GROUNDWATER SAMPLING AND MONITORING INVESTIGATION SECOND SEMIANNUAL 2005 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 20, 2006

Prepared by

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LETTER OF TRANSMITTAL

TO: Dr. Kwang-iL Lee, PhD, PE California Regional Water Quality Control Board – Los Angeles Region 320 West 4th Street, Suite 200 Los Angeles, CA 90013 FROM: Redwan Hassan	DATE: Januray 20, 2006 PARSONS JOB NO.: 743447.02000 SUBJECT: Enclosures re: Groundwater Sampling and Monitoring Investigation, Second Semiannual 2005 Report

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REMARKS:

Dr. Lee,
Copies of the document also are being provided to the persons listed below. If you have any questions or requests, please contact me at 602-852-9110.
Thank you,
Redwan Hassan
Project Manager

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ABBREVIATIONS AND ACRONYMS

1,2-DCA	1,2-dichloroethane
Alpha	Alpha Analytical, Inc
BTEX	benzene, toluene, ethylbenzene, and total xylenes
Calscience	Calscience Environmental Laboratories, Inc.
COCs	constituents of concern
DEOLA	Defense Energy Office — Los Angeles
DESC	Defense Energy Support Center
DFSP	Defense Fuel Support Point
EPA	Environmental Protection Agency
EXP	Exposition aquifer
Geomatrix	Geomatrix Consultants, Inc.
GTI	Groundwater Technology, Incorporated
HCl	hydrochloric acid
JP-4	jet propellant 4
JP-5	jet propellant 5
KMEP	Kinder Morgan Energy Partners, L.P.
MRP	Monitoring and Reporting Program
MTBE	methyl tertiary-butyl ether
µg/L	micrograms per liter
RAB	Restoration Advisory Board
RWQCB	Regional Water Quality Control Board, Los Angeles
SECOR	SECOR International Incorporated
the site	Defense Fuel Support Point, Norwalk
SFPP	Santa Fe Pacific Pipeline, L. P.
TPH	total petroleum hydrocarbons
TPHd	total petroleum hydrocarbons as diesel
TPHfp	total petroleum hydrocarbons as fuel products
TPHg	total petroleum hydrocarbons as gasoline
VOA	volatile organic analysis
VOCs	volatile organic compounds

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 2005. 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), KMEP and the DESC jointly perform groundwater monitoring events at the site. KMEP contracted Geomatrix Consultants, Inc. (Geomatrix) to perform project oversight and SECOR International Incorporated (SECOR) to perform the 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 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 the liquid-phase, adsorbed-phase, and dissolved-phase hydrocarbons in soil and groundwater beneath the facility and off-site properties to the south, west, and, to a limited extent, to the southeast.

The principal chemical constituents of concern (COCs) are total petroleum hydrocarbons (TPH; including TPH quantified as gasoline [TPHg], diesel fuel [TPHd], jet propellant 4 [JP-4], and jet propellant 5 [JP-5]), benzene, toluene, ethylbenzene, and total xylenes (BTEX); 1,2-dichloroethane (1,2-DCA), and methyl tertiary-butyl ether (MTBE). Additional background information regarding investigations and monitoring events at the DFSP 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, this event has been referred to as the "sentry monitoring event" or "sentry event." Since 1998, wells have been added to or removed from the sentry event. Table 2 provides a list of wells monitored during the August 2005 sentry event, including wells GMW-57, GMW-58, GMW-59, GMW-60, and GMW-61, which were included per the RWQCB letter dated February 16, 2005. In addition, GMW-47 was included based on an earlier request by the RWQCB received on September 13, 2002. This report furnishes information pertaining to the August 2005 sentry and the November 2005 semiannual groundwater monitoring events. This report includes groundwater gauging and sampling data from selected wells throughout the DFSP Norwalk facility and from wells located off site to the west and south and updates 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 described in Section 2.1. Field and laboratory methods are described in Section 2.2.

2.1 Overview of Monitoring Events

This section summarizes the gauging and sampling activities conducted for the August 2005 sentry monitoring event and the November 2005 semiannual monitoring event.

2.1.1 Sentry Event

The sentry monitoring event was conducted by Secor and Parsons during August 1 through 4, 2005. Groundwater level gauging, 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. Well gauging and sampling records for this event are provided in Appendix A.

Overall, a total of 76 wells were gauged and 29 of those wells were sampled. SECOR gauged and sampled 23 wells. MW-SF-4 was gauged by SECOR but was not sampled because it contained free product. Parsons gauged 54 wells and sampled 6 of those wells (GMW-47, GMW-57, GMW-58, GMW-59, GMW-60, and GMW-61). Table 2 lists the wells that were monitored during the August 2005 sentry event.

2.1.2 Semiannual Event

The second semiannual 2005 monitoring event was conducted from October 31, 2005 through November 8, 2005 by SECOR and Parsons. Copies of well gauging and sampling field records for the semiannual monitoring event are provided in Appendix B. SECOR gauged and sampled 43 wells located within the facility and at nearby off-site locations south of the site. SECOR gauged an additional 34 wells to measure water level

and free-product thickness; however, these wells were not sampled. Parsons gauged and sampled 89 wells located within the facility and at nearby off-site locations west of the site. Parsons gauged an additional 41 wells to provide additional groundwater elevation data. Combined, Parsons and SECOR gauged a total of 165 wells and sampled a total of 91 wells. SECOR submitted 43 groundwater samples and 3 trip blanks for analysis. Parsons submitted 53 groundwater samples, including 5 field duplicate samples, and 3 trip blanks for analysis. Table 3 lists the wells that were monitored during the November 2005 semiannual event.

2.2 Field and Laboratory Methods

Field activities for both events were conducted in accordance with the sampling plan and as described in Section 2.2.1. During the 2005 sentry and semiannual monitoring events, samples collected by Parsons were submitted to Calscience Environmental Laboratories, Inc. (Calscience) for analysis. Samples collected by SECOR were submitted to Alpha Analytical, Inc. (Alpha) for analysis. Calscience and Alpha are both State of California certified laboratories. Samples were submitted to these laboratories for analysis as described in Section 2.2.2.

2.2.1 Field Methods

Prior to commencement of purging and sampling activities, Parsons or SECOR measured depth to water in each well using an electronic water level sounder or free-product thickness using an interface probe if the well contained free-product. The down-well instruments used to gauge the wells were cleaned with a non-detergent cleaner, then rinsed successively with tap water and distilled water before each use. Prior to sampling, Parsons or SECOR purged each well by removing a minimum of three casing volumes of groundwater through a dedicated stinger using a vacuum truck. Groundwater temperature, pH, and electrical conductivity were monitored during purging. Purging records for the 2005 sentry and semiannual events are provided in Appendices A and B, respectively. Samples were collected using disposable polyethylene bailers.

Samples were collected after each well had recharged to within 80 percent of its initial static level. Polyethylene bailers were discarded after each sample was collected. Samples analyzed for TPHg and volatile organic compounds (VOCs) including BTEX, 1,2-DCA, 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 analyzed for TPH as fuel products (TPHfp) were collected in 1/2-liter amber sample jars (provided by Calscience) and sealed with Teflon® lined airtight caps or in unpreserved 40-milliliter VOA vials (provided by Alpha), filled to zero headspace, and sealed with Teflon® septa and 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 (EPA) 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 as "TPHg" throughout this report. Results for TPH analyses using extraction sample preparation were quantified and reported against a standard of site fuel collected from the north-central remediation system and provided to the laboratories by Parsons. These results are abbreviated as "TPHfp" throughout this report.

Samples were analyzed for VOCs using EPA Method 8260B or EPA Method 8021B. Groundwater samples from monitoring wells completed in the Exposition aquifer or in areas associated with plumes containing gasoline were analyzed for VOCs using EPA Method 8260B with MTBE included on the analyte list. Samples from wells where MTBE is not believed to be present were analyzed for VOCs using EPA Method 8021B with MTBE included on the analyte list. If MTBE is detected using EPA Method 8021B, it will later be confirmed using EPA Method 8260B.

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 sections.

3.1 Sentry Event

During the sentry event, free-product was observed in one (MW-SF-4) of the 24 wells gauged by SECOR. Free-product was observed in one of the 54 wells (TF-17) gauged by Parsons. A sheen was observed in wells GMW-58 and GMW-59. Free-product, water level measurements, and groundwater elevations for these wells are summarized in Table 2.

3.2 Semiannual Event

Water level and free-product thickness were measured in 165 wells during the semiannual monitoring event. Free-product thickness, water level measurements, and calculated groundwater elevations are presented in Table 3. Groundwater elevation contours for the uppermost groundwater zone along with 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:

- 22 wells with presence of free-product,
- 5 wells screened in the Exposition aquifer,
- 6 wells screened near the bottom of the uppermost aquifer only, or
- Wells with groundwater elevations that were inconsistent with surrounding groundwater elevations due to groundwater remediation activities or that were considered anomalous.

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 49.96 to 53.75 feet above mean sea level (msl).

The north-central remediation system groundwater pumping and biosparging wells were turned off approximately one month prior to the November groundwater sampling event. The south-central, south-eastern, and west side barrier groundwater extraction wells were turned off approximately one week prior to the November 2005 groundwater monitoring event.

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 (Groundwater Technology, Incorporated [GTI], 2002). The overall flow direction during this monitoring event also was to the northwest, with a horizontal hydraulic gradient of approximately 0.001 foot per foot on a regional basis measured southeast to northwest across the site (Figure 2). Groundwater elevations at the site during the November 2005 semiannual monitoring event were, on average, approximately 1.0 to 2.5 foot lower than elevations reported during the May 2005 semiannual monitoring event, likely due to the dryer summer and fall.

Groundwater levels in the six wells [GMW-O-4(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 six wells ranged from 48.58 to 51.24 feet above msl.

Groundwater elevations in the five Exposition aquifer wells at and near the site ranged from 25.58 to 30.60 feet above msl. Figure 3 shows groundwater elevation contours for

the Exposition aquifer. The groundwater elevations in four of the five Exposition wells have decreased by approximately 1 to 2 feet since May 2005, with the exception being EXP-4 for which the elevation has increased more than 2 feet. Groundwater flow in the Exposition aquifer beneath the site is southeastward, generally opposite groundwater flow in the uppermost aquifer.

Free product was observed in 22 of the 165 wells gauged, and apparent free-product thickness measured ranged from 0.03 (GWR-3) to 3.41 (MW-SF-2) feet. The detection of free product in 22 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 in monitoring wells at the site is shown on Figure 2.

The north-central free-product plume appears as isolated or separated plumes or localized product present in isolated wells. Much of the reduction of free-product located in the north-central tank farm area may be attributable to the expansion of the total fluids recovery wells network and air sparging system into this area, including the recently expanded biosparging system between Tanks 80002 and 80006.

Measured free product associated with the western part of the north-central free-product plume was detected again in wells GMW-21 and TF-09. The greatest product thickness in this plume was measured in GMW-21 (1.22 feet). A 2-inch diameter product-recovery pump was installed in this well in July 2004 and several gallons of product have been recovered from this well. Free-product in the central area of the north-central plume was detected again in TF-17, TF-18, and was detected in TF-20 where it was not detected in the May 2005 monitoring event. The greatest product thickness in this plume was measured in TF-20 (2.35 feet). Free-product also was observed (sheen) in the eastern area in well GMW-57, where it was not detected in May 2005.

During the November 2005 monitoring event, free product was detected in the south-central area in wells MW-O-2, GMW-9, GMW-23, and GWR-3, locations where it was not detected in May 2005. Free product was also detected again in GMW-24, MW-O-1, GMW-O-11, GMW-22, MW-SF-2, and MW-SF-3. The greatest thickness of the south-central plume was measured in MW-SF-2 (3.41 feet). Free product was not detected in the intermediate block valve area (near MW-SF-4) during November 2005. Free product was detected again near the truck rack area in wells GMW-4 and MW-15, and was detected in MW-9, where it was not detected in May 2005.

Free product was also detected again in the southeastern area in wells GMW-36 and GMW-O-15. The free-product plume in this area remains similar to that interpreted during the previous monitoring event.

4.0 GROUNDWATER QUALITY

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

4.1 Results for Sentry Event

In general, concentrations of dissolved analytes seem to indicate a slight decreasing trend compared to recent results. Sentry results were reported and discussed in a letter dated November 28, 2005 to the RWQCB (Parsons, 2005).

Laboratory analytical results for TPH, BTEX, MTBE, and 1,2-DCA are summarized in Table 4, and other miscellaneous VOCs detected by EPA Method 8260B analyses 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, and are presented as Figures 4 through 7, respectively. The concentrations of TPH, benzene, MTBE, and 1,2-DCA presented in these figures are used to assess the extent of impact to groundwater beneath the site. Laboratory analytical results for TPH, BTEX, 1,2-DCA and MTBE are summarized in Table 6; other VOCs detected by EPA 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 for each well sampled during the semiannual monitoring event are summed and contoured as TPH on Figure 4. The

representation of TPH concentrations is conservative; the TPH concentrations shown on Figure 4 are overstated for some samples because the hydrocarbon range reported by the two TPH analyses (TPHg and TPHfp) overlap and most samples with detected TPH contained hydrocarbons within the range of the overlap. Table 6 shows separate values for TPHg and TPHfp. Samples collected by Parsons from wells in the north-central free-product plume area were not analyzed for TPHg, with a few exceptions: wells GMW-47 and GMW-57 through GMW-61 in the northeastern part of the site, and well GMW-12 between the north-central and south-central free product plume areas, were analyzed for both TPHg and TPHfp. The maximum reported concentration of TPHg was 16,000 micrograms per liter (µg/L) in GMW-61, which is located in the eastern part of the north-central plume area; this is an increase from 11,000 µg/L reported in May 2005 (Table 9), but is less than the concentration observed in November 2004. The maximum reported concentration of TPHfp was 30,000 µg/L in MW-SF-4, which is located in the intermediate block valve area near the south-central plume area. Free product was detected in MW-SF-4 in May 2005 but was not present in this well during November 2005, and the reported TPH concentration in this well for November 2005 is less than the concentration of 86,000 µg/L reported in October 2003. The maximum concentration of TPH was 35,500 µg/L in GMW-59, located in the northeastern part of the site; this is an increase from 18,000 µg/L reported in May 2005, but less than the concentration observed in November 2004. TPH was not detected in any of the Exposition aquifer wells during the semiannual sampling event.

In the north-central area, the concentration of TPH has increased relative to the May 2005 result in well GMW-18 (17,000 µg/L), located between Tanks 80006 and 80007, in GMW-43 (200 µg/L), located near Tank 80007, which was reported as non-detect in May 2005, and in wells MW-23(MID) and GMW-16, both of which are located near Tank 80002. The TPH concentrations were reported as non-detect and have decreased relative to the May 2005 results in wells MW-26 and MW-22(MID) located near Tank 80005 and in well GMW-44 located near Tank 80007. The TPH concentrations have decreased relative to the May 2005 results in well GMW-17 near Tank 80006; in well TF-16, GMW-35, and TF-21 located near Tank 80003; and in wells GMW-12 and GMW-32

located between Tanks 55003 and 55004. In the western portion of the site, the concentration of TPH has increased relative to the May 2005 results in well MW-14.

In the eastern portion of the north-central area, the analytical results for TPH indicate a decreasing trend, relative to the May 2005 results, in wells GMW-47, GMW-57, GMW-58, and GMW-60, whereas the TPH results indicate an increasing trend for wells GMW-59 and GMW-61. The analytical results for TPHg in wells GMW47, GMW-57, GMW-58, GMW-59 and GMW-60 indicate a decreasing trend relative to the May 2005 results, whereas the TPHg concentration in well GMW-61 (16,000 µg/L) has increased relative to the May 2005 results and continues to be greater than 10,000 µg/L. Similarly, the analytical results for TPHfp in wells GMW47, GMW-57, GMW-58, and GMW-60 indicate a decreasing trend relative to the May 2005 results, whereas the TPHfp concentrations in well GMW-59 (26,000 µg/L) and GMW-61 (10,000 µg/L) have increased relative to the May 2005 results and are greater than the 10,000 µg/L level. Existing off-site well PO-7, owned by Thrifty Oil (formerly Golden West), was sampled for the first time in conjunction with this sampling event. Dissolved analytes, including TPH, were not detected in this well.

Off-site to the west, TPHfp was detected in well WCW-04, where it had not been detected since May 2004, and in well WCW-8 (210 µg/L) at an increased concentration relative to the May 2005 result. TPHfp concentrations were plotted with a best-fit curve added to illustrate that concentrations have decreased over time within these two wells (Appendix F).

The southern lateral extent of dissolved TPH appears to be similar to that of the May 2005 monitoring event. Several southern off-site wells remained non-detect for TPH. The concentration of TPH in well GMW-O-4(MID) was reported as non-detect, which represents a decrease in concentration since May 2005. Concentrations of TPH increased in well GMW-O-14 since the May 2005 event but remain less than those observed in the same well one year ago. The concentration of TPH in well GMW-O-10 shows an apparent increase with reference to the non-detect result reported from May 2005,

although the current result is actually less than the reporting limit for May 2005. The TPH concentration in GMW-O-3 increased since the May 2005 event; however, as described in subsequent sections of this report, concentrations of other dissolved constituents at this well were not detected or were similar to those detected in recent monitoring events.

Since May 2005, TPH concentrations increased in wells GMW-3 and MW-9 near the truck rack area, and wells MW-SF-1 and GMW-1 near the intermediate block valve area, but generally remained less than those observed in the same well one year ago. TPH concentrations have decreased in wells MW-SF-9 and PZ-10 near the intermediate block valve area since their previous results. The TPH concentration of MW-SF-4 (30,000 µg/L), which was not sampled in November 2004 or May 2005 due to the presence of free product in this well, was the greatest concentration of all samples collected during the November 2005 monitoring event. Compared to the October 2003 results, the TPH concentration in MW-SF-4 has decreased.

In the southeastern part of the site, the TPH concentration increased in well MW-8 in which TPH was reported as non-detect in May 2005. TPH concentrations have decreased (TPH was reported as non-detect) in wells GMW-O-16 and GMW-O-19, where it had been detected in May 2005.

In the southwestern part of the site, TPH concentrations increased relative to May 2005 results in MW-19(MID) and GMW-27 but decreased in wells HL-2, MW-6 and MW-20(MID).

4.2.2 Benzene

Benzene concentrations reported during the semiannual monitoring event are mapped on Figure 5. Concentrations of benzene ranged from below detection limits in several wells to 5,600 µg/L in MW-SF-1 located in the south-central plume area. Benzene was not

detected in any of the offsite wells west of the site nor in any of the Exposition aquifer wells.

The interpreted extent of the north-central benzene plume remains generally consistent with the May 2005 interpretation. The benzene plume consists of four to five areas, each encompassing one or several wells. As illustrated on Figure 5, concentrations of benzene both decreased and increased throughout the site.

In the north-central area, the benzene concentration decreased in wells TF-16, TF-21, GMW-18, GMW-35, and GMW-45 relative to the May 2005 results, and in wells MW-23(MID), GMW-44, GMW-32, GMW-47, and GMW-57 in which benzene was reported as non-detected.

Benzene was detected in the eastern portion of the north-central area in wells GMW-58 and GMW-59 at higher concentrations than in the May 2005 event. Benzene was also detected in eastern boundary wells GMW-61 (2,600 µg/L: representing an increased concentration from the results of the May 2005 monitoring event), and in GMW-60 (970 µg/L: representing a decrease). Benzene concentrations were not detected in the off-site well PO-7.

Benzene was detected at a low level (6.5 µg/L) in well MW-14 in the western portion of the north-central area, representing an increased concentration relative to the May 2005 result. Benzene concentrations decreased at wells MW-11 and GMW-17. Benzene was again reported as non-detect in MW-27.

The benzene plume associated with the south-central free-product plume within the upper aquifer remained similar in lateral extent to that observed during the previous semiannual monitoring event. Since the May 2005 monitoring event, benzene concentrations increased in monitoring well GMW-27 located northwest of the south-central free-product plume, in well MW-SF-1, located northeast of that plume, and wells GMW-O-10, GMW-O-3, and GMW-O-14, located south of the free-product plume. However,

these concentrations remain less than those observed in the same wells one year ago. Since May 2005, benzene concentrations have decreased in wells HL-2 and MW-SF-9 and remained non-detect in PZ-10.

Benzene also was detected in MW-9, in the truck rack area east of the south-central free-product plume, at an increased concentration relative to the May 2005 result.

In the southeastern 24-inch valve area, the benzene concentration in wells GMW-O-16 and GMW-O-19 were reported as non-detect, representing a decrease relative to the May 2005 monitoring event result. Benzene was also not detected in other wells located in the southeastern area during the November 2005 monitoring event.

4.2.3 1,2-Dichloroethane

1,2-DCA concentrations reported during the semiannual monitoring event are contoured on Figure 6. The maximum reported 1,2-DCA concentration during this sampling event was 25 µg/L in well MW-20 (MID). 1,2-DCA was not detected in any of the Exposition aquifer wells.

The extent of 1,2-DCA is interpreted as two smaller plumes. Although the 1,2-DCA concentration in off-site well WCW-6 increased to 1.1 µg/L from non-detect in the May 2005 event, the 1,2-DCA plume continues to have a reduced western extent as illustrated by decreasing concentrations in western perimeter wells WCW-3 and WCW-7 and in western area wells MW-6 and MW-20(MID), and MW-25 relative to the May 2005 sampling event results. On the southwest extent of the plume, there was a decrease in the concentration of 1,2-DCA in well PW-2 and PW-3 to non-detect levels relative to the May 2005 result. South of the site, the concentration of 1,2-DCA in well GMW-O-9 continued to decrease. 1,2-DCA was not detected in well GMW-O-14; however, the reporting limit for this sample (40 µg/L) was greater than the reported concentration from the sample collected in May 2005.

4.2.4 Methyl tertiary-butyl ether

MTBE concentrations reported during the semiannual monitoring event are mapped on Figure 7. Concentrations of MTBE ranged from below detection limits to 570 µg/L in well MW-SF-1 located near the south-central free-product plume and to 2100 µg/L in PZ-5 located northeast of the 24 inch block valve. MTBE was not detected in any of the Exposition aquifer wells.

Two main MTBE plumes and several smaller plumes are characterized from the current data set. One main plume is associated with the 24-inch valve area in the southeastern corner of the facility, and the other main plume extends northwestward from the vicinity of the south-central free-product plume. MTBE was detected near the southeastern portion of the site in wells PZ-5, GMW-O-16, GMW-O-18, and MW-8. MTBE also was detected in the north-central area of the site in wells TF-21 and TF-16 near Tank 80003, well GMW-45 near Tank 80004, wells GMW-17 and MW-11 near Tank 80006. MTBE was detected in well MW-9 south of the truck fill stands, wells MW-SF-1 and MW-SF-4 near the intermediate block valve area, well GMW-27 located northwest of the south-central free-product plume, and southern off-site well GMW-O-10. MTBE was also detected in the western portion of the site in well MW-6, MW-14, MW-20(MID), and off-site well WCW-7.

The lateral extent of the MTBE plume in the western portion of the site is generally similar to that interpreted for the semiannual monitoring event of May 2005. Concentrations of MTBE remained non-detect in off-site monitoring wells west of the site, except at WCW-7 where the concentration was 6.7 µg/L, which represents a slight decrease from the May 2005 result and is similar to other previous results. The northern extent of the western MTBE has decreased as indicated by the decrease in MTBE concentrations in MW-14 relative to the May 2005 result. MTBE was again not detected in GW-3 and GW-6. Elsewhere within this plume, the concentrations of MTBE have generally decreased or remained similar to those observed during the previous monitoring

events, with the exceptions of wells MW-11 and GMW-17 near Tank 80006 in which the MTBE concentrations have increased relative to the May 2005 results.

The MTBE plume near the southeastern 24-inch valve area is interpreted to have a reduced extent based on a decrease in MTBE concentration in MW-8, GMW-O-16, and GMW-O-19 and non-detections of MTBE in samples collected from well GMW-38 during the November 2005 monitoring event. Also, the MTBE concentration has increased relative to the May 2005 result in PZ-5 (2,100 µg/L) but remain less than the result observed in October 2003.

4.3 Quality Assurance/Quality Control

Calscience and Alpha did not report any significant quality assurance/quality control problems with the analytical work performed as part of the current sampling event. A total of six trip blanks were submitted to the laboratory during this sampling event. All of the trip blank samples were reported as non-detected for all analytes. 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 November 2005 monitoring event. Samples GMW-16, GMW-41, MW-16, TF-21, and WCW-6 were collected as field duplicates. Reported sample results exhibited acceptable agreement between the sample pair. Field duplicate sample results are shown on data summary tables and report figures.

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 SECOR was treated in the SFPP system located in the southern part of the site and discharged under NPDES permit number CA0063509. Purged groundwater extracted by Parsons was pumped into the DESC system located in the northern part of the site to be discharged under NPDES permit number CAG834001.

4.5 Health and Safety

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

5.0 SUMMARY

Groundwater monitoring of sentry wells was conducted in August of 2005. Semiannual monitoring of these and other wells at the site and its vicinity was conducted in November 2005. In general, groundwater elevations, free-product conditions, and groundwater quality interpreted from these monitoring events are similar to those interpreted from the recent May 2005 semiannual sampling event.

Groundwater elevations have decreased by as much as 6.7 feet (MW-SF-9), with most wells having decreased in the range of 0.5 to 2.5 feet at the site since the May 2005 semiannual monitoring event, although the groundwater elevations of certain wells have increased during that time period. The overall flow direction during this monitoring event in the upper groundwater zone was to the northwest, with a horizontal hydraulic gradient of 0.001 foot per foot across the site measured southeast to northwest. This is consistent with previous monitoring events. Groundwater flow in the Exposition aquifer continues to be southeasterly.

The distribution and thickness of free-phase product were similar to recent groundwater monitoring events. Among the wells measured, GMW-22 and MW-SF-2 in the south-central plume measured the greatest product thickness of 3.37 feet and 3.41 feet, respectively. The free-product in the north-central tank farm area, including the northeast area, has been largely removed due to the total fluid extraction and biosparging. DESC recently expanded the biosparging system in the area between Tanks 80002 and 80006 to attempt to further biodegrade residual product. As a result, the free-product thickness appears to have decreased in PZ-3. Free-product depths south of Tank 80008 increased. Additional biosparging or fluids extraction may be needed in this area.

In general, the lateral extent and concentrations of the dissolved-phase TPH, benzene, 1,2-DCA, and MTBE plumes were similar to those detected during the previous monitoring events.

Concentrations of TPHg reported from samples collected from two wells located in the eastern part of the site (GMW-59 and GMW-61) during both the sentry and semiannual event were over 10,000 µg/L. Nearby offsite well PO-7 was non-detect. Concentrations of TPH increased in six wells, including MW-14 and two off-site wells located on the western edge of the north-central free-product plume. In the western off-site wells, TPHfp was detected in WCW-4 where it was not detected in May 2005 and TPHfp concentration increased in WCW-8 relative to the May 2005 result. Due to the increased concentrations in these wells, it is recommended that MW-14 be sampled during the next sentry event and consider renewing groundwater extraction from nearby groundwater extraction well GW-3.

TPH concentrations increased in five wells and decreased in three wells located near the south-central free-product plume area.

Benzene was not detected in off-site wells west of the site. Concentrations of benzene in the north-central plume area generally decreased since the May 2005 monitoring event, with the exceptions of several wells near the eastern site boundary, one well north of Tank 80007, and in MW-14 located near the western site boundary. Concentrations of benzene in several monitoring wells in the south-central plume area increased since the May 2005 monitoring event, but remained within recent historical ranges. The southern lateral extent of south-central benzene plume remains similar and benzene remains non-detect in several other southern off-site wells. Benzene was not detected in the area between the north-central and south-central free-product plumes and was not detected in the southeastern 24-inch block valve area.

Concentrations of 1,2-DCA in western off-site wells remained non-detect or decreased since the May 2005 monitoring event, with the exception of WCW-6 in which the concentration increased from non-detect to 1.1 µg/L. Although 1,2-DCA was not detected in GMW-O-14, the reporting limit for this sample was greater than the reported concentration of 1,2-DCA during three of the last four monitoring events.

Concentrations of MTBE remained non-detect in off-site monitoring wells west of the site, except at WCW-7 where the concentration remained similar to concentrations observed during recent previous events. The lateral extent of the MTBE plume near the southeastern 24-inch valve has a reduced east-west extent based on a decrease in MTBE concentration in MW-8, GMW-O-16, and GMW-O-19 and non-detections of MTBE in samples collected from well GMW-38 during the November 2005 monitoring event. Also, the MTBE concentration has increased relative to the May 2005 result in PZ-5 (2,100 µg/L) but remained less than that observed in the same well in October 2003. No COCs were detected in Exposition aquifer wells during the semiannual sampling event.

Efforts have been made throughout the site to optimize removal of free-phase product at the site. In addition, due to increases in TPHfp and benzene concentrations in MW-14 and in nearby wells, it is recommended to increase the monitoring and possibly recommence groundwater extraction from nearby GW-3. Similarly, due to the elevated concentrations near the eastern boundary, an evaluation will be conducted regarding expanding remedial activities in this area.

6.0 REFERENCES

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