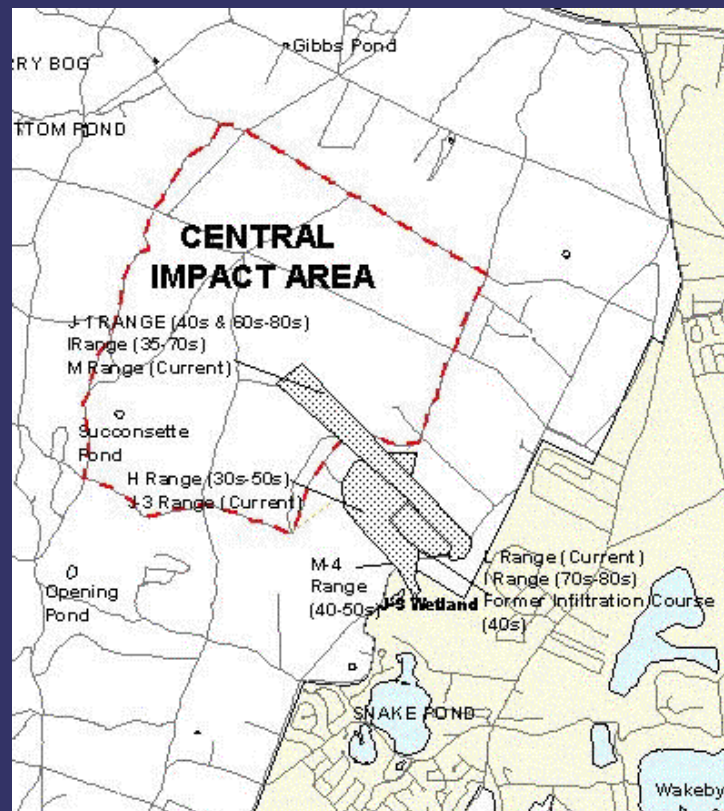


# DISTRIBUTION AND FATE OF ENERGETICS J Ranges

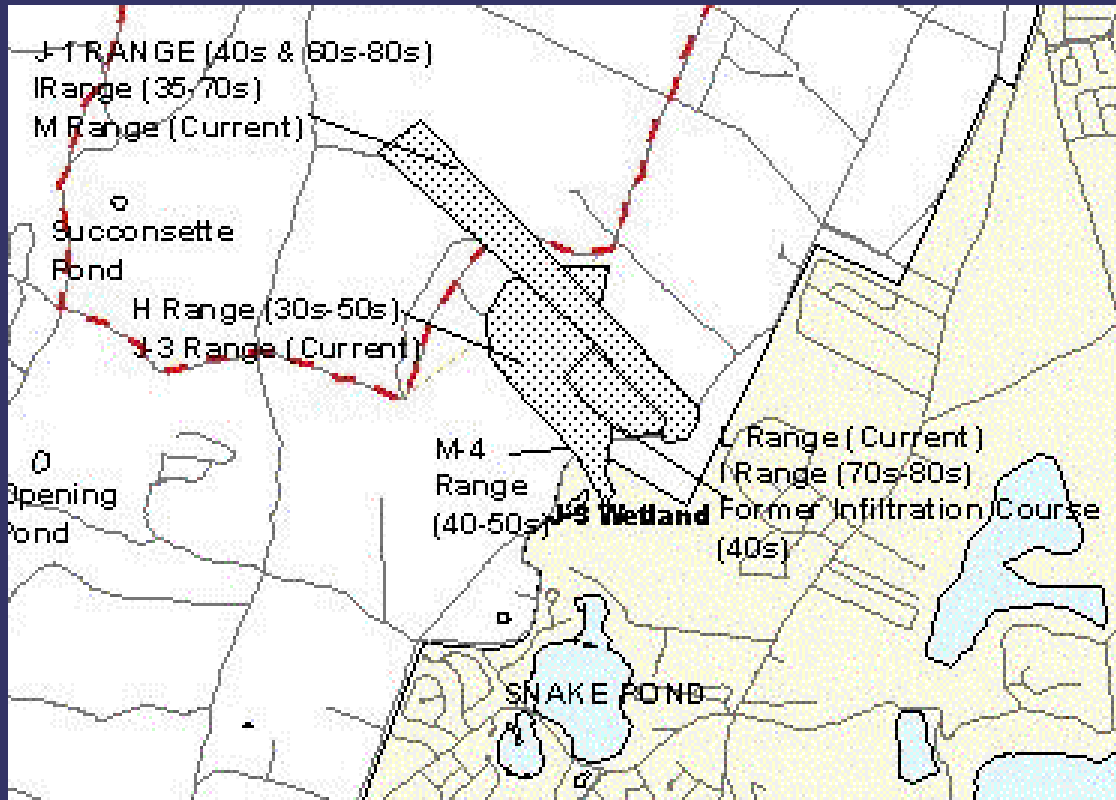


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Geochemist

## Introduction

- Separated into:
  - J-1, J-3, and L Ranges
  - J-2 Range
- Used for the testing and development of munitions
- Ongoing soil and groundwater investigations
- Investigations began only recently compared to other areas of MMR

# J-1, J-3, and L Range Locations

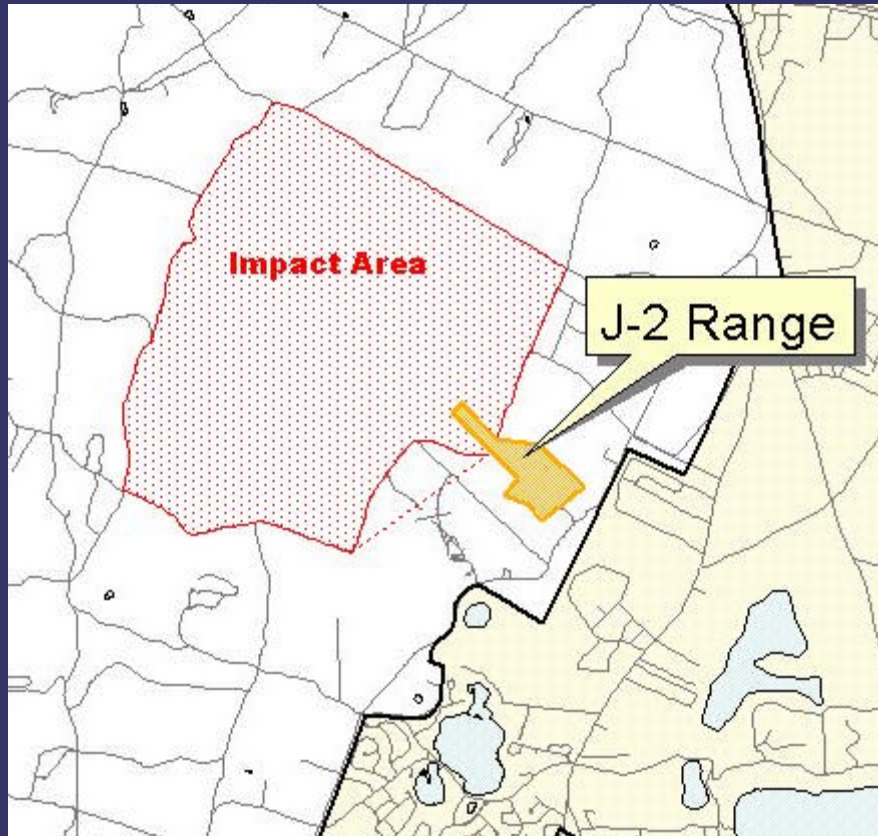


- Southeast of (and partially in) the Impact Area
- Ranges overlie groundwater mound
- Snake Pond downgradient
- Treatment system at FS-12 (north of snake pond)

## J-1, J-3, and L Range History

- J-1 Range
  - Mid-1930s to 1950s - antitank and transition range
  - 1960s to 1980s - weapons testing
- J-3 Range
  - 1935 to 1950s - mortar and machine gun range
  - 1968 to 1990s - munitions and fuzes testing
- L Range
  - 1940s to present - infiltration course and grenade launcher

## J-2 Range Location



- Southeast of (and partially in) the Impact Area
- Northeast of groundwater mound

## J-2 Range History

- 1935 to 1941 - firing range
- late 1940s - transition range for small arms firing
- 1953 to 1979 - DoD contractor test range (ordnance and other testing)
- late 1960s - also 25-m rifle range
- currently a 25-meter rifle range

## J Ranges Investigations as of August 2001

- J-1, J-3, and L Ranges
  - UXO and BIP
  - 12 wipes samples from J-3 Range buildings
  - 61 wells installed
  - Over 600 soil samples collected
  - Over 800 groundwater samples collected
  - Bi-weekly sampling of Snake Pond surface water
  - Water level measurements

## J Ranges Investigations as of August 2001

- J-2 Range
  - UXO/UXORM discoveries
  - BIP samples (before and after detonation)
  - Approximately soil samples collected
  - 12 monitoring wells (up to 3 rounds of sampling)
- Regional and sub-regional groundwater computer models developed for J Ranges



## J Ranges Soil Investigations

- Sampling targeted based on historical research and suspected sources areas
- Soil sampling:
  - grid and grab samples
  - discrete and composite
  - varying depths
- Analyzed for COCs
- Concentrations compared to:
  - MMR PRGs
  - background levels
  - MA S1/GW-1 or RCS-1 soil standards

## J Range Groundwater Investigations

- Profile sampling at 10 ft intervals during installation
- Well screen locations determined by profile sampling results
- Analyzed for COCs
- Concentrations compared to:
  - Federal MCLs/HAs
  - MA GW-1 standards
- Supplemental sampling
  - surface water from snake pond
  - FS-12 treatment facility

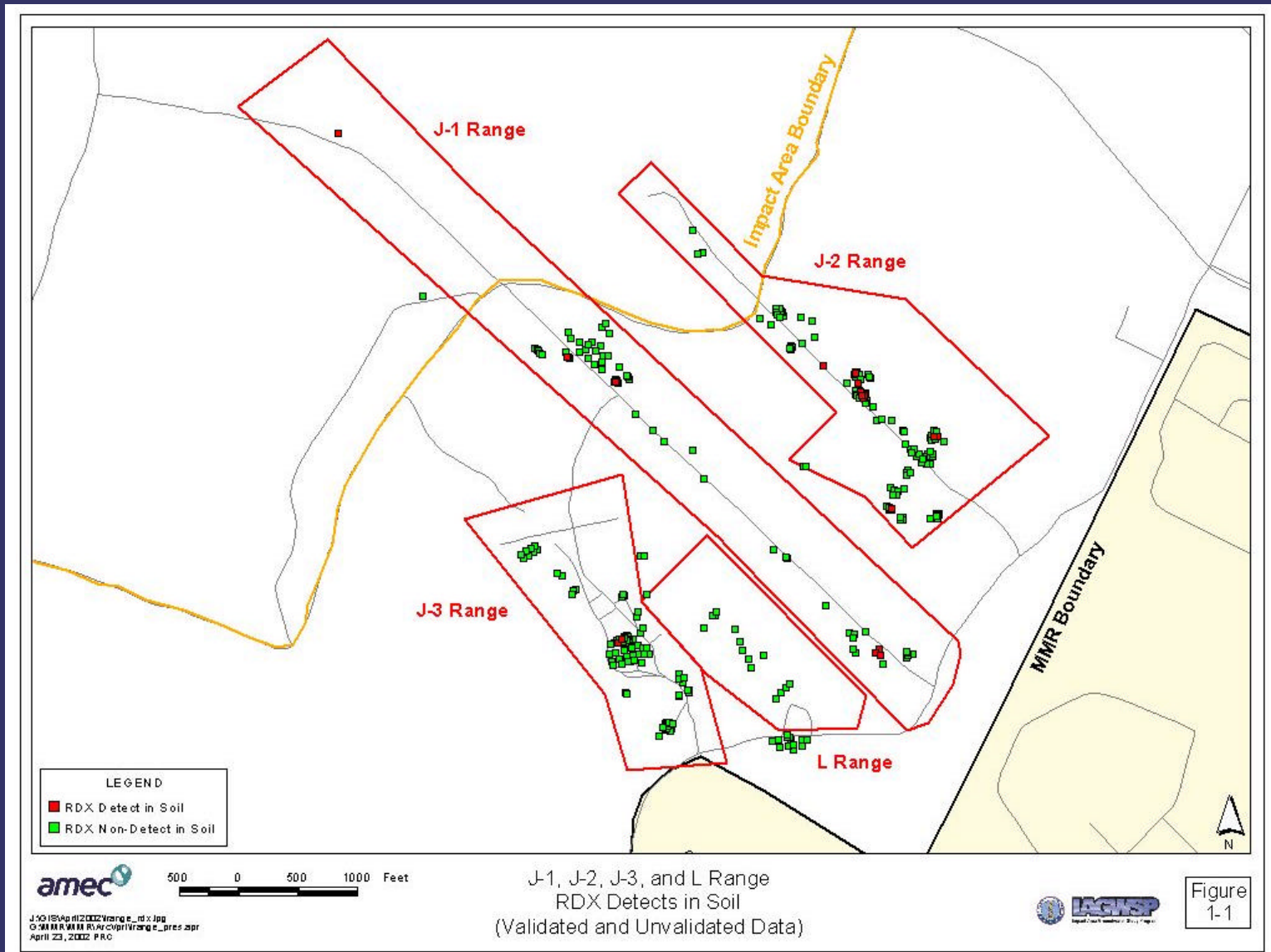
# Contaminant Distribution in Soil

- J-1, J-3, and L Ranges
  - HMX at various locations
  - No RDX in soil
  - Various metals, pesticides, and herbicides detected at levels exceeding background and screening criteria

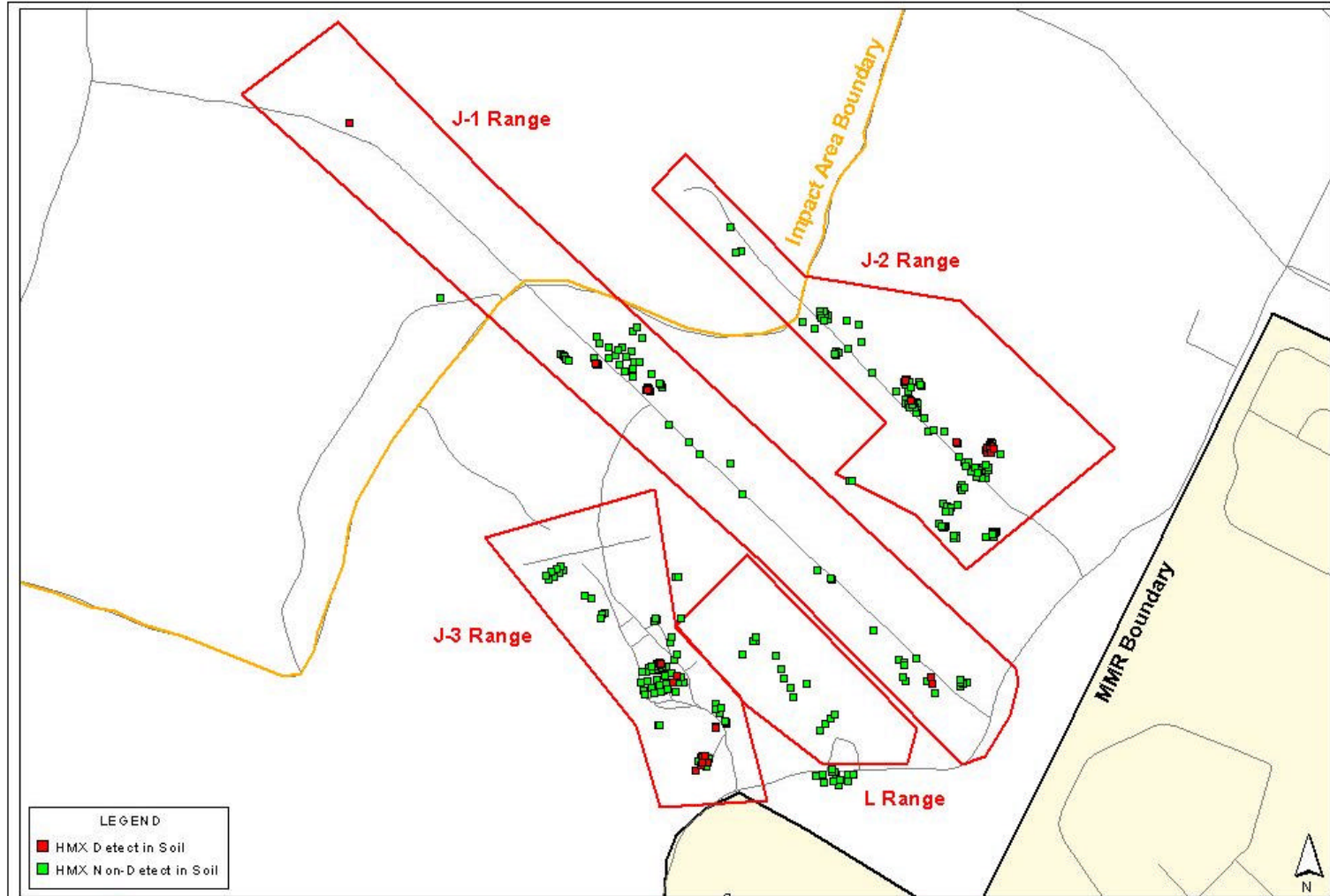
# Contaminant Distribution in Soil

- J-2 Range
  - PCNs detected in 31 out of 46 samples and at varying depths (although not consistently)
    - mainly tetra- and trichlorinated naphthalenes
    - do not have TCDD-like toxicity
    - used as fillers and derived from Halowaxes
  - Dioxins/furans in all samples (mainly octachlorinated dioxin) but are below PRGs
  - Range Road Burn Area and Disposal Areas - explosives, pesticides, and metals

# RDX Distribution in Soil



# HMX Distribution in Soil



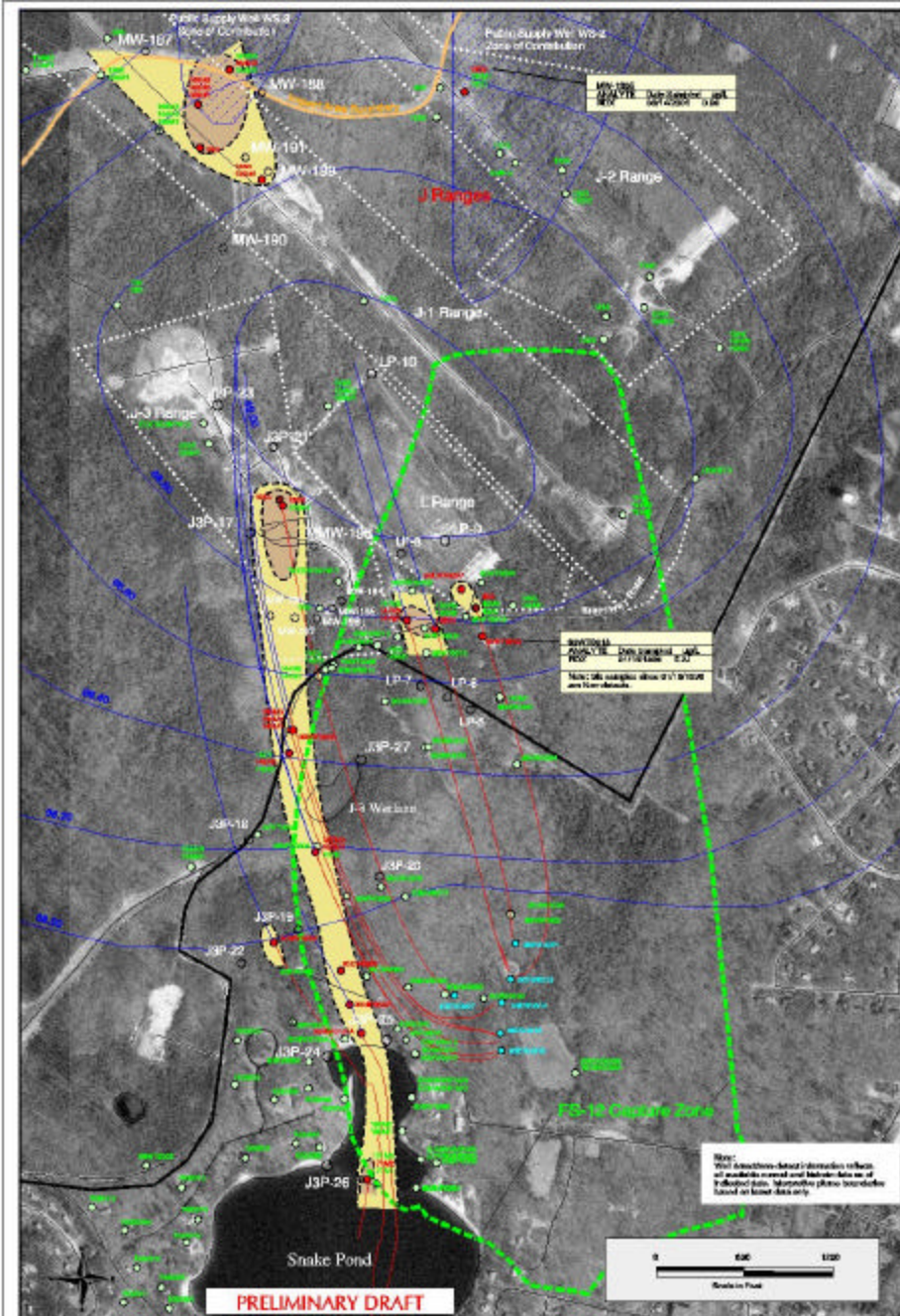
## Contaminant Distribution in Groundwater

- J-1, J-3, and L Ranges
  - RDX and HMX detected northwest of J-1 Range and from the center of the J-3 Range to Snake Pond
  - RDX is above while HMX is below the MCL/HAs
  - Perchlorate is widely distributed with the highest concentration (75 ug/L) detected in center of J-3 Range near detonation pit
  - No explosives or perchlorate in surface water from Snake Pond, residential or public water supply wells

# Contaminant Distribution in Groundwater

- J-2 Range
  - RDX, HMX, other PEPs, and dyes detected at 1 well (of 12)
  - Perchlorate (2 wells)
  - no PCNs in groundwater

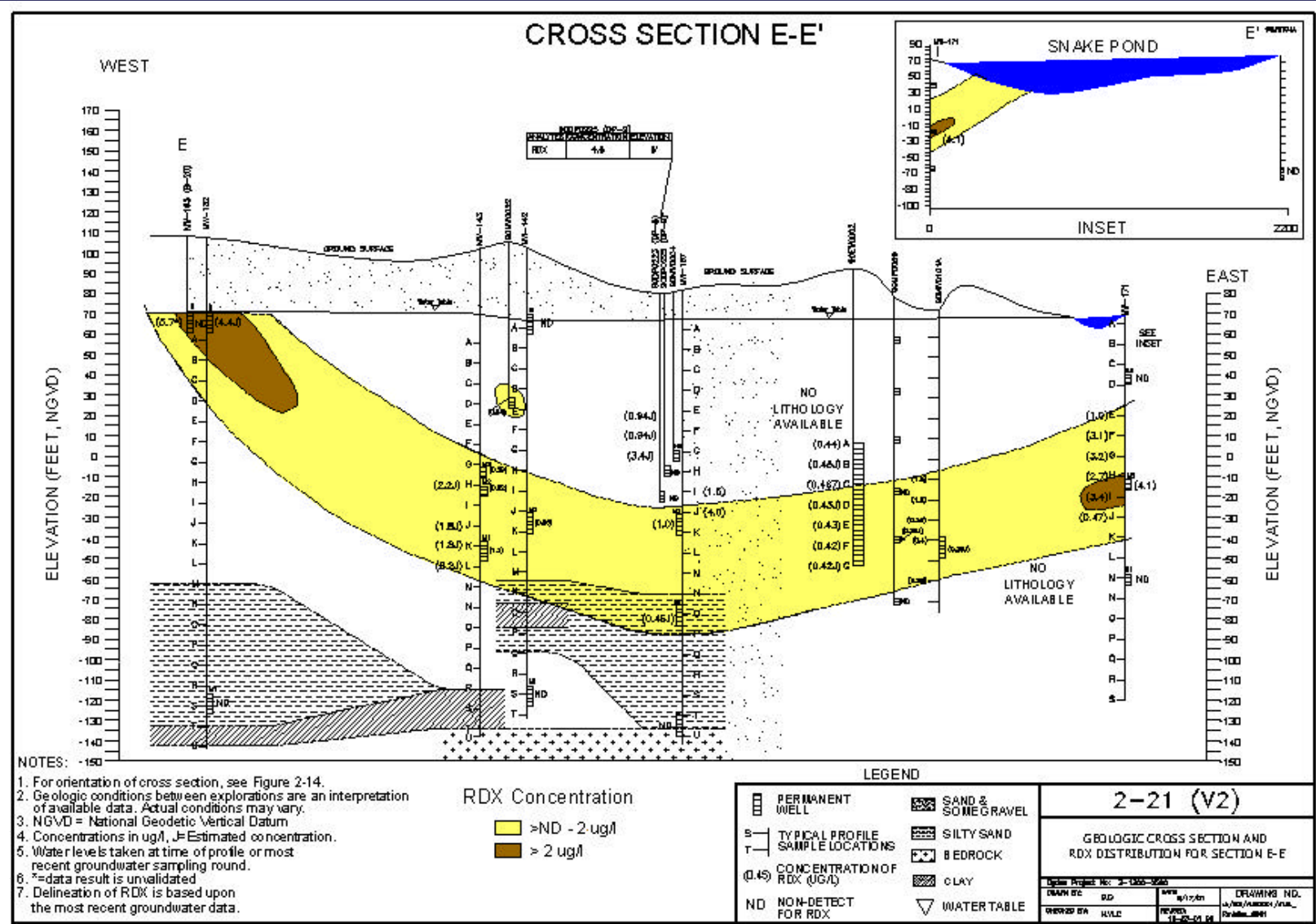




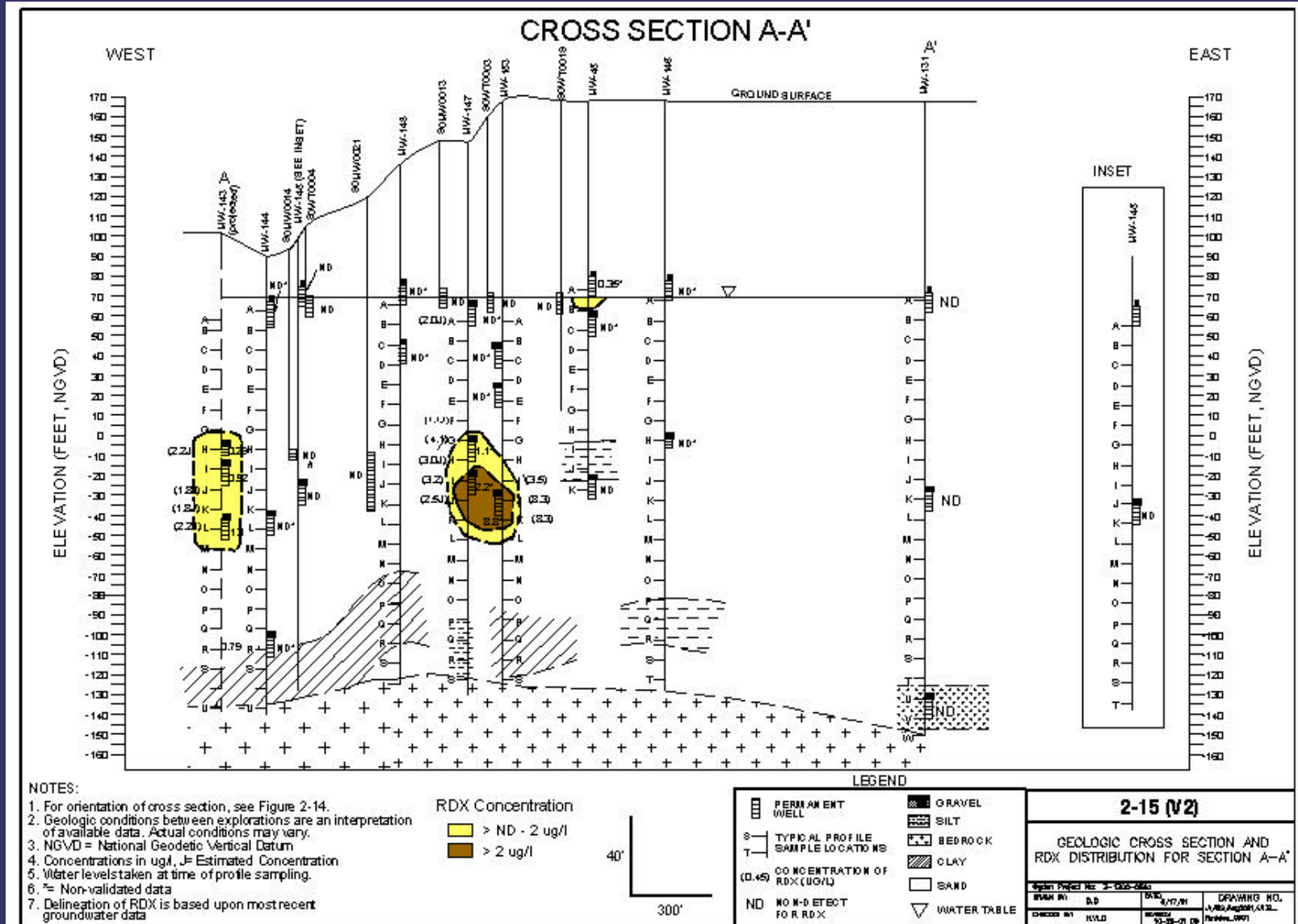
- J-1, J-3, L Range and J-2 RDX Groundwater Plume

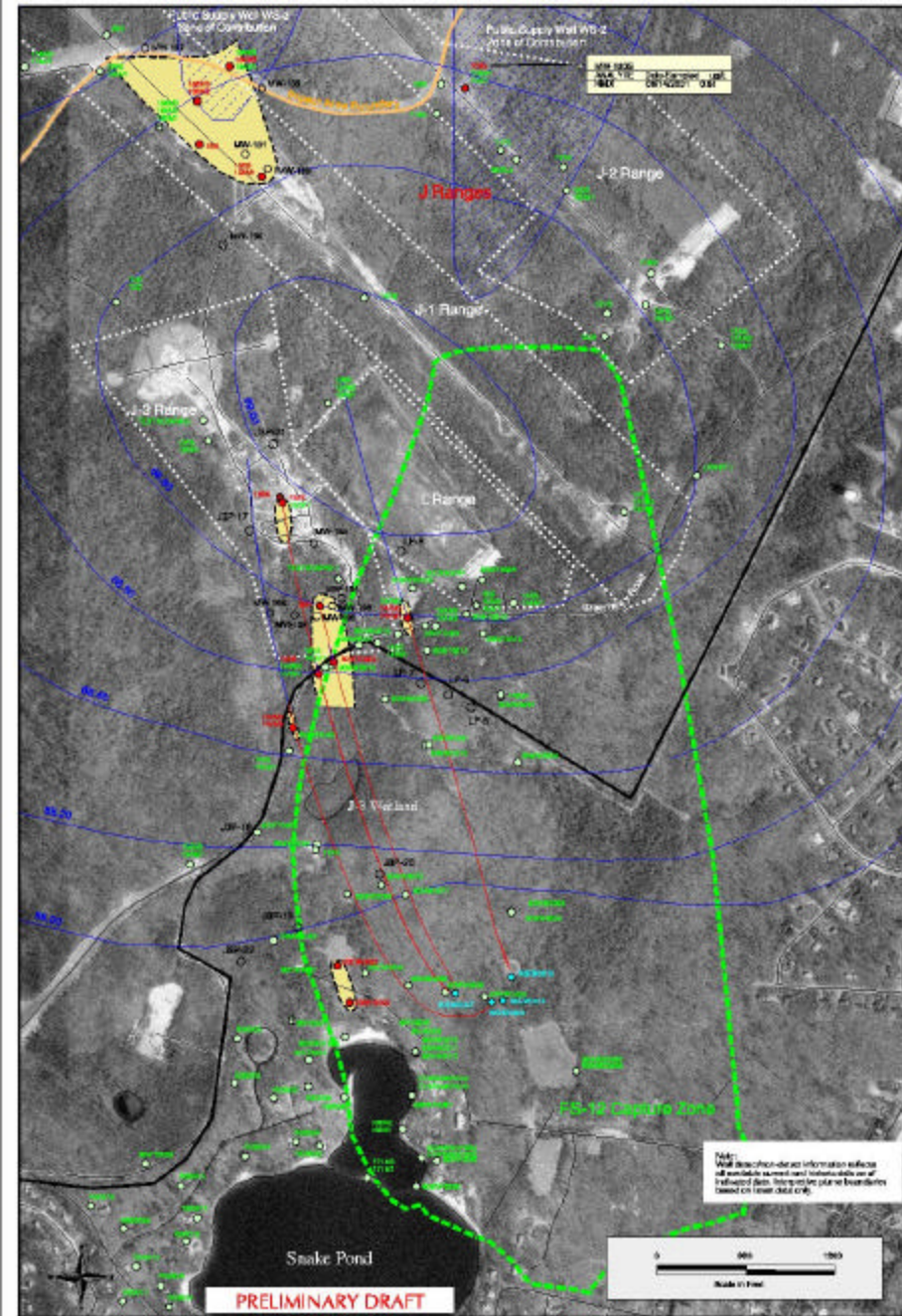


# RDX Groundwater Plume Cross-Section



# RDX Groundwater Plume Cross-Section





- J-1, J-3, L Range and J-2 HMX Groundwater Plume

**Estimated Extent of HMX**

**LEGEND**

Greater than Not Detected	Validated Detect	Collection Well
Unvalidated Detect	Forward Particle Track	Reverse Particle Track
Unvalidated Non-detect	10 to 100-day Particle Track	10 to 100-day Particle Track
Unvalidated Non-detect	10 to 100-day Particle Track	10 to 100-day Particle Track
Unvalidated Non-detect	10 to 100-day Particle Track	10 to 100-day Particle Track
Unvalidated Non-detect	10 to 100-day Particle Track	10 to 100-day Particle Track
Unvalidated Non-detect	10 to 100-day Particle Track	10 to 100-day Particle Track

**Snake Pond**

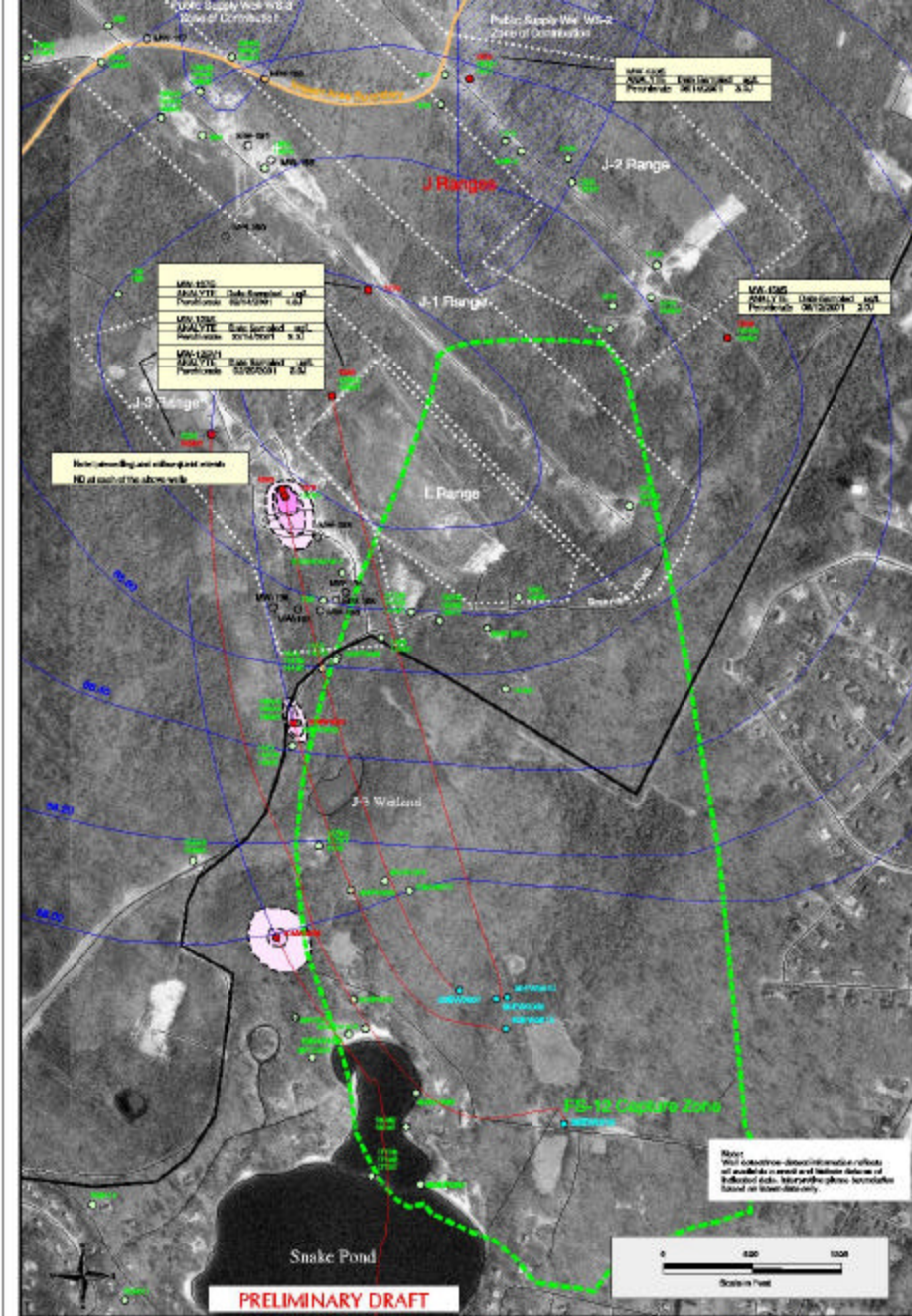
**PRELIMINARY DRAFT**

**AMEC**

December 15, 2021

Southwest Ranges and Snake Pond  
HMX Detections in Groundwater  
All Data as of 10/15/01

Figure 2-12



J-1, J-3, L Range and J-2 Perchlorate Groundwater Plume

**SWAMP**  
Southwest Ranges and Snake Pond  
Perchlorate Detections in Groundwater  
All Data as of 10/15/01  
Figure 2-13

## Preliminary Conclusions

- Groundwater flows NW&SE
- Mound location does not shift with time (based on modeling), which means the plume flow does not shift either
- Most groundwater contamination flows to Snake Pond or is captured by FS-12 treatment system
- No explosives or perchlorate found in public water supply or Snake Pond surface water
- No soil tested for perchlorate, but groundwater indicates it is present

## Preliminary Conclusions

- Still in investigations stage; Proposed additional delineation
- J-1, J-3, and L Ranges
  - RDX, HMX, and perchlorate groundwater plumes emanating from these areas
  - Contamination appears to be the result of munitions testing and poor waste management practices
- J-2 Range
  - PCNs in soil and not groundwater
    - solid wax matrix of less-soluble, more chlorinated naphthalenes likely limits the rate of dissolution of the lighter PCN congeners, therefore not dissolved in groundwater
- UXO on road potential sources of groundwater contamination