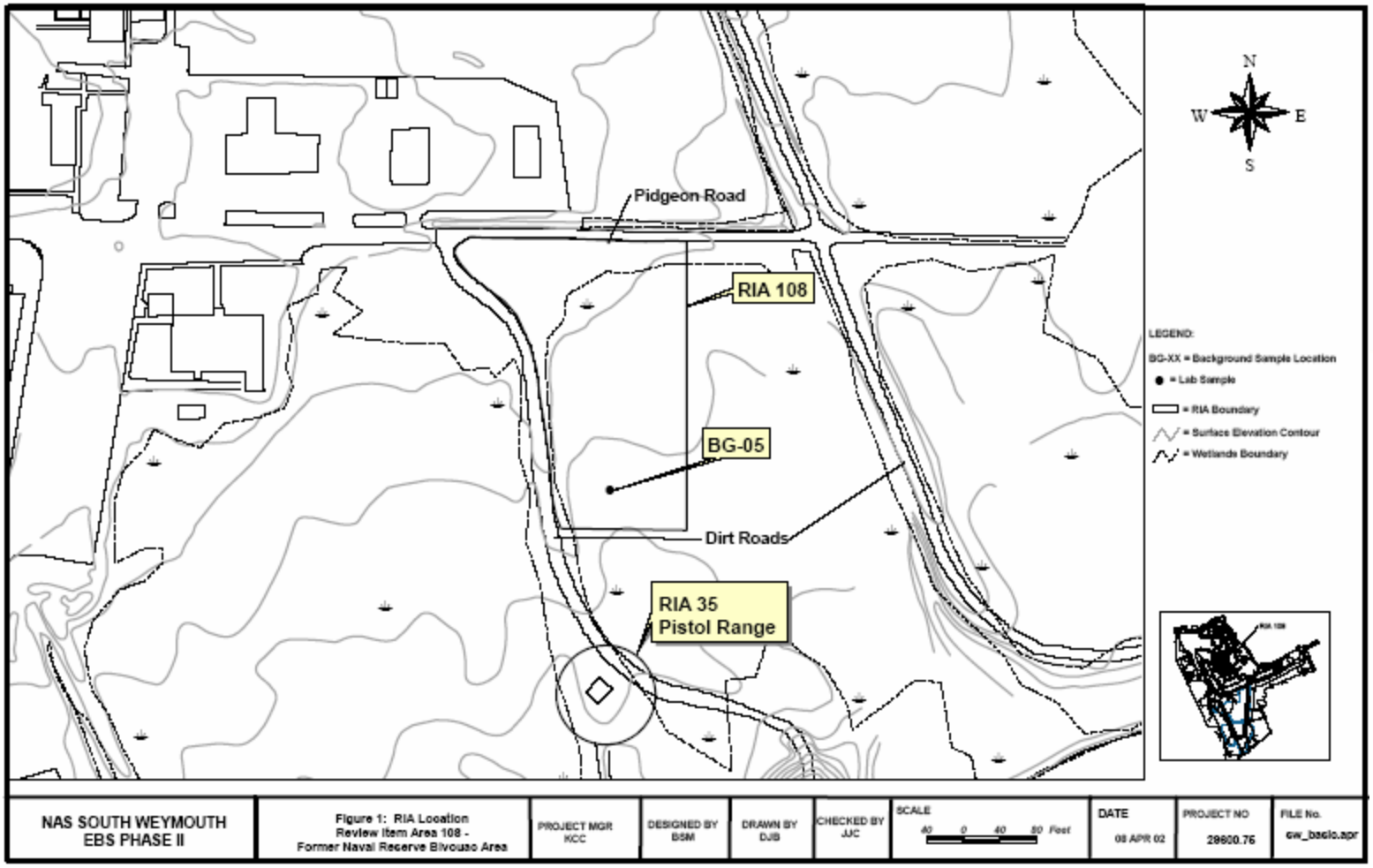
IR Site 11 – Solvent Release Area (SRA) –(formerly AOC 108)

Mark Leipert, P.G.
Project Manager
Engineering Field Activity North East
Restoration Advisory Board, March 10, 2005

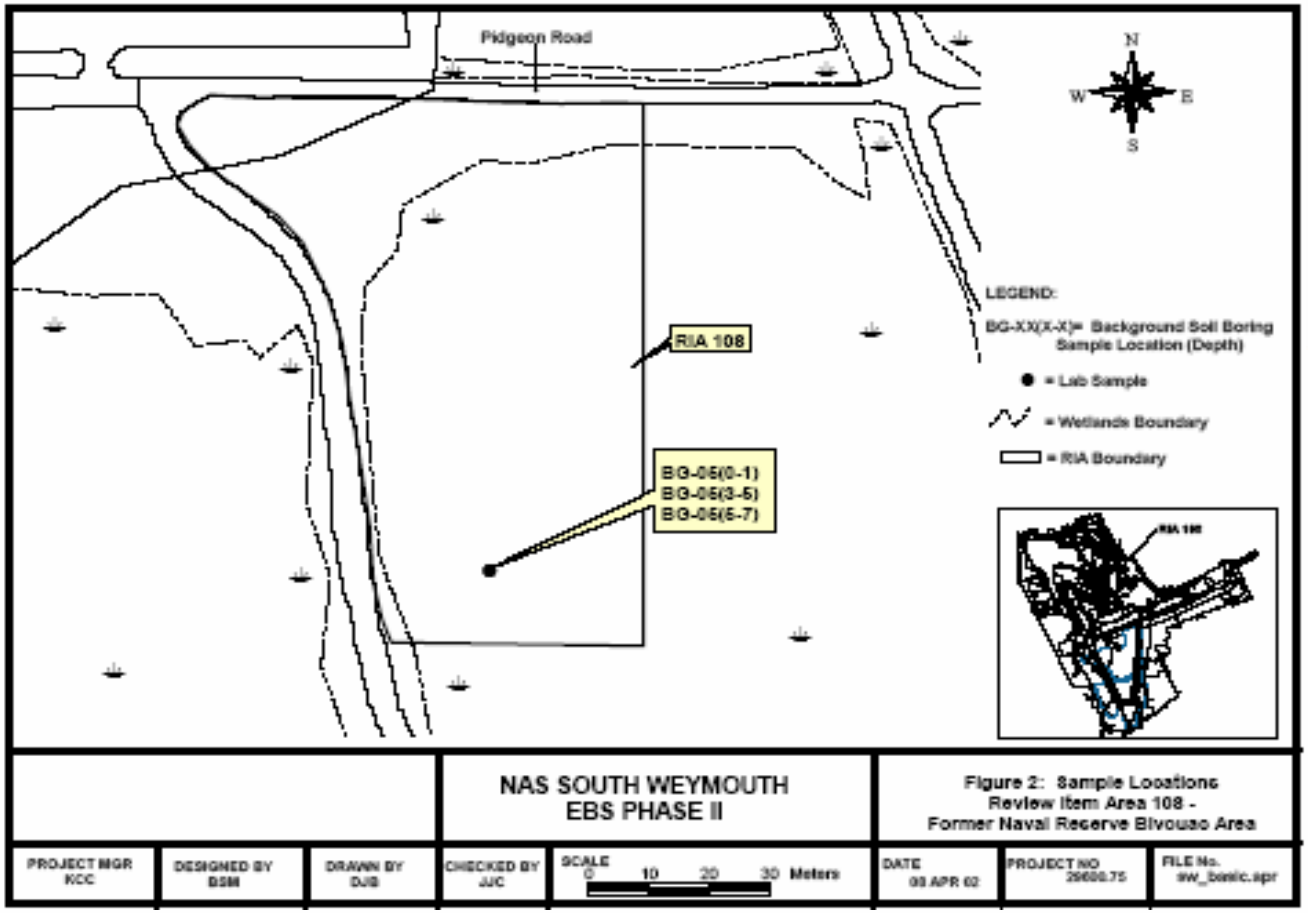
Site History

- **Timeline of Events:**
- **1998-1999 – BG-05 Basewide Background Study**
- **2002 – Soil sampling at BG-05 (0-1), (3-5), (5-7)**
- **April 2003 – VOCs at downgradient well (MW-302)**
- **September & October 2003 – (33) Temporary wells installed to evaluate the ground water.**
- **Winter 2004 – Installed seven monitoring wells (5 overburden & 2 bedrock wells)**
- **February 2004 – CH_2MHill installed 2 overburden monitoring wells**
- **October 2004 – Geophysical Investigations**
- **November /December 2004 –Ground truthing & solid waste removal.**
- **December 2004 – Soil sampling at potential source area**

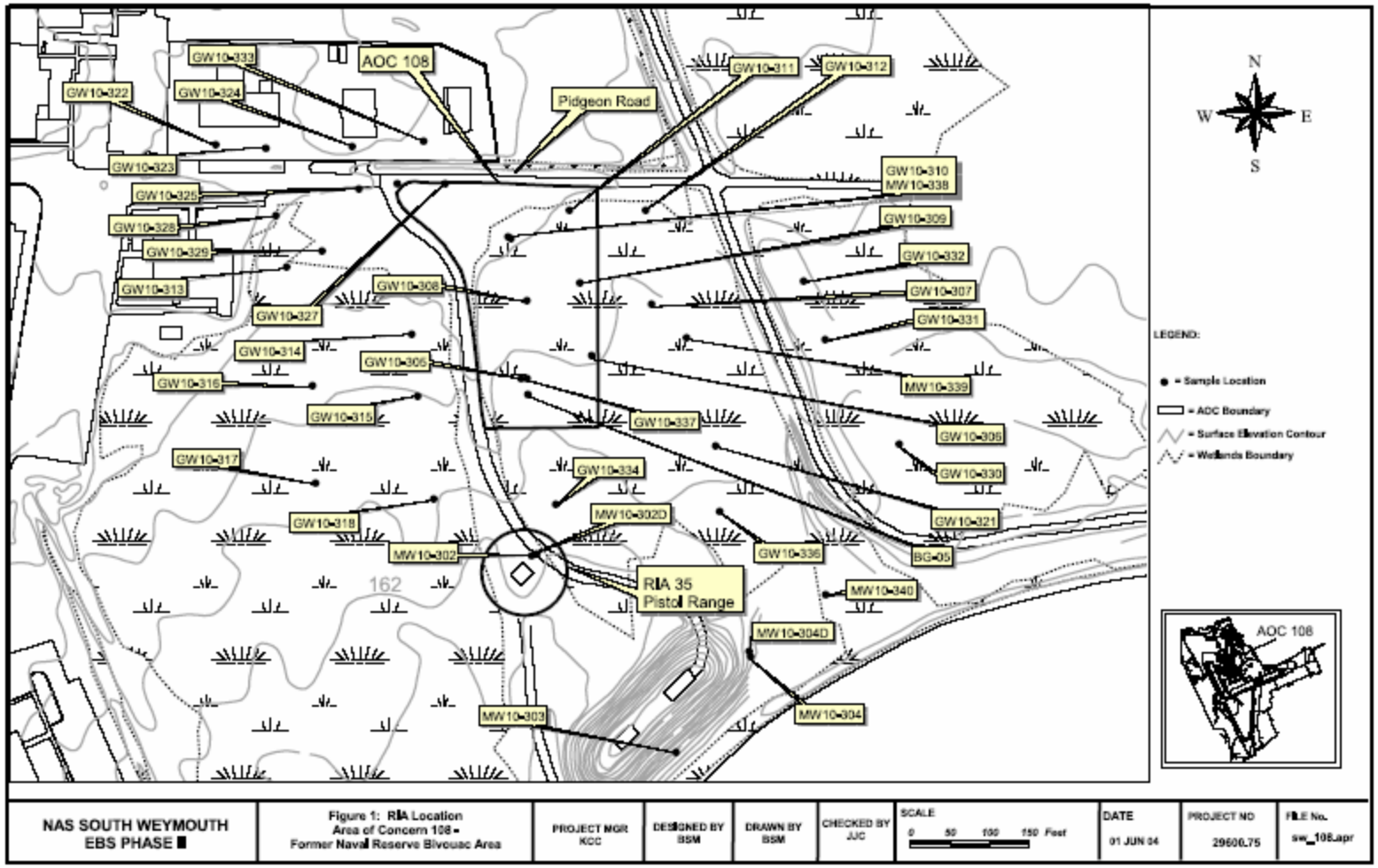
Solvent Release Area Location Map



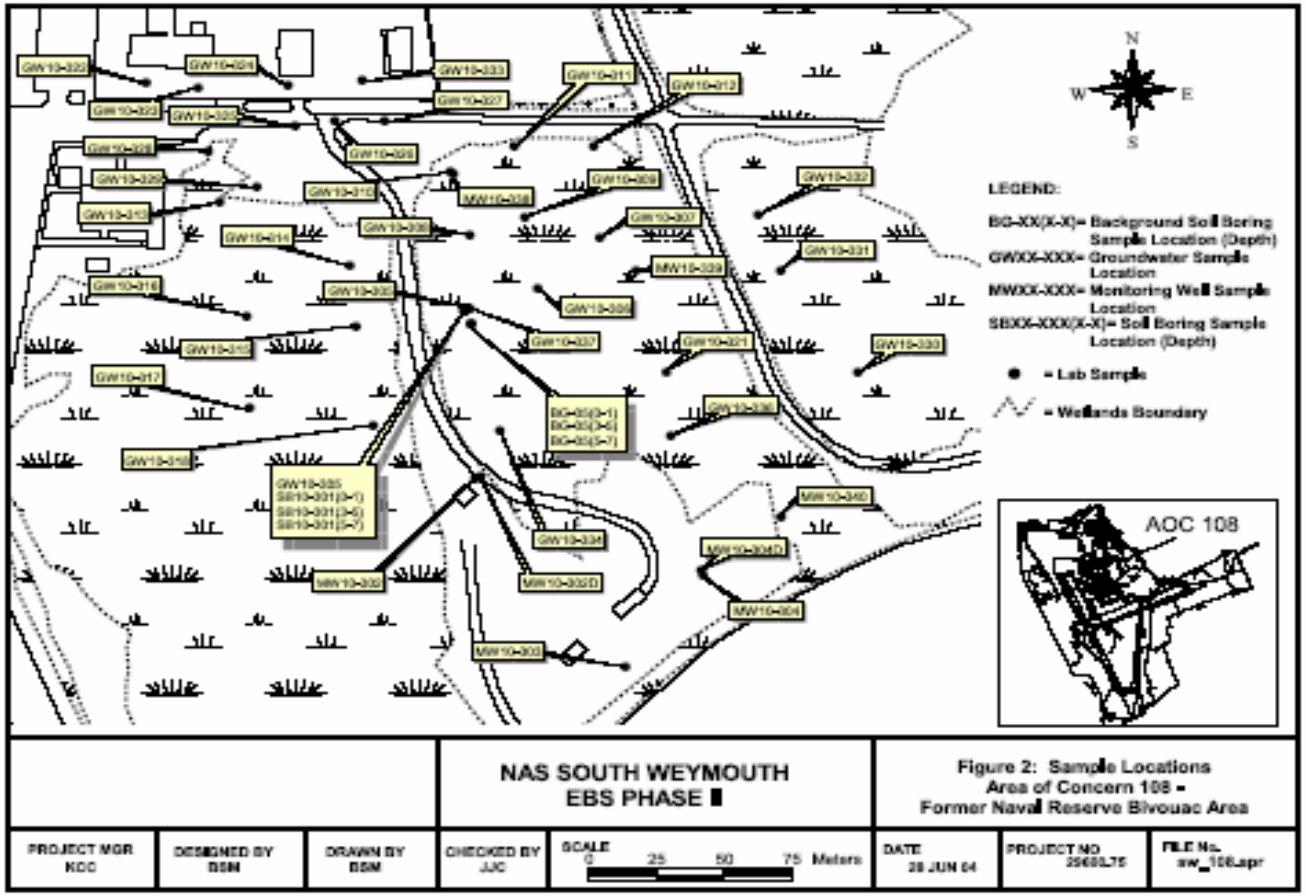
SRA Site Map


Pidgeon Road
N
W
E
S
LEGEND:
BG-XX(X-X)= Background Soil Boring Sample Location (Depth)
= Lab Sample
= Wetlands Boundary
= RIA Boundary
RIA 108
BG-06(0-1)
BG-06(3-5)
BG-06(5-7)
NAS SOUTH WEYMOUTH
EBS PHASE II
Figure 2: Sample Locations
Review Item Area 108 -
Former Naval Reserve Bivouac Area
PROJECT MGR KCC
DESIGNED BY BSM
DRAWN BY DJB
CHECKED BY JJC
SCALE 0 10 20 30 Meters
DATE 08 APR 02
PROJECT NO 26600.75
FILE No. sw_basic.apr

SRA Map – Prior to Pistol Range/De-Armament Embankment Removal.



SRA Map – Post-removal of Pistol Range/De-Armament Embankment



Geophysical Investigations

- Conducted geophysical investigations in October 2004. Needed to clear vegetation and surficial metals.
- Geophysics – Gives information about the underlying ground/subsurface without having to engage invasive digging.
  - Includes – Electromagnetic (EM) Terrain Conductivity, Magnetometry and Seismic.

EM Terrain Conductivity Meter

- Measures conductivity without electrodes or direct soil contact.
- Operates on the principle that secondary electric and magnetic current can be induced in metallic objects and conductive bodies.
  - Drums, USTs, sludge and leachate

EM Survey (cont'd)

- Geonics EM-31-
- Measurements taken every 5 feet over the site-specific project grid.
- Covered an area 300 ft X 400 ft and penetration to a depth of 20 feet.
- Used same project grid as the Magnetometry survey.
- Used for detection of buried ferrous-metallic and non-metallic debris.

Geologist using an EM-31, Terrain Conductivity Meter to locate buried objects.

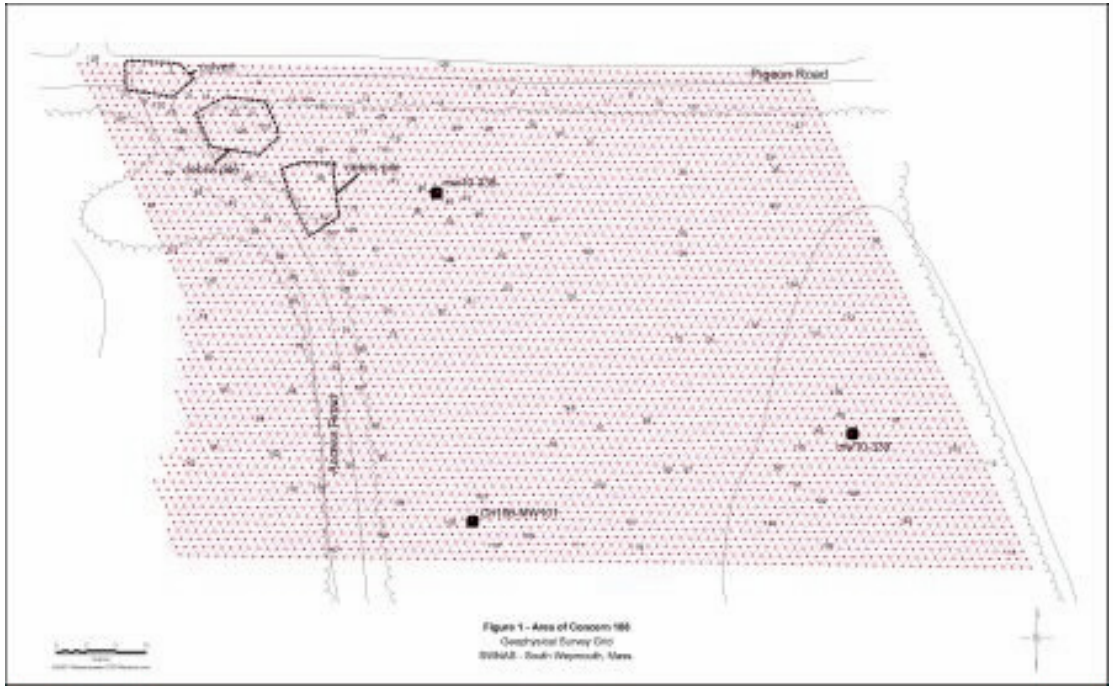
Magnetometry Survey

- Used Geometrics G-858-G magnetometer.
- Typically used to map buried metallic objects and provide geologic information.
  - Drums, steel pipes and other ferromagnetic objects.
  - Sand and gravel formation containing heavy metals.

Magnetometry Survey just off south side of Pigeon Road.

Magnetometry Survey conducted in heavily wooded sections of SRA.

EM & Magnetometry Target Area



Electromagnetic Survey

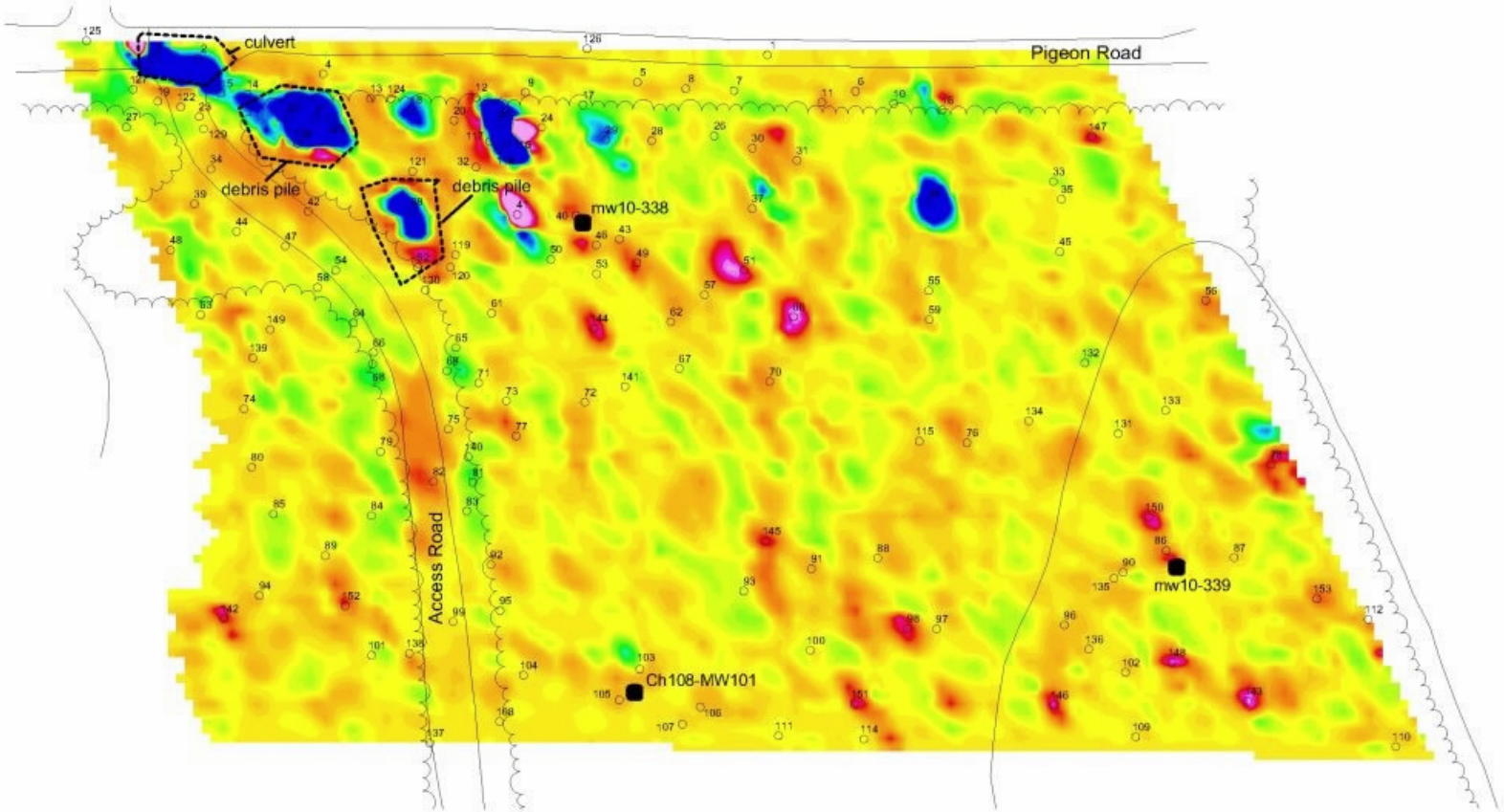
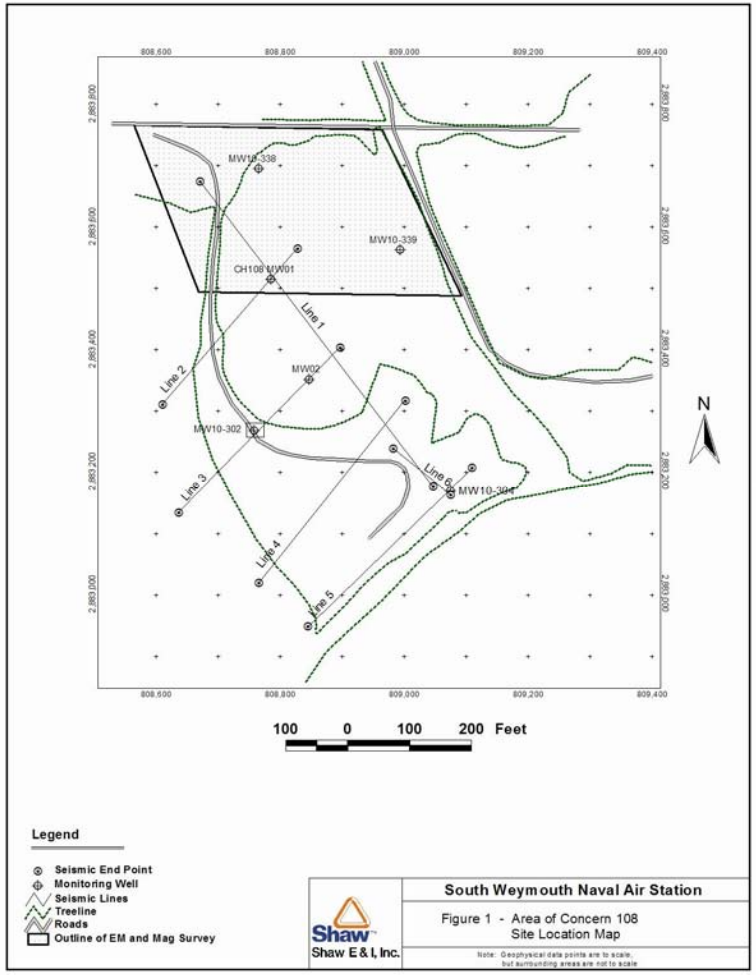


Figure 3b - Electromagnetic Survey
In-Phase
SWNAS - South Weymouth, Mass.

EM & Magnetometry Results

- Identified 153 anomalies; no drums found.
- Ground truthing each anomaly. By hand or by backhoe.
- Found surface metal or metal scraps at 12” to 18”. Backhoe was used for test pits and deeper anomalies. Found a gas tank to a vehicle at target ID 36. Head space readings on soil indicated no release.
- Solid waste was removed.

EM, Magnetometry and Seismic Refraction Survey Profiles for SRA.



Seismic Refraction Survey

- Utilizes seismic waves travelling through different media in the subsurface.
- Used to determine depth to bedrock and bedrock topography.
- Penetration with a hammer usually to depth of approximately 30 meters.
- Lateral resolution is governed by the geophone spacing.
- Difficult in determining a thin, low velocity sand/gravel layer beneath a high velocity clay layer.

Seismic Refraction Survey (cont'd)

- **Seismic source needed to generate compressional waves, which are measured by a seismograph and a series of evenly spaced geophones (24 geophones spaced at 5 ft intervals).**
  - **Seismic sources –**
    - Sledge hammer, trigger switch and metal plate.
    - Explosives used for deeper penetration.
- **Measure seismic velocities.**
- **Two kind of seismic waves are generated.**
  - **P waves – compressional- longitudinal waves.**
  - **S waves – shear, transverse waves.**
- **P waves propagate the highest velocity of any seismic waves.**

Seismic Refraction Results

- Identified three main layers:
- Layer 1 – surficial layer that ranges from approx. 1100 fps to 2400 fps (blue colors).
  - Typical of dry to slightly moist organic materials, surface soils, near surface sediments.
  - 5 to 10 feet in thickness.
- Layer 2 – velocities approx. 4,000 to 6,000 fps (green to yellow).
  - Represents an unconfined aquifer.
  - Velocity of water is 4,800 fps – layer 2 represents saturated sediments. Upper part of layer is likely the water table.
  - Sediments within aquifer are unconsolidated or partially consolidated. Increases velocity towards bottom of layer 2 (orange). Common in basal glacial deposits overlying bedrock.

Seismic Refraction Results

- Layer 3 – Velocities are approx. 7,000 fps to 12,000 fps.
- Higher velocities represent hard unweathered gneiss and granitic bedrock.
- Lower velocities are likely weathered or fractured bedrock.
- Some variations occur in flat lying low velocity zones covering covering bedrock surface – weathered horizon.
- Small localized relatively lower velocity zones occur in bedrock (Profile 2, 3 & 6)
- Highest velocities represent hard, sound rock (pink colors)
- Depth to bedrock ranges from 15 to 20 feet.

Seismic refraction concept.

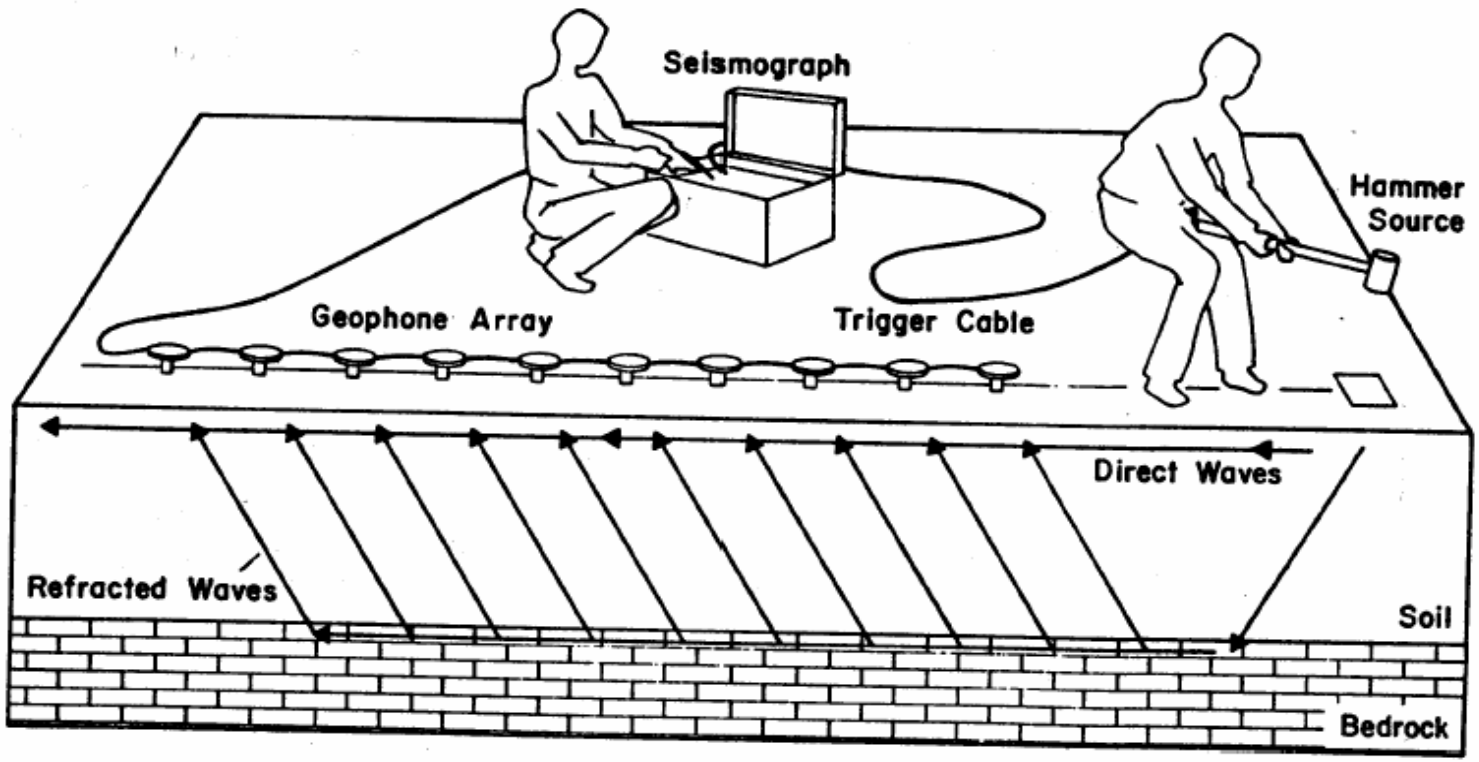


Figure 67. Field layout of a 12-channel seismograph showing the path of direct and refracted seismic waves in a two-layer soil/rock system.

Sledge hammer (8 lbs) used for seismic source with trigger setup and plate.

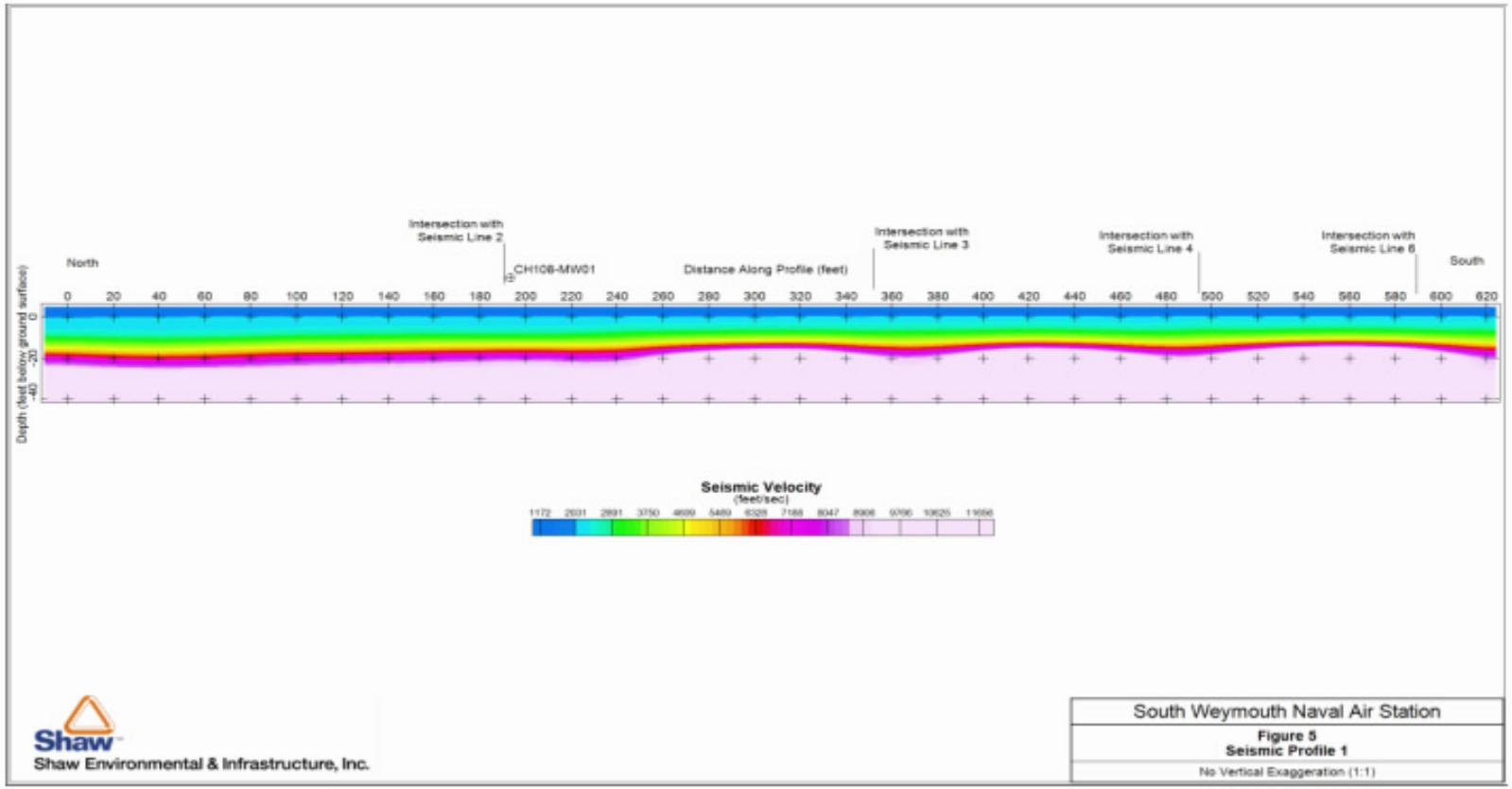
Geophone array setup – Spike, geophone and wire hookup to main wire.

Seismic refraction survey profile line 5. Sledge hammer for seismic source.

Seismic refraction survey profile line 4.

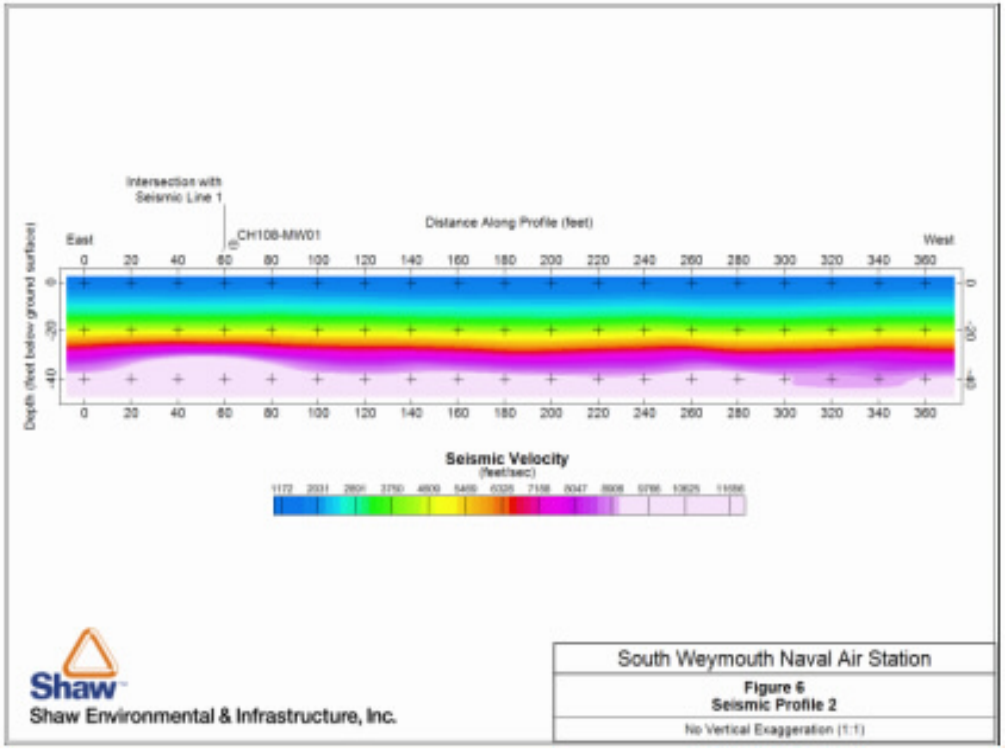
Seismic refraction survey profile line 3. Larger source (16 lbs) for making waves.

Seismic Refraction Survey profile 1 – Trending NW to SE.

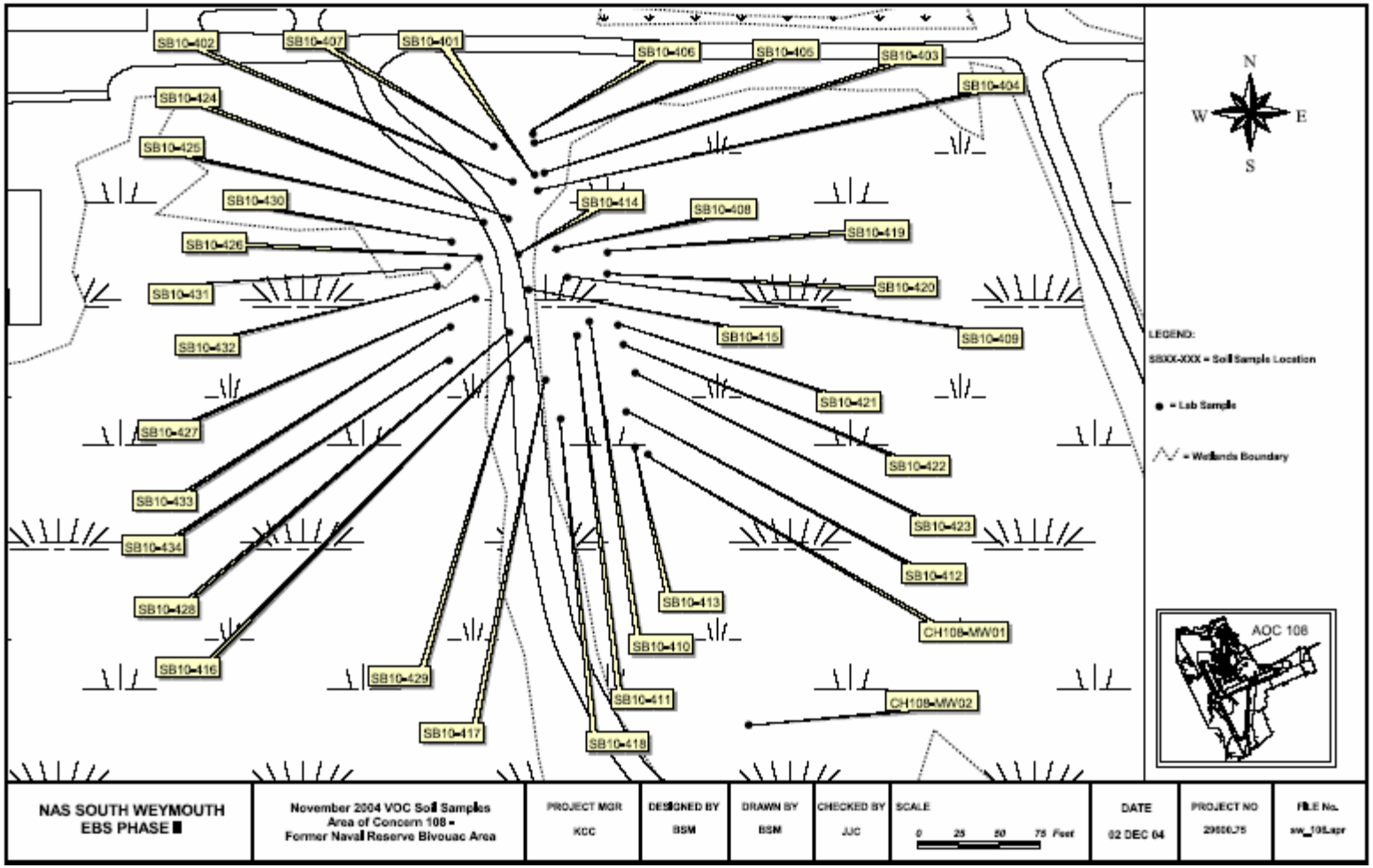


Seismic Refraction Survey profile line 5 (South end). Seismograph set up in van.

Seismic Refraction Survey profile 2 – Trending NE to SW.



Soil sampling to find source area. November 2004.



Track mounted Geoprobe unit used to collect subsurface soil samples.

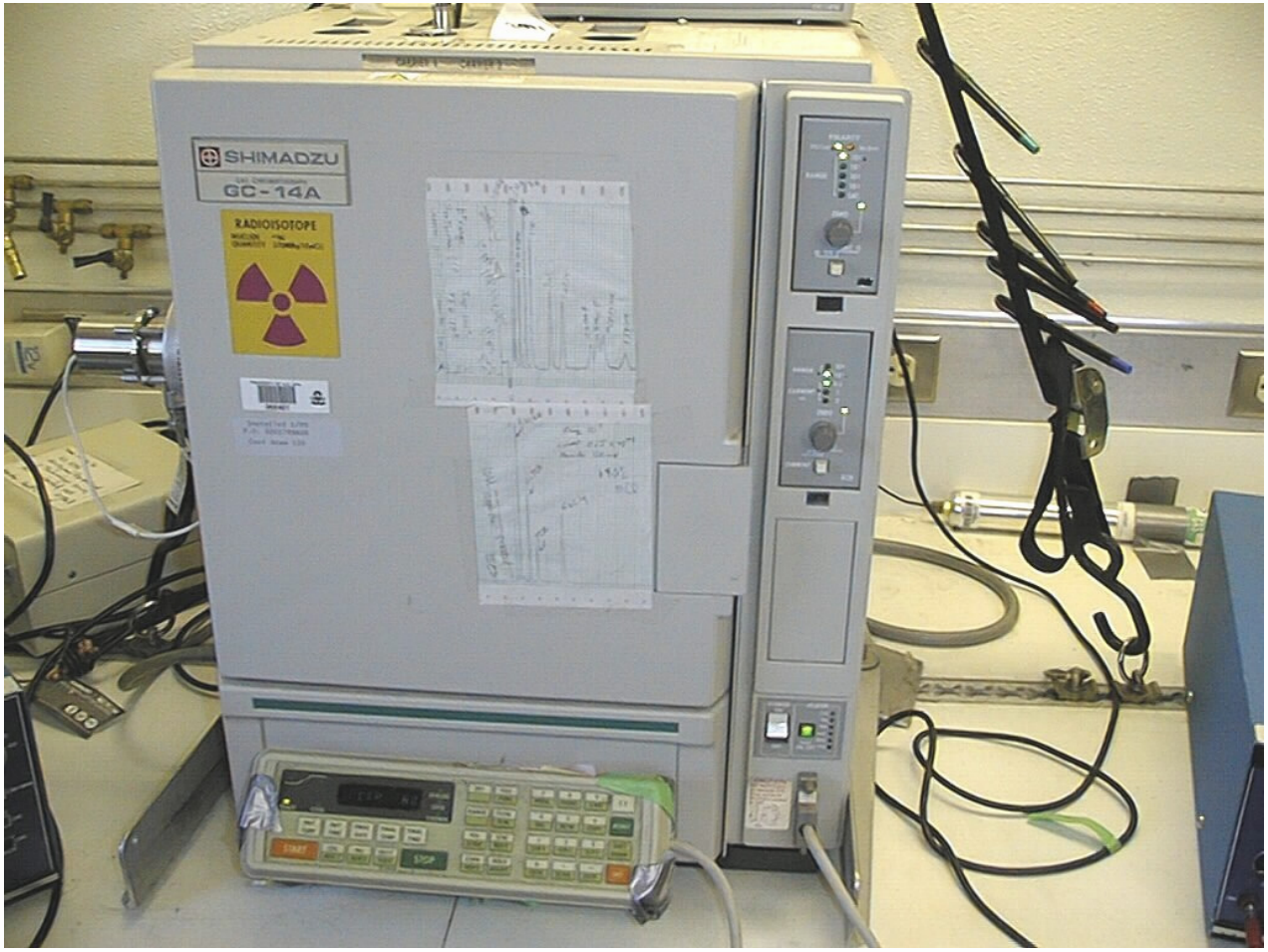
Field Technician screening soil samples.

Acetate sleeves used to collect soil boring samples.

EPA Region I Mobil Field Lab

EPA Chemist injecting sample into Gas Chromatograph.

Gas Chromatograph for on-site analysis of soil samples.



What's Next ???

- Kick-off meeting with EPA and MADEP occurred on March 2nd.
- Begin scoping Remedial Investigation (RI) work plan.
  - Draft work plan – late spring/early summer
  - Begin field work late summer.

What's Next?? (cont'd)

- **Scope of Work to include:**
  - **Refine site conceptual model after reviewing all information with team.**
  - **Source area evaluation.**
  - **Soil sampling program using innovative field screening methods.**
  - **Identify data gaps.**
  - **Ground water evaluation – overburden and bedrock.**
    - Nature and Extent

Summary

- Geophysical efforts:
  - EM & Magnetometry penetration to approximately 20 feet.
  - No drums identified.
  - In general, depth to bedrock surface is 15 to 20 feet.
  - Weathered zone differ in thickness.
  - Velocities within the weathered zone are typical for gneissic or granitic bedrock. Deeper weathered zones on the west side of profiles 2 & 3.
  - In general, no large obvious and extensive fracture zones.

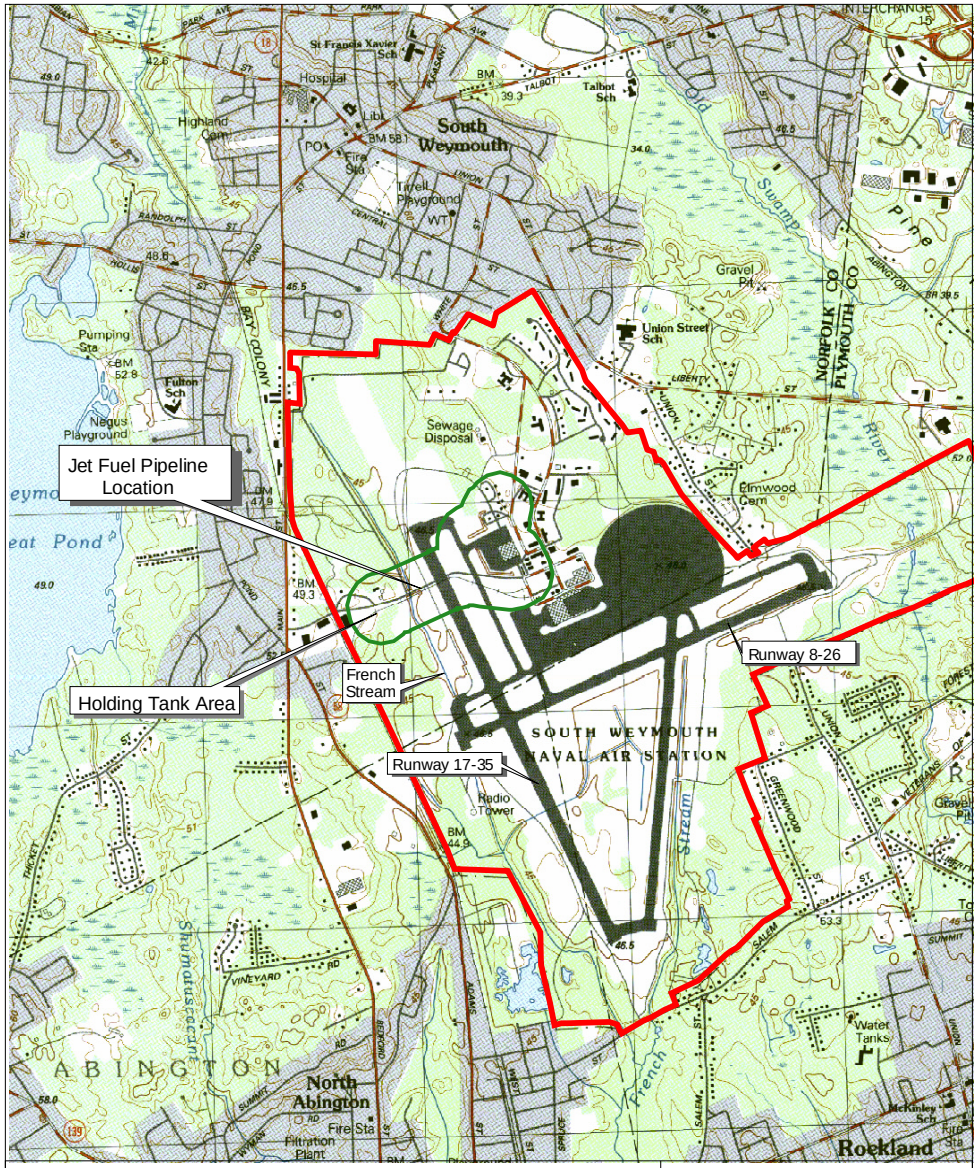
Update of Massachusetts Contingency Plan (MCP) Activities at the Jet Fuel Pipeline Site, NAS South Weymouth

Lawrence M. Hogan, P.G., LSP, LEP

March 10, 2005

Summary of Presentation

1. Site Description/Operational History (1952 – Present)
2. Investigation History within the Massachusetts Contingency Plan (Phase I & II)
3. Evaluation of Clean-up Options (Phase III)



N

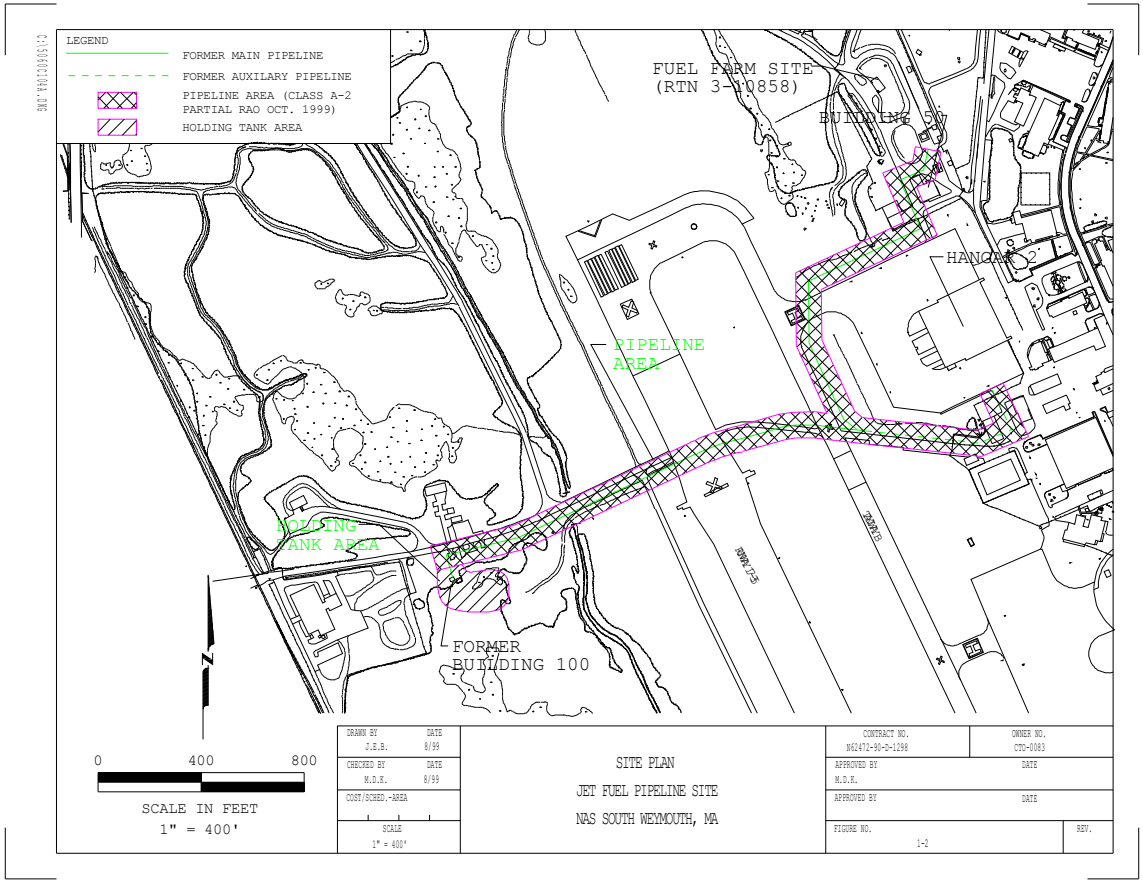
0 0.5 1 Miles

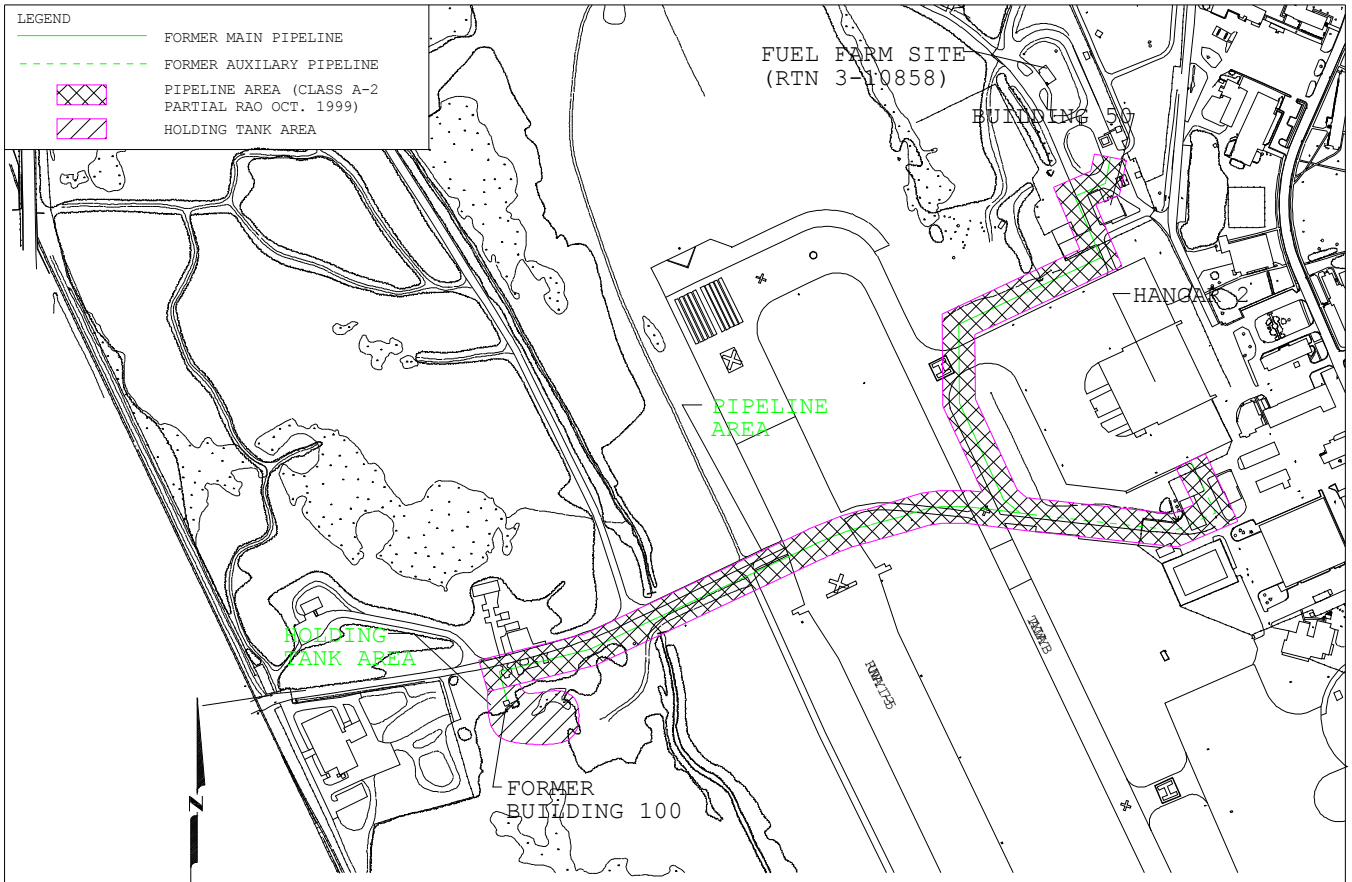
SCALE 1:24000

Figure 1-1
Site Locus Map
Jet Fuel Pipeline Site
NAS South Weymouth, MA

JFP Components

1. **Main Pipeline**
2. **“Auxiliary” Pipeline**
3. **Holding Tank Area (the site)**





DRAWN BY J.E.B.	DATE 8/99	SITE PLAN JET FUEL PIPELINE SITE NAS SOUTH WEYMOUTH, MA	CONTRACT NO. N62472-90-D-1298 / OWNER NO. CTO-0083
CHECKED BY N.D.K.	DATE 8/99		APPROVED BY N.D.K. / DATE
COST/SCHED.-AREA			APPROVED BY / DATE
SCALE 1" = 400'			FIGURE NO. 1-2 / REV.

C:\50600104A.DWG

Release Description and Initial Response Activities

- March 13, 1998 – Impacted soil reporting detected above MCP threshold during removal of the Holding Tank (>100 ppmv)
- Main and "Auxiliary" pipelines cleaned up to state standards and a partial closure report was completed (Partial Response Action Outcome – October 1999)
- Holding Tank Area further assessed – potential jet fuel impact to groundwater, GW-1 area

Bureau of Waste Site Cleanup Figures

Site Scoring Map: 500 feet & 0.5 mile Radii

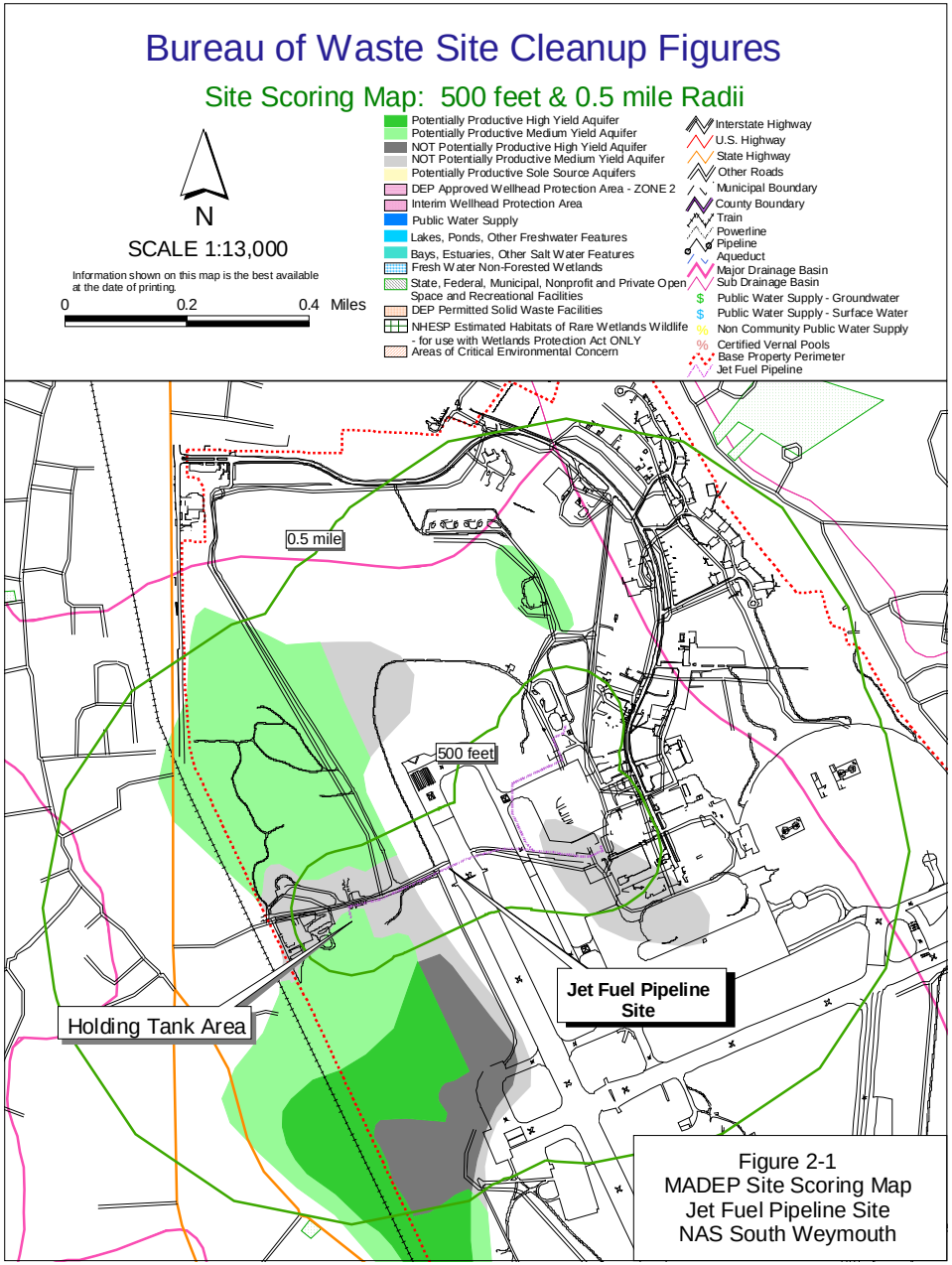
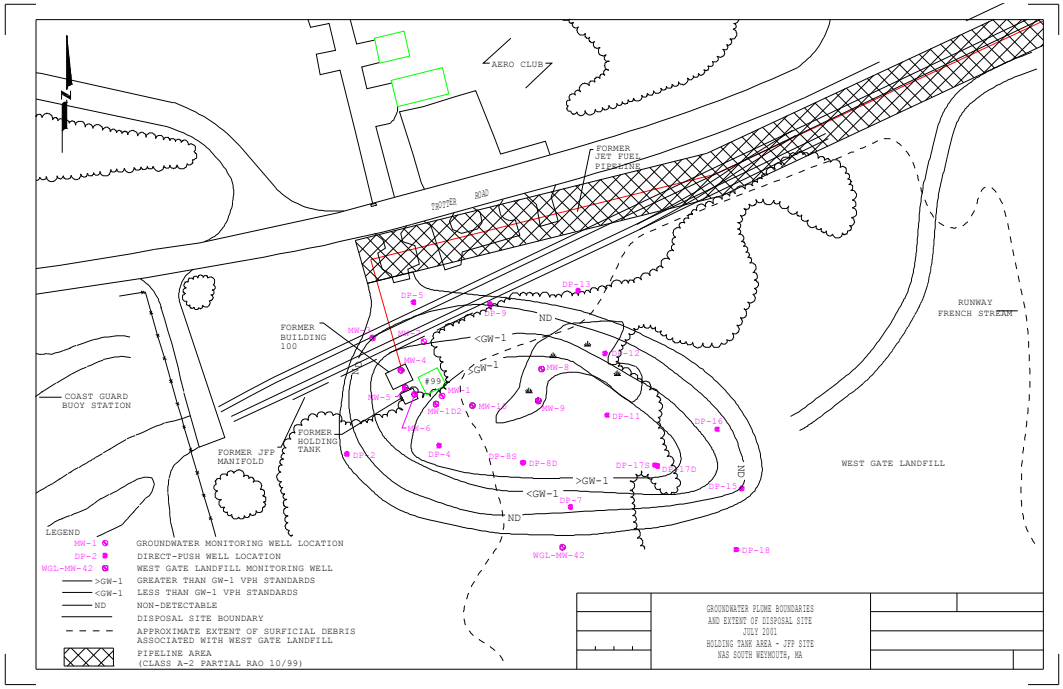
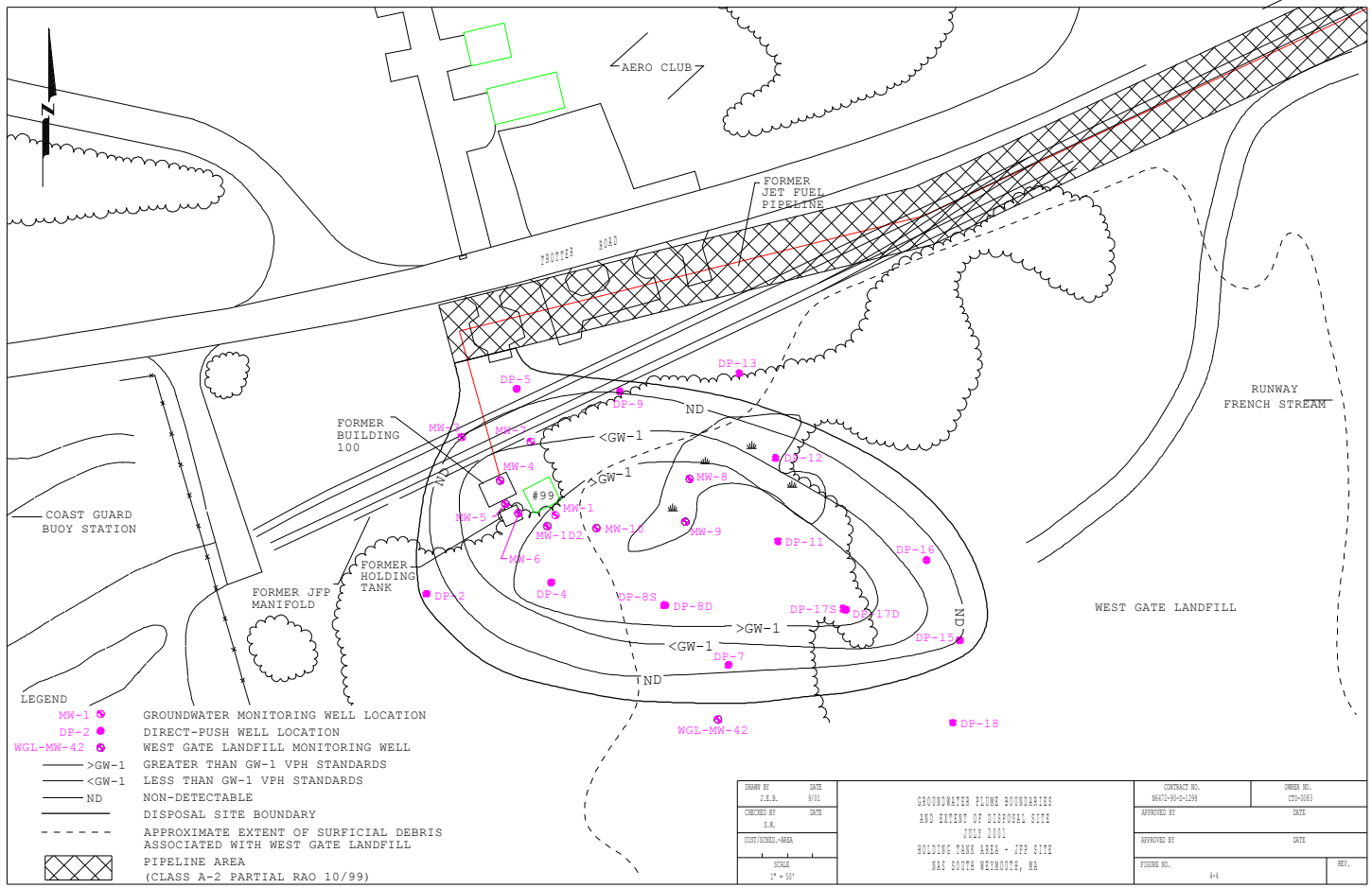


Figure 2-1
MADEP Site Scoring Map
Jet Fuel Pipeline Site
NAS South Weymouth

Site Description - Holding Tank Area

- **Open area, gravel covered**
- **Wooded area to the south with Small Wetland Area**
- **No MassGIS mapped environmentally sensitive areas (e.g., certified vernal pools)**
- **Plume Extends Under West Gate Landfill**




AERO CLUB
FORMER JET FUEL PIPELINE
TROTTER ROAD
RUNWAY FRENCH STREAM
FORMER BUILDING 100
COAST GUARD BUOY STATION
FORMER JFP MANIFOLD
FORMER HOLDING TANK
WEST GATE LANDFILL
#99
MW-1
MW-1D2
MW-2
MW-3
MW-4
MW-5
MW-6
MW-8
MW-9
MW-10
DP-2
DP-4
DP-5
DP-7
DP-8S
DP-8D
DP-9
DP-11
DP-12
DP-13
DP-15
DP-16
DP-17S
DP-17D
DP-18
WGL-MW-42
ND
<GW-1
>GW-1
LEGEND
MW-1 GROUNDWATER MONITORING WELL LOCATION
DP-2 DIRECT-PUSH WELL LOCATION
WGL-MW-42 WEST GATE LANDFILL MONITORING WELL
>GW-1 GREATER THAN GW-1 VPH STANDARDS
<GW-1 LESS THAN GW-1 VPH STANDARDS
ND NON-DETECTABLE
DISPOSAL SITE BOUNDARY
APPROXIMATE EXTENT OF SURFICIAL DEBRIS ASSOCIATED WITH WEST GATE LANDFILL
PIPELINE AREA (CLASS A-2 PARTIAL RAO 10/99)
DRAWN BY J.S.B. DATE 9/01
CHECKED BY S.W. DATE
SCALE 1" = 50'
GROUNDWATER PLUME BOUNDARIES AND EXTENT OF DISPOSAL SITE JULY 2001 HOLDING TANK AREA - JFP SITE NAS SOUTH WEYMOUTH, MA
CONTRACT NO. N6472-90-D-1298
ORDER NO. CTO-0083
APPROVED BY DATE
APPROVED BY DATE
FIGURE NO. 4-4
REV.

Candidate Technologies Evaluated

- **Soil Excavation (De-watering & Saturated Soil Removal)**
- **In-Situ Bioremediation (ORC, Biosparging)**
- **In-Situ Chemical Treatment (ISCO)**
- **In-Situ Aeration/Volatilization (Air Sparge/Soil Vapor Extraction)**
- **In-Situ Thermal Treatment (Electrical Resistance Heating)**

Technologies Selected for Potential Implementation

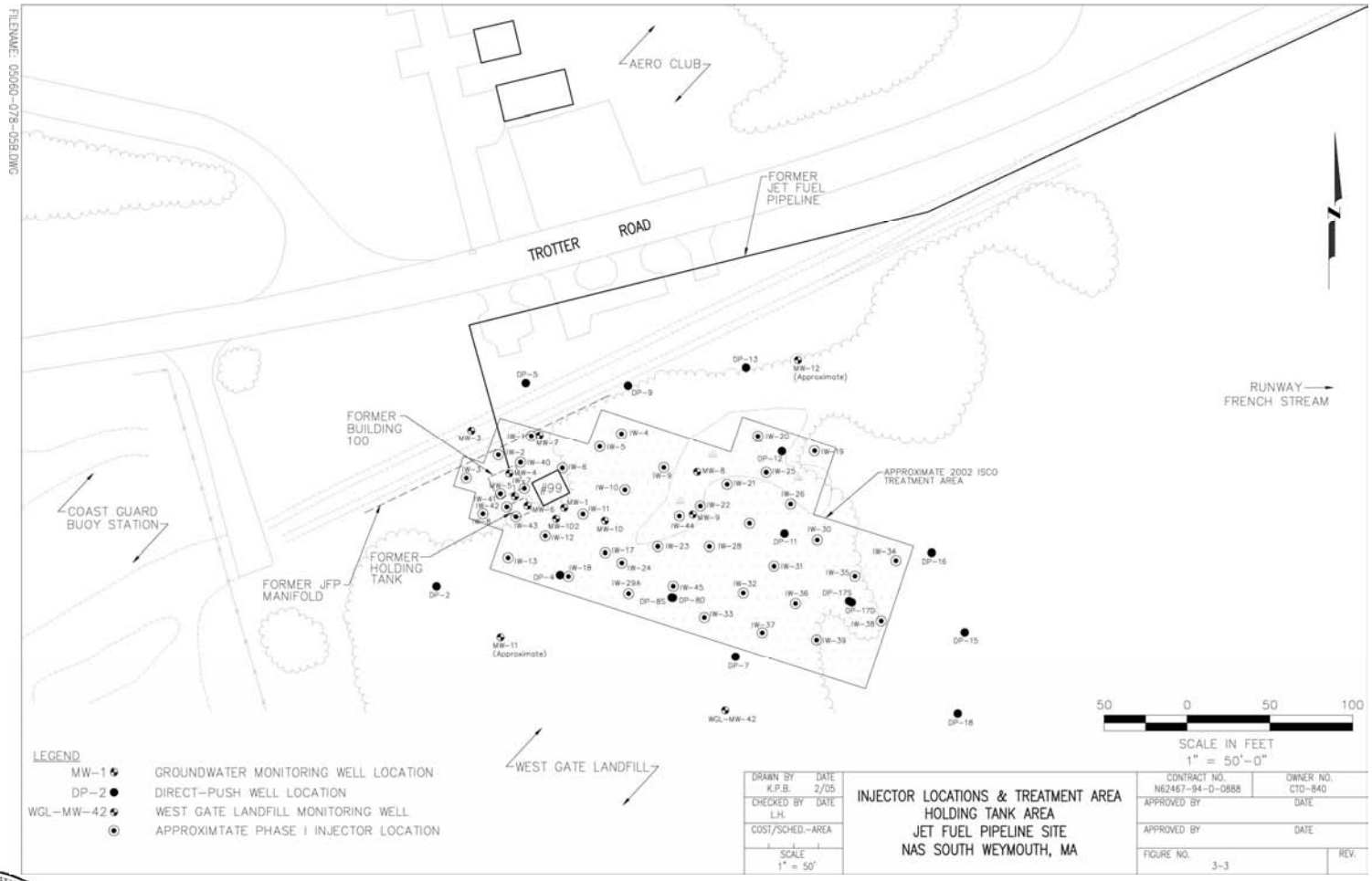
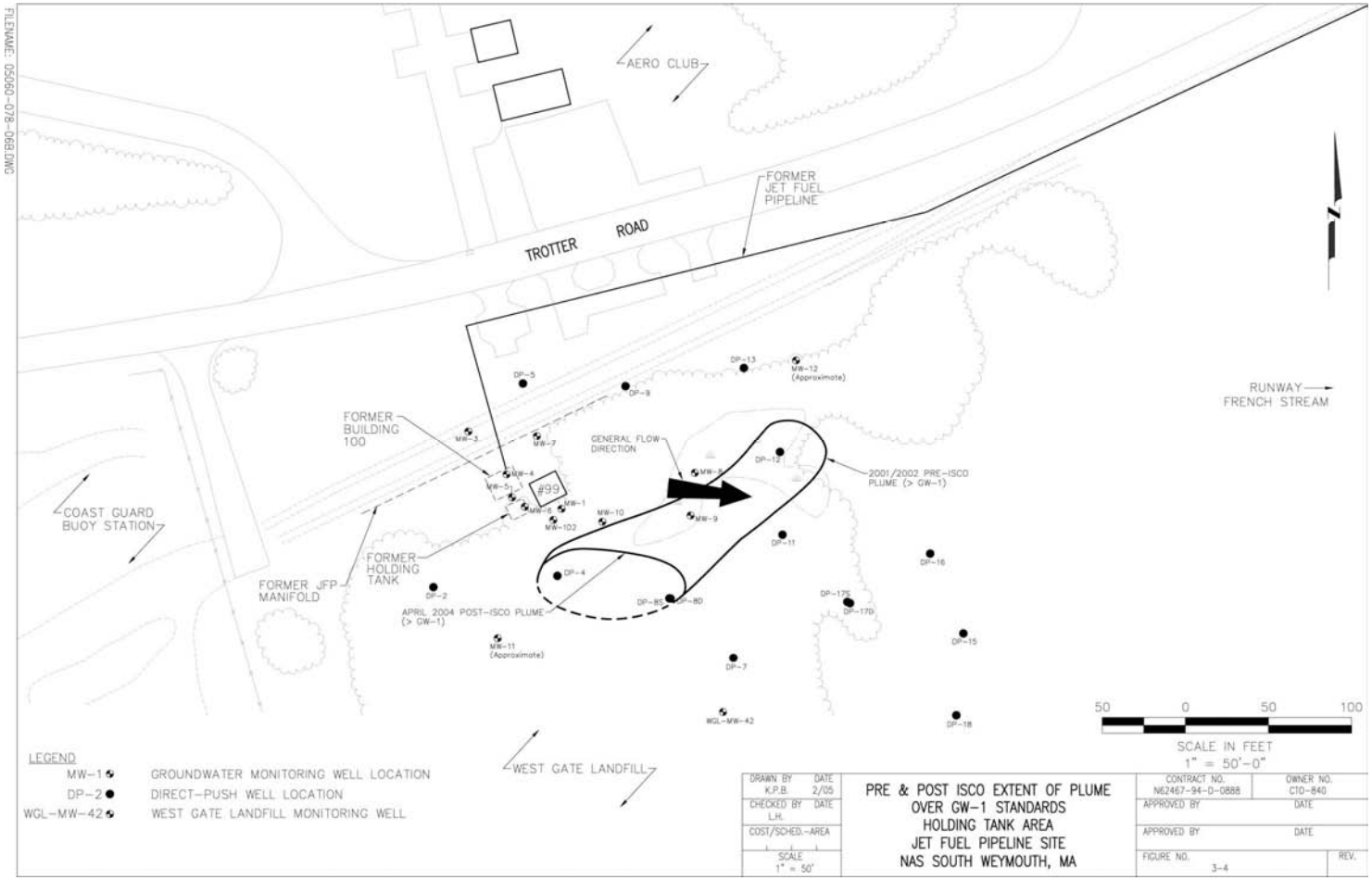
Additional data gathering Performed in August 2001 to Aid in Final Selection of Technologies Retained:

- **Soil excavation/De-Watering**
- **In Situ Chemical Oxidation**
- **Air sparging/soil vapor extraction**

Summary/Next Steps

Date	Event
3/13/1998	72-hour reportable release discovery
3/16/1998	verbal notification to DEP
3/16/1998	VERBAL IRA Plan Approval
5/5/1998	IRA Plan
3/12/1999	Phase I Report and Tier II Classification
10/12/1999	IRA Completion and Partial RAO Report
6/4/2001	Phase II Report
7/12/2001	Phase III Report
12/6/2002	Phase IV Remedy Implementation Plan
12/02-1/03	Injector Installations
1/7/03 -2/6/03	Initial Peroxide and Catalyst Injections
8/14/2003	Additional Injectors Installed
9/3 to 9/11/03	Additional Peroxide and Catalyst Injected
5/03 to current	Groundwater Monitoring
3/14/2005	Phase IV Completion Statement Remedy Operation Status Submittal

ISCO Treatment Area



Baseline Plume 2002 vs. Post ISCO Plume 2004