DEPARTMENT OF THE NAVY
Naval Facilities Engineering Command Southwest

DRAFT
EXPANDED SITE INSPECTION

INSTALLATION RESTORATION SITE 4
FLEET INDUSTRIAL SUPPLY CENTER (FISC)
POINT LOMA NAVAL COMPLEX
SAN DIEGO, CALIFORNIA

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ACRONYMS AND ABBREVIATIONS

AST	Above ground storage tank
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	Below ground surface
CDFG	California Department of Fish and Game
CFR	Code of Federal Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CNPS	California Native Plant Society
COPC	Compound of potential concern
COPEC	Chemical of potential ecological concern
DERP	Defense Environmental Restoration Program
DFM	Diesel Fuel Marine
DoN	Department of Navy
ERA	Ecological risk assessment
ESI	Expanded Site Inspection
FISC	Fleet and Industrial Supply Center
GPS	Global positioning system
IDW	Investigation-Derived Waste
IR	Installation Restoration
IRCDQM	Installation Restoration Chemical Data Quality Manual
mg/kg	Milligram per kilogram
MSF	Magnetic Silencing Facility
MS/MSD	Matrix spike/matrix spike duplicate
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDDB	Natural Diversity Data Base
NEESA	Navy Energy and Environmental Support Activity
NFESC	Naval Facilities Engineering Service Center
NAVFAC	Naval Facilities Engineering Command Southwest
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
PAHs	Polynuclear aromatic hydrocarbons
PAL	Project action level
PA/SI	Preliminary Assessment / Site Inspection
PCBs	Polychlorinated biphenyls
PLNC	Point Loma Naval Complex
PG	Professional Geologist
PPE	Personal protective equipment
PRGs	Preliminary Remediation Goals
PWC	[United States Navy] Public Works Center
QC	Quality Control
RWQCB	Regional Water Quality Control Board
SARA	Superfund Amendments and Reauthorization Act
SCAPS	Site Characterization and Penetrometer System
SIM	Selective Ion Monitoring
SPLP	Synthetic Precipitation Leaching Procedure

TBM	Tank bottom material
U.S.	United States
U.S.C.	United States Code
U.S. EPA	United States Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UST	Underground storage tank

Executive Summary

This report presents the results of Expanded Site Inspection (ESI) activities at Installation Restoration (IR) Site 4, Fleet Industrial Supply Center (FISC), Point Loma Naval Complex (PLNC), San Diego, California. The ESI was conducted to assess the potential impacts of tank bottom material (TBM) on underlying soil. Soil samples were collected and analyzed from depths and locations designed to evaluate the impact of TBM on underlying soil and assess site risk to human health and the environment.

Tasks associated with this ESI included field sampling, laboratory analysis, data evaluation, assessment of risk to human health and the environment, and preparation of the ESI Report. The primary goals of the ESI were to evaluate the impact of TBM on underlying soil quality, and to assess risk to human health and the environment posed by site soil.

IR Site 4 was identified in 1986 because TBM, the heavy fuel fraction removed during periodic tank cleaning, was reportedly applied to slopes and berms in the fuel farm to control erosion and suppress dust. The application of TBM was initiated in the early 1940s and continued through 1976-77. An estimated volume of 18,500 to 37,000 gallons of TBM was applied during this time (Navy Energy and Environmental Support Activity [NEESA] 1986).

Several investigations have been conducted addressing the nature and extent of TBM at the site. The results from these investigations support the identification of polynuclear aromatic hydrocarbons (PAHs) as the compounds of potential concern (COPCs). PAHs have been consistently reported in laboratory analytical data from TBM samples. Although elevated concentrations of lead and polychlorinated biphenyls were reported in the 1991 sampling data, subsequent sampling has determined that these compounds are unrelated to TBM.

The field investigation included twenty soil borings advanced at locations representative of various site conditions where TBM had been applied. Three soil samples were collected from each soil boring for laboratory analysis for PAHs by EPA Method 8270SIM. All soil data obtained during the planned investigation was independently validated in accordance with the Navy IR Program requirements.

Determination of TBM impact to underlying soil quality was measured by comparison to background ranges of soil PAH concentrations published by the Agency for Toxic Substances and Disease Registry (ATSDR). Assessment of risk to human health posed by IR Site 4 soil was based on the Preliminary Remedial Goals (PRGs) established by U.S. EPA Region 9 for both residential and industrial land use.

Conclusions from this ESI include the following:

- PAH concentrations in underlying soil do not exceed the background range concentrations identified by ATSDR,
- Underlying soil poses no unacceptable risk to human health;

- There are no complete pathways to ecological receptors;
- Most surface TBM was encapsulated by shotcrete in the early 1990s and is not bio available; and
- The remaining TBM is relatively immobile based on previous Synthetic Precipitation Leaching Procedure results and the results of this investigation.

No further site characterization or remedial action is recommended under CERCLA, under current conditions.

1.0 INTRODUCTION

This report presents the results of Expanded Site Inspection (ESI) activities at Installation Restoration (IR) Site 4, Fleet Industrial Supply Center (FISC), Point Loma Naval Complex (PLNC), San Diego, California. This work was completed by Anteon Corporation for the Department of the Navy (DoN), Naval Facilities Engineering Command, Southwest (NAVFAC Southwest).

Field sampling activities were conducted May 24 through May 27, 2005 in accordance with the Sampling and Analysis Plan (PWC, 2004) approved by the California Regional Water Quality Control Board, San Diego Region (RWQCB).

1.1 Objective

The primary objectives of this investigation were to determine if polynuclear aromatic hydrocarbons (PAHs) in tank bottom material (TBM) historically spread at IR Site 4 have impacted underlying soil quality, and to assess PAH risk to human health and the environment.

1.2 Scope of Work

In response to the above objectives, the following scope of work was performed at FISC IR Site 4:

- **Soil Borings** – Twenty soil borings were advanced at locations with surface exposures of TBM.
- **Sample Collection and Analysis** – Three soil samples from each boring were collected for PAH analysis. Soil analytical data was independently validated in accordance with Navy IR Program requirements.
- **Assessment of Risk** –Risk to human health and the environment was evaluated based on PAH data collected during this investigation. Although current and projected future land use at IR Site 4 is industrial, both residential and industrial exposures were calculated for human health risk determination.
- **Reporting** – This Expanded Site Inspection (ESI) Report was written to present the investigation results.

2.0 SITE BACKGROUND AND REGULATORY HISTORY

Information summarizing the site description and history, previous investigations, and regulatory history is presented in the following subsections.

2.1 Site Description and History

IR Site 4 is part of the FISC Fuel Farm, Point Loma, which encompasses approximately 100 acres near the northeast boundary of the Point Loma Naval Complex in San Diego, California (Figures 1 and 2).

The FISC Fuel Farm is composed of twenty underground storage tanks (USTs) and 11 above ground storage tanks (ASTs), with a total storage capacity of approximately 1.2 million barrels. These storage tanks were constructed between 1917 and 1954, and currently store JP5 and Diesel Fuel Marine (DFM). In addition, Navy Special Fuel Oil, JP4, mo-gas, and av-gas have historically been stored at the facility.

IR Site 4 was identified in 1986 because TBM, a relatively low-volatility PAH-bearing fuel hydrocarbon periodically cleaned from the bottoms of the storage tanks, was reportedly applied to slopes and berms in the Fuel Farm to control erosion. Between early 1940 and 1976-77, an estimated volume of 18,500 to 37,000 gallons of TBM was applied throughout the site (Navy Energy and Environmental Support Activity [NEESA] 1986).

2.1.1 Regional and Site Vicinity Geology

In the vicinity of the site, the underlying Point Loma and Cabrillo Formations are overlain by the Bay Point Formation. Landslide deposits and outcrops of the Linda Vista Formation are also mapped in the area (Kennedy, 1975).

2.1.2 Regional and Site Vicinity Hydrology

The subject site is within the Point Loma Hydrologic Area of the Pueblo San Diego Hydrologic Unit (RWQCB, 1994). Groundwater on Point Loma is not used for drinking, irrigation, recreation or industrial supply. The groundwater basin is not designated a beneficial use aquifer and therefore is not subject to specific water quality goals or discharge requirements. However, it is subject to the non-degradation policy of the RWQCB. The coastal waters of San Diego Bay and the Pacific Ocean, with which the groundwater aquifer is in hydrologic communication, do have beneficial uses, including water contact, recreation, and marine habitat (RWQCB, 1994).

2.2 Previous Investigations

Several investigations have been conducted addressing the nature and extent of TBM at the site. Previous investigations and significant events include:

- *Initial Assessment Study, Point Loma Naval Complex and Naval Hospital, San Diego, California*, prepared for Naval Energy and Environmental Support Activity (NEESA, 1986). This study identified seven sites at the Point Loma Naval Complex

for further investigation. IR Site 4, the Tank Bottom Spreading Area, is listed as fifth of seven sites, in descending order of priority.

- *Draft Letter Report, Site 4 Naval Supply Center, Tank Bottoms Sludge Spreading Area, Point Loma Naval Complex* (IT Corporation, 1989). This report presents the results of 46 soil samples analyzed as part of the Point Loma Naval Complex Remedial Investigation Verification Step Work Plan.
- *Environmental Site Investigations, Fuel Storage Tank Repairs and Site Improvement, Naval Supply Center, Point Loma Annex (Dames & Moore, 1991a).* The objective of this assessment was to evaluate the impact of TBM on planned construction projects. A total of 72 TBM samples and 66 soil samples were analyzed for petroleum hydrocarbons and other constituents. Although polychlorinated biphenyls (PCBs) were reported in three TBM samples at relatively low concentrations (two slightly above preliminary remediation goals, and one below), the PCBs do not appear to be related to TBM. The ESI report documented the presence of a dark, oily sludge at the storm drain servicing Tanks 59, 60, and 42. It is likely that the PCBs identified in 1991 were associated with the oily sludge. Subsequent sampling and analysis have not corroborated the presence of PCBs at the site.
- *Final Report Volume II, Abatement Plan, Fuel Storage Tank Repairs and Site Improvement, Naval Supply Center, Point Loma Annex* (Dames & Moore, 1991a). This Plan presented a proposed approach to TBM abatement and identified data gaps in the characterization of the vertical and lateral extent of contamination. Regulatory agencies concluded that TBM could remain in place with appropriate encapsulation or pavement.
- *Addendum Report, Additional ESA for Project A (SD91-5), Assess Extent of CCR Metals Contamination, Naval Supply Center, Point Loma Annex* (Dames & Moore 1991b). This assessment was conducted to characterize the vertical and lateral extent of elevated concentrations of lead and copper in soil and TBM. A total of 54 samples were collected for analysis. Metals were related to paint chip fragments, and regulatory agencies concurred with a proposal to encapsulate surface TBM with shotcrete.
- *Additional ESI, Conduct Organic Lead, Total Lead, and California WET for Lead Tests for Seven SD91-5 Soil/TBM Samples, Naval Supply Center, Point Loma Annex* (Dames & Moore 1992). This investigation was conducted to evaluate the source of lead identified in previous sampling. Lead levels were consistent with paint flakes from ASTs, which were also analyzed. Data suggest that paint is the source of lead in the soil and TBM.
- Following 1992 regulatory approval, shotcrete was applied to most of the exposed TBM as an encapsulation medium.
- The U.S. Navy Public Works Center, San Diego (PWC) conducted a global positioning system (GPS) survey of exposed TBM at IR Site 4 in 2003. A total estimated area of 3.4 acres was identified. Figure 3 presents the TBM extent with previous sample locations.

- The PWC conducted an investigation using the Site Characterization and Analysis Penetrometer System (SCAPS) in 2003. The purpose of the investigation was to characterize the composition and determine the mobility of exposed TBM. Additionally, the feasibility of using laser-induced fluorescence and downhole microscopy to assess the vertical extent of TBM was evaluated. Eighteen borings were advanced, and five TBM samples were analyzed for PAHs, metals, and PCBs. Results from three samples analyzed for Synthetic Precipitation Leaching Procedure (SPLP) suggest very low PAH mobility, and demonstrated that the PAHs are unlikely to leach into underlying soil. Detectable PAH concentrations were reported in TBM samples. Lead and PCBs were not identified in TBM samples, confirming previous TBM characterization results.

The results from these investigations supported the identification of PAHs as the compound of potential concern (COPC) at IR Site 4. Although elevated concentrations of lead and PCBs were reported in 1991 sampling data, subsequent sampling determined that these compounds are unrelated to TBM. The lead detection was linked with the paint chips included in the sampling of surface TBM samples, and PCBs likely associated with a localized sludge documented in the ESI. The decision to exclude lead and PCBs as COPCs was made in a January 2004 meeting with the RWQCB, as documented in meeting minutes included in the 2004 SAP as Appendix A.

2.3 Regulatory History

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) established a series of nationwide federal programs to identify, characterize, and clean up or control contamination from hazardous waste disposal and spill sites. One of these programs, the Defense Environmental Restoration Program (DERP), is codified in SARA Section 21 (10 *United States Code* [U.S.C.] 2701). The DERP specifies Navy and Marine Corps personnel responsibilities; describes the various steps of the IR Program; and assures consistency with regulatory guidelines for evaluation of hazardous waste site conditions.

The Department of Defense developed the IR Program to identify, assess, characterize, and clean up or control contamination from past hazardous waste-disposal operations and hazardous materials spills at United States (U.S.) Navy and Marine Corps installations. The program was established to comply with federal requirements regarding cleanup of hazardous waste sites. These federal requirements are outlined in CERCLA, as amended by SARA.

Since the inception of the Navy/Marine Corps IR Program, efforts have been made to identify, assess, and remediate contaminated sites at FISC. A total of three IR sites have been identified at FISC. IR Site 4 was identified by NEESA in 1986 because of the presence of TBM.

Although FISC is not listed on the National Priorities List (NPL), the Department of Navy has elected to follow U.S. Environmental Protection Agency (EPA) Preliminary

Assessment and Site Inspection protocols for site characterization and cleanup (U.S. EPA 1991, 1992, and 1999). The National Oil and Hazardous Substances Pollution Contingency Plan (NCP), promulgated in the Code of Federal Regulations (CFR) at 40 CFR 300, provides investigation protocols.

Fuel releases from tanks, pipelines, and other operations have been documented at a variety of locations at the site. In 1986, IR Site 4 was identified and recommended for further characterization because of the presence of TBM (NEESA 1986). The Navy is the lead agency and the San Diego RWQCB is the lead regulatory agency for the site.

2.4 Project Action Levels

Project action levels (PALs) for this investigation are presented in this section. Two sets of PALs were applied during this investigation to address each of the investigation goals (Table 1). To determine if PAHs in TBM have impacted underlying soil quality, background ranges of soil PAH concentrations published by the Agency for Toxic Substances and Disease Registry (ATSDR) were established for baseline PAH concentrations (ATSDR, 1999). To assess any potential risk to human health posed by IR Site 4 soil, Preliminary Remedial Goals (PRGs) developed by U.S. Environmental Protection Agency (EPA) Region 9 for both residential and industrial land use were compared with concentrations of PAHs detected in soil above background levels (U.S. EPA 2004).

PAH concentrations have tended to increase in soil over the last 150 years, particularly in urban areas due to the combustion processes that are a major source of PAHs in soils. The ATSDR has compiled a data set representing PAH background concentrations for soil representing various land use types in the United States. This data set was used to establish whether PAH concentrations at IR Site 4 fall within the ATSDR background range or exceed this range. Analytical results generated from this investigation were compared to this data set. For the purpose of this investigation, PAH analytical results that are lower than the ATSDR background threshold values are considered consistent with background, with related risk no greater than what would be encountered in a typical urban environment. Sample results exceeding background threshold values may potentially be release-related. All results that exceeded the method detection limit are included in the risk assessment data set.

At sites governed by CERCLA, decisions regarding remedial action are initially based on the magnitude of risk posed by COPCs to site receptors. In accordance with the NCP, remedial action should be recommended if site release-related cancer risk exceeds 1×10^{-4} or if the hazard index exceeds 1.0. Site cancer risk in the 10^{-4} to 10^{-6} range requires justification for any recommended remedial action. If site risk falls in this range or if the hazard index nominally exceeds 1.0, then overall site risk should be evaluated in the context of potential exposure pathways and receptors, and the recommended action would be made in consideration of this evaluation.

No further action should be recommended if site release-related cancer risk is less than 10^{-6}, the hazard index is less than 1.0, and ecological risk is in the acceptable range.

3.0 FIELD METHODS

Field methods, including soil sampling, analytical methods, and waste management and disposal, are presented in the following subsections.

3.1 Mobilization

In accordance with Navy policy, Anteon coordinated the field activities with Mr. Ray Gomez, the Deputy Director for the Fuel Farm. On May 12, 2005, Anteon initiated the documentation and notification procedures required for equipment and personnel site access.

Field mobilization included procurement of field equipment, establishment of a bermed Investigation-Derived Waste (IDW) storage area, and designation of an equipment staging area. Office mobilization activities included preparation of subcontractor scopes of work and delivery orders, preparation of field notebooks, sample labels, and procurement of necessary sampling and safety equipment.

ULS utility locators surveyed the site on 5/16 and 5/20/2005 using electromagnetic and ground penetrating radar technology. The PWC underground utilities locators surveyed the site prior to the May 12, 2005 subsurface operations approval date.

Permits obtained for this investigation included the monitoring well application acknowledgement granted April 20, 2005 (LMON103055) from the County of San Diego Department of Environmental Health. On May 12, 2005 subsurface operations permit numbered 25-7169 was approved by PWC utilities locators. Other required notifications included the Regional Water Quality Control Board on May 18, 2005 and the May 16, 2005 activation of Underground Services Alert (USA) ticket number #A1360186.

3.2 Soil Sampling

A hollow-stem auger drill rig was chosen for the capability to extract a continuous soil core suited for detailed logging of the subsurface, identification of TBM horizon(s), determination of appropriate soil sample intervals based on visual TBM observation, and collection of soil samples. Boring permits and lithologic logs are included in Appendices A and B respectively.

Following extraction, the soil core was logged, photographed and sampled in accordance with the Sampling and Analysis Plan (PWC, 2004) and Standard Operating Procedures for Drilling and Soil Sampling. Soil samples were collected and analyzed from three depths in each boring to gain a more complete representation of the vertical PAH distribution. Sample depths were primarily determined by TBM emplacement discreetly targeting the interval one foot below the lower extent of the TBM.

Due to grading and related site activities conducted since the surficial emplacement of the TBM, some of the TBM has been buried. Because all of the borings were located at surface exposures of TBM, all of the upper interval samples (0-2 foot) were collected one

foot below the lower extent of the surface TBM layer. Buried TBM layers, when encountered, were similarly sampled one foot beneath the lower TBM extent. Typically, subsurface TBM layers were not observed and the intermediate and deep samples from each boring were collected from two to six feet below ground surface (bgs), and from six to ten feet bgs respectively. Soil core photographs are presented in Appendix C.

Soil samples were packed in glass jars, labeled, placed in a cooler with ice for transport, and delivered to the Columbia Analytical Laboratory for analysis. Field blanks, equipment blanks, and additional sample volume to conduct matrix spike/matrix spike duplicate (MS/MSD) analyses were collected as follows:

- Field blanks were collected once for the entire mobilization effort.
- Equipment blanks were collected at a rate of one per day, for reused sampling equipment.
- MS/MSD samples were collected at a rate of one per every 20 original samples.

Field Quality Control (QC) sample results (as well as laboratory QC samples) were evaluated during the data validation process to determine the need for sample qualification and ultimately to assess data usability for this investigation.

3.3 Boring Location Survey

All borings were surveyed using GPS following drilling activities. Boring location coordinates are included on the boring logs (Appendix B).

3.4 Analytical Methods

All soil samples were analyzed for PAHs using EPA Method 8270C Selective Ion Monitoring (SIM) to attain required reporting limits. The samples were transported on ice, following chain-of-custody protocol, to a state-certified stationary laboratory (Columbia Analytical) for analysis (Appendix D). Analyses were performed in accordance with U.S. EPA SW-846, Update III (U.S. EPA, 1997) and with the Navy Installation Restoration Chemical Data Quality Manual (IRCDQM) (NFESC 1999).

3.5 Investigation-Derived Waste (IDW) Management and Disposal

Wastes generated during fieldwork included soil, decontamination water, and personal protective equipment (PPE). Investigation-derived waste was disposed of as follows:

- Soil was temporarily stored on-site in 55-gallon drums until it was characterized for disposal. Following laboratory analysis and waste profiling, the soil was found to be non-hazardous and was delivered to Candelaria Environmental, in Anza California. The Non-Hazardous Materials Hauling Manifest is available in Appendix E.

- Equipment decontamination wash water solutions (approximately 55 gallons) were transported to Dome Rock Industries, Inc. in Quartzite Arizona. The Waste Acceptance Form is included in Appendix E.
- Non-hazardous solid waste, such as personal protective equipment and other disposable materials used during this investigation, was bagged and disposed as inert solid waste with other trash generated during the IR Site 4 ESI investigation.

3.6 Deviations from Sampling and Analysis Plan

There were no substantive deviations from the SAP.

4.0 INVESTIGATION RESULTS

Analytical results and supporting or related data quality evaluation are presented in the following subsections.

4.1 Geology

Based on a review of the continuous core logs from this investigation, soil type within the upper 10 feet was predominantly a mix of sand and silty sand with interbedded silt lenses and minor clay.

TBM deposits were easily distinguished by the contrasting dark color and asphalt-like consolidation. Typical TBM thickness was approximately 2 inches, with a minimum thickness observed of one-half inch and a maximum of 7 inches. Buried TBM was observed in borings SB-06, SB-07, and SB-20 (Appendix B). Soil underlying TBM layers was sampled at a depth of one foot beneath the visible and generally sharply defined lower extent of the TBM layer. The dark stained layer observed and sampled in boring SB-11 at 3.6 feet below grade surface (bgs) was logged as a likely fuel leak rather than TBM because it appeared to be stained with lighter fraction petroleum lacking the asphalt-like appearance of all the other TBM. The probable fuel-stained interval in SB-11 was sampled using TBM protocol.

4.2 Laboratory Results

As described above, three soil samples were collected in each of the 20 borings targeting the shallow interval (0-2 ft bgs), the intermediate interval (2-6 ft bgs), and the deep interval (6-10 feet bgs). The primary focus was precise sample collection at one foot below the base of TBM layer(s) encountered in the boring.

Soil analytical results showed low but detectable concentrations of eleven PAHs. These PAHs include: 2-methylnaphthalene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i,)-perylene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, phenanthrene, and pyrene. Most of the PAH concentrations were less than the analytical laboratory's reporting limit and were reported as estimated values. The PAH analytical results are summarized in Table 1 and on Figures 4, 5 and 6. Copies of the laboratory analytical results are presented in Appendix D.

None of the analytes from the 60 samples analyzed for PAHs exceeded the ATSDR background concentrations or industrial PRGs (Table 1; Figures 4, 5, and 6). The only analyte detected at a concentration that exceeded residential PRGs was benzo(a)pyrene. The residential PRG for benzo(a)pyrene, 0.062 milligram per kilogram (mg/kg), was exceeded in samples 04-FISC-032 SB-010-24" and 04-FISC-033 SB-010-72" at 0.17 and 0.079 mg/kg, respectively.

The relatively random horizontal and vertical dissemination of low-level PAH concentrations found throughout the study area are more indicative of a background

distribution rather than a release-related PAH population. In the 0 to 2 foot interval there were 20 detections, 18 in the intermediate interval (2-6 feet), and 19 PAH detections in the deep interval (6 to 9 feet deep).

The judgmental sampling design was developed to evaluate the impact of TBM on underlying soil. The analytical results from this investigation showing PAH concentrations less than ATSDR background levels corroborate previous SPLP results as evidence of very low mobility PAHs bound in the TBM matrix. Several analytes, including pyrene which was the most frequently detected and benzo(a)pyrene which was the only analyte to exceed residential PRGs, had lower concentrations in the shallow zone samples nearest to the TBM than in the deeper samples collected five feet below the surface TBM horizon. It should be noted that the benzo(a)pyrene identified in soil samples from boring SB-10 at depths of 2 feet and 6 feet bgs were collected in sandy silt and silty sand layers, respectively, and do not appear to be associated with buried TBM (Appendix B).

4.3 Data Quality Evaluation and Usability

This section presents the various elements associated with the assessment of the quality of laboratory data generated in connection with soil data collected at IR Site 4. The data were verified and validated to assure that they met the data quality objectives for the project and to assess data usability issues, if any, that may prevent its inclusion in decision-making.

Data verification included proofreading and comparing hard copy data reports against the electronic submittal to assure that data correctly represented the analytical measurement, identifying any non-technical errors in the data package for correction (e.g., typographical errors), and verifying that the sample identifiers on laboratory reports (hard copy) matched those on the chain-of-custody record.

Subsequent to verification, the data were validated by an independent contractor (Laboratory Data Consultants Inc.). Validation was performed under the Naval Facilities Engineering Service Center (NFESC) Level III and IV guidelines. For IR Site 4, data validation was performed to Level III criteria on 90% of the data, and Level IV on 10% of the data. Both levels of validation include the review of laboratory quality control summaries (blank, calibrations, spike recoveries, duplicates, etc.). Level IV process incorporates a review of raw data including chromatograms and quantitation reports. This additional information is utilized in the Level IV data validation process for checking calculations of quantified analytical data.

Data that did not meet the applicable validation criteria were flagged with the following data qualifiers:

U – Indicates the compound or analyte was analyzed for but not detected at or above the associated detection limit.

J – The associated value is an estimated quantity.

UJ –Indicates the compound or analyte was analyzed for but was not detected. The associated detection limit is an estimated value.

R – The data are unusable.

4.3.1 Data Validation Results

This section summarizes the results of data validation and internal data quality assessment for all analytical parameters. For a detailed discussion of the validation results, Appendix F contains the data validation case narratives. Adherence to field protocols specified in the Work Plan and the effects of contamination present in field QC samples were also evaluated as part of the data quality assessment.

There were no significant analytical problems noted for the samples analyzed for PAHs with the exception of the following: Benzo(b)fluoranthene, pyrene, benzo(g,h,i)perylene, and/or benzo(k)fluoranthene results in several samples were qualified as estimated "J" on the basis of continuing calibration parameters being slightly above the validation criteria. In general, most MS/MSD percent recoveries were within control limit. MS/MSDs that were not within control limits are discussed in the data validation case narratives in Appendix F. No reported data points were qualified as unusable due to noncompliance issues.

4.3.2 Data Usability

Based on data validation results, minor discrepancies were noted in laboratory QC samples. A thorough review of the data, however, indicate that these discrepancies do not adversely affect the quality, validity, usability, and overall data interpretation presented in this report. Therefore, the data presented herein are considered valid and usable as indicated by their specific qualifiers.

5.0 SCREENING-LEVEL RISK ASSESSMENT

This section presents the results of the screening-level human health risk assessment and ecological risk assessment (ERA).

Risk assessment determines the likelihood that PAHs in soil could impact the health of human or ecological receptors. This risk assessment, based on data collected during this investigation, estimates human health cancer risk, non-cancer hazard, and ecological hazard. Screening level risk calculation uses the maximum concentrations detected in any sample with published health-based screening levels. Screening level risk above target levels of 1×10^{-6} for cancer risk or 1 for the human health or ecological hazard index does not indicate a potential concern but only that further evaluation or risk management decisions may be warranted.

The screening-level ERA follows the procedures outlined by the U.S Department of the Navy, U.S EPA, and state guidance as appropriate. Specific references used and consulted in developing this screening risk assessment approach include those by the U.S. Navy (1999, 2000, and 2001), U.S. EPA (1989a, 1989b, 2000, and 2001), and DTSC (1994, 1996a, and 1996b).

5.1 Risk Evaluation Factors

This section describes risk evaluation factors applicable to the following screening-level human health risk assessment and ecological risk assessment.

5.1.1 Analytical Basis for the Risk Evaluation

The PAH analytical data used for the risk analysis came exclusively from the 60 soil samples collected in May 2005 for this ESI. This data set represents a standardized sampling event with a statistically appropriate quantity of decision quality, validated, sample results.

5.1.2 Chemicals of Potential Concern

The COPCs for IR Site 4 are limited to PAHs associated with the TBM applied between early 1940 and 1976-77 to slopes and berms in the Fuel Farm for erosion control.

As previously described, the PAHs alone were established as COPCs based on IR Site 4 investigations spanning 1986 to 2003. Historical investigations have identified other contaminants in the vicinity that were determined to be unassociated with the TBM. PCB concentrations were associated with an isolated oily sludge and elevated lead measurements were attributed to sandblast debris from storage-tank paint removal.

5.1.3 Fate and Transport of the COPCs

This section describes the processes by which COPCs migrate and are chemically altered. The fate and transport of PAHs in soil and sediment are influenced by physical, chemical, and biological factors, often acting in combination. Some of these processes influence contaminant transport, while others directly affect the bioavailability and toxicity of contaminants.

Polynuclear aromatic hydrocarbons are long-chain or multi-ring semi-volatile organic compound molecules that include phenols and phthalates. PAHs are composed of various combinations of fused benzene rings. Their properties vary with molecular weight. Generally, the higher molecular weight compounds are less mobile and less toxic than the lower-molecular-weight compounds. PAHs in the atmosphere, water, soil, and sediment become associated with particulate material. PAHs in the environment tend to be altered or diminished by evaporation from soil or water, reaction with sunlight or other chemicals, or breakdown by microorganisms.

Site-specific conditions bearing on PAH fate and transport include the tendency of the PAH to bind tightly with particulate matter, and the asphalt-like cohesive nature of TBM. The surficial TBM application and extended time frame for photodegradation and sublimation are mitigating factors. The ASTDR (1995) literature describes breakdown by sunlight and microbial action as occurring in a time frame of days to months. Additionally, the PAHs in TBM had extended exposure to biodegradation and oxidation. Finally, most of the TBM was encapsulated in the early 1990s beneath a layer of shotcrete, effectively reducing bioavailability.

5.2 Human Health Screening Risk Assessment

This screening risk assessment evaluates the risk to human receptors from PAHs identified in soil underlying TBM at IR Site 4. Current and anticipated land use at the site is military industrial. Exposure to construction/industrial workers is the most representative human health scenario for risk assessment; however, the more conservative residential risk has been calculated for comparison.

5.2.1 Exposure Pathways

The exposure pathways define the ways that receptors can come into contact with site COPCs. Although there is no residential use of the site current or anticipated, exposure pathways at IR Site 4 were evaluated based on residential and industrial land use. Potential human exposure pathways include incidental ingestion of exposed soil particles, and dermal contact with exposed soil particles.

A potential exposure pathway that was judged to be incomplete under present-day land use was ingestion of terrestrial or aquatic plant products gathered on the site. No viable species for routine use as a food source have been identified at the site. IR Site 4 surface water also was not identified as an exposure medium for two reasons: the PAHs are relatively insoluble and, therefore, relatively unlikely to partition into surface water, and

surface water at the site is tested for National Pollutant Discharge Elimination System (NPDES) permit compliance prior to direct discharge to the bay.

5.2.2 Human Health Risk Screening Process

Cancer and non-cancer risks were estimated for each exposure pathway for chemicals in soil. PAHs are relatively insoluble in water and bind tightly to soil and sediment particles, especially organic matter in aquatic systems. PAHs have been shown to bioconcentrate in aquatic plants and invertebrates; however, many vertebrates can metabolize PAHs, therefore biomagnification is not a significant concern. Exposure to PAHs has been shown to cause reproductive impairment and birth defects in mice, and seven of the PAH compounds have been classified as human carcinogens (ATSDR, 1995).

5.2.2.1 Direct Soil Contact

Due to the industrial site use, the cohesive asphalt-like nature of the TBM, and absence of an affected food or water source, the only viable pathway for the contamination to affect human health is direct contact with soil.

Risks for soil were calculated using U.S. EPA PRGs (EPA, 2003), and CAL-EPA toxicity factors, where available. PRGs for cancer health effects are based on adults and children, while PRGs for non-cancer health effects are based only on children, the most sensitive receptor.

The PRGs for soil address potential health effects from direct contact with soil including ingestion, dermal absorption and inhalation of soil particulates. The PRGs are protective of the most sensitive receptor (hypothetical residents and workers) identified for future land use at IR Site 4. Residential exposure duration and frequency are assumed to be 30 years and 350 days a year. The residential exposure scenarios used in this case are protective because a typical military residence on a facility is less than 30 years. Occupational worker exposure to soil is assumed for 250 days a year as adults for 25 years.

The target risk for PRGs based on the cancer end point is $1x10^{-6}$ and the target risk for the non-cancer endpoint is a hazard index of 1.0. To calculate the risk for carcinogenic chemicals, the maximum concentration of a chemical was divided by its carcinogenic PRG and multiplied by $1x10^{-6}$ to obtain a cancer risk estimate. For non-carcinogens, the maximum concentration for each chemical was divided by its respective PRG to calculate the non-cancer hazard index for each chemical. The overall additive risk of these numbers was then calculated by summing the individual cancer risks and hazard indices.

5.2.3 Human Health Risk Results

5.2.3.1 Risk from Direct Soil Contact

As above, previous investigation has limited the COPCs to PAHs. The cumulative risks calculated using the maximum PAH concentrations identified in soil yields an acceptable

residential cancer risk of $3x10^{-6}$ and hazard index of 0.003. The occupational cancer risk and hazard index are also within acceptable risk boundaries at $9x10^{-07}$ and 0.00088, respectively. Table 2 presents a summary of the chemicals identified and the risk screening calculation results for PAHs.

5.3 Screening-Level Ecological Risk Assessment

A screening-level ERA was conducted to estimate the potential impacts of PAHs reported in the soil at IR Site 4. The screening-level ERA is Tier 1 of the Navy policy for conducting ERAs (DoN 1999, and 2001). It employs existing data and conservative assumptions about contaminant exposure to determine whether additional work is warranted. The Navy policy is consistent with Steps 1 and 2 of the Ecological Risk Assessment Guidance for Superfund (U.S. EPA, 1997).

The state of California has also prepared guidance documents for ERAs (Cal/EPA 1996). The Navy Tier 1 process is similar to the first two components of the California process (Scoping Assessment and Phase I Predictive Assessment). Following the Navy process for ERAs (DoN 1999, 2001) is expected to be consistent with the California process.

The primary objective of Navy Tier Step 1 is to determine whether complete exposure pathways exist between chemicals and selected ecological receptors at IR Site 4. In Step 2, risks are estimated for those chemicals for which complete pathways were identified. At the conclusion of Tier 1, a risk management decision is made about site status. The decision criteria identify three possible outcomes of the Tier 1 screening-level ERA:

- IR Site 4 poses an acceptable risk and no further action is warranted.
- IR Site 4 poses a potentially unacceptable risk that requires additional evaluation with a Tier 2 baseline ERA.
- IR Site 4 poses a potentially unacceptable risk and accelerated site remediation is warranted.

5.3.1 Problem Formulation

The site characteristics, chemicals of potential ecological concern (COPECs), and fate and transport factors for the COPECs are discussed above. The problem formulation as follows, additionally evaluates ecological habitats, representative organisms, threatened and endangered species, and potential exposure pathways between the COPECs and the ecological receptors.

5.3.2 Ecological Setting

Three habitat types are mapped at IR Site 4 (RECON, 2002). Vegetation types associated with each of these habitats were obtained from the *Final Naval Base Point Loma Integrated Natural Resources Management Plan*, dated July 2002, prepared by RECON and are described below.

Cultivated/Landscape – Thirty-one acres of the site is mapped as cultivated landscaped. The land around the FISC fuel tanks northeast of the site, and adjacent to Warhead Road east of the site is also mapped as cultivated land.

Developed – Approximately 28 acres in the northeastern corner and above the underground storage tanks has been mapped as developed. Developed areas support no native vegetation and typically contain man-made structures. Much of the developed land at Site 4 is used for buildings, roads, and fuel tanks.

Diegan Coastal Sage Scrub – An approximate 1-acre pocket of Diegan coastal sage is mapped at the north and south ends of the western boundary of IR Site 4 and is considered a rare habitat.

Ecological habitats mapped within an approximate one-mile radius of the site are listed below. All native vegetation communities on PLNC are listed as rare and sensitive on the California Department of Fish and Game's (CDFG's) Natural Diversity Data Base (NDDB) (CDFG, 1977).

Undisturbed Habitats

Diegan Coastal Sage Scrub –As a rare habitat the Diegan coastal sage scrub is considered to be uncommon, supports sensitive or rare plants or animals, or receives regulatory protection. In addition, the CDFG's NDDB has designated this habitat as rare. Although this is the most widespread type of coastal sage scrub in southern California, up to 72 percent of the original sage scrub habitat in San Diego County has been destroyed or modified (RECON, 2002).

Southern Maritime Chaparral – Southern maritime chaparral is a distinct chaparral association that occurs on weathered sands within the coastal fog belt. Its distribution appears to be tied to particular soil formations.

Chaparral stands on ridge tops is growing to about 3 to 4 feet in height and is fairly open. Along drainages the chaparral tends to be denser and grows to heights of six to seven feet, apparently in response to increased water and nutrients. Dominant species include chamise, sea dahlia, and wart-stemmed ceanothus (*Ceanothus verrucosus*), scrub oak, toyan (*Heteromeles arbutifolia*), lemonadeberry, black sage.

Diegan Coastal Sage Scrub/Southern Maritime Chaparral –This association is similar to the mixed maritime succulent scrub/chaparral habitat; however, it lacks species such as cliff spurge, California encelia, and the common understory succulents that are more characteristic of maritime succulent scrub on the peninsula. This mixed association occurs in ecotonal areas and is also considered a post-disturbance community. The closest mapped community of the vegetative habitat to the site is located about 300 feet east of IR Site 4.

Southern Foredunes – This habitat includes dynamic dune systems located in the immediate proximity of the high surf line. Southern foredunes can provide nesting habitat for the endangered California least tern and western snowy plover. The dunes also provide potential habitat for the silvery legless lizard, a CDFG species of special concern. It is inhabited by plant species that are tolerant of unstable environments, subject to storm winds with their desiccating effects, and shifting sands. The seaward zone is sparsely vegetated with herbaceous species such as saltgrass (*Distichlis spicata*), beach evening primrose (*Camissonia cheiranthifolia* ssp. *suffruticosa*), and red sand verbena (*Abronia maritime*). The inland zone is more densely vegetated with shrubs such as broom baccharis (*Baccharis sarothroides*), California sagebrush (*Artemisia californica*), and California buckwheat.

Southern foredunes occur at one location on PLNC. Approximately two acres of disturbed southern foredune vegetation occurs north of the deperming pier on Magnetic Silencing Facility (MSF) along the San Diego Bay shoreline southeast of IR Site 4.

Southern Coastal Bluff Scrub – This habitat has a restricted range along the coast in southern California. It occurs in narrow vegetation bands on seaside bluffs along the entire length of PLNC and extends around the point south of the MSF degaussing facility. The closest mapped community of this vegetative habitat to the site is located to the west of IR Site 4.

Several rare plant species including Shaw's agave and seaside calandrinia are associated with this habitat. Vegetation in this habitat is low, sometimes prostrate scrub. Dominant plants are mostly wood and/or succulent species that are often dwarfed by almost constant exposure to coastal, moisture-laden winds with high salt content. Representative species include California desert-thorn (*Lycium californicum*), lemonadeberry (*Rhus integrifolia*), Shaw's agave (*Agave shawii*), coast barrel cactus (*Feroacactus viridescens*), and snake cholla (*Opuntia parryi*).

Maritime Succulent Scrub/Southern Maritime Chaparral – This association is a transitional community, composed of elements from two distinct vegetation communities that typically occur in ecotonal areas between the two habitats. This mixed community includes both drought-deciduous maritime succulent scrub species and woody chaparral species. Total vegetation cover includes roughly equal amounts of both scrub and chaparral species. However, this can vary considerably from site to site. Dominant species include California sagebrush, cliff spurge, California encelia, chamise, and wart-stemmed ceanothus.

Maritime Succulent Scrub – Maritime succulent scrub is a low, open scrub dominated by drought deciduous, soft-woody shrubs, many of which are stem and/or leaf succulents. Much of the area between shrubs is unvegetated or sparsely vegetated with native grasses, forbs, and low-growing succulents. This habitat typically occurs on thin rocky or sandy soils, often on steep slopes of coastal headlands and bluffs. It is currently restricted to within a few miles of the coast from near Torrey Pines south to El Rosario, Baja

California. Its range also includes San Clemente and Santa Catalina islands (Holland 1986).

Torrey Pine Forest – Torrey pine (*Pinus torreyana*) is the most restricted pine species in California with only two natural populations remaining. Both the Torrey pine and the forest community that it dominates are considered sensitive resources by the NDDB and the City of San Diego. The Torrey pine is a California Native Plant Society (CNPS) List 1B plant species, which means it is rare within its range. Although Torrey pines on PLNC are planted, site conditions appear to be appropriate for this species, as evidenced by it naturalization and the site is within the species historical range. Consequently, Torrey pine forest at PLNC is treated as a native plant community, and a rare habitat. Torrey pines occur along Woodward Road near the Space and Naval Warfare Systems Center, San Diego (SSC) Command Control and Communications site. The closest mapped community of the vegetative habitat to the site is located about 0.5 miles southeast of IR Site 4. Rare plant species characteristic of this community and present on Point Loma include wart-stemmed ceanothus and sea dahlia.

Eucalyptus Woodland – Eucalyptus woodland is characterized by dense stands of gum trees (*Eucalyptus* spp.), which are native to Australia. Gum trees are well adapted to the Mediterranean climate. In many areas, they have displaced native species, forming nearly monotypic stands. Understory vegetation is typically lacking beneath these trees, except in areas that the canopy layer is relatively open. Despite the negative effects that gum trees can have on native vegetation, these trees provide habitat for a number of native bird species known to occur on Point Loma. The largest areas of mapped eucalyptus woodland occur on the bay side on SUBASE. Several smaller stands also occur at scattered locations on SUBASE and SSC Seaside. The closest mapped community of the vegetative habitat to the site is located about 0.7 miles southwest of IR Site 4.

Intertidal – The intertidal zone is a U.S. Army Corps of Engineer (USACE) regulated "waters of the U.S.", a category which includes territorial seas, tidal waters, and non-tidal waters. Most of the undeveloped coastline of Point Loma consists of rocky intertidal habitat with isolated sand and cobble beaches. The term "intertidal" refers to the part of the shoreline that is under water during high tides and exposed to air during low tides. Rocky intertidal tide pools are formed when water gets trapped in small depressions in the rock when the tide recedes. These pools along with the rocky benches, scattered boulders and isolated sandy beach found on Point Loma are habitat for a diverse assemblage of marine plants, algae, and animals that are specially adapted to tolerate exposure to air and large wave forces, and provide foraging ground for many shorebirds and seabirds. Over 300 species of algae and invertebrates have been documented in Cabrillo National Monument. The closest mapped intertidal zone to the site is located about 0.4 miles east of IR Site 4.

Disturbed Habitats

Ruderal – The vegetation type is described as ruderal (RECON, 2002). Areas mapped as ruderal are lands on which the native vegetation has been significantly altered by construction or other land-clearing activities, and the species composition and site conditions are not characteristic of the disturbed phase of one of the native plant associations. Ruderal vegetation typically occurs in vacant lots, along roadsides, and at construction staging areas and is dominated by non-native species and perennial broad-leaved species. Typical plant species in ruderal areas include Russian thistle (*Salsola tragus*), sweet fennel (*Foeniculum vulgare*), garland daisy (*Chrysanthemum coronarium*), ripgut grass, and Australian saltbush (*Atriplex semibaccata*) (RECON, 2002).

Cultivated/landscape – Extensive stands of golden wattle (*Acacia longifolia*) and hottentot-fig occur on the FISC fuel division site. In some areas, cultivated species are invading open space areas and degrading the quality of other native vegetation communities.

Urban/developed – (described above) the bordering residential area to the north is developed. Most of the IR Site 4 northeast AST area and the immediate vicinity of the USTs to the south of the site is mapped as developed. Adjacent the site is the entirely developed residential area to the north and Navy development to the south.

Developed areas support no native vegetation and typically contain man-made structures such as buildings, roads, storage structures, radar installations, and ship piers and docks. Small inclusions of disturbed habitat or landscaped areas may be present within developed areas. The closest urban/developed land is mapped about 400 feet northeast of IR Site 4.

5.3.3 Threatened Endangered and Of-Concern Species

Comprehensive lists of plants and animals that are classified as threatened, endangered, or of-concern by state or federal agencies that are known or suspected to occur in Point Loma were reviewed (RECON, 2002). One federally and state listed endangered plant species is identified at PLNC. Nine bird species known to be residents or migrants at PLNC are listed by either federal or state agencies as threatened or endangered. These bird species are also covered by the Migratory Bird Treaty Act (MBTA). No federally listed wildlife has been observed on Point Loma. A description of federally and state listed plant and bird species known to occur on Point Loma is provided below.

5.3.3.1 Federal and State Listed Plant Species

Orcutt's Spineflower (*Chorizanthe Orcuttiana*) is the only federally and state listed endangered plant species known to occur on PLNC. It is currently listed as endangered by both the U.S. Fish and Wildlife Service (USFWS) (November 6, 1996) and the CDFG. The CNPS also considers it to be rare and endangered (CNPS, 2000). Its diminutive size

makes it difficult to detect. Because of its rarity and susceptibility to disturbance, access to the areas where this plant occurs is restricted.

Orcutt's spineflower is diminutive herbaceous annual in the family Polygonaceae. Its yellowish stems are prostrate and grow up to 15 centimeters in length. This species is found on sandy soils developed from eroded coastal bluffs, within openings in chaparral and coastal sage scrub communities.

Two populations of Orcutt's spineflower exist on PLNC, one on the SUBASE and one on SSC. The closest known population of Orcutt's spineflower is mapped about 1,500 south of the site (RECON, 2002).

5.3.3.2 Avian Species

Bald Eagle *(Haliateetus Leucocephalus)* Federal and state endangered. Approximately 10 years ago, a bald eagle migrated through Point Loma. This bird landed on a security sign on SSC Topside and was taken to Project Wildlife because it was in poor health (RECON, 2002). Bald eagles are considered rare migrants on Point Loma.

California Brown Pelican *(Pelicanus Occidentalis Californicus)* Federal and state endangered. California brown pelicans roost on rocks, beaches, and structures along the shoreline of the Bay on the cliffs above the ocean. Docks and floating structures at the MSF Degaussing Station and at SUBASE provide roosting habitat for a large number of California brown pelicans. Surrounding waters provide important foraging habitat.

Coastal California Gnatcatcher *(Polioptila Californica Californica)* Federal threatened. The gnatcatcher is a small slate-colored bird with a black tail, which it flicks erratically as it perches. The gnatcatcher is strongly associated with coastal sage scrub below 820 feet in coastal areas and between 820 and 1,640 feet in inland areas. Nesting Coastal California gnatcatchers have not been reported on Point Loma since 1915 (RECON, 2002). Although California gnatcatchers are not known to currently breed on Point Loma, there are sightings of individuals on a fairly regular basis, particularly in the fall (RECON, 2002).

California Least Tern *(Sterna Antillarium Browni)* Federal and state endangered. This species is also a California fully protected species. The California least tern was listed as an endangered species in 1970 under the federal Endangered Species Conservation Act (ESA) of 1969, then obtained protection under the ESA after it was established in 1973.

California least terns nest colonially along the coasts. Originally, they preferred colony sites located on barrier dunes at river mouths at lagoon entrances, and along sandy strips of sparse coastal strand vegetation. Due to human encroachment of these areas, the birds have sought alternative colony sites and nest wherever they can find fairly flat sandy ground with little or no vegetation. Most colonies are now found on dry mud flats, alluvial sand, or fill land created with dredge spoil. Terns often return to successful nesting areas. Tern foraging areas have been identified adjacent to SSC Bayside and the

MSF deperming facility. Section 7 consultation is required prior to in-water construction in these areas (RECON, 2002).

Least Bell's Vireo *(Vireo bellii pusillus)* Federal and state endangered. This small, gray migratory songbird depends on riparian habitat for breeding. The least Bell's vireo has been reported as a summer migrant in several vegetation communities on Point Loma. Because appropriate riparian vegetation for breeding is absent on Point Loma, least Bell's vireo is unlikely to nest there, and the birds reported were most likely migrating to or from nesting sites.

Swainson's Hawk *(Buteo swainsoni)* State threatened. Swainson's hawks and their nests are considered threatened by the State of California. Swainson's hawks are similar in size to the red-tailed hawk, but with narrower wings. Swainson's hawks prefer prairies and open land with scattered trees or ranch yard groves in desert grassland or agricultural areas. Swainson's hawks were observed during migration on Point Loma, however, there are no reports of Swainson's hawks breeding in the vicinity.

American Peregrine Falcon *(Falco perigrinus anatum)* State endangered. The peregrine falcon is a state endangered species and a California fully protected species. This former federally listed species was recently delisted. A monitoring program is required for a minimum of five years following delisting. Nesting sites are typically located on high cliffs, in trees, or on man-made structures. The same nest site may be used for many years. The peregrine falcon is most often seen in the fall or winter in San Diego County. One pair of peregrines is known to nest in Point Loma.

California Black Rail *(Laterallis jamaicensis coturniculus)* State threatened. California black rail is a state threatened and California fully protected species. The California black rail feeds on insects and arthropods from saltwater, freshwater, and brackish marshes. They are considered a rare transient and migrant to San Diego County. California black rails have been reported as year-round residents on intertidal flats on Point Loma. However, recent sightings have not been documented.

Bank Swallow *(Riparia riparia)* State threatened. Nested colonies of bank swallows are considered threatened by the State of California. Bank swallows nest colonially in vertical sandy banks or cliffs by streams, rivers, ponds, lakes, or the ocean. Bank swallows are a rare migrant to San Diego County and are not expected to nest on Point Loma.

5.3.3.3 Wildlife Species

No federally listed wildlife has been observed on Point Loma. Federally listed wildlife that has the potential to occur on Point Loma includes the Pacific pocket mouse (*Perognathus longimembris pacificus*). The Pacific pocket mouse was listed as a Federal endangered species in 1994. Critical habitat for the Pacific pocket mouse has not been designated. CDFG also list the Pacific pocket mouse as a species of special concern. It is a small burrowing mammal that is found exclusively in sandy soils derived from marine

terraces near the Pacific Ocean. The most common habitat type is open coastal sage scrub, but it has also been found in coastal strand, coastal dunes, and river alluvium. This species was not detected on Point Loma during a focused trapping survey conducted in May 2001 or during a larger survey conducted earlier in 1996-1997 (RECON, 2002). Although the Pacific pocket mouse has not been identified on Point Loma, and the nearest known population exists at Camp Pendleton, there is a low potential that this species occurs in various suitable habitats on Point Loma (RECON, 2002).

5.3.4 Exposure Pathway Analysis

Exposure pathway analysis evaluates the potential for contact between the COPECs reported in IR Site 4 soil and the ecological receptors that are present, or potentially present in the vicinity.

Factors limiting the potential bioavailability of the COPECs are the shotcrete encapsulation of most of the exposed TBM which was an effort to prevent degradation. PAH transport to off-site marine receptors is considered unlikely due to the depth to groundwater, resistance of TBM to dissolve or disseminate into particulates, and the testing of the surface water runoff prior to permitted discharge.

Terrestrial organisms are potentially exposed to contaminants in soil by direct contact, ingestion, food ingestion, and inhalation. Primary exposure routes are direct contact for plants and soil invertebrates.

Contaminant pathways to terrestrial organisms, plants, and soil dwelling invertebrates are mitigated by the shotcrete encapsulation, the asphalt like cohesive nature of the PAH-bearing TBM, and limited habitat.

5.3.5 Ecological Conceptual Model

Several environmental investigations spanning 1986 to 2003 have refined the potential IR Site 4 COPECs to the PAHs entrained within the TBM matrix applied to control erosion between early 1940 and 1976-77.

Because of the generally insoluble and cohesive consolidation of the asphalt-like TBM, transport mechanisms affecting the entrained PAHs are essentially nonexistent. The absence of PAH contamination in underlying soil is supported by the sub-background level, randomly distributed analytical results with no apparent TBM influence. Due to the extended time frame of the surficial TBM exposure, degradation by sunlight and sublimation, PAH impact that may have been present at application has likely been attenuated. Additionally, the PAHs have been subjected to oxidation and microbial action.

The three habitat types mapped at IR Site 4 include developed, cultivated landscaped, and Diegan coastal sage scrub. The undisturbed portions of IR Site 4 and the adjacent land to the west and south, vegetated with Diegan coastal sage scrub, is potential foraging or

nesting habitat for the federally listed California coastal gnatcatcher. Although numerous sightings of this species have been reported on Point Loma, there are no reported occurrences of this species nesting in Point Loma (RECON, 2002). Federal and state listed birds that may migrate over IR Site 4 include bald eagles, American peregrine falcons, and Swainson's hawk. There is one federally and state listed endangered plant identified at PLNC. There are no federal or state listed terrestrial animals in the PLNC. Nine bird species observed at PLNC are listed by either federal or state agencies as threatened or endangered.

Exposure pathways at IR Site 4 are considered incomplete because of shotcrete encapsulation covering most the site and the absence of PAHs exceeding ATSDR background concentrations in underlying soil.

Offsite exposure is similarly mitigated by the low mobility of PAHs. The depth to groundwater of over 100 feet, the distance from San Diego Bay, and testing of surface water runoff to ensure compliance with NPDES requirements.

5.3.6 Ecological Risk Results

Complete pathways linking ecological receptors with TBM-related COPECs were not identified. The factors interrupting the pathway between the COPECs and the ecological receptors in the vicinity include the following:

- Encapsulation of surface TBM and underlying  .
- PAHs were not detected at concentrations above published naturally occurring background concentrations.
- The extended time frame prior to encapsulation has allowed degradation of the largely surficially emplaced COPEC by photodegradation, sublimation, biodegradation, and oxidation.
- The TBM deposits are resistant to leaching and particulation that could increase biologic availability.
- The depth to groundwater paired with low mobility of PAHs, as supported by SPLP results eliminates groundwater as a pathway.
- San Diego Bay is protected by the approximately 1,000 foot distance from the site and the low mobility of PAHs.
- Surface water runoff is collected and tested prior to permitted discharge.

6.0 CONCLUSIONS

This ESI had two primary goals:

- To evaluate the impact of TBM on underlying soil quality, and
- To assess risk to human health and the environment posed by site soil.

Based on historical analytical results, the COPCs attributable to the TBM have been limited, with regulatory concurrence, to PAHs. Significant among the findings from this investigation was the determination that PAHs at IR Site 4 were within the background range identified by ATSDR. Principal findings from the ESI analytical results follow:

- None of the sample results exceeded the ATSDR background concentrations or the industrial PRGs. Residential PRGs were exceeded only by benzo(a)pyrene in two of the 60 samples collected.
- The concentrations of the PAHs detected in samples closest to the TBM were no greater than PAH concentrations from the intermediate and deeper zone samples, and all results are within the background concentration levels for PAHs. As such, there was no evidence that surface TBM results in elevated PAH concentrations in subsurface soil.
- The sub-background level PAH detections were distributed randomly within the upper, middle and lower target intervals.
- Samples collected one foot below the base of the exposed surface TBM layer show no identifiable PAH impact indicating that there has been no significant soil migration of the PAHs from the TBM.
- Most of the PAHs detected were reported as estimated values because the concentrations were less than the laboratory reporting limits.

The ESI results indicate that the background level PAHs detected during this investigation introduce no unacceptable risk to human health. The following are key human-health risk findings from this ESI.

- Current and anticipated land use at the site is military industrial.
- Due to the industrial site use, the cohesive asphalt-like nature of the TBM, and absence of an affected food or water source, the only viable pathway for PAHs to affect human health is via direct contact.
- Potential risk of direct contact was mitigated during the early 1990s with the encapsulation of the TBM beneath a layer of shotcrete.
- The target risk for PRGs is based on the cancer end point of $1x10^{-6}$. Risk calculations using the maximum PAH concentrations identified in soil show a residential cancer risk of $3x10^{-6}$ and an industrial cancer risk of $9x10^{-7}$. Both of these values are in the NCP acceptable range.

- The target risk for the non-cancer endpoint is a hazard index of 1.0. The cumulative risk calculated using the maximum PAH concentrations identified in soil yield an acceptable residential hazard index of 0.003. Similarly, the industrial hazard index is 0.00088. Both of these values are in the NCP-based acceptable range.

The following ecological risk assessment results support the findings showing no complete pathways to ecological receptors on IR Site 4 and the vicinity.

- Most of the TBM was encapsulated by the shotcrete in the early 1990s and is not bioavailable.
- PAHs were not detected at concentrations above published naturally occurring background concentrations in subsurface soil.
- The extended time frame of TBM exposure has allowed degradation of the largely surficially emplaced COPC by photodegradation, sublimation, biodegradation, and oxidation.
- The TBM deposits are resistant to leaching and particulation that could increase biologic availability.
- The depth to groundwater paired with low mobility of PAHs, as supported by SPLP results, eliminates groundwater as a pathway.
- San Diego Bay is protected by the approximately 1,000 foot distance from the site and the low mobility of PAHs.
- Surface runoff is collected and tested prior to permitted discharge.

7.0 RECOMMENDATIONS

No further site characterization or remedial action is recommended under CERCLA for IR Site 4 under current conditions. PAH concentrations in subsurface soil are within background ranges published by ATSDR, risk to human health is within the NCP acceptable range, and no complete pathways were identified linking ecological receptors with COPECs. Most surface TBM was encapsulated by shotcrete in the early 1990s and is not bio available. The remaining TBM is relatively immobile, based on previous SPLP results and the results of this investigation.

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APPENDIX E

IDW DISPOSAL FORMS