

**Interim Remedial Action Report**

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**Naval Air Station, Brunswick, Maine Superfund Site**

**Site 9 (OU6) Neptune Drive Disposal Site**

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**US Environmental Protection Agency  
New England  
Office of Site Remediation and Restoration**

**December 2000**

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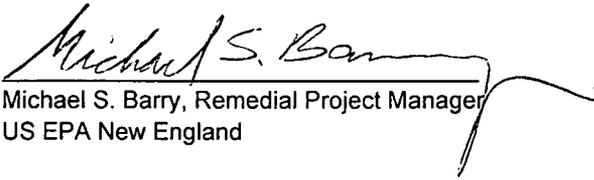
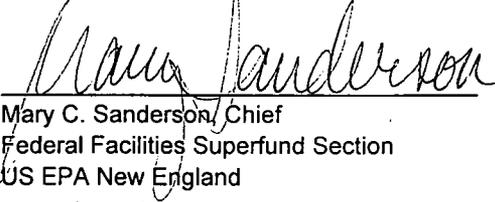
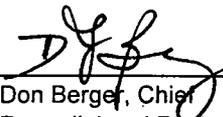
**December 2000**

**Interim Remedial Action Report**  
**Record of Preparation, Review and Approval**

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**Naval Air Station, Brunswick, Maine Superfund Site**  
**Site 9 (OU6) Neptune Drive Disposal Site**

This Interim Remedial Action Report has been prepared in accordance with EPA OSWER Directive 9320.2-09A. It will be used, along with previous and future Remedial Action Reports for other OU's at Naval Air Station Brunswick (NASB) and the Five Year Review Reports, as the basis for development of the site Preliminary and Final Close Out Report.

<i>Interim RA Report Prepared By:</i>	Signature:  Michael S. Barry, Remedial Project Manager US EPA New England  Date: <u>12/10/2000</u>
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<i>Approved By:</i>	Signature:  Don Berger, Chief Remedial and Restoration II Branch US EPA New England  Date: <u>12/20/0</u>

*This report was prepared by EPA New England. It summarizes information from various Navy reports and documents, which were produced for the Navy by EA Engineering, Science and Technology, Inc., Harding Lawson Associates and other contractors. EPA New England acknowledges EA, Inc as the source of all figures and many tables contained in this report. A full list of references is in Appendix A.*

## Table of Contents

1.0	Introduction and Background.....	3
2.0	Site 9 (OU6) Record of Decision Background.....	8
3.0	Construction Activities, Chronology of Events and Construction Quality Control.....	9
4.0	Performance Standards, Remediation Objectives, Final Inspection and Certifications.....	11
5.0	Operation and Maintenance Activities.....	11
6.0	Summary of Project Costs.....	13
7.0	Observations and Lessons Learned.....	28
8.0	Contact Information.....	28

Appendix A - References

Appendix B - Glossary

Appendix C - Source Documentation Excerpts for Remedial Action Components

Final Long Term Monitoring Plan

NASBINST 5090.1B, "Restriction of Excavation Activities"

First Five Year Review

## List of Figures and Tables

Figure 1 - Site Location Map (EA Figure 1).....	4
Figure 2 - Site Diagram (EA Figure 2-6).....	7
Figure 3 - Site Groundwater Elevation and Flow (EA Figure 3).....	15
Figure 4 - Site Cross Section (EA Figure 1-3).....	16
Figure 5 - Monitoring Well Contaminant Trend Graphs (EA Figure 2-1).....	17
Figure 6 - Total Contaminant Trend Graphs.....	18
Figure 7 - Vinyl Chloride/1,2-Dichloroethene Ratio Graph (EA Fig 2-2).....	19
Figure 8 - Five-Year Review Page 4-4, Conclusions and Recommendations for Site 9.....	20
Table 1 - NASB Operating History.....	3
Table 2 - Major Investigation, Enforcement and Cleanup Milestones at NASB.....	5
Table 3 - NASB Operable Unit/site Details.....	5
Table 4 - Remedial Action Events for Site 9 (OU6).....	10
Table 5 - ROD Remedy Component Objectives and Results.....	11
Table 6 - Project Costs.....	13
Table 7 - Long Term Monitoring Program.....	14
Tables 8.1 - 8.5, April 2000 LTM Results (EA Table A.1 - A.5).....	21
Tables 9.1 - 9.5, September 2000 LTM Results (EA Table A.1 and A.3 - A.6).....	24

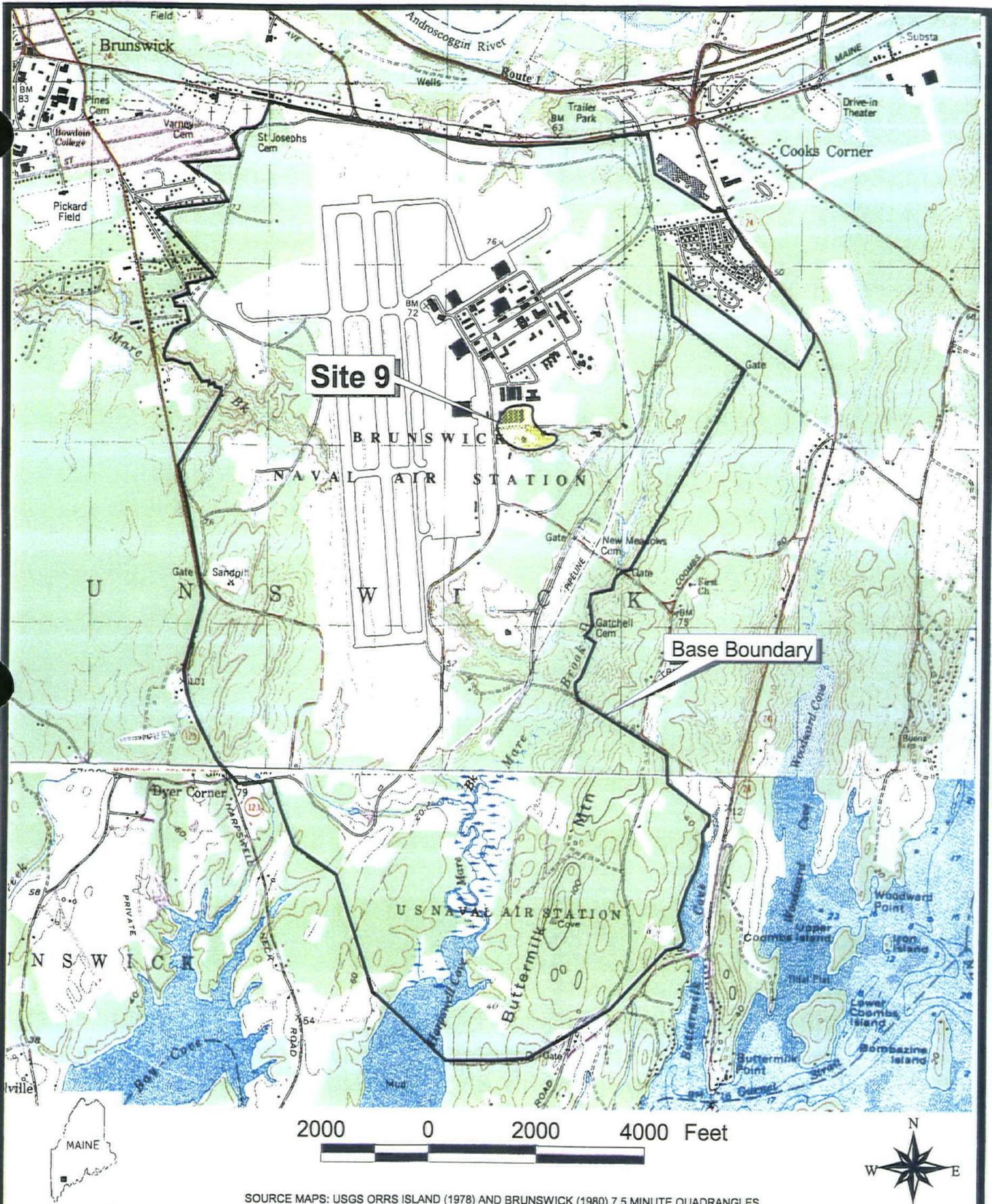
## 1 Introduction

### 1.1 Location, Setting and History of NASB and Site 9 (OU6).

- 1.1.1 Naval Air Station Brunswick (NASB) Maine is located in the coastal region of southwest Maine, south of the Androscoggin River and between the towns of Brunswick on the west and Bath on the east. It is roughly bounded by US route 1 on the north, Maine route 123 on the west, Maine route 24 on the east and coastal water and Harpswell Neck on the south. Please see figure 1 on page 4.
- 1.1.2 The natural topography at NASB is low, undulating hills with deeply incised brooks draining toward coastal wetlands areas. The airfield and operations area of NASB have been modified by construction and are generally flat at about 75 feet, mean sea level. About a 75% of the 3,048 acres of NASB remains forested, grasslands, marshes or open water. Surrounding property uses are primarily suburban and rural residential with some commercial and light industrial uses along routes 1, 24 and 123 around the northern part of the base. Brunswick town, including a college, hospital and elementary school are within 1 mile of the western boundary.
- 1.1.3 NASB is an active facility supporting the Navy's antisubmarine warfare operations in the Atlantic Ocean with several squadrons of P-3 maritime patrol aircraft and Commander, Patrol Wing Five stationed aboard. NASB is also the last remaining Department of Defense owned and operated airfield in New England and it sits astride air routes to Europe. NASB was established for maritime patrol and training British pilots in 1942, but was deactivated after the war. In the mid 1950's it underwent major expansion to perform it's current mission. Please see table 1 below.

**Table 1 - NASB Operating History**

Date	Milestone
1942	Established for pilot training and maritime patrol
1946	Deactivated (Navy retained property)
1952	Reactivated for maritime patrol
1955	Major facilities expansion starts
1983	Environmental assessment/investigation starts
2000	Facilities modernization plan, operations continue



SOURCE MAPS: USGS ORRS ISLAND (1978) AND BRUNSWICK (1980) 7.5 MINUTE QUADRANGLES.



EA ENGINEERING,  
SCIENCE, AND  
TECHNOLOGY

NAVAL AIR STATION  
BRUNSWICK, MAINE

FIGURE 1  
SITE LOCATION MAP,  
SITE 9 (NEPTUNE DRIVE DISPOSAL SITE)

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT No	FILE No
PLN	BT	BT	PLN	AS SHOWN	18 FEB. 2000	29600.47	I:\NASB_GIS \NAVY.APR

- 1.2 **NASB Contamination, Investigation and Cleanup History.** Historical hazardous materials handling and the resulting wastes disposal practices in support of military aircraft operations and maintenance, firefighting training, public works activities and residential household support were the cause of contamination at NASB. Please see table 2 below.

**Table 2 - Major Investigation, Enforcement and Cleanup Milestones at NASB**

Date	Milestone
1983-1984	initial Navy assessment studies
1987	NASB placed on the NPL
1988	technical review committee established (later converted to a RAB)
1990	Federal Facility Agreement signed (3-party)
1990	RI report
1991	supplemental RI report
1992 -1995	major sites (OU1-4) RODs and remedy construction
1998 - 2000	eastern plume optimizations and OU5-7 RODs and remedies
2000	first 5 year review

- 1.3 **NASB Operable Units.** There are seven OUs at NASB. Most comprise several sites that are adjacent or of similar contamination. They include a chlorinated VOC plume that originated from primarily the fire training area, several mixed hazardous and solid waste landfills, several debris disposal areas and incinerator ash disposal sites. Please see table 3 below for details on the operable units.

**Table 3 - NASB Operable Unit/site Details**

OU/Sites	ROD Date	Remedy
OU1/sites 1,3 - mixed waste landfill	9/92	landfill cap and slurry wall, pump and treat groundwater for metals & VOCs, monitoring, IC's and 5 yr reviews
OU2/Eastern Plume - chlorinated VOC plume	interim 6/92 final, seeOU5	pump and treat groundwater for VOCs with UV treatment, monitoring, IC's and 5 yr reviews
OU3/sites 5,6 - construction debris landfills	final 8/93	removed to OU1

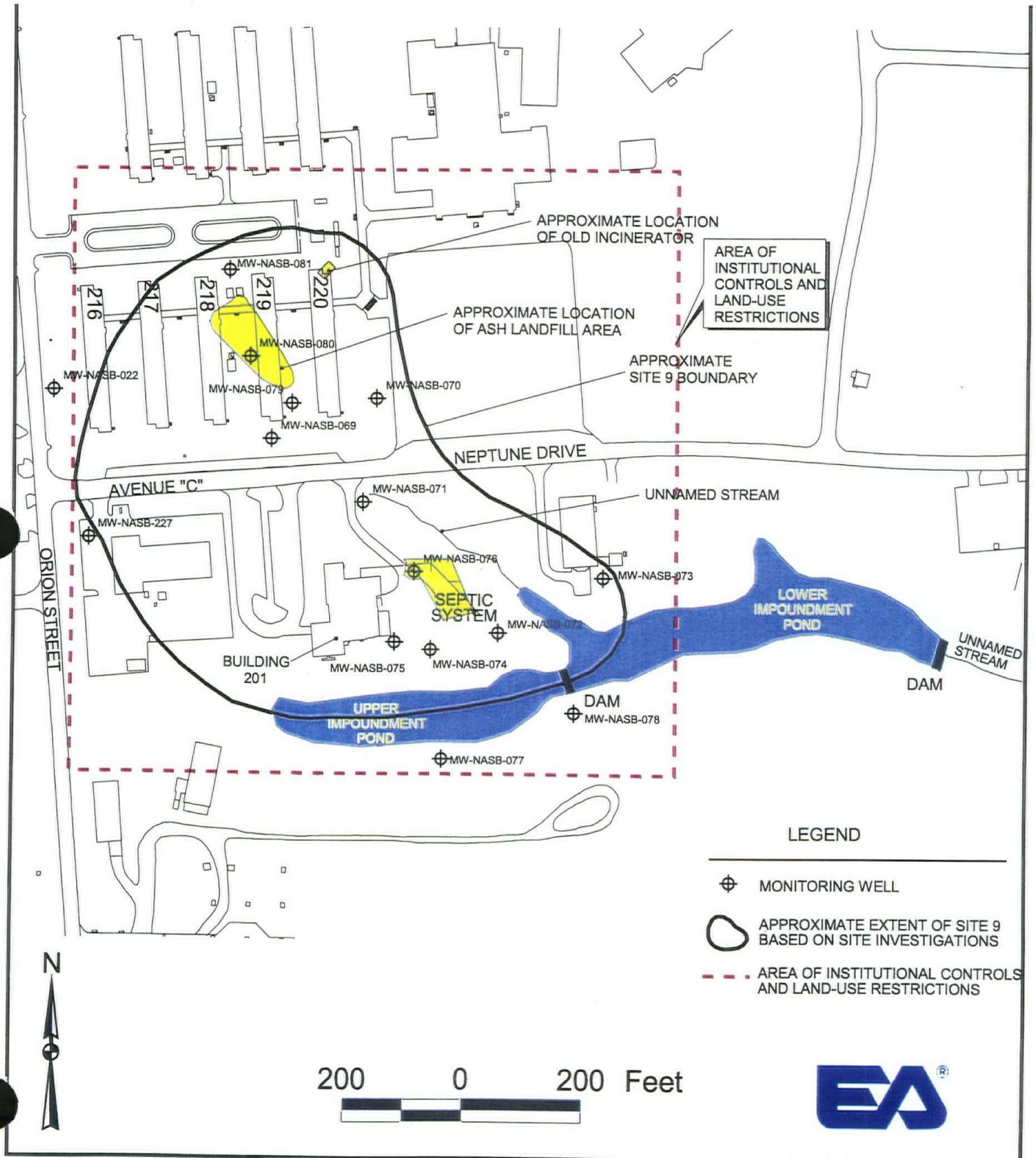
OU/Sites	ROD Date	Remedy
OU4/site 8 - construction & asbestos debris landfill	final 8/93	removed to OU1
OU5/site 4 - acid/caustic pit site 11 - fire training area site 13 - waste UST's  Eastern Plume - VOC plume	final 2/98	source removal and IC's  continue OU2 remedy, optimize extraction well network; change treatment from UV to air stripper by an ESD in 2000
OU6/site 9 - incinerator ash landfill and low level VOCs in groundwater	interim 9/94  final 9/99	additional source investigation, monitoring, ICs and 5 year reviews  monitored natural attenuation, monitoring, ICs and 5 year reviews
OU7/site 2 - old mixed waste landfill  site 7 - old acid/caustic pit	site 2 final 9/98  site 7 projected final in 3/02	existing soil cap (circa mid 1950's), monitoring, ICs and 5 year reviews, surface debris removal and toe slope stabilization  to be decided; Navy planning on source removal with aim of a no action ROD

1.4 **Site 9 Setting and Historical Activities.** Site 9, the Neptune Drive Disposal Site and the subject of this Remedial Action Report, is located in the central portion of the base (see figure 1 on page 4) and is approximately 20 acres in area. Current land use is residential/commercial; present structures include barracks, a dining hall and picnic/recreation facilities. Site 9 is generally flat with two steep sided steam channels in the southern portion of the site. Impoundment ponds are constructed in the steam channels; they receive surface runoff from most of the operations (industrial) area of the base, including the flight line and hanger areas (see figure 2 on page 7).

The primary CERCLA issue at site 9 is a low-level plume of VOCs in groundwater, comprised primarily of 1,2-DCE and vinyl chloride in the range of non-detect to 100 ppb (see section 5 for details). Historical activities at a former incinerator with ash landfill/dump area and a reported hazardous waste disposal area near building 201 may have contributed to current environmental conditions. These two historical activities plus the two unnamed streams comprise the three areas of concern at site 9 (again, please refer to figure 2 on page 7).

1.4.1 **Former Incinerator and Ash Landfill/Dump Area.** No detailed records of operation remain, but it is believed that operations occurred from 1943-46 in the vicinity of

**Figure 2 - Site Diagram (source: EA)**



buildings 218, 219 and 220. The incinerator could have been used up to 1953 when the current barracks were constructed on site 9. It was reported that metal shop wastes, paint sludge and waste solvents may have been burned on the ground. Prior to barracks construction in 1953, the ash landfill area was closed with a soil cover. Low level inorganics and PAHs are present in soil at depth, but groundwater in downgradient monitoring wells is not affected by the landfill contents.

- 1.4.2 Building 201. Historical documents and aerial photographs indicate a possible solvent burning or dumping area southeast of building 201. The building 201 septic system is also suspected as a source of contamination as it isn't clear when it was connected to the base/town sewer. Building 201 was the Chief's Club until 1993; it is now the base mess hall. A VOC source area has not been detected despite several investigations. This area is within the low level VOC "plume".
- 1.4.3 Unnamed streams. Portions of the two streams have been flooded by the 1997 construction of surface impoundment ponds to capture runoff from the central part of the base, including the runways, parking lots and roads. High PAHs detected in the surface water are attributed solely to surface runoff because they were not indicated in groundwater downgradient of the ash landfill or building 201 area. Low level VOCs in the surface water could be due to discharge from the VOC plume, but do not present an ecological risk.
- 1.5 Site 9 CERCLA Activities. An interim ROD was signed in 1994. It specified monitoring and institutional controls (essentially the same as the final ROD) and an additional investigation to find a source of the VOC contamination in groundwater. As with all past investigations, this one failed to find a source of the low level VOC's as well.

## **2 Site 9 (OU6) Record of Decision Background**

- 2.1 **Remedy components.** Natural attenuation with long term monitoring and institutional controls were selected to address soil and groundwater contamination in the site 9 ROD which was signed in September 1999. It included:

- Continue using natural attenuation to degrade volatile organic chemical contaminants present in the groundwater.
- Implement institutional controls by documenting land use and groundwater restrictions in NASB's Operations Instructions (NASBINST 5090). Language in the ROD also specifies that the Navy will permanently affix these restrictions, or obviate the need for them, in event the property is transferred or leased.
- Continue long term monitoring of groundwater to verify that landfill contents are not

impacting groundwater, to monitor the progress of natural attenuation and to monitor for contaminant plume migration.

- Continue long term monitoring of surface water. Leachate seeps and stream sediments for indications of contaminant migration.
- Perform 5 year reviews.

**2.2 Remedial action objectives for site 9 are:**

- To reduce the contaminant concentrations in Site 9 groundwater below the federal MCL and the state MEG target cleanup levels.
- To prevent human and ecological exposure by ingestion or dermal contact to site 9 groundwater or the inactive landfill contents.
- To prevent migration of the site 9 groundwater plume offsite or of contaminants from the inactive landfill to groundwater and/or surface water.

**2.3 These remedial objectives are the most practical for site 9 based on the current and reasonably anticipated exposure routes.**

- Since NASB's water is supplied by the Brunswick Water District, site 9 groundwater is not a current source of water and due to the low yield of the surface aquifer, isn't considered to be a potential future source.
- The inactive landfill was in effect capped with soil by construction of the barracks over it in 1953, thus preventing exposure to the landfill contents.
- Any impact from site 9 to the surface water in the unnamed stream's is negligible compared to the impact of surface water runoff. Construction of the retention ponds in 1997 localized impact, if any and will be monitored under the long term monitoring program.
- The site is within an operating Navy Installation, thus any construction or property action will be centrally managed in accordance the institutional controls as implemented by the base operating instructions (see section 3.3)

**3 Construction Activities, Chronology of Events and Construction Quality Control**

**3.1 Due to the absence of construction specified in the ROD, remedy design and construction weren't required. Developing Institutional Controls and revising the Long Term Monitoring Plan implemented by the Interim ROD did not require fieldwork.**

- 3.2 **The LTMP** developed for the IROD was revised to sample groundwater, surface water, leachate seeps and leachate station sediment semiannually. It was finalized in August 1999 and concurred to in November 1999; please refer to figure 3 on page 15 and table 7 on page 14 for a summary of required monitoring.
- 3.3 **Institutional Controls** were implemented by the Base Operating Instruction, NASBINST 5090.1A, "Restriction of Excavation Activities"; which was promulgated by NASB in September 1999. This instruction functions like a Base Master Plan and the Public Works Department is required to refer to it prior to performing any project or construction work so as to prevent any uncontrolled exposure to people or the environment. If there is any question, public works will refer to the base Installation Restoration Program Manger, who will in turn consult with EPA/MEDEP. This process was successfully used at site 9 in October 1999 when work on a new barracks was in the planning stages at one of the other OUs at NASB.

A finding of the first Five-Year Review by EPA and MEDEP comment was that the ICs should also formally restrict or control use of groundwater under the landfill. The Navy included this with a revised NASBINST5090.1B that was drafted in November 2000. It should be noted that groundwater ICs have been essentially enforced because NASB is an operating Naval Installation and supplied by town water.

3.4 **Chronology of Events**

**Table 4 - Remedial Action Events for Site 9 (OU6)**

Date	Event
September 30, 1994	Interim ROD for Site 9 (OU6) signed
March 1995	Long Term Monitoring Commenced
April 1997	Additional Source Investigation Completed
September 28, 1999	ROD for Site 9 (OU6) signed
August 25, 1999	Navy, USEPA and MEDEP conduct final site inspection
September 27, 1999	IC's (NASBINST 5090.1A) promulgated
November, 1999	Revised Long Term Monitoring Plan approved
March 2000 & Ongoing	First five year review report; continue 5 year reviews
April 2000 & Ongoing	Revised LTMP initiated with round 16, to revise LTMP as necessary.

3.5 **Construction Quality Control.** None required. QA/QC for Long Term Monitoring is assured by EPA and MEDEP approval and Navy conformance with the Quality Assurance Project Plan and Long Term Monitoring Plan.

**4 Performance Standards, Remedy Objectives, Final Inspection and Certifications**

4.1 **Performance Standards** were not specifically developed in the ROD. The purpose of the remedy is to ensure that human health and the environment continues to be protected from potential site risks and it is expected to result in groundwater meeting the MCL and MEG. Though a precise time to achieve this was not specified in the ROD, the remedy cost basis is 20 years. The ICs and LTMP were expected to be implemented and they have been.

4.2 **Remedy objectives** for each remedial component were established and accomplished; please see table 5 below:

**Table 5 - Remedy Objectives and Results**

ROD Remedy Component Objectives	Results
Reduce groundwater contaminants to below MCL/MEG with natural attenuation	•In progress, see section 5 for results to date
Long term monitoring	•Revised LTMP approved •Semiannual monitoring continues •LTMP to be revised as necessary by project team.
Institutional Controls	•Implemented with NASBINST 5090.1A in September 1999 •Groundwater restrictions documented with NASBINST 5090.1B in November 2000
5 year reviews	•First review performed in March, 2000

**4.3 Final Inspection and Certification.**

4.3.1 **Inspections.** A pre-ROD inspection of existing site conditions were performed by the Navy, EPA and MEDEP in August 1998 and a final post ROD site inspection was performed by the EPA in October 2000. No discrepancies were noted and no punch list was generated. Monitoring wells are in good condition and land use on site is consistent with the ICs.

- 4.3.2 Certification of Completion. The Navy has provided documentation verifying that IC and LTM remedy components are established and MPA/MEDEP have concurred. The first 5 year review has been performed. Natural attenuation is in progress with the aim of meeting the remedial objective of cleaning up the groundwater to meet MCLs and MEGs. Please refer back to tables 4 and 5 for details and see Appendix C for source documentation.

## **5 Operation and Maintenance**

- 5.1 Long term monitoring of groundwater, surface water, leachate station seep and leachate station sediment has been underway since 1995; 17 events have been completed to date. Sampling initially was triennially, but later changed to semiannually. Currently all wells are gauged, but analyses are tailored to conditions at each well. Wells with a history of VOCs are analyzed as such and wells downgradient of the landfill are sampled for TAL metals and SVOCs. Seeps and stream surface water are also tested for VOCs and TAL metals. Due to the low MEG for vinyl chloride of 0.2 ppb, a modified EPA method 8260 (SIM) will be run to achieve a lower detection limit on a well if previous results indicate the normal method will not detect vinyl chloride. This will be on a case by case basis in the best judgement of the Navy and in consultation with EPA/MEDEP. Please see table 7 on page 14 for details.
- 5.2 As specified in the ROD, the purpose of monitoring is to confirm the site continues to have no impact upon human health and the environment and to monitor the status of natural attenuation which appears to consist of dechlorination and diffusion at site 9. It's envisioned that the LTMP will be changed over time dependent upon results. Such changes will be noted in the LTMP and 5 year reviews. The duration of monitoring was not specified in the ROD, but it was costed out based upon 20 years.
- 5.3 The data to date indicates that natural dechlorination is in progress or has occurred prior to VOCs reaching site 9. VOCs are primarily 1,2-DCE and vinyl chloride, the second and third decay daughters of TCE respectively, in about a 1:1 ratio. The ratio of vinyl chloride to 1,2-DCE is also increasing, indicating that natural dechlorination is increasing. To date metals and SVOCs have not been detected in groundwater downgradient of the landfill, they are present at high concentrations in the retention ponds, but this is due to surface runoff. VOCs have been detected at low levels in the seeps and surface water indicating some plume discharge to the retention ponds, but at levels below a human health and environmental risk. Please see figures 3-7 and tables 8-9 for results and analysis.

An increase of VOCs to a total of about 110 ppb in the highest well has been noted; the data indicates that VOCs may be flowing into the site 9 area from an upgradient source. This will be monitored and evaluated by the LTM program.

Currently, a brief "just the facts" report is distributed after each event and an annual interpretive report is published by the Navy with subsequent comment by EPA/MEDEP.

- 5.4 Five year Review Findings/Recommendations. As noted in section 5.3, the overall rise in VOC concentrations is a cause for concern. The Review recommendation was to continue long term monitoring and consider additional action per results obtained in consultation with EPA/MEDEP. See figure 8 on page 20 for an excerpt of the Review

The review found that the remedy remains protective, primarily through institutional controls at this time, natural attenuation with monitoring has been implemented and the recommended NASB Institutional Controls Instruction revision has been drafted. Please see appendix C for source documentation excerpts.

- 6 **Summary of Project Costs.** The ROD lists a total cost of \$884,695 for 20 years of monitoring (see table 8) and five year reviews. No further detail of cost breakdown is available from the Navy. LTM and the 5 year review for site 9 are incorporated with other OUs at NASB.

**Table 6 - Project Costs**

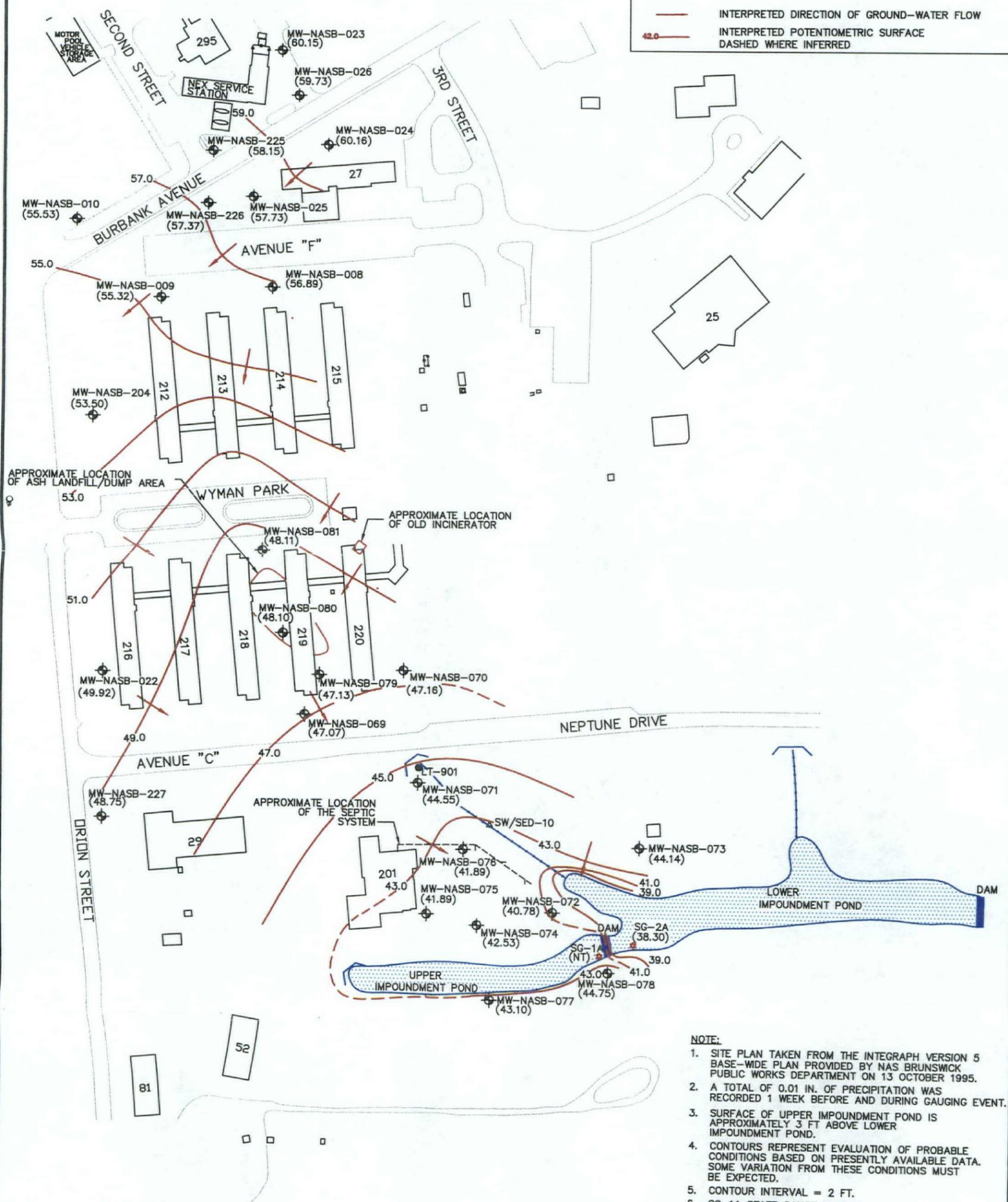
Item and basis (20 years and i=7%)	Cost
<b>Capital</b>	
Establish Institutional Controls	11,500
Long Term Monitoring Equipment	3,910
Closure Report	20,000
<b>Total Capital Costs</b>	<b>35,410</b>
<b>Operations and Maintenance - Per Year</b>	
Monitor Institutional Controls	2,000
Sample and Analyze Monitoring Wells (15)	61,240
Sample and Analyze Sediment Samples (5)	10,450
Meetings to Review Results/Comment Response	3,000
Five Year Review Report and Meeting (Annualized)	3,100
<b>Total Annual Operation and Maintenance Costs</b>	<b>79,790</b>
<b>Total Remedy</b>	<b>884,695</b>

**Table 7 - Long Term Monitoring Program (source: EA, Inc)**

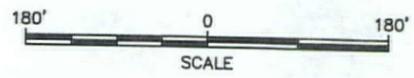
Well Designation	Previous Well Designation	Monitoring Frequency	Sample Parameters			Monitoring Event 16	
			TCL VOC	TAL Elements	Field Parameters <sup>(a)</sup>	Gauged	Sampled
<b>Monitoring Wells</b>							
MW-NASB-069	MW-901	Bi-Annual	X	X <sup>(b)</sup>	X	X	X
MW-NASB-070	MW-902	Bi-Annual	NR	X <sup>(b)</sup>	X	X	X
MW-NASB-071	MW-903	Bi-Annual	X	NR	X	X	X
MW-NASB-072	MW-904	Bi-Annual	X	NR	X	X	X
MW-NASB-073	MW-905	Bi-Annual	NR	NR	NR	X <sup>(c)</sup>	NR
MW-NASB-074	MW-906	Bi-Annual	X	NR	X	X	X
MW-NASB-075	MW-907	Bi-Annual	X	NR	X	X	X
MW-NASB-076	MW-908	Bi-Annual	X	NR	X	X	X
MW-NASB-077	MW-909	Bi-Annual	X <sup>(d)</sup>	NR	X	X	X
MW-NASB-078	MW-910	Bi-Annual	NR	NR	NR	X <sup>(c)</sup>	NR
MW-NASB-079	MW-914	Bi-Annual	NR	X <sup>(b)</sup>	X	X	X
MW-NASB-080	MW-915	Bi-Annual	X	NR	X	X	X
MW-NASB-081	MW-916	Bi-Annual	NR	NR	NR	X <sup>(c)</sup>	NR
MW-NASB-022	None	Bi-Annual	X	NR	X	X	X
MW-NASB-204	None	Bi-Annual	NR	NR	NR	X <sup>(c)</sup>	NR
MW-NASB-227	None	Bi-Annual	X	NR	X	X	X
<b>Leachate Station</b>							
LT-901 (SEEP)		Bi-Annual	X		X	NR	X
<b>Surface Water</b>							
SW-010		Bi-Annual	X		X	NR	X
<b>Sediment</b>							
SED-010		Bi-Annual	X		NR	NR	X
<b>Stream Gauge Water</b>							
SG-1A		Bi-Annual	NR		NR	X <sup>(c)</sup>	NR
SG-2A		Bi-Annual	NR		NR	X <sup>(c)</sup>	NR
<p>(a) Determination of field parameters in accordance with EPA/600/4-79/020 using the following methods: pH (Method 150.1), temperature (Method 170.1), specific conductance (Method 120.1), and turbidity (180.1); optional field parameters including dissolved oxygen (Method 360.1) and Eh, were also recorded. Includes water level measurement.</p> <p>(b) Well will be sampled and analyzed for semivolatile organic compounds by EPA Method 8270C.</p> <p>(c) Indicates water level measurement only.</p> <p>(d) Monitoring well MW-NASB-077 was analyzed using EPA Method 8260B Modified for selected ion mass for vinyl chloride.</p>							
<p>NOTE: TCL = Target Compound List; VOC = Volatile organic compounds; TAL = Target Analyte List; NR = Procedure not required; EPA = U.S. Environmental Protection Agency.</p>							

**LEGEND**

- ◆ MW-NASB-069 (47.07) MONITORING WELL (WATER TABLE ELEVATION, FT MSL)
- △ SW/SED-010 SURFACE WATER/SEDIMENT SAMPLING LOCATION
- ★ SG-2A (38.30) STREAM GAUGE STATION LOCATION (WATER TABLE ELEVATION, FT MSL)
- LT-901 LEACHATE SAMPLING STATION
- EXISTING CHAIN LINK FENCE
- UNNAMED STREAM PROFILE
- SEPTIC SYSTEM
- INTERPRETED DIRECTION OF GROUND-WATER FLOW
- INTERPRETED POTENTIOMETRIC SURFACE DASHED WHERE INFERRED



- NOTE:**
1. SITE PLAN TAKEN FROM THE INTEGRAPH VERSION 5 BASE-WIDE PLAN PROVIDED BY NAS BRUNSWICK PUBLIC WORKS DEPARTMENT ON 13 OCTOBER 1995.
  2. A TOTAL OF 0.01 IN. OF PRECIPITATION WAS RECORDED 1 WEEK BEFORE AND DURING GAUGING EVENT.
  3. SURFACE OF UPPER IMPOUNDMENT POND IS APPROXIMATELY 3 FT ABOVE LOWER IMPOUNDMENT POND.
  4. CONTOURS REPRESENT EVALUATION OF PROBABLE CONDITIONS BASED ON PRESENTLY AVAILABLE DATA. SOME VARIATION FROM THESE CONDITIONS MUST BE EXPECTED.
  5. CONTOUR INTERVAL = 2 FT.
  6. SG-1A STAFF GAUGE MISSING WATER LEVEL NOT TAKEN (NT).



FILE No. F:\FEDERAL\DDO\NAVY\2960047\CAD\LTMP\SITES\2000\EVENT\_16\S9MAR00.DWG



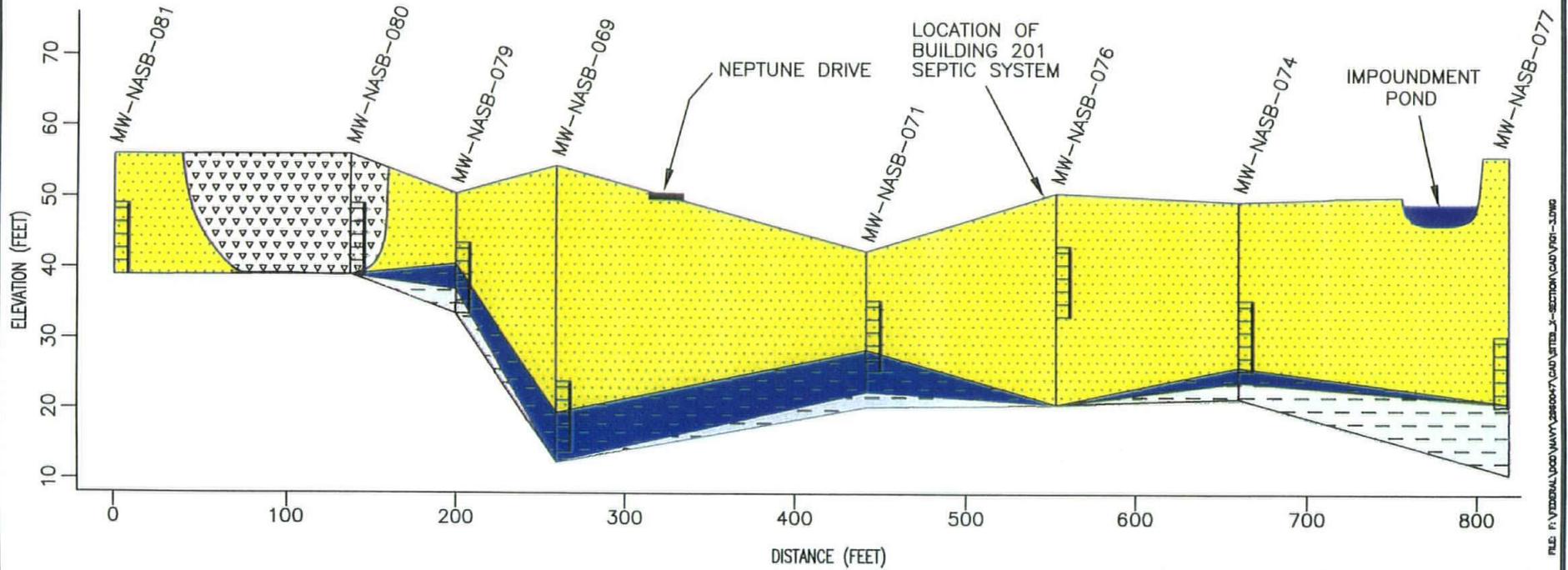
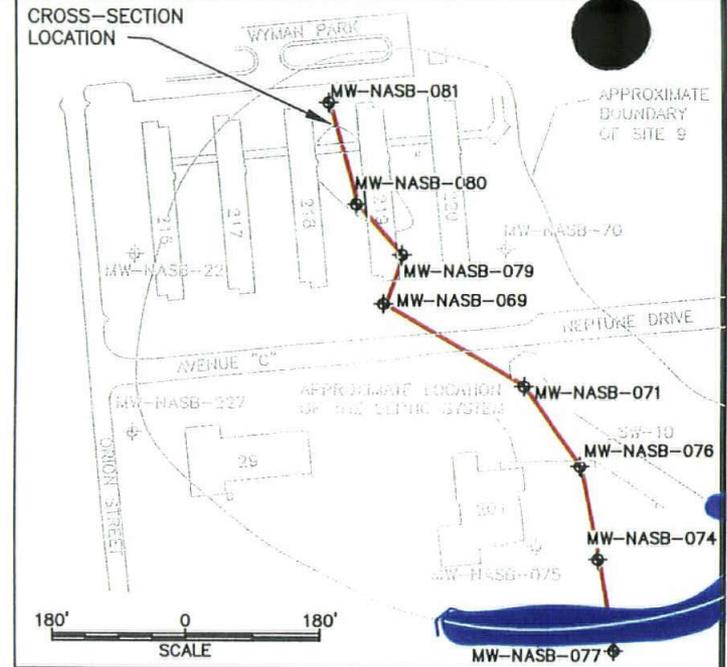
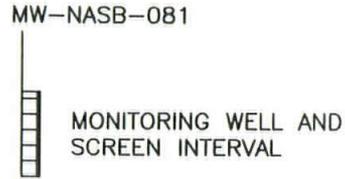
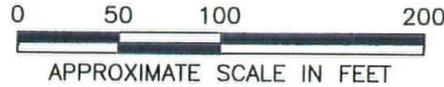
**SITE 9**  
 (NEPTUNE DRIVE DISPOSAL SITE)  
 NAVAL AIR STATION  
 BRUNSWICK, MAINE

**FIGURE 3**  
 INTERPRETED POTENTIOMETRIC  
 SURFACE ELEVATIONS, 27 MARCH 2000  
 WELL GAUGING DATA

PROJECT MGR AE	DESIGNED BY SAP	DRAWN BY SAP	CHECKED BY SYC	SCALE AS SHOWN	DATE 14 JUNE 2000	PROJECT NO 29600.47	FILE No. S9MAR00
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**LEGEND**

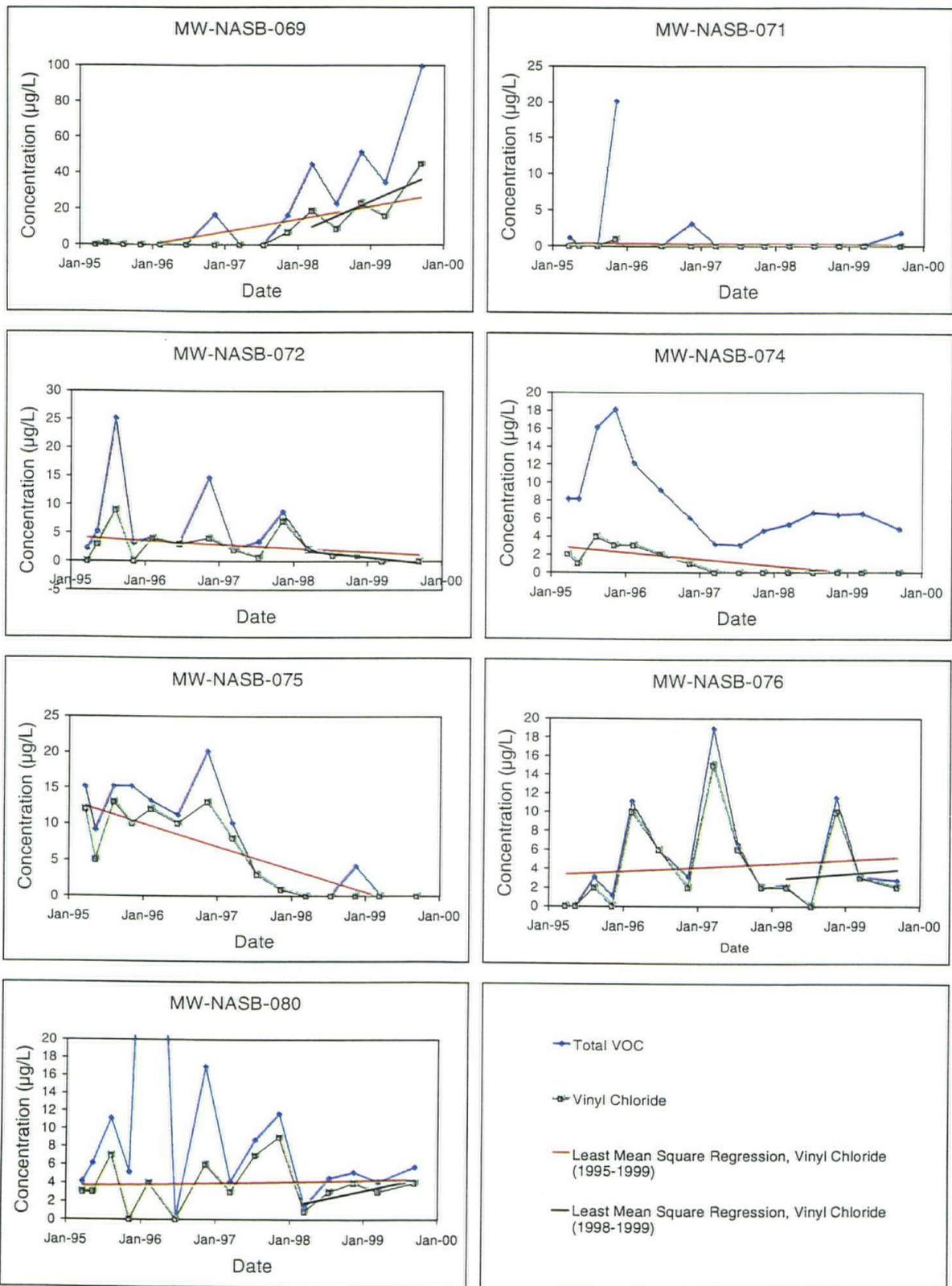
-  SAND
-  TRANSITION UNIT
-  CLAY
-  LANDFILL MATERIALS



FILE: F:\FEDERAL\G00\NAVY\2960047\CAD\FIG1\_3-SECTION\CAD\FIG1-3.DWG

NOTE: VERTICAL EXAGGERATION = 5 TIMES

 EA ENGINEERING, SCIENCE, AND TECHNOLOGY				SITE 9 (NEPTUNE DRIVE DISPOSAL SITE) NAVAL AIR STATION BRUNSWICK, MAINE		FIGURE 1-3 GEOLOGIC CROSS-SECTION OF SITE 9	
PROJECT MGR PLN	DESIGNED BY BT	DRAWN BY BT	CHECKED BY PLN	SCALE AS SHOWN	DATE 11 MAY 2000	PROJECT NO 29600.47	FILE No. FIG1-3



Note: Vinyl chloride concentrations less than the detection limit (2 µg/L) are plotted as a zero concentration on these charts. MW-NASB-080 graph scale enlarged to show vinyl chloride trends. Acetone concentration detected in March 1995 is considered laboratory contaminant and is shown off graph scale.

F:\Federal\DoD\Navy\2960047\ANNUAL\1999 Annual Reports\Site 9\Charts\FIG2-1.DOC



Figure 2-1. Total volatile organic compounds and vinyl chloride trends, 1995-1999.

**Figure 6 - Total Contaminant Trend Graphs**

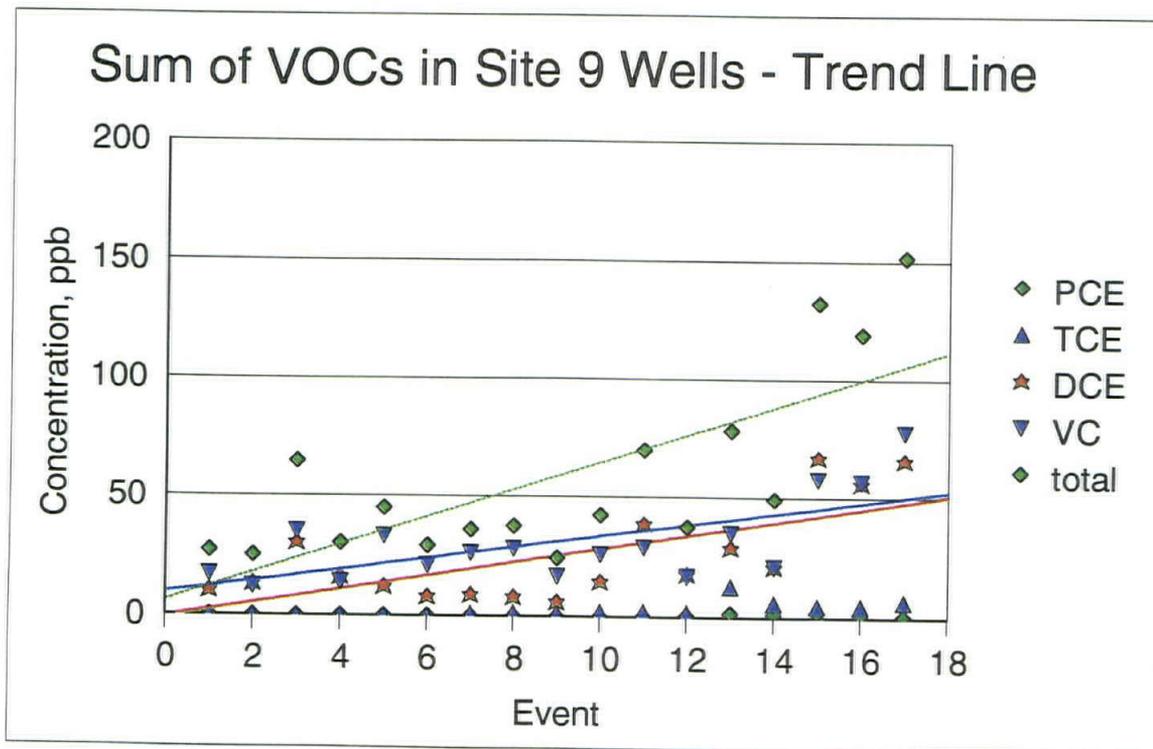
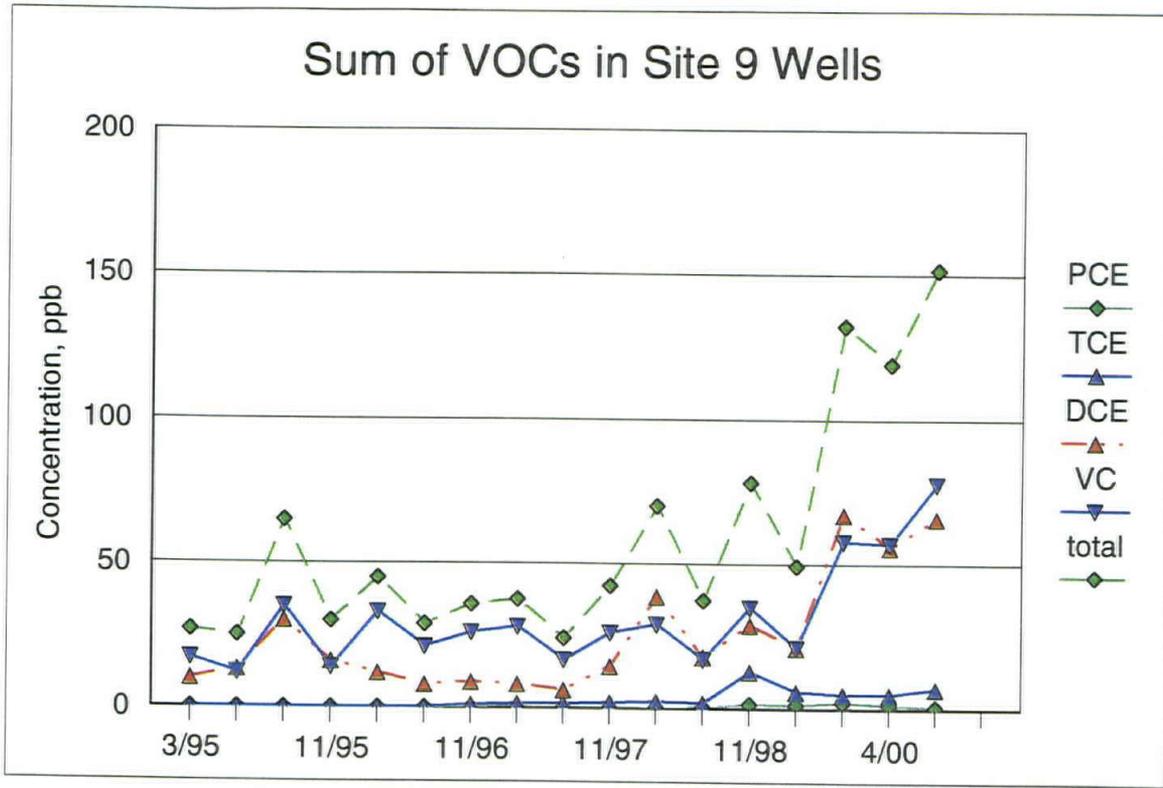
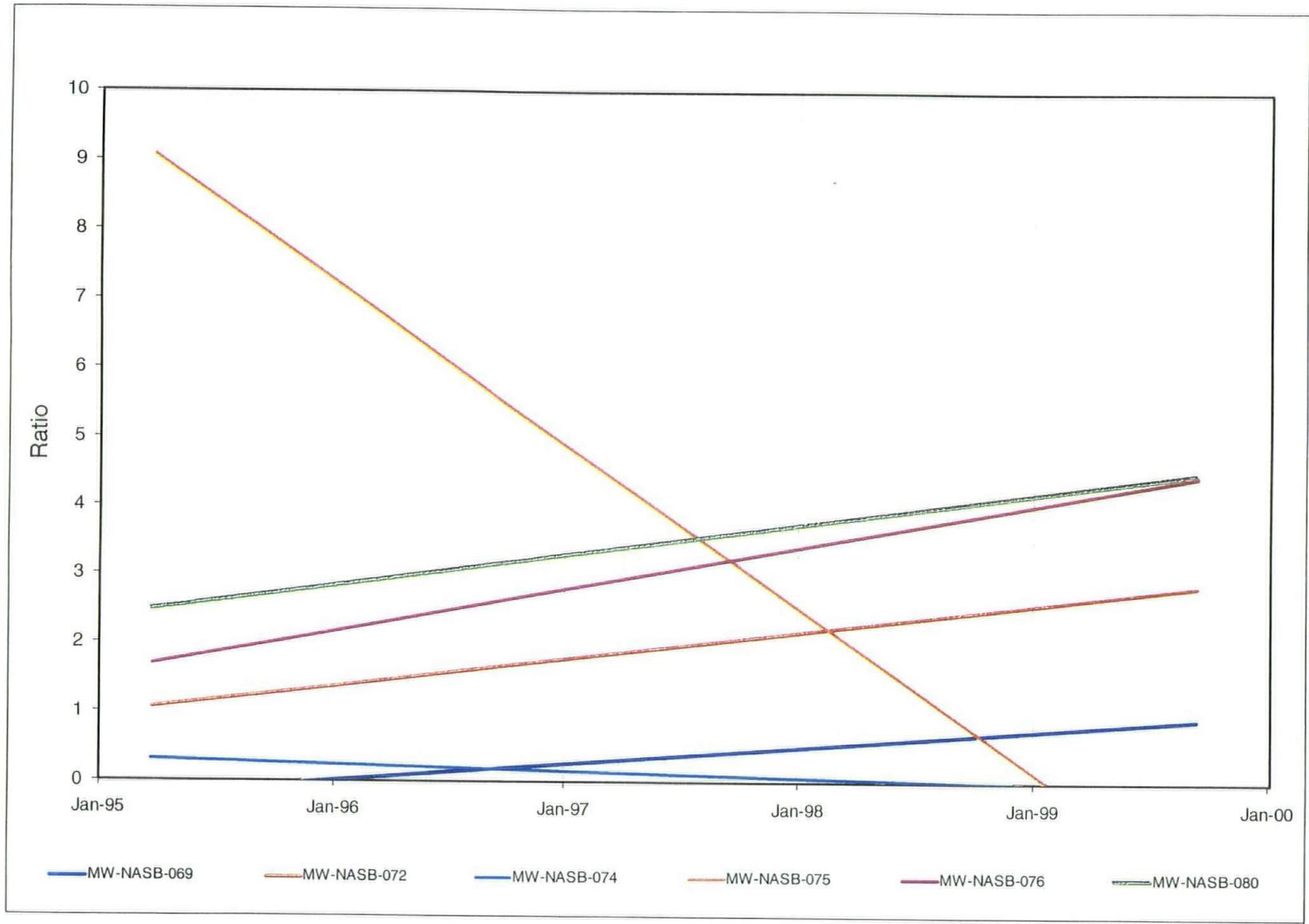


Figure 7 - Vinyl Chloride/1,2-DCE Ratio Graph (source: EA)



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NOTE: Higher vinyl chloride/total 1,2 -dichloroethene ratio indicates increasing dechlorination.  
Lines show least mean square regression based on ratios of vinyl chloride to total 1,2-dichloroethene.



Figure 2-2. Vinyl chloride/total 1,2-dichloroethene ratio trends, Monitoring Events 1 through 15.

**Figure 8 - Excerpt page from the Five-Year Review (source: EA)**

Revision: FINAL

Page 4-4

March 2000

Northern Division, Naval Facilities Engineering Command

- Monitor changes in the plume boundaries and potential migration pathways.
- Monitor effectiveness of the remedial action for the protection of human health and the environment.
- Evaluate whether the inactive landfill contents are impacting ground water.
- Monitor the VOC concentration to evaluate the effectiveness of natural attenuation and determine trends with time.
- Monitor impacts to the environment due to Site 9.

**4.3.3 Institutional Controls**

Institutional controls at Site 9 consist of ground-water and land use restrictions that apply to the entire Site 9 area east of Orion Road and Avenue F, east of MW-NASB-073, and south of Building 52. However, institutional controls to prohibit ground-water use and physical contact with ground water must be incorporated into the next revision of Operating Instruction NASBINST 5090.1A, "Restriction on Excavation Activities." The next revision of NASBINST 5090.1A is scheduled for September 2000. This program was shown to be effective by NAS Brunswick's recent request for concurrence with the proposed Bachelor Enlisted Quarters Military Construction Project.

**4.4 RECOMMENDATIONS**

- No additional remedial actions are required at this time; however, if sampling trends indicate sustained increases in vinyl chloride concentrations in ground water, additional field work may be required to better delineate a potential plume of deep-seated vinyl chloride. U.S. EPA and MEDEP will be consulted to establish a specific trigger level for this action.
- Ongoing operation and maintenance activities will continue and will be summarized in annual reports. Annual reports and monitoring event reports will continue to be submitted to U.S. EPA and MEDEP.
- The Long-Term Monitoring Plan will be refined as needed based on the annual reports.
- Amend the Operating Instruction NASBINST 5090.1A "Restriction on Excavation Activities" to include a restriction of use and physical contact with the ground water.

**4.5 STATEMENT OF PROTECTIVENESS**

The purpose of the five-year review is to ensure that the selected remedy remains protective of human health and the environment and is functioning as designed. The Natural Attenuation and Institutional Control remedy selected for Site 9 has been successfully implemented to date, and remains protective of human health and the environment. Long-term monitoring is ongoing.

TABLE A-1 SUMMARY OF GROUND-WATER SAMPLES COLLECTED FROM SITE 9 BETWEEN 11 AND 12 APRIL 2000  
VOLATILE ORGANIC COMPOUNDS BY U.S. ENVIRONMENTAL PROTECTION AGENCY METHOD 8260B

			MW-NASB-022	MW-NASB-069	MW-NASB-069 (Dup)	MW-NASB-071	MW-NASB-072	MW-NASB-080
			Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
			Low-flow Sample	Low-flow Sample	Low-flow Sample	Low-flow Sample	Low-flow Sample	Low-flow Sample
Compound/Element	MEG	MCL						
1,1-Dichloroethane	70	---	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)
1,2-Dichloroethene, Total	70	70	(<1U)	49	51	(<1U)	(<1U)	(<1U)
Chloroform	---	100	(<1U)	(<1U)	(<1U)	2	(<1U)	(<1U)
Ethylbenzene	700	700	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)
Tetrachloroethene	3	5	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)
Toluene	1,400	1,000	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)
Trichloroethene	5	5	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)
Vinyl Chloride	0.15	2	(<2U)	55	53	(<2U)	(<2U)	(<2U)
Xylenes, Total	600	10,000	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)

			MW-NASB-074	MW-NASB-075	MW-NASB-076	MW-NASB-077	MW-NASB-077 (Dup)	MW-NASB-227
			Ground Water	Ground Water				
			Low-flow Sample	Low-flow Sample				
Compound/Element	MEG	MCL						
1,1-Dichloroethane	70	---	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)
1,2-Dichloroethene, Total	70	70	2	(<1U)	2	(<1U)	(<1U)	2
Chloroform	---	100	0.5J	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)
Ethylbenzene	700	700	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)
Tetrachloroethene	3	5	0.7J	(<1U)	(<1U)	(<1U)	(<1U)	0.7J
Toluene	1,400	1,000	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)
Trichloroethene	5	5	2	(<1U)	(<1U)	(<1U)	(<1U)	3
Vinyl Chloride	0.15	2	(<2U)	(<2U)	3	(<0.15U)	(<2U)	(<2U)
Xylenes, Total	600	10,000	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)

(a) MEG (Maximum Exposure Guideline) obtained from State of Maine Department of Human Services Maximum Exposure Guidelines, memorandum dated 23 October 1992. Dashes (---) indicate compound has no applicable MEG.

(b) MCL (Maximum Contaminant Level) obtained from 40 CFR Parts 141 and 142 (U.S. EPA 1998). Dashes (---) indicate compound has no applicable MCL.

NOTE:

Units are micrograms per liter ( $\mu\text{g/L}$ ).

U = Not detected. Sample quantitation limits are shown as (< \_\_\_ U).

J = Estimated concentration.

B = Compound detected in associated method blank.

Only those analytes detected in at least one of the samples, and chemicals of concern listed in the Final Long-Term Monitoring Plan (EA 1999b), are shown on this table.

Concentrations highlighted with gray and bold type denote exceedance of MEG or MCL.

Monitoring well MW-NASB-077 was analyzed using EPA Method 8260B Modified for Selected Ion Mass.

Trip blank QT-001 results for EPA Method 8260B were non-detect, except for methylene chloride and acetone, which were detected at a concentrations of 1B  $\mu\text{g/L}$  and 3J  $\mu\text{g/L}$ , respectively. Equipment rinsate blanks QS-001 and QS-002 results for EPA Method 8260B were non-detect, except for methylene chloride, which was detected at a concentrations of 0.5JB  $\mu\text{g/L}$  and 0.7JB  $\mu\text{g/L}$ .

TABLE A-2 SUMMARY OF GROUND-WATER SAMPLES COLLECTED FROM SITE 9 BETWEEN 11 AND 12 APRIL 2000  
TARGET ANALYTE LIST ELEMENTS BY U.S. ENVIRONMENTAL PROTECTION AGENCY 6000/7000 SERIES METHODS

Compound/Element	MEG	MCL	MW-NASB-069	MW-NASB-069 (Dup)	MW-NASB-070	MW-NASB-079
			Ground Water	Ground Water	Ground Water	Ground Water
			Low-flow Sample	Low-flow Sample	Low-flow Sample	Low-flow Sample
Aluminum	1,430	200	51.4B*	79B*	75.4B*	140
Barium	1,500	2,000	9.6	9.6	9.1	222
Beryllium	---	4	0.82B*	0.78B*	(<0.56U)	0.78B*
Cadmium	5	5	2.6B*	(<2.61U)	(<2.61U)	(<2.61U)
Calcium	---	---	8,110	8,370	8,440	23,000
Chromium	100	100	9.9B*	(<4.02U)	6.7B*	(<4.02U)
Iron	---	300	161	170	51.6	18,600
Magnesium	---	---	3,110	3,200	817	1,550
Manganese	200	50	703	719	179	86.1
Mercury	2	2	(<0.02U)	(<0.02U)	0.03B*	0.04B*
Potassium	---	---	2,240	2,410	1,100	3,090
Sodium	---	---	71,200	73,800	8,760	4,620
Thallium	0.4	2	4.6B*	(<3.28U)	(<3.28U)	4.7B*
Vanadium	---	---	(<4.01U)	4B*	4B*	(<4.01U)
Zinc	---	5,000	11B*	10.8B*	8.5B*	11.8B*

(a) MEG (Maximum Exposure Guideline) obtained from State of Maine Department of Human Services Maximum Exposure Guidelines, memorandum dated 23 October 1992. Dashes (---) indicate compound has no applicable MEG.

(b) MCL (Maximum Contaminant Level) obtained from 40 CFR Parts 141 and 142 (U.S. EPA 1998). Dashes (---) indicate compound has no applicable MCL.

NOTE:

Units are micrograms per liter (µg/L).

B\* = Analyte concentration is between the Instrument Detection Limit and the Contract Required Detection Limit.

U = Not detected. Sample quantitation limits are shown as (<\_\_\_U).

Only those analytes detected in at least one of the samples, and chemicals of concern listed in the Final Long-Term Monitoring Plan (EA 1999b), are shown on this table.

Refer to data Quality Review section (Appendix B) for Method Detection Limits for referenced analytical methods.

Concentrations highlighted with gray and bold type denote exceedance of MEG or MCL.

TABLE A-3 SUMMARY OF SURFACE WATER SAMPLES COLLECTED FROM SITE 9 ON 11 APRIL 2000  
VOLATILE ORGANIC COMPOUNDS BY U.S. ENVIRONMENTAL PROTECTION AGENCY METHOD 8260B

			SW-010
			Surface Water Grab Sample
Compound/Element	MEG	MCL	
Vinyl Chloride	---	---	(<2U)

NOTE:

Units are micrograms per liter ( $\mu\text{g/L}$ ).

SW = Surface water sample locations.

U = Not detected. Sample quantitation limits are shown as (<\_\_\_ U).

B = Compound detected in associated method blank.

Only those compounds detected in at least one of the samples and vinyl chloride are shown on this table.

TABLE A-4 SUMMARY OF LEACHATE SAMPLES COLLECTED FROM SITE 9 ON 11 APRIL 2000  
VOLATILE ORGANIC COMPOUNDS BY U.S. ENVIRONMENTAL PROTECTION AGENCY METHOD 8260B

			LT-901	LT-901 (Dup)
			Leachate Grab Sample	Leachate Grab Sample
Compound/Element	MEG	MCL		
Acetone	---	---	4J	(<5U) #
Vinyl Chloride	---	---	(<2U)	(<2U)

NOTE:

Units are micrograms per liter ( $\mu\text{g/L}$ ).

LT = Leachate sample.

U = Not detected. Sample quantitation limits are shown as (<\_\_\_ U).

B = Compound detected in associated method blank.

Only those analytes detected in at least one of the samples and vinyl chloride are shown on this table.

TABLE A-5 SUMMARY OF SEDIMENT SAMPLES COLLECTED FROM SITE 9 ON 11 APRIL 2000  
VOLATILE ORGANIC COMPOUNDS BY U.S. ENVIRONMENTAL PROTECTION AGENCY METHOD 8260B

			SED-10	SED-10 (Dup)
			Sediment Grab Sample	Sediment Grab Sample
Compound/Element	MEG	MCL		
1,2-Dichloroethene, Total	---	---	17	7
Acetone	---	---	9B	6B
Methylene Chloride	---	---	10B	8B
Trichloroethene	---	---	5	(<1U)
Vinyl Chloride	---	---	(<3U)	(<3U)

NOTE:

Units are micrograms per liter ( $\mu\text{g/Kg}$ ).

SED = Stream sediment sample location.

B = Compound detected in associated method blank.

J = Estimated concentration below detection limit.

U = Not detected. Sample quantitation limits are shown as (<\_\_\_ U).

Only those compounds detected in at least one of the samples and vinyl chloride are shown on this table.

TABLE A-1 SUMMARY OF GROUND-WATER SAMPLES COLLECTED FROM SITE 9 BETWEEN 14 AND 15 SEPTEMBER 2000  
VOLATILE ORGANIC COMPOUNDS BY U.S. ENVIRONMENTAL PROTECTION AGENCY METHOD 8260B

			MW-NASB-022	MW-NASB-069	MW-NASB-069 (Dup)	MW-NASB-071	MW-NASB-072	MW-NASB-074
			Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
			Low-flow Sample	Low-flow Sample	Low-flow Sample	Low-flow Sample	Low-flow Sample	Low-flow Sample
Compound/Element	MEG	MCL						
Total VOC	---	---	---	111	112	3	3	7.2
1,1-Dichloroethane	70	---	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)
1,2-Dichloroethene, total	70	70	(<1U)	51	52	(<1U)	2	3
Chloroform	---	100	(<1U)	(<1U)	(<1U)	3	(<1U)	0.5J
Ethylbenzene	700	700	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)
Tetrachloroethene	3	5	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)	0.7J
Toluene	1,400	1,000	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)
Trichloroethene	5	5	(<1U)	(<1U)	(<1U)	(<1U)	1	3
Vinyl chloride	0.15	2	(<2U)			(<2U)	(<2U)	(<2U)
Xylenes, total	600	10,000	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)

			MW-NASB-075	MW-NASB-076	MW-NASB-076 (Dup)	MW-NASB-080	MW-NASB-227
			Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
			Low-flow Sample	Low-flow Sample	Low-flow Sample	Low-flow Sample	Low-flow Sample
Compound/Element	MEG	MCL					
Total VOC	---	---	---	11	11	11	6
1,1-Dichloroethane	70	---	(<1U)	(<1U)	(<1U)	1	(<1U)
1,2-Dichloroethene, total	70	70	(<1U)	3	3	1	3
Chloroform	---	100	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)
Ethylbenzene	700	700	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)
Tetrachloroethene	3	5	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)
Toluene	1,400	1,000	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)
Trichloroethene	5	5	(<1U)	(<1U)	(<1U)	(<1U)	3
Vinyl chloride	0.15	2	(<2U)				(<2U)
Xylenes, total	600	10,000	(<1U)	(<1U)	(<1U)	(<1U)	(<1U)

(a) MEG (Maximum Exposure Guideline) obtained from State of Maine Department of Human Services Maximum Exposure Guidelines, memorandum dated 23 October 1992. Dashes (---) indicate compound has no applicable MEG.

(b) MCL (Maximum Contaminant Level) obtained from 40 CFR Parts 141 and 142 (U.S. EPA 1998). Dashes (---) indicate compound has no applicable MCL.

NOTE:

Units are micrograms per liter ( $\mu\text{g/L}$ ).

U = Not detected. Sample quantitation limits are shown as (<\_\_ U).

J = Estimated concentration.

B = Compound detected in associated method blank.

Only those analytes detected in at least one of the samples, and chemicals of concern listed in the Final Long-Term Monitoring Plan (EA 1999b), are shown on this table. Concentrations highlighted with gray and bold type denote exceedance of MEG or MCL.

TABLE A-3 SUMMARY OF GROUND-WATER SAMPLES COLLECTED FROM SITE 9 BETWEEN 14 AND 15 SEPTEMBER 2000  
 TARGET ANALYTE LIST ELEMENTS BY U.S. ENVIRONMENTAL PROTECTION AGENCY 6000/7000 SERIES METHODS

Compound/Element	MEG	MCL	MW-NASB-069	MW-NASB-069 (Dup)	MW-NASB-070	MW-NASB-079
			Ground Water	Ground Water	Ground Water	Ground Water
			Low-flow Sample	Low-flow Sample	Low-flow Sample	Low-flow Sample
Aluminum	1,430	200	17.4B*	34.5B*	19.2B*	21.6B*
Arsenic	---	50	(<2.46U)	(<2.46U)	(<2.46U)	3.2B*
Barium	1,500	2,000	8.2	8.5	8.5	297
Cadmium	5	5	(<2.61U)	(<2.61U)	(<2.61U)	(<0.28U)
Calcium	---	---	7,270	7,250	6,760	32,600
Chromium	100	100	(<4.02U)	(<4.02U)	(<4.02U)	(<4.02U)
Copper	---	1,300	(<1.93U)	(<1.93U)	4.9B*	(<1.93U)
Iron	---	300	239	247	12.5B*	23,300
Magnesium	---	---	2,790	2,780	701	2,080
Manganese	200	50	33	34	161	125
Mercury	2	2	(<0.02U)	(<0.02U)	(<0.02U)	0.19B*
Potassium	---	---	1,340	1,180	480B*	3,320
Sodium	---	---	64,200	64,800	8,230	5,020
Zinc	---	5,000	(<1.55U)	3.4B*	(<1.55U)	(<1.55U)

(a) MEG (Maximum Exposure Guideline) obtained from State of Maine Department of Human Services Maximum Exposure Guidelines, memorandum dated 23 October 1992. Dashes (---) indicate compound has no applicable MEG.

(b) MCL (Maximum Contaminant Level) obtained from 40 CFR Parts 141 and 142 (U.S. EPA 1998). Dashes (---) indicate compound has no applicable MCL.

NOTE:

Units are micrograms per liter ( $\mu\text{g/L}$ ).

B\* = Analyte concentration is between the Instrument Detection Limit and the Contract Required Detection Limit.

U = Not detected. Sample quantitation limits are shown as (< \_\_\_ U).

Only those analytes detected in at least one of the samples, and chemicals of concern listed in the Final Long-Term Monitoring Plan (EA 1999b), are shown on this table.

Refer to data Quality Review section (Appendix B) for Method Detection Limits for referenced analytical methods.

Concentrations highlighted with gray and bold type denote exceedance of MEG or MCL.

**TABLE A-4 SUMMARY OF SURFACE WATER SAMPLES COLLECTED FROM SITE 9 ON 20 SEPTEMBER 2000  
VOLATILE ORGANIC COMPOUNDS BY U.S. ENVIRONMENTAL PROTECTION AGENCY METHOD 8260B**

			SW-010
			Surface Water
			Grab Sample
Compound/Element	MEG	MCL	
Total VOC	---	---	1.9
1,2-Dichloroethene, total	---	---	0.9J
Vinyl chloride	---	---	1J

(a) MEG (Maximum Exposure Guideline) obtained from State of Maine Department of Human Services Maximum Exposure Guidelines, memorandum dated 23 October 1992. Dashes (---) indicate compound has no applicable MEG.

(b) MCL (Maximum Contaminant Level) obtained from 40 CFR Parts 141 and 142 (U.S. EPA 1998). Dashes (---) indicate compound has no applicable MCL.

**NOTE:**

Units are micrograms per liter ( $\mu\text{g/L}$ ).

SW = Surface water sample locations.

J = Estimated concentration.

U = Not detected. Sample quantitation limits are shown as ( $< \text{___} \text{U}$ ).

Only those compounds detected in at least one of the samples and vinyl chloride are shown on this table.

**TABLE A-5 SUMMARY OF LEACHATE SAMPLES COLLECTED FROM SITE 9 ON 20 SEPTEMBER 2000  
VOLATILE ORGANIC COMPOUNDS BY U.S. ENVIRONMENTAL PROTECTION AGENCY METHOD 8260B**

			LT-901	LT-901 (Dup)
			Leachate	Leachate
			Grab Sample	Grab Sample
Compound/Element	MEG	MCL		
Total VOC	---	---	---	---
Acetone	---	---	(<5U)	3J
Vinyl chloride	---	---	(<2U)	(<2U)

(a) MEG (Maximum Exposure Guideline) obtained from State of Maine Department of Human Services Maximum Exposure Guidelines, memorandum dated 23 October 1992. Dashes (---) indicate compound has no applicable MEG.

(b) MCL (Maximum Contaminant Level) obtained from 40 CFR Parts 141 and 142 (U.S. EPA 1998). Dashes (---) indicate compound has no applicable MCL.

**NOTE:**

Units are micrograms per liter ( $\mu\text{g/L}$ ).

LT = Leachate sample.

J = Estimated concentration.

U = Not detected. Sample quantitation limits are shown as ( $< \text{___} \text{U}$ ).

Only those analytes detected in at least one of the samples and vinyl chloride are shown on this table.

TABLE A-6 SUMMARY OF SEDIMENT SAMPLES COLLECTED FROM SITE 9 ON 20 SEPTEMBER 2000  
TARGET ANALYTE LIST ELEMENTS BY U.S. ENVIRONMENTAL PROTECTION AGENCY 6000/7000 SERIES METHODS

Compound/Element	MEG	MCL	SED-10	SED-10 (Dup)
			Sediment	Sediment
			Grab Sample	Grab Sample
Aluminum	---	---	4,550	3,660
Arsenic	---	---	2.2	0.99B*
Barium	---	---	18.2	11.4
Beryllium	---	---	0.4B*	0.2B*
Calcium	---	---	878	643
Chromium	---	---	9	6.2
Cobalt	---	---	3.4B*	2.7B*
Copper	---	---	7.9	5.5
Iron	---	---	5,340	4,310
Lead	---	---	18.5	12.3
Magnesium	---	---	1,420N	1,030N
Manganese	---	---	76.8N	64.4N
Mercury	---	---	0.01B*	(<0.01U)
Nickel	---	---	7.1	5.2
Potassium	---	---	733	523
Sodium	---	---	85.8	71.9
Vanadium	---	---	12.7	11
Zinc	---	---	24.1E	17.8E

(a) MEG (Maximum Exposure Guideline) obtained from State of Maine Department of Human Services Maximum Exposure Guidelines, memorandum dated 23 October 1992. Dashes (---) indicate compound has no applicable MEG.

(b) MCL (Maximum Contaminant Level) obtained from 40 CFR Parts 141 and 142 (U.S. EPA 1998). Dashes (---) indicate compound has no applicable MCL.

**NOTE:**

Units are micrograms per liter ( $\mu\text{g}/\text{Kg}$ ).

SED = Stream sediment sample location.

B\* = Analyte concentration is between the Instrument Detection Limit and the Contract Required Detection Limit.

E = Reported value is estimated because of interference.

J = Estimated concentration below detection limit.

U = Not detected. Sample quantitation limits are shown as (< \_\_\_ U).

Only those compounds detected in at least one of the samples and vinyl chloride are shown on this table.

**7 Observations and Lessons Learned.** Rising VOCs will be monitored by the LTM program and formally evaluated in annual reports and the next 5-Year Review in 2004. No other significant observations or lesson's learned noted.

**8 Contact Information.**

8.1 The Navy used the following contractors for the RA:

EA Engineering Science and Technology: Al Easterday  
175 Middlesex Turnpike, Wyman Building  
Bedford, MA 01730  
781.275.8846  
easterd@eaest.com

8.2 No EPA contractors were used on site 9.

8.3 The following companies analyzed samples:

For the Navy: Katahdin Analytical Services  
340 County Rd No. 5  
PO Box 720  
Westbrook, ME 04098  
207.874.2400

For the EPA: None:

8.4 Remedial Project Managers:

For the Navy:  
Lonnie Monaco  
Northern Division  
Naval Facilities Engineering Command  
Code 1821/OM  
10 Industrial Highway, MS 82  
Lester, PA 19113-1090  
610.595.0567  
monacolj@exchange.edfnorth.navy.mil

For NASB:  
(Installation Restoration Manager)  
Tony Williams  
NAS Environmental Office  
Public Works Department  
437 Huey Lane  
Brunswick, ME 04011-5000  
207.921.1719  
williamsA@nasb.navy.mil

For the EPA Region 1:  
Mike Barry (HBT)  
1 Congress St, Suite 1100  
Boston, MA 02114  
617.918.1344  
barry.michael@epa.gov

For the MEDEP:  
Claudia Sait  
17 State House Station  
Augusta, ME 04333-0017  
207.287.7713  
claudia.b.sait@state.me.us

## Appendix A - References

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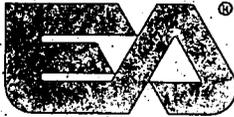
## Appendix B - Glossary of Acronyms and Abbreviations

ARAR	Applicable or relevant and appropriate requirement
AWQC	Ambient water quality criteria
CERCLA	Comprehensive Environmental Response, Comprehensive and Liability Act of 1980
COC	Contaminant of concern
COPC	Contaminant of potential concern
DDT	Dichlorodiphenyltichloroethane
DCA	Dichloroethane
1,2-DCE	1,2-Dichloroethene
EA	EA Engineering, Science and Technology Inc.
ERA	Environmental risk assessment
ESD	Explanation of significant differences
EPA	US Environmental Protection Agency
FFA	Federal facility agreement
FS	Feasibility study
HI	Hazard index
IAS	Initial assessment study
IC'S	Institutional controls
IROD	Interim Record of Decision
IRP	Installation Restoration Program
LTM	Long term monitoring
LTMP	Long term monitoring plan
MCL	Maximum contaminant level
MEDEP	Maine Department of Environmental Protection
MEG	Maine maximum exposure guideline
Ug/l	Micrograms per liter
Mg/kg	Milligrams per kilogram
MSL	Mean sea level
NAS	Naval Air Station
NASB	Naval Air Station Brunswick
NASBINST	Naval Air Station Brunswick Instruction
NPL	National Priorities List
NAVFAC	Naval Facilities Engineering Command
NORTHDIV	Northern Division
NCP	National Contingency Plan

PID	Photo-ionizer detector
PAH	Polycyclic aromatic compounds
PP	Proposed plan
ppb	parts per billion
PPE	Personal protective equipment
ppm	parts per million
OU	Operable unit
O&M	Operations and maintenance
QA	Quality assurance
QC	Quality control
RAB	Restoration Advisory Board
RI	Remedial investigation
ROD	Record of Decision
RA	Remedial action
RPM	Remedial project manager
TAL	Target Analyte List (metals)
TCE	Trichloroethylene
TCA	Trichloroethane
SARA	Superfund Amendments and Reauthorization Act
SVOC	Semi-volatile Organic Compound
USFWS	US Fish and Wildlife Service
UST	Underground Storage Tank
UV	Ultraviolet
UXO	Unexploded ordnance
VOC	Volatile organic compound

### Appendix C - Source Documentation

- Final Long Term Monitoring Plan
- NASBINST5090.1B "Restriction of Excavation Activities"
- First 5-Year Review



**Long-Term Monitoring Plan  
Site 9 (Neptune Drive Disposal Site)  
Naval Air Station, Brunswick, Maine**

**Contract No. N62472-92-D-1296**

**Contract Task Order No. 0047**



**Prepared for**

**Department of the Navy  
Northern Division  
Naval Facilities Engineering Command  
10 Industrial Highway  
Mail Stop No. 82  
Lester, Pennsylvania 19113-2090**

**Prepared by**

**EA Engineering, Science, and Technology  
The Maple Building  
3 Washington Center  
Newburgh, New York 12550**

**August 1999  
FINAL  
296.0047**

DEPARTMENT OF THE NAVY  
NAVAL AIR STATION  
BRUNSWICK, MAINE 04011-5000

IN REPLY REFER TO

5090  
Ser 18800/1150  
November 27, 2000



Michael Barry  
US Environmental Protection Agency, Region 1  
Federal Facilities Section, Mail Stop HBT  
1 Congress Street, Suite 1000  
Boston, Massachusetts 02114

Dear Mr. Barry,

Please find our draft Operating Instruction, NASBINST 5090.1B, Restriction on Excavation Activities and Groundwater Use, for your review and comment. A summary of our responses to your previous review comments is enclosed for your reference, in addition to a copy of your previous review comments.

In order to meet the suspense date contained in our Site 9 Record of Decision, we request your review comments no later than December 13, 2000 so we can incorporate them, recoordinate with you, and post the final instruction by December 31, 2000.

Thank you for your consideration and review of our report. If you have any questions or require additional information, please contact Tony Williams at (207) 921-1719 or by e-mail at [WilliamsA@nasb.navy.mil](mailto:WilliamsA@nasb.navy.mil).

Sincerely,

A handwritten signature in black ink, appearing to read "G. Apraham".

G. APRAHAM  
Environmental Director  
By direction of the  
Commanding Officer

Enclosure:

1. Draft NASBINST 5090.1B
2. Responses to Regulatory Comments (with Atch)

Copy to:  
Maine DEP (Sait)  
NORTHDIVNAVFACENCOM (Monaco)

NAS BRUNSWICK INSTRUCTION 5090.1B

From: Commanding Officer

Subj: RESTRICTION ON EXCAVATION ACTIVITIES AND GROUNDWATER USE

Encl: (1) Hazardous waste and petroleum contaminated sites on NAS Brunswick and Topsham Annex, Maine  
(2) Drawings of "No Digging Areas" and groundwater use restrictions on NAS Brunswick and Topsham Annex, Maine  
(3) NASB Excavation Clearance Permit, 25 September 2000

Ref: DUSD(ES/CL) Memorandum, "Interim Policy on Land Use Controls Associated with Environmental Restoration Activities," 31 Aug 2000, with Attachments

1. Purpose. To provide detailed information on the location of hazardous waste and petroleum sites on NAS Brunswick and Topsham Annex, and to enact internal land use restrictions—in the form of administrative controls—on soil excavation activities or groundwater use at these sites to prevent human exposure to hazardous chemicals.

2. Scope. This instruction applies to all military and civilian personnel assigned to NAS Brunswick, and civilian personnel working under contract with the Navy on NAS Brunswick and Topsham Annex. This instruction pertains to any soil digging, soil excavation, groundwater pumping, and groundwater reuse—for any reason—at any hazardous waste or petroleum site located on NAS Brunswick or at Topsham Annex.

3. Cancellation. NASBINST 5090.1 and NASBINST 5090.1A

4. Discussion.

a. NAS Brunswick is currently on the Environmental Protection Agency's "Superfund" list of hazardous waste sites formerly known as the National Priorities List (NPL). The Navy has conducted comprehensive investigations of the affected areas in close coordination with EPA and Maine's Department of Environmental Protection. Remedial actions have been completed or are in progress. Hazardous contaminants at all of the designated sites are located below ground surface and currently do not present an unacceptable risk to human health or the environment unless they are excavated, pumped, or otherwise disturbed. There will be no soil excavation or groundwater use allowed within any of the broad areas listed in Enclosure (1) and shown in Enclosure (2) without express written approval prior to start of work activities.

# DRAFT

## HAZARDOUS WASTE AND PETROLEUM SITES ON NAS BRUNSWICK & TOPSHAM ANNEX, MAINE NO DIGGING OR GROUNDWATER USE AREAS

### **Sites 1 & 3 — Orion Street Landfill North and Hazardous Waste Burial Area (Figure 1)**

These sites are co-located in the Weapons Storage Area and have restricted access. The sites are bounded by the landfill perimeter road on the north and east, and by Mare (Mere) Brook on the west and south. Groundwater use is restricted for the large area of the base shown that is bounded on the west by Orion Street, on the north by Huey Drive and the Picnic Pond, on the east by the base boundary, and on the south by Harpswell Cove.

### **Site 2 — Orion Street Landfill South (Figure 2)**

This site is located in the Weapons Storage Area and has restricted access. The site is bounded by Orion Street on the west, by the New Gurnet Road on the south, by an unnamed creek along the east and southeast, and by Mare (Mere) Brook on the north. Groundwater use is also restricted for Site 2 since the site is contained within the large Eastern Plume restriction zone described for Sites 1 & 3.

### **Site 4 — Acid/Caustic Disposal Pit (Figure 3)**

This site is located in the new Public Works complex site, in soils beneath the east end foundation of Building 584. Groundwater use is restricted for Site 4 as the site is contained within the large Eastern Plume restriction zone described for Sites 1 & 3.

### **Site 7 — Old Acid/Caustic Disposal Pit (Figure 4)**

This site is located in a clearing that's northeast of the Old Fuel Farm, in the northeast corner of the base. The site is bounded by wooded areas on the west, north, and east sides and by an dirt access road and the northeast corner of the Old Fuel Farm to the south. A small area of soils are suspected to be contaminated with cadmium and the cadmium leaches into the groundwater in the middle of the site. Groundwater use is restricted for Site 7 in the area shown by dashed lines on Figure 4.

### **Site 9 — Neptune Drive Disposal Area (Figure 5)**

This site is located in the community support area of the base beneath the Bachelor Enlisted Quarters (Bldgs 216-220) and the Galley (Bldg 201). The site is bounded by Orion Street on the west, by the BEQ (Bldgs 212-215) on the north, by the Athletic Field House (Bldg 211) and Theater Sewage Lift Station (Bldg 538) on the west, and by the upper impoundment pond to the south. Groundwater use is restricted for Site 9 in the area as previously described and shown by dashed lines on Figure 5.

### **Site 12 — Explosive Ordnance Disposal Training Area (Figure 6)**

This site is located in the southeastern end of the base within the Weapons Storage Area. The area is bounded by woods on the east at the base property line, and wooded areas to the north, south, and west. Analytical results from soil samples taken in the early 1990s had levels less than federal or state soil screening standards; however, the site is still active. The site area has inherent explosive safety concerns

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and soils in the actual detonation pits have a propensity to accumulate metals (inorganics). Changes in land use and groundwater use are restricted for Site 12 in the area shown by dashed lines on Figure 6.

## **Building 95 — Former Insecticide Storage Facility (Figure 7)**

This site is located at the former building and cleanup area located on the northeast corner of the base. The site is located on both sides of Avenue B bounded by Fifth Street on the west, by Bldg 40 on the north, by Sixth Street on the east, and by Fitch Avenue on the south. Groundwater use is restricted for the Bldg 95 site as described above and as shown by dashed lines in Figure 7.

## **Old Navy Fuel Farm (Figure 8)**

This site is located in the northeast section of the base, bounded on the south by Fitch Avenue, on the west by 6<sup>th</sup> Street, and by undeveloped land to the north and east. The Old Fuel Farm was used for bulk fuel storage as the terminus of the Casco Bay (Harpwell) Pipeline from 1952 to its demolition in 1993. A number of documented and undocumented releases occurred during the facility's operation. Approximately 15,000 tons of petroleum contaminated soils were removed in Aug-Oct 2000; however, the groundwater plume remains under study to verify petroleum concentration and extent. Until petroleum levels degrade to accepted regulatory standards, groundwater use is restricted for the Old Fuel Farm as shown by dashed lines in Figure 8.

## **Navy Exchange (NEX) Service Station, Bldg 538 (Figure 9)**

This site is located north of Burbank Avenue behind the Navy Exchange store. Former underground storage tanks released an undetermined quantity of petroleum into soils and groundwater around the tanks and downgradient beneath the station's asphalt driveway and the section of Burbank Avenue between the station and the Family Services Center, Bldg 27. Worker safety precautions are necessary for soil excavation work on utility lines in the area. Petroleum may have migrated into the backfill soils of utility trenches and along utility lines near the plume. Groundwater use is restricted in the area located along both sides of Burbank Avenue, south of Bldg 538 and north of the BEQ (Bldgs 212-215) as shown by dashed lines in Figure 9.

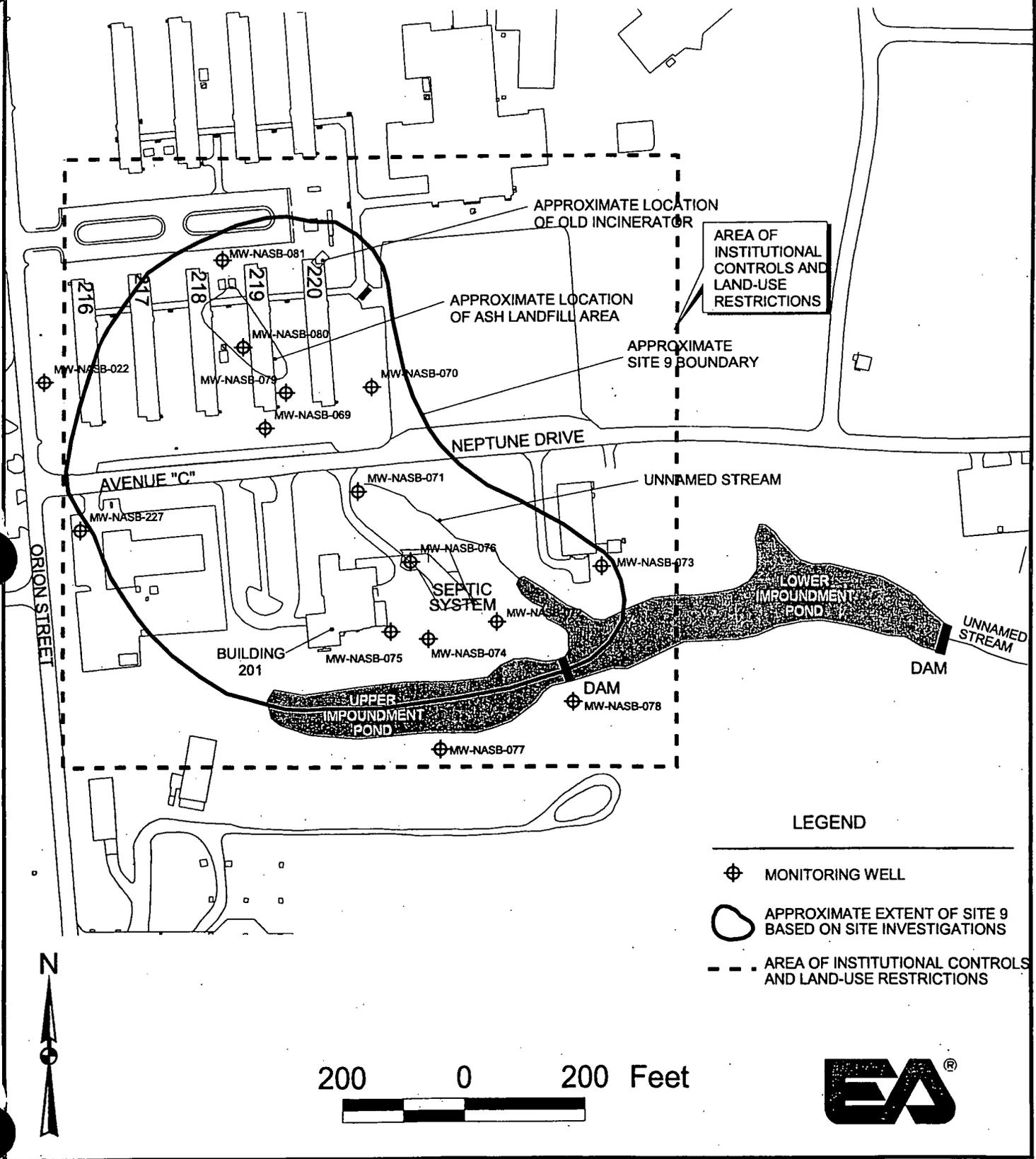
## **Topsham Annex Housing Area (Figure 10)**

- 238-244, 233-239, and 257-263 Parliament Circle, Bldgs 1099, 1114, and 1111 (Figure 10A)
- Housing Maintenance Facility, Bldg 378 (Figure 10A)
- Former Transmitter Facility, Bldg 374 (Figure 10B)

This site is a geographically separated section of NAS Brunswick located in the Town of Topsham on Main Street (US Route 201), about 4 miles northwest of the base. The Annex housing units previously used fiberglass underground heating oil tanks. Several documented releases from failed tank systems occurred from 1990 to 1994. Contaminated soils at these locations were removed during response actions. The housing maintenance facility is located across Canam Drive from a former vehicle refueling station that was demolished. The site of the former transmitter facility (Bldg 374) was used to spread out ("landfarm") petroleum-contaminated soils removed from other sites on the Annex. Worker safety precautions are necessary for soil excavation work on utility lines near the affected housing units. Heating oil may have migrated into the backfill soils of utility trenches and along utility lines near the release areas. Groundwater use is restricted in the entire housing area and around Bldg 378 due to elevated levels of petroleum constituents as shown by dashed lines in Figure 10A.

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# FIGURE 5 - LOCATION OF SITE 9 INSTITUTIONAL CONTROLS



**LEGEND**

-  MONITORING WELL
-  APPROXIMATE EXTENT OF SITE 9 BASED ON SITE INVESTIGATIONS
-  AREA OF INSTITUTIONAL CONTROLS AND LAND-USE RESTRICTIONS



# EXCAVATION CLEARANCE PERMIT

Updated 25 September 2000

DATE: \_\_\_\_\_

1. CLEARANCE IS REQUESTED TO PROCEED WITH WORK AT \_\_\_\_\_  
SERVICE CALL, WORK REQUEST OR CONTRACT NUMBER \_\_\_\_\_  
INVOLVING EXCAVATION OR UTILITY DISTURBANCE.

**2. INSTRUCTION:**

THE EXCAVATION CLEARANCE REQUEST IS USED FOR ANY WORK THAT MAY DISRUPT BASE UTILITY SERVICES AND PROTECTION PROVIDED BY FIRE OR INTRUSION ALARM SYSTEM. THE EXCAVATION CLEARANCE IS PROCESSED PRIOR TO THE START OF WORK. IF DELAYS ARE ENCOUNTERED OR THE JOB SITE CONSTRUCTION CHANGES, THIS CLEARANCE MUST BE REPROCESSED.

**NOTE:** ANY DISCREPANCY BETWEEN ATTACHED DRAWING AND THE ACTUAL CONDITIONS MUST BE NOTED ON THE ATTACHED DRAWING AND RETURNED WITH THIS FORM TO PUBLIC WORKS FMED. CONTACT DAVID DANIELS ( 921-1705) WITHIN 24 HOURS OF EXCAVATION COMPLETION TO REPORT ALL CONDITIONS NORMAL OR ANY DISCREPANCIES.

**3. ADDITIONAL INFORMATION & REQUIREMENTS:**

- A: ALL KNOWN UTILITIES ARE SHOWN ON ATTACHED DRAWING
- B: HAND DIG WITHIN FIVE FEET OF ESTIMATED POSITION
- C: REQUESTING PERSON(S) MUST CONTACT MECHANICAL SHOP ( SHOP 42) AND ELECTRICAL SHOP ( SHOP 41) TO SCHEDULE VISITS BY SHOP SUPERVISORS
- D: REQUESTING PERSON(S) STAN NOCK (921-2467) OF MECHANICAL SHOP 24 HOURS PRIOR TO EXCAVATION
- E: REQUESTING PERSON(S) MUST CONTACT DIG SAFE TO LOCATE PHONE LINES

4. DATE WORK SCHEDULED	5. REQUESTING SHOP/CONTRACTOR	6. PROJECT SUPERVISOR

**7. PW FMED REP.**

DAVID DANIELS 921-1705

**8. PW ELECTRICAL SHOP SUP.**

WAYNE BROWN 921-2626

**9. PW MECHANICAL SHOP SUP.**

STAN NOCK 921-2467

**10. ASBESTOS PROGRAM MANAGER**

CARLA SANDERS 921-921-1708

**11. NATURAL RESOURCE MANAGER**

KARI SCHANK 921-2772

**12. RESTORATION PROGRAM MANAGER**

ANTHONY WILLIAMS 921-1719

**13. GROUND ELECTRONICS MAINTENANCE DIVISION 921-2692**

14. DIG SAFE ( 1-800-225-4977) CALLED?      YES OR NO (CIRCLE ONE)

CLEARANCE DATE: \_\_\_\_\_ CLEARANCE NUMBER: \_\_\_\_\_

THE AREA BELOW IS FOR ANY OTHER SIGNATURES THAT MAY BE NEEDED DUE TO LOCATION OR NATURE OF WORK TO BE PREFORMED.

**2. EPA Review Comments, 14 December 1999 (Attachment 2):**

a. Subject (paraphrased): Although certain physical and administrative controls currently exist to prohibit incidental consumption of groundwater, groundwater ICs should be cited.

*Response: Groundwater ICs have been added to the revised instruction as noted.*

b. Subject (paraphrased): The instruction should address assessment of risks to construction workers and HH&E by contaminated groundwater.

*Response: Groundwater ICs have been added to the revised instruction as noted. Assessment of risks will be performed by the Environmental Division in consultation with our regulatory POCs.*

c. Subject (paraphrased): Need to update Site 9 figure to what's used in the Site 9 ROD.

*Response: Done as suggested.*

d. Subject (paraphrased): Site 9 ROD requires that groundwater restrictions be in place by 31 Dec 2000.

*Response: Groundwater ICs have been added to the revised instruction as noted. We have established a suspense date for signature and posting of this revision by 31 Dec 2000. Internal Navy review and coordination is currently in progress simultaneously with regulatory review in order to expedite this action.*

**2 Attachments:**

1. DEP Letter, 28 Dec 99
2. EPA Letter, 14 Dec 99

**Five-Year Review Report  
Naval Air Station  
Brunswick, Maine**



Prepared by

Department of the Navy  
Northern Division  
Naval Facilities Engineering Command  
10 Industrial Highway  
Mail Stop No. 82  
Lester, Pennsylvania 19113-2090

March 2000  
Revision: FINAL