

6/1/05-00873

Final

Record of Decision SWMU 7a: Small Boats Sandblast Yard

Naval Amphibious Base Little Creek
Virginia Beach, Virginia



Prepared for

Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

Contract No. N62470-95-D-6007
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Prepared by

CH2MHILL

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Acronyms and Abbreviations

ABM	abrasive blast material
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EE/CA	Engineering Estimate and Cost Analysis
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
FFA	Federal Facilities Agreement
HHRA	Human Health Risk Assessment
HI	Hazard Index
IAS	Initial Assessment Study
IRP	Installation Restoration Program
NAB	Naval Amphibious Base
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	no further action
NTCRA	non-time critical removal action
PAH	polycyclic aromatic hydrocarbon
PRAP	Proposed Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RI	Remedial Investigation
RME	reasonable maximum exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SWMU	Solid Waste Management Unit
TCL	Target Compound List
VDEQ	Virginia Department of Environmental Quality

Declaration

1.1 Site Name and Location

SWMU 7a: Small Boats Sandblast Yard
Naval Amphibious Base Little Creek
Virginia Beach, Virginia
EPA ID# VA5170022482

1.2 Statement of Basis and Purpose

This Record of Decision (ROD) presents the Selected Remedy at Solid Waste Management Unit (SWMU) 7a, Small Boats Sandblast Yard, at Naval Amphibious Base (NAB) Little Creek, Virginia Beach, Virginia. The determination has been made in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on information contained in the Administrative Record file for the site.

The United States Department of the Navy (Navy) is the lead agency and provides funding for site cleanups at NAB Little Creek. The Navy and United States Environmental Protection Agency (EPA) Region III issue this ROD jointly. The Virginia Department of Environmental Quality (VDEQ) concurs with the Selected Remedy.

1.3 Assessment of the Site

The Small Boats Sandblast Yard was designated as SWMU 7; however, as a result of previous investigations conducted at the site, the Navy, in partnership with EPA and VDEQ, agreed to separate the terrestrial and aquatic portions of SWMU 7 into

- SWMU 7a, terrestrial portion (soil and groundwater)
- SWMU 7b, aquatic portion (Desert Cove sediment and surface water)

SWMU 7a is the subject of this ROD, whereas SWMU 7b requires further investigation and will be addressed separately.

Based on all available data there are no unacceptable human health or ecological risks at SWMU 7a. The lead agency has determined that no action is necessary to protect human health or welfare or the environment. SWMU 7a is one of several Installation Restoration Program (IRP) sites under CERCLA at NAB Little Creek. The status of all the IRP sites at NAB Little Creek can be found in the current version of the Site Management Plan, which is located in the Administrative Record.

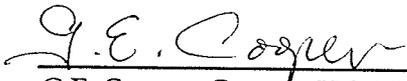
1.4 Description of the Selected Remedy

The Selected Remedy for SWMU 7a is no further action (NFA). Although no unacceptable human health risks were identified for soil, the Navy proactively conducted a soil removal action at SWMU 7a to excavate surface soils where lead concentrations exceeded 400 mg/kg. This is the EPA lead screening level for soil developed using the Integrated Exposure Uptake Biokinetic Model. Preconfirmation sampling delineated an area for removal that contained lead levels that exceeded 400 mg/kg. The results of site investigations and risk assessments support the NFA remedial alternative. Constituents in groundwater were determined to be reflective of background conditions rather than a CERCLA release. The Navy in partnership with the EPA and VDEQ, agree that no further CERCLA actions are warranted for SWMU 7a.

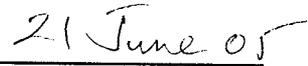
1.5 Statutory Determinations

The selected remedy is protective of human health and the environment. The soil removal action conducted at SWMU 7a and the absence of a CERCLA release to groundwater eliminates the need to conduct further remedial action. As there are no unacceptable risks or hazardous substances, pollutants, or contaminants remaining at SWMU 7a above levels that prohibit unlimited use and unrestricted exposure, a 5-year review will not be required.

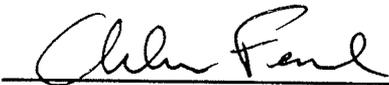
1.6 Authorizing Signatures



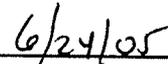
G.E. Cooper, Captain U.S. Navy
Commanding Officer
NAVPHIBASE Little Creek



Date



Abraham Ferdas, Director
Hazardous Site Cleanup Division
EPA (Region III)



Date

Decision Summary

2.1 Site Name, Location, and Description

NAB Little Creek consists of 2,215 acres located in the northwest corner of Virginia Beach, Virginia, adjacent to the Chesapeake Bay (Figure 2-1). The facility is primarily industrial, and the personnel provide logistic facilities and support services for local commands, organizations, home-ported ships, and other United States and allied units to meet amphibious warfare–training requirements of the Armed Forces of the United States. NAB Little Creek is also used for recreational, commercial, and residential purposes. Land development surrounding the base is residential, commercial, and industrial. NAB Little Creek (EPA ID# VA5170022482) was placed on the National Priorities List in May 1999.

The Small Boats Sandblast Yard (Figure 2-2) was used for sandblasting and ship painting prior to 1996. From 1960 to 1982, the Site was used to temporarily store spent abrasive blast material (ABM) pending testing for proper disposal. Approximately 4,000 yd³ of ABM were temporarily stored in open piles. Since 1996, sandblasting activities have been conducted in an indoor facility (Building CB-125).

The Site was originally entitled SWMU 7, however, as a result of previous investigations conducted at the site, the Navy, in partnership with EPA and VDEQ, agreed to separate the terrestrial and aquatic portion of SWMU 7 into SWMU 7a, the terrestrial portion including soil and groundwater, and SWMU 7b, the aquatic portion including Desert Cove sediment and surface water. SWMU 7a is the subject of this ROD. The adjacent Desert Cove potentially impacted by activities at SWMU 7a is being addressed separately as SWMU 7b.

2.2 Site History and Enforcement Activities

SWMU 7 was identified in initial basewide investigations as SWMU 137/7 and IRP Site 2, Sandblast Disposal Area. The Federal Facilities Agreement (FFA) for NAB Little Creek was signed November 2003. The FFA provides for CERCLA-directed enforcement activities. No enforcement activities have been recorded to date at SWMU 7.

Investigations at SWMU 7 have been conducted since 1984 and site documentation is available to the public in the Administrative Record for NAB Little Creek. In accordance with SARA as it pertains to CERCLA Federal Facilities Response Actions, SWMU 7a activities are funded by the Defense Environmental Restoration Program (DERP). Previous investigations are summarized below.

2.2.1 Initial Assessment Study (Rogers, Golden, and Halpern, 1984)

An Initial Assessment Study (IAS) was conducted to identify potential areas of concern at NAB Little Creek through a review of waste generation, handling, and disposal practices. The review involved historical records, aerial photographs, field inspections, and interviews

with NAB Little Creek personnel. At SWMU 7a, ABM from sandblasting activities accumulated between the 1960s and 1982. Based on the nonhazardous results of leachability testing of temporarily stored ABM, the IAS recommended that no confirmation studies or remedial actions be undertaken at SWMU 7a.

2.2.2 Visual Site Inspection (Earth Technologies Corp., 1988)

A Visual Site Inspection was conducted at NAB Little Creek to identify any potential sources of contamination. The Inspection determined that spent blast grit and oily substances were released to Desert Cove (SWMU 7b) from the Small Boats Sandblast Yard. According to the Navy comment on Draft Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) report, the oil-stained soils were removed.

2.2.3 RCRA Facility Assessment (A.T. Kearney, Inc., 1989)

An RFA was prepared to identify SWMUs and other areas of concern at the NAB Little Creek and evaluate their potential for releases of hazardous wastes or hazardous constituents to the environment. The assessment included a review of EPA records and site visits. Soil sampling was recommended at SWMU 7a to determine the extent of potential ABM contamination and that a cover be placed over the residue to preclude future wind dispersal.

2.2.4 Soil and Groundwater Investigations (ATEC Environmental, 1989 and 1993)

Prior to the construction of Building CB-125, which currently serves as an indoor sandblasting facility, soil and groundwater samples were collected for Toxicity Characterization Leaching Procedure (TCLP) metals analyses at the proposed building site. Low concentrations of arsenic (1 mg/kg) were detected in soil (one of nine results) and selenium (0.47 mg/L) was detected in groundwater.

2.2.5 Site Investigation (CH2M HILL, 2000–2001)

The Site Investigation conducted at SWMU 7 included the collection and analysis of groundwater, soil, and sediment samples. Results of the Investigation confirmed that ABM was present in the surface soils, making up 5 percent or less of the soil samples. Most ABM was observed near Building CB-125.

Several metals (aluminum, arsenic, chromium, iron, and manganese) in surface soils were elevated above background concentrations in localized areas along the site's western boundary, which is currently used for heavy equipment and container storage. Polycyclic aromatic hydrocarbons (PAHs) were detected in SWMU 7a soil samples northwest of Building CB-125, and metals and PAHs were found in the sediment in Desert Cove (SWMU 7b). Similar concentrations of PAHs and metals were detected in groundwater upgradient of SWMU 7a, indicating that SWMU 7a is not contributing contamination to groundwater.

2.2.6 Baseline Ecological Risk Assessment (CH2M HILL, 2001)

The baseline ecological risk assessment conducted for SWMU 7a indicated that several metals (chromium, iron, lead, silver, and zinc) posed potential risks to lower trophic-level receptors (plants and soil invertebrates) that might utilize the terrestrial habitats. However, almost all of SWMU 7a is paved, covered by buildings, or composed of hard-packed dirt or

gravel parking lots thereby limiting the exposure potential for ecological receptors. Potential risks to upper trophic-level terrestrial receptors (birds and mammals) were minimal.

2.2.7 Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment (CH2M HILL, 2002–2004)

A Remedial Investigation (RI)/Human Health Risk Assessment (HHRA)/Ecological Risk Assessment (ERA) was conducted to define the nature and extent of soil, groundwater, and sediment contamination, assess potential current and future threats to human health and the environment, and collect data to evaluate potential ecological risks related to SWMU 7.

Based on the sampling activities at SWMU 7a, the surface and subsurface soil contained metals and PAHs above background concentrations. The shallow groundwater (Columbia Aquifer) contained several metals at concentrations above background; however, results in downgradient samples were similar to those collected upgradient of site activities.

The baseline HHRA characterized potential current and future risks to human health. No unacceptable human health risks were identified for soil. Future potable use of groundwater indicated a potential risk based on metals concentrations. However, the metals were determined to be reflective of background conditions rather than a CERCLA release from SWMU 7a. Potential risks from SWMU 7a were considered acceptable. The ERA indicated that the developed nature of the terrestrial portions of SWMU 7a and the low quality of habitat present (gravel or hard-packed dirt with low and sparse herbaceous plants) was likely to significantly reduce potential ecological exposures.

Primary fate and contaminant migration pathways at SWMU 7a include surface runoff and erosion of soil to the adjacent Desert Cove and infiltration and leaching of precipitation through the vadose zone from soil to the groundwater system.

Although there was no unacceptable human health risk associated with SWMU 7a sitewide surface soil, a localized area of elevated lead in surface soil was removed based on the Integrated Exposure Uptake Biokinetic Model risk screening level (400 mg/kg). The removal activities were conducted concurrent with the RI/HHRA/ERA such that the final RI concluded there were no unacceptable human health or ecological risks associated with SWMU 7a. Documentation of removal actions are provided as an appendix to the RI. Further investigation was recommended for SWMU 7b.

2.2.8 Lead Delineation (CH2M HILL, 2004)

At the northeast portion of the site, surface soil samples were collected in a grid pattern around existing samples with elevated lead concentrations (greater than 400 mg/kg) (Figure 2-3). The sample collection was part of the RI to evaluate the lateral extent of elevated lead in surface soils. The resulting area identified for removal was approximately 0.04 acres.

2.2.9 Engineering Evaluation/Cost Analysis and Action Memorandum (CH2M HILL, 2004)

Based on the findings of the previous investigations, an Engineering Evaluation/Cost Analysis (EE/CA) was conducted to identify and analyze remedies or removal actions to mitigate elevated lead concentrations (greater than 400 mg/kg) in surface soil at SWMU 7a. Three alternatives were identified, evaluated, and ranked. Based on the comparative

analyses of the removal alternatives, the selected non-time critical removal action (NTCRA) involved excavation of lead-impacted surface soil and backfilling with clean fill.

As required by Section 300.415(n) of the NCP, a public notice of availability of the Draft EE/CA was issued, and the EE/CA was made available to the public for comment from May 11 to June 11, 2004. No comments were received from the public during the comment period. The Navy signed an Action Memorandum on July 1, 2004, to implement the NTCRA as specified in the EE/CA.

2.2.10 Removal Action and Construction Completion Report (AGVIQ/CH2M HILL Joint Venture I, 2004–2005)

The NTCRA activities at SWMU 7a were conducted in September 2004. Approximately 40 yd³ of surface soil (0 to 6 in.) were removed for off-site disposal (Figure 2-4). The limits of excavation were determined based on preremoval confirmatory sampling. Site restoration consisted of a 6-in. layer of clean fill, grading, and seeding. The Construction Completion Report, completed in May 2005, summarizes the confirmation sample results from the NTCRA and demonstrates that the elevated lead concentrations previously identified in surface soil have been removed from SWMU 7a. The Construction Completion Report was included as Appendix H in the RI.

2.3 Community Participation

The Navy and EPA provide information regarding the cleanup of NAB Little Creek to the public through the community relations program which includes a Restoration Advisory Board, public meetings, the Administrative Record file for the site, the information repository, and announcements published in local newspapers.

In accordance with Sections 113 and 117 of CERCLA, the Navy provided a public comment period from February 25 through March 25, 2005, for the Proposed Remedial Action Plan (PRAP) for SWMU 7a. A public meeting to present the PRAP was held on March 9, 2005, at the Shelton Park Elementary School. Public notice of the meeting and availability of documents was placed in *The Virginian-Pilot* newspaper on February 24, 2005. No comments were received during the public comment period.

The PRAP and previous investigation reports for SWMU 7 are available to the public in the information repository for the Administrative Record maintained at:

Virginia Beach Public Library
4100 Virginia Beach Boulevard
Virginia Beach, VA 23451
(757) 431-3001

A complete list of the documents included in the Administrative Record files for NAB Little Creek can be obtained from the IRP web site:

<http://public.lantops-ir.org/sites/public/nablcr/Site%20Files/AdminRecords.aspx>.

2.4 Scope and Role of Response Actions

The Small Boats Sandblast Yard (SWMU 7) was divided into two separate SWMUs:

- SWMU 7a, terrestrial portion (soil and groundwater)
- SWMU 7b, aquatic portion (Desert Cove sediment and surface water)

SWMU 7a is the subject of this ROD. SWMU 7b is under additional investigation and will be addressed separately. SWMU 7a is among the IRP sites under CERCLA investigation at NAB Little Creek. The status of all the IRP sites at NAB Little Creek is available in the Site Management Plan, which is located in the Administrative Record.

2.5 Site Characteristics

SWMU 7a encompasses about 20 acres of land adjacent to and along Desert Cove Piers 44-55, including Building CB-125 (Figure 2-2). The ground surface at SWMU 7a consists of buildings, concrete, asphalt, and hard-packed gravel. Heavy equipment (cranes and trailers) is stored on portions of the site. Open areas of maintained grass are present, but are limited in extent. There are no surface or subsurface features (e.g., tanks, structures) or areas of archaeological or historical importance at SWMU 7a.

Much of SWMU 7a is constructed of dredge-fill material from pier construction when the base was developed in the 1940s. Bulkheads surround almost the entire shoreline of the cove at SWMU 7a is bulkheaded and is used to moor small ships. A very small portion of the shoreline, near the boat ramp just north of Building CB-125, does not have a bulkhead. This area is adjacent to a concrete/asphalt work area (Figure 2-2).

The shallow groundwater (Columbia Aquifer) at SWMU 7a occurs primarily in dredge-fill materials from Desert Cove pier construction. Otherwise the Columbia Aquifer consists of interbedded silts, silty sand, clean sand, with some clay lenses. Shallow groundwater at the site ranges between 7 and 9 ft below ground surface and flows toward and discharges to Desert Cove. The site has a low hydraulic gradient (0.0025 to 0.0057 ft/ft). Underlying the Columbia Aquifer is the Yorktown Confining Unit, a clay unit with interbedded fine sand, silt, and clay that generally exceeds 20 ft in thickness. The Yorktown Confining Unit separates the overlying Columbia Aquifer from the sand and silty sand of the underlying Yorktown Aquifer.

The conceptual site models (CSMs) for human health (Figure 2-5) and ecological (Figure 2-6) exposure pathways were developed during the RI. Pathways that were evaluated include infiltration and leaching of precipitation through the vadose zone from soil to the groundwater system and surface runoff and erosion of soil to Desert Cove. Quantitative human health and ecological risk assessments were completed based on analysis of 25 surface soil samples, 36 subsurface soil samples, nine groundwater samples, and 100 sediment samples. Samples were analyzed for Target Compound List volatile organic compounds, semivolatile organic compounds, pesticides, and polychlorinated biphenyls, and Target Analyte List inorganic compounds. The risk assessments concluded there were no unacceptable human health or ecological risks associated with a CERCLA release from SWMU 7a activities to soil or groundwater.

Although there were no unacceptable human health risks associated with surface soil, findings of the RI identified a small grass area in the northern portion of SWMU 7a where lead concentrations in surface soil exceeded the EPA lead screening level of 400 mg/kg. All subsurface soil lead concentrations were well below 400 mg/kg. A surface soil removal action was conducted in September 2004 to excavate surface soil containing elevated lead concentrations, and the area was restored with clean fill and seeded.

2.6 Current and Potential Future Site and Resource Uses

SWMU 7a is actively used by the facility for heavy equipment storage, small ship mooring, ship maintenance (i.e., sandblasting in Building CB-125), and training. SWMU 7a is bounded by Desert Cove, which is tidally influenced, and light industrial activities. SWMU 7a is accessible to base personnel. Current land uses are expected to continue at SWMU 7a and there is currently no other planned future land use. Future residential development of the site is unlikely; however, residential scenarios were evaluated in the baseline HHRA to be conservative.

Groundwater beneath and downgradient of SWMU 7a is not currently used. The shallow groundwater (Columbia Aquifer) is not considered a potable water source at or in the vicinity of NAB Little Creek due to its general poor quality (iron and manganese above secondary drinking water standards), and low yield (generally less than three to five gallons per minute). The City of Norfolk supplies potable water to NAB Little Creek and the surrounding residential area with surface water from Lake Whitehurst and Lake Smith, located south of NAB Little Creek. The nearest groundwater supply wells are located on the Little Creek Golf Course, approximately 1/2 mile (2,300 ft) east of SWMU 7a. These four supply wells withdraw groundwater from the Yorktown Aquifer for irrigation purposes at the golf course and are not used for drinking-water supply.

Desert Cove is located directly downgradient from SWMU 7a, therefore any future use of shallow or deep groundwater would be at or upgradient of the site.

2.7 Site Risks

A HHRA and ERA were completed to evaluate potential human health and ecological risks associated with the presence of site-related constituents in soil and shallow groundwater at SWMU 7a. The risk assessments characterize the current and potential future risks at the site if no additional remediation is implemented. A detailed discussion of potential risks at SWMU 7a is provided in the RI/HHRA/ERA report (CH2M HILL, 2004); a summary of potential human health risk is provided in Table 2-1.

2.7.1 Soil

There is no unacceptable human health risk associated with exposure to soil at SWMU 7a. Although the noncarcinogenic hazard index (HI) associated with exposure to surface soil (1.4) is slightly above EPA's target HI of 1 for combined surface and subsurface soil exposure for the future child resident, none of the individual constituents in soil contribute a hazard quotient above 0.5. Additionally, there are no target organs with HIs above 1.0; therefore there is no unacceptable risk. The potential risks for all other human health scenarios from exposure to surface soil and combined surface and subsurface soil are within

EPA's acceptable risk range. Therefore, the Navy, in partnership with EPA and VDEQ, agree that the soil at SWMU 7a does not present any unacceptable human health risks.

The ERA indicated that the developed nature of the terrestrial portions of SWMU 7a and the resulting low quality of the habitat present (gravel or hard-packed dirt with low and sparse herbaceous plants) would significantly reduce potential ecological exposures. Additionally, based upon food-web models, there were no exceedances for terrestrial-based exposures.

While there are no unacceptable human health or ecological risks from exposure to lead in soil, a NTCRA was completed for surface soil where elevated lead concentrations exceeded the EPA soil screening level for lead (Figure 2-4). No further remedial action is necessary to ensure protection of human health and the environment from exposure to soil at SWMU 7a.

2.7.2 Shallow and Deep Groundwater

Groundwater beneath the site is not currently used as a potable water supply and not anticipated to be used as a potable water supply in the future. However, the shallow aquifer groundwater data from the site was evaluated as a worst-case risk estimate for potable groundwater use at the site for a future residential exposure scenario.

Potential human health risks associated with exposure to groundwater are limited to potable use by future residents from ingestion of arsenic, iron, and manganese, and potential dermal contact of a future construction worker to manganese in groundwater. While there is a slight potential risk (HI=1.7), based on reasonable maximum exposure point concentrations, to the future construction worker from dermal exposure to manganese in groundwater, there is no unacceptable risk (HI=0.4) based on a more realistic central tendency exposure point concentration. In samples collected from six monitoring wells, two yielded arsenic concentrations (10.4 and 18.4 µg/L) above the Maximum Contaminant Level (MCL) (10 µg/L). Although arsenic, iron, and manganese in groundwater indicate a potential human health risk for potable use, these naturally occurring metals are not believed to be related to a CERCLA release associated with sandblasting activities at SWMU 7a based on the following:

- If iron and manganese in groundwater were the result of leaching from surface ABM, then it would be expected that these metals would also be elevated in the overlying soil. There is no correlation between the elevated concentrations of iron and manganese in groundwater with the low concentrations of iron and manganese in soil; therefore, these metals are not considered to be associated with a release from SWMU 7a.
- Concentrations of typical ABM-related metals such as lead, copper, chromium, and zinc are not elevated in soil or groundwater; these metals would be expected to be elevated if iron and manganese were related to the ABM activities.
- The highest iron and manganese concentrations are found in the groundwater sample collected adjacent to the rip-rap shoreline of Desert Cove. These concentrations are likely reflective of tidal influence, as evidenced by elevated conductivity and salinity measurements in this groundwater sample.

- SWMU 7a monitoring wells are screened within dredge-fill material. It is likely that arsenic, iron and manganese concentrations in groundwater are reflective of the dredge fill components rather than surface ABM activities.
- Concentrations of arsenic in groundwater at SWMU 7a were statistically similar to those found in background groundwater based on a central-tendency-population-to-population comparison.

Potential ecological risks from groundwater discharge to Desert Cove were estimated indirectly through the evaluation of surface water and sediment. However, only iron and manganese were identified as potential constituents of concern in groundwater and as described above, neither of these metals are likely to be site-related based upon site history. Thus, groundwater does not appear to be a significant transport route from the site to the Desert Cove system.

Based on the above discussion, the Navy and EPA, in partnership with VDEQ, agree there are no unacceptable groundwater risks associated with a CERCLA release from SWMU 7a.

2.8 No Further Action Necessary

As demonstrated by the risk assessments, SWMU 7a poses no unacceptable risk to human health or the environment from exposure to soil or groundwater. The Navy and EPA, in consultation with VDEQ, agree that no further action (NFA) is required for SWMU 7a. Consequently, with the exception of no action, no remedial action alternatives were considered and the development of remedial action objectives is not necessary. There are no principal threat wastes at the site and a NFA determination for SWMU 7a meets the statutory requirements of CERCLA for protection of human health and the environment. No response action will be performed at SWMU 7a and no restrictions on land use or exposure are necessary.

2.9 Documentation of Significant Changes

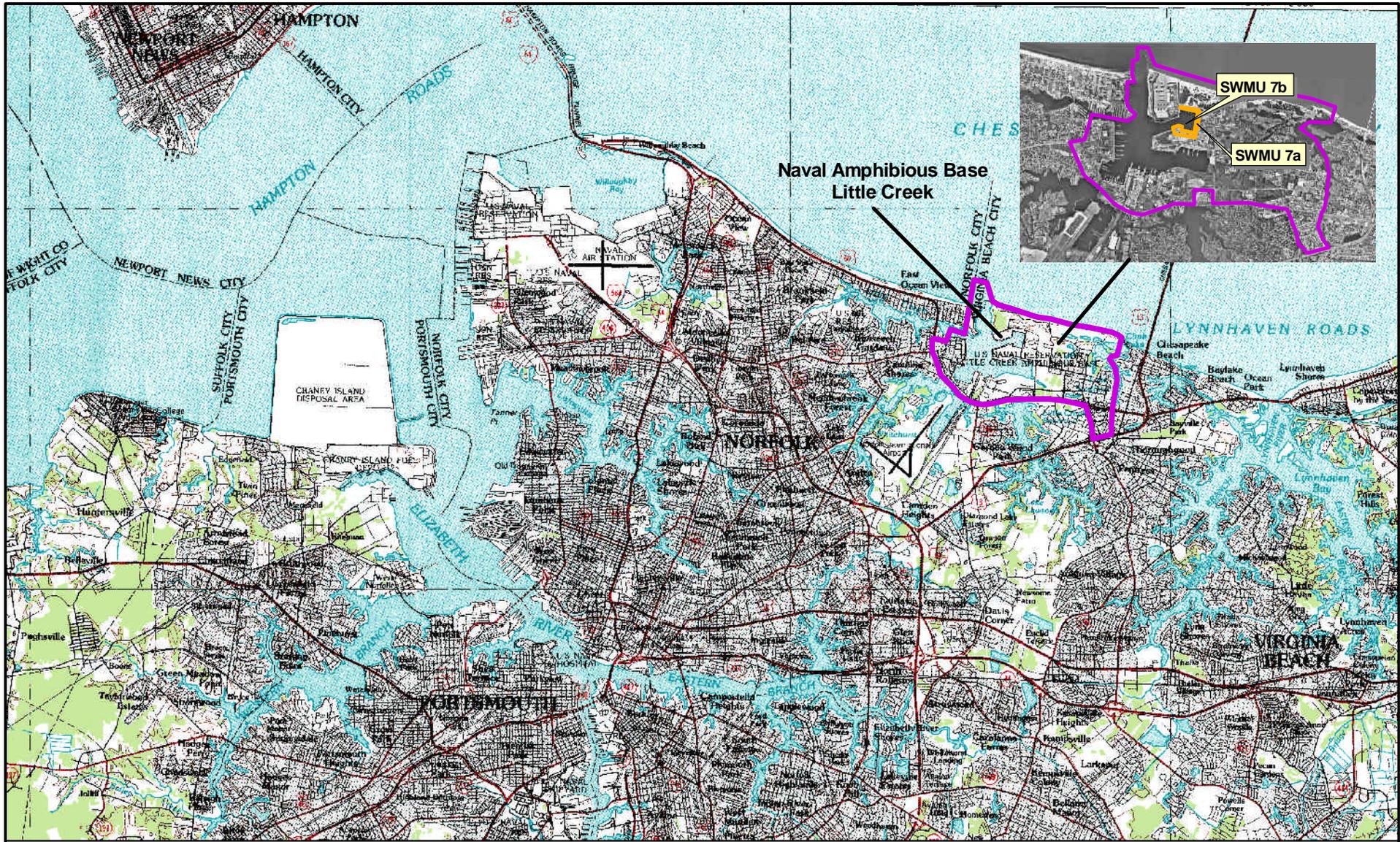
The PRAP for SWMU 7a identified NFA as the preferred alternative.

No members of the public attended the public meeting for the SWMU 7a PRAP and no comments were received during the public comment period. Therefore, no significant changes were made to the preferred remedial action alternative identified in the PRAP.

Table 2-1
Summary of RME Cancer Risks and Hazard Indices
SWMU 7a
NAB Little Creek, Virginia Beach, Virginia

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10 ⁻⁴	Hazard Index	Chemicals with HI>1
Current Trespasser/Visitor Adult	Surface Soil	Ingestion	5.3E-07	None	0.02	None
		Dermal Contact	2.9E-07		0.02	
		Inhalation	NA		NA	
		Total	8.2E-07		0.04	
Current Trespasser/Visitor Adolescent	Surface Soil	Ingestion	2.7E-07	None	0.03	None
		Dermal Contact	1.2E-07		0.024	
		Inhalation	NA		NA	
		Total	3.9E-07		0.05	
Current Maintenance Worker Adult	Surface Soil	Ingestion	2.5E-07	None	0.01	None
		Dermal Contact	7.8E-08		0.006	
		Inhalation	NA		NA	
		Total	3.3E-07		0.02	
Future Resident Adult	Groundwater	Ingestion	NA	NA	14	Arsenic, Iron, Manganese
		Dermal Contact	NA		1.1	Manganese
		Inhalation	NA		0.05	
		Total	NA		15	
	Soil*	Ingestion	NA		0.1	None
		Dermal Contact	NA		0.09	
		Inhalation	NA		NA	
		Total	NA		0.2	
	All Media	Total	NA		15	
Future Resident Child	Groundwater	Ingestion	NA	NA	33	Arsenic, Iron, Manganese
		Dermal Contact	NA		1.9	Manganese
		Inhalation	NA		NA	
		Total	NA		35	None
	Soil*	Ingestion	NA		0.95	None
		Dermal Contact	NA		0.1	
		Inhalation	NA		NA	
		Total	NA		1.1	
	All Media	Total	NA		36	
Future Resident Child/Adult	Groundwater	Ingestion	3.2E-04	Arsenic	NA	NA
		Dermal Contact	2.5E-05	None	NA	
		Inhalation	1.8E-05		NA	
		Total	3.6E-04		NA	
	Soil*	Ingestion	4.2E-05	None	NA	
		Dermal Contact	2.2E-05		NA	
		Inhalation	NA		NA	
		Total	6.5E-05		NA	
All Media	Total	4.3E-04	NA			
Future Industrial Worker	Groundwater	Ingestion	7.4E-05	None	5.0	Iron, Manganese
		Dermal Contact	NA		NA	NA
		Inhalation	NA		NA	
		Total	7.4E-05		5.0	
	Soil*	Ingestion	9.4E-06	None	0.07	None
		Dermal Contact	1.6E-05		0.09	
		Inhalation	NA		NA	
		Total	2.6E-05		0.2	
All Media	Total	1.0E-04	5.2			
Future Construction Worker	Groundwater	Ingestion	NA	None	NA	NA
		Dermal Contact	3.7E-07		1.7	Manganese
		Inhalation	3.8E-08		0.001	
		Total	4.1E-07		1.7	None
	Soil*	Ingestion	9.0E-07	None	0.16	None
		Dermal Contact	2.4E-07		0.02	
		Inhalation	NA		NA	
		Total	1.1E-06		0.18	
All Media	Total	1.6E-06	1.9			

NA - Not applicable, pathway incomplete.
Sediment*- Surface and subsurface sediment combined.
Soil*- Surface and subsurface soil combined.



Naval Amphibious Base
Little Creek

SWMU 7b

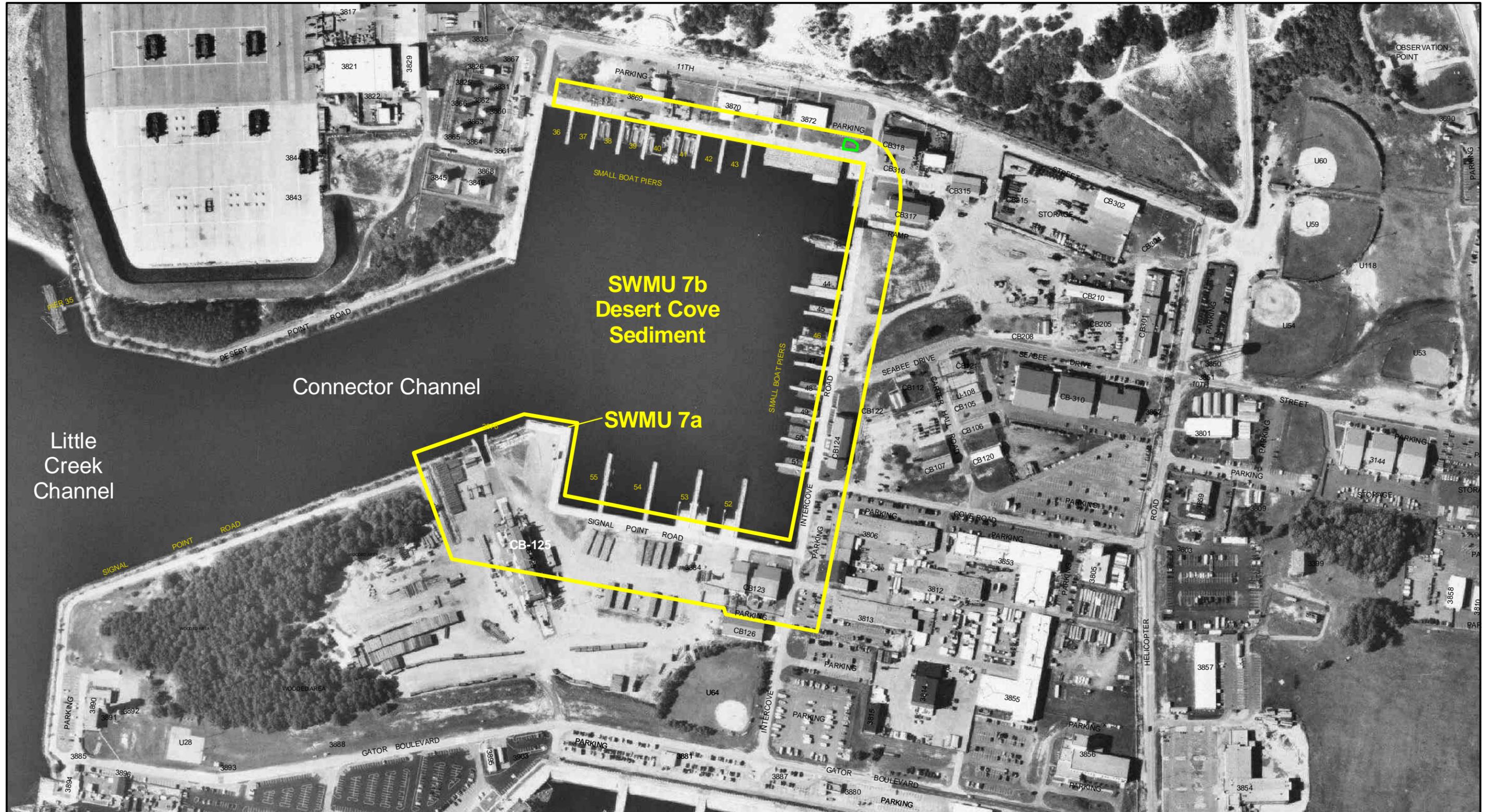
SWMU 7a

LEGEND

 Activity Boundary



Figure 2-1
Site Location Map
NAB Little Creek
Virginia Beach, Virginia



LEGEND
SWMU Boundary
Area of Removal

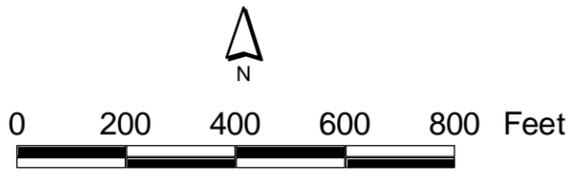
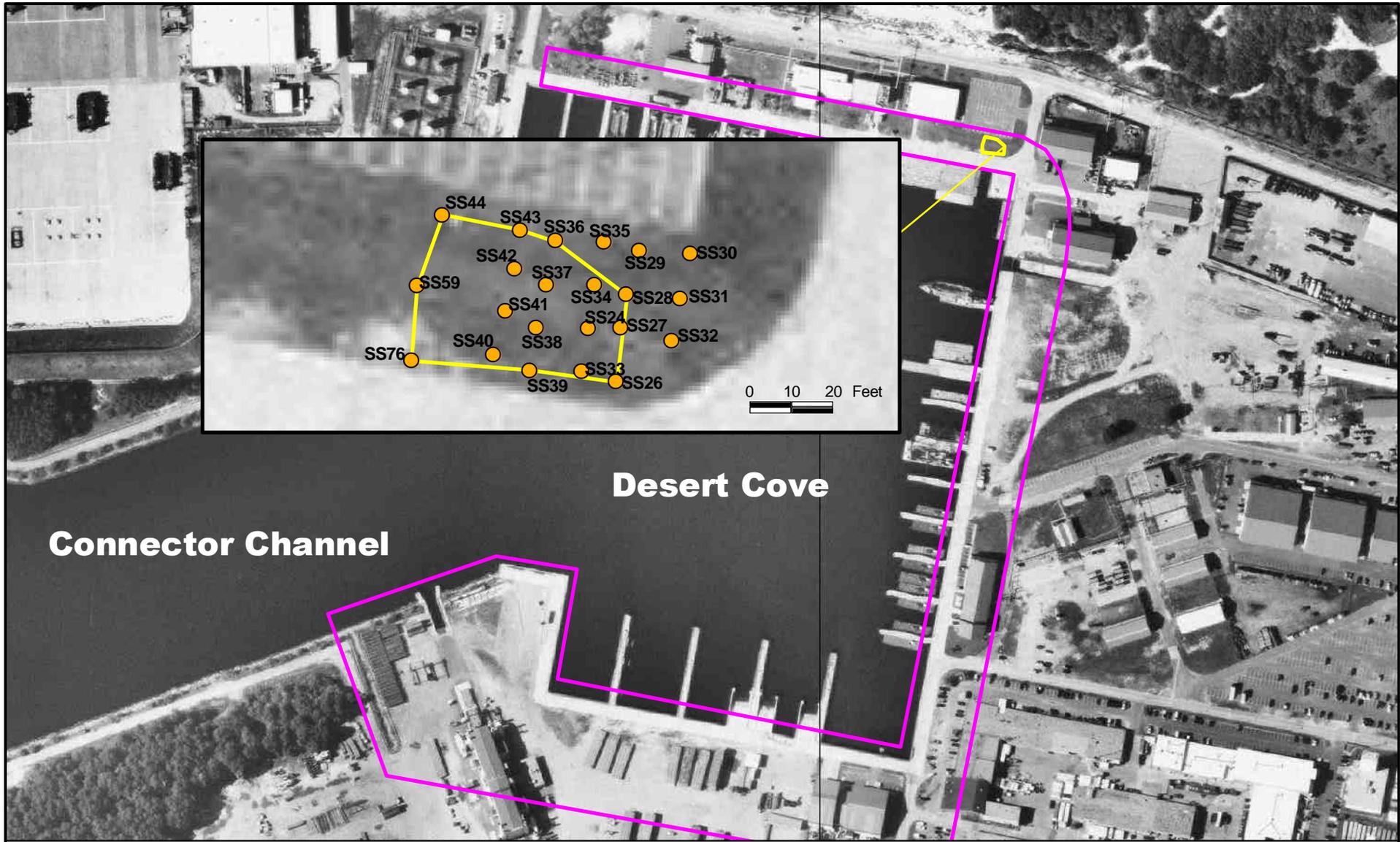


Figure 2-2
SWMU 7a Boundary and Immediate Vicinity
NAB Little Creek
Virginia Beach, Virginia



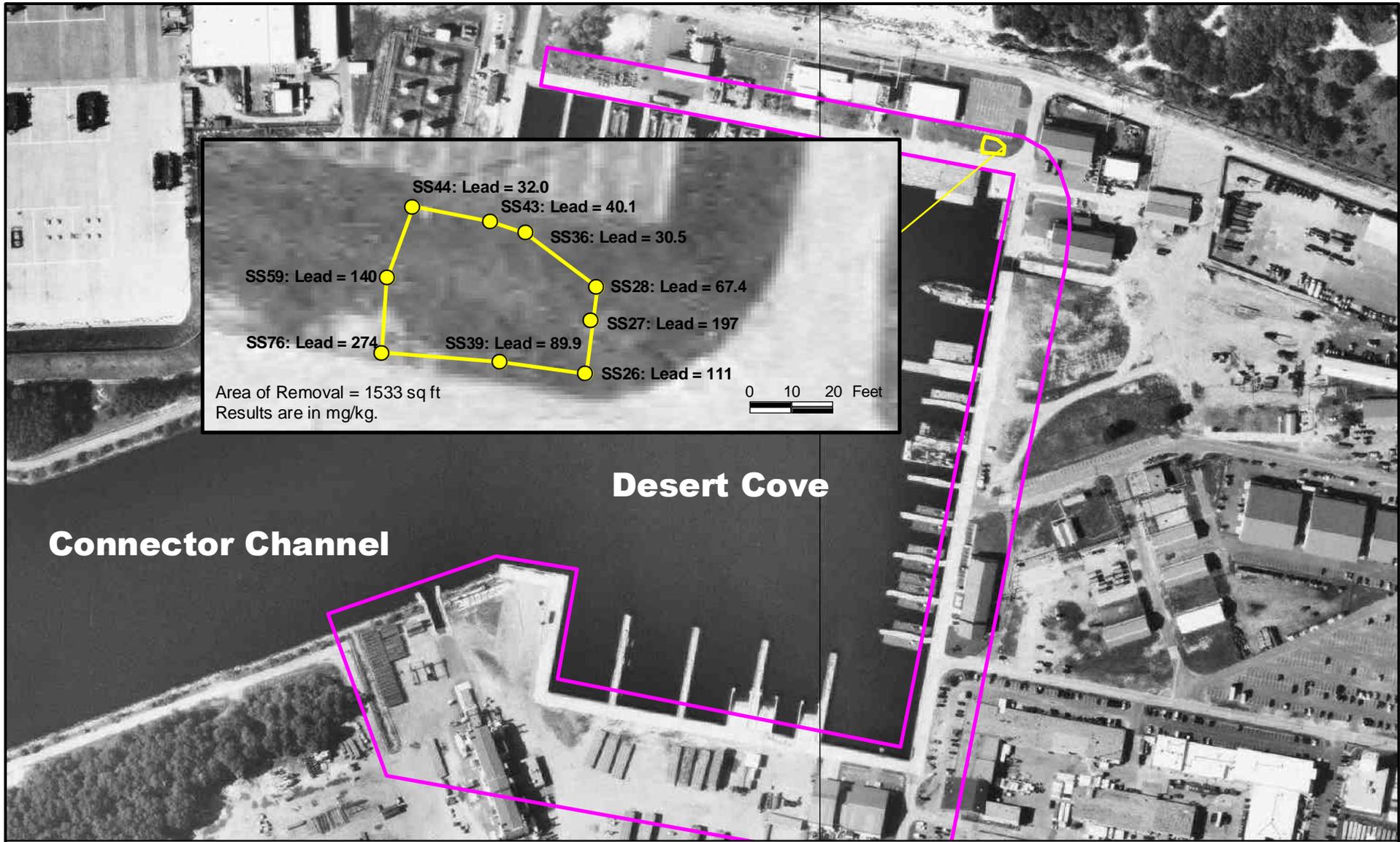
LEGEND

-  SWMU 7a Boundary
-  Limit of Excavation



0 200 400 Feet

Figure 2-3
Confirmation Sample Locations
NAB Little Creek
Virginia Beach, Virginia



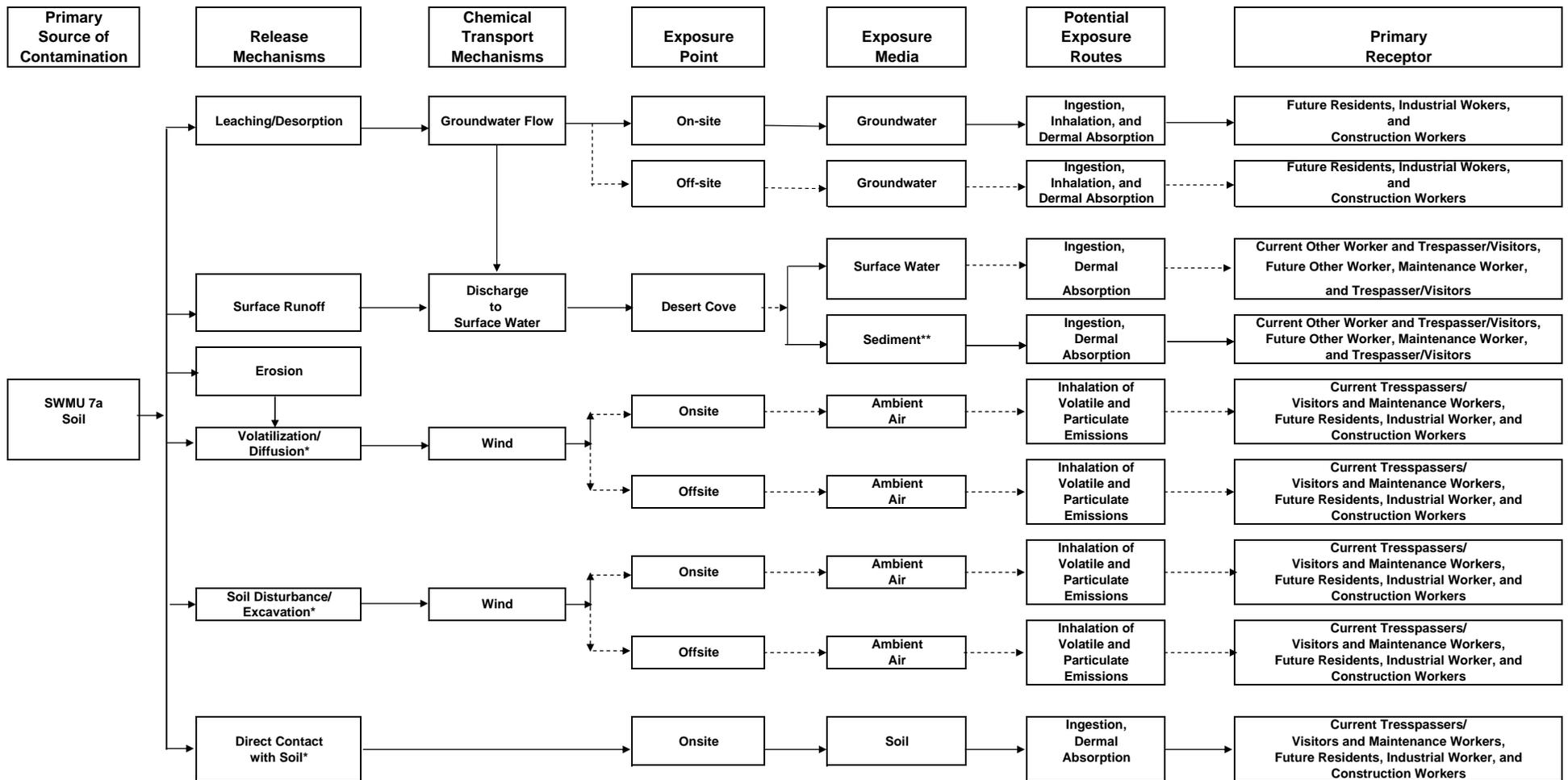
LEGEND

- SWMU 7a Boundary
- Limit of Excavation



0 200 400 Feet

Figure 2-4
Confirmation Sample Results
NAB Little Creek
Virginia Beach, Virginia



* Surface soil for current maintenance worker and trespasser/visitor; surface and subsurface soil for future industrial worker, trespasser/visitor, resident, and construction worker.

**Surface sediment for current other worker and trespasser/visitor; surface and subsurface sediment for future other worker, maintenance worker, and trespasser/visitor.

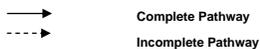


Figure 2-5
 Conceptual Site Model for Potential Human Exposures SWMU 7a
 NAB Little Creek, Virginia Beach, Virginia

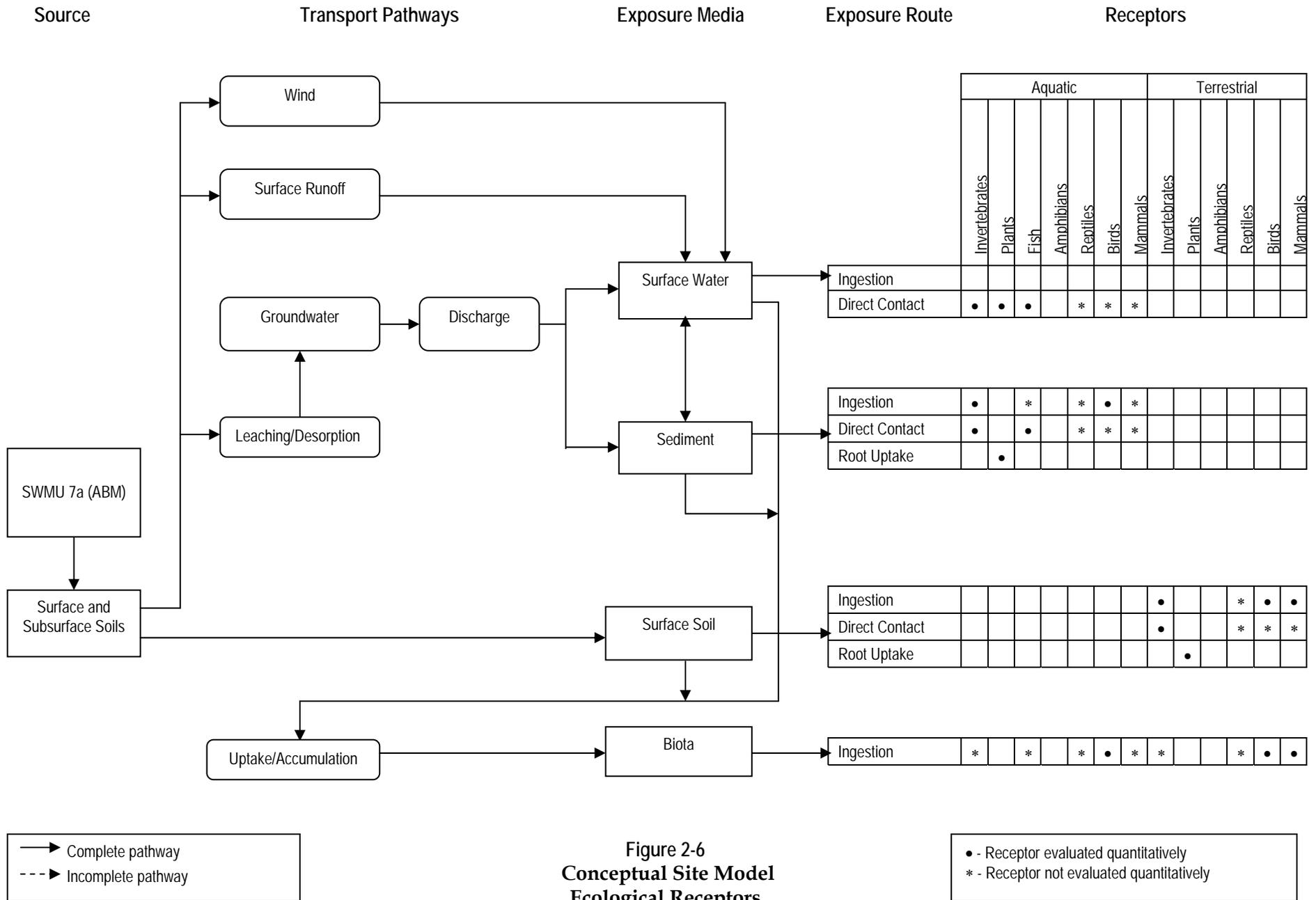


Figure 2-6
Conceptual Site Model
Ecological Receptors
NAB Little Creek - SWMU 7a

SECTION 3

Responsiveness Summary

The participants in the Public Meeting, held on March 9, 2005, included representatives of the Navy and the Commonwealth of Virginia. No members of the public attended the public meeting for the SWMU 7a PRAP and no comments were received during the public comment period.

SECTION 4

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