2016 Annual Environmental Monitoring Report
SMC and Cadet Sites
Port of Vancouver

Prepared for
Port of Vancouver USA

April 2017

Prepared by
Parametrix

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SMC and Cadet Sites
Port of Vancouver

Prepared for

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CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional hydrogeologist licensed to practice as such, is affixed below.

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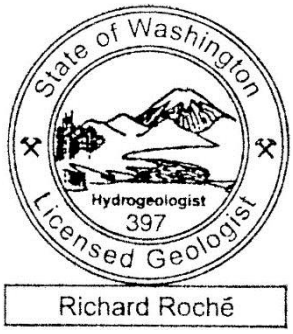

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APPENDICES (ON CD)

ACRONYMS

1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,1,1-TCA	1,1,1-trichloroethane
µg/L	micrograms per liter
AEMR	Annual Environmental Monitoring Report
AO	Agreed Order
AS/SVE	air sparging/soil vapor extraction
Cadet	Cadet Manufacturing Company
cis-1,2-DCE	cis-1,2-dichloroethene
Ecology	Washington State Department of Ecology
GWM	Great Western Malting
gpm	gallons per minute
GPTIA	groundwater pump and treat interim action
MTCA	Model Toxics Control Act
PCE	tetrachloroethene
Port	Port of Vancouver
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
SMC	Swan Manufacturing Company
SVE	Soil Vapor Extraction
TCE	trichloroethene
TGA	Troutdale gravel aquifer
USA	unconsolidated sedimentary aquifer
USGS	U.S. Geological Survey
VOC	volatile organic compound

1. INTRODUCTION

This 2016 Annual Environmental Monitoring Report (AEMR) for the Swan Manufacturing Company (SMC) site (a.k.a. SMC site or former Building 2220 site) and the Cadet Manufacturing Company (Cadet) site was prepared by Parametrix on behalf of the Port of Vancouver (Port). The SMC and Cadet sites are located near the intersection of Fourth Plain Boulevard (or Lower River Road) and Mill Plain Boulevard in Vancouver, Washington (Figure 1-1).

This report summarizes environmental monitoring data collected during 2016 as part of the remedial investigation and feasibility study (RI/FS) and interim cleanup actions at the SMC and Cadet sites. The Port has been conducting the RI/FS at the SMC and Cadet sites to address trichloroethene (TCE) and other related volatile organic compounds (VOCs) in soil and groundwater. The RI for the SMC site was completed in 2009 (Parametrix 2009a) and approved by Ecology in a letter dated May 8, 2009 (Ecology 2009). The RI for the Cadet site was completed in 2010 (Parametrix 2010) and approved by Ecology in a letter dated May 26, 2010 (Ecology 2010). The Port acquired the Cadet property in 2006 as part of a settlement agreement and assumed responsibility for cleanup of the Cadet site at that time. Contamination from the Cadet source had commingled with the SMC contaminant plume in the Port area east of the SMC site. Soil gas, outdoor air, and indoor air sampling were previously completed in the vicinity of the SMC and Cadet sites as an element of the remedial investigations and interim cleanup actions.

An RI/FS is also being conducted at the NuStar Vancouver Terminal facility to address TCE and related VOCs in soil, sediments, and groundwater. The RI for the NuStar site was completed in 2013. The NuStar site is located south of the SMC and Cadet sites adjacent to the north shore of the Columbia River (Figure 1-1).

A jointly prepared final draft FS Report for the NuStar, Cadet, and SMC sites (Parametrix & Apex 2015) was submitted to Ecology in January 2015.

The Port entered into Agreed Order (AO) 07-TC-S DE-5189 on May 1, 2008, which replaced and combined the SMC and Cadet sites into a single AO. This AO was amended effective January 24, 2014, to incorporate the SMC, Cadet and NuStar area-wide groundwater plume and address the collaborative nature of the FS conducted for the SMC, Cadet, and NuStar sites. A new AO (DE 11137) effective March 12, 2015, supersedes prior AOs and requires POV and NuStar to prepare a preliminary Cleanup Action Plan. The Port and NuStar continue to coordinate groundwater quality sampling events.

The term *project area* is used in this report to describe the delineated extent of groundwater contamination from the SMC, Cadet, and NuStar source areas. The project area includes Port-owned property and property owned by others. Although the project area includes the NuStar source, this report focuses on the nature and extent of contamination originating at the SMC and Cadet sites only.

1.1 Purpose

This report documents groundwater data and interpretations for monitoring completed during 2016 as part of the SMC and Cadet RI/FS.

Monitoring of the SMC and Cadet sites has included groundwater, soil gas, indoor air and outdoor air. As documented in prior AEMRs, interim treatment actions completed at the SMC and Cadet sites have resulted in substantial reduction in VOC concentrations. The monitoring program associated with the

SMC and Cadet sites has been, and will continue to be, optimized as contaminant issues and risks are reduced or eliminated. Examples of optimization include discontinuation of air and vapor monitoring and reduction of groundwater monitoring locations and frequency.

The Final Indoor Air Monitoring Evaluation was approved by Ecology in a letter dated March 8, 2013 (Ecology 2013). As summarized in Ecology's approval letter, indoor air monitoring, outdoor air, and soil vapor monitoring were discontinued in 2011 based on the results of additional monitoring conducted from 2009 to 2011. Consequently, since 2012, monitoring associated with the SMC and Cadet sites has been limited to groundwater.

Site-wide groundwater monitoring frequency changed from quarterly to a semi-annual beginning in late 2012 as approved by Ecology in a letter dated September 12, 2012 (Ecology 2012). During 2014, monitoring of SMC source area shallow wells was completed at a quarterly frequency to support the evaluation of interim actions and remedial alternatives assessed in the FS.

During 2015 the Port proposed modification of the groundwater monitoring program to reflect continued reductions of contaminant extent and concentrations. These modifications included reducing the frequency and/or discontinuing sampling at specific Port and Cadet monitoring well locations. These modifications were approved by Ecology (Ecology 2016).

A Groundwater Pump and Treatment Interim Action (GPTIA) was implemented in June 2009 to capture the commingled dissolved VOC plumes sourced from the SMC and Cadet sites and to reduce the concentrations of VOCs in groundwater in the project area. Operation of the GPTIA has been continuous with the exception of periods when maintenance required the system to be shut down. Consistent with Ecology-mandated remedial action objectives, the GPTIA is used to:

- Achieve hydraulic containment of the SMC/Cadet dissolved-phase VOC plume
- Remove dissolved-phase VOCs in groundwater

Hydraulic containment of the plume prevents further migration of contaminants in the aquifer. Removal of the dissolved-phase VOCs remediates the aquifer.

The GPTIA consists of a groundwater extraction well located at the former SMC site and a treatment system using air stripping technology to reduce VOCs to acceptable levels for discharge. Additional details regarding the rationale for selecting and implementing the interim action are summarized in the project Work Plan (Parametrix 2007).

2. GROUNDWATER MONITORING ACTIVITIES

The SMC and Cadet groundwater monitoring well networks are shown on Figures 2-1 and 2-2, respectively. Table 2-1 identifies SMC and Cadet groundwater monitoring wells sampled during 2016. The active groundwater monitoring networks for the SMC and Cadet sites currently consist of 37 and 56 well locations. The Cadet site network includes a number of multi-port wells with each port counted as one well. Groundwater monitoring well completion data are summarized in Table 2-2.

As shown in Table 2-1, the first and third quarter sampling events represent site-wide monitoring events with the objective to provide a comprehensive assessment of groundwater quality conditions at the two sites. The first quarter event is the more comprehensive of the two semi-annual events. The third quarter event focuses on wells within the plume and those that define its edges.

2.1 Groundwater Level Measurements

Due to the dynamic behavior of the groundwater system in the project area, caused by a combination of conditions including high transmissivity, relatively flat groundwater gradients, high river interconnectivity coupled with river stage change (tidal, regional precipitation, and dam discharge), groundwater level data used to develop potentiometric contour maps in the project area had been measured using a network of 16 pressure transducers located in intermediate zone wells since 2006. In 2016, the transducer network was modified based on long-term monitoring data, resulting in a reduction in the number of transducers to six). The distribution of transducers is used to confirm the current understanding of groundwater flow in the project area.

Using data collected from the pressure transducers, 72-hour rolling averages of groundwater levels were calculated and used to produce the potentiometric surface maps for the third quarter monitoring event discussed in Section 3. Transducers were not deployed during the first quarter monitoring event in 2016. Calculation of rolling averages aids in normalizing the influence of tidal fluctuations on groundwater levels (Serfes 1991). This method depicts the mean potentiometric surface (groundwater gradients) in the aquifer for the time period considered. The method and rationale to use 72-hour rolling averages of groundwater levels to produce potentiometric contour maps for the project area is presented in the Final SMC RI Report (Parametrix 2009a).

2.2 Groundwater Quality Sampling Activities

Groundwater quality samples collected from SMC and Cadet monitoring wells during the first quarter and third quarters of 2016 were submitted to Apex Laboratories located in Tigard, Oregon. Submitted samples were analyzed for VOCs by EPA Method 8260B. Groundwater quality samples were collected during the following time periods:

- First Quarter event – March 2 through April 8
- Third Quarter event – September 12 through October 5

Table 2-1 identifies monitoring wells sampled during each sampling event. Appendix A contains a summary of historical groundwater VOC analytical results for the SMC and Cadet sites. All appendices are provided on a CD attached to the back cover of this report. Appendix B contains the Quality Assurance Plan for sample collection, laboratory analysis, and data reporting. Laboratory analytical

reports, chain-of-custody documents, and a data quality assurance review of samples collected during 2016 are included in Appendix C. The data quality assurance review includes a summary of sample data quality and deviations, if any, from the quality control criteria established in the RI/FS Work Plan (Parametrix 1999). The quality assurance review indicates that the data are of sufficient quality to meet project objectives.

SMC and Cadet monitoring wells are sampled using low-flow sampling techniques with limited use of dedicated dual-valve pump or a peristaltic pump at locations where bladder pumps could not be accommodated. Water levels in shallower wells on occasion have been found to be below the intake of the dedicated bladder pump. A peristaltic pump is then used to sample the well if possible. Field methods are documented in Appendix D, and completed field sampling data sheets are included in Appendix F.

The presence of low water levels during the third quarter sampling event resulted in scheduled samples from shallow wells VMW-08, VMW-09, VMW-10 and VMW-11 at the SMC site and CM-MW-05s and CM-MW-20s at the Cadet site not being collected.

3. GROUNDWATER LEVEL RESULTS AND ANALYSIS

Groundwater level data collected from the transducer network described in Section 2.1 were used to develop potentiometric surface maps for the project area. Due to data logger battery failure, water level data from 2016 are limited to six transducers from the third quarter forward. As a result, no potentiometric surface map for the first quarter sampling event was produced. Figure 3-1 shows the calculated 72-hour rolling averages of transducer data for the third quarter of 2016.

As documented in several reports (Parametrix 2009a, 2010, 2011), estimating existing groundwater flow directions in the project area is difficult using conventional methods due to the following conditions:

- The groundwater gradient (potentiometric surface) in the project area, in general, is extremely flat due to a combination of high transmissivity and generally flat topography.
- The dominant influences on groundwater flow in the USA in the project area are tidal fluctuations in the Columbia River and pumping at the GPTIA extraction well. Water level measurements indicate that the USA responds rapidly to changes in river stage. There is a high connectivity between the USA and the river.
- Upstream dam releases, regional runoff events, pumping at the Great Western Malting (GWM)/Port well field, and pumping at City of Vancouver water stations 1 and 3 also influence groundwater flow in the project area.

Pumping wells located in and outside of the project area influence groundwater flow over relatively large areas due to the presence of a flat groundwater gradient and high aquifer transmissivity. As indicated in Section 2.1, groundwater level data initially obtained from a network of 16 pressure transducers are used to develop potentiometric contour maps based a 72-hour rolling average. This method aids in normalizing the influence of tidal fluctuations in groundwater flow and depicts the mean potentiometric surface for the 72-hour period considered (Serfes 1991). Capture zones in the project area are difficult to delineate based on groundwater elevations alone due to the conditions noted above. The Vancouver Lake lowlands groundwater flow model (Parametrix et al. 2008), which considers pumping stresses and river stage conditions, provides a means to best delineate capture zones.

Figure 3-2 displays Columbia River stage data for 2016. Consistent with the 2006 transducer study completed in coordination with Clark Public Utilities (Parametrix et al. 2008), Columbia River stage levels are obtained at the I-5 bridge gaging station (USGS station 1414700) equipped with a transducer owned and maintained by the National Weather Service. Research and survey work completed as part of the 2006 transducer study established a correction required to calibrate the monitoring well transducer survey datum with the I-5 bridge gaging station datum. The 72-hour rolling average river stage elevation also is presented on Figure 3-1.

As shown on Figure 3-2, river stage changes can be significant (over 7 feet during the first quarter sampling event in 2016) during the course of a sampling event and between events. River stage changes are manifested in variable water levels occurring in monitoring wells and in the apparent groundwater flow direction during short periods (e.g., less than an hour) in the project area. Water levels in wells located closest to the river tend to change most rapidly in response to river stage change. In contrast, wells located farther away from the river tend to have a more muted and lagged response to river stage change. The influence of river stage changes in addition to production and extraction well pumping affects groundwater flow in the project area.

General observations of Columbia River stage and groundwater levels include:

- Groundwater levels in the project area vary seasonally throughout the period of record. Generally, seasonal low groundwater elevations occur between July and December, while seasonal high groundwater elevations occur between January and June. These low and high groundwater elevation periods correspond to seasonal Columbia River stage conditions. The highest river stage in 2016 occurred in mid-March (12.74 feet on March 13th) resulting from spring precipitation and resulting snowmelt.
- Groundwater elevations measured during each semi-annual event of 2016 are generally consistent with historical elevations observed since 2002, suggesting a similar yearly pattern of high and low elevations during the periods of January through June and July through December, respectively.

Groundwater gradient and flow directions based on transducer data collected in the project area during 2016 are summarized as follows (as noted above, there are no data available for the first quarter of 2016).

- Third quarter 2016 monitoring event: Overall groundwater flow in the project area is generally toward the GPTIA extraction well EW-1 located at the SMC site (Figure 2-1,) with a generally flat area northeast of the Columbia River between Lower River Road and the Port area. Rolling average groundwater flow directions for the third quarter 2016 event are shown on Figure 3-1. During the period represented on Figure 3-1, the river stage elevation was lower than groundwater elevations at all measured wells. Historical groundwater flow directions were taken into account where there is an absence of groundwater level data.

In general, the third quarter 2016 potentiometric surface and associated groundwater flow directions are consistent with flow directions observed since operation of the GPTIA commenced in 2009. Observed flow directions are generally toward the GPTIA extraction well from the northwestern and eastern portions of the project area.

4. GROUNDWATER QUALITY RESULTS AND EVALUATION

VOC analytical results for groundwater samples collected at the SMC and Cadet sites during 2016 are summarized in Table 4-1. Only compounds detected during 2016 are summarized in Table 4-1. Appendix A contains historical and current groundwater VOC analytical data for the two sites. Laboratory analytical reports, chain-of-custody documents, and data validation reports are included in Appendix C.

The overall distribution of VOC contamination in the project area has been defined using analytical results of groundwater samples collected for more than 15 years as part of the SMC, Cadet, and NuStar investigations. Data collected during 2016 indicate overall continued decline of contaminant concentrations in groundwater.

The evaluation of VOCs in groundwater in the project area is primarily based on use of concentration trends and isoconcentration maps for each USA monitoring zone (e.g., shallow, intermediate, and deep). As indicated in Table 4-1, nine different VOCs were detected in groundwater samples collected during 2016. The evaluation of groundwater results focused on the distribution of TCE and tetrachloroethene (PCE), because these two compounds are most frequently detected and best represent the extent of chlorinated solvent contamination associated with the SMC and Cadet sites. Wherever TCE-related compounds such as cis-1,2-dichloroethene (cis-1,2-DCE) or 1,1-dichloroethene (1,1-DCE) were detected, TCE and/or PCE were also detected and at higher concentrations, with the exception of wells located north of the NuStar site.

4.1 Results

TCE and PCE isoconcentration maps for the shallow, intermediate, and deep USA zone wells are presented on Figures 4-1 through 4-15; isoconcentration maps are based on data collected during the first and third quarters of 2016. VOC detections (PCE and TCE) associated with the NuStar site source are also included on the isoconcentration maps. The TCE plume is defined by a 4-micrograms per liter (µg/L) contour representing the Model Toxics Control Act (MTCA) Method B cleanup level for TCE. The PCE plume is defined by a 5 µg/L contour representing the Federal Drinking Water Maximum Contaminant Level as the MTCA Method B cleanup level is higher.

The analysis for this report focuses on the contaminant distribution associated with the SMC and Cadet sites. The isoconcentration maps also consider historical detections at well locations that were not sampled during the first and third quarters of 2016. A separate figure displaying concentrations in the TGA is not included in this report as only one TGA well (CM-MW-29TGA) was sampled in 2016.

TCE and PCE concentration trends (time series plots) for individual wells are included in Appendix E. Two sets of time series plots are provided in Appendix E: full period and short period. The following is a description of the two time series plot types:

- Full period: January 1997 to September 2016 – These plots show the full TCE and PCE concentration record for each well. Soil and groundwater interim actions completed at the SMC and Cadet sites from 2002 through 2004 resulted in significant VOC reductions.

- Short period: January 2009 to September 2016 – These plots show the TCE and PCE concentration record for each well since 2009. Operation of the GPTIA began June 2009 as indicated on the plots. Due to significant reductions in TCE and PCE concentrations, these plots show concentrations at reduced scales to provide better resolution of recent results.

4.2 Evaluation

Analytical results for samples collected from SMC and Cadet monitoring wells during 2016 are discussed for each groundwater quality zone. Results specific to the SMC and Cadet sites are presented to provide an understanding of cleanup progress occurring at each site.

4.2.1 Shallow USA Zone

Shallow well TCE and PCE concentrations in 2016 were generally consistent with results from 2015. Overall, the data indicate a continued decrease in VOC concentrations and plume extent in response to continued operation of the GPTIA. With the exception of wells located in the SMC source area and CM-DPW-01 located at the Cadet facility, concentrations of TCE and PCE in shallow wells have been reduced to below 10 µg/L. Concentrations of TCE and PCE in shallow source area wells have decreased significantly since startup of the GPTIA in June 2009, as indicated in time series plots (Appendix E). Figure 4-5 shows changes in the shallow zone TCE plume since 2009.

4.2.1.1 SMC

TCE and/or PCE were detected in all 15 active shallow SMC (not including SMC shallow wells with contamination associated with the NuStar site) wells in 2016. The only related breakdown product detected was cis-1,2-DCE in SMC shallow source area wells VMW-09 and MW-05. Consistent with historical analytical results, the highest concentrations of TCE (1,930 µg/L during the third quarter) and PCE (108 µg/L during the third quarter) during 2016 were detected in shallow source area well MW-05. The highest concentration of cis-1,2-DCE (23.7 µg/L) was detected in MW-05 during the third quarter.

TCE concentrations in SMC shallow source area wells have been relatively stable or declining, and are consistent with results from 2015. As TCE is the primary contaminant at the SMC site, trends and plume geometry are discussed in terms of the extent of this compound. In 2016, the shallow TCE plume extended in a generally east-southeast direction from the SMC source with its eastern boundary in the vicinity of MW-7 (Figures 4-1 and 4-2). As noted in Section 2.2, low water levels did not allow for samples to be collected from wells VMW-08, VMW-09, VMW-10 and VMW-11 during the third quarter event.

4.2.1.2 CADET

There are 24 active shallow Cadet wells. During 2016, there were 4 shallow wells where TCE was detected above 4 µg/L and one shallow well where PCE was detected above 5 µg/L. The only other VOC detected in 2016 was 1,1,1-TCA at CM-DPW-01 and CM-DPW-06 located adjacent to the east side of the Cadet facility parking lot. Chloroform was detected below the method reporting limit in CM-MW-06s, CM-MW-19s, CM-MW-23s, and CM-MW-25s but is not considered a contaminant associated with the Cadet site.. Chloroform has been consistently detected in CM-MW-19s since early 2008, with concentrations slowly decreasing since early 2009. Chloroform has been occasionally detected in

CM-MW-6s, CM-MW-23s, and CM-MW-25s typically prior to 2013. The highest concentrations of TCE (36.2 µg/L) and PCE (5.31 µg/L) were detected during the third quarter in CM-DPW-01.

VOC concentrations in all Cadet shallow wells have declined significantly since startup of the GPTIA in June 2009. However, Cadet source area shallow wells CM-DPW-01 and CM-DPW-06 have exhibited slightly increasing TCE concentrations since 2012. The shallow plume associated with the Cadet site as defined by a 4 µg/L contour is generally confined to the vicinity of these two wells on the east side of the Cadet facility with lower concentrations extending farther east and northeast (Figures 4-1 and 4-2). As noted in Section 2.2, low water levels did not allow for samples to be collected from wells CM-MW-05s and CM-MW-20s during the third quarter event.

4.2.2 Intermediate USA Zone

TCE and PCE isoconcentration maps for intermediate wells during the 2016 first and third quarter sampling events are presented on Figures 4-6 through 4-9. Overall, TCE and PCE concentrations detected in intermediate zone wells associated with the SMC and Cadet sites continue to decline, with a few wells remaining stable. The Cadet intermediate zone plume is approximately the same in extent compared to 2015 with concentrations within the plume declining slightly. Figure 4-10 shows changes in the intermediate zone TCE plume since 2009.

4.2.2.1 SMC

There are 11 active intermediate SMC wells. During 2016, there were seven intermediate wells where TCE was detected above 4 µg/L and two shallow wells where PCE was detected above 5 µg/L. Additional VOCs cis-1,2-DCE, 1,1,1-TCA, 1,1-DCA, and 1,1-DCE were also detected in the intermediate zone at well MW-05i. These additional VOCs were not detected in intermediate SMC wells that do not have contamination associated with the NuStar site (although cis-1,2 DCE was detected in shallow SMC source area wells). The highest concentration of TCE, or any other VOC, in an intermediate zone SMC well during 2016 was detected in MW-37i (TCE 41.4 µg/L) during the first quarter. This well is located east of GWM with detected TCE interpreted as coming from a source other than SMC or Cadet. Historically, the highest concentrations of TCE were detected in samples collected from well MW-07i, located directly down-gradient of the SMC source area. VOC concentrations detected in groundwater samples collected from MW-07i have decreased significantly since the start of the GPTIA. Currently the highest SMC-related concentrations in the intermediate zone occur at source area well MW-05i, which has seen higher concentrations since the implementation of the GPTIA.

In 2016, the intermediate plume associated with the SMC source extended in a north-northeast direction with a southern extent just north of MW-07i. A small remnant portion of the plume is still present in the vicinity of GWM. The intermediate zone plume continued to contract between 2015 and 2016, with concentrations within the defined plume also decreasing.

4.2.2.2 CADET

There are 20 active intermediate Cadet wells. During 2016, similar to the SMC intermediate wells, there were seven intermediate wells where TCE was detected above 4 µg/L and two shallow wells where PCE was detected above 5 µg/L. Additionally, cis-1,2-DCE was detected in six intermediate zone wells. The highest concentration of any VOC in an intermediate zone Cadet well during 2016 was detected in

CM-MW-23i (TCE 12.24 µg/L) during the third quarter. CM-MW-23i is located northeast of the Cadet source area in the Fruit Valley Neighborhood.

Prior to startup of GPTIA operation in 2009, CM-MW-04i had the highest TCE concentrations in the intermediate USA. Immediately following startup of the GPTIA, TCE concentrations in intermediate zone Cadet wells decreased notably, with increasing concentrations observed at CM-MW-20i, which is located just north of the GPTIA extraction well. More recently, TCE concentrations in CM-MW-20i have consistently been declining.

4.2.3 Deep USA Zone

TCE and PCE isoconcentration maps for deep wells during the 2016 first and third quarter sampling events are presented on Figures 4-11 through 4-14. Concentrations of TCE and PCE detected in deep zone wells have generally remained stable since 2012 after initially decreasing following GPTIA startup in 2009. Figure 4-15 shows changes in the intermediate zone TCE plume since 2009.

4.2.3.1 SMC

TCE, PCE, and cis-1,2-DCE were detected in four of the four active deep SMC wells in 2016. During 2016, TCE was detected above 4 µg/L in the four deep wells. PCE was detected above 5 µg/L in one well (MW-01d). In addition, 1,1,1-TCA, 1,1-DCA, and/or 1,1-DCE were also detected in two of those four wells.

4.2.3.2 CADET

TCE and PCE were detected in 11 of the 11 active deep Cadet wells in 2016. During 2016, there were eight intermediate wells where TCE was detected above 4 µg/L and two shallow wells where PCE was detected above 5 µg/L. In addition, 1,1,1-TCA, cis-1,2-DCE, 1,1-DCA, and/or 1,1-DCE were detected in 10 of those 11 wells.

4.2.4 TGA

Consistent with historical data, TGA well CM-MW-29TGA (associated with the Cadet site) is the only active TGA well with detectable VOC concentrations. TCE, PCE, and cis-1,2-DCE were detected in the 2016 event sample collected from CM-MW-29TGA. Concentrations of TCE and PCE detected in CM-MW-29TGA have decreased since startup of the GPTIA in 2009. Benzene was detected in CM-MW-29TGA in 2015, but not 2016. VOC analytical results for TGA wells are presented in Table 4-1.

5. INTERIM ACTION STATUS SUMMARIES

As documented in the Remedial Investigation reports (Parametrix 2009a, 2010), interim actions were implemented at the SMC and Cadet sites to remediate VOC concentrations in soil, groundwater, and indoor air. The majority of these interim actions were completed prior to 2016, with the exception of the GPTIA, which was installed at the SMC site and started operation in June 2009 and has continued to operate since. The following sections summarize the status of the remaining operating interim action (GPTIA) and the inactive Air Sparge/Soil Vapor Extraction (AS/SVE) system at the Cadet site source area.

5.1 Groundwater Pump and Treat Interim Action System

The GPTIA was installed to reduce VOC concentrations in the USA and to provide hydraulic capture for the commingled Cadet and SMC plumes. Operation of the GPTIA was initiated on June 22, 2009. Hydraulic capture is provided by a groundwater extraction well (EW-1) located in the SMC source area (Figure 2-1) which currently operates at an average flow rate of approximately 2,500 gallons per minute (gpm). Extracted groundwater is treated ex-situ (i.e., above ground) by an air stripping process prior to discharge in accordance with a National Pollutant Discharge Elimination System permit.

The GPTIA extracted and treated approximately 1.303 billion gallons of groundwater and removed approximately 75 pounds of VOCs during 2016. The following table summarizes monthly operation of the GPTIA system during 2016.

GPTIA Monthly Monitoring for 2016

Month	Total flow (million gallons)	VOCs removed (pounds)
January 2016	91.3	5.01
February 2016	106.9	6.79
March 2016	114.3	6.70
April 2016	110.5	6.91
May 2016	114.0	6.96
June 2016	110.3	7.51
July 2016	114.0	5.85
August 2016	114.0	6.18
September 2016	110.3	5.33
October 2016	104.6	5.59
November 2016	99.0	5.55
December 2016	114.1	6.15
Total	**1303**	**75**

The GPTIA system experienced minor operational issues in January and November associated with significant precipitation events that resulted in reduced flows and mass removal during those months.

The GPTIA system has pumped a total of 9.59 billion gallons and removed approximately 1,135 pounds of VOCs since beginning operation in 2009 through the end of 2016.

GPTIA operation is will continue at an approximate flow rate of 2,500 gpm. System O&M will occur on an as-needed basis, and sampling in support of GPTIA-associated National Pollutant Discharge Elimination System and Southwest Clean Air Agency permits will be performed on a monthly basis.

5.2 Air Sparge/Soil Vapor Extraction System

An SVE system associated with the Cadet facility was initiated in May 2002, and the associated AS portion of the AS/SVE system began operation in October 2003. The system consists of 41 SVE wells and 73 AS wells and associated contaminant removal equipment. The purpose of this system was to reduce concentrations of VOCs in groundwater and soil gas beneath the Cadet site and indoor air within the Cadet building through a process of stripping VOCs out of groundwater with the AS wells and removing VOCs from the subsurface via the SVE wells.

As documented in the AS/SVE Performance Evaluation Report (Parametrix 2009b), the AS/SVE system has effectively remediated groundwater and soil gas beneath the Cadet site and indoor air within the Cadet building. Ecology approved shut-down of the system in July 2011. An evaluation and decommissioning memorandum was submitted to Ecology in December 2014 (Parametrix 2014) and was approved by Ecology in April 2015 (Ecology 2015).

6. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on field and analytical data collected during 2016 sampling events and previous site data.

6.1 Conclusions

Results of 2016 sampling of groundwater indicate continued overall decline of VOC concentrations in groundwater and reduction of the overall plume in response to prior interim actions and continued operation of the GPTIA. More specific conclusions include:

- The overall extent of the SMC and Cadet dissolved VOC plume continues to contract though the rate of contraction has decreased over time.
- VOC concentrations in the SMC and Cadet shallow groundwater monitoring wells continue to indicate an overall declining trend.
- VOC concentrations in a majority of the SMC and Cadet intermediate USA zone wells continue to decline. The more recent significant reductions in intermediate zone wells are attributed to the GPTIA.
- VOC concentrations in a majority of the SMC and Cadet deep USA zone wells are stable. After initially declining following operation of the GPTIA, concentrations have varied slightly.

6.2 Recommendations

The following recommendations are based on the findings of the 2016 monitoring program:

- Continue operation of the GPTIA to further reduce VOC concentrations in the project area.
- Continue groundwater monitoring to evaluate GPTIA effectiveness, but prepare an analysis for Ecology approval focused on streamlining the program to reflect current conditions.
- Continue to use limited deployment of transducers to monitor for changes in current understanding of groundwater flow direction at the site. Download, process, and present transducer results only if needed.
- Continue to coordinate SMC and Cadet groundwater monitoring events with monitoring at the NuStar site.

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Tables

Table 2-1 - Groundwater Monitoring Schedule

Well Name	2015				2016				2017				Notes	Sample Schedule Rationale (for 2017)
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
Swan Site Monitoring Wells														
IMW-05	X	X	-		X		X		X		X		Source area. Declining trend since GPTIA	Semi-annual sampling. Additional source area data.
MW-01	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Usually NDs, outside of plume.	Inactive monitoring point.
MW-01d	X		X		X		X		X		X		Regular fairly consistent detects. Deep USA well. Possible downward trend.	Semi-annual. Regular detects. Confirmation sampling.
MW-02	X		-		X		X		X		X		Downgradient of source area. Slight downward trend	Semi-annual sampling for GPTIA monitoring.
MW-02d	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	TGA well. Historically NDs. Previsouly classified as deep USA well.	Inactive monitoring point.
MW-03	D	D	D	D	D	D	D	D	D	D	D	D	Well decommissioned on 9/18/08.	Well decommissioned.
MW-04	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Below 1 ppb or ND. Declining trend since GPTIA.	Inactive monitoring point.
MW-04i	X				X				X				Historically NDs. TCE detected 2014 Q1.	Annual sampling. Outside of plume. Confirmation sampling.
MW-04d	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Historically NDs. Deep USA well.	Inactive monitoring point.
MW-05	X	X	X		X		X		X		X		Source area. Showing GPTIA decline.	Semi-annual sampling for GPTIA monitoring. Source area well.
MW-05i	X		X		X		X		X		X		Historically NDs. Regular detects beginning with GPTIA.	Semi-annual sampling. Source area well. Monitor GPTIA changes.
MW-05d*****	D	D	D	D	D	D	D	D	D	D	D	D	Peaking variable behavior. Well decommissioned in 11/06.	Well decommissioned.
MW-05dR	X		X		X		X		X		X		Replacement well for MW-5d, declining trend, below 20 µg/l TCE.	Semi-annual sampling. Monitor GPTIA changes.
MW-06	X		-		X		X		X		X		Regular fairly consistent detects. Stable	Semi-annual sampling. Stable conditions. Monitor GPTIA changes.
MW-07	X		-		X		X		X		X		Regular fairly consistent detects. Stable	Semi-annual sampling. Stable conditions. Monitor GPTIA changes.
MW-07i	X		-		X		X		X		X		Regular fairly consistent detects. Declining trend	Semi-annual sampling. Declining levels. Monitor GPTIA changes.
MW-08	X		-		X		X		X		X		Regular fairly consistent detects. Stable	Semi-annual sampling. Monitor GPTIA changes.
MW-08i	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Historically NDs.	Inactive monitoring point.
MW-09	X		X		X		X		X		X		Downward trend since GPTIA.	Semi-annual sampling. Showing GPTIA change.
MW-10	X		-		X		X		X		X		Regular fairly consistent detects. Stable	Semi-annual sampling. Monitor GPTIA changes.
MW-11	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	PCE detects below 1ppb. Source uncertain - NuStar?	Inactive monitoring point.
MW-12	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Historically NDs	Inactive monitoring point.
MW-12d	X		X		X		X		X		X		Regular fairly consistent detects. Stable below 15ppb. Deep USA well	Semi-annual sampling. Monitor GPTIA changes.
MW-13*	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Not sampled. Perched gw zone well. NDs.	Inactive monitoring point.
MW-13d	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	TGA well. Historically NDs.	Inactive monitoring point.
MW-14d	X		X		X		X		X		X		Regular fairly consistent detects. Stable below 15ppb. Deep USA well	Semi-annual sampling. Regular detects; stable. GPTIA change?.
MW-15	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Historically NDs	Inactive monitoring point.
MW-15i	X		X		X		X		X		X		Historically below 5 ppb. Recently increasing. Inter USA well.	Semi-annual sampling. Showing GPTIA change?
MW-16	X		X		X		X		X		X		Stable since GPTIA.	Semi-annual sampling. GPTIA monitoring.
MW-16d	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Historically NDs. TGA well	Inacitve monitoring point.
MW-17	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Historically NDs	Inactive monitoring point.
MW-17d	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Historically NDs. TGA well	Inactive monitoring point.
MW-18	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	NDs for over 8 years.	Inactive monitoring point.
MW-18i	X		X		X		X		X		X		Regular detections. Stable below 10ppb.	Semi-annual sampling. GPTIA monitoring.
MW-19s	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	ND for over 6 years. Near GWM-5 well.	Inactive monitoring point.
MW-19i	X		-		X		X		X		X		Regular detections.Declining trend	Semi-annual sampling. GPTIA monitoring and GWM influence.
MW-20	X		-		X		X		X		X		Stable. Notable decline since GPTIA	Semi-annual sampling. GPTIA monitoring.
MW-21	X		-		X		X		X		X		Stable. Notable decline since GPTIA	Semi-annual sampling. GPTIA monitoring.
MW-22**	D	D	D	D	D	D	D	D	D	D	D	D		Well decommissioned.
MW-23	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	NDs for over 8 years.	Inactive monitoring point.
MW-24	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Historically NDs.	Inactive monitoring point.
MW-24i	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	ND since 2011.	Inactive monitoring point.
MW-25	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Variable. Historically below 5 ppb. ND in 2012.	Inactive monitoring point.
MW-26i	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Variable. ND in 2014. Below 5 ppb.	Inactive monitoring point.
MW-28s	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	One detection. Rest NDs. Outside of plume.	Sampling discontinued 2008. Inactive monitoring point.
MW-28i	X		X		X				X				Variable. Declining trend. GPTIA influence?	Annual sampling. Monitor GPTIA changes.
MW-29i	X				X				X				Historically NDs. Recent detections.	Annual sampling. Outside of plume. Confirmation sampling.
MW-30i	X		X		X				X				Some variability. GPTIA influence on NT plume.	Annual sampling. Some variabiliy; downgradient of NT source. Monitor GPTIA changes
MW-31i	X		X		X		X		X		X		Variable concentrations over time. GPTIA influence on NT source.	Semi-annual sampling. Some variabiliy; downgradient of NT source. Monitor GPTIA changes
MW-32s	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Historically NDs. Well screened in silt overbank deposit.	Inactive monitoring point.
MW-32i	X		X		X		X		X		X		Variable concentrations over time. GPTIA influence.	Semi-annual sampling. Downgradient of NT source. Monitor GPTIA changes. Ash Creek (NS site) samples well quarterly.
MW-33s	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Historically NDs. Recent detection. Below 5 ppb.	Inactive monitoring point.
MW-33i	X		X		X		X		X		X		Variable concentrations over time. GPTIA influence.	Semi-annual sampling. Some variabiliy; downgradient of NT source. Monitor GPTIA changes.
MW-34i	X		X		X				X				Some variability. Declining due to GPTIA?	Annual sampling. Some variabilty; Cross-gradient of NT source. Monitor GPTIA changes
MW-35s	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Historically NDs. Screened above plume.	Sampling discontinued 2008. Inactive monitoring point.
MW-35i	X		X		X		X		X		X		Some variability. Some decline due to GPTIA?	Semi-annual sampling. Monitor GPTIA change.
MW-36s	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Mostly NDs. Below 5 ppb with exception.	Inactive monitoring point.
MW-36i	X		X		X				X				Some variability. Possible decline due to GPTIA.	Annual sampling. Monitor GPTIA changes
MW-37s	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Historically NDs. Screened above plume.	Sampling discontinued 2008. Inactive monitoring point.

Table 2-1 - Groundwater Monitoring Schedule

Well Name	2015				2016				2017				Notes	Sample Schedule Rationale (for 2017)
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
MW-37i	X		X		X		X		X		X		Regular TCE only detections; stable. Another source?	Semi-annual sampling. Regular detections. Stable. TCE only detected. Monitor GPTIA changes.
MW-38i	X		X		X		X		X		X		Regular almost only TCE detections. Same source as MW-37i? Apparent downward TCE trend.	Semi-annual sampling. Monitor GPTIA changes.
MW-39s	D	D	D	D	D	D	D	D	D	D	D	D	Decommissioned February 2011	
MW-E	X		X		X		X		X		X		Variable concentrations. Shallow well sreened below silt north of NT site.	Semi-annual sampling. Some variabiliy; downgradient of NT source. Monitor GPTIA and NS interim action changes.
MW-F	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	No detections since 2012. Above and possibly cross-gradient of NT plume.	Inactive monitoring point.
MW-G	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Some variability. No detections in 2014.	Inactive monitoring point.
VMW-08	X	X	-		X		-		X		X		Source area. Variable, not sampled, dry Q3 2016	Semi-annual sampling. Additional source area data.
VMW-09	X	X	-		X		-		X		X		Source area. Variable, not sampled, dry Q3 2016	Semi-annual sampling. Additional source area data.
VMW-10[1]	X	X	-		X		-		X		X		Source area. Variable, not sampled, dry Q3 2016	Semi-annual sampling. Additional source area data.
VMW-11[1]	X	X	-		X		-		X		X		Source area. Variable, not sampled, dry Q3 2016	Semi-annual sampling. Additional source area data.
Cadet Site Monitoring Wells														
CM-MW-01s	X		X		X		X		X		X		Occasional use of peristaltic when WL is low. Noisy data.	Semi-annual sampling. Declining trend since GPTIA. Downgradient of source.
CM-MW-01i	X		X		X		X		X		X		Recent concentration < 10 ug/l. GPTIA decreasing trend. Downgradient of source.	Semi-annual sampling. Monitor GPTIA changes.
CM-MW-01d-040	X				X				X				Decreasing to stable concentrations.	Annual sampling. Declining trend since GPTIA.
CM-MW-01d-121	X		X		X		X		X		X		Recent concentration < 20 ug/l. Decreasing trend. Downgradient of source.	Semi-annual sampling. Monitor GPTIA changes.
CM-MW-01d-161	X		X		X				X				Fairly stable.	Annual sampling. Monitor GPTIA changes.
CM-MW-01d-194	X		X		X		X		X		X		Fairly stable.	Semi-annual sampling. Check TCE trend. Monitor GPTIA changes.
CM-MW-01d-224	X		X		X				X				Fairly stable.	Annual sampling. Fairly stable. Monitor GPTIA changes.
CM-MW-02s	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Has been NDs for several years.	Inactive monitoring point.
CM-MW-02d	X		X		X		X		X		X		Fairly stable. Possible upward trend.	Semi- annual sampling as of 2015. Deep well. Confirmation sampling.
CM-MW-03s	X		X		X		X		X		X		Concentrations below 5 ug/l.	Semi-annual sampling. Monitoring GPTIA change.
CM-MW-03d-060	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Showing GPTIA declining trend. Low concentrations. Port since 2009.	Port inoperable. Inactive monitoring point.
CM-MW-03d-100	X		X		X				X				Concentrations lower and stable since GPTIA.	Annual sampling. Monitoring GPTIA change.
CM-MW-03d-141	X		X		X				X				Possible downward trend. Low concentrations. Deep well.	Annual sampling. Generally stable levels.
CM-MW-03d-181	X		X		X				X				Possible downward trend. Low concentrations. Deep well.	Annual sampling. Generally stable levels.
CM-MW-03d-227	X		X		X		X		X		X		Low concentrations. Deep well.	Semi-annual sampling. Generally stable levels.
CM-MW-04s	X		-		X		X		X		X		Need to use peristaltic pump when WL is low. Stable around 5ppb. Dry 2015 Q3.	Semi-annual sampling. Monitor GPTIA changes.
CM-MW-04i	X		X		X		X		X		X		Notable decrease since GPTIA. Below 20 µg/l.	Semi-annual sampling. Monitor GPTIA changes.
CM-MW-05s	X		X		X		-		X		X		Need to use of peristaltic pump when WL is low.Showing GPTIA change. Dry 2016 Q3.	Semi-annual sampling. Monitor GPTIA changes.
CM-MW-05i	X		X		X		X		X		X		Fairly stable and low concentrations.	Semi-annual sampling.
CM-MW-05d	X		X		X		X		X		X		Slight variability but generally stable.	Semi-annual. Generally stable conditions.
CM-MW-06s***	X		X		X		X		X		X		Stable below 5ppb.	Semi-annual sampling. Monitor GPTIA changes.
CM-MW-07s	X		X		X		X		X		X		Generally low concentrations. Located near plume boundary.Stable below 2ppb.	Semi-annual sampling.Monitor GPTIA changes.
CM-MW-07i	X		X		X		X		X		X		Stable concentrations.	Semi-annual sampling. Stable. Monitor GPTIA changes.
CM-MW-07d	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Below 1 ppb since 2005. Stable deep well.	Inactive monitoring point.
CM-MW-08s	X		-		X				X				Need to use a peristaltic pump when WL is low. Dry 2015 Q3.	Annual sampling. Monitor GPTIA changes.
CM-MW-09s	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Usually NDs.	Inactive monitoring point.
CM-MW-10s	X				X				X				Fairly stable. Below 5 ppb. Near plume boundary.	Annual sampling. Historically <5 ppb. Confirmation sampling.
CM-MW-10d	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Historically NDs. TGA well.	Inactive monitoring point.
CM-MW-15s	X		X		X				X				Showing delining trend. < 5 ppb. An intermediate depth well. Cross-gradient location. ND in 2014 Q3.	Annual sampling. Monitor GPTIA changes.
CM-MW-16s****	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Iron fouling. Well eliminated from sample list. NDs.	Inactive monitoring point.
CM-MW-17i	X		X		X				X				Well located beneath Cadet facility. Recent < 5 ppb. Showing GPTIA influence.	Annual sampling. Monitor GPTIA changes.
CM-MW-18s	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	ND since 2012.	Inactive monitoring point.
CM-MW-18i	X		X		X		X		X		X		Low concentrations < 10 ppb. Variable. Located outer area of plume. PCE ND.	Semi-annual sampling. Edge of plume location. Variable and low concentraitons.
CM-MW-18d	X		X		X		X		X		X		Stable with slight variability. Possible downward trend.	Semi-annual sampling. Stable, northern lobe deep well.
CM-MW-19s	X		X		X				X				Historically ND. Recent detections in 2013 and 2014.	Annual sampling.

Table 2-1 - Groundwater Monitoring Schedule

Well Name	2015				2016				2017				Notes	Sample Schedule Rationale (for 2017)
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
CM-MW-19i	X		X		X		X		X		X		Low concentrations < 5 ppb. Showing GPTIA influence? Increasing trend prior to GPTIA.	Semi-annual sampling. Some variability.
CM-MW-19d	X		X		X		X		X		X		Deep zone well. Stable with slight variability. Concentrations < 15 ppb. Possible downward trend.	Semi-annual sampling. Stable, northern lobe deep well.
CM-MW-20s	X		-		X		-		X		X		Need to use a peristaltic pump when WL is low. Located between Cadet site and GPTIA. Showing declining concentration. Dry 2016 Q3.	Semi-annual sampling. Monitor GPTIA changes
CM-MW-20i	X		X		X		X		X		X		Intermediate well located between Cadet source and GPTIA. Decliningsince GPTIA.	Semi-annual sampling. Monitor GPTIA changes.
CM-MW-21s	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Usually NDs. Outside of plume.	Inactive monitoring point.
CM-MW-21i	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Generally NDs. Well inaccessible in 2013. PCE detected in 2014 Q1.	Inactive monitoring point.
CM-MW-22s	X		X		X				X				Well located near Cadet source area. Intermediate zone well. Showing declining trend.	Annual sampling. Monitor GPTIA changes.
CM-MW-23s	X		X		X		X		X		X		Has been showing possible decreasing trend.	Semi-annual sampling. Monitor GPTIA changes
CM-MW-23i	X		X		X		X		X		X		Slight decreasing trend. Higher concentration zone.	Semi-annual sampling. Monitor GPTIA change.
CM-MW-24s	X		X		X				X				Decreasing trend < 5 ppb. Recent NDs.	Annual sampling. Monitor GPTIA change.
CM-MW-24i	X		X		X		X		X		X		Decreasing trend. Recently above 5 ppb.	Semi-annual sampling.
CM-MW-25s	X		X		X		X		X		X		Declining trend sicne GPTIA.	Semi-annual sampling. Monitor GPTIA changes.
CM-MW-26s	X		X		X				X				Decline since GPTIA.	Annual sampling. Monitor GPTIA changes.
CM-MW-27TGA	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Usually NDs. TGA.	Inactive monitoring point.
CM-MW-27USA-049.5	X		X		X		-		X		X		Variable since GPTIA. ND 2014 Q3. Port malfunction 2016 Q3.	Semi-annual sampling. Monitor GPTIA changes
CM-MW-27USA-090	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Port has never worked per 2005 Cadet RI Report.	Inactive monitoring point.
CM-MW-27USA-127	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Port has never worked per 2005 Cadet RI Report.	Inactive monitoring point.
CM-MW-28TGA	X		IA	IA	IA	IA	IA	IA	IA	IA	IA	IA	Historically NDs.	Inactive monitoring point.
CM-MW-28USA-050	X		X		X				X				Inermediate depth zone well. Generally below 5 ppb. Stable since GPTIA.	Annual sampling. Northern plume monitoring point.
CM-MW-28USA-120.5	X		X		X		X		X		X		Some variability. Appears declining since GPTIA.	Semi-annual sampling. Northern plume monitoring point.
CM-MW-28USA-180	X		X		X		X		X		X		Stable, remains below 5 ppb.	Semi-annual sampling. Northern plume monitoring point.
CM-MW-29TGA	X				X				X				Regular detections. Fairly stable. Only TGA well with regular detections. Declining trend.	Annual sampling.
CM-MW-29USA-060.5	X		X		X				X				Showing some variability. Decreasing trend, GPTIA influence? <5 ppb.	Annual sampling. Monitor GPTIA changes.
CM-MW-29USA-100	X		X		X				X				Showing some variability. Decreasing trend, GPTIA influence? <5 ppb.	Annual sampling. Monitor GPTIA changes.
CM-MW-29USA-140.5	X		X		X		X		X		X		Showing some variability. Decreasing trend, GPTIA influence? <5 ppb.	Semi-annual sampling. Monitor GPTIA changes.
CM-VE-09	X		X		X		X		X		X		Variable below 10ppb. Cadet source area location.	Semi-annual sampling. Monitor GPTIA changes.
CM-VE-10	X		X		X				X				Variable below 10ppb. Cadet source area location.	Annual sampling. Monitor GPTIA changes.
CM-VE-11	X		X		X		X		X		X		Variable below 10ppb. Cadet source area location.	Semi-annual sampling. Monitor GPTIA changes.
CM-VE-12	X		X		X				X				Variable below 10ppb. Cadet source area location.	Annual sampling. Monitor GPTIA changes.
CM-DPW-01	X		X		X		X		X		X		Decline since GPTIA. Cadet source area location.	Semi-annual sampling. Monitor GPTIA changes.
CM-DPW-06	X		X		X		X		X		X		Decline since GPTIA. Cadet source area location.	Semi-annual sampling. Monitor GPTIA changes.
CM-DPW-10	X		X		X				X				Decline since GPTIA. Cadet source area location.	Annual sampling. Monitor GPTIA changes.
CM-DPW-16	X		X		X				X				Decline since GPTIA. Cadet source area location.	Annual sampling. Monitor GPTIA changes.
CM-MW-Ui	X				X				X				Well installed by Cadet for legal purpose. TCE detected below 10ppb. Detecting same TCE source as MW-37i and -38i.	Annual sampling. Off-site monitoring point for POV wellfield. VOCs at well not from SMC/Cadet.

Notes:
Green highlighted cells - Represent future sampling events
Elevations denoted "MSL" are in the vertical datum NGVD 29

X = groundwater quality sample (VOCs) collected or will be collected
- = location was scheduled to be sampled but a sample was not collected during event. See sample location notes for details.
D = Well has been decommissioned.
IA = Inactive well. Well is not an active monitoring location.
Samping Periods for Each Quarter: Q1 - 1st quarter (Jan. - Mar.); Q2 - 2nd quarter (Apr. - Jun.); Q3 - 3rd quarter (Jul. - Sept.); Q4 - 4th quarter (Oct. - Dec.)
Sampling Method: Low flow method using dedicated bladder pumps or dedicated dual valve pumps (DVP) equipped with bladders. Select wells sampled using peristaltic pump.
Elevations based on NGVD.
NM indicates that elevation at the well has not been established. Estimated elevations have been applied as indicated by "est".
na = not applicable. This is a multiport well that does not use a screen interval, just a sample port.
* - MW-13 is not currently sampled because it is screened in a perched water zone
** - MW-22 was abandoned in June 2002
*** - CM-MW-06 was originally completed on 6/12/00 to a depth of 26.5 ft bgs. It was subsequently deepened on 2/21/01 to a total depth of 34.5 ft bgs.
**** - CM-MW-16s dropped from sampling due to NDs and close proximity to MW-15s.
***** - MW-05d was decommissioned in November 2006 and replaced with MW-05dR.
1- Top of Casing elevations for VMW-10 and VMW-11 are approximations taken from nearby wells.

Table 2-2 - Well Completion Summary - Groundwater Monitoring Wells

Well ID	Date of Well Installation	Ground Elevation (ft NGVD)	Borehole Depth (ft bgs)	Well Depth (ft bgs)	Casing Diameter (in)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Top of Casing Elevation (ft NGVD)	Northing (ft)	Easting (ft)	Water Quality Zone
SMC Groundwater Wells											
IMW-5	12/12/01	31.06	30	30	2	20	30	30.84	119592.26	1078965.18	shallow
MW-01	01/30/98	26.46	25	25	2	15	25	26.37	119596.05	1078681.11	shallow
MW-01d	04/02/98	26.42	227	221	2	211	220.7	26.41	119586.24	1078679.52	deep
MW-02	01/29/98	30.37	30	30	2	20	30	30.09	119499.20	1079177.88	shallow
MW-02d	12/03/98	30.65	223	217	2	207	216.7	30.19	119490.00	1079172.00	deep
MW-03****	01/29/98	27.19	27	23	2	13	23	26.64	119440.76	1078945.99	shallow
MW-04	01/29/98	27.06	25	25	2	15	25	26.57	119230.87	1079009.27	shallow
MW-04i***	04/09/99	28.72	140	100	2	90	99.7	28.48	118891.70	1079059.70	intermediate
MW-04d	01/14/99	26.97	240	232.3	2	222	232	26.66	119076.00	1079049.00	deep
MW-05††	10/10/00	28.44	30.5	30	2	20	30	28.74	119584.85	1078925.63	shallow
MW-05i	01/22/99	28.05	101	100	2	90	99.7	28.11	119578.80	1078939.21	intermediate
MW-05d****	05/20/98	28.34	234	227.6	2	217.3	227.3	27.97	119572.00	1078929.00	deep
MW-05dR†	11/30/06	28.44	240	227.5	4	216	226	28.49	119565.00	1078948.42	deep
MW-06	07/13/98	29.58	31.5	29	2	19	29	29.29	119255.42	1079212.22	shallow
MW-07	07/13/98	31.24	31.5	30	2	20	30	30.84	119424.64	1079484.07	shallow
MW-07i	08/09/00	32.81	180	90	2	80	90	32.50	119388.17	1079448.70	intermediate
MW-08	07/13/98	31.65	31.5	30	2	20	30	31.38	119642.60	1079434.51	shallow
MW-08i	02/25/99	31.65	140	130	2	120	129.7	31.42	119648.00	1079444.00	deep
MW-09	07/14/98	33.60	32	32	2	22	32	33.32	119667.75	1079889.61	shallow
MW-10	07/14/98	33.11	31.5	31.5	2	21	31	32.84	119148.22	1079694.51	shallow
MW-11	04/12/99	25.41	27	26	2	16	26	24.96	119259.00	1078694.00	shallow
MW-12	10/06/00	32.32	31.5	31	2	21	31	32.07	119835.92	1078262.84	shallow
MW-12d	03/25/99	32.58	224	216.3	2	206	216	32.32	119825.86	1078272.05	deep
MW-13	10/10/00	33.19	30	29	2	19	29	35.42	120182.57	1077319.61	shallow
MW-13d	01/20/00	33.19	268	262	2	252	261.7	35.52	120173.07	1077318.21	deep
MW-14d	03/27/00	26.51	226	221	2	211	220.7	26.37	119128.10	1078405.40	deep
MW-15	10/10/00	31.08	33	33	2	23	33	30.68	117072.04	1079498.19	shallow
MW-15i	05/31/00	31.28	220	139	2	129	139	30.89	117074.69	1079490.77	TGA
MW-16	10/09/00	35.33	36	36	2	26	36	37.21	119171.17	1080005.68	shallow
MW-16d	05/01/00	35.33	240	230	2	220	229.7	36.40	119161.85	1080004.35	TGA
MW-17	10/11/00	29.57	31	31	2	21	31	29.34	118248.30	1079807.04	shallow
MW-17d	02/18/00	29.84	205	195	2	185	195	29.56	118238.03	1079808.99	TGA
MW-18	11/03/00	32.03	39	38	2	28	38	31.65	117101.54	1080373.33	shallow
MW-18i	06/30/00	32.06	180	130	2	120	130	31.84	117096.77	1080382.43	intermediate
MW-19s	10/06/04	33.55	34	33	2	23	33	33.26	116599.17	1079945.49	shallow
MW-19i	08/31/00	34.37	191	130	2	120	130	34.10	116549.83	1079957.77	intermediate
MW-20	10/13/00	56.36	57.5	57.5	2	47	57	56.04	119620.69	1080541.28	shallow
MW-21	10/16/00	40.33	42	42	2	32	42	39.87	118919.77	1080513.18	shallow
MW-22****	10/13/00	35.38	21.5	16	2	6	16	35.08	118234.81	1080450.10	shallow
MW-23	10/18/00	46.38	45	45	2	35	45	45.85	117371.59	1080888.89	shallow
MW-24	10/17/00	60.74	62	62	2	52	62	60.47	119436.64	1081748.82	shallow
MW-24i	04/25/01	61.14	165	123	2	113	123	60.59	119428.20	1081744.89	intermediate
MW-25	10/17/00	80.27	85	85	2	75	85	79.91	117917.25	1081715.67	shallow
MW-26i	05/18/01	82.35	181	113	2	103	113	82.09	118143.23	1082098.01	intermediate
MW-28s	10/05/04	29.21	30	29	2	19	29	29.08	117927.36	1079806.47	shallow
MW-28i	04/06/01	31.11	130	85	2	75	85	30.90	117831.28	1079674.86	intermediate
MW-29i	03/16/01	31.32	130	125	2	115	125	30.79	117363.99	1078364.02	intermediate
MW-30i	03/03/03	29.82	187	85.5	2	75	85.5	29.66	118607.30	1077713.80	intermediate
MW-31i	02/04/03	31.65	167	85.5	2	75	85.5	31.20	119133.40	1077245.30	intermediate
MW-32s	10/07/04	34.49	34.5	33	2	23	33	34.23	118880.79	1076872.08	shallow
MW-32i	07/23/04	34.49	141.5	70	2	60	70	34.28	118876.04	1076874.99	intermediate
MW-33s	10/04/04	31.81	35	31	2	21	31	31.57	119262.97	1077875.35	shallow
MW-33i	08/10/04	31.58	177	85.5	2	75	85	31.35	119263.65	1077870.27	intermediate
MW-34i	10/14/04	32.73	181	105.5	2	95	105	35.16	118284.68	1078512.00	intermediate
MW-35s	10/04/04	34.61	33	32.5	2	22.5	32.5	34.31	117240.30	1080198.71	shallow
MW-35i	10/14/04	34.60	182	122.5	2	112	122	34.35	117243.47	1080161.16	intermediate
MW-36s	10/05/04	35.05	35.5	34	2	24	34	34.64	118220.48	1080185.64	shallow
MW-36i	09/28/04	35.11	163	105	2	95	105	34.89	118216.29	1080185.57	intermediate
MW-37s	10/06/04	34.90	35	34	2	24	34	34.79	116677.79	1080852.41	shallow
MW-37i	09/09/04	34.69	182	125	2	115	125	34.64	116675.25	1080849.76	intermediate
MW-38i	11/12/04	44.47	210	155.5	2	145	155	44.05	117482.74	1080862.92	intermediate
MW-39s****	10/07/04	33.37	34	33	2	23	33	33.26	116629.82	1079205.82	shallow
MW-E^	10/05/94	30.80	35	34.1	2	23.7	33.7	30.66	119152.27	1077281.70	shallow
MW-F^	10/04/94	34.16	37	37.3	2	26.9	36.9	33.61	118394.19	1077369.78	shallow
MW-G^	10/04/94	32.15	37	37.7	2	27.3	37.3	31.73	118582.49	1077528.75	shallow
VMW-8	12/05/01	28.55	25	25	2	15	25	28.59	119540.64	1078968.09	shallow
VMW-9	04/25/02	28.50	26	26	2	16	26	28.67	119557.99	1078955.85	shallow
VMW-10	04/26/02	31.33	28	28	2	18	28	31.06	119553.34	1078980.45	shallow
VMW-11	04/26/02	30.36	28	28	2	18	28	30.06	119533.68	1079013.00	shallow

Table 2-2 - Well Completion Summary - Groundwater Monitoring Wells

Well ID	Date of Well Installation	Ground Elevation (ft NGVD)	Borehole Depth (ft bgs)	Well Depth (ft bgs)	Casing Diameter (in)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Top of Casing Elevation (ft NGVD)	Northing (ft)	Easting (ft)	Water Quality Zone
Cadet Groundwater Wells											
CM-DPW-01	08/17/00	NM	28.4	28.4	3/4	8	28	23.52	120271.18	1078504.45	shallow
CM-DPW-06	08/17/00	NM	28.4	28.4	3/4	18	28	22.96	120268.71	1078538.53	shallow
CM-DPW-10	08/17/00	NM	28.4	28.4	3/4	18	28	22.97	120304.01	1078525.16	shallow
CM-DPW-16	04/22/02	26.24	28	28	3/4	17.5	27.5	25.94	120277.00	1078558.12	shallow
CM-MW-01s*	10/15/99	23.72	25	25	2	15	25	23.54	120088.21	1078504.59	shallow
CM-MW-01i*	10/14/99	23.73	94	91	2	81	91	23.50	120156.04	1078476.18	intermediate
CM-MW-01d-040	05/01/01	NM	228	226	2	39.75	40.25	NM	120197.05	1078491.52	shallow
CM-MW-01d-121	05/01/01	NM	228	226	2	120.25	120.75	NM	120197.05	1078491.52	intermediate
CM-MW-01d-161	05/01/01	NM	228	226	2	160.75	161.25	NM	120197.05	1078491.52	deep
CM-MW-01d-194	05/01/01	NM	228	226	2	193.25	193.75	NM	120197.05	1078491.52	deep
CM-MW-01d-224	05/01/01	NM	228	226	2	223.75	224.25	NM	120197.05	1078491.52	deep
CM-MW-02s*	10/16/99	20.15	22	20	2	10	20	20.03	120502.29	1078283.01	shallow
CM-MW-02d*	11/15/00	NM	230.7	230.7	2	220	230	27.09	120809.96	1078388.15	deep
CM-MW-03s*	10/16/99	23.27	25	25	2	15	25	23.07	120334.37	1078549.52	shallow
CM-MW-03d-060	09/06/02	NM	227.8	227.8	2	59.2	59.7	NM	120462.66	1078561.61	intermediate
CM-MW-03d-100	09/06/02	NM	227.8	227.8	2	99.7	100.2	NM	120462.66	1078561.61	intermediate
CM-MW-03d-141	09/06/02	NM	227.8	227.8	2	140.2	140.7	NM	120462.66	1078561.61	deep
CM-MW-03d-181	09/06/02	NM	227.8	227.8	2	180.7	181.2	NM	120462.66	1078561.61	deep
CM-MW-03d-227	09/06/02	NM	227.8	227.8	2	226.2	226.7	NM	120462.66	1078561.61	deep
CM-MW-04s*	10/15/99	30.19	30	30	2	15	30	29.94	119943.34	1079331.83	shallow
CM-MW-04i*	06/14/00	30.37	97	95	2	85	95	29.95	119933.02	1079352.79	intermediate
CM-MW-05s*	11/12/99	26.92	26	25	2	15	25	26.70	120183.78	1078713.06	shallow
CM-MW-05i*	11/15/99	26.97	95	95	2	85	95	26.68	120169.81	1078710.82	intermediate
CM-MW-05d*	07/11/00	27.11	221	217	2	206.5	216.5	26.75	120065.10	1078700.95	deep
CM-MW-06s** *	6/12/00, 2/21/2001	NM	34.5	34.5	2	19	34	30.46	120249.03	1079434.19	shallow
CM-MW-07s*	06/14/00	42.04	45	44.5	2	24	44	42.02	120073.84	1080087.69	shallow
CM-MW-07i	07/22/02	42.75	109	109	2	99	109	42.47	120068.96	1080120.54	intermediate
CM-MW-07d	08/21/02	43.59	245	225	2	215	225	43.32	120104.21	1080125.99	deep
CM-MW-08s*	06/12/00	26.71	26.5	24.5	2	14	24	26.55	120590.48	1078805.24	shallow
CM-MW-09s*	06/15/00	23.72	23	23	2	7.5	22.5	25.92	120220.25	1078080.42	shallow
CM-MW-10s*	11/07/00	NM	60	59	2	49	59	51.21	121017.53	1080749.32	shallow
CM-MW-10d***	11/27/00	NM	230.9	230	2	220	230	51.40	121018.00	1080772.10	TGA
CM-MW-11	02/28/02	NM	30	29	2	23.5	28.5	NM	120146.59	1078252.98	shallow
CM-MW-12	02/28/02	NM	30	29.5	2	24	29	NM	120132.24	1078253.94	shallow
CM-MW-13	02/28/02	NM	55	54	2	48.5	53.5	NM	120136.28	1078245.79	shallow
CM-MW-14	02/28/02	NM	55	54.5	2	49	54	NM	120154.83	1078255.48	shallow
CM-MW-15s*	02/27/02	22.31	56.5	55	2	49.5	54.5	21.97	120125.49	1078251.48	intermediate
CM-MW-16s*	03/01/02	21.53	30	28.5	2	23	28	21.31	120131.34	1078232.27	shallow
CM-MW-17i	07/13/02	NM	95	95	2	85	95	NM	120202.27	1078430.00	intermediate
CM-MW-18s	07/16/02	25.09	30	29.5	2	14	29	24.98	121791.30	1078509.37	shallow
CM-MW-18i	07/17/02	25.13	100	98	2	88	98	24.77	121801.31	1078511.64	intermediate
CM-MW-18d***	08/23/02	25.12	202.7	198.5	2	188.5	198	24.65	121776.03	1078504.12	deep
CM-MW-19s	07/15/02	31.55	37.5	34.5	2	19	34	31.35	121187.31	1079212.25	shallow
CM-MW-19i	07/16/02	31.65	100	94	2	84	94	31.39	121204.54	1079210.17	intermediate
CM-MW-19d***	08/29/02	33.85	183	178.5	2	168	178	33.69	121366.20	1079207.56	deep
CM-MW-20s	07/19/02	33.71	35	35	2	20	35	33.42	119790.37	1078908.25	shallow
CM-MW-20i	07/19/02	33.56	100	99.5	2	89	99	33.28	119784.49	1078906.50	intermediate
CM-MW-21s	07/22/02	55.67	64	64	2	49	64	57.98	120178.96	1081311.86	shallow
CM-MW-21i	07/23/02	55.46	125	120.5	2	110	120	57.47	120172.65	1081307.09	intermediate
CM-MW-22s	06/10/03	23.82	42.5	40.5	2	35	40	23.54	120205.07	1078483.52	intermediate
CM-MW-23s	11/07/03	34.21	40	37	2	22	37	34.06	120791.58	1079506.53	shallow
CM-MW-23i	11/18/03	33.77	105	102	2	92	102	33.65	120748.84	1079503.45	intermediate
CM-MW-24s	11/07/03	24.89	40	35	2	20	35	24.79	121102.68	1078628.59	shallow
CM-MW-24i	11/17/03	25.36	100	98.5	2	88	98	25.27	121096.44	1078690.06	intermediate
CM-MW-25s	01/21/04	28.82	30	30	2	15	30	28.62	120248.56	1079188.25	shallow
CM-MW-26s	04/29/04	26.61	30.5	30	2	15	30	26.40	120286.00	1078793.02	shallow
CM-MW-27TGA	08/23/04	NM	240	170	2	159.5	169.5	44.93	121971.68	1079624.35	TGA
CM-MW-27USA-049.5	09/13/04	NM	129	129	2	49	49.5	NM	121970.78	1079631.90	shallow
CM-MW-28TGA	09/29/04	NM	215	210.5	2	200	210	33.45	122187.94	1078911.46	TGA
CM-MW-28USA-050	10/05/04	NM	180	180	2	49.5	50	NM	122184.17	1078915.81	intermediate
CM-MW-28USA-120.5	10/05/04	NM	180	180	2	120	120.5	NM	122184.17	1078915.81	intermediate
CM-MW-28USA-180	10/05/04	NM	180	180	2	179.5	180	NM	122184.17	1078915.81	deep
CM-MW-29TGA	10/06/04	NM	164	160	2	150	160	46.40	121039.52	1079979.98	TGA
CM-MW-29USA-060.5	10/13/04	NM	140.5	140.5	2	60	60.5	NM	121038.70	1079985.82	intermediate
CM-MW-29USA-100	10/13/04	NM	140.5	140.5	2	99.5	100	NM	121038.70	1079985.82	intermediate
CM-MW-29USA-140.5	10/13/04	NM	140.5	140.5	2	140	140.5	NM	121038.70	1079985.82	intermediate
CM-VE-09	03/02/02	NM	30	30	2	5	30	NM	120376.4	1078443.9	shallow
CM-VE-10	03/02/02	NM	30	30	2	5	30	NM	120302.3	1078422.1	shallow
CM-VE-11	03/01/02	NM	30	30	2	5	30	NM	120219.2	1078410	shallow
CM-VE-12	03/01/02	NM	30	30	2	5	30	NM	120226.1	1078441.6	shallow
CM-MW-Us	06/16/05	NM	56	55	2	39.5	54.5	NM	NM	NM	shallow
CM-MW-Ui	06/15/05	NM	132	130	2	110	129.5	NM	NM	NM	intermediate

NGVD - National Geodetic Vertical Datum

ft bgs - feet below ground surface; in - inches

NM - not measured

* - The top-of-casing elevations were resurveyed on 3/27/02 and 11/18/02 (CM-MW-15s & CM-MW-16s only) to new well caps associated with dedicated pumps.

** - CM-MW-06 was originally completed on 6/12/00 to a depth of 26.5 ft bgs. It was subsequently deepened on 2/21/01 to a total depth of 34.5 ft bgs.

5/19/03.

**** - MW-22 was decommissioned in June 2002; MW-05d was decommissioned in November 2006; MW-03 was decommissioned in September 2008; MW-39s was decommissioned in February 2011.

† - MW-05dR was intalled to replace MW-05d. Above ground monument was removed, top of casing was lowered to just below ground surface, and a flush-mount monument was installed.

†† - MW-05 above-ground monument was removed, top of casing was lowered to just below ground surface, and a flush-mount monument was installed.

^ - Flush mount monitoring wells were raised and extentions added to monitoring wells. No updated survey information has been collected.

-- = construction details not available

Table 4-1 - Summary of Analytical Results 2016 (µg/L)

Well Name	QC Code	Sample Depth (ft bgs)	Sampling Event/ Quarter	Sample Date	Sample Time	1,1,1-Trichloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethene	Benzene	Bromo-dichloro-methane	Chloro-form	cis-1,2-Dichloro-ethene	Tetra-chloro-ethene	Trichloro-ethene
Shallow USA Zone Monitoring Wells														
CM-DPW-01		18	2016Q1	04/07/16	15:50	1.04	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	2.39	12.8
CM-DPW-01		18	2016Q3	09/30/16	17:11	3.46	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	5.31	36.2
CM-DPW-06		23	2016Q1	04/07/16	15:25	0.74	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.68	8.00
CM-DPW-06		23	2016Q3	09/30/16	16:45	0.809	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.70	7.58
CM-DPW-10		23	2016Q1	04/08/16	9:52	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.65	1.63
CM-DPW-16		22.5	2016Q1	04/07/16	15:00	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.59	1.13
CM-MW-01d		40	2016Q1	04/01/16	13:15	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	2.99	3.28
CM-MW-01s		20	2016Q1	04/08/16	15:28	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.77	1.68
CM-MW-01s		20	2016Q3	09/21/16	12:59	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.29	2.26
CM-MW-03s		20	2016Q1	04/01/16	16:30	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.970	1.55
CM-MW-03s		20	2016Q3	09/30/16	17:35	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.08	2.42
CM-MW-04s		22.5	2016Q1	03/31/16	15:35	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	2.40	2.42
CM-MW-04s	DP	22.5	2016Q3	09/30/16	15:10	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.34	2.39
CM-MW-04s	D	22.5	2016Q3	09/30/16	15:10	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.36	1.95
CM-MW-05s		20	2016Q1	04/04/16	15:35	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	2.23	0.98
CM-MW-06s		26.5	2016Q1	04/04/16	10:50	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	2.31	2.83
CM-MW-06s		26.5	2016Q3	09/14/16	17:46	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.541 J	0.5 U	1.85	2.07
CM-MW-07s		34	2016Q1	04/06/16	15:08	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.68	0.67
CM-MW-07s		34	2016Q3	09/15/16	10:44	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.770	1.02
CM-MW-08s		19	2016Q1	04/07/16	14:20	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CM-MW-10s	DP	54	2016Q1	04/05/16	13:37	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.861	0.5 U
CM-MW-10s	D	54	2016Q1	04/05/16	13:37	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.873	0.5 U
CM-MW-19s		26.5	2016Q1	04/05/16	11:08	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.98 J	0.5 U	0.519	0.5 U
CM-MW-20s		27.5	2016Q1	04/06/16	14:12	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.23	0.799
CM-MW-23s		34	2016Q1	04/05/16	16:00	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.772 J	0.5 U	1.38	1.59
CM-MW-23s		34	2016Q3	09/13/16	18:17	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.22	1.28
CM-MW-24s		25	2016Q1	04/06/16	9:35	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CM-MW-25s		21	2016Q1	04/04/16	11:30	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	2.55	3.42
CM-MW-25s		21	2016Q3	09/15/16	14:02	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.52 J	0.5 U	1.54	2.05
CM-MW-26s		24	2016Q1	04/04/16	13:08	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.65	0.5 U
CM-MW-27USA		49.5	2016Q1	04/05/16	14:25	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.503
CM-VE-09		17.5	2016Q1	04/08/16	10:40	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.55	0.85
CM-VE-09		17.5	2016Q3	09/23/16	12:55	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.43	4.60
CM-VE-10		17.5	2016Q1	04/08/16	11:00	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.59
CM-VE-11		17.5	2016Q1	04/08/16	12:13	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.63	1.06
CM-VE-11		17.5	2016Q3	09/23/16	13:35	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.38	5.57
CM-VE-12		17.5	2016Q1	04/08/16	11:28	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.550	0.760
IMW-05	DP	25	2016Q1	03/08/16	10:55	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	2.52	9.47
IMW-05	D	25	2016Q1	03/08/16	10:55	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	2.55	9.90
IMW-05		25	2016Q3	09/15/16	13:21	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	2.64	9.28
MW-02		25	2016Q1	03/31/16	13:50	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.72	8.68
MW-02		25	2016Q3	09/21/16	11:57	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.65	7.22
MW-05		25	2016Q1	03/04/16	11:25	12.5 U	12.5 U	12.5 U	2.5 U	12.5 U	12.5 U	12.5 U	75.8	1064

Table 4-1 - Summary of Analytical Results 2016 (µg/L)

MW-05		25	2016Q3	09/15/16	11:48	5 U	5 U	5 U	1 U	5 U	5 U	23.7	108	1932
MW-06		24	2016Q1	03/31/16	13:15	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.13	2.03
MW-06		24	2016Q3	09/15/16	17:28	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.992	2.17
MW-07		25	2016Q1	03/31/16	16:40	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.28	2.94
MW-07		25	2016Q3	09/21/16	13:00	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.40	5.30
MW-08		25	2016Q1	03/31/16	12:25	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.10	2.00
MW-08		25	2016Q3	09/21/16	11:24	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.24	2.22
MW-09		27	2016Q1	03/02/16	15:20	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.79	1.09
MW-09		27	2016Q3	09/14/16	17:02	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.6 J	0.5 U	1.02	1.11
MW-10		26	2016Q1	03/07/16	14:45	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.990	1.76
MW-10		26	2016Q3	09/15/16	16:35	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.01	2.14
MW-16		31	2016Q1	03/02/16	14:45	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.31	2.89
MW-16		31	2016Q3	09/14/16	16:27	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.09	3.04
MW-20		52	2016Q1	03/07/16	12:25	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.884 J	0.5 U	1.22	0.997
MW-20		52	2016Q3	09/12/16	12:35	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.86	1.10
MW-21		37	2016Q1	03/07/16	13:00	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.936	1.38
MW-21		37	2016Q3	09/12/16	13:07	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.950	1.03
MW-E		29	2016Q1	03/31/16	11:30	0.5 U	0.539	0.5 U	0.1 U	0.5 U	0.5 U	8.44	0.947	3.96
MW-E		29	2016Q3	09/13/16	13:29	0.5 U	0.790	0.5 U	0.1 U	0.5 U	0.5 U	21.9	5.85	10.9
VMW-08		20	2016Q1	03/04/16	13:30	5 U	5 U	5 U	1 U	5 U	5 U	5 U	49.3	817
VMW-09		21	2016Q1	03/04/16	13:05	5 U	5 U	5 U	1 U	5 U	5 U	9.40	98.1	1591
VMW-10		23	2016Q1	03/08/16	11:20	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	5.81	61.0
VMW-11		23	2016Q1	03/08/16	11:50	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	2.50	22.1
Intermediate Zone Monitoring Wells														
CM-MW-01d		121	2016Q1	04/01/16	12:50	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	4.06	2.85
CM-MW-01d		121	2016Q3	09/21/16	13:49	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	3.26	2.45
CM-MW-01i		86	2016Q1	04/08/16	15:05	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	1.66	0.600	1.35
CM-MW-01i		86	2016Q3	10/05/16	17:30	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.923	0.737	1.35
CM-MW-03d	DP	100	2016Q1	04/01/16	14:30	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.760	1.99
CM-MW-03d	D	100	2016Q1	04/01/16	14:30	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.770	1.83
CM-MW-04i		90	2016Q1	03/31/16	15:55	0.5 U	0.5 U	0.5 U	0.286	0.5 U	0.627 J	0.5 U	1.74	3.19
CM-MW-04i		90	2016Q3	09/13/16	12:52	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.622 J	0.5 U	1.67	3.55
CM-MW-05i		90	2016Q1	04/04/16	15:10	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.618	1.63	0.927
CM-MW-05i		90	2016Q3	09/13/16	16:06	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	2.19	3.83
CM-MW-07i		104	2016Q1	04/06/16	15:25	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.85	4.73	5.99
CM-MW-07i		104	2016Q3	09/15/16	11:28	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.55	2.61	4.13
CM-MW-15s		52	2016Q1	04/08/16	12:58	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CM-MW-17i		90	2016Q1	04/08/16	11:54	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.13	1.5
CM-MW-18i		93	2016Q1	04/06/16	12:05	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.558	5.37
CM-MW-18i		93	2016Q3	09/14/16	12:23	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.584	6.60
CM-MW-19i		89	2016Q1	04/05/16	10:45	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.755	1.33
CM-MW-19i	DP	89	2016Q3	09/14/16	14:53	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.675
CM-MW-19i	D	89	2016Q3	09/14/16	14:53	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.617
CM-MW-20i		94	2016Q1	04/06/16	14:30	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	1.23	6.99	4.62
CM-MW-20i		94	2016Q3	09/15/16	12:17	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	1.36	5.76	4.99
CM-MW-22s		40	2016Q1	04/06/16	16:15	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.968	0.5 U
CM-MW-23i		97	2016Q1	04/05/16	15:25	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	3.23	9.57	10.39

Table 4-1 - Summary of Analytical Results 2016 (µg/L)

CM-MW-23i		97	2016Q3	09/13/16	17:45	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	3.69	8.84	12.2
CM-MW-24i		93	2016Q1	04/06/16	10:35	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.652	2.04
CM-MW-24i		93	2016Q3	10/05/16	16:33	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.763	2.11
CM-MW-28USA		50	2016Q1	03/15/16	10:42	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.5 U	1.34
CM-MW-28USA		120.5	2016Q1	03/15/16	11:03	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.550	4.44
CM-MW-28USA		120.5	2016Q3	09/15/16	16:09	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.559	3.98
CM-MW-29USA		60.5	2016Q1	03/15/16	13:00	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.28	1.66
CM-MW-29USA		100	2016Q1	03/15/16	12:27	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.53	2.32
CM-MW-29USA		140.5	2016Q1	03/15/16	12:10	0.5 U	0.5 U	0.5 U	0.1 J	0.5 U	0.5 U	1.44	2.95	5.63
CM-MW-29USA		140.5	2016Q3	09/30/16	13:45	0.5 U	0.5 U	0.5 U	0.151 J	0.5 U	0.5 U	3.03	0.605	1.51
CM-MW-Ui	DP	115	2016Q1	04/08/16	13:59	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.73 J	0.5 U	0.5 U	6.61
CM-MW-Ui	D	115	2016Q1	04/08/16	13:59	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.78 J	0.5 U	0.5 U	6.59
MW-04i		95	2016Q1	03/07/16	13:55	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.689	0.5 U	0.652
MW-05i		95	2016Q1	03/04/16	11:50	0.78	0.74	0.81	0.1 U	0.5 U	0.5 U	5.02	2.55	25.68
MW-05i	DP	95	2016Q3	09/15/16	11:19	0.925	0.753	0.766	0.1 U	0.5 U	0.5 U	4.64	2.55	22.3
MW-05i	D	95	2016Q3	09/15/16	12:00	0.946	0.738	0.756	0.1 U	0.5 U	0.5 U	4.73	2.64	22.6
MW-07i		85	2016Q1	03/07/16	16:10	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.67	3.78
MW-07i		85	2016Q3	09/21/16	12:33	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.58	3.64
MW-15i		134	2016Q1	03/03/16	14:05	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.5 U	9.26
MW-15i		134	2016Q3	09/13/16	10:57	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.64	0.5 U	8.63
MW-18i		125	2016Q1	03/03/16	15:10	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	2.14	4.91
MW-18i		125	2016Q3	09/13/16	17:22	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	2.09	4.91
MW-19i		125	2016Q1	03/03/16	17:00	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.500	0.660
MW-19i		125	2016Q3	09/14/16	14:24	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.770	0.950
MW-28i		80	2016Q1	03/03/16	13:05	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.680	1.21
MW-29i		120	2016Q1	03/02/16	10:55	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.562
MW-30i		80	2016Q1	03/02/16	11:35	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MW-31i		80	2016Q1	03/02/16	12:55	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	1.14	1.68	0.950
MW-31i	DP	80	2016Q3	09/14/16	13:32	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.591	1.53	0.724
MW-31i	D	80	2016Q3	09/14/16	13:32	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.612	1.42	0.923
MW-32i		65	2016Q1	03/02/16	12:10	0.5 U	1.89	0.521	0.1 U	0.5 U	0.5 U	39.3	23.8	14.0
MW-32i		65	2016Q3	09/13/16	14:50	0.5 U	0.830	0.5 U	0.1 U	0.5 U	0.5 U	14.8	14.4	7.20
MW-33i		80	2016Q1	03/02/16	14:00	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	9.24	7.52	4.61
MW-33i		80	2016Q3	09/12/16	12:00	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	3.33	2.96	1.62
MW-34i	DP	100	2016Q1	03/03/16	12:10	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.880	0.5 U
MW-34i	D	100	2016Q1	03/03/16	12:10	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.81	0.5 U
MW-35i		117	2016Q1	03/03/16	14:40	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.07	1.93
MW-35i		117	2016Q3	09/13/16	16:49	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	1.14	2.50
MW-36i		100	2016Q1	03/04/16	16:05	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.67	1.22
MW-37i		120	2016Q1	03/03/16	16:30	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.5 U	41.4
MW-37i		120	2016Q3	09/14/16	15:16	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.5 U	36.5
MW-38i		150	2016Q1	03/04/16	15:25	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.510 J	0.5 U	2.01	5.67
MW-38i		150	2016Q3	09/12/16	13:43	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.510 J	0.5 U	1.24	5.20
Deep USA Zone Monitoring Wells														
CM-MW-01d		161	2016Q1	04/01/16	12:30	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	2.68	7.03	9.06
CM-MW-01d		194	2016Q1	04/01/16	12:00	0.5 U	0.670	0.710	0.1 U	0.5 U	0.5 U	4.89	4.85	17.5
CM-MW-01d		194	2016Q3	09/21/16	14:32	0.583	0.546	0.5 U	0.1 U	0.5 U	0.5 U	4.31	3.60	12.8

Table 4-1 - Summary of Analytical Results 2016 (µg/L)

CM-MW-01d		224	2016Q1	04/01/16	11:40	0.790	0.790	1.18	0.1 U	0.5 U	0.5 U	3.99	3.72	16.5
CM-MW-02d		225	2016Q1	04/06/16	13:18	0.749	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	1.24	1.66	7.74
CM-MW-02d		225	2016Q3	09/21/16	16:10	0.706	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.744	1.25	7.29
CM-MW-03d		141	2016Q1	04/01/16	14:55	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	1.81	3.79	7.72
CM-MW-03d		181	2016Q1	04/01/16	15:28	0.530	0.5 U	0.550	0.1 U	0.5 U	0.5 U	1.02	1.73	7.78
CM-MW-03d		227	2016Q1	04/01/16	16:00	1.08	0.960	1.49	0.1 U	0.5 U	0.5 U	4.32	2.66	18.5
CM-MW-03d		227	2016Q3	09/21/16	15:20	1.15	0.621	0.806	0.1 U	0.5 U	0.5 U	2.90	1.62	10.8
CM-MW-05d		211.5	2016Q1	04/04/16	14:25	2.06	1.78	2.26	0.1 U	0.5 U	0.5 U	9.90	5.68	29.9
CM-MW-05d		211.5	2016Q3	09/13/16	14:33	2.34	1.76	2.23	0.1 U	0.5 U	0.5 U	9.34	5.68	33.6
CM-MW-18d		193.5	2016Q1	04/21/16	10:50	0.619	0.5 U	0.5 U	0.1 U	0.840 J	0.5 U	0.5 U	1.09	6.50
CM-MW-18d		193.5	2016Q3	09/23/16	11:50	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.740	5.04
CM-MW-19d		173	2016Q1	04/05/16	10:10	0.994	0.5 U	0.735	0.1 U	0.5 U	0.5 U	1.306	1.599	7.755
CM-MW-19d		173	2016Q3	09/14/16	15:45	1.14	0.575	0.771	0.1 U	0.5 U	0.5 U	1.33	1.77	9.14
CM-MW-28USA		180	2016Q1	03/15/16	11:27	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.5 U	4.73
CM-MW-28USA		180	2016Q3	09/15/16	16:38	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	0.5 U	0.5 U	3.77
MW-01D		216	2016Q1	03/04/16	14:40	1.00	0.939	1.10	0.1 U	0.5 U	0.5 U	5.27	5.28	18.2
MW-01d		216	2016Q3	09/13/16	11:50	1.12	1.01	1.27	0.1 U	0.5 U	0.5 U	6.05	5.10	20.6
MW-05dR		221	2016Q1	03/04/16	12:20	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	2.05	3.45	12.9
MW-05dR		221	2016Q3	09/13/16	18:10	0.700	0.5 U	0.520	0.1 U	0.5 U	0.5 U	2.86	3.32	11.76
MW-12d		211	2016Q1	03/03/16	11:15	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	2.36	3.49	10.47
MW-12d		211	2016Q3	09/12/16	16:20	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	2.27	3.19	8.28
MW-14d		216	2016Q1	03/02/16	16:05	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	2.83	1.24	5.73
MW-14d		216	2016Q3	09/12/16	15:08	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	1.41	1.21	4.19
Troutdale Gravel Aquifer Monitoring Wells														
CM-MW-29TGA		155	2016Q1	04/06/16	12:35	0.5 U	0.5 U	0.5 U	0.1 U	0.5 U	0.5 U	3.41	8.13	11.0

Notes

Table includes constituents present above detection limits in at least one well.
Groundwater samples were analyzed for VOCs using Method 8021B/8260B.
Blue font indicates most recent data: Third quarter 2015 sampling event.

Abbreviations
QC Code: D = field duplicate sample; DP = assoicated field sample (the duplicate pair); ASC - sample preserved with ascorbic acid; R = resampled
Water Quality Zones: SH = Unconsolidated Sedimentary Aquifer Shallow Zone; IN = Unconsolidated Sedimentary Aquifer Intermediate Zone; DP = Unconsolidated Sedimentary Aquifer Deep Zone; TGA = Troutdale Gravel Aquifer
ft bgs - feet below ground surface
ug/L = micrograms per liter

Data Qualifiers
U = Not detected at or above the method reporting limit).
UJ = Not detected at or above the method reporting limit. However, the method reporting limit value is uncertain.
UB - Result qualified as undetected due to a concentration less than 5 times the concentration detected in a QC blank.
J = The analyte was positively identified but the associated value is approximate.
N = Indicates an analyte has been tentatively identified but not all required identification criteria were met. The associated result is both qualitatively and quantitatively uncertain.
R = The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Figures

Parametrix

Date: 1/4/2017 Path: P:\GIS\POV\MXD_PDF\AEMR_2016\Fig_1_1_Site_Location_Map.mxd

N

0 1,000

SCALE IN FEET

Figure 1-1
Site Location Map

2016 ANNUAL ENVIRONMENTAL MONITORING REPORT
SMC AND CADET SITES
PORT OF VANCOUVER, WASHINGTON

Parametrix Date: 1/4/2017 Path: P:\GIS\POV\MXD_PDF\AEMR_2016\Fig_2_1_SMC_Well_Locations.mxd

N

0 250 500

Scale in Feet

- Shallow USA Groundwater Monitoring Well
- Intermediate USA Groundwater Monitoring Well
- Deep USA Groundwater Monitoring Well
- TGA Monitoring Well
- GPTIA Extraction Well

Figure 2-1
SMC Site Groundwater Monitoring Well Locations

2016 Annual Environmental Monitoring Report
SMC and Cadet Sites
Port of Vancouver, WA

Parametrix Date: 1/4/2017 Path: P:\GIS\POV\MXD_PDF\AEMR_2016\Fig_2_2_Cadet_Well_Locations.mxd

N

0 250 500

Scale in Feet

- Shallow USA Groundwater Monitoring Well
- Intermediate USA Groundwater Monitoring Well
- Deep USA Groundwater Monitoring Well
- TGA Monitoring Well

Note: Wells shown in italics have been decommissioned.

Figure 2-2
Cadet Site Groundwater Monitoring Well Locations

2016 Annual Environmental Monitoring Report
SMC and Cadet Sites
Port of Vancouver, WA

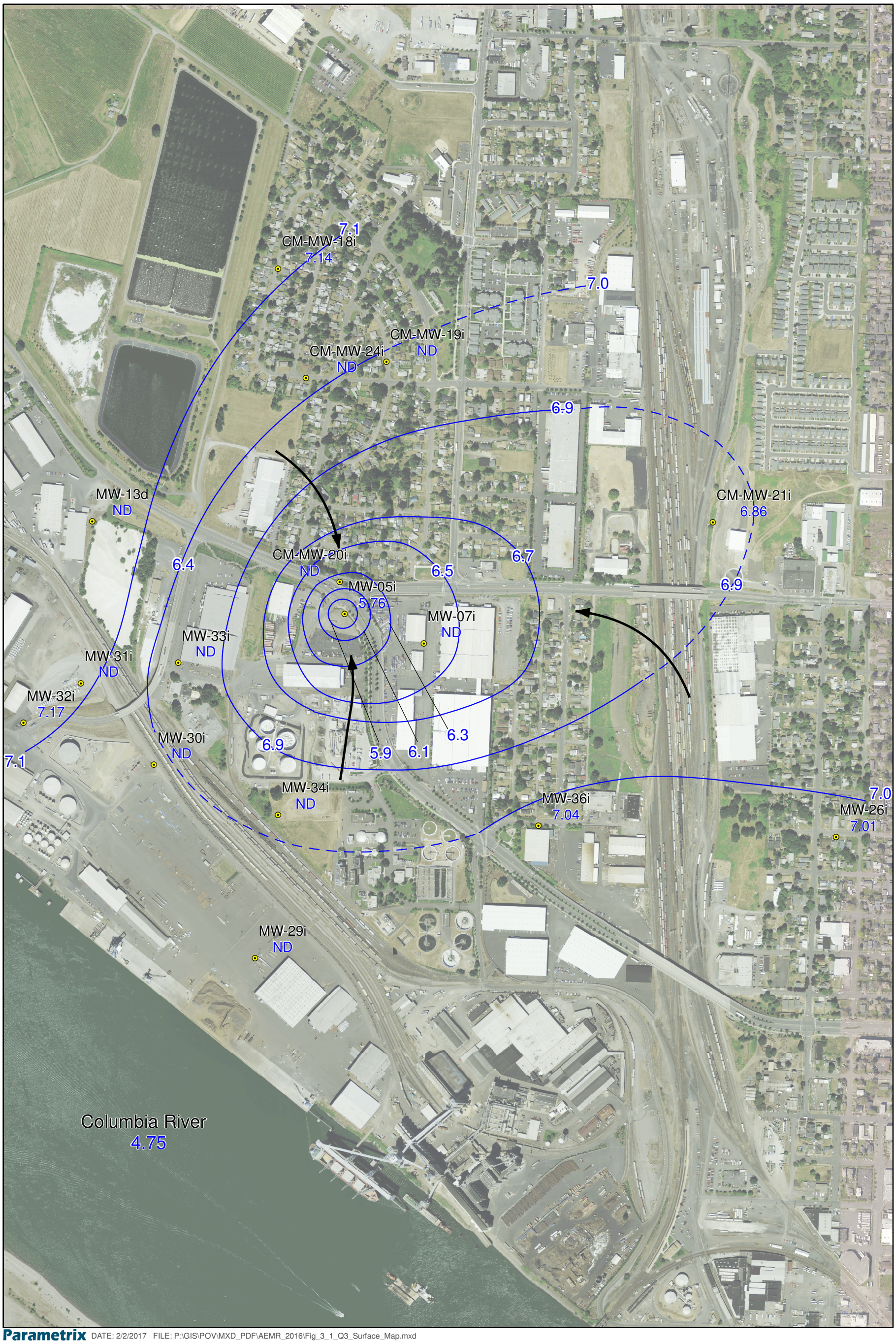
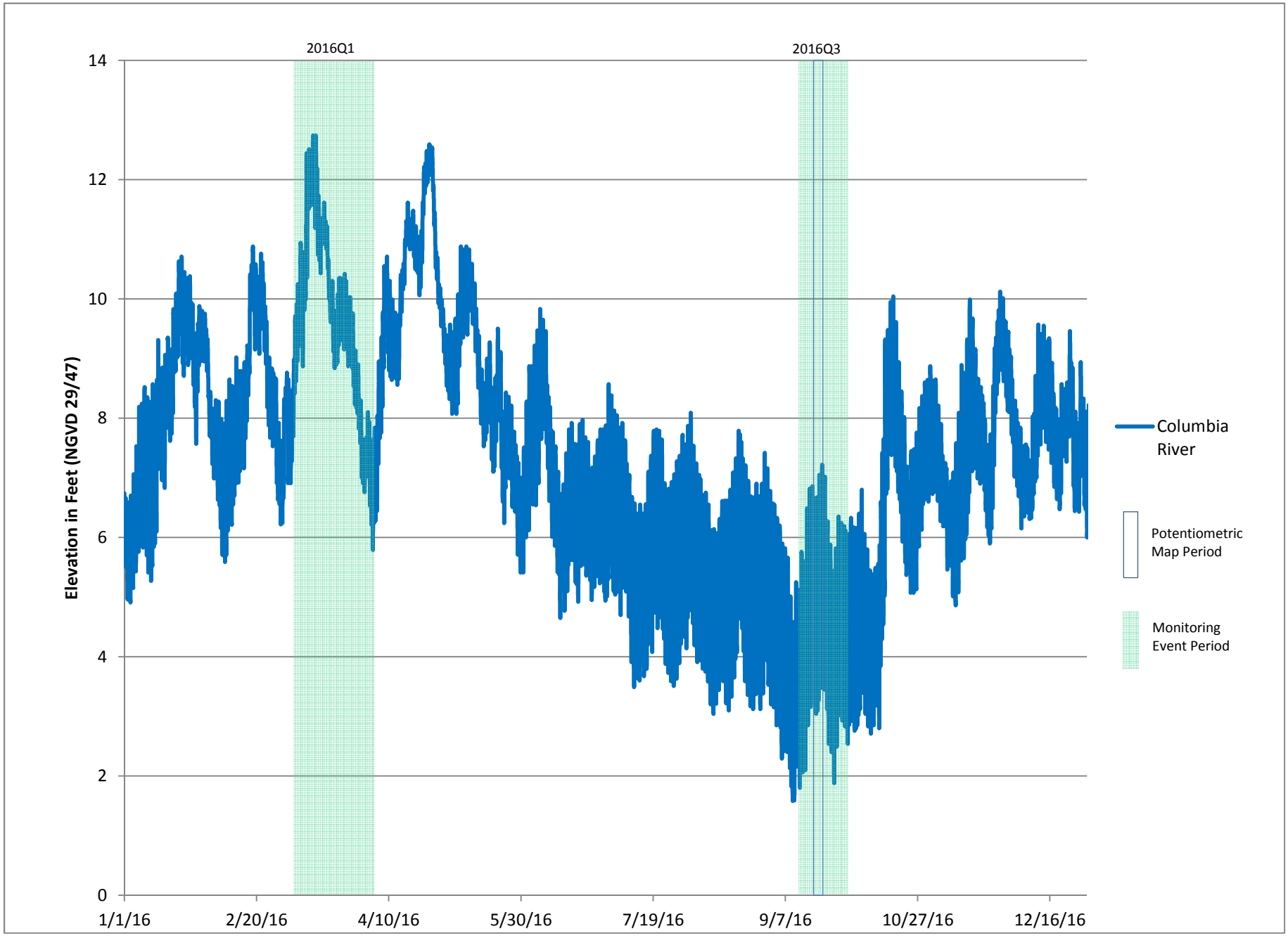


Figure 3-1
Potentiometric Surface Map
Rolling Average
3rd Quarter 2016

2016 ANNUAL ENVIRONMENTAL
MONITORING REPORT
SMC AND CADET SITES
PORT OF VANCOUVER, WASHINGTON

Figure 3-2 - Columbia River Stage Data, 2016



Parametrix Date: 1/25/2017 Path: P:\GIS\POV\MXD_PDF\Isoconcentrations\POV_Isoconcentrations_TCE_Shallow4_Q1_2016.mxd

N

0 250 500 750

Scale in Feet

MW-10 — Well Location Name

23 — Concentration Value (µg/l)

ND = Non-Detect
NS = Not sampled
IA = Inactive Sampling Location

- > 4 µg/L
- > 25 µg/L
- > 50 µg/L
- > 100 µg/L
- > 500 µg/L
- > 1000 µg/L

Figure 4-1
TCE Isoconcentrations in Shallow USA Zone Groundwater
1st Quarter 2016

2016 ANNUAL ENVIRONMENTAL MONITORING REPORT
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Note: Not all groundwater concentrations in the shallow USA in the vicinity of the NuStar site were used for contouring in order to simplify and present a general picture of the nature and extent of groundwater contamination at a project area level.

Parametrix Date: 1/25/2017 Path: P:\GIS\POV\MXD_PDF\Isoconcentrations\POV_Isoconcentrations_TCE_Shallow4_Q3_2016.mxd

N

0 250 500 750

Scale in Feet

MW-10 — Well Location Name

23 — Concentration Value (µg/l)

ND = Non-Detect
NS = Not sampled
IA = Inactive Sampling Location

- > 4 µg/L
- > 25 µg/L
- > 50 µg/L
- > 100 µg/L
- > 500 µg/L

Figure 4-2
TCE Isoconcentrations in Shallow USA Zone Groundwater 3rd Quarter 2016

2016 ANNUAL ENVIRONMENTAL MONITORING REPORT
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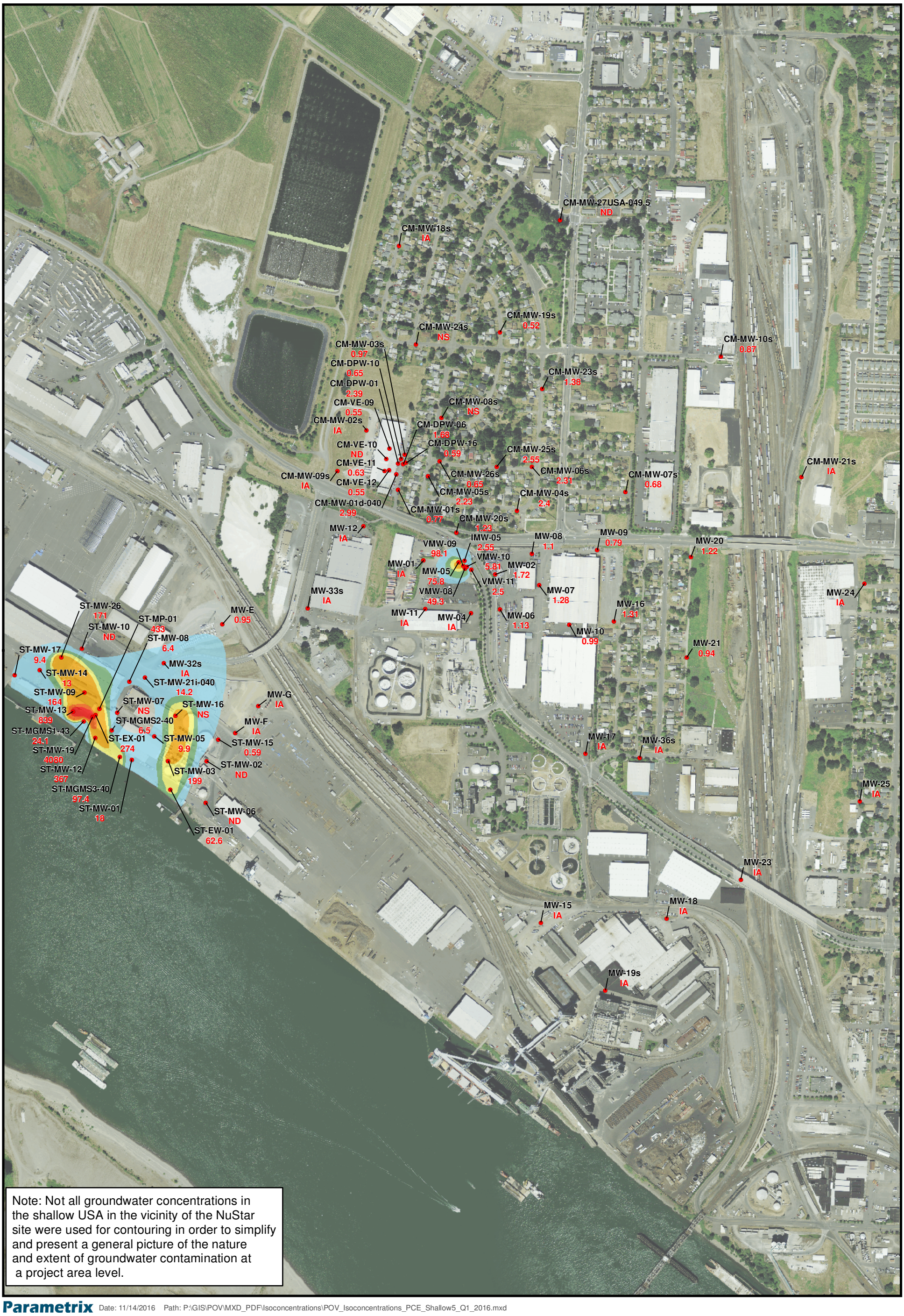


Note: Not all groundwater concentrations in the shallow USA in the vicinity of the NuStar site were used for contouring in order to simplify and present a general picture of the nature and extent of groundwater contamination at a project area level.

Parametrix Date: 11/14/2016 Path: P:\GIS\POV\MXD_PDF\Isoconcentrations\POV_Isoconcentrations_PCE_Shallow5_Q1_2016.mxd

N

0 250 500 750

Scale in Feet

MW-10 — Well Location Name

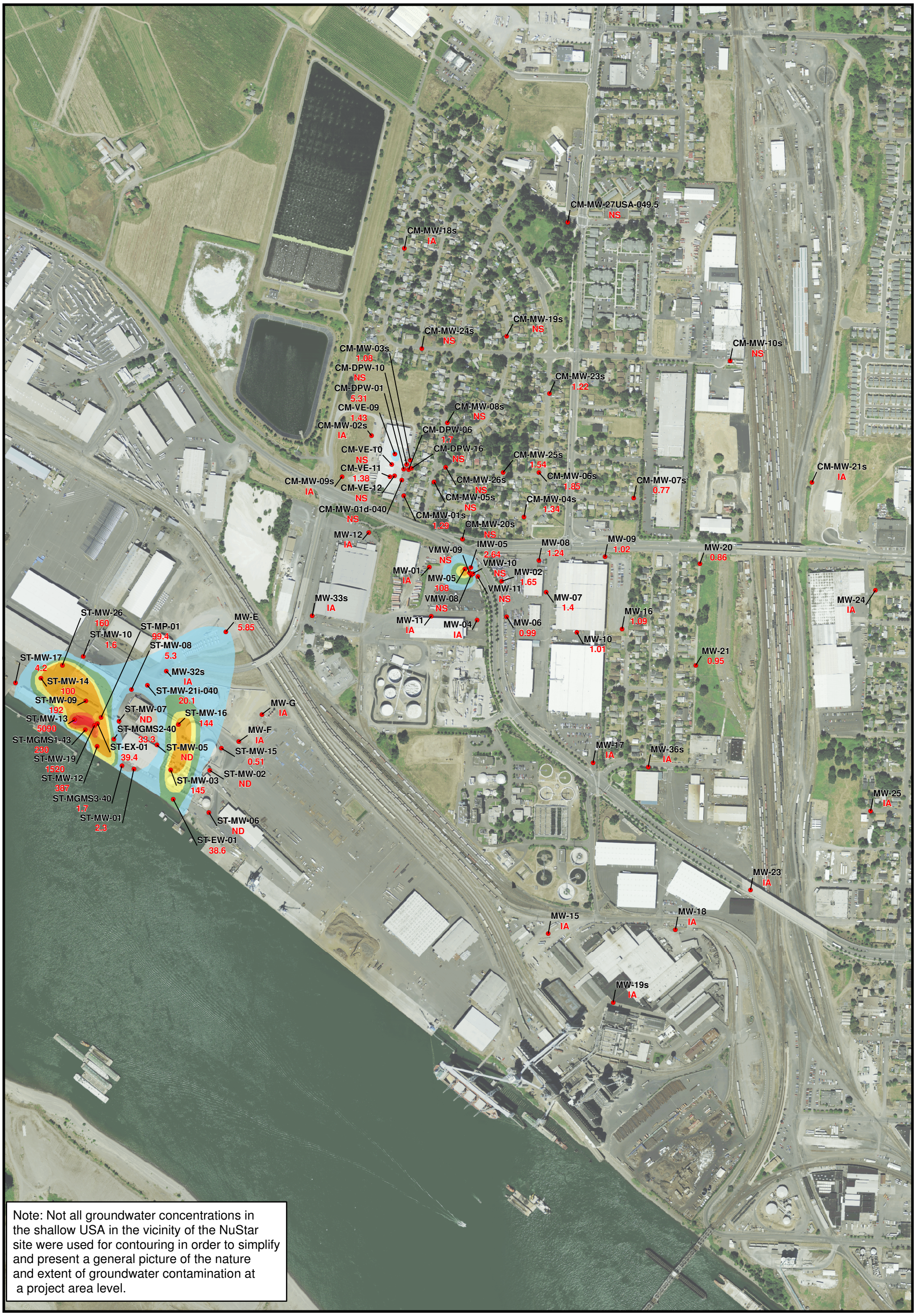
23 — Concentration Value (µg/l)

ND = Non-Detect
NS = Not sampled
IA = Inactive Sampling Location

- > 5 µg/L
- > 25 µg/L
- > 50 µg/L
- > 100 µg/L
- > 500 µg/L
- > 1000 µg/L

Figure 4-3
PCE Isoconcentrations in Shallow USA Zone Groundwater
1st Quarter 2016

2016 ANNUAL ENVIRONMENTAL MONITORING REPORT
SMC AND CADET SITES
PORT OF VANCOUVER, WASHINGTON



Parametrix Date: 3/24/2017 Path: P:\GIS\POV\MXD_PDF\Isoconcentrations\POV_Isoconcentrations_PCE_Shallow5_Q3_2016_error.mxd

N

0 250 500 750

Scale in Feet

- > 5 µg/L
- > 25 µg/L
- > 50 µg/L
- > 100 µg/L
- > 500 µg/L
- > 1000 µg/L
- > 5000 µg/L

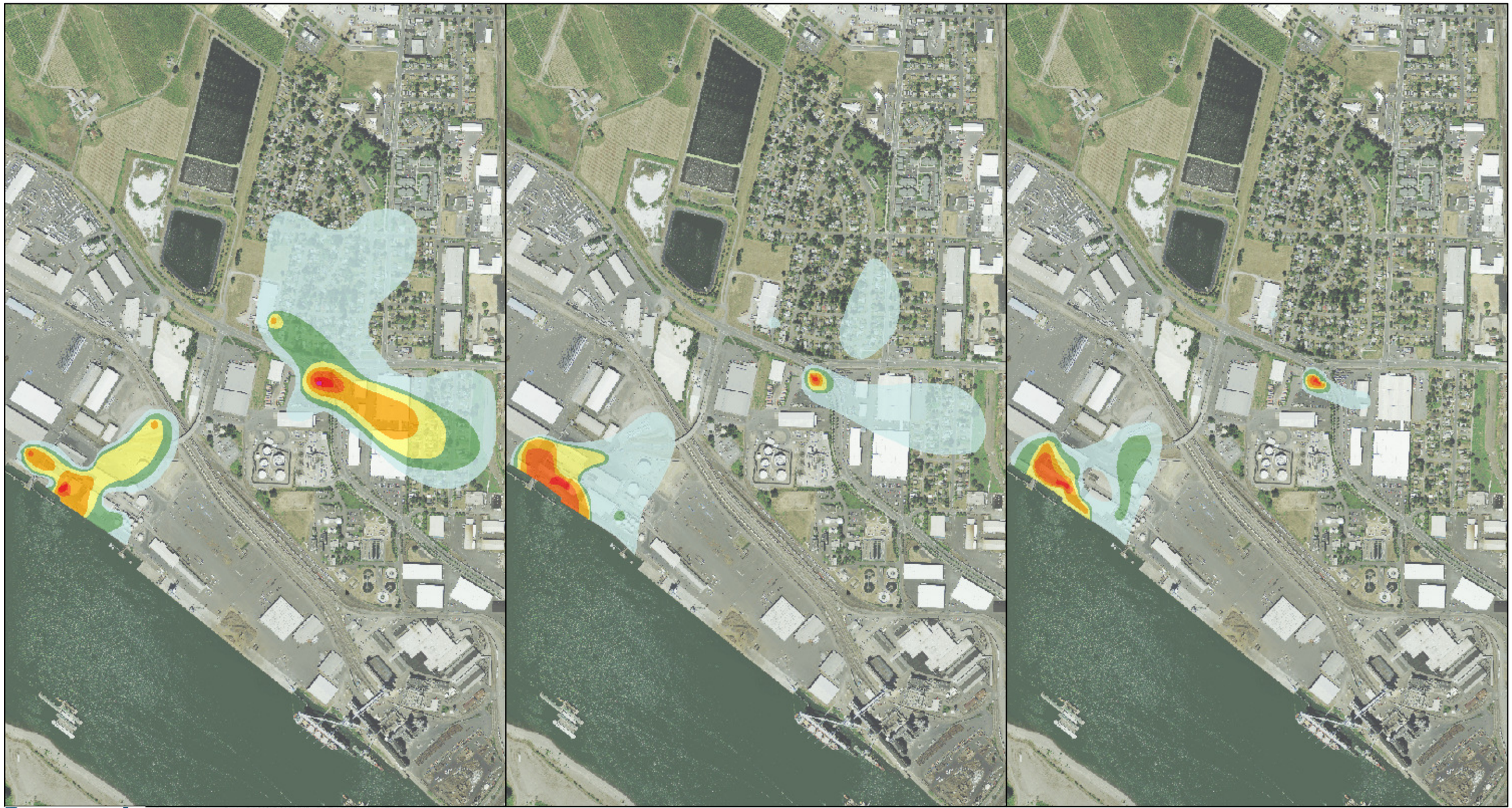
Figure 4-4
PCE Isoconcentrations in Shallow USA Zone Groundwater 3rd Quarter 2016

2016 ANNUAL ENVIRONMENTAL MONITORING REPORT
SMC AND CADET SITES
PORT OF VANCOUVER, WASHINGTON

2009 Q1

2012 Q1

2016 Q1



Parametrix

Date: 1/25/2017 Path: P:\GIS\POV\MXD_PDF\AEMR_2016\Fig_4_5_sh_compare.mxd

N

0 500 1,000 2,000 Feet

- > 4 µg/L
- > 25 µg/L
- > 50 µg/L
- > 100 µg/L
- > 500 µg/L
- > 1000 µg/L

Figure 4-5
TCE Isoconcentrations in Shallow USA Zone Groundwater 2009, 2012, and 2016

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Parametrix Date: 2/7/2017 Path: P:\GIS\POV\MXD_PDF\Isoconcentrations\POV_Isoconcentrations_TCE_Intermediate4_Q1_2016.mxd

N

0 250 500 750

Scale in Feet

MW-10
23
Well Location Name
Concentration Value (µg/l)

ND = Non-Detect
NS = Not sampled
IA = Inactive Sampling Location

> 4 µg/L
> 25 µg/L

Figure 4-6
TCE Isoconcentrations in Intermediate USA Zone Groundwater
1st Quarter 2016

2016 ANNUAL ENVIRONMENTAL MONITORING REPORT
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Parametrix Date: 3/24/2017 Path: P:\GIS\POV\MXD_PDF\Isoconcentrations\POV_Isoconcentrations_TCE_Intermediate4_Q3_2016.mxd

N

0 250 500 750

Scale in Feet

MW-10
23
Well Location Name
Concentration Value (µg/l)

ND = Non-Detect
NS = Not sampled
IA = Inactive Sampling Location

> 4 µg/L
> 25 µg/L

Figure 4-7
TCE Isoconcentrations in Intermediate USA Zone Groundwater 3rd Quarter 2016

2016 ANNUAL ENVIRONMENTAL MONITORING REPORT
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PORT OF VANCOUVER, WASHINGTON

Parametrix Date: 11/14/2016 Path: P:\GIS\POV\MXD_PDF\Isoconcentrations\POV_Isoconcentrations_PCE_Intermediate5_Q1_2016.mxd

N

0 250 500 750

Scale in Feet

MW-10
23

Well Location Name

Concentration Value (µg/l)

> 5 µg/L

ND = Non-Detect
NS = Not sampled
IA = Inactive Sampling Location

Figure 4-8
PCE Isoconcentrations in Intermediate USA Zone Groundwater
1st Quarter 2016

2016 ANNUAL ENVIRONMENTAL MONITORING REPORT
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Parametrix Date: 1/25/2017 Path: P:\GIS\POV\MXD_PDF\Isoconcentrations\POV_Isoconcentrations_PCE_Intermediate5_Q3_2016.mxd

N

0 250 500 750

Scale in Feet

MW-10
23

Well Location Name

Concentration Value (µg/l)

> 5 µg/L

ND = Non-Detect
NS = Not sampled
IA = Inactive Sampling Location

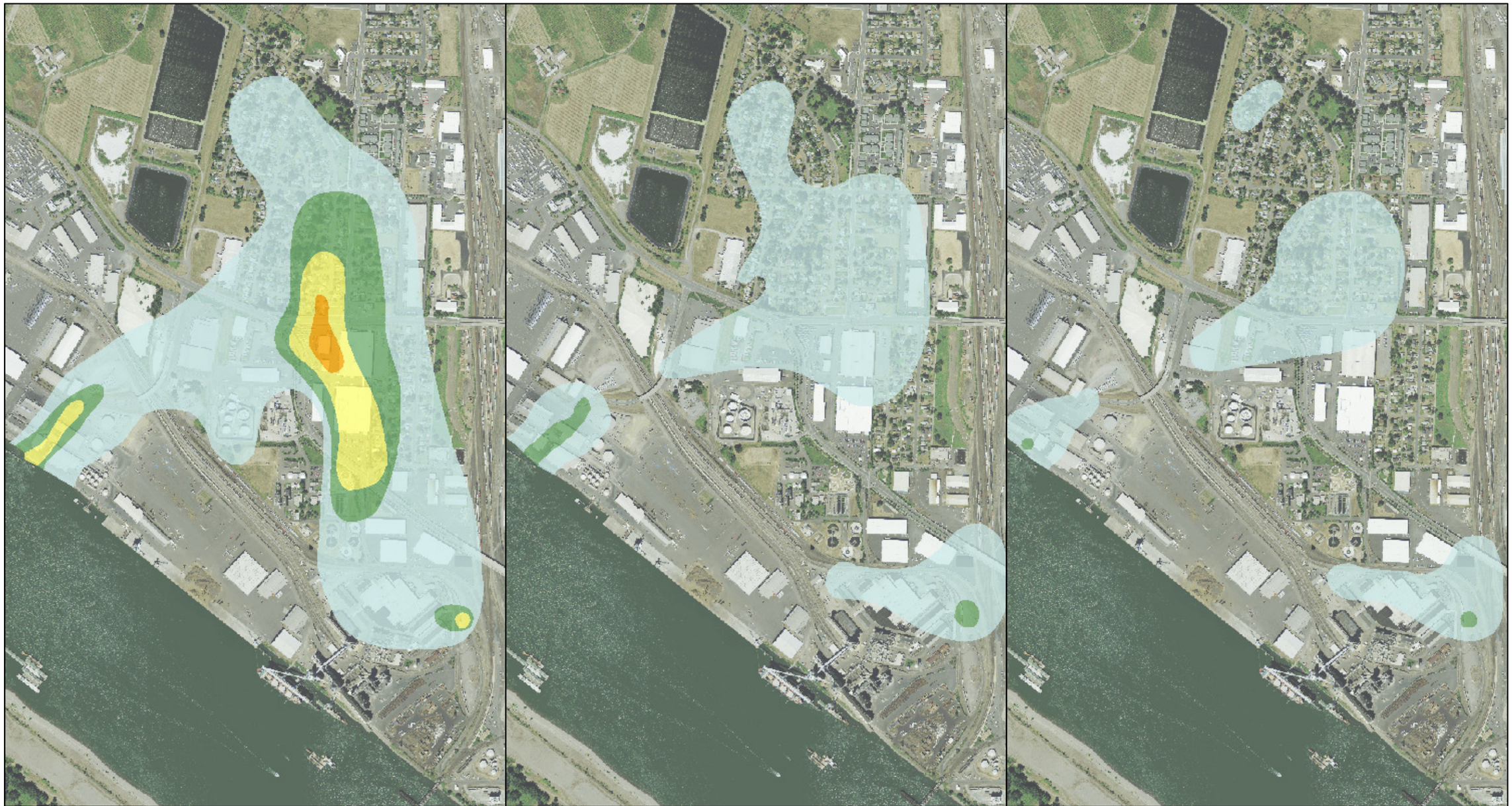
Figure 4-9
PCE Isoconcentrations in Intermediate USA Zone Groundwate
3rd Quarter 2016

2016ANNUAL ENVIRONMENTAL MONITORING REPORT
SMC AND CADET SITES
PORT OF VANCOUVER, WASHINGTON

2009 Q1

2012 Q1

2016 Q1



Parametrix

Date: 1/25/2017 Path: P:\GIS\POV\MXD_PDF\AEMR_2016\Fig_4_10_int_compare.mxd

> 4 µg/L
> 25 µg/L
> 50 µg/L
> 100 µg/L

N

0 500 1,000 2,000 Feet

Figure 4-10
TCE Isoconcentrations in Intermediate USA Zone Groundwater 2009, 2012, and 2016

2016 ANNUAL ENVIRONMENTAL MONITORING REPORT
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Parametrix Date: 2/7/2017 Path: P:\GIS\POV\MXD_PDF\Isoconcentrations\POV_Isoconcentrations_TCE_Deep4_Q1_2016.mxd

N

0 250 500 750

Scale in Feet

MW-10
23
Well Location Name
Concentration Value (µg/l)

ND = Non-Detect
NS = Not sampled
IA = Inactive Sampling Location

> 4 µg/L
> 25 µg/L

Figure 4-11
TCE Isoconcentrations in Deep USA Zone Groundwater 1st Quarter 2016

2016 ANNUAL ENVIRONMENTAL MONITORING REPORT
SMC AND CADET SITES
PORT OF VANCOUVER, WASHINGTON

Parametrix Date: 2/22/2017 Path: P:\GIS\POV\MXD_PDF\Isoconcentrations\POV_Isoconcentrations_TCE_Deep4_Q3_2016.mxd

N

0 250 500 750

Scale in Feet

MW-10
23
Well Location Name
Concentration Value (µg/l)

ND = Non-Detect
NS = Not sampled
IA = Inactive Sampling Location

> 4 µg/L
> 25 µg/L

Figure 4-12
TCE Isoconcentrations in Deep USA Zone Groundwater 3rd Quarter 2016

2016 ANNUAL ENVIRONMENTAL MONITORING REPORT
SMC AND CADET SITES
PORT OF VANCOUVER, WASHINGTON

Parametrix Date: 1/26/2017 Path: P:\GIS\POV\MXD_PDF\Isoconcentrations\POV_Isoconcentrations_PCE_Deep5_Q1_2016.mxd

N

0 250 500 750

Scale in Feet

MW-10 — Well Location Name

23 — Concentration Value (µg/l)

ND = Non-Detect
NS = Not sampled
IA = Inactive Sampling Location

> 5 µg/L

Figure 4-13
PCE Isoconcentrations in Deep USA Zone Groundwater 1st Quarter 2016

2016 ANNUAL ENVIRONMENTAL MONITORING REPORT
SMC AND CADET SITES
PORT OF VANCOUVER, WASHINGTON

Parametrix Date: 2/22/2017 Path: P:\GIS\POV\MXD_PDF\Isoconcentrations\POV_Isoconcentrations_PCE_Deep5_Q3_2016.mxd

N

0 250 500 750

Scale in Feet

MW-10 Well Location Name

23 Concentration Value (µg/l)

ND = Non-Detect
NS = Not sampled
IA = Inactive Sampling Location

> 5 µg/L

Figure 4-14
PCE Isoconcentrations in Deep USA Zone Groundwater 3rd Quarter 2016

2016 ANNUAL ENVIRONMENTAL MONITORING REPORT
SMC AND CADET SITES
PORT OF VANCOUVER, WASHINGTON

2009 Q1

2012 Q1

2016 Q1

Parametrix

Date: 1/26/2017 Path: P:\GIS\POV\MXD_PDF\AEMR_2016\Fig_4_15_dp_compare.mxd

> 4 µg/L
> 25 µg/L

N

0 500 1,000 2,000
Feet

Figure 4-15
TCE Isoconcentrations in Deep USA Zone Groundwater 2009, 2012, and 2016

2016 ANNUAL ENVIRONMENTAL MONITORING REPORT
SMC AND CADET SITES
PORT OF VANCOUVER, WASHINGTON