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RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT
ADDENDUM AREA OF CONCERN 586 (AOC 586) ZONE E CNC CHARLESTON SC
8/26/2002
CH2M HILL

RFI REPORT ADDENDUM

Area of Concern 586. Zone E



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

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

CH2M Jones

August 2002

Contract N62467-99-C-0960



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August 26, 2002

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

Re: RFI Report Addendum (Revision 0) – AOC 586, Zone E

Dear Mr. Scaturo:

Enclosed please find four copies of the RFI Report Addendum (Revision 0) for AOC 586 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 Sam Naik. Please do not hesitate to contact him at 770/604-9182, extension 255, should 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

RFI REPORT ADDENDUM

Area of Concern 586, Zone E



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

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

PREPARED BY
CH2M-Jones

August 2002

Revision 0
Contract N62467-99-C-0960
158814.ZE.PR.01

**Certification Page for RFI Report Addendum (Revision 0) –
AOC 586, Zone E**

I, Dean Williamson, 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

P.E. No. 21428



Dean Williamson, P.E.

8/21/2002
Date

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1 **Acronyms and Abbreviations**

2	AOC	Area of concern
3	AST	Aboveground storage tank
4	BCT	BRAC Cleanup Team
5	BEQ	Benzo[a]pyrene equivalent
6	BRAC	Base Realignment and Closure Act
7	BRC	Background reference concentration
8	CA	Corrective action
9	CMS	Corrective measures study
10	CNC	Charleston Naval Complex
11	COC	Chemical of concern
12	COPC	Chemical of potential concern
13	CSI	Corrective Study Investigation
14	DAF	Dilution attenuation factor
15	EnSafe	EnSafe Inc.
16	EPA	U.S. Environmental Protection Agency
17	FRE	Fixed-point risk evaluation
18	HHRA	Human Health Risk Assessment
19	HI	Hazard index
20	IM	Interim measure
21	LUC	Land use control
22	MCL	Maximum contaminant level
23	mg/kg	Milligrams per kilogram
24	NAVBASE	Naval Base
25	NFA	No further action
26	NFI	No further investigation
27	OWS	Oil/water separator
28	PCB	Polychlorinated biphenyl
29	RBC	Risk-based concentration
30	RCRA	Resource Conservation and Recovery Act

1 **Acronyms and Abbreviations, Continued**

2	RFI	RCRA Facility Investigation
3	SCDHEC	South Carolina Department of Health and Environmental Control
4	SSL	Soil screening level
5	SVOC	Semivolatile organic compound
6	SWMU	Solid waste management unit
7	TDS	Total dissolved solids
8	VOC	Volatile organic compound
9	UST	Underground storage tank

1.0 Introduction

2 In 1993, Naval Base (NAVBASE) Charleston was added to the list of bases scheduled for
3 closure as part of the Defense Base Realignment and Closure Act (BRAC), which regulates
4 closure and transition of property to the community. The Charleston Naval Complex (CNC)
5 was formed as a result of the dis-establishment of the Charleston Naval Shipyard and
6 NAVBASE on April 1, 1996.

7 Corrective Action (CA) activities are being conducted under the Resource Conservation and
8 Recovery Act (RCRA) with the South Carolina Department of Health and Environmental
9 Control (SCDHEC) as the lead agency for CA activities at the CNC. All RCRA CA activities
10 are performed in accordance with the Final RCRA Part B Permit (Permit No. SC0 170
11 022 560).

12 In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation
13 and remediation services at the CNC. This submittal has been prepared by CH2M-Jones to
14 complete the RCRA Facility Investigation (RFI) for Area of Concern (AOC) 586 in Zone E of
15 the CNC. The location of AOC 586 in Zone E is shown in Figure 1-1. Figure 1-2 is an aerial
16 photograph of the site.

1.1 Background

18 AOC 586 consisted of a temporary powerhouse built in 1905 that was designated as
19 Building 1014. AOC 586 is located approximately 300 feet west of the intersection of
20 Necessary Lane and River Road in Zone E of the CNC. In 1953 an annex was added to
21 Building 1014. In 1944, Building 1014 was connected to Building 1077. The combined
22 structure was used for industrial salvage, which included a battery shop. Building 1014 was
23 demolished around 1957. Currently, AOC 586 consists of a concrete slab adjacent to the
24 southeast corner of Building 11. Railroad lines run through the middle of the site.

25 The materials of concern identified in the *Final Zone E RFI Work Plan, Revision 1* (EnSafe Inc.
26 [EnSafe]/Allen & Hoshall, 1995) which are based on historical operations for AOC 586,
27 include acids, solvents, dielectric fluid, lead-acid batteries, coal by-products, and petroleum
28 hydrocarbons. This area of Zone E is zoned M-2 (industrial). The CNC RCRA Permit
29 identified AOC 586 as requiring a Confirmatory Sampling Investigation (CSI).

1 Following fieldwork conducted for the RFI, the *Zone E RFI Report, Revision 0* (EnSafe, 1997)
2 was prepared and submitted during 1997. Regulatory review was conducted on this
3 document and draft responses to the comments from SCDHEC were prepared by the
4 Navy/EnSafe team.

5 **1.2 Purpose of the RFI Report Addendum**

6 The purpose of this RFI Report Addendum is to document the results of previous RFI
7 investigations conducted by the Navy/EnSafe team at AOC 586. This RFI Report
8 Addendum also discusses the findings of previous investigations, existing site conditions,
9 and surrounding area land use.

10 Prior to changing the status of any site in the CNC RCRA CA permit, the BRAC Cleanup
11 Team (BCT) agreed that the following issues should be considered:

- 12 • Status of the RFI
- 13 • Presence of metals (inorganics) in groundwater
- 14 • Potential linkage to Solid Waste Management Unit (SWMU) 37, Investigated Sanitary
15 Sewers at the CNC
- 16 • Potential linkage to AOC 699, Investigated Storm Sewers at the CNC
- 17 • Potential linkage of AOC 504, Investigated Railroad Lines at the CNC
- 18 • Potential linkage to surface water bodies (Zone J)
- 19 • Potential contamination associated with oil/water separators (OWSs)
- 20 • Relevance or need for land use controls (LUCs) at the site

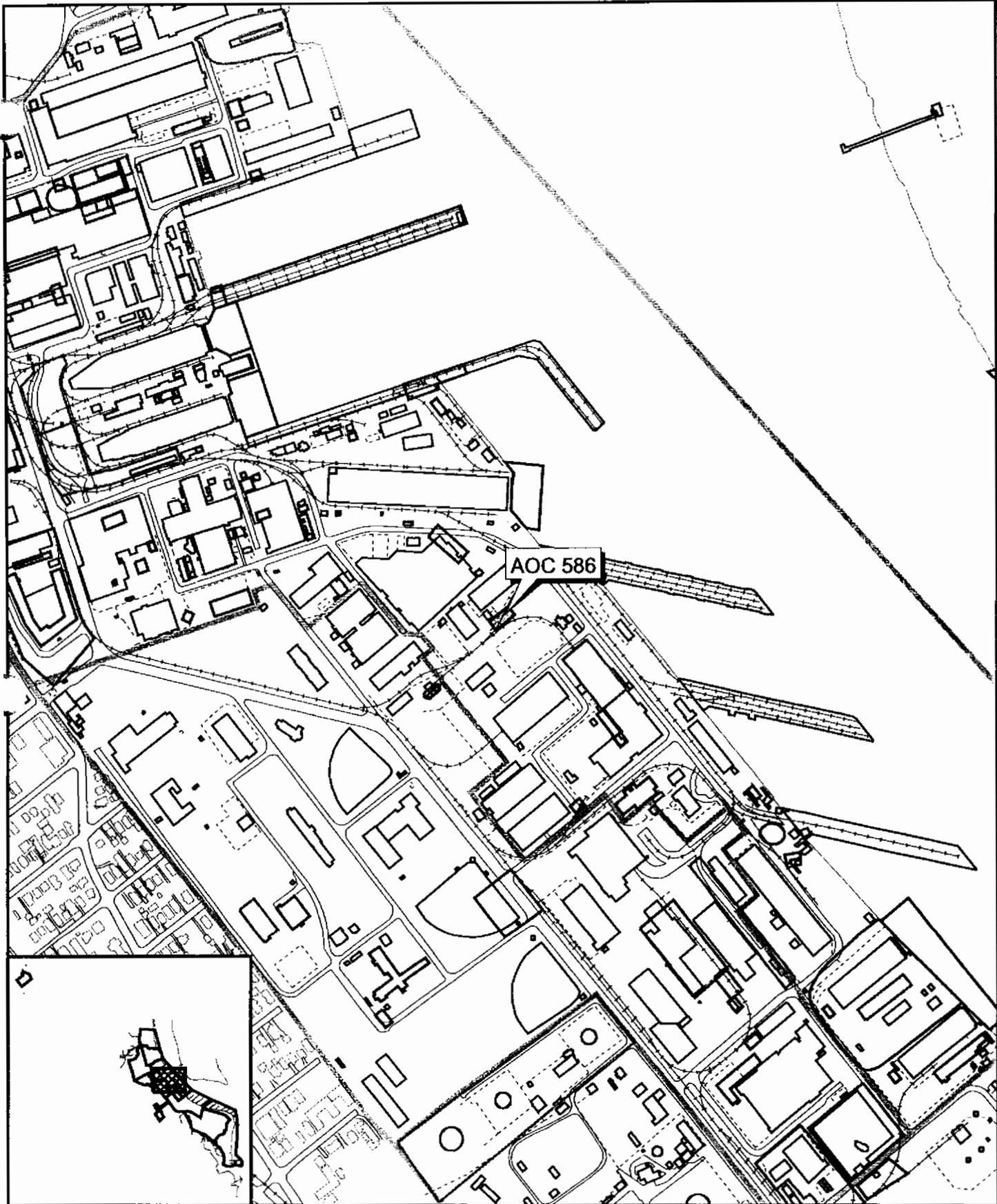
21 Information regarding these issues is also provided in this RFI Report Addendum to
22 expedite evaluation of closure of the site.

23 **1.3 Report Organization**

24 This RFI Report Addendum consists of the following sections, including this introductory
25 section:

26 **1.0 Introduction** – Presents the purpose of the report and background information relating
27 to the RFI Report Addendum.

- 1 **2.0 Summary of RFI Conclusions for AOC 586** – Summarizes the conclusions from the RFI
2 investigations and risk evaluation for AOC 586 as presented in the *Zone E RFI Report,*
3 *Revision 0* (EnSafe, 1997).
- 4 **3.0 Interim Measures and UST/AST Removals** – Provides information regarding any
5 interim measures (IMs) or tank removal activities performed at the site.
- 6 **4.0 Summary of Additional Investigations** – Summarizes information, if any, collected
7 after completion of the *Zone E RFI Report, Revision 0*.
- 8 **5.0 COPC/COC Refinement** – Provides further evaluation of chemicals of potential concern
9 (COPC) based on RFI and additional data to assess them as chemicals of concern
10 (COCs).
- 11 **6.0 Summary of Information Related to Site Closeout Issues** – Discusses the various site
12 closeout issues that the BCT agreed to evaluate prior to site closeout.
- 13 **7.0 Recommendations** – Provides recommendations for proceeding with site closure.
- 14 **8.0 References** – Lists the references used in this document.
- 15 **Appendix A** – Contains excerpts from the *Zone E RFI Report, Revision 0*, including a
16 summary of detections of chemicals and a groundwater flow map for the site vicinity.
- 17 **Appendix B** – Contains the UCL₉₅ Percent Estimates for Aroclor-1260 at AOC 586.
- 18 All tables and figures appear at the end of their respective sections.



AOC 586

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

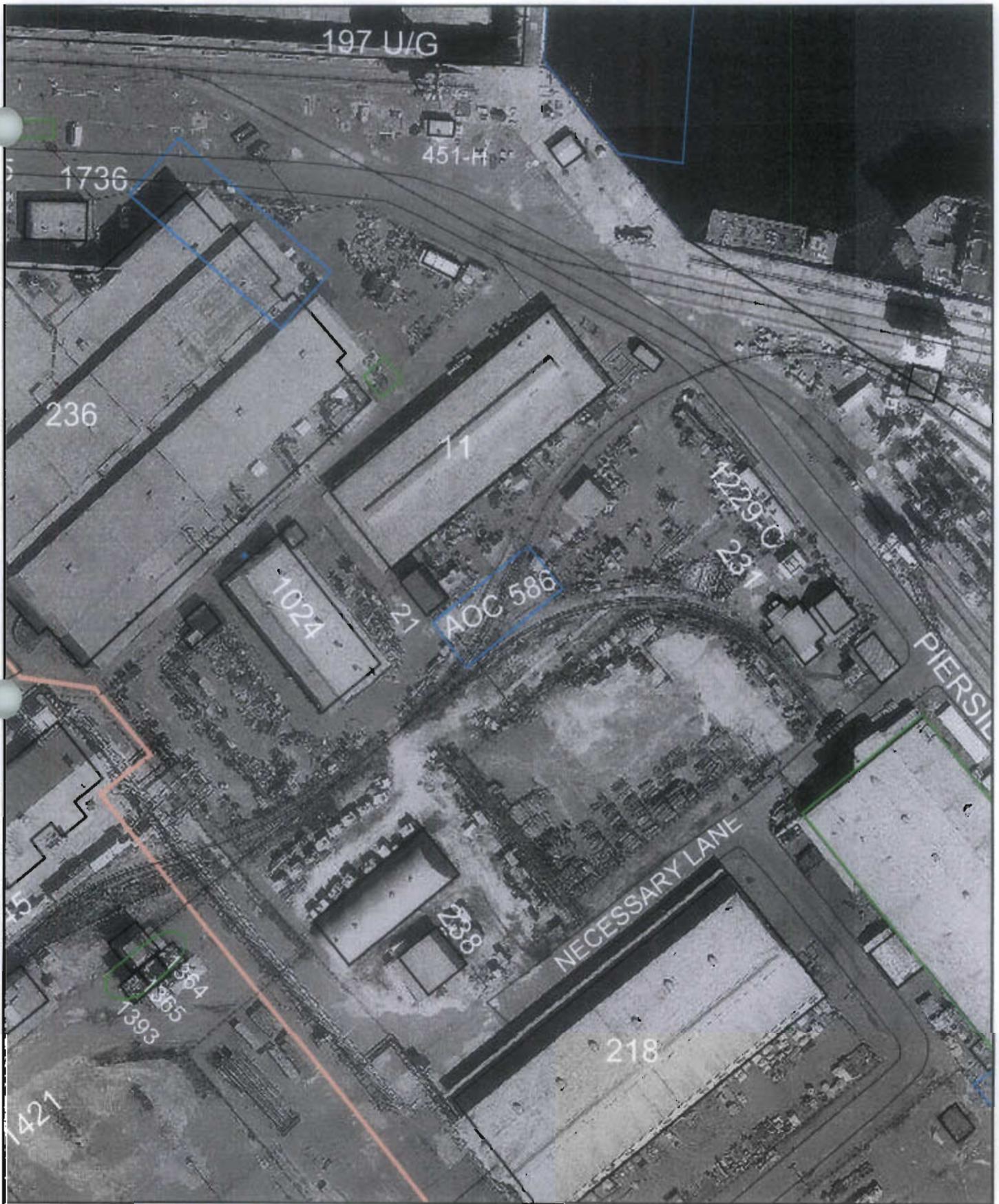


0 400 800 Feet



1 inch = 559 feet

Figure 1-1
Location of AOC 586 in Zone E
Charleston Naval Complex



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

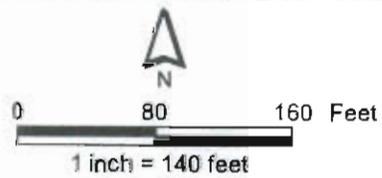


Figure 1-2
Aerial Photograph of AOC 586
AOC 586, Zone E
Charleston Naval Complex

1 **2.0 Summary of RFI Conclusions for AOC 586**

2 This section summarizes the results and conclusions from the RFI conducted at AOC 586
3 which were reported in the *Zone E RFI Report, Revision 0* (EnSafe, 1997). Figure 2-1 shows
4 the soil and groundwater sampling locations.

5 As part of the Zone E RFI, soil and groundwater investigations were conducted at AOC 586
6 during 1995 -1997. The RFI report presented the results of these investigations and
7 conclusions concerning contamination and risk, as summarized in the following sections. A
8 further evaluation of COCs at this combined site is provided in Section 5.0.

9 Appendix A contains a summary of the detected chemicals in soil and groundwater from
10 the *Zone E, RFI Report, Revision 0*.

11 **2.1 Soil Sampling and Analysis**

12 Soil was sampled during one sampling event at AOC 586. Surface and subsurface soil
13 samples were collected beneath the concrete slab and gravel covering AOC 586 from soil
14 sampling locations E586SB001 through E586SB004 (see Figure 2-1). All samples were
15 analyzed for volatile organic compounds (VOCs), semivolatile organic compounds
16 (SVOCs), metals, polychlorinated biphenyl compounds (PCBs), and pH. No field duplicate
17 samples were collected.

18 **2.1.1 Surface Soil Results**

19 During the RFI, surface soil detections of organic compounds were evaluated against the
20 U.S. Environmental Protection Agency (EPA) Region III industrial risk-based
21 concentrations (RBCs) (with a hazard index [HI]=0.1 for noncarcinogens). Surface soil
22 detections of inorganic compounds were evaluated against the EPA Region III industrial
23 RBCs (HI=0.1 for noncarcinogens) and the Zone E background reference concentrations
24 (BRCs).

25 Detected concentrations of organic and inorganic compounds for surface soil samples were
26 as follows:

- 27 • **VOCs:** No VOCs were detected in surface soil at concentrations above the screening
28 criteria.

- 1 • **SVOCs:** Surface soil samples had three detections of benzo[a]pyrene equivalents (BEQs)
2 with a maximum calculated concentration of 0.641 milligrams per kilogram (mg/kg),
3 which was below the EPA Region III industrial RBC for benzo[a]pyrene in surface soil
4 (0.780 mg/kg).
- 5 • **Inorganics:** The surface soil sample collected at sample location E586SB002 had a
6 manganese concentration of 431 mg/kg. The Zone E BRC for manganese in surface soil
7 is 302 mg/kg.
- 8 • **PCBs:** The RFI report stated that the surface soil sample collected at sample location
9 E586SB001 had an Aroclor-1260 concentration of 0.870 mg/kg, which exceeded the EPA
10 Region III industrial RBC for Aroclor-1260 in surface soil in effect during the RFI (0.740
11 mg/kg).

12 **2.1.2 Subsurface Soil Results**

13 During the RFI, subsurface soil detections of organic compounds were compared with
14 generic soil screening levels (SSLs) (using a dilution attenuation factor [DAF]=10).

15 Subsurface soil detections of inorganic compounds were compared with generic SSLs (using
16 a DAF=10) and the Zone E BRCs.

17 Detected concentrations of organic and inorganic compounds from subsurface soil samples
18 were as follows:

- 19 • **VOCs:** VOCs were not detected in subsurface soil samples at concentrations above the
20 screening criteria.
- 21 • **SVOCs:** SVOCs were not detected in subsurface soil samples at concentrations above the
22 screening criteria.
- 23 • **Inorganics:** Inorganics were not detected in subsurface soil samples at concentrations
24 above the screening criteria.
- 25 • **PCBs:** PCBs were not detected in subsurface soil samples at concentrations above the
26 screening criteria.

27 **2.2 Groundwater Sampling and Analysis**

28 Groundwater samples were collected at AOC 586 during four sampling events for
29 inorganics and two sampling events for organics from shallow groundwater monitoring
30 well E586GW001. The sampling location is shown in Figure 2-1. Groundwater samples were

1 analyzed for VOCs, SVOCs, PCBs, metals, pH, chlorides, sulfates, and total dissolved solids
2 (TDS).

3 **2.2.1 Shallow Groundwater Results**

4 During the RFI, detections in shallow groundwater samples were compared with the EPA
5 Region III tap-water RBCs, maximum contaminant levels (MCLs), and for inorganics, the
6 Zone E BRCs for shallow groundwater.

7 Detected concentrations of organic and inorganic compounds for shallow groundwater
8 samples were as follows:

- 9 • **VOCs:** VOCs were not detected in shallow groundwater above laboratory detection
10 limits.
- 11 • **SVOCs:** SVOCs were not detected in shallow groundwater above the screening criteria.
- 12 • **PCBs:** PCBs were not detected in shallowground water above laboratory detection
13 limits.
- 14 • **Inorganics:** Inorganics were not detected in shallow groundwater above the screening
15 criteria.

16 **2.2.2 Deep Groundwater Results**

17 Deep groundwater samples were not collected at AOC 586.

18 **2.3 RFI Human Health Risk Assessment (HHRA)**

19 The *Zone E RFI Report, Revision 0* used a fixed-point risk evaluation (FRE) approach at this
20 site. The FRE considered site resident and site worker scenarios during the FRE. The
21 detailed risk assessment for AOC 586 is presented in Section 10.42.6 of the *Zone E RFI*
22 *Report, Revision 0*.

23 **2.3.1 Soils**

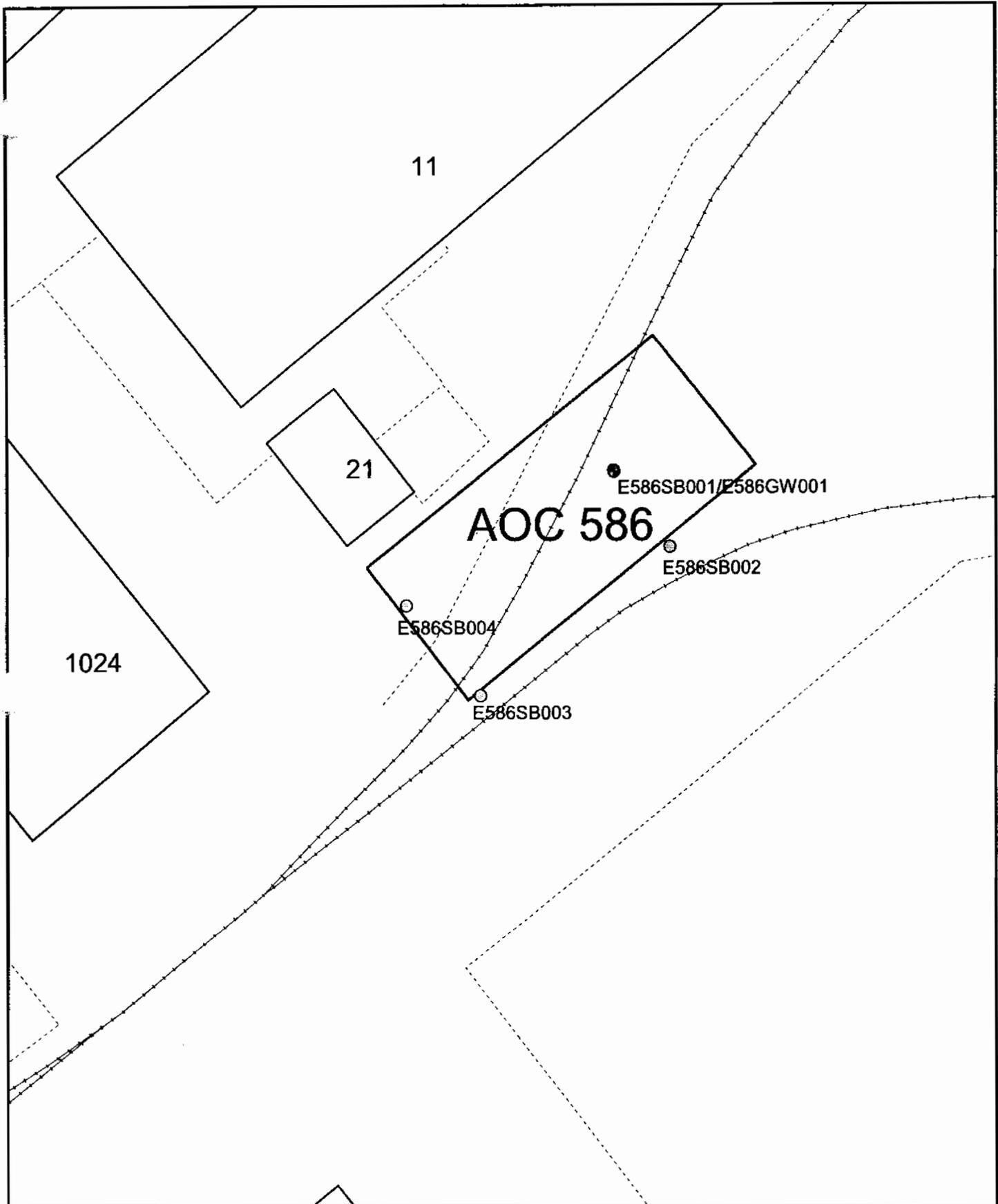
24 The HHRA for AOC 586 identified Aroclor-1260, BEQs, and manganese as COCs in surface
25 soil for an unrestricted (i.e., residential) land use scenario. No COCs were identified in
26 subsurface soil.

27 **2.3.2 Groundwater**

28 The HHRA for AOC 586 did not identify any COCs for shallow groundwater. Deep
29 groundwater was not sampled.

1 **2.4 RFI Conclusions and Recommendations**

- 2 The *Zone E RFI Report, Revision 0* concluded that based on the analytical results and the FRE,
3 a Corrective Measures Study (CMS) should be conducted for the COCs identified in surface
4 soil at AOC 586 (Aroclor-1260, BEQs, and manganese). The RFI report recommended No
5 Further Action (NFA) status for groundwater at AOC 586.



- Groundwater Well
- Soil Sample
- - - Fence
- ≡ Railroads
- ▭ AOC Boundary
- ▭ SWMU Boundary
- ▭ Buildings

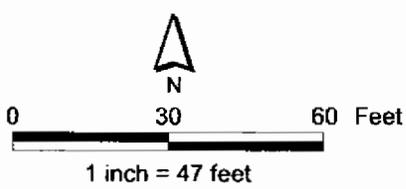


Figure 2-1
RFI Sample Locations
AOC 586, Zone E
Charleston Naval Complex

1 **3.0 Interim Measures and UST/AST Removals**

2 **3.1 UST/AST Removals**

3 There is no indication of an underground storage tank (UST) or aboveground storage tank
4 (AST) being present at AOC 586.

5 **3.2 Interim Measures**

6 There were no interim measures (IMs) conducted at AOC 586.

1 **4.0 Summary of Additional Investigations**

- 2 No additional investigations have been conducted at AOC 586 since the RFI was completed
3 by the Navy/EnSafe team during 1995-1997.

Section 5.0

1 5.0 COPC/COC Refinement

2 The *Zone E RFI Report, Revision 0* (EnSafe, 1997) identified Aroclor-1260, BEQs, and
3 manganese as surface soil COCs at AOC 586. Detected concentrations of site constituents
4 were compared to current screening criteria adopted by the BCT for the CNC project. These
5 chemicals are re-evaluated in this section to determine if they should be considered COCs.

6 The BCT has agreed that soil VOC data will be re-screened against generic SSLs, using a
7 DAF=1. Two VOCs, acetone and carbon disulfide, were detected in the surface and
8 subsurface soil samples from soil boring E562SB001. These detections are presented in Table
9 5-1, which also presents their respective SSLs based on a DAF=1. The data indicate that the
10 detected VOCs do not exceed the SSL screening criteria.

11 5.1 Surface Soil

12 5.1.1 BEQs

13 The RFI report identified BEQs as a COC based on two detections above the EPA Region III
14 residential RBC for benzo[a]pyrene of 0.780 mg/kg. These detections were found in surface
15 soil samples collected at sample locations E586SB001 and E586SB003, with BEQ
16 concentrations of 0.810 mg/kg and 1.085 mg/kg, respectively. These values are below the
17 CNC BEQ site-wide reference concentration in surface soil of 1.304 mg/kg. There were no
18 BEQ exceedances of screening criteria in subsurface soil samples from AOC 586. Therefore,
19 BEQs are not considered a COC at AOC 586.

20 5.1.2 Aroclor-1260

21 The RFI report identified Aroclor-1260 as a COC based on an exceedance of the EPA Region
22 III industrial RBC of 0.740 mg/kg in the sample from E586SB001, which had an Aroclor-
23 1260 concentration of 0.870 mg/kg. The detected concentration exceeds the EPA Region III
24 residential RBC for Aroclor-1260 of 0.320 mg/kg. A 95-percent Upper Confidence Limit
25 (UCL_{95}) estimation indicated lognormal distribution for the data. However, due to the small
26 sample size, the result was a UCL_{95} estimate greater than the maximum concentration, and
27 thus defaulted to the maximum concentration. A summary of these UCL_{95} calculations is
28 presented in Appendix B.

29 A UCL_{95} estimate based on the bootstrap method resulted in a value of 0.57 mg/kg, which
30 is also above the EPA Region III residential RBC value, but below the industrial RBC value.

1 Overall concentrations did not exceed the target action level of 1 mg/kg established by the
2 EPA for high occupancy areas (EPA, 2001). There were no detections of Aroclor-1260 in the
3 subsurface soil sample at this location.

4 The site is located within a highly industrialized area of Zone E. The detected
5 concentrations of PCBs are below the industrial worker protection-based RBC, and well
6 below the target action level of 1 mg/kg, although the detections slightly exceeded the
7 residential land use-based RBC. Based on these considerations, Aroclor-1260 is not
8 considered a COC for surface soil at AOC 586.

9 **5.1.3 Manganese**

10 The RFI report identified manganese in surface soil as a COC based on a detection in the
11 surface soil sample from E586SB002 of 431 mg/kg, which is above the EPA Region III
12 residential RBC of 160 mg/kg (HI=0.1). This detection is below the Zone E maximum
13 background manganese concentration of 508 mg/kg, indicating that manganese detections
14 at this site are due to natural occurrence and not site-related. Therefore manganese is not
15 considered a COC at AOC 586.

16 **5.2 COC Summary**

17 Based on current screening criteria adopted by the BCT, no COCs were identified in soil or
18 groundwater for the unrestricted or industrial land use scenarios at AOC 586.

TABLE 5-1
 Detected Concentrations of VOCs Methyl Ethyl Ketone, Carbon Disulfide, and Carbon Tetrachloride in Soil
RFI Report Addendum, AOC 586, Zone E, Charleston Naval Complex

Parameter	Station ID	Sample ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Residential RBC	SSL (DAF=1)	Zone E Background Range of Conc.
Methyl Ethyl Ketone								
Surface Soil								
	E586SB003	E586SB00301	0.004	J	10/16/95	4,700	NA	NA
Subsurface Soil								
	E586SB001	E586SB00102	0.003	J	10/16/95	4,700	NA	NA
Carbon Disulfide								
Subsurface Soil								
	E586SB003	E586SB00302	0.003	J	10/16/95	780	2	NA
Carbon Tetrachloride								
Subsurface Soil								
	E586SB003	586SB00302	0.002	J	12/05/1995	44	0.003	NA

All values are presented in units of milligrams per kilogram (mg/kg).

J Indicates an estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.

NA Not applicable

1 **6.0 Summary of Information Related to Site** 2 **Closeout Issues**

3 **6.1 RFI Status**

4 The *Zone E RFI Report, Revision 0* (EnSafe, 1997) addressed SWMUs/AOCs within Zone E of
5 the CNC, including AOC 586. In accordance with the RFI completion process, if a
6 determination of No Further Investigation (NFI) is made upon completion of the RFI, then a
7 site may proceed to either NFA status or to a CMS. The RFI for AOC 586 did not identify
8 any COCs for soil or groundwater. The remaining subsections address the issues that the
9 BCT agreed to evaluate prior to site closeout.

10 **6.2 Presence of Inorganics in Groundwater**

11 For the purpose of site closeout documentation, the inorganics in groundwater issue refers
12 to the detection of several metals (primarily arsenic, thallium, and antimony) in
13 groundwater at concentrations above the applicable MCL, preceded or followed by
14 detections of these same metals below the MCL or below the practicable quantitation limit.

15 There were no detections of arsenic in shallow groundwater at the site above the arsenic
16 MCL. There were no detections of thallium or antimony in shallow groundwater above
17 laboratory detection limits at AOC 586. Therefore, further evaluation of this issue is not
18 warranted.

19 **6.3 Potential Linkage to SWMU 37, Investigated Sanitary** 20 **Sewers at the CNC**

21 There are no data suggesting that there was an impact to the sanitary sewers from this site.
22 Therefore, further evaluation of this issue is not warranted.

23 **6.4 Potential Linkage to AOC 699, Investigated Storm Sewers at** 24 **the CNC**

25 No direct connection from AOC 586 to the storm sewers is known to exist. No COCs
26 requiring further evaluation are present at the site. Based on these findings, further
27 evaluation of this issue is not warranted.

1 **6.5 Potential Linkage to AOC 504, Investigated Railroad Lines** 2 **at the CNC**

3 A railroad line runs through the middle of the site. There are no data indicating impacts to
4 the site from the railroad line and no connection is established between the site and the
5 investigated railroad lines in Zone E. Therefore, further investigation of this issue is not
6 warranted.

7 **6.6 Potential Migration Pathways to Surface Water Bodies at** 8 **the CNC**

9 The nearest surface water body to AOC 586 is the Cooper River, which lies approximately
10 285 feet northeast of the site. The only potential migration pathway from the site to surface
11 water is by overland flow from stormwater runoff. AOC 586 is covered by concrete and
12 gravel, which limits contact of surface soil with stormwater. Since no soil COCs have been
13 identified at the site, no further evaluation of a potential pathway for contaminant
14 migration via stormwater runoff is warranted.

15 **6.7 Potential Contamination in Oil/Water Separators (OWSs)**

16 There are no OWSs associated with AOC 586. In addition, there is no reference to an OWS
17 at the site in the *Oil Water Separator Data* report, Department of the Navy, September 2000.
18 Therefore, further evaluation of this issue is not warranted.

19 **6.8 Land Use Controls (LUCs)**

20 No COCs have been identified at AOC 586. This evaluation was based on unrestricted risk-
21 based criteria land use classification. Therefore, LUCs at this site are not necessary.
22 However, the BCT has agreed that LUCs will be applied across all of Zone E at the CNC.
23 These LUCs are expected to include, at a minimum, restrictions for future land use to non-
24 residential use only. These LUCs will apply at AOC 586 due to its location within Zone E.

Section 7.0

1 7.0 Recommendations

2 AOC 586 consisted of a temporary powerhouse built in 1905 that was designated as
3 Building 1014. AOC 586 is located approximately 300 feet west of the intersection of
4 Necessary Lane and River Road in Zone E of the CNC. In 1953 an annex was added to
5 Building 1014. In 1944, Building 1014 was connected to Building 1077. The combined
6 structure was used for industrial salvage, which included a battery shop. Building 1014 was
7 demolished around 1957. Currently, AOC 586 consists of a concrete slab adjacent to the
8 southeast corner of Building 11.

9 The CNC RCRA Permit identified AOC 586 as requiring a CSI.

10 The *Zone E RFI Report, Revision 0* (EnSafe, 1997) identified Aroclor-1260, BEQs, and
11 manganese in surface soil as COCs for AOC 586. Based on an evaluation of the RFI data
12 against current screening criteria adopted by the CNC BCT, as well as the site conditions as
13 discussed above, no COCs were identified for the unrestricted future land use scenario.
14 Therefore, AOC 586 is suitable for unrestricted future land use and no further corrective
15 action is needed for this site.

16 AOC 586 is recommended for NFA status in the RCRA Corrective Action Permit for the
17 CNC. Provided that the information presented in this report is adequate to address RFI
18 completion and site closeout issues, it is expected that the BCT will concur that NFA is
19 appropriate for AOC 586. After BCT concurrence for NFA, a Statement of Basis will be
20 prepared and made available for public comment to allow for public participation in the
21 final remedy selection, in accordance with SCDHEC policy.

1 8.0 References

- 2 EnSafe Inc. *Zone E RFI Report, Revision 0, NAVBASE Charleston*. 1997.
- 3 EnSafe Inc./Allen & Hoshall. *Final RCRA Facility Assessment, NAVBASE Charleston*. July
4 1995.
- 5 EnSafe Inc./Allen & Hoshall. *Final Zone E RFI Work Plan, Revision 1, NAVBASE Charleston*.
6 June 1995.
- 7 CH2M-Jones. *Technical Memorandum: A Summary of Inorganic Chemical Concentrations in*
8 *Background Soil and Groundwater at the CNC*. 2001.
- 9 South Carolina Department of Health and Environmental Control, *Final RCRA Part B*
10 *Permit No. SC0 170 022 560*.
- 11 U.S. Environmental Protection Agency. *Code of Federal Regulations, 40 CFR 761.61.4*
12 *Subchapter R – Toxic Substances Control Act, Part 761, PCB Remediation Waste*. February 2001.

Table 10.42.6.1
 Chemicals Present in Site Samples
 AOC 586 - Surface Soil
 NAVBASE - Charleston
 Charleston, South Carolina

Parameter	Frequency of Detection		Range of Detection		Average Detected Conc.	Range of SQL		Screening Concentrations			Units	Number Exceeding		
								Residential RBC	Industrial RBC	Reference		Res.	Ind.	Ref.
PCBs														
Aroclor-1260	3	4	110	870	373	94	94	83	740	NA	UG/KG	3	1	
Carcinogenic PAHs														
B(a)P Equiv.	3	4	0.14	641.36	347	2149.23	2149.23	88	780	NA	UG/KG	2		
Benzo(a)anthracene	2	4	170	380	275	930	940	880	7800	NA	UG/KG			
Benzo(b)fluoranthene	2	4	460	590	525	930	940	880	7800	NA	UG/KG			
Chrysene	3	4	140	460	303	930	930	88000	780000	NA	UG/KG			
Dibenz(a,h)anthracene	1	4	94	94	94	820	940	88	780	NA	UG/KG	1		
Indeno(1,2,3-cd)pyrene	2	4	240	260	250	930	940	880	7800	NA	UG/KG			
Benzo(k)fluoranthene	2	4	330	390	360	930	940	8800	78000	NA	UG/KG			
Benzo(a)pyrene	2	4	310	420	365	930	940	88	780	NA	UG/KG	2		
Inorganics														
Aluminum (Al)	4	4	6400	11700	7973	NA	NA	7800	100000	26600	MG/KG	1		
Antimony (Sb)	2	4	1.3	1.8	1.55	0.61	0.76	3.1	82	1.77	MG/KG			1
Arsenic (As)	4	4	7.9	23.3	14.6	NA	NA	0.43	3.8	23.9	MG/KG	4	4	
Barium (Ba)	4	4	22	35.8	28.9	NA	NA	550	14000	130	MG/KG			
Beryllium (Be)	4	4	0.63	0.96	0.75	NA	NA	0.15	1.3	1.7	MG/KG	4		
Cadmium (Cd)	3	4	0.34	0.8	0.5	0.19	0.19	3.9	100	1.5	MG/KG			
Calcium (Ca)	N	4	18100	85400	62225	NA	NA	NA	NA	NA	MG/KG			
Chromium (Cr)	4	4	25.8	32.9	28.85	NA	NA	39	1000	94.6	MG/KG			
Cobalt (Co)	4	4	3.2	13.4	6.45	NA	NA	470	12000	19	MG/KG			
Copper (Cu)	4	4	16.5	104	46.2	NA	NA	310	8200	66	MG/KG			1
Iron (Fe)	N	4	8440	22500	12655	NA	NA	NA	NA	NA	MG/KG			
Lead (Pb)	4	4	19.1	132	61.9	NA	NA	400	1300	265	MG/KG			
Magnesium (Mg)	N	4	3790	4220	3948	NA	NA	NA	NA	NA	MG/KG			
Manganese (Mn)	*	4	140	431	240.5	NA	NA	180	4700	302	MG/KG	3		1
Mercury (Hg)	4	4	0.06	0.3	0.17	NA	NA	2.3	61	2.6	MG/KG			
Nickel (Ni)	4	4	9.5	15.2	12.85	NA	NA	160	4100	77.1	MG/KG			
Potassium (K)	N	4	1230	2430	1688	NA	NA	NA	NA	NA	MG/KG			
Selenium (Se)	4	4	1	1.2	1.1	NA	NA	39	1000	1.7	MG/KG			
Sodium (Na)	N	4	305	929	660	NA	NA	NA	NA	NA	MG/KG			
Thallium (Tl)	4	4	0.87	1.7	1.10	NA	NA	0.63	16	2.8	MG/KG	4		
Tin (Sn)	1	4	4.8	4.8	4.8	2.8	3.8	4700	6100	59.4	MG/KG			
Vanadium (V)	4	4	19.2	48.5	27.5	NA	NA	55	1400	94.3	MG/KG			
Zinc (Zn)	4	4	73.6	178	114.6	NA	NA	2300	61000	827	MG/KG			
Semivolatile Organics														
Benzo(g,h,i)perylene	2	4	280	310	295	930	940	310000	8200000	NA	UG/KG			
Fluoranthene	2	4	170	600	385	930	940	310000	8200000	NA	UG/KG			
Phenanthrene	1	4	210	210	210	820	940	310000	8200000	NA	UG/KG			
Pyrene	3	4	170	660	360	930	930	230000	6100000	NA	UG/KG			
Volatile Organics														
2-Butanone (MEK)	1	4	4	4	4	12	35	4700000	100000000	NA	UG/KG			

* - Identified as a residential COPC
 ** - Identified as an industrial COPC
 N - Essential nutrient
 MG/KG - milligram per kilogram
 UG/KG - microgram per kilogram
 SQL - Sample quantitation limit
 RBC - Risk-based concentration
 NA - Not Applicable

Table 10.42.6.3
Point Estimates of Risk and Hazard - Surface Soil Pathways
Industrial Scenario
AOC 586
NAVBASE-Charleston
Charleston, South Carolina

<u>Site</u>	<u>Location</u>	<u>Parameter</u>	<u>Concentration</u>	<u>Units</u>	<u>Hazard Index</u>	<u>% HI</u>	<u>Risk (E-06)</u>	<u>% Risk</u>
586	B001	<u>Aroclor-1260</u>	870.00	UG/KG	<u>NA</u>		<u>0.8026</u>	100.00
		Total			<u>NA</u>		<u>0.8026</u>	
586	B002	<u>Aroclor-1260</u>	110.00	UG/KG	<u>NA</u>		<u>0.1015</u>	100.00
		Total			<u>NA</u>		<u>0.1015</u>	
586	B003	<u>Aroclor-1260</u>	140.00	UG/KG	<u>NA</u>		<u>0.1292</u>	100.00
		Total			<u>NA</u>		<u>0.1292</u>	
586	B004	<u>Aroclor-1260</u>	ND	UG/KG	<u>NA</u>		<u>NA</u>	
		Total			<u>NA</u>		<u>NA</u>	

Table 10.42.6.4
 Chemicals Present in Site Samples
 AOC 586 - Shallow Groundwater
 NAVBASE - Charleston
 Charleston, South Carolina

Parameter	Frequency of Detection		Range of Detection		Average Detected Concentration	Range of SQL		Screening Concentration Residential RBC Reference		Units	Number Exceeding RBC Ref.	
Inorganics												
Aluminum (Al)	1	1	157	157	157	NA	NA	3700	2810	UG/L		
Arsenic (As)	1	1	11.4	11.4	11.4	NA	NA	0.045	18.7	UG/L	1	
Semivolatile Organics												
Naphthalene	1	1	5	5	5	NA	NA	150	NA	UG/L		

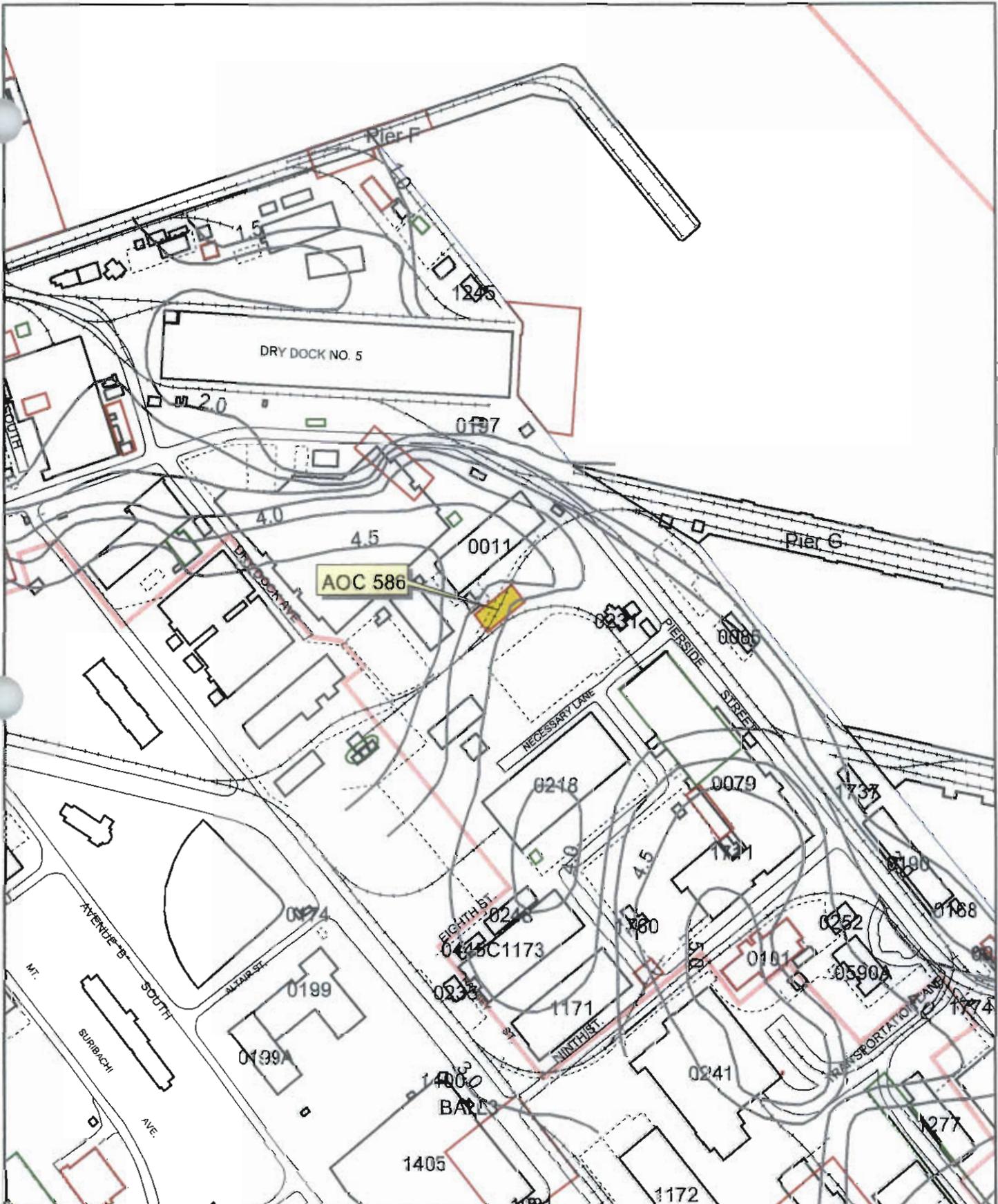
* - Identified as a COPC

UG/L - micrograms per kilogram

SQL - Sample quantitation limit

RBC - Risk-based concentration

NA - Not applicable



- Shallow Groundwater Contours ft. bls
- Fence
- Railroads
- Roads
- AOC Boundary
- SWMU Boundary
- Buildings
- Zone Boundary

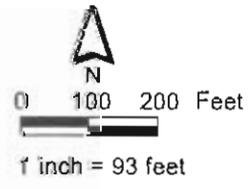


Figure A-1
 Shallow Groundwater Contour Map
 AOC 586, Zone E
 Charleston Naval Complex

Site: AOC 586
 Media: surface soil
 Units: ug/kg
 Chemical: Aroclor-1260
 CASRN:

STATISTICS

N	4
Detects	3
FOD	75%
Mean of Detect	373.333
Min of Detect	110.0000
Max of Detect	870.00
Best Estimate of Mean (arithmetic)	569.6
Best Estimate of Mean (geometric)	158.4
Nondetects at 1/2 DL	YES

95% UPPER CONFIDENCE LIMITS FOR MEAN

UCL95 Normal	747.6	
<i>t</i> -statistic	2.35	
UCL95 Lognormal	195977.4	Exceeds Max Detect
<i>H</i> -statistic	8.98	
UCL95 Nonparametric	#VALUE!	
UCL95 Bootstrap	569.57	

95% UPPER TOLERANCE INTERVAL

UTL95 Normal	1311.010047	
<i>coverage</i>	95%	
UTL95 Lognormal	4009.447587	
<i>coverage</i>	95%	
UTL95 Nonparametric	870.00	
<i>coverage</i>	80%	

DISTRIBUTION TESTING

Population is best described as:		LOGNORMAL
W_{normal}		0.723
W_{log}		0.925
$W_{\alpha = 0.05}$		0.748

Notes:

1. If population does not fit normal or lognormal distribution, check Q-Q plots and W-test values. The population may be close enough to one of those distributions to subjectively select a normal or lognormal distribution.
2. For site data, if the selected UCL95 exceeds the Max Detect, the Max Detect should be chosen as the EPC.
3. Lognormal UCL or UTL values calculated for less than 30 samples may be widely inflated.
4. If there is >90% nondetection, it is generally impossible to calculate a UTL or UCL with any level of confidence.