



Colorado Department
of Public Health
and Environment

UPDATE FACT SHEET

CENTRAL CITY/CLEAR CREEK SUPERFUND SITE

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RECOVERY.GOV



State, EPA List Site Clean-up Accomplishments

The Central City/Clear Creek Superfund site, located in Clear Creek and Gilpin counties, was placed on the Environmental Protection Agency's (EPA's) National Priorities List in 1983. Since then, the Colorado Department of Public Health and Environment (the Department), EPA and the local communities have worked within the 400-square-mile watershed to clean up contamination from zinc, copper, cadmium, manganese, lead and arsenic.

The site is divided into four Operable Units (OUs) to organize the evaluation and implementation of the cleanup:

- OU1 addressed acid mine drainage from five mine tunnels (the Argo, Big Five, Quartz Hill, and National tunnels, plus the Gregory Incline) using passive treatment. The technology was determined not to be feasible, so OU3 was created to include the active treatment of two of the five drainage sources. The other three mine discharges were transferred to OU4, which focused on sources of metals contamination within the North Fork of the Clear Creek watershed.
- OU2 addresses remediation of mill tailings and mine waste rock associated with the five OU1 tunnels. OU 2 remedial actions are complete except for the Quartz Hill tailings pile, which was transferred to OU4.
- OU3 was designated to evaluate the Clear Creek Watershed and to treat the Argo and Big Five tunnel discharges.
- OU4 focuses on the North Fork of Clear Creek, including waste rock and sediment controls on tributaries, the three remaining

OU3 adit (mine or tunnel entrance) discharges, plus the Quartz Hill tailings pile in Central City.

To date, EPA and the Colorado Department of Public Health and Environment have closed or consolidated more than 40 mine waste piles, constructed two major sediment retention dams, an on-site mine waste repository and one water treatment plant with another in the design phase. The following list describes the accomplishments made under the Superfund Remedial Program and the Superfund Removal Program:

Superfund Remedial Program

OU2

- Two waste rock piles, the Argo and Big Five, have been closed in place.
- Two waste rock piles, the National and Gregory Incline, have been removed.

OU3

- In 1998, the Argo Tunnel Water Treatment Plant began treating mine discharge from the Argo Tunnel, Big Five Tunnel and Virginia Canyon groundwater.
- Eleven waste piles have been closed in place: Gregory Gulch #1 and #2, Clay County, Boodle Mill, McClelland, North Clear Creek, Chase Gulch #1 and #2, Black Eagle, Little Bear and the Golden Gilpin Mill Site piles.

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Site Clean-up Accomplishments

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- EPA and the Department conducted a domestic well sampling and evaluation program involving 60 wells in Russell Gulch and provided at-the-tap (reverse osmosis) domestic water treatment for four homes.
- In cooperation with the U.S. Forest Service, EPA and the Department closed the Minnesota Mine in Empire Gulch and reclaimed and revegetated an associated mill tailings pile.
- The Big Five pond was closed in cooperation with the Colorado Department of Transportation (CDOT).
- A mine drainage tunnel was constructed to pipe Big Five drainage to the Argo Tunnel Water Treatment Plant.
- A cutoff wall was constructed in Virginia Canyon to convey metals-contaminated groundwater to the Argo Treatment Plan.

OU4:

Mine Waste Remediation and Sediment Control Project:

- Two sediment retention dams and two check dams have been constructed.
- Fourteen waste rock piles have been closed in place.
- The Department and EPA acquired and restored mine-impacted property and constructed the Church Placer Repository to consolidate mine waste.
- Eight waste rock piles have been relocated to the Church Placer Repository (plus three piles that were disposed by the Town of Black Hawk).
- Four mine adits have been closed.

North Fork Clear Creek Stream Stabilization:

- Funding from EPA and the Department is allowing CDOT to remove mill tailings in the State Highway 119 corridor to the Church Placer Repository and to stabilize the stream and revegetate riparian areas.

- EPA and the Department partnered with the Black Hawk Central City Sanitation District to build a constructed wetlands to filter metals from surface water.

North Fork Water Treatment:

- A water treatment plant to treat contaminated mine water from Gregory Incline, Gregory Gulch and National Tunnel is being designed; site development is under way, with construction of a retaining wall backfilling and utilities work.
- A mine drainage pipeline to convey water to the new treatment plant is currently under construction.

Quartz Hill:

- A design to regrade and cover the pile has been prepared. Negotiations with the property owner are in progress.

Argo Tunnel Bulkhead:

- An investigation is under way to guide design of a bulkhead to control flow from the Argo Tunnel.

Silver Plume Evaluation (Clear Creek Segment 2a)/Burleigh Tunnel:

- An evaluation of Clear Creek water quality and aquatic habitat conditions is under way.

Superfund Removal Program:

- Five OU3 mine waste piles in Virginia Canyon have been closed in place: the Williams, Rio Grande, Trio, Lower Clarissa and Diamond Joe Mine piles.
- Run-off/run-on ditches were constructed to control erosion on the Two Brothers waste pile and a ground water collection structure was built in Virginia Canyon.
- The National Tunnel portal was stabilized.
- Erosion controls will be constructed at the Quartz Hill tailings pile to prevent sediment washout during storms.

Mine Drainage Pipeline Construction Resumes

Pipeline construction on State Highway 119 in Black Hawk resumed Sept. 12. Construction was suspended at the end of June when casino operators voiced concerns about impacts to their businesses during the busy summer season and offered to pay to suspend work. The pipeline will carry mine-contaminated water from the National Tunnel, Gregory Incline and Gregory Gulch to a new water treatment plant south of Black Hawk. The plant, scheduled to begin construction in 2012, will support the survival of a brown trout population in the North Fork and also will protect drinking water supplies for downstream users.

The pipeline contractor, K.R. Swerdfeger Construction (KRS) of Pueblo West, initially began work May 2, 2011. Approximately 1,400 feet of pipe was laid underneath State Highway 119 between Richman Street and Black Hawk Street prior to the summer shut-down. Pipe has been laid through the intersections with Mill and Richman streets, and will be laid through the intersection with Main Street this fall. Upon completion, the pipeline will be approximately 5,400 feet long.

KRS plans to have two crews to ensure that the project is completed in a timely manner. The company will take the following steps to reduce construction-related impacts to Black Hawk businesses:

- Construction will be limited to 7 a.m. to 5 p.m. Monday through Thursday and 7 a.m. to 2 p.m. on Friday, unless problems requiring immediate attention are encountered.



Contractors install pipe under Highway 119 in Black Hawk.

- Northbound Highway 119 will remain open throughout construction.
- Traffic management plans allow for bus and pedestrian access around construction sites and signs informing motorists that businesses remain open.
- Recorded updates are available at (719) 626-4951. To sign up for e-mail updates, contact KRS's public information manager, Bob Denzler at (719) 778-4145 or bobd@krsward.com.

The project is funded by the American Recovery and Reinvestment Act (ARRA), the EPA and the Colorado Department of Public Health and Environment. EPA and the Department also are funding mill tailings removal and stream stabilization along the North Fork of Clear Creek, as well as utilities relocation, a retaining wall and site preparation for the new water treatment plant.

OU4 Water Treatment Plant Design Hits 30 Percent Milestone

Colorado Department of Public Health and Environment officials are reviewing the draft schematic design for a new active water treatment plant that will treat contaminated water from the Gregory Incline, National Tunnel and Gregory Gulch. The building will be located south of Black Hawk in the Highway 119 right of way.

The 1.1-acre site will be created as part of the Colorado Department of Transportation (CDOT) curve-straightening project now in progress. Squeezing the building and associated infrastructure into the long and narrow site will test the creativity of the design team.

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Design Milestone

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Golder Associates of Lakewood is responsible for the engineering design, while Bennett Wagner and Grody Architects, PC, of Denver is the project architect. The design is funded by the American Recovery and Reinvestment Act of 2009 (ARRA). The design cost is expected to be around \$1.2 million.

The schematic design phase, which represents 30-percent design completion, includes the building concept and treatment process design, which will treat up to 600 gallons per minute. The building footprint will be between 15,000 and 16,000 square feet, approximately 100 feet by 1,680 feet, with a maximum height of approximately 55 feet. There will be one exterior chemical silo. The plant will use high-density sludge processes similar to those being designed for the Argo Tunnel Water Treatment Plant in Idaho Springs (*see related article*).

“We’re hiding all the industrial aspects behind the building so they won’t be visible from the highway,” explains Mary Boardman, project manager for the Colorado Department of Public Health and Environment. “Those features include load-in and load-out areas, the lime silo and storage tanks.” The color palette and materials will blend with nearby historic structures, and varied roof lines will help prevent the building from looking out of place, she explains.

When the design reaches 90 percent completion — scheduled for February 2012 — the plans will undergo another review prior to the development of construction documents, or blueprints. Before the project goes out for construction bids, the EPA’s National Priorities Panel must approve funding.

Because the site has yet to be created, geotechnical data affecting final construction costs is unavailable. Boardman estimates construction will cost around \$12 million. With National Priorities Panel approval, construction could start next summer.

Agencies Cooperate to Restore Fish Habitat

Historic mining ravaged the North Fork of Clear Creek. Placer miners scooped up the creek, separated the gold and then dumped the waste rock without attempting to create a natural-looking stream. Mill tailings loaded with heavy metals and mercury were deposited directly into the creek, which became inhospitable to fish. That’s all changing, thanks to funding by the EPA, Colorado Department of Public Health and Environment and CDOT.

EPA and the state health department are providing approximately \$3.4 million for stream restoration south of Black Hawk as part of the Main Street South and Highway 119 straightening projects. CDOT contractor American Civil Constructors is removing mill tailings from the creek and rebuilding the streambed. Revegetation will take place next year. The project includes retaining wall construction and creation of a site for a new water treatment plant to remove metals from the water.

A stream morphologist helped design the restoration to include a mix of deep and shallow water, fast and slow water, and sun and shade to promote a healthy trout population in the future.



Stream improvements include removal of mill tailings and mining debris. Tailings are sent to the Church Placer Repository.

Efficiency Improvements Planned for Argo Tunnel WTP

In October 2010 the Colorado Department of Public Health and Environment assumed full responsibility for operating the Argo Tunnel Water Treatment Plant in Idaho Springs. Previously the plant, which treats contaminated water from Virginia Canyon and the Argo and Big Five tunnels and Virginia Canyon before discharging to Clear Creek, was funded 90 percent by the Environmental Protection Agency (EPA) and 10 percent by the state.

Colorado officials have decided to implement a high-density sludge (HDS) conversion, according to Mary Boardman, state project manager for the plant.

Currently the plant uses a low-density lime precipitation process. Lime is added to contaminated water, creating a chemical change that causes dissolved metal hydroxides to re-solidify and fall to the bottom of a clarifier tank, where they are removed by gravity.

“We wind up with a slurry that’s about three percent solids,” Boardman explains. “After we filter press it, the resulting filter cake is about 18 percent solids.”

The HDS process would send the metal hydroxides back into a lime conditioning tank

where they are coated with lime and sent back through the system for up to 30 more cycles. Each time the metal particles cycle through the system, they attract more metal, growing like hailstones. After the sludge is filter pressed, the resulting filter cake is between 40 percent to 45 percent solids (*see diagram, next page*).

“We will generate about one quarter of the filter cake we currently generate, which means we’re hauling less to a landfill,” Boardman explains. “It uses reagents more efficiently, so we’ll consume less lime and less polymer.”

Denver engineering company CH₂M Hill is designing the system. The design phase is funded by the EPA, which will cover 90 percent of the construction cost.

The most visible change will be a new clarifier tank, which will have to be installed outside of the existing building. The two existing clarifiers within the building will be repurposed to become reaction tanks, possibly resulting in an overall increase in plant capacity.

The Argo Tunnel Water Treatment plant came online in April 1998, and is credited with the return of a reproducing brown trout population to the main stem of Clear Creek.

Argo Tunnel Bulkhead Would Help Control Flow

Inspectors from the Colorado Department of Public Health and Environment and the state Division of Reclamation Mining and Safety entered the Argo Tunnel last April looking for a place to anchor a concrete bulkhead, or plug, to control the release of mine-contaminated water from the tunnel. They found suitable rock about 100 feet in to the tunnel, but couldn’t go much further because of a three-foot deep accumulation of iron hydroxide sediment.

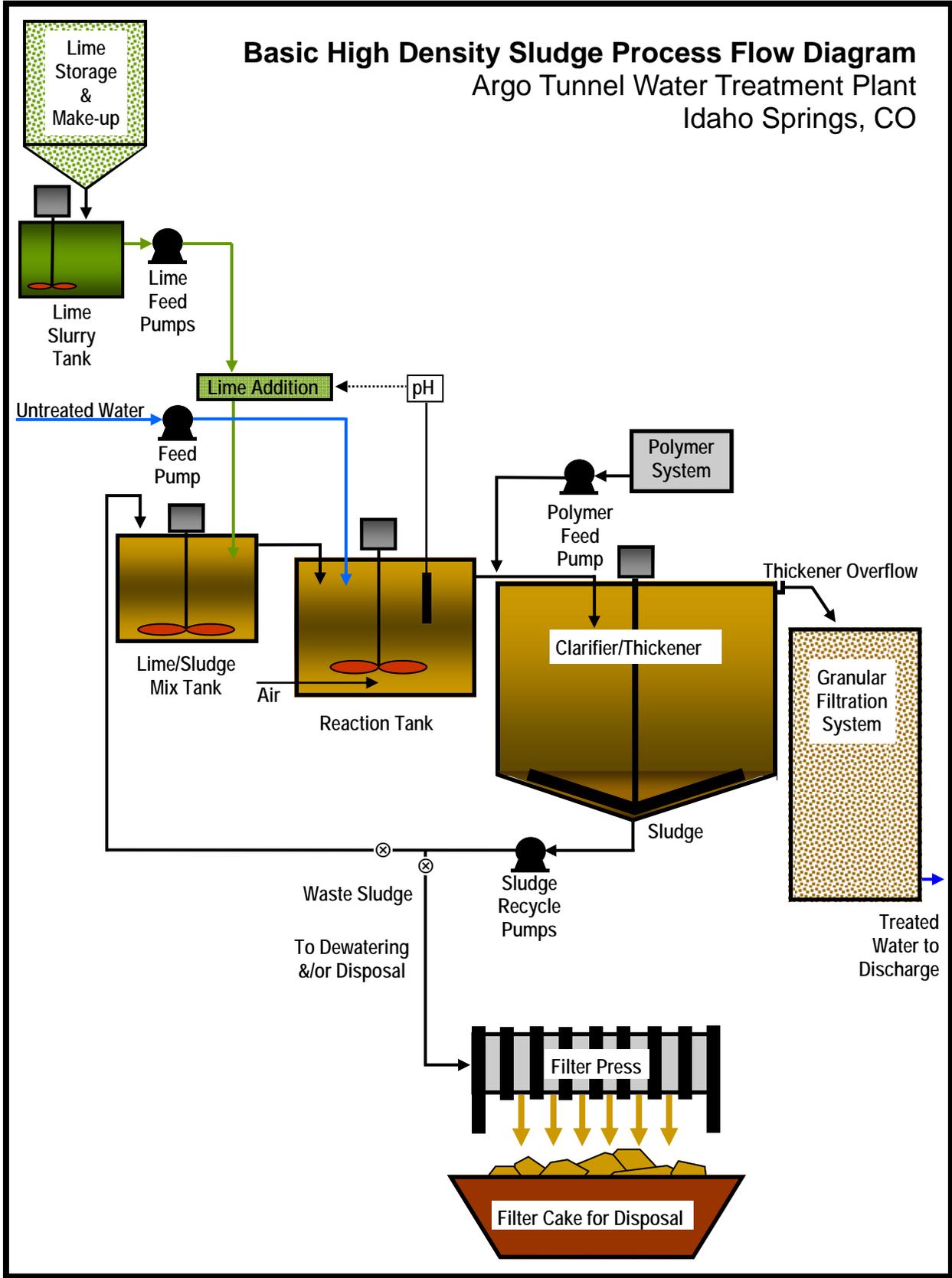
“We knew there was sediment behind the doors, but we didn’t realize how much there was and how deep it was,” says Mary Boardman, state project manager for the Argo Tunnel Water Treatment Plant.

A bulkhead would prevent large releases of contaminated water and sediment from overwhelming the treatment plant and would improve operational flexibility, Boardman says. Concrete basins upstream of the plant can store water for 12 hours, depending on flow, limiting how long the plant can remain down for maintenance. A valve in the bulkhead could shut off the flow temporarily, allowing more time for maintenance work at the plant.

The bulkhead installation depends upon negotiating an agreement with the tunnel owner. Before the bulkhead could be constructed, the sediment would have to be removed from the tunnel.

Basic High Density Sludge Process Flow Diagram

Argo Tunnel Water Treatment Plant
Idaho Springs, CO



This diagram illustrates the concept behind improvements planned for the Argo Tunnel Water Treatment Plant.

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Site Documents on the Web

State Websites:

[www.cdphe.state.co.us/hm/
ClearCreek/index.htm](http://www.cdphe.state.co.us/hm/ClearCreek/index.htm)

[www.cdphe.state.co.us/hm/
blackhawkpipeline/index.htm](http://www.cdphe.state.co.us/hm/blackhawkpipeline/index.htm)

EPA Website:

[www.epa.gov/region08/superfund/co/
ccclearcreek](http://www.epa.gov/region08/superfund/co/ccclearcreek)

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