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1998 Annual Report
Monitoring Events 11 through 13
Site 9: Neptune Drive Disposal Site
Naval Air Station, Brunswick, Maine

Contract No. N62472-92-D-1296
Contract Task Order No. 0047

U.S. NAVAL AIR STATION
BRUNSWICK, MAINE

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

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August 1999
FINAL
296.0047

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8/19/99

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August 1999
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QUALITY REVIEW STATEMENT

Contract No. N62472-92-D-1296 EA Project No.: 29600.47.7598
Contract Task Order No. 0047
Activity: Naval Air Station, Brunswick, Maine

Description of Report/Deliverable:

1998 Annual Report, Monitoring Events 11 through 13, Site 9: Neptune Drive Disposal Site, Naval Air Station, Brunswick, Maine

EA CTO Manager: Peter L. Nimmer, P.G.

In compliance with EA's Quality Procedures for review of deliverables outlined in the Quality Management Plan, this final deliverable has been reviewed for quality by the undersigned Senior Technical Reviewer(s). The information presented in this report/deliverable has been prepared in accordance with the approved Implementation Plan for the Contract Task Order (CTO) and reflects a proper presentation of the data and/or the conclusions drawn and/or the analyses or design completed during the conduct of the work. This statement is based upon the standards identified in the CTO and/or the standard of care existing at the time of preparation.

Senior Technical Reviewer

18 August 1999

James A. Shultz, C.P.G. (Date)
Senior Geologist

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1. INTRODUCTION

1.1 BACKGROUND

Under Contract No. N62472-92-D-1296, Contract Task Order No. 0047, Northern Division, Naval Facilities Engineering Command contracted with EA Engineering, Science, and Technology to perform long-term monitoring at the Neptune Drive Disposal Site (Site 9), Naval Air Station (NAS), Brunswick, Maine. NAS Brunswick is located south of the Androscoggin River between Brunswick and Bath, Maine (Figure 1-1). The layout of Site 9 is shown on Figure1-2.

NAS Brunswick is an active base owned and operated by the Federal government through the Department of the Navy. In 1987, NAS Brunswick was placed on the National Priorities List by the U.S. Environmental Protection Agency (EPA) and is currently participating in the Navy's Installation Restoration Program. At Site 9, the Navy is performing long-term monitoring and maintenance as part of the long-term remedial actions required by the Interim Record of Decision dated September 1994 (ABB-ES 1994a). A Long-Term Monitoring Plan (LTMP) was established pursuant to the Interim Record of Decision (ABB-ES 1995); this document serves as the basis for conducting long-term monitoring activities. The selected site remedy is monitoring to assess the effectiveness of natural attenuation.

1.2 LONG-TERM MONITORING PROGRAM

The LTMP document, which is comprised of a Long-Term Monitoring Program and an addendum to the Quality Assurance Project Plan contained in the LTMP for Building 95, Sites 1 and 3, and Eastern Plume (ABB-ES 1994b), establishes the requirement for monitoring, sampling, and analysis of ground water, surface water, and sediment, along with the implementation of institutional controls to prevent human contact with ground water in the area. The LTMP is in the process of being revised based on data collected from 1994 to 1998.

The objective of the Long-Term Monitoring Program is to obtain data necessary to monitor the long-term effectiveness of the proposed remedial action (i.e., natural attenuation with long-term monitoring and institutional controls) conducted at Site 9. Monitoring and sampling data collected during the performance of long-term monitoring are being used to:

- Assess variations in the concentration of volatile organic compounds (VOC) in ground water, surface water, and sediment to assess the effectiveness of natural attenuation. Vinyl chloride in ground water is the primary chemical of concern at Site 9.

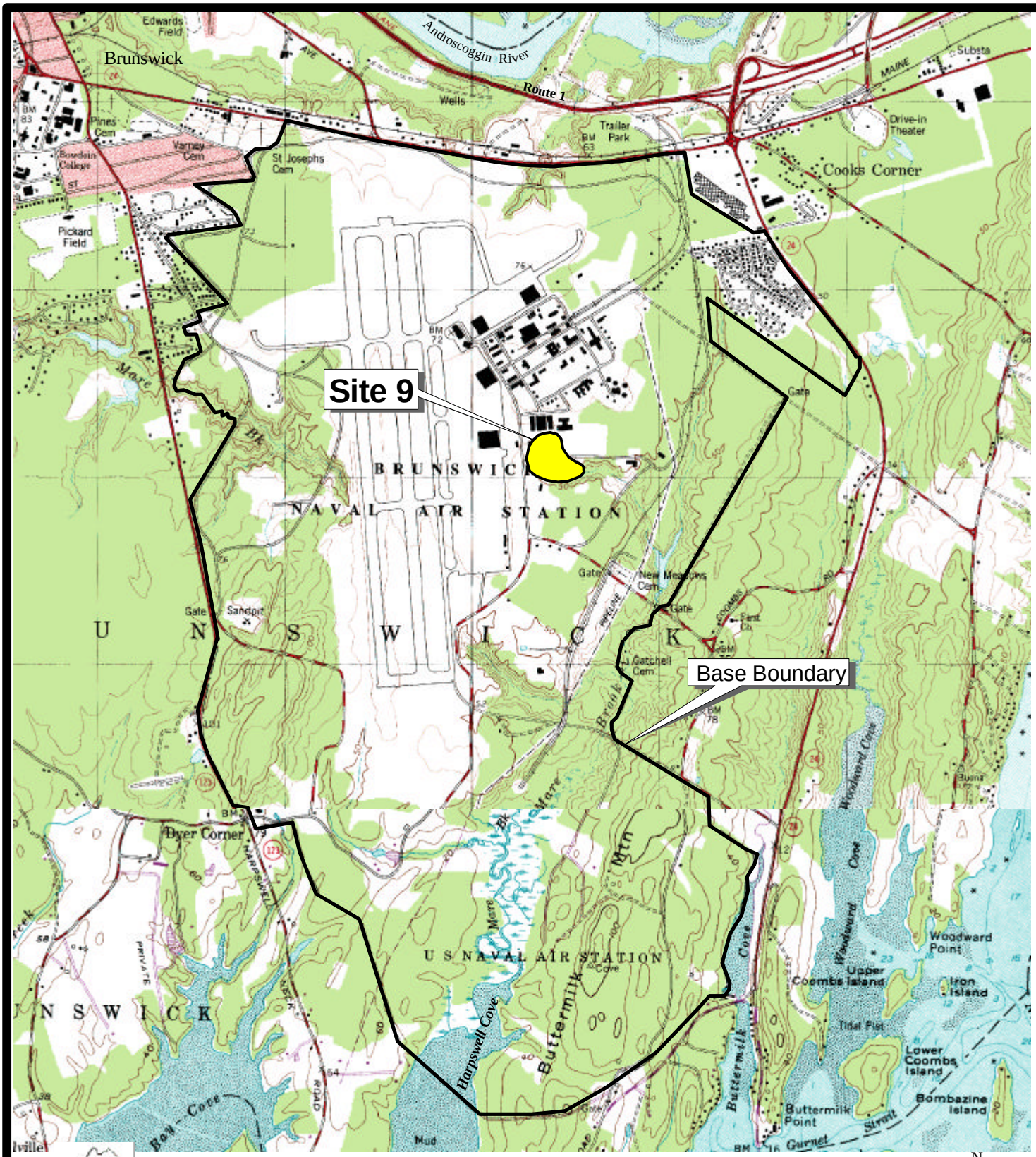
- Assess whether ground water downgradient of the Site 9 landfill is impacted by inorganics from the site.
- Assess variations in the ground-water flow patterns.

- Monitor the structural integrity of the ground-water monitoring wells.

A summary of the sampling and gauging conducted during 1998 is provided in Table 1-1. Although not required by the LTMP, bi-monthly gauging of wells at Site 9 was performed during January, May, and September 1998 to investigate the potential for seasonal changes in ground-water flow patterns at the site. As requested by the Maine Department of Environmental Protection (MEDEP), nine site monitoring wells at the Navy Exchange Service Station were gauged as part of Monitoring Event 13 to assess ground-water flow patterns upgradient of Site 9 where an active air sparging system is in place to address petroleum impact. Ground-water flow data will be gathered to assess whether the Navy Exchange Service Station air sparging may be affecting the ground-water geochemistry of Site 9. Additional information on site gauging and sampling activities completed during 1998 can be found in the reports for Monitoring Events 11, 12, and 13 for Site 9 (EA 1998a, 1998b, 1999).

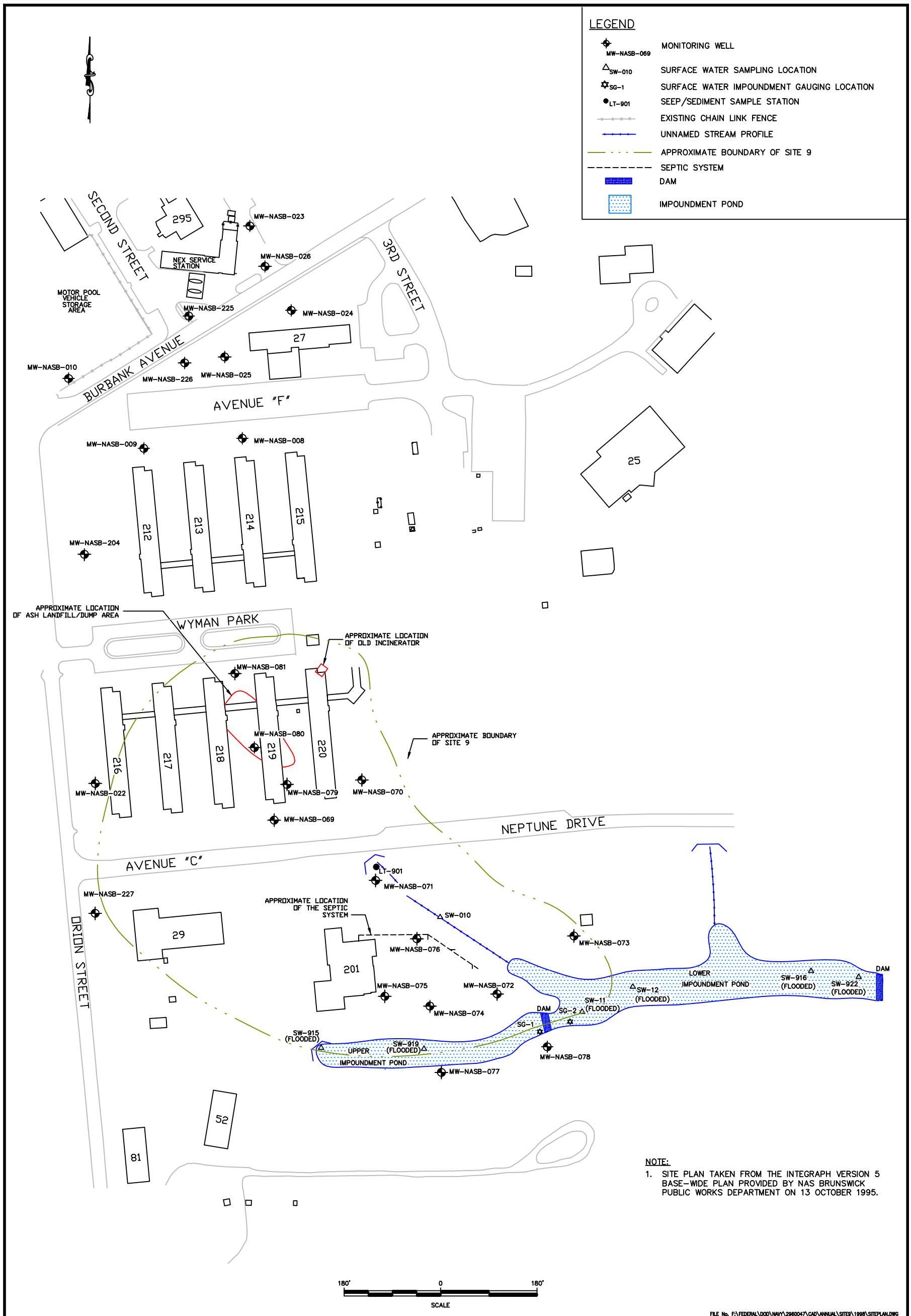
1.3 ANNUAL REPORT ORGANIZATION

This annual report details the project activities conducted as part of the Long-Term Monitoring Program at Site 9 during the three monitoring/sampling events of 1998. Chapter 1 provides an introduction and overview of the Long-Term Monitoring Program activities conducted at the site. Chapter 2 presents site background information and a description of the geology and hydrogeology of the site. Chapter 3 presents the results of the three monitoring events conducted during 1998. Chapter 4 presents conclusions and recommendations based on site data. Appendix A provides details of the installation of monitoring well MW-NASB-227. Graphs showing trends of data collected during the Long-Term Monitoring Program are presented in Appendix B. Response to regulator comments received regarding Annual 1997 and Monitoring Events 11 and 12 reports are included in Appendix C.



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 - 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	16 AUGUST 1999	29600.47	I:\NASB_GIS \NAVY.APR



NOTE:

1. SITE PLAN TAKEN FROM THE INTEGRAPH VERSION 5 BASE-WIDE PLAN PROVIDED BY NAS BRUNSWICK PUBLIC WORKS DEPARTMENT ON 13 OCTOBER 1995.

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

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

FIGURE 1-2
SITE PLAN

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FILE No.
PLN	SAP	SAP	PLN	1"=180'	31 MARCH 1999	29600.47	SITEPLAN

TABLE 1-1 SUMMARY OF 1998 LONG-TERM MONITORING PROGRAM AT SITE 9, NAVAL AIR STATION, BRUNSWICK, MAINE

Well Designation	Previous Well Designation	1998 Sampling Dates	Sample Parameters		
			TCL VOC	TAL Elements	Water Level Gauging [a]
Monitoring Wells					
MW-NASB-069	MW-901	March, July, November	X	---	X
MW-NASB-070	MW-902	Not sampled	---	---	X
MW-NASB-071	MW-903	March, July, November	X	X	X
MW-NASB-072	MW-904	March, July, November	X	X	X
MW-NASB-073	MW-905	Not sampled	---	---	X
MW-NASB-074	MW-906	March, July, November	X	---	X
MW-NASB-075	MW-907	March, July, November	X	---	X
MW-NASB-076	MW-908	March, July, November	X	---	X
MW-NASB-077	MW-909	July	X	---	X
MW-NASB-078	MW-910	July	X	---	X
MW-NASB-079	MW-914	March, July	X	X	X
MW-NASB-080	MW-915	March, July, November	X	X[c]	X
MW-NASB-081	MW-916	March, July	X	X	X
MW-NASB-022[b]	None	November	X	---	X
MW-NASB-204[b]	None	Not sampled	---	---	X
MW-NASB-227[b]	None	November	X	---	X

Sample Location	1998 Sampling Dates	Sample Parameters		
		TCL VOC	TAL Elements	Water Level Gauging
Seep Station				
LT-901 (SEEP)	March, July, November	X	X[c]	---
LT-901 (SED)	March, July	X	X	---
Surface Water				
SW-010	March, July, November	X	---	---
Sediment				
SED-010	March, July	X	X[d]	---
Surface Water Impoundment Gauging				
SG-01	Not sampled	---	---	X[e]
SG-02	Not sampled	---	---	X[e]

(a) Water level gauging conducted in during January, March, May, July, September, and November.
(b) Monitoring wells MW-NASB-022 and MW-NASB-204 were added to the Long-Term Monitoring Program in November 1998. MW-NASB-227 was installed on 9 November.
(c) Inorganic sample not collected in November.
(d) Sample for semivolatile organic compound analysis also collected.
(e) Staff gauges added to Site 9 monitoring program during September 1998. Water elevations collected during September and November 1998.

NOTE: TCL = Target Compound List; VOC = Volatile organic compounds by EPA Method 8260;
TAL = Target Analyte List by EPA Method 6010/7000.
Nine monitoring wells associated with the Naval Exchange Service Station w ere gauged during November 1998 to assess ground-water flow patterns upgradient of Site 9.
Dashes (---) indicate sample parameter not collected or gauging not performed.
Sample locations, frequency, and collection methods for 1998 were implemented in accordance with the Long-Term Monitoring Plan (ABB-ES 1994a) and revisions determined during Data Quality Objective meetings in May 1998. Analytical methods and detection limits were established in the Interim Record of Decision (ABB-ES 1995).

2. SITE BACKGROUND

2.1 SITE DESCRIPTION

The Neptune Drive Disposal Site (Site 9) is an area north of Neptune Drive containing a former incinerator and an abandoned ash landfill/dump area (Figure 1-2). Hazardous materials disposal activities reportedly occurred south of Neptune Drive at unspecified locations. Areas of potential concern include:

- The primary concern at Site 9 is the detected concentrations of vinyl chloride in ground water. Vinyl chloride has been detected in ground-water samples collected as part of the Long-Term Monitoring Program at several monitoring wells at Site 9. A septic system east of Building 201 was thought to be a possible source of VOC in ground water, although an Additional Source Investigation indicated that this area is not a likely source of vinyl chloride contamination in ground water (ABB-ES 1995).

- An incinerator was located at what is currently the northeast corner of Building 220, and an ash landfill/dump area is located in the current area of Buildings 218 and 219. There are no exact data detailing the location or types of wastes handled or disposed at these locations, although wastes may have included solvents that were burned on the ground, paint sludge, and metal shop wastes. Inorganics and semivolatile compounds have been detected in soil and ground water in this area.

- The unnamed stream and impoundment ponds located near Building 201 receive water from the Site 9 area and receive surface runoff from the central portion of NAS Brunswick, including runways, parking lots, and paved roads. Surface water impoundment ponds were constructed in 1997 to capture runoff from the developed portion of NAS Brunswick. Construction of the surface water impoundments have flooded the former southern unnamed stream, and partially flooded the northern unnamed stream.

2.2 GEOLOGY

The Site 9 area is underlain by fine to medium sand at depths ranging in thickness up to 40 ft. The sand unit decreases in thickness to the east and south. Underlying the sand is a transition unit composed of fine sand and silt with clay. A clay unit underlies the transition unit and extends to an undetermined depth. The elevation of the upper surface of the clay unit increases to the east and south. The depth to bedrock at the site has not been determined. Additional details of site geology is presented in previous reports (E.C. Jordan 1991; ABB-ES 1995). Figure 2-1 shows a generalized cross-section through Site 9.

2.3 HYDROGEOLOGY

Ground water occurs at the site at a depth of less than 20 ft below surface grade. Thirteen ground-water monitoring wells are part of the Long-Term Monitoring Program at Site 9 in the shallow overburden. Monitoring well MW-NASB-227 was installed on 9 November 1998 to further characterize VOC concentrations along the western boundary of Site 9 based on discussions with MEDEP and EPA. AppendixA provides details of the installation of monitoring well MW-NASB-227. The well construction information for Site 9 monitoring wells is summarized on Table 2-1. Based on ground-water elevation data gathered during the Long-Term Monitoring Program, the ground-water flow direction is generally toward the unnamed stream and surface water impoundments.

The construction of the surface water impoundment ponds appears to have increased the ground-water elevations adjacent to these bodies, however, the direction of ground-water flow does not appear to have changed (i.e., the ground-water flow direction has continued to be toward the former stream or the current surface water impoundment pond), although the gradient near the stream has varied. Additional detail of site hydrogeology is presented in previous reports (E.C. Jordan 1991; ABB-ES 1995, 1997).

LEGEND

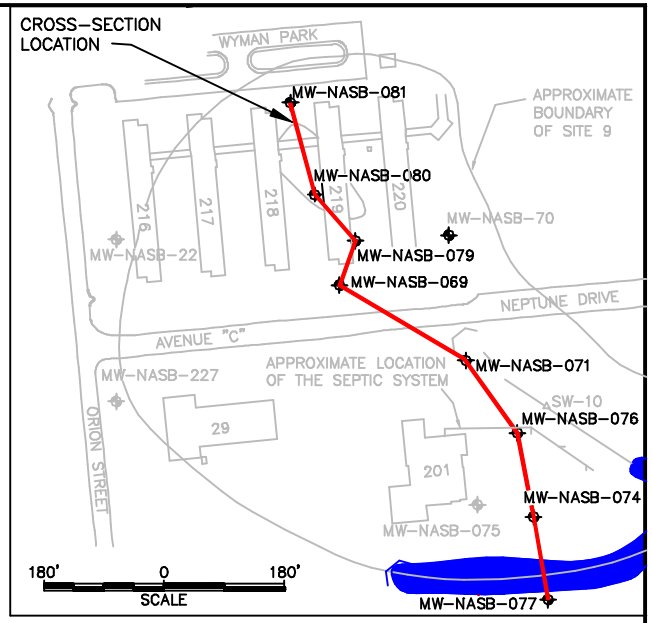
- SAND
- TRANSITION UNIT
- CLAY
- LANDFILL MATERIALS

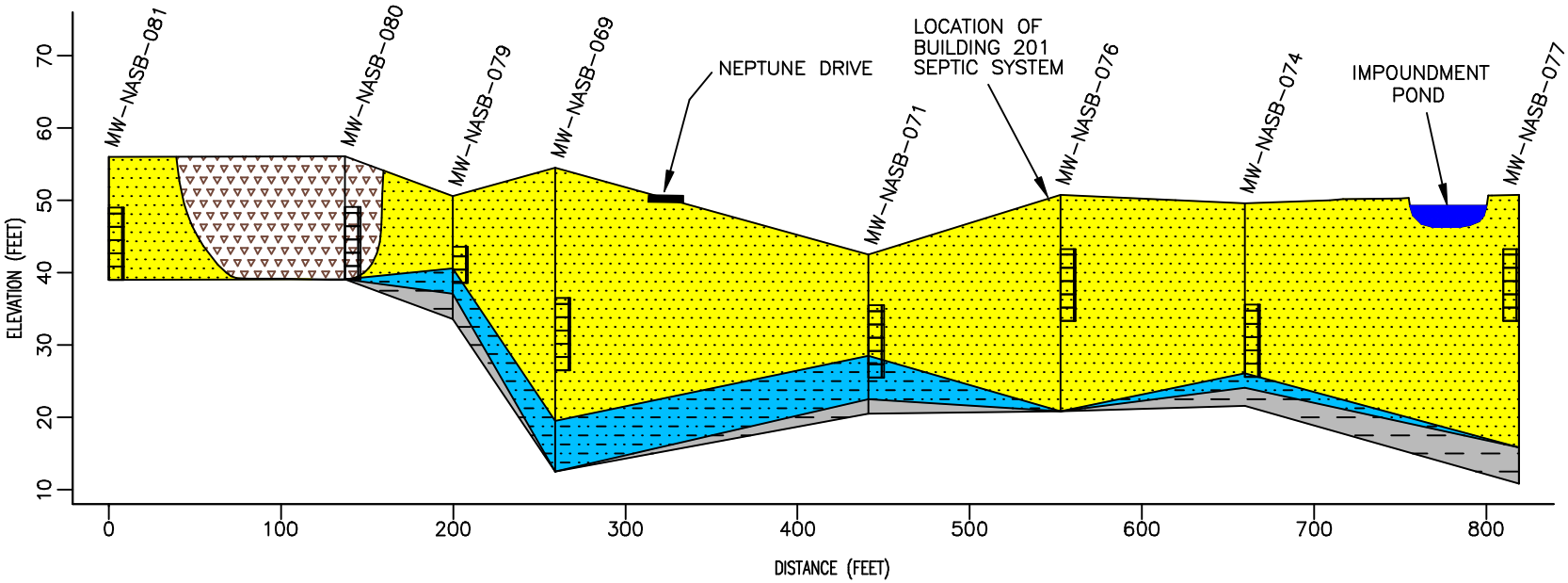
MW-NASB-081

MONITORING WELL AND SCREEN INTERVAL

0 50 100 200

APPROXIMATE SCALE IN FEET





NOTE: VERTICAL EXAGGERATION = 5 TIMES

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

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

FIGURE 2-1
GEOLOGIC CROSS-SECTION OF SITE 9

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FILE No.
PLN	BT	BT	PLN	AS SHOWN	16 AUGUST 1999	29600.47	FIG_2-1

TABLE 2-1 SUMMARY OF MONITORING WELLS AT SITE 9, NAVAL AIR STATION, BRUNSWICK, MAINE

Well Designation	Previous Well Designation	Ground Surface Elevation (ft MSL)	Elevation of Screened Interval (ft MSL)
MW-NASB-069	MW-901	54.5	24.5 to 14.5
MW-NASB-070	MW-902	55.5	40.5 to 30.5
MW-NASB-071	MW-903	42.5	35.5 to 25.5
MW-NASB-072	MW-904	47.7	39.7 to 34.7
MW-NASB-073	MW-905	49.6	24.6 to 19.6
MW-NASB-074	MW-906	49.6	35.6 to 25.6
MW-NASB-075	MW-907	52.5	43.5 to 33.5
MW-NASB-076	MW-908	50.8	43.3 to 33.3
MW-NASB-077	MW-909	56.0	31.0 to 21.0
MW-NASB-078	MW-910	50.6	43.6 to 38.6
MW-NASB-079	MW-914	56.1	49.1 to 39.1
MW-NASB-080	MW-915	56.0	49.0 to 39.0
MW-NASB-081	MW-916	56.5	49.5 to 39.5
MW-NASB-022	---	56.7	51.7 to 41.7
MW-NASB-204	---	59.3	54.3 to 44.3
MW-NASB-227	--	55.7	28.7 to 18.7

NOTE: MSL = Mean sea level.

3. LONG-TERM MONITORING PROGRAM—1998

3.1 WATER LEVEL GAUGING PROGRAM

During the 1998 monitoring events, depth to ground water was obtained (gauged) from 13 ground-water monitoring wells located at Site 9. During Monitoring Event 13, 1 newly installed monitoring well (MW-NASB-227) and 2 existing wells (MW-NASB-022 and MW-NASB-204) were added to the gauging program based on revisions to the LTMP. Well gauging was conducted as part of tri-annual sampling events completed on 3 March, 1 July, and 2 November 1998. Although not required by the LTMP, bi-monthly water level measurements were collected from Site 9 wells on 6 January, 6 May, and 2 September 1998 in order to assess the potential for seasonal changes in ground-water flow direction. Nine additional monitoring wells associated with the Navy Exchange Service Station were gauged as part of Monitoring Event 13 to assess flow patterns upgradient of Site 9. Two stream gauges were added to the impoundment ponds (SG-1 and SG-2) during September 1998 to collect data on water elevation within the ponds. Gauging data are presented in the reports for Monitoring Events 11 through 13 (EA 1998a, 1998b, 1999).

Interpretive water table elevation maps were developed from data collected during the tri-annual (March, July, and November 1998) and three bi-monthly gauging events (January, May, and September 1998). Figures 3-1 through 3-6 provide the interpreted water table contour maps for the six gauging events.

3.2 GROUND-WATER MONITORING AND SAMPLING PROGRAM

Ground-water samples were obtained during Monitoring Events 11 through 13 from monitoring wells at Site 9.

Two monitoring wells were sampled for the first time during Monitoring Event 13 (MW-NASB-227 and MW-NASB-022). Note that these wells were sampled approximately 2 weeks after the other wells at Site 9.

Two wells (MW-NASB-070 and MW-NASB-073) which have not shown past ground-water impacts were not sampled as part of the Long-Term Monitoring Program in 1998. In addition, 2 monitoring wells (MW-NASB-077 and MW-NASB-078) that are sampled annually were sampled during Monitoring Event 12. A summary of the wells included in the Long-Term Monitoring Program at Site 9 is provided in Table 1-1.

Summaries of those compounds/analytes detected in ground-water samples collected during the three sampling events, and those listed as chemicals of concern for Site 9, are provided in Table 3-1.

The analytical results of ground-water samples were compared against State Maximum Exposure Guidelines (MEG) and Federal Maximum Contaminant Levels (MCL) to assess whether analytes exceeded applicable regulatory criteria.

Volatile Organic Compounds

Vinyl chloride was reported at concentrations above the corresponding Federal MCL or State MEG in samples from 4 monitoring wells during 1998: MW-NASB-069, MW-NASB-072, MW-NASB-076, and MW-NASB-080. The highest reported vinyl chloride concentration (23 Fg/L) was reported in the MW-NASB-069 sample during the November 1998 sampling event. No other VOC were reported above MEG/MCL. Graphs showing VOC trends for Monitoring Events 1 through 13 are presented in Appendix B. Contaminants that were detected in the associated method blank have not been used when calculating the total VOC values. VOC results are summarized on Table 3-1.

VOC indicators of natural attenuation assessed include vinyl chloride trends over the Long-Term Monitoring Program and the ratio of vinyl chloride to 1,2-dichloroethene (DCE) overtime.

Vinyl Chloride Trend Data

Figure 3-7 illustrates total VOC and vinyl chloride trends for long-term monitoring data collected between 1995 and 1998 for the 7 monitoring wells which have reported vinyl chloride concentrations in this time period. Regression analyses of vinyl chloride data are presented for 1995 through 1998, and separately for 1998 data to illustrate changing trends with time. The table below summarizes the trends as indicated by the least-mean square regressions shown on Figure 3-7:

Vinyl Chloride Trends		
Well	1995-1998	1998
MW-NASB-069	Increasing	Increasing
MW-NASB-071	Steady at non-detection	Steady at non-detection
MW-NASB-072	Steady	Decreasing
MW-NASB-074	Decreasing	Steady at non-detection
MW-NASB-075	Decreasing	Steady at non-detection
MW-NASB-076	Increasing	Increasing
MW-NASB-080	Steady	Increasing

Vinyl Chloride/Total Dichloroethene Ratio

The assessment of the vinyl chloride/DCE ratio provides a measure of whether dechlorination is occurring in ground water noted by changing concentrations of the parent-daughter compounds. A decreasing concentration of total DCE (parent compound) and an increasing concentration of vinyl chloride (daughter product) suggests the dechlorination process is occurring. Figure 3-8 shows trend data for the ratio of vinyl chloride to total DCE for Monitoring Events 1 through 13

for wells where both compounds were detected in samples. Figure 3-9 illustrates the sum of vinyl chloride and 1,2-DCE concentrations from all Site 9 monitoring wells for long-term monitoring data collected between 1995 and 1998. The table below summarizes the trends in the vinyl chloride to total DCE ratios as shown on Figure 3-8:

Vinyl Chloride to DCE Ratio	
Well	1995-1998 Trend
MW-NASB-069	Stable
MW-NASB-072	Increasing
MW-NASB-074	Stable
MW-NASB-075	Increasing
MW-NASB-076	Increasing
MW-NASB-080	Increasing

Inorganic Analytes

Inorganic analytes were reported in each of the samples from 5 wells analyzed for metals during the 1998 monitoring events. Concentrations of 2 inorganic analytes (chromium and manganese) were detected above the corresponding State MEG during the 1998 sampling events. The inorganic results are summarized in Table 3-1.

3.3 SURFACE WATER, SEDIMENT, AND SEEP SAMPLING

Surface water and sediment samples were collected from 1 location (SW/SED-010) along the northern unnamed stream during 1998. Due to the installation of 2 surface water impoundments at Site 9 in 1997, other surface water and sediment sampling locations sampled during previous long-term monitoring events were flooded and were not sampled during 1998. Table 1-1 summarizes the surface water and sediment sampling completed at Site 9.

Surface Water Sample

Vinyl chloride was detected at surface water sample location SW-010 (1 Fg/L) during Monitoring Event 11 and at 0.6J Fg/L during Monitoring Event 12. One VOC (acetone) was detected in surface water sample SW-010 collected during Monitoring Event 12. A summary of analytical results for surface water samples collected during 1998 is provided in Table 3-2.

Sediment Sample

There were no reported concentrations of vinyl chloride detected in sediment samples collected during 1998. One VOC (acetone) was reported in sediment sample SED-010 collected during Monitoring Event 11. Acetone was reported in the associated source water blank and is

considered a field contaminant. A summary of analytical results for sediment samples collected during 1998 is provided in Table 3-3. Figure 3-10 presents graphs of total semivolatile organic compounds concentrations in stream sediment.

Seep Sample

There were no reported concentrations of vinyl chloride in seep samples collected during 1998. Table 3-4 provides a summary of analytical results for seep samples collected at sample station LT-901.

Seep Sediment Sample

There were no reported concentrations of vinyl chloride in the seep sediment sample during 1998. A large number of VOC were reported in the sample collected during Monitoring Event 12 at estimated concentrations (less than 100 Fg/kg), although similar concentrations were not detected during other sampling events or in associated duplicate sample. Additionally, the reported concentrations for many of the compounds were at or below the detection limit for other monitoring events and the duplicate sample. A summary of the analytical results for sediment samples collected at LT- 901 during 1998 is provided in Table 3-4.

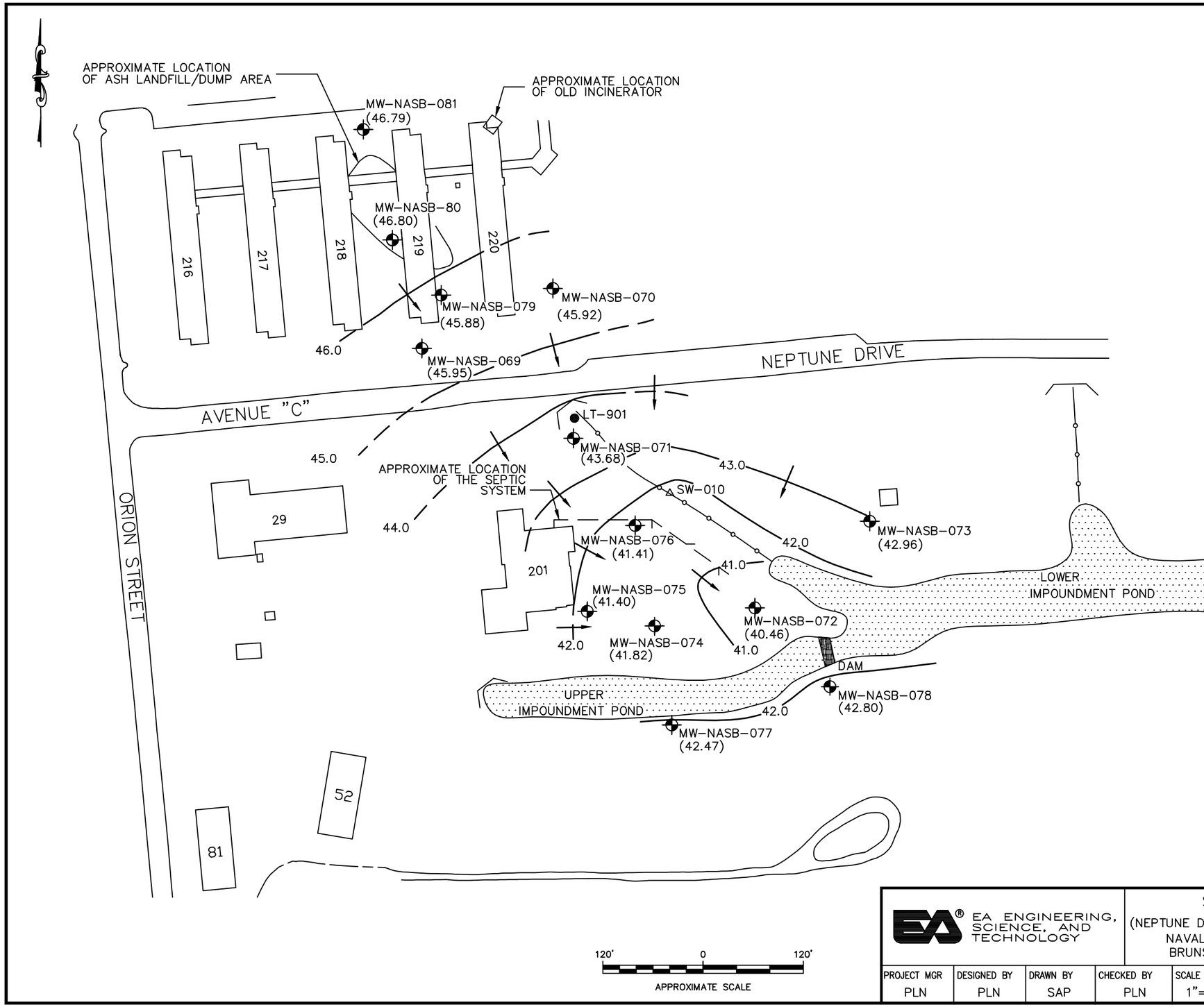
3.4 VISUAL INSPECTION

Site inspection activities were completed during the 1998 monitoring events by a civil engineer in accordance with the LTMP (ABB-ES 1995). Site inspection activities included the following:

- Inspection of the ground surface for evidence of stressed vegetation
- Inspection of the site ground-water monitoring wells
- Inspection of the stream channel for evidence of additional seeps.

Snow cover was present at the time of the March 1998 inspection, limiting visual inspection for stressed vegetation and/or signs of adverse impact. One monitoring well (MW-NASB-073) had a broken lock tab and was subsequently repaired. Site inspections during July and November 1998 indicated no evidence of stressed vegetation in the vicinity of the siteand no significant issues related to monitoring event integrity. No physical evidence of tampering of site wells was observed.

Site wells were observed to be locked, with the exception of MW-NASB-073 during Monitoring Event 11. All wells were found to be labeled. The surface water impoundments were drained for cleaning during the Monitoring Event 12 inspection and were back to previous water elevation during the Monitoring Event 13 inspection. Beaver activity was noted in the vicinity of the impoundment ponds during Monitoring Event 11, although no activity was observed that would affect pond water elevations.



LEGEND

MW-NASB-069 (45.95)	MONITORING WELL (WATER TABLE ELEVATION, FT MSL)
SW-010	SURFACE WATER/SEDIMENT SAMPLING LOCATION
LT-901	SEEP/SEDIMENT SAMPLE STATION
	NORTHERN/SOUTHERN UNNAMED STREAM PROFILE
	SEPTIC SYSTEM
	INTERPRETED DIRECTION OF GROUND-WATER FLOW
41.0	INTERPRETED POTENTIOMETRIC SURFACE DASHED WHERE INFERRED (CONTOUR INTERVAL = 1.0 FT)

NOTE:

1. NO PRECIPITATION OBSERVED DURING GAUGING EVENT
2. SITE PLAN TAKEN FROM THE INTEGRAPH VERSION 5 BASE-WIDE PLAN PROVIDED BY NAS BRUNSWICK PUBLIC WORKS DEPARTMENT ON 13 OCTOBER 1995.
3. CONTOURS REPRESENT EVALUATION OF PROBABLE CONDITIONS BASED ON PRESENTLY AVAILABLE DATA. SOME VARIATION FROM THESE CONDITIONS MUST BE EXPECTED.

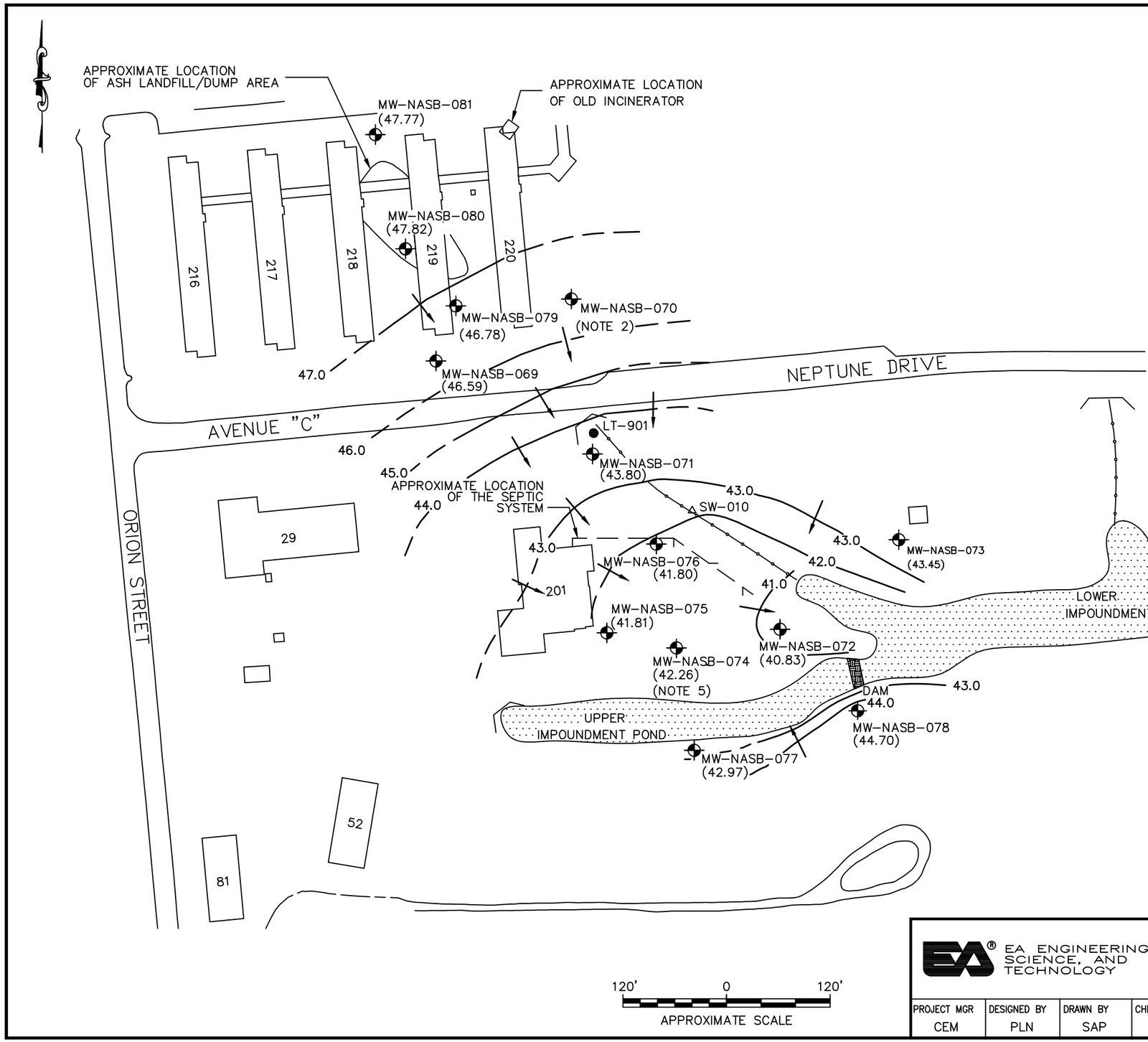
FILE No. F\FEDERAL\DOD\NAVY\2960047\CAD\ANNUAL\SITE9\1998\S9JAN98.DWG

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

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

FIGURE 3-1
INTERPRETED POTENTIOMETRIC SURFACE ELEVATIONS, 6 JANUARY 1998 WELL GAUGING DATA

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FILE No.
PLN	PLN	SAP	PLN	1"=120'	31 MARCH 1999	29600.47	S9JAN98



LEGEND

MW-NASB-069 (46.59)	MONITORING WELL (WATER TABLE ELEVATION, FT MSL)
SW-010	SURFACE WATER/SEDIMENT SAMPLING LOCATION
LT-901	SEEP/SEDIMENT SAMPLE STATION
	NORTHERN/SOUTHERN UNNAMED STREAM PROFILE
	SEPTIC SYSTEM
	INTERPRETED DIRECTION OF GROUND-WATER FLOW
41.0	INTERPRETED POTENTIOMETRIC SURFACE DASHED WHERE INFERRED (CONTOUR INTERVAL = 1.0 FT)

NOTE:

1. NO PRECIPITATION OBSERVED DURING GAUGING EVENT
2. ANOMALOUS WATER ELEVATION, NOT USED DURING CONTOUR MAP GENERATION.
3. SITE PLAN TAKEN FROM THE INTEGRAPH VERSION 5 BASE-WIDE PLAN PROVIDED BY NAS BRUNSWICK PUBLIC WORKS DEPARTMENT ON 13 OCTOBER 1995.
4. CONTOURS REPRESENT EVALUATION OF PROBABLE CONDITIONS BASED ON PRESENTLY AVAILABLE DATA. SOME VARIATION FROM THESE CONDITIONS MUST BE EXPECTED.
5. MONITORING WELL MW-NASB-074 IS SCREENED APPROXIMATELY 10 FT DEEPER THAN SURROUNDING MONITORING WELLS AND SHOWS A HIGHER POTENTIOMETRIC SURFACE, THEREFORE, IT IS NOT INCLUDED IN CONTOUR MAP GENERATION.

FILE No. F:\FEDERAL\DOD\NAVY\2960047\CAD\ANNUAL\SITE9\1998\S9MAR98.DWG

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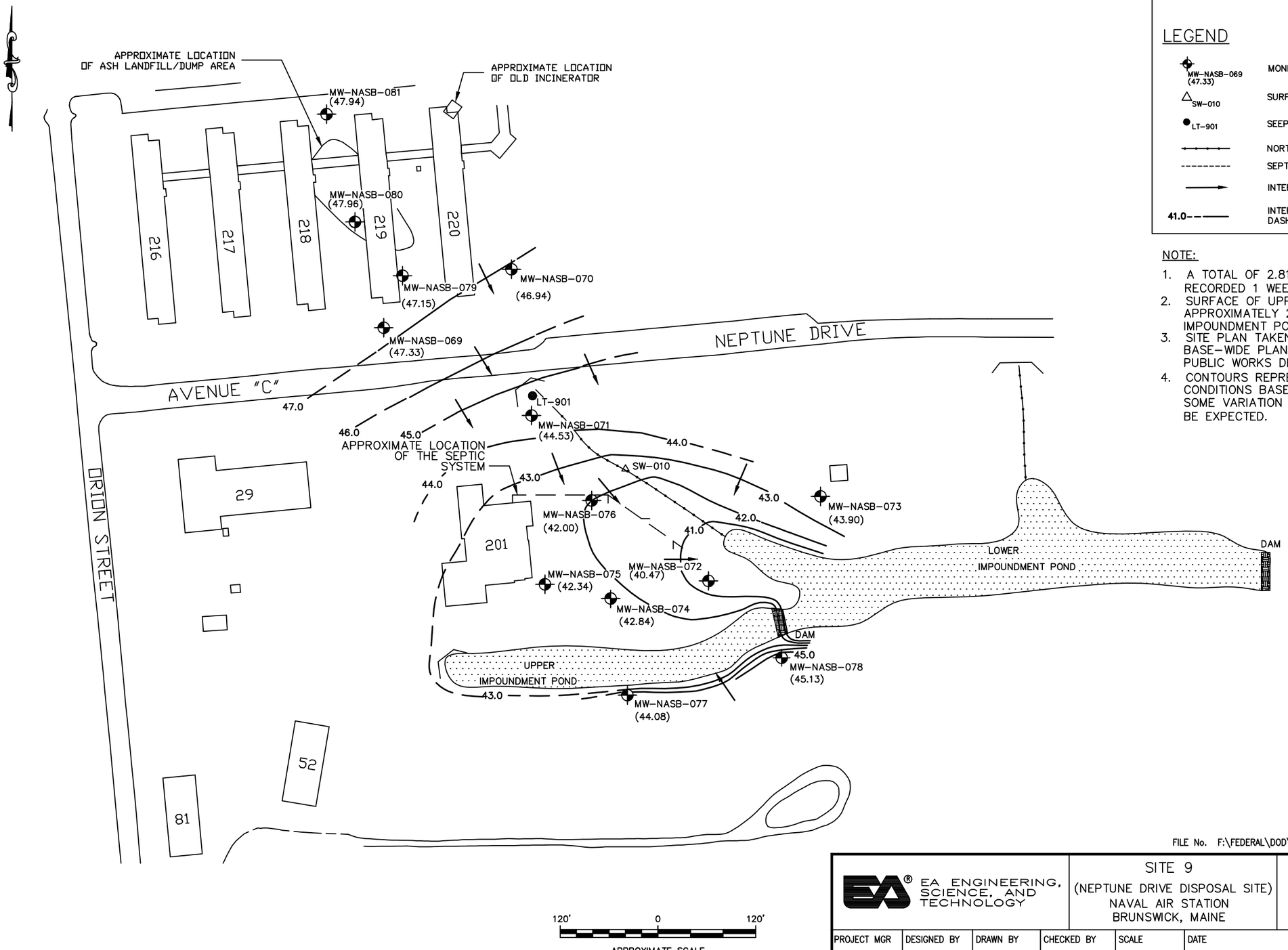
FIGURE 3-2
INTERPRETED POTENTIOMETRIC SURFACE ELEVATIONS, 3 MARCH 1998 WELL GAUGING DATA

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FILE No.
CEM	PLN	SAP	PLN	1"=120'	31 MARCH 1999	29600.47	S9MAR98



LEGEND

MW-NASB-069 (47.33)	MONITORING WELL (WATER TABLE ELEVATION, FT MSL)
SW-010	SURFACE WATER/SEDIMENT SAMPLING LOCATION
LT-901	SEEP/SEDIMENT SAMPLE STATION
	NORTHERN/SOUTHERN UNNAMED STREAM PROFILE
	SEPTIC SYSTEM
	INTERPRETED DIRECTION OF GROUND-WATER FLOW
41.0	INTERPRETED POTENTIOMETRIC SURFACE DASHED WHERE INFERRED (CONTOUR INTERVAL = 1.0 FT)

NOTE:

1. A TOTAL OF 2.81 INCHES OF PRECIPITATION WAS RECORDED 1 WEEK BEFORE AND DURING GAUGING EVENT
2. SURFACE OF UPPER IMPOUNDMENT POND IS APPROXIMATELY 2–4 FT ABOVE LOWER IMPOUNDMENT POND.
3. SITE PLAN TAKEN FROM THE INTEGRAPH VERSION 5 BASE–WIDE PLAN PROVIDED BY NAS BRUNSWICK PUBLIC WORKS DEPARTMENT ON 13 OCTOBER 1995.
4. CONTOURS REPRESENT EVALUATION OF PROBABLE CONDITIONS BASED ON PRESENTLY AVAILABLE DATA. SOME VARIATION FROM THESE CONDITIONS MUST BE EXPECTED.

FILE No. F:\FEDERAL\DOD\NAVY\2960047\CAD\ANNUAL\SITE9\1998\S9MAY98.DWG

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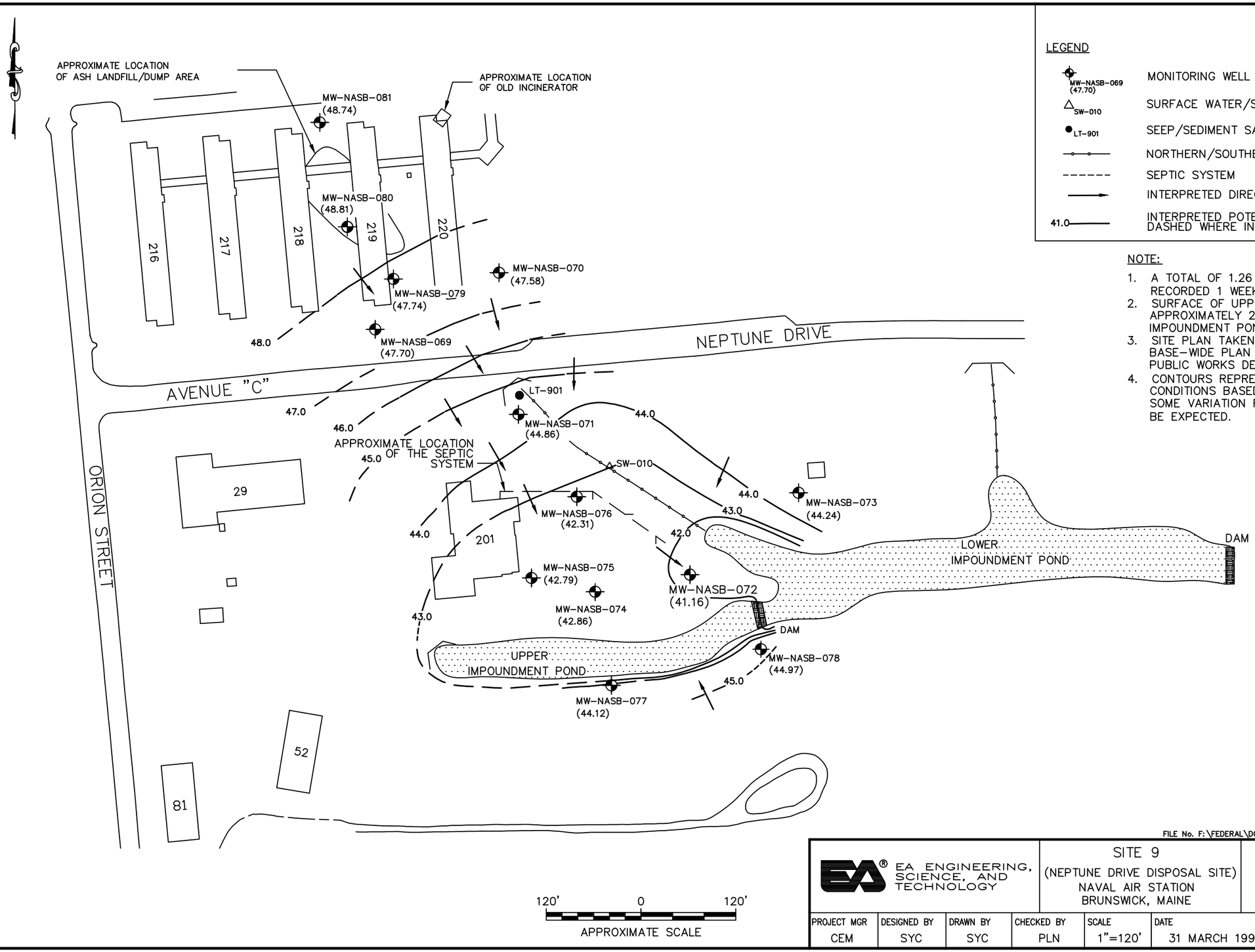
FIGURE 3–3
INTERPRETED POTENTIOMETRIC SURFACE ELEVATIONS, 6 MAY 1998
WELL GAUGING DATA

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FILE No.
CEM	PLN	SAP	PLN	1"=120'	31 MARCH 1999	29600.47	S9MAY98



LEGEND

MW-NASB-069 (47.70)	MONITORING WELL (WATER TABLE ELEVATION, FT MSL)
SW-010	SURFACE WATER/SEDIMENT SAMPLING LOCATION
LT-901	SEEP/SEDIMENT SAMPLE STATION
	NORTHERN/SOUTHERN UNNAMED STREAM PROFILE
	SEPTIC SYSTEM
	INTERPRETED DIRECTION OF GROUND-WATER FLOW
41.0	INTERPRETED POTENTIOMETRIC SURFACE DASHED WHERE INFERRED (CONTOUR INTERVAL = 1.0 FT)

NOTE:

1. A TOTAL OF 1.26 INCHES OF PRECIPITATION WAS RECORDED 1 WEEK BEFORE AND DURING GAUGING EVENT.
2. SURFACE OF UPPER IMPOUNDMENT POND IS APPROXIMATELY 2-4 FT ABOVE LOWER IMPOUNDMENT POND.
3. SITE PLAN TAKEN FROM THE INTEGRAPH VERSION 5 BASE-WIDE PLAN PROVIDED BY NAS BRUNSWICK PUBLIC WORKS DEPARTMENT ON 13 OCTOBER 1995.
4. CONTOURS REPRESENT EVALUATION OF PROBABLE CONDITIONS BASED ON PRESENTLY AVAILABLE DATA. SOME VARIATION FROM THESE CONDITIONS MUST BE EXPECTED.

FILE No. F:\FEDERAL\DOD\NAVY\2960047\CAD\ANNUAL\SITE9\1998\S9JUL98.DWG

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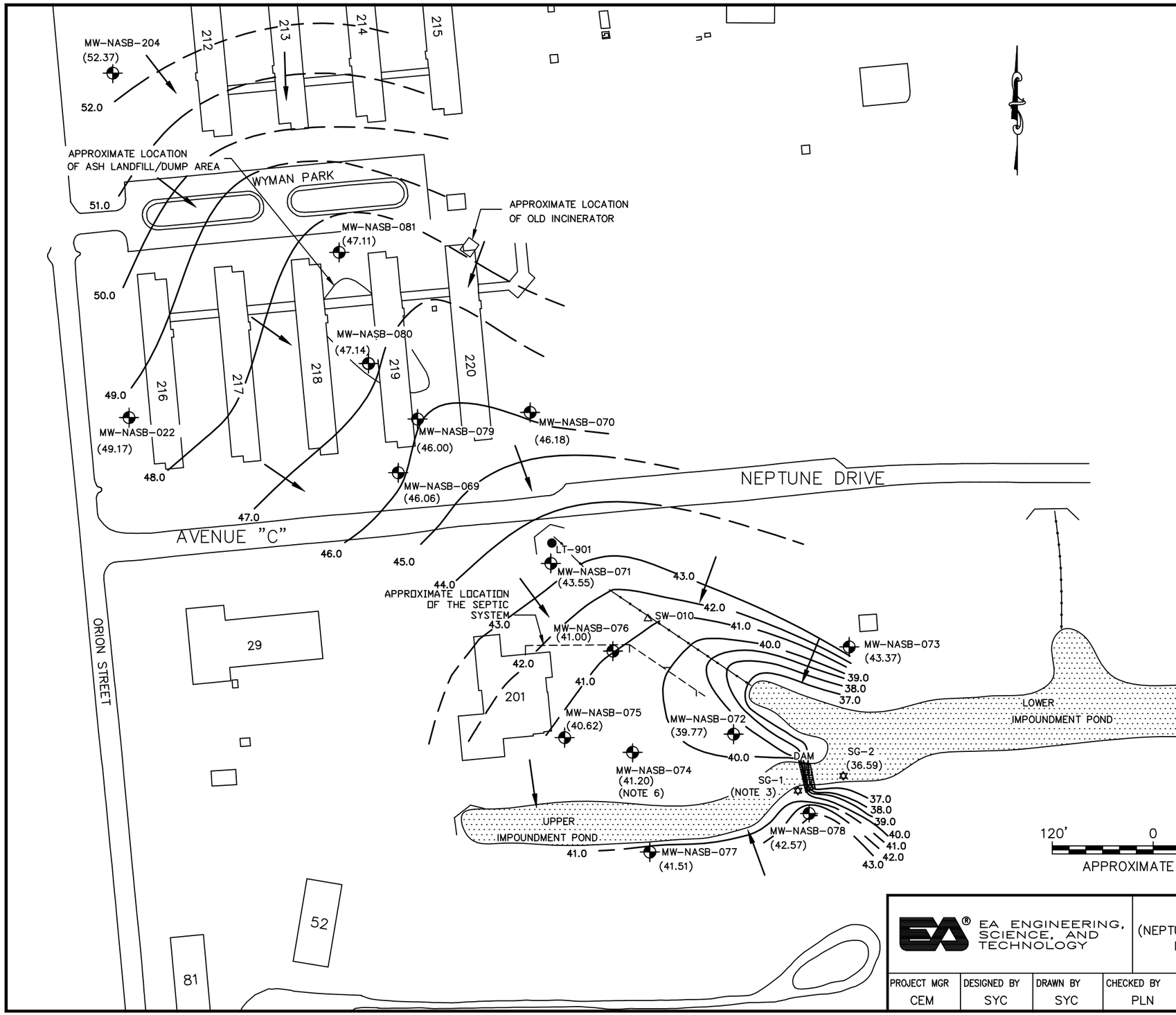
FIGURE 3-4
INTERPRETED POTENTIOMETRIC SURFACE ELEVATIONS, 1 JULY 1998
WELL GAUGING DATA

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FILE No.
CEM	SYC	SYC	PLN	1"=120'	31 MARCH 1999	29600.47	S9JUL98



LEGEND

MW-NASB-069 (46.06)	MONITORING WELL (WATER TABLE ELEVATION, FT MSL)
SW-010	SURFACE WATER SAMPLING LOCATION
SG-1	SURFACE WATER IMPOUNDMENT GAUGING LOCATION
LT-901	SEEP/SEDIMENT SAMPLE STATION
	UNNAMED STREAM PROFILE
	SEPTIC SYSTEM
	INTERPRETED DIRECTION OF GROUND-WATER FLOW
41.0	INTERPRETED POTENTIOMETRIC SURFACE DASHED WHERE INFERRED (CONTOUR INTERVAL = 1.0 FT)

NOTE:

1. A TOTAL OF 0.02 INCHES OF PRECIPITATION WAS RECORDED 1 WEEK BEFORE AND DURING GAUGING EVENT.
2. SURFACE OF UPPER IMPOUNDMENT POND IS APPROXIMATELY 2-4 FT ABOVE LOWER IMPOUNDMENT POND. STREAM GAUGES SG-1 AND SG-2 WERE ADDED DURING SEPTEMBER 1998.
3. STREAM GAUGE STATION SG-1 WAS DRY AT TIME OF GAUGING.
4. BASE MAP DEVELOPED FROM ERM - NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND SURVEYS PERFORMED BY CORNERSTONE PROFESSIONAL LAND SURVEYING, INC., 20 MAY 1994, 19 JULY 1995, AND 5 MAY 1997.
5. CONTOURS REPRESENT EVALUATION OF PROBABLE CONDITIONS BASED ON PRESENTLY AVAILABLE DATA. SOME VARIATION FROM THESE CONDITIONS MUST BE EXPECTED.
6. MONITORING WELL MW-NASB-074 IS SCREENED APPROXIMATELY 10 FT DEEPER THAN SURROUNDING MONITORING WELLS AND SHOWS A HIGHER POTENTIOMETRIC SURFACE, THEREFORE, IT IS NOT INCLUDED IN CONTOUR MAP GENERATION.

FILE No. F:\FEDERAL\DOD\NAVY\2960047\CAD\ANNUAL\SITE9\1998\S9SEP98.DWG

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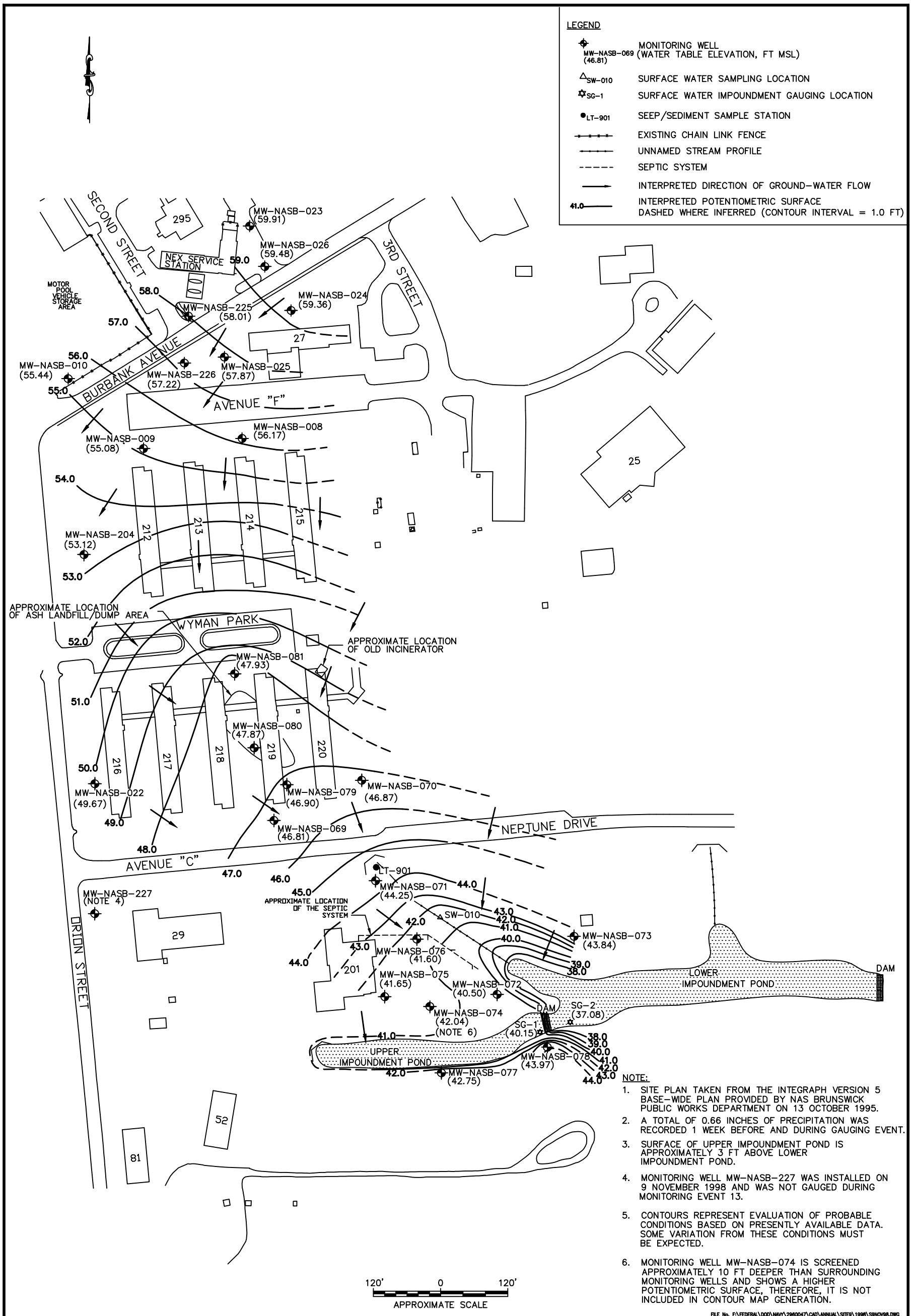
NAVAL AIR STATION
BRUNSWICK, MAINE

FIGURE 3-5
INTERPRETED POTENTIOMETRIC SURFACE ELEVATIONS, 2 SEPTEMBER 1998 WELL GAUGING DATA

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FILE No.
CEM	SYC	SYC	PLN	1"=120'	31 MARCH 1999	29600.47	S9SEP98



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 0.66 INCHES 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. MONITORING WELL MW-NASB-227 WAS INSTALLED ON 9 NOVEMBER 1998 AND WAS NOT GAUGED DURING MONITORING EVENT 13.
5. CONTOURS REPRESENT EVALUATION OF PROBABLE CONDITIONS BASED ON PRESENTLY AVAILABLE DATA. SOME VARIATION FROM THESE CONDITIONS MUST BE EXPECTED.
6. MONITORING WELL MW-NASB-074 IS SCREENED APPROXIMATELY 10 FT DEEPER THAN SURROUNDING MONITORING WELLS AND SHOWS A HIGHER POTENTIOMETRIC SURFACE, THEREFORE, IT IS NOT INCLUDED IN CONTOUR MAP GENERATION.

FILE No. F:\FEDERAL\DOD\NAVY\2960047\CAD\ANNUAL\SITE9\1998\S9NOV98.DWG

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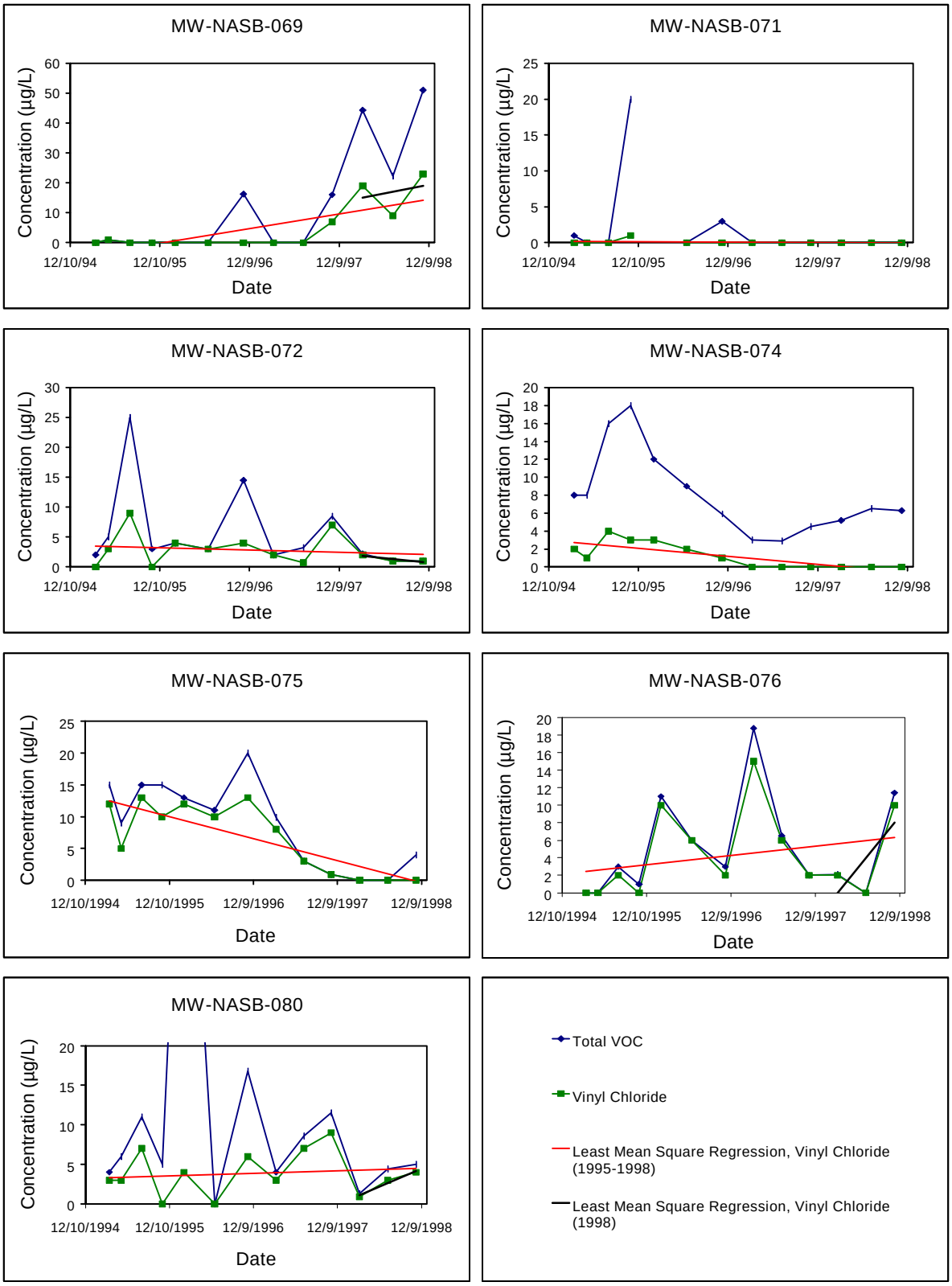
NAVAL AIR STATION
BRUNSWICK, MAINE

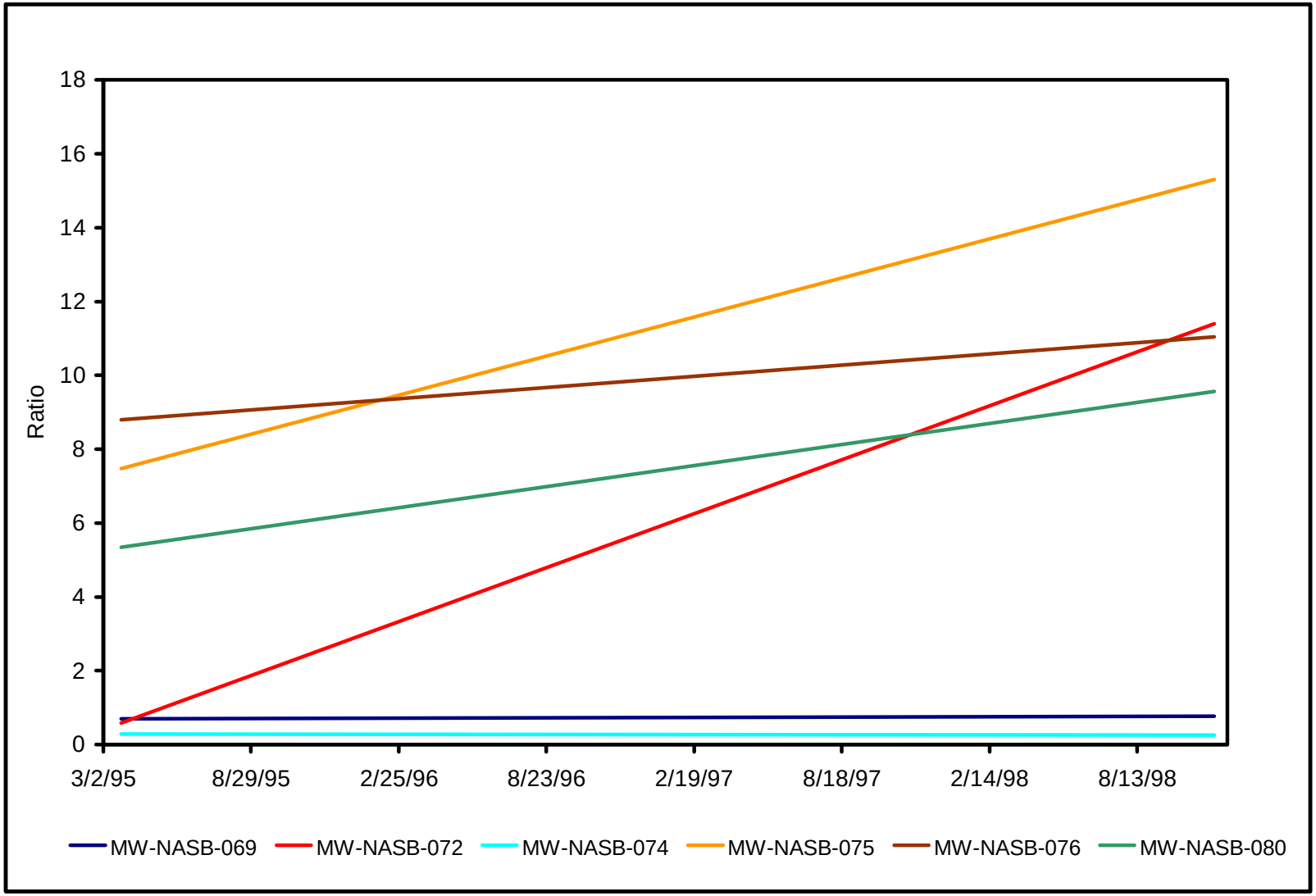
FIGURE 3-6
INTERPRETED POTENTIOMETRIC SURFACE ELEVATIONS, 2 NOVEMBER 1998 WELL GAUGING DATA

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FILE No.
CEM	SAP	SAP	SYC	AS SHOWN	31 MARCH 1999	29600.47	S9NOV98



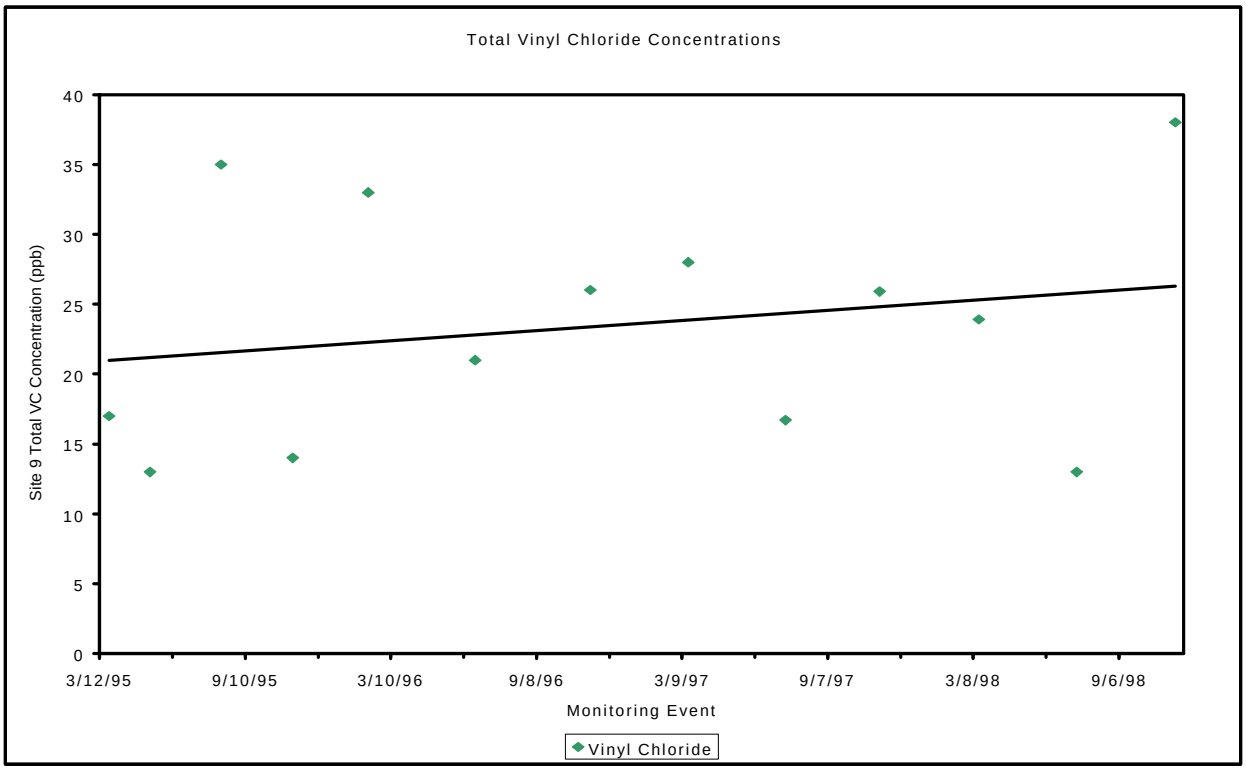
Note: MW-NASB-080 graph scale enlarged to show Vinyl Chloride trends. Acetone concentration detected in March 1995 is considered laboratory contaminant and is shown off graph scale.

Figure 3-7. Total volatile organic compounds and vinyl chloride trends, 1995 - 1998.



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 3-8. Vinyl chloride/total 1,2-dichloroethene ratio trends, Monitoring Events 1 through 13.



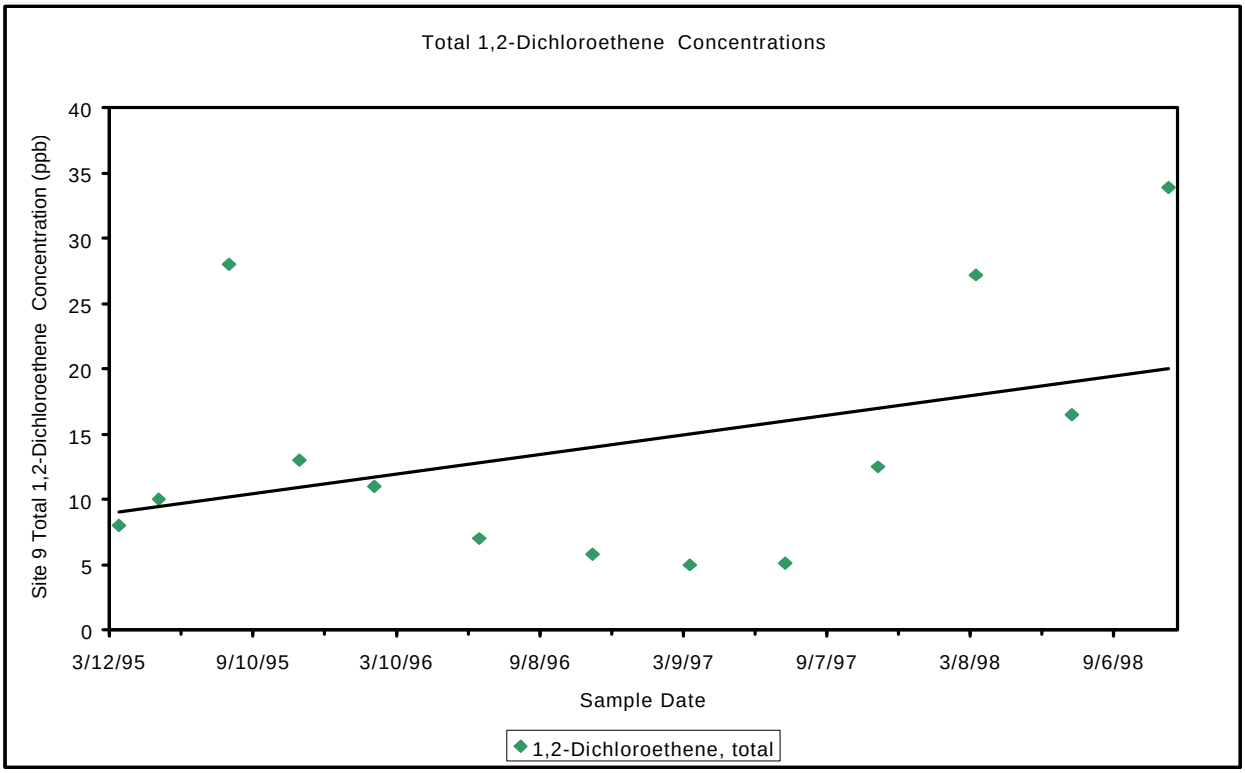
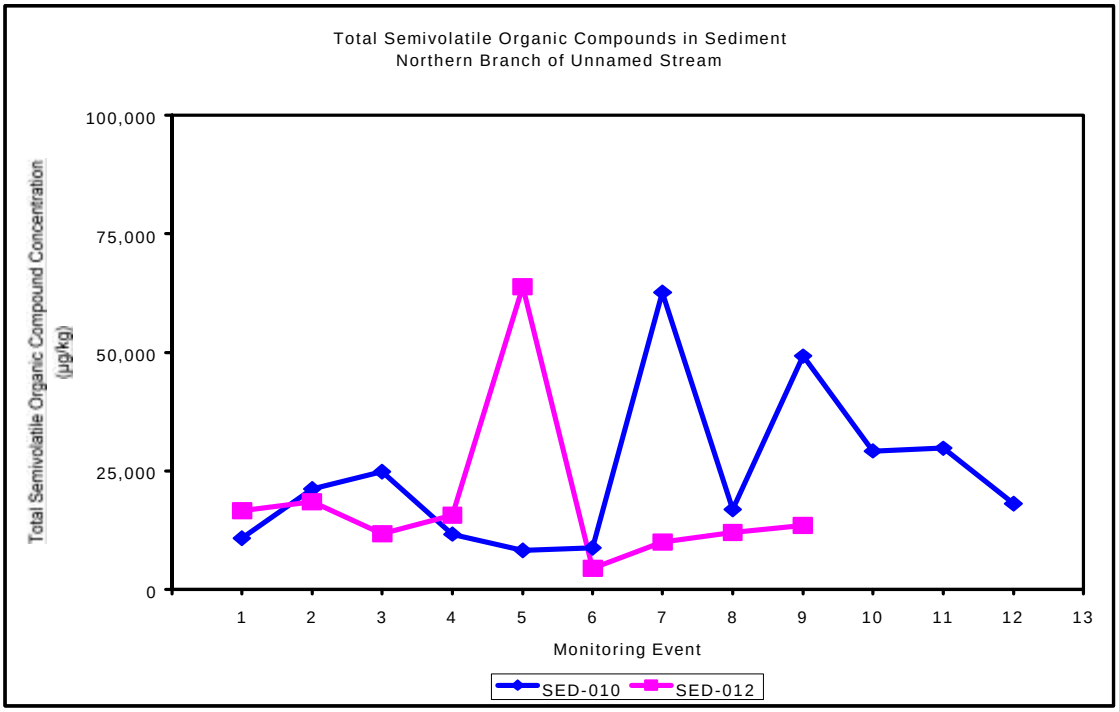
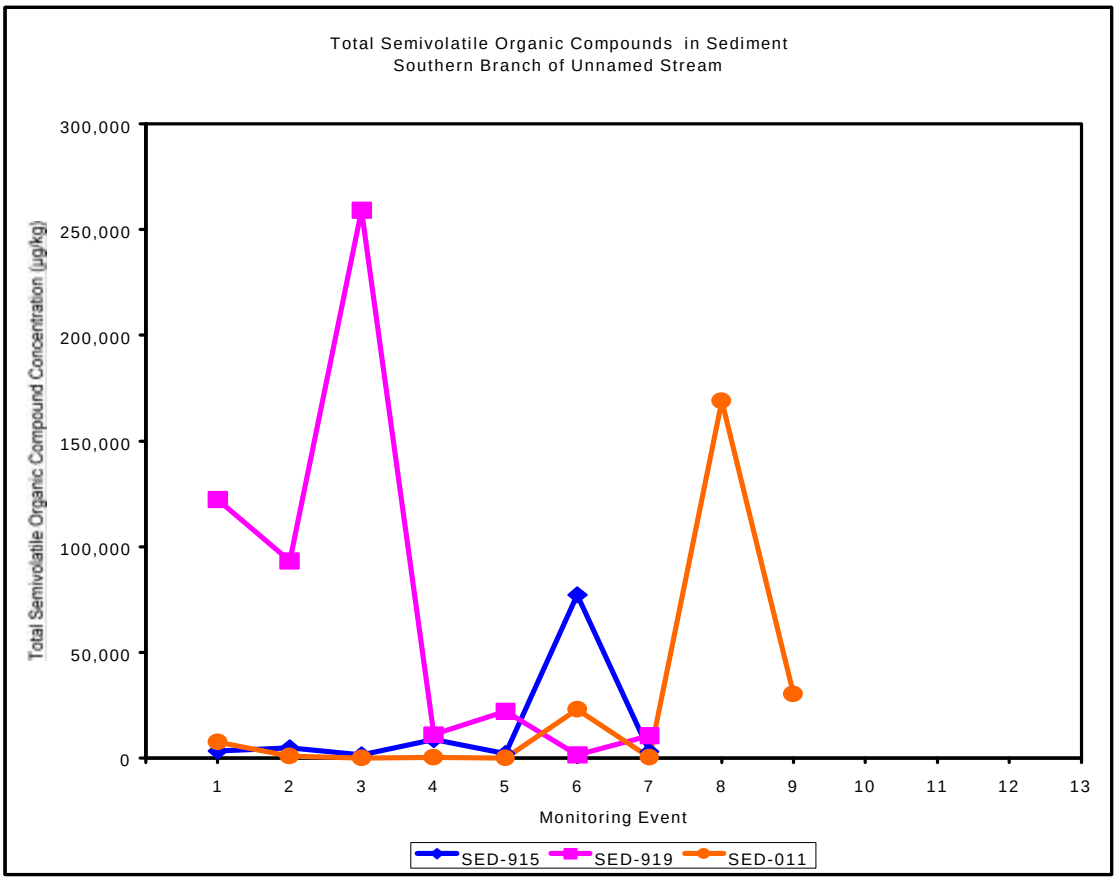


Figure 3-9. Sum of vinyl chloride and 1,2-dichloroethene, total concentration, 1995 - 1998.





NOTE: Sediment station SED- 916 was sampled annually from 1995 to 1997 and therefore is not presented on this graph.

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Figure 3-10. Total semivolatile organic compound trends in sediment, Monitoring Events 1 through 13.

TABLE 3-1 SUMMARY OF ANALYTICAL RESULTS FOR GROUND-WATER SAMPLES COLLECTED DURING MONITORING EVENTS 11 THROUGH 13, SITE 9, NAVAL AIR STATION, BRUNSWICK, MAINE

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 13 (NOV 1998)	MEG[a]	MCL[b]
MW-NASB-022					
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/L)					
Methylene chloride	NS	NS	0.7JB	48	5
Trichloroethene	NS	NS	2B	5	5
Vinyl chloride	NS	NS	(<2U)	0.15	2

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 13 (NOV 1998)	Monitoring Event 13 (Dup) (NOV 1998)	MEG[a]	MCL[b]
MW-NASB-069						
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/L)						
1,2-Dichloroethene,	25	13	28	18	70	70
Acetone	(<5U)	8B	(<5U)	(<5U)	--	--
Methylene chloride	(<1U)	3	4B	(<1U)	48	5
Trichloroethene	0.3J	(<1U)	1B	1	5	5
Vinyl chloride	**19**	**11**	**23**	**16**	0.15	2

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 13 (NOV 1998)	MEG[a]	MCL[b]
MW-NASB-071					
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/L)					
Methylene chloride	(<1U)	(<1U)	3B	48	5
Trichloroethene	(<1U)	(<1U)	1B	5	5
Vinyl chloride	(<1U)	(<1U)	(<1U)	0.15	2
TARGET ANALYTE LIST ELEMENTS BY SW-846 6010/7000 SERIES METHODS (Fg/L)					
Aluminum	131B*	NS	NS	1,430	200[c]
Antimony	2.4B*	NS	NS	---	6
Arsenic	27.2	NS	NS	---	50
Barium	10.6B*	NS	NS	1,500	2,000
Calcium	10,100	NS	NS	---	---
Chromium	(<4.0U)	NS	NS	100	100
Iron	22,200	NS	NS	---	300[c]
Lead	4.1	NS	NS	20	15[d]
Magnesium	4,530	NS	NS	---	---
Manganese	**263**	NS	NS	200	50[c]
Potassium	2,200	NS	NS	---	---
Selenium	2.2B*	NS	NS	10	50
Sodium	35,600	NS	NS	---	---
NOTE: See Standard Notes Table at end of table section.					

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 11 (Dup) (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 12 (Dup) (JUL 1998)	Monitoring Event 13 (NOV 1998)	MEG[a]	MCL[b]
MW-NASB-072							
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/L)							
Total 1,2-Dichloroet	0.2J	0.2J	(<1U)	(<1U)	(<1U)	70	70
Methylene chloride	(<1U)	(<1U)	(<1U)	(<1U)	4B	48	5
Trichloroethene	(<1U)	(<1U)	(<1U)	(<1U)	0.9JB	5	5
Vinyl chloride	**2**	**2**	**1**	**1**	**1J**	0.15	2
TARGET ANALYTE LIST ELEMENTS BY SW-846 6010/7000 SERIES METHODS (Fg/L)							
Aluminum	255	177B*	202	269	NS	1,430	200[c]
Antimony	(<1.0U)	(<1.0U)	1.2B*	1.4B*	NS	---	6
Barium	6.5B*	(<4.0U)	(<4.0U)	(<4.0U)	NS	1,500	2,000
Calcium	14,600	11,000	13,300	11,700	NS	---	---
Copper	4.6B*	3.2B*	2.9B*	2.9B*	NS	---	1,300
Chromium	(<4.0U)	(<4.0U)	(<4.0U)	(<4.0U)	NS	100	100
Iron	268	219	170	360	NS	---	300[c]
Lead	1.7B*	1.1B*	(<1.0U)	1.3B*	NS	20	15[d]
Magnesium	3,730	2,770	3,130	2,800	NS	---	---
Manganese	91.5	76.2	64.2	61.3	NS	200	50[c]
Potassium	673B*	488B*	1,020	999B*	NS	---	---
Sodium	5,860	4,720	8,640	7,540	NS	---	---

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 13 (NOV 1998)	MEG[a]	MCL[b]
MW-NASB-074					
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/L)					
1,2-Dichlorobenzene	0.3J	(<1U)	(<1U)	---	600
1,2-Dichloroethene, total	2	3	2	70	70
Chloroform	0.5J	0.9J	0.6J	---	100
Methylene chloride	(<1U)	(<1U)	0.7JB	48	5
Tetrachloroethene	0.4J	0.6J	0.7J	3	5
Trichloroethene	2	2	3	5	5
Vinyl chloride	(<1U)	(<1U)	(<2U)	0.15	2

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 13 (NOV1998)	MEG[a]	MCL[b]
MW-NASB-075					
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/L)					
Acetone	(<5U)	(<5U)	3J	---	---
Trichloroethene	(<1U)	(<1U)	1	5	5
Vinyl chloride	(<1U)	(<1U)	(<2U)	0.15	2

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 13 (NOV 1998)	MEG[a]	MCL[b]
MW-NASB-076					
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/L)					
1,1-Dichloroethane	(<1U)	(<1U)	0.5J	70	---
1,2-Dichloroethene, total	(<1U)	(<1U)	0.9J	70	70
1,4-Dichlorobenzene	0.1J	(<1U)	(<1U)	27	75
Methylene chloride	(<1U)	(<1U)	4B	48	5
Vinyl chloride	**2**	(<1U)	**10**	0.15	2

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 13 (NOV 1998)	MEG[a]	MCL[b]
MW-NASB-077					
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/L)					
Acetone	NS	6B	NS	---	---
Methylene chloride	NS	4	NS	48	5
Vinyl chloride	NS	(<1U)	NS	0.15	2

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 13 (NOV 1998)	MEG[a]	MCL[b]
MW-NASB-078					
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/L)					
Vinyl chloride	NS	(<1U)	NS	0.15	2

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 11 (Dup) (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 12 (Dup) (JUL 1998)	Monitoring Event 13 (NOV 1998)	MEG[a]	MCL[b]
MW-NASB-079							
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/L)							
Acetone	(<5U)	(<5U)	9B	13B	NS	---	---
Methylene chloride	(<1U)	(<1U)	3	**6**	NS	48	5
Vinyl chloride	(<1U)	(<1U)	(<1U)	(<1U)	NS	0.15	2
TARGET ANALYTE LIST ELEMENTS BY SW-846 6010/7000 SERIES METHODS (Fg/L)							
Aluminum	**1,830**	**2,360**	73.3B*	84.7B*	NS	1,430	200[c]
Antimony	2.5B*	1.1B*	2.0B*	1.7B*	NS	---	6
Arsenic	(<2.0U)	5.1B*	(<2.0U)	(<2.0U)	NS	---	50
Barium	121B*	172B*	163B*	169B*	NS	1,500	2,000
Calcium	13,400	17,300	18,500	19,300	NS	---	---
Chromium	**133**	(<4.0U)	(<4.0U)	(<4.0U)	NS	100	100
Copper	11.4	2.8B*	(<2.0U)	(<2.0U)	NS	---	1,300
Iron	14,200	22,400	12,900	13,300	NS	---	300[c]
Lead	3.3	5.4	(<1.0U)	(<1.0U)	NS	20	15[d]
Magnesium	1,040	1,320	1,130	1,170	NS	---	---
Manganese	68.4	80.8	66	67.8	NS	200	50[c]
Nickel	82	(<5.0U)	(<5.0U)	(<5.0U)	NS	150	100
Potassium	1,500	2,000	2,010	2,150	NS	---	---
Selenium	(<2.0U)	7.6	(<2.0U)	(<2.0U)	NS	10	50
Sodium	3,450	5,170	4,050	3,710	NS	---	---
Zinc	13.4B*	16.9B*	(<12.0U)	(<12.0U)	NS	---	5,000

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 13 (NOV 1998)	MEG[a]	MCL[b]
MW-NASB-080					
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/L)					
1,1-Dichloroethane	0.4J	0.9J	1	70	---
1,2-Dichloroethene, total	(<1U)	0.4J	(<1U)	70	70
Acetone	(<5U)	84EB	(<5U)	---	---
Methylene chloride	(<1U)	0.9J	3B	48	5
Toluene	(<1U)	(<1U)	(<1U)	1,400	1,000
Trichloroethene	(<1U)	(<1U)	1B	5	5
Vinyl chloride	**0.9J**	**5**	**4**	0.15	2
TARGET ANALYTE LIST ELEMENTS BY SW-846 6010/7000 SERIES METHODS (Fg/L)					
Aluminum	137B*	66.4B*	NS	1,430	200[c]
Antimony	(<1.0U)	4.0B*	NS	---	6
Barium	600	469	NS	1,500	2,000
Calcium	41,400	51,600	NS	---	---
Chromium	(<4.0U)	(<4.0U)	NS	100	100
Copper	64.4	(<2.0U)	NS	---	1,300
Iron	1,440	944	NS	---	300[c]
Magnesium	2,360	2,960	NS	---	---
Manganese	152	162	NS	200	50[c]
Potassium	4,150	4,970	NS	---	---
Selenium	(<2.0U)	3.8B*	NS	10	50
Sodium	8,190	9,860	NS	---	---
Zinc	16.0B*	(<12.0U)	NS	---	5,000

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 13 (NOV 1998)	MEG[a]	MCL[b]
MW-NASB-081					
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/L)					
Acetone	(<5U)	10B	NS	---	---
Vinyl chloride	(<1U)	(<1U)	NS	0.15	2
TARGET ANALYTE LIST ELEMENTS BY SW-846 6010/7000 SERIES METHODS (Fg/L)					
Aluminum	83.2B*	(<56.0U)	NS	1,430	200[c]
Antimony	1.4B*	3.6B*	NS	---	6
Barium	27.0B*	25.0B*	NS	1,500	2,000
Calcium	42,000	43,100	NS	---	---
Chromium	(<4.0U)	(<4.0U)	NS	100	100
Lead	1.3B*	1.3B*	NS	20	15[d]
Magnesium	2,990	2,940	NS	---	---
Potassium	3,750	3,760	NS	---	---
Selenium	3.4B*	3.9B*	NS	10	50
Sodium	22,400	17,800	NS	---	---

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 13 (NOV 1998)	MEG[a]	MCL[b]
MW-NASB-227					
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/L)					
1,2-Dichloroethene, total	NS	NS	3	70	70
Methylene chloride	NS	NS	1B	48	5
Tetrachloroethene	NS	NS	1	3	5
Trichloroethene	NS	NS	5B	5	5
Vinyl chloride	NS	NS	(<2U)	0.15	2

TABLE 3-2 SUMMARY OF ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES COLLECTED DURING MONITORING EVENTS 11 THROUGH 13, SITE 9, NAVAL AIR STATION, BRUNSWICK, MAINE

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 13 (NOV 1998)	Monitoring Event 13 (Dup) (NOV 1998)
SW-010				
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/L)				
1,2-Dichloroethene, total	0.7J	0.9J	(<1U)	(<1U)
Acetone	(<5U)	120	(<5U)	(<5U)
Vinyl chloride	1	0.6J	(<2U)	(<2U)
NOTE: See Standard Notes Table at end of table section.				

TABLE 3-3 SUMMARY OF ANALYTICAL RESULTS FOR SEDIMENT SAMPLES COLLECTED DURING MONITORING EVENTS 11 THROUGH 13, SITE 9, NAVAL AIR STATION, BRUNSWICK, MAINE

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 11 (Dup) (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 12 (Dup) (JUL 1998)	Monitoring Event 13 (NOV 1998)
SED-010					
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/Kg)					
Acetone	19	(<14U)	(<12U)	(<11U)	NS
SEMIVOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8270 (Fg/Kg)					
Acenaphthene	460J	(<460U)	210J	130J	NS
Anthracene	590	(<460U)	330J	190J	NS
Benzo(a)anthracene	1,800	120J	1,200	680	NS
Benzo(a)pyrene	2,000	130J	1,300	750	NS
Benzo(b)fluoranthene	3,100	200J	1,900	1,100	NS
Benzo(g,h,i)perylene	1,100	(<460U)	670	510	NS
Benzo(k)fluoranthene	1,100	(<460U)	780	450	NS
bis(2-Ethylhexyl) phthalate	270J	(<460U)	82J	100J	NS
Carbazole	700	(<460U)	400	230J	NS
Chrysene	3,100	(<460U)	1,500	970	NS
Dibenzo(a,h)anthracene	390J	(<460U)	170J	120J	NS
Dibenzofuran	290J	(<460U)	140J	79J	NS
Fluoranthene	4,400	320J	2,600	1,700	NS
Fluorene	560	(<460U)	260J	150J	NS
Indeno(1,2,3-cd)pyrene	1,300	(<460U)	770	540	NS
Naphthalene	120J	(<460U)	(<400U)	(<380U)	NS
Phenanthrene	3,800	190J	2,500	1,600	NS
Pyrene	4,700	270J	3,200	2,300	NS
NOTE: See Standard Notes Table at end of the table section.					

TABLE 3-4 SUMMARY OF ANALYTICAL RESULTS FOR SEEP STATION AQUEOUS AND SEEP SEDIMENT SAMPLES COLLECTED DURING MONITORING EVENTS 11 THROUGH 13, SITE 9, NAVAL AIR STATION, BRUNSWICK, MAINE

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 11 (Dup) (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 12 (Dup) (JUL 1998)	Monitoring Event 13 (NOV 1998)
LT-901 (SEEP)					
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/L)					
Acetone	(<5U)	(<5U)	(<5U)	7	(<5U)
Toluene	(<1U)	(<1U)	0.7J	0.6J	0.8J
TARGET ANALYTE LIST ELEMENTS BY SW-846 6010/7000 SERIES METHODS (Fg/L)					
Aluminum	20,900	15,200	7,020	5,000	NS
Antimony	2.5B*	1.0B*	2.3B*	2.5B*	NS
Arsenic	4.6B*	4.1B*	7.1B*	5.6B*	NS
Barium	286	236	107B*	87.1B*	NS
Calcium	27,400	24,900	29,200	28,100	NS
Chromium	32.5	22.6	13.7	7.3B*	NS
Cobalt	7.5B*	(<7.0U)	(<7.0U)	(<7.0U)	NS
Copper	36.5	26.3	23.2	15.8	NS
Iron	211,000	173,000	44,300	36,200	NS
Lead	226	193	111	81.1	NS
Magnesium	6,820	5,410	4,610	4,000	NS
Manganese	852	733	694	624	NS
Nickel	25.3B*	24.8B*	8.6B*	(<5.0U)	NS
Potassium	4,950	4,170	4,770	4,250	NS
Selenium	7.6	7.9	(<2.0U)	3.6B*	NS
Sodium	19,800	19,100	32,300	32,000	NS
Vanadium	53.2	38.2B*	24.8B*	15.8B*	NS
Zinc	349	263	157	115	NS
NOTE: See Standard Notes table at the end of the table section.					

Analyte	Monitoring Event 11 (MAR 1998)	Monitoring Event 11 (Dup) (MAR 1998)	Monitoring Event 12 (JUL 1998)	Monitoring Event 12 (Dup) (JUL 1998)	Monitoring Event 13 (NOV 1998)
LT-901 (SED)					
VOLATILE ORGANIC COMPOUNDS BY EPA METHOD 8260 (Fg/kg)					
1,1,1-Trichloroethane	(<6U)	(<7U)	5J	(<9U)	NS
1,1,2,2-Tetrachloroethane	(<6U)	(<7U)	8J	(<9U)	NS
1,1,2-Trichloroethane	(<6U)	(<7U)	5J	(<9U)	NS
1,1-Dichloroethane	(<6U)	(<7U)	4J	(<9U)	NS
1,1-Dichloroethene	(<6U)	(<7U)	5J	(<9U)	NS
1,2-Dichlorobenzene	(<6U)	(<7U)	7J	(<9U)	NS
1,2-Dichloroethene, total	(<6U)	(<7U)	11J	(<9U)	NS
1,2-Dichloropropane	(<6U)	(<7U)	6J	(<9U)	NS
1,3-Dichlorobenzene	(<6U)	(<7U)	6J	(<9U)	NS
1,4-Dichlorobenzene	(<6U)	(<7U)	7J	(<9U)	NS
2-Butanone	(<12U)	(<13U)	30	(<18U)	NS
2-Hexanone	(<12U)	(<13U)	9J	(<18U)	NS
4-Methyl-2-pentanone	(<12U)	(<13U)	16J	(<18U)	NS
Acetone	19	(<13U)	95	35	NS
Benzene	(<6U)	(<7U)	6J	(<9U)	NS
Bromodichloromethane	(<6U)	(<7U)	4J	(<9U)	NS
Bromoform	(<6U)	(<7U)	3J	(<9U)	NS
Carbon disulfide	(<6U)	(<7U)	6J	(<9U)	NS
Chloroform	(<6U)	(<7U)	6J	(<9U)	NS
Dibromochloromethane	(<6U)	(<7U)	3J	(<9U)	NS
Ethylbenzene	(<6U)	(<7U)	5J	(<9U)	NS
Methylene chloride	(<6U)	(<7U)	9J	(<9U)	NS
Styrene	(<6U)	(<7U)	3J	(<9U)	NS
Tetrachloroethene	(<6U)	(<7U)	4J	(<9U)	NS
Toluene	(<6U)	(<7U)	44	(<9U)	NS
trans-1,3-Dichloropropene	(<6U)	(<7U)	3J	(<9U)	NS
Trichloroethene	(<6U)	(<7U)	5J	(<9U)	NS
Xylenes, total	(<6U)	(<7U)	15	(<9U)	NS
TARGET ANALYTE LIST ELEMENTS BY SW-846 6010/7000 SERIES METHODS (mg/Kg)					
Aluminum	3,310	4,810	4,880	3,740	NS
Antimony	0.54B*	0.46B*	0.76B*	0.78B*	NS
Arsenic	3.3	2.4	4.7	2.7	NS
Barium	15.1B*	18.6B*	26.6B*	19.7B*	NS
Beryllium	(<0.02U)	0.04B*	(<0.14U)	(<0.11U)	NS
Cadmium	(<0.07U)	(<0.08U)	0.19B*	(<0.11U)	NS
Calcium	782*	705*	1,270	1,070	NS
Chromium	5.8*	6.3*	9.4	7.3	NS
Cobalt	3.2B*	2.8B*	3.4B*	1.4B*	NS
Copper	6.8	4.9	16.8	10.1	NS
Iron	8,570	7,420	13,900	9,840	NS
Lead	80.2	23.2	125	69.7	NS
Magnesium	975*	1,430*	1,570	1,260	NS
Manganese	47.9	70.7	70.9	55.2	NS
Mercury	(<0.05U)	0.05B*	(<0.10U)	(<0.08U)	NS
Nickel	6.1	5.5	9.0B*	5.4B*	NS
Potassium	408*	641*	663	542	NS
Selenium	0.86	0.6B*	0.7B*	(<0.35U)	NS
Silver	0.15B*	0.1B*	(<0.24U)	(<0.18U)	NS
Sodium	121	150	266	215	NS
Thallium	(<0.1U)	(<0.1U)	0.46B*	(<0.16U)	NS
Vanadium	14.4	10.3	21.0	14.2	NS
Zinc	36.3*	21.5*	74.0	38.6	NS

STANDARD NOTES FOR SAMPLES COLLECTED DURING MONITORING EVENTS 11 THROUGH 13 AT SITE 9, NAVAL AIR STATION, BRUNSWICK, MAINE

GROUND WATER

(a) MEG (Maximum Exposure Guideline) obtained from State of Maine Department of Human Services Revised Maximum Exposure Guidelines, memorandum dated 23 October 1992.
Dashes (---) indicate no MEG applicable.
(b) MCL (Maximum Contamination Level) obtained from 40 CFR Parts 141 and 142 (U.S. EPA 1994). Dashes (---) indicate no MCL applicable.
(c) Secondary MCL, based on taste, odor, or color.
(d) Action level.

NOTE:
- NS = Not sampled.
- U = Not detected. Sample quantitation limits are shown as (<____U).
- J = Estimated concentration below detection limit.
- B = Analyte reported in associated method blanks.
- B* = Analyte concentration is between the instrument detection limit and the Contract Required Detection Limit.
- E = Estimated value, analyte concentration exceeds instrument calibration range.
- Dup = Duplicate sample.

Only those analytes detected in at least one of the samples, and the chemicals of concern listed in the Long-Term Monitoring Plan (ABB-ES 1995), are shown on this table.
Detection limits for vinyl chloride established in interim Record of Decision (ABB-ES 1995).
Results in bold indicate concentrations above primary Federal MCL and/or State MEG.
Contaminants that were detected in the associated method blank have not been used when calculating the total volatile organic compound values.

SURFACE WATER

NOTE:
- U = Not detected. Sample quantitation limits are shown as (<____U).
- J = Estimated concentration below detection limit.
- Dup = Duplicate sample.

Only those analytes detected in at least one of the samples, and chemicals of concern listed in the Long-Term Monitoring Plan (ABB-ES 1995), are shown on this table.

SEDIMENT

NOTE:
- NS = Not sampled
- U = Not detected. Sample quantitation limits are shown as (<____U).
- D = This flag indicates an analysis at a secondary dilution factor.
- J = Estimated concentration below detection limit.
- Dup = Duplicate sample

Only those analytes detected in at least one of the samples, and chemicals of concern listed in the Long-Term Monitoring Plan (ABB-ES 1995), are shown on this table.
Results in bold indicate concentrations above primary Federal MCL and/or State MEG.

SAMPLE STATION LT-901 – SEEP AND SEDIMENT

NOTE:
- NS = Not sampled
- U = Not detected. Sample quantitation limits are shown as (<____U).
- J = Estimated concentration below detection limit.
- B* = Analyte concentration is between the instrument detection limit and the Contract Required Detection Limit.
- Dup = Duplicate sample

Only those analytes detected in at least one of the samples, and chemicals of concern listed in the Long-Term Monitoring Plan (ABB-ES 1995), are shown on this table.

4. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

4.1 SUMMARY AND CONCLUSIONS

4.1.1 Water Level Gauging Program

Results of the water level gauging program conducted during 1998 indicate that ground-water flow is generally to the south-southeast at Site 9, toward the unnamed stream located south of Neptune Drive. Flow patterns upgradient of Site 9 are to the southwest based on data collected from monitoring wells at the Navy Exchange Service Station, which appears to be upgradient of Site 9 based on one round of gauging data The interpreted hydraulic gradient is moderately low north of Neptune Drive and shows an increasing gradient to the south. The steepest hydraulic gradients are observed in the vicinity of the northern and southern branches of the unnamed stream and in the vicinity of the impoundment ponds.

Based on data collected during 1998, the following observations are noted:

- Ground water north of Neptune Drive is likely to flow towards to the northern branch of the unnamed streams and associated branch of the lower impoundment pond. Ground-water flow from the portion of Site 9 west and immediately south of Building 201 is likely to flow towards the upper impoundment pond. Ground-water flow to the north towards the upper impoundment pond is consistently observed based on ground-water elevations collected at MW-NASB-077 and MW-NASB-078 south of Site 9. Ground water south of the upper impoundment pond is hydraulically unrelated to Site 9.

- The presence of the Navy Exchange Service Station petroleum remediation system upgradient of Site 9 may be influencing ground-water conditions, notably dissolved oxygen and/or reduction-oxidation potential. The conditions may be in turn affecting concentrations of VOC and inorganic analytes at Site 9. Therefore, additional monitoring wells have been added to the gauging program beginning in November 1998 to assess flow patterns upgradient of Site 9. Following additional data collection during 1999, further discussion will be offered on what effect the Navy Exchange Service Station may be having on Site 9 ground water.

4.1.2 Ground-Water Monitoring and Sampling Program

Volatile Organic Compound Concentrations

The results of the ground-water sampling and analysis program conducted at Site 9 during 1998 indicate the following:

- Site monitoring wells showed a mix of increasing and decreasing vinyl chloride concentration trends during 1998. Three monitoring wells (MW-NASB-069, MW-NASB-076, and MW-NASB-080) located within the central portion of Site 9 have shown consistent increases in vinyl chloride concentrations over the Long-Term Monitoring Program and during 1998. Wells outside this central portion of Site 9 generally show steady or decreasing vinyl chloride concentrations.

- Data suggest dechlorination of 1,2-DCE into vinyl chloride is occurring at Site 9 as illustrated by the following observations:

  — The ratio of vinyl chloride to 1,2-DCE is increasing at the majority of locations that reported these compounds (Figure 3-8). These data are considered general trend indicators for dechlorination because calculation of the vinyl chloride to 1,2DCE ratio is sensitive to a number of factors, including the low concentrations of vinyl chloride and 1,2-DCE that have been reported at Site 9, the variability that may be present because of the laboratory methods, and the significant scatter of the site data. However, based on the overall increasing ratios at Site 9, dechlorination is suggested.

  — Concentrations of vinyl chloride and 1,2-DCE are increasing as shown on Figure 3-9. Although a significant degree of scatter is present in the site data, these trends suggest a correlation may be present between increasing 1,2-DCE concentrations (parent compound) and vinyl chloride (daughter compound) at Site 9. A notable increase has been recorded in total 1,2-DCE concentrations at Site 9 from 1997 to 1998 which may be a precursor to increasing vinyl chloride concentrations as the dechlorination process occurs.

- The degree to which changing ground-water chemistry and contaminant concentrations are related to the upgradient Navy Exchange Service Station cannot be clearly identified at this time. The possible influence of the Navy Exchange Service Station petroleum remediation system will be investigated further after additional ground-water flow data are collected. Samples of Site 9 ground water have not reported significant concentrations of VOC that would be commonly found in gasoline, which suggest impacts at Site 9 may be limited to potential impacts on site dissolved oxygen or reduction-oxidation conditions. Additionally, ground-water samples collected from the Navy Exchange Service Station site have not been analyzed for chlorinated VOC, therefore, direct comparison of such data to Site 9 cannot be done.

- Vinyl chloride was not detected in the sample from recently installed monitoring well MW-NASB-227. Therefore, based on current data, a source of vinyl chloride west of that portion of Site 9 does not appear likely. This is not a source in and of itself; however, because DCE has been detected and is anticipated to degrade, there could be vinyl chloride migrating from this area in the future.

- The observed spikes in VOC and vinyl chloride concentrations followed by decreasing concentrations have been noted in site wells. These results are sensitive to a number of factors, including the low concentrations of vinyl chloride, the variability that may be present because of laboratory methods, and the significant scatter of the site data. Similar patterns are expected to continue.

Inorganic Concentrations

The results of the ground-water sampling and analysis program conducted at Site 9 during 1998 indicate the following:

- Results of samples from the portion of Site 9 within and downgradient of the landfill reported elevated inorganic concentrations above the corresponding MEG and/or MCL, including manganese at MW-NASB-071 and chromium at MW-NASB-079.

4.1.3 Surface Water Sampling Program

Results of the surface water sampling and analysis program conducted during 1998 indicate the following:

- Vinyl chloride was reported in samples of the unnamed stream from two events during 1998. These results represent an increased frequency of vinyl chloride detection in surface water.

4.1.4 Sediment Sampling Program

Results of the sediment sampling and analysis program conducted during 1998 indicate the following:

- There were no reported concentrations of vinyl chloride in the sediment samples.

- Concentrations of semivolatile organic compounds were detected in the stream bed sediment at concentrations consistent with previous results. The presence of polycyclic aromatic hydrocarbons suggest the source for these compounds may be related to sediment originating from the paved portions of NAS Brunswick which drain into the northern unnamed stream.

4.1.5 Seep Sampling Program

Results of the seep sampling and analysis program conducted during 1998 indicate the following:

- There were no reported concentrations of vinyl chloride in the seep samples.

- Results of samples from the portion of Site 9 within and downgradient of the landfill reported elevated inorganics including lead at seep station LT-901. These detected concentrations may be the result of sediment becoming suspended in the seep sample following collection of water quality parameters, or the geochemical environment downgradient of the landfill at Site 9, which may have mobilized inorganic species.

4.1.6 Seep Sediment Sampling Program

Results of the seep sediment sampling and analysis program conducted during 1998 indicate the following:

- There were no reported concentrations of vinyl chloride in the seep sediment samples.

- Several VOC were reported in the seep sediment sample collected during Monitoring Event 12, but not in the associated duplicate sample. This has been attributed to the heterogeneous nature of the stream bed sediment.

- Reported concentrations of inorganics in stream sediment samples may be related to sediment originating from the paved portions of NAS Brunswick (upgradient of Site 9) that drain into the northern unnamed stream.

4.1.7 Visual Inspection

Site inspections indicated no evidence of stressed vegetation in the vicinity of the site during any of the three inspection events. Minor well repairs were conducted at site wells, and no significant well integrity issues were observed.

4.2 RECOMMENDATIONS

Based on an analysis of the data collected at Site 9 as part of the Long-Term Monitoring Program, the following recommendations are made:

- Continue long-term monitoring and sampling during 1999 to assess the effectiveness of natural attenuation with long-term monitoring, the selected remedy for the site.

- Continue gauging of upgradient monitoring wells during 1999 to collect data on ground-water flow pattern upgradient of Site 9.

- Revise sampling locations and analysis in conjunction with MEDEP and EPA. The following changes to the Long-Term Monitoring Program are recommended:

— Continue sampling at surface water location SW-010 for VOC by EPA Method 8260 as part the Long-Term Monitoring Program. The reported concentrations of vinyl chloride at this sample location warrant continued monitoring.

— Add sediment sample for VOC analysis by EPA Method 8260 at location SED-010 back into the Long-Term Monitoring Program to assess whether sediment may be impacted by vinyl chloride.

— Add Target Analyte List metals analysis to the 3 wells downgradient of the ash landfill (MW-NASB-069, MW-NASB-070, and MW-NASB-079) to the Long-Term Monitoring Program to assess the impact on ground water from this potential source area.

— Collect bi-annual samples at long-term monitoring sample points in April and October.

- Re-issue the LTMP based on discussions with MEDEP and EPA.

REFERENCES

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E.C. Jordan Company. 1991. Draft Final Supplemental Remedial Investigation Report - Naval Air Station, Brunswick, Brunswick, Maine. U.S. Department of the Navy. August.

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Appendix A

Details of
Monitoring Well MW-NASB-227
Installation

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Coordinates: 385918.5 562384.5
Surface Elevation: 55.7 Ft
Casing Below Surface:
Reference Elevation: 58.39
Reference Description: TOC

Job. No.	Client	Location
2960047	NAS Brunswick - NAVY	Site 9

Drilling Method: 4" Drive and Wash 300lb hammer - casing
Sampling Method: 2" x 24" long split barrel sampler - 140lb hammer
Boring No. MW-NASB 227
Sheet 1 of 2

Drilling	Start	Finish
	920	1415
	11-9-98	11-9-98

Water Lev.				
Time				
Date				
Reference				

Surface Conditions: grassy strip between Orion Road and Recreational Department Parking Lot

Sample Type	Inches Drvn/In. Recvrd	Dpth. Csg.	Samp. # /samp. depth	PID (ppm) HNu	Blows per 6 in.	Depth in Feet	USCS Log	
SS	24/14	0	0/2	0	3, 5, 8, 8	0, 1	SP	0-14 Light brown to tan, Fine SAND w/ trace asphalt Frags dry
SS	24/10	0	2/4	0	4, 6, 9, 8	2, 3	SP	0-5 as above; 5-10 tan Fine SAND, loose, dry
SS	24/11	4	3/6	0	10, 11, 9, 14	4, 5	SP	0-11 tan Fine SAND, moist
SS	24/11	4	4/8	0	13, 13, 14, 12	6, 7	SP	0-11 Tan Fine SAND, moist, thin layer (2 1/4-1/2 in) with some larger SAND, small gravel at 4"
SS	24/10	8	5/10	0	8, 10, 10, 10	8, 9	SP	0-3 Tan Fine SAND, moist; 3-5 rust colored, Fine medium SAND, mica flakes; 5-8 olive brown layer of very Fine SAND and SILT; 8-10 Olive very Fine SAND, moist
SS	24/11	8	6/12	0	7, 8, 9, 11	10, 11	SP	0-5 olive Brown Fine SAND trace medium SAND; 5-11 Tan brown olive banded Fine SAND, wet
SS	24/13	12	7/14	0	9, 10, 9, 12	12, 13	SM	0-13 tan rust brown, olive banded (1/4-1/2 in) of very Fine SAND, some SILT, some medium SAND wet
SS	24/10	14	8/16	0	4, 6, 6, 9	14, 15	SM	0-10 as above - thin layer of Fine to medium rust colored SAND in tip, wet, loose
SS	24/12	16	9/18	0	8, 6, 8, 10	16, 17	SM	0-12 as above - found 2" olive SILT color from tan to olive, thin bands (1/16 to 1/4" thick) very Fine SAND with some SILT, wet
SS	24/14	18	10/20	0	6, 7, 8, 8	18, 19	SM	0-7 as above - tan to olive SILT to very Fine SAND; 7-14 Brown Fine SAND, wet, loose
						20		SS = Split barrel sample.

Logged by: Paul Higgins
Date: 9 November 1998
Drilling Contractor: Northeast Drilling
Driller: Tim Whitman

WELL SPECIFICATIONS:

Diam. of casing: 2
BOH: 42
Screen Interval: 37-27'
Riser Interval: 27-+3
Sandpack: 38-26
Bentonite: 42-38, 26-24
Grout: 24-0
Cover: 4" Steel Casing

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Coordinates: 385918.5 562384.5
Surface Elevation: 55.7 Ft MSL
Casing Below Surface:
Reference Elevation: 58.39 Ft MSL
Reference Description: TOC

Job. No. 296004 | Client NAVY-NAS Brunswick | Location Site 9
Drilling Method: 4" Drive Wash 300lb hammer casing
Boring No. MW-NASB-227
Sampling Method: 2" x 24" long split barrel sampler 140lb hammer
Sheet 2 of 2

Water Lev.					Drilling Start	Drilling Finish
Time					920	1415
Date					11-9-98	11-9-98
Reference						

Surface Conditions: grassy strip between Orion Rd and Recreational Department Parking Lot

Sample Type	Inches Drvn/In. Recvrd	Dpth. Csg.	Samp. # /samp. depth	PID (ppm) HNu	Blows per 6 in.	Depth in Feet	USCS Log	
SS	24/12	20	11/22	0	6 6 7 13	20 21	SP	0-12 Tan to brown Fine SAND, loose, wet, Several minor SILT/CLAY lenses, 1/16 1/8" thick through sample interval
SS	24/14	22	12/24	0	6 7 8 13	22 23	SP SM	0-10 olive brown Fine SAND, wet loose 10-14 bands of rust to olive colored very Fine to SILT, wet
SS	24/11	24	13/26	0	8 6 10 9	24 25	SP	0-11 as in interval 10-14 above w/ very Fine to Fine SAND. At 3in. - one 1" rust band, very Fine SAND
SS	24/13	26	14/28	0	6 7 10 12	26 27	SP	0-13 rusty ~~to~~ tan to brown Fine SAND, loose, wet
SS	24/10	28	15/30	0	9 11 14 14	28 29	SP	0-10 brown, Fine to very Fine SAND, loose, wet
SS	24/14	30	16/32	1	4 6 9 10	30 31	SP	0-6 as above 6-14 brown to olive brown, very Fine to Fine SAND with distinctive bands of colors, loose, wet
SS	24/12	32	17/34		4 4 6 10	32 33	SP	0-12 brown to olive brown, Fine SAND
SS	24/16	34	18/36		5 8 10 9	34 35	SP	0-8 as above 8-16 rust colored bands of very Fine to Fine SAND intermixed with olive brown very Fine to Fine SAND loose, wet
SS	24/13	36	19/38		4 6 4 4	36 37	SP	0-3" as in 8-16 interval above 3-12 olive brown Fine SAND loose, wet 12-13 gray very Fine SAND and SILT, wet
SS	24/19	38	20/40		WOR WOR WOR WOR	38 39	CL	0-19 gray CLAY/SILT
SS	24/24	40	21/42		WOR ↓	40	CL	SS = Split barrel sample. as above Bottom of hole 42 Ft.

Logged by: Paul Higgins
Date: 9 November 1998
Drilling Contractor: Northeast Drilling
Driller: Tim Whitman

WELL SPECIFICATIONS:

Diam. of casing: 2
BOH: 42
Screen Interval: 37-27
Riser Interval: 27-+3
Sandpack: 38-26
Bentonite: 42-38, 26-24
Grout: 24-0
Cover: 4" Steel casing

EA Engineering, Science, and Technology

FIELD RECORD OF WELL DEVELOPMENT

Project Name: Site 9	Project No: 29600477503	Date: 11/13/98
EA Personnel: SYC	Development Method: surge, bail	
Weather/Temperature/Barometric Pressure: sunny, 50		Time: 1215

Well No.: MW-NASB227	Well Condition: Good
Well Diameter: 2	Measurement Reference: TOC
Well Volume Calculations	
A. Depth To Water (ft): 9.76	D. Well Volume/ft: 0.167
B. Total Well Depth (ft): 40.60	E. Total Well Volume (gal)[C*D]: 5.15
C. Water Column Height (ft): 30.84	F. Five Well Volumes (gal): 26

Parameter	Beginning	1 Volume	2 Volumes	3 Volumes	4 Volumes	5 Volumes
Time (min)	1230					
Turbidity (nTu)	216					
Purge Rate (gpm)						
Volume Purged (gal)	5					
pH	6.02					
Temperature (°C)	11.95					
Conductivity (μmhos/cm)	109					
eH (mV)	176					

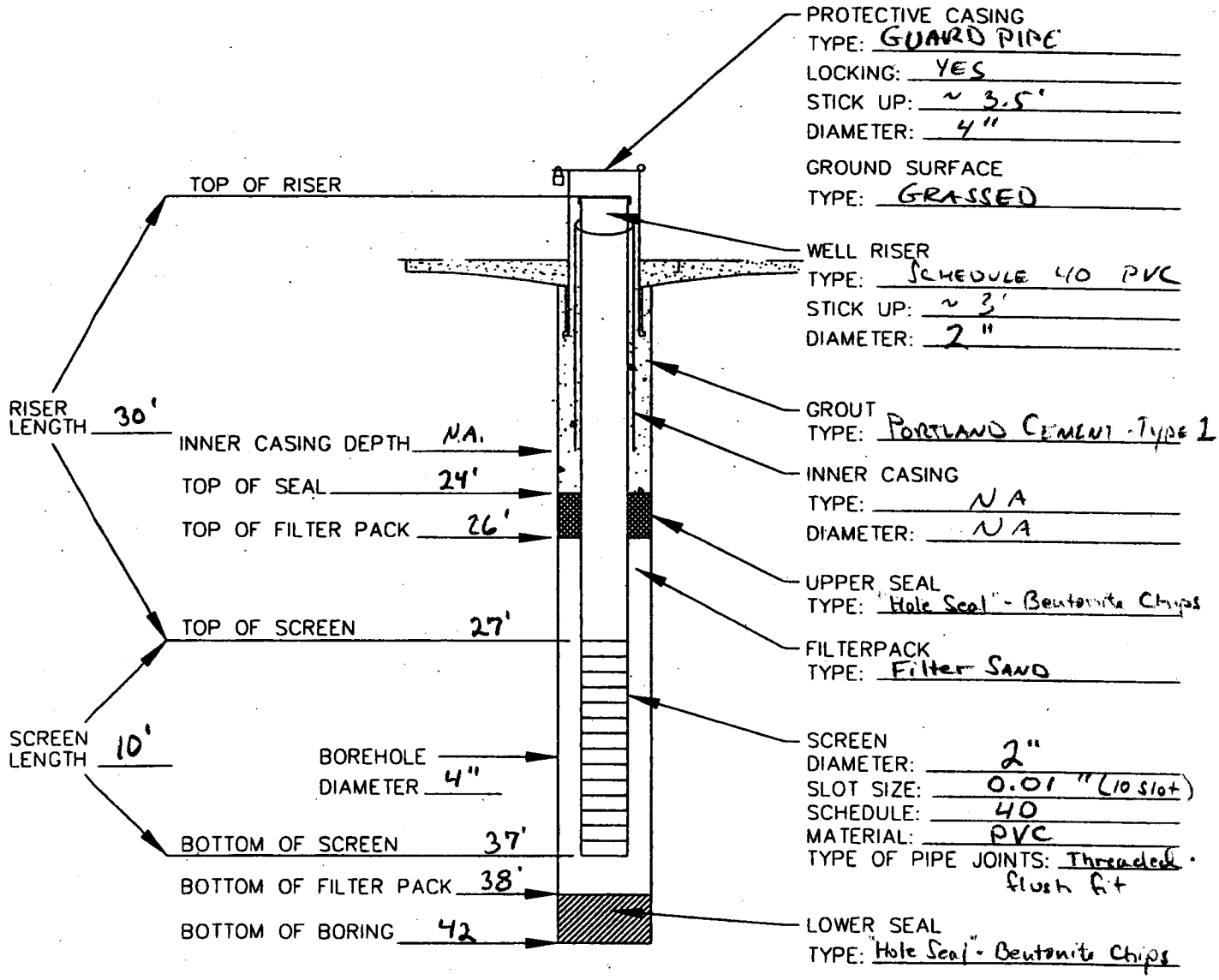
Parameter	6 Volumes	7 Volumes	8 Volumes	9 Volumes	10 Volumes	End
Time (min)						1430
Turbidity (nTu)						8
Purge Rate (gpm)						
Volume Purged (gal)						60
pH						6.61
Temperature (°C)						13.41
Conductivity (μmhos/cm)						115
eV (mV)						219

COMMENTS AND OBSERVATIONS: problems w/ YSI 6000. got initial and ending water quality readings. Purged 60 gallons over 2 hrs.

MONITORING WELL CONSTRUCTION

MW - NASB - 227

CLIENT/SITE NAME: NAS BRUNSWICK - DEPT OF NAVY SITE 9 - NEPTUNE DRIVE DISPOSAL SITE	
DATE INSTALLED: 9 November 1998	PROJECT No. 29600.47.
ELEVATION OF GROUND SURFACE: ELEVATION TOP OF WELL RISER:	COORDINATES: N: E:
DEPTH TO WATER: (BELOW GROUND SURFACE) DATE/TIME:	EA INSPECTOR: Paul Higgins
DRILLING METHOD & DEPTH: 4" Casing, Drive & Wash to Bottom of Hole	



MONITORING WELL CONSTRUCTION
(ALL DEPTH MEASURMENTS IN FT. BELOW GROUND SURFACE)

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

DWG FILE No. F:\PROJECTS\29600.80\2290\CADD\89-MW-02.DWG

Appendix B

Ground-Water Pesticide and Volatile Organic Compound Trend Results March 1995 – November 1998

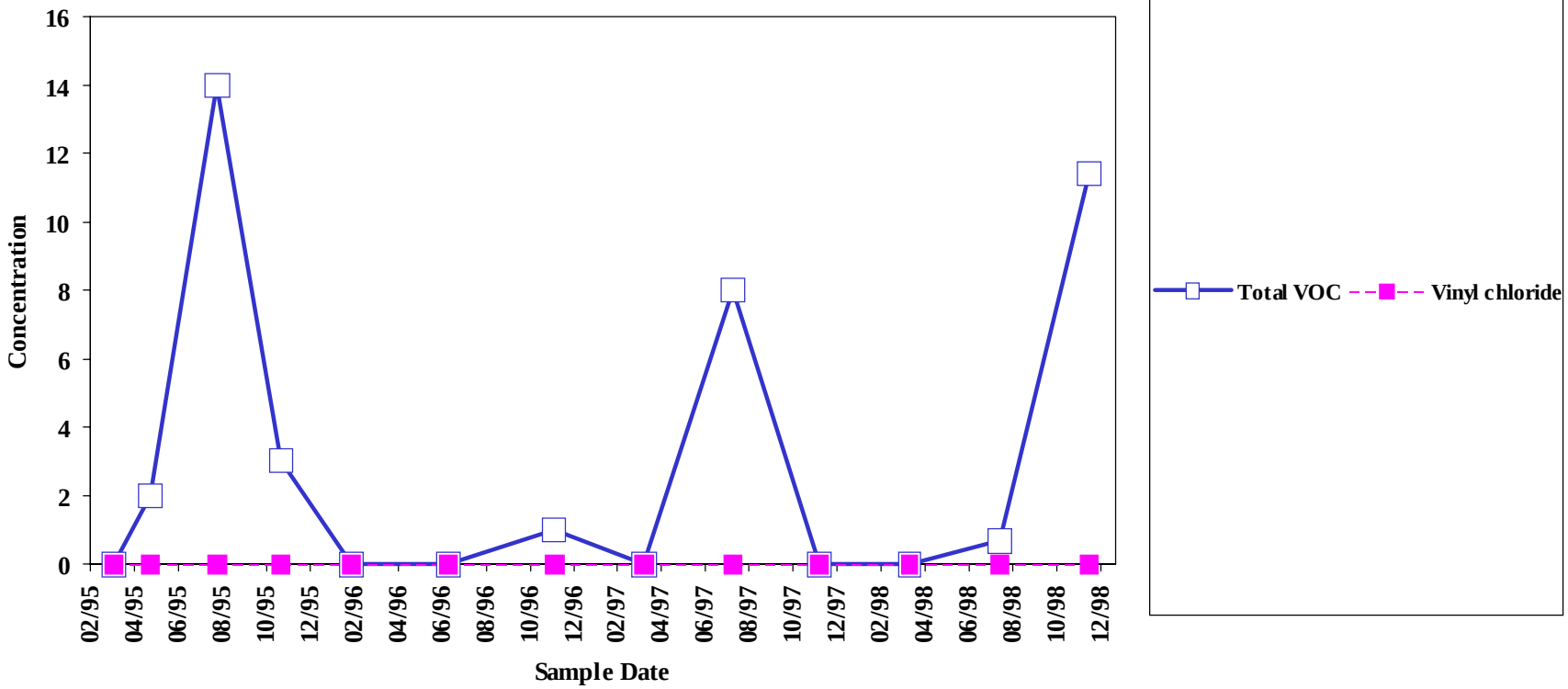
Sample Location:

LT-901

Site 9

Leachate

Chemicals of concern: Volatiles



Sample concentration units: µg/L

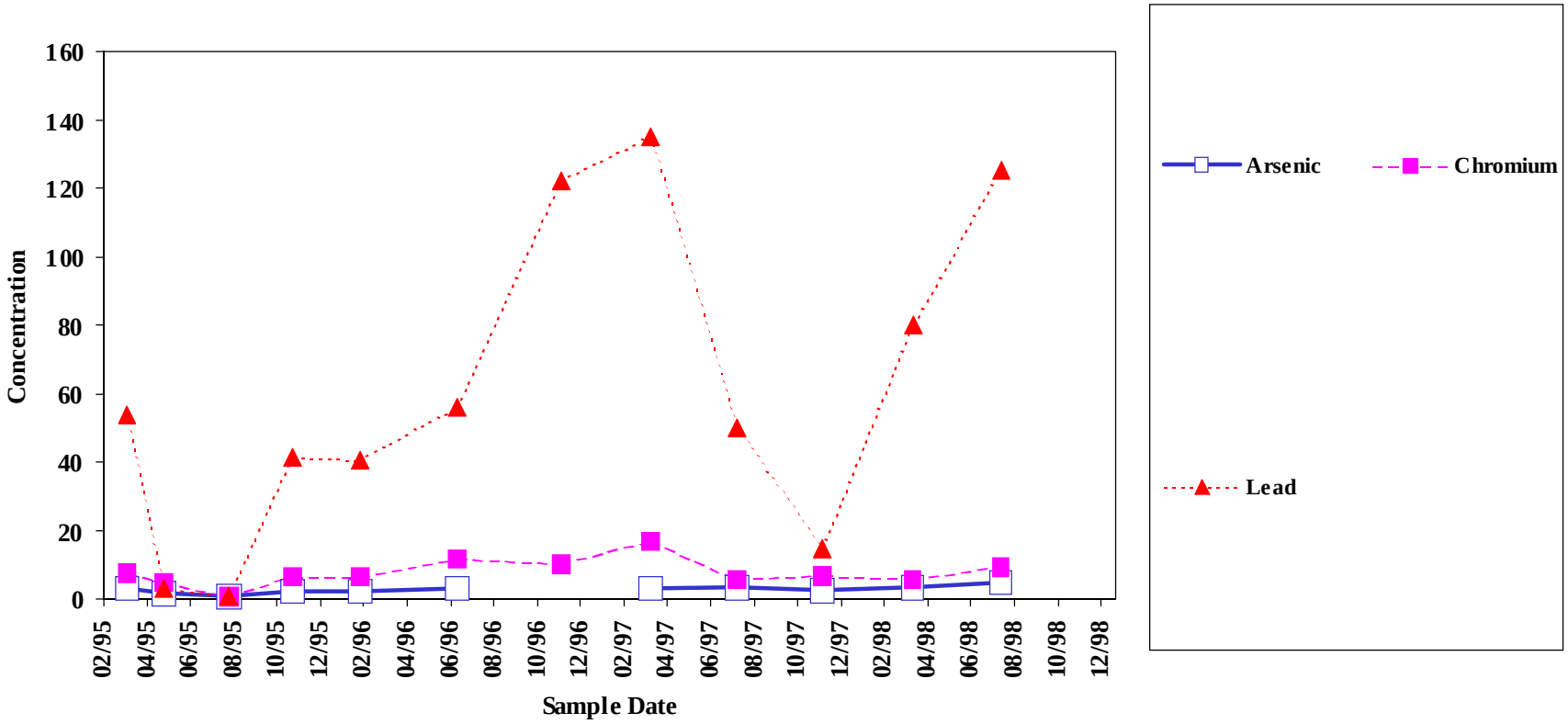
Sample Location:

LT-901

Site 9

Sediment

Chemicals of concern: Inorganics



Sample concentration units: mg/Kg

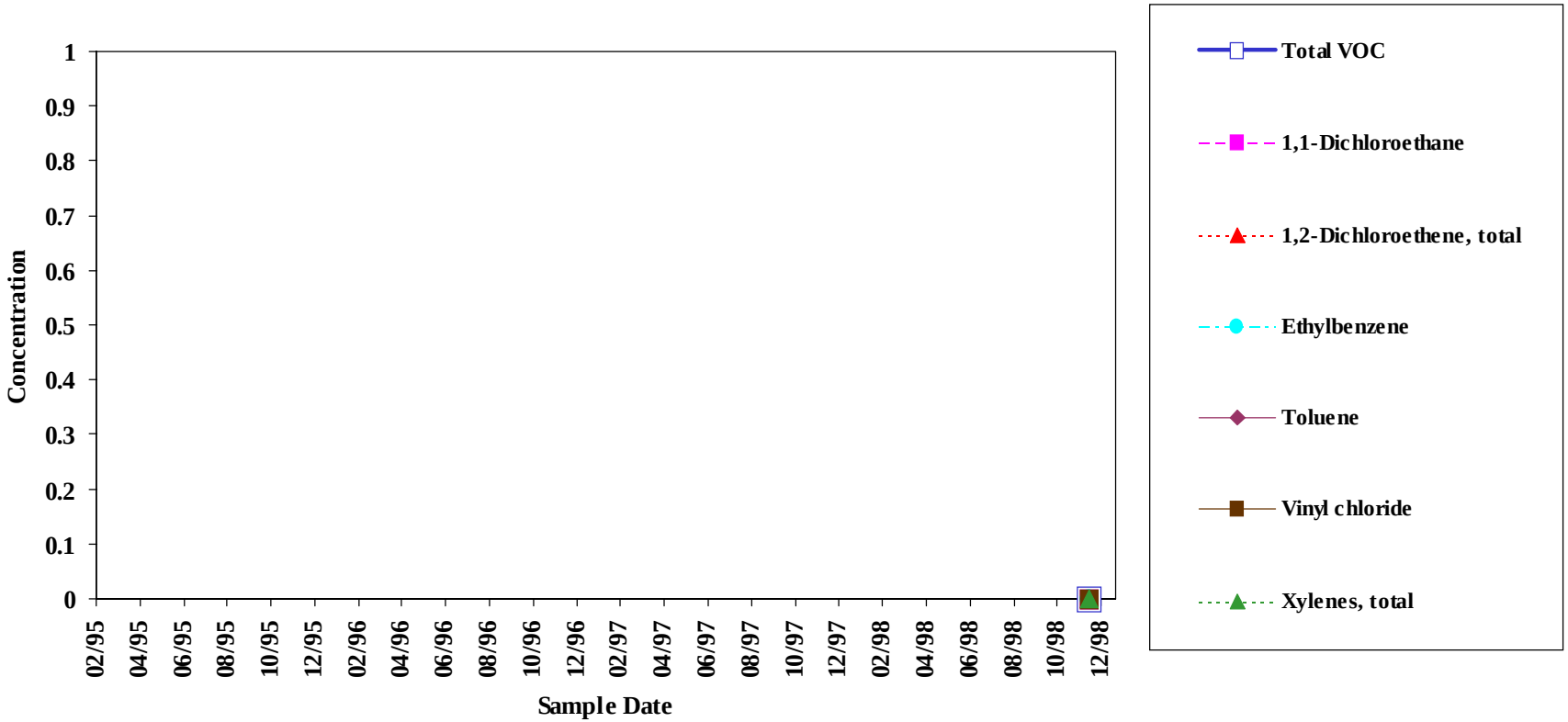
Sample Location:

MW-NASB-022

Site 9

Ground Water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

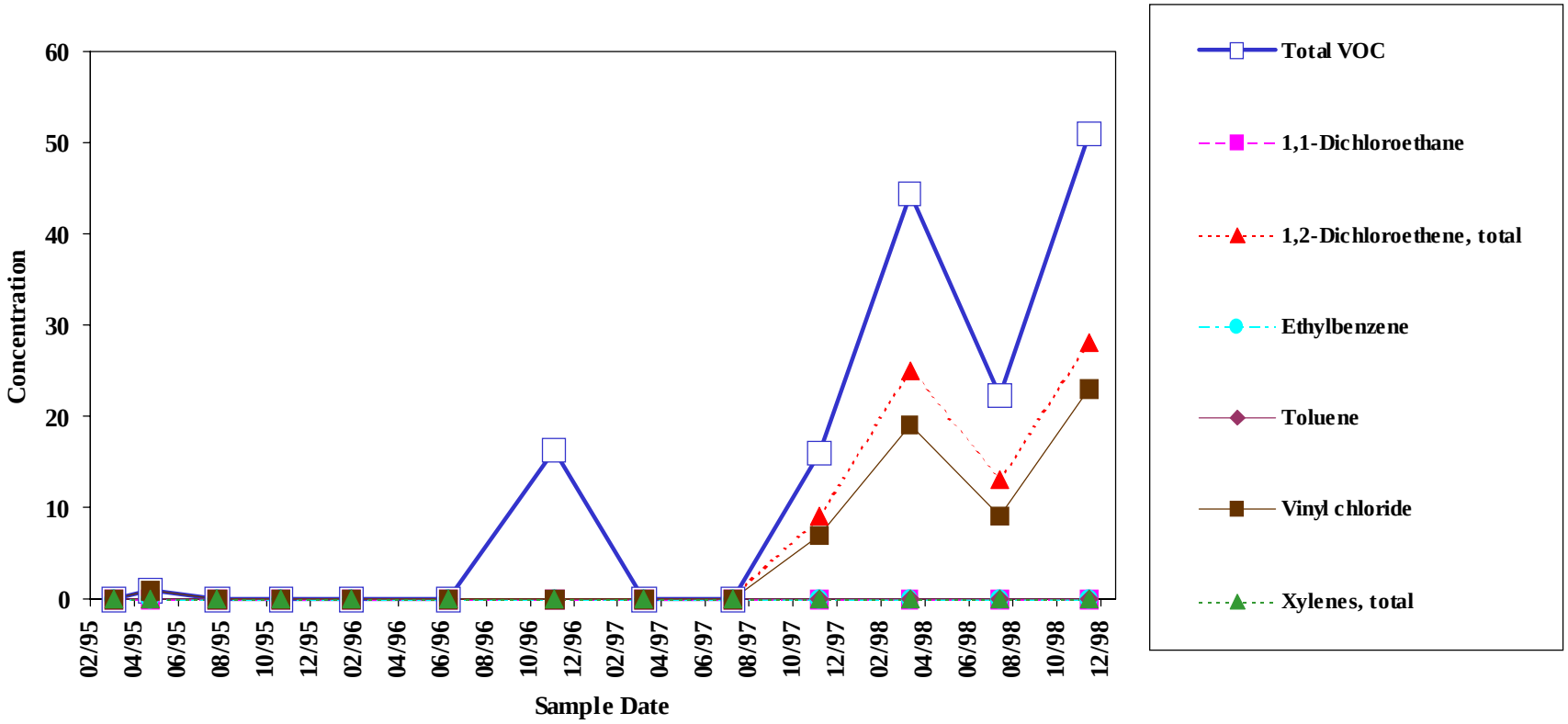
Sample Location:

MW-NASB-069

Site 9

Ground Water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

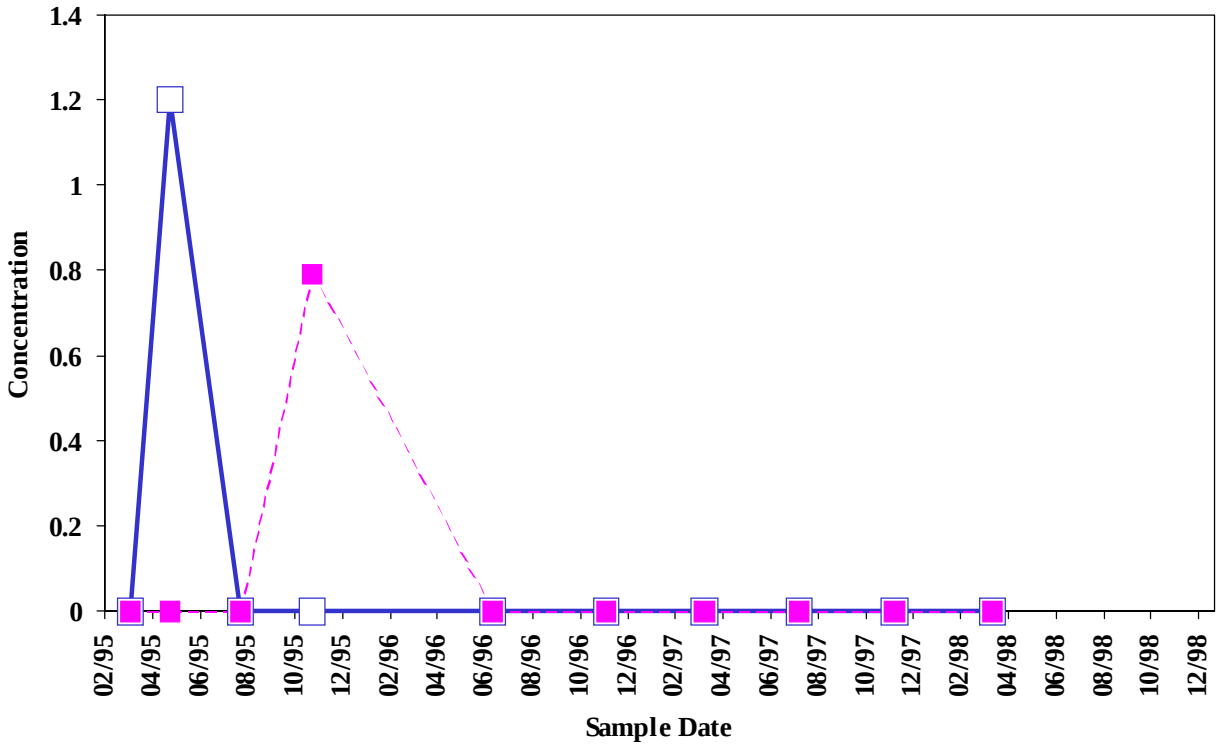
Sample Location:

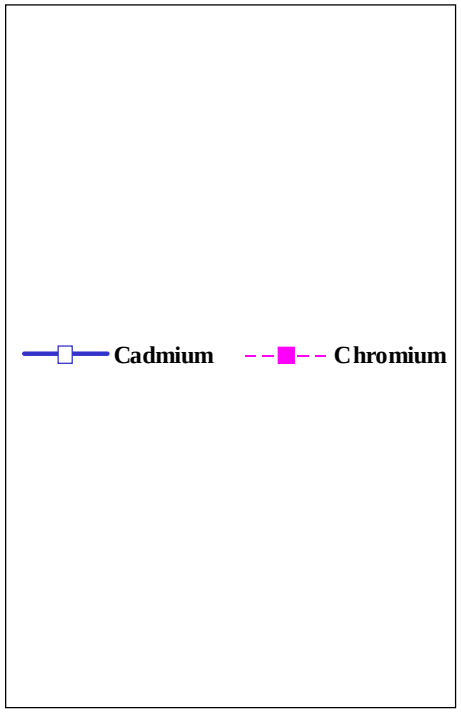
MW-NASB-071

Site 9

Ground Water

Chemicals of concern: Inorganics





Sample concentration units: µg/L

Cadmium		Chromium	
MEG:	5	MEG:	100
MCL:	5	MCL:	100

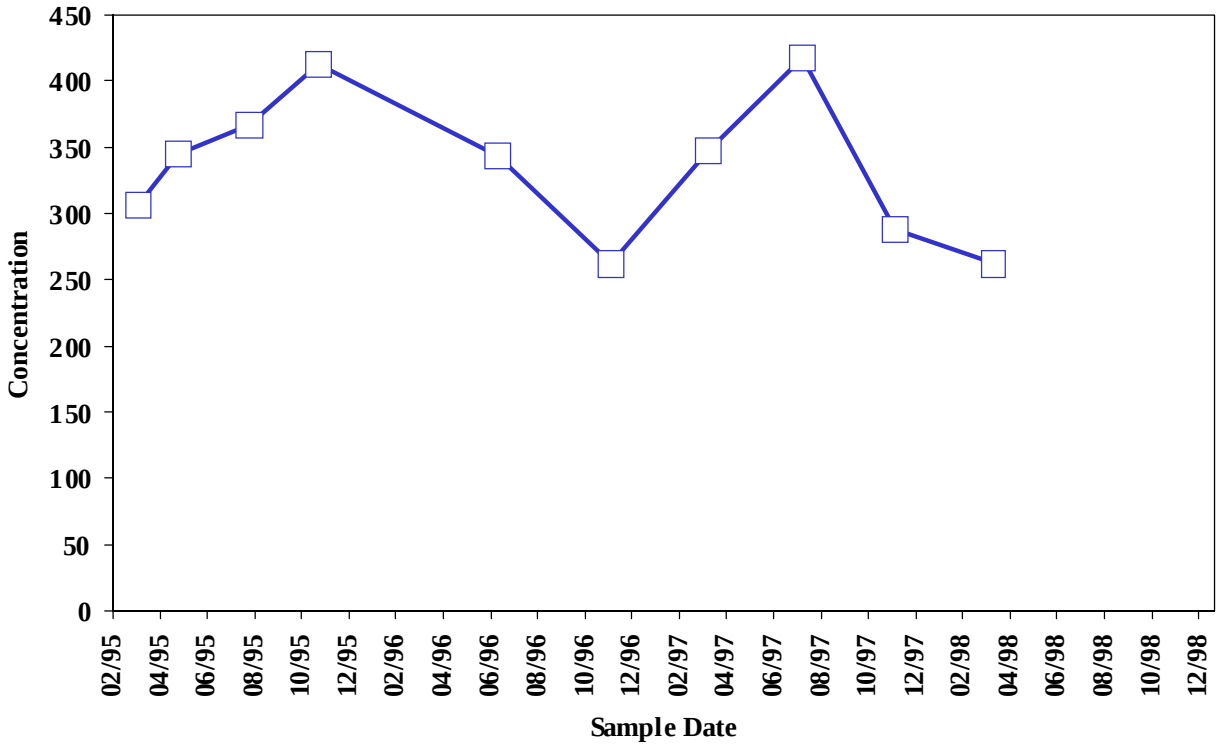
Sample Location:

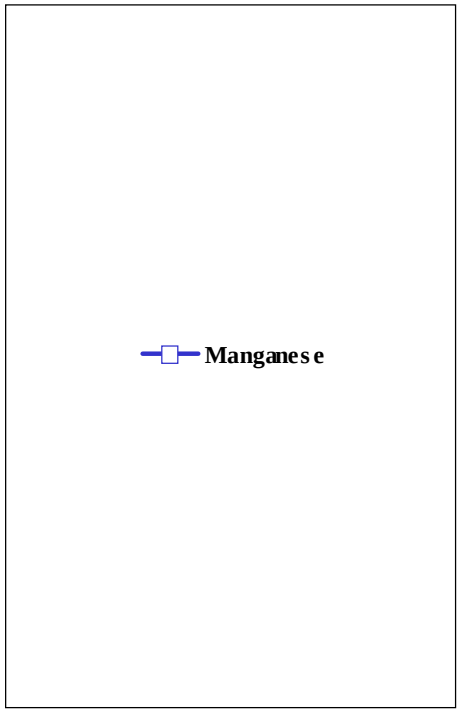
MW-NASB-071

Site 9

Ground Water

Chemicals of concern: Inorganics





Sample concentration units: µg/L

Manganese	
MEG:	200
MCL:	50

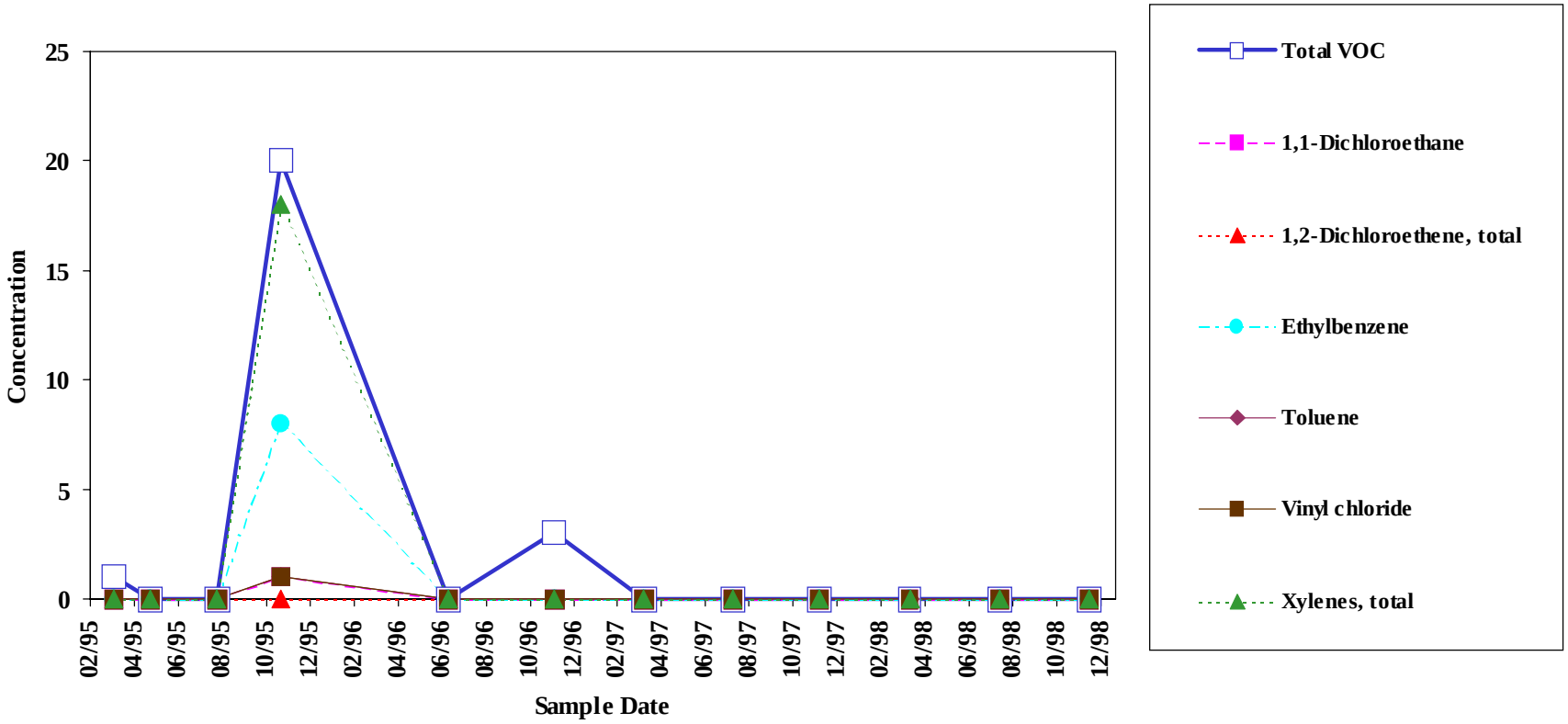
Sample Location:

MW-NASB-071

Site 9

Ground Water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

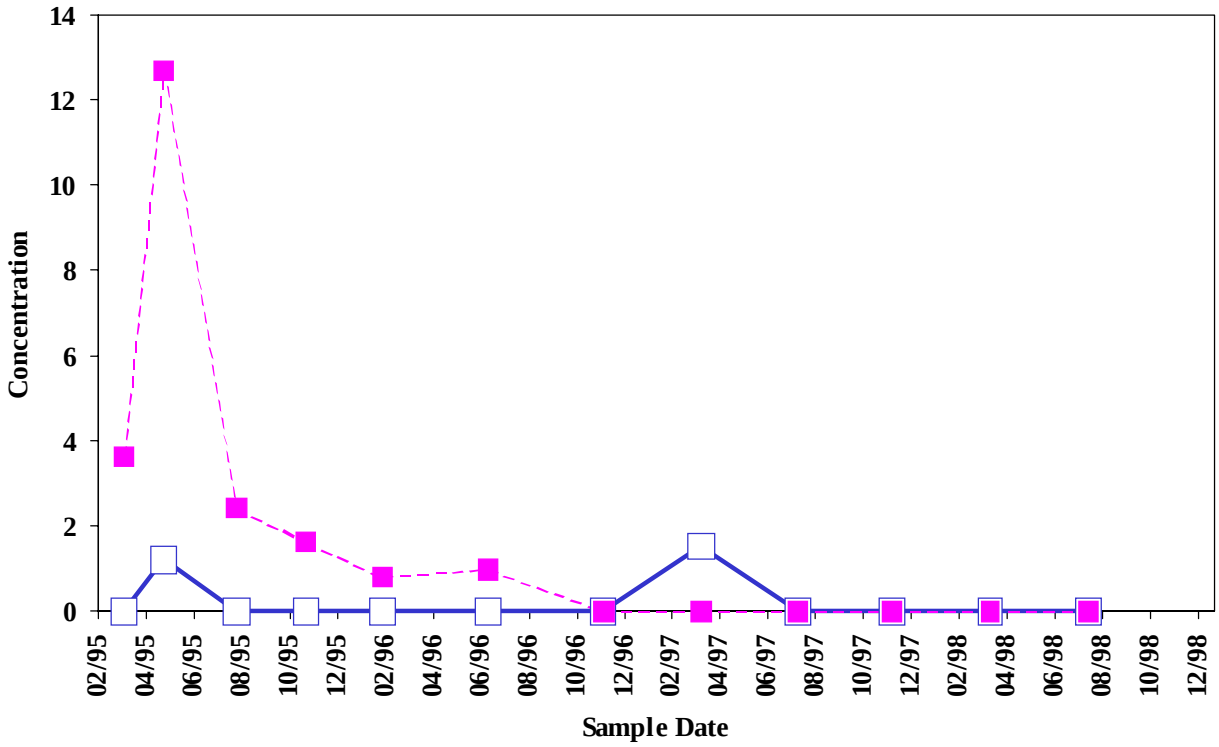
Sample Location:

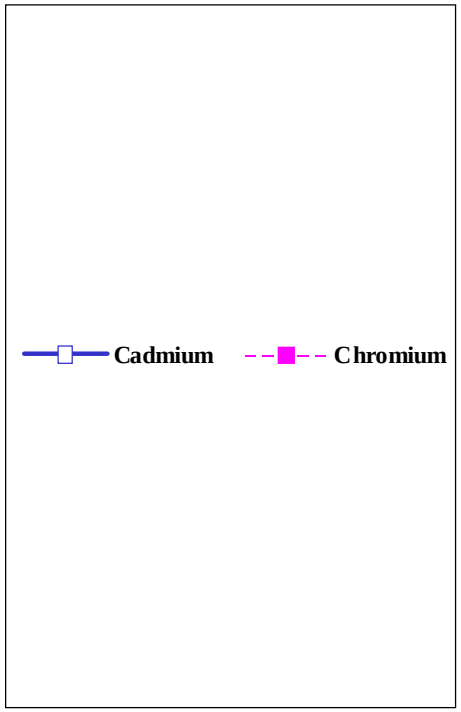
MW-NASB-072

Site 9

Ground Water

Chemicals of concern: Inorganics





Sample concentration units: µg/L

Cadmium		Chromium	
MEG:	5	MEG:	100
MCL:	5	MCL:	100

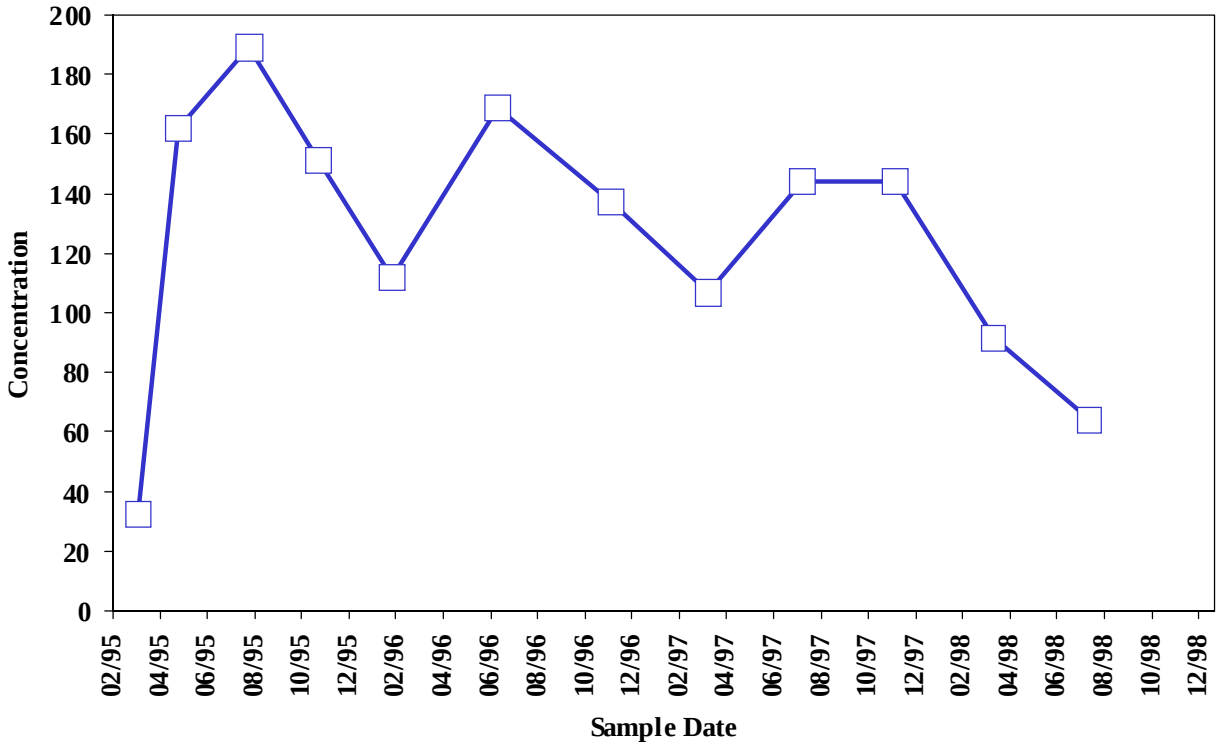
Sample Location:

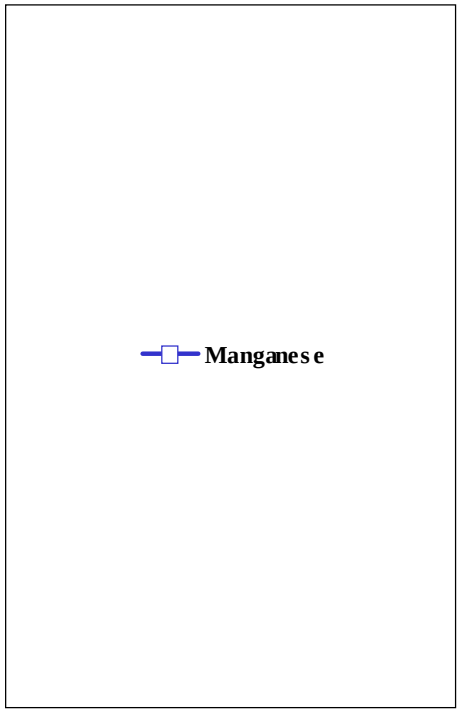
MW-NASB-072

Site 9

Ground Water

Chemicals of concern: Inorganics





Sample concentration units: µg/L

Manganese	
MEG:	200
MCL:	50

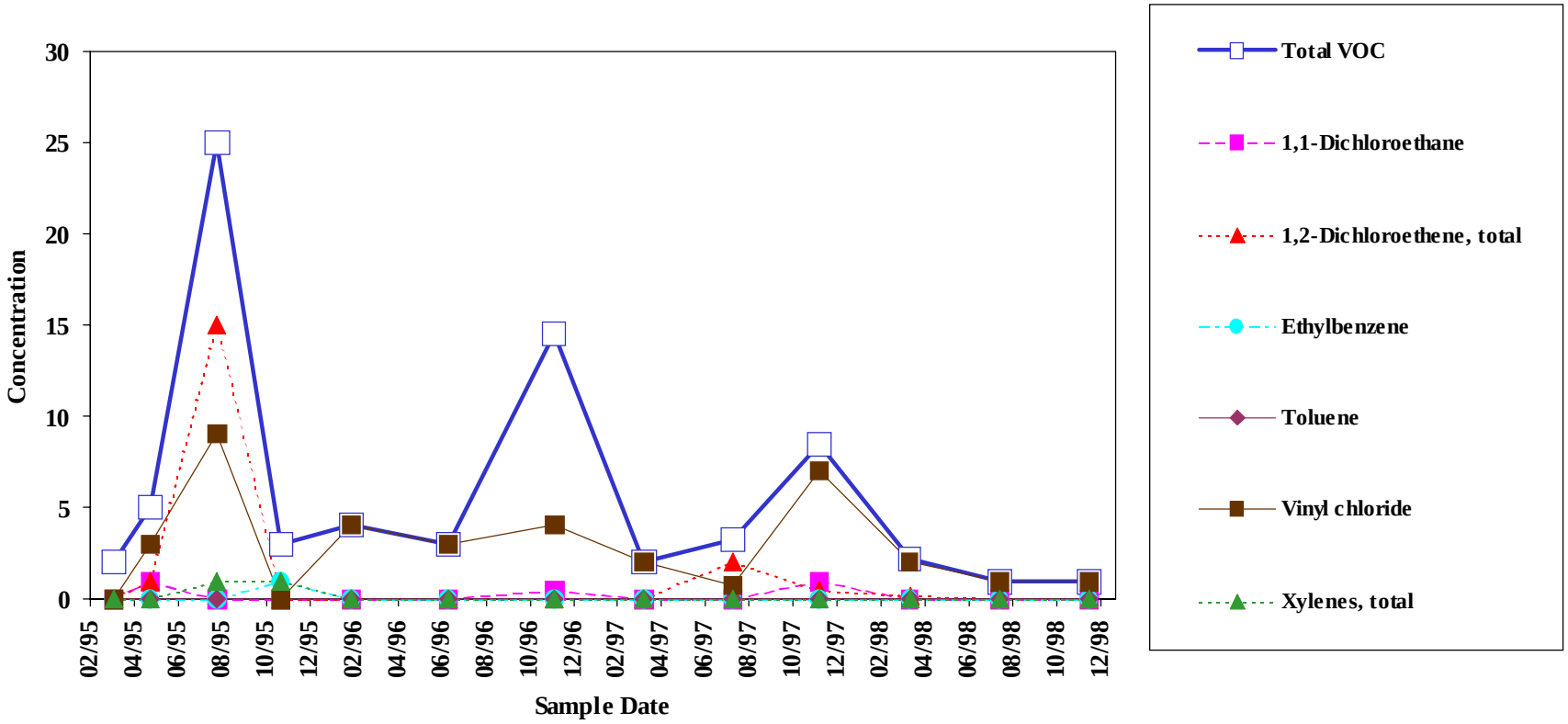
Sample Location:

MW-NASB-072

Site 9

Ground Water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

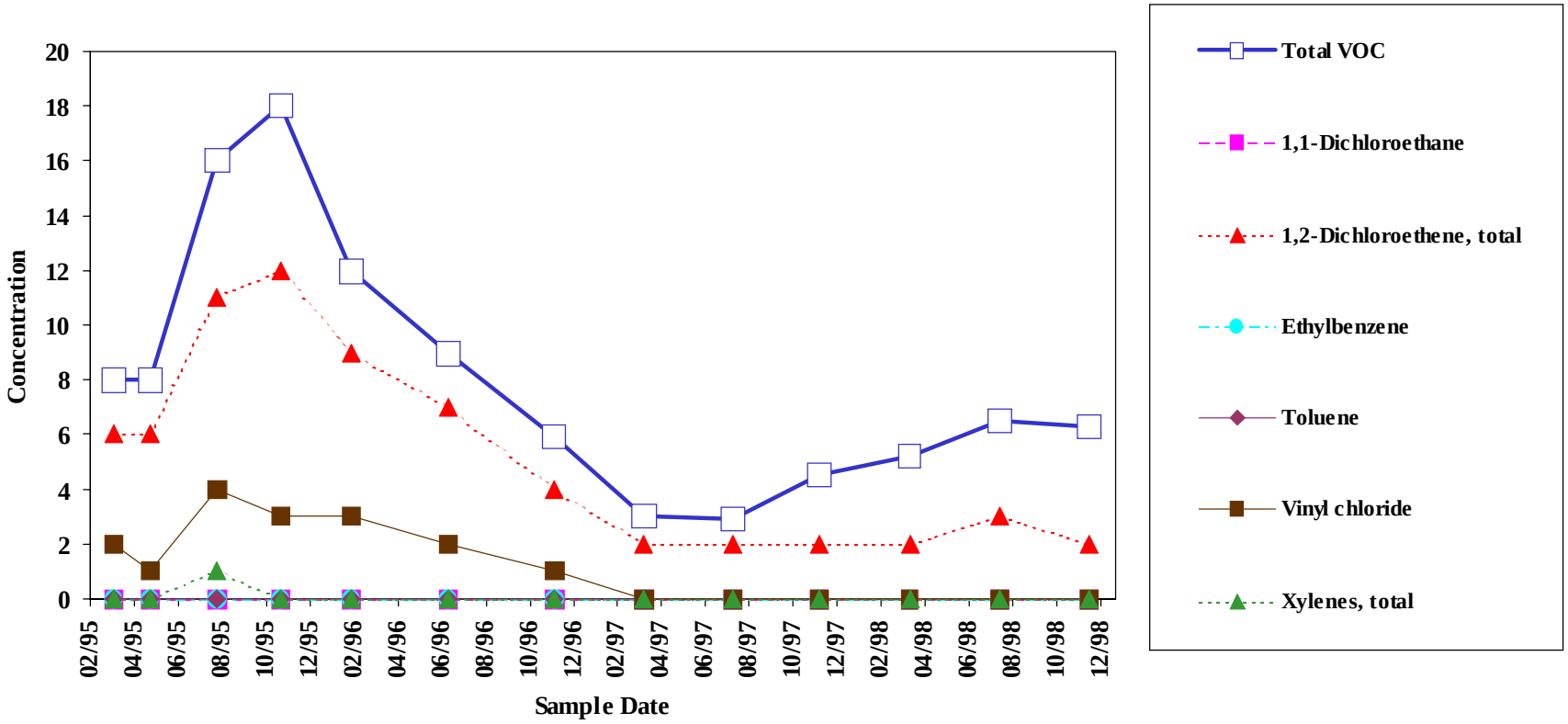
Sample Location:

MW-NASB-074

Site 9

Ground Water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

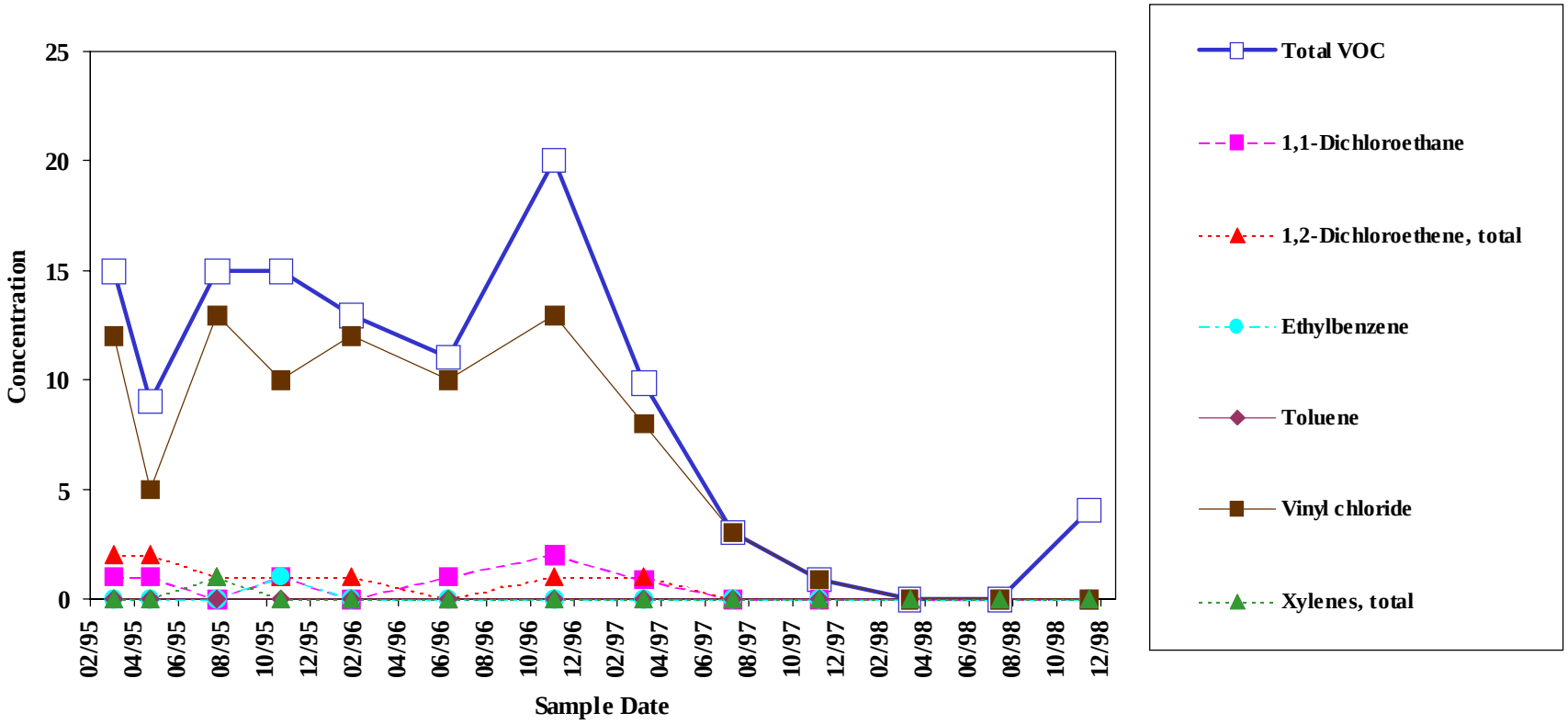
Sample Location:

MW-NASB-075

Site 9

Ground Water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

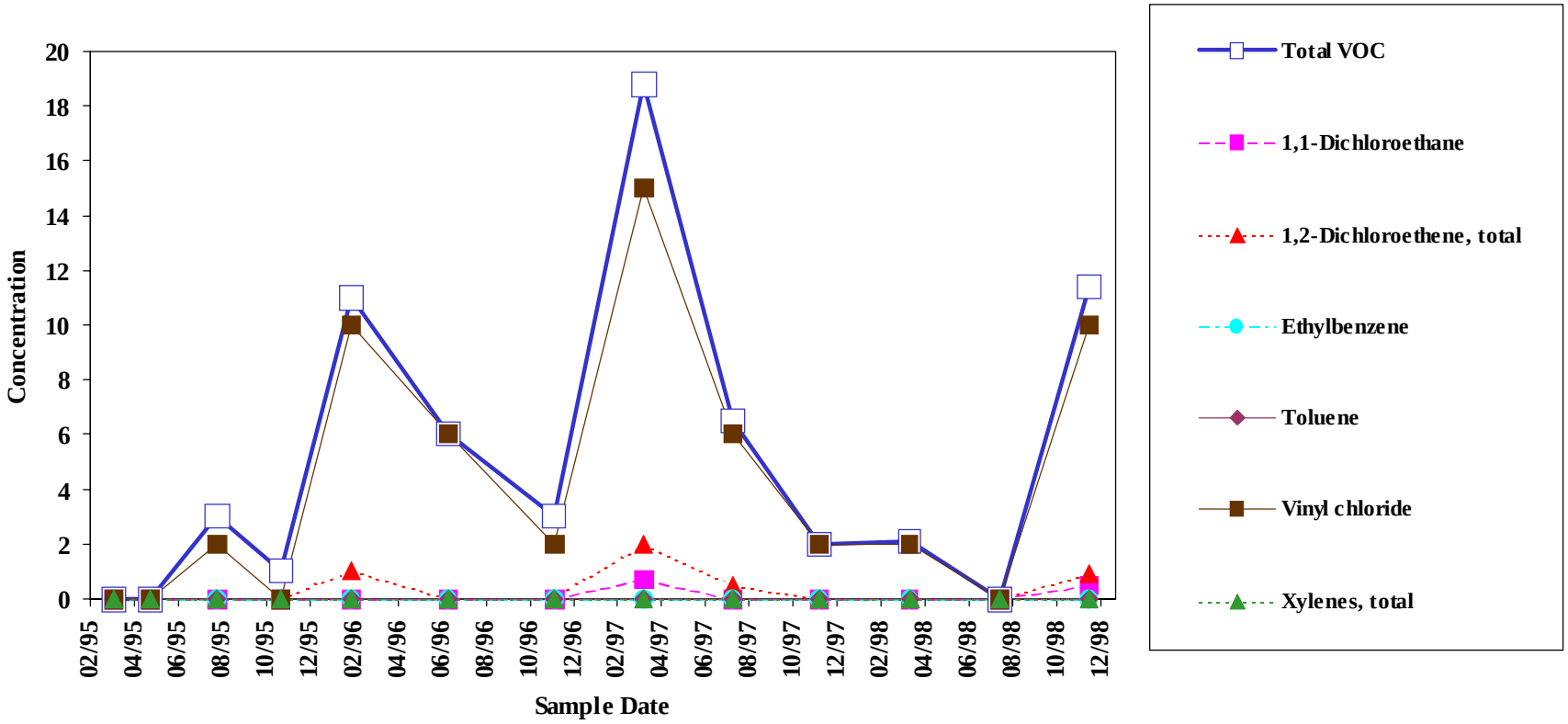
Sample Location:

MW-NASB-076

Site 9

Ground Water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

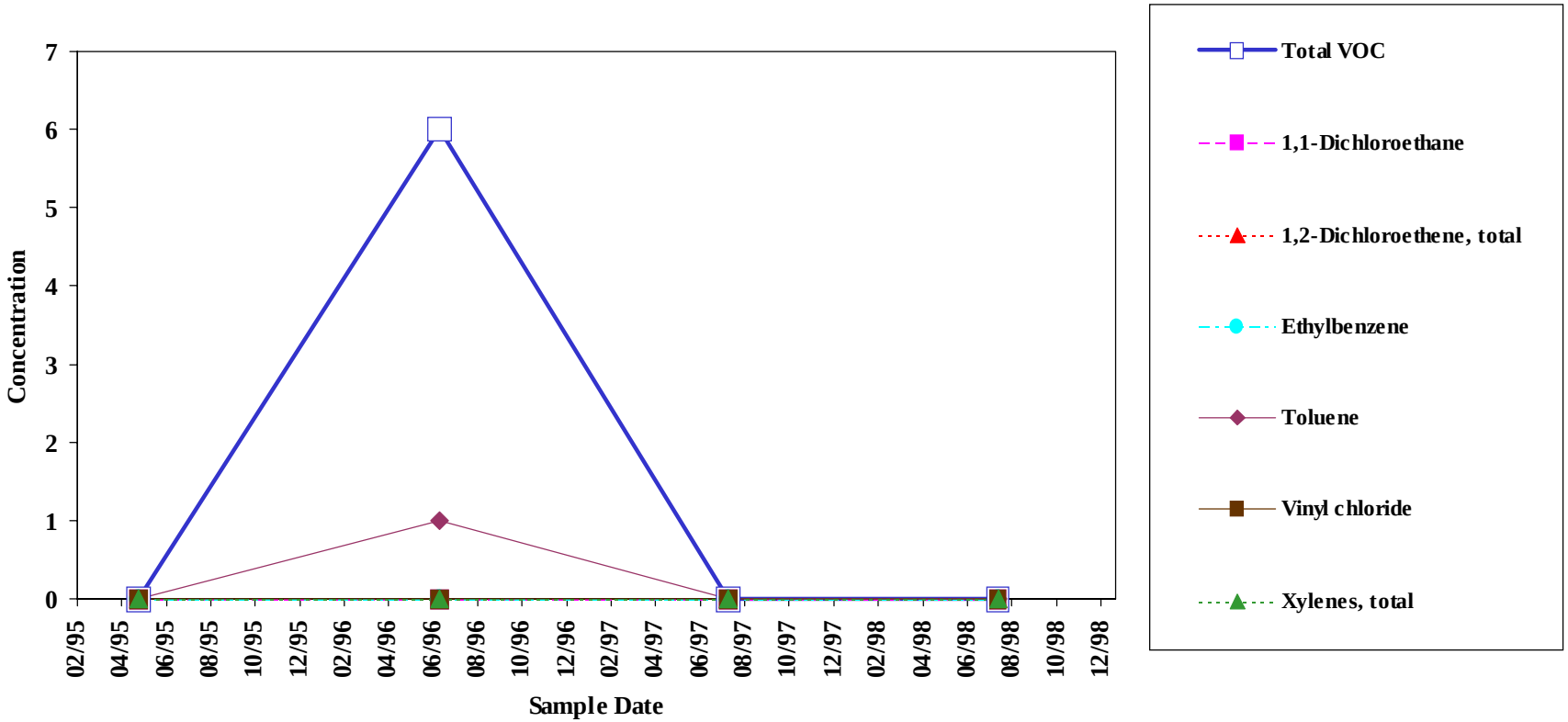
Sample Location:

MW-NASB-077

Site 9

Ground Water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

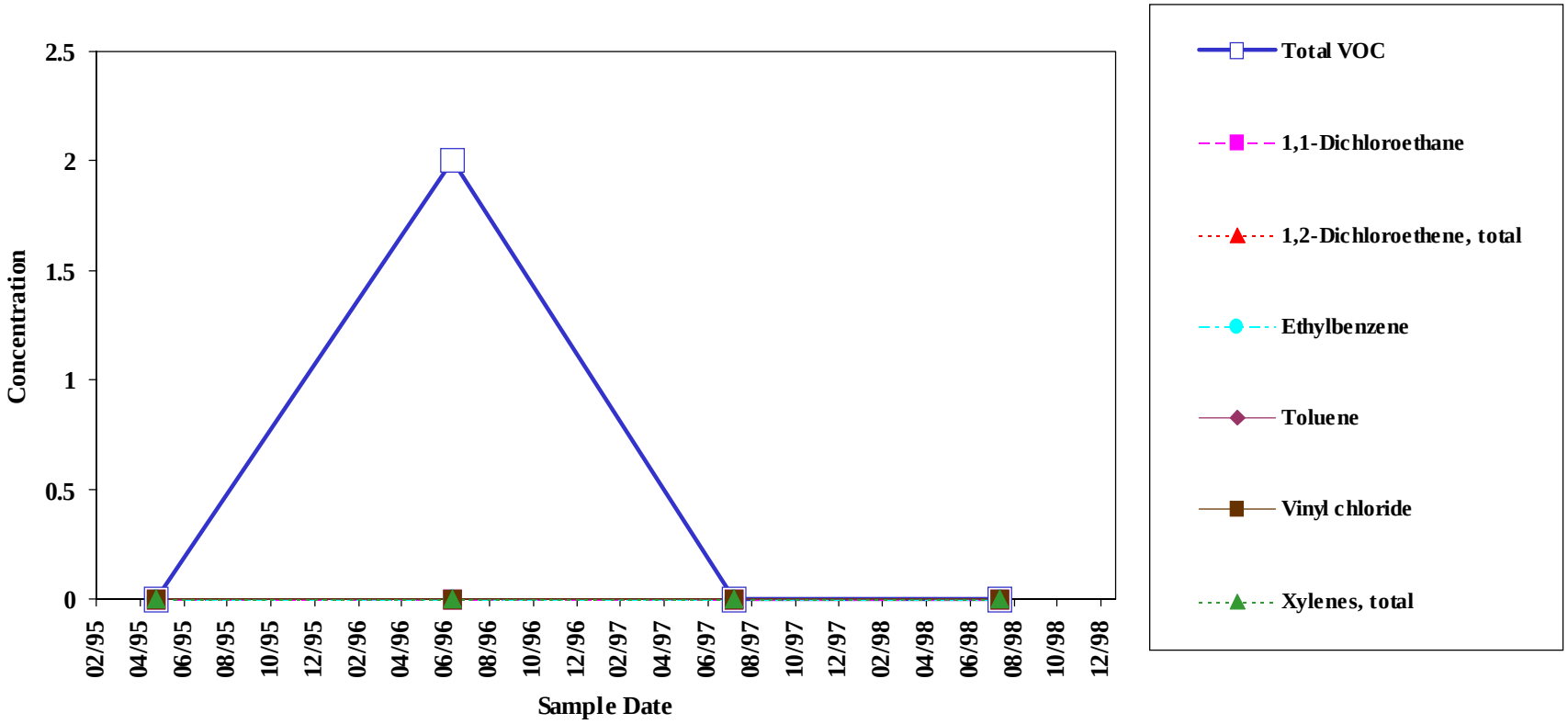
Sample Location:

MW-NASB-078

Site 9

Ground Water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

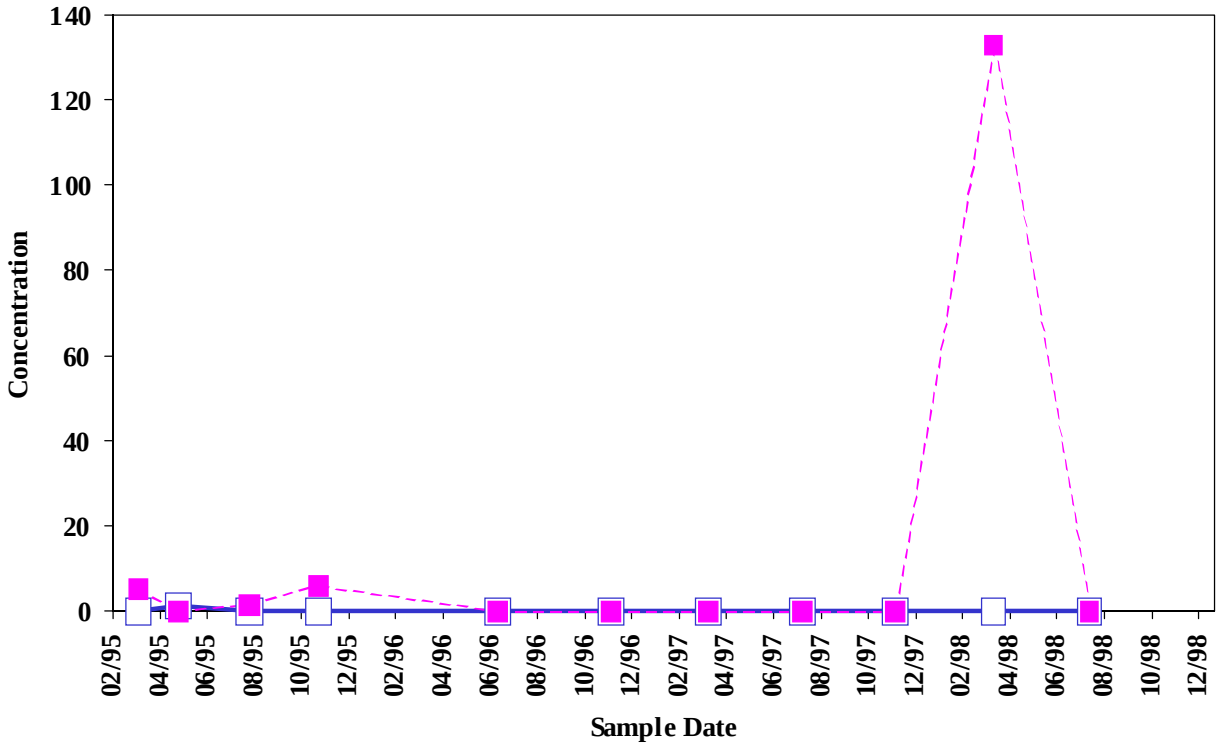
Sample Location:

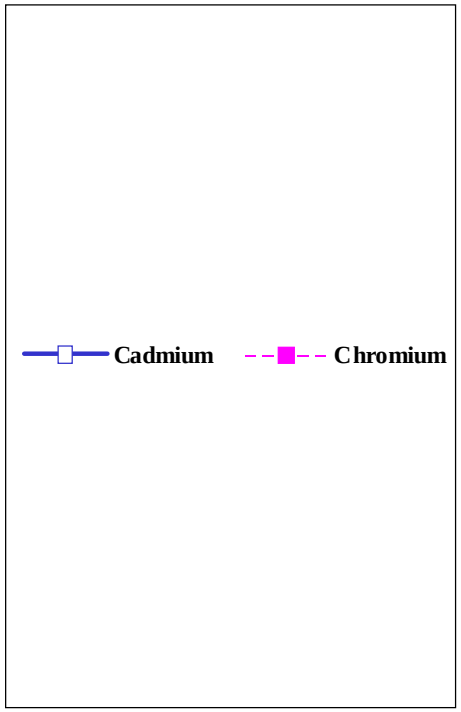
MW-NASB-079

Site 9

Ground Water

Chemicals of concern: Inorganics





Sample concentration units: µg/L

Cadmium		Chromium	
MEG:	5	MEG:	100
MCL:	5	MCL:	100

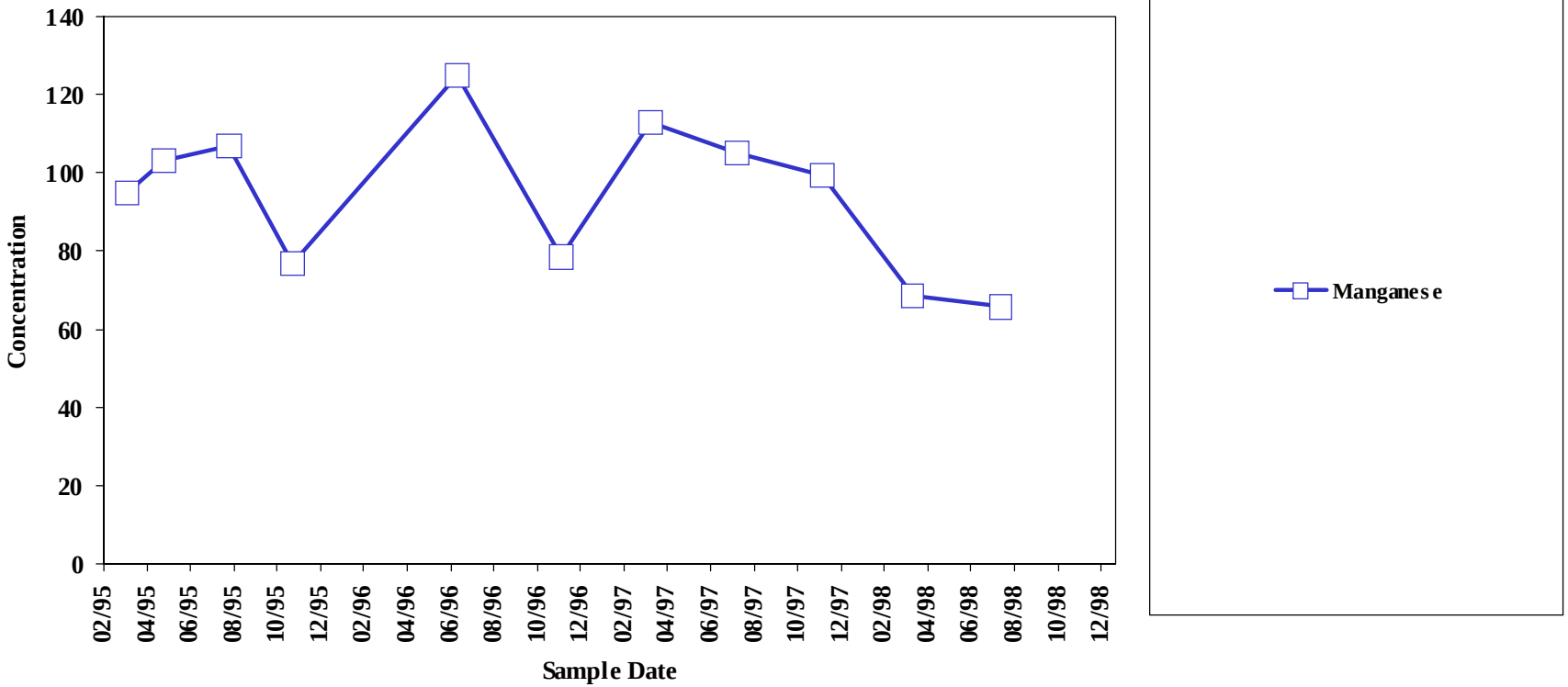
Sample Location:

MW-NASB-079

Site 9

Ground Water

Chemicals of concern: Inorganics



Sample concentration units: µg/L

Manganese	
MEG:	200
MCL:	50

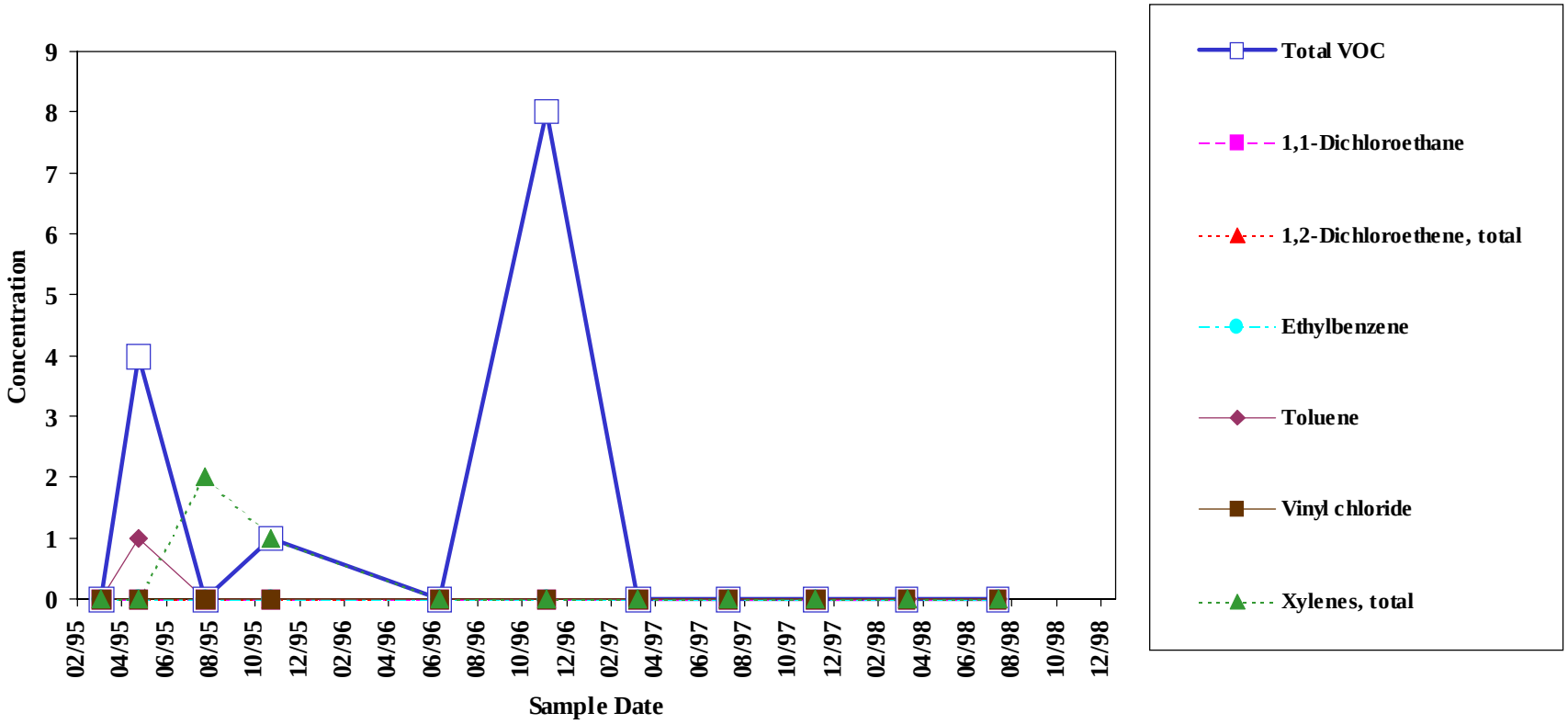
Sample Location:

MW-NASB-079

Site 9

Ground Water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

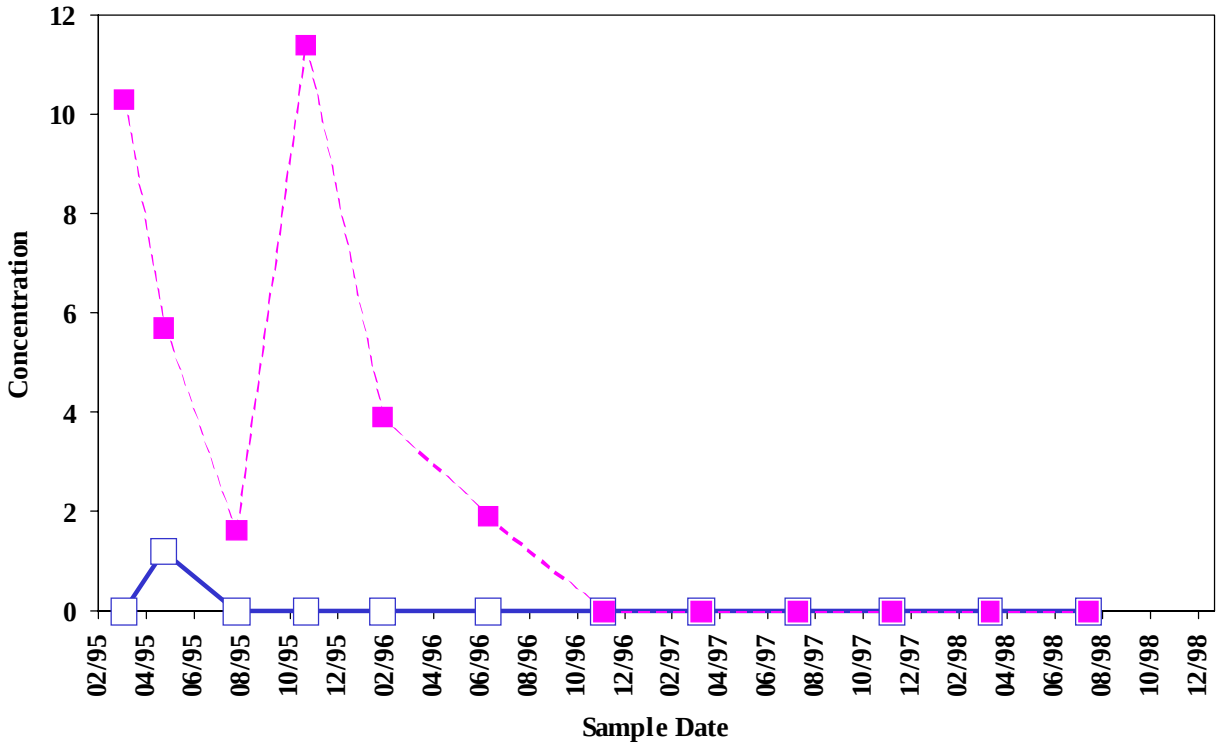
Sample Location:

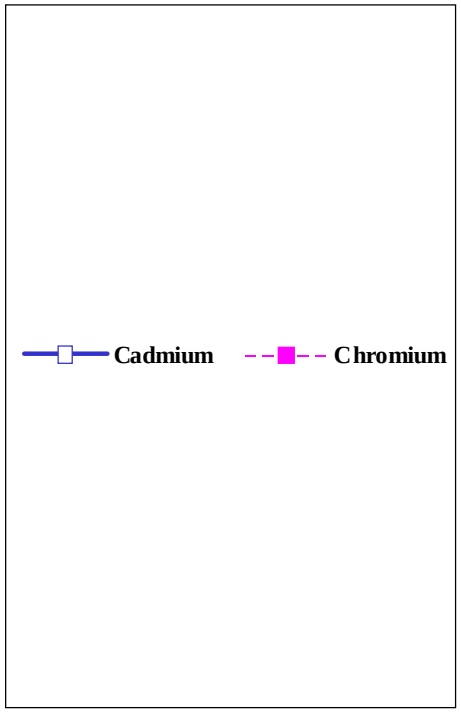
MW-NASB-080

Site 9

Ground Water

Chemicals of concern: Inorganics





Sample concentration units: µg/L

Cadmium		Chromium	
MEG:	5	MEG:	100
MCL:	5	MCL:	100

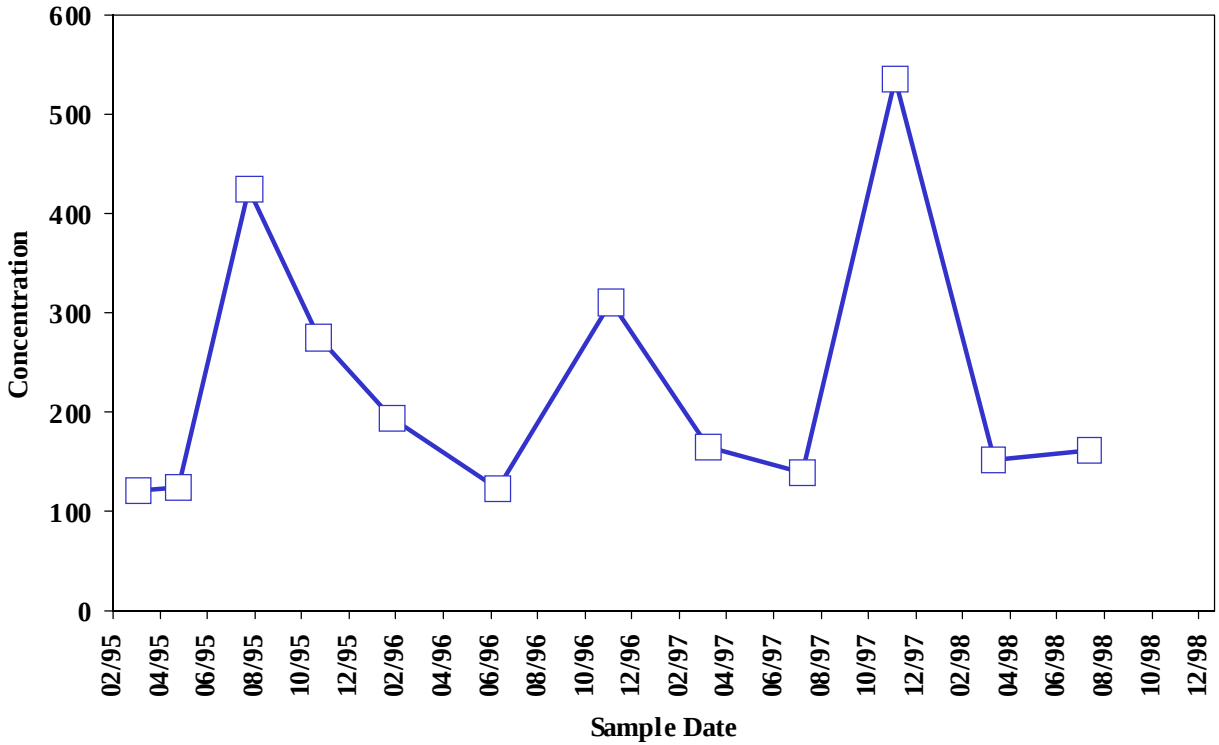
Sample Location:

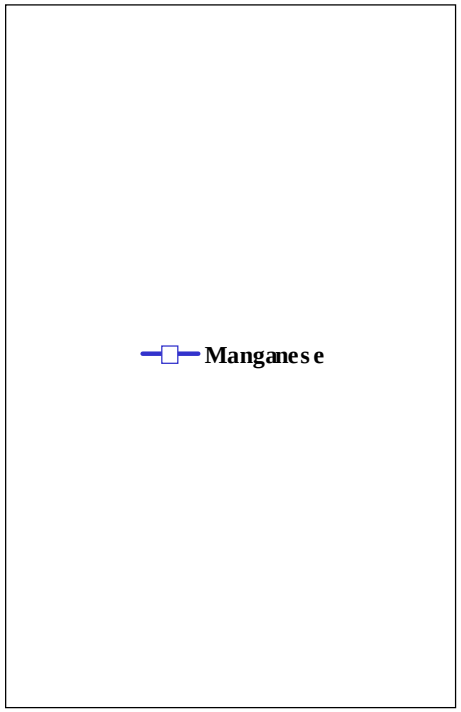
MW-NASB-080

Site 9

Ground Water

Chemicals of concern: Inorganics





Sample concentration units: µg/L

Manganese	
MEG:	200
MCL:	50

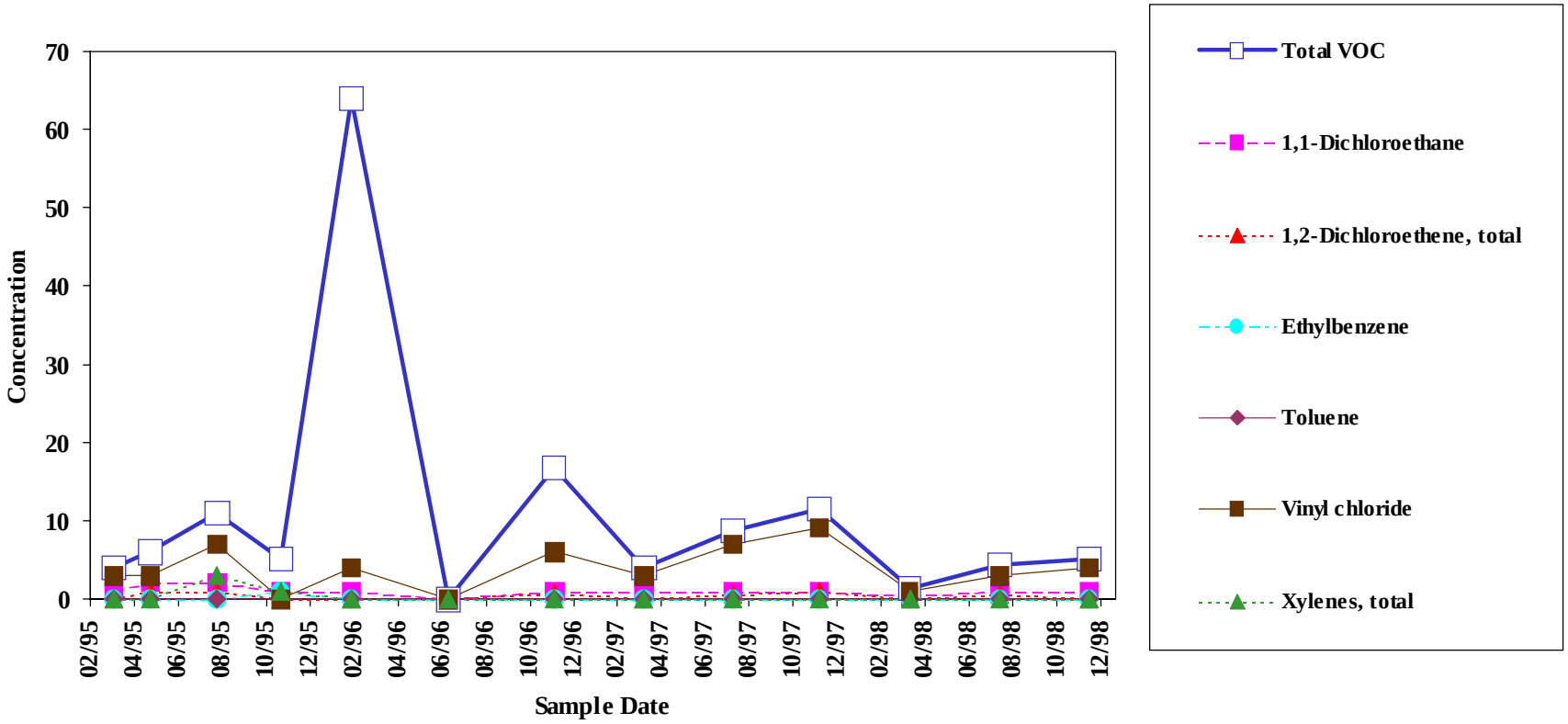
Sample Location:

MW-NASB-080

Site 9

Ground Water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

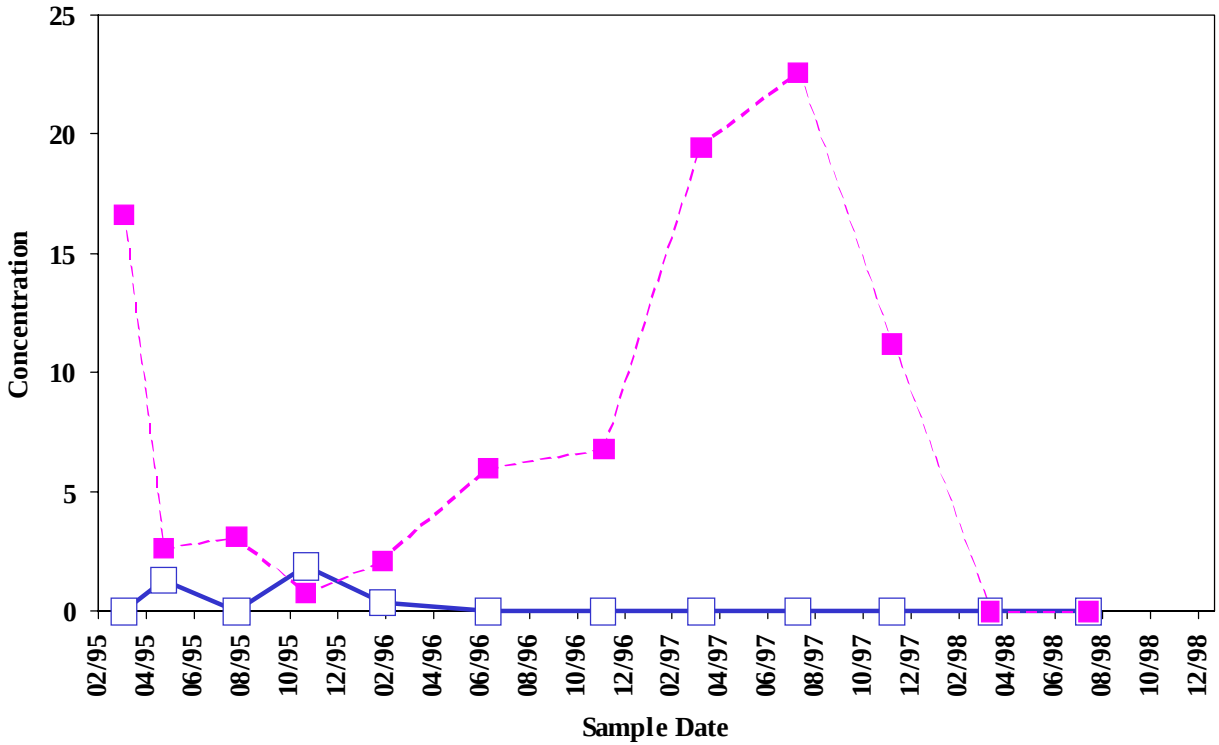
Sample Location:

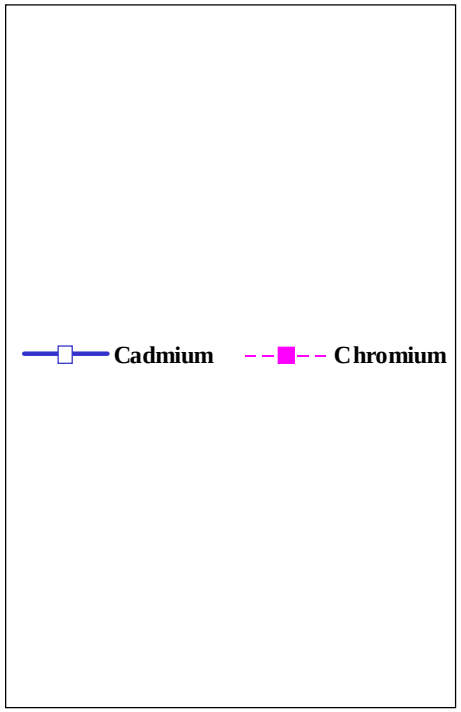
MW-NASB-081

Site 9

Ground Water

Chemicals of concern: Inorganics





Sample concentration units: µg/L

Cadmium		Chromium	
MEG:	5	MEG:	100
MCL:	5	MCL:	100

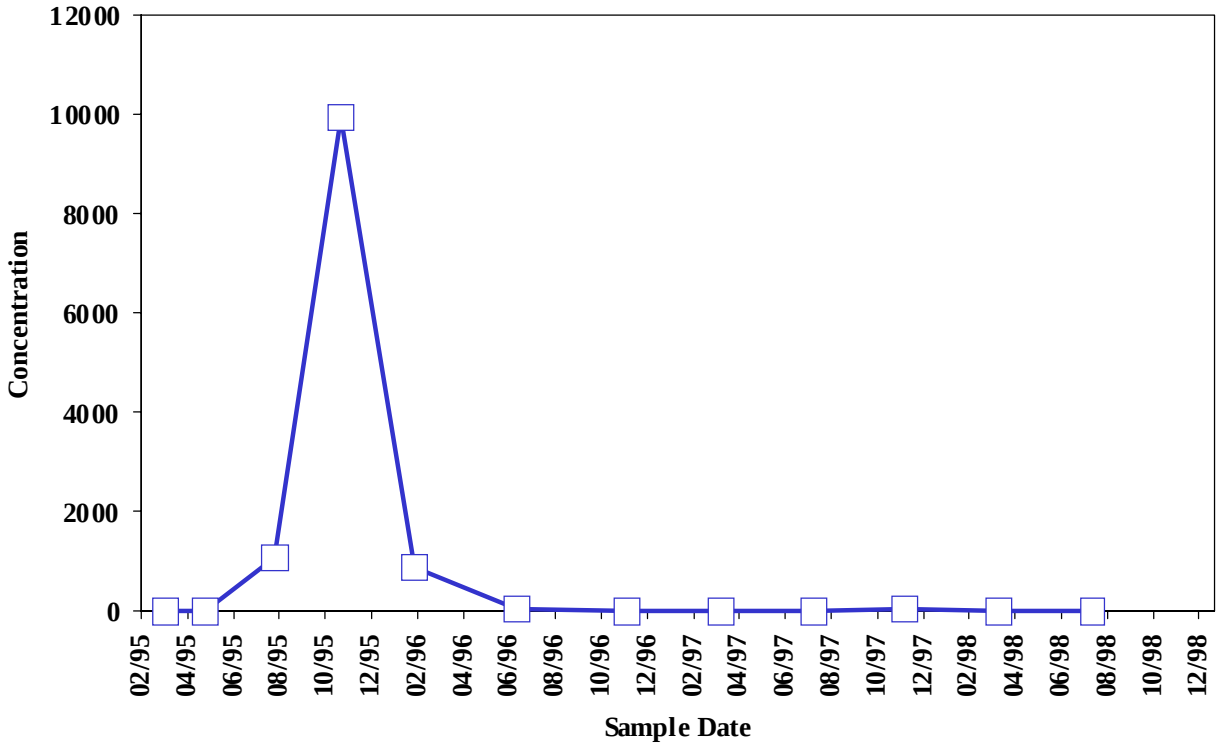
Sample Location:

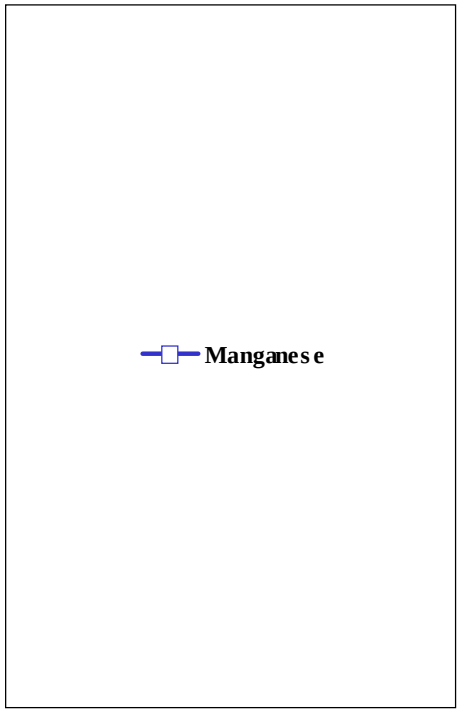
MW-NASB-081

Site 9

Ground Water

Chemicals of concern: Inorganics





Sample concentration units: µg/L

Manganese	
MEG:	200
MCL:	50

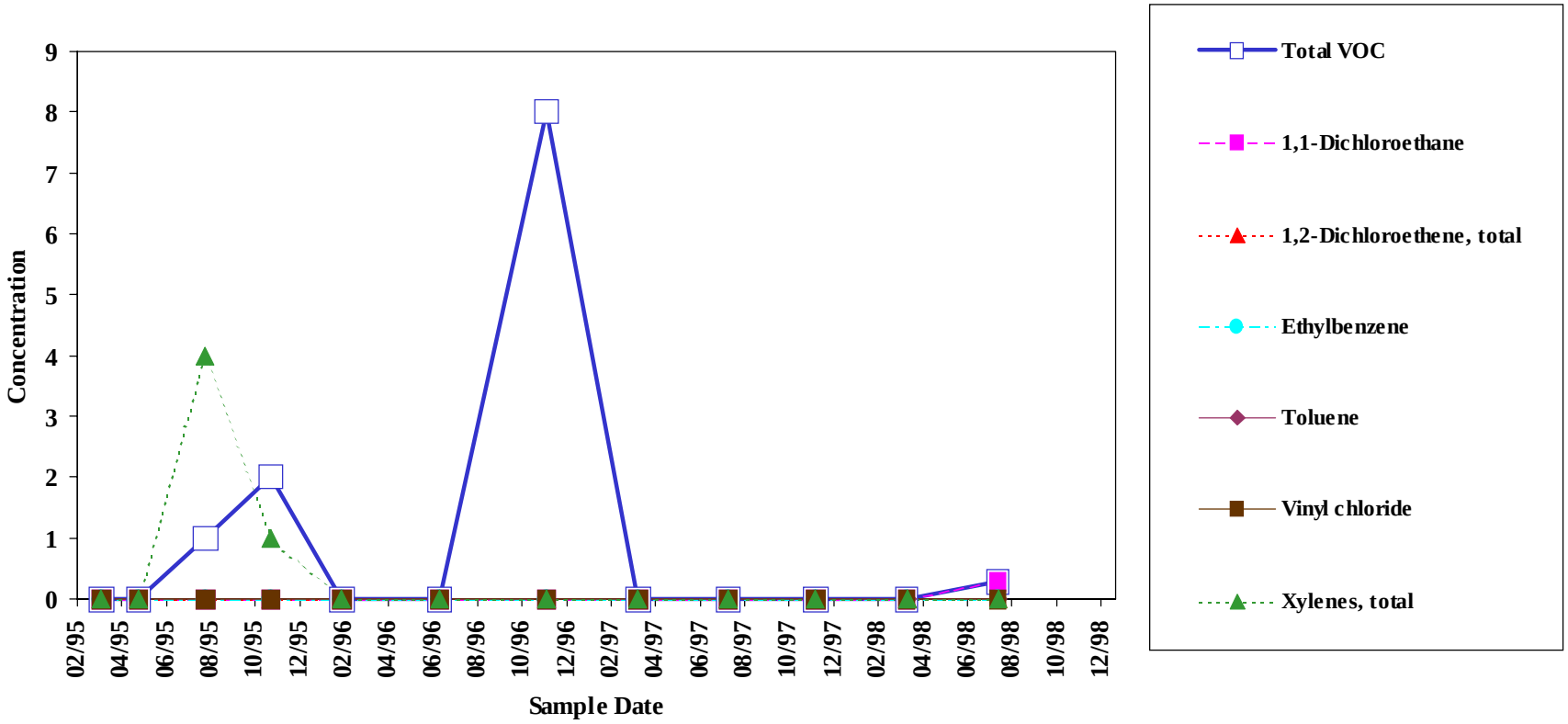
Sample Location:

MW-NASB-081

Site 9

Ground Water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

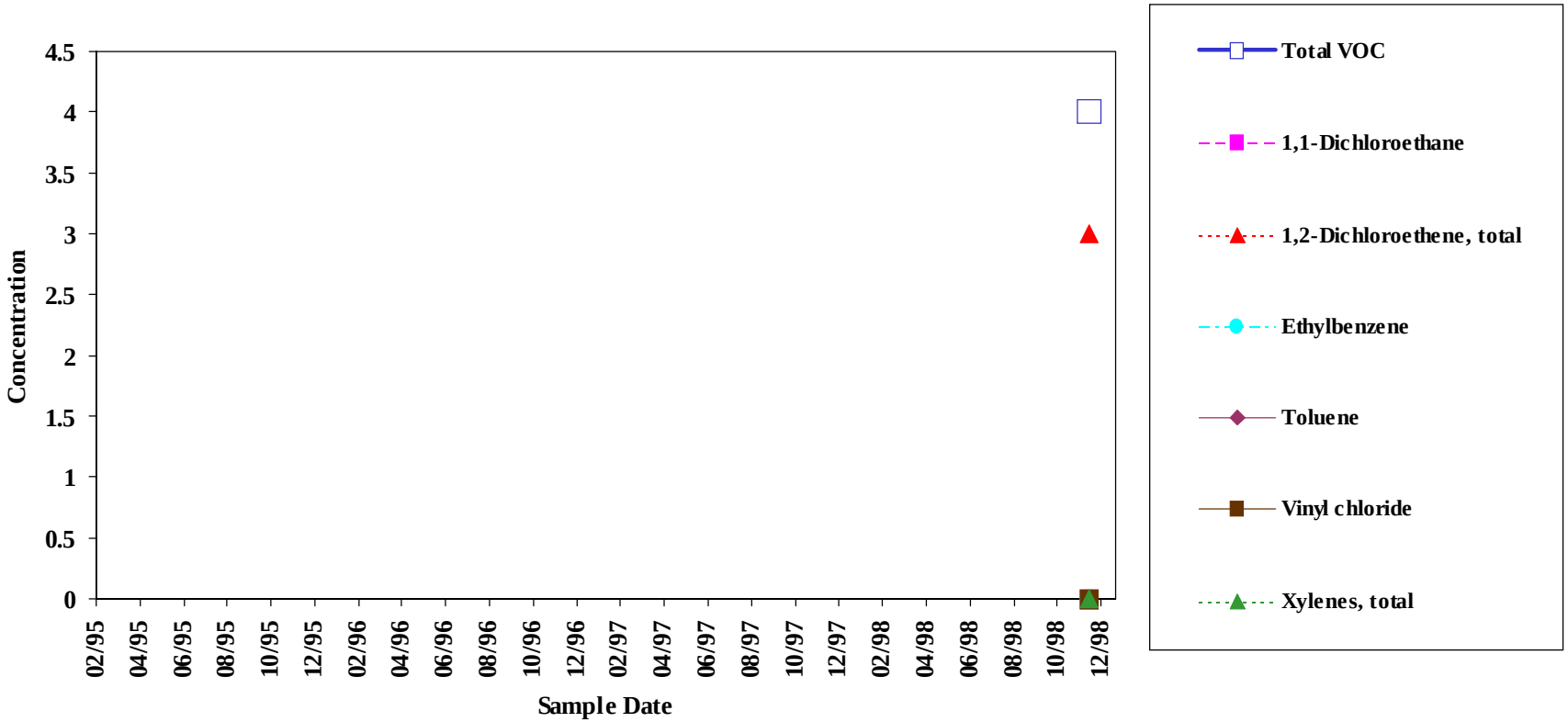
Sample Location:

MW-NASB-227

Site 9

Ground Water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

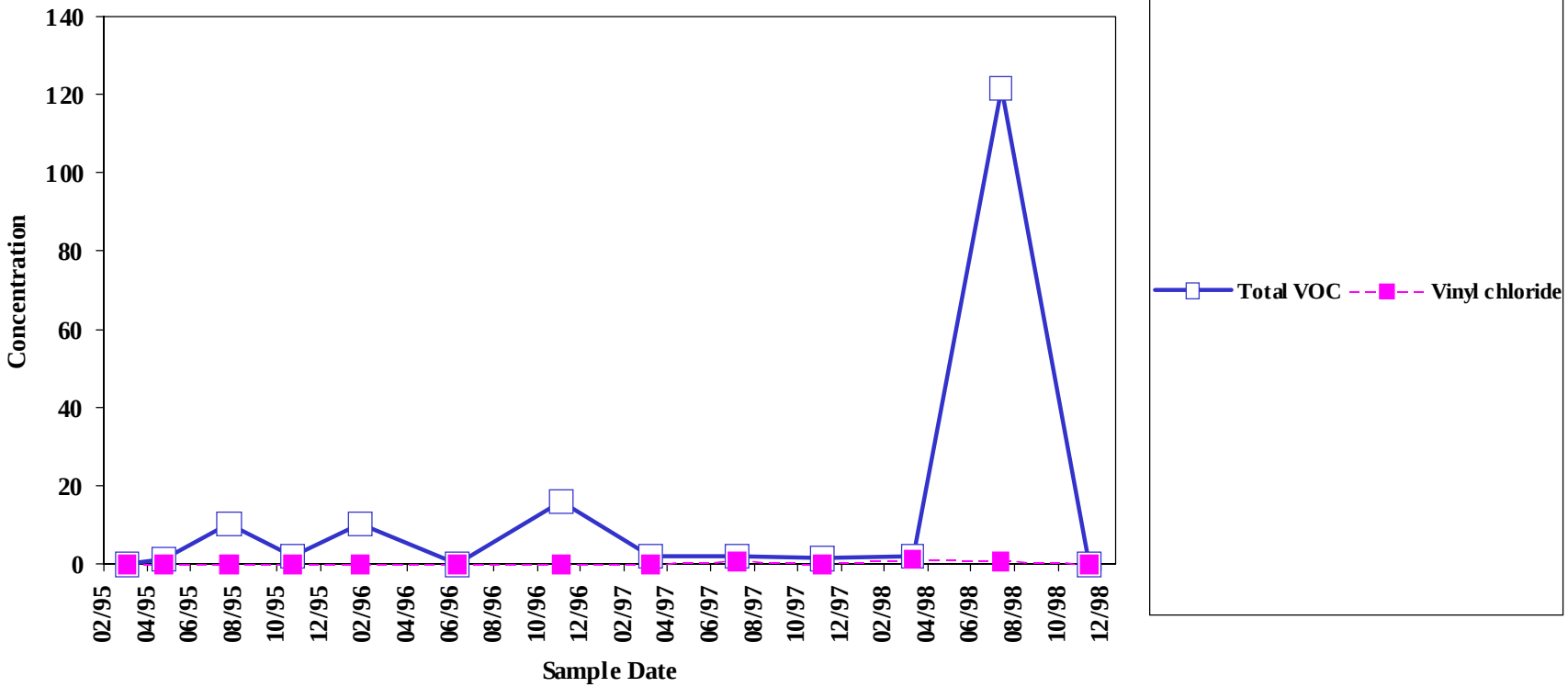
Sample Location:

SW-010

Site 9

Surface water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

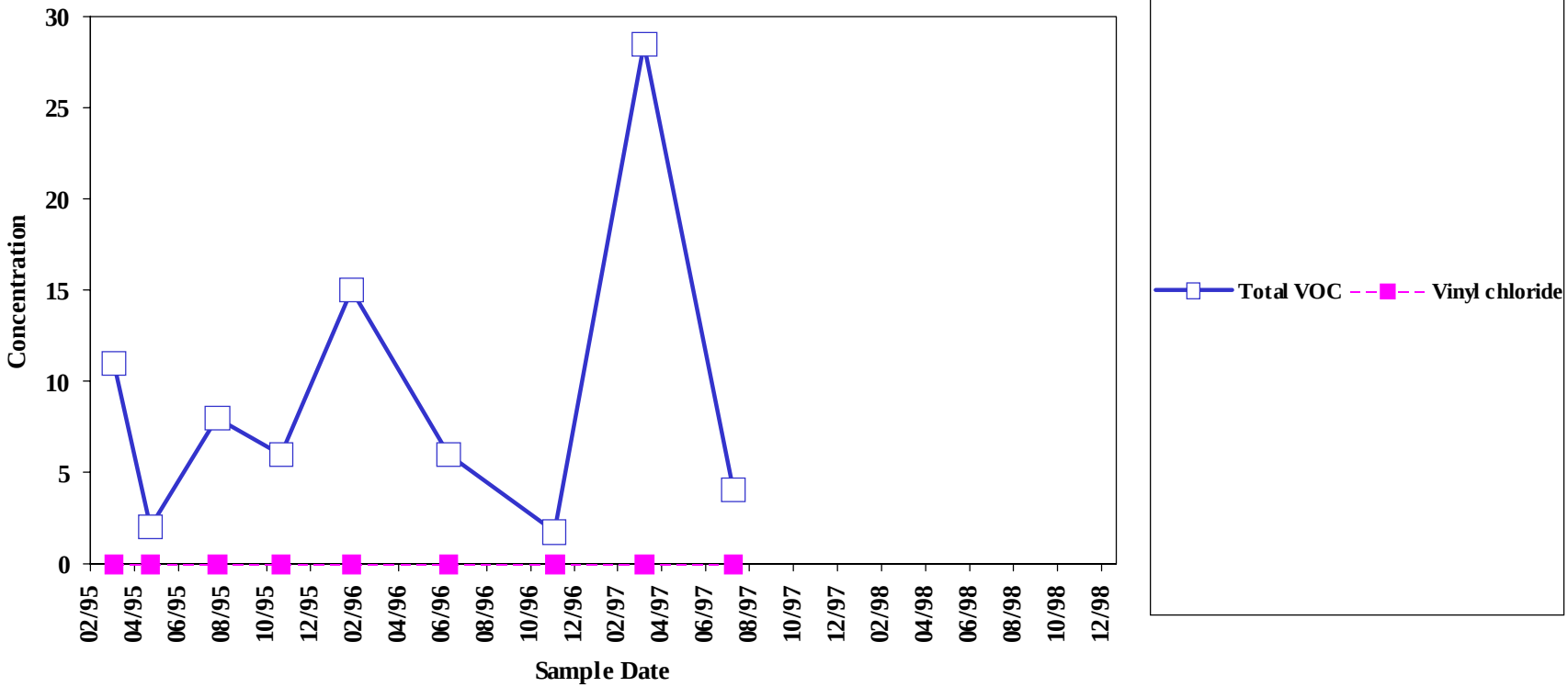
Sample Location:

SW-011

Site 9

Surface water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

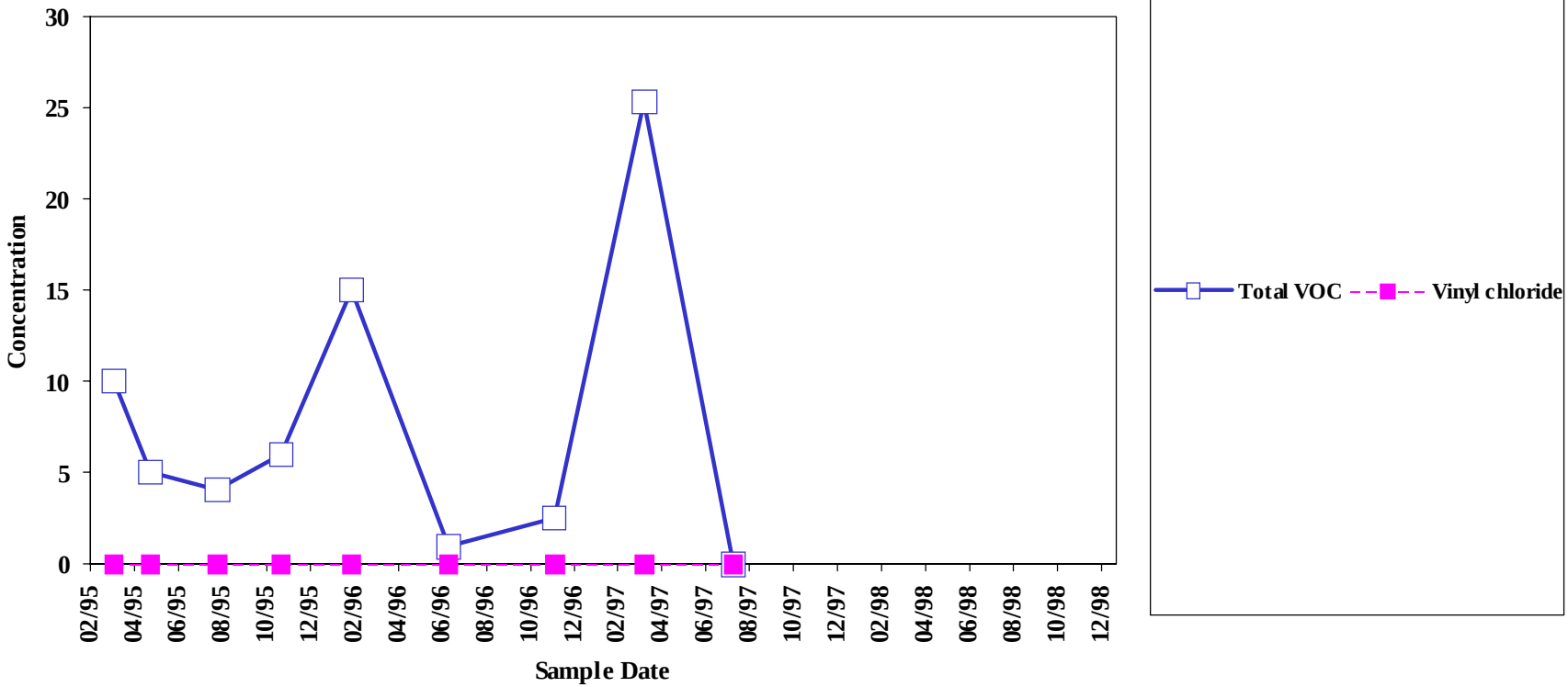
Sample Location:

SW-012

Site 9

Surface water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

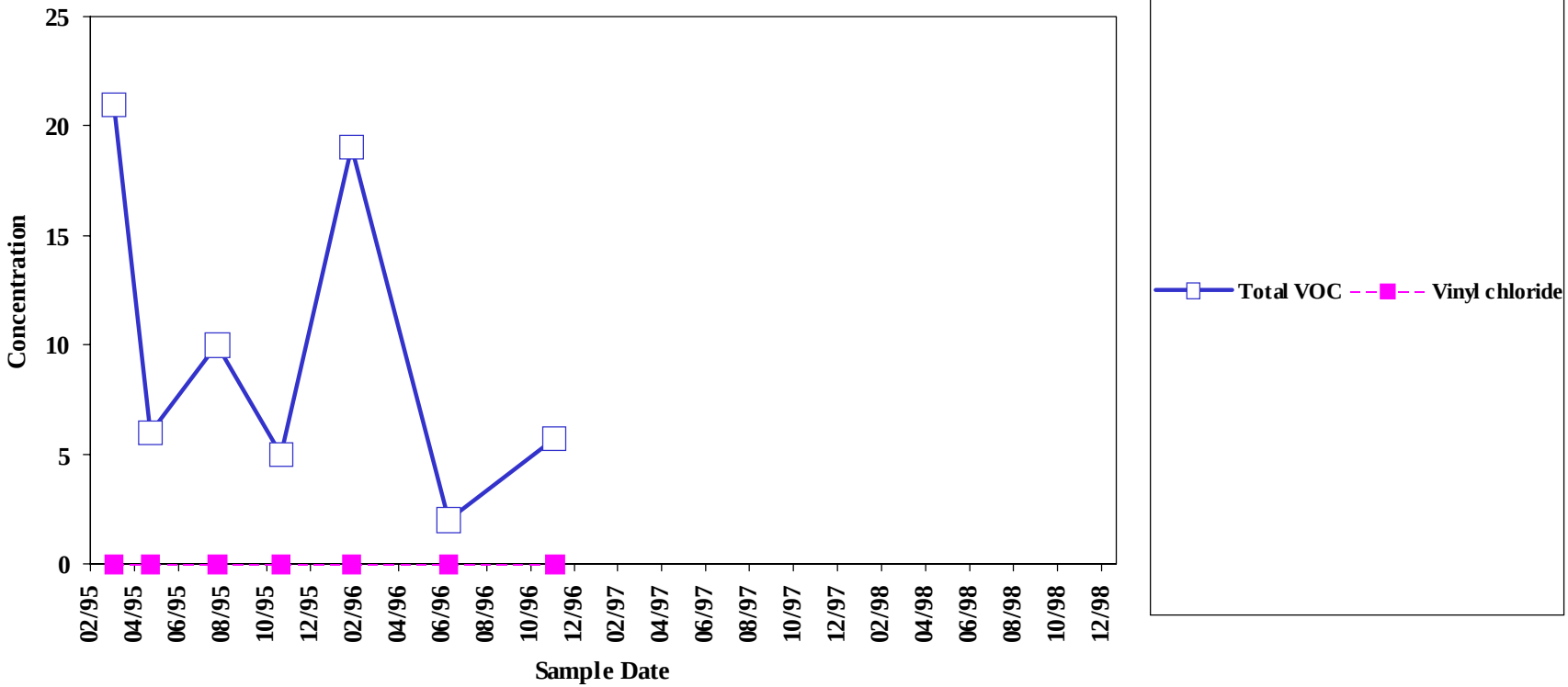
Sample Location:

SW-915

Site 9

Surface water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

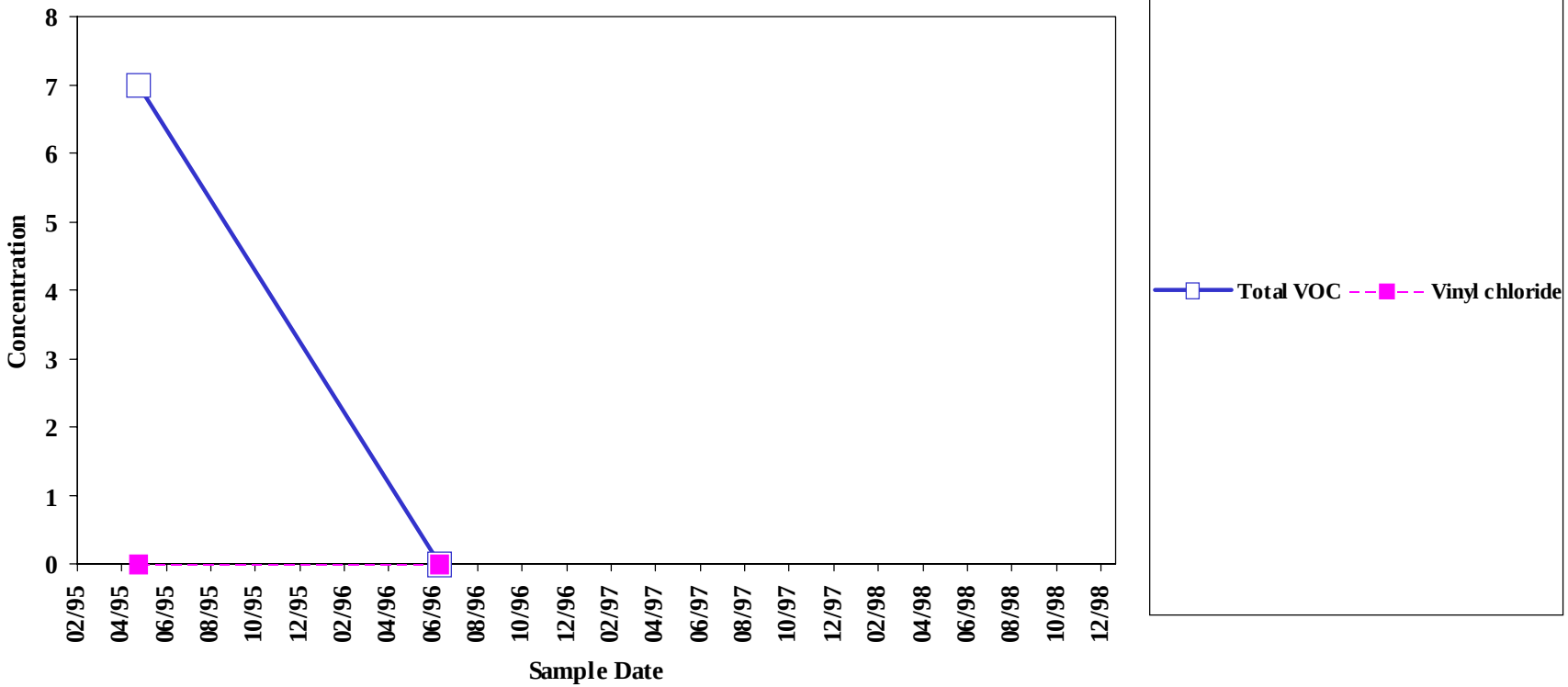
Sample Location:

SW-916

Site 9

Surface water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

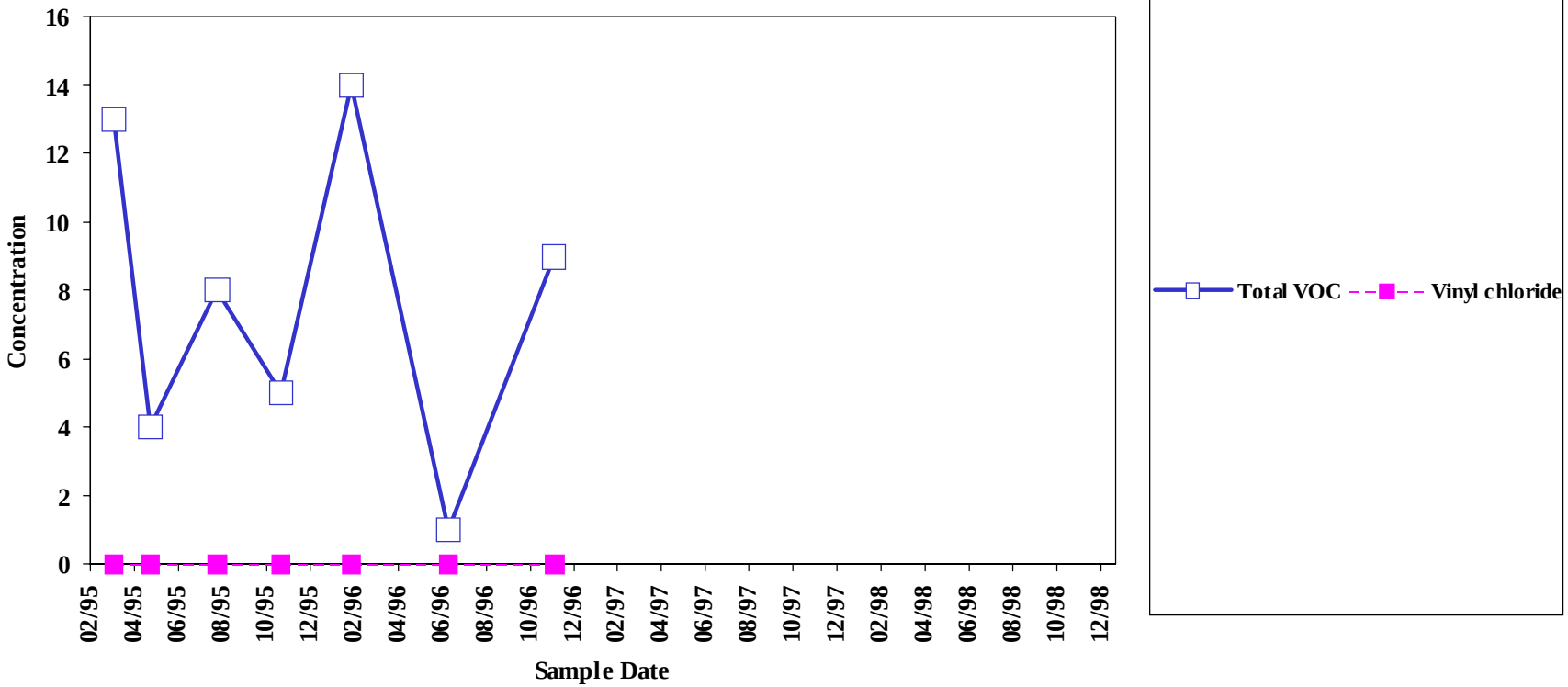
Sample Location:

SW-919

Site 9

Surface water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

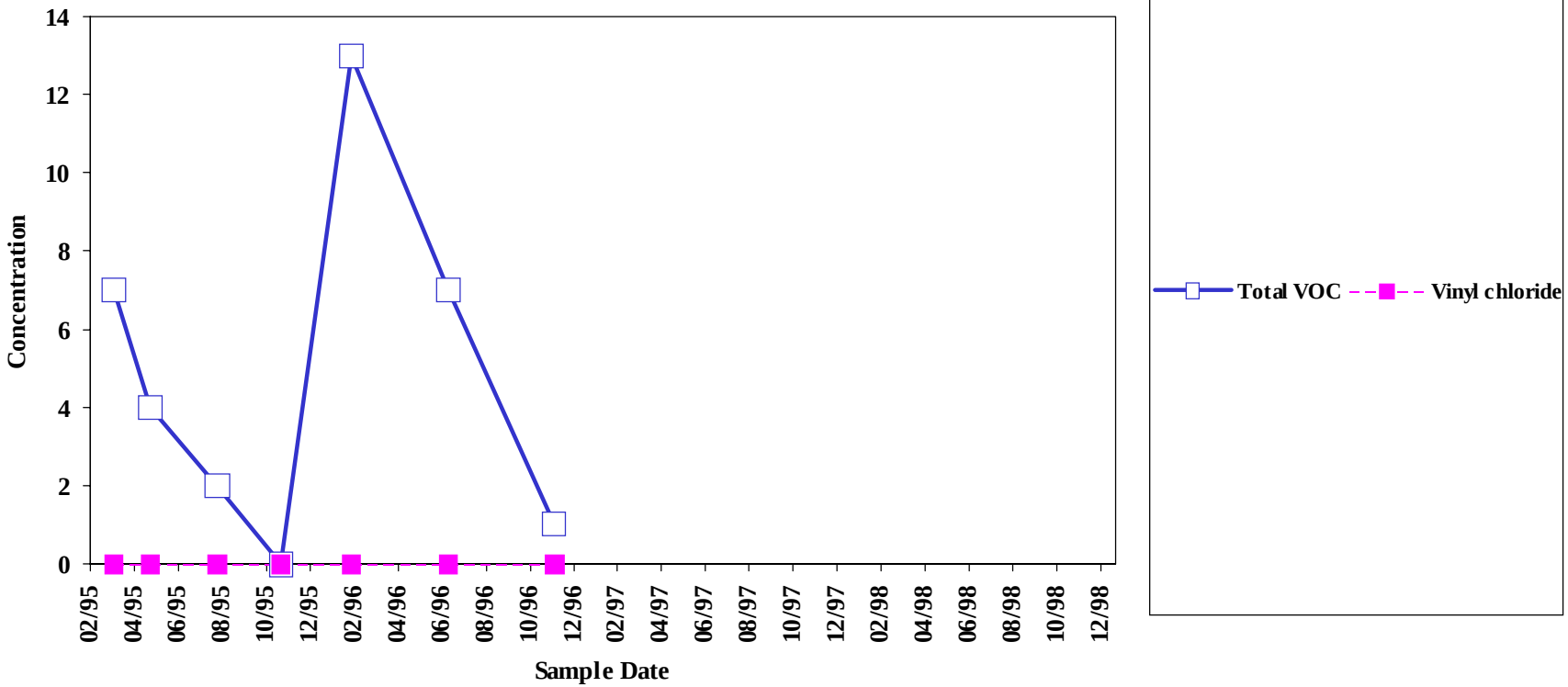
Sample Location:

SW-922

Site 9

Surface water

Chemicals of concern: Volatiles



Sample concentration units: µg/L

Appendix C

Response to Comments on 1997 Annual Report and Monitoring Events 11 and 12

RESPONSE TO COMMENTS FROM
MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION
ON DRAFT 1997 ANNUAL REPORT MONITORING EVENTS 8 THROUGH 10
SITE 9: NEPTUNE DRIVE DISPOSAL SITE
BRUNSWICK NAVAL AIR STATION

COMMENTOR: Claudia Sait **DATE: 28 August 1998**

General Response to Comment: The Navy will finalize the text of the 1997 Annual Report based on response to comments as listed below. These changes will focus on correcting errors identified in comments. The figures and graphs will not be revised in the Final 1997 Annual Report. The 1998 Annual will include the changes to report figures and report content.

SPECIFIC COMMENTS

1. The black triangle indicating Site 9 does not represent the site properly. The Department suggests adding an open black box that encompasses the entire area of investigation. That area should be the same as Figure 1-2, unless more precise site boundaries have been determined for the Final ROD.

   Response—The Navy agrees that the black triangle indicating Site 9 does not represent the site properly. The site map for future reports will be revised to include a more precise site location.

2. ***Purpose, Section 1.2.1, Page 1-2, Bullets***—A bullet needs to be added that gives importance to assessing variations in ground-water flow paths at Site 9, through contouring of water table elevation measurements in monitoring wells. The Department believes that flow path change has/is occurring as a result of the construction of impoundment ponds in the Site 9 discharge area. Evaluation of the natural attenuation remedy will depend on cognizance of such variation as it may affect the ground-water chemistry at each monitoring well.

   Response—The following bullet will be added to Section 1.2.1 of the Final 1997 Annual Report:

   Assess variations, if any, in the ground-water flow paths through contouring of water table elevation measurements in monitoring wells and surface water gauge stations.

3. ***Objective, Section 1.2.2, Page 1-2***—The title of this subsection does not accurately reflect its contents. The objectives of long-term monitoring were covered in Section 1.2.1, Purpose. Another title should be chosen that is more indicative of the text.

   Response—Subsection 1.2.2 will be renamed "Regulatory Requirements" in the 1997 Annual Report.

4. ***Background Wells, Section 1.2.3, Page 1-2***—This section is too brief, and does not reference any tables, figures, or later application to the present evaluation. It needs to be enhanced.

   Response—Discussion of background wells will be enhanced in the Final 1997 Annual Report to note additional data related to background wells. This section will not be included in the 1998 Annual Report.

5. ***Hydrogeology, Section 2.3, Page 2-2, 2nd Paragraph***—The recent construction of the surface water impoundment ponds appears to have affected water elevations immediately adjacent to these waterbodies but has not affected overall ground-water flow patterns at the site.

   Realizing that for this report the pertinent conditions are those characterizing the site between Monitoring Event 8 and 10, the Department is concerned that the above statement may be found to be inaccurate, particularly if Monitoring Event 12 data support Monitoring Event 11's water table contour map (MEDEP interpretation). The ponds probably have not significantly altered the "overall ground-water flow pattern at the site" (i.e., southeastward flow), but seemingly have caused bending of flow eastward near Building 201. The Department suggests,

   > *The recent construction of the surface water impoundment ponds appears to have affected water elevations adjacent to these bodies, but longer-term ramifications of this change on the flow pattern in the downgradient part of Site 9 are presently unknown.*

   Response—The Navy agrees to modify the sentence as follows:

   > *The recent construction of the surface water impoundment ponds appears to have affected water elevations ~~immediately~~ adjacent to these ~~water~~ bodies~~,~~ but longer-term effects of this potential change on the flow pattern at Site 9 will be assessed in future monitoring event reports~~ has not affected overall ground-water flow patterns~~.*

6. ***Results of Previous Investigations, Section 2.4, Page 2-2, 2nd Paragraph***—Media being monitored as part of the Long-Term Monitoring Program include ground water, surface water, sediment, and seeps.

   This sentence would be more appropriate at the end of the first paragraph.

   Response—The Navy agrees that the sentence is more appropriate at the end of the first paragraph. The sentence will be moved as requested.

7. ***Results of Previous Investigations, Section 2.4, Page 2-3, 1st Paragraph***—Extensive previous investigations have not defined a specific source for the presence of VOC in ground water.

Per correspondence in 1998, the Department believes that the source of VOC contamination is likely located upgradient of what has been defined as Site 9, and this area was not extensively investigated. The following language is recommended:

> *Previous investigations of Site 9 have not defined a specific source that explains the presence of VOC in ground water.*

Response—The Navy agrees to modify the sentence as requested.

8. ***Results of Previous Investigations, Section 2.4, Page 2-3, 1st Paragraph***—Elevated concentrations of inorganic analytes in ground water have been attributed to natural site background concentrations.

   The use of "site" is ambiguous here. The Department does not support attributing all exceedances to natural background levels (whether site means BNAS as a whole or Site 9), but does recognize that runway and street runoff (i.e., non-point sources) are probably responsible in some instances. This subject needs to be more clearly developed in the text.

   Response—The word "site" refers to Site 9, the subject of the report, and does not imply all ground water at NAS Brunswick.

9. ***Table 2-1***—Two of the background wells included in this table should be eliminated for this network. MW-801 has a history of producing turbid water samples (200 NTUs) even though the low-flow rate is 100 ml/min. Some inorganic concentrations are quite high (Al, Fe, Zn). Of direct concern to Site 9, MW-NASB-020 has very low dissolved oxygen values (<0.5 mg/L). This condition is likely the result of the well being located within an oxygen-deficient plume caused by upgradient fuel degradation at the NEX. Under the unnaturally strong reducing subsurface environment immediately upgradient of MW-NASB-20, metals attached to soil particles will tend to dissolve into ground water, and produce concentrations far above natural background levels. Low-flow sampling is currently at a rate of 300 ml/min, but will not mitigate this problem if lowered.

   The Department would like to place this topic of background well review on the agenda for the next RAB meeting.

   Response—The fact that MEDEP has questioned the appropriateness of these monitoring wells (MW-801, MW-211B, and MW-NASB-020) will be noted in discussions related to the background monitoring well network until the issue of background wells is resolved.

10. ***Results of Water Level Gauging Program, Section 3.1.2, Page 3-2, 2nd Paragraph***—...overburden ground water in the vicinity of Building 201 discharges to the northern and southern branches of the unnamed stream.

    The Department agrees that at least part of that flow path discharges to the northern branch. Without having pond elevations at the time of the monitoring events, the question of discharge to the southern branch cannot be definitively answered. Our current interpretation is that flow

past Building 201 may now skirt around the upper pond. If you have pond elevations, include them in this report and describe how they support discharge to the southern branch. If pond elevations have not be measured, MEDEP suggests that the text be revised to exclude the southern branch; or else such an interpretation be heavily qualified.

Response—Pond elevations were not available at the time of this report, however, they have been collected. The Navy agrees that ground-water flow past Building 201 may now skirt around the upper pond based on some gauging data, although flow towards the upper impoundment pond is not uncommon. The text will be revised to exclude the southern branch as appropriate.

11. ***Description of Ground-Water Monitoring and Sampling Program, Section 3.2.1, Page 3-3, 1st Paragraph***—Stabilization of water quality parameters was achieved when three consecutive measurements were within 10 percent agreement of the previous measurement, or when the turbidity measurements were reduced to below 10 nephelometric turbidity units (NTU).

    The word "or" is used erroneously; please replace it with "and."

    Response—The Navy will replace the word "or" with "and" as suggested.

12. ***Description of Ground-Water Monitoring and Sampling Program, Section 3.2.1, Page 3-3, 1st Paragraph***—During Event 9, 2 of 11 wells...had the water level drawn down to the top or below the top of the pump during pumping.

    Over the years, the Department has commented that monitoring wells should not be drawn down to the top of the pump before sampling. This situation should not occur if a water level measuring instrument is being used during purging. All analytical results for such dewatered wells must be flagged in the report table with a footnote that the concentrations may be affected by oxygenation.

    Response—Monitoring wells were sampled as part of Event 9 and sampling procedures have been changed in subsequent events. Wells are no longer purged dry. Prior to sampling, water levels are measured. If it is determined that a well has less than 2 ft of water in the PVC casing, the well is sampled with a peristaltic pump.

13. ***Volatile Organic Compounds, Section 3.2.2.1, Page 3-4, 2nd Paragraph***—In general, the highest concentrations of vinyl chloride were reported in samples from wells hydraulically downgradient of Building 201 (i.e., wells MW-NASB-072, MW-NASB-075, and MW-NASB-076), and from MW-NASB-080 which is located within the footprint of the ash landfill.

    The Department has several issues with this statement. MW-NASB-076 is not downgradient of Building 201; it is crossgradient. Reference to Building 201 is inappropriate since it is not believed to be a source. The "ash landfill" is associated with an old dump that may have included a wider variety of wastes; therefore, a multiple descriptor needs to be used. The

wording should be identical to that to be used in the Proposed Remedial Action Plan (PRAP). Lastly, the Department views the use of site features (such as Building 201 and ash landfill) in conjunction with vinyl chloride as misleading, in that it has not been shown that any feature within Site 9 is a source of vinyl chloride. To conclude, this sentence needs a complete overhaul.

Response—The Building and features noted in the sentence were landmarks and were not considered potential sources. The sentence will be revised as follows to remove reference to buildings and other site features:

> *In general, the highest concentrations of vinyl chloride were reported in samples from ~~wells hydraulically downgradient of Building 201 (i.e.,~~ wells MW-NASB-072, MW-NASB-075, ~~and~~ MW-NASB-076~~)~~, and from MW-NASB-080~~which is located within the footprint of the ash landfill~~.*

14. ***Volatile Organic Compounds, Section 3.2.2.1, Page 3-5, 1st Paragraph***—In general, decreasing or stable vinyl chloride concentrations were observed between Monitoring Event 8 (March 1997) and Monitoring Event 10 (November 1997) in samples collected from Site 9 monitoring wells.

    The Department interprets Figure 3-7 graphs differently. Looking at only the last three monitoring events, vinyl chloride concentration trends are as follows: 2 decreasing, 2 steady (always non-detect), and 3 increasing. Based on this categorization, the above statement in question is inaccurate. The Navy must be rewrite this statement to eliminate bias relative to perceived natural attenuation.

    Response—For the 1998 Annual Report, regression lines have been added to clarify site trends of vinyl chloride over time. For the 1997 Annual Report, the Navy will revise the statement as follows:

    > *~~In general,~~ Decreasing or stable vinyl chloride concentrations were observed in 4 of 7 site wells (MW-NASB-071, MW-NASB-074, MW-NASB-075, and MW-NASB-076). The 3 remaining site wells (MW-NASB-069, MW-NASB-072, and MW-NASB-080) showed an increase in vinyl chloride concentrations.*

15. ***Inorganic Analytes, Section 3.2.2.2, Page 3-5, 1st Paragraph***—Therefore, the reported concentrations of these elements are considered to represent natural site conditions.

    This assessment appears flawed in that 2 of the 10 NASB background wells are not documenting true background concentrations, in the opinion of the Department. These wells are MW-801, which greatly exceeds the aluminum MEG/MCL due to turbidity, and MW-NASB-020 which exceeds the manganese MEG/MCL due to a highly reductive subsurface environment. This situation has a strong bearing on the validity of the statement in question (see Comment No. 10). The Navy must rewrite this statement.

Response—The Navy understands that the MEDEP has expressed concerns about whether representative samples were collected from 3 wells (MW-801, MW-211B, and MW-NASB-020). The sentence in question will be revised as follows:

> *~~Therefore,~~ The Navy believes the reported concentrations of these elements are considered to represent natural site conditions and are unrelated to past activities at Site 9.*

16. ***Sediment Sample Results, Section 3.3.3.2, Page 3-8, 2nd Paragraph***—Under the discussion of SVOCs in sediment samples, the highest total SVOC value in the northern branch of the unnamed stream is not mentioned (179,370 Fg/kg, Event 10, sample location SED-010). MEDEP notes that this SVOC value is significantly higher than historical data values, and that total 1,2-dichloroethane and trichloroethene were also detected in 1997. Also, SW-010 was the only sampled location to detect vinyl chloride (0.8 Fg/L) in surface water. Continued sampling is very important at this location. Please include this information in this section.

    Response—The highest SVOC total (179,370 Fg/kg, Event 10, sample location SED-010) was inadvertently left out due to the fact it was the duplicate sample. The second paragraph will be revised as follows:

    > *The highest concentrations of SVOC were reported in SED-~~011 (165,500~~ 010 (179,370 Fg/kg) Monitoring Event 10 duplicate sample during 1997.*

    The Navy agrees that these SVOC data are significantly higher than historical data values, however, it should be noted that the original sample for SED-010 during Event 10 had a concentration of 27,740 Fg/kg, which is consistent with historical data. The Navy stated that total 1,2-dichloroethane and trichloroethene were detected in 1997 in the first paragraph of Section 3.3.3.2. Surface water location SW-010 will continue to be sampled as part of this program.

17. ***Sediment Sample Results, Section 3.3.3.2, Page 3-8, 2nd Paragraph***—SVOC concentrations in sediment are likely attributable to the paved areas which drain to the unnamed streams, including parking lots, runways, and taxiways.

    Statements such as this need to be deleted, unless they are backed up with appropriate data and analysis (or reference a BNAS report). The Department cannot endorse this explanation because benzo(a)pyrene and carbazole were found in both SED-0l0 and SED-011 samples; these are more typical of hazardous waste leachate than pavement runoff.

    Response—The Navy continues to believe that PAH such as benzo(a)pyrene and carbazole, and other SVOC are the result of surface water runoff and are unrelated to past activities at Site 9. These conclusions have been presented in previous Site 9 annual reports.

18. ***Seep Sample Results, Section 3.3.2.3, Page 3-8, 2nd Paragraph***—The report needs to state that the concentrations for lead and manganese exceeded their MCLs for all three monitoring events in 1997. Give the highest value and date for both analytes.

Response—Seep sample concentrations have not been compared to ground-water MCL in the past. Therefore, the Navy does not feel this comparison is appropriate.

19. ***Water Level Gauging Program, Section 4.1.1, Page 4-1, Bullets***—See previous Comment Nos. 2, 5, and 10.

Response—The first bullet will be modified as follows:

Overburden ground water is likely to discharge to the northern branch of the unnamed streams and impoundment ponds located south of Neptune Drive.~~ as indicated by localize groundwater flow to the north, southwest, and south.~~

The second bullet will be revised as follows:

Overburden ground water from the ash landfill/dump area, and the approximate location of the old incinerator, is likely to discharge to the northern branch of the unnamed stream; overburden ground water in the vicinity of Building 201 appears to discharge to the northern ~~southern~~ branch~~es~~ of the unnamed streams and impoundment ponds.

The third bullet will be revised as follows:

Two surface water impoundments were completed during 1997. These are likely to have affected water elevations adjacent to these bodies. ~~shallow ground-water flow patterns in the immediate vicinity of the ponds, although ground-water flow across Site 9 does not appear to have been affected.~~ Longer-term effects of this potential change on the flow pattern at Site 9 will be assessed in future monitoring event reports.

The fourth bullet will be revised as follows:

There were no significant variations in ground-water flow patterns at Site 9 noted during the three monitoring or bi-monthly gauging events.

20. ***Ground-Water Monitoring and Sampling Program, Site 9, Section 4.1.2.1, Page 4-2, 2nd Bullet***—See Comment No. 14.

Response—The second sentence of the second bullet of Section 4.1.2.1 on Page 4-2 will be revised as follows:

Vinyl chloride detections in 4 of 7 ~~other~~ site wells were consistent with previous long-term monitoring sample results showing decreasing or stable trends. The remaining 3 site wells (MW-NASB-069, MW-NASB-072, and MW-NASB-080) showed an increase in vinyl chloride concentrations.

21. ***Ground-Water Monitoring and Sampling Program, Site 9, Section 4.1.2.1, Page 4-2, Last Bullet***—Elevated manganese and thallium concentrations have also been reported in background samples, and are likely attributable to natural site conditions.

    Table 2-1 (Summary of Analytical results for Ground-Water Samples Collected During Monitoring Event 9 at Background Monitoring Wells) does not include any results for thallium. Please provide the indicated background data (or reference) for this analyte.

    Response—The following sentence will be added as the second to last sentence of the last bullet of Section 4.1.2.1:

    Thallium was not detected in ground-water samples collected at background wells during Monitoring Event 9 (November 1997), although levels were reported at concentrations ranging from 1.4 Fg/L to 2.1 Fg/L in samples collected during 1994 as part of the background well sampling.

22. ***Background Monitoring Wells, Section 4.1.2.2, Page 4-2, Bullet***—The primary reason for these exceedances is that two of these monitoring wells are not suitable for obtaining true background levels (see Comment Nos. 9 and 15).

    Response—See response to Comment No. 9. The bullet in Section 4.1.2.2 will be revised as follows:

    Of the reported inorganics, there were no concentrations reported above the corresponding State MEG.

23. ***Surface Water Sampling Program, Section 4.1.3, Page 4-3, Last Bullet***—The highest concentrations of VOC were reported during the March 1997 sampling event; VOC concentrations were consistently lower during the subsequent sampling events.

    This statement is only true for sample location SW-012. The Department recommends rewriting as follows:

    The highest concentrations of VOC were reported for the March 1997 sampling event; except for trace level detections at SW-010, VOC concentrations at SW-011 and SW-012 tended to be lower during subsequent sampling events.

    Response—The Navy agrees to revise the sentence as requested.

24. ***Sediment Sampling Program, Section 4.1.4, Page 4-3, 2nd and 3rd Bullets***—The description of the locations of sediment sampling locations SED-010 and SED-012 have been switched from that indicated by Figure 2-1. Please correct.

    Response—The description of the location of sediment locations SED-010 and SED-011 will be revised. Based on response to Comment No. 16, SED-011 will be replaced with SED-010 in the last sentence of the third bullet.

25. ***Seeps, Section 4.1.5.1, Page 4-3/4-4, Bullets***—None of these bullets addresses the large exceedances of MCLs for lead and manganese (see Comment No. 18).

    Response—See response to Comment No. 18. The Navy does not believe MCL are appropriate comparison for seep data.

26. ***Sediment, Section 4.1.5.2, Page 4-4, 3rd Bullet***—Twenty inorganic analytes were reported in the sediment samples….

    Response—Inorganic analytes will be replaced with SVOC.

27. ***Conclusions, Section 4.3, Page 4-5, 1st Bullet***—The primary constituent of concern at Site 9 (vinyl chloride) was reported in ground water from 5 wells during 1997, with the highest concentrations occurring in samples from 3 wells located downgradient of Building 201.

    Please list the 3 wells, and check that all are downgradient of Building 201. Note that MW-NASB-069 is upgradient of the building.

    Response—This comment is noted. The sentence will be revised as follows:

    The primary contaminant of concern at Site 9 (vinyl chloride) was reported in ground water from 5 wells during 1997, with the highest concentrations occurring in samples from 3 wells ~~located downgradient of Building 201~~ (MW-NASB-072, MW-NASB-069, and MW-NASB-080).

28. ***Conclusions, Section 4.3, Page 4-5, 2nd Bullet***—Sporadic vinyl chloride concentrations were reported in 3 site wells (MW-NASB-069, MW-NASB-072, and MW-NASB-080). These concentrations do not exhibit definitive trends, and are generally consistent with previous sampling events.

    The Department clearly sees an increasing trend in vinyl chloride for all 3 wells between Monitoring Events 8 and 10. Please recheck the data tables in Appendix A. Even though Event 11 data are included (should be deleted) and indicate an end to this trend in two of three cases, the no-trend statement does not fit the report period.

    MEDEP suggests that the following assessment be substituted:

    Vinyl chloride concentrations for 3 site wells (MW-NASB-069, MW-NASB-072, and MW-NASB-080) showed mild increasing trends during the report period resulting in exceedances of the MEG of 0.15 Fg/L and the MCL of 2 Fg/L. However, in all but one case, historic concentrations were not exceeded.

    Response—The Navy will revise the sentence as requested.

29. ***Conclusions, Section 4.3, Page 4-5, Bullets***—The high lead concentration (379 Fg/L) of Monitoring Event 10 in water of LT-901 seep needs be included. This occurrence seems to have been overlooked throughout the text.

    Response—The following will be added as a bullet to Section 4.3:

    Lead was reported at a concentration of 379 Fg/L during Monitoring Event 10. This result is elevated compared with other sampling events in 1997.

    It should be noted that the second paragraph of Section 3.3.2.3, Seep Sample Results, Page 3-8, does indicate that the highest concentrations were noted during the November sampling event, as compared to prior sampling events.

30. ***Conclusions, Section 4.3, Page 4-5, Next to Last Bullet***—The reported concentrations of inorganics and 1 SVOC in stream bed sediment are likely attributable to stormwater/surface water runoff from the runways and paved areas north of Site 9.

    Table 3-7 shows a lot more than one SVOC in streambed sediment at all three locations. Please correct this number.

    Also, see Comment No. 17 regarding a more probable source of some SVOCs, and adjust the bullet text accordingly.

    Response—The Navy continues to believe the SVOC reported in stream sediment at Site 9 are from the large portion of paved areas which drain into the stream. The sentence will be revised as follows:

    The reported concentrations of inorganics and 1 SVOC in stream bed sediment are likely attributable to stormwater/surface water runoff from the runways and paved areas north of Site 9.

31. ***Conclusions, Section 4.3, Page 4-6, Top Bullet***—Upon studying this report, the Department especially does not agree with removing surface water sediment location SED-010, and has some reservations with deleting SED-011 even though it is inundated by the lower pond.

    Response—Inclusion of these sediment sample locations will be discussed as part of the LTMP revision which is currently being finalized.

32. ***Conclusions, Section 4.3, Page 4-6, 3rd Bullet***—Data presented in Table 3-7 and Figure 3-8 plots indicate that SVOCs are important to monitor in order to better assess natural attenuation. Likewise, inorganics may be very useful for the same purpose. MEDEP needs to discuss this proposed change with the Navy.

Response—The Navy does not agree that metals of SVOC concentrations in sediment are directly related to the natural attenuation of vinyl chloride in ground water. Sampling program will be collected according to the Site 9 LTMP revision that is currently being finalized.

33. ***Table 3-4***—Why is thallium missing for 3 of the 5 wells for which TAL analyses were performed (MW-NASB071, MW-NASB-072, and MW-NASB-081)?

    Response—Thallium is not listed on Table 3-4 for wells MW-NASB071, MW-NASB-072, and MW-NASB-081 because it was not detected. As per previous reports, only those compounds detected in at least one of the samples, and the constituents of concern listed in the Long-Term Monitoring Plan (ABB-ES 1995), are shown on summary tables.

RESPONSE TO COMMENTS FROM
U.S. ENVIRONMENTAL PROTECTION AGENCY
ON DRAFT 1997 ANNUAL REPORT FOR MONITORING EVENT 8 THROUGH 10
SITE 9: NEPTUNE DRIVE DISPOSAL SITE
NAVAL AIR STATION BRUNSWICK, MAINE

COMMENTOR: Michael Barry **DATE: 13 November 1998**

General Response to Comment: The Navy will finalize the text of the 1997 Annual Report based on response to comments as listed below. These changes will focus on correcting errors identified in comments. The figures and graphs will not be revised in the Final 1997 Annual Report. The 1998 Annual will include the changes to report figures and report content.

1. EPA concurs with the sampling location and frequency change recommendations except for deleting SW/SD010 and SD-901 for VOCs and MW-078 for water level only.

   a. Sample points SD-901 and SW/SD-010 should both be retained to monitor any migration of VOCs to surface water or sediment. SW/SD-901 is the effluent from ground water and VOCs were detected in both SW-010 (vinyl chloride at 8 ppb) and SD-010 (total 1,2-dichloroethene at 17 ppb) in 1997.

      ***Response*?** The Navy agrees surface water data may be useful. Sediment sampling was discussed at the 6 April meeting and SW-010 will be sampled for VOC beginning with Monitoring Event 14 (April 1999). Surface water SW-010 will continue to be sampled as part of the LTMP.

   b. EPA concurs with deleting the other surface water and sediment sampling locations because they would yield little additional data relating to Site 9.

      ***Response*?** The Navy agrees with this comment.

   c. The graphs in Figure 3-7 were very helpful in displaying to EPA that no long-term data would be lost with bi-annual sampling and deleting the six proposed monitoring wells. We concur to the proposed April and October sampling events.

      ***Response*?** Based on discussions at the 10 February 1999 technical meeting, sampling events will now occur during April and September.

   d. Until the ground-water gradient stabilizes in response to the retention dams (see Comment No. 4), EPA believes that MW-78 should be included in gauging events to monitor levels south of the unnamed stream. EPA believes the data show that ground-water gradient trends are distinguishable without separate gauging events (see the attached spreadsheet and graphs).

***Response*?** Monitoring well MW-NASB-078 will be included in gauging events to monitor levels south of the unnamed stream as per the LTMP currently being finalized.

e. EPA concurs with deleting metals and SVOC sampling because we believe they have been shown not to be a CERCLA related release. These contaminants are not risk drivers with a pathway from Site 9 to the retention ponds via ground water. More detail on SVOCs is in Paragraph 6.

***Response*?** No response required.

2. We believe an additional monitoring well is required to fully monitor ground-water flow into Site 9 as discussed at the 21 October 1998 meeting. In summary, EPA's concerns are that:

a. The monitoring well network on the influent side of the vinyl chloride "plume" is along a narrow axis that leaves a large gap toward Building 29. Complete plume influent conditions and extent are needed to assess the monitored natural attenuation remedy. This is more important here because we agreed on natural attenuation without rigorous modeling and settled for really an "area of contamination" without finding a clear source.

***Response*?** Based on RAB discussing an additional monitoring well, MW-NASB-227 was installed 9 November 1998 at Site 9 and sampled as part of Monitoring Event 13.

b. The recent retention ponds and air sparging at the NEX site could have slightly altered ground-water flow since the monitoring wells were installed. This is evidenced by the flattening ground-water gradient in the last year; see paragraph 4 below. An additional concern is the "sporadic" vinyl chloride results at Site 9 over time.

***Response*—**The Navy believes that the addition of the NEX wells to the gauging program at Site 9 will resolve questions about flow directions. These additional upgradient wells were gauged in November 1998, as presented in the 1998 Annual Report.

c. Monitoring well network additions and deletions will routinely occur while monitoring plume conditions and shouldn't be misunderstood as an additional source investigation. If another source is present to the north/northwest, however, it would be better dealt with now than later.

***Response*?** No response required.

d. EPA concurs with the general location for the new monitoring well staked out near Building 29 on 21 October 1998.

***Response*?** Monitoring well MW-NASB-227 was installed 9 November 1998 and sampled as part of Monitoring Event 13.

3. EPA is not alarmed by the vinyl chloride rise in MW-69/80. However, this indicates that fluctuating results within a range should be expected for some time. Varying concentrations should be evaluated for the last year, the long-term trend and relative concentration of mother-daughter contaminants across the whole site. Better graphical tools are needed to display these data for analysis and to avoid misinterpretations.

   ***Response*?** The Navy agrees that better graphical tools are needed to display the data. Graphs will be revised and included as part of the 1998 Annual report.

   a. The data do not support conclusion bullet number one. Vinyl chloride rose in MW-69 by 7 parts per billion (ppb) to 7 ppb and by 6 ppb to 9 ppb in MW-80 during 1997 while lowering in most wells downgradient of Building 201. It thus appears the "critical mass" of vinyl chloride shifted from south to north of Neptune Drive in 1997.

      ***Response*?** Conclusion bullet number one will be revised as follows:

      > *The primary contaminant of concern at Site 9 (vinyl chloride) was reported in ground water from 5 wells during 1997, with the highest concentrations occurring in samples from 3 wells ~~located downgradient of Building 201~~ (MW-NASB-072, MW-NASB-069, and MW-NASB-080).*

   b. Conclusion bullets 3 and 4 are correct, yet could be misleading. Describing vinyl chloride results and trends with words is difficult because sporadic results and some yearly results oppose long-term trends, which leaves a wide area for judgement and interpretation. Figure 3-7 is a great format and goes a long way toward understanding this data. Another tool would be to produce another figure with two least squares regression lines plotted on the graphs, one for the year and one for the whole program. This figure would put more of this data into "black and white" and could further reduce misinterpretation.

      i. MW-76 shows a clear lowering trend for 1997, yet overall is increasing.
      ii. MW-69 is called sporadic, but I see increasing, even without the higher Event 11 result.
      iii. MW-72 is called sporadic, but I see decreasing, even without the lower Event 11 results.

      ***Response*?** The Navy agrees that graphic tools help with interpretation of data. The graphs will be revised as recommended in this comment and included as part of the 1998 Annual Report.

   c. One way to move forward would be to plot a graph of average well concentrations over time. This wouldn't be a measure of the true volume of contamination, but would be way to monitor the overall plume. This graph could also be used to quantify the "triggering" definitions for the ROD that were discussed at the meeting on 21 October 1998.

      ***Response*?** This revision will be considered to be added as part of the 1998 Annual Report.

   d. Because vinyl chloride and DCE are related through dechlorination, they should be looked at as a system. Rising vinyl chloride levels indicate that natural attenuation is working. In

fact, given overall steady VOC levels, I'd expect vinyl chloride concentration and ratio to rise. A quick look at the individual well graphs indicates that vinyl chloride ratios are increasing. Graphing vinyl chloride/DCE ratios by well and site average would monitor the dechlorination process.

***Response*?** The Navy agrees that the observed trends in vinyl chloride concentrations may be good evidence that natural attenuation is occurring at Site 9. The Navy will add the proposed vinyl chloride/DCE ratio analysis in future Annual Reports.

e. EPA will put more weight on long-term trends over yearly fluctuations at this site. The initial estimate of an active remedy in the IROD was about 5 years based on flushing up to 22 pore volumes. With natural flow only, this will take much longer than 5 years. Chemical decomposition wasn't factored in the IROD estimate, but the presence of mostly vinyl chloride and DCE proves it's occurring at some rate.

***Response*?** The Navy agrees that natural attenuation will likely take longer than 5 years for Site 9.

4. Monitoring well results clearly indicate to EPA that the ground-water gradients decreased across the site by 15-60 percent, see attached graphs and figure. Report text should reflect this.

***Response*?** The text will be altered to note changing flow gradients have been observed. The text of future Annual Reports will note if significant changes in gradient occur across the site.

a. This may alter the ground-water flow path on its way from the barracks area to the unnamed streams and could cause contaminated ground water to miss the monitoring well network. This is the primary reason why the EPA supports another monitoring well.

***Response*?** Monitoring well MW-NASB-227 was installed to address this issue. Results will be presented in the 1998 Annual Report.

b. Possible causes are the retention dams and air sparging at the NEX site. This situation should reach a new equilibrium with no net change to the ground-water outflow of the plume.

***Response*?** Changes in ground-water flow patterns will continue to be addressed based on data collected for NEX monitoring wells.

c. Note of the decreasing ground-water gradient should be made in Section 3.1.2 on Page 3-1 to 3-2 and Section 4.1.1 on Page 4-1.

***Response*?** The following sentence will be added to the end of the third paragraph of Section 3.1.2 of the Final 1997 Annual Report:

> *Ground-water gradients have decreased across the site due to the recent installation of the surface water impoundment ponds.*

d. This trend would have been discernable without the extra gauging events.

***Response*?** The Navy agrees that collection of gauging data more frequently than twice per year is not necessary.

5. The report needs more information to support the claim that thallium in ground water is due to background conditions. Thallium was detected in two wells above the MEG (0.4 ppb).

a. Adding thallium background concentrations to Table 2-1 would resolve this issue.

***Response*?** The following sentence will be added as the last sentence of Section 3.2.2.2 and as the second to last sentence of the last bullet of Section 4.1.2.1of the Final 1997 Annual Report:

> *Thallium was not detected in ground-water samples collected at background wells during Monitoring Event 9 (November 1997), although levels were reported at concentrations ranging from 1.4 Fg/L to 2.1 Fg/L in samples collected during 1994 as part of the background well sampling.*

b. If background thallium data aren't available, it should be directly addressed in Section 3.2.2.2 on Page 3-5 and the last bullet in Section 4.1.2.1 on Page 4-2.

***Response*?** See response to Comment No. 5a.

c. EPA does not regard thallium as a significant issue because:

i Detections are isolated, at 15 percent per table 3-5.
ii. Maximum concentration was 1.2 ppb, less than the MCL of 2.0 ppb.
iii. Detections were isolated to MW-NASB-79/80 which are immediately downgradient of the ash landfill dump area and straddle barracks building 219. These are far from the nearest ground-water seep to surface water and thus don't present an ecological exposure pathway.
iv. Human health risks due to thallium if the ground water at Site 9 was consumed would probably be minor compared to those posed by the vinyl chloride.

***Response*?** The Navy agrees reported concentrations of thallium do not present a human health risk.

6. EPA concurs that SVOCs in surface water and sediments are not due to Site 9.

   a. Earlier investigations at the ash landfill and incinerator identified SVOCs (actually PAHs) as soil contaminants, but did not detect them in ground water downgradient of this area.

      ***Response*?** No response required.

   b. The SVOCs found in the pond water/sediment are likely due to basewide runoff and stagnation behind the dams. This condition should be expected and monitored under the Air Station's NPDES Permit.

      ***Response*?** The Navy agrees that SVOC found in pond sediments are likely attributed to basewide runoff and stagnation behind dams.

7. EPA strongly supports briefer "just the facts" monitoring event reports and to focus analysis on the annual reports. This should improve and hasten the analysis and feedback process while reducing the project administrative burden of all.

   ***Response*?** The Navy agrees that supplying simplified" monitoring event reports is appropriate for the data collected as part of the Long-Term Monitoring Program.

RESPONSE TO COMMENTS FROM
MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION
ON FINAL REPORT MONITORING EVENT 11, SITE 9:
NEPTUNE DRIVE DISPOSAL SITE
NAVAL AIR STATION, BRUNSWICK, MAINE

COMMENTOR: Claudia Sait **DATE: 19 August 1998**

GENERAL DISCUSSION

1. As the Department has suggested verbally in recent RAB meetings, the surface water elevations in the two downgradient ponds should be accurately determined (within nearest 0.1 ft) and reported for each bi-monthly gauging event. These data are viewed as critical to accurately map ground-water flow paths at Site 9. Without such data, MEDEP is skeptical that the potentiometric surface maps (Figures 4 and 5) have been correctly drawn, since the shallow water table and ponds have to be closely connected hydraulically.

   ***Response*?** Staff gauges have been added to the ponds to collect these data.

2. The area of potentiometric data collection and contouring needs to be expanded to include more upgradient monitoring wells. The Department recommends that at a minimum the following wells be added: NASB-20, NASB-21, NASB-22, and NASB-204. These well locations should included on figures and future contour maps. Wells NASB-7 through 10 should also be measured to better facilitate the drawing of the most northern potentiometric contour line for Site 9.

   ***Response*?** This issue was discussed during the 21 October 1998 RAB meeting. Additional upgradient wells will be gauged to define ground-water flow patterns at Site 9. These additional wells will be included in Monitoring Event 13 (November 1998).

3. The Department would like to visit SED-010 sampling location during the scheduled 14 and 15 September observation of sampling at the NEX. We are thinking that a different sampling strategy could be devised to minimize the SVOC and TIC differences between the primary sample and duplicate sample experienced consistently in the past.

   ***Response*?** The MEDEP will be notified when sampling is conducted.

SPECIFIC COMMENTS

4. ***Water Level Gauging, Section 2.1, Page 5, 3rd Paragraph*?** The hydraulic gradient across the subject site is characterized as shallow at 1.0 percent (0.010 ft per foot)….

   The term "shallow" is inappropriate for describing hydraulic gradients. Please substitute the words "moderately low."

***Response*?** The term shallow will not be used in future reports.

5. ***Water Quality Indicator Parameters, 2.2, Page 5, Bottom Paragraph*?** Lower turbidity and conductivity values and higher dissolved oxygen values were observed in ground-water samples during Monitoring Event 11 (March 1998) as compared to Monitoring Event 10 November 1997). These results are likely attributed to the colder temperatures associated with the March sampling event.

   The comparison summary is accurate, however, the Department questions the reason given. Monitoring Event 9 (July 1997) data show the same trend in decreasing conductivity, but the DO values are generally very low like those of Event 10. Therefore, temperature does not appear to be a factor. The Department suspects these changes are due to changes in the upgradient ground-water environment, or possibly to variation in instrument calibration and/or instrument field use. Please delete the last sentence. Further investigation into differences between monitoring event values should be accomplished prior to finalizing the annual report.

   ***Response*?** This comment is noted. Discussion of trends will be provided in the annual report for Site 9, and will no longer be discussed in monitoring event reports.

6. ***Ground Water, Page 6, 1st Paragraph*?** A statement needs to be added regarding the Maximum Exposure Guideline and Maximum Contaminant Level exceedances. The Department suggests that the following statement be added:

   Only one VOC (vinyl chloride) exceeded Maine's Maximum Exposure Guideline and the Federal Maximum Contaminant Level, and two metals (manganese and chromium) exceeded regulatory standards.

   ***Response*?** Future event reports will focus on presenting data and will not contain discussions as listed above. Data interpretation will be limited to the annual report.

7. ***Surface Water, Page 6, 1st Paragraph*?** No tentatively identified VOC were reported in surface water sample SW-010.

   This sentence should be moved to the end of Paragraph 2 in this section, so that the detected VOCs are discussed first.

   ***Response*?** TICs data are no longer collected.

8. ***Sediment, Page 7, 1st Paragraph*?** A statement must be added that a number of tentatively identified compounds were detected at moderate concentrations in sediment sample SED-010 (see Table C-3). Also, the reader should be referred to Appendix B (Analytical Data Quality Review Subsections B.l, B.2, and B.7) which qualifies laboratory results as biased low estimates.

***Response*?** This comment is noted; although TICs will no longer be included for analysis subsequent to Monitoring Event 13.

9. ***Sediment, Page 7, 1st Paragraph*?** A majority of the SVOC reported in the sample were polycyclic aromatic hydrocarbons, likely attributed to stormwater runoff over asphalt paved areas.

   Polycyclic aromatic hydrocarbons were found to be present in soils of the ash landfill/dump area north of Neptune Drive as a result of the Pollution Abatement Confirmation Study conducted in 1984. This being the case, the Department requests that this nearby source directly upgradient be mentioned with equal weight as stormwater runoff, unless a strong argument can be made in support of only runoff as a source.

   ***Response*?** Discussion of potential sources will be limited to the annual reports, and will no longer be included in monitoring event reports. The Navy continues to believe these compounds are related to site runoff.

10. ***Sediment, Page 7, 1st Paragraph***? Note that significantly higher concentrations of SVOC were reported in the primary sample as compared to the duplicate sample at SW-010. This is attributed to the heterogeneous nature of the sediment media being sampled, and is consistent with previous monitoring events.

    Does the Navy mean SED-010 instead of SW-010? Please check and correct, as necessary.

    ***Response*?** This change will be reflected in future monitoring event reports.

11. ***Leachate Station Seep and Sediment, 2.6, Page 7, 2nd Paragraph*?** A total of 18 target analytes were reported in the leachate seep sample.

    Two of the inorganics (lead and manganese) have concentrations that exceed ground water MCLs and/or MEGs. A statement to this effect must be added.

    ***Response*?** The Navy disagrees with this comment. Additional discussion is necessary to resolve this issue. Surface water and leachate results have not previously been compared to ground-water MEG/MCL.

12. ***Figure 1*?** Site 9 label and boundary is missing. The area shown as Site 9 should encompass all long-term monitoring stations associated with the site.

    ***Response*?** Site maps have been revised to show the extent of Site 9.

13. ***Table 3*?** The conductivity value for MW-NASB-071 should be 241, not 2.41. An erroneous pseudo-decimal point in Appendix A.2 was apparently misinterpreted. Please correct.

    ***Response*?** This comment is noted.

RESPONSE TO COMMENTS
FROM U. S. ENVIRONMENTAL PROTECTION AGENCY
ON MONITORING EVENT 11 FINAL REPORT FOR SITE 9
AT NAVAL AIR STATION, BRUNSWICK, MAINE

COMMENTOR: Michael Barry **DATE: 8 February 1999**

1. This event resulted in the highest total and average VOC concentrations in ground water at Site 9 since formal long-term monitoring was started in March 1995.

   ***Response*—**No response is required.

2. VOCs were about evenly split between 1,2-dichloroethylene (DCE) and vinyl chloride. DCE and vinyl chloride are respectively the first and second decay daughters in the decay chain of the most likely "parent" solvent that was released.

   ***Response*—**No response is required.

3. Parent VOCs trichloroethylene (TCE) and/or tetrachloroethylene (PCE) were detected in MW-NASB-69 and 74 levels similar to past events and less than MCL/MEGs. MW-NASB-74 is downgradient of the Building 201 septic system, a suspected historical VOC source. Both chemicals were found in MW-NASB-74 whilst only TCE was found in MW-NASB-69 and at less than one part per billion.

   ***Response*—**No response is required.

4. VOCs were detected in surface water sample SW-010 in the unnamed stream at levels similar to previous events and nearby monitoring wells. VOCs were not detected at the upstream seep (LT-901).

   ***Response*—** No response is required.

5. TAL metals. Two monitoring wells contained metals above the MEG/MCL.

   a. MW-NASB-079 contained chromium at 133 ppb (MEG is 100); up to now this well was consistently less than 10 ppb.

      ***Response*—** No response is required.

   b. MW-NASB-071 contained manganese at 263 ppb (MCL is 50 ppb and MEG is 200 ppb), but these are in the range of historical values and manganese is attributed to site background conditions.

      Response—No response is required.

c. We recommend adding a description of footnote (c) Table 5. We assume this is a note about either site background or secondary MCLs.

Response—The referenced footnote will be added to future monitoring event reports.

6. We believe that site runoff, including portions of the airfield and flight line, are the cause of PAHs of about 28,500 ppm in the unnamed stream sediment at SED-010. This may present a greater environment risk to the environment than the CERCLA site that we expect is closely monitored under the Air Station's NPDES program.

Response—The Navy agrees with this comment.

RESPONSE TO COMMENTS FROM
MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION
MONITORING EVENT 12 - JULY 1998
SITE 9: NEPTUNE DRIVE DISPOSAL SITE
BRUNSWICK NAVAL AIR STATION

COMMENTOR: Claudia Sait **DATE: 9 February 1999**

GENERAL COMMENTS

1. The Department believes that sediment samples listed as tri-annual events should be obtained whether or not the stations are under several feet of water due to backwater flooding caused by the detention ponds. Procedures and equipment exist to take samples under these conditions. This issue needs to be resolved before Monitoring Event 13 is undertaken.

   ***Response*—**The Navy does not agree with this comment. This issue was discussed during the 7 April 1999 meeting.

2. On Pages 4 and 5, the wrong figure is referenced several times. Please change "Figure 1 to Figure 2."

   ***Response*—**This comment will be addressed in future monitoring event reports.

3. The Department believes, in retrospect, that TAL elements should be run for surface water sediment station SED-10, SED-11, and SED-12. Our rationale is that because metals are found in the leachate station sediment (LT-901 (SED), located 150 ft upstream, downstream samples are needed to determine if further sediment contamination is occurring. Data older than 1-2 years may not be representative of into the lower reach of the northern branch of the unnamed stream. Based on 1998 water table contour maps, it is thought that the retention ponds are deflecting ground-water flow eastward, away from the southern branch.

   ***Response*—**The Navy does not agree with this comment. This issue was discussed during the 7 April 1999 meeting.

SPECIFIC COMMENTS

4. ***Introduction, 1.1, Page 1, 2nd Paragraph***—At Site 9, the Navy is performing long-term monitoring, maintenance, and corrective measures as part of….

   The Department is unaware that any corrective measures are being performed at Site 9, therefore, the Navy needs to delete the reference to corrective measures or briefly describe them.

***Response*—**This will be revised in future monitoring event reports.

5. ***Results, 1.2.2, Page 2, 2nd Paragraph***—The ground-water flow directions are generally indicated in Figures 3 and 4 by the placement of short arrows across the potentiometric contours at scattered locations. While the arrows give a general sense of ground-water movement, the Department feels it is more instructive to show several key flow lines on the map using a continuous lightweight line with arrow heads, beginning at the most upgradient contour and ending at the ponds. Because well MW-NASB-069 has the highest concentration of vinyl chloride, one flow line should pass through this point. The Department recommends that future potentiometric maps adopt this convention.

   ***Response*—**The Navy does not agree with this comment. No changes will be made in future monitoring event reports.

6. ***Sediment Results, 1.4.3, Page 4***—There is no discussion of tentatively identified compounds (TICs), nor can any TIC results be found in the report. MEDEP notes do not show that the Restoration Advisor Bo ard (RAB) agreed to delete this analysis type for Monitoring Event 12. It appears that the Navy has intended to run TICs according to their November 1998 Response to Comments for Monitoring Event 11 (Comment No. 8). Please explain the omission.

   Response—As noted in the data quality objective meetings in May 1998, TIC data did not provide additional value to the sampling program, and were removed from the sampling program beginning in Monitoring Event 12.

7. ***Analytical Data Quality Review, 1.7, Page 6, 5th Bullet*—**The correct sample designation is LT-901 (SED) not SED 10.

   ***Response*—**This will be revised in future monitoring event reports.

8. ***Table 3***—The Department notes that dissolved oxygen (DO) was measured at less than 0.5 mg/L in the following monitoring wells: NASB-069, NASB-071, NASB-074, NASB-079, and NASB-080. These very depressed levels of DO seem unusual for such a shallow "aquifer," and may relate to the degradation of fuels in ground-water upgradient of Site 9. Does the Navy have an explanation for this?

   ***Response*—**No data interpretation will be offered in monitoring event reports. This issue will be explored after flow data are collected from monitoring wells upgradient of Site 9.

9. ***Table 5***—Footnote definitions are missing for (d) and (e) in the body of the table.

   Response—This will be revised in future monitoring event reports.

10. ***Table 8***—The Department notes that the lead concentration in seep water from LT-901 is still high (111 Fg/L) relative to non-detects of lead in monitoring well samples. Because seep water is presumed to be upgradient of ground water that is surfacing, MEDEP is concerned that the MCL is being exceeded. This is just an observation; no response is required.

    Response—The Navy would like to note that leachate sample is collected directly from the seep, and likely contains suspended sediment which are likely to be causing elevated metals concentrations that may not reflect actual dissolved inorganic concentrations. To further explore the issue of metals concentrations in ground water, the Navy will be collecting ground-water samples from wells downgradient of the Site 9 landfill for TAL metals starting in April 1999 (Monitoring Event 14).

RESPONSE TO COMMENTS
FROM THE U.S. ENVIRONMENTAL PROTECTION AGENCY
ON MONITORING EVENT 12 FINAL REPORT FOR SITE 9
AT NAVAL AIR STATION, BRUNSWICK, MAINE

COMMENTOR: Michael S. Barry **DATE: 8 February 1999**

1. VOCs in ground water have fallen to levels more in line within historical ranges at Site 9. Please see enclosed charts for your information.

   a. The rising overall trend in total and average VOCs observed in Events 8-10 was reversed significantly in Event 12. Because single events shouldn't be taken out of context of long-term trends, we will defer further analysis until future event results and the 1998 annual report are available. Data quality also counsels a "wait and see" approach for more data.

      ***Response*—**No response required.

   b. The data quality review stated that the results for MW-NASB-069, 079, 080, 081, 079 (DUP), LT-901 (SED), and SED-010 DUP should be regarded as estimates and are biased low because of low surrogate recoveries on the initial sample and that the reanalysis was rejected because of holding time discrepancies (Page 6, fourth bullet). We note this with some concern because this could have significantly skewed Event 12 results low as most of the sample points with VOC detections are affected.

      ***Response*—**The Navy agrees this issue is a concern, although subsequent monitoring events have not experienced similar laboratory problems.

   c. The finding and footnote (a) on Table 5 regarding this data quality issue are confusing. Clearly state which sample produced the result and any qualifying information in any future similar instances. For example, a clearer footnote (a) would have been, "Results should be regarded as estimates and are biased low because of low surrogate and could be misleading. We recommend that the qualifying footnotes on Table 5 recoveries on the first sample. The subsequent reanalysis was rejected due to holding time discrepancies."

      ***Response*—**This comment will be considered in future monitoring event reports.

2. VOCs in ground water and surface water continue to be about evenly split between 1,2-dichloroethylene (DCE) and vinyl chloride. DCE and vinyl chloride are respectively the first and second decay daughters in the decay chain of the most likely "parent" release solvent. No clear trend is discernable yet; we will continue tracking this relationship. Please see enclosed charts for your information.

   ***Response*—**No response required.

3. Parent VOCs trichloroethylene (TCE) and/or tetrachloroethylene (PCE) were detected in MW-NASB-69 and 74 at levels similar to past Events and less than MCL/MEGs. MW-NASB-74 is downgradient of the Building 201 septic system, a suspected historical source of VOCs. Both chemicals were found in MW–NASB-69; and at less than one part per billion.

   Response—No response required.

4. In 1998, it appears the ground-water gradient might be increasing to its historical level across the site prior to construction of the retention ponds in late 1996. Elevations of most wells are rising slightly in response to the ponds. Please see enclosed charts for your information.

   Response—No response required.

5. VOCs were detected in the unnamed stream at SW-010 at levels similar to previous events and nearby monitoring wells. VOCs were not detected at the upstream seep (LT-901).

   Response—No response required.

6. TAL Metals.

   a. We could not locate the metals results for MW-NASB-72 on Table 5. Results were found on the lab data sheet in Appendix C.1 with no exceedances of primary MCL/MEGs.

      Response—No response required.

   b. We note that MW-NASB-71 was inadvertently not sampled.

      Response—No response required.

   c. We recommend that footnote (d) 's description be added to Table 5 in future reports. It appears that this is a qualifier for secondary MCLs or site background.

      Response—This footnote will be added to future monitoring event reports.

7. Sediments.

   a. We note that VOCs were detected at estimated values in the range of 1-11 parts per million in sediment at LT-901 (SED). VOCs have been detected at this location in the past.

      Response—No response required.

   b. We believe that site runoff, including portions of the airfield and flight line, are the cause of PAHs of about 18,000 ppm in unnamed stream sediment at SED-010. This is in the same range but a bit lower than in Event 11.

***Response*—**The Navy agrees that PAH in stream bed sediment are related to surface water runoff and are unrelated to Site 9.

c. PAHs in sediment from general site runoff may present a greater environmental risk than the CERCLA site.

***Response*—**The Navy agrees with this comment.

d. We note that the retention ponds were drained at the time of Event 12 for cleaning under the Air Station's NPDES program.

***Response*—**No response required.