Quanta Resources Site

Dr. Peter L. deFur
Technical Assistance Services for Communities Program (TASC)

November 4 & 9, 2010
Purpose of the meetings

- Independent review
- Questions - discussion
- Other topics for Nov 9
- TASC
- E² Inc.
- ESC, LLC
Community Concerns

- Access road at hotel
- Separation into two operable units
- In situ stabilization
- Reactive barrier
- Remaining chemicals
- Arsenic and organic chemical interactions
Meeting 1 Agenda (Nov. 4)

- Site overview
- Human and Ecological Health
- TarGOST method
- Alternatives 1-3
- Alternative 4a
  - Cross-Sections
  - In Situ Solidification/ Stabilization
  - Subaqueous Reactive Barrier
- Questions/ Comments
Meeting 2 Agenda (Nov. 9)

- Follow up to Nov 4 issues
- Alternatives 5a and 5b
- Alternatives 6a and 6b
- Uncertainties
- Questions/ Comments
The Site

- Industrial history
- Condition of contaminants
- Cultural features
  - Existing buildings and infrastructure
  - Use, including traffic
- Hudson River
- Operable Units (OU1 & OU2)
  - Community question about OU’s
Human and Ecological Health

- Remedial Action Objectives
- Allowable future land use
- Effectiveness of institutional and engineering controls
Human and Ecological Health

Issue: Remaining NAPL and its influence on arsenic

Comment:
NAPL affects arsenic
Uncertain processes
Human and Ecological Health

Issue: Health risks remaining after treatment

Comment:
- Arsenic ELCR $\rightarrow 10^{-4}$
- Institutional controls
- Capping
- Risks at depth
Human and Ecological Health

Issue: Ecological receptors

Comment: SLERA limited risk characterization to small mammals as highest-order receptors, but...
Deer observed during site visit
Human and Ecological Health

Issue: Contaminants contained in NAPL at this site

Comment: Over sixty contaminants
## NAPL Constituents

<table>
<thead>
<tr>
<th>Ethylbenzene</th>
<th>Pyrene</th>
<th>Chrysene</th>
<th>C4-Benz(a)anthracene/chrysene</th>
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</thead>
<tbody>
<tr>
<td>Styrene</td>
<td>Cresols</td>
<td>Benzo(a)pyrene</td>
<td>C4-Dibenzothiophenes</td>
</tr>
<tr>
<td>N-Propylbenzene</td>
<td>Dibenzofuran</td>
<td>Dibenzo(a,h)anthracene</td>
<td>C4-Naphthalenes</td>
</tr>
<tr>
<td>1,3,5-Trimethylbenzene</td>
<td>Dibenzo thiophene</td>
<td>Benzo(a)anthracene</td>
<td>C4-Phenanthrenes/anthracenes</td>
</tr>
<tr>
<td>Toluene</td>
<td>2-Methylfluorene</td>
<td>Hexachloroethane</td>
<td>Xylenes, M &amp; P</td>
</tr>
<tr>
<td>Xylenes</td>
<td>4-Methylfluorene</td>
<td>Acenaphthene</td>
<td>Lead</td>
</tr>
<tr>
<td>Benzene</td>
<td>1-Methylfluorene</td>
<td>Carbazole</td>
<td>Silver</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>Benzo(g,h,i)perylene</td>
<td>1-Methylnaphthalene</td>
<td>Antimony</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>Benzo(e)pyrene</td>
<td>O-xylene</td>
<td>Arsenic</td>
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<tr>
<td>Isopropylbenzene</td>
<td>Indeno(1,2,3-CD)pyrene</td>
<td>2-Methylphenol</td>
<td>Chromium</td>
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<tr>
<td>P-Isopropyltoluene</td>
<td>Perylene</td>
<td>P-Isopropyltoluene</td>
<td>Copper</td>
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<tr>
<td>Butylbenzene</td>
<td>Phenanthrene</td>
<td>C1-Benzene</td>
<td>Zinc</td>
</tr>
<tr>
<td>2,4-Dimethylphenol</td>
<td>Tert-butylbenzene</td>
<td>C2-Alkylbenzenes</td>
<td>Selenium</td>
</tr>
<tr>
<td>Phenol</td>
<td>Benzo(b)fluoranthene</td>
<td>C3-Alkylbenzenes</td>
<td>Mercury</td>
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<tr>
<td>Pyridine</td>
<td>Fluoranthene</td>
<td>C4-Alkylbenzenes</td>
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</tr>
<tr>
<td>Hexachlorobenzene</td>
<td>Benzo(k)fluoranthene</td>
<td>C5-Benzenes</td>
<td></td>
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<tr>
<td>Anthracene</td>
<td>Acenaphthylene</td>
<td>Benzo(b/c)fluorenes</td>
<td></td>
</tr>
</tbody>
</table>
TarGOST®

- Tar-specific Green Optical Screening Tool
- Remote sensing
- Depth and amount of coal tar and creosote
- Mathematical model to draw a complete picture
- Technology limitations
- Modern technology
TarGOST™

LIF = laser induced fluorescence

Lasers are used to cause the contaminants to give off a signal that is detected by monitoring equipment
Alternatives 1 - 3

- Alternative 1 – No Further Action
- Alternative 2 – Capping
- Alternative 3 – NAPL Recovery Wells

- Do not satisfy principal threat Remedial Action Objectives
Alternative 4a Overview

- Predesign investigation and remedial design
- NAPL and arsenic in situ solidification/stabilization
- Passive NAPL recovery
- In situ stabilization or hydraulic containment of HCAA
- Capping/engineering controls
Alternative 4a cont.

- Vapor mitigation
- Enhancement of 115 River Road buildings
- Groundwater (G3) – Subaqueous Reactive Barrier
- Institutional controls
- Long-term operation and maintenance
Note:
1. Alternative also includes capping of residual soils.
2. Methods and reagents for solidification and stabilization may vary for the various NAPL and arsenic areas.
3. Response action for NZ-1 under River Road to be coordinated with Bergen County when future roadway work occurs.
4. It is assumed that AA-3 will be addressed as part of the remediation efforts performed by iPark.

ALTERNATIVE 4A - NAPL AND ARSENIC IN SITU SOLIDIFICATION/STABILIZATION
Quanta Resources Superfund Site
Operable Unit 1
Edgewater, New Jersey
July 6, 2010
Figure ES-7
Alternative 4a

Issue: The site was divided into two different sections (land and water), that will be treated at different times.

Comment: Operable Units are the usual or common way to clean up sites
Alternative 4a

Issue: Shoreline
vertical barrier
solidified soil near shore

Comment:
barriers are a known method
solidified soil - less experience
monitoring required
Cross-Sections

Issue: Cross-section data

Comment:
created from soil boring (visual descriptions),
soil chemical screening,
lab tests,
TarGOST® (LIF technology)
Alternative 4a Cross-Section

View along the shoreline: downriver (L) to upriver (R)
Cross-Sections

Issue: Cross-sections

Comment:

- Nature and extent of principal and low-level threat contaminants
- Geology
- Treatment extent
Cross-Sections

Issue: How geology affects remediation plan

Comment: Geologic features limiting mobility of NAPL, reducing status to “low-level”
In Situ Solidification/ Stabilization

- Source control treatment
- Solidification and/or stabilization
- Reagents
- Injection and auger mixing
- Volatile emissions
- Leachability testing
In Situ Solidification/ Stabilization

Issue: Adequate Treatment depth
Comment: NAPL Zone1 → 11 ft bgs
NZ-2 → 25 ft bgs near bulkhead
  10 ft bgs in remaining areas
NZ-5 → 25 ft bgs near bulkhead
NZ-3 → in part 23 ft bgs
arsenic area depths not specified
In Situ Solidification/ Stabilization

- Advantages
  - Reduced handling
  - Reduced spill potential
  - Decreases chance of resuspension
  - Monetary cost lower
In Situ Solidification/ Stabilization

- Disadvantages
  - Lack of process control
  - Treatment efficiency less than removal
  - Potential for contaminant mobilization
  - Long-term stability unknown - NAPL
  - Different sediment types affect uniformity of treatment
Auger mixing reagent with contaminated soil

ISS monolith

In Situ Solidification/ Stabilization

Issue: Untreated areas

Comment:

- Principal threat treated based on
  - Mobility
  - Toxicity
  - Volume

- Difficult and impractical to treat beneath structures and roads
In Situ Solidification/ Stabilization

- Specific areas left untreated by ISS
  - NZ-4 and NZ-6
  - Portions of NZ-1 and NZ-3
  - Residually contaminated soils

AA-3 i.Park Edgewater, LLC- now excavate and treat
In Situ Solidification/ Stabilization

Issue: Permanence

Comment:
- Relatively new technology (1980s)
  - Mostly metals
- Remedy Review Board comments
  - Limited treatment on NAPL
  - Suggest more removal
In Situ Solidification/ Stabilization

Issue: Effect on nearby residents

Comment:
Four stage remedial construction plan
heavy equipment and trucks
In Situ Solidification/ Stabilization

Issue: Source recontamination from future land use and natural occurrences

Comment:
weathering $\rightarrow$ affects solidification of mass and overall treatment effectiveness
In Situ Solidification/ Stabilization

Issue: Groundwater flow around the solidified monolith

Comment: Groundwater flow modeling results
  ● Pooling
  ● Flooding
  ● Flow direction
  ● Groundwater elevation
  ● Uncertainty remains
In Situ Solidification/ Stabilization

Issue: Soil expansion and modified landscape

Comment:
- 15% cement by weight $\rightarrow$ 25% soil expansion
- Differential settling of backfill material
ISS Challenges

- Expansion
- Potential NAPL migration
- Limited use on organic contaminants
Subaqueous Reactive Barrier- SRB

Issue: Installation

Comment:
- Removal or compaction of sediment
- 15 ft x 150 ft mats with 20% overlap
- 18 in thick layer mimicking river bottom sediments
Subaqueous Reactive Barrier

- Permeable reactive mat between geotextiles

Cetco® Reactive Core Mat®

1 cm = about ½ inch
Subaqueous Reactive Barrier

- Compaction or removal of sediment (11,000 yd³) Cover OU2 sediments (170,000 ft³)
- Sand and armor layer to keep in place
- Reactive mat- organoclay, apatite, and activated carbon
- Temporary cofferdam
Shoreline cofferdam

Photo from http://www.portadam.com/PortadamNetscape.htm
Cofferdam on the Pine River, MI

This cofferdam allowed dredging of contaminated sediments on one side of the river and then the other. Courtesy ESC, LLC
Subaqueous Reactive Barrier

Issue: Timing of SRB installation

Comment:
- Installed during Operable Unit 2
- coordination with on-land
- Concern with continuing contamination
Subaqueous Reactive Barrier

- OU2 BERA workplan and RI
- Habitat value
- Bench-scale testing
  - Contaminants
  - Limitations absorbing
- Monitoring
  - Physical inspections
  - Pore water data or surface water samples
  - Bathymetric surveys
  - Coring and analysis of SRB
Subaqueous Reactive Barrier

Issue: Effectiveness

Comment:
- Newer technology
- Possible release back into water
  - Adsorption ability used up
- Clogging possible
  - NAPL
  - Biological media
Questions?
Meeting 2 Agenda (Nov. 9)

- Issues from Nov 4
- Alternatives 5a and 5b
- Alternatives 6a and 6b
- Uncertainties
- Questions/ Comments
Alternative 5a Overview

- Predesign investigation and remedial design
- Shallow excavation of NAPL (tar boils, NZ-1, NZ-2)
- Chemical treatment (worst NAPL > 4ft bgs)
- Limited free-phase NAPL recovery
- In situ solidification of arsenic
- In situ stabilization or hydraulic containment of HCAA
Alternative 5a Overview

- Capping/engineering controls Vapor mitigation
- Enhancement of 115 River Road buildings
- Groundwater Alternative G2 – Hydraulic Containment (pump and treat)
- Institutional controls
- Maintain existing roads and parking services
- Operation and maintenance
In Situ Chemical Oxidation (ISCO)

- Oxidize NAPL constituents
  - VOCs and SVOCs
- Inject reagent according to grid
- Targeted NAPL zones that are principal threat
- Annual reinjections → five years ?
ALTERNATIVE 5A: NAPL IN SITU CHEMICAL OXIDATION WITH ARSENIC STABILIZATION

Quanta Resources Superfund Site
Edgewater, New Jersey

July 6, 2010

FIGURE ES-10

Notes:
1. Alternative also includes capping of residual soils.
2. Response action for NZ-1 under River Road to be coordinated with Bergen County when future roadway work occurs.
3. It is assumed that AA-3 will be addressed as part of the remediation efforts performed by iPark.
LEGEND

- Hudson River Shoreline
- Quanta Property Boundary
- Existing Arsenic Liner
- Asphalt Cap
- Engineered Cap
- Engineered Cap or Cover Selection based on technology implemented (see note 1)
- Approximate area of tar "bolts" (Not necessarily present throughout depicted area)

Notes:
2. Existing road surfaces and on-slab grade formations will remain in place and are maintained by others.
3. Arsenic liner remains and is maintained by others.

EXTENT OF CAPPING

Quanta Resources Superfund Site Operable Unit 1
Edgewater, New Jersey
July 6, 2010 Figure ES-2
Alternative 5b Overview

- Same as alternative 5a, except
  - 115 River Road demolished
  - Remove or treat more contaminated material
- Approx. additional 8,000 yds$^3$
ALTERNATIVE 5B - NAPL IN SITU CHEMICAL OXIDATION WITH ARSENIC STABILIZATION WITH DEMOLITION OF 115 RIVER ROAD BUILDINGS

Quanta Resources Superfund Site
Operable Unit 1
Edgewater, New Jersey

July 8, 2010

FIGURE ES-11

Notes:
1. Alternative also includes capping of residual soils.
2. Response action for NZ-1 under River Road to be coordinated with Bergen County when future roadway work occurs.
3. It is assumed that AA-3 will be addressed as part of the remediation efforts performed by iPark.

LEGEND
- Quanta Property Boundary
- Existing Arsenic Liner
- Principal Threat NAPL Zone
- High Concentration Arsenic Area
- Principal Threat Arsenic Area
- Area of NZ-3 Treatment
- Approximate area of tar "bolts" (Not necessarily present throughout depicted area)

Remedial Action Components
- Excavation for NAPL (0 - 4 ft bgs)
- Tar Bolts and ISCO
- Stabilization
- Demolition
- Barrier Wall
- NAFL Recovery Wells
- Groundwater Extraction Well
- Passive NAFL Recovery

Notes:
1. Alternative also includes capping of residual soils.
2. Response action for NZ-1 under River Road to be coordinated with Bergen County when future roadway work occurs.
3. It is assumed that AA-3 will be addressed as part of the remediation efforts performed by iPark.

ALTERNATIVE 5B - NAPL IN SITU CHEMICAL OXIDATION WITH ARSENIC STABILIZATION WITH DEMOLITION OF 115 RIVER ROAD BUILDINGS

Quanta Resources Superfund Site
Operable Unit 1
Edgewater, New Jersey

July 8, 2010

FIGURE ES-11
In Situ Chemical Oxidation

Issue: Potential complications

Comment:
- Volatilization
- Structural destabilization
  - 115 River Road
  - Bulkhead
- NAPL migration from heat reactions
- Bench-scale testing results
Alternative 6a Overview

- Predesign investigation and remedial design
- NAPL and arsenic excavation for off-site disposal
- On-site stabilization
- Dewatering and treatment of deep excavated material
- Temporary barrier wall along shoreline
- Capping/engineering controls
Alternative 6a continued

- Vapor mitigation
- Enhancement of 115 River Road buildings
- Ground water Alternative G3 – subaqueous reactive barrier
- Institutional controls
- Long-term operation and maintenance
Quanta Resources Superfund Site
Operable Unit 1
Edgewater, New Jersey

ALTERNATIVE 6A - NAPL AND ARSENIC EXCAVATION

July 6, 2010  FIGURE ES-13
Alternative 6b Overview

- Same as alternative 6a, except
  - 115 River Road demolished
  - Remove more contaminated material
    - Approx. additional 8,000 yds$^3$
Quanta Resources Superfund Site
Operable Unit 1
Edgewater, New Jersey

ALTERNATIVE 6B - NAPL AND ARSENIC EXCAVATION WITH DEMOLITION OF 115 RIVER ROAD BUILDINGS

Notes:
1. Alternative also includes capping of residual soils.
2. Final excavation depths will be determined during remedial design.
3. Response action for NZ-1 under River Road to be coordinated with Bergen County when future roadway work occurs.
4. As assumed that Area 3 will be addressed as part of the remediation efforts performed by iPark.

July 6, 2010

FIGURE ES-14
Excavation

- Principal threat areas excavated
- Disposed off-site
- Limited treatment of deep NAPL
Excavation

Issue: Potential complications

Comment:
- NAPL mobilization
- Structural destabilization
- Utilities
- Dewatering
Uncertainties

- Rain, river flow and other weather
- Chemical actions and reactions
- Future site use and economics
- Always ? when the digging begins
Questions?