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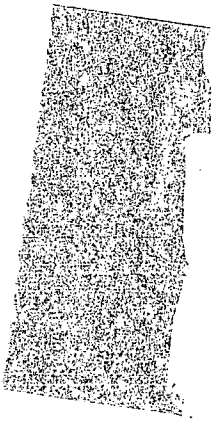
IMPLEMENTATION PLAN FOR REMEDIAL SYSTEM OPERATIONS AT NAVY EXCHANGE SERVICE STATION NAVAL AIR STATION, BRUNSWICK, MAINE

Contract No. N62472-92-D-1296
Contract Task Order No. 0035

Prepared for

Department of the Navy
Northern Division
Naval Facilities Engineering Command
10 Industrial Highway
Mail Stop No. 82
Lester, Pennsylvania 19113-2090



Prepared by

EA Engineering, Science, and Technology
15 Loveton Circle
Sparks, Maryland 21152

November 1994
FINAL
296.0035

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Michael S. Battle
CTO Manager

4 NOV 1994
Date

Charles W. Houlik, Jr., Ph.D., CPG
Program Manager

11-08-94
Date

November 1994
FINAL
EA Project No. 29600.35

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1. PROJECT DESCRIPTION

1.1 INTRODUCTION AND OBJECTIVES

Under Contract No. N62472-92-D-1296, Northern Division, Naval Facilities Engineering Command issued Contract Task Order (CTO) No. 0035 to EA Engineering, Science, and Technology to conduct remedial system operations tasks at the Navy Exchange (NEX) Service Station, Building No. 538, Naval Air Station, Brunswick, Maine. This Implementation Plan is being prepared as specified in the Statement of Architect-Engineer Services dated 25 July 1994 (Appendix A).

In 1993, a soil vapor extraction/aquifer air sparging (SVE/AAS) pilot plant was installed at the NEX Service Station (Building No. 538) and hydraulically upgradient of the adjacent Family Services Center (Building No. 27) to assess the feasibility of site remediation via these two innovative technologies. Pilot plant operations commenced in November 1993 with the operation of the SVE system. Following approximately 6 months of SVE pilot plant operations (May 1994), the AAS pilot plant was activated. Continuous SVE/AAS system operations occurred for approximately 1 month, at which time the AAS system was deactivated due to the mobilization of free-product and to assess ground-water quality at the site. For the remainder of June 1994, SVE pilot plant operations were continued.

Based on the performance of the SVE and SVE/AAS pilot tests, both technologies were demonstrated to be effective in remediating petroleum-related constituents from the soil and ground water at the subject site. Pilot testing indicated favorable hydrocarbon removal rates from the subsurface could be sustained and yielded valuable data regarding soil permeability and system operations. Modification of the system design, and the manner in which the system is operated, was determined to be necessary to enhance remedial system performance at the subject site.

To proceed with the effort to achieve the established clean-up goals for soil and ground water at the site, continued operations of the remedial system was deemed necessary. The objective of this CTO is to evaluate and implement measures necessary to enhance remedial

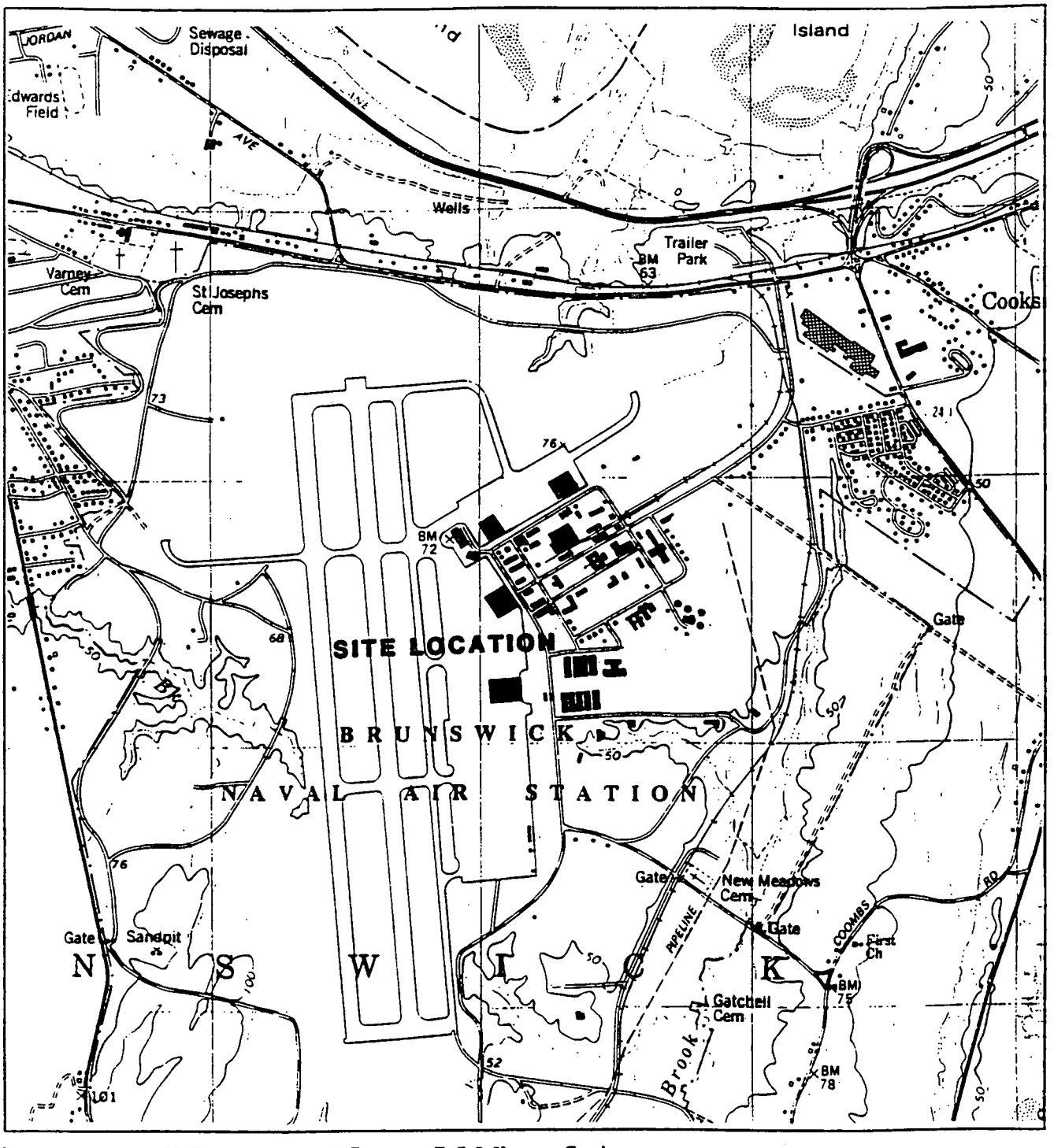
system performance, conduct an additional 12 months of plant operations, and perform quarterly ground-water sampling to monitor restoration of the water table aquifer.

1.2 SITE DESCRIPTION

The NEX Service Station is located north of the intersection of Second Street and Burbank Avenue at the Naval Air Station, Brunswick, Maine (Figures 1-1 and 1-2). The NEX Service Station (Building No. 538) and adjoining property to the southeast, occupied by the Family Services Center (Building No. 27), constitute the area undergoing additional subsurface investigation. The NEX Service Station is bordered on all sides by Naval Air Station grounds. West of the subject site, across Second Street, the Public Works Department maintains a vehicle compound. The NEX shopping complex (Building No. 11) is located approximately 100 ft northeast of the underground storage tanks (USTs). Abutting NEX Service Station property to the immediate north is a water pump house with mounded water tank (Building No. 295); approximately 100 ft to the southeast, on the opposite side of Burbank Avenue, is the Family Services Center (Building No. 27). Several other Base facilities exist within 1,000 ft of the site.

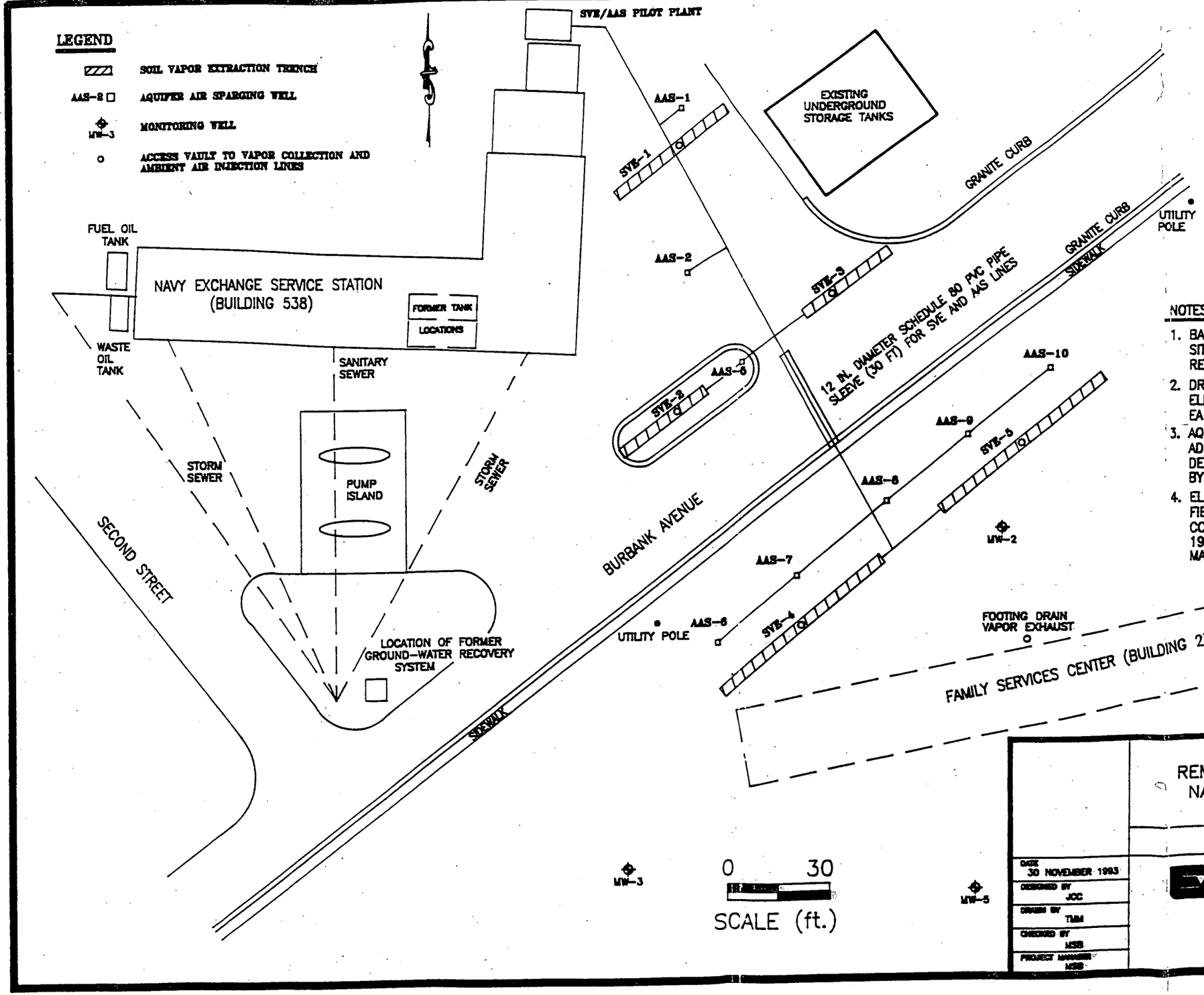
The NEX Service Station building is approximately 5,300 ft^2 in area and consists of a service garage with two bays, a beverage container redemption center, and an office. Remaining service station grounds include an active pump island with canopy and three 10,000-gal gasoline USTs, which were installed in 1993. Alongside the western side of the service station building are two aboveground storage tanks (one 275-gal waste oil tank and one 550-gal fuel oil tank). The original building was constructed in 1957 and has since been expanded. The site has been operated as a petroleum distributor for approximately 36 years. Product historically stored at the NEX Service Station includes several grades of gasoline, fuel oil, and waste oil.

The topography of the site area is characterized as flat and gently sloping to the south-southwest in the direction of the intersection of Burbank Avenue and Second Street. A small, steeply graded hill (approximately 8 ft total height) is located directly north of the service station and is the setting for the pumphouse and water tank (Building No. 295).



Source: U.S. Geological Survey 7.5 Minute Series
Topographic Quadrangle Map
Brunswick, Maine Quadrangle, 1980

Figure 1-1. Site location map, Navy Exchange Service Station, Naval Air Station, Brunswick, Maine.



WELL	ELEVATION (FT.)
AAS-1	67.00
AAS-2	65.67
AAS-5	65.69
AAS-6	65.34
AAS-7	65.21
AAS-8	65.66
AAS-9	65.99
AAS-10	66.26
MW-2	65.32
MW-3	64.34
MW-5	60.48

NOTES:

1. BASEMAP DEVELOPED FROM ERM-NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND EA FIELD RECONNAISSANCE ON 31 MARCH 1993.
2. DRAWING IS AN APPROXIMATE REPRESENTATION OF ELEMENTS OF THE SVE/AAS SYSTEM INSTALLED BY EA 10 SEPTEMBER THRU 20 SEPTEMBER 1993.
3. AQUIFER AIR SPARGING WELLS AAS-3 AND AAS-4, IN ADDITION TO MONITORING WELLS MW-1 AND MW-4, WERE DESTROYED DURING CONSTRUCTION ACTIVITIES PERFORMED BY OTHERS.
4. ELEVATIONS OF SPARGING WELLS BASED ON EA FIELD FIELD SURVEY PERFORMED 26 OCTOBER 1993 AND CORRELATED TO SURVEY DATA PROVIDED IN 24 JUNE 1992 SITE PLAN AS DEVELOPED BY ERM PROGRAM MANAGEMENT COMPANY.

AS-BUILT DRAWING
REMEDIATION SYSTEM CONSTRUCTION
NAVY EXCHANGE SERVICE STATION

NAVAL AIR STATION, BRUNSWICK, MAINE

Figure 1-2

DATE	30 NOVEMBER 1993
DESIGNED BY	JCC
DRAWN BY	TMM
CHECKED BY	MSB
PROJECT MANAGER	MSB

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.
3 WASHINGTON CENTER
THE MAPLE BUILDING
NEWBURGH, NEW YORK 12550
(914) 565-8100

PROJECT NUMBER	12197.14
SCALE	1"=30'
FILE NAME	12197\08\SVEAS
DRAWING NUMBER	-
SHEET NUMBER	1 OF 1

On and directly adjacent to the NEX Service Station exist several buried utilities, including water, storm sewer, sanitary sewer, and steam. Several storm sewer and sanitary sewer lines traverse the southern portion of NEX Service Station grounds, as shown in Figure 1-1. A water main extends across Second Street to a fire hydrant located at the southwestern corner of service station grounds. A 1-in. water line runs from the Burbank Avenue water main due east of the former pump dispensers into the center of the NEX Service Station. All electric services are located overhead within the vicinity of the subject site. The locations of utility lines are shown in Figure 1-2.

1.2.1 History of Fuel Storage

According to the report prepared as a result of a prior subsurface investigation (ERM 1992), in September 1992 there were four USTs at the NEX Service Station. Three of these USTs were single-walled steel gasoline storage tanks installed in 1974 and formerly located in the grassy area east of the service station; these tanks passed integrity tests conducted by Tankpro of Scarboro, Maine in July 1989. The fourth UST was a 1,000-gal single-walled steel fuel oil tank installed in 1975 and formerly located along the northern edge of the service station. The locations of the former tanks are shown in Figure 1-2. All of these tanks were registered with the State of Maine.

Prior to replacement in 1974, two 5,000-gal gasoline USTs were located onsite in an area now occupied by an extension to the original service station, as shown in Figure 1-2. A 550-gal waste oil tank, installed in 1975 along the western wall of the service station, was removed in 1989. No records of these removals were immediately available for review.

1.2.2 Spill/Release History

The spill/release history of the site has been taken directly from the remedial investigation report prepared by ERM (1992). According to Naval Air Station personnel, gasoline odors were detected in the vicinity of the service station in 1981. To determine the sources of the vapors, surface soils in a 60-70 ft^2 area around the UST system were removed, and a faulty connection in one of the pipes was found and repaired. The excavated soils were analyzed

by Maine Department of Environmental Protection (MEDEP) personnel, and the petroleum-impacted soils were disposed of off-site. No other information was available regarding the removal and disposal of impacted soil.

According to Mr. Neil Campbell, a Naval Air Station maintenance worker, a ground-water recovery system was installed at the site in 1984 to correct for gasoline odors in Building Nos. 25 and 27. The system is comprised of 3 shallow ground-water recovery wells connected to a central manifold and pump system, and was located in the grassy island at the corner of Second Street and Burbank Avenue. Using this recovery system, ground water was pumped into a temporary aboveground holding tank for approximately one week and analyzed by MEDEP. Subsequently, for a period of approximately one year, MEDEP authorized discharge of the ground water to the nearby storm sewer. Ground-water pumping was terminated when water no longer appeared to be contaminated. The date of the termination of pumping was not identified nor was any other information regarding the operation and maintenance of the ground-water recovery system.

There are no records, remedial system specifications, or sampling data in MEDEP's files to document any of the above activities or to characterize soil and ground-water contamination onsite. The only documentation in Naval Air Station files concerning these activities is a work authorization for installation of the wells dated 22 July 1981.

ERM reviewed MEDEP files to identify reported spill incidents associated with the site (complete files were only available for the period since 1984). One incident of a gasoline spill at the site had been reported to MEDEP in 1989. According to Mr. Bradford Hahn of MEDEP's Portland office who prepared a report for the incident, a minor amount of contaminated soil was discovered while performing a tank tightness test. Approximately 1 yd^3 of soil was removed and disposed off-site. According to the contractor who performed the tightness test (Tankpro of Scarboro, Maine), the spill did not appear to be related to the tightness test. Based on the contractor's description of the incident, Mr. Hahn indicated that due to the minor nature of the release and immediate containment of the impacted soil, no follow-up investigation was necessary. No other information was identified in MEDEP files regarding this spill incident.

During a 30 March 1993 site visit, EA personnel inspected a 6-in. diameter exhaust stack originating from below grade along the north side of the Family Services Center (Building No. 27), located hydraulically down-gradient of the NEX Service Station. From discussions with Naval Air Station Public Works personnel, the stack is connected to the footing drains installed beneath the building due to the high water table. The stack was installed in 1989 as a means of diverting and exhausting organic vapors from the foundation of Building No. 27. The underdrain system discharges to the storm sewer system located east and west of the building.

1.2.3 General Site Characteristics

The site-specific shallow stratigraphy is comprised of a surficial layer of brown, silty loam overlaying a tan-brown-gray, medium to fine-grained sand with trace silt. Underlying the above is a soft gray marine clay. The sand horizon ranges in thickness from less than 4 ft (Well MW-5) to greater than 16 ft (Well MW-1). The underlying marine clay was encountered at depths ranging from 5 ft below surface grade at Well MW-5 to greater than 16 ft below surface grade at Well MW-1.

The gray marine clay underlying the surficial loam and sand layers is considered to be a natural aquiclude for purposes of site remediation. Thickness of the marine clay has been reported to extend to a depth of 93.5 ft, based on a geotechnical boring installed adjacent to the NEX Service Station in 1974. Underlying the marine clay is 2 ft of coarse sand and gravel, followed by bedrock at approximately 95.5 ft below grade.

The average depth to ground water at the site ranges from approximately 2.5 ft (Well MW-5) to 7.57 ft (Sparge Well AAS-1) below grade but fluctuates at least 0.5 ft due to seasonal influences. Based upon several rounds of well gauging, ground-water flow in the shallow water table aquifer at the NEX Service Station is to the south at a shallow gradient, with a slight increase in hydraulic gradient south of Burbank Avenue. The average hydraulic gradient, as calculated from data presented in the remedial investigation report (ERM 1992), is 0.011 but may vary with seasonal recharge.

The saturated thickness of the water table in the silty loam and sand with trace silt ranges from approximately 1 ft (Wells MW-2 and MW-5, both located south of Burbank Avenue) to greater than 8.5 ft (Well MW-1) in the portion of the site to undergo remediation. Hydraulic conductivities derived from slug test data at Wells MW-4 and MW-5 (ERM 1992) were estimated at 8.6×10^{-6} cm/sec; these estimates appear low for the silty loam and sand with trace silt. Seepage velocity, as calculated by ERM (1992) is estimated at 0.39 ft/year. Other investigations at the Base calculate seepage velocities ranging from 9 to 104 ft/year.

1.2.4 Petroleum Hydrocarbons Detected

The petroleum hydrocarbons detected in soil and ground water at the NEX Service Station are summarized in Tables 1-1 and 1-2. In general, the hydrocarbons indicate the presence of gasoline-related constituents such as benzene, toluene, ethylbenzene, and xylenes (BTEX) and the oxygenate methyl tertiary-butyl ether (MTBE) in site soil and ground water. Total lead was observed in several soil samples at low concentrations.

1.2.5 Evaluation of Remediation Strategies

Several potential remedial actions were presented in the remedial investigation report (ERM 1992). Initial screening of remedial alternatives consisted of preliminarily identifying and screening technologies. The report identified four source area (soil) remedial alternatives and two ground-water remedial alternatives to be retained for further consideration. Preferred remedial methods were not selected by ERM (1992) as the extent of sorbed-phase and dissolved-phase hydrocarbons in soil and ground water was not completely delineated during the field investigation.

Upon completion of the remedial investigation, and since the site falls under the "Stringent Cleanup Goals" category (MEDEP 1992), the MEDEP approached NAS Public Works and Northern Division with the need to develop a remediation proposal (remedial action plan). AAS had been presented as most likely the best remedial approach as presented in a letter by MEDEP (1993). Through discussion, it was agreed that a technical evaluation of AAS (in conjunction with SVE) would be made by conducting a 6-month pilot study. A work plan defining the pilot study was subsequently prepared by EA (1993). Construction of the SVE/AAS pilot plant commenced in July 1993 and was completed in October 1993.

TABLE 1-1 SUMMARY OF ANALYTICAL DATA FOR SOIL SAMPLES TAKEN 14 MAY 1992 (PRIOR TO SVE) AND 21-24 MARCH 1994 (AFTER APPROXIMATELY 6 MONTHS OF SVE PILOT TESTING), NAVY EXCHANGE SERVICE STATION (BUILDING NO. 538), NAVAL AIR STATION, BRUNSWICK, MAINE

Parameter	Sample Locations			
	MW-1(R)		MW-4(R)	
	1992 (Pre-SVE)	1994 (During SVE)	1992 (Pre-SVE)	1994 (During-SVE)
TPH as Gasoline by MEDEP Method 4.2.3 (µg/kg dry soil)				
Gasoline	6	U<0.5	31,000	2,500
TPH as Fuel Oil by MEDEP Method 4.1.2 (µg/kg dry soil)				
Fuel Oil No. 2	10	120	4,800	U<20.0
Volatile Aromatics by EPA Method 8020 (µg/kg dry soil)				
Benzene	1.3	U<1.0	5,300	26,000
Ethylbenzene	1.3	U<1.0	340,000	76,000
Toluene	1.3	U<1.0	640,000	53,000
Total xylenes	2.6	U<1.0	1,800,000	680,000
Methyl tertiary-butyl ether	2.6	U<1.0	7,300	U<1.0
Total Lead (mg/Kg)	10U	----	10U	---

NOTE: U<__ and __U = Compound not detected above method detection limit shown.
Dashes (---) = Sample not analyzed for this analyte.
MEDEP = State of Maine Department of Environmental Protection.

TABLE 1-2 ANALYTICAL RESULTS FOR GROUND-WATER SAMPLES COLLECTED BETWEEN MAY 1992 AND JULY 1994 AT AND IN THE VICINITY OF THE NAVY EXCHANGE SERVICE STATION (BUILDING NO. 538), NAVAL AIR STATION, BRUNSWICK, MAINE

Date	Parameters							
	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE	TPH as Gasoline	TPH as Fuel Oil
MW-1R								
MAY 1992	U<1.0	U<1.0	U<1.0	U<2.0	ND	U<2.0	U<20.0	U<10.0
JUL 1993	U<1.0	U<1.0	U<1.0	U<1.0	ND	U<1.0	U<100.0	U<500.0
APR 1994	U<1.0	U<1.0	U<1.0	U<1.0	ND	U<1.0	U<100.0	U<50.0
JUL 1994	U<1.0	U<1.0	U<1.0	U<1.0	ND	U<1.0	U<50.0	U<50.0[e]
MW-2								
MAY 1992	U<1.0	1.1	U<1.0	4.2	5.3	U<2.0	35.0	460.0
JUL 1993	U<1.0	U<1.0	U<1.0	U<1.0	ND	U<1.0	U<100.0	U<500.0
APR 1994	U<1.0	U<1.0	U<1.0	U<1.0	ND	U<1.0	U<100.0	99.0
JUL 1994	U<1.0	U<1.0	U<1.0	U<1.0	ND	U<1.0	U<50.0	280[e]
MW-3								
MAY 1992	14.0	18.0	4.8	23.0	59.8	2.5	U<20.0	61.0
JUL 1993	2.0	U<1.0	U<1.0	U<1.0	2.0	2.0	U<100.0	U<500.0
APR 1994	U<1.0	U<1.0	U<1.0	U<1.0	ND	U<1.0	U<100.0	100.0
JUL 1994	2.1	3.0	U<1.0	2.3	7.4	3.2	51.0	110.0[e]

NOTE: Results in µg/L. Volatile compounds by EPA Methods 602. TPH as gasoline by MEDEP Method 4.2.1. TPH as fuel oil by MEDEP Method 4.1.1. Sample did not have chromatographic fingerprint indicative of petroleum product. The fingerprint was indicative of high average molecular weight interferences. However, since the interference was in the elution range (boiling point) of fuel oil, it was quantified against fuel oil.

U< __ = Compound not detected above method detection limit shown. ND = None detected. D = Analysis run at secondary dilution factor. Trip blanks for all four rounds "non-detect" for all EPA Method 602 compounds (BTEX and MTBE)

Date	Parameters							
	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE	TPH as Gasoline	TPH as Fuel Oil
MW-4(R)								
MAY 1992	1,000	12,000	3,900	22,000	38,900	U<2,000	210,000	84,000
JUL 1993	810.0	5,900	110.0	690.0	7,510	U<100.0	24,000	15,000
APR 1994	47.0	4,200	2,000	16,700	22,947	210.0	3,500	85,000
JUL 1994	21	4,300D	2,900D	24,800D	38,031	81	80,000	13,000[e]
MW-5								
MAY 1992	U<1.0	U<1.0	U<1.0	U<2.0	ND	5.9	56.0	300
JUL 1993	U<1.0	U<1.0	U<1.0	U<1.0	U<1.0	U<1.0	U<100.0	U<500.0
APR 1994	U<1.0	U<1.0	U<1.0	U<1.0	ND	U<1.0	U<100.0	53
JUL 1994	U<1.0	U<1.0	U<1.0	U<1.0	U<1.0	U<1.0	U<50	150[e]

2. PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 KEY PERSONNEL

Figure 2-1 shows the project organization for executing this CTO. The following are summaries of pertinent qualifications of the key personnel for this CTO.

2.1.1 CTO Manager—Michael S. Battle, Geologist

Mr. Battle is a geologist responsible for the development, implementation, and management of hydrogeologic and geotechnical investigations involving work plan design and subsequent data collection, analysis, and interpretation for environmental assessments and remedial investigations. His 5 years of experience include test boring, ground-water monitoring well, and soil vapor sampling network design; drilling and environmental sampling program development and implementation; assessment of the nature and extent of hydrocarbon releases; and evaluation and implementation of ground-water and soil remedial options.

Mr. Battle currently serves as project manager for several pilot-scale and full-scale remediation system operations, including the previously conducted SVE/AAS pilot study at the NEX Service Station. His in-depth knowledge of the design and operations of the pilot treatment plant at this site is well suited to the continued performance of plant operations at this site.

2.1.2 Senior Technical Reviewer—Gloria D. McCleary, P.E.

Ms. McCleary is a Registered Professional Engineer with expertise in environmental engineering, including remedial investigations, treatability studies, and remediation at UST sites at both industrial and federal facilities. Ms. McCleary has managed more than 200 projects involving the release of organic/petroleum constituents. She has served as project manager for remediation of a site with PCB-contaminated oil, including the design of a recovery system consisting of 8 recovery wells, oil/water separation, ground-water treatment, and offsite disposal of recovered oil. She has also served as project manager for a remedial investigation/feasibility study at a National Priorities List site containing chlorinated solvents.

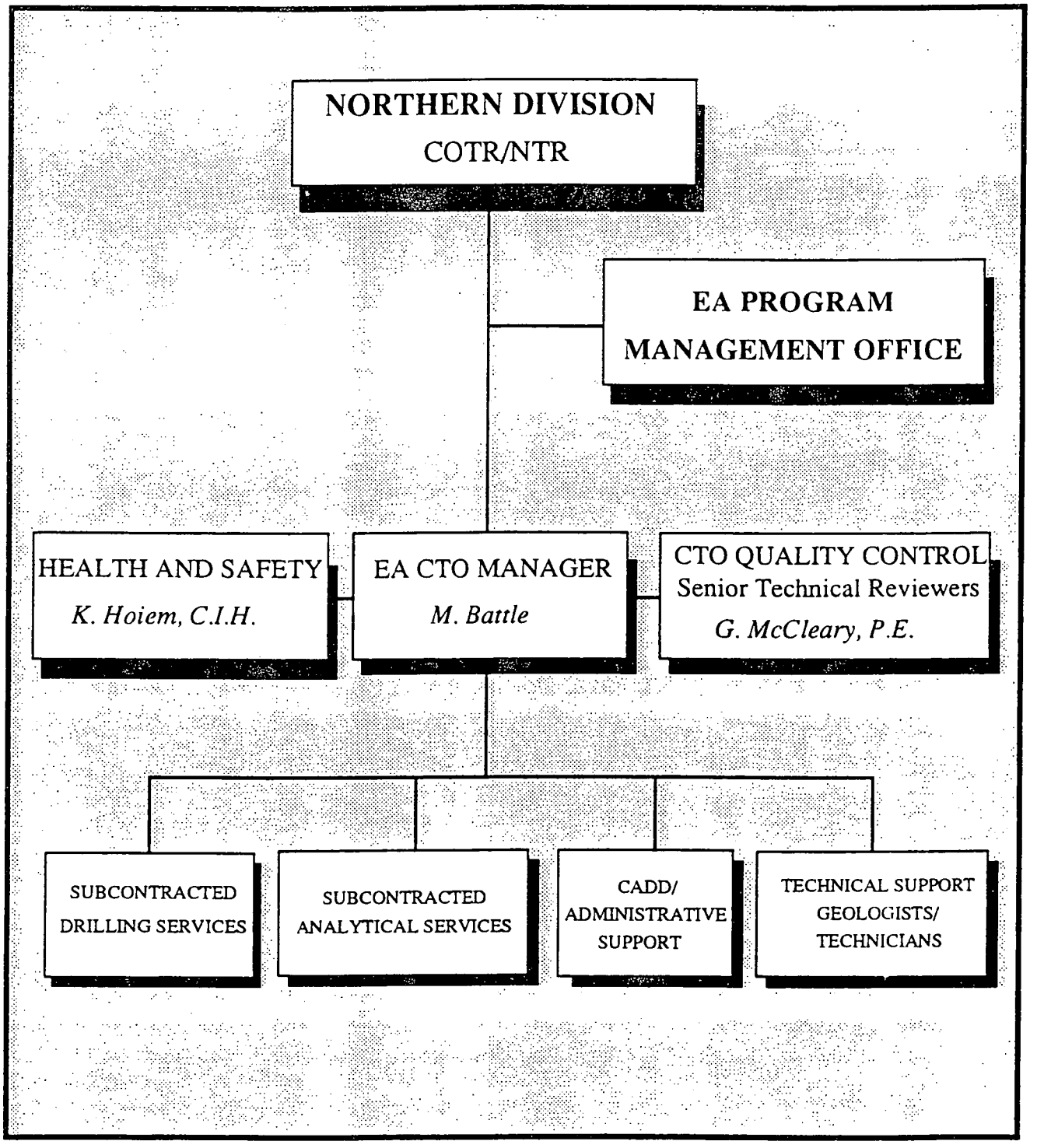


Figure 2-1 CTO organization chart.

2.1.3 Program Manager/Senior Technical Reviewer (Geology)— Dr. Charles W. Houlik, CPG

Dr. Houlik has more than 20 years of experience in the performance and management of multidisciplinary investigations addressing environmental issues and/or in support of engineering design. He is a Certified Professional Geologist with extensive experience in waste management, contaminant assessment, impact assessment, environmental remediation, and facilities siting. His responsibilities include active participation in, and supervision of, site and regional geological investigations, surface-water and ground-water hydrological evaluations for siting or design of facilities, impact assessments for existing and proposed facilities, remedial investigation/feasibility studies, and remedial design.

2.2 QUALITY CONTROL

EA's primary means of instituting quality at the inception of each project is through the use of the Quality Control Program EA has established for project planning and deliverables. EA's Quality Control Program for CTOs is described in the Program Quality Management Plan.

The Senior Technical reviewers, CTO Manager, and Program Manager will approve the various deliverables, as shown in Appendix B. This process will involve review of deliverables against the CTO and approved Implementation Plan. This review will be done by experienced personnel independent of the day-to-day project work.

3. SCOPE AND TECHNICAL APPROACH

3.1 PROJECT MEETINGS

No project meetings are scoped for this project.

3.2 FINALIZE IMPLEMENTATION PLAN

This Implementation Plan will be finalized and utilized as a Work Plan. The purpose of the Final Implementation Plan is to identify the monitoring, maintenance, sampling and analytical data requirements necessary to continue the remediation effort recently concluded. The Final Implementation Plan will describe the objectives of remedial system operations, current site conditions, sampling locations and analytical methods for planned ground-water sampling events, management of site wastes, and quality assurance/quality control procedures.

3.2.1 Assumptions

- No site visits are associated with this task.
- No federal or state permits are associated with long-term remedial system operations.
- No site-specific Quality Assurance/Quality Control Plan is required under this project.
- The existing site-specific Health and Safety Plan is acceptable for use in accomplishing the additional field efforts.

3.3 SYSTEM START-UP ACTIVITIES

System start-up will consist of those field efforts associated with making necessary adjustments to the SVE/AAS system based on the results of the SVE/AAS pilot study. As directed by Northern Division, EA will operate and maintain the SVE/AAS system currently

in place at the NEX Service Station on a twice per month basis for a period of 12 months. Remedial system operations will be performed in two phases. The first phase, system start-up, will include those system modifications identified as necessary for successful remediation based upon the recently concluded pilot test. System start-up is anticipated to occur during the first two weeks of operations. The second phase of operations and maintenance, designated here as long-term operations, will include regularly scheduled site visits, parts replacement as necessary, carbon unit replacement, and ground-water sampling. Project reporting for long-term operations will be accomplished under a separate task.

3.3.1 Modifications to Remediation System

Prior to the reactivation of the sparge system, the sparge well manifolds will be modified to permit more accurate control of sparge pressure and flow rate. The sparge well manifolds will be disassembled and rebuilt using carbon steel piping to facilitate the installation of pressure regulators and in-line flowmeters. Within the treatment shed, in-line flowmeters will be installed within all SVE and AAS lines to permit instantaneous measurements of flow and system balancing. Also within the treatment shed, fire-rated sheetrock will be installed on the walls and ceiling to maintain the building class as explosion-proof. To improve ventilation within the treatment shed, an explosion-proof fan/heater will be installed.

A backhoe will be used to dig a trench to connect the footing drain along the Family Services Center into the existing SVE system. This connection may prevent the migration of hydrocarbon vapors from within the building. Once completed, a load-bearing pre-cast steel service vault will be set atop the connection. Dwyer Magnehelic® pressure gauges and ball valves will also be installed at the manifold to the footing drain. Landscaped areas will be restored to original condition (when weather permits). All construction activities associated with the connections will be in accordance with the previously approved pilot plant configuration drawing set.

3.4 LONG-TERM REMEDIAL SYSTEM OPERATIONS

3.4.1 Furnish and Install Granular Activated Carbon Units

As necessary to minimize hydrocarbon emissions during continued SVE/AAS plant operations, additional granular activated carbon vessels will be required. Provisions will be made under this project to remove and replace the 1,800-lb vapor-phase granular activated carbon vessel twice during the 12-month operational period. Based on EA's knowledge of the waste, the spent carbon vessel will be returned to the vendor as a non-hazardous waste for regeneration of the carbon bed. To confirm characterization of the carbon as a non-hazardous waste, one sample will be taken and analyzed for the waste characteristics toxicity, reactivity, ignitability, and corrosivity (Table 3-1).

3.4.2 Operation and Maintenance Site Visits

Following the initial start-up period, EA will mobilize to the subject site twice per month to complete routine system maintenance and monitoring. System maintenance will include inspections of the blower, carbon vessel, and moisture separator intakes for clogging, excessive heat, and excessive pressures; inspecting particulate filters for clogging; monitoring liquid level in the moisture separator and evacuating when necessary; recording flow rates, temperatures, pressures, and vacuums throughout the SVE/AAS system, and obtaining soil vapor samples for measurements of total volatile hydrocarbons. Field parameters to be measured during the routine site visits include depth to water/light non-aqueous phase liquid (LNAPL), vacuum/pressure at the SVE trenches and AAS wells, and water quality parameters (dissolved oxygen, temperature, pH, conductivity).

During the first week of SVE/AAS system operations, EA will be onsite daily to frequently analyze soil vapor samples collected from the SVE system during operations. The data will used to permit rapid adjustments of the SVE/AAS system in an effort to maximize performance and ensure retrieval of sparged air. To monitor the impact of tying in the footing drain to the SVE system, air sampling will be conducted within the return line from the footing drain to SVE trench SVE-5.

TABLE 3-1 LABORATORY PROGRAM FOR SPENT CARBON CHARACTERIZATION
NAVY EXCHANGE SERVICE STATION (BUILDING NO. 538),
NAVAL AIR STATION, BRUNSWICK, MAINE

Toxicity Characteristic Leaching Procedure (TCLP)
TCLP Volatile Organic Compounds TCLP Metals
General Chemistry
Corrosivity (ph Units) Releasable Cyanide (mg/Kg) Releasable Sulfide (mg/kg) Ignitable Reactive

3.4.3 Quarterly Well Sampling and Analysis

3.4.3.1 Analytical Quality Assurance/Quality Control

Four rounds of ground-water sampling will be completed at the 5 site monitoring wells. The first round of sampling will occur following 3 months of remedial system operations. One duplicate sample will be collected as a split sample from one of the wells installed within the suspected impacted area. One field equipment rinsate blank per sampling round will be analyzed by the laboratory for sample collection quality control. One trip blank per sampling round will be analyzed by the laboratory for sample shipment quality control. Sampling parameters are summarized in Table 3-2.

3.4.3.2 Decontamination

All non-dedicated sampling equipment will be decontaminated prior to and following use at each well. Pre-cleaned, dedicated sampling equipment will be used wherever possible. Equipment to be re-used will be washed with warm potable water and laboratory-grade detergent (e.g., Alconox®), rinsed with de-ionized water, rinsed with methanol, rinsed a second time with de-ionized water, air dried, and appropriately wrapped/stored pending re-use.

3.4.4 Assumptions

- SVE-only operations during first 5 months of system operations (due to adverse weather and high water table in winter season).
- Connection of the footing drain to the existing SVE system will require a 2-person crew for 2 full field days (plus travel to site). Heavy machinery will be rented locally as needed.
- An abbreviated site survey will be conducted by EA to determine revised sparge well elevations. Elevations will be based on the benchmark established by others. Survey data will be transcribed onto existing site plans by EA.

TABLE 3-2 LABORATORY PROGRAM FOR REMEDIAL SYSTEM OPERATIONS AT NAVY EXCHANGE SERVICE STATION (BUILDING NO. 538), NAVAL AIR STATION, BRUNSWICK, MAINE

Sample Type	Sample Matrix	BTEX and MTBE (EPA Method 602)	TPH as Gas (MEDEP 4.2.1 Water)	TPH as Fuel Oil (MEDEP 4.1.1 Water)
Samples	Aqueous	5	5	5
Duplicate	Aqueous	1	1	1
Rinse Blank	Aqueous	1	1	1
Trip Blank	Aqueous	1	0	0
Total Per Quarter		8	7	7
CTO Totals		32	28	28

- Excess trench soil will be containerized, labeled as non-hazardous waste, and transferred to the land farming area at Naval Air Station by EA. Upon transfer to the land farm area, responsibility of the soil will be by others.

- Re-seeding to occur during Spring 1995.

- Long-term system operations will proceed according to the following schedule: twice per month during SVE-only operations, daily for first 5 days of SVE/AAS operations, twice per week during second week of SVE/AAS operations, once per week during Week 3 of SVE/AAS operations, twice per month thereafter (52 weeks, 30 site visits).

- Four trips to site (one per quarter) for unscheduled maintenance, system reactivation, etc.

- Routine operations and maintenance visits conducted by engineer/geologist at 10 hrs/visit.

- Four rounds of ground-water sampling are scoped into this field effort. One ground-water sample from each monitoring well (5 wells total), and 1 duplicate ground-water sample will be submitted to the laboratory for analysis of TPH as gas (MEDEP 4.2.1) and as fuel oil (MEDEP 4.1.1), and BTEX and MTBE by EPA Method 602. One aqueous rinsate blank will be analyzed for TPH as gas (MEDEP 4.2.1) and as fuel oil (MEDEP 4.1.1), and BTEX and MTBE by EPA Method 602.
  One aqueous trip blank will be analyzed for BTEX and MTBE by EPA Method 602.

- Carbon unit replacement to be accomplished twice during routine site visits.

- Ground-water sampling at 5 monitoring wells may be accomplished in 1 day by a 1-person field team (excluding travel time).

- No ground-water sampling will be conducted at the sparging wells.
- Purged ground water will be filtered through granular activated carbon and discharged to the sanitary sewer located on Burbank Avenue.
- Three-week standard turnaround time on all analytical deliverables.
- No permits are associated with field activities.
- No adverse weather delays or stand-by time encountered.
- Field personnel require only Level D personal protective equipment. Upgrades in personal protective equipment will result in additional field time.

3.4.5 Project Staffing

- Senior Technical Reviewer
- CTO Manager
- Senior Geologist
- Task Manager (field construction activities)
- Chemist
- Geologist
- Engineer
- Technician
- CADD Operator
- Clerical Support.

3.5 PROJECT REPORTING

3.5.1 Monthly Status Reports

The results of the remedial system performance will be incorporated into a brief monthly progress report. The monthly progress reports will contain the following components:

- A summary of the remedial effort results for the preceding month
- A summary of the remedial effort results for the project to date
- Discussion of any chemical analyses performed
- Summary tables of ground-water quality, depth to water, and absence/presence of LNAPL
- Summary tables of hydrocarbon removal rates
- Discussion of modifications or changes to project schedule, if any
- Field data sheets completed for the preceding month.

3.5.2 Final System Performance Report

A final report addressing the collective results of the remedial system operations will be prepared following the 12-month operational period. The final report will address the overall effectiveness of the SVE/AAS system in removing volatile hydrocarbons from the subsurface and compare ground-water sample results to MEDEP clean-up goals for the site.

The system performance report will contain the following components:

- A summary of the remedial effort results for the project to date
- Detail on the methodologies employed for data collection and analyses
- Interpretation of the results of long-term SVE/AAS operations
- Summary tables of ground-water analytical results and comparison to MEDEP clean-up goals
- Summary tables of water quality, depth to water, and absence/presence of LNAPL
- Summary tables of estimated total hydrocarbons removed from site.
- Recommendations for future site activity, if warranted.

3.5.3 Assumptions for Project Reporting

- Monthly progress reports due to Northern Division and NAS approximately 20 days following the end of the report month.

- Draft of Final System Performance Report to be issued to Northern Division and NAS within 30 days of receipt of analytical report for final round of ground-water sampling, which will be conducted within 1 week of end of SVE/AAS system operations.

- Final System Performance Report to be issued to Northern Division and others within 2 weeks of receipt of draft document comments.

- Four letter reports will be prepared to address the results of ground-water sampling. Each letter report will include a brief discussion of sampling methodology and summary table of analytical results. No water table elevation maps are to be prepared for these submittals.

- No additional site visits required.

3.5.4 Deliverables

- Monthly progress reports
- Letter report for Round 1 ground-water sampling
- Letter report for Round 2 ground-water sampling
- Letter report for Round 3 ground-water sampling
- Letter report for Round 4 ground-water sampling
- Draft System Performance Report
- Final System Performance Report

4. SCHEDULE AND DISTRIBUTION OF DELIVERABLES

4.1 SCHEDULE

Based on the activities defined in CTO No. 0035 dated 25 July 1994, the schedule shown on Table 4-1 is proposed for continued remedial system operations at the NEX Service Station at Naval Air Station, Brunswick, Maine. Milestone dates of field activities are conditional upon suitable weather.

4.2 DISTRIBUTION OF DELIVERABLES

The distribution of deliverables will be as set forth by the Distribution Schedule shown in Appendix B.

TABLE 4-1 PROJECT ACTIVITY SCHEDULE FOR REMEDIAL SYSTEM OPERATIONS AT THE NAVY EXCHANGE SERVICE STATION, NAVAL AIR STATION, BRUNSWICK, MAINE

REVISION No. 1, 6 DECEMBER 1994

Task	Date
Commence System Operations and Maintenance (SVE-Only)	14 DEC 1994
Installation of Carbon Vessel No. 1	05 JAN 1995
Tie in Footing Drain to SVE System; Install Sheetrock and Flowmeters	09 JAN 1995
Conduct Round 1 Ground-Water Sampling	14 MAR 1995
Install Pressure Regulators and Activate Air Sparging System (SVE/AAS)	03 APR 1995
Submit Letter Report for Round 1 Ground-Water Sampling	**25 APR 1995**
Conduct Round 2 Ground-Water Sampling	14 JUN 1995
Remove Carbon Vessel No. 1 and Install Carbon Vessel No. 2	07 JUL 1995
Submit Letter Report for Round 2 Ground-Water Sampling	**26 JUL 1995**
Conduct Round 3 Ground-Water Sampling	14 SEP 1995
Submit Letter Report for Round 3 Ground-Water Sampling	**26 OCT 1995**
Completion of 12 Month Operational Period	14 DEC 1995
Remove Carbon Vessel No. 2	14 DEC 1995
Conduct Round 4 Ground-Water Sampling	14 DEC 1995
Submit Letter Report for Round 4 Ground-Water Sampling	**25 JAN 1996**
Submit Draft System Performance Report	**25 JAN 1996**
Navy Review of Draft System Performance Report	08 FEB 1996
Submit Final System Performance Report	**15 FEB 1996**

Note: Project activities in bold indicate project deliverable due dates under this CTO.
Monthly progress reports for remedial system operations (12 total) will be prepared and delivered by the 20th of the month following the report period.
Schedule of system modifications conditional upon suitable weather.

REFERENCES

EA Engineering, Science, and Technology. 1993. Final Work Plan for the Soil Vapor Extraction/Aquifer Air Sparging Pilot Study, Navy Exchange Service Station, Brunswick Naval Air Station, Brunswick, Maine. June.

ERM Program Management Company (ERM). 1992. Naval Exchange Service Station Remedial Investigation, Final Technical Report. Naval Air Station, Brunswick, Maine. September.

Maine Department of Environmental Protection (MEDEP). 1992. Hydrocarbon Spill Decision Tree. March.

MEDEP. 1993. Personal communication from Bradford Hahn, 18 February.

Appendix A

Statement of Architect-Engineer Services
(Dated 25 July 1994)

NORTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
LESTER, PA

CONTRACT TASK ORDER NO. 035 TO
STATEMENT OF ARCHITECT-ENGINEER (A/E) SERVICES
UNDER
A/E CONTRACT N62472-92-C-1296

PART 1 - GENERAL INFORMATION

1.1 General Statement of Services

The A/E shall provide services in accordance with the requirements, schedules, guidance and information contained or referenced herein for the project listed below. All contract requirements shall be performed in accordance with the procedures outlined in the "Guide for Architect-Engineer Firms Performing Services for the Northern Division, Naval Facilities Engineering Command" dated 31 December 1991 (hereinafter referred to as the "A/E Guide"). By such reference, the A/E Guide shall form a part of this contract:

PROJECT TITLE: Navy Exchange Remediation
PROJECT LOCATION: NAS Brunswick
FY 94 FUNDS DERA JO # TBD

1.2 Project Information and Description

Background: A soil vapor extraction air sparging pilot plant has been installed at the NAS Brunswick NEX gas station. The pilot study has been completed and the technology confirmed to be applicable for remediation of the gasoline plume which exists at the site. The Navy now must establish the required operation and maintenance period to continue remediation.

Scope of Work: The A/E is requested to provide services for the operation of the remedial system for the next 12 months, consisting of the following tasks:

A. System start up.
B. Operation and maintenance visits (one man every two weeks). An operating budget shall be established for parts replacement anticipated during the operational period.
C. Installation of a 2000# granular activated carbon (GAC) filter for off gas treatment. Assume (1) additional replacement filter. Off gases shall be monitored during the O&M visits for breakthrough of the GAC filter with a FID/PID.
D. Quarterly sampling and analysis of site groundwater shall be conducted at (6) wells beginning with the end of the third month of operations. Samples are to be analyzed for BTEX, MTBE and gasoline iaw MDEP approved methods.
E. A one page synopsis of project status shall be prepared monthly. A final report shall be prepared at the end of the project.

1.3 Points of Contact

1.3.1 Government points of contact f r this project are:

1.3.1.1 N rthern Division:

Contract Specialist (Code 022):
Mr. J. Herlihy
Tel: (610) 595 - 0633

Design Manager (Code 4023PB):
Mr. F. Briegel
Tel: (610) 595 - 0590

Project Manager (Code 1812):
Mr. B. Helland
Tel: (610) 595 - 0567

1.3.1.2 NAS Brunswick Public Works Department:

For purposes of coordinating site visits contact Mr. J. Caruthers at (207) 921 - 2445 (2) working days prior to the A/E's site visit.

PART 2 - MILESTONE SCHEDULE

Bas d on a Basic Contract award date of 26 August 1994, the A/E shall provide the following services on or before the dates indicated:

Basic Contract	Date
System Start-up	31 August 1994
O&M	01 September 1994 - 31 August 1995
Final Report	30 September 1995

PART 3 - DISTRIBUTION OF DOCUMENTS

Submissions shall be distributed prepaid by mail service as appropriate to the following organizations and in accordance with the distribution schedule. The A/E shall insure that complete addresses are shown on the exterior of all letters and parcels:

1. Officer in Charge of Construction (OICC)
   North rn Division, Naval Facilities Engineering Command
   10 Industrial Highway
   Mail Stop #82
   Lester, PA 19113-2090

   A. ATTN: Code 4023PB

2. Public Works Officer
   Naval Air Station
   Brunswick, ME 04011-5000
   Att'n: J. Caruthers

Distributi n of all documents shall be made to NORTHDIV and NASB. One copy of monthly summaries and (3) copies of the final report shall be sent to each addressees.

Appendix B

Project Deliverables Schedule

APPENDIX B
PROJECT DELIVERABLES SCHEDULE

NAVY ACTIVITY: Naval Air Station Brunswick, Maine
PROJECT NAME: NEX Service Station - Remedial System Operations
PROJECT NO: 296.0035
PROJECT DESCRIPTION: Remedial System Operations
DATE IMPLEMENTATION PLAN APPROVED BY NAVY: _____

CTO MANAGER: Michael Battle
PROJECT LOCATION: Naval Air Station Brunswick, Maine
DATE PREPARED: 2 November 1994
DATE REVISED: _____

Type of Deliverable	Date to Reviewers	Client Due Date	Review/Sign-Off (ID by Name)				
			CTOM*	STR*	PM*	AM	Other
Final Implementation Plan	11/2/94	11/9/94	Battle		Houlik		
Monthly Progress Report (Technical)			Battle				
Letter Report for Round 1 Ground-Water Sampling	3/13/95	3/17/95	Battle	McCleary			
Letter Report for Round 2 Ground-Water Sampling	6/12/95	6/16/95	Battle	McCleary			
Letter Report for Round 3 Ground-Water Sampling	9/11/95	9/15/95	Battle	McCleary			
Letter Report for Round 4 Ground-Water Sampling	12/12/95	12/18/95	Battle	McCleary			
Draft Final System Performance Report	12/8/95		Battle	McCleary			
Draft Final System Performance Report	12/13/95	12/20/95	Battle		Houlik		
Final System Performance Report	1/19/96		Battle	McCleary			
Final System Performance Report	1/25/96	1/31/96	Battle		Houlik		

* Signoff by this individual required.

PROGRAM MANAGER APPROVED: CLH
DATE: 11-02-94

CTOM — CONTRACT TASK ORDER MANAGER
PM — PROGRAM MANAGER
AM — ACTIVITY MANAGER
STR — SENIOR TECHNICAL REVIEWER