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INTERIM MEASURE WORK PLAN AREA OF CONCERN 700 (AOC 700) BUILDING 1646
ZONE C WITH TRANSMITTAL CNC CHARLESTON SC
11/3/2000
NAVFAC SOUTHERN

INTERIM MEASURE WORK PLAN

AOC 700, Building 1646, Zone C



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



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

PREPARED BY
CH2M-Jones

October 2000

*Revision 0
Contract N62467-99-C-0960*

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AOC 700, Building 1646, Zone C



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DEPARTMENT OF THE NAVY

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
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5090/11
Code 18B1
3 November, 2000

Mr. John Litton, P.E.
Director, Division of Hazardous and Infectious Waste Management
Bureau of Land and Waste Management
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, SC 29201

Subj: SUBMITTAL OF AREA OF CONCERN 700 INTERIM MEASURE WORK PLAN

Dear Mr. Litton,

The purpose of this letter is to submit an Interim Measure Work Plan for Area of Concern (AOC) 700 located at the Charleston Naval Complex. The work plan is submitted to fulfill the requirements of condition IV.E.2 of the RCRA Part B permit issued to the Navy by the South Carolina Department of Health and Environmental Control and the U.S. Environmental Protection Agency.

The document is distributed under separate cover letter by CH2M Hill. Appropriate certification is provided under that correspondence. We request that the Department and the EPA review this document and provide comments or approval whichever is appropriate. If you should have any questions, please contact Matthew Humphrey or Matthew A. Hunt at (843) 743-9985 and (843) 820-5525 respectively.

Sincerely,

A handwritten signature in black ink that reads "Matthew A. Hunt".

Matthew A. Hunt, P.E.
Environmental Engineer
BRAC Division

Copy to:
SCDHEC (4),
USEPA (Dann Spariosu)
CSO Naval Base Charleston (Matt Humphrey)
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CH2MHILL

October 30, 2000

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John Litton, P.E.
Director
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

Dear Mr. Litton:

Enclosed please find four copies of an Interim Measures Work Plan for AOC 700 at 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.

Please contact me if you have any questions or comments.

Sincerely,

Dean Williamson, P.E.

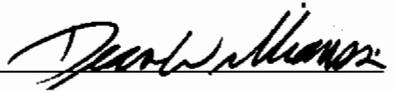
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Mihir Mehta/SCDHEC
Gary Foster/CH2M HILL w/att

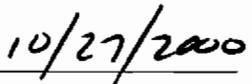
Certification Page for the Interim Measure Work Plan for AOC 700, Golf Course Maintenance Building, Building 1646, Zone C

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

Temporary Permit No. T2000342


Dean Williamson, P.E.


Date



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1 Acronyms and Abbreviations

2	AOC	Area of Concern
3	BCT	BRAC Clean-Up Team
4	BEQ	benzo(a)pyrene equivalent
5	bls	below land surface
6	BRA	Baseline Risk Assessment
7	BRAC	Base Realignment and Closure Act
8	CA	Corrective Action
9	CNC	Charleston Naval Complex
10	COC	contaminant of concern
11	CSAP	Comprehensive Sampling and Analysis Plan
12	Detachment	U.S. Naval Detachment
13	DPT	direct-push technology
14	EPA	U.S. Environmental Protection Agency
15	IM	Interim Measure
16	ILCR	Incremental Lifetime Excess Cancer Risk
17	LWA	lifetime weighted average
18	µg/kg	micrograms per kilogram
19	MEK	methyl-ethyl ketone
20	mg/kg	milligrams per kilogram
21	MW	monitoring well
22	NAVBASE	Naval Base
23	NFA	no further action

1 **Acronyms and Abbreviations, Continued**

2	OWS	oil/water separator
3	PAH	polynuclear aromatic hydrocarbon
4	PCB	polychlorinated biphenyl
5	PPE	personal protective equipment
6	RAB	Restoration Advisory Board
7	RBC	risk-based concentration
8	RCRA	Resource Conservation and Recovery Act
9	RFA	RCRA Facility Assessment
10	RFI	RCRA Facility Investigation
11	SCDHEC	South Carolina Department of Health and Environmental Control
12	SSL	Soil Screening Level
13	SWMU	Solid Waste Management Unit
14	VOC	volatile organic compound

SECTION 1.0

Introduction

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

12 In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation
13 and remediation services at CNC. This submittal has been prepared by CH2M-Jones to
14 document the basis for an Interim Measure (IM) at AOC 700 in Zone C of the CNC.

1.1 Background for Interim Measure Work Plan

16 As part of RCRA CA activities, a RCRA Facility Investigation (RFI) report was finalized for
17 Zone C (EnSafe Inc. [EnSafe] 1997). Zone C is located on the western edge of the northern
18 portion of CNC. It is bounded by McMillian Avenue to the south; Hobson Avenue to the
19 east; Avenue "D" to the northeast; and the CNC property boundary to the west and north.

20 Figure 1-1 shows the location of Zone C with respect to the CNC. Detailed figures depicting
21 AOC 700 are presented in Section 2.0 of this Work Plan.

22 The RFI at AOC 700 did not identify the presence of significant levels of soil or groundwater
23 contamination, and the site was recommended for No Further Action (NFA) in the final RFI
24 report (EnSafe 1997). However, an additional surface soil sample collected at AOC 700 as
25 part of the investigation of Solid Waste Management Unit (SWMU) 37, the sanitary sewer
26 system, revealed an arsenic concentration of 38.9 milligrams per kilogram (mg/kg), which
27 significantly exceeds the Zone C background arsenic soil concentration of 14.2 mg/kg. This
28 value also exceeds the Zone C arsenic soil screening level (SSL) of 29 mg/kg.

1 CH2M-Jones has determined that removal of the small area with elevated arsenic-
2 containing soil is appropriate and should enable closeout of the site in a condition suitable
3 for future unrestricted use (i.e., with no land use controls). Accordingly, CH2M-Jones has
4 prepared this IM Work Plan to describe the proposed approach for excavating and
5 disposing of the soil. SCDHEC's comments pertaining to sections of this IM Work Plan that
6 address the proposed soil remediation approach will be adjudicated with SCDHEC prior to
7 implementing the IM.

8 It is anticipated that once the IM is complete, no further remedial action will be required and
9 that the IM may be considered the final remedy for the site. At that point, the site status
10 could be modified to NFA. Prior to changing a site's status to NFA in the CNC RCRA CA
11 permit, the BRAC Clean-Up Team (BCT) agreed that the following issues should be
12 considered:

- 13 • Status of the RFI
- 14 • Presence of metals (inorganics) in groundwater
- 15 • Potential linkage of SWMU/Area of Concern (AOC) to SWMU 37 (investigated sanitary
16 sewers)
- 17 • Potential linkage of SWMU/AOC to AOC 699 (investigated stormwater sewers)
- 18 • Potential linkage of SWMU/AOC to AOC 504 (investigated railroad lines)
- 19 • Potential linkage to surface water bodies (Zone J)
- 20 • Potential contamination associated with oil/water separators (OWSs)
- 21 • Relevance or need for land-use controls at the site

22 Information regarding the above issues is also provided in this Work Plan to expedite
23 evaluation of site closure once the IM is complete. Comments received from SCDHEC on the
24 above closeout issues will be addressed in the IM Completion Report, which will be
25 prepared once the IM is complete.

26 Once the above issues have been adequately addressed, and the BCT concurs that NFA is
27 appropriate for the site, a Statement of Basis will be prepared. The Statement of Basis will be
28 available for public comment for a 60-day period, in accordance with SCDHEC policy,
29 which will allow public participation in the final remedy selection. In addition, the BCT will
30 inform the Restoration Advisory Board (RAB) of the intent to implement the IM after this

1 IM Work Plan has been approved. The RAB may also then provide comments to the BCT on
2 behalf of the public as to the proposed IM activities.

3 **1.2 Document Organization**

4 This IM Work Plan consists of the following five sections, including this introductory section:

5 **1.0 Introduction** – Presents the purpose of the IM Work Plan and background information
6 pertaining to the site.

7 **2.0 Technical Basis and Rationale for Interim Measure** – Provides a brief overview of site
8 and previous investigations.

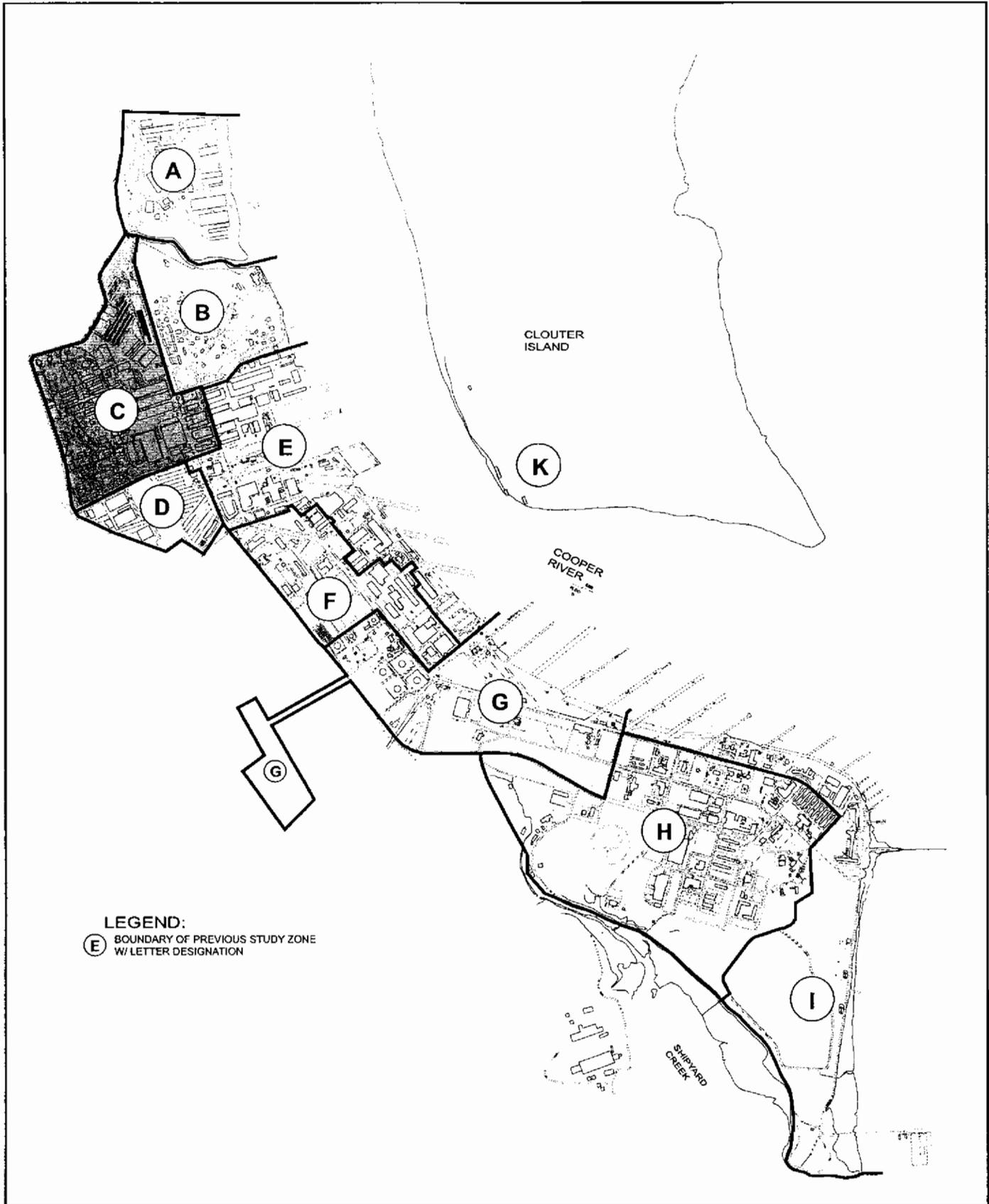
9 **3.0 Interim Measures Work Plan** – Presents details associated with the proposed site
10 cleanup plan.

11 **4.0 Summary of Information Related to Site Closeout Issues** – Summarizes site closeout
12 issues.

13 **5.0 References** – Lists the references used in this document.

14 **Appendix** – Contains a list of 27 known OWSs at the CNC.

15 Tables and figures appear at the end of their respective sections.



LEGEND:
 (E) BOUNDARY OF PREVIOUS STUDY ZONE
 W/ LETTER DESIGNATION

Note: Zone L Includes basewide railroad,
 sanitary and storm sewer systems.



0 1000 2000 Feet

Figure 1-1
 Location of Zone C within the CNC
 Charleston Naval Complex, Charleston, S.C.

SECTION 2.0

**Technical Basis and
Rationale for Interim Measure**

2.0 Technical Basis and Rationale for Interim Measure

This section provides a brief overview of site and previous investigations, including surface soil results from the Zone C and Zone L RFI, surface soil at SWMU 44 / AOC 700, and Zone C subsurface soil and groundwater results.

2.1 Brief Overview of Site and Previous Investigations

AOC 700, Building 1646, consists of a former golf course maintenance building. It is located west of Avenue "D" and north of Hunt Street. An aerial view of AOC 700 and the surrounding local area is presented on Figure 2-1.

The RCRA Facility Assessment (RFA) identified the following potential contaminants resulting from operations: metals, acids, solvents, herbicides, pesticides, and petroleum hydrocarbons (EnSafe 1995). An RFI work plan was developed for AOC 700, which included these potential contaminants as target analytes.

2.1.1 RFI Status and Conclusions

The status of the *Zone C RCRA Facility Investigation Report* is final (EnSafe 1997). Results of the RFI for AOC 700 are discussed in Section 10.9 of the *Zone C Final RFI Report*. In addition to the soil and groundwater samples that were collected at AOC 700 as part of the Zone C RFI, additional soil and groundwater samples were collected at AOC 700 as part of the Zone L investigation for SWMU 37, sanitary sewers. The results of these analyses were provided in the *Draft Zone L RFI Report* (EnSafe 1998). Figure 2-2 depicts the location of AOC 700 with respect to the sanitary sewer mains assessed as part of the Zone L investigation.

Brief Summary of Surface Soil Results from Zone C and Zone L RFI

Soil sampling locations in the AOC 700 vicinity are presented on Figure 2-3. Five soil borings (C700SB001 through C700SB005) were installed specifically as part of the AOC 700 RFI. Soil boring C044SB008 was installed as part of the RFI for SWMU 44, adjacent to the west side of AOC 700. Soil boring LC037SB001 was installed as part of the RFI for the sanitary sewer (SWMU 37) at a location adjacent to a sewer manhole.

1 Results of surface soil analyses in the RFI were compared to applicable screening criteria
2 (EPA Region III residential risk-based concentrations [RBCs] or background values).
3 Generally, inorganics surface soil concentrations were found to be within the range of
4 background values at the site. Arsenic and thallium were the only inorganics carried
5 forward through the risk assessment, based on minor exceedances of one sample over the
6 background reference values. For organics in soil, only benzo(a)pyrene was carried forward
7 in the risk assessment. The maximum value for benzo(a)pyrene equivalents (BEQs) in soil at
8 the site in the RFI report was 235 µg/kg, which is in the range of values commonly reported
9 in grid samples at the CNC. Table 2-1 presents a summary of the surface soil data for arsenic
10 and thallium for surface soil samples collected in the vicinity of AOC 700.

11 As part of the RFI, a Baseline Risk Assessment (BRA) was completed for the site. The BRA
12 concluded that estimated Incremental Lifetime Cancer Risks (ILCRs) were similar to those
13 calculated based on background inorganic values in Zone C and within the range of 1E-04 to
14 1E-06. Arsenic in surface soil accounted for 85 and 92 percent of the ILCR for the residential
15 and industrial exposure scenarios, respectively. Because the estimated risks are from
16 chemicals (PAHs and arsenic) commonly detected across Zone C and other zones within
17 CNC, and not significantly different from baseline risks estimated using background values
18 for these chemicals, NFA was recommended for site soil. SCDHEC approval of the *Zone C*
19 *Final RFI Report* indicates SCDHEC concurrence with NFA for this site (EnSafe 1997).

20 **Brief Summary of Previous Interim Measure for Surface Soil at SWMU 44 /AOC 700**

21 Surface soil C044SB008 was collected in the AOC 700 vicinity as part of the RFI at SWMU 44,
22 located adjacent to the west side of AOC 700. In March 1995, the sample (see Figure 2-3) was
23 collected from within approximately 10 feet of the railroad on the west side of AOC 700. The
24 arsenic concentration was 53.6 mg/kg in this surface soil sample.

25 Subsequent to this sampling event, the U.S. Naval Detachment (Detachment), on behalf of
26 the U.S. Navy, implemented an IM at SWMU 44, which extended into AOC 700. In
27 September 1996, the Detachment removed approximately 13,250 tons of coal and coal/soil
28 mixture from the SWMU 44 and AOC 700 area. The approximate limits of this IM at AOC
29 700, as reported in the IM Completion Report by the Detachment, are shown on Figure 2-3
30 (1997). Subsequent to this IM, a surface soil sample was obtained near C044SB008
31 (designated as C044SS008), which revealed an arsenic concentration of 15.7 mg/kg,
32 suggesting the IM had effectively reduced arsenic concentrations in surface soil in this
33 portion of AOC 700. The IM Completion Report did not specify the amount of soil removed
34 from this portion of the site.

1 As presented in Table 2-1, four arsenic values (14.3, 14.5, 15.7, and 38.9 mg/kg) exceed the
2 Zone C reference concentration of 14.2 mg/kg; three of these exceedances are marginal and
3 within or close to the typical error range for analyses.

4 It should be noted that several grid samples collected as part of the Zone C grid sampling
5 (GDCSB00201, GDCSB02801, and GDCSB03101) exhibited arsenic concentrations of 22.3, 22.4,
6 and 39.4 mg/kg, respectively, which is well above the Zone C background concentration.

7 These samples were excluded from the calculation of the Zone C background value. However,
8 these samples indicate that reference locations within Zone C have arsenic levels at
9 concentrations similar to those detected within AOC 700. These data notwithstanding, CH2M-
10 Jones has concluded that a focused IM for removing soil at AOC 700 with elevated arsenic is a
11 conservative measure and therefore proposes to remove this soil.

12 **Brief Summary of Zone C Subsurface Soil and Groundwater Results**

13 As with surface soils, inorganics in subsurface soil were generally within the range reported
14 for Zone C for background samples. TCE was the only VOC detected in soil during the RFI,
15 at a concentration below its RBC and SSL. Semi-volatile organics in subsurface soil were
16 below their respective SSLs.

17 Dieldrin was detected above its SSL at a single boring location (C700SB005) in both the surface
18 and subsurface intervals. However, based on the lack of detection of dieldrin in groundwater
19 samples collected at the site from well C044GW008, the BCT concluded that groundwater had
20 not been impacted by dieldrin and that concentrations of chemicals in soil were protective of
21 groundwater. On that basis, NFA for subsurface soils was proposed in the RFI.

22 In addition to the groundwater samples analyzed from well C044GW008, a groundwater
23 sample collected from well C700GWC01 was analyzed for pesticides. All pesticides were
24 below the detection limit in this sample, confirming that groundwater had not been impacted.

25 A summary of results for inorganics and dieldrin in groundwater samples collected from
26 permanent wells at site is presented in Table 2-2.

27 The surface soil sample collected as part of the SWMU 37 investigation, with an arsenic value
28 of 38.9 mg/kg, exceeds the arsenic SSL of 29 mg/kg (based on the default DAF of 20 used for
29 Zone C). Further evaluation of the arsenic concentration in soil beneath this sample will be
30 conducted as part of the IM, as described in Section 3.0. A goal of the IM will be to remove
31 subsurface soil in the target excavation area containing arsenic concentrations above the SSL.

1 2.2 Summary

2 Overall, the RFI for AOC 700 concluded that, although there were minor exceedances of
3 several screening criteria, NFA was appropriate because the exceedances were not
4 significant, groundwater had not been impacted, and the site is relatively small in size.

5 Because of the subsequent detection of elevated arsenic at a single surface soil sample
6 adjacent to the sanitary sewer manhole, CH2M-Jones proposes a focused soil excavation IM
7 to remove the small area with arsenic-containing soil.

8 With the reduction of the arsenic levels near the sewer manhole, AOC 700 will be suitable for
9 unrestricted land use. CH2M-Jones proposes a limited excavation in the area of LC037SB001
10 to remove soils with elevated levels of arsenic. The target arsenic cleanup level for surface
11 soil (0-1 foot) is the background level established in the Zone C RFI (14.2 mg/kg). The
12 proposed cleanup level for deeper soils (greater than one foot to the water table) is 29 mg/kg
13 (based on a default DAF of 20 and protection of groundwater to the arsenic MCL of 50 µg/L).

TABLE 2-1
 Summary of Surface Soil Data for Arsenic and Thallium
 IM Work Plan, Building 1646, AOC 700, Zone C

Station ID	Arsenic		Thallium		Sample Collection Date
	Result (mg/kg)	Qualifier	Result (mg/kg)	Qualifier	
C700SB001	9.3	=	0.39	UJ	6/5/1996
C700SB002	3.2	=	0.38	UJ	6/5/1996
C700SB003	9.5	=	2.0	J	6/5/1996
C700SB004	3.0	=	0.37	UJ	6/5/1996
C700SB005	14.3	=	0.39	UJ	6/5/1996
LC037SB001	38.9	=	0.63	J	
LB037SP004	14.5	=	1.18	U	
C044SB008	53.6	J	0.66	U	3/14/1995
C044SS008	15.7	J	0.55	U	7/24/1997

= Result is equal to reported value.
 J Result is estimated and below quantitation limit.
 U Result is not detected below reported level.
 UJ Result is not detected below estimated reported value.

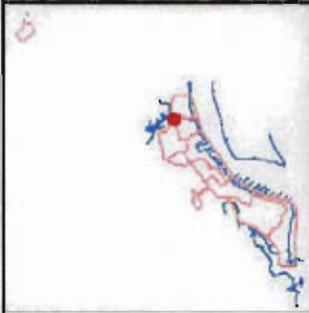
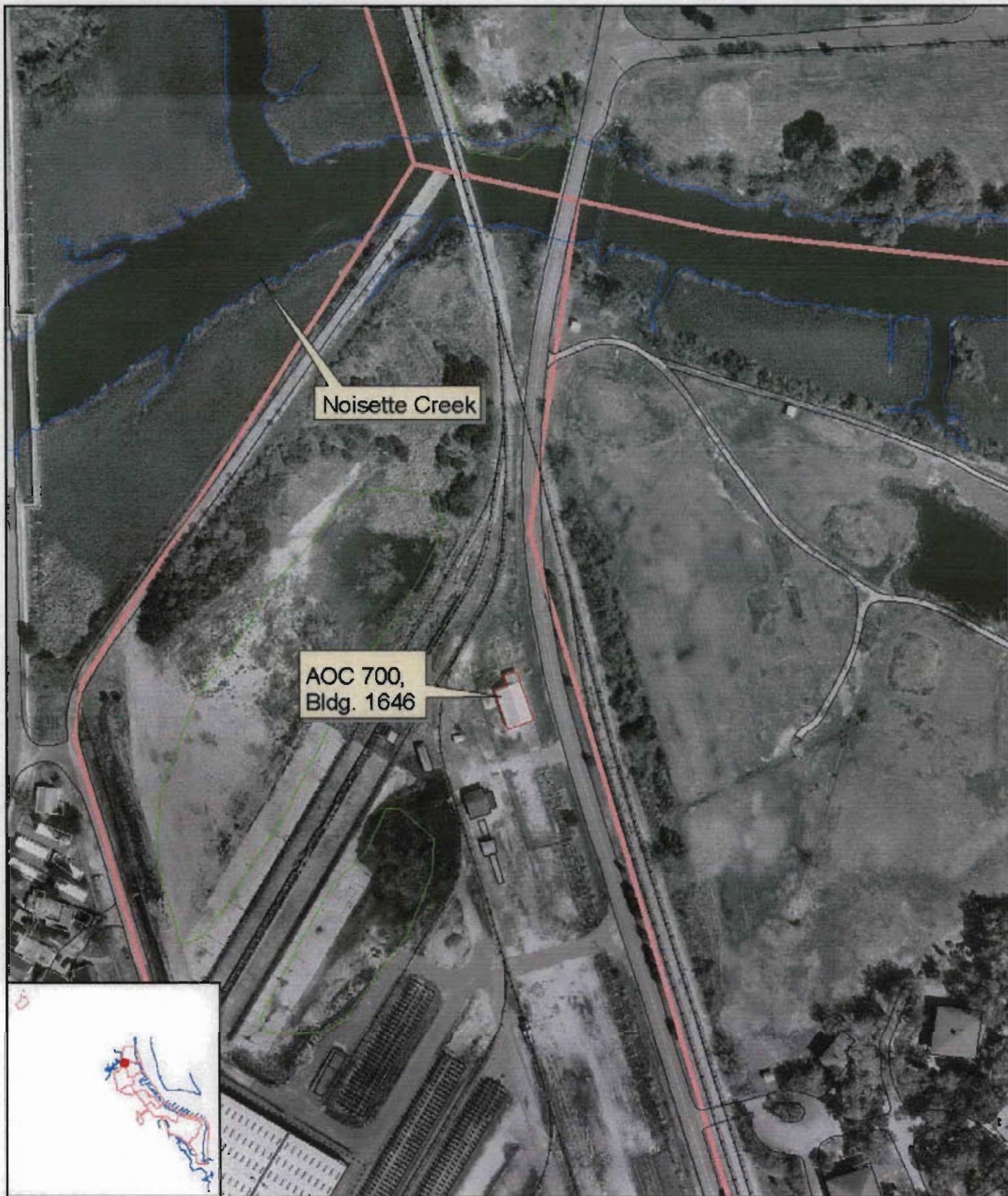
TABLE 2-2

Summary of Results for Heavy Metals and Dieldrin in Groundwater Samples Collected from Permanent Wells in AOC 700 Vicinity
IM Work Plan, Building 1646, AOC 700, Zone C

Parameter	Station ID/Sample Date				MCL
	C044GW008 7/28/1997	C700GWC01 3/22/99	LC037GW001 9/11/97	LC037GW001 7/30/98	
Aluminum	7,780	44.8J	28.1J	200	200
Arsenic	7.2J	6.4J	49.2	41.6	50
Barium	43	16.3J	55.3	200U	2,000
Beryllium	1.7UJ	0.3U	0.42U	5U	4
Chromium	16	1.5J	4.4J	11.2	100
Copper	12.6J	4U	1.4U	25U	1,000
Iron	9,290	1,530	16,800	14,900	300
Mercury	0.1UJ	0.1U	0.15J	0.2U	2
Manganese	467	91.5	473	359	50
Thallium	5U	2.3U	5U	10U	2
Nickel	7.4J	1.1U	1.1J	40U	
Vanadium	22.6	0.9U	1.7J	50U	
Zinc	166	16.4J	6.2J	20U	5,000
Dieldrin	0.08U	0.08U	0.08U	0.11U	

All values measured in micrograms per liter.

- J Estimated; below reporting limit.
- U Analyte was not detected; value given is detection limit.



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

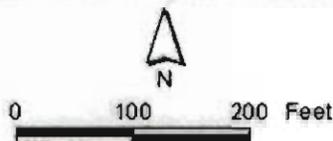
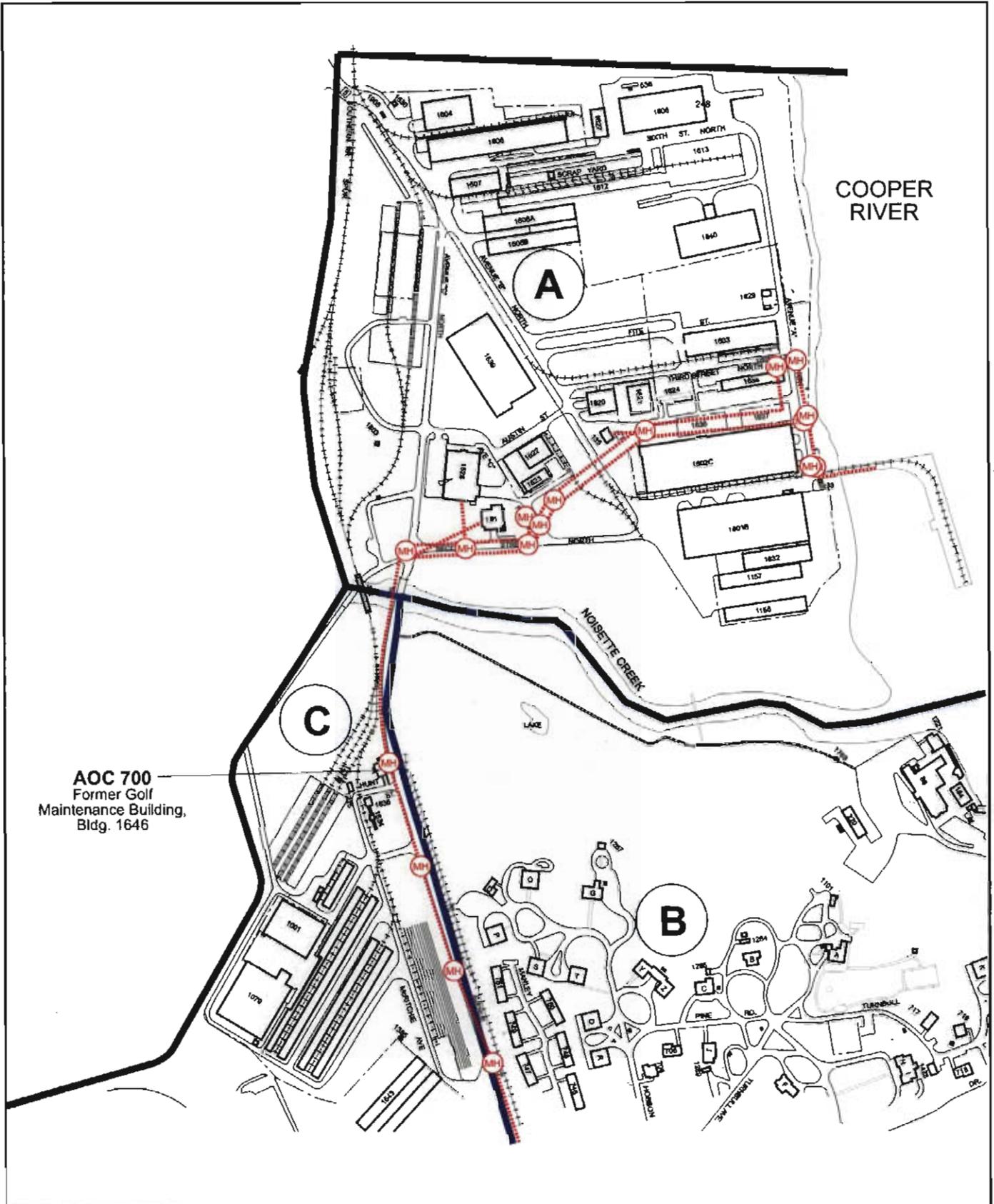


Figure 2-1
Areal View of AOC 700 Vicinity
Zone C
Activity

COOPER RIVER



AOC 700
Former Golf
Maintenance Building,
Bldg. 1646

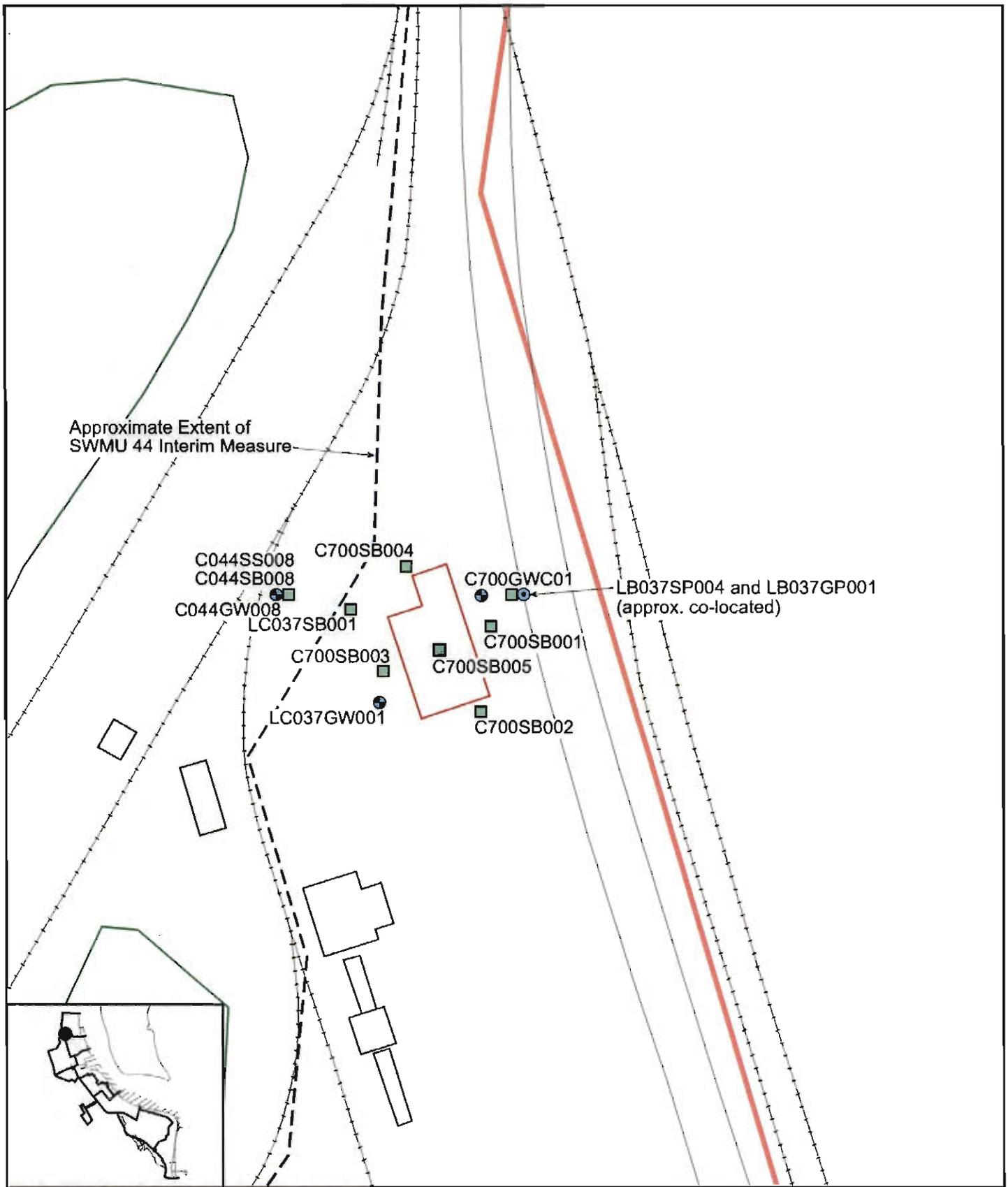
-  SANITARY SEWER LINE INVESTIGATED FOR SWMU 037
-  SEWER MANHOLE
-  FENCELINE
-  RAILROAD TRACKS
-  ZONE W/ LETTER DESIGNATION



0 250 500 Feet

Figure 2-2
SWMU 43 In Relation to Zone L
Charleston Naval Complex,
Charleston, S.C.

CH2MHILL



- SWMU 44 IM Approx. Extent
- Soil Boring
- Groundwater Well
- Railroads
- AOC Boundary
- Buildings
- SWMU Boundary
- Zone Boundary

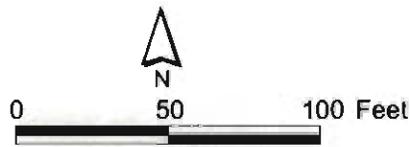


Figure 2-3
Soils and Groundwater Samples
Collected near AOC 700

SECTION 3.0

IM Work Plan

1 **3.0 IM Work Plan**

2 This section presents the details associated with the proposed site cleanup plan.

3 The objective of the IM is to remove surface and subsurface soils, if necessary, in the vicinity
4 of sample location LC037SB001 with arsenic concentrations greater than Zone C background
5 levels (14.2 mg/kg) and the SSL (29 mg/kg). Following removal of the contaminated soils,
6 the site will be backfilled with clean fill.

7 This IM is expected to be the only and final remedial action performed at AOC 700. After
8 arsenic levels have been reduced, and SCDHEC has reviewed and approved the IM
9 Completion Report and associated site closeout documentation, the site will fulfill NFA
10 requirements as agreed to by the BCT. A Statement of Basis recommending NFA then
11 would be prepared for public comment. Upon receipt of public comments and preparation
12 of appropriate responses, the RCRA CA permit will be modified.

13 The remainder of this section describes the components of the IM.

14 **3.1 Health and Safety**

15 All work completed as part of this IM will be performed in accordance with the CH2M-
16 Jones Site-Specific Health and Safety Plan.

17 **3.2 Sampling and Analysis Plan**

18 All investigative work will be performed in accordance with the Comprehensive Sampling
19 and Analysis Plan (CSAP) portion of the RFI Work Plan (EnSafe 1996).

20 **3.3 Contaminant Delineation**

21 Prior to excavation, soil samples will be collected and analyzed for arsenic from five soil
22 locations to determine the extent of the excavation. Subsurface soil samples will be collected
23 from sample location LC037SB001 at a depth of 2 to 3 feet below land surface (bls) and
24 immediately above the water table (estimated at approximately 4 feet bls). A surface and

1 subsurface soil sample (2 to 3 feet bls) also will be collected at a radial distance of about 10
2 feet from the manhole (see Figure 3-1) at four locations.

3 It is anticipated that arsenic in the shallow and deep outer samples will be reported at
4 concentrations of less than background levels and the SSL, respectively, and these locations
5 will therefore represent the limits of the excavation. Should concentrations be reported at
6 levels greater than the proposed cleanup levels (surface and subsurface), further sampling
7 (e.g., stepping out farther from the manhole or collecting deeper soil samples) will be
8 conducted, as required, to define an area and depth that complies with the proposed cleanup
9 levels. The maximum depth of soil sampling and soil excavation will be the water table.

10 Because of the presence of railroad tracks along the western boundary, the limits of
11 excavation in this direction will be no closer than within a few feet of the railroad ballast.
12 Excavation within 10 feet of the ballast must be cleared and coordinated with appropriate
13 railroad authorities.

14 Once the limits of excavation have been prepared, the footprint of the site to be excavated
15 will be clearly marked with stakes.

16 **3.4 Pre-Excavation Activities**

17 Once the limits (area and depth) of the excavation have been defined, the pre-excavation
18 activities will be initiated. To prepare for the start of onsite operations, CH2M-Jones will
19 notify the necessary agencies, departments, and utilities regarding planned activities at the
20 project site. No permits are necessary for completing the removal of soils at AOC 700.

21 CH2M-Jones will examine the site for existing water, electricity, natural gas, telephone, or
22 other utility lines that may pose a potential hazard at the site. Utilities will be clearly
23 marked and identified.

24 CH2M-Jones requires and places significant emphasis on project health and safety for our
25 own personnel, our subcontractors, and the local community. Once all mobilized site
26 personnel have arrived on site, a project briefing and health and safety orientation meeting
27 will be conducted for all site personnel. Work areas will be designated. Site control
28 procedures, including work area barricades, daily site security, and site cleanliness and
29 maintenance procedures will be reviewed and implemented. Vehicle access areas will be
30 identified and site traffic monitored.

1 **3.4.1 Site Security Zones**

2 The contaminant levels reported at AOC 700 are within a range considered protective of
3 industrial workers. Therefore, personnel working at the site will be required to comply with
4 wearing Level D personal protective equipment (PPE). For the purposes of this plan, it has
5 been assumed that the depth of excavation will not exceed one foot and will not be in
6 proximity of building structures. Should the contamination delineation indicate a larger
7 footprint or depth of excavation, or higher contamination levels, relative components of this
8 IM may be revised to ensure worker safety and protection of adjacent structures.

9 The excavation area will be clearly marked with warning tape to warn of possible tripping
10 or falling hazards.

11 **3.4.2 Site Clearing**

12 Site preparation, clearing, and grubbing of onsite vegetation will begin in areas where
13 excavation and site preparation activities will take place. In areas not disturbed by site
14 activities, reasonable attempts will be made to limit the disturbance of ground cover. No
15 activities in or under existing site structures are planned as part of this IM.

16 **3.5 Support Activities**

17 **3.5.1 Waste Management**

18 Three waste streams will be generated as part of this IM: excavated soils, decontamination
19 wastes, and PPE. No hazardous wastes are expected to be generated as a result of this IM.
20 Excavated soils will be characterized in accordance with South Carolina Hazardous Waste
21 Management Regulations (Section SCDHEC R.61-79.261) and disposed of in accordance
22 with all applicable regulations and permits. Assuming soils will be characterized as non-
23 hazardous, they will be sent to a subtitle D landfill. Decontamination wastes and PPE also
24 will be disposed of in accordance with applicable regulations.

25 Offsite transportation and disposal will be performed by properly permitted and licensed
26 subcontractors. Materials designated for offsite disposal will be documented, tracked, and
27 their disposition verified. This information will be reported in the IM Completion Report.

28 **3.5.2 Equipment Decontamination**

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

3.6 Excavation of Soils

3.6.1 Excavation

Figure 3-1 presents the estimated minimum limits of the excavation to a depth of one foot. As discussed in Section 3.1, the footprint and depth of the excavation could be revised, based on the assessment of the data collected in the contamination delineation phase.

Removal of soils around the manhole at Building 1646 will be accomplished by hand-excavating the area to prevent possible heavy equipment damage of the manhole structure. The remainder of the soils in the planned excavation area will be removed with a backhoe or similar equipment, to a depth of one foot (assuming a deeper removal of soil is not necessary, as discussed in Section 3.1).

Excavated soils will be transferred immediately to a disposal container (e.g., a roll-off box or similar container) and subsequently transported to an appropriately permitted offsite disposal facility for landfilling. The transported waste will be covered with a tarp to minimize airborne transfer of soil particulates.

Confirmation samples will not be collected prior to backfilling the excavation, as the soil samples described in Section 3.1 will define the extent of contamination requiring cleanup.

3.6.2 Site Restoration

The excavation will be backfilled with appropriate fill material to an elevation that approximates pre-excavation topography.

3.7 IM Completion Report

Upon IM Work Plan approval, the IM will be implemented. A final report will be submitted within 60 days of completion of the IM. The Final Report will summarize actions performed and will provide the following information:

- Excavated volumes
- Nature and volume of waste generated
- Waste disposal
- Sampling results
- Site photographs
- Problems encountered

- 1 • Other information that could be helpful in evaluating the IM
- 2 • Response to comments on closeout criteria presented in this Work Plan.

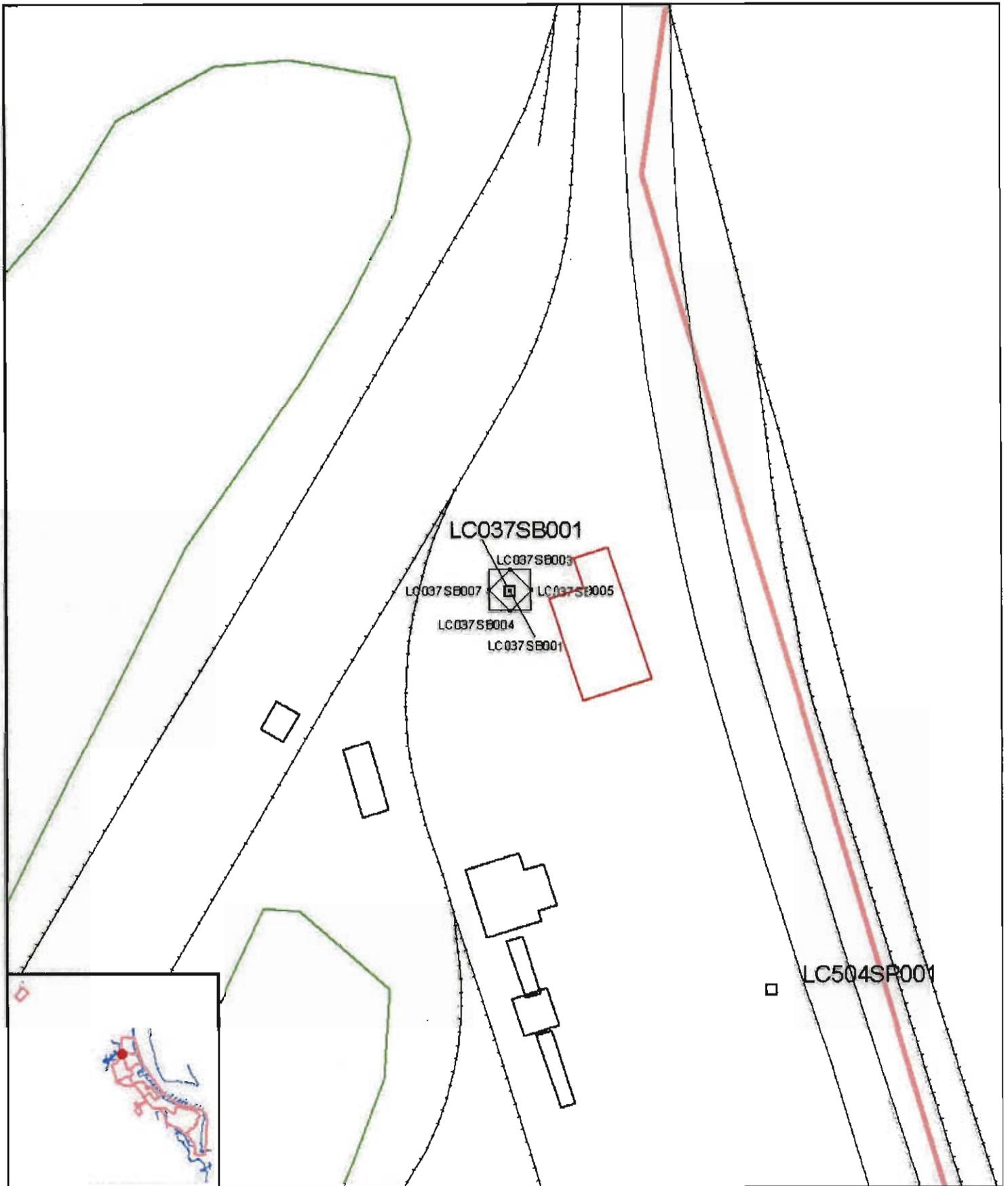


Figure 3-1
Proposed IM Excavation Area
and Sampling Locations

- Railroads
- AOC Boundary
- SWMU Boundary
- Buildings
- Zone Boundary
- Existing Soil Boring
- Proposed Soil Boring (Sample collected at surface and one-foot)



SECTION 4.0

**Summary of Information
Related to Site Closeout Issues**

4.0 Summary of Information Related to Site Closeout Issues

4.1 Presence of Inorganics in Groundwater

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

During the RFI, one well was evaluated (C044GW008) for groundwater quality. Additional groundwater samples from wells or direct-push technology (DPT) sampling activities were subsequently collected. Data from well C044GW008 and wells later installed near AOC 700 are presented in Table 2-2. Table 2-2 shows that no constituent exceeded primary MCLs. Arsenic was close to its MCL in several samples. The proposed IM to remove soil containing arsenic at elevated levels will help ensure that groundwater impacts from site soils are minimized.

The data in the Zone C RFI also indicated that aluminum, iron, and manganese were above their secondary MCLs in some groundwater samples. However, these parameters were not considered contaminants of concern (COCs), but rather are present as a result of natural site groundwater conditions. Based on SCDHEC concurrence with the Zone C RFI, the presence of iron, manganese, and aluminum does not require additional evaluation.

Based on the review of this data, the issue of inorganics in groundwater is not a concern at AOC 700. Consequently, no further evaluation of this issue is necessary at this AOC.

4.2 Potential Linkage to Sanitary Sewers (SWMU 37)

The nearest investigated sanitary sewer to AOC 700 is adjacent to the site (see Figure 2-2). As part of the SWMU 37 investigation, soil (boring and DPT) and water (DPT) samples were collected. A surface soil sample was collected from the west side of the building at AOC 700 (LC037SB001, see Figure 2-3) as part of the sub-zone C investigation in Zone L.

1 In addition, one DPT soil sample (LB037SP004, see Figure 2-3) was collected adjacent to the
2 sanitary sewer line of AOC 700, on the east side of the site, as part of the sub-zone B
3 investigation in Zone L. A groundwater DPT sample (LC037GP001) was also collected at
4 this same location.

5 These samples were used to assess whether discharge of wastes to the sanitary sewer could
6 have caused a release to the environment prior to the waste entering the main sanitary
7 sewer line. The results of these samples are discussed below.

8 **4.2.1 Sample LC037SB001 (Soil)**

9 Data for this surface soil sample were reported in the *Draft Zone L RFI Report* (EnSafe 1998).
10 No VOCs, chlorinated pesticides, or polychlorinated biphenyls (PCBs) were detected above
11 RBC or SSL values in the soil sample collected. Dibenzo(a,h)anthracene was detected at a
12 concentration of 170 µg/kg, exceeding the RBC of 88 µg/kg. However, this value is within
13 the range of the anthropogenic background samples in the AOC 700 local vicinity.

14 Arsenic (38.9 mg/kg), chromium (72.6 mg/kg), iron (8,920 mg/kg), and thallium (0.63
15 mg/kg) exceeded RBCs and/or generic SSLs (based on a dilution attenuation factor [DAF]
16 of 20). The thallium result was "J" flagged. Each of these parameters is further discussed
17 below in the text that follows.

18 **Arsenic**

19 The reported arsenic concentration of 38.9 mg/kg is greater than the zone-specific
20 background concentration of 14.2 mg/kg and the SSL of 29 mg/kg (which is based on a
21 default DAF of 20 and protection of groundwater to the MCL of 50 µg/L). For this reason,
22 removal of soils is proposed as part of this IM.

23 **Chromium**

24 The chromium concentration (72.6 mg/kg) reported at LC037SB001 is greater than the RBC
25 of 38 mg/kg screening value used in the RFI. However, since the RFI was finalized, EPA
26 Region IX developed a residential RBC value for total chromium of 210 mg/kg (assumes 1:6
27 ratio of Cr VI and Cr III). Therefore, NFA is warranted for chromium.

28 **Iron**

29 The reported iron concentration (8,920 mg/kg) exceeds the RBC of 2,300 mg/kg. However,
30 this screening value is 1/10 of the RBC value (HI = 0.1) to account for occurrence of multiple
31 constituents site soils. The RBC value at HI = 1 is 23,000 mg/kg. Given the limited number

1 of COCs at AOC 700, the reported iron value of 8,920 mg/kg does not represent a threat to
2 human health. Therefore, no NFA is warranted for iron.

3 **Thallium**

4 The reported thallium value was 0.63J mg/kg. The J qualifier indicates that thallium was
5 detected but the concentration is an estimated value. The detection limits reported for non-
6 detects from the samples collected simultaneously were between 0.39 mg/kg to 2.0 mg/kg,
7 indicating reported thallium has very high uncertainty (possible Type 1 error), and its
8 presence is questionable. Therefore, it would not be appropriate to compare this value to a
9 screening level. Also, the RBC value for thallium (HI=1.0) is 6.3 mg/kg. There are no other
10 concerns with thallium at AOC 700, and it was not detected in groundwater samples
11 collected from monitoring wells. Therefore, NFA action is warranted for this constituent.

12 **4.2.2 Sample LB037SP004 (Soil)**

13 Data for this soil sample were reported in the *Draft Zone L RFI Report* (EnSafe 1998). Methyl-
14 ethyl-ketone (MEK), acetone, and carbon disulfide were detected in LB037SP004; however,
15 the reported concentrations for these common laboratory contaminants were lower than
16 SSLs and RBCs. Arsenic (14.5 mg/kg) (see Table 2-1) and iron (4,700 mg/kg) were also
17 detected at concentrations greater than RBCs, and the SSL for iron was exceeded. The
18 arsenic value is only 0.3 mg/kg greater than the background concentration and does not
19 warrant further evaluation. For the reasons discussed for sample LC037SB001, the iron level
20 does not represent a threat to human health.

21 **4.2.3 Sample LB037GP001 (Groundwater)**

22 Data for this sample were reported in the *Draft Zone L RFI Report* (EnSafe 1998). A
23 groundwater sample was collected in the vicinity of AOC 700 as part of the sewer
24 investigation; a DPT sample was collected adjacent to 037SP004 (identified as 037GP001). No
25 VOCs were detected in the sample. Although metals were targeted in the analysis, they
26 were not compared to tap water standards, as the DPT samples contained significant solids.

27 **4.2.4 Conclusions Regarding Potential Linkage to Sanitary Sewers**

28 No data or evidence suggests that a release of waste from AOC 700 to the sanitary sewer has
29 resulted in a release to the environment between the AOC and the main sewer line.
30 Although the surface soil sample collected adjacent to the sewer manhole indicates the
31 presence of several heavy metals at elevated concentrations, the reason for the presence of

1 these metals at elevated concentrations is unknown, and it is not clear that these metals are
2 related to the presence of the sewer manhole.

3 The lack of discernable groundwater contamination at the site suggests that there has been
4 no impact to groundwater from the section of sewer line connecting AOC 700 to the main
5 sewer line.

6 Based on these data, as well as the planned removal of soil with elevated metals adjacent to
7 the sewer manhole, no further evaluation of potential linkage of AOC 700 to the sanitary
8 sewers is warranted.

9 **4.3 Potential Linkage to Storm Sewers (AOC 699)**

10 Potential linkage of a SWMU or AOC to the storm sewer refers to the possibility of a
11 groundwater plume at a SWMU or AOC migrating into a stormwater sewer from within
12 which it would subsequently migrate into the water bodies around the CNC, or to the
13 presence of a cross connection between the sanitary sewer and storm sewer, which could
14 transport pollutants directly to surface waters. Regarding the first of these potential
15 linkages, because there are no COCs in groundwater at this site and no groundwater plume
16 exists, no potential linkage of this AOC to a storm sewer exists.

17 Regarding the second potential linkage issue, the available storm sewer maps show that
18 there is no storm sewer beneath the site. Therefore, there is no reason to believe that a direct
19 discharge route for waste material to a storm sewer is present.

20 Based on this information, further evaluation of linkage between the stormwater sewer and
21 the subject site is not warranted.

22 **4.4 Potential Linkage to Railroad Lines (AOC 504)**

23 The potential linkage of a SWMU or AOC to a railroad potentially applies only to SWMUs
24 or AOCs at which an investigated portion of the railroad system identified as AOC 504 in
25 the *Draft Zone L RFI Work Plan*, passes through or directly adjacent to the AOC or SWMU.

26 None of the railroad lines adjacent to AOC 700 were identified as part of AOC 504 in the
27 *Draft Zone L RFI Work Plan*. Based on this information, further evaluation of a potential
28 linkage between the AOC 504 and the subject site is not necessary.

1 **4.5 Potential Migration Pathways to Surface Water Bodies**

2 Surface water was studied separately as part of the *Zone J Draft RCRA Facility Investigation*
3 *Report* (EnSafe 2000). The nearest investigated surface water body to AOC 700 is Noisette
4 Creek, approximately 500 feet to the north. The Cooper River is approximately 2,100 feet to
5 the east.

6 There are two possible migration pathways for contaminants to affect surface water:
7 overland flow via stormwater runoff and subsurface flow via groundwater. Figure 2-1
8 shows AOC 700 in relation to Noisette Creek. The fact that significant source area
9 contamination was not identified at AOC 700, and the nearest water-receiving body is 500
10 feet to the north, indicates that surface water runoff from AOC 700 would not be an
11 ecological concern at Noisette Creek. The only surface soil sample with elevated
12 concentrations of any COC at AOC 700 was a single sample adjacent to the sanitary sewer
13 manhole, indicating an extremely small impacted area. Therefore, further evaluation of a
14 potential pathway for contaminant migration via stormwater runoff is not warranted.

15 A groundwater contaminant plume was not identified at AOC 700. Therefore, further
16 evaluation of a potential contaminant migration via groundwater migration is not warranted.

17 **4.6 Potential Contamination in OWSs**

18 The potential contamination of OWS issue refers to the possible presence of OWS that has
19 not yet been investigated at a SWMU or AOC as part of the RCRA or UST process.

20 Neither the RFA nor the RFI refers to the presence or possible presence of an OWS at AOC 700.

21 Additionally, as part of a sitewide evaluation of the presence of OWSs, the Navy completed
22 (during 2000) a comprehensive review of its records and facilities to identify the presence of
23 OWSs. A list of 27 known OWSs were provided to BCT members, including DHEC staff, at
24 the BCT meeting in September 2000. Currently the best available data source about the
25 presence of OWSs at the CNC, the list is provided in the appendix of this report. No OWS
26 was identified at AOC 700; therefore, no further evaluation of this issue is warranted.

27 **4.7 Land Use Control Management Plan**

28 Upon completion of a removal action, the goal of which is to reduce COC concentrations to
29 levels acceptable for unrestricted use, land-use controls will not be necessary at AOC 700.

SECTION 5.0

References

1 **5.0 References**

- 2 EnSafe. *Draft Zone J RCRA Facility Investigation Report*. 2000.
- 3 EnSafe. *Draft Zone L RFI Report*. December 1998.
- 4 EnSafe. *RFI Work Plan*. 1996.
- 5 EnSafe. *Zone C RCRA Facility Investigation Report*. 1997.
- 6 SUPSHIP. *Completion Report, Interim/Stabilization Measure for SWMU 44 (Coal Storage Yard)*.
- 7 Prepared for the Department of the Navy, Southern Division, Naval Facilities Engineering
- 8 Command, North Charleston, S. C. February 10, 1997.

APPENDIX

List of Oil/Water Separators

Zone LNFILP App 2

DESCRIPTION	PROGRAM DATA			SAMPLES REPRESENTATIVE OF O/W SEPARATOR RELEASE	CHEMICAL OF CONCERN BASED ON SITE OPERATIONS					ANALYSIS PERFORMED								SAMPLING REQUIRED					
	Facility/IR site / (if applicable)	IR	Petroleum		No IR site	Solvents	Petroleum Products	Metals	Pesticides	PCB's	VOC's	SVOC's	Metals	Pesticides	PCB's	STEX 6200	PAHs 6270	Metals 3005	TPH	VOC's	SVOC's	Metals	Pesticides
1 Facility NS 2/AOC 675	x	x		Y		x	x			x	x	x	x	x	x	x	x						
2 Facility NS 3/AOC 675	x	x		Y		x	x	x	x	x	x	x	x	x	x	x	x						
3 Facility NS 26/AOC 680	x	x		Y	x	x	x			x	x	x	x	x	x	x	x						
4 Facility 32/AOC 559,580		x		N		x	x																
5 Facility NS 44(AOC 675, 676)	x	x		Y		x	x			x	x	x	x	x	x	x	x						
6 Facility FBM 61(SWMU 17)	x	x		Y	x	x	x			x	x	x	x	x	x	x	x						
7 Facility 80 (AOC 564)	x	x		Y	x	x	x	x	x	x	x	x											
8 Facility 98 AND 148/AOC 628		x		Y		x	x							x	x	x	x						
9 Facility 123		x	x	Y		x	x			x	x	x	x	x	x	x	x						
10 Facility NS 200		x	x	N	x	x	x	x	x														
11 Facility 221/SWMU 65, AOC 544	x	x		N	x	x	x	x	x														
12 Facility 228/SWMU23, AOC 540	x	x		N	x	x	x																
13 Facility 240 (tank)		x	x	Y	x	x	x	x	x	x	x	x	x	x	x	x	x						
14 Facility 241		x	x	INCOMPLETE	x	x	x	x	x	x	x	x	x	x	x	x	x						
15 Facility 242 (tank)		x	x	Y	x	x	x																
16 Facility 246	A search of the drawing files and a walk around the building revealed no oil-water separator on site.																						
17 Facility 680/(AOC 613)				N	x	x	x																
18 Facility 681 (tank) w/roof	x	x	x	Y	x	x	x			x	x	x	x	x	x	x	x						
19 Facility 1024			x	N	x	x	x																
20 Facility 1303/SWMU 13	x			N	x	x	x	x	x														
21 Facility 1308/SWMU 13	x			Y	x	x	x	x	x	x	x	x	x										
22 Facility 1653/AOC 626	x			N		x	x																
23 Facility 1656/SWMU 37	x			Y	x	x	x			x	x	x	x	x									
24 Facility 2505/SWMU 161	x			Y		x	x			x	x	x	x	x									
25 Facility 3913/AOC 627	x			Y		x				x	x	x	x	x									
26 Facility 3928/AOC 626	x			Y		x				x	x	x	x	x									

27 Facility 236 - pipe shop/AOC 583?