

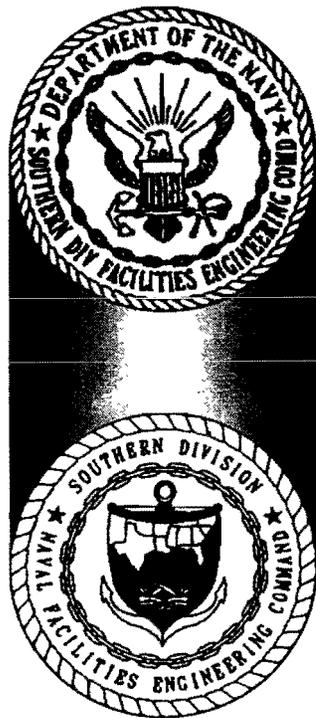
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PHASE I INTERIM MEASURE WORK PLAN SOLID WASTE MANAGEMENT UNITS 5 AND 18  
(SWMU 5 AND SWMU 18) AREA OF CONCERN 605 AND 621 (AOC 605 and AOC 621) ZONE  
E WITH TRANSMITTAL CNC CHARLESTON SC

10/12/2001  
CH2M HILL

# PHASE I INTERIM MEASURE WORK PLAN

## SWMU 5, SWMU 18, AOC 605, and AOC 621 Zone E



***Charleston Naval Complex  
North Charleston, South Carolina***

SUBMITTED TO  
***U.S. Navy Southern Division  
Naval Facilities Engineering Command***

PREPARED BY  
***CH2M-Jones***

*October 2001*

*Revision 0  
Contract N62467-99-C-0960  
158814.ZE.PR.26*

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October 12, 2001

Mr. David Scaturo  
Division of Hazardous and Infectious Wastes  
South Carolina Department of Health and  
Environmental Control  
Bureau of Land and Waste Management  
2600 Bull Street  
Columbia, SC 29201

Re: Phase I Interim Measure Work Plan (Revision 0) – SWMU 5, SWMU 18, AOC 605,  
and AOC 621, Zone E

Dear Mr. Scaturo:

Enclosed please find four copies of the Phase I Interim Measure Work Plan (Revision 0) for SWMU 5, SWMU 18, AOC 605, and AOC 621 in Zone E of the Charleston Naval Complex (CNC). This report has been prepared pursuant to agreements by the CNC BRAC Cleanup Team for completing the RCRA Corrective Action process.

The principal author of this document is Kris Garcia. Please contact her at 770/604-9182, extension 476, if you have any questions or comments.

Sincerely,

CH2M HILL

A handwritten signature in cursive script that reads "Dean Williamson".

Dean Williamson, P.E.

cc: ~~Rob~~ Harrell/Navy, w/att  
Gary Foster/CH2M HILL, w/att

# PHASE I INTERIM MEASURE WORK PLAN

## SWMU 5, SWMU 18, AOC 605, and AOC 621 Zone E



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North Charleston, South Carolina***

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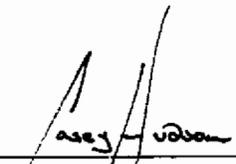
# Certification Page for Interim Measure Work Plan – SWMU 5, SWMU 18, AOC 605, and AOC 621, Zone E

## Soil Removal – Phase I

I, Casey Hudson, certify that this report has been prepared under my direct supervision. The data and information are, to the best of my knowledge, accurate and correct, and the report has been prepared in accordance with current standards of practice for engineering.

South Carolina

Temporary Permit No. T2000358



---

Casey Hudson, P.E.

OCTOBER 9 2001

---

Date



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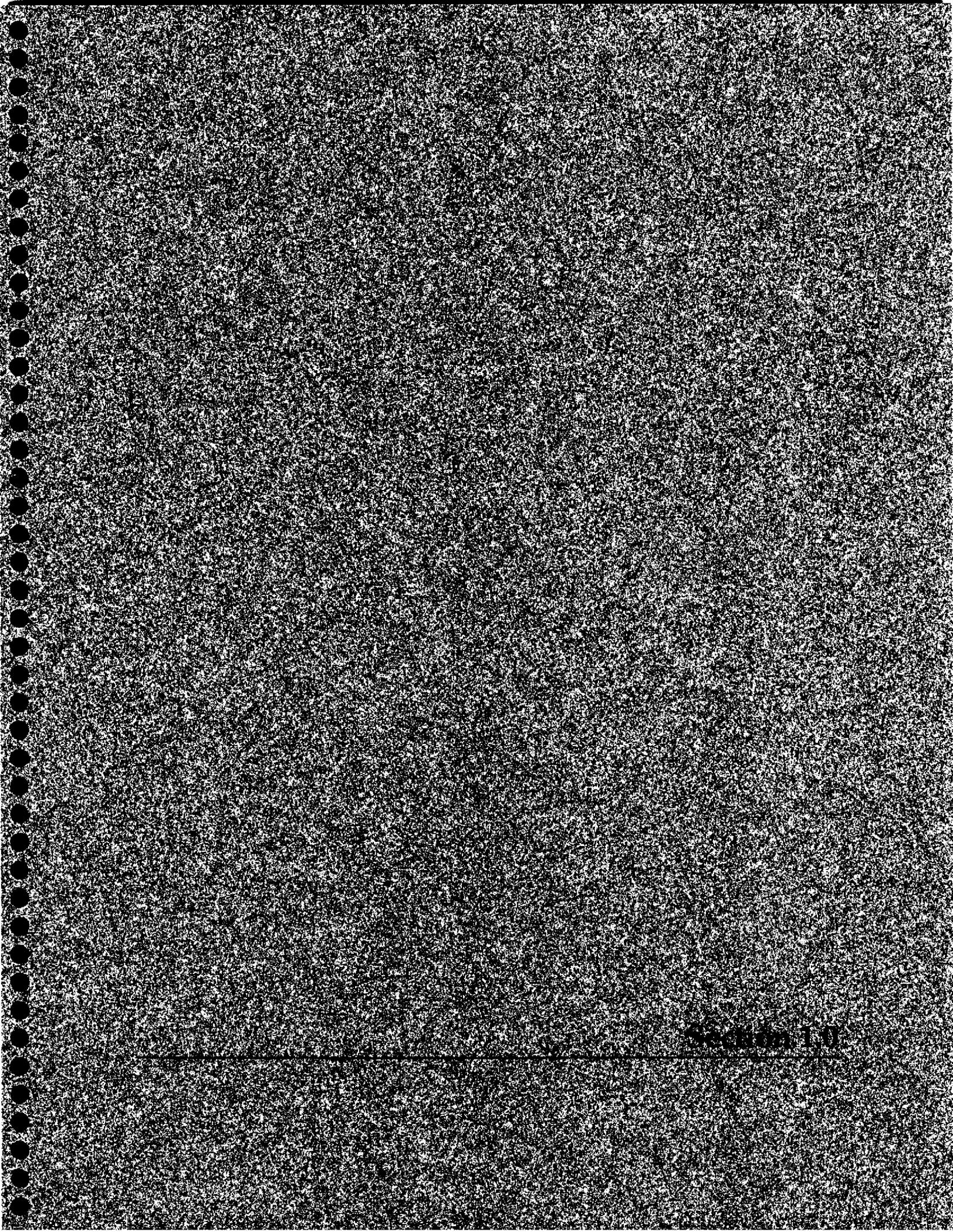
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# 1 Acronyms and Abbreviations

---

|    |        |   |
|----|--------|---|
| 2  | AOC    | area of concern   |
| 3  | BCT    | BRAC Cleanup Team   |
| 4  | BEQ    | benzo(a)pyrene equivalent                                     |
| 5  | BRAC   | Base Realignment and Closure Act                              |
| 6  | CA     | Corrective Action   |
| 7  | CNC    | Charleston Naval Complex                                      |
| 8  | COC    | chemical of concern   |
| 9  | COPC   | chemical of potential concern                                 |
| 10 | CSAP   | Comprehensive Sampling and Analysis Plan                      |
| 11 | DAF    | dilution attenuation factor                                   |
| 12 | DET    | Environmental Detachment Charleston                           |
| 13 | EGIS   | Environmental Geographic Information System                   |
| 14 | EnSafe | EnSafe Inc.   |
| 15 | EPA    | U.S. Environmental Protection Agency                          |
| 16 | ft bls | feet below land surface                                       |
| 17 | GPS    | Global Positioning System                                     |
| 18 | IM     | interim measure   |
| 19 | MCL    | maximum contaminant level                                     |
| 20 | MCS    | media cleanup standard  |
| 21 | µg/L   | microgram per liter   |
| 22 | PCB    | polychlorinated biphenyl                                      |
| 23 | PPE    | personal protective equipment                                 |
| 24 | RBC    | risk-based concentration                                      |
| 25 | RC     | reference concentration                                       |
| 26 | RCRA   | Resource Conservation and Recovery Act                        |
| 27 | RFA    | RCRA Facility Assessment                                      |
| 28 | RFI    | RCRA Facility Investigation                                   |
| 29 | SCDHEC | South Carolina Department of Health and Environmental Control |
| 30 | SPLP   | synthetic precipitation leaching procedure                    |

- 1 SSL soil screening level
- 2 SVOC semivolatile organic compound
- 3 SWMU solid waste management unit
- 4 TOC total organic carbon
- 5 UST underground storage tank
- 6 VOC volatile organic compound



# 1 1.0 Introduction

---

## 2 1.1 Background

3 Previous investigations in the vicinity of Solid Waste Management Units (SWMUs) 5 and 18  
4 and Areas of Concern (AOCs) 605 and 621, in Zone E of the Charleston Naval Complex  
5 (CNC), have indicated the presence of lead contamination in soil and groundwater. Several  
6 interim measures (IMs) have been completed at these sites; however, a review of the data  
7 indicated that these IMs have not remediated the sites to the extent that is likely required  
8 under the state of South Carolina's RCRA Corrective Action (CA) program. Additional  
9 active remediation will be required.

10 According to the CNC Redevelopment Authority (RDA), a potential lessee is seeking to  
11 implement redevelopment activities in the vicinity of Dry Docks 3 and 4, which includes the  
12 area encompassing SWMUs 5 and 18 and AOCs 605 and 621. CH2M-Jones has prepared this  
13 IM Work Plan in order to expedite RCRA CA activities in this area, and to the extent  
14 possible, minimize potential interferences between the CNC RCRA cleanup activities and  
15 the redevelopment activities proposed by the potential lessee.

## 16 1.2 Purpose of the Phase I IM Work Plan

17 This Phase I IM Work Plan will serve to provide the scope and technical approach for the  
18 final delineation of contaminants in the area of SWMUs 5 and 18 and AOCs 605 and 621,  
19 and complete the necessary RCRA Facility Investigation (RFI) activities at these sites. This  
20 IM Work Plan will also provide a conceptual approach for the excavation of impacted soils  
21 associated with SWMUs 5 and 18 and AOCs 605 and 621. The Phase II IM Work Plan will be  
22 prepared to provide detailed information on the areas to be addressed and to select final  
23 remediation criteria. Figure 1-1 illustrates the location of SWMUs 5 and 18 and AOCs 605  
24 and 621 within Zone E of the CNC. Figure 1-2 provides an aerial view of the sites.

25 The investigative approach proposed in this Phase I IM Work Plan will include the  
26 delineation of soil and groundwater at locations where concentrations of various  
27 constituents were detected above their appropriate screening criteria. Once delineation is  
28 complete, those soils exceeding the target Media Cleanup Standard (MCS) will likely be  
29 excavated, although site conditions may warrant an alternative scenario.

1 A Phase II IM Work Plan will be produced once the final delineation of contaminated soil is  
2 complete, and the risk evaluation/chemical of concern (COC) refinements have been  
3 completed.

4 As warranted, corrective action proposals for groundwater will be addressed separately.

### 5 **1.3 Organization of the Phase I IM Work Plan**

6 This Phase I IM Work Plan consists of the following sections, including this introductory  
7 section:

8 **1.0 Introduction** — Presents the purpose of the Phase I IM Work Plan and background  
9 information regarding the proposed IM.

10 **2.0 Site Background and Conditions** — Provides a brief description of SWMUs 5 and 18,  
11 and AOCs 605 and 621, as well as the results from previous RFI activities conducted at the  
12 sites.

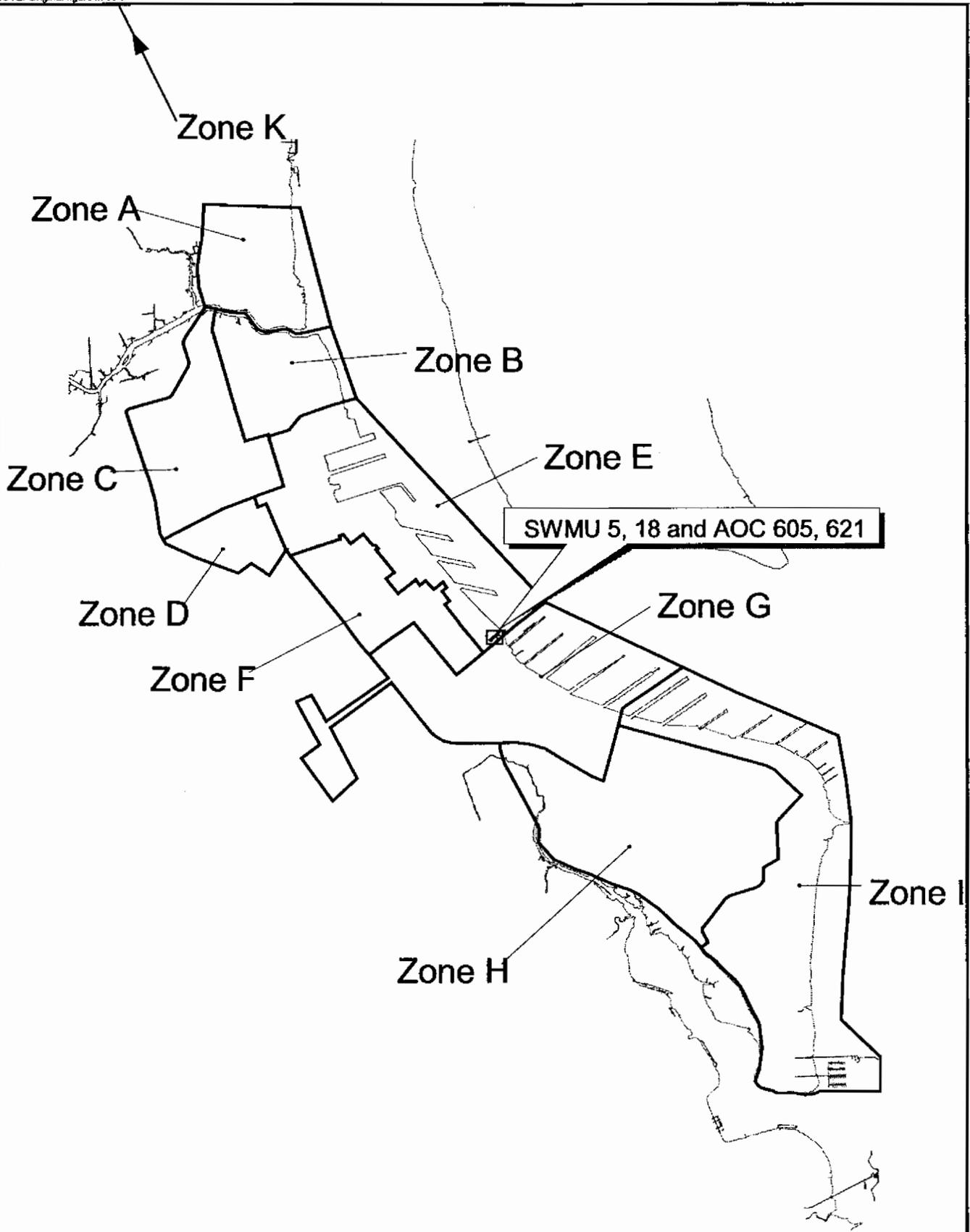
13 **3.0 Technical Approach**— Describes the proposed investigative approach for delineation of  
14 chemicals of potential concern (COPCs) for both the RFI and to support an anticipated IM.

15 **4.0 Soil Delineation and Excavation** — Provides a description of the approach that will be  
16 applied to completing the proposed IM at these sites.

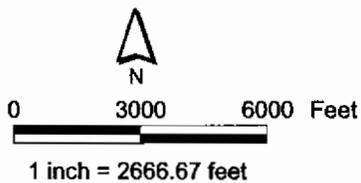
17 **5.0 References** – Provides the references used in this work plan.

18 All tables and figures appear at the end of their respective sections.

NOTE: Original figure in color



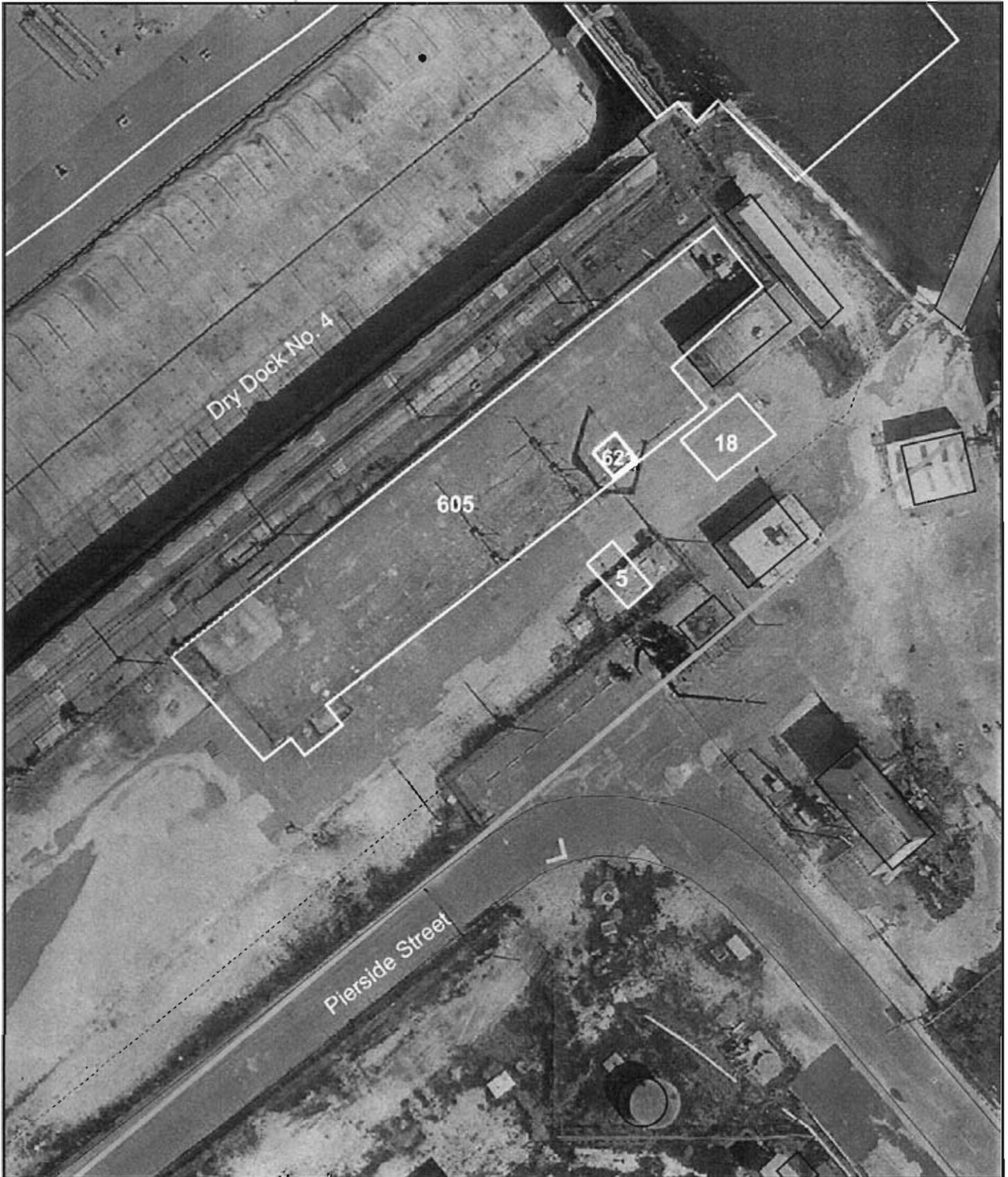
Shoreline  
Zone Boundary



**Figure 1-1**  
Site Location Map  
SWMU 5, SWMU 18, AOC 605, and AOC 621  
Zone E  
Charleston Naval Complex

**CH2MHILL**

NOTE: Original figure created in color



-  Fence
-  Railroads
-  Roads
-  AOC Boundary
-  SWMU Boundary
-  Buildings

 Zone Boundary



0 40 80 Feet

1 inch = 50 feet

**Figure 1-2**

Site Map

SWMU 5, SWMU 18, AOC 605, and AOC 621

Zone E

Charleston Naval Complex

**CH2MHILL**

Section 2.0

## 2.0 Site Background and Conditions

---

### 2.1 Site Background and Setting

SWMU 5 is a former battery electrolyte treatment area adjacent to Pad 1278 and Dry Dock 4. Associated with battery salvaging, restoring, and recharging operations, this site was used to neutralize submarine battery acid from 1962 until 1985. It consisted of a battery disassembly platform, two neutralization underground storage tanks (USTs), and customized transporting railcars.

SWMU 18 is a polychlorinated biphenyl (PCB)-spill area at the Public Works Resource Recovery Facility Storage Area at the CNC. On June 12, 1987, a contractor was loading items that contained PCB when a transformer broke and discharged Pyranol insulating fluid. The leaking transformer was placed in a drip pan, but the liquid overflowed and approximately 75 gallons of Pyranol fluid spilled onto the ground. Three soil excavations were conducted in 1987 to successfully remediate the site, as described in the RCRA Facility Assessment (RFA) Report (August 1987).

AOC 605 is a waste paint storage area adjacent to Dry Dock 4 on Pad 1278. The 40- by 250-ft concrete pad was constructed in 1943 as a welding area. Beginning in 1987, the pad was used to store materials such as paints, used oils, solvents, and chemicals; however, the pad is currently being used by the tenant to stage boats for repair and renovation. The pad is bordered to the south and west by unpaved areas.

AOC 621 comprises the battery cracking area associated with SWMUs 5 and 18 and AOC 605. This unit was not investigated during the RFI conducted in 1996. The unit consists of a concrete pad surrounded by a 1-ft-high concrete containment wall. AOC 621 was used as a welding slab from the early 1940s until around 1950. From the early 1950s to the mid-1970s, this work area was used for wrecking submarine batteries, which included cracking batteries and draining their acids to recover lead and container cells, which were sold for scrap. A collection sump drained acid from the pad to the neutralization facility. A crane adjacent to the site was used to move batteries around the work area. Concrete and asphalt pavement surrounded AOC 621, except for an area of soil and gravel to the southwest.

Two subsequent IMs were conducted at these sites. The first IM removal action was conducted by the Environmental Detachment Charleston (DET) at SWMU 5 (March through

1 July 1997). The activities conducted for the first IM resulted in partial removal of the battery-  
2 cracking pad. At the request of the South Carolina Department of Health and  
3 Environmental Control (SCDHEC), confirmation samples were collected around the  
4 remaining portion of the pad. The second IM was a removal action at AOC 621, which  
5 resulted in the removal of approximately half of the site and a large area southeast of AOC  
6 621, including a large portion of SWMU 18 (April through November 1997). These IM  
7 activities are documented in a report titled *Interim/Stabilization Measure Completion Report for*  
8 *SWMU 5, AOC 605, and AOC 621, Battery Wrecking/Salvage Area* (U.S. Naval Detachment  
9 [Detachment], 1998).

10 As identified in the RFA documentation, the materials of concern are as follows:

- 11 • SWMU 5: solvents and lead/acid batteries
- 12 • SWMU 18: Pyranol insulating fluid
- 13 • AOC 605: acids, paints, metals (lead), solvents, and petroleum hydrocarbons
- 14 • AOC 621: battery waste, such as acids and heavy metals

## 15 **2.2 RFI Investigation Results**

### 16 **2.2.1 Soil Investigation**

17 As part of the RFI field investigation, surface soil samples and collocated subsurface soil  
18 samples were collected. All samples were analyzed for organotins, volatile organic  
19 compounds (VOCs), semivolatile organic compounds (SVOCs), metals, cyanide, and  
20 pesticides/PCBs. Two upper-interval samples and two lower-interval samples were selected  
21 as duplicates and analyzed for RCRA Appendix IX parameters during the two RFI sampling  
22 events. In addition, confirmatory samples were collected and analyzed for lead only during  
23 an IM removal action by the DET (April 10,1998). Sample locations are shown in Figure 2-1.

24 Three of the RFI soil sampling locations were removed during the IM activities at SWMU 5,  
25 AOC 605, and AOC 621; the area of excavation and sample locations removed are shown in  
26 Figure 2-1.

#### 27 **Surface Soil**

28 Analytical results from surface soil samples were evaluated relative to the U.S.  
29 Environmental Protection Agency (EPA) Region III Risk-based Concentration (RBC) limits.  
30 Based on the analysis presented in the *Zone E RFI Report, Revision 0* (EnSafe, 1997),  
31 benzo(a)pyrene equivalents (BEQs), arsenic, beryllium, and lead exceeded their respective

1 screening criteria. Antimony, arsenic, beryllium, copper, lead and benzo(a)pyrene were  
2 identified as chemicals of concern (COCs) under the unrestricted land use scenario.

### 3 **Subsurface Soil**

4 Subsurface soil sample analytical results were evaluated relative to the EPA Region III  
5 unrestricted and industrial RBCs and soil screening levels (SSLs) with a dilution attenuation  
6 factor (DAF) of 10. Based on the risk analysis presented in the *Zone E RFI Report, Revision 0*,  
7 no constituents were identified as COCs.

### 8 **2.2.2 Groundwater Investigation**

9 Five shallow monitoring wells were installed and sampled as part of the RFI investigation  
10 (see Figure 2-2). The groundwater samples were analyzed for VOCs, SVOCs, metals,  
11 cyanide, pesticides/PCBs, chlorides, sulfates, total dissolved solids (TDS), and organotins.  
12 Constituents detected in the groundwater samples were evaluated relative to maximum  
13 contaminant levels (MCLs) and EPA Region III tap-water RBCs. Groundwater was sampled  
14 in four collection events, but the RFI report focused exclusively on the findings of the first  
15 set of data.

16 Based on the information provided in the *Zone E RFI Report, Revision 0*, one free product  
17 sample was collected and analyzed for VOCs, SVOCs, and pesticides (Section 10.1.3).  
18 However, the RFI report does not identify the well it was obtained from nor does it discuss  
19 the analytical results.

20 The following constituents were identified as COCs in shallow groundwater:

- 21 • Antimony was detected at concentrations exceeding its tap water RBC and MCL. In  
22 three samples from wells NBCE018001, NBCE605002, and NBCE605003, antimony  
23 exceeded its tap water RBC of 1.50 micrograms per liter ( $\mu\text{g}/\text{L}$ ), but did not exceed the  
24 MCL. However, samples from wells NBCE605002 and NBCE605003 did exceed the MCL  
25 for antimony ( $6 \mu\text{g}/\text{L}$ ).
- 26 • Arsenic was detected at a concentration exceeding its tap water RBC and shallow  
27 reference concentration (RC) in one groundwater sample. In one sample from well  
28 NBCE605003, arsenic exceeded its RBC of  $0.0450 \mu\text{g}/\text{L}$  and shallow groundwater RC of  
29  $18.7 \mu\text{g}/\text{L}$ . No groundwater samples exceeded the arsenic MCL of  $50 \mu\text{g}/\text{L}$ .
- 30 • Lead was detected at a concentration exceeding its treatment technique action level  
31 (TTAL) and shallow groundwater RC in one groundwater sample. One sample  
32 concentration from well NBCE605002, exceeded the TTAL of  $15 \mu\text{g}/\text{L}$  for lead in

1 groundwater and shallow groundwater RC of 4.8 µg/L. The lead concentrations  
2 detected in groundwater collected from this well ranged from 69 to 1,970 µg/L.

### 3 **2.2.3 RFI Risk Summary**

4 It was noted in the *Zone E RFI Report, Revision 0* that the area is currently industrialized and  
5 that there are currently no residential properties for consideration in the risk assessment. As  
6 a result, all risk evaluation activities were based on potential future unrestricted land use  
7 and current industrial scenarios. The detailed presentation of the risk assessment for SWMU  
8 5, SWMU 18, and AOC 605 was presented in Section 10.1 of the *Zone E RFI Report, Revision 0*,  
9 and summarized in the sections below. The risk assessment used a fixed-point risk  
10 evaluation (FRE) methodology.

#### 11 **Surface Soil**

12 At SWMU 5, SWMU 18 and AOC 605, antimony, arsenic, Aroclor-1260, BEQs, beryllium,  
13 copper, lead, nickel and zinc were identified as COPCs for a future unrestricted land use  
14 scenario. For future industrial workers, arsenic, BEQs, beryllium, and lead were identified  
15 as COPCs in surface soil. The risk assessment concluded that surface soils presented  
16 excessive cancer risks and non-cancerous hazards under the unrestricted land use exposure  
17 scenario as a result of potential exposure to antimony, arsenic, beryllium, BEQs, copper,  
18 lead and zinc. COCs identified for the future industrial workers were arsenic, beryllium and  
19 BEQs.

#### 20 **Subsurface Soil**

21 No subsurface soil COCs were identified.

#### 22 **Groundwater**

23 Antimony, arsenic, barium, lead, and dioxins were identified as COPCs in shallow  
24 groundwater. COCs identified from the FRE included antimony, arsenic, dioxins, and lead  
25 in shallow groundwater.

**TABLE 2-1**  
 RFI and IM Historical Soil Sampling Summary  
*IM Work Plan, SWMU 5, SWMU 18, AOC 605, and AOC 621, Zone E, Charleston Naval Complex*

| Sampling Event | Sampling Date | Samples Collected          | Sample Analyses   | Comments  |
|----------------|---------------|----------------------------|---|---|
| 1              | 09/21/95      | upper-(19) 19              | Organotins, Standard Suite  | Two upper-interval samples and two lower-interval samples were selected as duplicates and analyzed for Appendix IX parameters. One upper-interval sample could not be collected because of surface obstructions; one sample was analyzed for SVOCs and metals only. |
|                | 10/03/95      | lower-(19) 13              |   |   |
| 2              | 05/31/96      | upper-(6) 5<br>lower-(6) 4 | Organotins, Standard Suite  | Two upper-interval samples were selected as duplicates and analyzed for Appendix IX parameters. Subsurface obstructions prevented the collection of two samples; one sample was analyzed for SVOCs and metals only.   |
| 3              | 01/27/99      | Upper-26                   | Lead, Appendix IX (Standard Suite, VOCs, SVOCs, herbicides, hexavalent chromium, organophosphorous pesticides, and dioxins) | Four surface soil samples and three subsurface soil samples were analyzed for Appendix IX parameters.   |
|                | 07/28/99      | lower-25                   | Lead, Appendix IX (Standard Suite, VOCs, SVOCs, herbicides, hexavalent chromium, organophosphorous pesticides, and dioxins) |   |

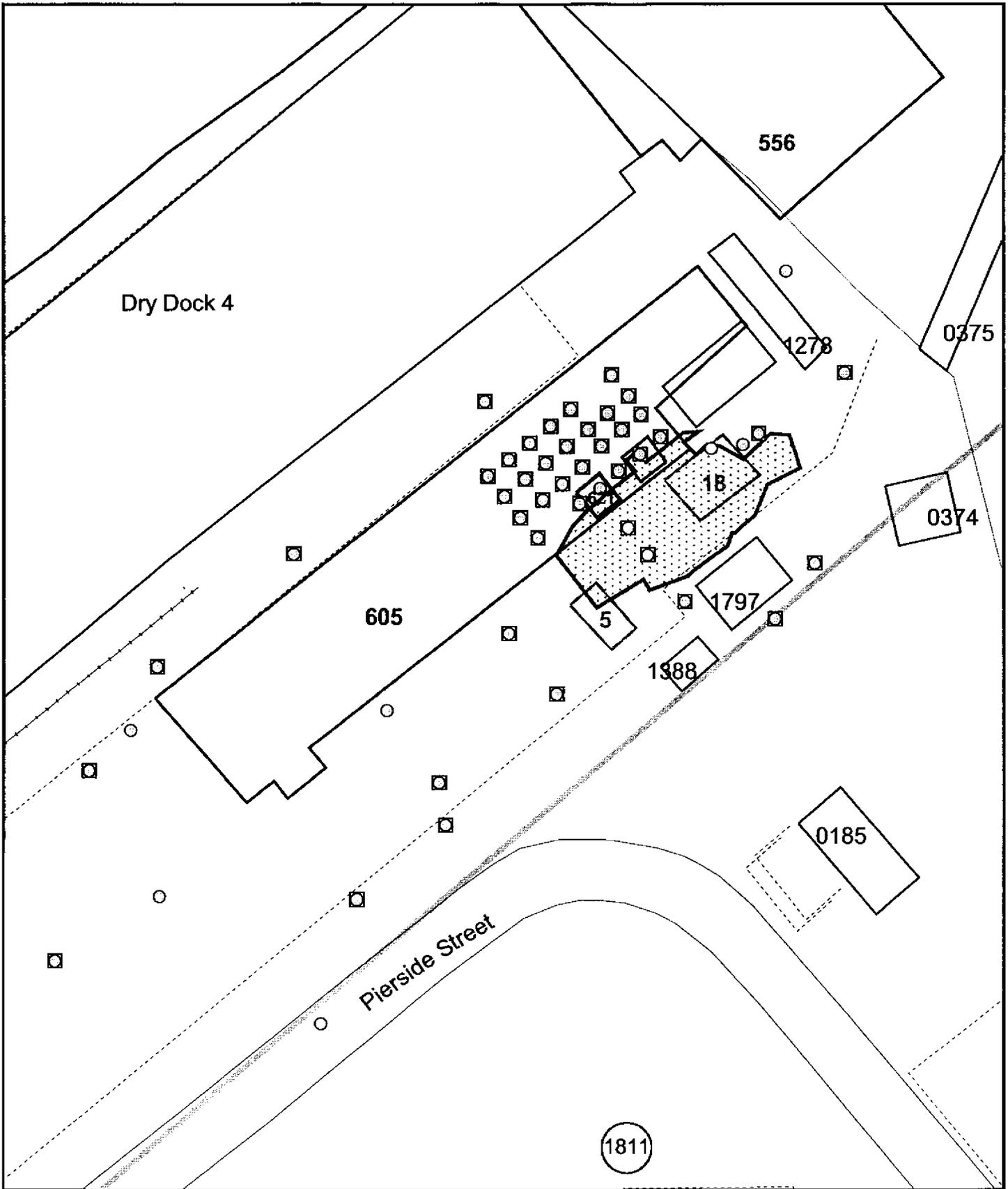
( ) Parentheses indicate number of samples proposed.  
 Standard Suite = VOCs, SVOCs, metals, cyanide, pesticides and PCBs at DQO Level III.  
 Appendix IX = Standard Suite, plus hex-chrome, dioxins, herbicides, and OP pesticides at DQO Level IV.  
 Source: EnSafe, 1997; DET, 1999.

**TABLE 2-2**  
 Historical Groundwater Sampling Summary for SWMU 5, SWMU 18, and AOC 605  
*IM Work Plan, SWMU 5, SWMU 18, AOC 605, and AOC 621, Zone E, Charleston Naval Complex*

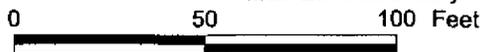
| <b>Depth</b> | <b>Wells Proposed</b> | <b>Wells Installed</b> | <b>Analyses Proposed</b>  | <b>Analyses Collected</b>  | <b>Deviations</b>   |
|--------------|-----------------------|------------------------|---|--|---|
| Shallow      | 5                     | 5                      | Standard Suite <sup>a</sup> ,<br>chlorides, sulfates,<br>TDS, and<br>organotins | Standard Suite <sup>a</sup> ,<br>chlorides, sulfates,<br>TDS, and organotins | One free-product sample<br>collected and analyzed<br>for VOCs, SVOCs, and<br>pesticides |

<sup>a</sup> Standard Suite includes VOCs, SVOCs, metals, cyanide, pesticides, and PCBs  
 Source: EnSafe, 1997.

NOTE: Original figure created in color



- Surface Soil Sample
- ◻ Subsurface Soil Sample
- Former Surface Soil Sample
- ◻ Former Subsurface Soil Sample
- ⚡ Fence
- ⚡ Roads
- ▨ Area of Excavation
- ▭ AOC Boundary
- ▭ SWMU Boundary
- ▭ Buildings
- ▭ Zone Boundary

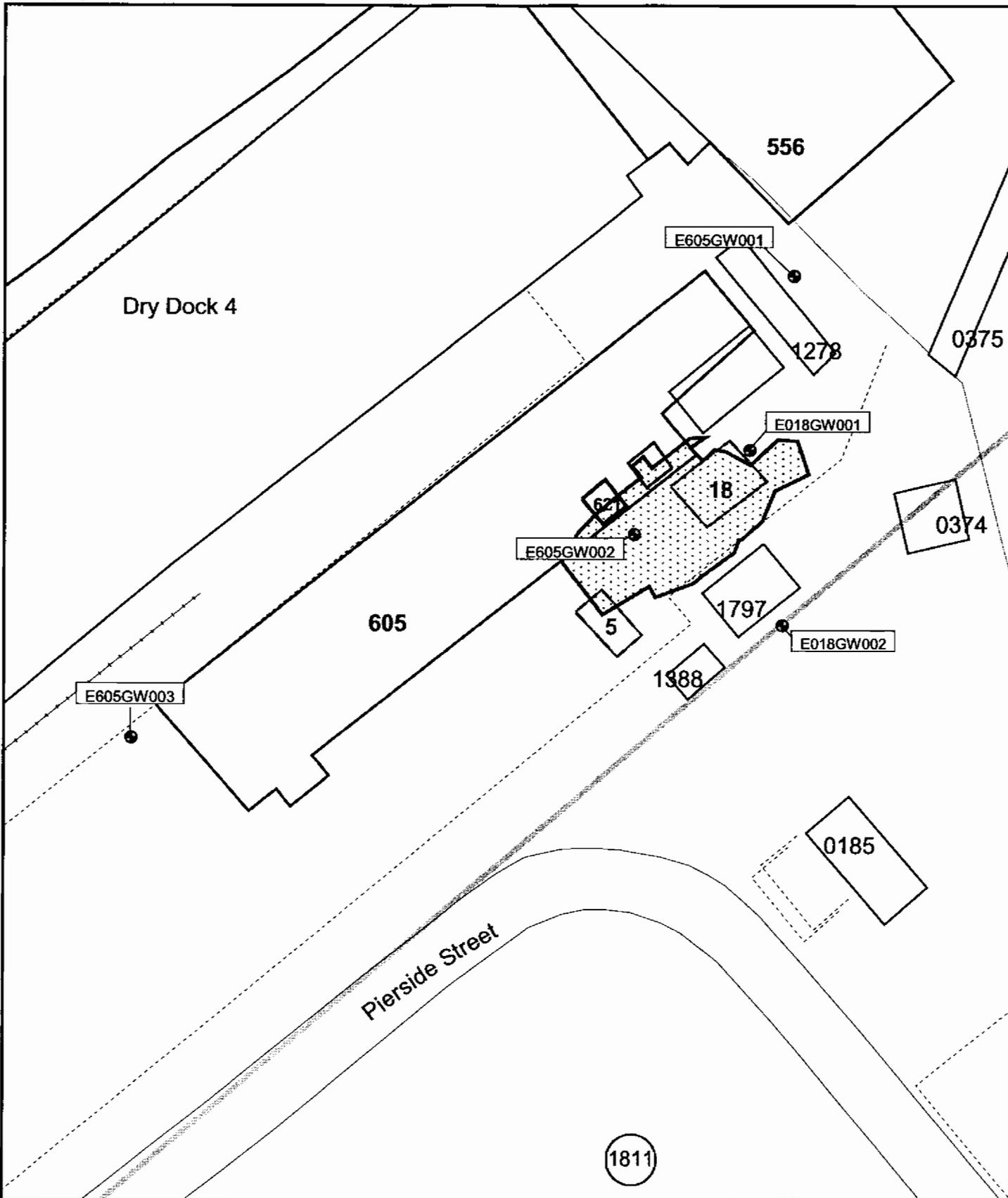


1 inch = 50 feet

**Figure 2-1**  
 Historical Surface and Subsurface Soil Location Map  
 SWMU 5, SWMU 18, AOC 605, and AOC 621  
 Zone E  
 Charleston Naval Complex

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NOTE: Original figure created in color



- Groundwater Well
- Shoreline
- - - Fence
- ≡ Railroads
- ≡ Roads
- ▣ Area of Excavation
- ▭ AOC Boundary
- - - SWMU Boundary
- ▭ Buildings
- ⋯ Zone Boundary



0 50 100 Feet

1 inch = 50 feet

Figure 2-2

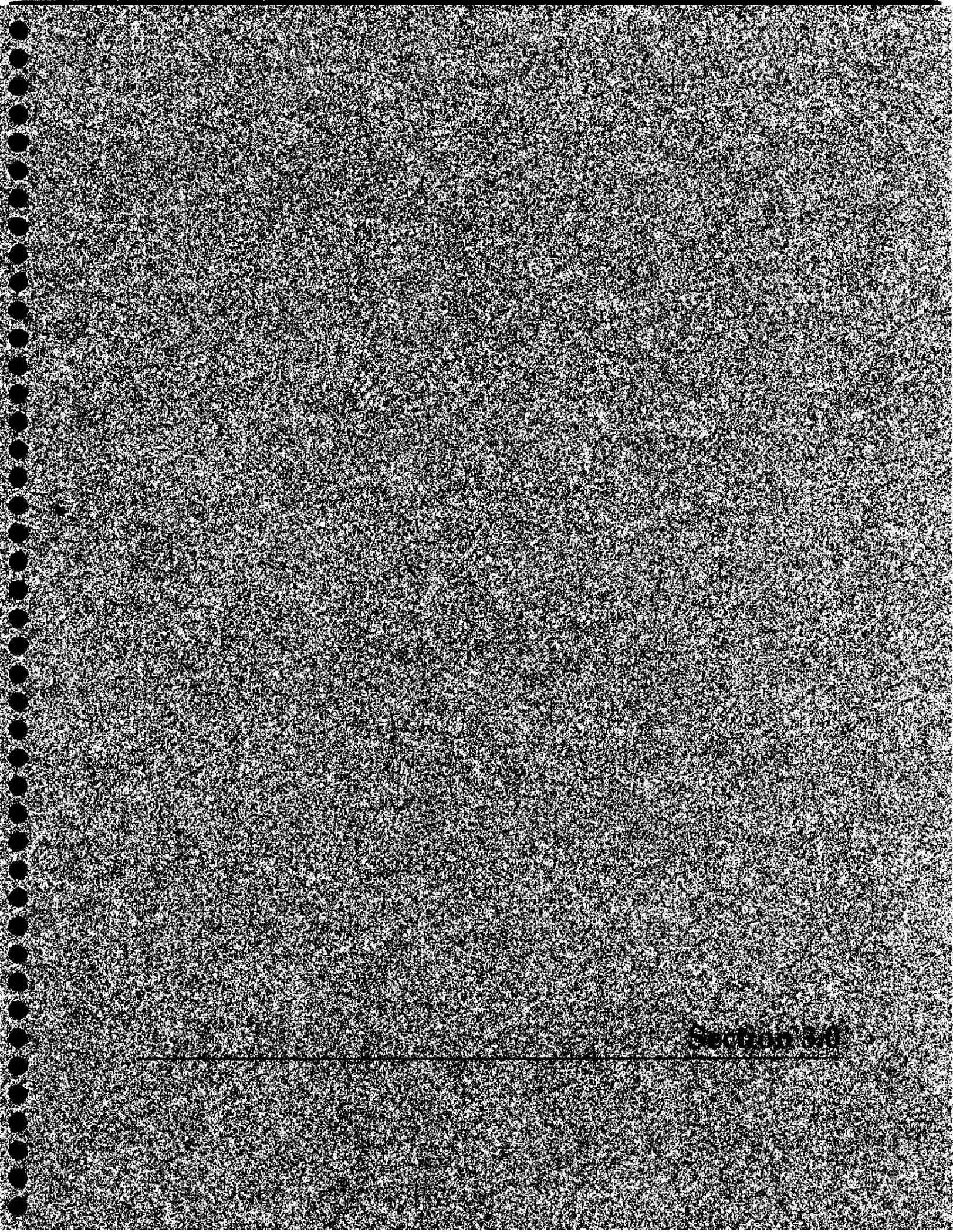
Historical Groundwater Sample Location Map

SWMU 5, SWMU 18, AOC 605, and AOC 621

Zone E

Charleston Naval Complex

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Page 14

## 3.0 Technical Approach

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Based on an evaluation of the data collected during the RFI and a comparison to COPC screening criteria currently used by the BRAC Cleanup Team (BCT), lead, nickel, and dieldrin in surface soil require further delineation. Figures 3-1 through 3-3 present sample concentration exceedances of these constituents, respectively. In addition, lead, nickel, alpha-BHC, and 2,4-dinitrotoluene in subsurface soil constituents require further delineation. Figures 3-4 through 3-7 present sample concentration exceedances of these constituents, respectively. The additional delineation sampling proposed in this section will focus on these parameters. The extent of lead in groundwater above its TTAL will also be delineated.

A full evaluation and presentation of the COPC screening against current criteria as well as a COPC/COC refinement analysis will be provided in an RFI Report Addendum, which will be developed by CH2M-Jones after collection and analyses of the samples proposed in this IM Work Plan. An IM Completion Report will be provided as a section in the RFI Report Addendum, in order to document activities conducted under the IM.

### 3.1 Surface and Subsurface Soil Sampling and Analysis

Additional samples will be collected to facilitate evaluation of surface soil and subsurface soil at the locations shown in Figure 3-8. The analyses that will be performed on these samples are presented in Table 3-1. If any of the delineation samples exceed the screening criteria, then additional soil samples will be collected farther out for analysis in order to complete the delineation.

The samples will be collected using hand augers, and the sampling will be performed in accordance with the *Environmental Services Division Standard Operating Procedures and Quality Assurance Manual (ESDSOPQAM)* (EPA, 1996).

At all boring locations the samples will be collected from the following depths:

- 0 to 1 feet below land surface (ft bls)
- 3 to 5 ft bls

In addition to the sampling which will be conducted to determine the nature and extent of the contamination, surface soil and subsurface soil samples will be collected for additional

1 characterization using synthetic precipitation leaching procedure (SPLP) tests at three  
2 locations associated with the highest lead concentrations and at three locations not impacted  
3 by historical operations (a total of six locations, with two samples each). Figure 3-9 presents  
4 the proposed SPLP surface and subsurface soil sampling locations. These data will be used  
5 to evaluate the partition coefficient for lead and assist in developing a target MCS for  
6 subsurface soil.

## 7 **3.2 Groundwater Sampling and Analysis**

8 In order to further determine the nature and extent of lead-impacted groundwater, a  
9 minimum of two temporary wells (E605GP001 and E605GP002) will be installed north and  
10 west of AOC 621. Since these groundwater samples are being collected to support the  
11 delineation of lead in groundwater, they will be analyzed for the eight RCRA metals, only.

12 If the results from the temporary wells indicate that lead is not present in groundwater at  
13 concentrations exceeding the screening criteria, then the temporary wells will be converted  
14 to permanent wells. However, if the screening criteria are exceeded, the affected temporary  
15 well(s) will be abandoned and additional temporary wells will be installed and sampled for  
16 the eight RCRA metals. Once delineation is complete, the two outermost non-impacted  
17 wells will be converted to permanent wells to provide access for long-term monitoring, if  
18 necessary.

19 In addition, samples will be collected from the three existing shallow monitoring wells  
20 (E018GW001, E018GW002, and E605GW002) and analyzed for the eight RCRA metals. All  
21 existing wells in the vicinity will be gauged for free products prior to sampling. Figure 3-10  
22 presents the proposed groundwater well locations.

## 23 **3.3 Sampling and Analysis Plan**

24 All investigative work will be performed in accordance with the Comprehensive Sampling  
25 and Analysis Plan (CSAP) portion of the *Zone E RFI Work Plan, Revision 1* (EnSafe, 1995). All  
26 samples will be analyzed for the associated COPC(s) identified by media as listed in Table  
27 3-1 (see Figures 3-8, 3-9, and 3-10).

## 28 **3.4 Health and Safety**

29 CH2M-Jones places significant emphasis on the health and safety of our personnel, our  
30 subcontractors, and the local community. Once all personnel have arrived on site as part of

1 the mobilization phase of the IM, a project briefing and health and safety orientation meet-  
2 ing will be held. All work completed as part of this IM will be performed in accordance with  
3 the CH2M-Jones Site-Specific Health and Safety Plan (CH2M-Jones, 2000).

4 Personnel working at the site will be required to comply with Level D personal protective  
5 equipment (PPE) requirements, as specified in the CH2M-Jones Site-Specific Health and  
6 Safety Plan.

### 7 **3.5 Site Clearance**

8 Prior to the commencement of sample collection activities, the soil boring locations will be  
9 marked or staked in the field using coordinates derived from the CNC Environmental  
10 Geographic Information System (EGIS) tool and utilizing Global Positioning System (GPS)  
11 equipment.

12 To prepare for the start of onsite operations, CH2M-Jones will notify the necessary agencies,  
13 departments, and utilities regarding planned activities at the project site.

14 A well request will be necessary for the groundwater sampling activities. This well request  
15 will be obtained from SCDHEC prior to the initiation of field activities.

16 CH2M-Jones will examine the site for existing water, electricity, natural gas, telephone, or  
17 other utility lines that are potential hazards at the site. Utilities will be clearly marked and  
18 identified.

### 19 **3.6 Site Security Zones**

20 Work areas will be designated, and site control procedures, including the use of caution  
21 tape to designate the work exclusion zone, daily site security, and site cleanliness and  
22 maintenance procedures will be reviewed and implemented. Potential tripping or falling  
23 hazards will be identified and flagged to alert site personnel. Vehicle access areas will be  
24 identified and site traffic will be monitored.

### 25 **3.7 Waste Management and Disposal**

26 Four waste streams will be generated as part of this IM: 1) pavement debris, 2) soil cuttings,  
27 3) decontamination wastes, and 4) used PPE. Soil cuttings will be characterized in  
28 accordance with South Carolina Hazardous Waste Management Regulations (Section  
29 SCDHEC R.61-79.261) and disposed of and/or treated in accordance with all applicable

- 1 regulations and permits. Decontamination wastes and used PPE will also be disposed in  
2 accordance with pertinent regulations.
- 3 Pavement debris will be transported off site for disposal and/or treatment either by asphalt  
4 recycling or landfilled as demolition debris.
- 5 Offsite transportation and disposal will be performed by properly permitted and licensed  
6 subcontractors. Materials designated for offsite disposal and/or treatment will be  
7 documented, tracked, and their disposition verified. This information will be documented in  
8 the IM Completion Report.

### 9 **3.8 Equipment Decontamination**

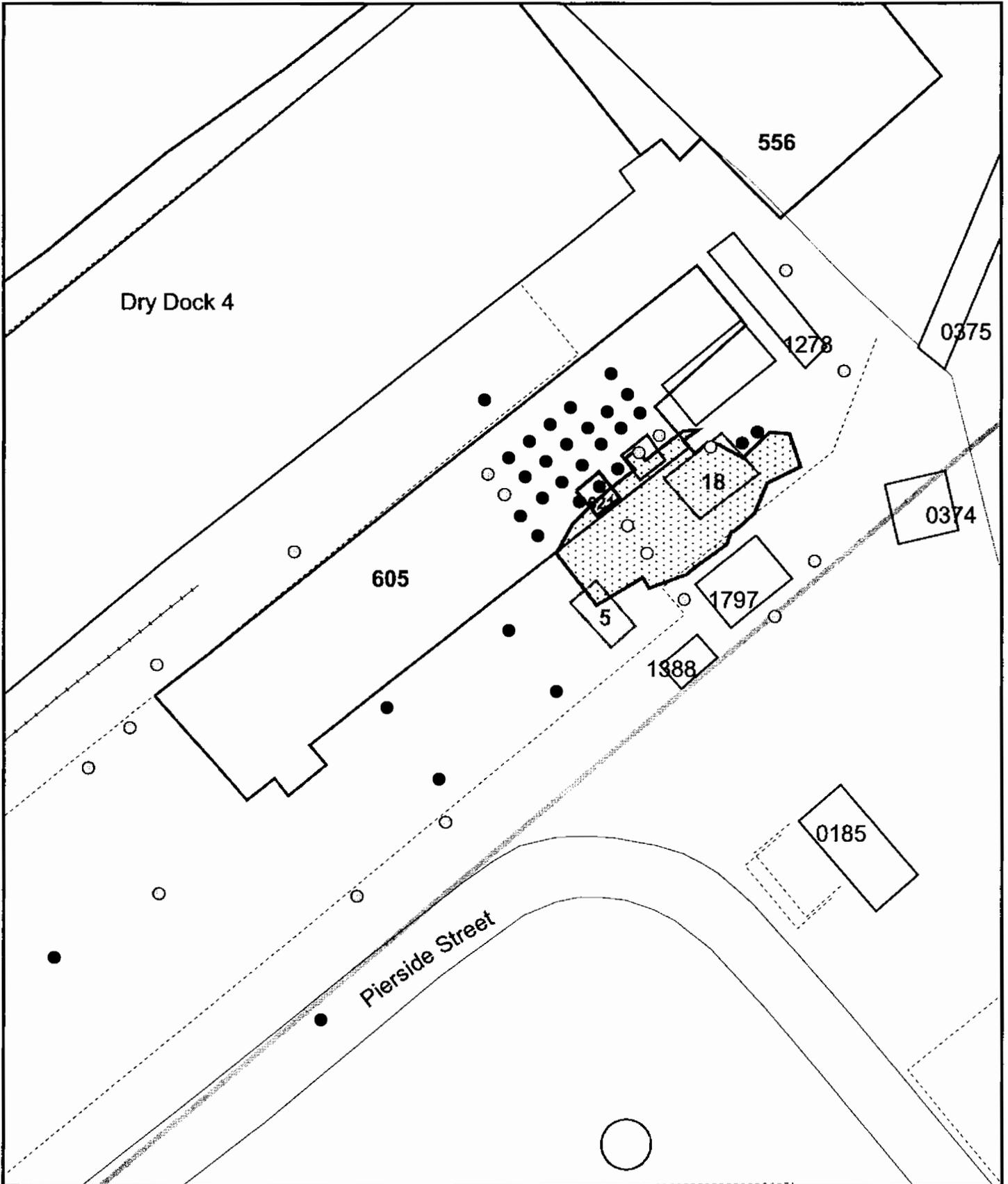
- 10 Decontamination of personnel, sampling equipment, and materials will be in accordance  
11 with the CH2M-Jones Site-Specific Project Health and Safety Plan.

**TABLE 3-1**  
 Analytical Summary for Additional Sampling Activities  
 SWMU 5, SWMU 18, AOC 605, and AOC 621, Zone E, Charleston Naval Complex

| Constituent             | Number of Sample Points <sup>a</sup> | Analytes    |
|-------------------------|--------------------------------------|-------------|
| <b>Surface Soils</b>    |                                      |             |
| Lead                    | 33                                   | Lead        |
| Nickel                  | 16                                   | Nickel      |
| Dieldrin                | 7                                    | Pesticides  |
| SPLP                    | 6                                    | SPLP metals |
| <b>Subsurface Soils</b> |                                      |             |
| Lead                    | 30                                   | Lead        |
| Nickel                  | 16                                   | Nickel      |
| alpha-BHC               | 7                                    | Pesticides  |
| 2,4-Dinitrotoluene      | 3                                    | SVOCs       |
| SPLP                    | 6                                    | SPLP metals |
| <b>Groundwater</b>      |                                      |             |
| Lead                    | 5<br>(plus 2 contingent points)      | RCRA metals |

<sup>a</sup> See Figure 3-8 for surface and subsurface soil sampling locations, Figure 3-9 for SPLP sampling locations, and Figure 3-10 for groundwater sampling locations.

NOTE: Original figure created in color



- Non-exceedance
- Exceeds 400 mg/kg (SSL)
- Excavated
- ∧ Fence
- ∧ Roads
- ∧ Shoreline

- AOC Boundary
- SWMU Boundary
- Buildings



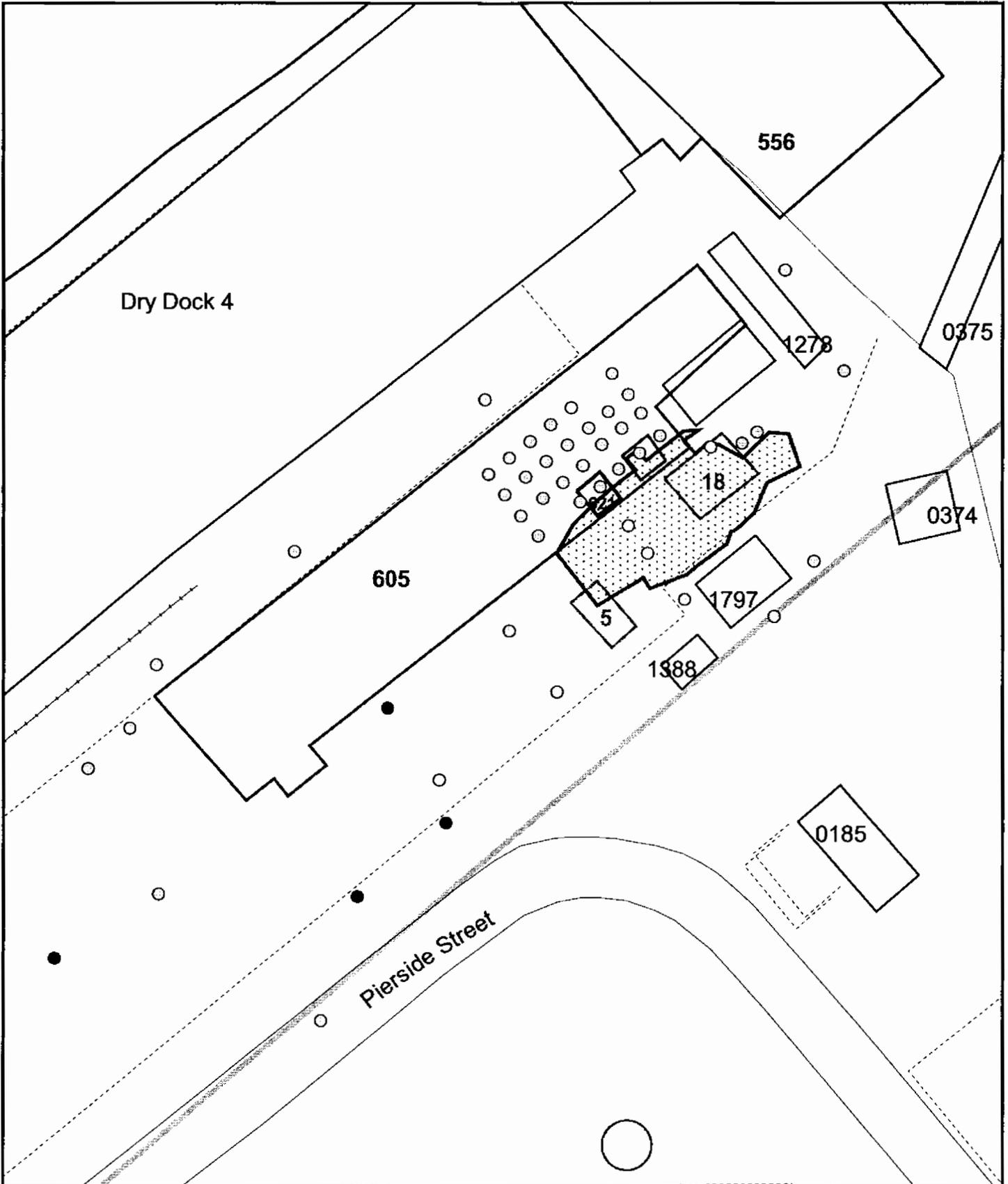
0 50 100 Feet

1 inch = 50 feet

**Figure 3-1**  
Surface Soil Lead Exceedance Map  
SWMU 5, SWMU 18, AOC 605, and AOC 621 Zone E  
Charleston Naval Complex

**CH2MHILL**

NOTE: Original figure created in color



**Figure 3-2**  
Surface Soil Nickel Exceedance Map  
SWMU 5, SWMU 18, AOC 605, AOC 621 Zone E  
Charleston Naval Complex

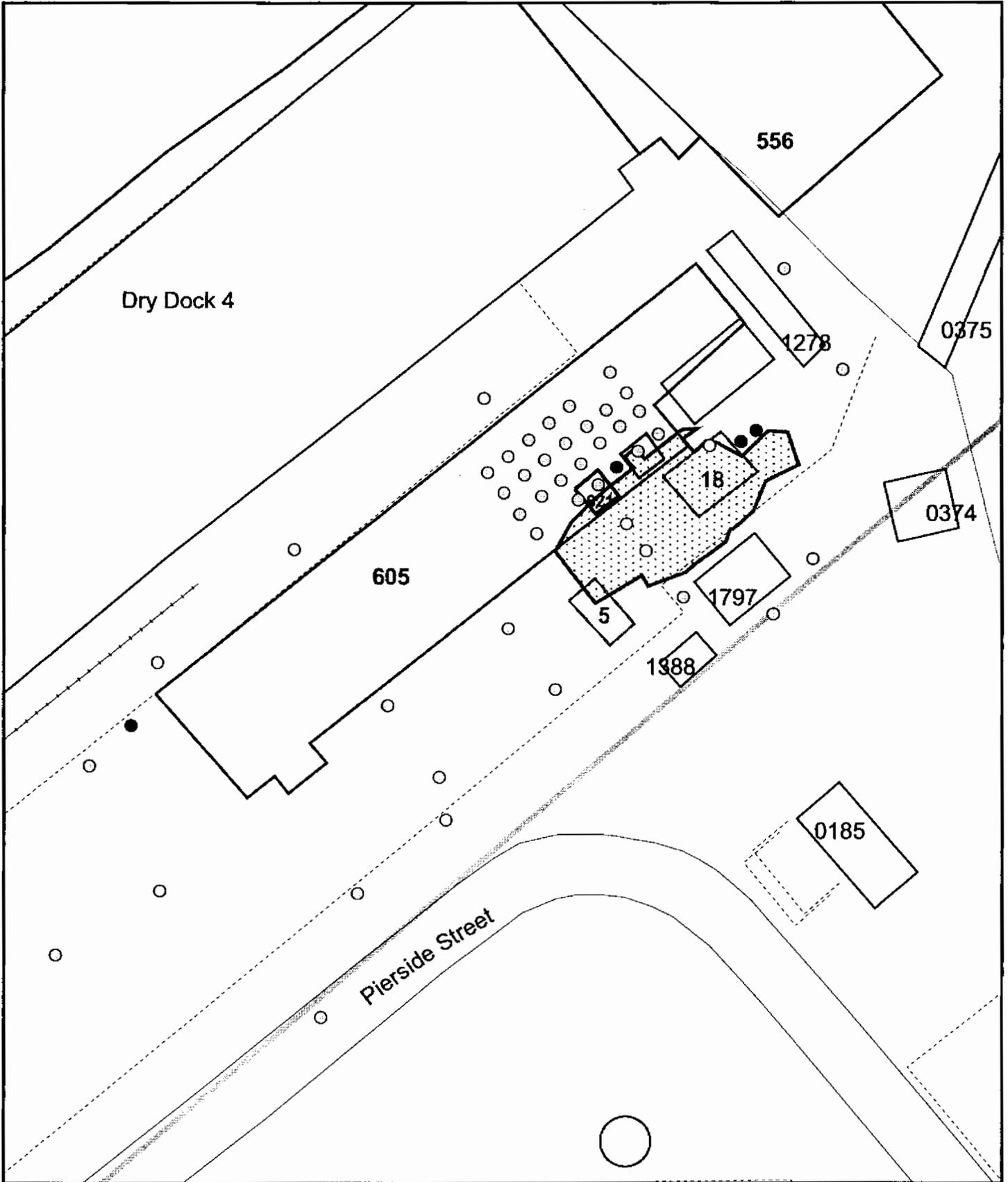
● Exceeds 65 mg/kg (SSL)    ◻ AOC Boundary  
○ Non-exceedance            ◻ SWMU Boundary  
○ Excavated                    ◻ Buildings  
- - - Fence  
- - - Roads  
- - - Shoreline

0                      50                      100 Feet

1 inch = 50 feet

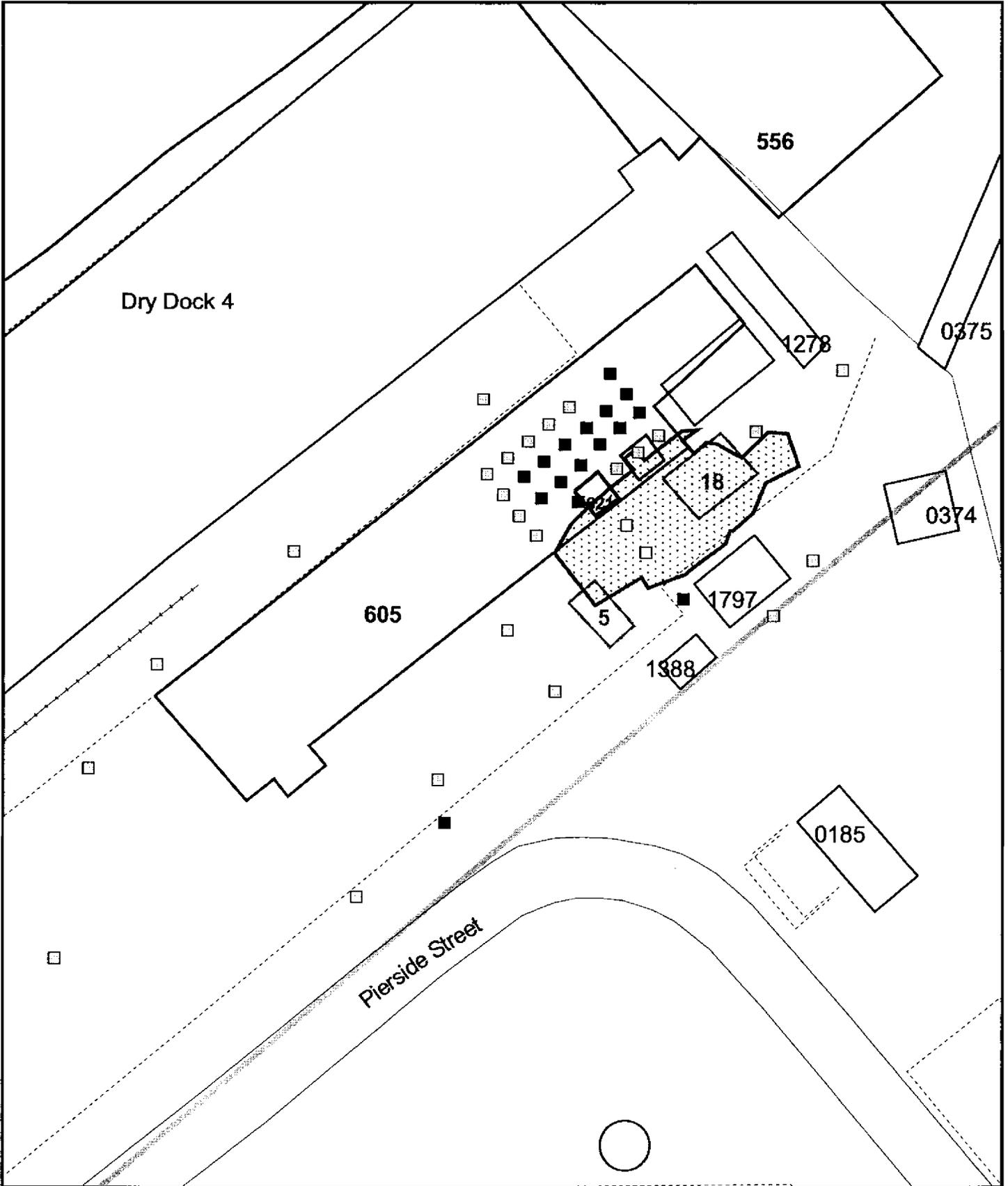
**CH2MHILL**

NOTE: Original figure created in color



|                            |                 |                  |               |   |
|----------------------------|-----------------|------------------|---------------|---|
| ● Exceeds .002 mg/kg (SSL) | ▭ AOC Boundary  | N                | 0 50 100 Feet | <b>Figure 3-3</b><br>Surface Soil Dieltrin Exceedance Map<br>SWMU 5, SWMU 18, AOC 605, and AOC 621 Zone E<br>Charleston Naval Complex |
| ○ Non-exceedance           | ▭ SWMU Boundary |                  |               |   |
| ○ Excavated                | ▭ Buildings     | 1 inch = 50 feet |               | <b>CH2MHILL</b>   |
| ⋯ Fence                    |                 |                  |               |   |
| ⋯ Roads                    |                 |                  |               |   |
| ⋯ Shoreline                |                 |                  |               |   |

NOTE: Original figure created in color



- Non-exceedance
- Exceeds 400 mg/kg (SSL)
- Removed
- △ Fence
- ∩ Roads
- ∩ Shoreline
- AOC Boundary
- SWMU Boundary
- Buildings



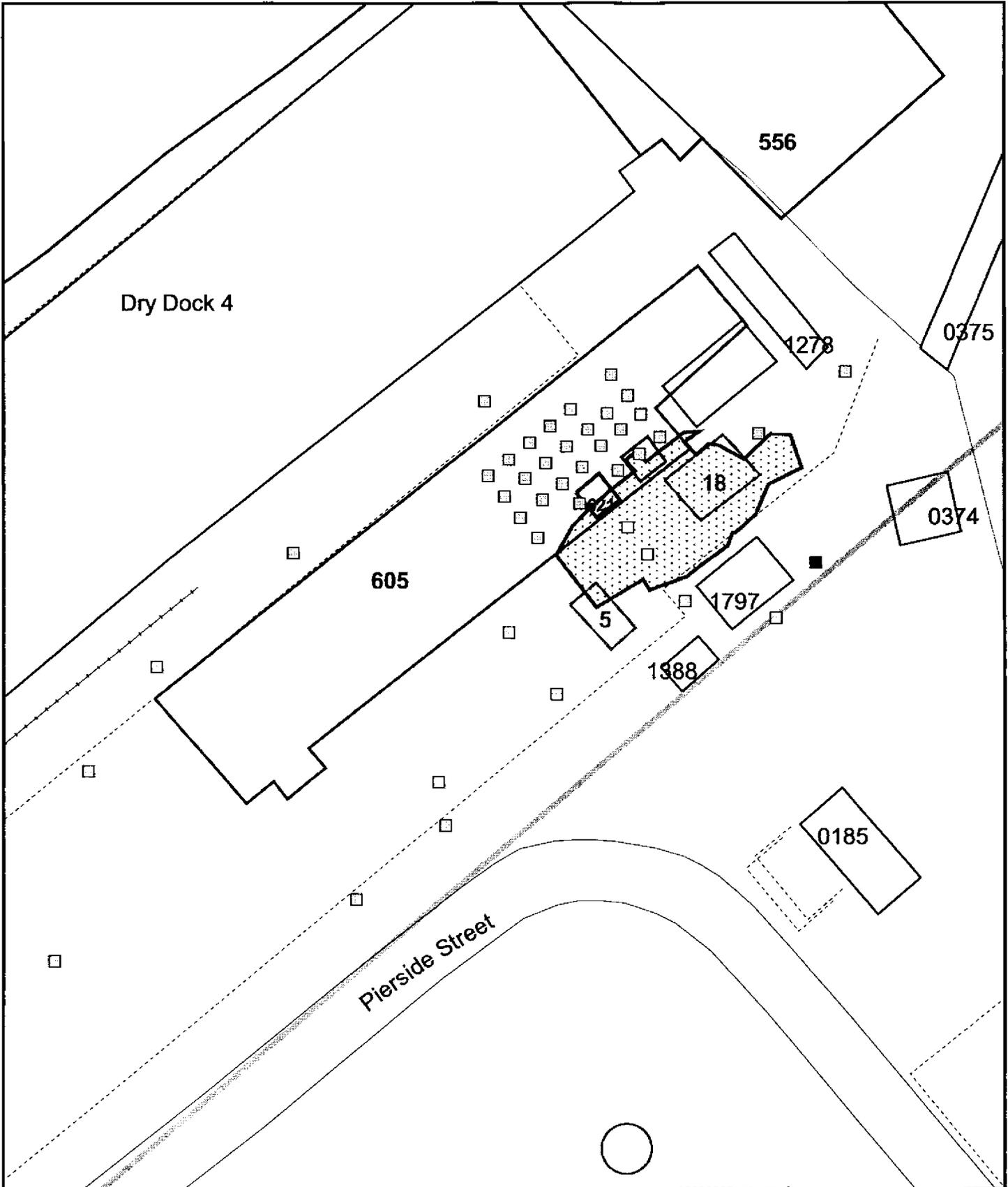
0 50 100 Feet

1 inch = 50 feet

**Figure 3-4**  
Subsurface Lead Exceedance Map  
SWMU 5, SWMU 18, AOC 605, and AOC 621 Zone E  
Charleston Naval Complex

**CH2MHILL**

NOTE: Original figure created in color



- Exceeds 65 mg/kg (SSL)
- Non-exceedance
- Excavated
- Fence
- Roads
- Shoreline
- AOC Boundary
- SWMU Boundary
- Buildings



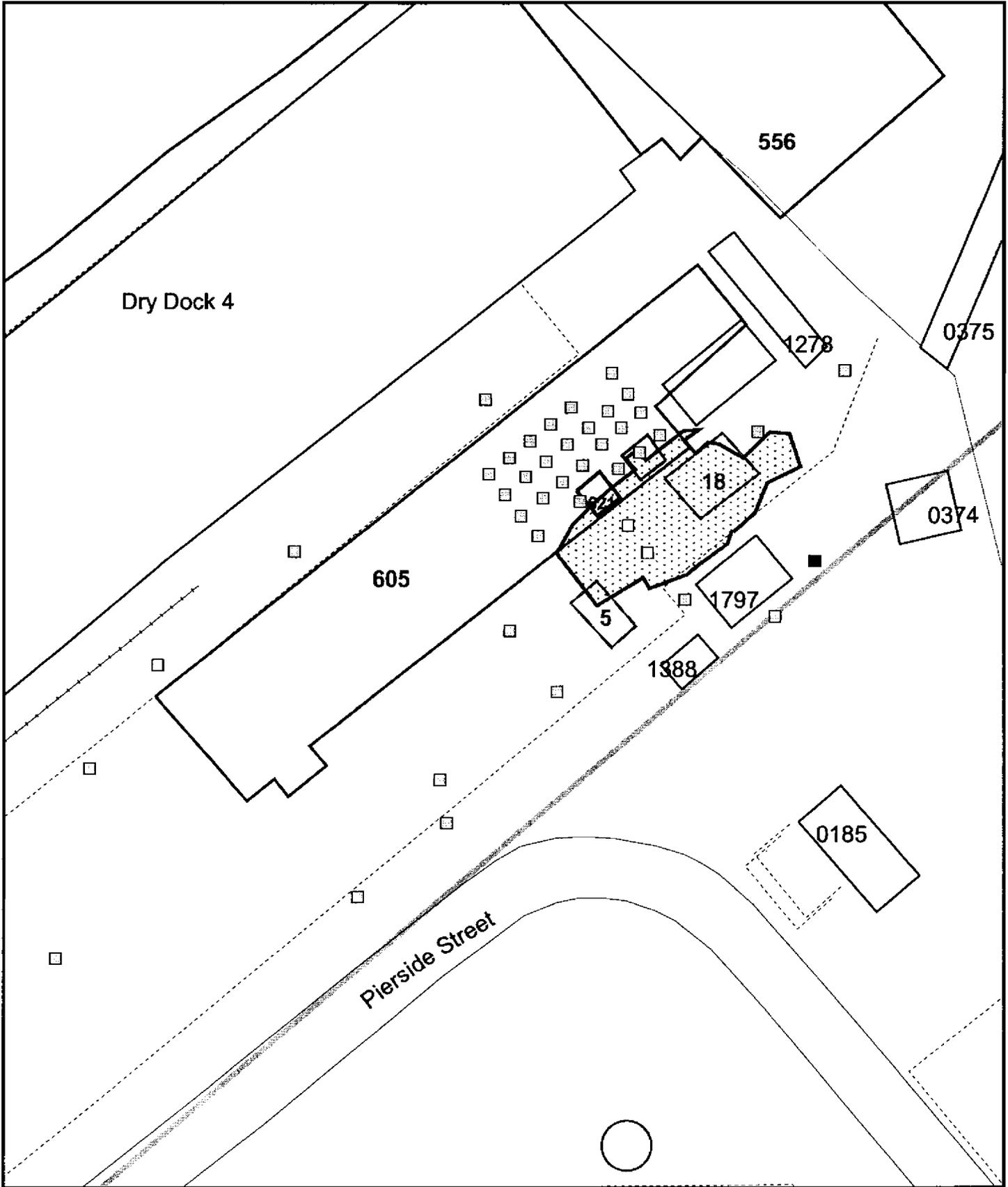
0 50 100 Feet

1 inch = 50 feet

**Figure 3-5**  
Subsurface Soil Nickel Exceedance Map  
SWMU 5, SWMU 18, AOC 604, and AOC 621 Zone E  
Charleston Naval Complex

**CH2MHILL**

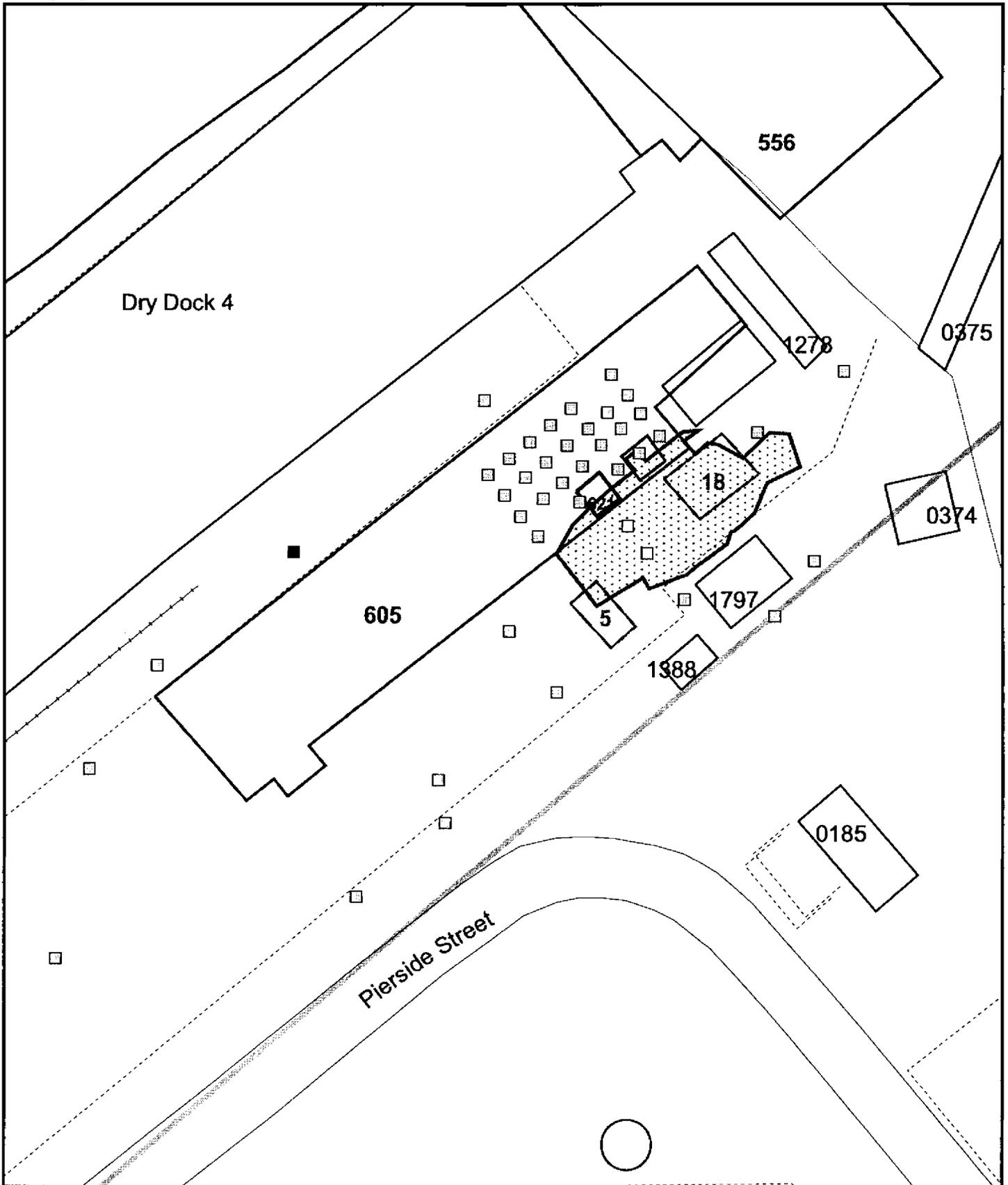
NOTE: Original figure created in color



**Figure 3-6**  
Subsurface Soil Alpha-BHC Exceedance Map  
SWMU 5, SWMU 18, AOC 605, and AOC 621 Zone E  
Charleston Naval Complex

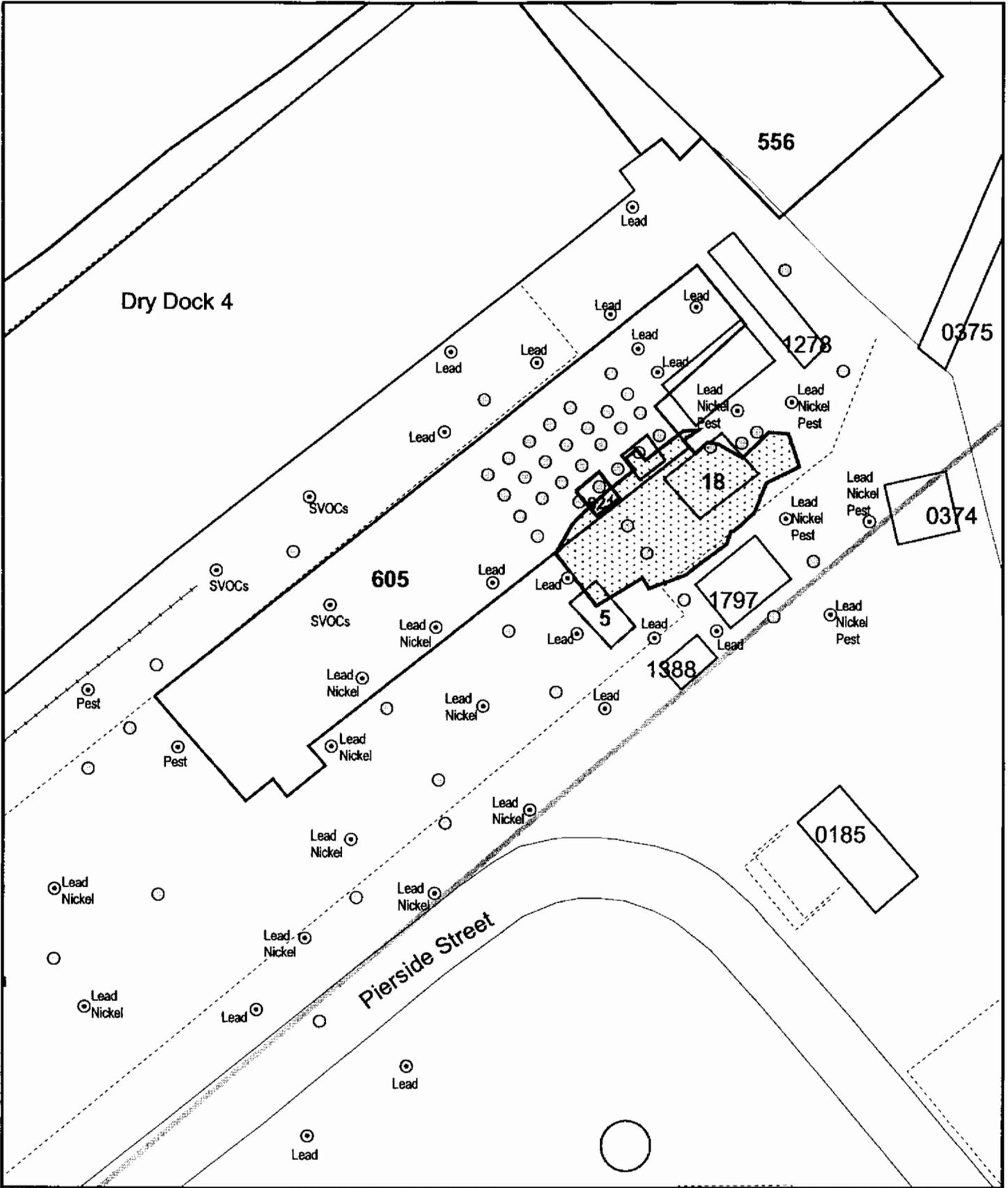
**CH2MHILL**

NOTE: Original figure created in color



|                             |                 |                  |               |   |
|-----------------------------|-----------------|------------------|---------------|---|
| ■ Exceeds .0004 mg/kg (SSL) | ▭ AOC Boundary  | N                | 0 50 100 Feet | Figure 3-7<br>Subsurface Soil 2,4-Dinitrotoluene Exceedance Map<br>SWMU 5, SWMU 18, AOC 605, and AOC 621 Zone E<br>Charleston Naval Complex |
| □ Non-exceedance            | ▭ SWMU Boundary |                  |               |   |
| □ Excavated                 | ▭ Buildings     | 1 inch = 50 feet |               | <b>CH2MHILL</b>   |
| ∩ Fence                     |                 |                  |               |   |
| ∩ Roads                     |                 |                  |               |   |
| ∩ Shoreline                 |                 |                  |               |   |

NOTE: Original figure created in color



- ⊙ Proposed Soil Sample Location
- Surface Soil
- - - Fence
- ≡ Railroads
- ≡ Roads
- ≡ Shoreline
- ▭ AOC Boundary
- ▭ SWMU Boundary
- ▭ Buildings



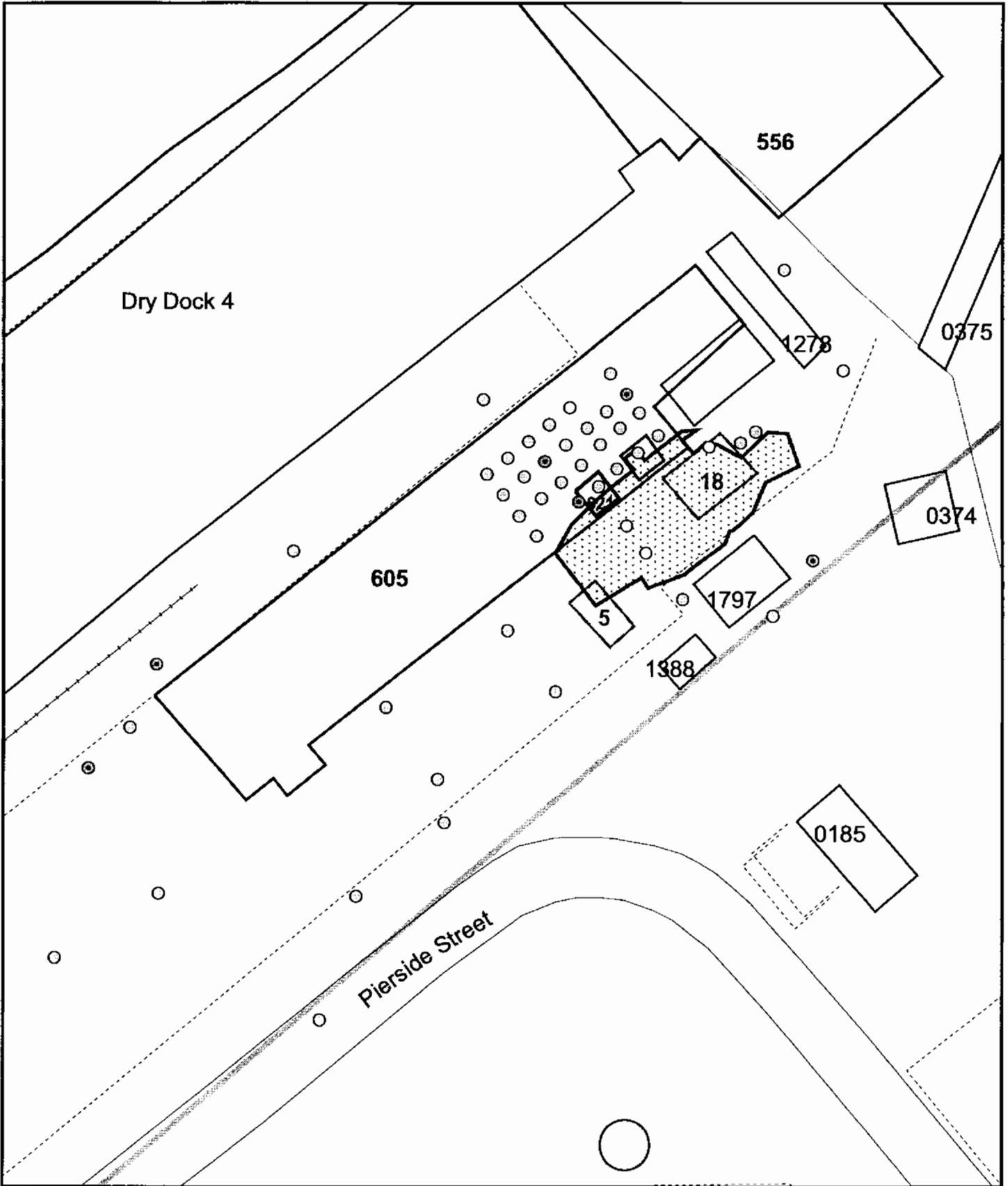
0 50 100 Feet

1 inch = 50 feet

**Figure 3-8**  
 Proposed Soil Sample Location Map  
 SWMU 5, SWMU 18, AOC 605, and AOC 621 Zone E  
 Charleston Naval Complex

**CH2MHILL**

NOTE: Original figure created in color



- ⊙ Proposed SPLP Sample
- Non-exceedance
- Excavated
- Fence
- Railroads
- Roads
- Shoreline
- AOC Boundary
- SWMU Boundary
- Buildings
- Zone Boundary

1 inch = 50 feet

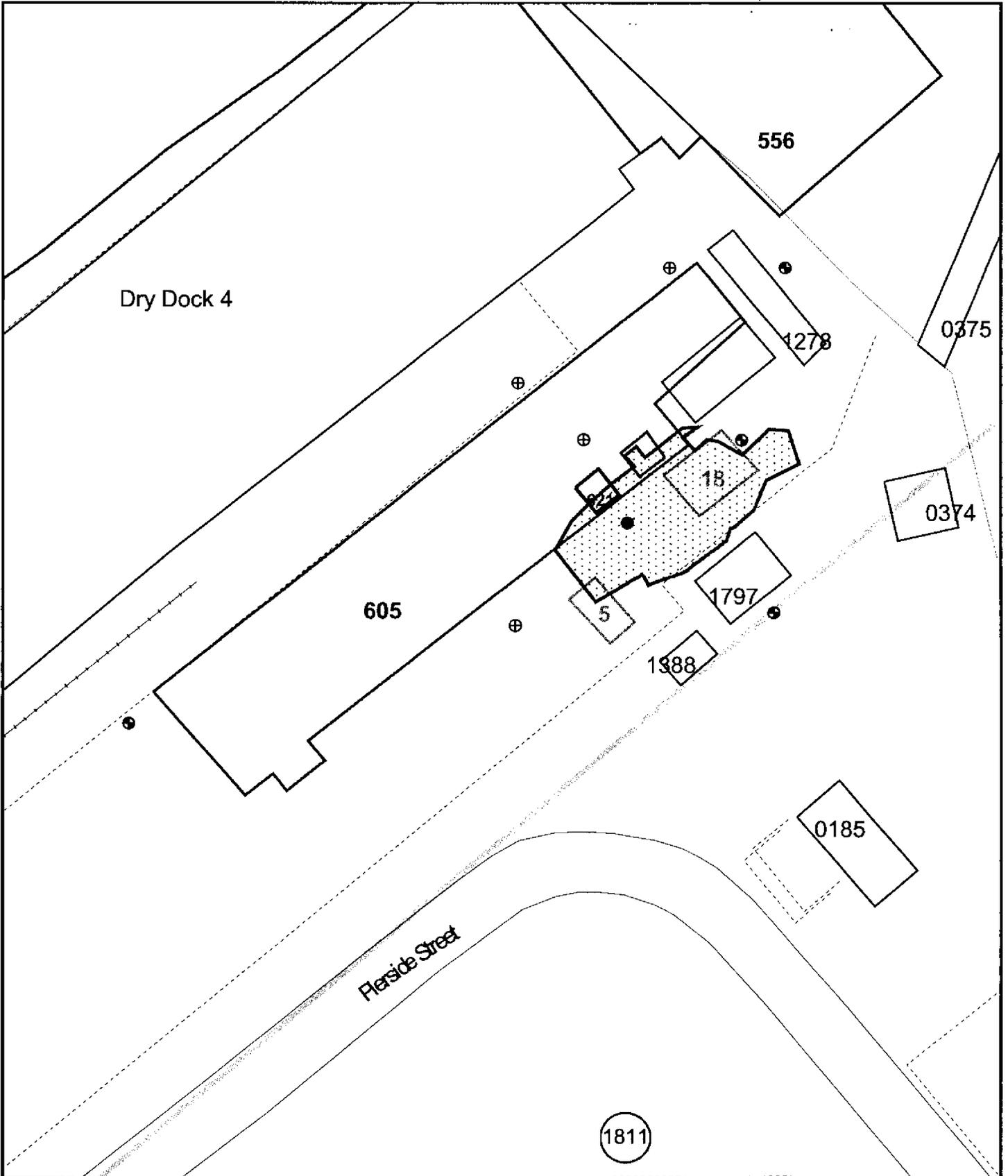


0 50 100 Feet

**Figure 3-9**  
 Proposed Surface and Subsurface Soil SPLP Sample Location Map  
 SWMU 5, SWMU 18, AOC 605, and AOC 621 Zone E  
 Charleston Naval Complex

**CH2MHILL**

NOTE: Original figure created in color



- ⊕ No Exceedance
- Exceeds 15 ug/L MCL-TT for Lead
- ⊕ Proposed Groundwater Sample
- Fence
- Railroads
- Roads
- Shoreline
- AOC Boundary
- SWMU Boundary
- Buildings
- Zone Boundary
- Area of Excavation



0 50 Feet

1 inch = 50 feet

**Figure 3-10**

Proposed Groundwater Well Locations  
 SWMU 5, SWMU 18, AOC 605, and AOC 621  
 Zone E  
 Charleston Naval Complex

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Section 40

## 4.0 Soil Delineation and Excavation

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### 4.1 Preliminary Media Cleanup Standards

The following preliminary MCSs are proposed to address SWMUs 5 and 18, and AOCs 605 and 621:

#### 4.1.1 Surface Soil

- Lead: the lower of the industrial land use target MCS or a site-specific SSL (to be presented in the Phase II IM Work Plan).
- Nickel: Generic SSL (DAF = 10) or site-specific SSL
- Dieldrin: Generic SSL (DAF = 10) or site-specific SSL

#### 4.1.2 Subsurface Soil

- Lead: site-specific SSL
- Nickel: Generic SSL (DAF = 10) or site-specific SSL
- alpha-BHC: Generic SSL (DAF = 10) or site-specific SSL
- 2,4-Dinitrotoluene: Generic SSL (DAF = 10) or site-specific SSL

Groundwater is not expected to be addressed as part of this IM. If necessary, groundwater will be addressed separately after assessment of the additional groundwater data.

Final MCSs for surface and subsurface soil will be proposed in the Phase II IM Work Plan, which will be submitted following completion of delineation activities. The following sections describe the general work approach expected to be used for the IM.

### 4.2 Soil Excavation

Prior to excavation, the pavement in the vicinity of the excavations will be removed as necessary. The final affected areas may be reduced by the presence of surface structures. No activities in or under existing site structures are planned for this IM.

At each location, the excavation will be to final depths based on the pre-excavation delineation, unless groundwater is encountered first. Excavation will not extend below the top of the water-bearing zone. Excavation will be performed using a backhoe or similar equipment. Excavated soils will be transferred immediately to a disposal container (e.g.,

1 lined roll-off box or similar container) and sampled for waste disposal characterization. The  
2 wastes will be transported to an appropriate offsite disposal facility according to  
3 appropriate regulations, based on the analytical results of waste characterization.  
4 The pavement removed from the excavation area will be staged separately for disposal off  
5 site.

### 6 **4.3 Site Restoration**

7 After the removal of the soils exceeding the target MCSs, the excavations will be back-filled  
8 with clean soil. Subsequent to the back-filling operations, the excavation areas may be paved  
9 with asphalt in order to restore the site to its original condition.

### 10 **4.4 Confirmatory Sampling**

11 Depending on the nature of the excavation required, additional confirmatory sampling  
12 during the excavation process may be required. The need for additional confirmation  
13 sampling will be addressed in the Phase II IMWP.

### 14 **4.5 IM Completion Report**

15 A final report will be submitted within 45 days of receipt of all final laboratory data. The  
16 report will summarize the actions that were taken and provide the following information:

- 17 • Excavated volumes
- 18 • Nature and volume of waste generated
- 19 • Waste transportation and disposal reports
- 20 • Analytical data reports
- 21 • Problems encountered during the IM and corrective measures implemented
- 22 • Other information that would be helpful in evaluating the success of the IM

Section 50

## 1 **5.0 References**

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- 2 CH2M-Jones. *Corporate Health and Safety Program – Program and Training Manual*. 2000.
- 3 EnSafe Inc. *Zone E RFI Report, NAVBASE Charleston*. Revision 0. November 1997.
- 4 EnSafe Inc./Allen & Hoshall. *Final RCRA Facility Assessment, NAVBASE Charleston*. June  
5 1995.
- 6 EnSafe Inc./Allen & Hoshall. *Final Zone E RFI Work Plan, NAVBASE Charleston*. Revision 1.  
7 June 1995.
- 8 EnSafe Inc. *Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) Report*.  
9 August 1997.
- 10 U.S. Naval Detachment. *Interim/Stabilization Measure Completion Report for SWMU 5, AOC*  
11 *605 and AOC 621 Battery Wrecking/Salvage Area*. April 1998.
- 12 U.S. Environmental Protection Agency (EPA). *Environmental Services Division Standard*  
13 *Operating Procedures and Quality Assurance Manual (ESDSOPQAM)*. 1996.