Naval Facilities Engineering Command Southwest
Contracts Department
1220 Pacific Highway, Building 127, Room 112
San Diego, California 92132-5190

CONTRACT NO. N62473-12-D-2004
DELIVERY ORDER NO. 0007

DRAFT
2014 ANNUAL PERFORMANCE MONITORING REPORT
June 2015

ENHANCED IN SITU BIOREMEDIATION
INSTALLATION RESTORATION PROGRAM SITE 70
NAVAL WEAPONS STATION SEAL BEACH
SEAL BEACH, CALIFORNIA

DCN: ECIN-2004-0007-0004

Prepared by:

ECC-INSIGHT LLC
1746 Cole Boulevard, Suite 350
Lakewood, CO 80401

Marco Mendoza, PG
Geologist

Anthony Ford
Project Manager

PROFESSIONAL GEOLOGIST
MARCO A. MENDOZA
No. 8363
STATE OF CALIFORNIA
Expires Jan. 31, 2017

This page intentionally left blank

EXECUTIVE SUMMARY

This 2014 Annual Performance Monitoring Report (PMR) presents the results of groundwater sampling completed to evaluate the effectiveness of the enhanced in situ bioremediation (EISB) at Installation Restoration Program (IRP) Site 70, Naval Weapons Station (NAVWPNSTA) Seal Beach, Seal Beach, California (Figure 1-1). The EISB is being implemented to treat elevated levels of trichloroethene (TCE), cis-1,2-dichloroethene (DCE), and vinyl chloride (VC) in groundwater. The 2014 annual groundwater sampling event was completed in December 2014.

The remediation at IRP Site 70 is being conducted under the IRP. NAVWPNSTA Seal Beach is an active federal facility and is not on the National Priorities List. The lead federal agency for this Comprehensive Environmental Response, Compensation, and Liability Act cleanup action is the Department of the Navy. The California Department of Toxic Substances Control (DTSC) and the California Regional Water Quality Control Board Santa Ana Region are the state regulatory agencies providing support and oversight.

To remediate the elevated levels of TCE, cis-1,2-DCE, and VC in groundwater, emulsified vegetable oil (EVO) and *Dehalococcoides* (Dhc) bacteria (in the form of the dechlorinating microbial culture [KB-1®] culture) were initially injected into all injection wells in the contaminant source area (Source Area Treatment Grid [SATG]) and six downgradient biobarriers, including the Source Area Biobarrier (SAB), the First Sand Biobarriers (FSB)-1 and FSB-2, the Shell Horizon Biobarriers (SHB)-1 and SHB-3, and the Second Sand Biobarrier (SSB)-1 between 2008 and 2010. Since that initial round of injection, one additional round of injection (EVO only) was completed in select wells at six of the seven biobarriers. Additional EVO was not injected at SHB-1 because it was determined that conditions for reductive dechlorination at that biobarrier were satisfactory. The SATG and the six downgradient biobarriers treat contaminants in four hydrostratigraphic units, including the Upper Fines, First Sand, Shell Horizon, and Second Sand.

The following field activities were completed during the 2014 annual performance monitoring event:

- Depth to groundwater was measured in each hydrostratigraphic unit.
- Groundwater samples were collected from 79 wells. Samples were analyzed for volatile organic compounds (VOCs), dissolved hydrocarbon gases, volatile fatty acids (VFAs), anions, total dissolved solids, alkalinity, total organic carbon (TOC), dissolved metals, sulfide, and Gene-Trac Dhc with vinyl chloride reductase A gene (*vcr*A). In addition, field parameters, including pH, dissolved oxygen (DO), oxidation-reduction potential (ORP), and specific conductance of groundwater, were measured.
- All 12 soil vapor probes located in the contaminant source area were sampled for methane, hydrogen sulfide, and VOCs. The ambient air both inside and outside of buildings, and utility corridors near the contaminant source area was monitored for methane and VOCs for health and safety purposes.

Review of the data collected during the 2014 annual event indicates that, overall, reductive dechlorination is occurring at the site. The following summarize the results of the event:

- Groundwater flow directions and gradients in each hydrostratigraphic unit are consistent with historical data, with the overall groundwater flow to the southeast, with the exception of the Upper Fines Unit which flows locally at the site to the northwest, with relatively low gradients.
- Data obtained from the annual performance monitoring event in 2013 indicated that while conditions along portions of each biobarrier were still effectively enhancing the reductive dechlorination of TCE, other portions of the biobarriers contained the electron donor TOC at concentrations below those considered necessary to support reductive dechlorination. Based on these results, additional EVO was injected into select wells at six of the seven biobarriers between September and December 2013. The results of the 2014 annual monitoring event indicate that reductive dechlorination is occurring, and that the concentrations of the electron donor TOC increased in most of the injection wells sampled due to the recent EVO injections. While the recent EVO injections had some noticeable positive impacts on oxidation-reduction (redox) conditions the most recent (2014) TOC data indicate that four of the 13 injection wells sampled this event have TOC above 50 milligrams per liter (mg/L). Based on the distance of the monitoring wells to the injection points it is possible that the EVO had not yet impacted the wells at the time of sampling.
- Compared to the last annual event in 2013, TCE concentrations across the site generally decreased or were relatively stable. The highest TCE concentrations remain in the Upper Fines Unit (2,800 micrograms per liter [µg/L] versus 1,700 µg/L in 2013) and the First Sand Unit (3,400 µg/L versus 4,200 µg/L in 2013).
- Compared to the last annual event in 2013, the cis-1,2-DCE concentrations in the Upper Fines Unit have remained stable. Relatively elevated concentrations of cis-1,2-DCE are still present in all of the hydrostratigraphic units, including the Upper Fines Unit (790 µg/L versus 1,200 µg/L in 2013), the First Sand Unit (1,300 µg/L versus 1,600 µg/L in 2013), the Shell Horizon Unit (1,600 µg/L versus 940 µg/L in 2013), and the Second Sand Unit (1,500 µg/L versus 1,200 µg/L in 2013). Compared to the last annual event in 2013, the VC concentrations in the Upper Fines Unit remained stable. Relatively elevated concentrations of VC are still present in all of the hydrostratigraphic units including the Upper Fines Unit (3,700 µg/L versus 2,100 µg/L in 2013), the First Sand Unit (920 µg/L versus 1,300 µg/L in 2013), the Shell Horizon Unit (180 µg/L versus 140 µg/L in 2013), and the Second Sand Unit (310 µg/L – unchanged since 2013).
- Data indicate that some of the highest concentrations of TCE are in the SATG near well MW-70-MNA01 (2,800 µg/L). Only the TCE in well MW-70-PMW06B, located in the First Sand Unit immediately upgradient of the FSB-1, is higher (3,400 µg/L).
- Increasing cis-1,2-DCE concentrations in Shell Horizon Unit well MW-70-MNA14 (from 940 µg/L in 2013 to 1,600 µg/L in 2014), and in Second Sand Unit well MW-70-MNA16 (from 1,200 µg/L in 2013 to 1,500 µg/L in 2014), located approximately 100 feet downgradient of the furthest downgradient biobarrier (SHB-3), suggest that complete dechlorination did not occur in either biobarrier and cis-1,2-DCE contamination is continuing to migrate in this area.

- The elevated concentration of TCE reported in 2012 in well MW-70-43B (550 µg/L), located to the north of SSB-1, suggested that the plume was potentially migrating past this biobarrier. The TCE concentration reported in 2014 in this well was significantly lower (79 µg/L), and is now below the criterion for active treatment (200 µg/L).
- Low-to-trace levels of contamination were reported in a few of the point of compliance (POC) wells at four hydrostratigraphic units (Upper Fines, First Sand, Second Sand, and Deep Sand Units), suggesting that overall groundwater contamination at the site remains contained within the POC well boundary.
- Tetrachloroethylene (PCE) was reported in Second Sand Unit POC well MW-70-36 at 12 µg/L, which is above the TCG of 5 µg/L. During the 2013 annual event, PCE was reported in this well at 24 µg/L.
- Reductive dechlorination requires anaerobic conditions (DO levels below 0.5 mg/L, or at least not greater than 1 mg/L [generally considered anaerobic based on limitations of field instrumentation]). Within the injection wells in both the SATG and all of the downgradient biobarriers, the DO concentrations were equal to or below 1 mg/L, except for one injection well in FSB-2, suggesting the areas of injection have overall remained anaerobic (Table 2-2). DO levels were greater than 1 mg/L in only two monitoring wells, one monitored natural attenuation wells, and one performance monitoring well (Table 2-2). Overall, the aquifer also remains generally anoxic.
- ORP is a measure of the reducing capacity of the aquifer. In order for Dhc to survive and grow, and for reductive dechlorination to proceed optimally, ORP levels should be between -100 and 300 mV (millivolts) or lower. ORP levels in the injection wells in the SATG and in all of the downgradient biobarriers that were sampled were all below -100 mV (Table 2-2). ORP levels were also lower than -100 mV in all but five of the remaining wells sampled (Table 2-2) except the POC wells. Overall, ORP levels indicate that reducing conditions are present in the aquifer.
- While the redox conditions are clearly supportive of reductive dechlorination, the indicators of adequate electron donor presence to support microbial activity (through assessment of TOC and VFAs, as described below) are less suggestive of widespread optimal conditions. Data indicate that optimal concentrations of the electron donor EVO (TOC above 50 mg/L [Section 2.5.2]) were present in four of the 13 injection wells sampled. Nine of the 13 injection wells sampled have TOC below 50 mg/L. As expected, the TOC levels have generally decreased since the 2013 annual sampling which was completed just after the 2013 additional EVO injections. In addition, 26 performance monitoring wells were sampled, with approximately half of them located upgradient of the biobarriers and half located downgradient. Overall, the TOC concentrations in these wells remained generally low and unchanged from the 2013 annual sampling event.
- VFAs (which are produced during the metabolic degradation of EVO) were detected in two of the seven treatment areas in 2012, and detected in six of the seven treatment areas (all except the SHB-1) in 2013. In 2014, VFAs were detected in two of the seven treatment areas. VFAs were detected in one of the 13 injection wells sampled and in one of the monitoring wells sampled.

- The depletion of sulfate, an alternate electron acceptor, and the presence or increase in methane, a metabolic by-product of anaerobic microbial biodegradation, can indicate that anaerobic microbial respiration is occurring. During the 2014 annual event, sulfate was relatively stable in a majority of the wells sampled compared to the 2013 annual event, with sulfate in some wells slightly reduced, and sulfate in even fewer wells somewhat higher. Methane concentrations at the site also generally increased after the initial treatment, and have generally remained elevated. Almost an even number of the wells sampled in 2014 had the concentration of methane increase since 2013 as decrease, with a slightly fewer number of wells with relatively stable methane concentrations. Overall, the elevated levels of methane in the aquifer suggest that anaerobic microbial respiration is occurring.
- Dhc concentrations in three of the 13 injection wells sampled were above the desired concentration of 10^6 cells/L, and *vcr*A concentrations in eight of the 13 injection wells sampled were above the desired concentration of 10^5 cells/L. In addition, of the 26 performance monitoring wells sampled, with approximately half of them located upgradient of the biobarriers and half located downgradient, the Dhc and *vcr*A concentrations were noticeably higher in the wells located downgradient of the biobarriers, as expected, with most of them containing concentrations above, or close to, that considered optimal. It is believed that with time the recent EVO injections will support increasing concentrations of both Dhc and *vcr*A.
- Methane was reported above the upper explosive limit (UEL) of 150,000 parts per million by volume (ppm_V) in 4 of the 12 soil gas samples collected in the contaminant source area, and was reported below the lower explosive limit (LEL) of 50,000 ppm_V in all but one of the remaining samples. The one methane result above the LEL but below the UEL was from a soil vapor probe located near Building 123 (88,000 ppm_V in SV-70-10) (Figure 2-34). The presence of elevated levels of methane gas in subsurface soils suggests that microbial respiration is occurring. It is noted that methane gas was not detected inside the buildings surveyed or in the outdoor areas/utility corridors.
- Six VOC, Benzene, chloroform, cis-1,2-DCE, PCE, TCE and VC, were detected in soil gas samples at concentrations well above their respective environmental screening levels and California Human Health Screening Level. It is noted that VOCs were not detected inside the buildings surveyed or in the outdoor areas/utility corridors. Benzene is a non-contaminant of concern (COC) VOC and its detection in soil vapor samples may be indicative of off-site petroleum contamination. In review of the State Water Resources Control Board GeoTracker web site, there are three Leaking Underground Storage Tank (LUST) Cleanup sites, one site of which the LUST cleanup status is still open (with petroleum contamination, including benzene), located directly upgradient and off-site of IRP Site 70 which may be potential source of the benzene.

Data from the 2014 annual sampling event also indicate that some areas of the contaminant plumes are in locations that cannot be readily treated with the existing SATG and biobarriers. It is suggested that additional investigation be considered in these areas. Based on the results of the 2014 annual monitoring event, the following recommendations are made:

- As noted in the 2013 annual PMR, some of the highest concentrations of TCE at the site are located in monitoring wells situated east of the SATG injection well network at wells

MW-70-MNA01 (2,800 µg/L) and MW-70-27 (200 µg/L). No information is available on the contaminant plume between these wells. It is recommended that additional site investigation be considered in this area to better identify the nature and extent of contamination and to determine whether additional injection wells should be considered. It is recommended that the investigation be completed with the Site Characterization and Analysis Penetrometer System technology in which a cone penetrometer containing various sensors is hydraulically driven into the subsurface to identify subsurface stratigraphy and the presence of contamination. Samples of soil and groundwater can also be collected through the probe for additional analyses.

- During the annual sampling event completed in 2012, elevated concentrations of TCE were reported to the north of SSB-1, suggesting that a portion of the contaminant plume was migrating past this biobarrier. In 2012, TCE was detected in well MW-70-43B, located to the north of SSB-1 at 550 µg/L. During the 2014 annual event, the TCE concentration in well MW-70-43B was much lower, at 79 µg/L. Continued monitoring and assessment of TCE and DCE decay (and generation of VC and ethane/ethane) in this area of the site is recommended.
- During baseline sampling in 2008, well MW-70-MNA14, located in the Shell Horizon approximately 400 feet downgradient of the last Shell Horizon biobarrier (SHB-3) (Figure 2-35), had less than 1 µg/L TCE (currently 3.5 µg/L), suggesting that the increasing levels of cis-1,2-DCE and VC reported in the well (currently 1,600µg/L and 180 µg/L, respectively) is the result of contaminant migration in the Shell Horizon Unit and not from dechlorination of TCE in the vicinity of the well. In addition, the cis-1,2-DCE concentration in Second Sand Unit well MW-70-MNA16, located approximately 100 feet downgradient of the furthest downgradient biobarrier (SSB-1), increased (from 880 µg/L in 2012 to 1,500 µg/L in 2014), suggesting that complete dechlorination also did not occur in this biobarrier and cis-1,2-DCE contamination is continuing to migrate in this area. Even though the TCE concentrations in these wells are below the criterion for active treatment (200 µg/L), the cis-1,2-DCE and VC concentrations are significantly above the TCGs (6 and 0.5 µg/L, respectively). Since there are no biobarriers installed downgradient of these wells, it would be desirable to have additional downgradient monitoring wells to more closely monitor plume migration. A portion of the National Wildlife Refuge is downgradient of these wells, and it may be difficult to install downgradient monitoring wells along the inferred axis of the plume within approximately 1,000 feet of these wells. However, additional Shell Horizon Unit monitoring wells should be installed along the northern side of the projected path of the plume along Case Road where well installation is feasible. It is recommended that a Shell Horizon Unit well be installed coincident with the location of First Sand Unit well MW-70-16 and Second Sand Unit well MW-70-21. Further, it is recommended that the far downgradient wells existing in this area (e.g., First Sand Unit well MW-70-16 and Second Sand Unit wells MW-70-15 and MW-70-21) continue to be closely monitored.
- The presence of electron donor, in concert with the indication of anaerobic respiration and dechlorination, should be critically assessed in select injection wells during the next semi-annual event as a means of determining electron donor presence/significance. This evaluation should focus on sampling select injection wells not sampled as part of the routine semi-annual sampling event. It is recommended that the following injection wells be sampled for TOC and VFAs: IW-70-SAT-21 and IW-70-SAT-15 in the SATG; IW-

70-FSB116 and IW-70-FSB112 in the FSB-1; IW-70-FSB219 and IW-70-FSB207 in the FSB-2; IW-70-SHB306 and IW-70-SHB317 in SHB-3; and IW-70-SSB121 and IW-17-SSB116 in the SSB-1. In addition, one well of the two wells noted in the SATG, IW-70-SAT-21, and one injection well in each of the aforementioned biobarriers (IW-70-FSB112 in the FSB-1; IW-70-FSB219 in the FSB-2; IW-70-SHB306 in the SHB-3; and IW-70-SSB121 in the SSB-1) should also be sampled for dissolved gases and DHC analysis in the next annual sampling event.

- The robustness of the microbial community, changes in dissolved hydrogen gases, and ethene generation should continue to be critically monitored and assessed in the next annual event. The results of the suggested expanded semi-annual and annual sampling and analysis (noted above) should be used in the next (2015) annual assessment to evaluate overall EISB performance and the need to conduct any further optimization of the injection scheme.
- Continue implementation of the existing methane monitoring program that is in place. Continue monitoring ambient air and suspected soil gas entry locations (i.e., foundation cracks, utility corridors, etc.) with both a photo-ionization detector (PID) and a 4-gas meter for lower explosive limit (LEL), percent carbon dioxide and percent oxygen in addition to methane. Consider supplementing the PID with a flame-ionization detector (FID) which is intrinsically safe to the environment and also responds to methane and has excellent response to chlorinated volatile organic compounds (CVOCs).

TABLE OF CONTENTS

PAGE

EXECUTIVE SUMMARY ES-1

1.0 INTRODUCTION 1-1
1.1 Scope of Work 1-1
1.2 Background 1-2
1.2.1 Summary of Monitoring and Injection Well Network 1-3
1.2.2 Physical Setting and Site Conditions 1-4
1.2.3 Site-Specific Hydrogeology 1-4
1.2.4 Nature and Extent of Contamination 1-6
1.3 Report Organization 1-6

2.0 FIELD ACTIVITIES AND RESULTS 2-1
2.1 Groundwater Monitoring Program 2-1
2.2 2014 Semiannual Groundwater Monitoring 2-1
2.3 Groundwater Flow and Direction 2-2
2.3.1 Upper Fines Unit Groundwater Elevations 2-2
2.3.2 First Sand Unit Groundwater Elevations 2-3
2.3.3 Shell Horizon Unit Groundwater Elevations 2-3
2.3.4 Second Sand Unit Groundwater Elevations 2-4
2.3.5 Deep Sand Unit Groundwater Elevations 2-4
2.3.6 Summary of Groundwater Elevation Data 2-5
2.4 Remedy Performance Evaluation 2-5
2.4.1 Chlorinated Ethenes 2-5
2.4.2 Electron Donor (EVO) 2-8
2.4.3 Aquifer Redox Conditions 2-8
2.4.4 Bioaugmentation (*Dehalococcoides*) 2-9
2.4.5 Water Quality Parameters 2-10
2.4.6 Summary of Remedy Performance Evaluation 2-10

3.0 CONCEPTUAL SITE MODEL UPDATE 3-1
3.1 Lithology 3-1
3.2 Contaminants of Concern 3-2
3.2.1 Upper Fines Unit 3-2
3.2.2 First Sand Unit 3-3
3.2.3 Shell Horizon Unit 3-4
3.2.4 Second Sand Unit 3-5
3.2.5 Deep Sand Unit 3-6
3.3 Visualization of Dissolved Plume Extent 3-7
3.3.1 Trichloroethene 3-7
3.3.2 Cis-1,2-Dichloroethene 3-7
3.3.3 Vinyl Chloride 3-8
3.3.4 Ethene 3-8

4.0 VARIANCES TO THE WORK PLAN AND DATA QUALITY ASSESSMENT 4-1
4.1 Variances to the Work Plan 4-1
4.2 Data Quality Assessment 4-1

TABLE OF CONTENTS
(Continued)

PAGE

5.0 LAND-USE CONTROLS 5-1

6.0 SUMMARY AND RECOMMENDATIONS 6-1
6.1 Summary of Results 6-1
6.2 Recommendations 6-4

7.0 REFERENCES 7-1

TABLE OF CONTENTS
(Continued)

TABLES

Table 1-1	Contaminants of Concern and Target Cleanup Goals
Table 1-2	2014 Groundwater and Performance Monitoring Schedule
Table 1-3	Well Construction Summary
Table 2-1	December 2014 Groundwater Level Data
Table 2-2	Field Parameter Data
Table 2-3	Source Area Treatment Grid Analytical Results
Table 2-4	Upper Fines Point of Compliance Analytical Results
Table 2-5	Source Area Biobarrier/First Sand Analytical Results
Table 2-6	First Sand Biobarrier 1 Analytical Results
Table 2-7	First Sand Biobarrier 2 Analytical Results
Table 2-8	First Sand Point of Compliance Analytical Results
Table 2-9	Shell Horizon Biobarrier 1 Analytical Results
Table 2-10	Shell Horizon Biobarrier 3 Analytical Results
Table 2-11	Shell Horizon Point of Compliance Analytical Results
Table 2-12	Second Sand Biobarrier 1 Analytical Results
Table 2-13	Second Sand Point of Compliance Analytical Results
Table 2-14	Deep Sand Point of Compliance Analytical Results
Table 2-15	Soil Vapor Analytical Results
Table 3-1	Comparison of Baseline (2008), 2012, and 2014 Annual Maximum and Average Concentrations of TCE, Cis-1,2-DCE, and VC for Each Hydrostratigraphic Unit

FIGURES

Figure 1-1	Site Location Map
Figure 1-2	Well Location Map
Figure 1-3	Soil Vapor Probe Location Map
Figure 2-1	Upper Fines Groundwater Elevations – December 2014
Figure 2-2	First Sand Groundwater Elevations – December 2014
Figure 2-3	Shell Horizon Groundwater Elevations – December 2014
Figure 2-4	Second Sand Groundwater Elevations – December 2014
Figure 2-5	Deep Sand Groundwater Elevations – December 2014
Figure 2-6	Water Level Trend Graphs: Upper Fines and First Sand (2008–2014)
Figure 2-7	Water Level Trend Graphs: Shell Horizon, Second Sand, and Deep Sand (2008–2014)
Figure 2-8	CVOC Molar Concentrations – Source Area Treatment Grid
Figure 2-9	CVOC Molar Concentrations – Source Area Biobarrier 1
Figure 2-10	CVOC Molar Concentrations – First Sand Biobarrier 1
Figure 2-11	CVOC Molar Concentrations – First Sand Biobarrier 2
Figure 2-12	CVOC Molar Concentrations – Shell Horizon Biobarrier 1
Figure 2-13	CVOC Molar Concentrations – Shell Horizon Biobarrier 3

TABLE OF CONTENTS
(Continued)

Figure 2-14 CVOC Molar Concentrations – Second Sand Biobarrier 1
Figure 2-15 Total Organic Carbon Trends: SATG, SAB, and FSB-1
Figure 2-16 Total Organic Carbon Trends: FSB-2, SHB-1, SHB-3, and SSB-1
Figure 2-17 Volatile Fatty Acid (VFA) Trends Since Baseline
Figure 2-18 DO-ORP Trends Since Baseline
Figure 2-19 Sulfate-Methane Trends Since Baseline
Figure 2-20 Dehalococcoides Trends Since Baseline: SATG, SAB, FSB-1, FSB-2
Figure 2-21 Dehalococcoides Trends Since Baseline: SHB-1, SHB-3, SSB
Figure 2-22 IR Site 70, Upper Fines – Source Area Treatment Grid, Trichloroethene in Groundwater – 2014
Figure 2-23 IR Site 70, Upper Fines – Source Area Treatment Grid, cis-1,2-Dichloroethene in Groundwater – 2014
Figure 2-24 IR Site 70, Upper Fines – Source Area Treatment Grid, Vinyl Chloride in Groundwater – 2014
Figure 2-25 IR Site 70, First Sand – Source Area Biobarrier, First Sand Biobarriers 1 & 2, Trichloroethene in Groundwater – 2014
Figure 2-26 IR Site 70, First Sand – Source Area Biobarrier, First Sand Biobarriers 1 & 2, cis-1,2-DCE in Groundwater – 2014
Figure 2-27 IR Site 70, First Sand – Source Area Biobarrier, First Sand Biobarriers 1 & 2, Vinyl Chloride in Groundwater – 2014
Figure 2-28 IR Site 70 – Shell Horizon Biobarriers 1 & 3, Trichloroethene in Groundwater – 2014
Figure 2-29 IR Site 70 – Shell Horizon Biobarriers 1 & 3, cis-1,2-Dichloroethene in Groundwater – 2014
Figure 2-30 IR Site 70 – Shell Horizon Biobarriers 1 & 3, Vinyl Chloride in Groundwater – 2014
Figure 2-31 IR Site 70, Second Sand – Second Sand Biobarrier 1, Trichloroethene in Groundwater – 2014
Figure 2-32 IR Site 70, Second Sand – Second Sand Biobarrier 1, cis-1,2-Dichloroethene in Groundwater – 2014
Figure 2-33 IR Site 70, Second Sand – Second Sand Biobarrier 1, Vinyl Chloride in Groundwater – 2014
Figure 2-34 IR Site 70 – Soil Vapor Analytical Results
Figure 2-35 2008 Baseline TCE Extent (Projected to Ground Surface)
Figure 2-36 2013 Baseline TCE Extent (Projected to Ground Surface)
Figure 3-1 Trichloroethylene Extent Above 1,000 µg/L in the Source Area, 2014 Annual Sampling Event
Figure 3-2 Trichloroethylene Extent Above 250 µg/L Along Cross Section A-A', 2014 Annual Sampling Event
Figure 3-3 Trichloroethylene Extent Above 250 µg/L Along Cross Section B-B', 2014 Annual Sampling Event
Figure 3-4 Trichloroethylene Extent Above 250 µg/L, 2014 Annual Sampling Event
Figure 3-5 Cis-1,2-Dichloroethylene Extent Above 60 µg/L, 2014 Annual Sampling Event

TABLE OF CONTENTS
(Continued)

Figure 3-6 Vinyl Chloride Extent Above 20 µg/L, 2014 Annual Sampling Event
Figure 3-7 Ethene Extent Above 10 µg/L, 2014 Annual Sampling Event
Figure 3-8 Cis-1,2-Dichloroethylene Extent Above 60 µg/L Along Cross Section J-J', 2014 Annual Sampling Event
Figure 3-9 Vinyl Chloride Extent Above 20 µg/L Along Cross Section J-J', 2014 Annual Sampling Event
Figure 3-10 Ethene Extent Above 10 µg/L Along Cross Section J-J', 2014 Annual Sampling Event
Figure 3-11 Three Dimensional Views of the Trichloroethylene Plume (>250 µg/L) 2008 – 2014
Figure 3-12 Three Dimensional Views of the Cis-1,2-Dichloroethene Plume (>60 µg/L) and Vinyl Chloride Plume (>20 µg/L) 2010 – 2014

APPENDICES

Appendix A Field Sample Collection and Ambient Air Monitoring Logs (on CD only)
Appendix B-1 Laboratory Analytical Reports and Chain-of-Custody Documentation (on CD only)
Appendix B-2 Laboratory Data Validation Reports (on CD only)
Appendix C Performance Monitoring Detailed Trend Graphs (on CD only)
Appendix D 2008 Baseline Sampling Maps (on CD only)
Appendix E Long Beach Airport Precipitation Data (on CD only)

ATTACHMENTS

Attachment 1 Final Data Submittal for the August 2014 Semiannual Performance Monitoring Event – Enhanced In Situ Bioremediation (EISB) at IR Site 70, Naval Weapons Station Seal Beach, Seal Beach, CA (on CD only)

ABBREVIATIONS AND ACRONYMS

°F	degrees Fahrenheit
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
bgs	below ground surface
cells/L	cells per liter
BEI	Bechtel Environmental, Inc.
CHHSL	California Human Health Screening Level
COC	contaminant of concern
CSM	conceptual site model
CVOC	chlorinated VOC
DCE	dichloroethene
Dhc	*Dehalococcoides*
DNA	deoxyribonucleic acid
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
DTSC	Department of Toxic Substances Control
DWR	Department of Water Resources
ECC/Geosyntec	Environmental Chemical Corporation/Geosyntec Consultants
EISB	enhanced in situ bioremediation
EPA	U.S. Environmental Protection Agency
ESL	environmental screening level
EWI	Environmental Work Instruction
EVO	emulsified vegetable oil
FID	flame-ionization detector
FSB	First Sand Biobarrier
GMS	Groundwater Modeling Software
IC	institutional control
IRP	Installation Restoration Program
J	estimated
JEG	Jacobs Engineering Group Inc.
KB-1®	dechlorinating microbial culture
LEL	lower explosive limit
LUC	land-use control
MCL	maximum contaminant level
mg/L	milligrams per liter
MNA	monitored natural attenuation
MSL	mean sea level
mV	millivolt
NASA	National Aeronautics and Space Administration
NAVFAC SW	Naval Facilities Engineering Command Southwest
NAVWPNSTA	Naval Weapons Station
OCHCA	Orange County Health Care Agency
OCWD	Orange County Water District
ORP	oxidation-reduction potential
PCE	tetrachloroethylene

ABBREVIATIONS AND ACRONYMS
(Continued)

PID	photo-ionization detector
pH	potential of hydrogen
PMR	Performance Monitoring Report
PMW	performance monitoring well
POC	point of compliance
ppm_V	parts per million by volume
QA	quality assurance
QC	quality control
RAWP	Remedial Action Work Plan
redox	oxidation-reduction
SAB	Source Area Biobarrier
SAP	Sampling and Analysis Plan
SATG	Source Area Treatment Grid
SHB	Shell Horizon Biobarrier
SSB	Second Sand Biobarrier
TCE	trichloroethene
TCG	target cleanup goal
TOC	total organic carbon
TtEC	Tetra Tech, EC, Inc.
UEL	upper explosive limit
UJ	non-detected estimated
VC	vinyl chloride
*vcr*A	vinyl chloride reductase A gene
VFA	volatile fatty acid
VOC	volatile organic compound

This page intentionally left blank

1.0 INTRODUCTION

This 2014 Annual Performance Monitoring Report (PMR) presents the field activities and results of annual groundwater sampling that was completed at Installation Restoration Program (IRP) Site 70 (Research, Testing, and Evaluation Area), at Naval Weapons Station (NAVWPNSTA) Seal Beach, Seal Beach, California (Figure 1-1). The primary purpose of the sampling was to evaluate the effectiveness of seven enhanced in situ bioremediation (EISB) treatment areas at the site. The 2014 annual groundwater sampling event was completed in December 2014. This PMR was prepared by ECC-Insight, LLC on behalf of Naval Facilities Engineering Command Southwest (NAVFAC SW) under Contract No. N62473-12-D-2004, Contract Task Order No. 0007.

The remediation at IRP Site 70 is being conducted under the IRP. NAVWPNSTA Seal Beach is an active federal facility and is not on the National Priorities List. The lead federal agency is the Department of the Navy, with the California Department of Toxic Substances Control (DTSC) and the California Regional Water Quality Control Board Santa Ana Region providing support and oversight.

NAVFAC SW directs the remedial action in accordance with requirements of the Comprehensive Environmental Response, Compensation, and Liability Act and the National Oil and Hazardous Substances Pollution Contingency Plan. A Final Remedial Action Work Plan (RAWP) defined the implementation of the EISB (Environmental Chemical Corporation/Geosyntec Consultants [ECC/Geosyntec] 2008a), and the current sampling activities were completed pursuant to the *Addendum No. 5 to the Final Sampling and Analysis Plan* (SAP) (ECC-Insight 2014a) and *Addendum No.4 to the Final Accident Prevention Plan/Site Safety and Health Plan* (ECC-Insight 2014b).

The EISB treatment areas were installed at IRP Site 70 for remediation of dissolved phase chlorinated solvents and potential dense non-aqueous phase liquids (DNAPLs) in groundwater. The EISB program is a semi-passive approach, comprising biostimulation and bioaugmentation, which incorporates a grid of injection wells in the contaminant source area and six rows of injection wells (biobarriers) that transect the downgradient dissolved phase plume (Figure 1-2). The injection wells were used to inject both an electron donor (EVO) and the dechlorinating microbial culture (KB-1®) Dehalococcoides (Dhc) bacteria culture initially between 2008 and 2010, and one additional EVO injection into select wells in 2013.

The initial areas of injection were selected based on the vertical and lateral extent of 250 micrograms per liter (µg/L) trichloroethene (TCE) (ECC/Geosyntec 2008b, Bechtel Environmental, Inc. [BEI] 2006). It was proposed that treatment be terminated once the TCE concentrations in groundwater were reduced to 200 µg/L, and that monitored natural attenuation (MNA) would then be employed until target cleanup goals (TCGs) for contaminants of concern (COCs) were achieved (Table 1-1).

1.1 Scope of Work

The annual groundwater sampling event was completed in December 2014. The following field activities were completed during the annual performance monitoring event:

- Depth to groundwater measurements were collected on December 15, 2014, before groundwater sampling activities began. The water level measurements and associated groundwater flow maps are discussed in Section 2.3.
- Groundwater samples were collected between December 16 and December 23 from 79 wells. The wells sampled and the associated laboratory analyses completed are listed in Table 1-2.
- All 12 soil vapor probes located in the contaminant source area (Figure 1-3) were sampled for methane, hydrogen sulfide and volatile organic compounds (VOCs). Additionally, the ambient air both inside and outside of buildings near the contaminant source area was monitored for methane for health and safety purposes.

1.2 Background

IRP Site 70 encompasses approximately 40 acres located south of Westminster Boulevard and east of Seal Beach Boulevard in the city of Seal Beach, California (Figure 1-1). Groundwater at the site is impacted by chlorinated solvents, primarily TCE and associated degradation products, up to a depth of approximately 160 feet below ground surface (bgs) (ECC/Geosyntec 2008b, BEI 2006). The remedial approach for the site was first presented in the *Revised Feasibility Study* (Geosyntec 2005). Previous investigations are summarized in the RAWP (ECC/Geosyntec 2008a) and the Fifth Annual Groundwater Monitoring Report (BEI 2006). The EISB baseline groundwater sampling results from 2008, and subsequent groundwater sampling results (2009 through 2013) have previously been documented (ECC-Insight 2009a, 2010, 2011, 2012; Tetra Tech, EC, Inc. [TtEC] 2013, 2014).

IRP Site 70 consists of multi-story office and production buildings, asphalt-paved parking areas, an assortment of aboveground tanks, associated above- and belowground piping systems, and concrete-lined sumps. From 1962 to 1973, the National Aeronautics and Space Administration (NASA) and its contractors utilized the area for the design and manufacture of the second stage of the Saturn V launch vehicle for the Apollo Program. Subsequent to NASA leaving the area, the United States Department of Energy and Garrett Engineering (Allied Signal) conducted pilot test assembly operations for a classified uranium enrichment process in portions of Building 112. The tests were conducted from 1980 to 1985 but did not include either the manufacture or enrichment of uranium. Currently, the building is used for storage, equipment testing, and office space.

The Final Removal Site Evaluation Report for IRP Site 70 (Bechtel National, Inc. 1996) evaluated the following structures in the contaminant source area:

- Bulkhead Fabrication Building 128
- Vertical Assembly and Hydrotest Building 112
- Pneumatic Test, Paint, and Packaging Building 122
- Tool and Maintenance Building 130
- Structural Test Tower
- Water Conditioning Plant

Operations at these facilities included the use of diluted acids, VOCs (including TCE), phenolic compounds, petroleum oils, sodium dichromate containing hexavalent chromium, detergents, metals containing paint wastes, and machine lubricating oil.

1.2.1 Summary of Monitoring and Injection Well Network

The groundwater monitoring well network at IRP Site 70 (Figure 1-2 and Table 1-3) consists of wells screened within five hydrostratigraphic units designated as the Upper Fines, First Sand, Shell Horizon, Second Sand, and Deep Sand. The monitoring wells have three general purposes based on their location (Geosyntec 2006b):

1. MNA wells. These wells are located on the fringe of the plume and provide early indications of plume migration and information on the natural attenuation of lower contaminant concentrations.
2. Performance monitoring wells (PMWs). These wells are located along the core of the plume between the biobarriers and provide information on biobarrier performance.
3. Point of compliance (POC) or "sentinel" wells. These wells are located downgradient of the contaminant plume to provide early indication of contamination migration off the site.

The majority of these wells were installed in 2007 (ECC/Geosyntec 2008b, 2009) and were sampled for the first time during the baseline monitoring event completed in 2008. The 2014 annual monitoring event included resampling these wells to evaluate the performance of the biobarriers.

The initial EISB injection at IRP Site 70 began in November 2008 after the baseline groundwater monitoring event was completed. Both EVO and Dhc were injected into seven treatment areas, including a general grid pattern at the contaminant source area, and six downgradient biobarriers. The injection wells were installed in four separate hydrostratigraphic units. To date, one additional round of EVO injection (without additional Dhc) has been completed in select wells at six of the seven treatment areas. Rationale for the locations of the additional EVO injections, completed between September and December 2013, are included in the *Final Annual Performance Monitoring Report, Enhanced In Situ Bioremediation, Installation Restoration Program Site 70, Naval Weapons Station Seal Beach, Seal Beach, California* (TtEC 2013). Additional EVO was not injected at the Shell Horizon Biobarrier (SHB)-1 because it was determined that conditions for reductive dechlorination at that biobarrier were satisfactory (TtEC 2013).

The initial large scale EVO and Dhc injection activities were performed over a few years at the following treatment areas in the following sequence (ECC-Insight 2010, 2011):

1. Source Area Biobarrier (SAB). Injection was completed on January 30, 2009.
2. Second Sand Biobarrier (SSB)-1. Injection was completed on March 18, 2009.
3. SHB-3. Injection was completed on September 25, 2009.
4. First Sand Biobarrier (FSB)-2. Injection was completed on November 24, 2009.
5. FSB-1. Injection was completed on February 12, 2010.
6. SHB-1. Injection was completed on April 7, 2010.

7. Source Area Treatment Grid (SATG). Injection was completed on August 3, 2010.

1.2.2 Physical Setting and Site Conditions

NAVWPNSTA Seal Beach is located within the Los Angeles-Orange County coastal plain situated at latitude 33° 45′ 27″ N and longitude 118° 4′ 22″ W, San Bernardino Baseline and Meridian. Most of NAVWPNSTA Seal Beach lies in the flat alluvial deposits in the southeastern portion of the Los Angeles Basin. The Los Angeles Basin is bounded on the north by the Santa Monica Mountains, to the northeast by the Repetto and Puente Hills, to the east and southeast by the Santa Ana Mountains and the San Joaquin Hills, and to the south, southwest, and west by the Palos Verdes Hills and the Pacific Ocean. NAVWPNSTA Seal Beach slopes evenly from approximately 20 feet mean sea level (msl) in the northwestern part, near the IRP Site 70, to sea level in the tidal flats of the Seal Beach National Wildlife Refuge in the southeast (Figure 1-1).

The climate in the area is classified as a marine-influenced southern California coastal region with temperature ranges from winter lows of approximately 30 degrees Fahrenheit (°F) to summer highs around 90°F. Annual precipitation is variable with an average of 12.5 inches. Prevailing winds average 4 miles per hour from the west with occasional strong dry winds ("Santa Ana") that can occur in the fall and winter. Groundwater levels are influenced by periods of high precipitation or drought, as well as tidal cycles near the tidal flats (ECC/Geosyntec 2008a). The sequence of regional stratigraphic units underlying the site, from youngest (shallowest) to oldest (deepest), is:

- Recent Alluvium with a maximum depth of approximately 80 to 100 feet bgs. The upper 50 feet consists of fine sands, silty clays, and clays, overlying sands and gravels, silty sands, silty clays, and clays.
- Upper Pleistocene Lakewood Formation extends between approximately 80 to 100 feet bgs to approximately 350 feet bgs. Lithologic units are discontinuous and contain zones of high and low permeability (California Department of Water Resources [DWR] 1961).
- Lower Pleistocene San Pedro Formation.
- Pliocene Pico Formation.

NAVWPNSTA Seal Beach is located on the Newport-Inglewood fault zone. Two faults, the Seal Beach fault and the Los Alamitos fault, are part of the Newport-Inglewood fault zone. The Seal Beach fault is located in the southern portion of the Newport-Inglewood fault zone. On the station, the Seal Beach fault has uplifted Upper Pleistocene deposits at Landing Hill and Hog Island (Jacobs Engineering Group Inc. [JEG] 1995). Movement along the fault appears to not have displaced recent sediments.

1.2.3 Site-Specific Hydrogeology

NAVWPNSTA Seal Beach is located at the southwestern corner of the Orange County Basin, which includes six major aquifers: the Artesia, Gage, Hollydale, Jefferson, Lynwood, and Silverado aquifers.

There are four general aquifer zones identified at NAVWPSTA Seal Beach (JEG 1995):

- A semiperched, unconfined zone within the upper portion of the Recent alluvial deposits

- A confined fresh groundwater zone contained in the lower portion of the Recent alluvial deposits
- Late and Early Pleistocene deposits of the Lakewood and San Pedro Formations, respectively, and in some parts, deposits of the Late Pliocene Pico Formation
- A confined zone of saline water underlying the freshwater zone

More specifically, groundwater underlying NAVWPNSTA Seal Beach (upper Recent Alluvium deposits) is within the Lower Santa Ana River Basin (Orange County Management Zone) (Water Board 1995, with Amendment R8-2004-001 2004). Beneficial uses of groundwater within this zone include municipal and domestic supply, agricultural supply, industrial service supply, and industrial process supply. However, shallow groundwater underlying IRP Site 70 does not serve as a water source for any of the beneficial uses designated in the Water Quality Control Plan, Santa Ana River Basin (Basin Plan) (Water Board 1995).

The principal freshwater aquifer body (lower Recent Alluvium deposits and Upper Pleistocene Lakewood Formation) is part of a large confined aquifer that occupies two zones. The first zone is approximately 75 to 200 feet deep and is saline. The second zone is approximately 250 to 1,000 feet deep and is fresh water. This second zone is the primary water supply source for neighboring cities. Groundwater levels in this principal freshwater zone fluctuate from year to year due to variations in pumping, infiltration, and recharge. Recharge to this aquifer is primarily from unconfined areas located upgradient and from unlined rivers that are hydraulically connected to the aquifer. Seasonal variations occur with highs in the wet winter months and lows in the dry summer months when large quantities of water are used for irrigation (JEG 1995).

Six specific stratigraphic units have been delineated beneath IRP Site 70, as presented in the Final Technical Memorandum (ECC/Geosyntec 2008b):

1. **Upper Fines Unit (ground surface to approximately 60 feet bgs)**. The Upper Fines Unit comprises three zones: a) a shallow zone of surficial soils and recent clayey sediments; b) an intermediate zone of interbedded silts, clays, and sandy silts and clays that include a semiperched zone; and c) a lower zone of interbedded silts, clays, and fine- to coarse-grained, silty to clayey sands. A zone of organic material, mainly wood chips, was encountered in a number of boreholes at a depth of approximately 45 to 50 feet bgs.
2. **First Sand Unit (approximately 60 to 105 feet bgs).** The First Sand Unit consists of poorly graded, fine-grained sands and silty sands. A coarse sand/fine gravel layer was encountered in several borings between 80 and 95 feet bgs. This coarse layer lies just above or slightly within the underlying Shell Horizon Unit. The First Sand Unit varies in thickness from approximately 30 to 50 feet.
3. **Shell Horizon Unit (approximately 105 to 135 feet bgs).** The Shell Horizon Unit is characterized by a sequence of interbedded clays, silts, sands, and gravels with laterally discontinuous interbeds of dense shells and shell fragments. This unit is characterized by a sequence of interbedded clays, silts, sands, and gravels below the source area grading downgradient to predominantly fine grained sand in the dissolved-phase plume area. This unit has been subdivided into an area with primarily interbedded clays and an area with primarily fine-grained sands to reflect differences in the hydrogeologic characteristics and potential plume migration behavior. Shell and gravel layers were

encountered in some but not all borings, which compose interbeds within the unit that do not appear to be spatially extensive. Wood chips were encountered in several borings at a depth of about 110 feet bgs.

4. **Second Sand Unit (approximately 135 to 170 feet bgs).** Although similar in character to the First Sand Unit, this deeper unit appears to be slightly coarser in its upper section.
5. **Deep Clay Unit (approximately 170 to 190 feet bgs).** The Deep Clay Unit consists of an upper clay to silty clay horizon and an underlying clayey silt, silt, sandy silt, or sandy clay layer. The upper clay to silty clay horizon appears to be a continuous low-permeability unit that is encountered at depths between 164 to 176 feet bgs. The upper clay to silty clay unit grades downward to clayey silt, silt, sandy silt, or sandy clay. This underlying layer is 3 to 20 feet thick, extending to depths of 175 to 188 feet bgs. Below the clayey silt, silt, sandy silt, or sandy clay layer is a silty sand and sand layer, up to 6 feet thick, which has been found to a depth of 191 feet bgs.
6. **Deep Sand Unit (approximately 190 feet bgs and below).** The Deep Sand Unit, where encountered, consists of fine-grained sands and silty sands, and appears to be similar in character to the First and Second Sand Units.

1.2.4 Nature and Extent of Contamination

The initial nature and extent of contamination at IRP Site 70, based on historical site investigations and the baseline groundwater monitoring event completed in 2008, formed the basis of the EISB remedial design (BEI 2002, 2006; Geosyntec 2006b; ECC-Insight 2009a).

Groundwater contamination at IRP Site 70 has been divided into two areas:

1. Source Area: potential residual DNAPL and dissolved phase TCE and its breakdown by-products contamination (cis-1,2-dichloroethene [DCE] and vinyl chloride [VC]) is located in the Upper Fines Unit between approximately 0 and 60 feet bgs. TCE concentrations in some areas exceed 1,000 µg/L.
2. Downgradient dissolved-phase plume: extends in a southeasterly direction from the Source Area. The primary VOCs in the dissolved-phase plume are TCE and its breakdown by-products (cis-1,2-DCE and VC), which extended approximately 4,000 feet downgradient and down to approximately 160 feet bgs. The downgradient dissolved-phase plume has been identified in the First Sand Unit (60 to 105 feet bgs), the Shell Horizon Unit (105 to 135 feet bgs), and the Second Sand Unit (135 to 170 feet bgs).

The extent of contamination depicted in the current conceptual site model (CSM) (Section 3.0) is consistent with previous CSMs where the local spatial termination of fine-grained stratigraphic horizons allows for a downward “stair stepping” geometry to the VOC plume (ECC-Insight 2009a; ECC/Geosyntec 2008b).

1.3 Report Organization

This report is organized as follows:

- Section 2.0 summarizes the 2014 groundwater sampling field activities and results.
- Section 3.0 includes a site CSM update.

- Section 4.0 describes variances from the work plan and a data quality assessment.
- Section 5.0 discusses land-use controls (LUCs).
- Section 6.0 presents a report summary and recommendations.
- Section 7.0 lists references cited in this report.
- Appendix A provides field sampling logs and ambient air monitoring documentation.
- Appendix B-1 provides laboratory analytical reports and chain-of-custody documentation.
- Appendix B-2 provides laboratory data validation reports
- Appendix C provides graphs of performance monitoring trends.
- Appendix D provides the 2008 baseline sampling plume maps.
- Appendix E provides precipitation data from Long Beach Airport.
- Attachment 1 consists of the *Final Data Submittal for the August 2014 Semiannual Performance Monitoring Event – Enhanced In Situ Bioremediation (EISB) at IR Site 70, Naval Weapons Station Seal Beach*

2.0 FIELD ACTIVITIES AND RESULTS

This section documents the activities associated with the groundwater and soil vapor monitoring completed at the site in 2014.

2.1 Groundwater Monitoring Program

Per the Remedial Design and RAWP (Geosyntec 2006b; ECC/Geosyntec 2008a), the groundwater monitoring program was established to track the progress of achieving the following performance criteria for the EISB remedy:

- Complete dechlorination of TCE to ethene within the biobarriers.
- Microbial growth (Dhc) to concentrations exceeding 10^7 cells per liter (cells/L) and migration of microbes throughout the active treatment areas.
- Localized and/or minimal secondary groundwater quality impacts.

For complete reductive dechlorination of TCE to occur, three primary factors are required. First, the oxidation-reduction (redox) state of the aquifer must be sufficiently reducing to support the required microbial community. Second, an adequate supply of electron donor must be present to maintain the reducing redox condition of the aquifer as well as provide the microbial community with its preferred electron donor (i.e., molecular hydrogen). Third, an active microbial community (Dhc) must be present.

The groundwater sampling program measures various parameters necessary to evaluate progress towards achieving the complete reductive dechlorination of TCE. The concentrations of chlorinated ethenes, including cis-1,2-DCE and VC, serve as direct evidence of the degradation of TCE. Other performance indicators include changes in dissolved hydrogen gases and polymerase chain reaction assays specific to Dhc. In addition, surrogate monitoring of EVO through evaluating total organic carbon (TOC) and volatile fatty acids (acetic, butyric, lactic, and propionic acids) were completed to assess the presence of the electron donor.

Determining the redox state of the aquifer at each biobarrier is important since reductive dechlorination of TCE by Dhc occurs best when the environment is reducing. The redox state of the aquifer is best evaluated using several parameters including oxidation/reduction potential (ORP), dissolved oxygen (DO), nitrate, ferrous iron, sulfate, and methane. Reducing environments are anaerobic as heterotrophic bacteria utilize the oxygen in the aquifer. Evaluating these parameters helps determine the aquifer's redox potential.

In the following subsections, the groundwater flow and direction, quality and redox potential in the aquifer, and soil vapor and ambient air sampling results obtained in 2014 are discussed. Table 1-2 summarizes the wells sampled and the parameters measured during the 2014 annual performance monitoring event.

2.2 2014 Semiannual Groundwater Monitoring

In August 2014, the 2014 semiannual groundwater sampling event was completed. Groundwater samples were collected from 44 wells. A letter report presenting the results of the 2014 semiannual

monitoring event was previously provided to the regulatory agencies for review and is included as Attachment 1 of this report. These semiannual results were evaluated with the more recent annual data in the context of assessing the overall performance of the EISB remedy. All semiannual data was used in the assessment of long-term trending of site data for this annual report.

2.3 Groundwater Flow and Direction

On December 15, 2014, groundwater levels were measured prior to beginning the annual groundwater sampling activities (Table 2-1). The hydraulic gradient and flow direction were determined for the Upper Fines, First Sand, Shell Horizon, Second Sand, and Deep Sand hydrostratigraphic units. Water level elevation contour maps for each hydrostratigraphic unit are included on Figures 2-1 through 2-5, and water level trend graphs for each unit are included on Figures 2-6 and 2-7.

Due to the very low hydraulic gradients across the site, external factors may influence local flow directions, including nearby aquifer recharge activities and pumping from nearby water supply wells. Aquifer recharge occurs at the Alamitos Injection Barrier, which is located approximately 2,000 feet northwest of the site. The barrier is operated by the Los Angeles County Department of Public Works, the Water Replenishment District of Southern California, and the Orange County Water District (OCWD) to prevent seawater intrusion. This barrier injects fresh water at depths as shallow as 27 feet bgs (Geosyntec 2006b).

As described for each hydrostratigraphic unit below, groundwater flow directions and gradients across the site for this event were consistent with historical data, suggesting that significant influence from external pumping wells or injection wells did not occur. Overall, groundwater elevations across the site were lower than last year, suggesting the decrease in rainfall and therefore, recharge in 2014 influenced the elevation of the groundwater table. Precipitation data from 2014 for the Long Beach Airport (Appendix E) indicate that the total annual precipitation for 2014 was only 4.62 inches which is lower than the 6.70 inches reported in 2013 and significantly lower compared to the 16.11 inches in 2012 (TtEC 2013).

2.3.1 Upper Fines Unit Groundwater Elevations

Groundwater levels in the Upper Fines Unit were measured in 13 wells (Figure 2-1 and Table 2-1). Note that water level data collected from MW-70-28, MW-70-MNA01, MW-70-PMW01B was not used to generate groundwater elevation contours due to the presence of vertical gradients and the difference in screen elevations between these and nearby and/or co-located Upper Fines wells. For example, MW-70-28 is horizontally co-located with MW-70-27. However, MW-70-28 is screened 25-ft deeper than MW-70-27. The difference in water levels between these two wells is 0.82-ft. Due to the observed vertical gradient between horizons, the water level at MW-70-28 could be considered to be more representative of the potentiometric heads in the transition between hydrostratigraphic units. The Upper Fines Unit, the shallowest hydrostratigraphic unit at the site, is located between the ground surface and approximately 60 feet bgs. Wells installed in the source area treatment grid are targeting the Upper Fines.

Groundwater elevations in the Upper Fines Unit measured in December 2014 are generally consistent with historical data. In December 2014, depth to groundwater ranged between approximately 9 and 15 feet bgs, and the groundwater elevations generally ranged between -0.5

and -6.1 feet msl. Comparison of the January 2014 water levels to the water levels recorded during the last annual event in January 2014 indicates that water levels have dropped approximately 2 feet (Table 2-1). The decrease in water levels this year is likely attributed to the decrease in annual rainfall in 2014 compared to 2013.

The direction of groundwater flow in the Upper Fines in December 2014 was to the northwest (gradient 0.0025), creating a groundwater low near the center of the source area (Figure 2-1).

The different groundwater flow directions observed in the Upper Fines Unit as compared to the other deeper units at the site is consistent with historical data. An old stream drainage system has been traced from north of Westminster Boulevard, trending southwest, through the source area, parallel to the current drainage channel that ultimately flows into Anaheim Bay (BEI 2006). This old stream drainage system is believed to influence groundwater flow directions in the Upper Fines Unit in the source area (BEI 2006).

2.3.2 First Sand Unit Groundwater Elevations

Groundwater levels in the First Sand Unit were measured in 32 wells (Figure 2-2 and Table 2-1). Note that water level data collected from MW-70-MNA10, MW-70-PMW07B, MW-70-PMW08B was not used to generate groundwater elevation contours due to the presence of vertical gradients and the difference in screen elevations between these and nearby and/or co-located First Sand wells. The First Sand Unit is located between approximately 60 to 105 feet bgs. Wells installed in and near biobarriers SAB-1, FSB-1, and FSB-2 are screened in the First Sand Unit.

Groundwater elevations measured in the First Sand Unit are generally consistent with historical data. In December 2014, depth to groundwater ranged between approximately 10 and 20 feet bgs, and the groundwater elevations generally ranged between approximately -5.8 and -10.4 feet msl. Four wells are screened in the shallower portion of the First Sand Unit, between 64 and 75 feet bgs, and show relatively higher water-level elevations (MW-70-PMW07A, MW-70-PMW08A, MW-70-MNA09, and IW-70-FSB216). Comparison of the December 2014 water levels to the water levels recorded during the last annual event in January 2014 indicates that water levels have dropped approximately 2 feet (Table 2-1). The decrease in water levels this year is likely attributed to the decrease in annual rainfall in 2014 compared to 2013.

The direction of groundwater flow in the First Sand Unit in December 2014 was to the southeast with an overall gradient of approximately 0.0027 (Figure 2-2).

2.3.3 Shell Horizon Unit Groundwater Elevations

Groundwater levels in the Shell Horizon Unit were measured in 11 wells (Figure 2-3 and Table 2-1). Note that water level data collected from IW-70-SHB113, MW-70-PMW11A, MW-70-PMW12A was not used to generate groundwater elevation contours due to the presence of vertical gradients and the difference in screen elevations between these and nearby and/or co-located Shell Horizon wells. The Shell Horizon Unit is located between approximately 105 to 135 feet bgs, and wells installed in and near biobarriers SHB-1 and SHB-3 are screened in the Shell Horizon.

Groundwater elevations measured in the Shell Horizon are generally consistent with historical data. In December 2014, depth to groundwater ranged between approximately 15 and 22 feet bgs,

and the groundwater elevations generally ranged between approximately -8.1 and -13.0 feet msl. Comparison of the December 2014 water levels to the water levels recorded during the last annual event in January 2014 indicates that water levels have dropped approximately 2.5 feet (Table 2-1). The decrease in water levels this year is likely attributed to the decrease in annual rainfall in 2014 compared to 2013.

The direction of groundwater flow in the Shell Horizon in December 2014 was to the southeast with a very low gradient of approximately 0.0036 (Figure 2-3).

2.3.4 Second Sand Unit Groundwater Elevations

Groundwater levels in the Second Sand Unit were measured in 13 wells (Figure 2-4 and Table 2-1). Note that water level data collected from MW-70-MNA16, MW-70-PMW13A/B, MW-70-PMW14A/B was not used to generate groundwater elevation contours due to the presence of vertical gradients and the difference in screen elevations between these and nearby Second Sand wells. The Second Sand Unit is located between approximately 135 to 170 feet bgs, and wells installed in and near biobarrier SSB-1 are screened in the Second Sand Unit.

Groundwater elevations measured in the Second Sand Unit are generally consistent with historical data. In December 2014, depth to groundwater ranged between approximately 15 and 20 feet bgs, and the groundwater elevations generally ranged between approximately -8.7 and -12.4 feet msl. The groundwater elevations for the two sets of performance monitoring wells at the biobarrier were somewhat higher than nearby wells, possibly due to well screen locations and lithologic variances within the Second Sand Unit. Comparison of the December 2014 water levels to the water levels recorded during the last annual event in January 2014 indicates that water levels have dropped approximately 2.5 feet (Table 2-1). The decrease in water levels this year is likely attributed to the decrease in annual rainfall in 2014 compared to 2013.

The direction of groundwater flow in the Second Sand Unit in December 2014 was to the southeast with a gradient of approximately 0.0013 (Figure 2-4).

2.3.5 Deep Sand Unit Groundwater Elevations

Groundwater levels in the Deep Sand Unit were measured in three POC wells (Figure 2-5 and Table 2-1). The Deep Sand Unit is located below approximately 190 feet bgs.

Groundwater elevations measured in the Deep Sand Unit are generally consistent with historical data. In December 2014, depth to groundwater ranged between approximately 19 and 21 feet bgs, and the groundwater elevations generally ranged between approximately -9.2 and -13.0 feet msl. Comparison of the December 2014 water levels to the water levels recorded during the last annual event in January 2014 indicates that water levels have dropped approximately 2 feet (Table 2-1). The decrease in water levels this year is likely attributed to the decrease in annual rainfall in 2014 compared to 2013.

The direction of groundwater flow in the Deep Sand Unit in December 2014 was to the southeast with a gradient of approximately 0.0017 (Figure 2-5).

2.3.6 Summary of Groundwater Elevation Data

Groundwater flow directions and gradients in each hydrostratigraphic unit are generally consistent with historical data (TtEC 2013), indicating that influence from external pumping wells or injection wells did not occur in 2014. Overall, groundwater flows to the southeast in each unit, with the exception of the Upper Fines Unit which flows locally at the site to the northwest, and each unit has a generally similar horizontal gradient (approximately 0.0013 to 0.0036).

Overall, the groundwater elevations measured for this event are between approximately 2 feet lower than elevations measured during the last annual sampling event in January 2014 (Figures 2-6 and 2-7). This decrease in groundwater elevation is likely attributed to the relatively significant decrease in annual rainfall in water year 2014 compared to 2013. The annual precipitation total for water year 2014 was 4.62 inches for the Long Beach Airport area, compared to 6.70 inches in 2013 and 16.11 inches in 2012. The groundwater elevations were also slightly lower in each successively deeper hydrostratigraphic unit from the Upper Fines Unit through the Shell Horizon Unit, indicating a downward vertical gradient across the site through these units. The limited co-located groundwater head data from the Second Sand Unit and the Deep Sand Unit prevent definitive determination of gradients, and the mapped interpolation of the December 2014 head data for these units is inconclusive regarding apparent vertical gradients between these units.

2.4 Remedy Performance Evaluation

The 2014 annual groundwater sampling event consisted of collecting groundwater samples from all 79 groundwater monitoring wells scheduled to be sampled (Table 1-2). The sampling event was completed to monitor the performance of the EISB activities within, upgradient, and downgradient of the biobarriers.

The performance of the EISB treatment in the contaminant source area (SATG) and the six downgradient biobarriers (SAB, FSB-1, FSB-2, SHB-1, SHB-3, and SSB-1) is discussed below based primarily on changes in molar concentrations of chlorinated ethenes and biogeochemistry. Contaminant concentrations are discussed in terms of molar concentrations because reductive dechlorination is a 1 to 1 stoichiometric conversion (i.e., for each mole of TCE degraded, one mole of DCE is produced). Graphs displaying the molar concentrations of TCE, DCE, VC, and ethene are presented as Figures 2-8 through 2-14. In addition, trend graphs of various performance monitoring parameters (including TOC, volatile fatty acids [VFAs], DO, ORP, etc.) are included as Figures 2-15 through 2-21; two-dimensional contaminant concentration maps for the TCE, cis-1,2-DCE, and VC for each of the biobarriers are included as Figures 2-22 through 2-33; and three-dimensional computer visualizations showing VOC contamination are presented in Section 3.0.

2.4.1 Chlorinated Ethenes

Overall, the data indicate that the TCE initially reported at each of the EISB treatment areas is being dechlorinated. In general, the emulsified oil injections have enhanced conditions in groundwater around the treatment areas for reductive dechlorination though many locations did not respond as favorably as expected based on the initial injection events conducted between 2008 and 2010. The following summarize the chlorinated ethene data (TCE, cis-1,2-DCE, and VC) and observations associated with each treatment area:

- SATG: Data collected during the 2014 annual event indicate that most of the remaining chlorinated ethenes continue to be located in two general areas: 1) immediately to the east of the SATG, and 2) to the southwest, outside the SATG (Figures 2-8, 2-22, 2-23, and 2-24). Data collected since baseline sampling in 2008 indicate that TCE, cis-1,2-DCE, and VC concentrations in wells located outside the SATG have remained relatively stable (MW-70-MNA01, MW-70-MNA02, MW-70-MNA03, and MW-70-MNA04) (Figure 2-8). However, TCE and cis-1,2-DCE concentrations in wells within the SATG have generally been variable to overall decreasing, and the VC concentrations have generally been increasing. The highest concentration of VC in the SATG is 3,700 µg/L in well MW-70-PMW01B (Figure 2-24). It is noted that there is incomplete characterization of the source area contaminant distribution. The data gaps include: a) the eastern side of the SATG source area (between wells MW-70-MNA-01 and MW-70-27, east of well MW-70-27 and east and west of well MW-70-MNA-01); b) the northern extent of the SATG source area (north of well MW-70-MNA-01) and the western side of the SATG (south of well IW-70-SAT-35 and north of IW-SAT-20). Further, elevated and persistent concentrations at well MW-70-MNA-04 (located southwest of the SATG) should be further characterized to ensure that this area does not contain more elevated concentrations further to the southwest and is not long-term continuing source.
- SAB: Data collected during the 2014 annual event indicate that relatively low concentrations of TCE are currently present in the SAB (Figures 2-9 and 2-25). The highest TCE concentration is 6.4 µg/L at MW-70-PMW02A. The highest cis-1,2-DCE and VC concentrations are 260 µg/L (Figure 2-26) and 140 µg/L (Figure 2-27), respectively, in wells MW-70-PMW02A and MW-70-PMW03B, which have relatively deep screen intervals suggesting that most of the contamination remaining near the SAB-1 is near the bottom of the First Sand Unit.
- FSB-1: Data collected during the 2014 annual event indicate that, overall, while TCE concentrations have remained relatively low and stable since 2013, cis-1,2-DCE, VC, and ethene concentrations are somewhat variable (Figure 2-10). The highest TCE concentration is in upgradient well MW-70-PMW06B (3,400 µg/L) (Figure 2-25), which has had relatively stable TCE concentrations since 2008. Well MW-70-PMW06B has a relatively deep screen interval, suggesting that most of the contamination remaining in this area is near the bottom of the First Sand Unit. The relatively lower concentration of TCE, and the relatively elevated concentrations of cis-1,2-DCE and VC in downgradient well MW-70-MNA07 and MW-70-PW05B, suggest that dechlorination is occurring, however, complete dechlorination to ethene is not yet supported by the data from this horizon.
- FSB-2: Data collected during the 2014 annual event indicate that, overall, TCE concentrations have remained relatively low and stable the last few years (Figure 2-11). The cis-1,2-DCE, VC, and ethene concentrations have generally remained stable overall, with variability in some wells. In well MW-70-MNA12, located approximately 500 feet downgradient of the SSB (Figure 2-26), the cis-1,2-DCE concentration remains relatively elevated (1,000 µg/L).
- SHB-1: Data collected during the 2014 annual event indicate that the TCE and cis-1,2-DCE concentrations have remained low and, overall, have decreased since 2013 (Figure 2-12). VC and ethane concentrations have remained relatively stable since 2013.

- SHB-3: Data collected during the 2014 annual event indicate that the TCE concentrations have remained low and relatively stable since 2013 (Figure 2-13). Cis-1,2-DCE and VC concentrations show a generally increasing trend since 2013. The ethene concentrations remain relatively low. The concentrations of cis-1,2-DCE (1,600 µg/L), and VC (180 µg/L) in downgradient well MW-70-MNA14 (Figures 2-29 and 2-30, respectively), located approximately 400 feet downgradient of the biobarrier, are increasing. In 2008, well MW-70-MNA14 had less than 1 µg/L TCE, suggesting that the elevated cis-1,2-DCE and VC concentrations currently reported in the well are the result of contaminant migration and not from dechlorination of the low level of TCE originally in the well.
- SSB-1: Data collected during the 2014 annual event indicate that overall the TCE concentrations have remained relatively stable since 2013 (Figure 2-14). Compared to 2013, the cis-1,2-DCE and VC concentrations trends are variable, increasing in some wells and decreasing in other wells. The ethene concentrations remain relatively low (Figure 2-14). The relatively high concentration of TCE in well MW-70-43B (79 µg/L; 170 µg/L in 2013) and elevated concentrations of cis-1,2-DCE in adjacent well MW-70-14 (1,100 µg/L) suggests that a portion of the plume has likely migrated to the northern extent of the biobarrier (Figures 2-31 and 2-32, respectively). The cis-1,2-DCE concentration in downgradient well MW-70-MNA16, located approximately 100 feet downgradient of the south-central portion of the SSB, remains relatively elevated (1,500 µg/L).

In general, the TCE concentrations across the site decreased or were relatively stable compared to the last annual sampling event in 2013. The highest TCE concentrations are in the Upper Fines Unit (2,800 µg/L) and the First Sand Unit (3,400 µg/L). Relatively high concentrations of cis-1,2-DCE are present in all of the hydrostratigraphic units, including the Upper Fines Unit (790 µg/L), the First Sand Unit (1,300 µg/L), the Shell Horizon Unit (1,600 µg/L), and the Second Sand Unit (1,500 µg/L). Relatively high concentrations of VC are also present in all of the hydrostratigraphic units including the Upper Fines Unit (3,700 µg/L), the First Sand Unit (980 µg/L), the Shell Horizon Unit (180 µg/L), and the Second Sand Unit (310 µg/L).

Overall, the data indicate that while the TCE concentrations have decreased, the cis-1,2-DCE and VC concentrations remain relatively high, and the ethene concentrations remain relatively low. Data indicate that while reductive dechlorination is occurring, relatively elevated concentrations of TCE appear to be present in the eastern portion of the SATG between wells MW-70-27 (200 µg/L) and MW-70-MNA01 (2,800 µg/L). The highest remaining concentration of TCE at the site is located near the bottom of the First Sand Unit (3,400 µg/L in MW-70-PMW06B). Increasing cis-1,2-DCE concentrations in Shell Horizon Unit well MW-70-MNA14 (from 590 µg/L in 2012 to 1,600 µg/L in 2014), and in Second Sand Unit well MW-70-MNA16 (from 880 µg/L in 2012 to 1,500 µg/L in 2014), located approximately 100 feet downgradient of the furthest downgradient biobarrier (SHB-3), suggest that complete dechlorination did not occur in either biobarrier and cis-1,2-DCE contamination is continuing to migrate in this area. In addition, the somewhat elevated concentration of TCE in well MW-70-43B (79 µg/L) and elevated cis-1,2-DCE in well MW-70-14 (1100 µg/L), located to the north of the SSB-1, suggests that a portion (the northern edge) of the TCE plume may migrate north of the northern extent of the SSB.

2.4.2 Electron Donor (EVO)

As part of the annual performance monitoring, TOC and VFAs were measured to evaluate the presence of the electron donor EVO. The presence of TOC can be used as a direct indicator of substrate availability, and the metabolic degradation of EVO produces VFAs. TOC concentrations above 20 milligrams per liter (mg/L) are generally considered necessary to support anaerobic dechlorination. For the purposes of this project, to be conservative, TOC levels above 50 mg/L are considered optimal for supporting reductive dechlorination, and TOC levels above 20 mg/L are considered acceptable. Figures 2-15 to 2-17 show TOC and VFA trends for select performance monitoring wells associated with each biobarrier, and additional trend graphs for additional wells are included in Appendix C.

During baseline sampling in 2008, all of the TOC concentrations were below 3 mg/L. In general, after injection of the EVO, the TOC concentrations in the injection wells increased to greater than 100 mg/L. As expected, the TOC levels within the biobarriers will decrease with time as EVO is consumed during reductive dechlorination. As indicated on the graphs on Figures 2-15 and 2-16, the TOC levels in most of the groundwater monitoring wells located outside the biobarriers have consistently been low (below 50 mg/L), likely a result of their distance from the injection wells.

TOC data from injection wells sampled for the 2014 annual event indicate that four of the 13 wells sampled have TOC above 50 mg/L (Tables 2-3 to 2-14). As expected, the TOC levels have generally decreased since the 2013 annual sampling which was completed just after the 2013 additional EVO injections. In addition, 26 performance monitoring wells were sampled, with approximately half of them located upgradient of the biobarriers and half located downgradient. Overall, the TOC concentrations in these wells remained generally low and unchanged from the 2013 annual sampling event.

TOC concentrations are just one line of evidence used to evaluate whether conditions are suitable for reductive dechlorination. However, TOC is considered of primary importance, as it reflects the presence of an electron donor required to drive the process. Additionally, the presence of COCs, ethene, redox conditions, Dhc, and vinyl chloride reductase A gene (*vcr*A) levels are also being evaluated to assess biobarrier performance.

VFAs (acetic, butyric, lactic, and propionic acids) were also monitored to evaluate the presence of EVO (Figure 2-17; Tables 2-3 through 2-14). VFAs are produced during the metabolic degradation of EVO, and monitoring for VFAs helps to indirectly evaluate the distribution of and metabolism EVO. In 2012, VFAs were detected in two of the seven treatment areas (SATG and the SHB-3), and in 2013 VFAs were detected in six of the seven treatment areas (all except the SHB-1). In 2014, VFAs were detected in two of the seven treatment areas (SATG and SHB-3). VFAs were detected in one of the 13 injection wells sampled and in one of the monitoring wells sampled. As noted above, concentrations of VFAs are one line of evidence to assess the suitability of the aquifer to support active reductive dechlorination.

2.4.3 Aquifer Redox Conditions

This section discusses DO-ORP and sulfate-methane concentrations measured during the annual event.

2.4.3.1 DO-ORP

Reductive dechlorination occurs under anaerobic conditions. This requires DO levels below 0.5 mg/L, or at least no higher than 1 mg/L (generally considered "non-detect" within the limits of field instrumentation). Within the injection wells in both the SATG and all of the downgradient biobarriers, the DO concentrations were equal to or below 1 mg/L, except for one injection well in FSB-2, suggesting the areas of injection have overall remained anaerobic (Table 2-2). DO levels were greater than 1 mg/L in only two monitoring wells, one MNA wells, and one PMW well (Table 2-2). Overall, the aquifer also remains generally anoxic.

ORP is a measure of the reducing capacity of the aquifer. In order for Dhc to survive and grow, and for reductive dechlorination to proceed optimally, ORP levels should be between -100 and -300 millivolts (mV) or lower. ORP levels in the injection wells in the SATG and in all of the downgradient biobarriers that were sampled were all below -100 mV (Table 2-2). ORP levels were also lower than -100 mV in all but five of the remaining wells sampled (Table 2-2) except POC wells. Overall, ORP levels indicate that reducing conditions are present in the aquifer.

Figure 2-18 show DO-ORP trends for a select performance monitoring well associated with each biobarrier.

2.4.3.2 Sulfate-Methane

The depletion of sulfate, an alternate electron acceptor, and the presence or increase in methane, a metabolic by-product of anaerobic microbial biodegradation, can indicate that anaerobic microbial respiration is occurring. Although there are variations within each biobarrier, historical data generally indicate that sulfate concentrations were initially reduced in the injection wells and other nearby monitoring wells shortly after the original EVO injections, but eventually the concentrations increased with time. During the 2014 annual event, sulfate was relatively stable in a majority of the wells sampled compared to the 2013 annual event, with sulfate in some wells slightly reduced, and sulfate in even fewer wells somewhat higher. Methane concentrations at the site also generally increased after the initial treatment, and have generally remained elevated. Almost an even number of the wells sampled in 2014 had the concentration of methane increase since 2013 as decrease, with a slightly fewer number of wells with relatively stable methane concentrations. Overall, the elevated levels of methane in the aquifer suggest that anaerobic microbial respiration is occurring.

Figure 2-19 show sulfate-methane trends for select performance monitoring wells associated with each biobarrier, and additional trend graphs for additional wells are included in Appendix C

2.4.4 Bioaugmentation (*Dehalococcoides*)

As part of the EISB remedy, a commercially available dechlorinating culture containing Dhc organisms (KB-1) was injected into the aquifer following the injection of the EVO during the initial 2008 to 2010 injection program. Additional Dhc organisms were not injected into the aquifer during the 2013 EVO injection program. One of the important lines of evidence indicating that the EISB remedy is functioning is to confirm the presence of Dhc and the *vcr*A gene. The presence of the *vcr*A gene in the dechlorinating population has been shown to be important in facilitating complete reduction of TCE to ethene.

The concentrations of Dhc and *vcr*A were measured in select wells located both within and around the biobarriers. A total of 13 injection wells were sampled from six of the biobarriers. Three of the wells had Dhc at levels above the desired concentration of 10^7 cells/L, and eight had *vcr*A at levels above the desired concentration of 10^5 cells/L (Tables 2-3 to 2-14, Figures 2-20 and 2-21). In addition, 26 performance monitoring wells were sampled, with approximately half of them located upgradient of the biobarriers and half located downgradient. It is believed that with time the recent EVO injections (from September to December 2013) will support increasing concentrations of both Dhc and *vcr*A.

2.4.5 Water Quality Parameters

During the 2014 annual event, aquifer hydrogen ion concentration (pH) values primarily ranged between 6 and 8, the range ideal for microbial growth. Relatively high pH outside this range was reported in one MW-70-43A (8.04). Relatively low pH outside this range was reported in two injection wells including IW-70-FSB118 (5.93) and IW-70-SHB310 (4.86). Potentially, the lower pH values in the injection wells could be attributable to production of hydrochloric acid as chlorinated ethenes degrade. As EVO is used by microorganisms, they produce VFAs, which have the potential to lower the pH.

Alkalinity is an indicator of the buffering capacity of the aquifer, and the alkalinity values reported during the annual event are consistent with historical results.

Results are provided under Table 2-2.

2.4.6 Summary of Remedy Performance Evaluation

Overall, the data indicate that while the TCE concentrations have decreased, the cis-1,2-DCE and VC concentrations remain relatively high, and the ethene concentrations remain relatively low. Overall, the remedy has been effective in reducing TCE concentrations. However, the results for cis-1,2-DCE and VC suggest that while dechlorination continues throughout the plume, complete dechlorination to ethene has been less uniform. Relatively high concentrations of cis-1,2-DCE and VC are present in all of the hydrostratigraphic units at the site. The stable to increasing concentrations of cis-1,2-DCE and VC in the Shell Horizon and Second Sand Units suggests continued migration from upgradient sources and incomplete dechlorination within these zones. The results suggest that continued monitoring north of the northern extent of the SSB1 barrier is necessary to assess continued plume migration along the northern extent of the plume in the Second Sand Unit that may be outside the influence of the injection wells.

The redox conditions (specifically DO and ORP) generally remained during 2014 in the optimal range to support reductive dechlorination. The low DO clearly indicates that all hydrostratigraphic units are anaerobic and the ORP similarly indicates all units are reducing. While the redox conditions are clearly supportive of reductive dechlorination, the indicators of adequate electron donor presence to support microbial activity (through assessment of TOC and VFAs) are less suggestive of widespread optimal conditions. While the recent EVO injections had some noticeable positive impacts on redox conditions, the most recent (2014) TOC data indicate that four of the 13 injection wells have TOC above 50 mg/L. Further, VFAs were detected in only one of the 13 injection wells and in one of the monitoring wells sampled. However, based on the distance of the monitoring wells to the injection points, it is possible that the EVO had not yet

impacted the wells at the time of sampling. The presence of electron donors, in concert with the indication of anaerobic respiration and dechlorination, should be critically assessed in select injection wells during the next semi-annual event as a means of determining electron donor presence and significance.

Three of the 13 injection wells sampled had Dhc at levels above the desired concentration of 10^7 cells /L, and eight had vcrA at levels above the desired concentration of 10^5 cells/L. Dhc and vcrA concentrations were noticeably higher in the performance monitoring wells located downgradient of the biobarriers, as expected, with most of them containing concentrations above, or close to, that considered optimal. The presence of elevated methane in many locations suggests that anaerobic microbial respiration is occurring at the site. The robustness of the microbial community and associated changes in hydrogen gases should continue to be critically monitored in the next annual event. The results of the suggested semi-annual assessment of electron donor and standard annual sampling and analysis should be used in the next annual assessment to evaluate overall EISB performance and the need to conduct any further optimization of the injection scheme.

2.5 SOIL VAPOR RESULTS

Twelve soil vapor probes were installed in the contaminant source area (Figure 2-34) to monitor methane and hydrogen sulfide gases within the vadose zone for health and safety purposes (ECC-Insight 2009a). The soil vapor probes were constructed with screens at depths between 5 and 6 feet bgs (the vadose zone extends from ground surface to between 9 – 17 feet bgs) at locations near active buildings or underground utility corridors that could potentially contain elevated concentrations. The probes were installed to monitor for migration of methane and hydrogen sulfide gases, as required by the RAWP (ECC/Geosyntec 2008a), for the protection of on-site workers and tenants/occupants of the surrounding facilities. In addition, a *Methane Monitoring Plan* with emergency procedures was prepared in 2009 (ECC-Insight 2009b) for implementation after elevated concentrations of methane were initially detected in the soil vapor probes during the 2008 base line sampling event. As part of this plan, the methane levels are measured within utility corridors and nearby buildings in the contaminant source area where methane concentrations could potentially accumulate.

In addition to methane and hydrogen sulfide gas measurements, soil gas samples were analyzed for VOCs to monitor for TCE and TCE-related biological breakdown products in the vicinity of the in-situ bioremediation area.

During the annual performance monitoring event, soil gas samples were collected from the 12 probes and analyzed for methane and hydrogen sulfide gases, and VOCs. The analytical results are shown in Table 2-15 and on Figure 2-34 and discussed in further detail below.

2.5.1 Methane Soil Vapor Results

Methane was reported in all samples between 320 parts per million by volume (ppm_V) and 530,000 ppm_V (Figure 2-34). The lower explosive limit (LEL) for methane in air is 50,000 ppm_V and the upper explosive limit (UEL) in air is 150,000 ppm_V. Methane was reported above its LEL at four locations, including SV-70-02, SV-70-05, SV-70-07, and SV-70-10 (Figure 2-34). At three of these locations the UEL was also exceeded. Compared to the 2013 soil vapor sampling event, methane concentrations increased at nearly all monitored locations, including 11 of 12 soil vapor

probes. The remaining location was not sampled in 2013 so a comparison cannot be made. The highest concentration, 530,000 ppmV, was detected at probe SV-70-07, located near the southern edge of the SATG (Figure 2-34).

2.5.2 VOC Soil Vapor Results

All 12 samples were analyzed for VOCs. Benzene was detected in four samples. The maximum concentration was 786.9 micrograms per cubic meter (µg/m^3). Cis-1,2-DCE was detected in twelve samples. The maximum concentration was 73,242 µg/m^3. Chloroform was detected in three samples.. The maximum concentration was 2,956 µg/m^3. PCE was detected in five samples.. The maximum concentration was 2,456 µg/m^3. TCE was detected in eight samples.. The maximum concentration was 7,169 µg/m^3. VC was detected in 12 of 12 samples. The maximum concentration was 472,212 µg/m^3.

2.5.3 Hydrogen Sulfide Soil Vapor Results

Hydrogen sulfide was not detected in any sample.

2.5.4 Ambient Air Monitoring for Methane Gas and VOCs

Ambient air monitoring, for both methane gas and VOCs was conducted on March 3, 2015, in the contaminant source area, including areas extending from utility corridors and around buildings within the treatment grid to the southeast towards SAB-1. The areas surveyed were consistent with the areas identified in the *Methane Monitoring Plan* (ECC-Insight 2009b) and previous surveys. Specifically, ambient air monitoring was conducted inside Buildings 118, 119, 121, 122, 123, and 124, and utility corridors west of the tank farm and east of soil gas probes SV-70-02 and SV-70-05 Methane gas monitoring was conducted using a hand-held multi-gas monitor with methane and oxygen sensors (RKI Eagle). A photo-ionization detector (PID) was used to monitor for the presence of VOCs. Field monitoring logs documenting the locations monitored and results are included in Appendix A.

Gas measurements were obtained from surface features such as cracks, joints, penetrations, corners, subsurface utility accesses at exterior asphalt paved areas and inside the buildings at floor slabs that could serve as potential pathways for the migration of methane gas and/or VOCs from underlying soils. No VOCs were detected at any of the locations surveyed.

2.5.5 Summary of Soil Vapor Results

The presence of elevated methane gas concentrations and both secondary and tertiary TCE daughter products in soil gas samples provides further evidence that substantial biodegradation has been occurring in the remedial target area at IR Site 70. Although these findings are quite positive with respect to remedial performance, several of the soil gas findings warrant further evaluation because of potential hazards and/or human health risks.

Potential risks associated with the soil gas conditions reported at IR Site 70 include the following:

- Acute Risk - Fire/Explosion hazard resulting from methane gas concentrations greater than both its LEL and UEL: the presence of methane at concentrations exceeding 50,000 ppm_v in soil gas creates the potential for methane and oxygen to accumulate at explosive concentrations within confined spaces, utility vaults/corridors and similar locations where soil gas may mix with ambient air under confined or semi-confined conditions.

- Acute Risk – Asphyxiation hazard due to depressed oxygen conditions resulting from elevated methane gas and other soil gas components (principally carbon dioxide): the presence of methane at percent levels within the vadose zone creates the potential for confined or semi-confined spaces to become asphyxiation hazards. Such conditions can be Immediately Dangerous to Life and Health.

- Several chlorinated VOCs (CVOCs), including PCE, TCE, cis-1,2-DCE, and VC were reported in soil gas samples. As noted under Section 2.5.4 where ambient air showed no detections for VOCs, these soil gas data does not have any impact on indoor air.

Soil Gas Recommendations:

- Continue implementation of the existing confined space monitoring program at IR Site 70.

- Continue monitoring ambient air and suspected soil gas entry locations (i.e., foundation cracks, utility corridors, etc.) with both PID and a 4-gas meter, for LEL, percent carbon dioxide and percent oxygen in addition to methane. Consider supplementing the PID with an FID which is intrinsically safe to the environment and also responds to methane and has excellent response to CVOCs.

3.0 CONCEPTUAL SITE MODEL UPDATE

The primary purpose of the CSM is to provide a visualization of both the subsurface hydrogeology and dissolved-phase TCE, cis-DCE, and VC plume morphologies. This is achieved by using both two-dimensional water-level and plume contour maps, and three-dimensional plume visualization figures using Groundwater Modeling Software (GMS). Over several CSM iterations, both the hydrogeology and contaminant distribution have been improved and refined. This updated CSM provides an understanding of the current conditions at IRP Site 70 based on the 2014 annual performance monitoring results (Figures 3-1 through 3-12). Specific data include:

- Water level elevation data from the 2014 annual performance monitoring event
- Groundwater sample results for TCE and daughter products of reductive dechlorination (specifically, cis-1,2-DCE, VC, and ethene data) from the 2014 sampling event

3.1 Lithology

No new lithologic information for IRP Site 70 was obtained during 2014; therefore, the hydrogeology of the site used in the 2012 CSM was used in the 2014 revision. A summary of the subsurface hydrogeology used in the model is illustrated in cross-sections both through the source area (Figures 3-2 and 3-3) and the downgradient plume (Figures 3-8 through 3-10) and is described below:

- **Upper Fines Unit (from surface fill material to approximately 60 feet bgs).** The Upper Fines Unit comprises the following five subunits:
  - **Clay 1:** Clayey soils are present from below the fill to approximately 20 feet bgs (i.e., "surficial fines").
  - **Sand 1:** Beginning at approximately 20 feet bgs, a predominantly fine-grained sand is present that ranges in thickness from 2 to 17 feet (i.e., "20 foot sand").
  - **Clay 2:** Beginning at approximately 30 to 38 feet bgs, a predominantly clayey unit is present that ranges in thickness from approximately 3 to 10 feet (i.e., "30 foot fines").
  - **Sand 2:** Beginning at approximately 38 to 57 feet bgs, a fine- to medium-grained sand unit is present that ranges in thickness from 13 to 20 feet (i.e., "40 foot sand").
  - **Clay 3:** Beginning at approximately 57 to 60 feet bgs, a silty clay to clay layer is present that ranges in thickness from 2 to 3 feet (i.e., "60 foot clay").
- **First Sand Unit (approximately 60 to 105 feet bgs).** The First Sand Unit consists of interbedded fine-grained and medium-grained sands and silty sands. A coarse sand/fine gravel layer was encountered in several borings between 80 and 95 feet bgs, and localized clays layers were observed between 80 to 90 feet bgs in several SAB injection wells. The First Sand Unit varies in thickness from approximately 30 to 50 feet.
- **Shell Horizon Unit (approximately 105 to 135 feet bgs).** The Shell Horizon Unit consists of a sequence of interbedded clays, silts, sands, and gravels with laterally discontinuous interbeds of dense shells and shell fragments. In the source area, this unit comprises a sequence of interbedded clays, silts, sands, and gravels. The unit transitions to predominantly fine-grained sand near well RDO-6A/B between First and Second

Street in the downgradient plume area. Within the CSM, the Shell Horizon Unit is subdivided into the Shell Horizon Clays Unit (interbedded) and Shell Horizon Sand Unit (fine-grained) to reflect differences in hydrogeologic characteristics.

- **Second Sand Unit (approximately 135 to 170 feet bgs).** Although similar in overall lithology to the First Sand Unit, the Second Sand Unit appears to be slightly coarser grained in its upper section.
- **Deep Clay Unit (approximately 170 to 190 feet bgs).** The Deep Clay Unit consists of an upper clay to silty clay horizon and a lower clayey silt, silt, sandy silt, or sandy clay layer. The upper clay to silty clay layer appears to be a continuous low-permeability unit that is encountered between 164 to 176 feet bgs. The upper clay to silty clay unit grades downward to clayey silt, silt, sandy silt, or sandy clay. This lower layer is 3 to 20 feet thick, and extends to depths of 175 to 188 feet bgs. Below the clayey silt, silt, sandy silt, or sandy clay layer is a silty sand and sand layer, up to 6 feet thick, which has been observed at a depth of 191 feet bgs.
- **Deep Sand Unit (approximately 190 feet bgs and deeper).** The Deep Sand Unit consists of fine-grained sands and silty sands and appears to be similar in character to the First and Second Sand Units. It should be noted that the Deep Sand Unit has been logged in only a few boreholes on NAVWPNSTA Seal Beach (BEI 2002).

3.2 Contaminants of Concern

This section discusses the COCs detected in each of the hydrostratigraphic units based on the 2014 groundwater monitoring results (Tables 2-3 through 2-14, and Figures 2-22 through 2-33). The COCs identified for IRP Site 70 include TCE, cis-1,2-DCE, VC, trans-1,2-DCE, PCE, 1,1-DCE, and chloroform. In addition, concentrations of TCE are compared to results from the baseline sampling event completed in 2008, and concentrations of cis-1,2-DCE and VC are compared to results from the last annual sampling event completed in 2012 (Table 3-1).

3.2.1 Upper Fines Unit

Contamination in the Upper Fines Unit is monitored by wells located in and near the SATG. During the 2014 performance monitoring event, 10 monitoring wells and four POC wells were sampled in the Upper Fines Unit.

The analytical results are presented in Tables 2-4, and the results for TCE, cis-1,2-DCE, and VC are summarized on Figures 2-22, 2-23, and 2-24, respectively. The following summarizes the results for COCs:

- TCE was detected above the TCG (5 µg/L) in six of the 10 monitoring wells. The two highest TCE concentrations were 2,800 µg/L and 260 µg/L (wells MW-70-MNA01 and MW-70-MNA04, respectively), with the remaining concentrations above the TCG ranging between 12 and 200 µg/L. The maximum concentration of TCE in the Upper Fines Unit during baseline sampling in 2008 was 11,000 µg/L, compared to the current (2014) maximum concentration of 2,800 µg/L (Table 3-1).

- Cis-1,2-DCE was detected above the TCG (6 µg/L) in eight of the 10 monitoring wells. The two highest cis-1,2-DCE concentrations were 790 µg/L and 720 µg/L (wells MW-70-28 and MW-70-MNA01, respectively), with the remaining concentrations above the TCG ranging between 9.4 and 560 µg/L. The maximum concentration of cis-1,2-DCE in the Upper Fines Unit during the 2012 annual sampling event was 5,700 µg/L, compared to the current (2014) maximum concentration of 790 µg/L (Table 3-1).
- VC was detected above the TCG (0.5 µg/L) in nine of the 10 monitoring wells. Two monitoring wells had VC above 1,000 µg/L, including MW-70-28 (1,800 µg/L), and MW-70-PMW01B (3,700 µg/L). The maximum concentration of VC in the Upper Fines Unit during the 2012 annual sampling event was 9,000 µg/L, compared to the current (2014) maximum concentration of 3,700 µg/L (Table 3-1).
- Trans-1,2-DCE was detected above the TCG (10 µg/L) in five of the 10 monitoring wells. The highest trans-1,2-DCE concentration was 88 µg/L in well MW-70-MNA01, compared to the maximum concentration of 44 µg/L reported in the Upper Fines Unit during baseline sampling in 2008.
- PCE was not detected in any of the POC wells, and was not detected in any of the 10 monitoring wells above the TCG of 5 µg/L. PCE was reported up to 9.5 µg/L in the Upper Fines Unit during baseline sampling in 2008.
- 1,1-DCE was detected above the TCG (6 µg/L) in one of the 10 monitoring wells, and was not detected in any of the POC wells. 1,1-DCE was reported up to 16 µg/L in the Upper Fines during baseline sampling in 2008.
- Chloroform was not detected above the TCG (100 µg/L) in any of the sampled wells.

Low concentrations of some non-COC VOCs were reported (Tables 2-4). However, 1,1-dichloroethane was reported above its maximum contaminant level (MCL) of 5.0 µg/L in two wells (MW-70-28 at 7.7 µg/L and MW-70-MNA03 at 11 µg/L); 1,2-dichloroethane was reported above its MCL of 0.5 µg/L in the same two wells (MW-70-28 at 0.81 µg/L and MW-70-MNA03 at 2.4 µg/L); and methyl tert-butyl ether was detected in upgradient POC well MW-70-02 at 30 µg/L, which is above its MCL of 13 µg/L.

3.2.2 First Sand Unit

Contamination in the First Sand Unit is monitored by wells located in and near the SAB, FSB-1, and FSB-2. During the 2014 performance monitoring event, 25 monitoring wells, six injection wells, and four POC wells were sampled in the First Sand Unit.

The analytical results are presented in Tables 2-5 to 2-8, and the results for TCE, cis-1,2-DCE, and VC are summarized on Figures 2-25, 2-26, and 2-27, respectively. The following summarizes the results for COCs:

- TCE was detected above the TCG (5 µg/L) in five of the 25 monitoring wells, detected at trace levels at two of the six injection wells, and was not detected in the four POC wells. The highest TCE concentration was 3,400 µg/L (MW-70-PMW06B), with the remaining concentrations above the TCG ranging between 6.0 and 9.9 µg/L. The maximum

concentration of TCE in the First Sand Unit during baseline sampling in 2008 was 4,100 µg/L, compared to the current (2014) maximum concentration of 3,400 µg/L (Table 3-1).

- Cis-1,2-DCE was detected above the TCG (6 µg/L) in 21 of the 25 monitoring wells. Five monitoring wells had cis-1,2-DCE concentrations over 500 µg/L, including MW-70-PMW04A (620 µg/L), MW-70-PMW04B (1,200 µg/L), MW-70-PMW07B (1,300 µg/L), MW-70-PMW06B (530 µg/L), and MW-70-MNA12 (1,000 µg/L). The maximum concentration of cis-1,2-DCE in the First Sand Unit during the 2012 annual sampling event was 1,600 µg/L, compared to the current (2014) maximum concentration of 1,300 µg/L (Table 3-1).
- VC was detected above the TCG (0.5 µg/L) in 23 of the 25 monitoring wells and in four of the six injection wells. VC was not detected in any of the POC wells. The highest VC concentration was 920 µg/L in well MW-70-PMW06A. The maximum concentration of VC in the First Sand Unit during the 2012 annual sampling event was 850 µg/L, compared to the current (2014) maximum concentration of 920 µg/L (Table 3-1).
- Trans-1,2-DCE was detected above the TCG (10 µg/L) in three of the 24 monitoring wells and not detected in the six injection wells. Trans-1,2-DCE was not detected in any of the POC wells. The highest trans-1,2-DCE concentration was 98 µg/L in well MW-70-PMW06B, compared to the maximum concentration of 47 µg/L reported in the First Sand Unit during baseline sampling in 2008.
- PCE was not detected in any of the monitoring, injection, or POC wells during the 2014 sampling event. PCE was reported at a maximum of 2 µg/L in the First Sand Unit during baseline sampling in 2008.
- 1,1-DCE was detected above the TCG (6 µg/L) in 2 of the 25 monitoring wells at a maximum of 9 µg/L. 1,1-DCE was also detected in one of the injection wells (0.21 µg/L), but was not detected in any of the POC wells. 1,1-DCE was reported up to 14 µg/L during baseline sampling in 2008.
- Chloroform was not detected in any of the monitoring, injection, or POC wells during the 2014 sampling event.

Low concentrations of some non-COC VOCs were reported (Tables 2-5 to 2-8); however, none of the compounds were present above their respective MCLs.

3.2.3 Shell Horizon Unit

Contamination in the Shell Horizon Unit is monitored by wells located in and near the SHB-1 and the SHB-3. During the 2014 performance monitoring event, eight monitoring wells, four injection wells, and one POC well were sampled.

The analytical results are presented in Tables 2-9 to 2-11, and the results for TCE, cis-1,2-DCE, and VC are summarized on Figures 2-28, 2-29, and 2-30, respectively. The following summarizes the results for COCs:

- TCE was detected above the TCG (5 µg/L) in two of the eight monitoring wells and in two of the four injection wells. TCE was not detected in the POC well. The highest TCE concentration was 8.3 µg/L (MW-70-SHB217). The maximum concentration of TCE in

the Shell Horizon Unit during baseline sampling in 2008 was 4,300 µg/L, compared to the current (2014) maximum concentration of 8.3 µg/L (Table 3-1).

- Cis-1,2-DCE was detected above the TCG (6 µg/L) in seven of eight of the monitoring wells and in three of four of the injection wells. Cis-1,2-DCE was not detected in the POC well. Three monitoring wells and one injection well had cis-1,2-DCE over 500 µg/L. The maximum concentration of cis-1,2-DCE in the Shell Horizon Unit during the 2012 annual sampling event was 1,800 µg/L, compared to the current (2014) maximum concentration of 1,600 µg/L (Table 3-1).
- VC was detected above the TCG (0.5 µg/L) in six of the eight monitoring wells and in all four of the injection wells. VC was not detected in the POC well. Three monitoring wells and one injection well had VC over 100 µg/L, with the highest concentration at 180 µg/L (MW-70-PMW10). The maximum concentration of VC in the Shell Horizon Unit during the 2012 annual sampling event was 440 µg/L, compared to the current (2013) maximum concentration of 180 µg/L (Table 3-1).
- Trans-1,2-DCE was detected above the TCG (10 µg/L) in four of the eight monitoring wells and in one of the four injection wells. Trans-1,2-DCE was not detected in the POC well. The highest trans-1,2-DCE concentration was 84 µg/L in well MW-70-PMW11B, compared to the maximum concentration of 60 µg/L reported in the Shell Horizon Unit during baseline sampling in 2008.
- PCE was not detected in any of the monitoring, injection, or POC wells during the 2014 sampling event. PCE was also not detected in the Shell Horizon Unit during the baseline sampling event in 2008.
- 1,1-DCE was not detected above the TCG (6 µg/L) in any of the eight monitoring wells or in any of the four injection wells. 1,1-DCE was not detected in the POC well. During the baseline sampling event in 2008, 1,1-DCE was detected in the Shell Horizon Unit at a maximum of 6 µg/L.
- Chloroform was detected in one of the monitoring wells at a trace level (0.44J µg/L). Chloroform was not detected in any of the injection wells or the POC well during the 2008 sampling event.

Low concentrations of some non-COC VOCs were reported (Tables 2-9 to 2-11); however, none of the compounds were present above their respective MCLs.

3.2.4 Second Sand Unit

Contamination in the Second Sand Unit is monitored by wells located in and near SSB-1. During the 2014 performance monitoring event, 10 monitoring wells, 2 injection wells, and 2 POC wells were sampled.

The analytical results are presented in Tables 2-12 and 2-13, and the results for TCE, cis-1,2-DCE, and VC are summarized on Figures 2-31, 2-32, and 2-33, respectively. The following summarizes the results for COCs:

- TCE was detected above the TCG (5 µg/L) in nine of the 10 monitoring wells, but was not detected above the TCG in the 2 injection wells. TCE was not detected in any of the

POC wells. The highest TCE concentration was 79 µg/L (MW-70-43B). The maximum concentration of TCE in the Second Sand Unit during baseline sampling in 2008 was 1,100 µg/L, compared to the current (2014) maximum concentration of 79 µg/L (Table 3-1).

- Cis-1,2-DCE was detected above the TCG (6 µg/L) in nine of the 10 monitoring wells, but was not detected above the TCG in the 2 injection wells. Cis-1,2-DCE was detected in one of the two POC wells at 0.23J µg/L (MW-70-36). The highest cis-1,2-DCE concentration was 1,500 µg/L (MW-70-MNA16). The maximum concentration of cis-1,2-DCE in the Second Sand Unit during the 2012 annual sampling event was 1,100 µg/L, compared to the current (2014) maximum concentration of 1,500 µg/L (Table 3-1).
- VC was detected above the TCG (0.5 µg/L) in seven of the 10 monitoring wells and in both of the injection wells. VC was not detected in the two POC wells. The highest VC concentration was 310 µg/L (MW-70-PMW14B), located downgradient of the biobarrier. The maximum concentration of VC in the Second Sand Unit during the 2012 annual sampling event was 370 µg/L, compared to the current (2014) maximum concentration of 310 µg/L (Table 3-1).
- Trans-1,2-DCE was detected above the TCG (10 µg/L) in seven of the 10 monitoring wells and in both of the two injection wells. Trans-1,2-DCE was not detected in the two POC wells. The highest trans-1,2-DCE concentration was 100 µg/L in well MW-70-PMW13A, compared to the maximum concentration of 39 µg/L reported during baseline sampling in 2008.
- PCE was not detected in any of the monitoring or injection wells during the 2014 sampling event. However, PCE was reported in one of the two POC wells at 12 µg/L (MW-70-36), which is above the TCG of 5 µg/L. During the baseline sampling event in 2008, PCE was reported in the Second Sand Unit at a maximum of 2.4 µg/L.
- 1,1-DCE was not detected in any of the injection or POC wells, and was not reported above the TCG (6 µg/L) in any of the monitoring wells. During the baseline sampling event in 2008, 1,1-DCE was also not reported in the Second Sand Unit above the TCG (6 µg/L).
- Chloroform was not detected in any of the monitoring wells, injection wells, or the POC wells during the 2014 sampling event.

Low concentrations of some non-COC VOCs were reported (Tables 2-12 and 2-13); however, none of the compounds were present above their respective MCLs.

3.2.5 Deep Sand Unit

Contamination in the Deep Sand Unit is monitored by three POC wells (Figure 2-5). The analytical results are presented in Table 2-14. COCs were not detected in any of the Deep Sand wells during the 2014 monitoring event.

The only compound reported in the Deep Sand Unit was 1.4 µg/L toluene in well MW-70-POC04, which is significantly below the 150 µg/L MCL.

3.3 Visualization of Dissolved Plume Extent

Groundwater data from the 2014 performance monitoring event were imported into GMS, a 3-dimensional visualization software package. The Environmental Visualization Software presentation of the nature and extent of site contamination identified during the baseline sampling event in 2008 is included in Appendix D for reference to help illustrate the remediation progress achieved to date. A discussion on the spatial extent of contamination is provided in the subsequent subsections based on the results of the GMS visualization (Figures 3-1 through 3-12) and the two-dimensional plume contour maps (Figures 2-22 through 2-33). Assessment of the spatial extent of the plumes is made based on mapping the plumes at their respective TCGs and at concentrations reflective of the core of the plumes, including 250 µg/L for TCE, 60 µg/L for DCE, 20 µg/L for VC and 10 µg/L for ethene. In addition, the extent of the TCE plume at concentrations greater than 1000 µg/L is also evaluated.

3.3.1 Trichloroethene

The extent of TCE at concentrations greater than 1000 µg/L is illustrated in Figure 3-1. The extent of plume at this concentration threshold is very similar to the conceptualization presented in the 2013 annual assessment (TtEC 2014). A comparison of the extent of TCE above 250 µg/L between 2008 and 2014 is shown on Figures 2-35 and 2-36, respectively. In the 2013 and 2014 annual monitoring events, there was an equal number of wells with TCE greater than 250 µg/L, with three wells with TCE concentrations greater than 250 µg/L. The core of the TCE plume has not changed appreciably since the 2013 sampling events.

TCE at concentrations greater than 250 µg/L was detected in the Upper Fines Unit (contaminant source area) and the First Sand Unit (Figures 2-22, 2-25, 3-2, 3-3, 3-4, and 3-11). As shown on Cross Section B-B' (Figure 3-3), the elevated concentration of TCE in the First Sand Unit is located near the bottom of the unit.

After comparing the plume maps showing the extent of TCE above the MCL for drinking water (5 µg/L) between the 2014 event (Figures 2-22, 2-25, 2-28 and 2-31) and the 2013 event (TtEC 2014), the overall extent of TCE was generally similar to slightly smaller. TCE concentrations overall remained stable in each unit and the areal extent of the 5 µg/L plume boundaries did not change significantly. TCE was not reported in any POC wells, suggesting that overall the plume remains adequately contained within the POC well boundary.

3.3.2 Cis-1,2-Dichloroethene

During the 2014 annual monitoring event, a total of 34 of 79 wells sampled contained cis-1,2-DCE concentrations greater than 60 µg/L, compared to 38 of 78 wells during the 2013 annual event. Comparing the plume maps showing the extent of cis-1,2-DCE above the maximum concentration limit for drinking water (60 µg/L) between the 2014 event (Figures 2-23, 2-26, 2-29 and 2-32, 3-5, 3-8 and 3-12) and the 2013 event (TtEC 2014), the overall extent of cis-1,2-DCE was generally similar to slightly smaller except at the leading edge of the plume where the plume is projected to have migrated slightly in the Shell Horizon and Second Sand Units.

Cis-1,2-DCE was not reported in any POC wells, suggesting that overall the plume remains adequately contained within the POC well boundary.

3.3.3 Vinyl Chloride

During the 2014 annual monitoring event, a total of 28 of 79 wells sampled had VC concentrations greater than 20 µg/L, compared to 25 of 78 wells during the 2013 annual event. Comparing the plume maps showing the extent of VC above the maximum concentration limit for drinking water (0.5 µg/L) between the 2014 event (Figures 2-24, 2-27, 2-30 and 2-33, 3-6, 3-9 and 3-12) and the 2013 event (TtEC 2014), the overall extent of VC was generally similar to slightly smaller except at the leading edge of the plume where the plume is projected to have migrated slightly in the Shell Horizon Unit.

VC was not reported in any POC wells, suggesting that overall the plume remains adequately contained within the POC well boundary.

3.3.4 Ethene

The extent of ethene at concentrations greater than 10 µg/L from the 2014 CSM is shown on Figure 3-7, which shows the plume slightly smaller in the contaminant source area and generally the same in downgradient locations compared to the 2013 CSM (TtEC 2014).

4.0 VARIANCES TO THE WORK PLAN AND DATA QUALITY ASSESSMENT

This section summarizes variances to the RAWP and a Data Quality Assessment of the data collected during the 2014 annual performance monitoring event.

4.1 Variances to the Work Plan

An addendum (#5) to the SAP (ECC-Insight, 2014a) was performed which included the addition of the new scope for sampling and analysis of the soil vapor samples for VOCs. No other changes were made to the previous addendum (#4).

4.2 Data Quality Assessment

Samples were collected and analyzed in accordance with the Final Addendum 5 to the Final SAP (ECC-Insight 2014a). Groundwater samples were analyzed by EMAX located in Torrance, California, for any or all of the following parameters:

- VOCs by EPA Method 8260B
- Dissolved hydrocarbon gases (ethane, ethene, and methane) by RSK175
- Total alkalinity by Standard Method 2320B
- Total dissolved solids by Standard Method 2540C
- Anions (bromide, chloride, nitrate, nitrite, sulfate) by EPA Method 300.0
- VFAs (acetate, butyrate, lactate, propionate) by EPA Method 300.0M
- Dissolved hydrogen sulfide by Standard Method 4500S2H
- TOC by Standard Method 5310B
- Dissolved metals (arsenic, iron, manganese) by EPA Method 6010B

In addition, some of the groundwater samples required deoxyribonucleic acid (DNA) assay analysis, which was conducted by SiREM located in Ontario, Canada.

Soil gas vapor samples were also collected during this performance period for methane and hydrogen sulfide analysis at 12 locations using EPA Methods 25C and 16, respectively. In addition, VOCs by EPA Method TO-15 (Full List). These vapor samples were analyzed by Calscience Environmental located in Garden Grove, California.

A third-party validation company (Laboratory Data Consultants, Inc.) performed data validation only on groundwater sample analyses performed by EMAX. (DNA assay analysis and soil vapor analysis were not required to be third-party validated.) The data validation was conducted in accordance with Environmental Work Instruction (EWI) #1, 3EN2.1, Chemical Data Validation (NAVFAC SW 2001), the Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA 540/R-99/008 (EPA 1999), the Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA 540-R-0-/004 (EPA 2004), the Quality Systems Manual for Environmental Laboratories (Department of Defense 2010), and the criteria specified in the Final Addendum 5 to the Final SAP (ECC-Insight 2014a). Twenty percent of the

samples were validated in accordance with an EPA Level IV-equivalent protocol, and the remaining samples were validated with an EPA Level III-equivalent protocol.

Tables 2-3 through 2-14 summarize the groundwater results, and Table 2-15 summarizes the soil gas results. Appendix B-1 contains the laboratory analytical reports and chain-of-custody forms.

The laboratory's quality assurance oversight involved the performance of a first-level screening of the data and an indication of any deviations from their precision, accuracy, detection limit, or laboratory quality assurance/quality control (QA/QC) criteria. A copy of the laboratory QA/QC analytical results including the chain-of-custody documentation can be found in Appendix B-1. A representative from the laboratory signed the data sheets, ensuring that the screening described above had been completed. Subsequently, ECC-Insight completed data review by comparing chain-of-custody forms, sample receipts, sample log-ins, and laboratory data packages. Review of these summaries confirmed that data quality objectives were met. Additionally, the analytical data, along with the associated laboratory quality control information, were forwarded to Laboratory Data Consultants, Inc., for data validation. A EPA Level III data validation was performed on 80 percent of the groundwater samples; the remaining 20 percent of the samples underwent a Level IV data validation. Data validation reports are provided in Appendix B-2.

Data validation includes evaluation of holding times, sample preservation, instrument performance checks, initial and continuing calibration verifications, method blanks, surrogates, laboratory control samples, internal standards, inductively coupled plasma interference check, target compound identification and system performance. Generally, the results were within analytical criteria with a few minor exceptions, such as calibration outliers of some VOCs, detections in the laboratory method blanks and equipment blanks, VOC surrogate spikes and technical holdings times for wet chemistry parameters. All affected compounds were qualified "J" (estimated) or "UJ" (non-detect estimated).

QA/QC measurements were taken in the field to ensure that meaningful and representative data sets were generated. Field duplicate samples were collected at a rate of 10 percent of the total number of groundwater monitoring wells sampled and trip blank samples were included in the coolers that contained volatile organic analysis vials. These samples were collected to ensure the consistency and integrity of sample collection methods. Field duplicate samples were collected for wells MW-70-SSB109, MW-70-PMW07A, MW-70-MNA01, MW-70-PMW04A, MW-70-PMW-02A, MW-70-PMW09 and MW-70-10. Field duplicate results are generally similar to the original results and no significant problems were noted. Five trip blank samples were shipped. No VOC contaminant was reported in the trip blanks. Four equipment rinse samples were collected. Minor exceptions are noted in the data validation reports under Appendix B-2. One source blank was collected. Minor exceptions are noted in the data validation reports under Appendix B-2.

Data were generally found to be acceptable with respect to accuracy, precision, completeness, and comparability criteria. All analytical data presented in Tables 2-3 through 2-14 are valid and usable. Validation findings were advisory and findings are detailed in Appendix B-2.

5.0 LAND-USE CONTROLS

This section summarizes the LUCs implemented at IRP Site 70, per the Record of Decision and RAWP (Geosyntec 2006a, ECC/Geosyntec 2008a). The LUC objectives include:

- Preventing the use of VOC-contaminated groundwater until cleanup objectives have been achieved
- Protecting the integrity groundwater monitoring and injection wells
- Managing intrusive activities at the site to minimize potential human exposure to contaminated groundwater
- Managing groundwater injection and extraction activities to ensure that hydraulic control of the contaminant plume is not unacceptably compromised

The LUCs are applied to approximately 50 acres overlying the existing areas of contamination, but extend to a half-mile radius buffer zone established for groundwater from the surface to a depth of 495 feet bgs. The institutional controls (ICs) addressing the on-station portion of the groundwater plume are implemented through the Station Project Review Process.

The purpose of this IC with OCHCA is to prevent off-base activities to influence groundwater flow direction drastically. Also the purpose of the IC inside the Base, where the plume is completely encompassed, is to protect the human receptors and to protect the integrity of the remediation system. This is all controlled by the Navy. ICs are implemented to prevent use of or exposure to contaminated groundwater; protect the integrity of the remedial action; and allow access for sampling, installing, operating, and maintaining monitoring wells or remediation equipment, and implementing future remedial measures. Per the Navy's "10.7 Land Use Controls," Orange County Environmental Health has not issued any well construction permits for any off-site water supply wells or injections wells in 2014 within the Seal Beach Naval Weapons Station buffer zone.

The field activities that were completed as part of the on-station ICs during the reporting period, or since the last annual groundwater sampling event was completed (January 2014) were related to the 2014 semiannual groundwater sampling event and the 2014 annual performance monitoring event. None of the completed water level measuring, groundwater sampling, soil vapor sampling, or injection activities completed violated the LUC objectives established for IRP Site 70 as outlined in the Record of Decision and RAWP.

6.0 SUMMARY AND RECOMMENDATIONS

The remedial activities at IRP Site 70 are being conducted in accordance with the technical and functional requirements specified in the RAWP (ECC/Geosyntec 2008a). The following summarizes the field activities described in this report:

- For the annual groundwater sampling event, the depth to groundwater was measured in each well prior to sampling. Groundwater samples were collected in December 2014 from 79 wells, including injection, monitoring, performance monitoring, MNA, and POC wells.
- All 12 soil vapor probes located in the contaminant source area were sampled for methane, hydrogen sulfide and VOCs. In addition, the ambient air both inside and outside of buildings near the contaminant source area was monitored for methane gas and VOCs for health and safety purposes.

6.1 Summary of Results

The following summarizes the results of the 2014 annual performance monitoring event:

- Groundwater flow directions and gradients in each hydrostratigraphic unit are consistent with historical data, including the overall groundwater flow to the southeast, with the exception of the Upper Fines Unit which flows locally at the site to the northwest, and relatively low gradients.
- Data obtained from the last annual performance monitoring event in 2012 indicated that while conditions along portions of each biobarrier were still effectively enhancing the reductive dechlorination of TCE, other portions of the biobarriers contained the electron donor TOC at concentrations below those considered necessary to support reductive dechlorination. Based on these results, additional EVO was injected into select wells between September and December 2013. The results of the 2014 annual monitoring event indicate that reductive dechlorination is still occurring.
- Compared to the last annual event in 2013, TCE concentrations across the site generally decreased or were relatively stable. The highest TCE concentrations remain in the Upper Fines Unit (2,800 versus 1,700 µg/L in 2013) and the First Sand Unit (3,400 versus 4,200 µg/L 2013).
- Compared to the last annual event in 2013, the cis-1,2-DCE concentrations in the Upper Fines Unit have remained stable. Relatively elevated concentrations of cis-1,2-DCE are still present in all of the hydrostratigraphic units, including the Upper Fines Unit (790 versus 1,200 µg/L in 2013), the First Sand Unit (1,300 versus 1,600 µg/L in 2013), the Shell Horizon Unit (1,600 versus 940 µg/L in 2013), and the Second Sand Unit (1,500 versus 1,200 µg/L in 2013). Compared to the last annual event in 2013, the VC concentrations in the Upper Fines Unit remained stable. Relatively elevated concentrations of VC are still present in all of the hydrostratigraphic units including the Upper Fines Unit (3,700 versus 2,100 µg/L in 2013), the First Sand Unit (920 versus 1,300 µg/L in 2013), the Shell Horizon Unit (180 versus 140 µg/L in 2013), and the Second Sand Unit (310 µg/L – unchanged since 2013).

- Data indicate that some of the highest concentrations of TCE are in the SATG near well MW-70-MNA01 (2,800 µg/L). Only the TCE in well MW-70-PMW06B, located in the First Sand Unit immediately upgradient of the FSB-1, is higher (3,400 µg/L).
- Increasing cis-1,2-DCE concentrations in Shell Horizon Unit well MW-70-MNA14 (from 940 µg/L in 2013 to 1,600 µg/L in 2014), and in Second Sand Unit well MW-70-MNA16 (from 1,200 µg/L in 2013 to 1,500 µg/L in 2014), located approximately 100 feet downgradient of the furthest downgradient biobarrier (SHB-3), suggest that complete dechlorination did not occur in either biobarrier and cis-1,2-DCE contamination is continuing to migrate in this area.
- The relatively high concentration of TCE in well MW-70-43B (79 µg/L; 550 µg/L in 2012) and elevated concentrations of cis-1,2-DCE in adjacent well MW-70-14 (1,100 µg/L) suggests that a portion of the plume has likely migrated to the northern extent of the second sand biobarrier (Figures 2 31 and 2-32). The cis-1,2-DCE concentration in downgradient well MW-70-MNA16, located approximately 100 feet downgradient of the south-central portion of the SSB, remains relatively elevated (1,500 µg/L).
- Low-to-trace levels of contamination were reported in a few of the POC wells at four hydrostratigraphic units (Upper Fines, First Sand, Second Sand, and Deep Sand Units), suggesting that overall groundwater contamination at the site remains contained within the POC well boundary.
- PCE was reported in Second Sand Unit POC well MW-70-36 at 12 µg/L, which is above the TCG of 5 µg/L. During the 2013 annual event, PCE was reported in this well at 24 µg/L.
- Reductive dechlorination requires anaerobic conditions (DO levels below 0.5 mg/L, or at least not greater than 1 mg/L [generally considered anaerobic based on limitations of field instrumentation]). Within the injection wells in both the SATG and all of the downgradient biobarriers, the DO concentrations were equal to or below 1 mg/L, except for one injection well in FSB-2, suggesting the areas of injection have overall remained anaerobic (Table 2-2). DO levels were greater than 1 mg/L in only two monitoring wells, one MNA wells, and one PMW well (Table 2-2). Overall, the aquifer also remains generally anoxic.
- ORP is a measure of the reducing capacity of the aquifer. In order for Dhc to survive and grow, and for reductive dechlorination to proceed optimally, ORP levels should be between -100 and 300 mV or lower. ORP levels in the injection wells in the SATG and in all of the downgradient biobarriers that were sampled were all below -100 mV (Table 2-2). ORP levels were also lower than -100 mV in all but five of the remaining wells sampled (Table 2-2) excepting POC wells. Overall, ORP levels indicate that reducing conditions are present in the aquifer.
- While the redox conditions are clearly supportive of reductive dechlorination, the indicators of adequate electron donor presence to support microbial activity (through assessment of TOC and VFAs, as described below) are less suggestive of widespread optimal conditions. Data indicate that optimal concentrations of the electron donor EVO (TOC above 50 mg/L [Section 2.4.2]) were present in 4 of the 13 injection wells sampled. Nine of the 13 injection wells sampled have TOC below 50 mg/L. As expected, the TOC levels have generally decreased since the 2013 annual sampling which was completed

just after the 2013 additional EVO injections. In addition, 26 performance monitoring wells were sampled, with approximately half of them located upgradient of the biobarriers and half located downgradient. Overall, the TOC concentrations in these wells remained generally low and unchanged from the 2013 annual sampling event.

- VFAs (which are produced during the metabolic degradation of EVO) were detected in two of the seven treatment areas in 2013, and detected in six of the seven treatment areas (all except the SHB-1) in 2013. In 2014, VFAs were detected in two of the seven treatment areas. VFAs were detected in one of the 13 injection wells sampled and in one of the monitoring wells sampled.
- The depletion of sulfate, an alternate electron acceptor, and the presence or increase in methane, a metabolic by-product of anaerobic microbial biodegradation, can indicate that anaerobic microbial respiration is occurring. During the 2014 annual event, sulfate was relatively stable in a majority of the wells sampled compared to the 2013 annual event, with sulfate in some wells slightly reduced, and sulfate in even fewer wells somewhat higher. Methane concentrations at the site also generally increased after the initial treatment, and have generally remained elevated. Almost an even number of the wells sampled in 2014 had the concentration of methane increase since 2013 as decrease, with a slightly fewer number of wells with relatively stable methane concentrations. Overall, the elevated levels of methane in the aquifer suggest that anaerobic microbial respiration is occurring.
- Dhc concentrations in three of the 13 injection wells sampled were above the desired concentration of 10^7 cells/L, and *vcr*A concentrations in 8 of the 13 injection wells sampled were above the desired concentration of 10^5 cells/L. In addition, of the 26 performance monitoring wells sampled, with approximately half of them located upgradient of the biobarriers and half located downgradient, the Dhc and *vcr*A concentrations were noticeably higher in the wells located downgradient of the biobarriers, as expected, with most of them containing concentrations above, or close to, that considered optimal. It is believed that with time the recent EVO injections will support increasing concentrations of both Dhc and *vcr*A.
- Methane was reported above the UEL of 150,000 ppm_V in three of the 12 soil gas samples collected in the contaminant source area, and was reported below the LEL of 50,000 ppm_V in all but one of the remaining samples. The one methane result above the LEL but below the UEL was from a vapor well located near Building 123 (88,000 ppm_V in SV-70-10) (Figure 2-34). It is noted that methane was not detected inside the buildings surveyed or in the outdoor areas/utility corridors
- Six VOC (benzene, chloroform, cis-1,2-DCE, PCE, TCE and VC) were detected in soil gas samples at concentrations well above their respective ESLs and CHHSL. It is noted that VOCs were not detected inside the buildings surveyed or in the outdoor areas/utility corridors. Benzene is a non-COC VOC and its detection in soil vapor samples may be indicative of off-site petroleum contamination. In review of the State Water Resources Control Board GeoTracker web site, there are three Leaking Underground Storage Tank (LUST) Cleanup sites, one site of which the LUST cleanup status is still open (with petroleum contamination, including benzene), located directly upgradient and off-site of IRP Site 70 which may be potential source of the benzene (SWRCB, 2015).

6.2 Recommendations

Based on the results of the 2014 annual monitoring event, the following recommendations are made:

- Data from the 2014 annual sampling event indicate that some areas of the contaminant plumes remain in locations that cannot be readily treated with the SATG and biobarriers. It is suggested that additional investigation be conducted in these areas to refine the CSM and to determine the need, and design parameters, for optimization of these treatment areas. The results should be used to design an expansion of the northern extent of the SSB-1 biobarrier injection well network and to assess the need to optimize the injection well footprint within the SATG treatment area:
  - As noted in the 2013 Annual PMR, some of the highest concentrations of TCE at the site are from wells MW-70-MNA01 (2,800 µg/L) and MW-70-27 (200 µg/L), located approximately 150 feet from each other at the eastern edge of the SATG (Figure 2-22). No information is available on the contaminant plume between these wells. It is recommended that additional site investigation be considered in this area to better identify the nature and extent of contamination and to determine whether additional injection wells should be considered. It is recommended that the investigation be completed with the Site Characterization and Analysis Penetrometer System technology in which a cone penetrometer containing various sensors is hydraulically driven into the subsurface to identify subsurface stratigraphy and the presence of contamination. Samples of soil and groundwater can also be collected through the probe for additional analyses. Specifically, the data gaps in source delineation include: a) the eastern side of the SATG source area (between wells MW-70-MNA01 and MW-70-27, east of well MW-70-27 and east and west of well MW-70-MNA01); b) the northern extent of the SATG source area (north of well MW-70-MNA01) and the southwestern side of the SATG (south of well IW-70-SAT35 and west of IW-SAT39).
  - During the annual sampling event completed in 2012, elevated concentrations of TCE were reported to the north of SSB-1, suggesting that a portion of the contaminant plume was migrating past this biobarrier. In 2012, TCE was detected in well MW-70-43B, located to the north of SSB-1 at 550 µg/L. During the 2014 annual event, the TCE concentration in well MW-70-43B was much lower, at 79 µg/L. Continued monitoring and assessment of TCE and DCE decay (and generation of VC and ethane/ethane) in this area of the site is recommended.
- During baseline sampling in 2008, well MW-70-MNA14, located in the Shell Horizon Unit approximately 400 feet downgradient of the last Shell Horizon biobarrier (SHB-3) (Figure 2-35), had less than 1 µg/L TCE (currently 3.5 µg/L), suggesting that the increasing levels of cis-1,2-DCE and VC reported in the well (currently 1,600µg/L and 180 µg/L, respectively) is the result of contaminant migration in the Shell Horizon Unit and not from dechlorination of TCE in the well. In addition, the cis-1,2-DCE concentration in Second Sand Unit well MW-70-MNA16, located approximately 100 feet downgradient of the furthest downgradient biobarrier (SSB-1), increased (from 880 µg/L in 2012 to 1,500 µg/L in 2014), suggesting that complete dechlorination also did not occur in this biobarrier and cis-

1,2-DCE contamination is continuing to migrate in this area. Even though the TCE concentrations in these wells are below the criterion for active treatment (200 µg/L), the cis-1,2-DCE and VC concentrations are significantly above the TCGs (6 and 0.5 µg/L, respectively). Since there are no biobarriers installed downgradient of these wells, it would be desirable to have additional downgradient monitoring wells to more closely monitor plume migration. A portion of the National Wildlife Refuge is downgradient of these wells, and it may be difficult to install downgradient monitoring wells along the inferred axis of the plume within approximately 1,000 feet of these wells. However, additional Shell Horizon Unit monitoring wells could be installed along the northern side of the projected path of the plume adjacent to Case Road where well installation is feasible. It is recommended that a Shell Horizon Unit well be installed coincident with the location of First Sand Unit well MW-70-16 and Second Sand Unit well MW-70-21. Further, it is recommended that the far downgradient wells existing in this area (e.g., First Sand well MW-70-16 and Second Sand Unit wells MW-70-15 and MW-70-21) continue to be closely monitored.

- There was not a significant response in aquifer biogeochemical conditions following the most recent (2013) EVO injection; there was little to no change in TOC concentration, VFA presence, Dhc cell count, and ethene generation. Therefore, the presence of electron donor in concert with the indication of anaerobic respiration and dechlorination should be critically assessed in select injection wells during the next semi-annual event as a means of determining electron donor presence/significance. This evaluation should focus on sampling select additional injection wells not sampled as part of the routine semi-annual sampling event. It is recommended that the following injection wells be sampled for TOC and VFAs: IW-70-SAT-21 and IW-70-SAT-15 in the SATG; IW-70-FSB116 and IW-70-FSB112 in the FSB-1; IW-70-FSB219 and IW-70-FSB207 in the FSB-2; IW-70-SHB306 and IW-70-SHB317 in SHB-3; and IW-70-SSB121 and IW-17-SSB116 in the SSB-1. These wells were selected based on their relative position to those injection wells routinely sampled and the location of high contaminant concentration zones within the biobarriers and SATG. In addition, one well of the two wells noted in the SATG, IW-70-SAT-21, and one injection well in each of the aforementioned biobarriers (IW-70-FSB112 in the FSB-1; IW-70-FSB219 in the FSB-2; IW-70-SHB306 in the SHB-3; and IW-70-SSB121 in the SSB-1) should also be sampled for dissolved gases and Dhc analysis in the next annual sampling event.
- The robustness of the microbial community, changes in hydrogen gases, and ethene generation should continue to be critically monitored and evaluated in the next annual assessment. The results of the suggested expanded semi-annual and annual sampling (noted above) should be used in the next (2015) annual assessment to evaluate overall EISB performance and the need to conduct any further optimization of the injection scheme.
- Continue implementation of the existing confined space monitoring program including an updated survey of known or suspected confined spaces.

- Continue monitoring ambient air and suspected soil gas entry locations (i.e., foundation cracks, utility corridors, etc.) with both PID and 4-gas monitors, reporting percent carbon dioxide and percent oxygen in addition to methane. Consider supplementing the PID with a flame-ionization detector which is intrinsically safe to the environment and also responds to methane and has excellent response to CVOCs.

7.0 REFERENCES

BEI (Bechtel Environmental, Inc.). 2002. Final Groundwater Feasibility Study Report, Installation Restoration Program Sites 40 and 70, Naval Weapons Station, Seal Beach, Seal Beach, California. June.

————. 2006. Final Fifth Annual Groundwater Monitoring Report IRP Sites 40 and 70, Naval Weapons Station Seal Beach, California. April.

Bechtel National, Inc. 1996. Final Removal Site Evaluation Report, for the Research, Testing, and Evaluation Area, Naval Weapons Station, Seal Beach, Seal Beach, California. November.

California Environmental Protection Agency (California EPA). 2005. Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties. January.

Department of Defense. 2010. Quality Systems Manual for Environmental Laboratories. Version 4.2. October.

DWR (California Department of Water Resources). 1961. Planned Utilization of Ground Water Basins of the Coastal Plain of Los Angeles County. Bulletin 104. Appendix B. June.

ECC/Geosyntec (Environmental Chemical Corporation/Geosyntec Consultants). 2008a. Final Remedial Action Work Plan, Implementation of Enhanced *In-Situ* Bioremediation, Installation Restoration Program Site 70, Naval Weapons Station Seal Beach, Seal Beach, California. March.

————. 2008b. Final Technical Memorandum, Installation Restoration Program Site 70, Installation of Enhanced *In-Situ* Bioremediation System, Well Installation Phase, Naval Weapons Station Seal Beach, Seal Beach, California. January.

————. 2009. Errata to Final Technical Memorandum, Installation Restoration Program Site 70, Installation of Enhanced *In-Situ* Bioremediation System, Well Installation Phase, Naval Weapons Station Seal Beach, Seal Beach, California. January.

EPA (U.S. Environmental Protection Agency). 1999. National Functional Guidelines for Organic Data Review, EPA 540/R-99/008. Contract Laboratory Program. October.

————. 2004. National Functional Guidelines for Inorganic Data Review, EPA 540/R-04/004. Contract Laboratory Program. October.

Geosyntec (Geosyntec Consultants). 2005. Final Revised Groundwater Feasibility Study Report, Installation Restoration Program Site 70, Naval Weapons Station, Seal Beach, Seal Beach, California. August.

————. 2006a. Record of Decision for IR Site 70 , Naval Weapons Station, Seal Beach, Seal Beach, California. August.

————. 2006b. Final Remedial Design for IR Site 70 Enhanced *In-Situ* Bioremediation, Naval Weapons Station, Seal Beach, Seal Beach, California. December.

ECC-Insight, Inc. 2009a. Baseline Groundwater Monitoring Report. Installation Restoration Program Site 70, Naval Weapons Station, Seal Beach, Seal Beach, California. April.

——————. 2009b. Methane Monitoring Plan and Emergency Procedures. Installation Restoration Program Site 70, Naval Weapons Station, Seal Beach, Seal Beach, California. January.

——————. 2010. 2009 Performance Monitoring Report Enhanced In Situ Bioremediation Installation Restoration Program Site 70, Naval Weapons Station, Seal Beach, California.

——————. 2011. 2010 Performance Monitoring Report Enhanced In Situ Bioremediation Installation Restoration Program Site 70, Naval Weapons Station, Seal Beach, California. August.

——————. 2012. 2011 Performance Monitoring Report Enhanced In Situ Bioremediation Installation Restoration Program Site 70, Naval Weapons Station, Seal Beach, California.

——————. 2014a. Addendum Number 5 to the Final Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan), Installation Restoration Site 70, Naval Weapons Station Seal Beach, Seal Beach, California.

——————. 2014b. Addendum Number 4 to the Accident Prevention Plan/ Site Safety and Health Plan, Installation Restoration Site 70, Naval Weapons Station Seal Beach, Seal Beach, California. December.

JEG (Jacobs Engineering Group Inc.). 1995. Final Preliminary Assessment Report for the Research, Testing and Evaluation Area, Naval Weapons Station, Seal Beach, Seal Beach, California. February.

NAVFAC SW (Naval Facilities Engineering Command Southwest). 2001. Environmental Work Instruction (EWI) #1, 3EN2.1, Chemical Data Validation. November.

SWRCB (State Water Resources Control Board). 2012. GeoTracker map for sites in the vicinity of 13980 Seal Beach Boulevard, Seal Beach, CA: http://geotracker.waterboards.ca.gov /map/?CMD=runreport&myaddress=13980+SeaI+Beach+Blvd.%2C+Seal+Beach%2C+ CA

TtEC (Tetra Tech, EC, Inc.). 2012. Addendum Number 4 to the Final Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan), Installation Restoration Site 70, Naval Weapons Station Seal Beach, Seal Beach, California. November.

——————. 2013. Final Annual Performance Monitoring Report, Enhanced In Situ Bioremediation, Installation Restoration Program Site 70, Naval Weapons Station Seal Beach, Seal Beach, California. October.

——————. 2014. Final Annual Performance Monitoring Report, Enhanced In Situ Bioremediation, Installation Restoration Program Site 70, Naval Weapons Station Seal Beach, Seal Beach, California. October.

Water Board (California Regional Water Quality Control Board, Santa Ana Region). 1995. Water Quality Control Plan, Santa Ana River Basin; with amendment R8-2004-0001, January 2004.

Water Resources Control Board California. 2015. GeoTracker map for sites in the vicinity of 13980 Seal Beach Boulevard, Seal Beach, CA. http://geotracker.waterboards.ca.gov/

——————. 2013. User's Guide: Derivation and Application of Environmental Screening Levels, Interim Final. December.

TABLES

This page intentionally left blank.

TABLE 1-1
CONTAMINANTS OF CONCERN AND TARGET CLEANUP GOALS

Contaminant of Concern	Exposure Pathway	Receptors	Target Cleanup Goal (µg/L)
Chloroform	Ingestion	Future residential groundwater users	100
1,1-Dichloroethene	Ingestion	Future residential groundwater users	6
cis-1,2-Dichloroethene	Ingestion	Future residential groundwater users	6
trans-1,2-Dichloroethene	Ingestion	Future residential groundwater users	10
Tetrachloroethene	Ingestion	Future residential groundwater users	5
Trichloroethene	Ingestion	Future residential groundwater users	5
Vinyl Chloride	Ingestion	Future residential groundwater users	0.5

Source: ECC/Geosyntec (2008a) – Remedial Action Work Plan. Target Cleanup Goals are based on Applicable or Relevant and Appropriate Requirements. Reevaluation of the Target Cleanup Goals may be required at a future date, per trends in remedial performance.

Abbreviations and Acronyms:
µg/L – micrograms per liter

This page intentionally left blank

TABLE 1-2
2014 GROUNDWATER AND PERFORMANCE MONITORING SCHEDULE

Seal Beach IRP Site 70

	Field Parameters [a]	VOCs (8260B)	Dissolved Hydrogen Gases (DHGs) (RSK 175)	Anions/TDS/Alkalinity [b]	Volatile Fatty Acids (VFAs) (300.0M)	TOC (5013B)	Sulfide (Method 4500 S2F)	Dissolved Metals [c] (6010B)	DHC/vcrA [d]	Soil Vapor [e]
Source Area Treatment Grid										
MW-70-PMW01A (25-35)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW01B (45-55)	X	X	X	X	X	X	X	X	X	—
MW-70-27 (25.5-35.5)	X	X	X	X	X	X	X	X	X	—
MW-70-28 (50.3-60.3)	X	X	X	X	X	X	X	X	X	—
MW-70-MNA01 (40-50)	X	X	X	—	X	—	—	—	X	—
MW-70-MNA02 (35-45)	X	X	X	—	X	—	—	—	X	—
MW-70-MNA03 (35-45)	X	X	X	—	X	—	—	—	X	—
MW-70-MNA04 (35-45)	X	X	X	—	X	—	—	—	X	—
Point of Compliance/Upper Fines										
MW-70-02 (20-30)	X	X	—	—	—	—	—	—	—	—
MW-70-03 (20-30)	X	X	—	—	—	—	—	—	—	—
MW-70-10 (30-40)	X	X	—	—	—	—	—	—	—	—
MW-70-17 (30-40)	X	X	—	—	—	—	—	—	—	—
MW-70-22 (20-30)	X	X	—	—	—	—	—	—	—	—
Source Area Biobarrier/First Sand										
IW-70-SAB06 (65-80/85-105)	X	X	X	X	X	X	X	X	X	—
IW-70-SAB11 (60-105)	X	X	X	X	X	X	X	X	X	—
MW-70-MNA05 (70-80)	X	X	X	—	X	—	—	—	X	—
MW-70-PMW02A (70.5-80.5)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW02B (90-100)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW03A (70.5-80.5)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW03B (90-100)	X	X	X	X	X	X	X	X	X	—

TABLE 1-2
2014 GROUNDWATER AND PERFORMANCE MONITORING SCHEDULE

Seal Beach IRP Site 70										
	Field Parameters [a]	VOCs (8260B)	Dissolved Hydrogen Gases (DHGs) (RSK 175)	Anions/TDS/Alkalinity [b]	Volatile Fatty Acids (VFAs) (300.0M)	TOC (5013B)	Sulfide (Method 4500 S2F)	Dissolved Metals [c] (6010B)	DHC/vcrA [d]	Soil Vapor [e]
First Sand Biobarrier 1										
MW-70-38 (80-100)	X	X	X	X	X	X	X	X	X	—
IW-70-FSB108 (60-105)	X	X	X	X	X	X	X	X	X	—
IW-70-FSB118 (60-105)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW04A (70-80)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW04B (90-100)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW05A (70-80)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW05B (90-100)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW06A (69.5-79.5)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW06B (91-101)	X	X	X	X	X	X	X	X	X	—
RDO-5 (65-105)	X	X	X	X	X	X	X	X	X	—
MW-70-MNA08 (80-90)	X	X	X	—	X	—	—	—	X	—
MW-70-MNA06 (80-90)	X	X	X	—	X	—	—	—	X	—
MW-70-MNA11 (80-90)	X	X	X	—	X	—	—	—	X	—
MW-70-MNA07 (90-100)	X	X	X	—	X	—	—	—	X	—
MW-70-43A (86-106)	X	X	X	—	X	—	—	—	X	—
First Sand Biobarrier 2										
IW-70-FSB216 (65-100)	X	X	X	X	X	X	X	X	X	—
IW-70-FSB229 (65-100)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW07A (65-75)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW07B (85-95)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW08A (65-75)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW08B (85-95)	X	X	X	X	X	X	X	X	X	—
MW-70-MNA09 (64-74)	X	X	X	—	X	—	—	—	X	—
MW-70-MNA10 (75-85)	X	X	X	—	X	—	—	—	X	—
MW-70-MNA12 (75-85)	X	X	X	—	X	—	—	—	X	—

TABLE 1-2
2014 GROUNDWATER AND PERFORMANCE MONITORING SCHEDULE

Seal Beach IRP Site 70										
	Field Parameters [a]	VOCs (8260B)	Dissolved Hydrogen Gases (DHGs) (RSK 175)	Anions/TDS/Alkalinity [b]	Volatile Fatty Acids (VFAs) (300.0M)	TOC (5013B)	Sulfide (Method 4500 S2F)	Dissolved Metals [c] (6010B)	DHC/vcrA [d]	Soil Vapor [e]
Point of Compliance/First Sand										
MW-70-11 (80-100)	X	X	—	—	—	—	—	—	—	—
MW-70-16 (95-105)	X	X	—	—	—	—	—	—	—	—
MW-70-35 (90-100)	X	X	—	—	—	—	—	—	—	—
MW-70-POC01 (80-90)	X	X	—	—	—	—	—	—	—	—
Shell Horizon Biobarrier 1										
IW-70-SHB113 (105-130)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW09 (120-130)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW10 (120-130)	X	X	X	X	X	X	X	X	X	—
IW-70-SHB217 (105-130)	X	X	X	X	X	X	X	X	X	—
MW-70-MNA13 (115-125)	X	X	X	—	X	—	—	—	X	—
Shell Horizon Biobarrier 2										
IW-70-SHB310 (105-130)	X	X	X	X	X	X	X	X	X	—
IW-70-SHB311 (80-95)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW11A (85-95)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW11B (115-125)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW12A (85-95)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW12B (115-125)	X	X	X	X	X	X	X	X	X	—
MW-70-MNA14 (115-125)	X	X	X	—	X	—	—	—	X	—
Point of Compliance/Shell Horizon										
MW-70-23 (110-130)	X	X	—	—	—	—	—	—	—	—

TABLE 1-2
2014 GROUNDWATER AND PERFORMANCE MONITORING SCHEDULE

Seal Beach IRP Site 70										
	Field Parameters [a]	VOCs (8260B)	Dissolved Hydrogen Gases (DHGs) (RSK 175)	Anions/TDS/Alkalinity [b]	Volatile Fatty Acids (VFAs) (300.0M)	TOC (5013B)	Sulfide (Method 4500 S2F)	Dissolved Metals [c] (6010B)	DHC/vcrA [d]	Soil Vapor [e]
Second Sand Biobarrier 1										
IW-70-SSB109 (125.75-165.75)	X	X	X	X	X	X	X	X	X	—
IW-70-SSB119 (125-165)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW13A (125-135)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW13B (145-155)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW14A (128-138)	X	X	X	X	X	X	X	X	X	—
MW-70-PMW14B (140.5-150.5)	X	X	X	X	X	X	X	X	X	—
MW-70-MNA15 (140-150)	X	X	X	X	X	X	X	X	X	—
MW-70-MNA16 (140.5-150.5)	X	X	X	—	X	—	—	—	X	—
MW-70-MNA17 (140-150)	X	X	X	—	X	—	—	—	X	—
MW-70-15 (161-171)	X	X	X	—	X	—	—	—	X	—
MW-70-14 (160-170)	X	X	X	—	X	—	—	—	X	—
MW-70-43B (136-146)	X	X	X	—	X	—	—	—	X	—
MW-70-49 (125-165)	X	X	X	X	X	X	X	X	X	—
Point of Compliance/Second Sand										
MW-70-21 (150-170)	X	X	—	—	—	—	—	—	—	—
MW-70-36 (150-160)	X	X	—	—	—	—	—	—	—	—
Point of Compliance/Deep Sand										
MW-70-POC02 (190-200)	X	X	—	—	—	—	—	—	—	—
MW-70-POC03 (190-200)	X	X	—	—	—	—	—	—	—	—
MW-70-POC04 (195-205)	X	X	—	—	—	—	—	—	—	—

TABLE 1-2
2014 GROUNDWATER AND PERFORMANCE MONITORING SCHEDULE

Seal Beach IRP Site 70										
	Field Parameters [a]	VOCs (8260B)	Dissolved Hydrogen Gases (DHGs) (RSK 175)	Anions/TDS/Alkalinity [b]	Volatile Fatty Acids (VFAs) (300.0M)	TOC (5013B)	Sulfide (Method 4500 S2F)	Dissolved Metals [c] (6010B)	DHC/vcrA [d]	Soil Vapor [e]
Soil Vapor Samples										
SV-70-01	—	—	—	—	—	—	—	—	—	X
SV-70-02	—	—	—	—	—	—	—	—	—	X
SV-70-03	—	—	—	—	—	—	—	—	—	X
SV-70-04	—	—	—	—	—	—	—	—	—	X
SV-70-05	—	—	—	—	—	—	—	—	—	X
SV-70-06	—	—	—	—	—	—	—	—	—	X
SV-70-07	—	—	—	—	—	—	—	—	—	X
SV-70-08	—	—	—	—	—	—	—	—	—	X
SV-70-09	—	—	—	—	—	—	—	—	—	X
SV-70-10	—	—	—	—	—	—	—	—	—	X
SV-70-11	—	—	—	—	—	—	—	—	—	X
SV-70-12	—	—	—	—	—	—	—	—	—	X

Notes:

— not analyzed

[a] pH, DO, ORP, conductivity, temperature, and turbidity

[b] Anions (EPA Method 300.0)/TDS (EPA Method 2540C)/Alkalinity (EPA Method 2320B)

[c] dissolved metals – iron, manganese, and arsenic

[d] DHC/vcrA – Polymerase Chain Reaction Assay (Dehalococcoides/vinyl chloride reductase gene)

[e] Soil vapor for hydrogen sulfide (ASTM D5504) and methane (25C). Sample from SV-70-07 also analyzed for VOCs (EPA TO-15).

Abbreviations and Acronyms:

DHC – dehalococcoides
DHG – dissolved hydrocarbon gas
TDS – total dissolved solids
TOC – total organic carbon
vcrA – vinyl chloride reductase A gene
VFA – volatile fatty acid
VOC – volatile organic compound

This page intentionally left blank

TABLE 1-3
WELL CONSTRUCTION SUMMARY

Well Number	Well Installation			Construction Depths (feet bgs)					Construction Elevations (feet MSL, NGVD29)						Screen Dimensions			Well Maintenance		
	Date Installed	Coordinates (feet NAD83)		Borehole Depth	Filter Pack		Screen Interval		TOC	Ground Surface	Filter Pack		Screen Interval		Length (feet)	Diameter (inches)	Slot Size (inches)	Date Last Developed	Well Depth	
		Northing	Easting		Top	Bottom	Top	Bottom			Top	Bottom	Top	Bottom					Date Measured	Measurement (feet below TOC)
Source Area Treatment/Upper Fines																				
MW-70-27	07/03/01	2224170.00	6005991.20	36.00	23.00	36.00	25.50	35.50	8.25	8.80	-14.20	-27.20	-16.70	-26.70	10.00	4	0.01	08/21/01	07/09/01	35.90
MW-70-28	07/03/01	2224165.50	6005991.20	62.00	45.00	62.00	50.30	60.30	8.30	8.65	-36.35	-53.35	-41.65	-51.65	10.00	4	0.01	08/21/01	07/09/01	60.70
MW-70-MNA01	02/21/07	2224281.89	6006003.22	57.00	38.00	57.00	40.00	50.00	8.36	8.76	-29.24	-48.24	-31.24	-41.24	10.00	4	0.02	03/15/07	03/15/07	50.42
MW-70-MNA02	02/13/07	2224020.66	6006052.91	47.00	33.00	46.00	35.00	45.00	8.51	8.78	-24.22	-37.22	-26.22	-36.22	10.00	4	0.02	03/06/07	03/06/07	45.58
MW-70-MNA03	02/26/07	2224096.48	6006104.81	47.00	31.00	47.00	35.00	45.00	9.18	9.47	-21.53	-37.53	-25.53	-35.53	10.00	4	0.02	03/06/07	03/06/07	45.42
MW-70-MNA04	02/14/07	2224052.55	6005800.63	47.00	32.00	46.00	35.00	45.00	8.39	8.65	-23.35	-37.35	-26.35	-36.35	10.00	4	0.02	03/05/07	03/05/07	45.66
MW-70-PMW01A	02/26/07	2224162.70	6005948.30	37.00	20.00	37.00	25.00	35.00	8.23	8.51	-11.49	-28.49	-16.49	-26.49	10.00	4	0.02	03/19/07	03/19/07	35.67
MW-70-PMW01B	02/27/07	2224163.30	6005952.70	57.00	41.90	57.00	45.00	55.00	8.21	8.49	-33.41	-48.51	-36.51	-46.51	10.00	4	0.02	03/19/07	03/19/07	55.08
IW-70-SAT01	02/22/07	2224308.07	6005882.81	57.00	20.00	57.00	25.00	55.00	9.21	9.44	-10.56	-47.56	-15.56	-45.56	30.00	4	0.02	03/26/07	03/26/07	55.40
IW-70-SAT02	02/13/07	2224286.80	6005883.15	57.00	20.00	57.00	25.00	55.00	9.19	9.45	-10.55	-47.55	-15.55	-45.55	30.00	4	0.02	04/02/07	04/02/07	55.80
IW-70-SAT03	06/05/07	2224286.83	6005948.18	57.00	22.00	57.00	25.00	55.00	9.16	9.30	-12.70	-47.70	-15.70	-45.70	30.00	4	0.02	06/14/07	06/14/07	54.80
IW-70-SAT04	06/07/07	2224281.63	6005958.82	57.00	20.00	57.00	25.00	55.00	9.01	9.16	-10.84	-47.84	-15.84	-45.84	30.00	4	0.02	06/13/07	06/13/07	52.40
IW-70-SAT05	04/24/07	2224283.87	6005900.79	57.00	21.50	57.00	25.00	55.00	9.39	9.60	-11.90	-47.40	-45.40	-45.40	30.00	4	0.02	05/09/07	05/08/07	54.00
IW-70-SAT06	05/01/07	2224279.17	6005925.75	57.00	21.50	57.00	25.00	55.00	9.14	9.36	-12.14	-47.64	-45.64	-45.64	30.00	4	0.02	05/08/07	05/08/07	55.40
IW-70-SAT07	06/06/07	2224271.70	6005956.20	57.00	21.00	57.00	25.00	55.00	8.89	9.15	-11.85	-47.85	-15.85	-45.85	30.00	4	0.02	06/20/07	06/20/07	54.90
IW-70-SAT08	02/08/07	2224266.79	6005871.29	62.00	20.00	60.00	25.00	55.00	9.00	9.31	-10.69	-50.69	-15.69	-45.69	30.00	4	0.02	04/03/07	04/03/07	53.70
IW-70-SAT09	04/23/07	2224268.38	6005896.88	57.00	22.00	57.00	25.00	55.00	9.18	9.44	-12.56	-47.56	-15.56	-45.56	30.00	4	0.02	05/09/07	05/08/07	55.00
IW-70-SAT10	05/03/07	2224267.02	6005934.82	57.00	22.00	57.00	25.00	55.00	9.26	9.42	-12.58	-47.58	-15.58	-45.58	30.00	4	0.02	05/08/07	05/08/07	55.67
IW-70-SAT11	04/19/07	2224260.42	6005960.01	57.00	22.00	57.00	25.00	55.00	8.95	9.23	-12.77	-47.77	-15.77	-45.77	30.00	4	0.02	06/20/07	06/14/07	52.90
IW-70-SAT12	06/04/07	2224266.96	6005945.79	57.00	20.00	57.00	25.00	55.00	9.24	9.41	-10.59	-47.59	-15.59	-45.59	30.00	4	0.02	06/14/07	06/14/07	55.00
IW-70-SAT13	06/01/07	2224220.16	6005941.83	57.00	20.00	57.00	25.00	55.00	9.10	9.29	-10.71	-47.71	-15.71	-15.71	30.00	4	0.02	06/11/07	06/11/07	55.50
IW-70-SAT14	05/30/07	2224216.81	6005949.90	57.00	20.00	57.00	25.00	55.00	9.20	9.32	-10.68	-47.68	-15.68	-45.68	30.00	4	0.02	06/11/07	06/11/07	55.20
IW-70-SAT15	05/31/07	2224218.67	6005973.62	57.00	20.00	57.00	25.00	55.00	9.12	9.30	-10.70	-47.70	-15.70	-45.70	30.00	4	0.02	06/12/07	06/12/07	55.50
IW-70-SAT16	05/29/07	2224206.66	6005943.24	57.00	20.00	57.00	25.00	55.00	8.93	9.18	-10.82	-47.82	-15.82	-45.82	30.00	4	0.02	06/12/07	06/12/07	53.40
IW-70-SAT17	02/28/07	2224206.64	6005963.27	57.00	21.00	57.00	25.00	55.00	9.06	9.23	-11.77	-47.77	-15.77	-45.77	30.00	4	0.02	03/15/07	03/15/07	55.50
IW-70-SAT18	02/22/07	2224206.59	6005983.32	57.00	20.00	57.00	25.00	55.00	8.61	8.81	-11.19	-48.19	-16.19	-46.19	30.00	4	0.02	03/14/07	03/14/07	55.50
IW-70-SAT19	02/21/07	2224199.76	6005923.20	57.00	20.00	57.00	25.00	55.00	8.66	8.87	-11.13	-48.13	-16.13	-26.13	30.00	4	0.02	03/28/07	03/28/07	55.20
IW-70-SAT20	02/07/07	2224186.41	6005878.23	57.00	21.00	56.00	25.00	55.00	8.63	8.86	-12.14	-47.14	-16.14	-46.14	30.00	4	0.02	03/28/07	03/28/07	53.00
IW-70-SAT21	02/13/07	2224189.36	6005933.56	57.00	20.00	57.00	25.00	55.00	8.65	8.83	-11.17	-48.17	-16.17	-46.17	30.00	4	0.02	03/26/07	03/22/07	55.67
IW-70-SAT22	02/27/07	2224189.38	6005953.39	57.00	20.00	57.00	25.00	55.00	8.69	8.90	-11.10	-48.10	-16.10	-46.10	30.00	4	0.02	03/22/07	03/21/07	55.00
IW-70-SAT23	02/12/07	2224166.93	6005881.47	57.00	20.00	57.00	25.00	55.00	8.50	8.64	-11.36	-48.36	-16.36	-46.36	30.00	4	0.02	03/27/07	03/27/07	53.60
IW-70-SAT24	02/14/07	2224166.75	6005949.70	57.00	20.00	57.00	25.00	55.00	8.30	8.56	-11.44	-48.44	-16.44	-46.44	30.00	4	0.02	03/21/07	03/20/07	55.10
IW-70-SAT25	02/06/07	2224166.69	6005963.20	62.00	21.00	59.00	25.00	55.00	8.34	8.57	-12.43	-50.43	-16.43	-46.43	30.00	4	0.02	03/20/07	03/20/07	55.58
IW-70-SAT26	02/26/07	2224147.43	6005877.11	57.00	20.00	57.00	25.00	55.00	8.10	8.34	-11.66	-48.66	-16.66	-46.66	30.00	4	0.02	03/27/07	03/27/07	55.50
IW-70-SAT27	02/27/07	2224128.90	6005902.08	57.00	20.60	57.00	25.00	55.00	7.98	8.22	-12.38	-48.78	-16.78	-46.78	30.00	4	0.02	03/12/07	03/12/07	55.58
IW-70-SAT28	03/01/07	2224146.56	6005933.34	57.00	19.00	57.00	25.00	55.00	8.13	8.30	-10.70	-48.70	-16.70	-46.70	30.00	4	0.02	04/05/07	04/04/07	55.40
IW-70-SAT29	02/15/07	2224146.68	6005953.13	57.00	20.00	57.00	25.00	55.00	8.24	8.32	-11.68	-48.68	-16.68	-46.68	30.00	4	0.02	03/14/07	03/13/07	55.33
IW-70-SAT30	02/28/07	2224131.36	6005923.41	57.00	21.40	56.00	25.00	55.00	8.22	8.18	-13.22	-47.82	-16.82	-46.82	30.00	4	0.02	03/12/07	03/12/07	55.33
IW-70-SAT31	02/28/07	2224130.42	6005942.91	57.00	21.60	57.00	25.00	55.00	8.18	8.07	-13.53	-48.93	-16.93	-46.93	30.00	4	0.02	03/13/07	03/13/07	56.08
IW-70-SAT32	02/23/07	2224097.57	6005993.18	57.00	21.00	57.00	25.00	55.00	8.53	8.77	-12.23	-48.23	-16.23	-46.23	30.00	4	0.02	03/08/07	03/08/07	55.90
IW-70-SAT33	02/22/07	2224100.53	6006013.44	57.00	21.00	57.00	25.00	55.00	8.56	8.76	-12.24	-48.24	-16.24	-46.24	30.00	4	0.02	03/08/07	03/07/07	55.50
IW-70-SAT34	02/22/07	2224100.68	6006034.35	57.00	21.75	57.00	25.00	55.00	8.65	8.92	-12.83	-48.08	-16.08	-46.08	30.00	4	0.02	03/07/07	03/07/07	56.16
IW-70-SAT35	04/13/10	2224242.29	6005863.16	57.00	21.00	57.00	25.00	55.00	9.02	9.34	-11.66	-47.66	-15.66	-45.66	30.00	4	0.02	04/21/10	04/21/10	56.00
IW-70-SAT36	05/10/10	2224240.96	6005881.59	57.00	21.00	57.00	25.00	55.00	8.86	9.19	-11.81	-47.81	-15.81	-45.81	30.00	4	0.02	05/13/10	05/13/10	55.00

TABLE 1-3
WELL CONSTRUCTION SUMMARY

Well Number	Well Installation			Construction Depths (feet bgs)					Construction Elevations (feet MSL, NGVD29)						Screen Dimensions			Well Maintenance		
	Date Installed	Coordinates (feet NAD83)		Borehole Depth	Filter Pack		Screen Interval		TOC	Ground Surface	Filter Pack		Screen Interval		Length (feet)	Diameter (inches)	Slot Size (inches)	Date Last Developed	Well Depth	
		Northing	Easting		Top	Bottom	Top	Bottom			Top	Bottom	Top	Bottom					Date Measured	Measurement (feet below TOC)
IW-70-SAT37	04/13/10	2224229.21	6005880.64	57.00	22.00	57.00	26.50	56.50	8.96	9.06	-12.94	-47.94	-17.44	-47.44	30.00	4	0.02	05/13/10	05/13/10	55.00
IW-70-SAT38	05/12/10	2224215.28	6005887.15	57.00	21.00	57.00	25.00	55.00	8.77	9.16	-11.84	-47.84	-15.84	-45.84	30.00	4	0.02	05/17/10	05/17/10	55.00
IW-70-SAT39	04/14/10	2224199.16	6005880.05	57.00	21.00	57.00	25.00	55.00	8.63	9.04	-11.96	-47.96	-15.96	-45.96	30.00	4	0.02	04/21/10	04/21/10	55.60
IW-70-SAT40	04/14/10	2224201.29	6005893.29	57.00	21.00	57.00	25.00	55.00	8.75	9.16	-11.84	-47.84	-15.84	-45.84	30.00	4	0.02	04/22/10	04/22/10	55.00
IW-70-SAT41	04/15/10	2224196.03	6005916.09	57.00	20.50	57.00	25.00	55.00	8.55	8.92	-11.58	-48.08	-16.08	-46.08	30.00	4	0.02	04/22/10	04/22/10	55.50
IW-70-SAT42	04/16/10	2224183.70	6005896.09	57.00	21.00	57.00	25.00	55.00	8.77	8.98	-12.02	-48.02	-16.02	-46.02	30.00	4	0.02	04/23/10	04/23/10	55.00
IW-70-SAT43	04/28/10	2224183.59	6005916.47	57.00	21.00	57.00	25.00	55.00	8.42	8.84	-12.16	-48.16	-16.16	-46.16	30.00	4	0.02	05/04/10	05/04/10	55.00
IW-70-SAT44	04/16/10	2224181.51	6005974.36	57.00	21.00	57.00	25.00	55.00	8.43	8.81	-12.19	-48.19	-16.19	-46.19	30.00	4	0.02	04/23/10	04/23/10	54.90
IW-70-SAT45	04/26/10	2224193.23	6005995.85	57.00	21.00	57.00	25.00	55.00	8.30	8.67	-12.33	-48.33	-16.33	-46.33	30.00	4	0.02	05/04/10	05/04/10	55.00
IW-70-SAT46	05/13/10	2224155.27	6005884.75	57.00	21.00	57.00	25.00	55.00	8.19	8.48	-12.52	-48.52	-16.52	-46.52	30.00	4	0.02	05/17/10	05/17/10	55.00
IW-70-SAT47	05/14/10	2224180.44	6005940.92	57.00	21.00	57.00	25.00	55.00	8.44	8.86	-12.14	-48.14	-16.14	-46.14	30.00	4	0.02	05/18/10	05/18/10	55.00
IW-70-SAT48	04/27/10	2224168.70	6005984.54	57.00	21.00	57.00	25.00	55.00	8.42	8.83	-12.17	-48.17	-16.17	-46.17	30.00	4	0.02	05/03/10	05/03/10	55.00
IW-70-SAT49	04/13/10	2224166.15	6006005.15	57.00	21.00	57.00	25.00	55.00	7.96	8.37	-12.63	-48.63	-16.63	-46.63	30.00	4	0.02	04/28/10	04/28/10	55.60
IW-70-SAT50	05/13/10	2224145.73	6005926.70	57.00	21.00	57.00	25.00	55.00	7.97	8.33	-12.67	-48.67	-16.67	-46.67	30.00	4	0.02	05/18/10	05/18/10	55.00
IW-70-SAT51	04/19/10	2224144.99	6005975.30	57.00	21.00	57.00	25.00	55.00	8.00	8.38	-12.62	-48.62	-16.62	-46.62	30.00	4	0.02	04/28/10	04/28/10	55.20
IW-70-SAT52	04/28/10	2224144.89	6005996.09	57.00	21.00	57.00	25.00	55.00	7.94	8.31	-12.69	-48.69	-16.69	-46.69	30.00	4	0.02	05/04/10	05/04/10	55.00
IW-70-SAT53	04/23/10	2224143.90	6006027.57	57.00	21.00	57.00	25.00	55.00	7.77	8.20	-12.80	-48.80	-16.80	-46.80	30.00	4	0.02	04/27/10	04/27/10	56.10
IW-70-SAT54	04/21/10	2224128.75	6005967.94	57.00	21.00	57.00	25.00	55.00	7.73	8.06	-12.94	-48.94	-16.94	-46.94	30.00	4	0.02	04/26/10	04/26/10	55.00
IW-70-SAT55	04/20/10	2224128.29	6005986.14	57.00	21.00	57.00	25.00	55.00	7.80	8.23	-12.77	-48.77	-16.77	-46.77	30.00	4	0.02	04/26/10	04/26/10	55.00
IW-70-SAT56	04/20/10	2224127.58	6006005.90	57.00	20.00	57.00	25.00	55.00	7.65	8.12	-11.88	-48.88	-16.88	-46.88	30.00	4	0.02	04/26/10	04/26/10	56.00
IW-70-SAT57	04/22/10	2224128.64	6005886.17	57.00	21.00	57.00	25.00	55.00	8.13	8.35	-12.65	-48.65	-16.65	-46.65	30.00	4	0.02	04/27/10	04/27/10	56.00
Source Area Biobarrier/First Sand																				
MW-70-MNA05	01/24/07	2224052.67	6005796.72	87.00	67.00	82.00	70.00	80.00	8.46	8.67	-58.33	-73.33	-61.33	-71.33	10.00	4	0.02	02/07/07	02/07/07	81.45
MW-70-PMW02A	02/15/07	2223909.82	6005902.30	82.00	67.84	82.00	70.50	80.50	8.35	8.56	-59.28	-73.44	-61.94	-71.94	10.00	4	0.02	03/01/07	03/01/07	81.33
MW-70-PMW02B	02/21/07	2223912.08	6005905.73	102.00	86.75	102.00	90.00	100.00	8.38	8.57	-78.18	-93.43	-81.43	-91.43	10.00	4	0.02	03/05/07	03/05/07	100.25
MW-70-PMW03A	02/15/07	2223867.82	6005930.07	82.00	66.00	82.00	70.00	80.00	7.94	8.21	-57.79	-73.79	-61.79	-71.79	10.00	4	0.02	03/01/07	03/01/07	80.75
MW-70-PMW03B	02/20/07	2223870.34	6005933.39	102.00	87.00	102.00	90.00	100.00	7.88	8.21	-78.79	-93.79	-81.79	-91.79	10.00	4	0.02	02/28/07	02/28/07	100.91
IW-70-SAB01	01/23/07	2223802.98	6005831.22	120.00	57.00	82.00	60.00	80.00	7.55	7.71	-49.29	-74.29	-52.29	-72.29	20.00	4	0.02	02/06/07	02/06/07	81.30
IW-70-SAB02	01/29/07	2223817.58	6005849.48	117.00	60.00	107.00	65.00	105.00	7.58	7.78	-52.22	-99.22	-57.22	-97.22	40.00	4	0.02	02/06/07	02/06/07	105.60
IW-70-SAB03	01/31/07	2223836.63	6005867.03	107.00	60.00	107.00	65.00	105.00	8.11	8.36	-51.64	-98.64	-56.64	-96.64	40.00	4	0.02	02/23/07	02/23/07	106.50
IW-70-SAB04 (Screen 1)	01/23/07	2223846.50	6005889.02	107.00	57.00	81.00	60.00	80.00	8.14	8.33	-48.67	-72.67	-51.67	-71.67	20.00	4	0.02	02/07/07	02/07/07	105.00
IW-70-SAB04 (Screen 2)	01/23/07	2223846.50	6005889.02	107.00	84.00	106.00	85.00	105.00	8.14	8.33	-75.67	-97.67	-76.67	-96.67	20.00	4	0.02	02/07/07	02/07/07	105.00
IW-70-SAB05	02/07/07	2223861.03	6005908.25	107.00	61.50	107.00	65.00	105.00	7.83	8.07	-53.43	-98.93	-56.93	-96.93	40.00	4	0.02	02/23/07	02/23/07	105.00
IW-70-SAB06 (Screen 1)	02/05/07	2223875.37	6005927.28	117.00	60.00	80.00	65.00	80.00	8.07	8.25	-51.75	-71.75	-56.75	-71.75	15.00	4	0.02	02/27/07	02/27/07	106.08
IW-70-SAB06 (Screen 2)	02/05/07	2223875.37	6005927.28	117.00	85.00	106.00	85.00	105.00	8.07	8.25	-76.75	-97.75	-76.75	-96.75	20.00	4	0.02	02/27/07	02/27/07	106.08
IW-70-SAB07	02/08/07	2223889.57	6005946.53	107.00	60.00	107.00	65.00	105.00	8.18	8.47	-51.53	-98.53	-56.53	-96.53	40.00	4	0.02	02/28/07	02/28/07	105.00
IW-70-SAB08	01/31/07	2223904.42	6005965.58	117.00	60.00	107.00	65.00	105.00	8.36	8.60	-51.40	-98.40	-56.40	-96.40	40.00	4	0.02	02/21/07	02/21/07	105.00
IW-70-SAB09	02/01/07	2223918.58	6005984.74	107.00	59.50	107.00	65.00	105.00	8.46	8.75	-50.75	-98.25	-56.25	-96.25	40.00	4	0.02	02/19/07	02/19/07	105.00
IW-70-SAB10 (Screen 1)	02/05/07	2223927.98	6006003.88	117.00	62.00	87.00	67.00	87.00	8.05	8.09	-53.91	-78.91	-58.91	-78.91	20.00	4	0.02	02/15/07	02/15/07	108.00
IW-70-SAB10 (Screen 2)	02/05/07	2223927.98	6006003.88	117.00	91.00	108.00	92.00	107.00	8.05	8.09	-82.91	-99.91	-83.91	-98.91	15.00	4	0.02	02/15/07	02/15/07	108.00
IW-70-SAB11	02/06/07	2223947.40	6006023.16	107.00	61.00	107.00	65.00	105.00	8.02	8.19	-52.81	-98.81	-56.81	-96.81	40.00	4	0.02	02/15/07	02/15/07	105.40
IW-70-SAB12	01/29/07	2223961.76	6006042.52	117.00	60.00	106.00	65.00	105.00	8.19	8.34	-51.66	-97.66	-56.66	-96.66	40.00	4	0.02	04/04/07	04/04/07	104.70
IW-70-SAB13	04/16/07	2223976.19	6006061.42	106.00	61.00	106.00	65.00	105.00	8.54	8.85	-52.15	-97.15	-56.15	-96.15	40.00	4	0.02	05/07/07	05/07/07	105.50
IW-70-SAB14	01/25/07	2223999.69	6006072.38	107.00	58.50	106.00	60.00	105.00	8.81	9.02	-49.48	-96.98	-50.98	-95.98	45.00	4	0.02	02/08/07	02/08/07	105.00

TABLE 1-3
WELL CONSTRUCTION SUMMARY

Well Number	Well Installation			Construction Depths (feet bgs)					Construction Elevations (feet MSL, NGVD29)						Screen Dimensions			Well Maintenance		
	Date Installed	Coordinates (feet NAD83)		Borehole Depth	Filter Pack		Screen Interval		TOC	Ground Surface	Filter Pack		Screen Interval		Length (feet)	Diameter (inches)	Slot Size (inches)	Date Last Developed	Well Depth	
		Northing	Easting		Top	Bottom	Top	Bottom			Top	Bottom	Top	Bottom					Date Measured	Measurement (feet below TOC)
First Sand Biobarrier 1																				
MW-70-38	09/17/03	2223522.20	6006119.80	101.50	75.00	101.50	80.00	100.00	6.85	4.37	-70.63	-97.13	-75.63	-95.63	20.00	4	0.01	09/24/03	09/16/03	102.98
MW-70-43A	07/19/05	2222847.90	6007211.10	150.00	82.30	108.60	85.50	105.50	10.76	7.93	-71.54	-100.67	-77.57	-97.57	10.00	2	0.01	07/22/05	NM	NM
MW-70-MNA06	05/03/07	2223223.94	6005822.01	92.00	74.50	91.00	80.00	90.00	3.95	4.30	-70.20	-86.70	-75.70	-85.70	10.00	4	0.02	05/08/07	05/08/07	90.30
MW-70-MNA07	05/10/07	2223353.52	6006032.68	102.00	86.00	102.00	90.00	100.00	4.63	5.00	-81.00	-97.00	-85.00	-95.00	10.00	4	0.02	05/17/07	05/17/07	99.70
MW-70-MNA08	03/29/07	2223428.52	6006211.91	92.00	75.00	92.00	80.00	90.00	7.66	8.00	-67.00	-84.00	-72.00	-82.00	10.00	4	0.02	04/19/07	04/19/07	90.10
MW-70-MNA11	03/28/07	2223538.78	6006673.87	94.00	75.00	94.00	80.00	90.00	8.30	8.80	-66.20	-85.20	-71.20	-81.20	10.00	4	0.02	04/18/07	04/18/07	89.90
MW-70-PMW04A	05/07/07	2223422.47	6005948.01	92.00	65.00	82.00	70.00	80.00	4.52	5.00	-60.00	-77.00	-65.00	-75.00	10.00	4	0.02	05/21/07	05/21/07	80.10
MW-70-PMW04B	05/08/07	2223422.44	6005942.78	102.00	85.00	99.00	90.00	100.00	4.53	5.00	-80.00	-94.00	-85.00	-95.00	10.00	4	0.02	05/22/07	05/22/07	100.57
MW-70-PMW05A	05/14/07	2223356.43	6005957.41	82.00	64.00	82.00	70.00	80.00	4.21	4.60	-59.40	-77.40	-65.40	-75.40	10.00	4	0.02	08/07/07	08/07/07	80.25
MW-70-PMW05B	05/14/07	2223355.68	6005965.64	102.00	87.00	102.00	90.00	100.00	4.34	4.90	-82.10	-97.10	-85.10	-95.10	10.00	4	0.02	05/23/07	05/23/07	100.35
MW-70-PMW06A	05/08/07	2223555.96	6006088.30	82.00	65.25	80.00	69.50	79.50	4.14	4.60	-60.65	-75.40	-64.90	-74.90	10.00	4	0.02	05/21/07	05/21/07	79.70
MW-70-PMW06B	05/09/07	2223550.60	6006086.34	102.00	85.00	102.00	91.00	101.00	4.16	4.60	-80.40	-97.40	-86.40	-96.40	10.00	4	0.02	05/14/07	05/14/07	101.30
IW-70-FSB101	05/01/07	2223378.30	6005796.47	107.00	56.50	106.00	60.50	105.50	4.49	4.55	-51.95	-101.45	-55.95	-100.95	45.00	4	0.02	05/08/07	05/08/07	105.50
IW-70-FSB102	04/26/07	2223377.60	6005819.46	107.00	56.50	105.00	61.00	106.00	4.38	4.45	-52.05	-100.55	-56.55	-101.55	45.00	4	0.02	05/08/07	05/08/07	103.45
IW-70-FSB103	04/25/07	2223377.79	6005842.17	107.00	56.00	107.00	60.00	105.00	4.31	4.35	-51.65	-102.65	-55.65	-100.65	45.00	4	0.02	05/07/07	05/07/07	105.00
IW-70-FSB104	04/24/07	2223378.19	6005864.40	107.00	55.95	107.00	60.00	105.00	4.35	4.45	-51.50	-102.55	-55.55	-100.55	45.00	4	0.02	NM	NM	105.00
IW-70-FSB105	04/19/07	2223377.45	6005886.78	107.00	57.00	107.00	60.00	105.00	4.51	4.75	-52.25	-102.25	-55.25	-100.25	45.00	4	0.02	05/02/07	05/02/07	105.50
IW-70-FSB106	04/18/07	2223377.49	6005910.28	107.00	57.00	107.00	60.00	105.00	4.48	4.55	-52.45	-102.45	-55.45	-100.45	45.00	4	0.02	05/02/07	05/02/07	106.50
IW-70-FSB107	04/18/07	2223376.75	6005933.24	107.00	54.00	107.00	60.00	105.00	4.39	4.65	-49.35	-102.35	-55.35	-100.35	45.00	4	0.02	05/02/07	05/02/07	103.70
IW-70-FSB108	04/17/07	2223375.30	6005955.71	107.00	56.00	107.00	60.00	105.00	4.64	4.90	-51.10	-102.10	-55.10	-100.10	45.00	4	0.02	05/01/07	05/01/07	105.30
IW-70-FSB109	04/16/07	2223375.40	6005978.82	107.00	56.00	107.00	60.00	105.00	4.72	4.85	-51.15	-102.15	-55.15	-100.15	45.00	4	0.02	04/30/07	04/30/07	105.65
IW-70-FSB110	04/11/07	2223374.32	6006001.81	107.00	54.50	107.00	59.00	104.00	4.46	4.65	-49.85	-102.35	-54.35	-99.35	45.00	4	0.02	04/26/07	04/26/07	104.50
IW-70-FSB111	04/11/07	2223374.26	6006024.77	107.00	55.00	107.00	60.70	105.70	4.08	4.25	-50.75	-102.75	-56.45	-101.45	45.00	4	0.02	04/25/07	04/25/07	105.70
IW-70-FSB112	04/10/07	2223393.48	6006037.31	107.00	55.00	107.00	60.00	105.00	4.04	4.15	-50.85	-102.85	-55.85	-100.85	45.00	4	0.02	04/24/07	04/24/07	104.70
IW-70-FSB113	04/09/07	2222413.19	6006049.43	107.00	55.00	107.00	60.00	105.00	4.26	4.45	-50.55	-102.55	-55.55	-100.55	45.00	4	0.02	04/24/07	04/23/07	104.60
IW-70-FSB114	04/03/07	2223432.63	6006061.39	107.00	57.00	107.00	60.00	105.00	4.32	4.45	-52.55	-102.55	-57.55	-102.55	45.00	4	0.02	04/23/07	04/23/07	103.90
IW-70-FSB115	05/09/07	2223476.05	6006085.17	107.00	58.00	107.00	65.00	105.00	4.21	4.35	-53.65	-102.65	-60.65	-100.65	45.00	4	0.02	05/16/07	05/16/07	106.40
IW-70-FSB116	05/08/07	2223492.98	6006094.23	107.00	55.00	107.00	60.00	105.00	4.13	4.35	-50.65	-102.65	-55.65	-100.65	45.00	4	0.02	05/17/07	05/17/07	105.60
IW-70-FSB117	05/07/07	2223514.06	6006104.40	107.00	61.00	107.00	60.00	105.00	4.09	4.35	-56.65	-102.65	-55.65	-100.65	45.00	4	0.02	05/16/07	05/16/07	105.20
IW-70-FSB118	05/02/07	2223552.40	6006128.68	107.00	55.00	107.00	60.00	105.00	4.42	4.60	-50.40	-102.40	-55.40	-100.40	45.00	4	0.02	05/15/07	05/15/07	105.45
IW-70-FSB119	05/01/07	2223569.99	6006142.21	107.00	55.00	107.00	60.00	105.00	4.44	4.65	-50.35	-102.35	-55.35	-100.35	45.00	4	0.02	05/15/07	05/15/07	105.65
IW-70-FSB120	04/30/07	2223588.30	6006155.56	107.00	55.00	107.00	60.00	105.00	4.66	4.75	-50.25	-102.25	-55.25	-100.25	45.00	4	0.02	05/15/07	05/15/07	105.50
IW-70-FSB121	04/25/07	2223606.06	6006169.28	107.00	55.00	107.00	60.00	105.00	4.68	4.75	-50.25	-102.25	-55.25	-100.25	45.00	4	0.02	05/14/07	05/14/07	105.00
IW-70-FSB122	04/24/07	2223648.83	6006186.92	107.00	55.00	107.00	60.00	105.00	4.86	4.95	-50.05	-102.05	-55.05	-100.05	45.00	4	0.02	05/14/07	05/14/07	105.40
IW-70-FSB123	04/23/07	2223664.05	6006207.36	107.00	55.00	106.00	60.00	105.00	4.96	5.15	-49.85	-100.85	-54.85	-99.85	45.00	4	0.02	05/10/07	05/10/07	105.50
IW-70-FSB124	04/19/07	2223683.35	6006219.55	107.00	53.00	107.00	60.00	105.00	5.25	5.25	-47.75	-101.75	-54.75	-99.75	45.00	4	0.02	05/09/07	05/09/07	105.00
IW-70-FSB125	04/17/07	2223703.25	6006232.21	107.00	56.00	107.00	60.00	105.00	5.21	5.35	-50.65	-101.65	-54.65	-99.65	45.00	4	0.02	05/10/07	05/10/07	105.35
IW-70-FSB126	04/16/07	2223722.50	6006244.80	107.00	54.00	107.00	60.00	105.00	4.96	4.95	-49.05	-102.05	-55.05	-100.05	45.00	4	0.02	05/08/07	05/08/07	105.95
IW-70-FSB127	04/12/07	2223742.00	6006357.78	107.00	57.00	107.00	60.00	105.00	5.14	5.35	-51.65	-101.65	-54.65	-99.65	45.00	4	0.02	04/26/07	04/26/07	105.00
IW-70-FSB128	04/11/07	2223762.66	6006265.42	107.00	55.00	107.00	60.00	105.00	5.98	6.25	-48.75	-100.75	-53.76	-98.75	45.00	4	0.02	05/17/07	05/17/07	105.20
IW-70-FSB129	04/10/07	2223780.39	6006283.15	107.00	57.00	107.00	60.00	105.00	5.95	5.95	-51.05	-101.05	-54.05	-99.05	45.00	4	0.02	04/25/07	04/25/07	105.50
IW-70-FSB130	04/05/07	2223818.20	6006309.06	107.00	56.00	107.00	60.00	105.00	5.45	5.51	-50.49	-101.49	-54.49	-99.49	45.00	4	0.02	04/24/07	04/24/07	104.00
IW-70-FSB131	04/03/07	2223835.73	6006324.05	107.00	53.00	107.00	60.00	105.00	5.39	5.45	-47.55	-101.55	-54.55	-99.55	45.00	4	0.02	04/23/07	04/23/07	105.20
IW-70-FSB132	04/02/07	2223854.61	6006338.08	112.00	55.00	105.00	60.00	105.00	5.47	5.55	-49.45	-99.45	-54.45	-99.45	45.00	4	0.02	04/19/07	04/19/07	105.30

TABLE 1-3
WELL CONSTRUCTION SUMMARY

Well Number	Well Installation			Construction Depths (feet bgs)					Construction Elevations (feet MSL, NGVD29)						Screen Dimensions			Well Maintenance		
	Date Installed	Coordinates (feet NAD83)		Borehole Depth	Filter Pack		Screen Interval		TOC	Ground Surface	Filter Pack		Screen Interval		Length (feet)	Diameter (inches)	Slot Size (inches)	Date Last Developed	Well Depth	
		Northing	Easting		Top	Bottom	Top	Bottom			Top	Bottom	Top	Bottom					Date Measured	Measurement (feet below TOC)
RDO-1	08/19/05	2223799.53	6006296.04	110.00	60.50	107.00	65.10	105.10	5.21	5.35	-55.15	-101.65	-59.75	-99.75	40.00	4	0.02	08/28/07	08/28/07	105.10
RDO-2	08/18/05	2223624.53	6006182.61	110.00	60.50	107.00	65.10	105.10	4.62	4.65	-55.85	-102.35	-60.45	-100.45	40.00	4	0.02	08/29/07	08/29/07	105.10
RDO-3A	08/23/05	2223534.56	6006114.83	31.00	16.50	31.00	20.00	30.00	9.28	7.09	-9.41	-23.91	-12.91	-22.91	10.00	4	0.02	NM	NM	NM
RDO-3B	08/23/05	2223534.56	6006114.83	107.00	61.30	107.00	65.00	105.00	6.96	4.35	-56.95	-102.65	-60.65	-100.65	40.00	4	0.02	09/06/07	09/06/07	106.08
RDO-4	08/16/05	2223452.05	6006074.35	111.50	60.00	107.00	65.00	105.00	4.13	4.15	-55.85	-102.85	-60.85	-100.85	40.00	4	0.02	09/07/07	09/07/07	105.60
RDO-5	08/15/05	2223283.80	6005966.40	107.00	61.00	107.00	65.00	105.00	6.01	4.00	-57.00	-103.00	-61.00	-101.00	40.00	4	0.02	08/19/05	08/19/05	103.39
RDO-6A	08/30/05	2223072.00	6006285.00	109.00	90.30	107.50	95.00	105.00	11.30	9.28	-81.02	-98.22	-85.72	-95.72	10.00	4	0.02	NM	NM	NM
RDO-6B	08/25/05	2223059.00	6006258.00	145.00	125.00	142.00	130.00	140.00	10.60	8.44	-116.56	-133.56	-121.56	-131.56	10.00	4	0.02	08/19/05	08/19/05	103.39
First Sand Biobarrier 2																				
MW-70-MNA09	03/05/07	2222951.70	6006103.60	87.00	60.00	76.00	64.25	74.25	6.82	7.10	-52.90	-68.90	-57.15	-67.15	10.00	4	0.02	04/18/07	04/18/07	73.80
MW-70-MNA10	03/27/07	2223077.90	6006534.00	87.00	71.50	87.00	74.50	84.50	7.01	7.40	-64.10	-79.60	-67.10	-77.10	10.00	4	0.02	05/18/07	04/18/07	84.10
MW-70-MNA12	03/29/07	2222706.20	6006650.50	87.00	70.00	87.00	75.00	85.00	5.85	6.10	-63.90	-80.90	-68.90	-78.90	10.00	4	0.02	04/18/07	04/18/07	85.30
MW-70-PMW07A	03/22/07	2223191.90	6006440.40	77.00	61.00	77.00	65.00	75.00	7.89	8.10	-52.90	-68.90	-56.90	-66.90	10.00	4	0.02	04/04/07	04/04/07	75.40
MW-70-PMW07B	03/27/07	2223194.30	6006445.20	97.00	80.00	97.00	85.00	95.00	7.52	8.00	-72.00	-89.00	-77.00	-87.00	10.00	4	0.02	04/04/07	04/04/07	95.60
MW-70-PMW08A	03/28/07	2223146.80	6006447.80	77.00	60.00	77.00	65.00	75.00	9.04	9.20	-50.80	-67.80	-55.80	-65.80	10.00	4	0.02	04/05/07	04/05/07	75.50
MW-70-PMW08B	03/28/07	2223144.40	6006442.70	97.00	80.00	97.00	85.00	95.00	9.08	9.20	-70.80	-87.80	-75.80	-85.80	10.00	4	0.02	04/09/07	04/05/07	95.50
IW-70-FSB201	03/06/07	2222968.01	6006154.54	107.00	61.00	107.00	65.00	100.00	8.24	8.45	-52.55	-98.55	-56.55	-91.55	35.00	4	0.02	04/17/07	04/17/07	100.30
IW-70-FSB202	03/06/07	2222994.69	6006169.02	107.00	62.50	101.00	65.00	100.00	8.75	8.95	-53.55	-92.05	-56.05	-91.05	35.00	4	0.02	04/16/07	04/16/07	100.10
IW-70-FSB203	03/07/07	2223008.01	6006188.90	107.00	61.00	107.00	65.00	100.00	7.78	7.85	-53.15	-99.15	-57.15	-92.15	35.00	4	0.02	04/17/07	04/17/07	100.40
IW-70-FSB204	03/08/07	2223020.91	6006210.05	107.00	61.00	107.00	65.00	100.00	6.50	6.65	-54.35	-100.35	-58.35	-93.35	35.00	4	0.02	04/12/07	04/12/07	100.90
IW-70-FSB205	03/12/07	2223033.98	6006229.89	107.00	61.00	102.00	65.00	100.00	5.75	5.95	-55.05	-96.05	-59.05	-94.05	35.00	4	0.02	04/16/07	04/16/07	100.60
IW-70-FSB206	03/13/07	2223045.69	6006249.09	107.00	63.00	107.00	65.00	100.00	5.94	6.15	-56.85	-100.85	-58.85	-93.85	35.00	4	0.02	04/12/07	04/12/07	100.10
IW-70-FSB207	03/14/07	2223059.19	6006269.71	107.00	62.00	105.00	65.00	100.00	6.27	6.15	-55.85	-98.85	-58.85	-93.85	35.00	4	0.02	04/12/07	04/12/07	100.00
IW-70-FSB208	03/13/07	2223071.31	6006292.10	107.00	59.00	107.00	65.00	100.00	7.30	7.05	-51.95	-99.95	-57.95	-92.95	35.00	4	0.02	04/11/07	04/11/07	100.00
IW-70-FSB209	03/15/07	2223084.89	6006310.87	107.00	60.00	107.00	65.00	100.00	7.81	8.15	-51.85	-98.85	-56.85	-91.85	35.00	4	0.02	04/11/07	04/11/07	100.00
IW-70-FSB210	03/21/07	2223107.56	6006328.12	102.00	60.00	102.00	65.00	100.00	8.01	8.35	-51.65	-93.65	-56.65	-91.65	35.00	4	0.02	04/10/07	04/10/07	100.40
IW-70-FSB211	03/20/07	2223111.01	6006352.02	102.00	62.00	102.00	65.00	100.00	8.84	9.13	-52.87	-92.87	-55.87	-90.87	35.00	4	0.02	04/11/07	04/11/07	99.90
IW-70-FSB212	03/19/07	2223124.06	6006371.93	102.00	61.00	102.00	65.00	100.00	8.72	9.03	-51.97	-92.97	-55.97	-90.97	35.00	4	0.02	04/09/07	04/09/07	99.50
IW-70-FSB213	03/20/07	2223135.90	6006391.89	102.00	60.33	102.00	65.00	100.00	8.69	8.88	-51.45	-93.12	-56.12	-91.12	35.00	4	0.02	04/10/07	04/10/07	100.30
IW-70-FSB214	03/20/07	2223148.98	6006411.70	102.00	59.83	102.00	65.00	100.00	8.75	8.96	-50.87	-93.04	-56.04	-91.05	35.00	4	0.02	04/09/07	04/09/07	100.00
IW-70-FSB215	03/05/07	2223162.09	6006433.16	102.00	61.00	102.00	66.00	101.00	8.53	8.55	-52.45	-93.45	-57.45	-92.45	35.00	4	0.02	04/05/07	04/05/07	99.50
IW-70-FSB216	03/06/07	2223174.70	6006453.10	102.00	61.00	102.00	65.00	100.00	8.34	8.60	-52.40	-93.40	-56.40	-91.40	35.00	4	0.02	04/09/07	04/05/07	99.70
IW-70-FSB217	03/06/07	2223187.76	6006472.94	102.00	61.00	102.00	65.00	100.00	8.33	8.45	-52.55	-93.55	-56.55	-91.55	35.00	4	0.02	04/04/07	04/04/07	100.00
IW-70-FSB218	03/07/07	2223202.19	6006493.55	102.00	60.00	102.00	65.00	100.00	8.39	8.45	-51.55	-93.55	-56.55	-91.55	35.00	4	0.02	04/04/07	04/04/07	99.95
IW-70-FSB219	03/07/07	2223213.05	6006514.05	102.00	61.00	102.00	65.50	100.50	8.14	8.25	-52.75	-93.75	-57.25	-92.25	35.00	4	0.02	04/03/07	04/03/07	100.20
IW-70-FSB220	03/26/07	2223236.28	6006523.70	102.00	62.00	102.00	65.00	100.00	7.70	7.75	-54.25	-94.25	-57.25	-92.25	35.00	4	0.02	04/02/07	04/02/07	100.60
IW-70-FSB221	03/08/07	2223239.02	6006554.31	102.00	54.00	102.00	65.00	100.00	7.43	7.55	-46.45	-94.45	-57.45	-92.45	35.00	4	0.02	04/03/07	04/03/07	100.20
IW-70-FSB222	03/12/07	2223251.90	6006575.07	102.00	60.00	102.00	65.00	100.00	7.47	7.55	-52.45	-94.45	-57.45	-92.45	35.00	4	0.02	03/29/07	03/29/07	100.30
IW-70-FSB223	03/13/07	2223263.90	6006595.39	102.00	60.00	102.00	65.00	100.00	7.48	7.65	-52.35	-94.35	-57.35	-92.35	35.00	4	0.02	03/28/07	03/28/07	100.00
IW-70-FSB224	03/13/07	2223274.28	6006617.78	102.00	60.00	102.00	65.00	100.00	7.37	7.35	-52.65	-94.65	-57.65	-92.65	35.00	4	0.02	03/29/07	03/29/07	100.30
IW-70-FSB225	03/15/07	2223283.98	6006640.13	102.00	58.66	102.00	65.00	100.00	7.09	6.95	-51.71	-95.05	-58.05	-93.05	35.00	4	0.02	03/28/07	03/28/07	100.50
IW-70-FSB226	03/15/07	2223292.06	6006663.09	102.00	59.33	102.00	65.00	100.00	7.22	7.25	-52.08	-94.75	-57.75	-92.75	35.00	4	0.02	03/28/07	03/28/07	100.00
IW-70-FSB227	03/19/07	2223293.29	6006693.53	102.00	60.00	102.00	65.00	100.00	6.91	6.95	-53.05	-95.05	-58.05	-93.05	35.00	4	0.02	03/27/07	03/27/07	100.70
IW-70-FSB228	03/21/07	2223321.92	6006698.54	102.00	60.00	102.00	65.00	100.00	6.94	6.85	-53.15	-95.15	-58.05	-93.05	35.00	4	0.02	03/28/07	03/28/07	98.45
IW-70-FSB229	03/22/07	2223341.19	6006714.70	102.00	60.00	102.00	65.00	100.00	6.83	7.05	-52.95	-94.95	-57.95	-92.95	35.00	4	0.02	03/27/07	03/27/07	99.70

TABLE 1-3
WELL CONSTRUCTION SUMMARY

Well Number	Well Installation			Construction Depths (feet bgs)					Construction Elevations (feet MSL, NGVD29)						Screen Dimensions			Well Maintenance		
	Date Installed	Coordinates (feet NAD83)		Borehole Depth	Filter Pack		Screen Interval		TOC	Ground Surface	Filter Pack		Screen Interval		Length (feet)	Diameter (inches)	Slot Size (inches)	Date Last Developed	Well Depth	
		Northing	Easting		Top	Bottom	Top	Bottom			Top	Bottom	Top	Bottom					Date Measured	Measurement (feet below TOC)
Shell Horizon Biobarrier 1																				
MW-70-MNA13	07/17/07	2222951.31	6006096.89	128.00	113.00	128.00	115.00	125.00	6.64	6.90	-106.10	-121.10	-108.10	-118.10	10.00	4	0.02	07/30/07	07/30/07	121.50
MW-70-PMW09	06/28/07	2223253.90	6006226.30	132.00	117.00	132.00	120.00	130.00	6.82	7.00	-110.00	-125.00	-113.00	-123.00	10.00	4	0.02	07/10/07	07/10/07	130.59
MW-70-PMW10	08/02/07	2223215.80	6006247.20	132.00	116.00	132.00	120.00	130.00	6.60	7.00	-109.00	-125.00	-113.00	-123.00	10.00	4	0.02	07/09/07	07/09/07	130.70
IW-70-SHB101	05/22/07	2223111.23	6006007.76	137.00	101.00	137.00	105.00	130.00	7.77	7.95	-93.05	-129.05	-97.05	-122.05	25.00	4	0.2	06/28/07	06/28/07	128.10
IW-70-SHB102	07/17/07	2223127.25	6006021.88	132.00	102.00	132.00	105.00	130.00	8.10	8.45	-93.55	-123.55	-96.55	-121.55	25.00	4	0.2	07/31/07	07/31/07	129.52
IW-70-SHB103	07/26/07	2223136.27	6006040.01	132.00	100.00	132.00	105.00	130.00	8.65	8.86	-91.14	-123.14	-96.14	-121.14	25.00	4	0.2	08/08/07	08/08/07	121.40
IW-70-SHB104	07/30/07	2223144.96	6006057.96	132.00	100.00	132.00	105.00	130.00	8.83	9.03	-90.97	-122.97	-95.97	-120.97	25.00	4	0.2	08/02/07	08/02/07	129.90
IW-70-SHB105	07/31/07	2223154.22	6006076.12	132.00	101.00	132.00	105.00	130.00	8.67	8.82	-92.18	-123.18	-96.18	-121.18	25.00	4	0.2	08/08/07	08/08/07	129.15
IW-70-SHB106	07/10/07	2223163.10	6006093.86	132.00	99.00	132.00	105.00	130.00	8.36	8.89	-90.11	-123.11	-96.11	-121.11	25.00	4	0.2	08/02/07	08/02/07	129.40
IW-70-SHB107	06/18/07	2223172.96	6006113.11	132.00	100.00	132.00	105.00	130.00	8.40	8.45	-91.55	-123.55	-96.55	-121.55	25.00	4	0.2	07/03/07	07/03/07	129.80
IW-70-SHB108 (Screen 1)	06/20/07	2223181.38	6006129.32	132.00	100.00	111.50	105.00	110.00	8.58	8.65	-91.35	-102.85	-96.35	-101.35	5.00	4	0.2	07/10/07	07/10/07	130.00
IW-70-SHB108 (Screen 2)	06/20/07	2223181.38	6006129.32	132.00	113.50	132.00	115.00	130.00	8.58	8.65	-104.85	-123.35	-106.35	-121.35	15.00	4	0.2	07/10/07	07/10/07	130.00
IW-70-SHB109 (Screen 1)	06/21/07	2223190.18	6006146.80	135.00	94.50	110.50	100.00	110.00	8.20	8.45	-86.05	-102.05	-91.55	-101.55	10.00	4	0.2	07/11/07	07/11/07	130.55
IW-70-SHB109 (Screen 2)	06/21/07	2223190.18	6006146.80	135.00	114.00	135.00	115.00	130.00	8.20	8.45	-105.55	-126.55	-106.55	-121.55	15.00	4	0.2	07/11/07	07/11/07	130.55
IW-70-SHB110	06/26/07	2223200.36	6006164.79	132.00	101.00	132.00	105.00	130.00	8.50	8.45	-92.55	-123.55	-96.55	-121.55	25.00	4	0.2	07/31/07	07/31/07	129.25
IW-70-SHB111 (Screen 1)	07/09/07	2223228.40	6006171.38	132.00	95.00	112.50	100.00	110.00	8.31	8.55	-86.45	-103.95	-91.45	-101.45	10.00	4	0.2	07/30/07	07/30/07	127.54
IW-70-SHB111 (Screen 2)	07/09/07	2223228.40	6006171.38	132.00	115.00	132.00	120.00	130.00	8.31	8.55	-106.45	-123.45	-111.45	-121.45	10.00	4	0.2	07/30/07	07/30/07	127.54
IW-70-SHB112 (Screen 1)	06/28/07	2223218.79	6006200.98	132.00	94.50	110.50	100.00	110.00	8.21	8.25	-86.25	-102.25	-91.75	-101.75	10.00	4	0.2	07/11/07	07/11/07	130.50
IW-70-SHB112 (Screen 2)	06/28/07	2223218.79	6006200.98	132.00	113.00	132.00	115.00	130.00	8.21	8.25	-104.75	-123.75	-106.75	-121.75	15.00	4	0.2	07/11/07	07/11/07	130.50
IW-70-SHB113	05/16/07	2223226.40	6006218.07	132.00	100.00	132.00	105.00	130.00	7.49	7.60	-92.40	-124.40	-97.40	-122.40	25.00	4	0.02	05/24/07	06/27/07	131.20
IW-70-SHB114	05/21/07	2223236.09	6006235.54	137.00	100.00	137.00	105.00	130.00	6.72	6.85	-93.15	-130.15	-98.15	-123.15	25.00	4	0.02	05/23/07	05/23/07	130.35
IW-70-SHB115 (Screen 1)	05/30/07	2223244.79	6006254.10	132.00	100.00	110.50	105.00	110.00	6.33	6.55	-93.45	-103.95	-98.45	-103.45	5.00	4	0.02	06/26/07	06/26/07	130.00
IW-70-SHB115 (Screen 2)	05/30/07	2223244.79	6006254.10	132.00	111.00	132.00	115.00	130.00	6.33	6.55	-104.45	-125.45	-108.45	-123.45	15.00	4	0.02	06/26/07	06/26/07	130.00
IW-70-SHB116 (Screen 1)	5/31/1/07	2223254.20	6006271.93	132.00	99.00	111.50	105.00	110.00	6.41	6.55	-92.45	-104.95	-98.45	-103.45	5.00	4	0.02	06/27/07	06/27/07	130.80
IW-70-SHB116 (Screen 2)	5/31-6/1/07	2223254.20	6006271.93	132.00	112.50	132.00	115.00	130.00	6.41	6.55	-105.95	-125.45	-108.45	-123.45	15.00	4	0.02	06/27/07	06/27/07	130.80
IW-70-SHB117 (Screen 1)	06/06/07	2223262.61	6006290.12	132.00	100.50	111.00	105.50	110.50	6.48	6.65	-93.85	-104.35	-98.85	-103.85	5.00	4	0.02	07/09/07	07/09/07	130.00
IW-70-SHB117 (Screen 2)	06/06/07	2223262.61	6006290.12	132.00	113.00	131.00	115.50	130.50	6.48	6.65	-106.35	-124.35	-108.85	-123.85	15.00	4	0.02	07/09/07	07/09/07	130.00
IW-70-SHB118 (Screen 1)	06/13/07	2223279.23	6006304.06	132.00	93.00	110.50	100.00	110.00	6.31	6.55	-86.45	-103.95	-93.45	-103.45	10.00	4	0.02	07/02/07	07/02/07	128.70
IW-70-SHB118 (Screen 2)	06/13/07	2223279.23	6006304.06	132.00	114.00	132.00	115.00	130.00	6.31	6.55	-107.45	-125.45	-108.45	-123.45	15.00	4	0.02	07/02/07	07/02/07	128.70
IW-70-SHB119 (Screen 1)	06/19/07	2223288.27	6006320.24	132.00	98.00	110.50	100.00	110.00	7.00	7.25	-90.75	-103.25	-92.75	-102.75	10.00	4	0.02	06/28/07	06/28/07	130.30
IW-70-SHB119 (Screen 2)	06/19/07	2223288.27	6006320.24	132.00	114.00	132.00	115.00	130.00	7.00	7.25	-106.75	-124.75	-107.75	-122.75	15.00	4	0.02	06/28/07	06/28/07	130.30
IW-70-SHB120 (Screen 1)	06/21/07	2223289.71	6006342.88	137.00	96.00	112.00	100.00	110.00	7.83	8.05	-87.95	-103.95	-91.95	-101.95	10.00	4	0.02	06/27/07	06/28/07	130.60
IW-70-SHB120 (Screen 2)	06/21/07	2223289.71	6006342.88	137.00	117.00	132.00	120.00	130.00	7.83	8.05	-108.95	-123.95	-111.95	-121.95	10.00	4	0.02	06/28/07	06/28/07	130.60
IW-70-SHB121 (Screen 1)	06/14/07	2223298.01	6006360.94	132.00	98.00	112.00	100.00	110.00	8.57	8.75	-89.25	-103.25	-91.25	-101.25	10.00	4	0.02	06/27/07	06/27/07	130.00
IW-70-SHB121 (Screen 2)	06/14/07	2223298.01	6006360.94	132.00	117.00	132.00	120.00	130.00	8.57	8.75	-108.25	-123.25	-111.25	-121.25	10.00	4	0.02	06/27/07	06/27/07	130.00
IW-70-SHB122 (Screen 1)	06/13/07	2223303.82	6006380.97	132.00	96.00	112.00	100.00	110.00	8.15	8.35	-87.65	-103.65	-91.65	-101.65	10.00	4	0.02	06/26/07	06/26/07	130.00
IW-70-SHB122 (Screen 2)	06/13/07	2223303.82	6006380.97	132.00	117.50	132.00	120.00	130.00	8.15	8.35	-109.15	-123.65	-111.65	-121.65	10.00	4	0.02	06/26/07	06/26/07	130.00
IW-70-SHB123 (Screen 1)	06/11/07	2223302.16	6006405.55	132.00	97.00	112.00	100.00	110.00	6.46	6.55	-90.45	-105.45	-93.45	-103.45	10.00	4	0.02	06/26/07	06/26/07	130.00
IW-70-SHB123 (Screen 2)	06/11/07	2223302.16	6006405.55	132.00	119.00	132.00	120.00	130.00	6.46	6.55	-112.45	-125.45	-113.45	-123.45	10.00	4	0.02	06/26/07	06/26/07	130.00
IW-70-SHB124 (Screen 1)	06/01/07	2223337.35	6006409.84	132.00	100.00	112.00	105.00	110.00	7.58	7.65	-92.35	-104.35	-97.35	-102.35	5.00	4	0.02	06/19/07	06/19/07	130.00
IW-70-SHB124 (Screen 2)	06/01/07	2223337.35	6006409.84	132.00	113.00	132.00	115.00	130.00	7.58	7.65	-105.35	-124.35	-107.35	-122.35	15.00	4	0.02	06/19/07	06/19/07	130.00
IW-70-SHB125	05/31/07	2223336.14	6006431.77	135.00	100.00	135.00	105.00	130.00	6.53	6.65	-93.35	-128.35	-98.35	-123.35	15.00	4	0.02	06/20/07	06/20/07	130.30
IW-70-SHB126 (Screen 1)	05/30/07	2223345.25	6006449.68	132.00	101.00	112.00	105.00	110.00	6.57	6.65	-94.35	-105.35	-98.35	-103.35	5.00	4	0.02	06/21/07	06/21/07	130.60
IW-70-SHB126 (Screen 2)	05/30/07	2223345.25	6006449.68	132.00	113.08	132.00	115.00	130.00	6.57	6.65	-106.43	-125.35	-108.35	-123.35	15.00	4	0.02	06/21/07	06/21/07	130.60

TABLE 1-3
WELL CONSTRUCTION SUMMARY

Well Number	Well Installation			Construction Depths (feet bgs)					Construction Elevations (feet MSL, NGVD29)						Screen Dimensions			Well Maintenance		
	Date Installed	Coordinates (feet NAD83)		Borehole Depth	Filter Pack		Screen Interval		TOC	Ground Surface	Filter Pack		Screen Interval		Length (feet)	Diameter (inches)	Slot Size (inches)	Date Last Developed	Well Depth	
		Northing	Easting		Top	Bottom	Top	Bottom			Top	Bottom	Top	Bottom					Date Measured	Measurement (feet below TOC)
IW-70-SHB127	05/17/07	2223353.91	6006467.89	132.00	99.00	132.00	103.50	128.50	6.79	6.85	-92.15	-125.15	-96.65	-121.65	25.00	4	0.02	05/24/07	05/24/07	127.60
IW-70-SHB128	05/16/07	2223362.83	6006485.63	132.00	102.00	132.00	105.00	130.00	7.61	7.75	-94.25	-124.25	-97.25	-122.25	25.00	4	0.02	05/22/07	05/22/07	130.85
IW-70-SHB129 (Screen 1)	07/11/07	2223371.33	6006504.09	132.00	96.00	112.00	100.00	110.00	8.58	8.75	-87.25	-103.25	-91.25	-101.25	10.00	4	0.02	08/01/07	08/01/07	130.00
IW-70-SHB129 (Screen 2)	07/11/07	2223371.33	6006504.09	132.00	116.00	132.00	120.00	130.00	8.58	8.75	-107.25	-123.25	-111.25	-121.25	10.00	4	0.02	08/01/07	08/01/07	130.00
IW-70-SHB130 (Screen 1)	07/13/07	2223380.74	6006521.04	132.00	97.00	110.00	100.00	110.00	9.01	9.16	-87.84	-100.84	-100.84	-110.84	10.00	4	0.02	08/01/07	08/01/07	130.00
IW-70-SHB130 (Screen 2)	07/13/07	2223380.74	6006521.04	132.00	116.00	132.00	120.00	130.00	9.01	9.16	-106.84	-122.84	-110.84	-120.84	10.00	4	0.02	08/01/07	08/01/07	130.00
IW-70-SHB131 (Screen 1)	07/12/07	2223389.92	6006538.90	132.00	97.00	112.00	100.00	110.00	9.06	9.19	-87.81	-102.81	-90.81	-100.81	10.00	4	0.02	08/01/07	08/01/07	129.90
IW-70-SHB131 (Screen 2)	07/12/07	2223389.92	6006538.90	132.00	116.00	132.00	120.00	130.00	9.06	9.19	-106.81	-122.81	-110.81	-120.81	10.00	4	0.02	08/01/07	08/01/07	129.90
IW-70-SHB132 (Screen 1)	06/07/07	2223398.76	6006557.30	135.00	101.00	111.20	105.00	110.00	8.57	8.65	-92.35	-102.55	-96.35	-101.35	5.00	4	0.02	06/25/07	06/25/07	132.90
IW-70-SHB132 (Screen 2)	06/07/07	2223398.76	6006557.30	135.00	113.50	135.00	115.00	130.00	8.57	8.65	-104.85	-126.35	-110.35	-120.35	15.00	4	0.02	06/25/07	06/25/07	132.90
IW-70-SHB133 (Screen 1)	06/05/07	2223407.64	6006574.95	132.00	98.00	113.00	100.00	110.00	8.34	8.55	-89.45	-104.45	-91.45	-101.45	10.00	4	0.02	06/21/07	06/21/07	130.35
IW-70-SHB133 (Screen 2)	06/05/07	2223407.64	6006574.95	132.00	118.00	132.00	120.00	130.00	8.34	8.55	-109.45	-123.45	-111.45	-121.45	10.00	4	0.02	06/21/07	06/21/07	130.35
IW-70-SHB134 (Screen 1)	06/04/07	2223416.72	6006593.08	132.00	100.00	117.00	105.00	115.00	9.01	9.15	-90.85	-107.85	-95.85	-105.85	10.00	4	0.02	06/20/07	06/20/07	130.60
IW-70-SHB134 (Screen 2)	06/04/07	2223416.72	6006593.08	132.00	118.00	132.00	120.00	130.00	9.01	9.15	-108.85	-122.85	-110.85	-120.85	10.00	4	0.02	06/20/07	06/20/07	130.60
IW-70-SHB135 (Screen 1)	07/02/07	2223426.03	6006610.97	134.00	99.00	112.50	105.00	110.00	9.17	9.28	-89.72	-103.22	-95.72	-100.72	5.00	4	0.02	07/11/07	07/11/07	130.50
IW-70-SHB135 (Screen 2)	07/02/07	2223426.03	6006610.97	134.00	117.00	134.00	120.00	130.00	9.17	9.28	-107.72	-124.72	-110.72	-120.72	10.00	4	0.02	07/11/07	07/11/07	130.50
IW-70-SHB136 (Screen 1)	07/09/07	2223436.16	6006627.91	132.00	103.00	112.00	105.00	110.00	9.12	9.24	-93.76	-102.76	-95.76	-100.76	5.00	4	0.02	07/11/07	07/11/07	130.33
IW-70-SHB136 (Screen 2)	07/09/07	2223436.16	6006627.91	132.00	116.00	132.00	120.00	130.00	9.12	9.24	-106.76	-122.76	-110.76	-120.76	10.00	4	0.02	07/11/07	07/11/07	130.33
IW-70-SHB137 (Screen 1)	05/29/07	2223444.88	6006646.03	137.00	100.00	117.00	105.00	115.00	9.02	9.14	-90.86	-107.86	-95.86	-100.86	10.00	4	0.02	06/19/07	06/19/07	130.90
IW-70-SHB137 (Screen 2)	05/29/07	2223444.88	6006646.03	137.00	118.00	137.00	120.00	130.00	9.02	9.14	-108.86	-127.86	-110.86	-120.86	10.00	4	0.02	06/19/07	06/19/07	130.90
IW-70-SHB201	05/23/07	2222510.01	6006405.50	137.00	100.00	132.00	105.00	130.00	7.63	7.45	-92.55	-124.55	-97.55	-122.55	25.00	4	0.02	08/02/07	08/02/07	130.50
IW-70-SHB217	05/24/07	2222624.89	6006709.51	137.00	100.00	137.00	105.00	130.00	8.67	8.70	-91.30	-128.30	-96.30	-121.30	25.00	4	0.02	07/12/07	07/12/07	130.50
IW-70-SHB232	05/23/07	2222844.20	6006893.69	137.00	101.00	131.00	105.00	130.00	7.93	7.85	-93.15	-123.15	-97.15	-122.15	25.00	4	0.02	07/12/07	07/12/07	130.50
Shell Horizon Biobarrier 3																				
MW-70-MNA14	07/13/07	2222157.30	6007254.70	130.00	110.00	130.00	115.00	125.00	8.86	9.20	-100.80	-120.80	-105.80	-115.80	10.00	4	0.02	07/30/07	07/30/07	125.80
MW-70-PMW11A	08/14/07	2222552.20	6007015.00	97.00	81.00	95.00	85.00	95.00	8.13	8.40	-72.60	-86.60	-76.60	-86.60	10.00	4	0.02	09/07/07	09/07/07	95.95
MW-70-PMW11B	08/23/07	2222545.80	6007013.60	127.00	110.00	127.00	115.00	125.00	7.95	8.30	-101.70	-118.70	-106.70	-116.70	10.00	4	0.02	09/06/07	09/06/07	125.30
MW-70-PMW12A	08/14/07	2222526.80	6007058.10	97.00	79.00	97.00	85.00	95.00	7.86	8.20	-70.80	-88.80	-76.80	-86.80	10.00	4	0.02	09/05/07	09/05/07	94.90
MW-70-PMW12B	08/10/07	2222518.10	6007051.40	127.00	110.00	127.00	115.00	125.00	8.09	8.30	-101.70	-118.70	-106.70	-116.70	10.00	4	0.02	08/22/07	08/22/07	125.50
IW-70-SHB301 (Screen 1)	07/26/07	2222266.64	6006863.01	132.00	76.00	97.00	80.00	95.00	7.96	8.23	-67.77	-88.77	-71.77	-86.77	15.00	4	0.02	08/08/07	08/08/07	129.20
IW-70-SHB301 (Screen 2)	07/26/07	2222266.64	6006863.01	132.00	103.00	132.00	105.00	130.00	7.96	8.23	-94.77	-123.77	-96.77	-121.77	25.00	4	0.02	08/08/07	08/08/07	129.20
IW-70-SHB302 (Screen 1)	07/31/07	2222286.47	6006875.79	132.00	76.00	97.00	80.00	95.00	8.07	8.38	-67.62	-88.62	-71.62	-86.62	15.00	4	0.02	08/08/07	08/08/07	129.75
IW-70-SHB302 (Screen 2)	07/31/07	2222286.47	6006875.79	132.00	102.50	132.00	105.00	130.00	8.07	8.38	-94.12	-123.62	-96.62	-121.62	25.00	4	0.02	08/08/07	08/08/07	129.75
IW-70-SHB303 (Screen 1)	08/01/07	2222306.99	6006888.87	132.00	75.50	96.50	80.00	95.00	8.46	8.78	-66.72	-87.72	-71.22	-86.22	15.00	4	0.02	08/09/07	08/09/07	130.00
IW-70-SHB303 (Screen 2)	08/01/07	2222306.99	6006888.87	132.00	101.50	132.00	105.00	130.00	8.46	8.78	-92.72	-123.22	-96.22	-121.22	25.00	4	0.02	08/09/07	08/09/07	130.00
IW-70-SHB304 (Screen 1)	07/23/07	2222330.86	6006904.23	132.00	77.00	100.00	82.00	97.00	8.67	9.07	-67.93	-90.93	-72.93	-87.93	10.00	4	0.02	08/10/07	08/10/07	127.00
IW-70-SHB304 (Screen 2)	07/23/07	2222330.86	6006904.23	132.00	104.00	132.00	107.00	127.00	8.67	9.07	-94.93	-122.93	-97.93	-117.93	20.00	4	0.02	08/10/07	08/10/07	127.00
IW-70-SHB305 (Screen 1)	07/24/07	2222347.45	6006915.08	132.00	76.00	97.00	80.50	95.50	8.88	9.15	-66.85	-87.85	-71.35	-86.35	15.00	4	0.02	08/13/07	08/13/07	130.50
IW-70-SHB305 (Screen 2)	07/24/07	2222347.45	6006915.08	132.00	103.00	132.00	105.50	130.50	8.88	9.15	-93.85	-122.85	-96.35	-121.35	25.00	4	0.02	08/13/07	08/13/07	130.50
IW-70-SHB306 (Screen 1)	08/07/07	2222367.42	6006928.33	132.00	76.50	97.00	80.00	95.00	8.91	9.11	-67.39	-87.89	-70.89	-85.89	15.00	4	0.02	08/15/07	08/15/07	130.00
IW-70-SHB306 (Screen 2)	08/07/07	2222367.42	6006928.33	132.00	103.00	131.50	105.00	130.00	8.91	9.11	-93.89	-122.39	-95.89	-120.89	25.00	4	0.02	08/15/07	08/15/07	130.00
IW-70-SHB307 (Screen 1)	08/08/07	2222387.55	6006941.19	133.00	77.00	97.00	80.00	95.00	8.70	9.13	-67.87	-87.87	-70.87	-85.87	15.00	4	0.02	08/22/07	08/22/07	130.00
IW-70-SHB307 (Screen 2)	08/08/07	2222387.55	6006941.19	133.00	102.50	133.00	105.00	130.00	8.70	9.13	-93.37	-123.87	-95.87	-120.87	25.00	4	0.02	08/22/07	08/22/07	130.00
IW-70-SHB308 (Screen 1)	08/10/07	2222407.92	6006954.21	132.00	76.40	97.00	80.00	95.00	8.89	9.07	-67.33	-87.93	-70.93	-85.93	15.00	4	0.02	08/16/07	08/16/07	129.60
IW-70-SHB308 (Screen 2)	08/10/07	2222407.92	6006954.21	132.00	103.00	132.00	105.00	130.00	8.89	9.07	-93.93	-122.93	-95.93	-120.93	25.00	4	0.02	08/16/07	08/16/07	129.60

TABLE 1-3
WELL CONSTRUCTION SUMMARY

Well Number	Well Installation			Construction Depths (feet bgs)					Construction Elevations (feet MSL, NGVD29)						Screen Dimensions			Well Maintenance		
	Date Installed	Coordinates (feet NAD83)		Borehole Depth	Filter Pack		Screen Interval		TOC	Ground Surface	Filter Pack		Screen Interval		Length (feet)	Diameter (inches)	Slot Size (inches)	Date Last Developed	Well Depth	
		Northing	Easting		Top	Bottom	Top	Bottom			Top	Bottom	Top	Bottom					Date Measured	Measurement (feet below TOC)
IW-70-SHB309 (Screen 1)	07/26/07	2222427.88	6006967.25	132.00	75.00	97.00	80.00	95.00	8.89	9.09	-65.91	-87.91	-70.91	-85.91	15.00	4	0.02	08/23/07	08/23/07	130.50
IW-70-SHB309 (Screen 2)	07/26/07	2222427.88	6006967.25	132.00	103.00	130.50	105.00	130.00	8.89	9.09	-93.91	-121.41	-95.91	-120.91	25.00	4	0.02	08/23/07	08/23/07	130.50
IW-70-SHB310 (Screen 1)	07/30/07	2222447.97	6006980.50	137.00	77.00	95.00	80.00	95.00	8.73	9.11	-67.89	-85.89	-70.89	-85.89	15.00	4	0.02	08/27/07	08/27/07	130.70
IW-70-SHB310 (Screen 2)	07/30/07	2222447.97	6006980.50	137.00	103.00	132.00	105.00	130.00	8.73	9.11	-93.89	-122.89	-95.89	-120.89	25.00	4	0.02	08/27/07	08/27/07	130.70
IW-70-SHB311 (Screen 1)	08/01/07	2222466.38	6006996.03	132.00	76.00	98.00	80.00	95.00	8.78	9.06	-66.94	-88.94	-70.94	-85.94	15.00	4	0.02	08/14/07	08/14/07	130.00
IW-70-SHB311 (Screen 2)	08/01/07	2222466.38	6006996.03	132.00	103.00	132.00	105.00	130.00	8.78	9.06	-93.94	-122.94	-95.94	-120.94	25.00	4	0.02	08/14/07	08/14/07	130.00
IW-70-SHB312 (Screen 1)	07/25/07	2222488.35	6007006.82	132.00	76.70	102.00	80.00	100.00	8.67	8.78	-67.92	-93.22	-71.22	-91.22	20.00	4	0.02	08/13/07	08/13/07	131.00
IW-70-SHB312 (Screen 2)	07/25/07	2222488.35	6007006.82	132.00	108.00	132.00	110.00	130.00	8.67	8.78	-99.22	-123.22	-101.22	-121.22	20.00	4	0.02	08/13/07	08/13/07	131.00
IW-70-SHB313 (Screen 1)	07/23/07	2222508.44	6007019.69	132.00	76.00	103.00	80.50	100.50	8.26	8.46	-67.54	-94.54	-72.04	-92.04	20.00	4	0.02	08/10/07	08/10/07	129.55
IW-70-SHB313 (Screen 2)	07/23/07	2222508.44	6007019.69	132.00	108.00	132.00	110.50	130.50	8.26	8.46	-99.54	-123.54	-102.04	-122.04	20.00	4	0.02	08/10/07	08/10/07	129.55
IW-70-SHB314 (Screen 1)	08/09/07	2222527.76	6007033.48	132.00	75.00	102.00	80.00	100.00	7.88	8.05	-66.95	-93.95	-71.95	-91.95	20.00	4	0.02	08/20/07	08/20/07	129.80
IW-70-SHB314 (Screen 2)	08/09/07	2222527.76	6007033.48	132.00	107.00	132.00	110.00	130.00	7.88	8.05	-98.95	-123.95	-101.95	-121.95	20.00	4	0.02	08/20/07	08/20/07	129.80
IW-70-SHB315 (Screen 1)	08/08/07	2222544.33	6007043.63	132.00	75.50	102.00	80.00	100.00	8.06	8.25	-67.25	-93.75	-71.75	-91.75	20.00	4	0.02	08/21/07	08/21/07	129.80
IW-70-SHB315 (Screen 2)	08/08/07	2222544.33	6007043.63	132.00	107.50	132.00	110.00	130.00	8.06	8.25	-99.25	-123.75	-101.75	-121.75	20.00	4	0.02	08/21/07	08/21/07	129.80
IW-70-SHB316 (Screen 1)	07/18/07	2222561.57	6007056.54	132.00	75.50	102.50	80.00	100.00	8.77	8.95	-66.55	-93.55	-71.05	-91.05	20.00	4	0.02	08/07/07	08/07/07	129.70
IW-70-SHB316 (Screen 2)	07/18/07	2222561.57	6007056.54	132.00	107.00	132.00	110.00	130.00	8.77	8.95	-98.05	-123.05	-101.05	-121.05	20.00	4	0.02	08/07/07	08/07/07	129.70
IW-70-SHB317 (Screen 1)	08/13/07	2222587.72	6007073.02	132.00	75.00	102.00	80.00	100.00	8.75	8.95	-66.05	-93.05	-71.05	-91.05	20.00	4	0.02	08/16/07	08/16/07	130.35
IW-70-SHB317 (Screen 2)	08/13/07	2222587.72	6007073.02	132.00	107.00	132.00	110.00	130.00	8.75	8.95	-98.05	-123.05	-101.05	-121.05	20.00	4	0.02	08/16/07	08/16/07	130.35
IW-70-SHB318 (Screen 1)	08/07/07	2222611.82	6007089.34	132.00	75.00	101.50	80.00	100.00	7.76	7.85	-67.15	-93.65	-72.15	-92.15	20.00	4	0.02	08/21/07	08/21/07	130.30
IW-70-SHB318 (Screen 2)	08/07/07	2222611.82	6007089.34	132.00	105.50	132.00	110.00	130.00	7.76	7.85	-97.65	-124.15	-102.15	-121.15	20.00	4	0.02	08/21/07	08/21/07	130.30
IW-70-SHB319 (Screen 1)	08/01/07	2222631.06	6007100.61	132.00	75.00	101.00	80.00	100.00	7.54	7.85	-67.15	-93.15	-72.15	-92.15	20.00	4	0.02	08/22/07	08/22/07	128.80
IW-70-SHB319 (Screen 2)	08/01/07	2222631.06	6007100.61	132.00	107.00	132.00	110.00	130.00	7.54	7.85	-99.15	-124.15	-102.15	-121.15	20.00	4	0.02	08/22/07	08/22/07	128.80
IW-70-SHB320 (Screen 1)	07/23/07	2222648.10	60076112.67	137.00	75.00	102.66	80.00	100.00	7.78	8.15	-66.85	-94.51	-71.85	-91.85	20.00	4	0.02	08/20/07	08/20/07	130.50
IW-70-SHB320 (Screen 2)	07/23/07	2222648.10	60076112.67	137.00	105.50	137.00	110.00	130.00	7.78	8.15	-97.35	-128.85	-101.85	-121.85	20.00	4	0.02	08/20/07	08/20/07	130.50
Second Sand Biobarrier 1																				
MW-70-14	03/19/98	2223055.91	6007290.58	172.50	154.00	187.00	160.00	170.00	11.01	8.51	-145.49	-178.49	-151.49	-161.49	10.00	5	0.01	03/26/98	04/09/98	172.50
MW-70-15	03/23/98	2221994.30	6008038.90	175.00	155.00	175.00	160.80	170.30	9.41	7.14	-147.86	-167.86	-153.66	-163.16	9.50	5	0.01	03/30/98	04/08/98	172.82
MW-70-43B	07/19/05	2222847.90	6007211.10	150.00	131.30	150.00	135.50	145.50	10.58	7.93	-123.37	-142.07	-127.57	-137.57	20.00	2	0.01	07/22/05	NM	NM
MW-70-49	09/14/11	2222561.84	6007405.30	167.00	120.00	167.00	125.00	165.00	7.89	8.27	-111.73	-158.73	-116.73	-156.73	40.00	4	0.02	09/16/11	10/26/11	164.62
MW-70-MNA15	06/04/07	2222706.18	6006650.49	160.00	136.00	151.00	140.00	150.00	5.96	6.10	-129.90	-144.90	-133.90	-143.90	10.00	4	0.02	06/18/07	06/18/07	151.10
MW-70-MNA16	06/04/07	2222145.26	6007245.65	155.00	135.50	155.00	140.50	150.50	8.65	9.22	-126.28	-145.78	-131.28	-141.28	10.00	4	0.02	07/26/07	07/26/07	150.60
MW-70-MNA17	06/06/07	2222026.24	6007015.43	167.00	135.00	152.00	140.00	150.00	6.80	7.00	-128.00	-145.00	-133.00	-143.00	10.00	4	0.02	06/19/07	06/19/07	140.35
MW-70-PMW13A	08/20/07	2222293.78	6007163.19	137.00	119.00	137.00	125.00	135.00	7.47	4.60	-114.40	-132.40	-120.40	-130.40	10.00	4	0.02	09/06/07	09/06/07	135.60
MW-70-PMW13B	08/15/07	2222303.10	6007169.25	157.00	139.00	157.00	145.00	155.00	7.48	4.70	-134.30	-152.30	-140.30	-150.30	10.00	4	0.02	09/05/07	09/05/07	155.15
MW-70-PMW14A	08/22/07	2222253.67	6007203.49	140.00	123.00	140.00	128.00	138.00	7.64	8.00	-115.00	-132.00	-120.00	-130.00	10.00	4	0.02	09/05/07	09/05/07	139.35
MW-70-PMW14B	08/22/07	2222270.94	6007216.27	160.00	138.00	160.00	149.00	159.00	7.92	8.20	-129.80	-151.80	-140.80	-150.80	10.00	4	0.02	09/04/07	09/04/07	159.15
IW-70-SSB101	06/19/07	2222076.99	6007048.06	170.00	120.00	170.00	125.00	165.00	7.77	7.85	-112.15	-162.15	-117.15	-157.15	40.00	4	0.02	07/24/07	07/24/07	163.40
IW-70-SSB102	07/13/07	2222093.15	6007066.72	167.00	120.00	167.00	125.00	165.00	7.82	7.85	-112.15	-159.15	-117.15	-157.15	40.00	4	0.02	07/25/07	07/25/07	165.30
IW-70-SSB103	07/16/07	2222111.08	6007083.61	167.00	121.00	167.00	125.00	165.00	7.69	7.65	-113.35	-159.35	-117.35	-157.35	40.00	4	0.02	07/26/07	07/26/07	165.50
IW-70-SSB104	07/18/07	2222131.43	6007097.29	167.00	119.60	167.00	125.00	165.00	7.54	7.65	-111.95	-159.35	-117.35	-157.35	40.00	4	0.02	07/24/07	07/24/07	165.75
IW-70-SSB105	07/19/07	2222151.11	6007109.73	167.00	121.00	167.00	125.00	165.00	7.51	7.75	-113.25	-159.25	-117.25	-157.25	40.00	4	0.02	07/25/07	07/25/07	165.75
IW-70-SSB106	08/16/07	2222171.01	6007123.05	167.00	121.00	167.00	125.00	165.00	8.04	8.05	-112.95	-158.95	-116.95	-156.95	40.00	4	0.02	08/28/07	08/28/07	165.20
IW-70-SSB107	08/20/07	2222191.24	6007136.11	167.00	120.00	167.00	125.00	165.00	7.93	7.95	-112.05	-159.05	-117.05	-157.05	40.00	4	0.02	08/29/07	08/29/07	165.20
IW-70-SSB108	08/21/07	2222207.47	6007147.74	167.00	120.10	167.00	125.00	165.00	8.02	8.05	-112.05	-158.95	-116.95	-156.95	40.00	4	0.02	08/30/07	08/30/07	165.20
IW-70-SSB109	08/23/07	2222230.86	6007162.75	167.00	120.00	167.00	125.75	165.75	7.96	8.10	-111.90	-158.90	-117.65	-157.65	40.00	4	0.02	08/20/07	08/20/07	165.81

TABLE 1-3
WELL CONSTRUCTION SUMMARY

Well Number	Well Installation			Construction Depths (feet bgs)					Construction Elevations (feet MSL, NGVD29)						Screen Dimensions			Well Maintenance		
	Date Installed	Coordinates (feet NAD83)		Borehole Depth	Filter Pack		Screen Interval		TOC	Ground Surface	Filter Pack		Screen Interval		Length (feet)	Diameter (inches)	Slot Size (inches)	Date Last Developed	Well Depth	
		Northing	Easting		Top	Bottom	Top	Bottom			Top	Bottom	Top	Bottom					Date Measured	Measurement (feet below TOC)
IW-70-SSB110	08/10/07	2222256.03	6007179.36	167.00	122.00	167.00	125.00	165.00	8.90	9.05	-112.95	-157.95	-115.95	-155.95	40.00	4	0.02	08/29/07	08/29/07	165.30
IW-70-SSB111	08/09/07	2222270.57	6007189.28	167.00	120.50	167.00	125.00	165.00	8.90	9.05	-111.45	-157.95	-115.95	-155.95	40.00	4	0.02	08/14/07	08/14/07	165.00
IW-70-SSB112	06/20/07	2222290.37	6007203.00	167.00	120.00	170.00	125.00	165.00	7.87	8.05	-111.95	-161.95	-116.95	-156.95	40.00	4	0.02	07/16/07	07/16/07	165.50
IW-70-SSB113	08/08/07	2222310.44	6007215.97	167.00	121.50	167.00	125.00	165.00	7.84	7.85	-113.65	-159.15	-117.15	-157.15	40.00	4	0.02	08/15/07	08/14/07	165.00
IW-70-SSB114	07/11/07	2222330.31	6007229.33	167.00	121.00	167.00	125.00	165.00	7.68	7.85	-113.15	-159.15	-117.15	-157.15	40.00	4	0.02	07/19/07	07/19/07	166.00
IW-70-SSB115	07/10/07	2222350.66	6007242.08	167.00	120.00	167.00	125.00	165.00	7.98	8.05	-111.95	-158.95	-116.95	-156.95	40.00	4	0.02	07/18/07	07/18/07	165.50
IW-70-SSB116	06/27/07	2222370.00	6007255.79	167.00	120.00	167.00	125.00	165.00	8.42	8.45	-111.55	-158.55	-116.55	-156.55	40.00	4	0.02	07/17/07	07/17/07	165.50
IW-70-SSB117	07/02/07	2222389.76	6007268.13	167.00	120.50	167.00	125.00	165.00	8.45	8.55	-111.95	-158.45	-116.45	-156.45	40.00	4	0.02	07/18/07	07/18/07	165.50
IW-70-SSB118	08/13/07	2222409.23	6007281.32	167.00	122.00	165.00	125.00	165.00	8.54	8.75	-113.25	-156.25	-116.25	-156.25	40.00	4	0.02	08/28/07	08/28/07	164.15
IW-70-SSB119	08/14/07	2222429.64	6007294.68	167.00	121.00	167.00	125.00	165.00	9.06	9.34	-111.66	-157.66	-115.66	-155.66	40.00	4	0.02	08/27/07	08/27/07	166.30
IW-70-SSB120	08/13/07	2222452.33	6007308.58	167.00	122.00	167.00	125.00	165.00	8.24	8.75	-113.25	-158.25	-116.25	-156.25	40.00	4	0.02	08/23/07	08/23/07	163.30
IW-70-SSB121	06/26/07	2222469.91	6007320.42	167.00	120.00	167.00	125.00	165.00	8.34	8.55	-111.45	-158.45	-116.45	-156.45	40.00	4	0.02	07/19/07	07/19/07	165.50
IW-70-SSB122	06/21/07	2222487.22	6007331.79	170.00	120.00	170.00	125.00	165.00	8.20	8.45	-111.55	-161.55	-116.55	-156.55	40.00	4	0.02	07/18/07	07/18/07	165.50
Point of Compliance/Upper Fines																				
MW-70-02	07/21/97	2224602.60	6005708.20	32.00	17.00	32.00	20.00	30.00	7.85	5.90	-11.10	-26.10	-14.10	-24.10	10.00	4	0.01	08/04/97	07/21/97	33.95
MW-70-10	04/13/00	2223724.30	6007203.10	41.50	27.00	41.50	30.10	40.10	10.10	8.37	-18.63	-33.13	-21.73	-31.73	10.00	4	0.01	04/24/00	04/24/00	42.28
MW-70-17	04/14/00	2222804.90	6005569.00	41.50	27.00	41.50	30.00	40.00	4.58	2.85	-24.15	-38.65	-27.15	-37.15	10.00	4	0.01	05/01/00	05/01/00	42.10
MW-70-22	04/17/00	2221971.60	6007067.40	32.00	17.00	32.00	20.00	30.00	10.21	8.67	-8.33	-23.33	-11.33	-21.33	10.00	4	0.01	05/03/00	05/03/00	32.09
Point of Compliance/First Sand																				
MW-70-11	04/21/00	2223726.20	6007217.50	102.00	67.80	102.00	80.00	100.00	11.07	8.56	-59.24	-93.44	-71.44	-91.44	20.00	5	0.01	04/24/00	04/24/00	101.70
MW-70-16	03/26/98	2222003.60	6008020.10	110.00	89.50	110.00	94.70	104.70	9.76	7.19	-82.31	-102.81	-87.51	-97.51	10.00	5	0.01	04/01/98	04/09/98	107.22
MW-70-35	03/01/02	2222536.90	6005190.60	103.00	84.00	103.00	90.00	100.00	6.31	3.67	-80.33	-99.33	-86.33	-96.33	10.00	4	0.01	03/04/02	05/02/02	103.50
MW-70-POC01	09/21/07	2224584.60	6005713.40	96.00	77.00	96.00	80.00	90.00	8.88	6.41	-70.59	-89.59	-73.59	-83.59	10.00	4	0.02	10/02/07	10/02/07	93.50
Point of Compliance/Shell Horizon																				
MW-70-23	04/18/00	2223145.60	6008894.60	132.00	103.90	132.00	110.00	130.00	11.17	8.46	-95.44	-123.54	-101.54	-121.54	20.00	5	0.01	04/21/00	04/21/00	132.00
Point of Compliance/Second Sand																				
MW-70-21	04/25/00	2221200.70	6008513.60	172.00	143.00	172.00	150.00	170.00	7.70	5.33	-137.67	-166.67	-144.67	-164.67	20.00	5	0.01	04/27/00	04/27/00	170.20
MW-70-36	03/04/02	2221672.00	6006269.80	170.00	143.00	170.00	150.00	160.00	9.04	6.71	-136.29	-163.29	-143.29	-153.29	10.00	4	0.01	03/08/02	05/23/02	163.23
Point of Compliance/Deep Sand																				
MW-70-POC02	09/19/07	2223170.00	6008885.30	240.00	186.00	202.00	190.00	200.00	8.25	8.68	-177.32	-193.32	-181.32	-191.32	10.00	4	0.02	10/03/07	10/03/07	200.50
MW-70-POC03	09/11/07	2221664.30	6006260.90	205.00	187.00	205.00	190.00	200.00	9.64	7.19	-179.81	-197.81	-182.81	-192.81	10.00	4	0.02	10/03/07	10/03/07	203.30
MW-70-POC04	10/18/07	2221192.20	6008511.20	210.00	191.00	210.00	195.00	205.00	8.50	5.87	-185.13	-204.13	-189.13	-199.13	10.00	4	0.02	10/07/08	10/07/08	208.48

Table 2-1
Groundwater Level Data

Well No.	Screen Interval (feet above MSL)	TOC Elevation (feet above MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)
Upper Fines																	
MW-70-03	20-30	8.03	8/18/2008	NA	NA	8/24/2009	19.19	-11.16	8/25/2010	13.7	-5.67	7/25/2011	9.50	-1.47	10/26/2011	9.61	-1.58
Source Area Treatment/Upper Fines																	
MW-70-PMW01A	25-35	8.23	8/18/2008	20.31	-12.08	8/24/2009	21.60	-13.37	8/25/2010	15.21	-6.98	7/25/2011	8.95	-0.72	10/26/2011	9.06	-0.83
MW-70-PMW01B	45-55	8.21	8/18/2008	22.02	-13.81	8/24/2009	22.04	-13.83	8/25/2010	16.25	-8.04	7/25/2011	9.21	--1.00	10/26/2011	9.30	-1.09
MW-70-27[a]	26-36	8.25	8/21/2008	21.70	-13.45	8/24/2009	21.78	-13.53	8/25/2010	15.20	-6.95	7/25/2011	9.10	-0.85	10/26/2011	9.20	-0.95
MW-70-28[a]	50-60	8.30	8/21/2008	22.13	-13.83	8/24/2009	21.81	-13.51	8/25/2010	17.02	-8.72	7/25/2011	9.43	-1.13	10/26/2011	9.54	-1.24
MW-70-MNA01	40-50	8.36	8/18/2008	22.48	-14.12	8/24/2009	22.32	-13.96	8/25/2010	17.07	-8.71	7/25/2011	9.57	-1.21	10/26/2011	9.68	-1.32
MW-70-MNA02	35-45	8.51	8/18/2008	22.23	-13.72	8/24/2009	20.45**	-11.94	8/25/2010	15.13	-6.62	7/25/2011	9.23	-0.72	10/26/2011	9.33	-0.82
MW-70-MNA03	35-45	9.18	8/18/2008	20.90	-11.72	8/24/2009	21.46	-12.28	8/25/2010	15.73	-6.55	7/25/2011	9.85	-0.67	10/26/2011	9.96	-0.78
MW-70-MNA04	35-45	8.39	8/18/2008	20.52	-12.13	8/24/2009	21.06	-12.67	8/25/2010	15.37	-6.98	7/25/2011	9.20	-0.81	10/26/2011	9.32	-0.93
Source Area Biobarrier/First Sand																	
MW-70-PMW02A	71-81	8.35	8/18/2008	23.06	-14.71	8/24/2009	22.82	-14.47	8/25/2010	17.45	--9.10	7/25/2011	9.52	-1.17	10/26/2011	9.63	-1.28
MW-70-PMW02B	90-100	8.38	8/18/2008	23.11	-14.73	8/24/2009	22.88	--14.50	8/25/2010	17.50	-9.12	7/25/2011	9.57	-1.19	10/26/2011	9.67	-1.29
IW-70-SAB06	65-80/85-105	8.07	8/18/2008	22.81	-14.74	8/24/2009	22.60	-14.53	8/25/2010	17.22	-9.15	7/25/2011	9.27	--1.20	10/26/2011	9.38	-1.31
MW-70-MNA05	70-80	8.46	8/18/2008	22.90	-14.44	8/24/2009	22.79	-14.33	8/25/2010	17.45	-8.99	7/25/2011	9.55	-1.09	10/26/2011	9.65	-1.19
MW-70-PMW03A	70-80	7.94	8/18/2008	22.72	-14.78	8/24/2009	22.49	-14.55	8/25/2010	17.05	-9.11	7/25/2011	9.56	-1.62	10/26/2011	9.67	-1.73
MW-70-P MW03B	90-100	7.88	8/18/2008	22.69	-14.81	8/24/2009	22.44	-14.56	8/25/2010	17.05	-9.17	7/25/2011	9.07	-1.19	10/26/2011	9.18	--1.30
First Sand Biobarrier 1																	
MW-70-38	80-100	6.85	8/18/2008	22.20	-15.35	8/24/2009	21.80	-14.95	8/25/2010	16.32	-9.47	7/25/2011	8.10	-1.25	10/26/2011	8.60	-1.75
IW-70-FSB118	60-105	4.42	8/18/2008	19.71	-15.29	8/24/2009	19.30	-14.88	8/25/2010	13.97	-9.55	7/25/2011	5.79	-1.37	10/26/2011	6.20	-1.78
MW-70-PMW06A	70-80	4.14	8/18/2008	19.42	-15.28	8/24/2009	19.04	--14.90	8/25/2010	13.68	-9.54	7/25/2011	5.50	-1.36	10/26/2011	6.00	-1.86
MW-70-PMW06B	91-101	4.16	8/18/2008	19.50	-15.34	8/24/2009	19.05	-14.89	8/25/2010	13.68	-9.52	7/25/2011	5.47	-1.31	10/26/2011	6.02	-1.86
MW-70-PMW04A	70-80	4.52	8/18/2008	19.90	-15.38	8/24/2009	19.47	-14.95	8/25/2010	14.03	-9.51	7/25/2011	5.78	-1.26	10/26/2011	6.24	-1.72
MW-70-PMW04B	90-100	4.53	8/18/2008	19.05	-14.52	8/24/2009	19.51	-14.98	8/25/2010	14.05	-9.52	7/25/2011	5.82	-1.29	10/26/2011	6.36	-1.83
IW-70-FSB108	60-105	4.64	8/18/2008	20.02	-15.38	8/24/2009	19.63	-14.99	8/25/2010	14.21	-9.57	7/25/2011	6.11	-1.47	10/26/2011	6.55	-1.91
MW-70-PMW05A	70-80	4.21	8/18/2008	19.65	-15.44	8/24/2009	19.21	--15.00	8/25/2010	13.82	-9.61	7/25/2011	5.51	--1.30	10/26/2011	6.06	-1.85
MW-70-PMW05B	90-100	4.34	8/18/2008	19.80	-15.46	8/24/2009	19.34	--15.00	8/25/2010	14.00	-9.66	7/25/2011	5.68	-1.34	10/26/2011	6.11	-1.77
RDO-5	65-105	6.01	8/18/2008	21.55	-15.54	8/24/2009	21.05	-15.04	8/25/2010	15.58	-9.57	7/25/2011	7.33	-1.32	10/26/2011	7.73	-1.72
MW-70-MNA08	80-90	7.66	8/18/2008	23.27	-15.61	8/24/2009	22.74		8/25/2010	17.21	-9.55	7/25/2011	8.99	-1.33	10/26/2011	9.41	-1.75
MW-70-MNA06	80-90	3.95	8/18/2008	19.48	-15.53	8/24/2009	19.03	-15.08	8/25/2010	13.58	-9.63	7/25/2011	5.30	-1.35	10/26/2011	5.70	-1.75
MW-70-MNA11	80-90	8.30	8/18/2008	24.55	-16.25	8/24/2009	23.90	--15.60	8/25/2010	18.35	-10.05	7/25/2011	9.73	-1.43	10/26/2011	10.25	-1.95
MW-70-MNA07	90-100	4.63	8/18/2008	20.18	-15.55	8/24/2009	19.74	-15.11	8/25/2010	14.29	-9.66	7/25/2011	5.97	-1.34	10/26/2011	6.43	--1.80
First Sand Biobarrier 2																	
MW-70-PMW07A	65-75	7.89	8/18/2008	24.43	-16.54	8/24/2009	23.61	-15.72	8/25/2010	17.97	-10.08	7/25/2011	9.10	-1.21	10/26/2011	9.97	-2.08
MW-70-PMW07B	85-95	7.52	8/18/2008	26.44	-18.92	8/24/2009	25.43	-17.91	8/25/2010	19.60	-12.08	7/25/2011	9.44	-1.92	10/26/2011	9.95	-2.43
IW-70-FSB216	65-100	8.34	8/18/2008	26.89	-18.55	8/24/2009	26.50	-18.16	8/25/2010	19.13	-10.79	7/25/2011	10.75	-2.41	10/26/2011	11.34	--3.00
MW-70-PMW08A	65-75	9.04	8/18/2008	26.77	-17.73	8/24/2009	25.98	-16.94	8/25/2010	20.30	-11.26	7/25/2011	10.96	-1.92	10/26/2011	11.50	-2.46
MW-70-PMW08B	85-95	9.08	8/18/2008	28.26	-19.18	8/24/2009	27.32	-18.24	8/25/2010	21.58	--12.50	7/25/2011	11.24	-2.16	10/26/2011	11.84	-2.76
MW-70-MNA09	64-74	6.82	8/18/2008	23.30	-16.48	8/24/2009	22.68	-15.86	8/25/2010	17.08	-10.26	7/25/2011	8.53	-1.71	10/26/2011	9.00	-2.18
MW-70-MNA10	75-85	7.01	8/18/2008	26.67	-19.66	8/24/2009	25.63	-18.62	8/25/2010	19.69	-12.68	7/25/2011	9.24	-2.23	10/26/2011	9.85	-2.84
MW-70-MNA12	75-85	5.85	8/18/2008	26.22	-20.37	8/24/2009	25.07	-19.22	8/25/2010	19.23	-13.38	7/25/2011	8.33	-2.48	10/26/2011	8.91	-3.06
MW-70-43A	86-106	10.76	8/18/2008	NA	NA	8/24/2009	30.44	-19.68	8/25/2010	24.20	-13.44	7/26/2011	13.37	-2.61	10/26/2011	14.04	-3.28
Shell Horizon Biobarrier 1																	
MW-70-PMW09	120-130	6.82	8/18/2008	26.61	-19.79	8/24/2009	25.39	-18.57	8/25/2010	19.47	-12.65	7/25/2011	8.75	-1.93	10/26/2011	9.35	-2.53
IW-70-SHB113	105-130	7.49	8/18/2008	24.20	-16.71	8/24/2009	23.44	-15.95	8/25/2010	20.00	-12.51	7/25/2011	9.64	-2.15	10/26/2011	10.25	-2.76
MW-70-PMW10	120-130	6.60	8/18/2008	26.46	-19.86	8/24/2009	25.20	--18.60	8/25/2010	19.29	-12.69	7/25/2011	8.61	-2.01	10/26/2011	9.26	-2.66
IW-70-SHB217	105-130	8.67	8/18/2008	29.97	--21.30	8/24/2009	27.80	-19.13	8/25/2010	21.82	-13.15	7/25/2011	11.10	-2.43	10/26/2011	11.80	-3.13
MW-70-MNA13	115-125	6.64	8/18/2008	26.42	-19.78	8/24/2009	25.24	--18.60	8/25/2010	19.38	-12.74	7/25/2011	8.75	-2.11	10/26/2011	9.37	-2.73
Shell Horizon Biobarrier 3																	
MW-70-PMW11A	85-95	8.13	8/18/2008	28.81	-20.68	8/24/2009	27.51	-19.38	8/25/2010	22.19	-14.06	7/26/2011	10.10	-1.97	10/26/2011	11.68	-3.55
MW-70-PMW11B	115-125	7.95	8/18/2008	28.51	-20.56	8/24/2009	27.12	-19.17	8/25/2010	21.20	-13.25	7/26/2011	10.22	-2.27	10/26/2011	10.90	-2.95
IW-70-SHB310	80-95/105-130	8.73	8/18/2008	29.37	-20.64	8/24/2009	25.54	-16.81	8/25/2010	22.34	-13.61	7/26/2011	10.12	-1.39	10/26/2011	12.95	-4.22

Table 2-1
Groundwater Level Data

Well No.	Screen Interval (feet above MSL)	TOC Elevation (feet above MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)
MW-70-PMW12A	85-95	7.86	8/18/2008	28.54	-20.68	8/24/2009	27.20	-19.34	8/25/2010	22.28	-14.42	7/26/2011	10.21	-2.35	10/26/2011	10.97	-3.11
MW-70-PMW12B	115-125	8.09	8/18/2008	28.65	-20.56	8/24/2009	27.30	-19.21	8/25/2010	21.35	-13.26	7/26/2011	10.43	-2.34	10/26/2011	10.83	-2.74
MW-70-MNA14	115-125	8.86	8/18/2008	30.02	-21.16	8/24/2009	28.47	-19.61	8/25/2010	23.67	-14.81	7/26/2011	11.35	-2.49	10/26/2011	12.20	-3.34
Second Sand Biobarrier 1																	
MW-70-PMW13A	125-135	7.47	8/18/2008	27.37	--19.90	8/24/2009	26.16	-18.69	8/25/2010	20.25	-12.78	7/26/2011	9.11	-1.64	10/26/2011	9.93	-2.46
MW-70-PMW13B	145-155	7.48	8/18/2008	27.44	-19.96	8/24/2009	26.09	-18.61	8/25/2010	20.16	-12.68	7/26/2011	9.10	-1.62	10/26/2011	9.90	-2.42
IW-70-SSB109	126-166	7.96	8/18/2008	28.82	-20.86	8/24/2009	28.10	-20.14	8/25/2010	21.83	-13.87	7/26/2011	10.95	-2.99	10/26/2011	11.52	-3.56
MW-70-PMW14A	128-138	7.64	8/18/2008	27.62	-19.98	8/24/2009	26.05	-18.41	8/25/2010	20.10	-12.46	7/26/2011	8.97	-1.33	10/26/2011	9.80	-2.16
MW-70-PMW14B	149-159	7.92	8/18/2008	28.13	-20.21	8/24/2009	26.37	-18.45	8/25/2010	20.45	-12.53	7/26/2011	9.35	-1.43	10/26/2011	10.05	-2.13
MW-70-MNA16	141-151	8.65	8/18/2008	29.79	-21.14	8/24/2009	27.27	-18.62	8/25/2010	22.43	-13.78	7/26/2011	11.09	-2.44	10/26/2011	11.93	-3.28
MW-70-MNA17	140-150	6.80	8/18/2008	28.24	-21.44	8/24/2009	27.04	-20.24	8/25/2010	21.33	-14.53	7/26/2011	9.50	--2.70	10/26/2011	10.76	-3.96
MW-70-MNA15	140-150	5.96	8/18/2008	26.23	-20.27	8/24/2009	24.60	-18.64	8/25/2010	18.97	-13.01	7/25/2011	7.92	-1.96	10/26/2011	8.65	-2.69
MW-70-15	161-171	9.41	8/18/2008	31.48	-22.07	8/24/2009	29.97	-20.56	8/25/2010	23.97	-14.56	7/26/2011	12.44	-3.03	10/26/2011	13.35	-3.94
MW-70-14*	160-170	11.01	8/18/2008	NA	NA	8/24/2009	30.19	-19.18	8/25/2010	24.24	-13.23	7/26/2011	13.21	--2.20	10/26/2011	13.85	-2.84
MW-70-43B*	136-146	10.58	8/18/2008	NA	NA	8/24/2009	30.41	-19.83	8/25/2010	24.25	-13.67	7/26/2011	13.17	-2.59	10/26/2011	13.85	-3.27
MW-70-49	125-165	7.89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10/26/2011	11.00	-3.11
Point of Compliance/Upper Fines																	
MW-70-02	20-30	7.85	8/18/2008	18.88	-11.03	8/24/2009	19.77	-11.92	8/25/2010	14.28	-6.43	7/25/2011	8.33	-0.48	10/26/2011	8.32	-0.47
MW-70-10	30-40	10.10	8/18/2008	19.33	-9.23	8/24/2009	20.29	-10.19	8/25/2010	15.44	-5.34	7/25/2011	10.41	-0.31	10/26/2011	10.73	-0.63
MW-70-17	30-40	4.58	8/18/2008	15.00	-10.42	8/24/2009	15.39	-10.81	8/25/2010	11.39	-6.81	7/25/2011	5.85	-1.27	10/26/2011	6.03	-1.45
MW-70-22	20-30	10.21	8/18/2008	12.51	--2.30	8/24/2009	12.65	-2.44	8/25/2010	11.85	-1.64	7/26/2011	10.37	-0.16	10/26/2011	10.16	0.05
Point of Compliance/First Sand																	
MW-70-POC01	80-90	8.88	8/18/2008	22.92	-14.04	8/24/2009	22.80	-13.92	8/25/2010	17.55	-8.67	7/25/2011	9.81	-0.93	10/26/2011	10.15	-1.27
MW-70-11	80-100	11.07	8/18/2008	28.67	--17.60	8/24/2009	27.76	-16.69	8/25/2010	22.10	-11.03	7/25/2011	12.73	-1.66	10/26/2011	13.35	-2.28
MW-70-35	90-100	6.31	8/18/2008	25.53	-19.22	8/24/2009	24.34	-18.03	8/25/2010	18.66	-12.35	7/25/2011	8.45	-2.14	10/26/2011	9.11	--2.80
MW-70-16	95-105	9.76	8/18/2008	31.49	-21.73	8/24/2009	30.01	-20.25	8/25/2010	23.99	-14.23	7/26/2011	12.45	-2.69	10/26/2011	13.36	--3.60
Point of Compliance/Shell Horizon																	
MW-70-23	110-130	11.17	8/18/2008	33.63	-22.46	8/24/2009	32.39	-21.22	8/25/2010	26.05	-14.88	7/26/2011	14.12	-2.95	10/26/2011	14.85	-3.68
Point of Compliance/Second Sand																	
MW-70-36	150-160	9.04	8/18/2008	29.85	-20.81	8/24/2009	28.41	-19.37	8/25/2010	22.57	-13.53	7/25/2011	11.62	-2.58	10/26/2011	12.64	--3.60
MW-70-21	150-170	7.70	8/18/2008	32.52	-24.82	8/24/2009	30.46	-22.76	8/25/2010	24.10	--16.40	7/26/2011	11.60	--3.90	10/26/2011	12.35	-4.65
Point of Compliance/Deep Sand																	
MW-70-POC02	190-200	8.25	8/18/2008	35.21	-26.96	8/24/2009	32.90	-24.65	8/25/2010	25.80	-17.55	7/26/2011	11.76	-3.51	10/26/2011	12.69	-4.44
MW-70-POC03	190-200	9.64	8/18/2008	30.00	-20.36	8/24/2009	28.39	-18.75	8/25/2010	22.34	--12.70	7/25/2011	10.25	-0.61	10/26/2011	12.30	-2.66
MW-70-POC04	195-205	8.50	8/18/2008	32.35	-23.85	8/24/2009	32.71	-24.21	8/25/2010	26.08	-17.58	7/26/2011	12.94	-4.44	10/26/2011	14.13	-5.63

Table 2-1
Groundwater Level Data

Well No.	Screen Interval (feet above MSL)	TOC Elevation (feet above MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)
Upper Fines																	
MW-70-03	20-30	8.03	12/10/2013	NA	NA	8/22/2013	10.81	-2.78	1/27/2014	11.11	-3.08	7/21/2014	13	-4.97	12/15/2014	12.33	-4.3
Source Area Treatment/Upper Fines																	
MW-70-PMW01A	25-35	8.23	12/10/2013	10.28	-2.05	8/22/2013	12.03	-3.80	1/27/2014	11.31	-3.08	7/21/2014	13.99	-5.76	12/15/2014	13.24	-5.01
MW-70-PMW01B	45-55	8.21	12/10/2013	10.6	-2.39	8/22/2013	13.16	-4.95	1/27/2014	12.05	-3.84	7/21/2014	15.75	-7.54	12/15/2014	14.19	-5.98
MW-70-27[a]	26-36	8.25	12/10/2013	10.31	-2.06	8/22/2013	11.84	-3.59	1/27/2014	11.31	-3.06	7/21/2014	14.16	-5.91	12/15/2014	13.54	-5.29
MW-70-28[a]	50-60	8.30	12/10/2013	10.9	-2.60	8/22/2013	13.39	-5.09	1/27/2014	12.21	-3.91	7/21/2014	16.17	-7.87	12/15/2014	14.41	-6.11
MW-70-MNA01	40-50	8.36	12/10/2013	10.95	-2.59	8/22/2013	13.42	-5.06	1/27/2014	12.35	-3.99	7/21/2014	16.18	-7.82	12/15/2014	14.34	-5.98
MW-70-MNA02	35-45	8.51	12/10/2013	10.1	-1.59	8/22/2013	11.72	-3.21	1/27/2014	11.45	-2.94	7/21/2014	14.28	-5.77	12/15/2014	13.30	-4.79
MW-70-MNA03	35-45	9.18	12/10/2013	10.8	-1.62	8/22/2013	12.39	-3.21	1/27/2014	12.16	-2.98	7/21/2014	14.99	-5.81	12/15/2014	14.13	-4.95
MW-70-MNA04	35-45	8.39	12/10/2013	10.26	-1.87	8/22/2013	11.75	-3.36	1/27/2014	11.45	-3.06	7/21/2014	14.14	-5.75	12/15/2014	13.46	-5.07
Source Area Biobarrier/First Sand																	
MW-70-PMW02A	71-81	8.35	12/10/2013	10.03	-1.68	8/22/2013	13.78	-5.43	1/27/2014	12.54	-4.19	7/21/2014	16.65	-8.30	12/15/2014	14.62	-6.27
MW-70-PMW02B	90-100	8.38	12/10/2013	11.05	-2.67	8/22/2013	13.82	-5.44	1/27/2014	12.6	-4.22	7/21/2014	16.7	-8.32	12/15/2014	14.70	-6.32
IW-70-SAB06	65-80/85-105	8.07	12/10/2013	10.8	-2.73	8/22/2013	13.68	-5.61	1/27/2014	12.4	-4.33	7/21/2014	16.46	-8.39	12/15/2014	14.38	-6.31
MW-70-MNA05	70-80	8.46	12/10/2013	11.02	-2.56	8/22/2013	13.81	-5.35	1/27/2014	12.53	-4.07	7/21/2014	16.57	-8.11	12/15/2014	14.91	-6.45
MW-70-PMW03A	70-80	7.94	12/10/2013	10.56	-2.62	8/22/2013	13.51	-5.57	1/27/2014	12.17	-4.23	7/21/2014	16.27	-8.33	12/15/2014	14.23	-6.29
MW-70-P MW03B	90-100	7.88	12/10/2013	10.57	-2.69	8/22/2013	13.46	-5.58	1/27/2014	12.13	-4.25	7/21/2014	16.28	-8.40	12/15/2014	14.28	-6.4
First Sand Biobarrier 1																	
MW-70-38	80-100	6.85	12/10/2013	9.77	-2.92	8/22/2013	12.72	-5.87	1/27/2014	11.36	-4.51	7/21/2014	15.73	-8.88	12/15/2014	13.47	-6.62
IW-70-FSB118	60-105	4.42	12/10/2013	7.27	-2.85	8/22/2013	10.27	-5.85	1/27/2014	8.3	-3.88	7/21/2014	14.28	-9.86	12/15/2014	11.16	-6.74
MW-70-PMW06A	70-80	4.14	12/10/2013	7.09	-2.95	8/22/2013	10.05	-5.91	1/27/2014	8.7	-4.56	7/21/2014	13.06	-8.92	12/15/2014	10.79	-6.65
MW-70-PMW06B	91-101	4.16	12/10/2013	7.08	-2.92	8/22/2013	10.04	-5.88	1/27/2014	8.69	-4.53	7/21/2014	12.98	-8.82	12/15/2014	10.75	-6.59
MW-70-PMW04A	70-80	4.52	12/10/2013	7.39	-2.87	8/22/2013	10.39	-5.87	1/27/2014	9	-4.48	7/21/2014	13.32	-8.80	12/15/2014	11.12	-6.6
MW-70-PMW04B	90-100	4.53	12/10/2013	7.4	-2.87	8/22/2013	10.41	-5.88	1/27/2014	9.04	-4.51	7/21/2014	13.33	-8.80	12/15/2014	11.13	-6.6
IW-70-FSB108	60-105	4.64	12/10/2013	7.68	-3.04	8/22/2013	10.63	-5.99	1/27/2014	9.32	-4.68	7/21/2014	13.55	-8.91	12/15/2014	11.35	-6.71
MW-70-PMW05A	70-80	4.21	12/10/2013	7.13	-2.92	8/22/2013	10.11	-5.90	1/27/2014	8.79	-4.58	7/21/2014	13.05	-8.84	12/15/2014	10.88	-6.67
MW-70-PMW05B	90-100	4.34	12/10/2013	7.25	-2.91	8/22/2013	10.25	-5.91	1/27/2014	8.84	-4.5	7/21/2014	13.18	-8.84	12/15/2014	11.01	-6.67
RDO-5	65-105	6.01	12/10/2013	7.58	-1.57	8/22/2013			1/27/2014	10.53	-4.52		14.77	-8.76	12/15/2014		
MW-70-MNA08	80-90	7.66	12/10/2013	10.78	-3.12	8/22/2013	13.6	-5.94	1/27/2014	12.22	-4.56	7/21/2014	16.54	-8.88	12/15/2014	14.34	-6.68
MW-70-MNA06	80-90	3.95	12/10/2013	6.87	-2.92	8/22/2013	9.94	-5.99	1/27/2014	8.49	-4.54	7/21/2014	12.86	-8.91	12/15/2014	10.61	-6.66
MW-70-MNA11	80-90	8.30	12/10/2013	11.42	-3.12	8/22/2013	14.69	-6.39	1/27/2014	13.23	-4.93	7/21/2014	17.86	-9.56	12/15/2014	15.40	-7.1
MW-70-MNA07	90-100	4.63	12/10/2013	7.58	-2.95	8/22/2013	10.66	-6.03	1/27/2014	9.21	-4.58	7/21/2014	13.59	-8.96	12/15/2014	11.37	-6.74
First Sand Biobarrier 2																	
MW-70-PMW07A	65-75	7.89	12/10/2013	11	-3.11	8/22/2013	14.39	-6.50	1/27/2014	12.93	-5.04	7/21/2014	17.52	-9.63	12/15/2014	15.23	-7.34
MW-70-PMW07B	85-95	7.52	12/10/2013	11.34	-3.82	8/22/2013	15.64	-8.12	1/27/2014	13.79	-6.27	7/21/2014	18.35	-10.83	12/15/2014	16.26	-8.74
IW-70-FSB216	65-100	8.34	12/10/2013	12.54	-4.20	8/22/2013	15.75	-7.41	1/27/2014	12.09	-3.75	7/21/2014	13.48	-5.14	12/15/2014	15.80	-7.46
MW-70-PMW08A	65-75	9.04	12/10/2013	12.6	-3.56	8/22/2013	16.46	-7.42	1/27/2014	14.92	-5.88	7/21/2014	19.85	-10.81	12/15/2014	17.00	-7.96
MW-70-PMW08B	85-95	9.08	12/10/2013	13.09	-4.01	8/22/2013	17.71	-8.63	1/27/2014	15.81	-6.73	7/21/2014	21.43	-12.35	12/15/2014	17.91	-8.83
MW-70-MNA09	64-74	6.82	12/10/2013	10.19	-3.37	8/22/2013	13.49	-6.67	1/27/2014	12.01	-5.19	7/21/2014	16.49	-9.67	12/15/2014	14.02	-7.2
MW-70-MNA10	75-85	7.01	12/10/2013	11.4	-4.39	8/22/2013	15.79	-8.78	1/27/2014	13.94	-6.93	7/21/2014	19.58	-12.57	12/15/2014	16.00	-8.99
MW-70-MNA12	75-85	5.85	12/10/2013	9.84	-3.99	8/22/2013	14.88	-9.03	1/27/2014	13	-7.15	7/21/2014	18.88	-13.03	12/15/2014	15.07	-9.22
MW-70-43A	86-106	10.76	12/10/2013	10.78	-0.02	8/22/2013	20.36	-9.60	1/27/2014	18.49	-7.73	7/21/2014	24.48	-13.72	12/15/2014	20.48	-9.72
Shell Horizon Biobarrier 1																	
MW-70-PMW09	120-130	6.82	12/10/2013	10.71	-3.89	8/22/2013	15.6	-8.78	1/27/2014	13.41	-6.59	7/21/2014	19.42	-12.60	12/15/2014	15.59	-8.77
IW-70-SHB113	105-130	7.49	12/10/2013	11.44	-3.95	8/22/2013	16.09	-8.60	1/27/2014	13.64	-6.15	7/21/2014	19.07	-11.58	12/15/2014	15.62	-8.13
MW-70-PMW10	120-130	6.60	12/10/2013	10.53	-3.93	8/22/2013	15.47	-8.87	1/27/2014	13.29	-6.69	7/21/2014	19.27	-12.67	12/15/2014	15.43	-8.83
IW-70-SHB217	105-130	8.67	12/10/2013	12.97	-4.30	8/22/2013	16.04	-7.37	1/27/2014	16.12	-7.45	7/21/2014	22.24	-13.57	12/15/2014	18.36	-9.69
MW-70-MNA13	115-125	6.64	12/10/2013	11.08	-4.44	8/22/2013	15.48	-8.84	1/27/2014	13.42	-6.78	7/21/2014	19.14	-12.50	12/15/2014	15.53	-8.89
Shell Horizon Biobarrier 3																	
MW-70-PMW11A	85-95	8.13	12/10/2013	12.95	-4.82	8/22/2013	18.21	-10.08	1/27/2014	16.08	-7.95	7/21/2014	21.6	-13.47	12/15/2014	18.19	-10.06
MW-70-PMW11B	115-125	7.95	12/10/2013	12.02	-4.07	8/22/2013	17.28	-9.33	1/27/2014	15.39	-7.44	7/21/2014	22.25	-14.30	12/15/2014	17.63	-9.68
IW-70-SHB310	80-95/105-130	8.73	12/10/2013	15.6	-6.87	8/22/2013	NS	NS	1/27/2014	16.64	-7.91	NS	NS	NS	12/15/2014		

Table 2-1
Groundwater Level Data

Well No.	Screen Interval (feet above MSL)	TOC Elevation (feet above MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)	Date	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet +/- MSL)
MW-70-PMW12A	85-95	7.86	12/10/2013	12.16	-4.30	8/22/2013	17.36	-9.64	1/27/2014	15.31	-7.45	7/21/2014	21.49	-13.63	12/15/2014	17.47	-9.61
MW-70-PMW12B	115-125	8.09	12/10/2013	12.36	-4.27	8/22/2013	17.5	-10.59	1/27/2014	15.34	-7.25	7/21/2014	22.52	-14.43	12/15/2014	17.64	-9.55
MW-70-MNA14	115-125	8.86	12/10/2013	13.34	-4.48	8/22/2013	18.68	-9.82	1/27/2014	16.51	-7.65	7/21/2014	22.93	-14.07	12/15/2014	21.87	-13.01
Second Sand Biobarrier 1																	
MW-70-PMW13A	125-135	7.47	12/10/2013	11.04	-3.57	8/22/2013	16.29	-8.82	1/27/2014	14.16	-6.69	7/21/2014	20.52	-13.05	12/15/2014	16.46	-8.99
MW-70-PMW13B	145-155	7.48	12/10/2013	11.02	-3.54	8/22/2013	16.26	-8.78	1/27/2014	14.11	-6.63	7/21/2014	20.4	-12.92	12/15/2014	16.40	-8.92
IW-70-SSB109	126-166	7.96	12/10/2013	12.98	-5.02	8/22/2013	18.1	-10.14	1/27/2014	15.74	-7.78	7/21/2014	22.21	-14.25	12/15/2014	18.18	-10.22
MW-70-PMW14A	128-138	7.64	12/10/2013	11.12	-3.48	8/22/2013	16.17	-9.07	1/27/2014	14.06	-6.42	7/21/2014	20.41	-12.77	12/15/2014	16.38	-8.74
MW-70-PMW14B	149-159	7.92	12/10/2013	11.59	-3.67	8/22/2013	16.71	-10.40	1/27/2014	14.57	-6.65	7/21/2014	21	-13.08	12/15/2014	17.20	-9.28
MW-70-MNA16	141-151	8.65	12/10/2013	12.97	-4.32	8/22/2013	18.32	-8.94	1/27/2014	16.25	-7.6	7/21/2014	22.62	-13.97	12/15/2014	18.53	-9.88
MW-70-MNA17	140-150	6.80	12/10/2013	12.31	-5.51	8/22/2013	17.59	-11.04	1/27/2014	15.44	-8.64	7/21/2014	21.87	-15.07	12/15/2014	17.92	-11.12
MW-70-MNA15	140-150	5.96	12/10/2013	14.2	-8.24	8/22/2013	17.84	-14.28	1/27/2014	13.2	-7.24	7/21/2014	19.17	-13.21	12/15/2014	15.41	-9.45
MW-70-15	161-171	9.41	12/10/2013	14.2	-4.79	8/22/2013	20.24	-10.83	1/27/2014	17.84	-8.43	7/21/2014	24.52	-15.11	12/15/2014	20.18	-10.77
MW-70-14*	160-170	11.01	12/10/2013	14.98	-3.97	8/22/2013	20.3	-9.27	1/27/2014	18.27	-7.26	7/21/2014	24.42	-13.41	12/15/2014	20.35	-9.34
MW-70-43B*	136-146	10.58	12/10/2013	14.86	-4.28	8/22/2013	20.28	-9.70	1/27/2014	18.25	-7.67	7/21/2014	24.41	-13.83	12/15/2014	20.42	-9.84
MW-70-49	125-165	7.89	12/10/2013	12.23	-4.34	8/22/2013	17.47	-9.58	1/27/2014	15.25	-7.36	7/21/2014	22.67	-14.78	12/15/2014		
Point of Compliance/Upper Fines																	
MW-70-02	20-30	7.85	12/10/2013	9.11	-1.26	8/22/2013	10.66	-2.81	1/27/2014	10.53	-2.68	7/21/2014	12.85	-5.00	12/15/2014	12.38	-4.53
MW-70-10	30-40	10.10	12/10/2013	11.64	-1.54	8/22/2013	12.7	-2.60	1/27/2014	12.76	-2.66	7/21/2014	14.92	-4.82	12/15/2014	15.25	-5.15
MW-70-17	30-40	4.58	12/10/2013	6.49	-1.91	8/22/2013	8.21	-3.63	1/27/2014	7.91	-3.33	7/21/2014	10.42	-5.84	12/15/2014	9.46	-4.88
MW-70-22	20-30	10.21	12/10/2013	10.61	-0.40	8/22/2013	10.75	-0.54	1/27/2014	10.4	-0.19	7/21/2014	9.66	0.55	12/15/2014	10.76	-0.55
Point of Compliance/First Sand																	
MW-70-POC01	80-90	8.88	12/10/2013	NA	NA	8/22/2013	13.87	-4.99	1/27/2014	12.62	-3.74	7/21/2014	16.6	-7.72	12/15/2014	14.67	-5.79
MW-70-11	80-100	11.07	12/10/2013	NA	NA	8/22/2013	18.38	-7.31	1/27/2014	16.64	-5.57	7/21/2014	21.88	-10.81	12/15/2014	18.89	-7.82
MW-70-35	90-100	6.31	12/10/2013	NA	NA	8/22/2013	14.85	-8.54	1/27/2014	12.75	-6.44	7/21/2014	18.27	-11.96	12/15/2014	14.93	-8.62
MW-70-16	95-105	9.76	12/10/2013	NA	NA	8/22/2013	20.02	-10.26	1/27/2014	17.85	-8.09	7/21/2014	24.51	-14.75	12/15/2014	20.12	-10.36
Point of Compliance/Shell Horizon																	
MW-70-23	110-130	11.17	12/10/2013	15.77	-4.60	8/22/2013	22.11	-10.94	1/27/2014	19.7	-8.53	7/21/2014	26.85	-15.68	12/15/2014	21.95	-10.78
Point of Compliance/Second Sand																	
MW-70-36	150-160	9.04	12/10/2013	13.58	-4.54	8/22/2013	18.71	-9.67	1/27/2014	16.86	-7.82	7/21/2014	22.52	-13.48	12/15/2014	18.96	-9.92
MW-70-21	150-170	7.70	12/10/2013	13.52	-5.82	8/22/2013	20.41	-12.71	1/27/2014	17.88	-10.18	7/21/2014	25.15	-17.45	12/15/2014	20.09	-12.39
Point of Compliance/Deep Sand																	
MW-70-POC02	190-200	8.25	12/10/2013	13.52	-5.27	8/22/2013	21.4	-13.15	1/27/2014	18.51	-10.26	7/21/2014	26.93	-18.68	12/15/2014	20.75	-12.5
MW-70-POC03	190-200	9.64	12/10/2013	13.56	-3.92	8/22/2013	18.65	-9.01	1/27/2014	16.63	-6.99	7/21/2014	22.56	-12.92	12/15/2014	18.87	-9.23
MW-70-POC04	195-205	8.50	12/10/2013	14.8	-6.30	8/22/2013	21.52	-13.02	1/27/2014	19.21	-10.71	7/21/2014	26.63	-18.13	12/15/2014	21.47	-12.97

TABLE 2-2
FIELD PARAMETER DATA

Well ID	Date	pH	Conductivity (µs/cm)	Turbidity (NTU)	DO (mg/L)	Temperature (°C)	ORP (mV)
SOURCE AREA TREATMENT GRID							
IW-70-SAT35	12/15/2014	6.66	8,905	8	0.19	18.84	-356
MW-70-03	12/15/2014	6.77	1,693	25	3.4	23.27	-73.6
MW-70-27	12/15/2014	6.3	16,527	121	0.12	19.48	-100
MW-70-28	12/15/2014	6.16	6,341	9	0.21	19.67	-123.4
MW-70-MNA01	12/15/2014	6.46	8,140	6	0.13	18.65	-90.2
MW-70-MNA02	12/15/2014	6.45	4,139	1	0.22	18.19	-65.2
MW-70-MNA03	12/15/2014	6.23	5,249	1	0.33	17.36	-26.9
MW-70-MNA04	12/15/2014	6.97	5,591	2	0.62	22.88	-139.8
MW-70-PMW01A	12/15/2014	6.23	1,153	50	0.19	19.71	-324.1
MW-70-PMW01B	12/15/2014	6.12	5,490	28	0.21	19.18	-177.7
POINT OF COMPLIANCE/UPPER FINES							
MW-70-02	12/15/2014	6.37	5,769	6	0.5	22.37	-15.1
MW-70-10	12/15/2014	6.91	5,220	4	0.41	21.18	-48.7
MW-70-17	12/15/2014	6.57	11,710	4	0.72	20.94	-87.7
MW-70-22	12/16/2014	7.15	53,638	4	0.53	20.9	-75.6
SOURCE AREA BIOBARRIER/FIRST SAND							
IW-70-SAB06	12/15/2014	6.3	2,208	13	0.13	20.46	-177.2
IW-70-SAB11	12/15/2014	6.63	2,622	29	0.1	18.95	-228.1
MW-70-MNA05	12/15/2014	7.55	1,179	2	0.35	22.63	-250.5
MW-70-PMW02A	12/15/2014	7.47	1,442	2	0.23	19.69	-189.5
MW-70-PMW02B	12/15/2014	7.37	1,358	1	0.21	20.12	-188.1
MW-70-PMW03A	12/15/2014	6.66	1,576	15	1.58	22.96	-275.8
MW-70-PMW03B	12/15/2014	7.03	1,949	2	0.76	22.88	-246.9
FIRST SAND BIOBARRIER 1							
IW-70-FSB108	12/15/2014	6.48	1,969	9	0.15	18.51	-197.3
IW-70-FSB118	12/15/2014	5.93	2,879	41	0.3	14.98	-176.7
MW-70-38	12/15/2014	6.2	3,180	1	0.59	14.74	-102
MW-70-43A	12/15/2014	8.04	9,006	69	2.16	21.2	-296.2
MW-70-MNA06	12/15/2014	7.31	906	4	0.64	21.41	-243.1
MW-70-MNA07	12/15/2014	6.66	1,868	5	1.57	21.34	-218.2
MW-70-MNA08	12/15/2014	6.57	3,290	10	0.2	18.32	-170
MW-70-MNA11	12/15/2014	7.07	2,691	8	0.93	20.06	-180.7
MW-70-PMW04A	12/15/2014	7.31	1,212	1	0.16	19.43	-111.4
MW-70-PMW04B	12/15/2014	7.12	1,369	2	0.21	19.21	-198
MW-70-PMW05A	12/15/2014	7.28	1,050	1	0.16	18.82	-207.6
MW-70-PMW05B	12/15/2014	6.52	1,390	10	0.21	18.65	-174.2
MW-70-PMW06A	12/15/2014	7.11	2,631	6	0.83	21.15	-242.3
MW-70-PMW06B	12/15/2014	7.59	1,927	4	0.59	21.26	-254.3
RDO-5	12/19/2014	7.22	1,051	3	0.72	21.34	-233.2

TABLE 2-2
FIELD PARAMETER DATA

Well ID	Date	pH	Conductivity (µs/cm)	Turbidity (NTU)	DO (mg/L)	Temperature (°C)	ORP (mV)
FIRST SAND BIOBARRIER 2							
IW-70-FSB216	12/15/2014	6.55	25,028	47	1.63	21.2	-468.1
IW-70-FSB229	12/18/2014	7.13	3,049	7	0.32	19.03	-305.1
MW-70-MNA09	12/15/2014	6.68	16,178	31	0.36	15.3	-165.3
MW-70-MNA10	12/15/2014	7.03	7,867	25	0.84	22.4	-439.9
MW-70-MNA12	12/15/2014	7.13	12,271	26	0.6	20	-477.3
MW-70-PMW07A	12/15/2014	6.78	32,164	10	0.99	21.5	-480.7
MW-70-PMW07B	12/15/2014	7.43	5,142	16	0.61	21.7	-497
MW-70-PMW08A	12/15/2014	6.79	17,116	9	0.33	20	-443.1
MW-70-PMW08B	12/15/2014	6.72	5,516	11	0.42	20.7	-468.9
POINT OF COMPLIANCE/FIRST SAND							
MW-70-11	12/16/2014	7.31	2,490	1	0.33	20.4	-104.9
MW-70-16	12/16/2014	6.82	14,246	2	0.61	19.4	-62.2
MW-70-35	12/15/2014	6.92	13,960	4	0.63	20.88	-121.6
MW-70-POC01	12/15/2014	7.43	1,339	2	0.25	18.39	-155.2
SHELL HORIZON BIOBARRIER 1							
IW-70-SHB113	12/15/2014	6.75	2,328	6	0.28	17.45	-207.4
IW-70-SHB217	12/15/2014	7.06	11,629	10	0.24	18.37	-225.7
MW-70-MNA13	12/15/2014	7.24	5,028	13	0.26	19.08	-204.1
MW-70-PMW09	12/18/2014	7.36	673	2	0.42	18.48	-72.7
MW-70-PMW10	12/15/2014	7.33	1,254	3	0.23	18.3	-195.4
SHELL HORIZON BIOBARRIER 3							
IW-70-SHB310	12/15/2014	4.86	8,849	106	0.27	19.11	-113.2
IW-70-SHB311	12/16/2014	6.33	4,431	39	0.3	21.6	-135.2
MW-70-MNA14	12/16/2014	7.17	5,143	1	0.31	21.2	-229.6
MW-70-PMW11A	12/16/2014	7.21	33,063	1	0.23	21.6	-304.2
MW-70-PMW11B	12/16/2014	7.13	7,848	6	0.51	21.4	-182.6
MW-70-PMW12A	12/15/2014	7.16	567	92	0.21	21.1	-276.1
MW-70-PMW12B	12/15/2014	6.55	7,539	7.4	0.27	21.1	-229.3
POINT OF COMPLIANCE/SHELL HORIZON							
MW-70-23	12/15/2014	6.96	3,559	2	0.06	17.48	-59.1
SECOND SAND BIOBARRIER 1							
IW-70-SSB109	12/15/2014	6.58	19,766	22	0.08	16.95	-334.2
IW-70-SSB119	12/15/2014	6.67	11,585	30	0.24	18.66	-330.1
MW-70-14	12/15/2014	6.86	6,970	8.6	0.42	21.1	-295.3
MW-70-15	12/15/2014	6.45	26,912	7.6	0.26	18	-199.2
MW-70-43B	12/15/2014	7.04	4,587	8.6	0.15	21.2	-290.6
MW-70-49	12/16/2014	6.9	14,646	41	0.44	20.6	-295.4
MW-70-MNA16	12/15/2014	7.28	11,415	4	0.3	18.16	-261.7
MW-70-MNA17	12/15/2014	6.8	27,216	5.8	0.1	20.8	-306.9
MW-70-PMW13A	12/15/2014	6.96	8,068	1	0.47	18.4	-150.5
MW-70-PMW13B	12/15/2014	6.95	15,381	4	0.37	19.93	-210.8
MW-70-PMW14A	12/15/2014	6.99	7,100	3	0.42	20.14	-204.8
MW-70-PMW14B	12/15/2014	7.03	13,827	1	0.31	20.48	-231.5

TABLE 2-2
FIELD PARAMETER DATA

Well ID	Date	pH	Conductivity (µs/cm)	Turbidity (NTU)	DO (mg/L)	Temperature (°C)	ORP (mV)
POINT OF COMPLIANCE/SECOND SAND							
MW-70-21	12/15/2014	6.64	30,095	4	0.26	16.73	-91.5
MW-70-36	12/15/2014	6.84	21,665	2	0.42	18.88	-170.1
POINT OF COMPLIANCE/DEEP SAND							
MW-70-POC02	12/15/2014	7.58	1,542	2	0.21	17.83	-163.4
MW-70-POC03	12/17/2014	6.64	17,781	1	0.21	18.7	-95.2
MW-70-POC04	12/15/2014	6.57	35,399	5	0.27	16.69	-86.8

Abbreviations and Acronyms:
°C – degrees Celsius
DO – dissolved oxygen
mS/cm – milli siemens per centimeter
mg/L – milligrams per liter
mV – millivolt
NTU – nephelometric turbidity unit
ORP – oxidation-reduction potential
pH – potential of hydrogen
* DO from Chemets field instrument

This page intentionally left blank

TABLE 2-3
SOURCE AREA TREATMENT GRID ANALYTICAL RESULTS

		Location	MW-70-03	MW-70-27	MW-70-28	MW-70-MNA01		MW-70-MNA02	MW-70-MNA03	MW-70-MNA04	MW-70-PMW01A
		Sample ID	IR70-A14-065	IR70-A14-003	IR70-A14-004	IR70-A14-005	IR70-A14-091	IR70-A14-006	IR70-A14-007	IR70-A14-008	IR70-A14-001
		QA/QC					Duplicate				
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**									
Wet Chemistry											
Total Alkalinity	2320B	mg/L	---	1150	743	---	---	---	---	---	222
TDS	2540C	mg/L	---	13200	4150	---	---	---	---	---	560
Bromide	300.0	mg/L	---	1.64	4.06	---	---	---	---	---	2.50 U
Chloride-Cl	300.0	mg/L	---	2510	1300	---	---	---	---	---	136
Nitrate-N	300.0	mg/L	---	0.115 J	0.176 J	---	---	---	---	---	2.91
NITRITE-N	300.0	mg/L	---	3.20 U	1.00 U	---	---	---	---	---	1.00 U
Sulfate	300.0	mg/L	---	5560	852	---	---	---	---	---	60.8
Acetate	300.0_MOD	mg/L	---	5.00 U	1.00 U	2.00 U	2.00 U	1.00 U	1.00 U	1.00 U	2.03
Butyrate	300.0_MOD	mg/L	---	5.00 U	1.00 U	2.00 U	2.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Lactate	300.0_MOD	mg/L	---	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Propionate	300.0_MOD	mg/L	---	5.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Sulfide	4500_S2_F	mg/L	---	1 U	1 U	---	---	---	---	---	31.3
TOC	5310B	mg/L	---	7.69	3.33	---	---	---	---	---	15.1
Dissolved Metals											
Arsenic	6010B	mg/L	---	0.0690 J	0.0328 J	---	---	---	---	---	0.200 U
Iron	6010B	mg/L	---	11.1	41.0	---	---	---	---	---	1.51
Manganese	6010B	mg/L	---	7.01	2.48	---	---	---	---	---	0.0763 J
Volatile Organic Compounds											
1,1,1,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	0.20 J	0.35 J	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	8260B	µg/L	1.0 U	1.1	7.7	0.79 J	0.79 J	0.39 J	11	1.7	1.0 U
1,1-Dichloroethene	8260B	µg/L	0.43 J	2.3	16	4.0	4.0	0.34 J	0.50 U	3.6	0.50 U
1,1-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	8260B	µg/L	0.25 J	0.50 U	0.81	0.50 U	0.50 U	0.50 U	2.4	0.22 J	0.50 U
1,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	0.73 J	1.0 U	1.0 U	1.0 U	2.2	1.0 U	1.0 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

TABLE 2-3
SOURCE AREA TREATMENT GRID ANALYTICAL RESULTS

		Location	MW-70-03	MW-70-27	MW-70-28	MW-70-MNA01		MW-70-MNA02	MW-70-MNA03	MW-70-MNA04	MW-70-PMW01A
		Sample ID	IR70-A14-065	IR70-A14-003	IR70-A14-004	IR70-A14-005	IR70-A14-091	IR70-A14-006	IR70-A14-007	IR70-A14-008	IR70-A14-001
		QA/QC					Duplicate				
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**									
2,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-Pentanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	13
Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Carbon Disulfide	8260B	µg/L	1.0 U	1.0 U	0.21 J	1.0 U	1.0 U	1.0 U	1.0 U	0.20 J	0.71 J
Carbon Tetrachloride	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	8260B	µg/L	2.0 U	0.69 J	1.8 J	0.49 J	0.54 J	0.50 J	2.0 U	2.0 U	2.0 U
Chloroform	8260B	µg/L	1.0 U	13	2.7	1.0	1.0	1.0 U	1.0 U	0.43 J	1.0 U
Chloromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
cis-1,2-Dichloroethene	8260B	µg/L	12	440	790	720	710	45	9.4	560	1.8
cis-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromomethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Ethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Freon113	8260B	µg/L	1.0 U	12	3.1	1.1	1.1	1.0 U	1.0 U	5.6	1.0 U
Hexachlorobutadiene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
m/p-Xylenes	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MTBE	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o-Xylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p-Isopropyltoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Sec-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tert-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethylene	8260B	µg/L	1.0 U	0.50 J	1.0 U	0.96 J	0.95 J	1.0 U	1.0 U	4.1	1.0 U

TABLE 2-3
SOURCE AREA TREATMENT GRID ANALYTICAL RESULTS

		Location	MW-70-03	MW-70-27	MW-70-28	MW-70-MNA01		MW-70-MNA02	MW-70-MNA03	MW-70-MNA04	MW-70-PMW01A
		Sample ID	IR70-A14-065	IR70-A14-003	IR70-A14-004	IR70-A14-005	IR70-A14-091	IR70-A14-006	IR70-A14-007	IR70-A14-008	IR70-A14-001
		QA/QC					Duplicate				
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**									
Toluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trans-1,2-Dichloroethene	8260B	µg/L	0.37 J	8.1	32	86	88	1.5	0.62 J	34	1.5
Trans-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	8260B	µg/L	17	200	24	2800	2700	12	1.4 J	260	5.0
Trichlorofluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl Chloride	8260B	µg/L	0.72	350	1800	310	320	2.6	0.33 J	2.1	3.8
Xylenes (Total)	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Chloride Reductase (vcrA)											
Dehalococcoides16 S rRNA gene	Gene-Trac Dhc	gene copies/liter	---	30000000	2000000	2000 J	---	1000 U	1000 U	1000 U	1000000
vinyl chloride reductase A gene	Gene-Trac VC	gene copies/liter	---	10000000	300000	3000 C	---	---*	---*	---*	3000000
Dissolved Hydrocarbon Gases											
Ethane	RSK-175	µg/L	---	7.0	15	2.0 U	2.0 U	0.80 J	1.1 J	12	18
Ethene	RSK-175	µg/L	---	35	88	34	29	2.0	2.0 U	2.0 U	11
Methane	RSK-175	µg/L	---	14000	22000	2200	2100	6700	94	170	14000

Notes:
U = Not Detected
J = Estimated value
C – Correction factor applied to correct for non-specific PCR amplification products, value is an estimated quantity.
L = Liter
µg/L = micrograms per liter
mg/L = milligrams per liter
--- = not analyzed
* = not analyzed since dehalococcoides was not detected

TABLE 2-3
SOURCE AREA TREATMENT GRID ANALYTICAL RESULTS

		Location	MW-70-PMW01B	IW-70-SAT35
		Sample ID	IR70-A14-002	IR70-A14-115
		QA/QC		
		Sample Date	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**		
Wet Chemistry				
Total Alkalinity	2320B	mg/L	526	2100
TDS	2540C	mg/L	3430	5540
Bromide	300.0	mg/L	3.85	3.34
Chloride-Cl	300.0	mg/L	1230	1590
Nitrate-N	300.0	mg/L	0.0971 J	0.340 J
NITRITE-N	300.0	mg/L	1.00 U	1.00 U
Sulfate	300.0	mg/L	620	773
Acetate	300.0_MOD	mg/L	1.00 U	2.00 U
Butyrate	300.0_MOD	mg/L	1.00 U	2.00 U
Lactate	300.0_MOD	mg/L	1.00 U	1.00 U
Propionate	300.0_MOD	mg/L	1.00 U	1.00 U
Sulfide	4500_S2_F	mg/L	1 U	55.7
TOC	5310B	mg/L	2.80	18.5
Dissolved Metals				
Arsenic	6010B	mg/L	0.0378 J	0.0118 J
Iron	6010B	mg/L	44.3	2.29
Manganese	6010B	mg/L	2.51	1.37
Volatile Organic Compounds				
1,1,1,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U
1,1,1-Trichloroethane	8260B	µg/L	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U
1,1,2-Trichloroethane	8260B	µg/L	0.55 J	0.33 J
1,1-Dichloroethane	8260B	µg/L	1.6	0.22 J
1,1-Dichloroethene	8260B	µg/L	3.4	0.50 U
1,1-Dichloropropene	8260B	µg/L	1.0 U	1.0 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U
1,2,3-Trichloropropane	8260B	µg/L	1.0 U	1.0 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.0 U	2.0 U
1,2-Dibromoethane	8260B	µg/L	1.0 U	1.0 U
1,2-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U
1,2-Dichloroethane	8260B	µg/L	0.50 U	0.50 U
1,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U
1,3-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U
1,4-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U

TABLE 2-3
SOURCE AREA TREATMENT GRID ANALYTICAL RESULTS

		Location	MW-70-PMW01B	IW-70-SAT35
		Sample ID	IR70-A14-002	IR70-A14-115
		QA/QC		
		Sample Date	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**		
2,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U
2-Butanone	8260B	µg/L	10 U	10 U
2-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U
2-Hexanone	8260B	µg/L	10 U	10 U
4-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U
4-Methyl-2-Pentanone	8260B	µg/L	10 U	10 U
Acetone	8260B	µg/L	10 U	5.7 J
Benzene	8260B	µg/L	1.0 U	1.0 U
Bromobenzene	8260B	µg/L	1.0 U	1.0 U
Bromodichloromethane	8260B	µg/L	1.0 U	1.0 U
Bromoform	8260B	µg/L	1.0 U	1.0 U
Bromomethane	8260B	µg/L	2.0 U	2.0 U
Carbon Disulfide	8260B	µg/L	0.39 J	1.7
Carbon Tetrachloride	8260B	µg/L	0.50 U	0.50 U
Chlorobenzene	8260B	µg/L	1.0 U	1.0 U
Chloroethane	8260B	µg/L	1.8 J	0.82 J
Chloroform	8260B	µg/L	3.6	2.0
Chloromethane	8260B	µg/L	2.0 U	2.0 U
cis-1,2-Dichloroethene	8260B	µg/L	83	5.0
cis-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U
Dibromochloromethane	8260B	µg/L	1.0 U	1.0 U
Dibromomethane	8260B	µg/L	1.0 U	1.0 U
Dichlorodifluoromethane	8260B	µg/L	2.0 U	2.0 U
Ethylbenzene	8260B	µg/L	1.0 U	1.0 U
Freon113	8260B	µg/L	3.0	1.0 U
Hexachlorobutadiene	8260B	µg/L	1.0 U	1.0 U
Isopropyl Benzene	8260B	µg/L	1.0 U	1.0 U
m/p-Xylenes	8260B	µg/L	1.0 U	1.0 U
Methylene Chloride	8260B	µg/L	1.0 U	1.4
MTBE	8260B	µg/L	1.0 U	1.0 U
n-Butylbenzene	8260B	µg/L	1.0 U	1.0 U
n-Propylbenzene	8260B	µg/L	1.0 U	1.0 U
o-Xylene	8260B	µg/L	1.0 U	1.0 U
p-Isopropyltoluene	8260B	µg/L	1.0 U	1.0 U
Sec-Butylbenzene	8260B	µg/L	1.0 U	1.0 U
Styrene	8260B	µg/L	1.0 U	1.0 U
Tert-Butylbenzene	8260B	µg/L	1.0 U	1.0 U
Tetrachloroethylene	8260B	µg/L	1.0 U	1.0 U

TABLE 2-3
SOURCE AREA TREATMENT GRID ANALYTICAL RESULTS

		Location	MW-70-PMW01B	IW-70-SAT35
		Sample ID	IR70-A14-002	IR70-A14-115
		QA/QC		
		Sample Date	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**		
Toluene	8260B	µg/L	0.22 J	0.21 J
Trans-1,2-Dichloroethene	8260B	µg/L	38	20
Trans-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U
Trichloroethene	8260B	µg/L	4.6 J	0.31 J
Trichlorofluoromethane	8260B	µg/L	2.0 U	2.0 U
Vinyl Chloride	8260B	µg/L	3700	40
Xylenes (Total)	8260B	µg/L	2.0 U	2.0 U
Chloride Reductase (vcrA)				
Dehalococcoides16 S rRNA gene	Gene-Trac Dhc	gene copies/liter	1000000	800000000
vinyl chloride reductase A gene	Gene-Trac VC	gene copies/liter	700000	1000000000
Dissolved Hydrocarbon Gases				
Ethane	RSK-175	µg/L	16	86
Ethene	RSK-175	µg/L	170	360
Methane	RSK-175	µg/L	21000	17000

Notes:
U = Not Detected
J = Estimated value
C – Correction factor applied to correct for non-specific PCR amplification produ
L = Liter
µg/L = micrograms per liter
mg/L = milligrams per liter
--- = not analyzed
* = not analyzed since dehalococcoides was not detected

TABLE 2-4
UPPER FINES POINT OF COMPLIANCE ANALYTICAL RESULTS

		Location	MW-70-02	MW-70-10		MW-70-17	MW-70-22
		Sample ID	IR70-A14-064	IR70-A14-066	IR70-A14-098	IR70-A14-067	IR70-A14-068
		QA/QC			Duplicate		
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/16/2014
Parameter	**Method**	**Unit**					
Volatile Organic Compounds							
1,1,1,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U
2-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U
4-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-Pentanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U
Acetone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U
Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Carbon Disulfide	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon Tetrachloride	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Chloroform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

TABLE 2-4
UPPER FINES POINT OF COMPLIANCE ANALYTICAL RESULTS

		Location	MW-70-02	MW-70-10		MW-70-17	MW-70-22
		Sample ID	IR70-A14-064	IR70-A14-066	IR70-A14-098	IR70-A14-067	IR70-A14-068
		QA/QC			Duplicate		
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/16/2014
Parameter	**Method**	**Unit**					
Chloromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
cis-1,2-Dichloroethene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromomethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Ethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Freon113	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
m/p-Xylenes	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MTBE	8260B	µg/L	30	1.0 U	1.0 U	1.0 U	1.0 U
n-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o-Xylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p-Isopropyltoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Sec-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tert-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trans-1,2-Dichloroethene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trans-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	8260B	µg/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Trichlorofluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl Chloride	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Xylenes (Total)	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

Notes:
U = Not Detected
L = Liter
µg/L = micrograms per liter

TABLE 2-5
SOURCE AREA BIOBARRIER/FIRST SAND ANALYTICAL RESULTS

		Location	IW-70-SAB06	IW-70-SAB11	MW-70-MNA05	MW-70-PMW02A		MW-70-PMW02B	MW-70-PMW03A	MW-70-PMW03B
		Sample ID	IR70-A14-011	IR70-A14-012	IR70-A14-013	IR70-A14-009	IR70-A14-092	IR70-A14-010	IR70-A14-014	IR70-A14-015
		QA/QC					Duplicate			
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**								
Wet Chemistry										
Total Alkalinity	2320B	mg/L	873	834	---	203	202	202	568	229
TDS	2540C	mg/L	1200	1590	---	869	893	779	850	1330
Bromide	300.0	mg/L	0.652	0.927	---	0.669	0.646	0.610	2.50 U	0.798
Chloride-Cl	300.0	mg/L	193	287	---	174	169	149	155	280
Nitrate-N	300.0	mg/L	0.0844 J	0.0862 J	---	0.0648 J	0.0652 J	0.0616 J	1.00 U	0.0736 J
NITRITE-N	300.0	mg/L	0.200 U	0.200 U	---	0.200 U	0.200 U	0.200 U	1.00 U	0.200 U
Sulfate	300.0	mg/L	1.01	172	---	274	266	223	3.13	401
Acetate	300.0_MOD	mg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Butyrate	300.0_MOD	mg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Lactate	300.0_MOD	mg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Propionate	300.0_MOD	mg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Sulfide	4500_S2_F	mg/L	2.83	4.18	---	1 U	1 U	1 U	5.34	1 U
TOC	5310B	mg/L	36.6	27.9	---	0.657 U	0.669 U	0.664 U	3.33	0.937 U
Dissolved Metals										
Arsenic	6010B	mg/L	0.200 U	0.200 U	---	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
Iron	6010B	mg/L	0.442	0.823	---	0.320	0.268	0.245	4.09	2.04
Manganese	6010B	mg/L	0.619	0.195 J	---	0.178 J	0.178 J	0.164 J	0.259	0.582
Volatile Organic Compounds										
1,1,1,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	0.36 J	0.37 J	1.0 U	1.0 U	0.70 J
1,1-Dichloroethene	8260B	µg/L	0.50 U	0.50 U	0.50 U	1.2	1.2	0.26 J	0.50 U	0.30 J
1,1-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

TABLE 2-5
SOURCE AREA BIOBARRIER/FIRST SAND ANALYTICAL RESULTS

		Location	IW-70-SAB06	IW-70-SAB11	MW-70-MNA05	MW-70-PMW02A		MW-70-PMW02B	MW-70-PMW03A	MW-70-PMW03B
		Sample ID	IR70-A14-011	IR70-A14-012	IR70-A14-013	IR70-A14-009	IR70-A14-092	IR70-A14-010	IR70-A14-014	IR70-A14-015
		QA/QC					Duplicate			
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**								
2-Butanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-Pentanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Carbon Disulfide	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.25 J	1.0 U
Carbon Tetrachloride	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Chloroform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
cis-1,2-Dichloroethene	8260B	µg/L	0.28 J	1.2	13	240	260	50	1.0 U	140
cis-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromomethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Ethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Freon113	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
m/p-Xylenes	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MTBE	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o-Xylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p-Isopropyltoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Sec-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tert-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	8260B	µg/L	1.1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.35 J	1.0 U
Trans-1,2-Dichloroethene	8260B	µg/L	0.77 J	0.98 J	0.37 J	1.7	1.7	0.40 J	0.36 J	6.3

TABLE 2-5
SOURCE AREA BIOBARRIER/FIRST SAND ANALYTICAL RESULTS

		Location	IW-70-SAB06	IW-70-SAB11	MW-70-MNA05	MW-70-PMW02A		MW-70-PMW02B	MW-70-PMW03A	MW-70-PMW03B
		Sample ID	IR70-A14-011	IR70-A14-012	IR70-A14-013	IR70-A14-009	IR70-A14-092	IR70-A14-010	IR70-A14-014	IR70-A14-015
		QA/QC					Duplicate			
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**								
Trans-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	8260B	µg/L	5.0 U	5.0 U	0.32 J	6.4	6.0	3.1 J	5.0 U	1.5 J
Trichlorofluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl Chloride	8260B	µg/L	0.44 J	0.50 U	15	1.8	1.7	4.3	0.84	140
Xylenes (Total)	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dehalococcoides (Dhc)/Vinyl Chloride Reductase (vcrA)										
Dehalococcoides16 S rRNA gene	Gene-Trac Dhc	gene copies/liter	40000	2000000	40000	40000	---	3000	8000 J	600000
vinyl chloride reductase A gene	Gene-Trac VC	gene copies/liter	200000 C	8000000	40000 C	30000	---	3000	200000	2000000
Dissolved Hydrocarbon Gases										
Ethane	RSK-175	µg/L	1.6 J	0.92 J	2.0 U	2.0 U	2.0 U	2.0 U	1.4 J	2.0 U
Ethene	RSK-175	µg/L	2.0 U	2.5	1.2 J	2.0 U	2.0 U	0.62 J	2.0 U	46
Methane	RSK-175	µg/L	27000	23000	12	1500	1500	58	27000	9200

Notes:
U = Not Detected
J = Estimated value
C – Correction factor applied to correct for non-specific PCR amplification products, value is an estimated quantity.
L = Liter
µg/L = micrograms per liter
mg/L = milligrams per liter
--- = not analyzed
* = not analyzed since dehalococcoides was not detected

This Page Intentionally Left Blank

TABLE 2-6
FIRST SAND BIOBARRIER 1 ANALYTICAL RESULTS

		Location	IW-70-FSB108	IW-70-FSB118	MW-70-38	MW-70-43A	MW-70-MNA06	MW-70-MNA07	MW-70-MNA08	MW-70-MNA11		MW-70-I
		Sample ID	IR70-A14-022	IR70-A14-017	IR70-A14-016	IR70-A14-030	IR70-A14-027	IR70-A14-029	IR70-A14-026	IR70-A14-028	IR70-A14-094	IR70-A14-020
		QA/QC									Duplicate	
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**										
Wet Chemistry												
Total Alkalinity	2320B	mg/L	887	907	802	---	---	---	---	---	---	239
TDS	2540C	mg/L	1170	1830	2030	---	---	---	---	---	---	720
Bromide	300.0	mg/L	0.423 J	1.60 J	1.55	---	---	---	---	---	---	0.518
Chloride-Cl	300.0	mg/L	122	437	536	---	---	---	---	---	---	134
Nitrate-N	300.0	mg/L	0.0802 J	0.280 J	0.0846 J	---	---	---	---	---	---	0.0615 J
NITRITE-N	300.0	mg/L	0.200 U	1.00 U	0.400 U	---	---	---	---	---	---	0.200 U
Sulfate	300.0	mg/L	0.451 J	2.50 U	162	---	---	---	---	---	---	149
Acetate	300.0_MOD	mg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Butyrate	300.0_MOD	mg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Lactate	300.0_MOD	mg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Propionate	300.0_MOD	mg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Sulfide	4500_S2_F	mg/L	1 U	1 U	1 U	---	---	---	---	---	---	1 U
TOC	5310B	mg/L	48.3	156	5.36	---	---	---	---	---	---	1.01 U
Dissolved Metals												
Arsenic	6010B	mg/L	0.00734 J	0.200 U	0.200 U	---	---	---	---	---	---	0.200 U
Iron	6010B	mg/L	20.5	43.4	15.3	---	---	---	---	---	---	0.177 J
Manganese	6010B	mg/L	0.929	1.45	1.17	---	---	---	---	---	---	0.185 J
Volatile Organic Compounds												
1,1,1,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	8260B	µg/L	1.0 U	1.0 U	0.89 J	1.0 U	1.0 U	0.75 J	1.1	1.0 U	1.0 U	0.45 J
1,1-Dichloroethene	8260B	µg/L	0.21 J	0.50 U	0.50 U	0.50 U	0.96	0.50 U	0.96	0.50 U	0.50 U	5.3
1,1-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

TABLE 2-6
FIRST SAND BIOBARRIER 1 ANALYTICAL RESULTS

		Location	IW-70-FSB108	IW-70-FSB118	MW-70-38	MW-70-43A	MW-70-MNA06	MW-70-MNA07	MW-70-MNA08	MW-70-MNA11		MW-70-I
		Sample ID	IR70-A14-022	IR70-A14-017	IR70-A14-016	IR70-A14-030	IR70-A14-027	IR70-A14-029	IR70-A14-026	IR70-A14-028	IR70-A14-094	IR70-A14-020
		QA/QC									Duplicate	
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**										
2-Butanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-Pentanone	8260B	µg/L	10 U	4.7 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	8260B	µg/L	10 U	7.4 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	6.8 J
Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Carbon Disulfide	8260B	µg/L	1.0 U	0.45 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon Tetrachloride	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	8260B	µg/L	2.0 U	2.0 U	0.43 J	2.0 U	2.0 U	2.0 U	0.32 J	2.0 U	2.0 U	2.0 U
Chloroform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
cis-1,2-Dichloroethene	8260B	µg/L	0.82 J	4.0	6.6	0.67 J	71	33	210	5.3	5.1	620
cis-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromomethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.2 J
Ethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Freon113	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
m/p-Xylenes	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MTBE	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o-Xylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p-Isopropyltoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Sec-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tert-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	8260B	µg/L	0.49 J	17	0.35 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trans-1,2-Dichloroethene	8260B	µg/L	1.1	1.4	7.5	1.0 U	0.91 J	9.3	10	0.63 J	0.59 J	4.5

TABLE 2-6
FIRST SAND BIOBARRIER 1 ANALYTICAL RESULTS

		Location	IW-70-FSB108	IW-70-FSB118	MW-70-38	MW-70-43A	MW-70-MNA06	MW-70-MNA07	MW-70-MNA08	MW-70-MNA11		MW-70-I
		Sample ID	IR70-A14-022	IR70-A14-017	IR70-A14-016	IR70-A14-030	IR70-A14-027	IR70-A14-029	IR70-A14-026	IR70-A14-028	IR70-A14-094	IR70-A14-020
		QA/QC									Duplicate	
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**										
Trans-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	8260B	µg/L	5.0 U	0.33 J	2.5 J	5.0 U	0.98 J	1.6 J	1.6 J	1.3 J	1.2 J	9.9
Trichlorofluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl Chloride	8260B	µg/L	1.4	3.9	56	0.50 U	3.8	34	160	0.50 U	0.50 U	60
Xylenes (Total)	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dehalococcoides (Dhc)/Vinyl Chloride Reductase (vcrA)												
Dehalococcoides16 S rRNA gene	Gene-Trac Dhc	gene copies/liter	100000	100000	100000	1000 U	100000	1000000	80000	1000 U	---	7000
vinyl chloride reductase A gene	Gene-Trac VC	gene copies/liter	400000	100000 C	300000	---*	1000 U	2000000	10000	---*	---	30000
Dissolved Hydrocarbon Gases												
Ethane	RSK-175	µg/L	2.0 U	2.0 U	9.7	2.0 U	2.0 U	1.0 J	2.2	2.0 U	2.0 U	2.0 U
Ethene	RSK-175	µg/L	6.0	1.3 J	35	2.0 U	1.7 J	34	55	2.0 U	2.0 U	3.7
Methane	RSK-175	µg/L	25000	13000	27000	330	8700	29000	24000	17	18	5500

Notes:
U = Not Detected
J = Estimated value
C – Correction factor applied to correct for non-specific PCR amplification products, value is an estimated quantity.
L = Liter
µg/L = micrograms per liter
mg/L = milligrams per liter
--- = not analyzed
* = not analyzed since dehalococcoides was not detected

TABLE 2-6
FIRST SAND BIOBARRIER 1 ANALYTICAL RESULTS

		Location	PMW04A	MW-70-PMW04B	MW-70-PMW05A	MW-70-PMW05B	MW-70-PMW06A	MW-70-PMW06B	RDO-5
		Sample ID	IR70-A14-093	IR70-A14-021	IR70-A14-023	IR70-A14-024	IR70-A14-018	IR70-A14-019	IR70-A14-025
		QA/QC	Duplicate						
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/19/2014
Parameter	**Method**	**Unit**							
Wet Chemistry									
Total Alkalinity	2320B	mg/L	239	247	189	377	365	173	264
TDS	2540C	mg/L	736	820	630	832	1740	1200	631
Bromide	300.0	mg/L	0.523	0.561	0.476 J	0.512	1.17	0.772	0.435 J
Chloride-Cl	300.0	mg/L	136	167	114	137	432	339	95.4
Nitrate-N	300.0	mg/L	0.0622 J	0.0632 J	0.0593 J	3.94	0.0697 J	0.0685 J	0.0635 J
NITRITE-N	300.0	mg/L	0.200 U	0.200 U	0.200 U	0.200 U	0.400 U	0.200 U	0.200 U
Sulfate	300.0	mg/L	152	157	148	109	448	309	124
Acetate	300.0_MOD	mg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Butyrate	300.0_MOD	mg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Lactate	300.0_MOD	mg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Propionate	300.0_MOD	mg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Sulfide	4500_S2_F	mg/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
TOC	5310B	mg/L	0.849 U	0.953 U	0.801 U	1.36 U	1.28 U	0.777 U	0.680 U
Dissolved Metals									
Arsenic	6010B	mg/L	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
Iron	6010B	mg/L	0.188 J	0.806	0.794	8.47	0.938	0.0533 J	0.529
Manganese	6010B	mg/L	0.184 J	0.258	0.160 J	1.16	0.346	0.333	0.284
Volatile Organic Compounds									
1,1,1,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	8260B	µg/L	0.44 J	0.64 J	0.21 J	0.60 J	0.93 J	1.9	1.0 U
1,1-Dichloroethene	8260B	µg/L	5.1	7.0	0.90	3.2	2.4	9.0	0.50 U
1,1-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

TABLE 2-6
FIRST SAND BIOBARRIER 1 ANALYTICAL RESULTS

		Location	PMW04A	MW-70-PMW04B	MW-70-PMW05A	MW-70-PMW05B	MW-70-PMW06A	MW-70-PMW06B	RDO-5
		Sample ID	IR70-A14-093	IR70-A14-021	IR70-A14-023	IR70-A14-024	IR70-A14-018	IR70-A14-019	IR70-A14-025
		QA/QC	Duplicate						
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/19/2014
Parameter	**Method**	**Unit**							
2-Butanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-Pentanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	5.5 J
Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Carbon Disulfide	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon Tetrachloride	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Chloroform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
cis-1,2-Dichloroethene	8260B	µg/L	580	1200	60	290	180	530	1.2
cis-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromomethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	8260B	µg/L	1.1 J	0.72 J	2.0 U	0.36 J	2.0 U	1.5 J	2.0 U
Ethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Freon113	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
m/p-Xylenes	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MTBE	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o-Xylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p-Isopropyltoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Sec-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tert-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trans-1,2-Dichloroethene	8260B	µg/L	4.2	12	1.2	6.6	9.0	98 J	0.61 J

TABLE 2-6
FIRST SAND BIOBARRIER 1 ANALYTICAL RESULTS

		Location	PMW04A	MW-70-PMW04B	MW-70-PMW05A	MW-70-PMW05B	MW-70-PMW06A	MW-70-PMW06B	RDO-5
		Sample ID	IR70-A14-093	IR70-A14-021	IR70-A14-023	IR70-A14-024	IR70-A14-018	IR70-A14-019	IR70-A14-025
		QA/QC	Duplicate						
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/19/2014
Parameter	**Method**	**Unit**							
Trans-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	8260B	µg/L	9.6	1.4 J	0.58 J	7.7	2.2 J	3400	5.0 U
Trichlorofluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl Chloride	8260B	µg/L	58	22	58	290	920	7.8	3.5
Xylenes (Total)	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dehalococcoides (Dhc)/Vinyl Chloride Reductase (vcrA)									
Dehalococcoides16 S rRNA gene	Gene-Trac Dhc	gene copies/liter	---	200000	4000	200000	3000000	1000 U	8000
vinyl chloride reductase A gene	Gene-Trac VC	gene copies/liter	---	100000	2000	900000	10000 C	---*	9000 C
Dissolved Hydrocarbon Gases									
Ethane	RSK-175	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	1.8 J	2.0 U	1.2 J
Ethene	RSK-175	µg/L	3.7	5.7	4.0	26	110	0.64 J	0.87 J
Methane	RSK-175	µg/L	5400	8700	3400	21000	13000	46	19000

Notes:
U = Not Detected
J = Estimated value
C – Correction factor applied to correct for non-specific PCR amplification pro
L = Liter
µg/L = micrograms per liter
mg/L = milligrams per liter
--- = not analyzed
* = not analyzed since dehalococcoides was not detected

TABLE 2-7
FIRST SAND BIOBARRIER 2 ANALYTICAL RESULTS

		Location	IW-70-FSB216	IW-70-FSB229	MW-70-MNA09	MW-70-MNA10	MW-70-MNA12	MW-70-PMW07A		MW-70-PMW07B	MW-70-PMW08A	MW-70-PMW08B
		Sample ID	IR70-A14-033	IR70-A14-034	IR70-A14-037	IR70-A14-038	IR70-A14-039	IR70-A14-031	IR70-A14-095	IR70-A14-032	IR70-A14-035	IR70-A14-036
		QA/QC							Duplicate			
		Sample Date	12/15/2014	12/18/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**										
Wet Chemistry												
Total Alkalinity	2320B	mg/L	2020	358	---	---	---	287	290	266	308	303
TDS	2540C	mg/L	16500	2080	---	---	---	29400	25400	2940	11900	3820
Bromide	300.0	mg/L	30.2	1.72	---	---	---	46.4	44.3	3.71	21.5	6.03
Chloride-Cl	300.0	mg/L	9060	519	---	---	---	13600	13300	1190	6110	1700
Nitrate-N	300.0	mg/L	0.406 J	0.0853 J	---	---	---	1.00 U	0.424 J	0.0755 J	0.200 U	0.0669 J
NITRITE-N	300.0	mg/L	8.00 U	0.400 U	---	---	---	8.00 U	8.00 U	0.800 U	3.20 U	1.00 U
Sulfate	300.0	mg/L	12.1	554	---	---	---	2150	2070	617	1300	541
Acetate	300.0_MOD	mg/L	5.00 U	1.00 U	5.00 U	1.00 U	5.00 U	5.00 U	5.00 U	1.00 U	5.00 U	1.00 U
Butyrate	300.0_MOD	mg/L	5.00 U	1.00 U	5.00 U	1.00 U	5.00 U	5.00 U	5.00 U	1.00 U	5.00 U	1.00 U
Lactate	300.0_MOD	mg/L	5.00 U	1.00 U	5.00 U	1.00 U	5.00 U	5.00 U	5.00 U	1.00 U	5.00 U	1.00 U
Propionate	300.0_MOD	mg/L	5.00 U	1.00 U	5.00 U	1.00 U	5.00 U	5.00 U	5.00 U	1.00 U	5.00 U	1.00 U
Sulfide	4500_S2_F	mg/L	74.1	15.9	---	---	---	1 U	1 U	1 U	1 U	1 U
TOC	5310B	mg/L	54.9	5.65	---	---	---	1.72	1.80	1.32	1.75	1.45
Dissolved Metals												
Arsenic	6010B	mg/L	0.200 U	0.200 U	---	---	---	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
Iron	6010B	mg/L	0.239	0.200 U	---	---	---	5.99	5.65	0.202	1.53	0.750
Manganese	6010B	mg/L	3.17	0.115 J	---	---	---	6.33	5.94	0.483	2.60	0.792
Volatile Organic Compounds												
1,1,1,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	0.55 J	0.64 J	1.0 U	1.0 U	0.80 J	0.45 J	0.48 J
1,1-Dichloroethene	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.28 J	4.5	0.50 U	0.50 U	3.7	0.39 J	0.78
1,1-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

TABLE 2-7
FIRST SAND BIOBARRIER 2 ANALYTICAL RESULTS

		Location	IW-70-FSB216	IW-70-FSB229	MW-70-MNA09	MW-70-MNA10	MW-70-MNA12	MW-70-PMW07A		MW-70-PMW07B	MW-70-PMW08A	MW-70-PMW08B
		Sample ID	IR70-A14-033	IR70-A14-034	IR70-A14-037	IR70-A14-038	IR70-A14-039	IR70-A14-031	IR70-A14-095	IR70-A14-032	IR70-A14-035	IR70-A14-036
		QA/QC							Duplicate			
		Sample Date	12/15/2014	12/18/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**										
2-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-Pentanone	8260B	µg/L	16	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Carbon Disulfide	8260B	µg/L	1.0 U	0.21 J	1.0 U	1.0 U	1.0 U	0.21 J	0.21 J	1.0 U	1.0 U	1.0 U
Carbon Tetrachloride	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Chloroform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
cis-1,2-Dichloroethene	8260B	µg/L	0.36 J	0.37 J	21	90	1000	32	33	1300	79	180
cis-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromomethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.30 J	2.0 U	2.0 U
Ethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Freon113	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
m/p-Xylenes	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MTBE	8260B	µg/L	1.0 U	1.0 U	0.27 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o-Xylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p-Isopropyltoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Sec-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tert-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	8260B	µg/L	0.38 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trans-1,2-Dichloroethene	8260B	µg/L	0.51 J	1.0 U	0.49 J	4.2	57	0.41 J	0.39 J	7.5	2.8	5.7
Trans-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	8260B	µg/L	0.48 J	5.0 U	0.99 J	2.8 J	7.1	0.35 J	0.37 J	4.3 J	1.5 J	4.0 J

TABLE 2-7
FIRST SAND BIOBARRIER 2 ANALYTICAL RESULTS

		Location	IW-70-FSB216	IW-70-FSB229	MW-70-MNA09	MW-70-MNA10	MW-70-MNA12	MW-70-PMW07A		MW-70-PMW07B	MW-70-PMW08A	MW-70-PMW08B
		Sample ID	IR70-A14-033	IR70-A14-034	IR70-A14-037	IR70-A14-038	IR70-A14-039	IR70-A14-031	IR70-A14-095	IR70-A14-032	IR70-A14-035	IR70-A14-036
		QA/QC							Duplicate			
		Sample Date	12/15/2014	12/18/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**										
Trichlorofluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl Chloride	8260B	µg/L	4.0	0.78	2.4	250	7.5	3.7	3.8	130	89	400
Xylenes (Total)	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dehalococcoides (Dhc)/Vinyl Chloride Reductase (vcrA)												
Dehalococcoides16 S rRNA gene	Gene-Trac Dhc	gene copies/liter	200000	2000 J	1000 U	20000	1000 U	1000 U	---	7000	10000	300000
vinyl chloride reductase A gene	Gene-Trac VC	gene copies/liter	40000	2000 J, C	---*	50000	---*	---*	---	1000 U	20000 C	100000
Dissolved Hydrocarbon Gases												
Ethane	RSK-175	µg/L	2.0 U	2.0 U	2.0 U	0.96 J	2.0 U	1.3 J	2.0 U	0.73 J	0.90 J	2.0 U
Ethene	RSK-175	µg/L	2.0 U	2.0 U	0.68 J	57	1.4 J	1.6 J	1.3 J	39	17	31
Methane	RSK-175	µg/L	9400	14000	3800	11000	770	820	710	8200	11000	17000

Notes:
U = Not Detected
J = Estimated value
C – Correction factor applied to correct for non-specific PCR amplification products, value is an estimated quantity.
L = Liter
µg/L = micrograms per liter
mg/L = milligrams per liter
--- = not analyzed
* = not analyzed since dehalococcoides was not detected

This Page Intentionally Left Blank

TABLE 2-8
FIRST SAND POINT OF COMPLIANCE ANALYTICAL RESULTS

		Location	MW-70-11	MW-70-16	MW-70-35	MW-70-POC01
		Sample ID	IR70-A14-070	IR70-A14-072	IR70-A14-071	IR70-A14-069
		QA/QC				
		Sample Date	12/16/2014	12/16/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**				
Volatile Organic Compounds						
1,1,1,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	8260B	µg/L	10 U	10 U	10 U	10 U
2-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	8260B	µg/L	10 U	10 U	10 U	10 U
4-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-Pentanone	8260B	µg/L	10 U	10 U	10 U	10 U
Acetone	8260B	µg/L	10 U	10 U	5.4 J	10 U
Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Bromobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U
Carbon Disulfide	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Carbon Tetrachloride	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U
Chloroform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U
cis-1,2-Dichloroethene	8260B	µg/L	1.2	1.0 U	0.80 J	1.0 U
cis-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Dibromomethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U
Ethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Freon113	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
m/p-Xylenes	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
MTBE	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
n-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
o-Xylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
p-Isopropyltoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Sec-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Tert-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Trans-1,2-Dichloroethene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Trans-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	8260B	µg/L	5.0 U	5.0 U	5.0 U	5.0 U
Trichlorofluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl Chloride	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U
Xylenes (Total)	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U

Notes:
U = Not Detected
J = Estimated value
L = Liter
µg/L = micrograms per liter

This Page Intentionally Left Blank

TABLE 2-9
SHELL HORIZON BIOBARRIER 1 ANALYTICAL RESULTS

		Location	IW-70-SHB113	IW-70-SHB217	MW-70-MNA13	MW-70-PMW09		MW-70-PMW10
		Sample ID	IR70-A14-041	IR70-A14-043	IR70-A14-044	IR70-A14-040	IR70-A14-096	IR70-A14-042
		QA/QC					Duplicate	
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/18/2014	12/18/2014	12/15/2014
Parameter	**Method**	**Unit**						
Wet Chemistry								
Total Alkalinity	2320B	mg/L	516	208	228	163	165	258
TDS	2540C	mg/L	1540	6860	2800	379	383	765
Bromide	300.0	mg/L	2.50 U	12.0	4.50	0.264 J	0.257 J	0.427 J
Chloride-Cl	300.0	mg/L	367	3640	1280	76.6	78.9	155
Nitrate-N	300.0	mg/L	1.00 U	0.200 U	0.200 U	0.0695 J	0.0679 J	0.0513 J
NITRITE-N	300.0	mg/L	1.00 U	1.60 U	0.800 U	0.200 U	0.200 U	0.200 U
Sulfate	300.0	mg/L	251	814	410	51.6	54.0	154
Acetate	300.0_MOD	mg/L	1.00 U	2.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Butyrate	300.0_MOD	mg/L	1.00 U	2.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Lactate	300.0_MOD	mg/L	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Propionate	300.0_MOD	mg/L	1.00 U	2.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Sulfide	4500_S2_F	mg/L	2.63	1 U	1 U	1 U	1 U	1 U
TOC	5310B	mg/L	1.55	1.40 U	1.34	1.00 U	1.00 U	1.04
Dissolved Metals								
Arsenic	6010B	mg/L	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
Iron	6010B	mg/L	0.0995 J	2.72	0.609	0.111 J	0.117 J	0.797
Manganese	6010B	mg/L	0.448	0.903	0.434	0.0433 J	0.0484 J	0.204
Volatile Organic Compounds								
1,1,1,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	8260B	µg/L	0.83 J	0.57 J	1.0 U	1.0 U	1.0 U	0.52 J
1,1-Dichloroethene	8260B	µg/L	0.50 U	4.9	0.73	0.52	0.51	2.2
1,1-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

TABLE 2-9
SHELL HORIZON BIOBARRIER 1 ANALYTICAL RESULTS

		Location	IW-70-SHB113	IW-70-SHB217	MW-70-MNA13	MW-70-PMW09		MW-70-PMW10
		Sample ID	IR70-A14-041	IR70-A14-043	IR70-A14-044	IR70-A14-040	IR70-A14-096	IR70-A14-042
		QA/QC					Duplicate	
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/18/2014	12/18/2014	12/15/2014
Parameter	**Method**	**Unit**						
2-Butanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
2-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
4-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-Pentanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Carbon Disulfide	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.23 J
Carbon Tetrachloride	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Chloroform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
cis-1,2-Dichloroethene	8260B	µg/L	12	1200	72	67	66	530
cis-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromomethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Ethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Freon113	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
m/p-Xylenes	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MTBE	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o-Xylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p-Isopropyltoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Sec-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tert-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trans-1,2-Dichloroethene	8260B	µg/L	9.9	54	2.3	1.0	1.0	20

TABLE 2-9
SHELL HORIZON BIOBARRIER 1 ANALYTICAL RESULTS

		Location	IW-70-SHB113	IW-70-SHB217	MW-70-MNA13	MW-70-PMW09		MW-70-PMW10
		Sample ID	IR70-A14-041	IR70-A14-043	IR70-A14-044	IR70-A14-040	IR70-A14-096	IR70-A14-042
		QA/QC					Duplicate	
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/18/2014	12/18/2014	12/15/2014
Parameter	**Method**	**Unit**						
Trans-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	8260B	µg/L	0.50 J	8.3	3.4 J	3.6 J	3.4 J	0.54 J
Trichlorofluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl Chloride	8260B	µg/L	120	3.1	11	0.50 U	0.23 J	180
Xylenes (Total)	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dehalococcoides (Dhc)/Vinyl Chloride Reductase (vcrA)								
Dehalococcoides16 S rRNA gene	Gene-Trac Dhc	gene copies/liter	30000000	2000 J	3000000	1000 U	---	600000
vinyl chloride reductase A gene	Gene-Trac VC	gene copies/liter	70000000	2000 J	3000	---*	---	30000
Dissolved Hydrocarbon Gases								
Ethane	RSK-175	µg/L	2.4	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Ethene	RSK-175	µg/L	160	0.99 J	2.0 U	2.0 U	2.0 U	11
Methane	RSK-175	µg/L	21000	110	310	5.6	19	10000

Notes:
U = Not Detected
J = Estimated value
C – Correction factor applied to correct for non-specific PCR amplification products, value is an estimated quantity.
L = Liter
µg/L = micrograms per liter
mg/L = milligrams per liter
--- = not analyzed
* = not analyzed since dehalococcoides was not detected

This Page Intentionally Left Blank

TABLE 2-10
SHELL HORIZON BIOBARRIER 3 ANALYTICAL RESULTS

		Location	IW-70-SHB310	IW-70-SHB311	MW-70-MNA14	MW-70-PMW11A	MW-70-PMW11B	MW-70-PMW12A	MW-70-PMW12B
		Sample ID	IR70-A14-047	IR70-A14-048	IR70-A14-051	IR70-A14-045	IR70-A14-046	IR70-A14-049	IR70-A14-050
		QA/QC							
		Sample Date	12/15/2014	12/16/2014	12/16/2014	12/16/2014	12/16/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**							
Wet Chemistry									
Total Alkalinity	2320B	mg/L	269	886	---	263	202	147	212
TDS	2540C	mg/L	5790	2510	---	19900	4710	376	4560
Bromide	300.0	mg/L	7.90	3.03	---	38.9	7.98	1.00 U	6.71
Chloride-Cl	300.0	mg/L	2490	985	---	12000	2250	37.2	2120
Nitrate-N	300.0	mg/L	1.00 U	0.299 J	---	0.351 J	0.0577 J	3.93	0.0590 J
NITRITE-N	300.0	mg/L	1.60 U	1.00 U	---	8.00 U	1.60 U	0.400 U	1.00 U
Sulfate	300.0	mg/L	31.3	1.82 J	---	1750	605	21.3	510
Acetate	300.0_MOD	mg/L	32.4	1.00 U	1.00 U	2.00 U	1.00 U	1.00 U	1.00 U
Butyrate	300.0_MOD	mg/L	277	1.00 U	1.00 U	2.00 U	1.00 U	1.00 U	1.00 U
Lactate	300.0_MOD	mg/L	1.00 U	1.00 U	1.00 U	2.00 U	1.00 U	1.00 U	1.00 U
Propionate	300.0_MOD	mg/L	382	1.00 U	1.00 U	2.00 U	1.00 U	1.00 U	1.00 U
Sulfide	4500_S2_F	mg/L	6.06	1 U	---	5.58	1 U	1 U	1 U
TOC	5310B	mg/L	1500	22.6	---	1.64	1.40	29.9	1.93
Dissolved Metals									
Arsenic	6010B	mg/L	0.200 U	0.200 U	---	0.200 U	0.200 U	0.0524 J	0.200 U
Iron	6010B	mg/L	151	26.0	---	0.0431 J	1.67	0.987	6.75
Manganese	6010B	mg/L	2.51	1.05	---	3.52	0.428	0.0504 J	0.364
Volatile Organic Compounds									
1,1,1,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	8260B	µg/L	1.0 U	1.0 U	0.28 J	1.0 U	0.64 J	1.0 U	0.54 J
1,1-Dichloroethene	8260B	µg/L	0.50 U	0.50 U	4.8	0.50 U	4.7	0.50 U	2.5
1,1-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

TABLE 2-10
SHELL HORIZON BIOBARRIER 3 ANALYTICAL RESULTS

		Location	IW-70-SHB310	IW-70-SHB311	MW-70-MNA14	MW-70-PMW11A	MW-70-PMW11B	MW-70-PMW12A	MW-70-PMW12B
		Sample ID	IR70-A14-047	IR70-A14-048	IR70-A14-051	IR70-A14-045	IR70-A14-046	IR70-A14-049	IR70-A14-050
		QA/QC							
		Sample Date	12/15/2014	12/16/2014	12/16/2014	12/16/2014	12/16/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**							
Wet Chemistry									
Total Alkalinity	2320B	mg/L	269	886	---	263	202	147	212
2-Butanone	8260B	µg/L	360	10 U	10 U	10 U	10 U	10 U	10 U
2-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	8260B	µg/L	120	10 U	10 U	10 U	10 U	10 U	10 U
4-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-Pentanone	8260B	µg/L	80	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	8260B	µg/L	1100	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	8260B	µg/L	0.26 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Carbon Disulfide	8260B	µg/L	0.36 J	0.41 J	0.22 J	1.0 U	1.0 U	1.0 U	1.0 U
Carbon Tetrachloride	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	8260B	µg/L	0.38 J	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Chloroform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	8260B	µg/L	0.34 J	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
cis-1,2-Dichloroethene	8260B	µg/L	120	0.29 J	1600	18	860	1.0 U	500
cis-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromomethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Ethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Freon113	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
m/p-Xylenes	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MTBE	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o-Xylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p-Isopropyltoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Sec-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tert-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

TABLE 2-10
SHELL HORIZON BIOBARRIER 3 ANALYTICAL RESULTS

		Location	IW-70-SHB310	IW-70-SHB311	MW-70-MNA14	MW-70-PMW11A	MW-70-PMW11B	MW-70-PMW12A	MW-70-PMW12B
		Sample ID	IR70-A14-047	IR70-A14-048	IR70-A14-051	IR70-A14-045	IR70-A14-046	IR70-A14-049	IR70-A14-050
		QA/QC							
		Sample Date	12/15/2014	12/16/2014	12/16/2014	12/16/2014	12/16/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**							
Wet Chemistry									
Total Alkalinity	2320B	mg/L	269	886	---	263	202	147	212
Toluene	8260B	µg/L	0.73 J	0.43 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trans-1,2-Dichloroethene	8260B	µg/L	8.3	2.0	22	8.8	84	1.0 U	45
Trans-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	8260B	µg/L	6.3	5.0 U	3.5 J	1.5 J	7.0	5.0 U	5.7
Trichlorofluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl Chloride	8260B	µg/L	9.2	3.0	180	66	33	0.50 U	180
Xylenes (Total)	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dehalococcoides (Dhc)/Vinyl Chloride Reductase (vcrA)									
Dehalococcoides16 S rRNA gene	Gene-Trac Dhc	gene copies/liter	600000	1000000	10000	2000 J	2000000	8000 J	6000
vinyl chloride reductase A gene	Gene-Trac VC	gene copies/liter	5000000	2000000	1000 U	1000 J	1000000	300000 C	40000 C
Dissolved Hydrocarbon Gases									
Ethane	RSK-175	µg/L	2.0 U	1.3 J	3.8	2.0 U	2.0 U	2.0 U	0.67 J
Ethene	RSK-175	µg/L	2.0 J	2.0 U	30	2.4	2.8	2.0 U	11
Methane	RSK-175	µg/L	11000	20000	25000	920	17	66	12000

Notes:
U = Not Detected
J = Estimated value
C – Correction factor applied to correct for non-specific PCR amplification products, value is an estimated quantity.
L = Liter
µg/L = micrograms per liter
mg/L = milligrams per liter
--- = not analyzed

This Page Intentionally Left Blank

TABLE 2-11
SHELL HORIZON POINT OF COMPLIANCE ANALYTICAL RESULTS

		Location	MW-70-23
		Sample ID	IR70-A14-073
		QA/QC	
		Sample Date	12/15/2014
Parameter	**Method**	**Unit**	
Volatile Organic Compounds			
1,1,1,2-Tetrachloroethane	8260B	µg/L	1.0 U
1,1,1-Trichloroethane	8260B	µg/L	1.0 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	1.0 U
1,1,2-Trichloroethane	8260B	µg/L	1.0 U
1,1-Dichloroethane	8260B	µg/L	1.0 U
1,1-Dichloroethene	8260B	µg/L	0.50 U
1,1-Dichloropropene	8260B	µg/L	1.0 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.0 U
1,2,3-Trichloropropane	8260B	µg/L	1.0 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.0 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.0 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.0 U
1,2-Dibromoethane	8260B	µg/L	1.0 U
1,2-Dichlorobenzene	8260B	µg/L	1.0 U
1,2-Dichloroethane	8260B	µg/L	0.50 U
1,2-Dichloropropane	8260B	µg/L	1.0 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.0 U
1,3-Dichlorobenzene	8260B	µg/L	1.0 U
1,4-Dichlorobenzene	8260B	µg/L	1.0 U
2,2-Dichloropropane	8260B	µg/L	1.0 U
2-Butanone	8260B	µg/L	10 U
2-Chlorotoluene	8260B	µg/L	1.0 U
2-Hexanone	8260B	µg/L	10 U
4-Chlorotoluene	8260B	µg/L	1.0 U
4-Methyl-2-Pentanone	8260B	µg/L	10 U
Acetone	8260B	µg/L	10 U
Benzene	8260B	µg/L	1.0 U
Bromobenzene	8260B	µg/L	1.0 U
Bromodichloromethane	8260B	µg/L	1.0 U
Bromoform	8260B	µg/L	1.0 U
Bromomethane	8260B	µg/L	2.0 U
Carbon Disulfide	8260B	µg/L	1.0 U
Carbon Tetrachloride	8260B	µg/L	0.50 U
Chlorobenzene	8260B	µg/L	1.0 U
Chloroethane	8260B	µg/L	2.0 U
Chloroform	8260B	µg/L	1.0 U
Chloromethane	8260B	µg/L	2.0 U
cis-1,2-Dichloroethene	8260B	µg/L	1.0 U
cis-1,3-Dichloropropene	8260B	µg/L	1.0 U
Dibromochloromethane	8260B	µg/L	1.0 U
Dibromomethane	8260B	µg/L	1.0 U
Dichlorodifluoromethane	8260B	µg/L	2.0 U
Ethylbenzene	8260B	µg/L	1.0 U
Freon113	8260B	µg/L	1.0 U
Hexachlorobutadiene	8260B	µg/L	1.0 U
Isopropyl Benzene	8260B	µg/L	1.0 U
m/p-Xylenes	8260B	µg/L	1.0 U
Methylene Chloride	8260B	µg/L	1.0 U
MTBE	8260B	µg/L	1.0 U
n-Butylbenzene	8260B	µg/L	1.0 U
n-Propylbenzene	8260B	µg/L	1.0 U
o-Xylene	8260B	µg/L	1.0 U
p-Isopropyltoluene	8260B	µg/L	1.0 U
Sec-Butylbenzene	8260B	µg/L	1.0 U
Styrene	8260B	µg/L	1.0 U
Tert-Butylbenzene	8260B	µg/L	1.0 U
Tetrachloroethylene	8260B	µg/L	1.0 U
Toluene	8260B	µg/L	1.0 U
Trans-1,2-Dichloroethene	8260B	µg/L	1.0 U
Trans-1,3-Dichloropropene	8260B	µg/L	1.0 U
Trichloroethene	8260B	µg/L	5.0 U
Trichlorofluoromethane	8260B	µg/L	2.0 U
Vinyl Chloride	8260B	µg/L	0.50 U
Xylenes (Total)	8260B	µg/L	2.0 U

Notes:
U = Not Detected
L = Liter
µg/L = micrograms per liter

This Page Intentionally Left Blank

TABLE 2-12
SECOND SAND BIOBARRIER 1 ANALYTICAL RESULTS

		Location	IW-70-SSB109		IW-70-SSB119	MW-70-14	MW-70-15	MW-70-43B	MW-70-49	MW-70-MNA16	MW-70-MNA17
		Sample ID	IR70-A14-054	IR70-A14-097	IR70-A14-055	IR70-A14-061	IR70-A14-063	IR70-A14-062	IR70-A14-060	IR70-A14-058	IR70-A14-059
		QA/QC		Duplicate							MS/MSD
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/16/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**									
Wet Chemistry											
Total Alkalinity	2320B	mg/L	671	672	974	---	---	---	---	---	---
TDS	2540C	mg/L	12600	12200	6620	---	---	---	---	---	---
Bromide	300.0	mg/L	22.1	22.1	11.4	---	---	---	---	---	---
Chloride-Cl	300.0	mg/L	6490	6680	3270	---	---	---	---	---	---
Nitrate-N	300.0	mg/L	0.313 J	0.318 J	0.287 J	---	---	---	---	---	---
NITRITE-N	300.0	mg/L	3.20 U	3.20 U	2.00 U	---	---	---	---	---	---
Sulfate	300.0	mg/L	462	471	16.2	---	---	---	---	---	---
Acetate	300.0_MOD	mg/L	5.00 U	5.00 U	2.00 U	1.00 U	2.00 U	1.00 U	2.00 U	2.00 U	5.00 U
Butyrate	300.0_MOD	mg/L	5.00 U	5.00 U	2.00 U	1.00 U	2.00 U	1.00 U	2.00 U	2.00 U	5.00 U
Lactate	300.0_MOD	mg/L	5.00 U	5.00 U	2.00 U	1.00 U	2.00 U	1.00 U	2.00 U	2.00 U	5.00 U
Propionate	300.0_MOD	mg/L	5.00 U	5.00 U	2.00 U	1.00 U	2.00 U	1.00 U	2.00 U	2.00 U	5.00 U
Sulfide	4500_S2_F	mg/L	57.8	57.7	55.4	---	---	---	---	---	---
TOC	5310B	mg/L	37.3	35.6	51.3	---	---	---	---	---	---
Dissolved Metals											
Arsenic	6010B	mg/L	0.200 U	0.200 U	0.200 U	---	---	---	---	---	---
Iron	6010B	mg/L	0.637	0.516	0.385	---	---	---	---	---	---
Manganese	6010B	mg/L	0.373	0.372	0.851	---	---	---	---	---	---
Volatile Organic Compounds											
1,1,1,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	0.72 J	1.0 U	1.0 U	0.26 J	0.47 J	1.0 U
1,1-Dichloroethene	8260B	µg/L	0.50 U	0.50 U	0.50 U	5.5	0.28 J	0.50 U	1.5	5.8	0.50 U
1,1-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	8260B	µg/L	10 U	10 U	4.1 J	10 U	10 U	10 U	10 U	10 U	10 U

TABLE 2-12
SECOND SAND BIOBARRIER 1 ANALYTICAL RESULTS

		Sample ID	IR70-A14-054	IR70-A14-097	IR70-A14-055	IR70-A14-061	IR70-A14-063	IR70-A14-062	IR70-A14-060	IR70-A14-058	IR70-A14-059
		QA/QC		Duplicate							MS/MSD
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/16/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**									
2-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	8260B	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-Pentanone	8260B	µg/L	10 U	10 U	6.1 J	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	8260B	µg/L	10 U	10 U	6.5 J	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Carbon Disulfide	8260B	µg/L	0.38 J	1.0	0.32 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon Tetrachloride	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	8260B	µg/L	2.0 U	2.0 U	0.42 J	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Chloroform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
cis-1,2-Dichloroethene	8260B	µg/L	2.3	2.1	0.38 J	1100	39	8.2	280	1500	1.2
cis-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromomethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Ethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Freon113	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
m/p-Xylenes	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MTBE	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
o-Xylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
p-Isopropyltoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Sec-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tert-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	8260B	µg/L	1.0 U	1.0 U	0.98 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trans-1,2-Dichloroethene	8260B	µg/L	14	12	11	78	0.37 J	6.5	18	60	0.90 J
Trans-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	8260B	µg/L	0.69 J	0.58 J	5.0 U	6.1	8.3	79	5.6	11	9.7
Trichlorofluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

TABLE 2-12
SECOND SAND BIOBARRIER 1 ANALYTICAL RESULTS

		Sample ID	IR70-A14-054	IR70-A14-097	IR70-A14-055	IR70-A14-061	IR70-A14-063	IR70-A14-062	IR70-A14-060	IR70-A14-058	IR70-A14-059
		QA/QC		Duplicate							MS/MSD
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/15/2014	12/16/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**									
Vinyl Chloride	8260B	µg/L	35	39	4.3	8.0	0.50 U	0.50 U	0.85	5.2	0.50 U
Xylenes (Total)	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dehalococcoides (Dhc)/Vinyl Chloride Reductase (vcrA)											
Dehalococcoides16 S rRNA gene	Gene-Trac Dhc	gene copies/liter	300000	---	60000	200000	1000 U	1000 U	1000 U	100000	1000 U
vinyl chloride reductase A gene	Gene-Trac VC	gene copies/liter	3000000	---	100000	80000 C	---*	---*	---*	900000	---*
Dissolved Hydrocarbon Gases											
Ethane	RSK-175	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Ethene	RSK-175	µg/L	9.5	7.5	7.3	2.0 U	2.0 U	2.0 U	2.0 J	1.8 J	2.0 U
Methane	RSK-175	µg/L	26000	21000	18000	490	4.0	6.6	16	16000	6.2

Notes:
U = Not Detected
J = Estimated value
C – Correction factor applied to correct for non-specific PCR amplification products, value is an estimated quantity.
L = Liter
µg/L = micrograms per liter
mg/L = milligrams per liter
--- = not analyzed
* = not analyzed since dehalococcoides was not detected

TABLE 2-12
SECOND SAND BIOBARRIER 1 ANALYTICAL RESULTS

		Location	MW-70-PMW13A	MW-70-PMW13B	MW-70-PMW14A	MW-70-PMW14B
		Sample ID	IR70-A14-052	IR70-A14-053	IR70-A14-056	IR70-A14-057
		QA/QC				
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**				
Wet Chemistry						
Total Alkalinity	2320B	mg/L	237	195	161	312
TDS	2540C	mg/L	5210	10400	2910	8640
Bromide	300.0	mg/L	8.51	18.1	4.92	15.1
Chloride-Cl	300.0	mg/L	2570	5360	1460	4580
Nitrate-N	300.0	mg/L	0.106 J	0.0723 J	0.0562 J	0.0855 J
NITRITE-N	300.0	mg/L	1.60 U	3.20 U	0.800 U	2.00 U
Sulfate	300.0	mg/L	590	957	318	672
Acetate	300.0_MOD	mg/L	1.00 U	2.00 U	1.00 U	2.00 U
Butyrate	300.0_MOD	mg/L	1.00 U	2.00 U	1.00 U	2.00 U
Lactate	300.0_MOD	mg/L	1.00 U	2.00 U	1.00 U	2.00 U
Propionate	300.0_MOD	mg/L	1.00 U	2.00 U	1.00 U	2.00 U
Sulfide	4500_S2_F	mg/L	1 U	1 U	1 U	1 U
TOC	5310B	mg/L	1.62	1.30	3.09	2.56
Dissolved Metals						
Arsenic	6010B	mg/L	0.200 U	0.200 U	0.200 U	0.00931 J
Iron	6010B	mg/L	2.98	2.14	2.66	17.5
Manganese	6010B	mg/L	0.553	0.873	0.282	0.872
Volatile Organic Compounds						
1,1,1,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	8260B	µg/L	0.50 J	0.50 J	0.23 J	0.39 J
1,1-Dichloroethene	8260B	µg/L	5.0	6.0	1.6	2.0
1,1-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	8260B	µg/L	10 U	10 U	10 U	10 U

TABLE 2-12
SECOND SAND BIOBARRIER 1 ANALYTICAL RESULTS

		Sample ID	IR70-A14-052	IR70-A14-053	IR70-A14-056	IR70-A14-057
		QA/QC				
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**				
2-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	8260B	µg/L	10 U	10 U	10 U	10 U
4-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-Pentanone	8260B	µg/L	10 U	10 U	10 U	10 U
Acetone	8260B	µg/L	10 U	10 U	10 U	10 U
Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Bromobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U
Carbon Disulfide	8260B	µg/L	0.23 J	1.0 U	1.0 U	1.0 U
Carbon Tetrachloride	8260B	µg/L	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U
Chloroform	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U
cis-1,2-Dichloroethene	8260B	µg/L	770	1000	470	510
cis-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Dibromomethane	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U
Ethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Freon113	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Isopropyl Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
m/p-Xylenes	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride	8260B	µg/L	3.8	1.0 U	1.0 U	1.0 U
MTBE	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
n-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
n-Propylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
o-Xylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
p-Isopropyltoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Sec-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Tert-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethylene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Trans-1,2-Dichloroethene	8260B	µg/L	100	54	36	35
Trans-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	8260B	µg/L	12	8.4	3.0 J	5.9
Trichlorofluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U

TABLE 2-12
SECOND SAND BIOBARRIER 1 ANALYTICAL RESULTS

		Sample ID	IR70-A14-052	IR70-A14-053	IR70-A14-056	IR70-A14-057
		QA/QC				
		Sample Date	12/15/2014	12/15/2014	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**				
Vinyl Chloride	8260B	µg/L	200	8.2	49	310
Xylenes (Total)	8260B	µg/L	2.0 U	2.0 U	2.0 U	2.0 U
Dehalococcoides (Dhc)/Vinyl Chloride Reductase (vcrA)						
Dehalococcoides16 S rRNA gene	Gene-Trac Dhc	gene copies/liter	6000	2000 J	20000	30000
vinyl chloride reductase A gene	Gene-Trac VC	gene copies/liter	1000 U	0 J	1000 U	2000 J, C
Dissolved Hydrocarbon Gases						
Ethane	RSK-175	µg/L	2.0 U	2.0 U	2.0 U	3.5
Ethene	RSK-175	µg/L	4.6	0.69 J	5.0	18
Methane	RSK-175	µg/L	1300	47	480	16000

Notes:
U = Not Detected
J = Estimated value
C – Correction factor applied to correct for non-specific PCR amplification products,
L = Liter
µg/L = micrograms per liter
mg/L = milligrams per liter
--- = not analyzed
* = not analyzed since dehalococcoides was not detected

TABLE 2-13
SECOND SAND POINT OF COMPLIANCE ANALYTICAL RESULTS

		Location	MW-70-21	MW-70-36
		Sample ID	IR70-A14-075	IR70-A14-074
		QA/QC		
		Sample Date	12/15/2014	12/15/2014
Parameter	**Method**	**Unit**		
Volatile Organic Compounds				
1,1,1,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U
1,1,1-Trichloroethane	8260B	µg/L	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U
1,1,2-Trichloroethane	8260B	µg/L	1.0 U	1.0 U
1,1-Dichloroethane	8260B	µg/L	1.0 U	1.0 U
1,1-Dichloroethene	8260B	µg/L	0.50 U	0.50 U
1,1-Dichloropropene	8260B	µg/L	1.0 U	1.0 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U
1,2,3-Trichloropropane	8260B	µg/L	1.0 U	1.0 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.0 U	2.0 U
1,2-Dibromoethane	8260B	µg/L	1.0 U	1.0 U
1,2-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U
1,2-Dichloroethane	8260B	µg/L	0.50 U	0.50 U
1,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U
1,3-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U
1,4-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U
2,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U
2-Butanone	8260B	µg/L	10 U	10 U
2-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U
2-Hexanone	8260B	µg/L	10 U	10 U
4-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U
4-Methyl-2-Pentanone	8260B	µg/L	10 U	10 U
Acetone	8260B	µg/L	10 U	10 U
Benzene	8260B	µg/L	1.0 U	1.0 U
Bromobenzene	8260B	µg/L	1.0 U	1.0 U
Bromodichloromethane	8260B	µg/L	1.0 U	1.0 U
Bromoform	8260B	µg/L	1.0 U	1.0 U
Bromomethane	8260B	µg/L	2.0 U	2.0 U
Carbon Disulfide	8260B	µg/L	1.0 U	1.0 U
Carbon Tetrachloride	8260B	µg/L	0.50 U	0.50 U
Chlorobenzene	8260B	µg/L	1.0 U	1.0 U
Chloroethane	8260B	µg/L	2.0 U	2.0 U
Chloroform	8260B	µg/L	1.0 U	1.0 U
Chloromethane	8260B	µg/L	2.0 U	2.0 U
cis-1,2-Dichloroethene	8260B	µg/L	1.0 U	0.23 J
cis-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U
Dibromochloromethane	8260B	µg/L	1.0 U	1.0 U
Dibromomethane	8260B	µg/L	1.0 U	1.0 U
Dichlorodifluoromethane	8260B	µg/L	2.0 U	2.0 U
Ethylbenzene	8260B	µg/L	1.0 U	1.0 U
Freon113	8260B	µg/L	1.0 U	1.0 U
Hexachlorobutadiene	8260B	µg/L	1.0 U	1.0 U
Isopropyl Benzene	8260B	µg/L	1.0 U	1.0 U
m/p-Xylenes	8260B	µg/L	1.0 U	1.0 U
Methylene Chloride	8260B	µg/L	1.0 U	1.0 U
MTBE	8260B	µg/L	1.0 U	1.0 U
n-Butylbenzene	8260B	µg/L	1.0 U	1.0 U
n-Propylbenzene	8260B	µg/L	1.0 U	1.0 U
o-Xylene	8260B	µg/L	1.0 U	1.0 U
p-Isopropyltoluene	8260B	µg/L	1.0 U	1.0 U
Sec-Butylbenzene	8260B	µg/L	1.0 U	1.0 U
Styrene	8260B	µg/L	1.0 U	1.0 U
Tert-Butylbenzene	8260B	µg/L	1.0 U	1.0 U
Tetrachloroethylene	8260B	µg/L	1.0 U	12
Toluene	8260B	µg/L	1.0 U	1.0 U
Trans-1,2-Dichloroethene	8260B	µg/L	1.0 U	1.0 U
Trans-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U
Trichloroethene	8260B	µg/L	5.0 U	5.0 U
Trichlorofluoromethane	8260B	µg/L	2.0 U	2.0 U
Vinyl Chloride	8260B	µg/L	0.50 U	0.50 U
Xylenes (Total)	8260B	µg/L	2.0 U	2.0 U

Notes:

U = Not Detected

L = Liter

µg/L = micrograms per liter

This Page Intentionally Left Blank

TABLE 2-14
DEEP SAND POINT OF COMPLIANCE ANALYTICAL RESULTS

		Location	MW-70-POC02	MW-70-POC03	MW-70-POC04
		Sample ID	IR70-A14-076	IR70-A14-077	IR70-A14-078
		QA/QC			
		Sample Date	12/15/2014	12/17/2014	12/15/2014
Parameter	**Method**	**Unit**			
Volatile Organic Compounds					
1,1,1,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	8260B	µg/L	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	8260B	µg/L	0.50 U	0.50 U	0.50 U
1,1-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U
1,2,3-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U
1,2,3-Trichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U
1,2,4-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U
1,2-Dibromo-3-chloropropane	8260B	µg/L	2.0 U	2.0 U	2.0 U
1,2-Dibromoethane	8260B	µg/L	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	8260B	µg/L	0.50 U	0.50 U	0.50 U
1,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U
2,2-Dichloropropane	8260B	µg/L	1.0 U	1.0 U	1.0 U
2-Butanone	8260B	µg/L	10 U	10 U	10 U
2-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U
2-Hexanone	8260B	µg/L	10 U	10 U	10 U
4-Chlorotoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U
4-Methyl-2-Pentanone	8260B	µg/L	10 U	10 U	10 U
Acetone	8260B	µg/L	10 U	10 U	10 U
Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U
Bromobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U
Bromodichloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U
Bromoform	8260B	µg/L	1.0 U	1.0 U	1.0 U
Bromomethane	8260B	µg/L	2.0 U	2.0 U	2.0 U
Carbon Disulfide	8260B	µg/L	1.0 U	1.0 U	1.0 U
Carbon Tetrachloride	8260B	µg/L	0.50 U	0.50 U	0.50 U
Chlorobenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U
Chloroethane	8260B	µg/L	2.0 U	2.0 U	2.0 U
Chloroform	8260B	µg/L	1.0 U	1.0 U	1.0 U
Chloromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U
cis-1,2-Dichloroethene	8260B	µg/L	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U
Dibromochloromethane	8260B	µg/L	1.0 U	1.0 U	1.0 U
Dibromomethane	8260B	µg/L	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U
Ethylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U
Freon113	8260B	µg/L	1.0 U	1.0 U	1.0 U
Hexachlorobutadiene	8260B	µg/L	1.0 U	1.0 U	1.0 U
Isopropyl Benzene	8260B	µg/L	1.0 U	1.0 U	1.0 U
m/p-Xylenes	8260B	µg/L	1.0 U	1.0 U	1.0 U
Methylene Chloride	8260B	µg/L	1.0 U	1.0 U	1.0 U
MTBE	8260B	µg/L	1.0 U	1.0 U	1.0 U
n-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U
n-Propylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U
o-Xylene	8260B	µg/L	1.0 U	1.0 U	1.0 U
p-Isopropyltoluene	8260B	µg/L	1.0 U	1.0 U	1.0 U
Sec-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U
Styrene	8260B	µg/L	1.0 U	1.0 U	1.0 U
Tert-Butylbenzene	8260B	µg/L	1.0 U	1.0 U	1.0 U
Tetrachloroethylene	8260B	µg/L	1.0 U	1.0 U	1.0 U
Toluene	8260B	µg/L	1.0 U	1.0 U	1.4
Trans-1,2-Dichloroethene	8260B	µg/L	1.0 U	1.0 U	1.0 U
Trans-1,3-Dichloropropene	8260B	µg/L	1.0 U	1.0 U	1.0 U
Trichloroethene	8260B	µg/L	5.0 U	5.0 U	5.0 U
Trichlorofluoromethane	8260B	µg/L	2.0 U	2.0 U	2.0 U
Vinyl Chloride	8260B	µg/L	0.50 U	0.50 U	0.50 U
Xylenes (Total)	8260B	µg/L	2.0 U	2.0 U	2.0 U

Notes:
U = Not Detected
L = Liter
µg/L = micrograms per liter

This Page Intentionally Left Blank

TABLE 2-15
SOIL VAPOR ANALYTICAL RESULTS

		Sample Location	SV-70-01	SV-70-02	SV-70-03	SV-70-04	SV-70-05	SV-70-06	SV-70-07	SV-70-08	SV-70-09	SV-70-10	SV-70-11	SV-70-12
		Sample Date	12/15/2015	12/15/2015	12/15/2015	12/15/2015	12/15/2015	12/15/2015	12/15/2015	12/15/2015	12/15/2015	12/15/2015	12/15/2015	12/15/2015
Parameter	**Method**	**Unit**												
Hydrogen Sulfide														
Hydrogen Sulfide	EPA 16	ppmV	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methane														
Methane	SCAQMD 25.1M	ppmV	19000	430000	600	320	370000	3300	530000	18000	21000	88000	710	2300
Volatile Organic Compounds														
1,1-Dichloroethane	EPA TO-15M	$\mu g/m^3$	ND	ND	ND	ND	ND	ND	ND	ND	120.5	ND	ND	ND
1,1-Dichloroethene	EPA TO-15M	$\mu g/m^3$	ND	406.9	ND	12.2	ND	ND	ND	1,749.7	447.6	1,993.8	175.0	37.4
2-Butanone	EPA TO-15M	$\mu g/m^3$	ND	ND	4.8	7.0	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	EPA TO-15M	$\mu g/m^3$	127.9	ND	3.9	6.6	786.9	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	EPA TO-15M	$\mu g/m^3$	203.5	1,871.7	18.7	122.1	895.2	406.9	6,510.4	73,242.0	5,696.6	44,759.0	11,393.2	2,685.5
Chlorobenzene	EPA TO-15M	$\mu g/m^3$	ND	ND	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	EPA TO-15M	$\mu g/m^3$	ND	ND	ND	ND	ND	ND	ND	2,956.4	ND	240.5	140.3	47.6
Chloromethane	EPA TO-15M	$\mu g/m^3$	ND	ND	1.6	1.5	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	EPA TO-15M	$\mu g/m^3$	ND	ND	2.7	2.6	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	EPA TO-15M	$\mu g/m^3$	ND	ND	5.8	5.3	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	EPA TO-15M	$\mu g/m^3$	ND	ND	7.6	6.7	ND	ND	ND	ND	ND	ND	ND	ND
p/m-Xylene	EPA TO-15M	$\mu g/m^3$	ND	ND	18.3	16.5	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	EPA TO-15M	$\mu g/m^3$	ND	2,645.0	201.9	556.8	ND	ND	ND	264.5	ND	ND	ND	52.9
Toluene	EPA TO-15M	$\mu g/m^3$	ND	ND	ND	20.5	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	EPA TO-15M	$\mu g/m^3$	183.1	150.6	ND	7.3	1,139.3	447.6	17,089.8	4,069.0	813.8	6,917.3	691.7	179.0
Trichloroethene	EPA TO-15M	$\mu g/m^3$	ND	2,867.8	71.7	353.0	ND	ND	ND	2,150.9	5,515.0	992.7	7,169.5	1,599.4
Vinyl Chloride	EPA TO-15M	$\mu g/m^3$	4,459.8	970.7	19.2	10.0	152,157.2	1,416.6	472,212.0	4,722.1	3,935.1	81,325.4	1,416.6	233.5

Notes:
Only VOC detected in at least one sample are shown on the table
Cells highlighted in red indicate an exceedance of applicable criteria
ppmV – parts per million by volume
µg/m3 - micrograms per cubic meter
ND – not detected

This Page Intentionally Left Blank

TABLE 3-1

COMPARISON OF BASELINE (2008), 2012 AND 2014 ANNUAL MAXIMUM AND AVERAGE CONCENTRATIONS OF TCE, CIS-1,2-DCE, AND VC FOR EACH HYDROSTRATIGRAPHIC UNIT

Hydrostratigraphic Unit	Biobarrier	TCE					Cis-1,2-DCE				Vinyl Chloride			
		Baseline 2008		2014			2012		2014		2012		2014	
		Max (µg/L)	Ave (µg/L)	Max (µg/L)	Ave (µg/L)	Ave % Remaining	Max (µg/L)	Ave (µg/L)	Max (µg/L)	Ave (µg/L)	Max (µg/L)	Ave (µg/L)	Max (µg/L)	Ave (µg/L)
Upper Fines	SATG	11,000	4,800	2,800	548	11%	5,700	1,561	790	307	9,000	1,498	3,700	594
	SAB	350	184	6	2	1%	1,600	556	260	88	170	41	140	21
	FSB-1	4,100	1,144	3,400	202	18%	1,500	338	1,200	223	850	181	920	99
	FSB-2	970	299	7	2	1%	910	219	1,300	274	470	71	400	89
First Sand	Total	4,100	542	3,400	69	13%	1,600	371	1,300	195	850	97	920	69
	SHB-1	4,300	1,553	8	3	0%	1,800	620	1,200	325	70	22	180	52
	SHB-3	870	380	7	3	1%	590	152	1,600	443	440	123	180	67
Shell Horizon	Total	4,300	966	8	3	0%	1,800	386	940	342	440	73	140	56
Second Sand	SSB-1	1,100	413	79	12	3%	1,100	393	1,500	437	370	111	310	51

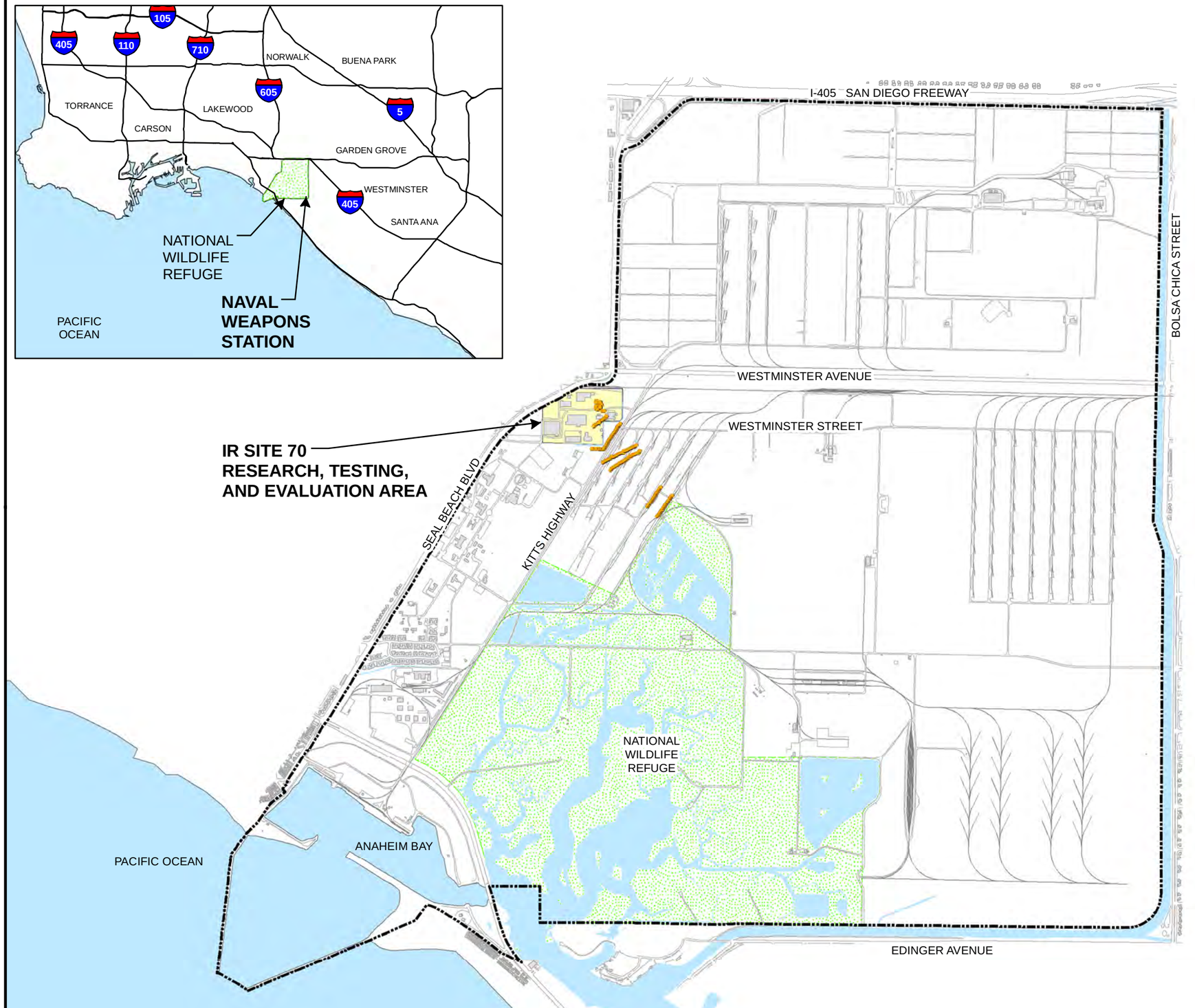
Notes:
Data used to determine the average are from tables on Figures 2-22 to 2-33. Only data from wells sampled in 2008, and the 2012 and 2014 annual events were used.
Detection limit was used for calculations when a result was non-detect.

Abbreviations and Acronyms:
µg/L – micrograms per liter
Ave – average
DCE – dichloroethene
FSB – First Sand Biobarrier
Max – maximum
SAB – Source Area Biobarrier
SATG – Source Area Treatment Grid
SHB – Shell Horizon Biobarrier
SSB – Second Sand Biobarrier
TCE – trichloroethene
VC – vinyl chloride

This page intentionally left blank

FIGURES

This page intentionally left blank.



LEGEND

- IR SITE 70 BOUNDARY
- BASE BOUNDARY
- ROAD
- RAILROAD TRACK
- BUILDING

1,000 0 1,000 2,000 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 1-1
IR SITE 70
SITE LOCATION MAP

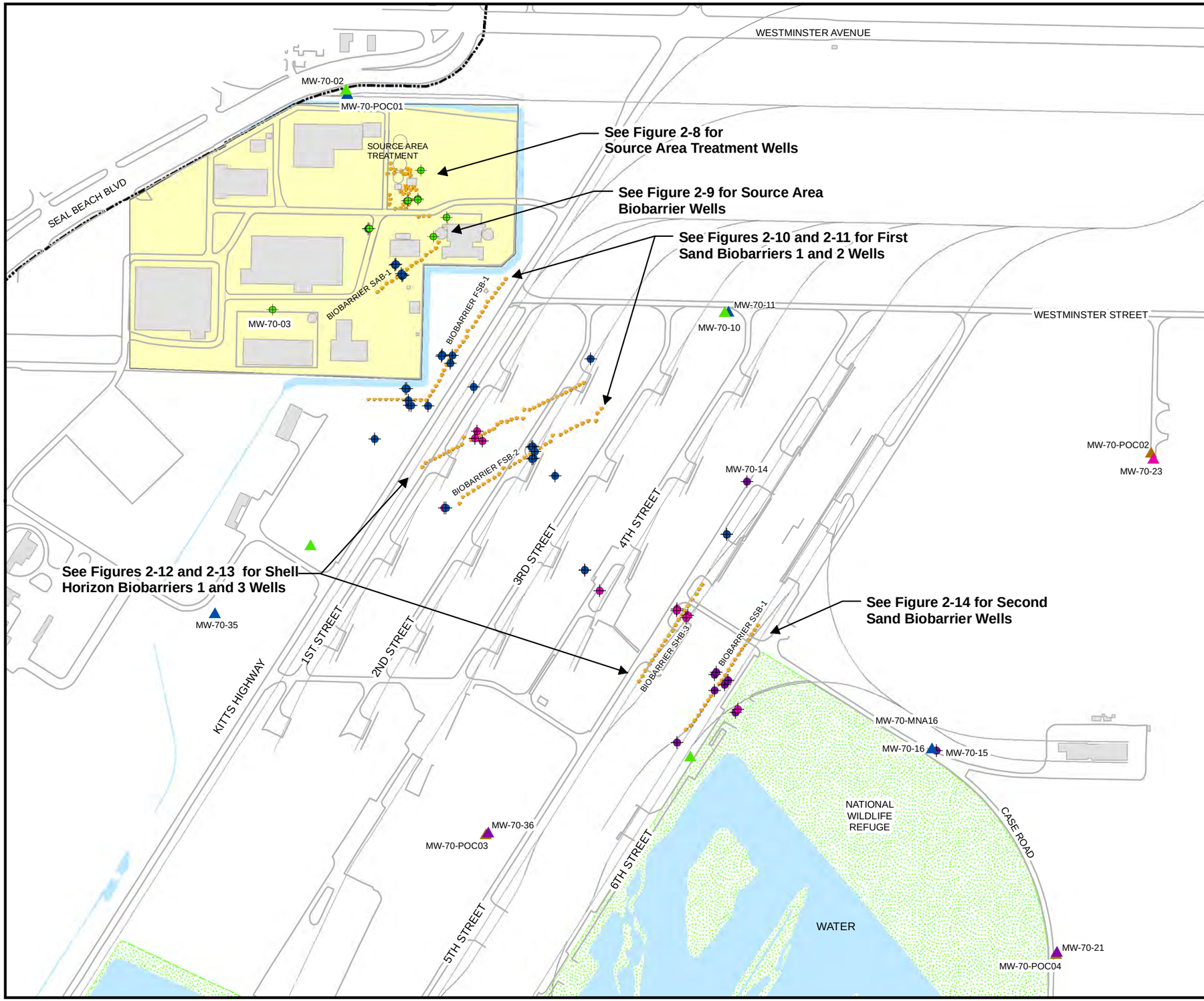
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 1-1.mxd

NAVFAC

ECC-INSIGHT LLC

This Page Intentionally Left Blank



LEGEND

- MW-70-MNA02 — UPPER FINES/SOURCE AREA TREATMENT MONITORING WELL
- MW-70-22 — UPPER FINES/SOURCE AREA TREATMENT POC MONITORING WELL
- MW-70-MNA08 — FIRST SAND MONITORING WELL
- MW-70-11 — FIRST SAND POC MONITORING WELL
- MW-70-MNA14 — SHELL HORIZON MONITORING WELL
- MW-70-23 — SHELL HORIZON POC MONITORING WELL
- MW-70-15 — SECOND SAND MONITORING WELL
- MW-70-36 — SECOND SAND POC MONITORING WELL
- MW-70-POC02 — DEEP SAND POC MONITORING WELL
- BIOBARRIER OR SOURCE AREA TREATMENT WELL
- IR SITE 70 BOUNDARY
- BASE BOUNDARY
- ROAD
- RAILROAD TRACK
- BUILDING

NOTE:

POC - POINT OF COMPLIANCE

200 0 200 400 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 1-2
IR SITE 70
WELL LOCATION MAP

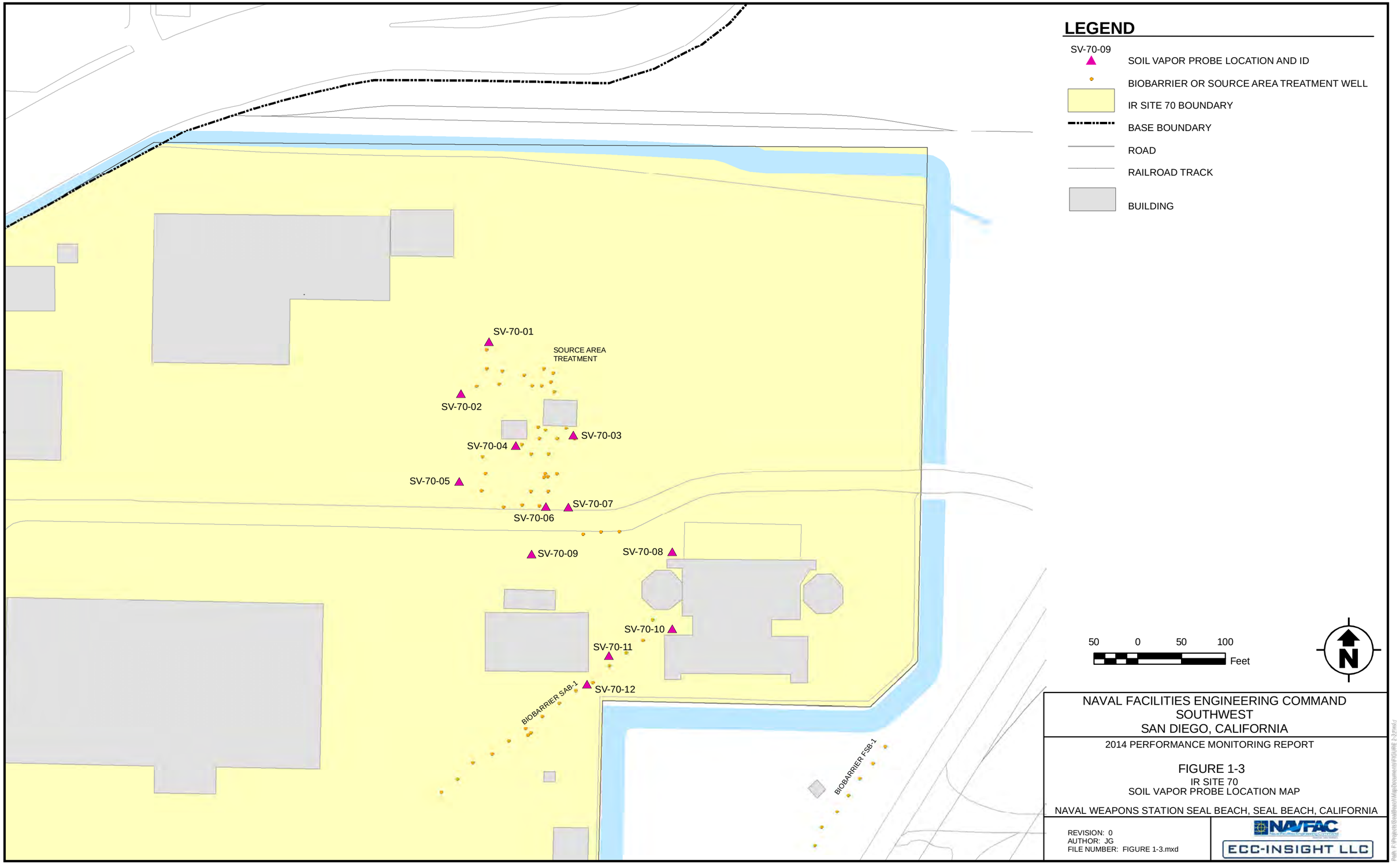
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 1-1.mxd

NAVFAC

ECC-INSIGHT LLC

This Page Intentionally Left Blank



NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

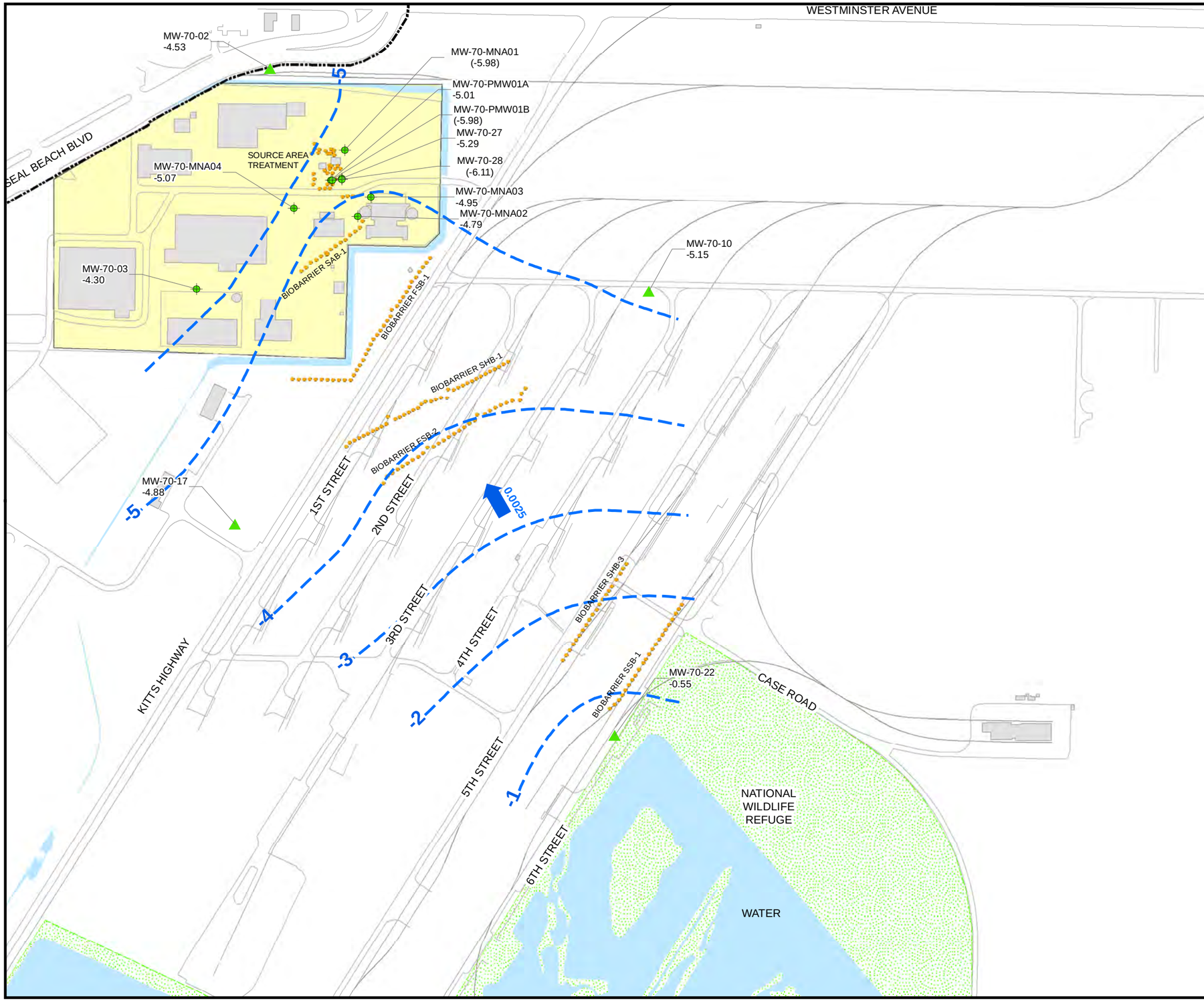
FIGURE 1-3
IR SITE 70
SOIL VAPOR PROBE LOCATION MAP

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 1-3.mxd

NAVFAC
ECC-INSIGHT LLC

This Page Intentionally Left Blank



LEGEND

MW-70-MNA02 -0.82	UPPER FINES/SOURCE AREA TREATMENT MONITORING WELL SHOWING WELL ID AND WATER LEVEL ELEVATION, IN FEET MEAN SEA LEVEL
MW-70-10 -0.63	UPPER FINES POC MONITORING WELL SHOWING WELL ID AND WATER LEVEL ELEVATION, IN FEET MEAN SEA LEVEL
	BIOBARRIER OR SOURCE AREA TREATMENT WELL
0.0025	INFERRED DIRECTION OF GROUNDWATER FLOW WITH GRADIENT
	IR SITE 70 BOUNDARY
	BASE BOUNDARY
	ROAD
	RAILROAD TRACK
	APPROXIMATE GROUNDWATER ELEVATION IN FEET MEAN SEA LEVEL
	BUILDING

NOTES:

WATER LEVELS MEASURED ON DECEMBER 15, 2014

( ) - PARENTHESES INDICATE GROUNDWATER ELEVATION AT THIS WELL WAS NOT USED FOR CONTOURING DUE TO THE DIFFERENCE IN THE ELEVATION OF ITS SCREEN INTERVAL RELATIVE TO THOSE OF NEARBY WELLS.

200 100 0 200 400 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-1
UPPER FINES GROUNDWATER ELEVATIONS
DECEMBER 2014

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

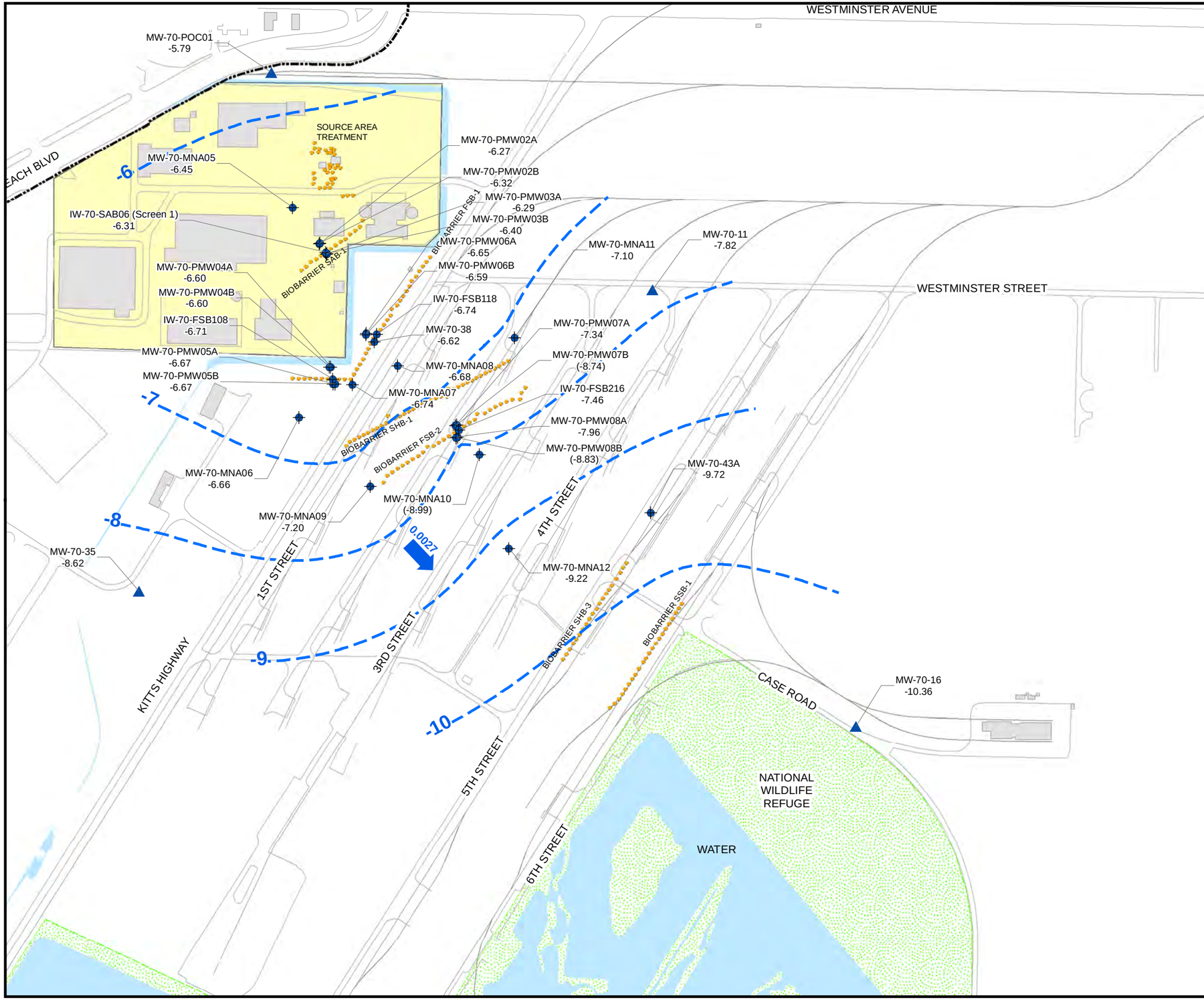
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-1.mxd

NAVFAC

ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-1.mxd

This Page Intentionally Left Blank



LEGEND

MW-70-MNA08 -1.75	FIRST SAND MONITORING WELL SHOWING WELL ID AND WATER LEVEL ELEVATION, IN FEET BGS MEAN SEA LEVEL
MW-70-16 -3.60	FIRST SAND POC MONITORING WELL SHOWING WELL ID AND WATER LEVEL ELEVATION, IN FEET BGS MEAN SEA LEVEL
	BIOBARRIER OR SOURCE AREA TREATMENT WELL
0.0027	INFERRED DIRECTION OF GROUNDWATER FLOW WITH GRADIENT
	IR SITE 70 BOUNDARY
	BASE BOUNDARY
	ROAD
	RAILROAD TRACK
	APPROXIMATE GROUNDWATER ELEVATION, IN FEET MEAN SEA LEVEL
	BUILDING

NOTES:

WATER LEVELS MEASURED ON DECEMBER 15, 2014

( ) - PARENTHESES INDICATE GROUNDWATER ELEVATION AT THIS WELL WAS NOT USED FOR CONTOURING DUE TO THE DIFFERENCE IN THE ELEVATION OF ITS SCREEN INTERVAL RELATIVE TO THOSE OF NEARBY WELLS.

200 100 0 200 400 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-2
FIRST SAND GROUNDWATER ELEVATIONS
DECEMBER 2014

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

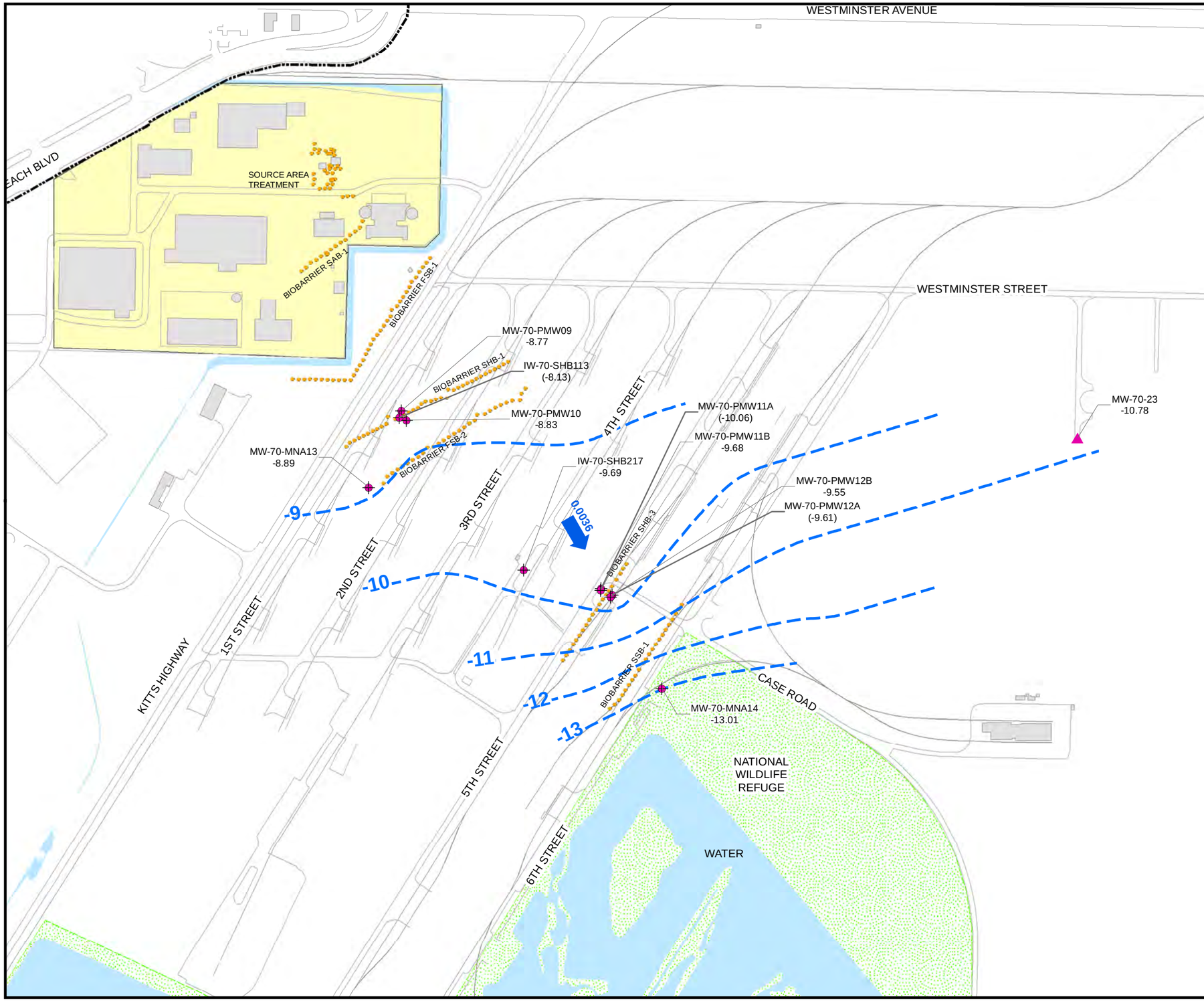
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-2.mxd

NAVFAC

ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-2.mxd

This Page Intentionally Left Blank



LEGEND

MW-70-MNA14 -3.34	SHELL HORIZON MONITORING WELL SHOWING WELL ID AND WATER LEVEL ELEVATION, IN FEET MEAN SEA LEVEL
MW-70-23 -3.68	SHELL HORIZON POC MONITORING WELL SHOWING WELL ID AND WATER LEVEL ELEVATION, IN FEET MEAN SEA LEVEL
	BIOBARRIER OR SOURCE AREA TREATMENT WELL
0.0036	INFERRED DIRECTION OF GROUNDWATER FLOW WITH GRADIENT
	IR SITE 70 BOUNDARY
	BASE BOUNDARY
	ROAD
	RAILROAD TRACK
	APPROXIMATE GROUNDWATER ELEVATION, IN FEET MEAN SEA LEVEL
	BUILDING

NOTES:

WATER LEVELS MEASURED ON DECEMBER 15, 2014

( ) - PARENTHESES INDICATE GROUNDWATER ELEVATION AT THIS WELL WAS NOT USED FOR CONTOURING DUE TO THE DIFFERENCE IN THE ELEVATION OF ITS SCREEN INTERVAL RELATIVE TO THOSE OF NEARBY WELLS.

200 100 0 200 400 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-3
SHELL HORIZON GROUNDWATER ELEVATIONS
DECEMBER 2014

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

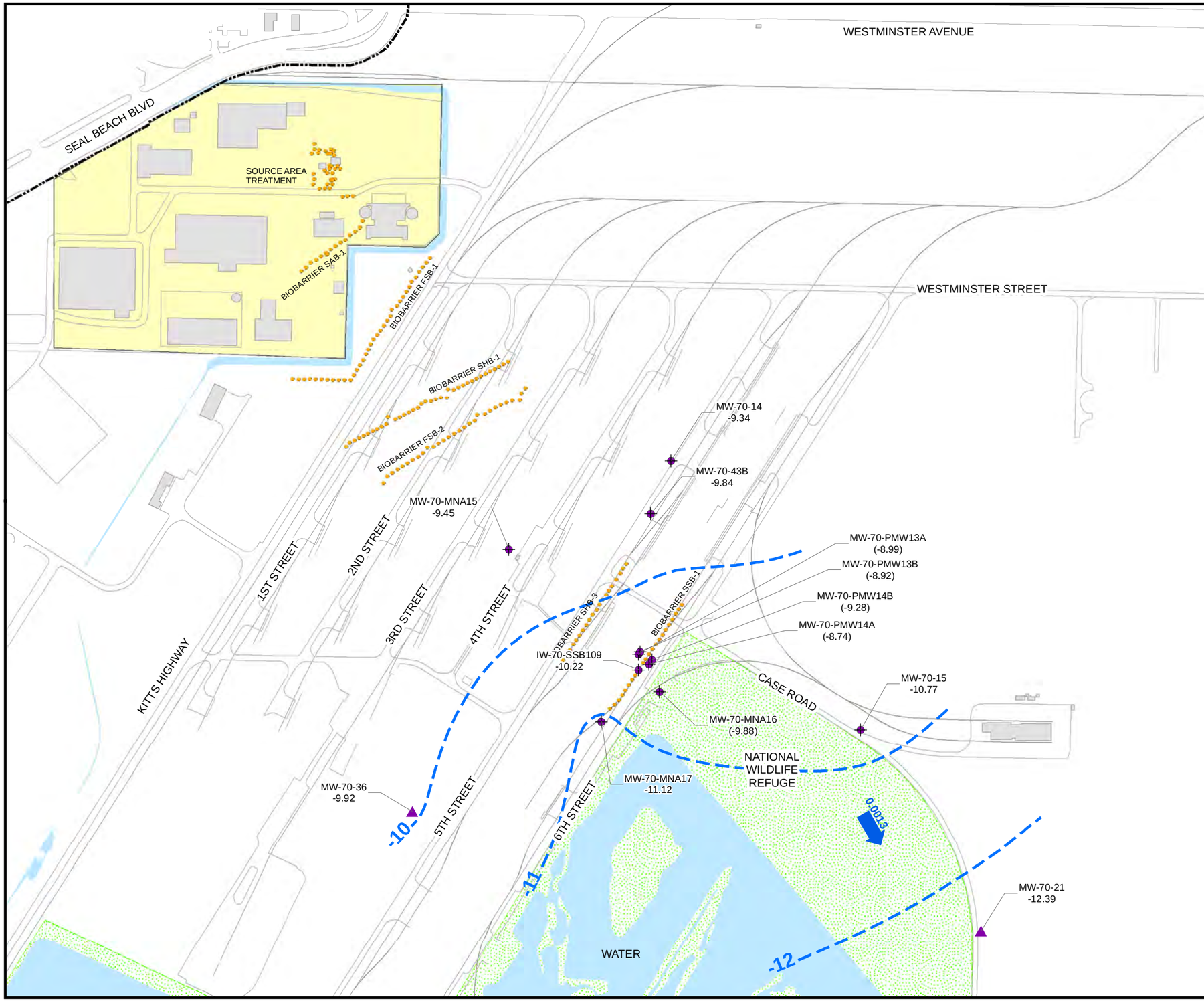
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-3.mxd

NAVFAC

ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-2.mxd

This Page Intentionally Left Blank



LEGEND

- MW-70-15 -3.94 — SECOND SAND MONITORING WELL SHOWING WELL ID AND WATER LEVEL ELEVATION, IN FEET MEAN SEA LEVEL
- MW-70-36 -3.60 — SECOND SAND POC MONITORING WELL SHOWING WELL ID AND WATER LEVEL ELEVATION, IN FEET MEAN SEA LEVEL
- BIOBARRIER OR SOURCE AREA TREATMENT WELL
- 0.0013 — INFERRED DIRECTION OF GROUNDWATER FLOW, WITH GRADIENT
- IR SITE 70 BOUNDARY
- BASE BOUNDARY
- ROAD
- RAILROAD TRACK
- APPROXIMATE GROUNDWATER ELEVATION, IN FEET MEAN SEA LEVEL
- BUILDING

NOTES:

WATER LEVELS MEASURED ON DECEMBER 15, 2014

( ) - PARENTHESES INDICATE GROUNDWATER ELEVATION AT THIS WELL WAS NOT USED FOR CONTOURING DUE TO THE DIFFERENCE IN THE ELEVATION OF ITS SCREEN INTERVAL RELATIVE TO THOSE OF NEARBY WELLS.

200 100 0 200 400 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-4
SECOND SAND GROUNDWATER ELEVATIONS
DECEMBER 2014

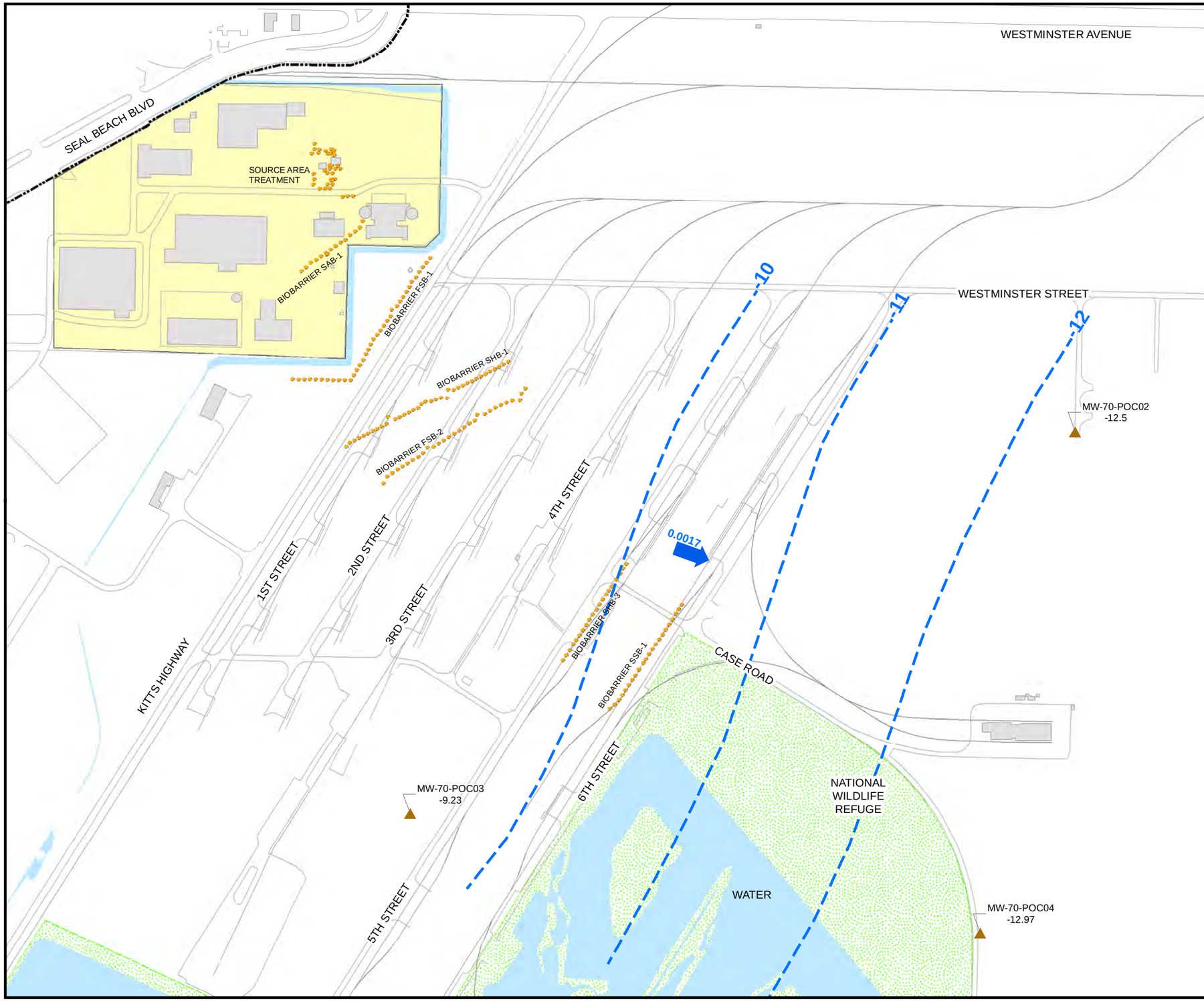
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-4.mxd

NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-4.mxd

This Page Intentionally Left Blank



LEGEND

MW-70-POC02 -4.44 ▲	DEEP SAND POC MONITORING WELL SHOWING WELL ID AND WATER LEVEL ELEVATION, IN FEET MEAN SEA LEVEL
●	BIOBARRIER OR SOURCE AREA TREATMENT WELL
0.0017 ➡	INFERRED DIRECTION OF GROUNDWATER FLOW, WITH GRADIENT
	IR SITE 70 BOUNDARY
	BASE BOUNDARY
	ROAD
	RAILROAD TRACK
- - -	APPROXIMATE GROUNDWATER ELEVATION, IN FEET MEAN SEA LEVEL
	BUILDING

NOTES:

WATER LEVELS MEASURED ON DECEMBER 15, 2014

200 100 0 200 400 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-5
DEEP SAND GROUNDWATER ELEVATIONS
DECEMBER 2014

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 1-1.mxd

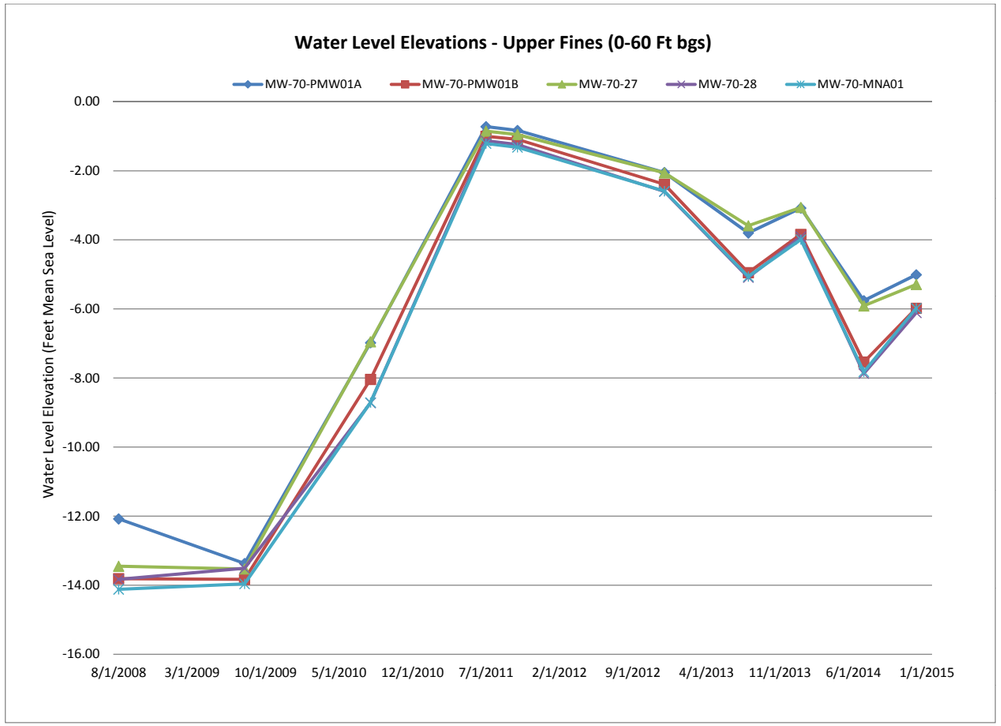
NAVFAC

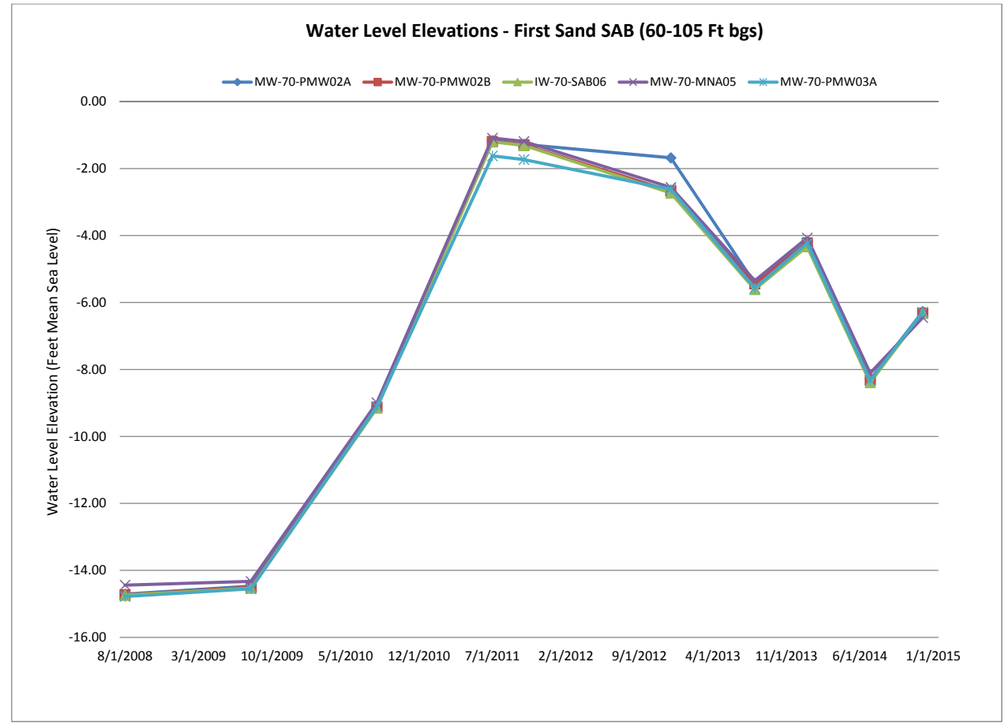
ECC-INSIGHT LLC

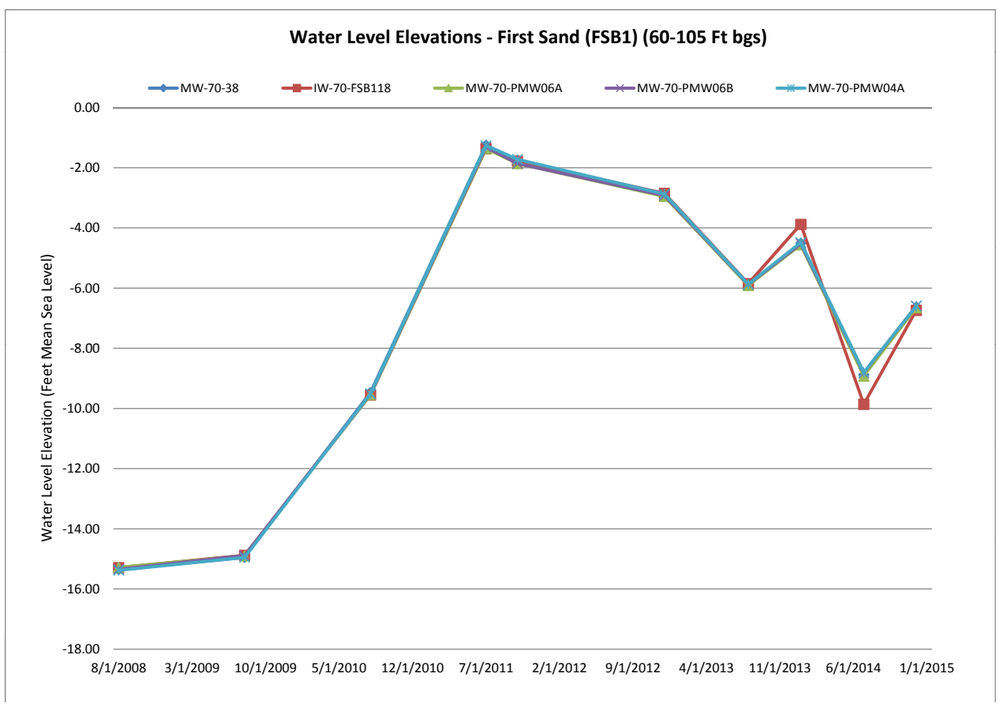
Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-5.mxd

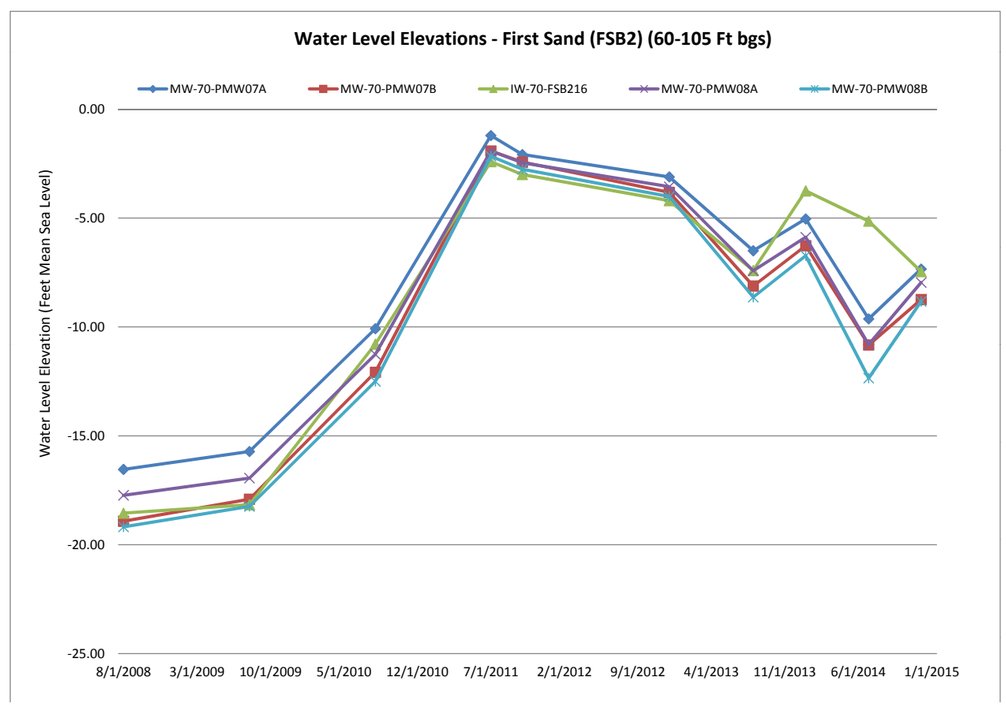
This Page Intentionally Left Blank

FIGURE 2-6
WATER LEVEL TREND GRAPHS: UPPER FINES AND FIRST SAND (2008-2014)



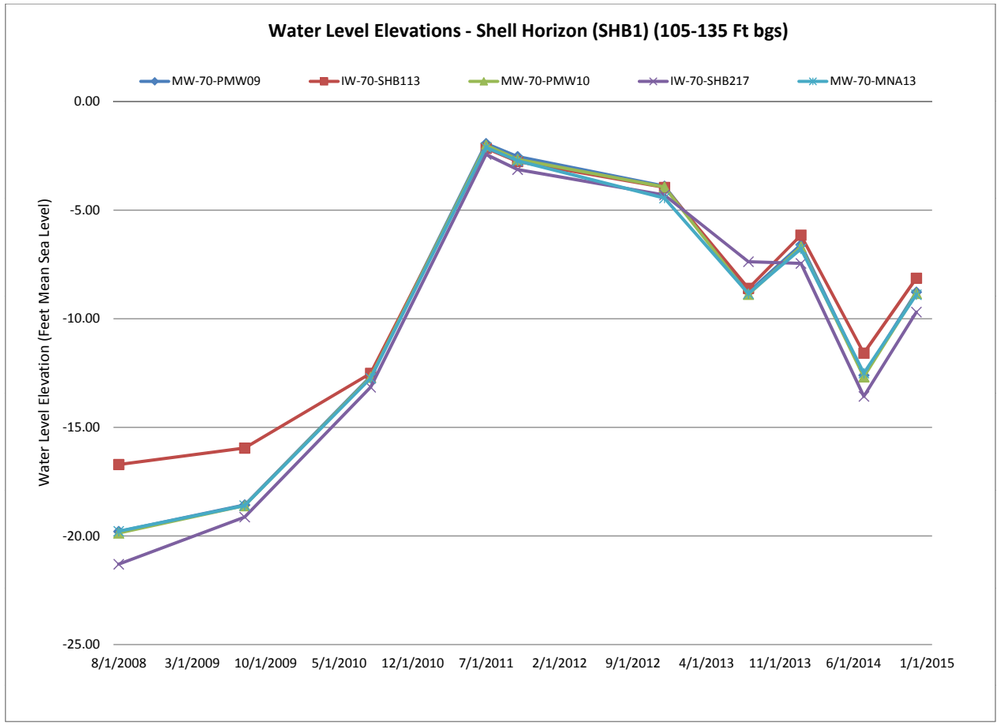


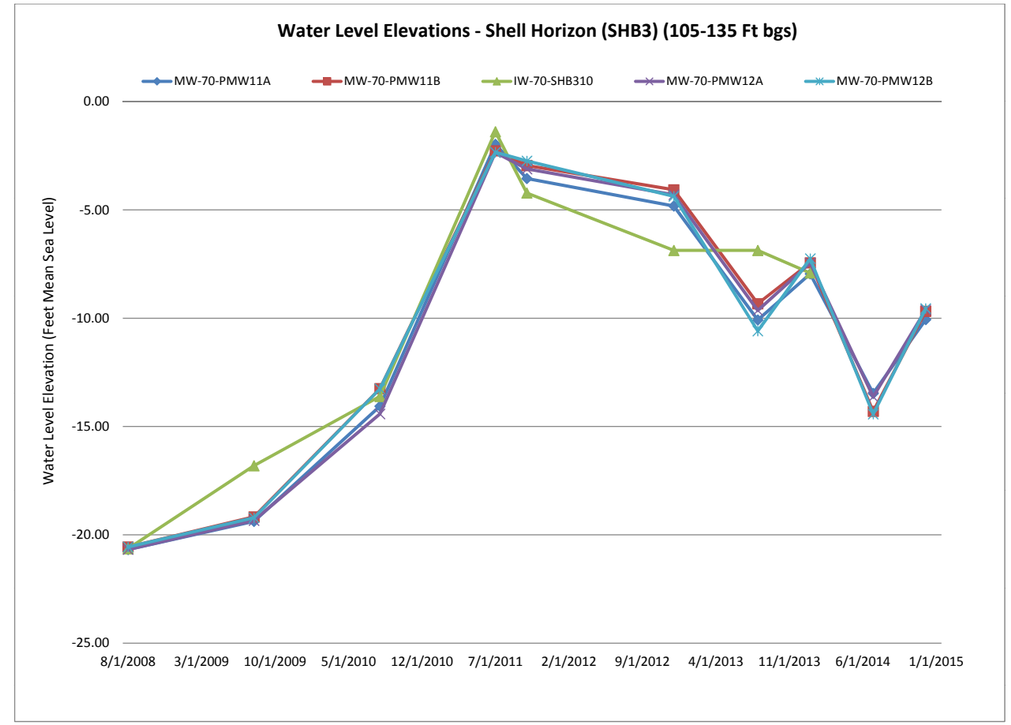


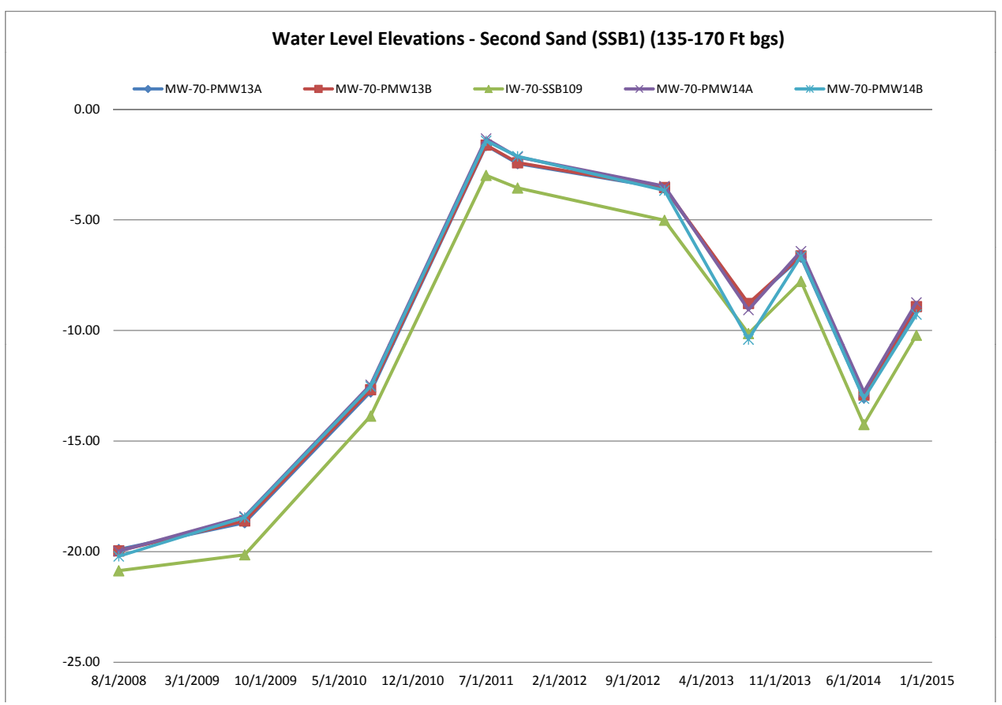


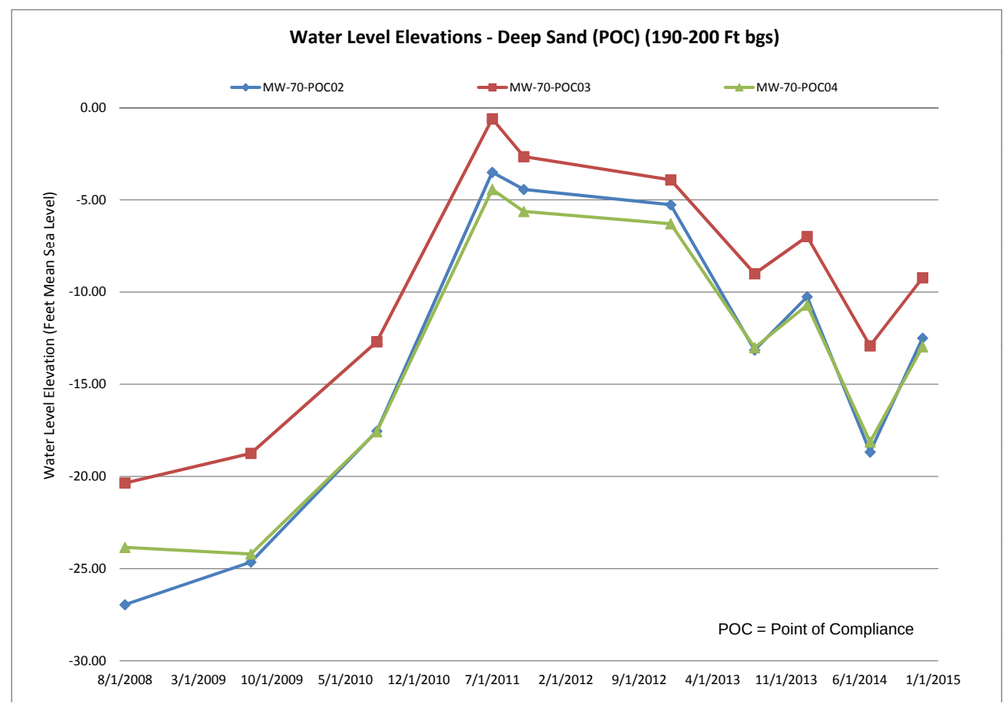
This Page Intentionally Left Blank

FIGURE 2-7
WATER LEVEL TREND GRAPHS: SHELL HORIZON, SECOND SAND, AND DEEP SAND (2008-2014)

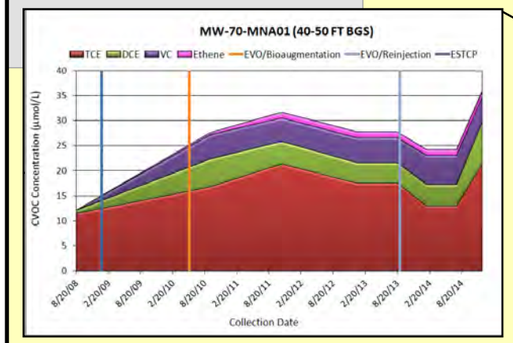


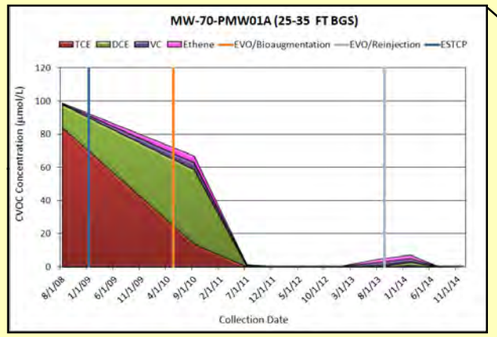


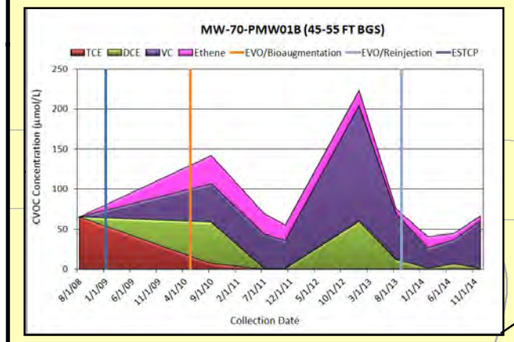


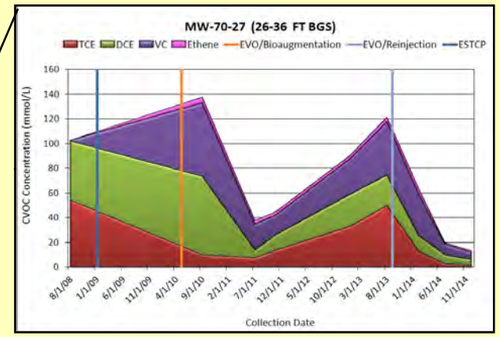


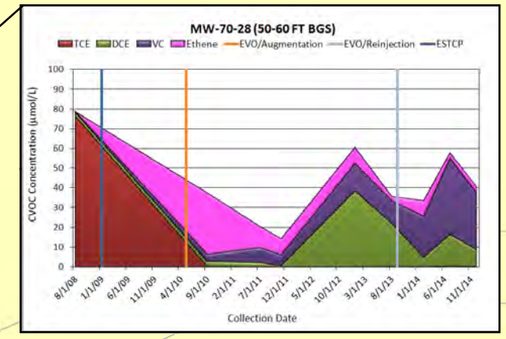
This Page Intentionally Left Blank

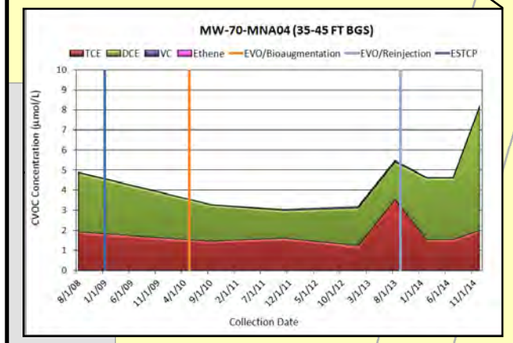


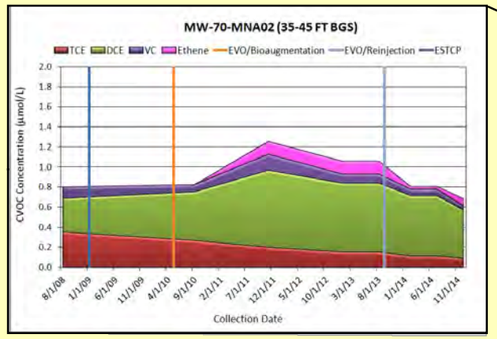


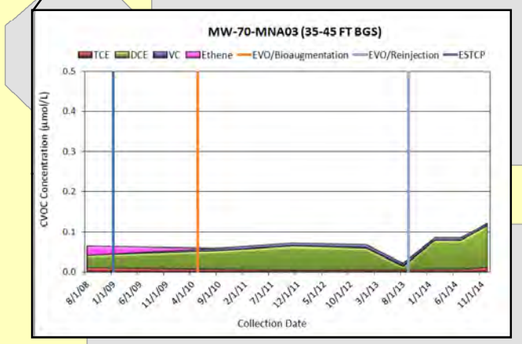


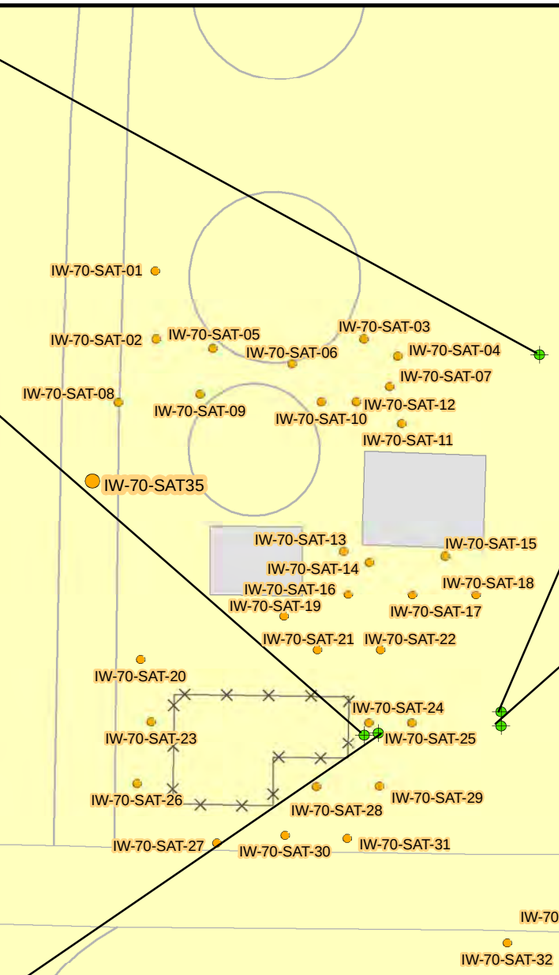












LEGEND

- UPPER FINES/SOURCE AREA TREATMENT MONITORING WELL
- SAMPLED BIOBARRIER OR SOURCE AREA TREATMENT WELL
- BIOBARRIER OR SOURCE AREA TREATMENT WELL
- IR SITE 70 BOUNDARY
- BASE BOUNDARY
- ROAD
- BUILDING

20 10 0 20 40 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-8
CVOC MOLAR CONCENTRATION - SOURCE AREA TREATMENT GRID

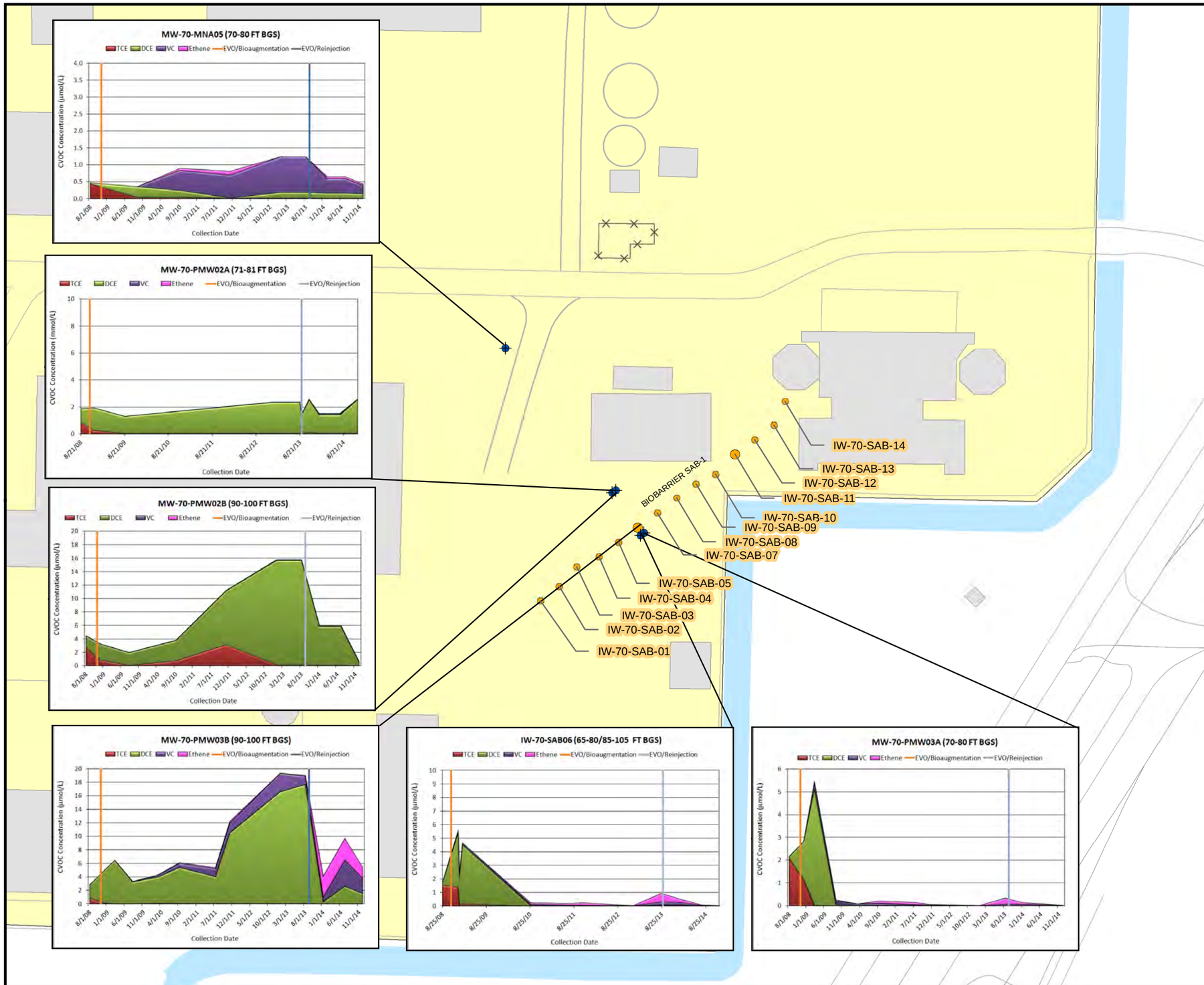
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-8.mxd

NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-32.mxd

This Page Intentionally Left Blank



LEGEND

- FIRST SAND SOURCE AREA BIOBARRIER MONITORING WELL
- SAMPLED BIOBARRIER OR SOURCE AREA TREATMENT WELL
- BIOBARRIER OR SOURCE AREA TREATMENT WELL
- IR SITE 70 BOUNDARY
- BASE BOUNDARY
- ROAD
- BUILDING

50 25 0 50 100 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-9
CVOC MOLAR CONCENTRATION - SOURCE AREA BIOBARRIER 1

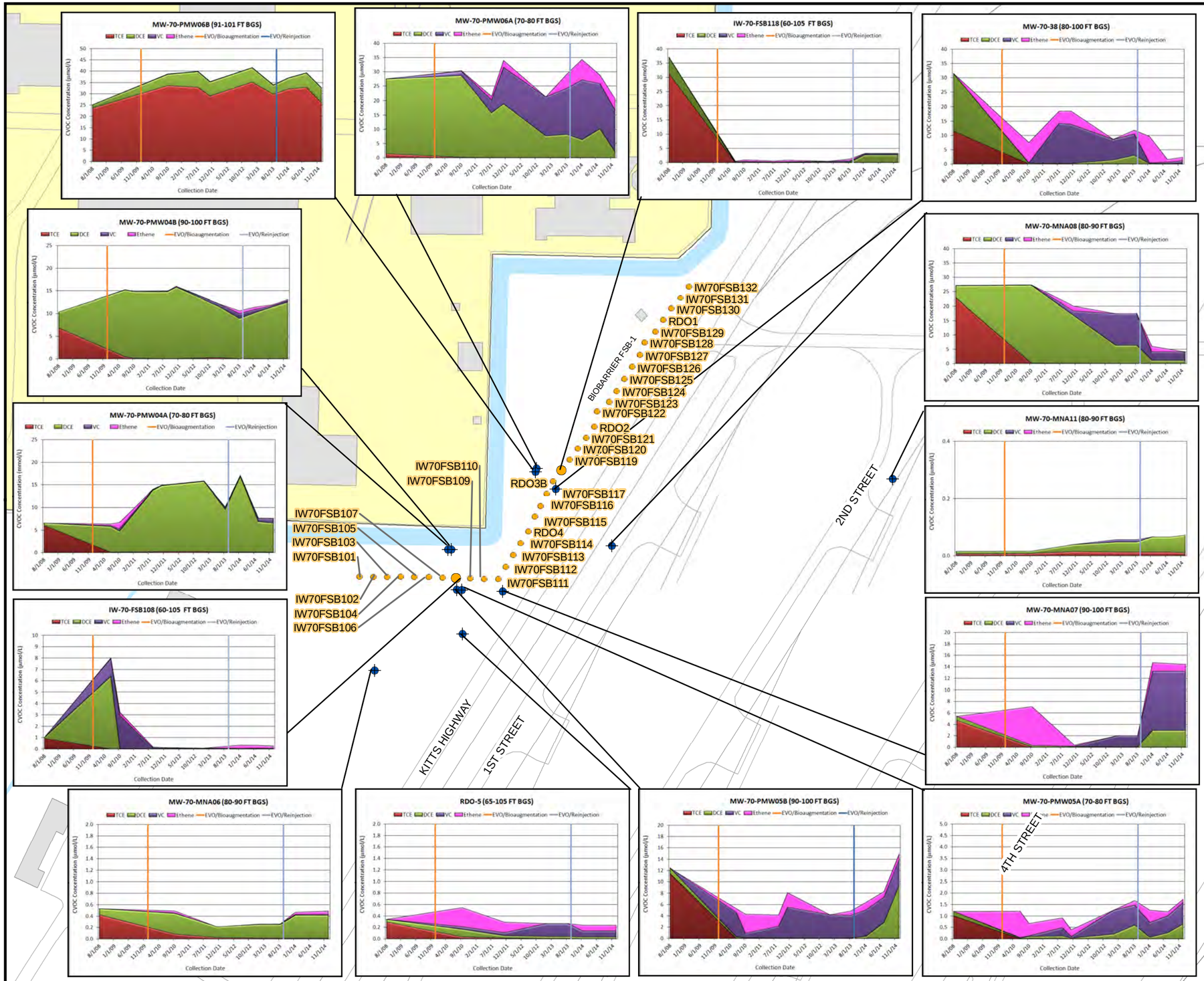
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-9.mxd

NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\Map Documents\FIGURE 2-2.mxd

This Page Intentionally Left Blank



LEGEND

- FIRST SAND BIOBARRIER 1 MONITORING WELL
- SAMPLED BIOBARRIER OR SOURCE AREA TREATMENT WELL
- BIOBARRIER OR SOURCE AREA TREATMENT WELL
- IR SITE 70 BOUNDARY
- BASE BOUNDARY
- ROAD
- BUILDING

100 50 0 100 200 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-10
CVOC MOLAR CONCENTRATION - FIRST SAND BIOBARRIER 1

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

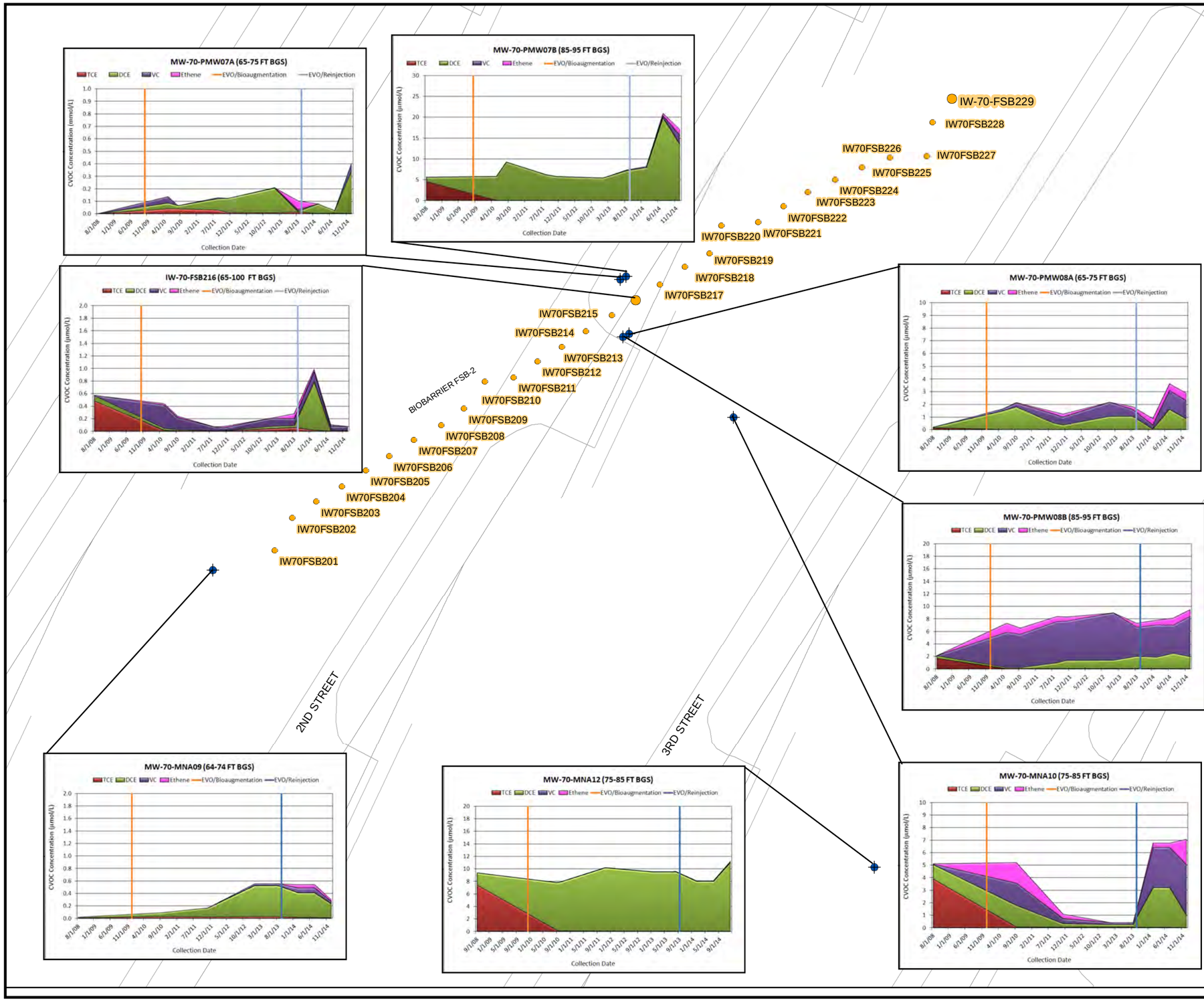
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-10.mxd

NAVFAC

ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-10.mxd

This Page Intentionally Left Blank



LEGEND

- FIRST SAND BIOBARRIER 2 MONITORING WELL
- SAMPLED BIOBARRIER OR SOURCE AREA TREATMENT WELL
- BIOBARRIER OR SOURCE AREA TREATMENT WELL
- IR SITE 70 BOUNDARY
- BASE BOUNDARY
- ROAD
- BUILDING

50 25 0 50 100 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-11
CVOC MOLAR CONCENTRATION - FIRST SAND BIOBARRIER 2

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

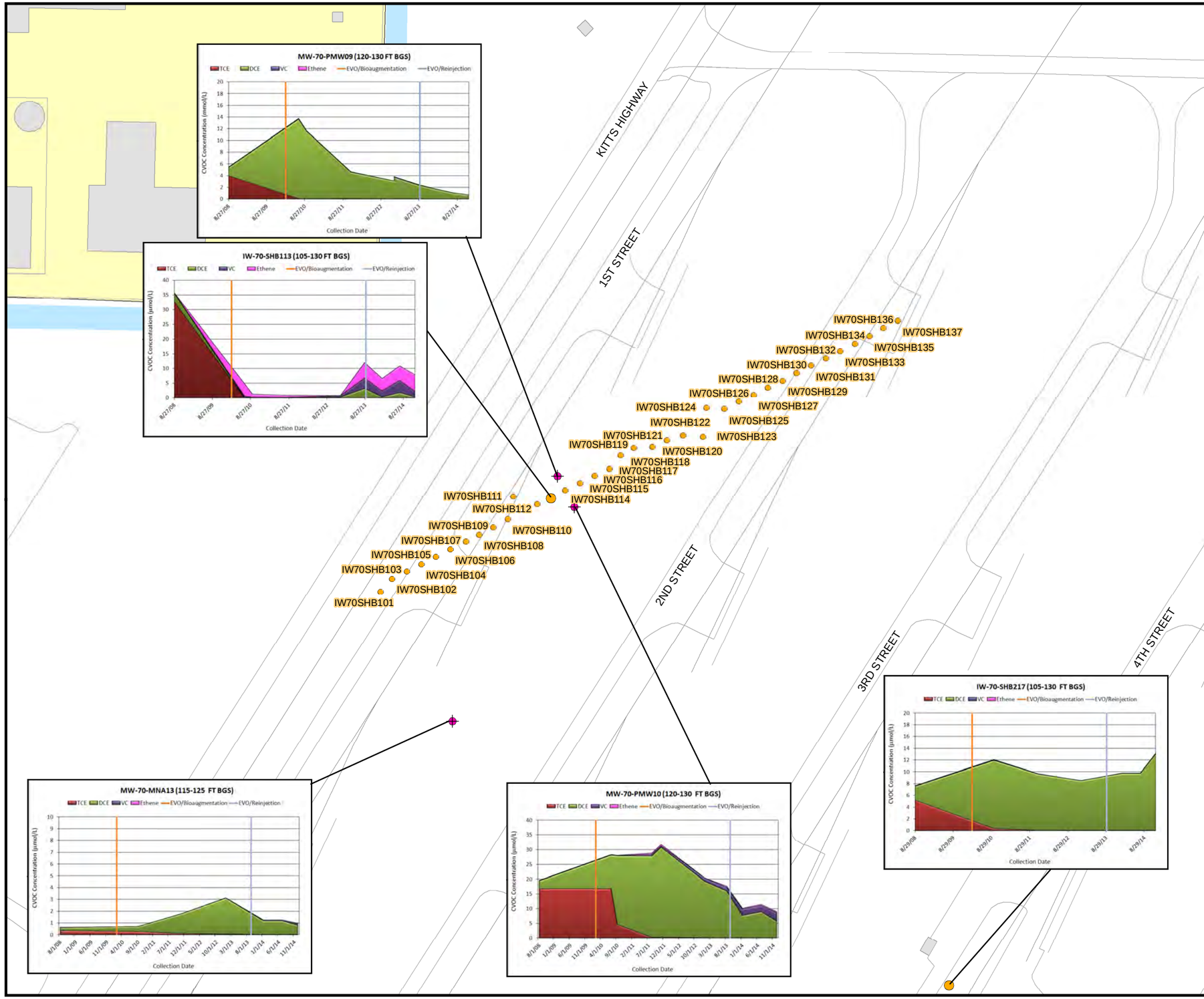
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-11.mxd

NAVFAC

ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\Map Documents\FIGURE 2-12.mxd

This Page Intentionally Left Blank



LEGEND

- SHELL HORIZON BIOBARRIER 1 MONITORING WELL
- SAMPLED BIOBARRIER OR SOURCE AREA TREATMENT WELL
- BIOBARRIER OR SOURCE AREA TREATMENT WELL
- IR SITE 70 BOUNDARY
- BASE BOUNDARY
- ROAD
- BUILDING

100 50 0 100 200 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-12
CVOC MOLAR CONCENTRATION - SHELL HORIZON BIOBARRIER 1

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

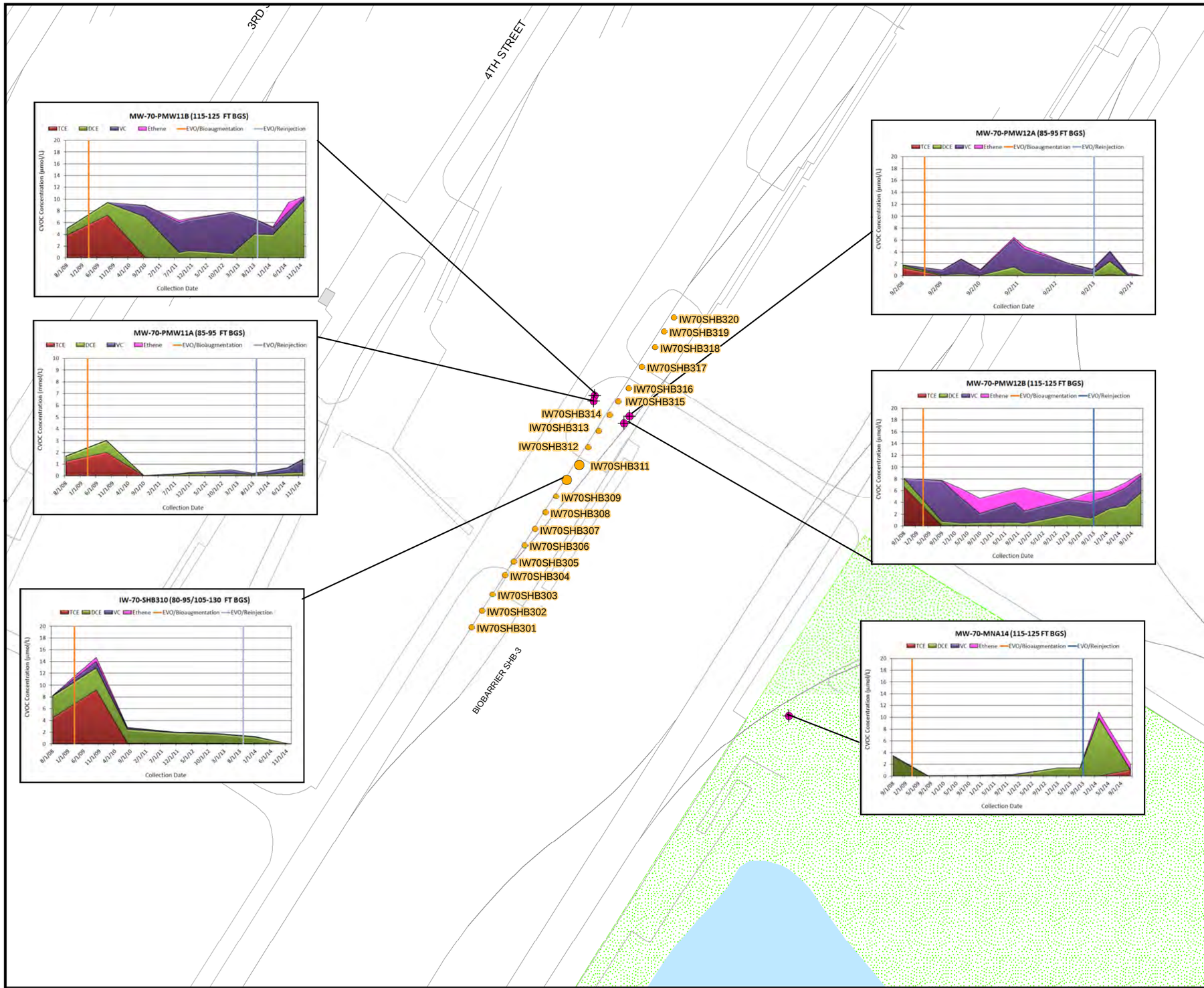
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-12.mxd

NAVFAC

ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\Map Documents\FIGURE 2-12.mxd

This Page Intentionally Left Blank



LEGEND

- SHELL HORIZON BIOBARRIER 3 MONITORING WELL
- SAMPLED BIOBARRIER OR SOURCE AREA TREATMENT WELL
- BIOBARRIER OR SOURCE AREA TREATMENT WELL
- IR SITE 70 BOUNDARY
- BASE BOUNDARY
- ROAD
- BUILDING

100 50 0 100 200 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-13
CVOC MOLAR CONCENTRATION - SHELL HORIZON BIOBARRIER 3

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

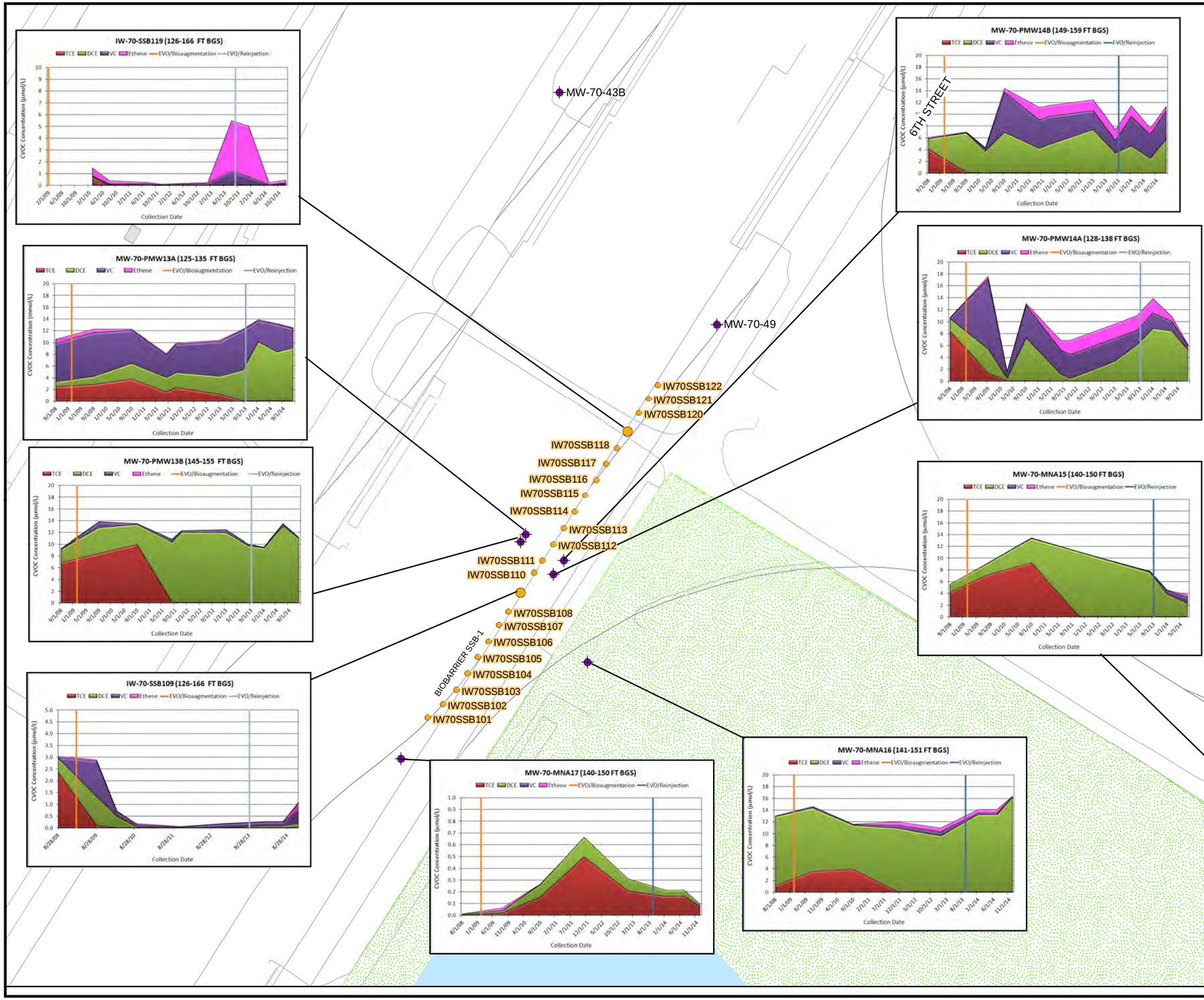
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-13.mxd

NAVFAC

ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-12.mxd

This Page Intentionally Left Blank



LEGEND

- SECOND SAND BIOBARRIER 1 MONITORING WELL
- SAMPLED BIOBARRIER OR SOURCE AREA TREATMENT WELL
- BIOBARRIER OR SOURCE AREA TREATMENT WELL
- IR SITE 70 BOUNDARY
- BASE BOUNDARY
- ROAD
- BUILDING

50 25 0 50 100 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-14
CVOC MOLAR CONCENTRATION - SECOND SAND BIOBARRIER 1

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

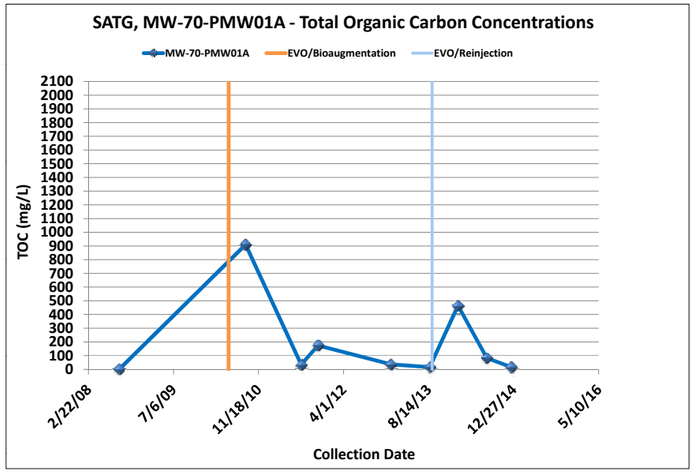
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-14.mxd

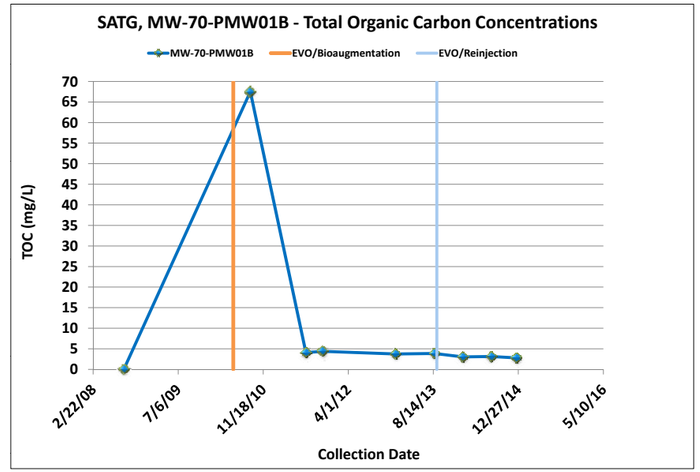
NAVFAC
ECC-INSIGHT LLC

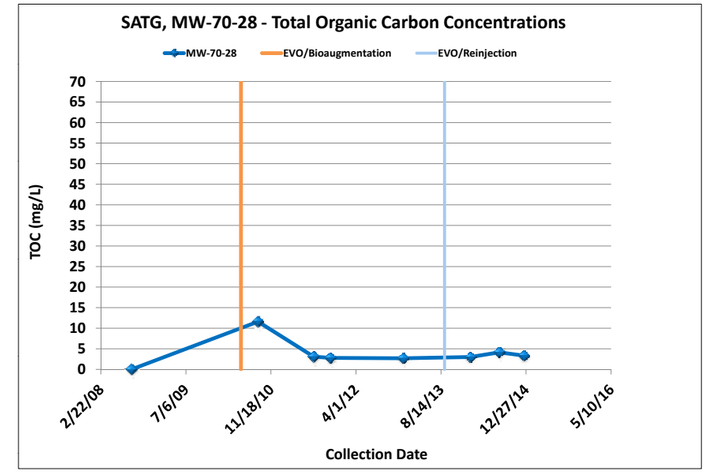
Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-12.mxd

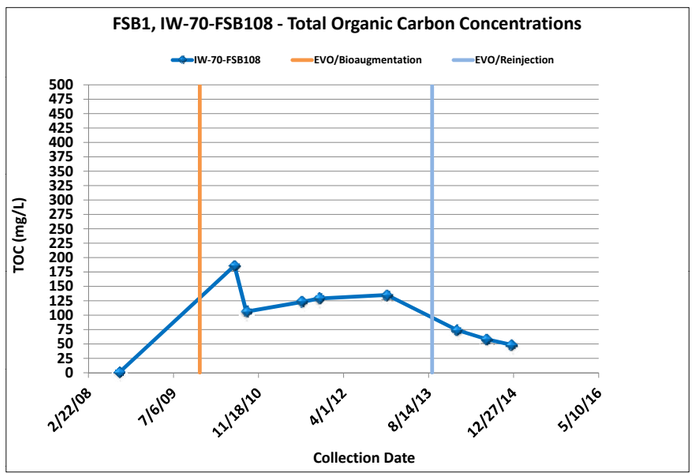
This Page Intentionally Left Blank

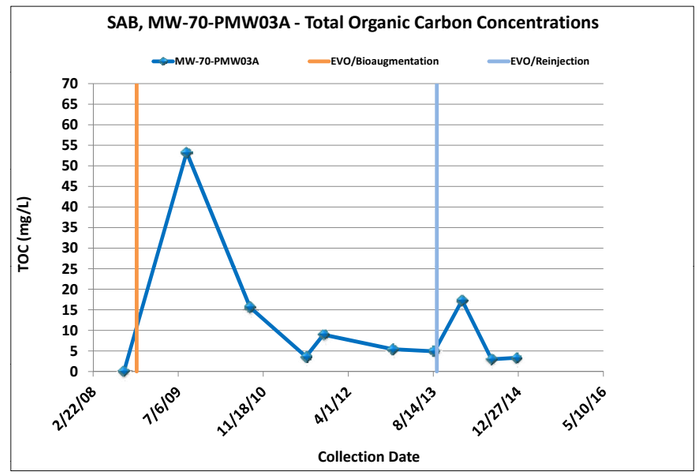
FIGURE 2-15
TOTAL ORGANIC CARBON TRENDS: SATG, SAB, AND FSB-1

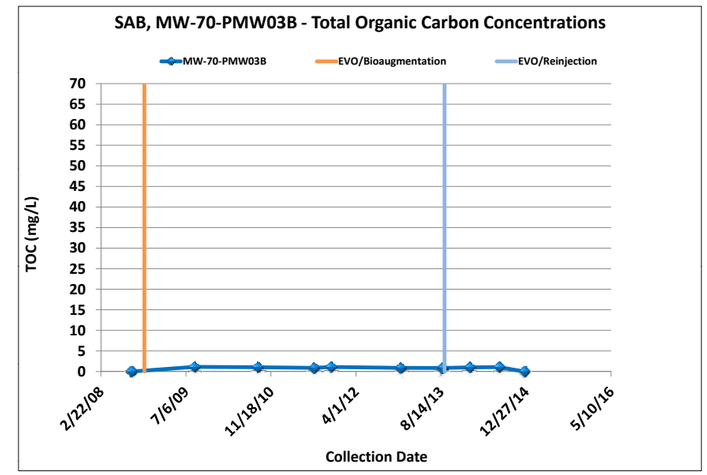


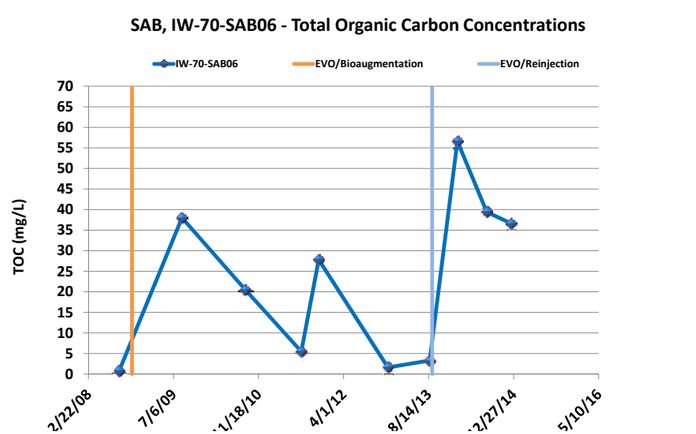


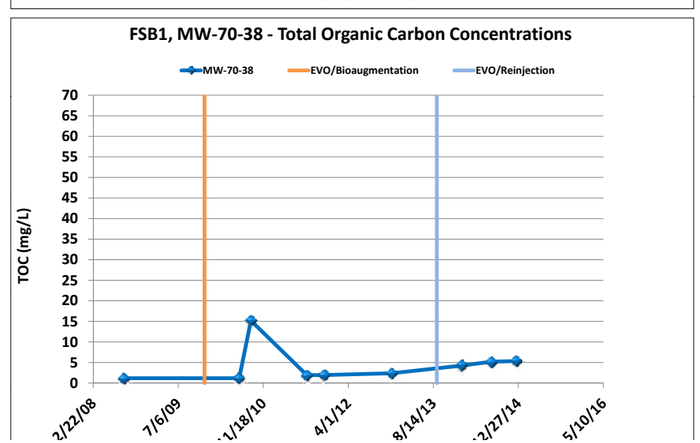


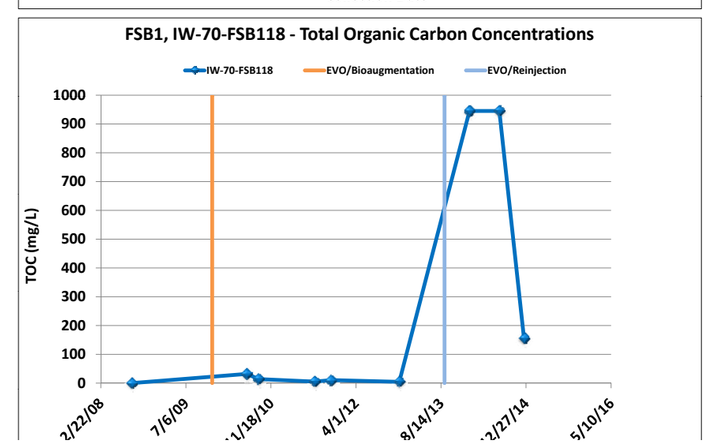






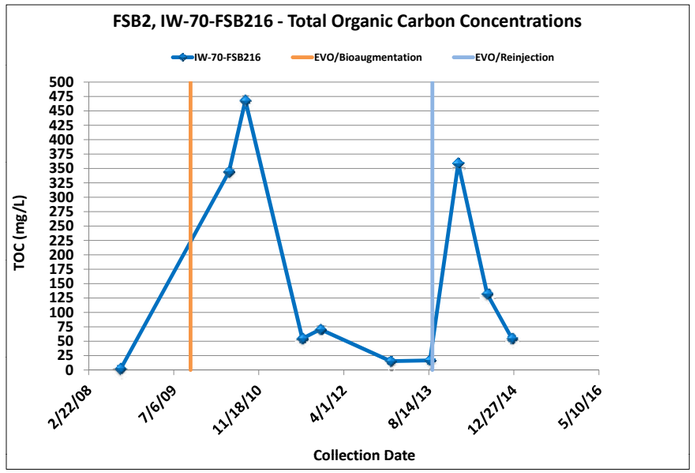


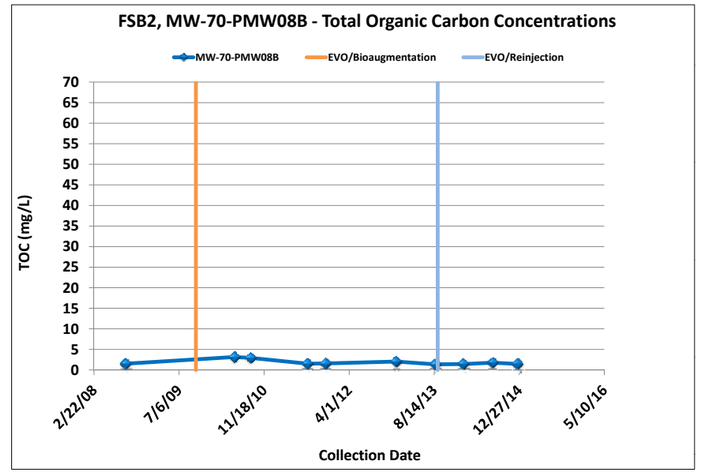


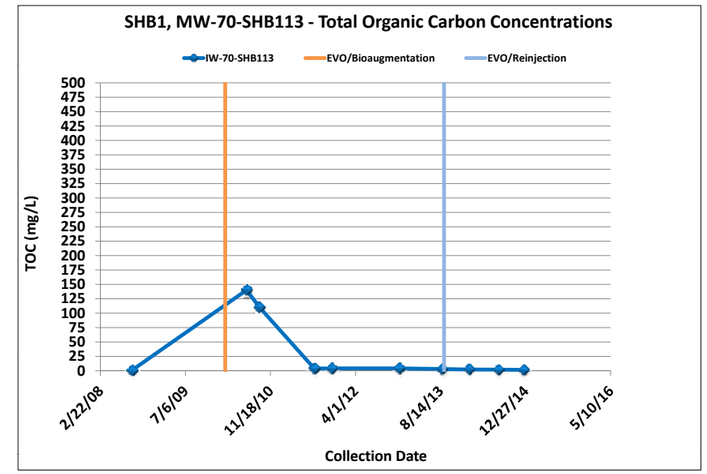


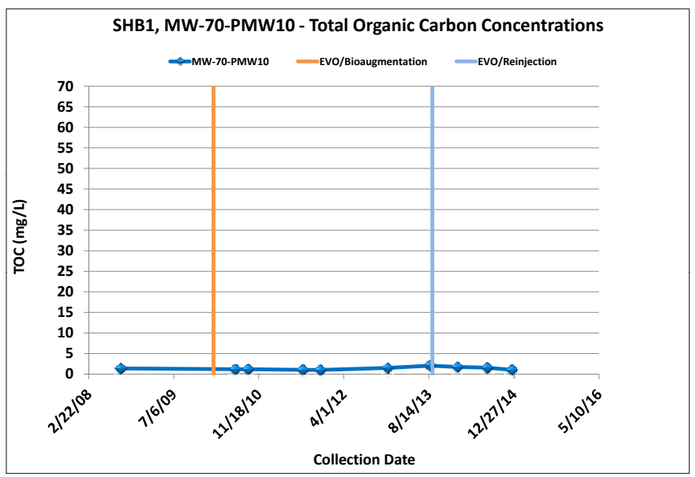
This Page Intentionally Left Blank

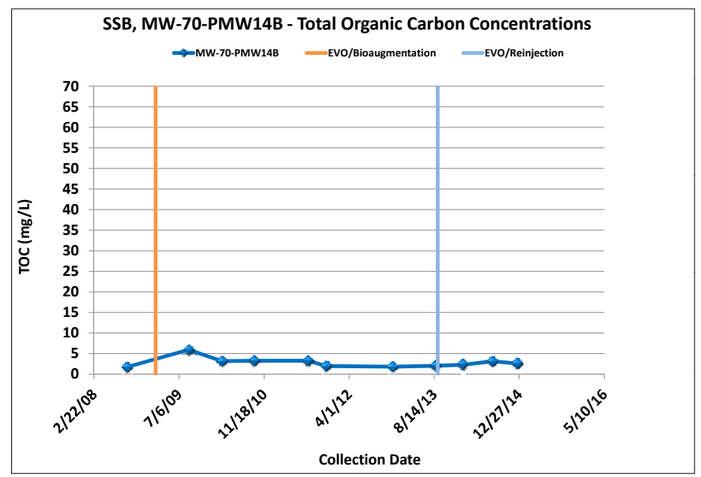
FIGURE 2-16
TOTAL ORGANIC CARBON TRENDS: FSB-2, SHB-1, SHB-3, AND SSB-1

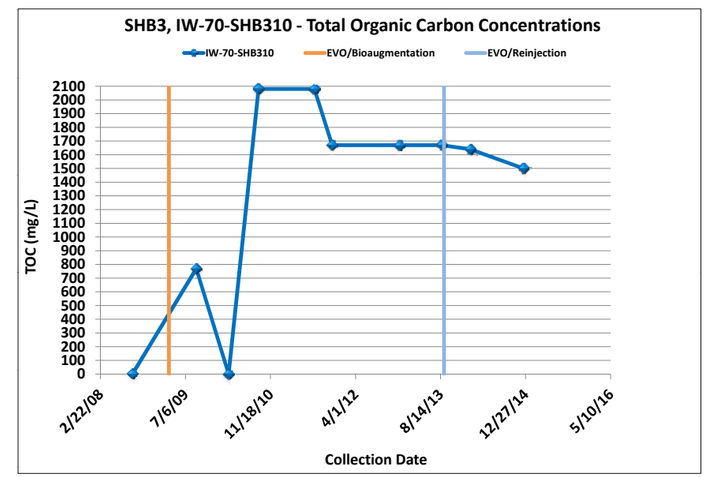


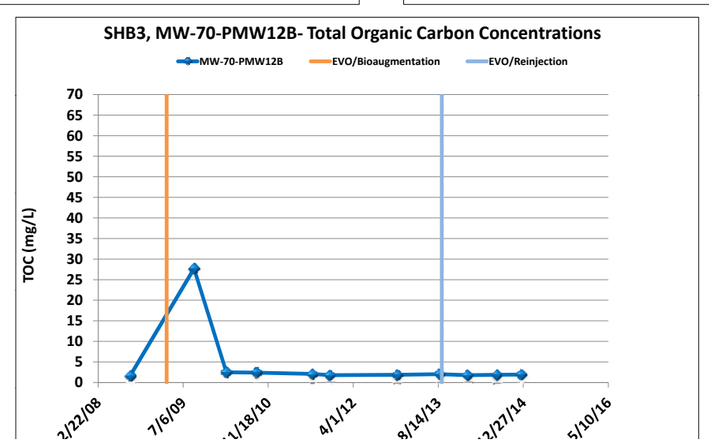


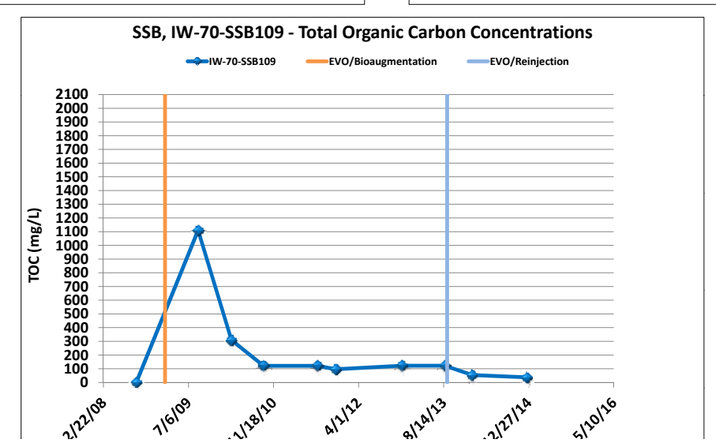






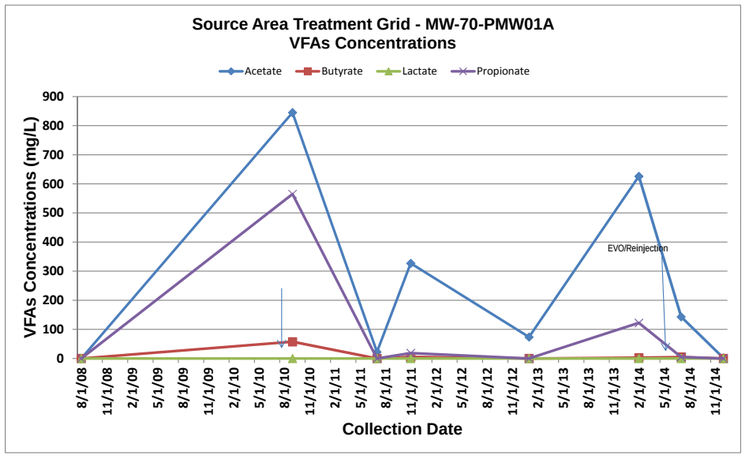


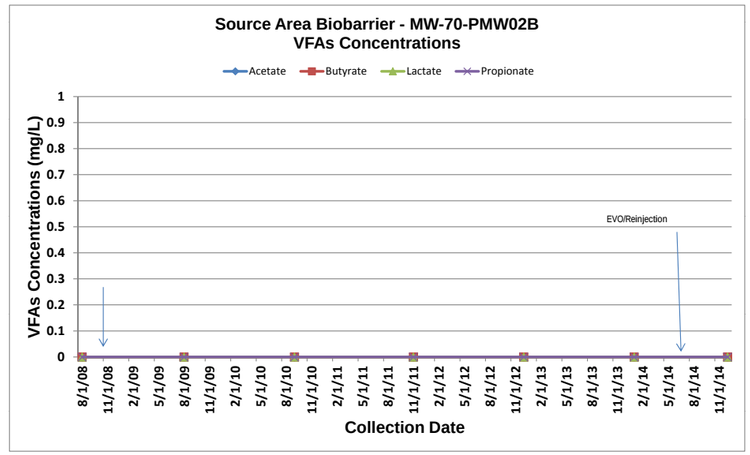


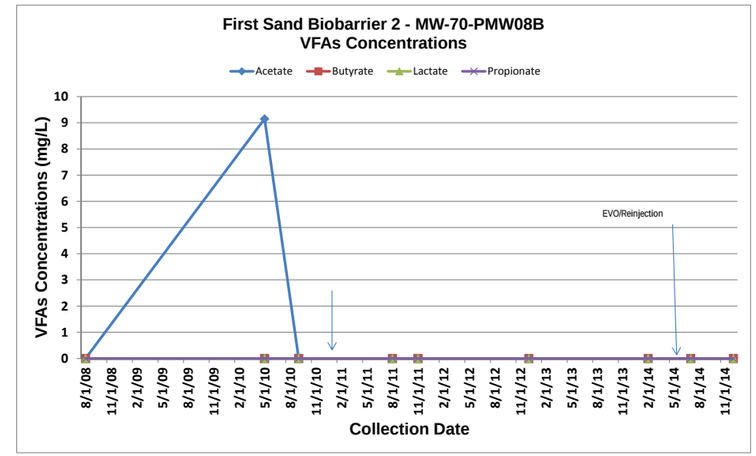


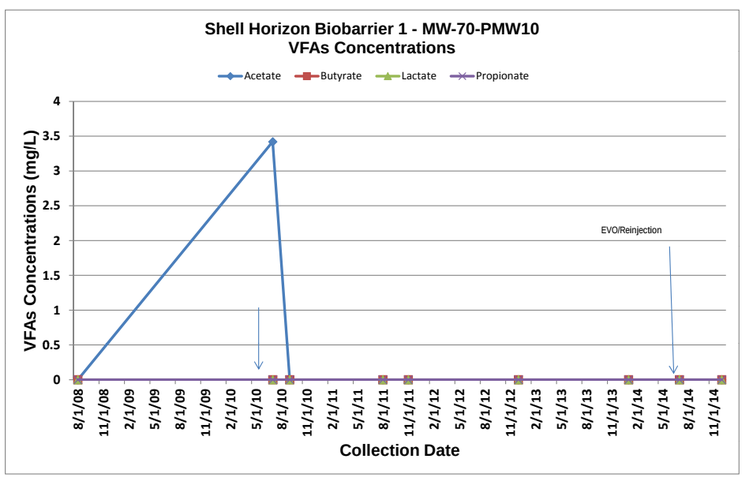
This Page Intentionally Left Blank

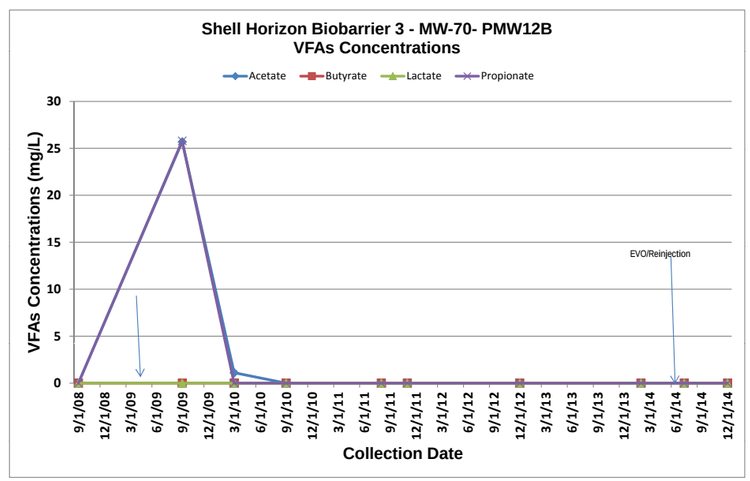
FIGURE 2-17
VOLATILE FATTY ACID (VFA) TRENDS SINCE BASELINE

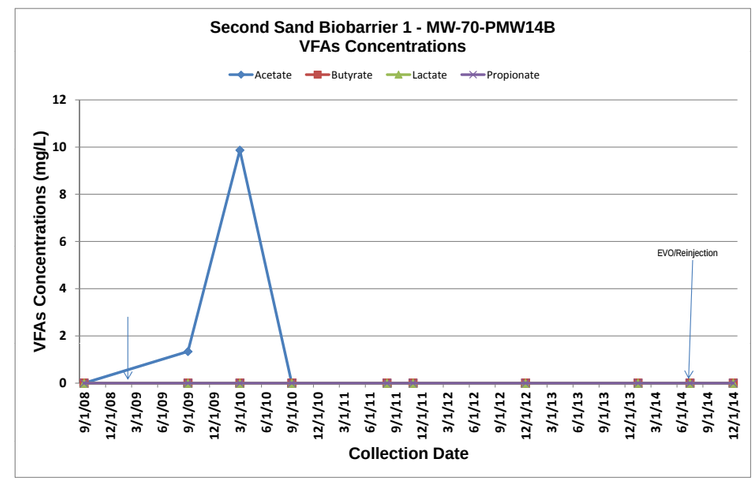






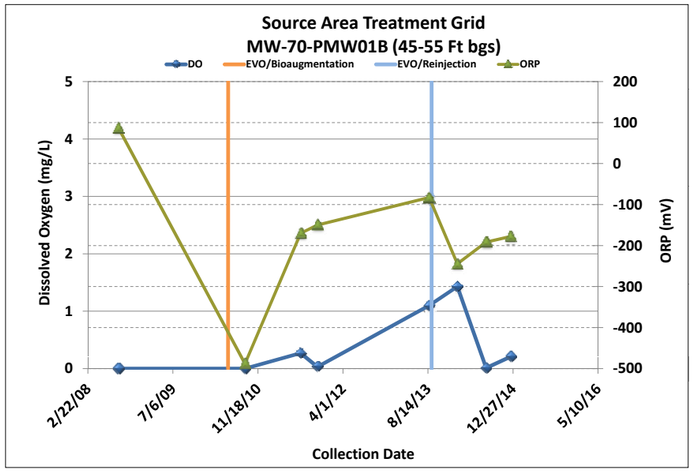


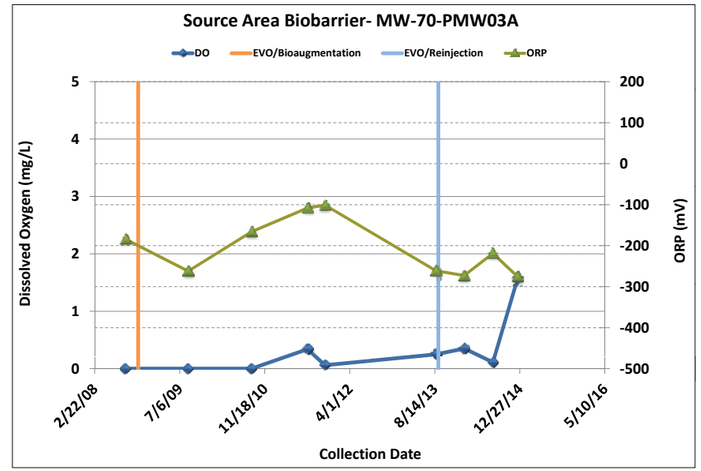


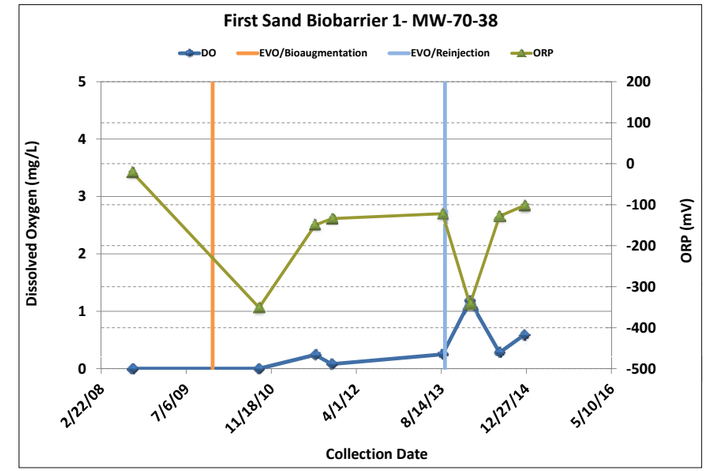


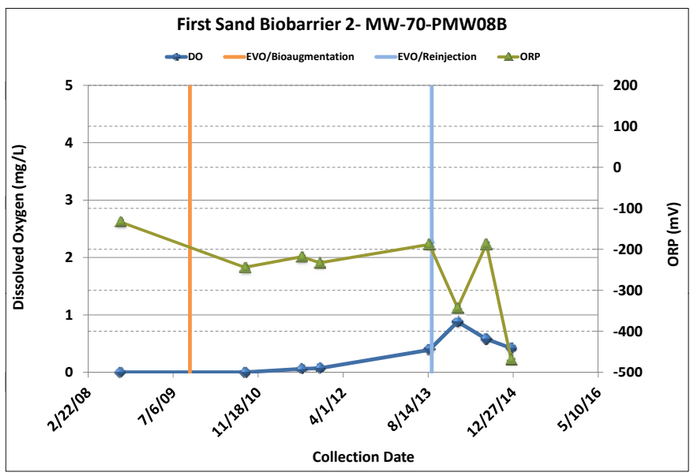
This Page Intentionally Left Blank

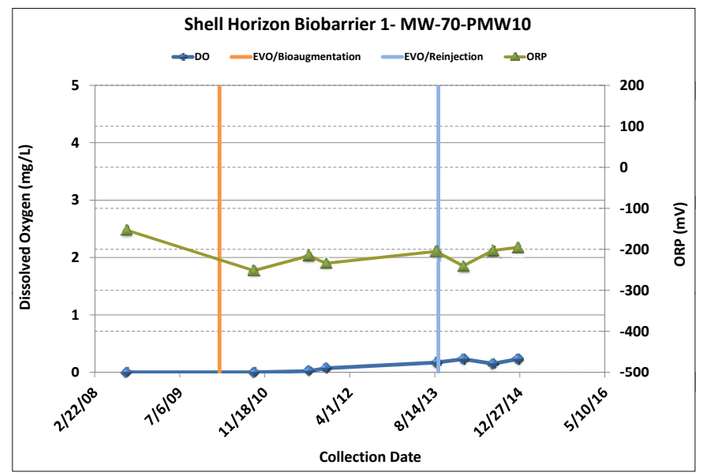
FIGURE 2-18
DO-ORP TRENDS SINCE BASELINE

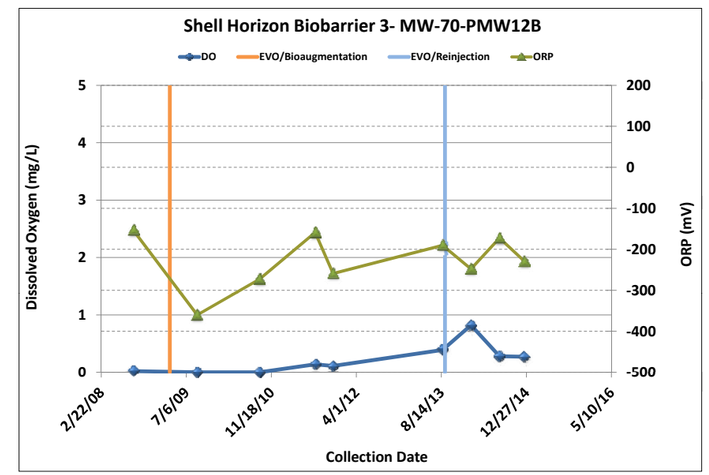


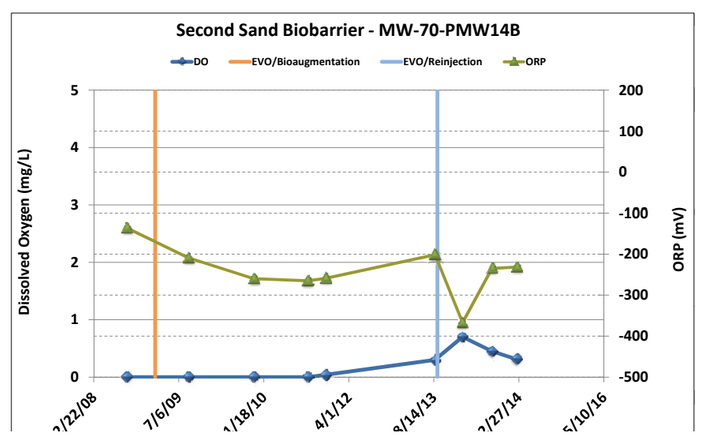






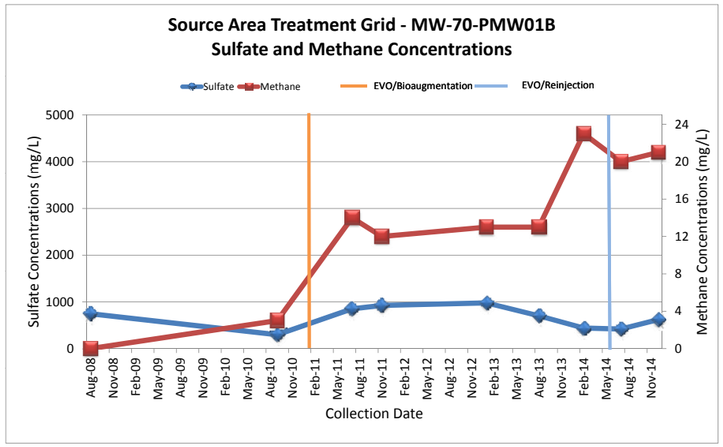


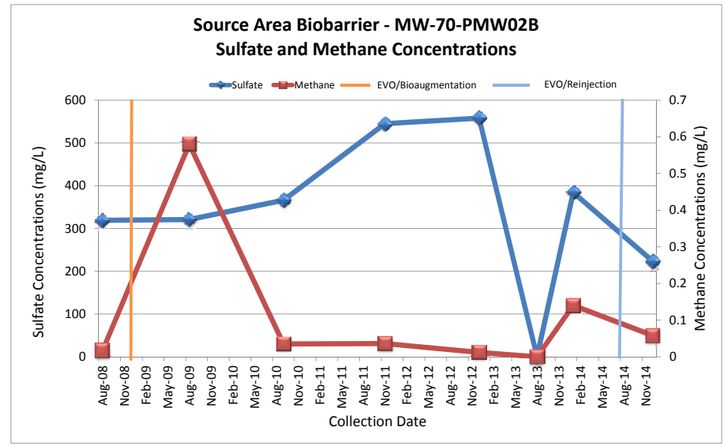


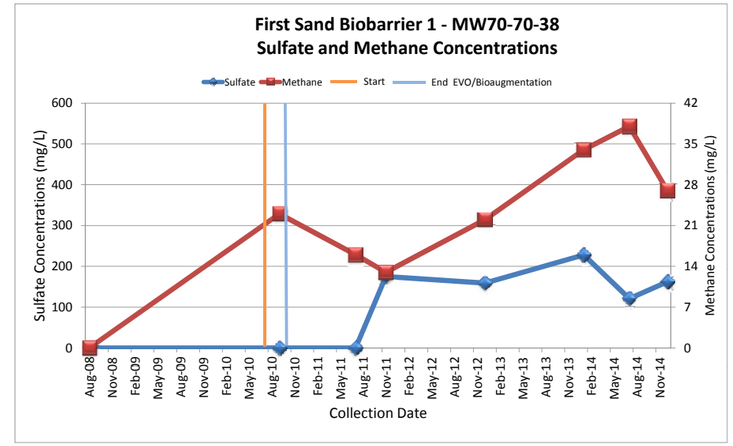


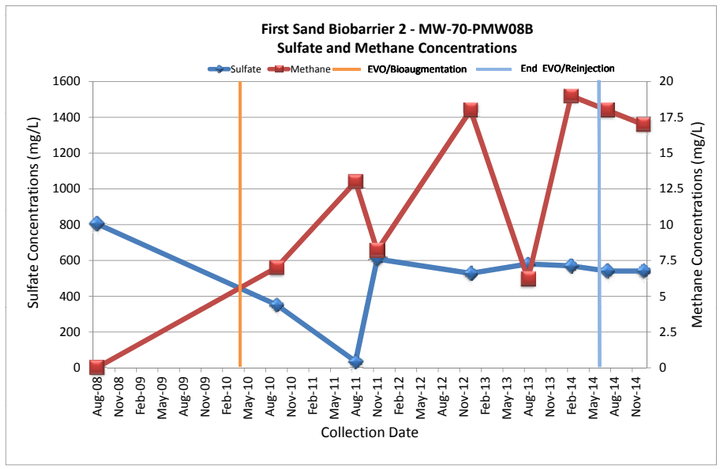
This Page Intentionally Left Blank

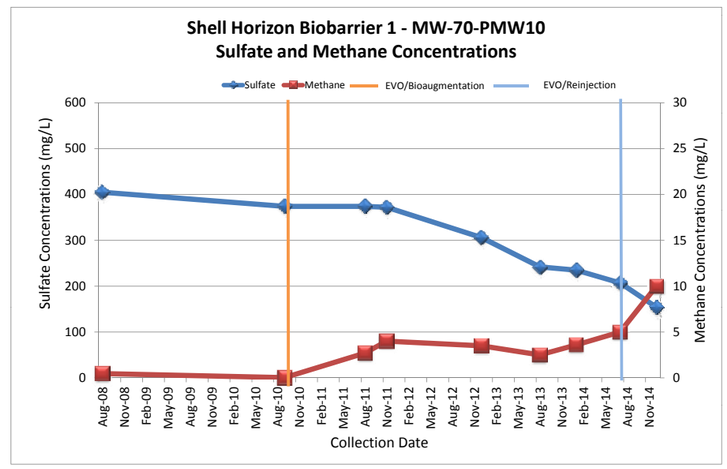
FIGURE 2-19
SULFATE-METHANE TRENDS SINCE BASELINE

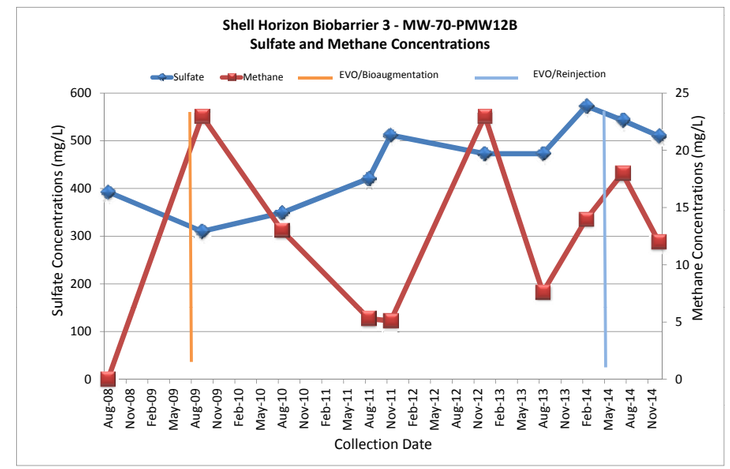


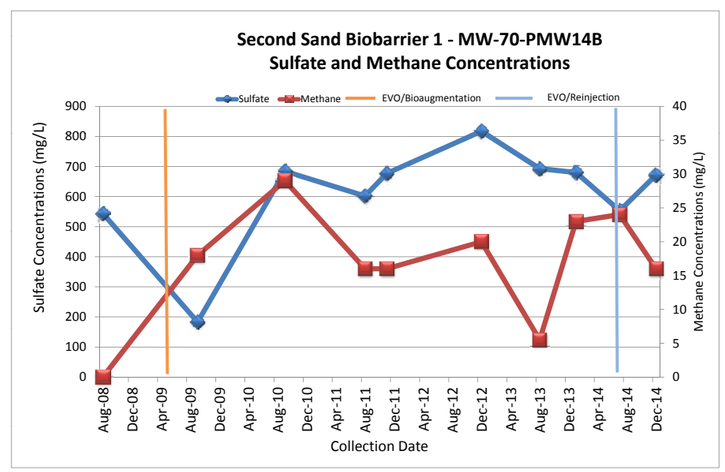






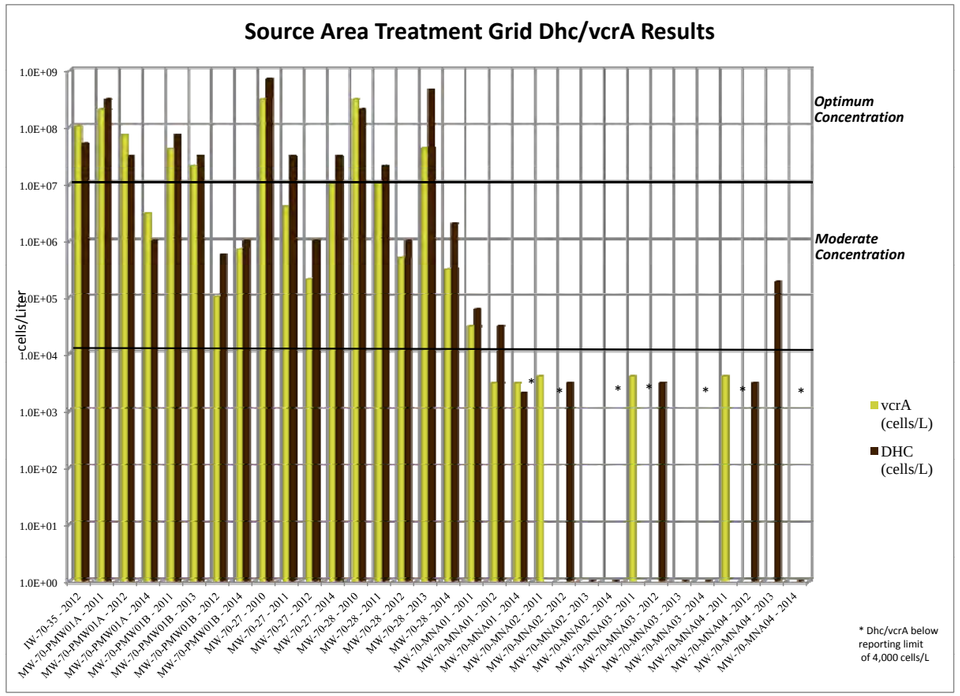


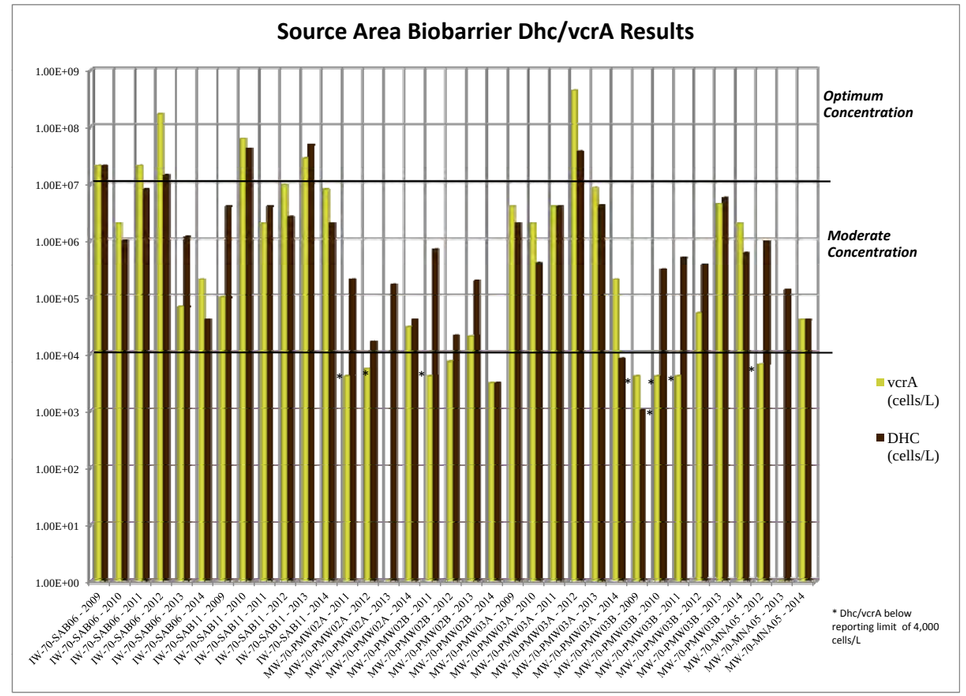


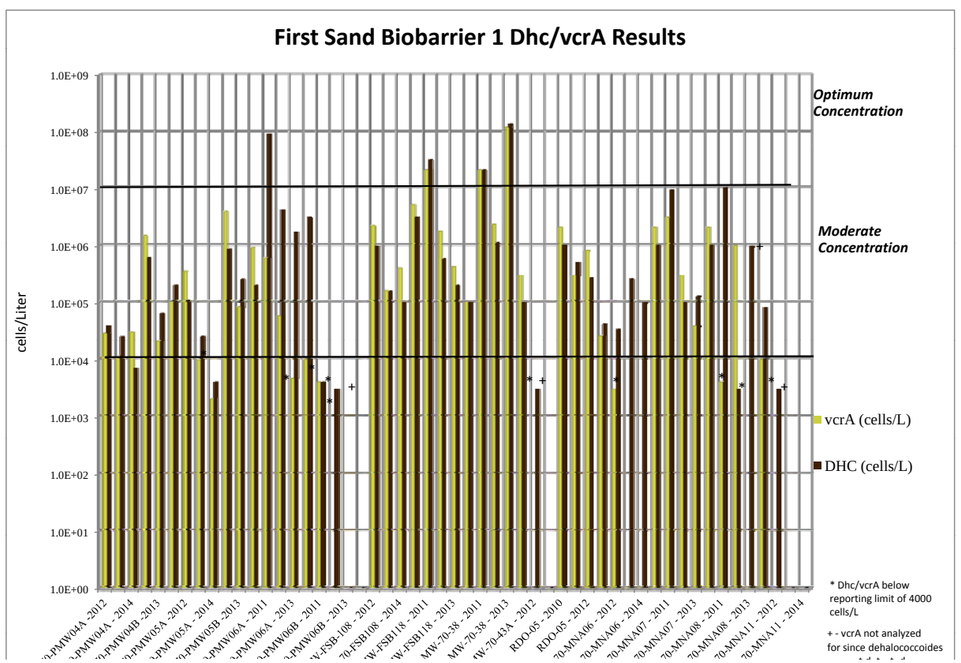


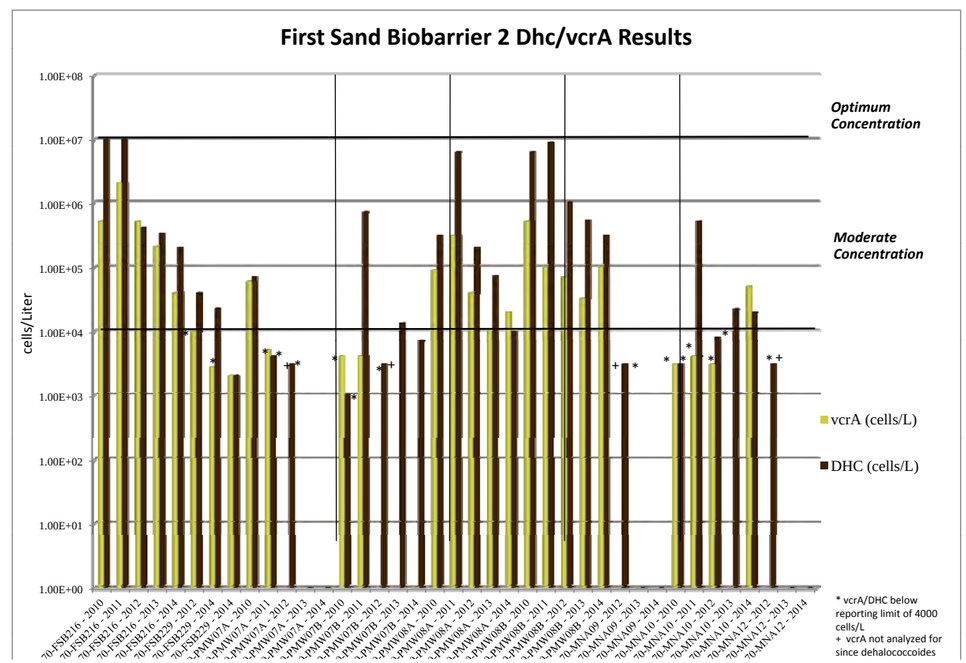
This Page Intentionally Left Blank

FIGURE 2-20
DEHALOCOCCOIDES TRENDS SINCE BASELINE: SATG, SAB, FSB-1, FSB-2



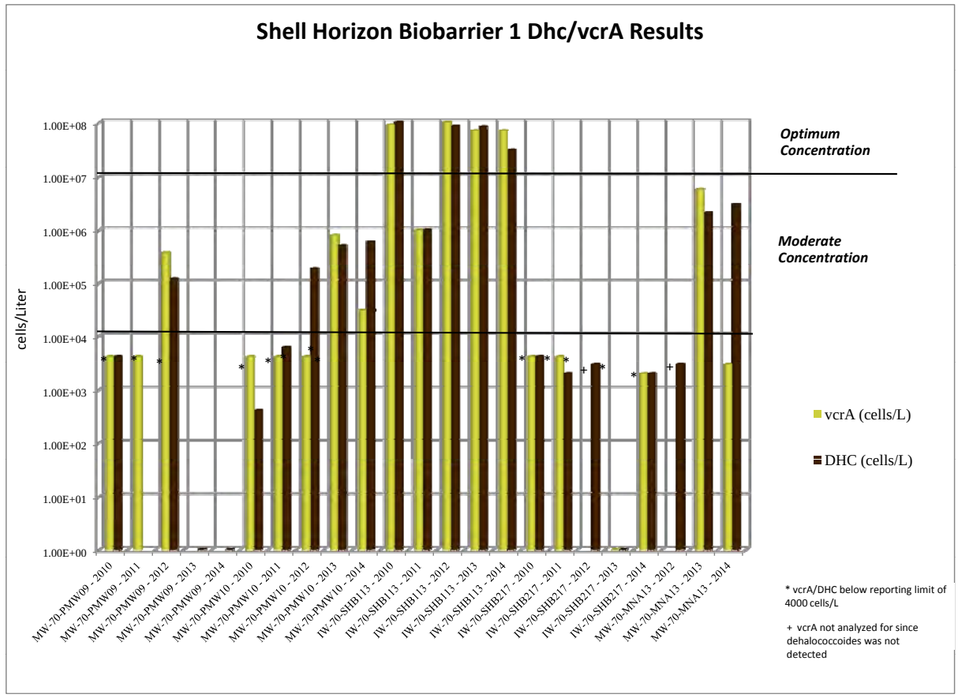


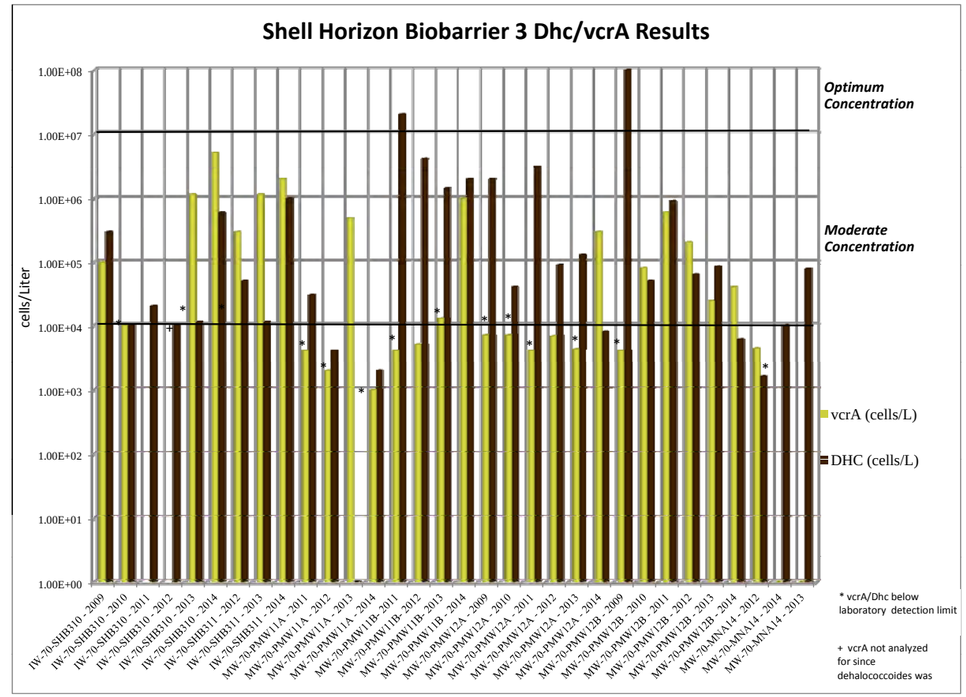


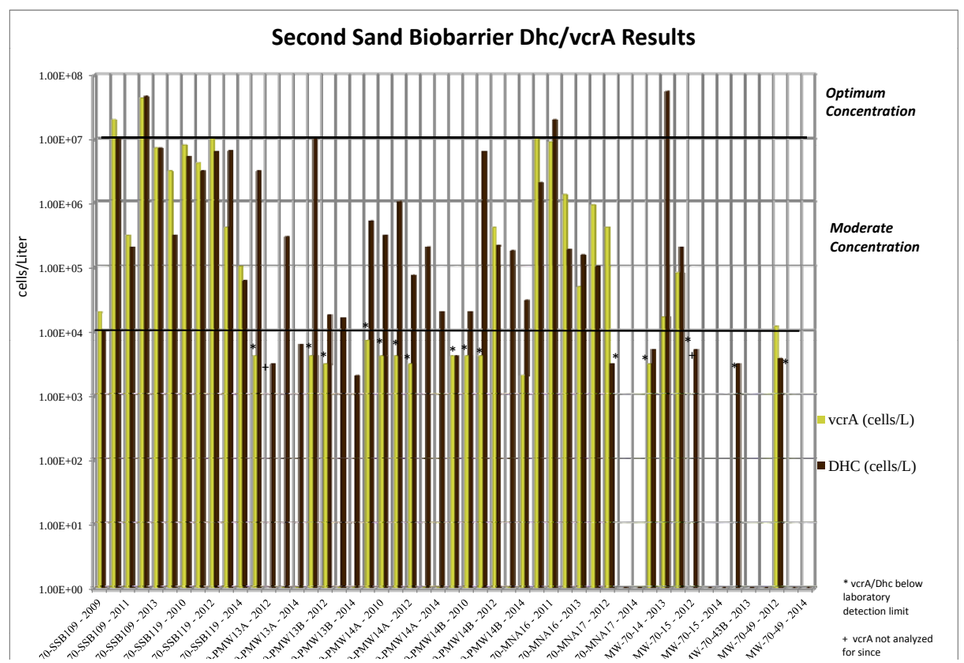


This Page Intentionally Left Blank

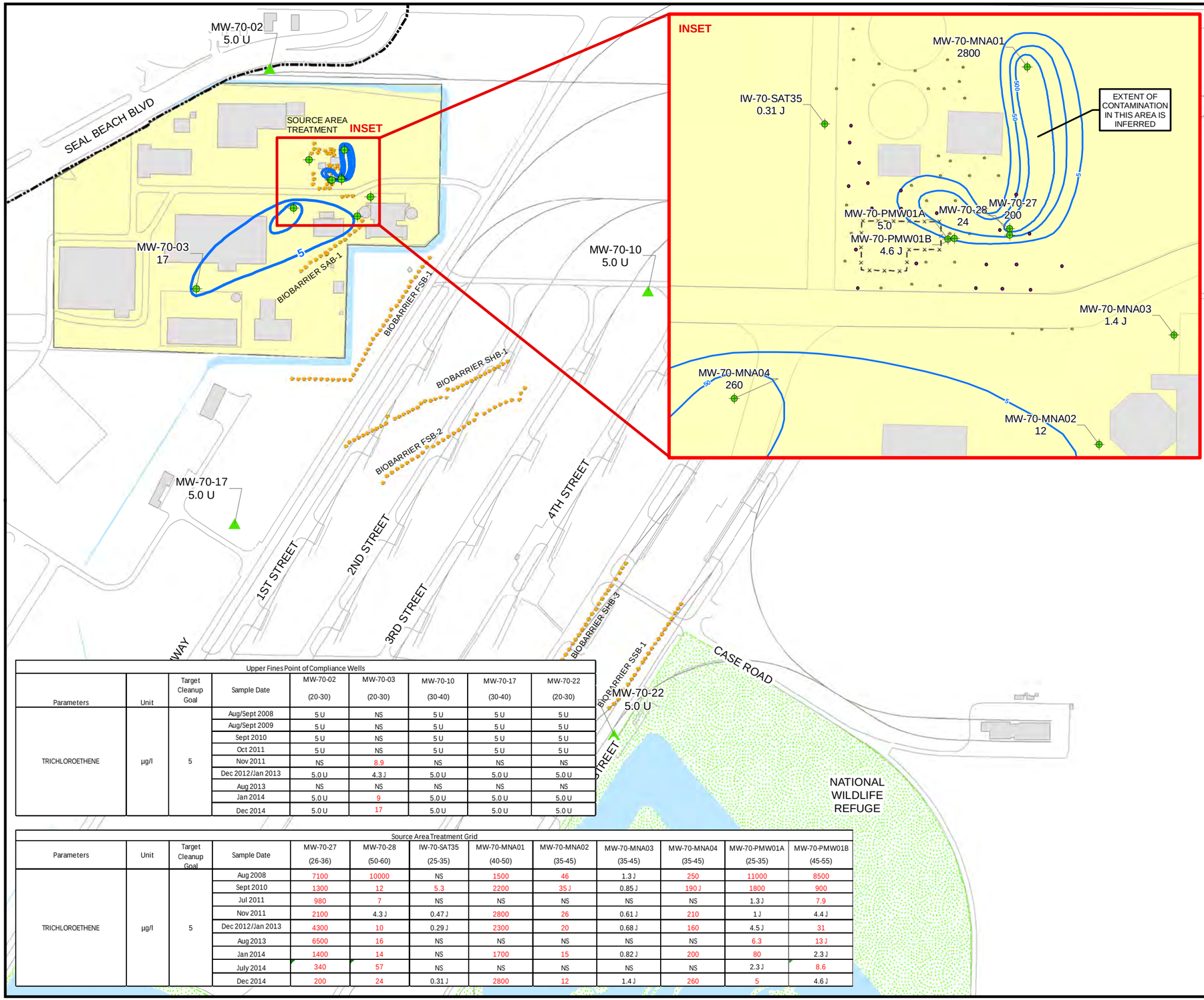
FIGURE 2-21
DEHALOCOCCOIDES TRENDS SINCE BASELINE: SHB-1, SHB-3, SSB







This Page Intentionally Left Blank



Upper Fines Point of Compliance Wells								
Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-02 (20-30)	MW-70-03 (20-30)	MW-70-10 (30-40)	MW-70-17 (30-40)	MW-70-22 (20-30)
TRICHLOROETHENE	µg/l	5	Aug/Sept 2008	5 U	NS	5 U	5 U	5 U
			Aug/Sept 2009	5 U	NS	5 U	5 U	5 U
			Sept 2010	5 U	NS	5 U	5 U	5 U
			Oct 2011	5 U	NS	5 U	5 U	5 U
			Nov 2011	NS	8.9	NS	NS	NS
			Dec 2012/Jan 2013	5.0 U	4.3 J	5.0 U	5.0 U	5.0 U
			Aug 2013	NS	NS	NS	NS	NS
			Jan 2014	5.0 U	9	5.0 U	5.0 U	5.0 U
			Dec 2014	5.0 U	17	5.0 U	5.0 U	5.0 U

Source Area Treatment Grid												
Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-27 (26-36)	MW-70-28 (50-60)	IW-70-SAT35 (25-35)	MW-70-MNA01 (40-50)	MW-70-MNA02 (35-45)	MW-70-MNA03 (35-45)	MW-70-MNA04 (35-45)	MW-70-PMW01A (25-35)	MW-70-PMW01B (45-55)
TRICHLOROETHENE	µg/l	5	Aug 2008	7100	10000	NS	1500	46	1.3 J	250	11000	8500
			Sept 2010	1300	12	5.3	2200	35 J	0.85 J	190 J	1800	900
			Jul 2011	980	7	NS	NS	NS	NS	NS	1.3 J	7.9
			Nov 2011	2100	4.3 J	0.47 J	2800	26	0.61 J	210	1 J	4.4 J
			Dec 2012/Jan 2013	4300	10	0.29 J	2300	20	0.68 J	160	4.5 J	31
			Aug 2013	6500	16	NS	NS	NS	NS	NS	6.3	13 J
			Jan 2014	1400	14	NS	1700	15	0.82 J	200	80	2.3 J
			July 2014	340	57	NS	NS	NS	NS	NS	2.3 J	8.6
			Dec 2014	200	24	0.31 J	2800	12	1.4 J	260	5	4.6 J

LEGEND

MW-70-MNA02 71	UPPER FINES/SOURCE AREA TREATMENT MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011
MW-70-02 1.0 U	UPPER FINES POC MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011
IW-70-SAT01 0.89J	SAMPLED BIOBARRIER OR SOURCE AREA TREATMENT WELL
	BIOBARRIER OR SOURCE AREA TREATMENT WELL
	IR SITE 70 BOUNDARY
	BASE BOUNDARY
	ROAD
	RAILROAD TRACK
	BUILDING
5	APPROXIMATE ISOCONCENTRATION CONTOUR (ug/L)

NOTES:

(D) - DUPLICATE SAMPLE
J - ESTIMATED VALUE
ug/L - MICROGRAMS PER LITER
NA - NOT ANALYZED
NE - NOT ESTABLISHED
U - ANALYTE NOT DETECTED ABOVE THE DETECTION LIMIT: ASSOCIATED
VALUE IS THE DETECTION LIMIT

POC - POINT OF COMPLIANCE

TCE - TRICHLOROETHENE

BOLDED **RED** PARAMETERS ARE CONSTITUENTS OF CONCERN THAT
EXCEED THE TARGET CLEANUP GOAL

(25-35) - WELL SCREEN INTERVAL, IN FEET BELOW GROUND SURFACE

200 100 0 200 400
Feet

N

NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-22
IR SITE 70, UPPER FINES - SOURCE AREA TREATMENT GRID
TRICHLOROETHENE IN GROUNDWATER - 2014

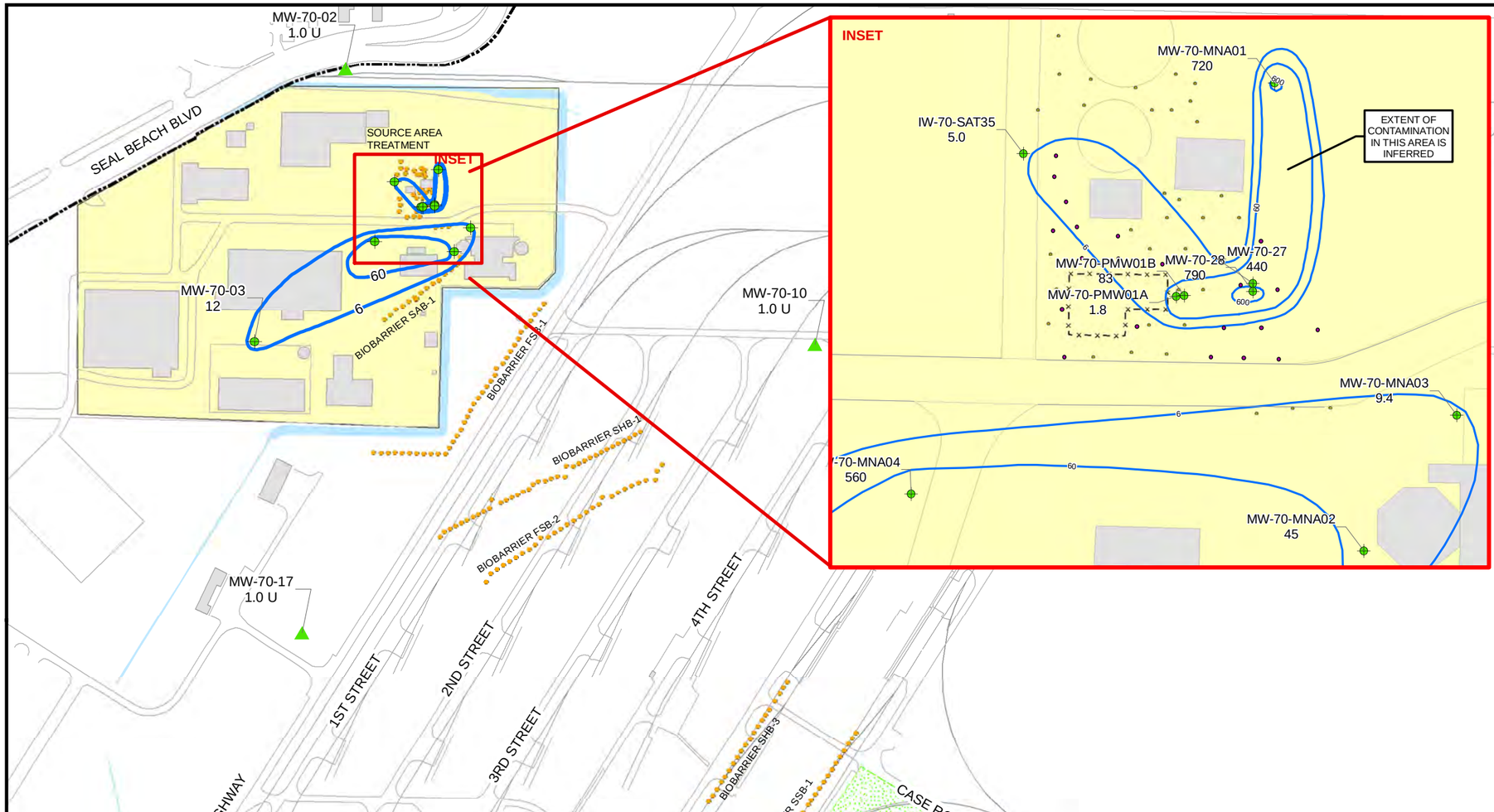
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-22.mxd

NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\Map Documents\FIGURE 2-22.mxd

This Page Intentionally Left Blank



Upper Fines Point of Compliance Wells								
Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-02 (20-30)	MW-70-03 (20-30)	MW-70-10 (30-40)	MW-70-17 (30-40)	MW-70-22 (20-30)
CIS-1,2-DICHLOROETHENE	µg/l	6	Aug/Sept 2008	1 U	NS	1 U	1 U	1 U
			Aug/Sept 2009	1 U	NS	1 U	1 U	1 U
			Sept 2010	1 U	NS	1 U	1 U	1 U
			Oct 2011	1 U	NS	1 U	1 U	1 U
			Nov 2011	NS	7.6	NS	NS	NS
			Dec 2012/Jan 2013	1 U	3.1	1 U	1 U	1 U
			Aug 2013	NS	NS	NS	NS	NS
			Jan 2014	5 U	9.2	5 U	5 U	5 U
			Dec 2014	1 U	12	1 U	1 U	1 U

Source Area Treatment Grid												
Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-27 (26-36)	MW-70-28 (50-60)	IW-70-SAT35 (25-35)	MW-70-MNA01 (40-50)	MW-70-MNA02 (35-45)	MW-70-MNA03 (35-45)	MW-70-MNA04 (35-45)	MW-70-PMW01A (25-35)	MW-70-PMW01B (45-55)
CIS-1,2-DICHLOROETHENE	µg/l	6	Aug 2008	4600	530	NS	40	31	3	270	1300	33
			Sept 2010	6100	11	740	490	45	4	170	4400	4900
			Jul 2011	600	51	NS	NS	NS	NS	NS	3	39
			Nov 2011	1500	40	0.5 J	380	71	5	130	0.81 J	16
			Dec 2012/Jan 2013	2500	3700	0.22 J	340	63	5	180	2	5700
			Aug 2013	2400	2100	NS	NS	NS	NS	NS	4	1,100 J
			Jan 2014	1200	440	NS	370	56	7	280	180	83
			July 2014	690	1500	NS	NS	NS	NS	NS	7.5	540
			Dec 2014	440	790	5	720	45	9.4	560	1.8	83

LEGEND

MW-70-MNA02 71	UPPER FINES/SOURCE AREA TREATMENT MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011
MW-70-02 1.0 U	UPPER FINES POC MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011
IW-70-SAT01 0.89J	SAMPLED BIOBARRIER OR SOURCE AREA TREATMENT WELL
	BIOBARRIER OR SOURCE AREA TREATMENT WELL
	IR SITE 70 BOUNDARY
	BASE BOUNDARY
	ROAD
	RAILROAD TRACK
	BUILDING
5	APPROXIMATE ISOCONCENTRATION CONTOUR (ug/L)

NOTES:

(D) - DUPLICATE SAMPLE
J - ESTIMATED VALUE
ug/L - MICROGRAMS PER LITER
NA - NOT ANALYZED
NE - NOT ESTABLISHED
U - ANALYTE NOT DETECTED ABOVE THE DETECTION LIMIT: ASSOCIATED
VALUE IS THE DETECTION LIMIT

POC - POINT OF COMPLIANCE

CIS-1,2-DCE - CIS-1,2-DICHLOROETHENE

BOLDED **RED** PARAMETERS ARE CONSTITUENTS OF CONCERN THAT
EXCEED THE TARGET CLEANUP GOAL

(25-35) - WELL SCREEN INTERVAL, IN FEET BELOW GROUND SURFACE

200 100 0 200 400
Feet

N

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-23
IR SITE 70, UPPER FINES - SOURCE AREA TREATMENT GRID
CIS-1,1-DICHLOROETHENE IN GROUNDWATER - 2014

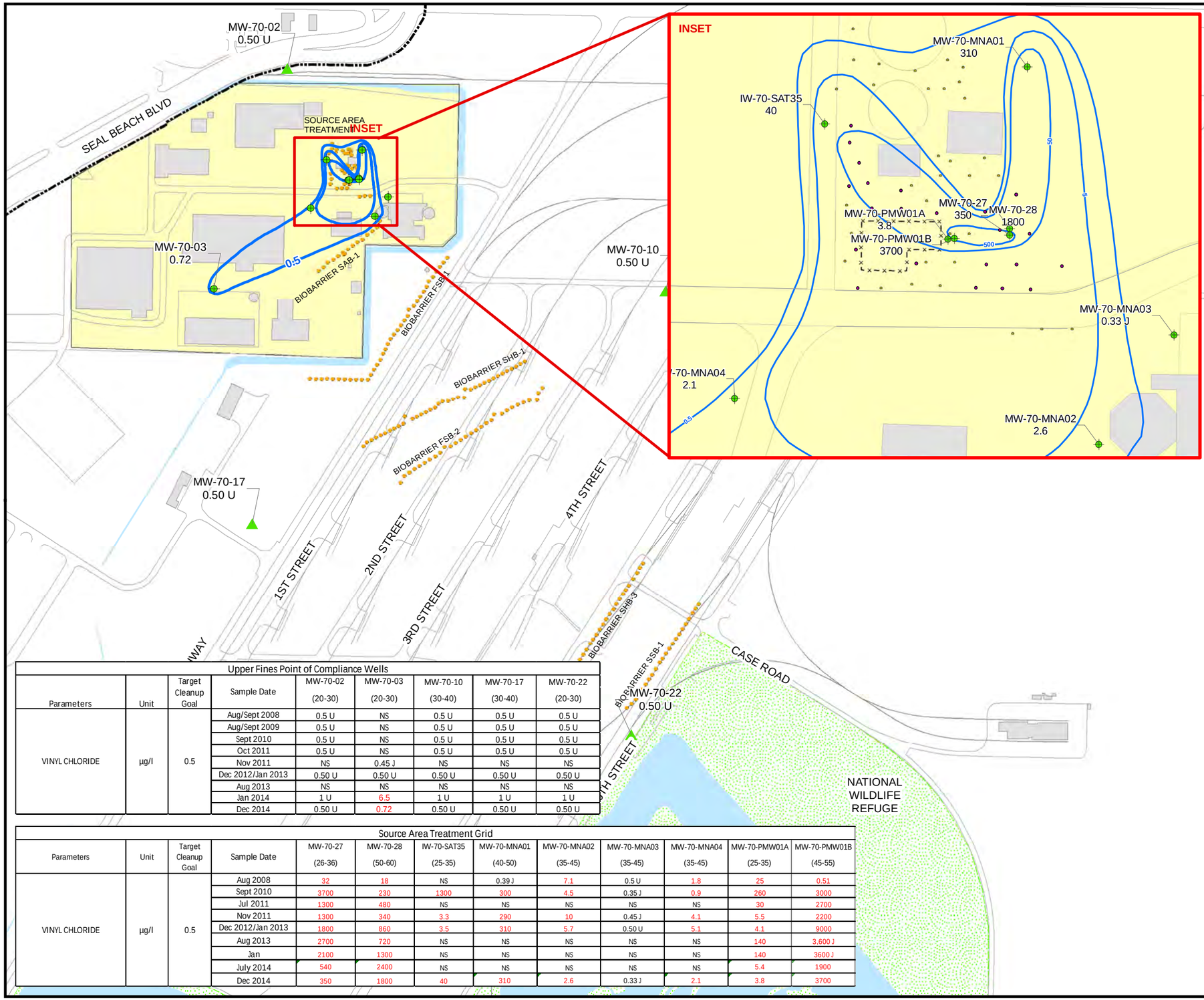
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-23.mxd

NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\Map\Documents\FIGURE 2-22.mxd

This Page Intentionally Left Blank



Upper Fines Point of Compliance Wells									
Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-02 (20-30)	MW-70-03 (20-30)	MW-70-10 (30-40)	MW-70-17 (30-40)	MW-70-22 (20-30)
VINYL CHLORIDE	µg/l	0.5	Aug/Sept 2008	0.5 U	NS	0.5 U	0.5 U	0.5 U
			Aug/Sept 2009	0.5 U	NS	0.5 U	0.5 U	0.5 U
			Sept 2010	0.5 U	NS	0.5 U	0.5 U	0.5 U
			Oct 2011	0.5 U	NS	0.5 U	0.5 U	0.5 U
			Nov 2011	NS	0.45 J	NS	NS	NS
			Dec 2012/Jan 2013	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
			Aug 2013	NS	NS	NS	NS	NS
			Jan 2014	1 U	6.5	1 U	1 U	1 U
			Dec 2014	0.50 U	0.72	0.50 U	0.50 U	0.50 U

Source Area Treatment Grid												
Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-27 (26-36)	MW-70-28 (50-60)	IW-70-SAT35 (25-35)	MW-70-MNA01 (40-50)	MW-70-MNA02 (35-45)	MW-70-MNA03 (35-45)	MW-70-MNA04 (35-45)	MW-70-PMW01A (25-35)	MW-70-PMW01B (45-55)
VINYL CHLORIDE	µg/l	0.5	Aug 2008	32	18	NS	0.39 J	7.1	0.5 U	1.8	25	0.51
			Sept 2010	3700	230	1300	300	4.5	0.35 J	0.9	260	3000
			Jul 2011	1300	480	NS	NS	NS	NS	NS	30	2700
			Nov 2011	1300	340	3.3	290	10	0.45 J	4.1	5.5	2200
			Dec 2012/Jan 2013	1800	860	3.5	310	5.7	0.50 U	5.1	4.1	9000
			Aug 2013	2700	720	NS	NS	NS	NS	NS	140	3,600 J
			Jan	2100	1300	NS	NS	NS	NS	NS	140	3600 J
			July 2014	540	2400	NS	NS	NS	NS	NS	5.4	1900
			Dec 2014	350	1800	40	310	2.6	0.33 J	2.1	3.8	3700

LEGEND

MW-70-MNA02 71 — UPPER FINES/SOURCE AREA TREATMENT MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011

MW-70-02 1.0 U — UPPER FINES POC MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011

IW-70-SAT01 0.89J — SAMPLED BIOBARRIER OR SOURCE AREA TREATMENT WELL

BIOBARRIER OR SOURCE AREA TREATMENT WELL

IR SITE 70 BOUNDARY

BASE BOUNDARY

ROAD

RAILROAD TRACK

BUILDING

5 — APPROXIMATE ISOCONCENTRATION CONTOUR (ug/L)

NOTES:

(D) - DUPLICATE SAMPLE
J - ESTIMATED VALUE
ug/L - MICROGRAMS PER LITER
NA - NOT ANALYZED
NE - NOT ESTABLISHED
U - ANALYTE NOT DETECTED ABOVE THE DETECTION LIMIT: ASSOCIATED
VALUE IS THE DETECTION LIMIT

POC - POINT OF COMPLIANCE

BOLDED **RED** PARAMETERS ARE CONSTITUENTS OF CONCERN THAT
EXCEED THE TARGET CLEANUP GOAL

(25-35) - WELL SCREEN INTERVAL, IN FEET BELOW GROUND SURFACE

200 100 0 200 400 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-24
IR SITE 70, UPPER FINES - SOURCE AREA TREATMENT GRID
VINYL CHLORIDE IN GROUNDWATER - 2014

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

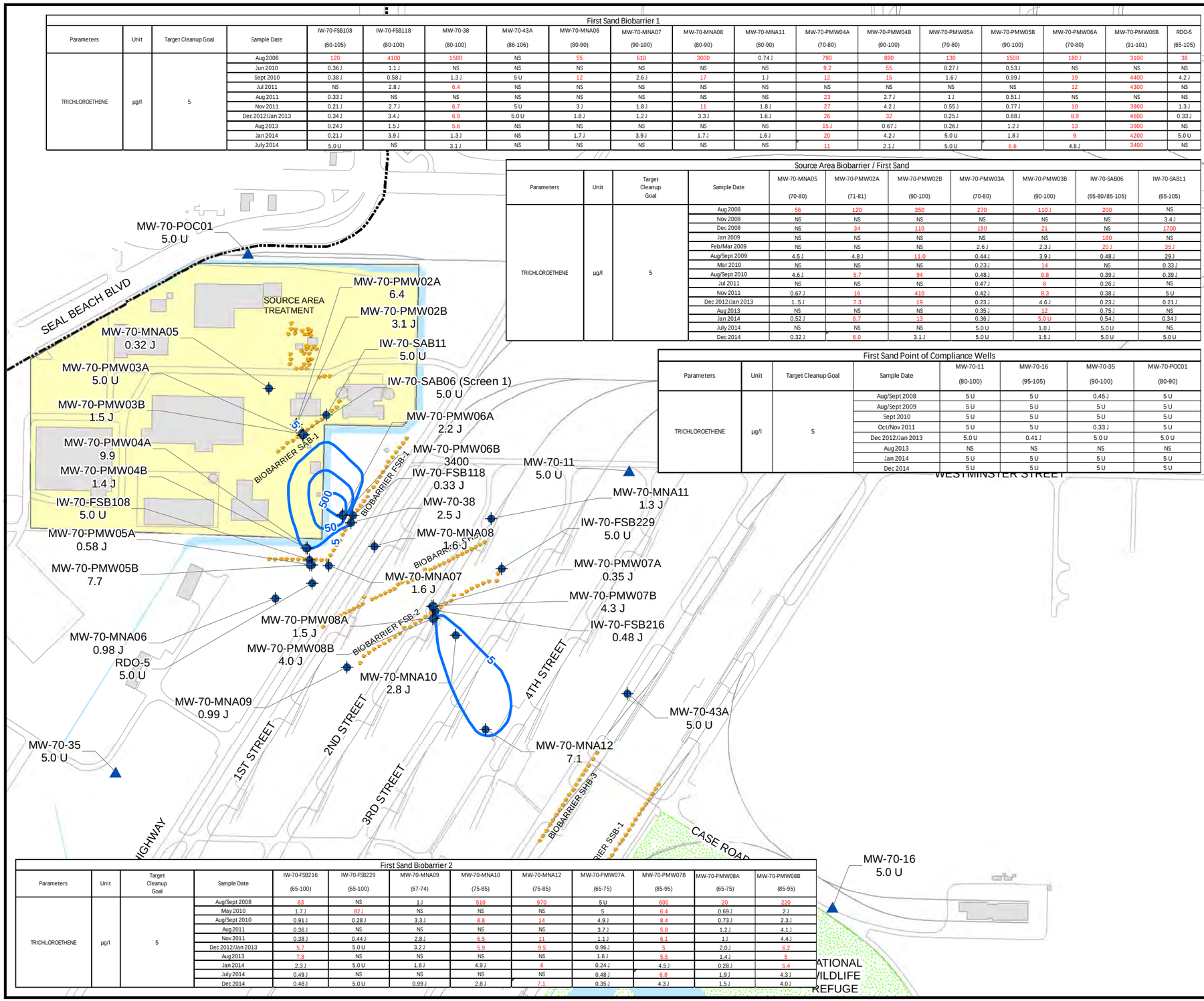
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-24.mxd

NAVFAC

ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\Map Documents\FIGURE 2-22.mxd

This Page Intentionally Left Blank



First Sand Biobarrier 1

Parameters	Unit	Target Cleanup Goal	Sample Date	IW-70-FSB108 (60-105)	IW-70-FSB118 (80-100)	MW-70-38 (80-100)	MW-70-43A (86-106)	MW-70-MNA06 (80-90)	MW-70-MNA07 (90-100)	MW-70-MNA08 (80-90)	MW-70-MNA11 (80-90)	MW-70-PMW04A (70-80)	MW-70-PMW04B (90-100)	MW-70-PMW05A (70-80)	MW-70-PMW05B (90-100)	MW-70-PMW06A (70-80)	MW-70-PMW06B (91-101)	RDO-5 (65-105)
TRICHLOROETHENE	µg/l	5	Aug 2008	120	4100	1500	NS	55	610	3000	0.74 J	790	890	130	1500	180 J	3100	38
			Jun 2010	0.36 J	1.1 J	NS	NS	NS	NS	NS	NS	9.2	55	0.27 J	0.53 J	NS	NS	NS
			Sept 2010	0.38 J	0.58 J	1.3 J	5 U	12	2.6 J	17	1 J	12	15	1.6 J	0.99 J	19	4400	4.2 J
			Jul 2011	NS	2.8 J	6.4	NS	NS	NS	NS	NS	NS	NS	NS	NS	12	4300	NS
			Aug 2011	0.33 J	NS	NS	NS	NS	NS	NS	NS	23	2.7 J	1 J	0.51 J	NS	NS	NS
			Nov 2011	0.21 J	2.7 J	6.7	5 U	3 J	1.8 J	11	1.8 J	27	4.2 J	0.55 J	0.77 J	10	3900	1.3 J
			Dec 2012/Jan 2013	0.34 J	3.4 J	6.9	5.0 U	1.8 J	1.2 J	3.3 J	1.6 J	26	32	0.25 J	0.88 J	8.9	4600	0.33 J
			Aug 2013	0.24 J	1.5 J	5.6	NS	NS	NS	NS	NS	15 J	0.67 J	0.26 J	1.2 J	13	3900	NS
			Jan 2014	0.21 J	3.9 J	1.3 J	NS	1.7 J	3.9 J	1.7 J	1.6 J	20	4.2 J	5.0 U	1.8 J	9	4200	5.0 U
			July 2014	5.0 U	NS	3.1 J	NS	NS	NS	NS	NS	11	2.1 J	5.0 U	6.6	4.8 J	3400	NS

Source Area Biobarrier / First Sand

Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-MNA05 (70-80)	MW-70-PMW02A (71-81)	MW-70-PMW02B (90-100)	MW-70-PMW03A (70-80)	MW-70-PMW03B (90-100)	IW-70-SAB06 (65-80/85-105)	IW-70-SAB11 (65-105)
TRICHLOROETHENE	µg/l	5	Aug 2008	56	120	350	270	110 J	200	NS
			Nov 2008	NS	NS	NS	NS	NS	NS	3.4 J
			Dec 2008	NS	34	110	150	21	NS	1700
			Jan 2009	NS	NS	NS	NS	NS	180	NS
			Feb/Mar 2009	NS	NS	NS	2.6 J	2.3 J	20 J	35 J
			Aug/Sept 2009	4.5 J	4.8 J	11.0	0.44 J	3.9 J	0.48 J	29 J
			Mar 2010	NS	NS	NS	0.23 J	14	NS	0.33 J
			Aug/Sept 2010	4.6 J	5.7	94	0.48 J	9.8	0.39 J	0.39 J
			Jul 2011	NS	NS	NS	0.47 J	8	0.26 J	NS
			Nov 2011	0.67 J	16	410	0.42 J	8.3	0.38 J	5 U
			Dec 2012/Jan 2013	1..5 J	7.3	19	0.23 J	4.6 J	0.23 J	0.21 J
			Aug 2013	NS	NS	NS	0.35 J	12	0.75 J	NS
			Jan 2014	0.52 J	6.7	13	0.36 J	5.0 U	0.54 J	0.34 J
			July 2014	NS	NS	NS	5.0 U	1.0 J	5.0 U	NS
			Dec 2014	0.32 J	6.0	3.1 J	5.0 U	1.5 J	5.0 U	5.0 U

First Sand Point of Compliance Wells

Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-11 (80-100)	MW-70-16 (95-105)	MW-70-35 (90-100)	MW-70-POC01 (80-90)
TRICHLOROETHENE	µg/l	5	Aug/Sept 2008	5 U	5 U	0.45 J	5 U
			Aug/Sept 2009	5 U	5 U	5 U	5 U
			Sept 2010	5 U	5 U	5 U	5 U
			Oct/Nov 2011	5 U	5 U	0.33 J	5 U
			Dec 2012/Jan 2013	5.0 U	0.41 J	5.0 U	5.0 U
			Aug 2013	NS	NS	NS	NS
			Jan 2014	5 U	5 U	5 U	5 U
			Dec 2014	5 U	5 U	5 U	5 U

First Sand Biobarrier 2

Parameters	Unit	Target Cleanup Goal	Sample Date	IW-70-FSB216 (65-100)	IW-70-FSB229 (65-100)	MW-70-MNA09 (67-74)	MW-70-MNA10 (75-85)	MW-70-MNA12 (75-85)	MW-70-PMW07A (65-75)	MW-70-PMW07B (85-95)	MW-70-PMW08A (65-75)	MW-70-PMW08B (85-95)
TRICHLOROETHENE	µg/l	5	Aug/Sept 2008	63	NS	1 J	510	970	5 U	600	20	220
			May 2010	1.7 J	82 J	NS	NS	NS	5	6.4	0.69 J	2 J
			Aug/Sept 2010	0.91 J	0.28 J	3.3 J	8.8	14	4.9 J	8.4	0.73 J	2.3 J
			Aug 2011	0.36 J	NS	NS	NS	NS	3.7 J	5.8	1.2 J	4.1 J
			Nov 2011	0.38 J	0.44 J	2.8 J	6.5	11	1.1 J	6.1	1 J	4.4 J
			Dec 2012/Jan 2013	5.7	5.0 U	3.2 J	5.9	9.5	0.96 J	5	2.0 J	6.2
			Aug 2013	7.8	NS	NS	NS	NS	1.6 J	5.5	1.4 J	5
			Jan 2014	2.3 J	5.0 U	1.8 J	4.9 J	8	0.24 J	4.5 J	0.28 J	5.4
			July 2014	0.49 J	NS	NS	NS	NS	0.48 J	6.8	1.9 J	4.3 J
			Dec 2014	0.48 J	5.0 U	0.99 J	2.8 J	7.1	0.35 J	4.3 J	1.5 J	4.0 J

LEGEND

MW-70-MNA05 0.32J — FIRST SAND/SOURCE AREA TREATMENT MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L

MW-70-11 5.0 U — FIRST SAND POC MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L

BIOBARRIER OR SOURCE AREA TREATMENT WELL

IR SITE 70 BOUNDARY

BASE BOUNDARY

ROAD

RAILROAD TRACK

BUILDING

5 — APPROXIMATE ISOCONCENTRATION CONTOUR (ug/L)

NOTES:

(D) - DUPLICATE SAMPLE
J - ESTIMATED VALUE
ug/L - MICROGRAMS PER LITER
NA - NOT ANALYZED
NE - NOT ESTABLISHED
U - ANALYTE NOT DETECTED ABOVE THE DETECTION LIMIT: ASSOCIATED
VALUE IS THE DETECTION LIMIT

POC - POINT OF COMPLIANCE

TCE - TRICHLOROETHENE

BOLDED **RED** PARAMETERS ARE CONSTITUENTS OF CONCERN THAT
EXCEED THE TARGET CLEANUP GOAL

(25-35) - WELL SCREEN INTERVAL, IN FEET BELOW GROUND SURFACE

200 100 0 200 400
Feet

N

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-25

IR SITE 70, FIRST SAND - SOURCE AREA BIOBARRIER, FIRST SAND BIOBARRIERS 1 & 2, TRICHLOROETHENE IN GROUNDWATER - 2014

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

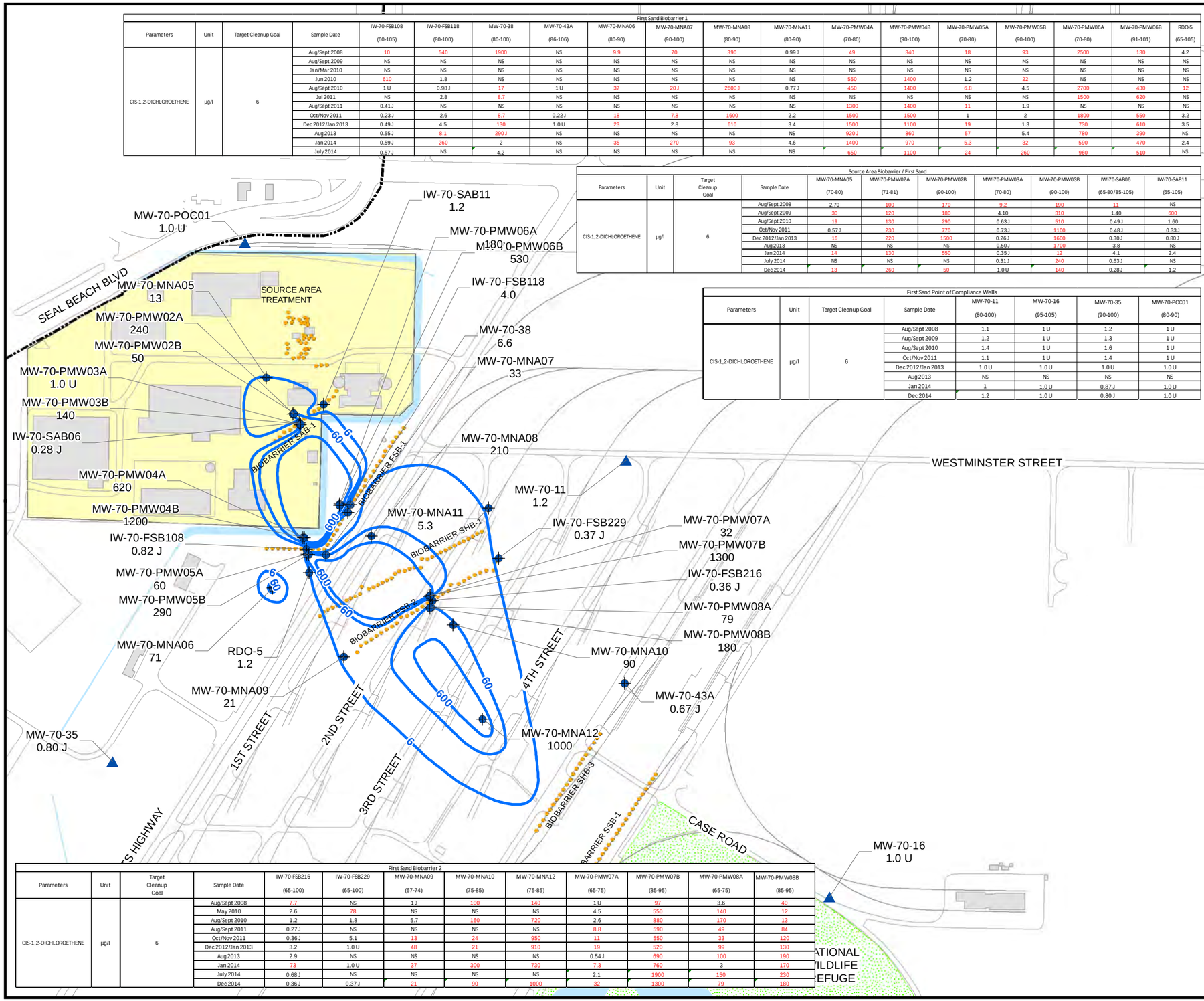
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-25.mxd

NAVFAC

ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\Map\Documents\FIGURE 2-22.mxd

This Page Intentionally Left Blank



First Sand Biobarrier 1																		
Parameters	Unit	Target Cleanup Goal	Sample Date	IW-70-FSB108 (60-105)	IW-70-FSB118 (80-100)	MW-70-38 (80-100)	MW-70-43A (86-106)	MW-70-MNA06 (80-90)	MW-70-MNA07 (90-100)	MW-70-MNA08 (80-90)	MW-70-MNA11 (80-90)	MW-70-PMW04A (70-80)	MW-70-PMW04B (90-100)	MW-70-PMW05A (70-80)	MW-70-PMW05B (90-100)	MW-70-PMW06A (70-80)	MW-70-PMW06B (91-101)	RDO-5 (65-105)
CIS-1,2-DICHLOROETHENE	µg/l	6	Aug/Sept 2008	10	540	1900	NS	9.9	70	390	0.99 J	49	340	18	93	2500	130	4.2
			Aug/Sept 2009	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
			Jan/Mar 2010	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
			Jun 2010	610	1.8	NS	NS	NS	NS	NS	NS	550	1400	1.2	22	NS	NS	NS
			Aug/Sept 2010	1 U	0.98 J	17	1 U	37	20 J	2600 J	0.77 J	450	1400	6.8	4.5	2700	430	12
			Jul 2011	NS	2.8	8.7	NS	NS	NS	NS	NS	NS	NS	NS	NS	1500	620	NS
			Aug/Sept 2011	0.41 J	NS	NS	NS	NS	NS	NS	NS	1300	1400	11	1.9	NS	NS	NS
			Oct/Nov 2011	0.23 J	2.6	8.7	0.22 J	18	7.8	1600	2.2	1500	1500	1	2	1800	550	3.2
			Dec 2012/Jan 2013	0.49 J	4.5	130	1.0 U	23	2.8	610	3.4	1500	1100	19	1.3	730	610	3.5
			Aug 2013	0.55 J	8.1	290 J	NS	NS	NS	NS	NS	920 J	860	57	5.4	780	390	NS
			Jan 2014	0.59 J	260	2	NS	35	270	93	4.6	1400	970	5.3	32	590	470	2.4
			July 2014	0.57 J	NS	4.2	NS	NS	NS	NS	NS	650	1100	24	260	960	510	NS

Source Area Biobarrier / First Sand											
Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-MNA05 (70-80)	MW-70-PMW02A (71-81)	MW-70-PMW02B (90-100)	MW-70-PMW03A (70-80)	MW-70-PMW03B (90-100)	IW-70-SAB06 (65-80/85-105)	IW-70-SAB11 (65-105)
CIS-1,2-DICHLOROETHENE	µg/l	6	Aug/Sept 2008	2.70	100	170	9.2	190	11	NS
			Aug/Sept 2009	30	120	180	4.10	310	1.40	600
			Aug/Sept 2010	19	130	290	0.63 J	510	0.49 J	1.60
			Oct/Nov 2011	0.57 J	230	770	0.73 J	1100	0.48 J	0.33 J
			Dec 2012/Jan 2013	16	220	1500	0.26 J	1600	0.30 J	0.80 J
			Aug 2013	NS	NS	NS	0.50 J	1700	3.8	NS
			Jan 2014	14	130	550	0.35 J	12	4.1	2.4
			July 2014	NS	NS	NS	0.31 J	240	0.63 J	NS
			Dec 2014	13	260	50	1.0 U	140	0.28 J	1.2

First Sand Point of Compliance Wells							
Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-11 (80-100)	MW-70-16 (95-105)	MW-70-35 (90-100)	MW-70-POC01 (80-90)
CIS-1,2-DICHLOROETHENE	µg/l	6	Aug/Sept 2008	1.1	1 U	1.2	1 U
			Aug/Sept 2009	1.2	1 U	1.3	1 U
			Aug/Sept 2010	1.4	1 U	1.6	1 U
			Oct/Nov 2011	1.1	1 U	1.4	1 U
			Dec 2012/Jan 2013	1.0 U	1.0 U	1.0 U	1.0 U
			Aug 2013	NS	NS	NS	NS
			Jan 2014	1	1.0 U	0.87 J	1.0 U
			Dec 2014	1.2	1.0 U	0.80 J	1.0 U

First Sand Biobarrier 2												
Parameters	Unit	Target Cleanup Goal	Sample Date	IW-70-FSB216 (65-100)	IW-70-FSB229 (65-100)	MW-70-MNA09 (67-74)	MW-70-MNA10 (75-85)	MW-70-MNA12 (75-85)	MW-70-PMW07A (65-75)	MW-70-PMW07B (85-95)	MW-70-PMW08A (65-75)	MW-70-PMW08B (85-95)
CIS-1,2-DICHLOROETHENE	µg/l	6	Aug/Sept 2008	7.7	NS	1 J	100	140	1 U	97	3.6	40
			May 2010	2.6	78	NS	NS	NS	4.5	550	140	12
			Aug/Sept 2010	1.2	1.8	5.7	160	720	2.6	880	170	13
			Aug/Sept 2011	0.27 J	NS	NS	NS	NS	8.8	590	49	84
			Oct/Nov 2011	0.36 J	5.1	13	24	950	11	550	33	120
			Dec 2012/Jan 2013	3.2	1.0 U	48	21	910	19	520	99	130
			Aug 2013	2.9	NS	NS	NS	NS	0.54 J	690	100	190
			Jan 2014	73	1.0 U	37	300	730	7.3	760	3	170
			July 2014	0.68 J	NS	NS	NS	NS	2.1	1900	150	230
			Dec 2014	0.36 J	0.37 J	21	90	1000	32	1300	79	180

LEGEND

MW-70-MNA05 0.32J — FIRST SAND/SOURCE AREA TREATMENT MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011

MW-70-11 5.0 U — FIRST SAND POC MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011

BIOBARRIER OR SOURCE AREA TREATMENT WELL

IR SITE 70 BOUNDARY

BASE BOUNDARY

ROAD

RAILROAD TRACK

BUILDING

5 — APPROXIMATE ISOCONCENTRATION CONTOUR (ug/L)

NOTES:

(D) - DUPLICATE SAMPLE
J - ESTIMATED VALUE
ug/L - MICROGRAMS PER LITER
NA - NOT ANALYZED
NE - NOT ESTABLISHED
U - ANALYTE NOT DETECTED ABOVE THE DETECTION LIMIT: ASSOCIATED
VALUE IS THE DETECTION LIMIT

POC - POINT OF COMPLIANCE

CIS-1,2-DCE - CIS-1,2-DICHLOROETHENE

BOLDED **RED** PARAMETERS ARE CONSTITUENTS OF CONCERN THAT
EXCEED THE TARGET CLEANUP GOAL

(25-35) - WELL SCREEN INTERVAL, IN FEET BELOW GROUND SURFACE

200 100 0 200 400 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-26
IR SITE 70, FIRST SAND - SOURCE AREA BIOBARRIER, FIRST SAND BIOBARRIERS 1 & 2, CIS-1,2-DCE IN GROUNDWATER - 2014

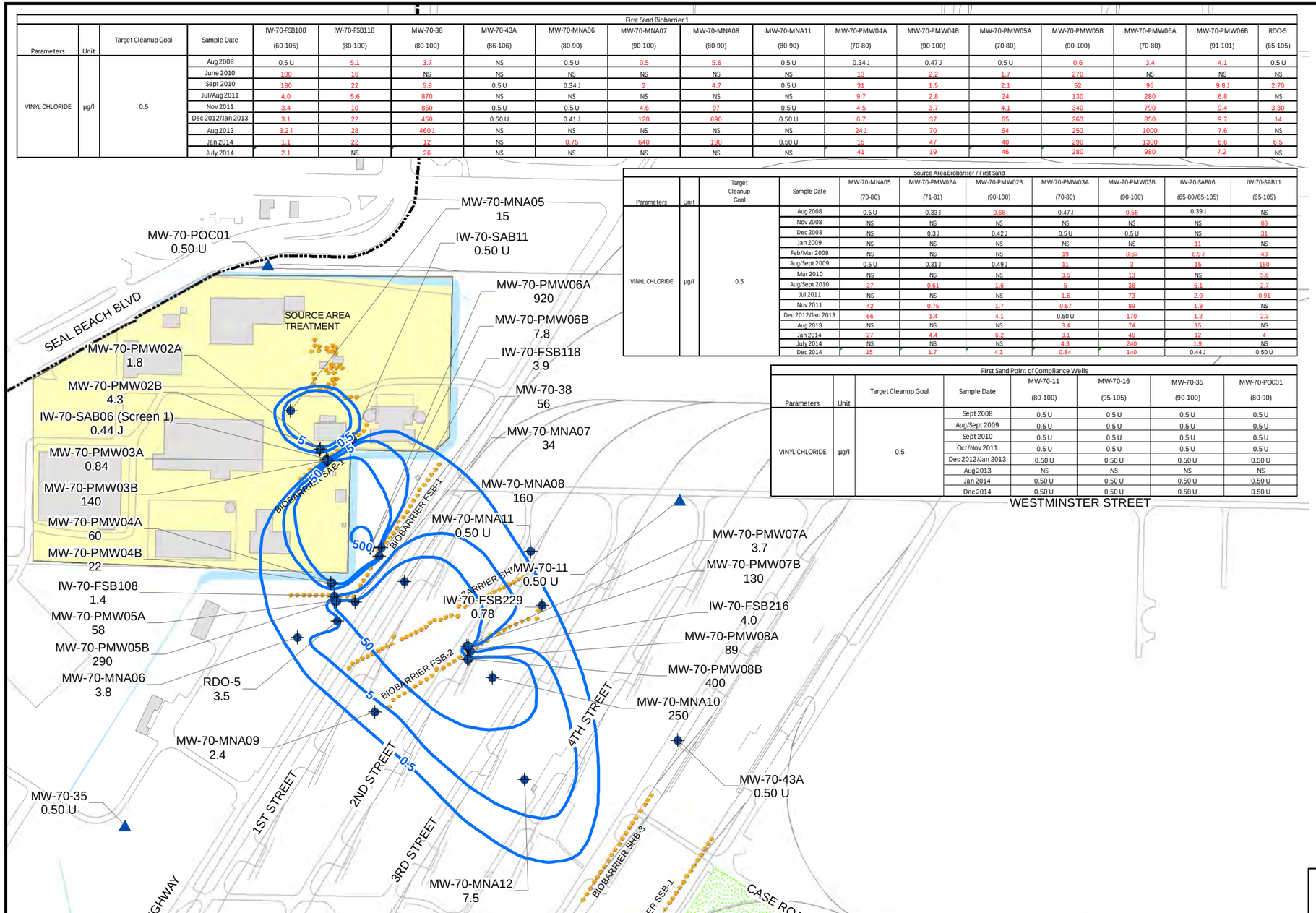
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-26.mxd

NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-22.mxd

This Page Intentionally Left Blank



First Sand Biobarrier 1																		
Parameters	Unit	Target Cleanup Goal	Sample Date	IW-70-FSB108 (60-105)	IW-70-FSB118 (80-100)	MW-70-38 (80-100)	MW-70-43A (86-106)	MW-70-MNA06 (80-90)	MW-70-MNA07 (90-100)	MW-70-MNA08 (80-90)	MW-70-MNA11 (80-90)	MW-70-PMW04A (70-80)	MW-70-PMW04B (90-100)	MW-70-PMW05A (70-80)	MW-70-PMW05B (90-100)	MW-70-PMW06A (70-80)	MW-70-PMW06B (91-101)	RDO-5 (65-105)
VINYL CHLORIDE	µg/l	0.5	Aug 2008	0.5 U	5.1	3.7	NS	0.5 U	0.5	5.6	0.5 U	0.34 J	0.47 J	0.5 U	0.6	3.4	4.1	0.5 U
			June 2010	100	16	NS	NS	NS	NS	NS	NS	13	2.2	1.7	270	NS	NS	NS
			Sept 2010	180	22	5.8	0.5 U	0.34 J	2	4.7	0.5 U	31	1.5	2.1	52	95	9.8 J	2.70
			Jul/Aug 2011	4.0	5.6	870	NS	NS	NS	NS	NS	9.7	2.8	24	130	280	6.8	NS
			Nov 2011	3.4	10	850	0.5 U	0.5 U	4.6	97	0.5 U	4.5	3.7	4.1	340	790	9.4	3.30
			Dec 2012/Jan 2013	3.1	22	450	0.50 U	0.41 J	120	690	0.50 U	6.7	37	65	260	850	9.7	14
			Aug 2013	3.2 J	28	460 J	NS	NS	NS	NS	NS	24 J	70	54	250	1000	7.6	NS
			Jan 2014	1.1	22	12	NS	0.75	640	190	0.50 U	15	47	40	290	1300	6.6	6.5
			July 2014	2.1	NS	26	NS	NS	NS	NS	NS	41	19	46	280	980	7.2	NS

Source Area Biobarrier / First Sand											
Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-MNA05 (70-80)	MW-70-PMW02A (71-81)	MW-70-PMW02B (90-100)	MW-70-PMW03A (70-80)	MW-70-PMW03B (90-100)	IW-70-SAB06 (65-80/85-105)	IW-70-SAB11 (65-105)
VINYL CHLORIDE	µg/l	0.5	Aug 2008	0.5 U	0.33 J	0.68	0.47 J	0.56	0.39 J	NS
			Nov 2008	NS	NS	NS	NS	NS	NS	88
			Dec 2008	NS	0.3 J	0.42 J	0.5 U	0.5 U	NS	31
			Jan 2009	NS	NS	NS	NS	NS	11	NS
			Feb/Mar 2009	NS	NS	NS	19	0.67	8.9 J	43
			Aug/Sept 2009	0.5 U	0.31 J	0.49 J	11	3	15	150
			Mar 2010	NS	NS	NS	3.6	13	NS	5.6
			Aug/Sept 2010	37	0.61	1.6	5	38	6.1	2.7
			Jul 2011	NS	NS	NS	1.6	73	2.9	0.91
			Nov 2011	42	0.75	1.7	0.67	89	1.8	NS
			Dec 2012/Jan 2013	66	1.4	4.1	0.50 U	170	1.2	2.3
			Aug 2013	NS	NS	NS	3.4	74	15	NS
			Jan 2014	27	4.4	6.2	3.1	46	12	4
			July 2014	NS	NS	NS	4.3	240	1.9	NS
			Dec 2014	15	1.7	4.3	0.84	140	0.44 J	0.50 U

First Sand Point of Compliance Wells							
Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-11 (80-100)	MW-70-16 (95-105)	MW-70-35 (90-100)	MW-70-POC01 (80-90)
VINYL CHLORIDE	µg/l	0.5	Sept 2008	0.5 U	0.5 U	0.5 U	0.5 U
			Aug/Sept 2009	0.5 U	0.5 U	0.5 U	0.5 U
			Sept 2010	0.5 U	0.5 U	0.5 U	0.5 U
			Oct/Nov 2011	0.5 U	0.5 U	0.5 U	0.5 U
			Dec 2012/Jan 2013	0.50 U	0.50 U	0.50 U	0.50 U
			Aug 2013	NS	NS	NS	NS
			Jan 2014	0.50 U	0.50 U	0.50 U	0.50 U
			Dec 2014	0.50 U	0.50 U	0.50 U	0.50 U

First Sand Biobarrier 2												
Parameters	Unit	Target Cleanup Goal	Sample Date	IW-70-FSB216 (65-100)	IW-70-FSB229 (65-100)	MW-70-MNA09 (67-74)	MW-70-MNA10 (75-85)	MW-70-MNA12 (75-85)	MW-70-PMW07A (65-75)	MW-70-PMW07B (85-95)	MW-70-PMW08A (65-75)	MW-70-PMW08B (85-95)
VINYL CHLORIDE	µg/l	0.5	Aug/Sept 2008	0.45 J	NS	0.5 U	2.4	2	0.5 U	2	0.5 U	0.94
			May 2010	23	10	NS	NS	NS	3.2	1.5	11	350
			Aug/Sept 2010	12	2.5	0.5 U	110	1.6	0.5 U	1.5	20	330
			Aug 2011	3.9	NS	NS	NS	NS	0.5	1.1	45	410
			Nov 2011	2.9	4.1	0.5 U	25	1.5	0.5 U	1.1	39	390
			Dec 2012/Jan 2013	8.1	0.59	1.7	9.4	3.5	0.22 J	1.3	70	470
			Aug 2013	6.9	NS	NS	NS	NS	0.82	3.2	34	290
			Jan 2014	10	0.81	4.6	200	2.2	0.50 U	3.6	20	320
			July 2014	3.7	NS	NS	NS	NS	0.50 U	29	93	280
			Dec 2014	4.0	0.78	2.4	250	7.5	3.7	130	89	400

LEGEND

MW-70-MNA05 0.32J — FIRST SAND/SOURCE AREA TREATMENT MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011

MW-70-11 5.0 U — FIRST SAND POC MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011

BIOBARRIER OR SOURCE AREA TREATMENT WELL

IR SITE 70 BOUNDARY

BASE BOUNDARY

ROAD

RAILROAD TRACK

BUILDING

5 — APPROXIMATE ISOCONCENTRATION CONTOUR (ug/L)

NOTES:

(D) - DUPLICATE SAMPLE
J - ESTIMATED VALUE
ug/L - MICROGRAMS PER LITER
NA - NOT ANALYZED
NE - NOT ESTABLISHED
U - ANALYTE NOT DETECTED ABOVE THE DETECTION LIMIT: ASSOCIATED
VALUE IS THE DETECTION LIMIT

POC - POINT OF COMPLIANCE

BOLDED **RED** PARAMETERS ARE CONSTITUENTS OF CONCERN THAT
EXCEED THE TARGET CLEANUP GOAL

(25-35) - WELL SCREEN INTERVAL, IN FEET BELOW GROUND SURFACE

200 100 0 200 400 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-27
IR SITE 70, FIRST SAND - SOURCE AREA BIOBARRIER, FIRST SAND BIOBARRIERS 1 & 2, VINYL CHLORIDE IN GROUNDWATER - 2014

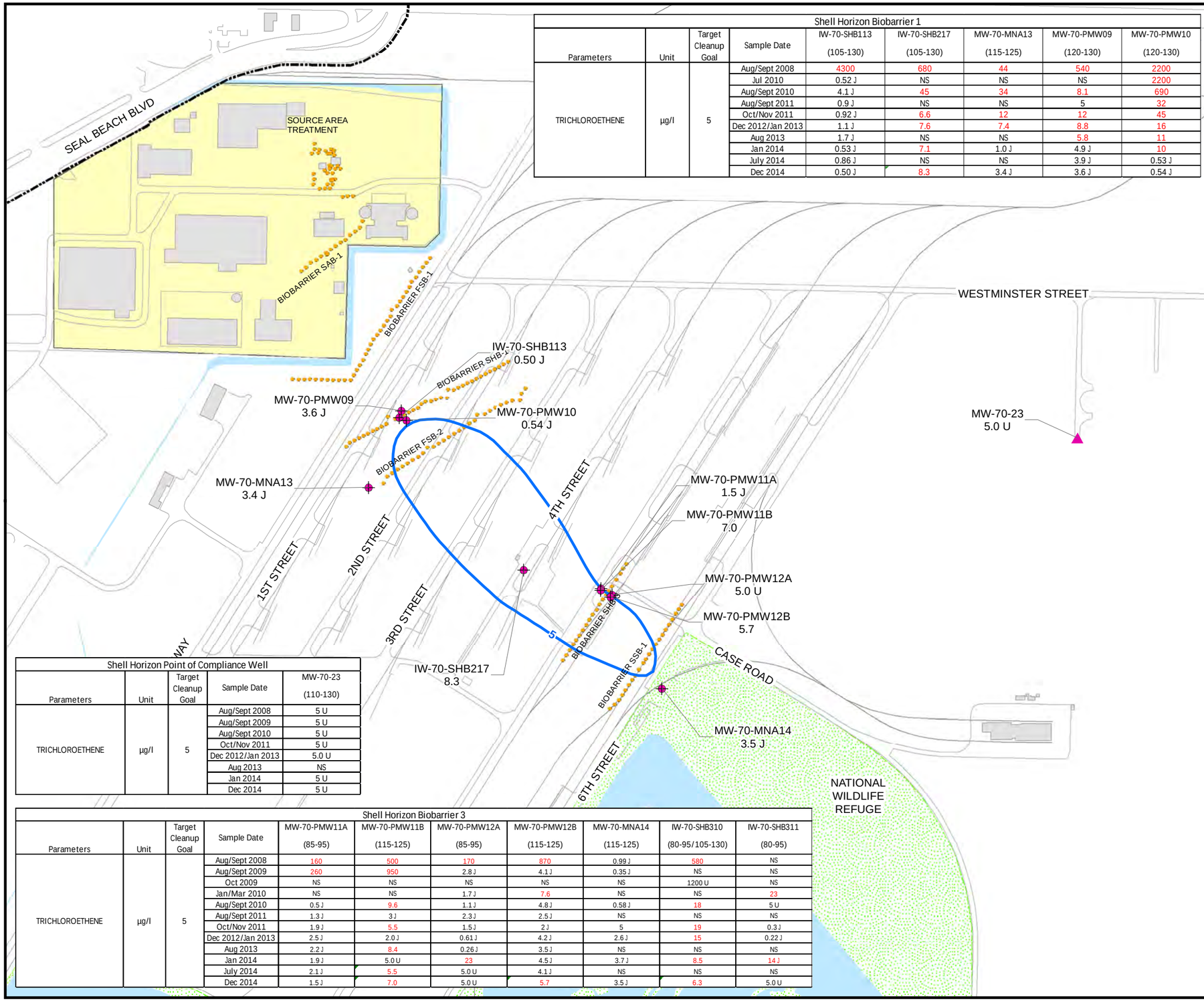
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-27.mxd

NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\Map\Documents\FIGURE 2-22.mxd

This Page Intentionally Left Blank



Shell Horizon Biobarrier 1								
Parameters	Unit	Target Cleanup Goal	Sample Date	IW-70-SHB113 (105-130)	IW-70-SHB217 (105-130)	MW-70-MNA13 (115-125)	MW-70-PMW09 (120-130)	MW-70-PMW10 (120-130)
TRICHLOROETHENE	µg/l	5	Aug/Sept 2008	4300	680	44	540	2200
			Jul 2010	0.52 J	NS	NS	NS	2200
			Aug/Sept 2010	4.1 J	45	34	8.1	690
			Aug/Sept 2011	0.9 J	NS	NS	5	32
			Oct/Nov 2011	0.92 J	6.6	12	12	45
			Dec 2012/Jan 2013	1.1 J	7.6	7.4	8.8	16
			Aug 2013	1.7 J	NS	NS	5.8	11
			Jan 2014	0.53 J	7.1	1.0 J	4.9 J	10
			July 2014	0.86 J	NS	NS	3.9 J	0.53 J
			Dec 2014	0.50 J	8.3	3.4 J	3.6 J	0.54 J

Shell Horizon Point of Compliance Well				
Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-23 (110-130)
TRICHLOROETHENE	µg/l	5	Aug/Sept 2008	5 U
			Aug/Sept 2009	5 U
			Aug/Sept 2010	5 U
			Oct/Nov 2011	5 U
			Dec 2012/Jan 2013	5.0 U
			Aug 2013	NS
			Jan 2014	5 U
			Dec 2014	5 U

Shell Horizon Biobarrier 3										
Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-PMW11A (85-95)	MW-70-PMW11B (115-125)	MW-70-PMW12A (85-95)	MW-70-PMW12B (115-125)	MW-70-MNA14 (115-125)	IW-70-SHB310 (80-95/105-130)	IW-70-SHB311 (80-95)
TRICHLOROETHENE	µg/l	5	Aug/Sept 2008	160	500	170	870	0.99 J	580	NS
			Aug/Sept 2009	260	950	2.8 J	4.1 J	0.35 J	NS	NS
			Oct 2009	NS	NS	NS	NS	NS	1200 U	NS
			Jan/Mar 2010	NS	NS	1.7 J	7.6	NS	NS	23
			Aug/Sept 2010	0.5 J	9.6	1.1 J	4.8 J	0.58 J	18	5 U
			Aug/Sept 2011	1.3 J	3 J	2.3 J	2.5 J	NS	NS	NS
			Oct/Nov 2011	1.9 J	5.5	1.5 J	2 J	5	19	0.3 J
			Dec 2012/Jan 2013	2.5 J	2.0 J	0.61 J	4.2 J	2.6 J	15	0.22 J
			Aug 2013	2.2 J	8.4	0.26 J	3.5 J	NS	NS	NS
			Jan 2014	1.9 J	5.0 U	23	4.5 J	3.7 J	8.5	14 J
			July 2014	2.1 J	5.5	5.0 U	4.1 J	NS	NS	NS
			Dec 2014	1.5 J	7.0	5.0 U	5.7	3.5 J	6.3	5.0 U

LEGEND

MW-70-MNA13
3.4J — SHELL HORIZON MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L

MW-70-23
5.0 U — SHELL HORIZON POC MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L

BIOBARRIER OR SOURCE AREA TREATMENT WELL

IR SITE 70 BOUNDARY

BASE BOUNDARY

ROAD

RAILROAD TRACK

BUILDING

5 — APPROXIMATE ISOCONCENTRATION CONTOUR (ug/L)

NOTES:

(D) - DUPLICATE SAMPLE
J - ESTIMATED VALUE
ug/L - MICROGRAMS PER LITER
NA - NOT ANALYZED
NE - NOT ESTABLISHED
U - ANALYTE NOT DETECTED ABOVE THE DETECTION LIMIT: ASSOCIATED
VALUE IS THE DETECTION LIMIT

POC - POINT OF COMPLIANCE

TCE - TRICHLOROETHENE

BOLDED **RED** PARAMETERS ARE CONSTITUENTS OF CONCERN THAT
EXCEED THE TARGET CLEANUP GOAL

(25-35) - WELL SCREEN INTERVAL, IN FEET BELOW GROUND SURFACE

200 100 0 200 400 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-28
IR SITE 70, SHELL HORIZON BIOBARRIERS 1 & 3
TRICHLOROETHENE IN GROUNDWATER - 2014

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

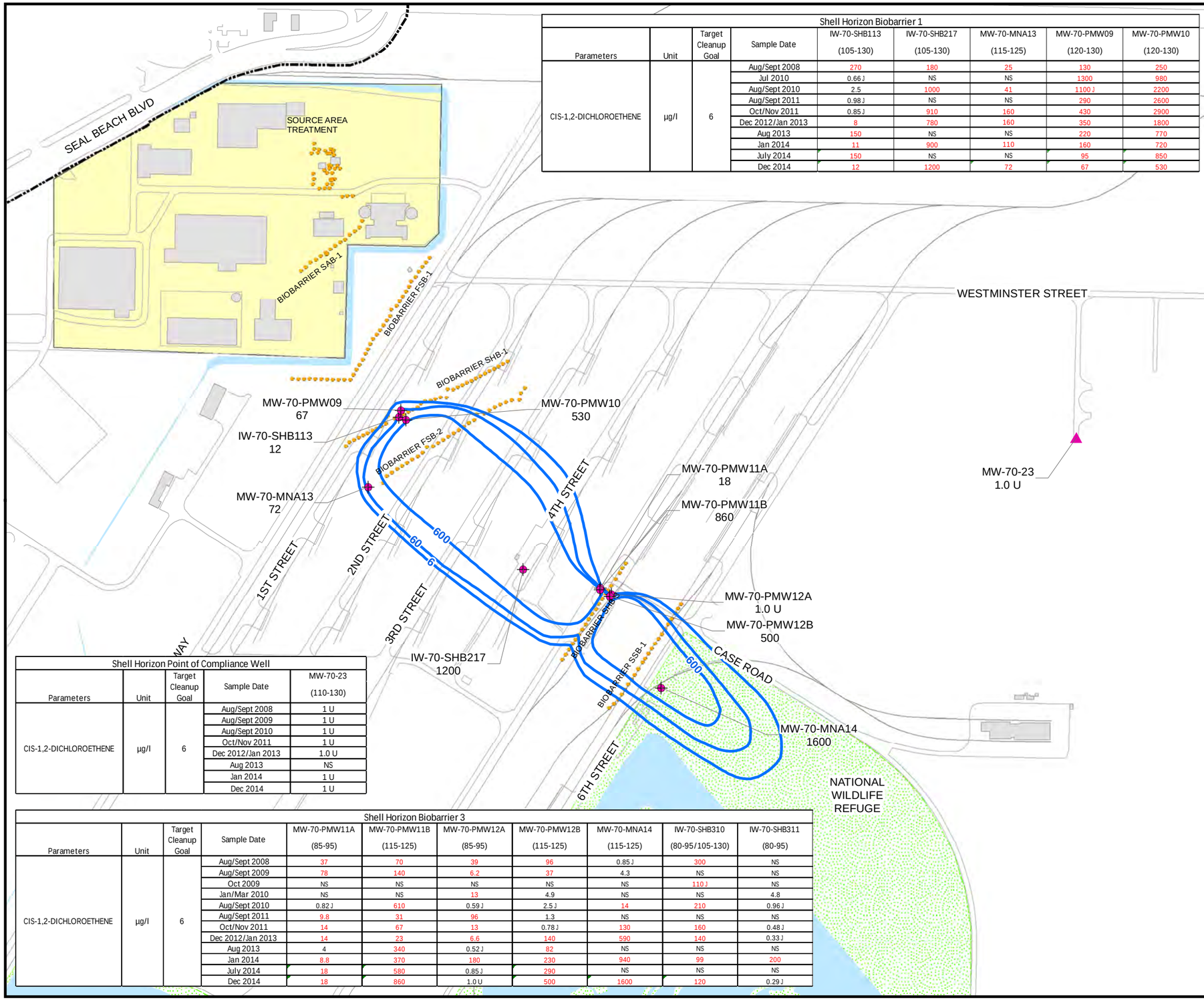
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-28.mxd

NAVFAC

ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\Map Documents\FIGURE 2-22.mxd

This Page Intentionally Left Blank



Shell Horizon Biobarrier 1								
Parameters	Unit	Target Cleanup Goal	Sample Date	IW-70-SHB113 (105-130)	IW-70-SHB217 (105-130)	MW-70-MNA13 (115-125)	MW-70-PMW09 (120-130)	MW-70-PMW10 (120-130)
CIS-1,2-DICHLOROETHENE	µg/l	6	Aug/Sept 2008	270	180	25	130	250
			Jul 2010	0.66 J	NS	NS	1300	980
			Aug/Sept 2010	2.5	1000	41	1100 J	2200
			Aug/Sept 2011	0.98 J	NS	NS	290	2600
			Oct/Nov 2011	0.85 J	910	160	430	2900
			Dec 2012/Jan 2013	8	780	160	350	1800
			Aug 2013	150	NS	NS	220	770
			Jan 2014	11	900	110	160	720
			July 2014	150	NS	NS	95	850
			Dec 2014	12	1200	72	67	530

Shell Horizon Point of Compliance Well				
Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-23 (110-130)
CIS-1,2-DICHLOROETHENE	µg/l	6	Aug/Sept 2008	1 U
			Aug/Sept 2009	1 U
			Aug/Sept 2010	1 U
			Oct/Nov 2011	1 U
			Dec 2012/Jan 2013	1.0 U
			Aug 2013	NS
			Jan 2014	1 U
			Dec 2014	1 U

Shell Horizon Biobarrier 3									
Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-PMW11A (85-95)	MW-70-PMW11B (115-125)	MW-70-PMW12A (85-95)	MW-70-PMW12B (115-125)	MW-70-MNA14 (115-125)	IW-70-SHB310 (80-95/105-130)	IW-70-SHB311 (80-95)
CIS-1,2-DICHLOROETHENE	µg/l	6	Aug/Sept 2008	37	70	39	96	0.85 J	300	NS
			Aug/Sept 2009	78	140	6.2	37	4.3	NS	NS
			Oct 2009	NS	NS	NS	NS	NS	110 J	NS
			Jan/Mar 2010	NS	NS	13	4.9	NS	NS	4.8
			Aug/Sept 2010	0.82 J	610	0.59 J	2.5 J	14	210	0.96 J
			Aug/Sept 2011	9.8	31	96	1.3	NS	NS	NS
			Oct/Nov 2011	14	67	13	0.78 J	130	160	0.48 J
			Dec 2012/Jan 2013	14	23	6.6	140	590	140	0.33 J
			Aug 2013	4	340	0.52 J	82	NS	NS	NS
			Jan 2014	8.8	370	180	230	940	99	200
			July 2014	18	580	0.85 J	290	NS	NS	NS
			Dec 2014	18	860	1.0 U	500	1600	120	0.29 J

LEGEND

MW-70-MNA13 3.4J — FIRST SAND/SOURCE AREA TREATMENT MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011

MW-70-23 5.0 U — FIRST SAND POC MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011

BIOBARRIER OR SOURCE AREA TREATMENT WELL

IR SITE 70 BOUNDARY

BASE BOUNDARY

ROAD

RAILROAD TRACK

BUILDING

5 — APPROXIMATE ISOCONCENTRATION CONTOUR (ug/L)

NOTES:

(D) - DUPLICATE SAMPLE
J - ESTIMATED VALUE
ug/L - MICROGRAMS PER LITER
NA - NOT ANALYZED
NE - NOT ESTABLISHED
U - ANALYTE NOT DETECTED ABOVE THE DETECTION LIMIT: ASSOCIATED
VALUE IS THE DETECTION LIMIT

POC - POINT OF COMPLIANCE

CIS-1,2-DCE - CIS-1,2-DICHLOROETHENE

BOLDED **RED** PARAMETERS ARE CONSTITUENTS OF CONCERN THAT EXCEED THE TARGET CLEANUP GOAL

(25-35) - WELL SCREEN INTERVAL, IN FEET BELOW GROUND SURFACE

200 100 0 200 400 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-29
IR SITE 70, SHELL HORIZON BIOBARRIERS 1 & 3
CIS-1,2-DCE IN GROUNDWATER - 2014

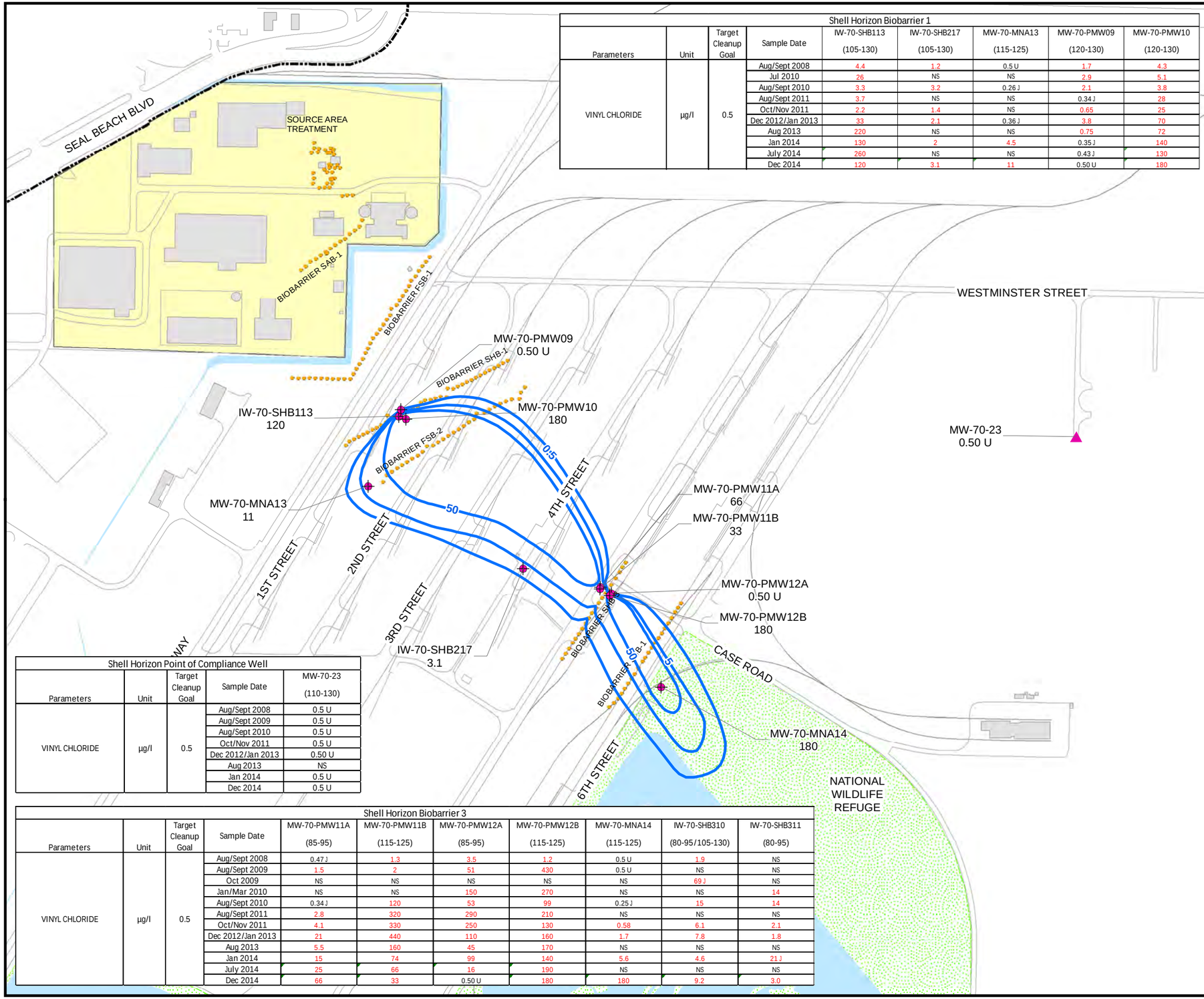
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-29.mxd

NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\Map\Documents\FIGURE 2-22.mxd

This Page Intentionally Left Blank



Shell Horizon Biobarrier 1								
Parameters	Unit	Target Cleanup Goal	Sample Date	IW-70-SHB113 (105-130)	IW-70-SHB217 (105-130)	MW-70-MNA13 (115-125)	MW-70-PMW09 (120-130)	MW-70-PMW10 (120-130)
VINYL CHLORIDE	µg/l	0.5	Aug/Sept 2008	4.4	1.2	0.5 U	1.7	4.3
			Jul 2010	26	NS	NS	2.9	5.1
			Aug/Sept 2010	3.3	3.2	0.26 J	2.1	3.8
			Aug/Sept 2011	3.7	NS	NS	0.34 J	28
			Oct/Nov 2011	2.2	1.4	NS	0.65	25
			Dec 2012/Jan 2013	33	2.1	0.36 J	3.8	70
			Aug 2013	220	NS	NS	0.75	72
			Jan 2014	130	2	4.5	0.35 J	140
			July 2014	260	NS	NS	0.43 J	130
			Dec 2014	120	3.1	11	0.50 U	180

Shell Horizon Point of Compliance Well				
Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-23 (110-130)
VINYL CHLORIDE	µg/l	0.5	Aug/Sept 2008	0.5 U
			Aug/Sept 2009	0.5 U
			Aug/Sept 2010	0.5 U
			Oct/Nov 2011	0.5 U
			Dec 2012/Jan 2013	0.50 U
			Aug 2013	NS
			Jan 2014	0.5 U
			Dec 2014	0.5 U

Shell Horizon Biobarrier 3										
Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-PMW11A (85-95)	MW-70-PMW11B (115-125)	MW-70-PMW12A (85-95)	MW-70-PMW12B (115-125)	MW-70-MNA14 (115-125)	IW-70-SHB310 (80-95/105-130)	IW-70-SHB311 (80-95)
VINYL CHLORIDE	µg/l	0.5	Aug/Sept 2008	0.47 J	1.3	3.5	1.2	0.5 U	1.9	NS
			Aug/Sept 2009	1.5	2	51	430	0.5 U	NS	NS
			Oct 2009	NS	NS	NS	NS	NS	69 J	NS
			Jan/Mar 2010	NS	NS	150	270	NS	NS	14
			Aug/Sept 2010	0.34 J	120	53	99	0.25 J	15	14
			Aug/Sept 2011	2.8	320	290	210	NS	NS	NS
			Oct/Nov 2011	4.1	330	250	130	0.58	6.1	2.1
			Dec 2012/Jan 2013	21	440	110	160	1.7	7.8	1.8
			Aug 2013	5.5	160	45	170	NS	NS	NS
			Jan 2014	15	74	99	140	5.6	4.6	21 J
			July 2014	25	66	16	190	NS	NS	NS
			Dec 2014	66	33	0.50 U	180	180	9.2	3.0

LEGEND

MW-70-MNA13 3.4J — FIRST SAND/SOURCE AREA TREATMENT MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011

MW-70-23 5.0 U — FIRST SAND POC MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011

BIOBARRIER OR SOURCE AREA TREATMENT WELL

IR SITE 70 BOUNDARY

BASE BOUNDARY

ROAD

RAILROAD TRACK

BUILDING

5 — APPROXIMATE ISOCONCENTRATION CONTOUR (ug/L)

NOTES:

(D) - DUPLICATE SAMPLE
J - ESTIMATED VALUE
ug/L - MICROGRAMS PER LITER
NA - NOT ANALYZED
NE - NOT ESTABLISHED
U - ANALYTE NOT DETECTED ABOVE THE DETECTION LIMIT: ASSOCIATED
VALUE IS THE DETECTION LIMIT

POC - POINT OF COMPLIANCE

BOLDED **RED** PARAMETERS ARE CONSTITUENTS OF CONCERN THAT
EXCEED THE TARGET CLEANUP GOAL

(25-35) - WELL SCREEN INTERVAL, IN FEET BELOW GROUND SURFACE

200 100 0 200 400 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-30
IR SITE 70, SHELL HORIZON BIOBARRIERS 1 & 3
VINYL CHLORIDE IN GROUNDWATER - 2014

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

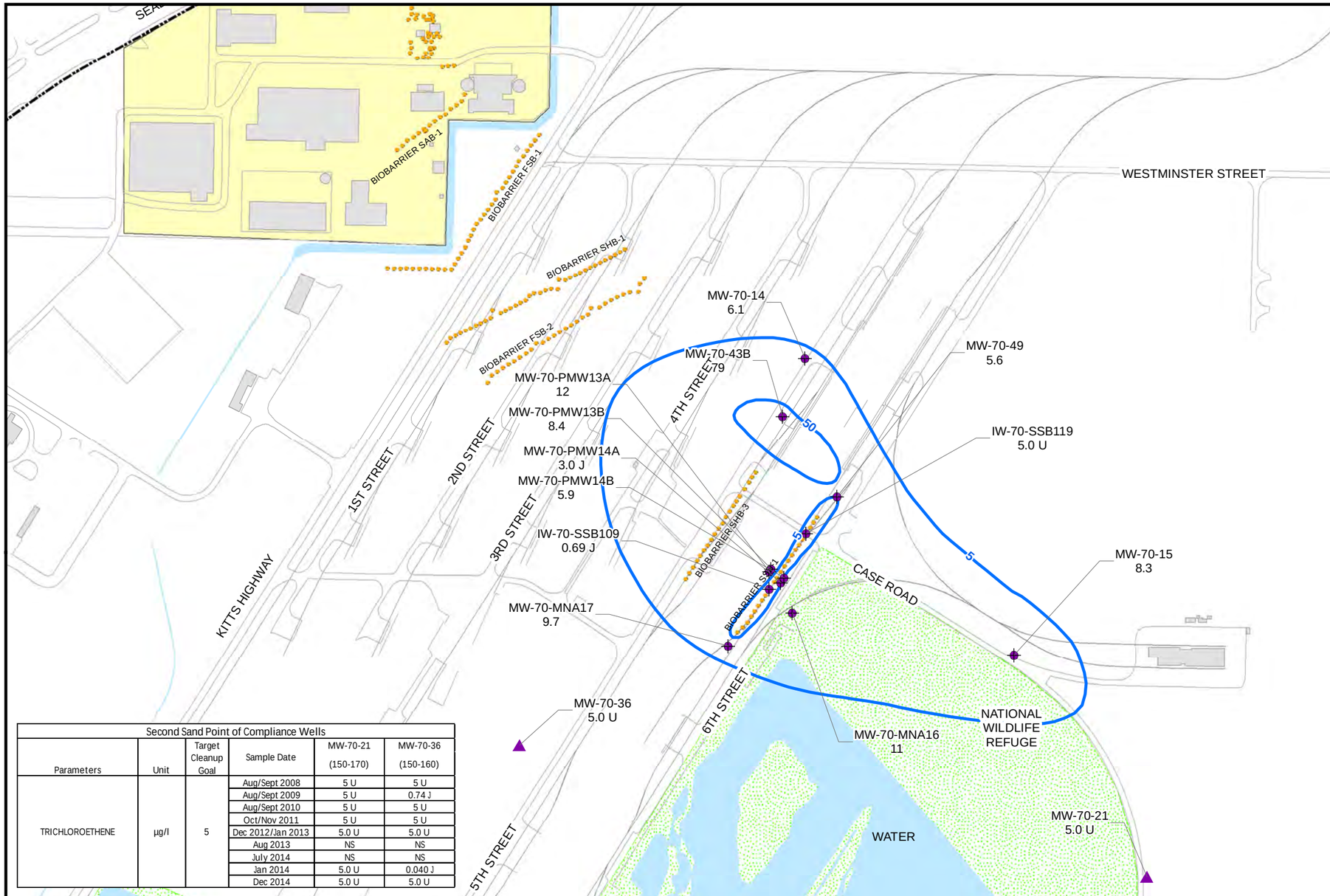
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-30.mxd

NAVFAC

ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\Map Documents\FIGURE 2-22.mxd

This Page Intentionally Left Blank



LEGEND

MW-70-MNA17 1.2 — SECOND SAND MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011

MW-70-21 1.0 U — SECOND SAND POC MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011

BIOBARRIER OR SOURCE AREA TREATMENT WELL

IR SITE 70 BOUNDARY

BASE BOUNDARY

ROAD

RAILROAD TRACK

BUILDING

5 — APPROXIMATE ISOCONCENTRATION CONTOUR (ug/L)

NOTES:

(D) - DUPLICATE SAMPLE
J - ESTIMATED VALUE
ug/L - MICROGRAMS PER LITER
NA - NOT ANALYZED
NE - NOT ESTABLISHED
U - ANALYTE NOT DETECTED ABOVE THE DETECTION LIMIT: ASSOCIATED
VALUE IS THE DETECTION LIMIT

POC - POINT OF COMPLIANCE

TCE - TRICHLOROETHENE

BOLDED **RED** PARAMETERS ARE CONSTITUENTS OF CONCERN THAT
EXCEED THE TARGET CLEANUP GOAL

(25-35) - WELL SCREEN INTERVAL, IN FEET BELOW GROUND SURFACE

200 100 0 200 400 Feet

N

Second Sand Point of Compliance Wells

Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-21 (150-170)	MW-70-36 (150-160)
TRICHLOROETHENE	µg/l	5	Aug/Sept 2008	5 U	5 U
			Aug/Sept 2009	5 U	0.74 J
			Aug/Sept 2010	5 U	5 U
			Oct/Nov 2011	5 U	5 U
			Dec 2012/Jan 2013	5.0 U	5.0 U
			Aug 2013	NS	NS
			July 2014	NS	NS
			Jan 2014	5.0 U	0.040 J
			Dec 2014	5.0 U	5.0 U

Second Sand Biobarrier 1

Parameters	Unit	Target Cleanup Goal	Sample Date	IW-70-SSB109 (126-166)	IW-70-SSB119 (126-166)	MW-70-14 (160-170)	MW-70-15 (161-171)	MW-70-43B (136-146)	MW-70-49 (125-165)	MW-70-MNA15 (140-150)	MW-70-MNA16 (141-151)	MW-70-MNA17 (140-150)	MW-70-PMW13A (125-135)	MW-70-PMW13B (145-155)	MW-70-PMW14A (128-138)	MW-70-PMW14B (149-159)
TRICHLOROETHENE	µg/l	5	Aug/Sept 2008	310	NS	NS	1.6 J	NS	NS	NS	140 J	0.21 J	320	900	1100	530
			Aug/Sept 2009	12	NS	530	6.9	5 U	NS	NS	460	2.4 J	370	1100	180 J	17
			Jan/Mar 2010	1.2 J	59	210	NS	NS	NS	NS	NS	NS	NS	NS	6.6	7.9
			Aug/Sept 2010	0.4 J	0.78 J	260	14	37	NS	NS	510	20	490 J	1300	14	18
			Aug/Sept 2011	NS	0.45 J	5.6	NS	NS	20	NS	NS	NS	200	11	6.3	12
			Oct/Nov 2011	0.3 J	0.24 J	0.89 J	16	180	17	NS	12	65	300	13	5.4	11
			Dec 2012/Jan 2013	0.61 J	1.2 J	4.0 J	9.2	550	130	NS	8.6	27	150	10	5.6	8.9
			Aug 2013	NS	0.91 J	2.0 J	NS	NS	57	6.3	NS	NS	12	8.7	5.7	4.1 J
			Jan 2014	0.70 J	5.0 U	0.2 J	13	170	0.98 J	6.5	11	21	13	11	8.6	7.2
			July 2014	NS	5.0 U	5.4	NS	NS	1.9 J	5.5	NS	NS	13	7.5	4.6 J	4.9 J
			Dec 2014	0.69 J	0.58 J	6.1	8.3	79	5.6	NS	11	9.7	12	8.4	3.0 J	5.9

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-31
IR SITE 70, SECOND SAND BIOBARRIER 1
TRICHLOROETHENE IN GROUNDWATER - 2014

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

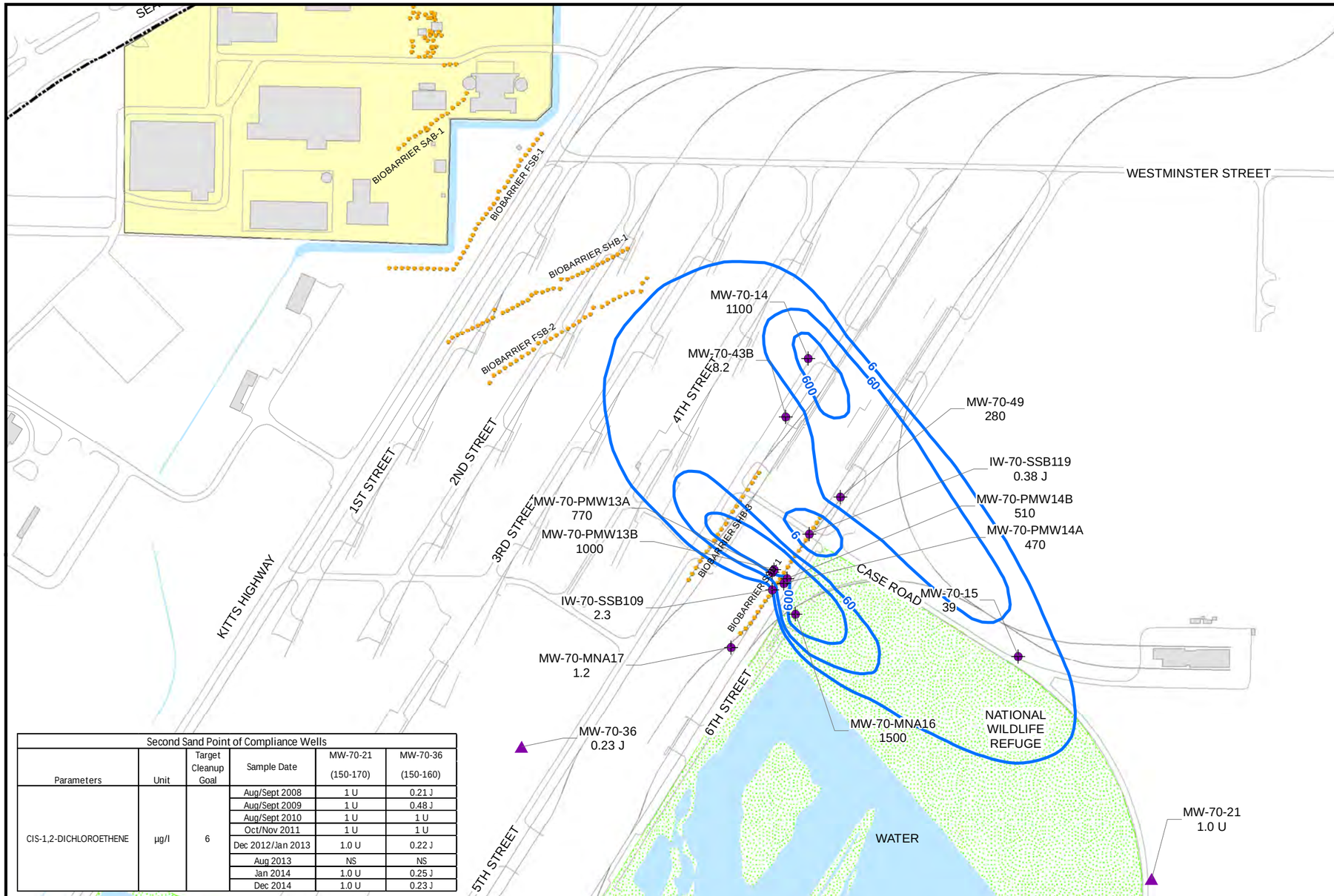
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-31.mxd

NAVFAC

ECC-INSIGHT LLC

Path: P:\Projects\SealBeach\Map Documents\FIGURE 2-22.mxd

This Page Intentionally Left Blank



LEGEND

MW-70-MNA17 1.2 — FIRST SAND/SOURCE AREA TREATMENT MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011

MW-70-21 1.0 U — FIRST SAND POC MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011

BIOBARRIER OR SOURCE AREA TREATMENT WELL

IR SITE 70 BOUNDARY

BASE BOUNDARY

ROAD

RAILROAD TRACK

BUILDING

5 — APPROXIMATE ISOCONCENTRATION CONTOUR (ug/L)

NOTES:

(D) - DUPLICATE SAMPLE
J - ESTIMATED VALUE
ug/L - MICROGRAMS PER LITER
NA - NOT ANALYZED
NE - NOT ESTABLISHED
U - ANALYTE NOT DETECTED ABOVE THE DETECTION LIMIT: ASSOCIATED
VALUE IS THE DETECTION LIMIT

POC - POINT OF COMPLIANCE

CIS-1,2-DCE - CIS-1,2-DICHLOROETHENE

BOLDED **RED** PARAMETERS ARE CONSTITUENTS OF CONCERN THAT
EXCEED THE TARGET CLEANUP GOAL

(25-35) - WELL SCREEN INTERVAL, IN FEET BELOW GROUND SURFACE

200 100 0 200 400 Feet

N

Second Sand Point of Compliance Wells

Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-21 (150-170)	MW-70-36 (150-160)
CIS-1,2-DICHLOROETHENE	µg/l	6	Aug/Sept 2008	1 U	0.21 J
			Aug/Sept 2009	1 U	0.48 J
			Aug/Sept 2010	1 U	1 U
			Oct/Nov 2011	1 U	1 U
			Dec 2012/Jan 2013	1.0 U	0.22 J
			Aug 2013	NS	NS
			Jan 2014	1.0 U	0.25 J
			Dec 2014	1.0 U	0.23 J

Second Sand Biobarrier 1

Parameters	Unit	Target Cleanup Goal	Sample Date	IW-70-SSB109 (126-166)	IW-70-SSB119 (126-166)	MW-70-14 (160-170)	MW-70-15 (161-171)	MW-70-43B (136-146)	MW-70-49 (125-165)	MW-70-MNA15 (140-150)	MW-70-MNA16 (141-151)	MW-70-MNA17 (140-150)	MW-70-PMW13A (125-135)	MW-70-PMW13B (145-155)	MW-70-PMW14A (128-138)	MW-70-PMW14B (149-159)
CIS-1,2-DICHLOROETHENE	µg/l	6	Aug/Sept 2008	44	NS	NS	2	NS	NS	NS	1100	0.79 J	63	180	180	130
			Aug/Sept 2009	110	NS	32	2.7	1 U	NS	NS	1000	1.4	75	360	320	630
			Jan/Mar 2010	40	18	22	NS	NS	NS	NS	NS	NS	NS	NS	35	310
			Aug/Sept 2010	1.4	0.69 J	280	4.2	9	NS	NS	670	7.2	150	270	630	600
			Aug/Sept 2011	NS	7.2	400	NS	NS	8.3	NS	NS	NS	130	940	67	340
			Oct/Nov 2011	0.3 J	0.74 J	450	3.4	16	9.5	NS	1000	9.9	150	1100	9.1	420
			Dec 2012/Jan 2013	0.58 J	0.47 J	200	2.8	46	22	NS	880	4.0	200	1,100	290	670
			Aug 2013	NS	0.51 J	280	NS	NS	22	670	NS	NS	400	890	560	290
			Jan 2014	1.7	0.28 J	1.2	4.2	23	150	360	1200	3	880	860	780	400
			July 2014	NS	0.20 J	450	NS	NS	1.1	210	NS	NS	710	1200	750	210
			Dec 2014	2.3	2.1	1100	39	8.2	280	NS	1500	1.2	770	1000	470	510

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-32
IR SITE 70, SECOND SAND BIOBARRIER 1
CIS-1,2-DCE IN GROUNDWATER - 2014

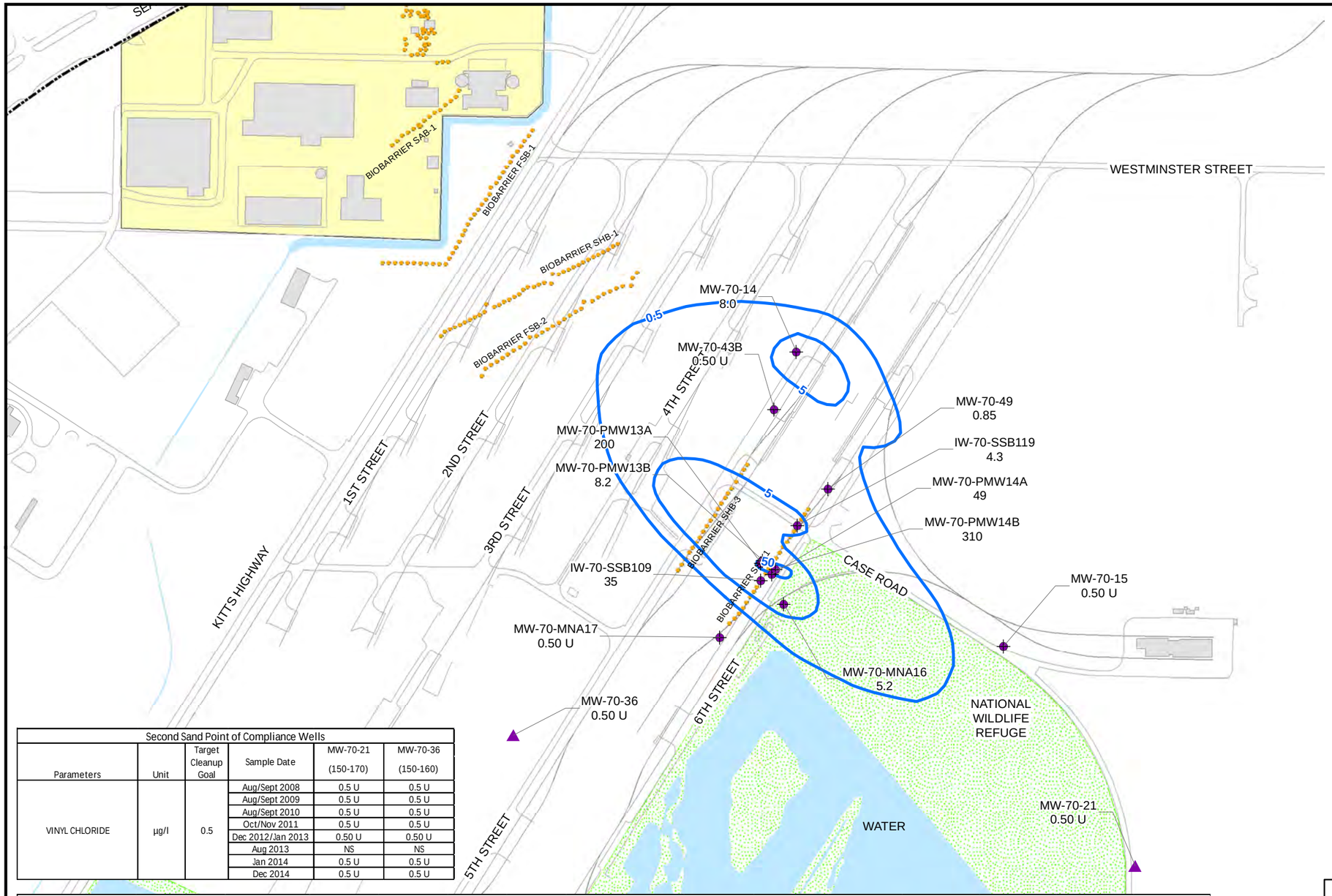
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-32.mxd

NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\Map\Documents\FIGURE 2-32.mxd

This Page Intentionally Left Blank



LEGEND

MW-70-MNA13 3.4J — FIRST SAND/SOURCE AREA TREATMENT MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011

MW-70-23 5.0 U — FIRST SAND POC MONITORING WELL SHOWING STATION ID AND TCE CONCENTRATION IN ug/L IN FALL 2011

BIOBARRIER OR SOURCE AREA TREATMENT WELL

IR SITE 70 BOUNDARY

BASE BOUNDARY

ROAD

RAILROAD TRACK

BUILDING

5 — APPROXIMATE ISOCONCENTRATION CONTOUR (ug/L)

NOTES:

(D) - DUPLICATE SAMPLE
J - ESTIMATED VALUE
ug/L - MICROGRAMS PER LITER
NA - NOT ANALYZED
NE - NOT ESTABLISHED
U - ANALYTE NOT DETECTED ABOVE THE DETECTION LIMIT: ASSOCIATED
VALUE IS THE DETECTION LIMIT

POC - POINT OF COMPLIANCE

BOLDED **RED** PARAMETERS ARE CONSTITUENTS OF CONCERN THAT
EXCEED THE TARGET CLEANUP GOAL

(25-35) - WELL SCREEN INTERVAL, IN FEET BELOW GROUND SURFACE

200 100 0 200 400 Feet

N

Second Sand Point of Compliance Wells

Parameters	Unit	Target Cleanup Goal	Sample Date	MW-70-21 (150-170)	MW-70-36 (150-160)
VINYL CHLORIDE	µg/l	0.5	Aug/Sept 2008	0.5 U	0.5 U
			Aug/Sept 2009	0.5 U	0.5 U
			Aug/Sept 2010	0.5 U	0.5 U
			Oct/Nov 2011	0.5 U	0.5 U
			Dec 2012/Jan 2013	0.50 U	0.50 U
			Aug 2013	NS	NS
			Jan 2014	0.5 U	0.5 U
			Dec 2014	0.5 U	0.5 U

Second Sand Biobarrier 1

Parameters	Unit	Target Cleanup Goal	Sample Date	IW-70-SSB109 (126-166)	IW-70-SSB119 (126-166)	MW-70-14 (160-170)	MW-70-15 (161-171)	MW-70-43B (136-146)	MW-70-49 (125-165)	MW-70-MNA15 (140-150)	MW-70-MNA16 (141-151)	MW-70-MNA17 (140-150)	MW-70-PMW13A (125-135)	MW-70-PMW13B (145-155)	MW-70-PMW14A (128-138)	MW-70-PMW14B (149-159)
VINYL CHLORIDE	µg/l	0.5	Aug/Sept 2008	0.34 J	NS	NS	0.5 U	NS	NS	NS	8.3	0.5 U	410	2.9	5.8	2
			Aug/Sept 2009	94	NS	1.5	0.5 U	0.5 U	NS	NS	14	0.5 U	460	59	730	5.1
			Jan/Mar 2010	13	5	0.65	NS	NS	NS	NS	NS	NS	NS	NS	70	28
			Aug/Sept 2010	5.3	3.5	1.1	0.5 U	0.43 J	NS	NS	9.7	0.27 J	350	10	340	430
			Aug/Sept 2011	NS	2.2	1.6	NS	NS	0.5 U	NS	NS	NS	280	26	250	300
			Oct/Nov 2011	1.3	1.7	1.2	0.5 U	0.61	0.33 J	NS	25	0.5 U	300	16	250	300
			Dec 2012/Jan 2013	9.3	9.6	0.72	0.50 U	1.7	1.1	NS	38	0.50 U	370	29	240	200
			Aug 2013	NS	73	7.7	NS	NS	0.68	8.5	NS	NS	420	15	150	130
			Jan 2014	10	42	130	0.50 U	0.76	0.6	38	13	0.50 U	220	6.6	160	310
			July 2014	NS	0.50 U	2.4	NS	NS	0.50 U	61	NS	NS	290	26	100	250
			Dec 2014	35	39	8.0	0.50 U	0.50 U	0.85	NS	5.2	0.50 U	200	8.2	49	310

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-33
IR SITE 70, SECOND SAND BIOBARRIER 1
VINYL CHLORIDE IN GROUNDWATER - 2014

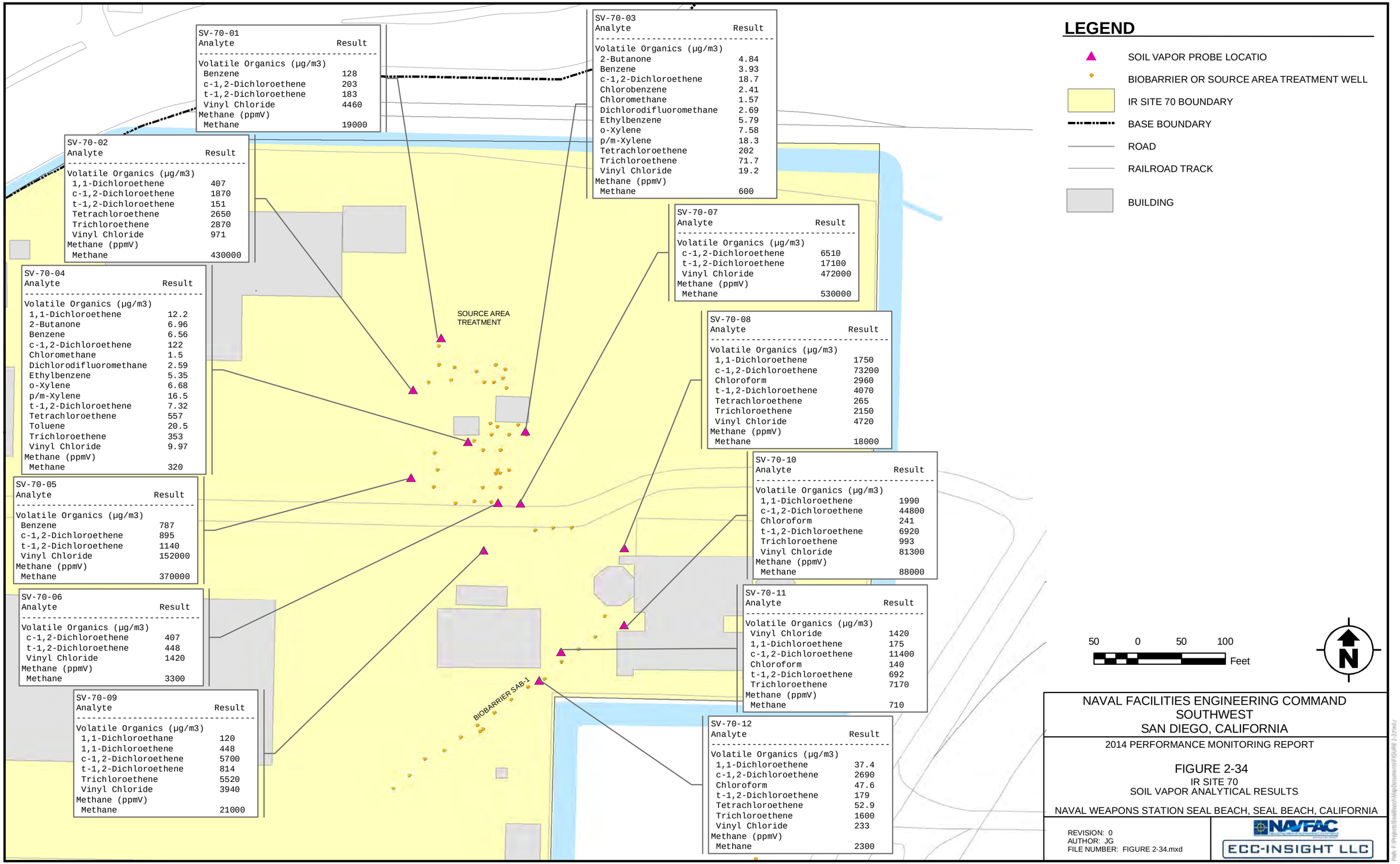
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-33.mxd

NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-22.mxd

This Page Intentionally Left Blank



SV-70-01

Analyte	Result
Volatile Organics (µg/m3)	
Benzene	128
c-1,2-Dichloroethene	203
t-1,2-Dichloroethene	183
Vinyl Chloride	4460
Methane (ppmV)	
Methane	19000

SV-70-02

Analyte	Result
Volatile Organics (µg/m3)	
1,1-Dichloroethene	407
c-1,2-Dichloroethene	1870
t-1,2-Dichloroethene	151
Tetrachloroethene	2650
Trichloroethene	2870
Vinyl Chloride	971
Methane (ppmV)	
Methane	430000

SV-70-03

Analyte	Result
Volatile Organics (µg/m3)	
2-Butanone	4.84
Benzene	3.93
c-1,2-Dichloroethene	18.7
Chlorobenzene	2.41
Chloromethane	1.57
Dichlorodifluoromethane	2.69
Ethylbenzene	5.79
o-Xylene	7.58
p/m-Xylene	18.3
Tetrachloroethene	202
Trichloroethene	71.7
Vinyl Chloride	19.2
Methane (ppmV)	
Methane	600

SV-70-04

Analyte	Result
Volatile Organics (µg/m3)	
1,1-Dichloroethene	12.2
2-Butanone	6.96
Benzene	6.56
c-1,2-Dichloroethene	122
Chloromethane	1.5
Dichlorodifluoromethane	2.59
Ethylbenzene	5.35
o-Xylene	6.68
p/m-Xylene	16.5
t-1,2-Dichloroethene	7.32
Tetrachloroethene	557
Toluene	20.5
Trichloroethene	353
Vinyl Chloride	9.97
Methane (ppmV)	
Methane	320

SV-70-05

Analyte	Result
Volatile Organics (µg/m3)	
Benzene	787
c-1,2-Dichloroethene	895
t-1,2-Dichloroethene	1140
Vinyl Chloride	152000
Methane (ppmV)	
Methane	370000

SV-70-06

Analyte	Result
Volatile Organics (µg/m3)	
c-1,2-Dichloroethene	407
t-1,2-Dichloroethene	448
Vinyl Chloride	1420
Methane (ppmV)	
Methane	3300

SV-70-07

Analyte	Result
Volatile Organics (µg/m3)	
c-1,2-Dichloroethene	6510
t-1,2-Dichloroethene	17100
Vinyl Chloride	472000
Methane (ppmV)	
Methane	530000

SV-70-08

Analyte	Result
Volatile Organics (µg/m3)	
1,1-Dichloroethene	1750
c-1,2-Dichloroethene	73200
Chloroform	2960
t-1,2-Dichloroethene	4070
Tetrachloroethene	265
Trichloroethene	2150
Vinyl Chloride	4720
Methane (ppmV)	
Methane	18000

SV-70-09

Analyte	Result
Volatile Organics (µg/m3)	
1,1-Dichloroethane	120
1,1-Dichloroethene	448
c-1,2-Dichloroethene	5700
t-1,2-Dichloroethene	814
Trichloroethene	5520
Vinyl Chloride	3940
Methane (ppmV)	
Methane	21000

SV-70-10

Analyte	Result
Volatile Organics (µg/m3)	
1,1-Dichloroethene	1990
c-1,2-Dichloroethene	44800
Chloroform	241
t-1,2-Dichloroethene	6920
Trichloroethene	993
Vinyl Chloride	81300
Methane (ppmV)	
Methane	88000

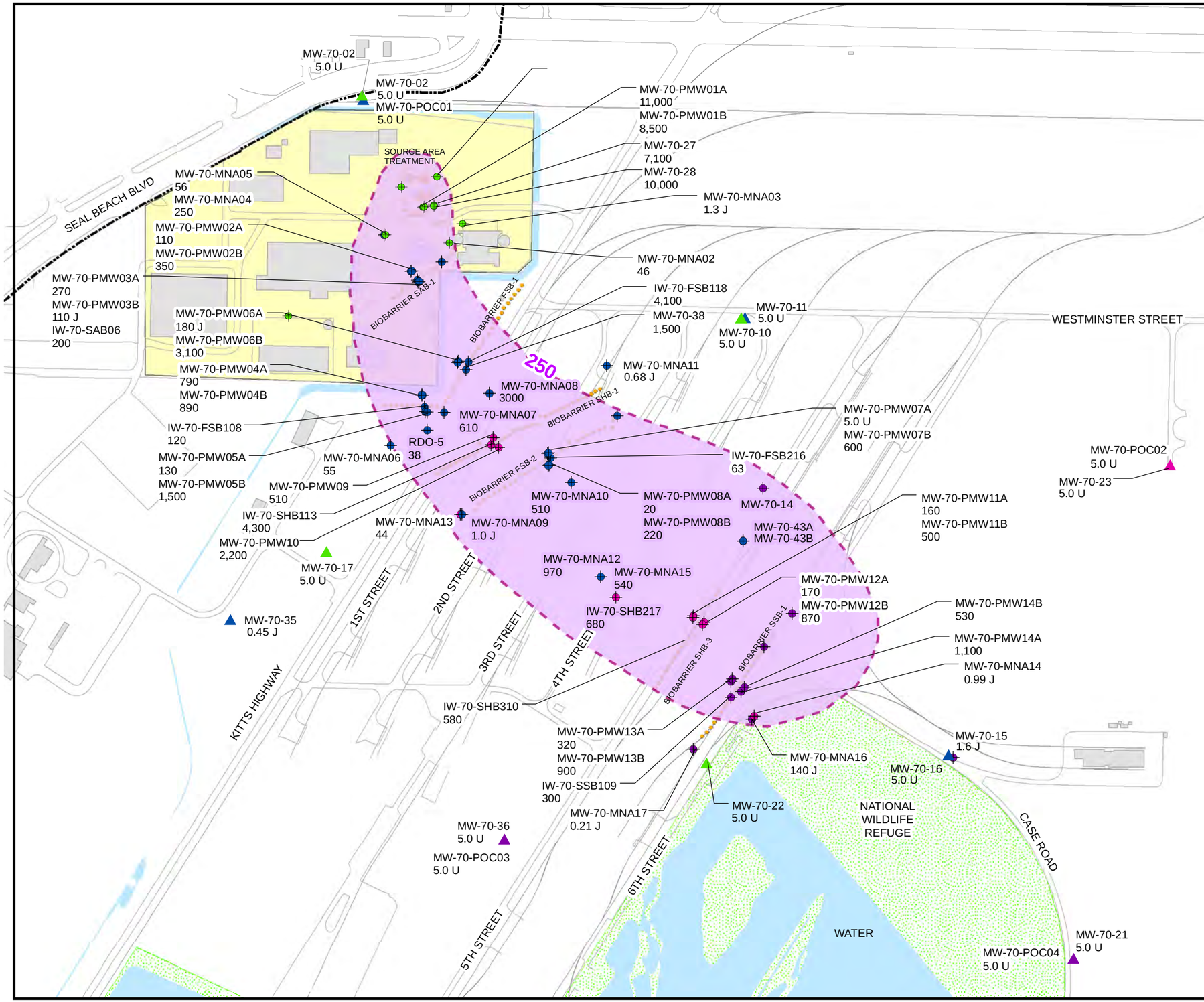
SV-70-11

Analyte	Result
Volatile Organics (µg/m3)	
Vinyl Chloride	1420
1,1-Dichloroethene	175
c-1,2-Dichloroethene	11400
Chloroform	140
t-1,2-Dichloroethene	692
Trichloroethene	7170
Methane (ppmV)	
Methane	710

SV-70-12

Analyte	Result
Volatile Organics (µg/m3)	
1,1-Dichloroethene	37.4
c-1,2-Dichloroethene	2690
Chloroform	47.6
t-1,2-Dichloroethene	179
Tetrachloroethene	52.9
Trichloroethene	1600
Vinyl Chloride	233
Methane (ppmV)	
Methane	2300

This Page Intentionally Left Blank



LEGEND

MW-70-MNA02	UPPER FINES/SOURCE AREA TREATMENT MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-22	UPPER FINES/SOURCE AREA TREATMENT POC MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-MNA08	FIRST SAND MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-11	FIRST SAND POC MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-MNA14	SHELL HORIZON MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-23	SHELL HORIZON POC MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-15	SECOND SAND MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-36	SECOND SAND POC MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-POC02	DEEP SAND POC MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
	BIOBARRIER OR SOURCE AREA TREATMENT WELL
	IR SITE 70 BOUNDARY
	BASE BOUNDARY
	ROAD
	RAILROAD TRACK
	BUILDING
250	APPROXIMATE EXTENT OF 250 ug/L TCE CONCENTRATION IN GROUNDWATER PROJECTED TO SURFACE - FALL 2008

NOTES:

ug/L - MICROGRAMS PER LITER

TCE - TRICHLOROETHYLENE

200 100 0 200 400 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-35
IR SITE 70
2008 TCE EXTENT (PROJECTED TO GROUND SURFACE)

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

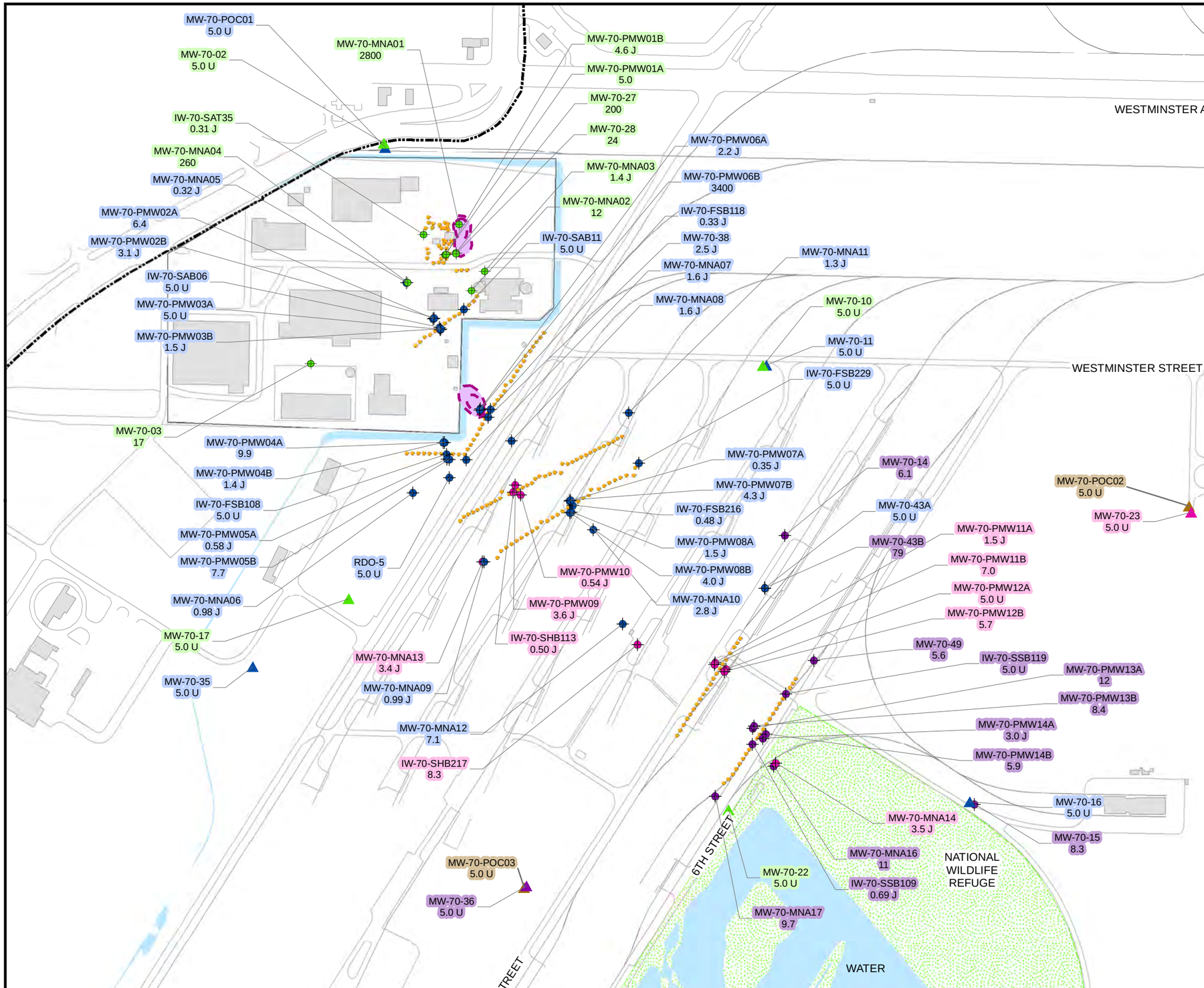
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-22.mxd

NAVFAC

ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-22.mxd

This Page Intentionally Left Blank



LEGEND

MW-70-MNA02	UPPER FINES/SOURCE AREA TREATMENT MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-22	UPPER FINES/SOURCE AREA TREATMENT POC MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-MNA08	FIRST SAND MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-11	FIRST SAND POC MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-MNA14	SHELL HORIZON MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-23	SHELL HORIZON POC MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-15	SECOND SAND MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-36	SECOND SAND POC MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-POC02	DEEP SAND POC MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
	BIOBARRIER OR SOURCE AREA TREATMENT WELL
	IR SITE 70 BOUNDARY
	BASE BOUNDARY
	ROAD
	RAILROAD TRACK
	BUILDING
250	APPROXIMATE EXTENT OF 250 ug/L TCE CONCENTRATION IN GROUNDWATER PROJECTED TO SURFACE - 2014

NOTES:

ug/L - MICROGRAMS PER LITER

TCE - TRICHLOROETHYLENE

200 100 0 200 400 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 2-36
IR SITE 70
2014 TCE EXTENT (PROJECTED TO GROUND SURFACE)

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

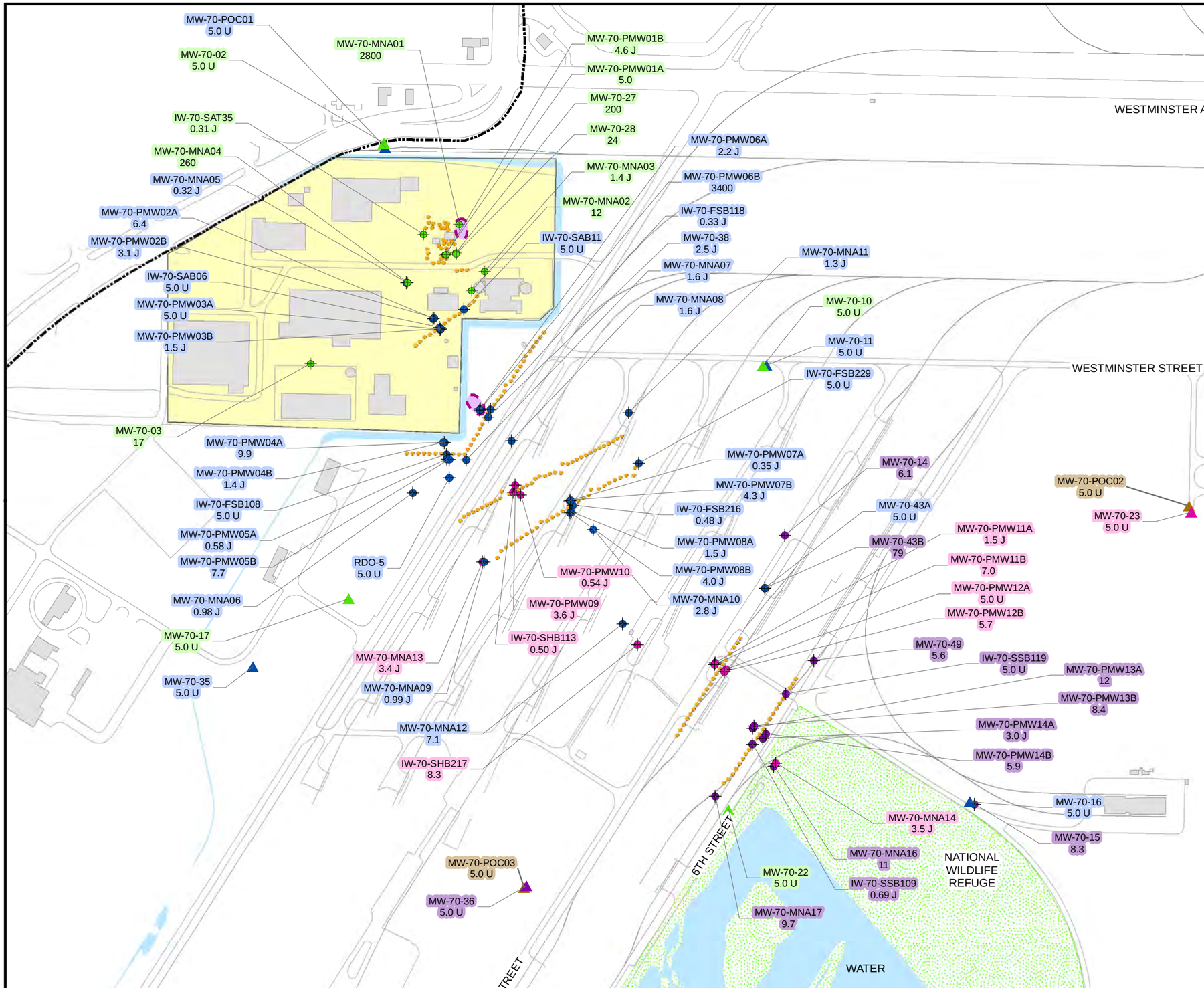
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-36.mxd

NAVFAC

ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\Map\Documents\FIGURE 2-22.mxd

This Page Intentionally Left Blank



LEGEND

MW-70-MNA02	UPPER FINES/SOURCE AREA TREATMENT MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-22	UPPER FINES/SOURCE AREA TREATMENT POC MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-MNA08	FIRST SAND MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-11	FIRST SAND POC MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-MNA14	SHELL HORIZON MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-23	SHELL HORIZON POC MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-15	SECOND SAND MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-36	SECOND SAND POC MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
MW-70-POC02	DEEP SAND POC MONITORING WELL SHOWING WELL ID AND TCE CONCENTRATION IN ug/L
	BIOBARRIER OR SOURCE AREA TREATMENT WELL
	IR SITE 70 BOUNDARY
	BASE BOUNDARY
	ROAD
	RAILROAD TRACK
	BUILDING
1,000	APPROXIMATE EXTENT OF 1,000 ug/L TCE CONCENTRATION IN GROUNDWATER PROJECTED TO SURFACE - 2014

NOTES:

ug/L - MICROGRAMS PER LITER

TCE - TRICHLOROETHYLENE

200 100 0 200 400 Feet

N

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 3-1
TRICHLOROETHYLENE EXTENT ABOVE 1,000 ug/L IN THE SOURCE AREA, 2013 ANNUAL SAMPLING EVENT

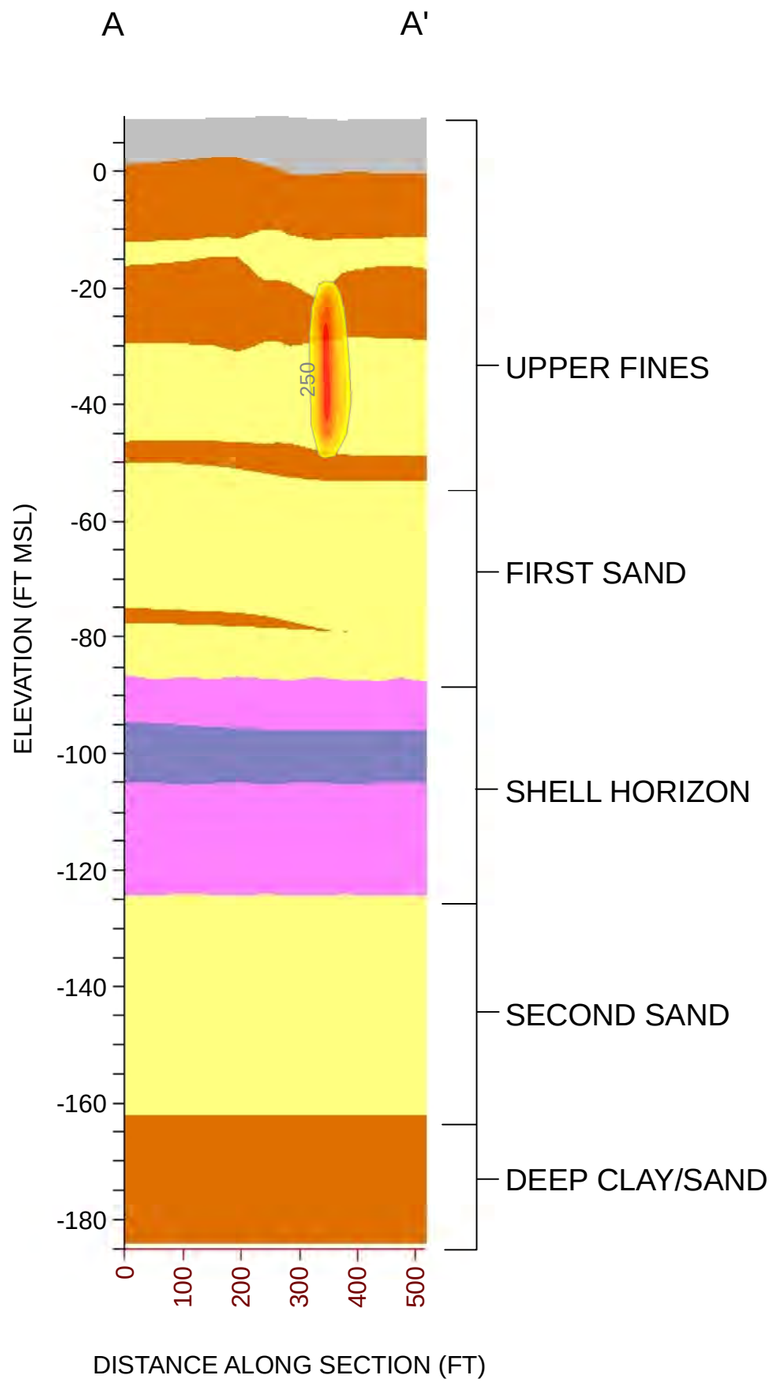
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

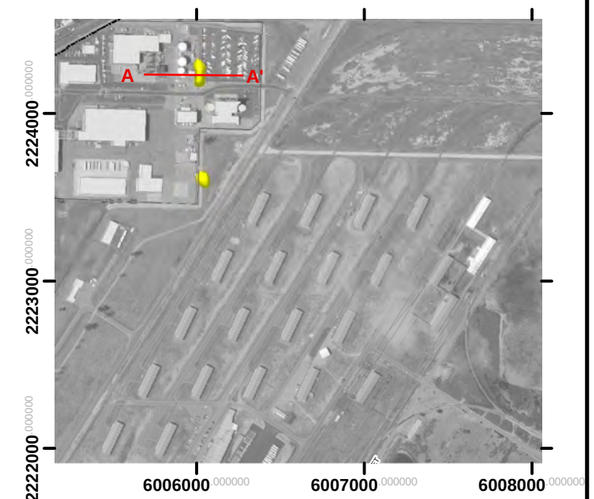
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 2-36.mxd

NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\Map\Documents\FIGURE 2-22.mxd

This Page Intentionally Left Blank





CROSS-SECTION LOCATION MAP

LITHOLOGY

- Fill
- Clay1
- Sand1
- Clay2
- Sand2
- Clay3
- FirstSand
- ClayMid
- SandMid
- SHSand1
- SHClay1
- SHSand2
- SHClay2
- SHSand3
- SecondSand
- DeepClay
- DeepSand

TCE (ug/L)

3500.0
3000.0
2500.0
2000.0
1500.0
1000.0
500.0
0.0

0 100 200 400 Feet

NOTES:
- EASTING AND NORTHING COORDINATES ARE IN NAD83 STATE PLANE, FEET
- ELEVATIONS ARE RELATIVE TO MEAN SEA LEVEL AS PER NGVD29 FEET
- CHEMISTRY UNITS ARE ug/L
- VERTICAL EXAGGERATION=10X

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 3-2
TRICHLOROETHYLENE EXTENT ABOVE 250 ug/L ALONG CROSSSECTION A-A', 2014 ANNUAL SAMPLING EVENT

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

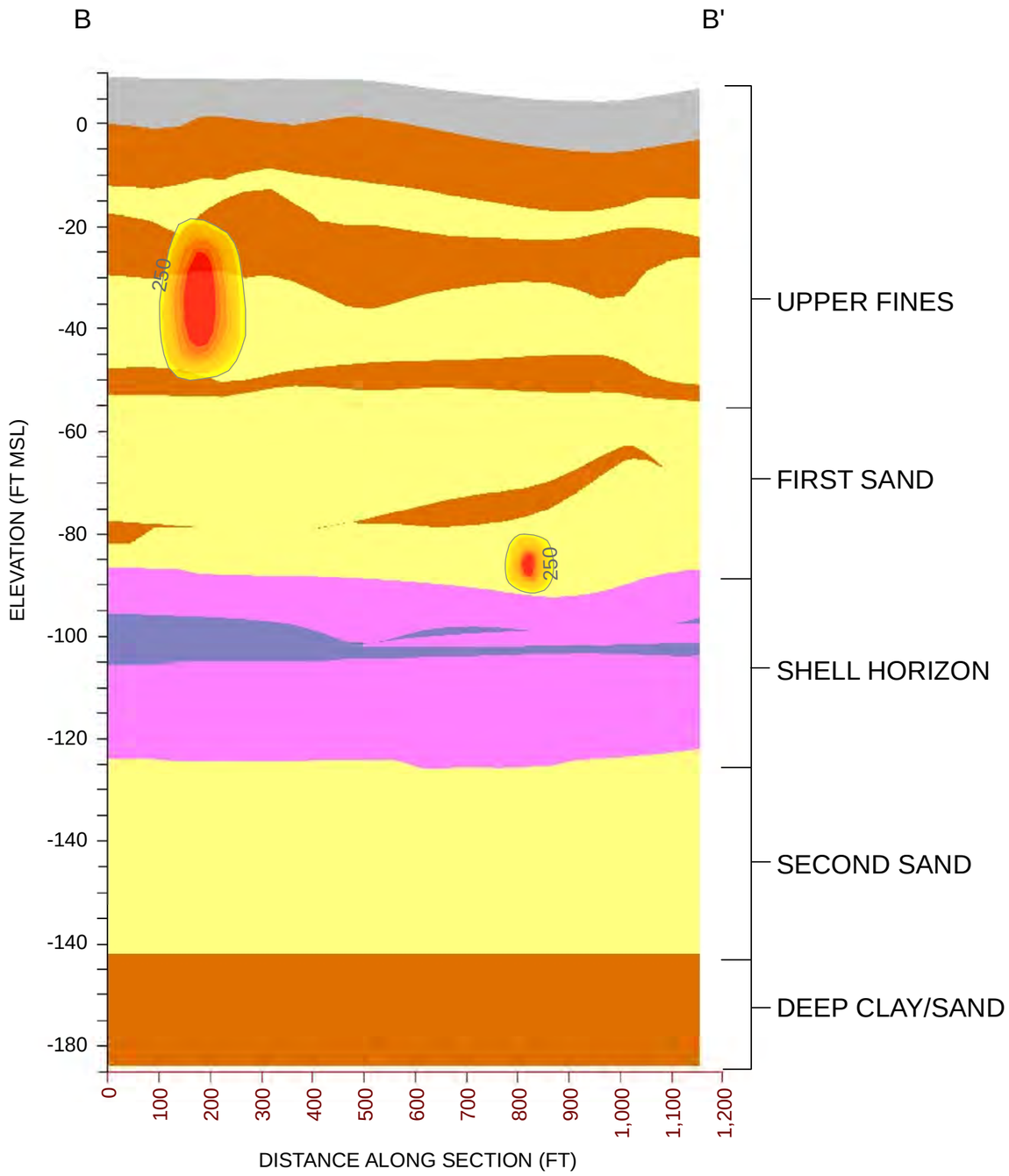
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 3-2.mxd

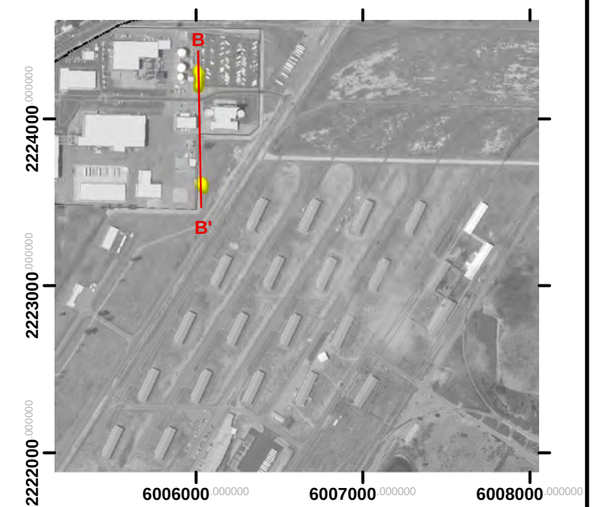
NAVFAC

ECC-INSIGHT LLC

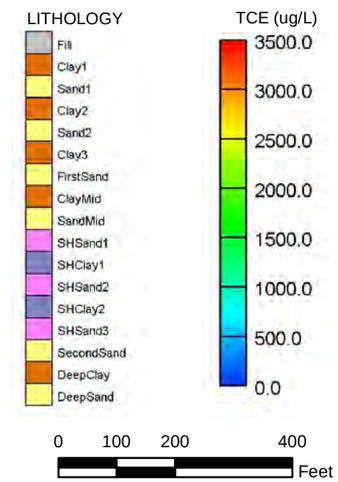
Path: P:\Projects\SealBeach\Map\Documents\FIGURE 2-22.mxd

This Page Intentionally Left Blank





CROSS-SECTION LOCATION MAP



NOTES:
- EASTING AND NORTHING COORDINATES ARE IN NAD83 STATE PLANE, FEET
- ELEVATIONS ARE RELATIVE TO MEAN SEA LEVEL AS PER NGVD29 FEET
- CHEMISTRY UNITS ARE ug/L
- VERTICAL EXAGGERATION=10X

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 3-3
TRICHLOROETHYLENE EXTENT ABOVE 250 ug/L ALONG CROSSSECTION B-B', 2014 ANNUAL SAMPLING EVENT

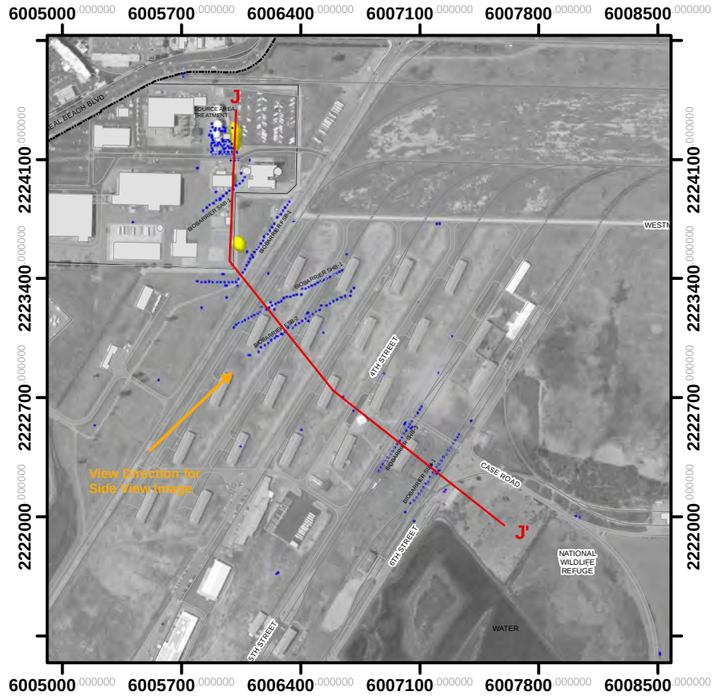
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 3-3.mxd

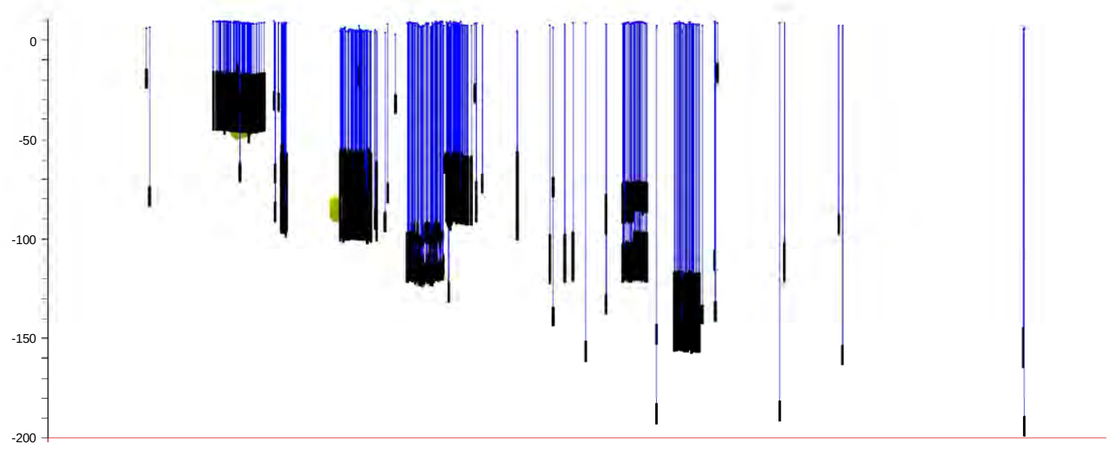
NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\Map Documents\FIGURE 2-22.mxd

This Page Intentionally Left Blank



TCE: Iso-level = 250 ug/L, Volume = 38,920 cubic yards



GENERAL LOCATION MAP

WELL RISER

WELL SCREEN

PLUME SHELL

NOTES:
- EASTING AND NORTHING COORDINATES ARE IN NAD83 STATE PLANE, FEET
- ELEVATIONS ARE RELATIVE TO MEAN SEA LEVEL AS PER NGVD29 FEET
- CHEMISTRY UNITS ARE ug/L
- VERTICAL EXAGGERATION=10X
- CROSS-SECTIONVIEW ANGLE TO THE NORTHEAST

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 3-4
TRICHLOROETHENE EXTENT ABOVE 250 ug/L
2014 ANNUAL SAMPLING EVENT

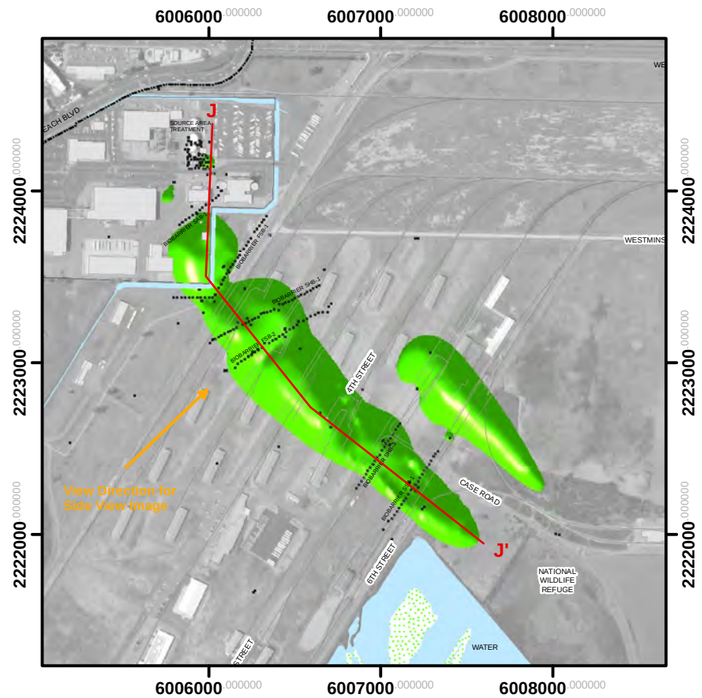
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 3-4.mxd

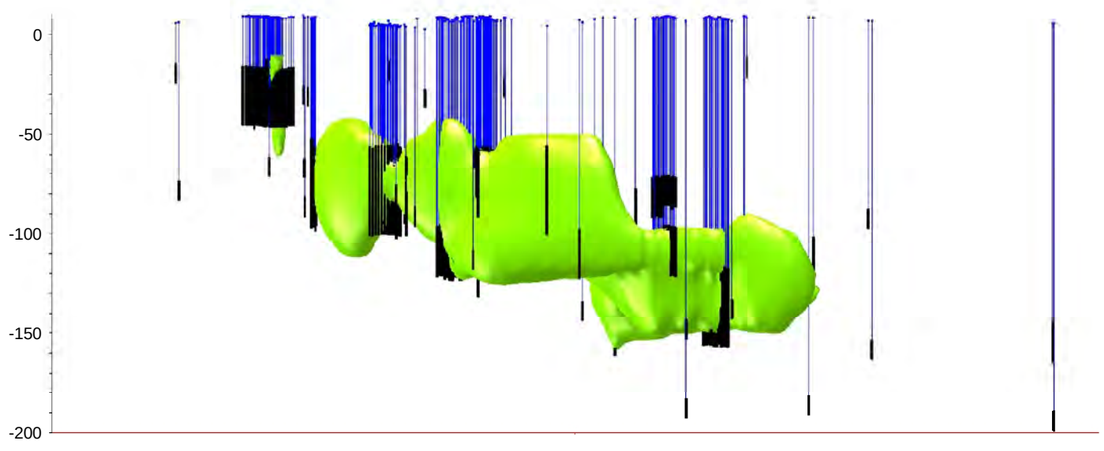
NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-22.mxd

This Page Intentionally Left Blank



1,2-DCE: Iso-level = 60 ug/L, Volume = 5,747,778 cubic yards



GENERAL LOCATION MAP

WELL RISER

WELL SCREEN

PLUME SHELL

NOTES:
- EASTING AND NORTHING COORDINATES ARE IN NAD83 STATE PLANE, FEET
- ELEVATIONS ARE RELATIVE TO MEAN SEA LEVEL AS PER NGVD29 FEET
- CHEMISTRY UNITS ARE ug/L
- VERTICAL EXAGGERATION=10X
- CROSS-SECTIONVIEW ANGLE TO THE NORTHEAST

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 3-5
CIS-1,2-DICHLOROETHENE EXTENT ABOVE 60 ug/L
2014 ANNUAL SAMPLING EVENT

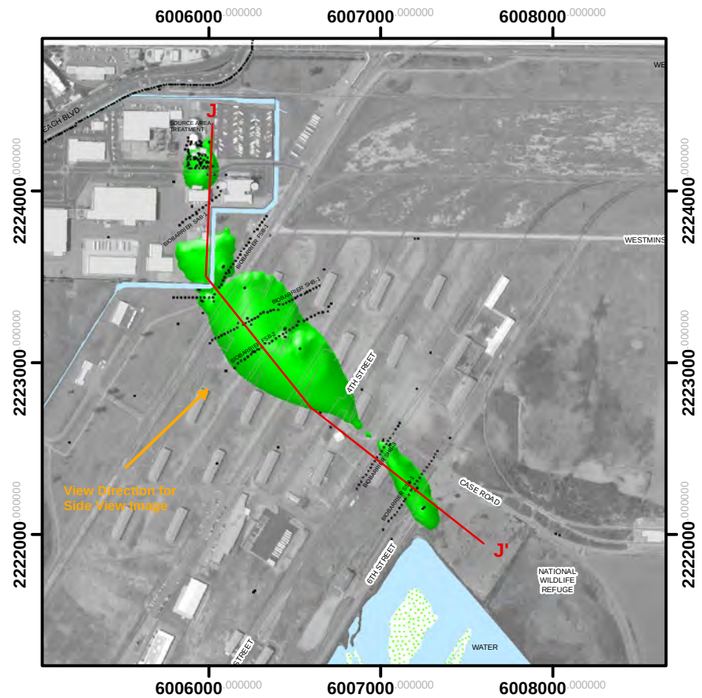
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 3-5.mxd

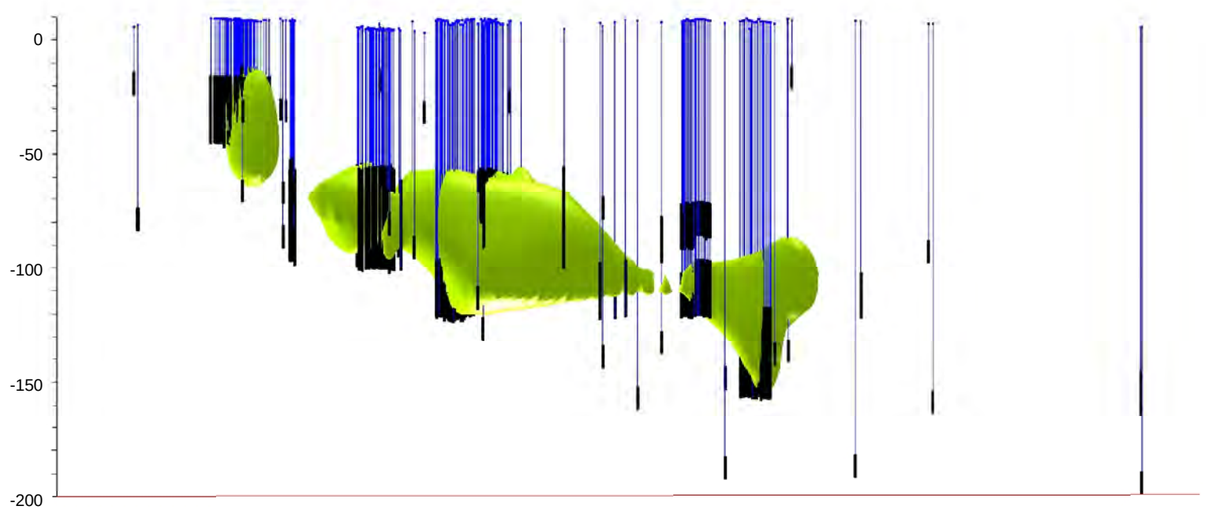
NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-22.mxd

This Page Intentionally Left Blank



VINYL CHLORIDE: Iso-level = 20 ug/L, Volume = 2,482,222 cubic yards



GENERAL LOCATION MAP

WELL RISER

WELL SCREEN

PLUME SHELL

NOTES:
- EASTING AND NORTHING COORDINATES ARE IN NAD83 STATE PLANE, FEET
- ELEVATIONS ARE RELATIVE TO MEAN SEA LEVEL AS PER NGVD29 FEET
- CHEMISTRY UNITS ARE ug/L
- VERTICAL EXAGGERATION=10X
- CROSS-SECTIONVIEW ANGLE TO THE NORTHEAST

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 3-6
VINYL CHLORIDE EXTENT ABOVE 20 ug/L
2014 ANNUAL SAMPLING EVENT

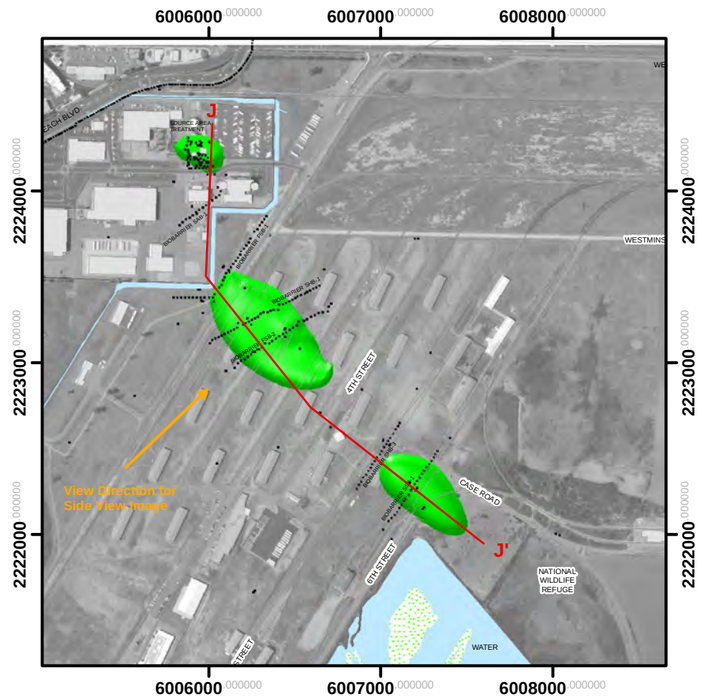
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 3-6.mxd

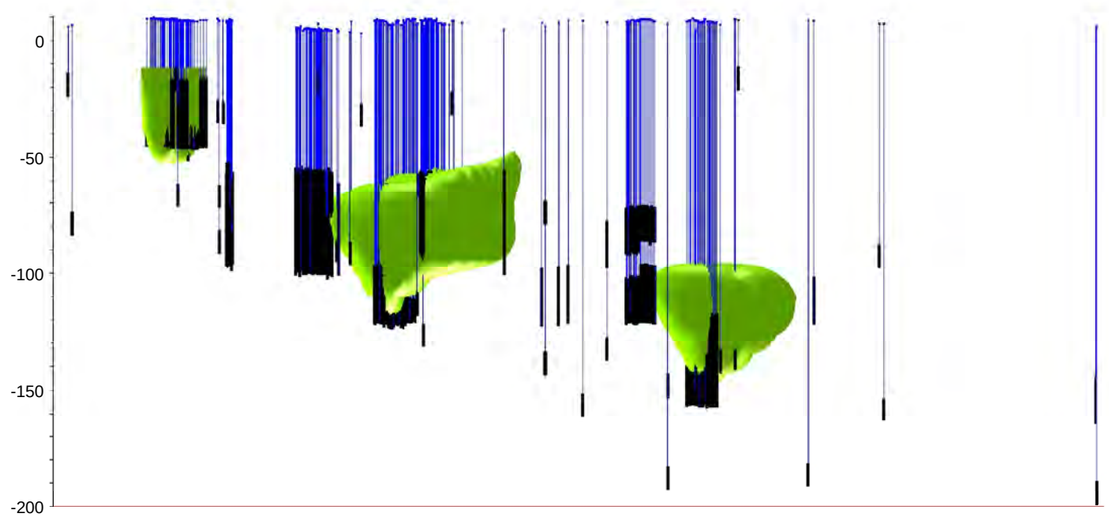
NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-22.mxd

This Page Intentionally Left Blank



Ethene: Iso-level = 10 ug/L, Volume = 1,734,444 cubic yards



GENERAL LOCATION MAP

WELL RISER

WELL SCREEN

PLUME SHELL

NOTES:
- EASTING AND NORTHING COORDINATES ARE IN NAD83 STATE PLANE, FEET
- ELEVATIONS ARE RELATIVE TO MEAN SEA LEVEL AS PER NGVD29 FEET
- CHEMISTRY UNITS ARE ug/L
- VERTICAL EXAGGERATION=10X
- CROSS-SECTIONVIEW ANGLE TO THE NORTHEAST

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 3-7
ETHENE EXTENT ABOVE 10 ug/L
2014 ANNUAL SAMPLING EVENT

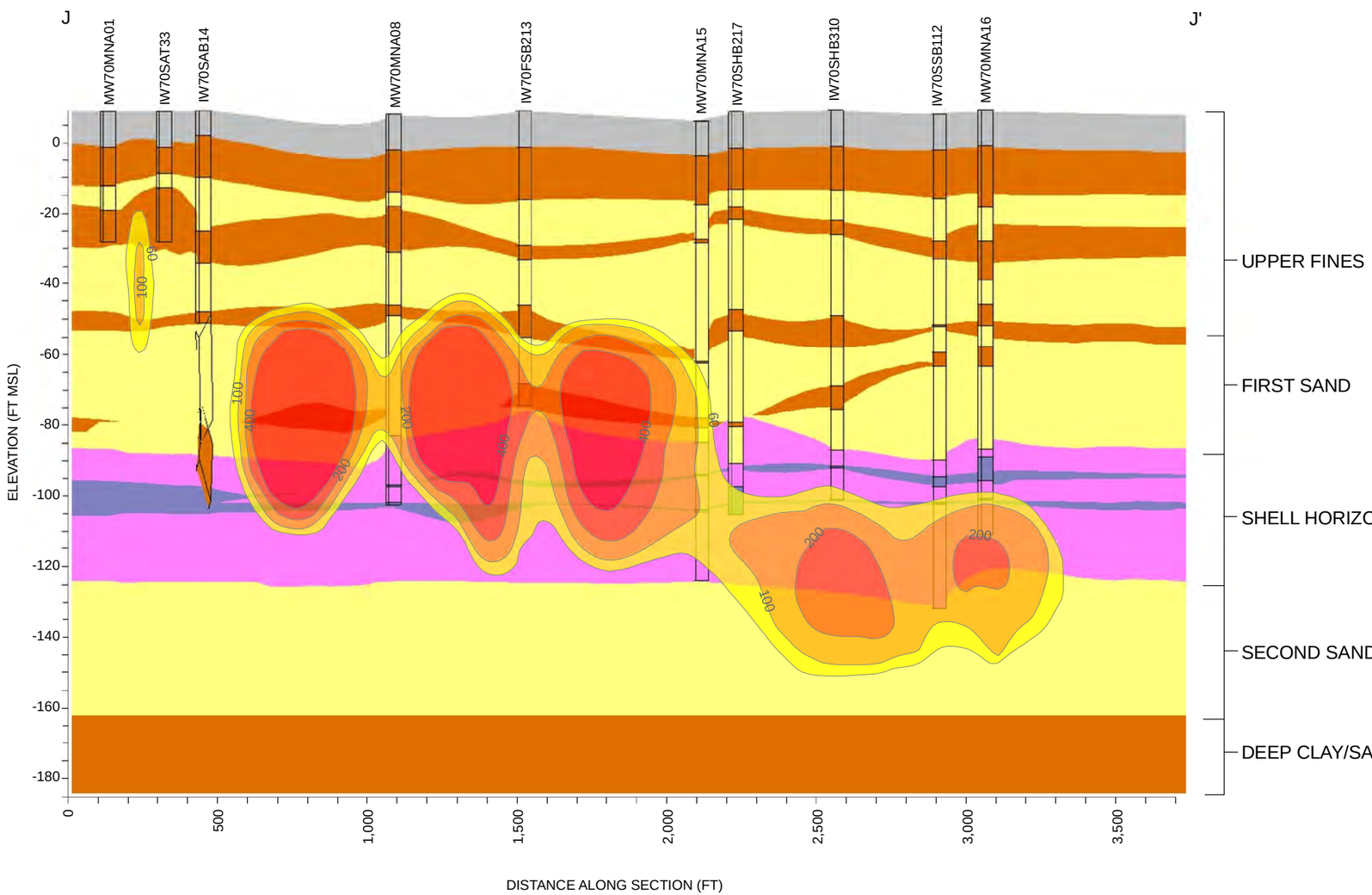
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

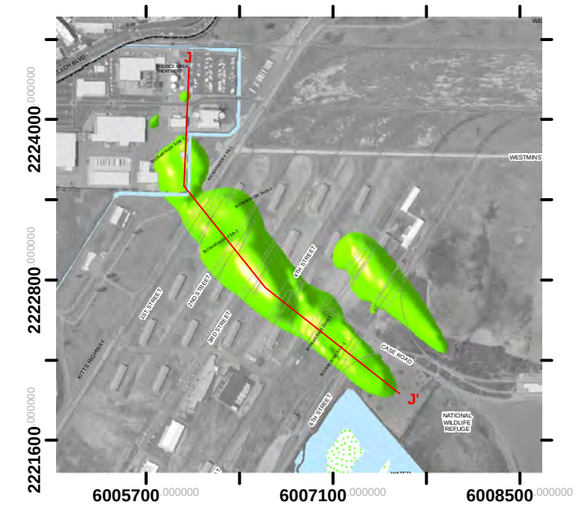
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 3-7.mxd

NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-22.mxd

This Page Intentionally Left Blank





CROSS-SECTION LOCATION MAP

LITHOLOGY

- Fill
- Clay1
- Sand1
- Clay2
- Sand2
- Clay3
- FirstSand
- ClayMid
- SandMid
- SHSand1
- SHClay1
- SHSand2
- SHClay2
- SHSand3
- SecondSand
- DeepClay
- DeepSand

1,2-DCE (ug/L)

- 1600.0
- 400.0
- 200.0
- 60.0

0 250 500 1,000 Feet

NOTES:
- EASTING AND NORTHING COORDINATES ARE IN NAD83 STATE PLANE, FEET
- ELEVATIONS ARE RELATIVE TO MEAN SEA LEVEL AS PER NGVD29 FEET
- CHEMISTRY UNITS ARE ug/L
- VERTICAL EXAGGERATION=10X

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 3-8
CIS-1,2-DICHLOROETHYLENE EXTENT ABOVE 60 ug/L ALONG CROSSSECTION J-J', 2014 ANNUAL SAMPLING EVENT

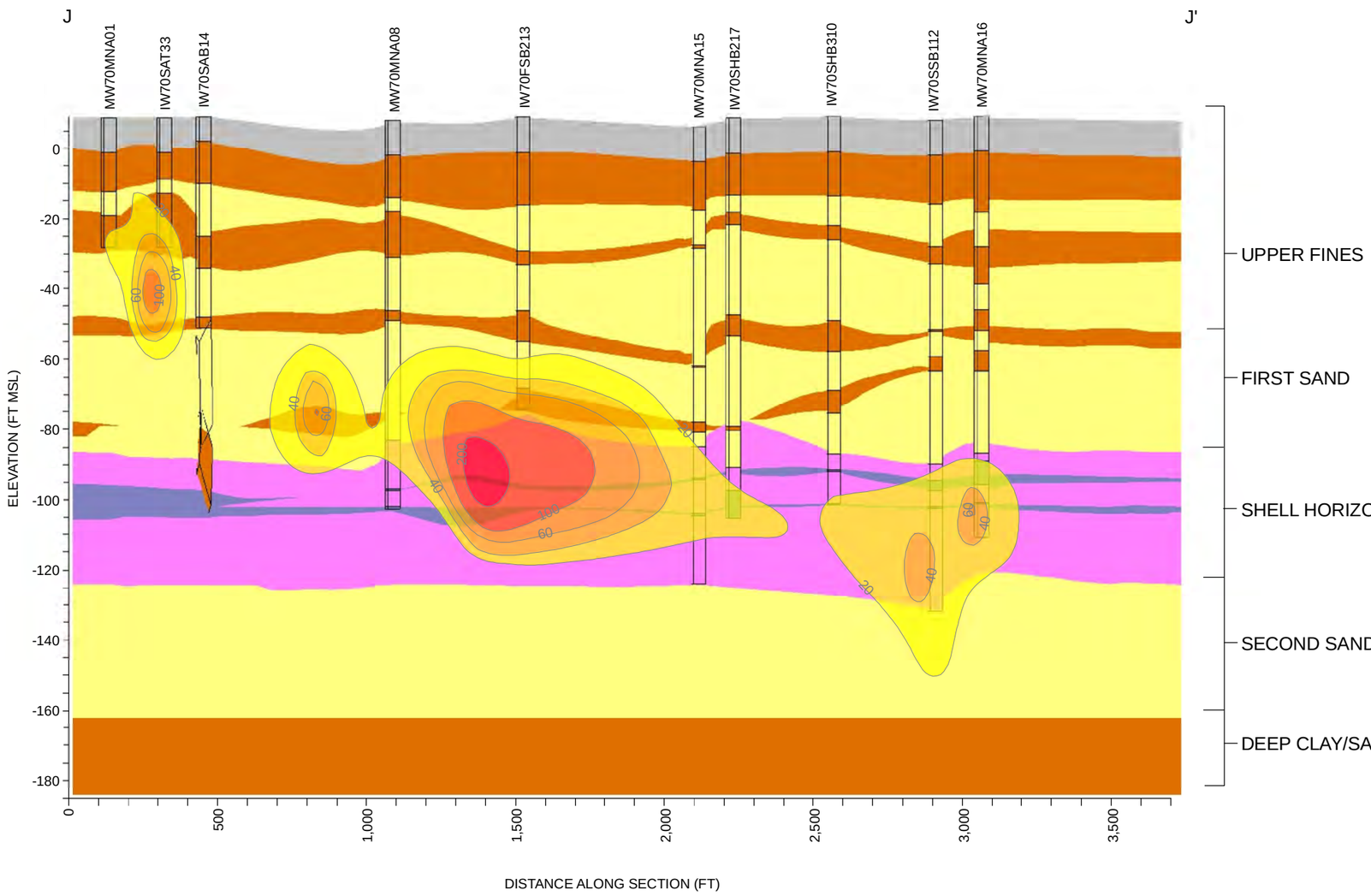
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

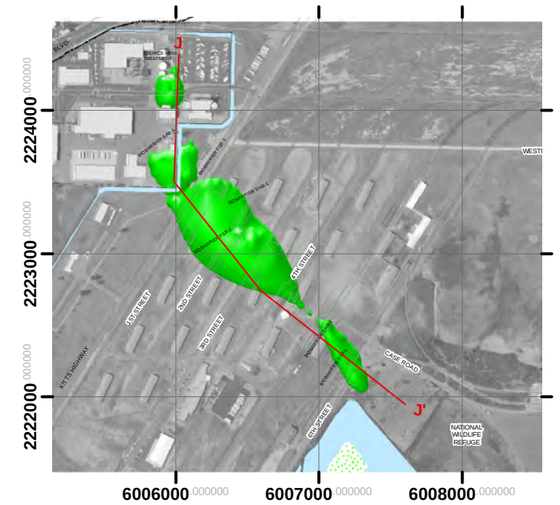
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 3-8.mxd

NAVFAC
ECC-INSIGHT LLC

Path: P:\Projects\SealBeach\Map Documents\FIGURE 2-22.mxd

This Page Intentionally Left Blank





CROSS-SECTION LOCATION MAP

LITHOLOGY

- Fill
- Clay1
- Sand1
- Clay2
- Sand2
- Clay3
- FirstSand
- ClayMid
- SandMid
- SHSand1
- SHClay1
- SHSand2
- SHClay2
- SHSand3
- SecondSand
- DeepClay
- DeepSand

Vinyl Chloride (ug/L)

548.0
200.0
100.0
20.0

0 250 500 1,000 Feet

NOTES:
- EASTING AND NORTHING COORDINATES ARE IN NAD83 STATE PLANE, FEET
- ELEVATIONS ARE RELATIVE TO MEAN SEA LEVEL AS PER NGVD29 FEET
- CHEMISTRY UNITS ARE ug/L
- VERTICAL EXAGGERATION=10X

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 3-9
VINYL CHLORIDE EXTENT ABOVE 20 ug/L ALONG CROSSSECTION J-J', 2014 ANNUAL SAMPLING EVENT

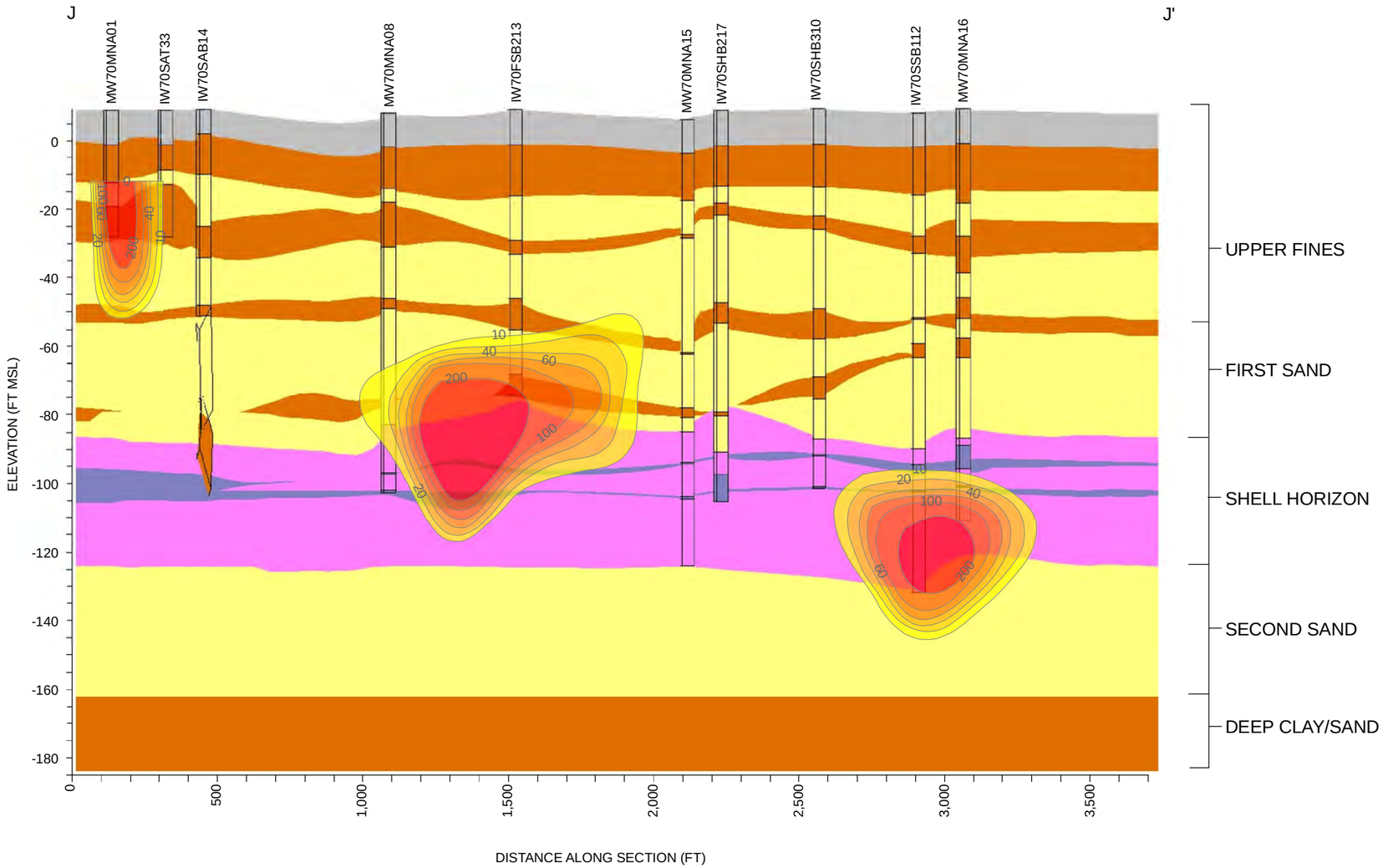
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

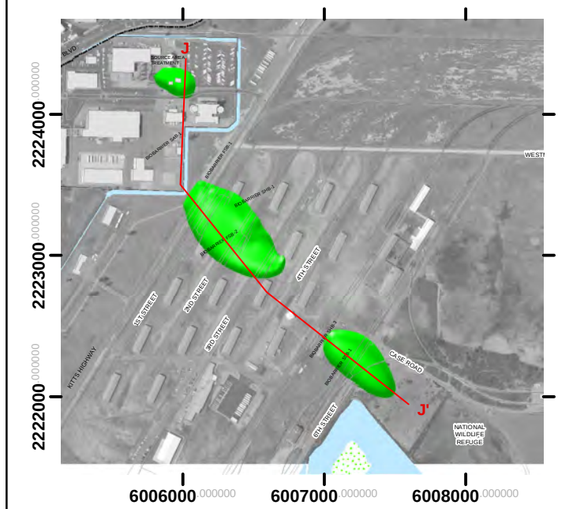
REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 3-9.mxd

NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-22.mxd

This Page Intentionally Left Blank





CROSS-SECTION LOCATION MAP

LITHOLOGY

- Fill
- Clay1
- Sand1
- Clay2
- Sand2
- Clay3
- FirstSand
- ClayMid
- SandMid
- SHSand1
- SHClay1
- SHSand2
- SHClay2
- SHSand3
- SecondSand
- DeepClay
- DeepSand

Ethene (ug/L)

- 360.0
- 200.0
- 100.0
- 40.0
- 10.0

0 250 500 1,000 Feet

NOTES:
- EASTING AND NORTHING COORDINATES ARE IN NAD83 STATE PLANE, FEET
- ELEVATIONS ARE RELATIVE TO MEAN SEA LEVEL AS PER NGVD29 FEET
- CHEMISTRY UNITS ARE ug/L
- VERTICAL EXAGGERATION=10X

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 3-10
ETHENE EXTENT ABOVE 10 ug/L ALONG
CROSSSECTION J-J', 2014 ANNUAL SAMPLING EVENT

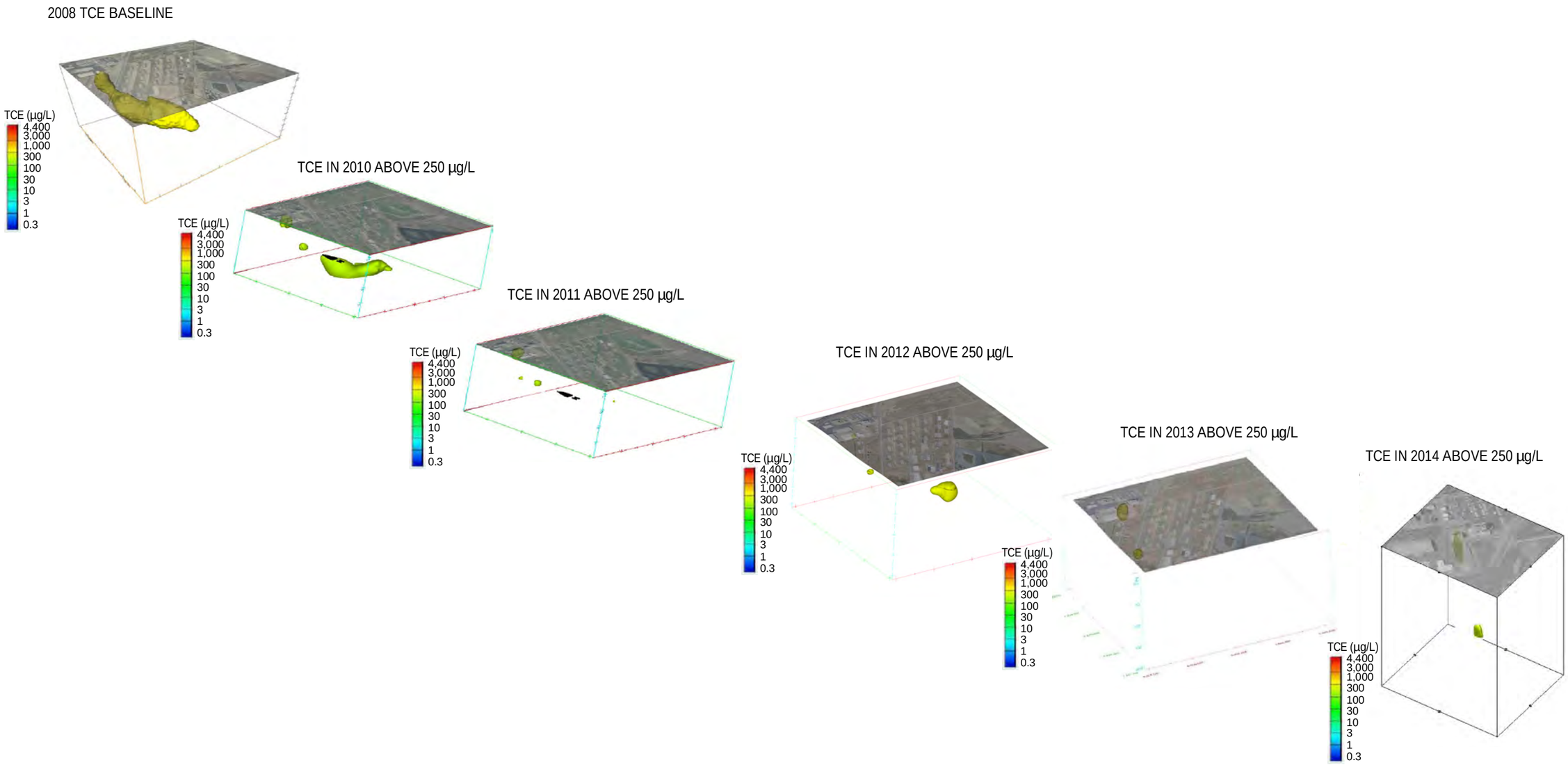
NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: JG
FILE NUMBER: FIGURE 3-10.mxd

NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\MapDocuments\FIGURE 2-22.mxd

This Page Intentionally Left Blank



NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 3-11

THREE DIMENSIONAL VIEWS OF TRICHLORETHYLENE PLUME
(>250 ug/L) 2008-2014

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

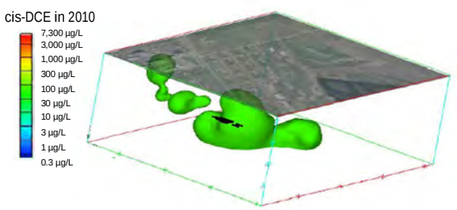
REVISION: 0
AUTHOR: MS
FILE NUMBER: FIGURE 3-11.mxd

ECC-INSIGHT LLC

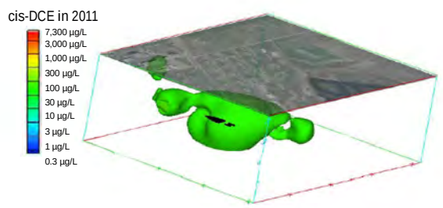
Path: P:\Projects\SealBeach\Map Documents\FIGURE 3-11_AJ.mxd

This Page Intentionally Left Blank

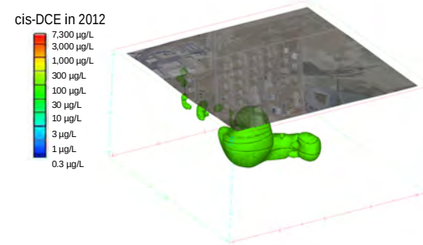
2010 CIS-DCE



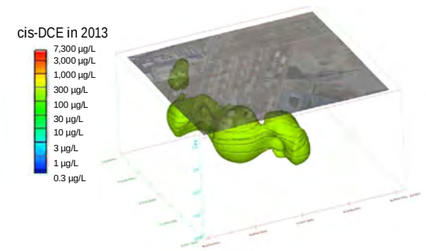
2011 CIS-DCE



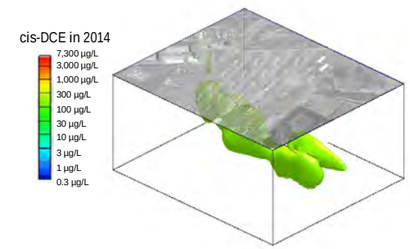
2012 CIS-DCE

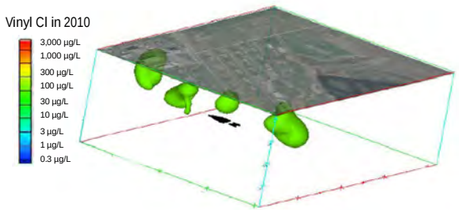


2013 CIS-DCE

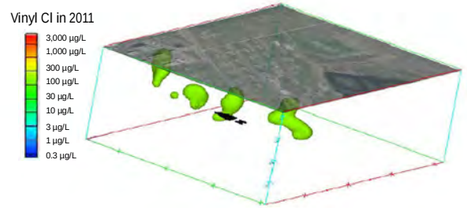


2014 CIS-DCE

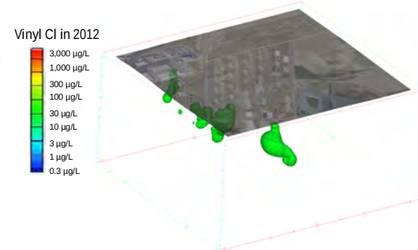




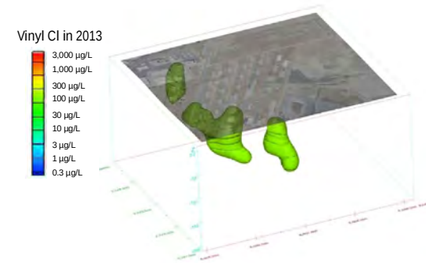
2010 VINYL CHLORIDE



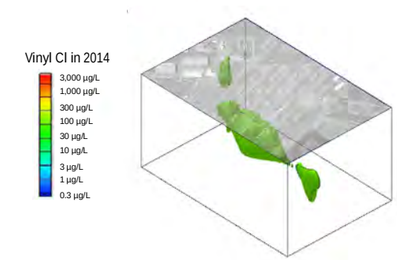
2011 VINYL CHLORIDE



2012 VINYL CHLORIDE



2013 VINYL CHLORIDE



2014 VINYL CHLORIDE

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
SAN DIEGO, CALIFORNIA

2014 PERFORMANCE MONITORING REPORT

FIGURE 3-12

THREE DIMENSIONAL VIEWS OF CIS-1,2-DICHLORETHENE PLUME (>60 ug/L) AND VINYL CHLORIDE PLUME (>20 ug/L) 2010 TO 2014

NAVAL WEAPONS STATION SEAL BEACH, SEAL BEACH, CALIFORNIA

REVISION: 0
AUTHOR: MS
FILE NUMBER: FIGURE 3-12.mxd

NAVFAC
ECC-INSIGHT LLC

Path: F:\Projects\SealBeach\Map\Documents\FIGURE 3-12_AJ.mxd

This Page Intentionally Left Blank