DRAFT Phase II Comprehensive Site Assessment (CSA) and DRAFT Phase III Evaluation/Selection of Remedial Alternatives

Former Medfield State Hospital
Medfield, Massachusetts
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Presenters

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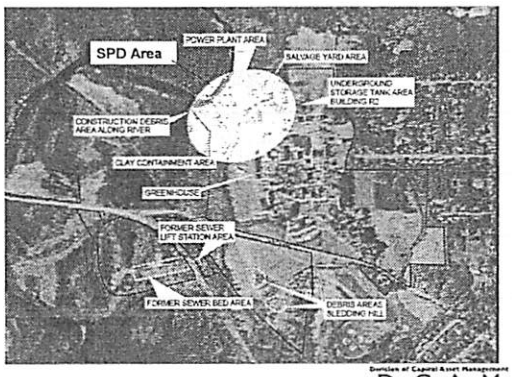

Special Project Designation Area Status

- ***Salvage Yard Area*** – Partial Class A RAO filed
- ***Clay Containment Area*** – Partial Class A RAO achieved – to be submitted Fall 2011
- ***Power Plant Area*** – Extent of petroleum impacts defined; Phase IV activities required
- ***C&D Area*** - Extent of soil and sediment impacts defined; Phase IV activities required
- ***SPD Area Groundwater***: Further assessment north of C&D Area required; Phase IV activities required

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Objectives of a Phase II CSA

The Massachusetts Contingency Plan (MCP) states that a CSA shall evaluate:

1. Source nature and extent of potential impacts
2. Risk of harm to health, environment, public welfare, and safety
3. Need for remedial actions

To support conclusions and LSP opinions

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CSA Activities Completed Overview

- 46 Soil borings installed throughout SPD Area
- 39 Groundwater monitoring wells
- 15 Groundwater screening points
- 37 Test pits
- Numerous groundwater, surface water, soil, sediment and organism samples
- Seasonal groundwater data collection
- Preparation of CSA

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Findings of Interim Phase II CSA

- Need to refine extent of:
  - PCE in groundwater
  - Sediment toxicity around sample point CD-SD-111 in Charles River
  - Lead impacts along the western end of the C&D Area
- Additional Assessment activities conducted to address these data gaps

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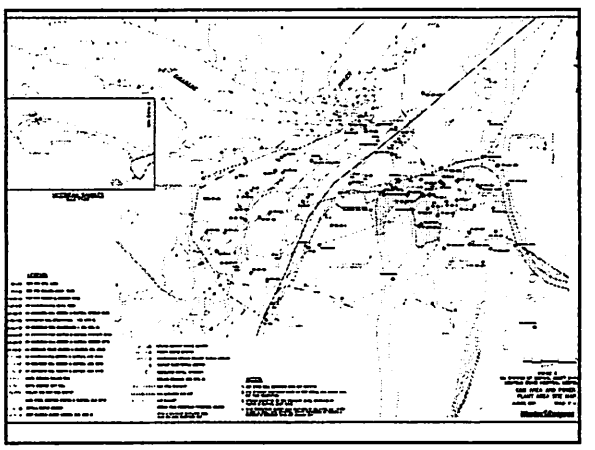

Supplemental Assessment Conducted

- Installed/sampled 13 additional wells (7 deep borings advanced to refusal and 6 shallow wells)
- Collected five additional sediment samples to assess extent of sediment toxicity
- Collected seven additional wetland soil samples along western C&D boundary
- Conducted quarterly groundwater sampling

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Findings of Phase II CSA

- A hydrogeologic connection to Town Well #6 does not seem possible based on the following:
  - Well located ~3,000 ft up/cross gradient from C&D Area
  - Groundwater from the C&D Area ultimately discharges to the Charles River (with no impact from dissolved concentrations based on GW-3 standards)
  - There are two boundary conditions located between MSH and Well #6 - an unnamed brook and a till hill
  - The Zone II of Well #6 is conceptual and not based on pumping test data

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Findings of Phase II CSA (Cont.)

- PCE extent greater than GW-1 standards consistent with historical results except north of C&D Area
- PCE concentrations in the deeper aquifer are lower or same order of magnitude as shallow aquifer
- Power Plant petroleum impacts defined in small area around former USTs
- The extent of C&D area sediment toxicity is limited to the area around CD-SD-111
- Method 2/Method 3 (for Eco risk) Risk Characterization conducted

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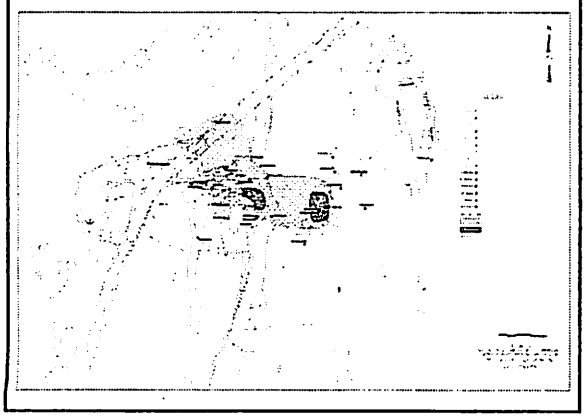

Environmental Risk Characterization

- Stage I Screening-Level Assessment
  - Comparison to local conditions, background, criteria
- Surface water is not a potentially significant exposure pathway
- Sediment, Wetland Soil, Terrestrial Soil are potentially significant exposure pathways
  - Concentrations of metals and PAHs exceed criteria
- **Conclusion = Stage II Environmental Risk Characterization required for sediment, wetland soil and terrestrial soil**

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Stage II Environmental Risk Characterization

- Assessed ability of sediment to sustain community of invertebrates
  - Comparison to sediment criteria and measures of bioavailability
  - 2 rounds of sediment toxicity tests
    - 2010: One sediment sample (CD-SD-111) significantly toxic in comparison to reference site
    - 2011: One sediment sample (CD-SD-11101) significantly toxic in comparison to reference site
- Weight of evidence indicates that area of CD-SD-11 is an area of concern for benthic invertebrates

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Stage II Environmental Risk Characterization

- Assessed ability of wetland soil and terrestrial soil to sustain populations of small mammals and birds
  - Co-located samples of soil and soil invertebrates
  - Comparison of estimated dietary doses to toxicity reference values indicate a potential risk to insectivorous mammals (e.g., shrew) and birds (e.g., robins) from metals and PAHs
- A conclusion of no significant risk to the environment cannot be reached at this time because:
  - Chronic sediment toxicity near sample CD-SD-111 and -11101
  - Potential risk to insectivorous birds and small mammals

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Phase III Evaluation and Selection of Remedial Alternatives

Objective of the Phase III:

- the identification and evaluation of remedial action alternatives to achieve a level of No Significant Risk
- the recommendation of a remedial action alternative that is a Permanent or Temporary Solution

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Evaluation of Phase II Findings

- Using the results of the Phase II, remedial alternatives were evaluated considering:
- Geology/Hydrogeology
- Location of PPA and Zone II of Well #6
- Concentrations of constituents exceeding cleanup standards/posing risk

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Phase III Remedial Evaluation

- ***Initial screening*** conducted to identify remedial alternatives likely to be feasible and achieve No Significant Risk
- Alternatives retained from initial evaluation were retained for ***detailed evaluation***
- Based on the detailed evaluation, ***Remedial Alternatives were selected*** for SPD Area Groundwater and the Power Plant Area

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Initial Screening (Cont.)

- The initial screening for ***SPD Area groundwater*** (PCE impacts) considered the following:
  - Passive/Reactive Treatment Barrier (Funnel and Gate System)
  - In-Situ Sparging/Soil Vapor Extraction
  - In-Situ Chemical Reduction (ISCR)
  - In-Situ Chemical Oxidation (ISCO)
  - Monitored Natural Attenuation (MNA)
  - Enhanced Bioremediation
  - In-Situ Thermal Treatment
  - Groundwater Pump and Treat
  - Physical Containment Barrier
  - In-Well Air Stripping
  - Phytoremediation
- The technologies for the ***Power Plant Area*** initially evaluated include the following:
  - Source Area Removal
  - Enhanced Bioremediation
  - Ex-Situ Biological Treatment
  - In-Situ Thermal Treatment
  - Groundwater Pump and Treat
  - In-Situ Air Sparging/Soil Vapor Extraction
  - Chemical Oxidation
  - Monitored Natural Attenuation

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Detailed Evaluation

Alternatives retained for detailed evaluation include:

SPD Area

- In-Situ Chemical Oxidation (ISCO)
- Monitored Natural Attenuation (MNA)
- Enhanced Bioremediation
- Phytoremediation

Power Plant Area

- Source Area Removal
- Enhanced Bioremediation
- Monitored Natural Attenuation

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Selection of Remedial Alternatives

SPD AREA

- A combination of ***ISCO (Source Areas) and MNA*** was selected as the proposed remedial action alternative for SPD Area groundwater.
  - DCAM will evaluate additional active remediation as a Phase IV Remedy Implementation Plan (RIP) modification

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In-Situ Chemical Oxidation

- Inject oxidant into aquifer to destroy PCE and other organic contaminants (e.g. petroleum related and/or daughter products)
- Monitor aquifer during injection to control delivery
- Oxidant reacts quickly and completely
- Need pilot study/full-scale design prior to Phase IV RIP

Selection of Remedial Alternatives

POWER PLANT AREA

- A combination of ***Source Area Removal and MNA*** was selected as the proposed remedial action alternative for the Power Plant
  - DCAM will evaluate additional active remediation as a Phase IV Remedy Implementation Plan (RIP) modification

Public Comment

For additional information or to submit written questions/comments, please contact:

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Public comments on Draft RAM Completion/RAO are due on or before September 28, 2011