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CORRECTIVE MEASURES STUDY REPORT SOLID WASTE MANAGEMENT UNIT 3 (SWMU
3) ZONE G CNC CHARLESTON SC
11/6/2003
CH2M HILL

CORRECTIVE MEASURES STUDY REPORT

SWMU 3, Zone G



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

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

PREPARED BY
CH2M-Jones

November 2003

Contract N62467-99-C-0960



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November 6, 2003

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

Re: CMS Report (Revision 0) – SWMU 3, Zone G

Dear Mr. Scaturo:

Enclosed please find two copies of the CMS Report (Revision 0) for SWMU 3 in Zone G 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.

Please contact me at 352/335-5877, ext. 2280, if you have any questions or comments.

Sincerely,

CH2M HILL

Dean Williamson, P.E.

cc: Dann Spariosu/USEPA, w/att
Rob Harrell/Navy, w/att
Gary Foster/CH2M HILL, w/att

CORRECTIVE MEASURES STUDY REPORT

SWMU 3, Zone G



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North Charleston, South Carolina***

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*Revision 0
Contract N62467-99-C-0960
158814.ZG.EX.14*

Certification Page for Corrective Measures Study Report – SWMU 3 in Zone G

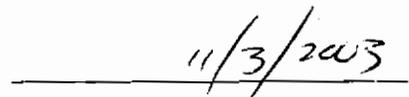
I, Dean Williamson, certify that this report has been prepared under my direct supervision. The data and information are, to the best of my knowledge, accurate and correct, and the report has been prepared in accordance with current standards of practice for engineering.

South Carolina

License No. 21428



Dean Williamson, P.E.



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1 Acronyms and Abbreviations

2	BHC	beta-hexachloro-cyclo-hexane
3	BRAC	Base Realignment and Closure Act
4	CA	corrective action
5	CMS	corrective measures study
6	CNC	Charleston Naval Complex
7	COC	chemical of concern
8	DDD	dichlorodiphenyldi-chloroethane
9	DDE	dichlorodiphenyldichloro-ethene
10	DDT	dichlorodiphenyltrichloro-ethane
11	DET	Environmental Detachment Charleston
12	EnSafe	EnSafe, Inc.
13	EPA	U.S. Environmental Protection Agency
14	ft bls	feet below land surface
15	HI	hazard index
16	ILCR	Incremental Lifetime Cancer Risk
17	IM	interim measure
18	IMCR	Interim Measure Completion Report
19	LUC	land use control
20	LUCIP	land use control implementation plan
21	µg/L	microgram per liter
22	mg/L	milligram per liter
23	mg/kg	milligram per kilogram
24	MCL	maximum contaminant level
25	MCS	media cleanup standard
26	msl	mean sea level
27	NAVBASE	Naval Base
28	PCB	polychlorinated biphenyl

1 Acronyms and Abbreviations, Continued

2	RAO	remedial action objective
3	RBC	risk-based concentration
4	RCRA	Resource Conservation and Recovery Act
5	RFA	RCRA Facility Assessment
6	RFI	RCRA Facility Investigation
7	RGO	remedial goal option
8	SAP	sampling and analysis plan
9	SCDHEC	South Carolina Department of Health and Environmental Control
10	SSL	soil screening level
11	SVOC	semivolatile organic compound
12	SWMU	solid waste management unit
13	VOC	volatile organic compound
14	yd ³	cubic yard

Section 1.0

1 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 Permit (Permit No. SC0 170 022 560). In April
11 2000, CH2M-Jones was awarded a contract to provide environmental investigation and
12 remediation services at the CNC.

13 As part of the RCRA CA activities for CNC, a RCRA Facility Investigation (RFI) was
14 conducted for Zone G of the CNC. SWMU 3 is located within the investigative boundaries
15 of SWMU 24, a fuel reclamation facility (see Figure 1-1) within Zone G. The Zone G RFI was
16 conducted in 1996 and 1997.

17 1.1 Background Information

18 SWMU 3 was identified in the *RCRA Facility Assessment (RFA) Report* (EBASCO, 1987) and
19 the *Zone G RFI Report, Revision 0* (EnSafe Inc. [EnSafe], 1998) as an approximately 50 by 30-
20 foot area used for pesticide handling adjacent to Building 249 and Tank 39-D in Zone G of
21 CNC (see Figures 1-2 and 1-3). In the RFA this location was shown to be occupied by
22 Building 42-A; however, historical records show Building 42-A was over 150 feet to the
23 south of SWMU 3, where Building 419 is currently located. The RFI indicates a former
24 mix/rinse slab adjacent to SWMU 3. Historical maps show Building 1316 at the west end of
25 present Building 249.

26 According to the RFA, pesticides were mixed in a small shed and equipment was rinsed on
27 the slab or ground. The slab and shed were subsequently removed, and Building 249 has
28 since been constructed at the site. The southwest wall and floor of Building 249 now cover a
29 portion of the original Building 1316 area. During the 1982 Confirmation Study (Geraghty
30 and Miller, 1982), a portion of the area adjacent to the shed was noted to be devoid of

1 vegetation. This once-devoid area is now covered with grass. Soil and groundwater samples
2 collected during the 1982 Confirmation Study revealed the presence of various pesticides
3 and associated degradation products, consistent with the types of pesticides documented as
4 being used there. Pesticides detected included dichlorodiphenyltrichloroethane (DDT) and
5 metabolites, heptachlor, and beta/delta-hexachlorocyclohexane (BHC). Groundwater
6 sample results were below detection limits for pesticides, herbicides, polychlorinated
7 biphenyls (PCBs), and arsenic. The area of CNC where SWMU 3 is located is currently
8 zoned M-1, for marine industrial land use.

9 SWMU 3 was further investigated as part of the RFI conducted by the Navy/EnSafe team in
10 1998, to confirm and delineate contamination at the site in the vicinity of the former
11 mix/rinse slab, shed, and Building 1316. The field work involved sampling and analysis of
12 soils and groundwater, with analyses for metals, pesticides, and PCBs. Results of the RFI
13 were presented in the *Zone G RFI Report, Revision 0* (EnSafe, 1998).

14 Since the submittal of the *Zone G RFI Report, Revision 0* in February 1998, additional
15 investigations and remediation have been performed at the site. The U.S. Navy
16 Environmental Detachment (DET) performed an interim measure (IM) in the summer of
17 1998 to remove approximately 22 cubic yards (yd³) of pesticide-contaminated soil. One of
18 the three existing monitoring wells was also abandoned in place during this effort due to
19 damage to the wellhead.

20 CH2M-Jones conducted additional soil sampling in 2002 to further delineate pesticides in
21 soils, and also conducted an additional IM to excavate the affected soils and to install and
22 sample additional monitoring wells to evaluate shallow groundwater quality in the vicinity
23 of the excavated soils. Approximately 865 tons of contaminated surface and subsurface soil
24 were removed during this IM. Surface soil was remediated to meet criteria for unrestricted
25 land use. Subsurface soil was remediated such that it does not present a leaching hazard.
26 Subsequent to completion of the IMs for soil removal, no COCs remain in site soils for the
27 unrestricted land use scenario.

28 An RFI Report Addendum, IM Completion Report (IMCR), and Corrective Measures Study
29 (CMS) Work Plan were subsequently prepared for SWMU 3 by CH2M-Jones (CH2M-Jones,
30 2003). A CMS was recommended to address shallow groundwater at SWMU 3, due to
31 detection of several pesticides in some of the newly installed monitoring wells. The CMS
32 Work Plan (Section 9.0 of the RFI Report Addendum) presented the remedial action
33 objectives (RAOs) and media cleanup standards (MCSs) proposed for SWMU 3. This CMS

1 report has been prepared by CH2M-Jones to complete the next stage of the CA process for
2 SWMU 3.

3 **1.2 Corrective Measures Study Report Purpose and Scope**

4 This CMS report evaluates corrective measure alternatives for contaminated groundwater at
5 SWMU 3 in Zone G. It consists of: 1) the identification of a set of corrective measure
6 alternatives that are considered to be technically appropriate for addressing pesticides and
7 metals in groundwater; 2) an evaluation of the alternatives using standard criteria from U.S.
8 Environmental Protection Agency (EPA) RCRA guidance; and 3) the selection of a
9 recommended (preferred) corrective measure alternative for the site.

10 **1.3 COC Summary and Extent of Groundwater Contamination**

11 The first groundwater sampling event at the site was conducted in November 1996 by the
12 Navy/EnSafe team for the three monitoring wells initially installed. The first set of
13 groundwater samples was analyzed for pesticides, organophosphorus pesticides, PCBs and
14 metals. A duplicate sample was also collected and analyzed for volatile organic compounds
15 (VOCs), semivolatile organic compounds (SVOCs), and dioxins. Monitoring well locations
16 are presented in Figure 1-4. Only metals were detected in these samples.

17 EnSafe collected four additional sets of groundwater samples from the three original
18 monitoring wells in May 1997, September 1997, December 1997, and April 1998. Pesticides
19 were not detected in any of the samples collected during these sampling events.

20 In May 2002, CH2M-Jones submitted a *Groundwater Sampling and Analysis Plan (SAP)*
21 (CH2M-Jones, 2002). The SAP proposed installing six additional monitoring wells at SWMU
22 3. Samples were collected from all eight monitoring wells (G003GW001, G003GW002, and
23 G003GW004 through G006GW009) at the site. Monitoring well G003GW003 was abandoned
24 as part of an IM conducted at the site. Samples were collected in October 2002 and were
25 analyzed for metals, pesticides, and VOCs. Copies of the boring logs and well completion
26 reports for the newly installed monitoring wells were provided in the *RFI Report*
27 *Addendum/IM Completion Report/CMS Work Plan* (CH2M-Jones, 2003). The analytical results
28 for these samples were also presented in the *RFI Report Addendum/IM Completion*
29 *Report/CMS Work Plan*. The data from these samples indicated the presence of several
30 pesticides in groundwater; these were the first sample results indicating that pesticides were
31 present in groundwater. The results of pesticides analyses for all samples collected to-date
32 are summarized in Table 1-1.

1 Based on these sample results, the following groundwater COCs were identified in the *RFI*
2 *Report Addendum/IM Completion Report/CMS Work Plan*: dichlorodiphenyldi-chloroethane
3 (DDD), dichlorodiphenyldichloro-ethene (DDE), DDT, alpha-BHC, delta-BHC, dieldrin, and
4 heptachlor epoxide.

5 In order to better assess the level of pesticide contamination present in site groundwater, an
6 additional set of samples was collected from the site in December 2002 and January 2003.
7 The results of these analyses are included in Table 1-1, along with other pesticides detected
8 during the October 2002 sampling event. Complete analytical results and data validation
9 summaries for these samples are presented in Appendix A.

10 Table 1-2 presents all detections of pesticides in SWMU 3 groundwater samples and
11 compares these detections to the MCSs. Figure 1-4 presents exceedances of the MCSs for
12 each well at SWMU 3. Only three wells (G003GW005, G003GW006, and G003GW007) have
13 had pesticide detections in groundwater samples that exceed the MCSs. It can also be noted
14 in Figure 1-4 that there were fewer pesticide exceedances of the MCSs in each of these three
15 wells during the December 2002/January 2003 sampling event than occurred during the
16 October 2002 sampling event, as follows:

17

Well	MCS Exceedances in Oct 2002 Samples	MCS Exceedances In Dec 2002/Jan 2003 Samples
G003GW005	5	1
G003GW006	2	1
G003GW007	3	2

18

19 The fewer MCS exceedances were a result of concentrations of pesticides being lower
20 overall during the December 2002/January 2003 sampling event. Additional sampling will
21 be required to determine if this trend continues.

22 **1.4 Summary of Hydrogeologic Setting**

23 SWMU 3 is located in the northwestern part of Zone G, west of Hobson between Wood
24 Street and Tank Farm Loop. The topography of the area is relatively flat. This area has been
25 subject to extensive filling and industrial development. Elevations range from 10 to 12 feet
26 above mean sea level (ft msl) in northwestern Zone G, gently sloping downward to

1 elevations of 6 to 8 feet above msl in eastern Zone G along the Cooper River. Because the
2 area is highly industrialized, surface water runoff is largely controlled by a system of
3 stormwater sewers that discharge to the Cooper River.

4 **Surface Geology**

5 Due to extensive soil disturbance at CNC over the history of its operation, the soils from
6 land surface to depths of approximately up to 6 feet are a mixture of artificial fill and native
7 sediments. The extent of fill material present varies widely and generally increases in
8 thickness toward the south and east in Zone G. In the vicinity of SWMU 3, undifferentiated
9 clay, sand, gravel, dredge spoils and construction debris may be present at or near the land
10 surface, extending to depths of greater than 6 feet. In undisturbed areas, surface deposits
11 consist of Quaternary age (Holocene epoch to recent) fine-grained sands, silts and clays
12 typical of a coastal plain environment, reworked by marine and river erosion prior to
13 development by man.

14 Based on boring logs for wells installed at SWMU 3, the RFI report indicated that the
15 shallow stratigraphy at SWMU 3 generally consists of interbedded silt, silty clay, and clayey
16 sand to a depth of approximately 15 feet below land surface (ft bls).

17 **Subsurface Geology**

18 The Zone G RFI work included soil boring and monitoring well installation, from which
19 geologic information was collected to develop geologic cross sections. These data indicate
20 that Quaternary (Pleistocene to Holocene epoch) and Tertiary period unconsolidated
21 sediments were the only subsurface geologic units encountered during Zone G RFI
22 investigations.

23 The deepest unit identified in Zone G is the Ashley Formation, a member of the mid-
24 Tertiary period Cooper Group. Overlying the Ashley Formation are the younger upper
25 Tertiary and Quaternary period deposits, which are in turn overlain by the Holocene to
26 recent surface soils.

27 The Ashley Formation occurs at depths of approximately 25 to 35 ft bls in Zone G. The top
28 of the Ashley is gently rolling and slopes gently downward to the east and south, with
29 thickness approaching 60 feet at boring location GGDG02D in northern Zone G. The
30 Ashley Formation is comprised of brown to olive marine silts with varying amounts of clay,
31 phosphatic sand and microfossils. The Ashley consistency is generally dense to stiff and
32 plastic, with low vertical permeability.

1 In most areas of Zone G, the Ashley Formation is overlain by marine lagoon deposits
2 consisting of undifferentiated Tertiary period silts, clays, and phosphatic sands up to 20 feet
3 in thickness.

4 Hydrogeology

5 The shallow aquifer system in Zone G is an unconfined water table aquifer occurring within
6 the Quaternary age sediments. Depth to groundwater is approximately 6 to 8 ft bls. The
7 underlying low-permeability Ashley Formation acts as an aquitard for the shallow aquifer
8 system and as a confining unit for deeper geologic units. The Cooper River acts as a
9 regional groundwater discharge boundary for the aquifer to the east. The average saturated
10 aquifer thickness in the SWMU 3 area based on boring log data is approximately 18 to 20
11 feet. Because the shallow aquifer system is thinner and the Ashley confining unit is
12 continuous across Zone G, only "shallow " monitoring wells are installed, with typical total
13 depths of 15 to 20 feet.

14 Shallow groundwater potentiometric isocontours for the SWMU 3 area are shown in Figure
15 1-5. The figure is based on water level data collected from the existing SWMU 3 monitoring
16 wells on October 29, 2002. The data show local shallow groundwater flow in a south-
17 southeasterly direction across the SWMU 3/SWMU 24 area (SWMU 3 lies within SWMU
18 24), with a horizontal gradient decrease of approximately 2 feet from north to south. Both
19 the average water table elevation (6 to 8 ft msl) and horizontal gradient appear to be higher
20 during this period than during March 2002, when a shallow groundwater potentiometric
21 map was developed for SWMU 24 (see Figure 1-6).

22 The SWMU 24 map was developed using water level measurements from approximately 30
23 monitoring wells spread across the northern Zone G area, but using only one well from
24 within SWMU 3. The SWMU 24 map depicted relatively stagnant low flow conditions in the
25 shallow aquifer in the SWMU 3 area, with less than 1 foot of hydraulic gradient across the
26 area, water table elevations around 5 ft msl, and some indications of outward radial flow
27 from the SWMU 3 area, with regional flow directions trending eastward. The differences in
28 these two maps are believed to be due to drier conditions in March 2002 and the spatial
29 distribution differences of the wells measured.

30 Based on the hydraulic gradients shown in Figure 1-5, an estimate of the groundwater flow
31 rate can be developed, using an average hydraulic conductivity value of 3.8 ft/day and an
32 effective porosity of 0.41 (both values from *Zone G RFI Report, Revision 0*). Based on these
33 values and a hydraulic gradient 0.0089 ft/ft from Figure 1-5, an average groundwater flow

1 rate of 0.084 ft/day or 31 ft/yr is estimated. Because of the hydrophobic nature of the
2 pesticide COCs at the site and their propensity to partition into the soil phase, the migration
3 rate of the COCs at SWMU 3 would be significantly less than the groundwater flow rate at
4 the site. The occurrence of the groundwater COCs in wells close to the contaminated soil
5 areas suggests that migration of the COCs from the site has been limited.

6 **1.5 Overall Approach for Selecting Candidate Corrective** 7 **Measure Alternatives for SWMU 3**

8 The most potentially feasible groundwater corrective measure approaches for SWMU 3,
9 based on the site conditions, the limited extent of the groundwater plume, the
10 hydrogeologic setting, and the previous removal of contaminated soil, are:

- 11 • Long-term Monitoring with Land Use Controls (LUCs)
- 12 • LUCs

13 This CMS evaluates both of these alternatives as potential corrective measures for SWMU 3.

14 **1.6 Report Organization**

15 This CMS report consists of the following sections, including this introductory section:

16 **1.0 Introduction** — Presents the purpose of and background information relating to this
17 CMS report.

18 **2.0 Remedial Goal Objectives and Evaluation Criteria** — Defines the remedial goal options
19 (RGOs) for SWMU 3, in addition to the criteria used in evaluating the corrective measure
20 alternatives for the site.

21 **3.0 Description of Candidate Corrective Measure Alternatives** — Describes each of the
22 candidate corrective measure alternatives for addressing pesticides and metals in site
23 groundwater.

24 **4.0 Evaluation and Comparison of Corrective Measure Alternatives** — Evaluates each
25 alternative relative to standard criteria, then compares the alternatives and the degree to
26 which they meet or achieve the evaluation criteria.

27 **5.0 Recommended Corrective Measure Alternative** — Describes the preferred corrective
28 measure alternative to achieve the MCS and RGOs for pesticides and metals in groundwater
29 based on a comparison of the alternatives.

- 1 **6.0 References** — Lists the references used in this document.
- 2 **Appendix A** contains Groundwater Analytical Data and Data Validation Reports.
- 3 **Appendix B** contains cost estimates developed for the proposed corrective measure
- 4 alternatives.
- 5 All tables and figures appear at the end of their respective sections.

TABLE 1-1
 Summary of All Pesticide Results - SWMU 3 Groundwater
 Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

STATION	SAMPLE	CHEM_LABEL	RESULT	UNIT	QUALIFIER	DATE_COL
G003GW001	003GW00101	4,4'-DDD	0.08000	µg/L	U	11/20/1996
G003GW001	003GW00101	4,4'-DDE	0.08000	µg/L	U	11/20/1996
G003GW001	003GW00101	4,4'-DDT	0.08000	µg/L	U	11/20/1996
G003GW001	003GW00101	Aldrin	0.04000	µg/L	U	11/20/1996
G003GW001	003GW00101	alpha-BHC	0.04000	µg/L	U	11/20/1996
G003GW001	003GW00101	alpha-Chlordane	0.04000	µg/L	U	11/20/1996
G003GW001	003GW00101	beta-BHC	0.04000	µg/L	U	11/20/1996
G003GW001	003GW00101	delta-BHC	0.04000	µg/L	U	11/20/1996
G003GW001	003GW00101	Dieldrin	0.08000	µg/L	U	11/20/1996
G003GW001	003GW00101	Endosulfan I	0.04000	µg/L	U	11/20/1996
G003GW001	003GW00101	Endosulfan II	0.08000	µg/L	U	11/20/1996
G003GW001	003GW00101	Endosulfan sulfate	0.08000	µg/L	U	11/20/1996
G003GW001	003GW00101	Endrin	0.08000	µg/L	U	11/20/1996
G003GW001	003GW00101	Endrin aldehyde	0.08000	µg/L	U	11/20/1996
G003GW001	003GW00101	Endrin ketone	0.08000	µg/L	U	11/20/1996
G003GW001	003GW00101	gamma-BHC	0.04000	µg/L	U	11/20/1996
G003GW001	003GW00101	gamma-Chlordane	0.04000	µg/L	U	11/20/1996
G003GW001	003GW00101	Heptachlor	0.04000	µg/L	U	11/20/1996
G003GW001	003GW00101	Heptachlor epoxide	0.04000	µg/L	U	11/20/1996
G003GW001	003GW00101	Methoxychlor	0.38000	µg/L	U	11/20/1996
G003GW001	003GW00101	Toxaphene	2.50000	µg/L	U	11/20/1996
G003GW001	003GW00102	4,4'-DDD	0.08000	µg/L	U	05/15/1997
G003GW001	003GW00102	4,4'-DDE	0.08000	µg/L	U	05/15/1997
G003GW001	003GW00102	4,4'-DDT	0.08000	µg/L	U	05/15/1997
G003GW001	003GW00102	Aldrin	0.04000	µg/L	U	05/15/1997
G003GW001	003GW00102	alpha-BHC	0.04000	µg/L	U	05/15/1997
G003GW001	003GW00102	alpha-Chlordane	0.04000	µg/L	U	05/15/1997
G003GW001	003GW00102	beta-BHC	0.04000	µg/L	U	05/15/1997
G003GW001	003GW00102	delta-BHC	0.04000	µg/L	U	05/15/1997
G003GW001	003GW00102	Dieldrin	0.08000	µg/L	U	05/15/1997
G003GW001	003GW00102	Endosulfan I	0.04000	µg/L	U	05/15/1997
G003GW001	003GW00102	Endosulfan II	0.08000	µg/L	U	05/15/1997
G003GW001	003GW00102	Endosulfan sulfate	0.08000	µg/L	U	05/15/1997
G003GW001	003GW00102	Endrin	0.08000	µg/L	U	05/15/1997
G003GW001	003GW00102	Endrin aldehyde	0.08000	µg/L	U	05/15/1997
G003GW001	003GW00102	Endrin ketone	0.08000	µg/L	U	05/15/1997
G003GW001	003GW00102	gamma-BHC	0.04000	µg/L	U	05/15/1997
G003GW001	003GW00102	gamma-Chlordane	0.04000	µg/L	U	05/15/1997
G003GW001	003GW00102	Heptachlor	0.04000	µg/L	U	05/15/1997
G003GW001	003GW00102	Heptachlor epoxide	0.04000	µg/L	U	05/15/1997
G003GW001	003GW00102	Methoxychlor	0.38000	µg/L	U	05/15/1997
G003GW001	003GW00102	Toxaphene	2.50000	µg/L	U	05/15/1997
G003GW001	003GW00103	4,4'-DDD	0.08000	µg/L	U	09/16/1997

TABLE 1-1
 Summary of All Pesticide Results - SWMU 3 Groundwater
 Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

STATION	SAMPLE	CHEM_LABEL	RESULT	UNIT	QUALIFIER	DATE_COL
G003GW001	003GW00103	4,4'-DDE	0.08000	µg/L	U	09/16/1997
G003GW001	003GW00103	4,4'-DDT	0.08000	µg/L	U	09/16/1997
G003GW001	003GW00103	Aldrin	0.04000	µg/L	U	09/16/1997
G003GW001	003GW00103	alpha-BHC	0.04000	µg/L	U	09/16/1997
G003GW001	003GW00103	alpha-Chlordane	0.04000	µg/L	U	09/16/1997
G003GW001	003GW00103	beta-BHC	0.04000	µg/L	U	09/16/1997
G003GW001	003GW00103	delta-BHC	0.04000	µg/L	U	09/16/1997
G003GW001	003GW00103	Dieldrin	0.08000	µg/L	U	09/16/1997
G003GW001	003GW00103	Endosulfan I	0.04000	µg/L	U	09/16/1997
G003GW001	003GW00103	Endosulfan II	0.08000	µg/L	U	09/16/1997
G003GW001	003GW00103	Endosulfan sulfate	0.08000	µg/L	U	09/16/1997
G003GW001	003GW00103	Endrin	0.08000	µg/L	U	09/16/1997
G003GW001	003GW00103	Endrin aldehyde	0.08000	µg/L	U	09/16/1997
G003GW001	003GW00103	Endrin ketone	0.08000	µg/L	U	09/16/1997
G003GW001	003GW00103	gamma-BHC	0.04000	µg/L	U	09/16/1997
G003GW001	003GW00103	gamma-Chlordane	0.04000	µg/L	U	09/16/1997
G003GW001	003GW00103	Heptachlor	0.04000	µg/L	U	09/16/1997
G003GW001	003GW00103	Heptachlor epoxide	0.04000	µg/L	U	09/16/1997
G003GW001	003GW00103	Methoxychlor	0.38000	µg/L	U	09/16/1997
G003GW001	003GW00103	Toxaphene	2.50000	µg/L	U	09/16/1997
G003GW001	003GW00104	4,4'-DDD	0.08000	µg/L	U	12/02/1997
G003GW001	003GW00104	4,4'-DDE	0.08000	µg/L	U	12/02/1997
G003GW001	003GW00104	4,4'-DDT	0.08000	µg/L	U	12/02/1997
G003GW001	003GW00104	Aldrin	0.04000	µg/L	U	12/02/1997
G003GW001	003GW00104	alpha-BHC	0.04000	µg/L	U	12/02/1997
G003GW001	003GW00104	alpha-Chlordane	0.04000	µg/L	U	12/02/1997
G003GW001	003GW00104	beta-BHC	0.04000	µg/L	U	12/02/1997
G003GW001	003GW00104	delta-BHC	0.04000	µg/L	U	12/02/1997
G003GW001	003GW00104	Dieldrin	0.08000	µg/L	U	12/02/1997
G003GW001	003GW00104	Endosulfan I	0.04000	µg/L	U	12/02/1997
G003GW001	003GW00104	Endosulfan II	0.08000	µg/L	U	12/02/1997
G003GW001	003GW00104	Endosulfan sulfate	0.08000	µg/L	U	12/02/1997
G003GW001	003GW00104	Endrin	0.08000	µg/L	U	12/02/1997
G003GW001	003GW00104	Endrin aldehyde	0.08000	µg/L	U	12/02/1997
G003GW001	003GW00104	Endrin ketone	0.08000	µg/L	U	12/02/1997
G003GW001	003GW00104	gamma-BHC	0.04000	µg/L	U	12/02/1997
G003GW001	003GW00104	gamma-Chlordane	0.04000	µg/L	U	12/02/1997
G003GW001	003GW00104	Heptachlor	0.04000	µg/L	U	12/02/1997
G003GW001	003GW00104	Heptachlor epoxide	0.04000	µg/L	U	12/02/1997
G003GW001	003GW00104	Methoxychlor	0.38000	µg/L	U	12/02/1997
G003GW001	003GW00104	Toxaphene	2.50000	µg/L	U	12/02/1997
G003GW001	003GW001M6	4,4'-DDD	0.08000	µg/L	U	10/08/2002
G003GW001	003GW001M6	4,4'-DDE	0.08000	µg/L	U	10/08/2002

TABLE 1-1
 Summary of All Pesticide Results - SWMU 3 Groundwater
 Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

STATION	SAMPLE	CHEM_LABEL	RESULT	UNIT	QUALIFIER	DATE_COL
G003GW001	003GW001M6	4,4'-DDT	0.08000	µg/L	U	10/08/2002
G003GW001	003GW001M6	Aldrin	0.04000	µg/L	U	10/08/2002
G003GW001	003GW001M6	alpha-BHC	0.04000	µg/L	U	10/08/2002
G003GW001	003GW001M6	alpha-Chlordane	0.04000	µg/L	U	10/08/2002
G003GW001	003GW001M6	beta-BHC	0.04000	µg/L	U	10/08/2002
G003GW001	003GW001M6	Chlordane	0.40000	µg/L	U	10/08/2002
G003GW001	003GW001M6	delta-BHC	0.04000	µg/L	U	10/08/2002
G003GW001	003GW001M6	Dieldrin	0.08000	µg/L	U	10/08/2002
G003GW001	003GW001M6	Endosulfan I	0.04000	µg/L	U	10/08/2002
G003GW001	003GW001M6	Endosulfan II	0.08000	µg/L	U	10/08/2002
G003GW001	003GW001M6	Endosulfan sulfate	0.08000	µg/L	U	10/08/2002
G003GW001	003GW001M6	Endrin	0.08000	µg/L	U	10/08/2002
G003GW001	003GW001M6	Endrin aldehyde	0.08000	µg/L	U	10/08/2002
G003GW001	003GW001M6	Endrin ketone	0.08000	µg/L	U	10/08/2002
G003GW001	003GW001M6	gamma-BHC	0.04000	µg/L	U	10/08/2002
G003GW001	003GW001M6	gamma-Chlordane	0.04000	µg/L	U	10/08/2002
G003GW001	003GW001M6	Heptachlor	0.04000	µg/L	U	10/08/2002
G003GW001	003GW001M6	Heptachlor epoxide	0.04000	µg/L	U	10/08/2002
G003GW001	003GW001M6	Methoxychlor	0.38000	µg/L	U	10/08/2002
G003GW001	003GW001M6	Toxaphene	2.50000	µg/L	U	10/08/2002
G003GW001	003GW001M7	4,4'-DDD	0.07800	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	4,4'-DDE	0.07800	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	4,4'-DDT	0.07800	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	Aldrin	0.03900	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	alpha-BHC	0.03900	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	alpha-Chlordane	0.03900	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	beta-BHC	0.03900	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	Chlordane	0.39000	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	delta-BHC	0.03900	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	Dieldrin	0.07800	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	Endosulfan I	0.03900	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	Endosulfan II	0.07800	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	Endosulfan sulfate	0.07800	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	Endrin	0.07800	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	Endrin aldehyde	0.07800	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	Endrin ketone	0.07800	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	gamma-BHC	0.03900	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	gamma-Chlordane	0.03900	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	Heptachlor	0.03900	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	Heptachlor epoxide	0.03900	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	Methoxychlor	0.37000	µg/L	UJ	01/02/2003
G003GW001	003GW001M7	Toxaphene	2.40000	µg/L	UJ	01/02/2003
G003GW002	003GW00201	4,4'-DDD	0.08000	µg/L	U	11/21/1996

TABLE 1-1
 Summary of All Pesticide Results - SWMU 3 Groundwater
 Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

STATION	SAMPLE	CHEM_LABEL	RESULT	UNIT	QUALIFIER	DATE_COL
G003GW002	003GW00201	4,4'-DDE	0.08000	µg/L	U	11/21/1996
G003GW002	003GW00201	4,4'-DDT	0.08000	µg/L	U	11/21/1996
G003GW002	003GW00201	Aldrin	0.04000	µg/L	U	11/21/1996
G003GW002	003GW00201	alpha-BHC	0.04000	µg/L	U	11/21/1996
G003GW002	003GW00201	alpha-Chlordane	0.04000	µg/L	U	11/21/1996
G003GW002	003GW00201	beta-BHC	0.04000	µg/L	U	11/21/1996
G003GW002	003GW00201	delta-BHC	0.04000	µg/L	U	11/21/1996
G003GW002	003GW00201	Dieldrin	0.08000	µg/L	U	11/21/1996
G003GW002	003GW00201	Endosulfan I	0.04000	µg/L	U	11/21/1996
G003GW002	003GW00201	Endosulfan II	0.08000	µg/L	U	11/21/1996
G003GW002	003GW00201	Endosulfan sulfate	0.08000	µg/L	U	11/21/1996
G003GW002	003GW00201	Endrin	0.08000	µg/L	U	11/21/1996
G003GW002	003GW00201	Endrin aldehyde	0.08000	µg/L	U	11/21/1996
G003GW002	003GW00201	Endrin ketone	0.08000	µg/L	U	11/21/1996
G003GW002	003GW00201	gamma-BHC	0.04000	µg/L	U	11/21/1996
G003GW002	003GW00201	gamma-Chlordane	0.04000	µg/L	U	11/21/1996
G003GW002	003GW00201	Heptachlor	0.04000	µg/L	U	11/21/1996
G003GW002	003GW00201	Heptachlor epoxide	0.04000	µg/L	U	11/21/1996
G003GW002	003GW00201	Methoxychlor	0.38000	µg/L	U	11/21/1996
G003GW002	003GW00201	Toxaphene	2.50000	µg/L	U	11/21/1996
G003GW002	003GW00202	4,4'-DDD	0.08000	µg/L	U	05/15/1997
G003GW002	003GW00202	4,4'-DDE	0.08000	µg/L	U	05/15/1997
G003GW002	003GW00202	4,4'-DDT	0.08000	µg/L	U	05/15/1997
G003GW002	003GW00202	Aldrin	0.04000	µg/L	U	05/15/1997
G003GW002	003GW00202	alpha-BHC	0.04000	µg/L	U	05/15/1997
G003GW002	003GW00202	alpha-Chlordane	0.04000	µg/L	U	05/15/1997
G003GW002	003GW00202	beta-BHC	0.04000	µg/L	U	05/15/1997
G003GW002	003GW00202	delta-BHC	0.04000	µg/L	U	05/15/1997
G003GW002	003GW00202	Dieldrin	0.08000	µg/L	U	05/15/1997
G003GW002	003GW00202	Endosulfan I	0.04000	µg/L	U	05/15/1997
G003GW002	003GW00202	Endosulfan II	0.08000	µg/L	U	05/15/1997
G003GW002	003GW00202	Endosulfan sulfate	0.08000	µg/L	U	05/15/1997
G003GW002	003GW00202	Endrin	0.08000	µg/L	U	05/15/1997
G003GW002	003GW00202	Endrin aldehyde	0.08000	µg/L	U	05/15/1997
G003GW002	003GW00202	Endrin ketone	0.08000	µg/L	U	05/15/1997
G003GW002	003GW00202	gamma-BHC	0.04000	µg/L	U	05/15/1997
G003GW002	003GW00202	gamma-Chlordane	0.04000	µg/L	U	05/15/1997
G003GW002	003GW00202	Heptachlor	0.04000	µg/L	U	05/15/1997
G003GW002	003GW00202	Heptachlor epoxide	0.04000	µg/L	U	05/15/1997
G003GW002	003GW00202	Methoxychlor	0.38000	µg/L	U	05/15/1997
G003GW002	003GW00202	Toxaphene	2.50000	µg/L	U	05/15/1997
G003GW002	003GW00203	4,4'-DDD	0.08000	µg/L	U	09/16/1997
G003GW002	003GW00203	4,4'-DDE	0.08000	µg/L	U	09/16/1997

TABLE 1-1
 Summary of All Pesticide Results - SWMU 3 Groundwater
 Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

STATION	SAMPLE	CHEM_LABEL	RESULT	UNIT	QUALIFIER	DATE_COL
G003GW002	003GW00203	4,4'-DDT	0.08000	µg/L	U	09/16/1997
G003GW002	003GW00203	Aldrin	0.04000	µg/L	U	09/16/1997
G003GW002	003GW00203	alpha-BHC	0.04000	µg/L	U	09/16/1997
G003GW002	003GW00203	alpha-Chlordane	0.04000	µg/L	U	09/16/1997
G003GW002	003GW00203	beta-BHC	0.04000	µg/L	U	09/16/1997
G003GW002	003GW00203	delta-BHC	0.04000	µg/L	U	09/16/1997
G003GW002	003GW00203	Dieldrin	0.08000	µg/L	U	09/16/1997
G003GW002	003GW00203	Endosulfan I	0.04000	µg/L	U	09/16/1997
G003GW002	003GW00203	Endosulfan II	0.08000	µg/L	U	09/16/1997
G003GW002	003GW00203	Endosulfan sulfate	0.08000	µg/L	U	09/16/1997
G003GW002	003GW00203	Endrin	0.08000	µg/L	U	09/16/1997
G003GW002	003GW00203	Endrin aldehyde	0.08000	µg/L	U	09/16/1997
G003GW002	003GW00203	Endrin ketone	0.08000	µg/L	U	09/16/1997
G003GW002	003GW00203	gamma-BHC	0.04000	µg/L	U	09/16/1997
G003GW002	003GW00203	gamma-Chlordane	0.04000	µg/L	U	09/16/1997
G003GW002	003GW00203	Heptachlor	0.04000	µg/L	U	09/16/1997
G003GW002	003GW00203	Heptachlor epoxide	0.04000	µg/L	U	09/16/1997
G003GW002	003GW00203	Methoxychlor	0.38000	µg/L	U	09/16/1997
G003GW002	003GW00203	Toxaphene	2.50000	µg/L	U	09/16/1997
G003GW002	003GW00204	4,4'-DDD	0.08000	µg/L	U	12/02/1997
G003GW002	003GW00204	4,4'-DDE	0.08000	µg/L	U	12/02/1997
G003GW002	003GW00204	4,4'-DDT	0.08000	µg/L	U	12/02/1997
G003GW002	003GW00204	Aldrin	0.04000	µg/L	U	12/02/1997
G003GW002	003GW00204	alpha-BHC	0.04000	µg/L	U	12/02/1997
G003GW002	003GW00204	alpha-Chlordane	0.04000	µg/L	U	12/02/1997
G003GW002	003GW00204	beta-BHC	0.04000	µg/L	U	12/02/1997
G003GW002	003GW00204	delta-BHC	0.04000	µg/L	U	12/02/1997
G003GW002	003GW00204	Dieldrin	0.08000	µg/L	U	12/02/1997
G003GW002	003GW00204	Endosulfan I	0.04000	µg/L	U	12/02/1997
G003GW002	003GW00204	Endosulfan II	0.08000	µg/L	U	12/02/1997
G003GW002	003GW00204	Endosulfan sulfate	0.08000	µg/L	U	12/02/1997
G003GW002	003GW00204	Endrin	0.08000	µg/L	U	12/02/1997
G003GW002	003GW00204	Endrin aldehyde	0.08000	µg/L	U	12/02/1997
G003GW002	003GW00204	Endrin ketone	0.08000	µg/L	U	12/02/1997
G003GW002	003GW00204	gamma-BHC	0.04000	µg/L	U	12/02/1997
G003GW002	003GW00204	gamma-Chlordane	0.04000	µg/L	U	12/02/1997
G003GW002	003GW00204	Heptachlor	0.04000	µg/L	U	12/02/1997
G003GW002	003GW00204	Heptachlor epoxide	0.04000	µg/L	U	12/02/1997
G003GW002	003GW00204	Methoxychlor	0.38000	µg/L	U	12/02/1997
G003GW002	003GW00204	Toxaphene	2.50000	µg/L	U	12/02/1997
G003GW002	003GW002M6	4,4'-DDD	0.08000	µg/L	U	10/08/2002
G003GW002	003GW002M6	4,4'-DDE	0.08000	µg/L	U	10/08/2002
G003GW002	003GW002M6	4,4'-DDT	0.08000	µg/L	U	10/08/2002

TABLE 1-1
 Summary of All Pesticide Results - SWMU 3 Groundwater
 Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

STATION	SAMPLE	CHEM_LABEL	RESULT	UNIT	QUALIFIER	DATE_COL
G003GW002	003GW002M6	Aldrin	0.04000	µg/L	U	10/08/2002
G003GW002	003GW002M6	alpha-BHC	0.04000	µg/L	U	10/08/2002
G003GW002	003GW002M6	alpha-Chlordane	0.04000	µg/L	U	10/08/2002
G003GW002	003GW002M6	beta-BHC	0.04000	µg/L	U	10/08/2002
G003GW002	003GW002M6	Chlordane	0.40000	µg/L	U	10/08/2002
G003GW002	003GW002M6	delta-BHC	0.04000	µg/L	U	10/08/2002
G003GW002	003GW002M6	Dieldrin	0.08000	µg/L	U	10/08/2002
G003GW002	003GW002M6	Endosulfan I	0.04000	µg/L	U	10/08/2002
G003GW002	003GW002M6	Endosulfan II	0.08000	µg/L	U	10/08/2002
G003GW002	003GW002M6	Endosulfan sulfate	0.08000	µg/L	U	10/08/2002
G003GW002	003GW002M6	Endrin	0.08000	µg/L	U	10/08/2002
G003GW002	003GW002M6	Endrin aldehyde	0.08000	µg/L	U	10/08/2002
G003GW002	003GW002M6	Endrin ketone	0.08000	µg/L	U	10/08/2002
G003GW002	003GW002M6	gamma-BHC	0.04000	µg/L	U	10/08/2002
G003GW002	003GW002M6	gamma-Chlordane	0.04000	µg/L	U	10/08/2002
G003GW002	003GW002M6	Heptachlor	0.04000	µg/L	U	10/08/2002
G003GW002	003GW002M6	Heptachlor epoxide	0.04000	µg/L	U	10/08/2002
G003GW002	003GW002M6	Methoxychlor	0.38000	µg/L	U	10/08/2002
G003GW002	003GW002M6	Toxaphene	2.50000	µg/L	U	10/08/2002
G003GW002	003GW002M7	4,4'-DDD	0.08100	µg/L	U	12/31/2002
G003GW002	003GW002M7	4,4'-DDE	0.08100	µg/L	U	12/31/2002
G003GW002	003GW002M7	4,4'-DDT	0.08100	µg/L	U	12/31/2002
G003GW002	003GW002M7	Aldrin	0.04000	µg/L	U	12/31/2002
G003GW002	003GW002M7	alpha-BHC	0.04000	µg/L	U	12/31/2002
G003GW002	003GW002M7	alpha-Chlordane	0.04000	µg/L	U	12/31/2002
G003GW002	003GW002M7	beta-BHC	0.04000	µg/L	U	12/31/2002
G003GW002	003GW002M7	Chlordane	0.40000	µg/L	U	12/31/2002
G003GW002	003GW002M7	delta-BHC	0.04000	µg/L	U	12/31/2002
G003GW002	003GW002M7	Dieldrin	0.08100	µg/L	U	12/31/2002
G003GW002	003GW002M7	Endosulfan I	0.04000	µg/L	U	12/31/2002
G003GW002	003GW002M7	Endosulfan II	0.08100	µg/L	U	12/31/2002
G003GW002	003GW002M7	Endosulfan sulfate	0.08100	µg/L	U	12/31/2002
G003GW002	003GW002M7	Endrin	0.08100	µg/L	U	12/31/2002
G003GW002	003GW002M7	Endrin aldehyde	0.08100	µg/L	U	12/31/2002
G003GW002	003GW002M7	Endrin ketone	0.08100	µg/L	U	12/31/2002
G003GW002	003GW002M7	gamma-BHC	0.04000	µg/L	U	12/31/2002
G003GW002	003GW002M7	gamma-Chlordane	0.04000	µg/L	U	12/31/2002
G003GW002	003GW002M7	Heptachlor	0.04000	µg/L	U	12/31/2002
G003GW002	003GW002M7	Heptachlor epoxide	0.04000	µg/L	U	12/31/2002
G003GW002	003GW002M7	Methoxychlor	0.38000	µg/L	U	12/31/2002
G003GW002	003GW002M7	Toxaphene	2.50000	µg/L	U	12/31/2002
G003GW003	003GW00301	4,4'-DDD	0.08000	µg/L	U	11/20/1996
G003GW003	003GW00301	4,4'-DDE	0.08000	µg/L	U	11/20/1996

TABLE 1-1
 Summary of All Pesticide Results - SWMU 3 Groundwater
 Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

STATION	SAMPLE	CHEM_LABEL	RESULT	UNIT	QUALIFIER	DATE_COL
G003GW003	003GW00301	4,4'-DDT	0.08000	µg/L	U	11/20/1996
G003GW003	003GW00301	Aldrin	0.04000	µg/L	U	11/20/1996
G003GW003	003GW00301	alpha-BHC	0.04000	µg/L	U	11/20/1996
G003GW003	003GW00301	alpha-Chlordane	0.04000	µg/L	U	11/20/1996
G003GW003	003GW00301	beta-BHC	0.04000	µg/L	U	11/20/1996
G003GW003	003GW00301	delta-BHC	0.04000	µg/L	U	11/20/1996
G003GW003	003GW00301	Dieldrin	0.08000	µg/L	U	11/20/1996
G003GW003	003GW00301	Endosulfan I	0.04000	µg/L	U	11/20/1996
G003GW003	003GW00301	Endosulfan II	0.08000	µg/L	U	11/20/1996
G003GW003	003GW00301	Endosulfan sulfate	0.08000	µg/L	U	11/20/1996
G003GW003	003GW00301	Endrin	0.08000	µg/L	U	11/20/1996
G003GW003	003GW00301	Endrin aldehyde	0.08000	µg/L	U	11/20/1996
G003GW003	003GW00301	Endrin ketone	0.08000	µg/L	U	11/20/1996
G003GW003	003GW00301	gamma-BHC	0.04000	µg/L	U	11/20/1996
G003GW003	003GW00301	gamma-Chlordane	0.04000	µg/L	U	11/20/1996
G003GW003	003GW00301	Heptachlor	0.04000	µg/L	U	11/20/1996
G003GW003	003GW00301	Heptachlor epoxide	0.04000	µg/L	U	11/20/1996
G003GW003	003GW00301	Methoxychlor	0.38000	µg/L	U	11/20/1996
G003GW003	003GW00301	Toxaphene	2.50000	µg/L	U	11/20/1996
G003GW003	003GW00302	4,4'-DDD	0.08000	µg/L	U	06/18/1997
G003GW003	003GW00302	4,4'-DDE	0.08000	µg/L	U	06/18/1997
G003GW003	003GW00302	4,4'-DDT	0.08000	µg/L	U	06/18/1997
G003GW003	003GW00302	Aldrin	0.04000	µg/L	U	06/18/1997
G003GW003	003GW00302	alpha-BHC	0.04000	µg/L	U	06/18/1997
G003GW003	003GW00302	alpha-Chlordane	0.04000	µg/L	U	06/18/1997
G003GW003	003GW00302	beta-BHC	0.04000	µg/L	U	06/18/1997
G003GW003	003GW00302	delta-BHC	0.04000	µg/L	U	06/18/1997
G003GW003	003GW00302	Dieldrin	0.08000	µg/L	U	06/18/1997
G003GW003	003GW00302	Endosulfan I	0.04000	µg/L	U	06/18/1997
G003GW003	003GW00302	Endosulfan II	0.08000	µg/L	U	06/18/1997
G003GW003	003GW00302	Endosulfan sulfate	0.08000	µg/L	U	06/18/1997
G003GW003	003GW00302	Endrin	0.08000	µg/L	U	06/18/1997
G003GW003	003GW00302	Endrin aldehyde	0.08000	µg/L	U	06/18/1997
G003GW003	003GW00302	Endrin ketone	0.08000	µg/L	U	06/18/1997
G003GW003	003GW00302	gamma-BHC	0.04000	µg/L	U	06/18/1997
G003GW003	003GW00302	gamma-Chlordane	0.04000	µg/L	U	06/18/1997
G003GW003	003GW00302	Heptachlor	0.04000	µg/L	U	06/18/1997
G003GW003	003GW00302	Heptachlor epoxide	0.04000	µg/L	U	06/18/1997
G003GW003	003GW00302	Methoxychlor	0.38000	µg/L	U	06/18/1997
G003GW003	003GW00302	Toxaphene	2.50000	µg/L	U	06/18/1997
G003GW003	003GW00303	4,4'-DDD	0.08000	µg/L	U	09/17/1997
G003GW003	003GW00303	4,4'-DDE	0.08000	µg/L	U	09/17/1997
G003GW003	003GW00303	4,4'-DDT	0.08000	µg/L	U	09/17/1997

TABLE 1-1
 Summary of All Pesticide Results - SWMU 3 Groundwater
 Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

STATION	SAMPLE	CHEM_LABEL	RESULT	UNIT	QUALIFIER	DATE_COL
G003GW003	003GW00303	Aldrin	0.04000	µg/L	U	09/17/1997
G003GW003	003GW00303	alpha-BHC	0.04000	µg/L	U	09/17/1997
G003GW003	003GW00303	alpha-Chlordane	0.04000	µg/L	U	09/17/1997
G003GW003	003GW00303	beta-BHC	0.04000	µg/L	U	09/17/1997
G003GW003	003GW00303	delta-BHC	0.04000	µg/L	U	09/17/1997
G003GW003	003GW00303	Dieldrin	0.08000	µg/L	U	09/17/1997
G003GW003	003GW00303	Endosulfan I	0.04000	µg/L	U	09/17/1997
G003GW003	003GW00303	Endosulfan II	0.08000	µg/L	U	09/17/1997
G003GW003	003GW00303	Endosulfan sulfate	0.08000	µg/L	U	09/17/1997
G003GW003	003GW00303	Endrin	0.08000	µg/L	U	09/17/1997
G003GW003	003GW00303	Endrin aldehyde	0.08000	µg/L	U	09/17/1997
G003GW003	003GW00303	Endrin ketone	0.08000	µg/L	U	09/17/1997
G003GW003	003GW00303	gamma-BHC	0.04000	µg/L	U	09/17/1997
G003GW003	003GW00303	gamma-Chlordane	0.04000	µg/L	U	09/17/1997
G003GW003	003GW00303	Heptachlor	0.04000	µg/L	U	09/17/1997
G003GW003	003GW00303	Heptachlor epoxide	0.04000	µg/L	U	09/17/1997
G003GW003	003GW00303	Methoxychlor	0.38000	µg/L	U	09/17/1997
G003GW003	003GW00303	Toxaphene	2.50000	µg/L	U	09/17/1997
G003GW003	003GW00304	4,4'-DDD	0.08000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	4,4'-DDE	0.08000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	4,4'-DDT	0.08000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	Aldrin	0.04000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	alpha-BHC	0.04000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	alpha-Chlordane	0.04000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	beta-BHC	0.04000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	delta-BHC	0.04000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	Dieldrin	0.08000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	Endosulfan I	0.04000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	Endosulfan II	0.08000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	Endosulfan sulfate	0.08000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	Endrin	0.08000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	Endrin aldehyde	0.08000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	Endrin ketone	0.08000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	gamma-BHC	0.04000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	gamma-Chlordane	0.04000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	Heptachlor	0.04000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	Heptachlor epoxide	0.04000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	Methoxychlor	0.38000	µg/L	UJ	12/03/1997
G003GW003	003GW00304	Toxaphene	2.50000	µg/L	UJ	12/03/1997
G003GW004	003GW004M6	4,4'-DDD	0.08000	µg/L	U	10/08/2002
G003GW004	003GW004M6	4,4'-DDE	0.08000	µg/L	U	10/08/2002
G003GW004	003GW004M6	4,4'-DDT	0.08000	µg/L	U	10/08/2002
G003GW004	003GW004M6	Aldrin	0.04000	µg/L	U	10/08/2002

TABLE 1-1
 Summary of All Pesticide Results - SWMU 3 Groundwater
 Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

STATION	SAMPLE	CHEM_LABEL	RESULT	UNIT	QUALIFIER	DATE_COL
G003GW004	003GW004M6	alpha-BHC	0.04000	µg/L	U	10/08/2002
G003GW004	003GW004M6	alpha-Chlordane	0.04000	µg/L	U	10/08/2002
G003GW004	003GW004M6	beta-BHC	0.04000	µg/L	U	10/08/2002
G003GW004	003GW004M6	Chlordane	0.40000	µg/L	U	10/08/2002
G003GW004	003GW004M6	delta-BHC	0.04000	µg/L	U	10/08/2002
G003GW004	003GW004M6	Dieldrin	0.08000	µg/L	U	10/08/2002
G003GW004	003GW004M6	Endosulfan I	0.04000	µg/L	U	10/08/2002
G003GW004	003GW004M6	Endosulfan II	0.08000	µg/L	U	10/08/2002
G003GW004	003GW004M6	Endosulfan sulfate	0.08000	µg/L	U	10/08/2002
G003GW004	003GW004M6	Endrin	0.08000	µg/L	U	10/08/2002
G003GW004	003GW004M6	Endrin aldehyde	0.08000	µg/L	U	10/08/2002
G003GW004	003GW004M6	Endrin ketone	0.08000	µg/L	U	10/08/2002
G003GW004	003GW004M6	gamma-BHC	0.04000	µg/L	U	10/08/2002
G003GW004	003GW004M6	gamma-Chlordane	0.04000	µg/L	U	10/08/2002
G003GW004	003GW004M6	Heptachlor	0.04000	µg/L	U	10/08/2002
G003GW004	003GW004M6	Heptachlor epoxide	0.02000	µg/L	J	10/08/2002
G003GW004	003GW004M6	Methoxychlor	0.38000	µg/L	U	10/08/2002
G003GW004	003GW004M6	Toxaphene	2.50000	µg/L	U	10/08/2002
G003GW004	003GW004M7	4,4'-DDD	0.08000	µg/L	U	12/31/2002
G003GW004	003GW004M7	4,4'-DDE	0.08000	µg/L	U	12/31/2002
G003GW004	003GW004M7	4,4'-DDT	0.08000	µg/L	U	12/31/2002
G003GW004	003GW004M7	Aldrin	0.04000	µg/L	U	12/31/2002
G003GW004	003GW004M7	alpha-BHC	0.04000	µg/L	U	12/31/2002
G003GW004	003GW004M7	alpha-Chlordane	0.04000	µg/L	U	12/31/2002
G003GW004	003GW004M7	beta-BHC	0.04000	µg/L	U	12/31/2002
G003GW004	003GW004M7	Chlordane	0.40000	µg/L	U	12/31/2002
G003GW004	003GW004M7	delta-BHC	0.04000	µg/L	U	12/31/2002
G003GW004	003GW004M7	Dieldrin	0.08000	µg/L	U	12/31/2002
G003GW004	003GW004M7	Endosulfan I	0.04000	µg/L	U	12/31/2002
G003GW004	003GW004M7	Endosulfan II	0.08000	µg/L	U	12/31/2002
G003GW004	003GW004M7	Endosulfan sulfate	0.08000	µg/L	U	12/31/2002
G003GW004	003GW004M7	Endrin	0.08000	µg/L	U	12/31/2002
G003GW004	003GW004M7	Endrin aldehyde	0.08000	µg/L	U	12/31/2002
G003GW004	003GW004M7	Endrin ketone	0.08000	µg/L	U	12/31/2002
G003GW004	003GW004M7	gamma-BHC	0.04000	µg/L	U	12/31/2002
G003GW004	003GW004M7	gamma-Chlordane	0.04000	µg/L	U	12/31/2002
G003GW004	003GW004M7	Heptachlor	0.04000	µg/L	U	12/31/2002
G003GW004	003GW004M7	Heptachlor epoxide	0.04000	µg/L	U	12/31/2002
G003GW004	003GW004M7	Methoxychlor	0.38000	µg/L	U	12/31/2002
G003GW004	003GW004M7	Toxaphene	2.50000	µg/L	U	12/31/2002
G003GW005	003GW005M6	4,4'-DDD	1.00000	µg/L	J	10/08/2002
G003GW005	003GW005M6	4,4'-DDE	0.21000	µg/L	=	10/08/2002
G003GW005	003GW005M6	4,4'-DDT	1.20000	µg/L	=	10/08/2002

TABLE 1-1
 Summary of All Pesticide Results - SWMU 3 Groundwater
 Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

STATION	SAMPLE	CHEM_LABEL	RESULT	UNIT	QUALIFIER	DATE_COL
G003GW005	003GW005M6	Aldrin	0.04000	µg/L	U	10/08/2002
G003GW005	003GW005M6	alpha-BHC	0.04000	µg/L	U	10/08/2002
G003GW005	003GW005M6	alpha-Chlordane	0.01000	µg/L	J	10/08/2002
G003GW005	003GW005M6	beta-BHC	0.00750	µg/L	J	10/08/2002
G003GW005	003GW005M6	Chlordane	0.40000	µg/L	U	10/08/2002
G003GW005	003GW005M6	delta-BHC	0.04000	µg/L	U	10/08/2002
G003GW005	003GW005M6	Dieldrin	0.06100	µg/L	J	10/08/2002
G003GW005	003GW005M6	Endosulfan I	0.01400	µg/L	J	10/08/2002
G003GW005	003GW005M6	Endosulfan II	0.01800	µg/L	J	10/08/2002
G003GW005	003GW005M6	Endosulfan sulfate	0.08000	µg/L	U	10/08/2002
G003GW005	003GW005M6	Endrin	0.08000	µg/L	U	10/08/2002
G003GW005	003GW005M6	Endrin aldehyde	0.08000	µg/L	U	10/08/2002
G003GW005	003GW005M6	Endrin ketone	0.08000	µg/L	U	10/08/2002
G003GW005	003GW005M6	gamma-BHC	0.04000	µg/L	U	10/08/2002
G003GW005	003GW005M6	gamma-Chlordane	0.07500	µg/L	J	10/08/2002
G003GW005	003GW005M6	Heptachlor	0.04000	µg/L	U	10/08/2002
G003GW005	003GW005M6	Heptachlor epoxide	0.08600	µg/L	J	10/08/2002
G003GW005	003GW005M6	Methoxychlor	0.38000	µg/L	U	10/08/2002
G003GW005	003GW005M6	Toxaphene	2.50000	µg/L	U	10/08/2002
G003GW005	003GW005M7	4,4'-DDD	0.10000	µg/L	=	01/02/2003
G003GW005	003GW005M7	4,4'-DDE	0.03500	µg/L	J	01/02/2003
G003GW005	003GW005M7	4,4'-DDT	0.16000	µg/L	=	01/02/2003
G003GW005	003GW005M7	Aldrin	0.03900	µg/L	U	01/02/2003
G003GW005	003GW005M7	alpha-BHC	0.03900	µg/L	U	01/02/2003
G003GW005	003GW005M7	alpha-Chlordane	0.02200	µg/L	J	01/02/2003
G003GW005	003GW005M7	beta-BHC	0.03900	µg/L	U	01/02/2003
G003GW005	003GW005M7	Chlordane	0.39000	µg/L	U	01/02/2003
G003GW005	003GW005M7	delta-BHC	0.03900	µg/L	U	01/02/2003
G003GW005	003GW005M7	Dieldrin	0.09100	µg/L	=	01/02/2003
G003GW005	003GW005M7	Endosulfan I	0.03900	µg/L	U	01/02/2003
G003GW005	003GW005M7	Endosulfan II	0.07800	µg/L	U	01/02/2003
G003GW005	003GW005M7	Endosulfan sulfate	0.07800	µg/L	U	01/02/2003
G003GW005	003GW005M7	Endrin	0.07800	µg/L	U	01/02/2003
G003GW005	003GW005M7	Endrin aldehyde	0.07800	µg/L	U	01/02/2003
G003GW005	003GW005M7	Endrin ketone	0.07800	µg/L	U	01/02/2003
G003GW005	003GW005M7	gamma-BHC	0.03900	µg/L	U	01/02/2003
G003GW005	003GW005M7	gamma-Chlordane	0.02400	µg/L	J	01/02/2003
G003GW005	003GW005M7	Heptachlor	0.03900	µg/L	U	01/02/2003
G003GW005	003GW005M7	Heptachlor epoxide	0.06000	µg/L	=	01/02/2003
G003GW005	003GW005M7	Methoxychlor	0.37000	µg/L	U	01/02/2003
G003GW005	003GW005M7	Toxaphene	2.40000	µg/L	U	01/02/2003
G003GW006	003GW006M6	4,4'-DDD	0.13000	µg/L	J	10/08/2002
G003GW006	003GW006M6	4,4'-DDE	0.05800	µg/L	J	10/08/2002

TABLE 1-1
 Summary of All Pesticide Results - SWMU 3 Groundwater
 Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

STATION	SAMPLE	CHEM_LABEL	RESULT	UNIT	QUALIFIER	DATE_COL
G003GW006	003GW006M6	4,4'-DDT	1.60000	µg/L	J	10/08/2002
G003GW006	003GW006M6	Aldrin	0.04000	µg/L	U	10/08/2002
G003GW006	003GW006M6	alpha-BHC	0.04000	µg/L	U	10/08/2002
G003GW006	003GW006M6	alpha-Chlordane	0.04000	µg/L	U	10/08/2002
G003GW006	003GW006M6	beta-BHC	0.04000	µg/L	U	10/08/2002
G003GW006	003GW006M6	Chlordane	0.40000	µg/L	U	10/08/2002
G003GW006	003GW006M6	delta-BHC	0.04000	µg/L	U	10/08/2002
G003GW006	003GW006M6	Dieldrin	0.08000	µg/L	U	10/08/2002
G003GW006	003GW006M6	Endosulfan I	0.04000	µg/L	U	10/08/2002
G003GW006	003GW006M6	Endosulfan II	0.08000	µg/L	U	10/08/2002
G003GW006	003GW006M6	Endosulfan sulfate	0.08000	µg/L	U	10/08/2002
G003GW006	003GW006M6	Endrin	0.08000	µg/L	U	10/08/2002
G003GW006	003GW006M6	Endrin aldehyde	0.03200	µg/L	J	10/08/2002
G003GW006	003GW006M6	Endrin ketone	0.08000	µg/L	U	10/08/2002
G003GW006	003GW006M6	gamma-BHC	0.01100	µg/L	J	10/08/2002
G003GW006	003GW006M6	gamma-Chlordane	0.04000	µg/L	U	10/08/2002
G003GW006	003GW006M6	Heptachlor	0.00610	µg/L	J	10/08/2002
G003GW006	003GW006M6	Heptachlor epoxide	0.21000	µg/L	J	10/08/2002
G003GW006	003GW006M6	Methoxychlor	0.38000	µg/L	U	10/08/2002
G003GW006	003GW006M6	Toxaphene	2.50000	µg/L	U	10/08/2002
G003GW006	003GW006M7	4,4'-DDD	0.02500	µg/L	J	01/02/2003
G003GW006	003GW006M7	4,4'-DDE	0.02000	µg/L	J	01/02/2003
G003GW006	003GW006M7	4,4'-DDT	0.68000	µg/L	J	01/02/2003
G003GW006	003GW006M7	Aldrin	0.03900	µg/L	U	01/02/2003
G003GW006	003GW006M7	alpha-BHC	0.03900	µg/L	U	01/02/2003
G003GW006	003GW006M7	alpha-Chlordane	0.03900	µg/L	U	01/02/2003
G003GW006	003GW006M7	beta-BHC	0.03900	µg/L	U	01/02/2003
G003GW006	003GW006M7	Chlordane	0.39000	µg/L	U	01/02/2003
G003GW006	003GW006M7	delta-BHC	0.03900	µg/L	U	01/02/2003
G003GW006	003GW006M7	Dieldrin	0.07800	µg/L	U	01/02/2003
G003GW006	003GW006M7	Endosulfan I	0.03900	µg/L	U	01/02/2003
G003GW006	003GW006M7	Endosulfan II	0.07800	µg/L	U	01/02/2003
G003GW006	003GW006M7	Endosulfan sulfate	0.07800	µg/L	U	01/02/2003
G003GW006	003GW006M7	Endrin	0.07800	µg/L	U	01/02/2003
G003GW006	003GW006M7	Endrin aldehyde	0.07800	µg/L	U	01/02/2003
G003GW006	003GW006M7	Endrin ketone	0.07800	µg/L	U	01/02/2003
G003GW006	003GW006M7	gamma-BHC	0.03900	µg/L	U	01/02/2003
G003GW006	003GW006M7	gamma-Chlordane	0.03900	µg/L	U	01/02/2003
G003GW006	003GW006M7	Heptachlor	0.03900	µg/L	U	01/02/2003
G003GW006	003GW006M7	Heptachlor epoxide	0.03900	µg/L	U	01/02/2003
G003GW006	003GW006M7	Methoxychlor	0.37000	µg/L	U	01/02/2003
G003GW006	003GW006M7	Toxaphene	2.40000	µg/L	U	01/02/2003
G003GW007	003GW007M6	4,4'-DDD	0.08000	µg/L	U	10/08/2002
G003GW007	003GW007M6	4,4'-DDE	0.08000	µg/L	U	10/08/2002

TABLE 1-1
 Summary of All Pesticide Results - SWMU 3 Groundwater
 Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

STATION	SAMPLE	CHEM_LABEL	RESULT	UNIT	QUALIFIER	DATE_COL
G003GW007	003GW007M6	4,4'-DDT	0.08000	µg/L	U	10/08/2002
G003GW007	003GW007M6	Aldrin	0.04000	µg/L	U	10/08/2002
G003GW007	003GW007M6	alpha-BHC	0.01300	µg/L	J	10/08/2002
G003GW007	003GW007M6	alpha-Chlordane	0.02900	µg/L	J	10/08/2002
G003GW007	003GW007M6	beta-BHC	0.02300	µg/L	J	10/08/2002
G003GW007	003GW007M6	Chlordane	0.40000	µg/L	U	10/08/2002
G003GW007	003GW007M6	delta-BHC	0.01700	µg/L	J	10/08/2002
G003GW007	003GW007M6	Dieldrin	0.67000	µg/L	=	10/08/2002
G003GW007	003GW007M6	Endosulfan I	0.04000	µg/L	U	10/08/2002
G003GW007	003GW007M6	Endosulfan II	0.04100	µg/L	J	10/08/2002
G003GW007	003GW007M6	Endosulfan sulfate	0.08000	µg/L	U	10/08/2002
G003GW007	003GW007M6	Endrin	0.08000	µg/L	U	10/08/2002
G003GW007	003GW007M6	Endrin aldehyde	0.08000	µg/L	U	10/08/2002
G003GW007	003GW007M6	Endrin ketone	0.03500	µg/L	J	10/08/2002
G003GW007	003GW007M6	gamma-BHC	0.04000	µg/L	U	10/08/2002
G003GW007	003GW007M6	gamma-Chlordane	0.04000	µg/L	=	10/08/2002
G003GW007	003GW007M6	Heptachlor	0.04000	µg/L	U	10/08/2002
G003GW007	003GW007M6	Heptachlor epoxide	0.13000	µg/L	J	10/08/2002
G003GW007	003GW007M6	Methoxychlor	0.38000	µg/L	U	10/08/2002
G003GW007	003GW007M6	Toxaphene	2.50000	µg/L	U	10/08/2002
G003GW007	003GW007M7	4,4'-DDD	0.07900	µg/L	U	12/31/2002
G003GW007	003GW007M7	4,4'-DDE	0.07900	µg/L	U	12/31/2002
G003GW007	003GW007M7	4,4'-DDT	0.07900	µg/L	U	12/31/2002
G003GW007	003GW007M7	Aldrin	0.04000	µg/L	U	12/31/2002
G003GW007	003GW007M7	alpha-BHC	0.04000	µg/L	U	12/31/2002
G003GW007	003GW007M7	alpha-Chlordane	0.12000	µg/L	=	12/31/2002
G003GW007	003GW007M7	beta-BHC	0.04000	µg/L	U	12/31/2002
G003GW007	003GW007M7	Chlordane	0.40000	µg/L	U	12/31/2002
G003GW007	003GW007M7	delta-BHC	0.04000	µg/L	U	12/31/2002
G003GW007	003GW007M7	Dieldrin	0.75000	µg/L	=	12/31/2002
G003GW007	003GW007M7	Endosulfan I	0.14000	µg/L	=	12/31/2002
G003GW007	003GW007M7	Endosulfan II	0.07900	µg/L	U	12/31/2002
G003GW007	003GW007M7	Endosulfan sulfate	0.07900	µg/L	U	12/31/2002
G003GW007	003GW007M7	Endrin	0.07900	µg/L	U	12/31/2002
G003GW007	003GW007M7	Endrin aldehyde	0.07900	µg/L	U	12/31/2002
G003GW007	003GW007M7	Endrin ketone	0.07900	µg/L	U	12/31/2002
G003GW007	003GW007M7	gamma-BHC	0.04000	µg/L	U	12/31/2002
G003GW007	003GW007M7	gamma-Chlordane	0.07000	µg/L	J	12/31/2002
G003GW007	003GW007M7	Heptachlor	0.04000	µg/L	U	12/31/2002
G003GW007	003GW007M7	Heptachlor epoxide	0.32000	µg/L	=	12/31/2002
G003GW007	003GW007M7	Methoxychlor	0.38000	µg/L	U	12/31/2002
G003GW007	003GW007M7	Toxaphene	2.50000	µg/L	U	12/31/2002
G003GW008	003GW008M6	4,4'-DDD	0.08000	µg/L	U	10/08/2002
G003GW008	003GW008M6	4,4'-DDE	0.08000	µg/L	U	10/08/2002

TABLE 1-1
 Summary of All Pesticide Results - SWMU 3 Groundwater
 Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

STATION	SAMPLE	CHEM_LABEL	RESULT	UNIT	QUALIFIER	DATE_COL
G003GW008	003GW008M6	4,4'-DDT	0.08000	µg/L	U	10/08/2002
G003GW008	003GW008M6	Aldrin	0.04000	µg/L	U	10/08/2002
G003GW008	003GW008M6	alpha-BHC	0.04000	µg/L	U	10/08/2002
G003GW008	003GW008M6	alpha-Chlordane	0.04000	µg/L	U	10/08/2002
G003GW008	003GW008M6	beta-BHC	0.00870	µg/L	J	10/08/2002
G003GW008	003GW008M6	Chlordane	0.40000	µg/L	U	10/08/2002
G003GW008	003GW008M6	delta-BHC	0.04000	µg/L	U	10/08/2002
G003GW008	003GW008M6	Dieldrin	0.08000	µg/L	U	10/08/2002
G003GW008	003GW008M6	Endosulfan I	0.04000	µg/L	U	10/08/2002
G003GW008	003GW008M6	Endosulfan II	0.08000	µg/L	U	10/08/2002
G003GW008	003GW008M6	Endosulfan sulfate	0.08000	µg/L	U	10/08/2002
G003GW008	003GW008M6	Endrin	0.08000	µg/L	U	10/08/2002
G003GW008	003GW008M6	Endrin aldehyde	0.08000	µg/L	U	10/08/2002
G003GW008	003GW008M6	Endrin ketone	0.08000	µg/L	U	10/08/2002
G003GW008	003GW008M6	gamma-BHC	0.04000	µg/L	U	10/08/2002
G003GW008	003GW008M6	gamma-Chlordane	0.04000	µg/L	U	10/08/2002
G003GW008	003GW008M6	Heptachlor	0.04000	µg/L	U	10/08/2002
G003GW008	003GW008M6	Heptachlor epoxide	0.01400	µg/L	J	10/08/2002
G003GW008	003GW008M6	Methoxychlor	0.38000	µg/L	U	10/08/2002
G003GW008	003GW008M6	Toxaphene	2.50000	µg/L	U	10/08/2002
G003GW008	003GW008M7	4,4'-DDD	0.07800	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	4,4'-DDE	0.07800	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	4,4'-DDT	0.07800	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	Aldrin	0.03900	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	alpha-BHC	0.03900	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	alpha-Chlordane	0.03900	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	beta-BHC	0.03900	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	Chlordane	0.39000	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	delta-BHC	0.03900	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	Dieldrin	0.07800	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	Endosulfan I	0.03900	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	Endosulfan II	0.07800	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	Endosulfan sulfate	0.07800	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	Endrin	0.07800	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	Endrin aldehyde	0.07800	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	Endrin ketone	0.07800	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	gamma-BHC	0.03900	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	gamma-Chlordane	0.03900	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	Heptachlor	0.03900	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	Heptachlor epoxide	0.03900	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	Methoxychlor	0.37000	µg/L	UJ	12/31/2002
G003GW008	003GW008M7	Toxaphene	2.40000	µg/L	UJ	12/31/2002
G003GW009	003GW009M6	4,4'-DDD	0.08000	µg/L	U	10/08/2002
G003GW009	003GW009M6	4,4'-DDE	0.08000	µg/L	U	10/08/2002

TABLE 1-1
 Summary of All Pesticide Results - SWMU 3 Groundwater
 Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

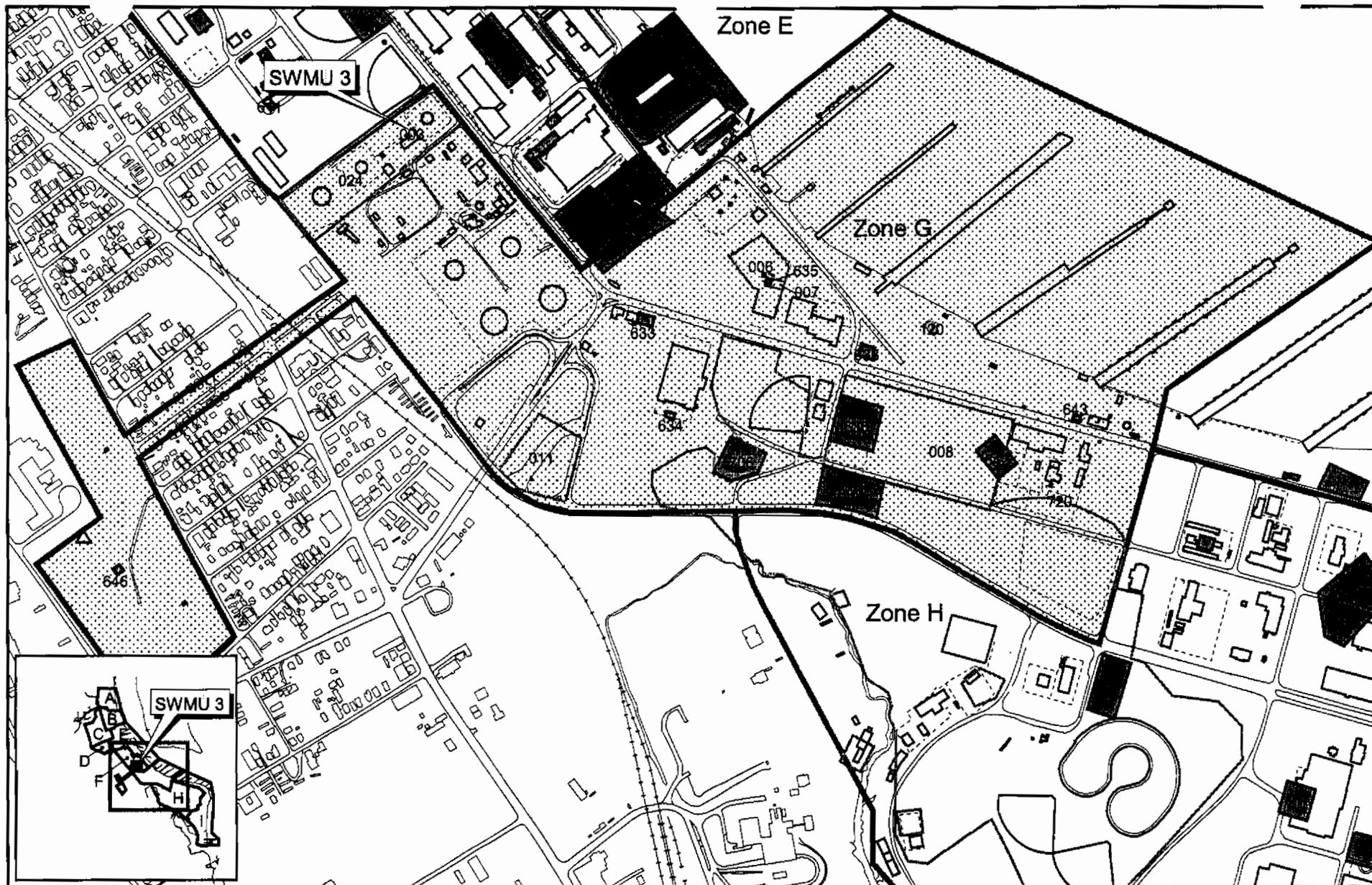
STATION	SAMPLE	CHEM_LABEL	RESULT	UNIT	QUALIFIER	DATE_COL
G003GW009	003GW009M6	4,4'-DDT	0.08000	µg/L	U	10/08/2002
G003GW009	003GW009M6	Aldrin	0.04000	µg/L	U	10/08/2002
G003GW009	003GW009M6	alpha-BHC	0.04000	µg/L	U	10/08/2002
G003GW009	003GW009M6	alpha-Chlordane	0.04000	µg/L	U	10/08/2002
G003GW009	003GW009M6	beta-BHC	0.04000	µg/L	U	10/08/2002
G003GW009	003GW009M6	Chlordane	0.40000	µg/L	U	10/08/2002
G003GW009	003GW009M6	delta-BHC	0.04000	µg/L	U	10/08/2002
G003GW009	003GW009M6	Dieldrin	0.08000	µg/L	U	10/08/2002
G003GW009	003GW009M6	Endosulfan I	0.04000	µg/L	U	10/08/2002
G003GW009	003GW009M6	Endosulfan II	0.08000	µg/L	U	10/08/2002
G003GW009	003GW009M6	Endosulfan sulfate	0.08000	µg/L	U	10/08/2002
G003GW009	003GW009M6	Endrin	0.08000	µg/L	U	10/08/2002
G003GW009	003GW009M6	Endrin aldehyde	0.08000	µg/L	U	10/08/2002
G003GW009	003GW009M6	Endrin ketone	0.08000	µg/L	U	10/08/2002
G003GW009	003GW009M6	gamma-BHC	0.04000	µg/L	U	10/08/2002
G003GW009	003GW009M6	gamma-Chlordane	0.04000	µg/L	U	10/08/2002
G003GW009	003GW009M6	Heptachlor	0.04000	µg/L	U	10/08/2002
G003GW009	003GW009M6	Heptachlor epoxide	0.04000	µg/L	U	10/08/2002
G003GW009	003GW009M6	Methoxychlor	0.38000	µg/L	U	10/08/2002
G003GW009	003GW009M6	Toxaphene	2.50000	µg/L	U	10/08/2002
G003GW009	003GW009M7	4,4'-DDD	0.08000	µg/L	U	01/02/2003
G003GW009	003GW009M7	4,4'-DDE	0.03400	µg/L	J	01/02/2003
G003GW009	003GW009M7	4,4'-DDT	0.08000	µg/L	U	01/02/2003
G003GW009	003GW009M7	Aldrin	0.04000	µg/L	U	01/02/2003
G003GW009	003GW009M7	alpha-BHC	0.04000	µg/L	U	01/02/2003
G003GW009	003GW009M7	alpha-Chlordane	0.04000	µg/L	U	01/02/2003
G003GW009	003GW009M7	beta-BHC	0.04000	µg/L	U	01/02/2003
G003GW009	003GW009M7	Chlordane	0.40000	µg/L	U	01/02/2003
G003GW009	003GW009M7	delta-BHC	0.04000	µg/L	U	01/02/2003
G003GW009	003GW009M7	Dieldrin	0.08000	µg/L	U	01/02/2003
G003GW009	003GW009M7	Endosulfan I	0.04000	µg/L	U	01/02/2003
G003GW009	003GW009M7	Endosulfan II	0.08000	µg/L	U	01/02/2003
G003GW009	003GW009M7	Endosulfan sulfate	0.08000	µg/L	U	01/02/2003
G003GW009	003GW009M7	Endrin	0.08000	µg/L	U	01/02/2003
G003GW009	003GW009M7	Endrin aldehyde	0.08000	µg/L	U	01/02/2003
G003GW009	003GW009M7	Endrin ketone	0.08000	µg/L	U	01/02/2003
G003GW009	003GW009M7	gamma-BHC	0.04000	µg/L	U	01/02/2003
G003GW009	003GW009M7	gamma-Chlordane	0.04000	µg/L	U	01/02/2003
G003GW009	003GW009M7	Heptachlor	0.04000	µg/L	U	01/02/2003
G003GW009	003GW009M7	Heptachlor epoxide	0.04000	µg/L	U	01/02/2003
G003GW009	003GW009M7	Methoxychlor	0.38000	µg/L	U	01/02/2003
G003GW009	003GW009M7	Toxaphene	2.50000	µg/L	U	01/02/2003

TABLE 1-2
Pesticides Detected in Groundwater at SWMU 3
Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

STATION	CHEM_NAME	RESULT	UNIT	QUALIFIER	DATE_COL	MCL ($\mu\text{g/L}$)	EPA Region III Tap Water RBC ($\mu\text{g/L}$)
G003GW004	Heptachlor Epoxide	0.02000	$\mu\text{g/L}$	J	10/08/2002	0.2	NA
G003GW005	Alpha-chlordane	0.01000	$\mu\text{g/L}$	J	10/08/2002	2	NA
G003GW005	Alpha-chlordane	0.02200	$\mu\text{g/L}$	J	01/02/2003	2	NA
G003GW005	Beta BHC	0.00750	$\mu\text{g/L}$	J	10/08/2002	NA	0.037
G003GW005	Dieldrin	0.06100	$\mu\text{g/L}$	J	10/08/2002	NA	0.0042
G003GW005	Dieldrin	0.09100	$\mu\text{g/L}$	=	01/02/2003	NA	0.0042
G003GW005	Endosulfan I	0.01400	$\mu\text{g/L}$	J	10/08/2002	NA	220
G003GW005	Endosulfan II	0.01800	$\mu\text{g/L}$	J	10/08/2002	NA	220
G003GW005	Gamma-chlordane	0.07500	$\mu\text{g/L}$	J	10/08/2002	2	NA
G003GW005	Gamma-chlordane	0.02400	$\mu\text{g/L}$	J	01/02/2003	2	NA
G003GW005	Heptachlor Epoxide	0.08600	$\mu\text{g/L}$	J	10/08/2002	0.2	NA
G003GW005	Heptachlor Epoxide	0.06000	$\mu\text{g/L}$	=	01/02/2003	0.2	NA
G003GW005	p,p'-DDD	1.00000	$\mu\text{g/L}$	J	10/08/2002	NA	0.28
G003GW005	p,p'-DDD	0.10000	$\mu\text{g/L}$	=	01/02/2003	NA	0.28
G003GW005	p,p'-DDE	0.21000	$\mu\text{g/L}$	=	10/08/2002	NA	0.2
G003GW005	p,p'-DDE	0.03500	$\mu\text{g/L}$	J	01/02/2003	NA	0.2
G003GW005	p,p'-DDT	1.20000	$\mu\text{g/L}$	=	10/08/2002	NA	0.2
G003GW005	p,p'-DDT	0.16000	$\mu\text{g/L}$	=	01/02/2003	NA	0.2
G003GW006	Endrin Aldehyde	0.03200	$\mu\text{g/L}$	J	10/08/2002	2	NA
G003GW006	Gamma BHC (Lindane)	0.01100	$\mu\text{g/L}$	J	10/08/2002	0.2	NA
G003GW006	Heptachlor	0.00610	$\mu\text{g/L}$	J	10/08/2002	0.4	NA
G003GW006	Heptachlor Epoxide	0.21000	$\mu\text{g/L}$	J	10/08/2002	0.2	NA
G003GW006	p,p'-DDD	0.13000	$\mu\text{g/L}$	J	10/08/2002	NA	0.28
G003GW006	p,p'-DDD	0.02500	$\mu\text{g/L}$	J	01/02/2003	NA	0.28
G003GW006	p,p'-DDE	0.05800	$\mu\text{g/L}$	J	10/08/2002	NA	0.2
G003GW006	p,p'-DDE	0.02000	$\mu\text{g/L}$	J	01/02/2003	NA	0.2
G003GW006	p,p'-DDT	1.60000	$\mu\text{g/L}$	J	10/08/2002	NA	0.2
G003GW006	p,p'-DDT	0.68000	$\mu\text{g/L}$	J	01/02/2003	NA	0.2
G003GW007	Alpha BHC	0.01300	$\mu\text{g/L}$	J	10/08/2002	NA	0.011
G003GW007	Alpha-chlordane	0.02900	$\mu\text{g/L}$	J	10/08/2002	2	NA
G003GW007	Alpha-chlordane	0.12000	$\mu\text{g/L}$	=	12/31/2002	2	NA
G003GW007	Beta BHC	0.02300	$\mu\text{g/L}$	J	10/08/2002	NA	0.037
G003GW007	Delta BHC	0.01700	$\mu\text{g/L}$	J	10/08/2002	NA	0.011
G003GW007	Dieldrin	0.67000	$\mu\text{g/L}$	=	10/08/2002	NA	0.0042

TABLE 1-2
 Pesticides Detected in Groundwater at SWMU 3
 Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

STATION	CHEM_NAME	RESULT	UNIT	QUALIFIER	DATE_COL	MCL ($\mu\text{g/L}$)	EPA Region III Tap Water RBC ($\mu\text{g/L}$)
G003GW007	Dieldrin	0.75000	$\mu\text{g/L}$	=	12/31/2002	NA	0.0042
G003GW007	Endosulfan I	0.14000	$\mu\text{g/L}$	=	12/31/2002	NA	220
G003GW007	Endosulfan II	0.04100	$\mu\text{g/L}$	J	10/08/2002	NA	220
G003GW007	Endrin Ketone	0.03500	$\mu\text{g/L}$	J	10/08/2002	2	NA
G003GW007	Gamma-chlordane	0.04000	$\mu\text{g/L}$	=	10/08/2002	2	NA
G003GW007	Gamma-chlordane	0.07000	$\mu\text{g/L}$	J	12/31/2002	2	NA
G003GW007	Heptachlor Epoxide	0.13000	$\mu\text{g/L}$	J	10/08/2002	0.2	NA
G003GW007	Heptachlor Epoxide	0.32000	$\mu\text{g/L}$	=	12/31/2002	0.2	NA
G003GW008	Beta BHC	0.00870	$\mu\text{g/L}$	J	10/08/2002	NA	0.037
G003GW008	Heptachlor Epoxide	0.01400	$\mu\text{g/L}$	J	10/08/2002	0.2	NA
G003GW009	p,p'-DDE	0.03400	$\mu\text{g/L}$	J	01/02/2003	NA	0.2



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

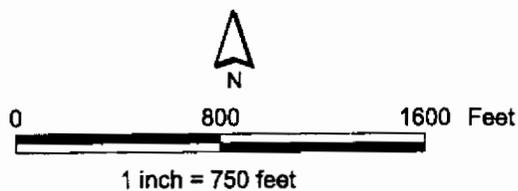


Figure 1-1
Site Location
SWMU 3, Zone G
Charleston Naval Complex

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NOTE: Aerial Photo 1997
NOTE: Original file saved in color



- Fence
- Roads
- SWMU / AOC
- Buildings
- Zone Boundary

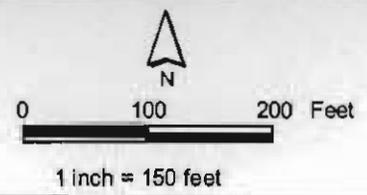
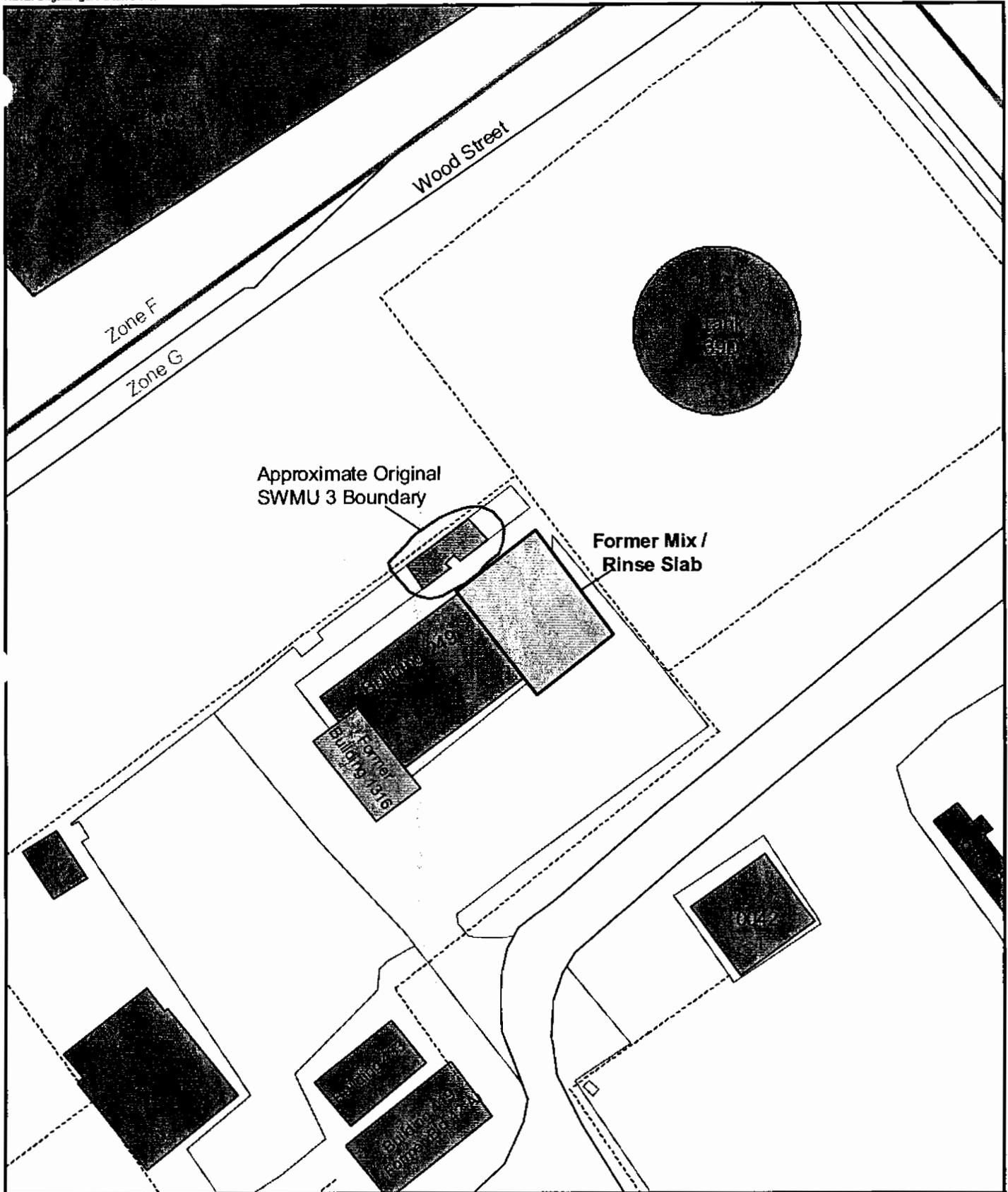


Figure 1-2
Site Layout
SWMU 3, Zone G
Charleston Naval Complex

CH2MHILL

NOTE: Original figure created in color



- Original SWMU 3 Boundary
- DET IM Excavation Area
- Former Mix / Rinse Slab
- Building 1316 Footprint
- Fence
- Roads
- Pavement
- Buildings
- Zone Boundary

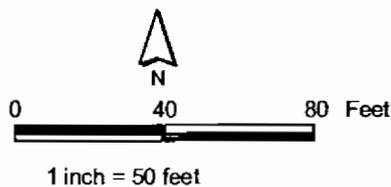
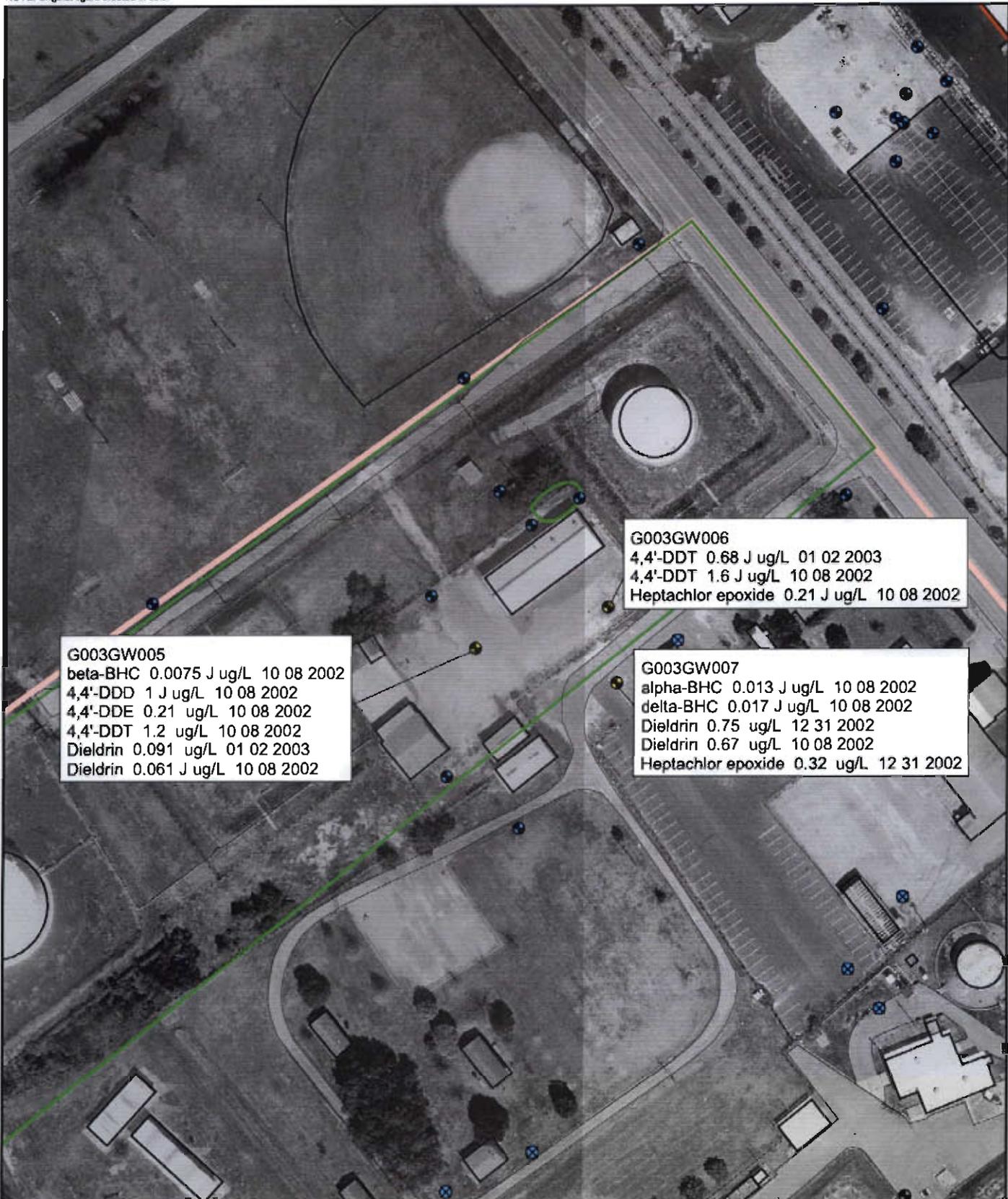


Figure 1-3
 Historical Features
 SWMU 3, Zone G
 Charleston Naval Complex

CH2MHILL

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

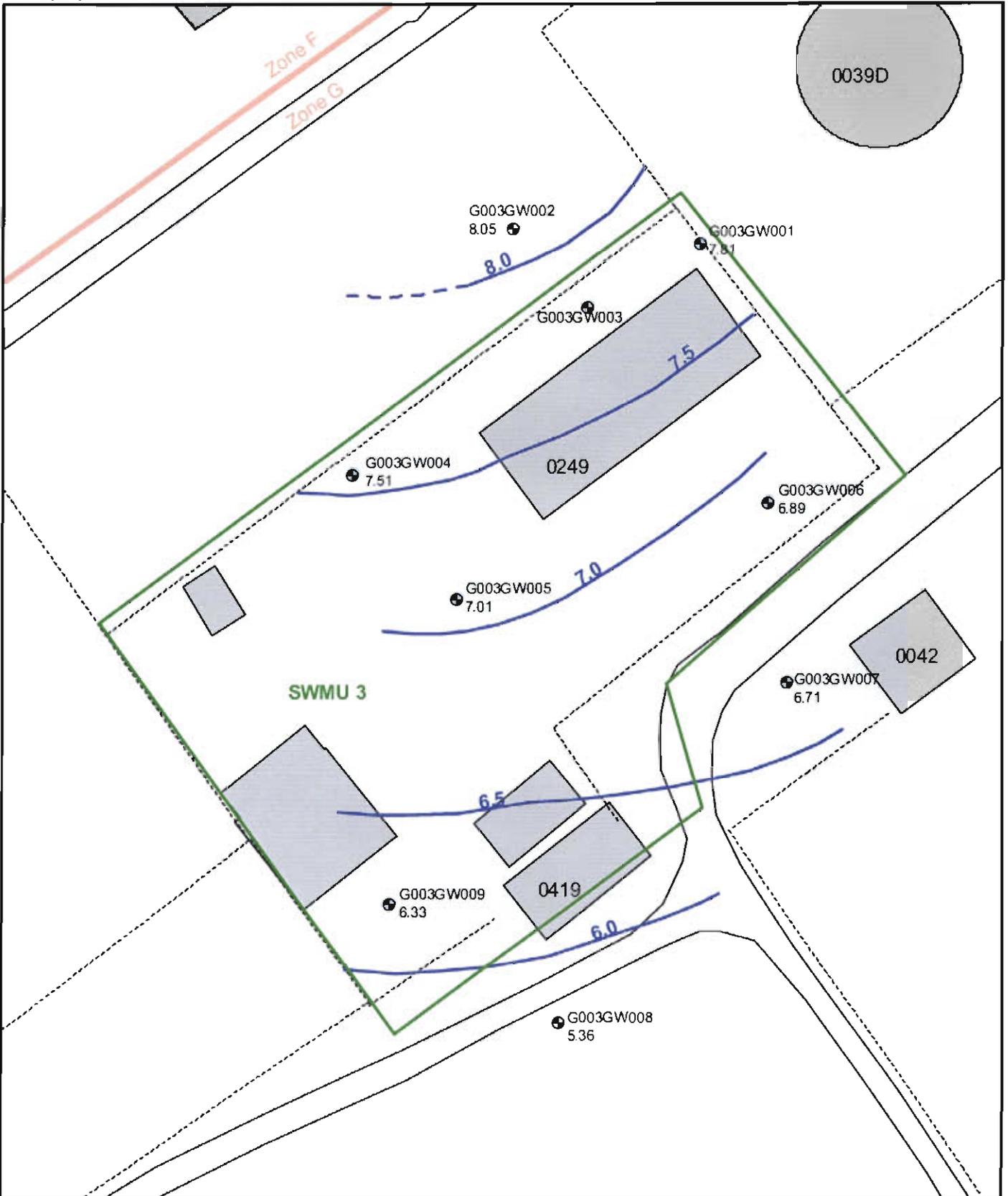


— AOC Boundary
— SWMU Boundary



Figure 1-4
Pesticide Exceedances of MCSs in Groundwater
SWMU 3
Charleston Naval Complex

NOTE: Original figure created in color



- 10/29/2002 Gauging Event
- Known Groundwater Contour (feet above msl)
 - Inferred Groundwater Contour (feet above msl)
 - Groundwater Well
 - Buildings
 - Fence
 - Zone Boundary
 - Roads
 - SWMU Boundary

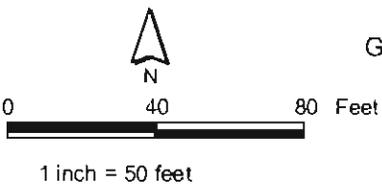
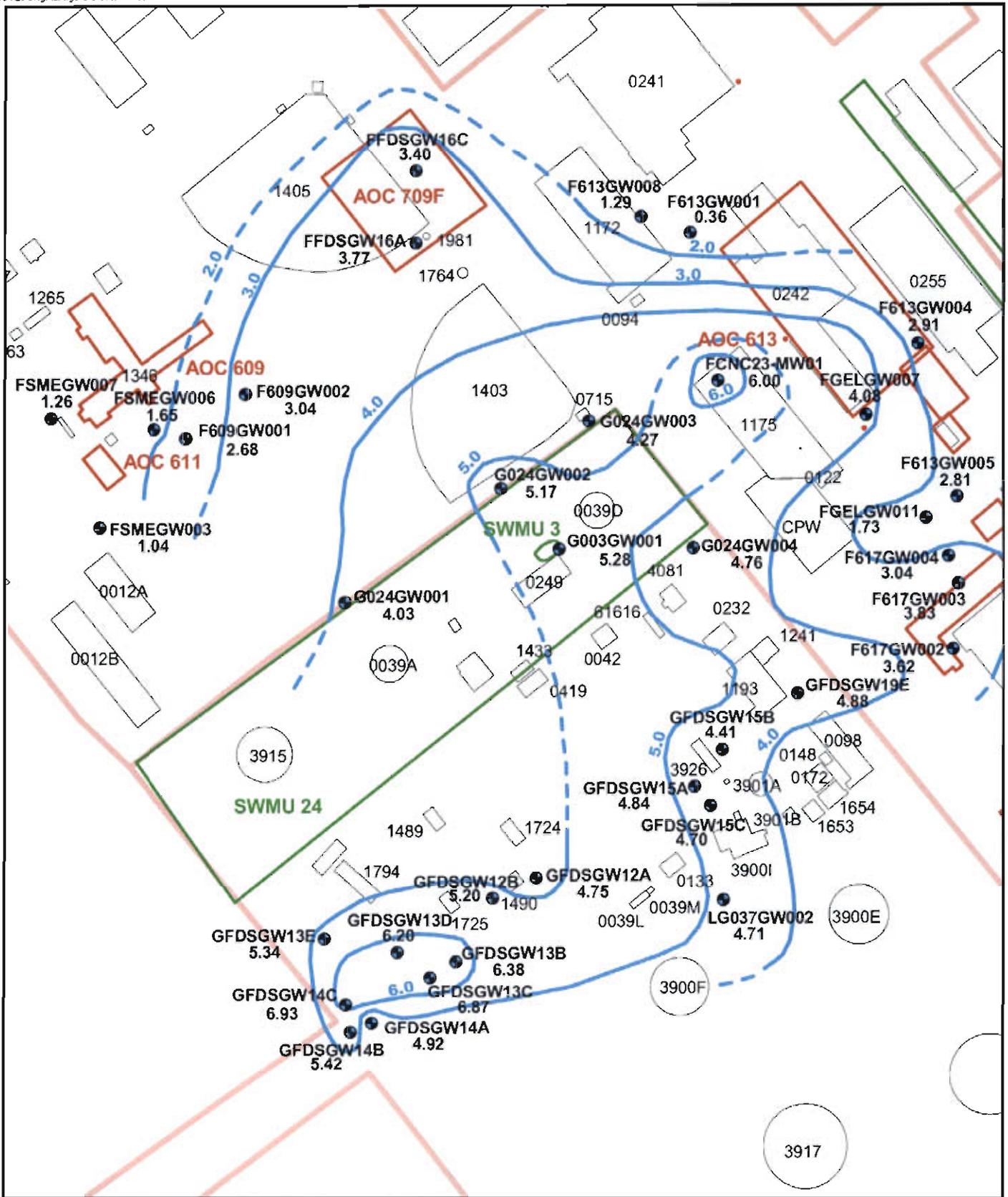


Figure 1-5
Groundwater Monitor Wells and Contours
SWMU 3, Zone G
Charleston Naval Complex

CH2MHILL

NOTE: Original figure created in color



- Groundwater Well (ft/msl) - 3/28/02
- GW Shallow Contours (ft/msl) - 3/28/02 - inferred
- GW Shallow Contours (ft/msl) - 3/28/02 - known
- AOC Boundary
- SWMU Boundary
- Buildings
- Zone Boundary



Figure 1-6
 Shallow Groundwater Potentiometric Surface
 SWMUs 24 and SWMU 3, Zone G
 Charleston Naval Complex

CH2MHILL

1 2.0 Remedial Goal Objectives and Evaluation 2 Criteria

3 2.1 Remedial Action Objectives

4 RAOs are medium-specific goals that protect human health and the environment by
5 preventing or reducing exposures under current and future land use conditions. The RAOs
6 identified for the groundwater at SWMU 3 are to:

- 7 1) Prevent ingestion and direct/dermal contact with groundwater having unacceptable
8 non-carcinogenic risk;
- 9 2) Prevent migration to offsite areas; and
- 10 3) Restore the aquifer to its beneficial use.

11 2.2 Remedial Goal Options and Media Cleanup Standards

12 Typically after RAOs have been established and the risk assessment is complete, RGOs are
13 developed for each RAO. The RGOs are based on assumptions about a particular land use
14 scenario and include different residual risk levels for comparison. For example, to remediate
15 surface soils to protect an onsite maintenance worker, RGOs might include remediating to
16 anthropogenic background levels or to one of a variety of specific risk levels (such as 1E-06
17 or 1E-04). For each RGO, a specific MCS is determined for specific chemicals. These MCSs
18 are expressed in conventional concentration units, such as milligrams per kilogram (mg/kg)
19 or milligrams per liter (mg/L), for specific chemicals.

20 RGOs and MCSs can be based on a variety of criteria, such as drinking water maximum
21 contaminant levels (MCLs), specific incremental lifetime cancer risk (ILCR) target levels
22 (e.g., 1E-04, 1E-05, or 1E-06), target Hazard Index (HI) levels (e.g., 0.1, 1.0, 3.0), or site
23 background concentrations. For a particular RGO, specific MCSs can be determined as
24 target concentration values that the selected alternative is required to achieve. Achieving
25 these goals should protect human health and the environment, while achieving compliance
26 with applicable state and federal standards. Remediating the site to those specific MCSs
27 would be suitable to demonstrate that the RAO has been achieved.

28 The exposure medium of concern for SWMU 3 is shallow groundwater.

1 Proposed MCSs for groundwater COCs are the EPA Drinking Water Standards (MCLs), or
 2 for those COCs that do not have an MCL, the EPA Region III tap water risk-based
 3 concentration (RBC). The table below presents these COCs and their respective proposed
 4 MCSs.

Chemical	EPA Drinking Water MCL ($\mu\text{g/L}$)	EPA Region III Tap Water RBC ($\mu\text{g/L}$)
DDD	NA	0.28
DDE	NA	0.2
DDT	NA	0.2
Alpha-BHC	NA	0.011
Delta-BHC	NA	0.011
Dieldrin	NA	0.0042
Heptachlor Epoxide	0.2	NA

5 $\mu\text{g/L}$ = micrograms per liter

6 2.3 Evaluation Criteria

7 According to the EPA RCRA CA guidance, corrective measure alternatives should be
 8 evaluated using the following five criteria:

- 9 1. Protection of human health and the environment.
- 10 2. Attainment of MCSs.
- 11 3. The control of the source of releases to minimize future releases that may pose a threat
 12 to human health and the environment.
- 13 4. Compliance with applicable standards for the management of wastes generated by
 14 remedial activities.
- 15 5. Other factors, including (a) long-term reliability and effectiveness; (b) reduction in
 16 toxicity, mobility, or volume of wastes; (c) short-term effectiveness; (d)
 17 implementability; and (e) cost.

18 Each of these criteria is defined in more detail below:

- 19 1. **Protection of human health and the environment.** The alternatives will be evaluated on
 20 the basis of their ability to protect human health and the environment. The ability of an
 21 alternative to achieve this criterion may or may not be independent of its ability to
 22 achieve the other criteria. For example, an alternative may be protective of human

1 health, but may not be able to attain the MCSs if the MCSs were not developed based on
2 human health protection factors.

3 2. **Attainment of MCSs.** The alternatives will be evaluated on the basis of their ability to
4 achieve the MCS defined in this CMS. Another aspect of this criterion is the time frame
5 required to achieve the MCS. Estimates of the time frame for the alternatives to achieve
6 RGOs will be provided.

7 3. **The control the source of releases.** This criterion deals with the control of releases of
8 contamination from the source (the area in which the contamination originated) and the
9 prevention of future migration to uncontaminated areas.

10 4. **Compliance with applicable standards for management of wastes.** This criterion deals
11 with the management of wastes derived from implementing the alternatives (i.e.,
12 treatment or disposal of VOC-contaminated residuals from groundwater treatment
13 processes). Corrective measure alternatives will be designed to comply with all
14 standards for management of wastes. Consequently, this criterion will not be explicitly
15 included in the detailed evaluation presented in the CMS, but such compliance would be
16 incorporated into the cost estimates for which this criterion is relevant.

17 5. **Other factors.** Five other factors are to be considered if an alternative is found to meet
18 the four criteria described above. These other factors are as follows:

19 a. Long-term reliability and effectiveness

20 Corrective measure alternatives will be evaluated on the basis of their reliability, and
21 the potential impact should the alternative fail. In other words, a qualitative
22 assessment will be made as to the chance of the alternative's failing and the
23 consequences of that failure.

24 b. Reduction in the toxicity, mobility, or volume of wastes

25 Alternatives with technologies that reduce the toxicity, mobility, or volume of the
26 contamination will be generally favored over those that do not. Consequently, a
27 qualitative assessment of this factor will be performed for each alternative.

28 c. Short-term effectiveness

29 Alternatives will be evaluated on the basis of the risk they create during the
30 implementation of the remedy. Factors that may be considered include fire,
31 explosion, and exposure of workers to hazardous substances.

32 d. Implementability

1 The alternatives will be evaluated for their implementability by considering any
2 difficulties associated with conducting the alternatives (such as the construction
3 disturbances they may create), operation of the alternatives, and the availability of
4 equipment and resources to implement the technologies comprising the alternatives.

5 e. Cost

6 A net present value of each alternative will be developed. These cost estimates will
7 be used for the relative evaluation of the alternatives, not to bid or budget the work.
8 The estimates will be based on information available at the time of the CMS and on a
9 conceptual design of the alternative. They will be "order-of-magnitude" estimates
10 with a generally expected accuracy of -50 percent to +100 percent for the scope of
11 action described for each alternative. The estimates will be categorized into capital
12 costs and operations and maintenance costs for each alternative.

3.0 Description of Candidate Corrective Measure Alternatives

3.1 Introduction

Currently available groundwater remediation technologies were screened for applicability to the contaminants and site conditions present at SWMU 3. Detailed analyses of selected technologies presented in Section 4.0 provide the rationale to support selection of the recommended corrective measure alternative. Two candidate corrective measure alternatives were selected for this site:

- Alternative 1: Long-term Monitoring with LUCs
- Alternative 2: LUCs

The sections below describe each selected alternative in more detail.

3.2 Alternative 1: Long-term Monitoring with LUCs

3.2.1 Description of Alternative

Alternative 1 would involve periodic groundwater sampling to further characterize concentrations of the COCs in groundwater and assess changes in groundwater quality over time. As noted in Section 1.0, the detections of the pesticide COCs above the MCSs has been limited to three wells, and the number of MCS exceedances was lower in the more recent sampling (December 2002/January 2003) compared to the October 2002 sampling event.

The source of contamination has been removed from SWMU 3. The removal of significant amounts of pesticide-impacted soil from the site during the IMs completed at SWMU 3 is expected to result in a beneficial effect on groundwater quality over time. With the source removed, natural attenuation processes, such as dispersion, dilution, and adsorption, are expected to mitigate groundwater contaminants and allow groundwater concentrations to achieve the target MCSs in all site wells over time.

During the period that the groundwater monitoring is ongoing and COCs are still identified at the site, LUCs will also be applied. The LUCs will limit the site to industrial land use only and provide for groundwater use restrictions so that no unacceptable exposure of receptors to site contaminants occurs.

3.2.2 Uncertainties

No significant uncertainties are associated with Alternative 1.

3.2.3 Other Considerations

No other considerations were identified for Alternative 1.

3.3 Alternative 2: LUCs

3.3.1 Description of Alternative

Alternative 2 would involve the implementation of LUCs alone as the remedy. The LUCs would limit the site to industrial land use only and provide groundwater use restrictions so that no unacceptable exposure of receptors to site contaminants occurs.

3.3.2 Key Uncertainties

The key uncertainty for Alternative 2 is the rate at which groundwater contamination will decrease due to natural attenuation processes. Although the data collected suggest that the groundwater contamination is attenuating, additional data would better confirm this attenuation. The removal of the contaminated soil, combined with natural attenuation processes, is expected to mitigate the plume and allow groundwater concentrations to eventually achieve the target MCSs. Because the degree and extent of contamination is limited and the rate of contaminant migration is very low, no receptors are expected to be exposed to contaminated groundwater at the site.

3.3.3 Other Considerations

No other considerations were noted for Alternative 2.

4.0 Evaluation and Comparison of Corrective Measure Alternatives

The two corrective measure alternatives were evaluated relative to the evaluative criteria previously described in Section 2.0 and then subjected to a comparative evaluation. A cost estimate for each alternative was also developed; the assumptions and unit costs used for these estimates are included in Appendix B.

4.1 Alternative 1: Long-term Monitoring with LUCs

Assumptions for Alternative 1 include the following:

- Five monitoring wells would be sampled on an annual basis for groundwater COCs for up to 5 years to demonstrate that the plume is either associated with turbidity or until natural attenuation processes indicate that an adequate decrease in COC concentrations has occurred.
- A base-wide land use control implementation plan (LUCIP) will be developed for the CNC. The LUCIP will allow for restrictions on land use and groundwater use at SWMU 3 and will be developed outside the scope of this CMS.

4.1.1 Protection of Human Health and the Environment

Alternative 1 would be effective at protecting human health and the environment because the LUCs will preclude unacceptable exposure of receptors to COCs from occurring.

4.1.2 Attain MCS

Alternative 1 is expected to eventually achieve the target MCSs for groundwater. With the source removed, natural attenuation processes will act to mitigate groundwater COC concentrations.

4.1.3 Control the Source of Releases

The source of release has been removed from the site through the various IMs that have removed contaminated soil.

4.1.4 Compliance with Applicable Standards for the Management of Generated Wastes

Alternative 1 does not generate any wastes that would require special management. Only purge water from well sampling is expected to be generated.

4.1.5 Other Factors (a) Long-term Reliability and Effectiveness

Alternative 1 provides a level of protection that has long-term reliability and effectiveness. The risk of failure is low, provided the LUCs are enforced.

4.1.6 Other Factors (b) Reduction in the Toxicity, Mobility, or Volume of Wastes

Natural attenuation processes are expected to reduce the volume and mobility of groundwater contaminants over time.

4.1.7 Other Factors (c) Short-term Effectiveness

Alternative 1 would be effective in the short term due to the implementation of LUCs.

4.1.8 Other Factors (d) Implementability

Alternative 1 is easily implemented. No construction is needed to begin implementation.

4.1.9 Other Factors (e) Cost

Using the assumptions described earlier, the total present value of Alternative 1 is \$54,000.

4.2 Alternative 2:

The assumptions for Alternative 2 include the following:

- A base-wide LUCIP will be developed for the CNC. The plan will allow for restrictions on land use and groundwater use at SWMU 3 and will be developed outside the scope of this CMS.

4.2.1 Protection of Human Health and the Environment

Alternative 2 would be effective at protecting human health and the environment because through LUCs, it precludes unacceptable exposure of receptors to COCs.

4.2.2 Attain MCS

Alternative 2 is expected to eventually achieve the target MCSs for groundwater. However, no monitoring to confirm that the MCSs have been obtained is included with this alternative.

4.2.3 Control the Source of Releases

The source of release has been removed from the site through the various IMs that have removed contaminated soil.

4.2.4 Compliance with Applicable Standards for the Management of Generated Wastes

Alternative 2 does not generate any wastes that would require special management.

4.2.5 Other Factors (a) Long-term Reliability and Effectiveness

Alternative 2 provides a level of protection that has long-term reliability and effectiveness. The risk of failure is low, provided the LUCs are enforced.

4.2.6 Other Factors (b) Reduction in the Toxicity, Mobility, or Volume of Wastes

Natural attenuation processes are expected to reduce the volume and mobility of groundwater contaminants over time.

4.2.7 Other Factors (c) Short-term Effectiveness

Alternative 2 would be effective in the short term due to the implementation of LUCs.

4.2.8 Other Factors (d) Implementability

Alternative 2 is easily implemented. No construction is needed to begin implementation.

4.2.9 Other Factors (e) Cost

Using the assumptions listed above, the total present value of Alternative 2 is \$20,000.

4.3 Comparative Ranking of Corrective Measure Alternatives

Each corrective measure alternative's overall ability to meet the evaluation criteria is described above. In Table 4-1, a comparative evaluation of the degree to which each alternative meets a particular criteria is presented.

TABLE 4-1
 Ranking of Corrective Measure Alternatives
Corrective Measures Study Report, SWMU 3, Zone G, Charleston Naval Complex

Criterion	Alternative 1	Alternative 2
	Long-term Monitoring with LUCs	LUCs
Overall Protection of Human Health and the Environment	This alternative is protective of human health and the environment.	This alternative is protective of human health and the environment.
Attainment of MCS	This alternative is expected to eventually achieve the MCSs.	This alternative is expected to eventually achieve the MCSs. However, no monitoring to confirm this is included in this alternative.
Control of the source of releases	The source of releases has been removed from the site.	The source of releases has been removed from the site.
Compliance with applicable standards for the management of wastes	This alternative can be implemented in a manner that meets all applicable waste management standards.	This alternative can be implemented in a manner that meets all applicable waste management standards.
Long-term Reliability and Effectiveness	This alternative will have long-term reliability and effectiveness.	This alternative will have long-term reliability and effectiveness.
Reduction of Toxicity, Mobility, or Volume through Treatment	Natural attenuation processes will reduce the mobility and volume of contaminated groundwater over time.	Natural attenuation processes will reduce the mobility and volume of contaminated groundwater over time.
Short-term Effectiveness	This alternative will be effective in the short term.	This alternative will be effective in the short term.
Implementability	This alternative is easily implemented.	This alternative is easily implemented.
Estimated Cost	\$54,000	\$20,000

1 **5.0 Recommended Corrective Measure** 2 **Alternative**

3 Two corrective measure alternatives were evaluated using the criteria described in Section
4 2.0 of this CMS report: (1) Alternative 1: Long-term Monitoring with LUCs, and (2)
5 Alternative 2: LUCs. Based on the evaluation of these two alternatives, the preferred
6 corrective measure alternative is Alternative 1: Long-term Monitoring with LUCs. This
7 remedy would be protective at a reasonable cost.

8 Alternative 1 would protect human health and the environment by implementation of LUCs
9 and maintaining the current and planned future use of the site as industrial/commercial,
10 until concentrations of all groundwater COCs are below the MCSs. Groundwater use
11 restrictions would restrict use of groundwater until the groundwater COCs have been
12 found to be below the target MCSs.

13 Planning is already underway to develop and implement administrative controls that
14 would limit future site activities to those that would not involve unrestricted exposures. The
15 expected reliability of this alternative is good.

16 There are no community safety issues associated with the implementation of this remedy,
17 and the controls would be relatively easy to implement. This alternative provides long-term
18 effectiveness for the planned industrial/commercial use and relies on administrative
19 controls to prevent future residential use.

1 **6.0 References**

- 2 CH2M-Jones. *RFI Report Addendum/IM Completion Report/CMS Work Plan for SWMU 3, Zone*
3 *G. Revision 0. February 2003.*
- 4 CH2M-Jones. *Groundwater Sampling and Analysis Plan for SWMU 3, Zone G. Revision 0. May*
5 *2002.*
- 6 EBASCO. *RCRA Facility Assessment (RFA) Report. NAVBASE Charleston. 1987.*
- 7 EnSafe Inc. *Zone G RFI Report, NAVBASE Charleston. Revision 0. February 1998.*
- 8 Geraghty and Miller. *1982 Confirmation Study. 1982.*
- 9 South Carolina Department of Health and Environmental Control (SCDHEC). *RCRA Permit*
10 *SC0 170 022 560. Charleston Naval Complex, Charleston, South Carolina. August 17, 1988.*

Analytical Data Summary

11/04/2003 6:10 PM

StationID	G003GW001		G003GW002		G003GW004		
SampleID	003GW001M7		003GW002M7		003GW004M7		
DateCollected	01/02/2003		12/31/2002		12/31/2002		
DateExtracted	01/03/2003		01/02/2003		01/02/2003		
DateAnalyzed	01/07/2003		01/02/2003		01/02/2003		
SDGNumber	72810		72789		72789		
Parameter	Units						
Aldrin	ug/L	0.039	UJ	0.04	U	0.04	U
Alpha BHC (Alpha Hexachlorocyclohexane)	ug/L	0.039	UJ	0.04	U	0.04	U
Alpha-chlordane	ug/L	0.039	UJ	0.04	U	0.04	U
Beta BHC (Beta Hexachlorocyclohexane)	ug/L	0.039	UJ	0.04	U	0.04	U
Chlordane	ug/L	0.39	UJ	0.4	U	0.4	U
Delta BHC (Delta Hexachlorocyclohexane)	ug/L	0.039	UJ	0.04	U	0.04	U
Dieldrin	ug/L	0.078	UJ	0.081	U	0.08	U
Endosulfan I	ug/L	0.039	UJ	0.04	U	0.04	U
Endosulfan II	ug/L	0.078	UJ	0.081	U	0.08	U
Endosulfan Sulfate	ug/L	0.078	UJ	0.081	U	0.08	U
Endrin Aldehyde	ug/L	0.078	UJ	0.081	U	0.08	U
Endrin Ketone	ug/L	0.078	UJ	0.081	U	0.08	U
Endrin	ug/L	0.078	UJ	0.081	U	0.08	U
Gamma BHC (Lindane)	ug/L	0.039	UJ	0.04	U	0.04	U
Gamma-chlordane	ug/L	0.039	UJ	0.04	U	0.04	U
Heptachlor Epoxide	ug/L	0.039	UJ	0.04	U	0.04	U
Heptachlor	ug/L	0.039	UJ	0.04	U	0.04	U
Methoxychlor	ug/L	0.37	UJ	0.38	U	0.38	U
p,p'-DDD	ug/L	0.078	UJ	0.081	U	0.08	U
p,p'-DDE	ug/L	0.078	UJ	0.081	U	0.08	U
p,p'-DDT	ug/L	0.078	UJ	0.081	U	0.08	U
Toxaphene	ug/L	2.4	UJ	2.5	U	2.5	U

Analytical Data Summary

11/04/2006 1:10 PM

StationID	G003GW005		G003GW006		G003GW007		
SampleID	003GW005M7		003GW006M7		003GW007M7		
DateCollected	01/02/2003		01/02/2003		12/31/2002		
DateExtracted	01/03/2003		01/03/2003		01/02/2003		
DateAnalyzed	01/07/2003		01/07/2003		01/02/2003		
SDGNumber	72810		72810		72789		
Parameter	Units						
Aldrin	ug/L	0.039	U	0.039	U	0.04	U
Alpha BHC (Alpha Hexachlorocyclohexane)	ug/L	0.039	U	0.039	U	0.04	U
Alpha-chlordane	ug/L	0.022	J	0.039	U	0.12	=
Beta BHC (Beta Hexachlorocyclohexane)	ug/L	0.039	U	0.039	U	0.04	U
Chlordane	ug/L	0.39	U	0.39	U	0.4	U
Delta BHC (Delta Hexachlorocyclohexane)	ug/L	0.039	U	0.039	U	0.04	U
Dieldrin	ug/L	0.091	=	0.078	U	0.75	=
Endosulfan I	ug/L	0.039	U	0.039	U	0.14	=
Endosulfan II	ug/L	0.078	U	0.078	U	0.079	U
Endosulfan Sulfate	ug/L	0.078	U	0.078	U	0.079	U
Endrin Aldehyde	ug/L	0.078	U	0.078	U	0.079	U
Endrin Ketone	ug/L	0.078	U	0.078	U	0.079	U
Endrin	ug/L	0.078	U	0.078	U	0.079	U
Gamma BHC (Lindane)	ug/L	0.039	U	0.039	U	0.04	U
Gamma-chlordane	ug/L	0.024	J	0.039	U	0.07	J
Heptachlor Epoxide	ug/L	0.06	=	0.039	U	0.32	=
Heptachlor	ug/L	0.039	U	0.039	U	0.04	U
Methoxychlor	ug/L	0.37	U	0.37	U	0.38	U
p,p'-DDD	ug/L	0.1	=	0.025	J	0.079	U
p,p'-DDE	ug/L	0.035	J	0.02	J	0.079	U
p,p'-DDT	ug/L	0.16	=	0.68	J	0.079	U
Toxaphene	ug/L	2.4	U	2.4	U	2.5	U

Analytical Data Summary

11/04/2003 6:10 PM

	StationID	G003GW008		G003GW009	
	SampleID	003GW008M7		003GW009M7	
	DateCollected	12/31/2002		01/02/2003	
	DateExtracted	01/02/2003		01/03/2003	
	DateAnalyzed	01/03/2003		01/07/2003	
	SDGNumber	72789		72810	
Parameter	Units				
Aldrin	ug/L	0.039	UJ	0.04	U
Alpha BHC (Alpha Hexachlorocyclohexane)	ug/L	0.039	UJ	0.04	U
Alpha-chlordane	ug/L	0.039	UJ	0.04	U
Beta BHC (Beta Hexachlorocyclohexane)	ug/L	0.039	UJ	0.04	U
Chlordane	ug/L	0.39	UJ	0.4	U
Delta BHC (Delta Hexachlorocyclohexane)	ug/L	0.039	UJ	0.04	U
Dieldrin	ug/L	0.078	UJ	0.08	U
Endosulfan I	ug/L	0.039	UJ	0.04	U
Endosulfan II	ug/L	0.078	UJ	0.08	U
Endosulfan Sulfate	ug/L	0.078	UJ	0.08	U
Endrin Aldehyde	ug/L	0.078	UJ	0.08	U
Endrin Ketone	ug/L	0.078	UJ	0.08	U
Endrin	ug/L	0.078	UJ	0.08	U
Gamma BHC (Lindane)	ug/L	0.039	UJ	0.04	U
Gamma-chlordane	ug/L	0.039	UJ	0.04	U
Heptachlor Epoxide	ug/L	0.039	UJ	0.04	U
Heptachlor	ug/L	0.039	UJ	0.04	U
Methoxychlor	ug/L	0.37	UJ	0.38	U
p,p'-DDD	ug/L	0.078	UJ	0.08	U
p,p'-DDE	ug/L	0.078	UJ	0.034	J
p,p'-DDT	ug/L	0.078	UJ	0.08	U
Toxaphene	ug/L	2.4	UJ	2.5	U

MEMORANDUM

CH2MHILL

Data Validation Summary - Charleston Naval Complex – Zone G, SWMU 3

TO: Dean Williamson/CH2M HILL/GNV

FROM: Amy Juchem/CH2M HILL/GNV
Herb Kelly/CH2M HILL/GNV

DATE: October 21, 2003

The purpose of this memorandum is to present the results of the data validation process for the groundwater samples collected at Zone G, SWMU 3. The samples were collected between the dates of December 31, 2002 and January 2, 2003.

The specific samples and analytical fractions reviewed are summarized below in Table 1.

The Quality Control areas that were reviewed and the resulting findings are documented within each subsection that follows. This data was validated for compliance with the analytical method requirements. This process also included a review of the data to assess the accuracy, precision, and completeness based upon procedures described in the guidance documents such as the Environmental Protection Agency (EPA *National Functional Guidelines for Organic Data Review* (EPA 1999). Quality assurance/quality control (QA/QC) summary forms and data reports were reviewed.

Samples were submitted to General Engineering Laboratories, Inc., in Charleston, South Carolina, for the following analyses: SW-846 8081 Pesticides.

Sample results that were not within the acceptance limits were appended with a qualifying flag, which consisted of a single- or double-letter code that indicated a possible problem with the data. The qualifying flags originated during the data review and validation processes. These also include the secondary, or the two-digit "sub-qualifier" flags. The secondary qualifiers provide the reasoning behind the assignment of a qualifier flag to the data. The secondary qualifiers are presented and defined below.

Attachment 1 lists the changes in data qualifiers, due to the validation process.

The following primary flags were used to qualify the data:

- [=] Detected. The analyte was analyzed for and detected at the concentration shown.
- [J] Estimated. The analyte was present but the reported value may not be accurate or precise.
- [U] Undetected. The analyte was analyzed for but not detected above the method detection limit.
- [UJ] Detection limit estimated. The analyte was analyzed for but qualified as not detected; the result is estimated.
- [R] Rejected. The data is not useable.

Secondary Data Validation Qualifiers

<u>Code</u>	<u>Definition</u>
2S	Second Source
2C	Second Column Confirmation
BL	Blank
BD	Blank Spike/Blank Spike Duplicate or (LCS/LCSD) Precision
BS	Blank Spike/LCS
CC	Continuing Calibration Verification
DL	Dilution
FD	Field Duplicate
HT	Holding Time
IB	In-Between (metals - B's → J's)
IC	Initial Calibration
IS	Internal Standard
LD	Lab Duplicate
LR	Concentration exceeded Linear Range
MD	MS/MSD or LCS/LCSD Precision
MS	Matrix Spike/Matrix Spike Duplicate
OT	Other (see DV worksheet)
PD	Pesticide Degradation
PS	Post Spike
RE	Re-extraction/Re-analysis
SD	Serial Dilution
SS	Spiked Surrogate
TD	Total vs Dissolved
TN	Tune

Table 1 - Chemical Analytical Methods – Field and Quality Control Samples

SLID	Location ID	Sample ID	Lab Sample ID	Unit	Sample Type	Date Collected	Required Study
72789	FIELDQC	003EW001M7	72789001	WQ	EB	12/31/02	X
72789	G003GW002	003GW002M7	72789003	WG	N	12/31/02	X
72789	G003GW002	003HW002M7	72789004	WG	FD	12/31/02	X
72789	G003GW004	003GW004M7	72789005	WG	N	12/31/02	X
72789	G003GW007	003GW007M7	72789006	WG	N	12/31/02	X
72789	G003GW008	003GW008M7	72789007	WG	N	12/31/02	X
72789	LABQC	1200359621	1200359621	WQ	LB		X
72789	LABQC	1200359622	1200359622	WQ	BS		X
72810	FIELDQC	003EW002M7	72810001	WQ	EB	01/02/03	X
72810	G003GW009	003GW009M7	72810002	WG	N	01/02/03	X
72810	G003GW009	003GW009M7MS	1200360450	WG	MS	01/02/03	X
72810	G003GW009	003GW009M7SD	1200360451	WG	SD	01/02/03	X
72810	G003GW001	003GW001M7	72810003	WG	N	01/02/03	X
72810	G003GW005	003GW005M7	72810004	WG	N	01/02/03	X
72810	G003GW006	003GW006M7	72810005	WG	N	01/02/03	X
72810	LABQC	1200360442	1200360442	WQ	LB		X
72810	LABQC	1200360443	1200360443	WQ	BS		X
MATRIX CODE							
WG – Ground Water Samples							
WQ – Water QC Samples							
SAMPLE TYPE CODE							
EB - Equipment Blank							
FD - Field Duplicate							
MS - Matrix Spike							
SD - Matrix Spike Duplicate							
LB – Laboratory Blank							
BS – Laboratory Blank Spike							
N - Native Sample							

Organic Parameters

Quality Control Review

The following list represents the QA/QC measures that were reviewed during the data quality evaluation procedure for organic data.

- **Holding Times** – The holding times are evaluated to verify that samples were extracted and analyzed within holding times.
- **Blank samples** – Method blanks and equipment blanks, were provided for this project. Blank samples enable the reviewer to determine if an analyte may be attributed to sampling or laboratory procedures, rather than environmental contamination from site activities.
- **Surrogate Recoveries** – Surrogate Compounds are added to each sample and the recoveries are used to monitor lab performance and possible matrix interference.
- **Lab Control Sample (LCS)** – This sample is a "controlled matrix", either laboratory reagent water or Ottawa sand, in which target compounds have been added prior to extraction/analysis. The recoveries serve as a monitor of the overall performance of each step during the analysis, including sample preparation.
- **Field Duplicate Samples** – These samples are collected to determine precision between a native and its duplicate. This information can only be determined when target compounds are detected.
- **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples** – Spike recovery is used to evaluate potential matrix interferences, as well as accuracy. Precision information is also determined by calculating the reproducibility between the recoveries of each spiked parameter.
- **Initial Calibration** – The initial calibration ensures that the instrument is capable of producing acceptable qualitative and quantitative data for the compounds of interest.
- **Continuing Calibration** – The continuing calibration checks satisfactory performance of the instrument and its predicted response to the target compounds.
- **Confirmation** – If GCMS methodology is not initially used for analysis, SW-846 method 8000 requires confirmation when the composition of samples is not well characterized. Therefore, even when the identification has been confirmed on a dissimilar column or detector, the agreement of the quantitative results on both columns is evaluated. For Pesticide and PCB analyses covered in this report, confirmation was performed using a dissimilar analytical column. The laboratory analyzed samples with a gas chromatograph (GC) utilizing simultaneous primary and confirmation data acquisition. Per SW-86 method 8000, 40% RPD criteria was used as the acceptance limit.

Organochlorine Pesticides

The QA/QC parameters for the Organochlorine Pesticides analyses by method SW-846 8081 for all of the samples were within acceptable control limits, except as noted below.

Blanks

The Pesticide target parameters detected in blank samples are listed in [Table 2](#).

TABLE 2

Blank Contamination: Pesticides
Charleston Naval Complex, Zone G, SWMU 3, Charleston, SC

Site	Sample ID	Sample ID	Sample Type	Pesticide	Lab Result	Unit	Flag
72789	1200359621	1200359621	LB	Alpha-BHC	0.0057	µg/L	0.0285 µg/L
72789	1200359621	1200359621	LB	Beta-BHC	0.0082	µg/L	0.041 µg/L
72789	1200359621	1200359621	LB	Delta-BHC	0.0062	µg/L	0.031 µg/L
72789	1200359621	1200359621	LB	Gamma-BHC	0.0054	µg/L	0.027 µg/L
72789	1200359621	1200359621	LB	Heptachlor	0.0079	µg/L	0.0395 µg/L
72789	1200359621	1200359621	LB	Heptachlor epoxide	0.0061	µg/L	0.0305 µg/L
72789	1200359621	1200359621	LB	Endosulfan I	0.0063	µg/L	0.0315 µg/L
72789	1200359621	1200359621	LB	Dieldrin	0.012	µg/L	0.060 µg/L
72789	1200359621	1200359621	LB	4,4'-DDE	0.014	µg/L	0.070 µg/L
72789	1200359621	1200359621	LB	Endrin	0.012	µg/L	0.060 µg/L
72789	1200359621	1200359621	LB	Endosulfan II	0.012	µg/L	0.060 µg/L
72789	1200359621	1200359621	LB	4,4'-DDD	0.013	µg/L	0.065 µg/L
72789	1200359621	1200359621	LB	Endosulfan sulfate	0.015	µg/L	0.075 µg/L
72789	1200359621	1200359621	LB	4,4'-DDT	0.015	µg/L	0.075 µg/L
72789	1200359621	1200359621	LB	Methoxychlor	0.083	µg/L	0.415 µg/L
72789	1200359621	1200359621	LB	Endrin ketone	0.014	µg/L	0.070 µg/L
72789	1200359621	1200359621	LB	Endrin aldehyde	0.014	µg/L	0.070 µg/L
72789	1200359621	1200359621	LB	Gamma-Chlordane	0.0065	µg/L	0.0325 µg/L
72789	1200359621	1200359621	LB	Alpha-Chlordane	0.0064	µg/L	0.032 µg/L
72789	003EW001M7	72789001	EB	Alpha-BHC	0.0062	µg/L	0.031 µg/L
72789	003EW001M7	72789001	EB	Beta-BHC	0.0068	µg/L	0.034 µg/L

TABLE 2

Blank Contamination: Pesticides
 Charleston Naval Complex, Zone G, SWMU 3, Charleston, SC

Site	Sample ID	Sample ID	Sample Type	Parameter	Concentration	Unit	Reporting Limit
72789	003EW001M7	72789001	EB	Delta-BHC	0.0075	µg/L	0.0375 µg/L
72789	003EW001M7	72789001	EB	Gamma-BHC	0.0047	µg/L	0.0235 µg/L
72789	003EW001M7	72789001	EB	Heptachlor	0.010	µg/L	0.050 µg/L
72789	003EW001M7	72789001	EB	Heptachlor epoxide	0.0077	µg/L	0.0385 µg/L
72789	003EW001M7	72789001	EB	Endosulfan I	0.0066	µg/L	0.0330 µg/L
72789	003EW001M7	72789001	EB	Dieldrin	0.011	µg/L	0.055 µg/L
72789	003EW001M7	72789001	EB	4,4'-DDE	0.017	µg/L	0.085 µg/L
72789	003EW001M7	72789001	EB	Endrin	0.010	µg/L	0.050 µg/L
72789	003EW001M7	72789001	EB	4,4'-DDD	0.012	µg/L	0.060 µg/L
72789	003EW001M7	72789001	EB	Endosulfan sulfate	0.014	µg/L	0.070 µg/L
72789	003EW001M7	72789001	EB	4,4'-DDT	0.031	µg/L	0.155 µg/L
72789	003EW001M7	72789001	EB	Methoxychlor	0.081	µg/L	0.405 µg/L
72789	003EW001M7	72789001	EB	Endrin ketone	0.013	µg/L	0.065 µg/L
72789	003EW001M7	72789001	EB	Endrin aldehyde	0.014	µg/L	0.070 µg/L
72789	003EW001M7	72789001	EB	Gamma-Chlordane	0.0072	µg/L	0.036 µg/L
72789	003EW001M7	72789001	EB	Alpha-Chlordane	0.0060	µg/L	0.030 µg/L
72810	003EW002M7	72810001	EB	4,4'-DDT	0.020	µg/L	0.100 µg/L

If a target parameter determined to be a common contaminant was reported in a field sample, and the concentration was below the level determined to be due to blank contamination, the following actions were taken:

- If the concentration was above the reporting limit, the numeric result was unchanged, but it was flagged "U", as undetected.
- If the concentration was below the reporting limit, the numeric result was changed to the value of the reporting limit, and it was flagged "U", as undetected.

The results qualified due to blank contamination are listed in [Attachment 1](#).

Surrogate, Matrix Spike, Matrix Spike Duplicate, and Laboratory Control Sample Recoveries and Relative Percent Differences (RPDs)

All surrogate, matrix spike (MS), matrix spike duplicate (MSD), and laboratory control sample (LCS) recoveries and relative percent differences (RPDs) were within acceptable quality control limits, except as noted in [Table 3](#).

TABLE 3

Surrogate Recoveries Out of QC Limits: Pesticides
Charleston Naval Complex, Zone G, SWMU 3, Charleston, SC

Site	Sample	Compound	Recovery	Acceptable Range	Surrogate Sample	Flag
72789	003GW008M7	Decachlorobiphenyl	52* / 44*	60-150	003GW008M7	Detects – J; Non-Detects – UJ
72810	003GW001M7	Decachlorobiphenyl	54* / 55*	60-150	003GW001M7	Detects – J; Non-Detects – UJ

* - out of control limits

Initial and Continuing Calibration Criteria

All initial and continuing calibration criteria were met except as noted in [Table 4](#).

TABLE 4

Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: Pesticides
Charleston Naval Complex, Zone G, SWMU 3, Charleston, SC

Instrument/Calibration Date	Analyte	Recovery (Surrogate Addition) (RPD)	Associated Sample
ECD1A#2-CCAL-01/02/03, 1828	Toxaphene	45.5% high	72789 – All
ECD1A#2-CCAL-01/02/03, 2316	Alpha-BHC	20.0% high	72789 – All
	Delta-BHC	18.0% high	
	Gamma-BHC	16.0% high	
	Endosulfan sulfate	17.0% high	
	4,4'-DDT	16.5% high	
ECD1A#2-CCAL-01/03/03, 0013	Alpha-BHC	18.0% high	72789 – All
	Delta-BHC	17.0% high	
ECD3A#1-CCAL-01/07/03, 1148	Chlordane (tech)	66.0% high	72810 – All
ECD3A#2-CCAL-01/07/03, 1148	Chlordane (tech)	36.0% high	72810 – All

Flags were applied to the compounds in the associated samples in the following manner:

- When the percent difference (%D) was high in the continuing calibration standard, detected compounds were flagged "J", as estimated. Non-detected compounds were not flagged.

All associated results were non-detect, therefore no flags were applied due to calibration.

Second Column Confirmation

The second column confirmation percent difference (%D) for some detected parameters, exceeded the 40 %D criteria. Those results were flagged "J", as estimated. The laboratory reported the lower of the two concentrations. The individual samples and specific compounds that were flagged, are listed in [Table 5](#) below.

TABLE 5
Second Column Confirmation out of Criteria: Pesticides
Charleston Naval Complex, Zone G, SWMU 3, Charleston, SC

Sample ID	Sample ID	Sample ID	Compound
72789	72789006	003GW007M7	Endrin ketone
72789	72789006	003GW007M7	Gamma-Chlordane
72810	72810004	003GW005M7	Alpha-Chlordane
72810	72810005	003GW006M7	4,4'-DDE
72810	72810005	003GW006M7	4,4'-DDT

Rejected Data

No data were rejected based upon the validation process for this sampling event.

Conclusion

A review of the analytical data submitted regarding the investigation of SWMU 3 in Zone G at the Charleston Naval Complex, Charleston, South Carolina by CH2M HILL has been completed. An overall evaluation of the data indicates that the sample handling, shipment, and analytical procedures have been adequately completed, and that the analytical results should be considered usable as qualified.

The analytical data had minor QC concerns as indicated above, however, it did not affect data usability for those specific results. The validation review demonstrated that the analytical systems were generally in control and the data results can be used in the decision making process.

Attachment 1 - Chang Qualifiers and Results
 Zone G, SWMU Data Validation

Parameter Class	Analytical Method	Parameter	SDG	Sample ID	Lab Sample ID	Matrix	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
PEST	SW8081A	ALDRIN	72789	003GW008M7	72789007	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	ALDRIN	72810	003GW001M7	72810003	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	ALPHA BHC	72789	003GW008M7	72789007	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	ALPHA BHC	72810	003GW001M7	72810003	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	ALPHA-CHLORDANE	72789	003GW008M7	72789007	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	ALPHA-CHLORDANE	72810	003GW001M7	72810003	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	ALPHA-CHLORDANE	72810	003GW005M7	72810004	WG	0.022	JP	0.022	J	ug/L	2C
PEST	SW8081A	BETA BHC	72789	003GW008M7	72789007	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	BETA BHC	72810	003GW001M7	72810003	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	Chlordane	72789	003GW008M7	72789007	WG	0.39	U	0.39	UJ	ug/L	SS
PEST	SW8081A	Chlordane	72810	003GW001M7	72810003	WG	0.39	U	0.39	UJ	ug/L	SS
PEST	SW8081A	DELTA BHC	72789	003GW008M7	72789007	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	DELTA BHC	72810	003GW001M7	72810003	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	DIELDRIN	72789	003GW008M7	72789007	WG	0.009	J	0.078	UJ	ug/L	BL, SS
PEST	SW8081A	DIELDRIN	72810	003GW001M7	72810003	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	ENDOSULFAN I	72789	003GW008M7	72789007	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	ENDOSULFAN I	72810	003GW001M7	72810003	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	ENDOSULFAN II	72789	003GW008M7	72789007	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	ENDOSULFAN II	72810	003GW001M7	72810003	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	ENDOSULFAN SULFATE	72789	003GW008M7	72789007	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	ENDOSULFAN SULFATE	72810	003GW001M7	72810003	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	ENDRIN	72789	003GW008M7	72789007	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	ENDRIN	72810	003GW001M7	72810003	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	ENDRIN ALDEHYDE	72789	003GW008M7	72789007	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	ENDRIN ALDEHYDE	72810	003GW001M7	72810003	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	ENDRIN KETONE	72789	003GW007M7	72789006	WG	0.027	JP	0.079	U	ug/L	BL
PEST	SW8081A	ENDRIN KETONE	72789	003GW008M7	72789007	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	ENDRIN KETONE	72810	003GW001M7	72810003	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	GAMMA BHC (LINDANE)	72789	003GW008M7	72789007	WG	0.039	U	0.039	UJ	ug/L	SS

Attachment 1 - Change Qualifiers and Results
 Zone G, SWMU Data Validation

Parameter Class	Analytical Method	Parameter	SDG	Sample ID	Lab Sample ID	Matrix	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
PEST	SW8081A	GAMMA BHC (LINDANE)	72810	003GW001M7	72810003	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	GAMMA-CHLORDANE	72789	003GW007M7	72789006	WG	0.07	P	0.07	J	ug/L	2C
PEST	SW8081A	GAMMA-CHLORDANE	72789	003GW008M7	72789007	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	GAMMA-CHLORDANE	72810	003GW001M7	72810003	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	HEPTACHLOR	72789	003GW008M7	72789007	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	HEPTACHLOR	72810	003GW001M7	72810003	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	HEPTACHLOR EPOXIDE	72789	003GW004M7	72789005	WG	0.037	J	0.04	U	ug/L	BL
PEST	SW8081A	HEPTACHLOR EPOXIDE	72789	003GW008M7	72789007	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	HEPTACHLOR EPOXIDE	72810	003GW001M7	72810003	WG	0.039	U	0.039	UJ	ug/L	SS
PEST	SW8081A	METHOXYCHLOR	72789	003GW008M7	72789007	WG	0.37	U	0.37	UJ	ug/L	SS
PEST	SW8081A	METHOXYCHLOR	72810	003GW001M7	72810003	WG	0.37	U	0.37	UJ	ug/L	SS
PEST	SW8081A	p,p'-DDD	72789	003GW008M7	72789007	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	p,p'-DDD	72810	003GW001M7	72810003	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	p,p'-DDE	72789	003GW002M7	72789003	WG	0.026	J	0.081	U	ug/L	BL
PEST	SW8081A	p,p'-DDE	72789	003GW008M7	72789007	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	p,p'-DDE	72810	003GW001M7	72810003	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	p,p'-DDE	72810	003GW006M7	72810005	WG	0.02	JP	0.02	J	ug/L	2C
PEST	SW8081A	p,p'-DDT	72789	003GW002M7	72789003	WG	0.016	J	0.081	U	ug/L	BL
PEST	SW8081A	p,p'-DDT	72789	003GW007M7	72789006	WG	0.027	J	0.079	U	ug/L	BL
PEST	SW8081A	p,p'-DDT	72789	003GW008M7	72789007	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	p,p'-DDT	72810	003GW009M7	72810002	WG	0.021	J	0.08	U	ug/L	BL
PEST	SW8081A	p,p'-DDT	72810	003GW001M7	72810003	WG	0.078	U	0.078	UJ	ug/L	SS
PEST	SW8081A	p,p'-DDT	72810	003GW006M7	72810005	WG	0.68	P	0.68	J	ug/L	2C
PEST	SW8081A	TOXAPHENE	72789	003GW008M7	72789007	WG	2.4	U	2.4	UJ	ug/L	SS
PEST	SW8081A	TOXAPHENE	72810	003GW001M7	72810003	WG	2.4	U	2.4	UJ	ug/L	SS

COMPARISON OF TOTAL COST OF REMEDIAL SOLUTIONS		
Site:	Charleston Naval Complex	
Location:	SWMU 3	
Phase:	Corrective Measures Study	
Base Year:	2003	
Date:	10/21/03	
	<u>Alternative Number 1</u>	<u>Alternative Number 2</u>
	Long Term Monitoring With LUCs	LUCs
Total Assumed Project Duration (Years)	30	30
Capital Cost/O&M Cost	\$30,400	\$20,000
Annual Monitoring Cost (up to 5 years)	\$5,200	\$0
Total Present Worth of Solution	\$54,000	\$20,000
<p>Disclaimer: The information in this cost estimate is based on the best available information regarding the anticipated scope of the remedial alternatives. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This is an order-of-magnitude cost estimate that is expected to be within -30 to +50 percent of the actual project costs.</p>		

Element:	Sample Collection and Laboratory Costs				
Alternative:	1, 2				
Site:	Charleston Naval Complex	Prepared By: DFW	Checked By:		
Location:	SWMU 3	Date: 10/21/03	Date:		
Phase:	Corrective Measures study				
Base Year:	2003				
WORK STATEMENT					
Costs associated with water sample collection, shipment and analysis on a per event basis; no natural attenuation parameters.					
CAPITAL COSTS					
DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Equipment & Labor per Event					STL estimate
Sample Analysis (Pesticides)	5	SAMPLE	\$200	\$1,000	6 Wells, 2 extra QA/QC samples
Sampling Supplies	1	EA	\$200	\$200	
Groundwater Sampling Equipment Rental	0.5	WK	\$600	\$300	Includes MultiRAE and Peristaltic Pump
Sample Shipment	1	EA	\$100	\$100	CH2M-Jones Estimate
Labor - Technicians	30	HR	\$55	\$1,650	3 hrs/well, 2 people, includes data validation
SUBTOTAL				\$3,250	
Project Management	2%	of	\$3,250	\$65	
Technical Support	2%	of	\$3,250	\$65	
Construction Management	0%	of	\$3,250	\$0	
Subcontractor General Requirements	0%	of	\$3,250	\$0	
SUBTOTAL				\$3,380	
TOTAL UNIT COST				\$3,400	
OPERATION AND MAINTENANCE COSTS					
DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
SUBTOTAL				\$0	
Contingency	20%		\$0	\$0	
SUBTOTAL				\$0	
TOTAL O&M COST				\$0	
Source of Cost Data					
1. Analytical Bid Form - Charleston Naval Complex - Level III					

Alternative 1: TLM and LUCs		COST ESTIMATE SUMMARY			
Site:	Charleston Naval Complex	Description:			
Location:	SWMU 3	Monitoring of the surficial aquifer.			
Phase:	Corrective Measures Study				
Base Year:	2002				
Date:	10/21/03				
CAPITAL COSTS					
	DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
	Monitoring Plan				
	Labor - Project Manager	4	HR	\$125	\$500
	Labor - Engineer/Hydrogeologist	16	HR	\$90	\$1,440
	Labor - Editor	4	HR	\$65	\$260
	Labor - CAD Technician	4	HR	\$65	\$260
	Initial Groundwater Sample Collection	1	EA	\$3,380	\$3,380
	SUBTOTAL				\$5,840
	Project Management	5%	of	\$5,840	\$292
	Technical Support	5%	of	\$5,840	\$292
	Cost for LUCs	1	EA	\$20,000	\$20,000
	SUBTOTAL				\$26,424
	Contingency	15%	of	\$26,424	\$3,964
	TOTAL CAPITAL COST				\$30,400
OPERATIONS AND MAINTENANCE COST					
	DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
yrs 1 - 5	Annual Groundwater Sample Collection	1	EA	\$3,380	\$3,380
	Annual Report				
	Labor - Project Manager	2	HR	\$125	\$250
	Labor - Engineer/Hydrogeologist	10	HR	\$90	\$900
	Labor - Editor	4	HR	\$65	\$260
	Labor - CAD Technician	6	HR	\$65	\$390
	SUBTOTAL				\$1,800
yrs 1 - 5	TOTAL ANNUAL O&M COST				\$5,200
PRESENT VALUE ANALYSIS					
		Discount Rate =		3.2%	
End Year	COST TYPE	TOTAL COST	COST PER YEAR	TOTAL PRESENT WORTH	
1	FIRST YEAR CAPITAL COST	\$30,400	\$30,400	\$30,400	
1 - 5	ANNUAL O&M COST (Year 1 - 15)	\$26,000	\$5,200	\$23,679	
				\$54,079	
	TOTAL PRESENT WORTH OF ALTERNATIVE			\$54,000	
SOURCE INFORMATION					
1. United States Environmental Protection Agency. July 2000. A Guide to Preparing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. (USEPA, 2000).					

Element: Present Worth Analysis
Alternative: Monitoring/Natural Attenuation

Site: Charleston Naval Complex
Location: SWMU 3
Phase: Corrective Measures Study
Base Year: 2003

Prepared By:
Date:

Checked By:
Date:

WORK STATEMENT

Calculation of alternative present worth. Assumes total present value earns interest for an entire year (12 months), compound annually.
Discount Rate 3.2%

Present Worth Analysis

Elapsed Time	Year	Discount Factor at 3.2%	Capital Cost	O&M Cost	Total Cost	Total PV Capital Costs at 3.2%	Total PV O&M Costs at 3.2%	Total PV Costs at 3.2%	Balance of
									Interest Bearing Account at 3.2%
0	2003	1.000	\$ 30,400		\$ 30,400	\$ 30,400	\$ -	\$ 30,400	\$ 24,437
1	2004	0.969		\$ 5,200	\$ 5,200	\$ -	\$ 5,039	\$ 5,039	\$ 19,852
2	2005	0.939		\$ 5,200	\$ 5,200	\$ -	\$ 4,883	\$ 4,883	\$ 15,121
3	2006	0.910		\$ 5,200	\$ 5,200	\$ -	\$ 4,731	\$ 4,731	\$ 10,239
4	2007	0.882		\$ 5,200	\$ 5,200	\$ -	\$ 4,584	\$ 4,584	\$ 5,200
5	2008	0.854		\$ 5,200	\$ 5,200	\$ -	\$ 4,442	\$ 4,442	\$ 0
6	2009	0.828		\$ -	\$ -	\$ -	\$ -	\$ -	\$ 0
7	2010	0.802		\$ -	\$ -	\$ -	\$ -	\$ -	\$ 0
8	2011	0.777		\$ -	\$ -	\$ -	\$ -	\$ -	\$ 0
9	2012	0.753		\$ -	\$ -	\$ -	\$ -	\$ -	\$ 0
10	2013	0.730		\$ -	\$ -	\$ -	\$ -	\$ -	\$ 0
11	2014	0.707		\$ -	\$ -	\$ -	\$ -	\$ -	\$ 0
12	2015	0.685		\$ -	\$ -	\$ -	\$ -	\$ -	\$ 0
13	2016	0.664		\$ -	\$ -	\$ -	\$ -	\$ -	\$ 0
14	2017	0.643		\$ -	\$ -	\$ -	\$ -	\$ -	\$ 0
15	2018	0.623		\$ -	\$ -	\$ -	\$ -	\$ -	\$ 0
Total Alternative			\$ 30,400	\$ 26,000	\$ 56,400	\$ 30,400	\$ 23,679	\$ 54,079	