

Rio Tinto

Reclaiming the environment from a century of mining:
A status report on the Last Century Cleanup Program

Kennecott Utah Copper Corporation

Rio Tinto

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A century of mining in Bingham Canyon

For more than a century, people have mined Utah's Oquirrh Mountains for valuable metals. Through the decades, few ore deposits anywhere in the world have been as productive as that of the Bingham Canyon Mine. It has produced millions of tons of copper and millions of ounces of gold and silver.

Located 28 miles southwest of Salt Lake City, Bingham Canyon's mining history dates to 1863 when prospectors and miners discovered ore bodies of lead, zinc, silver and (in 1873) gold. While copper deposits initially were thought to be too marginal to justify mining, engineers theorized that a large-scale, open-pit copper mine could be profitable. In 1906, steam shovels made their first cut into a mountain, becoming the first, and eventually the largest, open-pit copper mine in the world. Since then, mining in the canyon has continued almost nonstop.



A Kennecott predecessor company purchased the Utah Copper Company in 1936, built a refinery in 1950 and bought an existing smelter in 1959 to create an integrated enterprise and transform the ore into saleable anodes, or slabs of copper. At one time, the mine employed 8,000 people; today, Kennecott employs approximately 1,800. The massive open-pit mine now measures

more than 2 3/4 miles wide and 3/4 of a mile deep and remains highly productive to this day.

In 1989, Rio Tinto purchased the Bingham Canyon Mine and related assets. Rio Tinto has been operating as a world leader in mining and exploration for 130 years, and its operations span the world with production on every continent. The company's products include aluminum, copper, diamonds, energy products, gold, industrial minerals and iron ore.

Kennecott has invested hundreds of millions of dollars over the years to modernize its mining, refining and smelting operations and clean up past environmental damage. During the 1990s, Kennecott invested \$1 billion to create an efficient refinery and one of the world's cleanest smelters, one that dramatically reduces both sulfur dioxide and

particulate emissions. At the same time, the company spent \$400 million on environmental remediation projects and \$500 million to expand and upgrade its tailings impoundment. In 2008, \$672 million was approved for investment in Kennecott operations.

Because of the vision and perseverance of Kennecott leaders, the story of this mining site is one of transformation and rejuvenation. Kennecott's legacy is one of helping to build Utah's economy and improve the lives of Utahns, as well as restoring land and water for beneficial use.



Timeline of mining in Bingham Canyon and smelting and refining in the northern Oquirrh Mountains

- 1863** Initial exploration and mining of mineral resources
- 1873** Mining boom descends on Bingham Canyon as deposits of lead, silver, zinc and gold are discovered
- 1906** Large-scale open-pit mining begins in Bingham Canyon
- 1910s** Most mining claims consolidated under Utah Copper Company
- 1920s** Copper artificially leached from waste rock repositories
- 1936** Kennecott Copper Corporation, a New York company and not affiliated with the present-day Kennecott, purchases Utah Copper Company
- 1941-45** Mine produces one-third of copper used by Allies during World War II
- 1950s** Refinery built and smelter purchased; copper production integrated
- 1960s** \$100 million modernization of the mine, including a new precipitation plant, new leach system, construction of the Bonneville Crushing and Grinding Plant and the molybdenite processing plant
- 1970s** \$300 million investment in smelter with new furnaces and new sulfur dioxide emission control technology
- 1980s** Worldwide copper recession leads to a plant shutdown; \$625 million plant modernization, including new Copperton Concentrator, follows; Kennecott Corporation (formerly Kennecott Copper Corporation) is purchased by Standard Oil of Ohio, then by British Petroleum. In 1989, Rio Tinto (formerly RTZ) purchased the assets of Kennecott Corporation and established "Kennecott Utah Copper Corporation."
- 1995** \$1 billion spent on smelter and refinery modernization, making the new smelter the world's cleanest, recovering 99.9 percent of sulfur dioxide emissions
- 1996** \$500 million spent on 3,200-acre tailings impoundment expansion and modernization, including seismic stabilization upgrade
- 1999** Tailings impoundment upgrade is completed and includes 3,800-acre Inland Sea Shorebird Reserve and Wetland Mitigation Bank near the Great Salt Lake
- 2003** Kennecott celebrates "100 Years in Mining"
- 2006** Garfield Smelter celebrates 100-year history of consecutive smelters at same site
- 2006** \$82 million approved to expand and modernize the bulk floatation process at the Copperton Concentrator.
- 2006** Water began flowing from the first of two reverse osmosis plants. The plant produces 3,500 acre-feet of water per year, enough to supply drinking water to 14,000 people.
- 2007** Kennecott commits to cleaning up the Bingham Magna-Ditch
- 2007** Kennecott celebrates 10th anniversary of providing and improving bird habitat at the Kennecott Inland Sea Shorebird Reserve.
- 2008** Major capital investments approved totaling \$672 million. These investments include:
- 2008** \$73 million in machinery and equipment
- 2008** \$270 million for the Molybdenum Autoclave Processing (MAP)
- 2008** \$179 million investment in Phase 1 of the Keystone Pre-Feasibility Study
- 2008** \$22 million construct combined heat and power systems at the refinery and the MAP

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Kennecott Utah Copper Corporation, working in close cooperation with the U.S. Environmental Protection Agency (EPA) and the State of Utah Department of Environmental Quality (UDEQ), is committed to addressing historic mine wastes in and around Bingham Canyon (much of which predated Kennecott's interests) as well as addressing contamination on its property in the northern Oquirrh Mountains. The goal is to return as much of the affected properties as possible to a beneficial use or reclaimed natural state.

Prepared September 2008.

The name "Kennecott" has been used by various entities, some associated with mining activities in Bingham Canyon and some not associated with these activities. "Kennecott" as used in this document refers to Kennecott Utah Copper Corporation, a unit of Rio Tinto, and other entities using the name "Kennecott" that were connected with historical activities described in this document. However, some of the historic companies using the name Kennecott are not connected to or affiliated with the present-day Kennecott.

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The Last Century Cleanup Program

It is a simple fact that modern life is not possible without copper. It is impossible to drive a car, watch television or place a phone call without it. It is integral to machines of all sorts, its remarkable conductivity allows electricity to be distributed and it is a base metal used to make other useful alloys such as bronze and brass.

While we need copper (and other metals) for our modern lifestyles, the process of getting the ore out of the ground and refining the metal affects our environment – our land and water – and requires special attention to protect these resources. Kennecott Utah Copper is dedicated to minimizing these disturbances wherever possible and to restoring the environment to the maximum extent feasible when disturbances occur. Historically, neither mining companies nor the state or federal governments addressed environmental stewardship. This resulted in contamination throughout the Oquirrh Mountains. This report describes the lengths to which Kennecott has gone to identify and clean up land and water contamination associated with historic mining activities along the Oquirrh Mountains – its Last Century Cleanup Program.

Forming the western boundary of the Salt Lake Valley, the Oquirrh Mountains are home to many historic mine properties, including the world-famous Bingham Canyon Mine, a keystone contributor to Utah's economy since before statehood. Kennecott, a member of Rio Tinto's worldwide mining group, owns most of these active and former mining properties. Kennecott's philosophy is to balance

society's need for metals with an environmentally responsible approach to mining. It is committed to successful mining operations while protecting and caring for the environment and preventing environmental problems for future generations. All of the company's cleanup projects to date have met or exceeded legal requirements and strived to meet community expectations.

Negotiation and cooperation have characterized Kennecott's stance toward reclaiming the landscape. These traits rose to the forefront in the 1990s when the Environmental Protection Agency (EPA) proposed to designate some Kennecott properties on the Superfund National Priorities List. The Superfund process is notoriously slow, costly and cumbersome. Kennecott believed that such a listing would cripple the company's ongoing operations, place a stigma on the company and surrounding communities and delay cleanup work that was already in progress. Rather than waiting for the Superfund process, Kennecott presented an accelerated cleanup program to the EPA and State of Utah officials in 1991. At the time, Kennecott's proposal was groundbreaking. Never before had a company approached the EPA with a proposal to avert a Superfund listing by sitting down and agreeing, collaboratively, to a cleanup program.

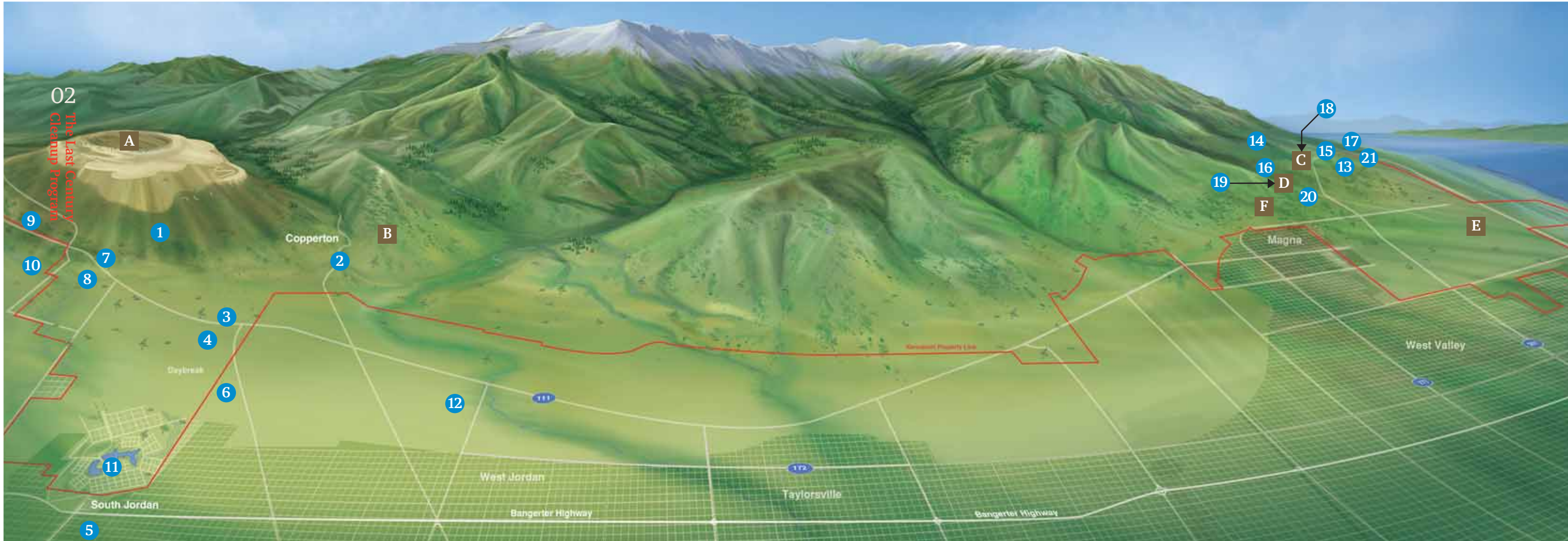
While starting the accelerated cleanup, Kennecott continued to negotiate the ultimate scope of cleanup work with the EPA and the State of Utah. After several years of negotiation, and backed by broad-based community, state and local government support, an

agreement was reached in September 1995. Kennecott, the EPA and Utah Department of Environmental Quality (UDEQ) signed a Memorandum of Understanding (MOU) outlining the scope of cleanup work, some of which was already complete or nearing completion by this time.

Under the MOU, Kennecott agreed to complete certain cleanup work and perform environmental studies. In return, EPA officials agreed not to take final action on formal Superfund listing and agreed to remove the Kennecott sites from the proposed Superfund list once Kennecott completed the work identified in the MOU. The State of Utah, meanwhile, agreed to participate in the review and guidance of the cleanup effort, address permitting as appropriate and avoid duplicate oversight where possible. As of August 2008, Kennecott has completed those aspects of the MOU for the South End; the official withdrawal of Kennecott South End sites from the proposed Superfund list occurred in September 2008. Withdrawal of the North End sites from proposed listing is expected by 2010.



Reclamation demonstration project
Bingham Canyon Mine waste rock area



Kennecott's operations extend about 26 miles along the Oquirrh Mountains in the western Salt Lake Valley. These are grouped into the South End sites around the Bingham Canyon Mine, and the North End sites around the smelter, refinery and related facilities.

South End cleanup projects

Groundwater Cleanup Projects

1. Eastside Water Collection System and Bingham Canyon Drainage Cutoff (source control)
Status: Complete
2. Large and Small Bingham Reservoirs (source control)
Status: Complete
3. Zone A Acidic Water Pumping and Treatment System
Status: Construction Complete; operation ongoing
4. Zone A Sulfate Water Pumping System and Reverse Osmosis Treatment Plant
Status: Construction Complete, Water Treatment Underway
5. Zone B Sulfate Water Pumping System and Reverse Osmosis Treatment Plant
Status: In design and construction

Mine Waste Cleanup Projects

6. Bingham Creek Tailings
Status: Complete
7. Lark Waste Rock
Status: Complete
8. Lark Tailings (State Motorcycle Park)
Status: Complete
9. Butterfield Canyon Waste Rock and Soil
Status: Complete
10. Herriman Residential Soil Removal and Agricultural Soil
Status: Complete
11. South Jordan Evaporation Ponds
Status: Complete
12. Bingham-Magna Ditch Soil Removal
Status: In Progress

North End cleanup projects

Soil Cleanup and Facilities Demolition Projects

13. Arthur Stepback Repository
Status: Complete
14. Lower Kessler Canyon
Status: Complete
15. North End Soil and Wastewater Treatment Plant Sludge
Status: Complete
16. Refinery Electrolyte Purification Ponds
Status: Complete
17. Smelter Slag Lagoon and I-80 Pond
Status: Complete
18. Smelter Footprint
Status: Complete
19. Refinery Footprint
Status: Complete
20. Arthur and Magna Concentrators
Status: Complete

Groundwater and Wetlands Cleanup Projects

21. Groundwater Plumes and Wetlands
Status: In Progress

Facilities

Operating Plants

- A. Bingham Canyon Mine
- B. Copperton Concentrator
- C. Smelter
- D. Refinery
- E. Tailings Impoundment
- F. Power Plant

South End cleanup projects

Much of the cleanup activities on the South End of Kennecott's operations were focused on removing historic mining wastes and facilities, and protecting and restoring groundwater in the southwestern Salt Lake Valley.

Restoration of groundwater involved controlling the sources of groundwater contamination, including the replacement of the Large and Small Bingham Reservoirs and construction of the Eastside Collection System. After studying potential solutions for restoring groundwater, Kennecott began pumping and treating acidic water and sulfate water. Following treatment, the neutralized acidic water is reused in Kennecott's process water system. Water with elevated levels of sulfate is treated using reverse osmosis to produce drinking water for nearby communities. Kennecott worked closely with affected communities, water rights owners, and the Jordan Valley Water Conservancy District (JVWCD) during implementation of these water programs.

Mine waste rock cleanup sites include Bingham Creek Tailings, Lark Tailings, the South Jordan Evaporation Ponds, Butterfield Canyon and Creek, and the Bingham-Magna Ditch. Additionally, in cooperation with the EPA's cleanup in and near the town of Herriman, Kennecott supplied clean soil and repository space for contaminated soil. In all of these projects, Kennecott worked closely with the affected communities and held numerous town meetings and tours during the process.

As a result of these successful soil and groundwater cleanup projects, Kennecott requested removal from the Superfund National Priorities List and was removed in September 2008.



Restoring contaminated groundwater

The Challenge *Identify and restore contaminated groundwater. Work collaboratively and transparently with regulatory agencies and the public to find effective solutions.*

Kennecott began work in the early 1980s to identify areas where groundwater had been affected by mining activities. This included the installation and sampling of hundreds of monitoring wells, and sampling of municipal and private water wells. Working with the EPA and the State of Utah, Kennecott identified two principal areas of contamination, or plumes. Just east of the mouth of Bingham Canyon, a groundwater plume, called Zone A, contains acidic water characterized by elevated levels of heavy metals and sulfate. Farther to the east, the second groundwater plume, called Zone B, is affected only by sulfate from both mining and non-mining sources.

Kennecott worked with the EPA and the UDEQ to study the problem, evaluate cleanup alternatives, and select a cleanup approach. This process relied on extensive community involvement with representatives from local communities and townships; local, state and federal governmental agencies; and other entities, such as the JVWCD.

Two agreements specify how Kennecott will carry out the groundwater cleanup. First, under two 2004 agreements with the State of Utah and JVWCD, Kennecott will treat sulfate-contaminated groundwater and produce drinking water for 40 years. Kennecott will also fund the construction of a second treatment plant to be owned and operated by JVWCD. These agreements fulfill a 1995 settlement with the State of Utah regarding a Natural Resources Damages (NRD) claim.

A second agreement is a Consent Decree with the EPA that became effective in May 2008. This Consent Decree implements a 2000 Record of Decision (ROD) in which the EPA listed requirements for clean up of the acidic portion of Zone A. Although this agreement was signed in 2008, Kennecott began implementing the cleanup more than 10 years earlier and has made considerable progress.

The Solution *Design and build projects to prevent future contamination and cleanup historically impacted groundwater.*

Through various studies and discussions with the EPA and the UDEQ, Kennecott identified an array of projects designed to prevent future groundwater contamination, as well as cleaning the water that was damaged by decades of mining activities. These projects are detailed on the next page.

Chronology of Kennecott's environmental responses

1983 Kennecott begins five-year Study of Bingham Canyon/Southwest Jordan Valley groundwater

1986 State of Utah files claim for groundwater contamination in the southwestern portion of the Salt Lake Valley (Southwestern Jordan Valley) and EPA conducts preliminary site investigations of Kennecott facilities

1990 State of Utah and EPA sample soil in Bingham Creek
Kennecott investigates Southwestern Jordan Valley groundwater contamination

Restoring contaminated groundwater *continued*

Eastside Water Collection System and Bingham Canyon Drainage Cutoff

In 1997, Kennecott completed a key component to control future water pollution: an upgraded surface water collection system including the construction of 29 cutoff walls in drainages below the Bingham Canyon Mine and waste rock disposal areas. These cutoff walls are tied into the bedrock and have been highly effective in capturing contaminated flows from the waste rock areas. The existing groundwater downstream of the cutoff walls has seen a substantial improvement.

In 2000, Kennecott stopped applying leach water to the waste rock dumps. Flows from the base of the waste rock disposal areas have since declined by about 95 percent. The remaining flow, which is collected in the collection

system and used in mining operations, is the result of rainwater and snowmelt falling directly on the waste rock surface.

Large and Small Bingham Reservoirs

The Large and Small Bingham Reservoirs were the primary source of groundwater contamination in the area just east of the mouth of Bingham Canyon. Between 1991 and 1994, Kennecott reconstructed both reservoirs using a state-of-the-art triple liner system with leak detection and a groundwater-monitoring system. Since leaching activities ceased in 2000, the small reservoir is used in tandem with the Large Bingham Reservoir to manage rainwater flows and drainage from the waste areas.

During reconstruction of the Large Bingham Reservoir, Kennecott removed more than four million tons of waste,

including sludges, tailings and soil from beneath the reservoir. Kennecott also removed waste rock from the foundation of an old dam and conducted a waste rock reclamation demonstration project on 600 acres. That work resulted in Kennecott being honored with an Earth Day Award from the Utah Division of Oil, Gas and Mining.



Before: Large Bingham Reservoir reclamation



A typical east side water collection system cutoff wall during construction



Completed cutoff wall



After: Large Bingham Reservoir reclamation

Zone A Acidic Water Pumping and Treatment System

After evaluating multiple options for restoring highly-contaminated water in the core of Zone A, Kennecott implemented a "pump and treat" system. Three large-capacity production wells, located in the core of the plume, now remove more than 2,300 gallons of contaminated water every minute. Blending this water with mill tailings neutralizes the water and stabilizes the heavy metals. Most of the water is then recycled for industrial use within Kennecott operations. Kennecott will be pumping and treating water for several decades.



Groundwater extraction well during construction

Zone A Sulfate Water Pumping System and Reverse Osmosis Treatment Plant

The first of two reverse osmosis plants treating sulfate-contaminated water is the Bingham Canyon Water Treatment Plant located just south of the town of Copperton. Kennecott delivered the first drinking water from this plant to JWCD in May 2006. Treating water from two wells on the eastern edge of Zone A, this plant produces 3,500 acre-feet of water per year, enough to supply drinking water to 14,000 people. The JWCD distributes water from the Bingham Canyon Water Treatment Plant to the cities of South Jordan, West Jordan, Herriman and Riverton at reduced wholesale rates. Kennecott will provide drinking water from the plant for 40 years.



Bingham Canyon Water Treatment Plant

Zone B Sulfate Water Pumping System and Reverse Osmosis Treatment Plant

The JWCD will construct a second reverse osmosis plant – the Southwest Groundwater Treatment Plant – along with a system of seven wells to pump and treat water from the Zone B plume. Kennecott is providing funding for construction and operation of this plant, which will also provide 3,500 acre-feet of water for 40 years. Located at 8300 South and 1300 West, the plant is scheduled to start up in 2010.



Reverse osmosis system at the Bingham Canyon Water Treatment Plant

1991 Kennecott begins accelerated cleanup program, makes settlement offer to State of Utah to resolve natural resources damages groundwater claims. Kennecott also submits Environmental Action Work Plans. EPA, State of Utah and Kennecott negotiate possible deferral from listing as Superfund sites

1992 EPA, State of Utah and Kennecott sign Agreement in principle deferring Superfund listing

First natural resources damages settlement proposal is rejected by the federal court

Superfund listing deferral delayed by federal review

1993 Negotiations on Superfund listing deferral Consent Decree fail

Kennecott sponsors lead-arsenic exposure study on Bingham Creek

Kennecott completes Large Bingham Reservoir removal

Kennecott completes Phase I Bingham Creek Channel removal

1994 EPA proposes Kennecott sites for Superfund listing

Kennecott completes Butterfield Waste Rock removal

Reclaiming the landscape for today and tomorrow

The Challenge *Rather than waiting for the Superfund listing, Kennecott worked cooperatively with the EPA and State of Utah to identify and clean up historic mining wastes on multiple sites, even those not generated or controlled by Kennecott.*

Having been mined continually for more than a century, there are many historic mining, tailings and waste-rock sites in the Oquirrh Mountains and their foothills. Kennecott has worked closely with the EPA to identify potential areas of remediation, to clean up those areas as efficiently as possible, and when necessary, to fund health studies to identify any long-term impacts.

The Solution *Dig up and move waste rock and tailings to secure repositories.*

A significant number of land reclamation projects on the South End of the Oquirrhs, involving the relocation of millions of cubic yards of materials, were conducted during the 1990s and early 2000s. Here are summaries of the main projects:

Bingham Creek Tailings

Early lead miners in Bingham Canyon placed tailings (crushed and milled rock left over after valuable metals have been removed from ore), waste rock and slag in Bingham Creek or on

its banks. These mine wastes were washed downstream and deposited in the channel and flood plain of Bingham Creek. Although neither Kennecott nor its predecessors had mined lead or zinc, Kennecott participated in the cleanup work in Bingham Creek.

In 1991, Kennecott assisted the EPA in removing lead- and arsenic-contaminated soil from 51 residential yards along Bingham Creek in West Jordan City. Kennecott also cooperated with the EPA to remove tailings and contaminated soil from Bingham Creek channel, moving more than 2 million cubic yards of materials to a permitted repository on Kennecott property. In addition, Kennecott helped fund a health study to

determine if any adverse effects were associated with the former presence of these tailings. No tailings-related problems were found. In fact, the average blood-lead concentration of children living along Bingham Creek was below the national average and well below any level of concern.



Before: Bingham Creek tailings



After: Bingham Creek tailings

1995 Kennecott and State of Utah settle southwest Jordan Valley natural resources groundwater damage claim

EPA, State of Utah and Kennecott sign Memorandum of Understanding on Superfund listing deferral

Kennecott completes Phase II Bingham Creek Channel Removal

1997 Kennecott completes South Jordan Evaporation Ponds Removal

Kennecott completes source control measures and installation of Eastside Leach Collection System and Cutoff Walls

Kennecott drills well to extract acidic groundwater plume and initiates pumping

Lark Waste Rock

The Lark waste-rock cleanup is another example where Kennecott removed wastes generated by an unrelated company. In 1993, Kennecott removed nearly 2 million tons of waste rock containing lead from historic mining operations near Lark. Kennecott completed the final stage of site reclamation in 1994 to return the area to wildlife habitat. The area is now the entrance to the Bingham Canyon Mine and Visitors Center.

Lark Tailings (State Motorcycle Park)

Kennecott completed the removal of 45,000 cubic yards of tailings containing lead and arsenic from the State Motorcycle Park in Lark in 1993. The material was removed to a repository at Kennecott's waste rock areas. Kennecott then covered the remaining 600 acres of low-level lead and arsenic-bearing tailings with a soil cap. The company also cleaned up a small natural seep and reconstructed it into a wetlands pilot study site.

Site reclamation restored the area as wildlife habitat in 1994. Kennecott received an Earth Day Award for this work from the State of Utah Division of Oil, Gas and Mining (DOG M).



Before: Lark waste-rock reclamation

Butterfield Canyon Waste Rock and Soil

Kennecott removed 1.1 million tons of waste rock from the historic (non-Kennecott) Butterfield drainage tunnel. The waste rock was relocated to a repository in the Bingham waste rock areas and the removal site was reclaimed for recreational use and wildlife habitat. This work was completed in 1994 with EPA oversight and received an Earth Day Award from DOGM. In 1996, the EPA discovered lead contamination in Butterfield Canyon downstream from the Butterfield Waste Rock area in and around irrigation systems and residential soil in the city of Herriman.

Herriman City Residential Soil Removal and Agricultural Soil

Once the EPA discovered the lead contamination in Butterfield Canyon, residential soil in the city of Herriman was removed. The lead was determined to be almost entirely from historic (non-Kennecott) mining operations. The EPA conducted the removal action in Herriman, while Kennecott provided repository space for more than 60,000 cubic yards of material. Kennecott also provided replacement topsoil and fill for the residential cleanup and funded an



After: Lark waste-rock reclamation



Lark Tailings before reclamation



Lark Tailings after soil cap and seeding

independent baseline blood-lead and arsenic exposure study in Herriman that demonstrated no adverse effects from the tailings. In addition to the contaminated residential soil in Herriman City, historic mining wastes entered the Herriman irrigation system and made their way to agricultural fields. The contaminants resulted from mining and milling activities upstream in Butterfield Canyon prior to 1900 and Kennecott's interest in the area. The EPA identified the best remedies to address the contamination. Kennecott aided the local jurisdictions in evaluating, designing and implementing ways to control the pollution. Additionally, Kennecott funded consultation services to help

1998 Kennecott completes Southwest Jordan Valley Groundwater Remedial Investigation and Feasibility Study

Kennecott completes Ecological Risk Assessment

Kennecott completes Lark Tailings and Waste Rock Removal project

Kennecott completes Butterfield Canyon soil and sediments cleanup project

Kennecott completes soil commitment to EPA for Herriman Residential Soil Cleanup

Reclaiming the landscape for today and tomorrow *continued*

Herriman develop a land use plan and provided an information management system for the review and analysis of building permit applications. Kennecott has also offered repository space for contaminated soil should residents choose to remove it from their properties.



Before: Butterfield Canyon waste-rock reclamation



After: Butterfield Canyon waste-rock reclamation

South Jordan Evaporation Ponds

Historically, 25 evaporation ponds covering more than 530 acres between the Bingham Canyon Mine and the city of South Jordan held flows diverted from Bingham Creek. The ponds were used primarily between 1936 and 1965. Additional ponds were built in 1983 and 1984 to manage flows associated with flood conditions during those years; these were last used in 1986. During 1994, material associated with the evaporation ponds was removed from the area and placed in permitted repositories and waste rock disposal areas. Pond sediments were excavated and placed in a 200-acre on-site repository.

In the mid- to late 1990s, Kennecott began exploring opportunities for land development on portions of its significant land holdings along the Oquirrh Mountains. The former South Jordan Evaporation Ponds site, with residential and commercial development fast approaching on three sides, was a prime candidate for development. The on-site waste repositories were removed between 2003 and 2007 to facilitate unrestricted land use development.

A decade in the planning, Kennecott Land's 4,126-acre planned community of Daybreak has taken shape where the evaporation ponds once were. About 13 percent of the Daybreak site is located on the former evaporation ponds. The 67-acre Oquirrh Lake, a



Before: South Jordan evaporation ponds



After: South Jordan evaporation ponds

signature amenity for the Daybreak community, now covers much of the reclaimed area. Daybreak is designed to be a model of environmentally and socially responsible growth. Kennecott Land plans to build 20,000 housing units and 9.1 million square feet of commercial buildings on this site. In addition, Daybreak homes are all EPA Energy Star® rated. Daybreak homes are at least 15-20 percent more energy efficient than local building codes require.

After: South Jordan Evaporation Ponds soil reclamation was completed in 2007 and is home to the Daybreak community

When finished, the community will feature 1,000 acres of parks and open space, pedestrian-friendly town centers, shops, churches, schools and mass transit. In June 2003, the community won the Envision Utah Governor's Quality Growth Award. The award recognized development projects and creative communities that keep Utah beautiful, prosperous and neighborly for future generations. Daybreak is a great example of returning the land to productive use. To highlight its sustainable development credentials, Kennecott Land is the first and only developer in the United States to achieve the prestigious ISO 14001 Environmental Certification.

Bingham-Magna Ditch

The Bingham-Magna Ditch was built and used in the 1930s to convey industrial wastewater from the Lead Mine Precipitation Plant near Copperton to Magna over easements obtained by Kennecott predecessor Utah Copper Company. The ditch



The old Bingham-Magna Ditch was buried for many decades just a few feet below the surface of open space and dry farm fields



began west of Copperton, ran east to about 7000 West, then north through what are now the urbanized areas of West Jordan, West Valley, Kearns and Magna. The ditch was taken out of use and filled in with topsoil in the mid-1930s, an acceptable practice for that time, and easements were relinquished to property owners.

Kennecott, the EPA and the UDEQ became aware of the ditch in the



Bingham-Magna Ditch during cleanup

early 1990s during environmental investigations. Kennecott collected samples from one portion of the ditch and found that arsenic levels were below recommended residential standards and no further action was taken or recommended by regulating agencies. Land development in 2007 on the Salt Lake Valley's west side uncovered more of the ditch and additional samples indicated that portions of the ditch may contain elevated concentrations of arsenic.

Although there are no known health problems related to the ditch, in 2007, Kennecott began removal of ditch sediments in open fields and is working with the EPA and UDEQ to determine the best approach to address ditch sediments in residential areas.

1999 Kennecott completes Draft Remedial Investigation for North End Groundwater

EPA issues Record of Decision and Consent Decree for Bingham Creek Channel, Large Reservoir and historic mining sites

Kennecott, together with Jordan Valley Water Conservancy District, submits draft Natural Resource Damage joint proposal to Utah Department of Environmental Quality

Eastside Leach Collection System and Cutoff Walls included in Bingham Canyon Mine Groundwater Discharge Permit

2000 EPA National Remedy Review Board reviews proposed remedial plan for Southwest Jordan Valley groundwater project

EPA issues Record of Decision on Southwest Jordan Valley groundwater project

Active waste rock leach operations terminated

North End cleanup projects

The cleanup projects on the North End of Kennecott's operations include the wastewater treatment plant sludge ponds and more than 30 sites with contaminated soil that had been identified for cleanup over the course of Kennecott's Last Century Cleanup Program. Similar to the South End cleanup projects, Kennecott has worked closely with local communities and held numerous meetings and tours for interested parties.

Cleanup projects on the North End have included demolishing obsolete industrial buildings and reclaiming the land, creating a lined repository for long-term storage of wastes and contaminated soil, managing selenium- and arsenic-contaminated groundwater, and implementing wetlands remediation.

By the time that the EPA and UDEQ issued a Record of Decision approving cleanup activities for Kennecott's North End sites in September 2002, much of the cleanup work had been completed.



Removing old facilities, cleaning their sites

The Challenge *Identify and clean up soil contaminated by nearly 100 years of milling, smelting and refining copper ore and remove unused structures.*

Kennecott identified more than 30 sites where historic milling and smelting wastes required remediation. As Kennecott has modernized and rebuilt its plants over the years, many obsolete structures were left behind. As part of its cleanup program and agreements with state and federal governments, the company has removed relics of past operations and reclaimed the land.

The Solution *Construct a 2.4-million cubic yard repository to store excavated wastes from wetlands, hillsides and underneath old buildings; remove relics of past mining operations; and reclaim the land for productive use.*

Key aspects of the cleanup work on the North End are:

Arthur Stepback Repository

Located on the southwestern flank of the Magna South Tailings Impoundment, the Arthur Stepback Repository was designed and built to accommodate approximately 2.4 million cubic yards of sludge and contaminated soil from North End cleanup areas. Covering 30 acres, it is lined with a state-of-the-art triple liner system over compacted clay.



Arthur Stepback Repository during construction

In addition to recent cleanup activities, the repository will eventually be used to hold historically contaminated soil under existing facilities that will be removed when the current operations end.

Lower Kessler Canyon

In 1991, all stockpiled flue dust, a by-product from the smelting process, was removed from lower Kessler



Capping of soil placed in Arthur Stepback Repository

Canyon. An additional 161,000 cubic yards of contaminated soil containing elevated levels of arsenic and lead were removed from the site in 2000 and 2001 and disposed of in the Arthur Stepback Repository.

North End Soil and Wastewater Treatment Plant Sludge

The Wastewater Treatment Plant Sludge Ponds covered approximately 40 acres between the southwestern corner of the Magna tailings impoundment, the Kennecott refinery and the Great Salt Lake. These five ponds stored neutralized sludge high in arsenic and other metals. The sludge, which is no longer part of the production process, was generated by the wastewater treatment plant that processed water from the smelter, refinery, Utah Power Plant, Magna Concentrator facilities, and in-plant sewage.

2001 EPA issues Record of Decision for Lark, Butterfield, Herriman and South Jordan Evaporation Ponds projects

Kennecott completes North End Remedial Investigation and Feasibility Study

Kennecott completes North End Soil Removal

2002 EPA issues Consent Decree for Lark, Butterfield, Herriman and South Jordan Evaporation Ponds projects

Final Remedial Design for South End Groundwater project completed

Removing old facilities, cleaning their sites

continued

Approximately 917,000 cubic yards of contaminated material was excavated from the five wastewater treatment plant sludge ponds and relocated to the Arthur Stepback Repository.

Refinery Electrolyte Purification Ponds

These ponds were used to dispose of wastewater and spent process solutions. They were taken out of service in the mid-1970s after a new wastewater treatment plant was built. As part of the North Facility Soil Wastewater Treatment Plant Sludge Pond removal action, the electrolyte purification ponds were excavated and contaminated soil recycled to recover precious metals. Some of the contamination below these ponds was too deep to reach. A clay cap was constructed over the soil to prevent rainwater from infiltrating.

Smelter Slag Lagoon and I-80 Pond

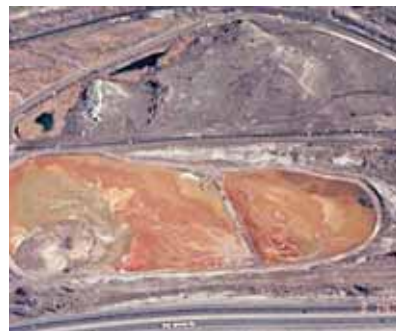
The Smelter Slag Lagoon held excess process water supply and excess storm water from Kessler Canyon. While Slag Lagoon sediments contained elevated concentrations of certain metals, the concentrations were not a risk to humans. However, they did present a potential risk to sensitive wetland species. As a result, during the summer of 2001, the lagoon was drained and contaminated sediments were relocated to the Arthur Stepback Repository. Contaminated soil containing elevated



Before: Lower Kessler Canyon



After: Lower Kessler Canyon



Before: Sludge pond C removal



After: Sludge pond C excavation



Refinery evaporation ponds cap in progress



Capping Arthur Stepback Repository

2003 Kennecott installs second acid extraction well

2004 Utah State Natural Resources Damages Trustee, Kennecott and Jordan Valley Water Conservancy District sign

agreement to implement and approve trust funds for Groundwater Extraction and Treatment Project

2006 Kennecott completes construction of first of two reverse osmosis water treatment plants

Kennecott completes demolition of Bonneville Concentrator in Little Valley and begins reclamation



Before: Beginning Slag Lagoon removal



After: Birds using the restored Slag Lagoon

levels of arsenic and lead were also removed from the I-80 Pond, which stretches along Interstate 80. Excavation and removal of the contaminated soil was completed during May 2001 and all soil disposed of in the Arthur Stepback Repository. One area with elevated arsenic sediments along I-80 was capped due to the proximity of a surface transcontinental communication line. Once the removal of contaminated

2007 Kennecott completes Magna Concentrator Complex demolition and begins revegetation

Kennecott begins remedial investigation and removal of the Bingham-Magna Ditch

2008 Consent Decree with EPA and UDEQ issued for South facilities groundwater

Consent Decree with US Fish and Wildlife for Natural Resource Damage Claim associated with North Zone wetlands

Removal of the proposed Superfund National Priorities List for Kennecott South Zone Site

soil was complete, sidewalls were sloped and 15 small islands were constructed. During fall 2001, native wetland plants were planted along all shorelines. During the removal of the Slag Lagoon soil, the earthen dike that separated the two sites was removed and a culvert under I-80 into the Great Salt Lake was opened. After remediation was completed, the area was refilled with water and is now used as wildlife habitat.

Smelter Footprint

Smelting has taken place on the south shore of the Great Salt Lake since 1906 when American Smelting and Refining Company, now ASARCO, built a smelter to process ore from Bingham Canyon. In 1959, Kennecott bought the smelter from ASARCO. The first smelter on the site was demolished in the late 1970s. In the mid-1990s Kennecott constructed a new state-of-the-art smelter, considered to be the cleanest in the world and the third at the same site,



Before: Smelter footprint demolition



After: Smelter footprint demolition

Removing old facilities, cleaning their sites

continued

Refinery Footprint

During modernization of the refinery in the mid 1990s, Kennecott encountered soil contaminated by process leaks under several demolished buildings. The soil was removed and either reprocessed to recover precious metals or hauled to the Arthur Stepback Repository. As part of the modernization, Kennecott replaced wastewater pipelines with double-wall pipes with leak-detection systems to prevent releases.



Before: Magna Concentrator demolition



After: Magna Concentrator demolition

Arthur and Magna Concentrators

The Arthur and Magna concentrators were built in the early 1900s and closed in 1985 and 2001, respectively. The Arthur Concentrator was demolished in 1989 and the Magna Mill was demolished in 2007. The sites have since been reclaimed and planted with native vegetation and the materials recycled.



Before: Bonneville Crusher demolition



After: Bonneville Crusher demolition

Restoring groundwater and bird habitat

The Challenge

Groundwater and soil contamination potentially threatened birds using North End wetlands.

North End operations are located adjacent to wetlands on the south shore of the Great Salt Lake, one of the world's most-valuable flyways and habitat for multiple species of birds and other wildlife.

Elevated selenium and arsenic levels are present in groundwater beneath and downhill from the smelter and refinery. Kennecott needed to control and clean up contaminated groundwater, as well as mitigate the impacts of contaminated water flowing into the wetlands.

The Solution

Stop the flow of contaminated water into the wetlands, remove contaminants accumulated in soil, and pump out contaminated groundwater.

After determining that the North End wetlands were potentially being affected by high levels of selenium, Kennecott identified the points where selenium-contaminated groundwater discharged naturally into the wetlands. Capture systems at a large spring and a flowing artesian well now divert water for industrial use by Kennecott. Following construction of these diversion systems, adjacent soil with elevated levels of selenium was relocated to the Arthur Stepback Repository. This removal complements other soil and sludge removals from the wetland area intended to restore conditions favorable to wetlands species, especially birds. Kennecott has subsequently conducted annual testing of water, soil, and wetland insects for selenium and has seen marked improvements in soil and water but slower improvements in insects. Monitoring continues and additional work may be necessary.

In 2008, Kennecott entered into a Natural Resources Damages Consent Decree with the U.S. Fish and Wildlife Service for alleged damages to migratory birds and bird habitat in the North End wetlands. Under the terms of the agreement, Kennecott will transfer 616 acres of land on the shore of the Great Salt Lake in Tooele County to The Nature Conservancy to enhance and conserve wetland habitat.

Kennecott also pumps water from an aquifer under the smelter where groundwater has elevated concentrations of arsenic and is used as process water. After more than five years of pumping, arsenic concentrations have declined notably.



The yellow headed blackbird, above, and the American avocet, are common visitors to Kennecott's restored North End Wetlands.



CONCLUSIONS

Collaboration saves time and money, betters the environment

The contamination in the western Salt Lake Valley that is the legacy of more than a hundred years of mining is significant, as is the amount Kennecott has spent and is spending to clean it up. Since the mid-1990s, Kennecott has demonstrated that continued success can be achieved while being open with the public and regulatory agencies about contamination challenges. Kennecott's decision to continue expensive assessment and cleanup activities during sometimes contentious negotiations with federal regulators confirmed its strong environmental commitment while doing what it believed was best for the future of the business.

This collaboration with EPA and the State of Utah to clean up the contamination was certainly in the company's best financial interests, but the company made the decision to look beyond the typical corporate

mindset and work to reduce risk to human health and the environment, and tailor cleanups to support future land uses that are in the community's best interest.

Meanwhile, the regulatory agencies also broke some new ground. Foremost, the partnership with Kennecott showed that alternative cleanup approaches could succeed at sites where the corporate commitment exists to address and fund contamination problems. By introducing flexibility in the regulatory process while remaining committed to their mandated responsibilities, the EPA and state agencies played an active part in ensuring the success of the cleanup projects. In addition, they improved communications by speaking to regulated parties with a unified message and establishing intra- and interagency coordinating committees, as well as a state-federal partnership. Finally, all parties realized the

importance of an open process and established technical review committees that allowed meaningful input from a wide range of stakeholders.

While the cleanup story for the Last Century Cleanup Program is coming to an end, mining at Bingham Canyon continues to thrive. With an eye on the past, Kennecott is taking steps now to ensure the environment is protected for generations to come.



Lessons learned

After more than a decade of working cooperatively with the EPA and the UDEQ, Kennecott has learned the following lessons:

- Faced with a slow, costly and cumbersome government program, companies and regulators who are willing to cooperate can achieve effective and cost-efficient solutions that benefit shareholders and the community.
- Under the correct circumstances, flexibility in the cleanup process can result in successful, timely and cost-effective cleanups.
- An open, transparent process builds trust among stakeholders and reduces regulatory overlap.
- Alternative, innovative cleanup processes can save time and money.

The Last Century Cleanup Program facts

Since the early 1990s:

- More than \$400 million spent to clean up historic mining wastes and install source-control measures
- 16.25 million cubic yards of mining wastes isolated, excavated, relocated, disposed of and/or permanently stabilized in place
- 6.25 million cubic yards of clean materials trucked in to support the cleanup work
- More than 3,340 acres of land restored, reclaimed or revegetated, including about 1,000 acres of new wildlife habitat and open space
- More than 135,000 trees and several thousand acres of shrubs, plants and grasses planted
- Nearly five million square feet of synthetic liner installed on about 100 acres to contain contaminated water and wastes in permitted repositories
- More than 10,000 cubic yards of concrete used to create cutoff walls and reservoir spillways at the Bingham Canyon Mine
- 580 groundwater monitoring wells installed throughout the North and South ends of the property