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NSB NEW LONDON
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DESIGN WORK PLAN
INTERIM REMEDIAL DESIGN

AREA A DOWNSTREAM/OBDA SITE

Prepared For:

Northern Division
Naval Facilities Engineering Command
10 Industrial Highway
Lester, PA 19113-2090

Navy Contract No.: N62472-88-C-1294

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1.0 INTRODUCTION

1.1 Purpose and Scope

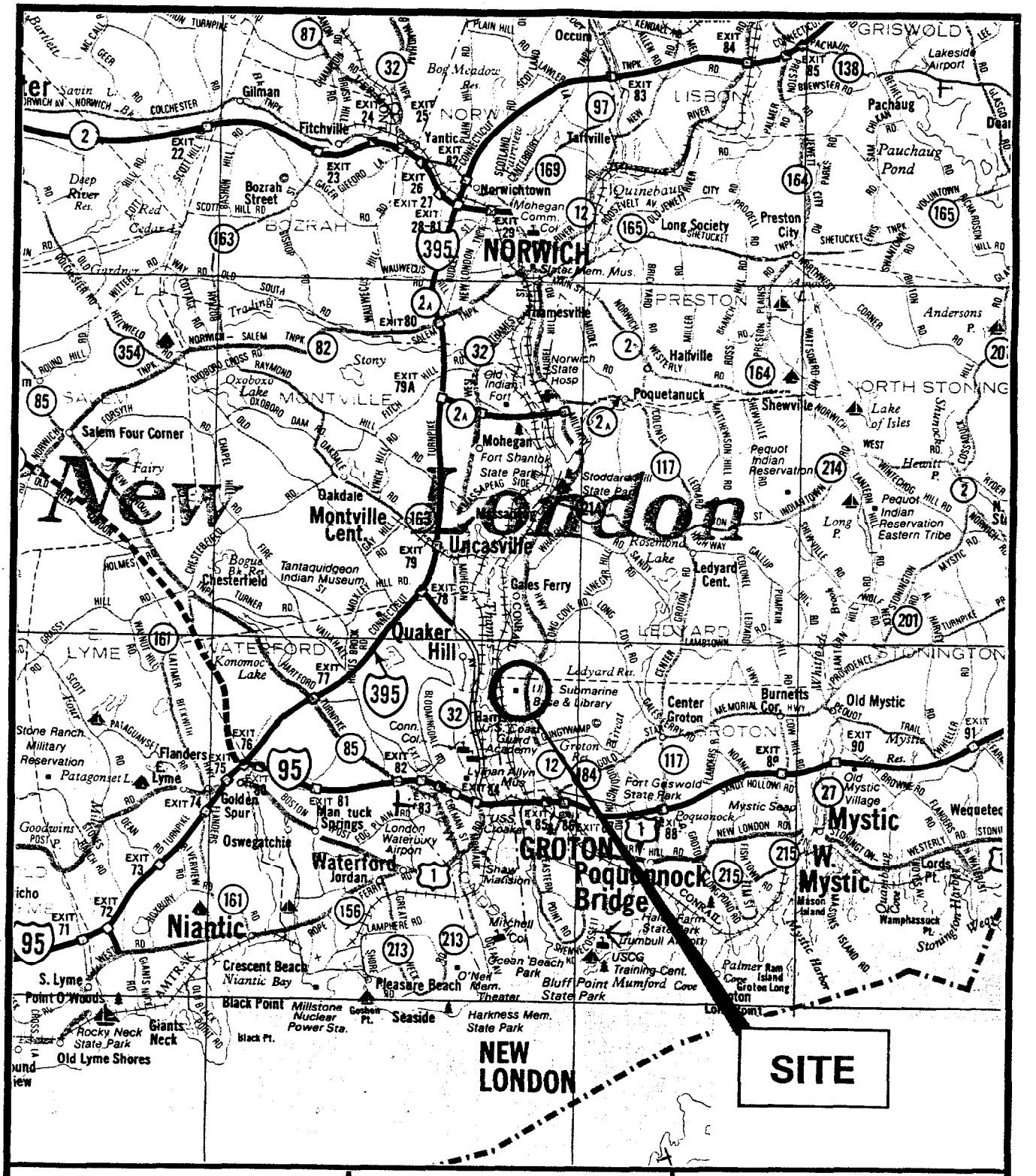
The Naval Submarine Base in New London (NSB-NLON) consists of approximately 547 acres of land and associated buildings in southeastern Connecticut in the towns of Ledyard and Groton. NSB-NLON is on the east bank of the Thames River, approximately 6.0 miles north of Long Island Sound. Figures 1-1 and 1-2 show the site vicinity and location, respectively. NSB-NLON was placed on the National Priorities List (NPL) on August 30, 1990 by the U.S. Environmental Protection Agency (U.S. EPA) pursuant to the comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980.

The purpose of this design work plan is to present the proposed interim remedial design for the Area A Downstream/Overbank Disposal Area (OBDA) at NSB-NLON in Groton, Connecticut. This interim remedial design is a source removal action. In addition to the interim remedial action which is the subject of this document, the following interim actions will also be implemented as discussed in separate documents:

- Spent Acid Storage and Disposal Area and Area A Landfill/Concrete Pad Area
- Area Landfill - Final Capping
- Defence Reutilization and Marketing Office (DRMO)

The draft design work plans for the above areas have been submitted to the Navy for review.

These interim remedial items represent the actions necessary to prevent the release of contaminants into the environment and to prevent human exposure to the contaminants. The Navy's goal is to begin interim remedial actions at NSB-NLON as quickly as possible to protect human health and the environment and to comply with applicable or relevant and appropriate requirements (ARARs). Pursuant to this goal, this design work plan has been



INSTALLATION RESTORATION STUDY

NAVAL SUBMARINE BASE - NEW LONDON

GROTON, CT

SOURCE: Marshall Penn-York Co. Inc.

Miles

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APPROXIMATE SCALE

FIGURE 1-1

SITE VICINITY

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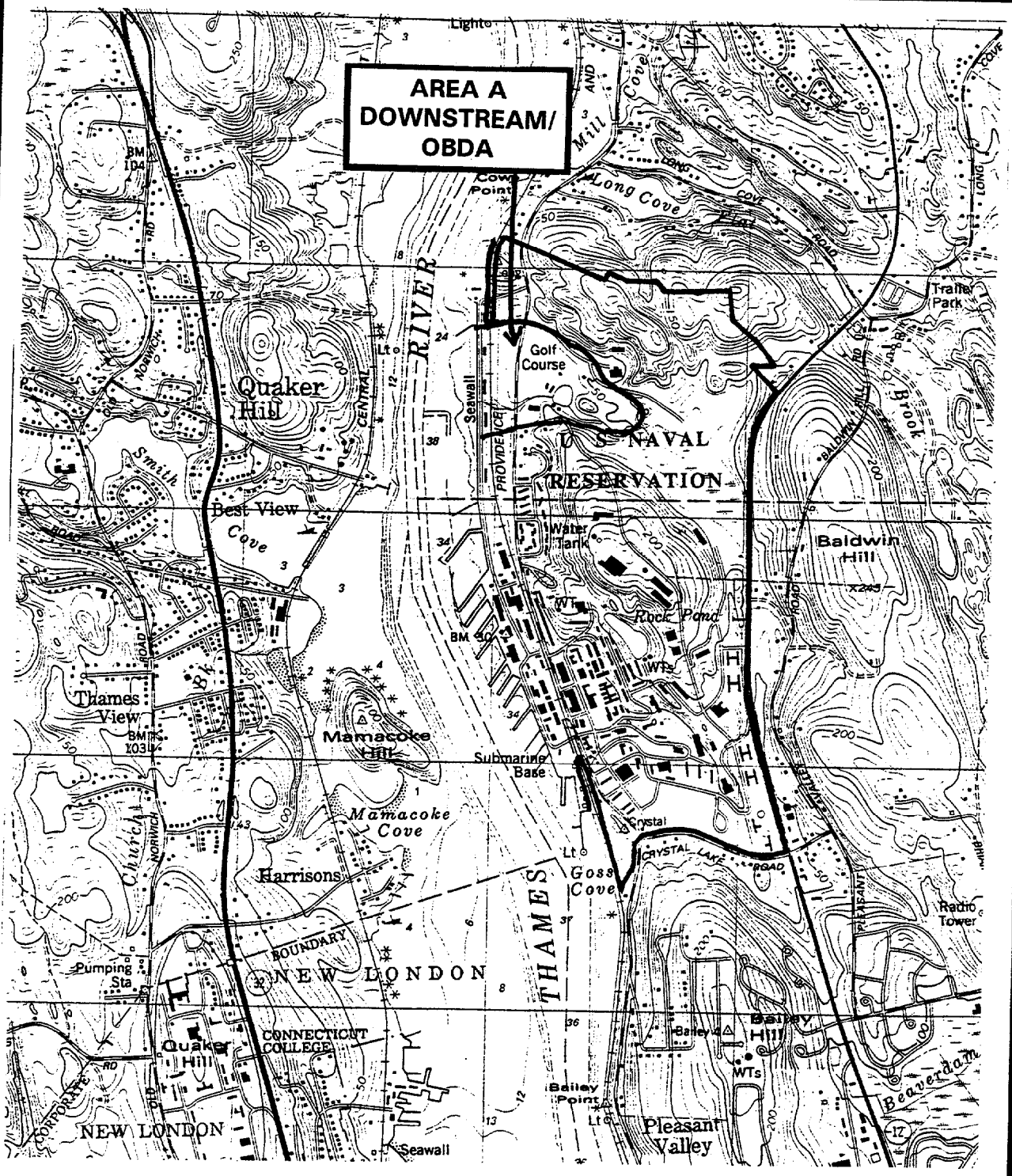

INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CT

SOURCE: Uncasville, CT
U.S.G.S. Topographic Map
1984

N

FIGURE 1-2
SITE LOCATION

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prepared concurrently with conducting portions of the Phase II Remedial Investigation (RI) Work Plan (Atlantic, May 1993) that collect design data required to finalize these interim remedial designs.

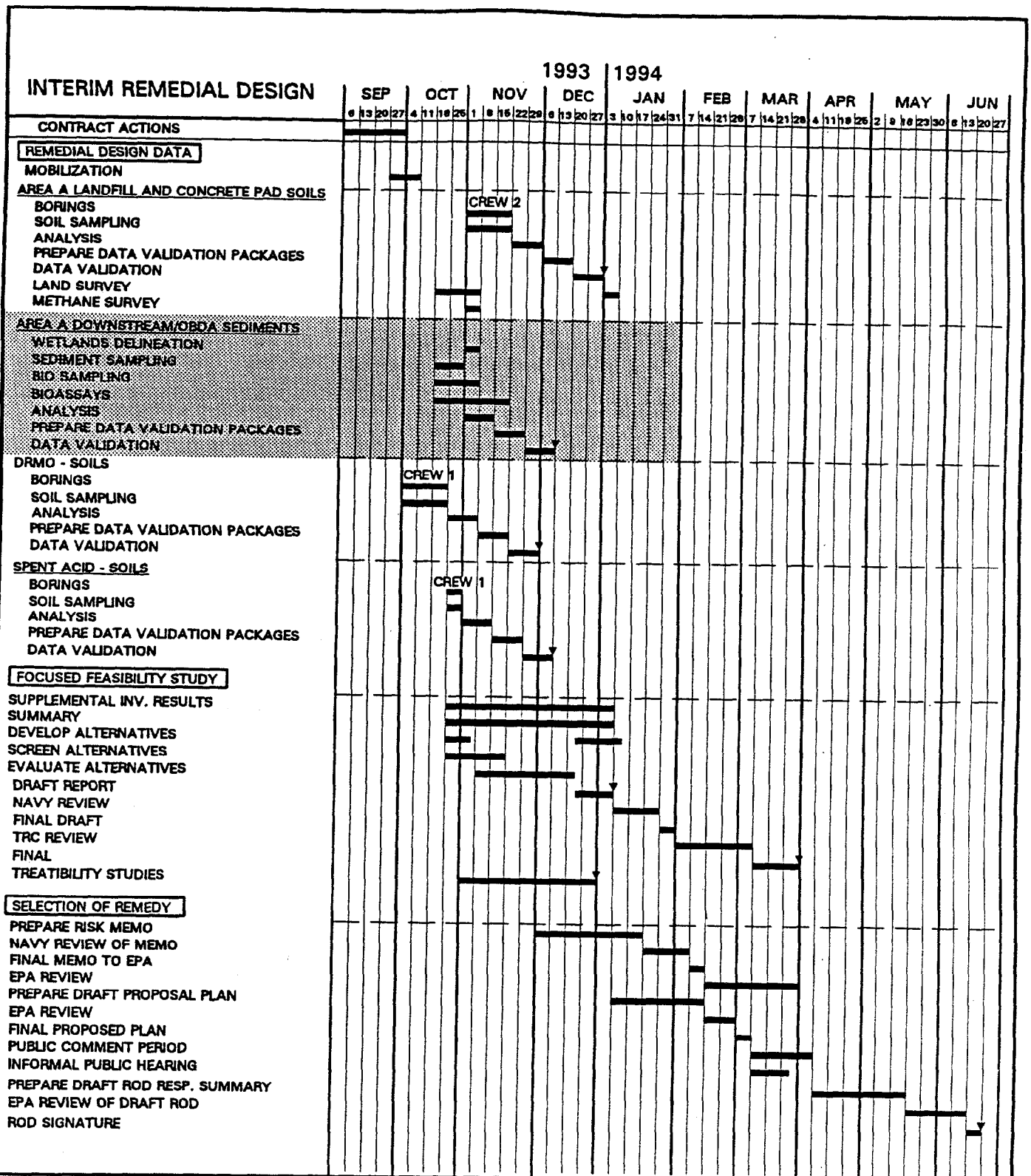
This preliminary design document provides the following information for the Area A Downstream/OBDA:

- Site Characteristics
- Interim Remedial Action Objectives and Remediation Target Levels
- Final Remediation Action
- Evaluation of Interim Remedial Action Alternatives
- Description of Work Items Required to Support the Remedial Action

The overall process of proceeding with the interim remedial actions is as follows:

- initiate the remedial design and collection of supplemental data (laboratory analysis, treatability studies, and engineering);
- complete a focused feasibility study including an evaluation of collected data and remedial alternatives;
- develop a proposed plan and record of decision (ROD);
- participate in ongoing public relations activities;
- complete the design; and
- implement approved, interim remedial actions.

This document represents the first phase of remedial design. Supplemental design data are currently being collected. Generalized schedules, showing all of the tasks to complete interim remedial actions for this project and the other interim remedial actions currently being implemented, are included in Tables 1-1 and 1-2.



INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CT

LEGEND

TASK TIME LINE

▼ ENDING MILESTONE

TABLE 1-1
SUPPLEMENTAL DESIGN DATA/
FOCUSED FEASIBILITY STUDY/
PROPOSED PLANS/RODS
INTERIM REMEDIAL ACTIONS

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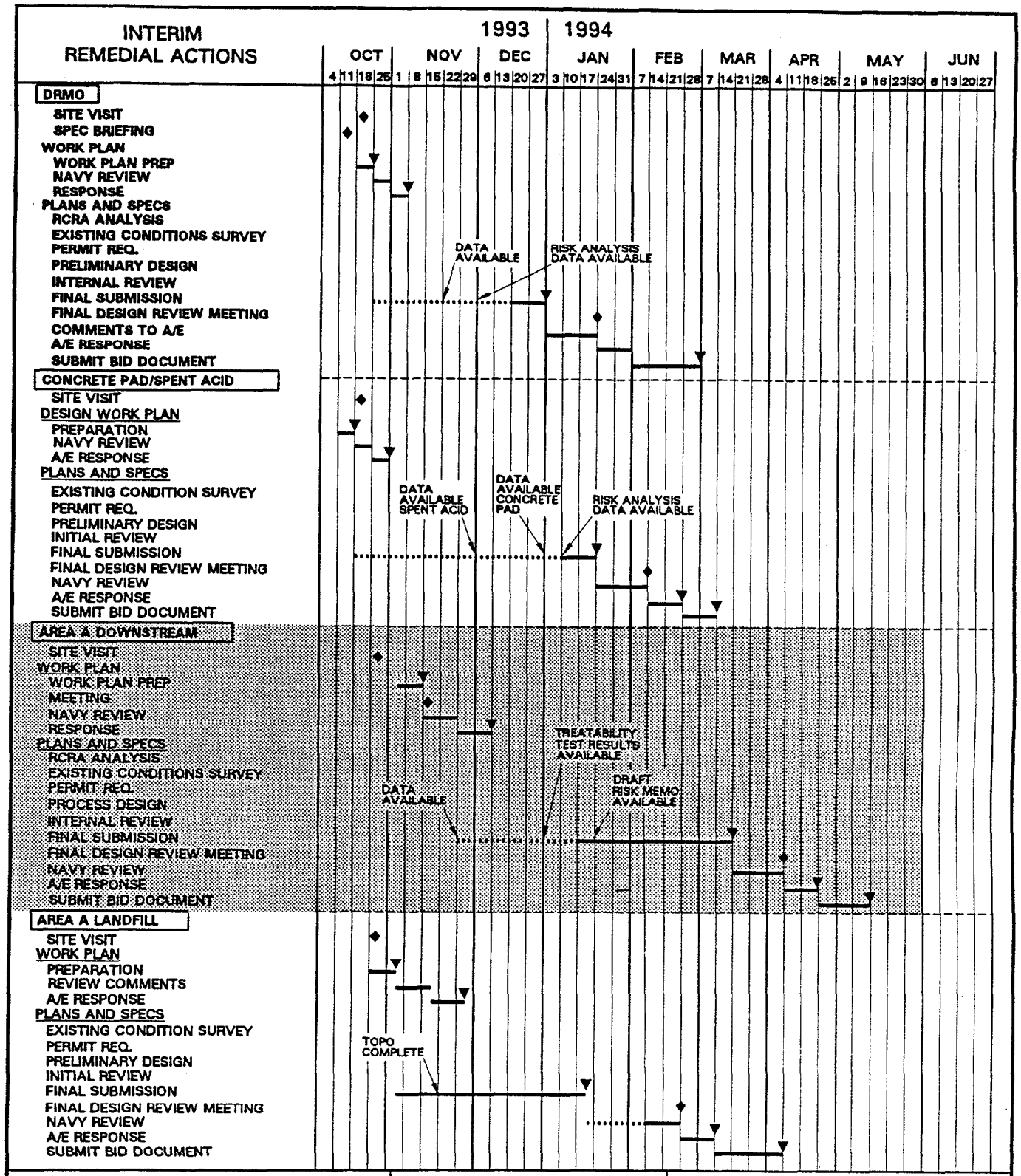

INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CT

LEGEND

- TASK TIME LINE
- PART TIME TASK TIME LINE
- MILESTONE/DELIVERABLE
- MEETING

TABLE 1-2
SCHEDULE
DESIGN INTERIM REMEDIAL ACTIONS

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Input from the Technical Review Committee (TRC) and regulatory agencies regarding the proposed interim remediation designs is requested at this time.

2.0 SITE CHARACTERISTICS

Regional geology and hydrogeology are described in the Phase I RI, along with detailed site background information and a description of the nature and extent of contamination. Presented herein is a summary of background-specific geology and hydrology for the Area A Downstream/OBDA site, and the nature and extent of contamination.

2.1 Site Background

Area A Downstream is the portion of Area A downstream of the dike which surrounds the wetlands and the landfill. OBDA is on the slope of the dike below and next to the Area A landfill. A small wetland exists at the base of the dike. OBDA is included within Area A Downstream. The Area A landfill and wetland exist east and upstream of Area A Downstream/OBDA. The Area A Downstream watercourses include North Lake and several small streams and ponds that discharge from Area A and ultimately into the Thames River. The ponds and streams are further discussed in Section 2.2.

A site plan of Area A Downstream/OBDA, which includes previous sample locations and the locations of soil borings and monitoring well installations currently being performed, is provided as Figure 2-1. The streams and ponds in Area A Downstream are natural in origin; however, they have been modified historically. North Lake, which is used as a recreational swimming area for Navy personnel, is recharged primarily by city water and has an overflow control structure at its outlet and beaches made of imported sand. The easternmost pond in the Area A Downstream appears to have been modified to act as a settling basin for discharges from the Area A wetland when dredged sediments were being disposed in the wetland during the 1950s. Several of the streams as they leave Area A Downstream at the limit of North Lake have been culverted.

NOTE:
1. UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE.
2. BASE MAP AND UTILITY INFORMATION FROM MAPS OF NSB-NLON PREPARED BY LOUREIRO ENGINEERING ASSOCIATES, DEC 1980. ELEVATIONS ARE BASED ON NSB-NLON DATUM WHICH IS 1.41 FEET BELOW NGVD.
3. PHASE I RI SAMPLE LOCATIONS ARE SHOWN.
3. THE LOCATION OF SURFACE SOIL SAMPLES 2DSS19 THROUGH 2DSS23 WILL BE DETERMINED IN THE FIELD AS NECESSARY FOR BETTER DEFINITION OF SOURCE AREAS.

2LTB9 – PROPOSED IRM SAMPLE LOCATION

– APPROXIMATE AREA OF DDTR CONCENTRATION EXCEEDING 25 ppm

THAMES RIVER
AMBERJACK ROAD
PENN CENTRAL RAILROAD
GOLF COURSE
BOULEVARD
SHARK
TRITON
ROAD
WAHOO
AVENUE
NORTH LAKE
AREA A DOWNSTREAM
OVER BANK DISPOSAL AREA
TORPEDO SHOPS
DIKE
GROUNDWATER FLOW DIRECTION
GRAPHIC SCALE IN FEET

FIGURE 2-1
SITE PLAN AREA A
LANDFILL, WETLAND, WEAPONS CENTER, DOWNSTREAM AND OBDA

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LEGEND

EXIST. PROP.
6MW1 7MW5 MONITORING WELL
6TB1 7TB5 TEST BORING
2DSD1 2DSD5 SEDIMENT SAMPLE
6SS1 7SS5 SURFACE SOIL SAMPLE
2DSW1 SDSW5 SURFACE WATER SAMPLE

EXIST. PROP.
10 EXIST CONTOUR
123 BUILDING No.
WATERCOURSE
STM STORM SEWER
CATCH BASIN

INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE-NEW LONDON
GROTON, CONN.

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OBDA became a disposal site after the earthen dike was constructed in 1957. Previous studies (1982) found that the material had been there for many years and included scrap lumber and 30 partially covered, 275-gallon, metal fuel tanks.

Atlantic personnel inspected the site in September 1988 and observed: (1) approximately 30 empty, unlabeled 200-gallon tanks, (2) old, creosoted telephone poles, (3) several empty, unlabeled, 55-gallon drums, and (4) rolls of wire. Bright orange, organic sediments (apparently leachate from the landfill) were observed in the water discharging from the base of the dike embankment.

2.2 Site-Specific Geology and Hydrology

Site-specific geology has been determined by using the Phase I RI and interpretation of the 1967 USGS Bedrock Geology Map, the 1983 SCS Soils Map, and the 1960 USGS Surficial Geology Map.

The 1983 SCS Soils Map shows the Area A Downstream as udorthents-urban land to the north and west of North Lake. The portion of the downstream between the earthen dike and North Lake is depicted as Hollis-Charlton Rock with 3 to 15 percent slopes. Both classifications are consistent with observed soil conditions, topography, and development in this area. OBDA is also shown as Hollis-Charlton Rock with 15 to 45 percent slopes. This classification is consistent with soil conditions and topography observed at the site.

The 1960 USGS Surficial Geology Map shows alluvium along the downstream watercourses from (and including) OBDA to North Lake. The area is mapped as Thames River terrace deposits from North Lake west to the Thames River. All classifications are generally consistent with observed soil conditions in the specified areas.

The Area A Downstream and OBDA are physically separated from the Area A wetland

by an earthen dike and from the Area A landfill by a steep slope. No evidence of fill material was observed in the Area A Downstream or OBDA. Unconsolidated material at the bottom of the slope consists of fine-grained sand and silt with rust-colored mottling. Similar soils were observed at 2DMW10 and in borings at the Torpedo Shops to the north. The sediments at 3MW12 consist of: (1) yellow and brown, mottled, fine-grained sand, and (2) silt and clay overlying fine-to-medium grained sand and gravel. Based on the sediments found in this area and the mapped surficial deposits in the vicinity, these sediments are probably alluvial deposits from either the present stream system or one that existed before the construction of the earthen dike.

The OBDA and the northern and western portions of the Area A Downstream are underlain by bedrock of the Mamacoke Formation. The southwestern portion of the Area A Downstream is mapped as an equigranular, gneissic granite known as the Hope Valley Alaskite Gneiss.

The Area A Downstream Watercourses drain the Area A Landfill and Wetland and ultimately flow into the Thames River. The Area A Downstream Watercourses include North Lake and several small streams which discharge from Area A and the Torpedo Shops and ultimately discharge into the Thames River.

The primary discharge point from the Area A Wetland is through four, 24-inch metal culverts through the dike. This discharge forms a small stream which flows west approximately 200 feet and into a small pond. Under normal flow conditions, this pond discharges to a small stream which flows north and then west toward Triton Avenue (past the OBDA site). The stream continues flowing west under Triton Avenue and Shark Boulevard and eventually discharges to the Thames River at the DRMO outfall. This pond also has a

discharge structure on the south side. During periods of high flow and high water at the pond, water also flows out through this discharge structure to a stream which flows south from the Overbank Disposal Area site. A second pond to the south of the above-referenced pond is formed by groundwater inflow and flows to the west around North Lake.

Groundwater also discharges from Area A to a small wetland at the base of the dike and the Overbank Disposal Area site. A stream flows from this wetland west toward North Lake, a recreational swimming area for Navy personnel. The stream enters a culvert which bypasses the pond and discharges to a stream below the outfall of the pond. This stream flows west under Shark Boulevard and through the golf course to the Thames River.

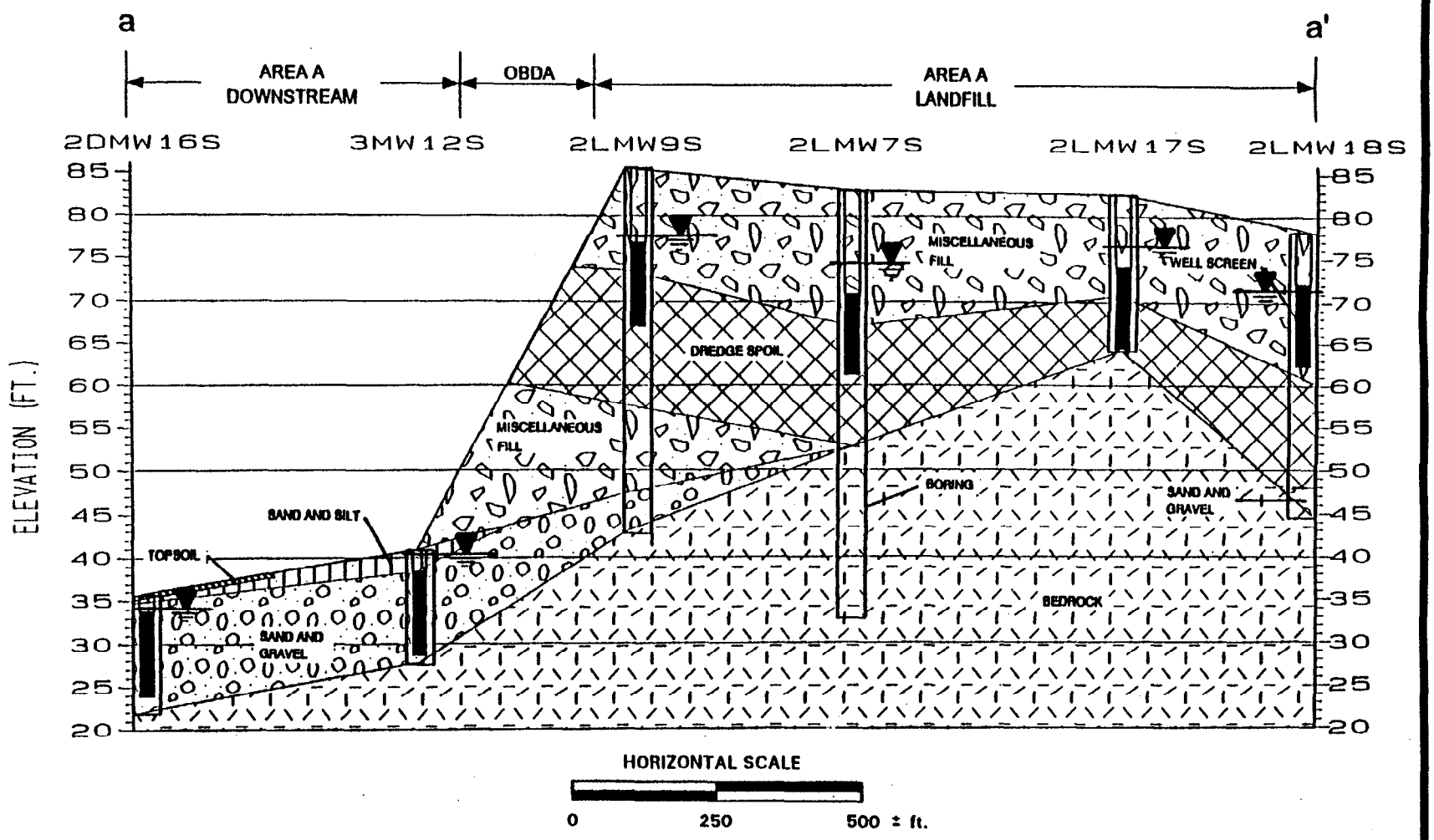
The hydraulic conductivity of the material surrounding well 2DMW16S was calculated to be 6.8 feet/day. The velocity of groundwater flow through the soils in the Area A Downstream (using a hydraulic conductivity of 6.8 feet/day, 0.30 for the porosity, and 0.01 for the hydraulic gradient) was calculated to be 0.2 feet/day.

Figure 2-2 depicts a geologic cross section of the Area A landfill and Area A Downstream/OBDA, indicating the subsurface geology, landfill material (miscellaneous fill), and the water table.

2.3 Nature and Extent of Soil and Sediment Contamination

The most significant level of contamination detected in the Area A Downstream/OBDA site is pesticides, primarily DDT and its derivatives (DDTR). The following section summarizes the results of the Phase I RI soil and sediments sampling and chemical analysis.

The subsurface soil samples were collected at well locations in wooded, undeveloped areas where no past disposal was reported or apparent. The exception was 3MW12S, which was located near to the wetland at OBDA where past disposal occurred.



INSTALLATION RESTORATION STUDY NAVAL SUBMARINE BASE - NEW LONDON GROTON, CT	GROUND WATER ELEVATION DATA: MARCH 21, 1991	FIGURE 2-2 GEOLOGIC CROSS SECTION A-A' AREA A ATLANTIC ENVIRONMENTAL SERVICES, INC.

Trichloroethene (24 ppb) and tetrachloroethene (58 ppb) were detected at a subsurface soil sample location near North Lake; both samples were above to-be-concerned (TBC) values of 5 ppb. Low levels of toluene and 1,1-dichloroethene were also detected. The source of the solvents detected near North Lake is unknown. One possibility comes from an unconfirmed report of a retired Navy employee who stated that there was a past disposal area in this general vicinity. This report could not be confirmed by a review of aerial photographs and discussions with other Navy personnel. Further investigation of this area has been included in the Phase II Work Plan.

No semivolatile organic compounds (SVOCs) were detected in subsurface soils, except for low levels of phthalates at one sample location. Low levels of SVOCs, principally polycyclic aromatic hydrocarbons (PAHs), were present in a subsurface soil sample at OBDA, which correlates with SVOCs detected in the sediment samples at OBDA.

No polychlorinated biphenyls (PCBs) were detected in the subsurface samples. Pesticides, including DDT and its derivatives, were detected in a subsurface soil sample near OBDA and at a sample near North Lake. The detection of pesticides at these locations appears related to past pesticide application in Area A. No significant detections of inorganics were noted in the subsurface soil samples.

Twenty-three sediment samples were collected for analysis from the OBDA wetland, the Area A Downstream and associated ponds, and North Lake. The sediment sampling and analysis programs assessed the extent of sediment contamination (principally pesticides) within this area caused by past application and/or sediment transport from potential source areas.

No volatile organic compounds (VOCs) were detected above TBC values in the collected sediment samples. At sample locations near the outlet of the Area A wetland, low

levels of VOCs (methylene chloride, trichloroethene) were detected, indicating some limited migration of VOCs via sediment transport from the Area A wetland. Within OBDA, all sediment samples contained low levels of VOCs, below TBC values. VOCs detected include methylene chloride, 2-butanone (methyl ethyl ketone), tetrachloroethene, toluene, ethylbenzene, and xylene. The data suggest that past releases of solvents and petroleum hydrocarbons occurred at the OBDA site. These VOCs could also be partially attributable to adsorption of chemicals to the sediments from groundwater. Low-to-moderate levels of SVOCs were detected in most sediment samples.

The only detection of PCBs was at 2DSD12, at the outlet of the downstream watercourse to the Thames River, adjacent to DRMO. Elevated levels of PCBs at the DRMO site indicate that this contamination is associated probably with surface water runoff from the DRMO site and not Area A.

Pesticides (DDTR) were detected at moderate to very high concentrations within the Area A Downstream watercourses and ponds. No pesticides were detected in the North Lake sediments. TBC values were exceeded at 10 of the 23 sample locations. The highest concentrations were detected in the two ponds below the Area A dike and within the OBDA sediments. This contamination may result from pesticide application rather than sediment transport, since these concentrations were much higher than those found within the Area A wetland. Lower concentrations downstream of these areas and extending to the Thames River are attributable to sediment transport from the higher concentration areas. The data indicate that ongoing migration of pesticides to the Thames River is occurring by sediment transport from the pond source areas.

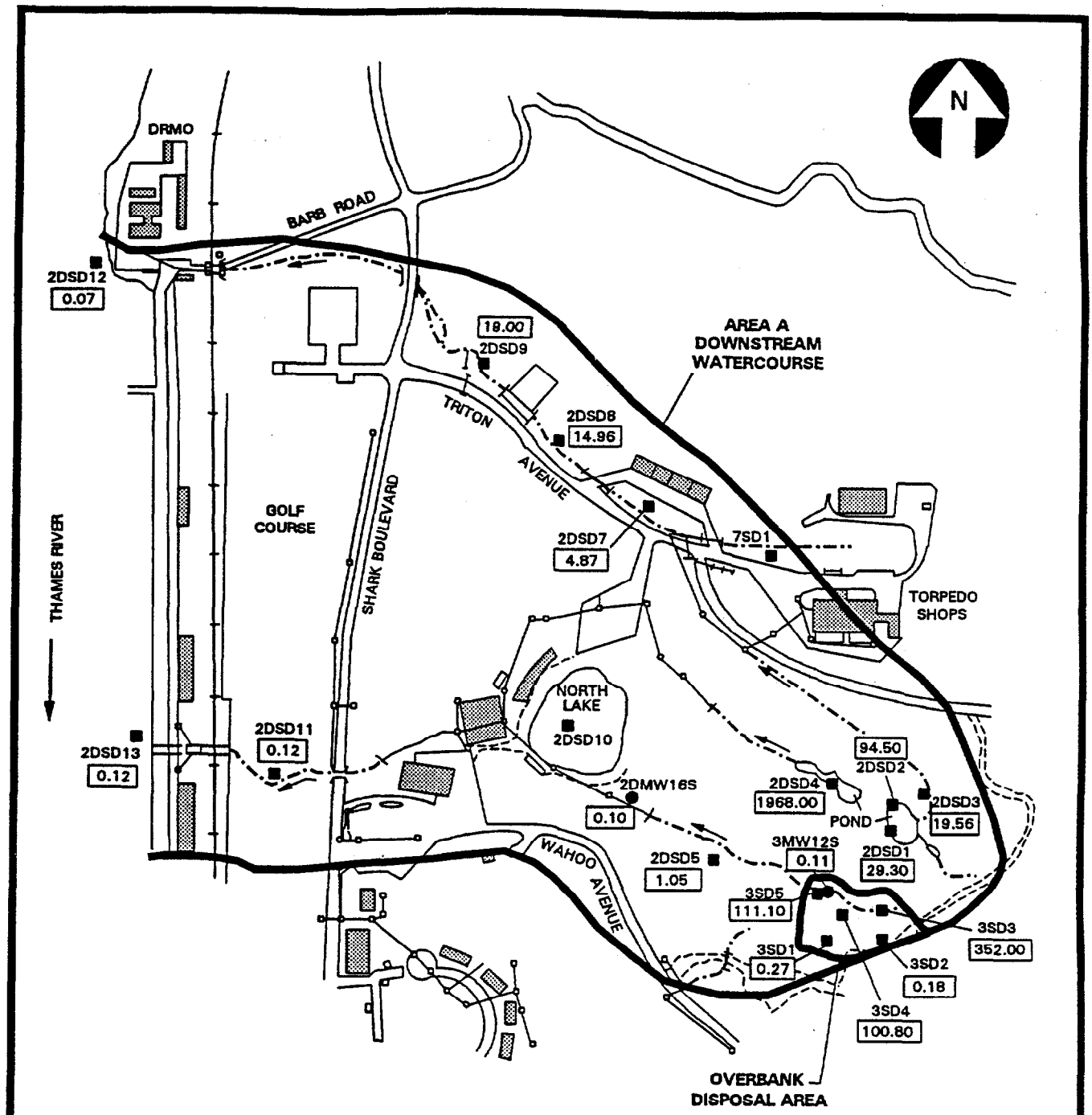
Several metals were detected above established background levels. These metals occur

in samples closest to the Area A wetland and include beryllium, cadmium, lead, selenium, zinc, and boron. Since cadmium was not detected above background levels in the Area A wetland sediments, the cadmium does not appear to be related to sediment transport from the wetland. No metals were detected above background levels in North Lake sediments.

The 10 sediment samples collected from the OBDA contained metals above the established background levels for cadmium (3 samples), iron (2), lead (4), selenium (2), and zinc (2). Cadmium sample results based on toxicity characteristic leaching procedure (TCLP) analysis correlated with mass weight analysis for two samples. TCLP analysis detected no lead. The elevated iron concentration may partially explain the rust-colored leachate that is visible in this wetland area and within the stream bed. The lead and cadmium may suggest battery/battery acid disposal in this area, where the highest concentrations throughout Area A were recorded. Alternatively, cadmium present in the groundwater could have adsorbed onto sediments while discharging to the OBDA.

The presence of pesticides (DDTR) in sediments is the most significant concern relative to the human health/ecological risks in this area. Figure 2-3 provides a summary of the pesticides soil/sediment data for this area.

The distribution of contaminants at this site has not been completely defined. Therefore, as part of the overall remediation design effort for this site, surface soil and sediment sampling and analysis will be conducted to fully delineate the extent of contamination. Future investigations for this site are specified in the Phase II RI Work Plan. Those activities of the work plan regarding the extent of contamination currently are being performed to allow for the timely incorporation of the data into the final interim remedial design. In general, these data collection requirements will consist of collection of sediment samples at 24 locations and



NOTE:
1. Wells not installed at 2DMW10S and 2DMW15S due to lack of ground water in overburden.
2. Pesticide totals for OBDA are highest of 0-6" or 12-18" sample intervals.
3. No data presented indicates parameters not detected.

INSTALLATION RESTORATION STUDY NAVAL SUBMARINE BASE - NEW LONDON GROTON, CT	LEGEND ■ 7SD1 - Sediment Sample 280 - Total DDTR (ppm) ND - Indicates Not Detected ▒ - Building —·—·· - Watercourse Approximate Scale 0 200'	FIGURE 2-3 SUMMARY OF TOTAL PESTICIDES DATA IN SOILS/SEDIMENTS AREA A DOWNSTREAM WATERCOURSE ATLANTIC ENVIRONMENTAL SERVICES, INC.

surface soils at 23 locations; field-screening for DDTR with a gas chromatograph (GC); qualitative soil invertebrate and fish surveys; quantitative bioassay and tissue analysis; and a wetlands survey in Area A (100 acres). Up to 21 sediment or soil samples will be analyzed in an off-site laboratory, and up to 43 tissue samples will be analyzed for pesticides in an off-site laboratory. The boring locations are illustrated in Figure 2-1.

2.4 Nature and Extent of Groundwater Contamination

Twenty-eight groundwater monitoring wells were installed and sampled within Area A, which includes the landfill, wetland, downstream and OBDA areas. Eleven were overburden wells, and 17 were bedrock wells.

VOCs were detected in only 6 of 28 monitoring wells within Area A. TBC/ARAR values for drinking water were exceeded at only 3 locations. Trichloroethene was detected above ARARs at 2LMW13D (10 ppb) at the west end of the landfill, and 2DMW16D (17 ppb) upgradient of North Lake. These are both bedrock wells. This finding suggests that a low-concentration plume of solvents exists within the bedrock aquifer and extends from the western portion of the former landfill downgradient to the North Lake area. The plume appears to be fairly narrow, since no solvents were detected in the Area A Downstream wells to the north. This possibility is supported by review of the groundwater-specific conductivity data, which are used as a landfill leachate indicator. Solvents were not detected in downgradient well 3MW12D (OBDA), suggesting that preferred fracture flow is occurring in the bedrock. However, the data do not correlate with the cadmium data, which indicated elevated levels of cadmium at 2LMW13S and 3MW12D. The downgradient extent of the solvent plume is undefined, but groundwater is flowing in a westerly direction.

Benzene was detected at 10 ppb, above drinking water standards (5 ppb) at 2LMW18S,

and may be related to parked vehicles in this area; benzene was not detected in any other well in Area A.

Overall, the VOC concentrations, where detected, were low, particularly given the historical use of Area A as a landfill. Although drinking water ARAR/TBC values were exceeded in three wells, the results do not indicate any significant, ongoing release of VOC contaminants. Soil gas and subsurface soil data indicate that low levels of aromatic hydrocarbons and solvents are present throughout much of the Area A landfill. The data suggest a generally uniform, low level of soil contamination within the landfill with no definitive source area. The deployed parking area and adjacent area to the east (also used for automobile storage and parking) had the most uniform level of petroleum hydrocarbons based on soil gas data.

Cadmium and lead were the only inorganics that exceeded primary drinking water standards (ARARs) within Area A. Lead was detected above the 15 ppb drinking water standard at one well in the Area A Wetland, 2WMW2D (22.4 ppb). Cadmium was detected above the 5 ppb drinking water standard at 2LMW18D (7.2 ppb), 2WMW3D (7.7 ppb), 2WMW5S (6.4 ppb), 2WMW3S (10.6 ppb), 2LMW18S (29.1 ppb), 2LMW13D (44.8 ppb), and 3MW12D (16 ppb).

The overburden groundwater flow in the central and eastern portions of the landfill is toward the wetland, and in the western portion of the landfill to the northwest and down the Area A Downstream watercourse valley. The cadmium groundwater contamination appears confined to the landfill and the OBDA area. Cadmium was detected only in well 3MW2D in the OBDA, suggesting a restricted plume to the northwest. Because of the preferred bedrock fracture flow patterns, other wells may not have intercepted the cadmium, and the cadmium

plume may be undefined.

Iron and manganese exceeded secondary drinking-water standards in many Area A wells. The results for 2WMW1D and 2WMW2D (upgradient wells) and the residential wells were much lower for iron and manganese, which indicates a source of these inorganics within the Area A landfill material and wetland sediments.

2.5 Nature and Extent of Surface Water Contamination

Fifteen surface water samples were collected within Area A, including the Wetland and Downstream areas and Thames River. These samples were collected to assess surface water quality.

Low levels of VOCs were detected in several samples (2DSW5, 2DSW7, 2DSW8, 2DSW12, and 2DSW13). Except for one sample, the constituents detected are petroleum hydrocarbons, which could be associated with runoff. One sample near Triton Avenue contained 3 ppb of tetrachloroethene and 2 ppb of styrene. No ARAR or TBC values were exceeded for the VOCs. No SVOCs were detected at any of the sampling locations.

No pesticides or PCBs were detected in any of the samples except for 2DSW4, which contained 1.9 ppb of DDD. This sample is from an area where high levels of DDTR, including DDD, were detected in sediments. The origin of DDD in the surface water is probably from the sediments.

ARAR/TBC values for inorganics were exceeded at several sample locations for cadmium (3 of 15), copper (15 of 15), iron (11 of 15), lead (11 of 15), manganese (13 of 15), zinc (14 of 15), and mercury (1 of 15). These ARARs are based upon in-stream, water-quality criteria and standards to protect aquatic life and may not be appropriate for the wetlands and small drainage streams. The presence of iron and manganese in surface water may be caused

by the low pH and reducing conditions created by the Area A landfill. Some of the iron and manganese may originate from wastes; however, the majority of these metals detected in surface water probably leached from native soils.

Copper and zinc, which exceeded water quality criteria or standards, were also detected in concentrations above background levels in soils at the Area A landfill. Assumed, the elevated concentrations originate from the Area A landfill.

Cadmium and lead are present above ARAR values, and levels normally seen in natural surface waters are present in both the Area A wetland and landfill soils and sediments. The presence may be the result of historical disposal activities. However, cadmium and lead were also detected in the upgradient sample location (2LSW1) above ARAR values.

Mercury was detected only in one surface water sample (2DSW9). This location (adjacent to Triton Road) is immediately downgradient of two sediment sampling locations where mercury was found. Although the two sediment concentrations were below background levels, mercury was not detected in any other sediment sample. There was one occurrence of mercury above background concentrations in Area A landfill soils. Mercury is rarely found in natural surface waters above one ppb. The source of the mercury in sediments is not apparent, although historical disposal in the Area A landfill is one possible cause. However, it is more likely that a past release occurred upgradient of sample locations 2DSD7 and 2DSD8 along Triton Road. It is noted that sediment sample 7SD1, within a runoff swale from the Torpedo Shops, contained no mercury, nor did any other soil or groundwater sample at the Torpedo Shops. This notification implies that the torpedo shops are not the source.

3.0 INTERIM REMEDIAL DESIGN

3.1 Interim Remedial Action Objectives and Remediation Target Levels

Risks were identified in connection with the presence of DDTR in streambeds and wetlands at the Area A Downstream/OBDA site. Risks associated with exposure to DDTR were for children who might play in these areas. Note that the Navy has since installed a fence separating this area from the North Lake recreation area which diminishes the chance of children playing in Area A. The objective of the interim remedial action is to reduce exposure of children and biota to DDTR in sediments and to prevent transport of the contaminated sediments.

The preliminary remediation action target level for DDTR in soil at this site is 25 ppm. This level was chosen based on a human health risk analysis, assuming a soil ingestion rate of 200 mg/day. The target level of 25 ppm DDTR in sediments and soils was chosen as it appears to be appropriate for protection of human health at a risk level of 1 E -6.

No target levels have been developed at this time with respect to the protection of ecological receptors. EPA has indicated a need for additional data to identify appropriate risk reduction objectives and target levels for ecological receptors. Additional ecological data currently are being collected during the Phase II RI so that target levels for ecological receptors can be developed to be incorporated into the final design for this interim remedial action.

3.2 Final Remediation Actions

Interim remedial actions for the Area A Downstream/OBDA site consist of dredging the DDTR-contaminated sediments, followed by on-site treatment or off-site disposal of the contaminated sediments. No further remedial activities to address DDTR-contaminated soils and sediments at this site are anticipated after the completion of the interim remediation.

The remainder of the work specified in the Phase II RI Work Plan for the Area A Downstream/OBDA site consists of performing additional sediment sampling at North Lake, surface water sampling, and groundwater sampling.

The purpose of sediment sampling at North Lake is to verify the results of the previous analyses at this location, which indicated that North Lake sediments are not contaminated with DDTR or any other hazardous substances. Surface water sampling is being conducted at several locations in Area A, including upstream and downstream locations, to determine the source of elevated levels of inorganics and to verify the Phase RI results indicating that dissolved DDTR is not present in surface waters. Groundwater sampling in the Area A Downstream/OBDA is being performed primarily to fully delineate contaminant plumes which appear to originate from the landfill and to verify the results of previous investigations which indicated that groundwater in the bedrock does not discharge to North Lake. Remediation of groundwater may be required as part of the final remedy for this site to address contaminants detected in the groundwater at Area A Downstream/OBDA, which appear to originate from the landfill.

3.3 Evaluation of Alternatives

To document further the rationale behind the selection of the proposed interim remedial action and to comply with the National Contingency Plan (NCP), a focused feasibility study (FFS) will be performed. Additional remedial design data currently are being collected to support the FFS and remedial design efforts. The preliminary evaluation of alternatives presented in the following paragraphs is based on data currently available from the Phase I RI. Based on the screening of technologies, several alternatives, as shown in Table 3-1, were selected for a screening evaluation. Three alternatives have been retained for further analysis;

TABLE 3–1
AREA A DOWNSTREAM/OBDA – SEDIMENTS
DEVELOPMENT OF ALTERNATIVES

RETAINED PROCESS OPTIONS	ALTERNATIVES									
	LIMITED ACTION		CONTAINMENT	OFF–SITE[2]		ON–SITE ALTERNATIVES				
SOIL/SEDIMENT	No Action	Access Restriction	Cap	Incineration	RCRA Landfill	In–situ Stabilization	Aboveground Stabilization	Incineration	Low–Temperature Thermal Desorption	Solvent Extraction
	2D–1	2D–2	2D–3	2D–4	2D–5	2D–6	2D–7	2D–8	2D–9	2D–10
No Action	●									
Access Restriction		●	●							
Horizontal Barrier – Cap			●							
Site Grading & Stormwater Management		●	●			●[3]				
Excavation – Backhoe										
Dredging				●	●		●	●	●	●
In situ Stabilization						●				
Dewatering				●	●		●	●	●	●
Solvent Extraction										●
Stabilization							●			
On–site Incineration								●		
Off–site Incineration				●					●[1]	●[1]
On–site Low–Temp. Thermal Desorption									●	
On–site Backfill							●	●	●	●
Off–site RCRA Chemical Landfill					●					

1. The condensed/extracted DDT and spent carbon will be transported off–site for incineration if an afterburner is not used.
2. Off–site low–temperature thermal desorption or off–site reuse (asphalt or cement) will be reconsidered if a permitted off–site facility is located.
3. Standing water will be removed and treated on site.
4. Shading indicates alternatives to be evaluated during the focused feasibility study.

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alternatives that did not include available, cost-effective, and proven technologies were eliminated. The three alternatives retained for further evaluation (shaded in Table 3-1) are as follows:

- containment via installation of a surface cap;
- dredging of contaminated sediments followed by on-site, low-temperature thermal desorption; and
- dredging of contaminated sediments, followed by disposal at a landfill designed to standards for the disposal of hazardous waste under RCRA (RCRA landfill).

Surface Cap:

The surface cap will consist of various layers of sand, gravel, and rip-rap covering the area contaminated with greater than 25 ppm DDTR. The surface cap would be constructed to minimize the direct-contact risks and to prevent downstream migration of the contaminated sediments. Alternatively, the contaminated sediments could be covered with soil, and the surface water could be redirected via culverts to bypass the contaminated sediments. If properly implemented, this alternative should eliminate all risks to human health associated with the DDTR-contaminated sediments. However, as the sediments remain untreated, the possibility for future risk exists and the ecology of the area would not be protected. Long-term maintenance and monitoring will be required to assure that the contaminated sediments have not migrated downstream. Since the area of DDTR-contaminated sediments is anticipated to be limited, providing a permanent remedy for the site via dredging the DDTR-contaminated material and treatment/disposal is anticipated to be more cost-effective than long-term monitoring and maintenance of the site required with a surface cap.

Dredging/On-Site Thermal Treatment:

Mechanical dredging is more cost-effective than hydraulic dredging, but there is a larger

amount of sediment resuspension using this method. If the sediment areas are first dewatered, mechanical dredging with a backhoe can be a viable option that will not resuspend large amounts of sediment. Hydraulic dredging also may not be feasible if there is a large amount of debris (e.g., sticks, rocks, etc.). Either method is acceptable and will ultimately be chosen by the remediation contractor.

Both on-site thermal desorption and off-site disposal of the contaminated sediments will require dewatering of the sediments prior to treatment or disposal. The water generated from the dewatering of the sediments will have to be treated on site via carbon adsorption prior to discharge. Bench-scale treatability studies currently are being performed regarding the dewatering of dredged sediments and treatment using carbon adsorption of dewatering water and thermal treatment of dewatered sediments. The data from the treatability studies will supplement the data gathered during the Phase II RI for remedial design purposes.

Once the contaminated sediments have been dredged and dewatered, the material can be thermally treated on site or shipped off site to be disposed of in a RCRA landfill. site. On-site thermal desorption of DDTR-contaminated material would be effective for removing DDTR from the sediments. On-site thermal desorbers and wastewater treatment systems are available commercially and have been proven on a full-scale basis. However, a treatability study on the thermal treatment of dewatered sediments will be performed for remedial design purposes to verify the effectiveness of thermal treatment.

Dredging/Landfill:

There are several, available commercial landfills designed to RCRA standards; these landfills are permitted to accept DDTR-contaminated materials. Since the DDTR contamination in the sediments appears to result from the legal application of DDT to control

insect populations, the sediments are not classified as a hazardous waste (i.e., the sediments are not the result of a spill of the commercial chemical product or manufacturing intermediate DDT). Since these contaminated sediments are not classified as hazardous waste, their disposal is not subject to any land disposal restrictions.

Both off-site disposal at a RCRA landfill and the thermal treatment of DDTR-contaminated materials provide a generally permanent remedy for the remediation of DDTR-contaminated sediments at this site. Since both of these alternatives are viable, the final selection will be decided based on the cost-effectiveness of each alternative. The cost-effectiveness of mobilization of a thermal desorber to the site compared to the cost-effectiveness of off-site disposal of the contaminated material at a RCRA landfill will be determined, based on the amount of contaminated material to be remediated. The extent of contamination and the volume of material with DDTR concentrations in excess of target remediation levels will be determined from the results of the Phase II RI currently being performed.

3.4 Interim Remediation Work Items

The interim remediation for this site consists of the dredging and dewatering of DDTR-contaminated sediments followed by off-site disposal at a RCRA landfill or on-site thermal treatment.

Based on the Phase I RI soil analyses results, the estimated area to be excavated for the interim remediation of the Area A Downstream/OBDA site is shown in Figure 2-1. The estimated depth of sediments is approximately 3.0 feet. Approximately 7,900 cubic yards of DDTR-contaminated materials will be removed, based on the preliminary estimate of the extent of DDTR contamination, assuming a depth of contamination of 3.0 feet. The results of the

Phase II RI currently being conducted will define more completely the actual depth and areal extent of the contamination. Therefore, the actual amount of sediments to be removed could increase or decrease.

Prior to the start of dredging activities, underground utilities will be located to determine if any conflicts exist. The work at the site will be coordinated with the Navy to minimize any interferences with Submarine Base operations.

The contaminated materials will be dredged and dewatered. The wastewater generated from the dewatering process will be treated at an on-site wastewater treatment facility before being discharged into an on-site sanitary sewer where it will receive additional treatment at the publicly owned treatment works (POTW).

The dredged area will be filled with clean fill in accordance with a wetlands/pond restoration plan as soon as possible after the contaminated soil has been removed, and the site will be graded to original grade. The wetlands/pond restoration plan will be included in the final design documents.

If on-site thermal desorption is chosen as the interim remediation method, then the clean fill will consist of thermally treated sediments.

In addition, as part of this interim remedial action, surficial debris in the OBDA will be removed and disposed. This debris includes empty, 275-gallon steel tanks, scrap lumber, and other, miscellaneous debris.

The following design work items will be completed for this interim remedial action:

- Topographical Survey of Existing Conditions
- Utility Locations
- Permit Requirements Investigations

- Soil Disposal Assessment and Determination of Acceptable Landfills (RCRA Landfill option only)

- Thermal Desorption Vendor Search (Thermal Desorption option only)

- Preliminary Design Plans

  - Existing Conditions
  - Final Grades
  - Boring Logs
  - Civil Details
  - Dewatering
  - Sediment Storage and Dewatering Liquid Storage Treatment/Requirements
  - Removal Profile
  - Wetlands Restoration Plan
  - Thermal Desorber Staging Area (Thermal Desorber option only)

- Finalization of Limits of Excavation Based on Review of Supplemental Data

- Design of Site Restoration

- Preparation of Contract Plans and Specifications for Bidding