LNAPL CHARACTERIZATION VIA ULTRA-VIOLET OPTICAL SCREENING TOOL TECHNOLOGY AND VAPOR MONITORING PROGRAM

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

September 14, 2010

Prepared by

PARSONS

100 WEST WALNUT STREET • PASADENA • CALIFORNIA 91124

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TABLE OF CONTENTS

FIGURES

ABBREVIATIONS AND ACRONYMS

µg/l	micrograms per liter
btoc	below top of casing
BTEX	benzene, toluene, ethylbenzene, and xylenes
COPCs	chemicals of potential concern
CPT	cone penetration testing
DESC	Defense Energy Support Center
DFSP	Defense Fuel Support Point
DOT	Department of Transportation
DPT	direct-push technology
HASP	Health and Safety Plan
IDW	investigation-derived waste
JP	jet propellant
KMEP	Kinder Morgan Energy Partners, L.P.
LIF	laser-induced fluorescence
mg/kg	milligrams per kilograms
MTBE	methyl tert-butyl ether
OSHA	Occupational Safety Health Association
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PID	photoionization detector
PPE	personal protective equipment
RAP	remedial action plan
ROST™	rapid optical screening tool
RWQCB	Regional Water Quality Control Board
SFPP	Santa Fe Pacific Pipeline, L.P.
SHSO	site health and safety officer
SVOC	semivolatile organic compounds
TFS	truck fill station
TPH	total petroleum hydrocarbons
TPHg	total petroleum hydrocarbons as gasoline
TPHjf	total petroleum hydrocarbons as jet fuel
USEPA	United States Environmental Protection Agency
UVOST®	ultra-violet optical screening tool
VMP	vapor monitoring probe
VOCs	volatile organic compounds
XeCl	xenon chloride

1 INTRODUCTION

Parsons prepared this work plan on behalf of the Defense Energy Support Center (DESC) to address specific requests by the RWQCB in their email dated April 15, 2010. The work plan was developed to address data gaps within specific areas of the Defense Fuel Support Point (DFSP) facility located at 15306 Norwalk Boulevard, Norwalk, California (Figure 1). These data gap locations are within or adjacent to areas that have been the focus of active remediation and/or monitoring. Uncertainties exist in these areas regarding the presence or extent of residual petroleum hydrocarbons or light non-aqueous phase liquid (LNAPL). In addition to the LNAPL characterization to be conducted across the site, a soil vapor monitoring program will be implemented that will include the installation of permanent vapor monitoring probes (VMP).

This work plan provides the technical approach and scope of work to assess the data gaps using an ultra-violet optical screening tool (UVOST®) and VMPs. The UVOST® is a high resolution sampling method that uses a laser-induced fluorescence (LIF) sensor deployed as an attachment to cone penetration testing (CPT) equipment. The CPT/UVOST® system is used to characterize stratigraphy and petroleum hydrocarbons in soils. This process provides a continuous real-time vertical profile without collecting soil or groundwater samples.

1.1 Objectives and Scope of Work

The objectives of this investigation are as follows:

1. to assess whether petroleum hydrocarbons are present in soil and groundwater at specific onsite areas where existing data is insufficient to determine its presence or its lateral/vertical extent;

2. to confirm the presence of the Bellflower Aquitard; and

3. to evaluate the soil vapor concentrations and assess whether off-gassing vapor may be migrating off-site to the adjacent park users or residential areas.

As noted above, to address the first objective, work will be conducted using UVOST® technology, which is designed to rapidly assess the presence and relative concentrations of petroleum hydrocarbons in the underlying soil. There will be 15 UVOST® locations as described in Section 3 and shown on Figure 2. The second objective will be addressed using the CPT results based on the capability of CPT technology to detect the interface between the surficial sandy and silty alluvium and the underlying clay-rich aquitard.

The third objective will be addressed by the implementation of a soil vapor monitoring program to further assess any potential for exposure to neighboring residents or park users outside the property line due to possible off-gassing vapors migrating off-site. This investigation includes the installation of seven on-site VMPs designated VMP-32 through VMP-38 as shown on Figure 3. Five VMPs will be located along the northern site border near the outline of the dissolved plume; one in the northwest corner; and one in the northeast corner.

2 BACKGROUND

The following sections summarize relevant background information.

2.1 Site Description

The DFSP Norwalk facility is a 50-acre facility consisting of 12 inactive aboveground fuel storage tanks and associated piping and facilities. The DFSP is owned by the DESC. The tanks had a total maximum capacity of 35 million gallons that previously stored jet propellant (JP)-5 and JP-8 and reportedly also aviation gasoline and JP-4. There are also non-operational truck fill stations and various fuel transfer systems. The facility was decommissioned in 2001 and is no longer used to handle fuel.

Santa Fe Pacific Pipeline, L.P. (SFPP), an operating partner of Kinder Morgan Energy Partners, L.P. (KMEP), currently leases a 2-acre easement along the southern and eastern boundaries of DFSP for operation of its pipelines, which convey gasoline, diesel, and jet fuel. Within the southern easement lie three active pipelines, one of which is 16-inch diameter (designated LS-1) that bends at the southeastern corner of the facility and continues northward within the eastern easement adjacent to Holifield Park. An abandoned pipeline, likely owned or formerly operated by Golden West Pipeline, also runs along the eastern boundary of the DFSP Norwalk facility. The DESC has decommissioned the site, but SFPP continues to operate their pipelines.

2.2 Site Setting

The ground surface elevation is approximately 75 feet above mean sea level (msl). Land use in the immediate vicinity of the site is primarily residential to the north, west, and south. Holifield Park, a City recreational facility, is located adjacent to and east of the site. Dolland Elementary School is located east of Holifield Park and approximately 500 feet east of the site.

2.2.1 Geology

DFSP Norwalk is located between the Montebello Forebay and the Downey Plain in the Central Basin pressure area. Approximately 50 to 60 feet of alluvium (primarily sand,

gravel, silt, and clay) cover the underlying Lakewood Formation in this area. Alluvial sediments exposed in the area of the site include mixtures and layers of sand, gravel, silt, and clay. The underlying Lakewood Formation consists of marine and continental gravel, sand, silt, and clay deposits. The San Pedro Formation underlies the area, approximately 300 feet below grade, and consists of marine and continental gravel, sandy silt, silt, and clay deposits[1].

Lithologic logs of borings drilled during previous investigations indicate that sediments beneath the site consist of clayey silt, sandy silt, silty sand, fine to coarse-grained sand, and deeper coarse-grained sand with granitic cobbles. The top of a clay layer, preliminarily identified as the uppermost sediment layer of the Bellflower Aquitard, was encountered at a depth of approximately 55 to 65 feet during previous investigations[2].

2.2.2 Hydrogeology

A shallow semi-perched aquifer, consisting of silt and fine to coarse sand, exists in the alluvial sediments underlying the site. Groundwater from this semi-perched aquifer was reported between 23.9 and 34.14 feet between January and March 2010. The water level data indicate that groundwater flow direction within this aquifer is generally toward the northwest. This shallow aquifer is approximately 30 to 35 feet thick, based on the inferred presence of a clay layer (aquitard) at approximately 55 to 65 feet below grade[3]. The Exposition Aquifer underlies the aquitard. Groundwater depths within the Exposition Aquifer ranged between 49.02 and 55.93 between January and March 2010. The groundwater elevation data indicate that flow within this aquifer is toward the southeast.

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1 California Department of Water Resources (CDWR), 1961, Bulletin No. 104 – *Planned Utilization of the Ground Water Basins of the Coastal Plain of Los Angeles County* (Appendix A – Ground water Geology). June (reprinted May 1991).

2 Groundwater Technology Government Services, Inc. (GSI), 1995, *Final Remedial Action Plan Report Defense Fuel Supply Point Tank Farm Area, Norwalk, California*, September 14.

3 GSI, 1995.

2.3 Chemicals of Potential Concern

Soil and groundwater at the DFSP Norwalk facility were found to be impacted with various volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and total petroleum hydrocarbons (TPH). The primary chemicals of potential concern (COPCs) within this facility are TPH as jet fuel (TPHjf), TPH as gasoline (TPHg), methyl tertiary-butyl ether (MTBE), and benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds. These COPCs have been found in soil and groundwater underlying various portions of the DFSP Norwalk facility. In each area, the COPCs were attributed to one or more sources. These COPCs were encountered in free phase, dissolved phase, adsorbed phase, or vapor phase in soil and/or groundwater. DESC and KMEP are currently conducting extensive remediation and monitoring programs for the impacted soil, soil gas, and groundwater underlying the DFSP Norwalk facility.

3 UVOST® LOCATION RATIONALE

Significant soil and groundwater analytical data have been generated from onsite investigations since 1988. The lateral and vertical extent of TPH-impacted soil and groundwater has been relatively well assessed. Remedial systems operating onsite since that time have significantly reduced the concentrations and extent of TPH-impacted soil and groundwater throughout the site. However, there is some uncertainty regarding the location and extent of residual TPH in soil and groundwater within certain portions of the site. Uncertainties also exist regarding the continuity of the Bellflower Aquitard underlying the site. It was proposed that these data gaps be eliminated by using a relatively rapid screening tool (UVOST®) to assess the underlying soils and residual TPH (if present).

The data gaps have been identified, in part, by assessing site geologic data and relatively recent soil and groundwater analytical data including the most recent semiannual groundwater monitoring report[4]. Several relatively large areas onsite have been reported with no detectable TPH in groundwater during the 2009 and early 2010 sampling events. These areas, located within the site's northern portion, west-central portion, southwestern portion, and southeastern portion west of 24-inch valve area have been excluded from UVOST® sampling program. Due to the absence of TPH in groundwater at these locations, significant TPH concentrations are not anticipated within the associated soils or adjoining soils. In addition, the SFPP leased area as well as the southeast block valve areas are excluded from this program.

In addition to TPH-related data gaps, each of the planned UVOST® locations will be used to assess the continuity of the Bellflower Aquitard underlying the site. For this reason, in part, the proposed UVOST® locations were widely distributed throughout the site, primarily in areas where Bellflower Aquitard data was deficient.

4 CH2MHill, 2010, *Final First Semiannual 2010 Groundwater Monitoring Report, Defense Fuel Support Point Norwalk, California,* July 22.

A brief discussion of known data gaps and rationale for choosing these proposed UVOST® locations is provided below. These locations are shown on Figure 2 as UV-1 through UV-15.

UV-1: **Between the Southern Water Tank and Tank No. 55003** – Early 2010 groundwater data reveal uncertainty (dashed "ND" contours) regarding the limits of TPH-impacted groundwater for two contaminant plumes that are located north and south of this area. Groundwater data is insufficient in this area to fully assess the lateral extent of these two plumes, or the vertical extent of TPH in soil within this area, if present. The soil boring (DPT-34) sampled immediately northwest of the water tank in June 2010 indicated the presence of TPH in soil at 20 and 25 feet. The extent of these contaminants in soil north-northwest of the water tank (data gap area) is unknown. UVOST® data at this location would assist in determining whether the two adjoining groundwater plumes are comingled, and whether TPH-impacted soil centered along the southwestern side of the water tank extends significantly farther north than the DPT-34 location.

UV-2: **West of MW-15, North of TFS and South of Water Tank** – MW-15 has obtained free product since 2002. This location can determine if the source is from the TFS or the water tank release.

UV-3: **Former Truck Fill Station** – The vertical extent of TPH-impacted soil has not been fully assessed at depths greater than 25 feet in the western portion of the former truck fill station (TFS). Boring DPT-4 was sampled at this location in September 2009, and revealed elevated TPH concentrations (11,000 mg/kg as gasoline and 6,100 mg/kg as JP-5) at a depth of 25 feet (deepest collected soil sample). This UVOST® location is proposed in order to further assess the vertical extent of TPH in this area, as well as to compare the analytical data from DPT-4 with the UVOST® data.

UV-4: **East of MW-9, South of the TFS, North of the Pump House** – Elevated TPH concentrations have been reported in groundwater samples MW-9 (12,600 micrograms per liter (µg/l) in May 2010), which is used to help define

the southeastern limits of the TPH plume that includes the former TFS. A soil boring (DPT-33) sampled near this well in June 2010 contained a 25-foot deep soil sample (deepest collected) with elevated TPH concentrations (1,700 mg/kg as gasoline and 2,200 mg/kg as JP-5). The vertical extent of this impacted soil is unknown. A UVOST® sampling location is proposed east of MW-9 and DPT-33 to assist in determining the eastern extent of the TPH plume in this portion of the site.

UV-5: **Between PZ-2 and GMW-10** – Historical detections of free product have been encountered (at depths between 24 to 28 feet below top of casing (btoc)) at these two locations as well as low TPH concentrations in groundwater within this portion of the site. A UVOST® sampling location is proposed between these two locations to assess if residual TPH-impacted soil remains within this portion of the site.

UV-6: **Adjacent to GMW-17 Between GMW-42** – Relatively elevated TPH concentrations remain in groundwater within the vicinity of GMW-17. Historical detects of free product have been encountered (at depths between 25 to 32 feet btoc) at GMW-17 and TF-11. A UVOST® sampling location is proposed adjacent to GMW-17 to assess whether residual TPH-impacted soil remains within this portion of the site.

UV-7: **North-Northwest of Tank No. 80006** – Early 2010 groundwater data reveal uncertainty (dashed "ND" contours) regarding the limits of TPH-impacted groundwater for two contaminant plumes that are located northwest and north of Tank No. 80006. Soil and groundwater data is insufficient in this area to fully assess the current lateral extent of these two plumes, or the vertical extent of TPH in soil within this area. UVOST® data at this location may help to determine whether the two adjoining groundwater plumes are comingled, and whether residual TPH concentrations remain in soil within this portion of the site.

UV-8: **Between GMW-7 and GMW-15** – Free product (0.02 foot) was reported in GMW-7 in October 2009 in the *Second Semiannual 2009 Groundwater*

Monitoring Report[5]. This free product plume is interpreted as extending north to GMW-15. The presence of free product suggests that TPH-impacted soil remains within this portion of the site. A UVOST® sampling location is proposed between GMW-7 and GMW-15 to assess the northern extent of the free product plume and the vertical extent of residual TPH-impacted soil remaining in this portion of the site.

UV-9: **Between TF-23 and GMW-45** – Free product (0.01 foot) was reported in TF-23 in October 2009. This free product plume is interpreted as extending toward the southeast. A UVOST® sampling location is proposed between TF-23 and GMW-45 to assess the northern extent of the free product plume and the vertical extent of residual TPH-impacted soil remaining in this portion of the site.

UV-10: **East of TF-17 and North of TF-18** – A free product plume is located between tanks 55004 and 80008 beneath the area that includes TF-17 and TF-18. Soil and groundwater data are insufficient east of TF-17 and north of TF-18 to determine the extent of this plume, as well as the possible presence of TPH at depth. The location of this UVOST® is intended to assess the free product plume's lateral extent and the vertical extent of residual TPH in soil at this location.

UV-11: **West of GMW-48, GMW-50, and GMW-51** – Historical free product observed in these wells. The location of this UVOST® is intended to assess the free product plume in this area.

UV-12: **West of GW-15** – Free product (2.05 feet) was reported in GW-15 in April 2010. This well is located adjacent to the Holifield Park. The extent of the free product plume has been adequately assessed by five near vicinity wells. A UVOST® sampling location is proposed just west of GW-15 to refine the eastern extent of the free product plume, and the vertical extent of TPH-impacted soil, if any.

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5 Parsons, 2009, *Second Semiannual 2009 Groundwater Monitoring Report, Defense Fuel Support Point Norwalk,*

UV-13: **South of GMW-53** – Free product (0.01 foot) was reported in GMW-53 in April 2010. Two wells located north of this plume have been used to assess the northern extent of free product and TPH concentrations in groundwater. The absence of detectable TPH in MW-16 indicates that TPH-impacted soil does not extend north past this location. The southern extent of this free product and the extent of impacted soil are unknown to the south. A UVOST® sampling location is proposed south of GMW-53 to assist in determining the southern extent of the free product plume and the extent of TPH-impacted soil in this area.

UV-14: **South of Tank 80007 and TF-15** – Free product has been historically detected at TF-15 from 1996 through 2004. The location of this UVOST® is intended to assess the free product plume in this area.

UV-15: **Southeast of Tank 80001** – This UVOST®/CPT location was selected to provide a northwest area point for the site cross-section and to confirm the Bellflower Aquitard.

DESC, January 21.

4 PROPOSED FIELD INVESTIGATION

The extent of residual TPH in soil, if any, and the presence of the Bellflower Aquitard will be assessed at 15 on-site locations (Figure 2) using UVOST® and CPT technologies. The field investigation also includes the installation of seven VMPs located along the northern and eastern boundaries, and the northeastern and northwestern corners of the site (Figure 3). The proposed CPT/UVOST® and VMP locations are tentative and subject to change based on access, utilities, field logistics, and other factors.

The pre-field activities and planned scope of work using UVOST® technology is described in the following sections. The vapor monitoring program is described in Section 5.

4.1 Project Planning and Preparation

Preparation for fieldwork will include acquisition of field equipment and permits, mobilization, and coordinating lines of communication. Parsons will procure services of a geophysical survey subcontractor to perform subsurface utility clearance at each of the planned UVOST® and VMP locations.

4.1.1 Permitting

Soil boring permits to drive the CPT/UVOST® tool into saturated soils beneath the site will be obtained prior to this investigation from the Los Angeles County Department of Public Work's permitting department. A construction permit will also be obtained from the City of Norwalk, if required. Well permits required for the VMP will also be obtained from the Los Angeles County Department of Public Work's permitting department prior to the field activities.

4.1.2 Utility Clearance

Prior to the start of this investigation, each planned CPT/UVOST® and VMP location will be clearly marked with white paint. Geophysical surveys will then be conducted at each of these locations to assess the possible presence of subsurface obstructions (e.g., pipes, utilities, metallic debris, etc.). The geophysical survey will use a combination of

electromagnetic induction and ground-penetrating radar instruments. In addition to the geophysical survey, Underground Service Alert (USA) will be notified at least 48 hours prior to the start of field activities to clear the CPT/UVOST® and VMP locations for any possible subsurface utilities.

If a utility is identified within 3 feet of a proposed UVOST® and VMP location, the affected boring will be moved to an alternate point at least 3 feet away from the utility but within the cleared area surrounding the boring location.

4.2 UVOST® System Description

The ultra-violet optical screening tool, developed by Dakota Industries, Inc., is a newer and improved version of the former technology referred to as the rapid optical screening tool (ROST™). The UVOST® system has proven successful in accurately delineating the location and relative concentrations of gasoline, diesel fuel, jet fuel, hydraulic fluids, and other hydrocarbon types in the subsurface soils above and below the groundwater table. This system will also differentiate between these hydrocarbon types if comingled at one location. The UVOST® is the only commercially-available sensor of its type to have its performance validated by the USEPA[6].

Coupled with the cone penetration testing (CPT) sensor, the UVOST® survey provides real-time field screening of the physical characteristics of soil and chemical characteristics of petroleum hydrocarbons within spill areas. The CPT and UVOST® data can provide a complete site assessment with no samples, saving laboratory costs as well as the site and environmental impact. This capability allows investigation and remediation decisions to be made more efficiently. The use of the UVOST® technology has the added benefit of reduced generation of investigation-derived waste and its associated disposal costs.

6 United States Environmental Protection Agency (USEPA), 2003, *Using the Triad Approach to Streamline Brownfields Site Assessment and Cleanup – Brownfields Technology Primer Series,* June 2003.

4.2.1 UVOST® Technological Description

The UVOST® module is mounted above a standard piezocone (penetrometer) used by a CPT truck or other direct push vehicle. The UVOST® module uses the principle of fluorescence spectrometry by irradiating the soil with ultra-violet light (308 nanometers) that is generated by a xenon chloride (XeCl) excimer laser mounted within the CPT truck. The ultra-violet light is transmitted from the laser to the subsurface module through a fiber optic cable (containing 600 micrometer diameter fibers). The ultra-violet light then passes from the fiber optic cable through a small sapphire window (6.35 millimeter diameter) on the side of the module and then into the soil. Any aromatic petroleum hydrocarbons present in the soil absorb the light energy during radiation, and immediately re-emit a light (fluoresce) containing a longer wavelength. This re-emission is termed fluorescence (or laser induced fluorescence [LIF]). The "signal" light is transmitted through a fiber optic cable back up to the truck to be analyzed. The UVOST® system measures the intensity and emission decay at various wavelengths (350 to 500 nanometers). The measured emissions decay is used by software within the CPT rig to determine a product “signature” in real time every 2 centimeters. The petroleum hydrocarbon and soil data collected at 2 centimeter intervals provides a virtually continuous color coded log of lithology and hydrocarbon distribution, minimizing the possibility of missing small zones of contamination and potential migration pathways.

4.2.2 Contaminants Detected with the UVOST®

As noted above, the UVOST® system identifies free phase and residual petroleum hydrocarbons in the subsurface soils above and below the water table. Petroleum hydrocarbon types are detected by way of the fluorescence response of their polycyclic aromatic hydrocarbon (PAH) constituents. Contaminant types detected using the UVOST® system include gasoline, diesel, jet fuel (kerosene), motor oil, cutting oil, hydraulic oil, and crude oil. The detection limit for these contaminants varies between 10 and 500 milligrams per kilogram (mg/kg), depending on the contaminant and associated soil matrix type. Contaminants rarely seen with this system include extremely weathered gasoline, coal tar, creosote, bunker oil, polychlorinated biphenyls (PCBs), chlorinated solvents, and dissolved phase PAHs.

4.3 UVOST® Sampling Locations and Depths

Parsons proposes obtaining UVOST® data at fifteen locations (UV-1 through UV-15). These locations are shown on Figure 2. A description and rationale for these locations are provided in Section 3. Each UVOST® location will be sampled to a depth of 80 feet in an attempt to assess the presence and depth of the underlying Bellflower Aquitard. The UVOST® tool will not be driven deeper than 80 feet.

4.4 UVOST® Calibration

As noted above, a soil sample contaminated with petroleum substances will have a fluorescence intensity that is proportional to the contaminant concentration. The concentration of the hydrocarbon fraction in soil at depth is determined by comparing its fluorescence intensity with calibration standards. The UVOST® system will be calibrated to these standards prior to sampling at each UVOST® location. In addition to calibrating with known standards, one UVOST® location (UV-3) will be placed immediately adjacent to a recent soil boring (DPT-4) containing a series of known petroleum hydrocarbon concentrations with depth. The UVOST® measurements will be compared with this analytical data.

4.5 Backfilling Borings

Each of the open borings resulting from the UVOST® investigation will be backfilled with a cement-bentonite slurry (a 95%:5% ratio). The purpose of this seal is to eliminate the possible development of conduits through which contaminants in the upper portion of the soil column could migrate into the lower soils and aquifer. The slurry will be pumped through a tremie pipe that extends to the bottom of the boring thus displacing groundwater and soil debris upward and out of the boring. The tremie pipe will be pulled up incrementally following successive injections of slurry. The slurry will be monitored for settlement at the surface. Additional slurry will be injected to compensate for any settlement.

5 PROPOSED VAPOR MONITORING PROGRAM

The vapor monitoring investigation will be conducted within site boundaries, along the northern boundary, in the northeastern area of the site immediately adjacent to Holifield Park, and along the northwestern area of the site. The purpose is to further assess any potential for exposure outside the property to neighboring residents or park users due to possible off-gassing vapors migrating off-site. A total of seven permanent soil gas probes (VMP-32 through VMP-38) will be installed; five along the northern site border near the outline of the dissolved plume, one in the northwest corner, and one in the northeast corner. The proposed VMP locations are shown on Figure 3. Each location will contain two soil vapor probes placed at depths of 5 and 15 feet below ground surface (bgs). Also shown on Figure 3 are the existing VMPs located throughout the site.

Soil gas sampling will be performed in general accordance with the *Advisory for Active Soil Gas Investigation* and updates, published by the Department of Toxic Substances Control (DTSC) and the RWQCB[7]. Results from the soil gas sampling will be compared to results from the soil gas sampling conducted in 2006 and the California Human Health Screening Levels (CHHSLs).

From the new seven locations, soil gas will be sampled quarterly for one year and analyzed for VOCs via EPA Method TO-15. If the results show that there are no impacts or detections above risk-based levels, then the probes will only be sampled annually. If the results contain detections above risk-based levels, then future action will be discussed with all parties.

5.1 Soil Gas Probe Installation Procedures

Prior to the start of field work, each planned location will be cleared with a geophysical survey and Underground Service Alert as discussed in Section 4.1.

7 Department Toxic Substances Control and Regional Water Quality Control Board – Los Angeles Region (DTSC/RWQCB), 2003, Advisory Active Soil Gas Investigation, January 28. Draft for Review, Updated March 2010.

Due to the previous collection of lithologic data within Holifield Park, soil sampling and logging will not be conducted prior to soil probe installation. A Geoprobe® drill rig will be used to push an expendable steel point directly to a depth of 15 feet. New polyethylene tubing (0.25-inch outside diameter [OD], 0.17-inch inside diameter [ID]) attached to a soil gas filter (vapor probe) will then be placed down through the open boring to the planned soil gas sampling depth. After installing the tubing and filter into the boring to a depth of 15 feet, a steel measuring tape will be used to verify the depth of the boring and soil gas filter. Number 2/12 sand will then be placed into the boring to fill the annular space surrounding the soil gas filter to at least 6-inches below and above the filter. The sand thickness will be verified with the steel measuring tape. After the filter pack has been created, approximately 6-inches of granular bentonite (a seal) will be placed above the filter pack. Once this first layer of bentonite had been hydrated, additional granular bentonite will be used to fill the boring up to the next sample interval (approximately 5.5 feet bgs), then hydrated again prior to placement of an additional soil vapor probe and sand. The upper soil vapor probe will be placed at a depth between approximately 5 and 5.5 feet bgs. The placement of sand and bentonite within and above this interval will be conducted in a manner similar to that described above. Bentonite will be used to fill the boring to a depth of approximately 0.8 feet. A sampling valve will be used as a temporary cap at the top of the polyethylene tubing, which will extend 1 to 2 feet above ground surface.

The upper portion of the polyethylene tubing associated with each sampling location will be housed within a well box set in concrete. The well box and supporting concrete will be mounted flush with the ground surface. Tamper-resistant bolts will secure the well box cover. All well boxes will be permanently marked with probe identification numbers. Depths, dimensions, materials used in vapor probe installation, and other information will be recorded in the field notebook and will be presented on a vapor probe construction diagram in the field investigation report.

5.2 Soil Gas Probe Sampling

The installed vapor tubing and filter will be allowed to set more than 24 hours prior to purging and sampling. Sampling will not be conducted within one week of a previous rainfall event.

The vapor probes and associated tubing will be purged of seven volumes prior to the collection of a soil gas sample, similar to previous sampling events at this site. Target purge volumes were established during purge tests conducted during the initial sampling event. During sampling, a tracer gas (isopropyl alcohol) will be introduced into ambient air at ground surface near the sampling point to verify that the soil zone being sampled is sealed from the surface.

Summa canisters will be used to collect soil gas samples during each sampling event. After leak testing is completed at a VMP location, sampling will be conducted as follows. Each Summa canister will be equipped with a dedicated flow regulator. The Summa canisters will be checked to verify that the vacuum in the canister is greater than 25 inches of mercury (i.e. negative pressure). If the vacuum is greater than the laboratory determined standard (25 inches of mercury), the Summa canister may have lost its integrity and will not be used. Initial vacuum will be recorded on the COC form, on the sampling record tag attached to the canister, and in the field notebook. The canister will then be filled, following system purging, at a rate of less than 200 milliliters per minute. The final vacuum upon completion of sampling will be greater than 5 inches of mercury. Final vacuum should not be allowed to approach zero as this could perturb the flow rate. Once sampling is completed and the Summa canister has been sealed, the tag attached to the canister will be labeled using non-volatile ink to show the sample location, sample depth, date, time, initial vacuum and final vacuum (negative pressure). The filled Summa canisters will be transported to the laboratory immediately following the completion of sampling each of the seven vapor wells. The VOC analyses (TO-15) will be performed with-in standard laboratory holding time.

5.3 Sample Containers, Custody, and Shipment

The laboratory will deliver pre-cleaned, flow-controlled Summa containers, labels, and chain of custody (COC) forms to the project site. Cleaned Summa canisters must be used so that no target compound contamination is present within the sample container. The laboratory will provide batch certification documentation verifying the cleanliness of the Summa canisters to the specified analytical method detection limits. Individual certification is not needed in order to meet CHHSLs and will not be required.

COC forms will be prepared at the time of sample collection and will accompany the samples through the laboratory sample processing. The COC forms will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone's custody if it is either in that person's physical possession, in that person's view, locked up, or kept in a secured area restricted to authorized personnel only. Until samples leave the site, custody of the samples will be the responsibility of Parsons. The site leader or designee will sign the "relinquished by" box on the COC form and note date and time samples leave the site.

Each Summa canister will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. The collected soil gas samples will have preassigned, identifiable, and unique numbers. At a minimum, the sample labels will contain the following information: project location/name, date of collection, time of collection, initial vacuum, final vacuum, and planned analyses.

The collected soil gas samples will be shipped to the analytical laboratory on the day of collection. All sample containers will be shipped with appropriate COC forms.

5.4 Soil Gas Analyses

Each collected soil gas sample at the new seven locations will be analyzed for VOCs by using USEPA Method TO-15 by Calscience Environmental Laboratory.

Field QC samples will be collected and analyzed during soil gas sampling to assess consistency and performance of the sampling program. Field QC samples will include one field duplicate and one field blank. The duplicate sample will be sent to the

laboratory under a separate name. The field blank will be collected in the field using ambient air away from vehicles and other potential contaminant sources. The duplicate sample and the field blank will also be analyzed for VOCs using USEPA Method TO-15.

Data quality assessment criteria will be used to evaluate the quality of the field sampling efforts, field screening results, and fixed-base laboratory results for compliance with project DQOs. The DQA criteria will be evaluated in terms of analytical precision, accuracy, representativeness, completeness, and comparability.

6 EQUIPMENT DECONTAMINATION PROCEDURES

Decontamination of the UVOST® and Geoprobe equipment will be conducted consistently so as to assure that contaminants are not transferred between sampling locations. All equipment that comes into contact with potentially contaminated soil or water will be decontaminated. Disposable equipment intended for one-time use will not be decontaminated, but will be package for appropriate disposal. Decontamination will occur prior to and after each use of piece of equipment. All sampling devices used, including the CPT, UVOST®, and Geoprobe modules, will be decontaminated according to United States Environmental Protection Agency (USEPA) Region IX recommended procedures. The associated push rods are decontaminated as they are pulled to the surface utilizing a rod wiper.

The following decontamination activities carried out in sequence, make up the USEPA Region IX[8] recommended procedure for the decontamination of smaller sampling equipment including the CPT, UVOST®, and Geoprobe modules:

- Non-phosphate detergent and tap water wash, using a brush if necessary,
- Tap-water rinse, and
- Deionized/distilled water rinse.

The CPT, UVOST®, and Geoprobe modules will be decontaminated at a cleaning station within the CPT and drilling rig. Cleaned small equipment will be stored in plastic bags. Materials to be stored more than a few hours will also be covered.

8 USEPA, 1997, *Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) with Guidance. Region IX*, March.

7 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

In the process of conducting the UVOST® and soil gas investigations, the site team will generate different types of potentially contaminated investigation-derived waste (IDW) that include the following:

- Used personal protective equipment (PPE),
- Decontamination fluids, and
- Soil cuttings.

The IDW will be managed and disposed of in accordance with current Federal, State, and local requirements. All IDW containers will be labeled and stored in accordance with the requirements of the Los Angeles County Department of Health Services.

Soil cuttings will be generated during clearing of each UVOST® and VMP hole location to a depth of 5 feet with a hand auger. The soil cuttings will be collected in a properly labeled and sealed U.S. Department of Transportation (DOT) approved 55-gallon drum (only one drum anticipated) and staged onsite. Profiling consisting of representative three-point composite sampling and analysis of the soil cuttings will be done to determine the appropriate disposal facility. Decontamination water will be processed through the on-site treatment system.

Used PPE and disposable equipment will be double bagged and placed in a municipal refuse dumpster on site. These wastes are not considered hazardous and may be sent to a municipal landfill. Any PPE and disposable equipment that is to be disposed of which can still be reused will be rendered inoperable before disposal in the refuse dumpster.

Off-site disposal of waste will be coordinated by Parsons. The DESC will be the generator and will sign any manifests. IDW will be profiled, transported, and disposed in accordance with applicable Federal, State, and local regulations.

8 SITE ACTIVITY DOCUMENTATION

This section itemizes the field documentation to be implemented during all phases of the proposed work.

8.1 Field Logbook

Field activities will be documented in field notebooks and activity-specific data forms. The information contained in the field notebook will provide sufficient data and observations to enable sampling personnel to reconstruct events that occur during the project and serve as a record of the activities conducted at the site. Field logbooks will be permanently bound with consecutively pre-numbered pages. If corrections are required, entries will be deleted by drawing a single line through them with a signature. If correct information cannot be included on the same page, then a reference to the page with the correct information will be added. At a minimum, the following information will be recorded for all site activities:

- Site identification;
- Team members and their responsibilities;
- Time of arrival/entry on site and time of site departure;
- Tailgate health and safety briefings;
- Changes in personnel and responsibilities with reasons for the changes;
- Names, titles, and organization of any visitors entering the site;
- Records of pertinent telephone conversations;
- General weather information;
- Deviations from work plan and site safety plan;
- Equipment used and associated serial numbers;
- Equipment calibrations;
- Field measurements not recorded on data sheets or field logs;
- Detailed sampling information;
- Levels of safety protection;
- Equipment decontaminated and procedures utilized; and

- Comments (suitable for reconstructing an incident without memory).

8.2 Photographs

Photographs will be taken where appropriate. For each photograph taken, the following information will be written in logbook or recorded in a separate field photography log:

- Direction in which the photograph was taken
- Time, date, location, and weather conditions
- Description of the subject photographed
- Name of the person taking the photograph.

9 HEALTH AND SAFETY

The project safety plan (PSP) developed for the DFSP Norwalk facility[9] will be followed during all site activities. The PSP was developed in accordance with Occupational Safety Health Association (OSHA) regulations pertaining to hazardous waste site investigations (29 CFR 1910.120) including remediation activities. The safety plan includes protocols for safe work practices throughout the field portion of the project. All project team members who will be performing field work under this work plan are responsible for reading and conforming to the PSP and are required to sign the Plan Acceptance Form (found in the plan) prior to fieldwork. At the beginning of each day of fieldwork, the scope of work will be discussed and all personnel will be advised of hazards, proper safety practices, and required PPE. Documentation of daily tailgate safety briefings, including agenda and signatures of attending personnel, will be maintained on site.

The scope of work that will be performed during this effort will require personnel to conduct and supervised activities related to the UVOST® and soil gas investigations. Environmental monitoring will be conducted using a calibrated photoionization detector (PID) during all activities requiring penetration of the ground surface, including driving of the CPT/UVOST® system and backfilling of the associated borings.

All locations will be cleared through Underground Service Alert and geophysical subsurface clearance prior to commencing field activities. Site-specific training will include information on safety around the CPT and Geoprobe rigs as well as the general site specific information contained in the project PSP.

Each UVOST® sampling location and VMP location will be hand augered for the first 5 feet in order to decrease the likelihood of damaging subsurface features such as utility pipelines and electrical cables.

The lead field geologist/engineer will function as the site health and safety officer (SHSO) during field activities. The SHSO will ensure that all field activities are

performed with strict adherence to Cal/OSHA requirements, the PSP, and any PSP addendum. The SHSO has the authority to stop work if actions or conditions are judged to be unsafe or not in conformance with the PSP or any addendum to the PSP.

9 Parsons, 2010, *Site-Specific Health and Safety Plan, Defense Energy Support Center*, July 1.

10 REPORTING

Within ten weeks following receipt of the UVOST® and soil gas analytical, Parsons will prepare a draft report that describes the field activities including vapor probe installation, sampling, and results of the chemical analyses. The report will include a discussion of the field procedures and results, and will be supplemented with tables, figures, logs, two cross-sections, a summary of the detected VOCs, data analysis, and conclusions and recommendations.

Upon review by DESC, the report will be finalized and submitted to the RWQCB. Recommendations will be made for each area for further investigation, additional remedial action, or no further action.

FIGURES

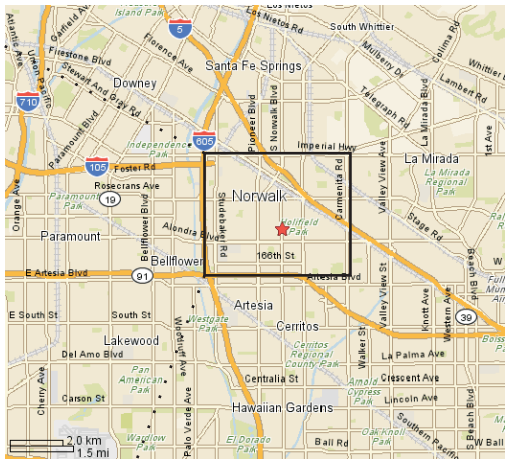

FIGURE 1

Site Location Map

DEFENSE FUEL SUPPORT POINT
Norwalk, California

PARSONS

Pasadena, California

K:\Depts\Dept48\DESC 07-2008 Contract\Norwalk\ACO-0011\Work Plan\Figure 1 - Site Location Map.cdr

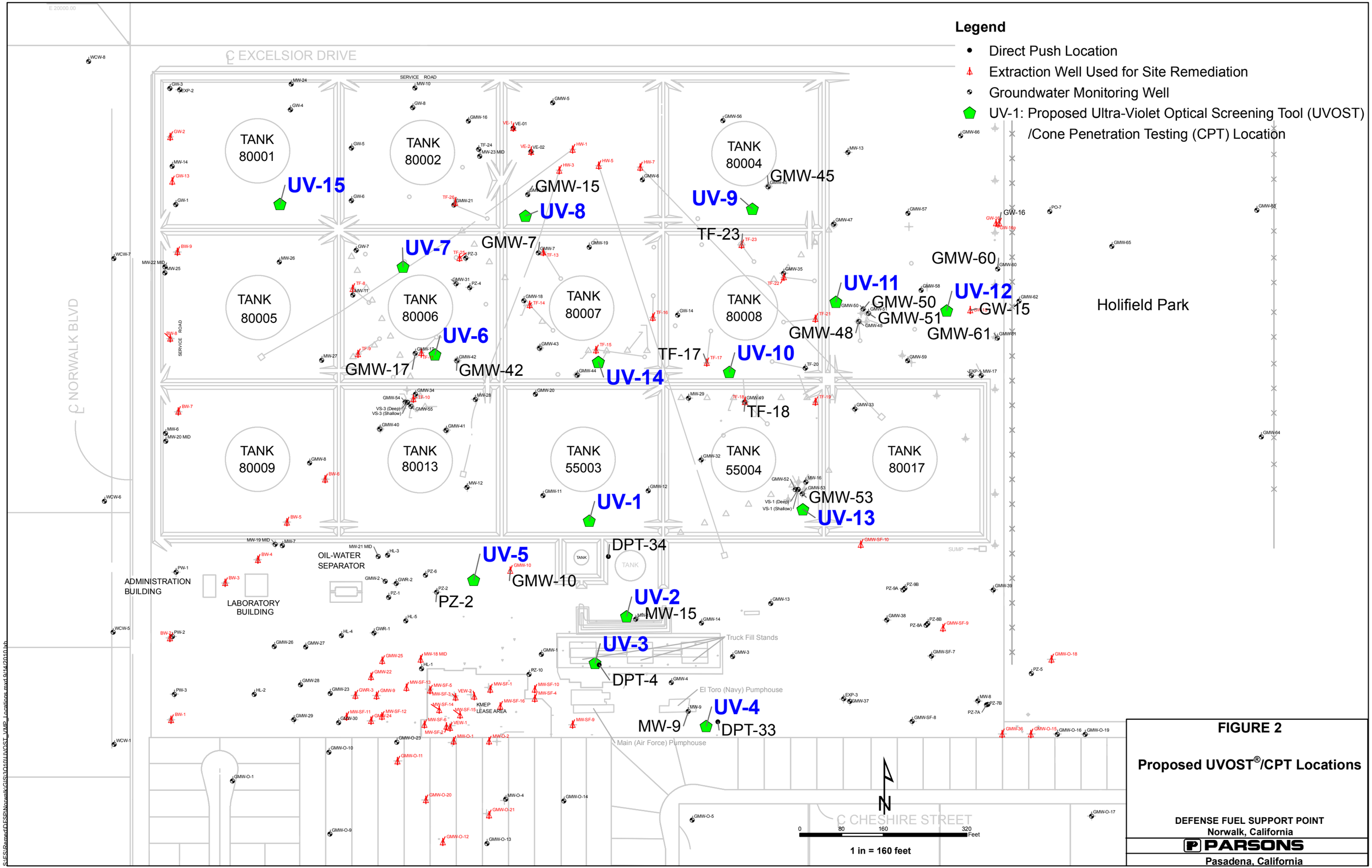

FIGURE 2

Proposed UVOST®/CPT Locations

DEFENSE FUEL SUPPORT POINT
Norwalk, California

PARSONS
Pasadena, California

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N 10000.00
E 20000.00

℄ EXCELSIOR DRIVE

℄ NORWALK BLVD

SERVICE ROAD

VMP-33 VMP-34 VMP-35 VMP-36 VMP-37 VMP-38

VMP-32

TANK 80001
TANK 80002
TANK 80004
TANK 80005
TANK 80006
TANK 80007
TANK 80008
TANK 80009
TANK 80013
TANK 55003
TANK 55004
TANK 80017

VMP-19
VMP-11
VMP-13
VMP-16
VMP-12
VMP-14
VMP-15
VMP-10

VMP-17
VMP-18

VMP-09
VMP-08
VMP-07
VMP-06
VMP-05

VMP-20
VMP-25
VMP-24
VMP-26
VMP-21
VMP-27
VMP-23
VMP-28
VMP-22

VMP-29
VMP-30
VMP-31

Holifield Park

OIL-WATER SEPARATOR

ADMINISTRATION BUILDING

LABORATORY BUILDING

SUMP

VMP-04

VMP-02
VMP-03
VMP-01

KMEP LEASE AREA

℄ CHESHIRE STREET

Legend

- Proposed Vapor Monitoring Probe
- Existing Vapor Monitoring Probe

N

0 80 160 320 Feet

1 in = 160 feet

FIGURE 3

Proposed VMP Locations

DEFENSE FUEL SUPPORT POINT
Norwalk, California

PARSONS

Pasadena, California

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