



COLORADO
Department of Public
Health & Environment



Update Fact Sheet

Central City/Clear Creek Superfund Site

December 2015

Site Summary

The Central City/Clear Creek Superfund site is located in Clear Creek and Gilpin counties, approximately 30 miles west of Denver. The Superfund study area covers the 400-square mile drainage basin of Clear Creek, which has been affected by a number of inactive precious metal mines.

History

Gold was discovered near Idaho Springs and in the Black Hawk/Central City area in 1859. For the next 20 years, the Black Hawk/Central City area was the leading mining center in Colorado. The decline of mining in the area began with the silver crash in the 1890s and the rise in mining in Leadville. However, mining continued in Clear Creek and Gilpin counties from the turn of the century until approximately 1950. Since 1950, mining in the area has been limited, with only a handful of mines currently operating.

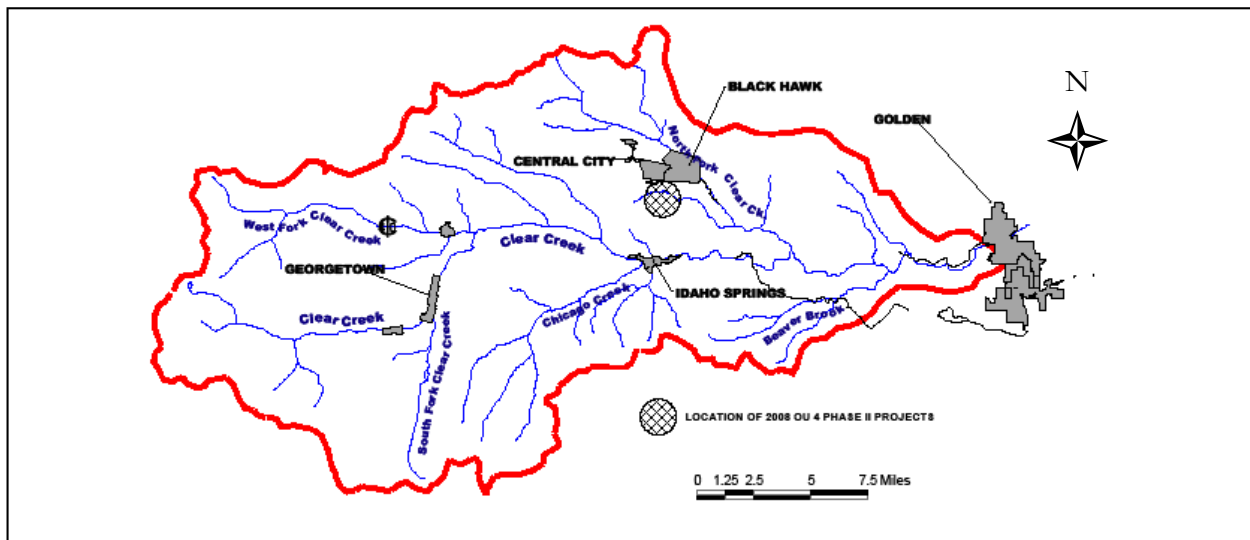
The site was placed on the list of Superfund sites in September 1983. Since that time, the Colorado Department of

Public Health and Environment (CDPHE), the U.S. Environmental Protection Agency (EPA) and the local community have worked to clean up heavy metal contamination resulting from decades of hard rock mining in the area.

Environmental Concerns

The most significant environmental impacts associated with the site affect the Clear Creek stream system, including a reduced fishery and impacts to other aquatic life and habitat. Acidic water that drains from many mines contains various heavy metals, and tailings and waste rock contribute to the non-point source impacts to the basin. Clear Creek is a drinking water source for more than one-quarter million people living in the Denver area, and is a favored place for kayaking, rafting, fishing, wildlife watching and gold panning. The human health hazard from this site involves potential exposure to heavy metals, primarily lead, arsenic, and cadmium. Soil from the tailings piles and waste rock contains heavy metals.

Central City/Clear Creek Superfund Study Area



Central City/Clear Creek site employs multiple remedies

The Central City/Clear Creek Superfund Site epitomizes many of the issues that plague mining remediation sites across the West: Draining mines and adits, acid rock drainage from waste rock and tailings piles, heavy metals contaminating groundwater and surface water, impaired fish and aquatic life populations, and historic structures in need of preservation. As a result, the site also employs remedial features and strategies typical of mining-impacted sites: Active water treatment, engineered waste pile covers and drainage systems, sediment-control structures, bulkheads, removal actions, and waste rock repositories.



Construction has begun on the North Clear Creek Water Treatment Plant.

Water Treatment

The Argo Tunnel was the primary drainage and ore transport tunnel from Nevadaville to Idaho Springs. Excavated between 1893 and 1910, the tunnel drained water from several mine workings, and allowed ore carts to be wheeled right up to the Argo Mill next door. The mill is now listed on the National Historic Registry and offers tours for visitors.

Although the tunnel has not been used to transport ore since the 1940s, water still drains through it day and night. The tunnel discharge averages 300 gallons of acidic, contaminated water per minute. Nearly 850 pounds of dissolved metals are released from the tunnel each day.

The Argo Tunnel Water Treatment Plant began operating in April 1998, treating water from the Argo Tunnel, the Big Five Tunnel at the west end of Idaho Springs and groundwater from Virginia Canyon. After 10 years of operation, the state became responsible for 100 percent of plant costs.

Recent upgrades converted the plant's conventional process to a high-density sludge (HDS) process. The HDS process sends metal hydrox-

ides into a conditioning tank where they are coated with lime and sent back through the system for up to 30 additional treatment cycles. The process is more efficient at removing metals from the water, resulting in denser filter cake, less material sent to landfills and cost savings.

Construction began in December on a second water treatment plan in the North Fork of Clear Creek, south of Black Hawk. Moltz Construction of Salida submitted the winning bid of \$16.6 million.

The new plant will treat contaminated water from the Gregory Incline, the National Tunnel and Gregory Gulch, which will be conveyed to the plant via a pipeline constructed in May 2012. The lime-based HDS plant is designed to treat anticipated flows ranging from 200 gallons per minute to 600 gallons per minute. The plant is expected to open in March 2017.

Acid Rock Drainage

Rain and melting snow percolate through soil at historic mine sites, seeping through abandoned piles of waste rock and mill tailings. Sulfur in the disturbed rock raises the water's acid level, which dissolves metals including zinc, copper, cadmium and manganese. When this acid rock drainage enters streams and rivers, it is toxic to fish and other aquatic life. Waste rock piles in or near waterways pose particular problems. As they erode, they load waterways with sediment and metals.

Engineers have devised a number of ways to redirect and slow the movement of water to minimize the potential for contaminating it. Regrading a waste pile eliminates steep slopes, while encouraging water to run off and not pond on top of the mine waste. Engineered runoff ditches also direct water off of a pile without causing erosion. If water can flow onto a pile



The Quartz Hill project also replaced 1,000 feet of deteriorated storm sewer, reducing Central City's maintenance costs.

from above, crews will dig a "run-on" ditch to channel water around the pile. The mine waste can be capped with inert rock or a vegetated soil cover. Some piles are stabilized further with rock, or "riprap," around the base, or "toe."

Within Russell and Nevada gulches, which are dry most of the time, crews have constructed riprap dams to slow down water during periods of high flow. Water can flow through the spaces between the rocks, but sediment tends to be trapped upstream.

Russell Gulch structures include riprap in wire cages. These "rock-drop" structures are designed to take energy out of rushing water, reducing the amount of metals-choked sediment that reaches North Clear Creek and Clear Creek.

Recontouring and capping the Quartz Hill Tailings Pile was completed in 2014. Previously, the pile eroded tailings into Gregory Gulch and Central City's storm sewer system. Grading the pile to a stable slope and capping with inert rock and an underlying geotextile helps prevent erosion, ultimately improving water quality in the North Fork of Clear Creek.

All of the cover rock came from a stockpile along the Central City Parkway about a mile and a half from the site, re-using what otherwise would be considered waste material. Because the stockpile contained native rock from the area, the appearance of the Quartz Hill pile is more appropriate than if an off-site source of rock had been used.

The State Historic Preservation Office (SHPO) and local historic preservation officials

were consulted before the project began. Existing cultural resources were documented, and an archaeologist was present during critical construction phases to protect historic structures revealed during excavation.

Bulkheads

The new Argo Tunnel Flow Control Bulkhead was completed in August 2015 at a cost of approximately \$900,000. A pipe runs through the concrete plug so water treatment plant operators can regulate the flow and control water levels inside the mine pool. The tunnel has a history of surge events that released acidic metals-laden mine water to the environment. The first recorded event occurred in 1943 when miners intercepted and released a large volume of naturally impounded water, killing four miners. A second event occurred naturally in 1980. An unknown volume of contaminated water that had been stored was released and entered Clear Creek from the tunnel portal. The surge event forced the closure of six drinking water intakes located within the Golden area. The bulkhead will prevent future surge events from impacting Clear Creek and control flow volume to the plant, resulting in reduced costs.



A significant amount of accumulated sediment was removed from the Argo Tunnel portal, making the adit accessible to water treatment plant personnel.



The Diamond Joe Waste Rock Pile (left), Trio Waste Rock Pile (right) and other mine waste piles had eroded into the Virginia Canyon channel, which created the need for a removal action by the U.S. Environmental Protection Agency. Removal actions can occur with or without a Superfund listing, depending on the situation.



Removal Actions

An EPA removal action during the summer of 2010 addressed five major and a few secondary waste rock piles located along the Two Brothers mine road in Virginia Canyon, halfway between Central City and Idaho Springs. The piles were excavated and consolidated at the Rio Grande waste dump. Waste rock in the immediate vicinity of the drainage was excavated and consolidated, along with waste rock piles adjacent to the drainage. Another waste pile and the excavation area were re-contoured and armored to control future precipitation run-off from the area. Grouted rip rap channels run through the area to help prevent erosion, stabilize piles and contain run-off.

Waste Rock Repository

CDPHE acquired 28.6 acres of the Church Placer claim in 2008 for a repository and reclamation of the site, which is impacted by historic mining and a former heap leach operation. Con-

struction activities included regrading and construction of water-management features, implemented in 2008 and 2009 using a local contractor. Approximately 26,000 cubic yards of waste rock and tailings were consolidated in the repository from Russell, Willis and Nevada gulches. Thirty thousand cubic yards of residual capacity remain.

CDPHE maintains the repository to ensure that erosion does not expose mine-related waste. The department has stockpiled materials to address erosion, replace cover material, provide interim cover for waste and final vegetative cover. The repository property is fenced to prevent trespass, and is subject to deed restrictions recorded in Gilpin County.

The repository may accept mining-related materials from local, non-profit voluntary projects. Mine wastes accepted at the repository are those located within the Superfund Study Area and approved by CDPHE and EPA on a case-by-case basis.

For more information:

Colorado Department of Public Health and Environment

Overall Coordination/Project Manager
Steve Laudeman, State Buildings Program
Delegee
(303) 692-3381
E-mail: steve.laudeman@state.co.us

Argo Tunnel Water Treatment Plant & OU 4
Water Treatment Plant
Mary Boardman, Plant Manager
(303) 692-3413
E-mail: mary.boardman@state.co.us

Operable Unit 4

Jim Lewis, Clear Creek Site Manager
(303) 692-3390
E-mail: james.lewis@state.co.us

Community Involvement

Warren Smith, Community Involvement
Manager
(303) 692-3373
E-mail: warren.smith@state.co.us

U.S. Environmental Protection Agency

Les Sims, Remedial Project Manager
(303) 312-6224
E-Mail: sims.leslie@epa.gov