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NARPM Presents...Practical Applications and Methods of Optimization across the Superfund Pipeline (Part 2)

Sponsored by: EPA Office of Superfund Remediation and Technology Innovation

Delivered: May 8, 2013, 1:00 PM - 3:00 PM, EDT (17:00-19:00 GMT)

Instructors:

- *Kirby Biggs, Office of Superfund Remediation and Technology Innovation (biggs.kirby@epa.gov or 703-823-3081)*
- *Steve Dyment, Office of Superfund Remediation and Technology Innovation (dyment.stephen@epa.gov or 703-603-9903)*
- *Sairam Appaji, EPA Region 6 (Appaji.sairam@Epa.gov or 214-665-3126)*
- *Joy Jenkins, EPA Region 8 (Jenkins.joy@Epa.gov or 303-312-6873)*
- *Rich Muzza, EPA Region 10 (muza.richard@epa.gov or 503-326-6554)*

Moderator:

- *Jean Balent, U.S. EPA, Technology Innovation and Field Services Division (balent.jean@epa.gov or 703-603-9924)*

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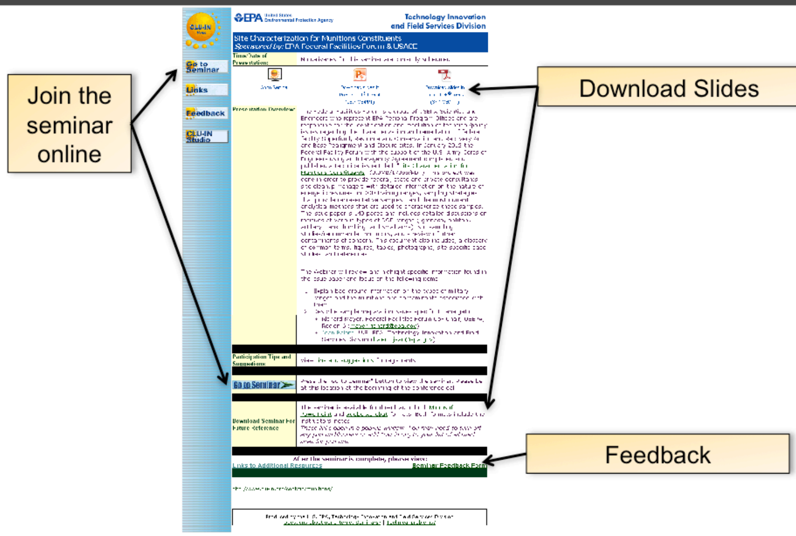
Seminar Homepage



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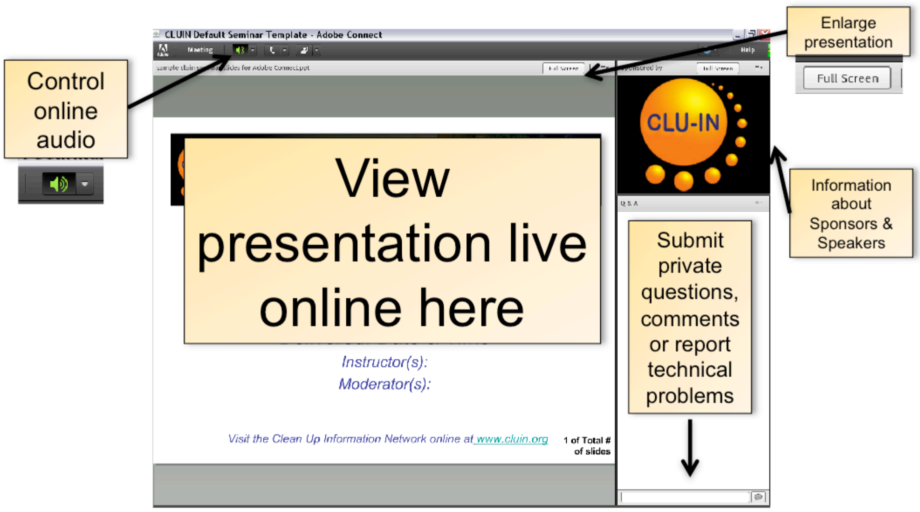
New online broadcast screenshot



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Practical Applications and Methods of Optimization Across the Superfund Pipeline – Part 2

EPA United States Environmental Protection Agency

NARPM Presents... May 8, 2013

Session Agenda

- Part 1 of 2 – Optimization Overview (4/30/13)
  - National Optimization Strategy
  - Optimization Evaluation Process
  - Optimization in Superfund Pipeline Stages
- Part 2 of 2 - Optimization Case Studies (5/8/13)
  - Black Butte Mine, CA
  - Grants Solvents, NM
  - Gilt Edge Mine, SD

Instructors

- Kirby Biggs, EPA TIFSD
- Joy Jenkins, EPA Region 8
- Sai Appaji, EPA Region 6
- Rich Muza, EPA Region 10

National Optimization Strategy and Optimization Evaluation Process

Kirby Biggs
EPA Technology Innovation and Field Services Division

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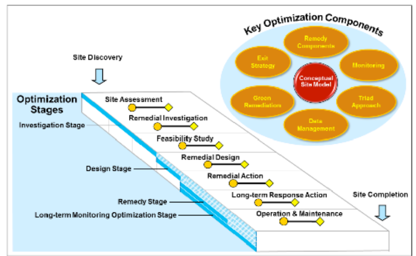
Recap

- In Part 1, we reviewed the National Optimization Strategy and what constitutes optimization in each pipeline stage.
- These case studies incorporate many of the findings and recommendations from previous optimization studies in each pipeline stage.
- Each optimization deliverable addresses key issues to the remediation of the site within a common template.

Optimization Introduction

- Optimization not new; active effort 13+ years with over 140 reviews conducted
- *National Strategy to Expand Superfund Optimization Practices from Site Assessment to Site Completion*
  - Finalized September 2012
  - Currently being implemented
  - Expands optimization throughout Superfund pipeline
  - Integrates optimization principles and practices into program operations
  - Increased optimizations (20 to 30 sites per year)
  - Training program, expanded web presence, standard procedures, ongoing technical support



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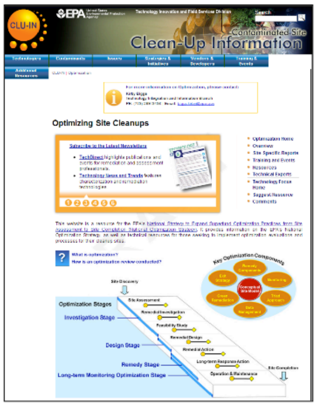
Optimization Key Components

- Protectiveness
- Cost-effectiveness
- Technical improvement
- Exit Strategy
- Environmental footprint reduction

Optimization Review Report

- Report Sections (to be used as appropriate)
  - Executive Summary
  - Introduction
  - Site Background
  - Description of Planned or Existing Remedies
  - Conceptual Site Model
  - Findings
  - Recommendations
- Tracking Recommendations
- Mining Site Optimization Initiative

EPA Optimization Websites



www.cluin.org/optimization

www.epa.gov/superfund/cleanup/postconstruction/optimize.htm

United States Environmental Protection Agency

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Q&A

United States Environmental Protection Agency

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Black Butte Mine Remedial Investigation Optimization

Rich Muza
Region 10
NARPM Presents Webinar Series
May 8, 2013

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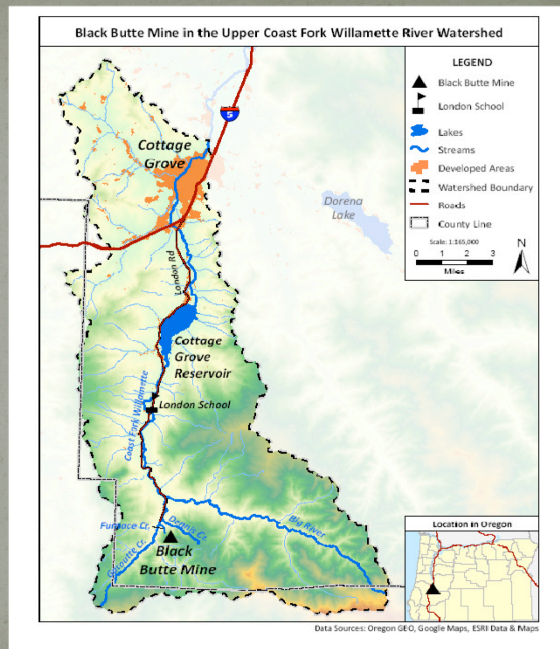
Roadmap

- Site Background
- Optimization Review Process
- Optimization Review Conclusions
- Region 10 Path Forward
- Key Findings to Date
- Lessons Learned

USGS Sampling near Black Butte Mine

Site Map


Black Butte Mine in the Upper Coast Fork Willamette River Watershed
LEGEND
Black Butte Mine
London School
Lakes
Streams
Developed Areas
Watershed Boundary
Roads
County Line
Scale: 1:165,000
0 1 2 3
Miles
N
5
Cottage Grove
Dorena Lake
London Rd
Cottage Grove Reservoir
London School
Coast Fork Willamette
Furnace Cr.
Dennis Cr.
Big River
Garoutte Cr.
Black Butte Mine
Location in Oregon
Data Sources: Oregon GEO, Google Maps, ESRI Data & Maps

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Site Background

- Former mercury mine that operated off and on from late 1890s to late 1960s
- Past research and investigations performed in area by State, various universities, and USGS
- Mercury contamination of sediments in local drainages and Cottage Grove Lake is primary risk to humans and wildlife
- EPA removal action in 2007 consolidated some tailings away from Dennis Creek area
- ODEQ investigation showed continuing Hg inputs to surface water draining the former minesite
- Added to NPL in 2010

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Mine Site Features

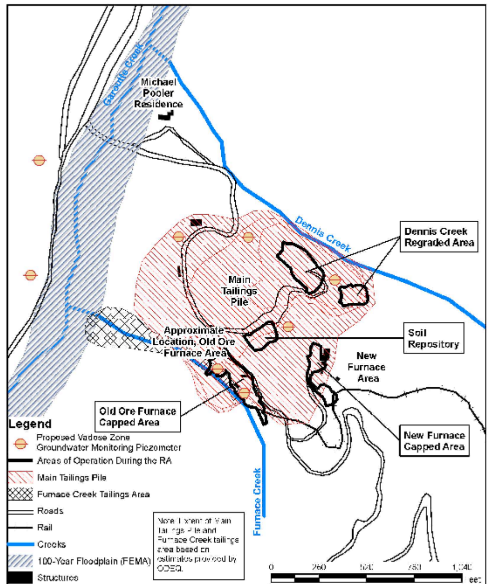

FIGURE 2: BLACK BUTTE MINE SITE AREA

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Optimization Review Process

- Review of existing site documents and data (OCT 2011 – FEB 2012)
- Site visit and meetings (JAN 2012)
- Team input into action items (JAN 2012 – FEB 2012)
- Development of draft CSM and data evaluation logic for RI sampling program (JAN 2012 – FEB 2012)
- Team input into CSM and data evaluation logic (FEB 2012)
- Development of draft report (MAR 2012)
- Team input on draft and draft final reports (MAR 2012 – MAY 2012)
- Final Optimization Review Report (July 2012)

Site Visit: January 10, 2012
Entrance to Minesite

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Site Visit: January 10, 2012
EPA Tailings Repository

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Site Visit: January 10, 2012
New Furnace Building

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Site Visit: January 10, 2012
Mine Adit on Black Butte

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Site Visit: January 10, 2012
Looking up Furnace Creek

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Site Visit: January 10, 2012
Furnace Creek Tailings

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Site Visit: January 10, 2012
Old Mine Equipment

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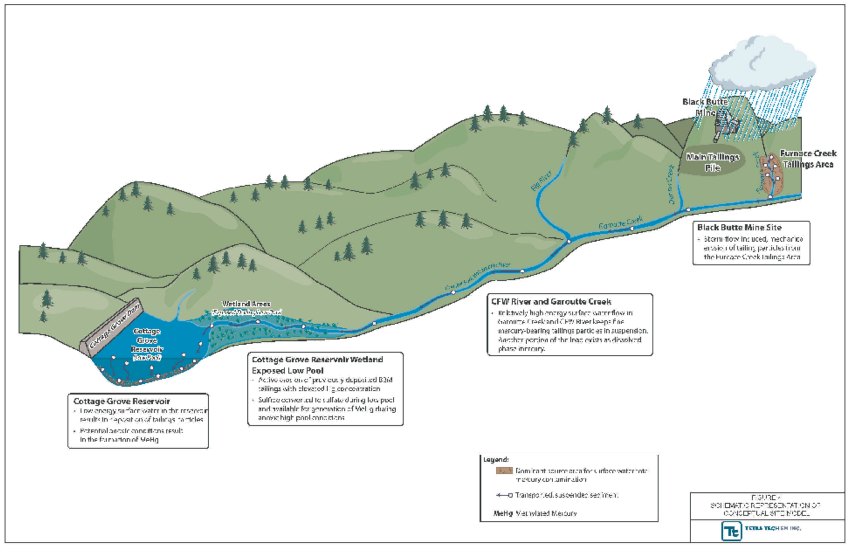
Optimization Review Conclusions



Optimization Review Conclusions

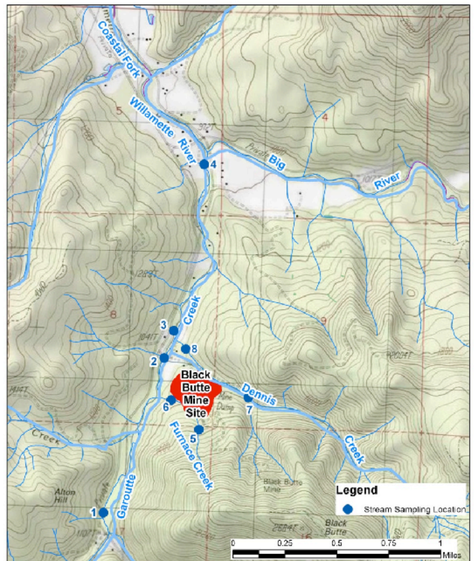


FIGURE 5: SURFACE WATER SAMPLING LOCATIONS AT BLACK BUTTE MINE SITE

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Optimization Review Conclusions

Surface water samples will be collected for one year from Garoutte Creek, Furnace Creek, and Dennis Creek at a total of eight locations. Sampling will occur seasonally at high and low flow conditions for a total of 64 samples (eight at each location for the year). Analyses will include HgT, HgD, MeHg (total), MeHg (dissolved), HgR (total), HgR (dissolved), TAL metals (total), TSS, and common ions. This combination of analytes will allow the estimation of the amount of mercury in dissolved and suspended phases and will provide insight on the speciation of the suspended phase. Stream discharge will also be measured at each sampling station during each sampling event. Furnace Creek and Dennis Creek discharge will be measured by installing a weir structure and monitoring the water level using a transducer. Garoutte Creek discharge will be measured by direct gauging or estimated using available gauging data. Sediment samples will be collected at each station during each surface water sampling event and evaluated using separate logic.

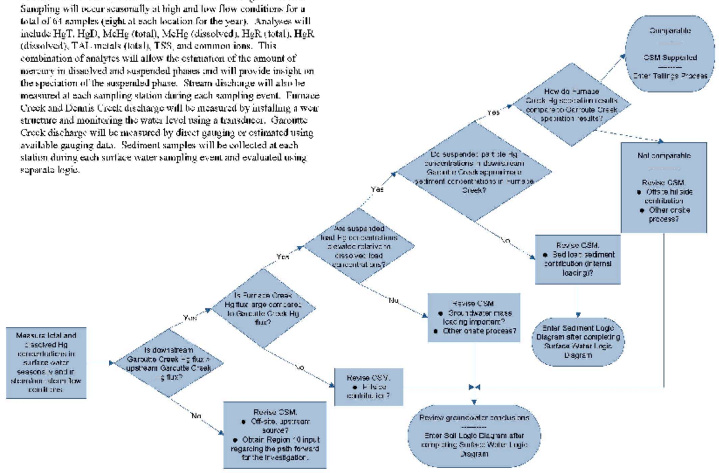

Figure 6. Data Evaluation Logic for Black Butte Mine Surface Water Sampling Task

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Region 10 Path Forward

- Divide Site into Three OUs
  - OU1 – Former mine site and drainages above Coast Fork Willamette River
  - OU2 – Coast Fork Willamette River above Lake
  - OU3 – Cottage Grove Lake and beyond (?)
- Meetings/Calls with CDM Smith
  - Optimization Team initial CSM
  - Optimization Team recommendations
  - Resource issues/limitations and in-house work
  - Modifying plans to meet numerous limitations
- Demonstration of Methods Analysis

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Region 10 Path Forward

- Phase I Field Work Limited to OU1
  - Focused stormwater sampling event(s)
  - Limited sediment sampling
  - Initiate vadose zone and groundwater studies
- Coordination with USGS Cottage Grove Lake Study initially sponsored by USACE, now funded by EPA
- Begin Scoping RI Field Tasks for OU1
  - Optimization recommendations and logic
  - Minimalist approaches to meet RI goals
  - Dependant on FY13 Pipeline funding

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Region 10 Path Forward

- Engineering Technical Support Project
  - "Identification of the Variables Controlling Methylmercury Production in the Sediments of a Reservoir Directly Downstream of a Historic Mercury Mine Superfund Site"
  - ORD-funded work that began in FEB 2013
- RARE Project Proposal
  - "Field Investigation and Modeling of Watershed Mercury Transport from a High-Profile Superfund Site to Elucidate Downstream Fluxes and Exposure"
  - Grant application not funded but we'll keep trying
- Western North America Hg Synthesis
  - Dr Chris Eckley of Region 10 is an EPA rep to this coordination effort

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Region 10 Path Forward

- Working with the Community – Potential Partners in Technical Assistance Project (PTAP) Pilot
  - Much interest from local students to get involved in RI work received at community involvement kickoff meetings in JULY 2012
  - Interest from Lane Community College and London School to use site as educational tool
  - Completed technical assistance needs assessment (TANA) in APR 2013
  - Potential pilot project with Superfund Research Program grantees

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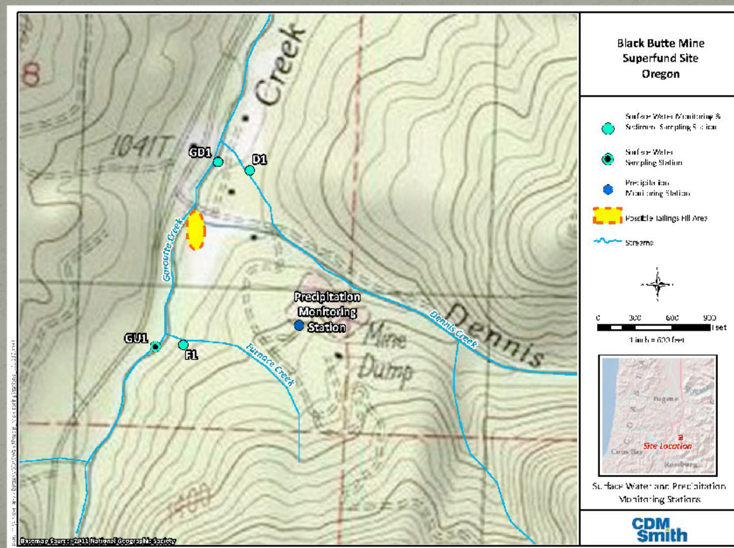
Key Findings to Date



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Key Findings to Date

- Furnace Creek is an intermittent stream with no to minimal flow for portions of the year
- First storm event sampling showed minimal rise in Furnace Creek stage and much of the streamflow appeared to be ground water influx
- There is a marshy area on the Garoutte Creek floodplain below the Furnace Creek tailings
- Ground water may play a greater role in Hg transport than initial CSM considered
- "Pre-preliminary" results show Hg transport during storm event sampling in MAR 2013
- Difficult, remote area to perform field work

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Lessons Learned

- Optimization can be very beneficial
- Value the Optimization Team's input
- Don't hinder the Optimization Team's efforts
- Search for all resources and others interested
  - ORD Superfund Technical Liaison
- "Thinking Outside the Box?"
  - Good for some, not so good for others
  - Ultimate goal is to extend limited resources
- Adapt CSM and recommendations to actual field investigation findings and modify optimization recommendations as appropriate

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Any Questions?

Cottage Grove Lake - Full

Cottage Grove Lake - Low-Pool

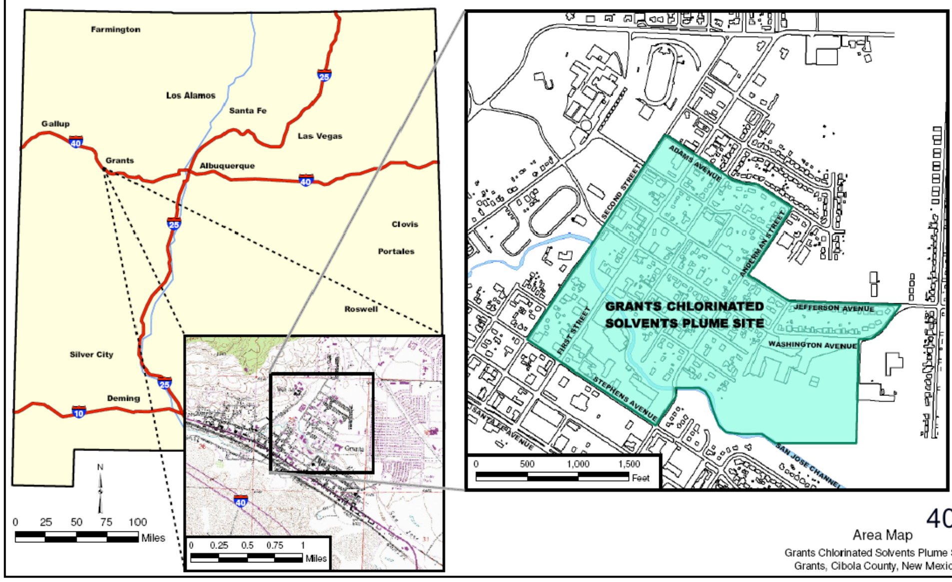
Independent Design Review

Grants Chlorinated Solvents Plume Site (GCSP), Grants, NM

Sairam Appaji

April 19, 2013

Site Location and Map



Area Map
Grants Chlorinated Solvents Plume Site
Grants, Cibola County, New Mexico

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Site Background

- The superfund site is located in Grants, New Mexico in a mixed commercial and residential area
- Population of Grants is approximately 15,000
- Source of drinking water is ground water from two City of Grants production wells upgradient of site
- Initial discovery of contamination by New Mexico Environment Department (NMED) in 1993 during near by UST removal

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Site Background

- Chlorinated solvents (PCE, TCE and DCE) detected in shallow ground water
- Source area near operating dry cleaner
- EPA begins remedial investigation / feasibility (RI/FS) study in October 2003
- The site is proposed to NPL in March 2004 and the ROD signed in June 2006
- IDR completed in 2008-2009
- RD completed in 2009
- Construction Complete in September 2012

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ROD Selected Remedy

- Indoor Air – Vapor Mitigation System
- Source Areas – Thermal Remediation
- Shallow Plume Core – In-situ Chemical Oxidation (ISCO)
- Shallow Plume Periphery – Enhanced Reductive Dechlorination (ERD)
- Deeper Ground Water Plume – ERD

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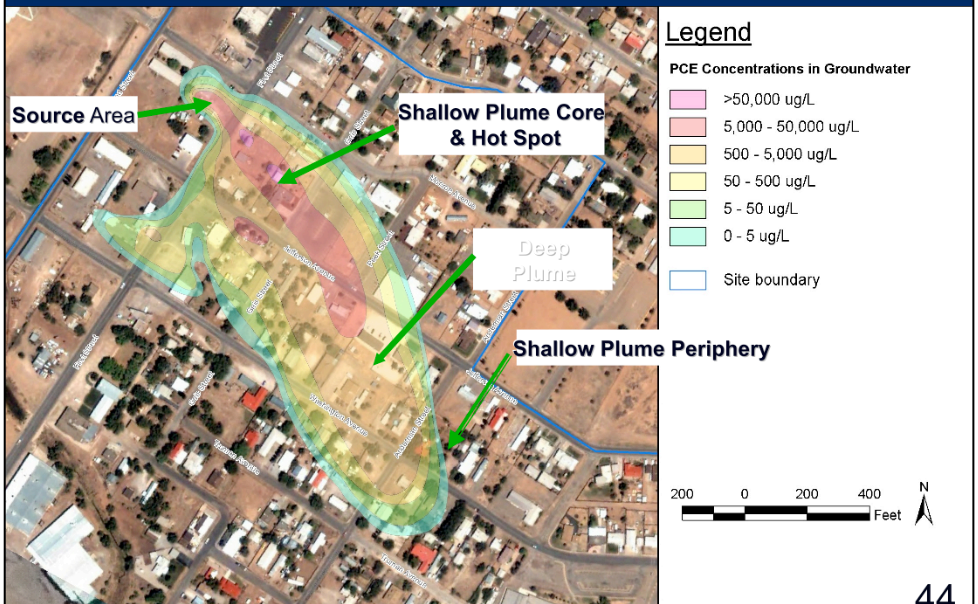
Plume Delineation



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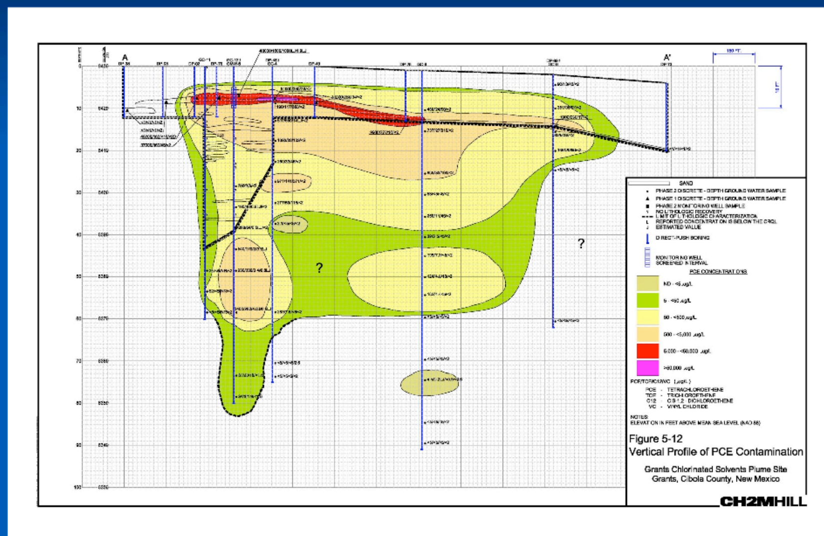
CSM from RI



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Grants Solvents IDR

- ROD Assumptions
  - Substantial contaminant mass remains in source area
  - Source area treatment 150 ft x 100 ft to 80 feet bgs
  - Application volumes, particularly for ISCO and ERD appear to be assumed as relatively uniform over entire volume
  - Keep dry-cleaning business operating
  - Majority of injections made via injection points and relatively small radii of influence

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GCSP IDR

- IDR findings
  - Presence of contamination in thin lenses
  - Potential for substantial mass to have migrated from source area
  - Potentially substantially lower mass in subsurface than likely considered when developing remedy costs
  - Need for additional information to help refine/ confirm site conceptual model
  - High ROD estimated costs for remediation

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GCSP IDR

- IDR Recommendations
  - Refine site conceptual model and, based on pre-design activities
    - Reconsider thermal remediation for source area
    - Reconsider application of remedy to shallow core area
    - Improve ERD application design
    - Reconsider remedial goals for comparing alternatives and determining progress

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GCSP IDR

- Recommendations regarding implementation
  - Use rotosonic drilling (for better cores and geologic interpretation)
  - Use groundwater for ERD applications
  - Additional characterization
    - monitoring wells
    - pumping tests
  - Limited data validation for long-term monitoring

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Post IDR/VE Study Remedy

- Indoor Air – Vapor Mitigation System
- Source Area (extended) – Thermal Remediation up to 40 ft bgs and ERD at depth
- Shallow Plume Core – Enhanced Reductive Dechlorination (ERD)
- Shallow Plume Periphery –(ERD)
- Deeper Ground Water Plume – ERD

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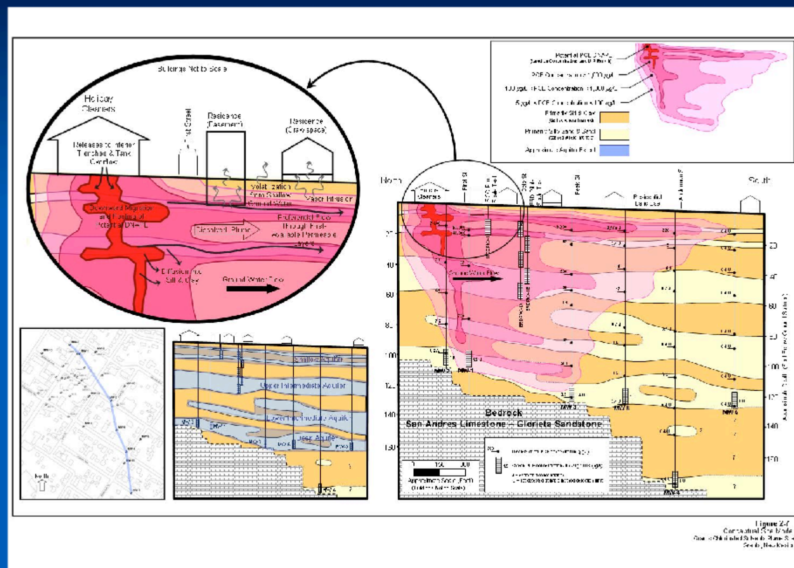
CSM – RD



Holiday Cleaners
North
South
Bedrock
San Andres Limestone – Glorieta Sandstone

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GCSP IDR

- IDR team provided follow-up review and feedback
  - Review of pre-design investigation and treatability studies produced by site contractor after the IDR
    - Confirmation that most mass is shallow
    - Confirmation that most mass has left source area
    - IDR team concern regarding ISCO performance during treatability study
    - IDR suggests benefit from bioaugmentation (injections of specifically cultured microbes) to degrade PCE to ethene
  - Participation as third-party in the site contractor-led VE study
    - Differing points of view regarding ERD effectiveness and cost (IDR team has a more favorable perspective of ERD in source areas)
    - Differing points of view regarding overall remedy time frame and relative effectiveness of thermal

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GCSP IDR

- Comparison of IDR input vs. actual RA implementation at the site
  - Additional monitoring wells installed but not with rotosonic drilling
  - Additional characterization and pumping tests conducted as suggested
  - Thermal remediation retained and implemented with the following changes
    - Not used for second source area
    - Used for shallower depth than described in ROD
    - Extended area to off-site and into First Street
  - ISCO remedy replaced with ERD in plume core
  - Bioaugmentation used with ERD injection
  - Pre-IDR Remedy Cost approximately $ 34 million
  - Post IDR/VE Study Cost $ 20 million

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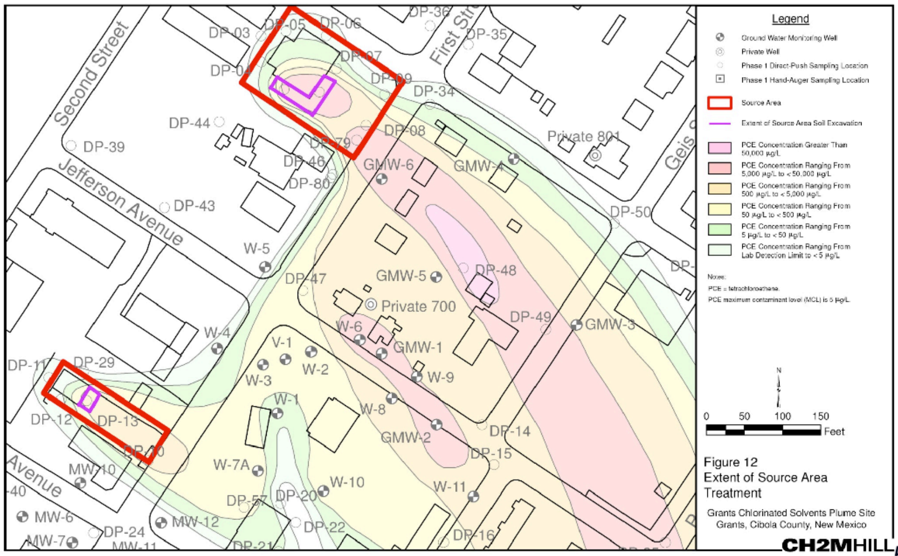
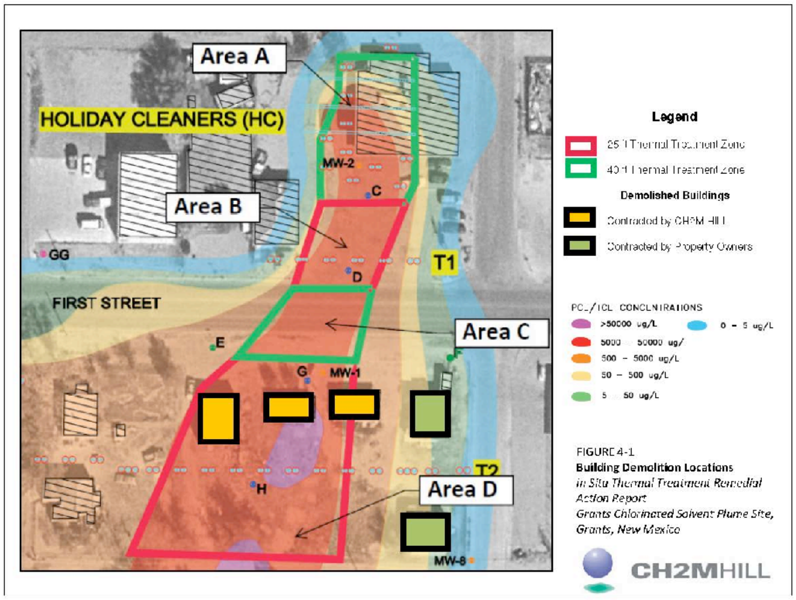
Source Areas Thermal Footprint - ROD





Post IDR/VE Thermal Footprint

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Question and Answer

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Optimization Evaluation

Gilt Edge Mine Superfund Site Water Treatment Plant

Lawrence County, South Dakota
Region 8 EPA

Joy Jenkins

Office of Solid Waste and
Emergency Response
(5203P)

EPA-542-R-13-002
December 2012
www.epa.gov/tio
www.clu-in.org/optimization

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Overview

- Site history & description
- Focus of the optimization study
- Facility description & limitations
- Recommendations & implementation

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Gilt Edge Mine: Site History

- Black Hills of South Dakota
  - Lead and Deadwood
- Former gold and silver mine
- Long history of mining:1876
- Historic mining operations: network of underground tunnels & mine exploration
- Open pit mining: 1986 to 1999
  - Cyanide heap-leach - gold extraction.

Sunday Pit

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Gilt Edge Mine: Superfund

- Mining company became insolvent & stopped operating after mine expansion was denied
- 360 acres of disturbed land
- >150 million gallons of water in 3 pits
- Several AMD seeps
- NaOH based AMD treatment facility

Former process plant & pregnant pond

Gilt Edge Mine: Superfund

- State immediately took over operations of WTP in 1999
- 2000 NPL site
- Spilt into 3 OUs
  - OU1 – Surface mine waste/HLP/open pits
  - OU2 – Site water
  - OU3 – Ruby mine waste dump
- Operable Unit 2 – focus of this study
  - Site water management and treatment
  - Interim ROD 2001- WTP upgrade to HDS plant
  - AMD seep collection & treatment are on-going

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Aerial of Site

Anchor Hill Pit

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Optimization Study Focus

- Water treatment plant operation
- Collection & conveyance systems
- Site operations cost:
  - $2 M to $2.4 M
  - Average annual AMD generation of 97 MG

Clarifier in HDS system

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Conversion to HDS Plant - 2004

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Description

- WTP discharges to Strawberry Creek
- Strawberry Creek runs to Bear Butte Creek
- SD surface water quality standards
  - Strawberry Creek = coldwater marginal fish life propagation
  - Bear Butte Creek = coldwater permanent fish life propagation
- TDS & selenium waiver for interim OU2 ROD
  - Se higher than standards occasionally
  - TDS estimated to be higher than standards commonly

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Facility Description & Limitations

- 24-hour site presence to ensure operation of the collection systems
- 3 main collection & pumping facilities
  - Network of piping and pond system for conveyance
  - Power outage occurs with winter storms
  - Backup generators, but not all auto-start type
  - Limited containment capacity
  - Only 1 pump station with auto controls

Strawberry Pump Station

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Water Management

- Site operators Successful in treating stored pit water over past several years
- 97 MG AMD generated a year on average
  - Design rate = 250 gpm
  - Current treatment rate = 325 gpm
- 12 MG high sulfate water stored in 2 pits
  - Cannot be treated directly by WTP at current treatment rate
    - solidifies multi-media filters with gypsum cake
    - blended with less sulfate water: ok

Dakota Maid Pit

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Summary of Recommendations & Associated Costs

Recommendation	Reason	Change in Cost*
1. Pretreatment for Remaining High-Sulfate ARD	Effectiveness	Not Quantified
2. Upgrade Hoodoo Gulch Collection Facility Prior To Remainder of OU1 Remedy	Effectiveness	$200,000
3. Eliminate Overnight Staffing, Cut Labor Force, and Operate in Batch Mode (includes reduced vehicle leases)	Cost Reduction	($750,000)/year **
4. Reduce Sampling Frequency	Cost Reduction	(40,000)/year
5. Do Not Add/Rebuild/Replace/Relocate WTP and Regularly Evaluate Collection System Pumping Requirements	Cost Reduction	Not Quantified
6. Minor WTP Changes	Technical Improvement	$35,000

*Due to the nature and timing of this review (focus on the WTP and collection facilities with the separate OU1 implementation pending), cost impacts were generally not quantified.

** Prior to OU1 implementation, additional savings likely after OU1 related flow reduction.

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Recommendations to Improve Effectiveness

- 1. Pre-treat remaining high-sulfate AMD
  - Need to remove Pit water for OU1 RA construction
    - Pits will be filled in & covered
    - Previous recommendations for a larger clarifier on WTP
  - Short term – pre-treat in pit with lime addition for gypsum precipitation in pit then treat clarified water in WTP
  - Long term – treat with ion exchange to effectively meet future standards
- Implementation – Conversations got us thinking…..
  - After study, realized there are some OU1 RA issues with generating more sludge in the pits
  - Tested slowing down WTP to 100 gpm - got gypsum to precipitate in clarifier rather than filters
    - Precipitate is removable from clarifier
    - Will continue this after spring melt
  - Will consider long term recommendation after OU1 RA

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Recommendations to Improve Effectiveness

- 2. Upgrade hoodoo gulch collection facility
  - Most vulnerable to power outage
    - Very small containment
    - Generator is not auto start
    - No in place back up pump
    - Difficult access road; snow clearing
- Short term –
  - Implemented
    - Larger tank for extra storage capacity
    - Auto Start on generator – in progress
  - Considering –
    - High level alarms
    - Duplex pump system for backup operation

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Recommendations to Reduce Costs

- 3. Eliminate overnight staffing, reduce labor force & operate in batch mode
  - Activated discussion between State & EPA
  - Site operators have been successful in treating backlog of stored water by increasing WTP flow rate
  - Implemented with additional winter protections at collection facilities
    - Still full time staff during WTP operation; no remote control yet on WTP
    - Average water year can be ~8 months of treatment

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Recommendations to Reduce Costs

- 4. Reduce Sampling Frequency
  - Implemented –some sample collection & monitoring frequencies were excessive considering history & understanding of site
  - pH & other parameters are field monitored in WTP & surface water locations & typically are good indicator of metals removal performance

Reactor Tank

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Recommendations to Reduce Costs

- 5. Do not add/rebuild/replace/relocate WTP & regularly evaluate collection system pumping requirements
  - Much discussion on when/if/where to move the WTP had occurred
  - Anticipate that OU1 RA will:
    - Decrease average AMD generation from 97 MG to 30 MG
    - Change in WQ & collection locations anticipated
  - Benefit of waiting to modify WTP until after the OU1 RA construction to see the resulting water quality & quantity & impacts to ground and surface water

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Recommendations for Technical Improvement

Filter Units

- 6. Make Minor WTP Changes
  - Identified the multi-media filters (just before discharge) as the most sensitive part of the plant
    - Add rate controlling orifice plates to each of the 4 in-line filter units – to even out flow to each filter
    - Install backup filter pump - for redundancy
      - Will be exploring these suggestions further

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Overall Benefits of Study

- Opened conversation lines for State & EPA & Site Contractor
  - On issues that had been assumed for a long time
  - On issues where we had been spinning our wheels
- Third Party Benefits–
  - Bring experience from many other sites
  - Listen to operations staff's observations
  - Ask questions
- 2013 Work Plan
  - ~ $350K less than 2012

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Thanks!

- Kathy Yeager – EPA
- Peter Rich – Tetra Tech
- John Nemcik –Tetra Tech
- Doug Sutton – Tetra Tech
- Carolyn Pitera – Tetra Tech
- Jody Edwards – Tetra Tech
- EPA Headquarters – Review

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Questions?

Spent Ore on the Heap Leach Pad

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Resources & Feedback

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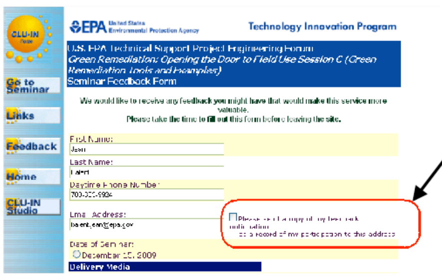

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