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LETTER REPORT REGARDING IMPLEMENTATION SCHEDULE FOR FUEL DISTRIBUTION SYSTEM (FDS) MONITORING CNC CHARLESTON SC
12/18/1998
ENSAFE INC

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ENSAFE

ENSAFE INC. ENVIRONMENTAL AND MANAGEMENT CONSULTANTS

201 North Palafox Street, Suite 200 • Pensacola, FL 32501 • Telephone 850-434-2230 • Facsimile 850-434-2288 • www.ensafe.com

December 18, 1998

Paul L. Bristol, P.G.
Groundwater Quality Section
Bureau of Water
South Carolina Department of Environmental Control
2600 Bull Street
Columbia, SC 29201-1708

RE: Fuel Distribution System, Charleston Naval Complex, Charleston, South Carolina

Dear Mr. Bristol:

On behalf of the Department of the Navy, Southern Division Naval Facilities Engineering Command, EnSafe is submitting the following document in response to your comments and recommendations dated November 16, 1998. Each numbered section of the attached document refers to a specific area investigated under the assessment of the Fuel Distribution System at the Charleston Naval Complex (CNC).

1.0 Area 1 - SCDHEC #01180 AP.
Implementation Schedule

2.0 Areas 2,3,4,5 and 6 - SCDHEC #01181 AP.
Implementation Schedule

3.0 Area 7 - SCDHEC #01182 AP.
Implementation Schedule

4.0 Area 8 - SCDHEC #01183 AP.
Implementation Schedule

5.0 Areas 9 and 10 - SCDHEC #01184 CAR
Intrinsic Remediation Monitoring Program

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6.0 Areas 12, 13, and 14 - SCDHEC #01186 CAP
Intrinsic Remediation Monitoring Program

7.0 Area 15 - SCDHEC #01187 AP
Area Reuse Discussion

8.0 Area 18 - SCDHEC #01188 AP
Pentachlorophenol Discussion

9.0 Area 19 - SCDHEC #not yet assigned #15405 AP
Contamination Assessment Plan

10.0 Area 20 - SCDHEC #not yet assigned #15405 AP
Contamination Assessment Plan

LO 1.20.99

Should you have questions or concerns regarding this submittal, please contact me.

Sincerely,

EnSafe Inc.

Craig R. Smith

Attachment

cc: G. Magwood, SOUTHDIV
T. Haverkost
0144 File

EnSafe

1.0 Area 1- SCDHEC #01180 Implementation Schedule

January 4	
January 11	
January 18	Measure all water levels. Check for free product.
January 25	
February 1	Install and develop shallow monitoring well FDSGW01F (Approval #0298).
February 8	
February 15	Resample all 6 wells. Measure all water levels. Check for free product.
February 22	
March 1	
March 8	
March 15	
March 22	
March 29	

2.0 Areas 2, 3, 4, 5, and 6 - SCDHEC #01181 Implementation Schedule

January 4	
January 11	
January 18	Measure all water levels. Check for free product.
January 25	Soil removal at FDSSC012.
February 1	Install and develop shallow monitoring well FDSGW02D (Approval #0301).
February 8	
February 15	Resample all 16 wells. Measure all water levels. Check for free product.
February 22	
March 1	
March 8	
March 15	
March 22	
March 29	

3.0 Area 7 - SCDHEC #01182 Implementation Schedule

January 4	
January 11	
January 18	Measure all water levels. Check for free product. Collect soil samples at 3 locations.
January 25	
February 1	Install and develop shallow monitoring well FDSGW07E (Approval #0302).
February 8	
February 15	Resample all 5 wells. Measure all water levels. Check for free product.
February 22	
March 1	
March 8	
March 15	
March 22	
March 29	

4.0 Area 8 - SCDHEC #01183 Implementation Schedule

January 4	
January 11	
January 18	Measure all water levels. Check for free product.
January 25	
February 1	Install and develop shallow monitoring well FDSGW08D (Approval #0303).
February 8	
February 15	Sample FDSGW08D. Measure all water levels. Check for free product.
February 22	
March 1	
March 8	
March 15	
March 22	
March 29	

5.0 Areas 9 and 10 (#01184), Intrinsic Remediation Monitoring Program

Intrinsic remediation (natural attenuation) is the suggested remedy for the naphthalene contamination detected in subsurface soil at Areas 9 and 10. Total naphthalene concentrations have been found at a maximum concentration of 250 micrograms per kilogram (μg/kg) exceeding the RBSL of 210 μg/kg. No other RBSLs were exceeded at this site.

Intrinsic remediation is defined as the natural reduction of environmental contaminant constituents such as organic compounds and metals in soil and groundwater without the use of man-made engineered mechanisms for treatment. The processes that occur to naturally attenuate, reduce, or clean up contaminated soil and groundwater are physical, chemical, and biological. Physical mechanisms include adsorption to soil, dispersion of contaminants, dilution effects, and volatilization. Chemical mechanisms include hydrolysis and chemical oxidation. Biological mechanisms are the transformation of organic compounds by indigenous microorganisms (microbial oxidation) that utilize the organic carbon as a source of food and energy, thereby destroying them to innocuous end products.

Organic compounds such as naphthalene and its derivatives are amenable to microbial oxidation and destruction in soil and groundwater. These processes are most effective at concentrations exceeding 1,000 μg/kg. Below this concentration bioavailability limits effective destruction. Microbial destruction can occur by engineered systems or natural means (intrinsic remediation). Engineered systems include land farming of contaminated soil or air sparging of groundwater to provide oxygen for microbial destruction. However, studies have shown that naphthalene can be degraded in the absence of oxygen (Durant et al., 1995). In such situations, other compounds or chemicals such as nitrate substitute for oxygen and provide the necessary microbial environment for degradation to occur. This is critical in subsurface conditions where oxygen is the limiting factor and where low concentrations of naturally occurring nitrate are present that are sufficient to degrade naphthalene. Other studies (King et al., 1995) have shown that naphthalene is amenable to natural microbial destruction.

In addition to natural microbial destruction, naphthalene is also amenable to destruction through natural chemical and physical processes such as hydrolysis, dilution, dispersion, and volatilization. Physical destruction processes are most effective where naphthalene concentrations are very low (around 1000 μg/kg) and bioavailability has limited microbial destruction. These physical mechanisms are most effective at further reduction of contaminant concentrations when these conditions are present.

In accordance with the current national regulatory guidance (U.S. EPA, 1996) intrinsic remediation can be considered an appropriate remedy for the naphthalene contamination at the low levels measured. At these low concentrations, it should not serve as a continuing contaminant source that feeds into the aquifer. In other words, intrinsic remediation is an appropriate candidate to clean up contaminated soil when concentrations are low enough that no significant threat to groundwater quality exists.

Based on the preceding discussion, it appears that intrinsic remediation is a reasonable and appropriate remedy for natural attenuation of the naphthalene contaminated soil at the site. Naphthalene concentrations measured in Areas 9 and 10 soil are low enough that they do not act as a continuing source. In addition, several natural mechanisms exist that are known to effectively attenuate naphthalene in soil and groundwater.

Durant, N.D., Jonkers, C.A.A., Wilson, L.P., and E.J. Bouwer. *Enhanced Biodegradation of Naphthalene in MGP Aquifer Microcosms*. Third International In Situ and On-Site Bioremediation Symposium. Batelle Press, Columbus, Ohio. April, 1995

King, M.W.G., Barker, J.F., and Kimberly A. Hamilton. *Natural Attenuation of Coal Tar Organics in Groundwater*. Third International In Situ and On-Site Bioremediation Symposium. Batelle Press, Columbus, Ohio. April, 1995.

Daniel Pope. *Natural Attenuation of Soils*. In proceedings of Seminar on Bioremediation of Hazardous Waste Sites: Practical Approaches to Implementation. U.S. EPA. June 1996.

6.0 Areas 12, 13 and 14 (#01186), Intrinsic Remediation Monitoring Program

Intrinsic remediation (natural attenuation) is the suggested remedy for the naphthalene contamination detected in subsurface soil at Areas 12, 13 and 14. Total naphthalene concentrations have been found at a maximum concentration of 6,500 micrograms per kilogram (μg/kg) exceeding the RBSL of 210 μg/kg at two locations. No other RBSLs were exceeded at this site.

Intrinsic remediation is defined as the natural reduction of environmental contaminant constituents such as organic compounds and metals in soil and groundwater without the use of man-made engineered mechanisms for treatment. The processes that occur to naturally attenuate, reduce, or clean up contaminated soil and groundwater are physical, chemical, and biological. Physical mechanisms include adsorption to soil, dispersion of contaminants, dilution effects, and volatilization. Chemical mechanisms include hydrolysis and chemical oxidation. Biological mechanisms are the transformation of organic compounds by indigenous microorganisms (microbial oxidation) that utilize the organic carbon as a source of food and energy, thereby destroying them to innocuous end products.

Organic compounds such as naphthalene and its derivatives are amenable to microbial oxidation and destruction in soil and groundwater. These processes are most effective at concentrations exceeding 1,000 μg/kg. Below this concentration bioavailability limits effective destruction. Microbial destruction can occur by engineered systems or natural means (intrinsic remediation). Engineered systems include land farming of contaminated soil or air sparging of groundwater to provide oxygen for microbial destruction. However, studies have shown that naphthalene can be degraded in the absence of oxygen (Durant et al., 1995). In such situations, other compounds or chemicals such as nitrate substitute for oxygen and provide the necessary microbial environment for degradation to occur. This is critical in subsurface conditions where oxygen is the limiting factor and where low concentrations of naturally occurring nitrate are present that are sufficient to degrade naphthalene. Other studies (King et al., 1995) have shown that naphthalene is amenable to natural microbial destruction.

In addition to natural microbial destruction, naphthalene is also amenable to destruction through natural chemical and physical processes such as hydrolysis, dilution, dispersion, and volatilization. Physical destruction processes are most effective where naphthalene concentrations are very low (around 1,000 μg/kg) and bioavailability has limited microbial destruction. These physical mechanisms are most effective at further reduction of contaminant concentrations when these conditions are present.

In accordance with the current national regulatory guidance (U.S. EPA, 1996) intrinsic remediation can be considered an appropriate remedy for the naphthalene contamination at the levels observed. At these low concentrations, far below the US EPA soil screening level of 84,000 μg/kg considered protective of groundwater, it should not serve as a continuing contaminant source that feeds into the aquifer. In other words, intrinsic remediation is an appropriate candidate to clean up contaminated soil when concentrations are low enough that no significant threat to groundwater quality exists.

Based on the preceding discussion, it appears that intrinsic remediation is a reasonable and appropriate remedy for natural attenuation of the naphthalene contaminated soil at the site. Naphthalene concentrations measured in Areas 12, 13 and 14 soil are low enough that they do not act as a continuing source. In addition, several natural mechanisms exist that are known to effectively attenuate naphthalene in soil and groundwater.

Durant, N.D., Jonkers, C.A.A., Wilson, L.P., and E.J. Bouwer. *Enhanced Biodegradation of Naphthalene in MGP Aquifer Microcosms*. Third International In Situ and On-Site Bioremediation Symposium. Batelle Press, Columbus, Ohio. April, 1995

King, M.W.G., Barker, J.F., and Kimberly A. Hamilton. *Natural Attenuation of Coal Tar Organics in Groundwater*. Third International In Situ and On-Site Bioremediation Symposium. Batelle Press, Columbus, Ohio. April, 1995.

Daniel Pope. *Natural Attenuation of Soils*. In proceedings of Seminar on Bioremediation of Hazardous Waste Sites: Practical Approaches to Implementation. U.S. EPA. June 1996.

6.0 Areas 12, 13, and 14 - SCDHEC #01186 Implementation Schedule

January 4	
January 11	
January 18	
January 25	
February 1	
February 8	
February 15	Sample FDSGW13A for Arsenic.
February 22	
March 1	
March 8	
March 15	
March 22	
March 29	

7.0 Area 15 - SCDHEC #01187, Area Reuse

Area 15 is located within AOC 626, the Fuel Farm. This industrial area is comprised of four large fuel storage tanks, several smaller tanks, various pumps and piping systems and waste oil and waste water processing systems. Specifically, Area 15 is located within the berm system of tank 3901-A.

The surface soil at Area 15 exhibited a maximum total naphthalene concentration of 8,500 μg/kg. This value was compared to the SCDHEC RBSL for ingestion or dermal contact with surficial soil (Table B6 of *South Carolina Risk-Based Corrective Action for Petroleum Releases 1998*) using a conservative residential scenario. The detection was significantly less than the RBSL of 3,100,000 μg/kg (near three orders of magnitude).

The CNC Redevelopment Authority was contacted regarding redevelopment plans for the tank farm area. Currently the area from Viaduct Road, between Hobson Avenue and the southern base boundary to Wood Street on the west side is planned to be Marine Industrial and will most likely remain a fuel farm. In the unlikely event that this area would become residential, significant reworking and demolition would be required. This type of activity would require reassessment of risk management decisions and quite possibly remediation/removal of impacted soil.

For these reasons, the Navy feels excavation is not appropriate and would prefer to remain with the original recommendation of no further action for Area 15.

8.0 Area 18 - SCDHEC #01188, Pentachlorophenol

Area 18 is located on an engineered quay between dry docks 2 and 5 immediately east of Building 247.

A shallow groundwater sample at Area 18 detected pentachlorophenol (PCP) during the second, most recent, sampling event. No petroleum constituents, of interest to the investigation of the fuel distribution system, were detected in groundwater in either event. A review of file information and the Zone E RCRA Facility Investigation (RFI) report identified no potential source or other detections of PCP. Adjacent grid-based and site specific shallow monitoring wells have had no detections of this compound. The construction materials utilized in the quay may be the source of PCP. The quay is supported by treated wood pilings with fill material placed to support the structure. These treated pilings may be the source, but this theory is not confirmed.

Because PCP is not a constituent of concern for this investigation, the RFI program will resample monitoring well FDS18A for semivolatile organic compounds. If PCP is detected above the RBSL, the site will be transferred to the RFI program. Should no PCP be detected, the site will be recommended for no further action.

01144

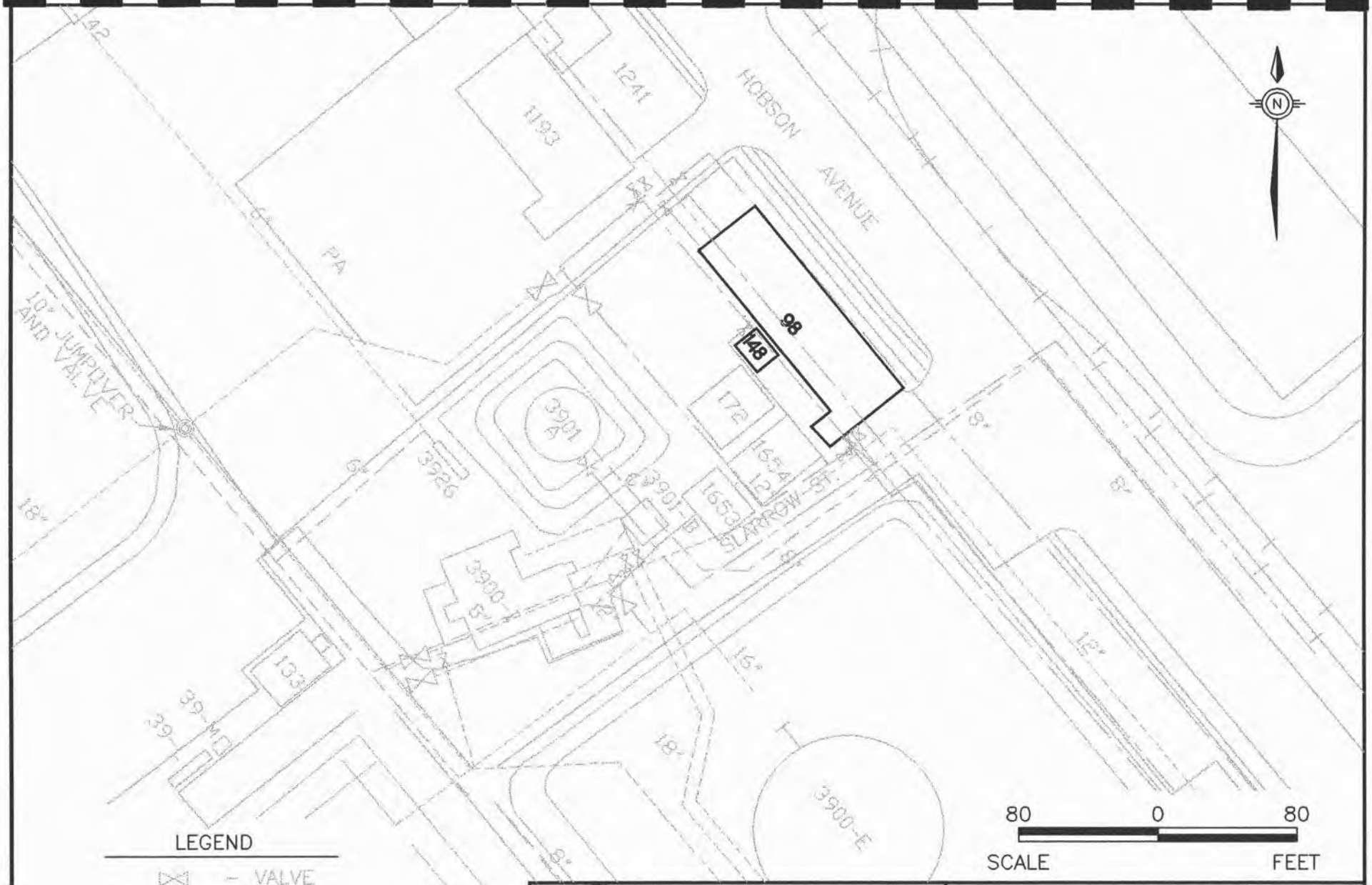
9.0 Area 19, Contamination Assessment Plan

This area is identified in the *Final RCRA Facility Assessment of Naval Base Charleston* (E/A&H June 6, 1995) as a part of Area of Concern (AOC) 633. Facility 148 is a 20,000 gallon, holding tank designated as a stripper tank. The tank is of reinforced concrete construction, rectangular in shape, and partially buried to approximately four feet below ground surface (ft bgs). Facility 148 was used to temporarily hold fuel oil during pipeline repair and maintenance. The tank does not appear on aerial photos of the Charleston Naval Complex (CNC) area prior to 1948, and was last used in 1987. The tank was closed, demolished and removed in 1996. The area also includes Building 98, a fuel oil booster pumphouse connected to Facility 148 by two eight-inch pipelines. Figure 9-1 depicts the Area 19 site features.

Previous Investigations

In 1992, S&ME, Inc. (S&ME) was retained by the Navy to conduct a soil total petroleum hydrocarbon (TPH) survey along a fuel supply line that parallels the south side of Hobson Avenue, and passes Building 98 on the north side. The purpose of the investigation was to determine if petroleum related contamination exists along the pipeline right-of-way. Soil samples for TPH analysis were collected at the soil water interface, at approximately six feet ft bgs. Two of four samples collected along the northeast and northwest sides of Building 98 revealed subsurface soil TPH concentrations of 1,000 and 690 milligrams per kilogram (mg/kg), respectively. S&ME's investigation report stated that soil and groundwater were likely contaminated along this pipeline, and that appropriate abatement procedures should be followed during excavation and dewatering activities which were to accompany forthcoming repairs. A copy of this report is contained in Appendix D of the *Fuel Distribution System Contamination Assessment Report* (EnSafe 1998).

In 1996, the Supervisor of Shipbuilding, Conversion and Repair, USN, Portsmouth, VA, Environmental Detachment Charleston, SC (SPORTENVDETCHASN) performed assessment and closure activities of the UST at Facility 148. The tank had been emptied and cleaned prior to the closure, and contained no residual fuel. Free product and petroleum contaminated soil were found throughout the excavation and demolition of Facility 148. The area most impacted was associated



FUEL DISTRIBUTION SYSTEM
CONTAMINATION
ASSESSMENT PLAN
NAVAL COMPLEX
CHARLESTON, S.C.

FIGURE 9-1
AREA 19
SITE FEATURES MAP

DWG DATE: 12/17/98 | DWG NAME: 2907B001

with the piping to Building 98. The excavation was open until July 1997 when the tank pit was backfilled with clean soil. A copy of the assessment and closure report is contained in Appendix E of the *Fuel Distribution System Contamination Assessment Report* (EnSafe 1998).

Objective

The objectives of the proposed field investigation at Area 19 are to: confirm the results of earlier sampling efforts for soil and groundwater; delineate the horizontal and vertical extent of soil and groundwater contamination determined by previous investigations; and to characterize the hydrostratigraphic conditions. Data collection efforts will support technical evaluation of remedial alternatives, if required.

Sampling and Analysis Plan

To achieve the objectives of this assessment, specific sampling and analysis requirements are proposed. This effort will be phased to determine: the extent of free-phase petroleum product, if any; the nature and extent of soil contamination; and the nature and extent of dissolved petroleum constituents. Table 9.1 outlines the proposed assessment plan and schedule. Initially a direct push technology (DPT) rig will be used to install temporary piezometers which will be used to identify free product. These piezometers will be screened to bracket the water table. After installation, these observation piezometers will be allowed to sit for 24 hours to allow free product, if present, to enter the screen. While these equilibrate, discrete soil samples will be collected, also using the DPT, (or hand auger beneath Building 98) and analyzed for RBSL parameters shown on Table 9.2. Subsequent sampling may be required for full delineation. This data will be used to document and characterize soil contamination and identify areas requiring corrective measures. The locations shown on Figure 9-2 are proposed only and may be modified due to actual site conditions.

The piezometers will be checked for free product using an oil/water interface probe or visual observation. A flame ionization detector (FID) will be used to check for organic vapors in the piezometers. It is expected that this effort will require subsequent rounds of installation and

Table 9.1
Site Assessment Plan and Proposed Schedule
Area 19

Proposed Schedule Date	Proposed Site Activity	Samples Proposed	Analyses Proposed	Remarks
Week of 1/18/99	DPT soil sampling	Up to 8 samples[a]	RBSL parameters	Purpose is to screen nature and extent of soil contamination
	DPT temporary piezometer installation and monitoring.	As required	None	Purpose is to determine extent of free product
	DPT groundwater sampling	As required	RBSL parameters	Purpose is to determine nature and extent of dissolved constituents
After DPT Data Analysis and Review				
Week of 2/22/99	Install permanent shallow groundwater monitoring wells	Up to 6 wells	NA	NA
Week of 3/15/99	Sample new permanent wells		RBSL constituents	Purpose is to confirm DPT results and facilitate future monitoring

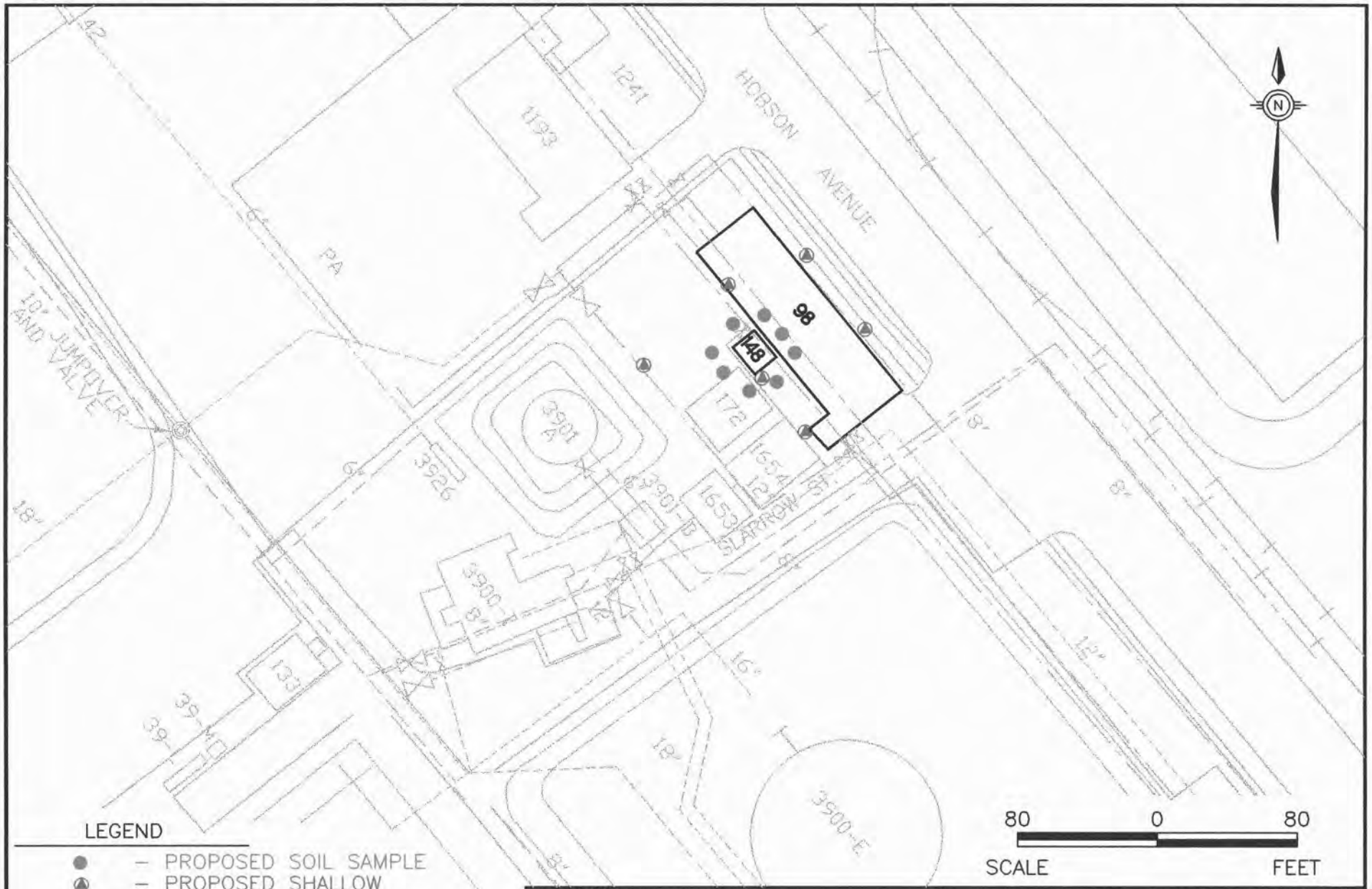
Notes:
a = More or less sample points may be required, depending on investigation findings.

MW 0365

Table 9.2
Sampling Plan
Area 19

Matrix	Quantity	Analysis
Soil	12 2	VOC, SVOC Design parameters
Groundwater	24 2	VOC, SVOC, metals Design parameters

Notes:
VOC = Benzene, toluene, ethylbenzene, xylenes
SVOC = Naphthalenes, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene
Metals = Arsenic, barium cadmium, chromium (total), lead, mercury, selenium, silver
Design Parameters Soil = Sulfur, ammonia, total phosphorous, nitrate-N, nitrate, heterotrophic plate count, total organic carbon, cation exchange capacity, grain size analysis, vertical permeability, percent soil moisture, porosity, bulk density, hydrometer analysis
Design Parameters Groundwater = Organic content, chlorides, 5-day biochemical oxygen demand, chemical oxygen demand, hardness, total suspended solids, total dissolved solids, alkalinity, pH



LEGEND

- PROPOSED SOIL SAMPLE
- PROPOSED SHALLOW MONITORING WELL
- VALVE
- FENCE
- DIESEL LINE
- FUEL LINE
- SLUDGE LINE

FUEL DISTRIBUTION SYSTEM
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FIGURE 9-2
AREA 19
SAMPLING LOCATIONS

DWG DATE: 12/17/98 | DWG NAME: 2907B004

observation before free-phase product is fully delineated. No locations are presented on Figure 9-2 for this effort, locations will be selected in the field based on actual site conditions. Once free phase product extent has been defined, DPT will be used to collect discrete shallow groundwater samples. These samples will be analyzed for RBSL parameters shown in Table 9.2. Trip blanks will be the only quality control samples evaluated.

After evaluation of the DPT sampling results, up to six permanent shallow groundwater monitoring wells will be installed (to an approximate depth of 10 ft bgs, depending on subsurface lithology and depth of the water table) and sampled for the RBSL parameters shown in Table 9.2. The permanent groundwater wells will be used to confirm the DPT results and facilitate future monitoring. Figure 9-2 shows the proposed shallow monitoring well locations for Area 19. Actual well locations will be selected based on site conditions identified by the DPT effort.

16929

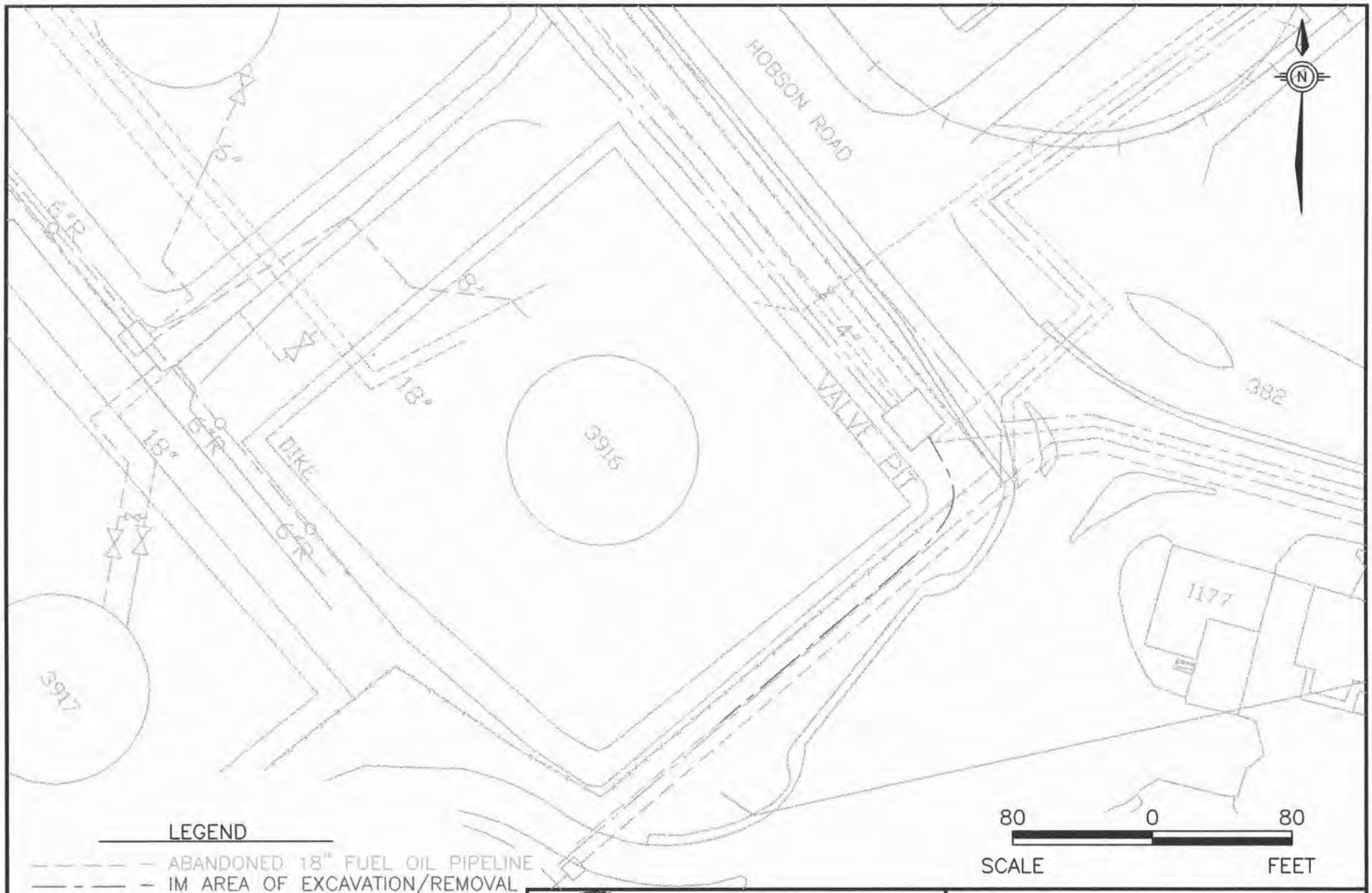
10.0 Area 20, Contamination Assessment Plan

This area is identified in the *Final RCRA Facility Assessment of Naval Base Charleston* (E/A&H June 6, 1995) as a part of Area of Concern (AOC) 626. This AOC includes four large fuel tanks, several smaller tanks, various pumping and piping systems, and waste oil and wastewater processing plants. The area also includes the intersection of Hobson Avenue and Viaduct Road, under which various petroleum supply pipelines of the CNC Fuel Distribution System (FDS) traverse from the Chicora Tank Farm towards the piers along the waterfront of the Cooper River. In September 1994, during cleanup and closure activities an unspecified amount of diesel fuel oil was released at this intersection, from an abandoned, 10-foot deep, 18-inch diameter fuel oil pipeline. Figure 10-1 depicts the site features of Area 20.

Previous Investigations

In 1995, The Naval Facilities and Engineering Service Center (NFESC) performed a site characterization within the AOC 626 area using a Site Characterization and Analysis Penetrometer System. The objective of the investigation was to define the extent of polynuclear aromatic hydrocarbon (PAH) contamination in the area outside of the Fuel Farm. Confirmatory soil samples were also collected from depths coinciding with the suspected contamination areas. The SCAPS investigation, in conjunction with the confirmatory soil sampling, revealed a lack of contamination at AOC 626. A copy of the AOC 626 Site Characterization and Analysis Penetrometer System report is contained in Appendix G of the *Fuel Distribution System Contamination Assessment Report* (EnSafe 1998).

In 1996, the Supervisor of Shipbuilding, Conversion and Repair, USN, Portsmouth, VA, Environmental Detachment Charleston, SC (SPORTENVDETCHASN) performed an Interim Measure (IM) at the site area to remove petroleum saturated soil, a 200 foot section of the 18-inch diameter abandoned pipeline, and install a free product recovery system. Initial excavations during this removal action revealed heavily stained soil to five ft bgs, with free phase product leaching from the sides of the open excavation. Approximately 450 cubic yards of petroleum contaminated soil were removed during the IM. In addition, 229 linear feet of the 18-inch



FUEL DISTRIBUTION SYSTEM
CONTAMINATION
ASSESSMENT PLAN
NAVAL COMPLEX
CHARLESTON, S.C.

FIGURE 10-1
AREA 20
SITE FEATURES MAP

DWG DATE: 12/17/98 | DWG NAME: 2907B002

diameter pipeline were removed from where the pipeline traversed Viaduct Road. Five vertical recovery wells and a 200-foot, horizontal, polyvinyl chloride free product recovery system were installed for product recovery. Approximately 40,000 gallons of water mixed with fuel oil has been recovered from the system as of May 1997. A copy of the Interim Measure Completion Report is contained in Appendix F of the *Fuel Distribution System Contamination Assessment Report* (EnSafe 1998).

Objective

The objectives of the proposed field investigation at Area 20 are to: confirm the results of earlier sampling efforts for both soil and groundwater; delineate the horizontal and vertical extent of soil and groundwater contamination; and to characterize hydrostratigraphic conditions. Data collection efforts will support technical evaluation of remedial alternatives, if required.

Sampling and Analysis Plan

To achieve the objectives of this assessment, specific sampling and analysis requirements are proposed. This effort will be phased to determine: the extent of free-phase petroleum product, if any; the nature and extent of soil contamination; and the nature and extent of dissolved petroleum constituents. Table 10.1 outlines the proposed sampling plan and schedule for Area 20. Initially a DPT rig will be used to install temporary piezometers which will be used to determine free product extent. These piezometers will be screened to bracket the water table. After installation, these observation piezometers will be allowed to sit for 24 hours to allow free product, if present, to enter the screen. While these equilibrate, discrete soil samples will be collected, also using the DPT and analyzed for RBSL parameters shown on Table 10.2. Subsequent sampling may be required for full delineation. This data will be used to document and characterize soil contamination and identify areas requiring corrective measures. The locations shown on Figure 10-2 are proposed only and may be modified due to actual site conditions.

After evaluation of the DPT sampling results, up to eight permanent shallow groundwater monitoring wells will be installed (to an approximate depth of 18 ft bgs, depending on subsurface

Table 10.1
Site Assessment Plan and Proposed Schedule
Area 20

Proposed Schedule Date	Proposed Site Activity	Samples Proposed	Analyses Proposed	Remarks
Week of 1/18/99	DPT soil sampling	Up to 12 samples[a]	RBSL constituents	Purpose is to determine nature and extent of soil contamination
	DPT temporary piezometer installation and monitoring	As required		Purpose is to determine extent of free product
	DPT groundwater sampling	As required		Purpose is to determine nature and extent of dissolved fuel constituents
After DPT Data Analysis and Review				
Week of 2/22/99	Install permanent shallow groundwater monitoring wells		NA	NA
Week of 3/15/99	Sample new permanent wells	Up to 8[a]	RBSL constituents	Purpose is to confirm DPT results and facilitate future monitoring

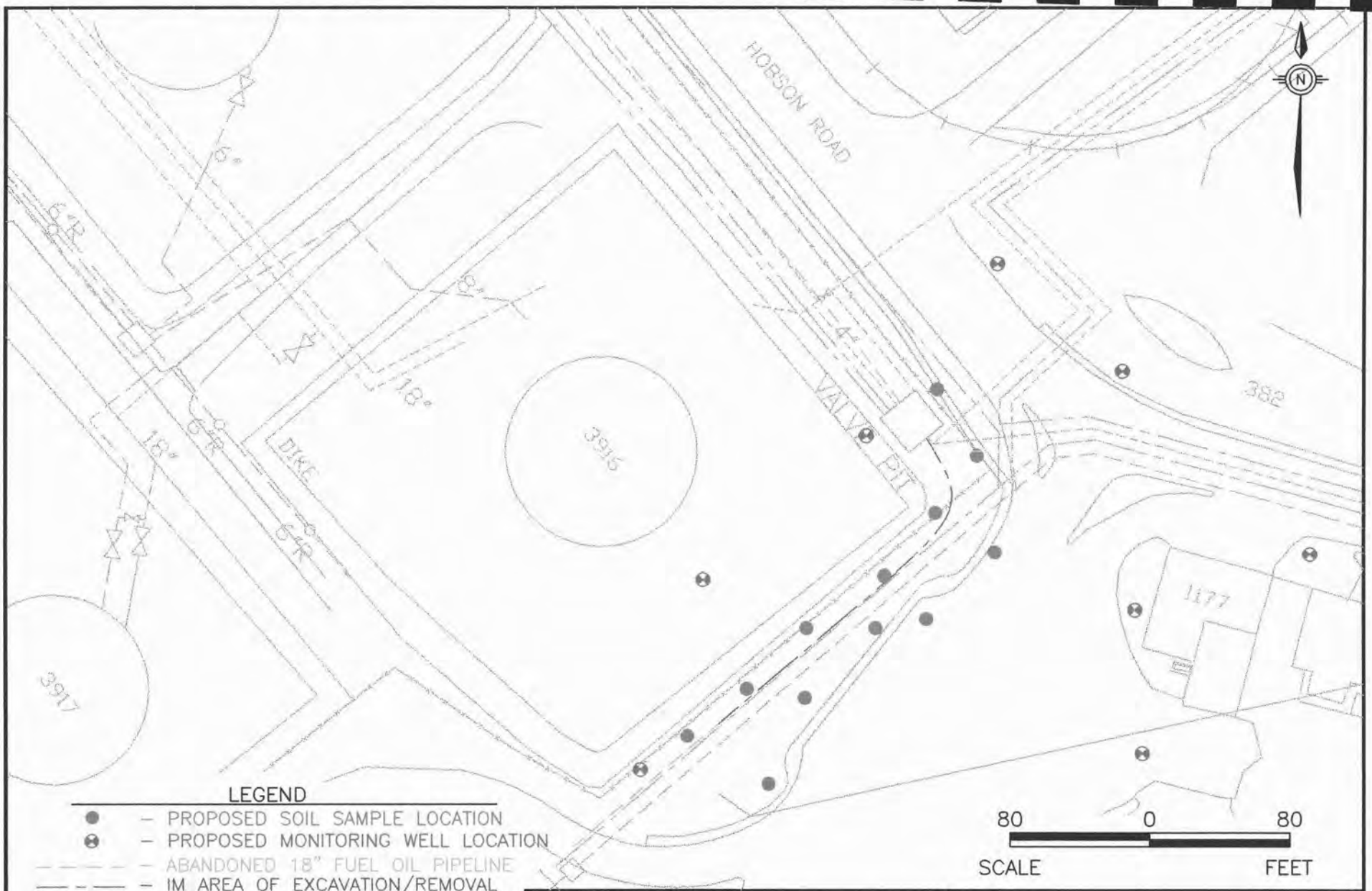
Notes:
a = More or less sample points may be required, depending on investigation findings

Table 10.2
Sampling Plan
Area 20

Matrix	Quantity	Analysis
Soil	14 2	VOC, SVOC Design parameters
Groundwater	32 2	VOC, SVOC, metals Design parameters

Notes:

VOC	=	Benzene, toluene, ethylbenzene, xylenes
SVOC	=	Naphthalenes, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene
Metals	=	Arsenic, barium cadmium, chromium (total), lead, mercury, selenium, silver
Design Parameters Soil	=	Sulfur, ammonia, total phosphorous, nitrate-N, nitrate, heterotrophic plate count, total organic carbon, cation exchange capacity, grain size analysis, vertical permeability, percent soil moisture, porosity, bulk density, hydrometer analysis
Design Parameters Groundwater	=	Organic content, chlorides, 5-day biochemical oxygen demand, chemical oxygen demand, hardness, total suspended solids, total dissolved solids, alkalinity, pH



FUEL DISTRIBUTION SYSTEM
CONTAMINATION
ASSESSMENT PLAN
NAVAL COMPLEX
CHARLESTON, S.C.

FIGURE 10–2
AREA 20
SAMPLING LOCATIONS

DWG DATE: 12/17/98 | DWG NAME: 2907B003

lithology and hydrogeology) and sampled for RBSL constituents. The permanent groundwater wells will be used to confirm DPT results and facilitate future monitoring. Figure 10-2 shows the proposed sampling locations for the Hobson Avenue and Viaduct Road area.