

Tittabawassee River, Saginaw River & Bay Site

Segment 1 Developing Cleanup Options

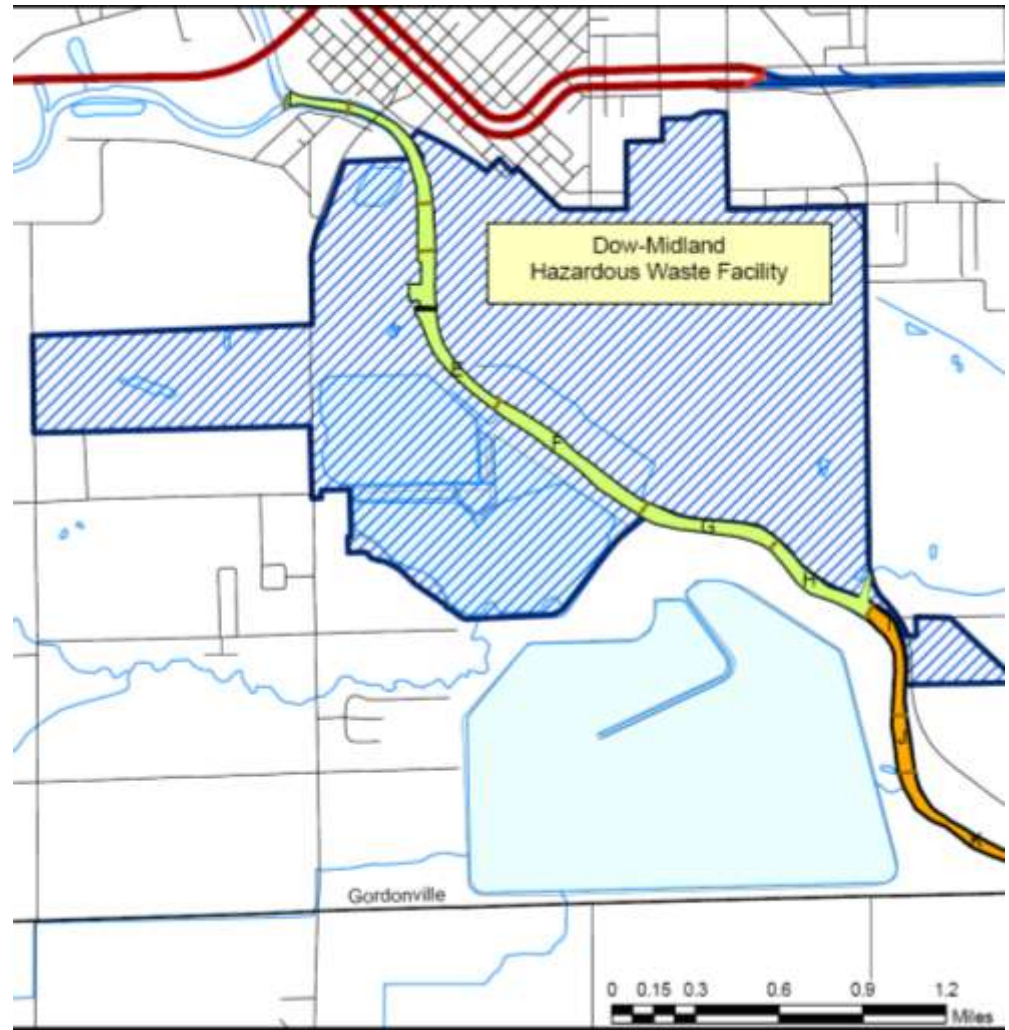
CAG Meeting May 16, 2011

Agenda

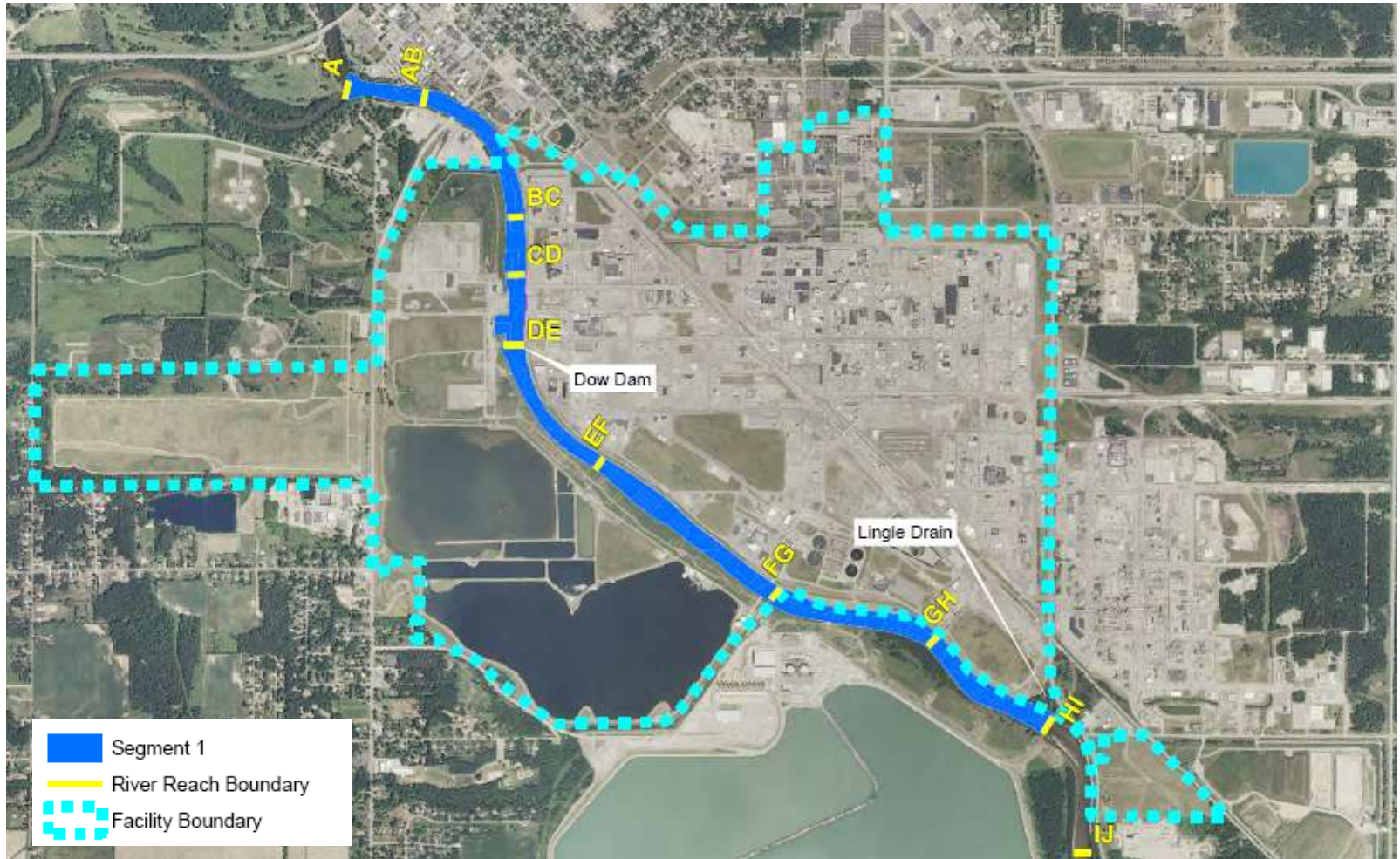
- Brief Summary of Segment 1 Conditions
- Sediment Cleanup Options
 - Sediment Management Areas (SMAs)

Segment 1 Overview

- Three miles next to Dow's Midland plant
- Some cleanup has already occurred
- Unique conditions in this segment
- Cleanup options proposed in 2011
- Cleanup expected to begin in 2012



Segment 1 Boundary



Summary of Segment Conditions

Site History & Source Control

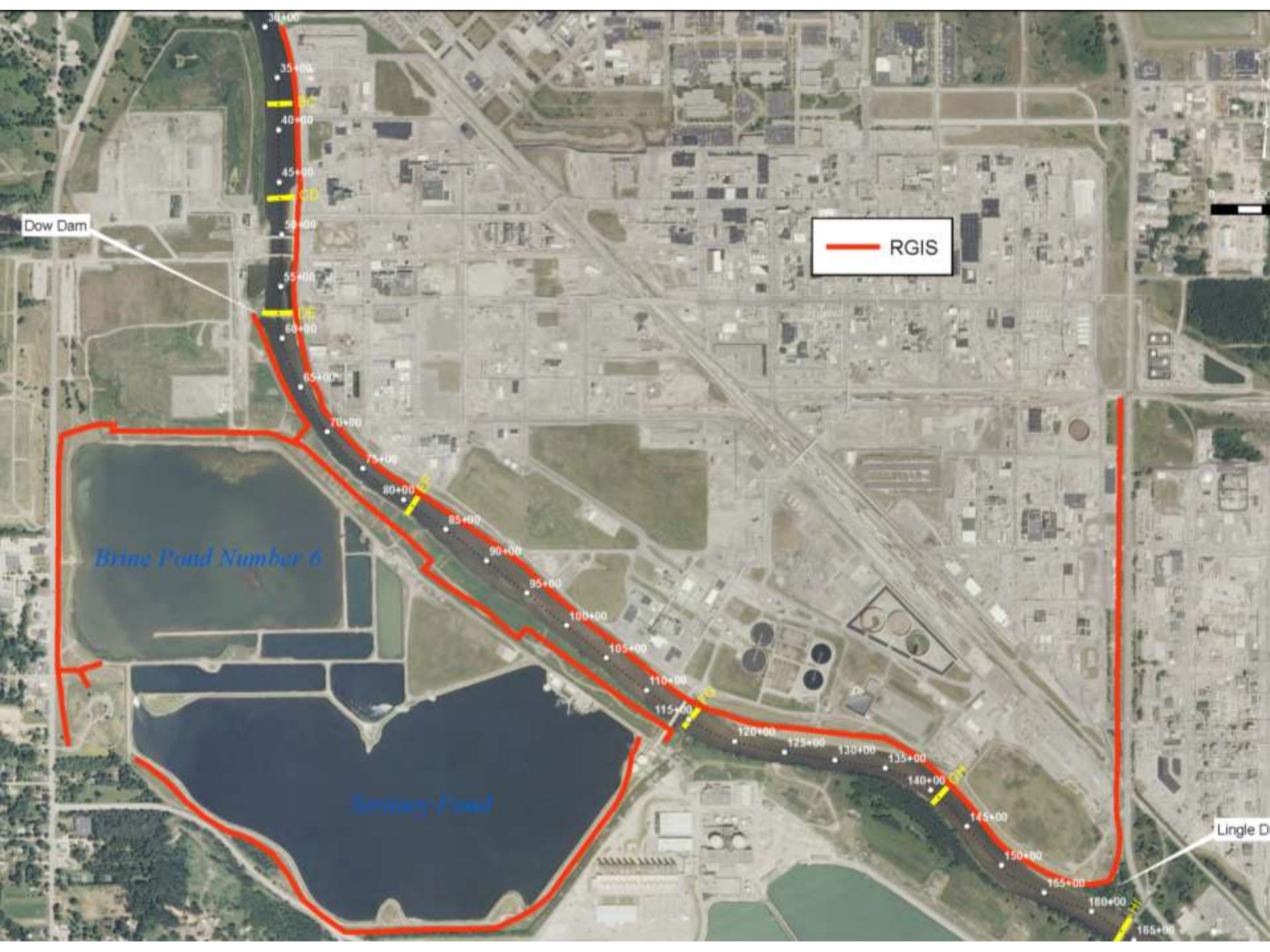
- Manufacturing operations have occurred nearby since the 1890s
- Contaminated sediment deposits due to historic releases
 - Discharge to the river – direct, holding ponds, outfalls
 - Surface water runoff
 - Groundwater
- Waste management systems and source controls now protect the river

Current Source Control



Groundwater Controls

- Plant groundwater is controlled by a system called the Revetment Groundwater Interception System (RGIS)
- RGIS intercepts plant groundwater that would otherwise go to the River
- Performance is continually monitored
- Need to consider RGIS in developing Segment 1 options



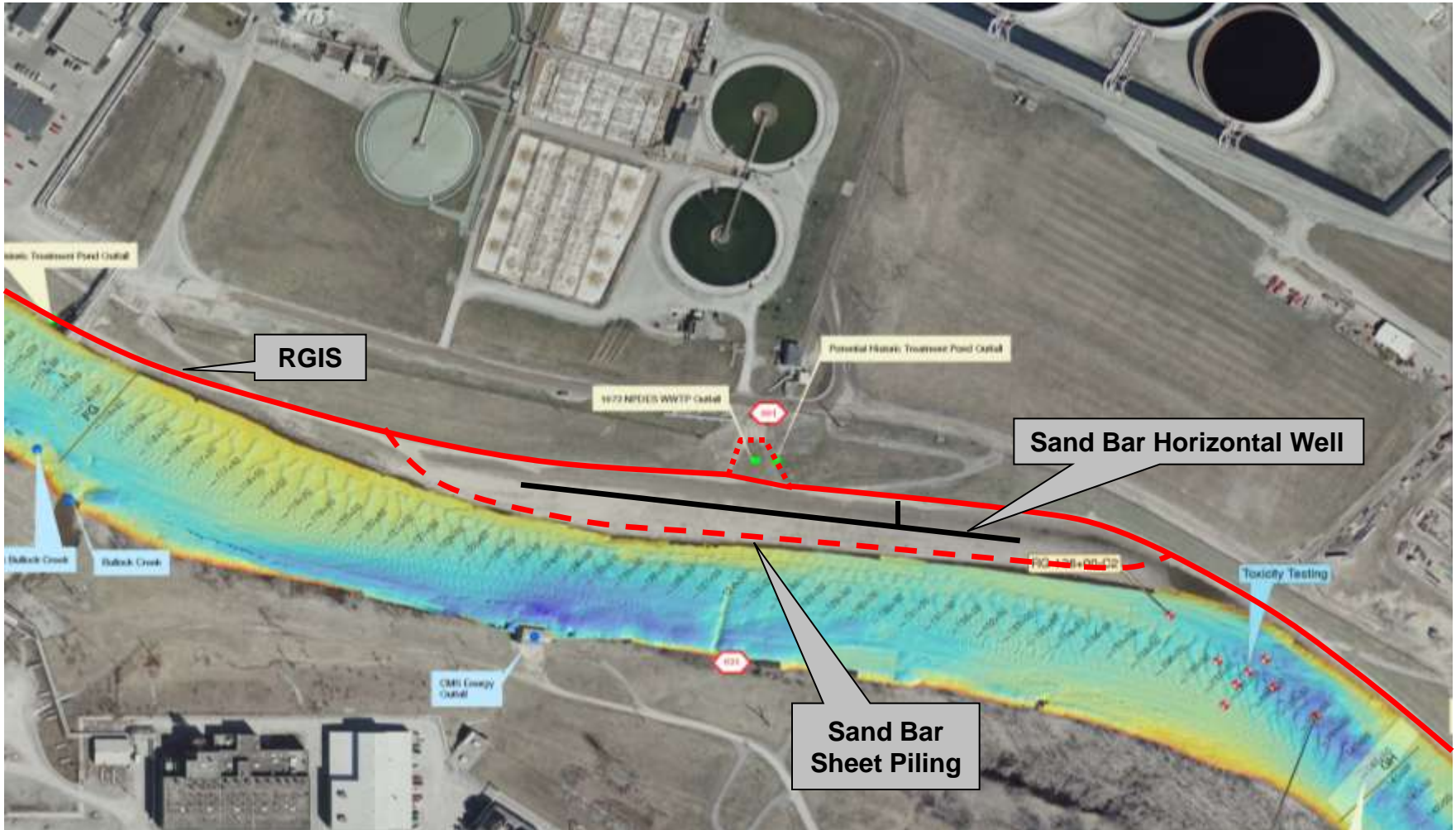
Near-Plant Actions Completed

- Significant cleanups in Segment 1
 - Address dioxin/furans and other chemicals
 - These completed actions help inform future actions in Segment 1
- Includes:
 - Reach B – Removal and capping
 - Reach D – Dredging, capping and monitored natural recovery
 - Reach G Sand Bar – Containment, groundwater capture and treatment

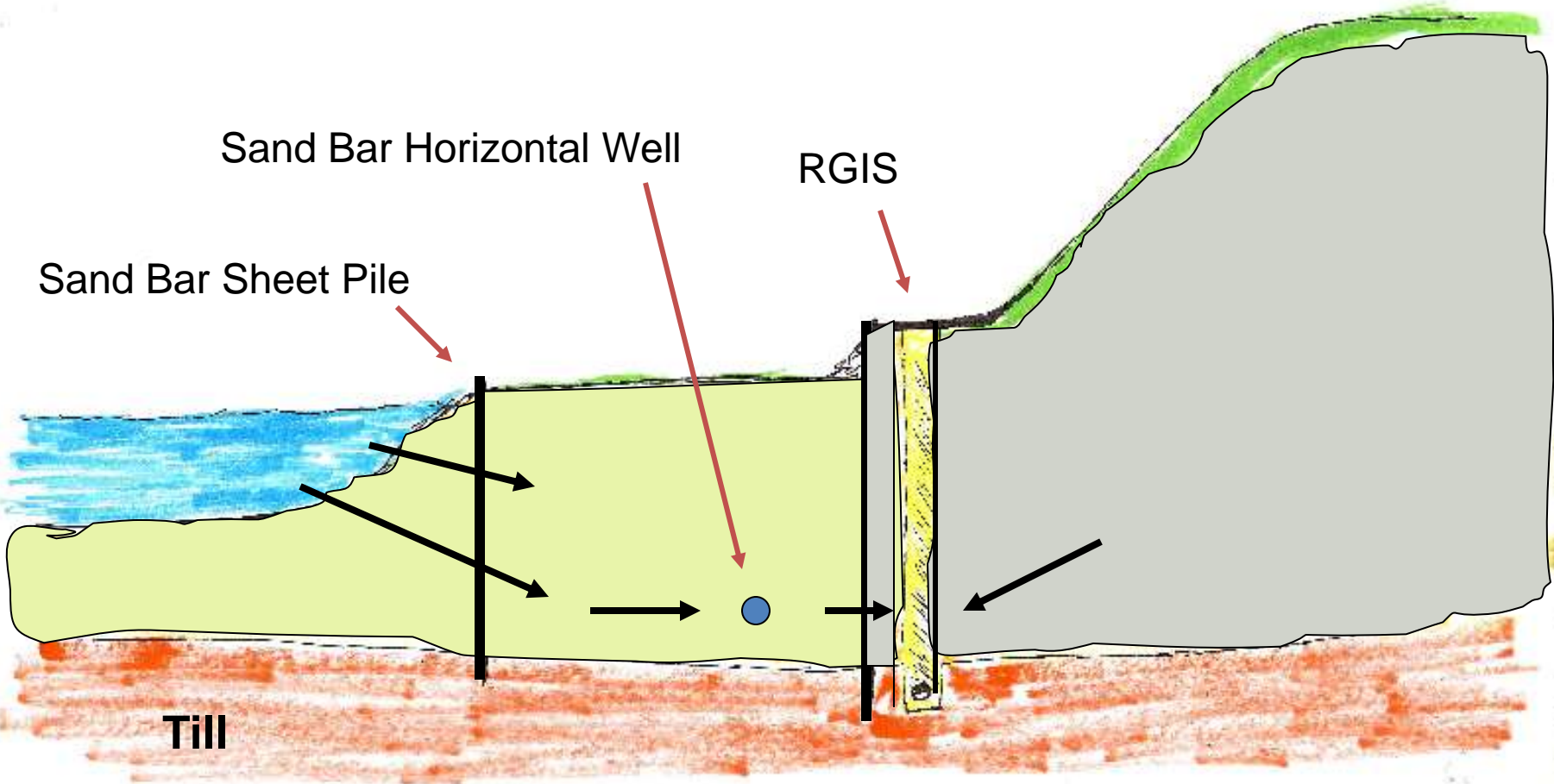
Reach G Sand Bar Source Control

- Dense Non-Aqueous Phase Liquid (DNAPL) discovered adjacent to a historic outfall on the inside of sand bar – 1997
- Lateral hydraulic barrier/containment (sheet piling) was installed in 1998
- Single horizontal well for hydraulic control installed ~12 feet below ground surface within the sand bar

Sand Bar Area



Reach G Sand Bar Area



Summary of Segment 1 Conditions

Investigation Activities

Extensive investigations since 2006:

- Sediment sampling and analysis
- Sediment stability evaluations
- Biological evaluations
- DNAPL/product investigation

Summary of Segment 1 Conditions

Preliminary Findings

- Six chemicals/chemical groups identified as key drivers for Segment 1
 - Chlorobenzenes
 - Chlorophenols
 - Polynuclear Aromatic Hydrocarbons (PAHs)
 - Arsenic
 - Ethyl parathion
 - Ortho-phenylphenol
- These chemicals are not found everywhere and are not always found together

Summary of Segment 1 Conditions

Preliminary Findings (cont.)

- DNAPL/recoverable product found in some locations
- Dioxin and furans in Segment 1 were largely addressed by the actions in Reaches B and D
- Specific areas have been identified that will need cleanup options
 - Called “Sediment Management Areas” or “SMAs”
 - Evaluations are ongoing

Summary of Segment 1 Conditions

Preliminary Findings (cont.)

- Surface sediment concerns
 - Harm to small invertebrates (“benthos”) that live on the river bottom
 - Potential bioaccumulation
- Underlying sediment concerns
 - Potential erosion of cleaner surface that exposes buried contamination
 - Potential contaminant source

Segment 1 Sediment Management Areas



SMA CLEANUP OPTIONS

Segment 1 Potential Options

- Cleanup options will be developed for each Sediment Management Area in Segment 1
- Cleanup options being developed include:
 - Monitored Natural Recovery (MNR)
 - Removal
 - In-place isolation/containment (e.g., capping)
 - Treatment (see next slide)
 - A combination of these

Specialized Options for Segment 1

- Hydraulic containment – isolate area and remove and treat contaminated water through RGIS
- Product recovery – DNAPL would be removed and treated
- Specialty caps
 - Low permeability
 - Reactive caps that provide some treatment (e.g., organoclay, activated granular carbon)

SMA Groupings for Response Options

- The SMAs have been grouped for response option development because of similarities in conditions and appropriate response options
- Groupings:
 - SMA 1
 - SMAs 2 and 3
 - SMAs 4 and 5
 - SMA 6

SMA 1 Characteristics

- Concentrations greater than levels potentially toxic to benthos at 0 – 2 ft
 - Arsenic
 - PAHs
- Underlying sediment
 - Sediment thickness to till ~ 6 to 9 ft

SMA 1 Alternatives

- Alt 1: Monitored natural recovery
- Alt 2: In situ containment
 - Sand/gravel cap
- Alt 3: Removal of sediment
 - Sediment removal
 - Dewatering and landfill disposal
 - Sand cover/backfill for residuals management, if needed

SMA 2 and 3 Characteristics

- Concentrations greater than levels potentially toxic to benthos at 0 – 2 ft
 - SMA 2: chlorobenzenes , chlorophenols
 - SMA 3: chlorobenzenes, chlorophenols, PAHs, ortho-phenylphenol
- Sediments containing potentially recoverable product overlie till
 - Sediment thickness to till: up to 3.5 ft in SMA 2 and 6.2 ft in SMA 3
 - Site characterization and product recovery pilot testing suggests that there is the potential for recoverable product

SMAAs 2 and 3 Response Alternatives

- Alt 1: In situ containment with hydraulic control
 - Lateral containment barrier (sheet piling)
 - Low permeability cap
 - Passive hydraulic control through RGIS
- Alt 2: Product removal/treatment and in situ containment with hydraulic control
 - Same as Alt 1 for containment
 - Removal and treatment of recoverable product
 - Active hydraulic control and treatment through RGIS
- Alt 3: Removal of sediment and post-removal residuals management
 - Sediment removal
 - Dewatering and landfill disposal
 - Reactive (e.g., organoclay) cap for residual management

SMA 4 and 5 Characteristics

- Concentrations at 0 – 2 ft are not expected to be toxic to benthos
- Subsurface contaminants/sheen identified above till (mostly chlorobenzenes)
 - Sediment thickness to till: up to 6.5 ft in SMA 4 and 3.1 ft in SMA 5
 - Site characterization and product recovery pilot testing suggests that recoverable product is not present

SMAAs 4 and 5 Response Alternatives

- Alt 1: Monitored natural recovery
- Alt 2: In situ containment
 - Erosion protection layer to ensure long-term isolation
- Alt 3: Removal of sediment
 - Sediment removal
 - Dewatering and landfill disposal
 - Sand cover/backfill for residuals management

SMA 6 Characteristics

- Only one nearshore sample greater than levels potentially toxic to benthos at 0 – 2 ft : Ethyl parathion (EP)
- Cleaner sediments overlie deeply buried chlorobenzene deposits
- Subsurface contaminants and product identified above till at ~9 ft (mostly chlorobenzenes)
- Site characterization and product recovery pilot testing suggests that recoverable product is present

SMA 6 Response Alternatives

All – Removal of nearshore surface sediments for EP

- Alt 1: Product removal/treatment and MNR of remainder of SMA
 - Removal and treatment of recoverable product
- Alt 2: Product removal/treatment and in situ containment with hydraulic control of remainder of SMA
 - Removal and treatment of recoverable product
 - Lateral containment barrier
 - Low permeability cap
 - Active hydraulic control and treatment through RGIS
- Alt 3: Removal of sediment
 - Sediment removal
 - Dewatering and landfill disposal
 - Backfill or cap (potentially reactive cap) for residual management

Common Elements of all SMAs

- Continued assurance of source control
- Dewatering and water/product treatment performed as practicable at the Dow facility
- Disposal of materials at approved site(s)
- Construction and post-construction monitoring
- Operation & Maintenance, including O&M of Reach B and D caps
- Remedial Design evaluations, including delineation of footprint and additional product recovery investigation

EPA Policy Statements on Remedy Selection... (2005 Guidance)

- There is **no presumptive remedy** for any contaminated sediment site, regardless of the contaminant or level of risk
- Generally, dredging, capping and monitored natural recovery (MNR) or a combination of approaches should be evaluated at every site
 - These are all being evaluated for Segment 1

EPA Policy Statements on Remedy Selection... (cont.)

- Both in-place and removal approaches may reach acceptable levels of effectiveness and permanence, depending on site conditions
- Must consider **risk reduction**:
 - Associated with reduced exposure to contaminants
 - Must consider risks introduced by implementing alternatives
 - Mass removal does not necessarily equate to risk reduction

Upcoming CAG Topics – Segment 1

Over the next few months, we would like to discuss:

- Advantages and limitations of cleanup options that best fit the environmental conditions in Segment 1
- EPA's preferred options
 - Effectiveness
 - Implementability
 - Cost

QUESTIONS?