
Bingham Canyon
Open Pit Copper
Mine –
Orientation Guide
Jack Crawford
1976
Photo

# INTRODUCTION

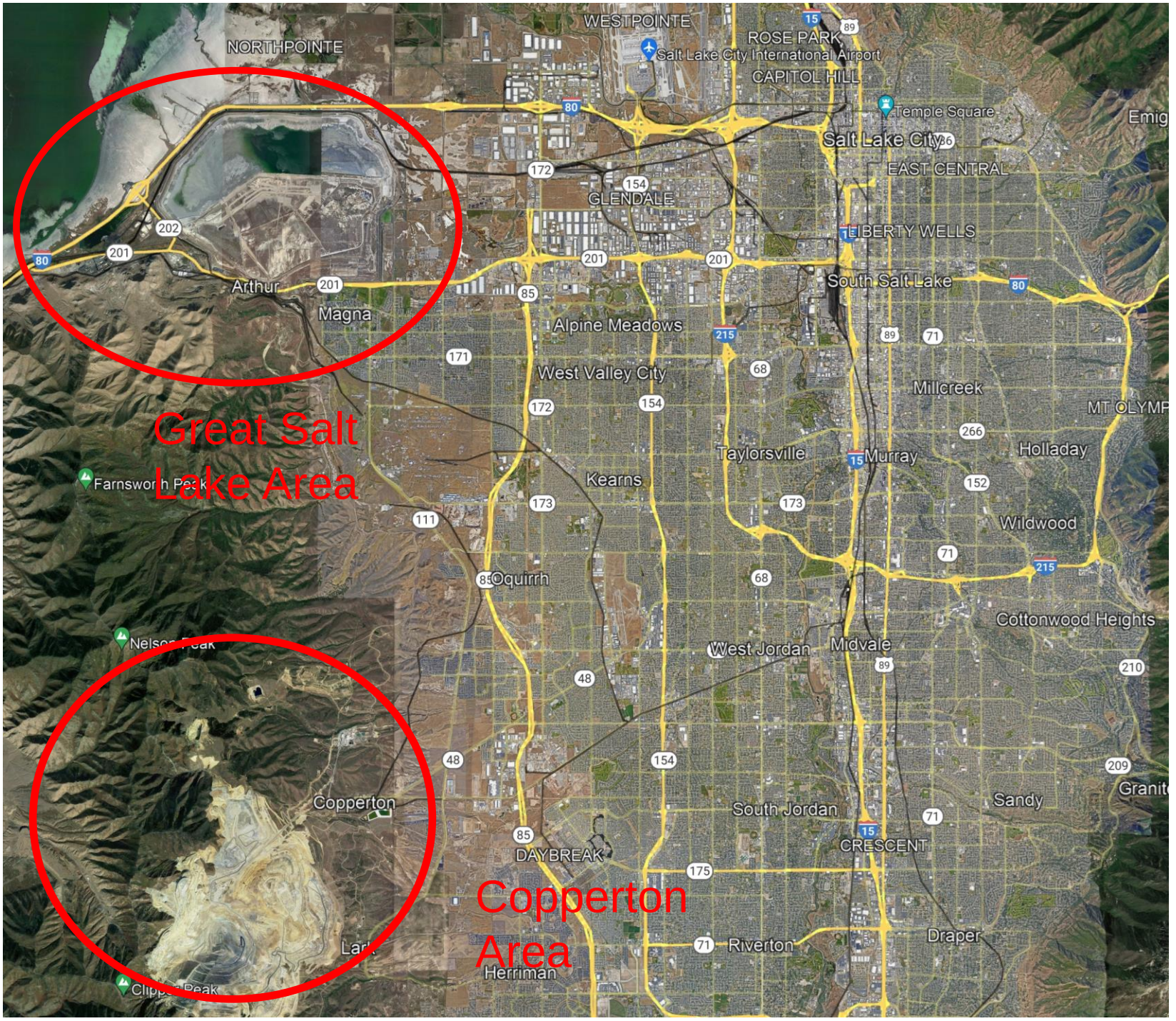
The famous Rio Tinto-Kennecott Bingham Canyon Copper Mine and Concentrator are located near Copperton, UT in the Salt Lake Valley approximately 25 miles southwest of Downtown Salt Lake City. The mine is the oldest (1906) and deepest (over 4,000 ft.) open pit copper mine in the world. The concentrator (1988) is the largest in the United States (150,000-160,000 stpd ore throughput rate).

The Rio Tinto-Kennecott Smelter (site used since 1905, current plant 1997) and Refinery (1950) are located west of Magna, UT and along the southern shore of the Great Salt Lake, approximately 18 miles west of Downtown Salt Lake City. Concentrator tailing disposal ponds and sites of power plant and former concentrators are there also.

This guide explains how to reach these two areas and what can be seen when you get there. Historic and recent photos show how the Mine, plants, and technologies have evolved during the over one hundred years of operation.

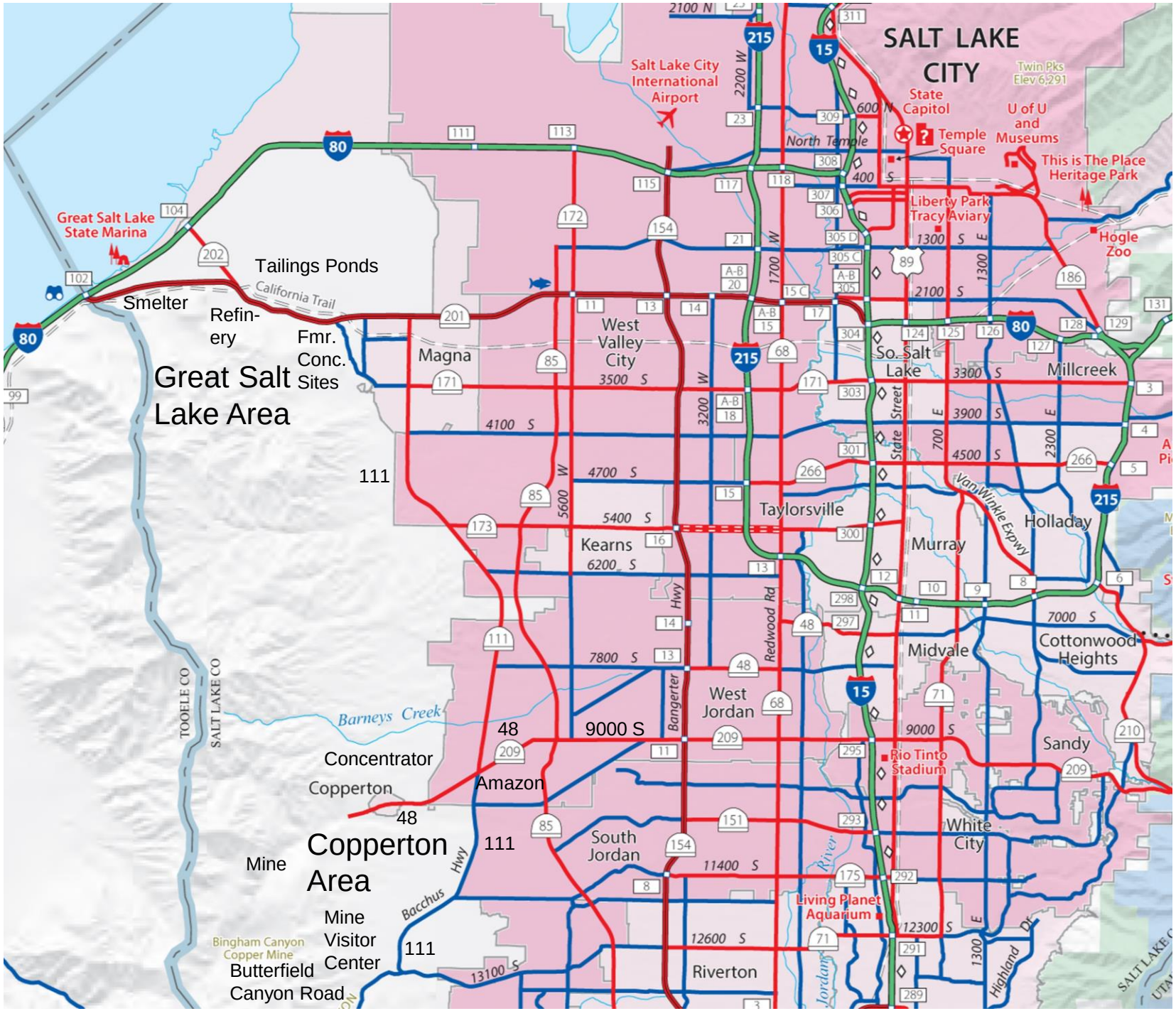
PLEASE NOTE: It is necessary to take the Kennecott Experience Tour to see the huge open pit mine.

There are no known public roads off main highways in all areas of interest, making close-up views difficult.




Salt Lake Valley Satellite Map

# Salt Lake Valley Map




I-80 From Park City

# Where to Go and What's There

## Copperton Area

- Open Pit Copper Mine
- Mine Visitor Center and Pit Overlook
- Mine Waste Dumps
- USMS&R Lark Mine surface facilities – brick building and green water tank

- Butterfield Canyon West Mtn. Pit Overlook - if road open, last part of road very rough

- Copperton Village
  - Village
  - End of Bingham Canyon Waste Dump
  - Ore Conveyor to Concentrator from mine down face of waste dump
  - Cone Precipitation Plant Site – not sure if can see from public access
  - SX-EW Plant for recovering copper from waste dump runoff water – right side of road at fence
  - Ore Haulage Yard Site – to left of overpass as enter village

- Copper Concentrator
- Barney's Canyon Gold Mine Pit Highwall

# Where to Go and What's There

## Great Salt Lake Area

Town of Magna
175 MW Company Power Plant - inactive
Magna Concentrator Site
Bonneville Crushing and Grinding Site
Arthur Concentrator Site
Tailings Disposal Ponds
Garfield Copper Electrolytic Refinery
Garfield Smelter - fourth smelter on site
Remnants of old smelter slag piles

Sequence of locations from east to west

# Suggested Tour Sequence to Rio Tinto-Kennecott Facilities

– requires about ½ day

Go to mine visitor center and take shuttle bus to visitor pit overlook.

Go north on Route 111 (Bacchus Highway) to Route 48 and turn left.

Proceed to Copperton Village, look at items of interest there.

Return to Bacchus Highway and turn left and view concentrator and Barney's Canyon Gold Mine pit high wall on left,

Proceed north on Bacchus Highway to Magna, viewing remnants of ore haulage right of way from Copperton to former concentrator sites.

At end of Bacchus Highway in Magna turn left and proceed to west past Great Salt Lake area processing sites and facilities.

# Open Pit Mining and Processing Timeline

1863 – Discovery of copper in Bingham Canyon.
1898 - Formation of Boston Consolidated.
1900 – Boston Con. underground development begins in Carr Fork, production stopped 1914.
1903 – Formation of Utah Copper.
1903 – Utah Copper underground development begins, production stopped 1910.
1904/1910 – Utah Copper Bingham Canyon Mill operated, pilot plant testing and evaluation of early mill methods.
1905/06 – ASARCO Garfield Smelter built, 2 reverbs., 6 converters, blister product.
1906 – Utah Copper and Boston Con. begin open pit mining.
1907/2001 – Utah Copper Magna Concentrator operations.
1909/1984 – Boston Con./Utah Copper Arthur Concentrator operations.
1910 – Utah Copper buys Boston Consolidated.
1911 – Bingham & Garfield RR opens, ore haulage mine to Great Salt Lake concentrators.
1914 – Flotation developed.
1915 – Kennecott Copper formed, acquires Guggenheim 25 % interest in Utah Copper.
1916 – First sulfuric acid plant at smelter, several more over the years.
1918/26 – Arthur and Magna Concentrators gravity separation changed to flotation.
1921 – First crude copper leaching at mine, active waste dump leaching began in 1929, both used iron precipitation.
1924 – First ball mills at concentrators.
Late 1920s – Mine rail haulage changed from steam engines to electric locomotives.
1936 – Kennecott completes acquisition of Utah Copper.
Molybdenum concentrate production begins.
1937 – First full revolving electric shovel at mine.

1948 – Ore Haulage changed from B&G RR steam to Copperton yard and electric low line.
1950 – Electrolytic Refinery built, modernized to Isa Kidd systems in 1995.
1958 – Contractor removes waste from high west side of pit using trucks.
1959 – Utah Copper buys ASARCO Garfield Smelter, 5 reverbs, 8 converters, anode casting.
1963 – Yosemite truck shop built, closed 1986.
1963/65 – Mine changed from rail to truck haulage above 6290 level.
Drilling and blasting changed from rock drills and dynamite to rotary drills (7 7/8,10 5/8, 12 ¼ inch holes) using an-fo explosives, with various delays over the years.
Dump leaching developed to 50,000 gpm. and cone iron precipitation plant built.
1963/4 – Smelter modified to 3 green feed large reverbs, roasting removed.
1966/2001 – Bonneville Crushing and Grinding operations.
1974/78 – Noranda Reactor smelter built.
1983 – All mine haulage becomes trucks.
All rail operations on mine levels ceased.
Rail ore reload and haul to Bonneville ends in 2001.
1986/2013 – First truck shop in 6190 area, destroyed by 2013 Manefay slide.
1988 – Copperton Concentrator begins operations with in-pit primary crusher.
1995/97 – Outukumpu flash smelter built, replaced Noranda reactor plant.
1997 – Waste dumping in Bingham Canyon begins.
2000 – Active dump leaching stopped, cone iron precipitation plant closed.
2006 – Copperfield truck shop built in 6190 area, expanded in 2011.
2021 – In-pit crusher moved from pit to 6190 area, 5490 tunnel instability.
2024 – Current mine production equipment: 8 Atlas-Copco blasthole drills (12 ¼, 10 5/8, 7 7/8 in. holes), 8-10 P&H 2800 and 4100 electric rope shovels (45-72 cu. yds.) and 2 large hydraulic back hoes, 106 Cat 794 and Komatsu 930 360-ton diesel-electric haulage trucks.

# Copperton Area

How to Get There

From Park City - I-80 west from Park City to intersection with I-15 in Salt Lake City. South on I-15 to 9000 South, West Exit.

From SLC Airport – Bangerter Highway (SR-154) from airport south to 9000 South, West Exit.

West on 9000 South angling on to SR-48 (New Bingham Highway).

Proceed west on SR-48 to SR-111 (Bacchus Highway, runs north, south from Magna to entrance to Butterfield Canyon near mine visitor center), Amazon large warehouse and fulfillment center on left at intersection with traffic lights.

Proceed through intersection on SR-48 to go to Village of Copperton.

Go north of intersection on Bacchus Highway short distance for views of copper concentrator and Barney's Canyon Gold Mine open pit high wall.

Proceed south on Bacchus Highway past east side waste dumps to mine visitor center (look for red Rio Tinto signs, entrance road off employee entry road) or to Butterfield Canyon Road (to get to West Mtn. view point if road open).

Get tickets online or at visitor center, cost about $7 per person goes to company sponsored charity fund, for shuttle bus to visitor pit overlook, ride provides views of waste dumps, primary crushed ore conveyor and copper concentrator.

# Highlights of Copperton Area

Open Pit Copper Mine – 1906, planned life - 2040, upper benches about 8,100 ft. elev., bottom below 3,990 ft. elev., ore production 150,000-160,000 stpd., strip ratio about 3:1.

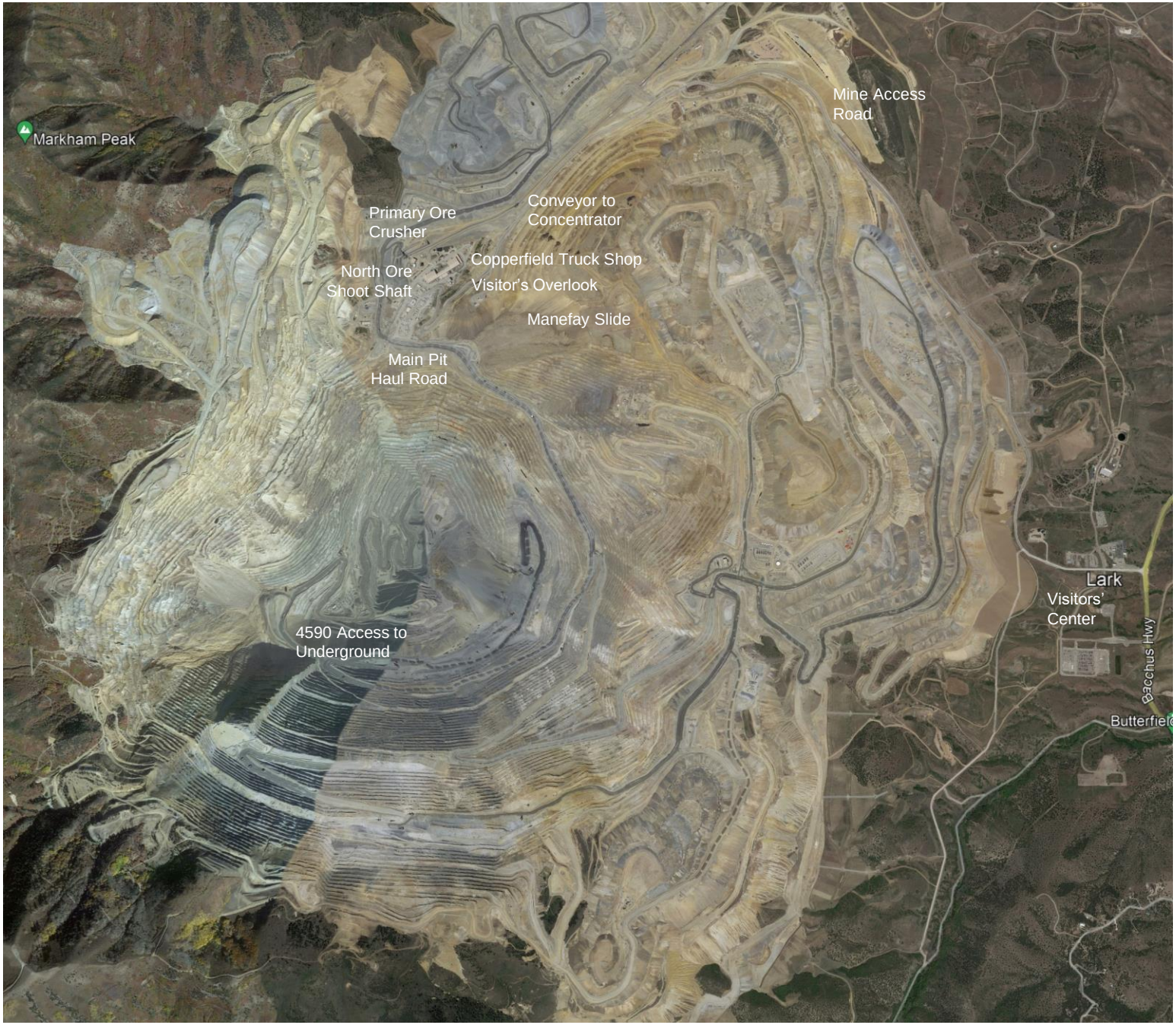
6190 Area – Copperfield Shop for mobile equipment replaced Yosemite Shop, Primary ore crusher and conveyor, North Ore Shoot shaft headframe.

Underground Mining – North Ore Shoot Shaft, 4590 production access area in pit.

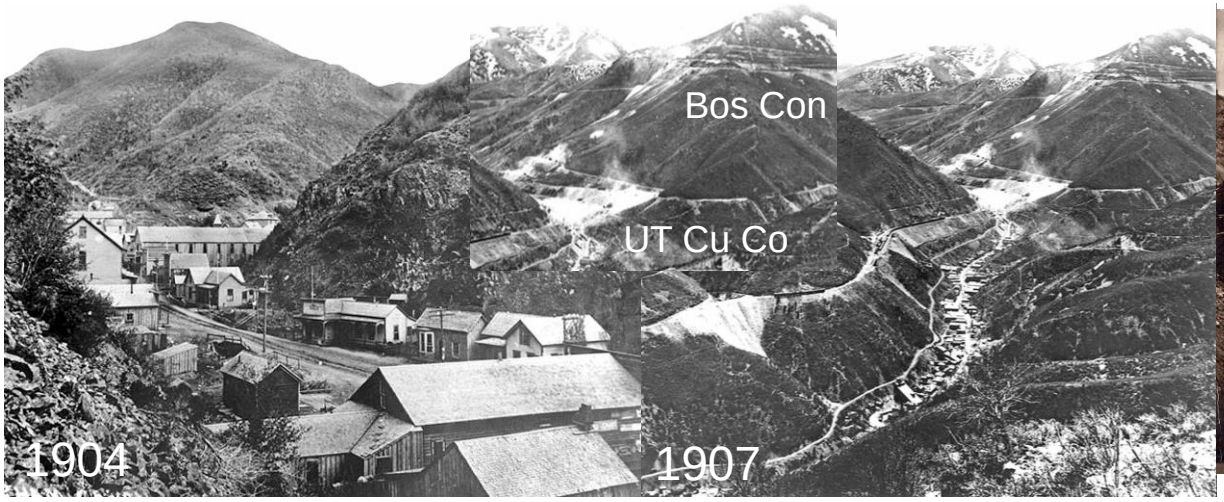
Barney's Canyon Gold Mine – Pit 2 highwall.

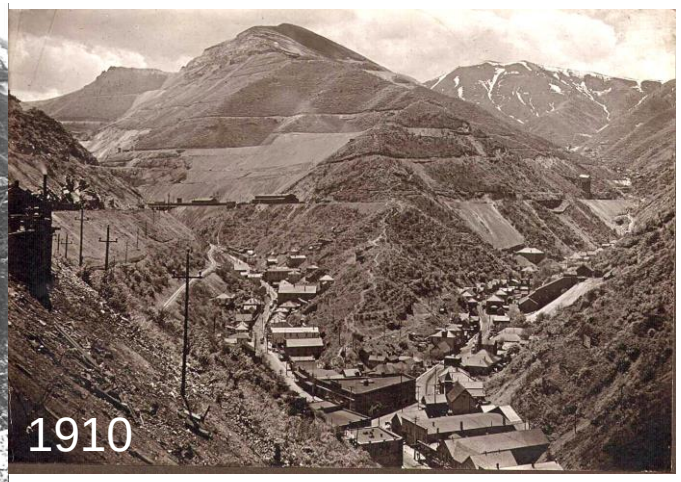
Waste Dumps – Yosemite 1964, East Side/Copper 1964, old rail early 1900s, Bingham Canyon 1997 buried initial North Ore Shoot shaft collar, Dry Fork rail shop area, North Side/Dry Fork old rail early 1900s; lower slope reclamation, drainage control.

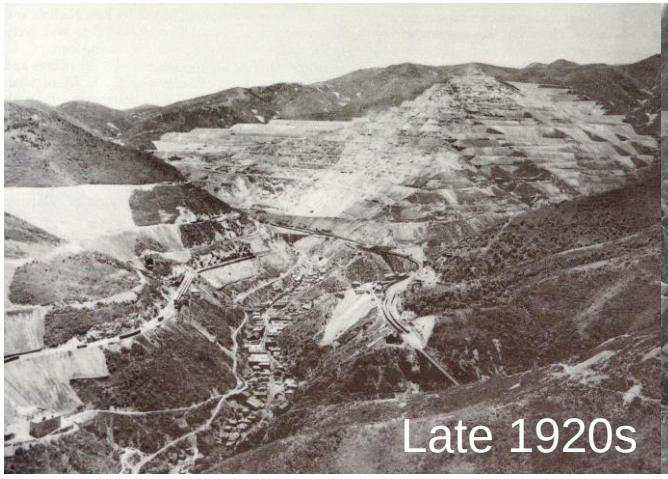
# Aerial View of Bingham Canyon Open Pit Copper Mine - 2022



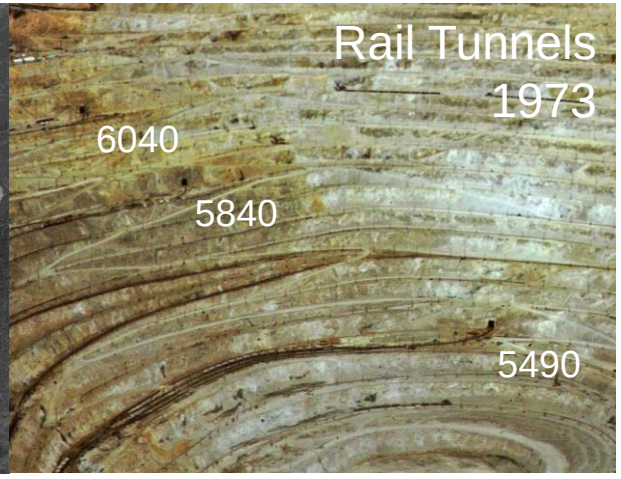
# Bingham Canyon Open Pit Evolution – from 1906



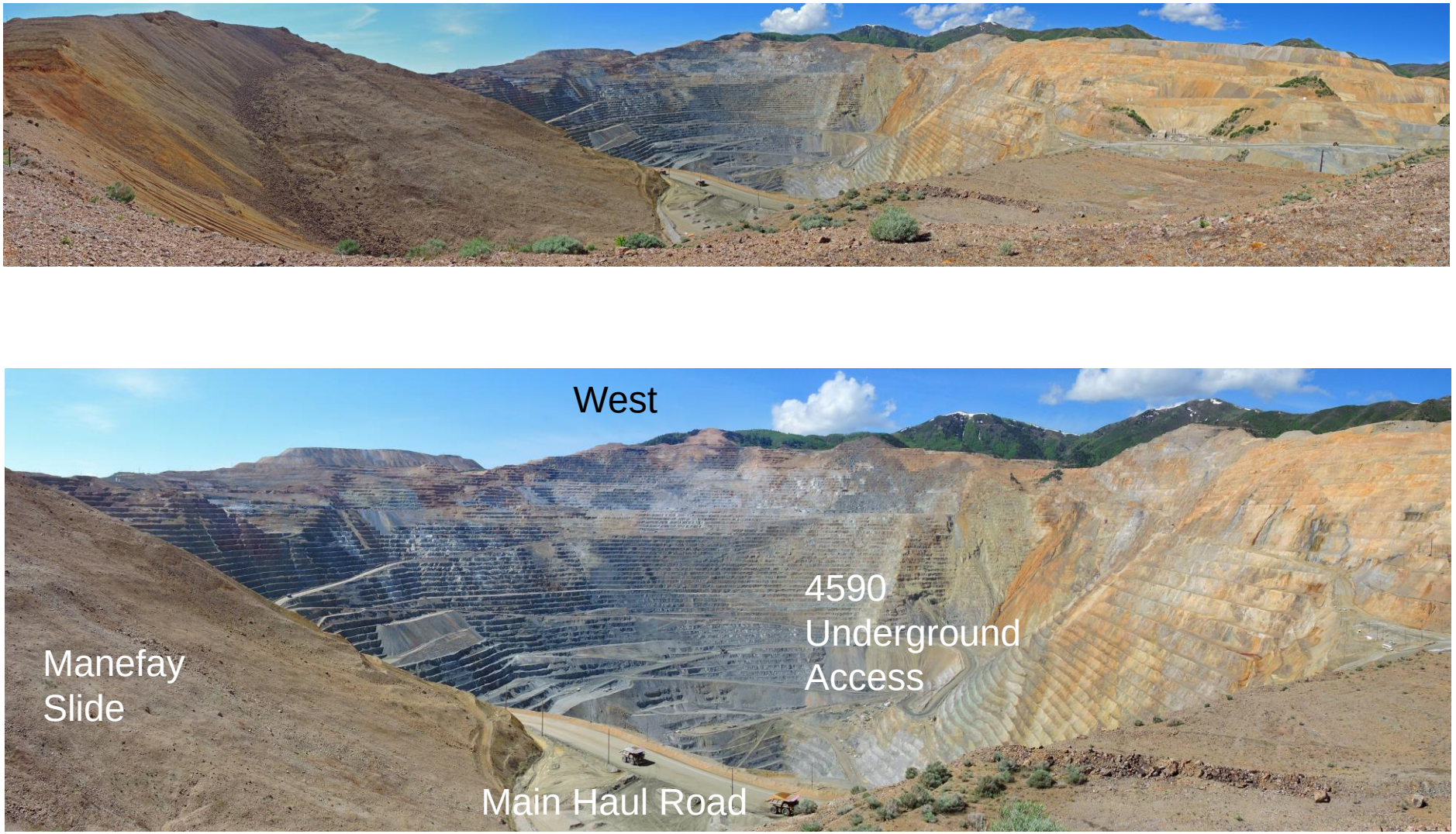







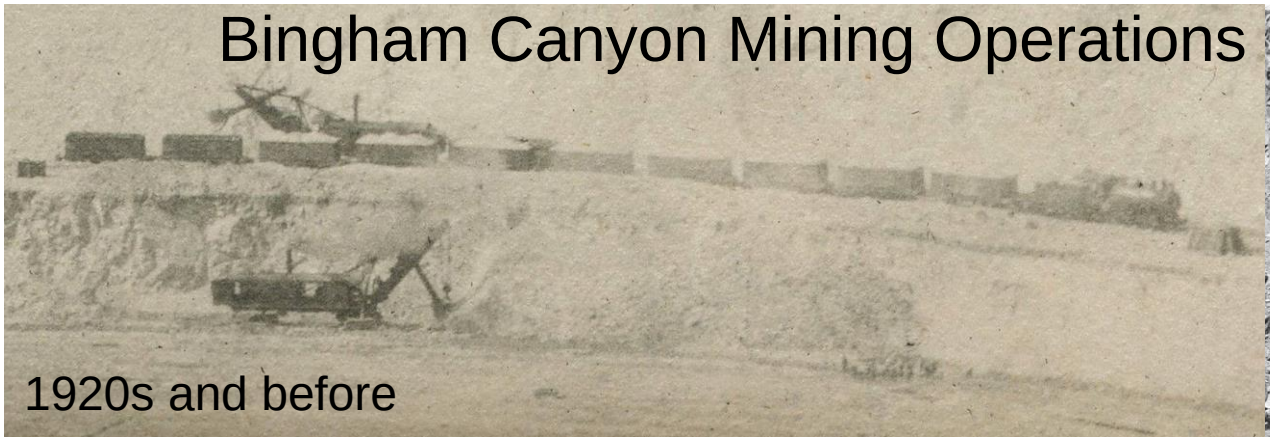


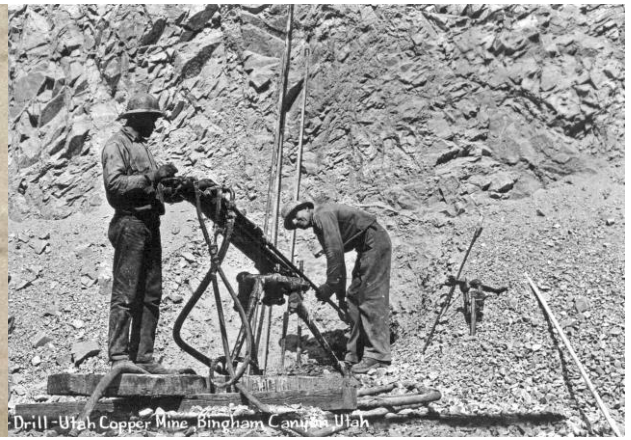

North Side 2014



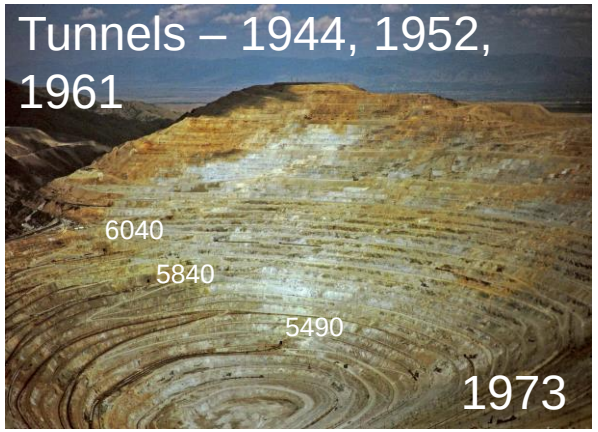

Bingham Canyon Open Pit Copper Mine
from Visitors' Overlook – June 2023

# Bingham Canyon Mining Operations



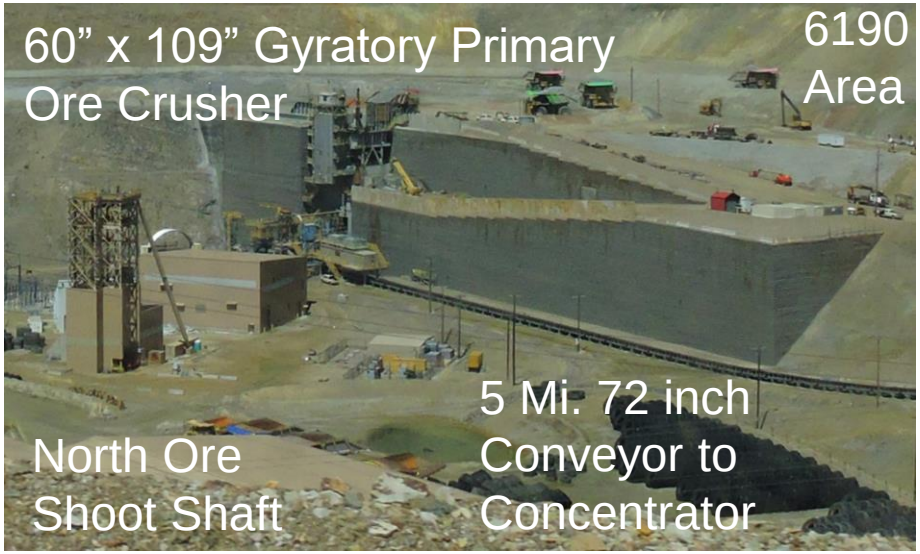




# Bingham Canyon Mine Operations – June 2023






# Bingham Canyon Mine Waste Dumps – June 2023

East Side (left) and Dry Fork (right) Waste Dumps

Yosemite Waste Dumps

With lower slope reclam-
ation and drainage control

View from Bacchus Road

# Highlights of Copperton Village

Ore Haulage – 1948, Copperton Yard, remnants of track right of way west of Bacchus Highway between Copperton and Magna.

Copperton Concentrator – 1988, concentrate and tailings slurries by pipelines to smelter and tailings disposal ponds at Great Salt Lake.

Village of Copperton

- Village – established 1926, replaced Town of Bingham Canyon as open pit mine expanded.
- SX-EW Plant – 2008, recover soluble copper from waste dump runoff water
- Cone Iron Precipitation Plant Site – 1966 – 2001.
  - Replaced previous vat/launder system, soluble copper recovered from active dump leaching by iron precipitation 1929 – 2001.
- End of Bingham Canyon waste dump
- Ore conveyor from mine to concentrator down face of dump

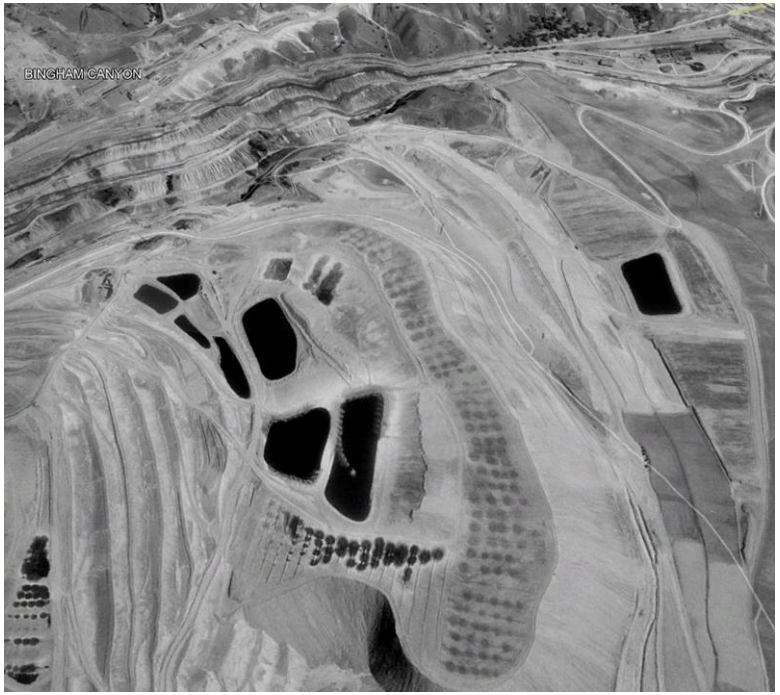
# Copperton Village Area – satellite view

# Waste Dump Leaching

Dump Leaching – 1929-2000, leaching water up to 50,000 gpm. to dumps.

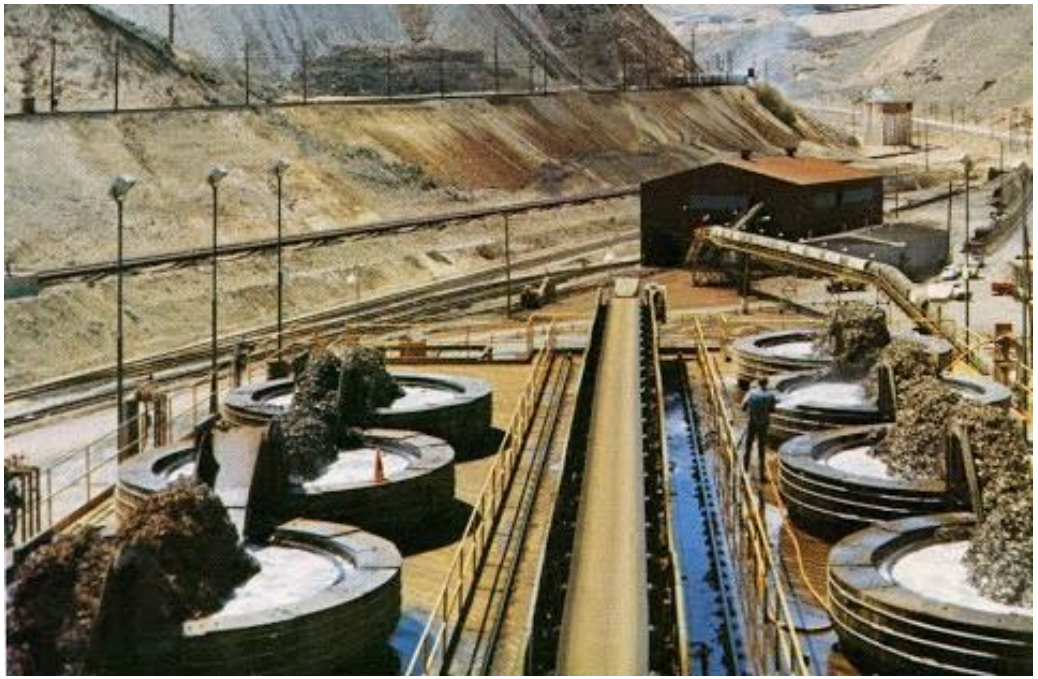
Vat/Launder Iron Precipitation - 1929-1966.

Cone Iron Precipitation Plant – 1966 – 2000.
- Kennecott invention.
- Precipitate (70 % Cu) processed at smelter.
- Active dump leaching stopped and plant shutdown 2000.

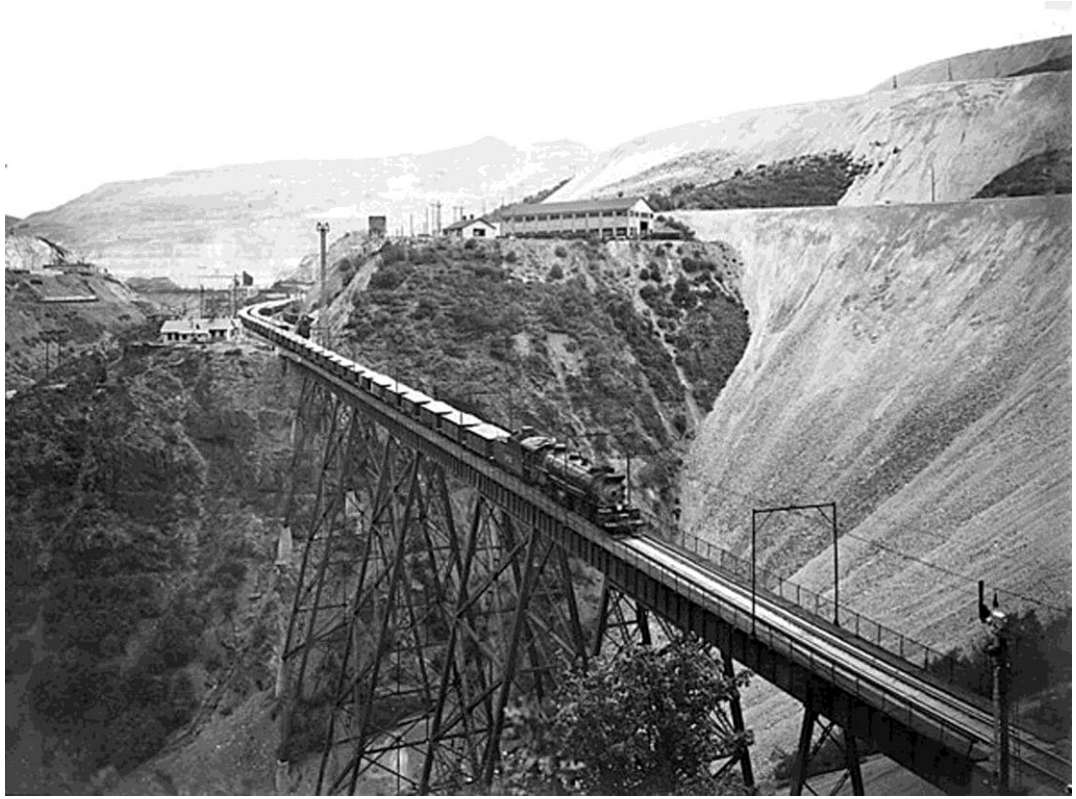



Dump Leaching Areas – 1990s

Solvent Extraction – Electrowinning
- Plant constructed at Copperton 2008
- Copper bearing solution treated is natural runoff from waste dumps before further processing for disposal, some to Magna tailings area.



Cone Iron Precipitation Cone Plant

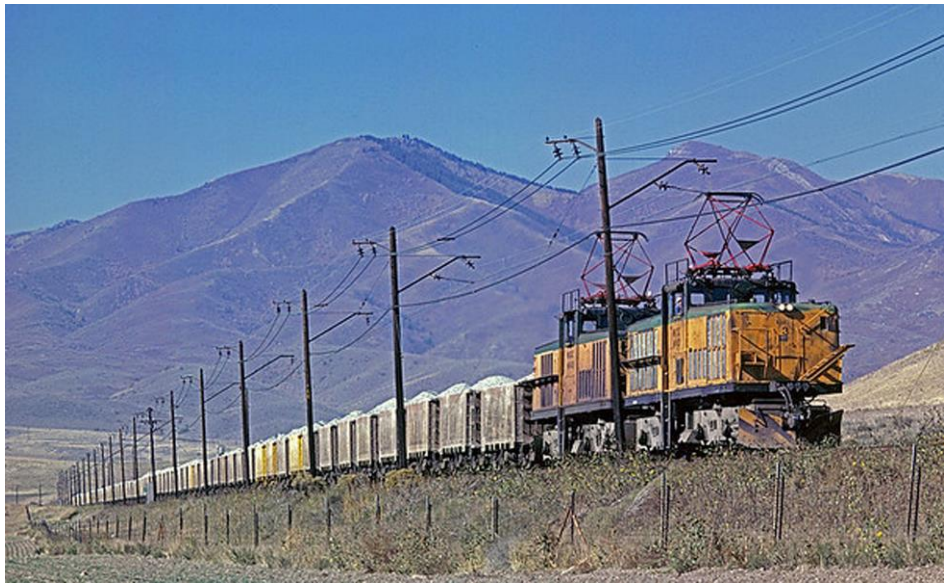


# Ore Haulage to Concentrators at Great Salt Lake

Bingham & Garfield
Railroad
Steam 1911-1948

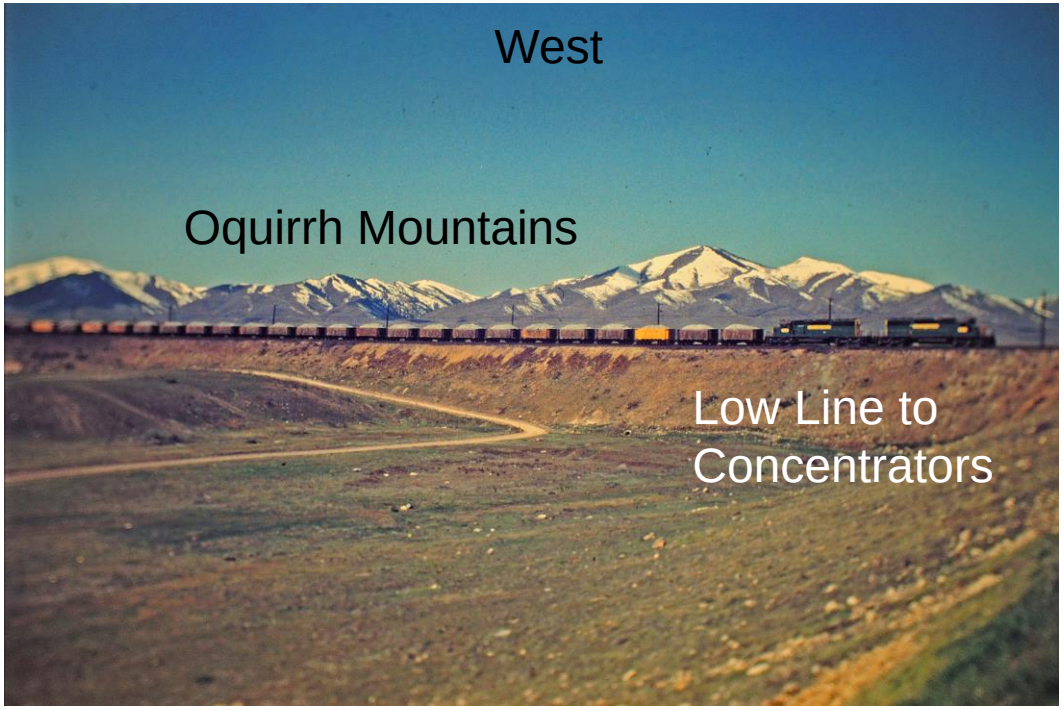
Low Line
Electric 1948-1984

Diesel 1984-2001



Copperton Yard - 1981

# Ore Haulage Low Line




Copperton Yard to Magna, Arthur and Bonneville Concentrators 1948-2001.

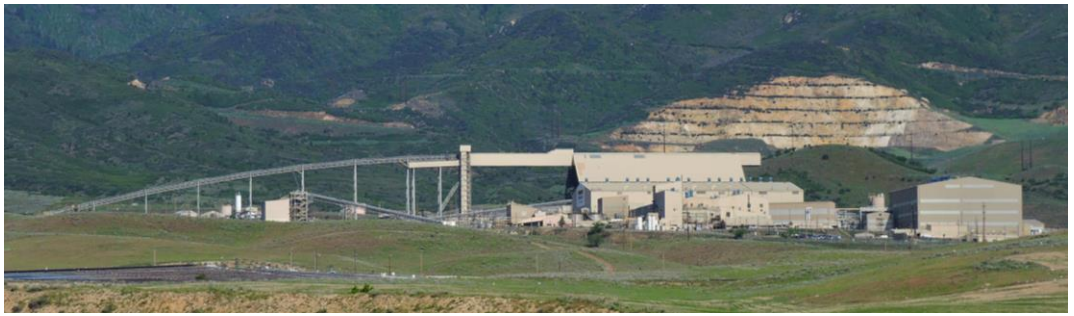
Remnants of track right of way visible west of Bacchus Highway north of Copperton.

EMD SD40-2 diesel-electric locomotives, 3,000-hp. Used 1978-1984.

# Concentrators in Copperton Area

Bingham Canyon Pilot Mill – 1904 – 1910

Site buried under waste dump in canyon.



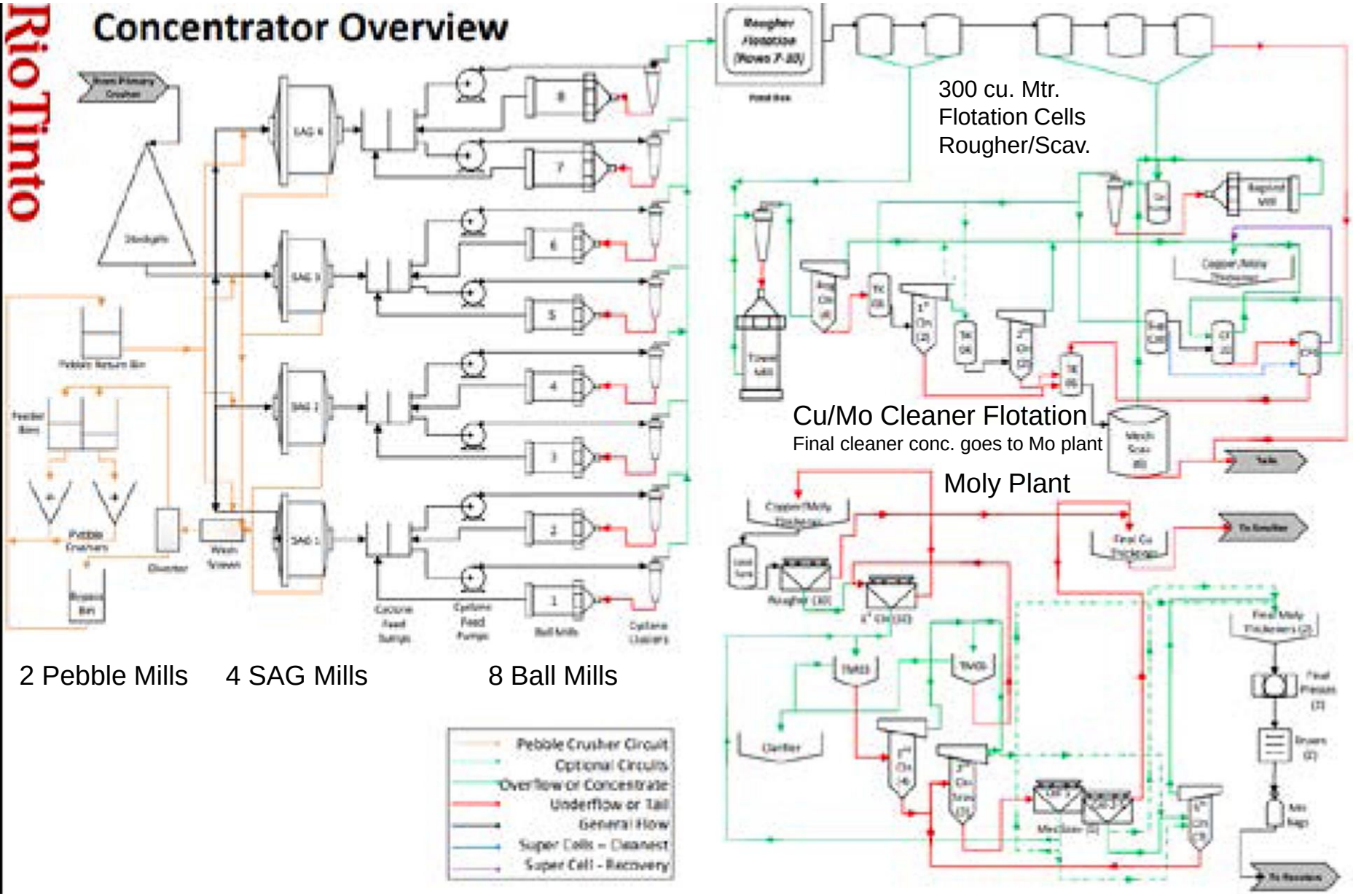
Copperton Concentrator and Barney's Canyon Gold Mine Open Pit High Wall from Bacchus Highway - 2023


Copperton Concentrator View from Mine Access Road

Operating since 1988.

# Copperton Concentrator Aerial View

# Copperton Concentrator Flowsheet



# Copperton Concentrator Operations

SAG 3 34’x15’, 36’x17’ and Ball Mills 6 28’x18’, 2 30’x20’

Ball Mill Sizing Cyclones - 2023

10,000 Cu Ft Flotn. Cells - Bulk Rough., Scav.

Cu Mo Bulk Conc. Thickener – 2023

# Great Salt Lake Area

How to Get There

From Park City - I-80 west from Park City to intersection with I-15 in Salt Lake City.

From SLC Airport – Bangerter Highway (SR-154) from airport south to 2100 South Freeway (SR-201), West Exit.

Follow signs to 2100 South Freeway West, also indicated on maps as SR-201.

Proceed west on highway through Magna.

Production facility sites of interest are on the left west of Magna and tailings disposals ponds are to the right.

The road ends at I-80.

# Highlights of Great Salt Lake Facilities

South of Highway

Power Plant – 1944 – 2019, now closed, 4 coal/gas fired boilers and generators, installed 1944 - 1960, 175 Mw capacity, supplied electric power for mine and Great Salt Lake facilities, now all power is from Utah Power and Light.

Magna Concentrator Site – crushing and grinding 1907 – 1988, gravity separation 1907 – 1920s, flotation 1920s – 2001, ore throughput 6,000 – 45,000 stpd.

Arthur Concentrator Site – 1909 – 1984, gravity separation 1909 – 1920s, flotation 1920s – 1984, ore throughput 3,000 – 45,000 stpd.

Bonneville Crushing and Grinding Plant Site – 1966 – 2001, ore throughput 28,000-35,000 stpd, slurry to Arthur and Magna for flotation.

Garfield Smelter – 4 smelters on site since 1905, current smelter since 1997, 300,000 stpy. copper anodes capacity, 1,215 ft stack, oxygen plant, 1 million stpy. acid plant, various acid plants since 1916.

Garfield Electrolytic Refinery – since 1950, modernized to Isa Kidd system 1995, precious metal refining, initial capacity 200,000 stpy. copper.

North of Highway

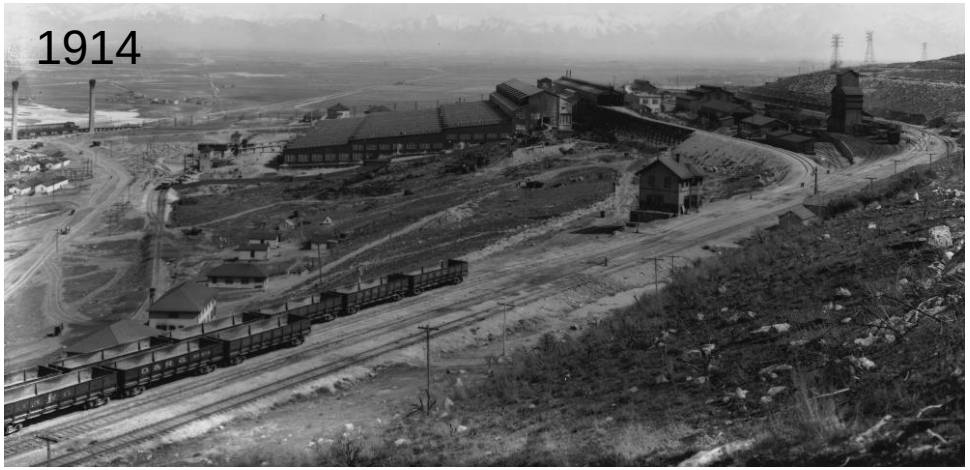
Concentrator tailings disposal areas – 1907, expanded mid-1990s, also used for current smelter slag disposal.

Remnants of old smelter slag pile areas, much used for railroad track ballast.

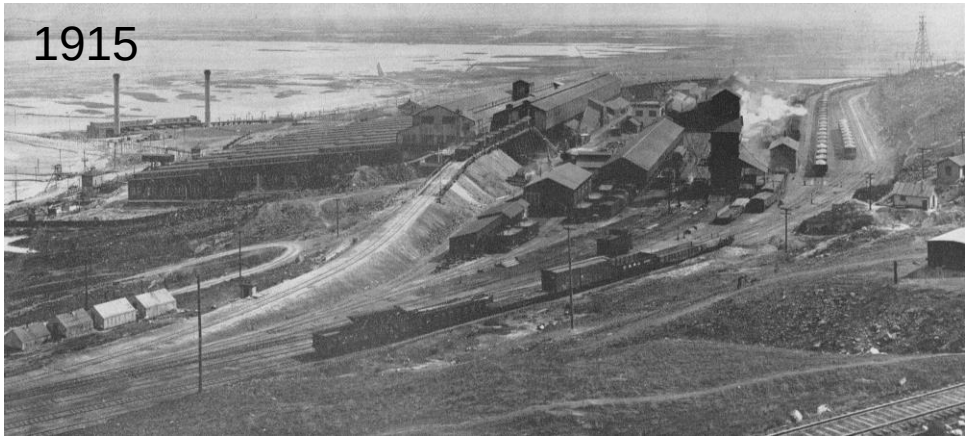
# Great Salt Lake Concentrators and Power Plant Sites

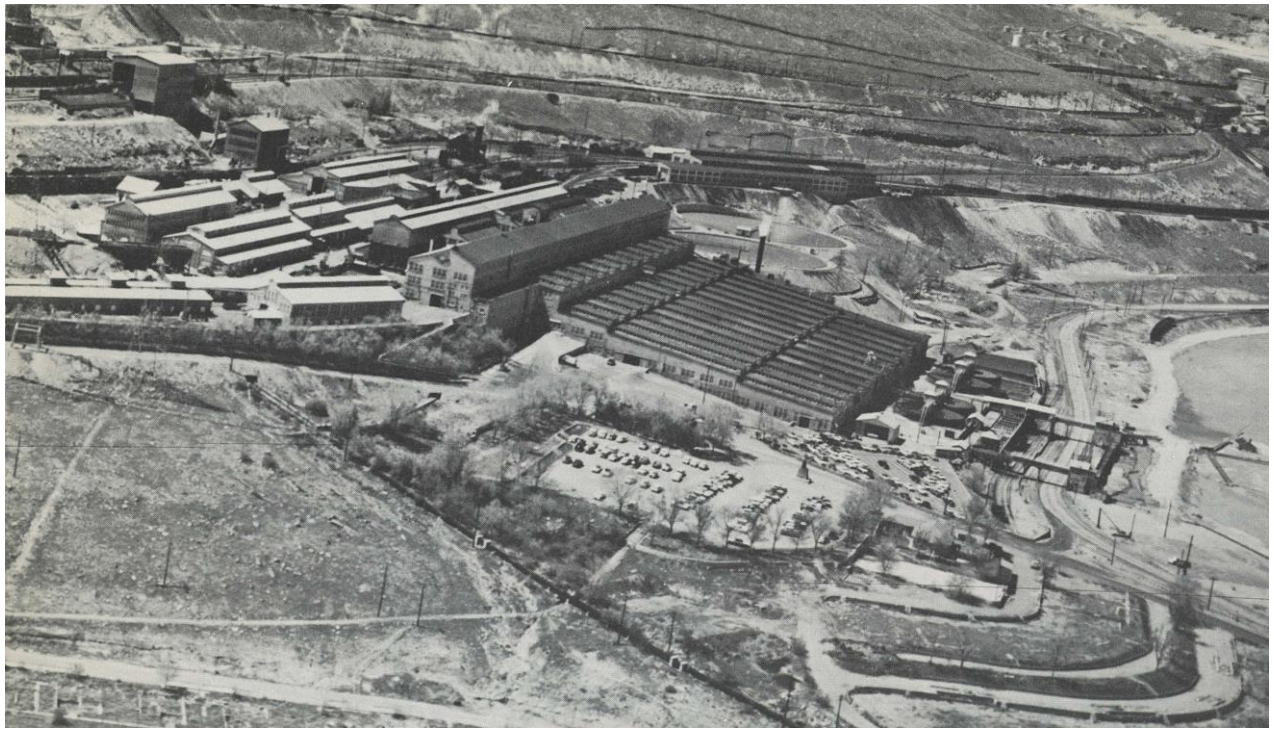
# Arthur Concentrator - Early Years - Magna Concentrator



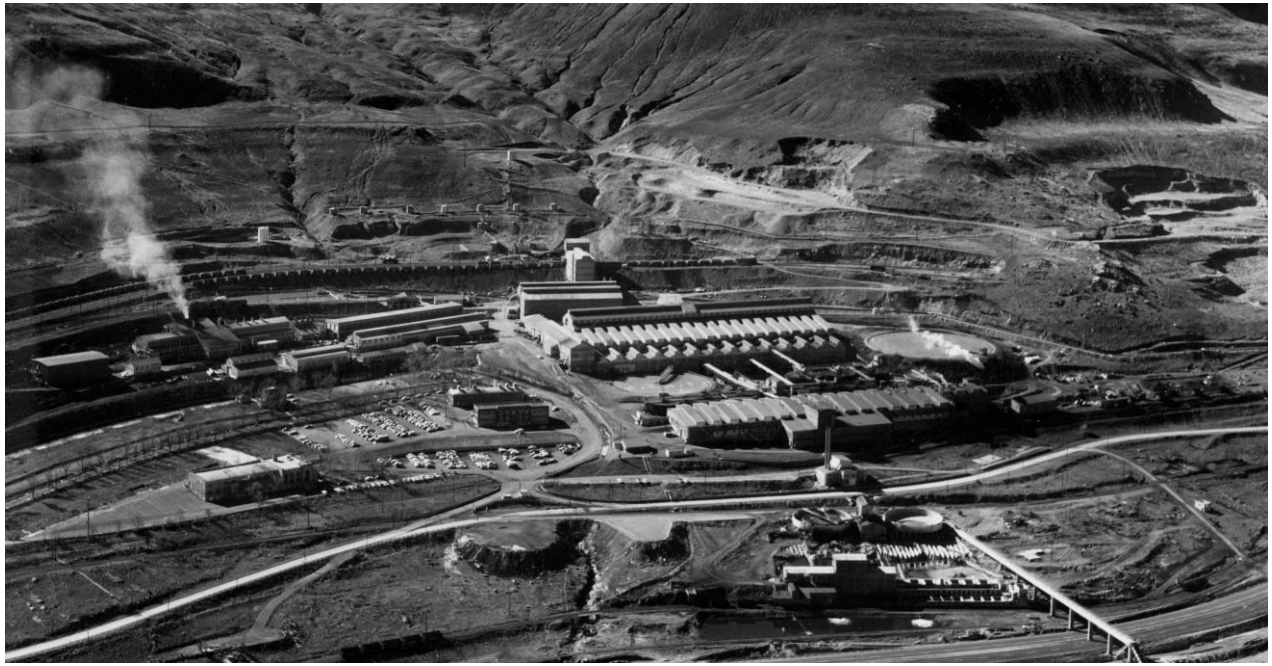







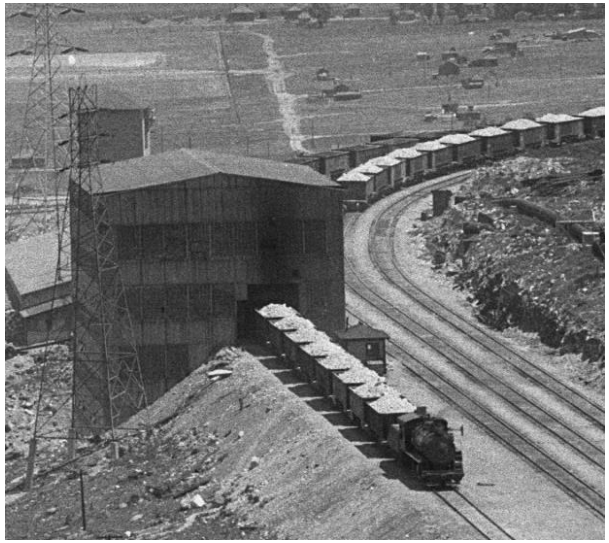


Magna Concentrator
- 1961

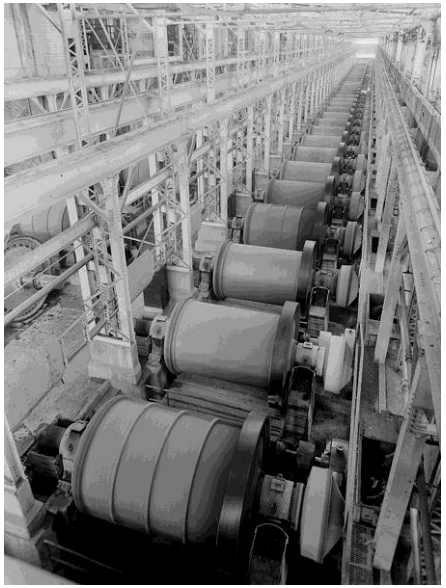


Arthur Concentrator
- 1961

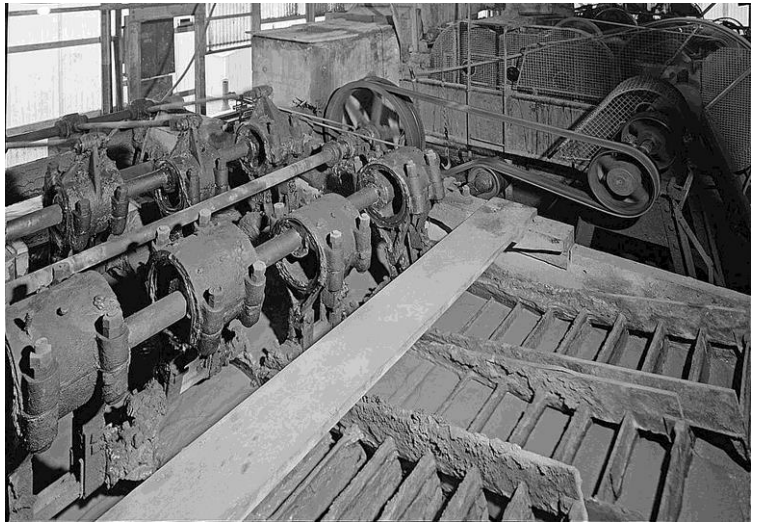
# Arthur and Magna Concentrators Operations



Magna Ore Car Dumper 1924



7” x 10” Ball Mills



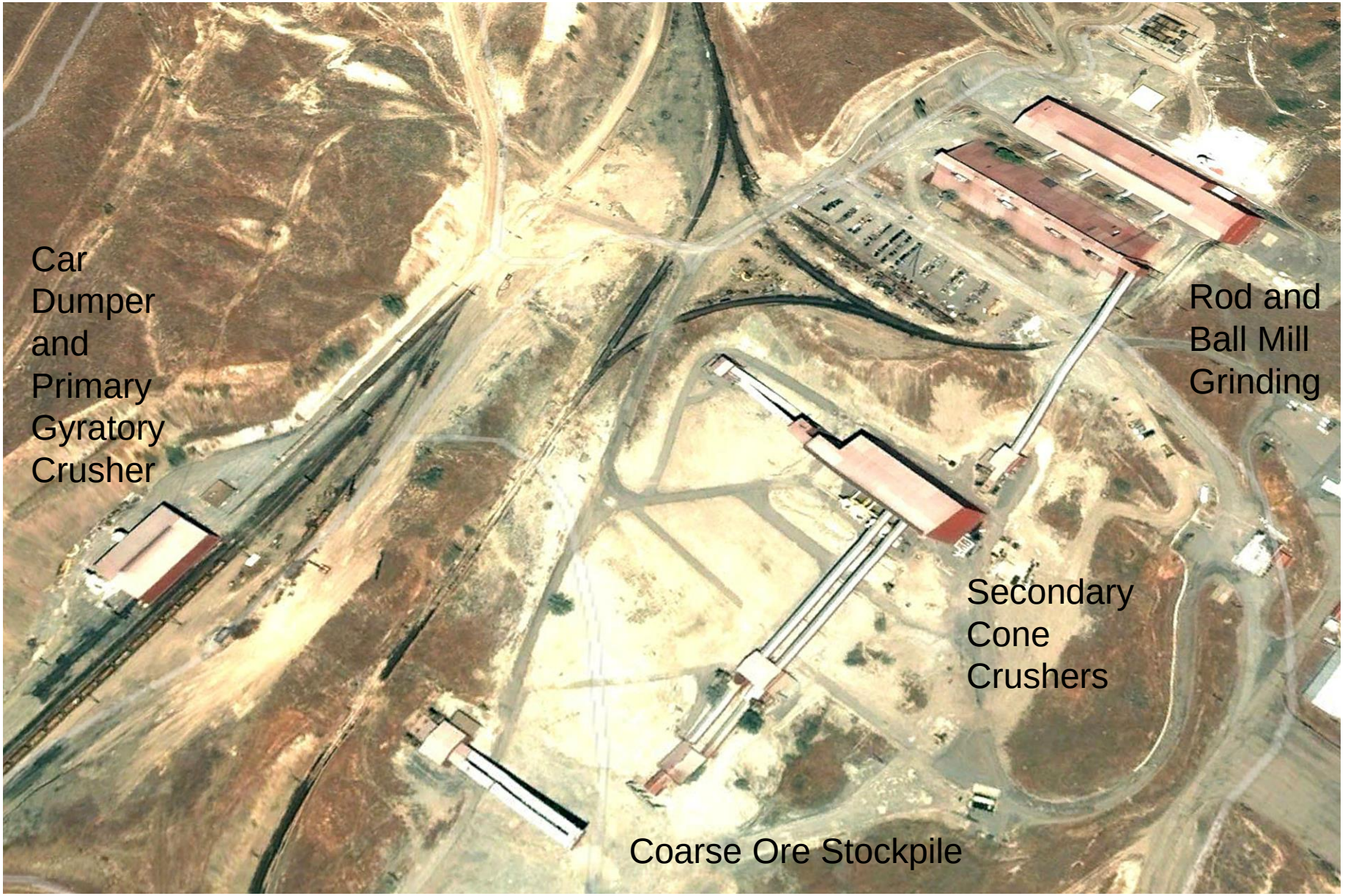
Rake Classifier


100 Cu. Ft. Flotation Cells

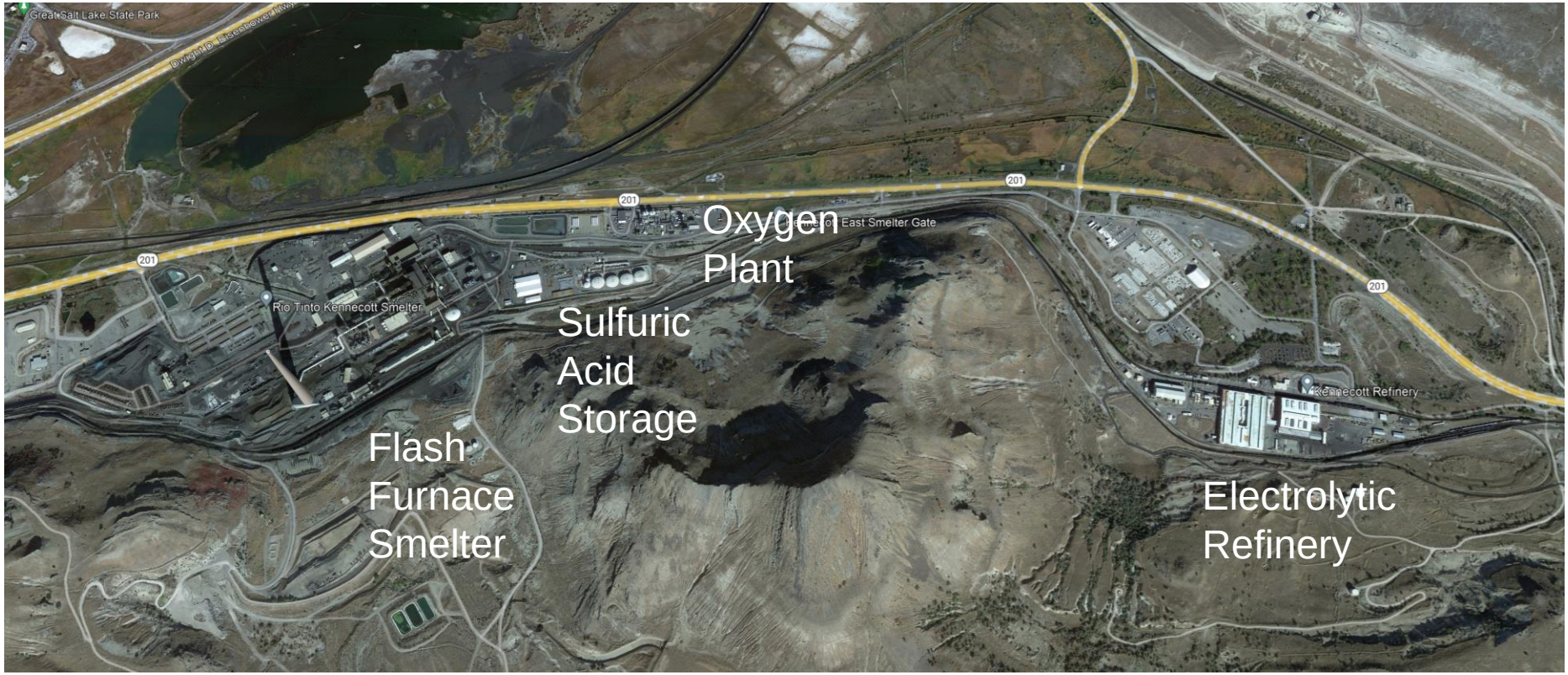
Flotation Concentrate Froth

Magna Ore Car Rotary Dumper

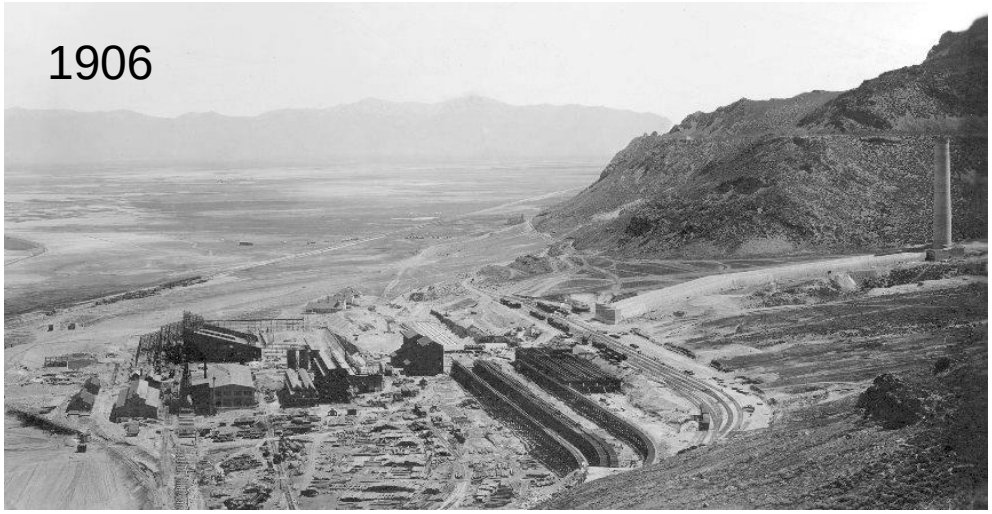
# Bonneville Crushing and Grinding Plant – 2003 Aerial



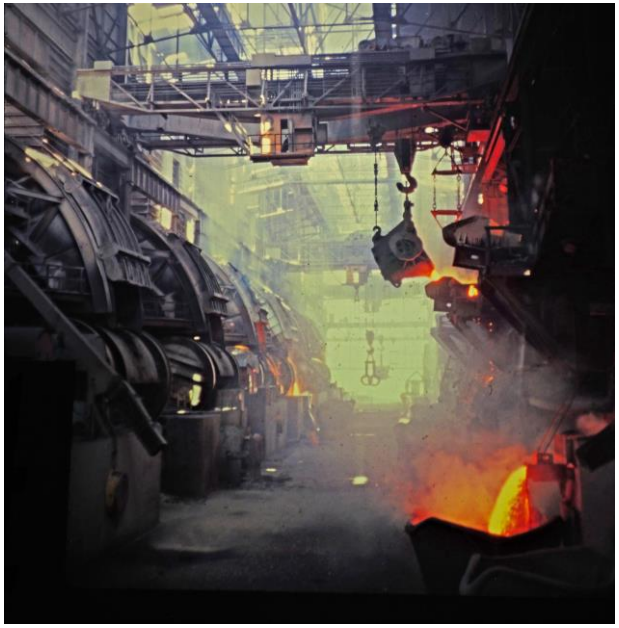
# Aerial View of Smelter and Refinery



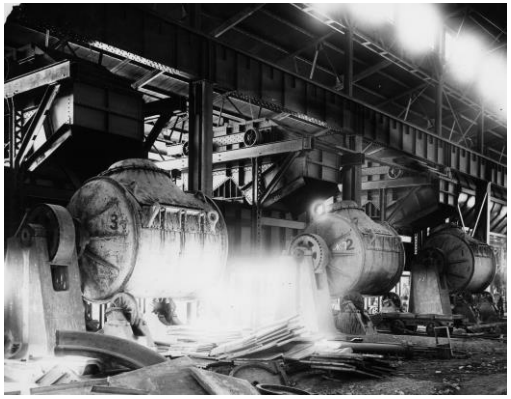
# ASARCO Garfield Smelter



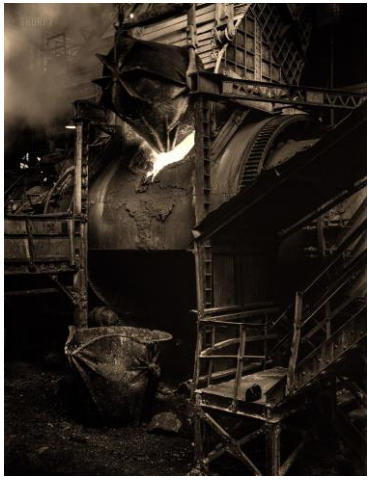

Slag Pile



Converter Aisle Example



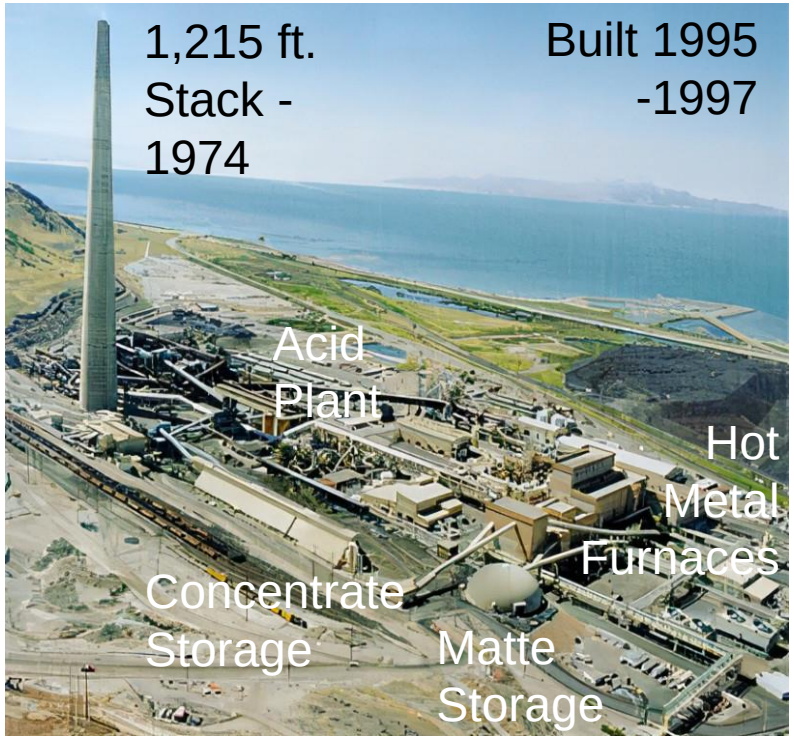
Early Barrel Converter



Pierce–Smith Converter 1942

Blister Casting 1942

# Outukumpu Kennecott Flash Smelting and Converting




Garfield Smelter and 1,215 ft. Stack

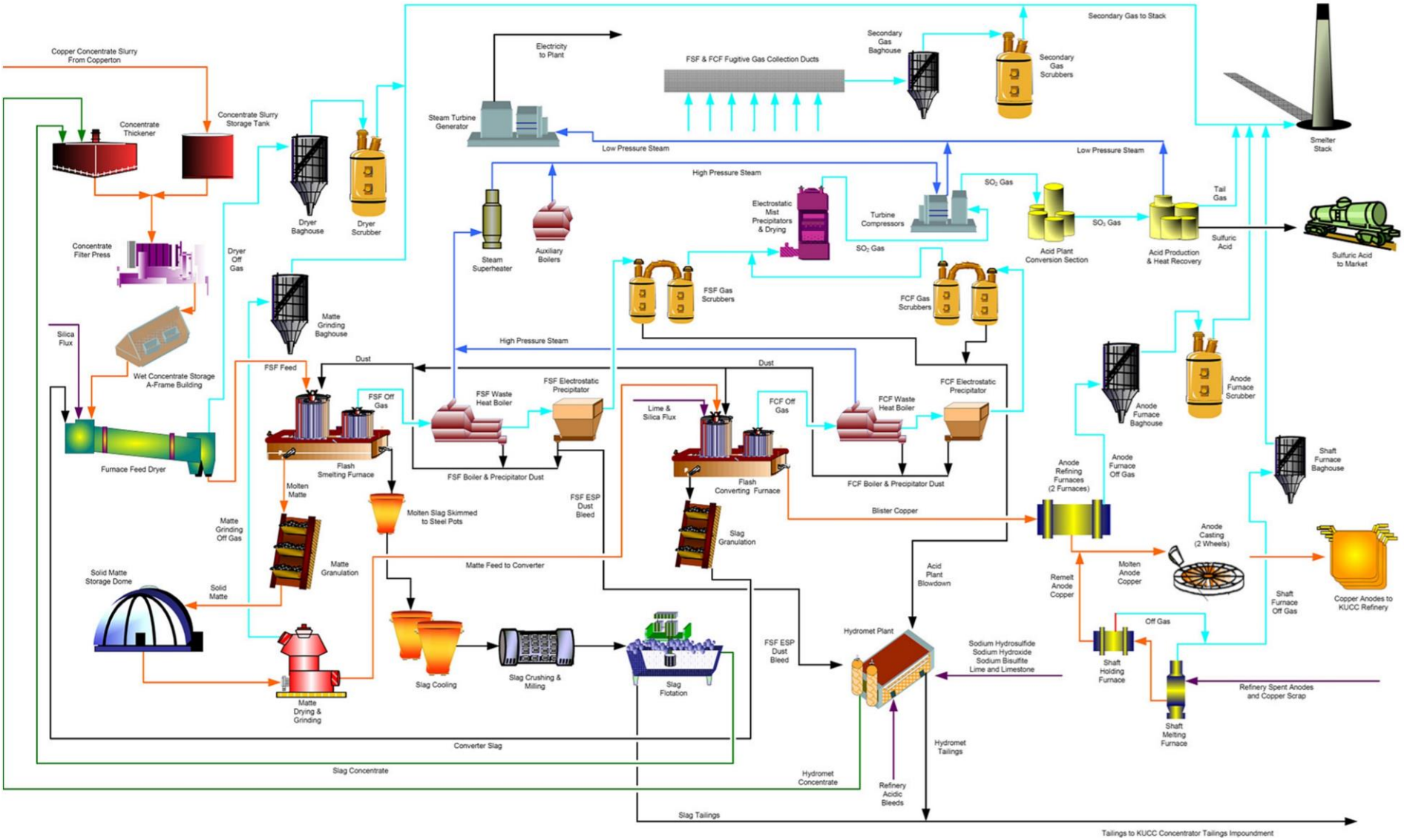


Anode Furnace

Anode Casting

Anodes – 750 lbs.

# Smelter Process Flowsheet

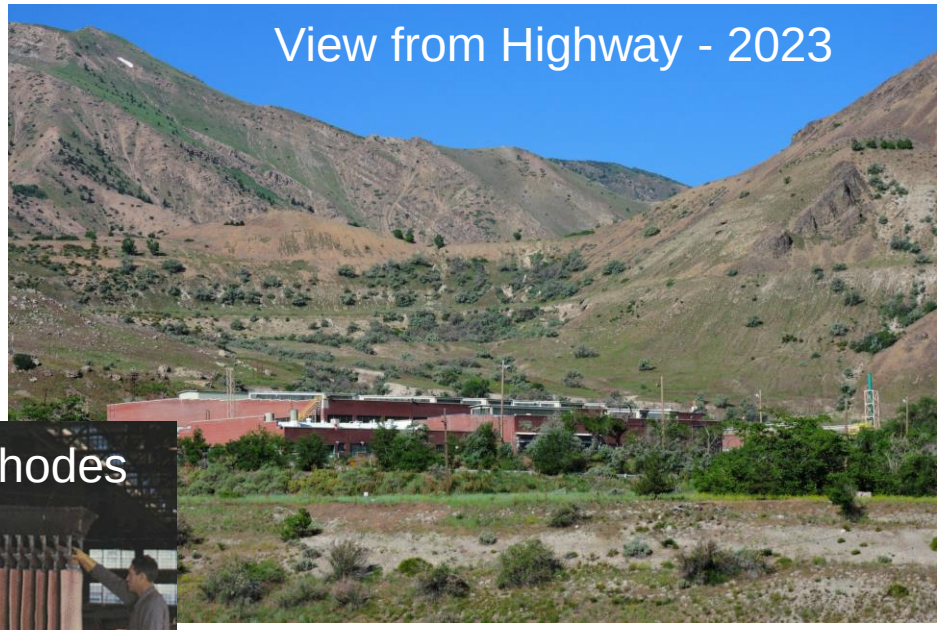


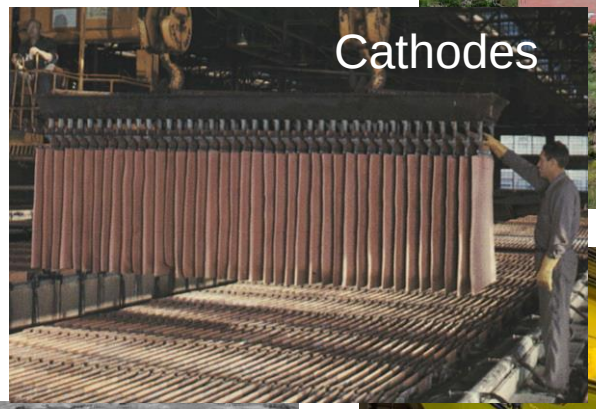
# Electrolytic Refining

Original – 1950, copper starter sheets (labor intensive), precious metals refining.

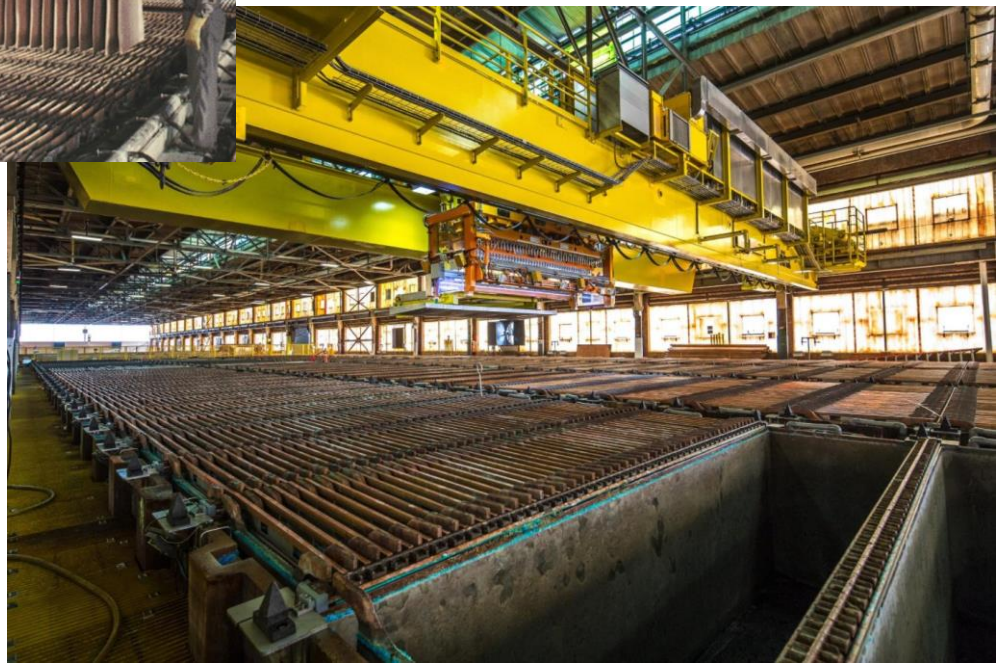
Modernized – 1995, stainless steel starter sheets, greater mechanization, automation, Isa Kidd.

Cathodes – 99.99 % Cu.
Cathode – 14 days,
Anode – 28 days.




Aerial View



Tank House