Overview

- Site Background and Regulatory Issues
- Development of Sediment Remedial Strategy
- Components of Strategy
- Expected Outcomes and Next Steps
A Sediment Challenge

1. The “default” approach often dredging – high disturbance and $$$$
2. Remedy constraints from regulatory requirements
3. Consideration of alternative approach:
   - Contaminant migration potential
   - Human and ecological exposures (“risk”)
   - Regulatory drivers

This case study: this approach achieves a cost-effective solution that is protective of the environment
Site and Regulatory Context

- Former petroleum facility - multiple operators over time
- Previous investigations and remediation – mostly upland areas
- River-side ‘lagoons’ - formerly received wastewater– limited investigation

Site

- We developed strategic plan to address environmental concerns – including sediment
- Strategic plan breaks logjam – now with approved path forward from Agency
- This presentation: focus on the strategic aspect

Regulatory
Scope of Sediment Issue

- Sediment remedial action is needed
- Dredging not a reasonable option
- Need protective yet reasonable solution
- Acceptable to State

Achieving forward movement where:
- Impacted sediment will be addressed
- Agency is on board
- Costs and scope are reasonable
Discharge occurred during 50’s, 60’s and 70’s

Lagoons’ – originally borrow pits from levee construction

More recently NPDES permitted outfall bypasses lagoons

No hydrologic connectivity to river (except during flooding)

Lagoons now have a sediment ‘cap’ deposited by river flooding and deposition
Current conditions

A functioning ecosystem
No current sheening or releases to surface
No hydrologic connectivity
No public access – but not inaccessible

Visually

Prior sediment investigation

LNAPL present in ‘lagoon’ sediment - ‘free product’* and sheens
Impacted sediment overlain by natural ‘cap’ of river sediment deposits
Elevated PAHs, BTEX, other SVOC, metals present in lagoon location

* ‘Free product’ - the term in State regulations for visible NAPL
LNAPL (sheens and/or free product) – in discontinuous lenses in deeper sediment

Elevated PAHs, BTEX and/or lead – mostly in deeper sediment

Former discharge point
LNAPL occurs as discontinuous lenses of free product or sheening

Other contaminants (PAHs and BTEX but also some metals and other SVOCs) present in deeper sediment
"Bathtub" Conceptual Site Model

- Recharge from flood events and precipitation
- No surface discharge channel to river
- Intermittent flooding deposits river sediment above impacted material
- Limited or no lateral or vertical hydraulic connectivity in the native clay
Basics of Approach

State Guidance…

- Has relatively **little to say** about sediments in regulations
- Does have a **risk-based approach** to sediments affected by hydrocarbons
Risk based closure

- When sediment toxicity and/or benthic community integrity risk acceptable
- When engineering and institutional can control human access

→ Conditions for risk based closure likely present in most but not all the system

Regulations constrain risk based approach

- ‘Free product’ precludes risk-based approach
- Material exceeding TCLP criteria precludes risk-based approach

But...
Initial Positions

• Agency initially favored removal remedy
• Cost for dredging - prohibitive
• Sampling costs to delineate discontinuously distributed impacts - very high

Remedial Strategy

• To define remedy without extensive additional sampling
• To define remedy protective under current and future conditions
• To meet regulatory requirements
Discussions held with State on preliminary data evaluation and path forward strategy.

Path Forward: Presumptive Remedy

→ Presumptively suitable to subaqueous capping (amended and/or simple)
→ Cap throughout with GAC amended materials to address uncertainty about nature and extent
→ Consider additional remedy (including spot removal) for areas with “migrating” LNAPL and material exceeding TCLP limits

REMEDIATION STRATEGY APPROACH

Has been accepted

Next steps – implement Work Plan to evaluate remedy feasibility
Implementing the Strategy: Components

- Is migrating LNAPL (or material > TCLP) present?
- Lagoons isolated from river and aquifer?
- Sediment stable under reasonably foreseeable conditions?
- Shorelines and sediment can support capping?
- Remaining areas meet risk-based closure criteria?

- TCLP and LNAPL mobility evaluation (later in this session)
- Shoreline lithology and COPCs (soil borings and sampling; hydraulic conductivity)
- Vertical and horizontal flux (vibrating wire piezometers)
- Sediment stability and cap support (sediment shear stress, geotechnical parameters, flood scour potential)
- Sediment toxicity testing and benthic community evaluation
• Details for migrating LNAPL evaluation to be presented in next session
• TCLP – elevated lead and benzene co-located with LNAPL – evaluate if exceeding TCLP limits

Flex wall permeameter
Shoreline stability and lithology

- Soil lithology around perimeter of lagoons
- Hydraulic conductivity testing
- Geotechnical parameters
Vertical and horizontal flux

- Vibrating wire piezometers – shoreline and in lagoons
- Monitoring program encompassing seasonal variability
Sediment Stability and Cap Support

- In-situ and lab vane shear testing
- USGS and Corps of Engineers flooding data review
- Sediment consolidation testing – field and lab under simulated cap load
- Porewater extrusion and analysis – top 3 feet
Risk based closure

- Sediment toxicity testing
- Sediment community integrity

... compared to reference sediment
Expected Outcomes and Next Steps

- Lagoon sediment is stable and suitable for capping
- GAC amended cap will address most impacts
- Area of migrating NAPL and/or exceeding TCLP small or absent – and can be addressed via additional amendment or spot removal

Next steps – fine tune and implement Work Plan to confirm feasibility
Questions?

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