**DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATIONS**

**RCRA Corrective Action**
**Environmental Indicator (EI) RCRIS code (CA725)**
**Current Human Exposures Under Control**

**Facility Name:** **Naval Station Roosevelt Roads**
**Facility Address:** **Ceiba, Puerto Rico**
**Facility EPA ID#:** **PR2170027203**

## Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EIs) are measures being used by the Resource Conservation Recovery Act (RCRA) Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved) to track changes in the quality of the environment. The two EIs developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

## Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no unacceptable human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can reasonably be expected under current land- and groundwater-use conditions (for all contamination subject to RCRA corrective action at or from the identified facility [i.e., site-wide]).

## Relationship of EI to Final Remedies

While final remedies remain the long-term objective of the RCRA Corrective Action program the EIs are near-term objectives that are currently being used as program measures for the Government Performance and Results Act of 1993, (GPRA). The "Current Human Exposures Under Control" EI is for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and does not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

## Duration / Applicability of EI Determinations

EI determination status codes should remain in the Resource Conservation and Recovery Information System (RCRIS) national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

**Facility Information**

U.S. Naval Station Roosevelt Roads (NSRR) occupies approximately 8,627 acres and is located on the east coast of the island of Puerto Rico in the municipality of Ceiba, approximately 33 miles southeast of San Juan. NSRR is bordered on all sides except the west by the Caribbean Sea. Ceiba (population approximately 17,000) adjoins the west boundary of NSRR. The closest large town is Fajardo (population approximately 37,000), which is about 10 miles north of NSRR off Route 3. NSRR is adjacent to Vieques Passage, and Vieques Island is approximately 10 miles east of the NSRR eastern boundary (i.e., coastline).

NSRR was commissioned in 1943 as a Naval Operations Base and redesignated as a Naval Station in 1957. The primary mission of NSRR is provision of full support for Atlantic Fleet weapons training and development activities. NSRR provides services and materials to support units of the Operating Forces within the Caribbean and the Chief of Naval Operations.

The facility is an active U.S. military base, that has a major security fence around its entire land perimeter. Access to the facility is strictly controlled 24 hours a day, 365 days a year. So, exposure to the SWMUS and/or AOCs by trespassers is precluded. Both on-site military and civilian employees and residents are present at the facility; however, all SWMUs and AOCs, except for two (SWMU 18 and SWMU 54) are located far from the residential areas of the facility, which are in the southwestern portion of the base. For on-site military and civilian or contractor employees and residents, access to the SWMUs and/or AOCS is controlled by the facility's Land Use Plan and other administrative controls. Also, certain SWMUs and AOCs have physical controls such as fencing and/or signage. For workers who are authorized to be present at SWMUs and/or AOCs, applicable base Safety Manuals and/or Operating protocols, which are discussed further under Questions 2 and 4, restrict potential exposures.

NSRR generates approximately 400,000 pounds of hazardous waste per year from operation and maintenance of aircraft, watercraft, and land vehicles. Generated hazardous waste include solvents, corrosives, paint waste, petroleum/oil/lubricants (POLs), and various chemical products. NSRR operates several greater than 90 day hazardous waste storage units, and is therefore a hazardous waste management storage facility under RCRA, and subject to RCRA permitting and corrective action requirements. EPA Region 2 issued a Final RCRA Part B Permit (PR2170027203) to NSRR on October 24, 1994, which was effective November 28, 1994. This permit contains requirements for RCRA Facility Investigation (RFI) activities at 24 solid waste management units (SWMUs) and three areas of concern (AOCs). NSRR submitted a renewal RCRA Part B Permit Application on June 10, 1999, and EPA is currently revising Module III of the permit.

The NSRR site is being addressed under the RCRA Corrective Action Program with EPA Region 2 as the lead agency. In conjunction with EPA, the Puerto Rico Environmental Quality Board (PREQB) is also involved in the decision making process and oversight. A RCRA Facility Assessment (RFA) was conducted in 1988 and included a preliminary review and visual site inspection (PR/VSI) of the site. A follow-up VSI was conducted in June 1993 as a component of RCRA Part B Permit development. Based on the VSIs, 52 SWMUs and four AOCs were identified. The 1994 Final RCRA Part B Permit (permit) required a full RFI for eight SWMUs and one AOC (SWMU 1, SWMU 2, SWMU 3, SWMU 7/8, SWMU 9, SWMU 11/45, and AOC B). In addition, the permit required additional investigation at 16 SWMUs and two AOCs (SWMU 6, SWMU 10, SWMU 12, SWMU 13, SWMU 14, SWMU 23, SWMU 24, SWMU 25, SWMU 26, SWMU 30, SWMU 31/32, SWMU 37, SWMU 39, SWMU 46, SWMU 51, AOC C, and AOC D) to confirm whether suspected release(s) occurred. RFI activities were initiated at NSRR in 1995 and subsequently, the results of the RFI have been presented in various reports submitted

to EPA. A brief discussion of previous investigation(s) and current status will be provided in SWMU/AOC descriptions in Question 1.

Groundwater is not used as a drinking water or potable water source at the site. For over 30 years, the Site has obtained drinking and potable water from a water treatment plant that receives raw water from the Rio Blanco. In addition, pump tests conducted in two wells at the site in 1999 indicated an aggregate yield of approximately 99 gallons per day, which is below the yield of aquifers considered for potable use. The Caribbean Sea borders the site on all downgradient sides; thus, groundwater is not used as a drinking water or potable water source downgradient of the site.

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from solid waste management units (SWMU), regulated units (RU), and areas of concern (AOC)), been **considered** in this EI determination?

   _X_ If yes - check here and continue with #2 below.

   ____ If no - re-evaluate existing data, or

   ____ If data are not available skip to #6 and enter IN (more information needed) status code

**Summary of SWMUs and AOCs**: As previously stated, the 1994 Final RCRA Part B Permit (permit) (Ref. 1) required RFI activities at 24 SWMUs and three AOCs. Conversely, the permit did not require RFI activities at the following SWMUs and AOC: SWMU 4, SWMU 5, SWMU 15 through SWMU 22, SWMU 27 through SWMU 29, SWMU 33 through SWMU 36, SWMU 38, SWMU 40 through SWMU 44, SWMU 47 through SWMU50, SWMU 52, and AOC A. Thus, the aforementioned SWMUs and AOC will not be discussed further in the CA725 EI determination. NSRR grouped SWMUs and AOCs into various operational units (OUs) based on the nature of the wastes managed, waste management techniques, location, and investigation approach (Refs. 2, 3). This grouping resulted in seven OUs (OU 1 through OU 7). The following SWMUs and AOC are associated with OU 1: SWMU 6, SWMU 10, SWMU 12, SWMU 13, SWMU 23 through SWMU 26, SWMU 30, SWMU 31, SWMU 32, SWMU 37, SWMU 39, SWMU 46, SWMU 51, and AOC C. OU 2 consists of SWMU 7 through SWMU 9. OU 3 includes SWMU 1 and SWMU 2. OU 4 is comprised solely of SWMU 3. SWMU 11 and SWMU 45 are in OU 5. OU 6 and OU7 contain AOC B and AOC D, respectively (Ref. 2). Subsequent to the Phase I and Phase II RFI activities at SWMU 26, EPA approved a no further action determination for this SWMU in a letter dated October 27, 1999. The locations of the SWMU/AOCs investigated in RFI activities are shown in Figure 2-1, which is from the Final CMS Final Report for SWMU 6/AOC B (Ref. 17), and discussed below.

It should be noted that under the EPA approved September 1995 RFI Work Plan, for 15 SWMUs and two AOCs, where a Phase I RFI was required under the permit, only the surface and possibly subsurface soils were investigated, in order to determine whether or not a release of hazardous constituents occurred. If no releases to soil were detected, no further investigation was required (including groundwater) as it was presumed that any release to groundwater would have also impacted the soil. Therefore, the absence of evidence of release to the soil was taken as presumptive evidence that groundwater was also not impacted at SWMU 12, SWMU 13, SWMU 23, SWMU 24, SWMU 37, and SWMU 39. Although surface soil contamination has been detected at SWMU 31/32, SWMU 46, SWMU 53, and AOC C, groundwater has not been investigation, to date, because there is currently no evidence that contaminants have impacted subsurface soil and subsequently groundwater. In addition, the waste management activities at these SWMUs occur above ground, in concrete or paved areas, which makes subsurface soil and groundwater contamination less likely to be complete transport pathway. For SWMU 25, which is an active RCRA permitted unit, addition investigation (including groundwater) has been postponed until closure of the unit.

**SWMU 1, Army Cremator Disposal Site:** SWMU 1 is located east of the Navy Lodge and is bounded to the north by Kearsage Road, mangroves and Ensenada Honda to the east and south, and the Navy Lodge and Bowling Alley to the west. SWMU 1 was in operation from the 1940s to the 1960s and consists of an abandoned, unlined landfill. An estimated 100,000 tons of waste including scrap metal, inert ordnance, batteries, tires, appliances, cars, cables, dry cleaning solvent cans, paint cans, gas cylinders, construction debris, dead animals, and residential waste

were disposed of at this unit (Ref. 5). Prior to the Phase I RFI, a Supplemental Investigation (SI) was performed and consisted of a geophysical investigation (electromagnetic terrain profiling and magnotometry) and collection of 17 soil samples and one groundwater sample. Phase I RFI activities were conducted in 1996 through 1997 and included collecting 15 surface soil samples, 16 subsurface soil samples, nine groundwater samples, three surface water samples, and three sediment samples. No contaminants were detected in surface soil or subsurface soil above the EPA Region 3 industrial risk-based concentrations (RBCs). Arsenic was detected in sediment collected from mangroves and Ensenada Honda at SWMU 1 exceeding the EPA Region 3 industrial RBCs. Semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), herbicides, dioxins/furans, and metals were detected in groundwater above Federal Maximum Contaminant Levels (MCLs) or Region 3 tap water RBCs. Metals were detected in surface water collected from mangroves at SWMU 1 above Federal MCLs and/or Federal Ambient Water Quality Criteria (FAWQC). The RFI report was submitted on April 1, 1999 (Ref. 5), and approved by EPA on September 28, 1999 (Ref. 6). Subsequently, a Revised Final II CMS Work Plan for SWMUs 1 and 2 was submitted to EPA on July 14, 2000 (Ref. 11), approved by EPA in December 2001, and is currently being implemented by NSRR.

**SWMU 2, Langley Drive Disposal Site:** SWMU 2 is located along Langley Drive approximately 2,000 feet northeast of the Navy Exchange and adjacent to mangroves. This SWMU consists of an abandoned, unlined landfill that was operational from 1939 to 1959. SWMU 2 is believed to have been used for the disposal of hazardous and nonhazardous wastes. Prior to the Phase I RFI, an SI was performed and 16 soil samples and one groundwater sample were collected. Phase I RFI activities were conducted in 1996 and included collecting eight surface soil samples, four subsurface soil samples, three groundwater samples, and three sediment samples. Metals were detected in surface soil and subsurface soil above EPA Region 3 industrial RBCs. In addition, benzo(a)pyrene and arsenic were detected in sediment collected from mangroves or Ensenada Honda adjacent to SWMU 2 above the EPA Region 3 industrial RBC. VOCs, pesticides, and metals were detected in groundwater above Federal MCLs or Region 3 tap water RBCs. SVOCs and metals were detected in surface water collected from mangroves at SWMU 2 above Federal MCLs and/or FAWQC (Ref. 5). The RFI report was approved by EPA on September 28, 1999 (Ref. 6). Subsequently, a Revised Final II CMS Work Plan for SWMUs 1 and 2 was submitted to EPA on July 14, 2000, approved by EPA in December 2001, and is currently being implemented by NSRR.

**SWMU 3, Base Landfill**: This SWMU is located south of the Forrestal Wastewater Treatment Plant (Building 1758) and Former Incinerator Area (SWMU 30) and is currently an active landfill that has been in operation since the 1960s. The landfill covers approximately 85 acres and was separated into several disposal areas. A new vertical cell of two acres was finished in March 1999 at the Base Landfill, and was placed into operation in June 2000 in accordance with the PREQB Solid Waste Management regulations. The design of the new cell included a two-foot clay liner, and a run-on/runoff collection pond. RFI activities were conducted at SWMU 3 in 2002 and included collecting 17 sediment samples from Puerca Bay or Ensenada Honda and nine groundwater samples. It should be noted that because this is an active landfill, soil investigations were not conducted during the RFI and are expected to be delayed until closure of the landfill. Although the nature and extent of soil contamination at SWMU 3 has not been currently defined, institutional and engineering controls (e.g., use of personal protective equipment) have been implemented at this unit to mitigate or minimize exposure to potentially contaminated soil. Therefore, exposure to potentially contaminated soil is not currently expected to be of concern. SVOCs and metals were detected in groundwater above Federal MCLs or EPA Region 3 tap water RBCs (Ref. 20). Dioxins/furans and metals were detected in sediment above EPA Region 3

industrial and residential RBCs. The Revised Final RFI report was submitted to EPA on March 18, 2003 (Ref. 20), and will become final pending EPA review and comment.

**SWMU 6, Building 145 and AOC B, Building 25**: SWMU 6 and AOC B are adjacent to each other in a limited access area of NSRR at the northeast section of Ensenada Honda. SWMU 6 consists of Building 145, which is a partially subterranean concrete bunker, and AOC B primarily consists of remnants of former Building 25. Drums and other containers were formerly stored in Building 145 since 1957. Phase I and Phase II RFI activities were conducted in 1996 and 1997, respectively, and 14 surface soil samples, 16 subsurface soil samples, three groundwater samples, and one standing surface water sample were collected. Dioxins/furans, metals, pesticides, and SVOCs were detected in surface soil above EPA Region 3 industrial RBCs. Metals were detected in groundwater above Federal MCLs or EPA Region 3 tap water RBCs. Metals, pesticides, and SVOCs were detected in surface water above Federal MCLs and/or EPA Region 3 tap water RBCs (Refs. 3, 4). Risks to on-site workers were evaluated and shown to be within acceptable limits. A focused Final CMS Report was submitted for this SWMU in June 21, 2001 (Ref. 17). No further action was recommended in the CMS report; EPA approval is pending.

**SWMU 7/8, Tow Way Fuel Farm (TWFF)**: SWMU 7/8 is located along Forrestal Road north of the Ensenada Honda. SWMU 7 currently consists of seven underground storage tanks (USTs) for storage of diesel fuel marine (DFM) and jet fuel (JP-5). SWMU 8 consists of suspected excavated sludge pits adjacent to the tanks formerly used during tank cleaning operations (a common industry practice). Numerous environmental investigations have been performed at TWFF since the 1980s and investigations post-permit include: a Multi-Stage Product Recovery Test Report (1996), Closure Report for Tank 56A/B (1996), Project Close-Out Report Interim Corrective Measure Free Product Recovery System (1997), Corrective Measures Study Investigation (1998), Additional Data Collection Investigation (2002), and the Trichloroethene (TCE) Plume Delineation and Source Investigation Work Plan (2003). Both soil and groundwater at SWMU 7 have been impacted by release from USTs and free product is also present in the subsurface. A free product recovery system was installed in 1997 as an interim corrective measure (ICM) and approximately 1,722 gallons of free product was recovered from March 1997 through April 2002 (Ref. 21). Metals, SVOCs, and VOCs were detected in groundwater above Federal MCLs or EPA Region 3 tap water RBCs. Metals and SVOCs were detected in surface soil at SWMU 7/8 and sediment collected from Ensenada Honda (adjacent to SWMU 7/8) above EPA Region 3 industrial RBCs. In addition, metals and SVOCs were detected in surface water collected from Ensenada Honda (adjacent to SWMU 7/8) above EPA Region 3 tap water RBCs and/or FAWQC. A Final CMS Task 1 Report (Ref. 21) was submitted to EPA on April 22, 2003, and is currently undergoing revision based on EPA comments.

**SWMU 9, Tanks 212-217 Sludge Disposal Pits*:*** SWMU 9 consists of six USTs (Tanks 212 - 217), installed in 1948, and associated unlined earthen pits with sludges from the tank bottoms. The SWMU was divided into three areas (A, B, anc C): Area A includes Tanks 212 and 213, Area B includes Tanks 214 and 215, and Area C includes Tanks 216 and 217. Areas A and B are located north of Forrestal Drive along Manila Bay Street. Area C is approximately 4,000 feet southeast of Area A and B. Tanks 212 and 213 are still in service for diesel fuel and unleaded gasoline, respectively, but the remaining tanks are not currently utilized. The RFI at SWMU 9 was conducted in three phases of investigation: Phase I was conducted in 1996, Phase II in 1997, and Phase III in 1999 (Refs. 3, 4, and 9). A total of ten surface soil, 54 subsurface soil, 51 groundwater (31 of which 31 samples analyzed at on-site laboratory), six sediment, and six surface water samples were collected during the RFI. Additional data was collected in 2000 as part of the CMS investigation and included 16 sediment samples, 3 surface soil samples, and 16 surface water samples. Metals, SVOCs, and VOCs were detected in groundwater above Federal

MCLs or EPA Region 3 tap water RBCs. Metals were detected in surface and subsurface soil above EPA Region 3 industrial RBCs. Metals and SVOCs were detected in sediment collected from mangroves at SWMU 9 above EPA Region 3 industrial RBCs. Metals were detected in surface water collected from mangroves or Ensenada Honda SWMU 9 above Federal MCLs and/or FAWQC. A final CMS Investigation Report and Additional Data Investigation Work Plan was submitted to EPA on April 25, 2003 (Ref. 22), and was approved on June 3, 2003 (Ref. 23).

**SWMU 10, Substation 2/Building 90**: SWMU 10 is located near the intersection of Forrestal Drive and Valley Forge Road. This area was formerly used to repair electrical transformers and PCB-containing transformer oil may have been poured on the ground. A Remedial Investigation/Feasibility Study (RI/FS) was conducted in 1992 and indicated that surface soil was contaminated with PCBs. Soil at SWMU 10 was remediated during the ICM implemented in 1995. Approximately 235 cubic yards of surface soil (excavated to one foot below ground surface (bgs)) and subsurface soil (excavated from hot spot locations) were removed during excavation activities. Confirmation sampling indicated that the residual concentrations are below the Toxic Substance and Control Act (TSCA) cleanup level (10 ppm) (Refs. 3, 18).

Phase I and Phase II RFI activities were conducted for groundwater at SWMU 10 due the potential of PCBs migrating from soil to groundwater (Refs. 3, 4). A total of six groundwater samples were collected during Phase I and Phase II RFI activities. No PCBs were detected in groundwater at SWMU 10. However, methylene chloride, chloroform, and acetophenone were detected in groundwater above the Federal MCLs and/or tap water RBC during Phase I RFI. No SVOCs or VOCs were detected in groundwater during the Phase II RFI. Since SVOCs and VOCs were not associated with a release or waste management activities at SWMU 10, no further action was recommended for groundwater at this SWMU in the Draft CMS Investigation Report (Ref. 18), which is pending review and approval by EPA. Thus, groundwater at SWMU 10 will not be discussed further in the CA725.

**SWMU 11/45, Building 38:** SWMU 11 is located along a dirt access road south of Forrestal Road and north of SWMU 3. SWMU 11 consists of the interior of Building 38, the "Old Power Plant," which was operational in the 1940s, and was previously a TSCA-regulated PCB storage area. SWMU 45 includes the area surrounding Building 38 as well as a cooling water tunnel extending from Building 38 to Puerca Bay. Two former 50,000-gallon Bunker C Fuel USTs were located adjacent to the building. An RI/FS was performed in 1992 and determined that concrete surfaces and soil surrounding Building 38 as well as sediments from Puerca Bay were contaminated with PCBs. An ICM for impacted soil was performed in 1994 and included excavation of the contaminated soil and confirmation sampling to ensure that the cleanup goals (TSCA level of 10 ppm) were achieved. In 1996, the cooling water tunnel was decommissioned and sealed as an ICM to address the reported discharges from the cooling water tunnels to the bay. Phase I RFI activities (Ref. 3), initiated in 1996, included collecting four surface soil samples, eight subsurface soil samples, nine sediment samples, eight groundwater samples, and 125 wipe samples from Building 38's floors and walls. Metals were detected in subsurface soil above EPA Region 3 industrial RBCs. SVOCs were detected in sediment above EPA Region 3 industrial and residential RBCs (Ref. 5). PBCs, SVOCs, and metals were detected in groundwater above Federal MCLs or EPA Region 3 tap water RBCs. Aroclor-1260 was detected in wipe samples at concentrations ranging from 0.22 µg/l (11WS091) to 330,000 µg/l (11WS041). However, subsequent to sample collection, a fire occurred within Building 38. Due to the fire, the wipe sampling results were deemed unusable. Thus, SWMU 11 requires recharacterization for PCBs and dioxins/furans, which are combustion products of PCBs. A Final Recharacterization Work Plan was submitted to EPA on July 21, 2003 (Ref. 23), but has not yet been approved by EPA.

**SWMU 12, Fire Training Area Oil/Water Separator**: SWMU 12 is located north of the base airfield and adjacent to SWMU 14. SWMU consists of a oil/water separator that is utilized for recycling oil used during fire training activities. Four surface soil samples were collected and analyzed at this SWMU during Phase I RFI activities conducted in 1996 (Ref. 3). No contaminants were detected in surface soil above industrial RBCs. Gasoline range organics (GRO) were detected in two soil samples; however, the GRO concentrations fell below the PREQB guideline standard of 100 mg/kg. No further action was recommended for SWMU 12 in the RFI report and EPA approval is pending.

**SWMU 13, Old Pest Control Shop:** SWMU 13 is located adjacent to Forrestal Drive and includes the former Old Pest Control Shop (Building 258), surrounding area, and drainage ditch behind Building 258. Building 258 was used from the 1950s through 1983 for storage of pesticides and was demolished in 1988 subsequent to major hurricane damage. Phase I and Phase II RFI activities (Refs. 3, 4) were conducted in 1996 and 1997, respectively, and a total of nine surface soil samples and 16 sediment samples were collected during the RFI. No contaminants were detected in surface soil above EPA Region 3 industrial RBCs. Pesticides were detected in sediment collected from the drainage ditch above EPA Region 3 RBCs. A CMS report was submitted to EPA on August 4, 2000 (Ref. 12), and was approved by EPA on September 15, 2000. The proposed remedy for SWMU 13 is excavation of drainage ditch sediments and implementation is pending public comment. No unacceptable human exposures currently are posed, based on the facility following operating procedures specified in the bases's Safety Manual for Base Operations and Service Contractors and/or Chapter 3 (Security, Safety, and Fire Prevention) of the Maintenance Manual - Fuels Division, U.S. Naval Station Roosevelt Roads, [copies of both were submitted to EPA in support of this evaluation by Lt. M. Lewis' letter dated June 23, 2003].

**SWMU 14, Fire Training Pit Area**: SWMU 14 is located adjacent to the NSRR airfield and currently consists of a lined pit used for fire training activities. Prior to construction of the lined pit in 1983, two unlined pits were used for fire training activities. These two pits were operational from the 1960s until 1983. Five surface soil samples were collected from SWMU 14 during Phase I RFI activities conducted in 1996 (Ref. 3). SVOCs were detected in surface soil above industrial RBCs. NSRR requested that additional investigation be suspended until the SWMU is ready for closure (Ref. 13). Thus, no subsurface soil or groundwater data is available for this SWMU. EPA approved this request in a letter dated May 4, 2001 (Ref. 16); thus, an RFI will be required once fire training activities have ceased. Although the nature and extent of contamination at SWMU 14 have not been defined, institutional and engineering controls (e.g., use of personal protective equipment) have been implemented at this unit to mitigate or minimize exposure to potentially contaminated subsurface soil and groundwater. Therefore, exposure to potentially contaminated media are not currently expected to be of concern.

**SWMU 23, Oil Spill Separator Tanks:** SWMU 23 is located approximately 100 feet inshore from the fuel pier and consists of three oil spill separator tanks for processing waste pumped from the Ships Waste Off-Load Barges (SWOBs). The separated oil subsequently is transferred to the Oil Spill Oil/Water Separator (SWMU 24). Two surface soil samples were collected during Phase I RFI activities conducted in 1996 (Ref. 3). No contaminants were detected above EPA Region 3 industrial RBCs. No further action was recommended for SWMU 23 in the RFI report and is pending EPA approval.

**SWMU 24, Oil Spill Oil/Water Separator:** SWMU 24 is located just west of SWMU 23 and consists of an oil/water separator with a concrete structure built below ground with a steel grating

covering the top at ground level. The oil/water separator receives discharge from SWMU 23 and has approximately a 1,500 gallon capacity. One surface soil sample was collected during Phase I RFI activities in 1996 and no contaminants were detected above EPA Region 3 industrial RBCs (Ref. 3). No further action was recommended for SWMU 24 in the RFI report and is pending EPA approval.

**SWMU 25, DRMO Storage Yard:** SWMU 25 is located adjacent to the flammable materials storage building (Building 2009). SWMU 25 includes the Defense Reutilization and Marketing Office (DRMO) facility, which consists of an administrative/hazardous waste storage building, a large metal building used for waste storage, a flammable material storage building, some storage racks, and a large fenced area where surplus material is stored. Nine surface soil samples at SWMU 25 and one sediment sample from a surface drainage ditch at SWMU 25 were collected during Phase I RFI activities conducted in 1996 (Ref. 3). No contaminants were detected above EPA Region 3 industrial RBCs and no further action was recommended in the RFI report. However, since this RCRA-regulated hazardous waste container storage area is still active, an RFI will be required upon cessation of operations in this area. Although the nature and extent of contamination at SWMU 25 have not been been defined, institutional and engineering controls (e.g., use of personal protective equipment) have been implemented at this unit to mitigate or minimize exposure to potentially contaminated media. Therefore, exposure to potentially contaminated media are not currently expected to be of concern.

**SWMU 30, Former Incinerator**: SWMU 30 is located adjacent to the Sanitary Sewage Treatment Plant and consists of former incinerator which was original installed in 1973. In 1983, this incinerator was dismantled and replaced. Reportedly, the new incinerator has not been utilized. Classified material, contaminated diesel oil, JP-5 fuel (usually mixed with some lube oil), solvents, and sludge residue were reportedly burned in the original incinerator. A former 550-gallon diesel fuel UST was associated with the original incinerator. No free product was encountered during decommissioning of the UST in 1993. However, residual petroleum contamination was subsequently detected in subsurface soil during an investigation performed in 1994. Nineteen subsurface soil samples and five groundwater samples were collected during the 1994 investigation and no contaminants were detected above relevant screening criteria (EPA Region 3 industrial soil RBCs, Federal MCLs and/or EPA Region 3 tap water RBCs). Phase I and Phase II RFI activities were conducted in 1995 and 1999, respectively, and included 11 surface soil samples, 19 subsurface soil samples, and two groundwater samples. PCBs were detected in subsurface soil above EPA Region 3 industrial RBCs and metals were detected in groundwater above Federal MCLs or EPA Region 3 tap water RBCs during the RFI (Ref. 8). No further action was recommended in the Final Phase II RFI Report for SWMU 30 because it is isolated and very small in area (Ref. 8), and EPA approval is pending.

**SWMU 31/32, Waste Oil Collection Area and Battery Collection Area**: SWMU 31/32 is located in the Public Works Department Operation Yard, near the Transportation Shop (Building 31). SWMU 31 consists of an outdoor area, with a curbed concrete storage pad used for temporary storage of waste oil. SWMU 32 is an outdoor area where discarded batteries were formerly stored but is currently used to store heavy equipment. Phase I and Phase II RFI activities and CMS investigation were conducted at SWMU 31/32 in 1995, 1997, and 1999, respectively (Refs. 3, 4, and 10). A total of 30 surface soil samples were collected during the RFI and CMS investigation. Dioxins and furans were detected in surface soil during the RFI and CMS investigation. The 1999 congener-specific data were converted to 2,3,7,8-tetrachlorodibenzodioxin (TCDD) toxicity equivalent (TEQ) concentrations and screened against Agency for Toxic Substance and Disease Registry (ASTDR) interim criteria of 50 parts per trillion (ppt) in the final CMS report. TEQ concentrations were detected above the ASTDR

interim criteria and industrial RBC for TCDD. A Final Basis of Design Corrective Measures Implementation (CMI) Work Plan for SWMU 31/32 was submitted to EPA on January 25, 2001 (Ref. 15) and approved by EPA on May 4, 2001 (Ref. 16). The planned remedy for these SWMUs are to install an asphalt cap and implement institutional controls; however, execution of this remedy is pending public comment. No unacceptable human exposures currently are posed, based on the facility following operating procedures specified in the bases's Safety Manual for Base Operations and Service Contractors and/or Chapter 3 (Security, Safety, and Fire Prevention) of the Maintenance Manual - Fuels Division, U.S. Naval Station Roosevelt Roads, [copies of both were submitted to EPA in support of this evaluation by Lt. M. Lewis' letter dated June 23, 2003].

**SWMU 37, Waste Oil Storage Area/Building 200**: SWMU 37 is located north of Building 200 and consists of a covered concrete pad used for drum storage. Phase I RFI activities were conducted in 1995 and included collecting four surface soil samples. SVOCs were detected in surface soil above EPA Region 3 industrial RBCs (Ref. 3). Risks to on-site workers were evaluated and shown to be within acceptable limits. No further action was recommended in the RFI report and is pending EPA approval.

**SWMU 39, Former Battery Drain Area/Building 3158**: SWMU 39 is located adjacent to Building 3158, formerly used for battery storage, and consisted of a covered battery drainage area. Battery contents were poured into the drain tank and the battery acid was caught below in a container. Two surface soil samples were collected during Phase I RFI activities conducted in 1995. No contaminants were detected in surface soil above EPA Region 3 industrial RBCs (Ref. 3). No further action was recommended in the 1996 RFI Report and is pending EPA approval.

**SWMU 46, Pole Storage Yard Covered Pad**: SWMU 46 is located adjacent to AOC C behind Buildings 2326 and 2042 and was historically used as a storage area for transformers and 55-gallon drums of PCB-contaminated material. SWMU 46 consists of two covered concrete pads surrounded by a chain link fence, presently used for less than 90 day hazardous waste storage/accumulating facilities for base operations. Phase I and Phase II RFI activities (Refs. 3, 4) conducted in 1995 and 1997, respectively, included collecting 27 surface soil samples and 13 subsurface soil samples. SVOCs, PCBs, and metals were detected in surface soil above EPA Region 3 industrial RBCs. No contaminants were detected in subsurface soil above EPA Region 3 industrial RBCs. A 100 Percent Basis of Design CMI Work Plan for SWMU 46 was submitted to EPA on January 25, 2001 (Ref. 15), and approved by EPA on May 5, 2001 (Ref. 16). The planned remedy for this SWMUs is to excavate contaminated surface soil; however, execution of this remedy is pending public comment. No unacceptable human exposures currently are posed, based on the facility following operating procedures specified in the bases's Safety Manual for Base Operations and Service Contractors and/or Chapter 3 (Security, Safety, and Fire Prevention) of the Maintenance Manual - Fuels Division, U.S. Naval Station Roosevelt Roads, [copies of both were submitted to EPA in support of this evaluation by Lt. M. Lewis' letter dated June 23, 2003].

**SWMU 51, New AIMD Storage Pad/Building 379:** SWMU 51 is located adjacent to Building 379. This SWMU is utilized by Aircraft Intermediate Maintenance Detachment (AIMD) facilities and consists of a concrete storage pad and a 200-gallon aboveground storage tank (AST). The storage pad is covered, enclosed with a cyclone fence, and surrounded by asphalt. Phase I RFI activities were conducted in 1995 and included collecting five surface soil samples (Ref. 3). No contaminants were detected in surface soil samples above EPA Region 3 industrial RBCs. No further action was recommended in the RFI report (Ref. 3) and is pending EPA approval.

**SWMU 53, Building 64 (Malaria Control Building)**: SWMU 53 is located approximately 200 feet from Forrestal Drive and consists of Building 64 (Malaria Control Building). This building

was built in 1942 and condemned in 1980. The building remains intact but is currently unoccupied. Phase I and Phase II RFI activities were conducted in 2000 and 2002 and included collecting 15 surface soil and 14 subsurface soil samples. Metals were detected in surface soil above EPA Region 3 industrial RBCs. No contaminants were detected in subsurface soil above EPA Region 3 industrial RBCs. A Final CMS Work Plan for SWMUs 53 and 54 (Ref. 19) was submitted to EPA on March 7, 2003, and approved on June 3, 2003 (Ref. 24). A Draft CMS Investigation Report and Final CMS Report were submitted to EPA on July 23, 2003, and are currently undergoing EPA review and comment (Refs. 24, 25). No unacceptable human exposures currently are posed, based on the facility following operating procedures specified in the bases's Safety Manual for Base Operations and Service Contractors and/or Chapter 3 (Security, Safety, and Fire Prevention) of the Maintenance Manual - Fuels Division, U.S. Naval Station Roosevelt Roads, [copies of both were submitted to EPA in support of this evaluation by Lt. M. Lewis' letter dated June 23, 2003].

**SWMU 54, Building 1914 (Former NEX Repair/Maintenance Shop)***:* SWMU 54 is located north-northeast across Bairoko Street from SWMU 26 and west across Bairoko Street from Building1686 (Former Base Laundromat) and consists of Building 1914. Building 1914 was built in 1979 and is currently unoccupied. The building was used to perform maintenance on vehicles (e.g., oil changes, lubrications). Site 510 is also included in this SWMU and was the location of a former 4,000-gallon UST, south of Building 1914. The date of installation and the type of fuel stored is unknown (assumed to be gasoline), but it was decommissioned in 1992. Phase I and Phase II RFI activities were conducted in 2000 and 2002 and included collecting 26 groundwater samples, three surface soil, and four subsurface soil samples. No contaminants were detected in surface soil or subsurface soil above EPA Region 3 industrial RBCs. However, 1,1-dichloroethene, 1,2-dichloroethane, benzene, chloroform, ethylbenzene, isobutanol, toluene, trichloroethene, xylene, 2-methylnaphthalene, and naphthalene were detected in groundwater above Federal MCLs or EPA Region 3 tap water RBCs. A Final CMS Work Plan for SWMUs 53 and 54 (Ref. 19) was submitted to EPA on March 7, 2003, and approved on June 3, 2003 (Ref. 24). A Draft CMS Investigation Report and Final CMS Report were submitted to EPA on July 23, 2003, and are currently undergoing EPA review and comment (Refs. 24, 25).

**AOC C, Discarded transformer and electrical equipment accumulation area:** AOC C is south of SWMU 46 behind Buildings 2326 and 2042. AOC C currently consists of three raised concrete pads with curbing, which formerly stored transformers and other miscellaneous electric equipment. RFI activities conducted in 1997 included collecting 27 surface soil samples and 14 subsurface soil samples (Ref. 4). SVOCs, PCBs, and metals were detected in surface soil above EPA Region 3 industrial RBCs. A 100 Percent Basis of Design CMI Work Plan for AOC C was submitted to EPA on January 25, 2001 (Ref. 15), and approved by EPA on May 5, 2001 (Ref. 16). The planned remedy for this AOC is to excavate contaminated surface soil; however, execution of this remedy is pending public comment.

**AOC D, Ensenada Honda Sediments**: AOC D consists of Ensenada Honda sediment that are believed to have been impacted due to releases from SWMU 1, SWMU 2, SWMU 3, and SWMU 7/8, which are along the shoreline of Ensenada Honda. The exact contaminant transport pathway has not been defined; however, evidence suggests that contaminated surface runoff from SWMU 1, SWMU 2, SWMU 3, and SWMU 7/8 is the most likely contaminant transport pathway, versus discharge of contaminated groundwater from those SWMUs to the surface (as discussed in Question 5 of the CA750 EI). The available sediment data will be discussed on a SWMU-specific basis in the following questions, AOC D will not be carried through the CA725 EI determination.

**References:**

1. Final RCRA Part B Permit PR2170027203. Prepared by EPA. Dated October 20, 1994.
2. Final RCRA Facility Investigation Workplan. Prepared by Baker Environmental, Inc. Dated September 14, 1995.
3. Draft RCRA Facility Investigation Report for Phase I Investigations at Operable Units 1, 6, and 7. Prepared by Baker Environmental, Inc. Dated July 1, 1996.
4. Draft Additional Investigations Report for Operable Units 1, 6, and 7. Prepared by Baker Environmental, Inc. Dated May 6, 1998.
5. Revised Draft RCRA Facility Investigation Report for Operable Unit 3/5. Prepared by Baker Environmental, Inc. Dated April 1, 1999.
6. Letter from Nicoletta DiForte, USEPA, to Paul Rakowski, NSRR, re: Revised Draft RCRA Facility Investigation Report for Operable Unit 3/5. Dated September 28, 1999.
7. Letter from Nicoletta DiForte, USEPA, to Paul Rakowski, NSRR, re: SWMU 26 Revised Risk Assessment. Dated October 27, 1999.
8. Final Phase II RCRA Facility Investigation Report for SWMU 30. Prepared by Baker Environmental, Inc. Dated February 15, 2000.
9. Revised Draft RCRA Facility Investigation Report for SWMU 9. Prepared by Baker Environmental, Inc. Dated March 10, 2000.
10. Final Corrective Measure Study Report for SWMU 31/32. Prepared by Baker Environmental, Inc. Dated April 17, 2000.
11. Revised Final II CMS Work Plan for SWMUs 1 and 2. Prepared by Baker Environmental, Inc. Dated July 14, 2000.
12. Revised Final II CMS Final Report for SWMU 13 and SWMU 46/AOC C. Prepared by Baker Environmental, Inc. Dated August 4, 2000.
13. Draft Interim Decision Document for SWMU 14. Prepared by Baker Environmental, Inc. Dated November 22, 2000.
14. Final Basis of Design Corrective Measures Implementation Work Plan for SWMU 31/32. Prepared by Baker Environmental, Inc. Dated January 25, 2001.
15. 100% Basis of Design Corrective Measures Implementation Work Plan for SWMUs 13 and 46/AOC C. Prepared by Baker Environmental, Inc. Dated January 25, 2001.
16. Letter from Raymond Basso, USEPA, to Christopher Penny, NSRR, re: Naval Station Roosevelt Roads - EPA I.D. PRD2170027203. Dated May 4, 2001.
17. Final Corrective Measures Study Final Report SWMU 6/AOC B. Prepared by Baker Environmental, Inc. Dated June 21, 2001.
18. Draft Corrective Measures Study Investigation Report for SWMU 10. Prepared by Baker Environmental, Inc. Dated July 6, 2001.
19. Final CMS Work Plan for SWMUs 53 and 54. Prepared by Baker Environmental, Inc. Dated March 7, 2003.
20. Revised Final RCRA Facility Investigation for SWMU 3. Prepared by Baker Environmental, Inc. Dated March 18, 2003.
21. Final Corrective Measure Study Task 1 Report for Tow Way Fuel Farm. Prepared by Baker Environmental, Inc. Dated April 22, 2003.
22. Final Corrective Measure Study Investigation Report for SWMU 9. Prepared by Baker Environmental, Inc. Dated April 25, 2003.
23. Final Recharacterization Work Plan for SWMU 11. Prepared by Baker Environmental, Inc. Dated July 21, 2003.
24. Draft CMS Investigation Report for SWMUs 53 and 54. Prepared by Baker Environmental, Inc. Dated July 23, 2003.
25. Final CMS Report for SWMUs 53 and 54. Prepared by Baker Environmental, Inc. Dated July 23, 2003.

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be "**contaminated**"[1] above appropriately protective risk-based levels (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

| Media | Yes | No | ? | Rationale/Key Contaminants |
|---|---|---|---|---|
| Groundwater | X | | | Dioxins/furans, metals, pesticides, SVOCs, and VOCs |
| Air (indoors)[2] | | X | | |
| Surface Soil (e.g., <2 ft) | X | | | Dioxins/furans, metals, PCBs, pesticides, and SVOCs |
| Surface Water | X | | | Metals, pesticides, and SVOCs |
| Sediment | X | | | Dioxins/furans, metals, SVOCs |
| Subsurface Soil (e.g., >2 ft) | X | | | Metals, PCBs |
| Air (Outdoor) | | X | | |

____ If no (for all media) - skip to #6, and enter YE, status code after providing or citing appropriate levels, and referencing sufficient supporting documentation demonstrating that these levels are not exceeded.

__X__ If yes (for any media) - continue after identifying key contaminants in each contaminated medium, citing appropriate levels (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

____ If unknown (for any media) - skip to #6 and enter IN status code.

**Rationale:**

**Groundwater**

The geology of the NSRR site is generally characterized by an upper zone of fill, a zone of residual soil, and an underlying zone of bedrock. The fill is sometimes absent, but can extend to depths of over 25 feet. The fill, where present, consists of sandy material with varying amounts of clay and silt. The residual soil unit is derived from in-situ bedrock weathering and consists of clayey weathering products and rock fragments. Unit thickness is variable, but can reach 40 feet as documented at SWMU 7/8 (Refs. 12, 13). The contact between this unit and the underlying bedrock is gradual until more competent bedrock is

[1] "Contamination" and "contaminated" describe media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Department of Public Health and Environment, and others) suggests that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

encountered. The bedrock consists of intrusive and extrusive volcanic rocks and interbedded limestones that have been highly faulted, folded, and fractured. With depth, the degree of bedrock weathering and fracturing decreases and rock competency increases (Refs. 12, 13). An additional unit is reported at SWMU 7/8 near Ensenada Honda. It consists of marine sediments composed primarily of silt with lessor amounts of sand and clay with coral and shell fragments.

Groundwater at the site occurs under unconfined and semi-confined conditions. Groundwater is encountered at depths ranging from approximately three feet to 26 feet below ground surface (bgs). Groundwater flow direction is primarily controlled by topography, which results in flow from the inland areas to the surrounding surface water features (mangrove swamps, Ensenada Honda, and Puerca Bay) where groundwater discharge occurs.

Groundwater is not used as a potable water supply source at NSRR. For over 30 years NSRR has obtained potable water from El Yunque Water Treatment Plant that receives raw water from the Rio Blanco (Refs. 12, 13). Water supply wells located in Ceiba, three miles inland and upgradient from Station Headquarters, have been abandoned due to unacceptable salinity concentrations. Pump tests conducted in two wells at the Facility in 1999 indicated an aggregate yield of approximately 99 gallons per day, which is below the yield of aquifers considered for potable use (Refs. 12, 13).

Contaminant concentrations detected at 11 SWMUs and one AOC (SWMUs 1 through 3, SWMU 6/AOC B, SWMU 7/8, SWMU 9, SWMU 11/45, SWMU 30 and SWMU 54) exceeded Federal MCLs and/or EPA Region 3 tap water RBCs. The maximum detected concentrations and location of maximum detected concentration are presented below.

Also, the relevant screening criteria are provided below and include the April 2003 EPA Region 3 tap water RBCs, Federal MCLs, National Primary Drinking Water Regulation (NPDWR) Action Level for Lead (tap water RBC not available), or site-specific corrective action objectives [CAOs].

**SWMU 1, Army Cremator Disposal Site:** The maximum detected concentrations in groundwater exceeding EPA Region 3 tap water RBCs and/or Federal MCLs are as follows: 2 µg/l of chloroform (1MW04) [RBC = 0.15 µg/l], 1.1 µg/l of 1,1,2,2-tetrachloroethane (5GW1) [RBC = 0.053 µg/l], 25 µg/l of pentachlorophenol (5GW4) [RBC = 0.56 µg/l, MCL = 1 µg/l] , 22 µg/l of bis(2-ethylhexyl)phthalate (5GW05) [RBC = 4.8 µg/l, MCL = 6 µg/l], 0.0032 µg/l of heptachlor (05GW101A) [RBC = 0.015 µg/l], 0.1 µg/l of aldrin (1MW02) [RBC = 0.0039 µg/l], 0.00005 µg/l of total HxCDD (5GW02) [RBC = 0.000015 µg/l], 86.7 µg/l of total antimony (1MW01D) [RBC = 15 µg/l, MCL = 6 µg/l], 93.4 µg/l of total arsenic (5GW3) [RBC = 0.045 µg/l], 4.8 µg/l of total beryllium (1MW04) [MCL = 4 µg/l], 30.9 µg/l of total cadmium (1MW01) [RBC = 18 µg/l, MCL = 5 µg/l], 259 µg/l of total chromium (1MW04) [RBC = 110 µg/l, MCL = 100 µg/l], 2,950 µg/l of total copper (1MW04) [RBC = 1,500 µg/l, MCL = 1,300 µg/l], 6.5 µg/l of total mercury (1MW04) [MCL = 2 µg/l], 188 µg/l of nickel (1MW04) [MCL = 100 µg/l], 359 µg/l of total selenium (5GW03) [RBC = 180 µg/l, MCL = 50 µg/l], 4,310 µg/l of total thallium (5GW03) [RBC = 2.6 µg/l, MCL = 2 µg/l], 913 µg/l of total vanadium [RBC = 260 µg/l], 42.1 µg/l of dissolved cadmium (1MW01) [RBC = 18 µg/l, MCL = 5 µg/l], 1,680 µg/l of dissolved copper (5GW02) [RBC = 1,500 µg/l, MCL = 1,300 µg/l], and 16.5 µg/l of dissolved thallium (05GW101B) [RBC = 2.6 µg/l, MCL = 2 µg/l] (Ref. 2).

**SWMU 2, Langley Drive Disposal Site**: The maximum detected contaminant concentrations in groundwater exceeding EPA Region 3 tap water RBCs and/or Federal MCLs are as follows: 7 µg/l of chloroform (2MW02) [RBC = 0.15 µg/l], 7 µg/l of trichloroethene (6GW01) [RBC = 0.026 µg/l, MCL = 5 µg/l], 11 µg/l of pentachlorophenol (R6GW01) [RBC = 0.56 µg/l, MCL = 1 µg/l], 0.13 µg/l of aldrin (2MW01) [RBC = 0.0039 µg/l], 0.04 µg/l of heptachlor epoxide

(2MW01) [RBC = 0.0074 µg/l, MCL = 0.2 µg/l], 19.6 µg/l of total antimony (2MW03) [RBC = 15 µg/l, MCL = 6 µg/l], 2.8 µg/l of total arsenic (2MW03) [RBC = 0.045 µg/l], and 631 µg/l of total vanadium (2MW02) [RBC = 260 µg/l]. In addition, the maximum detected concentration of lead (121 µg/l of total lead [R6GW01]) exceeds the National Primary Drinking Water Regulation (NPDWR) Action Level of 15 µg/l (Ref. 2).

**SWMU 3, Base Landfill:** The maximum detected contaminant concentrations in groundwater exceeding EPA Region 3 tap water RBCs and/or Federal MCLs are as follows: 3 µg/l of chloroform (R7GW11) [RBC = 0.15 µg/l], 0.5 µg/l of benzo(a)pyrene (R7GW01R) [RBC = 0.0092 µg/l, MCL = 0.2 µg/l], 38 µg/l of 1,4-dioxane (R7GW02R) [RBC = 6.1 µg/l], 0.36 µg/l of benzo(b)fluoranthene (R7GW01R) [RBC = 0.092 µg/l], 0.79 µg/l of indeno(1,2,3-cd)pyrene (R7GW01R) [RBC = 0.092 µg/l], 0.012 mg/l of total arsenic (R7GW04R) [RBC = 0.045 µg/l], 0.027 mg/l of dissolved thallium (R7GW04R) [RBC = 2.6 µg/l, MCL = 2 µg/l], and 0.034 mg/l of total thallium (R7GW04R) [RBC = 2.6 µg/l, MCL = 2 µg/l] (Ref. 10).

**SWMU 6/AOC B**: The maximum detected contaminant concentrations in groundwater above EPA Region 3 tap water RBCs and/or Federal MCLs are as follows: 5.8 µg/l of total arsenic (ACBMW01) [RBC = 0.045 µg/l], 2,210 µg/l of total barium (ACBMW01) [MCL = 2,000 µg/l], 5.9 µg/l of total beryllium 9ACBMW01) [MCL = 4 µg/l], 168 µg/l of total chromium (ACBMW01) [RBC = 110 µg/l, MCL = 100 µg/l], 2,480 µg/l of total copper (ACBMW01) [RBC = 1,500 µg/l, MCL = 1,300 µg/l], 199 µg/l of total nickel (ACBMW01) [RBC = 730 µg/l, MCL = 0.1 µg/l], and 790 µg/l of total vanadium (ACBMW01) [RBC = 260 µg/l]. In addition, the maximum detected concentration of total and dissolved lead (19.1 µg/l of total lead and 17.5 µg/l of dissolved lead [ACBMW03]) exceeds the NPDWR Action Level of 15 µg/l (Ref. 7).

**SWMU 7/8, Tow Way Fuel Farm (TWFF)**: Site-specific human health risk-based corrective action objects (CAOs), based on an industrial worker and construction worker scenarios, were developed for groundwater contaminants which exceeded Region 3 tap water RBCs at SWMU 7/8. The maximum detected contaminant concentrations in groundwater above the lower of the industrial worker and construction worker CAOs are as follows: 4,600 µg/l of 1,2,4-trimethylbenzene (470MW03) [CAO = 3,300 µg/l], 19,000 µg/l of benzene (470MW01) [CAO = 550 µg/l], 1,400 µg/l of ethylbenzene (470MW03) [CAO = 1,000 µg/l], 28,000 µg/l of trichloroethene (7MW07) [CAO = 22 µg/l], 22 µg/l of dissolved lead (470MW01) [CAO = 15 µg/l], and 52 µg/l of total lead (470MW01) [CAO = 15 µg/l] (Refs. 11, 12).

**SWMU 9, Tank 212 - 217 Sludge Disposal Pits:**

***Area A***

The maximum detected contaminant concentrations in groundwater above EPA Region 3 tap water RBCs and/or Federal MCLs are as follows: 29.2 µg/l of total arsenic (9GW02R) [RBC = 0.045 µg/l], 12.8 µg/l of dissolved arsenic (9GW02S) [RBC = 0.045 µg/l], 29 µg/l of total cadmium (9MW02) [RBC = 18 µg/l, MCL = 4 µg/l], 30.4 µg/l of dissolved cadmium (9MW02) [RBC = 18 µg/l, MCL = 4 µg/l], 193 µg/l of total chromium (9MW02S) [RBC = 110 µg/l, MCL = 100 µg/l], 1,600 µg/l of benzene (9MW02) [RBC = 0.34 µg/l, MCL = 5 µg/l], 7 µg/l of methylene chloride (9MW02) [RBC = 4.1 µg/l, MCL = 5 µg/l], 26 µg/l of naphthalene (13GW02) [RBC = 6.5 µg/l], 1 µg/l of acetophenone (9MW01) [RBC = 0.042 µg/l], 5 µg/l of bis(2-ethylhexyl)phthalate (9MW01/9MW02) [RBC = 4.8 µg/l] (Ref. 14).

***Area B***

The maximum detected contaminant concentrations in groundwater above EPA Region 3

tap water RBCs and/or Federal MCLs are as follows: 26.4 µg/l of total cadmium (9MW03) [RBC = 18 µg/l, MCL = 4 µg/l], 25.1 µg/l of dissolved cadmium (9MW03) [RBC = 18 µg/l, MCL = 4 µg/l], 140 µg/l of benzene (13GW05) [RBC = 0.34 µg/l, MCL = 5 µg/l], 460 µg/l of bromodichloromethane (13GW06) [RBC = 0.17 µg/l], 360 µg/l of bromoform (13GW06) [RBC = 8.5 µg/l], 1,100 µg/l of chloroform (13GW06) [RBC = 0.15 µg/l], 300 µg/l of dibromochloromethane (13GW06) [RBC = 0.13 µg/l], 11 µg/l of methylene chloride (13GW06) [RBC = 4.1 µg/l, MCL = 5 µg/l], and 7 µg/l of bis(2-ethylhexyl)phthalate (13GW04) [RBC = 4.8 µg/l, MCL = 6 µg/l] (Ref. 14).

***Area C***

The maximum detected contaminant concentrations in groundwater above EPA Region 3 tap water RBCs and/or Federal MCLs include the following: 12.1 µg/l of total cadmium (9MW04) [RBC = 18 µg/l, MCL = 5 µg/l], 24.7 µg/l of dissolved cadmium (9MW04) [RBC = 18 µg/l, MCL = 5 µg/l], 2 µg/l of 1,2-dichloropropane (13GW11) [RBC = 0.16 µg/l], and 38 µg/l of bis(2-ethylhexyl)phthalate (13GW10) [RBC = 4.8 µg/l] (Ref. 14).

**SWMU 11/45, Building 38**: The maximum detected contaminant concentrations in groundwater above EPA Region 3 tap water RBCs and/or Federal MCLs are as follows: 6 µg/l of benzo(a)anthracene (11-SB05) [RBC = 0.092 µg/l], 7 µg/l of benzo(a)pyrene (11-SB05) [RBC = 0.0092 µg/l, MCL = 0.2 µg/l], 64 µg/l of bis(2-ethylhexyl)phthalate (45MW02) [RBC = 4 .8 µg/l, MCL = 6 µg/l], 0.035 µg/l of Aroclor-1260 (45HP02) [RBC = 0.032 µg/l,], 103 µg/l of total arsenic (45HP01) [RBC = 0.045 µg/l], 16.1 µg/l of dissolved arsenic (45HP01) [RBC = 0.045 µg/l], 5.6 µg/l of dissolved cadmium (45HP01) [RBC = 18 µg/l, MCL = 4 µg/l], 27.8 µg/l of total cadmium (45MW04) [RBC = 18 µg/l, MCL = 4 µg/l], 182 µg/l of total chromium (45MW01) [RBC = 110 µg/l, MCL = 100 µg/l], and 2.6 µg/l of dissolved mercury (11-SB16) [MCL = 2 µg/l] (Ref. 2). In addition, the maximum detected concentration of total lead (30 µg/l) [45HP02] exceeds the NPDWR Action Level of 15 µg/l (Ref.2).

**SWMU 30, Former Incinerator**: The maximum detected contaminant concentrations in groundwater detected above EPA Region 3 tap water RBCs and/or Federal MCLs are as follows: 4.4 µg/l of dissolved arsenic [RBC = 0.045 µg/l], 23.3 µg/l of dissolved antimony (1983-DW1) [RBC = 15 µg/l, MCL = 4 µg/l], 3 µg/l of total arsenic [RBC = 0.045 µg/l], 31.5 µg/l of total antimony (1983-MW3) [RBC = 15 µg/l, MCL = 4 µg/l], and 72,000 µg/l of total zinc (1983-DW1) [RBC = 11,000 µg/l] (Ref. 3).

**SWMU 54, Building 1914 (Former NEX Repair/Maintenance Shop)**: The maximum detected contaminant concentrations in groundwater above EPA Region 3 tap water RBCs and/or Federal MCLs are as follows: 2.8 µg/l 1,2-dichloroethane (54TW07) [RBC = 0.12 µg/l, MCL = 7 µg/l], 3,000 µg/l of benzene (54TW15) [RBC = 0.34 µg/l, MCL = 5 µg/l], 8 µg/l of chloroform (54TW08) [RBC = 0.15 µg/l], 2,400 µg/l of ethylbenzene (54TW15) [RBC = 1,300 µg/l, MCL = 700 µg/l], 2,600 µg/l of isobutanol (54TW15) [RBC = 1,800 µg/l], 190 µg/l of trichloroethene (510MW5) [RBC = 0.026 µg/l, MCL = 5 µg/l], 190 µg/l of naphthalene (54TW15) [RBC = 6.5 µg/l] (Ref. 9), and 8,000 µg/l of xylenes (54TW15) [RBC = 210 µg/l].

**Air (Indoors)**

Based on the volatile nature of the contaminants detected at SWMUs 1, 2, 7/8, 9, and 54, migration of contaminants in groundwater to indoor air may be a concern. The maximum detected VOC concentrations in the uppermost groundwater unit were compared to the State of Connecticut Groundwater Standards for the Protection of Indoor Air under the Industrial/Commercial Scenario (CT I/C VC) to determine whether migration of VOCs to indoor air may be of concern. Table 1 identifies

those contaminants that exceed the CT I/C VC.

**Table 1. Groundwater Exceedences of the CT I/C VC (µg/L)**

| Contaminant | CT I/C VC | Maximum Detection |
|---|---|---|
| **SWMU 7/8** | | |
| Benzene<br>Trichloroethene | 530<br>540 | 19,000 (470MW01)<br>28,000 (7MW07) |
| **SWMU 9** | | |
| Chloroform | 710 | 1,100 (13GW06) |
| **SWMU 54** | | |
| Benzene | 530 | 3,000 (54TW15) |

Although VOCs exceeded the CT I/C VC at SWMU 9 (Refs. 14), there are no buildings present at SWMU 9; so contaminated groundwater is not presently beneath any buildings. Thus, indoor air is not currently considered a concern at SWMU 9. Trichloroethene (TCE) is present beneath the former Building 46 at SWMU 7/8; thus, the risk associated with TCE was evaluated using the Johnson-Ettinger (JE) Model to determine if indoor air may be a concern. The available file materials indicate that benzene is not currently detected beneath SWMU 7/8 or SWMU 54 buildings (Refs. 11, 12). However to be conservative, the risk associated with benzene at SWMU 7/8 and SWMU 54 was evaluated using the JE Model to determine if indoor air may be a concern.

The JE Model calculates incremental risk and hazard values associated with the potential migration of volatile contaminants into indoor air. The use of the maximum detected values provides a conservative calculated risk estimate. Site-specific input parameters used in the model include: the depth below grade to the bottom of enclosed space floor, depth below grade to the water table, soil type, and soil/groundwater temperature. For SWMU 7/8, the site-specific parameters used for the development of indoor air groundwater Corrective Action Objectives (CAOs) in the CMS (Ref. 11) were used for calculating the indoor risk. For SWMU 54, the site-specific parameter used for calculating indoor air risk were obtained from the RFI (Ref. 9). Conservative default values were used for the remaining parameters for which site-specific values were not readily available. The calculated incremental risk values for benzene and TCE at SWMU 7/8 are 1.8E-05 and 5.8E-06, which are within the EPA acceptable risk range of 1.0E-04 to 1.0E-06. The cumulative risks associated with both benzene and TCE are also within the EPA acceptable risk range. The calculated incremental risk value for benzene at SWMU 54 is 2.9E-06, which is within the EPA acceptable risk range of 1.0E-04 to 1.0E-06. Given the results of the JE Model, volatilization of groundwater contaminants into indoor air at SWMU 7/8 and SWMU 54 does not appear to pose unacceptable risk at this time. See Attachment 1 for JE Model results.

**Surface/Subsurface Soil**

Contaminants are detected in surface soil and/or subsurface soil above EPA Region 3 industrial RBCs or site-specific CAOs at SWMU 1, SWMU 2, SWMU 6/AOC B, SWMU 7/8, SWMU 30, SWMU 31/32, SWMU 11/45, SWMU 14, SWMU 37, SWMU 46, SWMU 55, and AOC C. The maximum detected contaminant concentrations in surface soil and/or subsurface soil for these SWMUs and AOCs are provided below.

**SWMU 1, Army Cremator Disposal Site:** No contaminants were detected in surface soil or

subsurface soil above EPA Region 3 industrial RBCs; however, the total hazard indices (HIs) for on-site worker and construction worker scenarios for exposure to soil are above the target HI of one in the risk assessment. Thus, although there are no contaminants above EPA Region 3 industrial RBCs in surface and subsurface soil, the impact of contamination in surface and subsurface soil will be discussed further in Questions 3, 4, and 5 given the calculated hazard (Ref. 2).

**SWMU 2, Langley Drive Disposal Site**: Arsenic was detected in surface and subsurface soil above EPA Region 3 industrial RBCs**.** The maximum detected concentrations of arsenic in surface soil and subsurface soil exceeding EPA Region 3 industrial RBCs are 134 mg/kg (R6S7A) and 21.4 mg/kg (06SS101) [RBC = 1.9 mg/kg], respectively. In addition, the maximum detected concentration of lead in surface soil and subsurface soil are 4,760 mg/kg of lead (06SS103) and 5,850 mg/kg of lead (06SS103), which exceeded the site-specific screening criterion of 1,000 mg/kg (Ref. 2).

**SWMU 6, Building 145 and AOC B, Building 25:** Arsenic, benzo(a)pyrene, 4,4'-DDE, and total HxCDD were detected in surface soil above EPA Region 3 industrial RBCs. The maximum detected concentrations of these contaminants are as follows: 10 mg/kg of arsenic [RBC = 1.9 mg/kg], 1,800 µg/kg of benzo(a)pyrene [RBC = 390 µg/kg], 0.76 µg/kg of total HxCDD [RBC = 0.46 µg/kg], and 22 mg/kg of 4,4'-DDE [RBC = 8.4 mg/kg] (Ref. 7). No contaminants were detected in subsurface soil exceeding EPA Region 3 industrial RBCs.

**SWMU 7/8, Tow Way Fuel Farm (TWFF):** SVOCs and metals were detected in surface soil above industrial RBCs. Human health-based CAOs were developed for surface/subsurface soil at SWMU 7/8 during the CMS. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, and arsenic were detected in surface soil above the CAOs calculated for an industrial worker scenario (all 2,900 µg/kg). The maximum detected contaminant concentrations above CAOs are as follows; 17,000 µg/kg of benzo(a)anthracene, 23,000 µg/kg of benzo(a)pyrene, 5,900 µg/kg of benzo(b)fluoranthene, 5,300 µg/kg of indeno(1,2,3-cd)pyrene, and 3.7 mg/kg of arsenic (Refs. 11, 12). In addition, benzo(a)pyrene was also detected in soil, at depths from 0 to10 feet bgs, above the CAO calculated for a construction worker scenario (7,300 µg/kg).

**SWMU 9, Tank 212 - 217 Sludge Disposal Pits:**

***Area A***

Arsenic was detected in surface soil and subsurface above EPA Region 3 industrial RBC [RBC = 1.9 mg/kg] at Area A. The maximum detected concentrations of arsenic in surface soil and subsurface soil were 3.7 mg/kg (9MW02-00) and 5 mg/kg (9TP08-04), respectively. The maximum detected concentration of GRO in subsurface soil was 130 mg/kg (9-02R-HP01), which was slightly above the PREBQ guideline standard of 100 mg/kg. No petroleum constituents were detected in subsurface soil above industrial RBCs; thus, petroleum contamination is not currently expected to be of concern for human health and will not be discussed further in this CA725 EI determination (Ref. 14).

***Area B***

The maximum detected concentration of arsenic in surface soil was 23 mg/kg (9SS07) and exceeded the EPA Region 3 industrial RBC [RBC = 1.9 mg/kg].

**SWMU 10, Substation 2/Building 90**: Approximately 235 cubic yards of PCB (Aroclor-1260) impacted soil was removed as an ICM at SWMU 10. However, residual soil contamination (less

than ten parts per million [ppm]) was left in place at SWMU 10. The residual soil contamination may exceed the EPA Region 3 industrial RBC of 1.4 mg/kg (Ref. 8).

**SWMU 11/45, Building 38:** The maximum detected concentration of arsenic in subsurface soil (3.9 mg/kg [45MW04-01]) exceeds the EPA Region 3 industrial RBC [RBC = 1.9 mg/kg] (Ref. 2).

**SWMU 14, Fire Training Pit Area**: SVOCs were detected in surface soil above EPA Region 3 industrial RBCs. The maximum detected contaminant concentrations in surface soil exceeding EPA Region 3 industrial RBCs are as follows: 7.6 mg/kg of benzo(b)fluoranthene (14SS07) [RBC = 3.9 mg/kg], 5 mg/kg of benzo(a)pyrene (14SS07) [RBC = 0.39 mg/kg], and 0.92 mg/kg of dibenzo(a,h)anthracene (14SS07) [RBC = 0.39 mg/kg] (Ref. 6).

**SWMU 30, Former Incinerator**: Aroclor-1260 was detected in subsurface soil above the EPA Region 3 industrial RBC. The maximum detected concentration of Aroclor-1260 is 2,000 µg/kg (30-HP05-03) [RBC = 1,400 µg/kg ]. The maximum detected concentration of diesel range organics (DRO) in subsurface is 1,800 mg/kg (30-HP04-03) which exceeds the PREQB guideline standard of 100 mg/kg. No petroleum constituents were detected in subsurface soil above EPA Region 3 industrial RBCs; thus, petroleum contamination is not currently expected to be of concern for human health and will not be discussed further in this CA725 EI determination (Ref. 3).

**SWMU 31/32, Waste Oil Collection Area and Battery Collection Area**: Dioxins and furans were detected in surface and subsurface soil above EPA Region 3 industrial RBCs (adjusted based on TEQs). The maximum detected contaminant concentrations in surface soil were as follows: 12 µg/kg of total HxCDD (31SS04) [RBC = 0.19 µg/kg] , 43 µg/kg of HxCDF (31SS04) [RBC = 0.19 µg/kg], 0.74 µg/kg of total PeCDD (31SS04) [RBC = 0.038 µg/kg], and 3.10 µg/kg of total PeCDF (31SS04) [RBC = 0.038 µg/kg]. The maximum detected contaminant concentrations in subsurface soil were the following: 0.11 µg/kg of total TCDD (31-SSDD) [RBC = 0.019 µg/kg], 0.44 µg/kg of total TCDF (31-SS07A) [RBC = 0.19 µg/kg], 0.061 µg/kg of total PeCDD (31-SS05A) [RBC = 0.038 µg/kg], 0.7 µg/kg of total PeCDF (31-SS05A) [RBC = 0.038 µg/kg], 1.1 µg/kg of total HxCDD (31-SS05A) [RBC = 0.19 µg/kg], 2.8 µg/kg of total HxCDF (31-SS05A) [RBC = 0.19 µg/kg], 17 µg/kg of total HPCDD (31-SS05A) [RBC = 1.9 µg/kg], 12 µg/kg of total HPCDF (31-2205A) [RBC = 1.9 µg/kg], and 130 µg/kg of OCDD (31-SS05A) [RBC = 19 µg/kg]. The maximum calculated 2,3,7,8-TCDD TEQ from the subsurface soil sample set was 0.34984 µg/kg (31-SS05A). A 2,3,7,8-TCDD TEQ was not calculated for surface soil since the surface soil samples were not analyzed for specific congeners. Four subsurface soil samples had TEQs greater than the screening level of 50 ppt but were below the ATSDR interim action level of 1 ppb. These samples included 31-SS07A (68.3 ppt), 31-SS08A (50.4 ppt), 31-SSDD (184 ppt), and 31-SS05A (349 ppt) (Ref. 4).

**SWMU 37, Waste Oil Storage Area/Building 200**: The maximum detected concentration of benzo(a)pyrene in surface soil (0.73 mg/kg [37SS03]) exceeded the EPA Region 3 industrial RBC [RBC = 0.39 mg/kg] (Ref. 1).

**SWMU 46, Pole Storage Yard Covered Pad**: The maximum detected contaminant concentrations in surface soil above EPA Region 3 industrial RBCs are as follows: 880 µg/kg of benzo(a)anthracene (46SS01) [RBC = 3,900 µg/kg ], 2,400 µg/kg of benzo(a)pyrene (46SS11) [RBC = 390 µg/kg], 5,400 µg/kg of benzo(b)fluoranthene (46SS11) [RBC = 3.9 µg/kg ], 820 µg/kg of dibenzo(a,h)anthracene (46SS11) [RBC = 390 µg/kg], 2,700 µg/kg of indeno(1,2,3-cd)pyrene (46SS11) [RBC = 3,900 µg/kg], 35,000 µg/kg of Aroclor-1260 (46SS21) [RBC =

1,400 µg/kg], and 5.3 mg/kg of arsenic (ACSS40) [RBC = 1.9 mg/kg] (Ref. 5).

**SWMU 53, Building 64 (Malaria Control Building)*:*** The maximum detected concentration of arsenic in surface soil exceeding the EPA Region 3 industrial RBC is 5.6 mg/kg (53SS01 and 53SB05) [RBC = 1.9 mg/kg]. The maximum detected concentration of lead in surface soil is 3,900 mg/kg (53SS06), which exceeds the site-specific screening criteria of 1,000 mg/kg (Ref. 9).

**AOC C, Discarded Transformer and Electrical Equipment Accumulation Areas**: The maximum detected contaminant concentrations in surface soil above EPA Region 3 industrial RBCs are as follows: 2,100 µg/kg of benzo(a)anthracene (ACSS32) [RBC = 3,900 µg/kg], 2,600 µg/kg of benzo(a)pyrene (ACSS32) [RBC = 390 µg/kg], 5,500 µg/kg of benzo(b)fluoranthene (ACSS32) [RBC = 3,900 µg/kg], 440 µg/kg of dibenzo(a,h)anthracene (ACSS32) [RBC = 390 µg/kg], 1,900 µg/kg of indeno(1,2,3-cd)pyrene (ACSS32) [RBC = 3,900 µg/kg], 30,000 µg/kg of Aroclor-1260 (ACSS13) [RBC = 1,400 µg/kg], and 40.5 mg/kg of arsenic (ACSS21) [RBC = 1.9 mg/kg] (Ref. 5).

**Surface Water**

Surface water bodies located at NSRR include mangrove swamps (mangroves), Ensenada Honda, and Puerca Bay. The most recent surface water sample results were screened against the FAWQC for Human Health (Water + Organism) or Federal MCLs if FAWQC was unavailable. Standing surface water sample results from SWMU 6/AOC B were screened against EPA Region 3 tap water RBCs. The contaminant concentrations in surface water collected from mangroves at SWMU 1, SWMU 2, and SWMU 9 exceeded FAWQC (Refs. 2, 14). In addition, surface water sample results from Ensenada Honda at SWMU 7/8 exceeded FAWQC (Refs. 11, 12). Standing surface water from SWMU 6/AOC B exceeded the EPA Region 3 tap water RBCs (Ref. 7). The maximum detected contaminant concentrations in surface water are presented below.

**SWMU 1, Army Cremator Disposal Site:** The maximum detected contaminant concentrations of contaminants in surface water exceeding FAWQC are as follows: 105 µg/l of total arsenic (5SW2) [FAWQC = 0.018 µg/l], 108 µg/l of total chromium (5SW01) [MCL = 100 µg/l], 221 µg/l of total selenium (5SW05) [FAWQC = 170 µg/l], and 116 µg/l of total thallium (5SW4) [FAWQC = 1.7 µg/l] (Ref. 2).

**SWMU 2, Langley Drive Disposal Site**: The maximum detected contaminant concentrations in surface water exceeding FAWQC are as follows: 2.4 µg/l of bis(2-ethylhexyl)phthalate (6SW2) [FAWQC = 1.2 µg/l], 50.6 µg/l of total beryllium (6SW2) [MCL = 4 µg/l], 611 µg/l of total chromium (6SW2) [MCL = 100 µg/l], 549 µg/l of total selenium (6SW3) [FAWQC = 170 µg/l], and 29.3 µg/l of total thallium (6SW1) [FAWQC = 1.7 µg/l] (Ref. 2).

**SWMU 6, Building 145 and AOC B, Building 25:** The maximum detected contaminant concentrations in surface water exceeding tap water RBCs are as follows: 2 µg/l of acetophenone (6SW01) [RBC = 0.042 µg/l], 1 µg/l of benzo(b)flouranthene (6SW01) [RBC = 0.092 µg/l], 0.52 µg/l of 4,4'-DDD (6SW01) [RBC = 0.28 µg/l], and 5 µg/l of total arsenic (6SW01) [RBC = 0.045 µg/l] (Ref. 7).

**SWMU 7/8, Tow Way Fuel Farm (TWFF):** The maximum detected contaminant concentrations exceeding FAWQC are as follows: 12 µg/l of bis(2-ethylhexyl)phthalate (7SW3) [FAWQC = 1.2 µg/l], 5.7 µg/l of total antimony (7SW4) [FAWQC = 5.6 µg/l], 7 µg/l of total arsenic (7SW5) [FAWQC = 0.018 µg/l], 4.9 µg/l of dissolved thallium (7SW6) [FAWQC = 1.7 µg/l], and 7.7 µg/l of dissolved arsenic (7SW9) [FAWQC = 0.018 µg/l] (Refs. 11, 12).

**SWMU 9, Tank 212 - 217 Sludge Disposal Pits:**

***Areas A and B***

The maximum detected concentrations of metals in surface water exceeding FAWQC are as follows: 4.3 µg/l of dissolved arsenic (9SW23) [FAWQC = 0.018 µg/l], 6.5 µg/l of total antimony (9SW17) [FAWQC = 5.6 µg/l], 110 µg/l of total arsenic (9SW18) [FAWQC = 0.018 µg/l], 6.6 of total beryllium (9SW18) [MCL = 4 µg/l], 38 µg/l of cadmium (9SW18) [MCL = 5 µg/l], 540 µg/l of total chromium (9SW18) [MCL = 100 µg/l], and 3,100 µg/l of total copper (9SW18) [FAWQC = 1,300 µg/l] (Ref. 14).

***Area C***

The maximum detected concentrations of metals in surface water above FAWQC are as follows: 60.8 µg/l of total arsenic (9SW06) [FAWQC = 0.018 µg/l], 8.1 µg/l of dissolved antimony (9SW27) [FAWQC = 5.6 µg/l], and 155 µg/l of total chromium (9SW06) [MCL = 100 µg/l] (Ref. 14).

**Sediment**

Surface water bodies located at NSRR include mangrove swamps (mangroves), Ensenada Honda, and Puerca Bay. The majority of the sediment sample results were screened against EPA Region 3 industrial RBCs because exposure to sediment contamination in mangroves and Ensenada Honda is expected to be limited to on-site workers. However, the sediment sample results from SWMUs 3 and 11/45 were compared against EPA Region 3 residential RBCs because sediments were collected from Puerca Bay, which is considered a potential recreational area. The contaminant concentrations in sediment collected from mangroves at SWMU 1, SWMU 2, and SWMU 9 exceeded industrial RBCs (Refs. 2, 14). Sediment sample results from Ensenada Honda at SWMU 3 and SWMU 7/8 exceeded industrial RBCs (Refs. 10, 11, 12). Also, sediment sample results from Puerca Bay at SWMU 3 and SWMU 11/45 exceeded residential RBCs (Refs. 2, 10). Sediment sample results from drainage ditch at SWMU 13 exceeded industrial RBCs (Ref. 5). The maximum detected contaminant concentrations in sediment are presented below.

**SWMU 1, Army Cremator Disposal Site:** The maximum detected concentration of arsenic in sediment (32 mg/kg [5SE4]) exceeds the EPA Region 3 industrial RBCs [RBC = 1.9 mg/kg] (Ref. 2).

**SWMU 2, Langley Drive Disposal Site**: The maximum detected concentrations in sediment exceeding EPA Region 3 industrial RBCs are 920 µg/kg benzo(a)pyrene (2SD03) [RBC = 390 µg/kg] and 16.4 mg/kg arsenic (6SE3) [RBC = 1.9 mg/kg] (Ref. 2).

**SWMU 3, Base Landfill**: The maximum detected contaminant concentrations in sediment exceeding EPA Region 3 residential RBCs are 1 µg/kg of total HxCDD (3SD15) [RBC = 0.1 µg/kg] and 4.3 mg/kg of arsenic (3SD02) [RBC = 0.43 mg/kg] (Ref. 10).

**SWMU 7/8, Tow Way Fuel Farm (TWFF)**: The maximum detected contaminant concentrations in sediment exceeding EPA Region 3 industrial RBCs are as follows: 2,200 µg/kg of benzo(a)pyrene (7SD12) [RBC = 390 µg/kg], 530 µg/kg of dibenzo(a,h)anthracene (7SD12) [RBC = 390 µg/kg], and 46 mg/kg of arsenic (7SD3) [RBC = 1.9 mg/kg] (Refs. 11, 12).

**SWMU 9, Tank 212 - 217 Sludge Disposal Pits:**

***Areas A and B***
The maximum detected concentrations in sediment exceeding EPA Region 3 industrial RBCs are 2.9 mg/kg of arsenic (9SD16) [RBC = 1.9 mg/kg] and 1,300 µg/kg of benzo(a)pyrene (9SD20) [RBC = 390 µg/kg] (Ref. 14).

***Area C***
The maximum detected concentrations of arsenic in sediment (15 mg/kg [9SD26]) exceeds the EPA Region 3 industrial RBC [RBC = 1.9 mg/kg] (Ref. 14).

**SWMU 11/45, Building 38**: The maximum detected contaminant concentrations detected in sediment exceeding EPA Region 3 residential RBCs are as follows: 12 mg/kg of arsenic (11SD01D) [RBC = 0.43 mg/kg], 3,200 µg/kg of benzo(a)pyrene (SD03D) [RBC = 87 µg/kg], and 5,000 µg/kg of benzo(b)fluoranthene [RBC = 870 µg/kg] (Ref. 2).

**SWMU 13, Old Pest Control Shop:** The maximum detected contaminant concentrations detected in sediment exceeding EPA Region 3 industrial RBCs are as follows: 50,000 µg/kg of 4,4'-DDD (13SD07) [RBC = 12,000 µg/kg], 21,000 µg/kg of 4,4'-DDE (13SD07) [RBC = 8,400 µg/kg], 34,000 µg/kg of 4,4'-DDT (13SD13) [RBC = 8,400 µg/kg], 1,800 µg/kg of dieldrin (13SD09-00) [RBC = 180 µg/kg] (Ref. 5).

**Air (Outdoors)**

No assessment of the impacts to outdoor air has been conducted at the site. Migration of VOCs in groundwater into outdoor air is not expected to be of concern due to natural dispersion of contaminants once they reach the surface. In addition, the majority of the site is either paved or highly vegetative, which significantly reduces particulates in air. Thus, the migration of contaminated particulates or volatile emissions are not expected to be significant exposure pathways at the site.

**References:**

1. Draft RCRA Facility Investigation Report for Phase I Investigations at Operable Units 1, 6, and 7. Prepared by Baker Environmental, Inc. Dated July 1, 1996.
2. Revised Draft RCRA Facility Investigation Report for Operable Unit 3/5. Prepared by Baker Environmental, Inc. Dated April 19, 1999.
3. Final Phase II RFI report for SWMU 30. Prepared by Baker Environmental, Inc. Dated February 15, 2000.
4. Final Corrective Measures Study Report for SWMU 31/32. Prepared by Baker Environmental, Inc. Dated April 17, 2000.
5. Revised Final II Corrective Measures Study Final Report, Prepared by Baker Environmental, Inc. Dated August 4, 2000.
6. Draft Interim Decision Document for SWMU 14. Prepared by Baker Environmental, Inc. Dated November 11, 2000.
7. Final Corrective Measures Study Final Report for SWMU 6/AOC B. Prepared by Baker Environmental, Inc. Dated June 21, 2001.
8. Draft Corrective Measures Study Report for SWMU 10. Prepared by Baker Environmental, Inc. Dated July 6, 2001.
9. Final RCRA Facility Investigation Report for SWMU 53 and 54. Prepared by Baker Environmental, Inc. Dated September 30, 2002.
10. Revised Final RCRA Facility Investigation Report for SWMU 3. Prepared by Baker Environmental, Inc. Dated March 18, 2003.

11. Final Additional Data Collection Investigation Report for Tow Way Fuel Farm. Prepared by Baker Environmental, Inc. Dated April 22, 2003.
12. Final Corrective Measures Study Task I Report for Tow Way Fuel Farm. Prepared by Baker Environmental, Inc. Dated April 22, 2003.
13. Final Groundwater Model Report for Tow Way Fuel Farm. Prepared by Baker Environmental, Inc. Dated April 22, 2003.
14. Final Corrective Measures Study Investigation Report for SWMU 9. Prepared by Baker Environmental, Inc. Dated April 25, 2003.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table
*Potential **Human Receptors** (Under Current Conditions)*

| "Contaminated" Media | Residents | Workers | Day-Care | Construction | Trespasser | Recreation | Food[3] |
|---|---|---|---|---|---|---|---|
| Groundwater | No | No | No | Yes | – | – | No |
| ~~Air (indoor)~~ | | | | | | | |
| Surface Soil (e.g. < 2 ft) | No | Yes | No | Yes | No | No | No |
| Surface Water | No | Yes | – | – | No | No | No |
| Sediment | No | Yes | – | – | No | Yes | Yes |
| Subsurface Soil (e.g., > 2 ft) | – | – | – | Yes | – | – | No |
| ~~Air (outdoors)~~ | | | | | | | |

Instruction for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media that are not "contaminated" as identified in #2 above.

2. Enter "yes" or "no" for potential "completeness" under each "Contaminated"Media — Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations, some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("--"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

___ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

__X__ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

____ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

**Rationale**:

The majority of the NSRR site is currently utilized for industrial purposes but portions of NSRR are used for Naval housing. However, the SWMUs and AOCs with contaminated media exceeding relevant

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish)

screening criteria are not where housing is located. In addition, these SWMUs and AOCs are not accessible from the housing complex due to fencing or overgrown vegetation. Thus, no on-site residents are expected to come in direct contact with contaminated media. In addition, groundwater at NSRR is not used for drinking water or other potable uses. Therefore, no receptors, including on-site receptors, are expected to be exposed to contaminated groundwater via drinking and/or potable water consumption. The available file materials indicate that day-care facilities are not present at NSRR; thus, day-care receptors are not expected to come in direct contact with contaminated media. Access to NSRR is restricted to Naval personnel. NSRR is also fenced and highly secured. As such, trespassers are not considered to be potential receptors at the NSRR. The remaining potential receptors are discussed below by SWMU/AOC.

**SWMU 1, Army Cremator Disposal Site*:*** Contaminants were detected in groundwater, sediment, and surface water exceeding relevant screening criteria at SWMU 1. As mentioned in Question 2, no contaminants were detected in surface soil or subsurface soil above industrial RBCs. However, the total hazard indices for on-site worker and construction worker scenarios were above the target HI of one in the risk assessment. Thus, surface soil and subsurface soil are considered contaminated media at SWMU 1 and on-site workers and construction workers may be exposed to contaminated surface soil and/or subsurface soil. In addition, on-site workers may potentially be exposed to contaminated surface water and sediment. Although groundwater at SWMU 1 is not currently used for drinking water or other potable uses, shallow groundwater occurs at approximately 5 to 26 feet bgs (Ref. 1); thus, construction workers may potentially come in direct contact with contaminated groundwater during intrusive activities.

**SWMU 2, Langley Drive Disposal Site*:*** Contaminants were detected in groundwater, surface soil, subsurface soil, sediment, and surface water exceeding relevant screening criteria at SWMU 2. On-site workers may potentially be exposed to contaminated surface soil, sediment, and surface water. Although groundwater at SWMU 2 is not currently used for drinking water or other potable uses, shallow groundwater occurs at approximately 3 to 10 feet bgs (Ref. 1); thus, constructions workers may potentially come in direct contact with contaminated groundwater during intrusive activities. In addition, construction workers may be exposed to contaminated surface and subsurface soil.

**SWMU 3, Base Landfill:** Contaminants were detected in groundwater exceeding relevant screening criteria at SWMU 3. Shallow groundwater occurs at approximately 8 to 25 feet bgs (Ref. 5). However, considering SWMU 3 is a lined RCRA landfill, construction workers are not expected to conduct intrusive activities and come in direct contact with contaminated groundwater. Contaminants were also detected in sediment collected from Ensenada Honda and Puerca Bay at SWMU 3. On-site workers may potentially be exposed to contaminated sediment at SWMU3. Since access to Ensenada Honda is restricted, recreators are not expected to be present. However, recreators may be present in Puerca Bay; thus, recreators were considered potential receptors at SWMU 3 that may potentially be exposed to contaminated sediments. In addition, recreator activities at Puerca Bay may potentially include fishing. Since the contaminants detected in sediment are considered to be persistent, bioaccumulative, and toxic (PBT) and bottom-dwelling shellfish (i.e., shrimp) may be fished from Puerca Bay, recreators may potentially be exposed to contamination via food exposure pathway.

**SWMU 6, Building 145 and AOC B, Building 25**: Contaminants were detected in groundwater, surface soil, surface water, and sediment exceeding relevant screening criteria at SWMU 6/AOC B. On-site workers may be exposed to contaminated surface soil, surface water, and sediment. Although groundwater at SWMU 6/AOC B is not currently used for drinking water or other potable uses, shallow groundwater occurs at approximately 9 to 10 feet bgs (Ref. 3); thus,

constructions workers may potentially come in direct contact with contaminated groundwater during intrusive activities. In addition, construction workers may potentially be exposed to contaminated surface soil.

**SWMU 7/8, Tow Way Fuel Farm (TWFF)**: Contaminants were detected in groundwater, surface soil, subsurface soil, surface water, and sediment exceeding relevant screening criteria at SWMU 7/8. Since groundwater occurs at a depth of 12 to 54 feet bgs (Ref. 6), construction workers are not expected to come in direct contact with contaminated groundwater. However, construction workers may be exposed to contaminated subsurface soil at SWMU 7/8. On-site workers may potentially be exposed to contaminated surface soil, surface water, and sediment.

**SWMU 9, Tank 212-217 Sludge Disposal Pits**: Contaminants were detected in groundwater, surface soil, subsurface soil, surface water, and sediment exceeding relevant screening criteria at SWMU 9. Although groundwater at SWMU 9 is not currently used for drinking water or other potable uses, shallow groundwater occurs at approximately 6 to 19 feet bgs (Ref. 7); thus, construction workers may potentially come direct contact with contaminated groundwater during intrusive activities. In addition, construction workers may be exposed to contaminated subsurface soil. On-site workers may potentially be exposed to contaminated surface soil, surface water, and sediment.

**SWMU 10, Substation 2/Building 90**: PCBs are present in residual soil contamination exceeding relevant screening criteria at SWMU 10. On-site workers may potentially be exposed to contaminated surface soil and construction workers may potentially be exposed to contaminated subsurface soil.

**SWMU 11/45, Building 38:** Building 38 has two doors that are chained and padlocked, it is fully secure, and signs are posted to restrict access to the building (Ref. 8). Building 38 is not currently being used, and access to the building by Naval personnel is strictly prohibited by the facility without prior authorization to enter. The facility has a building permit process that monitors all work and construction activities at SWMU 11. However if a building permit is approved, on-site workers and construction workers are expected to adhere to the appropriate Occupational Safety and Health Administration (OSHA) regulations (e.g., donning personal protective equipment [PPE]). Thus, on-site workers are not expected to be exposed to contamination.

Contaminants were detected in groundwater, subsurface soil, and sediment exceeding relevant screening criteria at SWMU 45. Because groundwater occurs at depth of 11 feet bgs, construction workers are not expected to come in direct contact with contaminated groundwater. However, construction workers may be exposed to contaminated subsurface soil. On-site workers and recreators may be exposed to contaminated sediments. In addition, recreator activities at Puerca Bay may potentially include fishing. Since the contaminants detected in sediment are considered to be persistent, bioaccumulative, and toxic (PBT), and bottom-dwelling shellfish (i.e., shrimp) may be fished from Puerca Bay, recreators may potentially be exposed to contamination via food exposure pathway.

**SWMU 13, Old Pest Control Shop:** Contaminants were detected in sediment exceeding relevant screening criteria at SWMU 13. On-site workers may potentially be exposed to contaminated sediment.

**SWMU 14, Fire Training Pit Area**: Contaminants were detected in surface soil exceeding

relevant screening criteria at SWMU 14. On-site workers and construction workers may potentially be exposed to contaminated surface soil.

**SWMU 30, Former Incinerator**: Contaminants were detected in groundwater and subsurface soil exceeding relevant screening criteria at SWMU 30. Although groundwater at SWMU 30 is not currently used for drinking water or other potable uses, shallow groundwater occurs at approximately 6 to 19 feet bgs (Ref. 2); thus, construction workers may potentially come in direct contact with contaminated groundwater during intrusive activities. In addition, construction workers may be exposed to contamination in subsurface soil.

**SWMU 31/32, Waste Oil Collection Area and Battery Collection Area**: Contaminants were detected in surface soil and subsurface soil exceeding relevant screening criteria. On-site workers may be exposed to contaminated surface soil. Construction workers may be exposed to contaminated surface soil and subsurface soil.

**SWMU 37, Waste Oil Storage Area/Building 200**: Contaminants were detected in surface soil exceeding relevant screening criteria at SWMU 37. Thus, on-site workers and construction workers may be exposed to contaminated surface soil.

**SWMU 46, Pole Storage Yard Covered Pad**: Contaminants were detected in surface soil exceeding relevant screening criteria at SWMU 46. Thus, on-site workers and construction workers may be exposed to contaminated surface soil.

**SWMU 53, Building 64 (Malaria Control Building):** Contaminants were detected in surface soil exceeding relevant screening criteria at SWMU 53. Thus, on-site workers and construction workers may be exposed to contaminated surface soil.

**SWMU 54, Building 1914 (Former NEX Repair/Maintenance Shop):** Contaminants were detected in groundwater exceeding relevant screening criteria at SWMU 54. Although groundwater at SWMU 54 is not currently used for drinking water or other potable uses, shallow groundwater occurs at approximately five to 13 feet bgs (Ref. 4); thus, construction workers may potentially come in direct contact with contaminated groundwater during intrusive activities.

**AOC C, Discarded Transformer and Electrical Equipment Accumulation Area**: Contaminants were detected in surface soil exceeding relevant screening criteria at AOC C. Thus, on-site workers and construction workers may be exposed to contaminated surface soil.

**References:**

1. Revised Draft RCRA Facility Investigation Report for Operable Unit 3/5. Prepared by Baker Environmental, Inc. Dated April 19, 1999.
2. Final Phase II RFI report for SWMU 30. Prepared by Baker Environmental, Inc. Dated February 15, 2000.
3. Final Corrective Measures Study Report for SWMU 6/AOC B. Prepared by Baker Environmental, Inc. Dated June 21, 2001.
4. Final RCRA Facility Investigation Report for SWMU 53 and 54. Prepared by Baker Environmental, Inc. Dated September 30, 2002.
5. Revised Final RCRA Facility Investigation Report for SWMU 3. Prepared by Baker Environmental, Inc. Dated March 18, 2003.
6. Final Corrective Measures Study Task I Report for Tow Way Fuel Farm. Prepared by Baker

Environmental, Inc. Dated April 22, 2003.
7. Final Corrective Measures Study Investigation Report for SWMU 9. Prepared by Baker Environmental, Inc. Dated April 25, 2003.
8. Interim Measures Plan for SWMU 11. Prepared by Baker Environmental, Inc. Dated July 21, 2003.

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **significant**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

____ If no (exposures cannot be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

__X__ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

**Rationale:**

All individuals conducting intrusive activities conducted at NSRR must first submit a building permit form, which is reviewed and approved by the Public Works Department as wells as the Engineering Division, Utilities Division, Environmental Division, and Fire Department, prior to commencing activities (Ref. 6). At SWMUs and AOCs with contamination above relevant screening criteria, this process provides for protection of construction workers through adherence to applicable OSHA regulations (e.g., PPE use) or by not allowing intrusive activities or disturbances to occur. Thus, construction worker exposure to surface soil, subsurface soil, or groundwater contamination is not currently expected to be significant. On-site workers and recreators are discussed below with the associated SWMU/AOC.

**SWMU 1, Army Cremator Disposal Site**: Risk to on-site workers was evaluated in a human health risk assessment and found to be unacceptable (total cancer risk [CR] = 1.3E-04 and total hazard index [HI] = 3.70) (Ref. 3). SWMU 1 is an abandoned landfill that is currently overgrown with vegetation. SWMU 1 is not currently used for any activities associated with NSRR. In addition, there are no structures or utilities that would require maintenance by an on-site worker. Thus, on-site worker exposure to contaminated media is not currently considered significant.

**SWMU 2, Langley Drive Disposal Site**: Risk to on-site workers was evaluated in a human health risk assessment and found to be unacceptable (total cancer risk [CR] = 1.2E-04 and total hazard index [HI] = 4.81) (Ref. 3). SWMU 2 is also an abandoned landfill that is currently overgrown with vegetation. SWMU 2 is not currently used for any activities associated with NSRR. In addition, there are no structures or utilities that would require maintenance by an on-site worker. Thus, on-site worker exposure to contaminated media is not currently considered significant.

[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable"), consult a human health risk assessment specialist with appropriate education, training and experience.

**SWMU 3, Base Landfill**: Because this is an active RCRA-regulated landfill, on-site workers adhere to the applicable OSHA regulations and, thus, are properly protected from exposure through the use of PPE. Therefore, on-site worker exposure to contaminated media is not currently expected to be significant. Recreator exposure to contaminated sediment may be significant; thus, a human health risk assessment was required to determine if risks are within an acceptable range. Although the contaminants detected are PBTs, bioaccumulation is expected to be very low because of the limited spatial extent of contamination and dilution. Thus, the food exposure pathway is currently considered insignificant.

**SWMU 6, Building 145 and AOC B, Building 25:** Surface water collected at SWMU 6/AOC B is standing surface water. The presence of standing water at SWMU 6/AOC B is expected to be intermittent and contingent on rainfall events. However, on-site workers performing activities while in standing surface water are expected to be wearing the appropriate PPE (e.g., waterproof safety boots). Thus, on-site worker exposure to contaminated standing surface water is not currently expected to be significant. On-site worker exposure to contaminated surface soil may be significant; thus, a human health risk assessment was required to determine if risks are within an acceptable range.

**SWMU 7/8, Tow Way Fuel Farm (TWFF)**: Since SWMU 7/8 is an active fuel farm, a security fence surrounds SWMU 7/8 and access is restricted to authorized naval personnel. Risk to on-site workers was evaluated in a human health risk assessment and cancer risks were found to be unacceptable (total cancer risk [CR] = 3.4E-04) (Ref. 1). NSRR has indicated that the appropriate OSHA regulations are implemented through TWFF standard operating procedures or the facility's building permit process. Thus, on-site worker exposure to contaminated surface soil is not currently expected to be significant.

On-site worker exposure to contaminated sediment and/or surface water is expected to be limited to storm water pipeline maintenance at SWMU 7/8. However, on-site workers engaged in any storm water drainage maintenance must first receive approval through the Navy's building process permit. The environmental engineering division would either require adherence to applicable OSHA regulations (e.g., PPE use) or would not allow maintenance activities to occur. Hence, on-site worker exposure to contaminated surface water or sediment is not currently expected to be significant.

**SWMU 9, Tank 212-217 Sludge Disposal Pits:** Surface water and sediment was collected from mangroves at Area A, Area B, and/or Area C. On-site workers are not expected to be working in mangroves as part of routine activities conducted at SWMU 9. However, on-site workers performing activities while in mangroves are expected to be wearing appropriate PPE (e.g., waterproof safety boots or waders). Thus, on-site worker exposure to contaminated surface water or sediment is not currently expected to be significant. On-site worker exposure to contaminated surface soil may be significant at Area A, Area B, and/or Area C; thus, a human health risk assessment was required to determine if risks are within an acceptable range.

**SWMU 10, Substation 2/Building 90**: On-site worker exposure to contaminated surface soil may be significant at SWMU 10; thus, a human health risk assessment was required to determine if risks are within an acceptable range.

**SWMU 11/45, Building 38**: Surface water and sediment were collected from Puerca Bay at SWMU 11/45. On-site workers are not expected to be working in Puerca Bay as part of routine

activities conducted at SWMU 11/45. However, on-site workers performing activities while in Puerca Bay are expected to be wearing appropriate PPE (e.g., waterproof safety boots or waders). Thus, on-site exposure to contaminated surface water or sediment is not currently expected to be significant. Recreator exposure to sediments may be significant; thus, a human health risk assessment was required to determine if risks are within an acceptable range. Although the contaminants detected are PBTs, bioaccumulation is expected to be very low because of the limited spatial extent of contamination and dilution. Thus, the food exposure pathway is currently considered insignificant.

**SWMU 13, Old Pest Control Shop**: Because the Old Pest Control Shop was demolished by a hurricane, there are currently no operations or on-site workers at this SWMU. However, on-site workers could potentially come in direct contact with contaminated sediments associated with maintenance activities at the drainage ditch. A human health risk assessment indicated unacceptable cancer risk (1.3E-04) to on-site workers exposed to contaminated sediments (Ref. 2). However, a site-wide building permit process prohibits and monitors excavation activities or disturbance in accordance with applicable OSHA regulations (e.g., PEE use). Thus, on-site worker exposure to contaminated sediments is not currently expected to be significant.

**SWMU 14, Fire Training Pit Area**: SWMU 14 is utilized for fire training activities, and on-site workers use PPE while performing activities at this site (Ref. 5). Thus, on-site worker exposure to contaminated surface soil is not currently considered significant. However, risk to on-site workers was evaluated in a human health risk assessment and the results indicated that the total carcinogenic risk (CR = 5.7E-06) and total hazard index (<1) are within "acceptable" limits (Ref. 5).

**SWMU 31/32, Waste Oil Collection Area and Battery Collection Area**: The majority of this SWMU is paved; however, approximately 5,400 square feet is currently unpaved. Although the majority of activities occur at areas that are paved, on-site workers may perform activities at unpaved areas. A human health risk assessment indicated unacceptable cancer risk (2.3E-04) to on-site workers exposed to contaminated surface soil (Ref. 2). However, on-site workers conducting activities in the unpaved portion of this SWMU are required to adhere to the applicable OSHA regulations (e.g., PPE use). In addition, NSRR has indicated that SWMU 31/32 is heavily used for vehicular traffic. Since the majority of SWMU is paved and the unpaved portion consists of hard-packed clay, on-site worker exposure to surface soil at SWMU 31/32 is not currently considered significant. It should be noted that, as a corrective measure, NSRR plans to pave the entire SWMU. The implementation of which is pending public comment.

**SWMU 37, Waste Oil Storage Area/Building 200**: On-site worker exposure to contaminated surface soil may be significant; thus, a human health risk assessment was required to determine if risks are within an acceptable range.

**SWMU 46, Pole Storage Yard Covered Pad**: On-site worker exposure to contaminated surface soil may be significant; thus, a human health risk assessment was required to determine if risks are within an acceptable range.

**SWMU 53, Building 64 (Malaria Control Building):** Currently, Building 64 is vacant and SWMU 53 is not used for activities associated with NSRR. In addition, SWMU 53 is overgrown with vegetation and exposure to surface soil contamination is limited (Ref. 4). Thus, on-site worker exposure to contaminated surface soil is not currently considered significant.

**AOC C, Discarded Transformer and Electrical Equipment Accumulation Area**: On-site worker exposure to contaminated surface soil may be significant; thus, a human health risk assessment was required to determine if risks are within an acceptable range.

**References:**

1. Revised Draft RFI Report for Operational Unit 2. Prepared by Baker Environmental, Inc. Dated June 1, 1997.
2. Draft Additional Investigations Report Operable Units 1, 6, and 7. Prepared by Baker Environmental, Inc. Dated May 6, 1998.
3. Revised Draft RCRA Facility Investigation Report for Operable Unit 3/5. Prepared by Baker Environmental, Inc. Dated April 19, 1999.
4. Final RCRA Facility Investigation Report for SWMU 53 and 54. Prepared by Baker Environmental, Inc. Dated September 30, 2002.
5. Email from Kevin Cloe, NSRR, to Timothy Gordon, USEPA, re: EI requirements for NSRR. Dated February 5, 2003.
6. Email from Kevin Cloe, NSRR, to Timothy Gordon, USEPA, re: EI requirements for NSRR. Dated February 13, 2003.

5. Can the "significant" **exposures** (identified in #4) be shown to be within acceptable limits?

__X__ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific human health risk assessment).

____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

**Rationale and Reference(s):**

**SWMU 3, Base Landfill**: Risk to recreators was evaluated in a human health risk assessment. The complete exposure pathways considered for adult and adolescent recreators was ingestion and dermal contact with contaminated sediment. The total excess-lifetime carcinogenic risk for adult and adolescent recreators were 5.7E-05 and 2.6E-05, respectively, which is within the "acceptable" risk range of 1E-04 to 1E-06. The HIs were less than one for both adult and adolescent receptors. Thus, the results of the risk assessment indicates that the carcinogenic and non-carcinogenic risks are within "acceptable" limits (Ref. 2).

**SWMU 6 and AOC B, Building 145 and 25*:*** Risks to on-site workers were evaluated in a human health risk assessment. The complete exposure pathways considered for on-site workers included ingestion of and dermal contact with surface soil as well as inhalation of particulates. The total excess-lifetime carcinogenic risk for on-site workers was 6.8E-05, which is within the "acceptable" risk range of 1E-04 to 1E-06. The hazard index was less than one. Thus, the results of the risk assessment indicates that the carcinogenic and non-carcinogenic risks are within "acceptable" limits (Ref. 3).

**SWMU 9, Tanks 212 - 217 Sludge Disposal Pits**:

***Area A***
Risk to on-site workers was evaluated in a human health risk assessment. The complete exposure pathways considered for on-site workers exposure to surface soil included ingestion, dermal contact, and inhalation of particulates. The total excess-lifetime carcinogenic risks for on-site was 3.0E-06, which is within the "acceptable" risk range of 1E-04 to 1E-06. The HI was less than one for on-site workers, which is below the target hazard index of one. Thus, the results of the risk assessment indicate that the carcinogenic and non-carcinogenic risks are within "acceptable" limits (Ref. 6).

***Area B***
Risk to on-site workers was evaluated in a human health risk assessment. The complete exposure pathways considered for on-site workers exposure to surface soil included ingestion, dermal contact, and inhalation of particulates. The total excess-lifetime carcinogenic risks for on-site workers was 3.0E-06, which is within the "acceptable" risk range of 1E-04 to 1E-06. The total HI was less than one for on-site workers, which is below the target hazard index of one. Thus, the results of the risk assessment indicate

that the carcinogenic and non-carcinogenic risks are within "acceptable" limits (Ref. 6).

***Area C***
Risk to on-site workers were evaluated in a human health risk assessment. The complete exposure pathways considered for on-site worker exposure to surface soil included ingestion, dermal contact, and inhalation of particulates. The total excess-lifetime carcinogenic risks for on-site worker was 6.1E-06, which is within the "acceptable" risk range of 1E-04 to 1E-06. The total HI was less than one for on-site worker, which is below the target hazard index of one. Thus, the results of the risk assessment indicate that the carcinogenic and non-carcinogenic risks are within "acceptable" limits (Ref. 6).

**SWMU 10, Substation 2/Building 90**: Risk to on-site workers were evaluated in a human health risk assessment conducted for the CA725 EI determination. Because the maximum PCB concentration in the residual contamination is less than 10 ppm, an exposure point concentrations of 10 ppm was used in the calculations. The parameters used in the risk calculations were either obtained from EPA guidance documents or were site-specific parameters. The parameters and risk calculations are provided in Attachment 2. The complete exposure pathways considered for on-site workers included ingestion, dermal contact, and inhalation of particulates. The total excess-lifetime carcinogenic risks for on-site workers is 6.06E-08, which is below the "acceptable" risk range of 1E-04 to 1E-06. Since reference dose values were not available for Aroclor-1260, the total HI was not calculated. Thus, the results of the risk assessment indicate that the carcinogenic and non-carcinogenic risks are within "acceptable" limits.

**SWMU 11/45, Building 38:** A current recreator scenario was not evaluated in a human health risk assessment but a future adult and child resident exposure to contaminated sediment was evaluated. The results of the human health risk assessment indicated the cancer risk (CR = 1.7E-06 and CR = 4.8E-06, respectively) and non-cancer hazard indices (both HI < 1) for adult and child resident exposure to contaminated sediment were within "acceptable" limits (Ref. 4). In this case, the future adult resident scenario is expected to be more conservative than a recreator scenario; thus, the risks to a recreator are expected to be less than for future adult resident.

**SWMU 37, Waste Oil Storage Area/Building 200**: Risk to on-site workers were evaluated in a human health risk assessment. The complete exposure pathways considered were on-site worker exposure to surface soil, including ingestion, dermal contact, and inhalation of particulates. The total excess-lifetime carcinogenic risks for on-site workers was 2.3E-5 which is within the "acceptable" risk range of 1E-04 to 1E-06. The total HI was less than one for on-site workers, which is below the target hazard index of one. Thus, the results of the risk assessment indicate that the carcinogenic and non-carcinogenic risks are within "acceptable" limits (Ref. 1).

**SWMU 46, Pole Storage Yard Covered Pad**: Risk to on-site workers was evaluated in a human health risk assessment. The complete exposure pathways considered were on-site worker exposure to surface soil included ingestion, dermal contact, and inhalation of particulates. The total excess-lifetime carcinogenic risk for on-site was 1.4E-04 which exceeds the "acceptable" risk range of 1E-04 to 1E-06. Dermal contact with beryllium (4.8E-05) was the primary contaminant of potential concern (COPC) driving the carcinogenic risk. However, subsequent to conducting the risk assessment, the beryllium slope factor was withdrawn from EPA's Integrated Risk Information System (IRIS). The total excess-lifetime carcinogenic risk without beryllium as a COPC is 5.2E-05, which is within the "acceptable" risk range of 1E-04 to 1E-06. The total HIs were less than one for on-site workers, which is below the target hazard index of one. Thus, the results of the risk assessment indicates that the carcinogenic and non-carcinogenic risks are

within "acceptable" limits (Ref. 3).

**AOC C, Discarded Transformer and Electrical Equipment Accumulation Area**: Risk to on-site workers were evaluated in a human health risk assessment. The complete exposure pathways considered were on-site worker exposure to surface soil included ingestion, dermal contact, and inhalation of particulates. The total excess-lifetime carcinogenic risk for on-site was 7.2E-05 which is within the "acceptable" risk range of 1E-04 to 1E-06. The total HI was less than one for on-site workers, which is below the target hazard index of one. Thus, the results of the risk assessment indicate that the carcinogenic and non-carcinogenic risks are within "acceptable" limits (Ref. 3).

**References:**

1. Draft RCRA Facility Investigation Report for Phase I Investigations at Operable Units 1, 6, and 7. Prepared by Baker Environmental, Inc. Dated July 1, 1996.
2. Letter from Thomas Fuller, Baker Environmental, Inc., to Ms. Nicoletta DiForte, USEPA, Re: Response to EPA's Letter Dated September 15, 1998. Dated November 24, 1998.
3. Draft Additional Investigations Report Operable Units 1, 6, and 7. Prepared by Baker Environmental, Inc. Dated May 6, 1998.
4. Revised Draft RCRA Facility Investigation Report for Operable Unit 3/5. Prepared by Baker Environmental, Inc. Dated April 19, 1999.
5. Draft Human Health Risk Assessment Report SWMU 14. Prepared by Baker Environmental, Inc. Dated February 4, 2000.
6. Revised Draft RCRA Facility Investigation Report for SWMU 9. Prepared by Baker Environmental, Inc. Dated March 10, 2000.

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

__X__ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI determination, "Current Human Exposures" are expected to be "Under Control" at the Naval Station Roosevelt Roads, Facility EPA ID# PR2170027203, Ceiba, Puerto Rico, under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

___ NO - "Current Human Exposures" are NOT "Under Control."

___ IN - More information is needed to make a determination.

**Completed by**: Original signed by _____ Date:_____
Angela Sederquist
Risk Assessor
Booz Allen Hamilton

**Reviewed by**: Original signed by _____ Date:_____
Kathy Rogovin
Senior Risk Assessor
Booz Allen Hamilton

**Also Reviewed by**: Original signed by _____ Date:_____
Timothy Gordon, RPM
RCRA Programs Branch
EPA Region 2

Original signed by _____ Date:_____
Dale Carpenter, Section Chief
RCRA Programs Branch
EPA Region 2

**Approved by:** Original signed by _____ Date: 9/26/2003
Adolph Everett, Acting Chief
RCRA Programs Branch
EPA Region 2

## Locations where references may be found:

References reviewed to prepare this EI determination are identified after each response. Reference materials are available at the USEPA Region 2, RCRA Records Center, located at 290 Broadway, 15th Floor, New York, New York.

**Contact telephone and e-mail numbers:** Timothy Gordon, EPA RPM
(212) 637-4167
gordon.timothy@epa.gov

**FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.**

**Attachments**

The following attachments have been provided to support this EI determination.

Attachment 1 - J&E Modeling Results

Attachment 2 - Risk Calculations for SWMU 10

Attachment 3 - Summary of Media Impacts Table

# Attachment 1 - J&E Modeling Results

## SWMU 7/8 - Benzene

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

| YES | |
|---|---|

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

| YES | X |
|---|---|

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 71432 | 3.00E+03 | Benzene |

| ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (15 or 200 cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER SCS soil type directly above water table | ENTER Average soil/ groundwater temperature, $T_S$ (°C) |
|---|---|---|---|
| 15 | 152 | C | 10 |

| ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined vadose zone soil vapor permeability, $k_v$ ($cm^2$) | ENTER Vadose zone soil dry bulk density, $\rho_b^V$ ($g/cm^3$) | ENTER Vadose zone soil total porosity, $n^V$ (unitless) | ENTER Vadose zone soil water-filled porosity, $\theta_w^V$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|
| sil | | | 1.5 | 0.43 | 0.2 |

| ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) | ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) |
|---|---|---|---|---|---|
| 1.0E-06 | 1 | 70 | 25 | 25 | 250 |

Used to calculate risk-based groundwater concentration.

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

| Indoor exposure groundwater conc., carcinogen (µg/L) | Indoor exposure groundwater conc., noncarcinogen (µg/L) | Risk-based indoor exposure groundwater conc., (µg/L) | Pure component water solubility, S (µg/L) | Final indoor exposure groundwater conc., (µg/L) |
|---|---|---|---|---|
| NA | NA | NA | 1.75E+06 | NA |

INCREMENTAL RISK CALCULATIONS:

| Incremental risk from vapor intrusion to indoor air, carcinogen (unitless) | Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless) |
|---|---|
| 2.9E-06 | NA |

# SWMU 7/8 - TCE

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 79016 | 2.80E+04 | Trichloroethylene |

| ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (15 or 200 cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER SCS soil type directly above water table | ENTER Average soil/ groundwater temperature, $T_S$ (°C) |
|---|---|---|---|
| 15 | 300 | C | 10 |

| ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined vadose zone soil vapor permeability, $k_v$ ($cm^2$) | ENTER Vadose zone soil dry bulk density, $\rho_b^V$ ($g/cm^3$) | ENTER Vadose zone soil total porosity, $n^V$ (unitless) | ENTER Vadose zone soil water-filled porosity, $\theta_w^V$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|
| sil | | | 1.5 | 0.43 | 0.2 |

| ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) | ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) |
|---|---|---|---|---|---|
| 1.0E-06 | 1 | 70 | 25 | 25 | 250 |

Used to calculate risk-based groundwater concentration.

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

| Indoor exposure groundwater conc., carcinogen (µg/L) | Indoor exposure groundwater conc., noncarcinogen (µg/L) | Risk-based indoor exposure groundwater conc., (µg/L) | Pure component water solubility, S (µg/L) | Final indoor exposure groundwater conc., (µg/L) |
|---|---|---|---|---|
| NA | NA | NA | 1.10E+06 | NA |

INCREMENTAL RISK CALCULATIONS:

| Incremental risk from vapor intrusion to indoor air, carcinogen (unitless) | Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless) |
|---|---|
| 5.8E-06 | NA |

# SWMU 54 - Benzene

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

**OR**

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (µg/L) | Chemical |
|---|---|---|
| 71432 | 1.90E+04 | Benzene |

| ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (15 or 200 cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER SCS soil type directly above water table | ENTER Average soil/ groundwater temperature, $T_S$ (°C) |
|---|---|---|---|
| 15 | 300 | C | 10 |

| ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability) | | ENTER User-defined vadose zone soil vapor permeability, $k_v$ ($cm^2$) | ENTER Vadose zone soil dry bulk density, $\rho_b^V$ ($g/cm^3$) | ENTER Vadose zone soil total porosity, $n^V$ (unitless) | ENTER Vadose zone soil water-filled porosity, $\theta_w^V$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|
| sil | OR | | 1.5 | 0.43 | 0.2 |

| ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) | ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) |
|---|---|---|---|---|---|
| 1.0E-06 | 1 | 70 | 25 | 25 | 250 |

Used to calculate risk-based groundwater concentration.

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

| Indoor exposure groundwater conc., carcinogen (µg/L) | Indoor exposure groundwater conc., noncarcinogen (µg/L) | Risk-based indoor exposure groundwater conc., (µg/L) | Pure component water solubility, S (µg/L) | Final indoor exposure groundwater conc., (µg/L) |
|---|---|---|---|---|
| NA | NA | NA | 1.75E+06 | NA |

INCREMENTAL RISK CALCULATIONS:

| Incremental risk from vapor intrusion to indoor air, carcinogen (unitless) | Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless) |
|---|---|
| 1.8E-05 | NA |

# Attachment 2 - Risk Calculations for SWMU 10

## On-site Worker Risk from Exposure to Surface Soil
## Ingestion of surface soil at SWMU 10
## Reasonable Maximum Exposure
## NSSR

Intake = (EPC*IR*CF*FI*EF*ED)/(BW*AT)
Excess-lifetime Carcinogenic risk (CR) = Intake*CSFo
Hazard Quotient (HQ) = Intake/RfDo

| Parameter | | Units | Rationale |
|---|---|---|---|
| Exposure Point Concentration (EPC) = | Chemical-specific | mg/kg | Site-specific parameter assuming that the maximum residual soil concentration does not exceed 10 mg/kg. |
| Ingestion Rate (IR) = | 50 | mg/day | Default parameter (USEPA, 1997) |
| Conversion Factor (CF) = | 1.00E-06 | kg/mg | Not applicable |
| Fraction of Ingested Soil = | 1 | unitless | Site-specific parameter conservatively assuming 100% of soil ingested by on-site workers is from SWMU 10. |
| Exposure Frequency (EF) = | 2.25 | days/year | Site-specific parameters (DON, 2003) |
| Exposure Duration (ED) = | 25 | years | Default parameter (USEPA, 1989) |
| Body Weight (BW) = | 70 | kg | Default parameter (USEPA, 1989) |
| Carcinogenic Averaging Time (ATc) = | 25550 | days | Default parameter (USEPA, 1989) |
| Noncarcinogenic Averaging Time (ATnc) = | 56.52 | days | Site-specific parameter assuming that on-site worker would spent 2.25 days/year for a duration of 25 years. |

| | | | | Excess-Limefime Cancer Risk (CR) | | | Noncancer Hazard Index (HI) | | |
|---|---|---|---|---|---|---|---|---|---|
| Contaminant | EPC (mg/kg) | CSFo | RfDo | Intake | CR | % Contribution of Total CR | Intake | HQ | % Contribution of Total HI |
| Aroclor-1260 | 10 | 2.00E+00 | NA | 1.57E-08 | 3.15E-08 | 100 | 7.11E-06 | -- | -- |
| | | | | Total CR = | 3.15E-08 | | HI = | -- | |

**Notes:**
CSFo = Oral Carcinogenic Slope Factor
NA = Not Available
RfDo = Oral Reference Dose
The CSFo and RfDo were obtained from the Intergrated Risk Information System (IRIS, 2003).

**References:**

USEPA, 1989. *Risk Assessment Guidance for Superfund - Volume 1 Human Health Evaluation Manual (Part A)*. December 1989. EPA/540/1-89/002.
USEPA, 1997. *Exposure Factors Handbook*. August 1997. EPA/600/P-95/002Fa.
DON, 2003. Letter to Tim Gordon, USEPA, from M. Lewis, Department of Navy (DON), re: Site-specific Exposure Parameters. Dated June 23, 2003.

**On-site Worker Risk from Exposure to Potential Surface Soil**
**Inhalation of fugtive dust at SWMU 10**
**Reasonable Maximum Exposure**
**NSSR**

Exposure Point Concentration (EPC) = EPCsoil*(1/PEF)
Intake = (EPC*IR*EF*ED)/(BW*AT)
Excess-lifetime Carcinogenic risk (CR) = Intake*CSFo
Hazard Quotient (HQ) = Intake/RfDo

| Parameter | | Units | Rationale |
|---|---|---|---|
| Exposure Point Concentration (EPC) = | Chemical-specfic | $mg/m^3$ | Site-specific parameter assuming that the maximum residual soil concentration does not exceed 10 mg/kg. |
| Particulate Emission Factor (PEF) = | 1.32E+09 | $m^3/kg$ | Default parameter (USEPA, 1996) |
| Inhalation Rate (IR) = | 6.4 | $m^3/day$ | Site-specific parameter assuming 1.6 $m^3$/day for moderate activities (USEPA, 1997) for a max of 4 hours (DON, 2003) |
| Exposure Frequency (EF) = | 2.25 | days/year | Site-specific parameters (DON, 2003) |
| Exposure Duration (ED) = | 25 | Years | Default parameter (USEPA, 1989) |
| Body Weight (BW) = | 70 | kg | Default parameter (USEPA, 1989) |
| Carcinogenic Averaging Time (ATc) = | 25550 | days | Default parameter (USEPA, 1989) |
| Noncarcinogenic Averaging Time (ATnc) = | 56.25 | days | Site-specific parameter assuming that on-site worker would spent 2.25 days/year for a duration of 25 years. |

| | | | | Excess-lifetime Cancer Risk (CR) | | | Noncancer Hazard Index (HI) | | |
|---|---|---|---|---|---|---|---|---|---|
| **Contaminant** | **EPC ($mg/m^3$)** | **CSFi** | **RfDi** | **Intake** | **CR** | **% Contribution of Total CR** | **Intake** | **HQ** | **% Contribution of Total HI** |
| Aroclor-1260 | 7.6E-09 | 2.00E+00 | NA | 1.52E-12 | 3.05E-12 | 100 | 6.93E-10 | -- | -- |
| | | | | **Total CR =** | **3.05E-12** | | **HQ =** | **--** | |

**Notes:**
CSFi = Inhalation Carcinogenic Slope Factor
NA = Not available
RfDi = Inhalation Reference Dose
The CSFi and RfDi were obtained from the Intergrated Risk Information System (IRIS, 2003).

**References:**

USEPA, 1989. *Risk Assessment Guidance for Superfund - Volume 1 Human Health Evaluation Manual (Part A)*. December 1989. EPA/540/1-89/002.
USEPA, 1997. *Soil Screening Guidance: Technical Background Document*. July 1996. EPA/540/R-95/128.
USEPA, 1997. *Exposure Factors Handbook*. August 1997. EPA/600/P-95/002Fa.
DON, 2003. Letter to Tim Gordon, USEPA, from M. Lewis, Department of Navy (DON), re: Site-specific Exposure Parameters. Dated June 23, 2003.

**On-site Worker Risk from Exposure to Surface Soil**
**Dermal contact with surface soil at SWMU 10**
**Reasonable Maximum Exposure**
**NSSR**

Intake = (EPC*CF*AF*ABS*A*EF*ED)/(BW*AT)
Excess-lifetime Carcinogenic risk (CR) = Intake*CSFo
Hazard Quotient (HQ) = Intake/RfDo

| Parameter | Units | Rationale |
|---|---|---|
| Exposure Point Concentration (EPC) = Chemical-specfic | mg/kg | Site-specific parameter assuming that the maximum residual soil concentration does not exceed 10 mg/kg. |
| Conversion Factor (CF) = 1.00E-06 | kg/mg | Not applicable |
| Adherence Factor (AF) = 0.1 | $mg/cm^2$ | Default parameter for grounds keeper (USEPA, |
| Absorption Fraction (ABS) = Chemical-specfic | | Default parameter (USEPA, 2002) |
| Exposure Frequency (EF) = 2.25 | days/year | Site-specific parameters (DON, 2003) |
| Exposure Duration (ED) = 25 | years | Default parameter (USEPA, 1989) |
| Skin Surface Area (A) = 3,300 | $cm^2/day$ | Default parameter (USEPA, 2002) |
| Body Weight (BW) = 70 | kg | Default parameter (USEPA, 1989) |
| Carcinogenic Averaging Time (ATc) = 25550 | days | Default parameter (USEPA, 1989) |
| Noncarcinogenic Averaging Time (ATnc) = 56.25 | days | Site-specific parameter assuming that on-site worker would spent 2.25 days/year for a duration of 25 years. |

| | | | | | Excess-lifetime Cancer Risk (CR) | | | Noncancer Hazard Index (HI) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Contaminant | EPC (mg/kg) | ABS | CSFo | RfDo | Intake | CR | % Contribution of Total CR | Intake | HQ | % Contribution of Total HI |
| Aroclor-1260 | 10 | 0.14 | 2.00E+00 | NA | 1.45E-08 | 2.91E-08 | 100 | 6.60E-06 | -- | -- |
| | | | | | Total CR = 2.91E-08 | | | HQ = | -- | |

**Notes:**
CSFo = Oral Carcinogenic Slope Factor
HI = Hazard Index
NA = Not Available
RfDo = Oral Reference Dose
The CSFo and RfDo were obtained from the Intergrated Risk Information System (IRIS, 2003).

**References:**
USEPA, 1989. *Risk Assessment Guidance for Superfund - Volume 1 Human Health Evaluation Manual (Part A)*. December 1989. EPA/540/1-89/002.
USEPA, 1997. *Exposure Factors Handbook*. August 1997. EPA/600/P-95/002Fa.
USEPA, 1997. *Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)*. Feburary 2000.
DON, 2003. Letter to Tim Gordon, USEPA, from M. Lewis, Department of Navy (DON), re: Site-specific Exposure Parameters. Dated June 23, 2003.

# Summary of Risk for On-Site Worker Risk Exposure to Surface Soil at SWMU 10

| Exposure Pathway | Excess-lifetime carcinogenic risk (CR) | Hazard Indices (HI) |
|---|---|---|
| Ingestion | 3.15E-08 | -- |
| Inhalation | 3.05E-12 | -- |
| Dermal | 2.91E-08 | -- |
| **Total** | **6.05E-08** | **--** |

**Attachment 3 - Summary of Media Impacts Table**
**Naval Station Roosevelt Roads, Ceiba, Puerto Rico**

| SWMU/AOC | GW | AIR (Indoor) | SURFACE SOIL | SURFACE WATER | SEDIMENT | SUBSURFACE SOIL | AIR (Outdoor) | CORRECTIVE ACTION | KEY CONTAMINANTS |
|---|---|---|---|---|---|---|---|---|---|
| SWMU 1 | Yes | No | Yes | Yes | Yes | Yes | No | Engineering and/or institutional controls | Dioxins, metals, pesticides, SVOCs, VOC |
| SWMU 2 | Yes | No | Yes | Yes | Yes | Yes | No | Engineering and/or institutional controls | Metals, pesticides, VOCs |
| SWMU 3 | Yes | No | No | No | Yes | No | No | Engineering and/or institutional controls | Metals, SVOCs, VOCs |
| SWMU 6/AOC B | Yes | No | Yes | Yes | No | No | No | No corrective action recommended in CMS. | Dioxins, metals, pesticides, SVOCs |
| SWMU 7/8 | Yes | No | Yes | Yes | Yes | Yes | No | Engineering and/or institutional controls Free product recovery | Metals, SVOCs, VOCs |
| SWMU 9 | Yes | No | Yes | Yes | Yes | Yes | No | No corrective action recommended in CMS. | Metals, SVOCs, VOCs |
| SWMU 10 | No | No | Yes | No | No | Yes | No | 235 cubic yards of PCB-impacted soil excavated. No corrective action recommended in CMS. | PCBs |
| SWMU 11/45 | Yes | No | No | No | Yes | Yes | No | Excavation of PCB-impacted soils In-situ decommissioning of cooling water tunnel Engineering and/or Institutional Controls | Metals, PCBs, SVOCs |

| SWMU/AOC | GW | AIR (Indoor) | SURFACE SOIL | SURFACE WATER | SEDIMENT | SUBSURFACE SOIL | AIR (Outdoor) | CORRECTIVE ACTION | KEY CONTAMINANTS |
|---|---|---|---|---|---|---|---|---|---|
| SWMU 13 | No | No | No | No | Yes | No | No | Engineering and/or institutional controls Excavation of pesticide-impacted sediment planned | Pesticides |
| SWMU 14 | No | No | Yes | No | No | No | No | Engineering and/or institutional controls | SVOCs |
| SWMU 30 | Yes | No | No | No | No | Yes | No | No further action recommended in RFI | Metals |
| SWMU 31/32 | No | No | Yes | No | No | Yes | No | Engineering and/or institutional controls Pavement installation planned | Dioxins, furans |
| SWMU 37 | No | No | Yes | No | No | No | No | No further action recommended in RFI | SVOCs |
| SWMU 46 | No | No | Yes | No | No | No | No | Engineering and/or institutional controls Excavation of SVOC-impacted surface soil planned | Metals, PCBs, SVOCs |
| SWMU 53 | No | No | Yes | No | No | No | No | Engineering and/or institutional controls | Metals |
| SWMU 54 | Yes | No | No | No | No | No | No | Engineering and/or institutional controls | SVOCs, VOCs |
| AOC C | No | No | Yes | No | No | No | No | Engineering and/or institutional controls Excavation of SVOC-impacted surface soil planned | Metals, PCBs, SVOCs |