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SAMPLING AND ANALYSIS PLAN AREA OF CONCERN 573 (AOC 573) ZONE E WITH  
TRANSMITTAL CNC CHARLESTON SC  
4/16/2002  
CH2M HILL

POC 573 Zone E

SAMPLING and ANALYSES PLAN (RO)



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April 16, 2002

Dr. Dann Spariosu, Ph.D.,  
United States Environmental Protection Agency  
Region IV  
61 Forsyth Street  
4WD-FFB  
Atlanta, GA 30303.

Re: Sampling and Analysis Plan, AOC 573, Zone E, CNC

Dear Dr. Spariosu:

Enclosed is a copy of the Sampling and Analysis Plan, AOC 573 in Zone E of the Charleston Naval Complex (CNC). This Sampling and Analysis Plan (SAP) has been prepared to complete the RCRA Facility Investigation (RFI) activities and to provide information that can be used to make decisions regarding the need for corrective measures at the site.

This site was previously unassigned to either SCDHEC or USEPA for regulatory review. Based on e-mail correspondence between Mr. Dean Williamson (CH2M-Jones) and Mr. David Scaturo (SCDHEC), Mr. Scaturo agreed that regulatory review for this site be assigned to USEPA. Two copies of this SAP are also being sent to Mr. Tim Frederick, Gannett-Fleming.

Please contact me at (770)-604-9182, extension 255, should you have any questions or comments.

Sincerely,

CH2M HILL

A handwritten signature in black ink, appearing to read "Sam Naik", is written over a circular stamp or seal.

Sam Naik

cc: David Scaturo/SCDHEC w/att  
Tim Frederick/Gannett-Fleming, Inc., w/att  
Rob Harrell/Navy, w/att  
Dean Williamson/CH2M HILL, w/att  
Gary Foster/CH2M HILL, w/att

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# *Sampling and Analysis Plan*

## **Area of Concern 573, Zone E**

**Charleston Naval Complex  
North Charleston, SC**

Prepared for  
**U.S. Navy Southern Division  
Naval Facilities Engineering Command**

Prepared by  
**CH2M-Jones**

April 2002

Contract N62467-99-C-0960

# 1.0 Introduction

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## 1.1 Background

Previous investigations in the vicinity of Area of Concern (AOC) 573 in Zone E of the Charleston Naval Complex (CNC) have indicated the presence of some organic and inorganic constituents in soil above their respective chemical of potential concern (COPC) screening criteria. CH2M-Jones has prepared this Sampling and Analysis Plan (SAP) to complete the delineation of these site constituents in the field as part of the RCRA Facility Investigation (RFI) and to provide information that can be used to make decisions regarding the need for corrective measures at this site.

Figure 1-1 illustrates the location of Zone E within the CNC. Figure 1-2 is an aerial photograph of AOC 573.

## 1.2 Organization of the Sampling and Analysis Plan

This SAP consists of the following sections, including this introductory section:

**1.0 Introduction** – Presents the purpose of the SAP and background information regarding the site.

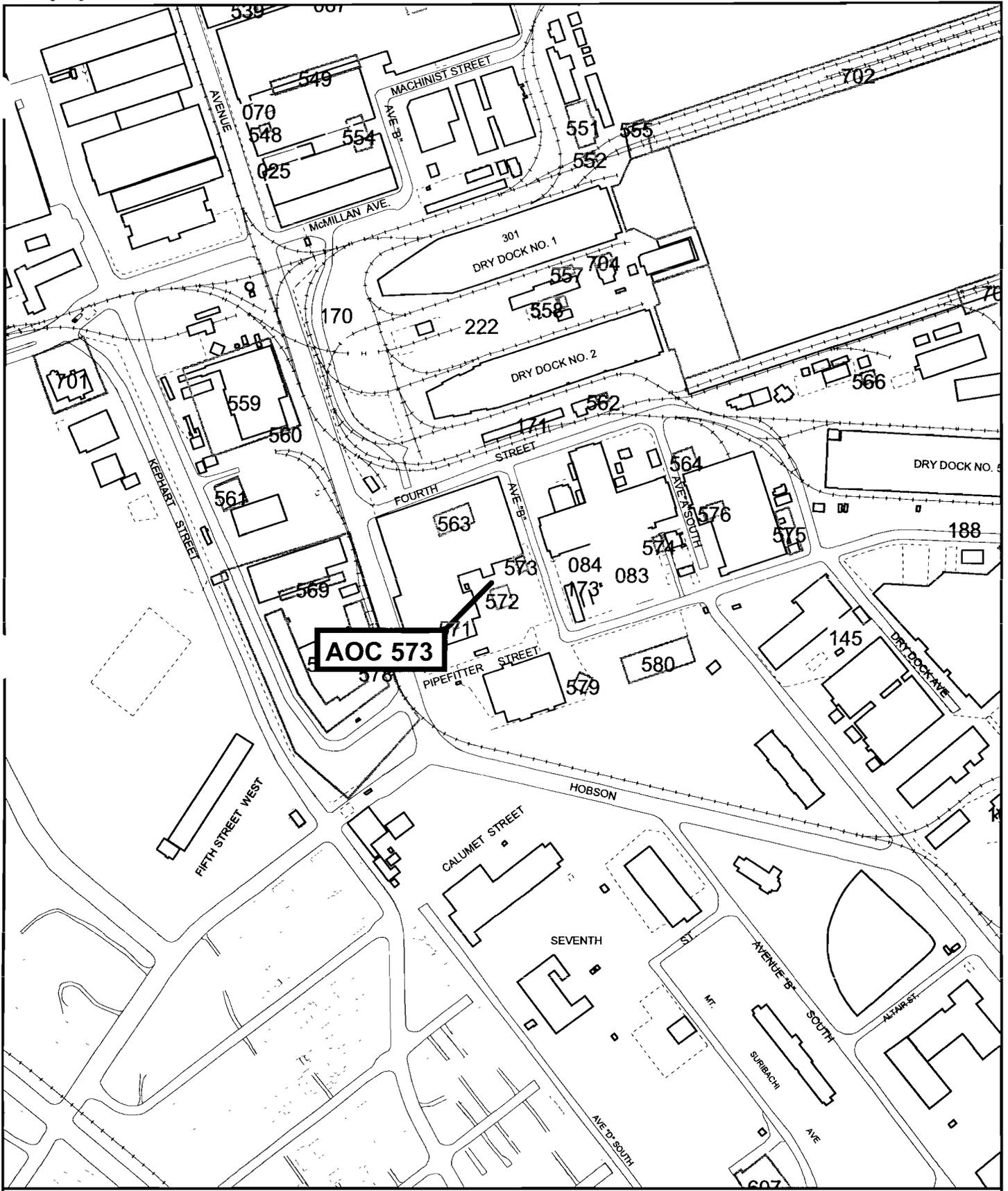
**2.0 Site Background** – Provides a brief description of AOC 573 and the findings of previous RFI activities.

**3.0 Proposed Sampling and Analysis** – Describes the investigative approach for delineation of COPCs to complete the RFI.

**4.0 References** – Lists the references used in this document.

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

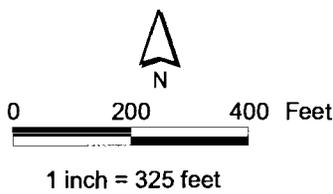
NOTE: Original figure created in color



**AOC 573**

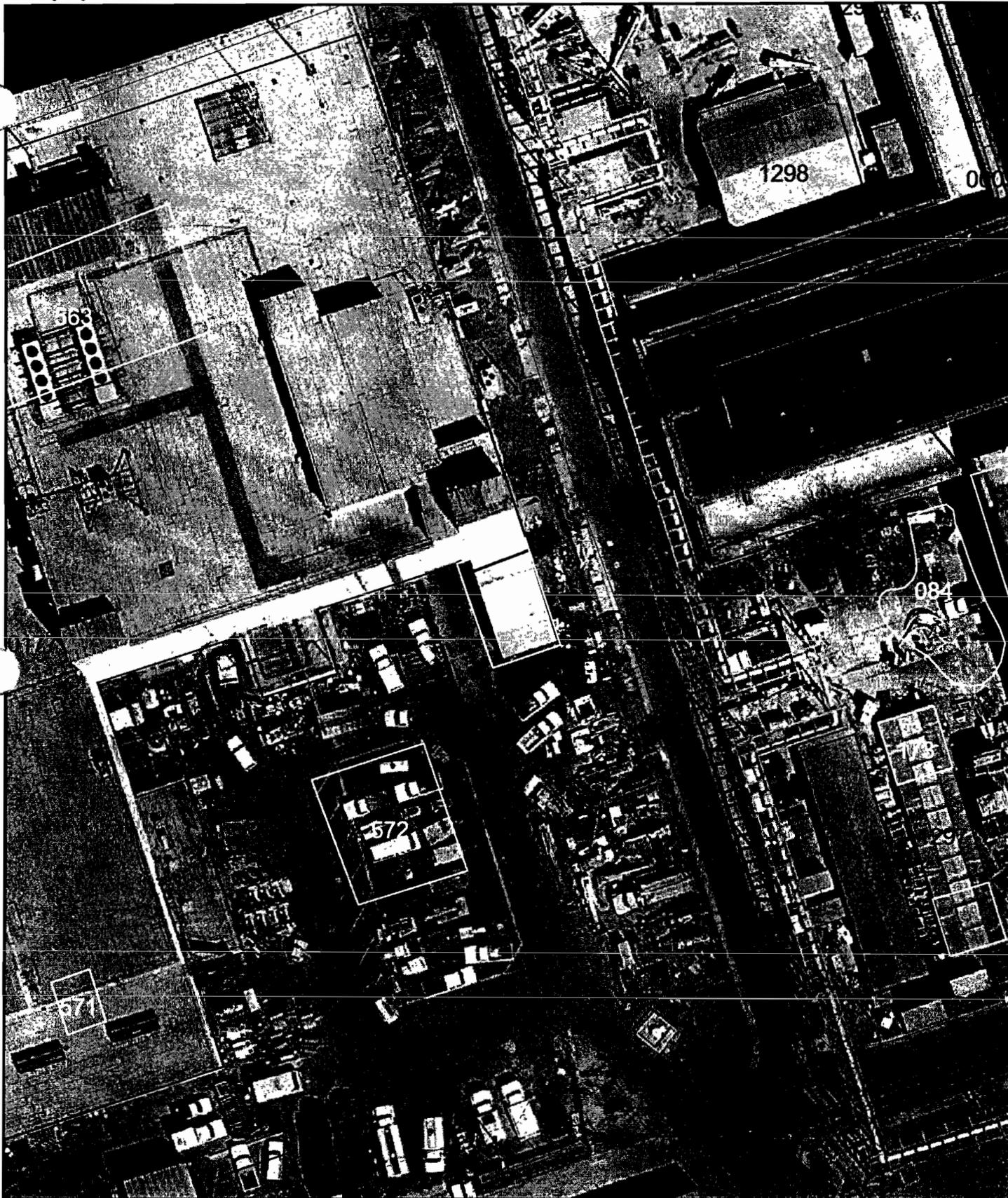
- Railroads
- Roads - Lines
- Shoreline
- AOC Boundary
- SWMU Boundary
- Buildings

Zone Boundary



**Figure 1-1**  
Location of AOC 573 in Zone E  
Charleston Naval Complex

NOTE: Aerial Photo Date is 1997  
NOTE: Original figure created in color



-  Fence
-  Roads - Lines
-  AOC Boundary
-  SWMU Boundary
-  Buildings



1 inch = 50 feet

**Figure 1-2**  
Site Map  
AOC 573, Zone E  
Charleston Naval Complex

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## 1 **2.0 Site Background**

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### 2 **2.1 Site Background and Setting**

#### 3 **AOC 573 – Anodizing Process, Building 177**

4 AOC 573 is a covered shed where an anodizing process was conducted. The shed is a 3-  
5 sided metal attachment to Building 177. The anodizing process included a 2,000-gallon  
6 irradiate (chromic acid solution) dipping tank and a spray area with a 110-gallon sump. The  
7 sump was used to collect excess spray and rinse water. Metal parts and antennas were  
8 dipped or sprayed and rinsed with tap water. This site was contained on three sides by a  
9 concrete berm. The fourth side sloped back to the sump. Before 1972, the sump was  
10 connected to the stormwater sewer.

11 AOC 573 is currently used by a vehicle maintenance shop as a storage facility for petroleum,  
12 oil, and lubricant (POL) substances. The sump is plugged. If the sump fills up, the contents  
13 are pumped into 55-gallon drums and are disposed as hazardous waste.

14 A review of historical engineering drawings for this site shows that railroad lines were  
15 previously located along the north, south, and west sides of the metal shed attached to  
16 Building 177 (see Figure 2-1). The railroad lines were either paved over or removed  
17 sometime after 1955.

18 This area of Zone E is zoned M2 (industrial). Materials of concern identified in the *Final Zone*  
19 *E RFI Work Plan, Revision 1* (EnSafe Inc. [EnSafe]/Allen & Hoshall, 1995) include acids,  
20 hexavalent chromium and other metals, and petroleum hydrocarbons.

### 21 **2.2 RFI Investigation Results**

#### 22 **Soil Investigation**

23 As part of the RFI field investigation, surface soil samples (0 to 1 foot below land surface [ft  
24 bls]) and co-located subsurface soil samples (3 to 5 ft bls) were collected in a single sampling  
25 event. Figure 2-2 shows historic RFI soil sample locations.

26 Soil samples were analyzed for VOCs, semivolatile organic compounds (SVOCs), metals,  
27 and pH. Four samples (two surface and two subsurface) were selected as duplicates and

1 were also analyzed for herbicides, organophosphorus pesticides, hexavalent chromium, and  
2 dioxins.

3 RFI activities at AOC 573 are described in the *Zone E RFI Report, Revision 0* (EnSafe, 1997).

4 **Surface Soil.** During the initial RFI, analytical results from surface soil samples were  
5 evaluated against the U.S. Environmental Protection Agency (EPA) Region III risk-based  
6 concentrations (RBCs) and the Zone E surface soil background reference concentrations  
7 (BRCs). Based on the analysis presented in the RFI report, benzo(a)pyrene equivalents  
8 (BEQs) exceeded the industrial RBC for benzo(a)pyrene. BEQs were identified as a chemical  
9 of concern (COCs) based on exceedances of the industrial RBC of 0.78 milligrams per  
10 kilogram (mg/kg) for benzo(a)pyrene at two sample locations. All samples were collected  
11 from the 0 to 1 ft bls interval beneath the asphalt cover. Figure 2-3 shows the locations and  
12 exceedances of site constituents above the current screening criteria (the BEQ sitewide  
13 reference concentration) in surface soil.

14 **Subsurface Soil.** During the initial RFI, analytical results from subsurface soil samples were  
15 compared to the EPA Region III unrestricted and industrial RBCs and EPA generic SSLs,  
16 using a DAF of 10. The RFI risk assessment did not identify any COCs in subsurface soil.  
17 The RFI report did not address the single exceedance of chromium at E573SB005 at 445  
18 mg/kg, which is above the SSL of 19 mg/kg. Figure 2-4 shows the location and exceedance  
19 of chromium above the current screening criteria in subsurface soil.

## 20 **Groundwater Investigation**

21 The RFI investigation for AOC 573 included the installation of one shallow monitoring well,  
22 E573GW001 (formerly identified as NBCE573001), and one deep monitoring well,  
23 E573GW01D (formerly identified as NBCE57301D), at the eastern side of Building 177 (see  
24 Figure 2-2 for locations of RFI monitoring wells). The groundwater samples were analyzed  
25 for VOCs, SVOCs, metals, pH, chlorides, sulfates, and total dissolved solids (TDS). One  
26 shallow monitoring well sample was selected as a duplicate and was also sampled for  
27 herbicides, organophosphorus pesticides, dioxins, and hexavalent chromium.

28 During the RFI, each well was sampled four times between 1996 and 1997. Constituents  
29 detected in the groundwater samples were evaluated relative to the EPA Region III tap  
30 water RBCs, maximum contaminant levels (MCLs), and the Zone E BRCs for shallow and  
31 deep aquifers. During the first sampling event, one metal detection—iron—exceeded its tap  
32 water RBC of 1,100 µg/L in shallow groundwater. No shallow groundwater BRC or MCL  
33 was developed for iron in Zone E during the RFI. None of the metals detected in deep

1 groundwater exceeded their screening criteria. Based on the risk assessment presented in  
2 the RFI report, no COCs were identified in shallow or deep groundwater.

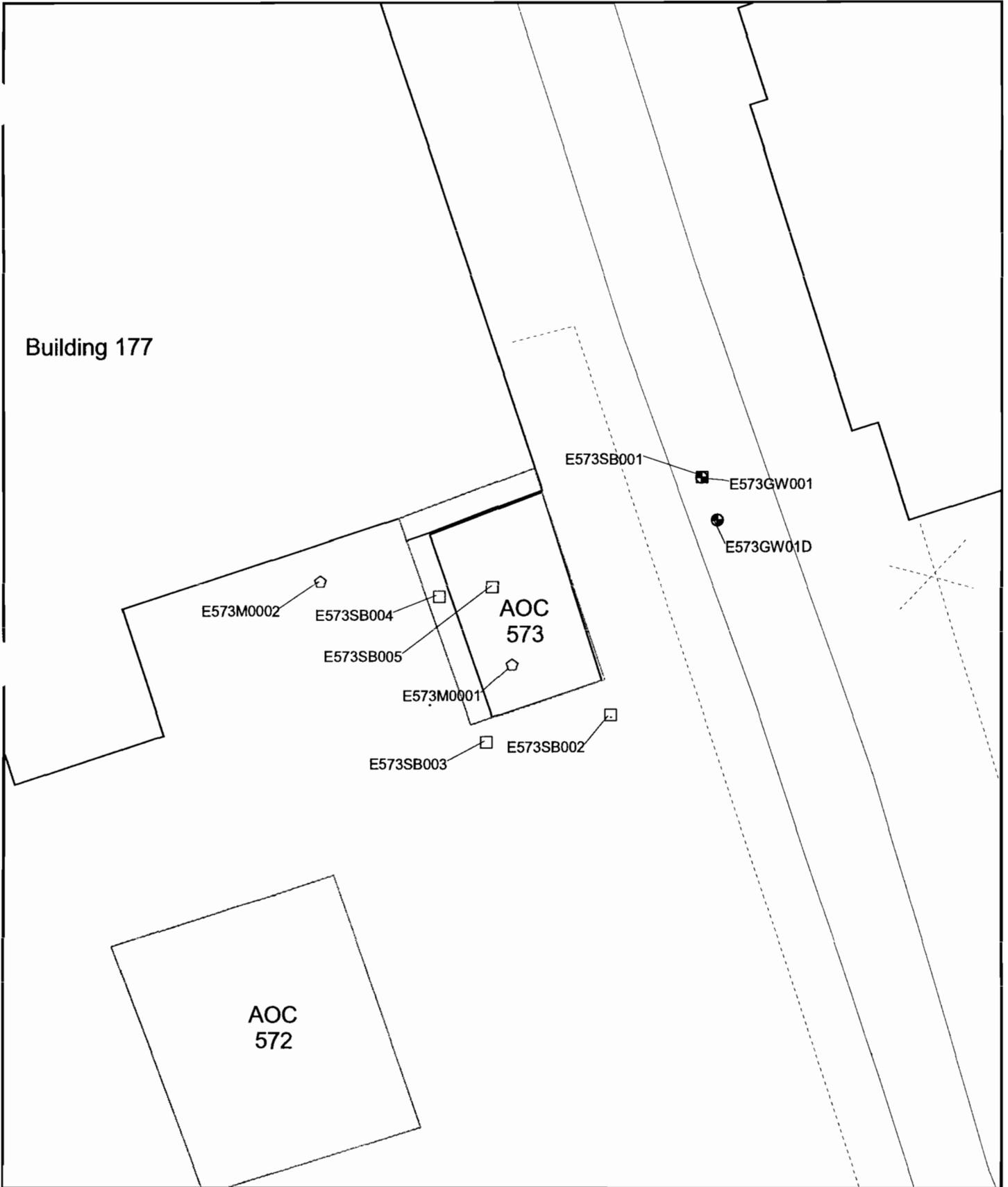
### 3 **Sediment Investigation**

4 The RFI Work Plan for AOC 573 proposed collection of two sediment samples from catch  
5 basins associated with the site. The RFI sediment investigation consisted of these two  
6 sediment samples (see Figure 2-2). No VOCs were detected in the sediment samples. No  
7 SVOCs were detected above their respective industrial soil RBCs. Three metals—arsenic,  
8 chromium, and lead—were detected above their respective industrial soil RBCs.

9 Subsequent to the RFI field investigation, the sediments that were present in catch basins at  
10 AOC 573 were removed during the Interim Measure (IM) for AOC 699, conducted by the  
11 Environmental Detachment Charleston (DET) in 1998. As a result, these sediments are no  
12 longer present at this site.

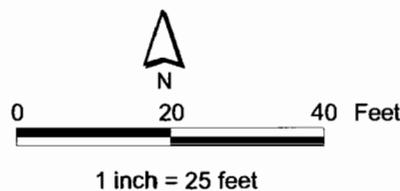


NOTE: Original figure created in color

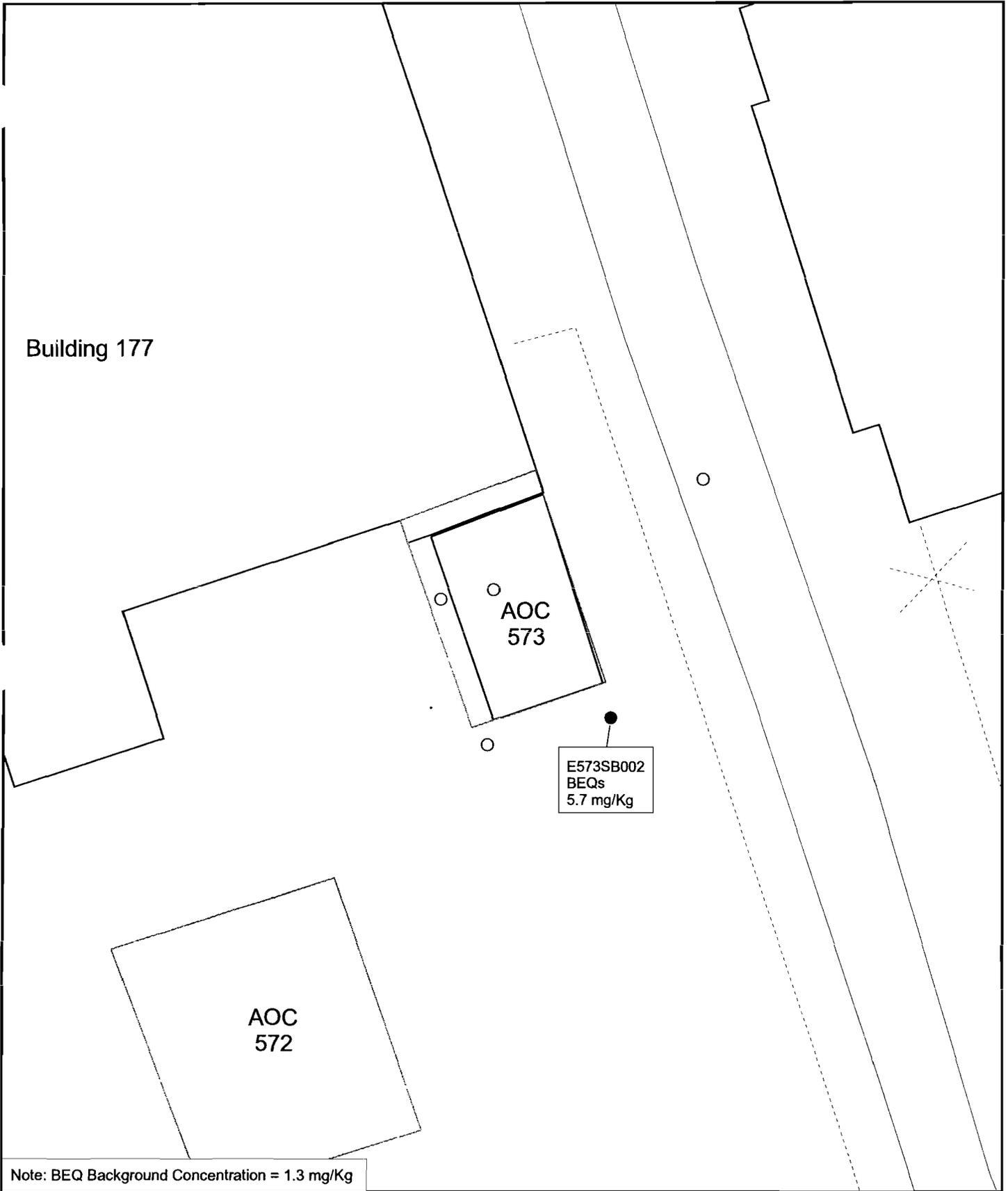


**Figure 2-2**  
RFI Sampling Locations  
AOC 573, Zone E  
Charleston Naval Complex

- Groundwater Well
- ⬠ Sediment Sample Location
- Soil Boring Location
- - - Fence
- ~ Roads - Lines
- ▭ AOC Boundary
- ▨ Buildings

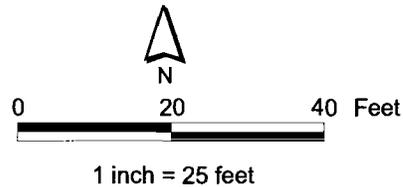


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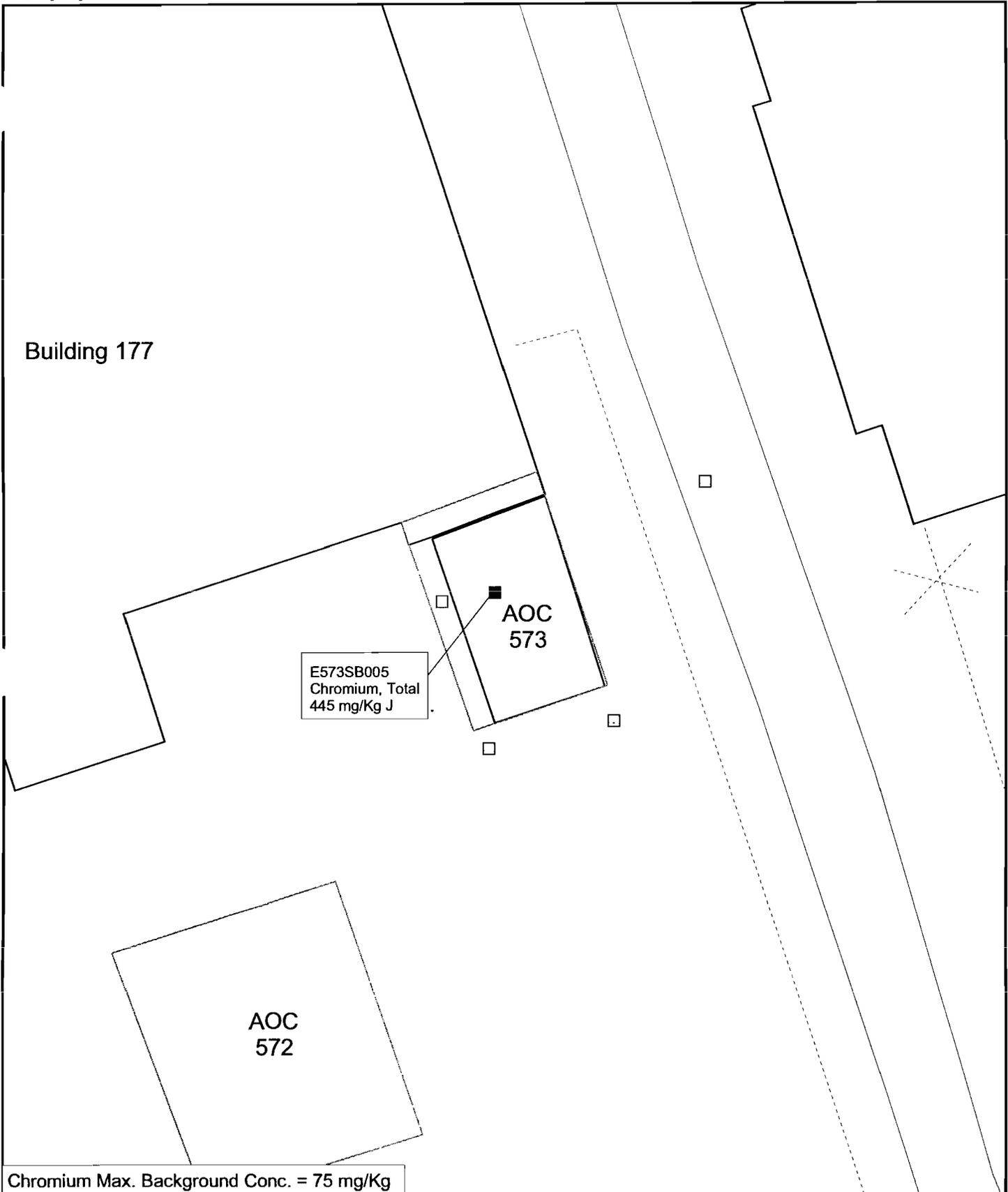


Note: BEQ Background Concentration = 1.3 mg/Kg

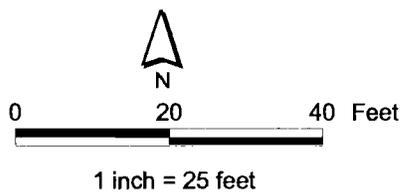
- Surface Soil Exceedance
- Surface Soil Location
- - - Fence
- ∧ Roads - Lines
- ▭ AOC Boundary
- ▨ Buildings



**Figure 2-3**  
Exceedances in Surface Soil  
AOC 573, Zone E  
Charleston Naval Complex



- Subsurface Soil Exceedance
- Subsurface Soil Location
- ⋈ Fence
- ∩ Roads - Lines
- ▭ AOC Boundary
- ▨ Buildings



**Figure 2-4**  
Exceedance in Subsurface Soil  
AOC 573, Zone E  
Charleston Naval Complex

## 1 **3.0 Proposed Sampling and Analysis**

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### 2 **3.1 Sampling Scope Summary**

#### 3 **AOC 573**

4 Based on an evaluation of the data collected during the RFI and a comparison to COPC  
5 screening criteria currently used by the Base Realignment and Closure Act (BRAC) Cleanup  
6 Team (BCT), chromium in subsurface soil requires further delineation. The RFI did not  
7 identify the single exceedance of chromium at E573SB005 at 445 mg/kg, which is above the  
8 SSL of 19 mg/kg and the maximum Zone E background concentration of 75 mg/kg. The  
9 additional delineation sampling proposed in this SAP will focus on this parameter.

10 Although BEQs were identified in the RFI report as a surface soil COC, they do not appear  
11 to be site-related. Exceedances of the screening criteria for surface and subsurface soil were  
12 identified at locations shown in Figures 2-3 and 2-4, respectively.

13 Figure 3-1 shows historic detections of chromium in groundwater wells at the site, which  
14 were below the MCL of 100 µg/L. Figure 3-3 shows shallow groundwater elevation  
15 contours from water level measurements conducted at the site during January 2002.

16 However, depending on the results of further chromium delineation in soil, if significant  
17 chromium concentrations are detected in soils, a groundwater investigation may be  
18 conducted. A full evaluation and presentation of the COPC screening against current  
19 criteria, as well as a COPC/COC refinement analysis, will be provided in an RFI report  
20 addendum after collection and analyses of the samples proposed herein.

### 21 **3.2 Sampling and Analysis Plan**

22 All investigative work will be performed in accordance with the Comprehensive Sampling  
23 and Analysis Plan (CSAP) portion of the *Final Zone E RFI Work Plan, Revision 1*  
24 (EnSafe/Allen & Hoshall, 1995).

#### 25 **Surface and Subsurface Soils**

26 Surface and subsurface soil samples will be collected for laboratory analyses at the locations  
27 shown in Figure 3-2 to delineate the nature and extent of contamination. The analyses to be  
28 performed on these samples are also presented in Table 3-1.

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

4 For all sample locations, samples will be collected from the following depths:

- 5 • 0 to 1 ft bls (below any pavement present)
- 6 • 1 to 3 ft bls
- 7 • 3 to 5 ft bls

### 8 **Groundwater**

9 Should the additional soil sampling proposed in this SAP detect significant concentrations  
10 of hexavalent chromium (in excess of the SSL), a groundwater investigation may be  
11 conducted at the proposed locations shown in Figure 3-2.

## 12 **3.3 Health and Safety**

13 CH2M-Jones places significant emphasis on the health and safety of our personnel, our  
14 subcontractors, and the local community. Once all personnel have arrived on site as part of  
15 the mobilization phase of the SAP, a project briefing and health and safety orientation  
16 meeting will be held. All work completed as part of this SAP will be performed in  
17 accordance with the CH2M-Jones Site-Specific Health and Safety Plan (CH2M-Jones, 2000).

18 Personnel working at the site will be required to comply with Level D personal protective  
19 equipment (PPE) requirements, as specified in the Health and Safety Plan.

## 20 **3.4 Site Clearance**

21 Soil boring locations will be marked or staked in the field using previously surveyed  
22 coordinates stored in the CNC Environmental Geographic Information System (EGIS) tool  
23 and utilizing the Global Positioning System (GPS) equipment. Table 3-2 shows the  
24 coordinates for the proposed soil sampling locations and potential new groundwater  
25 investigation locations.

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

28 CH2M-Jones will examine the site for existing water, electrical, natural gas, telephone, and  
29 other utility lines that are potential hazards at the site. Utilities will be clearly marked and  
30 identified.

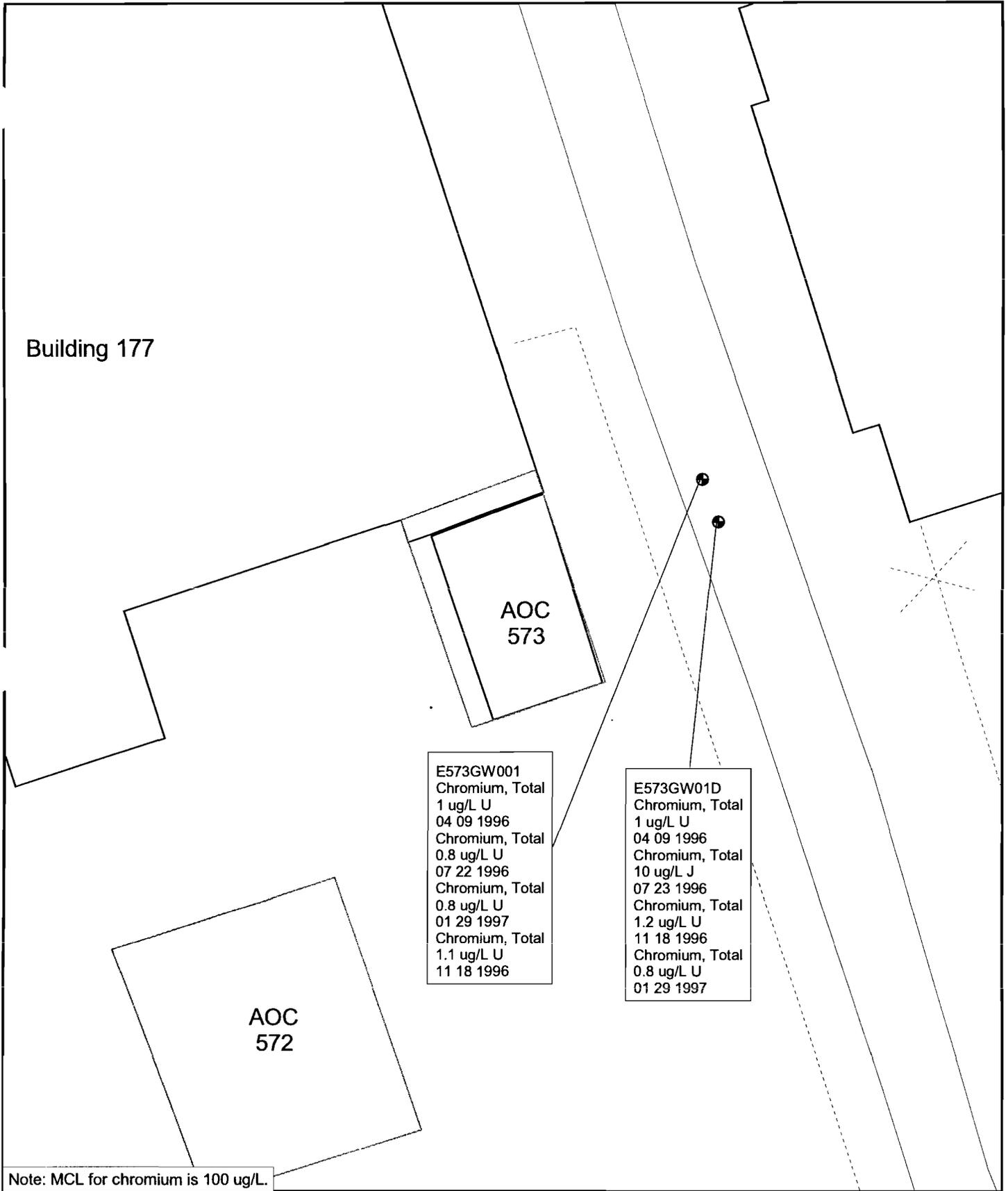
### 1    **3.5 Waste Management and Disposal**

2    Four waste streams will be generated as part of this SAP: pavement debris, soil cuttings,  
3    decontamination wastes, and used PPE. Soil cuttings will be drummed and characterized in  
4    accordance with South Carolina Hazardous Waste Management Regulations (SCDHEC  
5    R.61-79.261) and disposed in accordance with all applicable regulations and permits.  
6    Decontamination wastes and used PPE will also be disposed in accordance with applicable  
7    regulations.

8    Pavement debris will be transported offsite for disposal. Offsite transportation and disposal  
9    will be performed by properly permitted and licensed subcontractors.

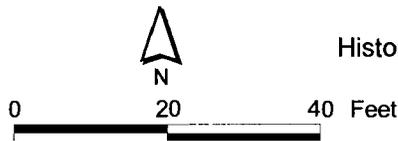
### 10   **3.6 Equipment Decontamination**

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

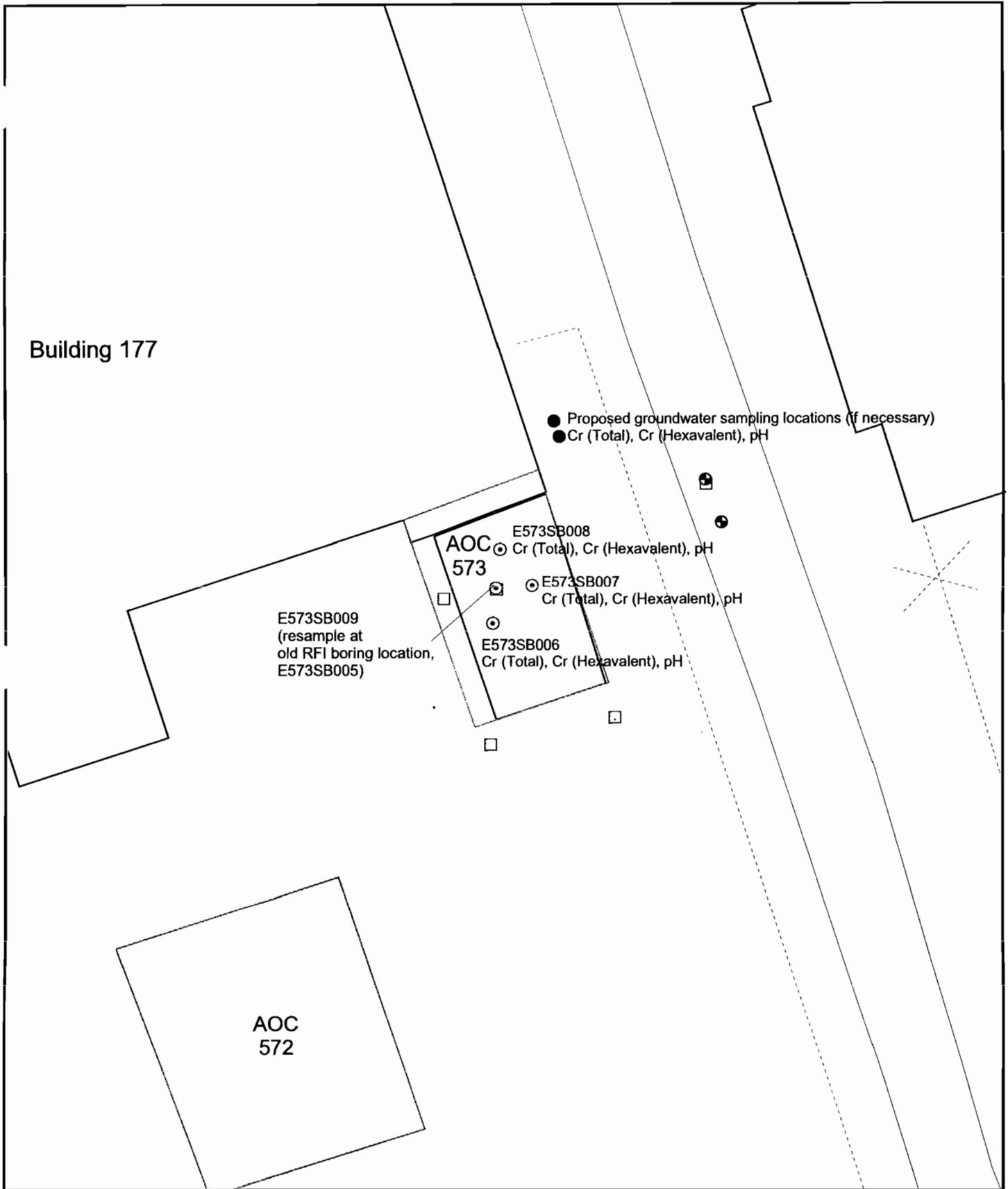


Note: MCL for chromium is 100 ug/L.

- Groundwater Well
- ⋈ Fence
- ∧ Roads - Lines
- AOC Boundary
- ▨ Buildings



**Figure 3-1**  
Historic Chromium Detections in Groundwater  
AOC 573, Zone E  
Charleston Naval Complex



Building 177

● Proposed groundwater sampling locations (if necessary)  
 ● Cr (Total), Cr (Hexavalent), pH

AOC 573  
 E573SB008  
 ⊙ Cr (Total), Cr (Hexavalent), pH

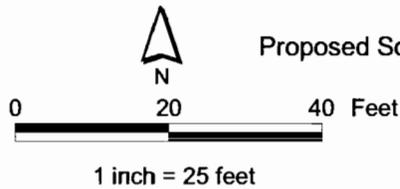
E573SB007  
 ⊙ Cr (Total), Cr (Hexavalent), pH

E573SB009  
 (resample at old RFI boring location, E573SB005)

E573SB006  
 ⊙ Cr (Total), Cr (Hexavalent), pH

AOC 572

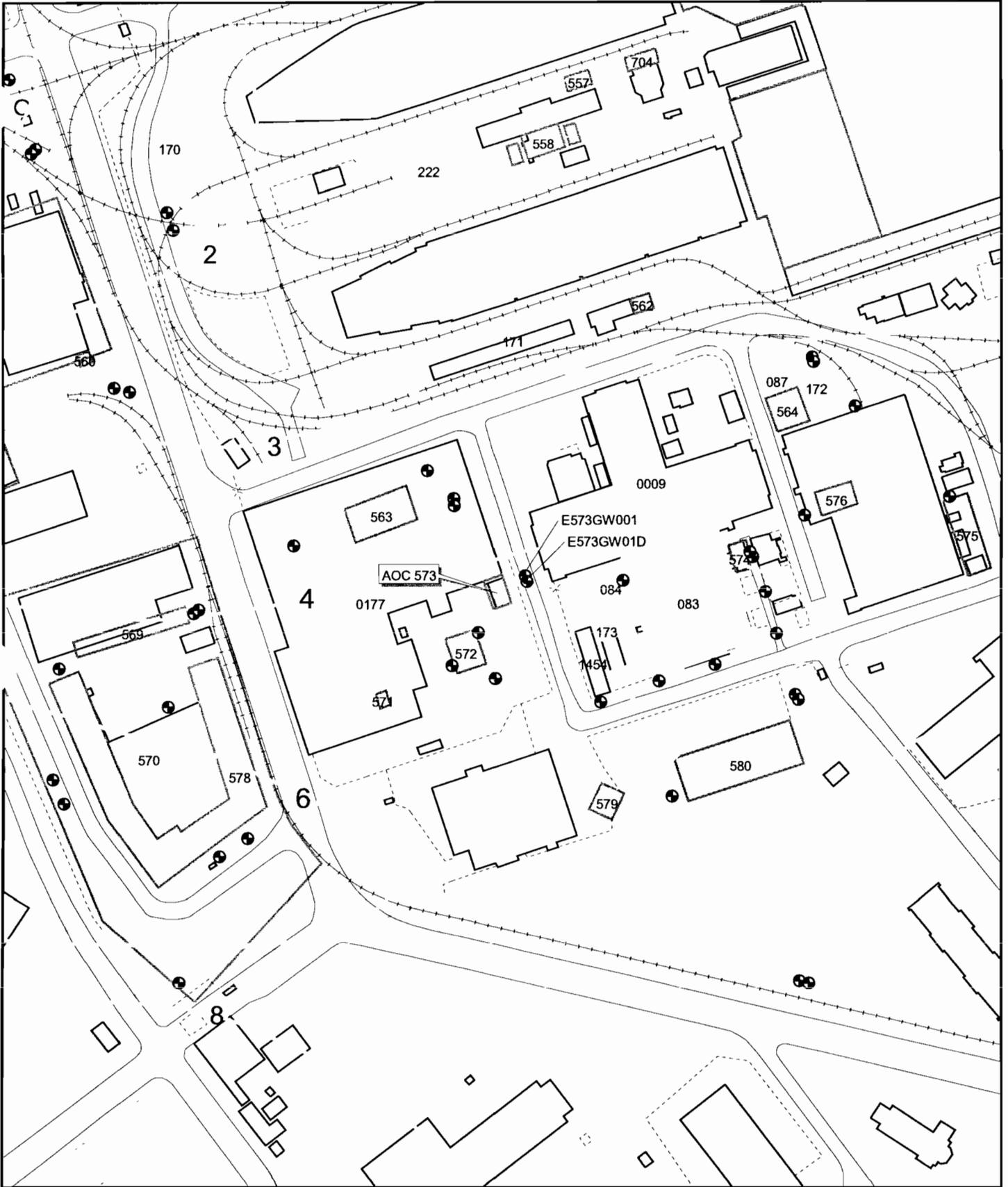
- RFI Soil Boring Location
- ⊙ Proposed Soil Boring Location
- ⊕ Existing Groundwater Well
- Proposed Groundwater Sampling Location
- Fence
- Roads - Lines
- ▨ Buildings
- AOC Boundary



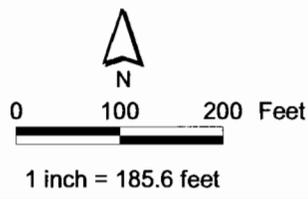
**Figure 3-2**  
 Proposed Soil and Groundwater Sampling Locations  
 AOC 573, Zone E  
 Charleston Naval Complex

**CH2MHILL**

NOTE: Original figure created in color



- Groundwater Well
- ⚡ Railroads
- ⚡ Fence
- ⚡ Roads - Lines
- 2 Groundwater Elevation (ft. above msl)
- AOC Boundary
- SWMU Boundary
- ▨ Buildings
- ▨ Zone Boundary



**Figure 3-3**  
 Shallow Groundwater Contour Map, 2002  
 AOC 573, Zone E  
 Charleston Naval Complex

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**TABLE 3-1**  
 Analytical Summary for Supplemental Soil Sampling Activities  
 Sampling and Analysis Plan, AOC 573, Zone E, Charleston Naval Complex

New Sample ID	Number of Sample Locations	Analytes	Analytical Methods
<b>Surface and Subsurface Soils – Nature and Extent</b>			
E573SB006	1 location, with 3 depth intervals (0 - 1 ft bls, 1-3 ft bls, and 3 - 5 ft bls)	Total chromium	SW-846 6010
		Hexavalent chromium	SW-846 7196
		pH	soil
E573SB007	1 location, with 3 depth intervals (0 - 1 ft bls, 1-3 ft bls, and 3 - 5 ft bls)	Total chromium	SW-846 6010
		Hexavalent chromium	SW-846 7196
		pH	soil
E573SB008	1 location, with 3 depth intervals (0 - 1 ft bls, 1-3 ft bls, and 3 - 5 ft bls)	Total chromium	SW-846 6010
		Hexavalent chromium	SW-846 7196
		pH	soil
E573SB009	1 location, with 3 depth intervals (0 - 1 ft bls, 1-3 ft bls, and 3 - 5 ft bls)	Total chromium	SW-846 6010
		Hexavalent chromium	SW-846 7196
		pH	soil
<b>(for potential future groundwater sampling)</b>			
Potential future sampling location	1 location	Total chromium	SW-846 6010
		Hexavalent chromium	SW-846 7196
		pH	Field measurement

**TABLE 3-2**  
 Coordinates for proposed sampling locations  
*Sampling and Analysis Plan, AOC 573, Zone E, Charleston Naval Complex*

<b>New Sample ID</b>	<b>Northing</b>	<b>Easting</b>
<b>Soil Borings to be Sampled</b>		
E573SB006	375,566	2,317,218
E573SB007	375,574	2,317,228
E573SB008	375,580	2,317,220
E573SB009	375,573	2,317,219
<b>Potential Future Groundwater Sampling Location</b>		
Potential future sampling location	375,601	2,317,230

## 1 4.0 References

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- 2 CH2M-Jones. *EBS for Transfer Phase III Parcels Charleston Naval Complex, Facility Number 177*  
3 *and 1358, Revision 0*. March 2001.
- 4 EnSafe Inc. *Zone E RFI Report, Revision 0, NAVBASE Charleston*. November 1997.
- 5 EnSafe Inc./Allen & Hoshall. *Final RCRA Facility Assessment, Naval Base Charleston*. June  
6 1995.
- 7 EnSafe Inc./Allen & Hoshall. *Final Zone E RFI Work Plan, Revision 1, Naval Base Charleston*.  
8 June 1995.
- 9 EnSafe Inc. *Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) Report*.  
10 July 1995.
- 11 U.S. Environmental Protection Agency (EPA). *Environmental Services Division Standard*  
12 *Operating Procedures and Quality Assurance Manual (ESDSOPQAM)*. 1996.