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Quality Site Assessments & Investigations Using the Conceptual Site Model Approach

CONDUCTING QUALITY SITE ASSESSMENTS

Using the Conceptual Site Model (CSM) Approach

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THE CONCEPTUAL SITE MODEL

Definition

CONCEPTUAL SITE MODEL (CSM)

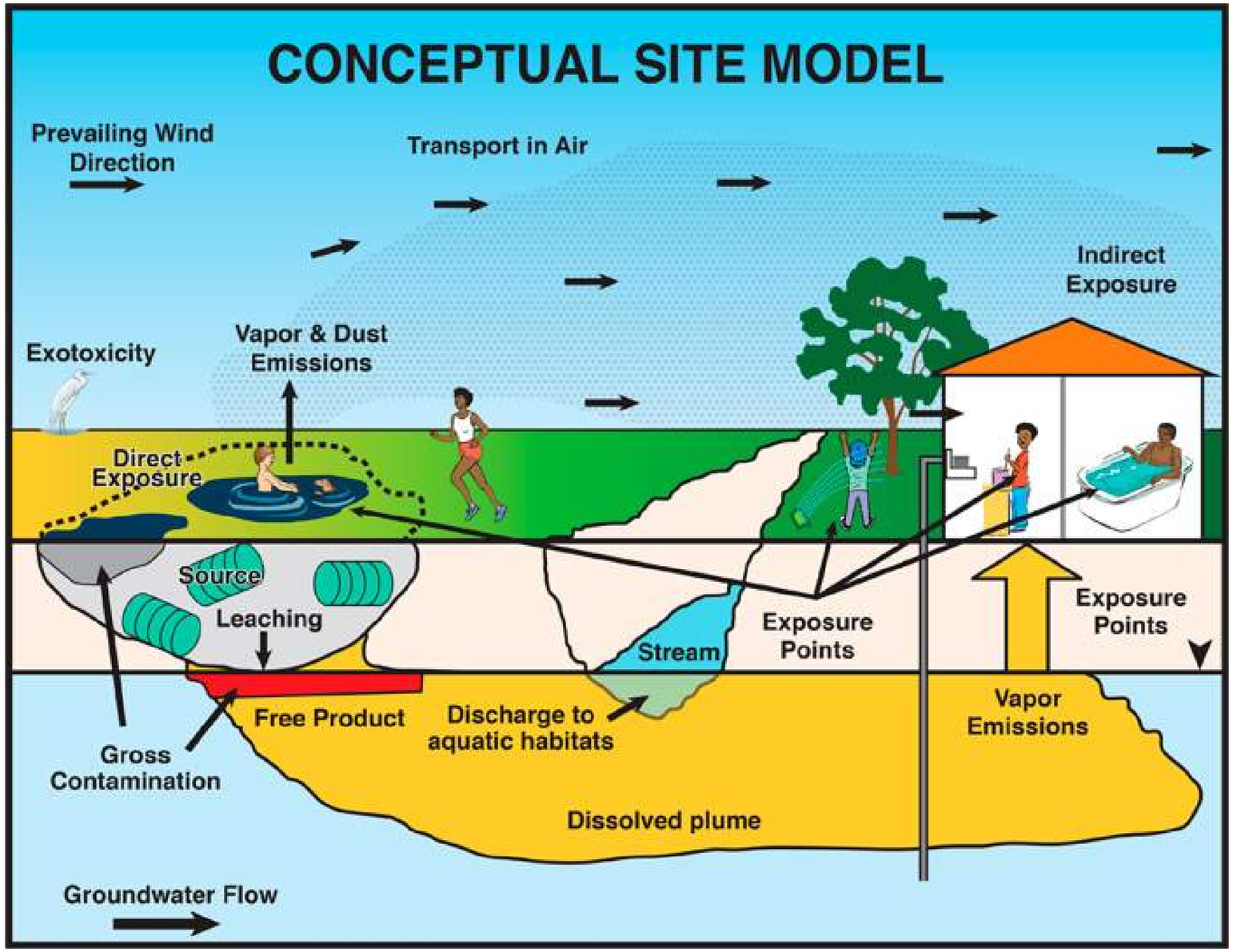
EPA

"The Conceptual Site Model (CSM) is an iterative, 'living representation' of a site that summarizes and helps project teams visualize and understand available information"

- Temporal (time-related)
- Iterative
- Living Model
- Guides assessment
- Informs cleanup objectives
- Exposure pathways

A CSM is continually "redeveloped" using:

- Known Information
- Hypothesized Information



Source: Interstate Technology Regulatory Counsel (ITRC) ***TPH Risk Evaluation at Petroleum-Contaminated Sites***

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PHASE I CONCEPTS

ASTM Phase I versus MCP Phase I

PHASE I CONCEPTS

An Objective of "Phase I" is to develop an Initial CSM

- ASTM Phase I Environmental Site Assessment – Gathers information on site characteristics
  - Satisfies EPA All Appropriate Inquiries (AAI) to avoid property-owner liability for property transactions
  - Identifies RECs, HRECs, CRECs
  - Records review
  - Physical observations
  - Interviews
  - CSM is not specifically mentioned, but the groundwork is laid for initial CSM development
  - Phase I ESA information are used to develop an initial CSM for sampling plan design (Phase II)
- Massachusetts Contingency Plan (MCP) Phase I Initial Site Investigation Report
  - Satisfies MCP regulatory requirements following a "Reportable Release"
  - Records review
  - Physical observations
  - Physical assessment (initial borings, wells, analytical data)
  - Potential migration pathways and exposure potential
  - Preliminary CSM and conclusions

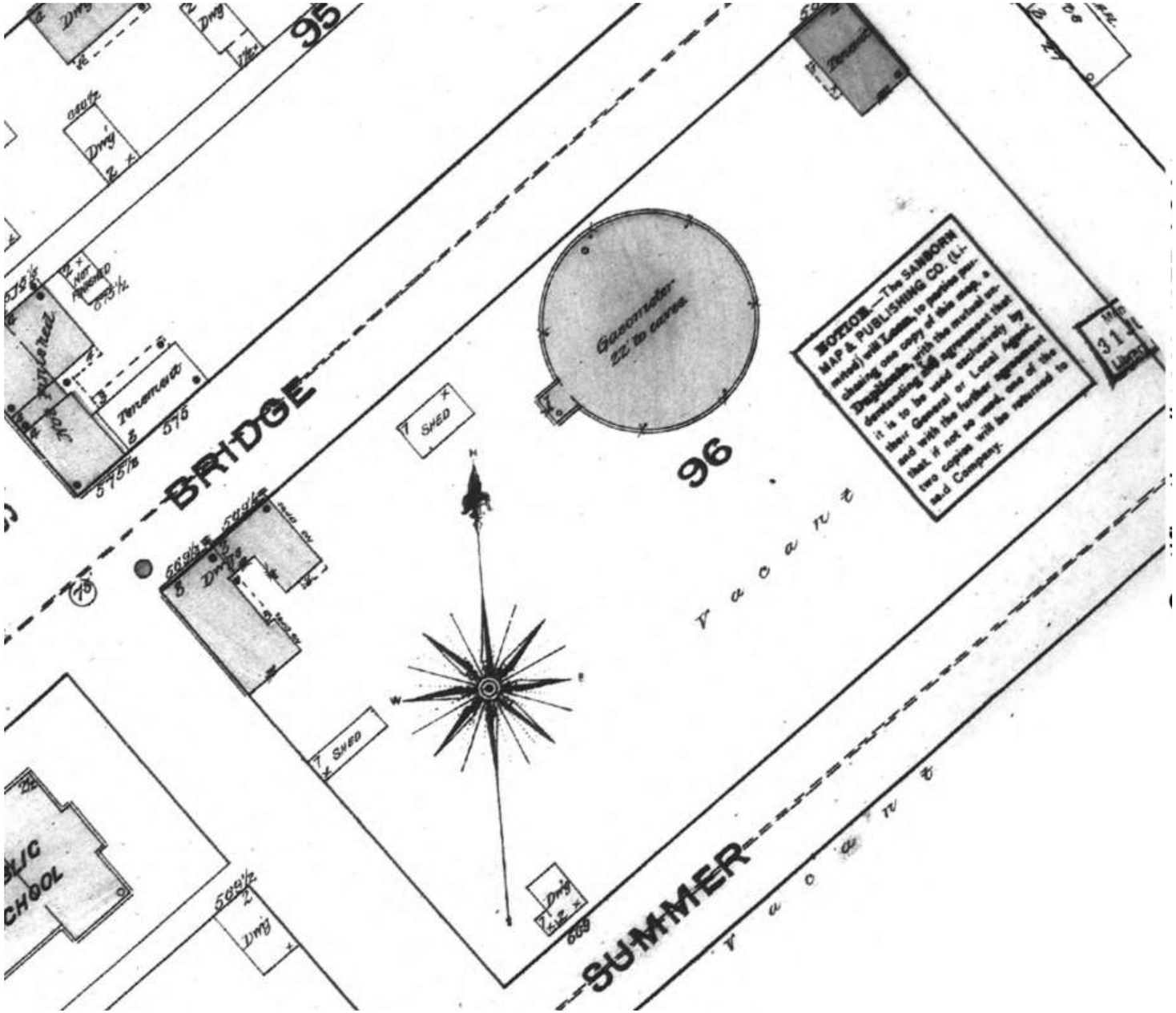
DEVELOPING THE CONCEPTUAL SITE MODEL

Using the “Phase I” Process

CONCEPTUAL SITE MODEL (CSM)

Known Information

- From Observations
  - Chemical storage and use
  - Manufacturing processes
  - Cracks, voids, penetrations
  - Staining
  - Presence of human/environmental receptors
- From Records
  - As-built drawings
  - Floor drains
  - Septic systems
  - MSDS/SDS
  - UST tightness testing
  - Sanborn Fire Insurance Maps
  - Analytical Data (sometimes available)

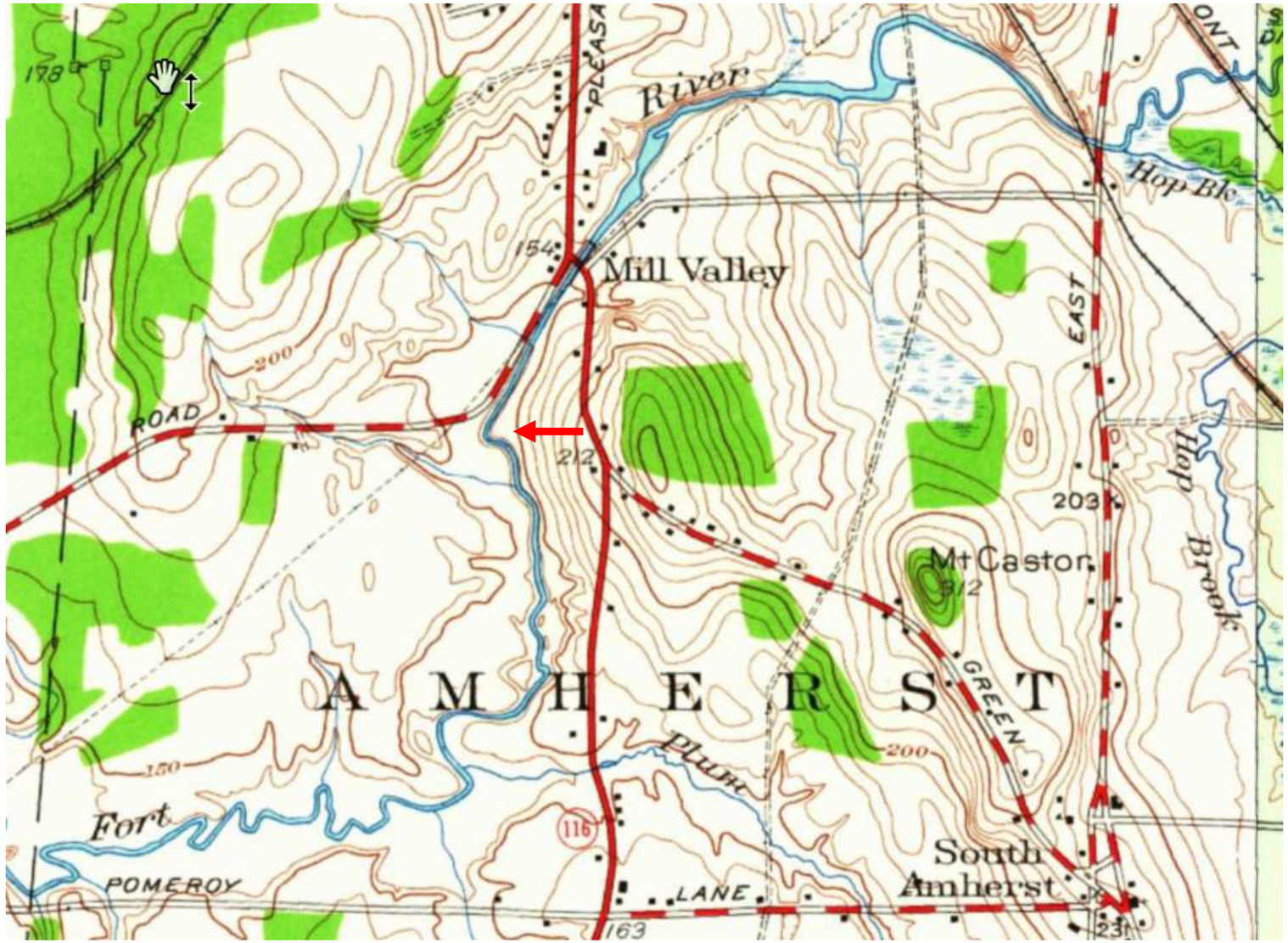


Source: The Sanborn Library, LLC

CONCEPTUAL SITE MODEL (CSM)

Hypothesized Information

- From Observations
  - Contaminant source locations
  - Land topography
  - Building remnants
  - Contaminant distribution, transport and fate
- From Records
  - Topographic maps
  - Aerial photographs
  - Historical descriptions of similar industrial processes
  - Surficial geologic maps



Source: United State Geological Society

CONCEPTUAL SITE MODEL (CSM)

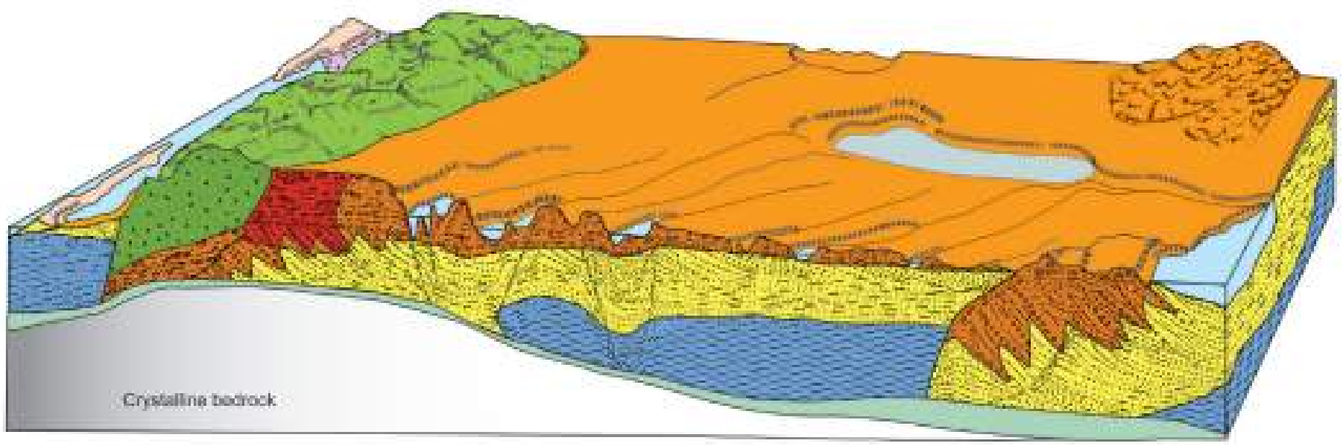
What Makes a Good CSM?

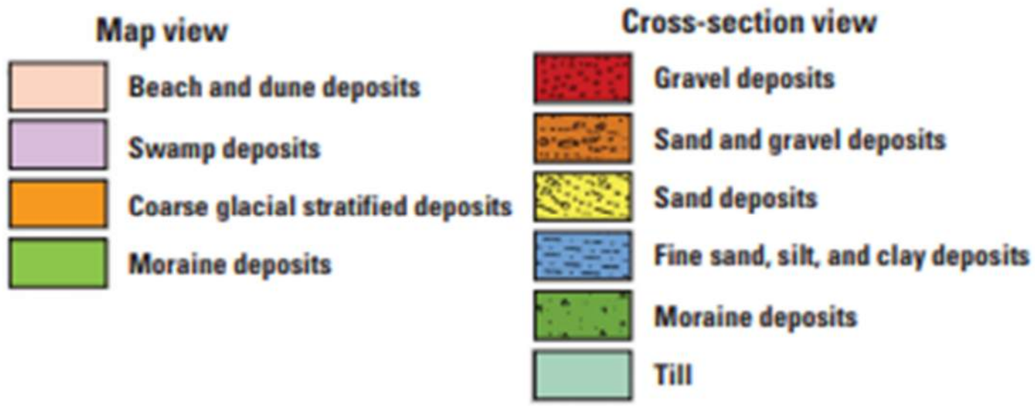
- **Adequate Site Characterization: What and where is the source, and where is it going?**
  - Source magnitude
  - Contaminants of concern and source(s) identified
  - General contaminant behavior discussed and hypothesized in CSM
  - Site physical characteristics
  - Extent of release
  - Potential exposure pathways identified
  - Preferential pathways contemplated
  - Potential receptors are identified
- **Refined with New Information**
  - Assume initial CSM is incomplete
  - Discussion of data is incorporated
  - CSM assumptions are refined each report
  - Confounding sources discussed as needed (indoor air)
  - Discuss deviations from CSM and implications

RECORDS REVIEW

Physical Setting (Current Mapping, Site Reconnaissance)

- Establishes general use of the property and adjacent property uses
- Population density and human receptors
- Sensitive environmental receptors
- Frequency and intensity of site use
- Site geology
- Topography
- Hydrogeology





Source: USGS *Surficial Geologic Map of the Heath-Northfield-Southwick-Hampden 24-Quadrangle Area in the Connecticut Valley Region, West-Central Massachusetts (Janet R. Stone and Mary L. DiGiacomo-Cohen)*

RECORDS REVIEW

Private Records - Current and Historical Records

- Past site assessments
- Facility as-built drawings, stormwater pollution prevention (SWPP) plans
- SDS (MSDS) indicating use of hazardous substances on the property
- Waste handling records (SQG, LGQ)
- Process diagrams/schematics
- Engineering controls

Public Records - Current and Historical

- Ownership records
- Newspaper articles, local history
- Municipal records

Cross-Reference as Much as Possible!

- Use multiple records to confirm/bolster CSM hypotheses

EPA cleanup in final stages

Removal of PCB contaminated topsoil at Temple Stuart site continues

By Sean DuBois
News Staff Writer

TEMPLETON — The Environmental Protection Agency plans to complete its two-year-long Temple Stuart cleanup project by the end of June. But the agency has plenty more work ahead — removing thousands of tons of contaminated topsoil from dozens of nearby residential properties.

The Board of Health held a public hearing Tuesday night for EPA and Department of Environmental Management officials to talk to residents about the project.

The cleanup began in July 2002 with the demolition of unstable buildings on the factory's property and asbestos removal. Currently the EPA is working to purge polychlorinated biphenyls from the area. PCBs are manmade chemicals that some believe are cancer causing.

The Temple Stuart site, located at 4 Holman St., is a 23-acre parcel with five buildings and a garage. The area surrounding the facility is largely residential; and PCBs have been found in some properties abutting the site, according to EPA officials.

"We held the informational meeting because we want townspeople to be informed about where the project it at," said Board of Health Vice Chairman Wayne Fontaine. "The new board is concerned about cancer in our town."

After a May 3 recall election, three new Board of Health members took office. One of Fontaine's campaign promises was to tackle cancer

Turn to CLEANUP, Page 4

EPA NEW ENGLAND
SUPERFUND REMOVAL SITE

News staff photo by SEAN DUBOIS

The Environmental Protection Agency works to remove PCBs from the soil at the Temple Stuart site.

MRPC advises outside review of town dump

Concerns renewed over Templeton site; group asks again for consultant

By Stacie N. Galang
News Staff Writer

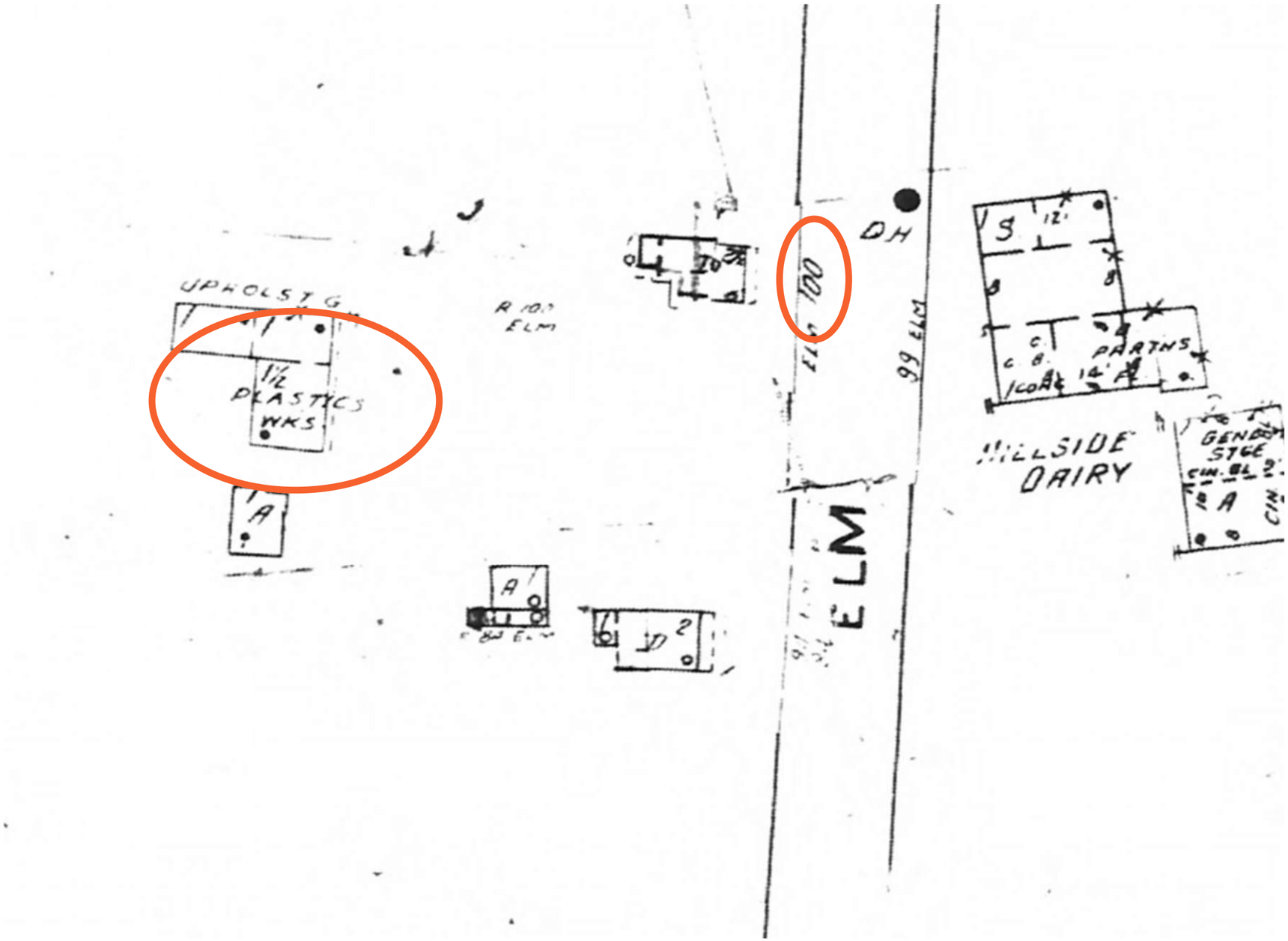
FITCHBURG — Members of the Montachusett Regional Planning Commission reinforced a previous decision, again recommending at their meeting Tuesday night that a consultant related to the landfill.

The commission voted in December to have the project reviewed by a consultant whose services would be paid for by New England Waste. In its report, the MRPC cited first the controversy surrounding the pro-

Getting prepared to play

RECORDS REVIEW

Cross-Reference as Much as Possible



RECORDS REVIEW

Cross-Reference as Much as Possible

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RECORDS REVIEW

What Resources are Important?

- **The MCP and ASTM specify which records to review**
  - Not a “one size fits all” situation
  - It is up to the LSP/EP to decide which records deserve detailed analysis based on site-specific conditions
  - Focus on records that will materially affect CSM development
  - Keep discussions practical
- **MassDEP MCP Phase I Report:**
  - Disposal Site Map
  - Site History
  - OHM Storage History
  - Site Hydrogeological Characteristics
  - Nature and Extent of Contamination
  - Migrations Pathways and Exposure Potential
  - CSM and Conclusions

EXAMPLES OF COMMON CONTAMINANTS

Characteristics, Transport and Fate

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COMMON CONTAMINANTS

ASTM Phase I ESA

- CERCLA Hazardous Substances - 800 substances and 1,500 radionuclides
- Common EPA analytical methods: TPH, VOCs, SVOCs, “RCRA 8” metals, PCBs
- New ASTM 2021 standard includes non-CERCLA substances as “Non-Scope” items
  - PFAS is not a CERCLA Hazardous Substance
  - PFAS is regulated by MassDEP
  - Additional information on the 2021 changes to the ASTM E-1527 standard available (contact Jen Griffith)

MCP Phase I Report

- “Oil and Hazardous Materials” (OHM)
- EPA analytical methods apply
- MassDEP analytical methods:
  - Hydrocarbon Ranges - EPH, VPH, APH
  - “MCP 14” metals
- Any site-specific “toxic” substance may be evaluated (eg. industry-specific chemicals)

COMMON CONTAMINANTS AND SOURCES

Volatile Organic Compounds (VOCs)

- Light, organic solvents (industrial manufacturing/degreasing)
- Light petroleum distillates (gasoline storage)
- Chlorinated solvents (military bases, dry cleaners)

Semi-Volatile Organic Compounds (SVOCs)

- Heavy petroleum distillates (fuel tanks, automotive waste oil, hydraulic fluid)
- PCBs (electrical transformers, substations, burn pits)
- PAHs (coal gasification, combustions)
- Pesticides and herbicides (production, preparation and storage facilities)

PFAS

- Fire-fighting foam (AFFF)
- Plastics/non-stick coating manufacturing

COMMON CONTAMINANTS AND SOURCES

Metals

- Electroplating (chromium [III, VI], nickel, zinc)
- Firing ranges (antimony, lead)
- Machining (chromium, vanadium)
- Paint manufacturing (lead)
- Mining, smelting (all)
- Coal combustion powerplants/boiler rooms (arsenic, lead, mercury, vanadium)

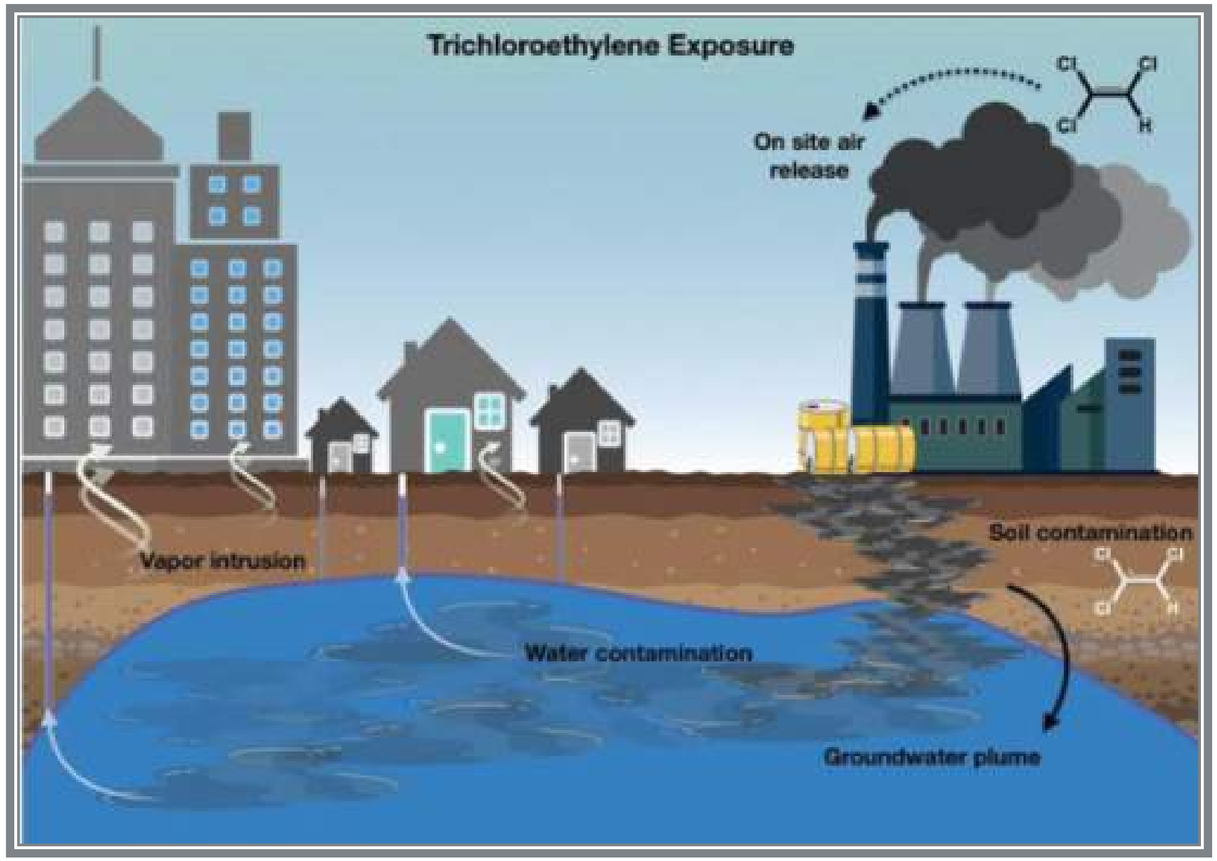
COMMON CONTAMINANTS – FATE & TRANSPORT

Physical Characteristics

- CSM should include physical and chemical factors for each substance being assessed
- Not all contaminants behave similarly in the environment (or at the same site)
- Include known/anticipated contaminant behavior in the environment

Contaminant Characteristics

- Mobility
- Density
- Solubility
- Volatility
- Toxicity
- Persistence
- Bioaccumulation



Source: University of Rochester Medical Center: ***Common Drycleaning Chemical Linked to Parkinson's Disease***

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Questions?