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SOIL SAMPLING AND ANALYSIS PLAN AREA OF CONCERN 579 AND 580 (AOC 579 AND 580) WITH TRANSMITTAL CNC CHARLESTON SC
11/8/2001
CH2M HILL

AOCs 579 and 580 Zone E
Soil Sampling and Analysis Plan (RO)

CH2M HILL
115 Perimeter Center Place NE
Suite 700
Atlanta, GA
30346-1278
Tel 770.604.9095
Fax 770.604.9183

CH2MHILL

November 8, 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: Soil Sampling and Analysis Plan (Revision 0) – AOCs 579 and 580, Zone E

Dear Mr. Scaturo:

Enclosed are four copies of the Soil Sampling and Analysis Plan (Revision 0) for AOCs 579 and 580 in Zone E of the Charleston Naval Complex (CNC). This sampling plan has been prepared pursuant to agreements by the CNC BRAC Cleanup Team for completing the RCRA Corrective Action process.

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

Sincerely,

CH2M HILL

Dean Williamson, P.E.

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

Sampling and Analysis Plan

Areas of Concern 579 and 580, Zone E

Charleston Naval Complex
North Charleston, SC

Prepared for

U.S. Navy Southern Division
Naval Facilities Engineering Command

Prepared by

CH2M-Jones

November 2001

Contract N62467-99-C-0960

Contents

Acronyms and Abbreviations

AOC	area of concern
BCT	BRAC Cleanup Team
BEQ	benzo(a)pyrene equivalent
BRAC	Base Realignment and Closure Act
BRC	background reference concentration
CNC	Charleston Naval Complex
COC	chemical of concern
COPC	chemical of potential concern
CSAP	Comprehensive Sampling and Analysis Plan
DAF	dilution attenuation factor
EGIS	Environmental Geographic Information System
EnSafe	EnSafe Inc.
EPA	U.S. Environmental Protection Agency
ft bls	feet below land surface
GPS	Global Positioning System
MCL	maximum contaminant level
mg/kg	milligram per kilogram
PPE	personal protective equipment
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SCDHEC	South Carolina Department of Health and Environmental Control
SSL	soil screening level
SVOC	semivolatile organic compound
TDS	total dissolved solids
VOC	volatile organic compound

1.0 Introduction

This Sampling and Analysis Plan (SAP) has been developed for Areas of Concern (AOCs) 579 and 580 in Zone E of the Charleston Naval Complex (CNC). Both of these sites are included in this SAP because they are adjacent to each other and both require further sampling to define the nature and extent of constituents previously detected in the surface and subsurface soils. Following completion of the field activities, AOCs 579 and 580 will be addressed separately under the RCRA Facility Investigation (RFI) process.

1.1 Background

Previous investigations in the vicinity of AOC 579 have indicated the presence of antimony, arsenic, and mercury in soil above their respective chemical of potential concern (COPC) screening criteria. In addition, the previous investigations in the vicinity of AOC 580 have indicated the presence of antimony, arsenic, and lead in soil above their respective COPC screening criteria. CH2M-Jones has prepared this SAP to complete the RFI activities and to provide information that can be used to make decisions regarding the need for corrective measures.

Figure 1-1 illustrates the location of Zone E within the CNC. Figure 1-2 is an aerial photograph of AOCs 579 and 580.

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 and Conditions — Provides a brief description of AOCs 579 and 580 and the findings of previous RFI activities.

3.0 Proposed Sampling and Analysis — Describes the investigative approach and program for delineation of COPCs for the RFI.

4.0 References —Lists the references used in this document.

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

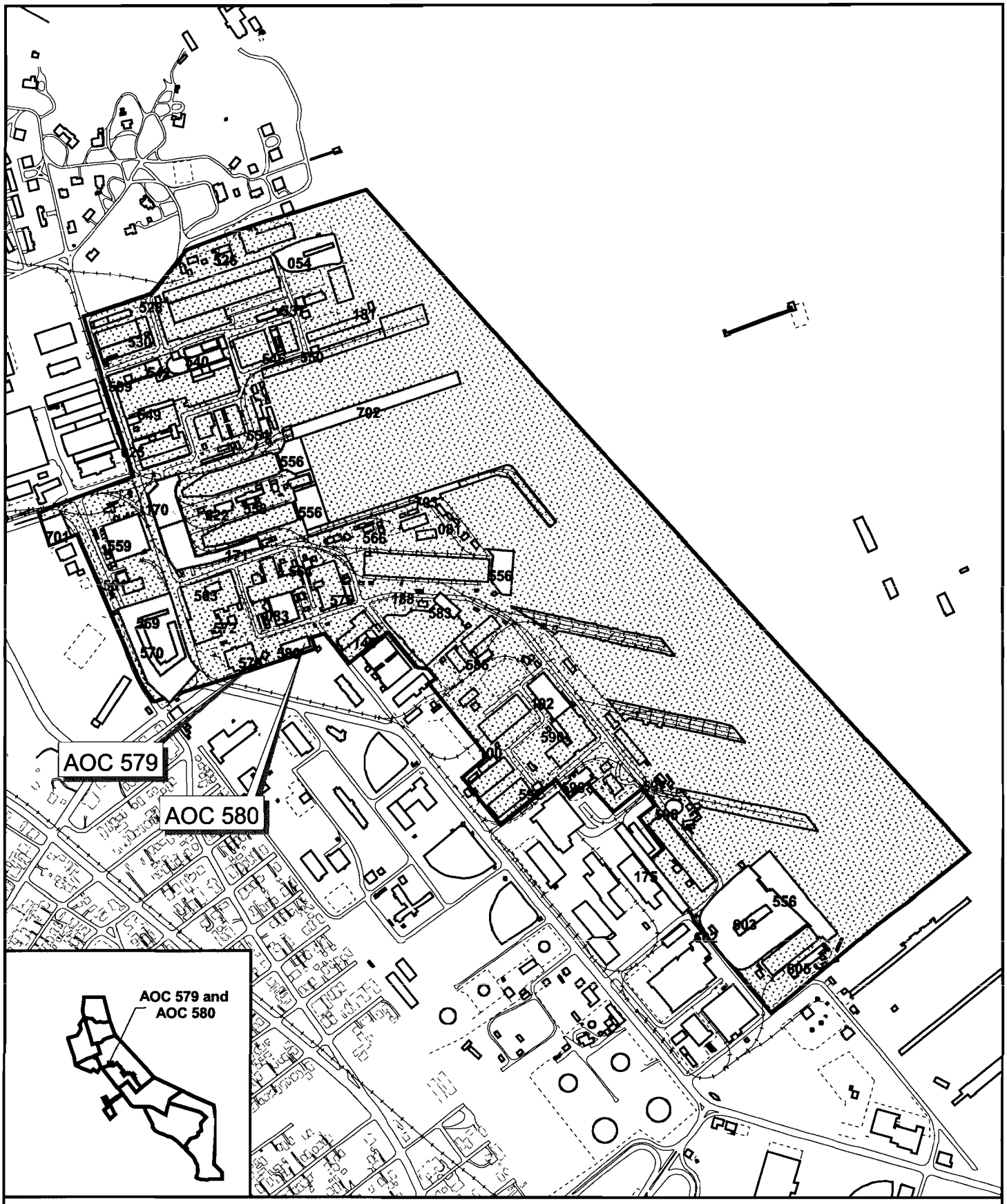

Figure 1-1
Zone E Within CNC
AOC 579 and AOC 580, Zone E
Charleston Naval Complex

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File Path: c:\18gis\projects\zone_e\newlocationfigs apr, Date 18 Oct 2001 14 06, User NMOUDRY, EGIS Charleston Naval Complex - Figure 1-1 Zone E Within CNC

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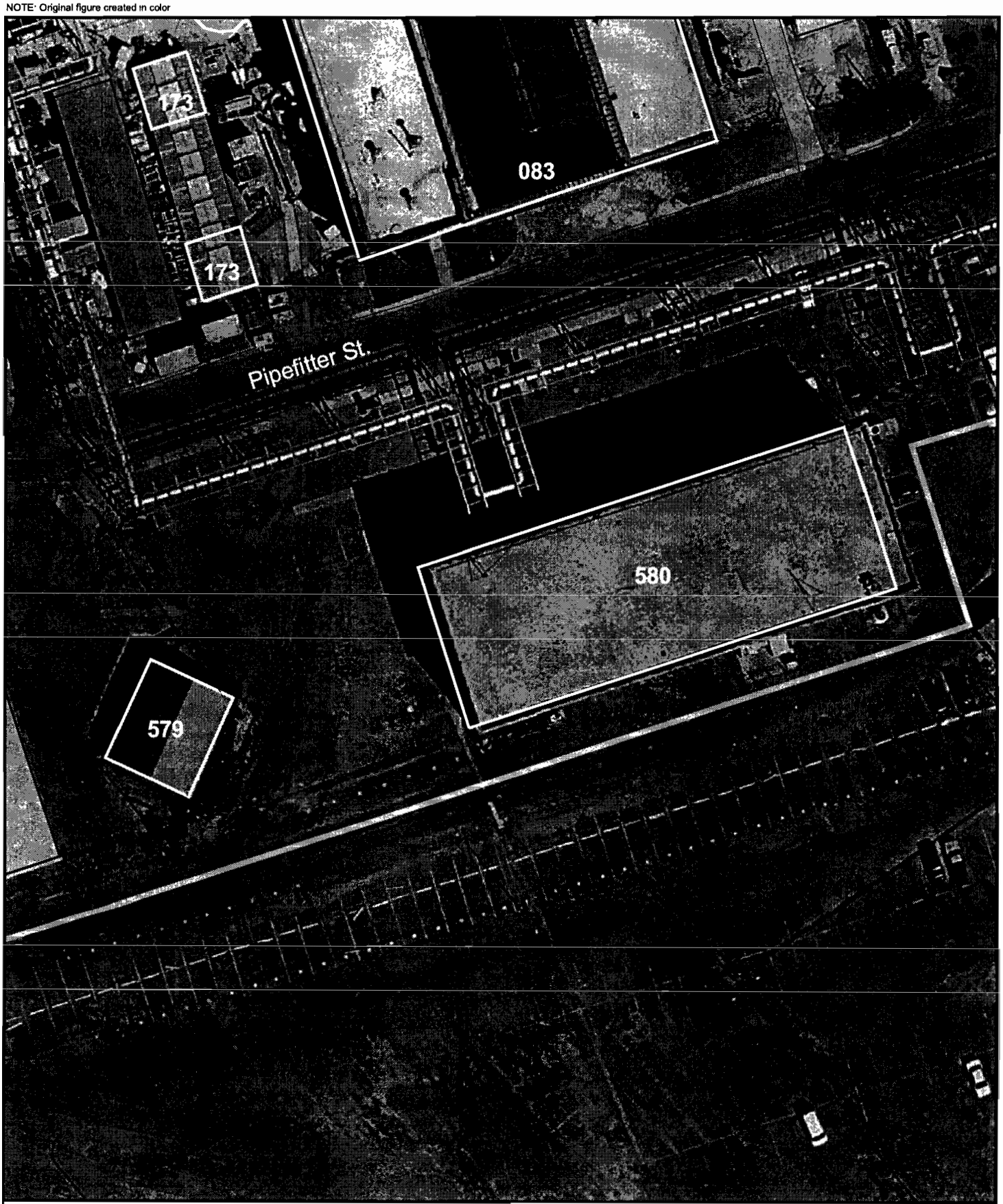

Fence
Roads
AOC Boundary
SWMU Boundary
Buildings
Zone Boundary

N

0 40 80 Feet

1 inch = 50 feet

Figure 1-2
Site Map
AOC 579 and AOC 580, Zone E
Charleston Naval Complex

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File Path: C:\18gis\Projects\Zone_E\AOC580\aoc580 apr, Date: 01 Nov 2001 6:51, User: NMOUDRY, Figure 1-2 Site Map

2.0 Site Background and Conditions

2.1 Site Background and Setting

2.1.1 AOC 579 – Paint Storage Shop

AOC 579 is a former paint storage shop located in Building 1035. The building was built in 1919 and used for meat storage and inspection until 1943. From 1943 to 1955, this unit was used as a cafeteria and storehouse. It stored paint from 1955 until approximately 1977. Currently the site is used as an electrical storehouse. No information could be found regarding the operating practices of the paint storage shop. The area is zoned for industrial use (M-2).

As identified in RCRA Facility Assessment (RFA) documentation, the materials of concern for AOC 579 include volatile organic compounds (VOCs) and heavy metals.

2.1.2 AOC 580 – Pattern and Electric Shop

AOC 580 is located in Building 10. The building was built in 1918 and used as a pattern and storage shop until 1935. From 1935 until 1955, this unit was used as a pattern and electric shop. In the early 1980s the shop became the office for the Nuclear Engineering Department. No information could be found regarding the operating practices of this building. The area is zoned for industrial use (M-2).

As identified in RFA documentation, the materials of concern for AOC 580 include VOCs and heavy metals (lead and zinc).

2.2 RFI Investigation Results

2.2.1 AOC 579 RFI Investigation

Soil Investigation

As part of the RFI field investigation, surface soil samples (0 to 1 foot below land surface [ft bls]) and co-located subsurface soil samples (3 to 5 ft bls) were collected in two sampling events (see Figure 2-1 for historical sample locations). Samples from the first sampling event were analyzed for VOCs, semivolatile organic compounds (SVOCs), and metals. One duplicate sample was collected during the first sampling event and analyzed for VOCs and SVOCs, as well as herbicides, organophosphorous pesticides, hexavalent chromium, and

dioxins. Samples from the second sampling event were analyzed for SVOCs and metals. No duplicate samples were collected during the second sampling event.

Surface Soil. In the *Zone E RFI Report, Revision 0* (EnSafe Inc. [EnSafe], 1997), surface soil sample analytical results were evaluated relative to the U.S. Environmental Protection Agency (EPA) Region III risk-based concentration (RBC) limits, background reference concentration (BRC), and site-specific soil screening levels (SSLs) (dilution attenuation factor [DAF] = 1). Based on the analysis presented in the RFI report, benzo(a)pyrene equivalents (BEQs), antimony, arsenic, copper, and mercury exceeded their screening criteria. BEQs were identified as chemicals of concern (COCs) based on exceedances of the industrial land use RBC of 0.78 milligrams per kilogram (mg/kg) at one sample location. However, the sample location did not exceed the base-wide anthropogenic background value of 1.3 mg/kg for surface soils, and the sample was collected from the 0 to 1-ft bls interval beneath the asphalt cover.

Antimony, arsenic, copper, and mercury were identified as COCs based on exceedances of their respective residential land use RBCs at multiple sample locations. In addition, arsenic exceeded both its SSL and BRC at one sample location. All samples were collected from the 0 to 1-ft bls interval beneath the asphalt cover.

Subsurface Soil. Subsurface soil sample analytical results were evaluated relative to the EPA Region III unrestricted and industrial RBCs and EPA generic SSLs, with a DAF of 1. Based on the risk assessment presented in the *Zone E RFI Report*, no constituents were identified as COCs.

However, arsenic is present at one location associated with AOC 579 at a concentration of 46.3 mg/kg at sample location E579SB006, which exceeds the Zone E background value of 19.9 mg/kg for surface soils (see Figure 2-4). This sample location sits within the footprint of a former railroad line. As a result, this sample location will be reinvestigated to verify whether the arsenic detected is associated with the historical operations at AOC 579.

Groundwater Investigation

Groundwater at AOC 579 was not identified as a medium of concern for this unit.

2.2.2 AOC 580 RFI Investigation

Soil Investigation

As part of the RFI field investigation, surface soil samples (0 to 1 ft bls) and co-located subsurface soil samples (3 to 5 ft bls) were collected in two sampling events (see Figure 2-1

for historical sample locations). Samples from the first sampling event were analyzed for VOCs, SVOCs, and metals. One duplicate sample was collected during the first sampling event and analyzed for VOCs and SVOCs, as well as herbicides, organophosphorous pesticides, hexavalent chromium, and dioxins. Samples from the second sampling event were analyzed for SVOCs and metals. No duplicate samples were collected during the second sampling event.

Surface Soil. In the *Zone E RFI Report*, surface soil sample analytical results were evaluated relative to the EPA Region III RBC limits, BRC, and site-specific SSLs (DAF = 1). Based on the analysis presented in the RFI report, BEQs, antimony, arsenic, copper, lead, manganese, and vanadium exceeded their screening criteria.

BEQs were identified as COCs based on exceedances of the industrial land use RBC of 0.78 mg/kg at two sample locations. However, none of the sample locations exceeded the base-wide anthropogenic background value of 1.3 mg/kg for surface soils, and all the samples were collected from the 0 to 1-ft bls interval beneath the asphalt cover.

Antimony, arsenic, copper, lead, manganese, and vanadium were identified as COCs based on exceedances of their respective residential land use RBCs at least one sample location. In addition, arsenic exceeded both its SSL and BRC at one sample location.

Based on the pattern of exceedances, it will be necessary to collect surface and subsurface soil samples to further delineate for arsenic, lead, antimony and mercury exceedances in the surface soil (see Figure 2-3).

Subsurface Soil. Subsurface soil sample analytical results were evaluated relative to the EPA Region III unrestricted and industrial RBCs and EPA generic SSLs, with a DAF of 1. Based on the risk assessment presented in the *Zone E RFI Report*, no constituents were identified as COCs. However, arsenic is present at two locations at concentrations of 449.9 mg/kg and 21.5 at sample locations E580SB002 and E580SB006, respectively, which exceeds the Zone E background value of 19.9 mg/kg for surface soils (see Figure 2-4). Sample location E580SB002 sits within the footprint of the same former railroad line that ran near AOC 679. As a result, sample location E580SB002 will be reinvestigated to verify whether the arsenic detected is associated with the historical operations at AOC 580.

Groundwater Investigation

Two shallow monitoring wells and one deep monitoring well were installed and sampled as part of the RFI investigation (see Figure 2-2). The groundwater samples were analyzed for VOCs, SVOCs, metals, chlorides, sulfates, and total dissolved solids (TDS). One duplicate

sample was collected from a shallow monitoring well and analyzed for VOCs and SVOCs, as well as herbicides, hexavalent chromium, organophosphorous pesticides, and dioxins. Constituents detected in the groundwater samples were evaluated relative to maximum contaminant levels (MCLs). In the absence of an MCL, the EPA Region III tap water RBCs were used. Groundwater was sampled during four sampling events, but the RFI report focused exclusively on the findings from the first sampling event. Based on the risk assessment presented in the *Zone E RFI Report*, arsenic and manganese were identified as COCs in deep groundwater.

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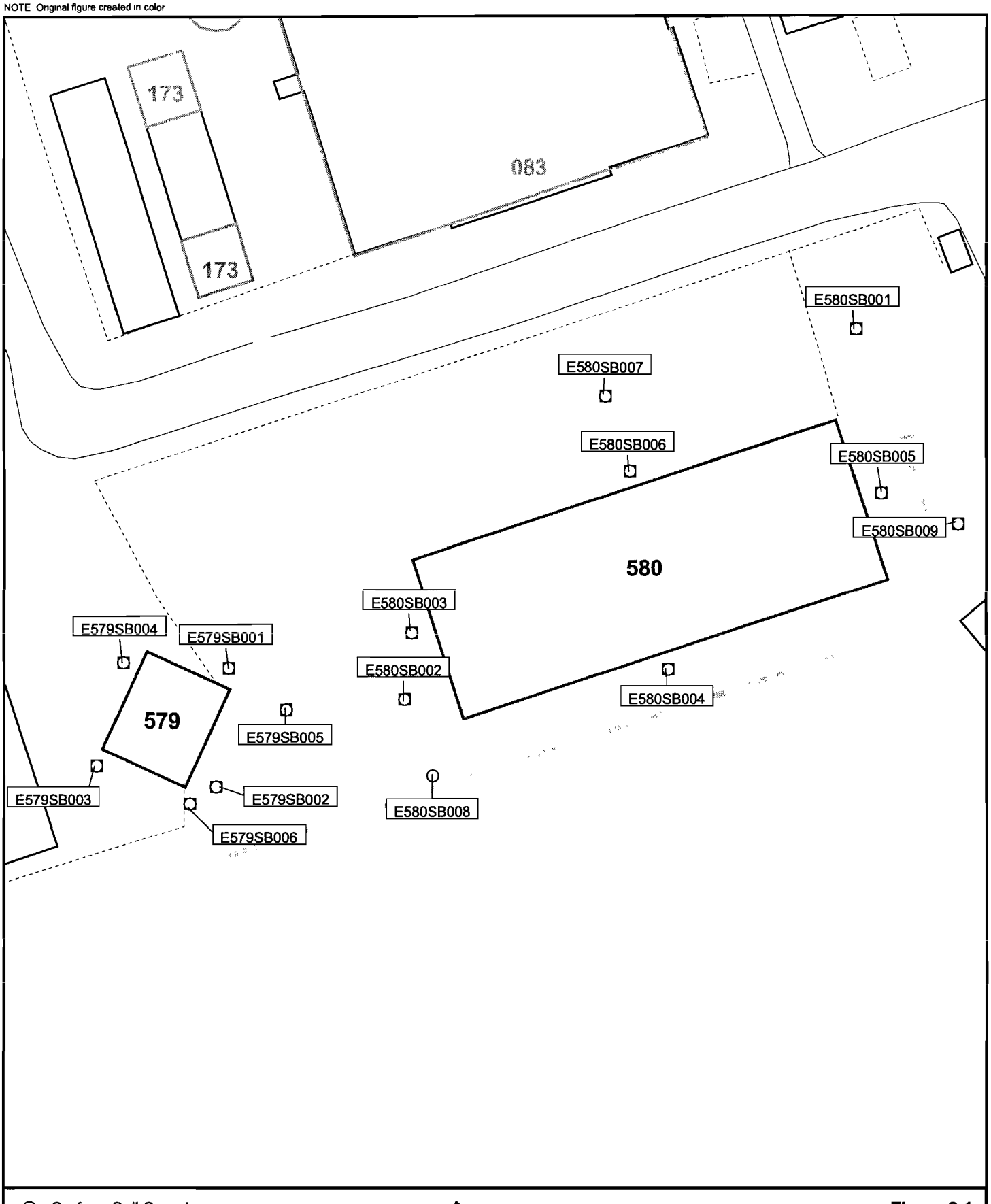

Surface Soil Sample
Subsurface Soil Sample
Fence
Roads
AOC Boundary
Buildings
SWMU Boundary
Zone Boundary

N

0 40 80 Feet

1 inch = 50 feet

Figure 2-1
Historical Surface and Subsurface Soil Sample Location Map
AOC 579 and AOC 580, Zone E
Charleston Naval Complex

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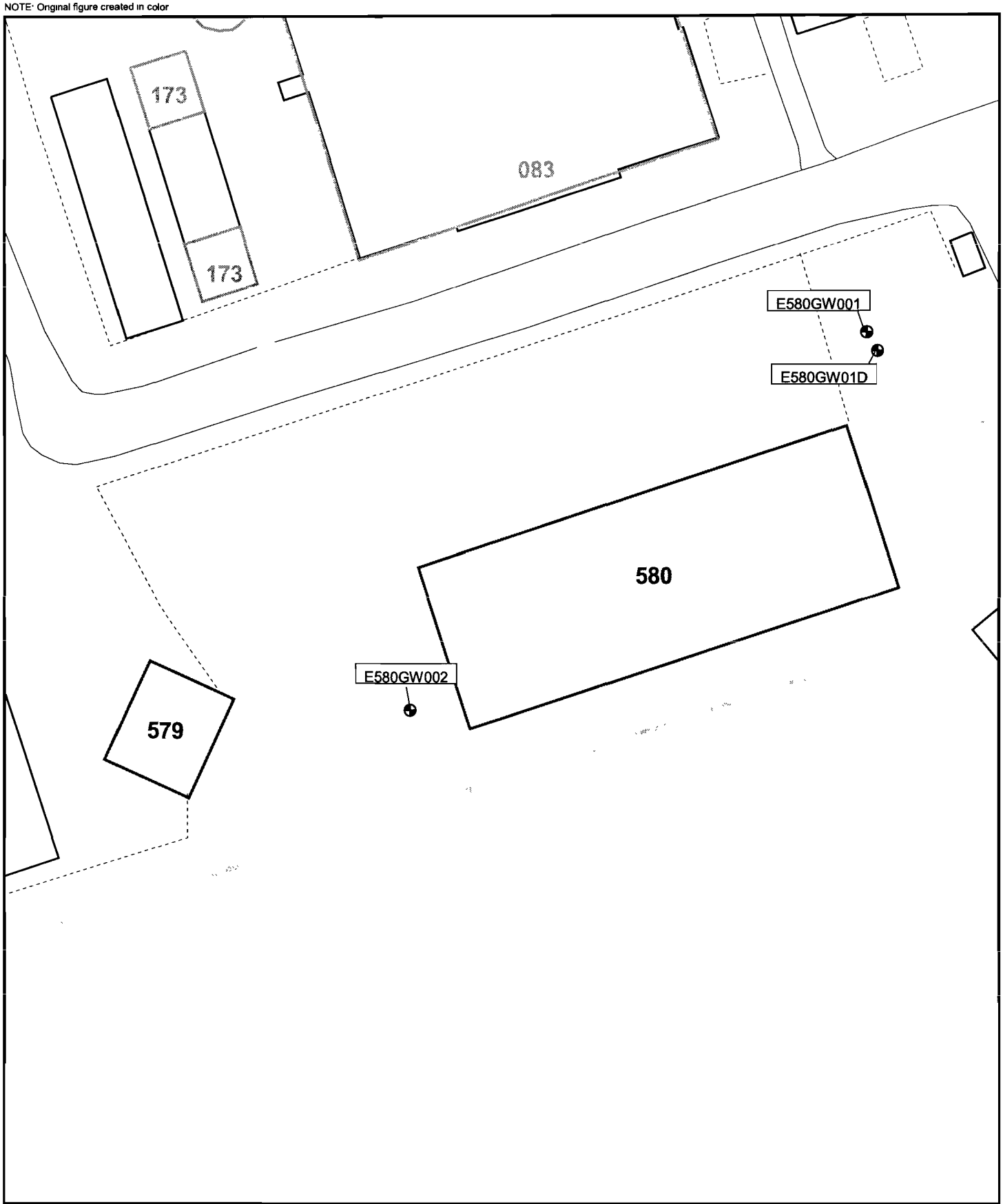
File Path C:\18gis\Projects\Zone_E\AOC580\aoc580 apr, Date: 31 Oct 2001 14:34, User: NMOUDRY, Figure 2-1 Historical Surface and Subsurface Soil Sample Location Map

NOTE: Original figure created in color



Groundwater Sample
Fence
Roads
AOC Boundary
SWMU Boundary
Buildings
Zone Boundary

N

0 40 80 Feet

1 inch = 50 feet

Figur 2-2
Historical Groundwater Sample Location Map
AOC 579 and AOC 580, Zone E
Charleston Naval Complex

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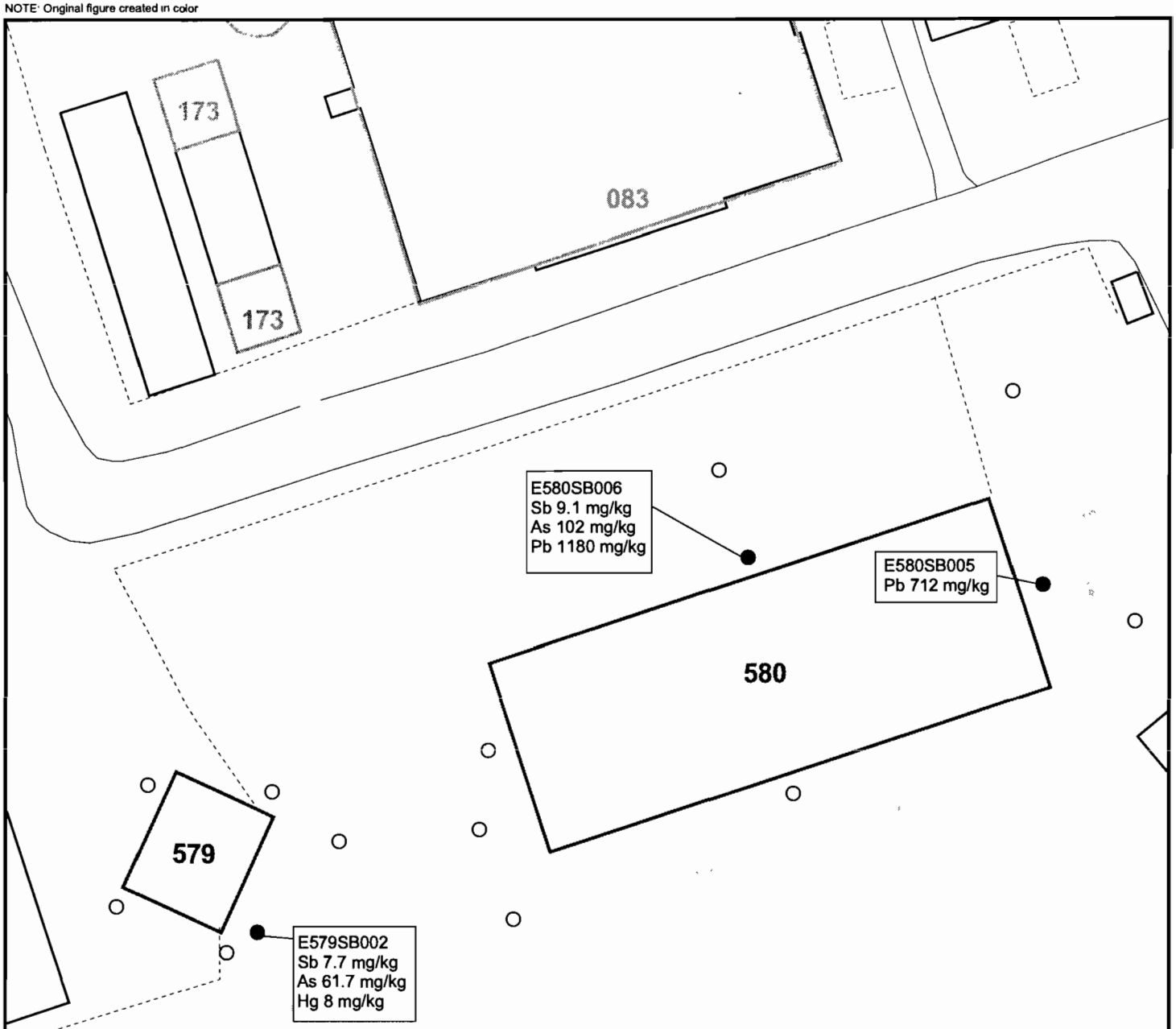
File Path: C:\18gis\Projects\Zone_E\AOC580\aoc580 apr, Date: 01 Nov 2001 6:14, User: NMOUDRY, Figure 2-2 Historical Groundwater Sample Location Map

NOTE: Original figure created in color



Screening Criteria:
As: 23.9 mg/kg (Zone Bkgd)
Pb: 400 mg/kg (SSL)
Sb: 2.5 mg/kg (SSL)
Hg: 2.6 mg/kg (Zone Bkgd)

Exceedance
Non-Exceedance
Fence
Roads
AOC Boundary
SWMU Boundary
Buildings
Zone Boundary

N

0 40 80 Feet

1 inch = 50 feet

Figure 2-3
Exceedances in Surface Soil
AOC 579 and AOC 580, Zone E
Charleston Naval Complex

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File Path C:\18gis\Projects\Zone_E\AOC580\aoc580 apr, Date 01 Nov 2001 6 22, User NMOUDRY, Figure 3-1 Exceedances in Surface Soil

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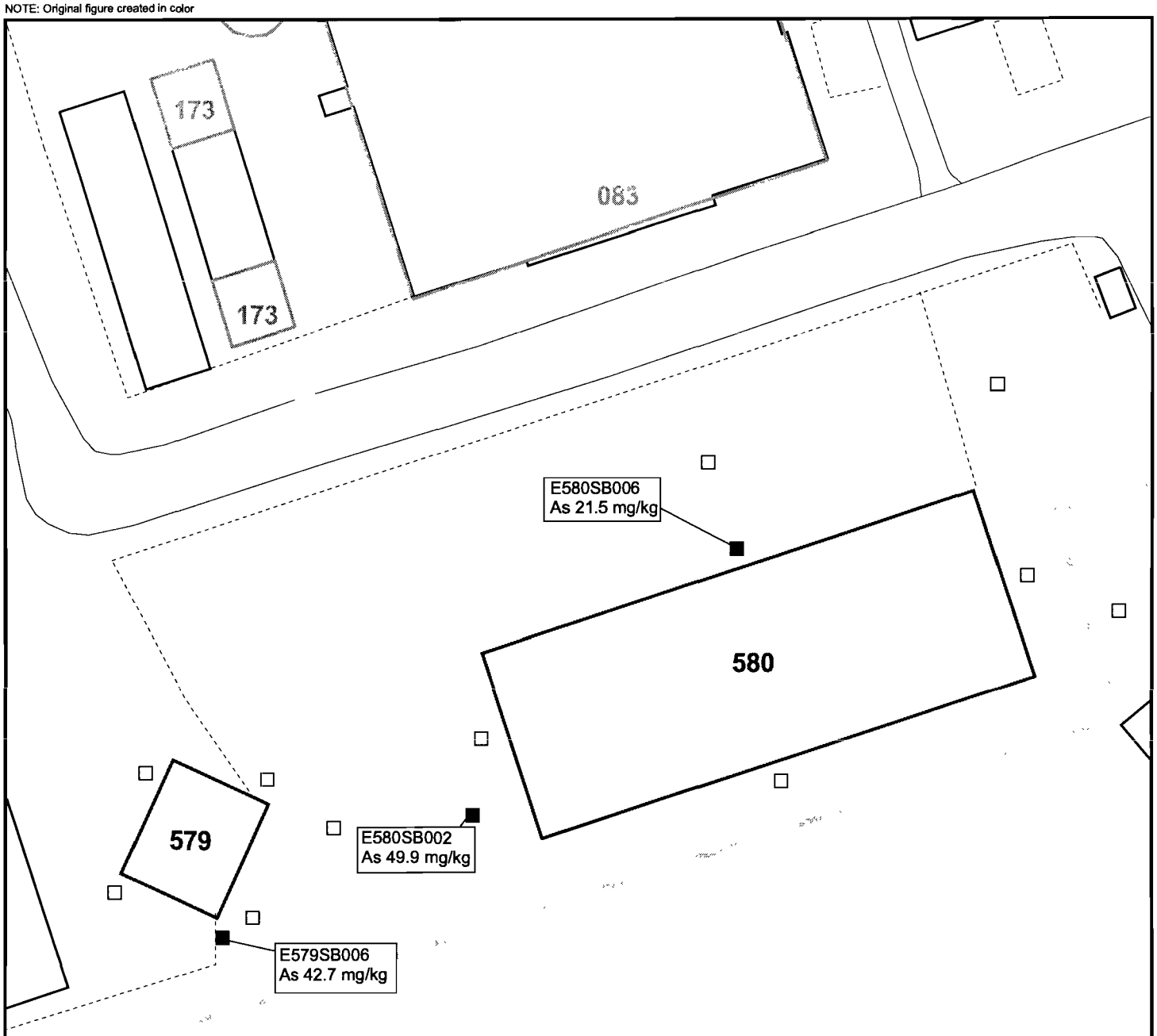

Screening Criteria:
As: 19.9 mg/kg (Zone Bkgd)

- Exceedance
- Non-Exceedance
- Fence
- Roads
- AOC Boundary
- SWMU Boundary
- Buildings
- Zone Boundary

N

0 40 80 Feet

1 inch = 50 feet

Figure 2-4
Exceedances in Subsurface Soil
AOC 579 and AOC 580, Zone E
Charleston Naval Complex

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File Path: C:\18gis\Projects\Zone_E\AOC580\aoc580 apr, Date 01 Nov 2001 6:31, User: NMOUDRY, Figure 3-2 Exceedances in Subsurface Soil

3.0 Proposed Sampling and Analysis

3.1 Sampling Scope Summary

3.1.1 AOC 579

Based on an evaluation of the data collected during the RFI and a comparison to COPC screening criteria currently used by the Base Realignment and Closure Act (BRAC) Cleanup Team (BCT), three constituents in surface soil require further delineation (arsenic, antimony, and mercury; see Figure 2-3) and one subsurface soil constituent requires further delineation (arsenic; see Figure 2-4). Thus, the additional delineation sampling will focus on these parameters. 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 after collection and analyses of the samples proposed herein.

3.1.2 AOC 580

Based on an evaluation of the data collected during the RFI and a comparison to COPC screening criteria currently used by the BCT, three constituents in surface soil require further delineation (arsenic, antimony, and lead; see Figure 2-3) and one subsurface soil constituent requires further delineation (arsenic; see Figure 2-4). Thus, the additional delineation sampling will focus on these parameters. 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 after collection and analyses of the samples proposed herein.

3.2 Surface and Subsurface Soil

3.2.1 Visual Inspection

Due to the historical presence of a railroad line immediately adjacent to the southern and eastern sides of Building 1035 (AOC 579) and along the western side of Building 10 (AOC 580), detected concentrations could be related to factors unrelated to the operational history of these units. Visual investigation of hand auger borings will be conducted at sample locations E579SB006 and E580SB002 initially to investigate whether there is an obvious source of these elevated levels. If a visible source material is observed, then the visual

inspection will be extended in 25-foot step-outs until the potential source material is no longer identifiable.

3.2.2 Analytical Sampling

Analytical samples will be collected to assess the nature and extent of contamination.

Nature and Extent of Contamination of Soils

Surface and subsurface soil samples will be collected for laboratory evaluation at the locations shown in Figure 3-1 to assess the nature and extent of contamination. The analyses to be performed on these samples is also presented in Figure 3-1. If any of the delineation samples exceed the screening criteria, additional soil samples may be collected farther out 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).

For all nature and extent sample locations, samples will be collected from the following depths:

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

Nature and Extent of Contamination of Groundwater

No further delineation of constituents detected in groundwater is necessary to complete the RFI. Therefore, no groundwater sampling events are included in this SAP.

3.3 Sampling and Analysis Plan

All investigative work will be performed in accordance with the Comprehensive Sampling and Analysis Plan (CSAP) portion of the *Final Zone E RFI Work Plan, Revision 1* (EnSafe/Allen & Hoshall, 1995). All samples will be analyzed for the associated COPCs identified by media as listed in Table 3-1.

3.4 Health and Safety

CH2M-Jones places significant emphasis on the health and safety of our personnel, our subcontractors, and the local community. Once all personnel have arrived on site as part of the mobilization phase of the SAP, a project briefing and health and safety orientation meet-

ing will be held. All work completed as part of this SAP will be performed in accordance with the CH2M-Jones Site-Specific Health and Safety Plan (CH2M-Jones, 2000).

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

3.5 Site Clearance

Soil boring locations will be marked or staked in the field using coordinates derived from the CNC Environmental Geographic Information System (EGIS) tool and utilizing Global Positioning System (GPS) equipment.

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

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

3.6 Waste Management and Disposal

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

Pavement debris will be transported offsite for disposal either by asphalt recycling or landfilled as demolition debris. Offsite transportation and disposal will be performed by properly permitted and licensed subcontractors.

3.7 Equipment Decontamination

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

TABLE 3-1
Analytical Summary for Supplemental Sampling Activities
Sampling and Analysis Plan, AOCs 579 and 580, Zone E, Charleston Naval Complex

Constituent	Number of Sample Points	Analytes	Analytical Methods
Lead	10	Lead	SW-846 6010
Arsenic	15[1]	Arsenic	SW-846 6010
Antimony	10	Antimony	SW-846 6010
Mercury	6	Mercury	SW-846 245.1, 245.5

Notes: 1 = Seven (7) surface/subsurface soils pairs, plus one subsurface sample only at E579SB006.

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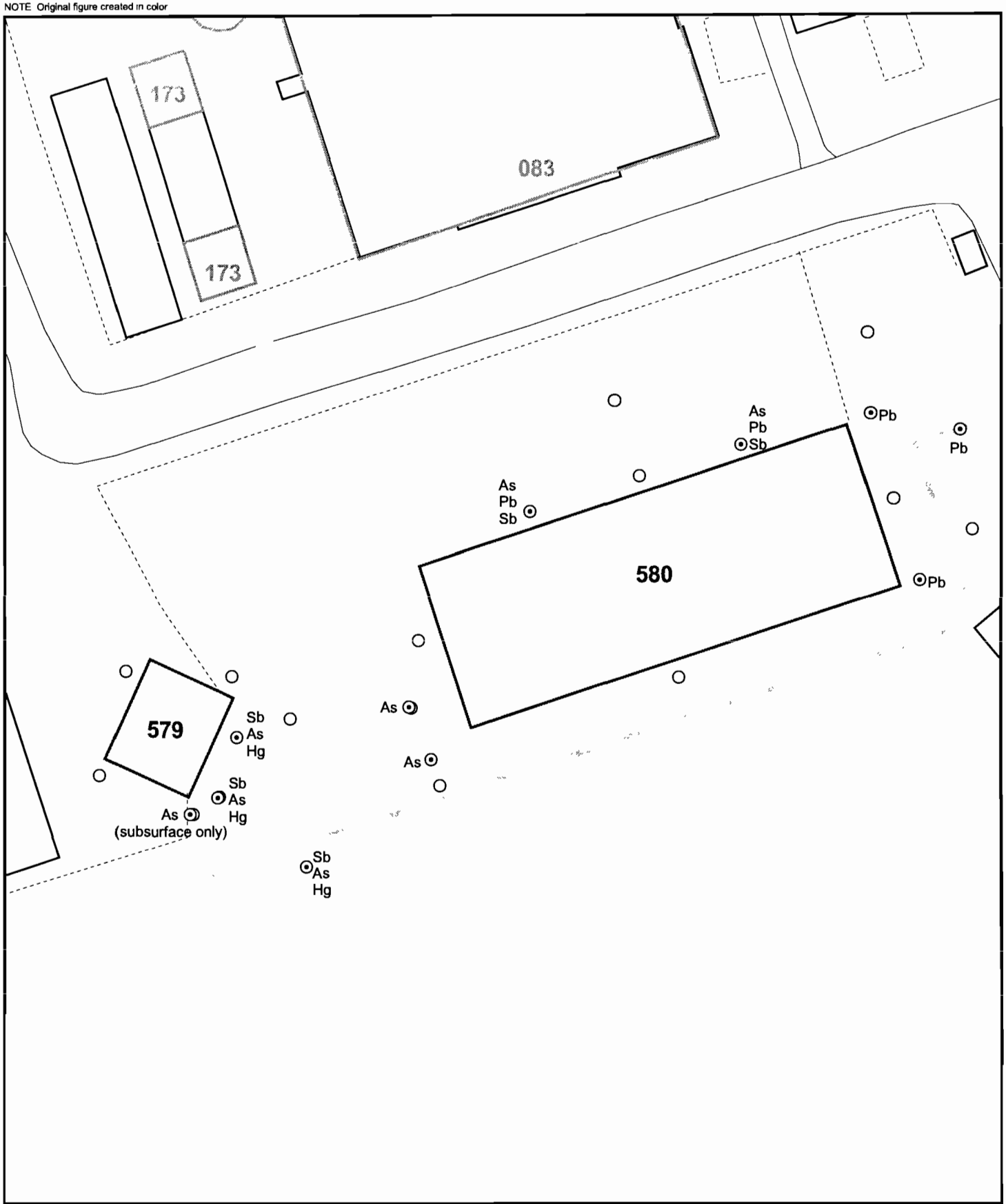

Figure 3-1
Proposed Soil Sample Locations
AOC 579 and AOC 580, Zone E
Charleston Naval Complex

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File Path C:\18gis\Projects\Zone_E\AOC580\aoc580 apr, Date. 01 Nov 2001 6 38, User· NMOUDRY, Figure 3-3 Proposed Soil Sample Locations

4.0 References

EnSafe Inc. *Zone E RFI Report, Revision 0, NAVBASE Charleston*. November 1997.

EnSafe Inc./Allen & Hoshall. *Final RCRA Facility Assessment, Naval Base Charleston*. June 1995.

EnSafe Inc./Allen & Hoshall. *Final Zone E RFI Work Plan, Naval Base Charleston. Revision 1.* June 1995.

EnSafe Inc. *Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) Report*. July 1995.

U.S. Environmental Protection Agency (EPA). *Environmental Services Division Standard Operating Procedures and Quality Assurance Manual (ESDSOPQAM)*. 1996.