

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action Environmental Indicator (EI) RCRIS Code (CA750) Migration of Contaminated Groundwater 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 and 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 “Migration of Contaminated Groundwater Under Control” EI

A positive “Migration of Contaminated Groundwater Under Control” EI determination (“YE” status code) indicates that the migration of “contaminated” groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original “area of contaminated groundwater” (for all groundwater “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 objectives of the RCRA Corrective Action program, the EIs are near-term objectives which are currently being used as program measures for the Government Performance and Results Act of 1993 (GPRA). The “Migration of Contaminated Groundwater Under Control” EI pertains ONLY to the physical migration (i.e., further spread) of contaminated groundwater and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

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 SWMUs, regulated units (RUs), and AOCs), been **considered** in this EI determination?

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 CA750 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 magnetometry) 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, and 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 CA750.

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). PCBs, 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 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 Building 1686 (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 CA750 EI determination.

References:

1. Final RCRA Part B Permit PR2170027203. Prepared by EPA. Dated October 20, 1994.
2. Final RCRA Facility Investigation Work Plan. 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. Is **groundwater** known or reasonably suspected to be “**contaminated**”¹ above appropriately protective “levels” (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

- If yes - continue after identifying key contaminants, citing appropriate “levels,” and referencing supporting documentation.
- If no - skip to #8 and enter “YE” status code, after citing appropriate “levels,” and referencing supporting documentation to demonstrate that groundwater is not “contaminated.”
- If unknown - skip to #8 and enter “IN” status code.

Rationale:

Groundwater Conditions

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. Thickness of the residual soil is variable, but can reach 40 feet as documented at SWMU 7/8 (Ref. 3). The contact between this unit and the underlying bedrock is gradual. 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. An additional unit is reported at SWMU 7/8 near Ensenada Honda that consists of marine sediments composed primarily of silt with lesser amounts of sand and clay with coral and shell fragments (Ref. 3).

Groundwater at the site occurs under unconfined and semi-confined conditions. Groundwater is encountered at depths ranging from 2.7 to 26.1 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. Hydraulic gradients are generally low and range from 0.0002 to 0.02. Hydraulic conductivity values range from 0.02 to 27.5 ft/day. Groundwater conditions and aquifer properties at the site are summarized in Table 1.

Groundwater is not used as a potable water source at the site (Ref. 7). For over 30 years, the Site has obtained potable water from a water treatment plant that receives raw water from the Rio Blanco. 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 site in 1999 indicated an aggregate yield of approximately 99 gallons per day, which is below the yield of aquifers considered for potable use (Ref. 7).

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 appropriate “levels” (appropriate for the protection of the groundwater resource and its beneficial uses).

Table 1 - Summary of Groundwater Conditions and Aquifer Properties

SWMU	Depth to Groundwater		Groundwater Flow		Hydraulic Conductivity	
	Date	fbgs	Direction	Gradient	ft/day	Wells
1 ¹	12/1996	4.6 - 26.1	follows topography towards mangrove swamps	0.0033 - 0.0044	4.1 - 27.5	1MW01, 1MW02, 1MW03, 1MW04, 5GW01, 5GW03, 5GW04
2 ¹	12/1996	2.7 - 9.5	east-southeast towards mangrove swamps	0.0101 - 0.0131	1.30 - 17.20	2MW03, 2MW01
3 ²	2/2002	~4 - 14	radial west, south, and east towards Puerca Bay	0.00055 - 0.00245	N/A	N/A
7/8 ³	2/2002	8 - 25	divide: north towards mangrove swamps and south towards Ensenada Honda	0.0002 - 0.02	0.07 - 4.77, ave 1.84 0.26 - 10.31, ave 3.03 0.02 - 11.98, ave 2.30 0.35 - 12.34, ave 3.52	Unconsolidated marine sediments Unconsolidated fill material Residual soil and saprolite Weathered and unweathered bedrock
9 ⁴	5/1996	6 - 19	radial, low marshy areas to the north, west, and east to possible discharge areas	0.0011 - 0.017	1.4 - 5.6	13GW01, 13GW02, 13GW03, 13GW05, 13GW06, 13GW07, 13GW08, 13GW09, 13GW11
30 ⁵	6/1994	9 - 16	northeast, possible discharge to Puerca Bay	0.0088	0.03 - 0.16	1983-MW2, 1983-MW3 1983-MW4
45 ¹	12/1996	~11	northeast towards Puerca Bay	0.005	0.09 - 24.3	45MW01, 45MW03 45MW04
54 ⁶	3/2002	5 - 13	groundwater divide, flow is NE and SW towards the Caribbean Sea	0.008 - 0.01	0.027 - 0.272	N/A
AOC B ⁷	N/A	N/A	west-southwest towards Puerca Bay	N/A	N/A	N/A

1. Ref. 9; 2. Ref. 2; 3. Ref. 5; 4. Ref. 6; 5. Ref. 8; 6. Ref. 4; 7. Ref. 10.

N/A = Not available

fbgs = feet below ground surface

Groundwater Quality

Groundwater at SWMUs 1, 2, 3, 7/8, 9, 14, 30, 45, and 54 and AOC B have groundwater contaminant concentrations in excess of relevant groundwater standards. The standards utilized for NSRR are the Federal Maximum Contaminant Limit (MCL) and the Region III Risk-Based Concentrations (RBCs), with the exception of SWMU 7/8, which used Corrective Action Objectives (CAOs) developed during the CMS. A summary of the constituents that exceed these standards is presented in Table 2. As presented in Table 2, the list of constituents that exceed relevant standards include VOCs, SVOCs, PCBs, pesticides, a dioxin, and metals.

Table 2 - Concentrations Above Tap Water RBCs / Federal MCLs / CAOs (µg/L)

SWMU	Constituent	Well I.D.	Maximum Concentration ⁹	Tap Water RBC ¹⁰	Federal MCL ¹⁰	CAO ¹⁰
1 ¹	VOCs					
	Chloroform	1MW04	2J	0.15	100	NE
	Pesticides					
	Aldrin	1MW02	0.1J	0.00394	NE	
	Dioxins					
	Total HxCDD	5GW02	0.0005J	0.0000045	NE	
	Metals					
	Antimony (total)	1MW01D	86.7	14.6	6	
	Beryllium (total)	1MW04	4.8	73	4	
	Chromium (total)	1MW04	259	110	100	
	Copper (total)	1MW04	2,950	1,460	1,300	
	Mercury (total)	1MW04	6.5	NE	2	
	Nickel (total)	1MW04	188	730	100	
Cadmium (dissolved)	1MW01	42.1J	18	5		
Copper (dissolved)	5GW02	1,680	1,460	1,300		
2 ¹	VOCs					
	Chloroform	2MW02	7	0.15	100	NE
	Trichloroethene	6GW01	7	1.55	5	
	SVOCs					
	Pentachlorophenol	6GW01	5J	0.56	1	
	Pesticides					
	Aldrin	2MW01	0.13	0.0039	NE	
	Heptachlor epoxide	2MW01	0.04	0.0012	0.2	
	Metals					
	Antimony (total)	2MW03	19.6J	14.6	6	
	Arsenic (total)	2MW03	2.8	0.045	50	
	Lead (total)	2MW02	16.9	NE	15	
	Vanadium (total)	2MW02	631	256	NE	
3 ²	VOCs					
	Chloroform	R7GW11	3J	0.15	100	NE
	SVOCs					
	1,4-Dioxane	R7GW02R	38	6.1	NE	
	Benzo(a)pyrene	R7GW01R	0.5J	0.092	NE	
	Benzo(b)fluoranthene	R7GW01R	0.36J	0.092	NE	
	Indeno(1,2,3-cd)pyrene	R7GW01R	0.79J	0.092	NE	
	Metals					
	Arsenic (total)	R7GW04R	12J	0.045	10	
	Barium (total)	R7GW04R	370	260	2,000	
	Thallium (total)	R7GW04R	34	0.26	2	
Vanadium (total)	R7GW04R	45	26	NE		
Thallium (dissolved)	R7GW04R	27	0.26	2		

SWMU	Constituent	Well I.D.	Maximum Concentration ⁹	Tap Water RBC ¹⁰	Federal MCL ¹⁰	CAO ¹⁰
7/8 ³	VOCs Benzene Ethylbenzene 1,2,4-trimethylbenzene Trichloroethene Free Product	470MW01 UGW13 470MW03 7MW07 UGW3, UGW12, UGW13, UGW17, UGW19, UGW21, PW2, 470MW1, 7MW08, 7MW15, RW1, RW5, GW02, GW03	19,000D 23,865 4,600 28,000J > 0.01 foot thickness	N/A	N/A	550 1,000 3,300 22
9 ⁴	VOCs Benzene Bis(2-ethylhexyl)phthalate Bromoform Bromodichloromethane Chloroform Dibromochloromethane Ethylbenzene Methylene chloride Toluene SVOCs Acetophenone Bis(2-ethylhexyl)phthalate Naphthalene Metals Arsenic (total) Cadmium (total) Chromium (total) Mercury (total) Cadmium (dissolved) Lead (dissolved) Mercury (dissolved)	9-B05-HP02 13GW10 13GW06 13GW06 13GW06 13GW06 9-B05-HP02 13GW06 9-B05-HP02 9MW01 13GW04 13GW02 9GW02S 9MW02 9GW02S 9MW02 9MW02 9GW02R 9MW02	11,000 38 360 460 1,100 300 1,200 11 14,000 1J 7J 26 29.2 29 193 0.33J 30.4 1.9J 0.31J	0.36 4.78 8.5 0.17 0.152 0.126 1,340 4.1 747 0.042 4.784 6.5 0.045 18.3 110 NE 18.3 NE NE	5 6 100 100 100 100 700 5 1,000 NE 6 NE 50 5 100 2 5 15 2	NE
30 ⁵	Metals Antimony (total) Arsenic (total) Zinc (total) Antimony (dissolved) Arsenic (dissolved) Vanadium (dissolved)	1983-MW3 1983-MW3 1983-DW1 1983-DW1 1983-MW3 1983-MW3	31.5 4.4 72,000 23.3 3.0 177	14.6 0.045 10,950 14.6 0.045 256	6.0 50.0 NE 6.0 50.0 NE	NE

SWMU	Constituent	Well I.D.	Maximum Concentration ⁹	Tap Water RBC ¹⁰	Federal MCL ¹⁰	CAO ¹⁰
45 ⁶	SVOCs					
	Benzo(a)anthracene	11-SB05	6J	0.09	NE	NE
	Benzo(a)pyrene	11-SB05	7J	0.01	0.2	
	Bis(2-ethylhexyl)phthalate	45MW02	64J	4.78	6	
	Chrysene	11-SB05	13J	9.17	NE	
	PCBs					
	Aroclor-1260	45HP02	0.35	0.03	0.5	
	Metals					
	Arsenic (total)	45HP01	103	0.04	50	
	Cadmium (total)	45MW04	27.8	18.25	5	
	Chromium (total)	45MW01	182	109.5	100	
	Lead (total)	45HP02	30	NE	15	
	Arsenic (dissolved)	45HP01	16.1J	0.04	50	
	Cadmium (dissolved)	45HP01	5.6	18.25	5	
Mercury (dissolved)	11-SB16	2.6	NE	2		
54 ⁷	VOCs					NE
	1,1-Dichloroethene	510MW3	1.5J	0.04	7	
	1,2-Dichloroethane	54TW07	2.8J	0.12	5	
	Benzene	54TW15	3,000	0.32	5	
	Chloroform	54TW08	8	0.15	NE	
	Ethylbenzene	54TW15	2,400	3.25	700	
	Isobutanol	54TW15	2,600J	183	NE	
	Toluene	54TW15	400	74.7	1,000	
	Trichloroethene	510MW5	190	0.03	5	
	Xylene	54TW15	8,000	1,217	10,000	
	SVOCs					
	2-Methylnaphthalene	54TW15	65	12.2	NE	
	Naphthalene	54TW15	190	0.65	NE	
AOC B ⁸	Metals					NE
	Arsenic (total)	ACBMW01	5.8J	0.045	50	
	Barium (total)	ACBMW01	2,210	2,555	2,000	
	Beryllium (total)	ACBMW01	5.9	73	4	
	Chromium (total)	ACBMW01	168	110	100	
	Copper (total)	ACBMW01	2,480	1,460	1,300	
	Lead (total)	ACBMW03	19.1J	NE	15	
	Nickel (total)	ACBMW01	199	730	0.1	
	Vanadium (total)	ACBMW01	790	255.5	NE	
Lead (dissolved)	ACBMW03	17.5J	NE	15		

1. Ref. 9 is the data source. Samples collected as part of a 1996 RFI field investigation.
2. Ref. 2. Samples collected in February and March 2002.
3. Ref. 1 and 5. Samples collected January and February 2002.
4. Ref. 6. Samples collected March/April 1996, September 1997, and June 1999.
5. Ref. 8. Samples collected in October 1995 during the Phase I RFI.
6. Ref. 9. "MW" and "HP" samples were collected in October 1996 during the 1996 RFI and "SB" samples were collected in September 1997 during the 1997 RFI.
7. Ref. 4. Samples were collected in February and March 2002 during the 2002 RFI.
8. Ref. 10. Samples were collected in March 1996 and September 1997.
9. Estimated concentrations are flagged with a "J." Concentrations flagged with a "D" are based on dilution analysis.
10. Standards listed are the Region III Risk Based Concentrations (RBC), the Federal Maximum Contaminant Limit (MCL), and the Corrective Action Objective (CAO).

NE = Not established
N/A = Not applicable

In addition to the dissolved phase contaminants, free product is reported in several discrete locations within SWMU 7/8. Product thickness has been monitored since product was first investigated in 1991. The most recent results available in file materials, measured in February 2002, indicate measurable free

product at wells UGW3, UGW12, UGW13, UGW17, UGW19, UGW21, PW2, 470MW1, 7MW08, 7MW15, RW1, RW5, GW02, and GW03 (Ref. 1). These occurrences of free product lie along and to the north of Forrestal Drive.

The lateral extent of groundwater contamination for each SWMU/AOC is illustrated in a number of figures presented in RFI and CMS reports. A summary of relevant figures and report references for each SWMU/AOC is presented in Table 3.

Table 3 - Summary of Report Figures that Illustrate Contaminant Plume Boundaries / Concentrations that Exceed Relevant Standards

SWMU/AOC	Figure Number	Report Reference
1	5-16, 5-17, 5-18, 5-19, 5-20	Ref. 9
2	5-50	Ref. 9
3	6-1	Ref. 2
7/8	2-4, 2-5, 2-6, 2-7, 2-8, 2-9	Ref. 1
9	5-10, 5-11, 5-12, 5-17, 5-25	Ref. 6
11/45	5-53	Ref. 9
30	5-3	Ref. 8
54	5-4, 5-5, 5-6	Ref. 4
AOC B	2-4	Ref. 10

Figures truncated, see facility file.

It is reported that decreases in hydraulic conductivity are associated with reductions in the degree of weathering and fracturing with depth (Ref. 3). Based on this conclusion, and the understanding that the occurrence of open fractures generally does decrease with depth in fractured bedrock systems, it appears that the extent of contaminant migration is limited in vertical extent. Although not mentioned in available file materials, it is also likely that water density differences between the upper impacted groundwater and the lower high salinity intruded seawater would further limit the vertical migration of contaminated groundwater.

References:

1. Corrective Measures Study Task 1 Report for Tow Way Fuel Farm, including the July 9, 2002 Draft Corrective Measures Study Task 1 Report for Tow Way Fuel Farm as modified by the Addendum submitted January 6, 2003 and replacement pages for the Addendum submitted April 22, 2003. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated April 22, 2003.
2. Revised Final RCRA Facility Investigation Report, SWMU 3, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated March 18, 2003.
3. Groundwater Model Report, Tow Way Fuel Farm, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated January 3, 2003.

4. Draft RCRA Facility Investigation Report, SWMUs 53 and 54, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated July 17, 2002.
5. Additional Data Collection Investigation Report, Tow Way Fuel Farm, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated January 13, 2002.
6. Revised Draft RCRA Facility Investigation Report for SWMU 9, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated March 10, 2000.
7. TCE Investigation Report for SWMU 7/8 - Tow Way Fuel Farm, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated February 15, 2000.
8. Final Phase II RCRA Facility Investigation Report, SWMU 30 - Former Incinerator Area, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM. Dated February 15, 2000.
9. RCRA Facility Investigation Report for Operable Unit 3/5, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by Baker Environmental, Foster Wheeler Environmental Corporation, and Weston Environmental. Dated April 1999.
10. Draft Additional Investigations Report, Operable Units 1, 6, and 7, Naval Station Roosevelt Roads, Ceiba, Puerto Rico, prepared by Baker Environmental, Inc. Dated May 6, 1998.

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within “existing area of contaminated groundwater”² as defined by the monitoring locations designated at the time of this determination)?

- If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the “existing area of groundwater contamination.”²
- If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the “existing area of groundwater contamination”²) - skip to #8 and enter “NO” status code, after providing an explanation.
- If unknown - skip to #8 and enter “IN” status code.

Rationale:

Contaminant Migration

As summarized in the response to Question 2, groundwater flow direction is primarily controlled by topography, which results in complete groundwater discharge to the mangrove swamps, Ensenada Honda, and Puerca Bay. Therefore, the migration of the dissolved phase of groundwater contamination can be considered stabilized at the NSRR site because the lateral extent of potential contaminant migration is limited by the boundaries of these surface water bodies.

As discussed in the response to Question 2, free product is reported in several discrete locations at SWMU 7/8. Delineation of the free product contamination was initiated in 1991. Remedial systems testing and product recovery began in 1994 with the testing of one-, two-, and three-phase recovery systems that recovered 12,630 gallons of product from 1994 to 1995. As part of an ICM, free product removal was performed from March 1997 to October 1999. The objective of the ICM was to stabilize the plume and to stop further migration and to begin removing product from the subsurface. Product removal was interrupted by the performance of a pneumatic fracturing pilot study to improve product recovery. Free product removal resumed in March 2001 and is currently performed by pumping free product with a portable pump. Approximately 1,611 gallons of product were recovered from March 1997 through October 1999, and 111 gallons from March 2001 through April 2002. A complete summary of investigation and product recovery testing and operations is provided in the 2003 Corrective Measures Study (Ref. 7). A review of RCRA Quarterly Monitoring Reports indicates that product thickness has generally decreased. The number of monitoring wells that had a product thickness of greater than one foot decreased from 19 wells in 1997 to 8 wells in 2000 (Ref. 17). The decrease in the size of the free product plume indicates that the product migration has been stabilized by product recovery efforts.

Proposed Remedial Action

SWMUs 1, 2, and 45

² “Existing area of contaminated groundwater” is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of “contamination” that can and will be sampled/tested in the future to physically verify that all “contaminated” groundwater remains within this area, and that the further migration of “contaminated” groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

The Department of the Navy is required to complete CMS reports for SWMUs 1, 2, and 45. As part of the CMS, a Baseline Risk Assessment (BRA) and Ecological Risk Assessment (ERA) will be completed (Ref. 1). The Navy has completed a draft Screening-Level Ecological Risk Assessment Problem Formulation (Step 1) and Exposure Estimate for these SWMUs (Refs. 11 and 12) and addenda (Refs. 3 and 4), which represent Step 1 of the ERA eight-step process. The CMS for SWMUs 1 and 2 will be used to support the Navy's recommendation for the placement of institutional controls related to land use restrictions (Ref. 21). The SWMU 45 CMS will address cooling water tunnel soils and Puerca Bay sediments. Potential impacts of chemicals of concern (COCs) in groundwater on ecological receptors will be evaluated through the review of existing and future surface water and sediment data collected from downgradient surface water bodies (Refs. 11 and 12).

SWMU 3

The Department of the Navy proposes to continue semi-annual groundwater monitoring under the RCRA Subtitle D program to ensure that groundwater is not being impacted by landfill operations (Ref. 8).

SWMU 7/8

According to the 2003 CMS, further investigation is planned to delineate TCE source areas in the vicinity of well 7MW07 (Ref. 7). Selection of the most appropriate corrective measure alternative presented in the CMS will be made following the investigation. The five alternatives provided in the CMS include various combinations of techniques including institutional controls, monitored natural attenuation, containment and collection, in-situ treatment, and ex-situ treatment. The CMS specifies that monitoring will continue within and downgradient of the plumes for all COCs (Ref. 7).

SWMU 9

Site conditions at SWMU 9 are generally discussed in terms of three areas: A, B, and C. The 2003 CMS evaluated potential impacts of COCs in groundwater on ecological receptors through the review of existing and future surface water and sediment data collected from downgradient surface water bodies. The CMS concluded that no potential ecological risks are posed by Area A and C surface soils, Area A/B and C surface water, and Area C sediment (Ref. 6). Potential risks were identified to soil invertebrates and upper trophic level receptors at Area B from lead and zinc surface soil and to benthic invertebrates and upper trophic level receptors from lead detected in Area A/B sediment. Subsequently, a work plan was developed for additional characterization of surface soils in Areas B and sediment in Area A/B (Ref. 5).

SWMU 14

Soil investigations conducted at SWMU 14 during Phase I RFI activities in 1996 identified several SVOCs at concentrations above relevant standards (Ref. 16). Institutional and engineering controls have been implemented at this unit to mitigate further impact of soil and potential impacts to groundwater. Following a Human Health Risk Assessment (Ref. 20) that identified no potential risks to human health, the Department of the Navy requested that additional RFI investigation be suspended until SWMU closure (Ref. 16). EPA approved this request in a letter dated May 4, 2001 and stated that remediation will be performed, as necessary, following the closure and completion of RFI activities (Ref. 15).

SWMU 30

As part of the Phase II RFI, human health and ecological screening evaluations were conducted to determine if impacted soil and groundwater could potentially pose a risk to human health or ecological receptors (Ref. 19). Although impacted groundwater from SWMU 30 is not currently discharging to surface water, discharge to surface water was considered as a potential exposure pathway. The RFI report concluded that a potential human health risk may exist in the residential/potable groundwater use scenario for antimony and zinc. No potential risks were identified for ecological receptors. The RFI report

recommended NFA based on the small size of the SWMU and the unlikelihood that groundwater will be used for potable purposes given the close proximity to the wastewater treatment plants and sanitary landfills. By letter dated January 20, 2000 (Ref. 18), EPA indicated it was prepared to approve the NFA at SWMU 30, contingent on groundwater underlying or downgradient of the SWMU not being used in the future as a drinking water source, and also completion of public comment on that determination, which is planned to be implemented when the Draft RCRA renewal permit undergoes public review.

SWMU 54

Based on the results of the 2002 RFI (Ref. 10), a CMS work plan was developed to address COCs identified in groundwater, which include trichloroethene, benzene, ethylbenzene, chloroform, and benzo(a)pyrene (Ref. 9). The CMS work plan was submitted to EPA on March 7, 2003, and approved on June 3, 2003 (Ref. 2).

AOC B

The human health risk assessment completed as part of the CMS concluded that there were no unacceptable risks to human health resulting from potential exposure to the metal concentrations reported in groundwater (Ref. 13). No remedial action is planned at AOC B (Ref. 14).

References:

1. Letter from Timothy Gordon, EPA, to Kevin Cloe, Navy Technical Representative, re: Naval Station Roosevelt Roads - EPA I.D. Number PR2170027203. Dated June 10, 2003.
2. Letter from Timothy Gordon, USEPA, to Kevin Cloe, Naval Station Roosevelt Roads, re: Naval Station Roosevelt Road. Dated June 3, 2003.
3. Addendum to the Draft Screening-Level Ecological Risk Assessment Problem Formulation (Step 1) and Exposure Estimate SWMU 45, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated May 22, 2003.
4. Addendum to the Draft Screening-Level Ecological Risk Assessment Problem Formulation (Step 1) and Exposure Estimate SWMUs 1 and 2, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated May 14, 2003.
5. Additional Data Collection Work Plan, Corrective Measures Study, SWMU 9, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated April 25, 2003.
6. Final Corrective Measures Study Investigation Report for SWMU 9, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated April 25, 2003.
7. Corrective Measures Study Task 1 Report for Tow Way Fuel Farm, including the July 9, 2002 Draft Corrective Measures Study Task 1 Report for Tow Way Fuel Farm as modified by the Addendum submitted January 6, 2003 and replacement pages for the Addendum submitted April 22, 2003. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated April 22, 2003.
8. Revised Final RCRA Facility Investigation Report, SWMU 3, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated March 18, 2003.
9. Corrective Measures Study Work Plan, SWMUs 53 and 54, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated March 7, 2003.

10. Draft RCRA Facility Investigation Report, SWMUs 53 and 54, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated July 17, 2002.
11. Screening-Level Ecological Risk Assessment Problem Formulation (Step 1) and Exposure Estimate SWMUs 1 and 2, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated August 10, 2001.
12. Screening-Level Ecological Risk Assessment Problem Formulation (Step 1) and Exposure Estimate SWMU 45, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated August 10, 2001.
13. Corrective Measures Study Final Report, SWMU 6/AOC B, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated June 21, 2001.
14. Letter from Mark Kimes, Baker Environmental, to Nicoletta DiForte, USEPA, re: Final CMS Final Report for SWMU 6 and AOC B. Dated June 21, 2001.
15. Letter from Raymond Basso, USEPA, to Christopher Penny, Naval Station Roosevelt Roads, re: Naval Station Roosevelt Roads - EPA I.D. PRD2170027203. Dated May 4, 2001.
16. Draft Interim Decision Document for SWMU 14 - Fire Training Pit Area. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated November 22, 2000.
17. Tow Way Fuel Farm, Quarterly Summary Progress Report No. 13, February 1, 2000 through April 30, 2000, RCRA/HSWA Permit No PR2170027203, Naval Station Roosevelt Roads, Ceiba, Puerto Rico. Dated May 31, 2000.
18. Letter from Nicoletta DiForte, EPA, to Christopher T. Penny, Naval Facilities Engineering Command, re: December 10, 1999 Draft Final RFI Report, SWMU 30 - Former Incinerator Area. Dated January 20, 2000.
19. Final Phase II RCRA Facility Investigation Report, SWMU 30 - Former Incinerator Area, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM. Dated February 15, 2000.
20. Human Health Risk Assessment Report SWMU 14 - Fire Training Pit Area, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR217002703, Ceiba, Puerto Rico. Prepared by Baker Environmental, Inc. Dated February 4, 2000.
21. Revised Draft RCRA Facility Investigation Report for Operable Unit 3/5, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by Baker Environmental, Foster Wheeler Environmental Corporation, and Weston Environmental. Dated April, 1999.

4. Does “contaminated” groundwater **discharge** into **surface water** bodies?

If yes - continue after identifying potentially affected surface water bodies.

If no - skip to #7 (and enter a “YE” status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater “contamination” does not enter surface water bodies.

If unknown - skip to #8 and enter “IN” status code.

Rationale:

SWMUs 1 and 2

Groundwater in SWMUs 1 and 2 discharges to the mangrove swamp located on the shore of Ensenada Honda (Ref. 6). The RFI concluded that the metal concentrations in groundwater are attributed to natural background conditions and not to site activities (Ref. 6). Review of data obtained from downgradient monitoring wells located adjacent to the mangrove swamp indicates that groundwater containing aldrin (SWMU 1 and 2), chloroform (SWMU 2), and heptachlor epoxide (SWMU 2) has the potential to discharge to the mangrove swamp.

SWMU 3

Groundwater in SWMU 3 discharges to Puerca Bay and the Caribbean Sea (Ref. 1). Data collected from monitoring wells located downgradient of the landfill and adjacent to the coast indicate that concentrations of one VOC (chloroform), four SVOCs (1,4-Dioxane, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene) and four metals (arsenic, barium, thallium, and vanadium) above relevant groundwater standards have the potential to discharge to surface water.

SWMU 7/8

Groundwater in SWMU 7/8 discharges to Ensenada Honda (Ref. 3). A review of data collected from monitoring wells located adjacent to Ensenada Honda indicates that fluorene and TCE-impacted groundwater has the potential to discharge to surface water. In addition, the discharge of contaminated groundwater is suggested by analytical results of surface water and sediment samples collected from Ensenada Honda. The surface water analytical results indicate detections of one VOC (carbon disulfide), one SVOC (bis(2-ethylhexyl)phthalate), six PAHs (anthracene, pyrene, fluoranthene, acenaphthene, phenanthrene, and naphthalene), and 10 dissolved metals (lead, thallium, tin, antimony, barium, cadmium, copper, vanadium, zinc, and selenium). Sediment analytical results indicate detections of six VOCs, 13 SVOCs, 16 PAHs, and 16 metals (Ref. 3).

SWMU 9

Groundwater in Area A discharges to the low lying marshy areas to the north, Area B groundwater discharges to the north, west, and east and Area C groundwater discharges to the west. A review of groundwater data (Ref. 4) collected adjacent to surface water bodies indicates that concentrations of various VOCs, SVOCs, and metals (dissolved and total) above groundwater standards have the potential to discharge to surface water.

SWMUs 30, 45, and 54, and AOC B

Contaminated groundwater in SWMUs 30 (Ref. 5), 45 (Ref. 6), and 54 (Ref. 2), and AOC B (Ref. 7) does not discharge to surface water bodies.

References:

1. Revised Final RCRA Facility Investigation Report, SWMU 3, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated March 18, 2003.
2. Draft RCRA Facility Investigation Report, SWMUs 53 and 54, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated July 17, 2002.
3. Additional Data Collection Investigation Report, Tow Way Fuel Farm, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated January 13, 2002.
4. Revised Draft RCRA Facility Investigation Report for SWMU 9, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated March 10, 2000.
5. Final Phase II RCRA Facility Investigation Report, SWMU 30 - Former Incinerator Area, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM. Dated February 15, 2000.
6. RCRA Facility Investigation Report for Operable Unit 3/5, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by Baker Environmental, Foster Wheeler Environmental Corporation, and Weston Environmental. Dated April, 1999.
7. Draft Additional Investigations Report, Operable Units 1, 6, and 7, Naval Station Roosevelt Roads, Ceiba, Puerto Rico, prepared by Baker Environmental, Inc. Dated May 6, 1998.

5. Is the **discharge** of “contaminated” groundwater into surface water likely to be “**insignificant**” (i.e., the maximum concentration³ of each contaminant discharging into surface water is less than 10 times its appropriate groundwater “level,” and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or ecosystems at these concentrations)?

_____ If yes - skip to #7 (and enter “YE” status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration³ of key contaminants discharged above their groundwater “level(s),” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or ecosystem.

X If no - (the discharge of “contaminated” groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration³ of each contaminant discharged above its groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations³ greater than 100 times their appropriate groundwater “levels,” the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and whether there is evidence that the amount of discharging contaminants is increasing.

_____ If unknown - enter “IN” status code in #8.

Rationale:

The discharge of contaminated groundwater to surface water is considered “significant” for SWMU 9 because several contaminant concentrations reported in monitoring wells adjacent to potential discharge points are above 10 times the relevant groundwater standards and the Marine Surface Water Screening Values (MSWSV). As shown in Table 4, benzene concentrations in well 13GW02 (130 µg/L) in Area A and well 9-B05-HP02 (1200 µg/L) in Area B are well above 10 times the RBC (3.6 µg/L) and 10 times the MCL (50 µg/L). Several other constituents (bromodichloromethane, bromoform, chloroform, and dibromochloromethane) exceed 10 times the RBCs and approach or exceed 10 times the MCL. However, for the following SWMUs (1,2, 3, and 7/8), the discharge of contaminated groundwater to surface water is “insignificant”, as discussed below:

SWMU 1

The concentration of contaminants that potentially discharge from SWMU 1 to the mangrove swamp can be roughly estimated as the concentration reported in monitoring well 1MW01. This well is located adjacent to the mangrove area and was last sampled in 1996. Metal concentrations in SWMU 1 groundwater are attributed to natural background conditions and are therefore not considered in this evaluation. Chloroform or total HxCDD, which exceeded relevant groundwater standards in upgradient wells, were not detected in Well 1MW01. Well 1MW01 reported an aldrin concentration of 0.03 µg/L,

³ As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

which does not exceed 10 times the tap water RBC or the MSWSV, as shown in Table 4. The RFI concludes that there are no impacts to surface water due to groundwater discharge (Ref. 7). Based on the comparisons with relevant standards and lack of surface water impacts, it is concluded that the discharge of SWMU 1 groundwater to surface water in the mangrove swamps is “insignificant.”

SWMU 2

Contaminant concentrations that potentially discharge from SWMU 2 to the mangrove swamp can be roughly estimated as the concentration reported in monitoring wells 2MW01 and 2MW03. These wells are located adjacent to the mangrove area. Trichloroethene and pentachlorophenol, reported above relevant groundwater standards in upgradient wells, were not detected in wells 2MW01 and 2MW03. The chloroform concentration in Well 2MW01 slightly exceeds 10 times the RBC, but is below the MCL and the MSWSV, as shown in Table 4. The highest reported aldrin concentration (0.13 µg/l in Well 2MW01) exceeds 10 times the RBC, but does not exceed the MSWSV. The reported heptachlor epoxide concentration exceeds 10 times the RBC and the MSWSV, but does not exceed the Federal MCL. The RFI concludes that there are no impacts to surface water due to groundwater discharge (Ref. 7). Due to the limited exceedence of 10 times the relevant groundwater standards, it is concluded that the discharge of SWMU 2 groundwater to surface water in the mangrove swamps is “insignificant.”

SWMU 3

Contaminant concentrations that potentially discharge from SWMU 3 to surface water can be roughly estimated as the concentrations reported in monitoring wells that are located between the landfill and the coast (Wells R7GW11, R7GW01R, R7GW02R, and R7GW04R). Chloroform, reported at an estimated concentration, is slightly above 10 times the RBC, but is well below the MCL and MSWSV, as shown in Table 4. The concentrations of 1,4-dioxane, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene are below 10 times the RBC and the MSWSV. Arsenic, reported at an estimated concentration, is above 10 times the RBC, but is below 10 times the MCL and MSWSV. Thallium is above 10 times the RBC and 10 times the MCL and also above the MSWSV. However, the 2003 RFI report states that metal concentrations were inconsistent both temporally and spatially and not necessarily indicative of a release (Ref. 3). The RFI report concludes that the concentrations that exceed the MSWSV would not likely pose a threat to ecological receptors. A technical review of the Draft RFI report supports this conclusion (Ref. 4).

Sediment samples that exceeded sediment screening levels were also reported to be isolated with minimal exceedances (Ref. 4). A risk assessment of AOC D sediments, which includes SWMU 3 sediments, concludes that no unacceptable risks are present (Ref. 3). Due to the limited exceedence of the 10 times the relevant groundwater standards and the risk assessment results that indicate no unacceptable ecological risks, it is concluded that the discharge of SWMU 3 groundwater to surface water is “insignificant.”

SWMU 7/8

Contaminant concentrations that potentially discharge from SWMU 7/8 to surface water can be roughly estimated as the concentrations reported in monitoring wells that are located adjacent to Ensenada Honda (wells UGW10 and TW-101 through TW-105). Fluorene, reported at an estimated concentration of 2.7 µg/L in well UGW10, is well below the MSWSV (no MCL or RBC is available for fluorene), as shown in Table 4. In addition, fluorene is not considered a groundwater COC for SWMU 7/8 according to analysis performed during the CMS (Ref. 2). TCE, which is considered a SWMU 7/8 COC, was reported in well TW-102 at a concentration well below 10 times the CAO and the MSWSV, as shown in Table 4. Based on these comparisons to relevant standards, it is concluded that discharge of SWMU 7/8 groundwater to surface water is “insignificant”.

Table 4 - Contaminant Concentrations Detected in Groundwater Adjacent to Surface Water (µg/L)

SWMU	Constituent	Well I.D.	Concentration ¹	10x RBC/ 10x Federal MCL ²	MSWSV ³
1	Aldrin	1MW01	0.03	0.0394/NE	0.13
2	Chloroform	2MW01	4J	1.5/1,000	815
	Aldrin	2MW01	0.13	0.0394/NE	0.13
	Aldrin	2MW03	0.084	0.0394/NE	0.13
	Heptachlor epoxide	2MW01	0.04	0.012/2	0.0038
3	Chloroform	R7GW11	3J	1.5/1,000	815
	1,4-Dioxane	R7GW02R	38	61/NE	67,000
	Benzo(a)pyrene	R7GW01R	0.5J	0.92/NE	10
	Benzo(b)fluoranthene	R7GW01R	0.36J	0.92/NE	30
	Indeno(1,2,3-cd)pyrene	R7GW01R	0.79J	0.92/NE	30
	Arsenic (total)	R7GW04R	12J	0.45/100	36
	Barium (total)	R7GW04R	370	2,600/20,000	50,000
	Thallium (total)	R7GW04R	34	2.6/20	21.3
	Vanadium (total)	R7GW04R	45	260/NE	NE
	Thallium (dissolved)	R7GW04R	27	2.6/20	21.3
7/8	Fluorene	UGW10	2.7J	NE/NE	10
	Trichloroethene	TW-102	5.4	220 ⁴	200
9	Area A				
	Acetophenone	9MW01	1J	0.42/NE	NE
	Benzene	13GW02	130	3.6/50	109
	Bis(2-ethylhexyl)phthalate	13GW02	5J	47.8/60	360
	Naphthalene	13GW02	26	65/NE	NE
	Cadmium (total)	9MW01	12.9	1,100/1,000	42.3
	Cadmium (dissolved)	9MW01	6.3	183/50	42.3
	Area B				
	Benzene	9-B05-HP02	1,200	3.6/50	109
	Bromodichloromethane	13GW06	460	1.7/1,000	6,400
	Bromoform	13GW06	360	85/1,000	640
	Chloroform	13GW06	1,100	1.52/1,000	815
	Dibromochloromethane	13GW06	300	1.26/1,000	6,400
	Methylene chloride	13GW06	11	41/50	2,560
	Cadmium (total)	9MW03	26.4	1,100/1,000	9.4
	Cadmium (dissolved)	9MW03	25.1	183/50	9.4
	Area C				
Cadmium (total)	9MW04	12.1	1,100/1,000	9.4	
Cadmium (dissolved)	9MW04	24.7	183/50	9.4	

¹ Data Sources: SWMUs 1 and 2 (Ref. 7); SWMU 3 (Ref. 4); SWMU 7/8 (Refs. 2 and 6); SWMU 9 (Ref. 5).

² RBC = Tap Water Risk Based Concentration; MCL = Maximum Contaminant Limit; NE = Not established

³ MSWSV = Marine Surface Water Screening Values. These values reflect National Ambient Water Quality Criteria (NAWQC) and in the absence of NAWQC reflect other saltwater screening values.

⁴ Number represents 10 times the Corrective Action Objective (CAO) for trichloroethene.

References:

1. Final Corrective Measures Study Investigation Report for SWMU 9, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated April 25, 2003.
2. Corrective Measures Study Task 1 Report for Tow Way Fuel Farm, including the July 9, 2002 Draft Corrective Measures Study Task 1 Report for Tow Way Fuel Farm as modified by the

- Addendum submitted January 6, 2003 and replacement pages for the Addendum submitted April 22, 2003. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated April 22, 2003.
3. Revised Final RCRA Facility Investigation Report SWMU 3, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM. Dated March 18, 2003.
 4. Technical Review of the September 4, 2002 Draft RCRA Facility Investigation (RFI) Report for Solid Waste Management Unit (SWMU 3), Naval Station Roosevelt Roads, Ceiba, Puerto Rico, REPA3-0203-003. Prepared by Booz Allen Hamilton. Dated November 4, 2002.
 5. Revised Draft RCRA Facility Investigation Report for SWMU 9, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated March 10, 2000.
 6. TCE Investigation Report for SWMU 7/8 - Tow Way Fuel Farm, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated February 15, 2000.
 7. RCRA Facility Investigation Report for Operable Unit 3/5, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by Baker Environmental, Foster Wheeler Environmental Corporation, and Weston Environmental. Dated April, 1999.

6. Can the **discharge** of “contaminated” groundwater into surface water be shown to be “**currently acceptable**” (i.e., not cause impacts to surface water, sediments or ecosystems that should not be allowed to continue until a final remedy decision can be made and implemented⁴)?

 X If yes - continue after either: 1) identifying the final remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site’s surface water, sediments, and ecosystems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment⁵, appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialist, including an ecologist) adequately protective of receiving surface water, sediments, and ecosystems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment “levels,” as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological risk assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

 If no - (the discharge of “contaminated” groundwater cannot be shown to be “**currently acceptable**”) - skip to #8 and enter “NO” status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or ecosystem.

 If unknown - skip to 8 and enter “IN” status code.

Rationale:

SWMU 9

As discussed in the response to Question 3, the CMS for SWMU 9 concluded that no potential ecological risks are posed by Area A and C surface soils, Area A/B and C surface water, and Area C sediment (Ref. 1). Potential ecological risks were identified to benthic invertebrates and upper trophic level receptors from lead detected in Area A/B sediment. However, lead was not detected in groundwater above relevant standards and therefore the occurrence of lead in sediment appears unrelated to the discharge of contaminated groundwater. Due to the lack of potential ecological risks posed by surface water and

⁴ Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, an appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

⁵ The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments, or ecosystems.

sediment in SWMU 9, it is concluded that the discharge of contaminated groundwater can be considered “currently acceptable.”

References:

1. Final Corrective Measures Study Investigation Report for SWMU 9, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated April 25, 2003.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the “existing area of contaminated groundwater?”

If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the “existing area of groundwater contamination.”

If no - enter “NO” status code in #8.

If unknown - enter “IN” status code in #8.

Rationale:

SWMUs 1, 2, 45, 54

As discussed in the response to Question 5, the discharge of contaminated groundwater from SWMU 1 and 2 is considered insignificant. As discussed in the response to Question 4, there is no discharge to surface water of contaminated groundwater from SWMUs 45 and 54. Therefore, for these four SWMUs, no groundwater monitoring is expected to be needed.

SWMU 3

The landfill is currently under operation in accordance with RCRA Subtitle D. A groundwater monitoring program is being conducted on a semi-annual basis. The RFI proposed NFA until closure, with continuation of groundwater monitoring (Ref. 3). The EPA remedial project manager has indicated that semiannual groundwater monitoring at SWMU 3 is planned to be required under the facility’s renewed RCRA permit currently being developed by EPA (Ref. 1). Under the renewed RCRA permit, the facility is expected to be required to implement a semi-annual groundwater monitoring program at SWMU 3, pursuant to the “Groundwater Sampling and Analysis Plan, Solid Waste Landfill Facility, U.S. Naval Station Roosevelt Roads”, prepared by Burns & McDonnell Waste Consultants Inc., dated April 1999 (Ref. 6). However, the exact requirements will not be fully determined until completion of public review of the renewed RCRA permit.

SWMU 7/8

The April 22, 2003 “Corrective Measures Study Task I Report for Tow Way Fuel Farm” states that Monitored Natural Attenuation (MNA) is expected to be one of the component of any final remedy for contamination at SWMU 7/8 (Tow Way Fuel Farm) (Ref. 2). EPA guidance on MNA requires that groundwater monitoring be part of the MNA. The EPA project manager has confirmed that on-going groundwater monitoring is expected to be part of the final remedy at SWMU 7/8 (Tow Way Fuel Farm) (Ref. 1). This final remedy will be implemented under the facility’s renewed RCRA permit currently being developed by EPA. However, the exact final remedy will not be fully determined until completion of the CMS Final Report currently being developed on behalf of the Navy, and EPA’s acceptance of the recommendations for the final remedy, followed by public review of the remedy selected and the modification of the RCRA permit to incorporate that remedy.

SWMU 14

Pursuant to the November 22, 2000 Interim Decision Document submitted on behalf of the facility, no current unacceptable human exposures are indicated for this SWMU; however, final actions with regard to any groundwater impacts will be deferred until cessation of the usage of this SWMU as a fire training area (Ref. 5). EPA by letter dated May 4, 2001, concurred that final actions with regard to any groundwater impacts will be determined following cessation of the usage of this SWMU as a fire training area (Ref. 4).

References:

1. Email correspondence from Timothy Gordon, EPA Region 2, to Kristin McKenney, Booz Allen & Hamilton. Dated September 9, 2003.
2. Corrective Measures Study Task 1 Report for Tow Way Fuel Farm, including the July 9, 2002 Draft Corrective Measures Study Task 1 Report for Tow Way Fuel Farm as modified by the Addendum submitted January 6, 2003 and replacement pages for the Addendum submitted April 22, 2003. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated April 22, 2003.
3. Revised Final RCRA Facility Investigation Report, SWMU 3, Naval Station Roosevelt Roads, RCRA/HSWA Permit No. PR2170027203, Ceiba, Puerto Rico. Prepared by CH2M Hill, Baker Environmental, and CDM Federal Programs Corp. Dated March 18, 2003.
4. Letter from Raymond Basso, USEPA, to Christopher Penny, Naval Station Roosevelt Roads, re: Naval Station Roosevelt Roads - EPA I.D. PRD2170027203. Dated May 4, 2001.
5. Draft Interim Decision Document for SWMU 14. Prepared by Baker Environmental, Inc. Dated November 22, 2000.
6. Groundwater Sampling and Analysis Plan, Solid Waste Landfill Facility, U.S. Naval Station Roosevelt Roads. Prepared by Burns & McDonnell Waste Consultants Inc. Dated April 1999.

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

- X YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the NSRR Facility, EPA ID# PR2170027203, located in Ceiba, Puerto Rico. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater." This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.
- NO - Unacceptable migration of contaminated groundwater is observed or expected.
- IN - More information is needed to make a determination.

Completed by: Original signed by _____ Date: _____
Lucas Kingston
Hydrogeologist
Booz Allen Hamilton

Reviewed by: Original signed by _____ Date: _____
Phebe Davol
Geoscientist
Booz Allen Hamilton

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

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

Approved by: Original signed by _____ Date: 9/26/2003
Adolph Everett, Acting Chief
RCRA Programs Branch
USEPA 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.

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Attachments

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

Attachment 1 - Summary of Media Impacts Table

**Attachment 1 - 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	Excavation of 235 cubic yards of PCB-impacted soil 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