene	21.7	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
4-Chlorotoluene	22.1	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
Dibromochloromethane	22.1	---	1.00	ug/L	1	20.0	---	111	80-120%	---	---	
1,2-Dibromo-3-chloropropane	21.7	---	5.00	ug/L	1	20.0	---	108	80-120%	---	---	
1,2-Dibromoethane (EDB)	21.5	---	0.500	ug/L	1	20.0	---	108	80-120%	---	---	
Dibromomethane	21.2	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
1,2-Dichlorobenzene	20.6	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100508 - EPA 5030B												
Water												
LCS (8100508-BS2)	Prepared: 10/02/18 10:37 Analyzed: 10/02/18 11:34											
1,3-Dichlorobenzene	21.0	---	0.500	ug/L	1	20.0	---	105	80-120%	---	---	
1,4-Dichlorobenzene	19.9	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Dichlorodifluoromethane	16.5	---	1.00	ug/L	1	20.0	---	82	80-120%	---	---	
1,1-Dichloroethane	20.0	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.7	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
1,1-Dichloroethene	19.5	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
cis-1,2-Dichloroethene	19.1	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
trans-1,2-Dichloroethene	18.9	---	0.400	ug/L	1	20.0	---	94	80-120%	---	---	
1,2-Dichloropropane	19.6	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
1,3-Dichloropropane	20.3	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
2,2-Dichloropropane	22.1	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
1,1-Dichloropropene	19.5	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
cis-1,3-Dichloropropene	20.3	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
trans-1,3-Dichloropropene	22.1	---	1.00	ug/L	1	20.0	---	111	80-120%	---	---	
Hexachlorobutadiene	18.8	---	5.00	ug/L	1	20.0	---	94	80-120%	---	---	
Methylene chloride	19.1	---	3.00	ug/L	1	20.0	---	96	80-120%	---	---	
1,1,1,2-Tetrachloroethane	21.5	---	0.400	ug/L	1	20.0	---	108	80-120%	---	---	
1,1,2,2-Tetrachloroethane	22.2	---	0.500	ug/L	1	20.0	---	111	80-120%	---	---	
Tetrachloroethene (PCE)	18.2	---	0.400	ug/L	1	20.0	---	91	80-120%	---	---	
1,2,3-Trichlorobenzene	21.5	---	2.00	ug/L	1	20.0	---	108	80-120%	---	---	
1,2,4-Trichlorobenzene	18.7	---	2.00	ug/L	1	20.0	---	94	80-120%	---	---	
1,1,1-Trichloroethane	20.8	---	0.400	ug/L	1	20.0	---	104	80-120%	---	---	
1,1,2-Trichloroethane	20.9	---	0.500	ug/L	1	20.0	---	105	80-120%	---	---	
Trichloroethene (TCE)	19.1	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
Trichlorofluoromethane	19.7	---	2.00	ug/L	1	20.0	---	98	80-120%	---	---	
1,2,3-Trichloropropane	22.8	---	1.00	ug/L	1	20.0	---	114	80-120%	---	---	
Vinyl chloride	19.7	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 101 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	102 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	97 %		80-120 %		"							



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QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100505 - Method Prep: Aq						Water						
Blank (8100505-BLK1)		Prepared: 10/02/18 09:37 Analyzed: 10/02/18 15:00										
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (8100505-BS1)		Prepared: 10/02/18 09:37 Analyzed: 10/02/18 15:02										
SM 4500-NH3 G												
Ammonia as N	2.08	---	0.0200	mg/L	1	2.00	---	104	90-110%	---	---	



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QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100512 - Method Prep: Aq						Water						
Blank (8100512-BLK2)		Prepared: 10/02/18 09:46 Analyzed: 10/02/18 17:02										
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	Q-16
LCS (8100512-BS2)		Prepared: 10/02/18 09:46 Analyzed: 10/02/18 17:03										
SM 4500-NH3 G												
Ammonia as N	2.09	---	0.0200	mg/L	1	2.00	---	104	90-110%	---	---	Q-16
Matrix Spike (8100512-MS2)		Prepared: 10/02/18 09:46 Analyzed: 10/02/18 17:06										
QC Source Sample: MW-25i (A810793-11RE1)												
SM 4500-NH3 G												
Ammonia as N	2.60	---	0.0250	mg/L	1	2.50	0.0140	104	90-110%	---	---	Q-16
Matrix Spike Dup (8100512-MSD2)		Prepared: 10/02/18 09:46 Analyzed: 10/02/18 17:08										
QC Source Sample: MW-25i (A810793-11RE1)												
SM 4500-NH3 G												
Ammonia as N	2.64	---	0.0250	mg/L	1	2.50	0.0140	105	90-110%	2	10%	Q-16



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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091239 - Method Prep: Aq						Water						
Blank (8091239-BLK1)		Prepared: 09/28/18 07:08		Analyzed: 09/28/18 08:18								
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
LCS (8091239-BS1)		Prepared: 09/28/18 07:08		Analyzed: 09/28/18 08:39								
EPA 300.0												
Nitrate-Nitrogen	2.04	---	0.250	mg/L	1	2.00	---	102	90-110%	---	---	---
Nitrite-Nitrogen	1.97	---	0.250	mg/L	1	2.00	---	98	90-110%	---	---	---



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Vancouver**
Project Manager: **Stephanie Salisbury**

Report ID:
A810793 - 10 11 18 0956

QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

Apex Laboratories

- E** Estimated Value. The result is above the calibration range of the instrument.
- EST** Result reported as an Estimated Value. Compound failed initial calibration criteria.
- Q-01** Spike recovery and/or RPD is outside acceptance limits.
- Q-03** Spike recovery and/or RPD is outside control limits due to the high concentration of analyte present in the sample.
- Q-16** Reanalysis of an original Batch QC sample.
- Q-54** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +17.9%. The results are reported as Estimated Values.
- Q-54c** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -10%. The results are reported as Estimated Values.
- Q-55** Daily CCV/LCS recovery for this analyte was below the +/-20% criteria listed in EPA 8260C, however there is adequate sensitivity to ensure detection at the reporting level.
- Q-56** Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C

Apex Laboratories

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REPORTING NOTES AND CONVENTIONS:

Abbreviations:

- DET Analyte DETECTED at or above the detection or reporting limit.
- ND Analyte NOT DETECTED at or above the detection or reporting limit.
- NR Result Not Reported
- RPD Relative Percent Difference

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

- Basis: Results for soil samples are generally reported on a 100% dry weight basis. The Result Basis is listed following the units as "dry", "wet", or "" (blank) designation.
 - "dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.
 - "wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.
 - "" Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) are not included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

- " --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.
- " *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to 1/2 the Reporting Limit (RL).
-For Blank hits falling between 1/2 the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a 'B' qualifier, per Apex Laboratories' Blank Policy.
For further details, please request a copy of this document.



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REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the blank results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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LABORATORY ACCREDITATION INFORMATION

TNI Certification ID: OR100062 (Primary Accreditation) - EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation
<u>All reported analytes are included in Apex Laboratories' current ORELAP scope.</u>					

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation. Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provided by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver
Project Number: Nustar Vancouver
Project Manager: Stephanie Salisbury

Report ID:
A810793 - 10 11 18 0956

CHAIN OF CUSTODY

Lab # A810793 PO# _____ Project # _____
COC 1 of 2

Company: Cascadia Associates Project Mgr: Stephanie Salisbury Project Name: Nustar Vancouver
Address: 6915 SW Macadam Ave Ste 250 Phone: 503 906 6577 Fax: _____ Email: Sbsalisbury@cascadiaassociates.com
Sampled by: Joel M.

LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	ANALYSIS REQUEST		SPECIAL INSTRUCTIONS
					YES	NO	
MW-9	9/27/18	0800	GW	5			
MW-7	9/27/18	0840	GW	5			
MW-5	9/27/18	0920	GW	5			
MW-21i-40	9/27/18	1015	GW	5			
MW-23i	9/27/18	1100	GW	5			
MW-18i	9/27/18	1150	GW	5			
MW-19i	9/27/18	1230	GW	5			
EW-1	9/27/18	1320	GW	5			
MW-24i	9/27/18	1410	GW	5			
MP-3	9/27/18	1430	GW	5			

Normal Turn Around Time (TAT) = 10 Business Days

TAT Requested (circle): 1 Day 2 Day 3 Day 4 DAY 5 DAY Other: _____

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY: Joel M. RECEIVED BY: _____
Signature: _____ Date: 9/27/18 Signature: _____
Printed Name: Joel M. Matlock Date: 9/27/18 Printed Name: _____
Time: 1630 Time: _____

Company: Cascadia Company: _____

Cascadia Associates Project: **Shore Terminal-Vancouver**
 6915 SW Macadam, Suite 250 Project Number: **Nustar Vancouver**
 Portland, OR 97219 Project Manager: **Stephanie Salisbury** Report ID:
 A810793 - 10 11 18 0956

COC 2 of 2

PO#

Lab # **A810793**

CHAIN OF CUSTODY

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

Company: **Cascadia Associates** Project Mgr: **Stephanie Salisbury** Project Name: **Nustar Vancouver** Project #

Address: **6915 SW Macadam Ave Ste 250** Phone: **503 906 6577** Fax: Email: **SbSalisbury@Cascadia.com**

Sampled by: **Joel M.**

Site Location: OR **(WA)**

Other:

SAMPLE ID

LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTFH-CID	NWTFH-DX	NWTFH-GX	8260 VOCs Full List	8260 RDM VOCs	8260 HVOCs	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TTO	RCRA Metals (8)	TCLP Metals (8)	AL, Sb, As, Ba, Be, Bi, Cd, Cr, Cu, Fe, Pb, Zn	He, Mg, Mn, Mo, Ni, P, Se, Ag, Na, TL, V, Zn	TOTAL DISS TCLP	1200-COLS	1200-Z		
MW-251	9/10/18	1530	6w 5							X														
Trip Blank	9/10/18	-	W 1							X														

ANALYSIS REQUEST

Normal Turn Around Time (TAT) = 10 Business Days YES NO

TAT Requested (circle) 1 Day 2 Day 3 Day 4 DAY 5 DAY Other: _____

SPECIAL INSTRUCTIONS:

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY: *Stephanie Salisbury* Date: **9/10/18** Signature: *Stephanie Salisbury* Date: **9/10/18**

RECEIVED BY: *Joel Makedon* Date: **9/10/18** Signature: *Joel Makedon* Date: **9/10/18**

Printed Name: **Joel Makedon** Time: **1620** Printed Name: **Joel Makedon** Time: **1620**

Company: **Cascadia** Company: **Apex Lab**

Joel M. Domenighini



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810793 - 10 11 18 0956
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APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A8 10793

Project/Project #: Nustar-Vancouver

Delivery info:
Date/Time Received: 9/27/18 @ 1620 By: CEH
Delivered by: Apex Client ESS FedEx UPS Swift Senvoy SDS Other

Cooler Inspection Inspected by: CEH : 9/27/18 @ 1734
Chain of Custody Included? Yes No Custody Seals? Yes No
Signed/Dated by Client? Yes No
Signed/Dated by Apex? Yes No

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (deg. C)	<u>3.3</u>						
Received on Ice? (Y/N)	<u>Y</u>						
Temp. Blanks? (Y/N)	<u>Y</u>						
Ice Type: (Gel/Real/Other)	<u>Real</u>						
Condition:	<u>Good</u>						

Cooler out of temp? (Y/N) Possible reason why: _____
If some coolers are in temp and some out, were green dot applied to out of temperature samples? Yes/No/NA

Samples Inspection: Inspected by: CEH : 9/28/18 @ 1015
All Samples Intact? Yes No Comments: JS 9/28/18

Bottle Labels/COCs agree? Yes No Comments: Unpre poly for sample MW-24; T reads 1310

Containers/Volumes Received Appropriate for Analysis? Yes No Comments: _____

Do VOA Vials have Visible Headspace? Yes No NA
Comments: 1/1 Triplicate has US

Water Samples: pH Checked and Appropriate (except VOAs): Yes No NA
Comments: _____

Additional Information: IB# 1875

Labeled by: CEH Witness: JS Cooler Inspected by: MW See Project Contact Form: Y

Lisa Domenighini



Friday, October 19, 2018
Stephanie Salisbury
Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

RE: A810823 - Shore Terminal-Vancouver - Nustar Vancouver

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A810823, which was received by the laboratory on 9/28/2018 at 3:35:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of final reporting, unless prior arrangements have been made.

Cooler Receipt Info (See Cooler Receipt Form for Details)

Default Cooler 2.6 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.

All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.



Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Vancouver**
Project Manager: **Stephanie Salisbury**

Report ID:
A810823 - 10 19 18 1512

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-24D	A810823-01	Water	09/28/18 08:10	09/28/18 15:35
MGMS1-43	A810823-02	Water	09/28/18 09:30	09/28/18 15:35
MGMS2-132	A810823-03	Water	09/28/18 10:15	09/28/18 15:35
MGMS2-110	A810823-04	Water	09/28/18 10:40	09/28/18 15:35
MGMS2-40	A810823-05	Water	09/28/18 11:40	09/28/18 15:35
MGMS3-132	A810823-06	Water	09/28/18 12:15	09/28/18 15:35
MGMS3-60	A810823-07	Water	09/28/18 12:50	09/28/18 15:35
MGMS3-40	A810823-08	Water	09/28/18 13:10	09/28/18 15:35
MGMS3-40 Dup	A810823-09	Water	09/28/18 13:10	09/28/18 15:35
MGMS3-101	A810823-10	Water	09/28/18 13:40	09/28/18 15:35
Trip Blank	A810823-11	Water	09/28/18 00:00	09/28/18 15:35

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24D (A810823-01)				Matrix: Water		Batch: 8100525		
Bromobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24D (A810823-01)				Matrix: Water		Batch: 8100525		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>

MGMS1-43 (A810823-02RE1)				Matrix: Water		Batch: 8100558		
Bromobenzene	ND	---	10.0	ug/L	20	10/03/18	EPA 8260C	
Bromochloromethane	ND	---	20.0	ug/L	20	10/03/18	EPA 8260C	
Bromodichloromethane	ND	---	20.0	ug/L	20	10/03/18	EPA 8260C	
Bromoform	ND	---	20.0	ug/L	20	10/03/18	EPA 8260C	
Bromomethane	ND	---	100	ug/L	20	10/03/18	EPA 8260C	
Carbon tetrachloride	ND	---	20.0	ug/L	20	10/03/18	EPA 8260C	
Chlorobenzene	ND	---	10.0	ug/L	20	10/03/18	EPA 8260C	
Chloroethane	ND	---	100	ug/L	20	10/03/18	EPA 8260C	
Chloroform	ND	---	20.0	ug/L	20	10/03/18	EPA 8260C	
Chloromethane	ND	---	100	ug/L	20	10/03/18	EPA 8260C	
2-Chlorotoluene	ND	---	20.0	ug/L	20	10/03/18	EPA 8260C	
4-Chlorotoluene	ND	---	20.0	ug/L	20	10/03/18	EPA 8260C	
Dibromochloromethane	ND	---	20.0	ug/L	20	10/03/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	100	ug/L	20	10/03/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	10.0	ug/L	20	10/03/18	EPA 8260C	
Dibromomethane	ND	---	20.0	ug/L	20	10/03/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	10.0	ug/L	20	10/03/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	10.0	ug/L	20	10/03/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	10.0	ug/L	20	10/03/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	20.0	ug/L	20	10/03/18	EPA 8260C	
1,1-Dichloroethane	141	---	8.00	ug/L	20	10/03/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	8.00	ug/L	20	10/03/18	EPA 8260C	
1,1-Dichloroethene	27.8	---	8.00	ug/L	20	10/03/18	EPA 8260C	
cis-1,2-Dichloroethene	3150	---	8.00	ug/L	20	10/03/18	EPA 8260C	
trans-1,2-Dichloroethene	47.4	---	8.00	ug/L	20	10/03/18	EPA 8260C	
1,2-Dichloropropane	ND	---	10.0	ug/L	20	10/03/18	EPA 8260C	
1,3-Dichloropropane	ND	---	20.0	ug/L	20	10/03/18	EPA 8260C	
2,2-Dichloropropane	ND	---	20.0	ug/L	20	10/03/18	EPA 8260C	

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS1-43 (A810823-02RE1)				Matrix: Water		Batch: 8100558		
1,1-Dichloropropene	ND	---	20.0	ug/L	20	10/03/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	20.0	ug/L	20	10/03/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	20.0	ug/L	20	10/03/18	EPA 8260C	
Hexachlorobutadiene	ND	---	100	ug/L	20	10/03/18	EPA 8260C	
Methylene chloride	ND	---	60.0	ug/L	20	10/03/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	8.00	ug/L	20	10/03/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	10.0	ug/L	20	10/03/18	EPA 8260C	
Tetrachloroethene (PCE)	252	---	8.00	ug/L	20	10/03/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	40.0	ug/L	20	10/03/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	40.0	ug/L	20	10/03/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	8.00	ug/L	20	10/03/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	10.0	ug/L	20	10/03/18	EPA 8260C	
Trichloroethene (TCE)	528	---	8.00	ug/L	20	10/03/18	EPA 8260C	
Trichlorofluoromethane	ND	---	40.0	ug/L	20	10/03/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	20.0	ug/L	20	10/03/18	EPA 8260C	
Vinyl chloride	134	---	8.00	ug/L	20	10/03/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>

MGMS2-132 (A810823-03)				Matrix: Water		Batch: 8100525		
Bromobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-132 (A810823-03)				Matrix: Water		Batch: 8100525		
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethane	0.520	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
cis-1,2-Dichloroethene	17.8	---	0.400	ug/L	1	10/02/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Tetrachloroethene (PCE)	4.82	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Trichloroethene (TCE)	5.63	---	0.400	ug/L	1	10/02/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Vinyl chloride	6.71	---	0.400	ug/L	1	10/02/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>

MGMS2-110 (A810823-04)				Matrix: Water		Batch: 8100525		
Bromobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-110 (A810823-04)				Matrix: Water		Batch: 8100525		
Chlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethane	0.410	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
cis-1,2-Dichloroethene	11.3	---	0.400	ug/L	1	10/02/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Tetrachloroethene (PCE)	4.98	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Trichloroethene (TCE)	4.27	---	0.400	ug/L	1	10/02/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Vinyl chloride	4.63	---	0.400	ug/L	1	10/02/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-110 (A810823-04)				Matrix: Water		Batch: 8100525		
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>	<i>Limits: 80-120 %</i>	<i>1</i>		<i>10/02/18</i>	<i>EPA 8260C</i>	
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>	<i>80-120 %</i>	<i>1</i>		<i>10/02/18</i>	<i>EPA 8260C</i>	
<i>4-Bromofluorobenzene (Surr)</i>		<i>97 %</i>	<i>80-120 %</i>	<i>1</i>		<i>10/02/18</i>	<i>EPA 8260C</i>	

MGMS2-40 (A810823-05)				Matrix: Water		Batch: 8100525		
Bromobenzene	ND	---	1.00	ug/L	2	10/03/18	EPA 8260C	
Bromochloromethane	ND	---	2.00	ug/L	2	10/03/18	EPA 8260C	
Bromodichloromethane	ND	---	2.00	ug/L	2	10/03/18	EPA 8260C	
Bromoform	ND	---	2.00	ug/L	2	10/03/18	EPA 8260C	
Bromomethane	ND	---	10.0	ug/L	2	10/03/18	EPA 8260C	
Carbon tetrachloride	ND	---	2.00	ug/L	2	10/03/18	EPA 8260C	
Chlorobenzene	ND	---	1.00	ug/L	2	10/03/18	EPA 8260C	
Chloroethane	ND	---	10.0	ug/L	2	10/03/18	EPA 8260C	
Chloroform	ND	---	2.00	ug/L	2	10/03/18	EPA 8260C	
Chloromethane	ND	---	10.0	ug/L	2	10/03/18	EPA 8260C	
2-Chlorotoluene	ND	---	2.00	ug/L	2	10/03/18	EPA 8260C	
4-Chlorotoluene	ND	---	2.00	ug/L	2	10/03/18	EPA 8260C	
Dibromochloromethane	ND	---	2.00	ug/L	2	10/03/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	10.0	ug/L	2	10/03/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	1.00	ug/L	2	10/03/18	EPA 8260C	
Dibromomethane	ND	---	2.00	ug/L	2	10/03/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	1.00	ug/L	2	10/03/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	1.00	ug/L	2	10/03/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	1.00	ug/L	2	10/03/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	2.00	ug/L	2	10/03/18	EPA 8260C	
1,1-Dichloroethane	8.74	---	0.800	ug/L	2	10/03/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.800	ug/L	2	10/03/18	EPA 8260C	
1,1-Dichloroethene	1.44	---	0.800	ug/L	2	10/03/18	EPA 8260C	
cis-1,2-Dichloroethene	140	---	0.800	ug/L	2	10/03/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.800	ug/L	2	10/03/18	EPA 8260C	
1,2-Dichloropropane	ND	---	1.00	ug/L	2	10/03/18	EPA 8260C	
1,3-Dichloropropane	ND	---	2.00	ug/L	2	10/03/18	EPA 8260C	
2,2-Dichloropropane	ND	---	2.00	ug/L	2	10/03/18	EPA 8260C	
1,1-Dichloropropene	ND	---	2.00	ug/L	2	10/03/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	2.00	ug/L	2	10/03/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	2.00	ug/L	2	10/03/18	EPA 8260C	
Hexachlorobutadiene	ND	---	10.0	ug/L	2	10/03/18	EPA 8260C	
Methylene chloride	ND	---	6.00	ug/L	2	10/03/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-40 (A810823-05)				Matrix: Water		Batch: 8100525		
1,1,1,2-Tetrachloroethane	ND	---	0.800	ug/L	2	10/03/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	1.00	ug/L	2	10/03/18	EPA 8260C	
Tetrachloroethene (PCE)	66.9	---	0.800	ug/L	2	10/03/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	4.00	ug/L	2	10/03/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	4.00	ug/L	2	10/03/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.800	ug/L	2	10/03/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	1.00	ug/L	2	10/03/18	EPA 8260C	
Trichloroethene (TCE)	43.3	---	0.800	ug/L	2	10/03/18	EPA 8260C	
Trichlorofluoromethane	ND	---	4.00	ug/L	2	10/03/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	2.00	ug/L	2	10/03/18	EPA 8260C	
Vinyl chloride	106	---	0.800	ug/L	2	10/03/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>

MGMS3-132 (A810823-06)				Matrix: Water		Batch: 8100525		
Bromobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-132 (A810823-06)				Matrix: Water		Batch: 8100525		
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
cis-1,2-Dichloroethene	3.45	---	0.400	ug/L	1	10/02/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Tetrachloroethene (PCE)	3.82	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Trichloroethene (TCE)	3.24	---	0.400	ug/L	1	10/02/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 105 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>

MGMS3-60 (A810823-07)				Matrix: Water		Batch: 8100525		
Bromobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-60 (A810823-07)				Matrix: Water		Batch: 8100525		
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
cis-1,2-Dichloroethene	9.26	---	0.400	ug/L	1	10/02/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Tetrachloroethene (PCE)	3.25	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Trichloroethene (TCE)	2.31	---	0.400	ug/L	1	10/02/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>

MGMS3-40 (A810823-08) **Matrix: Water** **Batch: 8100525**

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-40 (A810823-08)				Matrix: Water		Batch: 8100525		
Bromobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
1,1-Dichloroethane	6.74	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
cis-1,2-Dichloroethene	116	---	0.400	ug/L	1	10/03/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/03/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Tetrachloroethene (PCE)	0.970	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/03/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/03/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-40 (A810823-08)				Matrix: Water		Batch: 8100525		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/03/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Vinyl chloride	129	---	0.400	ug/L	1	10/03/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>

MGMS3-40 Dup (A810823-09)				Matrix: Water		Batch: 8100560		
Bromobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
1,1-Dichloroethane	9.08	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,1-Dichloroethene	0.560	---	0.400	ug/L	1	10/03/18	EPA 8260C	
cis-1,2-Dichloroethene	143	---	0.400	ug/L	1	10/03/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-40 Dup (A810823-09)				Matrix: Water		Batch: 8100560		
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/03/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Tetrachloroethene (PCE)	0.686	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/03/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/03/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/03/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 105 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>

MGMS3-40 Dup (A810823-09RE1)				Matrix: Water		Batch: 8100616		
Vinyl chloride	129	---	4.00	ug/L	10	10/04/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 109 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/04/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>106 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/04/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/04/18</i>	<i>EPA 8260C</i>

MGMS3-101 (A810823-10)				Matrix: Water		Batch: 8100560		
Bromobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-101 (A810823-10)				Matrix: Water		Batch: 8100560		
Dibromochloromethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
cis-1,2-Dichloroethene	1.52	---	0.400	ug/L	1	10/03/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/03/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Tetrachloroethene (PCE)	1.98	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/03/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/03/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Trichloroethene (TCE)	1.11	---	0.400	ug/L	1	10/03/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/03/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 113 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>106 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>

Trip Blank (A810823-11)				Matrix: Water		Batch: 8100525		
Bromobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A810823-11)				Matrix: Water		Batch: 8100525		
Bromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/02/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/02/18	EPA 8260C	

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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A810823-11)			Matrix: Water			Batch: 8100525		
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/02/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/02/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/02/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 105 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/02/18</i>	<i>EPA 8260C</i>

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ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24D (A810823-01)				Matrix: Water		Batch: 8100505		
Ammonia as N	0.145	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	
MGMS1-43 (A810823-02RE3)				Matrix: Water		Batch: 8100512		
Ammonia as N	240	---	1.00	mg/L	50	10/02/18	SM 4500-NH3 G	
MGMS2-132 (A810823-03RE1)				Matrix: Water		Batch: 8100512		
Ammonia as N	0.0500	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	
MGMS2-110 (A810823-04RE1)				Matrix: Water		Batch: 8100512		
Ammonia as N	ND	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	
MGMS2-40 (A810823-05RE2)				Matrix: Water		Batch: 8100512		
Ammonia as N	85.2	---	0.400	mg/L	20	10/02/18	SM 4500-NH3 G	
MGMS3-132 (A810823-06RE1)				Matrix: Water		Batch: 8100512		
Ammonia as N	ND	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	
MGMS3-60 (A810823-07RE1)				Matrix: Water		Batch: 8100512		
Ammonia as N	ND	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	
MGMS3-40 (A810823-08RE1)				Matrix: Water		Batch: 8100512		
Ammonia as N	1.71	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	
MGMS3-40 Dup (A810823-09RE1)				Matrix: Water		Batch: 8100512		
Ammonia as N	1.68	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	
MGMS3-101 (A810823-10RE1)				Matrix: Water		Batch: 8100512		
Ammonia as N	ND	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24D (A810823-01) Matrix: Water								
Batch: 8091293								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
MGMS1-43 (A810823-02) Matrix: Water								
Batch: 8091293								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
MGMS1-43 (A810823-02RE1) Matrix: Water								
Batch: 8091297								
Nitrate-Nitrogen	75.8	---	5.00	mg/L	20	09/29/18	EPA 300.0	
MGMS2-132 (A810823-03) Matrix: Water								
Batch: 8091293								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/28/18	EPA 300.0	
MGMS2-110 (A810823-04) Matrix: Water								
Batch: 8091293								
Nitrate-Nitrogen	0.412	---	0.250	mg/L	1	09/29/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/29/18	EPA 300.0	
MGMS2-40 (A810823-05) Matrix: Water								
Batch: 8091293								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/29/18	EPA 300.0	
MGMS2-40 (A810823-05RE1) Matrix: Water								
Batch: 8091297								
Nitrate-Nitrogen	9.38	---	0.500	mg/L	2	09/29/18	EPA 300.0	
MGMS3-132 (A810823-06) Matrix: Water								
Batch: 8091293								
Nitrate-Nitrogen	0.468	---	0.250	mg/L	1	09/29/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/29/18	EPA 300.0	
MGMS3-60 (A810823-07) Matrix: Water								

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-60 (A810823-07)				Matrix: Water				
Batch: 8091293								
Nitrate-Nitrogen	0.393	---	0.250	mg/L	1	09/29/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/29/18	EPA 300.0	
MGMS3-40 (A810823-08)				Matrix: Water				
Batch: 8091293								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/29/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/29/18	EPA 300.0	
MGMS3-40 Dup (A810823-09)				Matrix: Water				
Batch: 8091293								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	09/29/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/29/18	EPA 300.0	
MGMS3-101 (A810823-10)				Matrix: Water				
Batch: 8091293								
Nitrate-Nitrogen	0.506	---	0.250	mg/L	1	09/29/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	09/29/18	EPA 300.0	

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ANALYTICAL SAMPLE RESULTS

Demand Parameters

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS1-43 (A810823-02)				Matrix: Water				
Batch: 8100574								
Total Organic Carbon	5.52	---	1.00	mg/L	1	10/03/18	SM 5310 C	
MGMS2-40 (A810823-05)				Matrix: Water				
Batch: 8100574								
Total Organic Carbon	5.91	---	1.00	mg/L	1	10/03/18	SM 5310 C	
MGMS3-40 (A810823-08)				Matrix: Water				
Batch: 8100574								
Total Organic Carbon	4.38	---	1.00	mg/L	1	10/03/18	SM 5310 C	
MGMS3-40 Dup (A810823-09)				Matrix: Water				
Batch: 8100574								
Total Organic Carbon	4.35	---	1.00	mg/L	1	10/03/18	SM 5310 C	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100525 - EPA 5030B						Water						
Blank (8100525-BLK1)		Prepared: 10/02/18 13:00			Analyzed: 10/02/18 15:35							
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100525 - EPA 5030B						Water						
Blank (8100525-BLK1)	Prepared: 10/02/18 13:00					Analyzed: 10/02/18 15:35						
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 104 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	98 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	97 %		80-120 %		"							

LCS (8100525-BS3)						Prepared: 10/02/18 13:00 Analyzed: 10/02/18 15:07						
EPA 8260C												
Bromobenzene	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Bromochloromethane	21.5	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
Bromodichloromethane	18.0	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
Bromoform	15.3	---	1.00	ug/L	1	20.0	---	76	80-120%	---	---	Q-55
Bromomethane	20.5	---	5.00	ug/L	1	20.0	---	103	80-120%	---	---	
Carbon tetrachloride	16.3	---	1.00	ug/L	1	20.0	---	81	80-120%	---	---	
Chlorobenzene	19.6	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
Chloroethane	21.8	---	5.00	ug/L	1	20.0	---	109	80-120%	---	---	
Chloroform	19.1	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
Chloromethane	18.8	---	5.00	ug/L	1	20.0	---	94	80-120%	---	---	
2-Chlorotoluene	19.4	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
4-Chlorotoluene	18.0	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
Dibromochloromethane	17.6	---	1.00	ug/L	1	20.0	---	88	80-120%	---	---	
1,2-Dibromo-3-chloropropane	18.1	---	5.00	ug/L	1	20.0	---	91	80-120%	---	---	
1,2-Dibromoethane (EDB)	20.2	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Dibromomethane	20.7	---	1.00	ug/L	1	20.0	---	103	80-120%	---	---	
1,2-Dichlorobenzene	19.9	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100525 - EPA 5030B												
						Water						
LCS (8100525-BS3)			Prepared: 10/02/18 13:00			Analyzed: 10/02/18 15:07						
1,3-Dichlorobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
1,4-Dichlorobenzene	19.1	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Dichlorodifluoromethane	17.8	---	1.00	ug/L	1	20.0	---	89	80-120%	---	---	
1,1-Dichloroethane	18.8	---	0.400	ug/L	1	20.0	---	94	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.5	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
1,1-Dichloroethene	19.4	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
cis-1,2-Dichloroethene	19.5	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
trans-1,2-Dichloroethene	18.7	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
1,2-Dichloropropane	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
1,3-Dichloropropane	20.1	---	1.00	ug/L	1	20.0	---	100	80-120%	---	---	
2,2-Dichloropropane	12.8	---	1.00	ug/L	1	20.0	---	64	80-120%	---	---	Q-55
1,1-Dichloropropene	18.7	---	1.00	ug/L	1	20.0	---	93	80-120%	---	---	
cis-1,3-Dichloropropene	15.9	---	1.00	ug/L	1	20.0	---	79	80-120%	---	---	Q-55
trans-1,3-Dichloropropene	15.6	---	1.00	ug/L	1	20.0	---	78	80-120%	---	---	Q-55
Hexachlorobutadiene	18.0	---	5.00	ug/L	1	20.0	---	90	80-120%	---	---	
Methylene chloride	18.6	---	3.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1,1,2-Tetrachloroethane	18.4	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
1,1,2,2-Tetrachloroethane	21.9	---	0.500	ug/L	1	20.0	---	110	80-120%	---	---	
Tetrachloroethene (PCE)	18.9	---	0.400	ug/L	1	20.0	---	94	80-120%	---	---	
1,2,3-Trichlorobenzene	20.7	---	2.00	ug/L	1	20.0	---	103	80-120%	---	---	
1,2,4-Trichlorobenzene	19.8	---	2.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,1,1-Trichloroethane	16.2	---	0.400	ug/L	1	20.0	---	81	80-120%	---	---	
1,1,2-Trichloroethane	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Trichloroethene (TCE)	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
Trichlorofluoromethane	20.0	---	2.00	ug/L	1	20.0	---	100	80-120%	---	---	
1,2,3-Trichloropropane	20.9	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
Vinyl chloride	18.3	---	0.400	ug/L	1	20.0	---	91	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr) Recovery: 104 % Limits: 80-120 % Dilution: 1x												
Toluene-d8 (Surr) 98 % 80-120 % "												
4-Bromofluorobenzene (Surr) 98 % 80-120 % "												

Duplicate (8100525-DUP1)	Prepared: 10/02/18 15:27	Analyzed: 10/03/18 01:37
QC Source Sample: MGMS1-43 (A810823-02)		
EPA 8260C		

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100525 - EPA 5030B						Water						
Duplicate (8100525-DUP1)			Prepared: 10/02/18 15:27 Analyzed: 10/03/18 01:37									
QC Source Sample: MGMS1-43 (A810823-02)												
Bromobenzene	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
Bromoform	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
Bromomethane	ND	---	500	ug/L	100	---	ND	---	---	---	30%	
Carbon tetrachloride	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
Chloroethane	ND	---	500	ug/L	100	---	ND	---	---	---	30%	
Chloroform	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
Chloromethane	ND	---	500	ug/L	100	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	500	ug/L	100	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
Dibromomethane	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
1,1-Dichloroethane	123	---	40.0	ug/L	100	---	129	---	---	5	30%	
1,2-Dichloroethane (EDC)	ND	---	40.0	ug/L	100	---	ND	---	---	---	30%	
1,1-Dichloroethene	ND	---	40.0	ug/L	100	---	22.0	---	---	***	30%	
cis-1,2-Dichloroethene	2780	---	40.0	ug/L	100	---	2870	---	---	3	30%	
trans-1,2-Dichloroethene	45.0	---	40.0	ug/L	100	---	47.0	---	---	4	30%	
1,2-Dichloropropane	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	500	ug/L	100	---	ND	---	---	---	30%	
Methylene chloride	ND	---	300	ug/L	100	---	ND	---	---	---	30%	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100525 - EPA 5030B												
Water												
Duplicate (8100525-DUP1)			Prepared: 10/02/18 15:27 Analyzed: 10/03/18 01:37									
QC Source Sample: MGMS1-43 (A810823-02)												
1,1,1,2-Tetrachloroethane	ND	---	40.0	ug/L	100	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	220	---	40.0	ug/L	100	---	227	---	---	3	30%	
1,2,3-Trichlorobenzene	ND	---	200	ug/L	100	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	200	ug/L	100	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	ND	---	40.0	ug/L	100	---	ND	---	---	---	30%	
1,1,2-Trichloroethane	ND	---	50.0	ug/L	100	---	ND	---	---	---	30%	
Trichloroethene (TCE)	460	---	40.0	ug/L	100	---	476	---	---	3	30%	
Trichlorofluoromethane	ND	---	200	ug/L	100	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	100	ug/L	100	---	ND	---	---	---	30%	
Vinyl chloride	135	---	40.0	ug/L	100	---	147	---	---	9	30%	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>			<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>					
<i>Toluene-d8 (Surr)</i>			<i>98 %</i>		<i>80-120 %</i>		<i>"</i>					
<i>4-Bromofluorobenzene (Surr)</i>			<i>97 %</i>		<i>80-120 %</i>		<i>"</i>					

Matrix Spike (8100525-MS1)												
Prepared: 10/02/18 15:27 Analyzed: 10/02/18 21:07												
QC Source Sample: MW-24D (A810823-01)												
EPA 8260C												
Bromobenzene	19.5	---	0.500	ug/L	1	20.0	ND	98	80-120%	---	---	
Bromochloromethane	22.4	---	1.00	ug/L	1	20.0	ND	112	78-123%	---	---	
Bromodichloromethane	19.1	---	1.00	ug/L	1	20.0	ND	96	79-125%	---	---	
Bromoform	15.6	---	1.00	ug/L	1	20.0	ND	78	66-130%	---	---	Q-54k
Bromomethane	18.8	---	5.00	ug/L	1	20.0	ND	94	53-141%	---	---	
Carbon tetrachloride	19.5	---	1.00	ug/L	1	20.0	ND	97	72-136%	---	---	
Chlorobenzene	20.1	---	0.500	ug/L	1	20.0	ND	100	80-120%	---	---	
Chloroethane	37.6	---	5.00	ug/L	1	20.0	ND	188	60-138%	---	---	Q-01
Chloroform	20.3	---	1.00	ug/L	1	20.0	ND	102	79-124%	---	---	
Chloromethane	23.6	---	5.00	ug/L	1	20.0	ND	118	50-139%	---	---	
2-Chlorotoluene	19.9	---	1.00	ug/L	1	20.0	ND	100	79-122%	---	---	
4-Chlorotoluene	18.7	---	1.00	ug/L	1	20.0	ND	93	78-122%	---	---	
Dibromochloromethane	18.2	---	1.00	ug/L	1	20.0	ND	91	74-126%	---	---	
1,2-Dibromo-3-chloropropane	16.3	---	5.00	ug/L	1	20.0	ND	82	62-128%	---	---	
1,2-Dibromoethane (EDB)	19.7	---	0.500	ug/L	1	20.0	ND	99	77-121%	---	---	

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Lisa Domenighini, Client Services Manager



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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100525 - EPA 5030B						Water						
Matrix Spike (8100525-MS1)			Prepared: 10/02/18 15:27 Analyzed: 10/02/18 21:07									
QC Source Sample: MW-24D (A810823-01)												
Dibromomethane	21.2	---	1.00	ug/L	1	20.0	ND	106	79-123%	---	---	
1,2-Dichlorobenzene	19.9	---	0.500	ug/L	1	20.0	ND	100	80-120%	---	---	
1,3-Dichlorobenzene	19.8	---	0.500	ug/L	1	20.0	ND	99	80-120%	---	---	
1,4-Dichlorobenzene	19.6	---	0.500	ug/L	1	20.0	ND	98	79-120%	---	---	
Dichlorodifluoromethane	20.9	---	1.00	ug/L	1	20.0	ND	105	32-152%	---	---	
1,1-Dichloroethane	19.9	---	0.400	ug/L	1	20.0	ND	100	77-125%	---	---	
1,2-Dichloroethane (EDC)	20.5	---	0.400	ug/L	1	20.0	ND	102	73-128%	---	---	
1,1-Dichloroethene	21.2	---	0.400	ug/L	1	20.0	ND	106	71-131%	---	---	
cis-1,2-Dichloroethene	20.0	---	0.400	ug/L	1	20.0	ND	100	78-123%	---	---	
trans-1,2-Dichloroethene	19.9	---	0.400	ug/L	1	20.0	ND	99	75-124%	---	---	
1,2-Dichloropropane	19.8	---	0.500	ug/L	1	20.0	ND	99	78-122%	---	---	
1,3-Dichloropropane	19.8	---	1.00	ug/L	1	20.0	ND	99	80-120%	---	---	
2,2-Dichloropropane	11.9	---	1.00	ug/L	1	20.0	ND	60	60-139%	---	---	Q-54h
1,1-Dichloropropene	20.3	---	1.00	ug/L	1	20.0	ND	101	79-125%	---	---	
cis-1,3-Dichloropropene	15.3	---	1.00	ug/L	1	20.0	ND	76	75-124%	---	---	Q-54e
trans-1,3-Dichloropropene	15.0	---	1.00	ug/L	1	20.0	ND	75	73-127%	---	---	Q-54i
Hexachlorobutadiene	17.7	---	5.00	ug/L	1	20.0	ND	89	66-134%	---	---	
Methylene chloride	19.6	---	3.00	ug/L	1	20.0	ND	98	74-124%	---	---	
1,1,1,2-Tetrachloroethane	19.2	---	0.400	ug/L	1	20.0	ND	96	78-124%	---	---	
1,1,2,2-Tetrachloroethane	22.5	---	0.500	ug/L	1	20.0	ND	112	71-121%	---	---	
Tetrachloroethene (PCE)	20.2	---	0.400	ug/L	1	20.0	ND	101	74-129%	---	---	
1,2,3-Trichlorobenzene	20.4	---	2.00	ug/L	1	20.0	ND	102	69-129%	---	---	
1,2,4-Trichlorobenzene	19.3	---	2.00	ug/L	1	20.0	ND	97	69-130%	---	---	
1,1,1-Trichloroethane	18.2	---	0.400	ug/L	1	20.0	ND	91	74-131%	---	---	
1,1,2-Trichloroethane	19.4	---	0.500	ug/L	1	20.0	ND	97	80-120%	---	---	
Trichloroethene (TCE)	20.0	---	0.400	ug/L	1	20.0	ND	100	79-123%	---	---	
Trichlorofluoromethane	24.7	---	2.00	ug/L	1	20.0	ND	124	65-141%	---	---	
1,2,3-Trichloropropane	20.2	---	1.00	ug/L	1	20.0	ND	101	73-122%	---	---	
Vinyl chloride	21.1	---	0.400	ug/L	1	20.0	ND	106	58-137%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		Recovery: 105 %		Limits: 80-120 %		Dilution: 1x						
Toluene-d8 (Surr)		98 %		80-120 %		"						
4-Bromofluorobenzene (Surr)		96 %		80-120 %		"						

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100525 - EPA 5030B						Water						
Matrix Spike Dup (8100525-MSD1)			Prepared: 10/02/18 15:27 Analyzed: 10/02/18 21:34									
QC Source Sample: MW-24D (A810823-01)												
EPA 8260C												
Bromobenzene	20.2	---	0.500	ug/L	1	20.0	ND	101	80-120%	3	30%	
Bromochloromethane	24.2	---	1.00	ug/L	1	20.0	ND	121	78-123%	8	30%	
Bromodichloromethane	19.6	---	1.00	ug/L	1	20.0	ND	98	79-125%	2	30%	
Bromoform	16.1	---	1.00	ug/L	1	20.0	ND	81	66-130%	3	30%	Q-54k
Bromomethane	16.7	---	5.00	ug/L	1	20.0	ND	84	53-141%	12	30%	
Carbon tetrachloride	19.6	---	1.00	ug/L	1	20.0	ND	98	72-136%	0.8	30%	
Chlorobenzene	20.8	---	0.500	ug/L	1	20.0	ND	104	80-120%	4	30%	
Chloroethane	25.5	---	5.00	ug/L	1	20.0	ND	128	60-138%	38	30%	Q-01
Chloroform	21.0	---	1.00	ug/L	1	20.0	ND	105	79-124%	3	30%	
Chloromethane	27.0	---	5.00	ug/L	1	20.0	ND	135	50-139%	13	30%	
2-Chlorotoluene	20.1	---	1.00	ug/L	1	20.0	ND	100	79-122%	0.9	30%	
4-Chlorotoluene	18.9	---	1.00	ug/L	1	20.0	ND	94	78-122%	1	30%	
Dibromochloromethane	18.7	---	1.00	ug/L	1	20.0	ND	93	74-126%	3	30%	
1,2-Dibromo-3-chloropropane	18.5	---	5.00	ug/L	1	20.0	ND	92	62-128%	12	30%	
1,2-Dibromoethane (EDB)	20.7	---	0.500	ug/L	1	20.0	ND	103	77-121%	5	30%	
Dibromomethane	21.2	---	1.00	ug/L	1	20.0	ND	106	79-123%	0.1	30%	
1,2-Dichlorobenzene	20.9	---	0.500	ug/L	1	20.0	ND	104	80-120%	5	30%	
1,3-Dichlorobenzene	20.3	---	0.500	ug/L	1	20.0	ND	102	80-120%	2	30%	
1,4-Dichlorobenzene	20.2	---	0.500	ug/L	1	20.0	ND	101	79-120%	3	30%	
Dichlorodifluoromethane	21.8	---	1.00	ug/L	1	20.0	ND	109	32-152%	4	30%	
1,1-Dichloroethane	20.4	---	0.400	ug/L	1	20.0	ND	102	77-125%	2	30%	
1,2-Dichloroethane (EDC)	21.2	---	0.400	ug/L	1	20.0	ND	106	73-128%	4	30%	
1,1-Dichloroethene	22.0	---	0.400	ug/L	1	20.0	ND	110	71-131%	4	30%	
cis-1,2-Dichloroethene	20.6	---	0.400	ug/L	1	20.0	ND	103	78-123%	3	30%	
trans-1,2-Dichloroethene	20.5	---	0.400	ug/L	1	20.0	ND	103	75-124%	3	30%	
1,2-Dichloropropane	20.6	---	0.500	ug/L	1	20.0	ND	103	78-122%	4	30%	
1,3-Dichloropropane	20.6	---	1.00	ug/L	1	20.0	ND	103	80-120%	4	30%	
2,2-Dichloropropane	12.2	---	1.00	ug/L	1	20.0	ND	61	60-139%	3	30%	Q-54h
1,1-Dichloropropene	20.9	---	1.00	ug/L	1	20.0	ND	104	79-125%	3	30%	
cis-1,3-Dichloropropene	15.5	---	1.00	ug/L	1	20.0	ND	77	75-124%	1	30%	Q-54e
trans-1,3-Dichloropropene	15.2	---	1.00	ug/L	1	20.0	ND	76	73-127%	1	30%	Q-54i
Hexachlorobutadiene	18.5	---	5.00	ug/L	1	20.0	ND	93	66-134%	5	30%	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100525 - EPA 5030B						Water						
Matrix Spike Dup (8100525-MSD1)			Prepared: 10/02/18 15:27 Analyzed: 10/02/18 21:34									
QC Source Sample: MW-24D (A810823-01)												
Methylene chloride	20.8	---	3.00	ug/L	1	20.0	ND	104	74-124%	6	30%	
1,1,1,2-Tetrachloroethane	19.6	---	0.400	ug/L	1	20.0	ND	98	78-124%	2	30%	
1,1,2,2-Tetrachloroethane	23.1	---	0.500	ug/L	1	20.0	ND	116	71-121%	3	30%	
Tetrachloroethene (PCE)	20.6	---	0.400	ug/L	1	20.0	ND	103	74-129%	2	30%	
1,2,3-Trichlorobenzene	21.1	---	2.00	ug/L	1	20.0	ND	106	69-129%	4	30%	
1,2,4-Trichlorobenzene	20.2	---	2.00	ug/L	1	20.0	ND	101	69-130%	5	30%	
1,1,1-Trichloroethane	18.6	---	0.400	ug/L	1	20.0	ND	93	74-131%	3	30%	
1,1,2-Trichloroethane	20.1	---	0.500	ug/L	1	20.0	ND	101	80-120%	4	30%	
Trichloroethene (TCE)	20.7	---	0.400	ug/L	1	20.0	ND	104	79-123%	3	30%	
Trichlorofluoromethane	25.5	---	2.00	ug/L	1	20.0	ND	127	65-141%	3	30%	
1,2,3-Trichloropropane	21.1	---	1.00	ug/L	1	20.0	ND	106	73-122%	5	30%	
Vinyl chloride	22.8	---	0.400	ug/L	1	20.0	ND	114	58-137%	8	30%	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 104 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>95 %</i>		<i>80-120 %</i>		<i>"</i>						

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Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100558 - EPA 5030B						Water						
Blank (8100558-BLK1)	Prepared: 10/03/18 10:36					Analyzed: 10/03/18 11:56						
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100558 - EPA 5030B												
Water												
Blank (8100558-BLK1)	Prepared: 10/03/18 10:36 Analyzed: 10/03/18 11:56											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery:		105 %	Limits:	80-120 %	Dilution:		1x				
Toluene-d8 (Surr)			98 %	80-120 %				"				
4-Bromofluorobenzene (Surr)			97 %	80-120 %				"				

LCS (8100558-BS1)												
Prepared: 10/03/18 10:36 Analyzed: 10/03/18 11:03												
EPA 8260C												
Bromobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Bromochloromethane	23.2	---	1.00	ug/L	1	20.0	---	116	80-120%	---	---	
Bromodichloromethane	19.1	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
Bromoform	16.6	---	1.00	ug/L	1	20.0	---	83	80-120%	---	---	
Bromomethane	16.3	---	5.00	ug/L	1	20.0	---	81	80-120%	---	---	
Carbon tetrachloride	18.2	---	1.00	ug/L	1	20.0	---	91	80-120%	---	---	
Chlorobenzene	20.1	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Chloroethane	25.4	---	5.00	ug/L	1	20.0	---	127	80-120%	---	---	Q-56
Chloroform	20.2	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Chloromethane	25.5	---	5.00	ug/L	1	20.0	---	127	80-120%	---	---	Q-56
2-Chlorotoluene	19.3	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
4-Chlorotoluene	18.1	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
Dibromochloromethane	18.5	---	1.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,2-Dibromo-3-chloropropane	18.5	---	5.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,2-Dibromoethane (EDB)	20.3	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Dibromomethane	20.9	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
1,2-Dichlorobenzene	19.9	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100558 - EPA 5030B						Water						
LCS (8100558-BS1)			Prepared: 10/03/18 10:36		Analyzed: 10/03/18 11:03							
1,3-Dichlorobenzene	19.6	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
1,4-Dichlorobenzene	19.3	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Dichlorodifluoromethane	21.8	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
1,1-Dichloroethane	19.0	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
1,2-Dichloroethane (EDC)	20.7	---	0.400	ug/L	1	20.0	---	104	80-120%	---	---	
1,1-Dichloroethene	19.6	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
cis-1,2-Dichloroethene	19.4	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
trans-1,2-Dichloroethene	18.9	---	0.400	ug/L	1	20.0	---	94	80-120%	---	---	
1,2-Dichloropropane	19.1	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
1,3-Dichloropropane	20.0	---	1.00	ug/L	1	20.0	---	100	80-120%	---	---	
2,2-Dichloropropane	13.4	---	1.00	ug/L	1	20.0	---	67	80-120%	---	---	Q-55
1,1-Dichloropropene	19.2	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
cis-1,3-Dichloropropene	16.3	---	1.00	ug/L	1	20.0	---	82	80-120%	---	---	
trans-1,3-Dichloropropene	15.8	---	1.00	ug/L	1	20.0	---	79	80-120%	---	---	Q-55
Hexachlorobutadiene	18.0	---	5.00	ug/L	1	20.0	---	90	80-120%	---	---	
Methylene chloride	20.0	---	3.00	ug/L	1	20.0	---	100	80-120%	---	---	
1,1,1,2-Tetrachloroethane	19.6	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
1,1,2,2-Tetrachloroethane	22.3	---	0.500	ug/L	1	20.0	---	111	80-120%	---	---	
Tetrachloroethene (PCE)	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
1,2,3-Trichlorobenzene	20.2	---	2.00	ug/L	1	20.0	---	101	80-120%	---	---	
1,2,4-Trichlorobenzene	19.3	---	2.00	ug/L	1	20.0	---	96	80-120%	---	---	
1,1,1-Trichloroethane	17.7	---	0.400	ug/L	1	20.0	---	88	80-120%	---	---	
1,1,2-Trichloroethane	19.7	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Trichloroethene (TCE)	19.5	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
Trichlorofluoromethane	23.8	---	2.00	ug/L	1	20.0	---	119	80-120%	---	---	
1,2,3-Trichloropropane	21.2	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
Vinyl chloride	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 102 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>96 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>96 %</i>		<i>80-120 %</i>		<i>"</i>						

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Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100560 - EPA 5030B						Water						
Blank (8100560-BLK1)		Prepared: 10/03/18 10:52			Analyzed: 10/03/18 12:17							
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100560 - EPA 5030B												
Water												
Blank (8100560-BLK1)	Prepared: 10/03/18 10:52 Analyzed: 10/03/18 12:17											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 109 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	106 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	103 %		80-120 %		"							

LCS (8100560-BS1)	Prepared: 10/03/18 10:52 Analyzed: 10/03/18 11:20											
EPA 8260C												
Bromobenzene	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Bromochloromethane	23.4	---	1.00	ug/L	1	20.0	---	117	80-120%	---	---	
Bromodichloromethane	21.3	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
Bromoform	22.0	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
Bromomethane	27.1	---	5.00	ug/L	1	20.0	---	136	80-120%	---	---	EST, Q-56
Carbon tetrachloride	20.6	---	1.00	ug/L	1	20.0	---	103	80-120%	---	---	
Chlorobenzene	19.9	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Chloroethane	21.6	---	5.00	ug/L	1	20.0	---	108	80-120%	---	---	
Chloroform	21.1	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Chloromethane	16.5	---	5.00	ug/L	1	20.0	---	83	80-120%	---	---	
2-Chlorotoluene	22.1	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
4-Chlorotoluene	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Dibromochloromethane	21.4	---	1.00	ug/L	1	20.0	---	107	80-120%	---	---	
1,2-Dibromo-3-chloropropane	20.1	---	5.00	ug/L	1	20.0	---	100	80-120%	---	---	
1,2-Dibromoethane (EDB)	21.2	---	0.500	ug/L	1	20.0	---	106	80-120%	---	---	
Dibromomethane	21.1	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
1,2-Dichlorobenzene	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100560 - EPA 5030B												
						Water						
LCS (8100560-BS1)	Prepared: 10/03/18 10:52					Analyzed: 10/03/18 11:20						
1,3-Dichlorobenzene	21.1	---	0.500	ug/L	1	20.0	---	105	80-120%	---	---	
1,4-Dichlorobenzene	19.7	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Dichlorodifluoromethane	21.3	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
1,1-Dichloroethane	20.3	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.7	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
1,1-Dichloroethene	20.2	---	0.400	ug/L	1	20.0	---	101	80-120%	---	---	
cis-1,2-Dichloroethene	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
trans-1,2-Dichloroethene	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,2-Dichloropropane	19.9	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
1,3-Dichloropropane	20.0	---	1.00	ug/L	1	20.0	---	100	80-120%	---	---	
2,2-Dichloropropane	23.7	---	1.00	ug/L	1	20.0	---	119	80-120%	---	---	
1,1-Dichloropropene	20.4	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
cis-1,3-Dichloropropene	21.2	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
trans-1,3-Dichloropropene	22.5	---	1.00	ug/L	1	20.0	---	112	80-120%	---	---	
Hexachlorobutadiene	18.9	---	5.00	ug/L	1	20.0	---	94	80-120%	---	---	
Methylene chloride	19.9	---	3.00	ug/L	1	20.0	---	100	80-120%	---	---	
1,1,1,2-Tetrachloroethane	21.1	---	0.400	ug/L	1	20.0	---	106	80-120%	---	---	
1,1,2,2-Tetrachloroethane	20.8	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
Tetrachloroethene (PCE)	18.9	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
1,2,3-Trichlorobenzene	20.2	---	2.00	ug/L	1	20.0	---	101	80-120%	---	---	
1,2,4-Trichlorobenzene	19.2	---	2.00	ug/L	1	20.0	---	96	80-120%	---	---	
1,1,1-Trichloroethane	21.2	---	0.400	ug/L	1	20.0	---	106	80-120%	---	---	
1,1,2-Trichloroethane	20.2	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Trichloroethene (TCE)	19.4	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
Trichlorofluoromethane	20.1	---	2.00	ug/L	1	20.0	---	100	80-120%	---	---	
1,2,3-Trichloropropane	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Vinyl chloride	20.7	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)												
			Recovery: 94 %	Limits: 80-120 %								Dilution: 1x
Toluene-d8 (Surr)												
			98 %	80-120 %								"
4-Bromofluorobenzene (Surr)												
			96 %	80-120 %								"

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100616 - EPA 5030B						Water						
Blank (8100616-BLK1)		Prepared: 10/04/18 10:19			Analyzed: 10/04/18 12:13							
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100616 - EPA 5030B						Water						
Blank (8100616-BLK1)			Prepared: 10/04/18 10:19		Analyzed: 10/04/18 12:13							
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)		Recovery: 108 %		Limits: 80-120 %		Dilution: 1x						
Toluene-d8 (Surr)		106 %		80-120 %		"						
4-Bromofluorobenzene (Surr)		104 %		80-120 %		"						

LCS (8100616-BS3)			Prepared: 10/04/18 10:19		Analyzed: 10/04/18 11:45							
EPA 8260C												
Bromobenzene	20.1	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Bromochloromethane	23.9	---	1.00	ug/L	1	20.0	---	119	80-120%	---	---	
Bromodichloromethane	21.2	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
Bromoform	22.3	---	1.00	ug/L	1	20.0	---	112	80-120%	---	---	
Bromomethane	37.4	---	5.00	ug/L	1	20.0	---	187	80-120%	---	---	EST, Q-56
Carbon tetrachloride	21.5	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
Chlorobenzene	20.3	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Chloroethane	22.0	---	5.00	ug/L	1	20.0	---	110	80-120%	---	---	
Chloroform	21.0	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Chloromethane	16.4	---	5.00	ug/L	1	20.0	---	82	80-120%	---	---	
2-Chlorotoluene	22.3	---	1.00	ug/L	1	20.0	---	111	80-120%	---	---	
4-Chlorotoluene	22.2	---	1.00	ug/L	1	20.0	---	111	80-120%	---	---	
Dibromochloromethane	21.5	---	1.00	ug/L	1	20.0	---	107	80-120%	---	---	
1,2-Dibromo-3-chloropropane	20.0	---	5.00	ug/L	1	20.0	---	100	80-120%	---	---	
1,2-Dibromoethane (EDB)	21.4	---	0.500	ug/L	1	20.0	---	107	80-120%	---	---	
Dibromomethane	21.4	---	1.00	ug/L	1	20.0	---	107	80-120%	---	---	
1,2-Dichlorobenzene	19.7	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100616 - EPA 5030B						Water						
LCS (8100616-BS3)			Prepared: 10/04/18 10:19		Analyzed: 10/04/18 11:45							
1,3-Dichlorobenzene	20.9	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
1,4-Dichlorobenzene	19.7	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Dichlorodifluoromethane	22.6	---	1.00	ug/L	1	20.0	---	113	80-120%	---	---	
1,1-Dichloroethane	21.2	---	0.400	ug/L	1	20.0	---	106	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.7	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
1,1-Dichloroethene	21.5	---	0.400	ug/L	1	20.0	---	108	80-120%	---	---	
cis-1,2-Dichloroethene	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
trans-1,2-Dichloroethene	20.7	---	0.400	ug/L	1	20.0	---	104	80-120%	---	---	
1,2-Dichloropropane	20.1	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
1,3-Dichloropropane	20.3	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
2,2-Dichloropropane	26.0	---	1.00	ug/L	1	20.0	---	130	80-120%	---	---	Q-56
1,1-Dichloropropene	21.2	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
cis-1,3-Dichloropropene	21.8	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
trans-1,3-Dichloropropene	23.2	---	1.00	ug/L	1	20.0	---	116	80-120%	---	---	
Hexachlorobutadiene	19.0	---	5.00	ug/L	1	20.0	---	95	80-120%	---	---	
Methylene chloride	19.7	---	3.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,1,1,2-Tetrachloroethane	20.9	---	0.400	ug/L	1	20.0	---	104	80-120%	---	---	
1,1,2,2-Tetrachloroethane	20.6	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	
Tetrachloroethene (PCE)	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,2,3-Trichlorobenzene	19.7	---	2.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,2,4-Trichlorobenzene	18.3	---	2.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,1,1-Trichloroethane	22.2	---	0.400	ug/L	1	20.0	---	111	80-120%	---	---	
1,1,2-Trichloroethane	20.9	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
Trichloroethene (TCE)	20.2	---	0.400	ug/L	1	20.0	---	101	80-120%	---	---	
Trichlorofluoromethane	21.6	---	2.00	ug/L	1	20.0	---	108	80-120%	---	---	
1,2,3-Trichloropropane	21.1	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Vinyl chloride	22.8	---	0.400	ug/L	1	20.0	---	114	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		Recovery: 100 %		Limits: 80-120 %		Dilution: 1x						
Toluene-d8 (Surr)		102 %		80-120 %		"						
4-Bromofluorobenzene (Surr)		98 %		80-120 %		"						

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100661 - EPA 5030B						Water						
Blank (8100661-BLK1)		Prepared: 10/05/18 10:17 Analyzed: 10/05/18 11:42										
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100661 - EPA 5030B												
Water												
Blank (8100661-BLK1)	Prepared: 10/05/18 10:17 Analyzed: 10/05/18 11:42											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery:		108 %	Limits: 80-120 %		Dilution: 1x						
Toluene-d8 (Surr)			105 %	80-120 %		"						
4-Bromofluorobenzene (Surr)			102 %	80-120 %		"						

LCS (8100661-BS1)	Prepared: 10/05/18 10:17 Analyzed: 10/05/18 10:46											
EPA 8260C												
Bromobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Bromochloromethane	23.1	---	1.00	ug/L	1	20.0	---	115	80-120%	---	---	
Bromodichloromethane	20.6	---	1.00	ug/L	1	20.0	---	103	80-120%	---	---	
Bromoform	20.4	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
Bromomethane	30.0	---	5.00	ug/L	1	20.0	---	150	80-120%	---	---	EST, Q-56
Carbon tetrachloride	20.3	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Chlorobenzene	19.5	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Chloroethane	20.6	---	5.00	ug/L	1	20.0	---	103	80-120%	---	---	
Chloroform	20.3	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
Chloromethane	15.5	---	5.00	ug/L	1	20.0	---	77	80-120%	---	---	Q-55
2-Chlorotoluene	22.0	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
4-Chlorotoluene	22.2	---	1.00	ug/L	1	20.0	---	111	80-120%	---	---	
Dibromochloromethane	20.4	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
1,2-Dibromo-3-chloropropane	17.9	---	5.00	ug/L	1	20.0	---	90	80-120%	---	---	
1,2-Dibromoethane (EDB)	20.5	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	
Dibromomethane	20.6	---	1.00	ug/L	1	20.0	---	103	80-120%	---	---	
1,2-Dichlorobenzene	19.7	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100661 - EPA 5030B						Water						
LCS (8100661-BS1)			Prepared: 10/05/18 10:17		Analyzed: 10/05/18 10:46							
1,3-Dichlorobenzene	20.8	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
1,4-Dichlorobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Dichlorodifluoromethane	19.8	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,1-Dichloroethane	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.1	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
1,1-Dichloroethene	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
cis-1,2-Dichloroethene	19.9	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
trans-1,2-Dichloroethene	19.6	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
1,2-Dichloropropane	19.3	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
1,3-Dichloropropane	19.8	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
2,2-Dichloropropane	23.1	---	1.00	ug/L	1	20.0	---	115	80-120%	---	---	
1,1-Dichloropropene	20.6	---	1.00	ug/L	1	20.0	---	103	80-120%	---	---	
cis-1,3-Dichloropropene	21.2	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
trans-1,3-Dichloropropene	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Hexachlorobutadiene	18.4	---	5.00	ug/L	1	20.0	---	92	80-120%	---	---	
Methylene chloride	18.6	---	3.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1,1,2-Tetrachloroethane	20.5	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
1,1,2,2-Tetrachloroethane	19.5	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Tetrachloroethene (PCE)	18.5	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
1,2,3-Trichlorobenzene	19.7	---	2.00	ug/L	1	20.0	---	98	80-120%	---	---	
1,2,4-Trichlorobenzene	18.8	---	2.00	ug/L	1	20.0	---	94	80-120%	---	---	
1,1,1-Trichloroethane	20.5	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
1,1,2-Trichloroethane	19.9	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Trichloroethene (TCE)	19.2	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
Trichlorofluoromethane	19.6	---	2.00	ug/L	1	20.0	---	98	80-120%	---	---	
1,2,3-Trichloropropane	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Vinyl chloride	21.1	---	0.400	ug/L	1	20.0	---	106	80-120%	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 100 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>"</i>						

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QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100505 - Method Prep: Aq						Water						
Blank (8100505-BLK1)		Prepared: 10/02/18 09:37 Analyzed: 10/02/18 15:00										
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (8100505-BS1)		Prepared: 10/02/18 09:37 Analyzed: 10/02/18 15:02										
SM 4500-NH3 G												
Ammonia as N	2.08	---	0.0200	mg/L	1	2.00	---	104	90-110%	---	---	
Matrix Spike (8100505-MS1)		Prepared: 10/02/18 09:37 Analyzed: 10/02/18 15:05										
QC Source Sample: MW-24D (A810823-01)												
SM 4500-NH3 G												
Ammonia as N	2.66	---	0.0250	mg/L	1	2.50	0.145	101	90-110%	---	---	
Matrix Spike Dup (8100505-MSD1)		Prepared: 10/02/18 09:37 Analyzed: 10/02/18 15:06										
QC Source Sample: MW-24D (A810823-01)												
SM 4500-NH3 G												
Ammonia as N	2.73	---	0.0250	mg/L	1	2.50	0.145	104	90-110%	3	10%	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100512 - Method Prep: Aq						Water						
Blank (8100512-BLK2)		Prepared: 10/02/18 09:46 Analyzed: 10/02/18 17:02										
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	Q-16
LCS (8100512-BS2)		Prepared: 10/02/18 09:46 Analyzed: 10/02/18 17:03										
SM 4500-NH3 G												
Ammonia as N	2.09	---	0.0200	mg/L	1	2.00	---	104	90-110%	---	---	Q-16

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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091293 - Method Prep: Aq						Water						
Blank (8091293-BLK1)		Prepared: 09/28/18 17:17 Analyzed: 09/28/18 21:14										
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
LCS (8091293-BS1)		Prepared: 09/28/18 17:17 Analyzed: 09/28/18 21:35										
EPA 300.0												
Nitrate-Nitrogen	1.96	---	0.250	mg/L	1	2.00	---	98	90-110%	---	---	---
Nitrite-Nitrogen	1.93	---	0.250	mg/L	1	2.00	---	97	90-110%	---	---	---
Duplicate (8091293-DUP1)		Prepared: 09/28/18 17:17 Analyzed: 09/28/18 22:18										
QC Source Sample: MW-24D (A810823-01)												
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	10%	---
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	15%	---
Matrix Spike (8091293-MS1)		Prepared: 09/28/18 17:17 Analyzed: 09/28/18 22:40										
QC Source Sample: MW-24D (A810823-01)												
EPA 300.0												
Nitrate-Nitrogen	2.44	---	0.312	mg/L	1	2.50	ND	98	80-120%	---	---	---
Nitrite-Nitrogen	2.29	---	0.312	mg/L	1	2.50	ND	92	80-120%	---	---	---
Matrix Spike Dup (8091293-MSD1)		Prepared: 09/28/18 17:17 Analyzed: 09/28/18 23:02										
QC Source Sample: MW-24D (A810823-01)												
EPA 300.0												
Nitrate-Nitrogen	2.48	---	0.312	mg/L	1	2.50	ND	99	80-120%	2	10%	---
Nitrite-Nitrogen	2.31	---	0.312	mg/L	1	2.50	ND	92	80-120%	1	15%	---

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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8091297 - Method Prep: Aq						Water						
Blank (8091297-BLK1)		Prepared: 09/29/18 10:42 Analyzed: 09/29/18 12:05										
<u>EPA 300.0</u>												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
LCS (8091297-BS1)		Prepared: 09/29/18 10:42 Analyzed: 09/29/18 12:26										
<u>EPA 300.0</u>												
Nitrate-Nitrogen	2.01	---	0.250	mg/L	1	2.00	---	100	90-110%	---	---	---
Duplicate (8091297-DUP1)		Prepared: 09/29/18 10:42 Analyzed: 09/29/18 13:31										
<u>QC Source Sample: MGMS2-40 (A810823-05RE1)</u>												
<u>EPA 300.0</u>												
Nitrate-Nitrogen	9.24	---	0.500	mg/L	2	---	9.38	---	---	2	10%	---
Matrix Spike (8091297-MS1)		Prepared: 09/29/18 10:42 Analyzed: 09/29/18 13:53										
<u>QC Source Sample: MGMS2-40 (A810823-05RE1)</u>												
<u>EPA 300.0</u>												
Nitrate-Nitrogen	13.3	---	0.500	mg/L	2	4.00	9.38	99	80-120%	---	---	---
Matrix Spike Dup (8091297-MSD1)		Prepared: 09/29/18 10:42 Analyzed: 09/29/18 14:14										
<u>QC Source Sample: MGMS2-40 (A810823-05RE1)</u>												
<u>EPA 300.0</u>												
Nitrate-Nitrogen	13.5	---	0.500	mg/L	2	4.00	9.38	102	80-120%	4	10%	---

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QUALITY CONTROL (QC) SAMPLE RESULTS

Demand Parameters

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100574 - Method Prep: Aq						Water						
Blank (8100574-BLK1)		Prepared: 10/03/18 12:50 Analyzed: 10/03/18 15:35										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	
LCS (8100574-BS1)		Prepared: 10/03/18 12:50 Analyzed: 10/03/18 16:04										
SM 5310 C												
Total Organic Carbon	10.5	---	1.00	mg/L	1	10.0	---	105	85-115%	---	---	
LCS (8100574-BS2)		Prepared: 10/03/18 12:50 Analyzed: 10/03/18 16:33										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	0.00	---		85-115%	---	---	TOC_I
Duplicate (8100574-DUP1)		Prepared: 10/03/18 12:50 Analyzed: 10/03/18 17:31										
QC Source Sample: MGMS1-43 (A810823-02)												
SM 5310 C												
Total Organic Carbon	5.55	---	1.00	mg/L	1	---	5.52	---	---	0.5	10%	
Matrix Spike (8100574-MS1)		Prepared: 10/03/18 12:50 Analyzed: 10/03/18 18:00										
QC Source Sample: MGMS1-43 (A810823-02)												
SM 5310 C												
Total Organic Carbon	15.8	---	1.01	mg/L	1	10.0	5.52	103	85-115%	---	---	

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SAMPLE PREPARATION INFORMATION

Halogenated Volatile Organic Compounds by EPA 8260C

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8100525</u>							
A810823-01	Water	EPA 8260C	09/28/18 08:10	10/02/18 15:27	5mL/5mL	5mL/5mL	1.00
A810823-03	Water	EPA 8260C	09/28/18 10:15	10/02/18 15:27	5mL/5mL	5mL/5mL	1.00
A810823-04	Water	EPA 8260C	09/28/18 10:40	10/02/18 15:27	5mL/5mL	5mL/5mL	1.00
A810823-05	Water	EPA 8260C	09/28/18 11:40	10/02/18 15:27	5mL/5mL	5mL/5mL	1.00
A810823-06	Water	EPA 8260C	09/28/18 12:15	10/02/18 15:27	5mL/5mL	5mL/5mL	1.00
A810823-07	Water	EPA 8260C	09/28/18 12:50	10/02/18 15:27	5mL/5mL	5mL/5mL	1.00
A810823-08	Water	EPA 8260C	09/28/18 13:10	10/02/18 15:27	5mL/5mL	5mL/5mL	1.00
A810823-11	Water	EPA 8260C	09/28/18 00:00	10/02/18 15:27	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8100558</u>							
A810823-02RE1	Water	EPA 8260C	09/28/18 09:30	10/03/18 11:29	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8100560</u>							
A810823-09	Water	EPA 8260C	09/28/18 13:10	10/03/18 12:22	5mL/5mL	5mL/5mL	1.00
A810823-10	Water	EPA 8260C	09/28/18 13:40	10/03/18 12:22	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8100616</u>							
A810823-09RE1	Water	EPA 8260C	09/28/18 13:10	10/04/18 12:05	5mL/5mL	5mL/5mL	1.00

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8100505</u>							
A810823-01	Water	SM 4500-NH3 G	09/28/18 08:10	10/02/18 09:37	10mL/10mL	10mL/10mL	1.00
<u>Batch: 8100512</u>							
A810823-02RE3	Water	SM 4500-NH3 G	09/28/18 09:30	10/02/18 09:46	10mL/10mL	10mL/10mL	1.00
A810823-03RE1	Water	SM 4500-NH3 G	09/28/18 10:15	10/02/18 09:46	10mL/10mL	10mL/10mL	1.00
A810823-04RE1	Water	SM 4500-NH3 G	09/28/18 10:40	10/02/18 09:46	10mL/10mL	10mL/10mL	1.00
A810823-05RE2	Water	SM 4500-NH3 G	09/28/18 11:40	10/02/18 09:46	10mL/10mL	10mL/10mL	1.00
A810823-06RE1	Water	SM 4500-NH3 G	09/28/18 12:15	10/02/18 09:46	10mL/10mL	10mL/10mL	1.00
A810823-07RE1	Water	SM 4500-NH3 G	09/28/18 12:50	10/02/18 09:46	10mL/10mL	10mL/10mL	1.00
A810823-08RE1	Water	SM 4500-NH3 G	09/28/18 13:10	10/02/18 09:46	10mL/10mL	10mL/10mL	1.00
A810823-09RE1	Water	SM 4500-NH3 G	09/28/18 13:10	10/02/18 09:46	10mL/10mL	10mL/10mL	1.00
A810823-10RE1	Water	SM 4500-NH3 G	09/28/18 13:40	10/02/18 09:46	10mL/10mL	10mL/10mL	1.00

Anions by Ion Chromatography

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SAMPLE PREPARATION INFORMATION

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8091293</u>							
A810823-01	Water	EPA 300.0	09/28/18 08:10	09/28/18 17:17	5mL/5mL	5mL/5mL	1.00
A810823-02	Water	EPA 300.0	09/28/18 09:30	09/28/18 17:17	5mL/5mL	5mL/5mL	1.00
A810823-03	Water	EPA 300.0	09/28/18 10:15	09/28/18 17:17	5mL/5mL	5mL/5mL	1.00
A810823-04	Water	EPA 300.0	09/28/18 10:40	09/28/18 17:17	5mL/5mL	5mL/5mL	1.00
A810823-05	Water	EPA 300.0	09/28/18 11:40	09/28/18 17:17	5mL/5mL	5mL/5mL	1.00
A810823-06	Water	EPA 300.0	09/28/18 12:15	09/28/18 17:17	5mL/5mL	5mL/5mL	1.00
A810823-07	Water	EPA 300.0	09/28/18 12:50	09/28/18 17:17	5mL/5mL	5mL/5mL	1.00
A810823-08	Water	EPA 300.0	09/28/18 13:10	09/28/18 17:17	5mL/5mL	5mL/5mL	1.00
A810823-09	Water	EPA 300.0	09/28/18 13:10	09/28/18 17:17	5mL/5mL	5mL/5mL	1.00
A810823-10	Water	EPA 300.0	09/28/18 13:40	09/28/18 17:17	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8091297</u>							
A810823-02RE1	Water	EPA 300.0	09/28/18 09:30	09/29/18 10:44	5mL/5mL	5mL/5mL	1.00
A810823-05RE1	Water	EPA 300.0	09/28/18 11:40	09/29/18 10:44	5mL/5mL	5mL/5mL	1.00

Demand Parameters

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8100574</u>							
A810823-02	Water	SM 5310 C	09/28/18 09:30	10/03/18 12:50	40mL/40mL	40mL/40mL	1.00
A810823-05	Water	SM 5310 C	09/28/18 11:40	10/03/18 12:50	40mL/40mL	40mL/40mL	1.00
A810823-08	Water	SM 5310 C	09/28/18 13:10	10/03/18 12:50	40mL/40mL	40mL/40mL	1.00
A810823-09	Water	SM 5310 C	09/28/18 13:10	10/03/18 12:50	40mL/40mL	40mL/40mL	1.00

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

Apex Laboratories

- EST** Result reported as an Estimated Value. Compound failed initial calibration criteria.
- Q-01** Spike recovery and/or RPD is outside acceptance limits.
- Q-16** Reanalysis of an original Batch QC sample.
- Q-54e** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -0.6%. The results are reported as Estimated Values.
- Q-54h** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -16.1%. The results are reported as Estimated Values.
- Q-54i** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -2.0%. The results are reported as Estimated Values.
- Q-54k** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -3.7%. The results are reported as Estimated Values.
- Q-55** Daily CCV/LCS recovery for this analyte was below the +/-20% criteria listed in EPA 8260C, however there is adequate sensitivity to ensure detection at the reporting level.
- Q-56** Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C
- TOC_I** Inorganic Carbon Spike Check. Results are valid if Non Detect (No Inorganic Carbon detected.)

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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REPORTING NOTES AND CONVENTIONS:

Abbreviations:

- DET Analyte DETECTED at or above the detection or reporting limit.
- ND Analyte NOT DETECTED at or above the detection or reporting limit.
- NR Result Not Reported
- RPD Relative Percent Difference

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

- Basis: Results for soil samples are generally reported on a 100% dry weight basis. The Result Basis is listed following the units as "dry", "wet", or "" (blank) designation.
 - "dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.
 - "wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.
 - "" Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) are not included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

- " --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.
- " *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to 1/2 the Reporting Limit (RL).
-For Blank hits falling between 1/2 the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a 'B' qualifier, per Apex Laboratories' Blank Policy.
For further details, please request a copy of this document.

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates

6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**

Project Number: **Nustar Vancouver**

Project Manager: **Stephanie Salisbury**

Report ID:

A810823 - 10 19 18 1512

REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the blank results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.

Apex Laboratories maintains detailed records on sample receipt, including client label verification, cooler temperature, sample preservation, hold time compliance and field filtration. Data is qualified as necessary, and the lack of qualification indicates compliance with required parameters.

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates

6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**

Project Number: **Nustar Vancouver**

Project Manager: **Stephanie Salisbury**

Report ID:

A810823 - 10 19 18 1512

LABORATORY ACCREDITATION INFORMATION

TNI Certification ID: OR100062 (Primary Accreditation) - EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation
<u>All reported analytes are included in Apex Laboratories' current ORELAP scope.</u>					

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation. Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provided by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.

Apex Laboratories

Lisa Domenighini, Client Services Manager

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Cascadia Associates Project: Shore Terminal-Vancouver
 6915 SW Macadam, Suite 250 Project Number: Nustar Vancouver
 Portland, OR 97219 Project Manager: Stephanie Salisbury Report ID: A810823 - 10 19 18 1512

APEX LABS CHAIN OF CUSTODY **COC** of **Z**

Lab # A810823 PO# _____

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

Company: Cascadia Associates Project Mgr: Stephanie Salisbury Project Name: Nustar Vancouver Project # _____
 Address: 6915 SW Macadam Ave, Ste 250 Phone: 503 906 6577 Fax: _____ Email: sbsalisbury@cascadiaassociates.com

Sampled by: Joel M.

SAMPLE ID	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-DCID		NWTPH-DX		NWTPH-GX		8260 VOCs Full List	8260 RBDN VOCs	8260 HDVCs	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TTO	RCRA Metals (9)	TCLP Metals (9)	Al, Sb, As, Ba, Be, Cd, Cr, Cu, Ni, Pb, Se, Zn, Mn, Mo, Ni, K, Hg, Mg, Zn, Ti, V, Zn	TOTAL DISS TCLP	1200-COLS	1200-Z	Nitrate/Nitrite	Ammonia	Csk - 175	Toc	
					NWTPH-DCID	NWTPH-DX	NWTPH-GX	8260 VOCs Full List	8260 RBDN VOCs	8260 HDVCs																			8260 BTEX VOCs
1 MW-240	9/28/18	0810	GW 5									X													X				
2 NW-240 MS	9/28/18	0810	GW 5									X													X				
3 M2-240 MSD	9/28/18	0810	GW 5									X													X				
4 MCM5 1-43	9/28/18	0930	GW 7									X													X				
5 M6MS 2-132	9/28/18	1015	GW 5									X													X				
6 M6MS 2-110	9/28/18	1040	GW 5									X													X				
7 M6MS 2-46	9/28/18	1140	GW 7									X													X				
8 M6MS 3-132	9/28/18	1215	GW 5									X													X				
9 M6MS 3-60	9/28/18	1250	GW 5									X													X				
10 M6MS 3-40	9/28/18	1310	GW 7									X													X				

SPECIAL INSTRUCTIONS: CSK - 175 = Ethanol, Ethane, Methane

RELINQUISHED BY: Joel M. Date: 9/28/18 Signature: _____ Date: _____
 Signature: _____ Date: _____
 Printed Name: Joel Mathewson Time: 1535 Printed Name: Dave Parker Time: 1535
 Company: Cascadia Company: APEX LABS

RECEIVED BY: _____ Date: _____ Signature: _____ Date: _____
 Signature: _____ Date: _____
 Printed Name: _____ Time: _____
 Company: _____

SAMPLES ARE HELD FOR 30 DAYS

TAT Requested (circle): 1 Day 2 Day 3 Day 4 DAY 5 DAY Other: _____
 YES NO
 Normal Turn Around Time (TAT) = 10 Business Days

Joia A Domenighini

<p>Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219</p>	<p>Project: <u>Shore Terminal-Vancouver</u> Project Number: <u>Nustar Vancouver</u> Project Manager: <u>Stephanie Salisbury</u></p>	<p>Report ID: A810823 - 10 19 18 1512</p>
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COC 2 of 2

CHAIN OF CUSTODY

Lab # A810823 PO#

Project #

Company: Cascadia Associates Project Mgr: Stephanie Salisbury Project Name: Nustar Vancouver Email: ssalisbury@casco.com

Address: 6915 SW Macadam Ave., Ste 250 Phone: 503 906 6577 Fax:

Sampled by: Joel M.

LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS		ANALYSIS REQUEST
				YES	NO	
1 MGMS 3-40 Dup	9/26/18	1310	Gw	7		1200-Z 1200-COLS TOTAL DISS TCLP Hg, Ag, Zn, TL, V, Zn Cd, Cr, Cu, Co, Ni, Pb, Fe, Mn, Al, Sb, As, Ba, Be, Bi, Br, B, Ca, Cl, K, Li, Mg, Mo, Ni, P, Se, Si, Sr, Ti, U, W, Y, Zn
2 MGMS 3-101	9/26/18	1340	Gw	MS		X Niche/N:TE X Ammonia X RSK-175 X TDC
3 Trip Blank	-	-	-	W	1	
4						
5						
6						
7						
8						
9						
10						

Normal Turn Around Time (TAT) = 10 Business Days
 TAT Requested (circle) 1 DAY 2 Day 3 Day 4 DAY 5 DAY Other: _____

SPECIAL INSTRUCTIONS: RSK-175 = Methan, ethan, ethan

RELINQUISHED BY: Joel M. Date: 9/26/18 Signature: _____
 RECEIVED BY: _____ Date: _____ Signature: _____

Printed Name: Joel Matthecheck Time: 1535 Printed Name: Dave Padove Time: _____
 Company: Cascadia Company: ALEX LABS

Apex Laboratories

Joia A Domenighini

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Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Vancouver Project Manager: Stephanie Salisbury	Report ID: A810823 - 10 19 18 1512
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APEX LABS COOLER RECEIPT FORM

Client: Cascadia Associates Element WO#: A8 I0823

Project/Project #: Nustar Vancouver

Delivery info:
Date/Time Received: 9/28/18 @ 1535 By: DPandue
Delivered by: Apex Client ESS FedEx UPS Swift Senvoy SDS Other

Cooler Inspection Inspected by: DPandue : 9/28/18 @ 1620

Chain of Custody Included? Yes No Custody Seals? Yes No

Signed/Dated by Client? Yes No

Signed/Dated by Apex? Yes No

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (deg. C)	<u>2.6</u>						
Received on Ice? (Y/N)	<u>Y</u>						
Temp. Blanks? (Y/N)	<u>Y</u>						
Ice Type: (Gel/Real/Other)	<u>Real</u>						
Condition:	<u>Good</u>						

Cooler out of temp? (Y/N) Possible reason why:
If some coolers are in temp and some out, green dot applied to out of temperature samples? Yes/No/NA

Samples Inspection: Inspected by: (Signature) : 9/28/18 @ 1635

All Samples Intact? Yes No Comments: _____

Bottle Labels/COCs agree? Yes No Comments: MGMS3-10 Dup H2SO4 poly reads
MGMS3-10, bagged in set

Containers/Volumes Received Appropriate for Analysis? Yes No Comments: _____

Do VOA Vials have Visible Headspace? Yes No NA

Comments: _____

Water Samples: pH Checked and Appropriate (except VOAs): Yes No NA

Comments: _____

Additional Information:

Labeled by: (Signature) Witness: (Signature) Cooler Inspected by: (Signature) See Project Contact Form: Y

Lisa Domenighini

October 15, 2018

Apex Laboratories
ATTN: Lisa Domenighini
12232 S.W. Garden Place
Tigard, OR 97223



LA Cert #04140
EPA Methods TO3, TO14A, TO15, 25C/3C,
RSK-175

TX Cert T104704450-14-6
EPA Methods TO14A, TO15

UT Cert CA0133332015-3
EPA Methods TO3, TO14A, TO15, RSK-175

LABORATORY TEST RESULTS

Project Reference: A8I0823
Lab Number: J100203-01/04

Enclosed are results for sample(s) received 10/02/18 by Air Technology Laboratories. Samples were received intact and properly chilled. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the TNI Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

A handwritten signature in blue ink that appears to read "Mark Johnson".

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Note: The cover letter is an integral part of this analytical report.

SUBCONTRACT ORDER

Apex Laboratories

A8I0823

J100203-04/04

L.P. 10/11/18

TAG 10/11/18

SENDING LABORATORY:

Apex Laboratories ✓
12232 S.W. Garden Place
Tigard, OR 97223
Phone: (503) 718-2323
Fax: (503) 718-0333
Project Manager: Lisa Domenighini ✓

RECEIVING LABORATORY:

Air Technology Laboratories, Inc ✓
18501 E. Gale Ave Suite 130
City of Industry, CA 91748
Phone: (626) 964-4032
Fax: (626) 964-5832

Sample Name: MGMS1-43 ✓ Water ✓ Sampled: 09/28/18 09:30 ✓ (A8I0823-02) ✓

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub) ✓ Containers Supplied: (D)40 mL VOA - HCL ✓ (E)40 mL VOA - HCL ✓	10/11/18 17:00	10/12/18 09:30	

Sample Name: MGMS2-40 ✓ Water ✓ Sampled: 09/28/18 11:40 ✓ (A8I0823-05) ✓

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub) ✓ Containers Supplied: (D)40 mL VOA - HCL ✓ (E)40 mL VOA - HCL ✓	10/11/18 17:00	10/12/18 11:40	

Sample Name: MGMS3-40 ✓ Water ✓ Sampled: 09/28/18 13:10 ✓ (A8I0823-08) ✓

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub) ✓ Containers Supplied: (D)40 mL VOA - HCL ✓ (E)40 mL VOA - HCL ✓	10/11/18 17:00	10/12/18 13:10	

H2SO4 poly reads MGMS3-40, bagged in set ✓

Sample Name: MGMS3-40 Dup ✓ Water ✓ Sampled: 09/28/18 13:10 ✓ (A8I0823-09) ✓

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub) ✓ Containers Supplied: (D)40 mL VOA - HCL ✓ (E)40 mL VOA - HCL ✓	10/11/18 17:00	10/12/18 13:10	

Standard CAP

4°C

Released By AG Date 10/11/18 Received By UPS Date 10/2/18

Released By UPS Date 10/11/18 Received By UPS Date 10/15

Client: Apex Laboratories
Attn: Lisa Domenighini
Project Name: NA
Project No.: A8I0823
Date Received: 10/02/18
Matrix: Water
Reporting Units: ug/L

RSK175

Lab No.:	J100203-01	J100203-02	J100203-03	J100203-04				
Client Sample I.D.:	MGMS1-43 (A8I0823-02)	MGMS2-40 (A8I0823-05)	MGMS3-40 (A8I0823-08)	MGMS3-40 Dup (A8I0823-09)				
Date/Time Sampled:	9/28/18 9:30	9/28/18 11:40	9/28/18 13:10	9/28/18 13:10				
Date/Time Analyzed:	10/5/18 8:43	10/5/18 8:56	10/5/18 9:09	10/5/18 9:22				
QC Batch No.:	181004GC8A2	181004GC8A2	181004GC8A2	181004GC8A2				
Analyst Initials:	AS	AS	AS	AS				
Dilution Factor:	1.0	1.0	1.0	1.0				
ANALYTE	Result ug/L	RL ug/L	Result ug/L	RL ug/L	Result ug/L	RL ug/L	Result ug/L	RL ug/L
Ethene	ND	1.0	3.6	1.0	30	1.0	33	1.0
Ethane	34	1.0	12	1.0	66	1.0	69	1.0
Methane	8,700	1.0	220	1.0	5,700	1.0	5,400	1.0

ND = Not Detected (below RL)
 RL = Reporting Limit

Reviewed/Approved By: _____


 Mark Johnson
 Operations Manager

Date 10/15/18

The cover letter is an integral part of this analytical report



LCS/LCSD Recovery and RPD Summary Report

QC Batch #: 181004GC8A2

Matrix: Air

Reporting Units: ug/L

RSK175 LABORATORY CONTROL SAMPLE SUMMARY

Lab No.:	METHOD BLANK			LCS	LCSD						
Date/Time Analyzed:	10/4/18 15:17			10/4/18 14:31	10/4/18 14:44						
Analyst Initials:	AS			AS	AS						
Dilution Factor:	1.0			1.0	1.0						
ANALYTE	Result ug/L	RL ug/L	SPIKE AMT. ug/L	Result ug/L	% Rec.	Result ug/L	% Rec.	RPD	Low %Rec	High %Rec	Max. RPD
Ethene	ND	1.0	1,150	1,050	91.9	1,140	99.9	8.3	70	130	30
Ethane	ND	1.0	1,230	1,180	96.5	1,290	105	8.5	70	130	30
Methane	ND	1.0	654	638	97.5	697	107	8.9	70	130	30

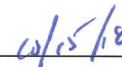
ND= Not Detected (below RL)

RL = Reporting Limit

Reviewed/Approved By: _____


 Mark Johnson
 Operations Manager

Date _____



The cover letter is an integral part of this analytical report





Thursday, October 11, 2018

Stephanie Salisbury
Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

RE: A8J0009 - Shore Terminal-Vancouver - Shore Terminal-Vancouver

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A8J0009, which was received by the laboratory on 10/1/2018 at 11:29:00AM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of final reporting, unless prior arrangements have been made.

Cooler Receipt Info

(See Cooler Receipt Form for Details)

Default Cooler 5.8 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.

All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.



Apex Laboratories

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Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A8J0009 - 10 11 18 1012
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ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-32 S	A8J0009-01	Water	10/01/18 08:15	10/01/18 11:29
M6MS1-110	A8J0009-02	Water	10/01/18 09:10	10/01/18 11:29
M6MS1-60	A8J0009-03	Water	10/01/18 09:50	10/01/18 11:29

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A8J0009 - 10 11 18 1012
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-32 S (A8J0009-01)				Matrix: Water		Batch: 8100562		
Bromobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/03/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/03/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/03/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/03/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-32 S (A8J0009-01)				Matrix: Water		Batch: 8100562		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/03/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/03/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/03/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	10/03/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 110 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/03/18</i>	<i>EPA 8260C</i>
M6MS1-110 (A8J0009-02)				Matrix: Water		Batch: 8100617		
cis-1,2-Dichloroethene	153	---	4.00	ug/L	10	10/04/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/04/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>96 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/04/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/04/18</i>	<i>EPA 8260C</i>
M6MS1-110 (A8J0009-02RE1)				Matrix: Water		Batch: 8100661		
Bromobenzene	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/05/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/05/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/05/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/05/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
1,1-Dichloroethane	6.12	---	0.400	ug/L	1	10/05/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/05/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
M6MS1-110 (A8J0009-02RE1)				Matrix: Water		Batch: 8100661		
1,1-Dichloroethene	0.723	---	0.400	ug/L	1	10/05/18	EPA 8260C	
trans-1,2-Dichloroethene	0.485	---	0.400	ug/L	1	10/05/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/05/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/05/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/05/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
Tetrachloroethene (PCE)	13.0	---	0.400	ug/L	1	10/05/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/05/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/05/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/05/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
Trichloroethene (TCE)	39.3	---	0.400	ug/L	1	10/05/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/05/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
Vinyl chloride	0.657	---	0.400	ug/L	1	10/05/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/05/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/05/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/05/18</i>	<i>EPA 8260C</i>

M6MS1-60 (A8J0009-03RE1)				Matrix: Water		Batch: 8100661		
Bromobenzene	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	10/05/18	EPA 8260C	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	10/05/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	10/05/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
M6MS1-60 (A8J0009-03RE1)				Matrix: Water		Batch: 8100661		
Dibromochloromethane	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	10/05/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
1,1-Dichloroethane	6.66	---	0.400	ug/L	1	10/05/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	10/05/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	10/05/18	EPA 8260C	
cis-1,2-Dichloroethene	23.9	---	0.400	ug/L	1	10/05/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	10/05/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	10/05/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	10/05/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	10/05/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
Tetrachloroethene (PCE)	29.4	---	0.400	ug/L	1	10/05/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	10/05/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	10/05/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	10/05/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	10/05/18	EPA 8260C	
Trichloroethene (TCE)	16.6	---	0.400	ug/L	1	10/05/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	10/05/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	10/05/18	EPA 8260C	
Vinyl chloride	20.0	---	0.400	ug/L	1	10/05/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>10/05/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/05/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>10/05/18</i>	<i>EPA 8260C</i>

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ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-32 S (A8J0009-01RE1)				Matrix: Water		Batch: 8100512		
Ammonia as N	ND	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	
M6MS1-110 (A8J0009-02RE1)				Matrix: Water		Batch: 8100512		
Ammonia as N	0.595	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	
M6MS1-60 (A8J0009-03RE1)				Matrix: Water		Batch: 8100512		
Ammonia as N	ND	---	0.0200	mg/L	1	10/02/18	SM 4500-NH3 G	

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-32 S (A8J0009-01)				Matrix: Water				
Batch: 8100472								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	10/01/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	10/01/18	EPA 300.0	
M6MS1-110 (A8J0009-02)				Matrix: Water				
Batch: 8100472								
Nitrate-Nitrogen	0.898	---	0.250	mg/L	1	10/01/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	10/01/18	EPA 300.0	
M6MS1-60 (A8J0009-03)				Matrix: Water				
Batch: 8100472								
Nitrate-Nitrogen	3.65	---	0.250	mg/L	1	10/01/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	10/01/18	EPA 300.0	



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Shore Terminal-Vancouver**
Project Manager: **Stephanie Salisbury**

Report ID:
A8J0009 - 10 11 18 1012

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100562 - EPA 5030B						Water						
Blank (8100562-BLK1)		Prepared: 10/03/18 11:35			Analyzed: 10/03/18 12:56							
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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Lisa Domenighini, Client Services Manager



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Shore Terminal-Vancouver**
Project Manager: **Stephanie Salisbury**

Report ID:
A8J0009 - 10 11 18 1012

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100562 - EPA 5030B												
Water												
Blank (8100562-BLK1)			Prepared: 10/03/18 11:35			Analyzed: 10/03/18 12:56						
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>96 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>"</i>						

LCS (8100562-BS1)												
			Prepared: 10/03/18 11:35			Analyzed: 10/03/18 12:02						
EPA 8260C												
Bromobenzene	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Bromochloromethane	23.4	---	1.00	ug/L	1	20.0	---	117	80-120%	---	---	
Bromodichloromethane	21.8	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Bromoform	24.0	---	1.00	ug/L	1	20.0	---	120	80-120%	---	---	
Bromomethane	19.0	---	5.00	ug/L	1	20.0	---	95	80-120%	---	---	
Carbon tetrachloride	19.4	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
Chlorobenzene	21.5	---	0.500	ug/L	1	20.0	---	107	80-120%	---	---	
Chloroethane	21.9	---	5.00	ug/L	1	20.0	---	110	80-120%	---	---	
Chloroform	21.7	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Chloromethane	19.4	---	5.00	ug/L	1	20.0	---	97	80-120%	---	---	
2-Chlorotoluene	20.7	---	1.00	ug/L	1	20.0	---	103	80-120%	---	---	
4-Chlorotoluene	19.9	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
Dibromochloromethane	23.0	---	1.00	ug/L	1	20.0	---	115	80-120%	---	---	
1,2-Dibromo-3-chloropropane	20.7	---	5.00	ug/L	1	20.0	---	104	80-120%	---	---	
1,2-Dibromoethane (EDB)	22.0	---	0.500	ug/L	1	20.0	---	110	80-120%	---	---	
Dibromomethane	21.7	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
1,2-Dichlorobenzene	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A8J0009 - 10 11 18 1012
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100562 - EPA 5030B						Water						
LCS (8100562-BS1)			Prepared: 10/03/18 11:35		Analyzed: 10/03/18 12:02							
1,3-Dichlorobenzene	20.9	---	0.500	ug/L	1	20.0	---	105	80-120%	---	---	
1,4-Dichlorobenzene	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Dichlorodifluoromethane	20.6	---	1.00	ug/L	1	20.0	---	103	80-120%	---	---	
1,1-Dichloroethane	19.3	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.4	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
1,1-Dichloroethene	18.5	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
cis-1,2-Dichloroethene	18.4	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
trans-1,2-Dichloroethene	18.3	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
1,2-Dichloropropane	19.7	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
1,3-Dichloropropane	19.3	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
2,2-Dichloropropane	21.1	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
1,1-Dichloropropene	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
cis-1,3-Dichloropropene	20.7	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
trans-1,3-Dichloropropene	23.1	---	1.00	ug/L	1	20.0	---	115	80-120%	---	---	
Hexachlorobutadiene	20.3	---	5.00	ug/L	1	20.0	---	101	80-120%	---	---	
Methylene chloride	20.2	---	3.00	ug/L	1	20.0	---	101	80-120%	---	---	
1,1,1,2-Tetrachloroethane	25.3	---	0.400	ug/L	1	20.0	---	126	80-120%	---	---	Q-56
1,1,2,2-Tetrachloroethane	22.7	---	0.500	ug/L	1	20.0	---	113	80-120%	---	---	
Tetrachloroethene (PCE)	22.2	---	0.400	ug/L	1	20.0	---	111	80-120%	---	---	
1,2,3-Trichlorobenzene	21.0	---	2.00	ug/L	1	20.0	---	105	80-120%	---	---	
1,2,4-Trichlorobenzene	18.9	---	2.00	ug/L	1	20.0	---	94	80-120%	---	---	
1,1,1-Trichloroethane	21.7	---	0.400	ug/L	1	20.0	---	109	80-120%	---	---	
1,1,2-Trichloroethane	21.9	---	0.500	ug/L	1	20.0	---	109	80-120%	---	---	
Trichloroethene (TCE)	20.6	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
Trichlorofluoromethane	25.5	---	2.00	ug/L	1	20.0	---	127	80-120%	---	---	Q-56
1,2,3-Trichloropropane	20.5	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
Vinyl chloride	18.3	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		Recovery: 102 %		Limits: 80-120 %		Dilution: 1x						
Toluene-d8 (Surr)		94 %		80-120 %		"						
4-Bromofluorobenzene (Surr)		93 %		80-120 %		"						

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A8J0009 - 10 11 18 1012
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100617 - EPA 5030B						Water						
Blank (8100617-BLK1)		Prepared: 10/04/18 10:26		Analyzed: 10/04/18 12:23								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A8J0009 - 10 11 18 1012
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100617 - EPA 5030B						Water						
Blank (8100617-BLK1)		Prepared: 10/04/18 10:26			Analyzed: 10/04/18 12:23							
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 105 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>95 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>"</i>						

LCS (8100617-BS3)		Prepared: 10/04/18 10:26			Analyzed: 10/04/18 11:56							
EPA 8260C												
Bromobenzene	19.1	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Bromochloromethane	21.7	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
Bromodichloromethane	20.7	---	1.00	ug/L	1	20.0	---	103	80-120%	---	---	
Bromoform	22.3	---	1.00	ug/L	1	20.0	---	111	80-120%	---	---	
Bromomethane	17.4	---	5.00	ug/L	1	20.0	---	87	80-120%	---	---	
Carbon tetrachloride	19.7	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Chlorobenzene	20.6	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	
Chloroethane	19.7	---	5.00	ug/L	1	20.0	---	99	80-120%	---	---	
Chloroform	20.3	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
Chloromethane	19.0	---	5.00	ug/L	1	20.0	---	95	80-120%	---	---	
2-Chlorotoluene	20.2	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
4-Chlorotoluene	19.1	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
Dibromochloromethane	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
1,2-Dibromo-3-chloropropane	18.5	---	5.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,2-Dibromoethane (EDB)	20.1	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Dibromomethane	19.8	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,2-Dichlorobenzene	20.2	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A8J0009 - 10 11 18 1012
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100617 - EPA 5030B						Water						
LCS (8100617-BS3)			Prepared: 10/04/18 10:26		Analyzed: 10/04/18 11:56							
1,3-Dichlorobenzene	20.7	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
1,4-Dichlorobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Dichlorodifluoromethane	21.7	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
1,1-Dichloroethane	18.3	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
1,2-Dichloroethane (EDC)	18.4	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
1,1-Dichloroethene	18.6	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
cis-1,2-Dichloroethene	17.8	---	0.400	ug/L	1	20.0	---	89	80-120%	---	---	
trans-1,2-Dichloroethene	17.8	---	0.400	ug/L	1	20.0	---	89	80-120%	---	---	
1,2-Dichloropropane	17.9	---	0.500	ug/L	1	20.0	---	90	80-120%	---	---	
1,3-Dichloropropane	17.9	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
2,2-Dichloropropane	23.2	---	1.00	ug/L	1	20.0	---	116	80-120%	---	---	
1,1-Dichloropropene	19.7	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
cis-1,3-Dichloropropene	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
trans-1,3-Dichloropropene	21.5	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
Hexachlorobutadiene	21.3	---	5.00	ug/L	1	20.0	---	107	80-120%	---	---	
Methylene chloride	18.8	---	3.00	ug/L	1	20.0	---	94	80-120%	---	---	
1,1,1,2-Tetrachloroethane	23.7	---	0.400	ug/L	1	20.0	---	119	80-120%	---	---	
1,1,2,2-Tetrachloroethane	21.1	---	0.500	ug/L	1	20.0	---	106	80-120%	---	---	
Tetrachloroethene (PCE)	22.4	---	0.400	ug/L	1	20.0	---	112	80-120%	---	---	
1,2,3-Trichlorobenzene	20.6	---	2.00	ug/L	1	20.0	---	103	80-120%	---	---	
1,2,4-Trichlorobenzene	19.6	---	2.00	ug/L	1	20.0	---	98	80-120%	---	---	
1,1,1-Trichloroethane	21.3	---	0.400	ug/L	1	20.0	---	106	80-120%	---	---	
1,1,2-Trichloroethane	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Trichloroethene (TCE)	20.5	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
Trichlorofluoromethane	24.5	---	2.00	ug/L	1	20.0	---	123	80-120%	---	---	Q-56
1,2,3-Trichloropropane	18.9	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
Vinyl chloride	18.6	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 101 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>94 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>95 %</i>		<i>80-120 %</i>		<i>"</i>						

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A8J0009 - 10 11 18 1012
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100661 - EPA 5030B						Water						
Blank (8100661-BLK1)		Prepared: 10/05/18 10:17 Analyzed: 10/05/18 11:42										
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A8J0009 - 10 11 18 1012
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100661 - EPA 5030B						Water						
Blank (8100661-BLK1)			Prepared: 10/05/18 10:17		Analyzed: 10/05/18 11:42							
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>"</i>						

LCS (8100661-BS1)			Prepared: 10/05/18 10:17		Analyzed: 10/05/18 10:46							
EPA 8260C												
Bromobenzene	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Bromochloromethane	23.1	---	1.00	ug/L	1	20.0	---	115	80-120%	---	---	
Bromodichloromethane	20.6	---	1.00	ug/L	1	20.0	---	103	80-120%	---	---	
Bromoform	20.4	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
Bromomethane	30.0	---	5.00	ug/L	1	20.0	---	150	80-120%	---	---	EST, Q-56
Carbon tetrachloride	20.3	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Chlorobenzene	19.5	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Chloroethane	20.6	---	5.00	ug/L	1	20.0	---	103	80-120%	---	---	
Chloroform	20.3	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
Chloromethane	15.5	---	5.00	ug/L	1	20.0	---	77	80-120%	---	---	Q-55
2-Chlorotoluene	22.0	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
4-Chlorotoluene	22.2	---	1.00	ug/L	1	20.0	---	111	80-120%	---	---	
Dibromochloromethane	20.4	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
1,2-Dibromo-3-chloropropane	17.9	---	5.00	ug/L	1	20.0	---	90	80-120%	---	---	
1,2-Dibromoethane (EDB)	20.5	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	
Dibromomethane	20.6	---	1.00	ug/L	1	20.0	---	103	80-120%	---	---	
1,2-Dichlorobenzene	19.7	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100661 - EPA 5030B												
Water												
LCS (8100661-BS1)	Prepared: 10/05/18 10:17 Analyzed: 10/05/18 10:46											
1,3-Dichlorobenzene	20.8	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
1,4-Dichlorobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Dichlorodifluoromethane	19.8	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,1-Dichloroethane	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.1	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
1,1-Dichloroethene	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
cis-1,2-Dichloroethene	19.9	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
trans-1,2-Dichloroethene	19.6	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
1,2-Dichloropropane	19.3	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
1,3-Dichloropropane	19.8	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
2,2-Dichloropropane	23.1	---	1.00	ug/L	1	20.0	---	115	80-120%	---	---	
1,1-Dichloropropene	20.6	---	1.00	ug/L	1	20.0	---	103	80-120%	---	---	
cis-1,3-Dichloropropene	21.2	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
trans-1,3-Dichloropropene	21.9	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
Hexachlorobutadiene	18.4	---	5.00	ug/L	1	20.0	---	92	80-120%	---	---	
Methylene chloride	18.6	---	3.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1,1,2-Tetrachloroethane	20.5	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
1,1,2,2-Tetrachloroethane	19.5	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Tetrachloroethene (PCE)	18.5	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
1,2,3-Trichlorobenzene	19.7	---	2.00	ug/L	1	20.0	---	98	80-120%	---	---	
1,2,4-Trichlorobenzene	18.8	---	2.00	ug/L	1	20.0	---	94	80-120%	---	---	
1,1,1-Trichloroethane	20.5	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
1,1,2-Trichloroethane	19.9	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Trichloroethene (TCE)	19.2	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
Trichlorofluoromethane	19.6	---	2.00	ug/L	1	20.0	---	98	80-120%	---	---	
1,2,3-Trichloropropane	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Vinyl chloride	21.1	---	0.400	ug/L	1	20.0	---	106	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 100 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	103 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	99 %		80-120 %		"							



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QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100512 - Method Prep: Aq						Water						
Blank (8100512-BLK2)		Prepared: 10/02/18 09:46 Analyzed: 10/02/18 17:02										
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	Q-16
LCS (8100512-BS2)		Prepared: 10/02/18 09:46 Analyzed: 10/02/18 17:03										
SM 4500-NH3 G												
Ammonia as N	2.09	---	0.0200	mg/L	1	2.00	---	104	90-110%	---	---	Q-16



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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8100472 - Method Prep: Aq						Water						
Blank (8100472-BLK1)		Prepared: 10/01/18 12:59 Analyzed: 10/01/18 14:57										
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
LCS (8100472-BS1)		Prepared: 10/01/18 12:59 Analyzed: 10/01/18 15:18										
EPA 300.0												
Nitrate-Nitrogen	2.14	---	0.250	mg/L	1	2.00	---	107	90-110%	---	---	---
Nitrite-Nitrogen	2.05	---	0.250	mg/L	1	2.00	---	102	90-110%	---	---	---
Duplicate (8100472-DUP1)		Prepared: 10/01/18 12:59 Analyzed: 10/01/18 16:01										
QC Source Sample: MW-32 S (A8J0009-01)												
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	---	10%
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	---	15%
Matrix Spike (8100472-MS1)		Prepared: 10/01/18 12:59 Analyzed: 10/01/18 16:23										
QC Source Sample: MW-32 S (A8J0009-01)												
EPA 300.0												
Nitrate-Nitrogen	2.69	---	0.312	mg/L	1	2.50	ND	107	80-120%	---	---	---
Nitrite-Nitrogen	2.37	---	0.312	mg/L	1	2.50	ND	95	80-120%	---	---	---



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates

6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver

Project Number: Shore Terminal-Vancouver

Project Manager: Stephanie Salisbury

Report ID:

A8J0009 - 10 11 18 1012

QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

Apex Laboratories

- EST** Result reported as an Estimated Value. Compound failed initial calibration criteria.
- Q-16** Reanalysis of an original Batch QC sample.
- Q-55** Daily CCV/LCS recovery for this analyte was below the +/-20% criteria listed in EPA 8260C, however there is adequate sensitivity to ensure detection at the reporting level.
- Q-56** Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C

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Lisa Domenighini, Client Services Manager

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REPORTING NOTES AND CONVENTIONS:

Abbreviations:

- DET Analyte DETECTED at or above the detection or reporting limit.
- ND Analyte NOT DETECTED at or above the detection or reporting limit.
- NR Result Not Reported
- RPD Relative Percent Difference

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

- Basis:** Results for soil samples are generally reported on a 100% dry weight basis.
The Result Basis is listed following the units as "dry", "wet", or "" (blank) designation.
 - "dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.
 - "wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.
 - "" Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) are not included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

- " --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.
- " *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to 1/2 the Reporting Limit (RL).
-For Blank hits falling between 1/2 the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.



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REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the blank results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.



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Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Shore Terminal-Vancouver**
Project Manager: **Stephanie Salisbury**

Report ID:
A8J0009 - 10 11 18 1012

LABORATORY ACCREDITATION INFORMATION

TNI Certification ID: OR100062 (Primary Accreditation) - EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation
<u>All reported analytes are included in Apex Laboratories' current ORELAP scope.</u>					

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation. Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provided by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.

Apex Laboratories

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Lisa Domenighini, Client Services Manager

Cascadia Associates Project: **Shore Terminal-Vancouver**
 6915 SW Macadam, Suite 250 Project Number: **Shore Terminal-Vancouver**
 Portland, OR 97219 Project Manager: **Stephanie Salisbury** **Report ID: A8J0009 - 10 11 18 1012**

CHAIN OF CUSTODY

Lab # **A850009** PO# **1 of 1**

Company: **Cascadia** Project Mgr: **Stephanie Salisbury** Project Name: **3Q 2018 Noster Gum** Project #
 Address: **6915 SW Macadam Ave, Ste 250** Phone: **503 906 6577** Fax: **56 Salisbury 2 Cascadia Associates.com**

Sampled by: **Joel M.**

Site Location: **OR** Other: **(WA)**

LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-DX	NWTPH-GX	8260 VOCs Full List	8260 RBDM VOCs	8260 HVOCs	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TTO	RCRA Metals (8)	TCLP Metals (8)	Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Hg, Mn, Ni, V, Zn	TOTAL DISS TCFP	1200-COLS	1200-Z		
MW-325	10/11/18	0815	GW 15							X											X	Nitrate/Nitrite	
MGMs 1-110	10/11/18	0910	GW 15							X											X	X	Ammonia
MGMs 1-60	10/11/18	0950	GW 15							X											X	X	

Normal Turn Around Time (TAT) = 10 Business Days

TAT Requested (circle): **1 Day** 2 Day 3 Day 4 DAY 5 DAY Other: _____

SPECIAL INSTRUCTIONS:

RECEIVED BY: **Joel M.** Date: **10/11/18** Signature: **[Signature]** Date: _____
 Signature: **[Signature]** Date: **10/11/18** Signature: _____ Date: _____
 Printed Name: **Joel M. Hechey** Time: **11:29** Printed Name: **Tanna Grady** Time: **11:29**
 Company: **Cascadia** Company: **Apex**

Apex Laboratories

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Joia A. Domenighini



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Shore Terminal-Vancouver Project Manager: Stephanie Salisbury	Report ID: A8J0009 - 10 11 18 1012
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APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A8J0009

Project/Project #: 3Q 2018 Nustar GWM

Delivery info:
Date/Time Received: 10/11/18 @ 11:29 By: TAG
Delivered by: Apex Client ESS FedEx UPS Swift Senvoy SDS Other

Cooler Inspection Inspected by: TAG : 10/11/18 @ 11:29
Chain of Custody Included? Yes No Custody Seals? Yes No
Signed/Dated by Client? Yes No
Signed/Dated by Apex? Yes No

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (deg. C)	<u>5.8</u>						
Received on Ice? (Y/N)	<u>Y</u>						
Temp. Blanks? (Y/N)	<u>N</u>						
Ice Type: (Gel/Real/Other)	<u>Real</u>						
Condition:	<u>good</u>						

Cooler out of temp? (Y/N) (N) Possible reason why: _____
If some coolers are in temp and some out, were green dot applied to out of temperature samples? Yes/No/NA (NA)

Samples Inspection: Inspected by: TAG : 10/11/18 @ 11:39
All Samples Intact? Yes No Comments: _____
Bottle Labels/COCs agree? Yes No Comments: _____
Containers/Volumes Received Appropriate for Analysis? Yes No Comments: _____
Do VOA Vials have Visible Headspace? Yes No NA
Comments: _____
Water Samples: pH Checked and Appropriate (except VOAs): Yes No NA
Comments: _____
Additional Information: _____

Labeled by: TAG Witness: OW Cooler Inspected by: TAG See Project Contact Form: Y



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Monday, December 31, 2018

Stephanie Salisbury
Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

RE: A8L0089 - Shore Terminal-Vancouver - Nustar Van. 4Q18

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A8L0089, which was received by the laboratory on 12/4/2018 at 4:30:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of final reporting, unless prior arrangements have been made.

Cooler Receipt Information

(See Cooler Receipt Form for details)

Cooler #1 2.8 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.

All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.



Apex Laboratories

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Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0089 - 12 31 18 1305

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-24i	A8L0089-01	Water	12/04/18 08:20	12/04/18 16:30
MP-1	A8L0089-02	Water	12/04/18 09:00	12/04/18 16:30
EX-1	A8L0089-03	Water	12/04/18 09:40	12/04/18 16:30
MGMS1-40	A8L0089-04	Water	12/04/18 10:40	12/04/18 16:30
MGMS1-60	A8L0089-05	Water	12/04/18 11:10	12/04/18 16:30
MW-12	A8L0089-06	Water	12/04/18 14:10	12/04/18 16:30
MW-12 DUP	A8L0089-07	Water	12/04/18 14:10	12/04/18 16:30
MW-1	A8L0089-08	Water	12/04/18 15:05	12/04/18 16:30
Trip Blank	A8L0089-09	Water	12/04/18 00:00	12/04/18 16:30

Apex Laboratories

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Cascadia Associates

6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver

Project Number: Nustar Van. 4Q18

Project Manager: Stephanie Salisbury

Report ID:

A8L0089 - 12 31 18 1305

ANALYTICAL CASE NARRATIVE

Work Order: A8L0089

Subcontract

This report is not complete without the attached subcontract laboratory report for RSK 175 from Air Technology Labs.

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24i (A8L0089-01)				Matrix: Water		Batch: 8120411		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	EST
Chloroform	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,1-Dichloroethane	0.800	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
cis-1,2-Dichloroethene	5.13	---	0.400	ug/L	1	12/05/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/05/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Tetrachloroethene (PCE)	10.2	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
--	--	--

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24i (A8L0089-01)			Matrix: Water		Batch: 8120411			
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Trichloroethene (TCE)	3.76	---	0.400	ug/L	1	12/05/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/05/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/05/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>96 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/05/18</i>	<i>EPA 8260C</i>

MP-1 (A8L0089-02)			Matrix: Water		Batch: 8120411			
Bromobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	EST
Chloroform	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,1-Dichloroethane	2.79	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,1-Dichloroethene	6.59	---	0.400	ug/L	1	12/05/18	EPA 8260C	
cis-1,2-Dichloroethene	130	---	0.400	ug/L	1	12/05/18	EPA 8260C	
trans-1,2-Dichloroethene	0.836	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MP-1 (A8L0089-02)				Matrix: Water		Batch: 8120411		
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/05/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Trichloroethene (TCE)	76.7	---	0.400	ug/L	1	12/05/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Vinyl chloride	1.24	---	0.400	ug/L	1	12/05/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 104 %</i>		<i>Limits: 80-120 %</i>	<i>1</i>	<i>12/05/18</i>	<i>EPA 8260C</i>	
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>	<i>1</i>	<i>12/05/18</i>	<i>EPA 8260C</i>	
<i>4-Bromofluorobenzene (Surr)</i>		<i>94 %</i>		<i>80-120 %</i>	<i>1</i>	<i>12/05/18</i>	<i>EPA 8260C</i>	

MP-1 (A8L0089-02RE2)				Matrix: Water		Batch: 8120508		
Tetrachloroethene (PCE)	355	---	4.00	ug/L	10	12/07/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 103 %</i>		<i>Limits: 80-120 %</i>	<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>	
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>	<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>	
<i>4-Bromofluorobenzene (Surr)</i>		<i>101 %</i>		<i>80-120 %</i>	<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>	

EX-1 (A8L0089-03RE1)				Matrix: Water		Batch: 8120460		
Bromobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	EST
Chloroform	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
EX-1 (A8L0089-03RE1)				Matrix: Water		Batch: 8120460		
Dibromochloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloroethane	0.876	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
cis-1,2-Dichloroethene	8.18	---	0.400	ug/L	1	12/06/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/06/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Tetrachloroethene (PCE)	6.35	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Trichloroethene (TCE)	3.60	---	0.400	ug/L	1	12/06/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Vinyl chloride	1.88	---	0.400	ug/L	1	12/06/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>	<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>	
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>	<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>	
<i>4-Bromofluorobenzene (Surr)</i>		<i>96 %</i>		<i>80-120 %</i>	<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>	

MGMS1-40 (A8L0089-04)				Matrix: Water		Batch: 8120411		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS1-40 (A8L0089-04)				Matrix: Water		Batch: 8120411		
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	EST
Chloroform	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,1-Dichloroethane	148	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,1-Dichloroethene	22.5	---	0.400	ug/L	1	12/05/18	EPA 8260C	
trans-1,2-Dichloroethene	48.1	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/05/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Tetrachloroethene (PCE)	146	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/18	EPA 8260C	
1,1,1-Trichloroethane	1.08	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS1-40 (A8L0089-04)				Matrix: Water		Batch: 8120411		
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Vinyl chloride	129	---	0.400	ug/L	1	12/05/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 98 %</i>		<i>Limits: 80-120 %</i>	<i>1</i>	<i>12/05/18</i>	<i>EPA 8260C</i>	
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>	<i>1</i>	<i>12/05/18</i>	<i>EPA 8260C</i>	
<i>4-Bromofluorobenzene (Surr)</i>		<i>93 %</i>		<i>80-120 %</i>	<i>1</i>	<i>12/05/18</i>	<i>EPA 8260C</i>	
MGMS1-40 (A8L0089-04RE2)				Matrix: Water		Batch: 8120508		
cis-1,2-Dichloroethene	2750	---	8.00	ug/L	20	12/07/18	EPA 8260C	
Trichloroethene (TCE)	388	---	8.00	ug/L	20	12/07/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 103 %</i>		<i>Limits: 80-120 %</i>	<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>	
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>	<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>	
<i>4-Bromofluorobenzene (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>	<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>	
MGMS1-60 (A8L0089-05RE1)				Matrix: Water		Batch: 8120460		
Bromobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	EST
Chloroform	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloroethane	0.666	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
cis-1,2-Dichloroethene	9.64	---	0.400	ug/L	1	12/06/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS1-60 (A8L0089-05RE1)				Matrix: Water		Batch: 8120460		
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/06/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Tetrachloroethene (PCE)	14.4	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Trichloroethene (TCE)	8.20	---	0.400	ug/L	1	12/06/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>96 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>

MW-12 (A8L0089-06RE1)				Matrix: Water		Batch: 8120460		
Bromobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12 (A8L0089-06RE1)				Matrix: Water		Batch: 8120460		
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
cis-1,2-Dichloroethene	4.30	---	0.400	ug/L	1	12/06/18	EPA 8260C	
trans-1,2-Dichloroethene	0.415	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/06/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Tetrachloroethene (PCE)	1.29	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Trichloroethene (TCE)	1.29	---	0.400	ug/L	1	12/06/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Vinyl chloride	1.69	---	0.400	ug/L	1	12/06/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>96 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>

MW-12 (A8L0089-06RE2)				Matrix: Water		Batch: 8120508		
Chloroethane	ND	---	5.00	ug/L	1	12/07/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 102 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12 (A8L0089-06RE2)			Matrix: Water		Batch: 8120508			
<i>Surrogate: 4-Bromofluorobenzene (Surr)</i>		<i>Recovery: 99 %</i>	<i>Limits: 80-120 %</i>	<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>		
MW-12 DUP (A8L0089-07RE1)			Matrix: Water		Batch: 8120460			
Bromobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloroethane	0.470	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
cis-1,2-Dichloroethene	3.95	---	0.400	ug/L	1	12/06/18	EPA 8260C	
trans-1,2-Dichloroethene	0.400	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/06/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Tetrachloroethene (PCE)	0.998	---	0.400	ug/L	1	12/06/18	EPA 8260C	

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Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12 DUP (A8L0089-07RE1)			Matrix: Water			Batch: 8120460		
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Trichloroethene (TCE)	1.02	---	0.400	ug/L	1	12/06/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Vinyl chloride	1.58	---	0.400	ug/L	1	12/06/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>95 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>
MW-12 DUP (A8L0089-07RE2)			Matrix: Water			Batch: 8120508		
Chloroethane	6.03	---	5.00	ug/L	1	12/07/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 102 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>
MW-1 (A8L0089-08)			Matrix: Water			Batch: 8120411		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	EST
Chloroform	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	

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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-1 (A8L0089-08)				Matrix: Water		Batch: 8120411		
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,1-Dichloroethane	4.73	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
cis-1,2-Dichloroethene	22.7	---	0.400	ug/L	1	12/05/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/05/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Tetrachloroethene (PCE)	15.7	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Trichloroethene (TCE)	9.04	---	0.400	ug/L	1	12/05/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Vinyl chloride	2.57	---	0.400	ug/L	1	12/05/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/05/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/05/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>92 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/05/18</i>	<i>EPA 8260C</i>

Trip Blank (A8L0089-09)				Matrix: Water		Batch: 8120411		
Bromobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	EST

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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A8L0089-09)				Matrix: Water		Batch: 8120411		
Chloroform	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/05/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/05/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/05/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/05/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/05/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/05/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/05/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/05/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/05/18</i>	<i>EPA 8260C</i>

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Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A8L0089-09)				Matrix: Water		Batch: 8120411		
<i>Surrogate: 4-Bromofluorobenzene (Surr)</i>		<i>Recovery: 94 %</i>	<i>Limits: 80-120 %</i>	<i>1</i>	<i>12/05/18</i>	<i>EPA 8260C</i>		

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ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24i (A8L0089-01)				Matrix: Water			Batch: 8120475	
Ammonia as N	0.0670	---	0.0200	mg/L	1	12/07/18	SM 4500-NH3 G	
MP-1 (A8L0089-02RE1)				Matrix: Water			Batch: 8120475	
Ammonia as N	6.01	---	0.0400	mg/L	2	12/07/18	SM 4500-NH3 G	
EX-1 (A8L0089-03RE2)				Matrix: Water			Batch: 8120475	
Ammonia as N	117	---	1.00	mg/L	50	12/07/18	SM 4500-NH3 G	
MGMS1-40 (A8L0089-04RE2)				Matrix: Water			Batch: 8120475	
Ammonia as N	246	---	1.00	mg/L	50	12/07/18	SM 4500-NH3 G	
MGMS1-60 (A8L0089-05)				Matrix: Water			Batch: 8120475	
Ammonia as N	0.104	---	0.0200	mg/L	1	12/07/18	SM 4500-NH3 G	
MW-12 (A8L0089-06RE1)				Matrix: Water			Batch: 8120475	
Ammonia as N	37.2	---	0.200	mg/L	10	12/07/18	SM 4500-NH3 G	
MW-12 DUP (A8L0089-07RE1)				Matrix: Water			Batch: 8120475	
Ammonia as N	37.1	---	0.200	mg/L	10	12/07/18	SM 4500-NH3 G	
MW-1 (A8L0089-08)				Matrix: Water			Batch: 8120475	
Ammonia as N	3.38	---	0.0200	mg/L	1	12/07/18	SM 4500-NH3 G	

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24i (A8L0089-01)				Matrix: Water				
Batch: 8120418								
Nitrate-Nitrogen	2.97	---	0.250	mg/L	1	12/05/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/18	EPA 300.0	
MP-1 (A8L0089-02)				Matrix: Water				
Batch: 8120418								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/18	EPA 300.0	
MP-1 (A8L0089-02RE1)				Matrix: Water				
Batch: 8120418								
Nitrate-Nitrogen	80.8	---	2.50	mg/L	10	12/05/18	EPA 300.0	
EX-1 (A8L0089-03)				Matrix: Water				
Batch: 8120418								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/18	EPA 300.0	
EX-1 (A8L0089-03RE1)				Matrix: Water				
Batch: 8120418								
Nitrate-Nitrogen	24.1	---	1.25	mg/L	5	12/05/18	EPA 300.0	
MGMS1-40 (A8L0089-04)				Matrix: Water				
Batch: 8120418								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/18	EPA 300.0	
MGMS1-40 (A8L0089-04RE1)				Matrix: Water				
Batch: 8120418								
Nitrate-Nitrogen	30.6	---	2.50	mg/L	10	12/05/18	EPA 300.0	
MGMS1-60 (A8L0089-05)				Matrix: Water				
Batch: 8120418								
Nitrate-Nitrogen	0.697	---	0.250	mg/L	1	12/05/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/18	EPA 300.0	
MW-12 (A8L0089-06)				Matrix: Water				
Batch: 8120418								
Nitrite-Nitrogen	0.487	---	0.250	mg/L	1	12/05/18	EPA 300.0	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-12 (A8L0089-06RE1)				Matrix: Water				
Batch: 8120418								
Nitrate-Nitrogen	82.2	---	2.50	mg/L	10	12/05/18	EPA 300.0	
MW-12 DUP (A8L0089-07)				Matrix: Water				
Batch: 8120418								
Nitrite-Nitrogen	0.526	---	0.250	mg/L	1	12/05/18	EPA 300.0	
MW-12 DUP (A8L0089-07RE1)				Matrix: Water				
Batch: 8120418								
Nitrate-Nitrogen	80.0	---	2.50	mg/L	10	12/05/18	EPA 300.0	
MW-1 (A8L0089-08)				Matrix: Water				
Batch: 8120418								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/05/18	EPA 300.0	
MW-1 (A8L0089-08RE1)				Matrix: Water				
Batch: 8120418								
Nitrate-Nitrogen	79.4	---	2.50	mg/L	10	12/05/18	EPA 300.0	



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ANALYTICAL SAMPLE RESULTS

Demand Parameters

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MP-1 (A8L0089-02)				Matrix: Water				
Batch: 8120415								
Total Organic Carbon	6.09	---	1.00	mg/L	1	12/05/18	SM 5310 C	
EX-1 (A8L0089-03RE1)				Matrix: Water				
Batch: 8120487								
Total Organic Carbon	11.0	---	5.00	mg/L	5	12/07/18	SM 5310 C	
MGMS1-40 (A8L0089-04RE1)				Matrix: Water				
Batch: 8120487								
Total Organic Carbon	6.06	---	1.00	mg/L	1	12/07/18	SM 5310 C	
MW-12 (A8L0089-06RE2)				Matrix: Water				
Batch: 8120532								
Total Organic Carbon	36.4	---	5.00	mg/L	5	12/07/18	SM 5310 C	



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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120411 - EPA 5030B						Water						
Blank (8120411-BLK1)		Prepared: 12/05/18 10:33		Analyzed: 12/05/18 11:55								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120411 - EPA 5030B												
Water												
Blank (8120411-BLK1)	Prepared: 12/05/18 10:33 Analyzed: 12/05/18 11:55											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 108 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	97 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	96 %		80-120 %		"							

LCS (8120411-BS1)	Prepared: 12/05/18 10:33 Analyzed: 12/05/18 11:01											
EPA 8260C												
Bromobenzene	18.6	---	0.500	ug/L	1	20.0	---	93	80-120%	---	---	
Bromochloromethane	23.9	---	1.00	ug/L	1	20.0	---	120	80-120%	---	---	
Bromodichloromethane	22.3	---	1.00	ug/L	1	20.0	---	111	80-120%	---	---	
Bromoform	23.7	---	1.00	ug/L	1	20.0	---	119	80-120%	---	---	
Bromomethane	24.7	---	5.00	ug/L	1	20.0	---	124	80-120%	---	---	Q-56
Carbon tetrachloride	22.5	---	1.00	ug/L	1	20.0	---	112	80-120%	---	---	
Chlorobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Chloroethane	31.2	---	5.00	ug/L	1	20.0	---	156	80-120%	---	---	EST, Q-56
Chloroform	21.1	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Chloromethane	30.7	---	5.00	ug/L	1	20.0	---	153	80-120%	---	---	Q-56
2-Chlorotoluene	16.7	---	1.00	ug/L	1	20.0	---	84	80-120%	---	---	
4-Chlorotoluene	16.9	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
Dibromochloromethane	22.0	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
1,2-Dibromo-3-chloropropane	17.5	---	5.00	ug/L	1	20.0	---	88	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.7	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
Dibromomethane	21.5	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
1,2-Dichlorobenzene	19.0	---	0.500	ug/L	1	20.0	---	95	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0089 - 12 31 18 1305

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120411 - EPA 5030B												
Water												
LCS (8120411-BS1)	Prepared: 12/05/18 10:33 Analyzed: 12/05/18 11:01											
1,3-Dichlorobenzene	18.5	---	0.500	ug/L	1	20.0	---	93	80-120%	---	---	
1,4-Dichlorobenzene	18.4	---	0.500	ug/L	1	20.0	---	92	80-120%	---	---	
Dichlorodifluoromethane	23.8	---	1.00	ug/L	1	20.0	---	119	80-120%	---	---	
1,1-Dichloroethane	20.7	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
1,2-Dichloroethane (EDC)	20.7	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
1,1-Dichloroethene	20.4	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
cis-1,2-Dichloroethene	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
trans-1,2-Dichloroethene	20.3	---	0.400	ug/L	1	20.0	---	101	80-120%	---	---	
1,2-Dichloropropane	20.8	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
1,3-Dichloropropane	19.0	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
2,2-Dichloropropane	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
1,1-Dichloropropene	19.3	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
cis-1,3-Dichloropropene	19.1	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
trans-1,3-Dichloropropene	19.9	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
Hexachlorobutadiene	18.9	---	5.00	ug/L	1	20.0	---	95	80-120%	---	---	
Methylene chloride	22.1	---	3.00	ug/L	1	20.0	---	110	80-120%	---	---	
1,1,1,2-Tetrachloroethane	20.9	---	0.400	ug/L	1	20.0	---	105	80-120%	---	---	
1,1,2,2-Tetrachloroethane	19.7	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Tetrachloroethene (PCE)	20.4	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
1,2,3-Trichlorobenzene	18.2	---	2.00	ug/L	1	20.0	---	91	80-120%	---	---	
1,2,4-Trichlorobenzene	17.4	---	2.00	ug/L	1	20.0	---	87	80-120%	---	---	
1,1,1-Trichloroethane	20.3	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
1,1,2-Trichloroethane	20.4	---	0.500	ug/L	1	20.0	---	102	80-120%	---	---	
Trichloroethene (TCE)	20.2	---	0.400	ug/L	1	20.0	---	101	80-120%	---	---	
Trichlorofluoromethane	35.7	---	2.00	ug/L	1	20.0	---	179	80-120%	---	---	Q-56
1,2,3-Trichloropropane	18.1	---	1.00	ug/L	1	20.0	---	91	80-120%	---	---	
Vinyl chloride	23.0	---	0.400	ug/L	1	20.0	---	115	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr) Recovery: 105 % Limits: 80-120 % Dilution: 1x												
Toluene-d8 (Surr) 98 % 80-120 % "												
4-Bromofluorobenzene (Surr) 94 % 80-120 % "												



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120460 - EPA 5030B						Water						
Blank (8120460-BLK1)		Prepared: 12/06/18 10:05		Analyzed: 12/06/18 11:26								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120460 - EPA 5030B												
Water												
Blank (8120460-BLK1)	Prepared: 12/06/18 10:05 Analyzed: 12/06/18 11:26											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr) Recovery: 105 % Limits: 80-120 % Dilution: 1x												
Toluene-d8 (Surr) 97 % 80-120 % "												
4-Bromofluorobenzene (Surr) 94 % 80-120 % "												

LCS (8120460-BS1)												
Prepared: 12/06/18 10:05 Analyzed: 12/06/18 10:32												
EPA 8260C												
Bromobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Bromochloromethane	23.6	---	1.00	ug/L	1	20.0	---	118	80-120%	---	---	
Bromodichloromethane	21.9	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
Bromoform	24.3	---	1.00	ug/L	1	20.0	---	121	80-120%	---	---	Q-56
Bromomethane	29.9	---	5.00	ug/L	1	20.0	---	150	80-120%	---	---	Q-56
Carbon tetrachloride	22.7	---	1.00	ug/L	1	20.0	---	113	80-120%	---	---	
Chlorobenzene	19.7	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
Chloroethane	26.5	---	5.00	ug/L	1	20.0	---	133	80-120%	---	---	EST, Q-56
Chloroform	21.2	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
Chloromethane	28.4	---	5.00	ug/L	1	20.0	---	142	80-120%	---	---	Q-56
2-Chlorotoluene	17.7	---	1.00	ug/L	1	20.0	---	88	80-120%	---	---	
4-Chlorotoluene	16.9	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
Dibromochloromethane	22.9	---	1.00	ug/L	1	20.0	---	114	80-120%	---	---	
1,2-Dibromo-3-chloropropane	18.0	---	5.00	ug/L	1	20.0	---	90	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.9	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Dibromomethane	21.8	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
1,2-Dichlorobenzene	18.8	---	0.500	ug/L	1	20.0	---	94	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120460 - EPA 5030B												
Water												
LCS (8120460-BS1)	Prepared: 12/06/18 10:05 Analyzed: 12/06/18 10:32											
1,3-Dichlorobenzene	18.6	---	0.500	ug/L	1	20.0	---	93	80-120%	---	---	
1,4-Dichlorobenzene	18.3	---	0.500	ug/L	1	20.0	---	91	80-120%	---	---	
Dichlorodifluoromethane	23.6	---	1.00	ug/L	1	20.0	---	118	80-120%	---	---	
1,1-Dichloroethane	20.4	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.3	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
1,1-Dichloroethene	20.6	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
cis-1,2-Dichloroethene	20.1	---	0.400	ug/L	1	20.0	---	101	80-120%	---	---	
trans-1,2-Dichloroethene	20.2	---	0.400	ug/L	1	20.0	---	101	80-120%	---	---	
1,2-Dichloropropane	20.8	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
1,3-Dichloropropane	18.9	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
2,2-Dichloropropane	18.9	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
1,1-Dichloropropene	19.9	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
cis-1,3-Dichloropropene	19.9	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
trans-1,3-Dichloropropene	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Hexachlorobutadiene	19.4	---	5.00	ug/L	1	20.0	---	97	80-120%	---	---	
Methylene chloride	21.9	---	3.00	ug/L	1	20.0	---	110	80-120%	---	---	
1,1,1,2-Tetrachloroethane	21.3	---	0.400	ug/L	1	20.0	---	106	80-120%	---	---	
1,1,2,2-Tetrachloroethane	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Tetrachloroethene (PCE)	21.2	---	0.400	ug/L	1	20.0	---	106	80-120%	---	---	
1,2,3-Trichlorobenzene	19.0	---	2.00	ug/L	1	20.0	---	95	80-120%	---	---	
1,2,4-Trichlorobenzene	18.3	---	2.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,1,1-Trichloroethane	20.0	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,1,2-Trichloroethane	20.6	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	
Trichloroethene (TCE)	20.4	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
Trichlorofluoromethane	32.9	---	2.00	ug/L	1	20.0	---	165	80-120%	---	---	Q-56
1,2,3-Trichloropropane	18.0	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
Vinyl chloride	22.3	---	0.400	ug/L	1	20.0	---	111	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr) Recovery: 104 % Limits: 80-120 % Dilution: 1x												
Toluene-d8 (Surr) 97 % 80-120 % "												
4-Bromofluorobenzene (Surr) 95 % 80-120 % "												



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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120508 - EPA 5030B						Water						
Blank (8120508-BLK1)		Prepared: 12/07/18 10:00		Analyzed: 12/07/18 13:35								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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Lisa Domenighini, Client Services Manager



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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120508 - EPA 5030B												
Water												
Blank (8120508-BLK1)	Prepared: 12/07/18 10:00 Analyzed: 12/07/18 13:35											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 103 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	105 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	103 %		80-120 %		"							

LCS (8120508-BS1)												
Prepared: 12/07/18 10:00 Analyzed: 12/07/18 12:38												
EPA 8260C												
Bromobenzene	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Bromochloromethane	17.4	---	1.00	ug/L	1	20.0	---	87	80-120%	---	---	
Bromodichloromethane	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Bromoform	26.5	---	1.00	ug/L	1	20.0	---	132	80-120%	---	---	Q-56
Bromomethane	16.5	---	5.00	ug/L	1	20.0	---	83	80-120%	---	---	
Carbon tetrachloride	19.2	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
Chlorobenzene	20.7	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
Chloroethane	21.6	---	5.00	ug/L	1	20.0	---	108	80-120%	---	---	
Chloroform	18.9	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
Chloromethane	14.0	---	5.00	ug/L	1	20.0	---	70	80-120%	---	---	Q-55
2-Chlorotoluene	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
4-Chlorotoluene	18.3	---	1.00	ug/L	1	20.0	---	91	80-120%	---	---	
Dibromochloromethane	23.4	---	1.00	ug/L	1	20.0	---	117	80-120%	---	---	
1,2-Dibromo-3-chloropropane	17.8	---	5.00	ug/L	1	20.0	---	89	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Dibromomethane	19.5	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
1,2-Dichlorobenzene	19.7	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120508 - EPA 5030B												
						Water						
LCS (8120508-BS1)												
			Prepared: 12/07/18 10:00			Analyzed: 12/07/18 12:38						
1,3-Dichlorobenzene	20.1	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
1,4-Dichlorobenzene	19.7	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
Dichlorodifluoromethane	18.0	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
1,1-Dichloroethane	18.5	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
1,2-Dichloroethane (EDC)	17.2	---	0.400	ug/L	1	20.0	---	86	80-120%	---	---	
1,1-Dichloroethene	17.2	---	0.400	ug/L	1	20.0	---	86	80-120%	---	---	
cis-1,2-Dichloroethene	17.7	---	0.400	ug/L	1	20.0	---	88	80-120%	---	---	
trans-1,2-Dichloroethene	18.2	---	0.400	ug/L	1	20.0	---	91	80-120%	---	---	
1,2-Dichloropropane	17.9	---	0.500	ug/L	1	20.0	---	89	80-120%	---	---	
1,3-Dichloropropane	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
2,2-Dichloropropane	17.4	---	1.00	ug/L	1	20.0	---	87	80-120%	---	---	
1,1-Dichloropropene	18.3	---	1.00	ug/L	1	20.0	---	91	80-120%	---	---	
cis-1,3-Dichloropropene	18.8	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
trans-1,3-Dichloropropene	19.5	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
Hexachlorobutadiene	20.1	---	5.00	ug/L	1	20.0	---	100	80-120%	---	---	
Methylene chloride	18.5	---	3.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,1,1,2-Tetrachloroethane	21.8	---	0.400	ug/L	1	20.0	---	109	80-120%	---	---	
1,1,2,2-Tetrachloroethane	19.5	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Tetrachloroethene (PCE)	21.6	---	0.400	ug/L	1	20.0	---	108	80-120%	---	---	
1,2,3-Trichlorobenzene	18.4	---	2.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,2,4-Trichlorobenzene	18.3	---	2.00	ug/L	1	20.0	---	91	80-120%	---	---	
1,1,1-Trichloroethane	17.5	---	0.400	ug/L	1	20.0	---	87	80-120%	---	---	
1,1,2-Trichloroethane	20.1	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Trichloroethene (TCE)	19.4	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
Trichlorofluoromethane	23.0	---	2.00	ug/L	1	20.0	---	115	80-120%	---	---	
1,2,3-Trichloropropane	18.7	---	1.00	ug/L	1	20.0	---	93	80-120%	---	---	
Vinyl chloride	20.6	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 100 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>"</i>						



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QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120475 - Method Prep: Aq						Water						
Blank (8120475-BLK1)		Prepared: 12/07/18 08:33 Analyzed: 12/07/18 10:23										
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (8120475-BS1)		Prepared: 12/07/18 08:33 Analyzed: 12/07/18 10:25										
SM 4500-NH3 G												
Ammonia as N	2.17	---	0.0200	mg/L	1	2.00	---	109	90-110%	---	---	



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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120418 - Method Prep: Aq						Water						
Blank (8120418-BLK1)			Prepared: 12/05/18 11:04			Analyzed: 12/05/18 12:53						
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
LCS (8120418-BS1)			Prepared: 12/05/18 11:04			Analyzed: 12/05/18 13:14						
EPA 300.0												
Nitrate-Nitrogen	2.06	---	0.250	mg/L	1	2.00	---	103	90-110%	---	---	---
Nitrite-Nitrogen	1.99	---	0.250	mg/L	1	2.00	---	99	90-110%	---	---	---
Duplicate (8120418-DUP1)			Prepared: 12/05/18 11:04			Analyzed: 12/05/18 13:58						
QC Source Sample: MW-24i (A8L0089-01)												
EPA 300.0												
Nitrate-Nitrogen	2.97	---	0.250	mg/L	1	---	2.97	---	---	0.01	10%	---
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	15%	---
Matrix Spike (8120418-MS1)			Prepared: 12/05/18 11:04			Analyzed: 12/05/18 14:19						
QC Source Sample: MW-24i (A8L0089-01)												
EPA 300.0												
Nitrate-Nitrogen	5.56	---	0.312	mg/L	1	2.50	2.97	104	80-120%	---	---	---
Nitrite-Nitrogen	2.49	---	0.312	mg/L	1	2.50	ND	100	80-120%	---	---	---



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QUALITY CONTROL (QC) SAMPLE RESULTS

Demand Parameters

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120415 - Method Prep: Aq						Water						
Blank (8120415-BLK1)		Prepared: 12/05/18 10:14 Analyzed: 12/05/18 18:13										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	---
LCS (8120415-BS1)		Prepared: 12/05/18 10:14 Analyzed: 12/05/18 18:42										
SM 5310 C												
Total Organic Carbon	10.3	---	1.00	mg/L	1	10.0	---	103	85-115%	---	---	---
Duplicate (8120415-DUP1)		Prepared: 12/05/18 10:14 Analyzed: 12/05/18 20:50										
QC Source Sample: MP-1 (A8L0089-02)												
SM 5310 C												
Total Organic Carbon	6.02	---	1.00	mg/L	1	---	6.09	---	---	1	10%	---
Matrix Spike (8120415-MS1)		Prepared: 12/05/18 10:14 Analyzed: 12/05/18 21:19										
QC Source Sample: MP-1 (A8L0089-02)												
SM 5310 C												
Total Organic Carbon	16.2	---	1.01	mg/L	1	10.0	6.09	101	85-115%	---	---	---



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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QUALITY CONTROL (QC) SAMPLE RESULTS

Demand Parameters

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120487 - Method Prep: Aq						Water						
Blank (8120487-BLK1)		Prepared: 12/06/18 14:21 Analyzed: 12/06/18 17:49										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	---
LCS (8120487-BS1)		Prepared: 12/06/18 14:21 Analyzed: 12/06/18 18:19										
SM 5310 C												
Total Organic Carbon	10.3	---	1.00	mg/L	1	10.0	---	103	85-115%	---	---	---
LCS (8120487-BS2)		Prepared: 12/06/18 14:21 Analyzed: 12/06/18 18:48										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	0.00	---		85-115%	---	---	TOC_I



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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QUALITY CONTROL (QC) SAMPLE RESULTS

Demand Parameters

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120532 - Method Prep: Aq						Water						
Blank (8120532-BLK1)		Prepared: 12/07/18 13:49 Analyzed: 12/07/18 17:45										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	---
LCS (8120532-BS1)		Prepared: 12/07/18 13:49 Analyzed: 12/07/18 18:14										
SM 5310 C												
Total Organic Carbon	10.4	---	1.00	mg/L	1	10.0	---	104	85-115%	---	---	---
LCS (8120532-BS2)		Prepared: 12/07/18 13:49 Analyzed: 12/07/18 18:43										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	0.00	---		85-115%	---	---	TOC_I



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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SAMPLE PREPARATION INFORMATION

Halogenated Volatile Organic Compounds by EPA 8260C

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8120411</u>							
A8L0089-01	Water	EPA 8260C	12/04/18 08:20	12/05/18 11:36	5mL/5mL	5mL/5mL	1.00
A8L0089-02	Water	EPA 8260C	12/04/18 09:00	12/05/18 11:36	5mL/5mL	5mL/5mL	1.00
A8L0089-04	Water	EPA 8260C	12/04/18 10:40	12/05/18 11:36	5mL/5mL	5mL/5mL	1.00
A8L0089-08	Water	EPA 8260C	12/04/18 15:05	12/05/18 11:36	5mL/5mL	5mL/5mL	1.00
A8L0089-09	Water	EPA 8260C	12/04/18 00:00	12/05/18 11:36	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8120460</u>							
A8L0089-03RE1	Water	EPA 8260C	12/04/18 09:40	12/06/18 11:21	5mL/5mL	5mL/5mL	1.00
A8L0089-05RE1	Water	EPA 8260C	12/04/18 11:10	12/06/18 11:21	5mL/5mL	5mL/5mL	1.00
A8L0089-06RE1	Water	EPA 8260C	12/04/18 14:10	12/06/18 11:21	5mL/5mL	5mL/5mL	1.00
A8L0089-07RE1	Water	EPA 8260C	12/04/18 14:10	12/06/18 11:21	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8120508</u>							
A8L0089-02RE2	Water	EPA 8260C	12/04/18 09:00	12/07/18 14:38	5mL/5mL	5mL/5mL	1.00
A8L0089-04RE2	Water	EPA 8260C	12/04/18 10:40	12/07/18 14:38	5mL/5mL	5mL/5mL	1.00
A8L0089-06RE2	Water	EPA 8260C	12/04/18 14:10	12/07/18 14:38	5mL/5mL	5mL/5mL	1.00
A8L0089-07RE2	Water	EPA 8260C	12/04/18 14:10	12/07/18 14:38	5mL/5mL	5mL/5mL	1.00

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8120475</u>							
A8L0089-01	Water	SM 4500-NH3 G	12/04/18 08:20	12/07/18 08:33	10mL/10mL	10mL/10mL	1.00
A8L0089-02RE1	Water	SM 4500-NH3 G	12/04/18 09:00	12/07/18 08:33	10mL/10mL	10mL/10mL	1.00
A8L0089-03RE2	Water	SM 4500-NH3 G	12/04/18 09:40	12/07/18 08:33	10mL/10mL	10mL/10mL	1.00
A8L0089-04RE2	Water	SM 4500-NH3 G	12/04/18 10:40	12/07/18 08:33	10mL/10mL	10mL/10mL	1.00
A8L0089-05	Water	SM 4500-NH3 G	12/04/18 11:10	12/07/18 08:33	10mL/10mL	10mL/10mL	1.00
A8L0089-06RE1	Water	SM 4500-NH3 G	12/04/18 14:10	12/07/18 08:33	10mL/10mL	10mL/10mL	1.00
A8L0089-07RE1	Water	SM 4500-NH3 G	12/04/18 14:10	12/07/18 08:33	10mL/10mL	10mL/10mL	1.00
A8L0089-08	Water	SM 4500-NH3 G	12/04/18 15:05	12/07/18 08:33	10mL/10mL	10mL/10mL	1.00

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8120418</u>							

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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SAMPLE PREPARATION INFORMATION

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A8L0089-01	Water	EPA 300.0	12/04/18 08:20	12/05/18 11:04	5mL/5mL	5mL/5mL	1.00
A8L0089-02	Water	EPA 300.0	12/04/18 09:00	12/05/18 11:04	5mL/5mL	5mL/5mL	1.00
A8L0089-02RE1	Water	EPA 300.0	12/04/18 09:00	12/05/18 11:04	5mL/5mL	5mL/5mL	1.00
A8L0089-03	Water	EPA 300.0	12/04/18 09:40	12/05/18 11:04	5mL/5mL	5mL/5mL	1.00
A8L0089-03RE1	Water	EPA 300.0	12/04/18 09:40	12/05/18 11:04	5mL/5mL	5mL/5mL	1.00
A8L0089-04	Water	EPA 300.0	12/04/18 10:40	12/05/18 11:04	5mL/5mL	5mL/5mL	1.00
A8L0089-04RE1	Water	EPA 300.0	12/04/18 10:40	12/05/18 11:04	5mL/5mL	5mL/5mL	1.00
A8L0089-05	Water	EPA 300.0	12/04/18 11:10	12/05/18 11:04	5mL/5mL	5mL/5mL	1.00
A8L0089-06	Water	EPA 300.0	12/04/18 14:10	12/05/18 11:04	5mL/5mL	5mL/5mL	1.00
A8L0089-06RE1	Water	EPA 300.0	12/04/18 14:10	12/05/18 11:04	5mL/5mL	5mL/5mL	1.00
A8L0089-07	Water	EPA 300.0	12/04/18 14:10	12/05/18 11:04	5mL/5mL	5mL/5mL	1.00
A8L0089-07RE1	Water	EPA 300.0	12/04/18 14:10	12/05/18 11:04	5mL/5mL	5mL/5mL	1.00
A8L0089-08	Water	EPA 300.0	12/04/18 15:05	12/05/18 11:04	5mL/5mL	5mL/5mL	1.00
A8L0089-08RE1	Water	EPA 300.0	12/04/18 15:05	12/05/18 11:04	5mL/5mL	5mL/5mL	1.00

Demand Parameters

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8120415</u>							
A8L0089-02	Water	SM 5310 C	12/04/18 09:00	12/05/18 10:14	40mL/40mL	40mL/40mL	1.00
<u>Batch: 8120487</u>							
A8L0089-03RE1	Water	SM 5310 C	12/04/18 09:40	12/06/18 14:21	40mL/40mL	40mL/40mL	1.00
A8L0089-04RE1	Water	SM 5310 C	12/04/18 10:40	12/06/18 14:21	40mL/40mL	40mL/40mL	1.00
<u>Batch: 8120532</u>							
A8L0089-06RE2	Water	SM 5310 C	12/04/18 14:10	12/07/18 13:49	40mL/40mL	40mL/40mL	1.00



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates

6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver

Project Number: Nustar Van. 4Q18
Project Manager: Stephanie Salisbury

Report ID:
A8L0089 - 12 31 18 1305

QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

Apex Laboratories

- EST** Result reported as an Estimated Value. Compound failed initial calibration criteria.
- Q-55** Daily CCV/LCS recovery for this analyte was below the +/-20% criteria listed in EPA 8260C, however there is adequate sensitivity to ensure detection at the reporting level.
- Q-56** Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C
- TOC_I** Inorganic Carbon Spike Check. Results are valid if Non Detect (No Inorganic Carbon detected.)

Apex Laboratories

Lisa Domenighini, Client Services Manager

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REPORTING NOTES AND CONVENTIONS:

Abbreviations:

- DET Analyte DETECTED at or above the detection or reporting limit.
- ND Analyte NOT DETECTED at or above the detection or reporting limit.
- NR Result Not Reported
- RPD Relative Percent Difference

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

- Basis: Results for soil samples are generally reported on a 100% dry weight basis. The Result Basis is listed following the units as "dry", "wet", or "" (blank) designation.
 - "dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.
 - "wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.
 - "" Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) are not included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

- " --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.
- " *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to 1/2 the Reporting Limit (RL).
-For Blank hits falling between 1/2 the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a 'B' qualifier, per Apex Laboratories' Blank Policy.
For further details, please request a copy of this document.



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the blank results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.

Apex Laboratories maintains detailed records on sample receipt, including client label verification, cooler temperature, sample preservation, hold time compliance and field filtration. Data is qualified as necessary, and the lack of qualification indicates compliance with required parameters.

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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LABORATORY ACCREDITATION INFORMATION

TNI Certification ID: OR100062 (Primary Accreditation) - EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation
<u>All reported analytes are included in Apex Laboratories' current ORELAP scope.</u>					

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation. Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provided by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.



Apex Laboratories, LLC

12232 S.W. Garden Place

Tigard, OR 97223

503-718-2323

EPA ID: OR01039

Cascadia Associates

Project: Shore Terminal-Vancouver

6915 SW Macadam, Suite 250

Project Number: Nustar Van. 4Q18

Portland, OR 97219

Project Manager: Stephanie Salisbury

Report ID:

A8L0089 - 12 31 18 1305

CHAIN OF CUSTODY APEX LABS 12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333		PO# _____ Project # _____	
Company: Cascadia Address: 6915 SW Macadam Ave Sampled by: Lindsey Hollis		Lab # <u>A8L0089</u> revised of _____ Project Name: <u>Nustar Van 4Q18</u> Project Mgr: <u>Stephanie Salisbury</u> Phone: _____ Fax: _____ Email: _____	
Site Location: OR <u>(WA)</u> Other: _____	ANALYSIS REQUEST # OF CONTAINERS _____ MATRIX _____ TIME _____ DATE _____ LAB ID # _____	TCEP Metals (H) _____ HCRA Metals (B) _____ 609 TTO _____ 8082 PCBs _____ 8270 SIM PAHs _____ 8270 SVOC _____ 8260 BTEX VOCs _____ 8260 HVOCS _____ 8260 RBDN VOCs _____ 8260 VOCs Full List _____ NMTPH-Gx _____ NMTPH-Dx _____ NMTPH-HClD _____	TOTAL DISS TCLP 96. AP. Na. TL. V. Zn CR. CR. Cu. Cd. Pb. Ni AL. SR. AR. Ba. Bz. Ca Hg. ME. Mn. Mg. PK. Se As H Pb Cr
Sample 1: MW-24 Date: 12/4/08 Time: 0820 W	Sample 2: mp-1 Date: 12/4/08 Time: 0900	Sample 3: Ex-1 Date: 10/4/08 Time: 1040	Sample 4: MGNMS1-40 Date: 11/10/08 Time: 1110
Sample 5: MGNMS1-60 Date: 12/10/08 Time: 1410	Sample 6: MW-12 Dup Date: 12/10/08 Time: 1410	Sample 7: MW-1 Date: 12/10/08 Time: 1505	Sample 8: Trip Blank Date: _____ Time: _____
Normal Turn Around Time (TAT) = 10 Business Days <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	TAT Requested (circle): 1 Day _____ 2 Day _____ 3 Day _____ 4 DAY _____ 5 DAY _____ Other: _____	SPECIAL INSTRUCTIONS: _____ _____ _____	RECEIVED BY: Signature: _____ Date: _____ Printed Name: _____ Title: _____ Company: _____

Apex Laboratories

Lisa Domenighini

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Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver
Project Number: Nustar Van. 4Q18
Project Manager: Stephanie Salisbury

Report ID:
A8L0089 - 12 31 18 1305

CHAIN OF CUSTODY
APEX LABS
12232 S.W. Garden Place, Tigard, OR 97223
Project Name: Nustar Van 4Q18
Project #: 1200-Z
Analysis Request: TCE, Ammonia, Nitrate/Nitrite, etc.
Signature: Lindsey Holts
Date: 12/4/18

Lisa Domenighini

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0089 - 12 31 18 1305
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APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A8 L0089

Project/Project #: Nustar Van 4Q18

Delivery Info:
 Date/time received: 12/4/18 @ 1630 By: CFH
 Delivered by: Apex Client ESS FedEx UPS Swift Senvoy SDS Other

Cooler Inspection Date/time inspected: 12/4/18 @ 1737 By: CFH

Chain of Custody included? Yes No Custody seals? Yes No

Signed/dated by client? Yes No

Signed/dated by Apex? Yes No

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (°C)	<u>2.8</u>						
Received on ice? (Y/N)	<u>Y</u>						
Temp. blanks? (Y/N)	<u>Y</u>						
Ice type: (Gel/Real/Other)	<u>Real</u>						
Condition:	<u>Good</u>						

Cooler out of temp? (Y/N) Possible reason why: _____

If some coolers are in temp and some out, were green dots applied to out of temperature samples? Yes/No/NA

Out of temperature samples form initiated? Yes/No/NA

Samples Inspection: Date/time inspected: 12/4/18 @ 1745 By: CFB

All samples intact? Yes No Comments: _____

Bottle labels/COCs agree? Yes No Comments: Trip Blank provided, not listed on COC.

COC/container discrepancies form initiated? Yes No NA

Containers/volumes received appropriate for analysis? Yes No Comments: _____

Do VOA vials have visible headspace? Yes No NA

Comments: EX-1 vis. sed. in HCL vials

Water samples: pH checked: Yes No NA pH appropriate? Yes No NA

Comments: _____

Additional information: TB # 1935

Labeled by: CFB Witness: TAKA Cooler Inspected by: CFB See Project Contact Form:

Lisa Domenighini

December 31, 2018

Apex Laboratories
ATTN: Lisa Domenighini
12232 S.W. Garden Place
Tigard, OR 97223



LA Cert #04140
EPA Methods TO3, TO14A, TO15, 25C/3C,
RSK-175

TX Cert T104704450-14-6
EPA Methods TO14A, TO15

UT Cert CA0133332015-3
EPA Methods TO3, TO14A, TO15, RSK-175

LABORATORY TEST RESULTS

Project Reference: A8L0089
Lab Number: J120606-01/04

Enclosed are results for sample(s) received 12/06/18 by Air Technology Laboratories. Samples were received intact and chilled to 3° C. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the TNI Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,


Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Note: The cover letter is an integral part of this analytical report.

SUBCONTRACT ORDER

Apex Laboratories

A8L0089

J120606-8/18/18
CMB 12/5/18

SENDING LABORATORY:

Apex Laboratories
12232 S.W. Garden Place
Tigard, OR 97223
Phone: (503) 718-2323
Fax: (503) 718-0333
Project Manager: Lisa Domenighini

RECEIVING LABORATORY:

Air Technology Laboratories, Inc
18501 E. Gale Ave Suite 130
City of Industry, CA 91748
Phone : (626) 964-4032
Fax: (626) 964-5832

Sample Name: MP-1 **Water** **Sampled: 12/04/18 09:00** (A8L0089-02)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/17/18 17:00	12/18/18 09:00	
<i>Containers Supplied:</i>			
(F)40 mL VOA - HCL			
(G)40 mL VOA - HCL			

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Sample Name: EX-1 **Water** **Sampled: 12/04/18 09:40** (A8L0089-03)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/17/18 17:00	12/18/18 09:40	Visible sediment in voas
<i>Containers Supplied:</i>			
(F)40 mL VOA - HCL			
(G)40 mL VOA - HCL			

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Sample Name: MGMS1-40 **Water** **Sampled: 12/04/18 10:40** (A8L0089-04)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/17/18 17:00	12/18/18 10:40	
<i>Containers Supplied:</i>			
(F)40 mL VOA - HCL			
(G)40 mL VOA - HCL			

63

Sample Name: MW-12 **Water** **Sampled: 12/04/18 14:10** (A8L0089-06)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/17/18 17:00	12/18/18 14:10	
<i>Containers Supplied:</i>			
(F)40 mL VOA - HCL			
(G)40 mL VOA - HCL			

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30C

WALD 12/5/18 14:20

Released By WALD Date 12/5/18 14:20 Received By Danf Date 12/6/18 15:26

Released By _____ Date _____ Received By _____ Date _____

Client: Apex Laboratories
Attn: Lisa Domenighini
Project Name: NA
Project No.: A8L0089
Date Received: 12/06/18
Matrix: Water
Reporting Units: ug/L

RSK175

Lab No.:	J120606-01	J120606-02	J120606-03	J120606-04				
Client Sample I.D.:	MP-1 (A8L0089-02)	EX-1 (A8L0089-03)	MGMS1-40 (A8L0089-04)	MW-12 (A8L0089-06)				
Date/Time Sampled:	12/4/18 9:00	12/4/18 9:40	12/4/18 10:40	12/4/18 14:10				
Date/Time Analyzed:	12/13/18 11:48	12/13/18 12:09	12/13/18 12:23	12/13/18 12:37				
QC Batch No.:	181213GC8A1	181213GC8A1	181213GC8A1	181213GC8A1				
Analyst Initials:	CM/MJ	CM/MJ	CM/MJ	CM/MJ				
Dilution Factor:	1.0	1.0	1.0	1.0				
ANALYTE	Result ug/L	RL ug/L	Result ug/L	RL ug/L	Result ug/L	RL ug/L	Result ug/L	RL ug/L
Ethene	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Ethane	6.9	1.0	11	1.0	19	1.0	8.0	1.0
Methane	7,400	1.0	2,000	1.0	2,600	1.0	7,300	1.0

ND = Not Detected (below RL)
 RL = Reporting Limit

Reviewed/Approved By: Mark Johnson
 Mark Johnson
 Operations Manager

Date 12/28/18

The cover letter is an integral part of this analytical report



LCS/LCSD Recovery and RPD Summary Report

QC Batch #: 181213GC8A1

Matrix: Air

Reporting Units: ug/L


RSK175											
LABORATORY CONTROL SAMPLE SUMMARY											

Lab No.:		METHOD BLANK		LCS		LCSD					
Date/Time Analyzed:		12/13/18 8:49		12/13/18 8:17		12/13/18 8:31					
Analyst Initials:		CM/MJ		CM/MJ		CM/MJ					
Dilution Factor:		1.0		1.0		1.0					
ANALYTE	Result ug/L	RL ug/L	SPIKE AMT. ug/L	Result ug/L	% Rec.	Result ug/L	% Rec.	RPD	Low %Rec	High %Rec	Max. RPD
Ethene	ND	1.0	1,150	1,300	114	1,230	107	6.1	70	130	30
Ethane	ND	1.0	1,230	1,440	117	1,380	113	4.0	70	130	30
Methane	ND	1.0	654	712	109	692	106	2.8	70	130	30

ND= Not Detected (below RL)

RL = Reporting Limit

Reviewed/Approved By: _____


 Mark Johnson
 Operations Manager

Date _____


 12/28/18

The cover letter is an integral part of this analytical report





AMENDED REPORT

Tuesday, January 8, 2019
Stephanie Salisbury
Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

RE: A8L0148 - Shore Terminal-Vancouver - Nustar Van. 4Q18

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A8L0148, which was received by the laboratory on 12/5/2018 at 4:35:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of final reporting, unless prior arrangements have been made.

Cooler Receipt Information

(See Cooler Receipt Form for details)

Cooler #1 1.5 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.

All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.





AMENDED REPORT

<u>Cascadia Associates</u> 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: <u>Shore Terminal-Vancouver</u> Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-19	A8L0148-01	Water	12/05/18 08:35	12/05/18 16:35
MW-19 DUP	A8L0148-02	Water	12/05/18 08:35	12/05/18 16:35
MW-13	A8L0148-03	Water	12/05/18 09:40	12/05/18 16:35
S-1	A8L0148-04	Water	12/05/18 10:40	12/05/18 16:35
S-2	A8L0148-05	Water	12/05/18 11:20	12/05/18 16:35
MW-14	A8L0148-06	Water	12/05/18 12:30	12/05/18 16:35
MW-26	A8L0148-07	Water	12/05/18 13:40	12/05/18 16:35
MW-22i	A8L0148-08	Water	12/05/18 14:30	12/05/18 16:35
Trip Blank	A8L0148-09	Water	12/05/18 00:00	12/05/18 16:35



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver
Project Number: Nustar Van. 4Q18
Project Manager: Stephanie Salisbury

Report ID:
A8L0148 - 01 08 19 0926

ANALYTICAL CASE NARRATIVE

Work Order: A8L0148

Subcontract

This report is not complete without the attached subcontract laboratory report for RSK 175 from Air Technology Labs.

Amended Report Revision 1:

Change to Sample Identification:

This report supersedes all previous reports.

Due to laboratory login error, the sample ID was incorrect for Sample A8L0148-08. Sample was originally reported as; MW-22;. That sample ID has been changed, and is now reported as; MW-22i.

Lisa Domenighini
Client Services Manager
1-8-19

Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19 (A8L0148-01)				Matrix: Water		Batch: 8120460		
Bromobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloroethane	91.8	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichloroethane (EDC)	0.453	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloroethene	39.3	---	0.400	ug/L	1	12/06/18	EPA 8260C	
trans-1,2-Dichloroethene	18.2	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/06/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,1,1-Trichloroethane	21.8	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1,2-Trichloroethane	0.669	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	

Apex Laboratories

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19 (A8L0148-01)			Matrix: Water			Batch: 8120460		
Vinyl chloride	79.0	---	0.400	ug/L	1	12/06/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 93 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>95 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>
MW-19 (A8L0148-01RE1)			Matrix: Water			Batch: 8120508		
Chloroethane	ND	---	500	ug/L	100	12/07/18	EPA 8260C	
cis-1,2-Dichloroethene	1750	---	40.0	ug/L	100	12/07/18	EPA 8260C	
Tetrachloroethene (PCE)	3090	---	40.0	ug/L	100	12/07/18	EPA 8260C	
Trichloroethene (TCE)	1490	---	40.0	ug/L	100	12/07/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 105 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>
MW-19 DUP (A8L0148-02)			Matrix: Water			Batch: 8120460		
Bromobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloroethane	90.1	---	0.400	ug/L	1	12/06/18	EPA 8260C	Q-42
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloroethene	39.2	---	0.400	ug/L	1	12/06/18	EPA 8260C	
trans-1,2-Dichloroethene	18.4	---	0.400	ug/L	1	12/06/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19 DUP (A8L0148-02)				Matrix: Water		Batch: 8120460		
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/06/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,1,1-Trichloroethane	21.3	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1,2-Trichloroethane	0.670	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Vinyl chloride	77.1	---	0.400	ug/L	1	12/06/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 93 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>94 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>

MW-19 DUP (A8L0148-02RE1)				Matrix: Water		Batch: 8120508		V-01
Chloroethane	ND	---	500	ug/L	100	12/07/18	EPA 8260C	
cis-1,2-Dichloroethene	1610	---	40.0	ug/L	100	12/07/18	EPA 8260C	
Tetrachloroethene (PCE)	2460	---	40.0	ug/L	100	12/07/18	EPA 8260C	
Trichloroethene (TCE)	1290	---	40.0	ug/L	100	12/07/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 105 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>

MW-13 (A8L0148-03RE1)				Matrix: Water		Batch: 8120508		
Bromobenzene	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/07/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	

Apex Laboratories

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-13 (A8L0148-03RE1)				Matrix: Water		Batch: 8120508		
Chloroethane	6.70	---	5.00	ug/L	1	12/07/18	EPA 8260C	M-02
Chloroform	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/07/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/07/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
cis-1,2-Dichloroethene	6.17	---	0.400	ug/L	1	12/07/18	EPA 8260C	
trans-1,2-Dichloroethene	0.682	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/07/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/07/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Tetrachloroethene (PCE)	0.567	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/07/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/07/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Trichloroethene (TCE)	0.413	---	0.400	ug/L	1	12/07/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/07/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Vinyl chloride	55.2	---	0.400	ug/L	1	12/07/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 102 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-13 (A8L0148-03RE1)			Matrix: Water		Batch: 8120508			
<i>Surrogate: Toluene-d8 (Surr)</i>		<i>Recovery: 104 %</i>	<i>Limits: 80-120 %</i>	<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>		
<i>4-Bromofluorobenzene (Surr)</i>		<i>101 %</i>	<i>80-120 %</i>	<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>		
S-1 (A8L0148-04RE1)			Matrix: Water		Batch: 8120508			
Bromobenzene	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/07/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/07/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/07/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/07/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
cis-1,2-Dichloroethene	1.10	---	0.400	ug/L	1	12/07/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/07/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/07/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0148 - 01 08 19 0926

ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
S-1 (A8L0148-04RE1)				Matrix: Water		Batch: 8120508		
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Tetrachloroethene (PCE)	1.94	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/07/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/07/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Trichloroethene (TCE)	7.39	---	0.400	ug/L	1	12/07/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/07/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 104 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>
S-2 (A8L0148-05RE1)				Matrix: Water		Batch: 8120508		
Bromobenzene	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/07/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/07/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/07/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/07/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
1,1-Dichloroethane	7.04	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
S-2 (A8L0148-05RE1)				Matrix: Water		Batch: 8120508		
cis-1,2-Dichloroethene	28.5	---	0.400	ug/L	1	12/07/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/07/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/07/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/07/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/07/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/07/18	EPA 8260C	
Trichloroethene (TCE)	2.18	---	0.400	ug/L	1	12/07/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/07/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/07/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/07/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 102 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>

MW-14 (A8L0148-06)				Matrix: Water		Batch: 8120463		
Bromobenzene	ND	---	5.00	ug/L	10	12/06/18	EPA 8260C	
Bromochloromethane	ND	---	10.0	ug/L	10	12/06/18	EPA 8260C	
Bromodichloromethane	ND	---	10.0	ug/L	10	12/06/18	EPA 8260C	
Bromoform	ND	---	10.0	ug/L	10	12/06/18	EPA 8260C	
Bromomethane	ND	---	50.0	ug/L	10	12/06/18	EPA 8260C	
Carbon tetrachloride	ND	---	10.0	ug/L	10	12/06/18	EPA 8260C	
Chlorobenzene	ND	---	5.00	ug/L	10	12/06/18	EPA 8260C	
Chloroethane	ND	---	50.0	ug/L	10	12/06/18	EPA 8260C	
Chloroform	ND	---	10.0	ug/L	10	12/06/18	EPA 8260C	
Chloromethane	ND	---	50.0	ug/L	10	12/06/18	EPA 8260C	
2-Chlorotoluene	ND	---	10.0	ug/L	10	12/06/18	EPA 8260C	
4-Chlorotoluene	ND	---	10.0	ug/L	10	12/06/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-14 (A8L0148-06)				Matrix: Water		Batch: 8120463		
Dibromochloromethane	ND	---	10.0	ug/L	10	12/06/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	50.0	ug/L	10	12/06/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	5.00	ug/L	10	12/06/18	EPA 8260C	
Dibromomethane	ND	---	10.0	ug/L	10	12/06/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	5.00	ug/L	10	12/06/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	5.00	ug/L	10	12/06/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	5.00	ug/L	10	12/06/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	10.0	ug/L	10	12/06/18	EPA 8260C	
1,1-Dichloroethane	5.43	---	4.00	ug/L	10	12/06/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	4.00	ug/L	10	12/06/18	EPA 8260C	
1,1-Dichloroethene	ND	---	4.00	ug/L	10	12/06/18	EPA 8260C	
cis-1,2-Dichloroethene	333	---	4.00	ug/L	10	12/06/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	4.00	ug/L	10	12/06/18	EPA 8260C	
1,2-Dichloropropane	ND	---	5.00	ug/L	10	12/06/18	EPA 8260C	
1,3-Dichloropropane	ND	---	10.0	ug/L	10	12/06/18	EPA 8260C	
2,2-Dichloropropane	ND	---	10.0	ug/L	10	12/06/18	EPA 8260C	
1,1-Dichloropropene	ND	---	10.0	ug/L	10	12/06/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	10.0	ug/L	10	12/06/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	10.0	ug/L	10	12/06/18	EPA 8260C	
Hexachlorobutadiene	ND	---	50.0	ug/L	10	12/06/18	EPA 8260C	
Methylene chloride	ND	---	30.0	ug/L	10	12/06/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	4.00	ug/L	10	12/06/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	5.00	ug/L	10	12/06/18	EPA 8260C	
Tetrachloroethene (PCE)	83.4	---	4.00	ug/L	10	12/06/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	20.0	ug/L	10	12/06/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	20.0	ug/L	10	12/06/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	4.00	ug/L	10	12/06/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	5.00	ug/L	10	12/06/18	EPA 8260C	
Trichloroethene (TCE)	260	---	4.00	ug/L	10	12/06/18	EPA 8260C	
Trichlorofluoromethane	ND	---	20.0	ug/L	10	12/06/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	10.0	ug/L	10	12/06/18	EPA 8260C	
Vinyl chloride	ND	---	4.00	ug/L	10	12/06/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>

MW-26 (A8L0148-07)				Matrix: Water		Batch: 8120508		
Bromobenzene	ND	---	1.00	ug/L	2	12/07/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-26 (A8L0148-07)				Matrix: Water		Batch: 8120508		
Bromochloromethane	ND	---	2.00	ug/L	2	12/07/18	EPA 8260C	
Bromodichloromethane	ND	---	2.00	ug/L	2	12/07/18	EPA 8260C	
Bromoform	ND	---	2.00	ug/L	2	12/07/18	EPA 8260C	
Bromomethane	ND	---	10.0	ug/L	2	12/07/18	EPA 8260C	Q-42
Carbon tetrachloride	ND	---	2.00	ug/L	2	12/07/18	EPA 8260C	
Chlorobenzene	ND	---	1.00	ug/L	2	12/07/18	EPA 8260C	
Chloroethane	ND	---	10.0	ug/L	2	12/07/18	EPA 8260C	
Chloroform	ND	---	2.00	ug/L	2	12/07/18	EPA 8260C	
Chloromethane	ND	---	10.0	ug/L	2	12/07/18	EPA 8260C	
2-Chlorotoluene	ND	---	2.00	ug/L	2	12/07/18	EPA 8260C	
4-Chlorotoluene	ND	---	2.00	ug/L	2	12/07/18	EPA 8260C	
Dibromochloromethane	ND	---	2.00	ug/L	2	12/07/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	10.0	ug/L	2	12/07/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	1.00	ug/L	2	12/07/18	EPA 8260C	
Dibromomethane	ND	---	2.00	ug/L	2	12/07/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	1.00	ug/L	2	12/07/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	1.00	ug/L	2	12/07/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	1.00	ug/L	2	12/07/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	2.00	ug/L	2	12/07/18	EPA 8260C	
1,1-Dichloroethane	3.02	---	0.800	ug/L	2	12/07/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.800	ug/L	2	12/07/18	EPA 8260C	
1,1-Dichloroethene	1.09	---	0.800	ug/L	2	12/07/18	EPA 8260C	
cis-1,2-Dichloroethene	147	---	0.800	ug/L	2	12/07/18	EPA 8260C	
trans-1,2-Dichloroethene	1.89	---	0.800	ug/L	2	12/07/18	EPA 8260C	
1,2-Dichloropropane	ND	---	1.00	ug/L	2	12/07/18	EPA 8260C	
1,3-Dichloropropane	ND	---	2.00	ug/L	2	12/07/18	EPA 8260C	
2,2-Dichloropropane	ND	---	2.00	ug/L	2	12/07/18	EPA 8260C	
1,1-Dichloropropene	ND	---	2.00	ug/L	2	12/07/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	2.00	ug/L	2	12/07/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	2.00	ug/L	2	12/07/18	EPA 8260C	
Hexachlorobutadiene	ND	---	10.0	ug/L	2	12/07/18	EPA 8260C	
Methylene chloride	ND	---	6.00	ug/L	2	12/07/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.800	ug/L	2	12/07/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	1.00	ug/L	2	12/07/18	EPA 8260C	
Tetrachloroethene (PCE)	139	---	0.800	ug/L	2	12/07/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	4.00	ug/L	2	12/07/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	4.00	ug/L	2	12/07/18	EPA 8260C	
1,1,1-Trichloroethane	0.846	---	0.800	ug/L	2	12/07/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	1.00	ug/L	2	12/07/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-26 (A8L0148-07)				Matrix: Water		Batch: 8120508		
Trichloroethene (TCE)	210	---	0.800	ug/L	2	12/07/18	EPA 8260C	
Trichlorofluoromethane	ND	---	4.00	ug/L	2	12/07/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	2.00	ug/L	2	12/07/18	EPA 8260C	
Vinyl chloride	0.848	---	0.800	ug/L	2	12/07/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 104 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/07/18</i>	<i>EPA 8260C</i>

MW-22i (A8L0148-08)				Matrix: Water		Batch: 8120556		
Bromobenzene	ND	---	0.500	ug/L	1	12/08/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/08/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/08/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/08/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/08/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/08/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/08/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/08/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/08/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/08/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/08/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/08/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/08/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/08/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/08/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/08/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/08/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/08/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/08/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/08/18	EPA 8260C	
1,1-Dichloroethane	0.474	---	0.400	ug/L	1	12/08/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/08/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/08/18	EPA 8260C	
cis-1,2-Dichloroethene	11.7	---	0.400	ug/L	1	12/08/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/08/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/08/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/08/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/08/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/08/18	EPA 8260C	

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AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-22i (A8L0148-08)				Matrix: Water		Batch: 8120556		
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/08/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/08/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/08/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/08/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/08/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/08/18	EPA 8260C	
Tetrachloroethene (PCE)	3.34	---	0.400	ug/L	1	12/08/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/08/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/08/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/08/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/08/18	EPA 8260C	
Trichloroethene (TCE)	8.19	---	0.400	ug/L	1	12/08/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/08/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/08/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/08/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 102 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/08/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/08/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>101 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/08/18</i>	<i>EPA 8260C</i>

Trip Blank (A8L0148-09)				Matrix: Water		Batch: 8120460		
Bromobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	EST
Chloroform	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	

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AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A8L0148-09)				Matrix: Water		Batch: 8120460		
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/06/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/06/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/06/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/06/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/06/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/06/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery:</i>	<i>105 %</i>	<i>Limits:</i>	<i>80-120 %</i>	<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>			<i>97 %</i>		<i>80-120 %</i>	<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>			<i>97 %</i>		<i>80-120 %</i>	<i>1</i>	<i>12/06/18</i>	<i>EPA 8260C</i>



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19 (A8L0148-01RE3)				Matrix: Water		Batch: 8120475		
Ammonia as N	188	---	1.00	mg/L	50	12/07/18	SM 4500-NH3 G	
MW-19 DUP (A8L0148-02RE2)				Matrix: Water		Batch: 8120476		
Ammonia as N	188	---	1.00	mg/L	50	12/07/18	SM 4500-NH3 G	
MW-13 (A8L0148-03RE1)				Matrix: Water		Batch: 8120476		
Ammonia as N	49.8	---	0.400	mg/L	20	12/07/18	SM 4500-NH3 G	
S-1 (A8L0148-04RE1)				Matrix: Water		Batch: 8120476		
Ammonia as N	ND	---	0.0200	mg/L	1	12/07/18	SM 4500-NH3 G	
S-2 (A8L0148-05RE1)				Matrix: Water		Batch: 8120476		
Ammonia as N	7.76	---	0.0400	mg/L	2	12/07/18	SM 4500-NH3 G	
MW-14 (A8L0148-06RE1)				Matrix: Water		Batch: 8120476		
Ammonia as N	53.7	---	0.400	mg/L	20	12/07/18	SM 4500-NH3 G	
MW-26 (A8L0148-07RE1)				Matrix: Water		Batch: 8120476		
Ammonia as N	35.3	---	0.400	mg/L	20	12/07/18	SM 4500-NH3 G	
MW-22i (A8L0148-08RE1)				Matrix: Water		Batch: 8120476		
Ammonia as N	0.378	---	0.0200	mg/L	1	12/07/18	SM 4500-NH3 G	

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AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19 (A8L0148-01)				Matrix: Water				
Batch: 8120478								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/06/18	EPA 300.0	
MW-19 (A8L0148-01RE2)				Matrix: Water				
Batch: 8120478								
Nitrate-Nitrogen	118	---	5.00	mg/L	20	12/07/18	EPA 300.0	A-01, H-01
MW-19 DUP (A8L0148-02)				Matrix: Water				
Batch: 8120478								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/06/18	EPA 300.0	
MW-19 DUP (A8L0148-02RE2)				Matrix: Water				
Batch: 8120478								
Nitrate-Nitrogen	119	---	5.00	mg/L	20	12/07/18	EPA 300.0	A-01, H-01
MW-13 (A8L0148-03)				Matrix: Water				
Batch: 8120478								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/06/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/06/18	EPA 300.0	
S-1 (A8L0148-04)				Matrix: Water				
Batch: 8120478								
Nitrate-Nitrogen	2.16	---	0.250	mg/L	1	12/06/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/06/18	EPA 300.0	
S-2 (A8L0148-05)				Matrix: Water				
Batch: 8120478								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/06/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/06/18	EPA 300.0	
MW-14 (A8L0148-06)				Matrix: Water				
Batch: 8120478								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/06/18	EPA 300.0	
MW-14 (A8L0148-06RE1)				Matrix: Water				
Batch: 8120478								

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AMENDED REPORT

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-14 (A8L0148-06RE1)				Matrix: Water				
Nitrate-Nitrogen	75.5	---	2.50	mg/L	10	12/06/18	EPA 300.0	
MW-26 (A8L0148-07)				Matrix: Water				
<u>Batch: 8120478</u>								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/06/18	EPA 300.0	
MW-26 (A8L0148-07RE2)				Matrix: Water				
<u>Batch: 8120478</u>								
Nitrate-Nitrogen	152	---	5.00	mg/L	20	12/07/18	EPA 300.0	
MW-22i (A8L0148-08)				Matrix: Water				
<u>Batch: 8120478</u>								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/06/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/06/18	EPA 300.0	



AMENDED REPORT

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ANALYTICAL SAMPLE RESULTS

Demand Parameters

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19 (A8L0148-01)				Matrix: Water				
<u>Batch: 8120487</u>								
Total Organic Carbon	10.5	---	1.00	mg/L	1	12/07/18	SM 5310 C	
MW-13 (A8L0148-03)				Matrix: Water				
<u>Batch: 8120487</u>								
Total Organic Carbon	51.7	---	5.00	mg/L	5	12/07/18	SM 5310 C	
MW-14 (A8L0148-06)				Matrix: Water				
<u>Batch: 8120487</u>								
Total Organic Carbon	13.4	---	1.00	mg/L	1	12/07/18	SM 5310 C	
MW-26 (A8L0148-07)				Matrix: Water				
<u>Batch: 8120487</u>								
Total Organic Carbon	ND	---	1.00	mg/L	1	12/07/18	SM 5310 C	



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120460 - EPA 5030B						Water						
Blank (8120460-BLK1)		Prepared: 12/06/18 10:05		Analyzed: 12/06/18 11:26								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120460 - EPA 5030B						Water						
Blank (8120460-BLK1)			Prepared: 12/06/18 10:05		Analyzed: 12/06/18 11:26							
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 105 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>94 %</i>		<i>80-120 %</i>		<i>"</i>						

LCS (8120460-BS1)			Prepared: 12/06/18 10:05		Analyzed: 12/06/18 10:32							
EPA 8260C												
Bromobenzene	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Bromochloromethane	23.6	---	1.00	ug/L	1	20.0	---	118	80-120%	---	---	
Bromodichloromethane	21.9	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
Bromoform	24.3	---	1.00	ug/L	1	20.0	---	121	80-120%	---	---	Q-56
Bromomethane	29.9	---	5.00	ug/L	1	20.0	---	150	80-120%	---	---	Q-56
Carbon tetrachloride	22.7	---	1.00	ug/L	1	20.0	---	113	80-120%	---	---	
Chlorobenzene	19.7	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
Chloroethane	26.5	---	5.00	ug/L	1	20.0	---	133	80-120%	---	---	EST, Q-56
Chloroform	21.2	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
Chloromethane	28.4	---	5.00	ug/L	1	20.0	---	142	80-120%	---	---	Q-56
2-Chlorotoluene	17.7	---	1.00	ug/L	1	20.0	---	88	80-120%	---	---	
4-Chlorotoluene	16.9	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
Dibromochloromethane	22.9	---	1.00	ug/L	1	20.0	---	114	80-120%	---	---	
1,2-Dibromo-3-chloropropane	18.0	---	5.00	ug/L	1	20.0	---	90	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.9	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Dibromomethane	21.8	---	1.00	ug/L	1	20.0	---	109	80-120%	---	---	
1,2-Dichlorobenzene	18.8	---	0.500	ug/L	1	20.0	---	94	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0148 - 01 08 19 0926

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120460 - EPA 5030B												
						Water						
LCS (8120460-BS1)			Prepared: 12/06/18 10:05			Analyzed: 12/06/18 10:32						
1,3-Dichlorobenzene	18.6	---	0.500	ug/L	1	20.0	---	93	80-120%	---	---	
1,4-Dichlorobenzene	18.3	---	0.500	ug/L	1	20.0	---	91	80-120%	---	---	
Dichlorodifluoromethane	23.6	---	1.00	ug/L	1	20.0	---	118	80-120%	---	---	
1,1-Dichloroethane	20.4	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.3	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
1,1-Dichloroethene	20.6	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
cis-1,2-Dichloroethene	20.1	---	0.400	ug/L	1	20.0	---	101	80-120%	---	---	
trans-1,2-Dichloroethene	20.2	---	0.400	ug/L	1	20.0	---	101	80-120%	---	---	
1,2-Dichloropropane	20.8	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
1,3-Dichloropropane	18.9	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
2,2-Dichloropropane	18.9	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
1,1-Dichloropropene	19.9	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
cis-1,3-Dichloropropene	19.9	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
trans-1,3-Dichloropropene	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Hexachlorobutadiene	19.4	---	5.00	ug/L	1	20.0	---	97	80-120%	---	---	
Methylene chloride	21.9	---	3.00	ug/L	1	20.0	---	110	80-120%	---	---	
1,1,1,2-Tetrachloroethane	21.3	---	0.400	ug/L	1	20.0	---	106	80-120%	---	---	
1,1,2,2-Tetrachloroethane	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Tetrachloroethene (PCE)	21.2	---	0.400	ug/L	1	20.0	---	106	80-120%	---	---	
1,2,3-Trichlorobenzene	19.0	---	2.00	ug/L	1	20.0	---	95	80-120%	---	---	
1,2,4-Trichlorobenzene	18.3	---	2.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,1,1-Trichloroethane	20.0	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,1,2-Trichloroethane	20.6	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	
Trichloroethene (TCE)	20.4	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
Trichlorofluoromethane	32.9	---	2.00	ug/L	1	20.0	---	165	80-120%	---	---	Q-56
1,2,3-Trichloropropane	18.0	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
Vinyl chloride	22.3	---	0.400	ug/L	1	20.0	---	111	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr) Recovery: 104 % Limits: 80-120 % Dilution: 1x												
Toluene-d8 (Surr) 97 % 80-120 % "												
4-Bromofluorobenzene (Surr) 95 % 80-120 % "												

Matrix Spike (8120460-MS1) Prepared: 12/06/18 11:21 Analyzed: 12/06/18 16:25

QC Source Sample: MW-19 DUP (A8L0148-02)

EPA 8260C

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120460 - EPA 5030B						Water						
Matrix Spike (8120460-MS1)			Prepared: 12/06/18 11:21 Analyzed: 12/06/18 16:25									
QC Source Sample: MW-19 DUP (A8L0148-02)												
Bromobenzene	18.3	---	0.500	ug/L	1	20.0	ND	92	80-120%	---	---	
Bromochloromethane	22.4	---	1.00	ug/L	1	20.0	ND	112	78-123%	---	---	
Bromodichloromethane	22.1	---	1.00	ug/L	1	20.0	ND	110	79-125%	---	---	
Bromoform	24.1	---	1.00	ug/L	1	20.0	ND	120	66-130%	---	---	Q-54
Bromomethane	30.3	---	5.00	ug/L	1	20.0	ND	152	53-141%	---	---	Q-54f
Carbon tetrachloride	22.2	---	1.00	ug/L	1	20.0	ND	111	72-136%	---	---	
Chlorobenzene	19.7	---	0.500	ug/L	1	20.0	ND	98	80-120%	---	---	
Chloroethane	52.4	---	5.00	ug/L	1	20.0	30.3	111	60-138%	---	---	EST, Q-54e
Chloroform	20.5	---	1.00	ug/L	1	20.0	ND	102	79-124%	---	---	
Chloromethane	27.7	---	5.00	ug/L	1	20.0	ND	139	50-139%	---	---	Q-54b
2-Chlorotoluene	16.8	---	1.00	ug/L	1	20.0	ND	84	79-122%	---	---	
4-Chlorotoluene	16.4	---	1.00	ug/L	1	20.0	ND	82	78-122%	---	---	
Dibromochloromethane	22.1	---	1.00	ug/L	1	20.0	ND	110	74-126%	---	---	
1,2-Dibromo-3-chloropropane	16.9	---	5.00	ug/L	1	20.0	ND	85	62-128%	---	---	
1,2-Dibromoethane (EDB)	18.7	---	0.500	ug/L	1	20.0	ND	93	77-121%	---	---	
Dibromomethane	21.3	---	1.00	ug/L	1	20.0	ND	107	79-123%	---	---	
1,2-Dichlorobenzene	18.5	---	0.500	ug/L	1	20.0	ND	93	80-120%	---	---	
1,3-Dichlorobenzene	18.2	---	0.500	ug/L	1	20.0	ND	91	80-120%	---	---	
1,4-Dichlorobenzene	18.1	---	0.500	ug/L	1	20.0	ND	91	79-120%	---	---	
Dichlorodifluoromethane	21.6	---	1.00	ug/L	1	20.0	ND	108	32-152%	---	---	
1,1-Dichloroethane	104	---	0.400	ug/L	1	20.0	90.1	68	77-125%	---	---	Q-01
1,2-Dichloroethane (EDC)	20.7	---	0.400	ug/L	1	20.0	0.329	102	73-128%	---	---	
1,1-Dichloroethene	57.2	---	0.400	ug/L	1	20.0	39.2	90	71-131%	---	---	
cis-1,2-Dichloroethene	1160	---	0.400	ug/L	1	20.0	1180	-75	78-123%	---	---	E, Q-03
trans-1,2-Dichloroethene	37.6	---	0.400	ug/L	1	20.0	18.4	96	75-124%	---	---	
1,2-Dichloropropane	20.7	---	0.500	ug/L	1	20.0	ND	103	78-122%	---	---	
1,3-Dichloropropane	18.6	---	1.00	ug/L	1	20.0	ND	93	80-120%	---	---	
2,2-Dichloropropane	17.0	---	1.00	ug/L	1	20.0	ND	85	60-139%	---	---	
1,1-Dichloropropene	18.9	---	1.00	ug/L	1	20.0	ND	95	79-125%	---	---	
cis-1,3-Dichloropropene	16.9	---	1.00	ug/L	1	20.0	ND	84	75-124%	---	---	
trans-1,3-Dichloropropene	16.4	---	1.00	ug/L	1	20.0	ND	82	73-127%	---	---	
Hexachlorobutadiene	17.6	---	5.00	ug/L	1	20.0	ND	88	66-134%	---	---	
Methylene chloride	22.8	---	3.00	ug/L	1	20.0	1.76	105	74-124%	---	---	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0148 - 01 08 19 0926

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120460 - EPA 5030B						Water						
Matrix Spike (8120460-MS1)			Prepared: 12/06/18 11:21 Analyzed: 12/06/18 16:25									
QC Source Sample: MW-19 DUP (A8L0148-02)												
1,1,1,2-Tetrachloroethane	21.0	---	0.400	ug/L	1	20.0	ND	105	78-124%	---	---	
1,1,2,2-Tetrachloroethane	19.4	---	0.500	ug/L	1	20.0	ND	97	71-121%	---	---	
Tetrachloroethene (PCE)	1700	---	0.400	ug/L	1	20.0	1740	-197	74-129%	---	---	E, Q-03
1,2,3-Trichlorobenzene	18.3	---	2.00	ug/L	1	20.0	ND	91	69-129%	---	---	
1,2,4-Trichlorobenzene	16.6	---	2.00	ug/L	1	20.0	ND	83	69-130%	---	---	
1,1,1-Trichloroethane	40.8	---	0.400	ug/L	1	20.0	21.3	98	74-131%	---	---	
1,1,2-Trichloroethane	19.9	---	0.500	ug/L	1	20.0	0.670	96	80-120%	---	---	
Trichloroethene (TCE)	1100	---	0.400	ug/L	1	20.0	1100	-9	79-123%	---	---	E, Q-03
Trichlorofluoromethane	35.1	---	2.00	ug/L	1	20.0	ND	175	65-141%	---	---	Q-54g
1,2,3-Trichloropropane	17.3	---	1.00	ug/L	1	20.0	ND	87	73-122%	---	---	
Vinyl chloride	94.1	---	0.400	ug/L	1	20.0	77.1	85	58-137%	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 91 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>96 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>92 %</i>		<i>80-120 %</i>		<i>"</i>						



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0148 - 01 08 19 0926

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120463 - EPA 5030B						Water						
Blank (8120463-BLK1)		Prepared: 12/06/18 10:10		Analyzed: 12/06/18 11:36								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120463 - EPA 5030B						Water						
Blank (8120463-BLK1)		Prepared: 12/06/18 10:10			Analyzed: 12/06/18 11:36							
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 105 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>101 %</i>		<i>80-120 %</i>		<i>"</i>						

LCS (8120463-BS1)		Prepared: 12/06/18 10:10			Analyzed: 12/06/18 10:39							
EPA 8260C												
Bromobenzene	20.7	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	
Bromochloromethane	18.8	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
Bromodichloromethane	21.1	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Bromoform	27.0	---	1.00	ug/L	1	20.0	---	135	80-120%	---	---	Q-56
Bromomethane	13.5	---	5.00	ug/L	1	20.0	---	67	80-120%	---	---	Q-56
Carbon tetrachloride	21.0	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	Q-55
Chlorobenzene	20.8	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
Chloroethane	25.1	---	5.00	ug/L	1	20.0	---	126	80-120%	---	---	Q-56
Chloroform	20.2	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Chloromethane	20.2	---	5.00	ug/L	1	20.0	---	101	80-120%	---	---	
2-Chlorotoluene	20.7	---	1.00	ug/L	1	20.0	---	103	80-120%	---	---	
4-Chlorotoluene	19.7	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
Dibromochloromethane	23.6	---	1.00	ug/L	1	20.0	---	118	80-120%	---	---	
1,2-Dibromo-3-chloropropane	19.8	---	5.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,2-Dibromoethane (EDB)	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Dibromomethane	20.3	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
1,2-Dichlorobenzene	20.5	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120463 - EPA 5030B						Water						
LCS (8120463-BS1)			Prepared: 12/06/18 10:10		Analyzed: 12/06/18 10:39							
1,3-Dichlorobenzene	21.1	---	0.500	ug/L	1	20.0	---	106	80-120%	---	---	
1,4-Dichlorobenzene	20.1	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Dichlorodifluoromethane	20.3	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
1,1-Dichloroethane	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,2-Dichloroethane (EDC)	18.4	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
1,1-Dichloroethene	19.1	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
cis-1,2-Dichloroethene	19.1	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
trans-1,2-Dichloroethene	20.0	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,2-Dichloropropane	19.3	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
1,3-Dichloropropane	20.4	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
2,2-Dichloropropane	18.0	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
1,1-Dichloropropene	20.0	---	1.00	ug/L	1	20.0	---	100	80-120%	---	---	
cis-1,3-Dichloropropene	19.5	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
trans-1,3-Dichloropropene	20.1	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Hexachlorobutadiene	21.3	---	5.00	ug/L	1	20.0	---	106	80-120%	---	---	
Methylene chloride	20.0	---	3.00	ug/L	1	20.0	---	100	80-120%	---	---	
1,1,1,2-Tetrachloroethane	21.7	---	0.400	ug/L	1	20.0	---	109	80-120%	---	---	
1,1,2,2-Tetrachloroethane	20.8	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
Tetrachloroethene (PCE)	21.5	---	0.400	ug/L	1	20.0	---	108	80-120%	---	---	
1,2,3-Trichlorobenzene	19.7	---	2.00	ug/L	1	20.0	---	98	80-120%	---	---	
1,2,4-Trichlorobenzene	19.5	---	2.00	ug/L	1	20.0	---	98	80-120%	---	---	
1,1,1-Trichloroethane	19.0	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
1,1,2-Trichloroethane	21.0	---	0.500	ug/L	1	20.0	---	105	80-120%	---	---	
Trichloroethene (TCE)	20.6	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
Trichlorofluoromethane	25.2	---	2.00	ug/L	1	20.0	---	126	80-120%	---	---	Q-56
1,2,3-Trichloropropane	19.8	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
Vinyl chloride	23.6	---	0.400	ug/L	1	20.0	---	118	80-120%	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 102 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>101 %</i>		<i>80-120 %</i>		<i>"</i>						



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120508 - EPA 5030B						Water						
Blank (8120508-BLK1)		Prepared: 12/07/18 10:00		Analyzed: 12/07/18 13:35								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120508 - EPA 5030B						Water						
Blank (8120508-BLK1)		Prepared: 12/07/18 10:00			Analyzed: 12/07/18 13:35							
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 103 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>"</i>						

LCS (8120508-BS1)		Prepared: 12/07/18 10:00			Analyzed: 12/07/18 12:38							
EPA 8260C												
Bromobenzene	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Bromochloromethane	17.4	---	1.00	ug/L	1	20.0	---	87	80-120%	---	---	
Bromodichloromethane	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Bromoform	26.5	---	1.00	ug/L	1	20.0	---	132	80-120%	---	---	Q-56
Bromomethane	16.5	---	5.00	ug/L	1	20.0	---	83	80-120%	---	---	
Carbon tetrachloride	19.2	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
Chlorobenzene	20.7	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
Chloroethane	21.6	---	5.00	ug/L	1	20.0	---	108	80-120%	---	---	
Chloroform	18.9	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
Chloromethane	14.0	---	5.00	ug/L	1	20.0	---	70	80-120%	---	---	Q-55
2-Chlorotoluene	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
4-Chlorotoluene	18.3	---	1.00	ug/L	1	20.0	---	91	80-120%	---	---	
Dibromochloromethane	23.4	---	1.00	ug/L	1	20.0	---	117	80-120%	---	---	
1,2-Dibromo-3-chloropropane	17.8	---	5.00	ug/L	1	20.0	---	89	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Dibromomethane	19.5	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
1,2-Dichlorobenzene	19.7	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0148 - 01 08 19 0926

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120508 - EPA 5030B												
Water												
LCS (8120508-BS1)												
			Prepared: 12/07/18 10:00			Analyzed: 12/07/18 12:38						
1,3-Dichlorobenzene	20.1	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
1,4-Dichlorobenzene	19.7	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
Dichlorodifluoromethane	18.0	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
1,1-Dichloroethane	18.5	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
1,2-Dichloroethane (EDC)	17.2	---	0.400	ug/L	1	20.0	---	86	80-120%	---	---	
1,1-Dichloroethene	17.2	---	0.400	ug/L	1	20.0	---	86	80-120%	---	---	
cis-1,2-Dichloroethene	17.7	---	0.400	ug/L	1	20.0	---	88	80-120%	---	---	
trans-1,2-Dichloroethene	18.2	---	0.400	ug/L	1	20.0	---	91	80-120%	---	---	
1,2-Dichloropropane	17.9	---	0.500	ug/L	1	20.0	---	89	80-120%	---	---	
1,3-Dichloropropane	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
2,2-Dichloropropane	17.4	---	1.00	ug/L	1	20.0	---	87	80-120%	---	---	
1,1-Dichloropropene	18.3	---	1.00	ug/L	1	20.0	---	91	80-120%	---	---	
cis-1,3-Dichloropropene	18.8	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
trans-1,3-Dichloropropene	19.5	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
Hexachlorobutadiene	20.1	---	5.00	ug/L	1	20.0	---	100	80-120%	---	---	
Methylene chloride	18.5	---	3.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,1,1,2-Tetrachloroethane	21.8	---	0.400	ug/L	1	20.0	---	109	80-120%	---	---	
1,1,2,2-Tetrachloroethane	19.5	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Tetrachloroethene (PCE)	21.6	---	0.400	ug/L	1	20.0	---	108	80-120%	---	---	
1,2,3-Trichlorobenzene	18.4	---	2.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,2,4-Trichlorobenzene	18.3	---	2.00	ug/L	1	20.0	---	91	80-120%	---	---	
1,1,1-Trichloroethane	17.5	---	0.400	ug/L	1	20.0	---	87	80-120%	---	---	
1,1,2-Trichloroethane	20.1	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Trichloroethene (TCE)	19.4	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
Trichlorofluoromethane	23.0	---	2.00	ug/L	1	20.0	---	115	80-120%	---	---	
1,2,3-Trichloropropane	18.7	---	1.00	ug/L	1	20.0	---	93	80-120%	---	---	
Vinyl chloride	20.6	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)												
		Recovery: 100 %		Limits: 80-120 %		Dilution: 1x						
Toluene-d8 (Surr)		104 %		80-120 %		"						
4-Bromofluorobenzene (Surr)		99 %		80-120 %		"						

Duplicate (8120508-DUP1) Prepared: 12/07/18 14:38 Analyzed: 12/07/18 23:59

QC Source Sample: MW-26 (A8L0148-07)

EPA 8260C

Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120508 - EPA 5030B						Water						
Duplicate (8120508-DUP1)		Prepared: 12/07/18 14:38		Analyzed: 12/07/18 23:59								
QC Source Sample: MW-26 (A8L0148-07)												
Bromobenzene	ND	---	1.00	ug/L	2	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	2.00	ug/L	2	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	2.00	ug/L	2	---	ND	---	---	---	30%	
Bromoform	ND	---	2.00	ug/L	2	---	ND	---	---	---	30%	
Bromomethane	ND	---	10.0	ug/L	2	---	ND	---	---	---	30%	
Carbon tetrachloride	ND	---	2.00	ug/L	2	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	1.00	ug/L	2	---	ND	---	---	---	30%	
Chloroethane	ND	---	10.0	ug/L	2	---	ND	---	---	---	30%	
Chloroform	ND	---	2.00	ug/L	2	---	ND	---	---	---	30%	
Chloromethane	ND	---	10.0	ug/L	2	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	2.00	ug/L	2	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	2.00	ug/L	2	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	2.00	ug/L	2	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	10.0	ug/L	2	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	1.00	ug/L	2	---	ND	---	---	---	30%	
Dibromomethane	ND	---	2.00	ug/L	2	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	1.00	ug/L	2	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	1.00	ug/L	2	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	1.00	ug/L	2	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	2.00	ug/L	2	---	ND	---	---	---	30%	
1,1-Dichloroethane	3.17	---	0.800	ug/L	2	---	3.02	---	---	5	30%	
1,2-Dichloroethane (EDC)	ND	---	0.800	ug/L	2	---	ND	---	---	---	30%	
1,1-Dichloroethene	1.06	---	0.800	ug/L	2	---	1.09	---	---	3	30%	
cis-1,2-Dichloroethene	144	---	0.800	ug/L	2	---	147	---	---	2	30%	
trans-1,2-Dichloroethene	1.85	---	0.800	ug/L	2	---	1.89	---	---	2	30%	
1,2-Dichloropropane	ND	---	1.00	ug/L	2	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	2.00	ug/L	2	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	2.00	ug/L	2	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	2.00	ug/L	2	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	2.00	ug/L	2	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	2.00	ug/L	2	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	10.0	ug/L	2	---	ND	---	---	---	30%	
Methylene chloride	ND	---	6.00	ug/L	2	---	ND	---	---	---	30%	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0148 - 01 08 19 0926

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120508 - EPA 5030B												
Water												
Duplicate (8120508-DUP1)			Prepared: 12/07/18 14:38			Analyzed: 12/07/18 23:59						
QC Source Sample: MW-26 (A8L0148-07)												
1,1,1,2-Tetrachloroethane	ND	---	0.800	ug/L	2	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	1.00	ug/L	2	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	132	---	0.800	ug/L	2	---	139	---	---	5	30%	
1,2,3-Trichlorobenzene	ND	---	4.00	ug/L	2	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	4.00	ug/L	2	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	ND	---	0.800	ug/L	2	---	0.846	---	---	***	30%	
1,1,2-Trichloroethane	ND	---	1.00	ug/L	2	---	ND	---	---	---	30%	
Trichloroethene (TCE)	205	---	0.800	ug/L	2	---	210	---	---	2	30%	
Trichlorofluoromethane	ND	---	4.00	ug/L	2	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	2.00	ug/L	2	---	ND	---	---	---	30%	
Vinyl chloride	0.930	---	0.800	ug/L	2	---	0.848	---	---	9	30%	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>			<i>Recovery: 105 %</i>			<i>Limits: 80-120 %</i>			<i>Dilution: 1x</i>			
<i>Toluene-d8 (Surr)</i>			<i>103 %</i>			<i>80-120 %</i>			<i>"</i>			
<i>4-Bromofluorobenzene (Surr)</i>			<i>102 %</i>			<i>80-120 %</i>			<i>"</i>			

Matrix Spike (8120508-MS1)												T-02
Prepared: 12/07/18 14:38			Analyzed: 12/08/18 00:28									
QC Source Sample: MW-26 (A8L0148-07)												
EPA 8260C												
Bromobenzene	40.1	---	1.00	ug/L	2	40.0	ND	100	80-120%	---	---	
Bromochloromethane	33.4	---	2.00	ug/L	2	40.0	ND	83	78-123%	---	---	
Bromodichloromethane	38.6	---	2.00	ug/L	2	40.0	ND	96	79-125%	---	---	
Bromoform	54.0	---	2.00	ug/L	2	40.0	ND	135	66-130%	---	---	Q-54a
Bromomethane	12.4	---	10.0	ug/L	2	40.0	ND	31	53-141%	---	---	Q-01
Carbon tetrachloride	41.1	---	2.00	ug/L	2	40.0	ND	103	72-136%	---	---	
Chlorobenzene	41.8	---	1.00	ug/L	2	40.0	ND	104	80-120%	---	---	
Chloroethane	46.4	---	10.0	ug/L	2	40.0	ND	116	60-138%	---	---	
Chloroform	38.8	---	2.00	ug/L	2	40.0	ND	97	79-124%	---	---	
Chloromethane	28.0	---	10.0	ug/L	2	40.0	ND	70	50-139%	---	---	Q-54i
2-Chlorotoluene	40.7	---	2.00	ug/L	2	40.0	ND	102	79-122%	---	---	
4-Chlorotoluene	37.0	---	2.00	ug/L	2	40.0	ND	93	78-122%	---	---	
Dibromochloromethane	46.5	---	2.00	ug/L	2	40.0	ND	116	74-126%	---	---	
1,2-Dibromo-3-chloropropane	38.3	---	10.0	ug/L	2	40.0	ND	96	62-128%	---	---	
1,2-Dibromoethane (EDB)	39.5	---	1.00	ug/L	2	40.0	ND	99	77-121%	---	---	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120508 - EPA 5030B						Water						
Matrix Spike (8120508-MS1)		Prepared: 12/07/18 14:38				Analyzed: 12/08/18 00:28				T-02		
QC Source Sample: MW-26 (A8L0148-07)												
Dibromomethane	38.4	---	2.00	ug/L	2	40.0	ND	96	79-123%	---	---	
1,2-Dichlorobenzene	40.4	---	1.00	ug/L	2	40.0	ND	101	80-120%	---	---	
1,3-Dichlorobenzene	41.1	---	1.00	ug/L	2	40.0	ND	103	80-120%	---	---	
1,4-Dichlorobenzene	39.3	---	1.00	ug/L	2	40.0	ND	98	79-120%	---	---	
Dichlorodifluoromethane	39.8	---	2.00	ug/L	2	40.0	ND	100	32-152%	---	---	
1,1-Dichloroethane	40.8	---	0.800	ug/L	2	40.0	3.02	95	77-125%	---	---	
1,2-Dichloroethane (EDC)	34.1	---	0.800	ug/L	2	40.0	ND	85	73-128%	---	---	
1,1-Dichloroethene	38.1	---	0.800	ug/L	2	40.0	1.09	92	71-131%	---	---	
cis-1,2-Dichloroethene	182	---	0.800	ug/L	2	40.0	147	88	78-123%	---	---	
trans-1,2-Dichloroethene	39.6	---	0.800	ug/L	2	40.0	1.89	94	75-124%	---	---	
1,2-Dichloropropane	35.5	---	1.00	ug/L	2	40.0	ND	89	78-122%	---	---	
1,3-Dichloropropane	39.1	---	2.00	ug/L	2	40.0	ND	98	80-120%	---	---	
2,2-Dichloropropane	31.6	---	2.00	ug/L	2	40.0	ND	79	60-139%	---	---	
1,1-Dichloropropene	38.7	---	2.00	ug/L	2	40.0	ND	97	79-125%	---	---	
cis-1,3-Dichloropropene	33.7	---	2.00	ug/L	2	40.0	ND	84	75-124%	---	---	
trans-1,3-Dichloropropene	37.9	---	2.00	ug/L	2	40.0	ND	95	73-127%	---	---	
Hexachlorobutadiene	43.3	---	10.0	ug/L	2	40.0	ND	108	66-134%	---	---	
Methylene chloride	37.5	---	6.00	ug/L	2	40.0	ND	94	74-124%	---	---	
1,1,1,2-Tetrachloroethane	44.0	---	0.800	ug/L	2	40.0	ND	110	78-124%	---	---	
1,1,2,2-Tetrachloroethane	40.3	---	1.00	ug/L	2	40.0	ND	101	71-121%	---	---	
Tetrachloroethene (PCE)	186	---	0.800	ug/L	2	40.0	139	117	74-129%	---	---	
1,2,3-Trichlorobenzene	38.3	---	4.00	ug/L	2	40.0	ND	96	69-129%	---	---	
1,2,4-Trichlorobenzene	37.3	---	4.00	ug/L	2	40.0	ND	93	69-130%	---	---	
1,1,1-Trichloroethane	37.8	---	0.800	ug/L	2	40.0	0.846	93	74-131%	---	---	
1,1,2-Trichloroethane	41.6	---	1.00	ug/L	2	40.0	ND	104	80-120%	---	---	
Trichloroethene (TCE)	251	---	0.800	ug/L	2	40.0	210	102	79-123%	---	---	
Trichlorofluoromethane	50.0	---	4.00	ug/L	2	40.0	ND	125	65-141%	---	---	
1,2,3-Trichloropropane	39.3	---	2.00	ug/L	2	40.0	ND	98	73-122%	---	---	
Vinyl chloride	40.8	---	0.800	ug/L	2	40.0	0.848	100	58-137%	---	---	
Surr: 1,4-Difluorobenzene (Surr)		Recovery: 101 %		Limits: 80-120 %		Dilution: 1x						
Toluene-d8 (Surr)		102 %		80-120 %		"						
4-Bromofluorobenzene (Surr)		99 %		80-120 %		"						

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0148 - 01 08 19 0926

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120556 - EPA 5030B						Water						
Blank (8120556-BLK1)		Prepared: 12/08/18 11:00		Analyzed: 12/08/18 14:05								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120556 - EPA 5030B						Water						
Blank (8120556-BLK1)			Prepared: 12/08/18 11:00		Analyzed: 12/08/18 14:05							
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 102 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>"</i>						

LCS (8120556-BS1)			Prepared: 12/08/18 11:00		Analyzed: 12/08/18 13:08							
EPA 8260C												
Bromobenzene	20.2	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Bromochloromethane	17.0	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
Bromodichloromethane	19.5	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
Bromoform	28.2	---	1.00	ug/L	1	20.0	---	141	80-120%	---	---	Q-56
Bromomethane	10.5	---	5.00	ug/L	1	20.0	---	53	80-120%	---	---	Q-55
Carbon tetrachloride	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Chlorobenzene	20.4	---	0.500	ug/L	1	20.0	---	102	80-120%	---	---	
Chloroethane	22.1	---	5.00	ug/L	1	20.0	---	110	80-120%	---	---	
Chloroform	19.1	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
Chloromethane	14.5	---	5.00	ug/L	1	20.0	---	72	80-120%	---	---	Q-55
2-Chlorotoluene	19.3	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
4-Chlorotoluene	18.0	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
Dibromochloromethane	23.5	---	1.00	ug/L	1	20.0	---	118	80-120%	---	---	
1,2-Dibromo-3-chloropropane	18.3	---	5.00	ug/L	1	20.0	---	91	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.7	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Dibromomethane	19.8	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
1,2-Dichlorobenzene	20.1	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0148 - 01 08 19 0926

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120556 - EPA 5030B												
						Water						
LCS (8120556-BS1)			Prepared: 12/08/18 11:00			Analyzed: 12/08/18 13:08						
1,3-Dichlorobenzene	20.5	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	
1,4-Dichlorobenzene	19.9	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Dichlorodifluoromethane	18.3	---	1.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,1-Dichloroethane	18.2	---	0.400	ug/L	1	20.0	---	91	80-120%	---	---	
1,2-Dichloroethane (EDC)	16.8	---	0.400	ug/L	1	20.0	---	84	80-120%	---	---	
1,1-Dichloroethene	17.3	---	0.400	ug/L	1	20.0	---	86	80-120%	---	---	
cis-1,2-Dichloroethene	17.0	---	0.400	ug/L	1	20.0	---	85	80-120%	---	---	
trans-1,2-Dichloroethene	18.0	---	0.400	ug/L	1	20.0	---	90	80-120%	---	---	
1,2-Dichloropropane	17.3	---	0.500	ug/L	1	20.0	---	87	80-120%	---	---	
1,3-Dichloropropane	18.9	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
2,2-Dichloropropane	17.7	---	1.00	ug/L	1	20.0	---	88	80-120%	---	---	
1,1-Dichloropropene	18.1	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
cis-1,3-Dichloropropene	18.1	---	1.00	ug/L	1	20.0	---	91	80-120%	---	---	
trans-1,3-Dichloropropene	19.2	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
Hexachlorobutadiene	20.9	---	5.00	ug/L	1	20.0	---	104	80-120%	---	---	
Methylene chloride	18.9	---	3.00	ug/L	1	20.0	---	95	80-120%	---	---	
1,1,1,2-Tetrachloroethane	22.0	---	0.400	ug/L	1	20.0	---	110	80-120%	---	---	
1,1,2,2-Tetrachloroethane	19.8	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Tetrachloroethene (PCE)	22.3	---	0.400	ug/L	1	20.0	---	111	80-120%	---	---	
1,2,3-Trichlorobenzene	18.9	---	2.00	ug/L	1	20.0	---	95	80-120%	---	---	
1,2,4-Trichlorobenzene	18.2	---	2.00	ug/L	1	20.0	---	91	80-120%	---	---	
1,1,1-Trichloroethane	17.9	---	0.400	ug/L	1	20.0	---	90	80-120%	---	---	
1,1,2-Trichloroethane	20.5	---	0.500	ug/L	1	20.0	---	102	80-120%	---	---	
Trichloroethene (TCE)	19.4	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
Trichlorofluoromethane	23.9	---	2.00	ug/L	1	20.0	---	120	80-120%	---	---	
1,2,3-Trichloropropane	19.3	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
Vinyl chloride	20.6	---	0.400	ug/L	1	20.0	---	103	80-120%	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 99 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>"</i>						



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120475 - Method Prep: Aq						Water						
Blank (8120475-BLK1)		Prepared: 12/07/18 08:33 Analyzed: 12/07/18 10:23										
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (8120475-BS1)		Prepared: 12/07/18 08:33 Analyzed: 12/07/18 10:25										
SM 4500-NH3 G												
Ammonia as N	2.17	---	0.0200	mg/L	1	2.00	---	109	90-110%	---	---	



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120476 - Method Prep: Aq						Water						
Blank (8120476-BLK2)		Prepared: 12/07/18 08:36 Analyzed: 12/07/18 12:37										
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	Q-16
LCS (8120476-BS1)		Prepared: 12/07/18 08:36 Analyzed: 12/07/18 11:13										
SM 4500-NH3 G												
Ammonia as N	2.15	---	0.0200	mg/L	1	2.00	---	107	90-110%	---	---	

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120478 - Method Prep: Aq						Water						
Blank (8120478-BLK1)		Prepared: 12/06/18 12:17 Analyzed: 12/06/18 13:59										
<u>EPA 300.0</u>												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
LCS (8120478-BS1)		Prepared: 12/06/18 12:17 Analyzed: 12/06/18 14:20										
<u>EPA 300.0</u>												
Nitrate-Nitrogen	2.09	---	0.250	mg/L	1	2.00	---	105	90-110%	---	---	---
Nitrite-Nitrogen	2.00	---	0.250	mg/L	1	2.00	---	100	90-110%	---	---	---
Duplicate (8120478-DUP1)		Prepared: 12/06/18 12:17 Analyzed: 12/06/18 15:03										
<u>QC Source Sample: MW-19 (A8L0148-01)</u>												
<u>EPA 300.0</u>												
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	15%	---
Duplicate (8120478-DUP3)		Prepared: 12/06/18 12:17 Analyzed: 12/07/18 13:31										
<u>QC Source Sample: MW-19 (A8L0148-01RE2)</u>												
<u>EPA 300.0</u>												
Nitrate-Nitrogen	118	---	5.00	mg/L	20	---	118	---	---	0.04	10%	H-01, Q-16
Matrix Spike (8120478-MS1)		Prepared: 12/06/18 12:17 Analyzed: 12/06/18 15:25										
<u>QC Source Sample: MW-19 (A8L0148-01)</u>												
<u>EPA 300.0</u>												
Nitrite-Nitrogen	2.56	---	0.312	mg/L	1	2.50	ND	102	80-120%	---	---	---
Matrix Spike (8120478-MS3)		Prepared: 12/06/18 12:17 Analyzed: 12/07/18 13:53										
<u>QC Source Sample: MW-19 (A8L0148-01RE2)</u>												
<u>EPA 300.0</u>												
Nitrate-Nitrogen	159	---	5.00	mg/L	20	40.0	118	103	80-120%	---	---	H-01, Q-01, Q-

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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QUALITY CONTROL (QC) SAMPLE RESULTS

Demand Parameters

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120487 - Method Prep: Aq						Water						
Blank (8120487-BLK1)		Prepared: 12/06/18 14:21 Analyzed: 12/06/18 17:49										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	---
LCS (8120487-BS1)		Prepared: 12/06/18 14:21 Analyzed: 12/06/18 18:19										
SM 5310 C												
Total Organic Carbon	10.3	---	1.00	mg/L	1	10.0	---	103	85-115%	---	---	---
LCS (8120487-BS2)		Prepared: 12/06/18 14:21 Analyzed: 12/06/18 18:48										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	0.00	---		85-115%	---	---	TOC_I



AMENDED REPORT

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0148 - 01 08 19 0926

SAMPLE PREPARATION INFORMATION

Halogenated Volatile Organic Compounds by EPA 8260C

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8120460</u>							
A8L0148-01	Water	EPA 8260C	12/05/18 08:35	12/06/18 11:21	5mL/5mL	5mL/5mL	1.00
A8L0148-02	Water	EPA 8260C	12/05/18 08:35	12/06/18 11:21	5mL/5mL	5mL/5mL	1.00
A8L0148-09	Water	EPA 8260C	12/05/18 00:00	12/06/18 11:21	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8120463</u>							
A8L0148-06	Water	EPA 8260C	12/05/18 12:30	12/06/18 11:30	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8120508</u>							
A8L0148-01RE1	Water	EPA 8260C	12/05/18 08:35	12/07/18 14:38	5mL/5mL	5mL/5mL	1.00
A8L0148-02RE1	Water	EPA 8260C	12/05/18 08:35	12/07/18 14:38	5mL/5mL	5mL/5mL	1.00
A8L0148-03RE1	Water	EPA 8260C	12/05/18 09:40	12/07/18 14:38	5mL/5mL	5mL/5mL	1.00
A8L0148-04RE1	Water	EPA 8260C	12/05/18 10:40	12/07/18 14:38	5mL/5mL	5mL/5mL	1.00
A8L0148-05RE1	Water	EPA 8260C	12/05/18 11:20	12/07/18 14:38	5mL/5mL	5mL/5mL	1.00
A8L0148-07	Water	EPA 8260C	12/05/18 13:40	12/07/18 14:38	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8120556</u>							
A8L0148-08	Water	EPA 8260C	12/05/18 14:30	12/08/18 12:35	5mL/5mL	5mL/5mL	1.00

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8120475</u>							
A8L0148-01RE3	Water	SM 4500-NH3 G	12/05/18 08:35	12/07/18 08:33	10mL/10mL	10mL/10mL	1.00
<u>Batch: 8120476</u>							
A8L0148-02RE2	Water	SM 4500-NH3 G	12/05/18 08:35	12/07/18 08:36	10mL/10mL	10mL/10mL	1.00
A8L0148-03RE1	Water	SM 4500-NH3 G	12/05/18 09:40	12/07/18 08:36	10mL/10mL	10mL/10mL	1.00
A8L0148-04RE1	Water	SM 4500-NH3 G	12/05/18 10:40	12/07/18 08:36	10mL/10mL	10mL/10mL	1.00
A8L0148-05RE1	Water	SM 4500-NH3 G	12/05/18 11:20	12/07/18 08:36	10mL/10mL	10mL/10mL	1.00
A8L0148-06RE1	Water	SM 4500-NH3 G	12/05/18 12:30	12/07/18 08:36	10mL/10mL	10mL/10mL	1.00
A8L0148-07RE1	Water	SM 4500-NH3 G	12/05/18 13:40	12/07/18 08:36	10mL/10mL	10mL/10mL	1.00
A8L0148-08RE1	Water	SM 4500-NH3 G	12/05/18 14:30	12/07/18 08:36	10mL/10mL	10mL/10mL	1.00

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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SAMPLE PREPARATION INFORMATION

Anions by Ion Chromatography

<u>Prep: Method Prep: Aq</u>					Sample	Default	RL Prep
Lab Number	Matrix	Method	Sampled	Prepared	Initial/Final	Initial/Final	Factor
<u>Batch: 8120478</u>							
A8L0148-01	Water	EPA 300.0	12/05/18 08:35	12/06/18 12:17	5mL/5mL	5mL/5mL	1.00
A8L0148-01RE2	Water	EPA 300.0	12/05/18 08:35	12/06/18 12:17	5mL/5mL	5mL/5mL	1.00
A8L0148-02	Water	EPA 300.0	12/05/18 08:35	12/06/18 12:17	5mL/5mL	5mL/5mL	1.00
A8L0148-02RE2	Water	EPA 300.0	12/05/18 08:35	12/06/18 12:17	5mL/5mL	5mL/5mL	1.00
A8L0148-03	Water	EPA 300.0	12/05/18 09:40	12/06/18 12:17	5mL/5mL	5mL/5mL	1.00
A8L0148-04	Water	EPA 300.0	12/05/18 10:40	12/06/18 12:17	5mL/5mL	5mL/5mL	1.00
A8L0148-05	Water	EPA 300.0	12/05/18 11:20	12/06/18 12:17	5mL/5mL	5mL/5mL	1.00
A8L0148-06	Water	EPA 300.0	12/05/18 12:30	12/06/18 12:17	5mL/5mL	5mL/5mL	1.00
A8L0148-06RE1	Water	EPA 300.0	12/05/18 12:30	12/06/18 12:17	5mL/5mL	5mL/5mL	1.00
A8L0148-07	Water	EPA 300.0	12/05/18 13:40	12/06/18 12:17	5mL/5mL	5mL/5mL	1.00
A8L0148-07RE2	Water	EPA 300.0	12/05/18 13:40	12/06/18 12:17	5mL/5mL	5mL/5mL	1.00
A8L0148-08	Water	EPA 300.0	12/05/18 14:30	12/06/18 12:17	5mL/5mL	5mL/5mL	1.00

Demand Parameters

<u>Prep: Method Prep: Aq</u>					Sample	Default	RL Prep
Lab Number	Matrix	Method	Sampled	Prepared	Initial/Final	Initial/Final	Factor
<u>Batch: 8120487</u>							
A8L0148-01	Water	SM 5310 C	12/05/18 08:35	12/06/18 14:21	40mL/40mL	40mL/40mL	1.00
A8L0148-03	Water	SM 5310 C	12/05/18 09:40	12/06/18 14:21	40mL/40mL	40mL/40mL	1.00
A8L0148-06	Water	SM 5310 C	12/05/18 12:30	12/06/18 14:21	40mL/40mL	40mL/40mL	1.00
A8L0148-07	Water	SM 5310 C	12/05/18 13:40	12/06/18 14:21	40mL/40mL	40mL/40mL	1.00

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AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

Apex Laboratories

- A-01** Reported value was analyzed outside of method holding time. Original analysis was analyzed within method holding time but was outside instrument calibration range and required dilution.
- E** Estimated Value. The result is above the calibration range of the instrument.
- EST** Result reported as an Estimated Value. Compound failed initial calibration criteria.
- H-01** This sample was analyzed outside the recommended holding time.
- M-02** Due to matrix interference, this analyte cannot be accurately quantified. The reported result is estimated.
- Q-01** Spike recovery and/or RPD is outside acceptance limits.
- Q-03** Spike recovery and/or RPD is outside control limits due to the high concentration of analyte present in the sample.
- Q-16** Reanalysis of an original Batch QC sample.
- Q-42** Matrix Spike and/or Duplicate analysis was performed on this sample. % Recovery or RPD for this analyte is outside laboratory control limits. (Refer to the QC Section of Analytical Report.)
- Q-54** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +1%. The results are reported as Estimated Values.
- Q-54a** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +12%. The results are reported as Estimated Values.
- Q-54b** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +13%. The results are reported as Estimated Values.
- Q-54e** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +22%. The results are reported as Estimated Values.
- Q-54f** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +30%. The results are reported as Estimated Values.
- Q-54g** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +45%. The results are reported as Estimated Values.
- Q-54i** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -10%. The results are reported as Estimated Values.
- Q-55** Daily CCV/LCS recovery for this analyte was below the +/-20% criteria listed in EPA 8260C, however there is adequate sensitivity to ensure detection at the reporting level.
- Q-56** Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C
- T-02** This Batch QC sample was analyzed outside of the method specified 12 hour tune window. Results are estimated.
- TOC_I** Inorganic Carbon Spike Check. Results are valid if Non Detect (No Inorganic Carbon detected.)
- V-01** Sample aliquot taken from VOA vial with headspace (air bubble greater than 6 mm diameter).

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AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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REPORTING NOTES AND CONVENTIONS:

Abbreviations:

- DET Analyte DETECTED at or above the detection or reporting limit.
- ND Analyte NOT DETECTED at or above the detection or reporting limit.
- NR Result Not Reported
- RPD Relative Percent Difference

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

- Basis: Results for soil samples are generally reported on a 100% dry weight basis. The Result Basis is listed following the units as "dry", "wet", or "" (blank) designation.
 - "dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.
 - "wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.
 - "" Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) are not included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

- " --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.
- " *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to 1/2 the Reporting Limit (RL).
-For Blank hits falling between 1/2 the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a 'B' qualifier, per Apex Laboratories' Blank Policy.
For further details, please request a copy of this document.



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the blank results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.

Apex Laboratories maintains detailed records on sample receipt, including client label verification, cooler temperature, sample preservation, hold time compliance and field filtration. Data is qualified as necessary, and the lack of qualification indicates compliance with required parameters.



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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LABORATORY ACCREDITATION INFORMATION

TNI Certification ID: OR100062 (Primary Accreditation) - EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation
<u>All reported analytes are included in Apex Laboratories' current ORELAP scope.</u>					

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation. Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provided by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.

Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager

AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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APEX LABS

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

Company: Cascadia

Address: 6915 SW Macadam Ave

Sampled by: Lindsay Walker

Site Location: OR (WA)

Other: _____

SAMPLE ID

CHAIN OF CUSTODY

Lab # A8L0148 COC # _____ of _____

PO# _____ Project # _____

Project Name: Nustar Van 4Q18 Email: Stephanie.Salisbury@cascadia.com

Project Mgr: Stephanie Salisbury Phone: _____ Fax: _____

LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	ANALYSIS REQUEST													
					AL, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Hg, Mg, Mn, Mo, Ni, K, Se, Ag, Na, TL, V, Zn	TOTAL DISS TCLP	1200-COLS	1200-Z										
1	12/15/08	1430	W	7					X	Nitrate/-ite	X	Ammonia	X	Methane/ethane	X	ToC	X	
2	12/15/08	1430	W	5														X
3	12/15/08	1430	W	7														X
4	12/15/08	1430	W	5														X
5	12/15/08	1430	W	5														X
6	12/15/08	1430	W	7														X
7	12/15/08	1430	W	7														X
8	12/15/08	1430	W	5														X
9	12/15/08	1430	W	5														X
10	12/15/08	1430	W	1														X

Normal Turn Around Time (TAT) = 10 Business Days

TAT Requested (circle): 1 Day 2 Day 3 Day 4 DAY 5 DAY Other: _____

SPECIAL INSTRUCTIONS: Trip Blank only Run for HVOCS

RECEIVED BY: [Signature] Date: 12/15/08

RELINQUISHED BY: [Signature] Date: 12/15/08

Signature: Lindsay Walker Date: 12/15/08

Printed Name: Lindsay Walker Time: 1635

Company: Cascadia

Apex Laboratories

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Lisa Domenighini, Client Services Manager



AMENDED REPORT

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0148 - 01 08 19 0926
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APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A8 L0148

Project/Project #: Nustar Van 4Q18

Delivery Info:
Date/time received: 12/5/18 @ 1635 By: CFH
Delivered by: Apex Client ESS FedEx UPS Swift Senvoy SDS Other

Cooler Inspection Date/time inspected: 12/5/18 @ 1835 By: CFH
Chain of Custody included? Yes No Custody seals? Yes No
Signed/dated by client? Yes No
Signed/dated by Apex? Yes No

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (°C)	<u>1.5</u>						
Received on ice? (Y/N)	<u>Y</u>						
Temp. blanks? (Y/N)	<u>Y</u>						
Ice type: (Gel/Real/Other)	<u>Real</u>						
Condition:	<u>Good</u>						

Cooler out of temp? (Y/N) Possible reason why: _____
If some coolers are in temp and some out, were green dots applied to out of temperature samples? Yes/No/NA NA
Out of temperature samples form initiated? Yes/No/NA _____
Samples Inspection: Date/time inspected: 12/5/18 @ 1935 By: CFH
All samples intact? Yes No Comments: _____
Bottle labels/COCs agree? Yes No Comments: _____
COC/container discrepancies form initiated? Yes No NA
Containers/volumes received appropriate for analysis? Yes No Comments: _____
Do VOA vials have visible headspace? Yes No NA
Comments Y3 MW-19 Dup MW-13 voa have sediment
Water samples: pH checked: Yes No NA pH appropriate? Yes No NA
Comments: _____
Additional information: TB # 1935
Labeled by: CFH Witness: THG Cooler Inspected by: CFH See Project Contact Form: Y

December 31, 2018

Apex Laboratories
ATTN: Lisa Domenighini
12232 S.W. Garden Place
Tigard, OR 97223



LA Cert #04140
EPA Methods TO3, TO14A, TO15, 25C/3C,
RSK-175

TX Cert T104704450-14-6
EPA Methods TO14A, TO15

UT Cert CA0133332015-3
EPA Methods TO3, TO14A, TO15, RSK-175

LABORATORY TEST RESULTS

Project Reference: A8L0148
Lab Number: J120702-01/04

Enclosed are results for sample(s) received 12/07/18 by Air Technology Laboratories. Samples were received intact and chilled to 2° C. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the TNI Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

A handwritten signature in blue ink, appearing to read "M Johnson".

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Note: The cover letter is an integral part of this analytical report.

SUBCONTRACT ORDER

Apex Laboratories
A8L0148

J120702-01/12/16/18
LAD
MAC

SENDING LABORATORY:

Apex Laboratories
12232 S.W. Garden Place
Tigard, OR 97223
Phone: (503) 718-2323
Fax: (503) 718-0333
Project Manager: Lisa Domenighini

RECEIVING LABORATORY:

Air Technology Laboratories, Inc
18501 E. Gale Ave Suite 130
City of Industry, CA 91748
Phone : (626) 964-4032
Fax: (626) 964-5832

Sample Name: MW-19 Water Sampled: 12/05/18 08:35 (A8L0148-01)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/18/18 17:00	12/19/18 08:35	
Containers Supplied:			
(F)40 mL VOA - HCL			
(G)40 mL VOA - HCL			

Sample Name: MW-13 Water Sampled: 12/05/18 09:40 (A8L0148-03)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/18/18 17:00	12/19/18 09:40	Visible sediment in voas
Containers Supplied:			
(F)40 mL VOA - HCL			
(G)40 mL VOA - HCL			

Sample Name: MW-14 Water Sampled: 12/05/18 12:30 (A8L0148-06)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/18/18 17:00	12/19/18 12:30	
Containers Supplied:			
(F)40 mL VOA - HCL			
(G)40 mL VOA - HCL			

Sample Name: MW-26 Water Sampled: 12/05/18 13:40 (A8L0148-07)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/18/18 17:00	12/19/18 13:40	
Containers Supplied:			
(F)40 mL VOA - HCL			
(G)40 mL VOA - HCL			

Standard TAT

2°C

Released By *[Signature]* Date *12/6/18* Received By *[Signature]* Date *12/7/18*

Released By *[Signature]* Date *12/7/18* Received By *[Signature]* Date *12/15*

Client: Apex Laboratories
Attn: Lisa Domenighini
Project Name: NA
Project No.: A8L0148
Date Received: 12/07/18
Matrix: Water
Reporting Units: ug/L

RSK175

Lab No.:	J120702-01	J120702-02	J120702-03	J120702-04				
Client Sample I.D.:	MW-19 (A8L0148-01)	MW-13 (A8L0148-03)	MW-14 (A8L0148-06)	MW-26 (A8L0148-07)				
Date/Time Sampled:	12/5/18 8:35	12/5/18 9:40	12/5/18 12:30	12/5/18 13:40				
Date/Time Analyzed:	12/19/18 15:21	12/19/18 15:44	12/19/18 16:04	12/19/18 16:28				
QC Batch No.:	181219GC8A1	181219GC8A1	181219GC8A1	181219GC8A1				
Analyst Initials:	CM/MJ	CM/MJ	CM/MJ	CM/MJ				
Dilution Factor:	1.0	1.0	1.0	1.0				
ANALYTE	Result ug/L	RL ug/L	Result ug/L	RL ug/L	Result ug/L	RL ug/L	Result ug/L	RL ug/L
Ethene	2.1	1.0	7.1	1.0	ND	1.0	ND	1.0
Ethane	15	1.0	20	1.0	ND	1.0	ND	1.0
Methane	3,600	1.0	6,600	1.0	40	1.0	3,200	1.0

ND= Not Detected (below MDL)

RL = Reporting Limit

Reviewed/Approved By: Mark Johnson
 Mark Johnson
 Operations Manager

Date 12/28/18

The cover letter is an integral part of this analytical report



LCS/LCSD Recovery and RPD Summary Report

QC Batch #: 181219GC8A1

Matrix: Air

Reporting Units: ug/L

RSK175											
LABORATORY CONTROL SAMPLE SUMMARY											

Lab No.:	METHOD BLANK			LCS		LCSD					
Date/Time Analyzed:	12/19/18 13:38			12/19/18 12:46		12/19/18 13:06					
Analyst Initials:	CM/MJ			CM/MJ		CM/MJ					
Dilution Factor:	1.0			1.0		1.0					
ANALYTE	Result ug/L	RL ug/L	SPIKE AMT. ug/L	Result ug/L	% Rec.	Result ug/L	% Rec.	RPD	Low %Rec	High %Rec	Max. RPD
Ethene	ND	1.0	1,150	1,080	93.9	1,110	96.7	2.9	70	130	30
Ethane	ND	1.0	1,230	1,210	98.4	1,250	102	3.2	70	130	30
Methane	ND	1.0	654	626	95.7	646	98.7	3.1	70	130	30

ND= Not Detected (below RL)

RL = Reporting Limit

Reviewed/Approved By: _____
Mark Johnson
Operations Manager

Date 12/28/18

The cover letter is an integral part of this analytical report





Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Wednesday, December 19, 2018

Stephanie Salisbury
Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

RE: A8L0188 - Shore Terminal-Vancouver - Nustar Van. 4Q18

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A8L0188, which was received by the laboratory on 12/6/2018 at 4:30:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of final reporting, unless prior arrangements have been made.

Cooler Receipt Information

(See Cooler Receipt Form for details)

Cooler #1 5.1 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.

All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.



Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0188 - 12 19 18 1325

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-23i	A8L0188-01	Water	12/06/18 08:30	12/06/18 16:30
MW-25i	A8L0188-02	Water	12/06/18 09:30	12/06/18 16:30
MW-21i-40	A8L0188-03	Water	12/06/18 10:20	12/06/18 16:30
MW-21i-105	A8L0188-04	Water	12/06/18 10:50	12/06/18 16:30
MW-19i	A8L0188-05	Water	12/06/18 12:10	12/06/18 16:30
MW-18i	A8L0188-06	Water	12/06/18 12:50	12/06/18 16:30
MW-20i	A8L0188-07	Water	12/06/18 13:50	12/06/18 16:30
MW-16	A8L0188-08	Water	12/06/18 15:00	12/06/18 16:30
Trip Blank	A8L0188-09	Water	12/06/18 00:00	12/06/18 16:30

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0188 - 12 19 18 1325
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-23i (A8L0188-01)				Matrix: Water		Batch: 8120565		
Bromobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	

Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0188 - 12 19 18 1325
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-23i (A8L0188-01)				Matrix: Water		Batch: 8120565		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>

MW-25i (A8L0188-02)				Matrix: Water		Batch: 8120565		
Bromobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0188 - 12 19 18 1325
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-25i (A8L0188-02)				Matrix: Water		Batch: 8120565		
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>

MW-21i-40 (A8L0188-03)				Matrix: Water		Batch: 8120565		
Bromobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0188 - 12 19 18 1325
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21i-40 (A8L0188-03)				Matrix: Water		Batch: 8120565		
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethane	2.44	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethene	0.666	---	0.400	ug/L	1	12/09/18	EPA 8260C	
cis-1,2-Dichloroethene	59.1	---	0.400	ug/L	1	12/09/18	EPA 8260C	
trans-1,2-Dichloroethene	0.483	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Tetrachloroethene (PCE)	32.7	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Trichloroethene (TCE)	19.3	---	0.400	ug/L	1	12/09/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>

MW-21i-105 (A8L0188-04)				Matrix: Water		Batch: 8120565		
Bromobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21i-105 (A8L0188-04)				Matrix: Water		Batch: 8120565		
Chlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
cis-1,2-Dichloroethene	8.64	---	0.400	ug/L	1	12/09/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Tetrachloroethene (PCE)	9.54	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Trichloroethene (TCE)	5.87	---	0.400	ug/L	1	12/09/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0188 - 12 19 18 1325
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-21i-105 (A8L0188-04)				Matrix: Water		Batch: 8120565		
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery:</i>	<i>107 %</i>	<i>Limits:</i>	<i>80-120 %</i>	<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>			<i>102 %</i>		<i>80-120 %</i>	<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>			<i>97 %</i>		<i>80-120 %</i>	<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>

MW-19i (A8L0188-05)				Matrix: Water		Batch: 8120565		
Bromobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-19i (A8L0188-05)				Matrix: Water		Batch: 8120565		
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>

MW-18i (A8L0188-06)				Matrix: Water		Batch: 8120565		
Bromobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0188 - 12 19 18 1325
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-18i (A8L0188-06)				Matrix: Water		Batch: 8120565		
cis-1,2-Dichloroethene	0.959	---	0.400	ug/L	1	12/09/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Tetrachloroethene (PCE)	1.34	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Trichloroethene (TCE)	0.698	---	0.400	ug/L	1	12/09/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>

MW-20i (A8L0188-07)				Matrix: Water		Batch: 8120565		
Bromobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-20i (A8L0188-07)				Matrix: Water		Batch: 8120565		
Dibromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethane	0.433	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
cis-1,2-Dichloroethene	10.7	---	0.400	ug/L	1	12/09/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Tetrachloroethene (PCE)	2.18	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Trichloroethene (TCE)	1.55	---	0.400	ug/L	1	12/09/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>

MW-16 (A8L0188-08)				Matrix: Water		Batch: 8120565		
Bromobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-16 (A8L0188-08)				Matrix: Water		Batch: 8120565		
Bromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
cis-1,2-Dichloroethene	4.54	---	0.400	ug/L	1	12/09/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Tetrachloroethene (PCE)	130	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1-Trichloroethane	0.761	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-16 (A8L0188-08)			Matrix: Water		Batch: 8120565			
Trichloroethene (TCE)	20.8	---	0.400	ug/L	1	12/09/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 110 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
Trip Blank (A8L0188-09)			Matrix: Water		Batch: 8120565			
Bromobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	

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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A8L0188-09)				Matrix: Water		Batch: 8120565		
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 104 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>101 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>



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ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-23i (A8L0188-01RE1)				Matrix: Water		Batch: 8120476		
Ammonia as N	ND	---	0.0200	mg/L	1	12/07/18	SM 4500-NH3 G	
MW-25i (A8L0188-02RE1)				Matrix: Water		Batch: 8120476		
Ammonia as N	ND	---	0.0200	mg/L	1	12/07/18	SM 4500-NH3 G	
MW-21i-40 (A8L0188-03RE1)				Matrix: Water		Batch: 8120476		
Ammonia as N	ND	---	0.0200	mg/L	1	12/07/18	SM 4500-NH3 G	
MW-21i-105 (A8L0188-04RE1)				Matrix: Water		Batch: 8120476		
Ammonia as N	3.05	---	0.0200	mg/L	1	12/07/18	SM 4500-NH3 G	
MW-19i (A8L0188-05RE1)				Matrix: Water		Batch: 8120476		
Ammonia as N	0.240	---	0.0200	mg/L	1	12/07/18	SM 4500-NH3 G	
MW-18i (A8L0188-06RE1)				Matrix: Water		Batch: 8120476		
Ammonia as N	ND	---	0.0200	mg/L	1	12/07/18	SM 4500-NH3 G	
MW-20i (A8L0188-07RE1)				Matrix: Water		Batch: 8120476		
Ammonia as N	ND	---	0.0200	mg/L	1	12/07/18	SM 4500-NH3 G	
MW-16 (A8L0188-08RE1)				Matrix: Water		Batch: 8120476		
Ammonia as N	ND	---	0.0200	mg/L	1	12/07/18	SM 4500-NH3 G	



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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-23i (A8L0188-01) Matrix: Water								
Batch: 8120526								
Nitrate-Nitrogen	0.520	---	0.250	mg/L	1	12/07/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/07/18	EPA 300.0	
MW-25i (A8L0188-02) Matrix: Water								
Batch: 8120526								
Nitrate-Nitrogen	0.541	---	0.250	mg/L	1	12/07/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/07/18	EPA 300.0	
MW-21i-40 (A8L0188-03) Matrix: Water								
Batch: 8120526								
Nitrate-Nitrogen	3.16	---	0.250	mg/L	1	12/07/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/07/18	EPA 300.0	
MW-21i-105 (A8L0188-04) Matrix: Water								
Batch: 8120526								
Nitrate-Nitrogen	5.29	---	0.250	mg/L	1	12/07/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/07/18	EPA 300.0	
MW-19i (A8L0188-05) Matrix: Water								
Batch: 8120526								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/07/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/07/18	EPA 300.0	
MW-18i (A8L0188-06) Matrix: Water								
Batch: 8120526								
Nitrate-Nitrogen	0.715	---	0.250	mg/L	1	12/07/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/07/18	EPA 300.0	
MW-20i (A8L0188-07) Matrix: Water								
Batch: 8120526								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/07/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/07/18	EPA 300.0	
MW-16 (A8L0188-08) Matrix: Water								
Batch: 8120526								

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-16 (A8L0188-08)				Matrix: Water				
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/07/18	EPA 300.0	
MW-16 (A8L0188-08RE1)				Matrix: Water				
Batch: 8120526								
Nitrate-Nitrogen	10.2	---	0.500	mg/L	2	12/07/18	EPA 300.0	



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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120565 - EPA 5030B						Water						
Blank (8120565-BLK1)		Prepared: 12/09/18 09:03		Analyzed: 12/09/18 10:57								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120565 - EPA 5030B						Water						
Blank (8120565-BLK1)	Prepared: 12/09/18 09:03		Analyzed: 12/09/18 10:57									
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 104 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>101 %</i>		<i>80-120 %</i>		<i>"</i>						

LCS (8120565-BS2)		Prepared: 12/09/18 09:03		Analyzed: 12/09/18 10:28								Q-50
EPA 8260C												
Bromobenzene	20.2	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Bromochloromethane	17.7	---	1.00	ug/L	1	20.0	---	88	80-120%	---	---	
Bromodichloromethane	19.5	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Bromoform	28.6	---	1.00	ug/L	1	20.0	---	143	80-120%	---	---	Q-56
Bromomethane	13.4	---	5.00	ug/L	1	20.0	---	67	80-120%	---	---	Q-55
Carbon tetrachloride	20.7	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
Chlorobenzene	20.9	---	0.500	ug/L	1	20.0	---	105	80-120%	---	---	
Chloroethane	23.7	---	5.00	ug/L	1	20.0	---	118	80-120%	---	---	
Chloroform	19.5	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
Chloromethane	15.5	---	5.00	ug/L	1	20.0	---	78	80-120%	---	---	Q-55
2-Chlorotoluene	19.5	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
4-Chlorotoluene	18.1	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
Dibromochloromethane	23.6	---	1.00	ug/L	1	20.0	---	118	80-120%	---	---	
1,2-Dibromo-3-chloropropane	18.1	---	5.00	ug/L	1	20.0	---	90	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.5	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Dibromomethane	19.4	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
1,2-Dichlorobenzene	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120565 - EPA 5030B						Water						
LCS (8120565-BS2)	Prepared: 12/09/18 09:03 Analyzed: 12/09/18 10:28					Q-50						
1,3-Dichlorobenzene	20.8	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
1,4-Dichlorobenzene	20.3	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Dichlorodifluoromethane	21.1	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
1,1-Dichloroethane	18.9	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
1,2-Dichloroethane (EDC)	17.3	---	0.400	ug/L	1	20.0	---	86	80-120%	---	---	
1,1-Dichloroethene	18.7	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
cis-1,2-Dichloroethene	16.8	---	0.400	ug/L	1	20.0	---	84	80-120%	---	---	
trans-1,2-Dichloroethene	18.4	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
1,2-Dichloropropane	17.5	---	0.500	ug/L	1	20.0	---	88	80-120%	---	---	
1,3-Dichloropropane	19.0	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
2,2-Dichloropropane	18.9	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
1,1-Dichloropropene	19.0	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
cis-1,3-Dichloropropene	17.0	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
trans-1,3-Dichloropropene	19.8	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
Hexachlorobutadiene	21.3	---	5.00	ug/L	1	20.0	---	107	80-120%	---	---	
Methylene chloride	19.5	---	3.00	ug/L	1	20.0	---	97	80-120%	---	---	
1,1,1,2-Tetrachloroethane	22.0	---	0.400	ug/L	1	20.0	---	110	80-120%	---	---	
1,1,2,2-Tetrachloroethane	19.7	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Tetrachloroethene (PCE)	23.2	---	0.400	ug/L	1	20.0	---	116	80-120%	---	---	
1,2,3-Trichlorobenzene	19.2	---	2.00	ug/L	1	20.0	---	96	80-120%	---	---	
1,2,4-Trichlorobenzene	18.3	---	2.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,1,1-Trichloroethane	18.5	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
1,1,2-Trichloroethane	20.8	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
Trichloroethene (TCE)	19.5	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
Trichlorofluoromethane	26.1	---	2.00	ug/L	1	20.0	---	130	80-120%	---	---	Q-56
1,2,3-Trichloropropane	19.2	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
Vinyl chloride	22.4	---	0.400	ug/L	1	20.0	---	112	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr) Recovery: 98 % Limits: 80-120 % Dilution: 1x												
Toluene-d8 (Surr) 99 % 80-120 % "												
4-Bromofluorobenzene (Surr) 98 % 80-120 % "												

Duplicate (8120565-DUP1) Prepared: 12/09/18 10:58 Analyzed: 12/09/18 17:07

QC Source Sample: MW-16 (A8L0188-08)

EPA 8260C

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120565 - EPA 5030B						Water						
Duplicate (8120565-DUP1)		Prepared: 12/09/18 10:58		Analyzed: 12/09/18 17:07								
QC Source Sample: MW-16 (A8L0188-08)												
Bromobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromoform	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromomethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Chloroethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Chloroform	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Chloromethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Dibromomethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	0.212	---	---	***	30%	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	0.209	---	---	***	30%	
cis-1,2-Dichloroethene	4.46	---	0.400	ug/L	1	---	4.54	---	---	2	30%	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Methylene chloride	ND	---	3.00	ug/L	1	---	ND	---	---	---	30%	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0188 - 12 19 18 1325
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120565 - EPA 5030B						Water						
Duplicate (8120565-DUP1)			Prepared: 12/09/18 10:58		Analyzed: 12/09/18 17:07							
QC Source Sample: MW-16 (A8L0188-08)												
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	131	---	0.400	ug/L	1	---	130	---	---	0.6	30%	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	0.708	---	0.400	ug/L	1	---	0.761	---	---	7	30%	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Trichloroethene (TCE)	21.0	---	0.400	ug/L	1	---	20.8	---	---	1	30%	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Vinyl chloride	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 110 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>"</i>						



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QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120476 - Method Prep: Aq						Water						
Blank (8120476-BLK2)		Prepared: 12/07/18 08:36 Analyzed: 12/07/18 12:37										
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	Q-16
LCS (8120476-BS1)		Prepared: 12/07/18 08:36 Analyzed: 12/07/18 11:13										
SM 4500-NH3 G												
Ammonia as N	2.15	---	0.0200	mg/L	1	2.00	---	107	90-110%	---	---	



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0188 - 12 19 18 1325
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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120526 - Method Prep: Aq						Water						
Blank (8120526-BLK1)		Prepared: 12/07/18 12:32			Analyzed: 12/07/18 15:19							
<u>EPA 300.0</u>												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
LCS (8120526-BS1)		Prepared: 12/07/18 12:32			Analyzed: 12/07/18 15:40							
<u>EPA 300.0</u>												
Nitrate-Nitrogen	2.07	---	0.250	mg/L	1	2.00	---	104	90-110%	---	---	---
Nitrite-Nitrogen	1.98	---	0.250	mg/L	1	2.00	---	99	90-110%	---	---	---



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0188 - 12 19 18 1325
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SAMPLE PREPARATION INFORMATION

Halogenated Volatile Organic Compounds by EPA 8260C

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 8120565							
A8L0188-01	Water	EPA 8260C	12/06/18 08:30	12/09/18 10:58	5mL/5mL	5mL/5mL	1.00
A8L0188-02	Water	EPA 8260C	12/06/18 09:30	12/09/18 10:58	5mL/5mL	5mL/5mL	1.00
A8L0188-03	Water	EPA 8260C	12/06/18 10:20	12/09/18 10:58	5mL/5mL	5mL/5mL	1.00
A8L0188-04	Water	EPA 8260C	12/06/18 10:50	12/09/18 10:58	5mL/5mL	5mL/5mL	1.00
A8L0188-05	Water	EPA 8260C	12/06/18 12:10	12/09/18 10:58	5mL/5mL	5mL/5mL	1.00
A8L0188-06	Water	EPA 8260C	12/06/18 12:50	12/09/18 10:58	5mL/5mL	5mL/5mL	1.00
A8L0188-07	Water	EPA 8260C	12/06/18 13:50	12/09/18 10:58	5mL/5mL	5mL/5mL	1.00
A8L0188-08	Water	EPA 8260C	12/06/18 15:00	12/09/18 10:58	5mL/5mL	5mL/5mL	1.00
A8L0188-09	Water	EPA 8260C	12/06/18 00:00	12/09/18 10:58	5mL/5mL	5mL/5mL	1.00

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 8120476							
A8L0188-01RE1	Water	SM 4500-NH3 G	12/06/18 08:30	12/07/18 08:36	10mL/10mL	10mL/10mL	1.00
A8L0188-02RE1	Water	SM 4500-NH3 G	12/06/18 09:30	12/07/18 08:36	10mL/10mL	10mL/10mL	1.00
A8L0188-03RE1	Water	SM 4500-NH3 G	12/06/18 10:20	12/07/18 08:36	10mL/10mL	10mL/10mL	1.00
A8L0188-04RE1	Water	SM 4500-NH3 G	12/06/18 10:50	12/07/18 08:36	10mL/10mL	10mL/10mL	1.00
A8L0188-05RE1	Water	SM 4500-NH3 G	12/06/18 12:10	12/07/18 08:36	10mL/10mL	10mL/10mL	1.00
A8L0188-06RE1	Water	SM 4500-NH3 G	12/06/18 12:50	12/07/18 08:36	10mL/10mL	10mL/10mL	1.00
A8L0188-07RE1	Water	SM 4500-NH3 G	12/06/18 13:50	12/07/18 08:36	10mL/10mL	10mL/10mL	1.00
A8L0188-08RE1	Water	SM 4500-NH3 G	12/06/18 15:00	12/07/18 08:36	10mL/10mL	10mL/10mL	1.00

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 8120526							
A8L0188-01	Water	EPA 300.0	12/06/18 08:30	12/07/18 12:32	5mL/5mL	5mL/5mL	1.00
A8L0188-02	Water	EPA 300.0	12/06/18 09:30	12/07/18 12:32	5mL/5mL	5mL/5mL	1.00
A8L0188-03	Water	EPA 300.0	12/06/18 10:20	12/07/18 12:32	5mL/5mL	5mL/5mL	1.00
A8L0188-04	Water	EPA 300.0	12/06/18 10:50	12/07/18 12:32	5mL/5mL	5mL/5mL	1.00
A8L0188-05	Water	EPA 300.0	12/06/18 12:10	12/07/18 12:32	5mL/5mL	5mL/5mL	1.00
A8L0188-06	Water	EPA 300.0	12/06/18 12:50	12/07/18 12:32	5mL/5mL	5mL/5mL	1.00
A8L0188-07	Water	EPA 300.0	12/06/18 13:50	12/07/18 12:32	5mL/5mL	5mL/5mL	1.00

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Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0188 - 12 19 18 1325
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SAMPLE PREPARATION INFORMATION

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A8L0188-08	Water	EPA 300.0	12/06/18 15:00	12/07/18 12:32	5mL/5mL	5mL/5mL	1.00
A8L0188-08RE1	Water	EPA 300.0	12/06/18 15:00	12/07/18 12:32	5mL/5mL	5mL/5mL	1.00

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EPA ID: OR01039

Cascadia Associates

6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**

Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0188 - 12 19 18 1325

QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

Apex Laboratories

- Q-16** Reanalysis of an original Batch QC sample.
- Q-50** Due to instrument malfunction, not all Batch QC samples were analyzed. The batch is accepted based on the recoveries of the Blank Spike (BS).
- Q-55** Daily CCV/LCS recovery for this analyte was below the +/-20% criteria listed in EPA 8260C, however there is adequate sensitivity to ensure detection at the reporting level.
- Q-56** Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C

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REPORTING NOTES AND CONVENTIONS:

Abbreviations:

- DET Analyte DETECTED at or above the detection or reporting limit.
- ND Analyte NOT DETECTED at or above the detection or reporting limit.
- NR Result Not Reported
- RPD Relative Percent Difference

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

- Basis:** Results for soil samples are generally reported on a 100% dry weight basis. The Result Basis is listed following the units as "dry", "wet", or "" (blank) designation.
 - "dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.
 - "wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.
 - "" Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) are not included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

- " --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.
- " *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to 1/2 the Reporting Limit (RL).
-For Blank hits falling between 1/2 the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0188 - 12 19 18 1325
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REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the blank results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.

Apex Laboratories maintains detailed records on sample receipt, including client label verification, cooler temperature, sample preservation, hold



<u>Cascadia Associates</u> 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: <u>Shore Terminal-Vancouver</u> Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0188 - 12 19 18 1325
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LABORATORY ACCREDITATION INFORMATION

TNI Certification ID: OR100062 (Primary Accreditation) - EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation
<u>All reported analytes are included in Apex Laboratories' current ORELAP scope.</u>					

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation. Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provided by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver
Project Number: Nustar Van. 4Q18
Project Manager: Stephanie Salisbury

Report ID:
A8L0188 - 12 19 18 1325

COC of _____

Lab # A8L0188 PO# _____ Project # _____

Project Name: Nustar Van 4Q18 Email: Stephanie.Salisbury@Cascadia.com

Project Mgr: Stephanie Salisbury Phone: _____ Fax: _____

Company: Cascadia Address: 6915 SW Macadam Ave Sampled by: Lindsay Wallis

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-DX	NWTPH-GX	8260 VOCs Full List	8260 RBDM VOCs	8260 HVOCS	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TTO	RCRA Metals (8)	TCLP Metals (8)	AT, Sb, As, Ba, Br, Cd, Cr, Co, Cu, Ni, Pb, Hg, Mn, Mo, Se, Zn	1200-COLS	1200-Z
MW-23	12/16/18	10:30	W	5						X										X
MW-25		0830																		X
MW-21, -40		1020																		
MW-22, -10S		1050																		
MW-17		1210																		
MW-18		1250																		
MW-20		1330																		
MW-14		1520																		
Trip Blank																				

ANALYSIS REQUEST

SPECIAL INSTRUCTIONS:

Normal Turn Around Time (TAT) = 10 Business Days (YES) (NO)

TAT Requested (circle): 1 Day 2 Day 3 Day 4 DAY 5 DAY Other: _____

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY: _____ RECEIVED BY: _____

Signature: _____ Date: 12/16/18 Signature: _____ Date: 12/16/18

Printed Name: Lindsay Wallis Printed Name: Charles K. Hansen Time: 6:50 Time: 10:30

Company: Cascadia Company: Apex Labs

Apex Laboratories

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Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0188 - 12 19 18 1325
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APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A8 L0188

Project/Project #: Nustar van 4Q18

Delivery Info:
Date/time received: 12/6/18 @ 1630 By: CFH
Delivered by: Apex Client ESS FedEx UPS Swift Senvoy SDS Other

Cooler Inspection Date/time inspected: 12/6/18 @ 1743 By: CFH
Chain of Custody included? Yes No Custody seals? Yes No
Signed/dated by client? Yes No
Signed/dated by Apex? Yes No

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (°C)	<u>5.1</u>						
Received on ice? (Y/N)	<u>Y</u>						
Temp. blanks? (Y/N)	<u>Y</u>						
Ice type: (Gel/Real/Other)	<u>Real</u>						
Condition:	<u>Good</u>						

Cooler out of temp? (Y/N) Possible reason why: _____
If some coolers are in temp and some out, were green dots applied to out of temperature samples? Yes/No/NA
Out of temperature samples form initiated? Yes/No/NA

Samples Inspection: Date/time inspected: 12/6/18 @ 1930 By: CFH
All samples intact? Yes No Comments: _____
Bottle labels/COCs agree? Yes No Comments: _____
COC/container discrepancies form initiated? Yes No NA
Containers/volumes received appropriate for analysis? Yes No Comments: _____
Do VOA vials have visible headspace? Yes No NA
Comments MW-18: 1/3, MW-16: 1/3
Water samples: pH checked: Yes No NA pH appropriate? Yes No NA
Comments: _____
Additional information: T6 # 1935
Labeled by: OP Witness: [Signature] Cooler Inspected by: [Signature] See Project Contact Form: Y

Lisa Domenighini



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Wednesday, December 19, 2018

Stephanie Salisbury
Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

RE: A8L0222 - Shore Terminal-Vancouver - Nustar Van. 4Q18

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A8L0222, which was received by the laboratory on 12/7/2018 at 3:20:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of final reporting, unless prior arrangements have been made.

Cooler Receipt Information

(See Cooler Receipt Form for details)

Cooler #1 1.0 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.

All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.



Apex Laboratories

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Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0222 - 12 19 18 1351

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-9	A8L0222-01	Water	12/07/18 08:45	12/07/18 15:20
MW-7	A8L0222-02	Water	12/07/18 09:30	12/07/18 15:20
MW-5	A8L0222-03	Water	12/07/18 10:30	12/07/18 15:20
MW-8	A8L0222-04	Water	12/07/18 12:20	12/07/18 15:20
MW-3	A8L0222-05	Water	12/07/18 13:20	12/07/18 15:20
Trip Blank	A8L0222-06	Water	12/07/18 00:00	12/07/18 15:20
MW-7 DUP	A8L0222-07	Water	12/07/18 09:30	12/07/18 15:20

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-9 (A8L0222-01)				Matrix: Water		Batch: 8120622		
Bromobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloroethane	0.748	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
cis-1,2-Dichloroethene	20.0	---	0.400	ug/L	1	12/11/18	EPA 8260C	
trans-1,2-Dichloroethene	0.800	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/11/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Tetrachloroethene (PCE)	178	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,1,1-Trichloroethane	3.36	---	0.400	ug/L	1	12/11/18	EPA 8260C	

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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
			Matrix: Water			Batch: 8120622		
MW-9 (A8L0222-01)								
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Trichloroethene (TCE)	66.5	---	0.400	ug/L	1	12/11/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Vinyl chloride	0.545	---	0.400	ug/L	1	12/11/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 114 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/11/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>101 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/11/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/11/18</i>	<i>EPA 8260C</i>

			Matrix: Water			Batch: 8120622		
MW-7 (A8L0222-02)								
Bromobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloroethane	3.97	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloroethene	0.428	---	0.400	ug/L	1	12/11/18	EPA 8260C	
cis-1,2-Dichloroethene	15.4	---	0.400	ug/L	1	12/11/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
			Matrix: Water			Batch: 8120622		
MW-7 (A8L0222-02)								
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/11/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Tetrachloroethene (PCE)	30.4	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Trichloroethene (TCE)	18.1	---	0.400	ug/L	1	12/11/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Vinyl chloride	1.62	---	0.400	ug/L	1	12/11/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 110 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/11/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>102 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/11/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>95 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/11/18</i>	<i>EPA 8260C</i>

			Matrix: Water			Batch: 8120622		
MW-5 (A8L0222-03)								
Bromobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-5 (A8L0222-03)				Matrix: Water		Batch: 8120622		
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloroethane	1.03	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
cis-1,2-Dichloroethene	129	---	0.400	ug/L	1	12/11/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/11/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Tetrachloroethene (PCE)	4.69	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Trichloroethene (TCE)	11.7	---	0.400	ug/L	1	12/11/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Vinyl chloride	4.80	---	0.400	ug/L	1	12/11/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/11/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/11/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/11/18</i>	<i>EPA 8260C</i>

MW-8 (A8L0222-04)				Matrix: Water		Batch: 8120622		
Bromobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	

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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-8 (A8L0222-04)				Matrix: Water		Batch: 8120622		
Chlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/11/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Tetrachloroethene (PCE)	2.95	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-8 (A8L0222-04)				Matrix: Water		Batch: 8120622		
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 110 %</i>		<i>Limits: 80-120 %</i>		1	12/11/18	EPA 8260C
<i>Toluene-d8 (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		1	12/11/18	EPA 8260C
<i>4-Bromofluorobenzene (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		1	12/11/18	EPA 8260C
MW-3 (A8L0222-05)				Matrix: Water		Batch: 8120634		
Bromobenzene	ND	---	1.00	ug/L	2	12/12/18	EPA 8260C	
Bromochloromethane	ND	---	2.00	ug/L	2	12/12/18	EPA 8260C	
Bromodichloromethane	ND	---	2.00	ug/L	2	12/12/18	EPA 8260C	
Bromoform	ND	---	2.00	ug/L	2	12/12/18	EPA 8260C	
Bromomethane	ND	---	10.0	ug/L	2	12/12/18	EPA 8260C	
Carbon tetrachloride	ND	---	2.00	ug/L	2	12/12/18	EPA 8260C	
Chlorobenzene	ND	---	1.00	ug/L	2	12/12/18	EPA 8260C	
Chloroethane	ND	---	10.0	ug/L	2	12/12/18	EPA 8260C	EST
Chloroform	ND	---	2.00	ug/L	2	12/12/18	EPA 8260C	
Chloromethane	ND	---	10.0	ug/L	2	12/12/18	EPA 8260C	
2-Chlorotoluene	ND	---	2.00	ug/L	2	12/12/18	EPA 8260C	
4-Chlorotoluene	ND	---	2.00	ug/L	2	12/12/18	EPA 8260C	
Dibromochloromethane	ND	---	2.00	ug/L	2	12/12/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	10.0	ug/L	2	12/12/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	1.00	ug/L	2	12/12/18	EPA 8260C	
Dibromomethane	ND	---	2.00	ug/L	2	12/12/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	1.00	ug/L	2	12/12/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	1.00	ug/L	2	12/12/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	1.00	ug/L	2	12/12/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	2.00	ug/L	2	12/12/18	EPA 8260C	
1,1-Dichloroethane	3.09	---	0.800	ug/L	2	12/12/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.800	ug/L	2	12/12/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.800	ug/L	2	12/12/18	EPA 8260C	
cis-1,2-Dichloroethene	44.2	---	0.800	ug/L	2	12/12/18	EPA 8260C	
trans-1,2-Dichloroethene	1.00	---	0.800	ug/L	2	12/12/18	EPA 8260C	
1,2-Dichloropropane	ND	---	1.00	ug/L	2	12/12/18	EPA 8260C	
1,3-Dichloropropane	ND	---	2.00	ug/L	2	12/12/18	EPA 8260C	
2,2-Dichloropropane	ND	---	2.00	ug/L	2	12/12/18	EPA 8260C	
1,1-Dichloropropene	ND	---	2.00	ug/L	2	12/12/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	2.00	ug/L	2	12/12/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	2.00	ug/L	2	12/12/18	EPA 8260C	
Hexachlorobutadiene	ND	---	10.0	ug/L	2	12/12/18	EPA 8260C	
Methylene chloride	ND	---	6.00	ug/L	2	12/12/18	EPA 8260C	



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-3 (A8L0222-05)				Matrix: Water		Batch: 8120634		
1,1,1,2-Tetrachloroethane	ND	---	0.800	ug/L	2	12/12/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	1.00	ug/L	2	12/12/18	EPA 8260C	
Tetrachloroethene (PCE)	96.1	---	0.800	ug/L	2	12/12/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	4.00	ug/L	2	12/12/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	4.00	ug/L	2	12/12/18	EPA 8260C	
1,1,1-Trichloroethane	0.992	---	0.800	ug/L	2	12/12/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	1.00	ug/L	2	12/12/18	EPA 8260C	
Trichloroethene (TCE)	27.8	---	0.800	ug/L	2	12/12/18	EPA 8260C	
Trichlorofluoromethane	ND	---	4.00	ug/L	2	12/12/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	2.00	ug/L	2	12/12/18	EPA 8260C	
Vinyl chloride	ND	---	0.800	ug/L	2	12/12/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>94 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>

Trip Blank (A8L0222-06)				Matrix: Water		Batch: 8120565		
Bromobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	

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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A8L0222-06)				Matrix: Water		Batch: 8120565		
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/09/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/09/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/09/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/09/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/09/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/09/18</i>	<i>EPA 8260C</i>

MW-7 DUP (A8L0222-07)				Matrix: Water		Batch: 8120634		
Bromobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	EST
Chloroform	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-7 DUP (A8L0222-07)				Matrix: Water		Batch: 8120634		
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloroethane	3.84	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloroethene	0.472	---	0.400	ug/L	1	12/11/18	EPA 8260C	
cis-1,2-Dichloroethene	17.7	---	0.400	ug/L	1	12/11/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/11/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Tetrachloroethene (PCE)	26.6	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Trichloroethene (TCE)	16.4	---	0.400	ug/L	1	12/11/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Vinyl chloride	1.06	---	0.400	ug/L	1	12/11/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>	<i>1</i>	<i>12/11/18</i>	<i>EPA 8260C</i>	
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>	<i>1</i>	<i>12/11/18</i>	<i>EPA 8260C</i>	
<i>4-Bromofluorobenzene (Surr)</i>		<i>96 %</i>		<i>80-120 %</i>	<i>1</i>	<i>12/11/18</i>	<i>EPA 8260C</i>	

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ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-9 (A8L0222-01RE1)				Matrix: Water			Batch: 8120544	
Ammonia as N	5.60	---	0.0400	mg/L	2	12/08/18	SM 4500-NH3 G	
MW-7 (A8L0222-02RE1)				Matrix: Water			Batch: 8120544	
Ammonia as N	22.4	---	1.00	mg/L	50	12/08/18	SM 4500-NH3 G	
MW-5 (A8L0222-03)				Matrix: Water			Batch: 8120544	
Ammonia as N	1.22	---	0.0200	mg/L	1	12/08/18	SM 4500-NH3 G	
MW-8 (A8L0222-04)				Matrix: Water			Batch: 8120544	
Ammonia as N	0.0230	---	0.0200	mg/L	1	12/08/18	SM 4500-NH3 G	
MW-3 (A8L0222-05)				Matrix: Water			Batch: 8120544	
Ammonia as N	1.18	---	0.0200	mg/L	1	12/08/18	SM 4500-NH3 G	
MW-7 DUP (A8L0222-07RE1)				Matrix: Water			Batch: 8120544	
Ammonia as N	22.1	---	1.00	mg/L	50	12/08/18	SM 4500-NH3 G	

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-9 (A8L0222-01)				Matrix: Water				
Batch: 8120554								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/08/18	EPA 300.0	
MW-9 (A8L0222-01RE2)				Matrix: Water				
Batch: 8120554								
Nitrate-Nitrogen	311	---	12.5	mg/L	50	12/10/18	EPA 300.0	A-01, H-01
MW-7 (A8L0222-02)				Matrix: Water				
Batch: 8120554								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/08/18	EPA 300.0	
MW-7 (A8L0222-02RE1)				Matrix: Water				
Batch: 8120554								
Nitrate-Nitrogen	13.3	---	0.500	mg/L	2	12/08/18	EPA 300.0	
MW-5 (A8L0222-03)				Matrix: Water				
Batch: 8120554								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/08/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/08/18	EPA 300.0	
MW-8 (A8L0222-04)				Matrix: Water				
Batch: 8120554								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/08/18	EPA 300.0	
MW-8 (A8L0222-04RE2)				Matrix: Water				
Batch: 8120554								
Nitrate-Nitrogen	260	---	12.5	mg/L	50	12/10/18	EPA 300.0	A-01, H-01
MW-3 (A8L0222-05)				Matrix: Water				
Batch: 8120554								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/08/18	EPA 300.0	
MW-3 (A8L0222-05RE1)				Matrix: Water				
Batch: 8120554								
Nitrate-Nitrogen	10.2	---	0.500	mg/L	2	12/08/18	EPA 300.0	

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Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-7 DUP (A8L0222-07)				Matrix: Water				
Batch: 8120554								
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/08/18	EPA 300.0	
MW-7 DUP (A8L0222-07RE1)				Matrix: Water				
Batch: 8120554								
Nitrate-Nitrogen	13.5	---	0.500	mg/L	2	12/08/18	EPA 300.0	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120565 - EPA 5030B						Water						
Blank (8120565-BLK1)		Prepared: 12/09/18 09:03		Analyzed: 12/09/18 10:57								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120565 - EPA 5030B												
Water												
Blank (8120565-BLK1)	Prepared: 12/09/18 09:03 Analyzed: 12/09/18 10:57											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 104 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>103 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>101 %</i>		<i>80-120 %</i>		<i>"</i>						

LCS (8120565-BS2)	Prepared: 12/09/18 09:03 Analyzed: 12/09/18 10:28											Q-50
EPA 8260C												
Bromobenzene	20.2	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Bromochloromethane	17.7	---	1.00	ug/L	1	20.0	---	88	80-120%	---	---	
Bromodichloromethane	19.5	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
Bromoform	28.6	---	1.00	ug/L	1	20.0	---	143	80-120%	---	---	Q-56
Bromomethane	13.4	---	5.00	ug/L	1	20.0	---	67	80-120%	---	---	Q-55
Carbon tetrachloride	20.7	---	1.00	ug/L	1	20.0	---	104	80-120%	---	---	
Chlorobenzene	20.9	---	0.500	ug/L	1	20.0	---	105	80-120%	---	---	
Chloroethane	23.7	---	5.00	ug/L	1	20.0	---	118	80-120%	---	---	
Chloroform	19.5	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
Chloromethane	15.5	---	5.00	ug/L	1	20.0	---	78	80-120%	---	---	Q-55
2-Chlorotoluene	19.5	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
4-Chlorotoluene	18.1	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
Dibromochloromethane	23.6	---	1.00	ug/L	1	20.0	---	118	80-120%	---	---	
1,2-Dibromo-3-chloropropane	18.1	---	5.00	ug/L	1	20.0	---	90	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.5	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Dibromomethane	19.4	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
1,2-Dichlorobenzene	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	

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Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120565 - EPA 5030B						Water						
LCS (8120565-BS2)	Prepared: 12/09/18 09:03					Analyzed: 12/09/18 10:28					Q-50	
1,3-Dichlorobenzene	20.8	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
1,4-Dichlorobenzene	20.3	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Dichlorodifluoromethane	21.1	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
1,1-Dichloroethane	18.9	---	0.400	ug/L	1	20.0	---	95	80-120%	---	---	
1,2-Dichloroethane (EDC)	17.3	---	0.400	ug/L	1	20.0	---	86	80-120%	---	---	
1,1-Dichloroethene	18.7	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
cis-1,2-Dichloroethene	16.8	---	0.400	ug/L	1	20.0	---	84	80-120%	---	---	
trans-1,2-Dichloroethene	18.4	---	0.400	ug/L	1	20.0	---	92	80-120%	---	---	
1,2-Dichloropropane	17.5	---	0.500	ug/L	1	20.0	---	88	80-120%	---	---	
1,3-Dichloropropane	19.0	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
2,2-Dichloropropane	18.9	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
1,1-Dichloropropene	19.0	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
cis-1,3-Dichloropropene	17.0	---	1.00	ug/L	1	20.0	---	85	80-120%	---	---	
trans-1,3-Dichloropropene	19.8	---	1.00	ug/L	1	20.0	---	99	80-120%	---	---	
Hexachlorobutadiene	21.3	---	5.00	ug/L	1	20.0	---	107	80-120%	---	---	
Methylene chloride	19.5	---	3.00	ug/L	1	20.0	---	97	80-120%	---	---	
1,1,1,2-Tetrachloroethane	22.0	---	0.400	ug/L	1	20.0	---	110	80-120%	---	---	
1,1,2,2-Tetrachloroethane	19.7	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Tetrachloroethene (PCE)	23.2	---	0.400	ug/L	1	20.0	---	116	80-120%	---	---	
1,2,3-Trichlorobenzene	19.2	---	2.00	ug/L	1	20.0	---	96	80-120%	---	---	
1,2,4-Trichlorobenzene	18.3	---	2.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,1,1-Trichloroethane	18.5	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
1,1,2-Trichloroethane	20.8	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
Trichloroethene (TCE)	19.5	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
Trichlorofluoromethane	26.1	---	2.00	ug/L	1	20.0	---	130	80-120%	---	---	Q-56
1,2,3-Trichloropropane	19.2	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
Vinyl chloride	22.4	---	0.400	ug/L	1	20.0	---	112	80-120%	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 98 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>"</i>						



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0222 - 12 19 18 1351

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120622 - EPA 5030B						Water						
Blank (8120622-BLK1)		Prepared: 12/11/18 09:58		Analyzed: 12/11/18 11:24								
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120622 - EPA 5030B												
Water												
Blank (8120622-BLK1)	Prepared: 12/11/18 09:58 Analyzed: 12/11/18 11:24											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 107 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	103 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	97 %		80-120 %		"							

LCS (8120622-BS1)												
Prepared: 12/11/18 09:58 Analyzed: 12/11/18 10:27												
EPA 8260C												
Bromobenzene	19.9	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Bromochloromethane	16.2	---	1.00	ug/L	1	20.0	---	81	80-120%	---	---	
Bromodichloromethane	20.4	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
Bromoform	26.2	---	1.00	ug/L	1	20.0	---	131	80-120%	---	---	Q-56
Bromomethane	6.08	---	5.00	ug/L	1	20.0	---	30	80-120%	---	---	Q-55
Carbon tetrachloride	21.5	---	1.00	ug/L	1	20.0	---	107	80-120%	---	---	
Chlorobenzene	20.9	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
Chloroethane	23.4	---	5.00	ug/L	1	20.0	---	117	80-120%	---	---	
Chloroform	20.2	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Chloromethane	27.7	---	5.00	ug/L	1	20.0	---	139	80-120%	---	---	Q-56
2-Chlorotoluene	19.4	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
4-Chlorotoluene	18.0	---	1.00	ug/L	1	20.0	---	90	80-120%	---	---	
Dibromochloromethane	23.0	---	1.00	ug/L	1	20.0	---	115	80-120%	---	---	
1,2-Dibromo-3-chloropropane	17.1	---	5.00	ug/L	1	20.0	---	85	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.2	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Dibromomethane	20.0	---	1.00	ug/L	1	20.0	---	100	80-120%	---	---	
1,2-Dichlorobenzene	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0222 - 12 19 18 1351

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120622 - EPA 5030B												
Water												
LCS (8120622-BS1)												
			Prepared: 12/11/18 09:58			Analyzed: 12/11/18 10:27						
1,3-Dichlorobenzene	20.7	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	
1,4-Dichlorobenzene	20.1	---	0.500	ug/L	1	20.0	---	101	80-120%	---	---	
Dichlorodifluoromethane	19.9	---	1.00	ug/L	1	20.0	---	100	80-120%	---	---	
1,1-Dichloroethane	19.2	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
1,2-Dichloroethane (EDC)	17.7	---	0.400	ug/L	1	20.0	---	88	80-120%	---	---	
1,1-Dichloroethene	18.1	---	0.400	ug/L	1	20.0	---	90	80-120%	---	---	
cis-1,2-Dichloroethene	17.6	---	0.400	ug/L	1	20.0	---	88	80-120%	---	---	
trans-1,2-Dichloroethene	18.8	---	0.400	ug/L	1	20.0	---	94	80-120%	---	---	
1,2-Dichloropropane	18.3	---	0.500	ug/L	1	20.0	---	92	80-120%	---	---	
1,3-Dichloropropane	19.1	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
2,2-Dichloropropane	19.1	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
1,1-Dichloropropene	19.0	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
cis-1,3-Dichloropropene	17.6	---	1.00	ug/L	1	20.0	---	88	80-120%	---	---	
trans-1,3-Dichloropropene	18.4	---	1.00	ug/L	1	20.0	---	92	80-120%	---	---	
Hexachlorobutadiene	20.2	---	5.00	ug/L	1	20.0	---	101	80-120%	---	---	
Methylene chloride	21.3	---	3.00	ug/L	1	20.0	---	106	80-120%	---	---	
1,1,1,2-Tetrachloroethane	22.1	---	0.400	ug/L	1	20.0	---	110	80-120%	---	---	
1,1,2,2-Tetrachloroethane	19.4	---	0.500	ug/L	1	20.0	---	97	80-120%	---	---	
Tetrachloroethene (PCE)	22.3	---	0.400	ug/L	1	20.0	---	112	80-120%	---	---	
1,2,3-Trichlorobenzene	17.6	---	2.00	ug/L	1	20.0	---	88	80-120%	---	---	
1,2,4-Trichlorobenzene	16.6	---	2.00	ug/L	1	20.0	---	83	80-120%	---	---	
1,1,1-Trichloroethane	19.4	---	0.400	ug/L	1	20.0	---	97	80-120%	---	---	
1,1,2-Trichloroethane	20.7	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	
Trichloroethene (TCE)	20.4	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
Trichlorofluoromethane	27.0	---	2.00	ug/L	1	20.0	---	135	80-120%	---	---	Q-56
1,2,3-Trichloropropane	19.0	---	1.00	ug/L	1	20.0	---	95	80-120%	---	---	
Vinyl chloride	23.9	---	0.400	ug/L	1	20.0	---	120	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr) Recovery: 101 % Limits: 80-120 % Dilution: 1x												
Toluene-d8 (Surr) 101 % 80-120 % "												
4-Bromofluorobenzene (Surr) 97 % 80-120 % "												

Matrix Spike (8120622-MS1) Prepared: 12/11/18 11:17 Analyzed: 12/11/18 21:50

QC Source Sample: MW-8 (A8L0222-04)

EPA 8260C

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Lisa Domenighini, Client Services Manager



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0222 - 12 19 18 1351

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120622 - EPA 5030B												
Water												
Matrix Spike (8120622-MS1)			Prepared: 12/11/18 11:17 Analyzed: 12/11/18 21:50									
QC Source Sample: MW-8 (A8L0222-04)												
Bromobenzene	20.2	---	0.500	ug/L	1	20.0	ND	101	80-120%	---	---	
Bromochloromethane	18.0	---	1.00	ug/L	1	20.0	ND	90	78-123%	---	---	
Bromodichloromethane	21.3	---	1.00	ug/L	1	20.0	ND	107	79-125%	---	---	
Bromoform	28.0	---	1.00	ug/L	1	20.0	ND	140	66-130%	---	---	Q-54
Bromomethane	9.04	---	5.00	ug/L	1	20.0	ND	45	53-141%	---	---	Q-54f
Carbon tetrachloride	22.8	---	1.00	ug/L	1	20.0	ND	114	72-136%	---	---	
Chlorobenzene	21.8	---	0.500	ug/L	1	20.0	ND	109	80-120%	---	---	
Chloroethane	24.5	---	5.00	ug/L	1	20.0	ND	122	60-138%	---	---	
Chloroform	21.7	---	1.00	ug/L	1	20.0	ND	108	79-124%	---	---	
Chloromethane	28.9	---	5.00	ug/L	1	20.0	ND	145	50-139%	---	---	Q-54b
2-Chlorotoluene	19.5	---	1.00	ug/L	1	20.0	ND	98	79-122%	---	---	
4-Chlorotoluene	18.3	---	1.00	ug/L	1	20.0	ND	91	78-122%	---	---	
Dibromochloromethane	23.7	---	1.00	ug/L	1	20.0	ND	119	74-126%	---	---	
1,2-Dibromo-3-chloropropane	18.9	---	5.00	ug/L	1	20.0	ND	95	62-128%	---	---	
1,2-Dibromoethane (EDB)	19.8	---	0.500	ug/L	1	20.0	ND	99	77-121%	---	---	
Dibromomethane	21.7	---	1.00	ug/L	1	20.0	ND	108	79-123%	---	---	
1,2-Dichlorobenzene	20.4	---	0.500	ug/L	1	20.0	ND	102	80-120%	---	---	
1,3-Dichlorobenzene	21.1	---	0.500	ug/L	1	20.0	ND	106	80-120%	---	---	
1,4-Dichlorobenzene	20.6	---	0.500	ug/L	1	20.0	ND	103	79-120%	---	---	
Dichlorodifluoromethane	21.4	---	1.00	ug/L	1	20.0	ND	107	32-152%	---	---	
1,1-Dichloroethane	20.8	---	0.400	ug/L	1	20.0	ND	104	77-125%	---	---	
1,2-Dichloroethane (EDC)	18.8	---	0.400	ug/L	1	20.0	ND	94	73-128%	---	---	
1,1-Dichloroethene	20.0	---	0.400	ug/L	1	20.0	ND	100	71-131%	---	---	
cis-1,2-Dichloroethene	18.7	---	0.400	ug/L	1	20.0	ND	92	78-123%	---	---	
trans-1,2-Dichloroethene	19.6	---	0.400	ug/L	1	20.0	ND	98	75-124%	---	---	
1,2-Dichloropropane	19.1	---	0.500	ug/L	1	20.0	ND	96	78-122%	---	---	
1,3-Dichloropropane	19.6	---	1.00	ug/L	1	20.0	ND	98	80-120%	---	---	
2,2-Dichloropropane	15.5	---	1.00	ug/L	1	20.0	ND	77	60-139%	---	---	
1,1-Dichloropropene	20.1	---	1.00	ug/L	1	20.0	ND	101	79-125%	---	---	
cis-1,3-Dichloropropene	15.3	---	1.00	ug/L	1	20.0	ND	76	75-124%	---	---	
trans-1,3-Dichloropropene	18.9	---	1.00	ug/L	1	20.0	ND	94	73-127%	---	---	
Hexachlorobutadiene	19.7	---	5.00	ug/L	1	20.0	ND	99	66-134%	---	---	
Methylene chloride	22.8	---	3.00	ug/L	1	20.0	ND	114	74-124%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120622 - EPA 5030B						Water						
Matrix Spike (8120622-MS1)			Prepared: 12/11/18 11:17 Analyzed: 12/11/18 21:50									
QC Source Sample: MW-8 (A8L0222-04)												
1,1,1,2-Tetrachloroethane	22.9	---	0.400	ug/L	1	20.0	ND	114	78-124%	---	---	
1,1,2,2-Tetrachloroethane	20.9	---	0.500	ug/L	1	20.0	ND	104	71-121%	---	---	
Tetrachloroethene (PCE)	25.6	---	0.400	ug/L	1	20.0	2.95	113	74-129%	---	---	
1,2,3-Trichlorobenzene	18.4	---	2.00	ug/L	1	20.0	ND	92	69-129%	---	---	
1,2,4-Trichlorobenzene	16.8	---	2.00	ug/L	1	20.0	ND	84	69-130%	---	---	
1,1,1-Trichloroethane	20.9	---	0.400	ug/L	1	20.0	ND	105	74-131%	---	---	
1,1,2-Trichloroethane	21.7	---	0.500	ug/L	1	20.0	ND	109	80-120%	---	---	
Trichloroethene (TCE)	21.8	---	0.400	ug/L	1	20.0	ND	109	79-123%	---	---	
Trichlorofluoromethane	29.9	---	2.00	ug/L	1	20.0	ND	150	65-141%	---	---	Q-54a
1,2,3-Trichloropropane	19.9	---	1.00	ug/L	1	20.0	ND	100	73-122%	---	---	
Vinyl chloride	26.9	---	0.400	ug/L	1	20.0	ND	135	58-137%	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 103 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>95 %</i>		<i>80-120 %</i>		<i>"</i>						



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120634 - EPA 5030B						Water						
Blank (8120634-BLK1)		Prepared: 12/11/18 12:33			Analyzed: 12/11/18 13:54							
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120634 - EPA 5030B												
Water												
Blank (8120634-BLK1)	Prepared: 12/11/18 12:33 Analyzed: 12/11/18 13:54											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 108 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>96 %</i>		<i>80-120 %</i>		<i>"</i>						

LCS (8120634-BS1)												
Prepared: 12/11/18 12:33 Analyzed: 12/11/18 13:00												
EPA 8260C												
Bromobenzene	19.1	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Bromochloromethane	23.5	---	1.00	ug/L	1	20.0	---	118	80-120%	---	---	
Bromodichloromethane	21.6	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
Bromoform	21.5	---	1.00	ug/L	1	20.0	---	107	80-120%	---	---	
Bromomethane	15.0	---	5.00	ug/L	1	20.0	---	75	80-120%	---	---	Q-55
Carbon tetrachloride	20.9	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Chlorobenzene	19.1	---	0.500	ug/L	1	20.0	---	95	80-120%	---	---	
Chloroethane	13.4	---	5.00	ug/L	1	20.0	---	67	80-120%	---	---	EST, Q-55
Chloroform	21.1	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
Chloromethane	28.9	---	5.00	ug/L	1	20.0	---	144	80-120%	---	---	Q-56
2-Chlorotoluene	18.4	---	1.00	ug/L	1	20.0	---	92	80-120%	---	---	
4-Chlorotoluene	18.2	---	1.00	ug/L	1	20.0	---	91	80-120%	---	---	
Dibromochloromethane	20.5	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
1,2-Dibromo-3-chloropropane	17.4	---	5.00	ug/L	1	20.0	---	87	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.0	---	0.500	ug/L	1	20.0	---	95	80-120%	---	---	
Dibromomethane	22.1	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
1,2-Dichlorobenzene	19.1	---	0.500	ug/L	1	20.0	---	95	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0222 - 12 19 18 1351

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120634 - EPA 5030B												
Water												
LCS (8120634-BS1)												
Prepared: 12/11/18 12:33 Analyzed: 12/11/18 13:00												
1,3-Dichlorobenzene	18.7	---	0.500	ug/L	1	20.0	---	93	80-120%	---	---	
1,4-Dichlorobenzene	18.8	---	0.500	ug/L	1	20.0	---	94	80-120%	---	---	
Dichlorodifluoromethane	20.9	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
1,1-Dichloroethane	20.9	---	0.400	ug/L	1	20.0	---	105	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
1,1-Dichloroethene	21.0	---	0.400	ug/L	1	20.0	---	105	80-120%	---	---	
cis-1,2-Dichloroethene	20.4	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
trans-1,2-Dichloroethene	20.9	---	0.400	ug/L	1	20.0	---	104	80-120%	---	---	
1,2-Dichloropropane	21.5	---	0.500	ug/L	1	20.0	---	107	80-120%	---	---	
1,3-Dichloropropane	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
2,2-Dichloropropane	18.7	---	1.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1-Dichloropropene	20.2	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
cis-1,3-Dichloropropene	19.1	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
trans-1,3-Dichloropropene	18.4	---	1.00	ug/L	1	20.0	---	92	80-120%	---	---	
Hexachlorobutadiene	17.6	---	5.00	ug/L	1	20.0	---	88	80-120%	---	---	
Methylene chloride	22.7	---	3.00	ug/L	1	20.0	---	114	80-120%	---	---	
1,1,1,2-Tetrachloroethane	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
1,1,2,2-Tetrachloroethane	21.1	---	0.500	ug/L	1	20.0	---	106	80-120%	---	---	
Tetrachloroethene (PCE)	19.2	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
1,2,3-Trichlorobenzene	18.4	---	2.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,2,4-Trichlorobenzene	18.1	---	2.00	ug/L	1	20.0	---	90	80-120%	---	---	
1,1,1-Trichloroethane	20.0	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,1,2-Trichloroethane	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Trichloroethene (TCE)	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
Trichlorofluoromethane	20.9	---	2.00	ug/L	1	20.0	---	104	80-120%	---	---	
1,2,3-Trichloropropane	18.8	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
Vinyl chloride	16.9	---	0.400	ug/L	1	20.0	---	84	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr) Recovery: 109 % Limits: 80-120 % Dilution: 1x												
Toluene-d8 (Surr) 98 % 80-120 % "												
4-Bromofluorobenzene (Surr) 94 % 80-120 % "												



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120544 - Method Prep: Aq						Water						
Blank (8120544-BLK1)		Prepared: 12/08/18 07:03 Analyzed: 12/08/18 12:48										
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (8120544-BS1)		Prepared: 12/08/18 07:03 Analyzed: 12/08/18 12:50										
SM 4500-NH3 G												
Ammonia as N	2.06	---	0.0200	mg/L	1	2.00	---	103	90-110%	---	---	



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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120554 - Method Prep: Aq						Water						
Blank (8120554-BLK1)		Prepared: 12/08/18 09:58		Analyzed: 12/08/18 11:27								
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
LCS (8120554-BS1)		Prepared: 12/08/18 09:58		Analyzed: 12/08/18 11:49								
EPA 300.0												
Nitrate-Nitrogen	2.03	---	0.250	mg/L	1	2.00	---	101	90-110%	---	---	---
Nitrite-Nitrogen	2.02	---	0.250	mg/L	1	2.00	---	101	90-110%	---	---	---
Duplicate (8120554-DUP1)		Prepared: 12/08/18 09:58		Analyzed: 12/08/18 12:32								
QC Source Sample: MW-9 (A8L0222-01)												
EPA 300.0												
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	ND	---	---	---	15%	---
Duplicate (8120554-DUP4)		Prepared: 12/08/18 09:58		Analyzed: 12/10/18 08:53								
QC Source Sample: MW-9 (A8L0222-01RE2)												
EPA 300.0												
Nitrate-Nitrogen	304	---	12.5	mg/L	50	---	311	---	---	2	10%	H-01
Matrix Spike (8120554-MS1)		Prepared: 12/08/18 09:58		Analyzed: 12/08/18 12:53								
QC Source Sample: MW-9 (A8L0222-01)												
EPA 300.0												
Nitrite-Nitrogen	2.56	---	0.312	mg/L	1	2.50	ND	102	80-120%	---	---	---
Matrix Spike (8120554-MS4)		Prepared: 12/08/18 09:58		Analyzed: 12/10/18 09:14								
QC Source Sample: MW-9 (A8L0222-01RE2)												
EPA 300.0												
Nitrate-Nitrogen	403	---	12.5	mg/L	50	100	311	92	80-120%	---	---	H-01

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Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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SAMPLE PREPARATION INFORMATION

Halogenated Volatile Organic Compounds by EPA 8260C

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 8120565							
A8L0222-06	Water	EPA 8260C	12/07/18 00:00	12/09/18 10:58	5mL/5mL	5mL/5mL	1.00
Batch: 8120622							
A8L0222-01	Water	EPA 8260C	12/07/18 08:45	12/11/18 11:17	5mL/5mL	5mL/5mL	1.00
A8L0222-02	Water	EPA 8260C	12/07/18 09:30	12/11/18 11:17	5mL/5mL	5mL/5mL	1.00
A8L0222-03	Water	EPA 8260C	12/07/18 10:30	12/11/18 11:17	5mL/5mL	5mL/5mL	1.00
A8L0222-04	Water	EPA 8260C	12/07/18 12:20	12/11/18 11:17	5mL/5mL	5mL/5mL	1.00
Batch: 8120634							
A8L0222-05	Water	EPA 8260C	12/07/18 13:20	12/11/18 14:12	5mL/5mL	5mL/5mL	1.00
A8L0222-07	Water	EPA 8260C	12/07/18 09:30	12/11/18 14:12	5mL/5mL	5mL/5mL	1.00

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 8120544							
A8L0222-01RE1	Water	SM 4500-NH3 G	12/07/18 08:45	12/08/18 07:03	10mL/10mL	10mL/10mL	1.00
A8L0222-02RE1	Water	SM 4500-NH3 G	12/07/18 09:30	12/08/18 07:03	10mL/10mL	10mL/10mL	1.00
A8L0222-03	Water	SM 4500-NH3 G	12/07/18 10:30	12/08/18 07:03	10mL/10mL	10mL/10mL	1.00
A8L0222-04	Water	SM 4500-NH3 G	12/07/18 12:20	12/08/18 07:03	10mL/10mL	10mL/10mL	1.00
A8L0222-05	Water	SM 4500-NH3 G	12/07/18 13:20	12/08/18 07:03	10mL/10mL	10mL/10mL	1.00
A8L0222-07RE1	Water	SM 4500-NH3 G	12/07/18 09:30	12/08/18 07:03	10mL/10mL	10mL/10mL	1.00

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 8120554							
A8L0222-01	Water	EPA 300.0	12/07/18 08:45	12/08/18 09:58	5mL/5mL	5mL/5mL	1.00
A8L0222-01RE2	Water	EPA 300.0	12/07/18 08:45	12/08/18 09:58	5mL/5mL	5mL/5mL	1.00
A8L0222-02	Water	EPA 300.0	12/07/18 09:30	12/08/18 09:58	5mL/5mL	5mL/5mL	1.00
A8L0222-02RE1	Water	EPA 300.0	12/07/18 09:30	12/08/18 09:58	5mL/5mL	5mL/5mL	1.00
A8L0222-03	Water	EPA 300.0	12/07/18 10:30	12/08/18 09:58	5mL/5mL	5mL/5mL	1.00
A8L0222-04	Water	EPA 300.0	12/07/18 12:20	12/08/18 09:58	5mL/5mL	5mL/5mL	1.00
A8L0222-04RE2	Water	EPA 300.0	12/07/18 12:20	12/08/18 09:58	5mL/5mL	5mL/5mL	1.00
A8L0222-05	Water	EPA 300.0	12/07/18 13:20	12/08/18 09:58	5mL/5mL	5mL/5mL	1.00

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Lisa Domenighini, Client Services Manager



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12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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SAMPLE PREPARATION INFORMATION

Anions by Ion Chromatography

<u>Prep: Method Prep: Aq</u>					Sample	Default	RL Prep
Lab Number	Matrix	Method	Sampled	Prepared	Initial/Final	Initial/Final	Factor
A8L0222-05RE1	Water	EPA 300.0	12/07/18 13:20	12/08/18 09:58	5mL/5mL	5mL/5mL	1.00
A8L0222-07	Water	EPA 300.0	12/07/18 09:30	12/08/18 09:58	5mL/5mL	5mL/5mL	1.00
A8L0222-07RE1	Water	EPA 300.0	12/07/18 09:30	12/08/18 09:58	5mL/5mL	5mL/5mL	1.00

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Lisa Domenighini, Client Services Manager



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van. 4Q18**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0222 - 12 19 18 1351

QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

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- A-01** Reported value was analyzed outside of method holding time. Original analysis was analyzed within method holding time but was outside instrument calibration range and required dilution.
- EST** Result reported as an Estimated Value. Compound failed initial calibration criteria.
- H-01** This sample was analyzed outside the recommended holding time.
- Q-50** Due to instrument malfunction, not all Batch QC samples were analyzed. The batch is accepted based on the recoveries of the Blank Spike (BS).
- Q-54** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +11%. The results are reported as Estimated Values.
- Q-54a** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +15%. The results are reported as Estimated Values.
- Q-54b** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by +19%. The results are reported as Estimated Values.
- Q-54f** Daily Continuing Calibration Verification recovery for this analyte failed the +/-20% criteria listed in EPA method 8260C/8270D by -50%. The results are reported as Estimated Values.
- Q-55** Daily CCV/LCS recovery for this analyte was below the +/-20% criteria listed in EPA 8260C, however there is adequate sensitivity to ensure detection at the reporting level.
- Q-56** Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C

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Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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REPORTING NOTES AND CONVENTIONS:

Abbreviations:

- DET Analyte DETECTED at or above the detection or reporting limit.
- ND Analyte NOT DETECTED at or above the detection or reporting limit.
- NR Result Not Reported
- RPD Relative Percent Difference

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

- Basis: Results for soil samples are generally reported on a 100% dry weight basis. The Result Basis is listed following the units as "dry", "wet", or "" (blank) designation.
 - "dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.
 - "wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.
 - "" Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) are not included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

- " --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.
- " *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to 1/2 the Reporting Limit (RL).
-For Blank hits falling between 1/2 the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a 'B' qualifier, per Apex Laboratories' Blank Policy.
For further details, please request a copy of this document.



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the blank results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.

Apex Laboratories maintains detailed records on sample receipt, including client label verification, cooler temperature, sample preservation, hold time compliance and field filtration. Data is qualified as necessary, and the lack of qualification indicates compliance with required parameters.

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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LABORATORY ACCREDITATION INFORMATION

TNI Certification ID: OR100062 (Primary Accreditation) - EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation
<u>All reported analytes are included in Apex Laboratories' current ORELAP scope.</u>					

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation. Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provided by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.

Cascadia Associates Project: **Shore Terminal-Vancouver**
 6915 SW Macadam, Suite 250 Project Number: **Nustar Van. 4Q18**
 Portland, OR 97219 Project Manager: **Stephanie Salisbury** Report ID:
 A8L0222 - 12 19 18 1351

APEX LABS **CHAIN OF CUSTODY** Lab # A910222 COC # of _____

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

Company: Cascadia Associates Project Mgr: Stephanie Salisbury Project Name: Nustar VAN 4Q18 PO# _____
 Address: 6915 SW Macadam Ave Phone: _____ Project # _____
 Sampled by: Lindsay Wallis Email: S.Salisbury@CascadiaAssociates.com

Site Location: OR (WA) Other: _____
 SAMPLE ID: _____

LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-DX	NWTPH-CX	8260 VOCs Full List	8260 RBDM VOCs	8260 HVOCs	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TTO	R CRA Metals (8)	TCLP Metals (8)	As, Sb, Ar, Ba, Be, Cd, Cr, Cu, Pb, Fe, Hg, Mn, Ni, Se, Zn, Zn	1200-COLS	1200-Z	
MW-9	12/7/08	1045	W	5					X											X	Ammonia Nitrate / Nitrite
MW-5																					
MW-5		0930																			
MW-8		1030																			
MW-3		1220																			
TRIP Blank		1320																			

Normal Turn Around Time (TAT) = 10 Business Days YES NO

TAT Requested (circle): 1 Day 2 Day 3 Day 4 Day 5 Day Other: _____

SPECIAL INSTRUCTIONS: _____

RELINQUISHED BY: Signature: Lindsay Wallis Date: 12/7/08
 RECEIVED BY: Signature: Stephanie Salisbury Date: 12/7/08
 Signature: _____ Date: _____
 Printed Name: Lindsay Wallis Time: 1520 Printed Name: Stephanie Salisbury Time: 1520
 Company: Cascadia Company: Apex

Lisa Domenighini



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van. 4Q18 Project Manager: Stephanie Salisbury	Report ID: A8L0222 - 12 19 18 1351
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APEX LABS COOLER RECEIPT FORM

Client: Cascadia Element WO#: A8 L0222
 Project/Project #: Nustar VAN 4Q18

Delivery Info:
 Date/time received: 12/7/18 @ 1520 By: CFH
 Delivered by: Apex Client ESS FedEx UPS Swift Senvoy SDS Other

Cooler Inspection Date/time inspected: 12/7/18 @ 1738 By: CFH
 Chain of Custody included? Yes No Custody seals? Yes No
 Signed/dated by client? Yes No
 Signed/dated by Apex? Yes No

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (°C)	<u>1.0</u>						
Received on ice? (Y/N)	<u>Y</u>						
Temp. blanks? (Y/N)	<u>Y</u>						
Ice type: (Gel/Real/Other)	<u>Real</u>						
Condition:	<u>Good</u>						

Cooler out of temp? (Y/N) Possible reason why: _____
 If some coolers are in temp and some out, were green dots applied to out of temperature samples? Yes/No/NA
 Out of temperature samples form initiated? Yes/No/NA

Samples Inspection: Date/time inspected: 12/7/18 @ 1825 By: OB
 All samples intact? Yes No Comments: _____

Bottle labels/COCs agree? Yes No Comments: MW-7 Dup provided, not listed on WC. DIT on conts. rec'd 12-7-18 @ 0930.
 COC/container discrepancies form initiated? Yes No NA
 Containers/volumes received appropriate for analysis? Yes No Comments: _____

Do VOA vials have visible headspace? Yes No NA
 Comments: _____
 Water samples: pH checked: Yes No NA pH appropriate? Yes No NA
 Comments: _____

Additional information: TB # 1935

Labeled by: OB Witness: AKC Cooler Inspected by: OB See Project Contact Form



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Monday, December 31, 2018

Stephanie Salisbury
Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

RE: A8L0249 - Shore Terminal-Vancouver - Nustar Van 4Q2018

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A8L0249, which was received by the laboratory on 12/10/2018 at 12:00:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of final reporting, unless prior arrangements have been made.

Cooler Receipt Information

(See Cooler Receipt Form for details)

Cooler #1 5.1 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.

All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.



Apex Laboratories

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Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

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503-718-2323
EPA ID: OR01039

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver
Project Number: Nustar Van 4Q2018
Project Manager: Stephanie Salisbury

Report ID:
A8L0249 - 12 31 18 1408

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-24d	A8L0249-01	Water	12/10/18 08:00	12/10/18 12:00
MW-32s	A8L0249-02	Water	12/10/18 08:40	12/10/18 12:00
MGMS2-40	A8L0249-03	Water	12/10/18 09:15	12/10/18 12:00
MGMS2-60	A8L0249-04	Water	12/10/18 09:40	12/10/18 12:00
MGMS3-40	A8L0249-05	Water	12/10/18 10:10	12/10/18 12:00
MGMS3-60	A8L0249-06	Water	12/10/18 10:40	12/10/18 12:00
Trip Blank	A8L0249-07	Water	12/10/18 00:00	12/10/18 12:00

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Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates

6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver

Project Number: Nustar Van 4Q2018

Project Manager: Stephanie Salisbury

Report ID:

A8L0249 - 12 31 18 1408

ANALYTICAL CASE NARRATIVE

Work Order: A8L0249

Subcontract

This report is not complete without the attached subcontract laboratory report for RSK 175 from Air Technology Labs.

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van 4Q2018 Project Manager: Stephanie Salisbury	Report ID: A8L0249 - 12 31 18 1408
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24d (A8L0249-01)				Matrix: Water		Batch: 8120634		
Bromobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	EST
Chloroform	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/11/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/11/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24d (A8L0249-01)				Matrix: Water		Batch: 8120634		
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/11/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/11/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/11/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/11/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 109 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/11/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/11/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>96 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/11/18</i>	<i>EPA 8260C</i>

MW-32s (A8L0249-02)				Matrix: Water		Batch: 8120678		
Bromobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,1-Dichloroethane	0.860	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
cis-1,2-Dichloroethene	16.5	---	0.400	ug/L	1	12/12/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-32s (A8L0249-02)				Matrix: Water		Batch: 8120678		
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/12/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Tetrachloroethene (PCE)	14.7	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Trichloroethene (TCE)	5.99	---	0.400	ug/L	1	12/12/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>

MGMS2-40 (A8L0249-03)				Matrix: Water		Batch: 8120678		
Bromobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van 4Q2018 Project Manager: Stephanie Salisbury	Report ID: A8L0249 - 12 31 18 1408
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-40 (A8L0249-03)				Matrix: Water		Batch: 8120678		
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,1-Dichloroethane	20.9	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1-Dichloroethene	0.563	---	0.400	ug/L	1	12/12/18	EPA 8260C	
cis-1,2-Dichloroethene	24.9	---	0.400	ug/L	1	12/12/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/12/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Tetrachloroethene (PCE)	18.7	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Trichloroethene (TCE)	12.0	---	0.400	ug/L	1	12/12/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Vinyl chloride	123	---	0.400	ug/L	1	12/12/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>98 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>

MGMS2-60 (A8L0249-04)				Matrix: Water		Batch: 8120678		
Bromobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-60 (A8L0249-04)				Matrix: Water		Batch: 8120678		
Chlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,1-Dichloroethane	2.26	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1-Dichloroethene	0.432	---	0.400	ug/L	1	12/12/18	EPA 8260C	
cis-1,2-Dichloroethene	41.7	---	0.400	ug/L	1	12/12/18	EPA 8260C	
trans-1,2-Dichloroethene	0.431	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/12/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Tetrachloroethene (PCE)	36.1	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Trichloroethene (TCE)	20.7	---	0.400	ug/L	1	12/12/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Vinyl chloride	4.35	---	0.400	ug/L	1	12/12/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van 4Q2018 Project Manager: Stephanie Salisbury	Report ID: A8L0249 - 12 31 18 1408
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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-60 (A8L0249-04)				Matrix: Water		Batch: 8120678		
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>	<i>Limits: 80-120 %</i>	<i>1</i>	<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>	
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>	<i>80-120 %</i>	<i>1</i>	<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>	
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>	<i>80-120 %</i>	<i>1</i>	<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>	

MGMS3-40 (A8L0249-05)				Matrix: Water		Batch: 8120678		
Bromobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,1-Dichloroethane	1.54	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
cis-1,2-Dichloroethene	1.77	---	0.400	ug/L	1	12/12/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/12/18	EPA 8260C	

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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-40 (A8L0249-05)				Matrix: Water		Batch: 8120678		
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Tetrachloroethene (PCE)	0.603	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Vinyl chloride	5.44	---	0.400	ug/L	1	12/12/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 107 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>

MGMS3-60 (A8L0249-06)				Matrix: Water		Batch: 8120678		
Bromobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,1-Dichloroethane	1.21	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	

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Lisa Domenighini, Client Services Manager



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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS3-60 (A8L0249-06)				Matrix: Water		Batch: 8120678		
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
cis-1,2-Dichloroethene	17.7	---	0.400	ug/L	1	12/12/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/12/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Tetrachloroethene (PCE)	0.919	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Trichloroethene (TCE)	1.16	---	0.400	ug/L	1	12/12/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Vinyl chloride	0.857	---	0.400	ug/L	1	12/12/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 105 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>105 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>97 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>

Trip Blank (A8L0249-07)				Matrix: Water		Batch: 8120678		
Bromobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Bromochloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromodichloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromoform	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Bromomethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Carbon tetrachloride	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Chlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Chloroethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Chloroform	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Chloromethane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
2-Chlorotoluene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	

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ANALYTICAL SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
Trip Blank (A8L0249-07)				Matrix: Water		Batch: 8120678		
4-Chlorotoluene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Dibromochloromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Dibromomethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	12/12/18	EPA 8260C	
Methylene chloride	ND	---	3.00	ug/L	1	12/12/18	EPA 8260C	
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	12/12/18	EPA 8260C	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	12/12/18	EPA 8260C	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	12/12/18	EPA 8260C	
Vinyl chloride	ND	---	0.400	ug/L	1	12/12/18	EPA 8260C	
<i>Surrogate: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>
<i>4-Bromofluorobenzene (Surr)</i>		<i>99 %</i>		<i>80-120 %</i>		<i>1</i>	<i>12/12/18</i>	<i>EPA 8260C</i>

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ANALYTICAL SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24d (A8L0249-01RE1)				Matrix: Water			Batch: 8120753	
Ammonia as N	0.993	---	0.0200	mg/L	1	12/13/18	SM 4500-NH3 G	
MW-32s (A8L0249-02)				Matrix: Water			Batch: 8120753	
Ammonia as N	0.0690	---	0.0200	mg/L	1	12/13/18	SM 4500-NH3 G	
MGMS2-40 (A8L0249-03)				Matrix: Water			Batch: 8120753	
Ammonia as N	80.7	---	1.00	mg/L	50	12/13/18	SM 4500-NH3 G	
MGMS2-60 (A8L0249-04)				Matrix: Water			Batch: 8120753	
Ammonia as N	1.39	---	0.0200	mg/L	1	12/13/18	SM 4500-NH3 G	
MGMS3-40 (A8L0249-05)				Matrix: Water			Batch: 8120753	
Ammonia as N	1.04	---	0.0200	mg/L	1	12/13/18	SM 4500-NH3 G	
MGMS3-60 (A8L0249-06)				Matrix: Water			Batch: 8120753	
Ammonia as N	ND	---	0.0200	mg/L	1	12/13/18	SM 4500-NH3 G	

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ANALYTICAL SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MW-24d (A8L0249-01)				Matrix: Water				
Batch: 8120577								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/10/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/10/18	EPA 300.0	
MW-32s (A8L0249-02)				Matrix: Water				
Batch: 8120577								
Nitrate-Nitrogen	1.81	---	0.250	mg/L	1	12/10/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/10/18	EPA 300.0	
MGMS2-40 (A8L0249-03)				Matrix: Water				
Batch: 8120577								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/10/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/10/18	EPA 300.0	
MGMS2-60 (A8L0249-04)				Matrix: Water				
Batch: 8120577								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/10/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/10/18	EPA 300.0	
MGMS3-40 (A8L0249-05)				Matrix: Water				
Batch: 8120577								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/10/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/10/18	EPA 300.0	
MGMS3-60 (A8L0249-06)				Matrix: Water				
Batch: 8120577								
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	12/10/18	EPA 300.0	
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	12/10/18	EPA 300.0	



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ANALYTICAL SAMPLE RESULTS

Demand Parameters

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
MGMS2-40 (A8L0249-03)				Matrix: Water				
Batch: 8120766								
Total Organic Carbon	5.08	---	1.00	mg/L	1	12/14/18	SM 5310 C	
MGMS3-40 (A8L0249-05)				Matrix: Water				
Batch: 8120766								
Total Organic Carbon	3.42	---	1.00	mg/L	1	12/14/18	SM 5310 C	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120634 - EPA 5030B						Water						
Blank (8120634-BLK1)		Prepared: 12/11/18 12:33			Analyzed: 12/11/18 13:54							
EPA 8260C												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	EST
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	

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Lisa Domenighini, Client Services Manager



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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120634 - EPA 5030B												
Water												
Blank (8120634-BLK1)	Prepared: 12/11/18 12:33 Analyzed: 12/11/18 13:54											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 108 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	97 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	96 %		80-120 %		"							

LCS (8120634-BS1)												
Prepared: 12/11/18 12:33 Analyzed: 12/11/18 13:00												
EPA 8260C												
Bromobenzene	19.1	---	0.500	ug/L	1	20.0	---	96	80-120%	---	---	
Bromochloromethane	23.5	---	1.00	ug/L	1	20.0	---	118	80-120%	---	---	
Bromodichloromethane	21.6	---	1.00	ug/L	1	20.0	---	108	80-120%	---	---	
Bromoform	21.5	---	1.00	ug/L	1	20.0	---	107	80-120%	---	---	
Bromomethane	15.0	---	5.00	ug/L	1	20.0	---	75	80-120%	---	---	Q-55
Carbon tetrachloride	20.9	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
Chlorobenzene	19.1	---	0.500	ug/L	1	20.0	---	95	80-120%	---	---	
Chloroethane	13.4	---	5.00	ug/L	1	20.0	---	67	80-120%	---	---	EST, Q-55
Chloroform	21.1	---	1.00	ug/L	1	20.0	---	106	80-120%	---	---	
Chloromethane	28.9	---	5.00	ug/L	1	20.0	---	144	80-120%	---	---	Q-56
2-Chlorotoluene	18.4	---	1.00	ug/L	1	20.0	---	92	80-120%	---	---	
4-Chlorotoluene	18.2	---	1.00	ug/L	1	20.0	---	91	80-120%	---	---	
Dibromochloromethane	20.5	---	1.00	ug/L	1	20.0	---	102	80-120%	---	---	
1,2-Dibromo-3-chloropropane	17.4	---	5.00	ug/L	1	20.0	---	87	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.0	---	0.500	ug/L	1	20.0	---	95	80-120%	---	---	
Dibromomethane	22.1	---	1.00	ug/L	1	20.0	---	110	80-120%	---	---	
1,2-Dichlorobenzene	19.1	---	0.500	ug/L	1	20.0	---	95	80-120%	---	---	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120634 - EPA 5030B												
Water												
LCS (8120634-BS1)	Prepared: 12/11/18 12:33 Analyzed: 12/11/18 13:00											
1,3-Dichlorobenzene	18.7	---	0.500	ug/L	1	20.0	---	93	80-120%	---	---	
1,4-Dichlorobenzene	18.8	---	0.500	ug/L	1	20.0	---	94	80-120%	---	---	
Dichlorodifluoromethane	20.9	---	1.00	ug/L	1	20.0	---	105	80-120%	---	---	
1,1-Dichloroethane	20.9	---	0.400	ug/L	1	20.0	---	105	80-120%	---	---	
1,2-Dichloroethane (EDC)	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
1,1-Dichloroethene	21.0	---	0.400	ug/L	1	20.0	---	105	80-120%	---	---	
cis-1,2-Dichloroethene	20.4	---	0.400	ug/L	1	20.0	---	102	80-120%	---	---	
trans-1,2-Dichloroethene	20.9	---	0.400	ug/L	1	20.0	---	104	80-120%	---	---	
1,2-Dichloropropane	21.5	---	0.500	ug/L	1	20.0	---	107	80-120%	---	---	
1,3-Dichloropropane	19.6	---	1.00	ug/L	1	20.0	---	98	80-120%	---	---	
2,2-Dichloropropane	18.7	---	1.00	ug/L	1	20.0	---	93	80-120%	---	---	
1,1-Dichloropropene	20.2	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
cis-1,3-Dichloropropene	19.1	---	1.00	ug/L	1	20.0	---	96	80-120%	---	---	
trans-1,3-Dichloropropene	18.4	---	1.00	ug/L	1	20.0	---	92	80-120%	---	---	
Hexachlorobutadiene	17.6	---	5.00	ug/L	1	20.0	---	88	80-120%	---	---	
Methylene chloride	22.7	---	3.00	ug/L	1	20.0	---	114	80-120%	---	---	
1,1,1,2-Tetrachloroethane	19.8	---	0.400	ug/L	1	20.0	---	99	80-120%	---	---	
1,1,2,2-Tetrachloroethane	21.1	---	0.500	ug/L	1	20.0	---	106	80-120%	---	---	
Tetrachloroethene (PCE)	19.2	---	0.400	ug/L	1	20.0	---	96	80-120%	---	---	
1,2,3-Trichlorobenzene	18.4	---	2.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,2,4-Trichlorobenzene	18.1	---	2.00	ug/L	1	20.0	---	90	80-120%	---	---	
1,1,1-Trichloroethane	20.0	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
1,1,2-Trichloroethane	20.0	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Trichloroethene (TCE)	19.9	---	0.400	ug/L	1	20.0	---	100	80-120%	---	---	
Trichlorofluoromethane	20.9	---	2.00	ug/L	1	20.0	---	104	80-120%	---	---	
1,2,3-Trichloropropane	18.8	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
Vinyl chloride	16.9	---	0.400	ug/L	1	20.0	---	84	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr)	Recovery: 109 %		Limits: 80-120 %		Dilution: 1x							
Toluene-d8 (Surr)	98 %		80-120 %		"							
4-Bromofluorobenzene (Surr)	94 %		80-120 %		"							

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120678 - EPA 5030B						Water						
Blank (8120678-BLK1)		Prepared: 12/12/18 14:15			Analyzed: 12/12/18 16:08							
<u>EPA 8260C</u>												
Bromobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Bromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromodichloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromoform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Bromomethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Chloroethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Chloroform	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Chloromethane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Dibromochloromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dibromomethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	---	---	---	---	---	---
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	---
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	---	---	---	---	---	---
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	---	---	---	---	---	---
Methylene chloride	ND	---	3.00	ug/L	1	---	---	---	---	---	---	---

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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120678 - EPA 5030B												
Water												
Blank (8120678-BLK1)	Prepared: 12/12/18 14:15 Analyzed: 12/12/18 16:08											
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Tetrachloroethene (PCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	---	---	---	---	---	
Trichloroethene (TCE)	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	---	---	---	---	---	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	---	---	---	---	---	
Vinyl chloride	ND	---	0.400	ug/L	1	---	---	---	---	---	---	
<i>Surr: 1,4-Difluorobenzene (Surr)</i>		<i>Recovery: 106 %</i>		<i>Limits: 80-120 %</i>		<i>Dilution: 1x</i>						
<i>Toluene-d8 (Surr)</i>		<i>104 %</i>		<i>80-120 %</i>		<i>"</i>						
<i>4-Bromofluorobenzene (Surr)</i>		<i>100 %</i>		<i>80-120 %</i>		<i>"</i>						

LCS (8120678-BS1)	Prepared: 12/12/18 14:15 Analyzed: 12/12/18 14:43											A-01
EPA 8260C												
Bromobenzene	19.9	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	
Bromochloromethane	14.5	---	1.00	ug/L	1	20.0	---	72	80-120%	---	---	Q-55
Bromodichloromethane	19.4	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
Bromoform	28.6	---	1.00	ug/L	1	20.0	---	143	80-120%	---	---	Q-56
Bromomethane	7.32	---	5.00	ug/L	1	20.0	---	37	80-120%	---	---	Q-55
Carbon tetrachloride	20.2	---	1.00	ug/L	1	20.0	---	101	80-120%	---	---	
Chlorobenzene	20.7	---	0.500	ug/L	1	20.0	---	104	80-120%	---	---	
Chloroethane	18.5	---	5.00	ug/L	1	20.0	---	92	80-120%	---	---	
Chloroform	18.9	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
Chloromethane	21.4	---	5.00	ug/L	1	20.0	---	107	80-120%	---	---	
2-Chlorotoluene	19.3	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
4-Chlorotoluene	17.7	---	1.00	ug/L	1	20.0	---	88	80-120%	---	---	
Dibromochloromethane	24.3	---	1.00	ug/L	1	20.0	---	122	80-120%	---	---	Q-56
1,2-Dibromo-3-chloropropane	18.3	---	5.00	ug/L	1	20.0	---	92	80-120%	---	---	
1,2-Dibromoethane (EDB)	19.5	---	0.500	ug/L	1	20.0	---	98	80-120%	---	---	
Dibromomethane	19.5	---	1.00	ug/L	1	20.0	---	97	80-120%	---	---	
1,2-Dichlorobenzene	19.9	---	0.500	ug/L	1	20.0	---	99	80-120%	---	---	

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Lisa Domenighini, Client Services Manager



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**
Project Number: **Nustar Van 4Q2018**
Project Manager: **Stephanie Salisbury**

Report ID:
A8L0249 - 12 31 18 1408

QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120678 - EPA 5030B												
						Water						
LCS (8120678-BS1)	Prepared: 12/12/18 14:15					Analyzed: 12/12/18 14:43					A-01	
1,3-Dichlorobenzene	20.6	---	0.500	ug/L	1	20.0	---	103	80-120%	---	---	
1,4-Dichlorobenzene	19.9	---	0.500	ug/L	1	20.0	---	100	80-120%	---	---	
Dichlorodifluoromethane	11.6	---	1.00	ug/L	1	20.0	---	58	80-120%	---	---	Q-55
1,1-Dichloroethane	17.8	---	0.400	ug/L	1	20.0	---	89	80-120%	---	---	
1,2-Dichloroethane (EDC)	16.5	---	0.400	ug/L	1	20.0	---	83	80-120%	---	---	
1,1-Dichloroethene	16.6	---	0.400	ug/L	1	20.0	---	83	80-120%	---	---	
cis-1,2-Dichloroethene	16.3	---	0.400	ug/L	1	20.0	---	82	80-120%	---	---	
trans-1,2-Dichloroethene	17.3	---	0.400	ug/L	1	20.0	---	87	80-120%	---	---	
1,2-Dichloropropane	17.1	---	0.500	ug/L	1	20.0	---	86	80-120%	---	---	
1,3-Dichloropropane	18.7	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
2,2-Dichloropropane	16.8	---	1.00	ug/L	1	20.0	---	84	80-120%	---	---	
1,1-Dichloropropene	18.2	---	1.00	ug/L	1	20.0	---	91	80-120%	---	---	
cis-1,3-Dichloropropene	18.4	---	1.00	ug/L	1	20.0	---	92	80-120%	---	---	
trans-1,3-Dichloropropene	18.7	---	1.00	ug/L	1	20.0	---	94	80-120%	---	---	
Hexachlorobutadiene	20.4	---	5.00	ug/L	1	20.0	---	102	80-120%	---	---	
Methylene chloride	20.3	---	3.00	ug/L	1	20.0	---	102	80-120%	---	---	
1,1,1,2-Tetrachloroethane	22.4	---	0.400	ug/L	1	20.0	---	112	80-120%	---	---	
1,1,2,2-Tetrachloroethane	18.7	---	0.500	ug/L	1	20.0	---	94	80-120%	---	---	
Tetrachloroethene (PCE)	22.2	---	0.400	ug/L	1	20.0	---	111	80-120%	---	---	
1,2,3-Trichlorobenzene	18.3	---	2.00	ug/L	1	20.0	---	91	80-120%	---	---	
1,2,4-Trichlorobenzene	17.6	---	2.00	ug/L	1	20.0	---	88	80-120%	---	---	
1,1,1-Trichloroethane	17.6	---	0.400	ug/L	1	20.0	---	88	80-120%	---	---	
1,1,2-Trichloroethane	20.5	---	0.500	ug/L	1	20.0	---	102	80-120%	---	---	
Trichloroethene (TCE)	19.7	---	0.400	ug/L	1	20.0	---	98	80-120%	---	---	
Trichlorofluoromethane	23.5	---	2.00	ug/L	1	20.0	---	118	80-120%	---	---	
1,2,3-Trichloropropane	18.6	---	1.00	ug/L	1	20.0	---	93	80-120%	---	---	
Vinyl chloride	18.6	---	0.400	ug/L	1	20.0	---	93	80-120%	---	---	
Surr: 1,4-Difluorobenzene (Surr) Recovery: 100 % Limits: 80-120 % Dilution: 1x												
Toluene-d8 (Surr) 101 % 80-120 % "												
4-Bromofluorobenzene (Surr) 98 % 80-120 % "												

Duplicate (8120678-DUP1) Prepared: 12/12/18 15:56 Analyzed: 12/12/18 21:03

QC Source Sample: MGMS2-40 (A8L0249-03)

EPA 8260C

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van 4Q2018 Project Manager: Stephanie Salisbury	Report ID: A8L0249 - 12 31 18 1408
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120678 - EPA 5030B												
Water												
Duplicate (8120678-DUP1)			Prepared: 12/12/18 15:56 Analyzed: 12/12/18 21:03									
QC Source Sample: MGMS2-40 (A8L0249-03)												
Bromobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Bromochloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromodichloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromoform	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Bromomethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Carbon tetrachloride	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Chlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Chloroethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Chloroform	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Chloromethane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
2-Chlorotoluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
4-Chlorotoluene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Dibromochloromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromo-3-chloropropane	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dibromoethane (EDB)	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Dibromomethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,2-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,3-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,4-Dichlorobenzene	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Dichlorodifluoromethane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloroethane	21.3	---	0.400	ug/L	1	---	20.9	---	---	2	30%	
1,2-Dichloroethane (EDC)	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloroethene	0.602	---	0.400	ug/L	1	---	0.563	---	---	7	30%	
cis-1,2-Dichloroethene	26.5	---	0.400	ug/L	1	---	24.9	---	---	6	30%	
trans-1,2-Dichloroethene	ND	---	0.400	ug/L	1	---	0.229	---	---	***	30%	
1,2-Dichloropropane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
1,3-Dichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
2,2-Dichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
1,1-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
cis-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
trans-1,3-Dichloropropene	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Hexachlorobutadiene	ND	---	5.00	ug/L	1	---	ND	---	---	---	30%	
Methylene chloride	ND	---	3.00	ug/L	1	---	ND	---	---	---	30%	

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van 4Q2018 Project Manager: Stephanie Salisbury	Report ID: A8L0249 - 12 31 18 1408
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QUALITY CONTROL (QC) SAMPLE RESULTS

Halogenated Volatile Organic Compounds by EPA 8260C

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120678 - EPA 5030B						Water						
Duplicate (8120678-DUP1)			Prepared: 12/12/18 15:56			Analyzed: 12/12/18 21:03						
QC Source Sample: MGMS2-40 (A8L0249-03)												
1,1,1,2-Tetrachloroethane	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1,2,2-Tetrachloroethane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Tetrachloroethene (PCE)	20.3	---	0.400	ug/L	1	---	18.7	---	---	8	30%	
1,2,3-Trichlorobenzene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,2,4-Trichlorobenzene	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,1,1-Trichloroethane	ND	---	0.400	ug/L	1	---	ND	---	---	---	30%	
1,1,2-Trichloroethane	ND	---	0.500	ug/L	1	---	ND	---	---	---	30%	
Trichloroethene (TCE)	12.8	---	0.400	ug/L	1	---	12.0	---	---	6	30%	
Trichlorofluoromethane	ND	---	2.00	ug/L	1	---	ND	---	---	---	30%	
1,2,3-Trichloropropane	ND	---	1.00	ug/L	1	---	ND	---	---	---	30%	
Vinyl chloride	129	---	0.400	ug/L	1	---	123	---	---	5	30%	

<i>Surr: 1,4-Difluorobenzene (Surr)</i>	<i>Recovery: 105 %</i>	<i>Limits: 80-120 %</i>	<i>Dilution: 1x</i>
<i>Toluene-d8 (Surr)</i>	<i>104 %</i>	<i>80-120 %</i>	<i>"</i>
<i>4-Bromofluorobenzene (Surr)</i>	<i>98 %</i>	<i>80-120 %</i>	<i>"</i>



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van 4Q2018 Project Manager: Stephanie Salisbury	Report ID: A8L0249 - 12 31 18 1408
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QUALITY CONTROL (QC) SAMPLE RESULTS

Ammonia by Gas Diffusion and Colorimetric Detection

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120753 - Method Prep: Aq						Water						
Blank (8120753-BLK1)		Prepared: 12/13/18 13:46 Analyzed: 12/13/18 17:59										
SM 4500-NH3 G												
Ammonia as N	ND	---	0.0200	mg/L	1	---	---	---	---	---	---	
LCS (8120753-BS1)		Prepared: 12/13/18 13:46 Analyzed: 12/13/18 18:00										
SM 4500-NH3 G												
Ammonia as N	2.11	---	0.0200	mg/L	1	2.00	---	106	90-110%	---	---	



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van 4Q2018 Project Manager: Stephanie Salisbury	Report ID: A8L0249 - 12 31 18 1408
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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by Ion Chromatography

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120577 - Method Prep: Aq						Water						
Blank (8120577-BLK1)		Prepared: 12/10/18 09:20		Analyzed: 12/10/18 12:22								
EPA 300.0												
Nitrate-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
Nitrite-Nitrogen	ND	---	0.250	mg/L	1	---	---	---	---	---	---	---
LCS (8120577-BS1)		Prepared: 12/10/18 09:20		Analyzed: 12/10/18 12:44								
EPA 300.0												
Nitrate-Nitrogen	2.10	---	0.250	mg/L	1	2.00	---	105	90-110%	---	---	---
Nitrite-Nitrogen	2.04	---	0.250	mg/L	1	2.00	---	102	90-110%	---	---	---



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van 4Q2018 Project Manager: Stephanie Salisbury	Report ID: A8L0249 - 12 31 18 1408
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QUALITY CONTROL (QC) SAMPLE RESULTS

Demand Parameters

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 8120766 - Method Prep: Aq						Water						
Blank (8120766-BLK1)		Prepared: 12/13/18 17:42 Analyzed: 12/13/18 21:27										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	---	---	---	---	---	---	---
LCS (8120766-BS1)		Prepared: 12/13/18 17:42 Analyzed: 12/13/18 21:56										
SM 5310 C												
Total Organic Carbon	10.3	---	1.00	mg/L	1	10.0	---	103	85-115%	---	---	---
LCS (8120766-BS2)		Prepared: 12/13/18 17:42 Analyzed: 12/13/18 22:36										
SM 5310 C												
Total Organic Carbon	ND	---	1.00	mg/L	1	0.00	---		85-115%	---	---	TOC_I



Cascadia Associates

6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**

Project Number: **Nustar Van 4Q2018**
Project Manager: **Stephanie Salisbury**

Report ID:

A8L0249 - 12 31 18 1408

SAMPLE PREPARATION INFORMATION

Halogenated Volatile Organic Compounds by EPA 8260C

Prep: EPA 5030B

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8120634</u>							
A8L0249-01	Water	EPA 8260C	12/10/18 08:00	12/11/18 14:12	5mL/5mL	5mL/5mL	1.00
<u>Batch: 8120678</u>							
A8L0249-02	Water	EPA 8260C	12/10/18 08:40	12/12/18 15:56	5mL/5mL	5mL/5mL	1.00
A8L0249-03	Water	EPA 8260C	12/10/18 09:15	12/12/18 15:56	5mL/5mL	5mL/5mL	1.00
A8L0249-04	Water	EPA 8260C	12/10/18 09:40	12/12/18 15:56	5mL/5mL	5mL/5mL	1.00
A8L0249-05	Water	EPA 8260C	12/10/18 10:10	12/12/18 15:56	5mL/5mL	5mL/5mL	1.00
A8L0249-06	Water	EPA 8260C	12/10/18 10:40	12/12/18 15:56	5mL/5mL	5mL/5mL	1.00
A8L0249-07	Water	EPA 8260C	12/10/18 00:00	12/12/18 15:56	5mL/5mL	5mL/5mL	1.00

Ammonia by Gas Diffusion and Colorimetric Detection

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8120753</u>							
A8L0249-01RE1	Water	SM 4500-NH3 G	12/10/18 08:00	12/13/18 13:46	10mL/10mL	10mL/10mL	1.00
A8L0249-02	Water	SM 4500-NH3 G	12/10/18 08:40	12/13/18 13:46	10mL/10mL	10mL/10mL	1.00
A8L0249-03	Water	SM 4500-NH3 G	12/10/18 09:15	12/13/18 13:46	10mL/10mL	10mL/10mL	1.00
A8L0249-04	Water	SM 4500-NH3 G	12/10/18 09:40	12/13/18 13:46	10mL/10mL	10mL/10mL	1.00
A8L0249-05	Water	SM 4500-NH3 G	12/10/18 10:10	12/13/18 13:46	10mL/10mL	10mL/10mL	1.00
A8L0249-06	Water	SM 4500-NH3 G	12/10/18 10:40	12/13/18 13:46	10mL/10mL	10mL/10mL	1.00

Anions by Ion Chromatography

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8120577</u>							
A8L0249-01	Water	EPA 300.0	12/10/18 08:00	12/10/18 14:00	5mL/5mL	5mL/5mL	1.00
A8L0249-02	Water	EPA 300.0	12/10/18 08:40	12/10/18 14:00	5mL/5mL	5mL/5mL	1.00
A8L0249-03	Water	EPA 300.0	12/10/18 09:15	12/10/18 14:00	5mL/5mL	5mL/5mL	1.00
A8L0249-04	Water	EPA 300.0	12/10/18 09:40	12/10/18 14:00	5mL/5mL	5mL/5mL	1.00
A8L0249-05	Water	EPA 300.0	12/10/18 10:10	12/10/18 14:00	5mL/5mL	5mL/5mL	1.00
A8L0249-06	Water	EPA 300.0	12/10/18 10:40	12/10/18 14:00	5mL/5mL	5mL/5mL	1.00

Demand Parameters

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Apex Laboratories, LLC

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates

6915 SW Macadam, Suite 250
Portland, OR 97219

Project: **Shore Terminal-Vancouver**

Project Number: **Nustar Van 4Q2018**

Project Manager: **Stephanie Salisbury**

Report ID:

A8L0249 - 12 31 18 1408

SAMPLE PREPARATION INFORMATION

Demand Parameters

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
<u>Batch: 8120766</u>							
A8L0249-03	Water	SM 5310 C	12/10/18 09:15	12/13/18 17:42	40mL/40mL	40mL/40mL	1.00
A8L0249-05	Water	SM 5310 C	12/10/18 10:10	12/13/18 17:42	40mL/40mL	40mL/40mL	1.00

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12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323
EPA ID: OR01039

Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver
Project Number: Nustar Van 4Q2018
Project Manager: Stephanie Salisbury

Report ID:
A8L0249 - 12 31 18 1408

QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

Apex Laboratories

- A-01** MS was not spiked. The batch is accepted based on the recoveries of the CCV and BS recoveries.
- EST** Result reported as an Estimated Value. Compound failed initial calibration criteria.
- Q-55** Daily CCV/LCS recovery for this analyte was below the +/-20% criteria listed in EPA 8260C, however there is adequate sensitivity to ensure detection at the reporting level.
- Q-56** Daily CCV/LCS recovery for this analyte was above the +/-20% criteria listed in EPA 8260C
- TOC_I** Inorganic Carbon Spike Check. Results are valid if Non Detect (No Inorganic Carbon detected.)

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REPORTING NOTES AND CONVENTIONS:

Abbreviations:

- DET Analyte DETECTED at or above the detection or reporting limit.
- ND Analyte NOT DETECTED at or above the detection or reporting limit.
- NR Result Not Reported
- RPD Relative Percent Difference

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

- Basis: Results for soil samples are generally reported on a 100% dry weight basis. The Result Basis is listed following the units as "dry", "wet", or "" (blank) designation.
 - "dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.
 - "wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.
 - "" Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) are not included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

- " --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.
- " *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to 1/2 the Reporting Limit (RL).
-For Blank hits falling between 1/2 the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a 'B' qualifier, per Apex Laboratories' Blank Policy.
For further details, please request a copy of this document.

Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van 4Q2018 Project Manager: Stephanie Salisbury	Report ID: A8L0249 - 12 31 18 1408
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REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the blank results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.

Apex Laboratories maintains detailed records on sample receipt, including client label verification, cooler temperature, sample preservation, hold time compliance and field filtration. Data is qualified as necessary, and the lack of qualification indicates compliance with required parameters.

Apex Laboratories

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Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van 4Q2018 Project Manager: Stephanie Salisbury	Report ID: A8L0249 - 12 31 18 1408
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LABORATORY ACCREDITATION INFORMATION

TNI Certification ID: OR100062 (Primary Accreditation) - EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation
<u>All reported analytes are included in Apex Laboratories' current ORELAP scope.</u>					

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation. Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provided by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.



Cascadia Associates
6915 SW Macadam, Suite 250
Portland, OR 97219

Project: Shore Terminal-Vancouver
Project Number: Nustar Van 4Q2018
Project Manager: Stephanie Salisbury

Report ID:
A8L0249 - 12 31 18 1408

CHAIN OF CUSTODY

Lab # A8L0249 of _____

PO# _____ Project # _____

Company: Cascadia Associates Project Mgr: Stephanie Salisbury Email: S.Salisbury@cascadiaassoc.com

Address: 6915 SW Macadam Ave Phone: _____ Project Name: Nustar Van 4Q18 Fax: _____

Sampled by: Lindsay Wallis

LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-CID	NWTPH-DX	NWTPH-GX	8260 VOCs Full List	8260 RBDM VOCs	8260 HVOCS	8260 BTEX VOCs	8270 SVOC	8270 SIM PAHs	8082 PCBs	600 TTO	RCRA Metals (8)	TCLP Metals (8)	AL, Sb, As, Ba, Be, Cd, Cr, Cu, Co, Ni, Pb, Se, Ag, Na, TL, V, Zn, Hg, Mg, Mn, Mo, Ni, K, Fe, P	1200-COLS	TOTAL DISS TCLP	1200-Z	
1																						
2	12/10	0800	W	5					X												X	Nitrate / -10
3		0840		5																	X	Ammonia
4		0915		7																	X	
5		0940		5																	X	
6		1016		7																	X	
7		1040		5																	X	
8				1																		
9																						
10																						

Site Location: OR (WA)
Other: _____

SAMPLE ID
1 WV-24d
2 WV-32s
3 MGM2-40
4 MGM2-60
5 MGM3-40
6 MGM3-60
7 Trip Blank

Normal Turn Around Time (TAT) = 10 Business Days YES NO

TAT Requested (circle): 1 Day 2 Day 3 Day 4 DAY 5 DAY Other: _____

SPECIAL INSTRUCTIONS:

RECEIVED BY: _____ RECEIVED BY: _____
Signature: Lindsay Wallis Signature: _____
Date: 12/10 Date: 12/18
Printed Name: Lindsay Wallis Printed Name: Miguel Acosta
Time: 12:00 Time: 12:00
Company: Cascadia Company: Apex Labs

Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini

Lisa Domenighini, Client Services Manager



Cascadia Associates 6915 SW Macadam, Suite 250 Portland, OR 97219	Project: Shore Terminal-Vancouver Project Number: Nustar Van 4Q2018 Project Manager: Stephanie Salisbury	Report ID: A8L0249 - 12 31 18 1408
--	---	--

APEX LABS COOLER RECEIPT FORM

Client: Cascadia Asc. Element WO#: A8 L0249

Project/Project #: Nustar Van 4Q18

Delivery Info:
Date/time received: 12-10-18 @ 1200 By: MP
Delivered by: Apex Client ESS FedEx UPS Swift Senvoy SDS Other

Cooler Inspection Date/time inspected: 12-10-18 @ 1230 By: MP

Chain of Custody included? Yes No Custody seals? Yes No

Signed/dated by client? Yes No

Signed/dated by Apex? Yes No

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (°C)	<u>5.1</u>						
Received on ice? (Y/N)	<u>Y</u>						
Temp. blanks? (Y/N)	<u>Y</u>						
Ice type: (Gel/Real/Other)	<u>Real</u>						
Condition:	<u>good</u>						

Cooler out of temp? (Y/N) Possible reason why: _____

If some coolers are in temp and some out, were green dots applied to out of temperature samples? Yes/No/NA

Out of temperature samples form initiated? Yes/No/NA

Samples Inspection: Date/time inspected: 12/10/18 @ 1505 By: SO

All samples intact? Yes No Comments: _____

Bottle labels/COCs agree? Yes No Comments: _____

COC/container discrepancies form initiated? Yes No NA

Containers/volumes received appropriate for analysis? Yes No Comments: _____

Do VOA vials have visible headspace? Yes No NA

Comments: _____

Water samples: pH checked: Yes No NA pH appropriate? Yes No NA

Comments: _____

Additional information: TB# 1935

Labeled by: (Signature) Witness: JS Cooler Inspected by: (Signature) See Project Contact Form: Y

Lisa Domenighini

December 31, 2018

Apex Laboratories
ATTN: Lisa Domenighini
12232 S.W. Garden Place
Tigard, OR 97223



LA Cert #04140
EPA Methods TO3, TO14A, TO15, 25C/3C,
RSK-175
TX Cert T104704450-14-6
EPA Methods TO14A, TO15
UT Cert CA0133332015-3
EPA Methods TO3, TO14A, TO15, RSK-175

LABORATORY TEST RESULTS

Project Reference: A8L0249
Lab Number: J121203-01/02

Enclosed are results for sample(s) received 12/12/18 by Air Technology Laboratories. Samples were received intact and chilled to 3° C. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the TNI Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

A handwritten signature in blue ink that reads "Mark Johnson".

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Note: The cover letter is an integral part of this analytical report.

SUBCONTRACT ORDER

Apex Laboratories

A8L0249

J121203-01/02

WAP 12/10/18

09/12/11/18

SENDING LABORATORY:

Apex Laboratories
12232 S.W. Garden Place
Tigard, OR 97223
Phone: (503) 718-2323
Fax: (503) 718-0333
Project Manager: Lisa Domenighini

RECEIVING LABORATORY:

Air Technology Laboratories, Inc
18501 E. Gale Ave Suite 130
City of Industry, CA 91748
Phone : (626) 964-4032
Fax: (626) 964-5832

Sample Name: MGMS2-40 Water Sampled: 12/10/18 09:15 (A8L0249-03)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/21/18 17:00	12/24/18 09:15	
<i>Containers Supplied:</i>			
(D)40 mL VOA - HCL			
(E)40 mL VOA - HCL			

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Sample Name: MGMS3-40 Water Sampled: 12/10/18 10:10 (A8L0249-05)

Analysis	Due	Expires	Comments
RSK 175 Preserved (Meth, Eth, Eth) (Sub)	12/21/18 17:00	12/24/18 10:10	
<i>Containers Supplied:</i>			
(D)40 mL VOA - HCL			
(E)40 mL VOA - HCL			

62

Standard TAT

30

Released By  Date 12/11/18

Received By  Date 12/12/18 944

Released By Date

Received By Date

Client: Apex Laboratories
Attn: Lisa Domenighini
Project Name: NA
Project No.: A8L0249
Date Received: 12/12/18
Matrix: Water
Reporting Units: ug/L

RSK175

Lab No.:	J121203-01	J121203-02						
Client Sample I.D.:	MGMS2-40 (A8L0249-03)	MGMS3-40 (A8L0249-05)						
Date/Time Sampled:	12/10/18 9:15	12/10/18 10:10						
Date/Time Analyzed:	12/19/18 16:52	12/19/18 17:06						
QC Batch No.:	181219GC8A1	181219GC8A1						
Analyst Initials:	CM/MJ	CM/MJ						
Dilution Factor:	1.0	1.0						
ANALYTE	Result ug/L	RL ug/L	Result ug/L	RL ug/L				
Ethene	78	1.0	4.9	1.0				
Ethane	28	1.0	18	1.0				
Methane	800	1.0	5,400	1.0				

ND = Not Detected (below RL)

RL = Reporting Limit

Reviewed/Approved By: _____



Mark Johnson
Operations Manager

Date

12-28-18

The cover letter is an integral part of this analytical report



LCS/LCSD Recovery and RPD Summary Report

QC Batch #: 181219GC8A1

Matrix: Air

Reporting Units: ug/L

RSK175 LABORATORY CONTROL SAMPLE SUMMARY

Lab No.:	METHOD BLANK					LCS	LCSD					
Date/Time Analyzed:	6/13/18 15:30					12/19/18 12:46	12/19/18 13:06					
Analyst Initials:	CM/MJ					CM/MJ	CM/MJ					
Dilution Factor:	1.0					1.0	1.0					
ANALYTE	Result ug/L	RL ug/L	SPIKE AMT. ug/L	Result ug/L	% Rec.	Result ug/L	% Rec.	RPD	Low %Rec	High %Rec	Max. RPD	
Ethene	ND	1.0	1,150	1,080	93.9	1,110	96.7	2.9	70	130	30	
Ethane	ND	1.0	1,230	1,210	98.4	1,250	102	3.2	70	130	30	
Methane	ND	1.0	654	626	95.7	646	98.7	3.1	70	130	30	

ND= Not Detected (below RL)

RL = Reporting Limit

Reviewed/Approved By: 
 Mark Johnson
 Operations Manager

Date 12-28-18

The cover letter is an integral part of this analytical report



TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Tel: (916)373-5600

TestAmerica Job ID: 320-46633-1
Client Project/Site: NuStar Vancouver

For:
Cascadia Associates LLC
6915 SE Macadam Ave
Suite 250
Portland, Oregon 97219

Attn: Stephanie Salisbury



Authorized for release by:
1/21/2019 3:56:57 PM
Kristine Allen, Manager of Project Management
(253)248-4970
kristine.allen@testamericainc.com

Designee for
Nathan Lewis, Project Manager I
(253)922-2310
nathan.lewis@testamericainc.com

LINKS

Review your project
results through
TotalAccess

Have a Question?



Visit us at:
www.testamericainc.com

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

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

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

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Definitions/Glossary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-46633-1

Glossary

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

Case Narrative

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-46633-1

Job ID: 320-46633-1

Laboratory: TestAmerica Sacramento

Narrative

Job Narrative
320-46633-1

Comments

No additional comments.

Receipt

The samples were received on 1/8/2019 10:25 AM; the samples arrived in good condition, properly preserved and, where required, on ice.

Air - GC/MS VOA

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

VOA Prep

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

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Detection Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-46633-1

Client Sample ID: SVE_South_Post Carbon_010419

Lab Sample ID: 320-46633-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
2-Butanone (MEK)	10		2.4		ug/m3 Air	1		TO-15	Total/NA
2-Hexanone	1.7		1.6		ug/m3 Air	1		TO-15	Total/NA
Acetone	37		12		ug/m3 Air	1		TO-15	Total/NA
Carbon disulfide	13		2.5		ug/m3 Air	1		TO-15	Total/NA
m,p-Xylene	5.2		3.5		ug/m3 Air	1		TO-15	Total/NA
Methylene Chloride	2.1		1.4		ug/m3 Air	1		TO-15	Total/NA
o-Xylene	2.1		1.7		ug/m3 Air	1		TO-15	Total/NA
Toluene	2.3		1.5		ug/m3 Air	1		TO-15	Total/NA
Vinyl chloride	1.5		1.0		ug/m3 Air	1		TO-15	Total/NA

Client Sample ID: SVE_South_Pre Carbon_010419

Lab Sample ID: 320-46633-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
1,1,1-Trichloroethane	84		84		ug/m3 Air	51.4		TO-15	Total/NA
cis-1,2-Dichloroethene	280		82		ug/m3 Air	51.4		TO-15	Total/NA
Tetrachloroethene	32000		140		ug/m3 Air	51.4		TO-15	Total/NA
Trichloroethene	920		110		ug/m3 Air	51.4		TO-15	Total/NA

This Detection Summary does not include radiochemical test results.

TestAmerica Sacramento

Client Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-46633-1

Client Sample ID: SVE_South_Post Carbon_010419

Lab Sample ID: 320-46633-1

Date Collected: 01/04/19 08:05

Matrix: Air

Date Received: 01/08/19 10:25

Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		1.6		ug/m3 Air			01/19/19 21:15	1
1,1,2,2-Tetrachloroethane	ND		2.7		ug/m3 Air			01/19/19 21:15	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		3.1		ug/m3 Air			01/19/19 21:15	1
1,1,2-Trichloroethane	ND		2.2		ug/m3 Air			01/19/19 21:15	1
1,1-Dichloroethane	ND		1.2		ug/m3 Air			01/19/19 21:15	1
1,1-Dichloroethene	ND		3.2		ug/m3 Air			01/19/19 21:15	1
1,2,4-Trichlorobenzene	ND		15		ug/m3 Air			01/19/19 21:15	1
1,2,4-Trimethylbenzene	ND		3.9		ug/m3 Air			01/19/19 21:15	1
1,2-Dibromoethane (EDB)	ND		6.1		ug/m3 Air			01/19/19 21:15	1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		2.8		ug/m3 Air			01/19/19 21:15	1
1,2-Dichlorobenzene	ND		2.4		ug/m3 Air			01/19/19 21:15	1
1,2-Dichloroethane	ND		3.2		ug/m3 Air			01/19/19 21:15	1
1,2-Dichloropropane	ND		1.8		ug/m3 Air			01/19/19 21:15	1
1,3,5-Trimethylbenzene	ND		2.0		ug/m3 Air			01/19/19 21:15	1
1,3-Dichlorobenzene	ND		2.4		ug/m3 Air			01/19/19 21:15	1
1,4-Dichlorobenzene	ND		2.4		ug/m3 Air			01/19/19 21:15	1
2-Butanone (MEK)	10		2.4		ug/m3 Air			01/19/19 21:15	1
2-Hexanone	1.7		1.6		ug/m3 Air			01/19/19 21:15	1
4-Ethyltoluene	ND		2.0		ug/m3 Air			01/19/19 21:15	1
4-Methyl-2-pentanone (MIBK)	ND		1.6		ug/m3 Air			01/19/19 21:15	1
Acetone	37		12		ug/m3 Air			01/19/19 21:15	1
Benzene	ND		1.3		ug/m3 Air			01/19/19 21:15	1
Benzyl chloride	ND		4.1		ug/m3 Air			01/19/19 21:15	1
Bromodichloromethane	ND		2.0		ug/m3 Air			01/19/19 21:15	1
Bromoform	ND		4.1		ug/m3 Air			01/19/19 21:15	1
Bromomethane	ND		3.1		ug/m3 Air			01/19/19 21:15	1
Carbon disulfide	13		2.5		ug/m3 Air			01/19/19 21:15	1
Carbon tetrachloride	ND		5.0		ug/m3 Air			01/19/19 21:15	1
Chlorobenzene	ND		1.4		ug/m3 Air			01/19/19 21:15	1
Chloroethane	ND		2.1		ug/m3 Air			01/19/19 21:15	1
Chloroform	ND		1.5		ug/m3 Air			01/19/19 21:15	1
Chloromethane	ND		1.7		ug/m3 Air			01/19/19 21:15	1
cis-1,2-Dichloroethene	ND		1.6		ug/m3 Air			01/19/19 21:15	1
cis-1,3-Dichloropropene	ND		1.8		ug/m3 Air			01/19/19 21:15	1
Dibromochloromethane	ND		3.4		ug/m3 Air			01/19/19 21:15	1
Dichlorodifluoromethane	ND		2.0		ug/m3 Air			01/19/19 21:15	1
Ethylbenzene	ND		1.7		ug/m3 Air			01/19/19 21:15	1
Hexachlorobutadiene	ND		21		ug/m3 Air			01/19/19 21:15	1
m,p-Xylene	5.2		3.5		ug/m3 Air			01/19/19 21:15	1
Methylene Chloride	2.1		1.4		ug/m3 Air			01/19/19 21:15	1
o-Xylene	2.1		1.7		ug/m3 Air			01/19/19 21:15	1
Styrene	ND		1.7		ug/m3 Air			01/19/19 21:15	1
Tetrachloroethene	ND		2.7		ug/m3 Air			01/19/19 21:15	1
Toluene	2.3		1.5		ug/m3 Air			01/19/19 21:15	1
trans-1,2-Dichloroethene	ND		1.6		ug/m3 Air			01/19/19 21:15	1
trans-1,3-Dichloropropene	ND		1.8		ug/m3 Air			01/19/19 21:15	1
Trichloroethene	ND		2.1		ug/m3 Air			01/19/19 21:15	1
Trichlorofluoromethane	ND		2.2		ug/m3 Air			01/19/19 21:15	1

TestAmerica Sacramento

Client Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-46633-1

Client Sample ID: SVE_South_Post Carbon_010419

Lab Sample ID: 320-46633-1

Date Collected: 01/04/19 08:05

Matrix: Air

Date Received: 01/08/19 10:25

Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Vinyl acetate	ND		2.8		ug/m3 Air			01/19/19 21:15	1
Vinyl chloride	1.5		1.0		ug/m3 Air			01/19/19 21:15	1
Surrogate	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	99		70 - 130					01/19/19 21:15	1
4-Bromofluorobenzene (Surr)	97		70 - 130					01/19/19 21:15	1
Toluene-d8 (Surr)	102		70 - 130					01/19/19 21:15	1

Client Sample ID: SVE_South_Pre Carbon_010419

Lab Sample ID: 320-46633-2

Date Collected: 01/04/19 08:15

Matrix: Air

Date Received: 01/08/19 10:25

Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	84		84		ug/m3 Air			01/19/19 22:08	51.4
1,1,2,2-Tetrachloroethane	ND		140		ug/m3 Air			01/19/19 22:08	51.4
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		160		ug/m3 Air			01/19/19 22:08	51.4
1,1,2-Trichloroethane	ND		110		ug/m3 Air			01/19/19 22:08	51.4
1,1-Dichloroethane	ND		62		ug/m3 Air			01/19/19 22:08	51.4
1,1-Dichloroethene	ND		160		ug/m3 Air			01/19/19 22:08	51.4
1,2,4-Trichlorobenzene	ND		760		ug/m3 Air			01/19/19 22:08	51.4
1,2,4-Trimethylbenzene	ND		200		ug/m3 Air			01/19/19 22:08	51.4
1,2-Dibromoethane (EDB)	ND		320		ug/m3 Air			01/19/19 22:08	51.4
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		140		ug/m3 Air			01/19/19 22:08	51.4
1,2-Dichlorobenzene	ND		120		ug/m3 Air			01/19/19 22:08	51.4
1,2-Dichloroethane	ND		170		ug/m3 Air			01/19/19 22:08	51.4
1,2-Dichloropropane	ND		95		ug/m3 Air			01/19/19 22:08	51.4
1,3,5-Trimethylbenzene	ND		100		ug/m3 Air			01/19/19 22:08	51.4
1,3-Dichlorobenzene	ND		120		ug/m3 Air			01/19/19 22:08	51.4
1,4-Dichlorobenzene	ND		120		ug/m3 Air			01/19/19 22:08	51.4
2-Butanone (MEK)	ND		120		ug/m3 Air			01/19/19 22:08	51.4
2-Hexanone	ND		84		ug/m3 Air			01/19/19 22:08	51.4
4-Ethyltoluene	ND		100		ug/m3 Air			01/19/19 22:08	51.4
4-Methyl-2-pentanone (MIBK)	ND		84		ug/m3 Air			01/19/19 22:08	51.4
Acetone	ND		610		ug/m3 Air			01/19/19 22:08	51.4
Benzene	ND		66		ug/m3 Air			01/19/19 22:08	51.4
Benzyl chloride	ND		210		ug/m3 Air			01/19/19 22:08	51.4
Bromodichloromethane	ND		100		ug/m3 Air			01/19/19 22:08	51.4
Bromoform	ND		210		ug/m3 Air			01/19/19 22:08	51.4
Bromomethane	ND		160		ug/m3 Air			01/19/19 22:08	51.4
Carbon disulfide	ND		130		ug/m3 Air			01/19/19 22:08	51.4
Carbon tetrachloride	ND		260		ug/m3 Air			01/19/19 22:08	51.4
Chlorobenzene	ND		71		ug/m3 Air			01/19/19 22:08	51.4
Chloroethane	ND		110		ug/m3 Air			01/19/19 22:08	51.4
Chloroform	ND		75		ug/m3 Air			01/19/19 22:08	51.4
Chloromethane	ND		85		ug/m3 Air			01/19/19 22:08	51.4
cis-1,2-Dichloroethene	280		82		ug/m3 Air			01/19/19 22:08	51.4
cis-1,3-Dichloropropene	ND		93		ug/m3 Air			01/19/19 22:08	51.4

TestAmerica Sacramento

Client Sample Results

Client: Cascadia Associates LLC
 Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-46633-1

Client Sample ID: SVE_South_Pre Carbon_010419

Lab Sample ID: 320-46633-2

Date Collected: 01/04/19 08:15

Matrix: Air

Date Received: 01/08/19 10:25

Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dibromochloromethane	ND		180		ug/m3 Air			01/19/19 22:08	51.4
Dichlorodifluoromethane	ND		100		ug/m3 Air			01/19/19 22:08	51.4
Ethylbenzene	ND		89		ug/m3 Air			01/19/19 22:08	51.4
Hexachlorobutadiene	ND		1100		ug/m3 Air			01/19/19 22:08	51.4
m,p-Xylene	ND		180		ug/m3 Air			01/19/19 22:08	51.4
Methylene Chloride	ND		71		ug/m3 Air			01/19/19 22:08	51.4
o-Xylene	ND		89		ug/m3 Air			01/19/19 22:08	51.4
Styrene	ND		88		ug/m3 Air			01/19/19 22:08	51.4
Tetrachloroethene	32000		140		ug/m3 Air			01/19/19 22:08	51.4
Toluene	ND		77		ug/m3 Air			01/19/19 22:08	51.4
trans-1,2-Dichloroethene	ND		82		ug/m3 Air			01/19/19 22:08	51.4
trans-1,3-Dichloropropene	ND		93		ug/m3 Air			01/19/19 22:08	51.4
Trichloroethene	920		110		ug/m3 Air			01/19/19 22:08	51.4
Trichlorofluoromethane	ND		120		ug/m3 Air			01/19/19 22:08	51.4
Vinyl acetate	ND		140		ug/m3 Air			01/19/19 22:08	51.4
Vinyl chloride	ND		53		ug/m3 Air			01/19/19 22:08	51.4
Surrogate	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	103		70 - 130					01/19/19 22:08	51.4
4-Bromofluorobenzene (Surr)	93		70 - 130					01/19/19 22:08	51.4
Toluene-d8 (Surr)	98		70 - 130					01/19/19 22:08	51.4

Surrogate Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-46633-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Matrix: Air

Prep Type: Total/NA

Percent Surrogate Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	DCA (70-130)	BFB (70-130)	TOL (70-130)
320-46633-1	SVE_South_Post Carbon_0104	99	97	102
320-46633-2	SVE_South_Pre Carbon_010419	103	93	98
LCS 320-271564/3	Lab Control Sample	113	103	99
LCSD 320-271564/4	Lab Control Sample Dup	112	104	102
MB 320-271564/8	Method Blank	109	96	99

Surrogate Legend

DCA = 1,2-Dichloroethane-d4 (Surr)

BFB = 4-Bromofluorobenzene (Surr)

TOL = Toluene-d8 (Surr)

QC Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-46633-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Lab Sample ID: MB 320-271564/8

Matrix: Air

Analysis Batch: 271564

Client Sample ID: Method Blank

Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		1.6		ug/m3 Air			01/19/19 18:28	1
1,1,2,2-Tetrachloroethane	ND		2.7		ug/m3 Air			01/19/19 18:28	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		3.1		ug/m3 Air			01/19/19 18:28	1
1,1,2-Trichloroethane	ND		2.2		ug/m3 Air			01/19/19 18:28	1
1,1-Dichloroethane	ND		1.2		ug/m3 Air			01/19/19 18:28	1
1,1-Dichloroethene	ND		3.2		ug/m3 Air			01/19/19 18:28	1
1,2,4-Trichlorobenzene	ND		15		ug/m3 Air			01/19/19 18:28	1
1,2,4-Trimethylbenzene	ND		3.9		ug/m3 Air			01/19/19 18:28	1
1,2-Dibromoethane (EDB)	ND		6.1		ug/m3 Air			01/19/19 18:28	1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		2.8		ug/m3 Air			01/19/19 18:28	1
1,2-Dichlorobenzene	ND		2.4		ug/m3 Air			01/19/19 18:28	1
1,2-Dichloroethane	ND		3.2		ug/m3 Air			01/19/19 18:28	1
1,2-Dichloropropane	ND		1.8		ug/m3 Air			01/19/19 18:28	1
1,3,5-Trimethylbenzene	ND		2.0		ug/m3 Air			01/19/19 18:28	1
1,3-Dichlorobenzene	ND		2.4		ug/m3 Air			01/19/19 18:28	1
1,4-Dichlorobenzene	ND		2.4		ug/m3 Air			01/19/19 18:28	1
2-Butanone (MEK)	ND		2.4		ug/m3 Air			01/19/19 18:28	1
2-Hexanone	ND		1.6		ug/m3 Air			01/19/19 18:28	1
4-Ethyltoluene	ND		2.0		ug/m3 Air			01/19/19 18:28	1
4-Methyl-2-pentanone (MIBK)	ND		1.6		ug/m3 Air			01/19/19 18:28	1
Acetone	ND		12		ug/m3 Air			01/19/19 18:28	1
Benzene	ND		1.3		ug/m3 Air			01/19/19 18:28	1
Benzyl chloride	ND		4.1		ug/m3 Air			01/19/19 18:28	1
Bromodichloromethane	ND		2.0		ug/m3 Air			01/19/19 18:28	1
Bromoform	ND		4.1		ug/m3 Air			01/19/19 18:28	1
Bromomethane	ND		3.1		ug/m3 Air			01/19/19 18:28	1
Carbon disulfide	ND		2.5		ug/m3 Air			01/19/19 18:28	1
Carbon tetrachloride	ND		5.0		ug/m3 Air			01/19/19 18:28	1
Chlorobenzene	ND		1.4		ug/m3 Air			01/19/19 18:28	1
Chloroethane	ND		2.1		ug/m3 Air			01/19/19 18:28	1
Chloroform	ND		1.5		ug/m3 Air			01/19/19 18:28	1
Chloromethane	ND		1.7		ug/m3 Air			01/19/19 18:28	1
cis-1,2-Dichloroethene	ND		1.6		ug/m3 Air			01/19/19 18:28	1
cis-1,3-Dichloropropene	ND		1.8		ug/m3 Air			01/19/19 18:28	1
Dibromochloromethane	ND		3.4		ug/m3 Air			01/19/19 18:28	1
Dichlorodifluoromethane	ND		2.0		ug/m3 Air			01/19/19 18:28	1
Ethylbenzene	ND		1.7		ug/m3 Air			01/19/19 18:28	1
Hexachlorobutadiene	ND		21		ug/m3 Air			01/19/19 18:28	1
m,p-Xylene	ND		3.5		ug/m3 Air			01/19/19 18:28	1
Methylene Chloride	ND		1.4		ug/m3 Air			01/19/19 18:28	1
o-Xylene	ND		1.7		ug/m3 Air			01/19/19 18:28	1
Styrene	ND		1.7		ug/m3 Air			01/19/19 18:28	1
Tetrachloroethene	ND		2.7		ug/m3 Air			01/19/19 18:28	1
Toluene	ND		1.5		ug/m3 Air			01/19/19 18:28	1
trans-1,2-Dichloroethene	ND		1.6		ug/m3 Air			01/19/19 18:28	1
trans-1,3-Dichloropropene	ND		1.8		ug/m3 Air			01/19/19 18:28	1
Trichloroethene	ND		2.1		ug/m3 Air			01/19/19 18:28	1
Trichlorofluoromethane	ND		2.2		ug/m3 Air			01/19/19 18:28	1

TestAmerica Sacramento

QC Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-46633-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: MB 320-271564/8

Matrix: Air

Analysis Batch: 271564

Client Sample ID: Method Blank

Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Vinyl acetate	ND		2.8		ug/m3 Air			01/19/19 18:28	1
Vinyl chloride	ND		1.0		ug/m3 Air			01/19/19 18:28	1
Surrogate	MB %Recovery	MB Qualifier	Limits				Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	109		70 - 130					01/19/19 18:28	1
4-Bromofluorobenzene (Surr)	96		70 - 130					01/19/19 18:28	1
Toluene-d8 (Surr)	99		70 - 130					01/19/19 18:28	1

Lab Sample ID: LCS 320-271564/3

Matrix: Air

Analysis Batch: 271564

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1-Trichloroethane	115	130		ug/m3 Air		113	69 - 129
1,1,1,2-Tetrachloroethane	146	147		ug/m3 Air		101	64 - 124
1,1,1,2-Trichloro-1,2,2-trifluoroethane	162	167		ug/m3 Air		103	70 - 130
1,1,2-Trichloroethane	116	110		ug/m3 Air		95	64 - 124
1,1-Dichloroethane	86.0	90.7		ug/m3 Air		106	71 - 131
1,1-Dichloroethene	84.3	91.0		ug/m3 Air		108	72 - 132
1,2,4-Trichlorobenzene	156	138		ug/m3 Air		89	58 - 138
1,2,4-Trimethylbenzene	104	103		ug/m3 Air		99	60 - 132
1,2-Dibromoethane (EDB)	162	160		ug/m3 Air		98	64 - 124
1,2-Dichloro-1,1,2,2-tetrafluoroethane	147	153		ug/m3 Air		104	74 - 134
1,2-Dichlorobenzene	127	127		ug/m3 Air		100	62 - 126
1,2-Dichloroethane	86.1	96.5		ug/m3 Air		112	71 - 131
1,2-Dichloropropane	97.6	108		ug/m3 Air		111	72 - 132
1,3,5-Trimethylbenzene	104	107		ug/m3 Air		104	65 - 125
1,3-Dichlorobenzene	126	130		ug/m3 Air		103	59 - 130
1,4-Dichlorobenzene	128	133		ug/m3 Air		104	58 - 132
2-Butanone (MEK)	62.5	62.2		ug/m3 Air		100	73 - 133
2-Hexanone	86.3	85.1		ug/m3 Air		99	69 - 129
4-Ethyltoluene	103	104		ug/m3 Air		101	66 - 129
4-Methyl-2-pentanone (MIBK)	86.4	90.8		ug/m3 Air		105	74 - 134
Acetone	50.3	54.2		ug/m3 Air		108	65 - 125
Benzene	68.0	67.2		ug/m3 Air		99	68 - 128
Benzyl chloride	109	93.2		ug/m3 Air		86	67 - 127
Bromodichloromethane	141	151		ug/m3 Air		106	71 - 131
Bromoform	218	229		ug/m3 Air		105	66 - 126
Bromomethane	82.1	82.1		ug/m3 Air		100	73 - 134
Carbon disulfide	65.8	62.2		ug/m3 Air		95	71 - 131
Carbon tetrachloride	133	153		ug/m3 Air		115	63 - 126
Chlorobenzene	97.5	88.8		ug/m3 Air		91	63 - 123
Chloroethane	55.8	54.7		ug/m3 Air		98	73 - 133
Chloroform	104	110		ug/m3 Air		107	70 - 130
Chloromethane	43.5	45.9		ug/m3 Air		105	61 - 140
cis-1,2-Dichloroethene	83.9	86.8		ug/m3 Air		103	70 - 130

TestAmerica Sacramento

QC Sample Results

Client: Cascadia Associates LLC
 Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-46633-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: LCS 320-271564/3
Matrix: Air
Analysis Batch: 271564

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
cis-1,3-Dichloropropene	99.9	97.1		ug/m3 Air		97	72 - 132
Dibromochloromethane	180	185		ug/m3 Air		103	66 - 126
Dichlorodifluoromethane	104	115		ug/m3 Air		110	69 - 129
Ethylbenzene	91.6	90.1		ug/m3 Air		98	64 - 124
Hexachlorobutadiene	224	215		ug/m3 Air		96	58 - 131
m,p-Xylene	183	184		ug/m3 Air		100	65 - 125
Methylene Chloride	73.4	78.0		ug/m3 Air		106	67 - 127
o-Xylene	91.7	92.2		ug/m3 Air		101	65 - 125
Styrene	90.2	87.9		ug/m3 Air		97	67 - 127
Tetrachloroethene	144	147		ug/m3 Air		102	63 - 123
Toluene	79.8	78.9		ug/m3 Air		99	68 - 128
trans-1,2-Dichloroethene	83.7	89.5		ug/m3 Air		107	72 - 132
trans-1,3-Dichloropropene	93.4	98.7		ug/m3 Air		106	66 - 126
Trichloroethene	114	116		ug/m3 Air		102	70 - 130
Trichlorofluoromethane	118	133		ug/m3 Air		112	71 - 131
Vinyl acetate	77.5	82.0		ug/m3 Air		106	65 - 134
Vinyl chloride	54.0	55.0		ug/m3 Air		102	59 - 152

Surrogate	LCS %Recovery	LCS Qualifier	Limits
1,2-Dichloroethane-d4 (Surr)	113		70 - 130
4-Bromofluorobenzene (Surr)	103		70 - 130
Toluene-d8 (Surr)	99		70 - 130

Lab Sample ID: LCSD 320-271564/4
Matrix: Air
Analysis Batch: 271564

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
1,1,1-Trichloroethane	115	129		ug/m3 Air		112	69 - 129	1	25
1,1,2,2-Tetrachloroethane	146	151		ug/m3 Air		104	64 - 124	3	25
1,1,2-Trichloro-1,2,2-trifluoroethane	162	169		ug/m3 Air		104	70 - 130	1	25
1,1,2-Trichloroethane	116	114		ug/m3 Air		98	64 - 124	3	25
1,1-Dichloroethane	86.0	92.2		ug/m3 Air		107	71 - 131	2	25
1,1-Dichloroethene	84.3	90.9		ug/m3 Air		108	72 - 132	0	25
1,2,4-Trichlorobenzene	156	137		ug/m3 Air		88	58 - 138	1	25
1,2,4-Trimethylbenzene	104	104		ug/m3 Air		100	60 - 132	1	25
1,2-Dibromoethane (EDB)	162	163		ug/m3 Air		100	64 - 124	2	25
1,2-Dichloro-1,1,2,2-tetrafluoroethane	147	152		ug/m3 Air		103	74 - 134	0	25
1,2-Dichlorobenzene	127	130		ug/m3 Air		102	62 - 126	2	25
1,2-Dichloroethane	86.1	95.7		ug/m3 Air		111	71 - 131	1	25
1,2-Dichloropropane	97.6	107		ug/m3 Air		109	72 - 132	2	25
1,3,5-Trimethylbenzene	104	109		ug/m3 Air		105	65 - 125	1	25
1,3-Dichlorobenzene	126	132		ug/m3 Air		105	59 - 130	2	25
1,4-Dichlorobenzene	128	135		ug/m3 Air		106	58 - 132	2	25
2-Butanone (MEK)	62.5	64.1		ug/m3 Air		103	73 - 133	3	25
2-Hexanone	86.3	87.4		ug/m3 Air		101	69 - 129	3	25

TestAmerica Sacramento

QC Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-46633-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: LCSD 320-271564/4

Client Sample ID: Lab Control Sample Dup

Matrix: Air

Prep Type: Total/NA

Analysis Batch: 271564

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
4-Ethyltoluene	103	107		ug/m3 Air		104	66 - 129	3	25
4-Methyl-2-pentanone (MIBK)	86.4	91.8		ug/m3 Air		106	74 - 134	1	25
Acetone	50.3	54.3		ug/m3 Air		108	65 - 125	0	25
Benzene	68.0	69.2		ug/m3 Air		102	68 - 128	3	25
Benzyl chloride	109	97.3		ug/m3 Air		90	67 - 127	4	25
Bromodichloromethane	141	151		ug/m3 Air		107	71 - 131	0	25
Bromoform	218	230		ug/m3 Air		106	66 - 126	0	25
Bromomethane	82.1	84.1		ug/m3 Air		103	73 - 134	2	25
Carbon disulfide	65.8	63.6		ug/m3 Air		97	71 - 131	2	25
Carbon tetrachloride	133	152		ug/m3 Air		114	63 - 126	0	25
Chlorobenzene	97.5	90.4		ug/m3 Air		93	63 - 123	2	25
Chloroethane	55.8	56.0		ug/m3 Air		100	73 - 133	2	25
Chloroform	104	111		ug/m3 Air		107	70 - 130	0	25
Chloromethane	43.5	46.3		ug/m3 Air		106	61 - 140	1	25
cis-1,2-Dichloroethene	83.9	88.0		ug/m3 Air		105	70 - 130	1	25
cis-1,3-Dichloropropene	99.9	98.9		ug/m3 Air		99	72 - 132	2	25
Dibromochloromethane	180	186		ug/m3 Air		103	66 - 126	0	25
Dichlorodifluoromethane	104	112		ug/m3 Air		108	69 - 129	2	25
Ethylbenzene	91.6	91.6		ug/m3 Air		100	64 - 124	2	25
Hexachlorobutadiene	224	215		ug/m3 Air		96	58 - 131	0	25
m,p-Xylene	183	186		ug/m3 Air		102	65 - 125	2	25
Methylene Chloride	73.4	78.9		ug/m3 Air		107	67 - 127	1	25
o-Xylene	91.7	93.7		ug/m3 Air		102	65 - 125	2	25
Styrene	90.2	90.0		ug/m3 Air		100	67 - 127	2	25
Tetrachloroethene	144	149		ug/m3 Air		103	63 - 123	1	25
Toluene	79.8	80.5		ug/m3 Air		101	68 - 128	2	25
trans-1,2-Dichloroethene	83.7	90.2		ug/m3 Air		108	72 - 132	1	25
trans-1,3-Dichloropropene	93.4	100		ug/m3 Air		107	66 - 126	2	25
Trichloroethene	114	118		ug/m3 Air		103	70 - 130	1	25
Trichlorofluoromethane	118	130		ug/m3 Air		110	71 - 131	2	25
Vinyl acetate	77.5	82.8		ug/m3 Air		107	65 - 134	1	25
Vinyl chloride	54.0	56.0		ug/m3 Air		104	59 - 152	2	25

Surrogate	LCSD %Recovery	LCSD Qualifier	LCSD Limits
1,2-Dichloroethane-d4 (Surr)	112		70 - 130
4-Bromofluorobenzene (Surr)	104		70 - 130
Toluene-d8 (Surr)	102		70 - 130

TestAmerica Sacramento

QC Association Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-46633-1

Air - GC/MS VOA

Analysis Batch: 271564

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-46633-1	SVE_South_Post Carbon_010419	Total/NA	Air	TO-15	
320-46633-2	SVE_South_Pre Carbon_010419	Total/NA	Air	TO-15	
MB 320-271564/8	Method Blank	Total/NA	Air	TO-15	
LCS 320-271564/3	Lab Control Sample	Total/NA	Air	TO-15	
LCSD 320-271564/4	Lab Control Sample Dup	Total/NA	Air	TO-15	

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Lab Chronicle

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-46633-1

Client Sample ID: SVE_South_Post Carbon_010419

Lab Sample ID: 320-46633-1

Date Collected: 01/04/19 08:05

Matrix: Air

Date Received: 01/08/19 10:25

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	TO-15		1	425 mL	250 mL	271564	01/19/19 21:15	AP1	TAL SAC

Client Sample ID: SVE_South_Pre Carbon_010419

Lab Sample ID: 320-46633-2

Date Collected: 01/04/19 08:15

Matrix: Air

Date Received: 01/08/19 10:25

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	TO-15		51.4	6.67 mL	250 mL	271564	01/19/19 22:08	AP1	TAL SAC

Laboratory References:

TAL SAC = TestAmerica Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-46633-1

Laboratory: TestAmerica Sacramento

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	17-020	01-20-21
ANAB	DoD ELAP		L2468	01-20-21
Arizona	State Program	9	AZ0708	08-11-19
Arkansas DEQ	State Program	6	88-0691	06-17-19
California	State Program	9	2897	01-31-19
Colorado	State Program	8	CA00044	08-31-19
Connecticut	State Program	1	PH-0691	06-30-19
Florida	NELAP	4	E87570	06-30-19
Georgia	State Program	4	N/A	01-28-19
Hawaii	State Program	9	N/A	01-29-19
Illinois	NELAP	5	200060	03-17-19
Kansas	NELAP	7	E-10375	10-31-19
Louisiana	NELAP	6	30612	06-30-19
Maine	State Program	1	CA0004	04-14-20
Michigan	State Program	5	9947	01-31-20
Nevada	State Program	9	CA00044	07-31-19
New Hampshire	NELAP	1	2997	04-18-19
New Jersey	NELAP	2	CA005	06-30-19
New York	NELAP	2	11666	03-31-19
Oregon	NELAP	10	4040	01-29-19
Pennsylvania	NELAP	3	68-01272	03-31-19
Texas	NELAP	6	T104704399	05-31-19
US Fish & Wildlife	Federal		LE148388-0	07-31-19
USDA	Federal		P330-18-00239	01-17-21
USEPA UCMR	Federal	1	CA00044	12-31-20
Utah	NELAP	8	CA00044	02-28-19
Vermont	State Program	1	VT-4040	04-30-19
Virginia	NELAP	3	460278	03-14-19
Washington	State Program	10	C581	05-05-19
Wyoming	State Program	8	8TMS-L	01-28-19

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
ANAB	DoD ELAP		L2236	01-19-22
ANAB	ISO/IEC 17025		L2236	01-19-22
California	State Program	9	2901	11-05-19
Montana (UST)	State Program	8	N/A	04-30-20
Nevada	State Program	9	WA000502019-1	07-31-19
Oregon	NELAP	10	WA100007	11-05-19
US Fish & Wildlife	Federal		LE058448-0	07-31-19
USDA	Federal		P330-14-00126	02-10-20
Washington	State Program	10	C553	02-17-19

Method Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-46633-1

Method	Method Description	Protocol	Laboratory
TO-15	Volatile Organic Compounds in Ambient Air	EPA	TAL SAC

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

TAL SAC = TestAmerica Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

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Sample Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-46633-1


Lab Sample ID	Client Sample ID	Matrix	Collected	Received
320-46633-1	SVE_South_Post Carbon_010419	Air	01/04/19 08:05	01/08/19 10:25
320-46633-2	SVE_South_Pre Carbon_010419	Air	01/04/19 08:15	01/08/19 10:25

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Canister Samples Chain of Custody Record

TestAmerica Laboratories, Inc. assumes no liability with respect to the collection and shipment of these samples.

TestAmerica Laboratories, Inc.

Client Contact Information		Client Project Manager: <i>Stephanie Salisbury</i>		Samples Collected By: <i>Lindsay Wallis</i>		COC No. <u>1</u> of <u>1</u> COCs											
Company Name: <i>Cascade Associates</i>		Phone: <i>503-906-6577 x110</i>		Other (Please specify in notes section)													
Address: <i>6915 SW Macadam Ave</i>		Email: <i>ssalisbury@cascadeassociates.com</i>		Landfill Gas													
City/State/Zip: <i>Portland, OR 97219</i>		Site Contact:		Soil Vapor Extraction (SVE)													
Phone: <i>503-906-6577</i>		Tel/Fax:		Soil Gas													
Project Name: <i>Nature Vancouver</i>		Analysis Turnaround Time		Sub-Slab													
Site/Location: <i>Vancouver, WA</i>		Standard (Specific): <input checked="" type="checkbox"/>		Indoor Air/Ambient Air													
P O #		Rush (Specify):		Sample Type													
Sample Identification	Sample Start Date	Time Start	Sample End Date	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, "Hg (Stop)	Flow Controller ID	Canister ID	TO-14/15 (Standard / Low Level)	EPA 3C	EPA 25C	ASTM D-1946	EPA 15/16	Other (Please specify in notes section)	Sample Specific Notes:		
															Start	Stop	
<i>SVE - South - Post Carbon - 010419</i>	<i>1/4/19</i>	<i>0804</i>	<i>1/4/19 0805</i>	<i>0805</i>	<i>-30</i>	<i>-5</i>		<i>34000477</i>	<input checked="" type="checkbox"/>								
<i>SVE - South - Pre Carbon - 010419</i>	<i>1/4/19</i>	<i>0814</i>	<i>1/4/19 0815</i>	<i>0815</i>	<i>-30</i>	<i>-1</i>		<i>34000426</i>	<input checked="" type="checkbox"/>								
 320-46633 Chain of Custody																	
		Temperature (Fahrenheit)															
		Start Interior															
		Stop															
		Start Interior															
		Stop															
Special Instructions/QC Requirements & Comments:																	
Samples Shipped by: <i>Lindsay Wallis</i>		Date / Time: <i>1/4/19 1330</i>		Samples Received by: <i>Carrie Sanders</i>		Date / Time: <i>10:25 1-8-19</i>										<i>TA-SAC</i>	
Samples Relinquished by: <i>Lindsay Wallis</i>		Date / Time:		Received by:		Date / Time:											
Relinquished by:		Date / Time:		Received by:		Date / Time:											
Lab Use Only:		Shipper Name:		Opened by:		Condition:											



Login Sample Receipt Checklist

Client: Cascadia Associates LLC

Job Number: 320-46633-1

Login Number: 46633

List Source: TestAmerica Sacramento

List Number: 1

Creator: Branscum, Cassie

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

Date Cleaned/Batch ID: B 12-07-18



320-45953 Chain of Custody

Date of QC: 12/11/18

Data File Number: C:\MSD\MGM\1\DATA\181211
(File ID for certification analysis of canister designated below)

CANISTER ID NUMBERS

*	Canister ID	Notes
	34000477	MS9121120.d
	7902	
	34001548	
	34000185	
	34000246	
	8251	
	34001473	
	34001122	
	34002017	
	34001672	
	34000776	
	34001552	

The above canisters were cleaned as a batch. This certifies this batch contains no target analyte concentration greater than or equal to the method criteria for the "Certification Type" indicated above.

***** INDICATES THE CAN OR CANS WHICH WERE SCREENED**

[Signature]
1st Level Reviewed By

12/12/18
Date

[Signature]
2nd Level Reviewed By

12/18/18
Date



Date Cleaned/Batch ID: A 12-14-18



320-46173 Chain of Custody

Date of QC: 12/19/18

Data File Number: C:\MSD\CUM\1\DATA\18(219)
(File ID for certification analysis of canister designated below)

CANISTER ID NUMBERS

*	Canister ID	Notes
*	34000426	MS121923.d
	34000038	
	34000259	
	34001172	
	8018	
	34000554	
	7703	
	34001434	
	34000846	
	34000004	
	34000826	
	34001280	

The above canisters were cleaned as a batch. This certifies this batch contains no target analyte concentration greater than or equal to the method criteria for the "Certification Type" indicated above.

***** INDICATES THE CAN OR CANS WHICH WERE SCREENED**

[Signature]
1st Level Reviewed By

12/20/18
Date

[Signature]
2nd Level Reviewed By

12/21/18
Date

FORM I
AIR - GC/MS VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Sacramento Job No.: 320-45953-1
 SDG No.: _____
 Client Sample ID: 34000477 Lab Sample ID: 320-45953-1
 Matrix: Air Lab File ID: MS9121120.D
 Analysis Method: TO-15 Date Collected: 12/07/2018 00:00
 Sample wt/vol: 500 (mL) Date Analyzed: 12/12/2018 06:56
 Soil Aliquot Vol: _____ Dilution Factor: 1
 Soil Extract Vol.: _____ GC Column: RTX-Volatiles ID: 0.32 (mm)
 % Moisture: _____ Level: (low/med) Low
 Analysis Batch No.: 264562 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
67-64-1	Acetone	0.96	J	5.0	0.18
107-02-8	Acrolein	ND		2.0	0.22
107-13-1	Acrylonitrile	ND		2.0	0.19
107-05-1	Allyl chloride	ND		0.80	0.11
71-43-2	Benzene	ND		0.40	0.079
100-44-7	Benzyl chloride	ND		0.80	0.16
75-27-4	Bromodichloromethane	ND		0.30	0.066
75-25-2	Bromoform	ND		0.40	0.070
74-83-9	Bromomethane	ND		0.80	0.34
106-99-0	1,3-Butadiene	ND		0.80	0.15
106-97-8	n-Butane	ND		0.40	0.15
78-93-3	2-Butanone (MEK)	ND		0.80	0.20
75-65-0	tert-Butyl alcohol (TBA)	ND		2.0	0.11
104-51-8	n-Butylbenzene	ND		0.40	0.18
135-98-8	sec-Butylbenzene	ND		0.40	0.070
98-06-6	tert-Butylbenzene	ND		0.80	0.068
75-15-0	Carbon disulfide	ND		0.80	0.078
56-23-5	Carbon tetrachloride	ND		0.80	0.064
108-90-7	Chlorobenzene	ND		0.30	0.064
75-45-6	Chlorodifluoromethane	ND		0.80	0.27
75-00-3	Chloroethane	ND		0.80	0.31
67-66-3	Chloroform	ND		0.30	0.095
74-87-3	Chloromethane	ND		0.80	0.20
95-49-8	2-Chlorotoluene	ND		0.40	0.080
110-82-7	Cyclohexane	ND		0.40	0.084
124-48-1	Dibromochloromethane	ND		0.40	0.079
106-93-4	1,2-Dibromoethane (EDB)	ND		0.80	0.075
74-95-3	Dibromomethane	ND		0.40	0.057
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		0.40	0.16
95-50-1	1,2-Dichlorobenzene	ND		0.40	0.13
541-73-1	1,3-Dichlorobenzene	ND		0.40	0.11
106-46-7	1,4-Dichlorobenzene	ND		0.40	0.15
75-71-8	Dichlorodifluoromethane	ND		0.40	0.15
75-34-3	1,1-Dichloroethane	ND		0.30	0.072
107-06-2	1,2-Dichloroethane	ND		0.80	0.088

FORM I
AIR - GC/MS VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Sacramento Job No.: 320-45953-1
 SDG No.: _____
 Client Sample ID: 34000477 Lab Sample ID: 320-45953-1
 Matrix: Air Lab File ID: MS9121120.D
 Analysis Method: TO-15 Date Collected: 12/07/2018 00:00
 Sample wt/vol: 500 (mL) Date Analyzed: 12/12/2018 06:56
 Soil Aliquot Vol: _____ Dilution Factor: 1
 Soil Extract Vol.: _____ GC Column: RTX-Volatiles ID: 0.32 (mm)
 % Moisture: _____ Level: (low/med) Low
 Analysis Batch No.: 264562 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
75-35-4	1,1-Dichloroethene	ND		0.80	0.13
156-59-2	cis-1,2-Dichloroethene	ND		0.40	0.089
156-60-5	trans-1,2-Dichloroethene	ND		0.40	0.10
78-87-5	1,2-Dichloropropane	ND		0.40	0.24
10061-01-5	cis-1,3-Dichloropropene	ND		0.40	0.10
10061-02-6	trans-1,3-Dichloropropene	ND		0.40	0.088
123-91-1	1,4-Dioxane	ND		0.80	0.10
141-78-6	Ethyl acetate	ND		0.30	0.18
100-41-4	Ethylbenzene	ND		0.40	0.063
622-96-8	4-Ethyltoluene	ND		0.40	0.19
142-82-5	n-Heptane	ND		0.80	0.063
87-68-3	Hexachlorobutadiene	ND		2.0	0.43
110-54-3	n-Hexane	ND		0.80	0.075
591-78-6	2-Hexanone	ND		0.40	0.087
98-82-8	Isopropylbenzene	ND		0.80	0.10
99-87-6	4-Isopropyltoluene	ND		0.80	0.12
1634-04-4	Methyl-t-Butyl Ether (MTBE)	ND		0.80	0.12
80-62-6	Methyl methacrylate	ND		0.80	0.16
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		0.40	0.14
75-09-2	Methylene Chloride	0.22	J	0.40	0.072
98-83-9	alpha-Methylstyrene	ND		0.40	0.065
91-20-3	Naphthalene	ND		0.80	0.56
111-65-9	n-Octane	ND		0.40	0.055
109-66-0	n-Pentane	ND		0.80	0.26
115-07-1	Propylene	0.16	J	0.40	0.099
103-65-1	N-Propylbenzene	ND		0.40	0.059
100-42-5	Styrene	ND		0.40	0.059
79-34-5	1,1,2,2-Tetrachloroethane	ND		0.40	0.069
127-18-4	Tetrachloroethene	ND		0.40	0.051
109-99-9	Tetrahydrofuran	ND		0.80	0.21
108-88-3	Toluene	ND		0.40	0.051
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	ND		0.40	0.16
120-82-1	1,2,4-Trichlorobenzene	ND		2.0	0.43
71-55-6	1,1,1-Trichloroethane	ND		0.30	0.065
79-00-5	1,1,2-Trichloroethane	ND		0.40	0.067

FORM I
AIR - GC/MS VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Sacramento Job No.: 320-45953-1
 SDG No.: _____
 Client Sample ID: 34000477 Lab Sample ID: 320-45953-1
 Matrix: Air Lab File ID: MS9121120.D
 Analysis Method: TO-15 Date Collected: 12/07/2018 00:00
 Sample wt/vol: 500 (mL) Date Analyzed: 12/12/2018 06:56
 Soil Aliquot Vol: _____ Dilution Factor: 1
 Soil Extract Vol.: _____ GC Column: RTX-Volatiles ID: 0.32 (mm)
 % Moisture: _____ Level: (low/med) Low
 Analysis Batch No.: 264562 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
79-01-6	Trichloroethene	ND		0.40	0.11
75-69-4	Trichlorofluoromethane	ND		0.40	0.20
96-18-4	1,2,3-Trichloropropane	ND		0.40	0.17
95-63-6	1,2,4-Trimethylbenzene	ND		0.80	0.16
108-67-8	1,3,5-Trimethylbenzene	ND		0.40	0.13
540-84-1	2,2,4-Trimethylpentane	ND		0.40	0.071
108-05-4	Vinyl acetate	ND		0.80	0.15
593-60-2	Vinyl bromide	ND		0.80	0.26
75-01-4	Vinyl chloride	ND		0.40	0.12
179601-23-1	m,p-Xylene	ND		0.80	0.10
95-47-6	o-Xylene	ND		0.40	0.054
1330-20-7	Xylenes, Total	ND		1.2	0.074
87-61-6	1,2,3-Trichlorobenzene	ND		2.0	0.62
60-29-7	Ethyl ether	ND		0.80	0.20
71-36-3	n-Butanol	ND		2.0	0.26
111-84-2	n-Nonane	ND		0.80	0.058

CAS NO.	SURROGATE	%REC	Q	LIMITS
460-00-4	4-Bromofluorobenzene (Surr)	93		70-130
17060-07-0	1,2-Dichloroethane-d4 (Surr)	103		70-130
2037-26-5	Toluene-d8 (Surr)	101		70-130

TestAmerica Sacramento
Target Compound Quantitation Report

Data File: \\chromna\Sacramento\ChromData\ATMS9\20181211-69007.b\MS9121120.D
 Lims ID: 320-45953-A-1
 Client ID: 34000477
 Sample Type: Client
 Inject. Date: 12-Dec-2018 06:56:30 ALS Bottle#: 3 Worklist Smp#: 20
 Purge Vol: 5.000 mL Dil. Factor: 1.0000
 Sample Info: 320-45953-A-1
 Misc. Info.: 500 mL CAN CERT
 Operator ID: LHS Instrument ID: ATMS9
 Method: \\chromna\Sacramento\ChromData\ATMS9\20181211-69007.b\TO15_ATMS9N.m
 Limit Group: MSA - TO15 - ICAL
 Last Update: 12-Dec-2018 10:06:45 Calib Date: 29-Nov-2018 08:42:30
 Integrator: RTE ID Type: Deconvolution ID
 Quant Method: Internal Standard Quant By: Initial Calibration
 Last ICal File: \\chromdocs2018\q3\Sacramento\ChromData\ATMS9\20181128-68347.b\MS9112815.D
 Column 1 : RTX Volatiles (0.32 mm) Det: MS SCAN
 Process Host: CTX0330

First Level Reviewer: vanommens Date: 12-Dec-2018 10:06:45

Compound	Sig	RT (min.)	Adj RT (min.)	Dlt RT (min.)	Q	Response	OnCol Amt ppb v/v	Flags
* 1 Chlorobromomethane (IS)	130	12.072	12.066	0.006	91	37679	4.00	
* 2 1,4-Difluorobenzene	114	14.183	14.189	-0.006	100	152712	4.00	
* 3 Chlorobenzene-d5 (IS)	117	20.169	20.169	0.000	99	134753	4.00	
\$ 4 1,2-Dichloroethane-d4 (Sur	65	13.252	13.252	0.000	0	65218	4.12	
\$ 5 Toluene-d8 (Surr)	100	17.383	17.383	0.000	99	99891	4.04	
\$ 6 4-Bromofluorobenzene (Surr	174	22.116	22.116	0.000	96	94301	3.73	
14 Propene	41	3.975	3.950	0.025	50	1064	0.1620	
31 Acetone	43	7.418	7.333	0.085	98	13697	0.9565	
47 Methylene Chloride	49	8.598	8.604	-0.006	87	2164	0.2202	
67 n-Butanol	56	13.459	13.368	0.091	65	1983	0.2350	

Reagents:

VAMIS20_00247 Amount Added: 50.00 Units: mL Run Reagent

Data File: \\chromna\Sacramento\ChromData\ATMS9\20181211-69007.b\MS9121120.D

Injection Date: 12-Dec-2018 06:56:30

Instrument ID: ATMS9

Operator ID: LHS

Lims ID: 320-45953-A-1

Lab Sample ID: 320-45953-1

Worklist Smp#: 20

Client ID: 34000477

Purge Vol: 5.000 mL

Dil. Factor: 1.0000

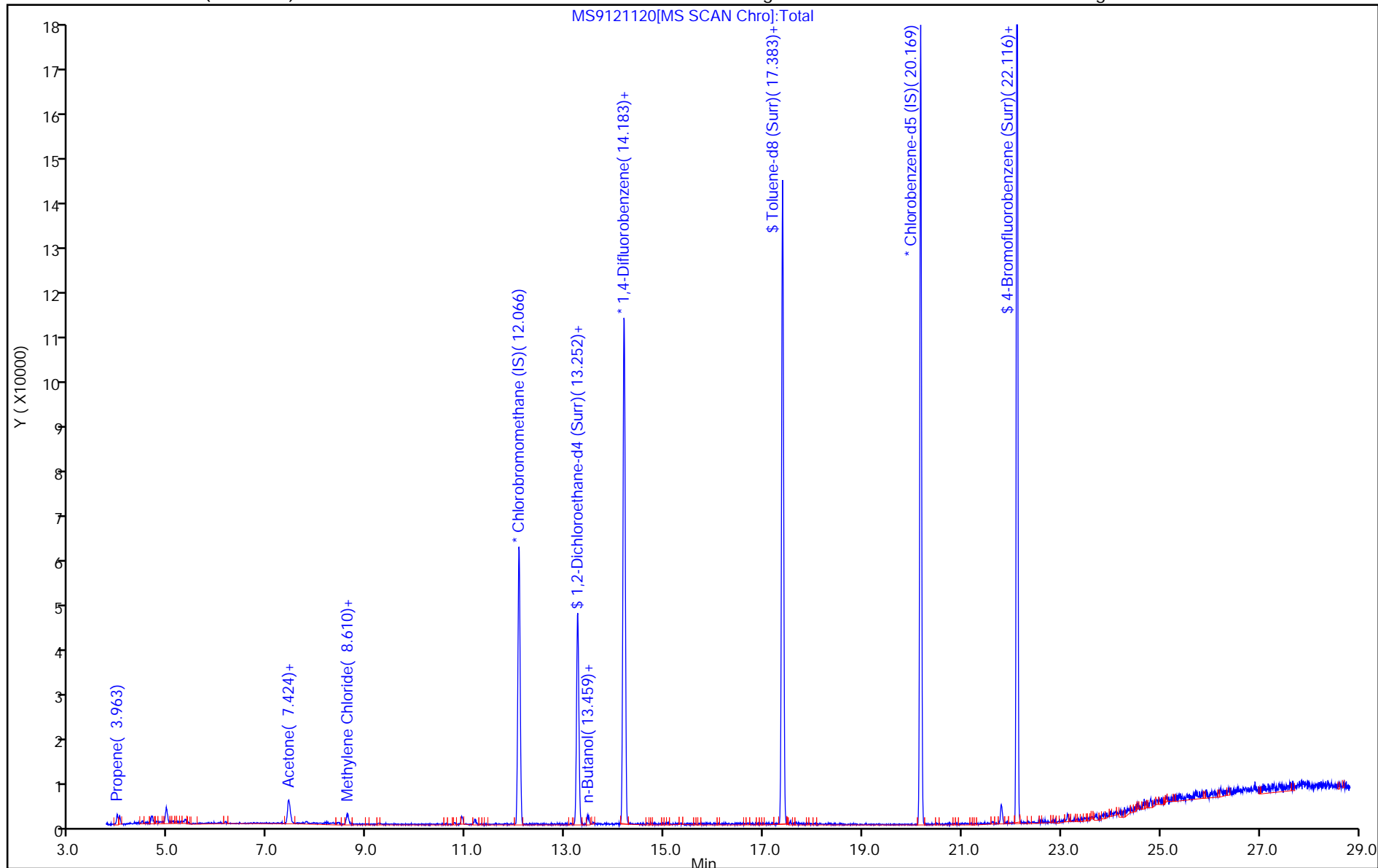
ALS Bottle#: 3

Method: TO15_ATMS9N

Limit Group: MSA - TO15 - ICAL

Column: RTX Volatiles (0.32 mm)

Y Scaling: Method Defined: Scale to the Nth Largest Peak: 2



TestAmerica Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS9\20181211-69007.b\MS9121120.D

Injection Date: 12-Dec-2018 06:56:30

Instrument ID: ATMS9

Lims ID: 320-45953-A-1

Lab Sample ID: 320-45953-1

Client ID: 34000477

Operator ID: LHS

ALS Bottle#: 3 Worklist Smp#: 20

Purge Vol: 5.000 mL

Dil. Factor: 1.0000

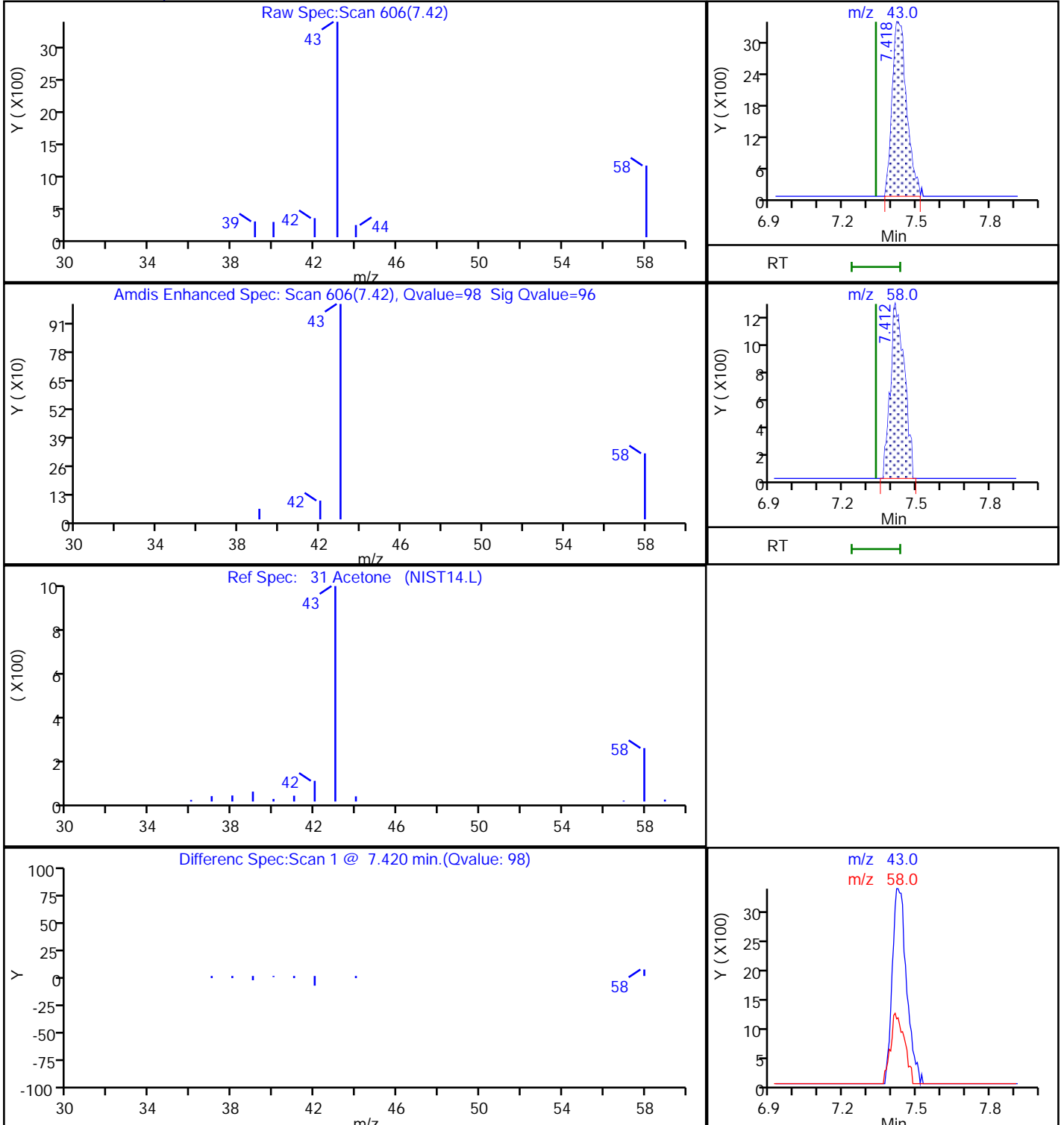
Method: TO15_ATMS9N

Limit Group: MSA - TO15 - ICAL

Column: RTX Volatiles (0.32 mm)

Detector: MS SCAN

31 Acetone, CAS: 67-64-1



TestAmerica Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS9\20181211-69007.b\MS9121120.D

Injection Date: 12-Dec-2018 06:56:30

Instrument ID: ATMS9

Lims ID: 320-45953-A-1

Lab Sample ID: 320-45953-1

Client ID: 34000477

Operator ID: LHS

ALS Bottle#: 3 Worklist Smp#: 20

Purge Vol: 5.000 mL

Dil. Factor: 1.0000

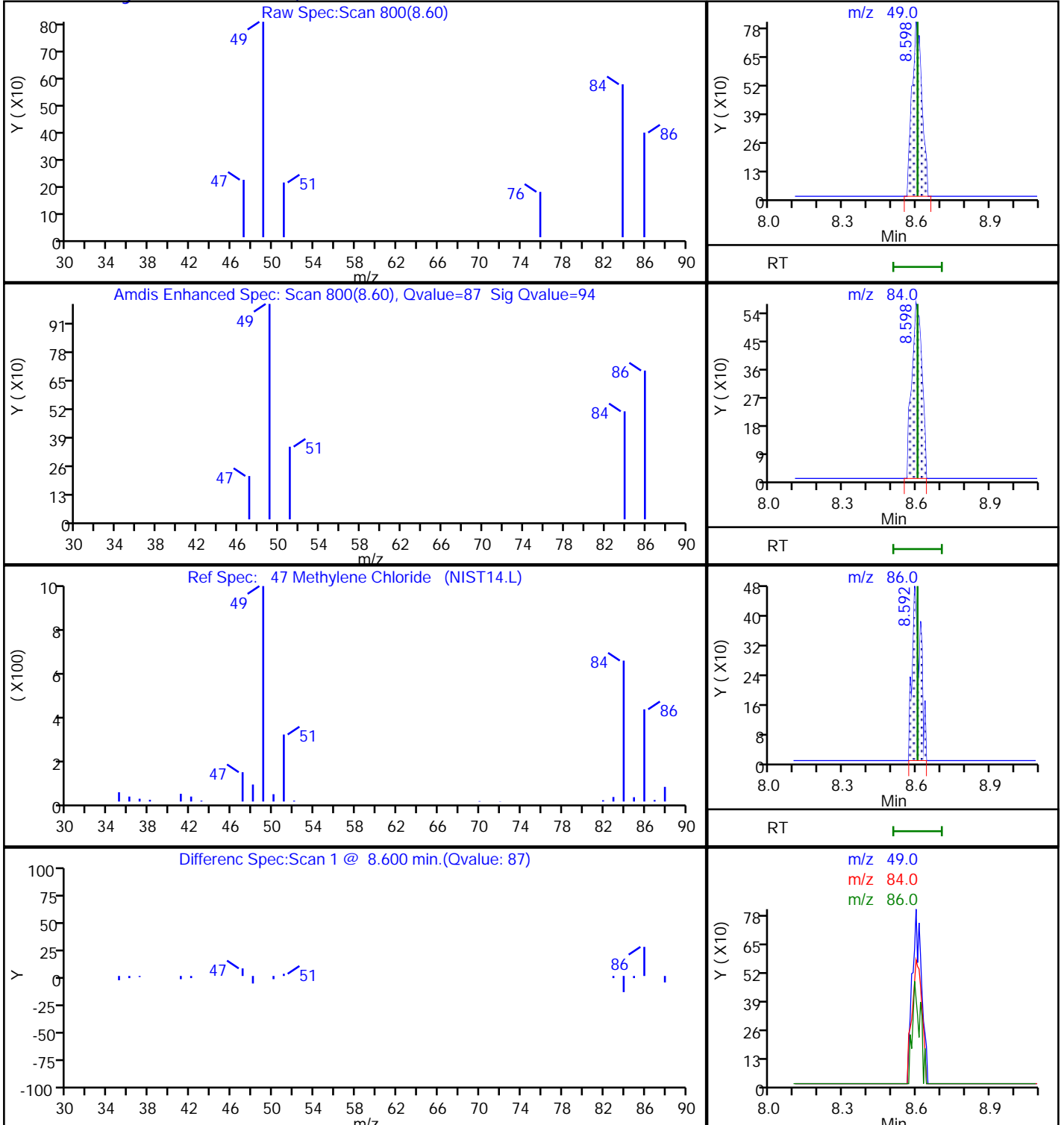
Method: TO15_ATMS9N

Limit Group: MSA - TO15 - ICAL

Column: RTX Volatiles (0.32 mm)

Detector: MS SCAN

47 Methylene Chloride, CAS: 75-09-2



TestAmerica Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS9\20181211-69007.b\MS9121120.D

Injection Date: 12-Dec-2018 06:56:30

Instrument ID: ATMS9

Lims ID: 320-45953-A-1

Lab Sample ID: 320-45953-1

Client ID: 34000477

Operator ID: LHS

ALS Bottle#: 3 Worklist Smp#: 20

Purge Vol: 5.000 mL

Dil. Factor: 1.0000

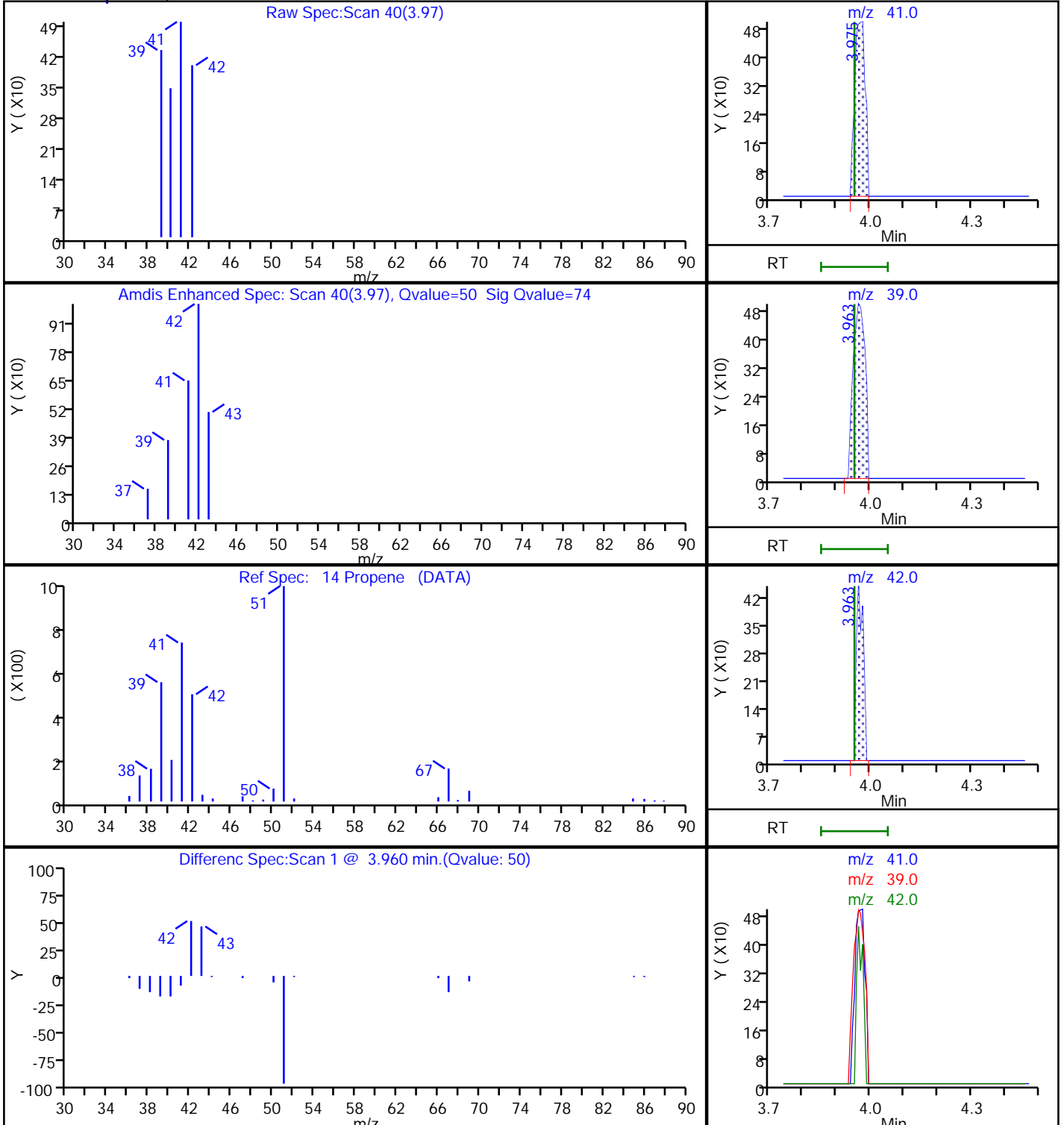
Method: TO15_ATMS9N

Limit Group: MSA - TO15 - ICAL

Column: RTX Volatiles (0.32 mm)

Detector: MS SCAN

14 Propene, CAS: 115-07-1

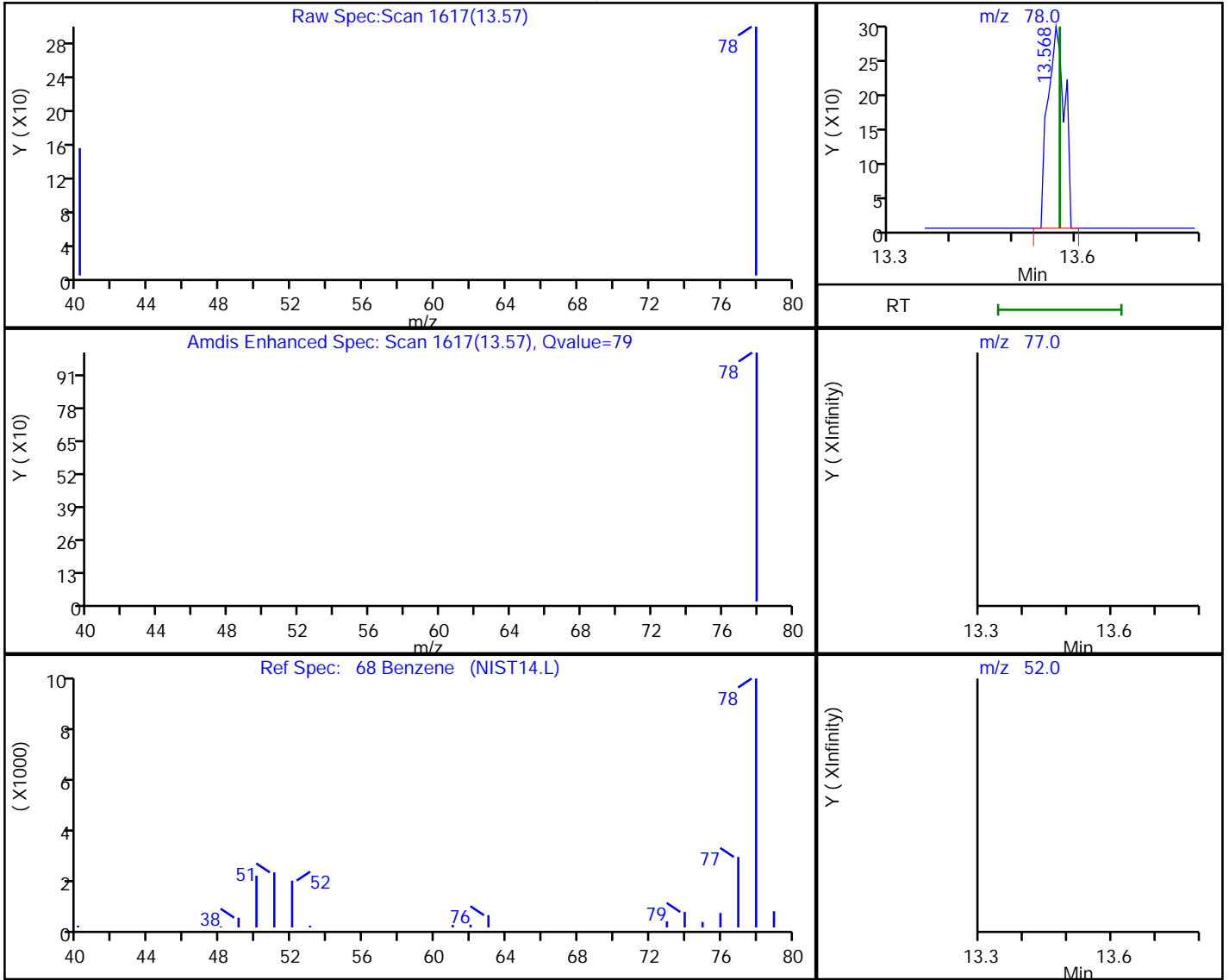


TestAmerica Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS9\20181211-69007.b\MS9121120.D
 Injection Date: 12-Dec-2018 06:56:30 Instrument ID: ATMS9
 Lims ID: 320-45953-A-1 Lab Sample ID: 320-45953-1
 Client ID: 34000477
 Operator ID: LHS ALS Bottle#: 3 Worklist Smp#: 20
 Purge Vol: 5.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS9N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector: MS SCAN

68 Benzene, CAS: 71-43-2

Processing Results



RT	Mass	Response	Amount
13.57	78.00	549	0.017510
13.57	77.00	0	
13.57	52.00	0	

Reviewer: vanommens, 12-Dec-2018 10:05:59

Audit Action: Marked Compound Undetected

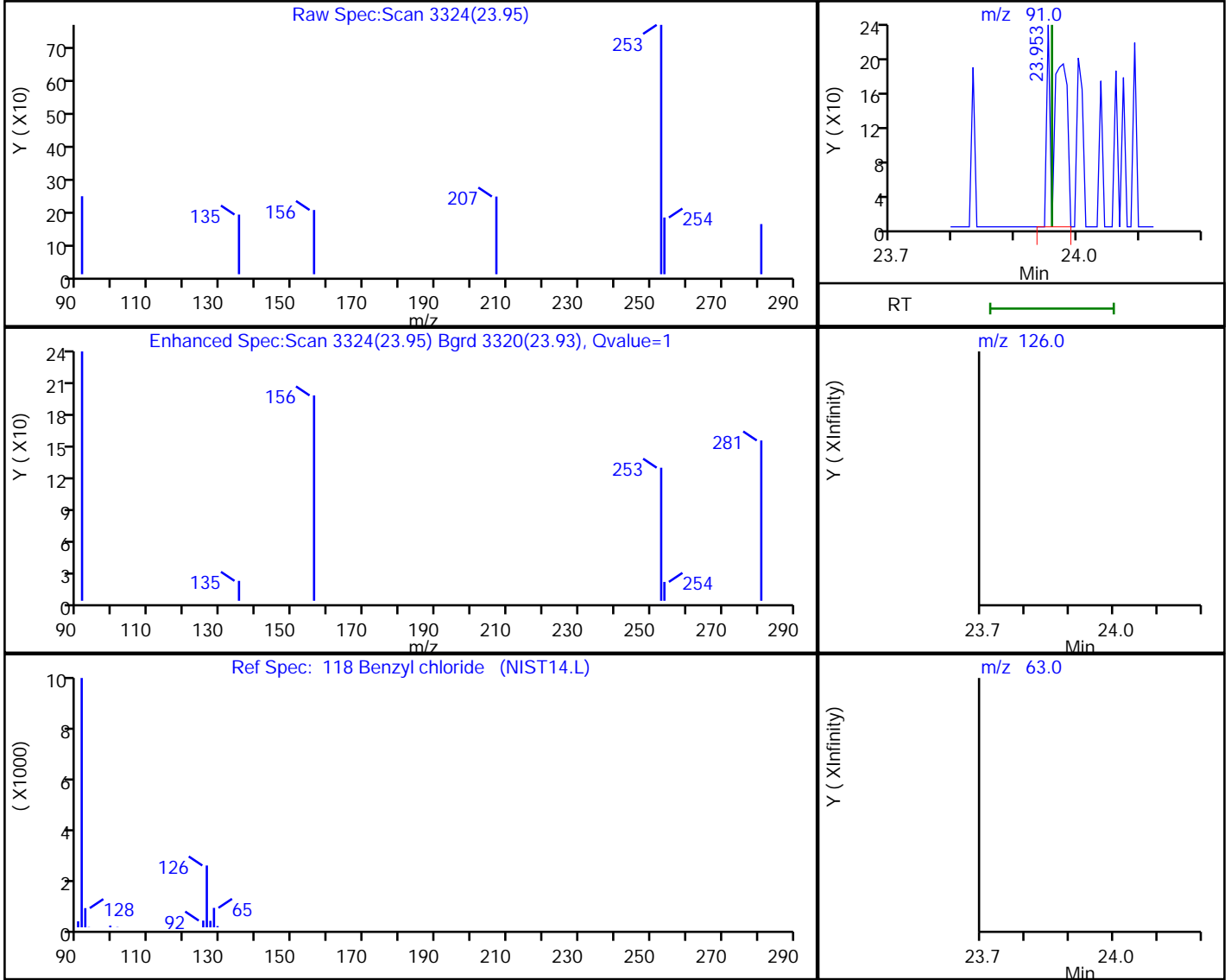
Audit Reason: Invalid Compound ID

TestAmerica Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS9\20181211-69007.b\MS9121120.D
 Injection Date: 12-Dec-2018 06:56:30 Instrument ID: ATMS9
 Lims ID: 320-45953-A-1 Lab Sample ID: 320-45953-1
 Client ID: 34000477
 Operator ID: LHS ALS Bottle#: 3 Worklist Smp#: 20
 Purge Vol: 5.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS9N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector: MS SCAN

118 Benzyl chloride, CAS: 100-44-7

Processing Results



RT	Mass	Response	Amount
23.95	91.00	352	0.006107
23.96	126.00	0	
23.96	63.00	0	

Reviewer: vanommens, 12-Dec-2018 10:06:32

Audit Action: Marked Compound Undetected

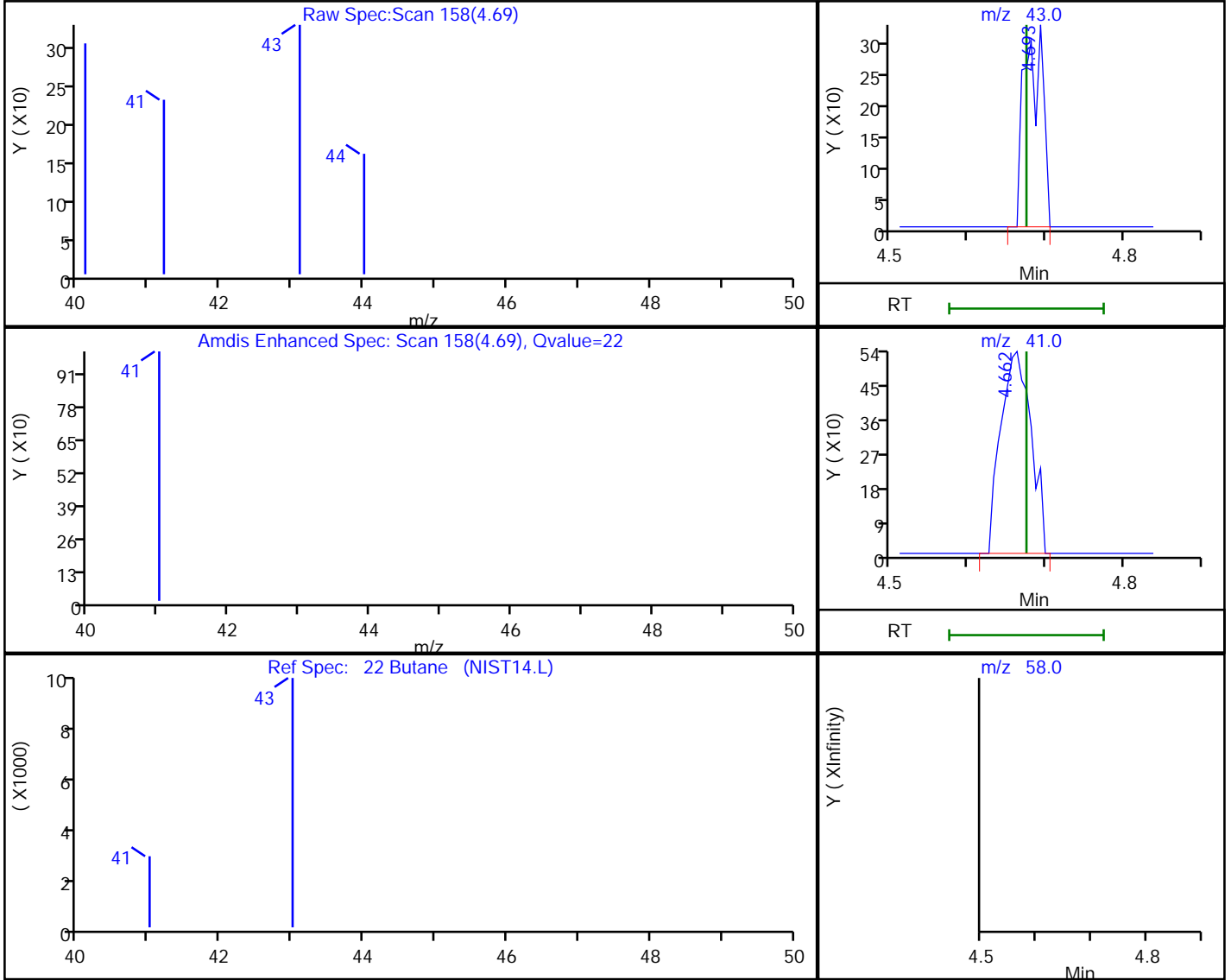
Audit Reason: Invalid Compound ID

TestAmerica Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS9\20181211-69007.b\MS9121120.D
 Injection Date: 12-Dec-2018 06:56:30 Instrument ID: ATMS9
 Lims ID: 320-45953-A-1 Lab Sample ID: 320-45953-1
 Client ID: 34000477
 Operator ID: LHS ALS Bottle#: 3 Worklist Smp#: 20
 Purge Vol: 5.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS9N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector: MS SCAN

22 Butane, CAS: 106-97-8

Processing Results



RT	Mass	Response	Amount
4.69	43.00	532	0.046665
4.66	41.00	1463	
4.67	58.00	0	

Reviewer: vanommens, 12-Dec-2018 10:05:28

Audit Action: Marked Compound Undetected

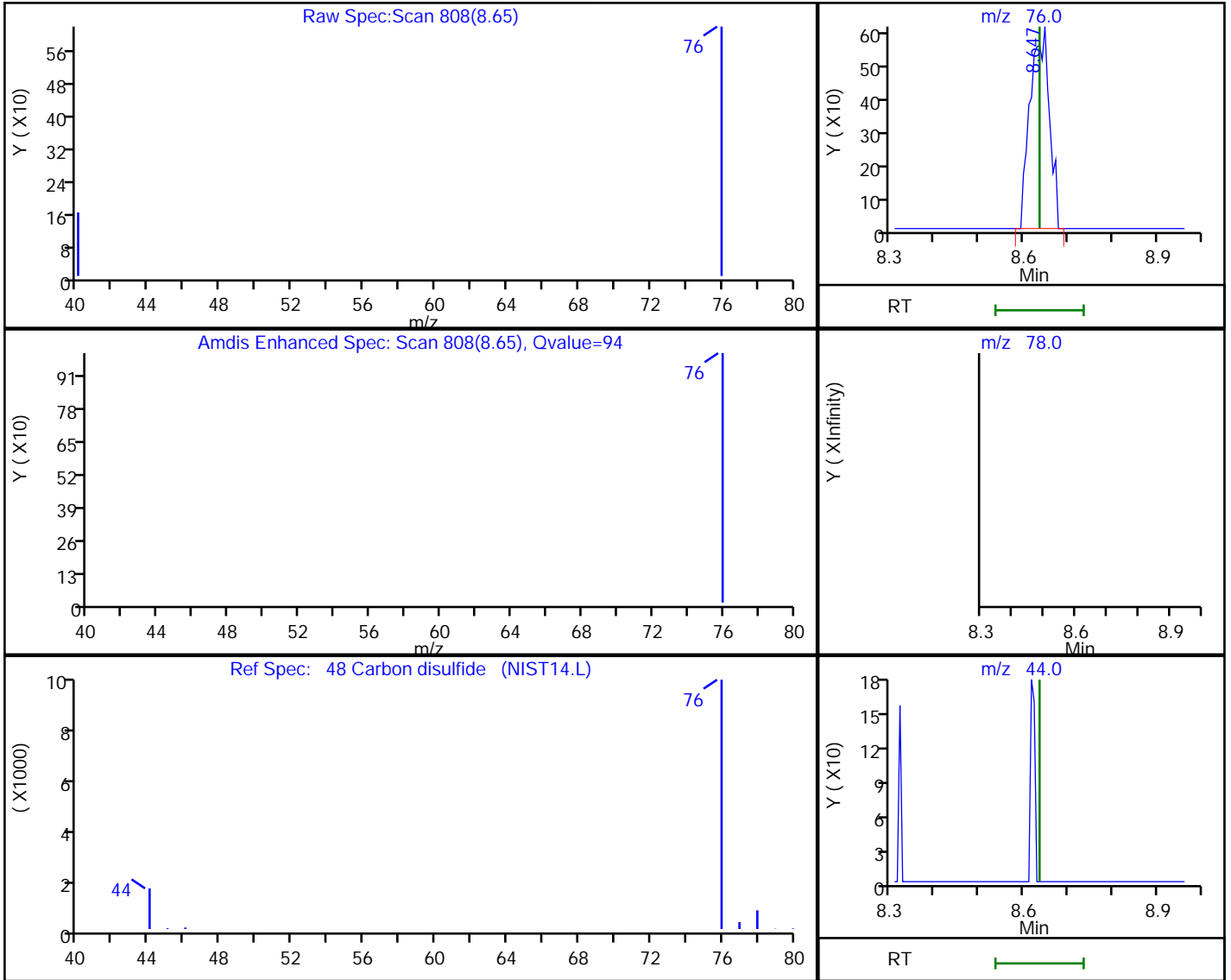
Audit Reason: Invalid Compound ID

TestAmerica Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS9\20181211-69007.b\MS9121120.D
 Injection Date: 12-Dec-2018 06:56:30 Instrument ID: ATMS9
 Lims ID: 320-45953-A-1 Lab Sample ID: 320-45953-1
 Client ID: 34000477
 Operator ID: LHS ALS Bottle#: 3 Worklist Smp#: 20
 Purge Vol: 5.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS9N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector MS SCAN

48 Carbon disulfide, CAS: 75-15-0

Processing Results



RT	Mass	Response	Amount
8.65	76.00	1860	0.087787
8.63	78.00	0	
8.63	44.00	0	

Reviewer: vanommens, 12-Dec-2018 10:05:44

Audit Action: Marked Compound Undetected

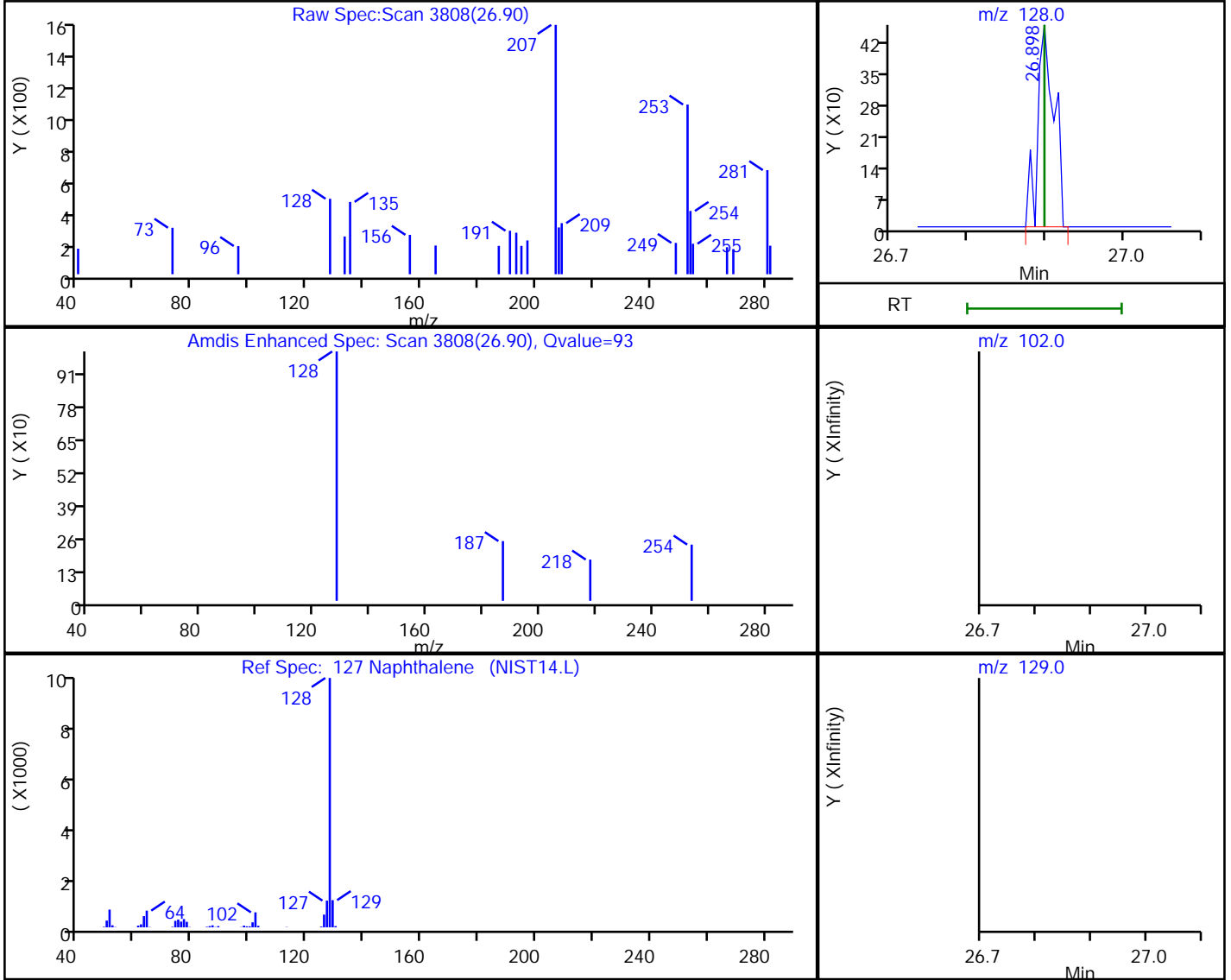
Audit Reason: Invalid Compound ID

TestAmerica Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS9\20181211-69007.b\MS9121120.D
 Injection Date: 12-Dec-2018 06:56:30 Instrument ID: ATMS9
 Lims ID: 320-45953-A-1 Lab Sample ID: 320-45953-1
 Client ID: 34000477
 Operator ID: LHS ALS Bottle#: 3 Worklist Smp#: 20
 Purge Vol: 5.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS9N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector: MS SCAN

127 Naphthalene, CAS: 91-20-3

Processing Results



RT	Mass	Response	Amount
26.90	128.00	677	0.012778
26.90	102.00	0	
26.90	129.00	0	

Reviewer: vanommens, 12-Dec-2018 10:06:36

Audit Action: Marked Compound Undetected

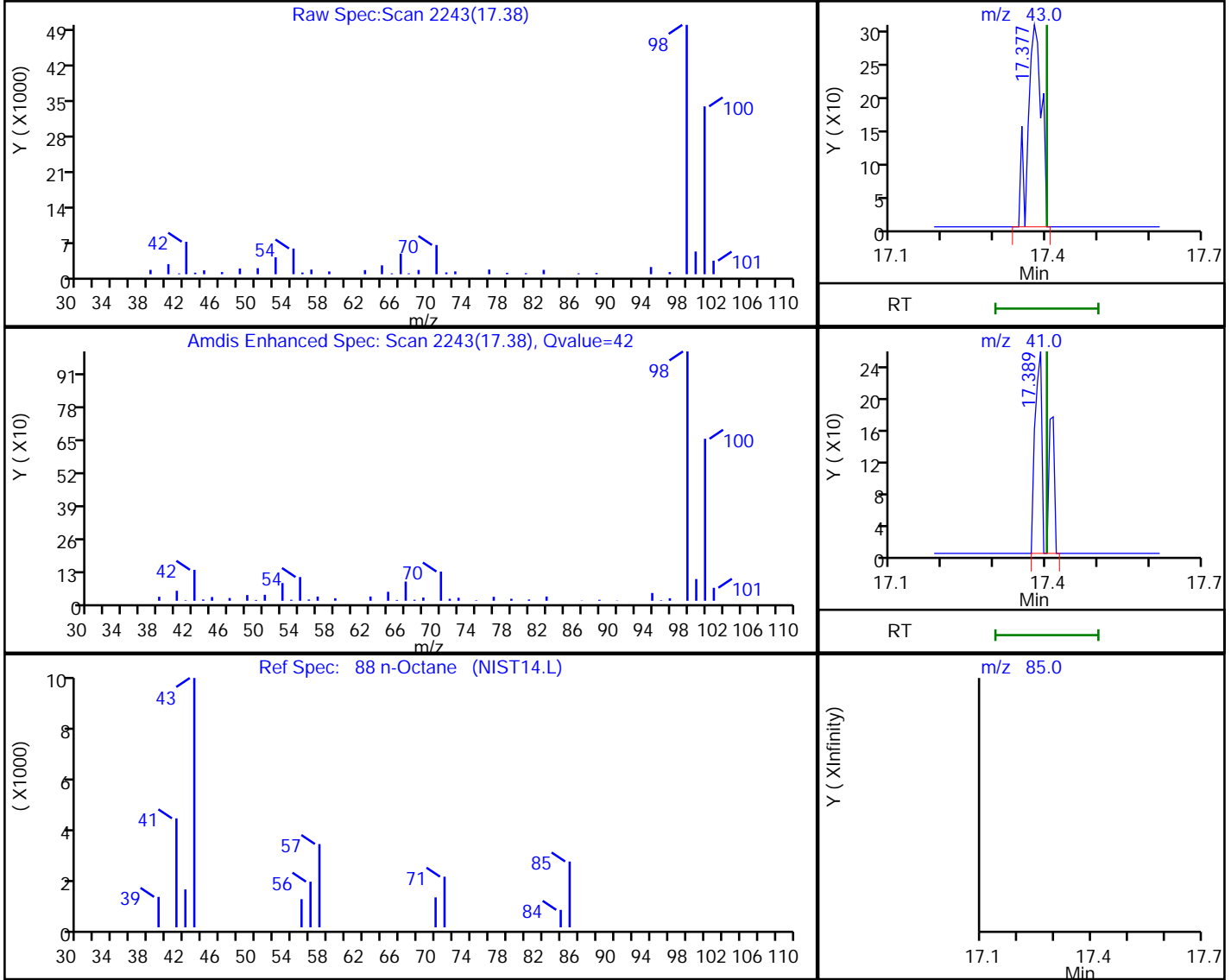
Audit Reason: Invalid Compound ID

TestAmerica Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS9\20181211-69007.b\MS9121120.D
 Injection Date: 12-Dec-2018 06:56:30 Instrument ID: ATMS9
 Lims ID: 320-45953-A-1 Lab Sample ID: 320-45953-1
 Client ID: 34000477
 Operator ID: LHS ALS Bottle#: 3 Worklist Smp#: 20
 Purge Vol: 5.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS9N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector: MS SCAN

88 n-Octane, CAS: 111-65-9

Processing Results



RT	Mass	Response	Amount
17.38	43.00	556	0.024758
17.39	41.00	356	
17.40	85.00	0	

Reviewer: vanommens, 12-Dec-2018 10:06:12

Audit Action: Marked Compound Undetected

Audit Reason: Invalid Compound ID

FORM I
AIR - GC/MS VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Sacramento Job No.: 320-46173-1
 SDG No.: _____
 Client Sample ID: 34000426 Lab Sample ID: 320-46173-1
 Matrix: Air Lab File ID: MS121923.D
 Analysis Method: TO-15 Date Collected: 12/14/2018 00:00
 Sample wt/vol: 500 (mL) Date Analyzed: 12/20/2018 14:27
 Soil Aliquot Vol: _____ Dilution Factor: 1
 Soil Extract Vol.: _____ GC Column: RTX-Volatiles ID: 0.32 (mm)
 % Moisture: _____ Level: (low/med) Low
 Analysis Batch No.: 266345 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
67-64-1	Acetone	1.0	J	5.0	0.18
107-02-8	Acrolein	ND		2.0	0.22
107-13-1	Acrylonitrile	ND		2.0	0.19
107-05-1	Allyl chloride	ND		0.80	0.11
71-43-2	Benzene	ND		0.40	0.079
100-44-7	Benzyl chloride	ND		0.80	0.16
75-27-4	Bromodichloromethane	ND		0.30	0.066
75-25-2	Bromoform	ND		0.40	0.070
74-83-9	Bromomethane	ND		0.80	0.34
106-99-0	1,3-Butadiene	ND		0.80	0.15
106-97-8	n-Butane	ND		0.40	0.15
78-93-3	2-Butanone (MEK)	ND		0.80	0.20
75-65-0	tert-Butyl alcohol (TBA)	ND		2.0	0.11
104-51-8	n-Butylbenzene	ND		0.40	0.18
135-98-8	sec-Butylbenzene	ND		0.40	0.070
98-06-6	tert-Butylbenzene	ND		0.80	0.068
75-15-0	Carbon disulfide	ND		0.80	0.078
56-23-5	Carbon tetrachloride	ND		0.80	0.064
108-90-7	Chlorobenzene	ND		0.30	0.064
75-45-6	Chlorodifluoromethane	ND		0.80	0.27
75-00-3	Chloroethane	ND		0.80	0.31
67-66-3	Chloroform	ND		0.30	0.095
74-87-3	Chloromethane	ND		0.80	0.20
95-49-8	2-Chlorotoluene	ND		0.40	0.080
110-82-7	Cyclohexane	ND		0.40	0.084
124-48-1	Dibromochloromethane	ND		0.40	0.079
106-93-4	1,2-Dibromoethane (EDB)	ND		0.80	0.075
74-95-3	Dibromomethane	ND		0.40	0.057
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		0.40	0.16
95-50-1	1,2-Dichlorobenzene	ND		0.40	0.13
541-73-1	1,3-Dichlorobenzene	ND		0.40	0.11
106-46-7	1,4-Dichlorobenzene	ND		0.40	0.15
75-71-8	Dichlorodifluoromethane	ND		0.40	0.15
75-34-3	1,1-Dichloroethane	ND		0.30	0.072
107-06-2	1,2-Dichloroethane	ND		0.80	0.088

FORM I
AIR - GC/MS VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Sacramento Job No.: 320-46173-1
 SDG No.: _____
 Client Sample ID: 34000426 Lab Sample ID: 320-46173-1
 Matrix: Air Lab File ID: MS121923.D
 Analysis Method: TO-15 Date Collected: 12/14/2018 00:00
 Sample wt/vol: 500 (mL) Date Analyzed: 12/20/2018 14:27
 Soil Aliquot Vol: _____ Dilution Factor: 1
 Soil Extract Vol.: _____ GC Column: RTX-Volatiles ID: 0.32 (mm)
 % Moisture: _____ Level: (low/med) Low
 Analysis Batch No.: 266345 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
75-35-4	1,1-Dichloroethene	ND		0.80	0.13
156-59-2	cis-1,2-Dichloroethene	ND		0.40	0.089
156-60-5	trans-1,2-Dichloroethene	ND		0.40	0.10
78-87-5	1,2-Dichloropropane	ND		0.40	0.24
10061-01-5	cis-1,3-Dichloropropene	ND		0.40	0.10
10061-02-6	trans-1,3-Dichloropropene	ND		0.40	0.088
123-91-1	1,4-Dioxane	ND		0.80	0.10
141-78-6	Ethyl acetate	ND		0.30	0.18
100-41-4	Ethylbenzene	ND		0.40	0.063
622-96-8	4-Ethyltoluene	ND		0.40	0.19
142-82-5	n-Heptane	ND		0.80	0.063
87-68-3	Hexachlorobutadiene	ND		2.0	0.43
110-54-3	n-Hexane	ND		0.80	0.075
591-78-6	2-Hexanone	ND		0.40	0.087
98-82-8	Isopropylbenzene	ND		0.80	0.10
99-87-6	4-Isopropyltoluene	ND		0.80	0.12
1634-04-4	Methyl-t-Butyl Ether (MTBE)	ND		0.80	0.12
80-62-6	Methyl methacrylate	ND		0.80	0.16
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		0.40	0.14
75-09-2	Methylene Chloride	ND		0.40	0.072
98-83-9	alpha-Methylstyrene	ND		0.40	0.065
91-20-3	Naphthalene	ND		0.80	0.56
111-65-9	n-Octane	ND		0.40	0.055
109-66-0	n-Pentane	ND		0.80	0.26
115-07-1	Propylene	0.18	J B	0.40	0.099
103-65-1	N-Propylbenzene	ND		0.40	0.059
100-42-5	Styrene	ND		0.40	0.059
79-34-5	1,1,2,2-Tetrachloroethane	ND		0.40	0.069
127-18-4	Tetrachloroethene	ND		0.40	0.051
109-99-9	Tetrahydrofuran	ND		0.80	0.21
108-88-3	Toluene	ND		0.40	0.051
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	ND		0.40	0.16
120-82-1	1,2,4-Trichlorobenzene	ND		2.0	0.43
71-55-6	1,1,1-Trichloroethane	ND		0.30	0.065
79-00-5	1,1,2-Trichloroethane	ND		0.40	0.067

FORM I
AIR - GC/MS VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Sacramento Job No.: 320-46173-1
 SDG No.: _____
 Client Sample ID: 34000426 Lab Sample ID: 320-46173-1
 Matrix: Air Lab File ID: MS121923.D
 Analysis Method: TO-15 Date Collected: 12/14/2018 00:00
 Sample wt/vol: 500 (mL) Date Analyzed: 12/20/2018 14:27
 Soil Aliquot Vol: _____ Dilution Factor: 1
 Soil Extract Vol.: _____ GC Column: RTX-Volatiles ID: 0.32 (mm)
 % Moisture: _____ Level: (low/med) Low
 Analysis Batch No.: 266345 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
79-01-6	Trichloroethene	ND		0.40	0.11
75-69-4	Trichlorofluoromethane	ND		0.40	0.20
96-18-4	1,2,3-Trichloropropane	ND		0.40	0.17
95-63-6	1,2,4-Trimethylbenzene	ND		0.80	0.16
108-67-8	1,3,5-Trimethylbenzene	ND		0.40	0.13
540-84-1	2,2,4-Trimethylpentane	ND		0.40	0.071
108-05-4	Vinyl acetate	ND		0.80	0.15
593-60-2	Vinyl bromide	ND		0.80	0.26
75-01-4	Vinyl chloride	ND		0.40	0.12
179601-23-1	m,p-Xylene	ND		0.80	0.10
95-47-6	o-Xylene	ND		0.40	0.054
1330-20-7	Xylenes, Total	ND		1.2	0.074
87-61-6	1,2,3-Trichlorobenzene	ND		2.0	0.62
60-29-7	Ethyl ether	ND		0.80	0.20
71-36-3	n-Butanol	ND		2.0	0.26
111-84-2	n-Nonane	ND		0.80	0.058

CAS NO.	SURROGATE	%REC	Q	LIMITS
460-00-4	4-Bromofluorobenzene (Surr)	109		70-130
17060-07-0	1,2-Dichloroethane-d4 (Surr)	107		70-130
2037-26-5	Toluene-d8 (Surr)	108		70-130

TestAmerica Sacramento
Target Compound Quantitation Report

Data File: \\chromna\Sacramento\ChromData\ATMS2\20181219-69463.b\MS121923.D
 Lims ID: 320-46173-A-1
 Client ID: 34000426
 Sample Type: Client
 Inject. Date: 20-Dec-2018 14:27:30 ALS Bottle#: 6 Worklist Smp#: 23
 Purge Vol: 250.000 mL Dil. Factor: 1.0000
 Sample Info: 320-46173-A-1
 Misc. Info.: 500 mL CAN CERT
 Operator ID: LHS Instrument ID: ATMS2
 Method: \\chromna\Sacramento\ChromData\ATMS2\20181219-69463.b\TO15_ATMS2N.m
 Limit Group: MSA - TO15 - ICAL
 Last Update: 20-Dec-2018 16:24:38 Calib Date: 19-Dec-2018 21:50:30
 Integrator: RTE ID Type: Deconvolution ID
 Quant Method: Internal Standard Quant By: Initial Calibration
 Last ICal File: \\chromna\Sacramento\ChromData\ATMS2\20181219-69463.b\MS121906.D
 Column 1 : RTX Volatiles (0.32 mm) Det: MS SCAN
 Process Host: CTX0319

First Level Reviewer: leeh

Date: 20-Dec-2018 16:24:00

Compound	Sig	RT (min.)	Adj RT (min.)	Dlt RT (min.)	Q	Response	OnCol Amt ppb v/v	Flags
* 1 Chlorobromomethane (IS)	130	11.313	11.310	0.003	94	34095	4.00	
* 2 1,4-Difluorobenzene	114	13.399	13.399	0.000	96	132374	4.00	
* 3 Chlorobenzene-d5 (IS)	117	19.467	19.467	0.000	89	107582	4.00	
\$ 4 1,2-Dichloroethane-d4 (Sur	65	12.462	12.462	0.003	0	50879	4.28	
\$ 5 Toluene-d8 (Surr)	100	16.634	16.631	0.006	98	82510	4.33	
\$ 6 4-Bromofluorobenzene (Surr	95	21.498	21.499	-0.001	92	66289	4.34	
10 Propene	41	3.910	3.919	-0.007	97	3296	0.1776	
32 Acetone	43	6.863	6.879	-0.012	94	16942	1.05	E

QC Flag Legend

Processing Flags

E - Exceeded Maximum Amount

Reagents:

VAMSIS20_00262

Amount Added: 50.00

Units: mL

Run Reagent

Data File: \\chromna\Sacramento\ChromData\ATMS2\20181219-69463.b\MS121923.D

Injection Date: 20-Dec-2018 14:27:30

Instrument ID: ATMS2

Operator ID: LHS

Lims ID: 320-46173-A-1

Lab Sample ID: 320-46173-1

Worklist Smp#: 23

Client ID: 34000426

Purge Vol: 250.000 mL

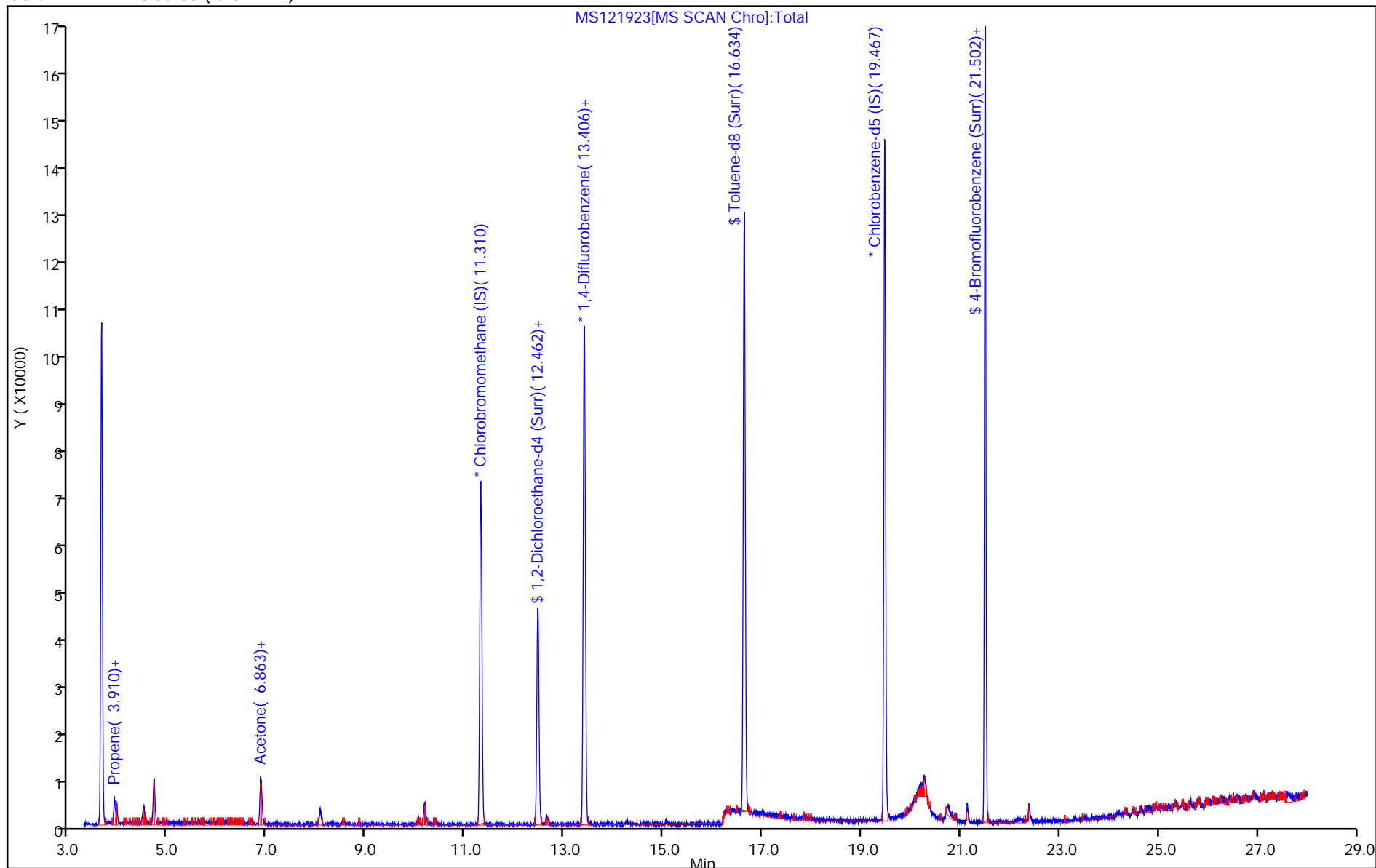
Dil. Factor: 1.0000

ALS Bottle#: 6

Method: TO15_ATMS2N

Limit Group: MSA - TO15 - ICAL

Column: RTX Volatiles (0.32 mm)



TestAmerica Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS2\20181219-69463.b\MS121923.D

Injection Date: 20-Dec-2018 14:27:30

Instrument ID: ATMS2

Lims ID: 320-46173-A-1

Lab Sample ID: 320-46173-1

Client ID: 34000426

Operator ID: LHS

ALS Bottle#: 6 Worklist Smp#: 23

Purge Vol: 250.000 mL

Dil. Factor: 1.0000

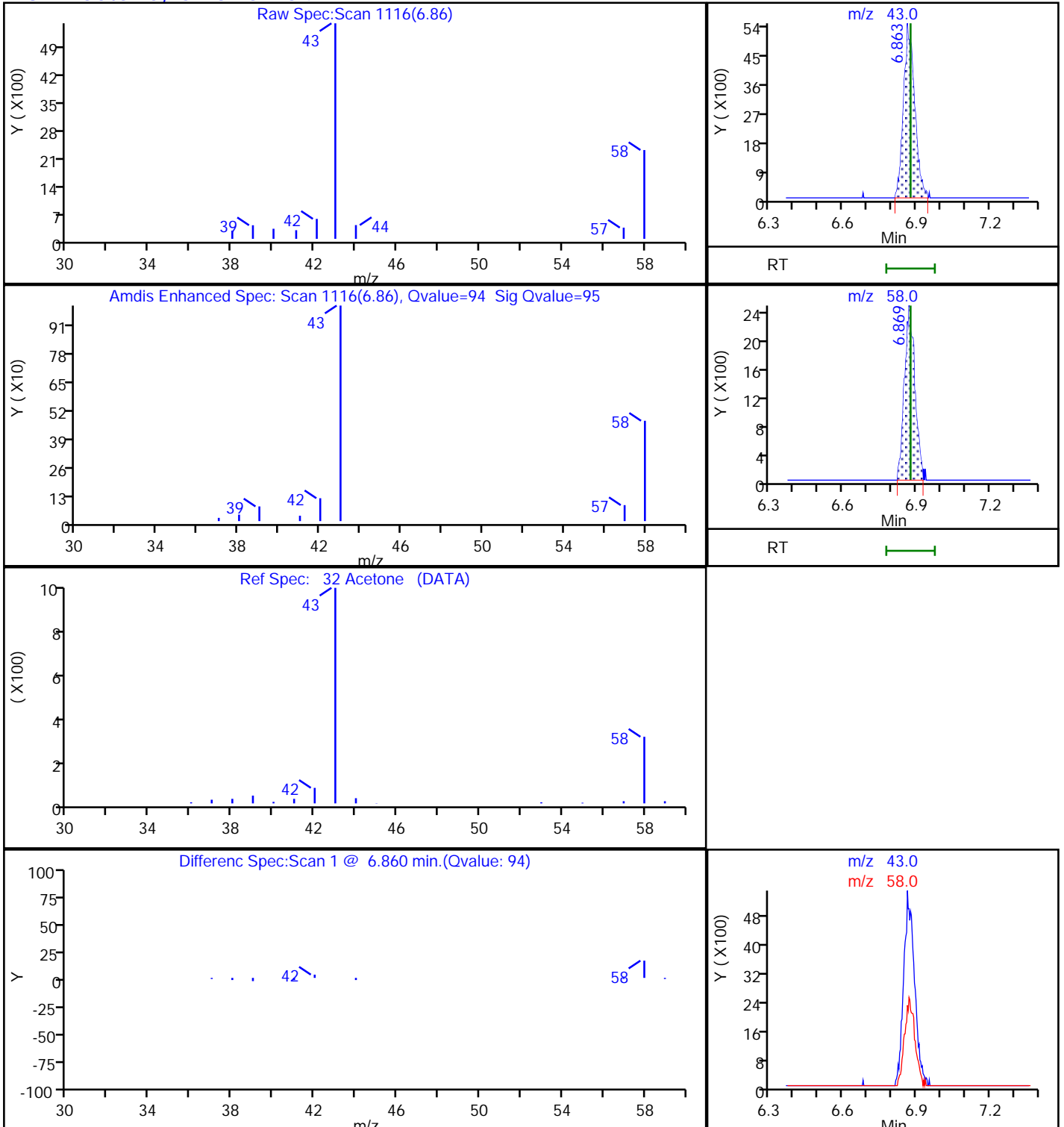
Method: TO15_ATMS2N

Limit Group: MSA - TO15 - ICAL

Column: RTX Volatiles (0.32 mm)

Detector: MS SCAN

32 Acetone, CAS: 67-64-1



- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16

TestAmerica Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS2\20181219-69463.b\MS121923.D

Injection Date: 20-Dec-2018 14:27:30

Instrument ID: ATMS2

Lims ID: 320-46173-A-1

Lab Sample ID: 320-46173-1

Client ID: 34000426

Operator ID: LHS

ALS Bottle#: 6 Worklist Smp#: 23

Purge Vol: 250.000 mL

Dil. Factor: 1.0000

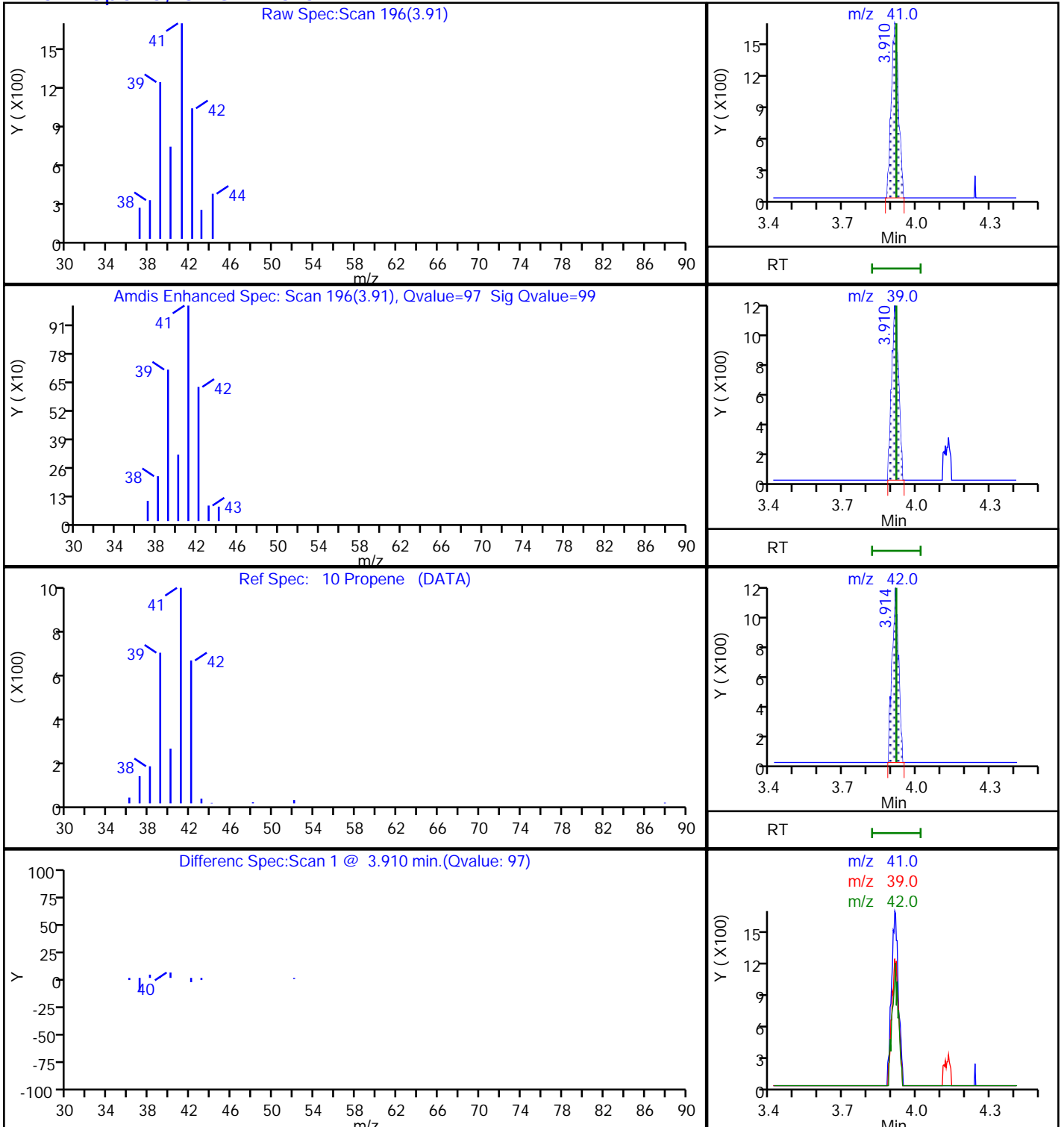
Method: TO15_ATMS2N

Limit Group: MSA - TO15 - ICAL

Column: RTX Volatiles (0.32 mm)

Detector: MS SCAN

10 Propene, CAS: 115-07-1

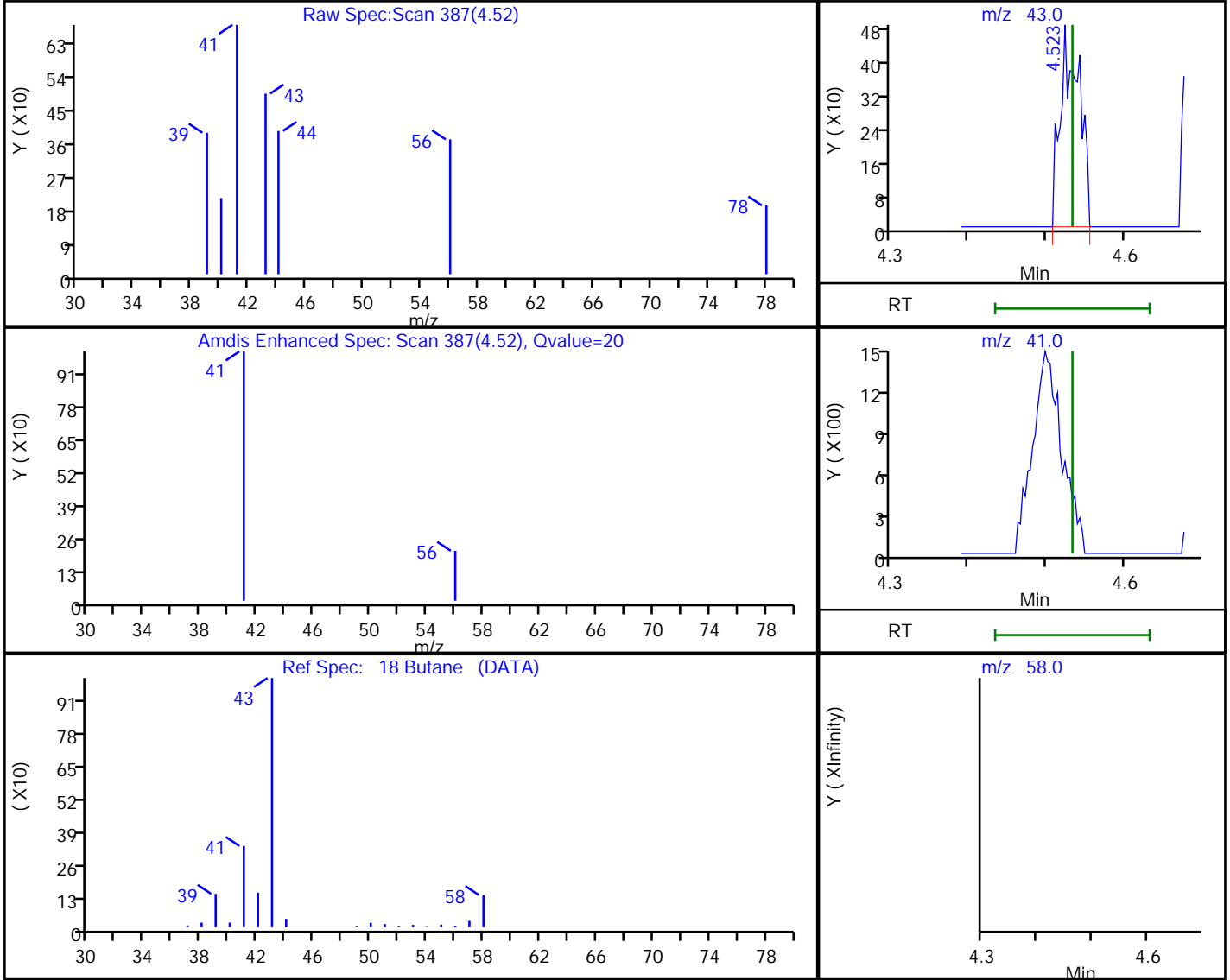


TestAmerica Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS2\20181219-69463.b\MS121923.D
 Injection Date: 20-Dec-2018 14:27:30 Instrument ID: ATMS2
 Lims ID: 320-46173-A-1 Lab Sample ID: 320-46173-1
 Client ID: 34000426
 Operator ID: LHS ALS Bottle#: 6 Worklist Smp#: 23
 Purge Vol: 250.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS2N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector: MS SCAN

18 Butane, CAS: 106-97-8

Processing Results



RT	Mass	Response	Amount
4.52	43.00	836	0.031167
4.53	41.00	0	
4.53	58.00	0	

Reviewer: leeh, 20-Dec-2018 16:23:38

Audit Action: Marked Compound Undetected

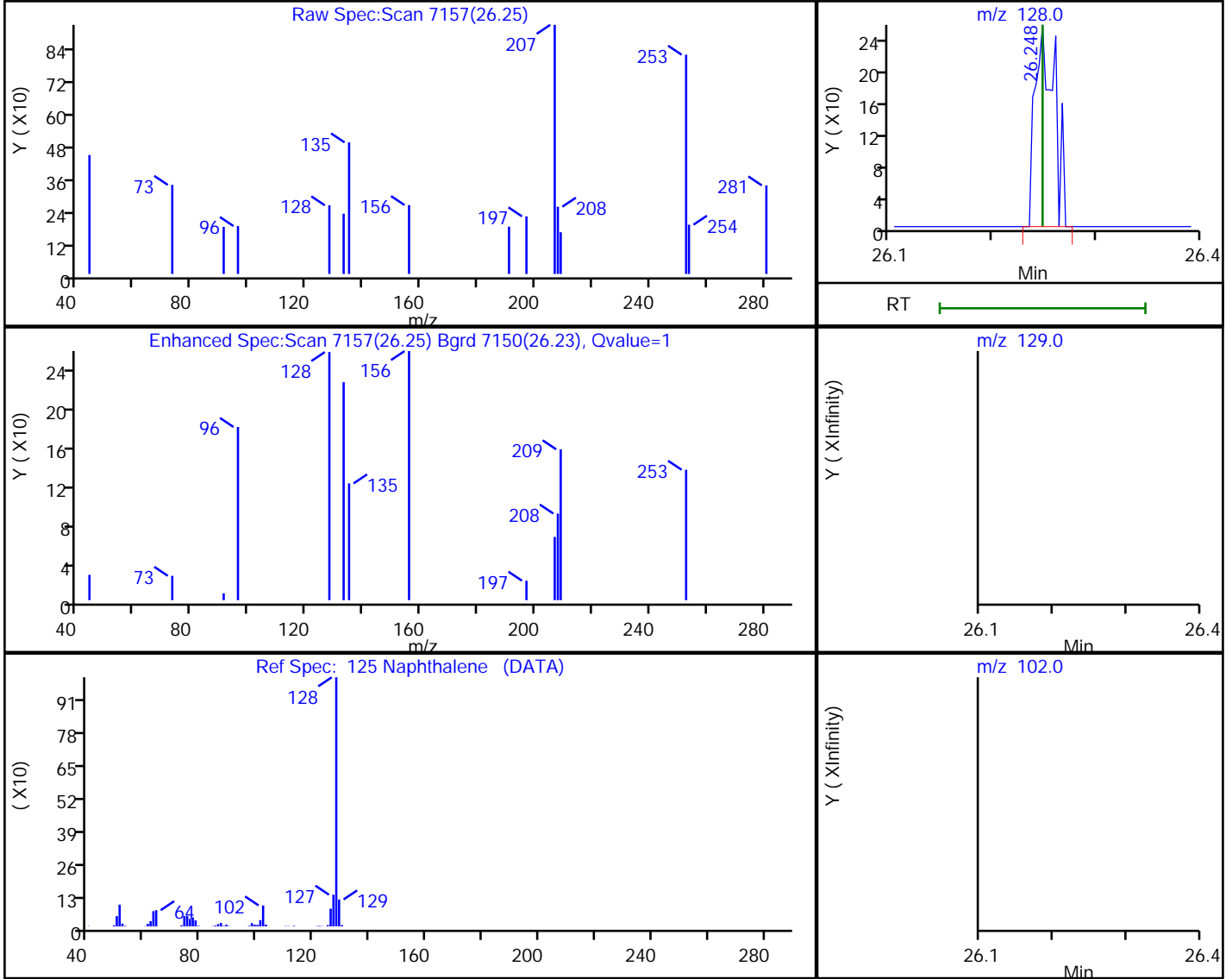
Audit Reason: Invalid Compound ID

TestAmerica Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS2\20181219-69463.b\MS121923.D
 Injection Date: 20-Dec-2018 14:27:30 Instrument ID: ATMS2
 Lims ID: 320-46173-A-1 Lab Sample ID: 320-46173-1
 Client ID: 34000426
 Operator ID: LHS ALS Bottle#: 6 Worklist Smp#: 23
 Purge Vol: 250.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS2N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector: MS SCAN

125 Naphthalene, CAS: 91-20-3

Processing Results



RT	Mass	Response	Amount
26.25	128.00	331	0.004635
26.25	129.00	0	
26.25	102.00	0	

Reviewer: leeh, 20-Dec-2018 16:23:55

Audit Action: Marked Compound Undetected

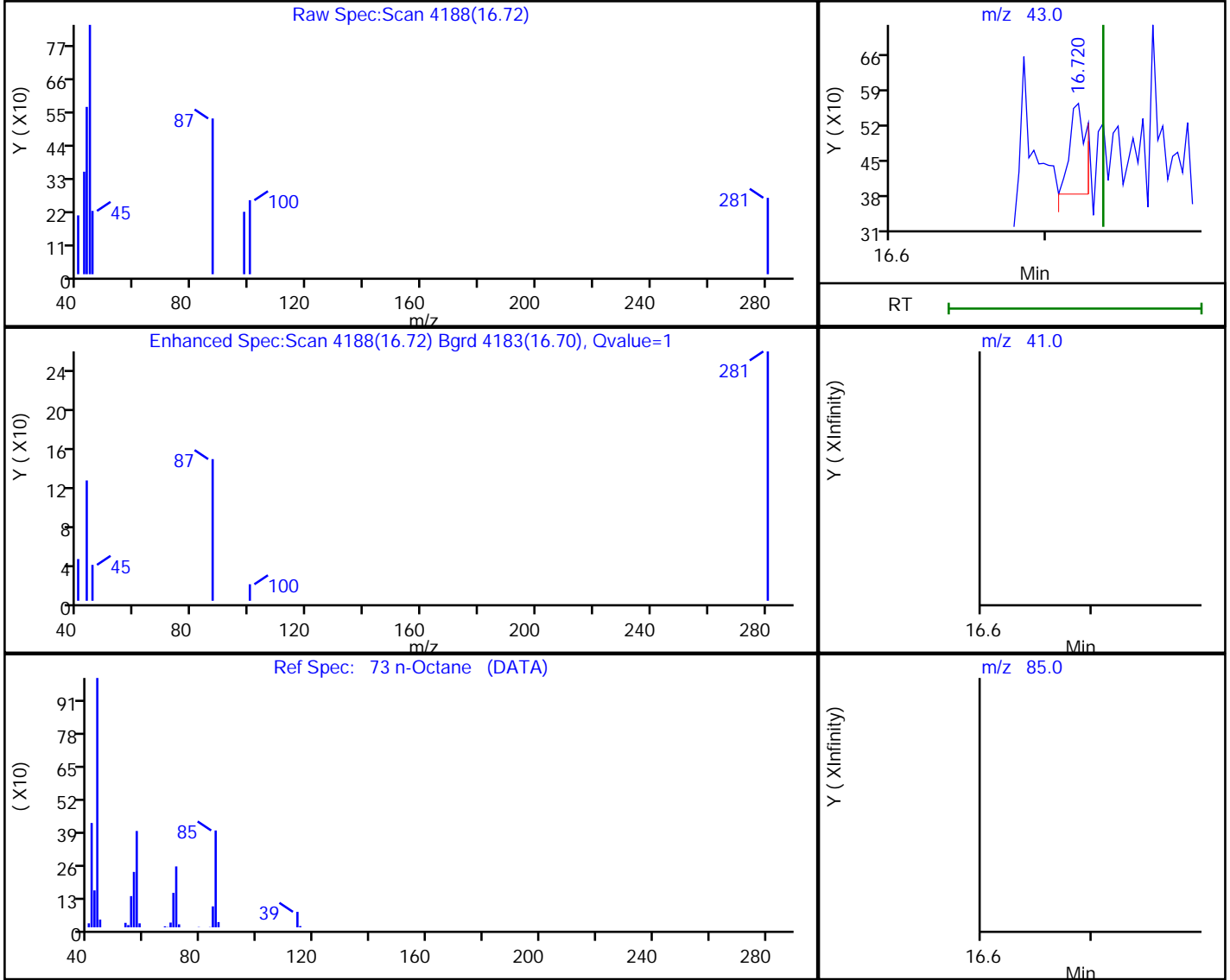
Audit Reason: Invalid Compound ID

TestAmerica Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS2\20181219-69463.b\MS121923.D
 Injection Date: 20-Dec-2018 14:27:30 Instrument ID: ATMS2
 Lims ID: 320-46173-A-1 Lab Sample ID: 320-46173-1
 Client ID: 34000426
 Operator ID: LHS ALS Bottle#: 6 Worklist Smp#: 23
 Purge Vol: 250.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS2N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector: MS SCAN

73 n-Octane, CAS: 111-65-9

Processing Results



RT	Mass	Response	Amount
16.72	43.00	133	0.002850
16.74	41.00	0	
16.74	85.00	0	

Reviewer: leeh, 20-Dec-2018 16:23:48

Audit Action: Marked Compound Undetected

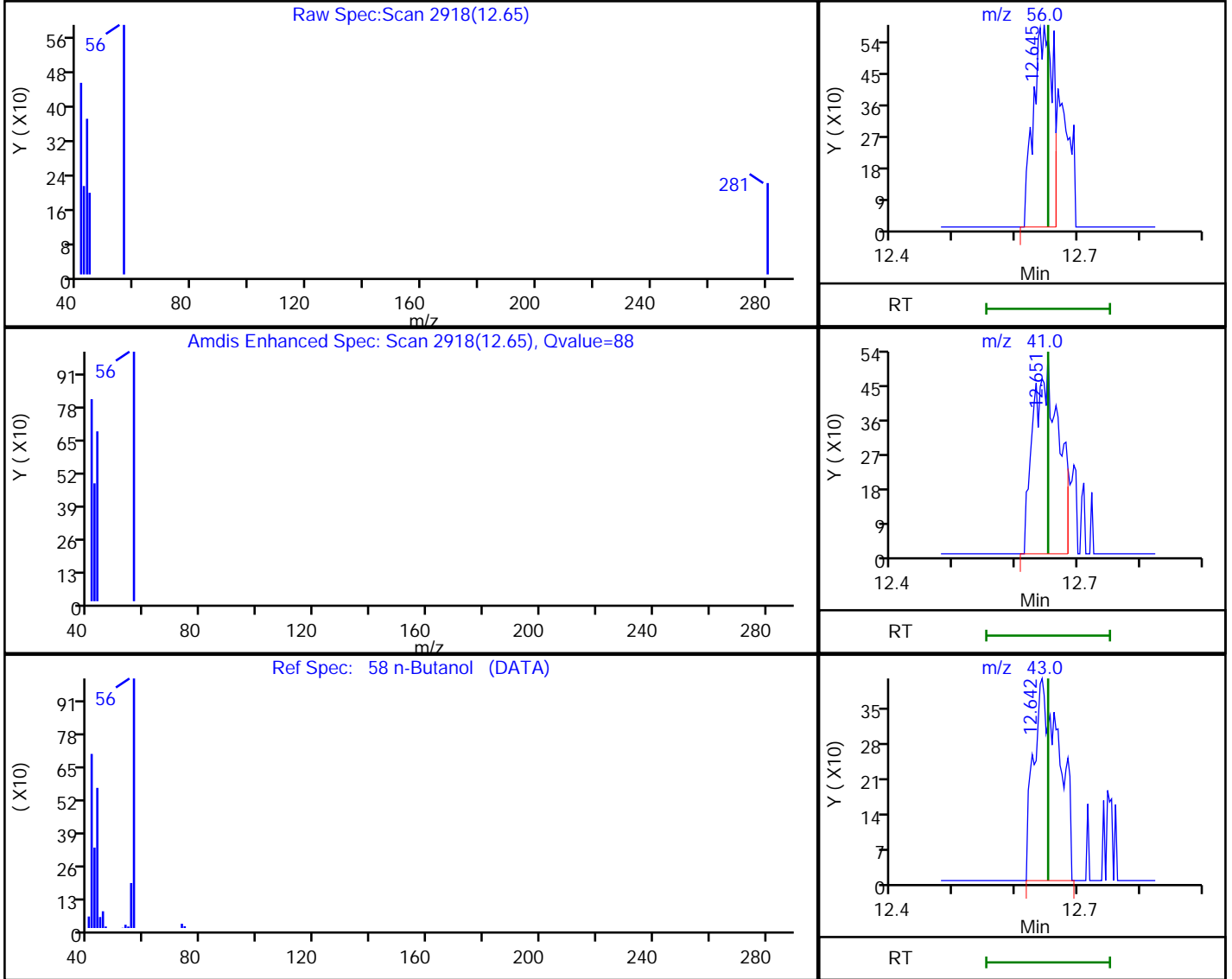
Audit Reason: Invalid Compound ID

TestAmerica Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS2\20181219-69463.b\MS121923.D
 Injection Date: 20-Dec-2018 14:27:30 Instrument ID: ATMS2
 Lims ID: 320-46173-A-1 Lab Sample ID: 320-46173-1
 Client ID: 34000426
 Operator ID: LHS ALS Bottle#: 6 Worklist Smp#: 23
 Purge Vol: 250.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS2N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector MS SCAN

58 n-Butanol, CAS: 71-36-3

Processing Results



RT	Mass	Response	Amount
12.65	56.00	1281	0.112020
12.65	41.00	1458	
12.64	43.00	1158	

Reviewer: leeh, 20-Dec-2018 16:23:43

Audit Action: Marked Compound Undetected

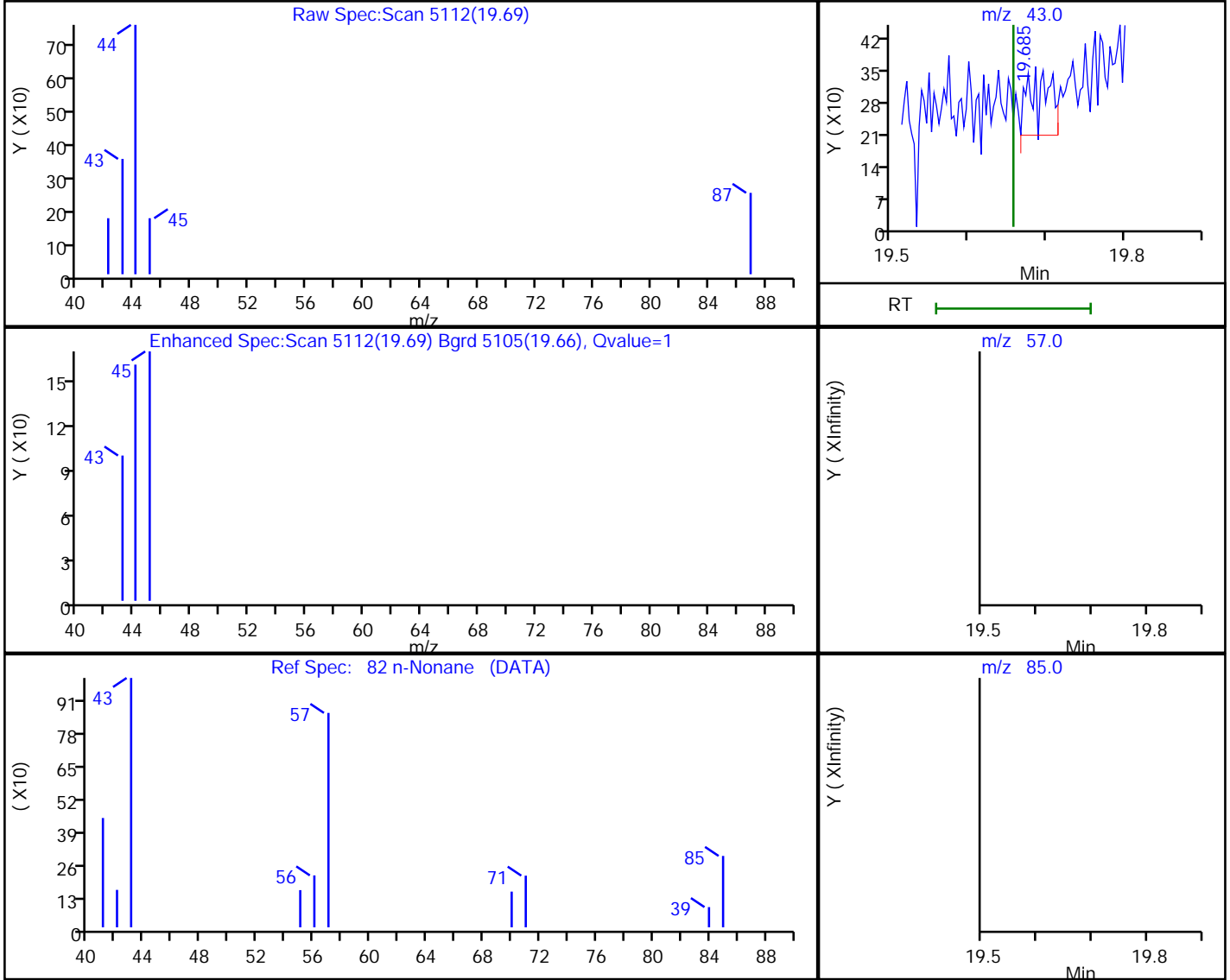
Audit Reason: Invalid Compound ID

TestAmerica Sacramento

Data File: \\chromna\Sacramento\ChromData\ATMS2\20181219-69463.b\MS121923.D
 Injection Date: 20-Dec-2018 14:27:30 Instrument ID: ATMS2
 Lims ID: 320-46173-A-1 Lab Sample ID: 320-46173-1
 Client ID: 34000426
 Operator ID: LHS ALS Bottle#: 6 Worklist Smp#: 23
 Purge Vol: 250.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS2N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector: MS SCAN

82 n-Nonane, CAS: 111-84-2

Processing Results



RT	Mass	Response	Amount
19.69	43.00	269	0.006037
19.66	57.00	0	
19.66	85.00	0	

Reviewer: leeh, 20-Dec-2018 16:23:50

Audit Action: Marked Compound Undetected

Audit Reason: Invalid Compound ID

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Tel: (916)373-5600

TestAmerica Job ID: 320-41388-1
Client Project/Site: NuStar Vancouver

For:
Cascadia Associates LLC
6915 SE Macadam Ave
Suite 250
Portland, Oregon 97219

Attn: Stephanie Salisbury



Authorized for release by:
8/6/2018 2:30:58 PM

Nathan Lewis, Project Manager I
(253)922-2310
nathan.lewis@testamericainc.com

LINKS

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

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

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

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Definitions/Glossary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Glossary

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

Case Narrative

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Job ID: 320-41388-1

Laboratory: TestAmerica Sacramento

Narrative

Job Narrative
320-41388-1

Comments

No additional comments.

Receipt

The samples were received on 7/24/2018 9:00 AM; the samples arrived in good condition and properly preserved.

Air - GC/MS VOA

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

VOA Prep

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

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Detection Summary

Client: Cascadia Associates LLC
 Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Client Sample ID: SVE_South_72318-Pre Carbon

Lab Sample ID: 320-41388-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
cis-1,2-Dichloroethene	43		21		ppb v/v	52.2		TO-15	Total/NA
Tetrachloroethene	2700		21		ppb v/v	52.2		TO-15	Total/NA
Trichloroethene	140		21		ppb v/v	52.2		TO-15	Total/NA
Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
cis-1,2-Dichloroethene	170		83		ug/m3 Air	52.2		TO-15	Total/NA
Tetrachloroethene	18000		140		ug/m3 Air	52.2		TO-15	Total/NA
Trichloroethene	770		110		ug/m3 Air	52.2		TO-15	Total/NA

Client Sample ID: SVE_South_Post Carbon-72318

Lab Sample ID: 320-41388-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
1,1,1-Trichloroethane	95		6.2		ppb v/v	20.6		TO-15	Total/NA
cis-1,2-Dichloroethene	58		8.2		ppb v/v	20.6		TO-15	Total/NA
Tetrachloroethene	1200		8.2		ppb v/v	20.6		TO-15	Total/NA
Trichloroethene	1200		8.2		ppb v/v	20.6		TO-15	Total/NA
Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
1,1,1-Trichloroethane	520		34		ug/m3 Air	20.6		TO-15	Total/NA
cis-1,2-Dichloroethene	230		33		ug/m3 Air	20.6		TO-15	Total/NA
Tetrachloroethene	8300		56		ug/m3 Air	20.6		TO-15	Total/NA
Trichloroethene	6400		44		ug/m3 Air	20.6		TO-15	Total/NA

This Detection Summary does not include radiochemical test results.

TestAmerica Sacramento

Client Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Client Sample ID: SVE_South_72318-Pre Carbon

Lab Sample ID: 320-41388-1

Date Collected: 07/23/18 08:45

Matrix: Air

Date Received: 07/24/18 09:00

Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		16		ppb v/v			08/05/18 02:00	52.2
1,1,2,2-Tetrachloroethane	ND		21		ppb v/v			08/05/18 02:00	52.2
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		21		ppb v/v			08/05/18 02:00	52.2
1,1,2-Trichloroethane	ND		21		ppb v/v			08/05/18 02:00	52.2
1,1-Dichloroethane	ND		16		ppb v/v			08/05/18 02:00	52.2
1,1-Dichloroethene	ND		42		ppb v/v			08/05/18 02:00	52.2
1,2,4-Trichlorobenzene	ND		100		ppb v/v			08/05/18 02:00	52.2
1,2,4-Trimethylbenzene	ND		42		ppb v/v			08/05/18 02:00	52.2
1,2-Dibromoethane (EDB)	ND		42		ppb v/v			08/05/18 02:00	52.2
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		21		ppb v/v			08/05/18 02:00	52.2
1,2-Dichlorobenzene	ND		21		ppb v/v			08/05/18 02:00	52.2
1,2-Dichloroethane	ND		42		ppb v/v			08/05/18 02:00	52.2
1,2-Dichloropropane	ND		21		ppb v/v			08/05/18 02:00	52.2
1,3,5-Trimethylbenzene	ND		21		ppb v/v			08/05/18 02:00	52.2
1,3-Dichlorobenzene	ND		21		ppb v/v			08/05/18 02:00	52.2
1,4-Dichlorobenzene	ND		21		ppb v/v			08/05/18 02:00	52.2
2-Butanone (MEK)	ND		42		ppb v/v			08/05/18 02:00	52.2
2-Hexanone	ND		21		ppb v/v			08/05/18 02:00	52.2
4-Ethyltoluene	ND		21		ppb v/v			08/05/18 02:00	52.2
4-Methyl-2-pentanone (MIBK)	ND		21		ppb v/v			08/05/18 02:00	52.2
Acetone	ND		260		ppb v/v			08/05/18 02:00	52.2
Benzene	ND		21		ppb v/v			08/05/18 02:00	52.2
Benzyl chloride	ND		42		ppb v/v			08/05/18 02:00	52.2
Bromodichloromethane	ND		16		ppb v/v			08/05/18 02:00	52.2
Bromoform	ND		21		ppb v/v			08/05/18 02:00	52.2
Bromomethane	ND		42		ppb v/v			08/05/18 02:00	52.2
Carbon disulfide	ND		42		ppb v/v			08/05/18 02:00	52.2
Carbon tetrachloride	ND		42		ppb v/v			08/05/18 02:00	52.2
Chlorobenzene	ND		16		ppb v/v			08/05/18 02:00	52.2
Chloroethane	ND		42		ppb v/v			08/05/18 02:00	52.2
Chloroform	ND		16		ppb v/v			08/05/18 02:00	52.2
Chloromethane	ND		42		ppb v/v			08/05/18 02:00	52.2
cis-1,2-Dichloroethene	43		21		ppb v/v			08/05/18 02:00	52.2
cis-1,3-Dichloropropene	ND		21		ppb v/v			08/05/18 02:00	52.2
Dibromochloromethane	ND		21		ppb v/v			08/05/18 02:00	52.2
Dichlorodifluoromethane	ND		21		ppb v/v			08/05/18 02:00	52.2
Ethylbenzene	ND		21		ppb v/v			08/05/18 02:00	52.2
Hexachlorobutadiene	ND		100		ppb v/v			08/05/18 02:00	52.2
m,p-Xylene	ND		42		ppb v/v			08/05/18 02:00	52.2
Methylene Chloride	ND		21		ppb v/v			08/05/18 02:00	52.2
o-Xylene	ND		21		ppb v/v			08/05/18 02:00	52.2
Styrene	ND		21		ppb v/v			08/05/18 02:00	52.2
Tetrachloroethene	2700		21		ppb v/v			08/05/18 02:00	52.2
Toluene	ND		21		ppb v/v			08/05/18 02:00	52.2
trans-1,2-Dichloroethene	ND		21		ppb v/v			08/05/18 02:00	52.2
trans-1,3-Dichloropropene	ND		21		ppb v/v			08/05/18 02:00	52.2
Trichloroethene	140		21		ppb v/v			08/05/18 02:00	52.2
Trichlorofluoromethane	ND		21		ppb v/v			08/05/18 02:00	52.2

TestAmerica Sacramento

Client Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Client Sample ID: SVE_South_72318-Pre Carbon

Lab Sample ID: 320-41388-1

Date Collected: 07/23/18 08:45

Matrix: Air

Date Received: 07/24/18 09:00

Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Vinyl acetate	ND		42		ppb v/v			08/05/18 02:00	52.2
Vinyl chloride	ND		21		ppb v/v			08/05/18 02:00	52.2
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		85		ug/m3 Air			08/05/18 02:00	52.2
1,1,2,2-Tetrachloroethane	ND		140		ug/m3 Air			08/05/18 02:00	52.2
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		160		ug/m3 Air			08/05/18 02:00	52.2
1,1,2-Trichloroethane	ND		110		ug/m3 Air			08/05/18 02:00	52.2
1,1-Dichloroethane	ND		63		ug/m3 Air			08/05/18 02:00	52.2
1,1-Dichloroethene	ND		170		ug/m3 Air			08/05/18 02:00	52.2
1,2,4-Trichlorobenzene	ND		770		ug/m3 Air			08/05/18 02:00	52.2
1,2,4-Trimethylbenzene	ND		210		ug/m3 Air			08/05/18 02:00	52.2
1,2-Dibromoethane (EDB)	ND		320		ug/m3 Air			08/05/18 02:00	52.2
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		150		ug/m3 Air			08/05/18 02:00	52.2
1,2-Dichlorobenzene	ND		130		ug/m3 Air			08/05/18 02:00	52.2
1,2-Dichloroethane	ND		170		ug/m3 Air			08/05/18 02:00	52.2
1,2-Dichloropropane	ND		96		ug/m3 Air			08/05/18 02:00	52.2
1,3,5-Trimethylbenzene	ND		100		ug/m3 Air			08/05/18 02:00	52.2
1,3-Dichlorobenzene	ND		130		ug/m3 Air			08/05/18 02:00	52.2
1,4-Dichlorobenzene	ND		130		ug/m3 Air			08/05/18 02:00	52.2
2-Butanone (MEK)	ND		120		ug/m3 Air			08/05/18 02:00	52.2
2-Hexanone	ND		86		ug/m3 Air			08/05/18 02:00	52.2
4-Ethyltoluene	ND		100		ug/m3 Air			08/05/18 02:00	52.2
4-Methyl-2-pentanone (MIBK)	ND		86		ug/m3 Air			08/05/18 02:00	52.2
Acetone	ND		620		ug/m3 Air			08/05/18 02:00	52.2
Benzene	ND		67		ug/m3 Air			08/05/18 02:00	52.2
Benzyl chloride	ND		220		ug/m3 Air			08/05/18 02:00	52.2
Bromodichloromethane	ND		100		ug/m3 Air			08/05/18 02:00	52.2
Bromoform	ND		220		ug/m3 Air			08/05/18 02:00	52.2
Bromomethane	ND		160		ug/m3 Air			08/05/18 02:00	52.2
Carbon disulfide	ND		130		ug/m3 Air			08/05/18 02:00	52.2
Carbon tetrachloride	ND		260		ug/m3 Air			08/05/18 02:00	52.2
Chlorobenzene	ND		72		ug/m3 Air			08/05/18 02:00	52.2
Chloroethane	ND		110		ug/m3 Air			08/05/18 02:00	52.2
Chloroform	ND		76		ug/m3 Air			08/05/18 02:00	52.2
Chloromethane	ND		86		ug/m3 Air			08/05/18 02:00	52.2
cis-1,2-Dichloroethene	170		83		ug/m3 Air			08/05/18 02:00	52.2
cis-1,3-Dichloropropene	ND		95		ug/m3 Air			08/05/18 02:00	52.2
Dibromochloromethane	ND		180		ug/m3 Air			08/05/18 02:00	52.2
Dichlorodifluoromethane	ND		100		ug/m3 Air			08/05/18 02:00	52.2
Ethylbenzene	ND		91		ug/m3 Air			08/05/18 02:00	52.2
Hexachlorobutadiene	ND		1100		ug/m3 Air			08/05/18 02:00	52.2
m,p-Xylene	ND		180		ug/m3 Air			08/05/18 02:00	52.2
Methylene Chloride	ND		73		ug/m3 Air			08/05/18 02:00	52.2
o-Xylene	ND		91		ug/m3 Air			08/05/18 02:00	52.2
Styrene	ND		89		ug/m3 Air			08/05/18 02:00	52.2
Tetrachloroethene	18000		140		ug/m3 Air			08/05/18 02:00	52.2
Toluene	ND		79		ug/m3 Air			08/05/18 02:00	52.2
trans-1,2-Dichloroethene	ND		83		ug/m3 Air			08/05/18 02:00	52.2

TestAmerica Sacramento

Client Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Client Sample ID: SVE_South_72318-Pre Carbon

Lab Sample ID: 320-41388-1

Date Collected: 07/23/18 08:45

Matrix: Air

Date Received: 07/24/18 09:00

Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
trans-1,3-Dichloropropene	ND		95		ug/m3 Air			08/05/18 02:00	52.2
Trichloroethene	770		110		ug/m3 Air			08/05/18 02:00	52.2
Trichlorofluoromethane	ND		120		ug/m3 Air			08/05/18 02:00	52.2
Vinyl acetate	ND		150		ug/m3 Air			08/05/18 02:00	52.2
Vinyl chloride	ND		53		ug/m3 Air			08/05/18 02:00	52.2
Surrogate	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	94		70 - 130					08/05/18 02:00	52.2
4-Bromofluorobenzene (Surr)	95		70 - 130					08/05/18 02:00	52.2
Toluene-d8 (Surr)	99		70 - 130					08/05/18 02:00	52.2

Client Sample ID: SVE_South_Post Carbon-72318

Lab Sample ID: 320-41388-2

Date Collected: 07/23/18 08:55

Matrix: Air

Date Received: 07/24/18 09:00

Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	95		6.2		ppb v/v			08/05/18 02:53	20.6
1,1,2,2-Tetrachloroethane	ND		8.2		ppb v/v			08/05/18 02:53	20.6
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		8.2		ppb v/v			08/05/18 02:53	20.6
1,1,2-Trichloroethane	ND		8.2		ppb v/v			08/05/18 02:53	20.6
1,1-Dichloroethane	ND		6.2		ppb v/v			08/05/18 02:53	20.6
1,1-Dichloroethene	ND		16		ppb v/v			08/05/18 02:53	20.6
1,2,4-Trichlorobenzene	ND		41		ppb v/v			08/05/18 02:53	20.6
1,2,4-Trimethylbenzene	ND		16		ppb v/v			08/05/18 02:53	20.6
1,2-Dibromoethane (EDB)	ND		16		ppb v/v			08/05/18 02:53	20.6
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		8.2		ppb v/v			08/05/18 02:53	20.6
1,2-Dichlorobenzene	ND		8.2		ppb v/v			08/05/18 02:53	20.6
1,2-Dichloroethane	ND		16		ppb v/v			08/05/18 02:53	20.6
1,2-Dichloropropane	ND		8.2		ppb v/v			08/05/18 02:53	20.6
1,3,5-Trimethylbenzene	ND		8.2		ppb v/v			08/05/18 02:53	20.6
1,3-Dichlorobenzene	ND		8.2		ppb v/v			08/05/18 02:53	20.6
1,4-Dichlorobenzene	ND		8.2		ppb v/v			08/05/18 02:53	20.6
2-Butanone (MEK)	ND		16		ppb v/v			08/05/18 02:53	20.6
2-Hexanone	ND		8.2		ppb v/v			08/05/18 02:53	20.6
4-Ethyltoluene	ND		8.2		ppb v/v			08/05/18 02:53	20.6
4-Methyl-2-pentanone (MIBK)	ND		8.2		ppb v/v			08/05/18 02:53	20.6
Acetone	ND		100		ppb v/v			08/05/18 02:53	20.6
Benzene	ND		8.2		ppb v/v			08/05/18 02:53	20.6
Benzyl chloride	ND		16		ppb v/v			08/05/18 02:53	20.6
Bromodichloromethane	ND		6.2		ppb v/v			08/05/18 02:53	20.6
Bromoform	ND		8.2		ppb v/v			08/05/18 02:53	20.6
Bromomethane	ND		16		ppb v/v			08/05/18 02:53	20.6
Carbon disulfide	ND		16		ppb v/v			08/05/18 02:53	20.6
Carbon tetrachloride	ND		16		ppb v/v			08/05/18 02:53	20.6
Chlorobenzene	ND		6.2		ppb v/v			08/05/18 02:53	20.6
Chloroethane	ND		16		ppb v/v			08/05/18 02:53	20.6
Chloroform	ND		6.2		ppb v/v			08/05/18 02:53	20.6

TestAmerica Sacramento

Client Sample Results

Client: Cascadia Associates LLC
 Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Client Sample ID: SVE_South_Post Carbon-72318

Lab Sample ID: 320-41388-2

Date Collected: 07/23/18 08:55

Matrix: Air

Date Received: 07/24/18 09:00

Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloromethane	ND		16		ppb v/v			08/05/18 02:53	20.6
cis-1,2-Dichloroethene	58		8.2		ppb v/v			08/05/18 02:53	20.6
cis-1,3-Dichloropropene	ND		8.2		ppb v/v			08/05/18 02:53	20.6
Dibromochloromethane	ND		8.2		ppb v/v			08/05/18 02:53	20.6
Dichlorodifluoromethane	ND		8.2		ppb v/v			08/05/18 02:53	20.6
Ethylbenzene	ND		8.2		ppb v/v			08/05/18 02:53	20.6
Hexachlorobutadiene	ND		41		ppb v/v			08/05/18 02:53	20.6
m,p-Xylene	ND		16		ppb v/v			08/05/18 02:53	20.6
Methylene Chloride	ND		8.2		ppb v/v			08/05/18 02:53	20.6
o-Xylene	ND		8.2		ppb v/v			08/05/18 02:53	20.6
Styrene	ND		8.2		ppb v/v			08/05/18 02:53	20.6
Tetrachloroethene	1200		8.2		ppb v/v			08/05/18 02:53	20.6
Toluene	ND		8.2		ppb v/v			08/05/18 02:53	20.6
trans-1,2-Dichloroethene	ND		8.2		ppb v/v			08/05/18 02:53	20.6
trans-1,3-Dichloropropene	ND		8.2		ppb v/v			08/05/18 02:53	20.6
Trichloroethene	1200		8.2		ppb v/v			08/05/18 02:53	20.6
Trichlorofluoromethane	ND		8.2		ppb v/v			08/05/18 02:53	20.6
Vinyl acetate	ND		16		ppb v/v			08/05/18 02:53	20.6
Vinyl chloride	ND		8.2		ppb v/v			08/05/18 02:53	20.6
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	520		34		ug/m3 Air			08/05/18 02:53	20.6
1,1,2,2-Tetrachloroethane	ND		57		ug/m3 Air			08/05/18 02:53	20.6
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		63		ug/m3 Air			08/05/18 02:53	20.6
1,1,2-Trichloroethane	ND		45		ug/m3 Air			08/05/18 02:53	20.6
1,1-Dichloroethane	ND		25		ug/m3 Air			08/05/18 02:53	20.6
1,1-Dichloroethene	ND		65		ug/m3 Air			08/05/18 02:53	20.6
1,2,4-Trichlorobenzene	ND		310		ug/m3 Air			08/05/18 02:53	20.6
1,2,4-Trimethylbenzene	ND		81		ug/m3 Air			08/05/18 02:53	20.6
1,2-Dibromoethane (EDB)	ND		130		ug/m3 Air			08/05/18 02:53	20.6
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		58		ug/m3 Air			08/05/18 02:53	20.6
1,2-Dichlorobenzene	ND		50		ug/m3 Air			08/05/18 02:53	20.6
1,2-Dichloroethane	ND		67		ug/m3 Air			08/05/18 02:53	20.6
1,2-Dichloropropane	ND		38		ug/m3 Air			08/05/18 02:53	20.6
1,3,5-Trimethylbenzene	ND		41		ug/m3 Air			08/05/18 02:53	20.6
1,3-Dichlorobenzene	ND		50		ug/m3 Air			08/05/18 02:53	20.6
1,4-Dichlorobenzene	ND		50		ug/m3 Air			08/05/18 02:53	20.6
2-Butanone (MEK)	ND		49		ug/m3 Air			08/05/18 02:53	20.6
2-Hexanone	ND		34		ug/m3 Air			08/05/18 02:53	20.6
4-Ethyltoluene	ND		41		ug/m3 Air			08/05/18 02:53	20.6
4-Methyl-2-pentanone (MIBK)	ND		34		ug/m3 Air			08/05/18 02:53	20.6
Acetone	ND		240		ug/m3 Air			08/05/18 02:53	20.6
Benzene	ND		26		ug/m3 Air			08/05/18 02:53	20.6
Benzyl chloride	ND		85		ug/m3 Air			08/05/18 02:53	20.6
Bromodichloromethane	ND		41		ug/m3 Air			08/05/18 02:53	20.6
Bromoform	ND		85		ug/m3 Air			08/05/18 02:53	20.6
Bromomethane	ND		64		ug/m3 Air			08/05/18 02:53	20.6
Carbon disulfide	ND		51		ug/m3 Air			08/05/18 02:53	20.6
Carbon tetrachloride	ND		100		ug/m3 Air			08/05/18 02:53	20.6

TestAmerica Sacramento

Client Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Client Sample ID: SVE_South_Post Carbon-72318

Lab Sample ID: 320-41388-2

Date Collected: 07/23/18 08:55

Matrix: Air

Date Received: 07/24/18 09:00

Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlorobenzene	ND		28		ug/m3 Air			08/05/18 02:53	20.6
Chloroethane	ND		43		ug/m3 Air			08/05/18 02:53	20.6
Chloroform	ND		30		ug/m3 Air			08/05/18 02:53	20.6
Chloromethane	ND		34		ug/m3 Air			08/05/18 02:53	20.6
cis-1,2-Dichloroethene	230		33		ug/m3 Air			08/05/18 02:53	20.6
cis-1,3-Dichloropropene	ND		37		ug/m3 Air			08/05/18 02:53	20.6
Dibromochloromethane	ND		70		ug/m3 Air			08/05/18 02:53	20.6
Dichlorodifluoromethane	ND		41		ug/m3 Air			08/05/18 02:53	20.6
Ethylbenzene	ND		36		ug/m3 Air			08/05/18 02:53	20.6
Hexachlorobutadiene	ND		440		ug/m3 Air			08/05/18 02:53	20.6
m,p-Xylene	ND		72		ug/m3 Air			08/05/18 02:53	20.6
Methylene Chloride	ND		29		ug/m3 Air			08/05/18 02:53	20.6
o-Xylene	ND		36		ug/m3 Air			08/05/18 02:53	20.6
Styrene	ND		35		ug/m3 Air			08/05/18 02:53	20.6
Tetrachloroethene	8300		56		ug/m3 Air			08/05/18 02:53	20.6
Toluene	ND		31		ug/m3 Air			08/05/18 02:53	20.6
trans-1,2-Dichloroethene	ND		33		ug/m3 Air			08/05/18 02:53	20.6
trans-1,3-Dichloropropene	ND		37		ug/m3 Air			08/05/18 02:53	20.6
Trichloroethene	6400		44		ug/m3 Air			08/05/18 02:53	20.6
Trichlorofluoromethane	ND		46		ug/m3 Air			08/05/18 02:53	20.6
Vinyl acetate	ND		58		ug/m3 Air			08/05/18 02:53	20.6
Vinyl chloride	ND		21		ug/m3 Air			08/05/18 02:53	20.6

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	94		70 - 130		08/05/18 02:53	20.6
4-Bromofluorobenzene (Surr)	94		70 - 130		08/05/18 02:53	20.6
Toluene-d8 (Surr)	102		70 - 130		08/05/18 02:53	20.6

Surrogate Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Matrix: Air

Prep Type: Total/NA

Percent Surrogate Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	DCA	BFB	TOL
		(70-130)	(70-130)	(70-130)
320-41388-1	SVE_South_72318-Pre Carbon	94	95	99
320-41388-2	SVE_South_Post Carbon-72318	94	94	102
LCS 320-238017/7	Lab Control Sample	101	123	105
LCSD 320-238017/8	Lab Control Sample Dup	100	123	103
MB 320-238017/11	Method Blank	92	97	107

Surrogate Legend

DCA = 1,2-Dichloroethane-d4 (Surr)

BFB = 4-Bromofluorobenzene (Surr)

TOL = Toluene-d8 (Surr)

QC Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Lab Sample ID: MB 320-238017/11

Matrix: Air

Analysis Batch: 238017

Client Sample ID: Method Blank

Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		0.30		ppb v/v			08/04/18 19:49	1
1,1,2,2-Tetrachloroethane	ND		0.40		ppb v/v			08/04/18 19:49	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		0.40		ppb v/v			08/04/18 19:49	1
1,1,2-Trichloroethane	ND		0.40		ppb v/v			08/04/18 19:49	1
1,1-Dichloroethane	ND		0.30		ppb v/v			08/04/18 19:49	1
1,1-Dichloroethene	ND		0.80		ppb v/v			08/04/18 19:49	1
1,2,4-Trichlorobenzene	ND		2.0		ppb v/v			08/04/18 19:49	1
1,2,4-Trimethylbenzene	ND		0.80		ppb v/v			08/04/18 19:49	1
1,2-Dibromoethane (EDB)	ND		0.80		ppb v/v			08/04/18 19:49	1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		0.40		ppb v/v			08/04/18 19:49	1
1,2-Dichlorobenzene	ND		0.40		ppb v/v			08/04/18 19:49	1
1,2-Dichloroethane	ND		0.80		ppb v/v			08/04/18 19:49	1
1,2-Dichloropropane	ND		0.40		ppb v/v			08/04/18 19:49	1
1,3,5-Trimethylbenzene	ND		0.40		ppb v/v			08/04/18 19:49	1
1,3-Dichlorobenzene	ND		0.40		ppb v/v			08/04/18 19:49	1
1,4-Dichlorobenzene	ND		0.40		ppb v/v			08/04/18 19:49	1
2-Butanone (MEK)	ND		0.80		ppb v/v			08/04/18 19:49	1
2-Hexanone	ND		0.40		ppb v/v			08/04/18 19:49	1
4-Ethyltoluene	ND		0.40		ppb v/v			08/04/18 19:49	1
4-Methyl-2-pentanone (MIBK)	ND		0.40		ppb v/v			08/04/18 19:49	1
Acetone	ND		5.0		ppb v/v			08/04/18 19:49	1
Benzene	ND		0.40		ppb v/v			08/04/18 19:49	1
Benzyl chloride	ND		0.80		ppb v/v			08/04/18 19:49	1
Bromodichloromethane	ND		0.30		ppb v/v			08/04/18 19:49	1
Bromoform	ND		0.40		ppb v/v			08/04/18 19:49	1
Bromomethane	ND		0.80		ppb v/v			08/04/18 19:49	1
Carbon disulfide	ND		0.80		ppb v/v			08/04/18 19:49	1
Carbon tetrachloride	ND		0.80		ppb v/v			08/04/18 19:49	1
Chlorobenzene	ND		0.30		ppb v/v			08/04/18 19:49	1
Chloroethane	ND		0.80		ppb v/v			08/04/18 19:49	1
Chloroform	ND		0.30		ppb v/v			08/04/18 19:49	1
Chloromethane	ND		0.80		ppb v/v			08/04/18 19:49	1
cis-1,2-Dichloroethene	ND		0.40		ppb v/v			08/04/18 19:49	1
cis-1,3-Dichloropropene	ND		0.40		ppb v/v			08/04/18 19:49	1
Dibromochloromethane	ND		0.40		ppb v/v			08/04/18 19:49	1
Dichlorodifluoromethane	ND		0.40		ppb v/v			08/04/18 19:49	1
Ethylbenzene	ND		0.40		ppb v/v			08/04/18 19:49	1
Hexachlorobutadiene	ND		2.0		ppb v/v			08/04/18 19:49	1
m,p-Xylene	ND		0.80		ppb v/v			08/04/18 19:49	1
Methylene Chloride	ND		0.40		ppb v/v			08/04/18 19:49	1
o-Xylene	ND		0.40		ppb v/v			08/04/18 19:49	1
Styrene	ND		0.40		ppb v/v			08/04/18 19:49	1
Tetrachloroethene	ND		0.40		ppb v/v			08/04/18 19:49	1
Toluene	ND		0.40		ppb v/v			08/04/18 19:49	1
trans-1,2-Dichloroethene	ND		0.40		ppb v/v			08/04/18 19:49	1
trans-1,3-Dichloropropene	ND		0.40		ppb v/v			08/04/18 19:49	1
Trichloroethene	ND		0.40		ppb v/v			08/04/18 19:49	1
Trichlorofluoromethane	ND		0.40		ppb v/v			08/04/18 19:49	1

TestAmerica Sacramento

QC Sample Results

Client: Cascadia Associates LLC
 Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: MB 320-238017/11
Matrix: Air
Analysis Batch: 238017

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Vinyl acetate	ND		0.80		ppb v/v			08/04/18 19:49	1
Vinyl chloride	ND		0.40		ppb v/v			08/04/18 19:49	1
Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		1.6		ug/m3 Air			08/04/18 19:49	1
1,1,2,2-Tetrachloroethane	ND		2.7		ug/m3 Air			08/04/18 19:49	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		3.1		ug/m3 Air			08/04/18 19:49	1
1,1,2-Trichloroethane	ND		2.2		ug/m3 Air			08/04/18 19:49	1
1,1-Dichloroethane	ND		1.2		ug/m3 Air			08/04/18 19:49	1
1,1-Dichloroethene	ND		3.2		ug/m3 Air			08/04/18 19:49	1
1,2,4-Trichlorobenzene	ND		15		ug/m3 Air			08/04/18 19:49	1
1,2,4-Trimethylbenzene	ND		3.9		ug/m3 Air			08/04/18 19:49	1
1,2-Dibromoethane (EDB)	ND		6.1		ug/m3 Air			08/04/18 19:49	1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		2.8		ug/m3 Air			08/04/18 19:49	1
1,2-Dichlorobenzene	ND		2.4		ug/m3 Air			08/04/18 19:49	1
1,2-Dichloroethane	ND		3.2		ug/m3 Air			08/04/18 19:49	1
1,2-Dichloropropane	ND		1.8		ug/m3 Air			08/04/18 19:49	1
1,3,5-Trimethylbenzene	ND		2.0		ug/m3 Air			08/04/18 19:49	1
1,3-Dichlorobenzene	ND		2.4		ug/m3 Air			08/04/18 19:49	1
1,4-Dichlorobenzene	ND		2.4		ug/m3 Air			08/04/18 19:49	1
2-Butanone (MEK)	ND		2.4		ug/m3 Air			08/04/18 19:49	1
2-Hexanone	ND		1.6		ug/m3 Air			08/04/18 19:49	1
4-Ethyltoluene	ND		2.0		ug/m3 Air			08/04/18 19:49	1
4-Methyl-2-pentanone (MIBK)	ND		1.6		ug/m3 Air			08/04/18 19:49	1
Acetone	ND		12		ug/m3 Air			08/04/18 19:49	1
Benzene	ND		1.3		ug/m3 Air			08/04/18 19:49	1
Benzyl chloride	ND		4.1		ug/m3 Air			08/04/18 19:49	1
Bromodichloromethane	ND		2.0		ug/m3 Air			08/04/18 19:49	1
Bromoform	ND		4.1		ug/m3 Air			08/04/18 19:49	1
Bromomethane	ND		3.1		ug/m3 Air			08/04/18 19:49	1
Carbon disulfide	ND		2.5		ug/m3 Air			08/04/18 19:49	1
Carbon tetrachloride	ND		5.0		ug/m3 Air			08/04/18 19:49	1
Chlorobenzene	ND		1.4		ug/m3 Air			08/04/18 19:49	1
Chloroethane	ND		2.1		ug/m3 Air			08/04/18 19:49	1
Chloroform	ND		1.5		ug/m3 Air			08/04/18 19:49	1
Chloromethane	ND		1.7		ug/m3 Air			08/04/18 19:49	1
cis-1,2-Dichloroethene	ND		1.6		ug/m3 Air			08/04/18 19:49	1
cis-1,3-Dichloropropene	ND		1.8		ug/m3 Air			08/04/18 19:49	1
Dibromochloromethane	ND		3.4		ug/m3 Air			08/04/18 19:49	1
Dichlorodifluoromethane	ND		2.0		ug/m3 Air			08/04/18 19:49	1
Ethylbenzene	ND		1.7		ug/m3 Air			08/04/18 19:49	1
Hexachlorobutadiene	ND		21		ug/m3 Air			08/04/18 19:49	1
m,p-Xylene	ND		3.5		ug/m3 Air			08/04/18 19:49	1
Methylene Chloride	ND		1.4		ug/m3 Air			08/04/18 19:49	1
o-Xylene	ND		1.7		ug/m3 Air			08/04/18 19:49	1
Styrene	ND		1.7		ug/m3 Air			08/04/18 19:49	1
Tetrachloroethene	ND		2.7		ug/m3 Air			08/04/18 19:49	1
Toluene	ND		1.5		ug/m3 Air			08/04/18 19:49	1

TestAmerica Sacramento

QC Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: MB 320-238017/11
Matrix: Air
Analysis Batch: 238017

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

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
trans-1,2-Dichloroethene	ND		1.6		ug/m3 Air			08/04/18 19:49	1
trans-1,3-Dichloropropene	ND		1.8		ug/m3 Air			08/04/18 19:49	1
Trichloroethene	ND		2.1		ug/m3 Air			08/04/18 19:49	1
Trichlorofluoromethane	ND		2.2		ug/m3 Air			08/04/18 19:49	1
Vinyl acetate	ND		2.8		ug/m3 Air			08/04/18 19:49	1
Vinyl chloride	ND		1.0		ug/m3 Air			08/04/18 19:49	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	92		70 - 130		08/04/18 19:49	1
4-Bromofluorobenzene (Surr)	97		70 - 130		08/04/18 19:49	1
Toluene-d8 (Surr)	107		70 - 130		08/04/18 19:49	1

Lab Sample ID: LCS 320-238017/7
Matrix: Air
Analysis Batch: 238017

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

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1-Trichloroethane	20.0	21.4		ppb v/v		107	69 - 129
1,1,1,2-Tetrachloroethane	20.0	18.3		ppb v/v		91	64 - 124
1,1,1,2-Trichloro-1,2,2-trifluoroethane	20.0	20.1		ppb v/v		100	70 - 130
1,1,2-Trichloroethane	20.0	18.6		ppb v/v		93	64 - 124
1,1-Dichloroethane	20.0	19.8		ppb v/v		99	71 - 131
1,1-Dichloroethene	20.0	18.7		ppb v/v		94	72 - 132
1,2,4-Trichlorobenzene	20.0	19.8		ppb v/v		99	58 - 138
1,2,4-Trimethylbenzene	20.0	18.6		ppb v/v		93	60 - 132
1,2-Dibromoethane (EDB)	20.0	19.2		ppb v/v		96	64 - 124
1,2-Dichloro-1,1,2,2-tetrafluoroethane	20.0	17.6		ppb v/v		88	74 - 134
1,2-Dichlorobenzene	20.0	18.2		ppb v/v		91	62 - 126
1,2-Dichloroethane	20.0	19.8		ppb v/v		99	71 - 131
1,2-Dichloropropane	20.0	22.1		ppb v/v		111	72 - 132
1,3,5-Trimethylbenzene	20.0	17.8		ppb v/v		89	65 - 125
1,3-Dichlorobenzene	20.0	18.7		ppb v/v		93	59 - 130
1,4-Dichlorobenzene	20.0	18.9		ppb v/v		95	58 - 132
2-Butanone (MEK)	20.0	21.9		ppb v/v		110	73 - 133
2-Hexanone	20.0	20.7		ppb v/v		104	69 - 129
4-Ethyltoluene	20.0	18.5		ppb v/v		92	66 - 129
4-Methyl-2-pentanone (MIBK)	20.0	21.4		ppb v/v		107	74 - 134
Acetone	20.0	17.0		ppb v/v		85	65 - 125
Benzene	20.0	21.2		ppb v/v		106	68 - 128
Benzyl chloride	16.0	15.2		ppb v/v		95	67 - 127
Bromodichloromethane	20.0	22.2		ppb v/v		111	71 - 131
Bromoform	20.0	20.8		ppb v/v		104	66 - 126
Bromomethane	20.0	16.9		ppb v/v		84	73 - 134
Carbon disulfide	20.0	19.4		ppb v/v		97	71 - 131
Carbon tetrachloride	20.0	23.3		ppb v/v		117	63 - 126
Chlorobenzene	20.0	18.1		ppb v/v		91	63 - 123

TestAmerica Sacramento

QC Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: LCS 320-2380177

Matrix: Air

Analysis Batch: 238017

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloroethane	20.0	18.5		ppb v/v		93	73 - 133
Chloroform	20.0	21.0		ppb v/v		105	70 - 130
Chloromethane	20.0	16.9		ppb v/v		85	61 - 140
cis-1,2-Dichloroethene	20.0	20.9		ppb v/v		105	70 - 130
cis-1,3-Dichloropropene	20.0	22.0		ppb v/v		110	72 - 132
Dibromochloromethane	20.0	19.0		ppb v/v		95	66 - 126
Dichlorodifluoromethane	20.0	18.2		ppb v/v		91	69 - 129
Ethylbenzene	20.0	18.3		ppb v/v		91	64 - 124
Hexachlorobutadiene	20.0	19.5		ppb v/v		98	58 - 131
m,p-Xylene	40.0	36.3		ppb v/v		91	65 - 125
Methylene Chloride	20.0	17.9		ppb v/v		90	67 - 127
o-Xylene	20.0	18.2		ppb v/v		91	65 - 125
Styrene	20.0	18.8		ppb v/v		94	67 - 127
Tetrachloroethene	20.0	18.5		ppb v/v		93	63 - 123
Toluene	20.0	21.9		ppb v/v		110	68 - 128
trans-1,2-Dichloroethene	20.0	20.1		ppb v/v		100	72 - 132
trans-1,3-Dichloropropene	20.0	18.7		ppb v/v		94	66 - 126
Trichloroethene	20.0	20.9		ppb v/v		104	70 - 130
Trichlorofluoromethane	20.0	18.6		ppb v/v		93	71 - 131
Vinyl acetate	20.0	20.2		ppb v/v		101	65 - 134
Vinyl chloride	20.0	17.9		ppb v/v		89	59 - 152

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1-Trichloroethane	110	117		ug/m3 Air		107	69 - 129
1,1,1,2-Tetrachloroethane	140	126		ug/m3 Air		91	64 - 124
1,1,2-Trichloro-1,2,2-trifluoroethane	150	154		ug/m3 Air		100	70 - 130
1,1,2-Trichloroethane	110	101		ug/m3 Air		93	64 - 124
1,1-Dichloroethane	81	80.0		ug/m3 Air		99	71 - 131
1,1-Dichloroethene	79	74.3		ug/m3 Air		94	72 - 132
1,2,4-Trichlorobenzene	150	147		ug/m3 Air		99	58 - 138
1,2,4-Trimethylbenzene	98	91.5		ug/m3 Air		93	60 - 132
1,2-Dibromoethane (EDB)	150	147		ug/m3 Air		96	64 - 124
1,2-Dichloro-1,1,2,2-tetrafluoroethane	140	123		ug/m3 Air		88	74 - 134
1,2-Dichlorobenzene	120	109		ug/m3 Air		91	62 - 126
1,2-Dichloroethane	81	80.0		ug/m3 Air		99	71 - 131
1,2-Dichloropropane	92	102		ug/m3 Air		111	72 - 132
1,3,5-Trimethylbenzene	98	87.4		ug/m3 Air		89	65 - 125
1,3-Dichlorobenzene	120	112		ug/m3 Air		93	59 - 130
1,4-Dichlorobenzene	120	114		ug/m3 Air		95	58 - 132
2-Butanone (MEK)	59	64.6		ug/m3 Air		110	73 - 133
2-Hexanone	82	85.0		ug/m3 Air		104	69 - 129
4-Ethyltoluene	98	90.9		ug/m3 Air		92	66 - 129
4-Methyl-2-pentanone (MIBK)	82	87.8		ug/m3 Air		107	74 - 134
Acetone	48	40.5		ug/m3 Air		85	65 - 125
Benzene	64	67.8		ug/m3 Air		106	68 - 128
Benzyl chloride	83	78.8		ug/m3 Air		95	67 - 127
Bromodichloromethane	130	148		ug/m3 Air		111	71 - 131

TestAmerica Sacramento

QC Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: LCS 320-238017/7

Matrix: Air

Analysis Batch: 238017

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Bromoform	210	215		ug/m3 Air		104	66 - 126
Bromomethane	78	65.5		ug/m3 Air		84	73 - 134
Carbon disulfide	62	60.3		ug/m3 Air		97	71 - 131
Carbon tetrachloride	130	147		ug/m3 Air		117	63 - 126
Chlorobenzene	92	83.4		ug/m3 Air		91	63 - 123
Chloroethane	53	48.9		ug/m3 Air		93	73 - 133
Chloroform	98	103		ug/m3 Air		105	70 - 130
Chloromethane	41	34.9		ug/m3 Air		85	61 - 140
cis-1,2-Dichloroethene	79	83.0		ug/m3 Air		105	70 - 130
cis-1,3-Dichloropropene	91	99.8		ug/m3 Air		110	72 - 132
Dibromochloromethane	170	162		ug/m3 Air		95	66 - 126
Dichlorodifluoromethane	99	90.2		ug/m3 Air		91	69 - 129
Ethylbenzene	87	79.3		ug/m3 Air		91	64 - 124
Hexachlorobutadiene	210	208		ug/m3 Air		98	58 - 131
m,p-Xylene	170	158		ug/m3 Air		91	65 - 125
Methylene Chloride	69	62.2		ug/m3 Air		90	67 - 127
o-Xylene	87	79.0		ug/m3 Air		91	65 - 125
Styrene	85	80.1		ug/m3 Air		94	67 - 127
Tetrachloroethene	140	126		ug/m3 Air		93	63 - 123
Toluene	75	82.7		ug/m3 Air		110	68 - 128
trans-1,2-Dichloroethene	79	79.6		ug/m3 Air		100	72 - 132
trans-1,3-Dichloropropene	91	85.1		ug/m3 Air		94	66 - 126
Trichloroethene	110	112		ug/m3 Air		104	70 - 130
Trichlorofluoromethane	110	104		ug/m3 Air		93	71 - 131
Vinyl acetate	70	71.0		ug/m3 Air		101	65 - 134
Vinyl chloride	51	45.7		ug/m3 Air		89	59 - 152

Surrogate	LCS %Recovery	LCS Qualifier	Limits
1,2-Dichloroethane-d4 (Surr)	101		70 - 130
4-Bromofluorobenzene (Surr)	123		70 - 130
Toluene-d8 (Surr)	105		70 - 130

Lab Sample ID: LCSD 320-238017/8

Matrix: Air

Analysis Batch: 238017

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
1,1,1-Trichloroethane	20.0	22.0		ppb v/v		110	69 - 129	3	25
1,1,2,2-Tetrachloroethane	20.0	18.5		ppb v/v		92	64 - 124	1	25
1,1,2-Trichloro-1,2,2-trifluoroethane	20.0	20.5		ppb v/v		102	70 - 130	2	25
1,1,2-Trichloroethane	20.0	19.2		ppb v/v		96	64 - 124	3	25
1,1-Dichloroethane	20.0	20.5		ppb v/v		103	71 - 131	4	25
1,1-Dichloroethene	20.0	19.5		ppb v/v		98	72 - 132	4	25
1,2,4-Trichlorobenzene	20.0	19.9		ppb v/v		100	58 - 138	1	25
1,2,4-Trimethylbenzene	20.0	18.5		ppb v/v		93	60 - 132	1	25
1,2-Dibromoethane (EDB)	20.0	19.8		ppb v/v		99	64 - 124	3	25

TestAmerica Sacramento

QC Sample Results

Client: Cascadia Associates LLC
 Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: LCSD 320-238017/8

Client Sample ID: Lab Control Sample Dup

Matrix: Air

Prep Type: Total/NA

Analysis Batch: 238017

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,2-Dichloro-1,1,2,2-tetrafluoroethane	20.0	18.5		ppb v/v		93	74 - 134	5	25
1,2-Dichlorobenzene	20.0	18.7		ppb v/v		93	62 - 126	3	25
1,2-Dichloroethane	20.0	20.1		ppb v/v		101	71 - 131	2	25
1,2-Dichloropropane	20.0	22.3		ppb v/v		111	72 - 132	1	25
1,3,5-Trimethylbenzene	20.0	18.0		ppb v/v		90	65 - 125	1	25
1,3-Dichlorobenzene	20.0	19.2		ppb v/v		96	59 - 130	3	25
1,4-Dichlorobenzene	20.0	19.4		ppb v/v		97	58 - 132	2	25
2-Butanone (MEK)	20.0	22.5		ppb v/v		112	73 - 133	2	25
2-Hexanone	20.0	21.7		ppb v/v		109	69 - 129	5	25
4-Ethyltoluene	20.0	18.5		ppb v/v		93	66 - 129	0	25
4-Methyl-2-pentanone (MIBK)	20.0	21.5		ppb v/v		108	74 - 134	1	25
Acetone	20.0	17.9		ppb v/v		90	65 - 125	5	25
Benzene	20.0	21.4		ppb v/v		107	68 - 128	1	25
Benzyl chloride	16.0	15.5		ppb v/v		97	67 - 127	2	25
Bromodichloromethane	20.0	22.4		ppb v/v		112	71 - 131	1	25
Bromoform	20.0	21.1		ppb v/v		105	66 - 126	1	25
Bromomethane	20.0	18.5		ppb v/v		93	73 - 134	9	25
Carbon disulfide	20.0	20.1		ppb v/v		101	71 - 131	4	25
Carbon tetrachloride	20.0	23.5		ppb v/v		118	63 - 126	1	25
Chlorobenzene	20.0	18.6		ppb v/v		93	63 - 123	3	25
Chloroethane	20.0	19.4		ppb v/v		97	73 - 133	4	25
Chloroform	20.0	21.6		ppb v/v		108	70 - 130	3	25
Chloromethane	20.0	18.5		ppb v/v		93	61 - 140	9	25
cis-1,2-Dichloroethene	20.0	21.7		ppb v/v		108	70 - 130	3	25
cis-1,3-Dichloropropene	20.0	22.2		ppb v/v		111	72 - 132	1	25
Dibromochloromethane	20.0	19.8		ppb v/v		99	66 - 126	4	25
Dichlorodifluoromethane	20.0	19.2		ppb v/v		96	69 - 129	5	25
Ethylbenzene	20.0	18.6		ppb v/v		93	64 - 124	2	25
Hexachlorobutadiene	20.0	19.7		ppb v/v		98	58 - 131	1	25
m,p-Xylene	40.0	37.0		ppb v/v		92	65 - 125	2	25
Methylene Chloride	20.0	18.8		ppb v/v		94	67 - 127	5	25
o-Xylene	20.0	18.4		ppb v/v		92	65 - 125	1	25
Styrene	20.0	19.3		ppb v/v		97	67 - 127	3	25
Tetrachloroethene	20.0	19.1		ppb v/v		95	63 - 123	3	25
Toluene	20.0	22.1		ppb v/v		110	68 - 128	1	25
trans-1,2-Dichloroethene	20.0	21.0		ppb v/v		105	72 - 132	4	25
trans-1,3-Dichloropropene	20.0	19.5		ppb v/v		98	66 - 126	4	25
Trichloroethene	20.0	20.8		ppb v/v		104	70 - 130	0	25
Trichlorofluoromethane	20.0	19.3		ppb v/v		96	71 - 131	4	25
Vinyl acetate	20.0	21.0		ppb v/v		105	65 - 134	4	25
Vinyl chloride	20.0	18.9		ppb v/v		94	59 - 152	5	25

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,1,1-Trichloroethane	110	120		ug/m3 Air		110	69 - 129	3	25
1,1,1,2-Tetrachloroethane	140	127		ug/m3 Air		92	64 - 124	1	25
1,1,1,2-Trichloro-1,2,2-trifluoroethane	150	157		ug/m3 Air		102	70 - 130	2	25
1,1,2-Trichloroethane	110	105		ug/m3 Air		96	64 - 124	3	25

TestAmerica Sacramento

QC Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: LCSD 320-238017/8

Matrix: Air

Analysis Batch: 238017

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
1,1-Dichloroethane	81	83.1		ug/m3 Air		103	71 - 131	4	25
1,1-Dichloroethene	79	77.5		ug/m3 Air		98	72 - 132	4	25
1,2,4-Trichlorobenzene	150	148		ug/m3 Air		100	58 - 138	1	25
1,2,4-Trimethylbenzene	98	91.1		ug/m3 Air		93	60 - 132	1	25
1,2-Dibromoethane (EDB)	150	152		ug/m3 Air		99	64 - 124	3	25
1,2-Dichloro-1,1,2,2-tetrafluoroethane	140	129		ug/m3 Air		93	74 - 134	5	25
1,2-Dichlorobenzene	120	112		ug/m3 Air		93	62 - 126	3	25
1,2-Dichloroethane	81	81.4		ug/m3 Air		101	71 - 131	2	25
1,2-Dichloropropane	92	103		ug/m3 Air		111	72 - 132	1	25
1,3,5-Trimethylbenzene	98	88.5		ug/m3 Air		90	65 - 125	1	25
1,3-Dichlorobenzene	120	116		ug/m3 Air		96	59 - 130	3	25
1,4-Dichlorobenzene	120	117		ug/m3 Air		97	58 - 132	2	25
2-Butanone (MEK)	59	66.2		ug/m3 Air		112	73 - 133	2	25
2-Hexanone	82	89.0		ug/m3 Air		109	69 - 129	5	25
4-Ethyltoluene	98	91.1		ug/m3 Air		93	66 - 129	0	25
4-Methyl-2-pentanone (MIBK)	82	88.2		ug/m3 Air		108	74 - 134	1	25
Acetone	48	42.6		ug/m3 Air		90	65 - 125	5	25
Benzene	64	68.5		ug/m3 Air		107	68 - 128	1	25
Benzyl chloride	83	80.0		ug/m3 Air		97	67 - 127	2	25
Bromodichloromethane	130	150		ug/m3 Air		112	71 - 131	1	25
Bromoform	210	218		ug/m3 Air		105	66 - 126	1	25
Bromomethane	78	72.0		ug/m3 Air		93	73 - 134	9	25
Carbon disulfide	62	62.7		ug/m3 Air		101	71 - 131	4	25
Carbon tetrachloride	130	148		ug/m3 Air		118	63 - 126	1	25
Chlorobenzene	92	85.7		ug/m3 Air		93	63 - 123	3	25
Chloroethane	53	51.1		ug/m3 Air		97	73 - 133	4	25
Chloroform	98	105		ug/m3 Air		108	70 - 130	3	25
Chloromethane	41	38.3		ug/m3 Air		93	61 - 140	9	25
cis-1,2-Dichloroethene	79	85.9		ug/m3 Air		108	70 - 130	3	25
cis-1,3-Dichloropropene	91	101		ug/m3 Air		111	72 - 132	1	25
Dibromochloromethane	170	168		ug/m3 Air		99	66 - 126	4	25
Dichlorodifluoromethane	99	94.9		ug/m3 Air		96	69 - 129	5	25
Ethylbenzene	87	80.8		ug/m3 Air		93	64 - 124	2	25
Hexachlorobutadiene	210	210		ug/m3 Air		98	58 - 131	1	25
m,p-Xylene	170	161		ug/m3 Air		92	65 - 125	2	25
Methylene Chloride	69	65.2		ug/m3 Air		94	67 - 127	5	25
o-Xylene	87	79.9		ug/m3 Air		92	65 - 125	1	25
Styrene	85	82.3		ug/m3 Air		97	67 - 127	3	25
Tetrachloroethene	140	129		ug/m3 Air		95	63 - 123	3	25
Toluene	75	83.2		ug/m3 Air		110	68 - 128	1	25
trans-1,2-Dichloroethene	79	83.1		ug/m3 Air		105	72 - 132	4	25
trans-1,3-Dichloropropene	91	88.6		ug/m3 Air		98	66 - 126	4	25
Trichloroethene	110	112		ug/m3 Air		104	70 - 130	0	25
Trichlorofluoromethane	110	108		ug/m3 Air		96	71 - 131	4	25
Vinyl acetate	70	74.0		ug/m3 Air		105	65 - 134	4	25
Vinyl chloride	51	48.2		ug/m3 Air		94	59 - 152	5	25

TestAmerica Sacramento

QC Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: LCSD 320-238017/8

Matrix: Air

Analysis Batch: 238017

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Surrogate	LCSD		Limits
	%Recovery	Qualifier	
1,2-Dichloroethane-d4 (Surr)	100		70 - 130
4-Bromofluorobenzene (Surr)	123		70 - 130
Toluene-d8 (Surr)	103		70 - 130

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QC Association Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Air - GC/MS VOA

Analysis Batch: 238017

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-41388-1	SVE_South_72318-Pre Carbon	Total/NA	Air	TO-15	
320-41388-2	SVE_South_Post Carbon-72318	Total/NA	Air	TO-15	
MB 320-238017/11	Method Blank	Total/NA	Air	TO-15	
LCS 320-238017/7	Lab Control Sample	Total/NA	Air	TO-15	
LCSD 320-238017/8	Lab Control Sample Dup	Total/NA	Air	TO-15	

Lab Chronicle

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Client Sample ID: SVE_South_72318-Pre Carbon

Lab Sample ID: 320-41388-1

Date Collected: 07/23/18 08:45

Matrix: Air

Date Received: 07/24/18 09:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	TO-15		52.2	6.39 mL	250 mL	238017	08/05/18 02:00	AP1	TAL SAC

Client Sample ID: SVE_South_Post Carbon-72318

Lab Sample ID: 320-41388-2

Date Collected: 07/23/18 08:55

Matrix: Air

Date Received: 07/24/18 09:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	TO-15		20.6	20 mL	250 mL	238017	08/05/18 02:53	AP1	TAL SAC

Laboratory References:

TAL SAC = TestAmerica Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: Cascadia Associates LLC
 Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Laboratory: TestAmerica Sacramento

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	17-020	01-20-21
ANAB	DoD ELAP		L2468	01-20-21
Arizona	State Program	9	AZ0708	08-11-18
Arkansas DEQ	State Program	6	88-0691	06-17-19
California	State Program	9	2897	01-31-19
Colorado	State Program	8	CA00044	08-31-19
Connecticut	State Program	1	PH-0691	06-30-19
Florida	NELAP	4	E87570	06-30-19
Georgia	State Program	4	N/A	01-28-19
Hawaii	State Program	9	N/A	01-29-19
Illinois	NELAP	5	200060	03-17-19
Kansas	NELAP	7	E-10375	10-31-18
Louisiana	NELAP	6	30612	06-30-19
Maine	State Program	1	CA0004	04-14-20
Michigan	State Program	5	9947	01-31-20
Nevada	State Program	9	CA00044	07-31-19
New Hampshire	NELAP	1	2997	04-18-19
New Jersey	NELAP	2	CA005	06-30-19
New York	NELAP	2	11666	03-31-19
Oregon	NELAP	10	4040	01-29-19
Pennsylvania	NELAP	3	68-01272	03-31-19
Texas	NELAP	6	T104704399	05-31-19
US Fish & Wildlife	Federal		LE148388-0	07-31-19
USDA	Federal		P330-18-00239	01-17-21
USEPA UCMR	Federal	1	CA00044	11-06-18
Utah	NELAP	8	CA00044	02-28-19
Vermont	State Program	1	VT-4040	04-30-19
Virginia	NELAP	3	460278	03-14-19
Washington	State Program	10	C581	05-05-19
West Virginia (DW)	State Program	3	9930C	12-31-18
Wyoming	State Program	8	8TMS-L	01-28-19

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	17-024	01-19-19
ANAB	DoD ELAP		L2236	01-19-19
ANAB	ISO/IEC 17025		L2236	01-19-19
California	State Program	9	2901	11-05-18
Montana (UST)	State Program	8	N/A	04-30-20
Oregon	NELAP	10	WA100007	11-05-18
US Fish & Wildlife	Federal		LE058448-0	07-31-19
USDA	Federal		P330-14-00126	02-10-20
Washington	State Program	10	C553	02-17-19

Method Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Method	Method Description	Protocol	Laboratory
TO-15	Volatile Organic Compounds in Ambient Air	EPA	TAL SAC

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

TAL SAC = TestAmerica Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

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Sample Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-41388-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
320-41388-1	SVE_South_72318-Pre Carbon	Air	07/23/18 08:45	07/24/18 09:00
320-41388-2	SVE_South_Post Carbon-72318	Air	07/23/18 08:55	07/24/18 09:00

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TestAmerica Sacramento
880 Riverside Parkway


West Sacramento, CA 95605
phone 916.374.4378 fax 916.372.1059

Canister Samples Chain of Custody Record

TestAmerica Laboratories, Inc. assumes no liability with respect to the collection and shipment of these samples.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact Information Company Name: <u>Cascadia Associates</u> Address: <u>6915 SW Macadam Ave</u> City/State/Zip: <u>Portland OR 97219</u> <u>Smith 250</u> Phone: <u>503 906 6577</u> FAX: _____		Project Manager: <u>Stephanie Salisbury</u> Phone: <u>503-906-6577 x 110</u> Email: <u>S.Salisbury@Cascadia.com</u> <u>0528@bs.com</u>		Project Name: <u>Nistar Van</u> Site/Location: <u>Vanover, VA</u> PO# <u>0060-001-003</u>		Site Contact: _____ TA Contact: _____ Analysis Turnaround Time: _____ Standard (Specific): <u>X</u> Rush (Specify): _____		Project Manager: <u>Joel M</u> Phone: _____ Email: _____		Samples Collected By: <u>Joel M</u>		COC No: _____ of _____ COCs					
Sample Identification Sample Date(s): <u>7/23/18</u> <u>7/23/18</u>		Time Start: <u>0845</u> <u>0855</u>		Time Stop: <u>0845</u> <u>0855</u>		Canister Vacuum in Field, 'Hg (Start)': <u>-30</u> <u>-30</u>		Canister Vacuum in Field, 'Hg (Stop)': <u>-1</u> <u>-5</u>		Flow Controller ID: _____ Canister ID: <u>-0845</u> <u>-0124</u>		MA-APH EPA 3C EPA 25C / 25.3 ASTM D-1946 / 1946 / 3588 EPA 15/16 TO-3 Other (Please specify in notes section): _____					
SVE - South - 72318 - Pre Carbon SVE - South - Post Carbon - 72318		Other (Please specify in notes section): _____ Landfill Gas Soil Gas Ambient Air Indoor Air		Sample Type: _____		Job / SDG No.: _____ (See below for Add'l items)		For Lab Use Only: Walk-in Client: _____ Lab Sampling: _____		Sample Specific Notes: _____ _____ _____		Other (Please specify in notes section): _____ Landfill Gas Soil Gas Ambient Air Indoor Air					
<div style="text-align: center;">  320-41388 Chain of Custody </div>																	
Temperature (Fahrenheit) <table border="1"> <tr> <td>Start</td> <td>Interior</td> <td>Ambient</td> </tr> <tr> <td>Stop</td> <td>Interior</td> <td>Ambient</td> </tr> </table>												Start	Interior	Ambient	Stop	Interior	Ambient
Start	Interior	Ambient															
Stop	Interior	Ambient															
Temperature (Fahrenheit) <table border="1"> <tr> <td>Start</td> <td>Interior</td> <td>Ambient</td> </tr> <tr> <td>Stop</td> <td>Interior</td> <td>Ambient</td> </tr> </table>												Start	Interior	Ambient	Stop	Interior	Ambient
Start	Interior	Ambient															
Stop	Interior	Ambient															
Special Instructions/QC Requirements & Comments: <u>Email Results to: sb.salisbury@cascadiaassociates.com</u>																	
Samples Shipped by: <u>Lindsay Wallis</u>		Date / Time: <u>7/23/18 09:55</u>		Samples Received by: <u>[Signature]</u>		Date / Time: <u>7/23/18 9:55</u>		Received by: <u>Jason O'Connell</u>		Condition: _____							
Samples Relinquished by: <u>[Signature]</u>		Date / Time: <u>7/23/18 12:50</u>		Received by: <u>[Signature]</u>		Date / Time: <u>7/24/18</u>		Received by: <u>Carrie [Signature]</u>		Condition: <u>0900 QA SAC</u>							
Lab Use Only: _____		Shipper Name: _____		Opened by: _____		Date / Time: _____		Received by: _____		Condition: _____							



Login Sample Receipt Checklist

Client: Cascadia Associates LLC

Job Number: 320-41388-1

Login Number: 41388

List Source: TestAmerica Sacramento

List Number: 1

Creator: Branscum, Cassie

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

TestAmerica

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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Tel: (916)373-5600

TestAmerica Job ID: 320-45096-1
Client Project/Site: NuStar Vancouver

For:
Cascadia Associates LLC
6915 SE Macadam Ave
Suite 250
Portland, Oregon 97219

Attn: Stephanie Salisbury



Authorized for release by:
11/20/2018 5:00:43 PM
Kristine Allen, Manager of Project Management
(253)248-4970
kristine.allen@testamericainc.com

Designee for
Nathan Lewis, Project Manager I
(253)922-2310
nathan.lewis@testamericainc.com

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

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

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



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www.testamericainc.com

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Definitions/Glossary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-45096-1

Glossary

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

Case Narrative

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-45096-1

Job ID: 320-45096-1

Laboratory: TestAmerica Sacramento

Narrative

Job Narrative
320-45096-1

Comments

No additional comments.

Receipt

The samples were received on 11/9/2018 9:25 AM; the samples arrived in good condition, properly preserved and, where required, on ice.

Air - GC/MS VOA

Method(s) TO-15: The continuing calibration verification (CCV) associated with batch 260167 recovered above the upper control limit for 4-Methyl-2-pentanone(MIBK).SVE_South_PreCarbon_110718 (320-45096-1), SVE_South_PostCarbon_110718 (320-45096-2), (CCVIS 320-260167/4) and (MB 320-260167/11) The samples associated with this CCV were non-detects for the affected analytes; therefore, the data have been reported.

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

VOA Prep

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

Detection Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-45096-1

Client Sample ID: SVE_South_PreCarbon_110718

Lab Sample ID: 320-45096-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
1,1,1-Trichloroethane	91		87		ug/m3 Air	53		TO-15	Total/NA
cis-1,2-Dichloroethene	310		84		ug/m3 Air	53		TO-15	Total/NA
Tetrachloroethene	31000		140		ug/m3 Air	53		TO-15	Total/NA
Trichloroethene	1300		110		ug/m3 Air	53		TO-15	Total/NA

Client Sample ID: SVE_South_PostCarbon_110718

Lab Sample ID: 320-45096-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
2-Butanone (MEK)	2.9		2.4		ug/m3 Air	1		TO-15	Total/NA
Acetone	83		12		ug/m3 Air	1		TO-15	Total/NA
Carbon disulfide	3.1		2.5		ug/m3 Air	1		TO-15	Total/NA
Dichlorodifluoromethane	2.4		2.0		ug/m3 Air	1		TO-15	Total/NA
Tetrachloroethene	15		2.7		ug/m3 Air	1		TO-15	Total/NA
Vinyl chloride	1.6		1.0		ug/m3 Air	1		TO-15	Total/NA

This Detection Summary does not include radiochemical test results.

TestAmerica Sacramento

Client Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-45096-1

Client Sample ID: SVE_South_PreCarbon_110718

Lab Sample ID: 320-45096-1

Date Collected: 11/07/18 08:20

Matrix: Air

Date Received: 11/09/18 09:25

Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	91		87		ug/m3 Air			11/19/18 23:45	53
1,1,2,2-Tetrachloroethane	ND		150		ug/m3 Air			11/19/18 23:45	53
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		160		ug/m3 Air			11/19/18 23:45	53
1,1,2-Trichloroethane	ND		120		ug/m3 Air			11/19/18 23:45	53
1,1-Dichloroethane	ND		64		ug/m3 Air			11/19/18 23:45	53
1,1-Dichloroethene	ND		170		ug/m3 Air			11/19/18 23:45	53
1,2,4-Trichlorobenzene	ND		790		ug/m3 Air			11/19/18 23:45	53
1,2,4-Trimethylbenzene	ND		210		ug/m3 Air			11/19/18 23:45	53
1,2-Dibromoethane (EDB)	ND		330		ug/m3 Air			11/19/18 23:45	53
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		150		ug/m3 Air			11/19/18 23:45	53
1,2-Dichlorobenzene	ND		130		ug/m3 Air			11/19/18 23:45	53
1,2-Dichloroethane	ND		170		ug/m3 Air			11/19/18 23:45	53
1,2-Dichloropropane	ND		98		ug/m3 Air			11/19/18 23:45	53
1,3,5-Trimethylbenzene	ND		100		ug/m3 Air			11/19/18 23:45	53
1,3-Dichlorobenzene	ND		130		ug/m3 Air			11/19/18 23:45	53
1,4-Dichlorobenzene	ND		130		ug/m3 Air			11/19/18 23:45	53
2-Butanone (MEK)	ND		130		ug/m3 Air			11/19/18 23:45	53
2-Hexanone	ND		87		ug/m3 Air			11/19/18 23:45	53
4-Ethyltoluene	ND		100		ug/m3 Air			11/19/18 23:45	53
4-Methyl-2-pentanone (MIBK)	ND		87		ug/m3 Air			11/19/18 23:45	53
Acetone	ND		630		ug/m3 Air			11/19/18 23:45	53
Benzene	ND		68		ug/m3 Air			11/19/18 23:45	53
Benzyl chloride	ND		220		ug/m3 Air			11/19/18 23:45	53
Bromodichloromethane	ND		110		ug/m3 Air			11/19/18 23:45	53
Bromoform	ND		220		ug/m3 Air			11/19/18 23:45	53
Bromomethane	ND		160		ug/m3 Air			11/19/18 23:45	53
Carbon disulfide	ND		130		ug/m3 Air			11/19/18 23:45	53
Carbon tetrachloride	ND		270		ug/m3 Air			11/19/18 23:45	53
Chlorobenzene	ND		73		ug/m3 Air			11/19/18 23:45	53
Chloroethane	ND		110		ug/m3 Air			11/19/18 23:45	53
Chloroform	ND		78		ug/m3 Air			11/19/18 23:45	53
Chloromethane	ND		88		ug/m3 Air			11/19/18 23:45	53
cis-1,2-Dichloroethene	310		84		ug/m3 Air			11/19/18 23:45	53
cis-1,3-Dichloropropene	ND		96		ug/m3 Air			11/19/18 23:45	53
Dibromochloromethane	ND		180		ug/m3 Air			11/19/18 23:45	53
Dichlorodifluoromethane	ND		100		ug/m3 Air			11/19/18 23:45	53
Ethylbenzene	ND		92		ug/m3 Air			11/19/18 23:45	53
Hexachlorobutadiene	ND		1100		ug/m3 Air			11/19/18 23:45	53
m,p-Xylene	ND		180		ug/m3 Air			11/19/18 23:45	53
Methylene Chloride	ND		74		ug/m3 Air			11/19/18 23:45	53
o-Xylene	ND		92		ug/m3 Air			11/19/18 23:45	53
Styrene	ND		90		ug/m3 Air			11/19/18 23:45	53
Tetrachloroethene	31000		140		ug/m3 Air			11/19/18 23:45	53
Toluene	ND		80		ug/m3 Air			11/19/18 23:45	53
trans-1,2-Dichloroethene	ND		84		ug/m3 Air			11/19/18 23:45	53
trans-1,3-Dichloropropene	ND		96		ug/m3 Air			11/19/18 23:45	53
Trichloroethene	1300		110		ug/m3 Air			11/19/18 23:45	53
Trichlorofluoromethane	ND		120		ug/m3 Air			11/19/18 23:45	53

TestAmerica Sacramento

Client Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-45096-1

Client Sample ID: SVE_South_PreCarbon_110718

Lab Sample ID: 320-45096-1

Date Collected: 11/07/18 08:20

Matrix: Air

Date Received: 11/09/18 09:25

Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Vinyl acetate	ND		150		ug/m3 Air			11/19/18 23:45	53
Vinyl chloride	ND		54		ug/m3 Air			11/19/18 23:45	53
Surrogate	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	97		70 - 130					11/19/18 23:45	53
4-Bromofluorobenzene (Surr)	78		70 - 130					11/19/18 23:45	53
Toluene-d8 (Surr)	99		70 - 130					11/19/18 23:45	53

Client Sample ID: SVE_South_PostCarbon_110718

Lab Sample ID: 320-45096-2

Date Collected: 11/07/18 08:29

Matrix: Air

Date Received: 11/09/18 09:25

Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		1.6		ug/m3 Air			11/20/18 00:42	1
1,1,2,2-Tetrachloroethane	ND		2.7		ug/m3 Air			11/20/18 00:42	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		3.1		ug/m3 Air			11/20/18 00:42	1
1,1,2-Trichloroethane	ND		2.2		ug/m3 Air			11/20/18 00:42	1
1,1-Dichloroethane	ND		1.2		ug/m3 Air			11/20/18 00:42	1
1,1-Dichloroethene	ND		3.2		ug/m3 Air			11/20/18 00:42	1
1,2,4-Trichlorobenzene	ND		15		ug/m3 Air			11/20/18 00:42	1
1,2,4-Trimethylbenzene	ND		3.9		ug/m3 Air			11/20/18 00:42	1
1,2-Dibromoethane (EDB)	ND		6.1		ug/m3 Air			11/20/18 00:42	1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		2.8		ug/m3 Air			11/20/18 00:42	1
1,2-Dichlorobenzene	ND		2.4		ug/m3 Air			11/20/18 00:42	1
1,2-Dichloroethane	ND		3.2		ug/m3 Air			11/20/18 00:42	1
1,2-Dichloropropane	ND		1.8		ug/m3 Air			11/20/18 00:42	1
1,3,5-Trimethylbenzene	ND		2.0		ug/m3 Air			11/20/18 00:42	1
1,3-Dichlorobenzene	ND		2.4		ug/m3 Air			11/20/18 00:42	1
1,4-Dichlorobenzene	ND		2.4		ug/m3 Air			11/20/18 00:42	1
2-Butanone (MEK)	2.9		2.4		ug/m3 Air			11/20/18 00:42	1
2-Hexanone	ND		1.6		ug/m3 Air			11/20/18 00:42	1
4-Ethyltoluene	ND		2.0		ug/m3 Air			11/20/18 00:42	1
4-Methyl-2-pentanone (MIBK)	ND		1.6		ug/m3 Air			11/20/18 00:42	1
Acetone	83		12		ug/m3 Air			11/20/18 00:42	1
Benzene	ND		1.3		ug/m3 Air			11/20/18 00:42	1
Benzyl chloride	ND		4.1		ug/m3 Air			11/20/18 00:42	1
Bromodichloromethane	ND		2.0		ug/m3 Air			11/20/18 00:42	1
Bromoform	ND		4.1		ug/m3 Air			11/20/18 00:42	1
Bromomethane	ND		3.1		ug/m3 Air			11/20/18 00:42	1
Carbon disulfide	3.1		2.5		ug/m3 Air			11/20/18 00:42	1
Carbon tetrachloride	ND		5.0		ug/m3 Air			11/20/18 00:42	1
Chlorobenzene	ND		1.4		ug/m3 Air			11/20/18 00:42	1
Chloroethane	ND		2.1		ug/m3 Air			11/20/18 00:42	1
Chloroform	ND		1.5		ug/m3 Air			11/20/18 00:42	1
Chloromethane	ND		1.7		ug/m3 Air			11/20/18 00:42	1
cis-1,2-Dichloroethene	ND		1.6		ug/m3 Air			11/20/18 00:42	1
cis-1,3-Dichloropropene	ND		1.8		ug/m3 Air			11/20/18 00:42	1

TestAmerica Sacramento

Client Sample Results

Client: Cascadia Associates LLC
 Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-45096-1

Client Sample ID: SVE_South_PostCarbon_110718

Lab Sample ID: 320-45096-2

Date Collected: 11/07/18 08:29

Matrix: Air

Date Received: 11/09/18 09:25

Sample Container: Summa Canister 6L

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dibromochloromethane	ND		3.4		ug/m3 Air			11/20/18 00:42	1
Dichlorodifluoromethane	2.4		2.0		ug/m3 Air			11/20/18 00:42	1
Ethylbenzene	ND		1.7		ug/m3 Air			11/20/18 00:42	1
Hexachlorobutadiene	ND		21		ug/m3 Air			11/20/18 00:42	1
m,p-Xylene	ND		3.5		ug/m3 Air			11/20/18 00:42	1
Methylene Chloride	ND		1.4		ug/m3 Air			11/20/18 00:42	1
o-Xylene	ND		1.7		ug/m3 Air			11/20/18 00:42	1
Styrene	ND		1.7		ug/m3 Air			11/20/18 00:42	1
Tetrachloroethene	15		2.7		ug/m3 Air			11/20/18 00:42	1
Toluene	ND		1.5		ug/m3 Air			11/20/18 00:42	1
trans-1,2-Dichloroethene	ND		1.6		ug/m3 Air			11/20/18 00:42	1
trans-1,3-Dichloropropene	ND		1.8		ug/m3 Air			11/20/18 00:42	1
Trichloroethene	ND		2.1		ug/m3 Air			11/20/18 00:42	1
Trichlorofluoromethane	ND		2.2		ug/m3 Air			11/20/18 00:42	1
Vinyl acetate	ND		2.8		ug/m3 Air			11/20/18 00:42	1
Vinyl chloride	1.6		1.0		ug/m3 Air			11/20/18 00:42	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	97		70 - 130		11/20/18 00:42	1
4-Bromofluorobenzene (Surr)	92		70 - 130		11/20/18 00:42	1
Toluene-d8 (Surr)	100		70 - 130		11/20/18 00:42	1

Surrogate Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-45096-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Matrix: Air

Prep Type: Total/NA

Percent Surrogate Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	DCA (70-130)	BFB (70-130)	TOL (70-130)
320-45096-1	SVE_South_PreCarbon_11071E	97	78	99
320-45096-2	SVE_South_PostCarbon_110718	97	92	100
LCS 320-260167/5	Lab Control Sample	102	112	103
LCSD 320-260167/6	Lab Control Sample Dup	100	110	102
MB 320-260167/11	Method Blank	92	84	98

Surrogate Legend

DCA = 1,2-Dichloroethane-d4 (Surr)

BFB = 4-Bromofluorobenzene (Surr)

TOL = Toluene-d8 (Surr)

QC Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-45096-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Lab Sample ID: MB 320-260167/11

Matrix: Air

Analysis Batch: 260167

Client Sample ID: Method Blank

Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1-Trichloroethane	ND		1.6		ug/m3 Air			11/19/18 21:58	1
1,1,2,2-Tetrachloroethane	ND		2.7		ug/m3 Air			11/19/18 21:58	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		3.1		ug/m3 Air			11/19/18 21:58	1
1,1,2-Trichloroethane	ND		2.2		ug/m3 Air			11/19/18 21:58	1
1,1-Dichloroethane	ND		1.2		ug/m3 Air			11/19/18 21:58	1
1,1-Dichloroethene	ND		3.2		ug/m3 Air			11/19/18 21:58	1
1,2,4-Trichlorobenzene	ND		15		ug/m3 Air			11/19/18 21:58	1
1,2,4-Trimethylbenzene	ND		3.9		ug/m3 Air			11/19/18 21:58	1
1,2-Dibromoethane (EDB)	ND		6.1		ug/m3 Air			11/19/18 21:58	1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		2.8		ug/m3 Air			11/19/18 21:58	1
1,2-Dichlorobenzene	ND		2.4		ug/m3 Air			11/19/18 21:58	1
1,2-Dichloroethane	ND		3.2		ug/m3 Air			11/19/18 21:58	1
1,2-Dichloropropane	ND		1.8		ug/m3 Air			11/19/18 21:58	1
1,3,5-Trimethylbenzene	ND		2.0		ug/m3 Air			11/19/18 21:58	1
1,3-Dichlorobenzene	ND		2.4		ug/m3 Air			11/19/18 21:58	1
1,4-Dichlorobenzene	ND		2.4		ug/m3 Air			11/19/18 21:58	1
2-Butanone (MEK)	ND		2.4		ug/m3 Air			11/19/18 21:58	1
2-Hexanone	ND		1.6		ug/m3 Air			11/19/18 21:58	1
4-Ethyltoluene	ND		2.0		ug/m3 Air			11/19/18 21:58	1
4-Methyl-2-pentanone (MIBK)	ND		1.6		ug/m3 Air			11/19/18 21:58	1
Acetone	ND		12		ug/m3 Air			11/19/18 21:58	1
Benzene	ND		1.3		ug/m3 Air			11/19/18 21:58	1
Benzyl chloride	ND		4.1		ug/m3 Air			11/19/18 21:58	1
Bromodichloromethane	ND		2.0		ug/m3 Air			11/19/18 21:58	1
Bromoform	ND		4.1		ug/m3 Air			11/19/18 21:58	1
Bromomethane	ND		3.1		ug/m3 Air			11/19/18 21:58	1
Carbon disulfide	ND		2.5		ug/m3 Air			11/19/18 21:58	1
Carbon tetrachloride	ND		5.0		ug/m3 Air			11/19/18 21:58	1
Chlorobenzene	ND		1.4		ug/m3 Air			11/19/18 21:58	1
Chloroethane	ND		2.1		ug/m3 Air			11/19/18 21:58	1
Chloroform	ND		1.5		ug/m3 Air			11/19/18 21:58	1
Chloromethane	ND		1.7		ug/m3 Air			11/19/18 21:58	1
cis-1,2-Dichloroethene	ND		1.6		ug/m3 Air			11/19/18 21:58	1
cis-1,3-Dichloropropene	ND		1.8		ug/m3 Air			11/19/18 21:58	1
Dibromochloromethane	ND		3.4		ug/m3 Air			11/19/18 21:58	1
Dichlorodifluoromethane	ND		2.0		ug/m3 Air			11/19/18 21:58	1
Ethylbenzene	ND		1.7		ug/m3 Air			11/19/18 21:58	1
Hexachlorobutadiene	ND		21		ug/m3 Air			11/19/18 21:58	1
m,p-Xylene	ND		3.5		ug/m3 Air			11/19/18 21:58	1
Methylene Chloride	ND		1.4		ug/m3 Air			11/19/18 21:58	1
o-Xylene	ND		1.7		ug/m3 Air			11/19/18 21:58	1
Styrene	ND		1.7		ug/m3 Air			11/19/18 21:58	1
Tetrachloroethene	ND		2.7		ug/m3 Air			11/19/18 21:58	1
Toluene	ND		1.5		ug/m3 Air			11/19/18 21:58	1
trans-1,2-Dichloroethene	ND		1.6		ug/m3 Air			11/19/18 21:58	1
trans-1,3-Dichloropropene	ND		1.8		ug/m3 Air			11/19/18 21:58	1
Trichloroethene	ND		2.1		ug/m3 Air			11/19/18 21:58	1
Trichlorofluoromethane	ND		2.2		ug/m3 Air			11/19/18 21:58	1

TestAmerica Sacramento

QC Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-45096-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: MB 320-260167/11

Matrix: Air

Analysis Batch: 260167

Client Sample ID: Method Blank

Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Vinyl acetate	ND		2.8		ug/m3 Air			11/19/18 21:58	1
Vinyl chloride	ND		1.0		ug/m3 Air			11/19/18 21:58	1
Surrogate	MB %Recovery	MB Qualifier	Limits				Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	92		70 - 130					11/19/18 21:58	1
4-Bromofluorobenzene (Surr)	84		70 - 130					11/19/18 21:58	1
Toluene-d8 (Surr)	98		70 - 130					11/19/18 21:58	1

Lab Sample ID: LCS 320-260167/5

Matrix: Air

Analysis Batch: 260167

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1-Trichloroethane	109	134		ug/m3 Air		123	69 - 129
1,1,1,2-Tetrachloroethane	137	155		ug/m3 Air		113	64 - 124
1,1,1,2-Trichloro-1,2,2-trifluoroethane	153	181		ug/m3 Air		118	70 - 130
1,1,2-Trichloroethane	109	118		ug/m3 Air		108	64 - 124
1,1-Dichloroethane	80.9	97.6		ug/m3 Air		121	71 - 131
1,1-Dichloroethene	79.3	93.0		ug/m3 Air		117	72 - 132
1,2,4-Trichlorobenzene	148	138		ug/m3 Air		93	58 - 138
1,2,4-Trimethylbenzene	98.3	110		ug/m3 Air		112	60 - 132
1,2-Dibromoethane (EDB)	154	175		ug/m3 Air		114	64 - 124
1,2-Dichloro-1,1,2,2-tetrafluoroethane	140	155		ug/m3 Air		111	74 - 134
1,2-Dichlorobenzene	120	136		ug/m3 Air		113	62 - 126
1,2-Dichloroethane	80.9	99.2		ug/m3 Air		123	71 - 131
1,2-Dichloropropane	92.4	113		ug/m3 Air		122	72 - 132
1,3,5-Trimethylbenzene	98.3	109		ug/m3 Air		110	65 - 125
1,3-Dichlorobenzene	120	129		ug/m3 Air		108	59 - 130
1,4-Dichlorobenzene	120	129		ug/m3 Air		107	58 - 132
2-Butanone (MEK)	59.0	74.5		ug/m3 Air		126	73 - 133
2-Hexanone	82.0	98.5		ug/m3 Air		120	69 - 129
4-Ethyltoluene	98.3	117		ug/m3 Air		119	66 - 129
4-Methyl-2-pentanone (MIBK)	81.9	109		ug/m3 Air		133	74 - 134
Acetone	47.5	51.0		ug/m3 Air		107	65 - 125
Benzene	63.9	75.5		ug/m3 Air		118	68 - 128
Benzyl chloride	82.8	86.0		ug/m3 Air		104	67 - 127
Bromodichloromethane	134	165		ug/m3 Air		123	71 - 131
Bromoform	207	243		ug/m3 Air		118	66 - 126
Bromomethane	77.7	92.1		ug/m3 Air		119	73 - 134
Carbon disulfide	62.3	73.5		ug/m3 Air		118	71 - 131
Carbon tetrachloride	126	156		ug/m3 Air		124	63 - 126
Chlorobenzene	92.1	101		ug/m3 Air		109	63 - 123
Chloroethane	52.8	61.4		ug/m3 Air		116	73 - 133
Chloroform	97.7	118		ug/m3 Air		121	70 - 130
Chloromethane	41.3	44.0		ug/m3 Air		107	61 - 140
cis-1,2-Dichloroethene	79.3	97.8		ug/m3 Air		123	70 - 130

TestAmerica Sacramento

QC Sample Results

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-45096-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: LCS 320-260167/5

Matrix: Air

Analysis Batch: 260167

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
cis-1,3-Dichloropropene	90.8	117		ug/m3 Air		129	72 - 132
Dibromochloromethane	170	191		ug/m3 Air		112	66 - 126
Dichlorodifluoromethane	98.9	105		ug/m3 Air		107	69 - 129
Ethylbenzene	86.8	93.8		ug/m3 Air		108	64 - 124
Hexachlorobutadiene	213	211		ug/m3 Air		99	58 - 131
m,p-Xylene	174	190		ug/m3 Air		110	65 - 125
Methylene Chloride	69.5	80.4		ug/m3 Air		116	67 - 127
o-Xylene	86.8	95.0		ug/m3 Air		109	65 - 125
Styrene	85.2	100		ug/m3 Air		118	67 - 127
Tetrachloroethene	136	143		ug/m3 Air		105	63 - 123
Toluene	75.4	90.2		ug/m3 Air		120	68 - 128
trans-1,2-Dichloroethene	79.3	98.5		ug/m3 Air		124	72 - 132
trans-1,3-Dichloropropene	90.8	106		ug/m3 Air		117	66 - 126
Trichloroethene	107	132		ug/m3 Air		122	70 - 130
Trichlorofluoromethane	112	129		ug/m3 Air		115	71 - 131
Vinyl acetate	70.4	88.9		ug/m3 Air		126	65 - 134
Vinyl chloride	51.1	57.2		ug/m3 Air		112	59 - 152

Surrogate	LCS %Recovery	LCS Qualifier	Limits
1,2-Dichloroethane-d4 (Surr)	102		70 - 130
4-Bromofluorobenzene (Surr)	112		70 - 130
Toluene-d8 (Surr)	103		70 - 130

Lab Sample ID: LCSD 320-260167/6

Matrix: Air

Analysis Batch: 260167

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
1,1,1-Trichloroethane	109	132		ug/m3 Air		121	69 - 129	1	25
1,1,2,2-Tetrachloroethane	137	156		ug/m3 Air		114	64 - 124	1	25
1,1,2-Trichloro-1,2,2-trifluoroethane	153	183		ug/m3 Air		120	70 - 130	1	25
1,1,2-Trichloroethane	109	111		ug/m3 Air		102	64 - 124	6	25
1,1-Dichloroethane	80.9	95.9		ug/m3 Air		119	71 - 131	2	25
1,1-Dichloroethene	79.3	94.0		ug/m3 Air		119	72 - 132	1	25
1,2,4-Trichlorobenzene	148	141		ug/m3 Air		95	58 - 138	2	25
1,2,4-Trimethylbenzene	98.3	112		ug/m3 Air		114	60 - 132	1	25
1,2-Dibromoethane (EDB)	154	171		ug/m3 Air		111	64 - 124	2	25
1,2-Dichloro-1,1,2,2-tetrafluoroethane	140	161		ug/m3 Air		115	74 - 134	4	25
1,2-Dichlorobenzene	120	137		ug/m3 Air		114	62 - 126	1	25
1,2-Dichloroethane	80.9	95.9		ug/m3 Air		118	71 - 131	3	25
1,2-Dichloropropane	92.4	109		ug/m3 Air		118	72 - 132	3	25
1,3,5-Trimethylbenzene	98.3	111		ug/m3 Air		112	65 - 125	2	25
1,3-Dichlorobenzene	120	132		ug/m3 Air		109	59 - 130	2	25
1,4-Dichlorobenzene	120	131		ug/m3 Air		109	58 - 132	2	25
2-Butanone (MEK)	59.0	63.5		ug/m3 Air		108	73 - 133	16	25
2-Hexanone	82.0	97.7		ug/m3 Air		119	69 - 129	1	25

TestAmerica Sacramento

QC Sample Results

Client: Cascadia Associates LLC
 Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-45096-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air (Continued)

Lab Sample ID: LCSD 320-260167/6

Client Sample ID: Lab Control Sample Dup

Matrix: Air

Prep Type: Total/NA

Analysis Batch: 260167

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
4-Ethyltoluene	98.3	119		ug/m3 Air		121	66 - 129	1	25
4-Methyl-2-pentanone (MIBK)	81.9	103		ug/m3 Air		126	74 - 134	5	25
Acetone	47.5	45.6		ug/m3 Air		96	65 - 125	11	25
Benzene	63.9	74.1		ug/m3 Air		116	68 - 128	2	25
Benzyl chloride	82.8	85.9		ug/m3 Air		104	67 - 127	0	25
Bromodichloromethane	134	158		ug/m3 Air		118	71 - 131	4	25
Bromoform	207	241		ug/m3 Air		116	66 - 126	1	25
Bromomethane	77.7	96.6		ug/m3 Air		124	73 - 134	5	25
Carbon disulfide	62.3	74.7		ug/m3 Air		120	71 - 131	2	25
Carbon tetrachloride	126	156		ug/m3 Air		124	63 - 126	0	25
Chlorobenzene	92.1	98.3		ug/m3 Air		107	63 - 123	2	25
Chloroethane	52.8	62.7		ug/m3 Air		119	73 - 133	2	25
Chloroform	97.7	116		ug/m3 Air		118	70 - 130	2	25
Chloromethane	41.3	46.7		ug/m3 Air		113	61 - 140	6	25
cis-1,2-Dichloroethene	79.3	96.4		ug/m3 Air		122	70 - 130	1	25
cis-1,3-Dichloropropene	90.8	111		ug/m3 Air		122	72 - 132	5	25
Dibromochloromethane	170	183		ug/m3 Air		107	66 - 126	4	25
Dichlorodifluoromethane	98.9	112		ug/m3 Air		113	69 - 129	6	25
Ethylbenzene	86.8	92.0		ug/m3 Air		106	64 - 124	2	25
Hexachlorobutadiene	213	213		ug/m3 Air		100	58 - 131	1	25
m,p-Xylene	174	188		ug/m3 Air		108	65 - 125	2	25
Methylene Chloride	69.5	79.0		ug/m3 Air		114	67 - 127	2	25
o-Xylene	86.8	94.3		ug/m3 Air		109	65 - 125	1	25
Styrene	85.2	99.0		ug/m3 Air		116	67 - 127	1	25
Tetrachloroethene	136	141		ug/m3 Air		104	63 - 123	2	25
Toluene	75.4	85.9		ug/m3 Air		114	68 - 128	5	25
trans-1,2-Dichloroethene	79.3	97.3		ug/m3 Air		123	72 - 132	1	25
trans-1,3-Dichloropropene	90.8	101		ug/m3 Air		111	66 - 126	5	25
Trichloroethene	107	129		ug/m3 Air		120	70 - 130	2	25
Trichlorofluoromethane	112	132		ug/m3 Air		117	71 - 131	2	25
Vinyl acetate	70.4	79.4		ug/m3 Air		113	65 - 134	11	25
Vinyl chloride	51.1	60.3		ug/m3 Air		118	59 - 152	5	25

Surrogate	LCSD %Recovery	LCSD Qualifier	LCSD Limits
1,2-Dichloroethane-d4 (Surr)	100		70 - 130
4-Bromofluorobenzene (Surr)	110		70 - 130
Toluene-d8 (Surr)	102		70 - 130

QC Association Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-45096-1

Air - GC/MS VOA

Analysis Batch: 260167

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-45096-1	SVE_South_PreCarbon_110718	Total/NA	Air	TO-15	
320-45096-2	SVE_South_PostCarbon_110718	Total/NA	Air	TO-15	
MB 320-260167/11	Method Blank	Total/NA	Air	TO-15	
LCS 320-260167/5	Lab Control Sample	Total/NA	Air	TO-15	
LCSD 320-260167/6	Lab Control Sample Dup	Total/NA	Air	TO-15	

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16

Lab Chronicle

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-45096-1

Client Sample ID: SVE_South_PreCarbon_110718

Lab Sample ID: 320-45096-1

Date Collected: 11/07/18 08:20

Matrix: Air

Date Received: 11/09/18 09:25

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	TO-15		53	6.51 mL	250 mL	260167	11/19/18 23:45	AP1	TAL SAC

Client Sample ID: SVE_South_PostCarbon_110718

Lab Sample ID: 320-45096-2

Date Collected: 11/07/18 08:29

Matrix: Air

Date Received: 11/09/18 09:25

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	TO-15		1	441 mL	250 mL	260167	11/20/18 00:42	AP1	TAL SAC

Laboratory References:

TAL SAC = TestAmerica Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: Cascadia Associates LLC
 Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-45096-1

Laboratory: TestAmerica Sacramento

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	17-020	01-20-21
ANAB	DoD ELAP		L2468	01-20-21
Arizona	State Program	9	AZ0708	08-11-19
Arkansas DEQ	State Program	6	88-0691	06-17-19
California	State Program	9	2897	01-31-19
Colorado	State Program	8	CA00044	08-31-19
Connecticut	State Program	1	PH-0691	06-30-19
Florida	NELAP	4	E87570	06-30-19
Georgia	State Program	4	N/A	01-28-19
Hawaii	State Program	9	N/A	01-29-19
Illinois	NELAP	5	200060	03-17-19
Kansas	NELAP	7	E-10375	11-30-18
Louisiana	NELAP	6	30612	06-30-19
Maine	State Program	1	CA0004	04-14-20
Michigan	State Program	5	9947	01-31-20
Nevada	State Program	9	CA00044	07-31-19
New Hampshire	NELAP	1	2997	04-18-19
New Jersey	NELAP	2	CA005	06-30-19
New York	NELAP	2	11666	03-31-19
Oregon	NELAP	10	4040	01-29-19
Pennsylvania	NELAP	3	68-01272	03-31-19
Texas	NELAP	6	T104704399	05-31-19
US Fish & Wildlife	Federal		LE148388-0	07-31-19
USDA	Federal		P330-18-00239	01-17-21
USEPA UCMR	Federal	1	CA00044	12-31-20
Utah	NELAP	8	CA00044	02-28-19
Vermont	State Program	1	VT-4040	04-30-19
Virginia	NELAP	3	460278	03-14-19
Washington	State Program	10	C581	05-05-19
West Virginia (DW)	State Program	3	9930C	12-31-18
Wyoming	State Program	8	8TMS-L	01-28-19

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	17-024	01-19-19
ANAB	DoD ELAP		L2236	01-19-19
ANAB	ISO/IEC 17025		L2236	01-19-19
Montana (UST)	State Program	8	N/A	04-30-20
Nevada	State Program	9	WA000502019-1	07-31-19
Oregon	NELAP	10	WA100007	11-05-19
US Fish & Wildlife	Federal		LE058448-0	07-31-19
USDA	Federal		P330-14-00126	02-10-20
Washington	State Program	10	C553	02-17-19

Method Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-45096-1

Method	Method Description	Protocol	Laboratory
TO-15	Volatile Organic Compounds in Ambient Air	EPA	TAL SAC

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

TAL SAC = TestAmerica Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

- 1
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- 14
- 15
- 16

Sample Summary

Client: Cascadia Associates LLC
Project/Site: NuStar Vancouver

TestAmerica Job ID: 320-45096-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
320-45096-1	SVE_South_PreCarbon_110718	Air	11/07/18 08:20	11/09/18 09:25
320-45096-2	SVE_South_PostCarbon_110718	Air	11/07/18 08:29	11/09/18 09:25

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- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16

TestAmerica Sacramento
880 Riverside Parkway


West Sacramento, CA 95605-1500
phone 916.373.5600 fax 303.467.7248

Canister Samples Chain of Custody Record

TestAmerica Laboratories, Inc. assumes no liability with respect to the collection and shipment of these samples.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact Information Company Name: Cascadia Associates Address: 6915 SW Macadam Ave SE City/State/Zip: Portland, OR 97209 Phone: 503-906-6577 FAX: Project Name: Nutor Vanover Site/Location: Vancouver, WA PO# 0060-001-002		Client Project Manager: Stephanie Salisbury Phone: 503-906-6577 x110 Email: ssalisbury@cascadiaassociates.com		Samples Collected By: Lindsey Wallis COC No: 1 of 1 COCs					
Site Contact: Tel/Fax Analysis Turnaround Time Standard (Specify): Rush (Specify):		Other (Please specify in notes section) EPA 15/16 ASTM D-1946 EPA 25C EPA 3C TO-15 SIM TO-14/15 (Standard / Low Level)		Sample Type Indoor Air/Ambient Air Sub-Slab Soil Gas Soil Vapor Extraction (SVE) Landfill Gas Other (Please specify in notes section)					
Sample Identification SVE - South - Pre-Carbon-110718 SVE - South - Post-Carbon-110718		Sample Date(s) 11/7/18 0819 11/7/18 0828	Time Start 0820 0829	Time Stop 0820 0829	Canister Vacuum in Field, 'Hg (Start)' -30 -30	Canister Vacuum in Field, 'Hg (Stop)' -1 -5	Flow Controller ID -1062 8234	Canister ID -1062 8234	Sample Specific Notes:  320-45096 Chain of Custody
Special Instructions/QC Requirements & Comments: Email Reports to ssalisbury@cascadiaassociates.com									
Samples Shipped by: Lindsey Wallis Date / Time: 11/8/18 1043		Samples Received by: Received by: [Signature] ME 11-8-18 / 1043 Received by: TRACER 11/8/18 JCO		Samples Relinquished by: Date / Time: 11/8/18 1200 Received by: Gmily James 11/9/18 9:28 TA-SAC		Condition: 25 CS		Shipper Name:	
* Canister ID Received in TA-SAC # 34001062. GUSE 11/9/18									



Login Sample Receipt Checklist

Client: Cascadia Associates LLC

Job Number: 320-45096-1

Login Number: 45096

List Source: TestAmerica Sacramento

List Number: 1

Creator: James, Emily M

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



Date Cleaned/Batch ID: B 09-28-18



320-43632 Chain of Custody

Date of QC: 10/4/18

Data File Number: C:\MSDCHEM\1\DATA\181004\
(File ID for certification analysis of canister designated below)

CANISTER ID NUMBERS

*	34001221	MS 100412.d
	8234	
	34001062	
	8018	
	34000846	
	34000004	
	34000426	
	34000554	
	34000826	
	34000259	
	34000038	
	34001280	

The above canisters were cleaned as a batch. This certifies this batch contains no target analyte concentration greater than or equal to the method criteria for the "Certification Type" indicated above.

***** INDICATES THE CAN OR CANS WHICH WERE SCREENED**

[Signature]
1st Level Reviewed By

10/5/18
Date

[Signature]
2nd Level Reviewed By

10/14/18
Date



FORM I
AIR - GC/MS VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Sacramento Job No.: 320-43632-1
 SDG No.: _____
 Client Sample ID: 34001221 Lab Sample ID: 320-43632-1
 Matrix: Air Lab File ID: MS100412.D
 Analysis Method: TO-15 Date Collected: 09/28/2018 00:00
 Sample wt/vol: 500 (mL) Date Analyzed: 10/04/2018 22:01
 Soil Aliquot Vol: _____ Dilution Factor: 1
 Soil Extract Vol.: _____ GC Column: RTX-Volatiles ID: 0.32 (mm)
 % Moisture: _____ Level: (low/med) Low
 Analysis Batch No.: 249671 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
67-64-1	Acetone	1.2	J	5.0	0.18
107-02-8	Acrolein	ND		2.0	0.22
107-13-1	Acrylonitrile	ND		2.0	0.19
107-05-1	Allyl chloride	ND		0.80	0.11
71-43-2	Benzene	ND		0.40	0.079
100-44-7	Benzyl chloride	ND		0.80	0.16
75-27-4	Bromodichloromethane	ND		0.30	0.066
75-25-2	Bromoform	ND		0.40	0.070
74-83-9	Bromomethane	ND		0.80	0.34
106-99-0	1,3-Butadiene	ND		0.80	0.15
106-97-8	n-Butane	ND		0.40	0.15
78-93-3	2-Butanone (MEK)	ND		0.80	0.20
75-65-0	tert-Butyl alcohol (TBA)	ND		2.0	0.11
104-51-8	n-Butylbenzene	ND		0.40	0.18
135-98-8	sec-Butylbenzene	ND		0.40	0.070
98-06-6	tert-Butylbenzene	ND		0.80	0.068
75-15-0	Carbon disulfide	ND		0.80	0.078
56-23-5	Carbon tetrachloride	ND		0.80	0.064
108-90-7	Chlorobenzene	ND		0.30	0.064
75-45-6	Chlorodifluoromethane	ND		0.80	0.27
75-00-3	Chloroethane	ND		0.80	0.31
67-66-3	Chloroform	ND		0.30	0.095
74-87-3	Chloromethane	ND		0.80	0.20
95-49-8	2-Chlorotoluene	ND		0.40	0.080
110-82-7	Cyclohexane	ND		0.40	0.084
124-48-1	Dibromochloromethane	ND		0.40	0.079
106-93-4	1,2-Dibromoethane (EDB)	ND		0.80	0.075
74-95-3	Dibromomethane	ND		0.40	0.057
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND		0.40	0.16
95-50-1	1,2-Dichlorobenzene	ND		0.40	0.13
541-73-1	1,3-Dichlorobenzene	ND		0.40	0.11
106-46-7	1,4-Dichlorobenzene	ND		0.40	0.15
75-71-8	Dichlorodifluoromethane	ND		0.40	0.15
75-34-3	1,1-Dichloroethane	ND		0.30	0.072
107-06-2	1,2-Dichloroethane	ND		0.80	0.088

FORM I
AIR - GC/MS VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Sacramento Job No.: 320-43632-1
 SDG No.: _____
 Client Sample ID: 34001221 Lab Sample ID: 320-43632-1
 Matrix: Air Lab File ID: MS100412.D
 Analysis Method: TO-15 Date Collected: 09/28/2018 00:00
 Sample wt/vol: 500 (mL) Date Analyzed: 10/04/2018 22:01
 Soil Aliquot Vol: _____ Dilution Factor: 1
 Soil Extract Vol.: _____ GC Column: RTX-Volatiles ID: 0.32 (mm)
 % Moisture: _____ Level: (low/med) Low
 Analysis Batch No.: 249671 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
75-35-4	1,1-Dichloroethene	ND		0.80	0.13
156-59-2	cis-1,2-Dichloroethene	ND		0.40	0.089
156-60-5	trans-1,2-Dichloroethene	ND		0.40	0.10
78-87-5	1,2-Dichloropropane	ND		0.40	0.24
10061-01-5	cis-1,3-Dichloropropene	ND		0.40	0.10
10061-02-6	trans-1,3-Dichloropropene	ND		0.40	0.088
123-91-1	1,4-Dioxane	ND		0.80	0.10
141-78-6	Ethyl acetate	ND		0.30	0.18
100-41-4	Ethylbenzene	ND		0.40	0.063
622-96-8	4-Ethyltoluene	ND		0.40	0.19
142-82-5	n-Heptane	ND		0.80	0.063
87-68-3	Hexachlorobutadiene	ND		2.0	0.43
110-54-3	n-Hexane	ND		0.80	0.075
591-78-6	2-Hexanone	ND		0.40	0.087
98-82-8	Isopropylbenzene	ND		0.80	0.10
99-87-6	4-Isopropyltoluene	ND		0.80	0.12
1634-04-4	Methyl-t-Butyl Ether (MTBE)	ND		0.80	0.12
80-62-6	Methyl methacrylate	ND		0.80	0.16
108-10-1	4-Methyl-2-pentanone (MIBK)	ND		0.40	0.14
75-09-2	Methylene Chloride	0.14	J	0.40	0.072
98-83-9	alpha-Methylstyrene	ND		0.40	0.065
91-20-3	Naphthalene	ND		0.80	0.56
111-65-9	n-Octane	ND		0.40	0.055
109-66-0	n-Pentane	ND		0.80	0.26
115-07-1	Propylene	0.13	J B	0.40	0.099
103-65-1	N-Propylbenzene	ND		0.40	0.059
100-42-5	Styrene	ND		0.40	0.059
79-34-5	1,1,2,2-Tetrachloroethane	ND		0.40	0.069
127-18-4	Tetrachloroethene	ND		0.40	0.051
109-99-9	Tetrahydrofuran	ND		0.80	0.21
108-88-3	Toluene	ND		0.40	0.051
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	ND		0.40	0.16
120-82-1	1,2,4-Trichlorobenzene	ND		2.0	0.43
71-55-6	1,1,1-Trichloroethane	ND		0.30	0.065
79-00-5	1,1,2-Trichloroethane	ND		0.40	0.067

FORM I
AIR - GC/MS VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Sacramento Job No.: 320-43632-1
 SDG No.: _____
 Client Sample ID: 34001221 Lab Sample ID: 320-43632-1
 Matrix: Air Lab File ID: MS100412.D
 Analysis Method: TO-15 Date Collected: 09/28/2018 00:00
 Sample wt/vol: 500 (mL) Date Analyzed: 10/04/2018 22:01
 Soil Aliquot Vol: _____ Dilution Factor: 1
 Soil Extract Vol.: _____ GC Column: RTX-Volatiles ID: 0.32 (mm)
 % Moisture: _____ Level: (low/med) Low
 Analysis Batch No.: 249671 Units: ppb v/v

CAS NO.	COMPOUND NAME	RESULT	Q	RL	MDL
79-01-6	Trichloroethene	ND		0.40	0.11
75-69-4	Trichlorofluoromethane	ND		0.40	0.20
96-18-4	1,2,3-Trichloropropane	ND		0.40	0.17
95-63-6	1,2,4-Trimethylbenzene	ND		0.80	0.16
108-67-8	1,3,5-Trimethylbenzene	ND		0.40	0.13
540-84-1	2,2,4-Trimethylpentane	ND		0.40	0.071
108-05-4	Vinyl acetate	ND		0.80	0.15
593-60-2	Vinyl bromide	ND		0.80	0.26
75-01-4	Vinyl chloride	ND		0.40	0.12
179601-23-1	m,p-Xylene	ND		0.80	0.10
95-47-6	o-Xylene	ND		0.40	0.054
1330-20-7	Xylenes, Total	ND		1.2	0.074
87-61-6	1,2,3-Trichlorobenzene	ND		2.0	0.62
60-29-7	Ethyl ether	ND		0.80	0.20
71-36-3	n-Butanol	ND		2.0	0.26
111-84-2	n-Nonane	ND		0.80	0.058

CAS NO.	SURROGATE	%REC	Q	LIMITS
460-00-4	4-Bromofluorobenzene (Surr)	100		70-130
17060-07-0	1,2-Dichloroethane-d4 (Surr)	103		70-130
2037-26-5	Toluene-d8 (Surr)	101		70-130

TestAmerica Sacramento
Target Compound Quantitation Report

Data File: \\ChromNA\Sacramento\ChromData\ATMS2\20181004-65242.b\MS100412.D
 Lims ID: 320-43632-A-1
 Client ID: 34001221
 Sample Type: Client
 Inject. Date: 04-Oct-2018 22:01:30 ALS Bottle#: 5 Worklist Smp#: 12
 Purge Vol: 250.000 mL Dil. Factor: 1.0000
 Sample Info: 320-43632-A-1
 Misc. Info.: 500 mL CAN CERT
 Operator ID: LHS Instrument ID: ATMS2
 Method: \\ChromNA\Sacramento\ChromData\ATMS2\20181004-65242.b\TO15_ATMS2N.m
 Limit Group: MSA - TO15 - ICAL
 Last Update: 05-Oct-2018 16:16:49 Calib Date: 04-Oct-2018 16:46:30
 Integrator: RTE ID Type: Deconvolution ID
 Quant Method: Internal Standard Quant By: Initial Calibration
 Last ICal File: \\ChromNA\Sacramento\ChromData\ATMS2\20181004-65242.b\MS100406.D
 Column 1 : RTX Volatiles (0.32 mm) Det: MS SCAN
 Process Host: XAWRK023

First Level Reviewer: phanthasena Date: 05-Oct-2018 16:05:05

Compound	Sig	RT (min.)	Adj RT (min.)	Dlt RT (min.)	Q	Response	OnCol Amt ppb v/v	Flags
* 1 Chlorobromomethane (IS)	130	11.317	11.327	-0.010	94	40519	4.00	
* 2 1,4-Difluorobenzene	114	13.413	13.412	0.001	97	168136	4.00	
* 3 Chlorobenzene-d5 (IS)	117	19.477	19.480	-0.003	90	147466	4.00	
\$ 4 1,2-Dichloroethane-d4 (Sur	65	12.472	12.472	0.000	0	69904	4.13	
\$ 5 Toluene-d8 (Surr)	100	16.644	16.644	0.000	98	105950	4.05	
\$ 6 4-Bromofluorobenzene (Surr	95	21.509	21.509	0.000	90	92573	4.00	
10 Propene	41	3.908	3.911	-0.003	97	3123	0.1348	
32 Acetone	43	6.879	6.889	-0.010	95	26103	1.21	
39 Methylene Chloride	49	8.034	8.041	-0.007	95	3639	0.1423	
48 2-Butanone (MEK)	72	10.428	10.419	0.010	98	355	0.1215	
71 4-Methyl-2-pentanone (MIBK	43	15.800	15.790	0.010	16	2489	0.0872	
74 Toluene	91	16.795	16.807	-0.012	10	694	0.0183	

Reagents:

VAMSIS20_00222 Amount Added: 50.00 Units: mL Run Reagent

Data File: \\ChromNA\Sacramento\ChromData\ATMS2\20181004-65242.b\MS100412.D

Injection Date: 04-Oct-2018 22:01:30

Instrument ID: ATMS2

Operator ID: LHS

Lims ID: 320-43632-A-1

Lab Sample ID: 320-43632-1

Worklist Smp#: 12

Client ID: 34001221

Purge Vol: 250.000 mL

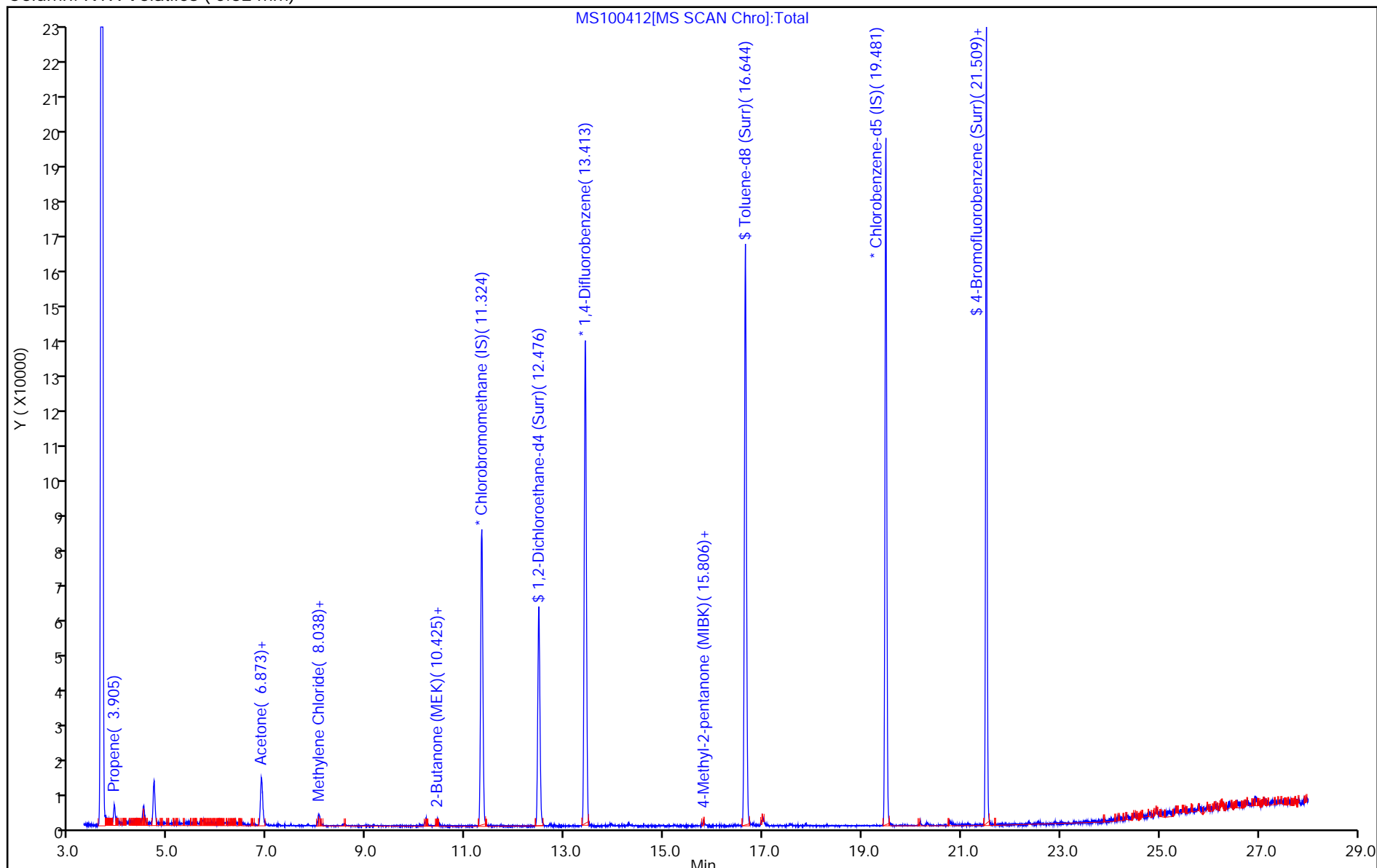
Dil. Factor: 1.0000

ALS Bottle#: 5

Method: TO15_ATMS2N

Limit Group: MSA - TO15 - ICAL

Column: RTX Volatiles (0.32 mm)



TestAmerica Sacramento

Data File: \\ChromNA\Sacramento\ChromData\ATMS2\20181004-65242.b\MS100412.D

Injection Date: 04-Oct-2018 22:01:30

Instrument ID: ATMS2

Lims ID: 320-43632-A-1

Lab Sample ID: 320-43632-1

Client ID: 34001221

Operator ID: LHS

ALS Bottle#: 5 Worklist Smp#: 12

Purge Vol: 250.000 mL

Dil. Factor: 1.0000

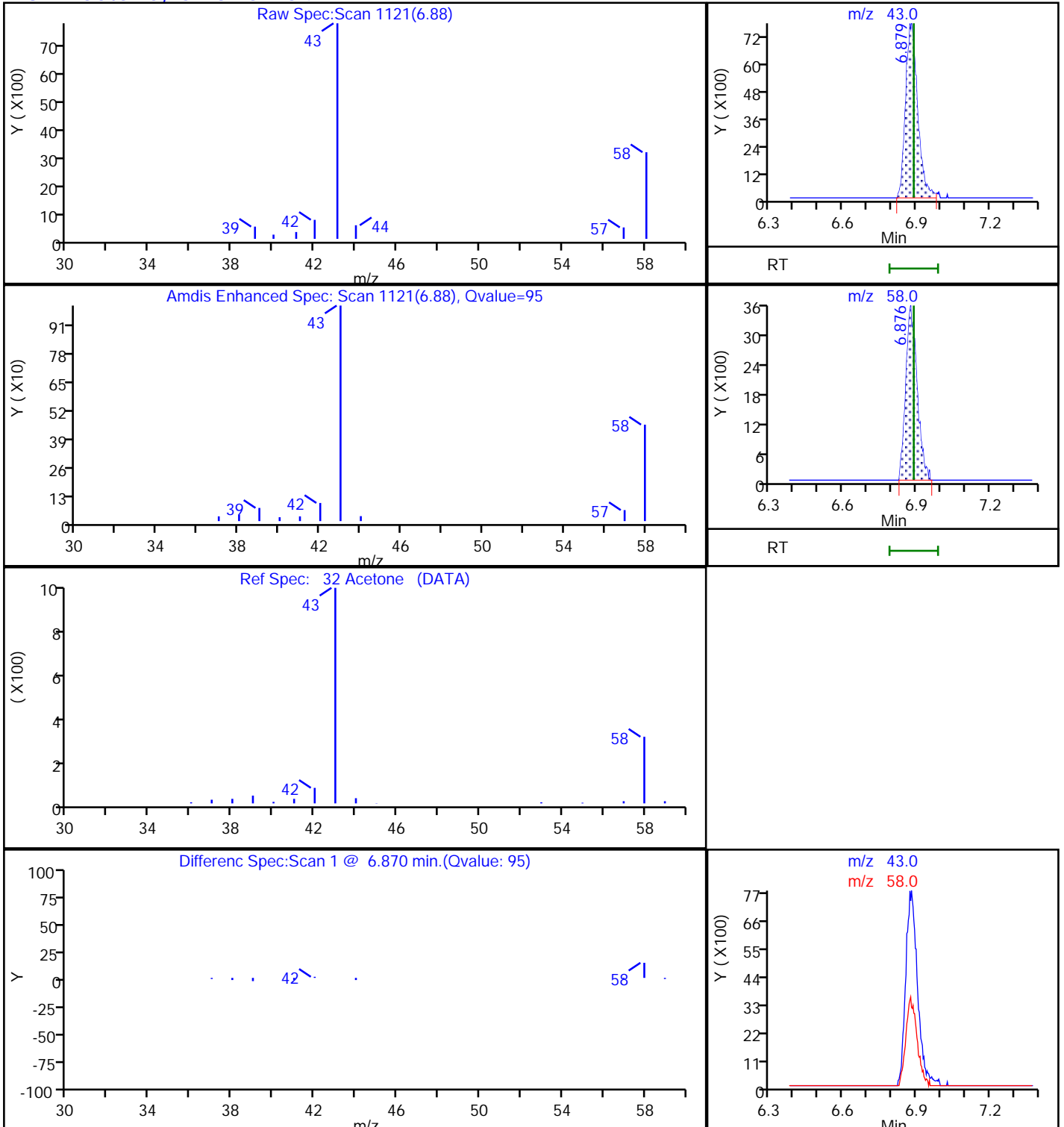
Method: TO15_ATMS2N

Limit Group: MSA - TO15 - ICAL

Column: RTX Volatiles (0.32 mm)

Detector: MS SCAN

32 Acetone, CAS: 67-64-1



TestAmerica Sacramento

Data File: \\ChromNA\Sacramento\ChromData\ATMS2\20181004-65242.b\MS100412.D

Injection Date: 04-Oct-2018 22:01:30

Instrument ID: ATMS2

Lims ID: 320-43632-A-1

Lab Sample ID: 320-43632-1

Client ID: 34001221

Operator ID: LHS

ALS Bottle#: 5 Worklist Smp#: 12

Purge Vol: 250.000 mL

Dil. Factor: 1.0000

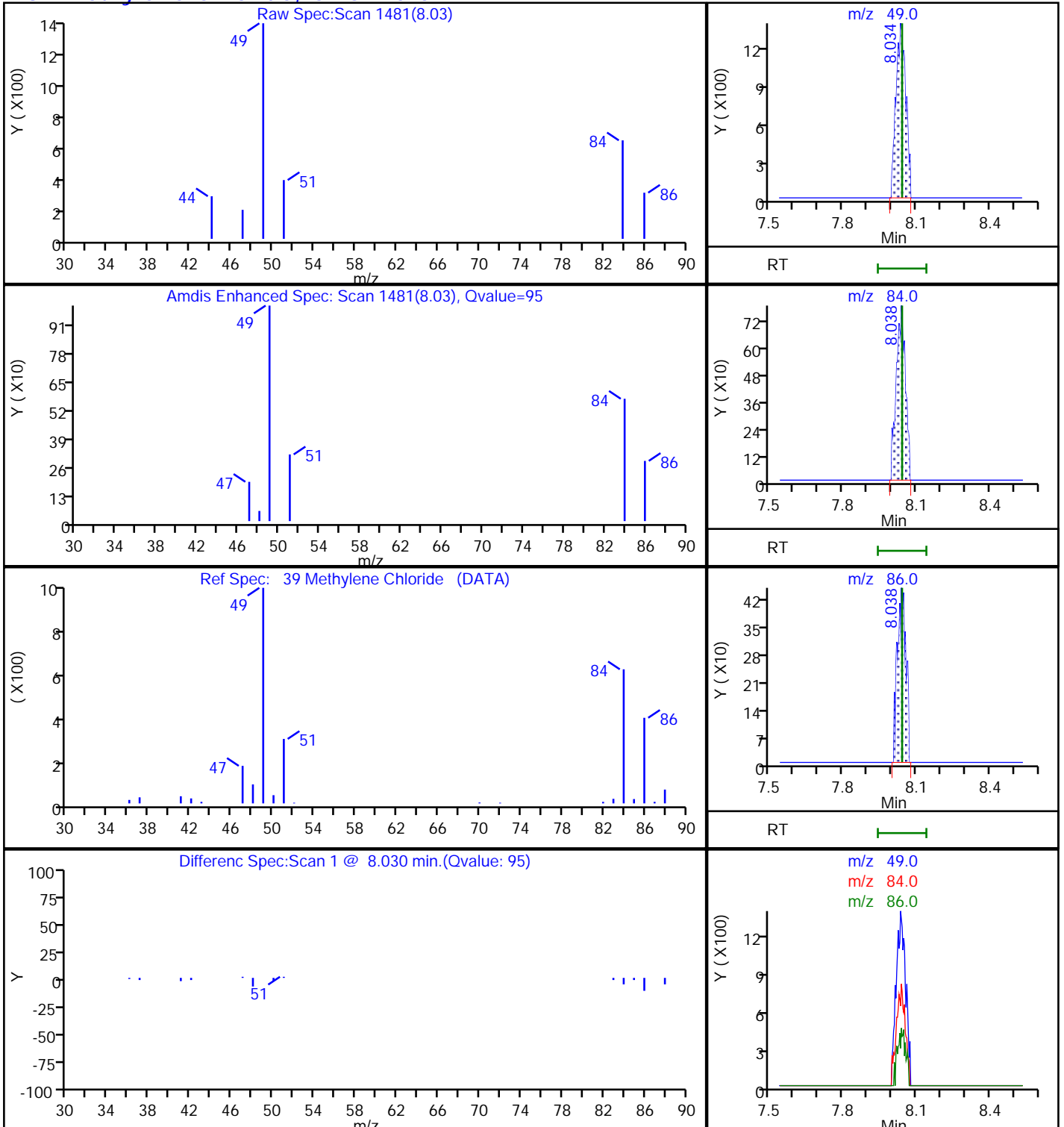
Method: TO15_ATMS2N

Limit Group: MSA - TO15 - ICAL

Column: RTX Volatiles (0.32 mm)

Detector: MS SCAN

39 Methylene Chloride, CAS: 75-09-2



TestAmerica Sacramento

Data File: \\ChromNA\Sacramento\ChromData\ATMS2\20181004-65242.b\MS100412.D

Injection Date: 04-Oct-2018 22:01:30

Instrument ID: ATMS2

Lims ID: 320-43632-A-1

Lab Sample ID: 320-43632-1

Client ID: 34001221

Operator ID: LHS

ALS Bottle#: 5 Worklist Smp#: 12

Purge Vol: 250.000 mL

Dil. Factor: 1.0000

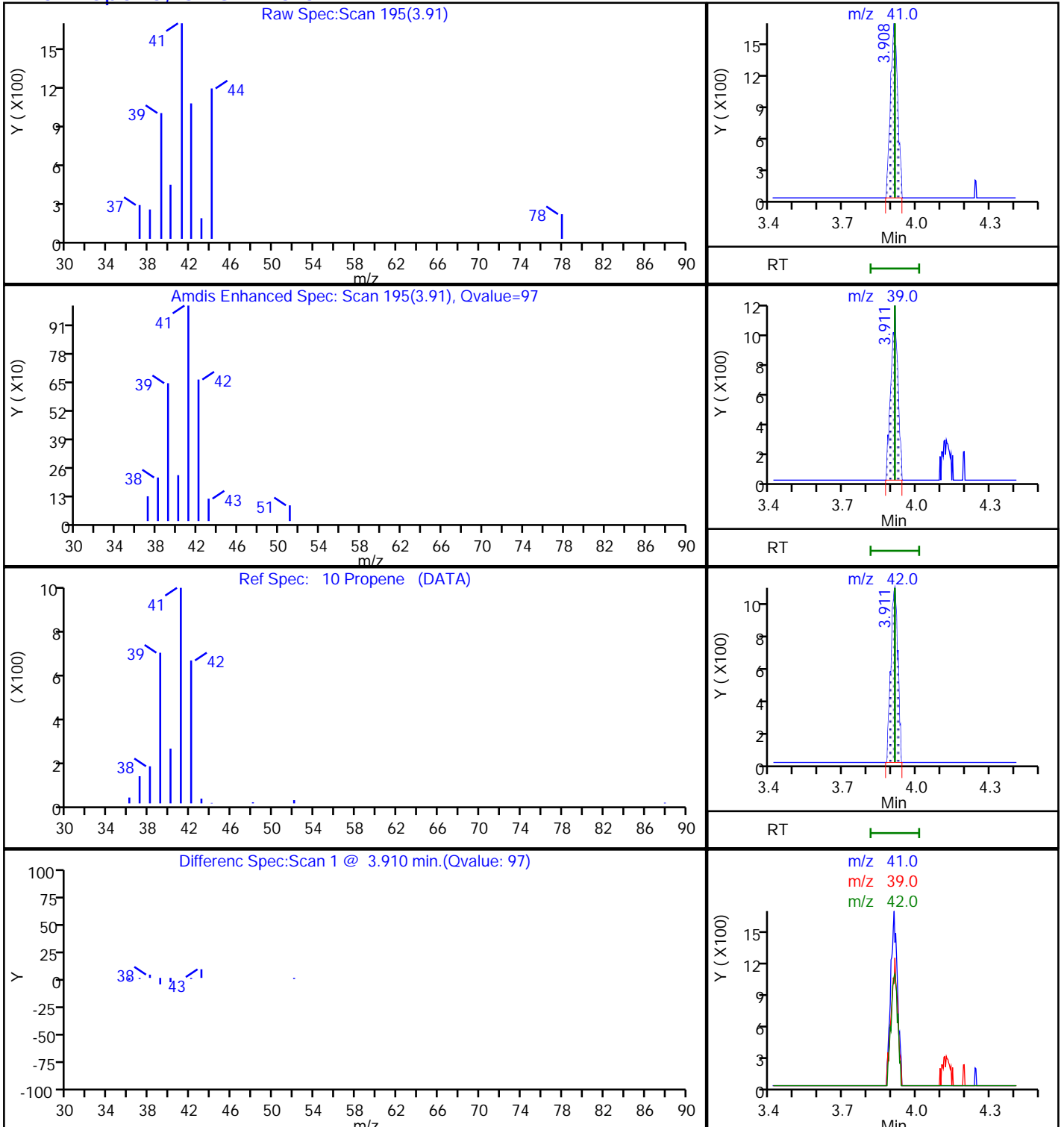
Method: TO15_ATMS2N

Limit Group: MSA - TO15 - ICAL

Column: RTX Volatiles (0.32 mm)

Detector: MS SCAN

10 Propene, CAS: 115-07-1

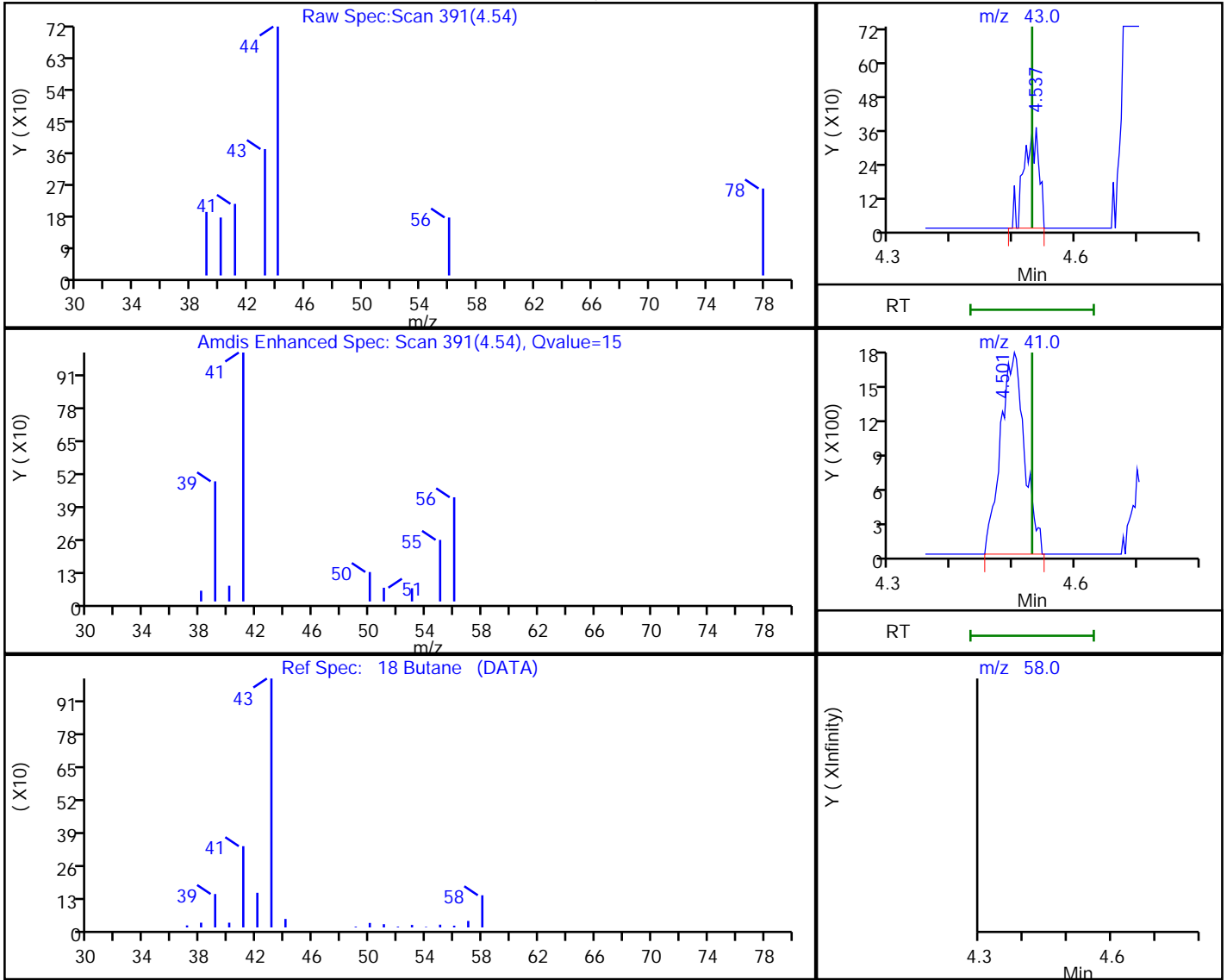


TestAmerica Sacramento

Data File: \\ChromNA\Sacramento\ChromData\ATMS2\20181004-65242.b\MS100412.D
 Injection Date: 04-Oct-2018 22:01:30 Instrument ID: ATMS2
 Lims ID: 320-43632-A-1 Lab Sample ID: 320-43632-1
 Client ID: 34001221
 Operator ID: LHS ALS Bottle#: 5 Worklist Smp#: 12
 Purge Vol: 250.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS2N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector: MS SCAN

18 Butane, CAS: 106-97-8

Processing Results



RT	Mass	Response	Amount
4.54	43.00	594	0.019400
4.50	41.00	4742	
4.53	58.00	0	

Reviewer: phanhasena, 05-Oct-2018 16:04:26

Audit Action: Marked Compound Undetected

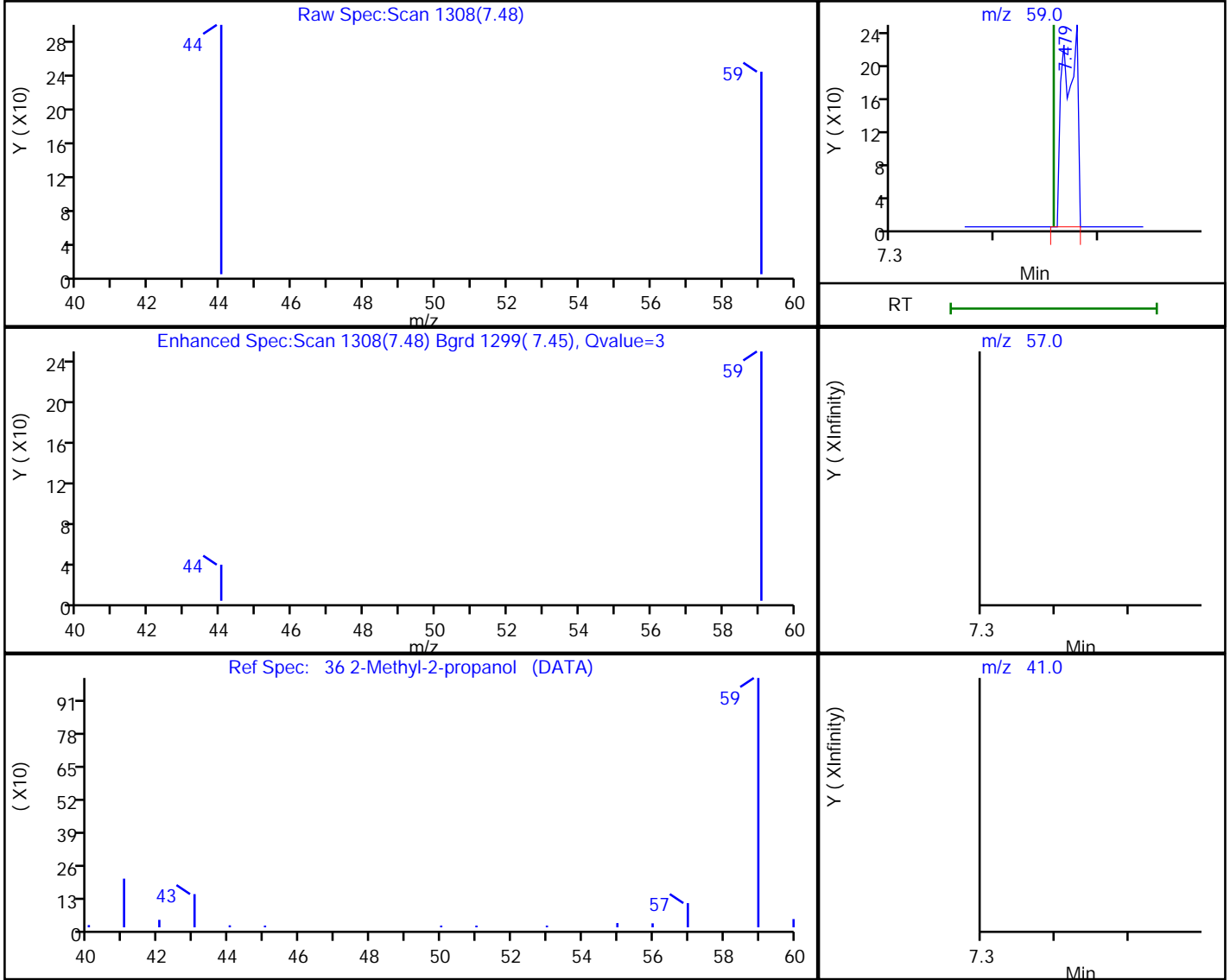
Audit Reason: Invalid Compound ID

TestAmerica Sacramento

Data File: \\ChromNA\Sacramento\ChromData\ATMS2\20181004-65242.b\MS100412.D
 Injection Date: 04-Oct-2018 22:01:30 Instrument ID: ATMS2
 Lims ID: 320-43632-A-1 Lab Sample ID: 320-43632-1
 Client ID: 34001221
 Operator ID: LHS ALS Bottle#: 5 Worklist Smp#: 12
 Purge Vol: 250.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS2N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector MS SCAN

36 2-Methyl-2-propanol, CAS: 75-65-0

Processing Results



RT	Mass	Response	Amount
7.48	59.00	219	0.007863
7.46	57.00	0	
7.46	41.00	0	

Reviewer: phanhasena, 05-Oct-2018 16:04:33

Audit Action: Marked Compound Undetected

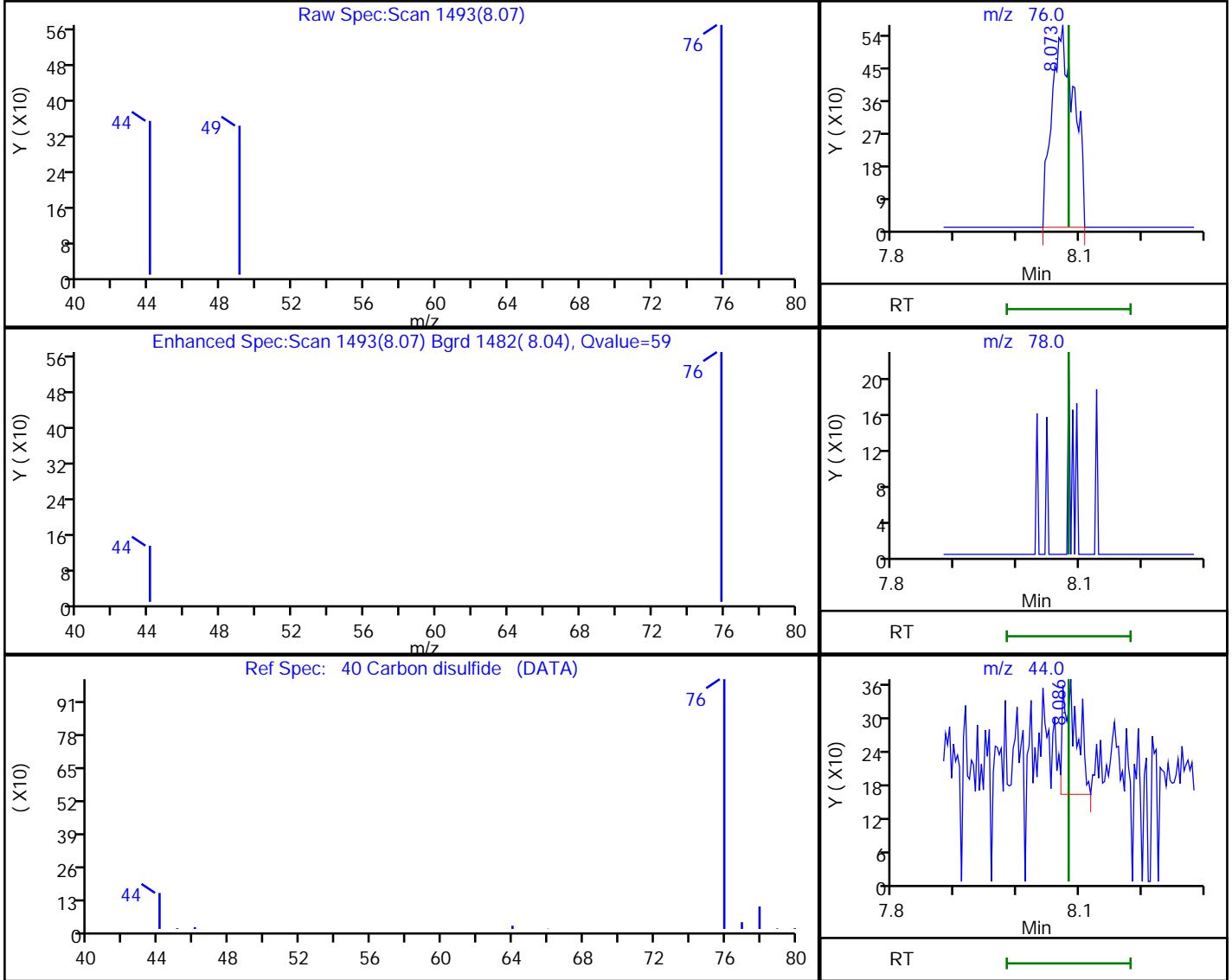
Audit Reason: Invalid Compound ID

TestAmerica Sacramento

Data File: \\ChromNA\Sacramento\ChromData\ATMS2\20181004-65242.b\MS100412.D
 Injection Date: 04-Oct-2018 22:01:30 Instrument ID: ATMS2
 Lims ID: 320-43632-A-1 Lab Sample ID: 320-43632-1
 Client ID: 34001221
 Operator ID: LHS ALS Bottle#: 5 Worklist Smp#: 12
 Purge Vol: 250.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS2N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector: MS SCAN

40 Carbon disulfide, CAS: 75-15-0

Processing Results



RT	Mass	Response	Amount
8.07	76.00	1413	0.044717
8.08	78.00	0	
8.09	44.00	316	

Reviewer: phanhasena, 05-Oct-2018 16:04:36

Audit Action: Marked Compound Undetected

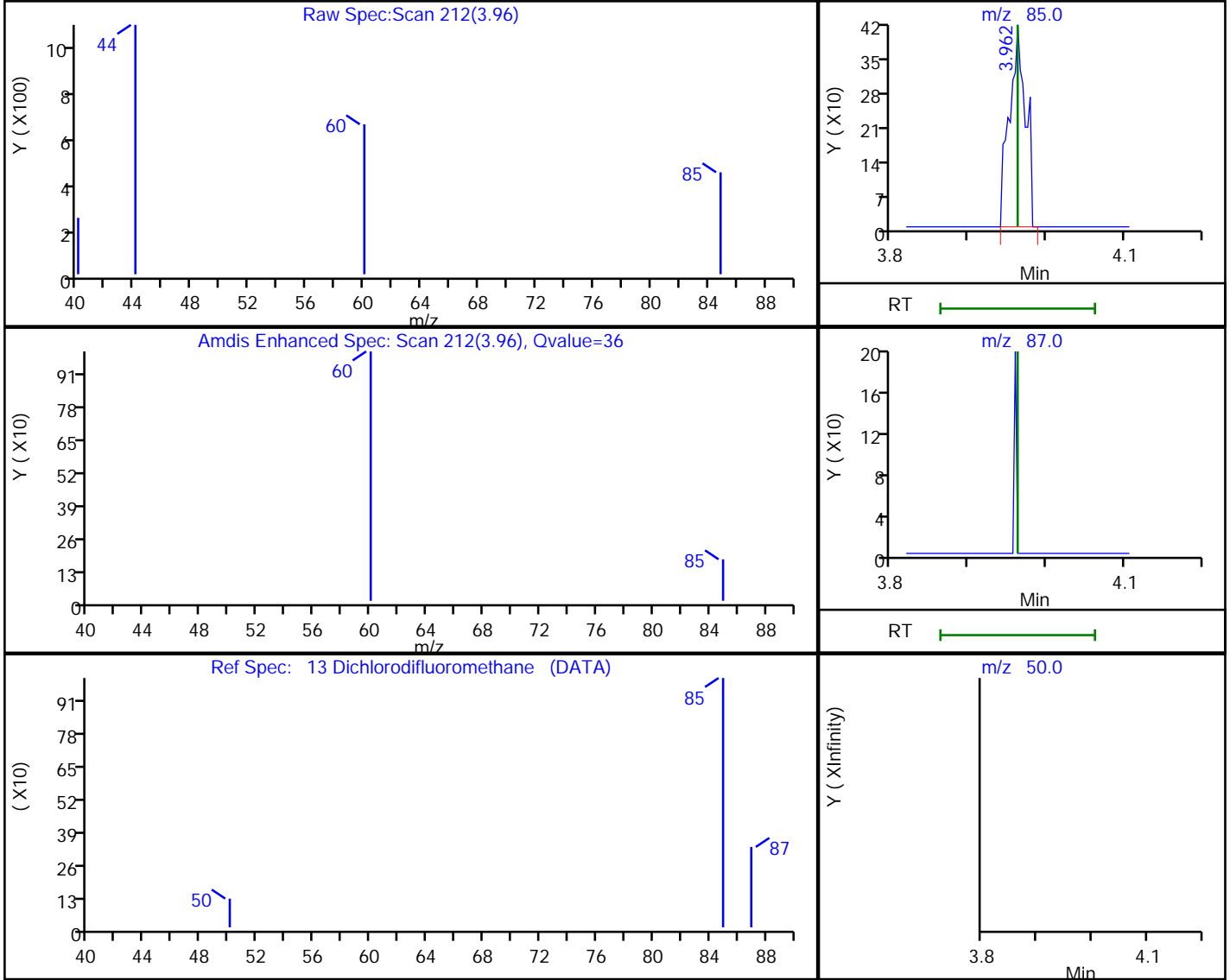
Audit Reason: Invalid Compound ID

TestAmerica Sacramento

Data File: \\ChromNA\Sacramento\ChromData\ATMS2\20181004-65242.b\MS100412.D
 Injection Date: 04-Oct-2018 22:01:30 Instrument ID: ATMS2
 Lims ID: 320-43632-A-1 Lab Sample ID: 320-43632-1
 Client ID: 34001221
 Operator ID: LHS ALS Bottle#: 5 Worklist Smp#: 12
 Purge Vol: 250.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS2N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector: MS SCAN

13 Dichlorodifluoromethane, CAS: 75-71-8

Processing Results



RT	Mass	Response	Amount
3.96	85.00	598	0.018639
3.96	87.00	0	
3.96	50.00	0	

Reviewer: phanhasena, 05-Oct-2018 16:04:25

Audit Action: Marked Compound Undetected

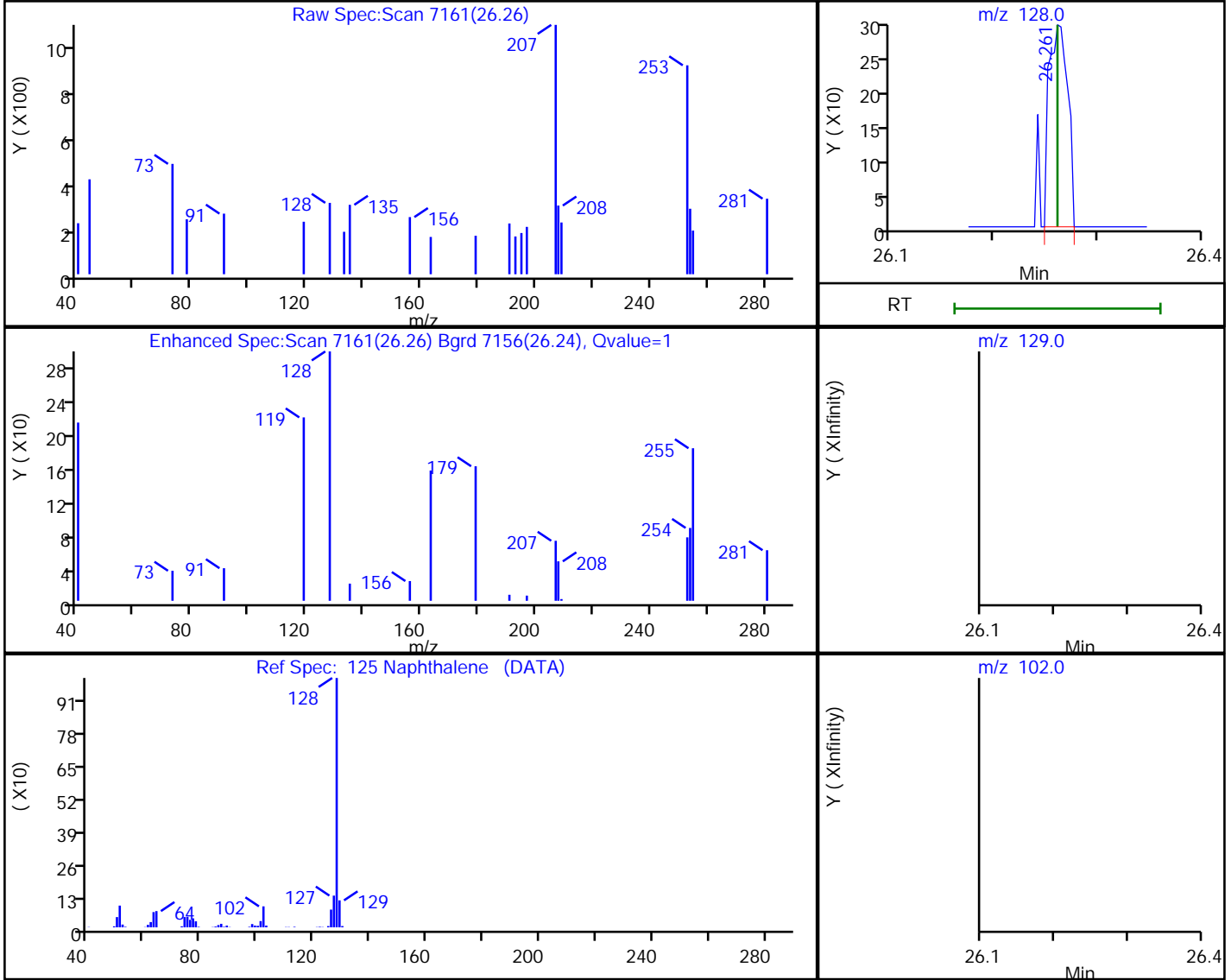
Audit Reason: Invalid Compound ID

TestAmerica Sacramento

Data File: \\ChromNA\Sacramento\ChromData\ATMS2\20181004-65242.b\MS100412.D
 Injection Date: 04-Oct-2018 22:01:30 Instrument ID: ATMS2
 Lims ID: 320-43632-A-1 Lab Sample ID: 320-43632-1
 Client ID: 34001221
 Operator ID: LHS ALS Bottle#: 5 Worklist Smp#: 12
 Purge Vol: 250.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS2N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector: MS SCAN

125 Naphthalene, CAS: 91-20-3

Processing Results



RT	Mass	Response	Amount
26.26	128.00	368	0.006721
26.26	129.00	0	
26.26	102.00	0	

Reviewer: phanhasena, 05-Oct-2018 16:05:03

Audit Action: Marked Compound Undetected

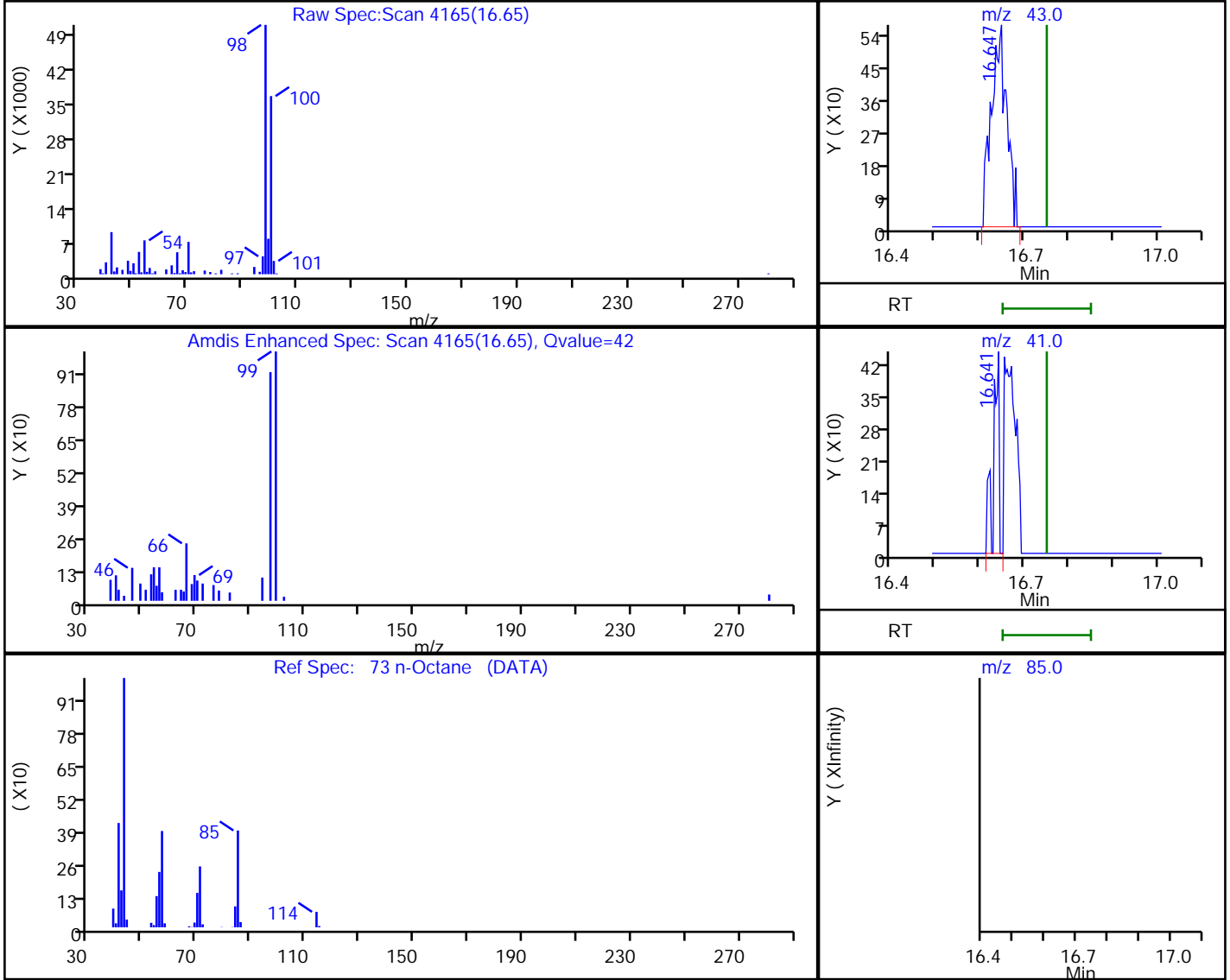
Audit Reason: Invalid Compound ID

TestAmerica Sacramento

Data File: \\ChromNA\Sacramento\ChromData\ATMS2\20181004-65242.b\MS100412.D
 Injection Date: 04-Oct-2018 22:01:30 Instrument ID: ATMS2
 Lims ID: 320-43632-A-1 Lab Sample ID: 320-43632-1
 Client ID: 34001221
 Operator ID: LHS ALS Bottle#: 5 Worklist Smp#: 12
 Purge Vol: 250.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS2N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector: MS SCAN

73 n-Octane, CAS: 111-65-9

Processing Results



RT	Mass	Response	Amount
16.65	43.00	1365	0.036586
16.64	41.00	390	
16.75	85.00	0	

Reviewer: phanhasena, 05-Oct-2018 16:04:52

Audit Action: Marked Compound Undetected

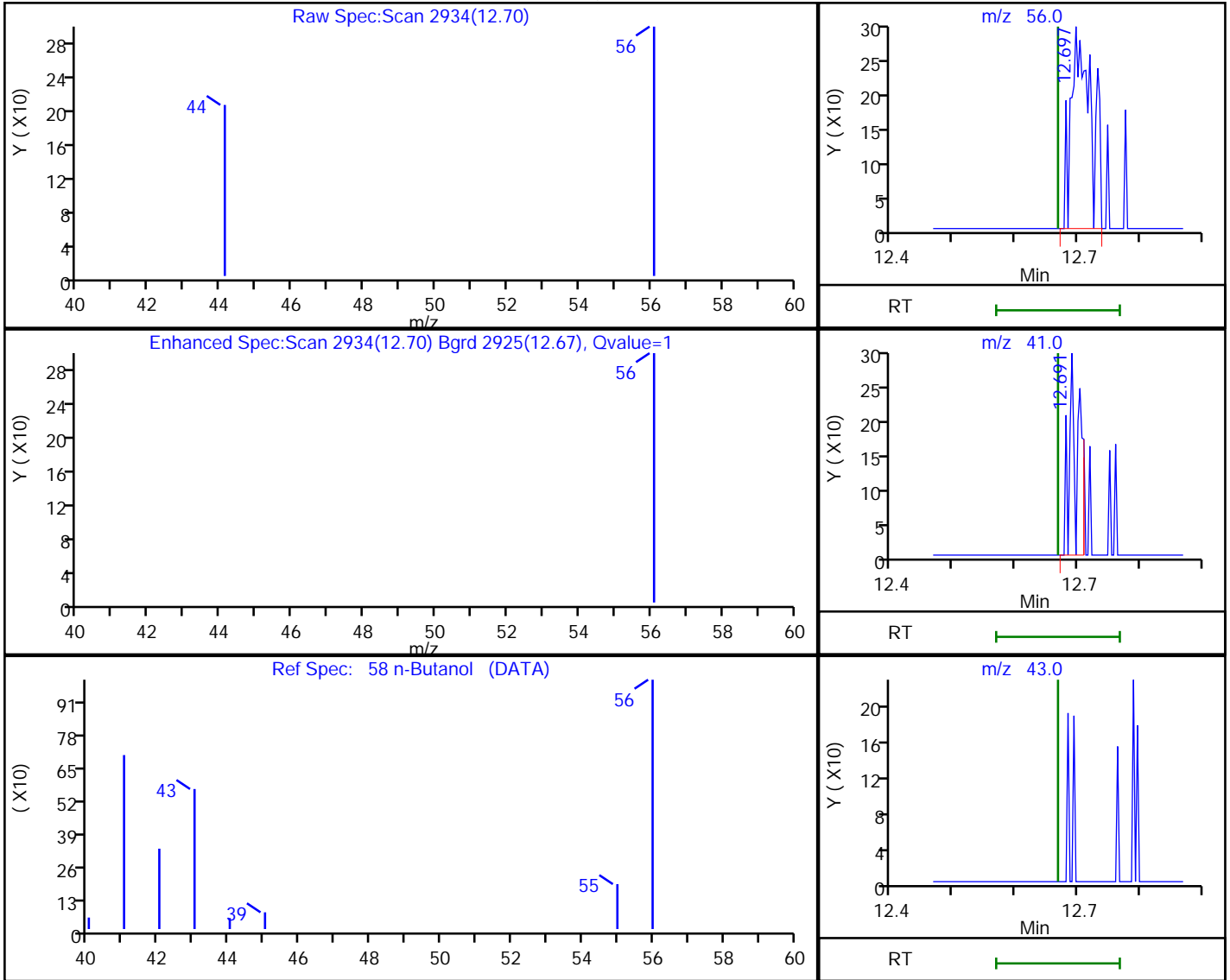
Audit Reason: Invalid Compound ID

TestAmerica Sacramento

Data File: \\ChromNA\Sacramento\ChromData\ATMS2\20181004-65242.b\MS100412.D
 Injection Date: 04-Oct-2018 22:01:30 Instrument ID: ATMS2
 Lims ID: 320-43632-A-1 Lab Sample ID: 320-43632-1
 Client ID: 34001221
 Operator ID: LHS ALS Bottle#: 5 Worklist Smp#: 12
 Purge Vol: 250.000 mL Dil. Factor: 1.0000
 Method: TO15_ATMS2N Limit Group: MSA - TO15 - ICAL
 Column: RTX Volatiles (0.32 mm) Detector MS SCAN

58 n-Butanol, CAS: 71-36-3

Processing Results



RT	Mass	Response	Amount
12.70	56.00	660	0.069395
12.69	41.00	309	
12.67	43.00	0	

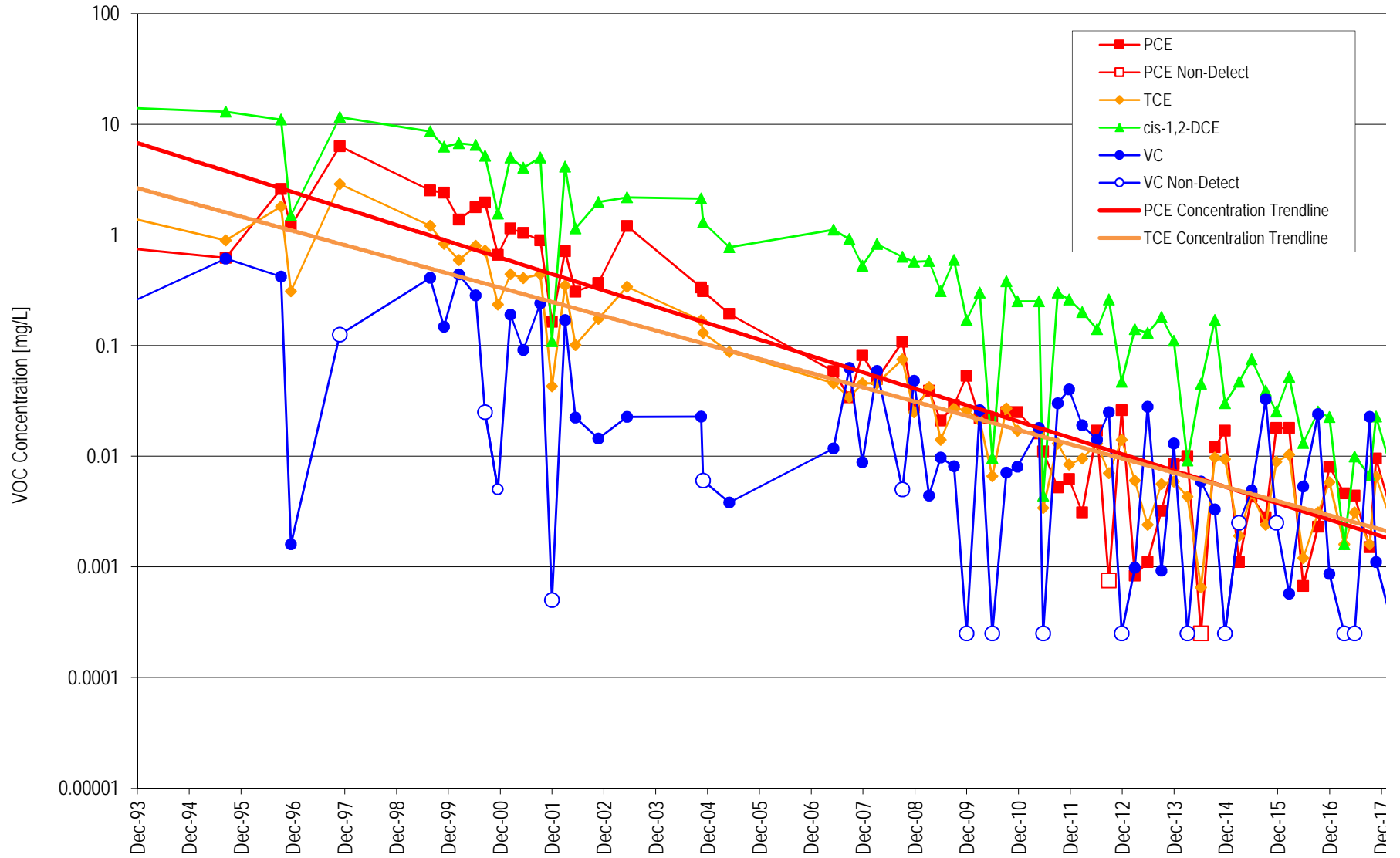
Reviewer: phanhasena, 05-Oct-2018 16:04:44

Audit Action: Marked Compound Undetected

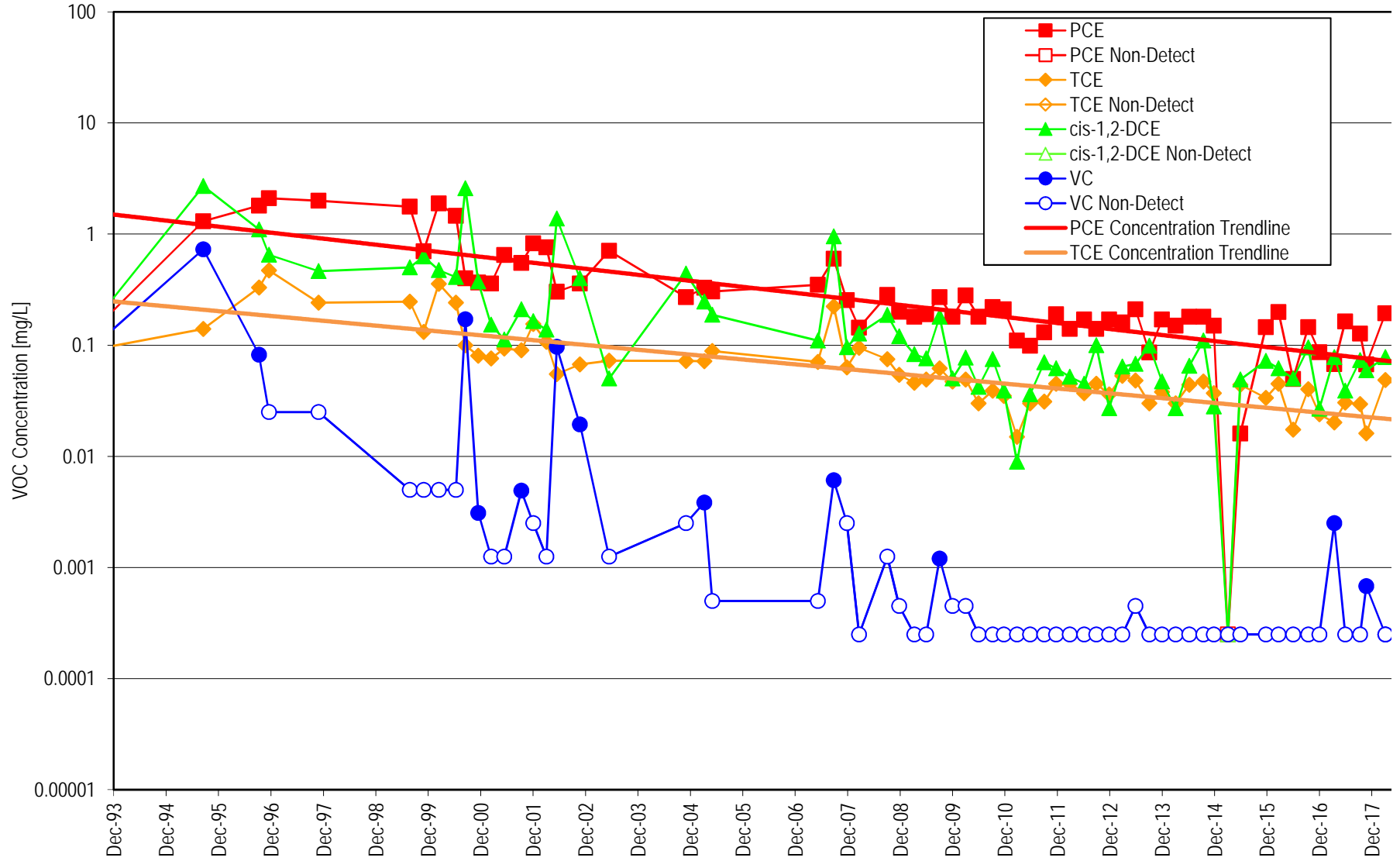
Audit Reason: Invalid Compound ID

APPENDIX D
CONCENTRATION TREND PLOTS

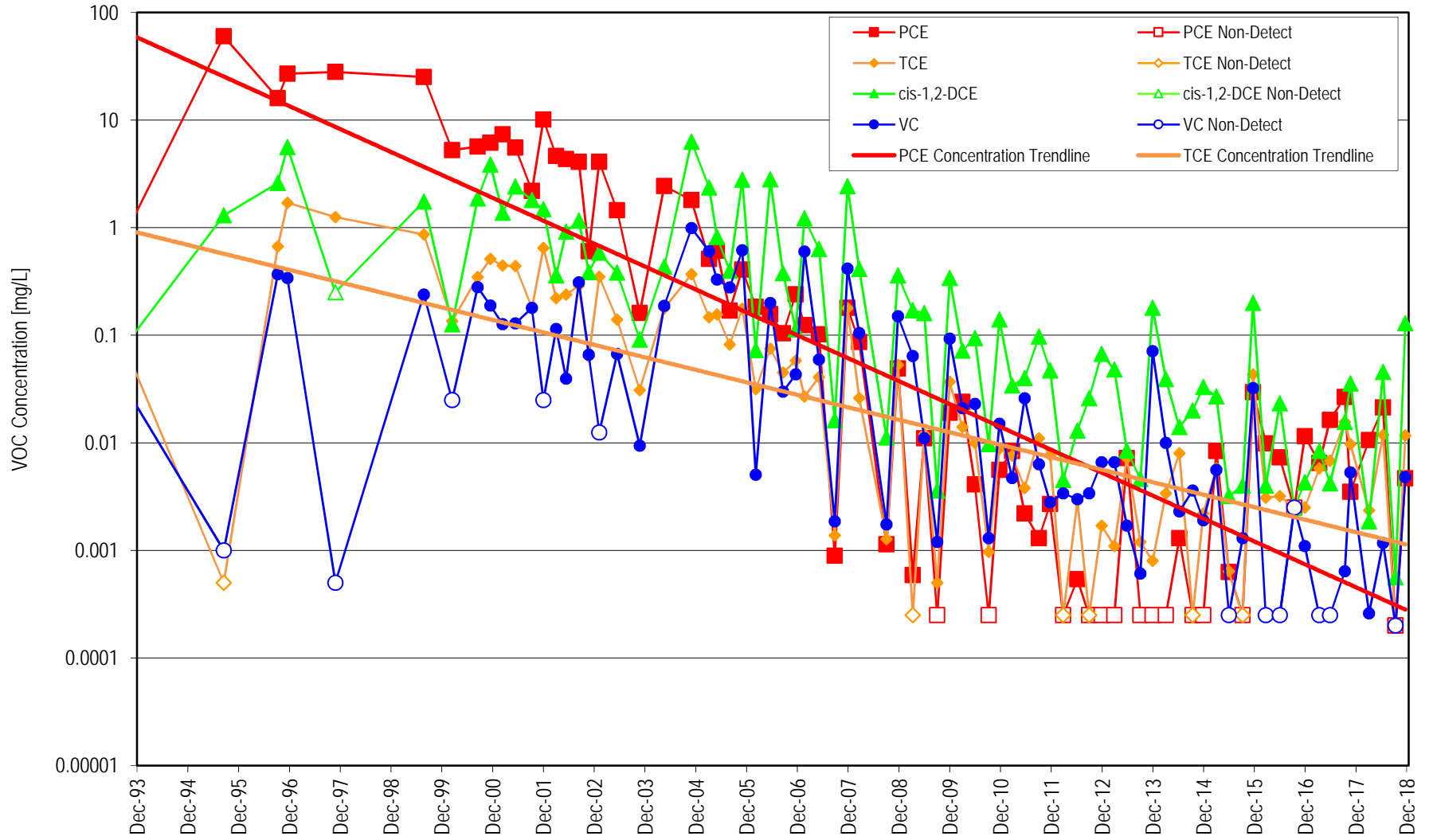
VOC Concentrations in MW-1



VOC Concentrations in MW-3

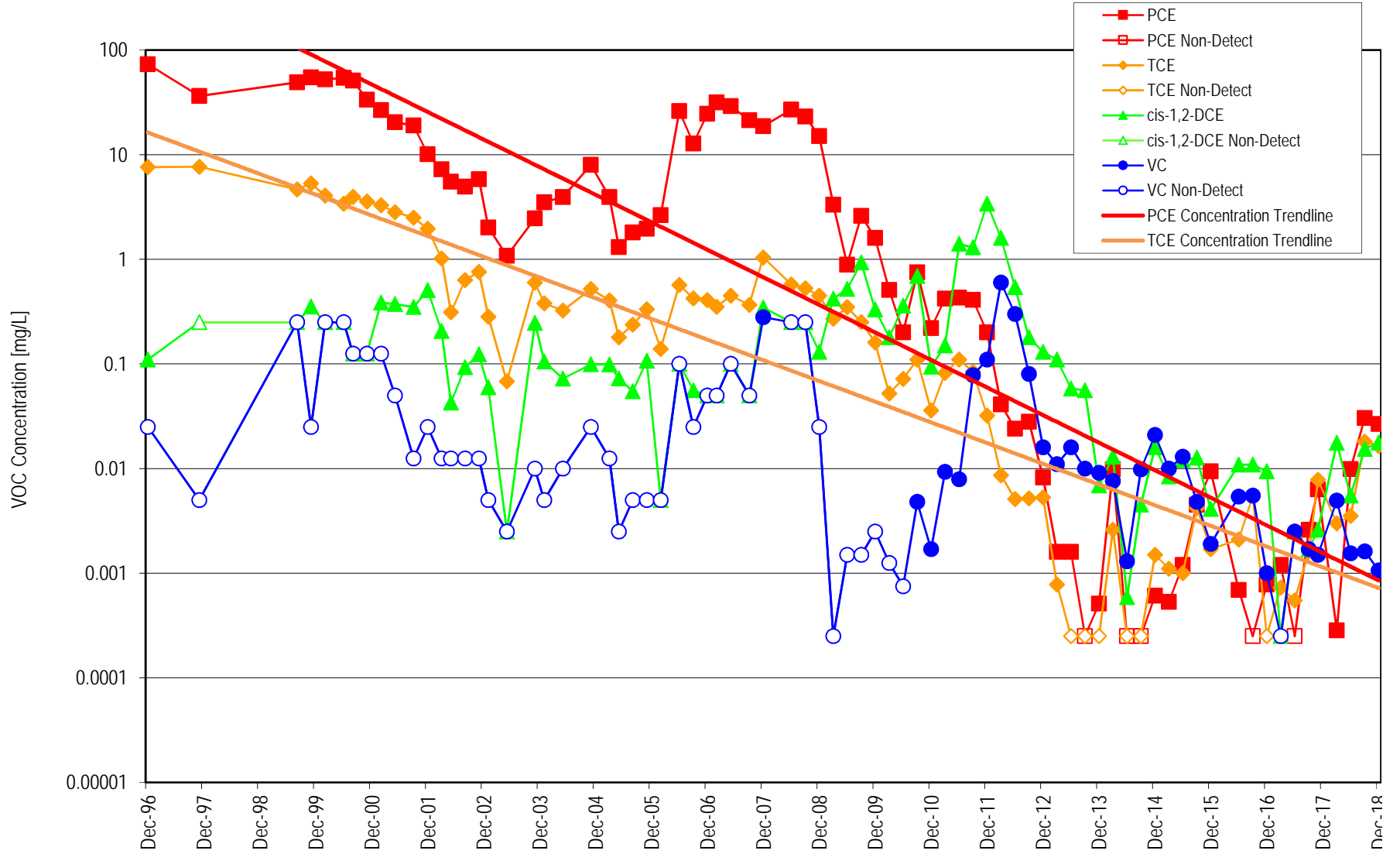


VOC Concentrations in MW-5



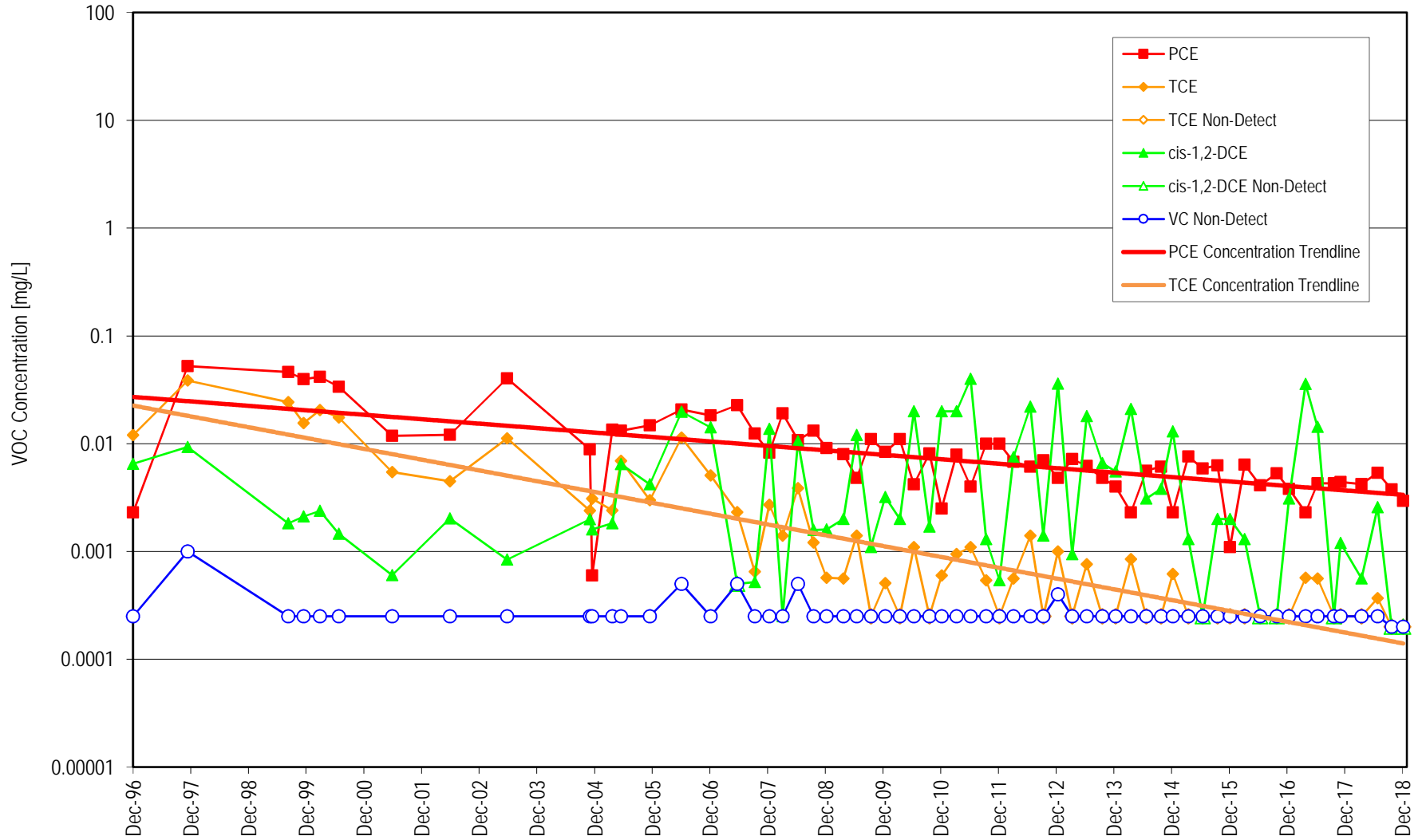
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-7



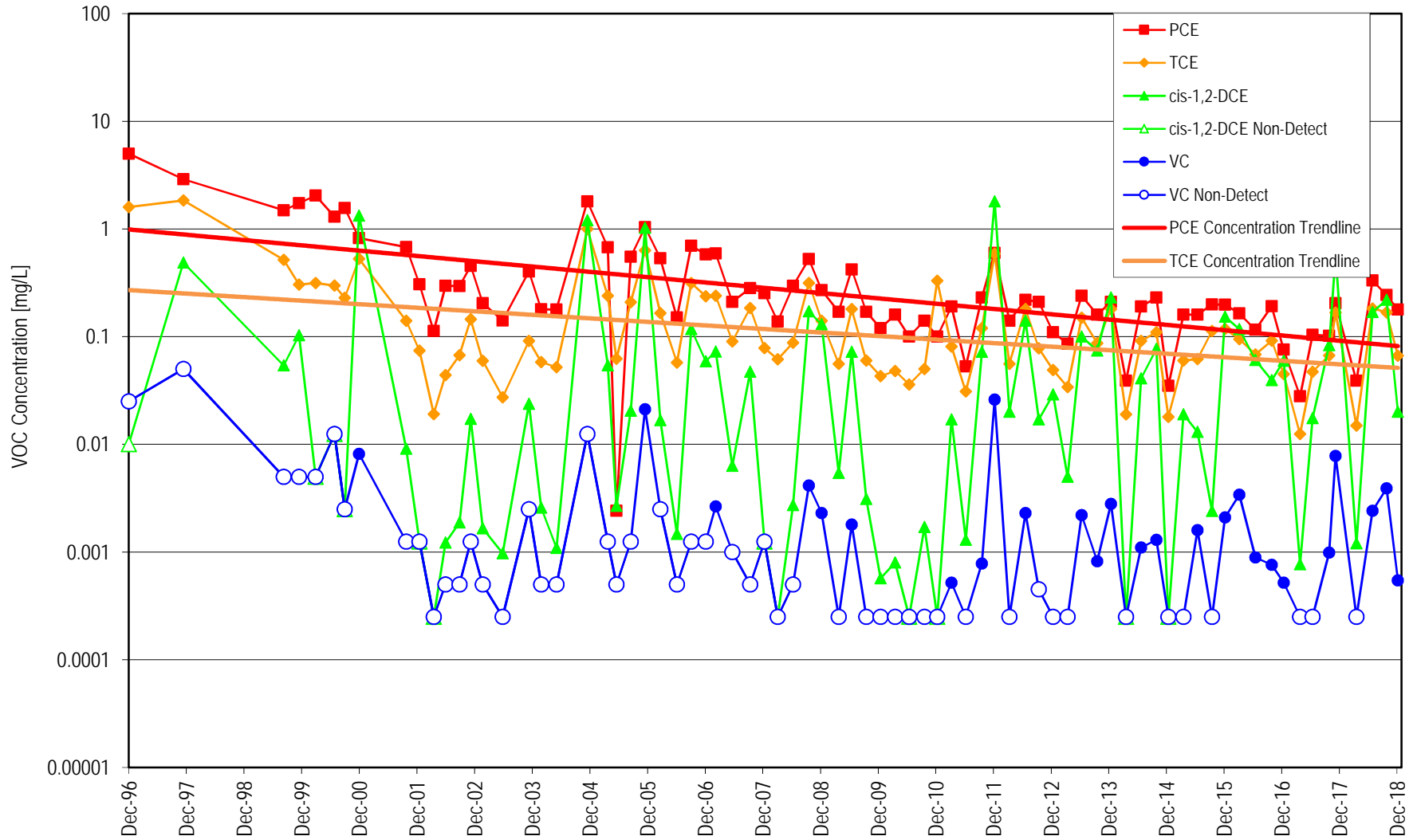
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-8



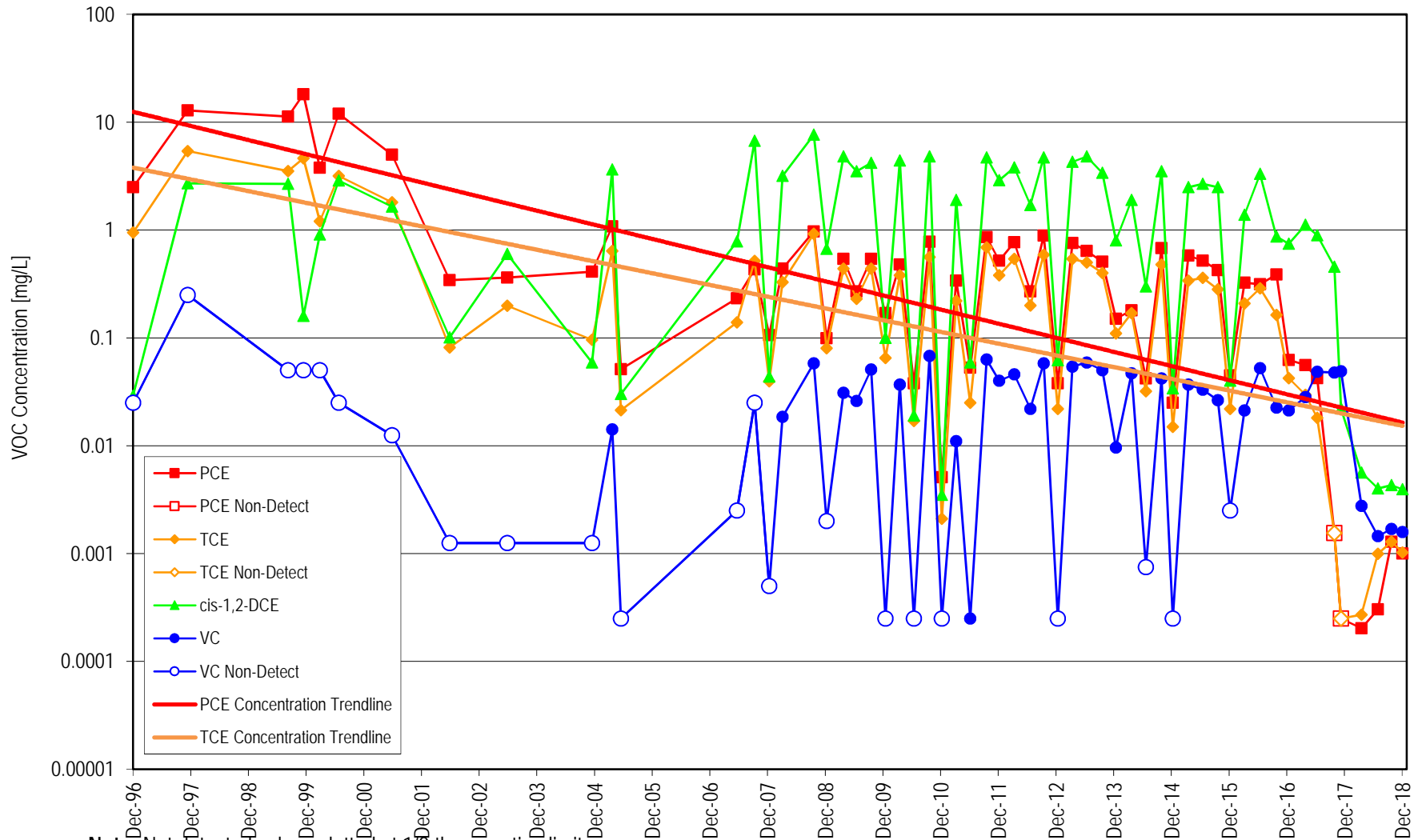
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-9



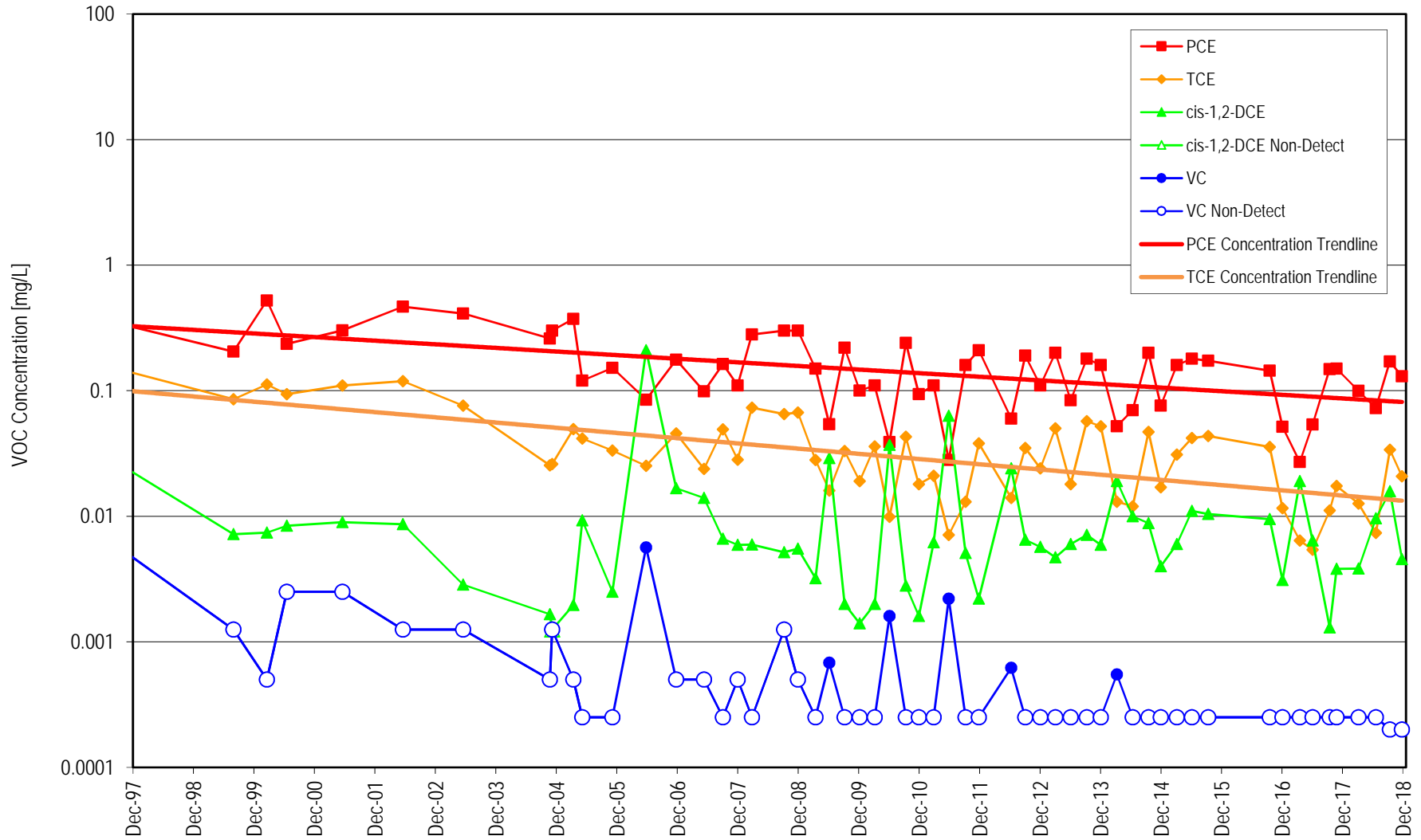
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-12



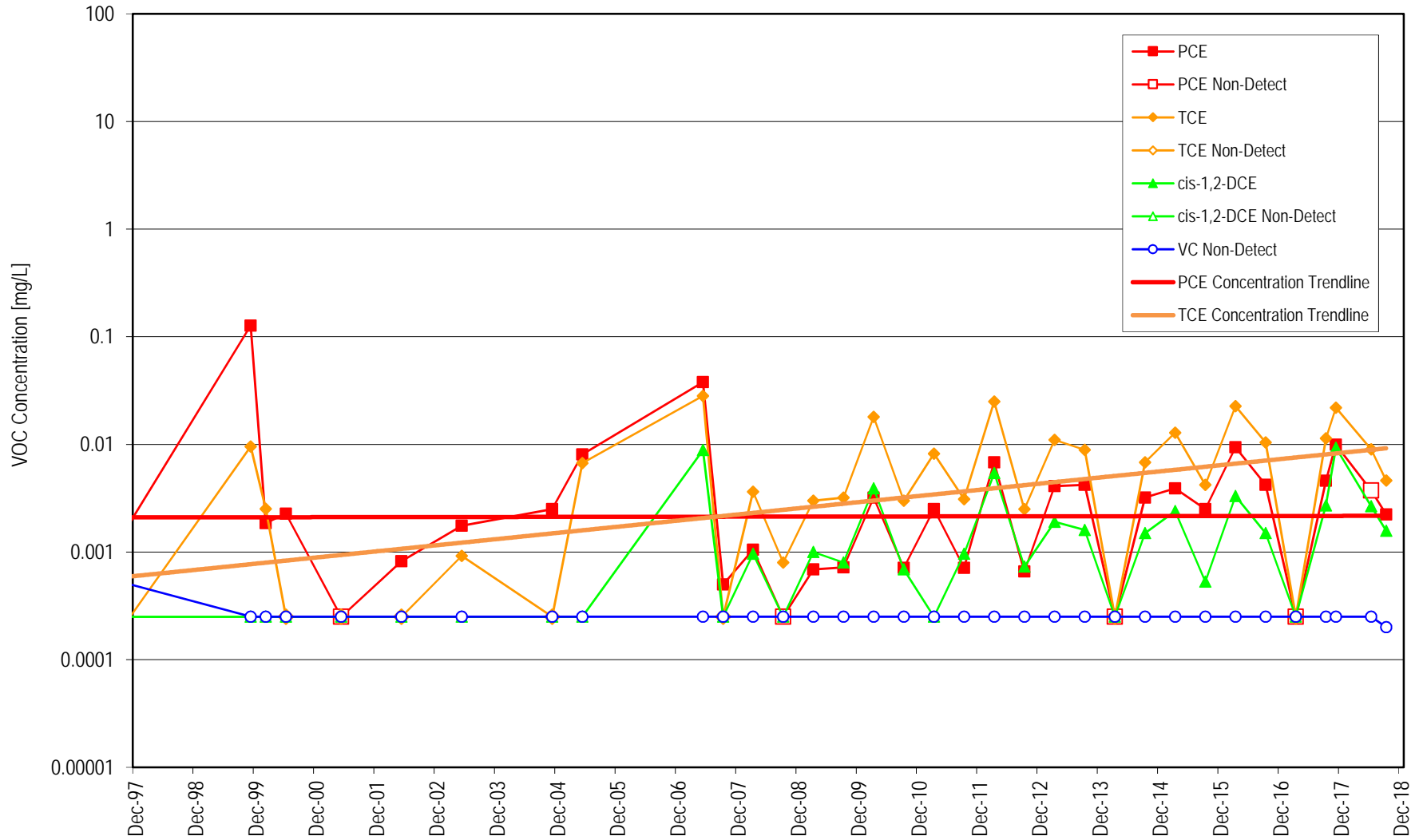
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-16



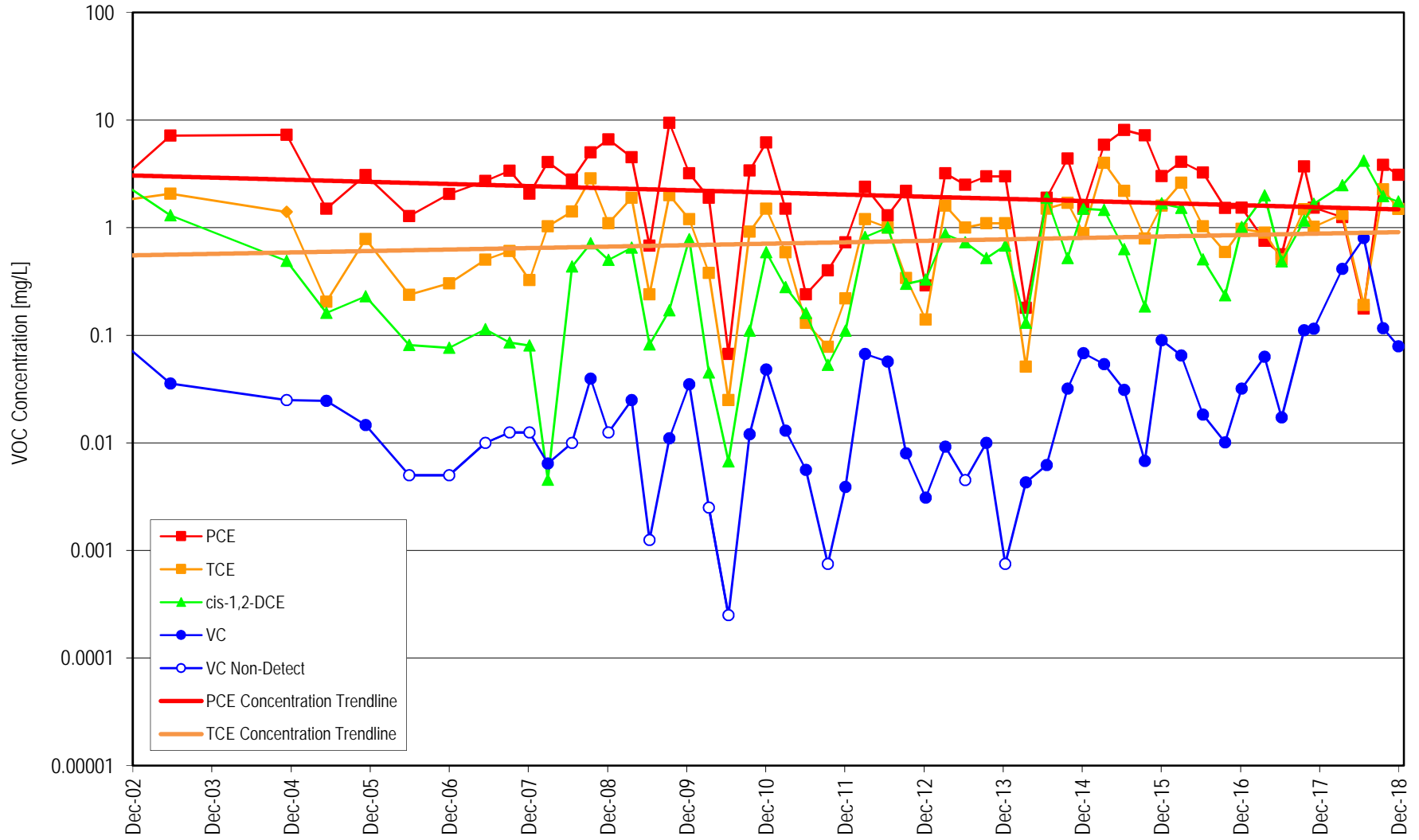
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-17



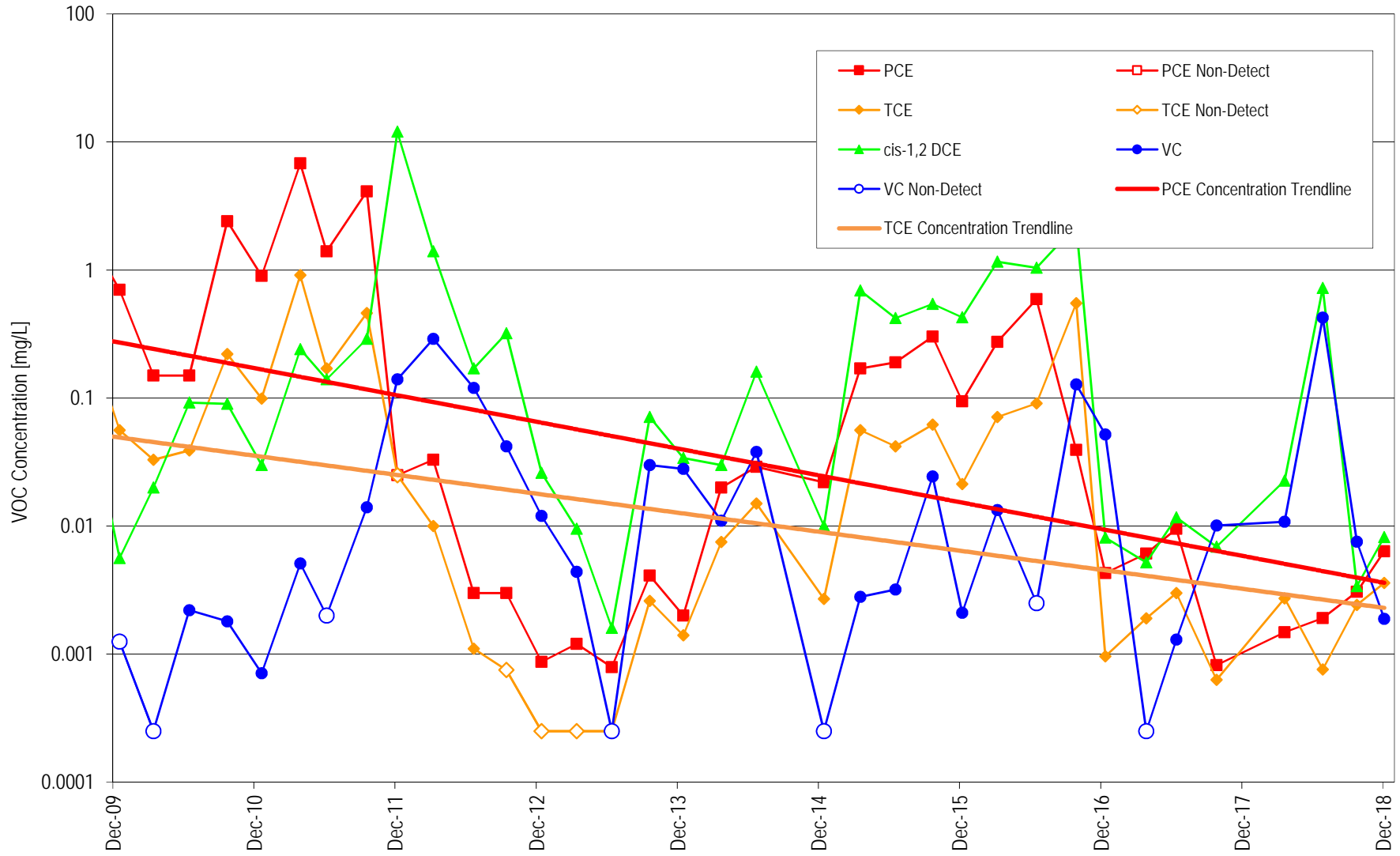
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-19



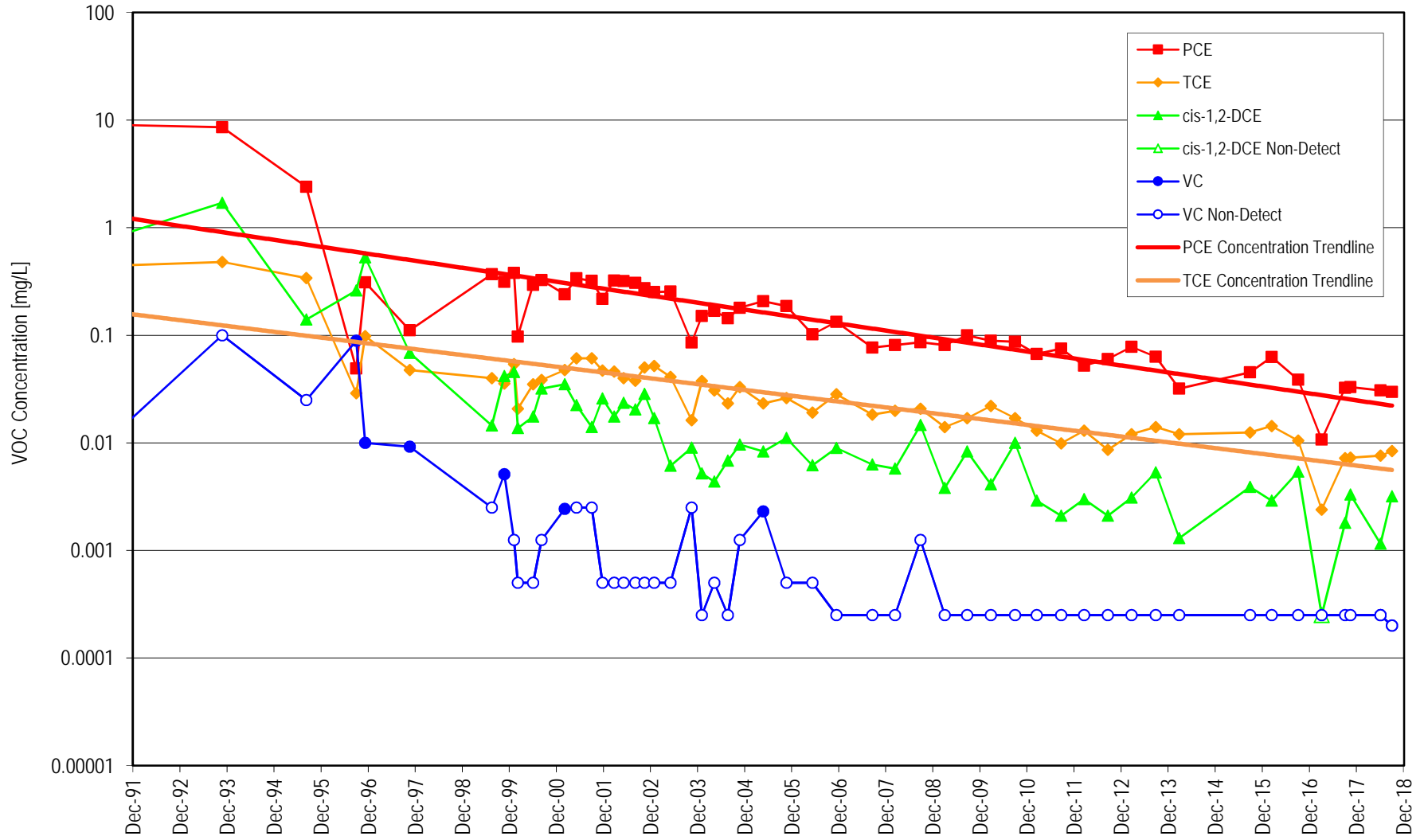
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in EX

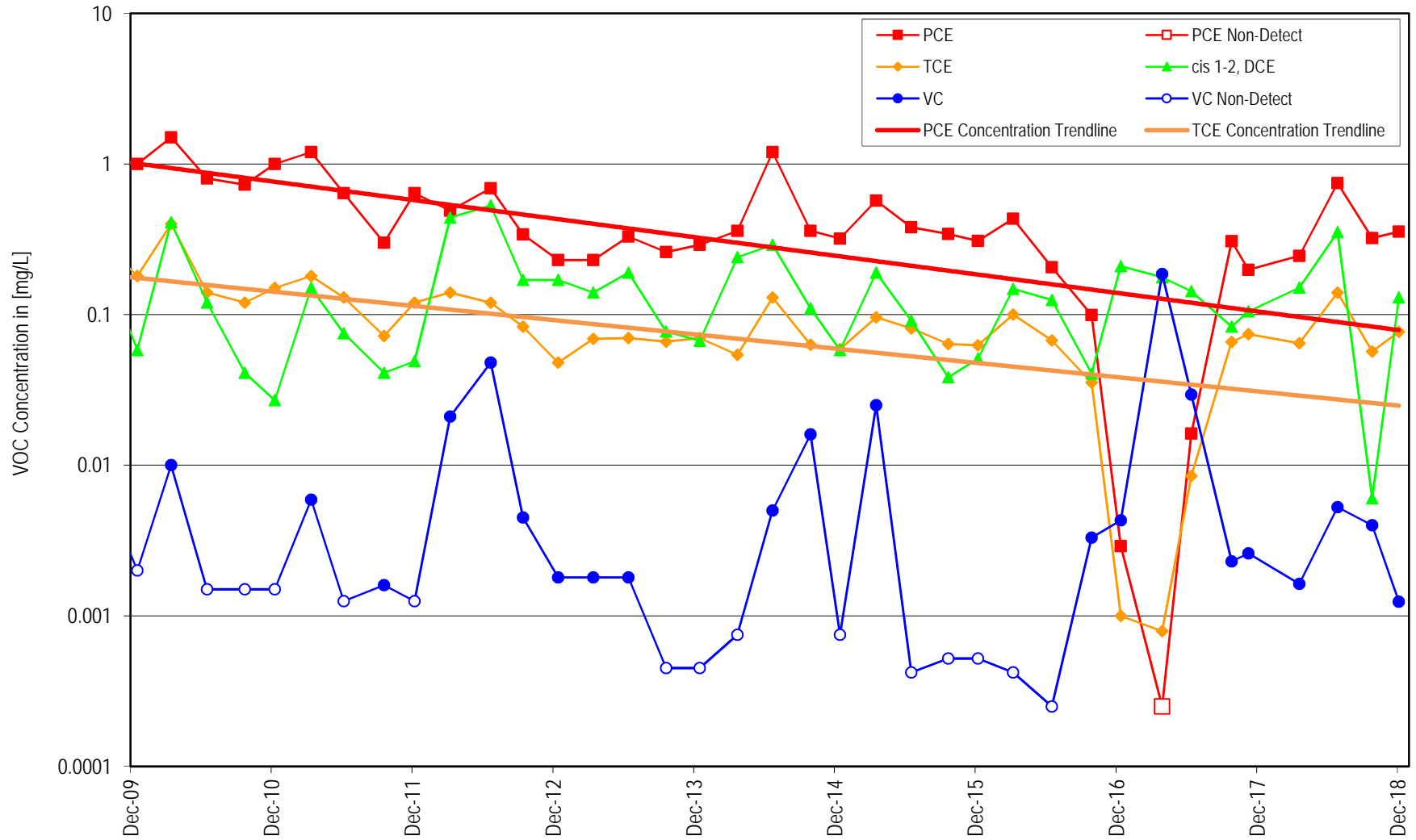


Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in EW-1

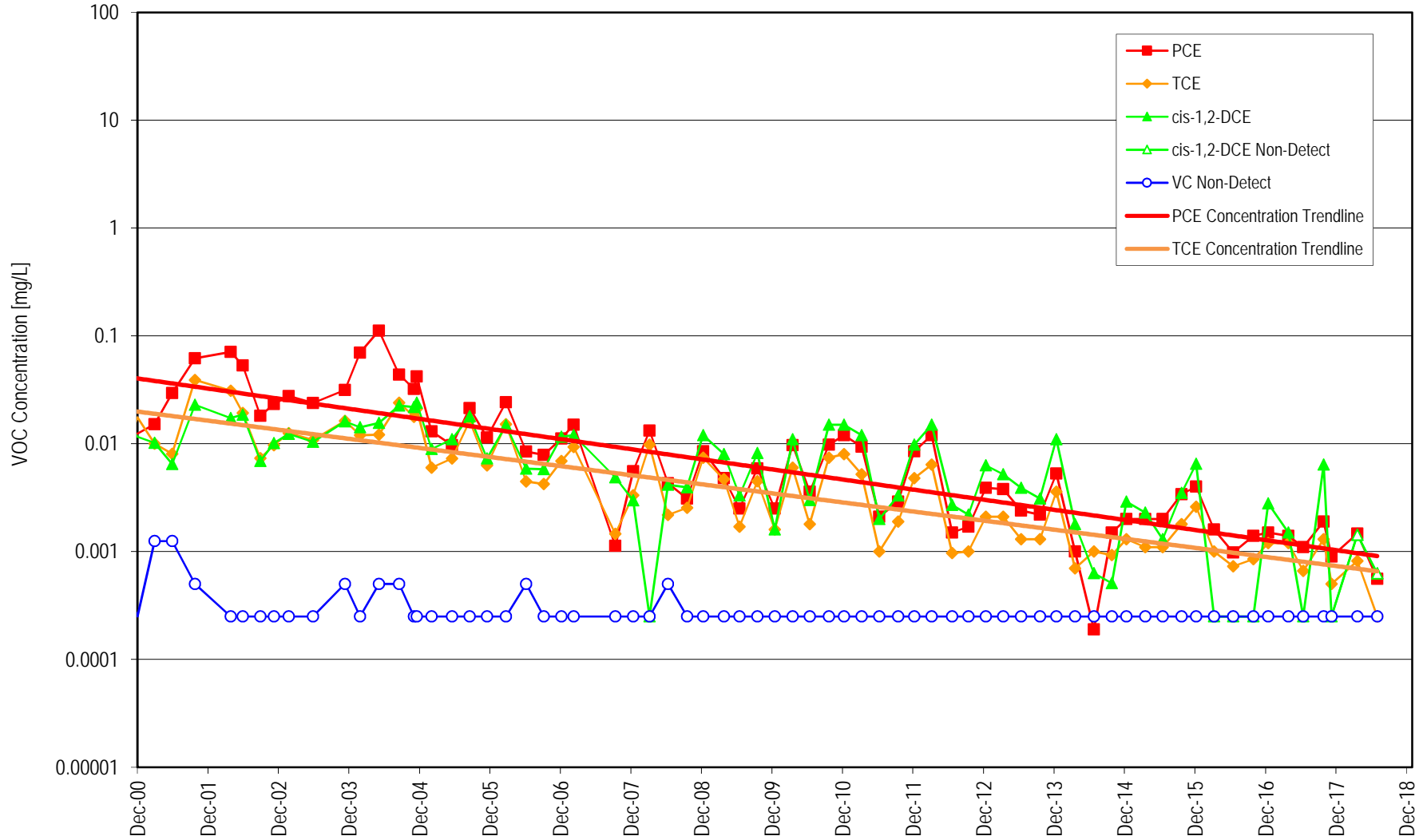


VOC Concentrations in MP-1

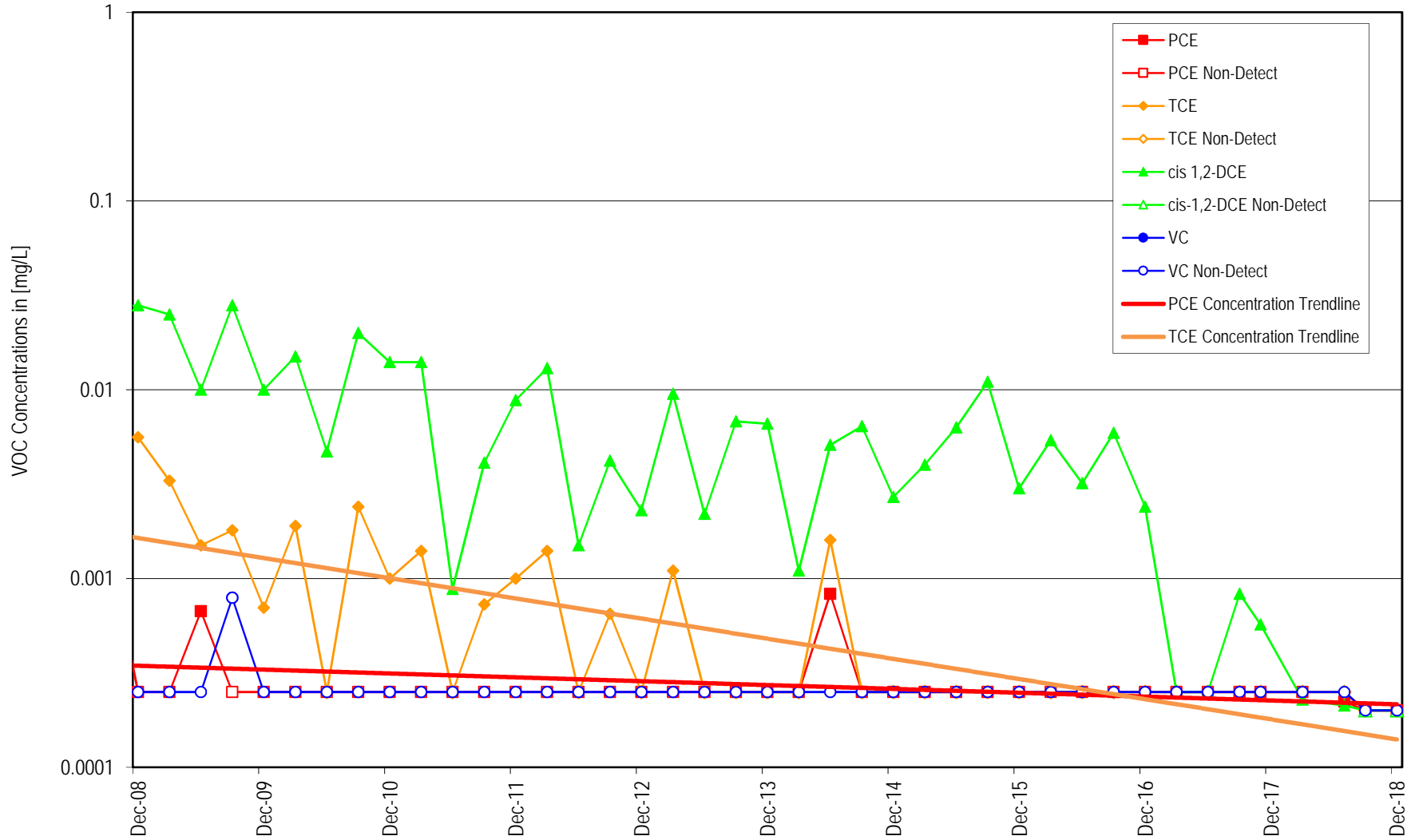


Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-18i

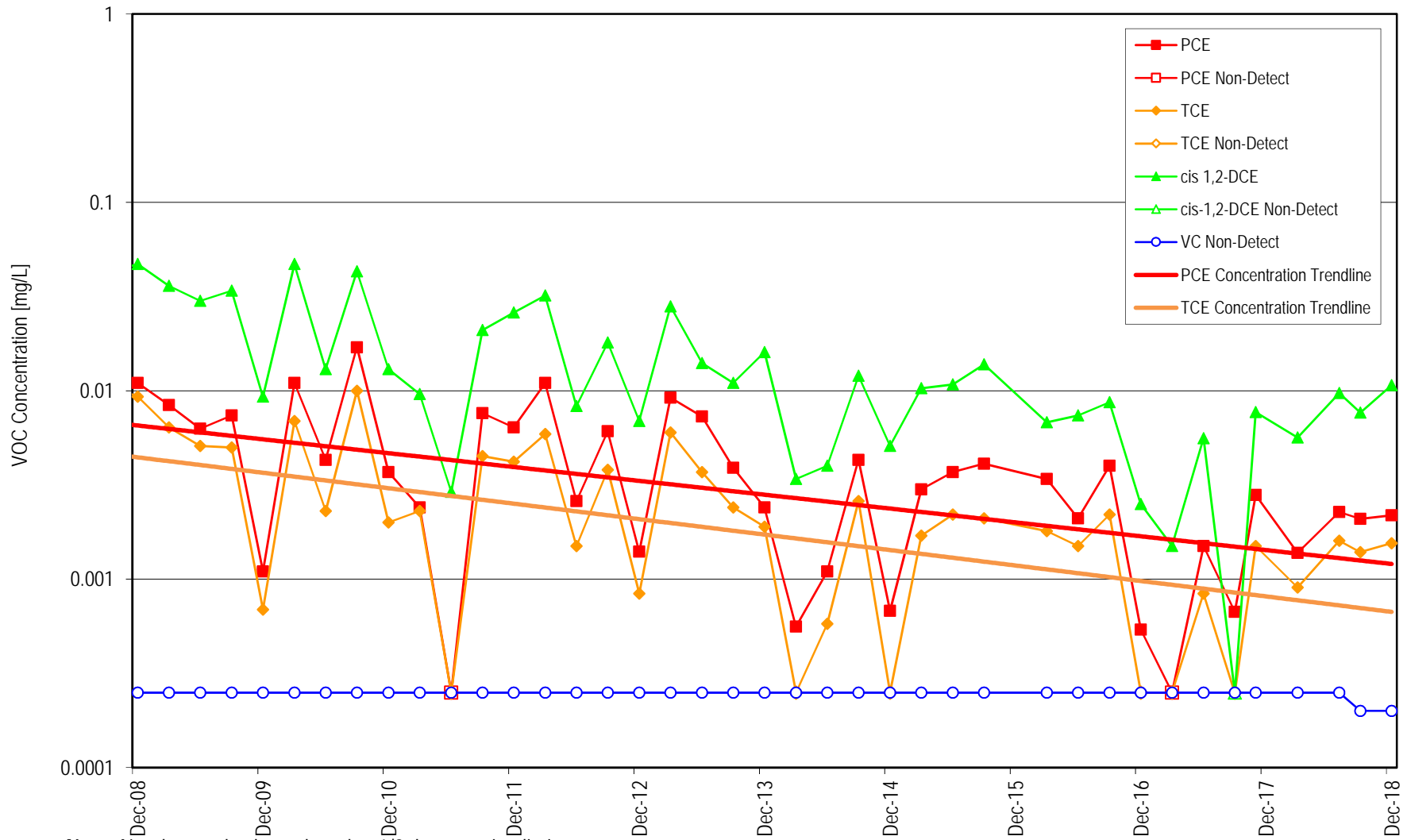


VOC Concentrations in MW-19i



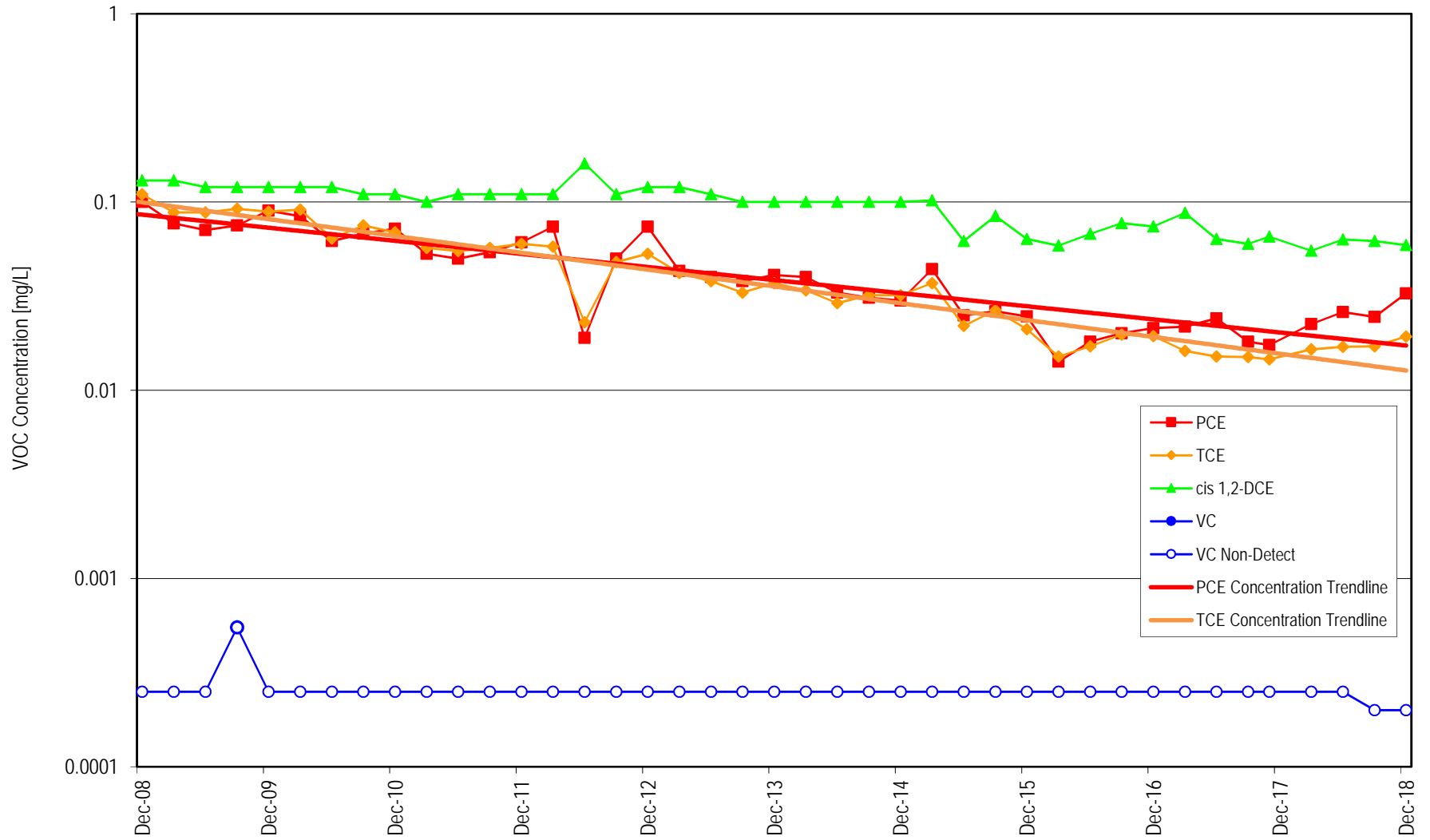
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-20i



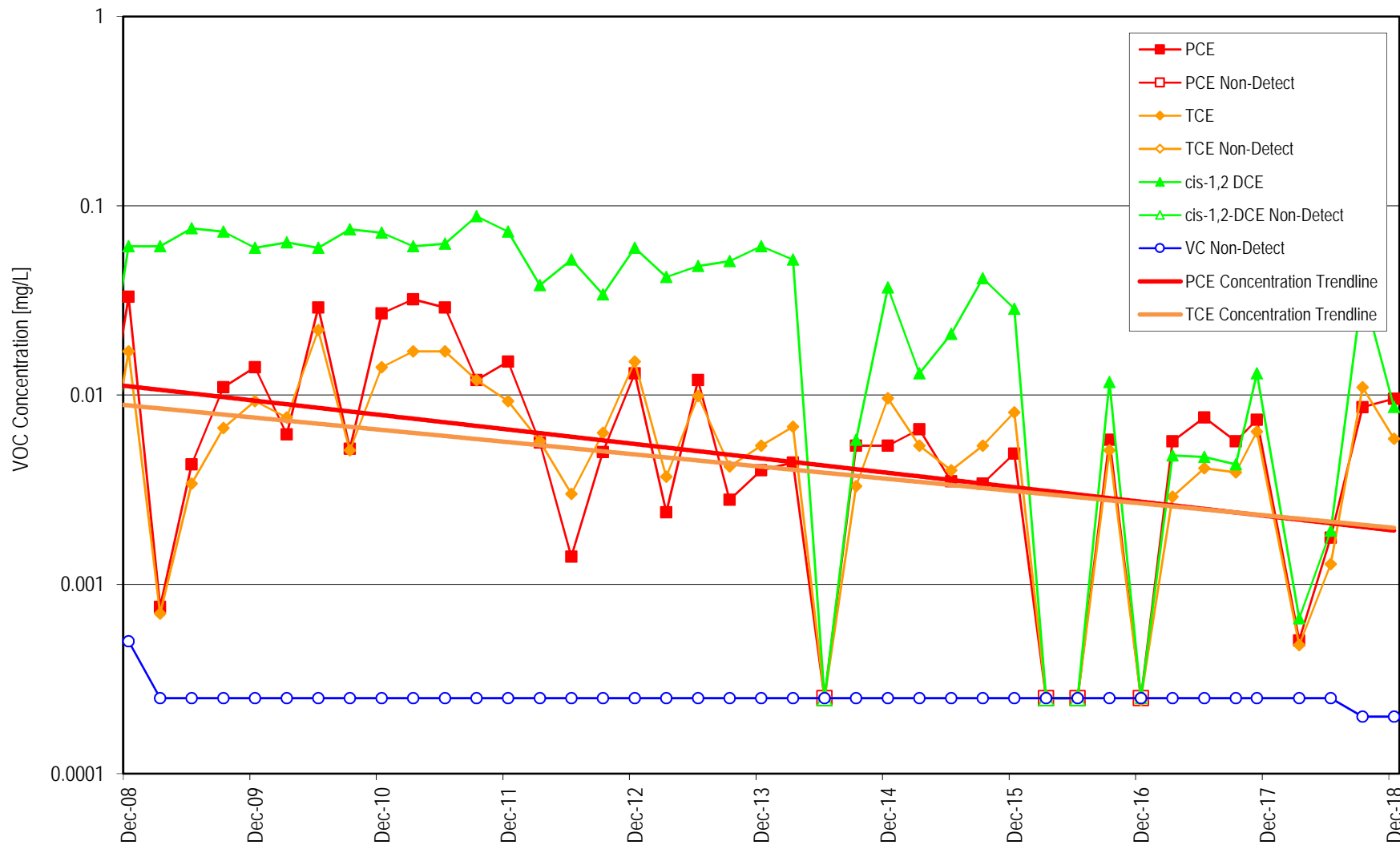
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-21i-40

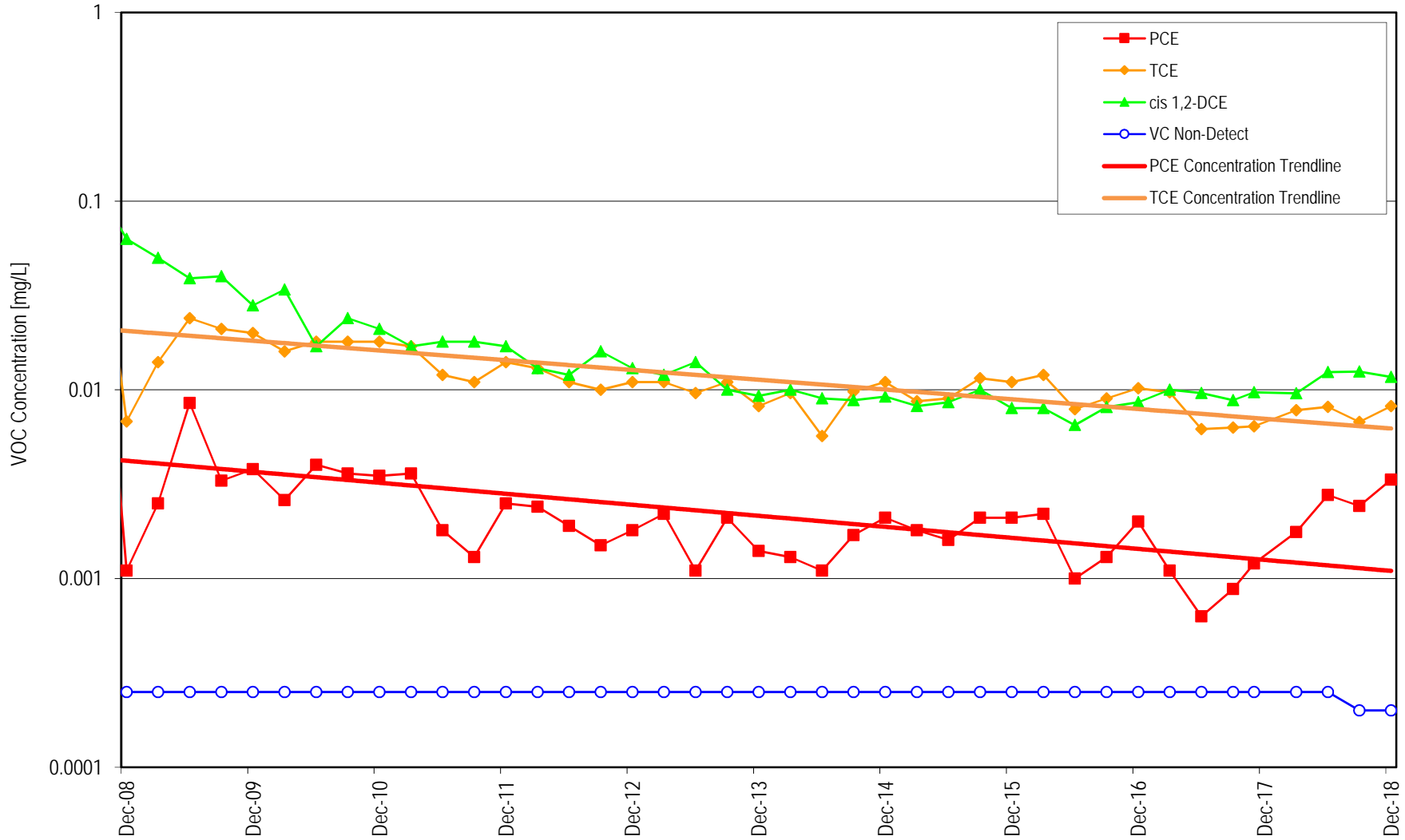


Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-21i-105

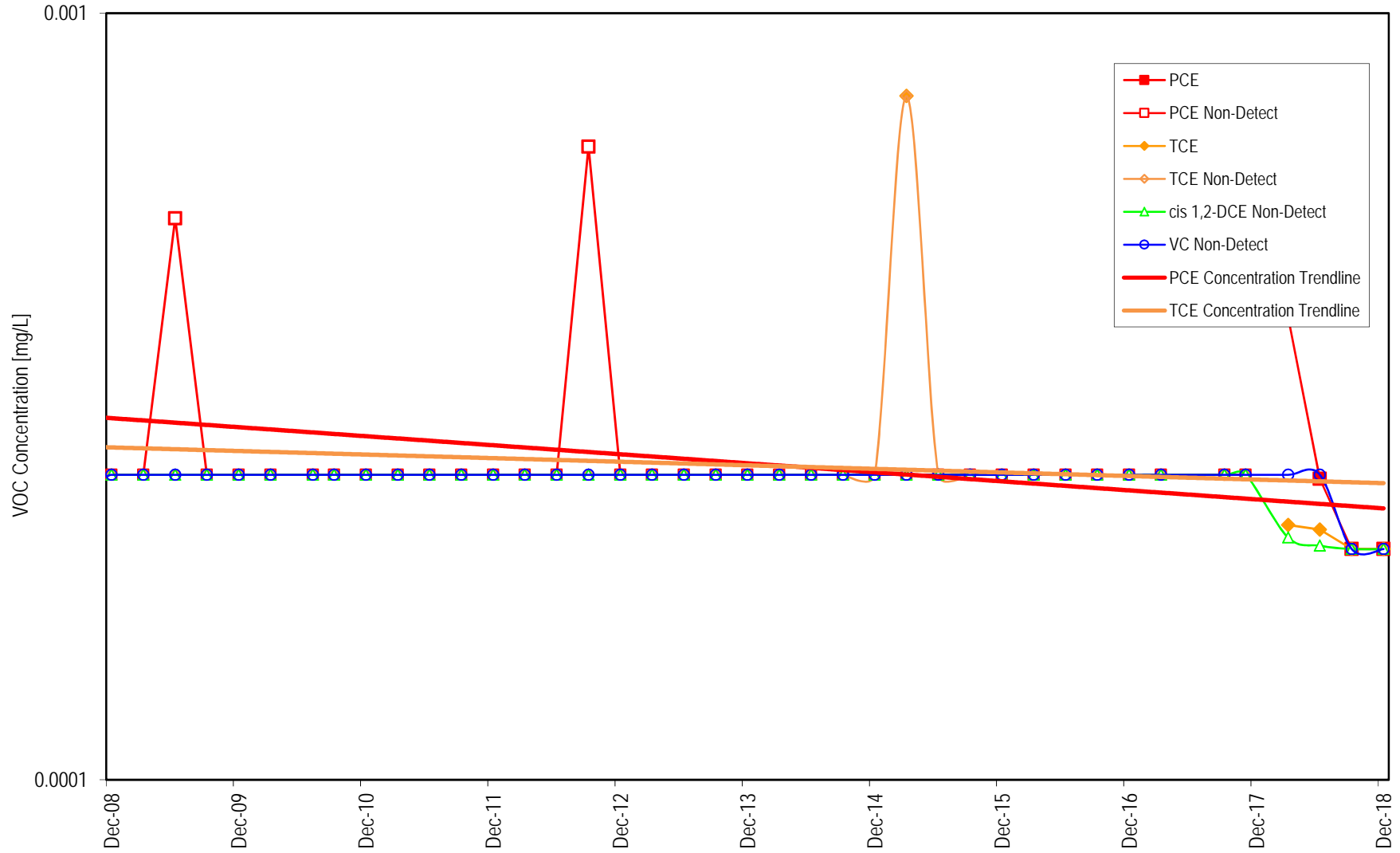


VOC Concentrations in MW-22i



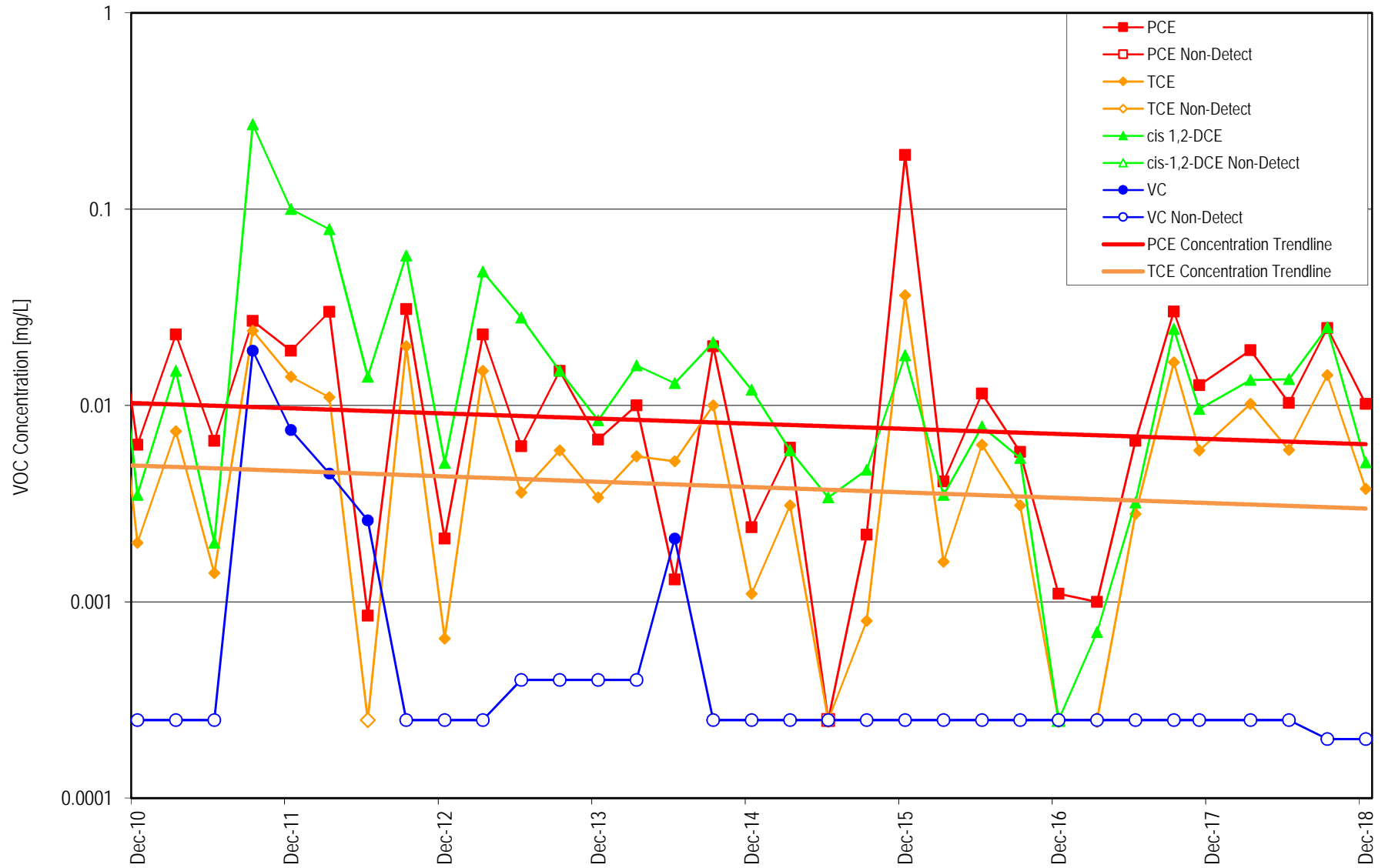
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-23i



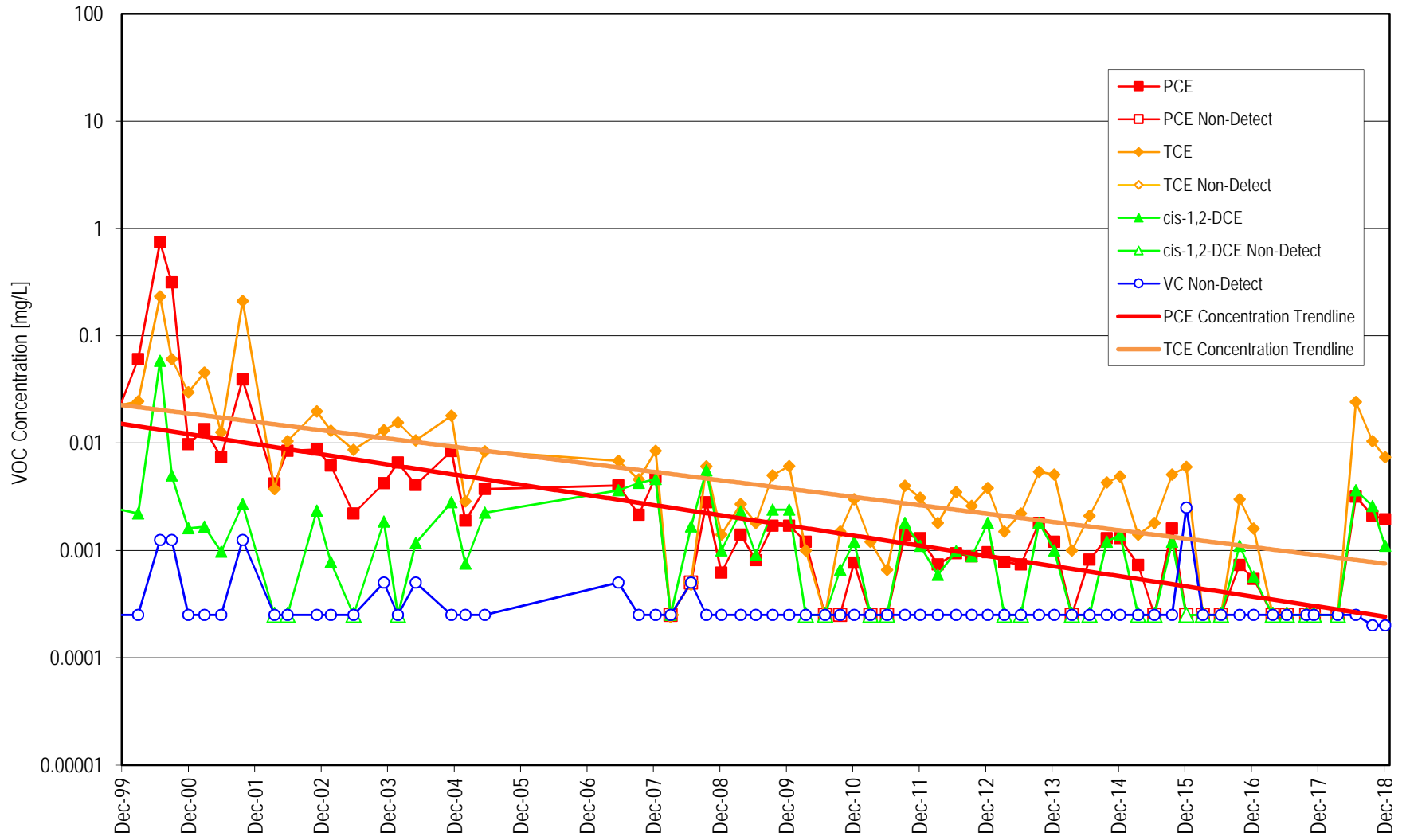
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MW-24i



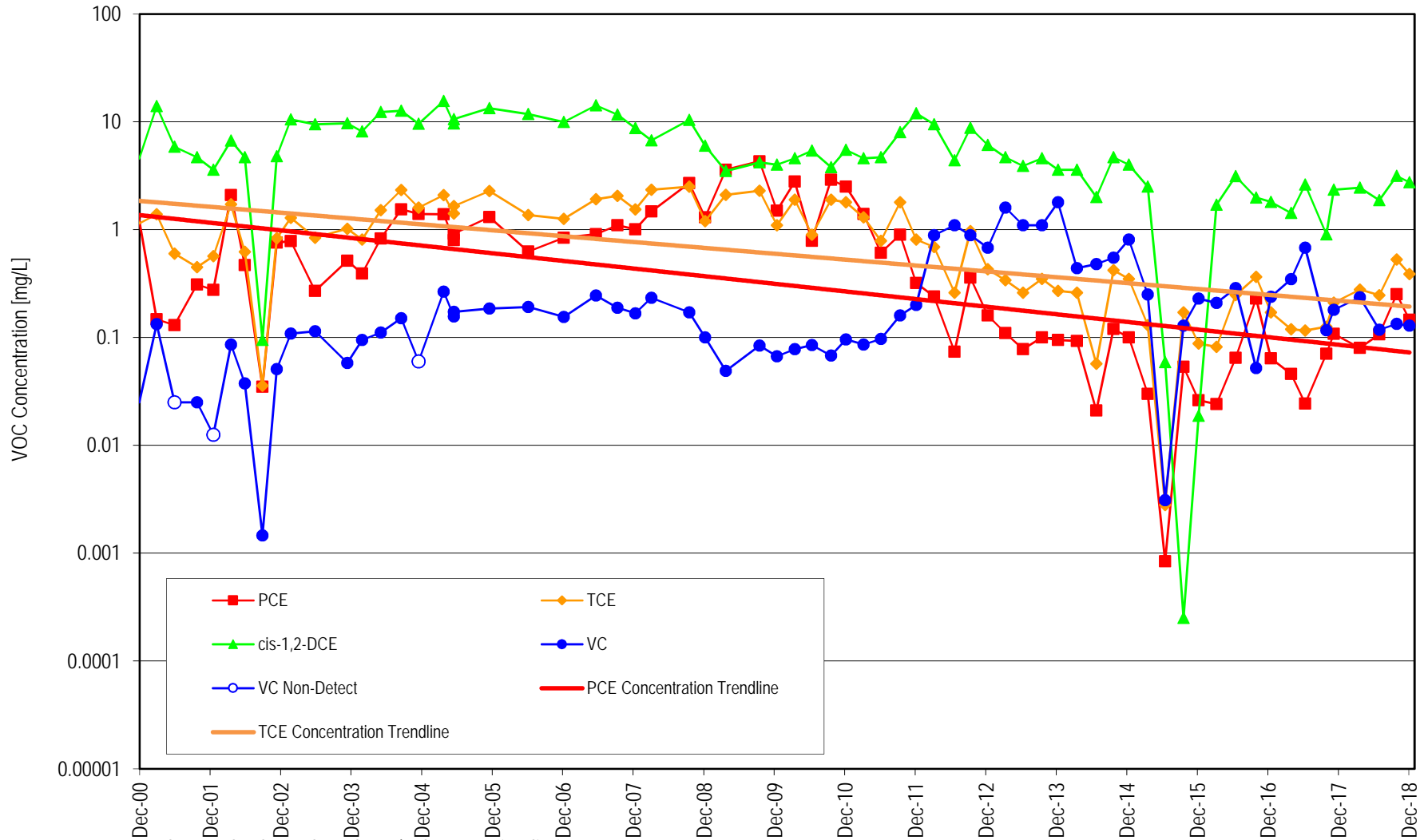
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in S-1



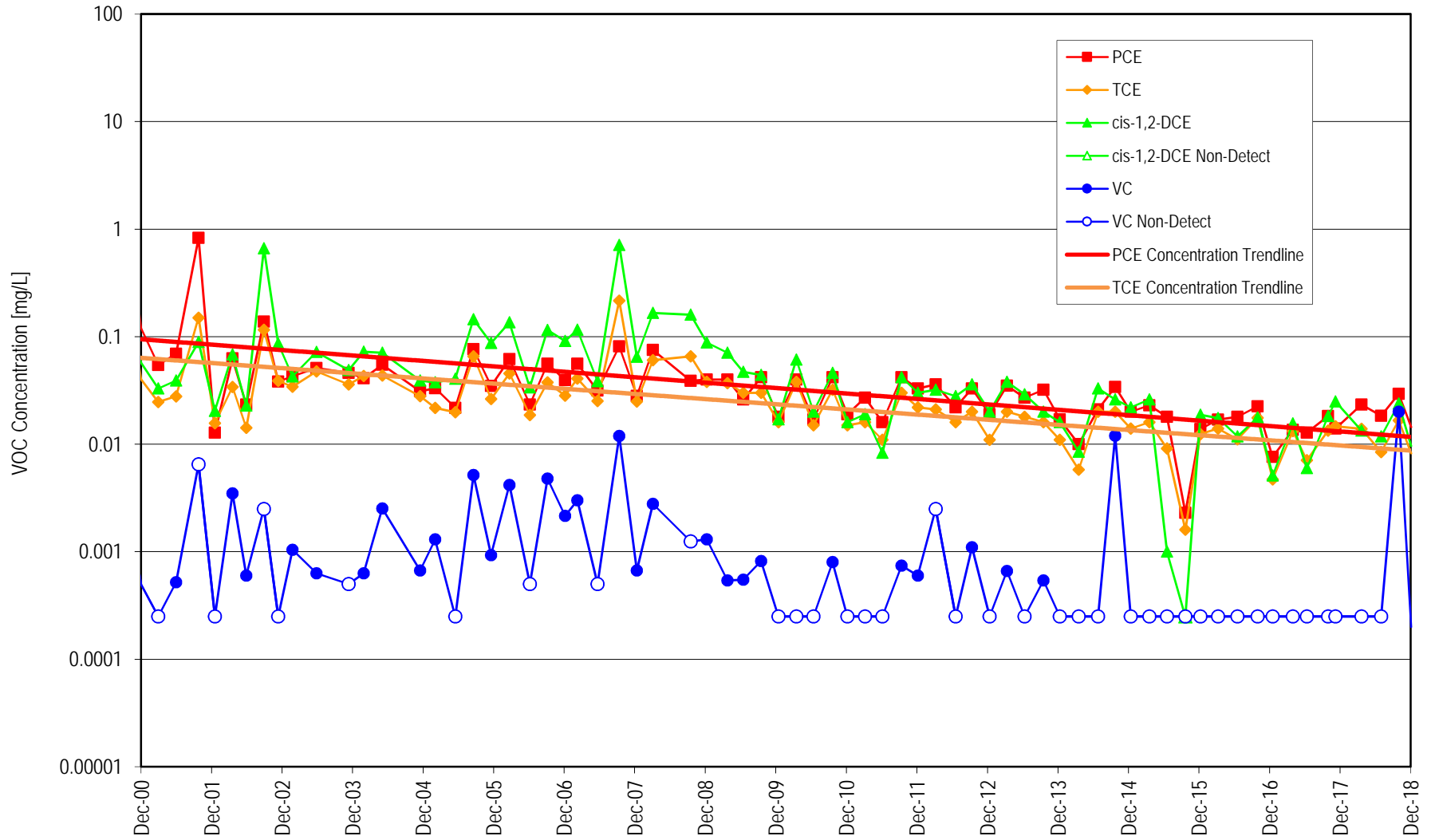
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMS1-43



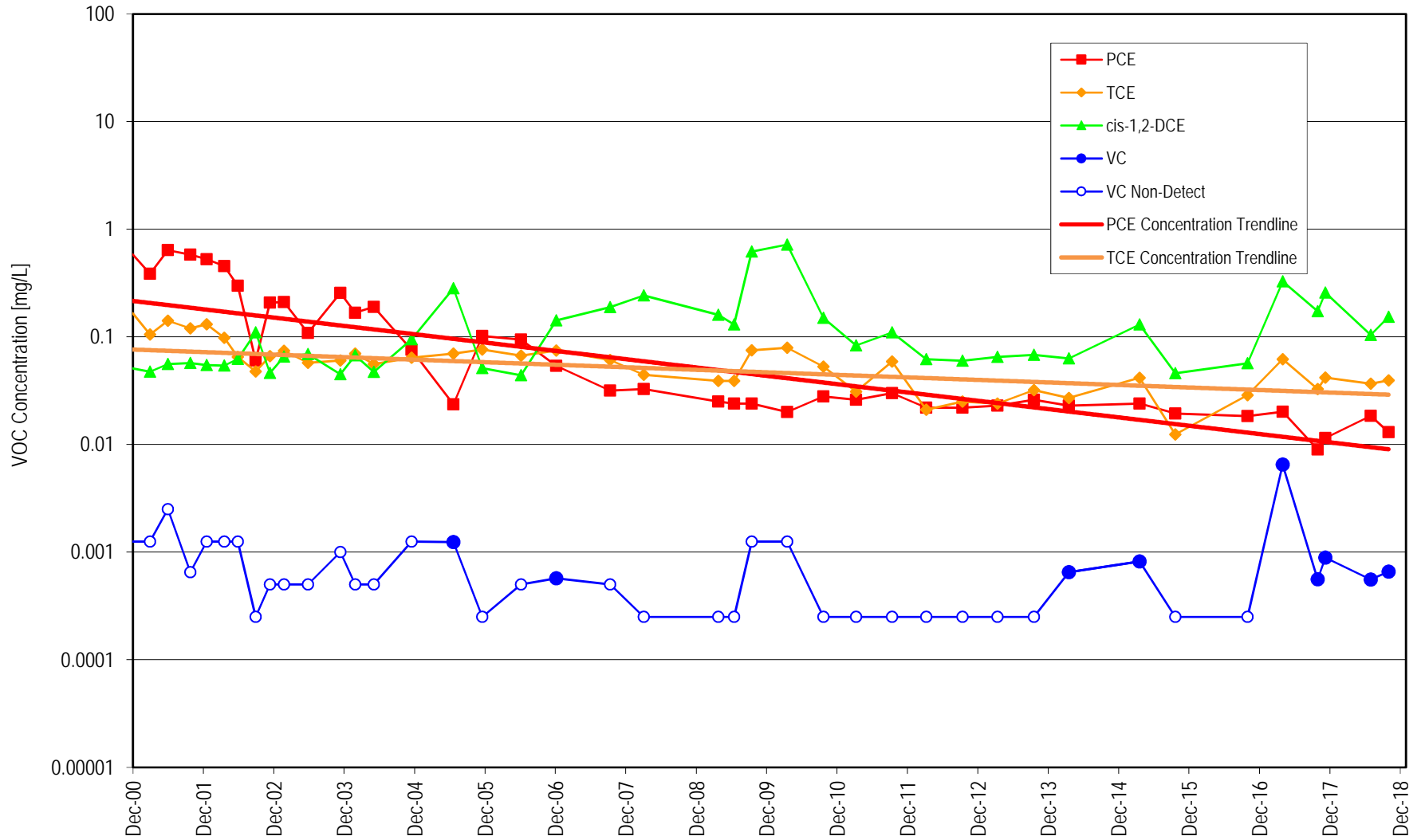
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMTS1-60



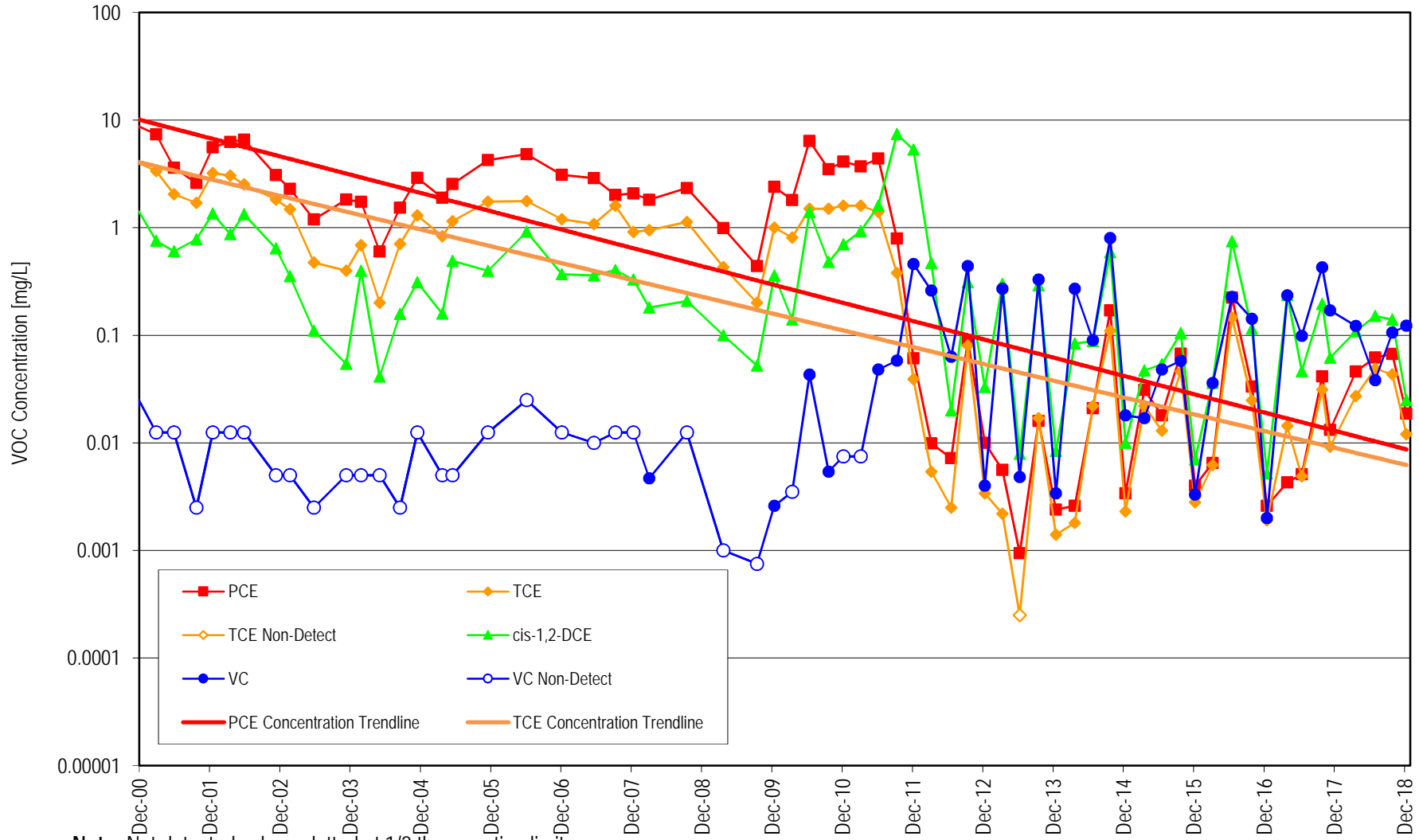
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMS1-110



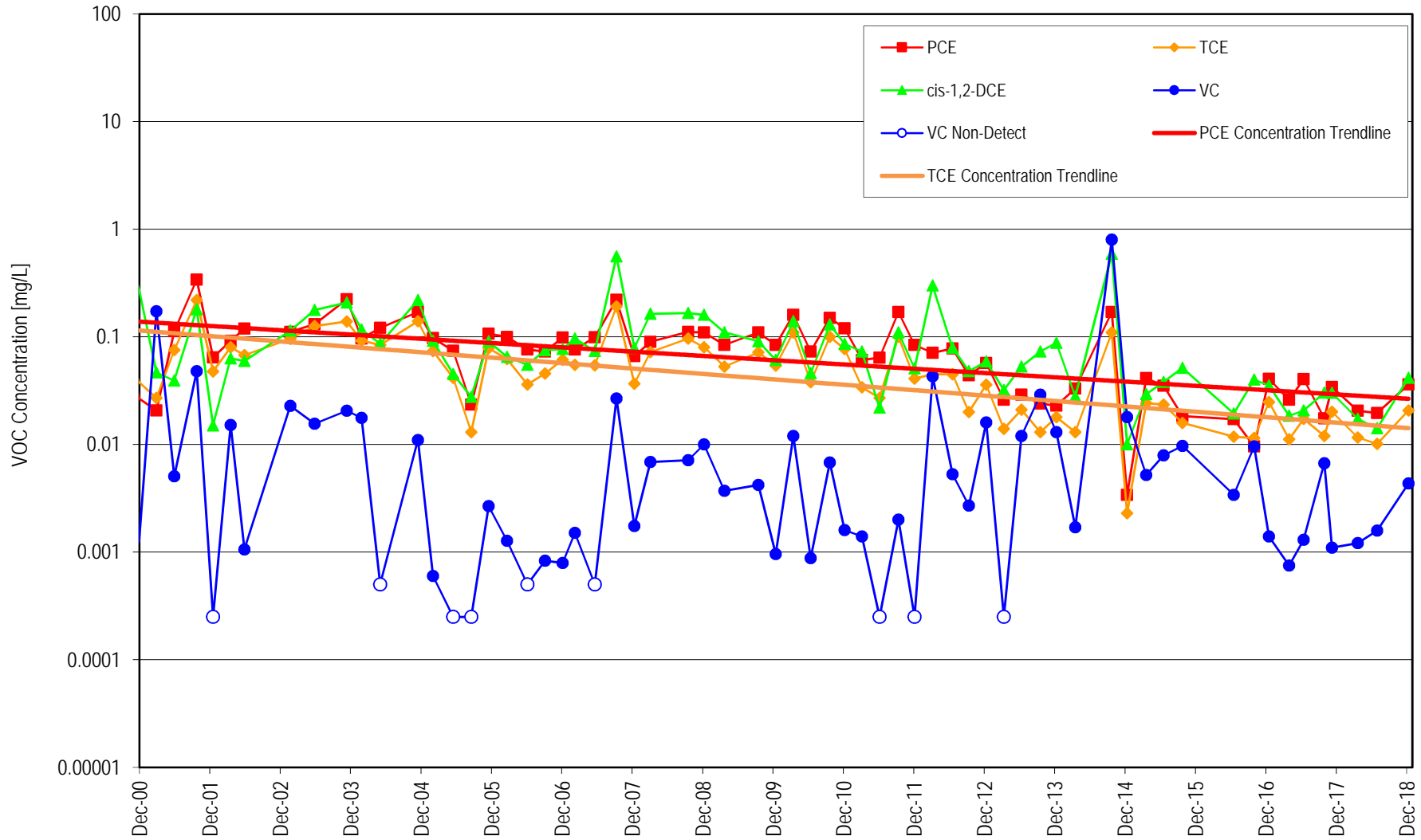
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMTS2-40



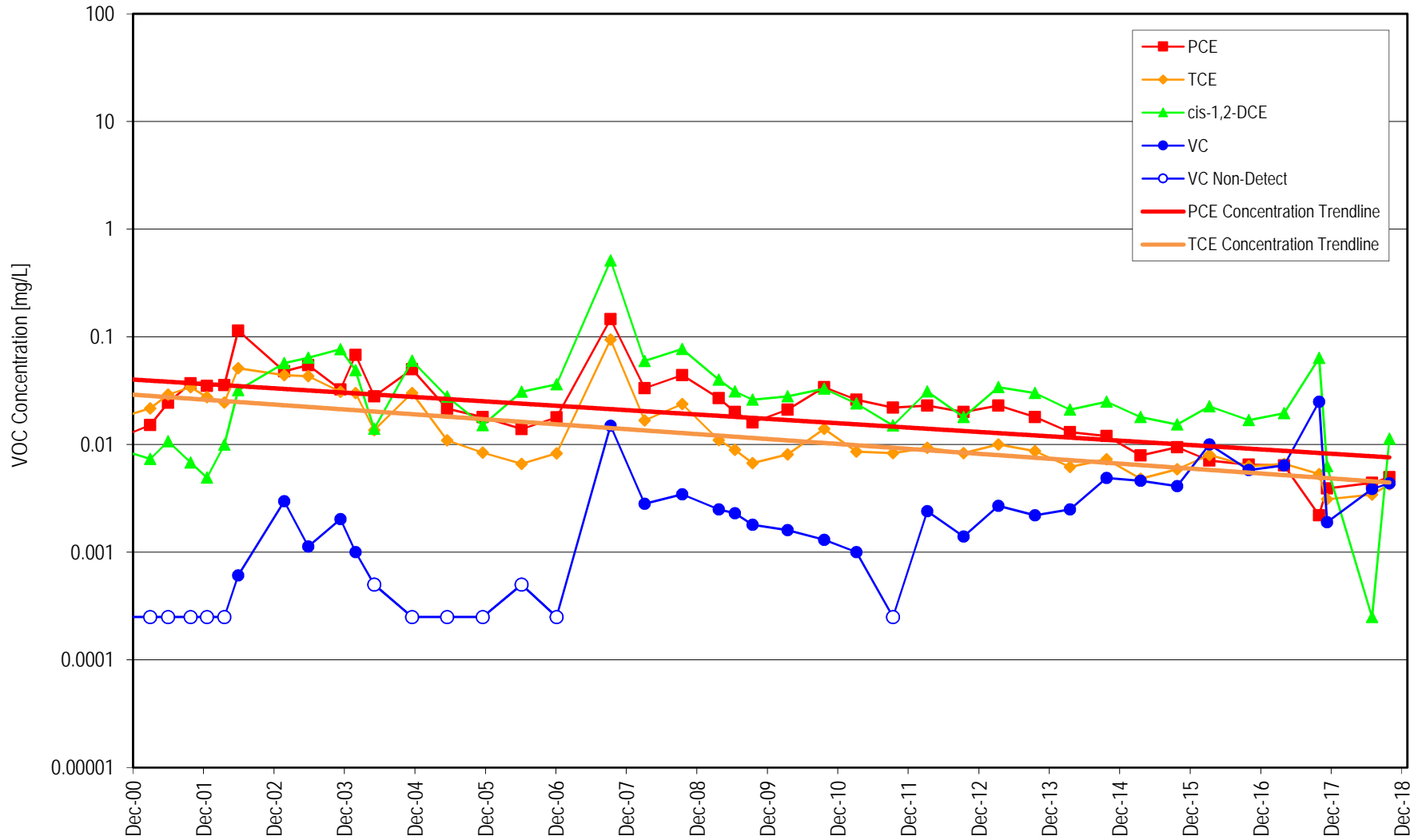
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMS2-60



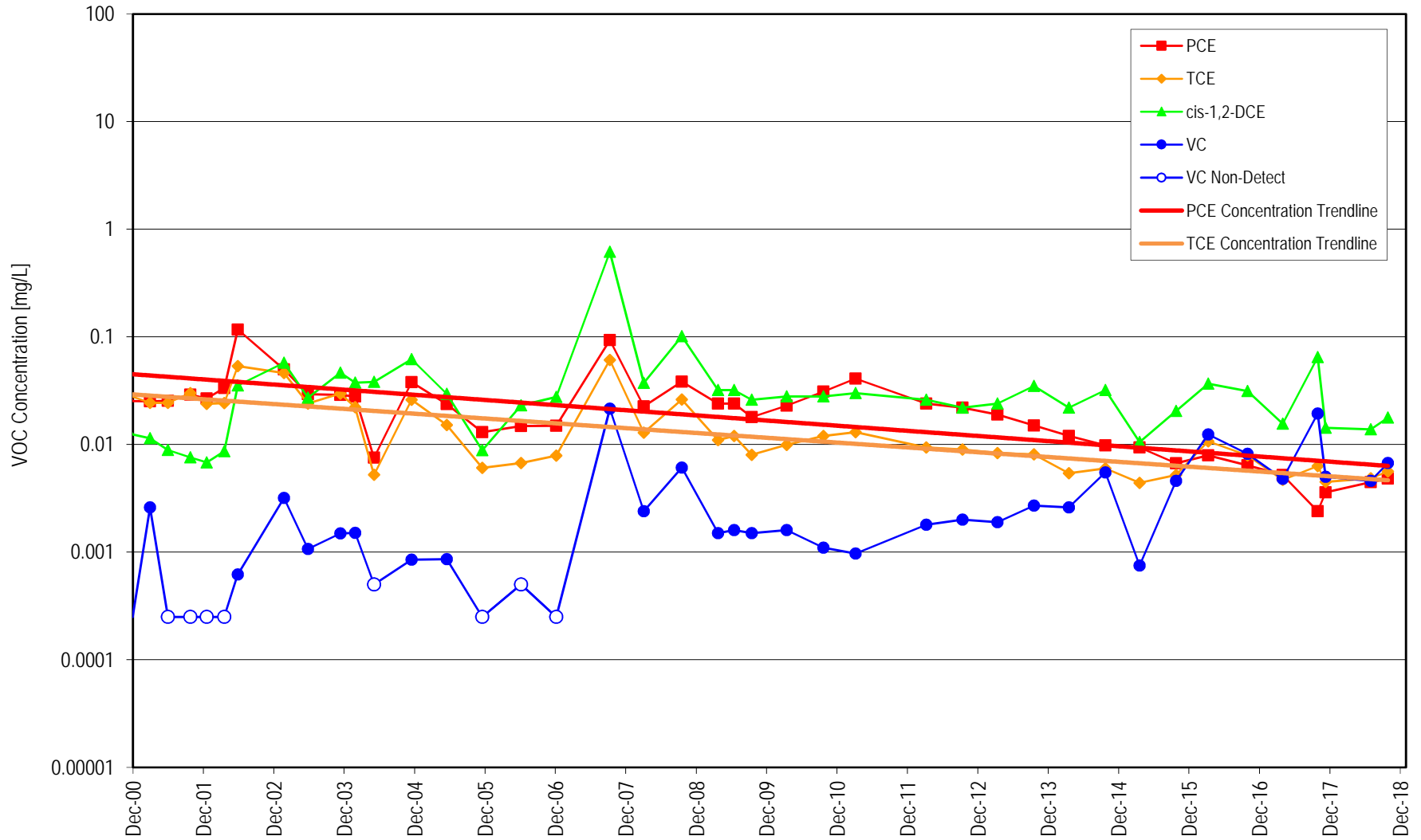
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMS2-110



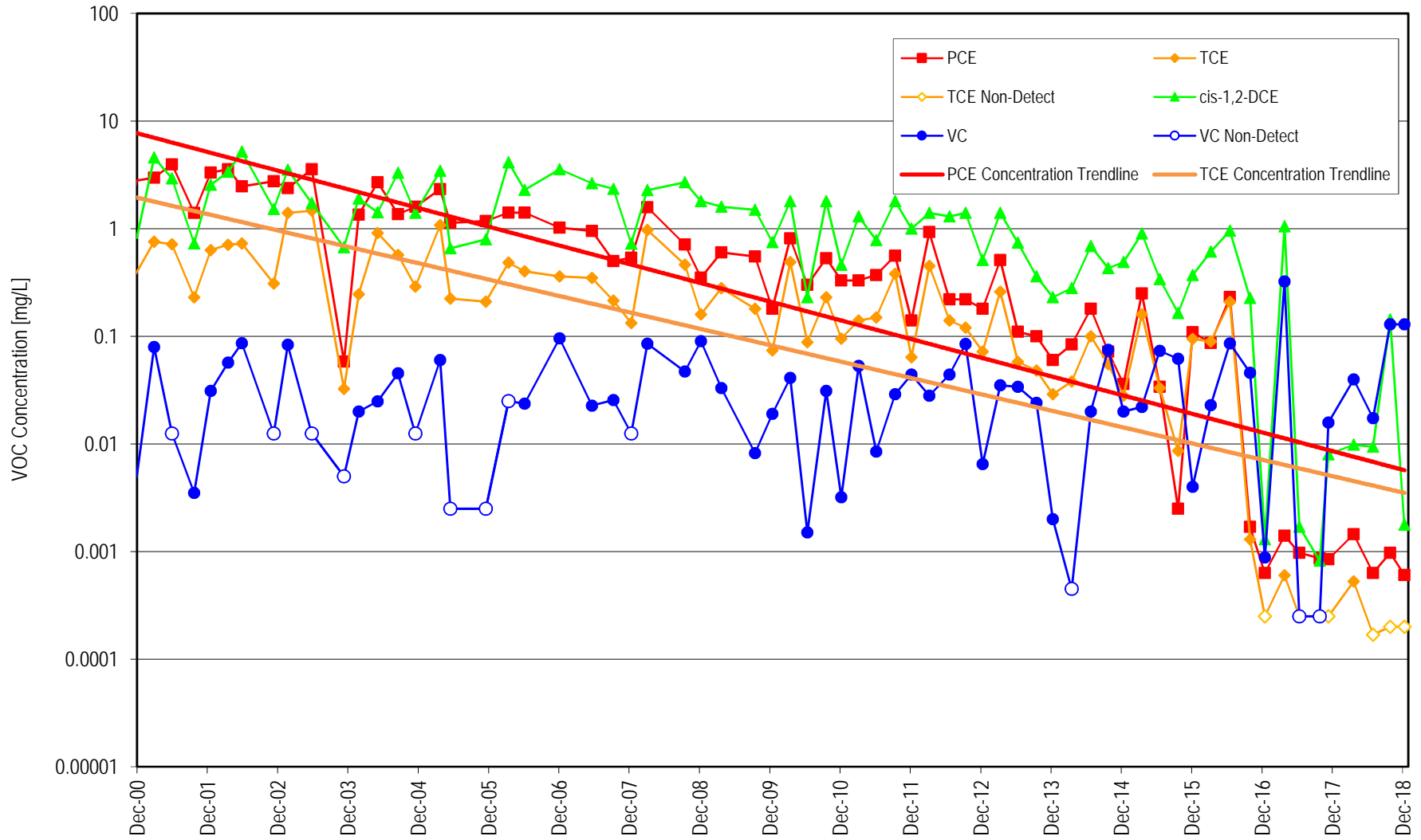
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMS2-132



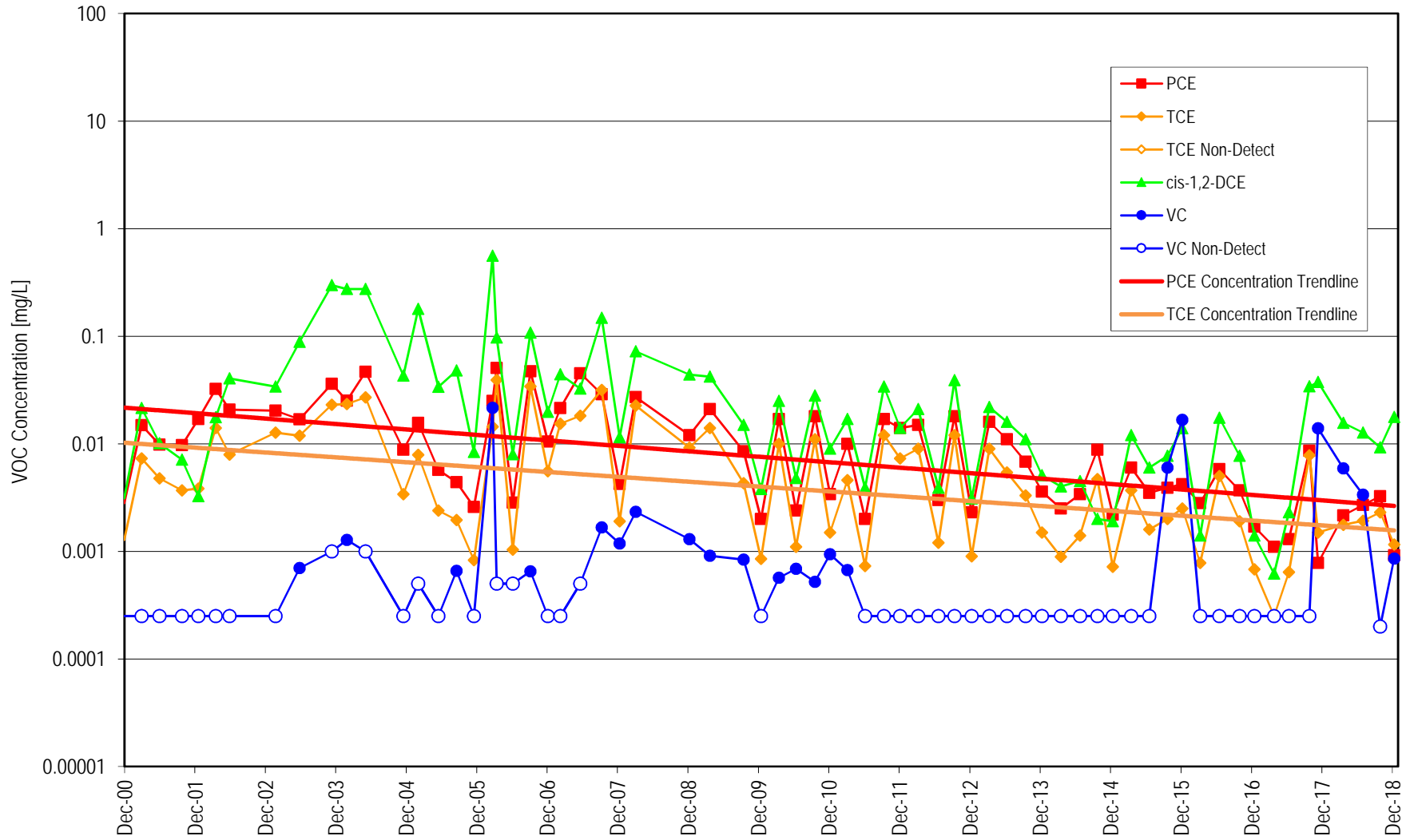
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMS3-40



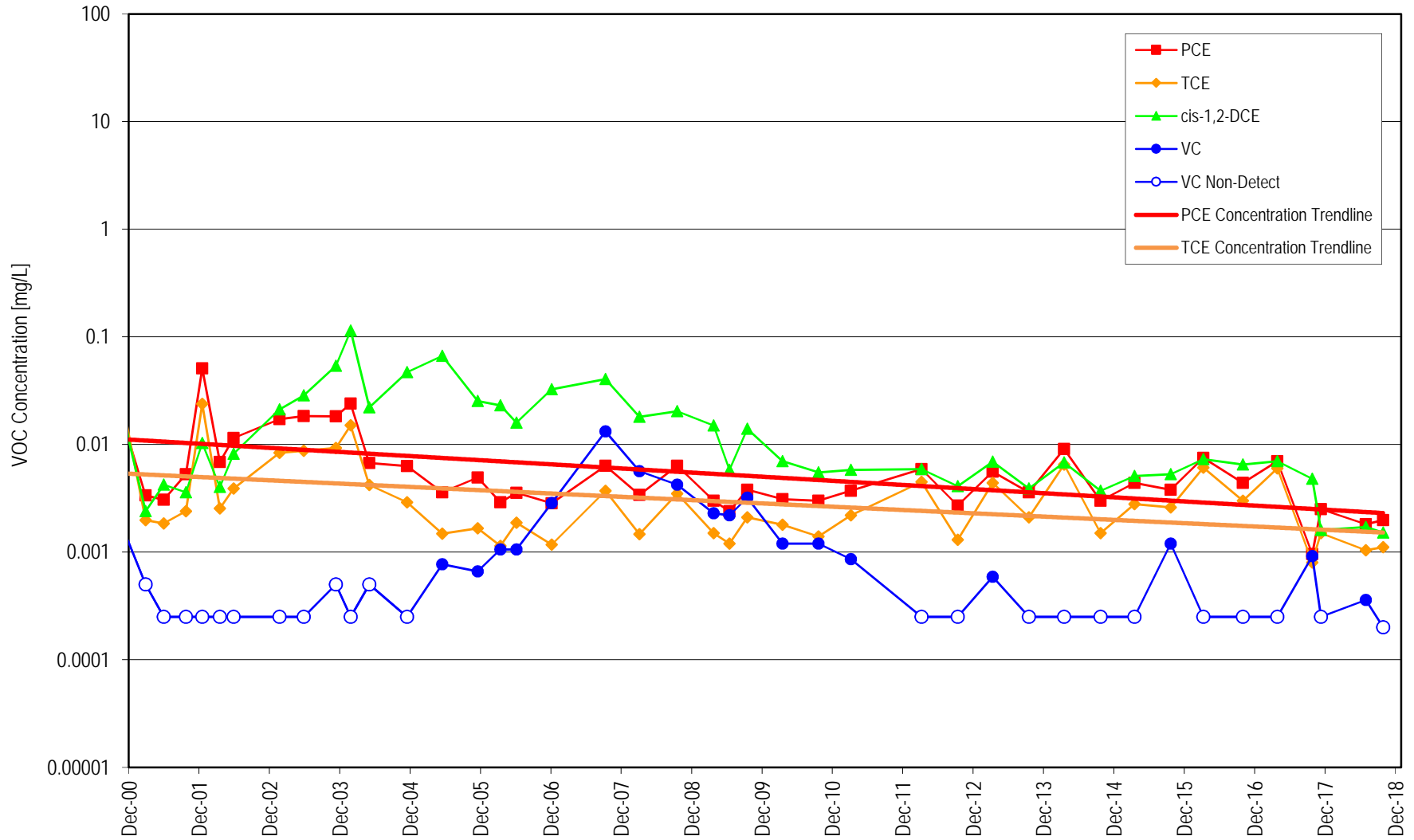
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMS3-60



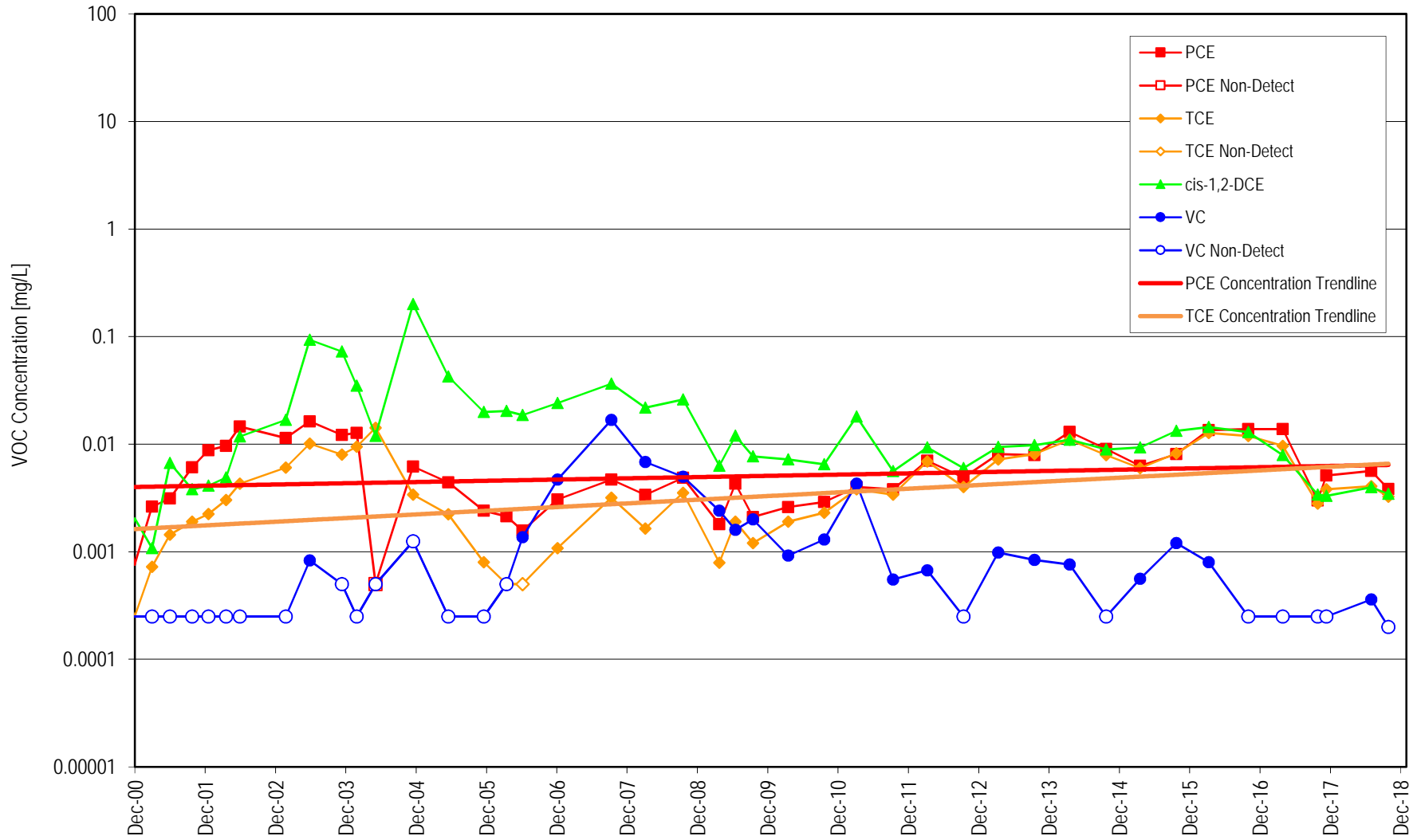
Note: Not detected values plotted at 1/2 the reporting limit.

VOC Concentrations in MGMS3-101



Note: Not detected values plotted at 1/2 the reporting limit.

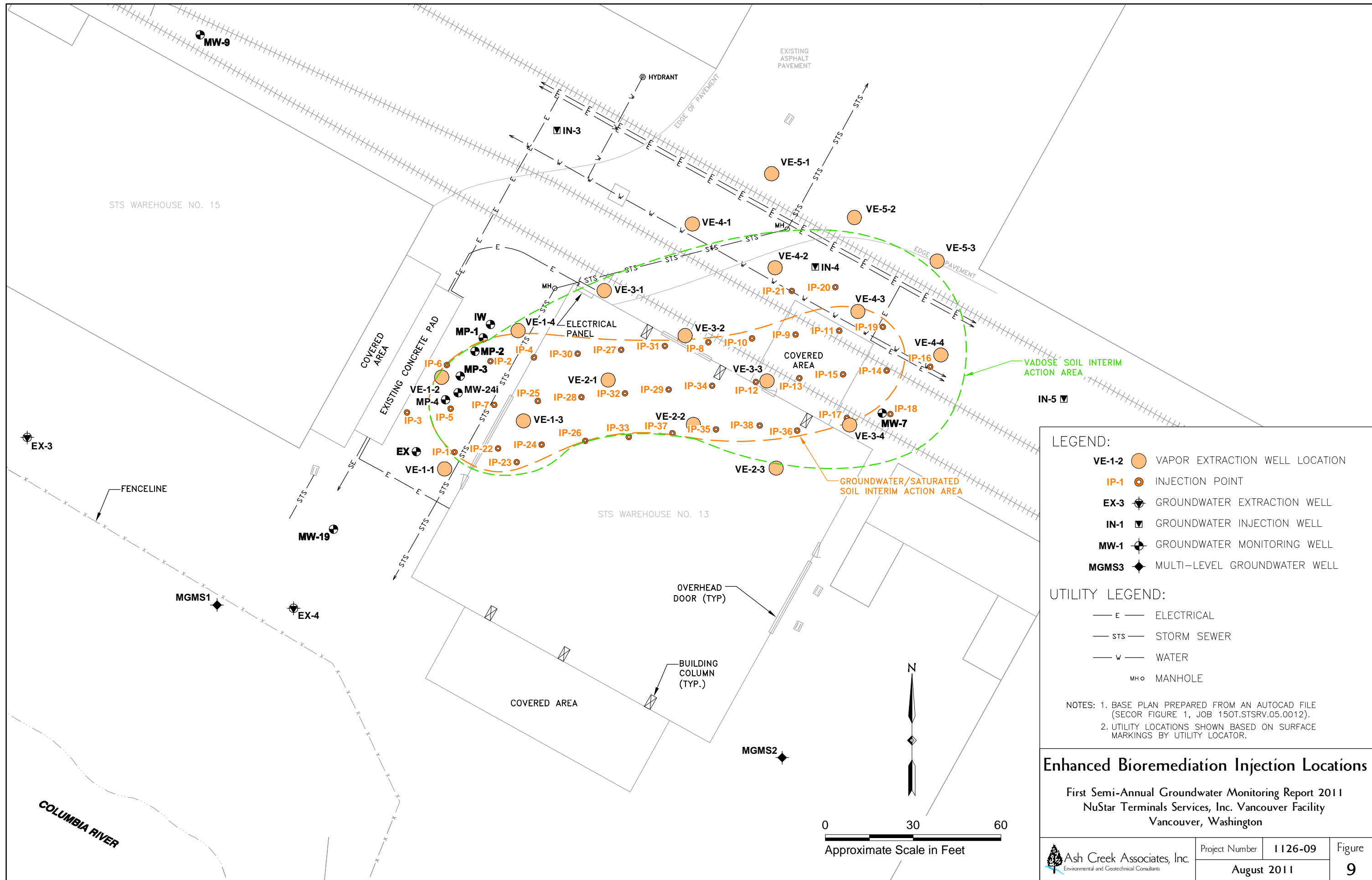
VOC Concentrations in MGMS3-132



Note: Not detected values plotted at 1/2 the reporting limit.

APPENDIX E

**2008 – SVE AND BIOREMEDIATION INJECTION LAYOUT AND
HISTORICAL MONITORING TABLES**



LEGEND:

- VE-1-2 ○ VAPOR EXTRACTION WELL LOCATION
- IP-1 ○ INJECTION POINT
- EX-3 ⊕ GROUNDWATER EXTRACTION WELL
- IN-1 ▽ GROUNDWATER INJECTION WELL
- MW-1 ⊕ GROUNDWATER MONITORING WELL
- MGMS3 ◆ MULTI-LEVEL GROUNDWATER WELL

UTILITY LEGEND:

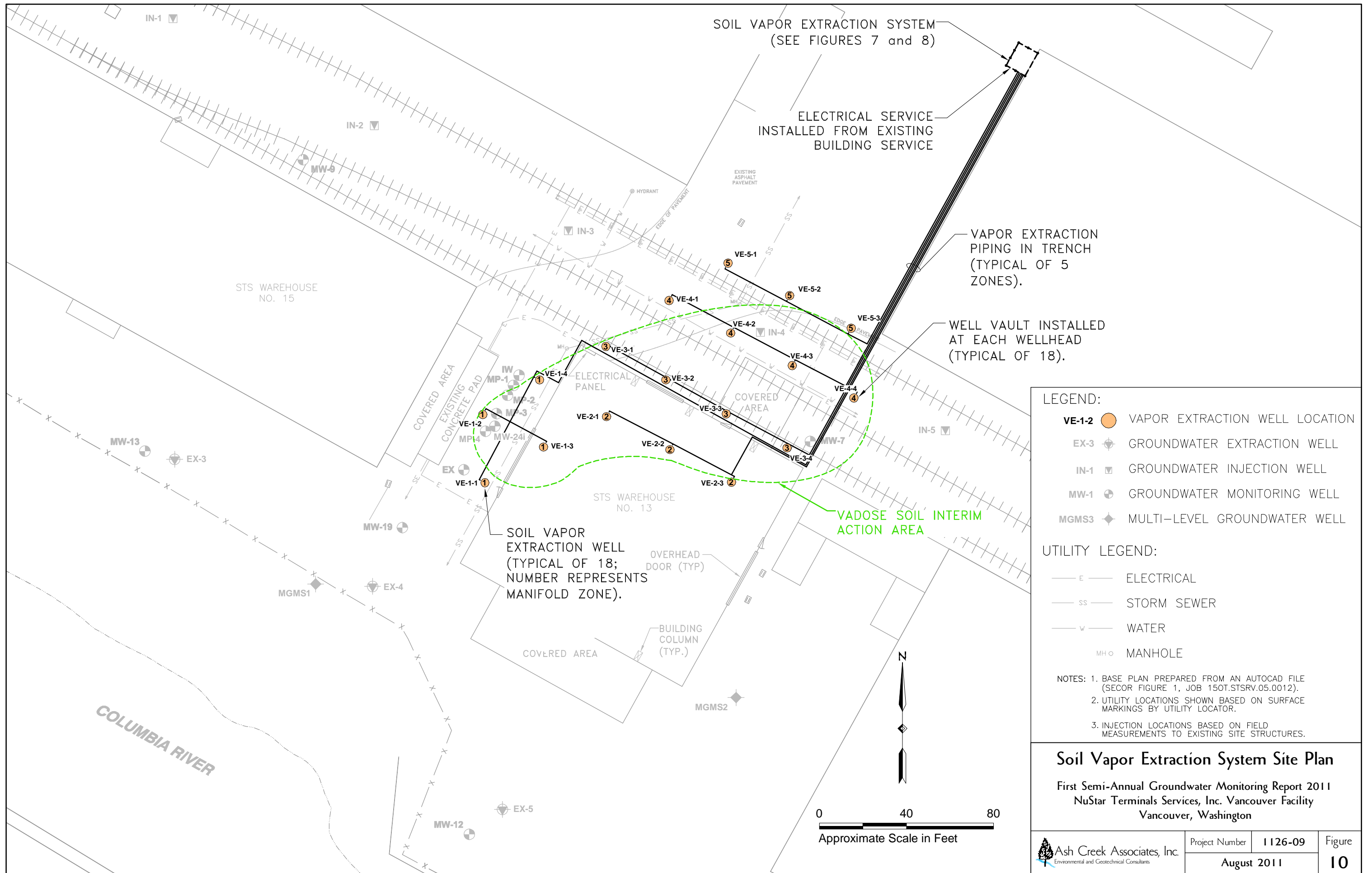
- E — ELECTRICAL
- STS — STORM SEWER
- W — WATER
- MH ⊕ MANHOLE

NOTES:

1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 150T.STSRV.05.0012).
2. UTILITY LOCATIONS SHOWN BASED ON SURFACE MARKINGS BY UTILITY LOCATOR.

Enhanced Bioremediation Injection Locations

First Semi-Annual Groundwater Monitoring Report 2011
 NuStar Terminals Services, Inc. Vancouver Facility
 Vancouver, Washington



LEGEND:

- VE-1-2** VAPOR EXTRACTION WELL LOCATION
- EX-3** GROUNDWATER EXTRACTION WELL
- IN-1** GROUNDWATER INJECTION WELL
- MW-1** GROUNDWATER MONITORING WELL
- MGMS3** MULTI-LEVEL GROUNDWATER WELL

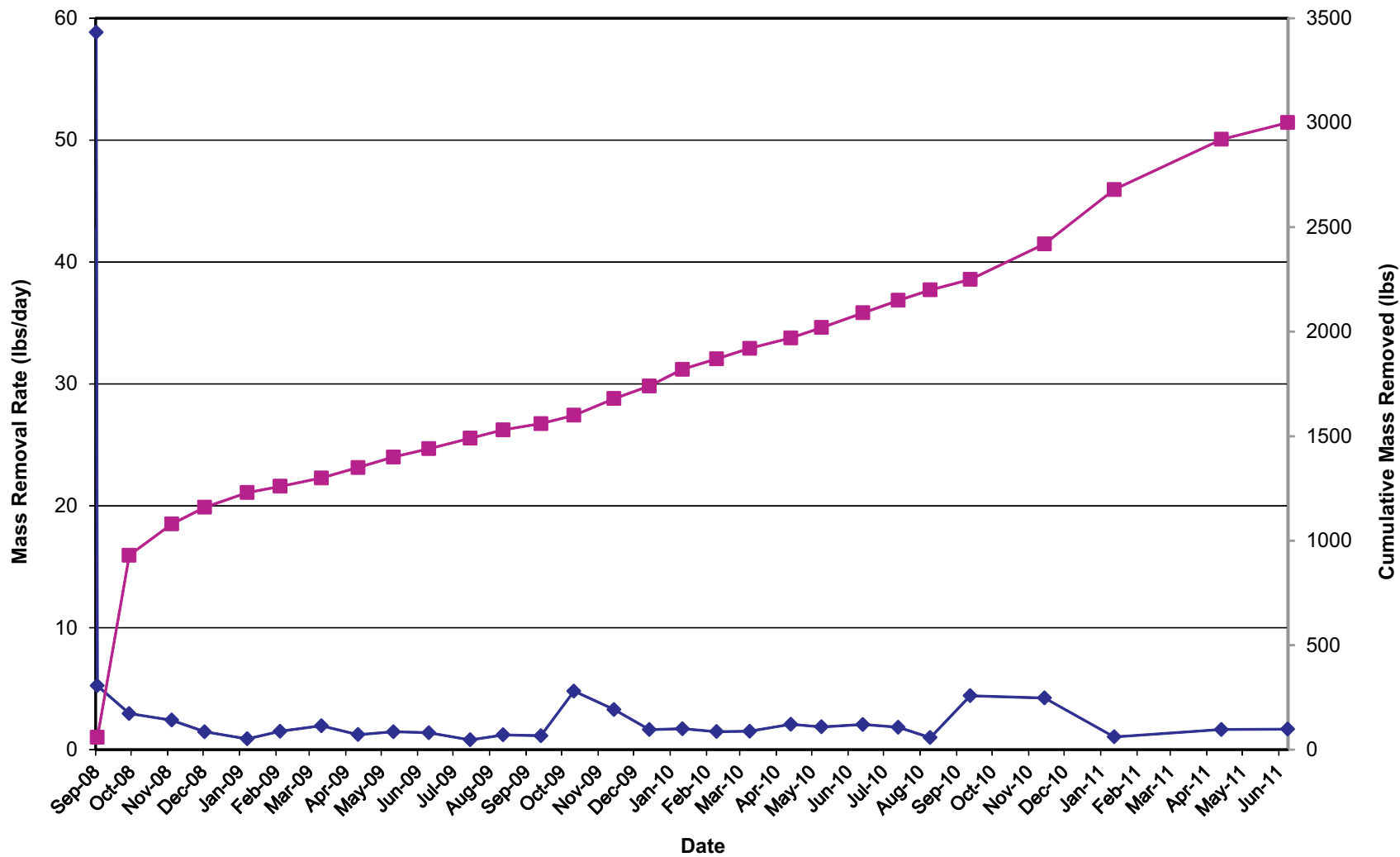
UTILITY LEGEND:

- ELECTRICAL
- STORM SEWER
- WATER
- MANHOLE

NOTES:

1. BASE PLAN PREPARED FROM AN AUTOCAD FILE (SECOR FIGURE 1, JOB 150T.STSRV.05.0012).
2. UTILITY LOCATIONS SHOWN BASED ON SURFACE MARKINGS BY UTILITY LOCATOR.
3. INJECTION LOCATIONS BASED ON FIELD MEASUREMENTS TO EXISTING SITE STRUCTURES.

Soil Vapor Extraction System Site Plan
 First Semi-Annual Groundwater Monitoring Report 2011
 NuStar Terminals Services, Inc. Vancouver Facility
 Vancouver, Washington



Legend:

- ◆ Removal Rate (lbs/day)
- Cumulative Mass Removal

2008 SVE System - VOC Mass Removal

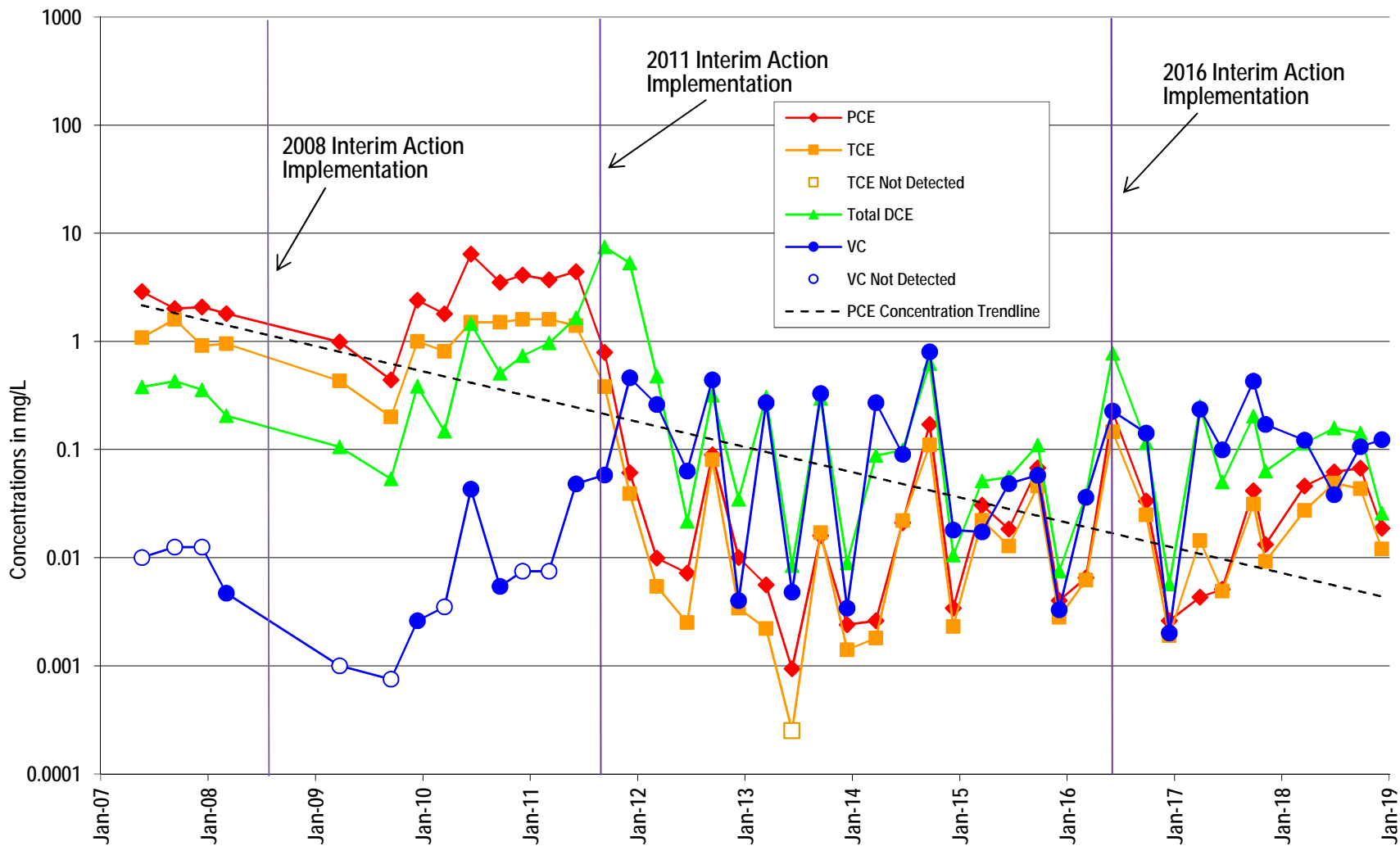
Second Semi-Annual Groundwater Monitoring Report 2011
 NuStar Terminals Services, Inc. Vancouver Facility
 Vancouver, Washington



Project Number	1126-09	Figure 11
January 2012		

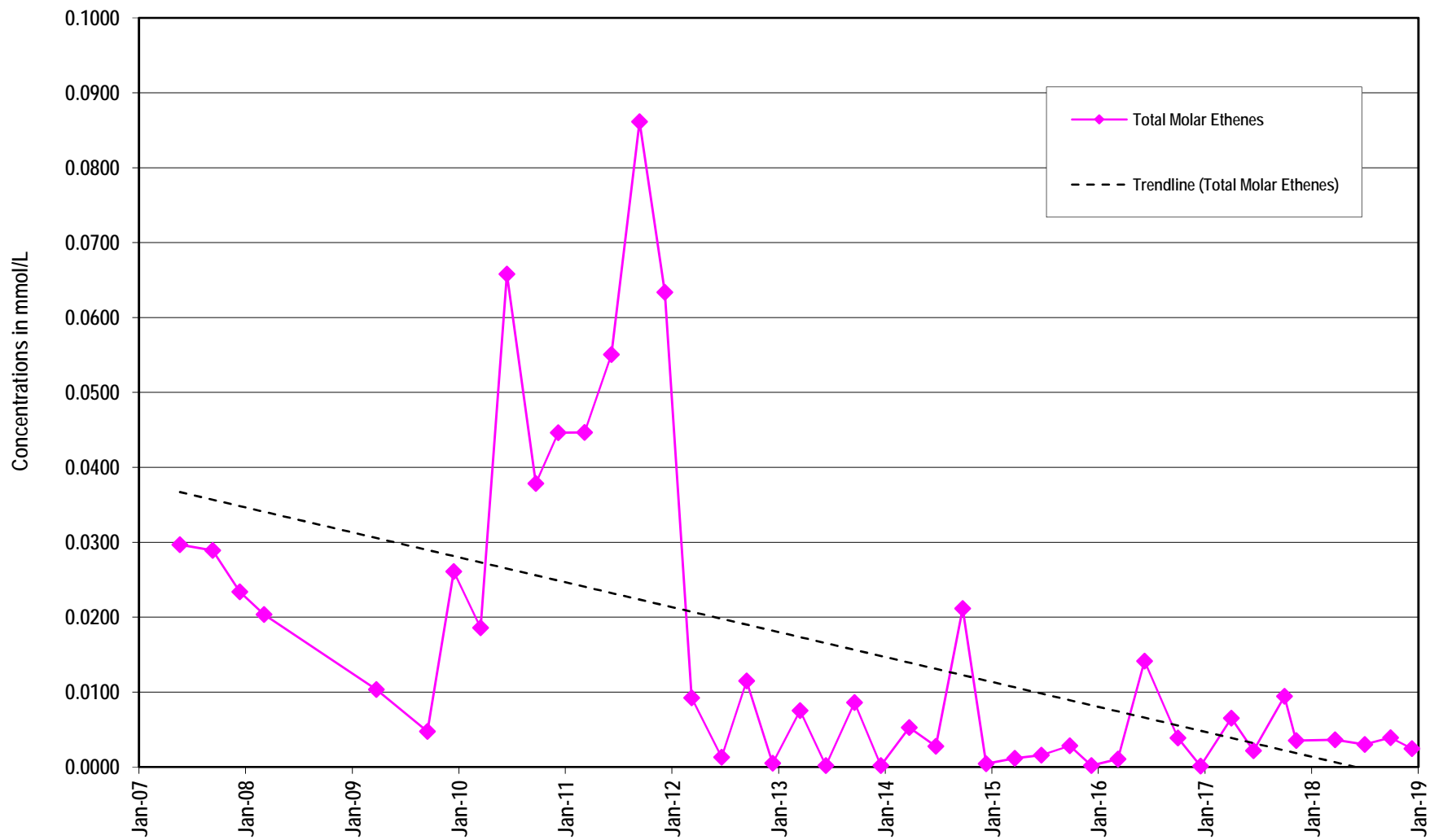
APPENDIX F
MOLAR CONCENTRATION TREND PLOTS –
INTERIM ACTION WELLS

Interim Action Area - VOC Trends: MGMS2-40

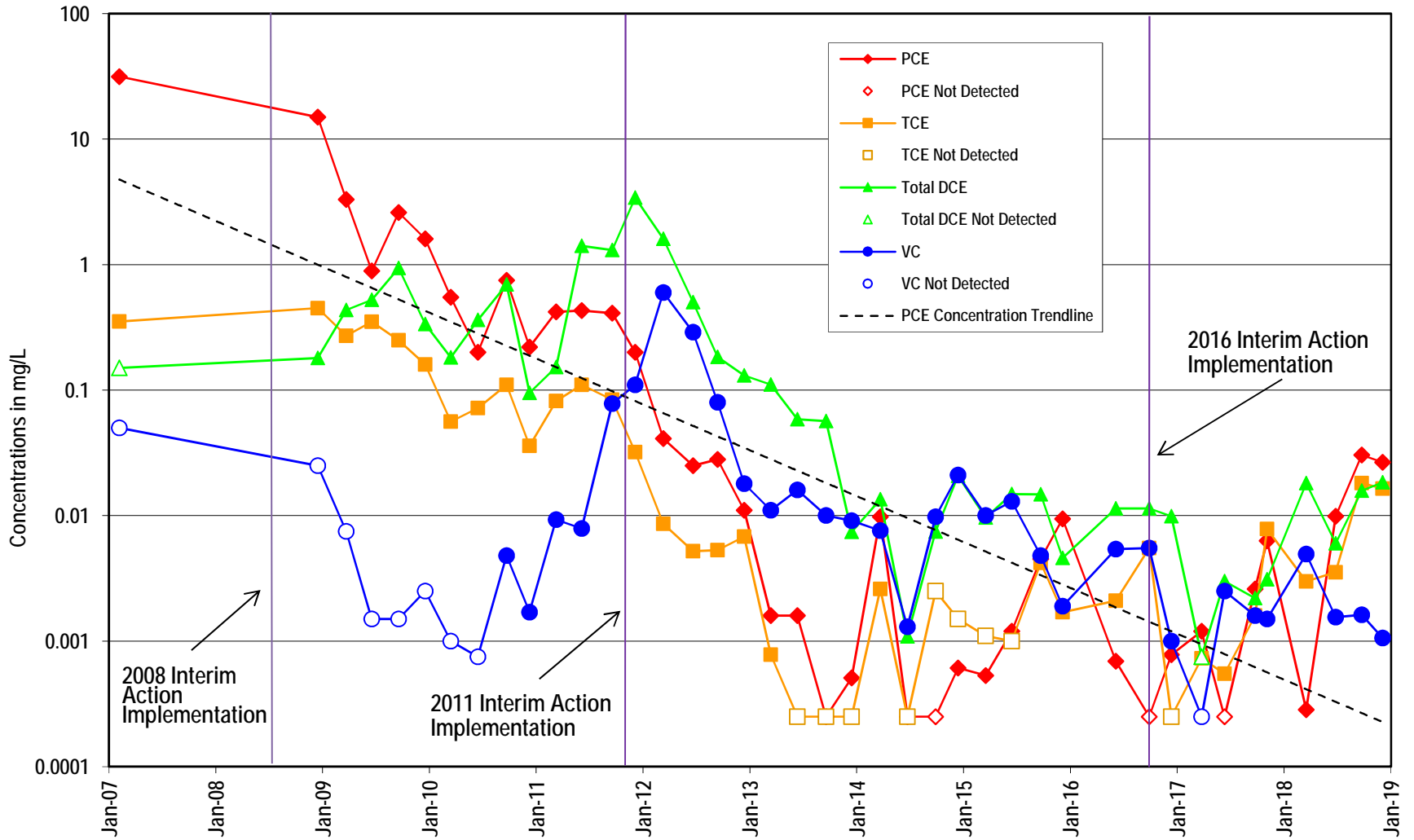


Note: Not detected values plotted at 1/2 the reporting limit.

Total Molar Ethenes in MGMS2-40

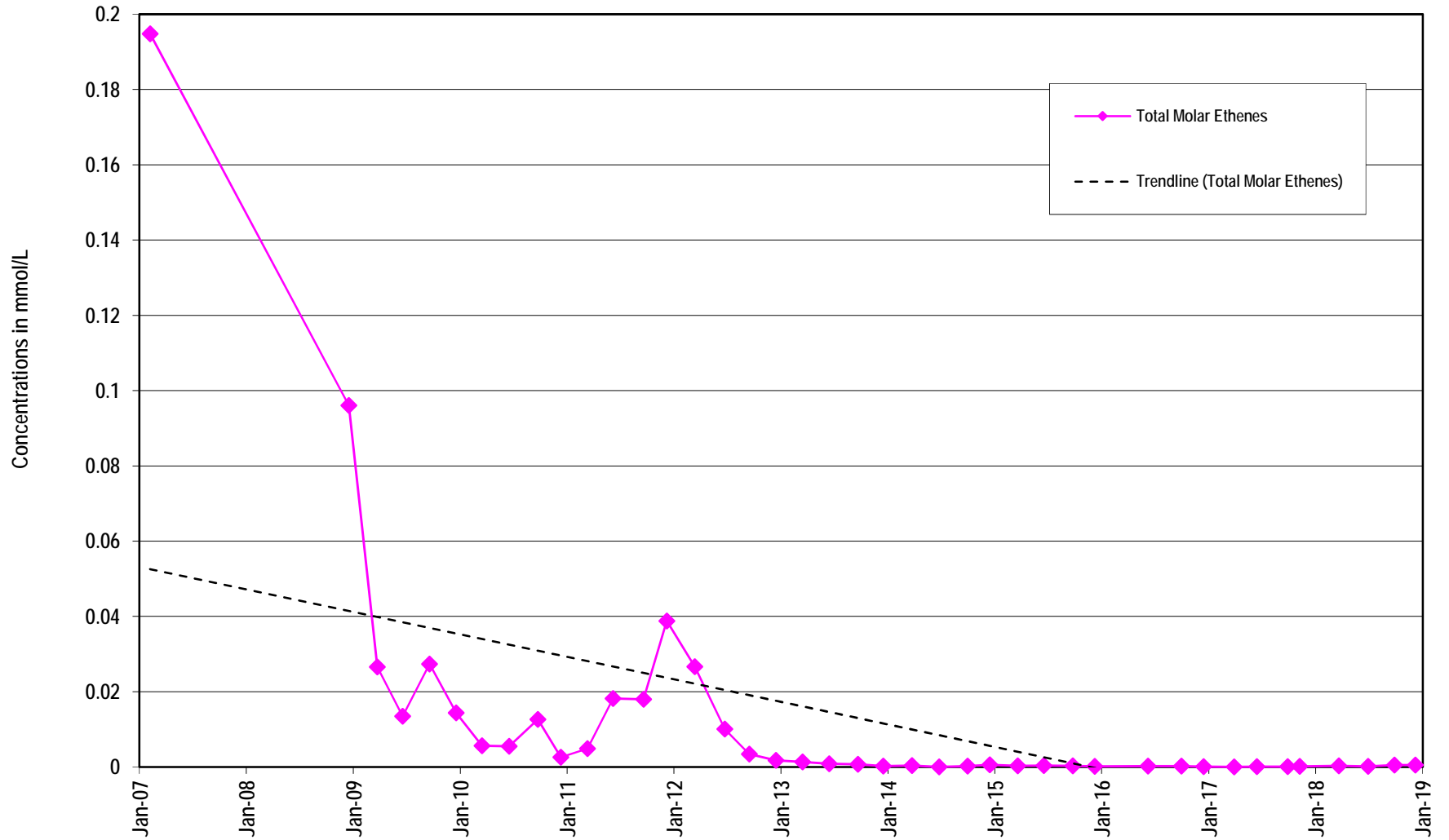


Interim Action Area - VOC Trends: MW-7

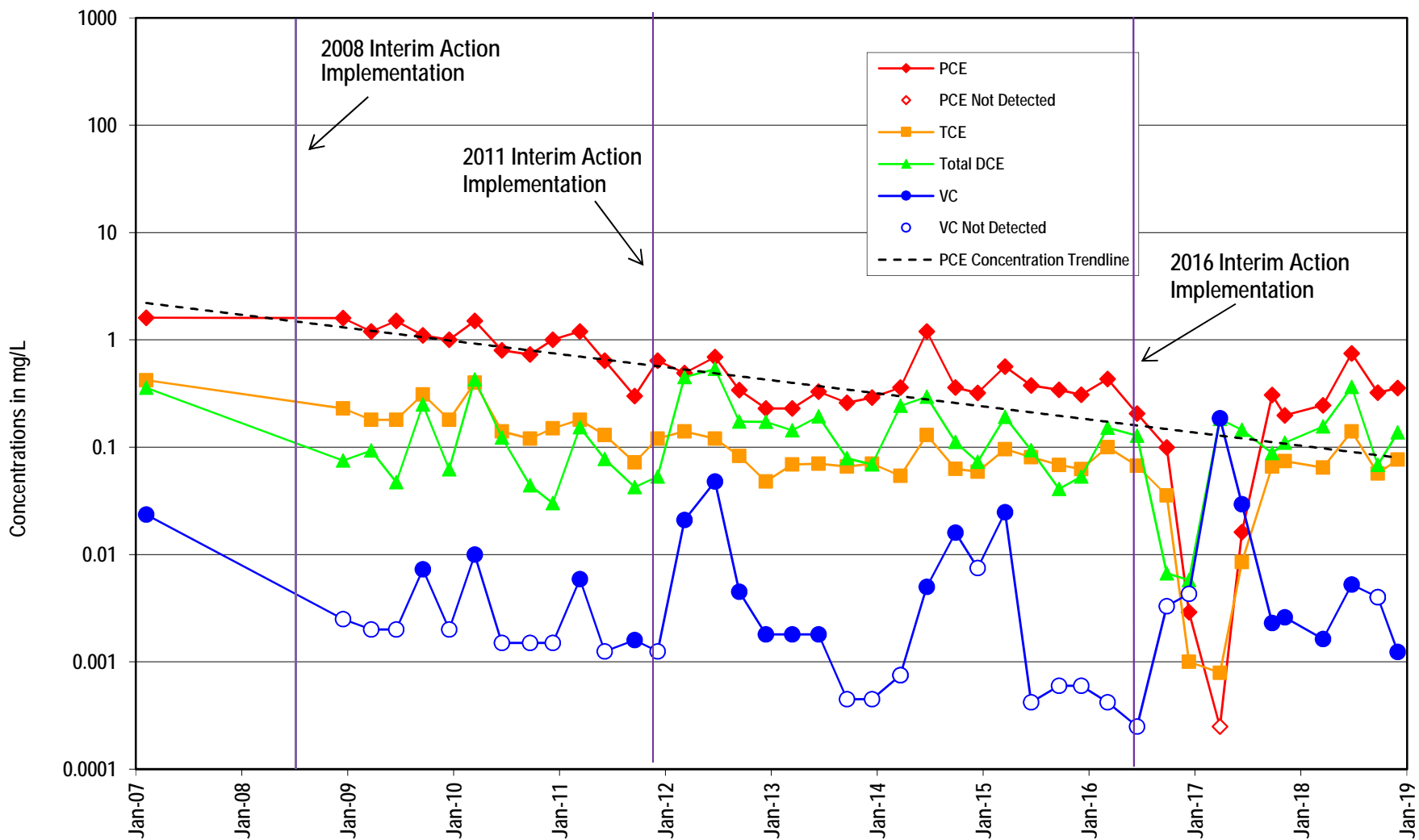


Notes: Not detected values plotted at 1/2 the reporting limit.

Total Molar Ethenes in MW-7

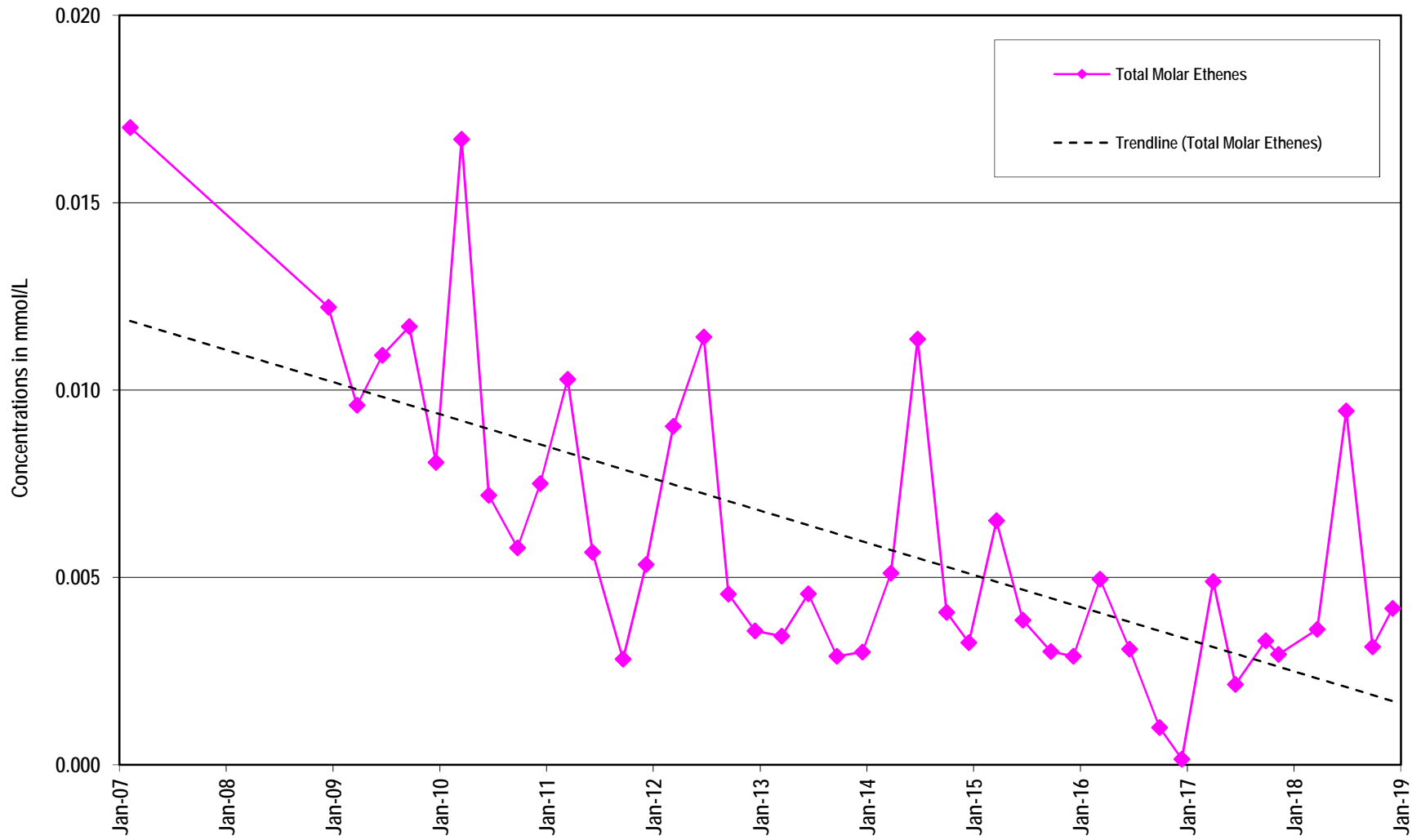


Interim Action Area - VOC Trends: MP-1

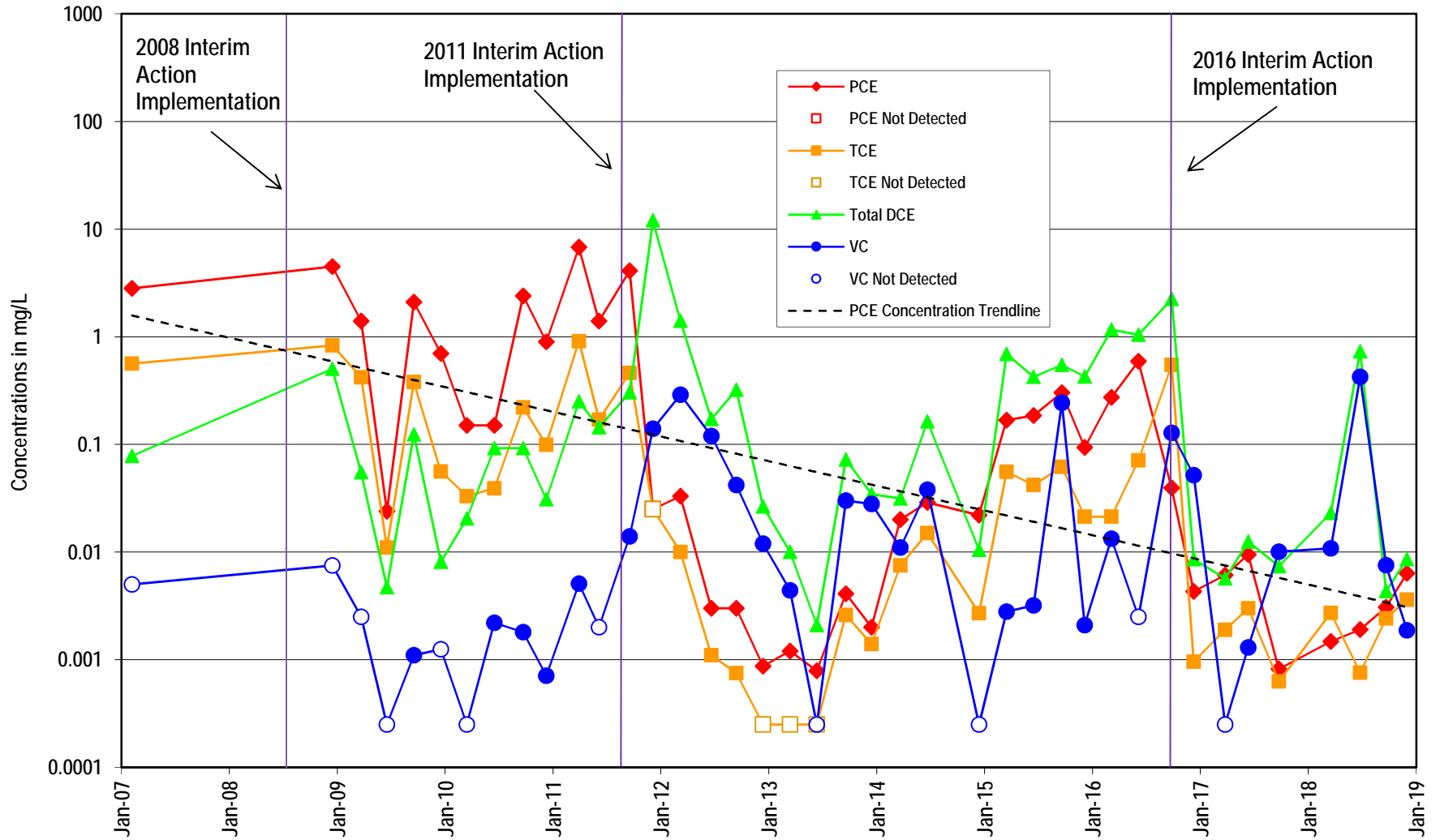


Note: Not detected values plotted at 1/2 the reporting limit.

Total Molar Ethenes in MP-1

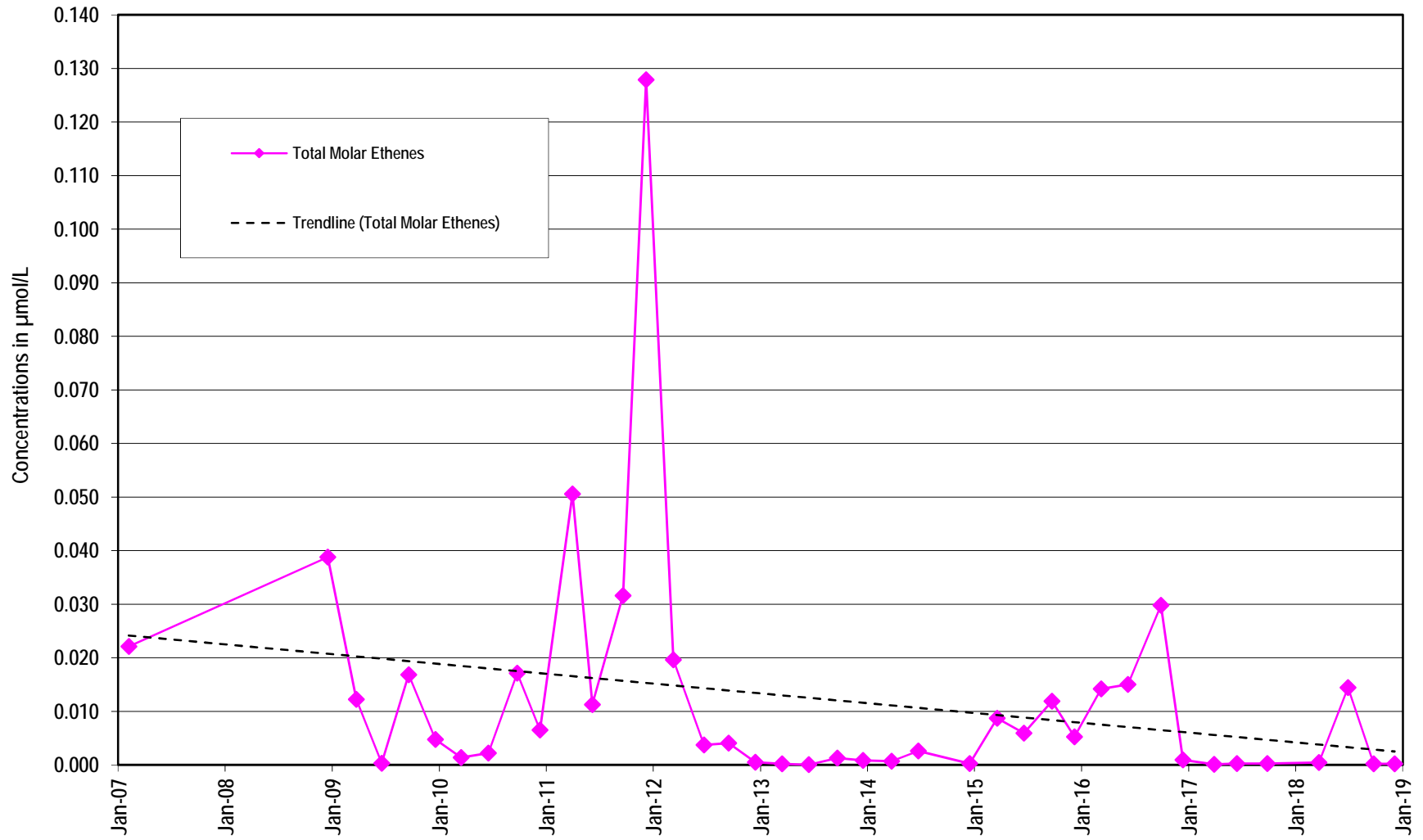


Interim Action Area - VOC Trends: EX

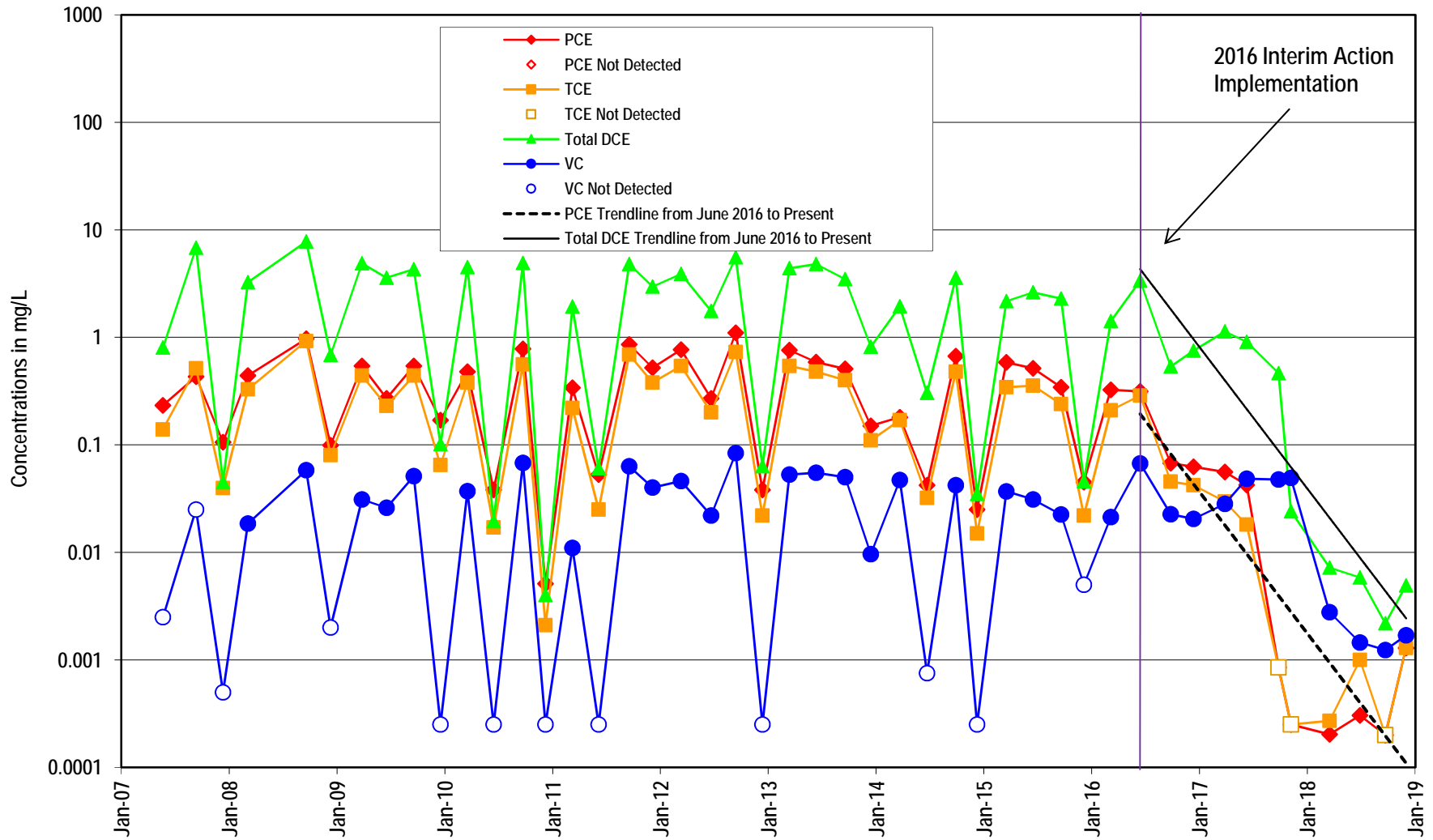


Note: Not detected values plotted at 1/2 the reporting limit.

Total Molar Ethenes in EX

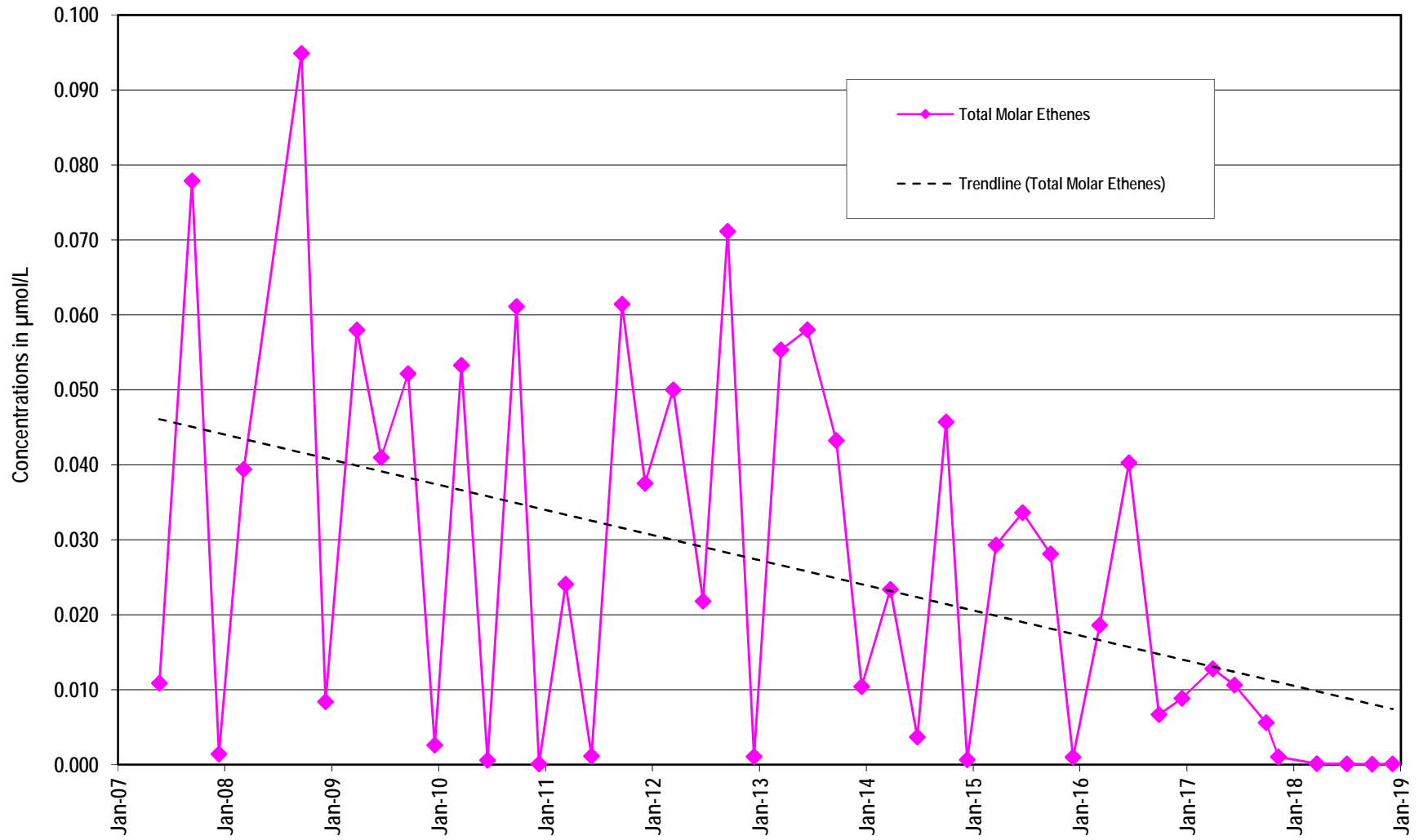


Interim Action Area - VOC Trends: MW-12

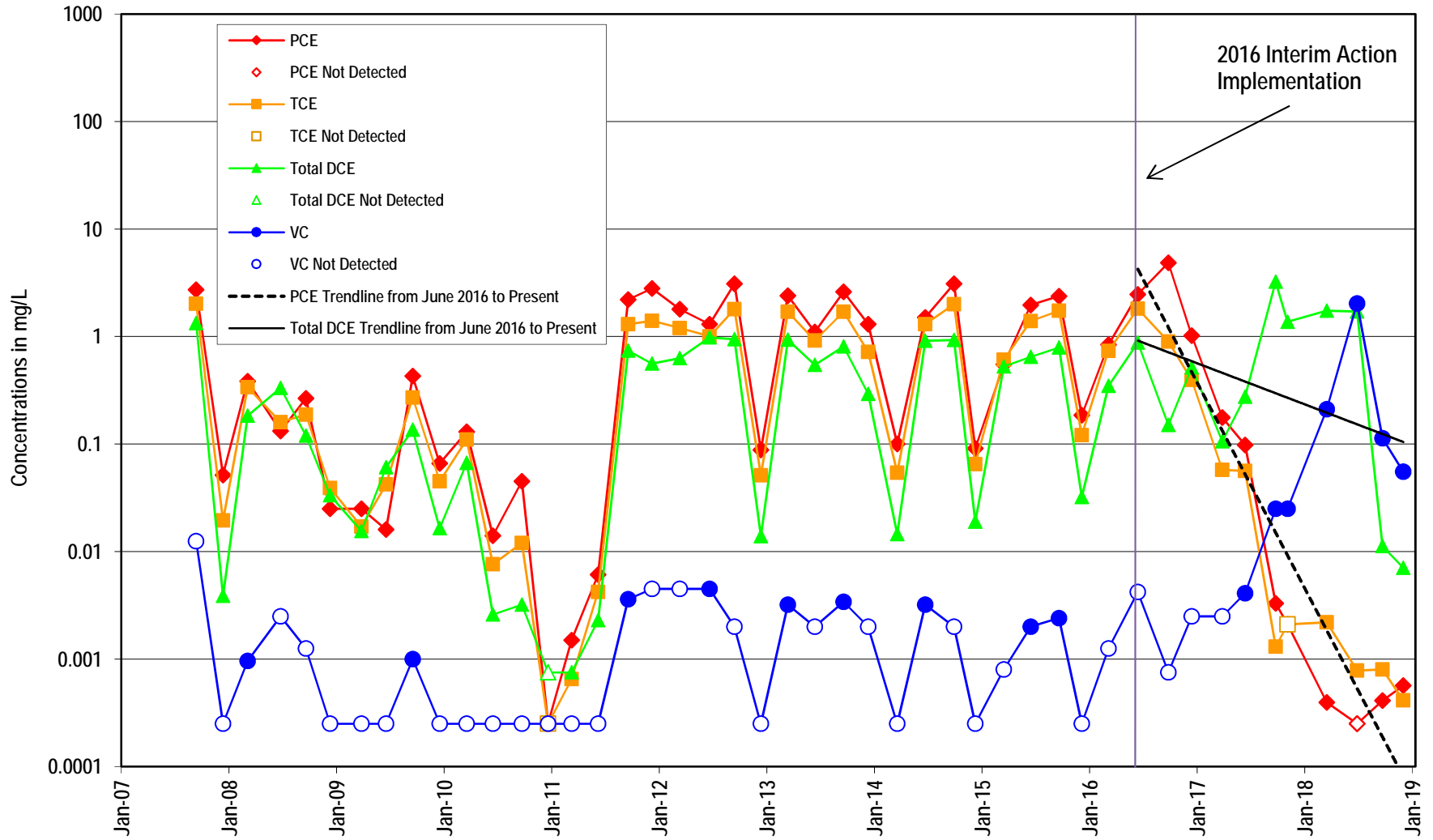


Note: Not detected values plotted at 1/2 the reporting limit.

Total Molar Ethenes in MW-12

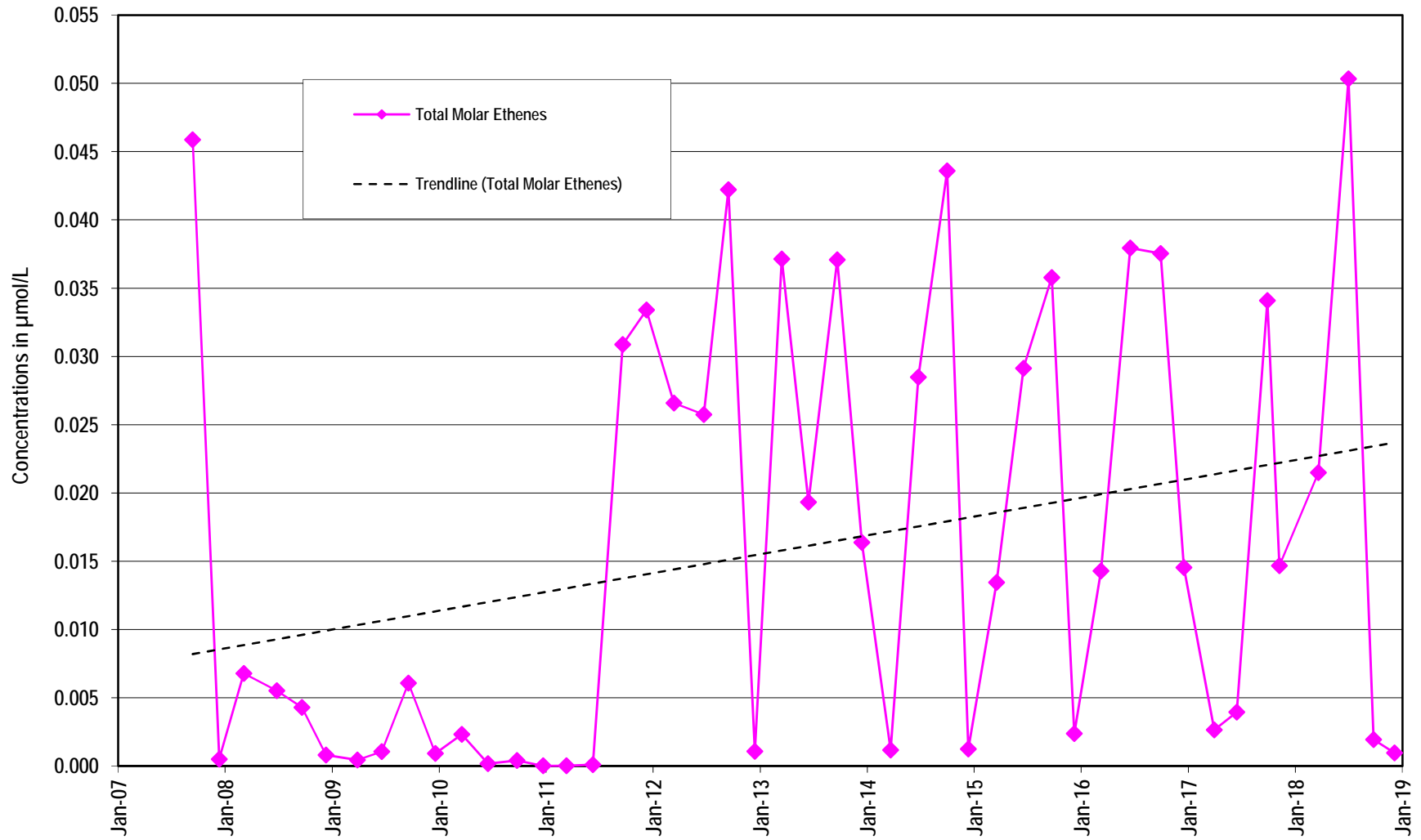


Interim Action Area - VOC Trends: MW-13

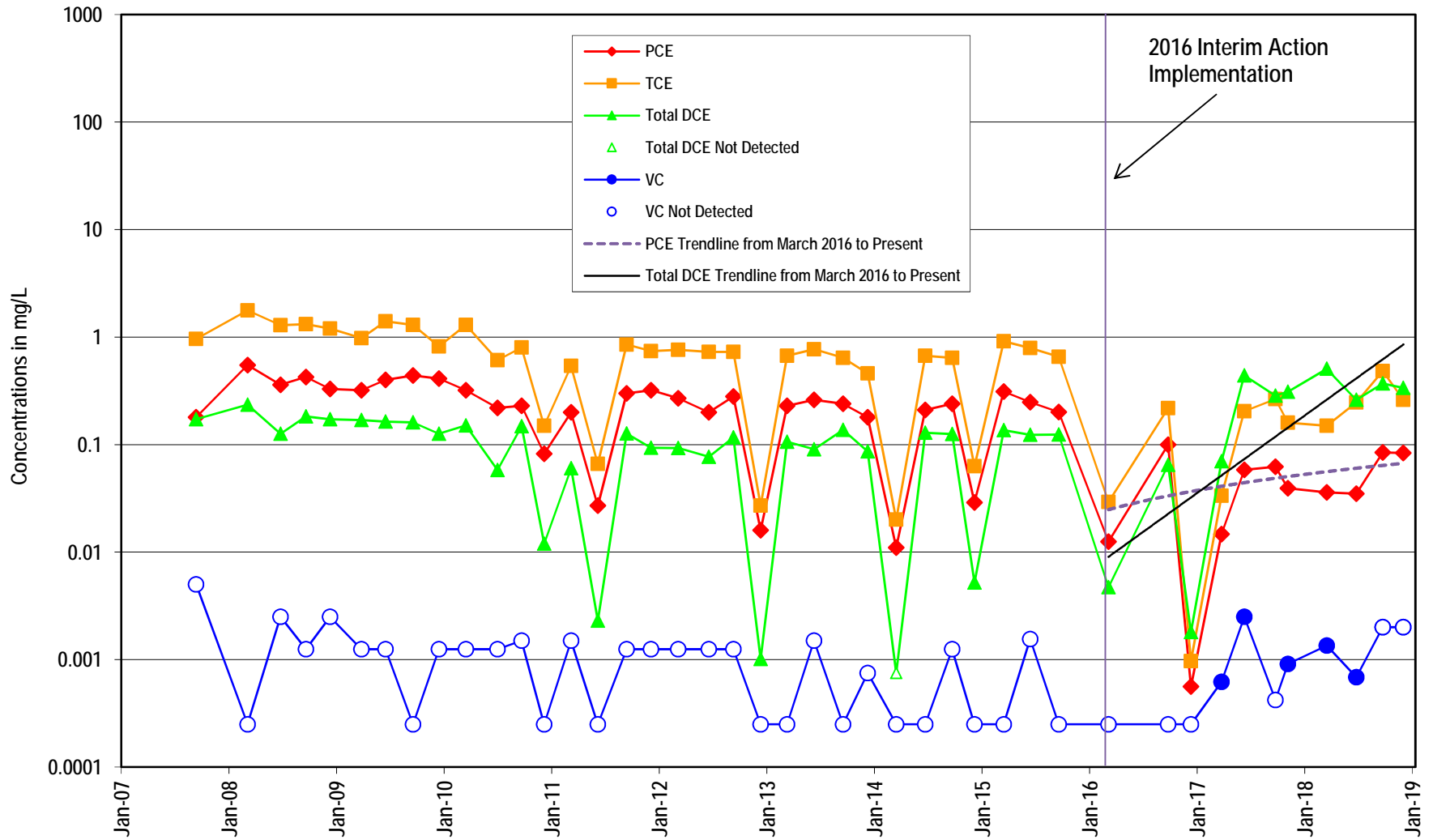


Note: Not detected values plotted at 1/2 the reporting limit.

Total Molar Ethenes in MW-13

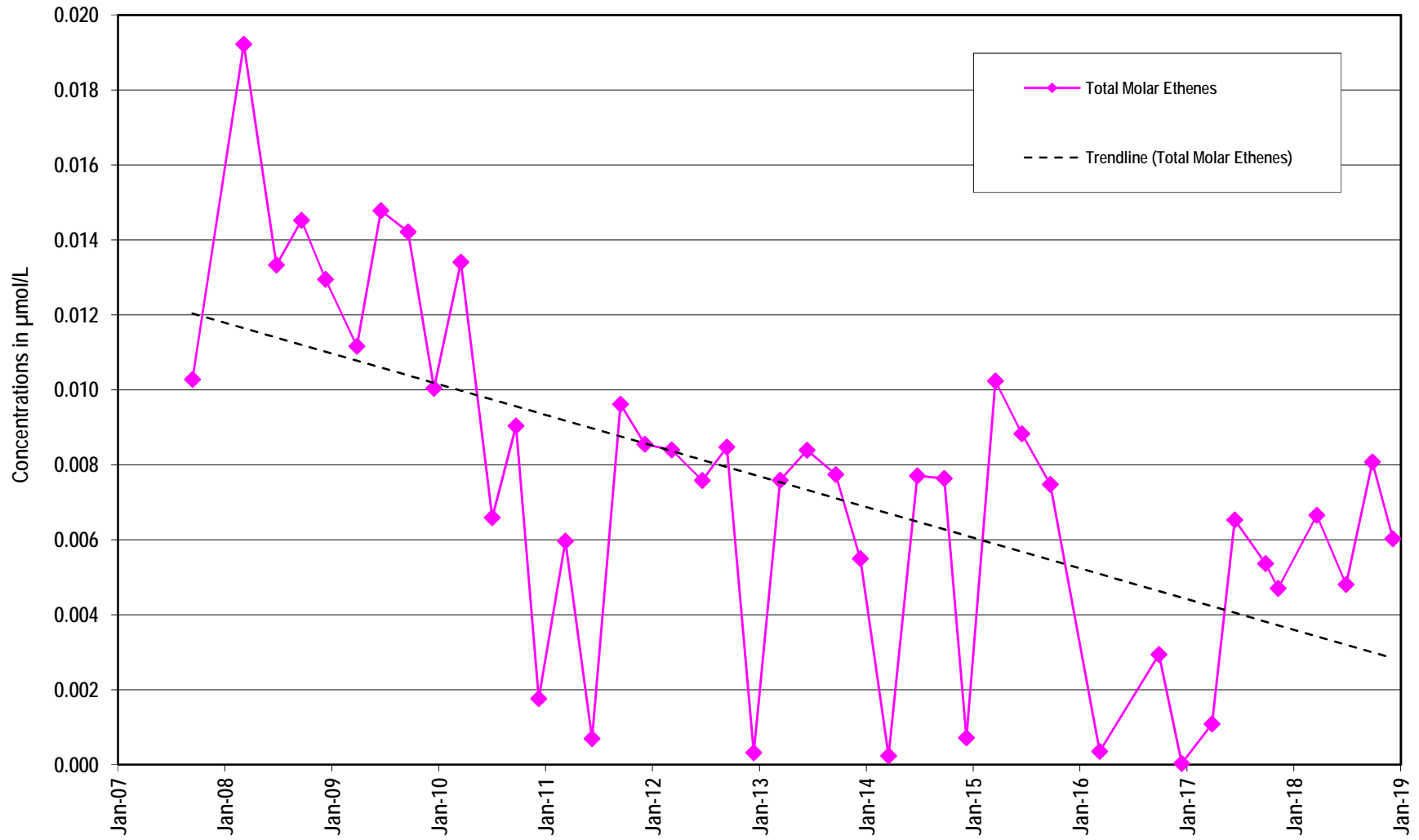


Interim Action Area - VOC Trends: MW-14

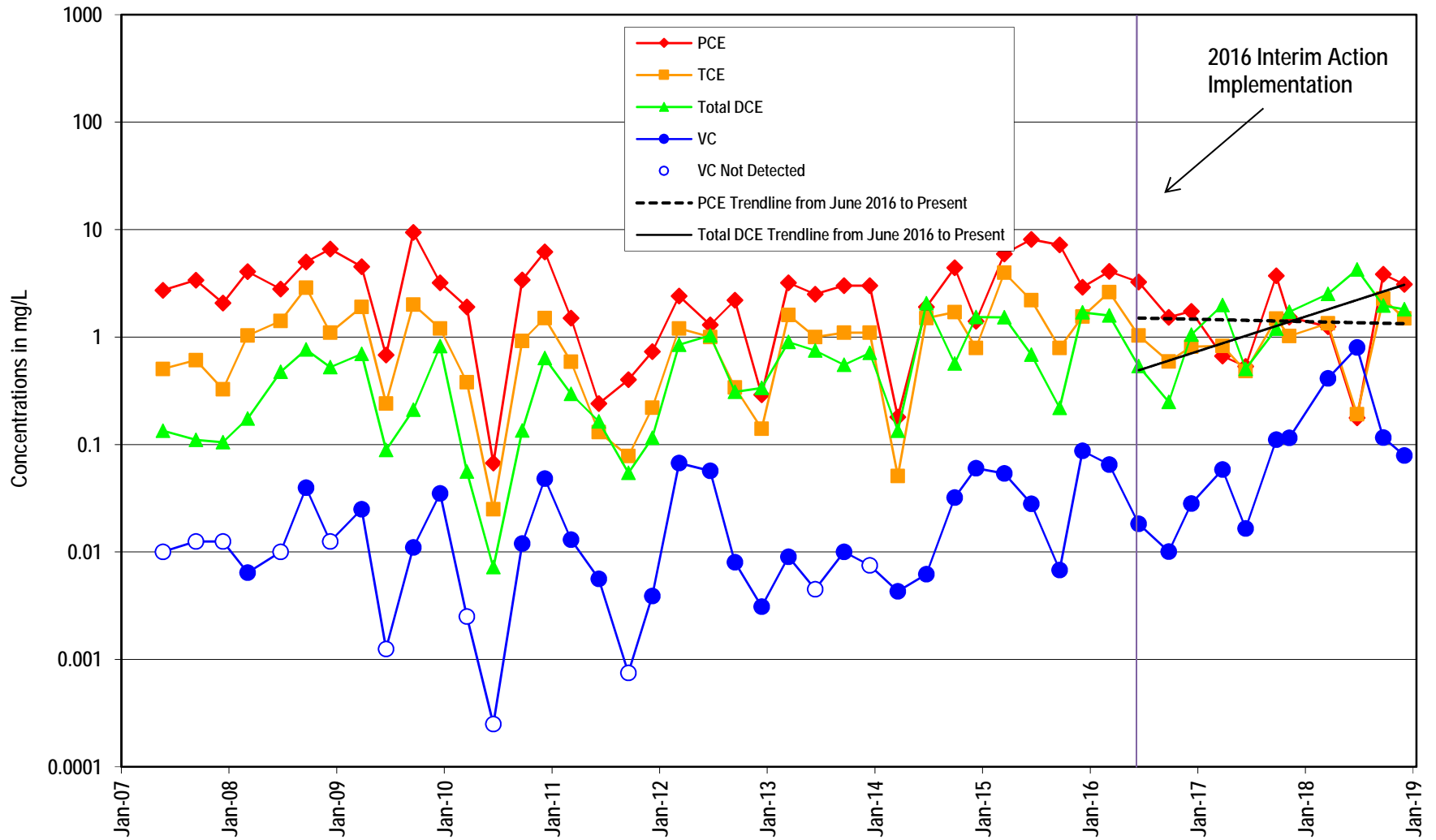


Note: Not detected values plotted at 1/2 the reporting limit.

Total Molar Ethenes in MW-14

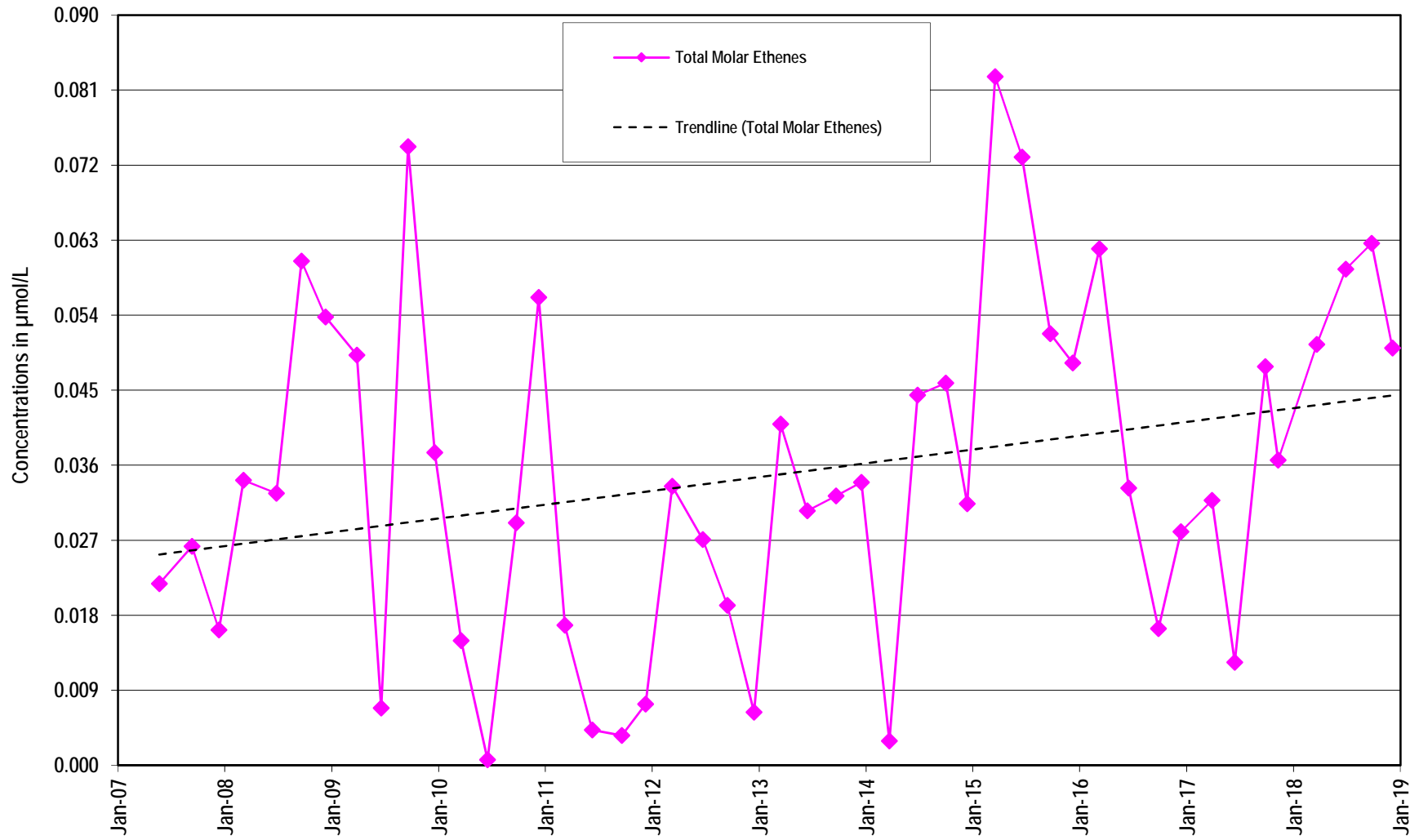


Interim Action Area - VOC Trends: MW-19

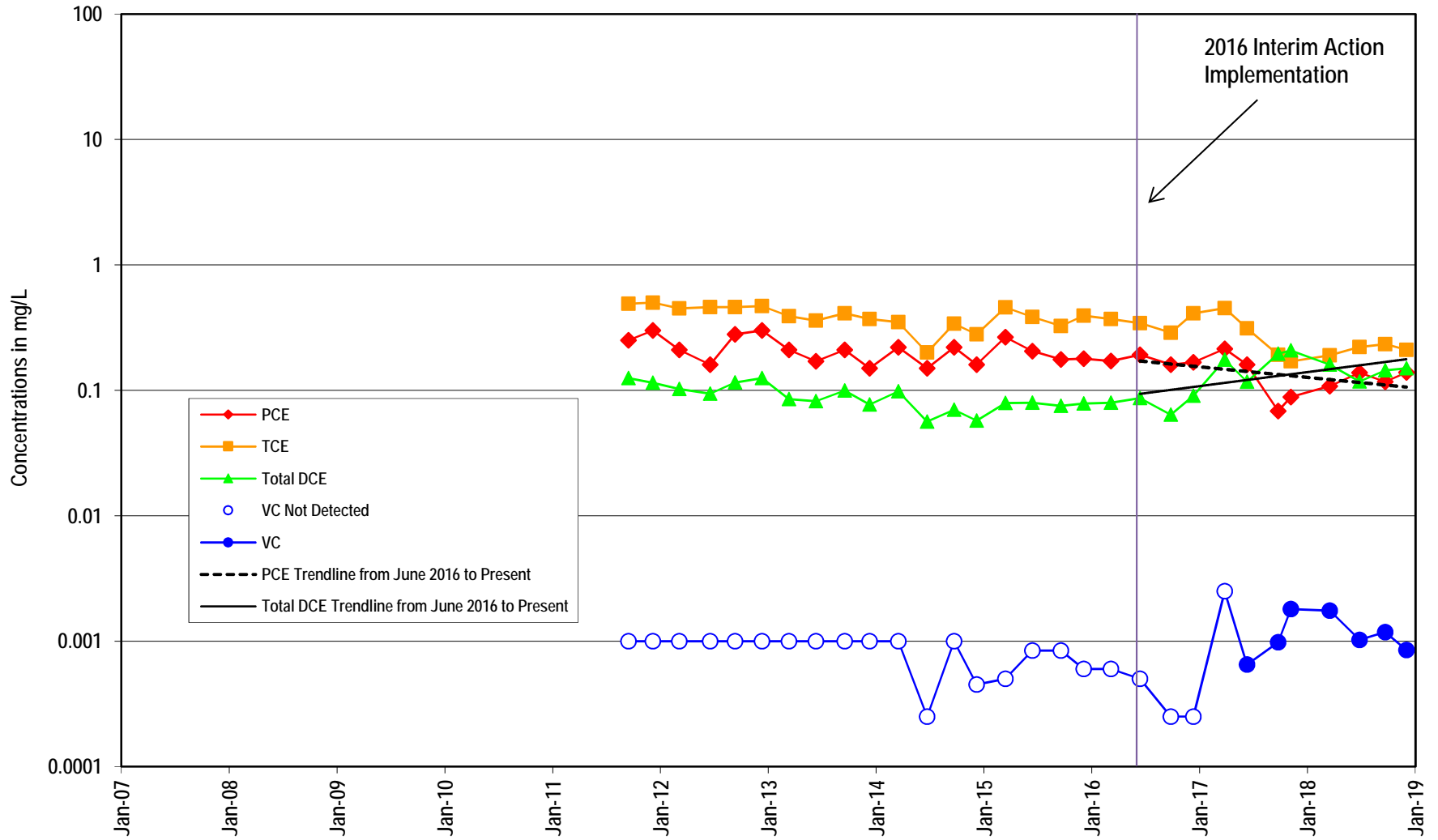


Note: Not detected values plotted at 1/2 the reporting limit.

Total Molar Ethenes in MW-19

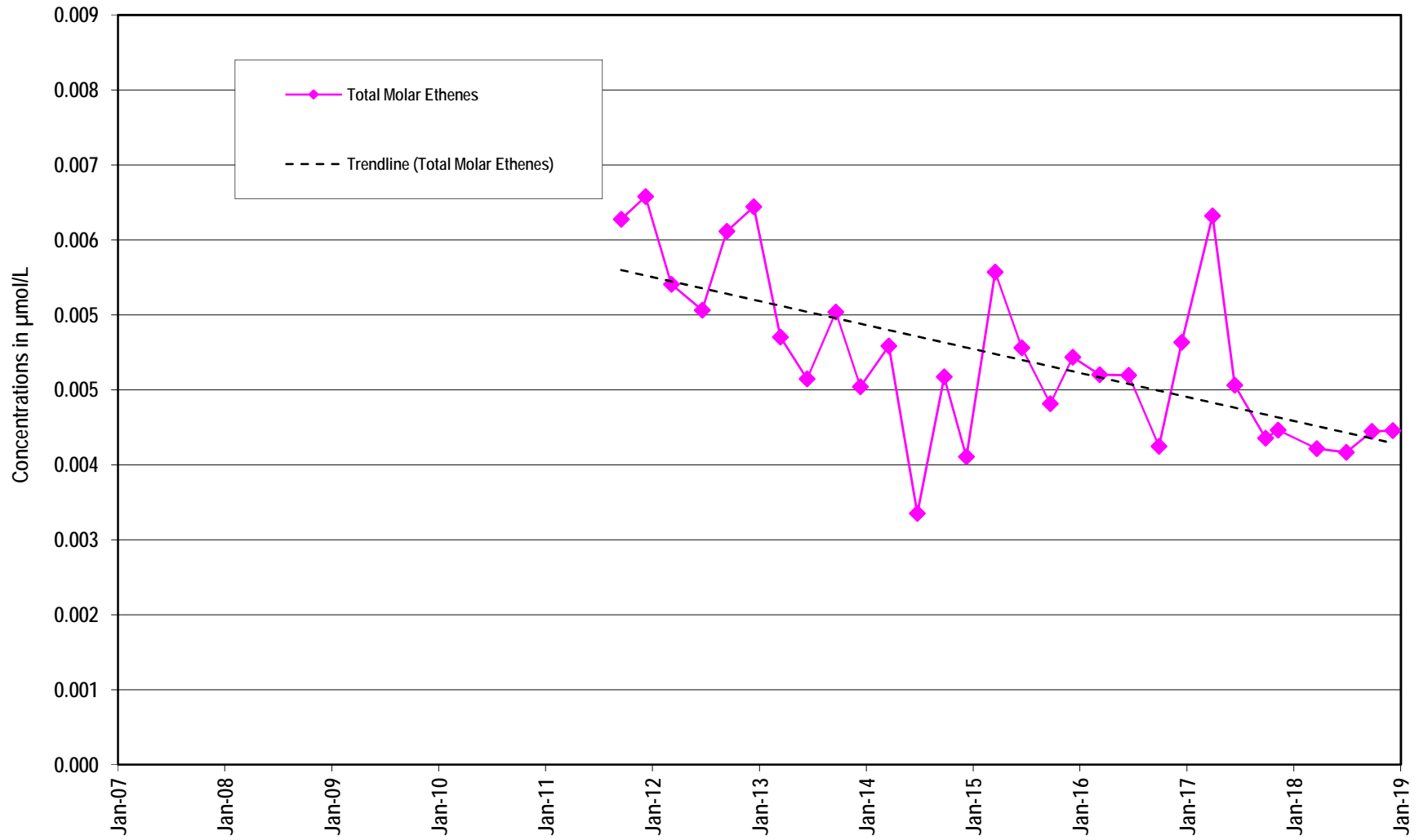


Interim Action Area - VOC Trends: MW-26

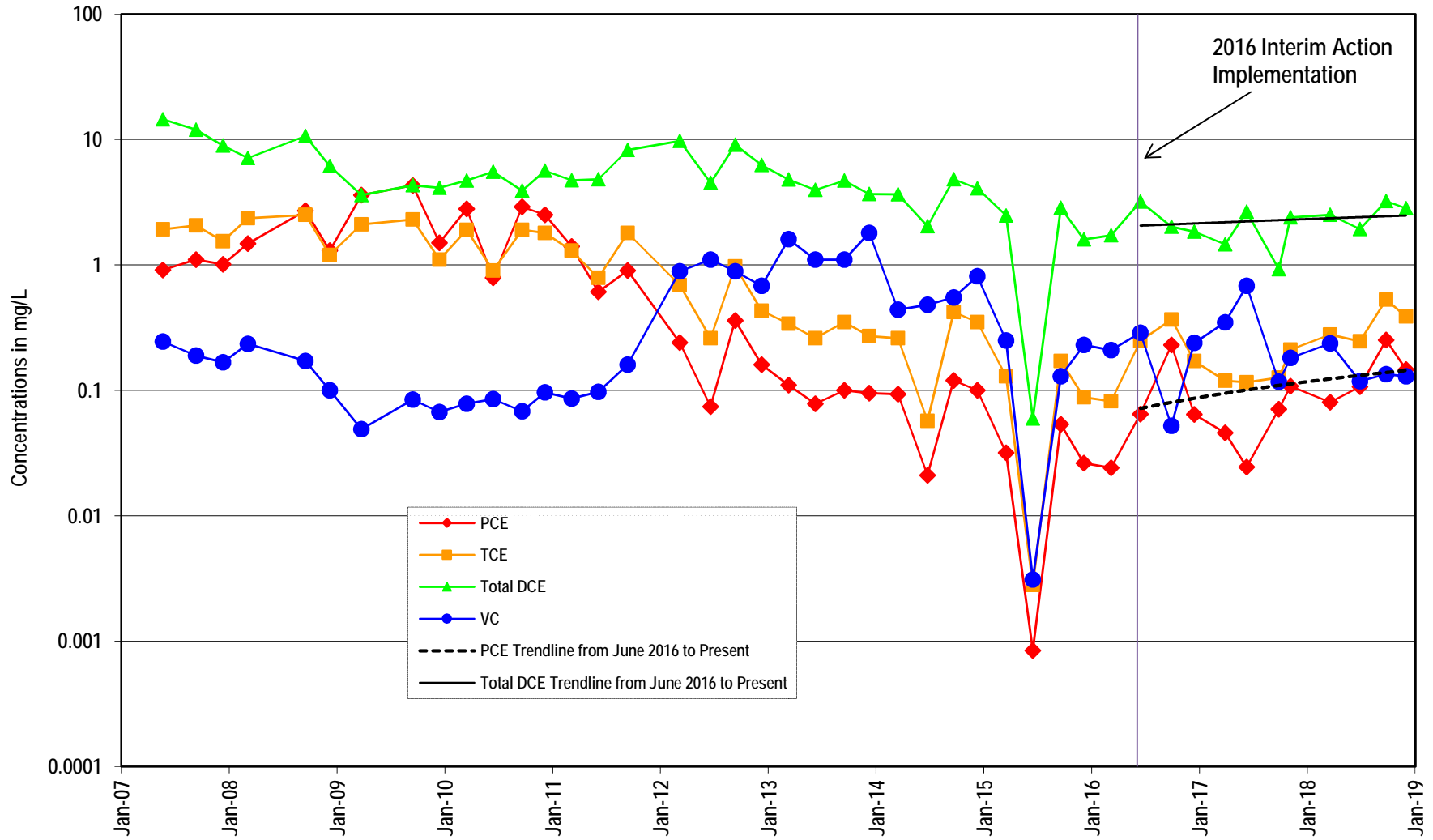


Note: Not detected values plotted at 1/2 the reporting limit.

Total Molar Ethenes in MW-26

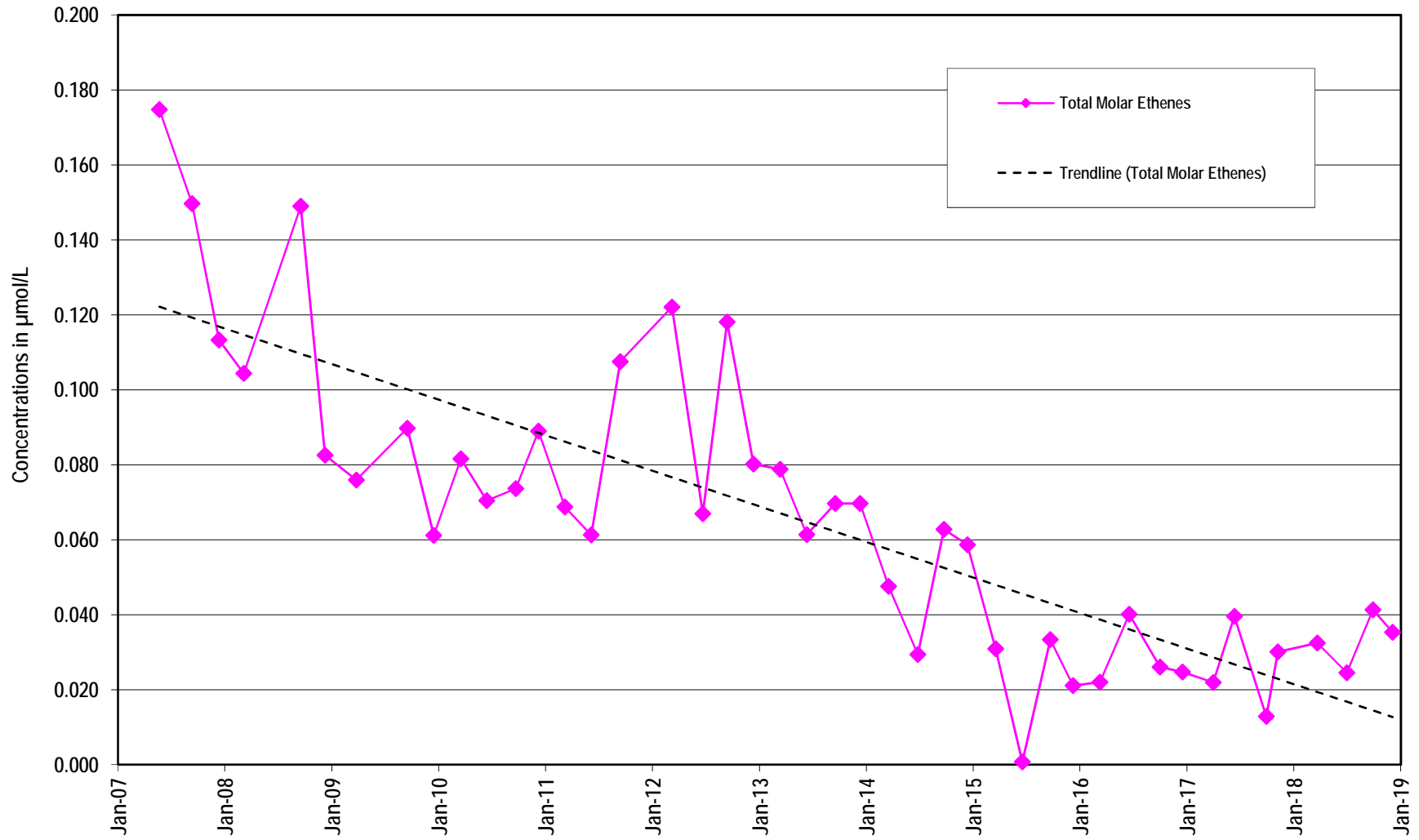


Interim Action Area - VOC Trends: MGMS1-43

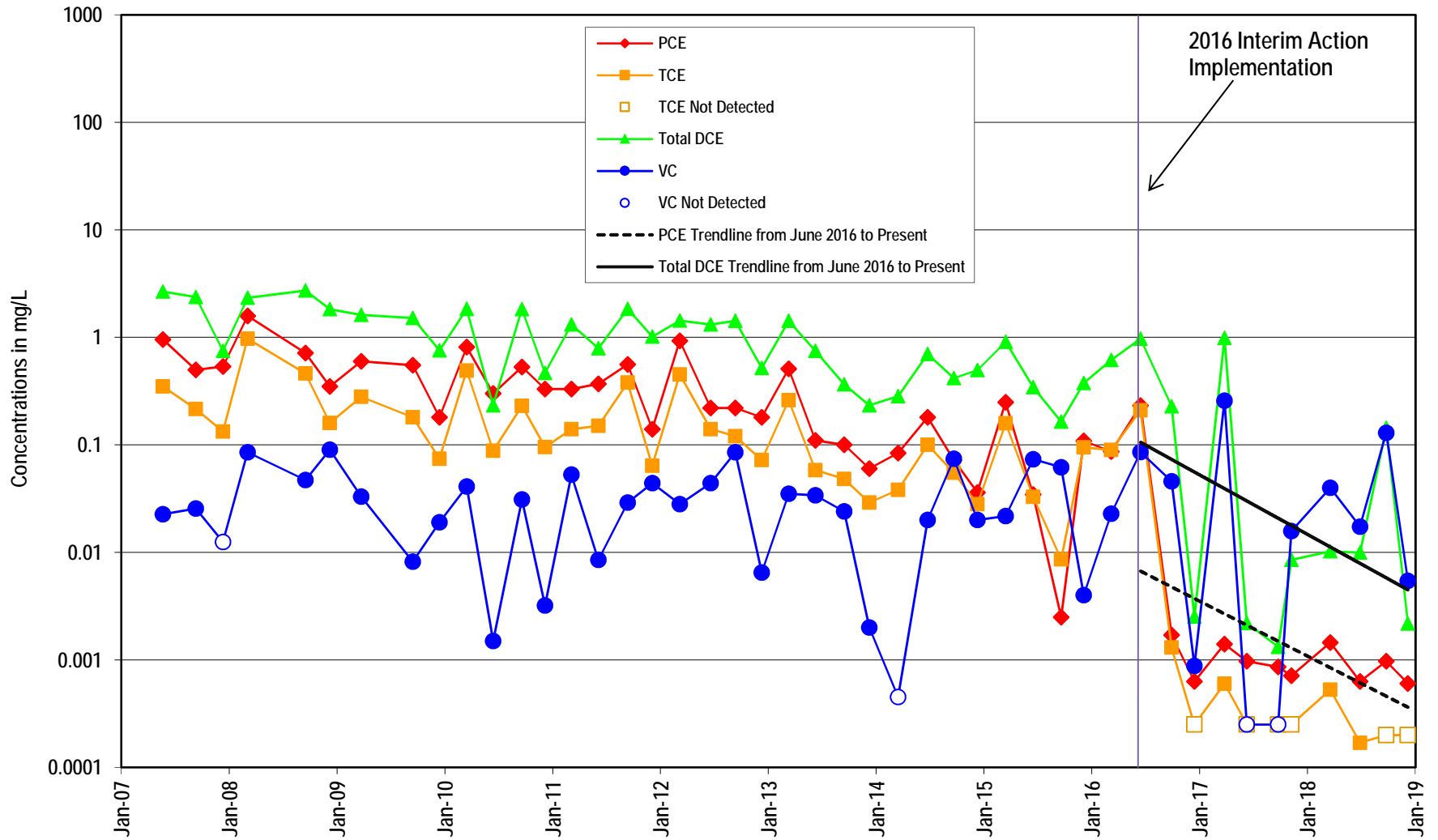


Note: Not detected values plotted at 1/2 the reporting limit.

Total Molar Ethenes in MGMTS1-43

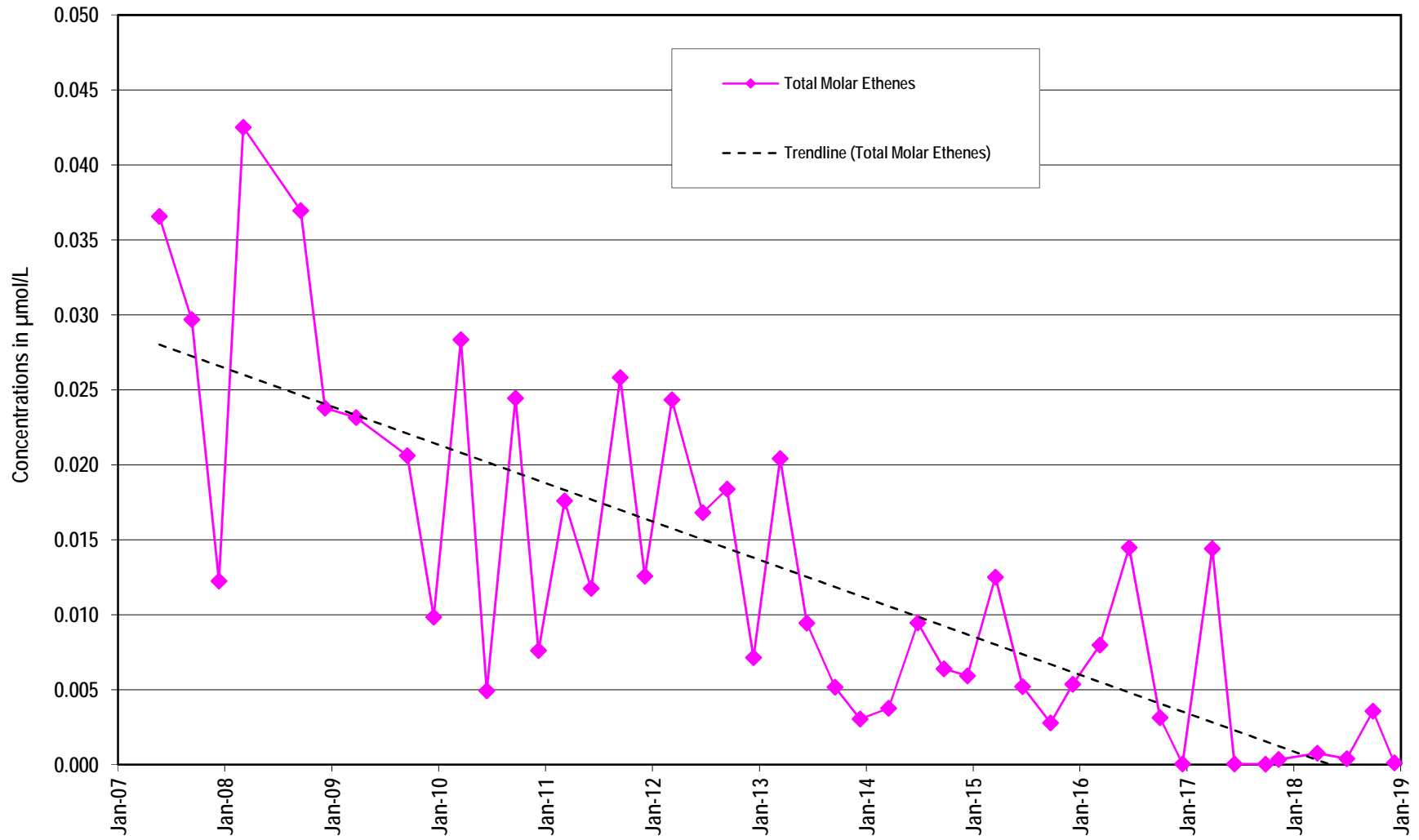


Interim Action Area - VOC Trends: MGMS3-40



Note: Not detected values plotted at 1/2 the reporting limit.

Total Molar Ethenes in MGMS3-40





Cascadia
Associates, LLC