Foregoing Traditional Prescriptive Design Through an Implementation Plan

Non-Time Critical Removal Action at the Furnace Creek Area, Black Butte Mine Superfund Site, Cottage Grove, Oregon

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Introduction

• Background and Site Overview
• Problem Statement
• Challenges with the Removal Action
• The Approach
• Implementation Plan Features
• Construction Activities
• Benefits and Lessons Learned
Background

• Black Butte Mine
  • Located near Cottage Grove, Oregon
• Mercury mining from 1880s to 1960s
  • Consisted of ore extracting and volatizing Mercury in kilns
• Mining operations and tailings piles resulted in Mercury contamination to the soil, surface water, and groundwater
• Establishment of the Black Butte Superfund Site in 2010
Cottage Grove Reservoir
Low energy water results in deposition of tailings. Low oxygen conditions result in formation of methyl mercury.

CFW River and Garoutte Creek
Relatively high energy surface water keeps mercury-bearing particles suspended. There is also dissolved mercury.

Black Butte Mine Site
Erosion of soil and tailings by storm flow transports mercury from the Furnace Creek Tailings Area.

Modified from Optimization Review Report, EPA; July 2012
Site Overview

• Furnace Creek Removal Area
  • Disposal site for waste material and tailings during mining operations
  • 1998 high flow event and debris flow
    • Resulted in a deeply entrenched channel with several head cuts
  • Tailings and co-mingled sediment from Furnace Creek are dominant sources of Mercury downstream

• Existing Repository
  • Initial construction was performed during a previous removal action in 2007 for Dennis Creek
  • Later observations indicated that the Repository was constructed in a drainage – “Adit Creek”
Problem Statement

• Traditionally removal actions are completed on an expedited schedule with limited planning, design, and documentation than comparable remedial actions
  • Increased risk for rework
  • Possible conflicts with final remedy
  • Limited documentation of the work (e.g., surveying)

• Detailed designs may not be practicable due to incomplete information and expedited schedules

• Adaptive Management strategies can be used to overcome these challenges
Challenges with the Furnace Creek Removal Action

- Unknown conditions
  - Depth and extent of tailings and contaminated materials
  - Borrow material needs and sourcing
- Physical constraints of the Furnace Creek catchment area
  - Heavily vegetated
  - Narrow, deeply entrenched channel
  - Small removal action boundary (2-3 acres)
  - Difficult access
- Construction schedule
- Existing Repository conditions
The Approach – “The Implementation Plan”

• Challenges with the removal action limited the effectiveness of a traditional design approach
  • Limited available field data, unknown conditions, expedited schedule

• Creation of an “Implementation Plan”
  • Field guidance document for the Contractor and EPA OSC
  • Achieve identified Preliminary Removal Action Objectives and desired Performance Metrics

Preliminary Removal Action Objectives
• Removal of contaminated sediment and tailings in Furnace Creek catchment and consolidate in an on-site Repository
• Mitigate releases of high concentrations of particulate Mercury

Desired Performance Metrics
• Visual confirmation
• Analytical confirmation
• Comparison of annual Mercury loading in surface water pre- and post-removal
Implementation Plan Details and Features

- Implementation Plan was developed to accommodate known challenges – “Toolbox” Approach
  - Several typical sections for different restoration needs
  - Grade control structures
  - Borrow material guidelines
  - Repository expansion and improvement
2019 Design and Construction Issues at Hazardous Waste Sites

Full Excavation and Removal of Tailings

Partial Removal and Tailings Covered in Place
Rock Cross Vane as Grade Control Structure for Head Cuts and Grade Breaks
Proposed Excavation and Restoration Plan Sheet Provided to Contractor
Repository Expansion and Improvement

• Implementation Plan Repository Guidance
  • Redirect incoming “Adit Creek” drainage – an identified site challenge
• Expand Repository
  • Physical constraints
    • Unknown amount of tailings / contaminated material to be consolidated
  • 20-foot maximum height
• Install clean cover system
Benefits of the Implementation Plan

- Reduction in initial data needs to support a detailed design
- Reduction in initial design costs
- Improved quality of construction with documentation
- Minimized rework during remedial construction
- Expedited construction schedule
  - No delays associated with design changes
- Cost savings allowed for field engineering support
  - Team readily available for questions
Construction Activities and Field Engineering Support

• A mid-construction site visit by the engineering team led to the issuance of several addendums
  • Accommodated changes occurred during construction
    • Locations of grade control structures
    • New typical section development
    • Revised seed mix
• Most of these “changes” were identified as known challenges in the preliminary stages of design
Creation of a New Typical Section to Accommodate Over-Excavation of Contaminated Material
Revised Restoration Sheets Following Excavation and Removal of Contaminated Material, as Exact Locations for Grade Control Structures Were Now Known
Construction Activities - By the Numbers

• Stream restoration after excavation included:
  • Backfilling with clean borrow soil
  • Grading to stable slopes
  • Installation of grade control structures (i.e., rock cross vanes)
  • Stabilization of slopes with native seed mix

• Borrow material needs:
  • Approximately 11,800 CY of clean fill
  • Approximately 2,500 CY of rock

• Repository expansion:
  • Approximately 13,100 CY of contaminated material
Post Construction Activities

• Ongoing monitoring of Furnace Creek
  • Analyzing vegetation establishment
  • Checking slopes for erosion

• Performance monitoring sampling event in February 2019 showed a significant reduction (~97%) in Mercury loading within and downstream
  • Achieved the Removal Action Objective!
Lessons Learned with the Implementation Plan Approach

• Flexibility in “design” allowed for the Contractor to be adaptable with changing field conditions and waste thickness

• Communication between all parties
  • Allowed for changes and questions to be resolved quickly

• Documenting the design and construction changes
Questions?

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