SECOND SEMIANNUAL 2009 GROUNDWATER MONITORING REPORT

DEFENSE FUEL SUPPORT POINT NORWALK
15306 NORWALK BOULEVARD
NORWALK, CALIFORNIA

Prepared for

Defense Energy Support Center
8725 John J. Kingman Road
Fort Belvoir, Virginia 22060-6222

January 21, 2010

Prepared by

PARSONS

100 WEST WALNUT STREET • PASADENA • CALIFORNIA 91124

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ACRONYMS AND ABBREVIATIONS

1,2-DCA	1,2-dichloroethane
Alpha	Alpha Analytical, Inc
AMEC	AMEC Geomatrix, Inc.
Blaine Tech	Blaine Tech Services, Inc.
BTEX	benzene, toluene, ethylbenzene, and total xylenes
Calscience	Calscience Environmental Laboratories, Inc.
COC	constituents of concern
DEOLA	Defense Energy Office — Los Angeles
DESC	Defense Energy Support Center
DFSP	Defense Fuel Support Point
DIPE	diisopropyl ether
ETBE	ethyl tert-butyl ether
EXP	Exposition aquifer
ft/ft	foot per foot
HCl	hydrochloric acid
JP-4	jet propellant 4
JP-5	jet propellant 5
JP-8	jet propellant 8
KMEP	Kinder Morgan Energy Partners, L.P.
MCL	maximum contaminant level
MRP	Monitoring and Reporting Program
msl	mean sea level
MTBE	methyl tertiary-butyl ether
RAB	Restoration Advisory Board
RWQCB	Regional Water Quality Control Board, Los Angeles
SFPP	Santa Fe Pacific Pipeline, L. P.
TAME	tert-amyl-methyl ether
TBA	tert-butyl alcohol
the site	Defense Fuel Support Point, Norwalk
TPH	total petroleum hydrocarbons
TPHd	total petroleum hydrocarbons as diesel
TPHfp	total petroleum hydrocarbons as fuel products
TPHg	total petroleum hydrocarbons as gasoline
TPHjp	total petroleum hydrocarbons as jet propellant 5
USEPA	U.S. Environmental Protection Agency
VOA	volatile organic analysis
VOC	volatile organic compound
μg/L	micrograms per liter

1.0 INTRODUCTION

Parsons was contracted by the Defense Energy Support Center (DESC) to prepare this Groundwater Monitoring Report on behalf of the Defense Energy Office – Los Angeles (DEOLA) and Santa Fe Pacific Pipeline, L.P. (SFPP), an operating partnership of Kinder Morgan Energy Partners, L.P. (KMEP), to summarize methods and results of groundwater monitoring activities conducted at the Defense Fuel Support Point (DFSP) Norwalk tank farm facility (the site) during the second half of 2009. The site is located at 15306 Norwalk Boulevard, Norwalk, California (Figure 1). The site is under the regulatory oversight of the California Regional Water Quality Control Board, Los Angeles (RWQCB).

As described in the March 6, 1995 Groundwater Sampling and Analysis Plan, DFSP Norwalk/SFPP Norwalk Pump Station (the sampling plan), SFPP and the DESC jointly perform groundwater monitoring events at the site. KMEP contracted AMEC Geomatrix, Inc. (AMEC) and DESC contacted Parsons to perform project oversight. Both SFPP and Parsons have subcontracted Blaine Tech Services, Inc. (Blaine Tech) to perform the low flow groundwater monitoring services. Groundwater monitoring is conducted in accordance with the revised Monitoring and Reporting Program (MRP) for the site, which was approved by the RWQCB in May 2002.

Since 1986, environmental assessments have been performed at the DFSP Norwalk tank farm facility (both on site and off site) by several consultants. During these investigations, wells were installed for monitoring and as components of groundwater remediation activities. Table 1 presents a summary of groundwater monitoring and remediation wells associated with the site. These investigations evaluated and defined the extent of liquid-phase, adsorbed-phase, and dissolved-phase hydrocarbons in soil and groundwater beneath the site and off-site to the south, west, and east.

The principal chemical constituents of concern (COC) at the site are total petroleum hydrocarbons (TPH; including TPH quantified as gasoline [TPHg], diesel fuel [TPHd], jet propellant 4 [JP-4], jet propellant 5 [JP-5], and jet propellant 8 [JP-8]); benzene, toluene, ethylbenzene, and total xylenes (BTEX); 1, 2-dichloroethane (1,2-DCA); and methyl tertiary-butyl ether (MTBE). In addition, tert-butyl alcohol (TBA) has been added to the MRP pursuant to a request made by the RWQCB in March 2009. Additional background information regarding investigations and monitoring events at the site is presented in previously submitted semiannual groundwater monitoring reports.

Monitoring wells and remediation wells are monitored on a semiannual basis to evaluate groundwater elevation and groundwater quality conditions. In addition to the semiannual monitoring event, certain wells are monitored quarterly. Initially, wells sampled during the quarterly monitoring event consisted of 11 “sentry wells” selected by the site’s Restoration Advisory Board (RAB) in 1998; thus, the quarterly monitoring events are referred to as the “sentry monitoring events” or “sentry events.” Since 1998, wells have been added to or removed from the sentry event in accordance with requests made by the RWQCB. In addition, certain wells are voluntarily monitored by DESC or SFPP based on requests made by the RAB.

This report furnishes information pertaining to the July 2009 sentry event and the October 2009 semiannual groundwater monitoring event. This report includes groundwater gauging and sampling data from selected wells throughout the DFSP Norwalk tank facility and from wells located off-site to the east, west, and south, and provides an updated description of the status of the dissolved-phase and liquid-phase hydrocarbon plumes.

2.0 FIELD AND LABORATORY ACTIVITIES

An overview of the sentry and semiannual monitoring events is provided in Subsection 2.1. Field and laboratory methods are described in Subsection 2.2.

2.1 OVERVIEW OF MONITORING EVENTS

This subsection summarizes the groundwater level measurement and sampling activities conducted for the July 2009 sentry monitoring event and the October 2009 semiannual monitoring event.

2.1.1 Sentry Event

The sentry monitoring event was conducted by Parsons and Blaine Tech from July 16 through July 22, 2009. Groundwater level measurements, sample collection, and laboratory analysis were performed in general accordance with the sampling plan. Field activities included water level and free product thickness measurements, purging, and sampling of the designated wells. Level measurements and sampling records for this event are provided in Appendix A.

Overall, water levels were measured in 79 wells, and 31 of those wells were sampled. Table 2 lists the wells that were gauged during the July 2009 sentry event, and Table 4 lists the wells that were sampled during the July 2009 sentry event.

2.1.2 Semiannual Event

Water levels were measured at 193 wells located within the facility and off-site to the west, south, and east to provide groundwater elevation and free product thickness data between October 15 and 22, 2009; and water quality samples were collected at 96 of these wells for the semiannual sampling event. Three monitoring wells (EXP-1, EXP-2, and EXP-3) were sampled by Blaine Tech on behalf of Parsons and SFPP. Blaine Tech on behalf of Parsons also submitted five field duplicate samples and seven trip blanks for analysis; and Blaine Tech on behalf of SFPP submitted five duplicate samples and seven trip blanks for analysis. Table 3 lists the wells that were gauged during the October 2009 semiannual monitoring event, and Table 6 lists the wells sampled for the semiannual event. Field well depth to groundwater measurements and sampling records for the semiannual sampling event are provided in Appendix B.

2.2 FIELD AND LABORATORY METHODS

Field activities for both events were conducted in accordance with the sampling plan and as described in Subsection 2.2.1. During the 2009 sentry and semiannual monitoring events, samples collected by Blaine Tech on behalf of Parsons were submitted to Calscience Environmental Laboratories, Inc. (Calscience) for analysis. Samples collected by Blaine Tech on behalf of SFPP were submitted to Alpha Analytical, Inc. (Alpha) for analysis. Calscience and Alpha are both certified by the Environmental Laboratory Accreditation Program of the

California Department of Health Services. Samples were submitted to these laboratories for analysis as described in Subsection 2.2.2.

2.2.1 Field Methods

Prior to commencement of purging and sampling activities, Parsons or Blaine Tech measured depth to water in each well using an electronic water level sounder; or depth to water and free product thickness using an interface probe if the well contained free product. The down-well instruments used in the wells were cleaned with a non-detergent cleaner, then rinsed successively with tap water and distilled water before each use. The EPA low-flow sampling method was followed, and Blaine Tech utilized a QED Sample Pro Bladder pump for wells sampled on behalf of Parsons and a Grundfos RF2 ES pump for wells sampled on behalf of SFPP. Each well was purged until the sampling parameters of specific conductivity, temperature, and pH have stabilized within 10% of the previous measurement. Purging records for the July 2009 sentry and October 2009 semiannual monitoring events are provided in Appendices A and B, respectively. Samples were collected directly from the pump discharge line into the sample container.

Samples analyzed for TPHg, TPH as fuel products (TPHfp), and volatile organic compounds (VOCs), including BTEX, 1,2-DCA, TBA, and MTBE, were collected in 40-milliliter volatile organic analysis (VOA) vials containing hydrochloric acid (HCl) preservative, filled to zero headspace, and sealed with Teflon® septa and airtight caps. Water samples for analysis of TPH as JP-5 (TPHjp) were collected in 1/2-liter amber sample jars and sealed with Teflon lined airtight caps. The samples were labeled and placed on ice for transport to the laboratory following chain-of-custody procedures.

2.2.2 Laboratory Analytical Methods

The laboratory analytical program for the sampling events included analysis for TPH using purge-and-trap and/or extraction sample preparation techniques followed by U.S. Environmental Protection Agency (USEPA) Method 8015 (modified). Results for TPH analyses using the purge-and-trap preparation technique were quantified and reported against a commercial gasoline standard and are abbreviated “TPHg” throughout this report. Results for TPH analyses using extraction sample preparation for groundwater samples collected by Blaine Tech on behalf of DESC were quantified and reported against a commercial JP-5 standard (results abbreviated “TPHjp”). Results for TPH analyses using extraction sample preparation for groundwater samples collected by Blaine Tech on behalf of SFPP were quantified and reported against a standard of site fuel collected from the north-central remediation system and provided to the laboratories by a former DESC contractor (results abbreviated “TPHfp”).

2.3 ABSORBENT SOCKS FOR PASSIVE FREE PRODUCT REMOVAL

The total fluids recovery operation has reduced the presence of measurable free product in several monitoring wells located throughout the site. However, in order to remove the

remainder of free product from the site, Parsons has installed absorbent polypropylene socks as an interim remedial measure.

The absorbent fibrous sock consists of hydrophobic (oleophilic) materials used for absorption of oil and hydrocarbon-based products. The 2-inch diameter absorbent socks are especially useful for removing thin layers of free product, even down to a sheen, and are likely to absorb approximately 1 quart of product per sock. The socks are replaced as needed by monitoring site conditions regularly to determine the most effective frequency of replacement.

Three wells (GMW-21, TF-17, and TF-20) have absorbent socks that were monitored/changed out during the quarterly monitoring events. Of the wells with absorbent socks, TF-17 was the only well with measureable product (0.74 feet in July and 0.6 feet in October) during the reporting period.

3.0 GROUNDWATER GAUGING RESULTS

Measurements of water level and free product thickness collected during the sentry and semiannual monitoring events are described in the following subsections.

3.1 SENTRY EVENT

During the sentry event, free product was observed in four (GMW-O-15, GW-15, MW-SF-4, and TF-17) of the 79 wells measured. Free product thicknesses, depths to groundwater, and calculated groundwater elevations for these wells are summarized in Table 2. Absorbent socks were installed for the removal of free product in wells TF-20, TF-17, and GMW-21.

3.2 SEMIANNUAL EVENT

Water level and free product thickness were measured in 193 wells during the semiannual monitoring event. Free product thicknesses, depths to groundwater, and calculated groundwater elevations are presented in Table 3. Groundwater elevations in wells with measureable free product were corrected for water-product density differences using a specific gravity of 0.84 for the free product, multiplying this specific gravity by the measured product thickness, and adding this correction to the groundwater elevation. Groundwater elevation contours for the uppermost groundwater zone along with estimated free product plumes are shown on Figure 2.

Some wells were not considered in contouring groundwater elevation in the uppermost groundwater zone for the following reasons:

- Twelve wells with measurable free product in October 2009;
- Five wells screened in the Exposition aquifer;
- Seven wells screened near the bottom of the uppermost aquifer (GMW-O-4 (MID), MW-18 (MID), MW-19 (MID), MW-20 (MID), MW-21 (MID), MW-22 (MID), and MW-23 (MID);
- Three wells with absorbent socks installed (GMW-21, TF-17, and TF-20); and
- Wells with groundwater elevations inconsistent with surrounding groundwater elevations due to groundwater remediation activities.

Groundwater elevation data from wells screened in the uppermost aquifer were used in interpreting site groundwater elevation contours, flow directions, and hydraulic gradient for the uppermost groundwater zone. Groundwater elevations used in contouring ranged from 47.06 feet above mean sea level (msl) in GW-3 to 48.65 feet above msl in GMW-59. Groundwater elevations considered anomalous are not included in the range listed here but are indicated on Figure 2.

Selected groundwater extraction wells used for groundwater monitoring were turned off prior to the second semiannual groundwater sampling event, including wells in the north-central, south-central, southeastern, and eastern areas.

Overall groundwater flow and gradient conditions encountered during the semiannual monitoring event were similar to those encountered during previous monitoring events at the site. Historically, the overall flow direction (assuming no wells are pumping) in the uppermost aquifer has been to the northwest. The overall flow direction during this monitoring event was to the north, with a horizontal hydraulic gradient of approximately 0.001 foot per foot (ft/ft) on the west side of the site to 0.006 ft/ft on the east side of the site (Figure 2). Groundwater elevations at the site during the October 2009 semiannual monitoring event were, generally in the range of 0.5 foot to 1.0 foot lower than elevations reported during the April 2009 semiannual monitoring event. The groundwater monitoring results for April 2009 were reported in the First Semiannual Report for 2009 (AMEC Geomatrix, 2009).

Groundwater levels in the seven wells [GMW-O-4 (MID), MW-18 (MID), MW-19 (MID), MW-20 (MID), MW-21 (MID), MW-22 (MID), and MW-23 (MID)] screened in the lower section of the uppermost aquifer varied from groundwater levels measured in nearby wells installed in the upper portion of the uppermost aquifer (Figure 2). Groundwater elevations in these seven "MID" wells ranged from 39.53 (GMW-O-4 (MID)) to 47.37 (MW-23 (MID)) feet above msl.

Groundwater elevations in the five Exposition aquifer wells at and near the site ranged from 21.80 (EXP-5) to 24.39 (EXP-4) feet above msl. Figure 3 shows groundwater elevation contours for the Exposition aquifer. During October 2009, groundwater elevations in all of the five Exposition aquifer wells had decreased by approximately 0.82 feet (EXP-2) to 2.75 feet (EXP-5) from elevations noted in the April 2009 sampling event. Groundwater flow in the Exposition aquifer beneath the site is generally east-southeastward with a horizontal hydraulic gradient of approximately 0.0007 ft/ft, generally opposite groundwater flow in the uppermost groundwater zone.

Free product was observed in 11 of the 193 wells measured during the second 2009 semiannual monitoring event, and apparent free product thicknesses measured ranged from 0.01 foot (TF-23) to 1.16 feet (MW-15). The detection of free product in 11 monitoring wells during this sampling event and data from remediation system operations, in addition to historical detections of free product, were used in interpreting the current limits of the free product plumes at the site. The interpreted distribution of free product at the site is shown on Figure 2.

The north-central free product plume has previously been interpreted as isolated or separated plumes. Most of the free product in these wells cannot be removed economically by mechanical means. Parsons has been using adsorbent socks to remove free product present in the remaining wells since July 2007. Measured free product associated with the north-central free product plume was detected in GMW-7, GMW-35, GW-15, TF-17, and TF-23 during the October 2009 gauging event.

As observed in recent gauging events (AMEC Geomatrix, 2009), the south-central free product plume remains in the same general area as smaller separated plumes instead of one continuous plume. Total fluids extraction is currently being performed at wells MW-SF-2, MW-SF-3, MW-SF-6, MW-SF-11 through MW-SF-16, GMW-9, GMW-22, GMW-24,

MW-O-1, MW-O-2, GMW-O-11, GMW-O-20, GMW-O-21, and GMW-O-23 in the south-central area. Free product has been historically detected in these wells, but during the previous semiannual event in April 2009, free product was detected in only seven of these wells. The south-central total fluids extraction wells remained in operation during the October 2009 sampling event and were not gauged or sampled; free product detected in the seven wells during April 2009 were interpreted to be in the same areas during October 2009.

Free product was again detected near the truck fill station area in MW-15. It appears that the area associated with the truck fill station is separate from the south-central plume area.

Free product was again detected in the southeastern block valve area near GMW-36. The product thickness of 0.11 foot measured in October 2009 is greater than had been observed there in recent previous monitoring events (0.04 feet in April 2009 and no product in July 2009). GMW-36 was sampled during the July 2009 sentry event because no free product was measured in the well (see Table 4). Due to the presence of product in October at GMW-36, this well was not purged and sampled. The free product plume in this area remains similar to that interpreted during the previous first half (April 2009) monitoring event.

4.0 GROUNDWATER QUALITY

Groundwater quality results for the sentry and semiannual monitoring events are described in Subsections 4.1 and 4.2, respectively.

4.1 RESULTS FOR SENTRY EVENT

The concentrations of dissolved analytes reported during the July sentry event were similar to those reported in several recent sampling events. The laboratory analytical results for the July 2009 sentry event for TPH, BTEX, MTBE, TBA, and 1,2-DCA are summarized in Table 4. Miscellaneous VOCs detected by USEPA Method 8260B analyses for this event are summarized in Table 5. Field data sheets are provided in Appendix A. Laboratory reports and chain-of-custody documentation are provided in Appendix C. Laboratory data validation reports for samples analyzed by Calscience are provided in Appendix E.

4.2 RESULTS FOR SEMIANNUAL EVENT

Laboratory analytical results for the semiannual sampling event were used to develop iso-concentration maps for TPH, benzene, 1,2-DCA, and MTBE. These maps are presented as Figures 4 through 7, respectively. The concentrations of TPH, benzene, MTBE, and 1,2-DCA presented in these figures were used to assess the extent of impact to groundwater beneath the site. Concentration data from the current semiannual event and three previous monitoring events (February 2009 sentry, April 2009 semiannual, and July 2009 sentry) are included on Figures 4 through 7. Laboratory analytical results for TPH, BTEX, 1,2-DCA, MTBE, and TBA are summarized in Table 6. Other VOCs detected by USEPA Method 8260B analyses are summarized in Table 7. Historical analytical results are presented in Table 9. Field data sheets are provided in Appendix B. Copies of the laboratory analytical data reports are presented in Appendix D. Laboratory data validation reports for samples analyzed by Calscience are provided in Appendix E.

4.2.1 Total Petroleum Hydrocarbons

The reported analytical results for TPHg and TPHfp or TPHjp for each well sampled during the semiannual monitoring event are summed and contoured as TPH on Figure 4. The contouring of TPH concentrations may be conservative in areas where gasoline is suspected because the hydrocarbon range reported by the two TPH analyses (TPHg, and TPHfp or TPHjp) overlap. As described in Section 2.2.2, a JP-5 standard instead of the expired fuel product standard was used to quantify heavier hydrocarbons in samples collected during the second semiannual monitoring event in the north-central area. Table 6 lists separate values for TPHjp, TPHg, and TPHfp. Samples collected by Blaine Tech on behalf of Parsons from wells in the north-central free product plume areas were analyzed for TPHjp and at selected wells for TPHg.

The lateral extent of TPH appears similar to that interpreted for the April 2009 monitoring event. The maximum reported concentrations of TPHg and TPHfp were 40,000 micrograms per liter (µg/L) and 21,000 µg/L, respectively, observed in well GMW-O-14 located upgradient and off-site to the south. The highest value of TPHjp was detected in the sample collected at GMW-15, located adjacent to the truck fill stations, at a concentration of 4,900 µg/L. In addition, the duplicate sample collected at GMW-58 had a concentration reported of 16,000 µg/L for TPHjp. See Section 4.3 below for additional details and Table 6 for results.

TPH was not detected in any of the Exposition aquifer wells sampled during the October 2009 semiannual event, indicating that the Bellflower aquitard is effective at inhibiting contamination of the deeper Exposition aquifer.

As shown on Figure 4 and Tables 6 and 9, overall TPH concentrations have generally either stayed the same or increased slightly in the north-central area. Still, some of the wells in the northern half of the site exhibit decreases in concentrations, as indicated by the blue data flags on Figure 4.

In the eastern part of the north-central plume area, the concentration of TPH at well GMW-58, located 100 feet to the west of GW-15, has increased over 70 % since the April 2009 sentry event. In addition, at GW-15, measurable free product was detected (0.58 foot) in the most recent sampling event. GW-15 is currently being pumped to create a cone of depression and control off-site migration to the east.

In the northwestern portion of the site at GW-13, TPHg and TPHjp have not been detected since April 2008. TPHjp concentration in GMW-17 (2,400 µg/L) and MW-11 (670 µg/L) was detected in October 2009. At MW-26, TPHjp has not been detected since October 2008, and TPHfp was not detected since May 2006.

In the south-central plume area of the site, the lateral extent of TPH generally stayed the same although concentrations increased in some wells, including offsite wells GMW-O-2 and GMW-O-14. The detection of THPfp in GMW-O-2 appears to be anomalous based on historical non-detect (ND) results for TPH and VOCs in this well. This well is scheduled to be sampled during the next sentry event. The concentrations of TPHg and TPHfp at well MW-SF-9, located near the intermediate block valve also exhibited a significant increase since the previous semiannual event (Figure 4 and Table 9).

Several wells in the southeast 24-inch block valve area are showing increased TPH concentrations (Figure 4) during the October semiannual sampling event. At GMW-O-18, TPHg (2,400 µg/L) had not been detected since May 2000, and TPHfp (680 µg/L) had never been previously detected dating back to November 1998. PZ-5 and GMW-O-16 also showed increases in TPH concentrations. The increased concentrations in the southeastern area may be attributed to the reduced pumping in this area as discussed during the October 2009 RAB. SFPP is working on resuming pumping at higher flow rates in this area.

4.2.2 Benzene

Benzene concentrations reported during the October 2009 semiannual monitoring event are presented on Table 6 and contoured on Figure 5. Concentrations of benzene ranged from below detection limits in several wells to 14,000 µg/L in GMW-O-14 (located in the south-central plume area). Benzene was not detected in any of the off-site wells west of the site, nor in any of the Exposition aquifer wells.

The northern plume (previously the north-central and eastern plumes) continues to be interpreted as one plume based on detections of benzene in the previously separate north-central and eastern wells. The size of the plume is generally consistent with the April 2009 interpretation. Although benzene concentrations decreased in some wells (indicated by blue data flags on Figure 5) and increased at others (indicated by red data flags on Figure 5); the most significant change occurred at GW-14 where the concentration has decreased below the reporting limit for the first time since sampling began at this well in May 2007. This change caused interpretation of a new no-detect re-entrant into the northern plume configuration, which is coincident with an interpreted groundwater ridge. The benzene concentration at GMW-58 increased above the reporting limit since the last semiannual event (an increase in TPH concentration was also observed), but continues to show a decreasing trend.

In the western portion of the northern plume area, the benzene concentrations continued to show a decreasing trend at GMW-17, and the interpreted size of the plume has been decreased on Figure 5. The reported concentration of benzene at GMW-17 is less than the maximum contaminant level (MCL) of 1 µg/L, and this small plume no longer poses a risk.

The benzene plume associated with the south-central area remained similar in the lateral extent to that observed during the previous semiannual monitoring event. The most significant change occurred in the northeast corner of the plume where the concentration of benzene decreased to less than the reporting limit (0.5 µg/L) at PZ-10. The benzene concentration at GMW-1, which was up slightly in February 2008 through April 2009, also decreased back to single digit levels (Table 9) in October 2009.

In the southeastern 24-inch valve area, benzene concentrations downgradient of the free product plume (Figure 5) continued to show an increasing trend at PZ-5 (1,100 µg/L); and for the first time since sampling began in 1996, benzene was detected at GMW-O-18 with a concentration of 170 µg/L. As described above, SFPP is working on increasing the pumping rates to contain the dissolved constituents in this area.

4.2.3 1,2-Dichloroethane

1,2-DCA concentrations reported during the semiannual monitoring event are provided in Table 6 and contoured on Figure 6. The maximum reported 1,2-DCA concentration during the October 2009 sampling event was 40 µg/L in well WCW-7, located along Norwalk Boulevard just west of the site. Detected concentrations of 1,2-DCA in the plume areas (Figure 6) were less than the conservative risk-based cleanup goal of 70 µg/L for 1,2-DCA. The size and configuration of the 1,2-DCA plume remains about the same as previous interpretations. 1,2-DCA was not detected in any of the Exposition aquifer wells.

As discussed in the previous semiannual report, 1,2-DCA concentrations in groundwater in the vicinity of the West Side Barrier and in the western off-site area have remained consistently below the risk-based cleanup goal for 1,2-DCA since 2005. Pumping of the West Side Barrier wells was discontinued in August 2008.

4.2.4 Methyl Tertiary-Butyl Ether

MTBE concentrations reported during the semiannual monitoring event are provided in Table 6 and contoured on Figure 7. Concentrations of MTBE ranged from below detection limits in many wells to 620 µg/L in well MW-SF-1 located in south-central area and 530 µg/L at PZ-5 located in southeastern area. MTBE was not detected in any of the Exposition aquifer wells.

The site has a bifurcated MTBE plume near the western edge of the site, two plumes in the north, an isolated plume around GW-15 in the truck fill station area, and one plume associated with the 24-inch valve in the southeastern corner of the site.

The lateral extent of the bifurcated MTBE plume in the western portion of the site is generally similar to that interpreted for the semiannual monitoring event of October 2008, but different than interpreted in April 2009 - the difference being no detections of MTBE at GMW-8, GMW-40, GMW-41, and MW-27 during the April 2009 semiannual sampling. Concentrations of MTBE in off-site monitoring wells west of the site generally remained below the detection limit, or were detected at low concentrations below the risk-based cleanup goal (i.e., WCW-4, WCW-7, and WCW-8).

The MTBE plume near the southeastern 24-inch valve area is interpreted to be similar in size and shape to the first semiannual event, based on stable or slightly decreasing concentrations of MTBE in this area. The exception is GMW-O-18, which increased from a concentration of 1 µg/L in April 2009 to 490 µg/L in October 2009.

The north-central plume area has been interpreted to have split into two distinct plumes. An interpreted groundwater high provides a divide separating the plumes. The most significant change since the first semiannual sampling event is at GMW-6, where the concentration increased from 43 to 350 µg/L.

4.2.5 Other Fuel Oxygenates

Pursuant to the RWQCB's request in March 2009, analysis for other fuel oxygenates including ethyl tert-butyl ether (ETBE), diisopropyl ether (DIPE), TBA, and tert-amyl methyl ether (TAME) using EPA Method 8260B was added to the MRP for this and future sampling events (RWQCB, 2009a; RWQCB, 2009b).

The highest concentration of TBA was detected in the southeast corner of the site near the 24-inch block valve at PZ-5, with a concentration of 50,000 µg/L. Nearby, TBA was also detected in GMW-39 at a concentration of 2,200 µg/L. Other wells in this area that had detected high levels of TBA include GMW-O-18 and MW8.

In the south-central plume area, TBA was detected in the groundwater sample from GMW-27 at a concentration of 830 µg/L. DIPE was also detected at GMW-27 at a concentration of 17 µg/L (Table 7). To the northwest, DIPE was detected at MW-19 MID and MW-20 MID at concentrations of 16 and 14 µg/L, respectively; and at WCW-7 and WCW-3 at concentrations of 3.7 and 0.44 µg/L, respectively.

TAME was detected at GMW-6, which is located near MW-20 MID, at a concentration of 0.51 µg/L. ETBE was not detected in any of the sampled wells.

4.3 QUALITY ASSURANCE/QUALITY CONTROL

Alpha and Calscience did not report any significant quality assurance/quality control problems with the analytical work performed as part of the current sampling events. A total 5 trip blanks from the third quarter sentry event and 14 trip blanks from the second semiannual event were submitted to the laboratories for analysis. Target compounds were not detected in any trip blank. Table 8 is a summary of the analytical results for these Quality Assurance/Quality Control samples.

Field duplicate samples were collected as part of the July sentry event (five duplicate pairs) and October 2009 semiannual event (eleven duplicate pairs). Reported sample results exhibited acceptable agreement between the sample pairs, except for TPHjp5 at GMW-58 and GMW-59 obtained during the second semiannual event. Due to the abnormally high disagreement between TPHjp5 results, the laboratory was asked to review these data and confirmed the reported results (no calculation or transcription errors); however, the sample had already been disposed and confirmation by reanalysis was not possible. Field duplicate sample results are shown on Tables 4 and 6.

4.4 WATER DISPOSAL

Purged groundwater generated during these monitoring events was treated on-site in the remediation systems operated by the DESC and SFPP. Purged groundwater extracted by Blaine Tech on behalf of Parsons was pumped into the DESC system located in the northern part of the site to be discharged under National Pollutant Discharge Elimination System (NPDES) permit number CAG834001. Purged groundwater extracted by Blaine Tech on behalf of SFPP was treated in the SFPP system located in the southern part of the site and discharged under NPDES permit number CA0063509.

4.5 HEALTH AND SAFETY

Field activities were conducted in accordance with the site-specific health and safety plans. The health and safety plans include protocols for safe work practices for the field portion of the project. Personnel working at the site were required to read, sign, and adhere to the health and safety plans. The health and safety plans were in effect throughout the monitoring events.

5.0 REMEDIAL SYSTEMS OPERATION

The remediation system at the site consists of soil vapor extraction, groundwater extraction, biosparging, absorbent sock installations for passive recovery of free product, and total fluids extraction.

DESC is currently conducting groundwater extraction in the northwest corner of the property from two pumping wells (GW-2 and GW-13), and also from two wells (GW-15 and GW-16) in the northeast area bordering Holifield Park. SFPP is currently extracting groundwater from 20 wells in the south-central area and from 2 wells in the 24-inch block valve area in the southeast corner of the property.

Details of the remediation system operation are presented quarterly to the RAB. DESC recently created a web site (*Norwalkrab.com)* to house project information, which includes agendas, minutes, and presentations from RAB meetings dating back to 1994. In addition, all historical project information and reports can be located in the information repository at the Norwalk Regional Library.

The groundwater extraction systems throughout the site (in the north, east, and southern areas) were turned off prior to the groundwater monitoring event. SFPP's West Side Barrier groundwater extraction system, which includes wells BW-1 through BW-9, has been shut down since August 2008. The north-central biosparging and soil vapor extraction remediation systems remained off during the second semiannual groundwater sampling event.

6.0 SUMMARY

Groundwater monitoring of sentry wells was conducted in July 2009. Semiannual monitoring of these and other wells at the site and its vicinity was conducted in October 2009. In general, free product conditions and groundwater quality interpreted from these monitoring events are similar to those interpreted from the April 2009 semiannual sampling event.

Groundwater elevations at the site during the October 2009 semiannual monitoring event were, on average, approximately 1 foot lower than the elevations reported during the April 2009 semiannual monitoring event. The overall flow direction during this monitoring event in the upper groundwater zone was to the north, with an estimated horizontal hydraulic gradient ranging from 0.001 to 0.006 ft/ft. This is generally consistent with previous monitoring events. Groundwater flow in the Exposition aquifer was generally east-southeastward with a horizontal hydraulic gradient of approximately 0.0007 ft/ft. This is also generally consistent with previous monitoring events.

Free product was observed in 11 of the 193 wells measured during the second 2009 semiannual monitoring event, and apparent free product thicknesses measured ranged from 0.01 foot (TF-23) to 1.16 feet (MW-15). Interpretation of the current limits of the free product plumes at the site was based on the detections of free product during this sampling event, data from remediation system operations, and historical detections of free product.

In most areas, the lateral extent and concentrations of dissolved TPH, benzene, 1,2-DCA, and MTBE plumes were similar to those detected during the April 2009 event. In general, TPH concentrations in the southern and eastern areas have increased since the April 2009 semiannual monitoring event. During the October 2009 event, the highest concentrations of TPHg and TPHfp (40,000 µg/L and 21,000 µg/L, respectively), was observed in well GMW-O-14, located upgradient and off-site to the south. The highest value of TPHjp was detected in the sample collected at GMW-15, located adjacent to the truck fill stations, at a concentration of 4,900 µg/L.

Benzene concentrations ranged from below detection limits in several wells to 14,000 µg/L in GMW-O-14, located in the south-central plume area. Benzene was not detected in any of the off-site wells west of the site, nor in any of the Exposition wells. The interpreted extent of the northern benzene plume remains generally consistent with the April 2009 interpretation. The benzene plume associated with the south-central free product plumes remained similar in lateral extent to that observed during the previous semiannual monitoring event. In the southeastern 24-inch valve area, benzene concentrations generally increased, and the extent of the plume expanded further north (downgradient) to include well GMW-O-18. SFPP is working on increasing the pumping rates in the southeastern area to contain dissolved constituents in this area.

The highest reported 1,2-DCA concentration during the reporting period was 40 µg/L in well WCW-7, located along Norwalk Boulevard just west of the site. All detections of 1,2-DCA were below the risk-based cleanup goal for 1,2-DCA of 70 µg/L. 1,2-DCA was not detected

in any of the Exposition aquifer wells. The extent and magnitude of 1,2-DCA is similar to previous interpretations.

Concentrations of MTBE ranged from below detection limits in many wells to 620 µg/L in well MW-SF-1, located in south-central area, and 530 µg/L at PZ-5 located in southeastern area. MTBE was not detected in any of the Exposition aquifer wells. The extent and magnitude of MTBE is generally similar to previous interpretations. Concentrations of MTBE in off-site monitoring wells west of the site generally remained below the detection limit, or were detected at low concentrations below the risk-based cleanup goal of 40 µg/L (i.e., WCW-4, WCW-7, and WCW-8).

Pursuant to the RWQCB's request March 2009, analysis for other fuel oxygenates including ETBE, DIPE, TBA, and TAME using EPA Method 8260B was added to the MRP for this and future sampling events (RWQCB, 2009a; RWQCB, 2009b). The highest concentration of TBA was detected in the southeast corner of the site near the 24-inch block valve at PZ-5, with a concentration of 50,000 µg/L. The extent of TBA and DIPE is similar to the MTBE plume in the south-central plume area. ETBE was not detected in any of the sampled wells.

7.0 REFERENCES

AMEC Geomatrix, Inc., 2009. *Defense Fuel Support Point, Norwalk First Semi-Annual 2009 Groundwater Monitoring Report,* July 27, 2009.

California Regional Water Quality Control Board, Los Angeles Region (RWQCB), Letter dated March 10, 2009a to Mr. Steve Osborn, Kinder Morgan Energy Partners; Additional Requirements on Groundwater Monitoring, Defense Fuel Support Point Norwalk, 15306 Norwalk Boulevard, Norwalk, California (SCP No. 0286B, Site No. 204DM00).

California RWQCB, Letter dated March 11, 2009b to Mr. Kola Olowu, Defense Energy Support Center; Additional Groundwater Extraction Well on Groundwater Monitoring and Well Installation, Defense Fuel Support Point Norwalk, 15306 Norwalk Boulevard, Norwalk, California (SCP No. 0286A, Site No. 16638).