Exhibit 9

WALKER MINE

The On-Going Effort To Improve the Environment

The continuous charge by the Water Quality Control Board that the owners and operators of Walker Mine have done nothing for 28 years to abate the pollution of Grizzly Creek is totally inaccurate, misleading and capricious as the chronological record will reveal. Let's examine that record.

1928 Anaconda created an evaporation pond and constructed a ditch around the tailings pond so the effluent could first go through a process of sedimentation and then be channeled to the side of the tailings pond rather than picking up toxicity by going through it.This procedure was followed until the Anaconda shut down in 1942 and was operative for several years thereafter.

1942 to 1959 During this period, the tailings dam on U.S. Forestry property broke - and the carefully constructed diversionary ditches which Anaconda had built broke their banks and water freely went through the tailings pond picking up toxicity. The U.S. Forestry were notified by the newly created California Water Control Board and did nothing about reconstituting the diversionary ditches or or in re-constructing the dam so water continued to be toxic to the extent it would not support a fishery.

1960 Before the Porter-Cologne Act S 13305 was passed, the owners of Walker Mine re-created settling ponds, and re-created ditches around cave-ins to reduce toxicity. We have pictures take and a report by C.D. Barnes of Oroville substantiating the effort made. At this time there was no penalty and the owners

proceeded with due dilligence although the Forestry did nothing to repair the dam.

1960 Commenting on what the owners had done, L. E. Trumbell wrote to Col. J. S. Gorlinski, the chairman of the California Water Control Board on 6/10/60:

"There is ample evidence . . . mine operators found it prudent to carefully divert water around the glory hole area . . . "

1961 L. E. Trumbell to Col. J. S. Gorlinski 8/4/61: "Currently excellent water conditions in Little Grizzly Creek."

1962 L. E. Trumbell to Col. J. S. Gorlinski 8/20/62: "Walker Mine drainage has stopped . . . coupled with a year of normal precipitation. Trout survived winter and spring in all parts of Grizzly Creek."

During ensuing years, a substantial cave-in occurred and several years may have been taken to fill up the mine until water began to flow from the ventilator shaft several hundred feet above the main portal.

Darrell Payne, County Surveyor-Engineer, wrote on 6/16/69: "It would be a simple matter to prevent at least 95% of the upper runoff from entering the mine shafts and and glory holes by reconstructing diversion ditches and furrows thereby directing the runoff and away from the mine entrance. Little Dolly Creek below the mine site should then be sufficient to dilute what minor amounts occur from underground seepage within the mine workings."

1969 Noranda Report: During 1969, Norandex constructed several ditches around the surface subsidences near Piute and Discovery Shafts. This action diverted all visible surface water away from the underground workings, and a noticeable decrease in in discharge flow was observed several days later.

1970 Noranda Mining Engineer Frank Condon 12/14/70: "CWQCB have made no recommendations to avert the pollution - and admit there may not be a feasible solution to the problem. I presented Norandex Program and they were impressed. They asked that the stipulations concerning cooperative government approval be removed."

The Plan By Norandex

1) Ditch diversion - needing U.S. Forest and Plumas County Road Department cooperation.
2) Opening the portal (which had caved) to the 712 orebody to reduce toxicity for which they needed Fish & Game cooperation for a temporary stay of pollution standards.
3) Construction of settling ponds to lessen the sudden rush of water in opening the portal.
4) Maintenance of diversionary ditches near Piute and Old Discovery Shafts.

1971 and 1972 Norandex Report (page 22):

"Norandex offered to put pollution plans into effect, but was rebuffed by a threat from Fish & Game to the effect that they would be liable for $6,000/day fine if the process caused pollution . . . of Grizzly Creek."

Norandex, a Canadian based company, had great difficulty in equating the harsh requirements and rhetoric with nothing being done by the U.S. Forestry when they judged that an equal or more pollution was caused by failure to repair the tailings

dam and diversionary ditches around the tailings.

1973 The owners of the mine engaged Dr. Frederick Kruger, Dean of the School of Mines, Stanford University, to advise them. His report of 12/4/73: Following two measure would greatly reduce the flow, and possibly reduce concentration of copper, zinc and sulfate:

1) Bulldoze diversion ditches around old mine workings . . . much oxidation and leaching can be prevented.
2) Repair 'windrowed' settling area so it can suspend solids before discharging into Dollie Creek.

The following two measures by the U.S. Forestry are necessary:

1) Divert natural drainage of creek around old tailings pond to prevent it from becoming a leachant, etc.
2) Repair tailings dam at end of tailings pond so that fine grained tailings cannot be eroded and washed downstream into Little Grizzly Creek.

During this year, the owners also hired Jones & Stokes Associates, prominent fish consultants, who advised them: "The normal numbers of adult trout in Little Grizzly may be 100 to 300 per mile - where people like to fish it amounts to 50 user days per mile per year. The amount of money value is not great - if 100 catchable fish per mile there are 1000 catchable fish at 1/4 lb. or 250 lbs. worth $250 at the hatchery and $1250 in the stream."

1974 The owners were introduced by Dr. Kruger to William McClung, a mining engineer with considerable experience with toxic mine drainage, who concurred in Nornada's evaluation to drain the mine and possible cut off or divert the underground water at its point of entry into the mine. This was almost complete when The CWQCB obtained an injunction to halt further progress, but the owners were able to convince the court of the folly of CWQCB's challenge and draining the mine continued. (See

Feather River Bulletin article of Nov. 14, 1974.)

The owners also began a two year systematic clean up of 40 acres of mining camp that was cluttered with metal debris that was partially causing the drain off water to become toxic.

1975 Mine was retimbered 500 feet and a pipeline was constructed at the portal to channel the water from the mine to cement tanks. Railroad tracks were replaced at mine entrance to provide access for further cleaning the tunnel.

1976 Pipeline was buried and two settling tanks were activated to settle water before tin-tank operation commences. Underground machinery acquired and constructed for further clean-out. An interior settling pond within the mine was constructed.

Amax was now the operator and cleaned the flumes inside the mine and reconstructed the tunnel up to the next cave-in.

1977 Amax timbered and cleaned out a major cave-in at the 900 ft. level.

By November 24th, the water volume had been reduced to 15 gallons per minute.

Amax reconstructed tunnel to 1000 ft and covered their earlier constrcution with earth.

1978 Conoco is now the mine operator and cleaned the tunnel to 1500 ft., and constructed a settling pond of a larger dimension. Conoco also constructed a new pipeline from the settling pond to below the mine property entrance. They further diverted flume water away from general drainage area to the settling pond.

1979 Conoco, with a 4 to 6 man crew, worked extensively to clean out the tunnel, replaced 12" pipe with 30" pipe to avoid washouts, repaired snow shed, and constructed an airline for use in further cleaning of the tunnel. During this time, the owners were constructing a mine trammer for use in tunnel work.

1980 Conoco had spent $85,000 on the portal and settlement ponds when the CWQCB put a stop order on further finishing of the pond when it was 95% complete. (Conoco totally cancelled their plans even though they were in the process of making a show place complete with landscaping.) Mr. William Crooks, Executive Director of the CWQCB, stated to Conoco water specialists that "the tailings don't contribute to pollution in any appreciable way." This was disputed by Conoco's water specialist and is contrary to the earlier advice given by Dr. Kruger, Dean of the School of Mines, Stanford University, and by Amax engineers and Noranda engineers, and the owner's consultants.

1981 Instead of proceeding with Dr. Kruger's policy and Conoco's planned operation for abating pollution, the CWQCB sent their engineer Frank Pearson to advise, and channels were constructed by the owners and Conoco to his design. Pearson was working on a process for water treatment that he claimed was economically feasible and his pilot project was put in operation.

1982 Pearson's plan was finally produced in a form not understandable to the average mining engineer, but costing-out the project proved far too expensive for implementation.

1983 Property owners entered into a contract with Triad Minerals to mine the water to acceptable standards. This contract was never implemented because the CWQCB brought a law suit against the owners.

There was also proposed and in the designing stage by water consultants and engineers another plan which also was arrested by the untimely law suit brought by the CWQCB.

1984 The mine is now operated by SBC Corporation International formerly the Standard Bullion Corporation of Salt Lake City. The owners have a plan and the operators have a plan that will abate the pollution using a technique developed by the Canadian government to extract metals from polluting mine streams. They are currently negotiating for such a plan to become operative. Prior to instituting such a plan, the owners and operators filed with the CWQCB to lower the standards required by the CWQCB to that of drinking water standards set by the national Environmental Protective Agency (NPDES). The regional board turned down this request, and the owners and operators have appealed the decision to the State Water Resources Board stating that the action of the regional board was arbitrary, misleading, capricious and contrary to law.

The water from Walker Mine is drinkable in its natural state as it flows from the portal, and contains many minerals found in purchased mineral water for human consumption, or found on the label of many favorite cereals where minerals are put back into grain for health purposes.

Pollution Problems: During the 1916-1941 period of operation of the Walker Mine by Anaconda's subsidiary, the tailings from the flotation plant flowed down Dolly Creek to Grizzly Creek, where they were dammed to form a pond many acres in extent. The trees which were inundated were killed. These dead snags together with the barren tailings form an unsightly area, which although it is on Forest Service lands, calls attention to past mining activity, and focusses attention upon the present effluent from the mine.

For perhaps the last ten years there have been complaints of fish kill in Grizzly Creek. Investigations have shown two sources of pollution. First, the most obvious, but perhaps the least offensive, is the drainage from the Seventh Level adit. This drainage from the portal of the mine reaches a maximum estimated flow of 150 gallons per minute during the peak of runoff from melting snow in the Spring, and diminishes to 30 gallons per minute during the summer. This outflow may be decreased by ditching around the old mine workings to prevent the inflow of surface waters. The pH of the water may be as acid as 3.7, and the content of copper may be as high as 22 parts per million. However, a few hundred yards down stream the copper content may be less than 2 parts per million.

Second, the least obvious, but probably the largest contributor of acidity and heavy metals to the waters of Grizzly Creek, is the leaching of the tailings pond. This has been lessened by diverting the waters of Dolly Creek and Grizzly Creek around the tailings, but the diversion has not been maintained and so the waters percolate through the tailings and pick up polluting acid and heavy metals. The old scars of mining have become overgrown and camouflaged by vegetation so that they have not been mentioned as yet as a form of "visual pollution."

POTENTIAL OF THE WALKER MINE

From a geological viewpoint the Walker Mine has potential for the development of additional ore reserves, both for underground and for surface mining.

Ore in Depth on the Shear Zone: Anaconda, the operating company during the 1917 to 1941 period of production, encountered the multiple problems of heavy ground, flattening dip, increased pumping, and increased hoisting from the lower levels of 1000 and 1200 feet, and therefore did not pursue the

Exhibit 10

STATE OF CALIFORNIA

Inter-Departmental Communication

To: Central Valleys Regional Water Pollution Control Board No. 5
608 - 13th Street
Sacramento, California

Att'n: Col. Joseph S. Garlinski, Executive Officer

File No.

Date: December 3, 1957

Subject: COMMENTS AND RECOMMENDATIONS CONCERNING WALKER MINE AND WALKER MINE TAILINGS, PLUMAS COUNTY

From: Department of Fish and Game
Region II, 1001 Jedsmith Drive
Sacramento 19, California

This is in reply to your request of October 14, 1957, for our comments concerning discharges from Walker Mine to Little Grizzly Creek, thence Indian Creek, Plumas County.

There is a verified history of fish kills in both Little Grizzly Creek and Indian Creek attributed to this waste discharge. Some 10 miles of the former and 5 of the latter have been affected. Drainage from the mine tunnels and through the mine tailings apparently carry toxic quantities of copper, zinc, and other heavy metals into Little Grizzly Creek, which is now essentially barren of aquatic life.

It is imperative that strict requirements be set to protect the beneficial uses of water in Little Grizzly and Indian Creeks; that is, fishing, camping, swimming, and picnicking. Restoration of the recreational potential of these streams is especially important in view of the increased tourist pressure in this area.

We would like to recommend that the following tentative requirements govern the nature of the discharges from Walker Mine. These requirements are esentially like those recommended for the Penn Mine discharge. The minimum concentrations may not be entirely reliable. They were chosen following a search of the literature and are not based on a specific evaluation of the Walker Mine discharge diluted with Little Grizzly Creek waters.

1. The discharge shall not cause concentrations of the following substances in Little Grizzly Creek in excess of the following limits:

Copper	0.05 ppm	Lead	0.10 ppm
Zinc	0.50 ppm	Arsenic	0.05 ppm
Aluminum	0.05 ppm	Sulfate	10.0 ppm
Iron	0.10 ppm		

2. The discharge shall not cause the pH of Little Grizzly Creek water to fall below 6.5.

3. The discharge shall not produce concentrations of toxic materials in Little Grizzly Creek which are deleterious to human, animal, plant or aquatic life.

4. The discharge shall not cause silt, gravel, or sludge deposits in Little Grizzly Creek.

5. The discharge shall not cause objectionable coloration of Little Grizzly Creek waters.

6. Neither the discharge nor the disposals shall result in nuisance due to odors or unsightliness.

Sincerely yours,

Robert D. Montgomery
Regional Manager
Region II

cc: Dept. of Fish and Game,
Water Projects Coordinator
Dept. of Water Resources,
Division of Resources Planning
Dept. of Public Health,
Bureau of Sanitary Engineering

Exhibit 11

APPENDIX V

EXPERT REPORT OF MARC LOMBARDI

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

CLEANUP AND ABATEMENT ORDER NO. R5-2014-XXXX

ATLANTIC RICHFIELD COMPANY
UNITED STATES DEPARTMENT OF AGRICULTURE,
UNITED STATES FOREST SERVICE

WALKER MINE TAILINGS
PLUMAS COUNTY

CLEANUP AND ABATEMENT ORDER NO. R5-2014-YYYY
ATLANTIC RICHFIELD COMPANY

WALKER MINE
PLUMAS COUNTY

amec

Expert Report of
Marc R. Lombardi, PG, CEM

California Regional Water Quality Control Board
Central Valley Region

Cleanup and Abatement Order No. R5-2014-YYYY
Atlantic Richfield Company
Walker Mine
Plumas County

Cleanup and Abatement Order No. R5-2014-XXXX
Atlantic Richfield Company
United States Department of Agriculture, United States Forest Service

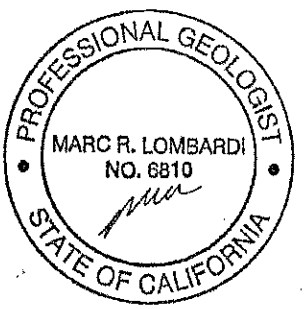
Walker Mine Tailings
Plumas County

Prepared for:
Atlantic Richfield Company

Submitted by:
AMEC Environment & Infrastructure, Inc.
Rancho Cordova, CA

Signature

February 20, 2014



Project No. SA14165090.1

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

EXPERT REPORT OF
MARC R. LOMBARDI, PG, CEM
Walker Mine Site
Plumas County, California

1.0 INTRODUCTION

I, Marc R. Lombardi, PG, CEM, of AMEC Environment & Infrastructure, Inc. (AMEC), have been retained by Atlantic Richfield Company (Atlantic Richfield) to provide expert review and evaluation of the environmental conditions at the former Walker Mine Site (site) in Plumas County, California. Specifically, I have been asked to review information that has been collected over many years relating to the site. Information reviewed included various historical reports, documents, and related information that describe mine exploratory development, mining, ore processing, mine closure, activities of previous owners, operators, leasees/leasors including remediation activities by private parties, state and federal agencies, and regulatory actions. Finally, I have been asked to provide expert opinions concerning pollution abatement measures that were implemented by the California Regional Water Quality Control Board – Central Valley Region (CVRWQCB) and the U.S. Department of Agriculture, Forest Service (USFS) at the site and to provide this expert report detailing my opinions and conclusions and the basis for those opinions and conclusions. I visited the site on November 6, 2013.

2.0 QUALIFICATIONS

This report was prepared under my supervision and direction. I have been assisted in this work by various staff including Dr. Robert C. Starr, PE, who provided input and expertise related to contaminant hydrogeology and environmental remediation. The use of staff to assist me is both necessary and common for this type of evaluation given the scope and nature of the data, information, and technical issues associated with the site.

I am a Principal of AMEC, a full-service environmental, geotechnical, water resources, and infrastructure consulting company. My area of expertise is geology with a professional practice emphasis on assessment of soil and groundwater contamination and remediation. I hold a Bachelor of Science in Geology from the University of California at Davis, conferred in 1988, and a Master of Science in Geology from San Diego State University, conferred in 1992. I am a member of the Groundwater Resources Association of California and the Association of Engineering Geologists. My curriculum vitae is provided in Appendix A.

Over the past four years I have testified by deposition in one case: *Atlantic Richfield Company vs. State of California, et. al.*, BC380474, Superior Court of the State of California, County of Los Angeles.

I am compensated for my time in this matter at a rate of $160 per hour for consulting and $240 per hour for deposition and trial testimony.

In preparation of this report, I have relied on historical reports, documents, and information related to the site in this matter. Finally, I have relied on my consulting education, training, and more than 24 years of experience in the environmental consulting field in forming the opinions in this report. The opinions I provide in this report are given to a reasonable degree of scientific certainty and are based on my knowledge, skill, experience, training, education, and the information and data about this matter that were available to me at the time these opinions were rendered. If additional information becomes available, including the submission of new or revised expert reports on or after submission of the present report by Atlantic Richfield in this matter, or if I receive any other information or data that were not made available as of the time I prepared this report, I may supplement my opinions to reflect such information.

3.0 SUMMARY OF OPINIONS AND CONCLUSIONS

The following list summarizes my opinions to date and is intended only as a summary. My opinions and testimony in this case are and will be based on all of the supporting information, analysis, and statements contained in this Expert Report.

1. Environmental impacts at the site are the result of mining and processing of ore, not exploration or development activities. The Walker Mine ore deposit was a discrete fissure or vein emplaced between distinctive walls of barren country rock. The vein consisted of mainly silica (quartz) with pockets of sulfide-bearing minerals. Mining activities exposed these sulfide-bearing minerals to air (oxygen) and water resulting in oxidation and formation of acid mine drainage (AMD).

2. The wall rock, or country rock, bracketing the vein is largely composed of schists that are intermediate to felsic in chemical composition. They are dense, hard rock typically containing no, to trace quantities, of sulfide-bearing minerals. Intermediate to felsic composition rocks do not oxidize to create AMD when exposed to air and water.

3. Water quality in Dolly Creek and Little Grizzly Creek near the Walker Mine is impaired by contaminants resulting from AMD, primarily elevated concentrations of copper, released from sources related to mining and processing of ore. Sources of contaminants from mining and processing ore to surface water are: mine drainage, tailings at the mill site, and tailings in the tailings impoundment area.

4. Prior to International Smelting & Refining's (IS&R) becoming a shareholder in Walker Mining Company in 1918, Walker Mining Company had removed ore and created underground workings, a mill, a tailings pond, and other mining related infrastructure and support facilities that were already operating at the site. Walker Mining Company milled ore and directed the resulting tailings to a pond located near the mill.

5. The CVRWQCB installation of the adit seal was not a comprehensive remedy, because it did not address the control of water into the mine, the long-term implications of water impoundment, or other sources of copper loading to the creeks. Design and placement of the mine adit seal has had some short-term benefit, but it may prove ineffective over the longer term and has likely deferred the implementation of a more protective permanent solution.

6. The effects of mine flooding implemented by the CVRWQCB on hydrology and geochemistry (i.e. production of AMD and dissolved metals) are likely contributing to the degradation of water quality in the flooded mine behind the seal, degradation of groundwater in the vicinity of the mine and downgradient surface water contamination; however, insufficient data have been collected for proper evaluation.

7. Numerous site owners or operators have followed Walker Mining Company. Since 1957, the CVRWQCB has received numerous recommendations, plans, alternatives, and options for the mitigation or remediation of AMD at the site. In

response, the CVRWQCB constructed the concrete seal in the 700 Level Adit portal in 1987. Between 1957 and 1987, continued production of AMD significantly contributed to degradation of water quality.

8. Attainment of water-quality objectives for Dolly Creek and other surface waters requires coordination of upstream and downstream response actions. Issues at the mine site and tailings impoundment area are interrelated. A cooperative effort between the CVRWQCB and the USFS would benefit the remedial activities in both locations.

4.0 BASIS FOR OPINIONS AND CONCLUSIONS

1. **Environmental impacts at the site are the result of mining and processing of ore, not exploration or development activities. The Walker Mine ore deposit was a discrete fissure or vein emplaced between distinctive walls of barren country rock. The vein consisted of mainly silica (quartz) with pockets of sulfide-bearing minerals. Mining activities exposed these sulfide-bearing minerals to air (oxygen) and water resulting in oxidation and formation of AMD.**

The Walker Mine ore deposits are lenticular veins consisting of massive chalcopyrite-pyrite seams and stringers in a granular quartz gangue with local concentrations of magnetite. The veins are essentially conformable with the enclosing country rock schists (Prochnau, 1986). The sulfide minerals are interspersed in pods and bands of magnetite (Fe_3O_4), barite ($BaSO_4$), pyrite (FeS_2), pyrrhotite ($Fe_{1-x}S$, x=0-0.2), and chalcopyrite ($CuFeS_2$), and locally they form 1- to 2-foot-thick pods of massive sulfide ore (Kilbreath and Leger, 1978).

The country rock surrounding the ore deposit consists primarily of iron, magnesium, and aluminum silicates and contains no, to trace quantities, of sulfide minerals. Ore, mine waste, or mill tailings that contain sulfide-bearing minerals have a high potential for acid production (Deutsch, 1997). When rock is reduced to a finer particle size through the mining and milling process, the increased surface area of the sulfide-bearing minerals allows for increased oxidation and weathering. Pyritic sulfur is oxidized to sulfate and the ferrous iron is released to solution (Langmuir, 1997). The hydrogen ions that are also released create an acidic solution with elevated concentrations of metals. The general chemical reaction representing oxidation of pyrite follows:

$$FeS_2 + (7/2)O_2 + H_2O \text{ ----> } Fe^{2+} + 2(SO_4)^{2-} + 2H^+$$

pyrite — atmospheric oxygen — water — iron — sulfate — hydrogen ions

Oxidation of copper sulfide minerals follows a similar reaction, resulting in an acidic solution with elevated concentrations of copper ions. Thus, the sulfide-bearing ore, mine waste, and mill tailings are the source of AMD at the Walker Mine.

Activities during the operational phase of the mine included exploration, development, mining ore, and milling ore. Exploration is delineating the three dimensional geometry and grade of the ore, and is primarily done by drilling holes and collecting rock samples and analyzing samples to determine concentrations of metals in the ore rock. Exploration activities produce small quantities of drill cuttings and core samples. Development consists of creating mine openings (e.g. shafts, tunnels) to provide access to the orebody. These are excavated in

country rock, and therefore development activities produce country rock that has little or no sulfide mineralization. Rock that has sulfide mineralization is processed as ore. During mining activities, sulfide mineral bearing ore is excavated, crushed, and transported to the mill for processing. Milling consists of reducing the rock to fine size particles and then extracting the valuable components from the fine rock particles. The portion that contains the valuable components is called the concentrate, which was shipped off site for smelting. The portion that remains after the valuable components were removed is called the tailings, which were disposed on site. Both mining ore and milling ore produce rock or tailings that contain appreciable concentrations of sulfide minerals, which can be oxidized and release acid and metals.

2. **The wall rock, or country rock, bracketing the vein is largely composed of schists that are intermediate to felsic in chemical composition. They are dense, hard rock typically containing no, to trace quantities, of sulfide-bearing minerals. Intermediate to felsic composition rocks do not oxidize to create AMD when exposed to air and water.**

The Walker Mine claims are principally underlain by Jurassic-age metasediment and metavolcanic rocks overthrust by Paleozoic sediments on the west and intruded and terminated by granitic rocks to the north and south. Tertiary volcanic rocks cap the older rocks (Prochnau, 1986).

The Jurassic-age country rock has been variously described. The country rock was initially termed blocky, fissured diorite (Hart, 1915a,b) (Cowan, 1915). Later, descriptions of underground workings identified granite dikes, gneisses, and clays (associated with faulting) (Gidel, 1920). More recent descriptions of the country rock is as schists that are probably derived from intermediate to felsic-composition tuffs and volcanic agglomerates (Prochnau, 1986).

The country rock is also intruded by a large body of augite-hornblende-biotite quartz diorite, possibly related to Sierra Nevada batholithic emplacement (Kilbreath and Leger, 1978). The country rock, including the intrusive rock, consist primarily of iron, magnesium and aluminum silicate minerals. These types of silicate minerals do not contain sulfur and therefore do not produce AMD during weathering. Thus, the country rock at the Walker Mine does not oxidize to create AMD when exposed to air and water.

3. **Water quality in Dolly Creek and Little Grizzly Creek near the Walker Mine is impaired by contaminants resulting from AMD, primarily elevated concentrations of copper, released from sources related to mining and processing ore. Sources of contaminants from mining and processing of ore**

to surface water are: mine drainage, tailings at the mill site, and tailings in the tailings impoundment area.

The Walker Mine is located in Plumas County, California, approximately 15 miles northeast of Quincy (Figure 1). The Walker Mine 700 Level Adit portal, the mill site, a former tailings pond, and a current settling pond in the mill site area are located near the upper reaches of Dolly Creek. Dolly Creek is a tributary to Little Grizzly Creek (Figure 2). The 100 acre or tailings impoundment area (called the "lower" tailings impoundment) is located at the confluence of Dolly Creek and Little Grizzly Creek. Analytical data is not available before 1957; the Prosecution Team materials provide no record of conditions at the mine at the time of mine closure and transfer for the property to Safeway Signal Corporation in 1945.

Recent analytical data collected by the Regional Board staff and others shows that surface water in the vicinity of the mine and tailings impoundment area is impacted by AMD from the 700 Level Adit portal, tailings in the mill site area, the settling pond in the mill site area, and the lower tailings impoundment.

Figure 3 illustrates surface water sampling locations and groundwater monitoring wells in the vicinity of the mill site area, the tailings impoundment, and creeks and tributaries to the north of the Walker Mine.

2006 through 2013 – Effect of Sources in the Mill Site Area and the Tailings Impoundment Area

Surface water locations monitored by the CVRWQCB, representing post-700 Level Adit seal emplacement conditions, are shown on Figures 4 and 5. Figure 4 illustrates dissolved copper concentrations at locations near the mine and lower tailings impoundment, and Figure 5 shows the dissolved copper concentrations for multiple creek and tributary locations north-northwest of the Walker Mine.

Mill Site Area

Figure 4 illustrates similar relationships in dissolved copper loading as those in the historical data set. Lower concentrations resulting from placement of the adit seal and the addition of sampling locations at the mill site allow for the identification of more discrete and ongoing sources of dissolved copper loading to surface water in the former mill area, which were not addressed by the adit seal.

There are three primary sources of copper in the former mill area that contribute to stream loading. These are the continued direct discharge from the portal, dissolved copper in the settling pond, and copper leaching from the mill tailings area.

Dissolved copper in the flow from the 700 Level Adit (WM-1) was significantly reduced because of the seal, although samples of standing water at the base of the seal have similar concentrations (mean of 13,000 µg/L copper) to historical, free flow conditions. The flow at this point was significantly reduced from approximately 275 gpm (SRK, 1985) pre-seal emplacement flows to an estimated 0.15 gpm seepage around the seal (Pujol, 2002). In addition, the source of the water in the pool at the base of the plug does not appear to have been sufficiently investigated and is thought to be either seepage around the seal, or seepage into the tunnel between the seal and the portal opening.

Dissolved copper in the settling pond water is presumably leaching from tailings in the mill site area and outfall collected from the 700 Level Adit portal. Outflow from the settling pond (WM-19) has high dissolved copper concentrations (mean of about 950 µg/L) relative to the adit flow discharge (WM-1), and the pond currently appears to be the most significant source of dissolved copper loading to Dolly Creek.

The tailings in the mill site area have elevated concentrations of both total and leachable copper and hence are a source of copper to surface water.

Sampling locations along Dolly Creek downstream of the former mine (WM-3, -4, -7A, -7B, and -6) all reflect increased dissolved copper concentrations from this loading in this area.

Tailings Impoundment

In 2007, the USFS constructed the Dolly Creek diversion, which routed Dolly Creek through a lined diversion channel across the lower tailings impoundment (Huggins and Rosenbaum, 2007). Renovations to the diversion channel headworks were required in 2009 because there was a considerable amount of subsurface drainage from Dolly Creek passing beneath the diversion structure and making its way through the Old Dolly Creek Channel (Huggins and Little, 2009). Dissolved copper concentrations in water quality samples collected from Dolly Creek show no appreciable increase in copper loading from sampling locations at the upstream (WM-7A) to downstream (WM-7B) end of the lined channel, indicating that the channel isolates water in Dolly Creek from the tailings. Visual inspection of the lined diversion channel does show sedimentation from wind-blown tailings to the diversion channel that may add some copper load to the creek, although it does not appear to be significant based upon the data available for review at this time. The lined diversion channel was observed to have mature vegetation growth that could compromise the liner. Leakage from Dolly Creek through the lined diversion channel to the tailings impoundment would result in increased copper loading to Little Grizzly Creek.

Flow across the western portion of the lower tailings impoundment in the unlined former channel of Dolly Creek is readily apparent visually in the field and on current aerial photographs, with well developed vegetation along the drainage-way. The source of water in the unlined channel does not appear to have been evaluated. This drainage contributes an ongoing and significant copper load to Little Grizzly Creek as evident in the sampling results at monitoring location WM-6 (Figure 4).

Little Grizzly Creek upstream of the lower tailings impoundment (WM-5) has low mean dissolved copper concentrations (1.1 µg/L), likely reflective of surface water conditions unaffected by mining. Downstream locations along Little Grizzly Creek but upstream of the confluence of Dolly Creek (WM-7C and WM-7) have slightly higher mean dissolved copper concentrations relative to location WM-5. This increase is likely due to groundwater infiltration through the lower tailings impoundment and discharge to the creek along the southwestern boundary of the lower tailings impoundment.

Figure 6 illustrates groundwater flow conditions and dissolved copper in groundwater in the lower tailings impoundment based on data from monitoring wells installed and monitored by the USFS (2014). Groundwater occurs at very shallow depths in the tailings, typically less than 10 feet below the surface and the groundwater flow direction in the tailings is south-southwest toward Little Grizzly Creek. Currently, the USFS is required under Waste Discharge Requirements (WDRs) to monitor water quality semiannually in three wells (W3, W5, and W7) installed in the tailings, (Figures 3 and 6). Dissolved copper from these well samples collected during the fourth quarter 2013 are shown on Figure 6, with the highest concentration of 1.0 µg/L detected in well W7. Since July 1994, dissolved copper as high as 51 µg/L, 10.1 µg/L, and 5.3 µg/L have been detected in samples from wells W3, W5, and W7, respectively. Although consistently high dissolved copper concentrations in groundwater in the tailings are not indicated, some dissolved copper loading to Little Grizzly Creek due to groundwater discharge from the lower tailings impoundment cannot be ruled out. It is not clear from the available data whether dissolved copper in groundwater is generated in-situ as result of residual sulfide minerals in the tailings, or is a result of dissolved copper in groundwater up-gradient of the tailings piles (e.g., beneath the former mill area) flowing downgradient into the tailings.

Little Grizzly Creek Downstream of the Tailings Impoundment

Surface water samples collected downstream of the confluence of Dolly Creek and Little Grizzly Creek (WM-8 and -9) have lower mean dissolved copper concentrations of about 11 µg/L reflecting the mixing of the two creeks. Sample location WM-9 is the compliance point of the USFS WDRs relative to meeting the WQPS of 5 µg/L. These data show that the

standard is not being met at the compliance point. Mean dissolved copper concentrations of 4.8 µg/L and 1.1 µg/L in Little Grizzly Creek downstream sampling locations WM-20 and WM-10, respectively, indicate downstream attenuation of dissolved copper relative to the compliance point at WM-9 (Figure 5).

Northern Streams and Tributaries

Further evaluation of the water quality data shows that the three sample locations on Ward Creek (MW-12, WM-11) and Nye Creek (WM-13) are the most proximal to the flooded orebody (Figure 5). The available head data collected for water impounded behind the adit seal shows that water levels in the flooded mine have fluctuated since approximately 1999 within an elevation range that is precisely correlative with the elevations of all three of these surface water sample collection locations (Figure 10). This suggests that seepage from the water impounded in the mine may be contributing to these higher dissolved copper concentrations. These data are discussed and presented in more detail in Opinion 6.

4. **Prior to IS&R's becoming a shareholder in Walker Mining Company in 1918, Walker Mining Company had removed ore and created underground workings, a mill, a tailings pond, and other mining related infrastructure and support facilities that were already operating at the site. Walker Mining Company milled ore and directed the resulting tailings to a pond located near the mill.**

The ore deposit at Walker Mine was discovered in 1904 (Plumas County, California, 2011), and the initial exploration and development of the Central Orebody was conducted from 1911 to 1916. By 1915, the extent of the Central Orebody had been explored by sinking a shaft to a depth of approximately 125 feet and excavating horizontal tunnels at two levels (Hart, 1915a). At that time, mine related facilities at the mine included a blacksmith shop, steel shop, machine shop, mess hall, commissary, theater, schoolhouse, recreation hall, gas station, post office, hospital, sawmill, and boarding houses and other residences and steam operated equipment including a hoist, air-compressor, and pumps (Hansen, 1915). The shaft was located about 4,700 feet from what would become the mill site and was about 1,000 feet higher in elevation than the mill site. A gravity-powered aerial tramway was constructed in late 1915 or early 1916 to transport ore from the Central Orebody to the mill (Hart, 1915b) (U.S. Bureau of Mines, 1932).

Walker Mining Company constructed and began operation of a 75 ton per day mill by June 1916 (U.S. Bureau of Mines, 1932). Tailings from the mill were discharged to a nearby tailings pond. The tailings pond is shown in the southern portion of the mill site area on a 1921 map (Unknown Author, 1919) (Figure 7), which is the earliest map of the mill camp area discovered

to date in the reference materials reviewed. To facilitate relating the tailings pond and other historic features to current features in the mill site area the features from the 1921 map, a 1928 map, and a modern aerial photograph were visually aligned and are illustrated in Figure 8. The larger lower tailings impoundment, approximately 80 to 100 acres, located near the confluence of Dolly Creek and Little Grizzly Creek was not constructed until 1919 (DeArrieta, 1926).

IS&R became a majority shareholder of Walker Mining Company in October 1918 (Hennesy, 1918).

A 1993 study prepared for the CVRWQCB characterized waste and soil in the mill site area. The study described as "processed waste tailings" in the area where the 1921 map shows the tailings pond Welch Engineering Science and Technology (WESTEC, 1993).

The WESTEC study measured total and extractable concentrations of copper and other metals in samples of tailings and unmilled ore, in waste rock (hornfelds, granitic sand, fill), and in soil (WESTEC, 1993, Tables 4-1, 4-2, 4-3, and 4-4). WESTEC's data show that total copper concentrations in tailings and unmilled ore (WESTEC's category "oxide") samples are substantially higher than concentrations reported for waste rock and in other materials. Their data also show that concentrations of extractable copper are higher in tailings and unmilled ore, as compared with concentrations reported for waste rock and other non-mineralized materials.

WESTEC also evaluated the potential for various materials in the mill site area to generate acid (WESTEC, 1993, Table 4-5). Materials WESTEC classified as being acid generating or possibly being acid generating are tailings or unmilled ore. Only one sample of a rock other than tailings or unmilled ore was classified as being acid-generating material. Acid generated from water coming in contact with tailings and unmilled ore would enhance leaching of extractable copper. Tailings and unmilled ore, which have the potential for being acid generating and having extractable copper, are sources of copper loading to surface water as discussed in evaluation of water quality data in Opinion 3 above.

5. **The CVRWQCB's installation of the adit seal was not a comprehensive remedy, because it did not address the control of water into the mine, the long-term implications of water impoundment, or other sources of copper loading to the creeks. Design and placement of the mine adit seal has had some short-term benefit, but it may prove ineffective over the longer term and has likely deferred the implementation of a more protective permanent solution.**

The overall hydrology of the mine includes inflow of surface runoff through the subsidence features, inflow from groundwater into portions of the mine, discharge of surface water through the 700 Level Adit portal (prior to placement of the adit seal); and outflow from the mine to groundwater within the fractured bedrock. The existing measures implemented to mitigate inflow into the subsidence features have limited effectiveness, and interactions between water in the mine and groundwater have not been fully evaluated. The existing remedy addresses only the discharge of water from the portal.

Mine Inflow

Adequate control of waters flowing into the mine through the Central and Piute subsidence areas has not been addressed despite the numerous evaluations and conclusions of several consultants working at the site. The Steffen Robertson and Kirsten, Inc. (SRK), *Final Feasibility and Design Report* published in November 1985 reported that "Much of the portal flow is believed to originate as surface flow, which is captured by sinkholes which connect the mine to the South and Middle Forks of Ward Creek." SRK's report indicates that flows out of the mine discharge at a 275 gpm with a maximum spring time flow rate of 3,000 gpm (presumed to be essentially surface water inflow). SRK's design report estimated an average total annual inflow through the Central and Piute subsidence features of 525 gpm (SRK, 1985) and that a significant portion of the flow through the mine could be removed by adequately addressing the control of flow into the mine.

In December 1989, SRK reported that "the surface diversions around the Central Orebody are in reasonable condition but are probably only effective in diverting some of the higher storm or snowmelt flows" (Hutchinson, 1989). However, SRK concluded that improving the efficiency of the diversions would likely involve costly engineering works for effective flow cutoff and SRK did not recommend improving the surface diversions around the sinkholes but rather recommended sealing off some of the openings in those areas as a means of inflow control.

In November 1996, WESTEC indicated that the diversion system diverts approximately 77 percent of the surface flow away from the sinkholes (WESTEC, 1996). WESTEC made the following recommendations to the CVRWQCB in the 1996 report:

- retrofit the existing diversion system with a clay liner and rip rap;
- construct an additional 1,000 lineal feet of diversion and line with clay and rip rap;
- install subsurface drains to intercept lateral subsurface flow.

Evidence that CVRWQCB acted on WESTEC's recommendations for improving inflow diversion system has not been included in the Prosecution materials.

The CVRWQCB has not provided consistent inspection and maintenance of the diversion ditches to keep them in optimum condition. Review of the CVRWQCB semi-annual site inspection reports between 2006 and 2013 (CVRWQCB, report that the diversion channels are often noted as in need of repairs and sometimes are partially obstructed with fallen trees and other debris. The presence of debris in the diversion channels would reduce their ability to convey runoff, and effectively reduce inflow into the mine.

Long-term Implications of Water Impoundment and Mine Adit Seal Placement

The long-term implications of water impoundment from the installation of the adit seal have not been adequately evaluated. Although surface water quality improved after installing the adit seal, the long-term effects of mine flooding on the production of AMD, potential discharge of contaminated water from the mine to nearby surface water, and contaminant migration in groundwater have not been adequately evaluated.

In 1986, Condor Minerals Management (CMM) provided comment to the SRK *Final Feasibility and Design Report* and concluded that "more work is needed to properly understand the flow mechanisms in the Walker Mine" (Dohms, 1986a). CMM noted that impounded water in the flooded mine workings, potentially contaminated by formation of acid from sulfide mineral oxidation will infiltrate into the surrounding subsurface and may contaminate areas that would otherwise remain unsaturated and uncontaminated. This scenario may significantly increase the overall cost of a long-term remedy. In particular, before the adit seal was installed, the AMD was a well-defined flow that discharged from the 700 Level Adit portal. The well-defined flow could be easily captured for further management. Sealing of the adit has caused additional flow of contaminated water into an extensive groundwater flow system. As a consequence of the CVRWQCB's remedy, a much larger area has been affected by AMD from the mine.

CMM indicated the adit seal would be, at best, a temporary solution. CMM also concluded that there are alternatives to sealing the mine that would treat the AMD without causing a long-term threat to other watersheds.

In a June 7, 1999 letter from the Department of Water Resources (DWR), Division of Engineering to the CVRWQCB, DWR indicated that most adit seals are typically used as part of a comprehensive AMD treatment program, not as a stand-alone remedial option (Torres, 1999). In their letter, DWR informs the CVRWQCB that they cannot support the approach to

the problem of maintaining the mine seal as defined in their Interagency Agreement. DWR recommends that the CVRWQCB revisit the assumptions in the Interagency Agreement relating to the design life of the seal, seepage, and the ability of the mine to contain future inflow. Finally, DWR recommended that the CVRWQCB begin permitting and design of an AMD treatment facility as a contingency plan to relieve excessive build up of water that may overflow out of the Piute Shaft.

Recent site inspections indicate the exterior of the mine seal is in good condition but the overall life expectancy of the plug is unknown. During construction, valved piping was installed through the seal in order to drain and collect the water from the upstream side of the plug if necessary. However, CVRWQCB field inspection reports indicate that the valves have not been operated since installation in 1987, despite recommendations from several consultants and CVRWQCB staff inspecting the mine (Pujol, 2002) (Huggins and Rosenbaum, 2006 and 2007) (Huggins and Little, 2009) (Huggins, 2010, 2013a, and 2013b).

Deferred Remedy

The adit seal was installed in November 1987. Water quality in Dolly Creek and Little Grizzly Creek improved afterwards as the amount of AMD flowing directly from the mine to surface water was reduced. However, water quality in the streams did not improve enough to reach water quality goals, indicating that the overall remedy for the site is incomplete. The USFS has an on-going remedy that is addressing the lower tailings impoundment. Surface water monitoring data collected after the adit seal was installed show that sources other than the mine discharge continue to contribute copper to surface water from the mill site area. The CVRWQCB has not addressed other sources of copper to surface waters, such as tailings in the mill site area, water that leaks past the adit seal, or water that drains from the settling pond near the mill site. It is likely that loading from all of these flows impacts the remedial efforts of the USFS at the lower tailings impoundment area. In addition, the CVRWQCB has not conducted investigations sufficient to evaluate the long-term effect of sealing the mine on hydrology, acid generation, and contaminant transport and how those effects may interact with other parts of the site or future remedial actions. The effect of flooding the mine workings and impoundment of the AMD behind the adit seal is discussed further in Opinion 6.

6. **The effects of mine flooding implemented by the CVRWQCB on hydrology and geochemistry (i.e. production of AMD and dissolved metals) are likely contributing to the degradation of water quality in the flooded mine behind the seal, degradation of groundwater in the vicinity of the mine and downgradient surface water contamination; however, insufficient data have been collected for proper evaluation.**

The potential for contaminating groundwater in the vicinity of the mine and downgradient of the mine was raise to the CVRWQCB prior to the installation of the mine seal in November 1987. In their comments to the *Final Feasibility and Design Report for the Walker Mine Closure Project* (SRK, 1985), CMM indicated that placing a seal in the mine will present the clear potential of introducing AMD to groundwater and nearby, unimpacted watersheds (Dohms, 1986a). CMM further commented that more work is necessary to properly understand the flow mechanisms in the Walker Mine and that the risk of damage is too great to allow a seal to be placed in the mine until a better understanding can be developed.

The CVRWQCB commissioned SRK to provide an independent evaluation of flow in the Walker Mine in 1986, as an addendum to the *Final Feasibility Study and Design Report* (SRK, 1985) for sealing the Walker Mine.. In their report, *Evaluation of Flow in the Walker Mine – Addendum to Final Report for Contract No. 4-051-150-0* (SRK, 1986), SRK reached similar conclusions as CMM; however, their conclusions failed to account for highly fluctuating water levels in the mine potentially exacerbating the generation of AMD, and SRK discounted the potential for surface water impacts from deep groundwater discharge.

After evaluating inflows, outflows, and known connections between the 700 Level and lower workings, SRK concluded that water moves from the 700 level to the lower workings where there was a loss of a considerable amount of water from the mine to surrounding groundwater system. SRK estimated that approximately 60 percent of the inflow to the mine was discharging from the deep mine workings into the bedrock. SRK also noted that the volume of flow from the mine to groundwater will increase as the mine floods because of the higher driving head. Based on the estimated loss to deep groundwater, SRK concluded that it was highly unlikely that water could flow from a sealed mine to the catchment or Ward Creek via the Piute Shaft. SRK's evaluation suggests that the acid drainage that accumulates behind the plug would migrate out into the country rock where it would be neutralized and the copper precipitate out of solution prior to discharging to surface water. SRK also concluded that the production of AMD would gradually decrease to the extent that inflow of surface water can be reduced in the surface shafts, and as the water stored in the plugged mine becomes less oxidizing over time.

However, while SRK predicted the mine workings would lose significant amounts of impacted water, SRK failed to anticipate that the water level in the mine workings would fluctuate potentially creating more AMD over time rather than stabilizing and creating less AMD over time. SRK also did not account for relatively short potential travel paths for water to migrate from the flooded workings to the tributaries of Ward and Nye creeks as the workings flooded. It also appears that SRK assumed that surface inflow to the workings through the subsidence

features would be substantially mitigated through recommended steps to divert surface runoff away from the openings. The hydrostatic pressure behind the seal has increased since the plug's installation in 1987 (Figure 9). Data show fluctuations in water levels with a maximum elevation of 232 feet above the adit seal measured in July 2006. Measured water levels have fluctuated between 100 feet and 150 feet above the seal over the last 5 years. The fluctuating water levels in the mine subject a large volume of sulfide mineral bearing rock to seasonal wet-dry cycles. During these wetting and drying cycles, rocks are alternately exposed to the two reagents needed for oxidation of pyrite and other sulfide minerals: water and oxygen. During the drying cycle, fresh oxygen rich air is drawn into the mine as water levels decline. During the wetting cycle, rocks below the water surface elevation become saturated as water levels rise.

The fluctuation in water levels and influx of oxygen in the flooded mine behind the adit seal resulting from seasonal and annual variations in precipitation, snowmelt, and runoff increase the volume of rock where sulfide minerals, water, and oxygen are all concurrently available. This constant fluctuation promotes more formation of AMD in areas where sulfide-bearing minerals exist than would be the case if the water level in the mine were stable. Additionally, the larger discharge rate to groundwater due to the higher driving head in the flooded mine would tend to spread AMD into the surrounding groundwater and watershed.

The CVRWQCB was aware of this potential before the adit seal was installed. In a memo documenting his 1979 review of the draft report *Evaluation of Water Pollution Sources and Development of Conceptual Pollution Abatement Plans, Walker Mine, Plumas County, California*, Jim Parsons of the State Water Resources Control Board (SRWCB) recognized that subjecting sulfide-mineral bearing rocks to annual wet-dry cycles would increase the extent of AMD processes (Parsons, 1979). Parsons' review memo was addressed to the CVRWQCB. Hence, the CVRWQCB was aware since that date that fluctuating water levels in the mine would have the adverse effect of increasing acid and dissolved metals generation in AMD.

In 1997 the SWRCB contracted with the Department of Water Resources (DWR) to install a deep well into the workings to monitor the water level and chemistry of the water impounded behind the seal (DWR, 1997). Although considerable expense was incurred to install the well, to date I have not seen the results of any data gained from the well installation, and it is unclear if any such data exists. Furthermore, during my site visit to the mine on November 6, 2013, CVRWQCB staff member Jeff Huggins indicated that he was unsure of the well's exact location and that the well had not been monitored because of some unknown equipment

problems (verbal communications, Jeff Huggins, November 6, 2013). Jeff Huggins is reportedly the CVRWQCB staff member in charge of completing the routine mine inspections.

Contrary to SRK's conclusions, there appears to be some evidence of seepage from the flooded mine impacting surface water as presented in Figures 7 and 12. Figure 9 shows the hydrostatic pressure data measured behind the seal converted to elevations in feet above mean sea level (feet msl). The data show that the water levels in the flooded mine and presumably for some distance laterally into the surrounding country rock have fluctuated between about 6,300 and 6,400 feet msl since about 1999. Figure 10 is a larger scale view of surface water data collected on the South and Middle Branches of Ward Creek and the upper reaches of Nye Creek including sampling locations WM-11, WM-12, and WM-13 that are most proximal to the flooded mine and where dissolved copper concentrations are highest (see Opinion 3 for presentation and discussion of these data). Superimposed on this diagram are the locations of the 6,300 and 6,400 topographic contours, which are the elevation range of the recent water-level fluctuations in the flooded mine (Figure 10). Locations WM-11, WM-12, and WM-13 are each bracketed within this elevation range. In addition, review of the recent water quality data since 2006 for WM-13 shows dissolved copper was not detected at this location from 2006 through 2010, but a sharp upward trend from non-detect to 14.9 µg/L is evident in the most recent three samples from June 2012 to November 2013. The elevation correlations and upward concentration trend in W-13 strongly suggests that seepage and discharge of impacted groundwater from the flooded mine may be a source of the higher concentrations of dissolved copper observed in these drainages.

Further impacts to surface and groundwater in the vicinity of the mine are unknown as insufficient data has been collected for proper evaluation.

7. **Numerous site owners or operators have followed Walker Mining Company. Since 1957, the CVRWQCB has received numerous recommendations, plans, alternatives, and options for the mitigation or remediation of AMD at the site. In response, the CVRWQCB constructed the concrete seal in the 700 Level Adit portal in 1987. Between 1957 and 1987, continued production of AMD significantly contributed to degradation of water quality.**

Evaluation of the ownership and operations history of the site, presented as a historical timeline in Table 1, shows that there have been numerous owners/operators/lessees at the site following the bankruptcy of Walker Mining Company and subsequent sale of the property in 1944. The record shows active ownership and lease operations at the site for a period of 60 years post-Walker Mining Company. These parties used the site for various activities, including preparation for the potential restart of mining activities, mineral exploration, and

timber harvesting. Many of these parties either initiated activities aimed at reducing potential pollution or proposed remedial solutions at the site. The available documentation indicates a number of these attempts and proposals aimed at reducing the surface water impacts were either halted or denied by the CVRWQCB.

Prior to mine closure in 1941, structures constructed by the Walker Mining Company were placed to divert the flow of water in Dolly Creek around the lower tailings impoundment. An aerial photograph taken October 7, 1941 (US FS, 1941) (Figure 11), shows that Dolly Creek was diverted around the lower tailings impoundment area via a ditch or flume located above the northern side of the lower tailings impoundment. The image shows no surface water flowing across the northern portion of the impounded tailings. As constructed and maintained by Walker Mining Company, the lower tailings impoundment dam ran the length of the impoundment next to Little Grizzly Creek; it appears functional and in good condition in the October 7, 1941 aerial photograph (Figure 11).

The Dolly Creek diversion and lower tailings impoundment dam were allowed to fall into disrepair by subsequent operators and/or government agencies, resulting in their failure. An aerial photograph taken May 22, 1954 (Army Map Service, 1954) (Figure14) shows that the Dolly Creek diversion ditch had failed, allowing the creek to flow across the northern portion of the impounded tailings. The same photograph shows a dendritic drainage pattern in the southern portion of the lower tailings impoundment (Figure 12). The newly formed drainage pattern terminates at a breach in the lower tailings impoundment dam adjacent to Little Grizzly Creek. The dendritic pattern was caused by erosion of tailings into Little Grizzly Creek. The failure of the Dolly Creek diversion, the subsequent realignment of Dolly Creek to a lower elevation pathway across the tailings, and the breach in the tailings dam adjacent to Little Grizzly Creek increased the loading of copper from the impounded tailings to Dolly Creek and Little Grizzly Creek.

Although the importance of water diversion is prominent in the correspondence between the CVRWQCB, the USFS, and others, appropriate steps to timely repair and maintain the diversion did not occur.

If the Dolly Creek diversion channel had been maintained following Walker Mining Company's departure in 1941, sedimentation and copper loading to Little Grizzly Creek would have been significantly decreased. Instead, Dolly Creek was allowed to flow across the lower tailings impoundment for a the period of approximately 66 years, until 2007, when the USFS constructed the new Dolly Creek Diversion channel that exists today.

The CVRWQCB was aware of the environmental issues at the site as early as 1957. A site inspection report and correspondence between the Department of Fish and Game (DFG) and the CVRWQCB indicates that the CVRWQCB was aware of water quality issues in Dolly Creek and Little Grizzly Creek no later than 1957. The DFG responded to a request for comments by the CVRWQCB (original request dated October 14, 1957). In this correspondence, the DFG informs the CVRWQCB that there is a verified history of fish kills in Little Grizzly Creek and Indian Creek. Further, they recommend that water quality requirements be set and enforced to protect water use downstream of the mine (DFG, 1957).

A 1957 report mentions the possibility of "sealing off exits" but states this solution does not seem feasible since "the main rock tunnel being inaccessible at the present time, and waters entering the mine through numerous fissures and openings." The report indicates that treatment of the mine waters is the only feasible approach and proposes a collaborative effort between the owners and Plumas County (Trumbull, 1957).

A 1971 report submitted to the CVRWQCB states that the "cheapest solution in terms of total cost may be...diversion of surface water away from openings into the mine...and reduction of the acidity of the water emanating from the mine" (Matthews, 1971).

In 1970, Noranda Mining (Norandex), the lessee of the mine property, proposed to the CVRWQCB...draining the mine, diverting the mine water around the tailings, reconditioning an old diversion ditch on Ward Creek, constructing settling ponds to reduce toxicity, and maintaining diversion ditches to prevent water from entering the discovery shaft. The proposed plan was refused by the CVRWQCB with the reasoning that Norandex could abandon the property when its lease ran out and consequently no one would remain to maintain the system. Thus, no action was taken (California Division of Mines and Geology [CDMG], 1972).

CDMG (1972) indicates that the CVRWQCB had two courses of potential action to mitigate the water quality issues associated with the Walker Mine. The first was to implement a remedial plan, and the second was to implement a data collection plan. For Option 1, the report outlines a remedial plan that would be "a step in the right direct even if it doesn't completely solve the problem", which includes soil filtration, evaporation ponds, pH adjustment, copper precipitation, mine inflow reduction, and mine air restriction. For Option 2, the report describes an extensive data collection program with the intent of determining the most practical method to control toxicity. To date no records have been located to indicate that either option was executed by the CVRWQCB.

William McClung, a mining consultant to Calicopia Corporation, recommended remedial measures for the mine. The CVRWQCB and Calicopia reached an agreement in which Calicopia was directed to construct a "system of dikes and ditches around the glory holes and the Piute Shaft" (Robertson, 1974) to reduce the amount of surface runoff entering the mine. Documentation has not been found that indicates these diversion channels were maintained until the CVRWQCB constructed concrete lined channels sometime after 2000 (Huggins, 2013).

Not only did the prior owner and lessees propose alternatives to the 700 Level Adit seal, but the CVRWQCB themselves examined several alternatives. A feasibility study for a chemical treatment plant was completed by D'Appalonia Consulting Engineers and recommended a chemical treatment plant be built. The CVRWQCB started to pursue this route, and a pilot study/design was done by Pearson and Associates (Pearson). In 1982, Pearson, on behalf of the CVRWQCB, constructed and operated a pilot AMD treatment facility in 1982 (Pearson, 1983a). The facility included "two limestone pre-neutralization processes, chemical neutralization to raise the pH to 9 to 10, a 15 feet fall spray decarbonation process, sedimentation in a 1,500 square foot basin...to remove chemically precipitated copper, followed by filtration through straw bales." The entire process ran on power generated by a water wheel. Up to 97 percent removal of total copper from the AMD was demonstrated during the pilot study. A follow-up report includes a design and estimates that the designed treatment facility would remove 80 percent of total copper from the mine discharge and would cost about half a million dollars (Pearson, 1983a and 1983b). Although the pilot study was apparently successful, the CVRWQCB rejected the chemical treatment option after a feasibility report (SRK, 1986) for the seal determined that the cost would be much lower (CVRWQCB Buff Sheet, ~1986).

In the Final Feasibility Study and Design Report (SRK, 1985), SRK indicates that a seal is a measure to immediately halt pollution from the mine but "in the absence of any additional precautions, the halt might be only temporary. If water in the workings was able and permitted to rise until it could overflow through the Piute shaft, the problem might simply be transferred from Dolly Creek to the Middle Fork of Ward Creek..." Thus, the seal was proposed as Step 1) to be completed in conjunction with Step 2) diversion ditches above subsidence, Step 3) isolation of the Piute Section of the mine workings, and Step 4) construction of a seal in the Old Sawmill Adit. The 1985 SRK report went on to recommend the completion of several flow and water balance studies (SRK, 1985) one of which was conducted in 1986. The follow-on 1986 SRK report (SRK, 1986) assumes that all water is either discharging from the adit or into the deep groundwater system. "The flow in the mine is a clearly identifiable hydraulic and

geochemical system." and "There is clearly loss of water from the mine which is a result of discharge of water from the deep mined workings to the natural groundwater system."

Following publication of the CVRWQCB's Initial Study and SRK's feasibility study for the mine seal, CMM (Dohms, 1986b) offered alternative remedies. CMM's first recommendation was to build on previous efforts to intercept surface water flows by filling and covering the subsidence features above the Central and Piute Orebodies, to evaluate the potential of a grout cut-off wall to prevent alluvial underflow in South Branch Ward Creek from entering the subsidence, and to start a regular program of diversion ditch maintenance. Second, they proposed intercepting high-quality in-mine flows (existence of which was demonstrated in SRK's 1986 report) and directing them to the 700 Level Adit portal to improve the quality of the portal discharge. Similarly, they suggest intercepting low-quality in-mine flows and directing them to lower workings where they can do less harm (Dohms, 1986b). This report also indicates that the owner (Robert Barry) had investigated the feasibility of a chemical treatment plant.

8. **Attainment of water-quality objectives for Dolly Creek and other surface waters requires coordination of upstream and downstream response actions. Issues at the mine site and tailings impoundment area are interrelated. A cooperative effort between the CVRWQCB and the USFS would benefit the remedial activities in both locations.**

As discussed in the opinions expressed above, installation of the adit seal by the CVRWQCB was not a comprehensive remedy. The adit seal does not address control of water flow into the mine workings, nor prevent discharges from the mine workings that reach Dolly Creek. Further response actions are required to reduce metals loading from mining-related sources of copper from leakage around the adit, the tailings and settling pond in the mill area.

The USFS remedy at the lower tailings impoundment area is on-going and is neither complete nor final. In order to minimize potential impact to the Tailings Site remedy from upstream response actions at the mine site, an integrated approach between both sites must be taken. The mine site is located approximately 300 feet above the lower tailings impoundment and changes to surface water or groundwater conditions at the mine site have the potential to interfere with the success of response actions at the lower tailings impoundment area. A coordinated response under the on-going federal remedy at the Tailings Site will better assure attainment of water quality goals in Little Grizzly Creek downstream of the mine and tailings impoundment.

Surface water and groundwater flow paths are based on the physical characteristics of the flow system, and are completely unaffected by arbitrary lines such as property or

administrative boundaries. Changes in surface water or groundwater systems in the mine and mill area will affect conditions in the lower tailings impoundment area, regardless of administrative boundaries. Attempting to address the mine and mill site area and the lower tailings impoundment area, which have closely linked hydrology, as two administratively-separate remediation sites is not a sound technical approach. Compounding of the issues at these two site is in turn reflected by the non-attainment of water quality goals in Little Grizzly Creek.

5.0 DOCUMENTS RELIED UPON

Documents that I relied upon directly for this report include:

Army Map Service, 1954, 1:60000 Aerial Photograph, Roll 000112, Frame 14073. May 22 [Fin. No. 176]

Busby, R., 2004, Central Valley Regional Water Quality Control Board Inspection Report, p. 1, June 3. [Fin. No. 251]

Busby, R., 2006, Central Valley Regional Water Quality Control Board Inspection Report, p. 1, May 27. [Fin. No. 250]

Busby, R., and Rosenbaum, S., 2002, Central Valley Regional Water Quality Control Board Inspection Report, p. 1, May 28. [Fin. No. 249]

California Division of Mines and Geology, 1972, Plans to Proceed Toward Abatement of the Water Pollution Problems Incident To Water Emanating from the Walker Mine, Plumas County, pursuant to Interagency Contract #1-4-45 with the State Water Resources Control Board, 156 p., March 25. [Fin. No. 183]

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HISTORICAL TIMELINE
WALKER MINE
Plumas County, California

Event Date	Event	Exhibit No.
	Summary of Chronology	
10/24/1941	Walker Mine shut down due to "unfavorable ore development and inability to operate under the prevailing price of copper"	173; 172
1944	Walker Mining Company filed for bankruptcy (assets were sold in 1945)	289; 290
3/27/1945	Safeway Signal Corporation purchased Anaconda/IS&R's claim in Walker Mining Company.	263; 266; 265; 264
8/19/1946	Quitclaim deed from Safeway Signal Company to R.P. Wilson	268; 288
9/20/1946	Quitclaim deed from R.P. Wilson to Plumas Land Company	267; 288
9/27/1948	Robert Barry received mine property from Plumas Land Company by deed.	197
11/19/1965	Grant Deed from Robert Barry gives property to Calicopia Corporation	288
1969 - 1971	Norandex is operator. Performed mapping, 11 bore holes, geochemistry and geophysics studies. Constructed unlined runoff diversion ditches around subsidence features near Piute Shaft (Piute Orebody) and Discovery Shaft (Central Orebody)	163; 214
1976 - 1977	Amax is operator. Additional infrastructure for treating mine drainage placed into service	163
1978 - 1982	Conoco is operator. Constructed a settling pond. Constructed pipeline from settling pond to below the mine property entrance. Diverted flume water to the settling pond (note – not clear what is meant by "flume water")	163
1984 - 1986	Property leased to Standard Bullion Corporation (SBC), SBC becomes operator.	270; 269
11/13/1987	K. G. Walters Construction Company installs 700 level mine adit plug.	221
6/14/1988	Barry died, and Calicopia owns 100% of Walker Mine.	221
9/8/1997	Property sold to Cedar Point Properties, Inc. from Tax Collector of Plumas Country	280; 288
9/9/1999	Cedar Point Properties is the current property owner and is responsible for the site and remedial activities; Calicopia is no longer responsible.	282; 283
8/4/2004	Cedar Point Properties abandons property, stops harvesting timber, and suspends corporate status.	285

HISTORICAL TIMELINE
WALKER MINE
Plumas County, California

Event Date	Event	Exhibit No.
	Detailed Summary of Chronology	
10/24/1941	Walker Mine shut down due to "unfavorable ore development and inability to operate under the prevailing price of copper"	173; 172
1942 - 1954	Failure of the tailings dam and diversion around the tailings impoundment; exact date unknown	163
1944	Walker Mining Company filed for bankruptcy (assets were sold in 1945)	289; 290
3/27/1945	Safeway Signal Corporation purchased Anaconda/IS&R's claim in Walker Mining Company.	263; 266; 265; 264
1945 - 1946	Safeway Signal Corporation sells mine equipment including ball mill	175
8/19/1946	Quitclaim deed from Safeway Signal Company to R.P. Wilson	268; 288
9/20/1946	Quitclaim deed from R.P. Wilson to Plumas Land Company	267; 288
9/27/1948	Robert Barry received mine property from Plumas Land Company by deed.	197
5/22/1954	Aerial photograph shows that ditch that diverts Dolly Creek around the tailings impoundment, and a portion of the dam along Little Grizzly Creek have failed	176
4/24/1958	Water Discharge Requirements (WDR) issued (#58-180) to Robert Barry requiring clean discharge of mine waters	197
4/8/1959	Cleanup and Abatement Order (CAO) issued to Barry. Additional details are unknown	197
1960	Maintenance of runoff diversion ditches around subsidence features	163
6/10/1960	Diversion structures around sinkholes have been neglected for the past 20 years (1940-1960) and need repair	181
7/18/1963	Cease and Desist Order (CDO) issued to Barry and Calicopia. Additional details are unknown	197
11/19/1965	Grant Deed from Robert Barry gives property to Calicopia Corporation	
1969 - 1971	Norandex is operator. Performed mapping, 11 bore holes, geochemistry and geophysics studies. Constructed unlined runoff diversion ditches around subsidence features near Piute Shaft (Piute Orebody) and Discovery Shaft (Central Orebody)	163; 214
10/26/1970	Abatement Order (Section 13305 of the California Water Code) issued to Barry/Calicopia. Additional details are unknown	197
9/8/1971	CAO #73-1 issued to Barry/Calicopia to abate the pollution of Dolly and Little Grizzly Creeks	184
1974 - 1976	Cleanup of 40 acres of mining camp	163
1975	Pipeline constructed to convey drainage from the portal to "cement tanks"	163

HISTORICAL TIMELINE
WALKER MINE
Plumas County, California

Event Date	Event	Exhibit No.
5/23/1975	WDR Order #75-119 issued to Barry/Calicopia with water pollution limitation and required monitoring and reporting	197; 186
1976 - 1977	Amax is operator. Additional infrastructure for treating mine drainage placed into service	163
1976 - 1977	Interior settling pond inside mine constructed	214
1978 - 1982	Conoco is operator. Constructed a settling pond. Constructed pipeline from settling pond to below the mine property entrance. Diverted flume water to the settling pond (note – not clear what is meant by "flume water")	163
Spring, 1978	Cave-ins on tunnels blocked drainage causing a blowout due to water pressure, resulting in major erosion of tailings below the adit (per 10/30/78 memo)	186
08/1978 - 11/1978	Ponderosa Mining and Development re-timbered the adit and cleared a caved-in tunnel	187
Fall, 1978	Settling pond constructed, flume system repaired, re-timbering on site	187
1980	California Water Quality Control Board issued stop order on completion of pond	163
1980	Levee and tailings dam were repaired by USFS in 1980	224
5/30/1980	WDR (80-058) issued to Barry and Calicopia to abate pollution of waters from Walker Mine and dispose of waste appropriately (replaces previous WDR 75-119)	191
5/30/1980	CAO 80-070 issued to Barry and Calicopia to abate and clean up pollution of waters from Walker Mine	190
5/30/1980	Monitoring and Reporting Program from CVRWQCB (for Barry and Calicopia)	189
7/2/1980	Mine owners ignored abatement tasks and therefore public funds will be used for site activities	192
8/1/1980	Surface water diversion ditches were constructed (no other details provided)	197
8/1/1981	Additional unlined diversion ditches around sinkholes were constructed	233
12/9/1983	Request to Abate Pollution (#83-148) adopted (Section 13305 of CA Water Code) to USFS to abate the condition of pollution	195
12/21/1983	CVRWQCB files complaint to Plumas County Superior Court for civil penalties against Barry and Calicopia	201
7/1/1984	Property leased to Standard Bullion Corporation (SBC). SBC becomes operator.	270; 269; 200

HISTORICAL TIMELINE
WALKER MINE
Plumas County, California

Event Date	Event	Exhibit No.
1/25/1985	WDR Order 85-033 for Barry and Calicopia (mine owners) and Standard Bullion, Inc. (mine operator) provides discharge limitations and requires a Report of Waste Discharge (RWD) to be filed	201
9/1/1985	Feasibility and Design report for mine seal submitted by SRK Consulting	252
3/28/1986	WDR (86-073) and MRP updates for USFS (re: mine tailings). Rescinds previous WDR #58-180	205; 205; 210
7/2/1986	Calicopia discharged tunnel muck, etc to an unlined settling pond near the main portal. Sample results of this material indicated hazardous levels of metals, etc.	221
10/20/1986	Improvements completed by Robert Barry including dike construction, tunnel rehabilitation, grading of settling pond, replacement of timbers in tunnel portal	212; 211
4/15/1987	The CVRWQCB signed a CAO (#87-703) outlining specific cleanup and discharge requirements for Calicopia	215
11/13/1987	Construction of mine seal in the main 700 level access tunnel completed	221
11/13/1987	K. G. Walters Construction Company installs 700 level mine adit plug.	221
1988 - 2013	Numerous site inspections performed to assess condition of mine (mine seal, water quality, tailings dam and pile, ditches, subsidence area, etc)	216; 271; 274; 273; 229; 253; 254; 255; 257; 258, 259; 292; 262
6/14/1988	Barry died, Calicopia owns 100% of mine	221
6/17/1988	Installation of pressure transducer and data logger to monitor pressure head on mine plug	216
3/31/1989	The CVRWQCB adopted a Water Quality Control Plan (Basin Plan) for the Sacramento River Basin	224
12/1/1989	Mine seal and surface diversion ditches around the Plute shaft and Central Orebody are in reasonable/good condition	220
1/26/1990	NPDES Permit #CA0080110 was written by CVRWQCB to Calicopia. Includes WDR #90-030 to abate pollution	221
1/26/1990	As of 01/26/90, no other technology for treatment/control of mine drainage has been implemented besides the mine seal	221

HISTORICAL TIMELINE
WALKER MINE
Plumas County, California

Event Date	Event	Exhibit No.
11/2/1990	Resolution (#90-316) authorizes CVRWQCB to apply to SWRCB for funds for cleanup actions associated with Walker Mine	272
1/22/1991	USFS accepts CVRWQCB's revised WDRs for the restoration and monitoring programs for mine tailings (revised WDRs dated 12/31/1990). No additional information provided	222
1/25/1991	WDRs (#91-017) for USFS (rescinds #86-073) for water pollution at the tailings dam discharge and at the culvert of the settling pond (pond located 2,300 feet SE of the tailings dam)	224
1/25/1991	Monitoring and Reporting Program (attachment to WDR #91-017) for USFS from CVRWQCB for mine tailings	223
2/21/1991	Approval of Request for up to $1,500,000 from Water Pollution Cleanup and Abatement Account for Walker Mine. Last known involvement of Calicopia with Walker Mine.	225
3/28/1991	Summary of Proposed Tailings Rehabilitation Program from USFS to CVRWQCB in order to meet the WDR	226
1/5/1994	USFS to Atlantic Richfield re: liability for all incurred costs to mine site	230
4/1/1994	Record of Decision (ROD) for remediation of Walker Mine Tailings by USFS	196
9/29/1995	Cooperative Agreement (#1432 C0250003) for constructing a ground water monitoring well at the Walker Mine site	231
2/27/1997	Division of State Architect agrees to provide services	275
3/11/1997	Interagency Agreement (#6-068-150-0; DWR #97-4803-165776) between SWRCB and DWR for monitoring well at the mine	276
3/24/1997	California RWQCB requested assistance from DSA in completing a surface water diversion project	279
6/1/1997	Resolution (#97-161) adopts the Operations and Maintenance Procedures for Walker Mine	278; 293
6/20/1997	Resolution (#97-160) authorizes continued State funds for mine remediation and to seek funds from responsible party	278; 277
9/8/1997	Property sold to Cedar Point Properties, Inc. from Tax Collector of Plumas Country	280; 288
9/18/1997	Resolution (#97-082) approves the allocation of $1.2M over 10 year period to CVRWQCB to operate and maintain the acid drainage at the mine	146
10/7/1997	CAO (#97-715) to Cedar Point Properties ordering to abate pollution of surface waters and maintain existing remedial structures	235
2/24/1998	The Interagency Agreement (#7-097-150-0 DWR 165928) between SWRCB and DWR for Walker Mine seal	240

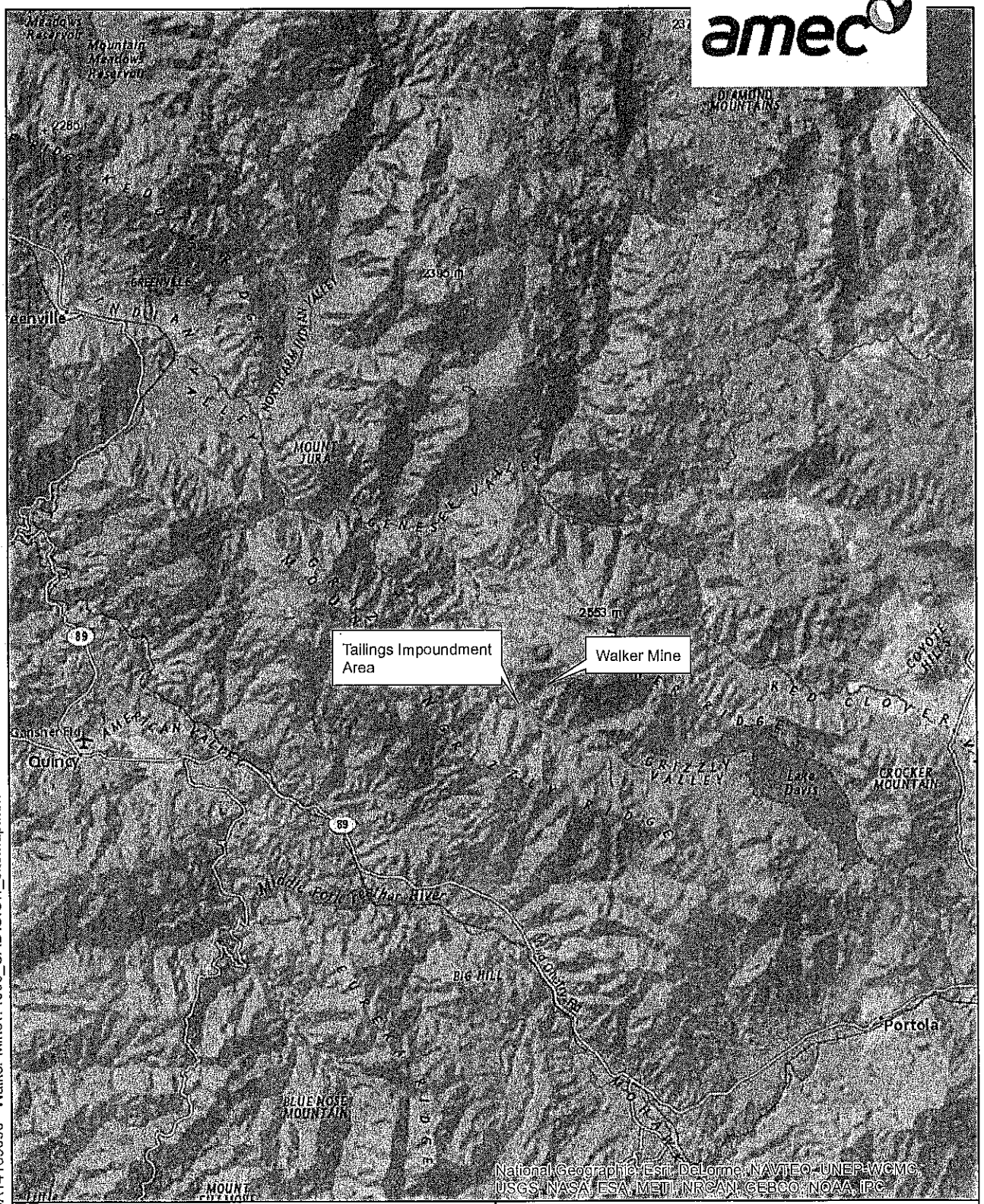
HISTORICAL TIMELINE
WALKER MINE
Plumas County, California

Event Date	Event	Exhibit No.
6/7/1999	Memo from DWR Division of Engineering to CVRWQCB rescinding services under Interagency Agreement dated 2/24/1998 due to lack of funds and experience	281
7/28/1999	WDR #99-110 to Cedar Point Properties to abate pollution of creek waters from mine (includes monitoring and reporting program); Rescinds previous WDR 90-030 (part of NPDES Permit CA0080110)	241
7/28/1999	CDO #99-111 to Cedar Point Properties that requires Cedar Point Properties not to violate WDR 99-110 issued	242
9/9/1999	Cedar Point Properties is the current property owner and is responsible for the site and remedial activities; Calicopia is no longer responsible.	282; 283
1/28/2000	WDR Order (#5-00-028) to USFS updates and rescinds previous WDR (91-017) re: mine tailings pollution	244
Early 2000's	Concrete lined diversion ditches were constructed in early 2000's around orebody subsidence areas	262
7/1/2001	Plumas National Forest ROD Amendment. Provides for diversion and control of Dolly Creek in addition to the requirement of the 1994 ROD	284
8/4/2004	Cedar Pont Properties abandons property, stops harvesting timber, and suspends corporate status.	285
6/13/2005	Consent Decree Order (CIV. NO. S-05-00686 GEB-DAD) to be used to resolve disputes re: costs for remediation between USFS and ARCO	286; 155
1/26/2006	Cedar Point Properties no longer exists as an entity that can be regulated by WDR 99-110 and CDO 99-111	252
10/10/2007	Diversion channels around subsidence/collapse areas of the Piute Orebodies were inspected	255
10/10/2007	Construction of diversion channels of Dolly Creek off the tailings site is nearly complete	255
10/21/2009	Renovations to the diversion channel headwork's were nearly complete (required by USFS by Order No R5-00-028). The prior design (2007) had not worked effectively	257
3/18/2010	CVRWQCB Resolution (#R5-2010-0036) authorizing to apply funds from State Water Pollution Cleanup and Abatement Account to Walker Mine remediation activities	287
4/29/2013	The CVWRQCB sent ARCO and USFS a draft CAO; ARCO for the mine site, ARCO and USFS for tailings	290; 291
11/13/2013	Tailings settling pond never completely fills and likely discharges into Dolly Creek via a buried drainage structure of through fill material	262
11/13/2013	Current tailings facility located just west of Dolly Creek diversion head-works still poses a threat to water systems	262

HISTORICAL TIMELINE
WALKER MINE
Plumas County, California

Date	Event	Source
6/7/1999	Memo from DWR Division of Engineering to CVRWQCB rescinding services under Interagency Agreement dated 2/24/1998 due to lack of funds and experience	20140065-00002181.tif
7/28/1999	WDR #99-110 to Cedar Point Properties to abate pollution of creek waters from mine (includes monitoring and reporting program); Rescinds previous WDR 90-030 (part of NPDES Permit CA0080110)	20140065-00003697.tif
7/28/1999	CDO #99-111 to Cedar Point Properties that requires Cedar Point Properties not to violate WDR 99-110 issued	20140065-00003717.tif
9/9/1999	Cedar Point Properties is the current property owner and is responsible for the site and remedial activities; Calicopia is no longer responsible.	20140065-00002010.tif; 20140065-00002011.tif
1/28/2000	WDR Order (#5-00-028) to USFS updates and rescinds previous WDR (91-017) re: mine tailings pollution	20140065-00002394.tif
Early 2000's	Concrete lined diversion ditches were constructed in early 2000's around ore-body subsidence areas	20131059-00004099.tif
7/1/2001	Plumas National Forest ROD Amendment. Provides for diversion and control of Dolly Creek in addition to the requirement of the 1994 ROD	20131042-00000164.tif; 20130964-00001470.tif
8/4/2004	Cedar Pont Properties abandons property, stops harvesting timber, and suspends corporate status.	20131059-00004708.tif
6/13/2005	Consent Decree Order (CIV. NO. S-05-00686 GEB-DAD) to be used to resolve disputes re: costs for remediation between USFS and ARCO	20130964-00004553.tif; 20140065-00006101.tif
1/26/2006	Cedar Point Properties no longer exists as an entity that can be regulated by WDR 99-110 and CDO 99-111	20131059-00004768.tif
10/10/2007	Diversion channels around subsidence/collapse areas of the Piute Orebodies were inspected	20131059-00004071.tif
10/10/2007	Construction of diversion channels of Dolly Creek off the tailings site is nearly complete	20131059-00004071.tif
10/21/2009	Renovations to the diversion channel headwork's were nearly complete (required by USFS by Order No R5-00-028). The prior design (2007) had not worked effectively	20131059-00004076.tif
3/18/2010	CVRWQCB Resolution (#R5-2010-0036) authorizing to apply funds from State Water Poilution Cleanup and Abatement Account to Walker Mine remediation activities	20131059-00004770.tif
4/29/2013	The CVWRQCB sent ARCO and USFS a draft CAO; ARCO for the mine site, ARCO and USFS for tailings	20131059-00003727.tif; 20131059-00003718.tif
11/13/2013	Tailings settling pond never completely fills and likely discharges into Dolly Creek via a buried drainage structure of through fill material	20131059-00004099.tif
11/13/2013	Current tailings facility located just west of Dolly Creek diversion head-works still poses a threat to water systems	20131059-00004099.tif

FIGURES



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SITE LOCATION MAP
Walker Mine Site
Plumas County, California

By: dpv	Date: 02/18/2014	Project No. SA14165090
amec		Figure .1

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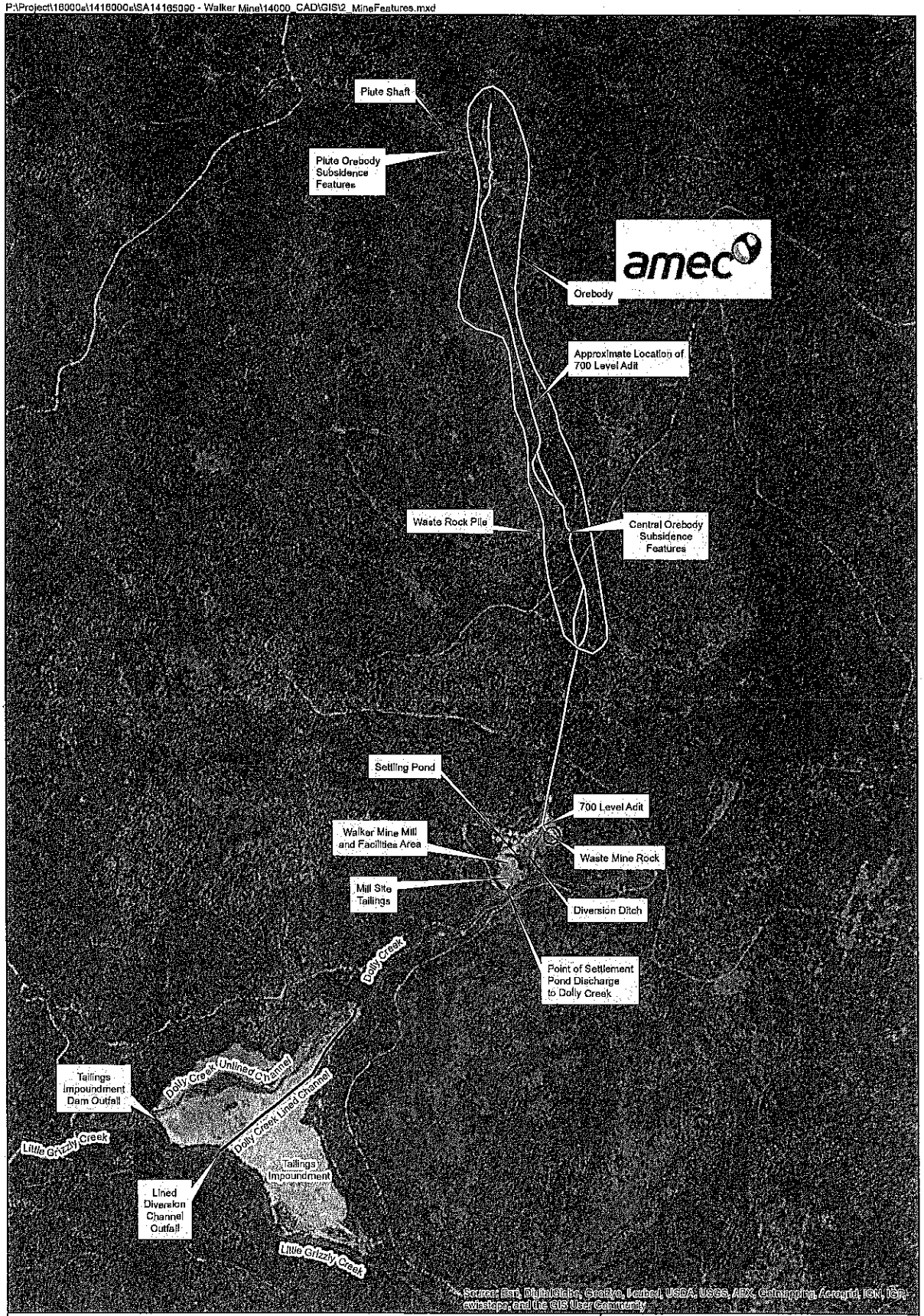

amec

MINE FEATURES
Walker Mine Site
Plumas County, California

0 1,000 Feet

By: dpv	Date: 02/20/2014	Project No. SA14165090
amec		Figure 2

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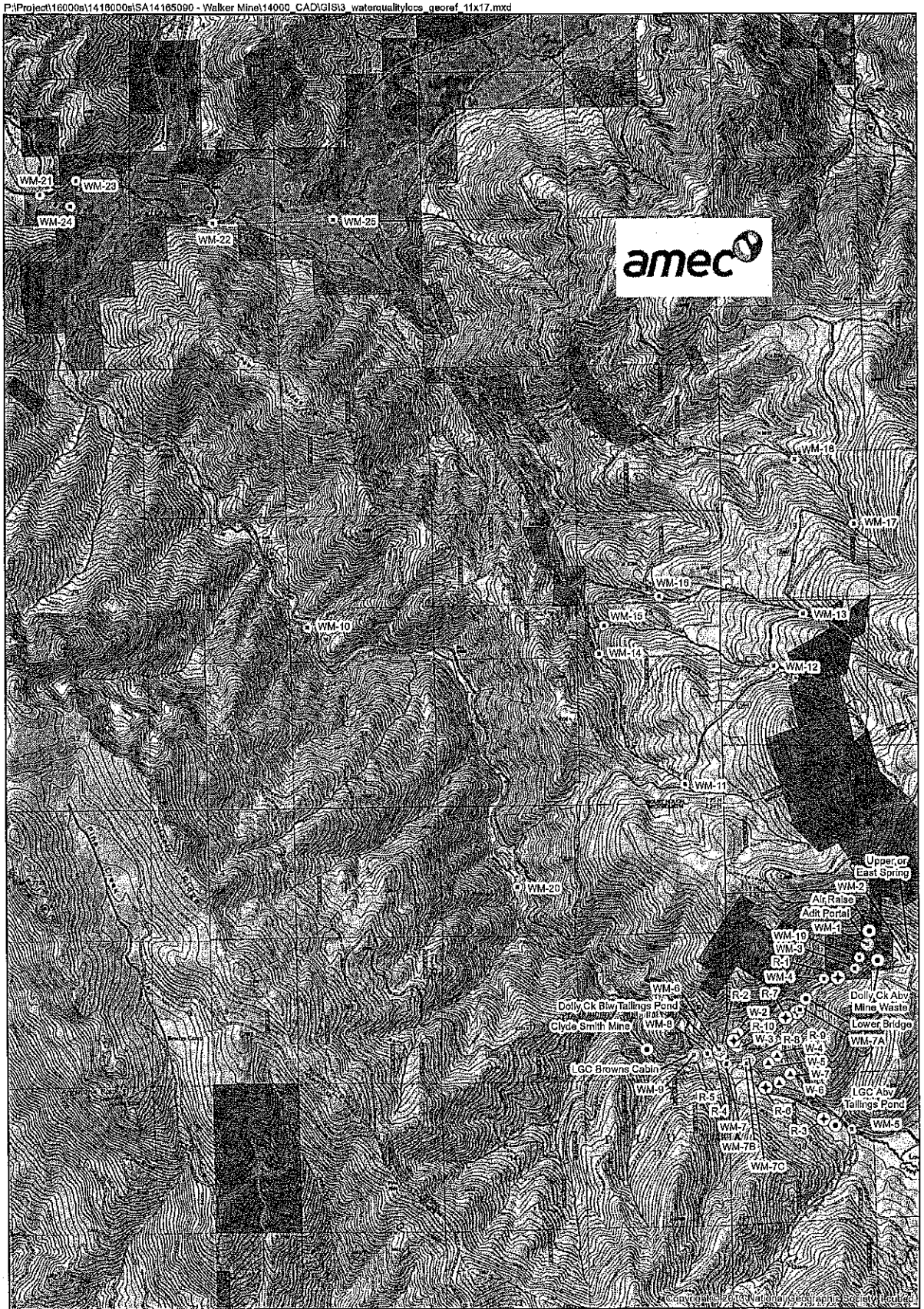


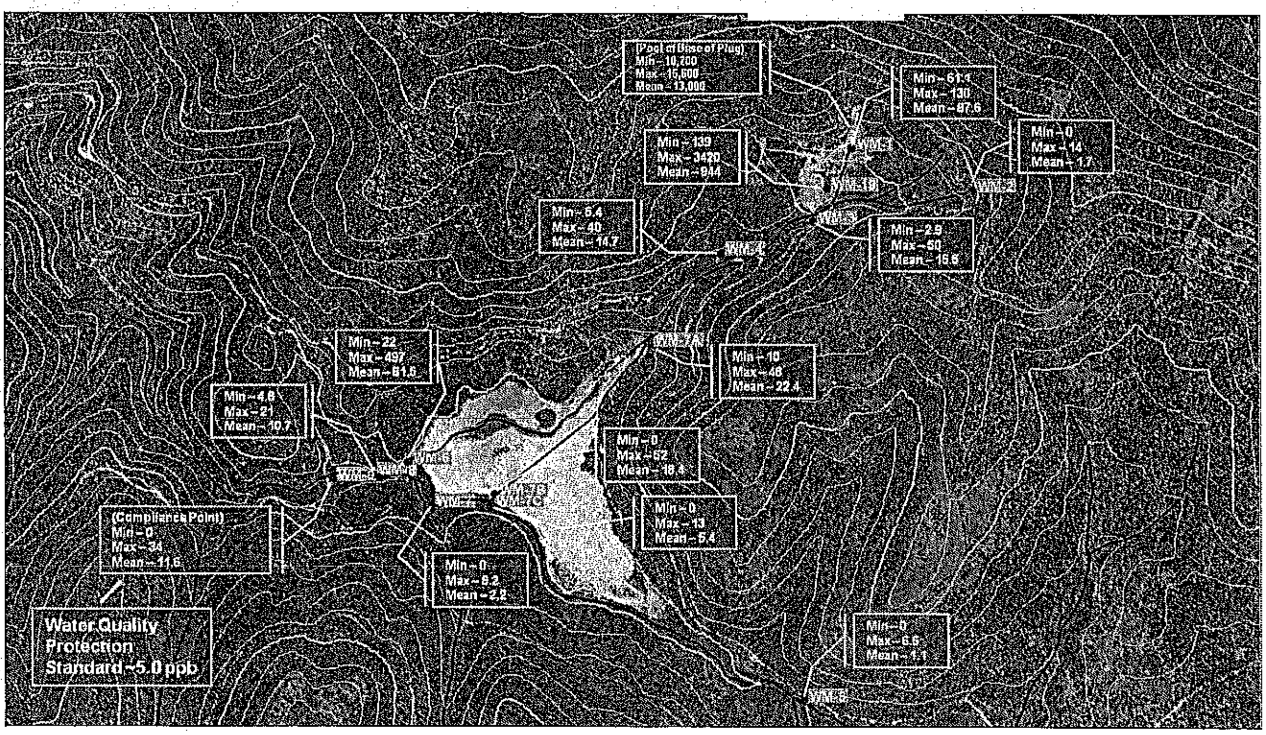
Explanation

- USFS Monitoring Wells
- USFS Surface Water Monitoring Stations
- CVRWQCB Surface Water Monitoring Stations
- CVRWQCB Surface Water Monitoring Stations 1957-1970

0 2,000 Feet

SURFACE WATER MONITORING LOCATIONS
Walker Mine Site
Plumas County, California

By: dpv	Date: 02/19/2014	Project No. SA14165090
amec		Figure 3



Central Valley Regional Water Quality Control Board Sampling,
Second Quarter 2006 through Fourth Quarter 2013.

0 1000
Scale is Approximate

SUMMARY OF DISSOLVED COPPER CONCENTRATIONS (µg/L)
CVRWQCB SAMPLING LOCATIONS – 2Q06 THROUGH 4Q13
Walker Mine Site
Plumas County, California

By: dpv	Date: 02/20/2014	Project No. SA14165090
amec		Figure 4

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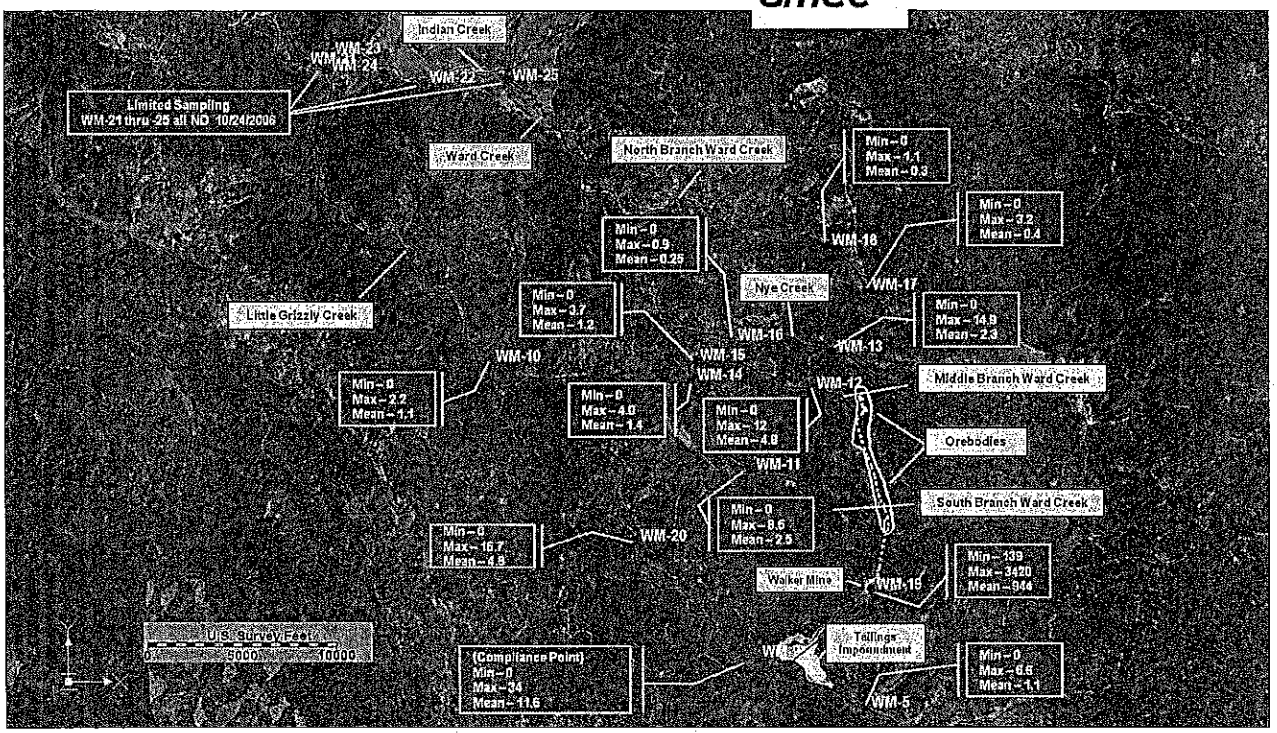

Central Valley Regional Water Quality Control Board Sampling Data -
Second Quarter 2006 through Fourth Quarter 2013.

SUMMARY OF DISSOLVED COPPER CONCENTRATIONS (µg/L)
CVRWQCB SAMPLING LOCATIONS
Walker Mine Site
Plumas County, California

By: dpw	Date: 02/20/2014	Project No. SA14165090
amec		Figure 5

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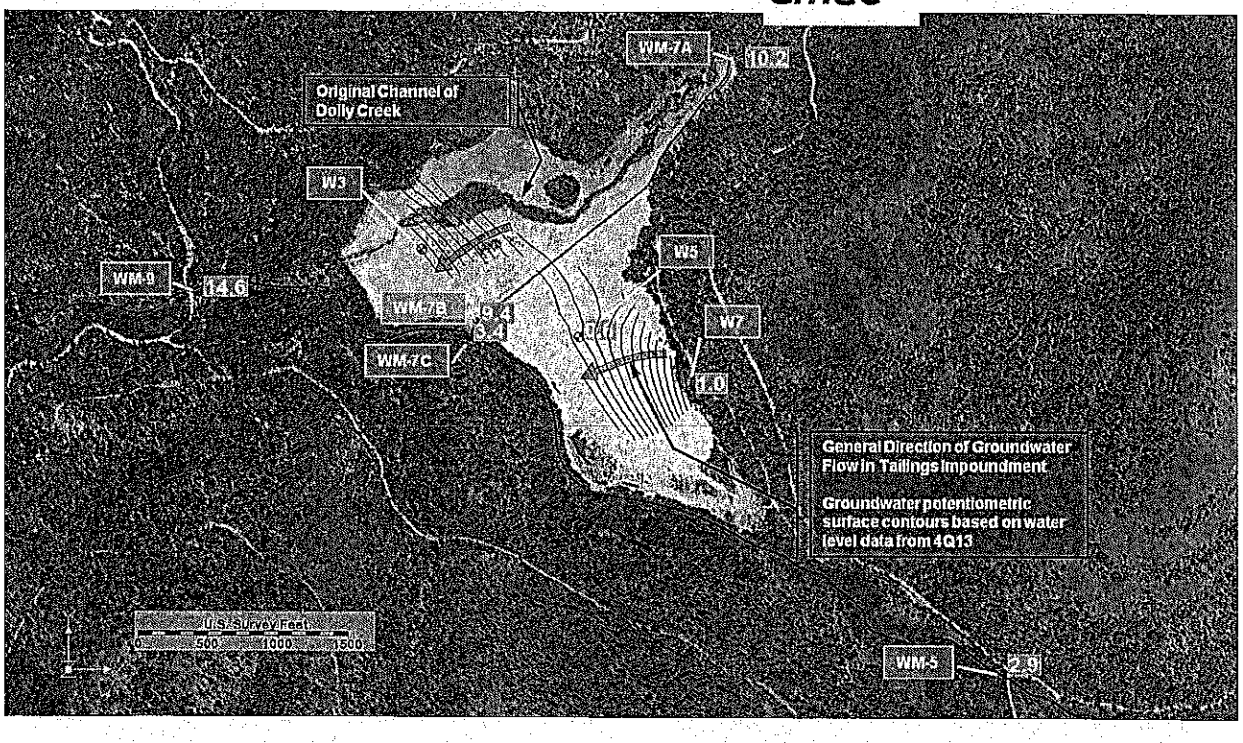


Legend:

- Surface Water Copper Concentrations (µg/L)
- Monitoring Well Copper Concentrations (µg/L)

Surface Water Quality Data: Central Valley Regional Water Quality Control Board Sampling Data - Second Quarter 2006 through Fourth Quarter 2013

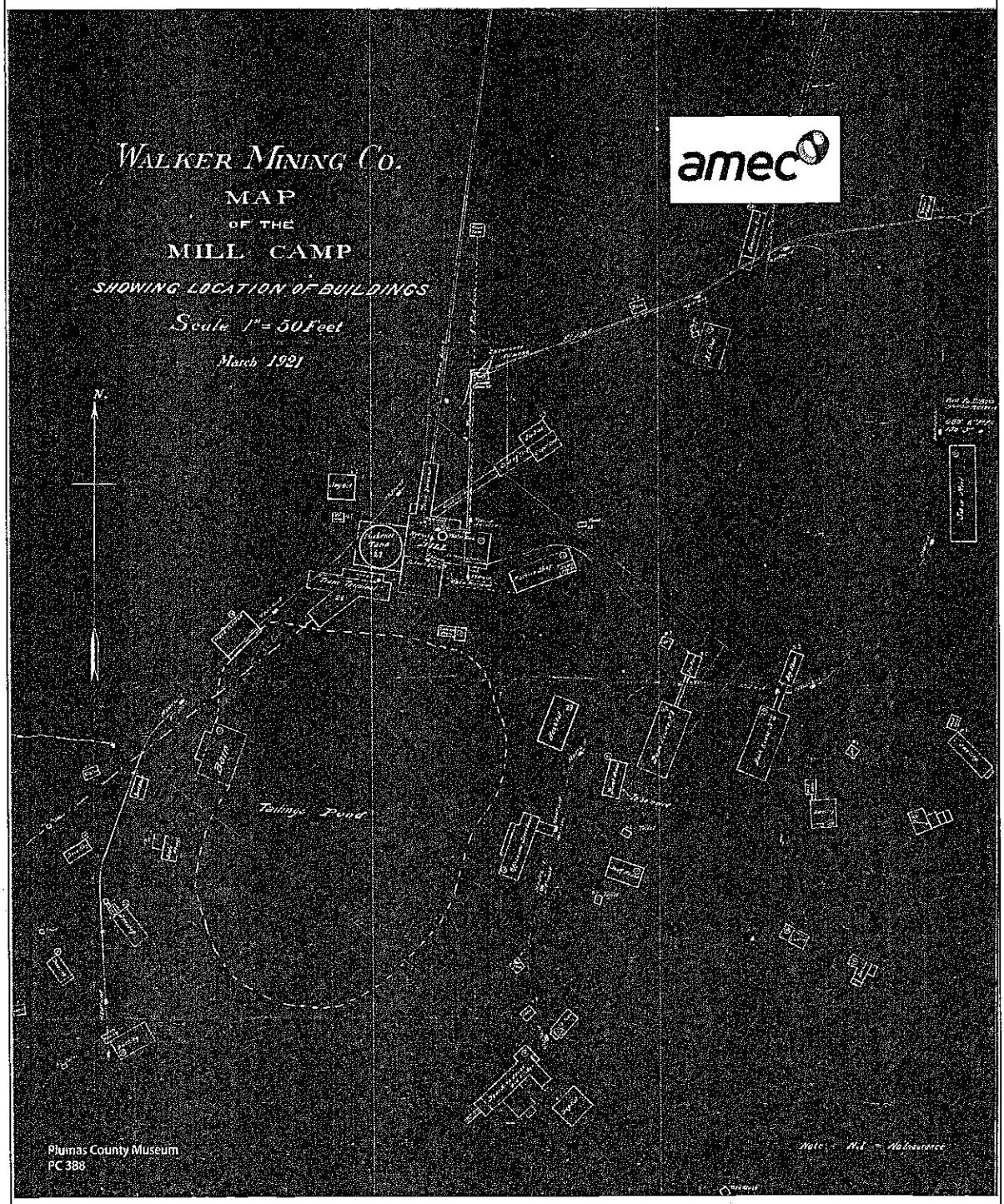
Monitoring Well Water Quality Data and Water-Level Data: United States Department of Agriculture, Forest Service Annual Water Quality Monitoring Report, Walker Mine Tailings, Plumas County, California, 2013

DISSOLVED COPPER CENCENTRATIONS (µg/L)
TAILINGS IMPOUNDMENT AREA GROUNDWATER AND SURFACE WATER SAMPLES
FOURTH QUARTER 2013
Walker Mine Site
Plumas County, California

By: dpv	Date: 02/20/2014	Project No. SA14166090
amec	Figure	6

P:\Projects\5000s\14166090s\SA14166090 - Walker Mine\14d00_CAD\GIS\5_GW_SW_Flow_Cu_Dis.mxd

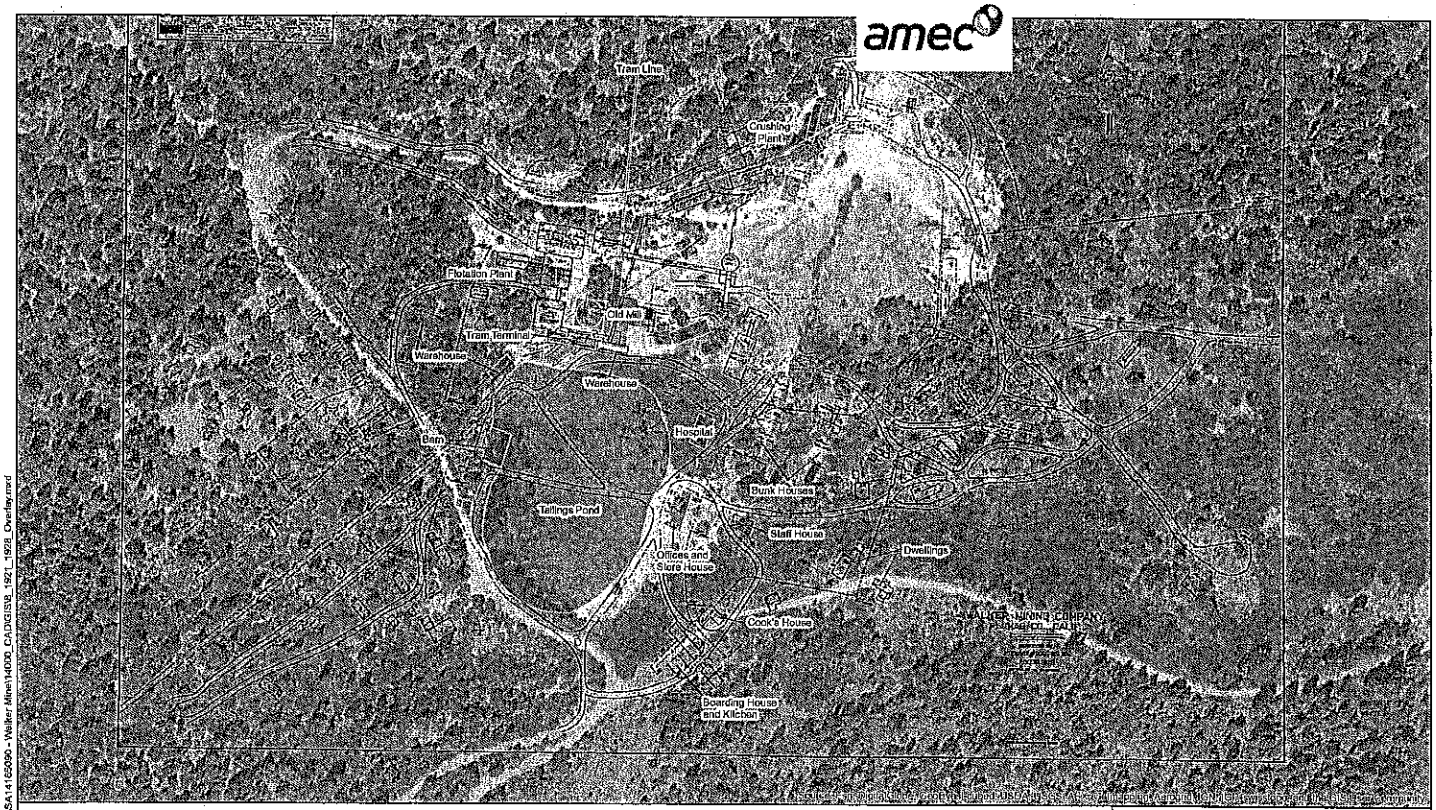
P:\Project\16000s\1416000s\SA14165090 - Walker Mine\14000_CAD\GIS\7_1921_SiteLayout.mxd



1921 SITE LAYOUT
Walker Mine Site
Plumas County, California

0 110
Approximate Scale In Feet

By: dpv	Date: 02/20/2014	Project No. SA14165090
amec		Figure 7



Selected Features from Walker Mining Co., Map of the Mill Camp Showing Locations of Buildings, March 1921.

June 19, 1928 Map from The Walker Mine, Plumas County, California. Henry J. Kaiser Company, December 10, 1942.

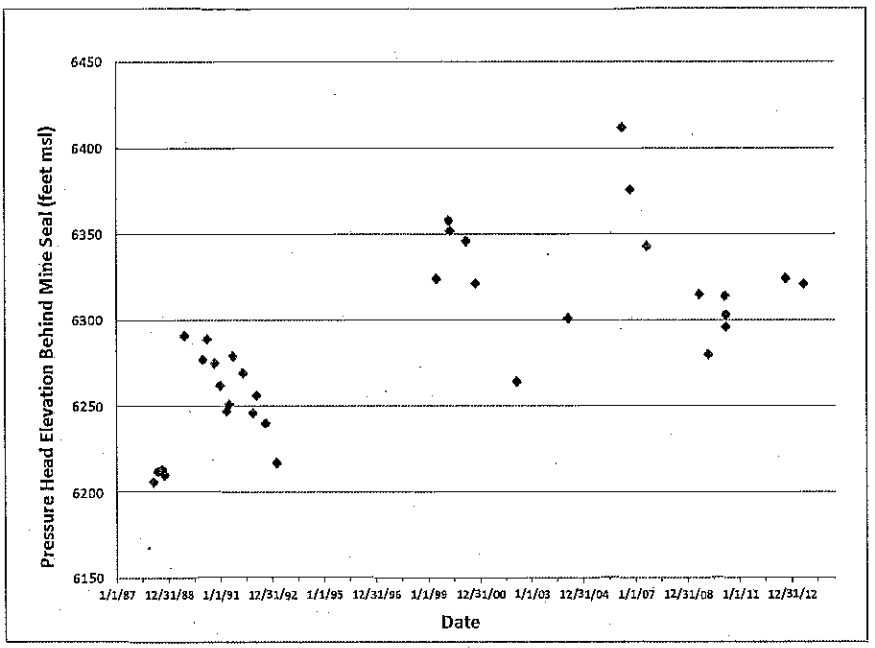
0 200 Feet

SITE LAYOUT
1921 AND 1928 FEATURES
Walker Mine Site
Plumas County, California

By: dpv	Date: 02/20/2014	Project No. SA14166060
amec		Figure 8

P:\Projects\166000s\SA14166060 - Walker Mine\14006_CAD\GIS\8_1921_1928_Overlay.mxd

P:\Project\16000s\1416000s\SA14165090 - Walker Mine\14000_CAD\GIS\9_Pressure.mxd



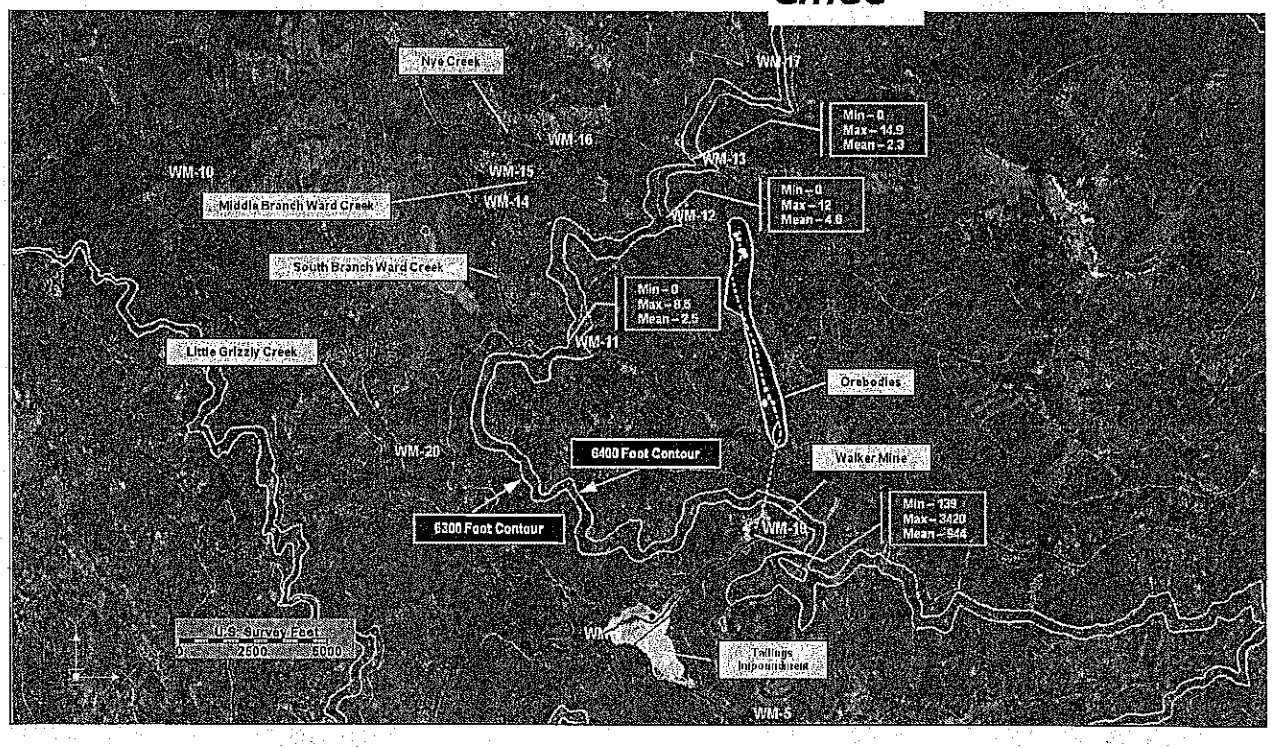
Data Compiled from CVRWQCB Walker Mine Site Inspection Reports, 1988-2013.

Croyle, W.A. and S.E. Rosenbaum. undated, Acid Mine Drainage on Public and Private Lands.

California Regional Water Quality Control Board Central Valley Region [2014 0036 - 0000 5603.tif].

PRESSURE HEAD ELEVATIONS BEHIND MINE SEAL
Walker Mine Site
Plumas County, California

By: dpv	Date: 02/20/2014	Project No. SA14165090
amec		Figure 9



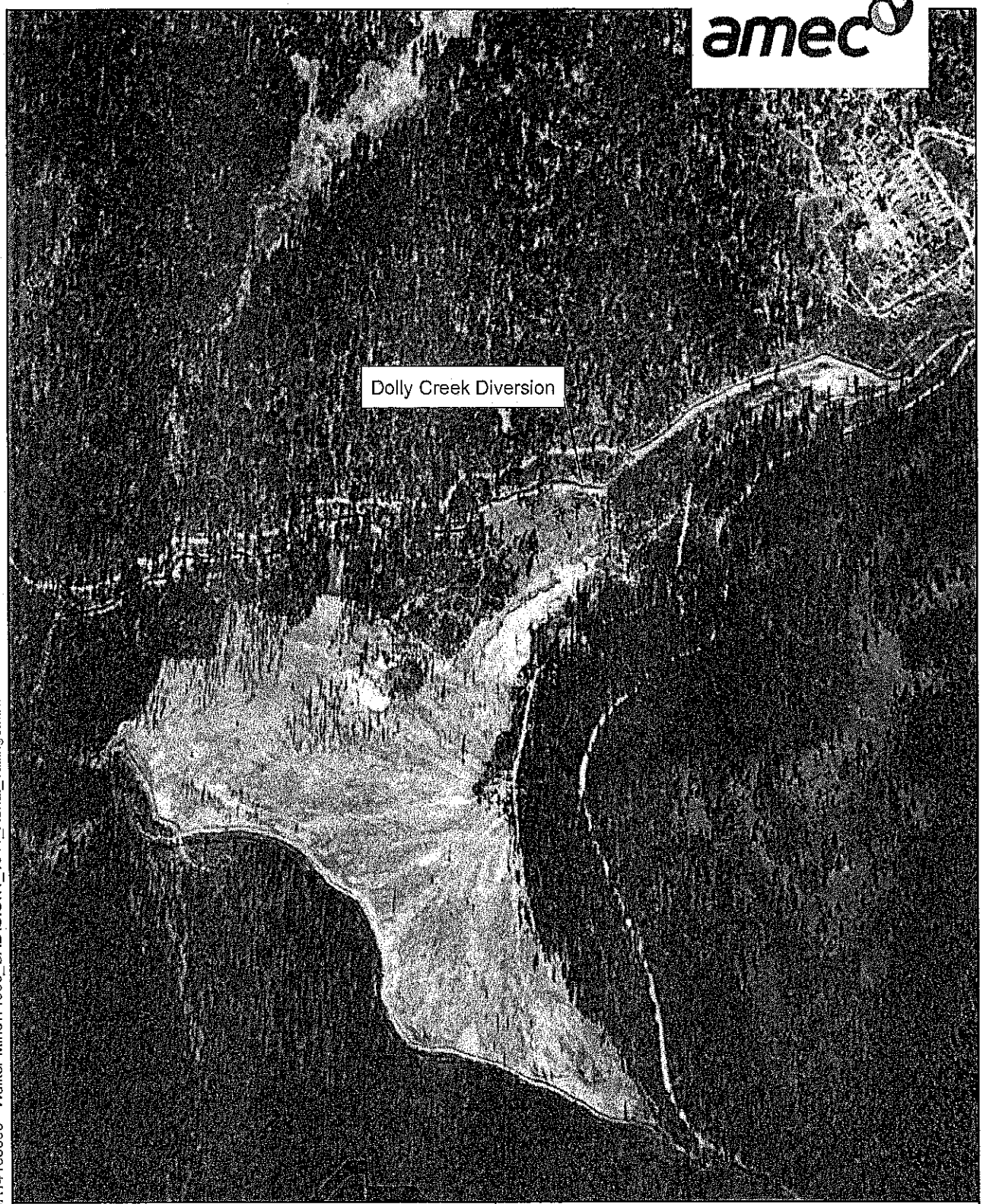
Dissolved Copper Data from Central Valley Regional Water Quality Control Board, Sampling Data Second Quarter 2006 through Fourth Quarter 2013.

Hydrostatic Head Data from Central Valley Regional Water Quality Control Board Site Inspection Report, 1988-2013.

INTERSECTION OF HYDROSTATIC HEAD ELEVATIONS IN THE FLOODED MINE AND SURFACE TOPOGRAPHY
Walker Mine Site
Plumas County, California

By: dpv	Date: 02/20/2014	Project No. SA14185090
amec	Figure	10

P:\Project\18000s\14185090\SA14185090 - Walker Mine\14000_CAD\GIS\10_Hydrostatic.mxd

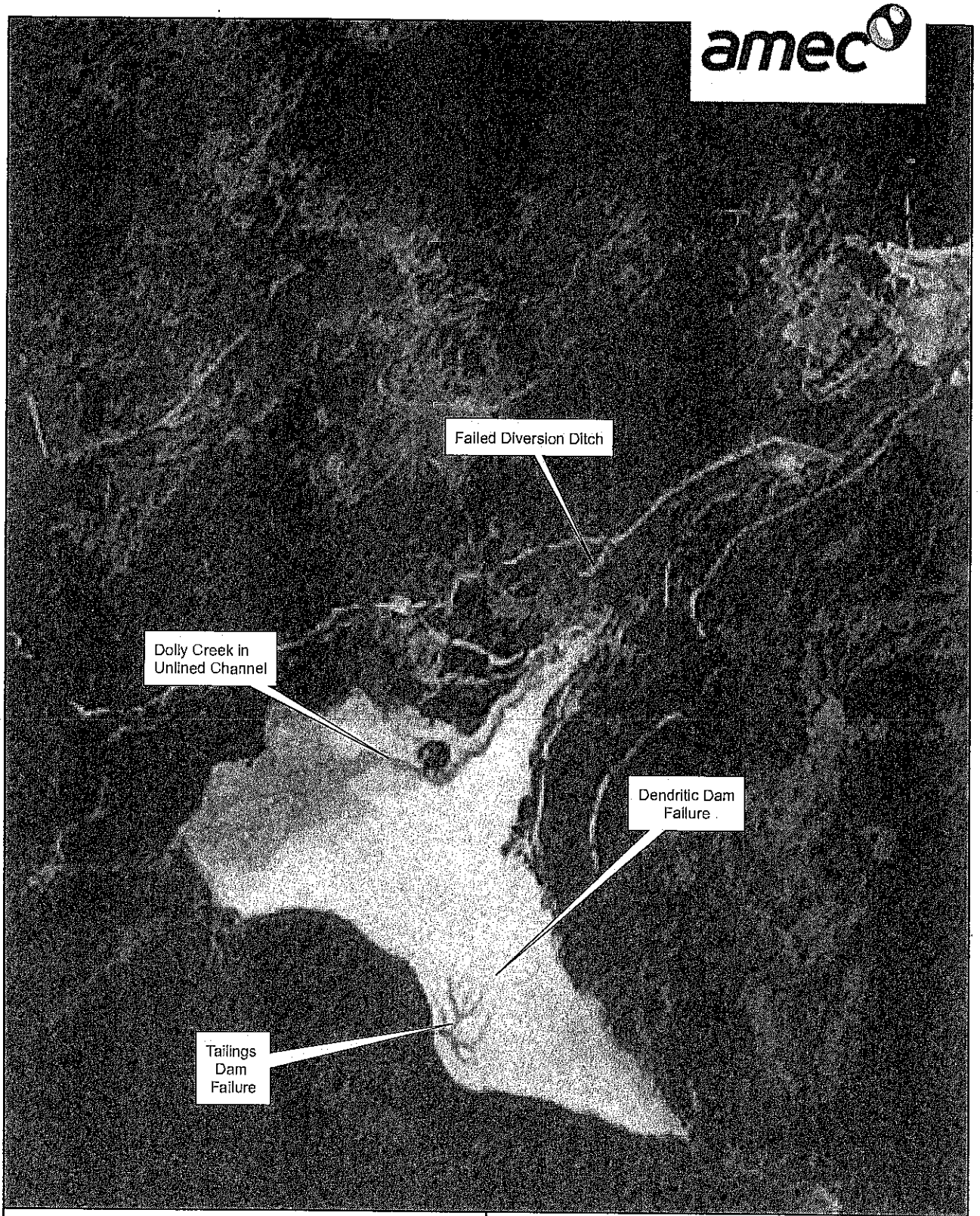


P:\Project\16000s\14160000s\SA14165090 - Walker Mine\14000_CAD\GIS\11_1941_Aerial_Tailings.mxd

U.S. Forest Service, 1941
Photo CWX_13_129, October 7

1941 AERIAL PHOTO - TAILINGS IMPOUNDMENT AREA
Walker Mine Site
Plumas County, California

By: dpv	Date: 02/20/2014	Project No. SA14165090
amec		Figure 11



P:\Project\16000s\14160000s\SA14165090 - Walker Mine\14000_CAD\GIS\12_1954Aerial_Tailings.mxd

Army Map Service, 1954
Roll 000112 Frame 14073, May 22.

N

1954 AERIAL PHOTO - TAILINGS IMPOUNDMENT AREA
Walker Mine Site
Plumas County, California

By: dpv	Date: 02/20/2014	Project No. SA14165090
amec		Figure 12

APPENDIX A

Curriculum Vitae of Marc R. Lombardi

Marc R. Lombardi, PG, CEM

Principal Geologist

Professional summary

Mr. Lombardi has more than 24 years of consulting experience in geologic, hydrogeologic, geotechnical, and hazardous waste investigation and remediation projects throughout the western United States. His wide-ranging experience encompasses site characterization and remediation of hazardous waste sites at industrial facilities and state and federal Superfund sites; abandoned mine investigations; mine site closure and reclamation strategies; litigation support; USEPA Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) studies; property transfer assessments; and environmental impact studies under the California Environmental Quality Act (CEQA). Mr. Lombardi's strengths include providing technical direction and strategy for complex projects, developing innovative investigation approaches, remedial strategy and cost estimation, chromium and volatile organic compound (VOC) fate and transport, mine site investigation and remediation, and data evaluation and interpretation including interpretation of aerial photographs. He further provides clients with cost savings/elimination; innovation; and effective, on-time/budget implementation.

Professional registrations

Professional Geologist, CA No. GEO6810, 1998
Certified Environmental Manager, NV No. EM1853, 2003

Education

M.S., Geology, San Diego State University, San Diego, CA, 1992
B.S., Geology, University of California, Davis, 1988

Affiliations

Association of Engineering Geologists
Groundwater Resources Association of California

Employment history

AMEC Environment & Infrastructure, Inc., Principal Geologist, Sacramento, CA, 2011 to present
AMEC Geomatrix, Inc., Senior II Geologist, Sacramento, CA, 2008 to 2011
Geomatrix Consultants, Inc., Senior II Geologist, Sacramento, CA, 2004 to 2008
MWH Americas, Inc., Supervising Geologist, Sacramento, CA, 2000 to 2004
Dames & Moore, Senior Geologist, Sacramento, CA, 1992 to 2000
Kleinfelder, Project Geologist, San Diego, CA, 1989 to 1992
Entrix, Field Assistant, Walnut Creek, CA, 1988

Representative projects

Mine Cleanup

Confidential Mine Superfund Site, EPA Region 9

0130910000. Program Manager. Responsible for mine site investigation and interim removal actions at an EPA Superfund Site located in a remote area of Alpine County, California. Project activities included the design, construction and operation and maintenance (O&M) of various acid mine drainage seep collection and treatment systems and development and implementation of the Remedial Investigation / Feasibility Study (RI/FS) for the Site. Technologies utilized at the site for the treatment of acid mine drainage include a Compost Free Bioreactor, a lime addition treatment system employing Rotating Cylinder Treatment System (RCTS) technology and a High Density Sludge (HDS)

Lime Treatment System. Responsible for oversight and assurance of treatment systems O&M, regulatory compliance, regulatory reporting, site access improvements and maintenance, implementation of the RI/FS and associated treatability studies; and health, safety, security and environment.

Confidential Mine Superfund Site, EPA Region 8
SA11161340. Program Manager. Responsible for the design and development of innovative in-situ pilot-scale mine water treatment technology testing at a former lead and zinc mine in southwest Colorado. Coordinated with the Colorado Division of Reclamation, Mining and Safety, and the US EPA to plan and implement the water treatment technology tests. Provided construction quality assurance oversight for subcontractor work completed at the mine.

Former Jamestown Mine, Tuolumne County, Jamestown, CA
0097160020. Project Manager. Oversaw mine site closure activities at the Former Jamestown Mine in Tuolumne County, California. Activities included geologic, hydrologic, geotechnical, and environmental consultation for mine site closure activities including development of cover system for a tailings impoundment and land application system for total dissolved solids (TDS)-impacted water. Prepared the Tailings Management Facility Closure Plan Amendment, Evaluation of the Spatial Distribution of Impacts in Groundwater, and source evaluation. Strategized and negotiated closure activities with the client and the California Regional Water Quality Control Board (CRWQCB).

CRWQCB v. Sonora Mining Co. et al., Tuolumne County, Jamestown, CA
0097160030. Provided litigation support to Tuolumne County in matters related to environmental compliance activities at the Former Jamestown Mine.

Camanche Reservoir Mine Drainage Ponds, East Bay Municipal Utility District, Ione, CA
0131020010. Investigation of ponds believed to be the result of mine discharges in Amador County. The ponds are near Comanche Reservoir and contain concentrations of metals, primarily arsenic.

Bully Hill, Lempres & Wulfsberg, Shasta County, CA
Prior Firm Experience. Provided geologic, hydrologic, geotechnical, and environmental consultation for mine closure activities at the Bully Hill Mine and the Rising Star Mine.

Bickford Ranch Abandoned Gold Mine Sites, City of Roseville, Roseville, CA
Prior Firm Experience. Project manager for the investigation of the Bickford Ranch abandoned gold mine sites in Placer County, California. Activities included delineation of soils elevated in arsenic and preparation of an environmental risk assessment. Negotiated remedial options with CA Department of Toxic Substances Control (DTSC).

Rising Star Mine, Shasta County, CA
Prior Firm Experience. Provided geologic, hydrologic, geotechnical, and environmental consultation for mine closure activities.

Geotechnical Consultation for Kings River Mine and Merced River Mine, Calaveras Materials, Various Locations CA
Prior Firm Experience. Provided geologic and geotechnical consultation for resource evaluation and reclamation plan development for the Kings River Mine in King County, California, and the Merced River Mine in Merced County, California.

Kennedy Mine, Amador County, CA
Provided geologic, hydrologic, geotechnical, and environmental consultation for mine closure activities.

Geologic and Hydrogeologic Studies and Hazardous Waste-Related Projects

Railroad Avenue Site and South Fresno Regional Groundwater Plume, Operable Unit #1, Weir Floway, Fresno, CA
0096620000. Project Manager. Responsible for investigation and remediation activities at an industrial site in south Fresno, California. Activities included providing geologic and hydrologic consultation for soil and groundwater investigations and remediation activities associated with hexavalent chromium and VOC impacts to soil and groundwater in a multi-aquifer system. Provided groundwater remediation system design and operations and maintenance. Provided technical support to litigation activities. Strategized and negotiated site activities with the client and the CA DTSC.

BMI Site, Henderson, NV
Project Manager. Oversaw investigation activities at a former 1,300-acre industrial site in Henderson, NV. Activities included development of a subsurface investigation program of a multi-aquifer system in an area of coalescing alluvial fan deposits. Investigation techniques included utilizing a combination of mud rotary drilling to depths greater than 450 feet below ground surface, lithologic and geophysical logging, depth discrete in-situ groundwater sampling, soil sampling, rotary-sonic drilling, hollow-stem auger drilling, continuous coring, and groundwater monitoring well installation. Constituents of concern included: VOCs, semi-volatile organic compounds, metals, radionuclides, pesticides, polynuclear aromatic hydrocarbons, dioxin furans, acids, and phthalate waste.

Caltrans Hazardous Waste Management Handbook Update, Sacramento, CA
Prepared and edited selected documents to update the Hazardous Waste Management Handbook for Caltrans into a group of interlinked guidance documents. The guidance documents covered 16 technical areas including ADL, NOA, initial site assessment, chemistry, risk analysis, USTs, environmental reports, and TO management. Project involved interviews with Caltrans staff to identify handbook uses and to scope content of document updates; and preparing various draft and final documents including identifying electronic links to internet resources that could provide additional information on each document process or problem. Draft/final documents were converted into a common electronic file format that included navigational tools to move within each document, inter-guidance links to other documents, and external links to internet resources. The electronic files were grouped into a folder that was loaded on to the Caltrans Intranet for access and use by Caltrans Headquarters and District staff.

Former Feather River Forrest Products Site, Rosboro Lumber, Marysville, CA
Prior Firm Experience. Lead consultant for investigation and remediation activities at a former lumber mill site. Activities included the delineation of a groundwater VOC (primarily trichloroethene [TCE]) plume and total petroleum hydrocarbon (TPH) impacts to shallow surface soils, development of remedial alternatives, negotiations with the CRWQCB for cleanup goals, managing soil and groundwater remediation activities, and implementation of the groundwater monitoring and reporting program. Prepared a feasibility study/remedial options evaluation for the site and implemented a Hydrogen Release Compound (HRC) pilot study for the in-situ remediation of VOC impacts in groundwater.

Metal Recycling Yard Soil and Ground Water Investigation, Sims Metal, Sacramento, CA
0102180000, 0106950030, and 0106950040. Program Manager. Conducted investigation activities at a metals recycling facility. Activities include evaluation of potential soil and groundwater impacts for a multiple Potential Responsible Party (PRP) group. Provide technical support to litigation activities. Strategized and negotiated Consent Order with the client, client's counsel, and the CA DTSC.

Lodi Northern Plume Area, Rossi Doskocil & Finkelstein, LLP, Lodi, CA
0104270000. Project Manager. Responsible for investigation of groundwater impacts beneath the northern portion of the City of Lodi, CA. Activities included evaluation of the lateral and vertical extent

of VOC impacts in a multi-aquifer system. Responsible for coordination of multiple party PRP group.

Adobe vs. Taecker, Lewis Brisbois Bisgaard & Smith LLP, Woodland, CA
Prior Firm Experience. Provided technical support to litigation activities associated with a former dry cleaner site.

Chico Nitrate Study, Chico, CA
Prior Firm Experience. Provided geologic consultation for a regional groundwater study, including task management, project coordination, and permitting.

Union Carbide, Florence, CA
Prior Firm Experience. Project geologist for environmental activities at the Union Carbide facility. Responsible for geologic review and oversight of project activities.

Remco Facility Investigation and Remediation, Willits Trust, Willits, CA
Prior Firm Experience. Provided registered geologic review for investigation and remediation at the former Remco facility. Facility impacts included hexavalent chromium and VOCs in soil and groundwater.

Bay Point Works Facility, General Chemical, Benicia, CA
Prior Firm Experience. Project geologist for environmental activities at the General Chemical Corporation Bay Point Works facility. Activities included investigation and fate and transport evaluation of VOC and metals impacts in shallow groundwater.

Soil and Groundwater Sampling, Florin Road Property, Sacramento School District, Sacramento, CA
Prior Firm Experience. Project geologist for a preliminary endangerment assessment (PEA) at a proposed school site. Responsibilities included design and implementation of a comprehensive soil and groundwater sampling program to evaluate for environmental impacts, negotiation of the investigation scope with the client and the DTSC, oversight of field personnel, and senior review of investigation documents.

White Rock North Dump, Aerojet-General, Rancho Cordova, CA
Prior Firm Experience. Project manager of soil-gas and groundwater investigation and remediation activities at a former municipal landfill. Activities included delineation of a groundwater VOC plume (primarily TCE) in a multi-aquifer system, development of remedial alternatives and design, implementation of the quarterly groundwater monitoring and reporting program, and litigation support.

Geologic Support for Pinedale Groundwater Site, The Vendo Company, Fresno, CA
Prior Firm Experience. Provided geologic support and staffing coordination for environmental activities at the Pinedale Groundwater site. Provided review and consultation of field investigation approaches. Responsible for coordination of field sampling crews.

Log Deck Permitting, Former Feather River Forest Products Site, Sierra Cedar Lumber, Marysville, CA
Prior Firm Experience. Project manager for the start-up permitting of a log storage yard. Activities included preparation of report of waste discharge, CEQA documents, Notice of Intent, storm water pollution prevention plan (SWPPP), and negotiations with the CRWQCB for the issuance of waste discharge requirements.

Field Investigation at the Defense Fuel Supply Point, Ozol, Army Corps of Engineers, Huntsville Division, Martinez, CA
Prior Firm Experience. Project manager for the follow-on field investigation at the Defense Fuel Supply Point, Ozol. Tasks included investigation of TPH impacts in a fracture flow groundwater aquifer. Included preparation of the follow-on investigation work plan, selection of subcontractors,

scheduling of the field program, implementing the soil and monitoring well borehole programs, implementing the free product removal program, and implementing the water sampling program. Project duration was five months. Presented findings to the CRWQCB.

Groundwater Monitoring Studies, Bayer Corporation, Sanger, CA
Prior Firm Experience. Project manager for two prospective groundwater monitoring studies to support the registration of a pesticide and a fungicide. Investigation included vadose zone and shallow groundwater characterization, site instrumentation, and vadose zone and groundwater monitoring following pesticide and fungicide application. Investigation performed in accordance with Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and Good Laboratory Practices (GLP).

Soil Investigation and Remediation for Chemical Manufacturing Plant, Procter and Gamble, Sacramento, CA
Prior Firm Experience. Project manager for investigation and remediation of impacted soil at a chemical manufacturing plant. Tasks included delineation of impacts, negotiating cleanup goals with the regulatory agency, and oversight of excavation activities.

Soil and Groundwater Investigation and Remediation at Former Automobile Dealership, Hilltop Dodge, Richmond, CA
Prior Firm Experience. Project manager for soil and groundwater investigation and remediation of a former automobile dealership. Responsibilities included preliminary site investigation, Phase I soil and groundwater investigation, and oversight of soil remediation activities.

Vadose Zone and Groundwater Assessment of Shopping Center, McHenry Village, Modesto, CA
Prior Firm Experience. Project manager for a vadose zone and groundwater assessment of a shopping center. Investigation focused on VOC impacts to the vadose zone and groundwater from former and existing dry cleaning operations and potential TPH impacts to groundwater from former service stations located on the site.

Superfund Site, Koppers, Inc. Oroville, CA
Prior Firm Experience. Performed various field activities at the Koppers EPA Superfund site. Responsibilities included logging exploratory borings; installing monitoring, extraction, and injection wells; providing oversight of remedial excavation; and performing Penta-Risc field test kit analysis.

Shell Oil, Martinez, CA
Prior Firm Experience. Performed off-shore environmental sediment sampling associated with a major crude oil release to an open water way in the Suisun Bay Delta and Carquinez Straights.

Due Diligence
Mr. Lombardi has prepared, managed, and provided technical oversight and third-party review for numerous preliminary site assessments (PSAs), environmental site assessments (ESAs), and Phase I hazardous material studies for property transaction screening and pipeline corridor assessments on commercial, industrial, residential, multiple unit residential, rural, and forested properties throughout California including: Butte, Contra Costa, El Dorado, Fresno, Glenn, Lake, Los Angeles, Mendocino, Napa, Nevada, Placer, Plumas, Riverside, Sacramento, San Diego, San Joaquin, Sierra, Solano, Sonoma, Sutter, Stanislaus, Tehama, Yuba, and Yolo counties.

Nature Conservancy, Multiple Sites, Northern CA
Prior Firm Experience. Lead consultant for environmental services to The Nature Conservancy. Responsible for oversight of Phase I environmental site assessments for acquisition of properties across Northern California.

Sacramento Valley Open Space Conservancy, Multiple Sites, Northern CA
Prior Firm Experience. Prepared, managed, and provided technical oversight for numerous PSAs.

California Department of Water Resources, Multiple Sites, Northern CA
Prior Firm Experience. Prepared, managed, and provided technical oversight for numerous PSAs.

Sacramento County Environmental Management Department, Hazardous Materials Division, Multiple Sites, Sacramento County, CA
Prior Firm Experience. Preparation and technical oversight of Phase I Hazardous Materials Studies along corridors ranging from 3 to 5 miles long and crossing county right-of-way and privately owned parcels.

Sacramento County Department of Public Works, Sacramento County, CA
Prior Firm Experience. Performed third-party technical reviews of numerous ESAs for completeness of the work performed in conducting the ESA and the adequacy of the findings and conclusions presented in the ESA reports.

Gagen, McCoy, McMahon & Armstrong, Multiple Sites, Northern CA
Prior Firm Experience. Prepared, managed, and provided technical oversight for numerous PSAs.

Conservation Fund, Multiple Sites, Northern CA
Prior Firm Experience. Prepared, managed and provided technical oversight for numerous PSAs.

Environmental Impact Reporting
Mr. Lombardi has been the technical lead for the soils, geology, seismicity, and hazardous waste sections of numerous Environmental Impact Reports (EIRs) throughout northern California including: Cirby-Linda Dry Creek EIR, Roseville; Del Web-Roseville EIR, Roseville; West Roseville EIR, Roseville; Rio Linda EIR, Rio Linda; NEC EIR, Roseville; Highlands Reserve North EIR, Roseville; and Bickford Ranch EIR, Placer County.

Geotechnical

San Pasqual Wastewater Treatment Facility, San Diego, CA
Prior Firm Experience. Managed compaction control program for 750,000 cubic yard mass grading project for the construction of the wastewater treatment facility.

Olivenhain Municipal Water District Pipeline 7B/7C, Encinitas, CA
Prior Firm Experience. Performed subsurface geotechnical investigation and compaction control during construction.

Geotechnical Investigations, Multiple Clients
Prior Firm Experience. Conducted subsurface investigations for the Mt. Signal and Calipatria Prison sites, Imperial Valley and Calipatria, CA; the Mission Valley Wastewater Treatment Plant, San Diego, CA; the La Jolla Shores Pipeline Replacement, La Jolla, CA; SeaShell Oil, Oceanside, CA; Linda Vista Trunk Sewer, San Diego, CA; and Huntington Beach Landfill, Huntington Beach, CA.

Tecate Water District, Tecate, CA
Prior Firm Experience. Performed percolation tests, subsurface (seismic) rippability investigation for evaluation of water resource development and distribution.

Mt. Laguna FBI Tower, San Diego County, CA
Prior Firm Experience. Performed site reconnaissance, budget, and scheduling for construction of a communications tower.

I-80/Cirby Creek Flood Control Project, U.S. Concrete, Inc., Roseville, CA
Prior Firm Experience. Managed compaction control and concrete testing program for project construction.

Managed Geotechnical Testing Laboratory, San Diego, CA
Prior Firm Experience. Responsible for technical training of personnel, review of laboratory test data, equipment maintenance and calibration, performing laboratory tests, reporting test results, record keeping, and billing. Responsible for laboratory certification with various city, county, state, and federal government agencies.

Certifications and training

OSHA 40-Hour Hazardous Waste Operations Training
OSHA 8-Hour Health and Safety Supervisor Training
American Red Cross Standard First Aid
American Red Cross Adult CPR
Dangerous Goods Shipping Regulations and Procedures Training
U.S. Dept. of Energy, Office of Environment, Safety and Health Radiological Worker II Training

Publications and presentations

"The Alpine Tonalite: An Image of a Gabbroic Source?" M.R. Lombardi and M.J. Walawender. *Geological Society of America, Abstracts with Programs*. v. 23, no. 5. 1991.

"A Synthesis of Recent Work in the Peninsular Ranges Batholith." M.J. Walawender, G.H. Girty, M.R. Lombardi, D. Kimbrough, M.S. Girty, and C. Anderson. *Geologic Excursions in Southern California and Mexico*. M.J. Walawender and B.B. Hanan, eds. Department of Geological Sciences, San Diego State University, San Diego, CA. 1991.

"Peraluminous Granitoid Intrusives, Yuba Rivers Pluton, Northern Sierra Nevada Foothills, California." M.R. Lombardi and H.W. Day. *Geological Society of America, Abstracts with Programs*. v. 21, no. 5. 1989.

Exhibit 12

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

RESOLUTION NO. 73-1

VIOLATION OF ABATEMENT ORDER

DISCHARGE OF TOXIC WASTES FROM THE WALKER MINE
TO DOLLIE CREEK AND LITTLE GRIZZLY CREEK, PLUMAS COUNTY
BY CALICOPIA CORPORATION AND ITS PRESIDENT, ROBERT R. BARRY

WHEREAS, the California Regional Water Quality Control Board, Central Valley Region finds:

1. The Executive Officer issued an order on 8 September 1971 directing Calicopia Corporation and its President Robert R. Barry to abate forthwith the pollution of Dollie and Little Grizzly Creeks, Plumas County.

2. Calicopia Corporation President Robert R. Barry responded to the order by letter dated 27 September 1971.

3. An inspection on 29 June 1972 by an engineer of the Board's staff found that the discharge of toxic mine wastes continues to pollute the waters of Dollie and Little Grizzly Creek and to cause a nuisance.

4. The California Department of Fish and Game reports that the waste discharge prevents the development of a fishery in Dollie Creek and in a significant reach of Little Gizzly Creek.

5. Calicopia Corporation and Robert R. Barry are intentionally or negligently discharging waste to Dollie Creek and Little Grizzly Creek in violation of the abatement order issued on 8 September 1971.

NOW, THEREFORE BE IT RESOLVED, that this Regional Board, in accordance with Section 13304 of the California Water Code, does hereby request the Attorney General for the State of California to take appropriate action under Section 13304 of the California Water Code, and

BE IT FURTHER RESOLVED, that the Executive Officer is authorized, and he is hereby directed to certify and submit copies of this Resolution to the Attorney General and such others as may have need therefore or as may request same.

I, JAMES A. ROBERTSON, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of a resolution adopted by the California Regional Water Quality Control Board, Central Valley Region, on 28 July 1972.

Original signed by
James A. Robertson

Executive Officer

7/28/72 wbb/jw

Exhibit 13

MEMORANDUM

TO: J. Lawrence Pearson
FROM: Larry F. Nash
SUBJECT: Walker Mine - Plumas County
WDR Order No. 75-119, NPDES No. CA0080110

On 17 October 1978, I inspected the subject non-operating copper mine to ascertain compliance with discharge requirements and to assess the current conditions at the mine site. At the time, I met Tex Tate and Jan Donato and three mine workers who are employed by the Continental Oil Company. Mr. Tate advised me that they were re-opening the tunnel in order to be able to better control the drainage from the mine and to evaluate possibilities of resuming mining activities. Cave-ins have blocked portions of the tunnel causing drainage water to back up until the water pressure eventually blows out the blockage. A major blowout this spring destroyed the pipes which had previously conveyed drainage to the tin tanks and eroded a large portion of the tailings below the adit. Mr. Tate believes that by eliminating the blockages and generally confining the drainage to the hard rock tunnel floors they will reduce the amount of water in contact with the ore body and improve the quality of the drainage water. Mr. Donato is operating a bulldozer in the flat area between the mine adit and Dollie Creek. He advised me that he is constructing a pond to provide containment and settling of the mine drainage. He said a one-acre pond should contain all the drainage during the summer and fall months and would provide sufficient removal of clay and silt during high flow periods to enable more effective treatment of overflow in a copper cementation tank system.

Drainage is currently discharged from the tunnel to the top of the tailings pile below the adit. The water quickly percolates into the rocks and resurfaces at the base of the tailings in the flat area. The drainage flows across the flat area in a deep trench before entering Dollie Creek. Dollie Creek supported abundant riparian vegetation and numerous beaver ponds immediately above the confluence with the Walker Mine drainage and was devoid of indications of plant and animal life downstream. I sampled the drainage above and below the tailings. Results of copper, Zinc, Cadmium, and pH analysis will be incorporated in the files when they are received from DWR Bryte Lab.

My inspection reveals that the mine remains "non-operating" although there is significant activity to re-open the mine tunnel and construct drainage control facilities. The involvement of the Continental Oil Company suggests that there is serious consideration of resuming mining activities at this site. Sufficient sampling was not conducted to determine compliance with all effluent and receiving water limitations contained in Order No. 75-119, however, previous inspection results, the lack of any treatment facilities, and the observed condition of Dollie Creek indicate that the discharge remains in violation of requirements. The discharge has also failed to comply with the monitoring and reporting required by Order No. 75-119.

LFN/sb 10/30/78

Exhibit 14

CALIFORI REGIONAL WATER QUALITY CONTRO OARD
CENTRAL VALLEY REGION

ORDER NO. 83-148

001755

REQUEST TO ABATE POLLUTION
FROM
WALKER MINE, ROBERT R. BARRY, AND CALICOPIA CORPORATION
PLUMAS COUNTY

The California Regional Water Quality Control Board, Central Valley Region, (hereafter Board) finds that:

1. A condition of pollution exists which has resulted from a nonoperating copper mine owned by Robert R. Barry and Calicopia Corporation (hereafter Discharger) in central Plumas County, about twenty miles (32 km) east of Quincy, in Sections 19, 29, 30, 31, and 32, T25N, R12E, and Sections 5, 6, 7, and 8, T24N, R12E, MDB&M, and situated within the jurisdiction of this Board.

2. The Board, on 30 May 1980, adopted Waste Discharge Requirements Order No. 80-058, NPDES No. CA0080110; Order No. 80-071, Referral to the Attorney General; and Order No. 80-070, Cleanup and Abatement Order against the Discharger.

3. The Discharger has violated and continues to violate Waste Discharge Requirements established in Order No. 80-058 and Cleanup and Abatement Order No. 80-070. No significant progress has been made by the Discharger towards reduction of the toxic acid mine drainage. The discharge flows to Dolly Creek, tributary to Little Grizzly Creek, which is tributary to Indian Creek, thence the East Branch North Fork Feather River, waters of the United States.

4. Unless certain abatement measures are initiated, the mine will continue to discharge acid water containing metals toxic to fish and other aquatic life.

5. Measures to abate the toxic discharges include either sealing the mine tunnel or providing treatment such as a limestone barrier, neutralization plant, and sedimentation basin.

6. Pursuant to Section 13305 of the California Water Code, the Board may "...request the city, county, or other public agency in which the conditions of pollution...exists to abate it." "The owner of the property on which the conditions exist...is liable for all reasonable costs incurred ...in abating the condition." And, "...the cost for abating the condition...shall constitute a lien upon the property...upon recordation,..."

7. Issuance of this Order is exempt from the provisions of the California Environmental Quality Act in accordance with Section 15321(a)(2), Title 14, Chapter 3, California Administrative Code.

8. On 9 December 1983, in Sacramento, after due notice of Finding No. 1 to the Discharger and all affected persons, in accordance with Section 13305, California Water Code, the Board conducted a public hearing and considered all objections and protests to the proposed correction of the condition.

IT IS HEREBY ORDERED, that pursuant to Section 13305 of the California Water Code:

1. The Board requests Plumas County, the U.S. Forest Service, and all other appropriate public agencies to abate the condition of pollution resulting from the nonoperating mine owned by Robert R. Barry and Calicopia Corporation.

2. In the event that the agencies listed above do not abate the condition of pollution resulting from the Walker Mine within a reasonable time, the Board shall take all steps necessary to abate the condition.

3. In the event that Robert R. Barry and Calicopia Corporation present to the Board a plan for abatement of the condition of pollution on or before 1 February 1984, the Board shall evaluate such plan prior to conducting any abatement work at the mine site.

I, WILLIAM H. CROOKS, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on 9 December 1983.

William H. Crooks

WILLIAM H. CROOKS, Executive Officer

Amended 12/9/83

Exhibit 15

JOHN K. VAN DE KAMP, Attorney General
of the State of California
R. H. CONNETT
Assistant Attorney General
KATHLEEN E. GNEKOW
Deputy Attorney General
1515 K Street, Suite 511
Sacramento, CA 95814
Telephone: (916) 324-5333

Attorneys for Plaintiff

SUPERIOR COURT OF THE STATE OF CALIFORNIA

FOR THE COUNTY OF PLUMAS

THE PEOPLE OF THE STATE OF CALIFORNIA, Plaintiff, v. ROBERT R. BARRY, CALICOPIA CORPORATION, and DOES I through XXX, exclusive, Defendants.	NO. 11901 DECLARATION OF WILLIAM J. MARSHALL

I, William J. Marshall, declare under penalty of perjury if called as a witness in the above-captioned matter, I would testify as follows:

That for the past sixteen months I have been, and now am a Senior Water Resources Control Engineer for the Regional Water Quality Control Board, Central Valley Region (Regional Board). I have a Bachelor of Arts degree in geology from Rutgers University, a Bachelor of Science degree in civil engineering from Newark College of Engineering, and a Masters

Degree in civil engineering from California State University, Sacramento. I am a registered engineer in the State of California. Prior to my employment with the Regional Board, I worked for the State Water Resources Control Board as a senior engineer in the area of water rights adjudication.

As Senior Water Resources Control Engineer my duties involve supervising and approving the actions of area engineers and setting policy for the enforcement of regulations. I make enforcement decisions for water quality violations occurring within my assigned region. I am responsible for the Regional Board's activities within several counties including Plumas County. All documents regarding Walker Mine which come to the Regional Board office are directed to me. I am familiar with the Regional Board's official file on Walker Mine, and I know the history of the Regional Board's involvement with Walker Mine from personal knowledge and from business records in the official file maintained by the Regional Board.

Walker Mine is an inactive copper mine located in east central Plumas County about twenty miles east of Quincy. Walker Mine discharges acid mine drainage to Dollie Creek and Little Grizzly Creek, upper tributaries of the East Branch of the North Fork Feather River. Above the mine these creeks are of excellent quality and contain abundant levels of aquatic insects and fish. However, below the mine the condition of the waters of Dollie Creek and Little Grizzly Creek is such that aquatic organisms cannot survive. Approximately ten miles of watercourses are toxic to aquatic organisms due to the acid

mine drainage. Only through the dilution by other tributaries at the confluence of Little Grizzly Creek with Indian Creek is the quality of these waters improved sufficiently for aquatic habitat.

Dollie Creek and Little Grizzly Creek below its confluence with Dollie Creek are grossly polluted by the discharge from the Walker Mine. The discharge originates from the mine adit, flows down and across the mine workings, and into Dollie Creek. The quality of this discharge is acidic and mineralized, having a pH as low as 3.3 and copper content as high as 69 miligrams per liter. The affected creek waters contain high concentrations of copper, zinc, iron, sulphates, and other mineral compounds and toxic materials, making them unfit for aquatic habitat. Below its confluence with Indian Creek the waters of Little Grizzly Creek are diluted enough to support aquatic life. However, even in Indian Creek periodic flows containing copper from the Walker Mine cause concentrations above tolerance limits for many aquatic organisms.

Walker Mine was discovered in 1904 and actively mined from 1916 to 1932, and from 1935 to 1941. Since the mid-1940's, the mine has discharged acid water containing metals toxic to fish. The Plumas County Assessor's Office indicates that Robert R. Barry received the Walker Mine property on 24 September 1948 from Coleman Burke by way of a quitclaim deed. Apparently, this was not recorded until 19 November 1965 at which time it was also deeded to Calicopia Corporation, a Robert R. Barry family-owned corporation (in New York State). A recent check with

New York indicates that Calicopia Corporation was dissolved by proclamation on 20 December 1977.

Waste discharge requirements were first adopted in 1958. The mine has continuously violated these and subsequent requirements, except for short periods in extremely dry years when the discharge has ceased. The following chonology provides a brief history of Regional Board actions relating to Walker Mine.

24 Apr 58	Waste Discharge Requirements issued.
8 Apr 59	Cleanup and Abatement Order issued.
18 Jul 63	Cease and Desist Order issued.
26 Oct 70	Abatement Order (Section 13305 of the California Water Code) issued.
8 Sep 71	Cleanup and Abatement Order issued.
23 May 75	Water Discharge Requirements Order No. 75-119 issued.
1978	Regional Board hires D'Appolonia Consulting Engineers with federal 208 funds to prepare report on Walker Mine abatement. Report recommends surface water diversion and wastewater treatment.
30 May 80	Waste Discharge Requirements Order 80-58 adopted; Cleanup and Abatement Order No. 80-70 adopted.
Jul 80	Surface water diversion ditches constructed under staff's direction at owner's expense.

Jul 81	Pearson and Associates Consulting Engineers proceed with State Clean Water Bond monies to evaluate treatment alternatives and construct a pilot project on-site.
Sep 83	Pearson and Associates complete draft "Pilot Plant Operation, December 1982 to July 1983, and Design Report".
9 Dec 83	Request to Abate Pollution, Order No. 83-148 adopted (Section 13305 of the California Water Code).
Feb 84	Regional Board sends out Request For Proposals to design and construct mine seal.
Jun 84	Steffen, Robertson and Kirsten, Consulting Engineers, selected to design and construct mine seal for Walker Mine.

D'Appolonia Consulting Engineers were hired by the Regional Board in 1978 to prepare a report on feasible methods of abating the acid mine drainage at Walker Mine. D'Appolonia submitted the final report to the Regional Board in 1979 and therein recommended that the Walker Mine pollution problem be treated by construction of a limestone barrier, neutralization plant, and sedimentation basins. The Regional Board then sent out Request For Proposals and subsequently awarded a contract

to Pearson and Associates, Consulting Engineers, to construct an on-site pilot project and evaluate treatment alternatives. The Pearson draft design report (September 1983) estimated that the diversion/treatment process of handling the mine drainage would entail a capital cost of more than $500,000 and additional significant operation and maintenance costs. The Regional Board then determined that this treatment method was no longer feasible for financial reasons and that the alternative solution of a mine seal should be investigated. Requests For Proposal were sent out and in February of 1984 Steffen, Robertson and Kirsten Consulting Engineers from Lakewood, Colorado were selected to design and construct a mine seal at a cost of $100,000. State Clean Water Bond Funds are being used to finance the project. Defendants have failed to comply with the Regional Board's orders to abate the pollution from Walker Mine (Waste Discharge Requirements Order No. 80-58 is attached hereto as Exhibit 1; Cleanup and Abatement Order No. 80-70 is attached hereto as Exhibit 2).

The Regional Board requested access to the Walker Mine tunnel (which is blocked by a locked metal door) and property by letter dated January 19, 1984 (attached hereto as Exhibit 3), and again by letter dated March 14, 1984 (attached hereto as Exhibit 4). Counsel for the Regional Board requested access by letter dated June 7, 1984 (attached hereto as Exhibit 5). Counsel for defendants refused such access by letter dated June 29, 1984 (attached hereto as Exhibit 6). The Regional Board again requested access by letter dated July 6, 1984

(attached hereto as Exhibit 7). Defendants have failed to respond.

Now that a contractor has been selected it is necessary that access to the mine be provided to enable the engineering firm hired to design the mine seal to conduct the necessary on site investigation. Furthermore, the main portal of Walker Mine is 6180 feet in elevation and early snows in the Walker Mine area could make access difficult. Typically the mine is inaccessible due to snow from October through May but occasionally snow occurs in September. To avoid potential weather problems access needs to occur as soon as possible.

I declare under penalty of perjury that the foregoing is true and correct and that this declaration was executed on July 15, 1984, at Sacramento, California.

William J. Marshall

WILLIAM J. MARSHALL

Exhibit 16

EXHIBIT B

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. 85-033

NPDES NO. CA0080110

WASTE DISCHARGE REQUIREMENTS FOR WALKER MINE ROBERT R. BARRY CALICOPIA CORPORATION AND THE STANDARD BULLION COMPANY, INC. PLUMAS COUNTY

The California Regional Water Quality Control Board, Central Valley Region, (hereafter Board) finds that:

1. The Walker Mine, owned by the Calicopia Corporation and Robert R. Barry (hereafter Discharger), is a non-operating copper mine in east central Plumas County about twenty miles (32 km) east of Quincy; T24N, R4E, MDB&M.

2. A Report of Waste Discharge (RWD) was filed on 2 November 1984. The RWD indicates that the mine operator is The Standard Bullion Company, Inc., (hereafter Discharger).

3. Mining operations ceased in 1941, but acid mine drainage continues to discharge to Dollie Creek near its confluence with Little Grizzly Creek, which is tributary to Indian Creek, thence the East Branch North Fork Feather River, waters of the United States.

4. Available data indicates the water quality of the discharge to be as follows:

Constituents	Median	Range	Units
Flow	0.2	0.0 - 0.5	cfs
pH	4.8	4.4 - 6.6	-
Copper	11.0	0.23 - 69	mg/l
Zinc	0.78	0.09 - 3.2	mg/l
Aluminum	4.8	0.9 - 12	mg/l
Iron	0.8	0.01 - 1.4	mg/l

5. The Board, on 25 July 1975, adopted a Water Quality Control Plan for the Sacramento River Basin (5A) which contains water quality objectives for all waters of the Basin. These requirements are consistent with that Plan.

6. The beneficial uses of the Feather River and its tributaries are municipal, industrial, and agricultural supply; recreation; esthetic enjoyment; navigation; ground water recharge, fresh water replenishment; hydroelectric power generation; and preservation and enhancement of fish, wildlife and other aquatic resources. The aquatic resources of much of Little Grizzly Creek have been eliminated by the discharge from Walker Mine.

Attachment A

7. On 21 December 1983, the Regional Board filed a complaint in the Plumas County Superior Court for preliminary and permanent injunction and civil penalties against Robert R. Barry and Calicopia Corporation and Does I through XXX, inclusive. This matter has not been brought to trial.

8. Effluent limitations, and toxic and pretreatment effluent standards established pursuant to Sections 208(b), 301, 302, 304, and 307 of the Clean Water Act and amendments thereto are applicable to the discharge.

9. The discharge is presently governed by waste discharge requirements Order No. 80-058 adopted by the Board on 30 May 1980 which expires 1 May 1985.

10. The action to adopt an NPDES permit is exempt from the provisions of the California Environmental Quality Act (Public Resources Code Section 21000, et seq.), in accordance with Section 13389 of the California Water Code.

11. The Board has notified the Discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for this discharge and has provided them with an opportunity for a public hearing and an opportunity to submit their written views and recommendations.

12. The Board, in a public meeting, heard and considered all comments pertaining to the discharge.

13. This Order shall serve as a NPDES permit pursuant to Section 402 of the Clean Water Act, or amendments thereto, and shall take effect ten days from the date of hearing, provided EPA has no objections.

IT IS HEREBY ORDERED that the Calicopia Corporation, and The Standard Bullion Company, Inc., and Robert R. Barry, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder, and the provisions of the Clean Water Act and regulations and guidelines adopted thereunder, shall comply with the following:

A. Effluent Limitations:

1. The discharge shall not have a pH less than 6.5 nor greater than 8.5.

2. The discharge shall not contain more than 0.2 ml/l settleable solids.

B. Sludge and Solid Waste Disposal:

1. Sludge and/or solid wastes generated by treatment facilities or during mining exploration shall only be disposed at sites which have been approved by the Executive Officer.

C. Receiving Water Limitations:

1. The discharge shall not cause concentrations of constituents in the receiving waters to exceed the following limits:

Constituents	Units	30-Day Average	Daily Maximum
Copper	mg/l	0.02	0.05
Zinc	mg/l	0.10	0.20
Aluminum	mg/l	0.20	0.40
Iron	mg/l	0.20	0.40

2. The discharge shall not cause visible oil, grease, scum, foam; floating or suspended material in the receiving waters or watercourses.

3. The discharge shall not cause concentrations of any materials in the receiving waters which are deleterious to human, animal, aquatic, or plant life.

4. The discharge shall not cause esthetically undesirable discoloration of the receiving waters.

5. The discharge shall not cause fungus, slimes, or other objectionable growths in the receiving waters.

6. The discharge shall not cause bottom deposits in the receiving waters.

7. The discharge shall not increase the turbidity of the receiving waters by more than 20% over background levels.

8 The discharge shall not alter the normal ambient pH of the receiving water more than 0.5 units.

9. The discharge shall not cause a violation of any applicable water quality standard for receiving waters adopted by the Board or the State Water Resources Control Board as required by the Clean Water Act and regulations adopted thereunder. If more stringent applicable water quality standards are approved pursuant to Section 303 of the Clean Water Act, or amendments thereto, the Board will revise and modify this Order in accordance with such more stringent standards.

D. Provisions:

1. Neither the discharge nor its treatment shall create a nuisance or pollution as defined in Section 13050 of the California Water Code.

2. The requirements prescribed by this Order amend the requirements prescribed by Order No. 75-119, which expired on 1 March 1980.

3. The Discharger shall comply with the Standard Provisions and Reporting Requirements dated 1 October 1984 which are part of this Order.

4. The Discharger shall comply with the attached Monitoring and Reporting Program No. 85-033 as ordered by the Executive Officer.

5. This Order expires on 1 February 1990 and the Discharger must file a Report of Waste Discharge in accordance with Title 23, California Administrative Code, not later than 180 days in advance of such date as application for issuance of new waste discharge requirements.

6. In the event of any change in control or ownership of land or waste discharge facilities presently owned or controlled by the Discharger, the Discharger shall notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be forwarded to this office.

I, WILLIAM H. CROOKS, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on 25 January 1985.

WILLIAM H. CROOKS, Executive Officer

12/24/84:EZC:gs

Attachments

Exhibit 17

WALKER MINE PROJECT
FINAL
FEASIBILITY AND DESIGN REPORT
CONTRACT NO. 4-051-150-0

Prepared for
California Regional Water Quality Control Board
Central Valley Region
3201 S Street
Sacramento, California 95816

Prepared by
Steffen Robertson and Kirsten (Colorado) Inc.
3232 South Vance Street, Suite 210
Lakewood, Colorado 80227

November, 1985

TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

TABLE OF CONTENTS (cont'd)

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

I STATEMENT OF PROBLEM

The Walker Mine discharges acid- and heavy metal-laden water from an adit and mine waste dump into Dolly Creek which is a tributary to Little Grizzly Creek. The discharge from the mine is reported to have totally eliminated aquatic life in Dolly Creek, and in Little Grizzly Creek for a distance of approximately ten miles downstream from the mine.

The primary goal of the California Regional Water Quality Control Board (the Board) is to restore Little Grizzly Creek and Dolly Creek to a condition capable of supporting a diversity of aquatic life.

The first objective of the studies forming the subject of this report is to evaluate the effectiveness and feasibility of sealing the Walker Mine adit in such a manner as to prevent a direct discharge of acid- and heavy metal-laden water from the underground workings. The second objective is to design and estimate construction costs for such a seal, should it prove to be warranted.

II SCOPE OF WORK

A. Feasibility

Steffen Robertson and Kirsten's (SRK) studies have been directed towards evaluating the feasibility of sealing the actual and potential portals through which acid mine drainage (AMD) might discharge by:

1) Performing a hydrologic assessment of the underground mine and its environs;

2) Examining available maps of the underground workings, surface features, and fault systems;

3) Examining available data to assess general groundwater movement and the potential for the escape of mine waters through surface springs or seepage; and

4) Identifying possible alternative outlets for mine water, when it is prevented from following its present course by sealing of the 700 Level Adit.

B Design Criteria

1) Concrete bulkheads have been designed to seal the main Access Adit on the 700 Level and to minimize the potential for the escape of mine water through other outlets.

Site selection for seals was made to:

- Minimize the potential for seepage around the seal;
- Maximize the structural integrity of the seal; and
- Permit future replacement of the seal, if necessary.

2) Seal design has taken into account:

- The maximum possible head of water to be held behind the seal;

- Installation of pipes through the seal to permit future dewatering of the mine in case that should become necessary;

- Materials and construction techniques appropriate to the environment in which the seal is to be located, and the objective of a design life in excess of 100 years; and

- Installation of a pressure gauge to monitor the head of water behind the seal.

C. Reporting

All feasibility studies and plug design will be submitted to the Board for review and approval.

D. Construction

Following the Board's approval of plug feasibility and design, and authorization for construction, the approved structures will be installed.

III STUDIES AND CONCLUSIONS

Data available from the Board's records and previous studies were evaluated, and related to current conditions through site visits during the weeks of September 17, 1984 and June 17, 1985. The physical conditions of accessible underground workings on the Main 700 Level from the portal to the Piute Section (a distance of approximately 8,000 ft.) were observed, and all accessible surface outlets from the mine workings were visited. Potential sources of surface inflows to the mine were also observed.

The results of site observations indicated that a single concrete bulkhead plug in the 700 Level Adit, at a point close to the South Orebody workings, would effectively stop the discharge of AMD from the Walker Mine Adit. Minor improvements and additions to the existing system of diversion ditches, around surface subsidence over the underground workings, would further minimize inflow of water to the workings.

Consideration was given to the possibility that water would rise in the mine workings behind the proposed plug and might eventually discharge through the next-lowest outlet, the Piute Shaft Landing Tunnel. The studies described in this report demonstrate the strong probability that water would not rise to the level of the Piute Shaft Landing Tunnel: equilibrium between inflow to the workings and outflow

as recharge to the groundwater system would probably be reached below that level.

The cost of constructing an internal plug to compartmentalize the mine workings and protect against the remote possibility that water might rise to a level at which it could discharge, was found to be unjustifiable. Insurance against any possible discharge through the Piute Shaft could be provided by monitoring the level of water in the mine workings. If, at any time in the future, as a result of excessive precipitation or snowmelt, the water should approach the overflow level, a controlled flow of AMD could be released through a valve in the 700 Level Adit plug, treated to acceptable standards, and discharged into Dolly Creek. The costs of proposed remedial measures, and of rejected alternative courses of action were estimated. A treatment system was found to be more cost efficient than the alternative of an internal plug.

IV RECOMMENDATIONS

The following course of action is recommended:

1. Rehabilitate and extend the existing diversion ditches around surface subsidence sinkholes, to minimize inflow of surface water to the underground mine workings.

2. Conduct a water flow and quality balance survey along the 700 Level Haulage and Adit, through the abandoned plant site area, and along Dolly Creek to its confluence with Little Grizzly Creek.

3. Install a single plug in the 700 Level Adit approximately 2,700' from the portal.

4. Monitor water levels in the mine workings by means of gauges reading pressure behind the plug.

5. Prepare a contingency plan for future construction and operation of a small treatment plant at the 700 Level Adit Portal, to treat AMD that might have to be discharged periodically (in the order of ten or more years after installation of the plug) to relieve any excess buildup of water that might threaten to overflow out of the Piute Shaft.

V COSTS

The cost of the recommended course of action, in 1985 dollars to the nearest $500, would be:

Rehabilitation of Diversion Ditches	$ 14,000
Water Balance Survey	6,500
Main Adit Plug Construction	150,000
Discharge Treatment Plant Specifications	6,500
Total Initial Cost of Abatement	$177,000

Future work associated with the recommended course of action would be:

Routine Monitoring	$ 1,000/year
Maintenance of Diversion Ditches	2,500/year
Total On-going Cost of Abatement	$ 3,500/year

Possible future costs could include:

Build Discharge Treatment Plant	$250,000
Operate Discharge Treatment Plant	5,000/year

The additional cost of rejected precautions, over the recommended course of action, is estimated as:

Internal 712/Piute Plug (minimum)	$227,000
Piute Landing Tunnel Plug	23,000
Sawmill Adit Plug	20,000
Total Cost of Rejected Precautions	$270,000

1.0 INTRODUCTION

1.1 Location and History

The Walker Mine is an inactive copper mine located some 20 miles east of Quincy, in Plumas County, California, approximately 20 miles by road from Portola. Access is by well-graded gravel road through the Plumas National Forest from California Highway 70 at Portola. Situated in hilly country at an altitude of between Elev. 6,000 and 7,000 ft, the mine site is subject to heavy snowfall in winter and is generally inaccessible to motor vehicles between November and April.

Copper ore was first discovered at the Walker Mine site in 1904. Production commenced in 1916, continuing until 1932 and again from 1935 to 1941, when it was closed down by the operator, Walker Mining Company, a subsidiary of Anaconda Copper Company. Mining started on the 200 Level (approximately 6,670 ft elevation) near the outcrop of the Central Orebody, but the Main Haulage Tunnel on the 700 Level (approximately 6,200 ft elevation) was driven in the early 1920's. The Main Access Adit on the 700 Level was driven as an adit from the millsite at Dolly Creek, cross-cutting north by northeast some 3,000 ft to intersect the South Orebody. From there, the haulage was driven north by northwest, following the vein through the Central, North, 712 and Piute Orebodies. Approximately 10,000 ft from the portal, the Piute Shaft was raised in the vein from the 700 Level to surface in 1927/28. The portal of the 700 Level Main Access Adit remains the lowest point at which the underground workings reach the surface.

No stoping was done below the 700 Level until the 1930's. The deepest level from which ore was mined was the 1000 Level (approximately 5,720 ft elevation) and the deepest exploration winze was sunk to below the 1200 Level (approximately 5,400 ft elevation) on the Central Orebody.

A total of 5,319,000 tons of ore was mined between 1916 and 1941, from which 83,890 tons of copper were recovered (an average recoverable grade of 1.58% Cu with 0.03 oz/ton gold and 0.68 oz/ton silver recovered as by-products).

Soon after cessation of mining in November, 1941, all the mining equipment was removed and the surface plant was dismantled. When mineral processing stopped, the neutralizing effect of the water discharged from the plant was lost and the acid mine drainage (AMD) water flowing from the main Access Adit Portal on the 700 Level began to affect the Dolly Creek and the Little Grizzly Creek. Increasing concern over the detrimental effects of the AMD prompted the California Regional Water Quality Control Board (the Board) to commission several investigations, including the studies forming the subject of this report.

1.2 Statement of the Problem

The Walker Mine discharges acid- and heavy metal-laden water from an adit and mine waste dump into Dolly Creek which is a tributary to Little Grizzly Creek. The discharge from the mine is reported to have totally eliminated aquatic life in Dolly Creek downstream from its confluence with mine drainage water, and in Little Grizzly Creek downstream from its confluence with Dolly Creek for a distance of approximately ten miles downstream from the Walker Mine.

The primary goal of the Board is to restore Little Grizzly Creek and Dolly Creek to a condition capable of supporting a diversity of aquatic life.

The first objective of the studies forming the subject of this report is to evaluate the effectiveness and feasibility of sealing the Walker Mine adit in such a manner as to prevent a direct discharge of acid- and heavy metal-laden water from the underground workings. The second objective is to design and estimate construction costs for such a seal, should it prove to be warranted.

1.3 Scope of Work

In terms of Contract No. 4-051-150-0, signed on August 20, 1984, and the subsequent order to proceed given on September 5, 1984, Steffen Robertson and Kirsten (Colorado) Inc. (SRK), has pursued the following scope of work:

A. Studies have been directed towards evaluating the feasibility of sealing all actual and potential portals through which AMD might discharge by:

1) Performing a hydrologic assessment of the underground mine and its environs;

2) Examining available maps of the underground workings, surface features, and fault systems;

3) Examining available data to assess general groundwater movement and the potential for the escape of mine waters through surface springs or seepage; and

4) Identifying possible alternative outlets for mine water, when it is prevented from following its present course by sealing of the 700 Level Adit.

B. Design Criteria

1) Concrete bulkheads have been designed to seal the main Access Adit on the 700 Level and to minimize the potential for the escape of mine water through other outlets.

The selection of sites for seals has been made to:

- Minimize the potential for seepage around the seal;
- Maximize the structural integrity of the seal; and
- Permit future replacement of the seal, if necessary.

2) Seal design has taken into account:

- The maximum possible head of water to be held behind the seal;
- Installation of pipes through the seal to permit future dewatering of the mine in case that should become necessary;
- Materials and construction techniques appropriate to the environment in which the seal is to be located, and the objective of a design life in excess of 100 years; and
- Installation of pressure gauges to monitor the head of water behind the seal.

C. Reporting

This report has been prepared to detail the observations and conclusions arising from the feasibility studies, and to specify the design of the proposed bulkhead plug.

D. Construction

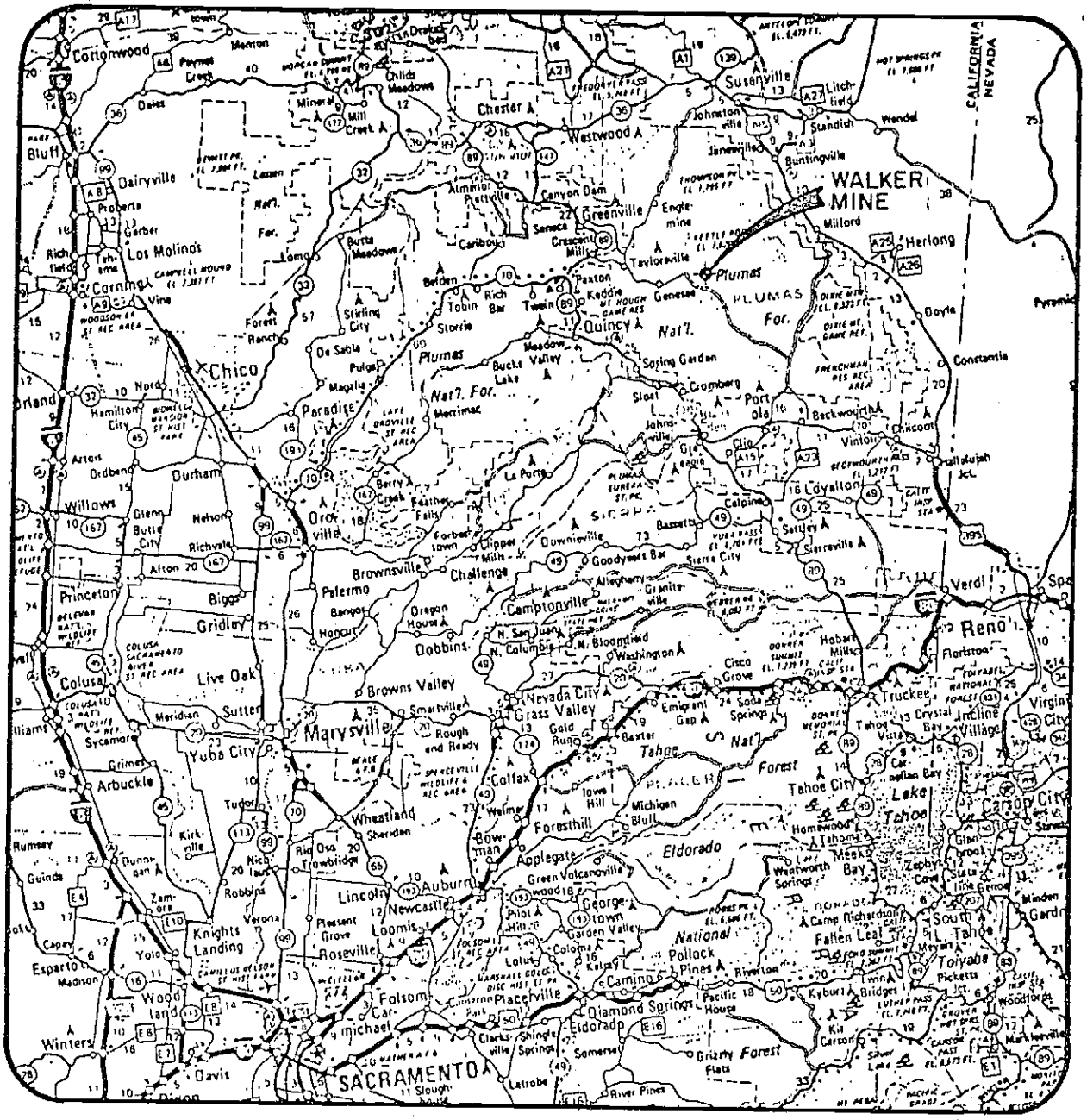
Following the Board's approval of plug feasibility and design, and authorization for construction, the approved structures will be installed.

1.4 Constraints

It must be emphasized that many of the opinions and conclusions recorded in this report are subjective and based on professional judgement. Assumptions have had to be made on the basis of limited or nonexistent data, to serve as a base on which professional experience and judgement can develop logical courses of action or events.

Certain information, such as underground plans showing the final extent of the mine workings and the locations of potential points (such as air raises or adits) for egress of water rising in the old workings, were not initially available. Research through the California Division of Mines and Geology discovered a vertical projection of the mine workings used to indicate ventilation flows at the time of an underground fire in 1940. Though incomplete and not necessarily indicating the full extent of the workings when mining stopped in 1941, this drawing has been used in the evaluation presented in this report.

Information regarding water flows and quality, both in surface streams and from the 700 Level Access Adit Portal, has been drawn from available sources. Time and restricted access have not permitted complete physical verification, but indirect checks have been applied. Water flows from the 700 Level were estimated by indirect measurements during the field visit by SRK in September, 1984 and June, 1985.



0 20 40

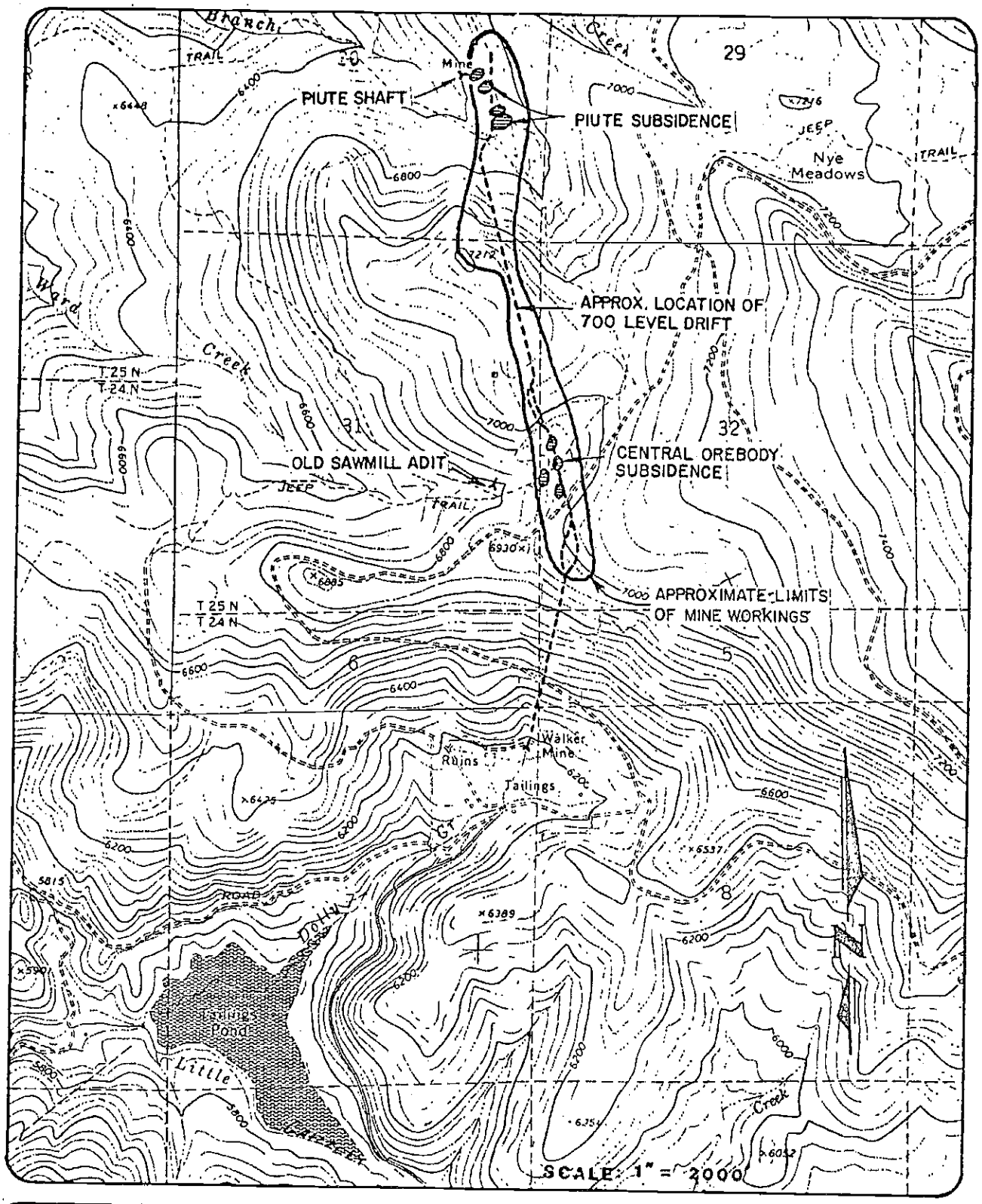
APPROX. SCALE IN MILES

N

Calif.

LOCATION OF MAP ABOVE

PROJECT NO. 06901	PREPARED BY: STEFFEN ROBERTSON & KIRSTEN	FIGURE 1
DATE 3/85	Consulting Engineers	PROJECT LOCATION
REVISION NO. 0		



PROJECT NO. 06901	PREPARED BY: STEFFEN ROBERTSON & KIRSTEN	FIGURE 2
DATE 3/85	Consulting Engineers	SITE PLAN AND TOPOGRAPHY
REVISION NO. 0		

2.0 STUDIES AND RESULTS

2.1 Site Visits

Unexpected delays were experienced by the Board in obtaining rights of access to the mine following signature of their contract with SRK. On September 5, 1984, a court order for entry onto the property was obtained, allowing SRK to examine the site and the accessible parts of the underground workings of the Walker Mine during a ten-day period between September 17 and 26. A site visit was arranged for the week of September 17 to enable all key members of the team to make a quick visual inspection of the mine workings and their environs.

Prior to the site visit, members of SRK's project team met with officials of the Board in Sacramento and studied the Board's project files relating to the Walker Mine. A composite underground plan of the main working levels at the Walker Mine, (at a scale of 1" = 200') was obtained, but no vertical projections or cross sections of the underground workings were available.

The 700 Level Main Access Adit was examined from its portal to the northern end of the Central Orebody workings. Data collected included:

- Observation and assessment of rock mass classification, noting evidence of permeability and orientation of fissures;

- Observation of the quantity and quality of water flow in the 700 Level tunnels at various locations from the Central Orebody workings to the adit portal;

- Measurement of tunnel profiles at selected alternative locations for a bulkhead seal in the 700 Level Main Access Adit, close to its intersection of the South Orebody; and

- Assessment of the transport and utility facilities available for construcion of a bulkhead seal.

All subsidence areas on surface were visited, as were the collars of the Main and Piute Shafts, and the portal area of the Sawmill Adit.

The effects of mine drainage from the Walker Mine 700 Level Adit were observed in the Oolly and Little Grizzly Creeks, and the tailings impoundment was examined visually. No evidence was found of seepage of mine drainage through outlets other than the 700 Level Adit, but it was recognized that this did not mean that seepage might not occur at other times of the year, at the same time in other years, or in other places.

Subsequent to the site visit, plans or other records concerning the underground workings and geology of the Walker Mine were sought from the Anaconda Minerals Company but, despite their generous cooperation, none could be found. However, valuable information in the form of a 1" = 200' scale vertical projection of the mine workings as of April, 1940 (shortly before the final cessation of operations) was obtained through the California Division of Mines and Geology.

Delays in obtaining access to the site did not allow more than a single cursory examination before the onset of winter prevented further access. This factor, combined with a paucity of documentary evidence of underground geological and mining features, and limited records of water flows and quantities up and downstream of the mine workings, forced the project team to base its preliminary conclusions on circumstantial evidence to a greater extent than it considered ideal.

Conclusions, drawn from available data and observations made during the first site visit led to a maximum security recommendation in SRK's Draft Feasibility and Design Report

The nature and volume of sludge, fallen timbers and rockfall in the haulage were observed and related to the work that would be required to remove them.

The presence or absence of rail track was checked by probing with a steel rod. The track's condition was noted at the few points where it was exposed and could visually be inspected.

Branches of the 700 Level haulage that could have led to another connection between the 712 and Piute Sections were checked and found to dead-end. The possibility of a connection at a higher level could not be checked as access into the 712 Orebody workings through the collapsed northern most stope drawpoint chute was considered unsafe on examination. In subsequent conversation with the owner's representative, Mr. Donato, he confirmed that he had descended through the Piute Shaft and workings to the 700 Level haulage, but had not ventured into the flooded part leading southward to the 712 Section. He had returned to surface up the Piute Shaft, checking the workings at each level for a connection to the 712 Section. No connection was found.

In addition to their underground inspection, SRK's engineers examined the diversion works around the sinkholes above the mine workings.

2.2 Hydrology

2.2.1 Introduction

This section of the report sets out the findings of a study of the hydrological effects of plugging the main access adit of the Walker Mine.

The mine has been generating and discharging acid drainage since its closure in 1941. The copper carried by

presented in February 1985. This recommendation required the installation of a second, internal plug, between the 712 and Piute Sections, in addition to a main plug in the 700 Level Adit. This requirement was based on concerns that water, held back by a single plug in the main adit, might rise to a level at which it could overflow through the Piute shaft and pollute the hitherto uncontaminated catchment of Ward Creek. The high degree of uncertainty attached to this possibility mandated a very conservative approach.

The Regional Board suggested a second visit to further investigate several specific questions they presented in a letter to SRK dated May 31, 1985. It was considered that the information gathered would permit SRK to attach a higher degree of confidence to their recommendations.

A court order was obtained on June 13, 1985 permitting SRK to enter the mine between June 17 and June 31, 1985. After two days of delay awaiting the owner's representative who held the keys to the property and the adit door, forced entry was made on June 18, 1985.

The team made a one-day underground inspection on June 19, 1985, the last day available in the team's schedule. It took over 3 hours to reach the Piute Orebody Section along the 700 Level haulage, and about 2½ hours to return by the same route .

Tunnel dimensions were measured, and rock quality observed, at the site selected for a possible internal plug between the 712 and Piute Sections. The selected site was flooded to a depth of about 3'-6".

Approximate measurements of water flow rates were made where flow was sufficiently channelized to be measurable, to estimate a flow profile along the 700 Level haulage. The locations of major inflows to and losses from the haulage were listed.

the water has reportedly rendered the receiving streams (Dolly Creek and Little Grizzly Creek) essentially barren of aquatic biota for about 10 miles downstream. In order to mitigate this impact, the Regional Board has proposed to install a plug in the mine portal. This section of the report comments on the effectiveness of this action to:

- Provide an immediate relief from the contaminated flow from the mine; and
- Build up the water level in the mine, thus reducing the volume of material capable of generating AMD,

and indicates the general order of magnitude of the effects to be expected following the installation of the mine plug. The anticipated results of this action are assessed in terms of:

- Effectiveness in achieving long-term improvement in water quality in the vicinity of the mine; and

- Extent and likelihood of possible undesirable side effects, and steps that can be taken to mitigate them.

2.2.2 Available Information

This study was performed entirely on the basis of existing information, together with field trips to the site in September, 1984 and June, 1985. The documents available were:

- Composite plan of the main levels of the mine, at a scale of 1" = 200', dated August 1, 1941;

- Vertical projection of mine workings at a scale of 1" = 200', as of early 1940;

- Report on "Plans to Proceed Toward Abatement of the Water Pollution Problems Incident to Water Emanating from the Walker Mine, Plumas County," California Division of Mines & Geology, August, 1972;

- Report on "Evaluation of Water Pollution Sources and Development of Conceptual Pollution Abatement Plans, Walker Mine, Plumas County, California", D'Appolonia Consultants, December, 1979;

- Water quality data from Conoco, for 1976 and 1977 (Pine, 1979), 1980 and 1981 (Hart, 1980 & 1981); and

- Water quality data from the California Regional Water Quality Control Board, Central Valley Region for 1977 and 1978 (Matteoli, 1977, and 1978; and Croyle 1985).

While this database is limited, particularly with respect to flows, it is considered to be adequate for the present evaluation. Little independent checking of the data was possible in the time available; however, consistency checks have been made when possible and some information has been omitted as a result.

2.2.3 Setting

2.2.3.1 The Mine

The Walker Mine is located in Plumas County,

California as shown in Figure 1. The workings strike approximately north-south, over a distance of nearly 1½ miles. The tabular orebody, 10 to 100 ft thick, was mined at an average stoping width of 35 ft, dipping to the east at about 60^{o} to 70^{o}. The mine excavations extended from surface above elevation 7,000 ft to below elevation 5,400 ft. A section through the mine is shown in Figure 4.

Rock containing sub-economic grades of copper was not mined, and remained in place. A study done during World War II estimated about 4 million tons of copper-bearing rock remained in the mine area. Subsequent exploration by several mining companies has failed to identify sufficient reserves to justify reactivation of mining.

The volume of voids resulting from mine excavations was estimated as a function of location based on Figure 4. In absence of transverse sections of the workings, an average stoping width of 35 ft was assumed throughout. The volume of rock excavated from the mine is estimated to be about 5,319,000 tons of ore plus an estimate of 680,000 tons of waste rock. Visual inspection of the mine suggested that the mine is still very stable and it is likely that little collapse of the hanging wall has taken place since the mining operation. It is assumed that the effective volume of the voids caused by mining is equivalent to the volume of rock excavated, i.e. some six million tons of rock or 543 million gallons of water. The estimated void volumes are shown in Table 1.

TABLE 1
ESTIMATE OF VOIDS AS MINED

SECTION	VOID VOLUMES (MILLION GALLONS)			
	Above 6600'	6200'-6600'	Below 6200'	Total
Piute	-	88	19	107
"712"	6	57	-	63
North	57	76	57	190
Central	44	63	50	157
South	-	13	13	26
Totals	107	297	139	543

2.2.3.2 Hydrology

The mine is located in the catchment area of Little Grizzly and Ward Creeks, both of which flow north to Indian Creek (Figure 2). Flow from the mine currently discharges out through a 3,000-ft long adit (700 Level Access Adit) at about the 6,200 elevation to the south of the mine. This flow varies considerably over the year, as shown in the data for 1978 (Figure 5). Much of the portal flow is believed to originate as surface flow, which is captured by sinkholes which connect the mine to the South and Middle Forks of Ward Creek. Remedial actions and diversions in recent years have probably reduced the peak flow below that shown in Figure 5.

Water from the adit flows into Dolly Creek, which flows to Little Grizzly Creek, which in turn flows to Indian Creek. Average flows in these creeks have been calculated to be of the order of 1.7 cubic feet per second per square mile of catchment (1.2 gpm/acre - Table 1 D'Appolonia, 1979).

2.2.3.3 Water Quality

The quality of water in local streams which are unaffected by the mine is excellent. The flow from the portal is, however, of low pH and high in copper and other dissolved metals, as shown in Table 2.

There is a seasonal variation in the copper concentrations measured in the water flowing from the portal of the mine. The available data are plotted in Figure 6. It is of interest to note that the copper concentration is highest during periods of greatest flow. This is a result of the spring flushing of acid generated in the mine all winter, which has a lower pH and a higher copper content than the flow later in the year. It is noteworthy that the total dissolved solids (TDS) of the mine water is low, indicating a low residence time in the ground and suggesting that the greater part of the flow is derived from surface inflow.

TABLE 2
TYPICAL SELECTED WATER QUALITY PARAMETERS
(Kaback, June, 1978)

Parameter	Unit	Portal	Streams
Ca	mg/l	24.5	5.8
Na	mg/l	2.7	2.8
K	mg/l	1.6	0.7
Mg	mg/l	6.4	2.2
SO_4	mg/l	146	5
HCO_3	mg/l	0	23
CO_3	mg/l	-	-
pH	Units	4.1	7.6
NO_3	mg/l	4.5	0.7
NH_3	mg/l	0.01	0.01
Cl	mg/l	1	-
Cu	mg/l	29	0.03
Zn	mg/l	0.93	0.01
Fe	mg/l	1.0	0.15

2.2.3.4 Flows Within the Mine

During the initial site visit, the flows in the southern part of the mine were measured using the floating object method. The results of these measurements are presented in Table 3a.

TABLE 3a
ESTIMATED MINE FLOWS (SEPTEMBER 20, 1984)

Location	Flow (GPM)	Comment
Between North and Central Orebodies	174	Location just south of north end of Central orebody
At junction of portal adit and the Central Orebody	229	-
At portal in timbered section	116	-

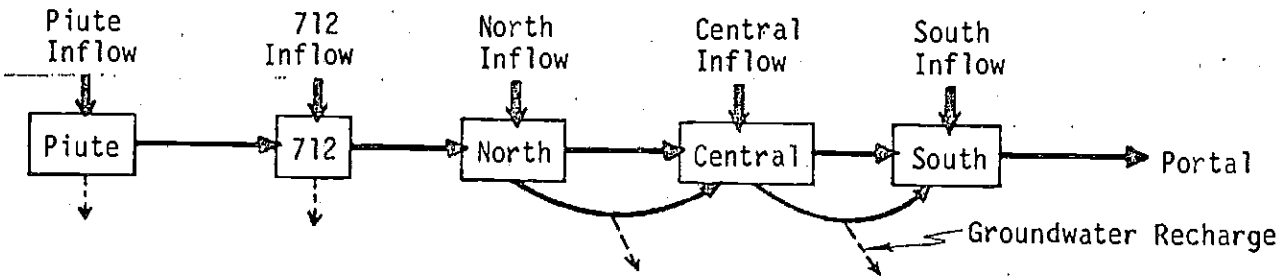
Based on these measurements, it was concluded that:

1. At the time there was apparent flow continuity in the southern portion of the mine, and
2. There appeared to be some flow loss along the portal adit.

Accordingly, it was considered wise to locate any adit plug remote from the portal. In addition, a more detailed flow survey was proposed to better defined in-mine flow.

During the second site visit, a portable direct-reading flow meter was used to determine flow velocity at points where the cross-sectional area of the channel could be estimated reasonably. Where no appropriate channel sections existed, flows were estimated by eye.

The results are presented in terms of flow from blocks of the mine, as indicated in the following sketch:



The results of the rough measurements are presented in Table 3b.

TABLE 3b
ESTIMATED MINE FLOWS (June 19, 1985)

Location	Flow (GPM)	Comment
Between Piute and 712 orebodies	130	Rough measurement.
Within 712 orebody	100	Visual estimate.
Flow on 700 Level at south end of North orebody	270	Rough measurement; does not include above 230 gpm, as this was observed to flow into lower mine workings.
Flow on 700 Level at south end of Central orebody	60	Rough measurement; does not include upstream flows, which entered lower workings.
Flow on 700 Level at south end of South orebody	215	Rough measurement.
Discharge from portal	275	Rough measurement.

Based on this set of readings (which do not cover the entire mine area due to measurement difficulties and shortness of time), it is concluded that, in all likelihood, the flows entering the mine exceed the flow entering the mine adit from the workings, suggesting a deep point of egress of inflow water within the mine.

2.2.4 Evaluation of Current Conditions

2.2.4.1 Conceptual Flow Model

In order to have a means of evaluating the probable behavior of the mine after remedial action, it is necessary to develop a conceptual model of the flow behavior of the mine system. The inflowing water is made up of the following components:

1. Surface water inflow. This enters from sinkholes near the Piute and Central orebody areas. As it is close to its source, quality is expected to be excellent.

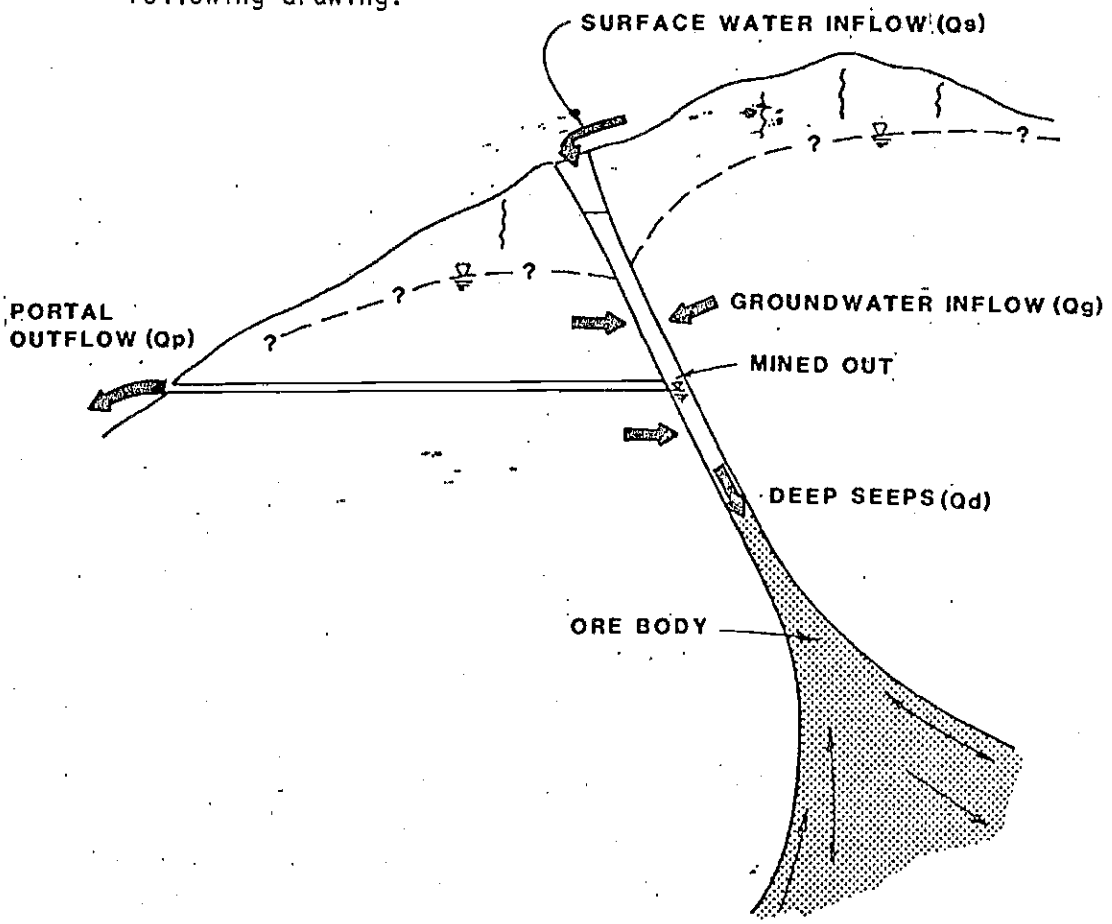
2. Groundwater inflow. The drainage of the mine has caused a groundwater sink in the vicinity of the mine. Local groundwater of (likely) moderate TDS and low metal content is flowing into the mine.

The outflowing water is made up of essentially two components:

1. Flow from the portal. This is essentially an overflow from the mine void, at the elevation of the intersection of the portal adit and the mine.

2. Discharge to deep groundwater system. As noted above, it is entirely possible that there is a deep conduit for flow from the mine. This conduit could allow discharge of water from the mine to the deep bedrock flow system via open pathways through the rock.

The total flow system is shown schematically in the following drawing:



Clearly the relationship between the flows shown for the steady state condition is

$$Q_s + Q_g = Q_p + Q_d$$

2.2.4.2 Groundwater Inflow to Mine

The portion of the measured flow due to groundwater influx to the mine is difficult to evaluate. The minimum low flow from the mine is an indication of the minimum groundwater inflow rate, on the assumption that there is no other outflow from the mine, and that the inflow from surface sources is negligible during low flow periods. The minimum inflow reported is zero (California Division of Mines and Geology, 1972) and 50 gpm (Kaback, 1979). That the flow due to groundwater is small, is further suggested by the low TDS of the Adit flow discussed in Section 2.2.3.3.

It is possible to check the reasonableness of this range of low flows. The groundwater inflow estimate can be used to back-calculate the average hydraulic conductivity of the host rock. Simple evaluation, based on Darcy's law, produces an average hydraulic conductivity of 10^{-5} cm/sec or less. Based on the observations of the rock mass made during the site inspection, this hydraulic conductivity is reasonable for the rock penetrated by the mine.

2.2.4.3 Surface Water Inflow to the Mine

The recorded flow from the mine adit has been as high as 3,000 gpm in the spring. This flow is presumed to be essentially surface water flow. This presumption may be checked by comparison with stream flows in the areas of the sinkholes above the mine.

The peak flow in 1978 presumably resulted from some stream capture at sinkholes in the Middle and South Forks of Ward Creek. As shown on Figure 7, the catchment area to the sinkholes at the Piute Shaft area is 234 acres,

while that to the central orebody sinkholes is about 212 acres. Applying flow/drainage relationships based upon local soil, vegetation, precipitation and runoff data, the total estimated average flow in these streams at these locations is given in Table 4.

This figure (525 gpm) compares well with the computed average flow of about 420 gpm in 1978, prior to much of the recent stream diversion activities.

TABLE 4
AVERAGE ANNUAL FLOW TO SINKHOLES (GPM)

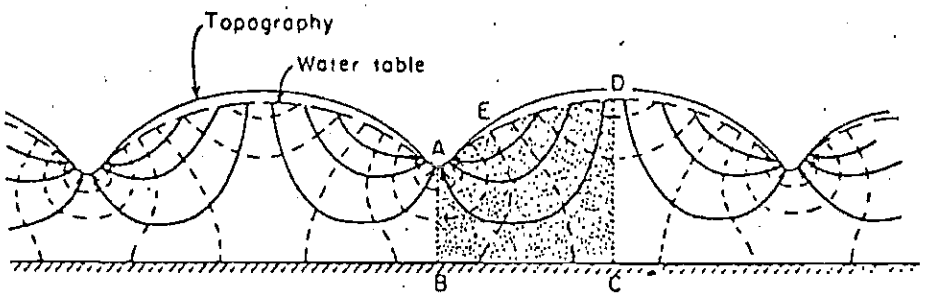
LOCATION	PIUTE	CENTRAL	TOTAL
Area (Ac)	234	212	546
Rate (GPM/Ac)	1.2	1.2	1.2
Flow (GPM)	275	250	525

2.2.4.4 Discharge to Deep Rock System

As noted above, it appears that more water currently flows into the mine than flows out via the 700 Level Adit. This suggests that water is being lost to the deep groundwater system using the mine as a conduit.

This process is possible under the following scenario. The area around the mine has high topographic relief. The current water level in the mine is Elev. 6,200 ft. The level of Grizzly Creek (about 2½ miles to the southwest) is around Elev. 5,000-5,500 ft, some 700-1,200 ft lower. The level of Indian Creek, some five miles to the northwest, is about Elev. 3,000 ft, some 2,400 ft lower. The hydraulic gradient to these two

possible regional groundwater receptors is about 0.1. Based on the evaluations of Toth et al (1963), it has become clear that deep groundwater circulation patterns differ from shallow patterns, because heads at depth are less dramatically influenced by topography. This effect is illustrated below by a figure from Freeze and Cherry.



GROUNDWATER FLOW NET IN A TWO-DIMENSIONAL VERTICAL SECTION THROUGH A HOMOGENIOUS, ISOTROPIC SYSTEM BOUNDED ON THE BOTTOM BY AN IMPERMEABLE BOUNDARY (after HUBBERT, 1940)

Accordingly, it is possible to have head conditions in the Walker Mine area which cause groundwater inflow to the mine near the surface, and flow out of the lower portions of the mine to the deep groundwater system.

It is possible to obtain an appreciation of the possible flow ranges which might occur by back-analyzing flow from the mine using some assumptions:

1. The head at an elevation of 4,000 ft (3,000 ft below surface at the mine) is 5,000 ft elevation (about half way between the mine water head and that at Indian Creek.
2. Flow is down the orebody fault zone only.
3. The fault zone in which flow occurs is 40-ft wide and 6,000-ft long.
4. Flow is downward.

Using these assumptions, the flows which result out of the mine are:

Hydraulic Conductivity (cm/s)	10^{-7}	10^{-6}	10^{-5}	10^{-4}	10^{-3}
Flow (gpm)	0.2	2	20	200	2000

A typical hydraulic conductivity for fractured rock is in the range of 10^{-4} cm/sec to 10^{-5} cm/sec. This suggests a reasonable flow estimate for present discharge from the mine to deep groundwater is about 20-200 gpm, which is in the same order as groundwater inflow to the mine.

2.2.5 Summary of Present Mine Flow System

A summary of the estimated mine inflow and outflow system is as follows:

Component	Winter (min)	Spring (max)
Surface Water	0	3000
Groundwater	50-200	50-200
Total Input	50-200	3050-3200
Deep Flow	20-200	20-200
Portal Flow	0-50	3000
Total Output	20-250	3020-3200

As can be seen, this is roughly in balance.

2.2.6 Evaluation of Remedial Actions

2.2.6.1 Do Nothing Alternative

In this alternative, the mine is allowed to flush of its own accord. Based upon continuing leaching of broken ore left in stopes and mineralized wall rocks fractured by mining, as little as 100,000 tons would continue to produce acidic, copper-bearing water at a concentration of 3 mg/l (Figure 6) for over a century. It appears clear that acid drainage can be expected to continue for a long time if unabated.

2.2.6.2 Effects of Installing a Seal in the 700 Level Access Adit

The proposed action is to install a seal in the main access adit which will cause the water level to build up in the mine. The mine water buildup will continue until inflow is equal to outflow in the mine system. The most probable effect of the water level rise in the mine will be to reduce groundwater inflow and increase the deep groundwater outflow. It is expected that the equilibrium water level will be considerably below the Piute Shaft outlet so no direct egress of the mine water to the surface is expected. The level to which the water will rise is a very strong function of the success of diverting surface water away from the Piute and Central Orebody sinkholes; therefore, it is difficult to estimate the final level. In addition, this level will fluctuate in the mine on a seasonal basis.

It is possible, but extremely unlikely, that there is no significant deep groundwater discharge from the mine. If this extreme condition were to occur, the water level would probably rise to the next exit from the mine (apparently the Piute Shaft at elevation 6,600 feet), or until the inflow is equalled by the outflow from the mine into the containing host rock.

The minimum time that it would take for the water level to rise up to the level of the Piute Shaft Landing Adit can be estimated by assuming no flow from the mine into the rock, and this calculation is presented below:

Volume to be filled = 297,000,000 gal (Table 1)
Time at 420 gpm = 1.3 years
Time at 50 gpm = 11.3 years

It would appear that refill to the level of the Piute Shaft collar could take between 5 and 10 years, given reasonable success diverting flows around the sinkholes, and given the extreme assumption of no groundwater outflow within the mine workings.

Flow could possibly occur from the Piute Shaft area under this scenario. This flow is expected to be no higher than 10 gpm because the head driving the inflow of groundwater would reduce as the water level rose in the mine workings, provided the diversion of the South Fork of Ward Creek around the Central Section sinkhole area was adequately maintained.

This flow would probably be of a similar quality to the water currently discharging from the main adit, as acid generation will continue in the un-submerged parts of the North, Central and 712 Orebodies, and it is mainly this water which would pass down through the 700 Level haulage connection and flow out of the Piute Shaft.

2.2.6.3 Additional Plugging to Isolate Piute Section

An alternate remedial strategy to avoid flow from the Piute Shaft after sealing the main portal is to isolate the Piute Section. This could be achieved by plugging the only connecting drift between the Piute and

712 Sections on the 700 Level at Elev. 6,200 ft. This could be done in two ways:

1. Before sealing the main adit, using conventional methods. This would require rehabilitating the 700 Level haulage to the plug location and installing the plug. It would provide a positive seal in this location.

2. After sealing the main adit, using a seal implaced via boreholes. This would be done from surface, and might be less effective than the conventional seal due to extreme difficulty of hitting the small target drift and ensuring an effectively watertight seal.

If a plug were successfully emplaced in this location, and if inflows were not balanced by net flows recharging the groundwater systems, the entire mine would likely refill with water, thus eliminating further acid generation through exclusion of oxygen.

2.2.7 Conclusions

The conclusions of this hydrologic evaluation are:

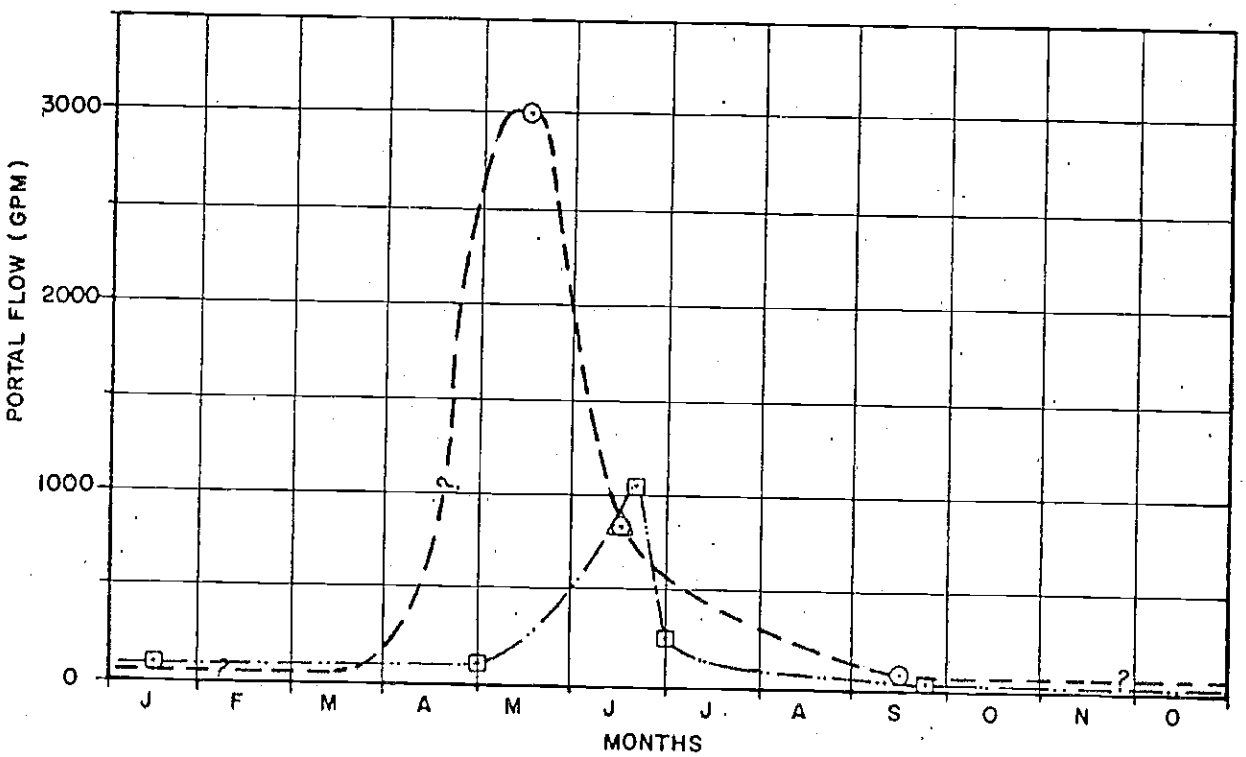
1. Sealing the main 700 Level Adit of Walker Mine will effectively remove the main source of copper contamination from Little Grizzly Creek, assuming there are no other, as yet unidentified outlets. The possibility of seepage of acid mine water from the flooded workings to surface in the catchment of Dolly Creek is considered to be extremely remote.

2. There is only a remote chance that a small flow of acidic water containing dissolved copper could ultimately occur from the Piute Shaft area, as a result of the single-plug strategy.

3. The remote chance of possible flow from the Piute Shaft could be minimized, and probably eliminated, by emplacement of another seal to separate the main mine from the Piute Section in addition to diverting surface water from the mine. This precaution would be extremely expensive, and is considered to be unjustified in view of alternative precautions and the low risk of flow.

4. Observations indicating a significant recharge of the groundwater system through outflow from the mine workings add substantially to confidence that equilibrium will be reached before the level of water in the mine workings rises to the level of the Piute Shaft Landing Tunnel (6,585 ft elevation).

5. The magnitude of the outflow inferred from the lower workings suggests a deep groundwater flow path from the mine. The orientation of regional faults (which appear from underground observation to be aquacludes) runs perpendicular to the direct path from the workings to the valley of the Little Grizzly Creek, and would tend to inhibit flow in this direction. Visual observation revealed no seepage into the valleys of the Dolly or Little Grizzly Creeks which could be identified as groundwater recharged from the Walker Mine workings.



⊙ 1978 (KABACK, 1978)

△ 1978 (MATTEOLI, 1978)

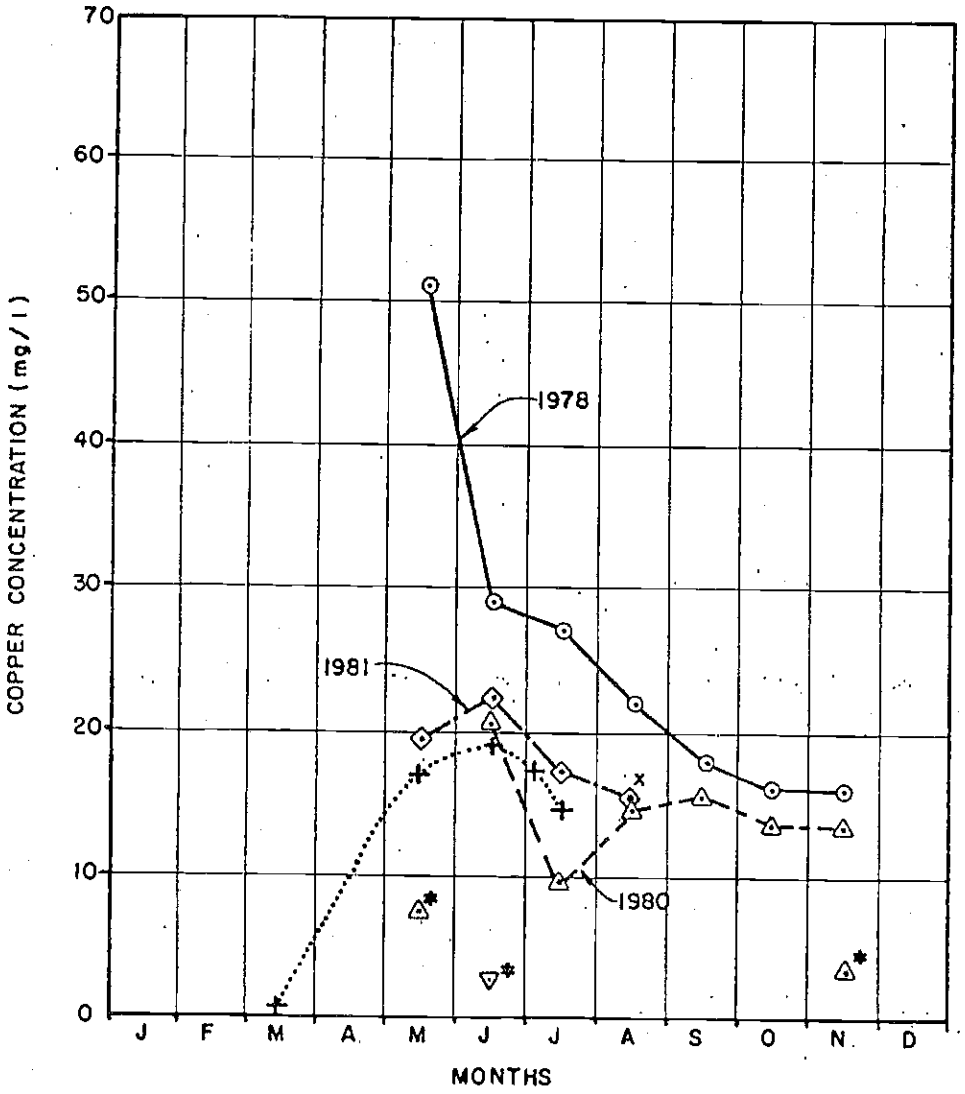
⊡ 1985 (CROYLE, 1985)

PROJECT NO. 6901	PREPARED BY: STEFFEN ROBERTSON & KIRSTEN Consulting Engineers	FIGURE 5
DATE 3/85		MINE OUTFLOWS
REVISION NO. 0		

- ⊡ 1977 (MATTEOLI, 1977)
- ⊙ 1978 (KABACK, 1978)
- ▽ 1978 (MATTEOLI, 1978)
- ◇ 1980 (HART, 1980)
- △ 1981 (HART, 1981)
- * 1984 (CRAWFORD)
- + 1985 (CROYLE)

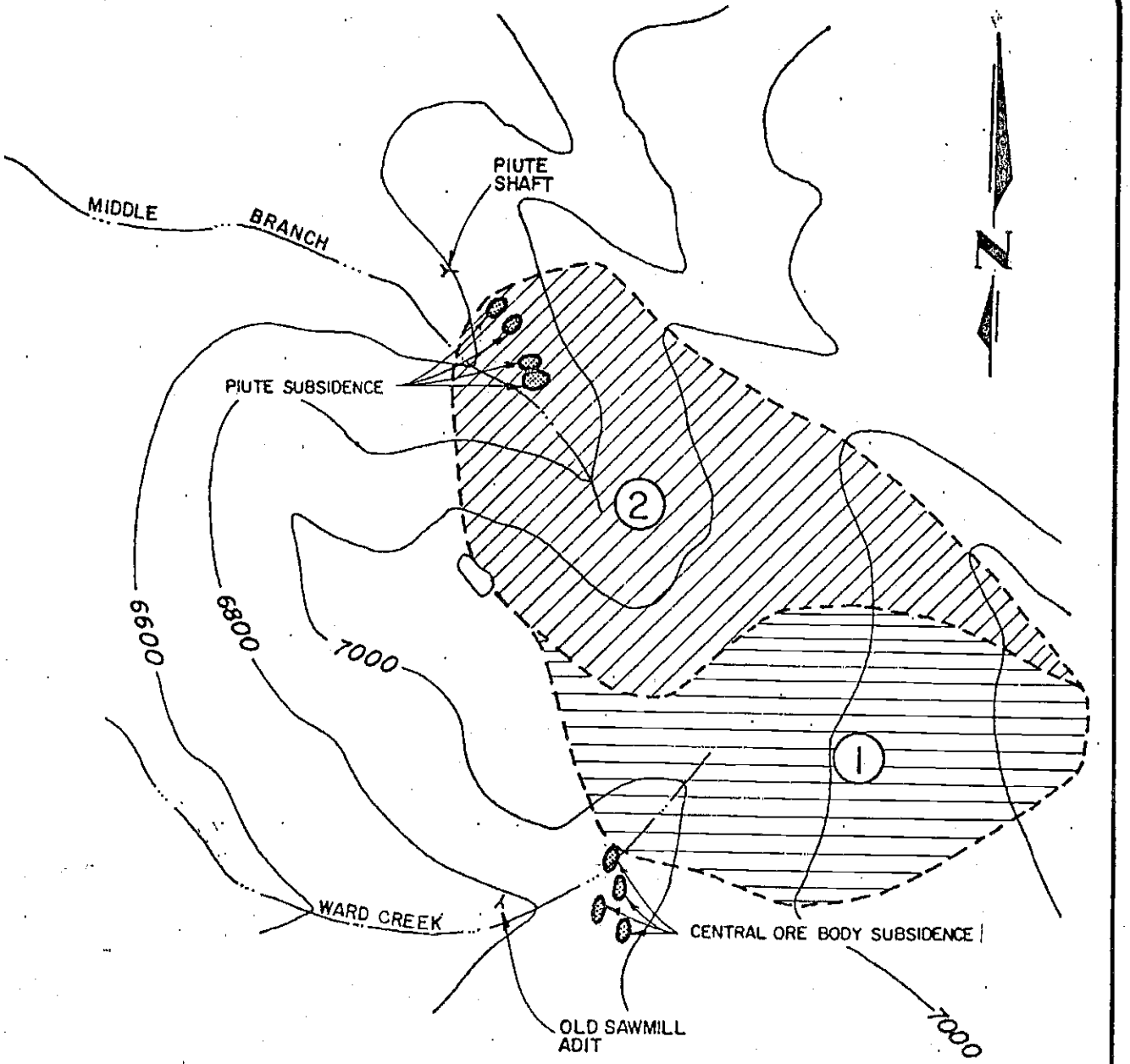
NOTE

DATA FROM AMAX LABS NOT INCLUDED AS Cu ≃ 0 mg/l



* pH ≃ 6-7, UNACIDIFIED SAMPLE ?

PROJECT NO. 6901	PREPARED BY: STEFFEN ROBERTSON & KIRSTEN	FIGURE 6
DATE 3/85	Consulting Engineers	COPPER CONCENTRATION FROM PORTAL
REVISION NO. 0		



AREA (1) = 212 ACRES

AREA (2) = 234 ACRES

0 1500

SCALE IN FEET

PROJECT NO. 6901	PREPARED BY: STEFFEN ROBERTSON & KIRSTEN	FIGURE 7
DATE 3/85	Consulting Engineers	CATCHMENT AREAS
REVISION NO. 0		

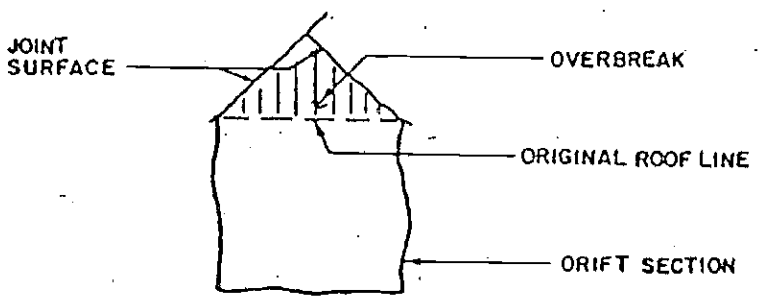
2.3 Geology and Geotechnical Considerations

2.3.1 Condition of Main Access

The main access drive was examined in order to determine its condition and its suitability as a site at which to install a bulkhead. Figure 8 shows schematically the main drive.

The first 1,300 ft of the drive from the mine portal is heavily supported. Timber square sets on approximately 3 ft centers are used, together with timber lagging. The surrounding ground is highly weathered granodiorite which has, in places, a soil-like consistency.

Beyond 1,300 ft from the portal, ground conditions are excellent. There is no installed support, little indication of blast damage, and no indication of any stress-induced failure. Due to the blocky nature of the ground, overbreak had been experienced during the original driving. The overbreak was generally in the roof as shown below:



The overbreak was a result of falls of ground along intersecting joint planes. The nature of the overbreak indicates a general lack of confinement on the rock mass

which, in turn, implies that a high in situ stress field does not exist.

A number of faults and shear zones were observed. These zones generally transect the drift at approximately right angles. The zones consisted of a composite of sheared and altered granodiorite and clay gouge. Due to the presence of the clay gouge, it is considered that such zones will act as regional groundwater barriers.

With the exception of the poor ground adjacent to the mine portal, the main access drift was essentially dry.

2.3.2 Rock Mass Classification

2.3.2.1 General

In order to summarize key geological and geotechnical data and to provide a tool for decision making during design, a system of rock mass classification and rating has been used. This type of classification makes use of measurable parameters in an attempt to minimize judgemental bias. This gives an effective quantitative method of rock mass description. The suggested method of rock mass description developed by the International Society for Rock Mechanics (1977), lists the following parameters:

- Number of joint sets;
- Orientation;
- Spacing (block size);
- Condition of joint walls;
- Joint roughness;
- Joint persistance;
- Joint opening; and
- Water seepage.

All of these parameters can either be directly measured or scaled against carefully calibrated descriptive scales.

To summarize these parameters into a single value, a rock mass classification system is used. The system considered appropriate to the bulkhead design at the Walker Mine was developed by Barton et al. (1974) and subsequently modified by Kirsten (1983). Rock mass quality (Q) is related to the parameters described above by the following expression:

$$Q = \frac{RQD}{Jn} \cdot \frac{Jr}{Ja} \cdot \frac{Jw}{SRF}$$

where RQD is the Rock Quality Designation, a measure of joint spacing, Jn the number of joint sets present, Jr the joint roughness, Ja joint alteration, Jw a measure of water pressure, and SRF a measure of the in situ stress condition.

2.3.2.2 Rock Mass Rating

Two important parameters relating to bulkhead design are rock mass strength, which in part will control the position and length of the bulkhead, and rock mass permeability, which will control the risk of leakage past the bulkhead. These parameters are both functions of rock mass quality.

An initial rock mass quality rating has been estimated from a number of observations and measurements carried out in the main access drive. Figure 9 shows the results of the observations made in granodiorite (the dominant rock type) while Figure 10 shows the results obtained in the hornfels schists that occur adjacent to

the orebody. The figures give the ratings obtained using the Q-system proposed by Barton et al (1974). For corroboration purposes, the CSIR system developed by Bieniawski (1973) was also undertaken.

The ratings from both systems indicated that the rock mass in the main access drive (granodiorite) can be regarded as good quality (Q-system) or very good quality (CSIR-system). The hornfels schists adjacent to the orebody are of slightly lesser quality, being rated as fair quality (Q-system) and good quality (CSIR-system).

The ratings estimated are in agreement with the observed conditions of the main access drive and the footwall drives visited which have stood unsupported for periods in excess of 40 years without deterioration.

2.3.3 Site Characterization

2.3.3.1 Geology

The Walker Mine is situated in a series of metasediments that have been metamorphosed by the intrusion of the Sierra Nevada Batholith. At the southern end of the mine, the hornfels and intruding diorite are unconformably overlain by flat-lying volcanic and clastic rocks.

The ore deposits consist of a series of vein-like pods with mineralization occurring in or adjacent to granitoid veins in hornfels and diorite. Major ore minerals include chalcopyrite, pyrrhotite, pyrite, cubanite, magnetite and sphalerite.

Structures in the mine area include cleavage, joints, and faults. The D'Appolonia report (1979) states

that the orientation of cleavage in the hornfels above the mine is northwest-trending and dips 53° to the southwest (approximately the same strike as the orebody). Jointing was observed in the main access drive and generally two sets, in addition to the cleavage, are present. Faulting is also evident in the main access drive and, according to the D'Appolonia report (1979), has been mapped on surface. The dominant fault set trends north to northwest and dips 50° to 80° east to northeast. A subordinate and apparently conjugate set trends northeast to east and dips 50° to 80° southeast to south. A more complete description of regional and local geology is given by D'Appolonia (1979).

2.3.3.2 Material Properties - Strength

The bulkhead and the surrounding rock can be regarded as a discontinuum consisting of a series of blocks of intact rock and concrete, separated by various planes of weakness. The behavior of this system will be controlled by both the strength and deformation moduli of the intact material and the strength and stiffness along the planes of weakness.

Values for these various components of strength have been evaluated from a number of simple field observations and measurements and from published data.

Intact Rock Strength

Intact rock strength was estimated from a series of simple field measurements. These indicated that the uniaxial compressive strength of the granodiorites is in the range of 22,000 to 29,000 psi. The hornfels schist is weaker with an estimated uniaxial compressive strength in the range of 12,000 to 17,000 psi.

A cross-check on these estimated strengths was carried out with the aid of the relationship between uniaxial compressive strength, vertical stress and tunnel condition given by Hoek and Brown (1980). The relationship is shown in Figure 11. The access tunnel and the footwall drifts were found to be in a stable condition (i.e. p_2/σ_c = 0.1 in Figure 11). It has been assumed that the vertical stress is equivalent to the overburden load of approximately 1,450 psi. Entering this value on Figure 11 and projecting up to the p_2/σ_c = 0.1 line, the minimum uniaxial compressive strength can be read off. This value is 16,000 psi and compares well with estimates done from field measurement.

Rock Mass Strength

Hoek (1983) has developed a failure criterion that can be used to predict rock mass strength. A series of approximate equations were derived that allow Mohr's strength envelopes to be constructed for different rock types and quality.

The rock mass classification outlined in the previous section was used to determine the appropriate strength equations as shown in Figure 12. From these equations, failure envelopes were constructed and are shown in Figure 12 for both the granodiorite and hornfels schist.

Strength at Rock-Bulkhead Interface

The strength along the rock/bulkhead contact is dependent upon the following parameters:

- Rock/concrete frictional and adhesion properties;

- The roughness and size of asperities along the rock surface;
- The condition of the rock; and
- The stress acting across the contact.

Strength estimates have, therefore, been based upon a series of field observations and tests, and published data.

The roughness and size of asperities found along a potential shear surface have a major influence on the shear strength of that surface. Patton (1966) has demonstrated that the roughness angle (i) can be combined with the base friction angle ($\emptyset_b$) of the surface to obtain an estimate of the peak frictional strength available along the surface.

Observations in the main access drift indicate that at least two orders of asperities exist. These are illustrated in Figure 14. The first order asperities reflect the roughness along individual joint planes and have been termed the roughness factor. The second order of asperities are at a greater scale and arise due to the intersection of joints with different orientations. This has been called the step factor.

For failure to occur along the rock/bulkhead interface, the following sequence of events must take place:

- The base frictional properties between the concrete and the rock must be exceeded;
- Shear through or dilation over the first order asperities (roughness factor); and

- Shear through or dilation over the second order asperities (step factor).

The peak strength of the contact (τ_p) is, therefore, a function of

$$\tau_p = f(\tau_b, \tau_r, \tau_s)$$

where τ_b is the strength component attributable to the base frictional properties, τ_r the strength component attributable to the roughness factor and τ_s the strength component attributable to the step factor.

An estimate of base frictional strength of the two principal rock types can be made from published data. Figure 15 shows a composite of results obtained by Einstein et al, 1979. The granodiorite rocks fall within the Group IV rock (Figure 15) while the hornfels schist falls within the Group III rock (Figure 15).

From Figure 15, it is estimated that the base frictional strength of the granodiorite is 30^o and that of the hornfels schist 25^o.

A number of observations were made underground on joint roughness. These observations indicate that some 2^o can be added to the base frictional strength to account for surface roughness.

As can be seen from Figure 14, the walls of the access drive comprise a series of large rock steps. The average relief change over one of these steps is approximately 8 inches. Any shear surface along a bulkhead/rock contact must either pass through the rock mass or dilate over the step. To account for this effect, the peak frictional strength can be increased. Based upon

results given by Robertson (1971), it is considered that 15^{o} can be added to the base friction angle to account for the stepped rock surface.

Based upon the above discussion, the peak frictional strength available along the rock/bulkhead is estimated to be:

$$\tau_p = \tau_n \tan (30^{o} + 2^{o} + 15^{o}),$$

where τ_n is the normal stress acting across the contact.

2.3.4 Bulkhead Design

2.3.4.1 Location

Two bulkhead positions have been considered. The first is in the main access drive and is intended to block the main discharge point of mine water. However, this will in turn cause the mine water to backup within the old workings until it might eventually issue out of the Piute Shaft. In order to minimize the consequences of this, a second bulkhead could be located between the 712 Orebody and the Piute Orebody. As indicated in Section 2.2.7.3, the installation of an internal plug is not recommended. Consideration of its technical feasibility and the cost of its construction is necessary for an effective evaluation of its merits on a cost/benefit basis.

The approximate locations of the two bulkheads is shown in Figures 3 and 4. The main bulkhead is positioned approximately 2,700 ft from the mine portal. Figure 16 shows the profile of the roof, floor and walls. The position was specifically chosen for its geometry; the narrowing of the drive at that point will greatly enhance the stability of the bulkhead.

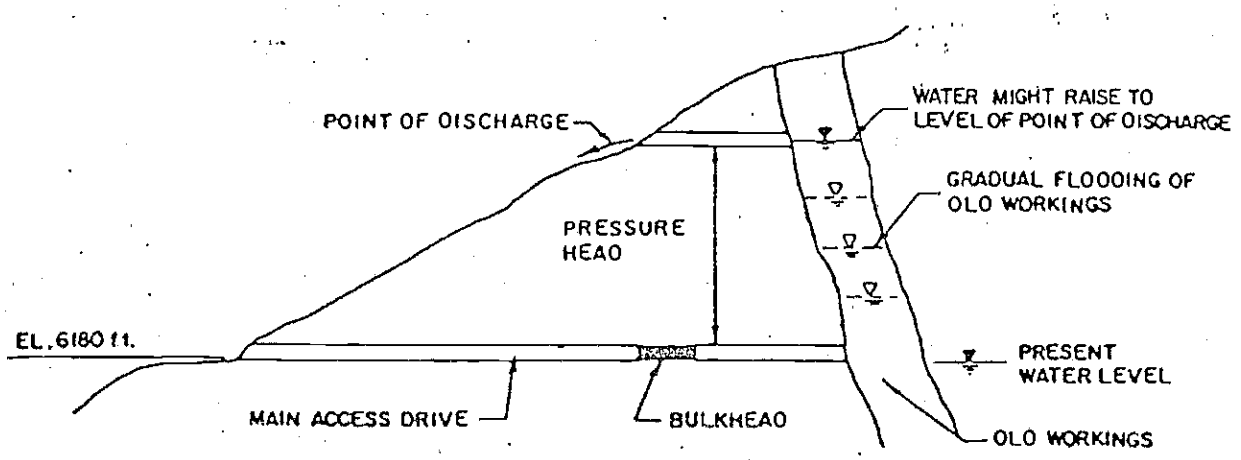
2.3.4.2 Design

The stability of a bulkhead will depend upon several factors. These include:

- The water pressure applied to the bulkhead;
- The strength of the bulkhead;
- The strength of the surrounding rock; and
- The strength along the bulkhead/rock interface.

Pressure on Bulkhead

The water pressure on a bulkhead is dependent on the head of water maintained behind it. As the flow of water is stopped by the bulkhead, the water will gradually back up through the mine until equilibrium is reached or a higher exit point is encountered. The difference in elevation between the higher exit point and the bulkhead elevation represents the pressure head the bulkhead has to resist. This is shown on the following drawing.



Two bulkhead locations have been studied, namely the main bulkhead and the Piute bulkhead. Examination of old mine records and plans indicate that with only the main bulkhead in place, the next point of egress for mine water will be the Piute Shaft. The difference in elevation between the Piute Shaft Landing Tunnel and the main bulkhead is approximately 390 ft. However, with both the main and Piute bulkheads in place, the point of egress for water contained between the two bulkheads will be the Old Sawmill Adit where it exits from the caved area above the Central Orebody. The pressure head in this instance is 570 ft. It should be noted that the water contained beyond the Piute bulkhead could still exit from the Piute Shaft.

For design purposes, it has, therefore, been assumed that the higher head acts against both bulkheads. In addition, a factor of safety of 2.5 has been applied to this head giving a design pressure head of 1,400 ft.

Bulkhead Dimensions

The water retained behind a bulkhead exerts a load on the bulkhead. This load is transferred to the surrounding rock in the form of shear stresses. It has been assumed, for design purposes, that the stress distribution is uniform over the length of the bulkhead.

Based upon the above assumptions, the bulkheads can be dimensioned by using the following relationship (Garret and Pitt, 1961):

$$l = \frac{p \cdot a \cdot b}{2(a + b)\, f_s}$$

where:

p = pressure applied to the bulkhead

a = width of bulkhead

b = height of bulkhead

l = length of plug

f_s = safe average shear stress

The two bulkheads would be placed in approximately 12 ft x 12 ft drifts. By using the pressure head established in the previous section, the relationship can now be written as:

$$l = \frac{1400 \times (0.434)\ (12 \times 12)\ (12 \times 12)}{2\ (12 + 12)\ (12)\ f_s}$$

$$= \frac{21874}{f_s} \text{ units in } \frac{\text{lb/in}}{\text{lb/in}^2}$$

F_s, the safe average shear stress can be estimated from Section 2.3.3.2, Material Properties. In this section, it was shown that, due to the roughness and stepped nature of the tunnel walls, any shearing along the bulkhead/tunnel interface will result in either dilation over the surface or shear through the rock mass.

The shear strength of the rock mass can be estimated from the curves shown in Figure 13. For design purposes, it has been assumed that there is little or no normal load acting across the bulkhead/rock interface. The design shear stress used is, therefore, the intercept on the shear stress axis. By using the value at $\sigma_n = 0$ (i.e. assuming no normal load across the interface; a conservative assumption), the estimated length of the bulkheads is:

granodiorite = 10 ft

hornfels schist = 14 ft

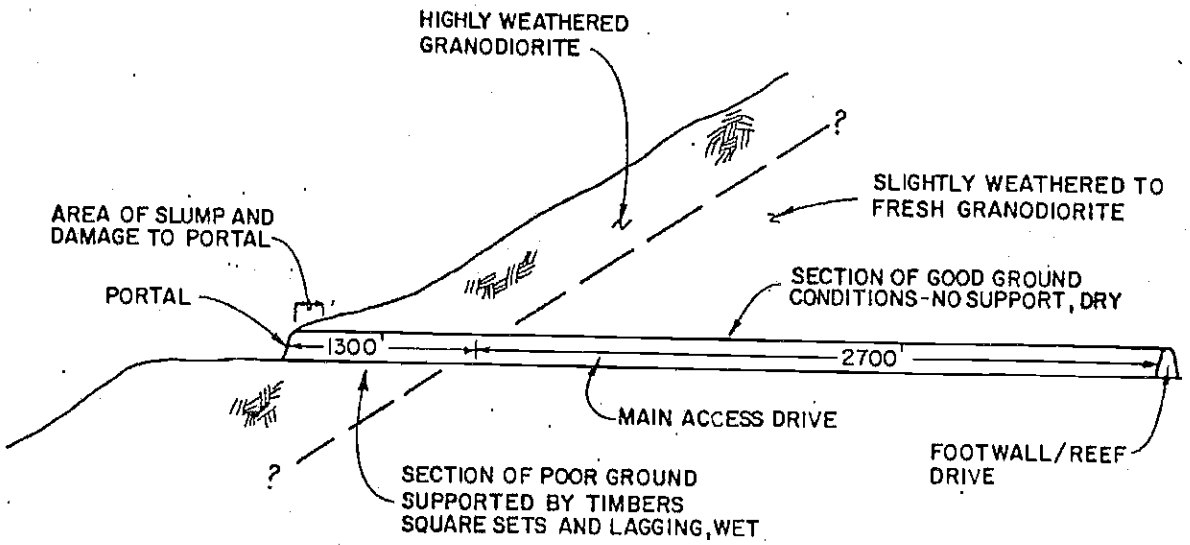
If dilation occurs, shearing has to occur within the plug. Therefore, a similar exercise was carried out by using an appropriate f_s value for concrete. The strength of concrete was taken as 2000 psi at 28 days. Some 10 ft of bulkhead length was found to be sufficient to preclude shear failure through the concrete. Therefore, to ensure the stability of the bulkhead, minimum bulkhead lengths of 10 ft in fresh granodiorite rocks and 14 ft in hornfels schists are required.

Practical experience gained in high pressure bulkheads used in South African gold mines has indicated that it is generally more difficult to stop leakage around a bulkhead than to make it strong enough to resist thrust. Recommendations put forward by Cummins and Given (1973) indicate that the pressure gradients along the plug should be moderate and experience has proven that gradients of up to 40 psi per ft are effective (though in a number of cases, gradients of up to 400 psi per ft have been achieved). By using the design pressure head of 1,400 ft (608 psi), the bulkhead length necessary to obtain the required pressure gradient is 15 ft. This value is in excess of the length necessary for bulkhead stability. It is, therefore, recommended that both the main bulkhead and the Piute bulkhead be 15-ft long.

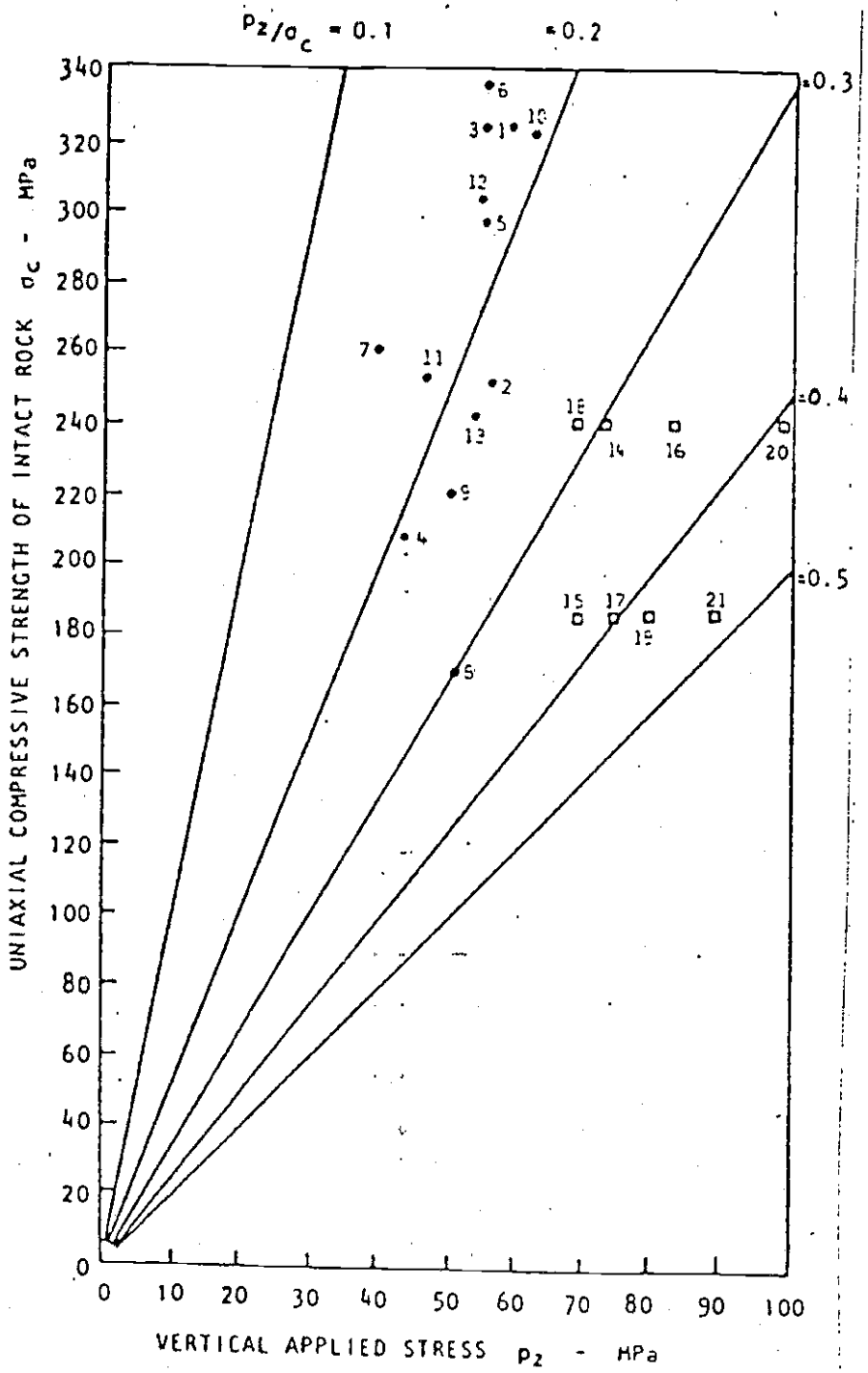
2.4 Results

Observations on surface and underground at the Walker Mine provided substantial confirmation of hydrological and geotechnical data derived from previous reports, relevant literature and the SRK team's past experience. Confidence in the available and derived data was sufficient to permit design and specification of the concrete bulkheads considered as seals in the 700 Level tunnel between the Piute and 712 Sections, and in the Access Adit close to its intersection of the South Orebody.

Observation of the condition and dimensions of the 700 Level Adit provided sufficient information to permit fairly accurate (-10% to +25%) estimates of construction costs for the proposed main (Adit) bulkhead seal. The 700 level Haulage had not been cleaned beyond the South Orebody at the time of the site visits, but the work required to clear it sufficiently to permit access for construction of an internal plug between the 712 and Piute Sections was estimated on the basis of visual inspection on June 19, 1985.



PROJECT NO. 06901	PREPARED BY: STEFFEN ROBERTSON & KIRSTEN	FIGURE 8
DATE 3/85	Consulting Engineers	MAIN PORTAL SECTION
REVISION NO. 0		



p_z/σ_c = 0.1 - stable unsupported tunnel.

p_z/σ_c = 0.2 - minor sidewall spalling.

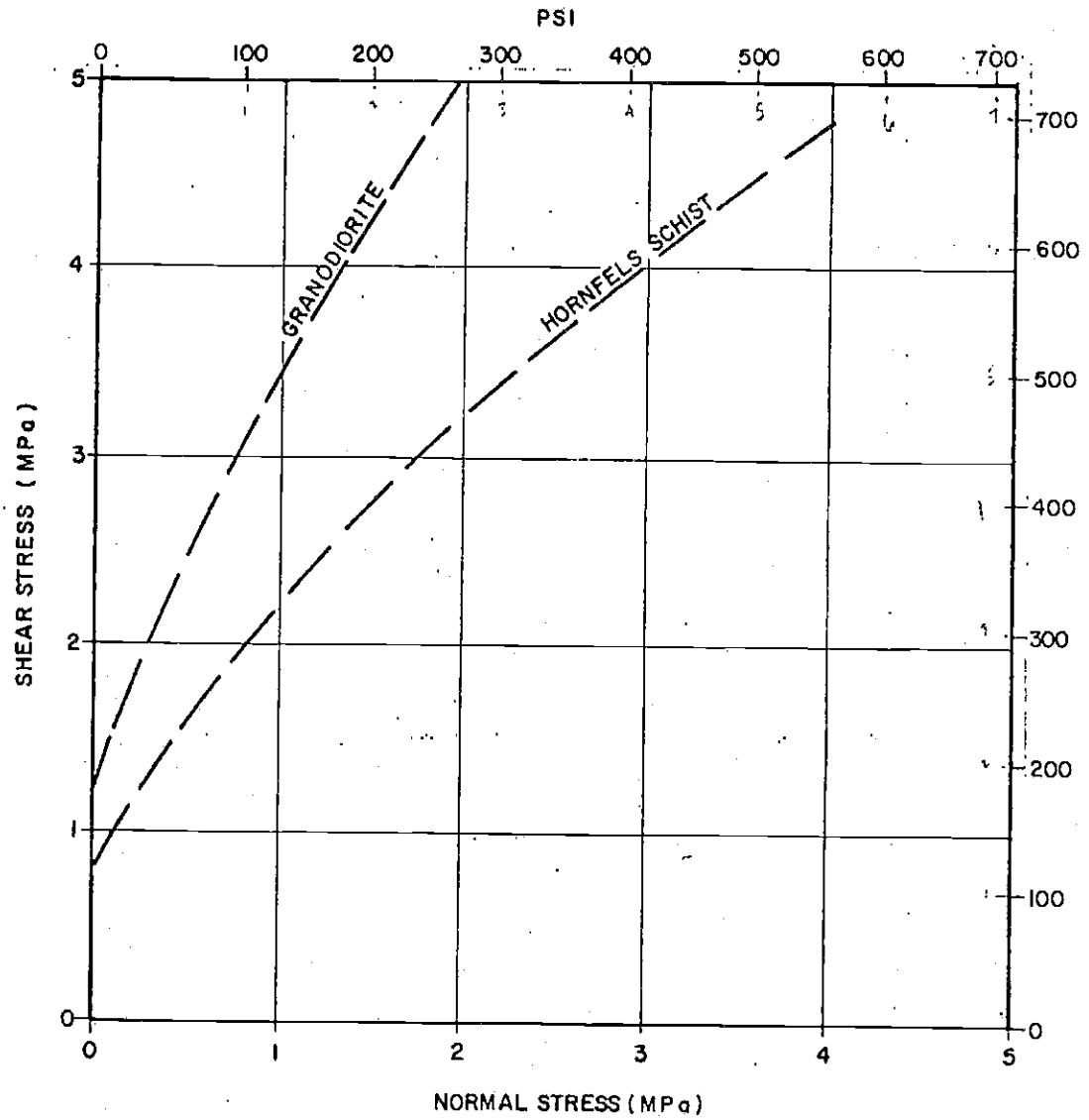
p_z/σ_c = 0.3 - severe sidewall spalling.

p_z/σ_c = 0.4 - heavy support required.

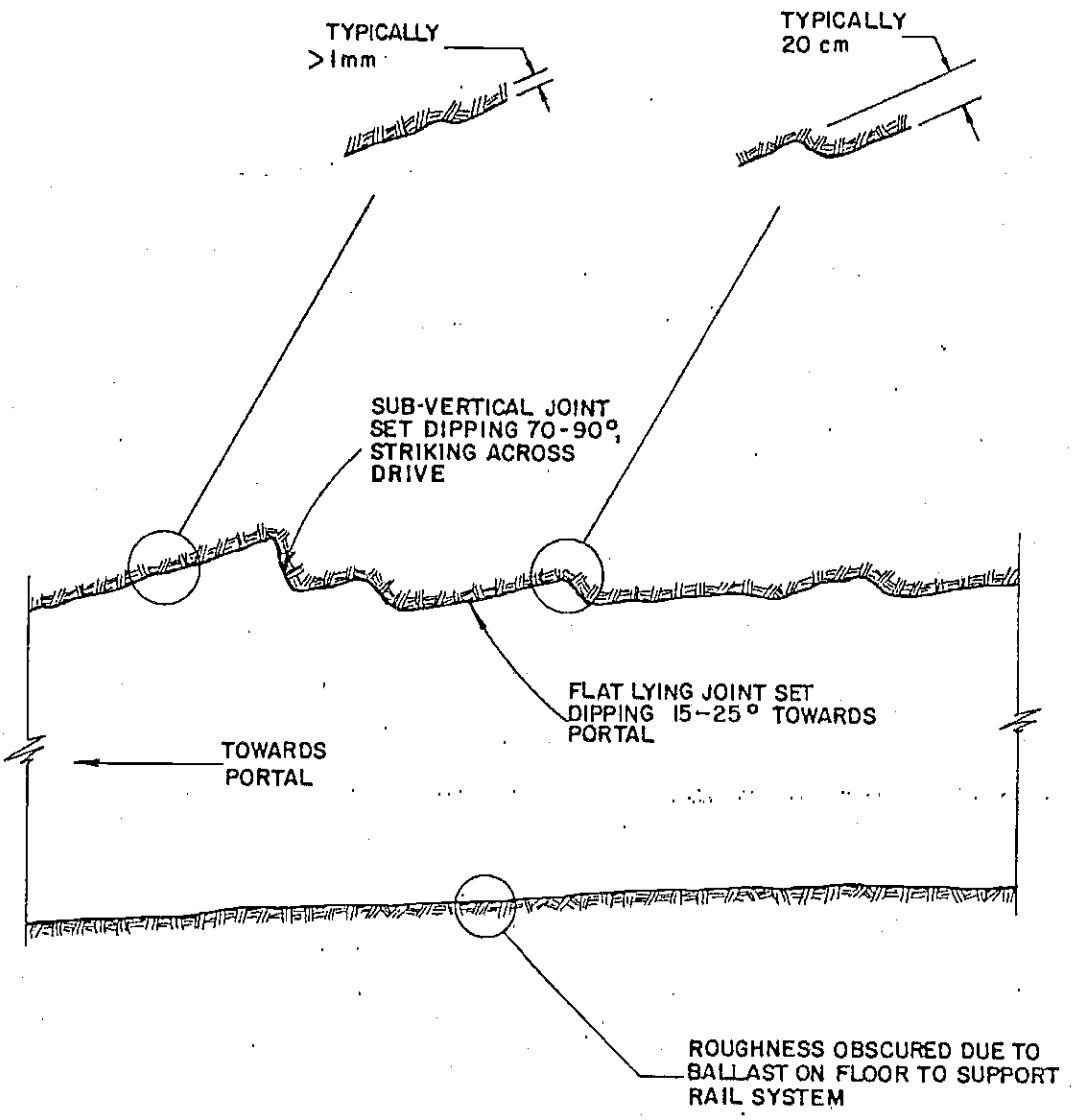
p_z/σ_c > 0.5 - possible rockburst conditions.

NOTE: 1 MPa = 145 PSI

PROJECT NO. 06901	PREPARED BY: STEFFEN ROBERTSON & KIRSTEN Consulting Engineers	FIGURE 11
DATE 3/85		COMPRESSIVE STRENGTH vs. APPLIED STRESS FOR SQUARE TUNNELS
REVISION NO. 0		

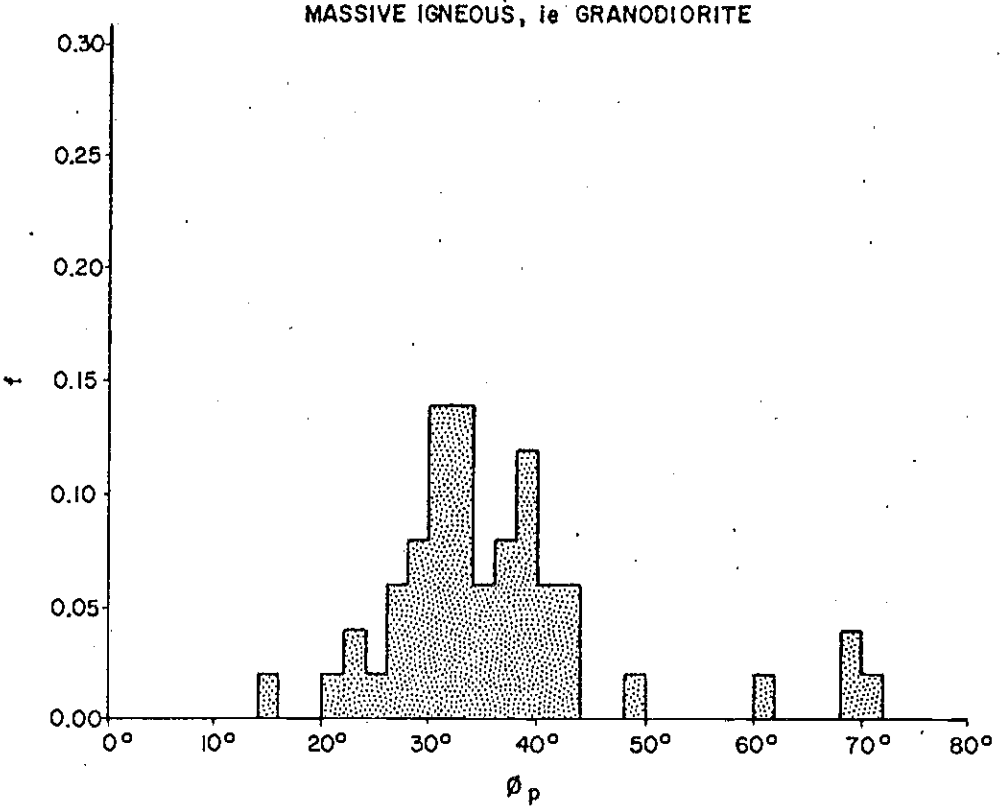


PROJECT NO. 06901	PREPARED BY: STEFFEN ROBERTSON & KIRSTEN	FIGURE 13
DATE 3/85	Consulting Engineers	ESTIMATED SHEAR STRENGTH OF ROCK MASS
REVISION NO. 0		

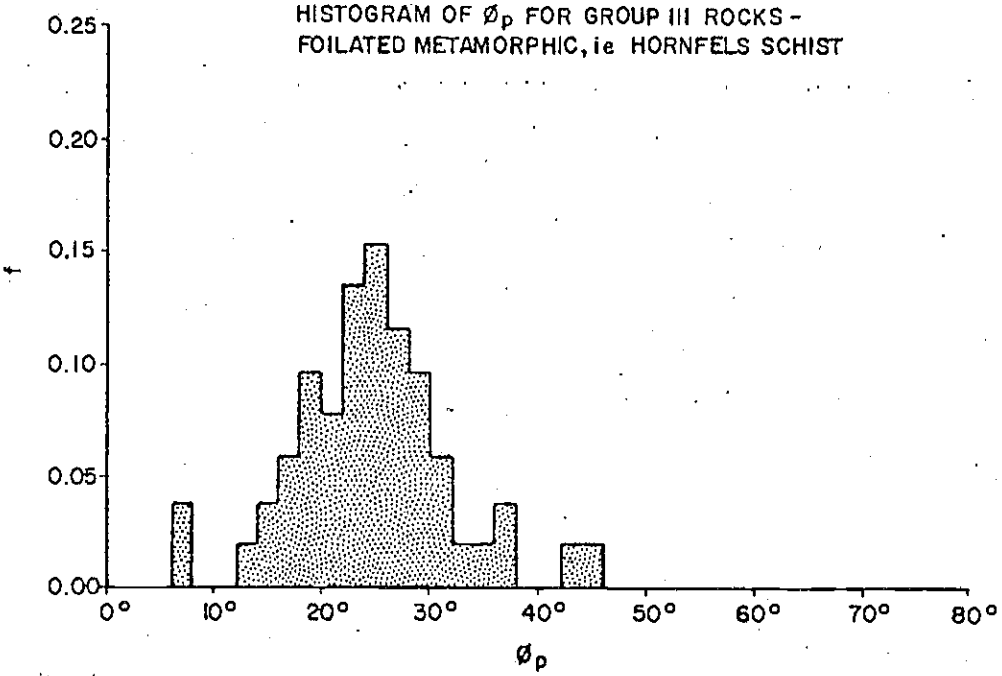


PROJECT NO. 06901	PREPARED BY: STEFFEN ROBERTSON & KIRSTEN	FIGURE 14
DATE 3/85	Consulting Engineers	VERTICAL SECTION THROUGH MAIN ACCESS DRIFT SHOWING ASPERITIES
REVISION NO. 0		

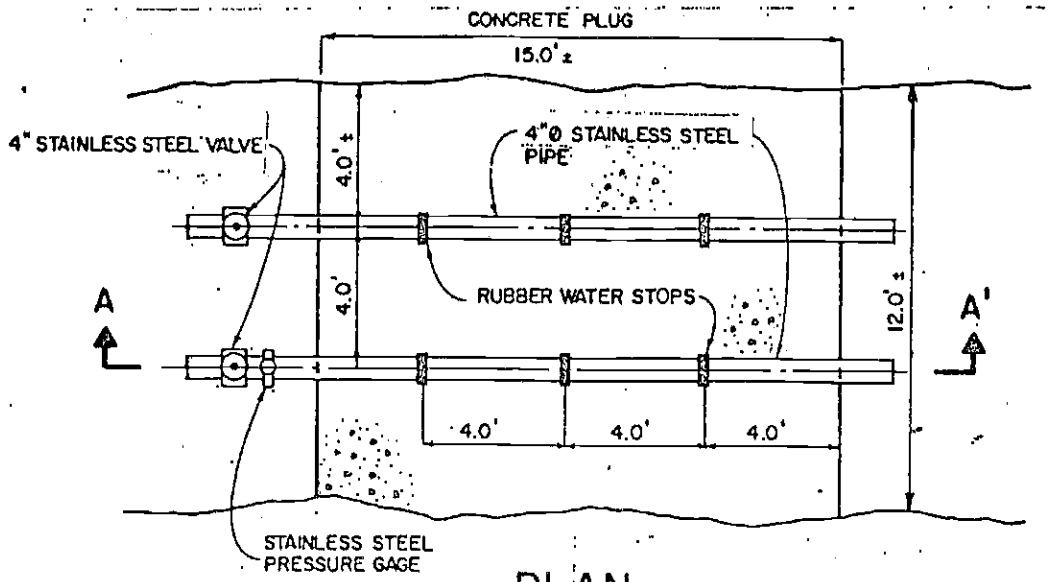
HISTOGRAM OF ϕ_p FOR GROUP IV ROCKS -
MASSIVE IGNEOUS, ie GRANODIORITE



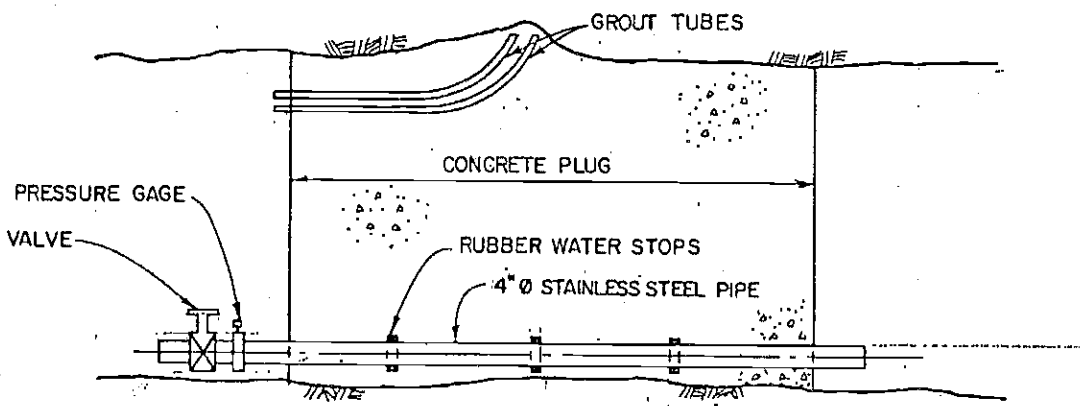
HISTOGRAM OF ϕ_p FOR GROUP III ROCKS -
FOILATED METAMORPHIC, ie HORNFELS SCHIST



PROJECT NO. 06901	PREPARED BY: STEFFEN ROBERTSON & KIRSTEN	FIGURE 15
DATE 3/85	Consulting Engineers	DISTRIBUTION OF PEAK FRICTIONAL STRENGTH
REVISION NO. 0		



PLAN



SECTION A-A'

PROJECT NO. 06901	PREPARED BY: STEFFEN ROBERTSON & KIRSTEN Consulting Engineers	FIGURE 17
DATE 3/85		TYPICAL DRAIN PIPE DETAILS
REVISION NO. 0		

3.0 PLUG SPECIFICATION AND CONSTRUCTION CONSIOERATIONS

3.1 Plug Specifications

The sections below summarize materials to be used in the construction of the plug. Discussions on the proposed mix design are presented in Appendix I. Technical specifications for bid purposes are presented in the attached addendum to this report.

3.1.1 Location and Dimensions

Main Adit Plug at approximately 12,950 N, 11,420 E
Plug Length = 15 ft
Piute Plug at approximately 18,600 N, 10,000 E
Plug Length = 15 ft

3.1.2 Site Preparation

The plug site shall be cleaned and prepared to ensure an adequate bond between the rock and concrete surfaces. Methods of site preparation shall be proposed by the contractor and approved by the engineer prior to construction. The cleaned and prepared surface shall be approved by the engineer prior to placement of concrete.

Access to the sites may require additional site preparations for transporting construction materials. This shall be done on an as-needed basis. Such site work need not be to the extent of maintaining permanent access, but shall be such that safe working conditions are established.

3.1.3 Formwork

The formwork for the bulkheads shall be constructed of good quality material and in such a manner as to provide a good seal for containment of the concrete and

any grout that may be injected. The design of the formwork shall be sufficient to withstand the fluid pressure of the concrete and any increased pressures due to grouting or concrete placement. The formwork will be subject to the engineer's approval prior to placement of the concrete.

3.1.4 Concrete

The concrete used to form the plugs shall be a 3,000 psi, 28-day strength mix. The mix shall use fine aggregate of the gradation and durability as specified in ASTM C 33-82 and C 117-80. The cement shall be sulfate-resistant Portland cement. Slump shall be 4 to 7 inches (see Appendix 1). Water used in the mix shall be of good quality so as not to degrade the concrete. Mine and mine drainage waters are not acceptable for use in the concrete mix. The mix design and admixtures are presented in Section 4.4 of the Addendum.

Concrete delivery and placement shall be according to ASTM and ACI standards. Under no circumstances shall delivery scheduling or placement methods be such that a cold joint shall be formed in the plug. If necessary, curing retards may be included in the mix design.

3.1.5 Piping and Valves

Two drainage pipes through the main adit plug shall each be 4-inch diameter schedule 40 stainless steel pipe. The valve(s) shall be of a corrosion resistant metal as specified in Section 4.5 of the Addendum or equivalent. Placement of the pipe shall be of good standard practice. Minimum clearance around the pipe shall be 12 inches.

A stainless steel screen shall be placed around the upstream end of the pipes. The screen shall have 3/4-inch opening. Placement and anchoring shall be determined as part of construction.

Piping for grout tubes shall consist of flexible nylon, PVC, or HDPE tubing.

3.1.6 Grouting

Grouting shall be done in areas of overhangs or protrusions to provide a tight seal between the rock and concrete. Grout tubes shall be placed such that air entrapment does not occur in the voids. A return line shall be installed at each location to provide a means of determining total void filling with grout. Placement of the grout lines is subject to the approval of the engineer.

Grouting may not be done within the first seven days after concrete emplacement. Grout pressures shall not exceed 1,500 psi. The grout shall be a neat mix of sulfate-resistant Portland cement. Chemical grouts may be used upon approval by the engineer.

3.1.7 Monitoring

Monitoring pressure head behind the in place plug in the main adit shall be done by means of a direct-reading pressure gauge inserted in one of the drainage pipes. In the event that an internal plug is constructed, pressure head in the Piute Section will be measured by an open standpipe piezometer installed from the surface or by a piezometer or vibrating wire piezometer installed during construction. Provisions for installation shall be included at the time of construction.

3.1.8 Operation

The discharge valves shall be locked at all times, except during operation or testing by authorized personnel. Upon completion of operation or testing, the operator shall check to see that the valves are locked prior to leaving the site. Operation and testing shall be done only by authorized personnel of the California Regional Water Quality Control Board Central Valley Region.

Prior to opening a valve, all personnel and equipment shall be clear of the line of discharge. This a high pressure system and will discharge at a high velocity and pressure. The valves shall be opened and closed at a slow and constant rate.

A warning sign shall be posted at the valves listing the above procedures.

3.2 Discussion of Alternatives

Effective permanent abatement of the flow of AMD from the Walker Mine could require up to four stages of control measures, each stage increasing the degree of confidence in the effectiveness of the solutions to the problem. These stages and comments on the rationale behind their conception are:

1. Installation of a concrete bulkhead plug in the 700 Level Main Access Adit.

   This measure will effect an immediate halt to the contaminating emissions from the mine, but, in the absence of any additional precautions, the halt might be only temporary. If water in the workings was able and permitted to rise until it could overflow through the

Piute shaft, the problem might simply be transferred from Dolly Creek to the Middle Fork of Ward Creek after a hiatus of up to ten years. The means by which such a transfer can be avoided are detailed in Section 5.2.

The optimum site for this plug is in the Access Adit, as close to the mine workings as possible. This site is indicated in Figures 3 and 4, and detailed in Figure 16. An alternate, less favorable site has been identified closer to the portal, about 250 ft from the end of the timbered section of the adit. This site could be used to replace the original bulkhead should that ever become necessary.

2. Establishment of diversion ditches above subsidence slumps over the Central and Piute Orebodies.

Evidence derived from examination of seasonal flow records for the 700 Level Adit suggest that a large part of the outflow of AMD consists of surface runoff, principally spring snowmelt which enters the mine workings through subsidence slumps. Adequate control of this inflow, combined with stoppage of the outflow by means of a plug in the 700 Level Adit, could allow the inflow of groundwater to reach equilibrium at a level below the next point of egress above the 700 Level, i.e. the Piute Shaft Landing Tunnel.

Much of the excavation necessary to divert flows in the upper catchment of the South and Middle Forks of Ward Creek around subsidence slumps has been done. A conservative estimate of the cost of additional upgrading of the diversion system has been based on observations on site during June, 1985. Unlike the concrete bulkhead plug, the diversion ditch system will require periodic inspection and maintenance, which might be timed to

coincide with availability of personnel and equipment near the site.

3. Isolation of the Piute Section of the mine workings.

Isolation could be achieved by construction of a concrete bulkhead plug in the 700 Level Haulage between the Piute and 712 Sections. The site of this plug is indicated in Figures 3 and 4. Its effect would be to compartmentalize the mine workings and permit groundwater to reach equilibrium at different levels in two separate sections of the mine workings, probably below the level at which water would overflow to surface from the flooded workings.

Construction of an internal (Piute) plug would be undertaken through the 700 Level Adit and Haulage. This would require rehabilitation of the haulage for a distance of about 6,000 feet to the extent that the rail track was clear and sound enough to permit passage of a locomotive and flat cars or concrete mixer cars for about 20 trips during plug construction. The alternative of gaining access to the internal plug site through the Piute Shaft has been rejected on the basis of evident unsafe conditions close to the collar, and Mr. Donato's reported observation of the severe deterioration and collapse of timbering in the shaft. Rehabilitation would be both slower and more expensive than cleaning out the 700 Level Haulage. Remote placement of a grouted plug through surface boreholes has been rejected because an effective seal could not be assured without thorough preparation of the rock surface at the plug site, and this would require almost as much rehabilitation work in the 700 Level Haulage as would be needed for conventional construction.

There is an indication on one sketch, prepared to indicate ventilation flows during an underground fire in the Walker Mine in 1940, that there might be a second drift on the 700 Level, parallel to the Main Haulage connecting the 712 and Piute Sections. Underground inspection does not support this possibility.

The very high cost of isolating the Piute Section is considered excessive in view of the low risk that it might be required, and the availability of other, lower-cost alternatives (see Section 2.2).

4. Construction of a seal in the Old Sawmill Adit.

This adit is the highest artificial outlet for water from the mine workings below the large openings provided by subsidence slumps over the Central Orebody. As such, it is the highest point at which a seal could be attempted in the event that groundwater did not reach equilibrium level at a lower elevation following isolation of the Piute Section. It is considered very unlikely that groundwater inflow could cause an overflow from the flooded mine workings through the slumps. Only under exceptional circumstances would heavy surface inflows raise the water level in the flooded workings to overflow level, and then only brief flows of minimally contaminated water could be expected to enter Ward Creek.

The Old Sawmill Adit Portal appears to have collapsed naturally and would probably permit passage of water overflowing from the mine workings. Insufficient information is available to design or estimate accurately the cost of a seal in this adit should it be needed some twenty years or so after construction of the 700 Level plugs.

3.3 Construction Consideration and Cost Estimate

3.3.1 Construction Considerations

It is generally more difficult to stop leakage past a bulkhead than it is to make the bulkhead strong enough to resist the total thrust due to hydrostatic pressure. Even if an impermeable plug or seal is effectively placed within the tunnel opening, the permeability of the contact between the plug material and the surrounding rock can be a weak link in the total performance of the plug. It has been noted in South Africa that leakage is likely along the floor and the roof, even at low pressure, where mud and air pockets commonly weaken the concrete-rock contact. This type of behavior has likewise been observed in tunnel plug construction at the Nevada Test Site. Construction practices have been developed to circumvent such undesirable behavior.

Several things can be done to reduce the likelihood of leakage along the plug perimeter. The first step in obtaining a good contact between the plug material and the surrounding rock is to have the rock thoroughly cleaned after final excavation and before placement of the plug material. This involves not only cleaning of the rock surface, but also spraying the rock surface with a concrete adhesive or a sodium silicate grout material and then spraying a fine-grained angular sand upon this adhesive material. It has been found that such a pre-treatment of the rock surface enhances and promotes the final bond between the concrete plug and the surrounding rock.

During actual placement of the concrete, bulkheads must be constructed at the two ends of the plug. These bulkheads must be strong enough to withstand the pressure

of the fluid concrete. Provisions must be made prior to concrete placement to allow air escape at the upper portion of the zone to be filled with concrete. It has been found useful, when topping off the concrete plug, to drill two six-inch diameter holes from outside of the bulkhead to the uppermost point of the void to be filled with concrete. Small pipes are then grouted into these two holes. As a topoff mechanism, the uppermost portion of the concrete is grouted by injection of grout in one of the two topoff pipes until grout flows from the second topoff pipe. At this point, the ejection pipe is shut off with a valve, the pressure on the injection pipe is increased to some predetermined value and then it is shut off. It has been found in tunnel plug construction practice, that placement of concrete at a minimum slump of 7½ inches increases the workability and flow characteristics of the fluid concrete within the tunnel plug forms. Even so, additional provisions must be made to promote the complete flow of concrete against both the tunnel form and the rock surface, to eliminate the possibility of honeycombing and void development at the concrete-rock interface.

It has been found in both South Africa and Nevada Test Site practices that leakages around tunnel plugs can be sealed acceptably by at least one stage if not multiple stages of grouting. The critical points to grout are at the top of the structure where topoff procedures may possibly not have completely filled the void, and the lower portion of the structure where sediment may have been allowed to collect. In grouting these areas, grout holes approximately two feet apart and intersecting the rock-concrete interface are suggested. This pressure grouting has been accomplished at pressure levels of a few hundred psi in South Africa.

It is extremely important that horizontal cold joints in the concrete plug be avoided by all means. Such cold joints can be crucial to the permeability of the concrete plug, and can make the entire plug ineffective if permeability through the plug is allowed. It has also been suggested that standard commercial grade expansive agent additives be employed to promote expansion of the concrete during curing, and thus to help seal any voids that may have a tendency to develop. Placement of plugs up to 30 ft long at the Nevada Test Site has not experienced any problems in thermal cracking and associated crack permeability. It should be noted however, that in these plugs concrete is placed at temperatures no higher than 55^{o}F. This procedure ensures that all hydration takes place within the forms, and that excessive temperatures do not develop.

Due to the chemistry of the mine waters that the bulkheads are intended to confine, sulfate resistant cement should be used in construction. In addition, it is recommended that a 3000 psi, 28-day strength concrete be used.

3.3.2 Cost Estimates

The level of accuracy of cost estimates is approximately -20%, +30%.

A. MAIN ACCESS ADIT PLUG

Activity Description	Labor	Equipment	Materials	Sub-Contract	Total
1. Mobilization	3,900	1,800	-	6,200	11,900
2. Site Service	5,300	8,700	-	-	14,000
3. Site Preparation	14,400	6,600	-	-	21,000
4. Plug Construction	15,700	7,300	36,600	-	59,600
5. Demobilization	6,600	3,000	-	6,100	15,700
6. Diversion Works	-	-	7,500	5,400	12,900
7. Management/Q-C	14,300	-	-	-	14,300
TOTAL	60,200	27,400	44,100	17,700	149,400
Plus 10% Contingency					14,900
Estimated Construction Cost					$164,300

For budgeting purposes:

- Total Estimated Construction Cost = $165,000
- Duration of Construction Activities = 35 days or 6 weeks

Activities itemized in the Cost Estimate include:

1. Transport of personnel and equipment from source to site, and set up.
2. Installation or extension of compressed air and water lines, ventilation fan and ducting, and rail track on surface, as well as generator, compressor and pumps.
3. Construction of cofferdam and bypass pipe, lifting track at plug site, excavation of invert, and barring/hammering/washing entire plug site to sound, clean rock. Best quote for concrete batched at portal is $180.00 per cu yd for 100 cu yd required.
4. Construction of bulkhead formwork, installation of reinforcing, pipes, valves and instrumentation, and grouting.
5. Stripping pipelines (fan and ducting left in place) and removal of equipment and personnel.
6. Five days of dozer work with supporting hand labor, and approximately 300 cu yd riprap.
7. Site supervision, inspection and certification by professional engineers.

B. PRELIMINARY AND ONGOING COSTS

1. Water Balance Survey:

Engineering time	$ 4,300
Equipment and materials	1,000
Travel and subsistence	1,200
Total estimated cost	$ 6,500

2. Discharge Treatment Plant Specifications:

Engineering time	$ 6,500

3. Routine Maintenance:

Inspection and gauge reading	-	(Board staff)
Equipment	$ 2,000	
Labor	500	
Materials (riprap, etc)	1,000	
Total estimated cost	$ 3,500/year	

C. ADDITIONAL COST FOR INTERNAL/PIUTE PLUG
(Assumed constructed immediately prior to Main Adit Plug)

Rehabilitation at 700' Level Haulage	$130,000
Concrete at Portal	17,000
Plug construction	60,000
Contingency @10%	20,000
Total estimated cost	$227,000

D. COST OF PLUGS IN MINOR ADITS
(Assumed constructed immediately after the Main Adit Plug)

1. Piute Landing Tunnel Plug:

Site Access and Cleanup	$ 12,000*
Plug construction	11,000
Estimated cost of plug	$ 23,000

2. Old Sawmill Adit Plug:

Site Access and Cleanup	$ 9,000*
Plug Construction	11,000
Estimated cost of plug	$ 20,000

*Tentative estimates as portals are caved.

E. POSSIBLE FUTURE TREATMENT PLANT.
(Subject to B.2)

1. Construction of a facility for short-term treatment
(estimate) $250,000

2. Operation of AMD treatment facility, allowing for materials and minimal supervisions $ 5,000/year

4.0 MONITORING

Three factors relating to the effectiveness of abatement procedures at the Walker Mine will have to be monitored:

- The water level in the flooded mine workings and, hence, the rate at which the workings fill up following installation of a seal;
- The development of surface springs or seepage indicating escape of mine waters; and
- Precipitation, in order to determine a relationship between rainfall, snowmelt, rate of filling of mine workings, and possible surface seepage.

4.1 Water Level in Mine Workings

Continuous pressure head readings will be taken at the main adit plug to monitor water level. This will be accomplished by the remote continuous recording station specified in Section 4.7 of Addendum 1 to this report. Data should be collected from the recording as near to quarterly as possible. As the adit will be a dead-end after installation of the plug, the remote reading and recording instruments will be set inside the portal immediately inside the steel door so observers will not need to enter the adit. The instrument station will be set sufficiently far back from the door to avoid adverse effect on the power supply due to low temperatures during the winter months.

4.2 Surface Springs and Seepage

During the construction period, a survey of seeps, springs, and drainage channels (wet or dry) will be made around the area of the mine. Following completion of the main plug, these areas should be inspected visually on a quarterly basis to see that no new seeps are developed as the mine fills. If additional seepage is noted at

any time, water quality samples should be taken to assess the impact of the mine filling on that water source. In addition, quarterly observations of the mine adit to check leakage from around the plug should also be made.

4.3 Precipitation and Temperature

A rain gauge and temperature recorder should be installed between Middle and South Forks of Ward Creek. Data from these recorders should be collected during the scheduled site visits. This data would then be used to compare the mine filling with precipitation/snow to the extent to which mine filling can be related to direct infiltration. It can also be used to determine the effectiveness of the installed diversion system and whether or not modifications or remedial work are warranted.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Observations

5.1.1 Achievement of Primary Objective

The installation of a concrete bulkhead seal in the main 700 Level Access Adit to the Walker Mine at an elevation of approximately 6,200 ft is technically feasible, and would be effective in sealing off the main source of copper contamination to the Dolly and Little Grizzly Creeks, assuming there are no other hitherto unidentified outlets below the level of the Piute Shaft Landing Tunnel (approximately 6,585 ft elevation).

5.1.2 Potential Adverse Effects

Under present conditions of incomplete control of spring runoff entering subsidence sinkholes over the Central and Piute Orebody workings, there is a remote possibility that the back-up of water caused by a seal in the main Access Adit at the 700 Level could rise to the level of the Piute Shaft Landing Tunnel within 10 years. A reduced flow of AMD, of a quality similar to that presently flowing from the 700 Level Access Adit, would then discharge through the Piute Shaft into the Middle Fork of Ward Creek. It is very unlikely that the average volume discharged would be more than 10 gpm.

5.1.3 Mitigation of Adverse Effects

Rehabilitation and regular maintenance of a system of diversion ditches, designed to keep surface runoff in the catchments of the Middle and South Forks of Ward

Creek out of the subsidence slumps, and consequently out of the mine workings, would substantially increase the time it would take to flood the old workings up to the level at which discharge could occur. This remedial action could be expected also to reduce the probability of any flow out of the Piute Shaft to insignificant levels. See Section 5.2.(5) for further possible precautions.

5.1.4 Maximum Security Option

In addition to installation of a primary seal in the main 700 Level Access Adit and establishing effective diversion ditches around slumps, isolation of the Piute Section by installing a concrete bulkhead in the 700 Level haulage (the only connection between the Piute Section and the remainder of the mine to the south) could be expected to reduce the volume of any possible outflow of AMD through the Piute Shaft by about 90%.

The mine workings in the Piute Section would flood to the level of the natural water table. Only snowmelt or rain in the immediate catchment of the Piute subsidence slumps would enter the workings and, if the water table was close to overflow level, run out of the Piute Shaft Landing Tunnel at approximately 6,580 ft elevation. Minimal mixing with and contamination by the stagnant water in the flooded Piute workings would occur.

The South, Central, North and 712 sections of the mine would also flood to the level of the natural water table in each section. If this level should be above the Old Sawmill Adit (6,770 ft elevation at its intersection with the mine workings), it might be necessary to clean out this adit portal and install a bulkhead capable of withstanding the maximum head of 110 ft of water that would be developed if the workings were to fill with

water to the level of the subsidence slumps above the Central Section workings. As in the case of the Piute Section described above, only local snowmelt or rain runoff could be expected to enter the upper part of the workings and possibly overflow, without significant contamination by the stagnant water in the mine workings.

The time required for flooding in the mine workings to reach equilibrium in this worst-case scenario is estimated to be in excess of 15 to 20 years after two bulkhead seals had been installed.

5.1.5 Critical Appraisal of Maximum Security Option

Rehabilitation of the 700 Level haulage to gain access to the site of a possible internal plug would be more expensive and time-consuming than expected prior to visual inspection. Costs have been estimated on the basis of sluicing sludge with a jet of water pumped from flooded lower workings. Suspended solids would settle in the large sump of the Central and South Orebody workings below the 700 Level. Any residual turbidity emerging from the adit would be settled in the existing ponds below the portal.

Items leading to higher costs included:

a) Sludge cover on the floor of the haulage, which was generally deeper than expected, up to 18 inches in places.

b) The collapse of timber stope draw point chutes which has caused significant blockages with 30 to 50 tons of rock and timber lying in the haulage at four points, which would require tedious hand labor for clearing.

c) Deterioration of timber sets, which has exposed potentially dangerous bad ground at two locations and would require re-timbering to permit safe passage of personnel and equipment.

d) Clearing of timber and other materials buried in the sludge, which would require considerable manual labor.

e) Track in sections of the haulage that pass over shafts or rock-passes, which is supported on timber that might not now support the weight of a locomotive and concrete cars without reinforcement.

f) Rails that showed signs of corrosion and were absent over several hundred feet through the Central Section.

g) 5 x 10 ton Bilby-type mine cars parked in the haulage in the North Orebody Section, which would have to be removed. The condition of their wheel bearings could not be determined.

h) Collapse of the northern-most stope drawpoint chute in the 712 Orebody Section (Chute No. 208), which has almost blocked the haulage with 150 to 200 tons of broken rock and timber. Stulls and platforms loaded with broken rock could be seen in the open stope above the drawpoint, making conditions hazardous for removal of the blockage.

i) It was possible to crawl over the blockage at drawpoint No. 208 and continue northward on the 700 Level haulage. Up to 3'-6" of a thick, opaque, azure blue colloidal suspension was backed up behind the blockage. The volume held back was estimated at 90,000 to 100,000 gallons.

The investigating team did not proceed more than 300 ft beyond the No. 208 drawpoint, but selected and measured tunnel dimensions at a suitable site for a plug about 150-ft north of No. 208 drawpoint. The time required for taking measurements, the 39° F "water", and the need to return to the portal within the predicted 5½ to 6 hours precluded further progress into the Piute Section.

Accurate measurement of water flow in the 700 Level haulage was not possible. A portable direct-reading flowmeter was used to determine flow velocity at points where the cross-sectional area of the channel could be estimated reasonably. From these measurements it was inferred that, of about 560 gpm flowing into the workings above the 700 Level, less than 300 gpm were being discharged through the main 700 Level Adit. The balance is presumed to return as recharge to the groundwater system.

Observation of the rock mass quality between the 712 and Piute Orebodies and calculation of the permeability of the pillar between the stoped out areas in these orebodies indicate that, although a plug in the 700 Level haulage between the 712 and Piute Sections would initially halt a potential 10 gpm outflow through the Piute Shaft, a flow of up to 1 gpm could be established through the pillar after a few years.

5.2 Conclusions

1. Installation of a plug in the 700 Level Adit, some 2,700 ft from the portal, would stop the discharge of Acid Mine Drainage (AMD) from the Walker Mine.

2. Water backed up in the mine workings would probably reach equilibrium below the 6,500 ft elevation, as the increasing head could be expected to increase the rate of recharge of the groundwater system.

3. Recharge of the groundwater system would be dispersed over the full strike length of the workings, maximizing the attenuation effect on AMD re-entering the surrounding rock mass. No seepage has been located which can be identified as a point at which water recharged from the mine workings eventually reaches surface.

4. The cost of rehabilitation of the 700 Level haulage and installing an internal plug between the 712 and Piute Section is considered excessive for insurance against the low risk of AMD emission through the Piute Shaft (see Section 3.2 (3)).

5. A more cost-effective back-up to a single plug in the 700 Level Adit would be:

   a) Rehabilitation and maintenance of diversion channels around surface sinkholes, to minimize inflow of runoff from rain or snowmelt.

   b) Regular monitoring of water level in the mine workings, by means of pressure gauges at the plug with remote-reading facilities at the portal.

   c) The facility to open valves on the 4-inch diameter pipes through the plug, to relieve any excessive build up of water in the workings. Two 4-inch diameter pipes, 30 ft long, could pass over 2,400 gpm under 400 ft head, equivalent to the peak expected instantaneous rate of inflow.

d) Adequate notice of impending overflow of water accumulating in the mine, through the Piute Shaft, would be available to permit construction of a small treatment plant at the portal of the 700 Level Adit.

By these means, the small and short-duration release of any possible excess inflow into the mine could be neutralized without risk of contaminating an unaffected catchment (Ward Creek).

e) The cost of such a treatment facility (should it ever be needed) would be less than the total cost of the internal plug and would be deferred for probably not less than ten years (see Section 3.3).

f) This proposal provides for a means to direct any possible emission of AMD from the Walker Mine, under controllable conditions, through a neutralizing facility, provided the build up of water pressure behind a plug did not divert excessive quantities of AMD through natural outlet(s), which could deliver it to surface without adequate natural attenuation of its acid and metal content.

6. Installation of a plug in the main adit of the Walker Mine need not necessarily sterilize the mine for future exploitation. Should it become feasible at some future time to mine the known mineral resource, the valves on pipes through the plug could be opened and the mine water drained in less time than it took to enter the workings. The workings could be drained at a controlled rate during the period required to plan mining operations and secure the relevant permits. The AMD could be treated at a rate of, say, 500 to 800 gpm and discharged to surface waters. It is not possible to comment on or endorse the economic feasibility of such a course of action without knowledge of the potential ore reserves.

5.3 Recommendations

Immediately:

1. Undertake minor rehabilitation of diversion channels around Central Orebody sinkholes;

2. Undertake minor rehabilitation of diversion channels around the southern sinkholes above the Piute Orebody and establish a diversion channel around the northern end; and

3. Conduct a flow and water quality balance study on water movements from the mine workings above 700 Level, along 700 Level Haulage and Adit, entering and leaving the workings below 700 Level, and in the Dolly Creek from the mine portal to its confluence with Little Grizzly Creek.

Then, subject to the findings of 3:

4. Install a single plug in the 700 Level Adit approximately 2,700 ft from the portal;

5. Monitor water levels in the mine workings by means of gauges reading pressure behind the plug; and

6. Prepare a contingency plan for future construction and operation of a small treatment plant at the 700 Level Adit Portal, to neutralize AMD that might have to be discharged periodically (several years after installation of the plug) to relieve any excessive build up of water that might threaten to overflow out of the Piute Shaft.

Note: Implementation of Item 3 would require:

a. Channelization of drains and construction of simple flow measurement stations at up to six points in the 700 Level Haulage and Adit;

b. Establishment of up to five flow measurement stations between the 700 Level Adit portal and the Dolly Creek's confluence with Little Grizzly Creek; and

c. Careful measurement of water flow quantity and quality at each measuring station, to determine the entire flow pattern between Walker Mine workings above 700 Level and Little Grizzly Creek.

6.0 GLOSSARY

Where used in this report, the following terms will be defined as follows:

Adit: A horizontal or nearly horizontal passage driven from the surface for the working or drainage of a mine;

Aquaclude: A geologic formation that prevents the passage of gound water in significant amounts;

Asperities: Protrusions forming roughness or jaggedness on the surfaces of the walls, roof and floor of a tunnel/adit;

Bulkhead: (i) A wall or partition erected to resist ground or water pressure; (ii) A tight partition of wood, concrete or metal used for retainment of fluids in a tunnel or channel; also used for protection against gas or fires in mines;

Bullnose: The narrow-angled corner formed where the walls of two tunnels intersect at less than 90^{0};

Haulage: Underground level either along and inside an orebody or closely parallel to it, usually in the footwall. On this level, the mineral drawn from stopes is transported to a shaft for hoisting or to surface through an adit. Haulage ways include levels and connecting passage ways (crosscuts) and are also used to transport supplies, waste rock, and for movement of personnel;

Portal: Any entrance to a mine, more usually the surface entry to an adit; and

Stope: An excavation from which ore has been extracted in a series of steps usually applied to steeply inclined or vertical veins.

APPENDIX I
CONCRETE MIX DESIGN RECOMMENDATIONS

by
Mr. Robert F. Adams, P.E.
Consulting Concrete Engineer

ROBERT F. ADAMS, P.E.
CONSULTING CONCRETE ENGINEER
5971 ANNRUD WAY
SACRAMENTO, CA 95822
(916) 428-9121

NOV - 1985

12 NOVEMBER 1985

Mr. Don Poulter
Steffen Robertson & Kirstan
7510 W. Mississippi Ave., Suite 210
Lakewood, CO 80226

Dear Mr. Poulter:

Subject: Concrete for Tunnel Plug, Walker Mine
Your Project No. 06901

I have reviewed your Draft Final Feasibility and Design Report for the Walker Mine pollution abatement project. You requested that I furnish my recommendations for concrete for the tunnel plug, the key feature of this project. This reports my recommendations for materials for concrete and concrete for the tunnel plug. A discussion gives the reasons for some of the recommendations and other matters pertaining to construction of the tunnel plug.

The low pH 4.1 of the acid mine water makes the concrete requirements of more concern than usual. Had the pH been above 5, there would have been less concern.

MATERIALS FOR CONCRETE

Aggregate shall meet the requirements of ASTM 633 for use in a severe weathering region. The sand shall be a natural sand. The coarse aggregate shall be a crushed limestone Size 57 (1 inch to No. 4) or Size 67 (3/4 inch to No. 4). The amount of flat and elongated particles in the coarse aggregate not exceed 15 percent. (Corps of Engineers Test CRD-C119). The sand and coarse aggregate may be rejected if the specific gravity, saturated surface dry basis, is less than 2.60.

Portland Cement shall be Type II, low alkali, meeting the requirements of ASTM C150.

Pozzolan shall be Class N,, natural or F, fly ash, meeting the requirements of ASTM C618. If a fly ash, Class F, pozzolan is used, the ignition-loss shall be less than one percent.

Air Entraining Admixture shall meet the requirements of ASTM C260.

Water Reducing-Retarding Admixture shall be an unmodified lignosulfonate meeting the requirements of ASTM C494, Type D, supplied as a 40 percent solution.

Silica Fume shall be EMSAC F-100 as supplied by Elkem Chemicals, Inc., Pittsburgh, Pennsylvania.

Water- Use good quality water for mixing water. Do not use mine water. Sulfates should not exceed 1500 ppm and chlorides should not exceed 2000 ppm. The water should not contain oil or material that would affect the setting of portland cement.

CONCRETE PROPORTIONS AND PROPERTIES

Cement Content:

Portland cement - 450 pounds per cubic yard
Pozzolan - Class N - 150 pounds per cubic yard
or Class F - 200 " " " "

Air Content: 5+1 percent

Slump: 4 to 7 inches

Water-Reducing Admixture: Use 8 fluid ounces of water-reducing admixture per 100 pounds of cementing material.

Silica Fume: Use EMSAC F-100 at dosage of 2 gallons per 100 pounds of portland cement.

Design Strength of Concrete: 3000 psi at 28 days. (The strength of concrete as specified above should far exceed the design strength under normal conditions.)

DISCUSSION

The following gives some of the reasons for some of the above recommendations and other discussion and recommendations pertaining to the job.

Low permeability of the concrete is one big factor in reducing aggressive chemical attack on concrete such as that caused by sulfates and acids. Lower permeability is achieved by lower water-cement ratio (which means higher cement content, other things being equal), air entrainment, use of pozzolans and use of silica fume (a rather special pzzolan).

The rather low sulfate content of the mine water, 146 ppm (in your Table 2) does not justify the use of Type V portland cement, a premium price cement. The use of Type II portland cement with pozzolans provides protection from sulfates, if needed, equivalent to a Type V portland cement alone, except in the most severe sulfate conditions.

The use of a limestone coarse aggregate is recommended as a sacrificial aggregate for the acid water. Limestone coarse aggregate is frequently used in concrete pipe for sanitary sewers where acid conditions sometimes form. The closest commercial source of limestone coarse aggregate known to me is Sierra Rock Co., Placerville, a distance of about 150 miles from the jobsite.

Another advantage to limestone aggregate concrete is that it has a lower coefficient of thermal expansion, hence less thermal volume change.

The tunnel plug, being 12 by 12 by 15 feet in section is "mass concrete" for which there is sometimes concern about temperature rise in the concrete and temperature differences which sometimes cause cracking. It is believed that with the cement contents recommended there will be no problem because the concrete is placed against rock in a rather stable temperature environment and is not exposed. Another reason for using a pozzolan is to lower the temperature rise of the concrete substantially.

My recommendations have included the use of silica fume, a "super" pozzolan which reduces the permeability of concrete by up to two orders of magnitude. Silica fume is recommended because of this, and your report notes a 100 year expected life for the job. Unfortunately, the particular silica fume recommended is rather expensive and will increase the cost of the concrete some 30 to 50 dollars per cubic yard, a small amount considering the total cost of the job and believed to be justified for this job. (See attached sales literature for EMSAC silica fume.)

Your report mentions the use of an expansive agent in the concrete. This has not been recommended because the expansion comes at the wrong time in this kind of job. This in grout would be OK. The use of shrinkage-compensating cement has not been recommended either because of some problems with this cement.

The closest ready mix producer is in Portola, some 25 to 30 miles away - over a dirt road part of the way at least. If concrete is to come from this source, the cement, pozzolan and admixtures should not be added until the ready mix truck gets to the jobsite. It would seem very desirable to bring in a very small portable batch plant to batch at the jobsite. Such plants are available in the area.

Your report mentions rock cleanup prior to concreting. This is a must. The floor particularily should be cleaned of all loose rock, mud, debris, etc. etc.

It is suggested that vibration of the concrete in the lower portion of the plug be required, particularly on the floor and against rock and forms and around the pipe - and lower slump concrete, 4 to 5 inches, can and should be used here. In the crown, more slump is required - 5-1/2 to 7 inches slump.

The pump slickline should be kept buried in the crown, pumping to refusal to fill in the arch as well as possible, and backing out the slickline as the arch is filled.

Grouting the arch will be necessary. And from your experiences, grouting the sides appears to be necessary also. It is suggested grouting wait at least a month to allow the plug to cool and stabilize dimensionally. The peak temperature might occur at about 5 to 7 days.

Wood forms would be better than steel forms because they would provide more insulation.

Limited trial mixes should be made to establish a recommended starting mix. This should be done after the Contractor has selected his material sources.

Job inspection and quality control should be done to insure that the requirements of the specifications are followed and that good construction practices are followed. Most importantly, the air content of the concrete should be controlled by tests.

This report was reviewed by a colleague, Mr. Lewis H. Tuthill who concurred with my recommendations.

Please advise if you have any questions or I can furnish further information or help.

Sincerely,

Robert F. Adams

Robert F. Adams, P. E.

Some Addresses

Source of EMSAC F-100. Hill Brothers Chemical Co., 410 Charcot Avenue, San Jose, CA 95131. Phone 408-263-3131

Small jobsite concrete plant - Engineered Concrete Placement, Box 51333, Middletown, CA 95461, Phone 707-987-0151.

Source of Class N Pozzolan - Lassenite Industries, Inc., produced this at Hallelujah Junction about 35 miles East of Portola. Believe this still being produced. Office for this company now believed to be in Oroville, or Yuba City, California. Phone might be 800-221-3134.

Limestone Aggregate - Sierra Rock Co., 1845 Quarry Road, Placerville, CA 95667, Phone 916-622-8571.

White Cap Ready Mix, Portola, Bob Higgins, 916-832-4225

ADDENDUM 1
TO
WALKER MINE PROJECT
FINAL
FEASIBILITY AND DESIGN REPORT
CONTRACT NO. 4-051-150-0

WALKER MINE PROJECT
700 LEVEL ADIT PLUG
AND
SURFACE DIVERSION DITCHES
TECHNICAL SPECIFICATIONS

Prepared for:
California Regional Water Quality Control Board
Central Valley Region
3201 S Street
Sacramento, California 95816

Prepared by:
Steffen Robertson and Kirsten (Colorado) Inc.
3232 South Vance Street, Suite 210
Lakewood, Colorado 80227

November, 1985

TABLE OF CONTENTS

TABLE OF CONTENTS (con't)

Page No.

1.0 INTRODUCTION

1.1 General

In the following paragraphs, technical specifications are presented for the various work items noted. Specific items concerning contractual agreements, environmental controls, and health and safety requirements that must be complied with by the Subcontractor, have not been included as part of these specifications.

The work to be performed under these specifications is the construction of a concrete plug with drains in the 700 Level Adit of the Walker Mine, diversion of mine waters during plug construction, remedial work on the diversion ditches around the subsidence above the Piute and Central Orebodies and construction of a new ditch around the Piute Orebody. Also included in the work is the reclamation of the disturbed areas resulting from the construction of these facilities. This includes the replacement or repair of portal doors which are currently in place.

The structures specified herein are to be constructed to the lines and grades shown in the construction drawings to meet the technical requirements in these specifications.

While every effort has been made to have specifications and construction drawings free of error and ambiguity, the Subcontractor is responsible for bringing any such points to the attention of the Owner's representative before execution of the work to allow correction and/or interpretation.,

For any discrepancy or ambiguity in the specifications, construction drawings, codes, standards, or regulations, it is the intent of these specifications that the most restrictive interpretation shall apply unless intepreted otherwise by the Engineer.

1.2 Definitions

a) "Agency", when referred to, shall be understood to mean a duly authorized representative of the California Regional Water Quality Control Board - Central Valley Region.

b) "Engineer", when referred to, shall be understood to mean a duly authorized representative of Steffen Robertson and Kirsten (Colorado) Inc. (SRK); SRK is a subcontractor to the Agency.

c) "Contractor", when referred to, shall be understood to mean the party which has executed a contract agreement for the work with the Agency.

d) "Regulatory Agencies", when referred to, shall be understood to mean duly authorized representatives of such public agencies that have jurisdiction over this project in addition to the Agency.

e) "Drawings", when referred to, shall be the 06901 series drawings for Contract No. 4-051-150-0.

1.3 Permits

All permits required to execute and complete the work under these specifications shall be the responsibility of the Contractor. This includes, but is not limited to permits required for 1) mobilization and demobilization of equipment of the site, 2) execution of underground work, and 3) access and clearing for construction of the diversion ditches, and 4) any permits required by Regulatory Agencies.

The Agency will provide the permit for right of entry to the property on which the mine portal is located.

2.0 CONTRACTOR'S RESPONSIBILITY

The Contractor shall carefully examine all of the technical specifications and construction drawings, and the site of the work. He shall fully inform himself as to the character of all conditions at the site, local and otherwise, affecting the execution of the work, including those conditions to which Federal, State, and local safety and/or health laws and regulations may be applicable. Failure to comply with the requirements of this section shall not relieve the Contractor of responsibility for complete performance of the work.

It shall be the sole responsibility of the Contractor to determine and satisfy himself, by such means as he considers necessary or desirable, as to all matters pertaining to this work including, but not limited to:

- The location and nature of work;
- Climatic conditions;
- The nature and conditions of the terrain;
- Geologic conditions at the site;
- Transportation and communication facilities;
- Location and nature of construction materials available for use in the work;
- Other construction or operation in the project area that may be underway simultaneously with the construction work for the adit plug or diversion ditches; and
- All other factors that may affect the cost, duration, and execution of the work.

Before accepting the work, the Contractor shall acknowledge in writing that he has inspected the site and determined the characteristics of the work and the conditions indicated above.

Technical and other information relating to the site of the work is available in the following reports:

1) "Walker Mine Project, Feasibility and Design Report", Contract NO. 4-051-150-0 (SRK, 1985); and
2) Open file data through the Agency.

This report and data are provided for the Contractor's information and convenience. Neither Agency nor SRK will assume any responsibility for the Contractor's interpretation of, or conclusions reached from, examination of such data.

The performance of items specified to be submitted for review and comment by the Engineer remain the responsibility of the Contractor.

3.0 INSPECTION OF WORK

Full-time inspection of all construction activities under this work shall be as defined in the contract documents between the Agency and their subcontractors. Inspection of all work shall be carried out by the Engineer while such work is in progress. Notwithstanding such inspection, the Subcontractor shall be held responsible for the acceptability of the finished work.

The Engineer and/or his representatives shall at all times have access to the work whenever it is in preparation of progress. The Contractor shall fully cooperate with the Engineer to facilitate inspection. The Contractor shall give the Engineer ample notice of readiness of the work for inspection to see that the work is performed in accordance with the requirements set forth in the technical specifications and construction drawings. All work done by the Contractor shall meet the approval of the Engineer, but the detailed manner and methods of doing work shall be the responsibility of the Contractor.

If any work should be covered up without prior review or consent of the Engineer, it must, if required by the Engineer, be uncovered for examination and be properly restored at the Contractor's expense.

It is the intent of these specifications that all materials will be inspected and tested by the Engineer before final acceptance of the work. Test data will be made available to the Contractor for inspection at his option. Any part of an item of work which is found not to comply with the specification requirements or which is improperly located or constructed shall be removed and replaced to the satisfaction of the Engineer, at the Contractor's expense.

4.0 PLUG SPECIFICATIONS

4.1 Plug Location and Dimensions

The plug shall be located as shown in the drawings. The approximate coordinates of the plug center are 12,950 N, 11,420 E. The actual location will be field sited by the Engineer. The plug site shall be surveyed and recorded by a Contractor for the Agency. The plug shall be 15 ft in length.

4.2 Site Preparation

4.2.1 Access

Access and remedial work required to maintain access to the plug site during construction shall be the responsibility of the Contractor. Ventilation in the adit and working area shall remain in-place and in working order upon completion of construction. All work shall be done in accordance with the required mine health and safety regulations.

4.2.2 Mine Water Diversion

Mine waters running through the plug site shall be diverted such that the plug (including form work) is constructed in the dry. The diversion system shall be maintained until such time that water against the plug will not adversely effect the completion of the concrete placement. The method of diversion and schedule shall be submitted to the Engineer for approval prior to construction. Such approval does not relieve the Contractor from the responsibilities for the performance or adequacy of the diversion system.

4.2.3 Plug Site

The plug site shall be cleared and prepared to ensure an adequate bond between the rock and concrete plug. All loose rock within the plug site shall be spawled off to sound, intact rock. The rock surface shall be cleaned of all loose and fine materials. Limits of the site preparation shall extend a minimum of 5 ft past either end of the plug limits.

Methods of site preparation shall be proposed by the Contractor and submitted for review and comment by the Engineer. This in no way relieves the Contractor from his responsibility to accomplish the required site preparation in an efficient and timely manner. The prepared site shall be approved by the Engineer prior to placement of concrete.

4.3 Formwork

The formwork for the bulkheads shall be the responsibility of the Contractor. It shall be constructed of good quality material and in such a manner as to provide an efficient seal for containment of the concrete and any grout that may be injected. The design of the formwork shall be in accordance with ACI 347, "Recommendated Practice for Concrete Formwork", and of sufficient strength to withstand the fluid pressure of the concrete and any increased pressures due to grouting or concrete placement. A reference design is provided in the drawings.

The Contractor shall be responsible for the design and safety of form work. Completed forms in place will be approved by the Engineer prior to concrete placement to check all lines, grades, and tolerances as shown in the drawings. A reference design showing drain pipe locations is provided in the drawings.

4.4 Concrete

4.4.1 General

Contained in the following sections are concrete materials specification, recommended mix specifications, and handling requirements for the concrete plug. Concrete mixing, delivery and placement shall be in accordance with ACI Standards and Specifications.

The selected method and procedures for mixing, transportation and placing the concrete shall be submitted to the Engineer for review and comment prior to construction mobilization.

All material testing shall be done to ASTM specifications where applicable or unless otherwise specified. Under no circumstances shall delivery scheduling or placement methods be such that a cold joint will be formed in the plug.

The Contractor shall locate and supply all materials and equipment necessary for this work, including water, concrete aggregate, additives, and vehicles for transport of concrete to the plug location. Once all materials have been located, the Contractor shall prepare a trial mix for testing to check the adequacy of the mix design. The mix design and test results shall then be submitted to the Engineer prior to construction.

Before any concrete is placed, the mix design shall have been approved by the Engineer, formwork and the prepared site shall have been inspected by the Engineer, and tests of all materials and mechanical operation of all equipment shall have been completed.

4.4.2 Applicable Codes of Specifications

The following publications of the latest edition are a part of this specification, except as noted within this specification.

American Society for Testing and Materials

ASTM C-31	Specification for Making and Curing Concrete Test Specimens in the Field
ASTM C-33	Specification for Concrete Aggregates
ASTM C-39	Test for Compressive Strength of Cylindrical Concrete Specimens
ASTM C-94	Specification for Ready-Mixed Concrete
ASTM C-143	Method of Test for Slump of Portland Cement Concrete
ASTM C-150	Specification for Portland Cement
ASTM C-171	Specification for Sheet Materials for Curing Concrete
ASTM C-172	Method of Sampling Fresh Concrete
ASTM C-231	Test for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C-260	Specification for Air Entraining Admixtures for Concrete
ASTM C-309	Specification for Liquid Membrane - Forming Compounds for Curing Concrete
ASTM C-494	Specification for Chemical Admixtures for Concrete

American Concrete Institute Publications

ACI 211.1	Recommended Practice for Selected Proportions for Normal and Heavy Weight Concrete
ACI 214	Evaluation of Strength Test Results of Concrete
ACI 304	Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
ACI 306	Recommended Practice for Curing Concrete
ACI 309	Recommended Practice for Consolidation of Concrete
ACI 311	Recommended Practice for Concrete Inspection
ACI 347	Recommended Practice for Concrete Formwork

4.4.3 Cement

Cement shall be an approved brand of Portland Cement complying with all the requirements of ASTM C-150, Type II.

4.4.4 Water

The water used for mixing concrete will be clean and free from oils and other substances deleterious to concrete. Sulphates shall not exceed 1,500 ppm and chlorides shall not exceed 2,000 ppm. Mine water is not acceptable for use in the concrete mix.

4.4.5 Concrete Aggregates

Aggregate shall meet the requirements of ASTM 633

for use in a severe weathering region. The sand shall be a natural sand. The coarse aggregate shall be a crushed limestone Size 57 (1 inch to No. 4) or Size 67 (3/4 inch to No. 4). The amount of flat and elongated particles in the coarse aggregate not exceed 15 percent. (Corps of Engineers Test CRD-C119). The sand and coarse aggregate may be rejected if the specific gravity, saturated surface dry basis, is less than 2.60.

4.4.6 Admixtures

The following admixtures shall be used in the design mix:

1. Pozzolan shall be Class N, natural or F, fly ash, meeting the requirements of ASTM C618. If a fly ash, Class F, pozzolan is used, the ignition loss shall be less than one percent.
2. Air Entraining Admixture shall meet the requirements of ASTM C260.
3. Water Reducing-Retarding Admixture shall be an unmodified lignosulfonate meeting the requirements of ASTM C494, Type D, supplied as a 40 percent solution.
4. Silica Fume shall be EMSAC F-100 as supplied by Elkem Chemicals, Inc., Pittsburgh, Pennsylvania, or equivalent.

4.4.7 Curing Aids and Coating

All materials used for curing shall conform to ASTM C-309. All materials used for coating shall conform to ASTM D-977. These apply to the front face of the plug once the formwork is removed.

4.4.8 Handling and Storage of Materials

4.4.8.1 Aggregate

Stored aggregate shall be handled in such manner as to prevent segregation of sizes and to avoid the inclusion of dirt and/or foreign materials in the concrete. Material shall be removed from stockpiles in approximately horizontal layers.

4.4.8.2 Cement

Cement in sacks or barrels shall be stored under a weather-tight cover with the floor raised at least one-half foot above the ground. Cement that has hardened or partially set shall be removed from the site and not used.

Bulk cement shall be stored in airtight and weatherproof bins with access for inspection.

4.4.9 Proportioning

It is the intent of this specification to secure, for every part of the work, concrete of homogeneous structure which, when hardened, will have the required strength, impermeability and resistance to chemicals and weathering.

Proportions shall be selected to produce concrete with a minimum 28-day compressive strength of 3,000 psi. The recommended design mix is as follows:

1. Cement Content:
   Portland cement - 450 pounds per cubic yard
   Pozzolan - Class N - 150 pounds per cubic yard
   or Class F - 200 pounds per cubic yard
2. Air Content: 5 + 1 percent
3. Slump: 4 to 7 inches (see Appendix I of SRK Feasibility and Design Report for explanation).
4. Water-Reducing Admixture: Use 8 fluid ounces of water-reducing admixture per 100 pounds of cementing material.
5. Silica Fume: Use EMSAC F-100 at dosage of 2 gallons per 100 pounds of Portland cement.

4.4.10 Batching of Concrete Mixture

The measurement of materials for concrete batching shall be in accordance with ASTM Specification C-94, Sections 6 and 7. After the equipment is set in operating position, the batching plant shall be inspected by an authorized agency and scales checked for accuracy. An inspection seal or tag properly documented shall be attached to the equipment.

4.4.10.1 Cement and Aggregate Measurements

The Contractor shall measure cement and aggregate by weighing only. Weighing shall be accurate to within 1.0 percent of the required weight. Cement may be measured in standard bags, however, no fraction of a bag shall be used unless weighed.

4.4.10.2 Water Measurement

The Contractor shall measure the water by

volume or by weight. The device for the measurement of the water shall be readily adjustable and under all operating conditions shall have an accuracy within 1.0 percent of the quantity of water required for the batch.

4.4.10.3 Moisture Content

The Contractor shall provide a moisture meter to measure the amount of free water in fine aggregates within 0.3 of a percent. The Contractor shall compensate for varying moisture contents of fine aggregates and change batch weights of materials if necessary before batching.

4.4.10.4 Admixture Measurement

Admixtures shall be used strictly in accordance with manufacturer's recommendations. All admixtures shall be added to the concrete mixture with dispensing equipment furnished by the manufacturer.

4.4.10.5 Batching Plant

Bins

Bins with adequate separate compartments for fine aggregates and for each required size of coarse aggregate shall be provided in the batching plant. Each compartment shall be designed to discharge efficiently and freely into the weighing hopper. Means of control will be provided so that, as the quantity desired in the weighing hopper is approached, the material

may be added slowly and shut off with precision. Weighing hoppers shall be constructed so as to eliminate accumulations of tare materials and to discharge fully.

Scales

The scales for weighing aggregates and cement shall be of either the beam type of the springless dial type. Scales shall be accurate within 1.0 percent under operating conditions.

4.4.11 Mixing and Transportation of Concrete

Concrete shall be mixed and transported in equipment approved by the Engineer in a manner which will deliver uniform and homogeneous concrete to the forms. Mixing and transporting shall be in accordance with the appropriate ACI and ASTM codes. Revisions to applicable codes to accomodate field conditions shall be approved by the Engineer prior to construction.

4.4.11.1 Mixing Equipment

Mixers may be stationary mixers or truck mixers. Agitators may be truck mixers or truck agitators. Truck mixers shall be equipped with revolution counters and water meters. Stationary mixers shall be equipped with a timing device that will not permit the batch to be discharged until the specified mixing time has elapsed.

Each unit shall have attached thereto, in a prominent place, a metal plate or plates on which are plainly marked, the various uses for

which the equipment is designed, the capacity of the drum or containers in terms of volume of mixed concrete and the speed of rotation of the mixing drum, blades, or paddles.

4.4.11.2 Mixing and Delivery

Concrete shall be mixed and delivered alongside the forms by one of the methods listed below. It should be noted that transport equipment from the portal to the plug site will be rail mounted.

Central Mixed

The materials completely mixed in a stationary mixer and transported to the delivery point in a truck agitator, a truck mixer operating as a truck agitator, a non-agitating truck approved by the Engineer or by pumping through a pipeline.

Shrink Mixed

The materials partially mixed or blended in a stationary mixer and the mixing completed in a truck mixer enroute to the job. This shall only be allowed provided the stationary mixer is located at the mine portal.

Transit Mixed

The materials placed into the truck mixer and all mixing done in the truck mixer.

4.4.11.3 Control

The Engineer will make slump tests from

samples taken at approximately the one-quarter and three-quarter points of the load. When the above pairs of slumps differ by more than two inches, the truck or agitator shall not be re-used until the condition causing the non-uniformity has been corrected.

The Engineer will make air content measurements at the beginning and approximately the one-half points of the load. When the air content is measured to be outside the limits of the specified content, the remainder of the load shall be refused. Subsequent loads will be tested prior to placement, and as above, to see that the problem has been corrected.

4.4.11.4 Retempering

Water shall not be added to mixed batches of concrete to increase the slump without specific written approval of the Engineer.

4.4.12 Testing of Concrete

The following tests will be performed by the Engineer on work performed under this Specification.

4.4.12.1 Strength Tests

During the course of construction, tests will be made to determine whether the concrete, as being produced, complies with the standards of quality specified in Section 4.4.9. The actual testing will be performed by an approved testing laboratory.

Preparation of Test Specimens

The concrete for test specimens will be sampled in accordance with ASTM C-172. The specimens will be cast and cured in accordance with ASTM C-31 and will be tested in accordance with ASTM C-39. Each test specimen will be tagged with the location of the sampled batch in the structure, the mix proportions or number, the slump and the type and brand of cement.

Number of Test Specimens

Not less than three (3) test specimens will be made for each 40 cubic yards, or portion thereof, of concrete placed in any one shift.

Age of Test Specimens

One or more test specimens will be broken at seven (7) days and the remaining specimens will be broken at twenty-eight (28) days.

4.4.12.2. Slump Tests

Slump tests will be made in accordance with ASTM C-143.

4.4.12.3 Tests for Entrained Air

The entrained air content of fresh concrete will be determined in accordance with ASTM C-231.

4.4.13 Enforcement of Strength Requirements

4.4.13.1 Definition of Failure

Cast Specimens

The test specimens cast in the field shall be considered to have failed the strength requirements when the average of all the strength tests or the average of any five consecutive strength tests is less than the specified strength or when more than one test in ten has an average value less than 90 percent of the specified strength. A strength test shall be the average strength of at least two companion cylinders.

Cored Specimens

The concrete represented by cored specimens shall be considered to have failed the strength requirements when the average strength of three specimens falls below 85 percent of the specified strength.

4.4.13.2 Failure of Test Specimens

When test specimens are made, cured, and tested in accordance with Section 4.4.12 of this specification, fail as defined above, the Engineer may require the following action be taken:

Testing of Cored Specimens

Specimens shall be secured, prepared and tested in accordance with ASTM C-42.

The Engineer will specify the location where each core specimen shall be secured. No more than three cores shall be taken from each portion of the structure for which cast test specimens have failed, as defined in Section 4.4.13.1 above.

Cored specimens shall be tested no later than sixty (60) days after the concrete was placed unless otherwise approved by the Engineer.

Where cored specimens fail as defined in Section 4.4.13.1 above, the Contractor shall strengthen or replace the structure in accordance with a plan approved by the Engineer.

4.5 Piping

Two drain pipes through the concrete plug shall be installed as shown in the draings. The pipes shall be 4-inch diameter stainless steel pipes. The values shall be as specified in the drawings or equivalent. The valve types and materials are subject to approval by the Engineer prior to installation.

Rubber water stops shall be placed around the pipes as shown in the drawings. If pipe connections are required within the concrete plug, they shall be threaded joints unless otherwise approved by the Engineer. Pipe connections shall be sufficiently tight to withstand up to 600 psi pressure.

4.6 Grouting

Grouting shall be done in areas where ever needed to provide a tight seal between the rock and concrete. Grout tubes shall be placed such that air entrapment does not occur in voids. A return line shall be installed at each location to provide a means of determining total void filling with grout. Placement of the grout lines is subject to the approval of the engineer.

Grouting may not be done within the first seven days after concrete emplacement. Grout pressures shall not exceed 1,500 psi. The grout shall be of a neat mix using sulfate resistant Portland cement. Chemical grouts may be used upon approval of the Engineer.

4.7 Instrumentation

A pressure gage shall be installed on one drainpipe and connected to a data logger as shown in the drawings. The equipment required is specified below. Installation and connection of the equipment shall be done as specified by the supplier. Routing of the readout lines shall be such as to protect them from damage.

The instrumentation installed shall be as listed below or equivalent. The supplier of the equipment itemized below is available upon request.

- Wekslar Gage - No. AA4-4-2
- TERRATRAC Model T/1015 Data Logger with 2,000 reading capacity; int. clock; in portable heavy-duty, gasketed case; battery-pak; signal connectors.
- Extended Operation Battery Pack (6 mo. of daily readings)
- Battery Charger (120VAC)
- HP-41CX Advanced Calculator (with programming for Interrogation; Extended Memory Module; HP-IL Module)
- Precision Pressure Transducer (SENSOMETRIC Series 97, 250 psig)

- Instrument Signal Cable (non-direct burial, 3 conductor and 100% shield)

Unless otherwise arranged and agreed to by the Agency, the Contractor shall be responsible for the selection, procurement and installation, operation of the above or equivalent instrumentation system.

Also, the Contractor shall be responsible to see that the instrumentation system is maintained in good condition and is properly operating at the time of acceptance of the work by the Agency. The Contractor shall also provide an operating warranty of the equipment for one full year following acceptance of the work by the Agency.

4.8 Cleanup

All materials used during construction and not built into the plug shall be removed from the adit and portal area, including the formwork at the face of the mine plug. Any support placed in the adit by the Contractor will be left in place.

The portal, the portal doors, and immediately surrounding area shall be left in a safe and operable condition. Reclamation of disturbed areas outside the portal shall consist of removal of all equipment and unused or discarded materials. The site shall be graded to re-establish original drainage conditions.

5.0 DIVERSION DITCHES

5.1 Scope

The work under this specification includes clearing, grubbing, and excavation for a diversion ditch as shown in the drawings, and remedial work for existing ditches.

5.2 Definitions

1) Clearing is defined as the cutting near ground level of trees and brush, and the removal of such cut material along with downed timber, rotten wood, rubbish, any other vegetation, and objectionable material.

2) Grubbing is defined as the removal from below the surface of the natural ground of stumps, vegetation, and roots 1-inch diameter and larger.

3) Excavating is defined as the removal of soil, soil-rock or rock materials within the limits shown on the construction drawings or specified by the Engineer.

5.3 Clearing and Grubbing

5.3.1 General

Clearing and grubbing shall be done along the alignment of new diversion ditches. Only clearing shall be done along access routes to the work area. Clearing along access shall be kept to a minimum. Prior to clearing, access routes shall be approved by the Engineer and the Regulatory Agencies.

5.3.2 Protection

1) Trees and vegetation beyond the specified limits for the diversion ditch and access route shall not be removed or damaged without the approval of the Engineer.

2) Beyond the clearing and grubbing limits, the following activity is not permitted:

   a) Compaction of root area by moving trucks or heavy motor equipment, or by storage of heavy equipment, supplies, gravel, and earthfill.
   b) Damage by trucks and motor equipment bumping into trees, leaning equipment, lumber, pipes, and other supplies against trees.
   c) Nailing or bolting objects to trees, using trees as temporary support posts, power poles, or sign posts.
   d) Strangling trees by tying ropes, guy wires, power lines to trunks or large branches of trees.
   e) Poisoning trees by pouring paint thinner, paint, solvents, oil, gasoline, dirty water, and other expendable materials on or around trees and roots.
   f) Burning of foilage and branches by burning trash under trees or so near that wind-blown heat damages tree leaves.
   g) Cutting of roots by utility ditching, foundation digging, placement of curbs and benches, and other miscellaneour excavation.
   h) Damaging of branches and foliage by temporary overhead power and telephone lines, swinging of power crane booms, cherry pickers, or driving too-tall van trucks under trees.

i) Cutting off branches, to allow for construction, by improper pruning methods such as peeling bark down the truck.

5.3.3 Extent of Removal

Clearing and grubbing shall be done for a maximum distance of 5 ft beyond the limits of the ditch excavation and grading; and 3 ft beyond the limits required for equipment access.

Blasting of stump removal shall not be permitted.

5.3.4 Disposal

a) If applicable, branches and brush shall be put through a chipper and the residue spread in designated areas to retard erosion and provide for dust control.

b) Larger trees and limbs shall be disposed of as proposed by the Contractor and approved by the Engineer, or as specified in a separate contract with the Agency.

5.3.5 Timing

Clearing and grubbing shall not be permitted during the rainy season unless proper sediment control structures have been installed to limit erosion and to prevent an increase in sediment loads in the streams. All runoff and sediment control measures shall be submitted to the Engineer in detail for comment and review. All waters discharged from the sediment control area shall be in compliance with State of California water quality control standards and discharge permit requirements.

5.4 Riprap Materials

Riprap may be required to provide protection against excessive erosion of the diversion ditches. It is anticipated that this material will be available from a local supplier. Suitable material may exist outside the mine portal and could be used subject to the Engineer's approval.

Riprap shall be as specified below.

Riprap with *d_{50} = 6 inches

Intermediate Rock Dimension	Percent smaller than given size by weight
24 inch	100
15 inch	70-100
12 inch	40-60
9 inch	20-40
6 inch	10-20
2 inch	2-10

*d_{50} = median particle size

5.5 Riprap Bedding Material

Riprap bedding material is not anticipated to be available at the site and will be obtained from commercial sources. Samples of the materials proposed for bedding shall be provided for testing and approval by the Engineer prior to use. Specifications for bedding are listed below.

Riprap Bedding Material

U.S. Standard Sieve	Percent Finer by Weight
3 inch	90-100
3/4 inch	20-90
No. 4	0-20
No. 200	0-3

5.6 Existing Ditches

Existing ditches requiring remedial work shall be regraded to their original geometry. Areas showing excessive erosion shall be regraded and protected from addtional erosion. Oetails for such protection are shown in the drawing.

Areas requiring additional work shall be field located by the Engineer in conjunction with the Contractor.

Acceptance of the completed work shall be subject to the approval of the Engineer.

5.7 New Ditches

New ditches to be installed shall be excavated and graded to the lines and grades or shown in the drawings. Areas which may be susceptible to excessive erosion under normal flow conditions will be protected as shown in the drawings.

Final alignment of the diversion ditch(es) will be field located and approved by the Engineer.

ADDENDUM 2

FLOW EVALUATION WITHIN THE WALKER MINE
ADDENDUM REPORT TO WALKER MINE PROJECT
FINAL FEASIBILITY AND DESIGN REPORT

FLOW EVALUATION WITHIN THE WALKER MINE
ADDENDUM REPORT TO WALKER MINE PROJECT
FINAL FEASIBILITY AND DESIGN REPORT
CONTRACT NO. 4-051-150-0

Prepared for:
California Regional Water Quality Control Board
Central Valley Region
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January, 1986

1.0 INTRODUCTION

On December 6, 1985, an inspection of the Walker Mine was made by Steffen Robertson and Kirsten (SRK) staff for the purposes of evaluating the mine flow system and of resolving the question as to whether there is currently any water which flows into the mine that does not pass out through the portal adit. This information is critical to the prediction of the post-sealing performance of the mine, particularly with respect to the question as to the likelihood of copper-laden water from the mine ever entering the Ward Creek catchment via the Piute Shaft.

The personnel participating in this phase of the work and the preparation of this report were Adrian Brown and Mark Logsdon of Terra Therma, Inc. and Colin Smith, associate consultants to SRK. As geohydrologist on the team, Adrian Brown was the lead engineer responsible for the data interpretation and preparation of this report.

2.0 ACTIVITIES

The mine was visited on Friday, December 6, 1985. The SRK team entered the adit at about 1000 hours and progressed from the portal to the rockfall between the Piute and 712 sections, taking water quality samples and flow measurements at appropriate locations on the way. The party returned to the portal at about 1715 hours. The water samples were filtered that evening, and carried to Denver the following morning for analysis.

3.0 RESULTS

3.1 Field Measurements

The results of the field measurements of flow and water quality are summarized on Table 1.

TABLE 1
SUMMARY OF RESULTS OBTAINED FOR FLOW ON THE 700 LEVEL

LOCATION	FLOW (gpm)	TEMP (^{o}C)	pH (units)	COND (umho)
Flow in the adit	21	7.3	5.25	340
South end of South orebody	1	5.9	3.29	289
South end of Central orebody	41	4.0	6.23	221
South end of North orebody	55	3.7	8.40	208
South end of 712 orebody	46	3.4	8.28	231
South end of Piute orebody	40	3.4	8.58	198

The pH results are questionable due to a malfunction of the pH probe resulting from the difficult conditions encountered underground. It should be noted that other readings were taken during the trip; the values presented above are the key values with respect to the question which was of primary interest during this visit.

The water level in the lower workings was visible at a few locations, and the distance below track grade was measured using a tape at these points. The results are indicated in Table 2.

TABLE 2
ELEVATIONS OF WATER LEVELS IN WORKINGS BELOW THE 700 LEVEL

LOCATION	CHAINAGE (feet)	TRACK ELEVATION (feet)	DEPTH TO WATER (feet)	WATER ELEVATION (feet)
North end of adit	-1900	0.0	0.0	0.0
Center of Center Orebody	- 500	7.0	5.0	2.0
Center of North Orebody	800	13.5	14.5	-1.0

Note: Elevations are relative to the elevation of the north end of adit. Elevation of the track is computed on the assumption that the track gradient is 0.5 percent. This is the gradient computed from plans.

Given the relatively low precision of the measurements, it is considered that the water elevations are the same; that is, the water level in the South, Central, and North orebody workings below the 700 level is the same, and is about equal to the elevation of the adit discharge point.

3.2 Laboratory Results

Seven water quality samples were collected in conjunction with the flow measurements in the mine, and a water quality sample of the outflow from the adit was also collected. Table 3 presents the laboratory analytical data for the samples.

All eight samples were analyzed for pH, specific conductance, and TDS, as indicators of the overall chemistry, and for copper (Cu), the heavy metal of principal concern. The water exiting the adit was analyzed for a full suite of major and minor species, primarily to allow correlation of these data with other sampling sessions. Copies of the laboratory report are attached.

TABLE 3

WATER QUALITY DATA, WALKER MINE - DECEMBER, 1985

PARAMETER	UNITS	SAMPLE NUMBER AND LOCATION							
		1	2	3	4	5	6	7	8
		S. end South ext.	S. end Central	S. end North	Inflow from roof, S. end North	S. end of 712	N. end of 712	S. end of Piute	Outflow from adit
pH	umho/cc	4.05	7.41	7.46	3.44	7.21	7.58	5.43	5.31
Conductivity	mg/l	346	242	217	436	222	203	167	256
TDS	mg/l	235	88	153	244	155	149	117	195
Alkalinity	mg/l $CaCO_3$				<1		73	11	12
Ca	mg/l				17		25	13	23
Mg	mg/l				5.5		5.1	3.1	6.2
Na	mg/l				1.87		3.6	1.81	3.1
K	mg/l				2.21		1.11	1.51	1.39
HCO_3	mg/l				<5		72	<5	<5
CO_3	mg/l				<1		<1	<1	<1
OH	mg/l				<.5		<0.05	<0.05	<0.05
SO_4	mg/l				135		45	73	111
Cl	mg/l				.5		0.5	0.5	0.6
Al	mg/l								0.4
As	mg/l								<0.01
Ba	mg/l								<0.1
Cd	mg/l								<0.01
Cr	mg/l								<0.01
Cu	mg/l	11.5	.33	.54	12.1	.73	1.00	10.4	8.7
Fe	mg/l				12.1		<0.05	0.21	0.10
Pb	mg/l								<0.01
Mn	mg/l				5.3		0.90	1.59	2.52
Hg	ug/l								<0.3
Ni	mg/l								<0.05
Se	mg/l								<0.01
Ag	mg/l								<0.01
Zn	mg/l				.96		0.24	0.40	0.65

4.0 DISCUSSION

These results quite clearly indicate that water which enters the mine does not all leave by the adit. The main inflow at the time of the visit was from the Piute area. In the 712 mine section, and to a lesser extent in the North orebody, there was some evidence of inflow from above. However, the two largest of the observed flows were measured and found to be of the order of 2 gallons per minute. It is estimated that, at the time of the visit, less than 10 gallons per minute of flow was observed coming from the workings above 700 level adit. There may, however, have been inflow to this level in sections which were not visible to the party, due to being in other segments of the drive system.

The available maps of the mine indicate that there is no mined connection between the Piute and the 712 orebody below the 700 level. Similarly, there is no known connection between the 712 orebody and the North orebody below the 700 level. Thus, it is not surprising to find that the flow on the 700 level increases from the south end of the Piute orebody to the south end 712 orebody.

There is believed to be connection below the 700 level between the North, Central and South orebody workings. The flow values reflect this, as the flow in the drain on the 700 level reduces in this stretch, presumably because of leakage to the lower workings. During the recent inspection trip, the flow could be seen to be disappearing from the 700 level adit drain into the lower workings at a number of locations, particularly in the South orebody area. The drain was essentially dry at the point where the 700 drive intersects the exit adit. Flow in the exit adit comes from the south extension, and is presumably return flow from the deeper mined area, which collects water from the entire mine.

The water level information indicates that there is a connection between the North, Central and South orebody workings below the 700 level. Water is presumably flowing into the lower workings from the 700 level, and moving towards the adit exit through the conduits provided by

the workings. This effect did not appear to be significant in the North orebody at the time of the visit. However, on the previous visit where this location was inspected, a considerable flow was observed to be dropping into the deeper portion of the North orebody workings at the location where the water level was measured this time.

The chemical parameters indicate regular changes from the input areas to the outflow areas. As the field readings were taken in winter, the water was entering the mine colder than the mine rock temperature. As a result, the water was warmed by the rock, which clearly shows in the field results.

The laboratory values for conductivity (and related TDS) are consistent with the field measurements - both generally increased from inflow to outflow points within the mine. The laboratory pH values (which were not subject to the vicissitudes of measurement under highly adverse field conditions) have a very strong correlation with TDS ($r = -0.78$). The correlation is even higher for copper, the metal of greatest interest ($r = -0.96$) for zinc and sulfate, the correlation factors are -0.93. These correlations clearly indicate that the dissolved load of the waters, particularly the concentrations of heavy metals is dependent primarily on pH.

The correlation of copper concentration with pH offers a ready explanation for why flow from the mine to the natural groundwater system has not introduced significant quantities of copper into the surface water system. The acid drainage in the mine system is the result of oxygenated waters reacting with the sulfide ores. When the water in the mine system flows out of the mine workings and into the country rock, it flows away from the concentrated sulfide zone, and along many flow paths through the granodiorite (and potentially other units) before it discharges to surface waters. During this flow, the acid produced in the ore zone is neutralized by water-rock reactions (primarily with the feldspars), and the copper initially carried in solution is precipitated and/or scavenged by clays, oxyhydroxides, and other phases that are present in the country rock.

The importance of the observation that there is a loss of a considerable amount of water from the mine to the groundwater system under natural conditions is as follows:

1. The loss from the mine will presumably increase as the mine fills after flooding, due to the higher driving head;
2. The increased flow loss from the mine makes it highly unlikely that water will ever rise high enough in the workings to cause a discharge from the Piute area, and into the presently unaffected catchment of Ward Creek; and
3. The losses have presumably been going on since the closing of the mine, and to date there is no evidence of a stream of copper-laden water egressing from the groundwater system to the surface water system via the natural flow system. Based upon the data collected in the mine, it is expected that as the water enters the groundwater, it is neutralized and the copper is precipitated from solution. Therefore, no increases in copper-ladened waters are expected to occur in the surface water system as a result of plugging the mine.

5.0 CONCLUSIONS

The conclusions of the evaluation are as follows:

1. The flow in the mine is a clearly identifiable hydraulic and geochemical system; water moves from the 700 level drive to the lower workings where it can, and discharges from the deep workings to the deep groundwater system, to the adjacent downgradient mine workings (when they are connected), or to the main exit adit and thence to the portal;
2. There is clearly loss of water from the mine which is a result of discharge of water from the deep mined workings to the natural groundwater system. At the time of the visit, about 40 percent of the influent water was appearing at the proposed plug location as flow in the adit drain, and approximately 60 percent of the inflow to the mine was discharging into the bedrock from the deep mine workings;

3. Based on these results, it is considered highly unlikely that copper-rich water could flow from a plugged mine to the catchment of Ward Creek via the Piute Shaft; and
4. There is a low probability that copper from the mine will emerge from the groundwater system once a plug has been installed in the mine and the water pressure in the mine has increased. In fact, the production of acid drainage will gradually decrease in importance to the extent that inflow of oxygenated surface water can be reduced (by reducing the flow into the surface shafts, particularly the Piute) and as the water stored in the plugged mine consequently becomes less oxidizing over time.

CORE LABORATORIES, INC.
ANALYTICAL REPORT

ANALYTICAL REPORT

W85884

TERRA THERMA INC.

CORE LABORATORIES, INC.
ANALYTICAL REPORT

CLIENT IDENTIFICATION

JOB NO.:6307-W35884
COMPANY: TERRA THERMA, INC.
JOB/GROUP REMARKS:

	IDENTIFICATION		IDENTIFICATION
1)	1285-04	2)	1285-06
3)	1285-07	4)	1285-08
5)	1285-01	6)	1285-02
7)	1285-03	8)	1285-05

CORE LABORATORIES, INC.
ANALYTICAL REPORT

7-JAN-86

TERRA THERMA, INC.

RESULTS OF WATER QUALITY ANALYSIS
ON SAMPLES COLLECTED AT LOCATION:

JOB NO. 6307-	W85884 - 1	W85884 - 2	W85884 - 3	W85884 - 4
SAMPLE ID:	1285-04	1285-06	1285-07	1285-08
SAMPLE REMARKS:				
DATE/TIME SAMPLED	12-06-85/1415	12-06-85/1515	12-06-85/1530	12-06-85/1730
DATE/TIME RECEIVED	12-09-85/	12-09-85/	12-09-85/	12-09-85/
DATE/TIME ANALYZED	12-10-85/	12-10-85/	12-10-85/	12-10-85/
CHEMIST: RIF/DRH				
LOCATION: AURORA, CO				

LAB pH (@ 25 deg. C)	3.44	7.58	5.43	5.31
LAB COND. (as umhos/cm @ 25C)	436	203	167	256

--ALL VALUES REPORTED ON A DISSOLVED BASIS (MG./L.) UNLESS INDICATED OTHERWISE

CORE LABORATORIES, INC.
ANALYTICAL REPORT

7-JAN-86

TERRA THERMA, INC.

RESULTS OF WATER QUALITY ANALYSIS
ON SAMPLES COLLECTED AT LOCATION:

JOB NO. 6307-	W85881 - 1		W85884 - 2		W85884 - 3		W85884 - 4	
SAMPLE ID:	1285-04		1285-06		1285-07		1285-08	
SAMPLE REMARKS:								
MAJOR CATIONS								
CALCIUM (Ca)	17	(0.85)	25	(1.25)	13	(0.65)	23	(1.15)
MAGNESIUM (Mg)	5.5	(0.45)	5.1	(0.42)	3.1	(0.26)	6.2	(0.51)
SODIUM (Na)	1.87	(0.08)	3.6	(0.16)	1.81	(0.08)	3.1	(0.13)
POTASSIUM (K)	2.21	(0.06)	1.11	(0.03)	1.51	(0.04)	1.39	(0.04)
SUM OF MAJOR CATIONS (me/l)		(1.44)		(1.86)		(1.03)		(1.83)
SUM OF TOTAL CATIONS (me/l)		(2.69)		(1.93)		(1.44)		(2.27)
MAJOR ANIONS								
BICARBONATE (HCO3)	<5	(0.00)	72	(1.18)	<5	(0.00)	<5	(0.00)
CARBONATE (CO3)	<1	(0.00)	<1	(0.00)	<1	(0.00)	<1	(0.00)
HYDROXIDE (OH)	<0.5	(0.00)	<0.5	(0.00)	<0.5	(0.00)	<0.5	(0.00)
SULFATE (SO4)	135	(2.81)	45	(0.94)	73	(1.52)	111	(2.31)
CHLORIDE (Cl)	0.5	(0.01)	0.5	(0.01)	0.5	(0.01)	0.6	(0.02)
SUM OF MAJOR ANIONS (me/l)		(2.82)		(2.13)		(1.53)		(2.33)
SUM OF TOTAL ANIONS (me/l)		(2.82)		(2.13)		(1.53)		(2.33)

CORE LABORATORIES, INC.
ANALYTICAL REPORT

7-JAN-86

TERRA THERMA, INC.

RESULTS OF WATER QUALITY ANALYSIS
ON SAMPLES COLLECTED AT LOCATION:

JOB NO. 6307-	W85884 - 1	W85884 - 2	W85884 - 3	W85884 - 4
SAMPLE ID:	1285-04	1285-06	1285-07	1285-08
SAMPLE REMARKS:				
GENERAL PARAMETERS				
TOTAL DISSOLVED SOLIDS (CALC.)	244 (193)	149 (118)	117 (106)	195 (158)
*TOTAL ALK. (pH 3.7 as CaCO3)	<1	73	11	12

*--FILTERABLE

CORE LABORATORIES, INC.
ANALYTICAL REPORT

7-JAN-86

TERRA THERMA, INC.

RESULTS OF WATER QUALITY ANALYSIS
ON SAMPLES COLLECTED AT LOCATION:

JOB NO. 6307-	W85884 - 1	W85884 - 2	W85884 - 3	W85884 - 4
SAMPLE ID:	1285-04	1285-06	1285-07	1285-08
SAMPLE REMARKS:				
DISSOLVED METALS				
ALUMINUM (Al)				0.4
ARSENIC (As)				<0.01
BARIUM (Ba)				<0.1
CADMIUM (Cd)				<0.01
CHROMIUM (Cr)				<0.01
COPPER (Cu)	12.1	1.00	10.4	8.7
IRON (Fe)	12.1	<0.05	0.21	0.10
LEAD (Pb)				<0.01
MANGANESE (Mn)	5.3	0.90	1.59	2.52
MERCURY (Hg)--ug./l.				<0.3
NICKEL (Ni)				<0.05
SELENIUM (Se)				<0.01
SILVER (Ag)				<0.01
ZINC (Zn)	0.96	0.24	0.40	0.65

CORE LABORATORIES, INC.
ANALYTICAL REPORT

7-JAN-86

TERRA THERMA, INC.

RESULTS OF WATER QUALITY ANALYSIS
ON SAMPLES COLLECTED AT LOCATION:

JOB NO. 6307-	W85884 - 5	W85884 - 6	W85884 - 7	W85884 - 8
SAMPLE ID:	1285-01	1285-02	1285-03	1285-05
SAMPLE REMARKS:				
DATE/TIME SAMPLED	12-06-85/1100	12-06-85/1210	12-06-85/	12-06-85/
DATE/TIME RECEIVED	12-09-85/	12-09-85/	12-09-85/	12-09-85/
DATE/TIME ANALYZED	12-10-85/	12-10-85/	12-10-85/	12-10-85/
CHEMIST: RIF/DRH				
LOCATION: AURORA, CO				

LAB pH (@ 25 deg. C)	4.05	7.41	7.46	7.21
LAB COND. (as umhos/cm @ 25C)	346	242	217	222

--ALL VALUES REPORTED ON A DISSOLVED BASIS (MG./L.) UNLESS INDICATED OTHERWISE

CORE LABORATORIES, INC.
ANALYTICAL REPORT

7-JAN-86

TERRA THERMA, INC.

RESULTS OF WATER QUALITY ANALYSIS
ON SAMPLES COLLECTED AT LOCATION:

JOB NO. 6307-	W85884 - 5	W85884 - 6	W85884 - 7	W85884 - 8
SAMPLE ID:	1285-01	1285-02	1285-03	1285-05
SAMPLE REMARKS:				
GENERAL PARAMETERS				
TOTAL DISSOLVED SOLIDS	235	88	153	155

CORE LABORATORIES, INC.
ANALYTICAL REPORT

7-JAN-86

TERRA THERMA, INC.

RESULTS OF WATER QUALITY ANALYSIS
ON SAMPLES COLLECTED AT LOCATION:

JOB NO. 6307-	W85884 - 5	W85884 - 6	W85884 - 7	W85884 - 8
SAMPLE ID:	1285-01	1285-02	1285-03	1285-05
SAMPLE REMARKS:				
DISSOLVED METALS				
COPPER (Cu)	11.5	0.33	0.54	0.73

Exhibit 18

MOODYS MANUAL OF RAILROADS AND CORPORATION SECURITIES

TWENTY-FIRST ANNUAL NUMBER

INDUSTRIAL SECTION

1920

4239

POOR'S PUBLISHING COMPANY

PUBLISHERS

33 BROADWAY NEW YORK

total depth of 233 feet; a level connecting the two shafts at this depth was driven. The ore is of high grade, running from 4¼% to 9% copper, and is particularly desirable on account of its excess sulphur content, which, manufactured into sulphuric acid, can be used for leaching the oxidized ores of the Lo Aguirre Mines.

Lo Aguirre and Farfana Farms.—The Lo Aguirre and Farfana Farms, the former consisting of 17,387 acres, the latter of 980.3 acres, were purchased first, in order to secure water rights belonging to the farms and which will furnish an adequate supply for mining and metallurgical purposes; second, to control the intervening space between the two mines; third, to avoid liability for damages to farm lands in the immediate vicinity of the proposed Reduction Works.

The Anaconda Copper Mining Co. will, from time to time as it becomes necessary, advance funds for the requirements of the Santiago Mining Co., taking its stock at par for such advances. Upon the completion of the financing of this company the Anaconda Copper Mining Co. will own approximately 80% of the issued stock of the Santiago Mining Co.; the remainder will be owned by William Braden and his associates under the contract between them and the Exploration organization of the Anaconda Copper Mining Co. The plan of initial development adopted contemplates the development of Africana to a production of 500 tons of ore per day and of Lo Aguirre to a production of 750 tons of ore per day. Development or ore bodies is being continued, but construction of mining and metallurgical works has been deferred until the resumption of normal conditions.

Company Enters Metal Manufacturing Field.—Early in 1918 a rod and wire mill, capable of rolling into rods 100 tons of copper per day and drawing into wire 80 tons of copper per day, was completed. Of the company's production in 1919 there was rolled into rods 43,241,497 lbs. copper; of this amount 13,914,008 lbs. were manufactured into wire, of which 6,405,782 lbs. were made into strand.

Gas Production.—In May, 1918, the company had developed natural gas production in the Sweet Grass Hills of Montana. It was hoped to secure a flow sufficient to operate the company's smelters and supply local towns with fuel and light and the Northern Montana Natural Gas Co. was formed. The project, however, was not successful and this Gas Co. was dissolved in Sept, 1919.

Walker Mining Co.—On Oct 1, 1918, the International Smelting Co. exercised its option on 630,000 shares out of a total of 1,250,000 shares of this company's stock. The holdings of the Walker Mining Co. consist of 38 patented lode claims and two placer claims, all forming a compact lot of ground located in Plumas County, Cal., approximately 22 miles from Portola, a station on the Western Pacific RR. Development operations have opened up a body of ore approximately 800 ft. in length, averaging 16 ft. in width and a grade of about 4% copper. In 1919 there were mixed and milled at this property 38,785 tons of ore producing 5,983 tons of concentrates.

Arizona Oil Co.—On account of the necessity for protecting the fuel oil supply upon which the operations of the International Smelting Co. at Miami depend, it was deemed advisable in 1918 to purchase jointly with the Inspiration Consolidated Copper Co., a tract of 160 acres of oil-producing land in the Bakersfield District of California. A company known as the Arizona Oil Co. was formed, and title to the property was conveyed to it. This company has an authorized capital stock of $2,500,000, of which $1,632,000 has been issued (par, $100). The Anaconda Copper Mining Co. and the Inspiration Consolidated Copper Co. each owns one-half of the issued stock. In 1919 this company produced 456,174 bbls. of oil and paid $8.50 per share in dividends, of which the Anaconda Copper Mining Co. received $69,360.

Anaconda Lead Products Co.—This company was formed in 1919 to engage in the production of white lead by means of an electrolytic process. A plant has been erected at East Chicago, Ind., adjacent to the plant of the International Lead Refining Co.; this plant, which was expected to be put in operation early in 1920, will have a capacity of 20 tons of white lead per day.

Copper Export Association, Inc.—Early in 1919, this association was formed under the provisions of the Webb Act for the purpose of conducting the export business of a number of American copper producers. Working capital was supplied by the various members of the association in proportion to their production.

DEVELOPMENT.

During 1919, there was done in the mines of the company, in the form of drifts, crosscuts, upraises, shafts and winzes, 20.39 miles of development, as compared with 41.85 miles during 1918; the shafts of the company were sunk additional depths aggregating 1,749 ft. The shaft on the Orphan Girl Claim was sunk to a depth of 10.36 ft.; a station was cut at this point and a crosscut started in a northerly direction to cut the veins apexing on the Orphan Boy and the Anglo-Saxon claims. At the Anaconda mines

Exhibit 19

7-62-(2)
X

REFERENCES
WALKER BROTHERS BANKERS
NATIONAL COPPER BANK

TELEPHONE
WASATCH 4122

MEMBER SALT LAKE STOCK AND MINING EXCHANGE

GEO. BAGLIN

INVESTMENT SECURITIES, METAL MINES AND
GENERAL BROKERAGE

404 NEWHOUSE BLDG.

P. O. BOX 525

SALT LAKE CITY, UTAH November 24, 1922

Analysis of Facts and History of the Walker Mining Company, Subsidiary of the Anaconda Copper Mining Company

GREAT mines are found and developed so seldom that as a general rule their discovery and beginning of production is heralded by widespread publicity. To every rule, however, there are exceptions. One of the most remarkable exceptions of recent years is the Walker mine. This property notwithstanding its extraordinary promise, its favorable position with regard to transportation, and the possession of all the natural endowments that go to make an exceptional mine, has been heard of by few people in California, in Plumas county of which state it is situated, or in Utah, where reside a great many of its largest stockholders, or in Montana, where the Anaconda Copper Mining company, which directs its destinies, began first activities.

There are several reasons why a mine of the size and promise of the Walker has not received the publicity which its wonderful natural resources deserve. In the first place, the Anaconda Copper Mining company, which owns control, is more interested in accomplishments than in publicity. A mine has had to be developed in which a comparatively few of the public were interested. Since the Anaconda has practically unlimited finances at its command, talking about the favorable conditions prevailing at the Walker mine has not been necessary to interest the investing public. This feeling has been shared by large minority stockholders as well as by officials of the company.

However, recent developments have been so favorable that it is felt that before long the Anaconda company will acknowledge that the Walker mine is one of its big assets, not alone because of the number of shares held, but because of the revenue which will be derived from the smelting of Walker ores by the International Smelting company, a subsidiary organization of the Montana mining corporation.

So it is that a property, which has in one of six known orebodies $30,000,000 of mineral blocked out; which should rapidly develop into one of the largest and lowest cost producers in the world; and which should be active on a large scale for generations has received little or no publicity in technical journals or newspapers.

In laying before the public the following analysis and history of facts pertaining to the Walker Mining company, I have two distinct but closely related purposes: To call attention of investors to the exceptional merits of this stock so that advantage may be taken in time of an unusual opportunity and at the same time to help myself to a bigger business—a business that will bring profit and satisfaction both to myself and my clients.

Before discussing the outlook of the Walker Mining company, it should be stated that a property must have two qualifications before it can become a great mine. First, it must have mineralization of great persistence and of sufficient richness to make exploitation profitable; Second, the management directing the development of an estate's natural resources must be both honest and efficient. Many a fine organization has been wrecked in an attempt to develop a mine which promised well but did not live up to expectations. Many a great mineral deposit has been exploited with disastrous results to shareholdNOV 30 1922

Frederick Laist

ers because of inefficient or dishonest management.

In the case of the Walker property, it may be most emphatically stated that both requisites, good management and great ore reserves, exist. If the Anaconda company were not organized and managed to the highest degree of efficiency, it is hardly possible that the corporation would have grown from one of limited capital to one that has paid since its organization in 1901 about $170,000,000 in dividends, besides acquiring the American Brass company and buying, equipping and developing great properties like the Andes Copper, the Walker and other holdings of vast possibilities. Were not the management of the Anaconda Copper Mining company most capable, it would be scarcely practical for this organization to operate mines, railroads, smelters, sawmills, fertilizer factories and the great plants of the American Brass company, the largest corporation of its kind in the world. To carry on such manifold activities in this day of keen competition and rapid progress implies the highest degree of efficiency. That the Walker Mining company has this type of management is as great an asset as its vast ore reserves.

Fully as indisputable are the facts concerning the mineral resources of the company. In the report of the Anaconda company for 1918 are recorded the following conservative, uninaginative but startling statements concerning the ore reserves of the Walker mine at that date:

"Exploration of the property to the depth of 346 feet has been accomplished by two shafts. Drifts from these shafts have opened up a body of ore approximately 800 feet in length averaging 16 feet in width and a grade of about 4 per cent copper. Recent developments by means of diamond drill holes indicate an additional length of vein approximately 900 feet. There is considerable amount of unexplored territory."

Report of the Anaconda company for 1921 contains the following statement concerning the tonnage developed.

"Ore reserves at the end of 1921 were estimated at 900,000 tons, averaging 4.2 per cent copper. There are on hand at the mill more than 7,600 tons of concentrates assaying 19.76 per cent copper, 7.46 ounces of silver per ton and .19 ounces of gold per ton."

It should be noted that no mention is made in the Anaconda reports of the gold-silver content of the ore which is nearly enough to pay all mining and and milling costs. How conservative the Anaconda statements are may be judged when it is known that during the past five months, milling ores have run from 5 to 7.5 per cent copper, with $5 in gold and silver. Shipping ores have averaged in the same period from ten to twelve per cent copper with excellent gold-silver values. Probably a clearer comprehension of the mine's mineral resouces can be had when it is known that from development work alone, during the past six years, ores of a gross value exceeding $2,225,000 have been produced and marketed. It can be truly stated that the Walker is today one of the highest grade copper mines now active.

Another striking fact in connection with the ore bodies of the Walker mine is that no hoisting of ore or waste nor no pumping is or should be necessary for many years. The deposits lie in such a position that every pound of ore can be handled by gravity. Contrast this condition with that pertaining in Butte where all ore and waste has to be hoisted 2000 to 4000 feet and tremendous volumes of water must be pumped to the surface.

In order that full advantage may be taken of physical conditions, the company has run a long tunnel which cuts the lode at a depth of 1000 feet on its dip. Ore stoped in the upper levels is dropped into chutes, loaded into trains of cars hauled by electrically driven locomotives, and trammed to the mill at the portal of the adit. Shipping ore is conveyed to the railroad station, Spring Garden, on the main line of the Western Pacific, 8.2 miles distant by one of the best equiped and constructed aerial tramways in the country.

Nor has the downward limit of the ore been reached on the main tunnel level. At this depth, the mineralization is as extensive and rich as on the upper levels of the mine. Because of the great size, the high-grade values of the deposits, and the simplicity with which mining operations can be conducted, it is doubtful whether there are many properties in the world that can compete with Walker mine in the matter of production costs.

Probably the most complete and interesting statement ever made concerning the financial status of the company and the physical condition of the mine is contained in an interview with President J. R. Walker in the Salt Lake Tribune of November 12, 1922, from which are quoted the most pertinent paragraphs as follows:

WALKER MINE FUTURE BRIGHT

President of Company Makes Statement Concerning Plumas Property.

Plans for Enlargement of Old Mill and Building of New Plant Announced.

Complete satisfaction was expressed yesterday with the present outlook of the Walker Mining company by President J. R. Walker. In his opinion, the Plumas county, California, property could scarcely have a brighter outlook. Development work is constantly adding to the already vast ore bodies, the financial position of the company strengthened by the gratifying profits which are being netted as a result of steady production, and plans of the utmost importance for the welfare of the company outlined. To increase the income of the company in the shortest time possible, steps are being taken to aug-

ment the capacity of the small test mill so that it will be capable of handling 300 tons daily.

"In addition to treating 300 tons daily of ore," said President Walker in discussing yesterday plans of the company for the immediate future, "the company will ship 100 tons daily of crude ore, averaging from 10 to 12 per cent copper. The above output will produce in round numbers $3,000,000 annually, with gold, silver and copper estimated at the present market values. Out of this gross output, the International Smelting company will receive for treating the ore, in round numbers, 29 per cent, or $870,000; the railroad company in freights on concentrates and crude ore, 9 per cent, or $270,000 per year, leaving for the company 62 per cent, or an annual income of $1,860,000."

From this annual gross income that the company receives, Mr. Walker explained, must be deducted $45,000 monthly, which will be adequate to pay all mining, milling and other charges. For disbursement, over $1 a share will remain on the company's capitalization of 1,250,000 shares. While the relatively small amount estimated as necessary for operation may seem out of proportion as compared to the large net profit, he said, it must be remembered that the Walker mine is probably one of the lowest-cost producers in the country. The relatively high-grade copper, as well as the gold and silver content of the ore, the fact that for years not a pound of waste or mineral need be hoisted and no pumping done, and that the company has millions of feet of timber on its property suitable for all mine and construction uses, will make it practical for the company to produce copper under 8 cents and nearer 7 cents on a daily output of 400 tons.

Mine in Good Shape.

"The physical condition of the mine was never better," Mr. Walker stated. "In one deposit, a body of ore 800 feet long, 1000 feet on its dip, and an average width of thirty feet has been blocked out, in which, figuring ten cubic feet to the ton and copper, silver and gold at present market prices, there are over $30,000,000.

"Moreover, there are five other known ore bodies in the mine. On the 300 level to the north of the tonnage already blocked out we have run over 900 feet through an ore body. This deposit has also been diamond drilled. The 600-foot level, which is next to the bottom level of the mine, is within 200 feet of cutting this ore body at depth. As the company owns nearly four miles of this great lode or zone, it is probable that many other ore bodies will be developed."

When asked regarding the company's present financial outlook, President Walker said that if the output is maintained at the rate of 300 tons of mill and 100 tons of crude ore daily, it will require but very little more than a year to pay off the indebtedness.

"In my opinion, new financing will not be necessary if plans are carried out as now outlined," he explained. "All of the present indebtedness of the company is carried at 6 per cent interest by the Anaconda Copper company, which owns 50.4 per cent of the Walker Mining company's stock, and will not be due until January 1, 1929.

"I believe that the minority stockholders should be congratulated on having a highly efficient organization like the Anaconda Mining company in charge of development and exploitation of the property. The conduct of the affairs of the Walker Mining company by the Anaconda company has always been for the best interests of all the stockholders. Minority stockholders have always had a square deal.

"For the protection and gratification of minority stockholders I might say that in the one ore body in the Walker mine which is blocked out, not taking into account the huge reserves in the five other known ore bodies, there are more dollars gross than the combined capital, surplus and undivided profits of all the national, the savings, and the state banks and trust companies in the state of Utah."

As an indication of what the future holds for the property, it is announced that the company has already cut lumber for erection of a large, new milling plant, to be begun just as soon as the weather permits next spring. Inasmuch as the company already has one of the best tramways in the country, capable of transporting 350 tons a day from the mine to the Western Pacific loading station at Spring Garden, nine miles distant, with the erection of the new mill the Walker mine will possess a surface plant and underground equipment of the highest efficiency.

To me, the salient facts of President Walker's clear-cut and comprehensive statement are as follows: Out of the $30,000,000 contained in one of six great orebodies, 29 per cent goes to the International Smelting company for reduction costs, 9 per cent to the railroads for freight; 18 per cent for mine, milling and overhead charges. Totaling these items, we have an aggregate of 56 per cent which represents the cost of producing the metal; 44 per cent represents the net profit, which, figured on $30,000,000, leaves $12,500,000 or $10 per share for payment of dividends on a stock which is selling in small lots around $4 per share on the Salt Lake Stock and Mining Exchange.

Furthermore, this estimate does not take into account the fact that there are five other known ore bodies which may prove to be as large as the one blocked out. The individual investor may best estimate for himself the speculative value of a mine which in one of the six ore bodies lying along an ore zone traversing the estate four miles, there is a deposit such as the one described above.

At the present rate of production, 300 tons of milling and 100 tons of shipping ore daily, the com-

pany is producing 18,980,000 pounds of copper per year, which means at present metal prices the annual earning of a gross income of $3,000,000, or a net profit of $1,320,000 or over $1 per share.

COMPARATIVE STATEMENT SHOWING PRESENT PRODUCTION AND EARNINGS ON WALKER MINING COMPANY WITH PRESENT EQUIPMENT ONLY.

	Annual Tons Crude	Annual Lbs. Copper
300 tons daily mill ore—80 tons concentrates	109,500	11,680,000
100 tons daily shipping ore, 10% Cu.	36,500	7,300,000
	146,000	18,980,000

Annual production of copper—18,980,000 lbs. @ .1377c	$ 2,613,546
Gold and silver content, underestimated	386,454
	$ 3,000,000

EXPENSES, CHARGES AND COSTS AGAINST PRODUCTION

	Lbs. Copper	Annual Expense	Cost per Ton Crude	Cost lb. Copper
Smelter	5,504,200—29%	$ 870,000	$ 5.96	.04c
Railroad	1,708,200— 9%	270,000	1,84	.0124c
Mine, Milling and Overhead	3,416,400—18%	540,000	3.70	.0247c
Total Costs	10,628,800—56%	1,680,000	$11.50	.0771c
NET PROFIT	8,351,200—44%	1,320,000	$ 9.04	.0606c
	18,980,000	$3,000,000	$20.54	.1377c

In connection with these figures, it must be remembered that if the company builds a new mill as planned next spring, both the output and the profit will be greatly increased. Cognizance should also be taken of the facts that the one ore body blocked out contains enough ore to run the present 300-ton plant and 100 tons shipping ore for twelve years and that every cent advance in the price of copper above the present settlement quotation of .1377c means the anual addition of $189,000 to the profits of the company.

Out of 1,250,000 shares of the company—630,000 of which were taken up by the Anaconda Copper Mining company when it exercised its option October 1, 1918. Approximately 400,000 shares are owned by Walker Brothers, leaving but 220,000 shares of floating stock left with the public, most of which is held in large blocks by shrewd investors, a number of whom are too familiar with the possibilities of the mine to be induced to sell at any figure.

When it is taken into account that the Walker mine is ideally situated with regard to transportation; that on the property there are millions of feet of timber; that water in abundance for all milling and domestic purposes is available; that the mine is equipped with the most modern buildings and labor-saving machinery; that the mill is making a recovery of 96 per cent, a record not exceeded by any other metallurgical plant in the country; that the management of the mine is as efficient as can be found any place in the world; that the stock, outside of its great speculative value, has a proven dividend potentiality of at least $10 per share, purchase of Walker, to put it most conservatively, seems to me the best investment afforded in the entire range of mining or industrial issues.

The stock of the Walker Mining comany is listed only on the SALT LAKE STOCK & MINING EXCHANGE, and is quoted at the present time around $4 per share.

My business is that of a stockbroker, and in sending out this letter I am acting entirely in the interest of the investing public, realizing that in getting the public interested in this stock, which is the most meritorious issue that has ever been called to their attention, I am at the same time helping myself to bigger business.

I have no hesitancy in advising the public to buy this stock, and can assure all investors who see fit to favor me with their orders that they will receive prompt and efficient service.

GEORGE BAGLIN.

Exhibit 20

ANACONDA COPPER MINING COMPANY

25 Broadway

New York

OFFICE OF THE
GENERAL MANAGER OF MINES

Butte, Montana
August 21, 1941

Walker Mine

Mr. J. R. Hobbins, President,
Anaconda Copper Mining Company,
25 Broadway,
New York, New York

Dear Sir:

As you know the Walker Mining Company has lost money steadily for the last year and a half. This loss was carried as we were doing certain exploration work which we were in hopes would develop additional orebodies or extensions of the present orebodies. The main development consisted of the 1017 drift, which was to explore the orebody under the 900 level showing of the Piute section. This showing on the 900 level was exceptionally good for the Walker mine. 1017 drift has now reached under at least one-third of the orebody shown on the 900 level, and to date has not opened up any ore of importance; in other words the 900 orebody does not extend to the 1000 in appreciable quantities.

We have known for a long time that the ore in the North and Central orebodies would be exhausted about this time, but had hoped that the 1017 would come into ore to replace this production. On account of the failure of this drift the production at Walker Mine will drop very rapidly in the next few weeks. The production has dropped from approximately 1500 tons of ore per day to 800 tons, and after October will drop still lower. Copper production has been 700,000 to 800,000 pounds per month. This has now dropped to 600,000, and the months of September and October will not exceed 500,000.

On July first we had 459,000 tons of ore developed averaging 1.41% copper. We could mine this for the period of a year at some figure around 500 tons of ore per day at a cost in excess of 15¢ per pound. This small production would have to carry all the overhead of the Walker Mining Company.

Under present conditions existing in the United States it is doubtful that they would wish to lose this much copper. While the amount is small nevertheless every little bit helps, and it would seem advisable to place the Walker situation before the proper authorities in Washington before closing down the mine.

ANACONDA COPPER MINING CO.

COPY

There is certain development work in the Walker mine which could be carried on, but judging from results we have obtained from our rather extensive campaign to develop additional orebodies it is my judgment, which is concurred in by Messrs. Sales and Lyon, that we could not anticipate any discoveries of ore which would help the situation in the near future. Any long range development is extremely speculative and even if an orebody is found there is no reason to believe it would be of better grade than the ore which we have found to date. This is not commercial at 12¢ copper.

Taking all of the information and advice which we have at the present time into consideration I would recommend that the Government be approached with a view to determine whether they wish to continue the operation at Walker merely as a clean up operation at considerable additional cost for the copper or whether they would prefer to see the property close down. If they are not interested in keeping the property operating I recommend that it be closed. This matter is of extreme importance to the Walker Mining Company and some definite action should be taken on it as soon as possible.

If this property was entirely owned by the Anaconda Copper Mining Company we would have a different situation than we have to face at present. However, as we own only 51% of the stock of the Company we have minority stockholders to consider.

Yours very truly,

C. Weed

CEW/gf

cc: C. F. Kelley
J. O. Elton
R. M. Sales
Frederick Laist

Exhibit 21

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY I ION

3443 Routier Road, Suite A
Sacramento, CA 95827-3098
Phone: (916) 255-3000
Fax: (916) 255-3015

Cal/EPA

Pete Wilson, Governo

Larry D. Milner
ARCO
555 17th Street, 16th Floor
Denver, CO 80202

13 August 1997

WALKER MINE, PLUMAS COUNTY

Walker Mine is an inactive copper mine in Plumas County, California. Acid mine drainage from the main portal and onsite wastes discharge to Dolly Creek where they impair beneficial uses of surface waters of the United States. The mine has been a continuous source of pollutants to the Little Grizzly Creek watershed since the mine was operated by the Walker Mining Company prior to becoming inactive in 1941. During the mine's operation, International Smelting and Refining Company (ISRC), a subsidiary of the Anaconda Copper Mining Company, owned a majority of the company's stock. It is well documented that ISRC was actively involved in managing the daily operations of the mine. Since ARCO is the successor to Anaconda, we believe that ARCO is a responsible party for the required environmental remediation at Walker Mine.

While some money has been spent by other responsible parties to provide remediation at Walker Mine, there is a continuing need for additional remediation. We are seeking reimbursement for costs associated with past and future remedial activities. In the alternative, ARCO may undertake the remedial activities. California Water Code section 13304, requires responsible parties to be liable for cleanup and abatement of waste discharge. As a responsible party, ARCO's participation in the cleanup and abatement work is essential.

We would like to begin negotiating an agreement with ARCO for undertaking or reimbursing past and future remediation activities. Please contact Patrick Morris at (916) 255-3121 so that we can begin discussions on an agreement for future remediation activities at Walker Mine.

William J. Marshall

WILLIAM J. MARSHALL, Chief
Waste Discharge to Land Unit
Lower Sacramento River Watershed

APPROVED
either PWM
order

WJM:PWM

cc: Betsy Jennings, OCC, SWRCB, Sacramento
Rose Miksovsky, USDA, San Francisco
Terry Benoit, USFS, Quincy
Chris Garlasco, ARCO, Denver, Colorado
Carl Leverenz, Chico
Dan Kennedy, Paradise

FILE

Exhibit 22

California Regional Water Quality Control Board
Central Valley Region

Peter M. Rooney
Secretary for Environmental Protection

Sacramento Main Office
Internet Address: http://www.swrcb.ca.gov/~rwqcb5/home.html
3443 Routier Road, Suite A, Sacramento, California 95827-3003
Phone (916) 255-3000 • FAX (916) 255-3015

Ed J. Schnabel
Chair

CERTIFIED MAIL
Z 684 995 670

Mr. Neal Brody
Atlantic Richfield Company
ALF 3587
444 South Flower Street
Los Angeles, CA 90071

RECEIVED
JUN 17 1998
LEGAL ENV.

15 June 1998

WALKER MINE PROPERTY, PLUMAS COUNTY

On 13 August 1997 we requested (see enclosure) that Atlantic Richfield Company (ARCO) begin negotiating an agreement with the California Regional Water Quality Control Board (Regional Board) for past and future environmental remediation activities at the Walker Mine in Plumas County, California. We have not received a response from ARCO regarding this matter.

The Regional Board is continuing to seek reimbursement for costs associated with remedial activities required at the Walker Mine site. California Water Code, Division 7, Section 13304, requires responsible parties to clean up and abate waste discharges. The Board has spent over $1.5 million on past remedial activities at the site. Most of this was reimbursed by now defunct parties. The site requires about $120,000 annually to maintain existing remedial structures and to continue monitoring activities. Additional funding is required to remediate continuing discharges from onsite mine tailings.

We propose to either include ARCO as a discharger under Cleanup and Abatement Order No. 97-715 (enclosed), or adopt a similar Order for ARCO. Order No. 97-715 requires responsible parties in part to (1) reimburse the Regional Board for reasonable costs associated with oversight and remedial activities at this facility, and (2) continue operations and maintenance of existing remedial structures to minimize waste discharges from the site.

We request that ARCO respond to this letter by **1 August 1998** and so that we can begin to negotiate an agreement with ARCO for undertaking or reimbursing past and future remediation activities. In the alternative, Regional Board staff will draft a tentative Cleanup and Abatement Order naming ARCO as a responsible party at the Walker Mine site. If you have any questions regarding this matter, please contact Patrick Morris at (916) 255-3121.

William J. Marshall

WILLIAM J. MARSHALL, Chief
Waste Discharge to Land Unit
Lower Sacramento River Watershed

RECEIVED
JUN 19 1998
ENVIRONMENTAL REMEDIATION

cc: Tony Schwarz

Enclosures
13 August 1997 Regional Board letter
Cleanup and Abatement Order No. 97-715

cc w/o encl: Ms. Rose Miksovsky, United States Department of Agriculture, San Francisco
Mr. Terry Benoit, United States Forest Service, Quincy
Ms. Tracy Knorr, Office of the Attorney General, Sacramento
Ms. Frances McChesney, State Water Resources Control Board, Office of Chief Counsel, Sacramento
Mr. Phil Woodward, Central Valley Regional Water Quality Control Board, Redding
Mr. Jim Richey, Atlantic Richfield Company, Los Angeles
Mr. Dan Kennedy, Cedar Point Properties, Paradise
Mr. Carl Leverenz, Chico

Exhibit 23

California Regional Water Quality Control Board

Central Valley Region

Steven T. Butler, Chair

Winston H. Hickox
Secretary for Environmental Protection

Sacramento Main Office
Internet Address: http://www.swrcb.ca.gov/~rwqcb5
3443 Routier Road, Suite A, Sacramento, California 95827-3003
Phone (916) 255-3000 • FAX (916) 255-3015

Gray Davis
Governor

1 December 1999

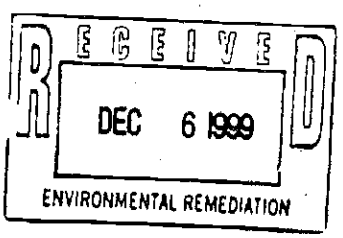
Mr. Terry Benoit
Plumas National Forest
P.O. Box 11500
Quincy, CA 95971-6025

Mr. Neal Brody
Senior Attorney
ARCO Legal Department
444 South Flower Street
Los Angeles, CA 90071

NOTICE
TENTATIVE ORDER REVISING
WASTE DISCHARGE REQUIREMENTS
ATLANTIC RICHFIELD COMPANY
AND
U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE, PLUMAS NATIONAL FOREST
WALKER MINE TAILINGS
PLUMAS COUNTY

Enclosed is a copy of a tentative order revising Waste Discharge Requirements (WDRs) Order No. 91-017 for the Walker Mine Tailings. The tentative WDRs name the US Forest Service and Atlantic Richfield Company as Discharger. The WDRs are being updated to reflect water quality improvements at the site and to provide a compliance time schedule for additional improvements. These revised requirements also modify the monitoring and reporting program. Any comments you may have concerning this revision should be submitted to this office by **30 December 1999**. Please contact Patrick Morris at (916) 255-3121 if you have any questions.

STEVE E. ROSENBAUM
Senior Engineering Geologist



Enclosures: Tentative Orders
Standard Provisions (Discharger only)

cc: See Attached List

cc: Ms. Rose Miksovsky, US Department of Agriculture, San Francisco
Ms. Tracy Winsor, Office of the Attorney General, Sacramento
Mr. Banky Curtis, Department of Fish and Game, Region II, Rancho Cordova
Department of Health Services, Office of Drinking Water, Redding
Department of Water Resources, Northern District, Red Bluff
Ms. Frances McChesney, State Water Resources Control Board, OCC, Sacramento
Ms. Liz Haven, State Water Resources Control Board, DWQ, Sacramento
Plumas County Environmental Health Department, Quincy
Plumas County Planning Department, Quincy
Mr. James Richey, Atlantic Richfield Company, Los Angeles
Mr. Dan Kennedy, Cedar Point Properties, Paradise

Exhibit 24

FILE COPY

DAVIS, GRAHAM & STUBBS LLP
A LIMITED LIABILITY PARTNERSHIP
ATTORNEYS AT LAW

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ROGER L. FREEMAN
(303) 892-7414
roger.freeman@dgslaw.com

December 30, 1999

VIA TELECOPY -
HARD COPY TO FOLLOW

Steve E. Rosenbaum
Senior Engineering Geologist
California Regional Water Quality Control Board
Central Valley Region
3443 Routier Road, Suite A
Sacramento CA 95827-3003

Re: Response to Tentative Revised Waste Discharge Requirements—Walker Mine Tailings, Plumas National Forest

Dear Mr. Rosenbaum:

This firm represents ARCO Environmental Remediation L.L.C. ("ARCO") with respect to the above-referenced matter. We are in receipt of your December 1, 1999 Notice of Tentative Order revising Waste Discharge Requirements ("WDRs") relating to the Walker Mine Tailings Site (the "Site"). The Notice seeks comments by December 30, 1999. ARCO appreciates the opportunity to provide these preliminary comments in advance of any formal issuance of the Tentative Order.

I. Introduction/Reservations of Rights.

As reflected in the information contained in the Tentative Order and other sources, the Walker Mine area has an extensive history of water quality regulation by various California agencies, dating back to at least the 1950s. ARCO has been trying to assimilate the various sources of information relating to this extensive regulatory history since receipt of your December 1 letter. However, given the short time provided to submit these comments, particularly in light of the holiday season, ARCO is not yet in position to comment on the technical feasibility of the new WDRs or scheduling requirements and related requirements in the

Tentative Order. Instead, this submission provides the legal and policy rationale for ARCO's position that naming ARCO as a "Discharger" under the revised WDRs is legally unsupportable, against federal and state policy, and plainly unwarranted. After outlining the bases for this position, we present ARCO's recommendation as to how the parties can avoid a contentious legal battle over this matter and instead create a forum in which the technical issues raised by the WDRs, as well as remaining issues surrounding the Site, can be systematically and efficiently addressed.

Please note that this submission represents only an informal set of comments on the Tentative Order, which we understand is not a final action of either the Central Valley Region of the California Regional Water Quality Control Board ("Regional Board") or any other state or federal agency. Thus, by presenting these comments, ARCO does not waive any argument, issue, point, submission, or other right it may have or assert in any future action taken by the Regional Board or any other party.

For purposes of brevity and given time restraints, these comments simply highlight the legal/policy problems and concerns raised by the Regional Board's proposal to name ARCO as a "Discharger" on the revised WDRs. Thus, while we occasionally cite legal authority relevant to ARCO's position, we intend to, and reserve all rights to, supplement and augment this statement if the Regional Board issues formal revised WDRs or pursues any related process.

II. Legal/Policy Objections to the Revised WDRs.

A. *ARCO Is Not and Has Never Been Involved with this Site*. The Tentative Order makes the bald assertion that the "Walker Mine Site was operated, in part, by the International Smelting and Refining Company ("ISRC")." Tentative Order ¶ 1. The Tentative Order goes on to state that since ISRC was a "subsidiary" of Anaconda Copper Mining Company, and ARCO is a successor to Anaconda, ARCO, along with the U.S. Department of Agriculture, Forest Service ("Forest Service"), are jointly referred to as the "Discharger" for purposes of the new WDRs.

The contention that ISRC "operated" the Walker Mine Site is wholly unsupported in the Tentative Order and finds no basis in law or fact. The Site was never owned or operated by ISRC, but rather by the Walker Mining Company ("WMC"), a separate company. While ISRC held slightly more than a 50% stock interest in WMC during a majority of that company's period of existence (approximately 1916 to 1941), WMC was always an independent company. In fact, when WMC wound down its affairs in 1944-45, it formally resolved its debts to ISRC and others

through a bankruptcy proceeding in which the bankruptcy court decreed that WMC "is not and has never at any time been an alter ego or instrument or department" of Anaconda or ISRC.[1]

The Bankruptcy Court's holding is consistent with applicable law as it existed at the time and as it has now evolved. In *In re* Aluminum Company of America ("Alcoa"), Order No. WQ 93-9, 1993 WL 303166 (Cal. St. Wat. Res. Bd. July 22, 1993), the State Water Resources Control Board ("State Board") recognized that the shareholders of a corporation generally are not liable under the California water quality laws for the actions of the corporation. An exception to this rule arises when: (1) there is such unity of interest and ownership that the separate personalities of the corporation and the shareholder no longer exist; and (2) if the acts are treated as those of the corporation alone, an inequitable result will follow. Id. at *6 n.4.[2]

At issue in Alcoa was whether Alcoa was the alter ego of two of its wholly owned subsidiaries. The Board found that Alcoa was not an alter ego despite the following facts: (1) Alcoa and its subsidiaries were jointly represented by the same counsel throughout the proceedings; (2) correspondence from Alcoa to the Regional Water Board indicated that Alcoa at one time held an interest in the mining site; (3) the principal executive office and the business address of all of the officers and directors of one of the subsidiaries was the Alcoa headquarters; (4) a senior financial officer for Alcoa served as a director and vice president of one subsidiary and a director of the other; (5) three of the four directors and four of the officers of one subsidiary had their business address at Alcoa's office. On its behalf, Alcoa submitted evidence that both subsidiaries were fully capitalized, independently operating companies, with their own boards of directors, assets, and bank accounts. The State Board concluded that "the evidence in the record is insufficient to support the conclusion that Alcoa exercised the type of pervasive management and control over [the subsidiaries] which would render Alcoa liable as the alter ego of the two subsidiaries." Id. at 3.

Unlike in the Alcoa case, where wholly-owned subsidiaries of Alcoa were involved in this case, ISRC held only about a 50% interest in WMC. However, like the relationship between

---

[1]The dissolution of WMC in bankruptcy raises separate questions of whether any liabilities at this Site arising from WMC's past actions have been discharged, an argument that we would pursue further if this proceeding continues.

[2]As discussed below, a similar standard is applied under federal law. The Supreme Court recognized in United States v. Bestfoods, 524 U.S. 51 (1998), that a corporate veil may be pierced and a shareholder held liable for the corporation's conduct when "the corporate form would otherwise be misused to accomplish certain wrongful proposes, most notably fraud, on the shareholder's behalf." The Court also reaffirmed the principle that mere majority ownership of a company's stock is not a sufficient basis on which to pierce the corporate veil.

Alcoa and its subsidiaries, the relationship between ISRC and the WMC was entirely within the bounds of the law. The WMC was fully capitalized, independently operated, with its own managers, assets, and bank accounts. Significantly, when the WMC could not pay its debt to ISRC, WMC was forced into bankruptcy, which resulted in the bankruptcy court's finding that ISRC was not the alter ego of WMC. Under the Alcoa case and applicable California law, the State Board would not sustain expanding the WDRs to include ARCO under these circumstances.

The Tentative Order's statement that ISRC "operated" the "Walker Mine Site" also suggests that the Regional Board believes that ISRC is "directly" liable under a Bestfoods analysis. In United States v. Bestfoods, 524 U.S. 51 (1998), after addressing the corporate veil piercing issues discussed above, the U.S. Supreme Court articulated the applicable standard in determining whether a shareholder is an "operator" of a facility under CERCLA. The Court held that a shareholder can be "directly" liable if it actually conducts operations at the facility that have to do with the leakage or disposal of hazardous waste or compliance with environmental regulations.

A similar theory of direct liability has been articulated by the State Board and the California courts in construing the California water quality laws. *In re* County of San Diego, Order No. WQ 96-2, 1996 WL 101751, at *4 (Cal. St. Wat. Res. Bd. Feb. 22, 1996) (observing that an entity is liable if its action "is the direct cause of a waste discharge."). Under either the federal or state test, ARCO is not a liable party here. ISRC did not "cause" any waste discharge or otherwise direct environmentally-related operations at the Site — as described below, the tailings "discharge" at issue here did not even materialize until after WMC's operations were terminated. There simply is no basis to conclude that ISRC is directly liable at the Walker Mine Site under either federal or state law.

B. *California Water Laws Do Not Apply Retroactively in this Situation*. Even if ARCO could be held liable for WMC's activities — which it cannot — WMC's wholly-past activities would not be subject to retroactive regulation in these circumstances under California water quality laws. As an initial matter, the State Board has specifically held under similar circumstances that the issuance of WDRs is not the appropriate procedure for addressing clean-up obligations. See *In re* County of San Diego, 1996 WL 101751, at *3-*4 (rescinding WDRs because a cleanup and abatement order pursuant to Water Code § 13304 "is the appropriate means to require clean-up actions, not WDRs."). WDRs are intended to address "proposed or current discharges, as opposed to past discharges," Id. at *3 (emphasis supplied). In this vein, the State Board noted in the Alcoa case that "dischargers are those with legal control over the property." 1993 WL 303166, at *4. ARCO does not have any control over the Site and is not the appropriate party to implement WDRs, and could not do so even if it desired, since the Site is on public land administered by the Forest Service.

As noted above, the procedural mechanism approved by the State Board in certain circumstances for imposing cleanup obligations is through a clean-up and abatement order under Water Code § 13304. See generally *In re* County of San Diego, 1996 WL 101751 at *3-*4 (collecting cases). However, Section 13304(f) contains an express provision that precludes the application of retroactive liability for conduct that occurred prior to 1981 when, at the time it occurred, the conduct at issue was lawful. It is clear that the federally-approved mining activities of WMC were lawful at the time, and that Section 13304(f) therefore precludes liability here.

We recognize that the State Board has held on occasion that past conduct can be deemed "unlawful" at the time where some form of nuisance existed at the time the conduct occurred. This theory is inapplicable here. First, as a factual matter, the Information Sheet attached to the Tentative Order recognizes that during the time the Walker Mine was in operation, Dolly Creek was diverted around the tailings area. The information sheet also notes that "after the mine ceased operations the tailings area also fell into disrepair." An alleged nuisance could arise only as a result of contamination caused by Dolly Creek coming in contact with the tailings. See *In re* County of San Diego, 1996 WL 101751, at *4 (observing that it is the "release of pollutants associated with [the] waste into the ground water that is . . . a violation of law."). Therefore, since Dolly Creek was diverted around the tailings during the entire period in which WMC operated the Site, no nuisance could have arisen at that time.

Second, the evolution of water quality regulation at this Site belies any theory that a nuisance arose during WMC's tenure at the mine. The mine, mill, and tailings pond were not a nuisance but a major economic boost to the area, approved and sanctioned by the federal government and partially permitted on federal land. In addition, the earliest water quality laws in California even potentially applying to this Site were not enacted until 1949, well after WMC was dissolved. See Alcoa, 1993 WL at 303166, at *4 (describing timing of California mine drainage regulations).

Third, not only were activities at the tailings Site lawful at the time, even the acid mine drainage problem from the mine adit that preoccupied the Regional Board for decades did not even begin until after WMC's activities had ceased. See People v. Barry, 239 Cal. Rptr. 349, 351-352 (Cal. Ct. App. 1987) (noting that Walker Mine discharged acid mine drainage since the mid-1940s, while mining ceased in about 1941). Moreover, the WDRs in place at this Site for decades have specifically forbidden the Forest Service (as the Discharger) from maintaining a nuisance at the tailings site — and it has never been suggested that one exists. In short, regardless of whether the Regional Board ultimately issues revised WDRs or an abatement order for this Site, it cannot retroactively apply the water quality laws in this situation.

C. *The Site is Subject to a Separate Federal Regulatory Process that will be Undercut by this Proceeding*. There can be no question, and the Regional Board apparently recognizes, that the Forest Service is the key party to any future work relating to the Site. The Site is a CERCLA federal facility which has been listed on the Federal Agency Hazardous Waste Compliance Docket since 1991. The Forest Service has taken the lead at the Site for over a decade in developing and implementing a series of studies and remedial actions under CERCLA attempting to address the relatively manageable and defined water quality issues associated with the tailings at the Site.[3] Discussions between ARCO and the Forest Service began in the early 1990s on these issues and there have been numerous meetings between Forest Service and ARCO regarding the appropriate remedial measures at the Site. As recently as last summer an ARCO team visited the Site to stay abreast of on-site developments. Discussions in recent years have centered on ways in which ARCO might lend future financial or technical assistance to identify and implement practical remedial approaches.

These discussions have stalled recently not by any "litigation" with ARCO, but by the Forest Service's unreasonable demands that ARCO pay a huge percentage of past costs incurred by that agency. By letter to the Forest Service's counsel dated May 21, 1999, ARCO described its position that it faces no CERCLA or other liability to the Forest Service and addressed the unreasonableness of the Forest Service's past cost demand. (Please let us know if you need a copy of this letter, which also addresses the Bestfoods issues outlined above.) No written response has been received by ARCO.

The point here is that the parties need to focus on what future course of action makes the most sense at the Site. This won't occur if the Regional Board proceeds with its proposed course of action. Instead, ARCO and the agencies will concentrate their resources on legal proceedings in which ARCO will almost certainly prevail. Even on the remote chance that ARCO is successfully named as a "discharger" along with the Forest Service under the revised WDRs, what would be accomplished? The Forest Service will remain the sole party responsible for remedial activities on this public-land site; it cannot cede this authority to ARCO even if it so desired.[4]

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[3]The allegation in the Tentative Order that the Forest Service had planned to "build a total of 15 acres of wetlands but has not constructed them due to litigation with ARCO" is incorrect. There has never been litigation between ARCO and the Forest Service surrounding this Site and ARCO's discussions with the Forest Service have not prevented it from conducting any type of remedial activity.

[4]Nor can the Forest Service delegate preparation of such CERCLA reports as the five-year report required under Section 121(c), now incorporated in Provision E.7 of the Tentative Order. In this vein, there is a serious question as to whether this entire proceeding is subject to various federal preemption restraints, another issue which ARCO would explore further if this matter proceeds.

ARCO has no access rights or legal interest in the Site that would allow it to proceed even if it were so inclined.

In short, the State's attempt to name ARCO as a Discharger will create a collateral legal battle which will only heighten the difficulties of resolving any future allocation of resources between ARCO and the Forest Service. The State Board has expressly declined to inject itself in such allocation disputes in the past. See *In re* San Diego, 1996 WL 101751, at *7, n.8 ("It is not within the authority of the [State or Regional Board] to apportion responsibility for the remediation activities").

D. *Any Action Against ARCO Is Time-Barred and Procedurally Suspect*. The WDRs at issue here have an extensive history, which is generally discussed in the Tentative Order itself and in the Barry case. The proposed revisions to the WDRs represent changes to longstanding WDRs under which the Forest Service has been operating for over 15 years; the history of WDRs at these sites goes back over 40 years. Nothing has changed with respect to the alleged role of ISRC and WMC in the decades since the State became involved at this Site. Various legal doctrines, such as laches, equitable estoppel, and the application of statutes of limitation would preclude Regional Board action against ARCO based on circumstances known for decades to both the State of California and the Forest Service. This is underscored by the very existence of the Barry case, involving many years of legal proceedings between the State and the site owner — long recognized as the only legally cognizable "discharger" here.

We also have serious questions regarding some of the procedural and financial mechanisms proposed in the Tentative Order. For instance, the Financial Assurance provisions relating to ARCO appear unwarranted and legally suspect. References are made in the Tentative Order to a public hearing of which ARCO has no knowledge. The procedural status of the prior Tentative Order is unclear. The entire process does not appear to meet due process requirements.

III. Conclusion/Proposed Approach.

Naming ARCO as a "Discharger" under the revised WDRs will simply result in contested proceedings and litigation, in which the State is unlikely to prevail and which will not change the basic situation at this Site. Rather than creating a legal quagmire, the Regional Board should take a productive and technically-oriented approach to facilitating discussions about how to proceed to address water quality issues at the Site. Use of a third-party mediator or other form of alternative dispute resolution might assist in these discussions. ARCO would be willing to engage in such discussions with representatives of the Regional Board and the Forest Service in lieu of the Tentative Order so long as all parties recognize that ARCO's role in this matter will always be subordinate to that of the Forest Service. We are willing to meet with all parties to discuss how

to shape such a process as an alternative to the expensive and cumbersome proceedings that would occur if ARCO were named in the Tentative Order. Please let us know if you wish to pursue such a course of action or wish to discuss this matter further.

Sincerely,

Roger L. Freeman
for
DAVIS, GRAHAM & STUBBS LLP

cc - **Via Regular Mail**:

Ms. Sandra Stash, ARCO, Anaconda
Mr. Neal Brody, Atlantic Richfield Company, Los Angeles
Mr. Michael Hagood, ARCO Environmental Remediation, Los Angeles
Ms. Rose Miksovsky, US Department of Agriculture, San Francisco
Ms. Tracy Winsor, Office of the Attorney General, Sacramento
Mr. Banky Curtis, Department of Fish and Game, Region II, Rancho Cordova
Department of Health Services, Office of Drinking Water, Redding
Department of Water Resources, Norhern District, Red Bluff
Ms. Frances McChesney, State Water Resources Control Board, OCC, Sacramento
Ms. Liz Haven, State Water Resources Control Board, DWQ, Sacramento
Plumas County Environmental Health Department, Quincy
Plumas County Planning Department, Quincy
Mr. James Richey, Atlantic Richfield Company, Los Angeles
Mr. Dan Kennedy, Cedar Point Properties, Paradise

Exhibit 25

California Regional Water Quality Control Board

Central Valley Region

Steven T. Butler, Chair

Winston H. Hickox
Secretary for Environmental Protection

Sacramento Main Office
Internet Address: http://www.swrcb.ca.gov/~rwqcb5
3443 Routier Road, Suite A, Sacramento, California 95827-3003
Phone (916) 255-3000 • FAX (916) 255-3015

Gray Davis
Governor

24 January 2000

Mr. Roger L. Freeman
Davis, Graham, and Stubbs, LLP
P.O. Box 185
Denver, CO 80201-0185

ATLANTIC RICHFIELD COMPANY, WALKER MINE TAILINGS

We have reviewed your 30 December 1999 letter regarding the Walker Mine Tailings site. The letter was in response to the 1 December 1999 tentative Waste Discharge Requirements (WDRs) wherein ARCO was named as a discharger at the site. Your letter discussed several reasons why ARCO should not be named in the WDRs. In response to your comments, we have removed ARCO from the tentative WDRs.

As mentioned in your letter, we agree that it may be beneficial to meet and discuss ARCO's participation with remedial activities at the Walker Mine Tailings site and at the Walker Mine. Please contact me at (916) 255-3121 so that we can begin discussions on an agreement for future remediation of these sites.

PATRICK MORRIS
Walker Mine Project

cc: Mr. Terry Benoit, Plumas National Forest, Quincy
Ms. Rose Miksovsky, US Department of Agriculture, San Francisco
Ms. Tracy Winsor, Office of the Attorney General, Sacramento
Ms. Frances McChesney, SWRCB, OCC, Sacramento
Mr. Neal Brody, Atlantic Richfield Company, Los Angeles
Mr. James Richey, Atlantic Richfield Company, Los Angeles

Exhibit 26

From: "Gebhardt, Roberta" <RGebhardt@mt.gov>
To: jhuggins@waterboards.ca.gov
Date: 9/23/2010 10:42 AM
Subject: RE: Anaconda Copper Mining Company records

Hi Jeff-

I looked at the folder for the Walker Mining Co.

Most of the correspondence is to or from Fred Laist, Manager, Anaconda Copper Mining Company. The correspondence mostly pertains to expanding the mill at the Walker Mine. There is nothing directly from the Mine in CA in the file. Most of the correspondence is from the Washoe Reduction Works in Anaconda (regarding ore samples), or the International Smelting Company in New York. I believe there is 1 letter from Mr. Elton, who was the president of Walker Mining Company.

There is also a prospectus for investors from 1922 (4 pages). It is from Geo. Baglin of Salt Lake and contains a report called Analysis and facts of the history of the Walker Mine. It specifically states that the Anaconda Company "directs the destiny" of the Walker Mine. And owns control of the Walker Mine.

So where do we go from here? If you are interested in copies of any of these items you can submit a research request. There is a $25.00 fee for the request and it includes an hour of research time and 10 free copies. Copies beyond 10 are $.35 a piece. There are 50 pages total in this folder (an additional $14.00 to have the whole folder copied). Here is a link to submit the research request http://mhs.mt.gov/research/library/generalresearch.asp

Your other option would be to hire a private researcher to look at the folder and determine what all you would be interested in from that folder. You can see a list of researchers here http://mhs.mt.gov/research/library/contractres.asp

Let me know if I can help in any other way.

Roberta

Roberta Gebhardt
Technical Services Librarian
Montana Historical Society
PO Box 201201
Helena MT 59620-1201
rgebhardt@mt.gov

406-444-4702

-----Original Message-----
From: Stoltz, Zoe Ann On Behalf Of MHS Library
Sent: Thursday, September 23, 2010 11:18 AM
To: 'Jeff Huggins'
Cc: Gebhardt, Roberta
Subject: RE: Anaconda Copper Mining Company records

Dear Mr. Huggins, I have ff your inquiry to Roberta Gebhardt. I understand that you have recently spoken to Roberta about your project.

Thank you,

Zoe Ann Stoltz
Reference Historian
Montana Historical Society Research Center
P.O. Box 201201
Helena, MT 59620-1201
Phone: 406-444-1988
Email: zstoltz@mt.gov

Who will teach your children the meaning behind the facts?
- Tammy Drennan

-----Original Message-----
From: Jeff Huggins [mailto:jhuggins@waterboards.ca.gov]
Sent: Wednesday, September 22, 2010 3:11 PM
To: MHS Library
Subject: Anaconda Copper Mining Company records

Hi,

I am interested in obtaining more information about files pertaining to the Anaconda Copper Mining Company subsidiary operation named Walker Mining Company. I found a reference to it under the Reports heading:

Box/Folder 82 / 8 #6.46 Subsidiaries: Walker Mining Company, Utah, 1922-1929

We are interested specifically in correspondence between Anaconda's management and the Walker Mine in Plumas County, California.

Can you tell me how best to go about it. I just spoke with Roberta and she said that she would take a look and respond via telephone. Do we need anything more formal than the telephone request?

Thank you,

Jeff S Huggins
Water Resources Control Engineer
Title 27 Permitting and Mining
Regional Water Quality Control Board
11020 Sun Center Drive, # 200
Rancho Cordova, CA 95670
Phone (916)464-4639
Fax (916)464-4782

Exhibit 27

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Central Valley Regional Water Quality Control Board

TO: Pamela C. Creedon, Executive Officer
Andrew Altevogt, Assistant Executive Officer
Robert Busby, Supervising Engineering Geologist

send out draft

FROM: Victor J. Izzo
Senior Engineering Geologist
TITLE 27 PERMITTING AND MINING

DATE: 11 April 2013

SUBJECT: TENTATIVE CLEANUP AND ABATEMENT ORDERS
WALKER MINE AND WALKER MINE TAILINGS FACILITY, PLUMAS COUNTY

Central Valley Water Board staff and the State Water Board's Office of Enforcement have prepared the attached tentative Cleanup and Abatement Orders (CAOs) for the Walker Mine and Walker Mine Tailings facility in Plumas County. The CAOs were developed after completing a Responsible Parties (RPs) search discussed in my 17 November 2011 memo.

Based on the results of the RP search, the Walker Mine CAO names ARCO as discharger and the Tailings CAO names both ARCO and the US Forest Service. Nearly all of the other potentially responsible parties are either long defunct (e.g., Walker Mining Company) or have previously settled with the Regional Board (e.g., recent landowners). Cedar Point Properties owns the mine and remains a potentially responsible party, but is no longer an active corporation and thus likely not a viable responsible party. Both CAOs would require the discharger(s) to assume responsibility at the respective sites and to take remedial actions.

Please review the tentative CAOs, determine if you concur with the CAO's and the remedial actions described. If so, please provide guidance on how the CAOs should be issued to the RPs, particularly regarding the following:

- Should we send a draft to the Discharger(s) and offer the opportunity to discuss the facts and potentially negotiate settlement of the remedial actions with the RPs before issuing the CAOs or go immediately to issuance of the Orders?
- Should the CAOs go to a Board hearing or have the Executive Officer sign the CAOs?
- Should the Executive Officer or an Attorney from the Office of Enforcement sign the transmittal letter for the CAOs?

Board staff and the Office of Enforcement's attorney recommend sending the draft CAOs to the Dischargers with the opportunity to discuss the facts and potentially negotiate a settlement of the remedial actions.

Please bear in mind that the Central Valley Water Board potentially is a responsible party for the mine seal and remedial actions that currently exist at the site and the sooner we bring ARCO in as a RP the sooner we are relieved of that responsibility.

cc: Andrew Tauriainen, Office of Enforcement

Exhibit 28

Davis Graham & Stubbs LLP

June 3, 2013

Robert Busby, M.S., P.G., C.E.G.
Supervising Engineering Geologist
Central Valley Region
11020 Sun Center Drive #200
Rancho Cordova, CA 95670

Andrew Tauriainen, Senior Staff Counsel
State Water Resources Control Board
Office of Enforcement
1001 I Street, 16th Floor
Sacramento, CA 95814

Re: Walker Mine and Walker Mine Tailings Sites, Plumas County
Atlantic Richfield Company Comments on Draft Orders

Gentlemen:

I submit this letter and comments as counsel for the Atlantic Richfield Company ("Atlantic Richfield") in the captioned matter. The Regional Water Quality Control Board for the Central Valley Region (the "Regional Board") on May 1, 2013 served by formal process two draft Cleanup and Abatement Orders (the "Draft CAOs") regarding the Walker Mine Site (the "Mine Site") and Walker Mine Tailings Site (the "Tailings Site" together with the Mine Site, the "Sites").

Atlantic Richfield appreciates the Regional Board's decision to provide Atlantic Richfield the opportunity to comment on the Draft CAOs. Atlantic Richfield regrets, however, that the Regional Board initially required a response to the Draft CAOs by May 20, 2013 when the Draft CAOs were served only 19 days earlier. Although the Regional Board's counsel agreed to extend the May 20 deadline by two weeks to June 3, 2013, the resulting time period for Atlantic Richfield's response (33 days) is not sufficient to prepare a complete response on issues that are legally and factually complex and that relate to events from so long ago. The abbreviated response period makes it particularly challenging to respond to the technical aspects of the Regional Board's conclusions about the Sites; thus, technical comments are not included in this submittal. Atlantic Richfield submits these comments without any express or implied waiver of Atlantic Richfield's right to present any additional evidence or arguments that may later develop.

In addition to the comments offered below, to the extent the Regional Board makes hearings available before finalizing draft cleanup and abatement orders, Atlantic Richfield requests that the Regional Board conduct a hearing and allow Atlantic Richfield to offer expert testimony and

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www.dgslaw.com

additional technical evidence to complete the administrative record in support of Atlantic Richfield's challenges to Draft CAOs.

SUMMARY OF COMMENTS

Atlantic Richfield disputes the Regional Board's assertion that Atlantic Richfield should pay for or perform any further remediation activity that may be necessary at the Sites. Neither Atlantic Richfield nor its predecessors (International Smelting & Refining Co. ("IS&R"), which later merged into the Anaconda Copper Mining Company ("Anaconda") owned or operated either Site. Nor has Atlantic Richfield conducted any past remediation at the Sites, which the Regional Board apparently now views as defective. And, as the Regional Board is aware, Atlantic Richfield negotiated a consent decree with the federal government for claims related to the Tailings Site (the "Consent Decree"). The U.S. District Court for the Eastern District of California approved the Consent Decree, including a contribution protection section that is expressly authorized by federal law and that bars claims such as those made in the Draft CAO for the Tailings Site. Thus, if the Regional Board finalizes the Draft CAOs, Atlantic Richfield reserves its right to contest the CAOs before the State Water Resources Control Board and, if necessary, its right to seek judicial review of any effort to enforce the CAOs in appropriate judicial proceedings.

I. Comments Applicable To The Tailings Site.

A. The Consent Decree Between Atlantic Richfield And The U.S. Forest Service Bars The Regional Board's Attempt To Impose Additional Liability On Atlantic Richfield At The Tailings Site.

The U.S. Forest Service ("USFS") has been performing investigatory and remedial work at the Tailings Site since at least 1991. The USFS issued a Record of Decision for the Tailings Site in 1994 (which ROD was later amended in 2001). In 1997, the USFS approached Atlantic Richfield asserting that, pursuant to CERCLA, Atlantic Richfield was a potentially responsible party for conditions at the Tailings Site. Atlantic Richfield disputed the USFS's claims – based in large part on the fact that Atlantic Richfield never owned or operated either the Mine Site or Tailings Site – but eventually resolved the dispute by entering a consent decree with the USFS, which the U.S. District Court for the Eastern District of California approved on June 13, 2005.

For present purposes, the key terms of the Consent Decree were these:

- Atlantic Richfield did not admit any liability arising out of the Tailings Site. (Consent Decree at § I.E.)[1]

[1] Because the Regional Board's Draft CAO for the Tailings Site references the Consent Decree, Atlantic Richfield presumes that a copy of the Consent Decree is available to the Regional Board and that none needs be added to the Administrative Record in this case. If the Regional Board does not have a copy of the Consent Decree, Atlantic Richfield will provide one upon request.

- Atlantic Richfield paid $2.5 million into an escrow account which the USFS agreed to use "to properly implement the ROD and any amendments to the ROD required to remediate current conditions at the [Tailings] Site." (Consent Decree at § VI.11.)

- In a section denominated "Effect of Settlement; Contribution Protection," the parties "agree[d], and by entering th[e] Consent Decree th[e] Court [found], that Settling Defendants are entitled . . . to protection from costs, damages, actions, or other claims (whether seeking contribution, indemnification, or however denominated) for matters addressed in th[e] Consent Decree as provided by (1) CERCLA Section 113(f)(2), and (2) any other applicable law." (Consent Decree at § IX.19.)

The contribution protection's scope extends to all "claims . . . however denominated . . . for matters addressed in th[e] Consent Decree." (*Id.*) The Consent Decree goes on to define "matters addressed" as "all Response Actions taken or to be taken and all Response Costs incurred or to be incurred by the United States *or any other person* with respect to the [Tailings] Site." (*Id.* (emphasis added).) The Consent Decree further defines "Response Actions" by reference to CERCLA's definitions of "remedial" and "removal" actions. (Consent Decree at § IV.3 ("'Response Action' shall mean remove, removal, remedy and remedial action, as those terms are defined in Section 101 of CERCLA.").) Those CERCLA definitions, in turn, are exceptionally broad: "The terms 'remove' or 'removal' means [sic] the cleanup or removal of released hazardous substances from the environment, . . . or the taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment, which may otherwise result from a release or threat of release." 42 U.S.C. § 9601(23); *see also* 42 U.S.C. § 9601(24) ("The terms 'remedy' or 'remedial action' means [sic] those actions consistent with permanent remedy taken instead of or in addition to removal actions.").

The Draft CAO unquestionably contemplates activities that constitute Response Actions as defined in the Consent Decree. If finalized as drafted, the CAO for the Tailings Site would require Atlantic Richfield to "investigate, identify, and classify all sources of mining waste," "submit a work plan and Time Schedule to close and maintain the tailings . . . to remediate the site in such a way to prevent future releases of mining waste," to "submit regularly quarterly reports documenting progress in completing remedial actions," and to "complete all remedial actions and submit a final construction report." (Draft CAO for Tailings Site at p. 9-10.) The "matters addressed" in the Consent Decree thus encompass the Regional Board's claim that Atlantic Richfield must now perform what amount to additional Response Actions at the Tailings Site.

CERCLA expressly authorizes court approval of contribution protection like that afforded to Atlantic Richfield in the Consent Decree and courts regularly enforce such contribution protection provisions. CERCLA Section 113(f)(2) provides that "[a] person who has resolved its liability to the United States or a State in an administrative or judicially approved settlement

shall not be liable for claims for contribution regarding matters addressed in the settlement." 42 U.S.C. § 9613(f)(2); *see also id.* at § 9622(g)(5) (making the same provision for *de minimis* settlements). Courts interpreting contribution protection clauses similar to the one here consistently enforce the clauses to bar claims like the Regional Board's. *See, e.g., United States v. S.E. Pa. Transp. Authority*, 235 F.3d 817, 822-23 (3d Cir. 2000); *City of Waukegan v. Nat'l Gypsum Co.*, No. 07 C 5008, 2009 WL 674347 at *2 (N.D. Ill. Mar. 12, 2009); *Alcan Alum. Corp. v. Butler Aviation-Boston, Inc.*, No. 3-CV-02-0562, 2003 WL 22169273 at *3-4 (M.D. Pa. Sept. 19, 2003). Proceeding with the Draft CAO for the Tailings Site would thus flaunt both the unambiguous terms of the Consent Decree and the plain meaning of federal law.

Proceeding with the Draft CAO for the Tailings Site in spite of Atlantic Richfield's entitlement to contribution protection would also undermine CERCLA's purpose of encouraging early settlement and remediation of contaminated sites. CERCLA's contribution protection "provision was designed to encourage settlements and provide PRPs a measure of finality in return for their willingness to settle." *United States v. Cannons Eng'g Corp.*, 899 F.2d 79, 92 (1st Cir. 1990). This purpose applies with equal force regardless of what statutory or common law basis the Regional Board asserts for its claims; a contrary rule "would eviscerate § 9613(f)(2) and allow . . . an end run around the statutory scheme." *Id.* Accordingly, Atlantic Richfield requests that the Regional Board look to the USFS as the responsible party for any response action as the Consent Decree bars any third party claim against Atlantic Richfield related to the Tailings Site.

B. Several Other CERCLA Provisions Bar The Regional Board's Attempt To Alter Or Supplement The Ongoing Remedial Efforts At The Tailings Site.

In addition to its contribution protection provision, CERCLA contains several other sections that bar the Regional Board's attempt to impose cleanup obligations in connection with the Tailings Site. CERCLA Section 113(b) states that "the United States district courts shall have exclusive original jurisdiction over all controversies arising under this chapter." 42 U.S.C. § 9613(b). Section 113(b)'s exclusive federal jurisdiction provision "cover[s] any 'challenge' to a CERCLA cleanup," even challenges based on state law. *Fort Ord Toxics Project v. California E.P.A.*, 189 F.3d 828, 832 (9th Cir. 1999). An action "challenges" a CERCLA cleanup and violates Section 113(b) "where the plaintiff seeks to dictate specific remedial actions, to postpone the cleanup, to impose additional reporting requirements on the cleanup, or to terminate the RI/FS and alter the method and order of cleanup." *ARCO Environmental Remediation, LLC v. Dep't of Health & Environmental Quality of Mont.*, 213 F. 3d 1108, 1115 (9th Cir. 2000) (internal citations omitted).

The Draft CAO for the Tailings Site purports to "dictate specific remedial actions" and therefore violates CERCLA Section 113(b). Even though the Draft CAO leaves open for later decision exactly *what* remedial actions will eventually be required, nonetheless it clearly contemplates *some* additional affirmative remedial action as the Regional Board's goal. The U.S. Forest Service has been conducting remedial action at the Tailings Site since issuance of the Record of Decision for the Tailings Site in 1994. Any different or additional remedial action the Regional

Board's CAO may require therefore will "interfere[] with the implementation of a CERCLA remedy." *Broward Gardens Tenants Association v. EPA*, 311 F.3d 1066, 1072 (11th Cir. 2002). CERCLA, thus, bars the Regional Board from issuing a CAO under these circumstances.

CERCLA Section 122(e)(6) also prohibits the Regional Board's proposed CAO: "When either the President, or a potentially responsible party pursuant to an administrative order or consent decree under this chapter, has initiated a remedial investigation and feasibility study for a particular facility under this chapter, no potentially responsible party may undertake any remedial action at the facility unless such remedial action has been authorized by the President." 42 U.S.C. § 9622(e)(6). The U.S. Forest Service conducted its remedial investigation and feasibility study for the Tailings Site many years ago, resulting in the 1994 Record of Decision, and the U.S. Forest Service's remedial activities at the Tailings Site are still ongoing. Congress' purpose when enacting Section 122(e)(6) was to "avoid situations" where a party performs "work at a site that prejudges or may be inconsistent with what the final remedy should be or exacerbates the problem." 132 Cong. Rec. S14895-02, 1986 WL 788210 (daily ed., Oct. 3, 1986). The Regional Board's Draft CAO would pose precisely the problem Congress sought to avoid and Section 122(e)(6) therefore bars implementation of the Draft CAO for the Tailings Site.

C. California State Law Also Prohibits The Regional Board's Effort To Impose Additional Liability After Entry Of The Consent Decree.

California Code of Civil Procedure § 877 states: "Where a release, dismissal with or without prejudice, or a covenant not to sue or not to enforce judgment is given in good faith before verdict or judgment to one or more of a number of tortfeasors claimed to be liable for the same tort, or to one or more other co-obligors mutually subject to contribution rights, it shall have the following effect: . . . (b) It shall discharge the party to whom it is given from all liability for any contribution to any other parties." There is no allegation that Atlantic Richfield and USFS entered the Consent Decree in bad faith – indeed, the Court's order approving the Consent Decree included a finding that Atlantic Richfield and USFS had negotiated the Consent Decree in good faith (Consent Decree at § I.O) – so California law as well as federal law prohibits the Regional Board from imposing on Atlantic Richfield additional liability related to the Tailings Site.

II. Comments Applicable To Both Sites.

A. The Regional Board Cannot Hold Atlantic Richfield Responsible For Walker Mining Corporation's Conduct When Atlantic Richfield's Alleged Predecessor Was A Mere Shareholder In Walker Mining Corporation.

Neither Atlantic Richfield nor Atlantic Richfield's predecessors ever owned or operated the Walker Mine. The Walker Mining Corporation owned and operated the Walker Mine. IS&R –

which later merged into Anaconda, which in turn later merged into Atlantic Richfield – was simply a shareholder in the Walker Mining Corporation.

Atlantic Richfield's status as the possible successor to a shareholder means the Regional Board can hold Atlantic Richfield responsible for remediation activities at the Walker Mine only if the Regional Board brings out evidence showing one of two circumstances: (1) IS&R or Anaconda was the alter ego of the Walker Mining Corporation so as to justify piercing Walker Mining Corporation's corporate veil; or (2) IS&R or Anaconda conducted operations specifically related to pollution at Walker Mine. To find that either of these circumstances exists here, the Regional Board's evidence must be "substantial." *In re Alum. Co. of Amer.*, Order No. WQ 93-9, 1993 WL 303166 at *3 (Cal.St.Wat.Res.Bd. July 22, 1993) ("[T]here must be substantial evidence to support a finding of responsibility for each party named.").

The U.S. Supreme Court's decision in *United States v. Bestfoods* is the most frequently cited authority for limiting shareholder liability in the environmental context to the two circumstances just described, *see* 524 U.S. 51 (1998), and those limits apply equally under the California Water Code (the "Water Code"). Water Code § 13304 applies only to a "person who has . . . caused or permitted, causes or permits, or threatens to cause or permit any waste to be discharged or deposited where it is, or probably will be, discharged into the waters of the state and creates, or threatens to create, a condition of pollution or nuisance." A shareholder could not "cause or permit" a discharge without either being the alter ego of the corporation that actually caused the discharge or controlling the aspect of the operations that were the source of the discharge.[2] *In re Mr. Kelly Engineer / All Star Gasoline, Inc.*, Order WQO-2002-0001, 2002 WL 232806 at *2 (Cal. St. Wtr. Res. Bd. Jan. 23, 2002) (citing *Bestfoods* and remanding because a regional board's order imposing liability on a shareholder "did not adequately show that [the shareholder] was the operator of the facility even though he had created a corporation."); *see also In re Original Sixteen to One Mine, Inc.*, Order WQO 2003-0006, 2003 WL 21224472 at *3 (Cal. St. Wtr. Res. Bd. Apr. 30, 2003) (explaining that shareholder liability under the Water Code can be either direct – if the shareholder "personally participated in the wrongful conduct or authorized that it be done" – or indirect, where the shareholder is the corporation's alter ego).

1. Neither IS&R Nor Anaconda Was An Alter Ego Of Walker Mining Corporation.

The United States Bankruptcy Court long ago rejected any claim that Anaconda or IS&R was an alter ego of Walker Mining Corporation. In the course of approving IS&R's claim against the Walker Mining Corporation's bankruptcy estate in 1945, the bankruptcy court found as follows:

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[2] Indeed, even the Regional Board's Draft CAOs implicitly recognize the limits on shareholder liability by charging that "Anaconda was a direct operator of the mine and . . . [i]n the alternative, . . . Anaconda operated Walker as a corporate alter ego." Draft CAO for Mine Site at ¶¶ 36-37.

- "Debtor [*i.e.*, Walker Mining Corporation] is not and has never at any time been an alter ego or instrument or department of Anaconda Copper Mining Company or of International Smelting & Refining Company, hereinafter claimant."

- "Debtor's business and affairs have at all times been carried on and conducted in the manner and according to the methods and practice usually employed by corporations free of any domination or control by others."

- "[N]o act or omission of said Anaconda Copper Mining Company or of said Claimant, their officers, agents and employees, or any of them established by any evidence, constitutes or proves any domination or control by them of any of them over Debtor or any of Debtor's acts, business or affairs, or constituted fraud, or occasioned damage or prejudice to or violated any right of Debtor or any of its stockholders." (Exh. 1.)

The bankruptcy court made its findings at a time when the evidence was far fresher than it is now, and nothing in the Regional Board's recently produced evidence contradicts those findings. To determine that IS&R or Anaconda was an alter ego of Walker Mining Corporation, the Regional Board would have to demonstrate "(1) that there be such unity of interest and ownership that the separate personalities of the corporation and the [shareholder] no longer exist, and (2) that, if the acts are treated as those of the corporation alone, an inequitable result will follow." *Associated Vendors, Inc. v. Oakland Meat Co.*, 210 Cal. App. 2d 825, 837 (Cal. 1962). As the State Board has explained, such "unity of interest and ownership" is usually found only where "(1) the corporation is under-capitalized to meet its likely obligations, (2) there is a failure to observe a strict separation between corporate and shareholder assets, (3) the corporation appears to have been used as a shell to perpetrate fraud or injustice, and (4) the corporate officers have failed to observe other corporate formalities." *In re Original Sixteen to One Mine, Inc.*, 2003 WL 21224472 at *3 (citing *Associated Vendors* and summarizing the factors courts consider when considering whether to pierce a corporation's veil).

The Draft CAOs do not even mention these requirements for alter ego liability. Likewise, the evidence the Regional Board has produced does not relate to Walker Mining Corporation's capitalization, assets, or its corporate formalities, let alone demonstrate fraud or the treatment of Walker Mining Corporation as a "shell." The Draft CAOs make the bare allegation that "Anaconda, through International, financed the indebtedness of Walker from at least 1922 through 1944 . . . [and] carried the costs of exploration and development during periods when Walker was not profitable." Draft CAO for Tailings Site at ¶ 28; Draft CAO for Mine Site at ¶ 37. But the documents the Regional Board recently produced do not appear to directly support these allegations. *Cf.* Draft CAO for Mine Site at ¶ 35 (explaining that "[d]ocuments showing Anaconda's direct operation of the mine are contained in Attachment E," but not mentioning documents related to financing). Atlantic Richfield is entitled to review all evidence relied on by the Regional Board in support of its proposed orders. If the Regional Board has relied upon historical documents not previously produced to Atlantic Richfield, Atlantic Richfield requests

that the Regional Board produce such documents for its review.[3] However, based on all evidence of which Atlantic Richfield is aware, there is no substantial evidence to support a Regional Board finding that IS&R or Anaconda was the alter ego of Walker Mining Corporation.

2. Neither IS&R Nor Anaconda Operated The Tailings Site.

IS&R and Anaconda did not operate the Tailings Site and it is entirely unclear what basis the Regional Board has for taking the contrary position that IS&R and Anaconda "concurrently operated the mine and tailings from 1918 through at least 1943." Draft CAO for Tailings Site at ¶ 26. Here again, it appears the Regional Board must be relying on documents or other evidence the Regional Board has not disclosed to Atlantic Richfield. The documents the Regional Board recently produced make no mention of how or where the Walker Mine disposed of tailings or any IS&R or Anaconda participation in those activities. And the earliest of the documents produced by the Regional Board is dated August 31, 1922; there are no documents indicating the extent of IS&R's or Anaconda's involvement beginning in 1918. If the Regional Board relied upon documents other than those produced, Atlantic Richfield requests again that the Regional Board immediately make any such additional documents available. Based on all evidence available to Atlantic Richfield, there is no substantial evidence to support the Regional Board's position that IS&R or Anaconda operated the Tailings Site.

3. Neither IS&R Nor Anaconda Operated The Mine Site.

The vast majority of the documentation produced by the Regional Board relates to IS&R's and Anaconda's purported involvement with exploration and development work at the Mine Site. That documentation is insufficient to impose liability on IS&R or Anaconda as a shareholder, for at least three reasons, as follows.

First, the documents produced by the Regional Board do not demonstrate IS&R or Anaconda involvement in any mine activities that would have caused pollution, namely "the leakage or disposal of hazardous waste." *Bestfoods*, 524 U.S. at 67. To be responsible for cleanup operations as a facility operator, IS&R or Anaconda must have "manage[d], direct[ed], or conduct[ed] operations *specifically related to pollution*." *Id.* at 66 (emphasis added). The documents the Regional Board produced are limited to exploration, development, and, very occasionally, personnel matters at the Walker Mine. The documents do *not* discuss proper removal, disposal, or storage of waste. In fact, the documents say little even about how ore would be removed from the Mine, instead focusing almost exclusively on where more ore could be located. The documents also do not reflect any IS&R or Anaconda participation in the Mine's closure – an activity that undoubtedly could have prevented much, if not all, of the allegedly

[3] In the event that the Regional Board produces additional evidence after Atlantic Richfield submits these comments or otherwise attempts to supplement the administrative record, Atlantic Richfield reserves its right to respond to that additional evidence by supplementing these comments or introducing additional evidence on its own behalf.

ongoing discharges from the Mine -- indicating that Walker Mining Corporation alone conducted mine closure activities during that period.[4]

Second, the documents produced by the Regional Board do not demonstrate IS&R or Anaconda control over the facility, but instead relate merely to the relationship between IS&R/Anaconda and Walker Mining Corporation. The critical question for purposes of determining a corporate shareholder's liability for allegedly operating a corporate-owned facility "is not whether the [shareholder] operates the [corporation], but rather whether [the shareholder] operates the facility, and that operation is evidenced by participation in the activities of the facility, not the [corporation]." *Bestfoods*, 554 U.S. at 68. The documents the Regional Board produced, at most, indicate interactions between IS&R/Anaconda and Walker Mining Corporation *regarding* the Walker Mine; the documents do not indicate IS&R/Anaconda directly *operating* the Walker Mine (*i.e.*, the "facility").

Third, the Regional Board's documentation does not actually demonstrate the level of control suggested in the Draft CAOs. In fact, many of the documents indicate that Walker Mining Corporation often refused to heed IS&R or Anaconda's recommendations. For instance, a September 20, 1923 letter between Reno Sales, of Anaconda, and Paul Billingsley, of IS&R, mentions that "the developments at the mine are carried on just about as Hart [the Walker Mine manager at the time] wants them." The letter goes on to say that Hart was not even providing maps of the Mine to Anaconda. On the subject of Anaconda geologists visiting Walker Mine, Mr. Sales states "I think it is absolutely useless for members of the Geological Department to be chasing to the Walker Mine on matters which are of no great moment and for which they are not responsible." Similarly, in a September 22, 1925 letter from another Anaconda geologist to Mr. Billingsley, the geologist recounted being "perturbed" by the Walker Mine manager's refusal to follow Anaconda's recommendations.[5] It seems highly unlikely that Anaconda would have allowed such disobedience from its mine manager to persist for over two years if "Anaconda operated the [Walker Mine] as it would have any of its directly-owned assets," as the Draft CAO for the Mine Site contends. Draft CAO for Mine Site at ¶ 35.

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[4] Atlantic Richfield notes that the Draft CAOs describe the cause of the alleged discharge at Walker Mine in only the most general terms. *See* Draft CAO for Mine Site at ¶ 22 ("The apparent source of the continuing elevated levels of copper is leachate being generated by surface water runoff from rainfall and/or snowmelt that comes in contact with the 700 level adit, the ruins of the mill and concentrator, exposed mining waste piles in and around the portal area, mining waste in the Dolly Creek drainage and mining waste in the tailings impoundment."). Without more specific data or information, it is exceptionally difficult to determine specifically what activities at the mine causes the alleged discharges there (and thereby who, if anyone other than Walker Mining Corporation, conducted those activities and could consequently be responsible for cleaning up or abating the alleged discharges). Regardless, based on the information available to Atlantic Richfield, there does not appear to be any substantive evidence of IS&R or Anaconda involvement in pollution-causing activities.

[5] *See also* October 25, 1924 letter from Reno Sales to Wm. Wraith, IS&R (saying that "some of the developments in the Walker Mine are not being carried out in accordance with the recommendations of the Geological Department [and] this department cannot be responsible for the manner in which some of the prospecting work has been done."); November 24, 1924 letter from Reno Sales to Wm. Wraith ("I know the Geological Department will not be held responsible for mining operations at the Walker . . . [and] in the final say so as to how it will be done I certainly am always glad and willing to leave it to the mine management.").

For all three of these reasons, the Regional Board cannot hold IS&R or Anaconda responsible for pollution at the Walker Mine based on a direct operator theory. The evidence the Regional Board has produced is insubstantial and does not correlate to the appropriate legal standards.

B. The Water Code Bars Retroactive Liability For Activities That Were Lawful At The Time.

Water Code § 13304(j) clarifies that Section 13304 "does not impose any new liability for acts occurring before January 1, 1981, if the acts were not in violation of existing laws or regulations at the time they occurred." Walker Mining Corporation stopped operating the Walker Mine in 1941, and thus any acts which the Regional Board seeks to attribute to Atlantic Richfield occurred well before 1981. By speaking in terms of "laws or regulations," Water Code § 13304(j) evinces the Legislature's intent to impose liability only for past violations of statutory or regulatory law. *But see In re Petitions of County of San Diego*, 1996 WL 101751 at *3 (Cal. St. Wtr. Res. Bd. 1996) (interpreting Water Code § 13304(j) as imposing liability for any pre-1981 activities deemed to have constituted a nuisance at the time). Yet the Regional Board's document production reveals no evidence of any unlawful activity at the Mine Site or Tailings Site – nuisance or otherwise – and Water Code § 13304(j) therefore bars any liability.

C. The Regional Board's Actions Are Time Barred.

The statute of limitations for "[a]n action commenced under the Porter-Cologne Water Quality Control Act (Division 7 (commencing with Section 13000 of the Water Code))" is three years. Cal. Code of Civ. Proc. § 338(i). The limitations period accrues from "the discovery by the State Water Resources Control Board or a regional water quality control board of the facts constituting grounds for commencing actions under their jurisdiction." *Id.* By the Regional Board's own admission, it has believed since 1997 that it has grounds for asserting jurisdiction. (Draft CAO for Mine Site at ¶ 31.)

The State Board has previously interpreted Cal. Code of Civ. Proc. § 338(i) as applicable only to "actions" filed in court, as opposed to cleanup and abatement orders. *See In re Trans-Tech Resources*, Order No. WQ 89-14, 1989 WL 110603 at *2 (Cal. St. Wtr. Res. Bd. Aug. 17, 1989). The *Trans-Tech* decision's rationale is highly suspect, however. In *Trans-Tech*, the State Board at once interpreted the word "action" in Cal. Code of Civ. Proc. § 338(i) as limited to judicial proceedings, and simultaneously interpreted the same word as applicable to both administrative and judicial proceedings when used in a different statute, with the result that the Regional Board's cleanup and abatement order would stand. Thus, there is substantial question whether the State Board could or should follow its *Tetra-Tech* decision. Consequently, the Regional Board should decline to issue the Draft CAOs in this case given the time passed since the end of the limitations period.

D. The Regional Board Cannot Recover Past Costs Through A Cleanup And Abatement Order.

The Regional Board's Draft CAO for the Mine Site attempts to hold Atlantic Richfield responsible for past costs the Regional Board incurred there. (Draft CAO for Mine Site at p. 11, ¶ 2 ("The Discharger shall reimburse the [Regional Board] for reasonable costs . . ., including the [Regional Board's] previous expenditures for remedial actions, pursuant to Water Code section 13305, subdivision (c)(1)."[6] The Regional Board cannot collect such past costs using a cleanup and abatement order. In defined circumstances, Water Code § 13304(c)(1) makes "reasonable costs actually incurred in cleaning up . . . waste, abating the effects of . . . waste, . . . or taking other remedial action . . . recoverable *in a civil action.*" (Emphasis added.) As previously discussed with regard to the statute of limitations for Water Code liability, current State Board precedent holds that a cleanup and abatement order is *not* a civil action.

E. If Atlantic Richfield Bears Any Responsibility For The Sites, Atlantic Richfield's Liability Must Be Secondary To The Respective Liabilities Of USFS And The Regional Board.

Where the Regional Board seeks to hold multiple parties responsible for the same site, the State Board has suggested that the Regional Board either divide liability between a primary party and secondary parties, *see In re Prudential Ins. Co. of Amer.*, Order No. WQ 87-6 at p. 5 (Cal. St. Wtr. Res. Bd. June 18, 1987), or divide responsibility for different parts of a cleanup and abatement order, *see In re Petition of San Diego Unified Port District*, 1989 WL 118194 at *5 n.6 (Cal. St. Wtr. Res. Bd. Aug. 17, 1989) ("[I]t may be appropriate for the Regional Board to direct the parties to submit a plan specifying the roles of each party in implementing the cleanup and abatement order.").

The Regional Board should designate the USFS as the party primarily liable for any remediation activities at the Tailings Site. USFS is, and always has been, the Tailings Site's owner. USFS also knew of and approved the Tailings Site's use for storage of mine waste from the Mine Site. (Exh. 2.) Furthermore, Atlantic Richfield contributed $2.5 million in good faith settlement of its purported liability for Tailings Site cleanup in consideration for the USFS' commitment to take all actions necessary to respond to releases of hazardous substances at the Tailings Site. To the extent the Regional Board believes the USFS's remedial actions at the Tailings Site are insufficient to protect human health and the environment, the Regional Board must require the USFS address the deficiencies identified by the Regional Board.

The Regional Board is, itself, the party primarily liable for any remediation activities at the Mine Site. The Regional Board conducted all prior remediation activities at the Mine Site, and appears to have done so with more than $1 million in funds from other parties who were very clearly

[6] Presumably, the intended statutory citation here is to Water Code § 13304(c)(1). Water Code § 13305(c) does not include a subsection (c)(1).

liable for the condition of the Mine Site as its past owners. When conducting the remediation, the Regional Board had a duty to exercise an appropriate standard of care; if the Regional Board's remedial actions are now failing, it may well be the result of the Regional Board having breached applicable standards of care. The Regional Board may also have liability for conditions at both Sites as an "operator" and/or "arranger" pursuant to Cal. Health & Safety Code § 25363. Thus, primary responsibility for fixing any problems with the Regional Board's prior remedial actions should lie with the Regional Board.

On behalf of Atlantic Richfield, we appreciate the Regional Board's careful consideration of these comments, and respectfully request that the Regional Board withdraw the Draft CAOs. Representatives of Atlantic Richfield are available to meet with Regional Board representatives to explain and discuss the Draft CAOs and the positions set forth in this letter.

Sincerely,

William J. Duffy
for
DAVIS GRAHAM & STUBBS LLP

WJD:lg

cc: James L. Lucari, Esq.
Marcus Ferries, P.E.
Brian S. Johnson, P.E.
Earl W. Ford, USDA Forest Supervisor
Jeffrey Moulton, USDA, San Francisco

Exhibit 29

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Central Valley Regional Water Quality Control Board

2 October 2013

VIA CERTIFIED MAIL NO.
7013 0600 0001 4937 9439

Atlantic Richfield Company
ATTN: Legal/Environmental Affairs
c/o CT Corporation System
818 W Seventh St
Los Angeles, CA 90017

VIA CERTIFIED MAIL NO.
7013 0600 0001 4937 9453

Tom Vilsack, Secretary
United States Department of Agriculture
1400 Independence Ave, S.W.
Washington, DC 20250

VIA CERTIFIED MAIL NO.
7013 0600 0001 4937 9446

Tom Tidwell, Chief
United States Forest Service
1400 Independence Ave, SW
Washington, D.C. 20250-0003

RE: NOTIFICATION OF HEARING AND PROPOSED HEARING PROCEDURES, CLEANUP AND ABATEMENT ORDERS R5-2013-XXXX (WALKER TAILINGS) AND R5-2013-YYYY (WALKER MINE), PLUMAS COUNTY, CALIFORNIA

On 29 April 2013, the Central Valley Regional Water Quality Control Board (Central Valley Water Board) served copies of draft Cleanup and Abatement Order (CAO) No. R5-2013-XXXX, regarding the Walker Tailings, to the United States Department of Agriculture, United States Forest Service (Forest Service) and Atlantic Richfield Company (Atlantic Richfield), and draft CAO No. R5-2013-YYYY, regarding the Walker Mine, to Atlantic Richfield. The Central Valley Water Board solicited comments, which the Forest Service and Atlantic Richfield separately provided on 3 June 2013. As part of its comments, Atlantic Richfield requested that the Central Valley Water Board conduct a hearing prior to finalizing the CAOs.

The Central Valley Water Board will hold a joint hearing on the Walker Mine and Walker Mine Tailings CAOs during the **5-6 December 2013** Board meeting in Rancho Cordova, California. Enclosed with this letter are draft Hearing Procedures prepared by the Prosecution Team. Once finalized, the Hearing Procedures will govern the hearing. The Hearing Procedures may be amended by the Central Valley Water Board's Advisory Team in its discretion. Any objections to the draft Hearing Procedures must be received by David Coupe, whose contact information is listed in the Hearing Procedures, no later than **5 p.m. on 10 October 2013**. If no objections are received, this version of the Hearing Procedures will become final. The Forest Service and Atlantic Richfield shall attempt to resolve objections to the Hearing Procedures with the Prosecution Team before submitting objections to the Advisory Team.

The Prosecution Team intends to request that the Regional Board adopt the CAOs, but we offer you the opportunity to discuss matters relating to the proposed orders before the hearing. Please contact Andrew Tauriainen, Senior Staff Counsel, State Water Resources Control Board, Office of Enforcement, at (916) 341-5445.

Sincerely,

ROBERT D. BUSBY
Supervising Engineering Geologist
Discharge to Land Section

Enclosure: Proposed Hearing Procedures

cc: (w/encl.)

Advisory Team

William J. Duffy, Davis Graham & Stubbs LLP, 1550 Seventeenth Street, Suite 500, Denver, CO 80202 (attorney for Atlantic Richfield) – via electronic and regular mail

Michael R. Hope, Office of the General Counsel, US Dept. of Agriculture, 740 Simms St., Room 309, Golden, CO 80401 (attorney for United States Forest Service) – via electronic and regular mail

Prosecution Team

Central Valley Regional Water Quality Control Board

HEARING PROCEDURE
FOR CLEANUP AND ABATEMENT ORDERS

R5-2013-XXXX
ISSUED TO
ATLANTIC RICHFIELD COMPANY
UNITED STATES DEPARTMENT OF AGRICULTURE,
UNITED STATES FOREST SERVICE
WALKER MINE TAILINGS
PLUMAS COUNTY

AND

R5-2013-YYYY
ISSUED TO
ATLANTIC RICHFIELD COMPANY
WALKER MINE
PLUMAS COUNTY

SCHEDULED FOR 5/6 DECEMBER 2013

PLEASE READ THIS HEARING PROCEDURE CAREFULLY. FAILURE TO COMPLY WITH THE DEADLINES AND OTHER REQUIREMENTS CONTAINED HEREIN MAY RESULT IN THE EXCLUSION OF YOUR DOCUMENTS AND/OR TESTIMONY.

Overview

On 5/6 December 2013, the Central Valley Regional Water Quality Control Board (Central Valley Water Board) will conduct a hearing to consider Cleanup and Abatement Order (CAO) R5-2013-XXXX, regarding Walker Mine Tailings, and CAO R5-2013-YYYY, regarding the Walker Mine, both in Plumas County. Given the overlap between the parties, issues, alleged facts and evidence, the Central Valley Water Board will consider both CAOs during the same hearing. The proposed CAOs impose cleanup obligations, including characterizing waste material and conducting remediation activities, on those who have legal responsibility for mining wastes at the Walker Mine and Tailings.

The purpose of the hearing is to consider relevant evidence and testimony regarding the CAOs. At the hearing, the Central Valley Water Board will consider whether to issue the CAOs as proposed, whether to modify or remand the CAOs, or whether to direct other appropriate actions designed to control discharges from the Walker Mine and Tailings site. If less than a quorum of the Board is available, this matter may be conducted before a hearing panel. The public hearing will commence at 8:30 a.m. or as soon thereafter as practical, or as announced in the Board's meeting agenda. The meeting will be held at:

11020 Sun Center Drive, Suite 200, Rancho Cordova, California.

An agenda for the meeting will be issued at least ten days before the meeting and posted on the Board's web page at:

http://www.waterboards.ca.gov/centralvalley/board_info/meetings

Hearing Procedure

The hearing will be conducted in accordance with this Hearing Procedure. This version of the Hearing Procedure has been prepared by the Prosecution Team, and is subject to revision and approval by the

Central Valley Water Board's Advisory Team. The procedures governing adjudicatory hearings before the Central Valley Water Board may be found at California Code of Regulations, title 23, section 648 et seq., and are available at

http://www.waterboards.ca.gov

Copies will be provided upon request. In accordance with Section 648(d), any procedure not provided by this Hearing Procedure is deemed waived. Except as provided in Section 648(b) and herein, Chapter 5 of the Administrative Procedures Act (Gov. Code, § 11500 et seq.) does not apply to this hearing.

The procedures and deadlines herein may be amended by the Advisory Team in its discretion. Any objections to the hearing procedures must be received by the Central Valley Water Board's Advisory Team no later than 5 p.m. on 10 October 2013, or they will be waived. Failure to comply with the deadlines and requirements contained herein may result in the exclusion of documents and/or testimony. If no objections are received by the Advisory Team, this version of the Hearing Procedures will become final at 5 p.m. on 10 October 2013. The Discharger shall attempt to resolve objections to this Hearing Procedure with the Prosecution Team BEFORE submitting objections to the Advisory Team.

Separation of Prosecutorial and Advisory Functions

To help ensure the fairness and impartiality of this proceeding, the functions of those who will act in a prosecutorial role by presenting evidence for consideration by the Board (the "Prosecution Team") have been separated from those who will provide legal and technical advice to the Board (the "Advisory Team"). Members of the Advisory Team are: Ken Landau, Assistant Executive Officer; David Coupe, Senior Staff Counsel. Members of the Prosecution Team are: Pamela Creedon, Executive Officer; Andrew Altevogt, Assistant Executive Officer; Victor Izzo, Senior Engineering Geologist; Jeffrey Huggins, Water Resources Control Engineer; and Andrew Tauriainen, Senior Staff Counsel.

Any members of the Advisory Team who normally supervise any members of the Prosecution Team are not acting as their supervisors in this proceeding, and vice versa. Pamela Creedon regularly advises the Central Valley Water Board in other, unrelated matters, but is not advising the Central Valley Water Board in this proceeding. Other members of the Prosecution Team act or have acted as advisors to the Central Valley Water Board in other, unrelated matters, but they are not advising the Central Valley Water Board in this proceeding. Members of the Prosecution Team have not had any ex parte communications with the members of the Central Valley Water Board or the Advisory Team regarding this proceeding.

Hearing Participants

Participants in this proceeding are designated as either "Designated Parties" or "Interested Persons." Designated Parties may present evidence and cross-examine witnesses and are subject to cross-examination. Interested Persons may present non-evidentiary policy statements, but may not cross-examine witnesses and are not subject to cross-examination. Interested Persons generally may not present evidence (e.g., photographs, eye-witness testimony, monitoring data). At the hearing, both Designated Parties and Interested Persons may be asked to respond to clarifying questions from the Central Valley Water Board, staff, or others, at the discretion of the Board Chair.

The following participants are hereby designated as Designated Parties in this proceeding:

1. Central Valley Water Board Prosecution Team
2. Atlantic Richfield Company (as to R5-2013-XXXX and R5-2013-YYYY)
3. United States Forest Service (as to R5-2013-XXXX only)

Requesting Designated Party Status

Persons who wish to participate in the hearing as a Designated Party must request designated party status by submitting a request in writing so that it is received no later than the deadline listed under "Important Deadlines" below. The request shall include an explanation of the basis for status as a Designated Party (i.e., how the issues to be addressed at the hearing affect the person, the need to present evidence or cross-examine witnesses), along with a statement explaining why the parties listed above do not adequately represent the person's interest. Any objections to these requests for designated party status must be submitted so that they are received no later than the deadline listed under "Important Deadlines" below.

Primary Contacts

Advisory Team:
Kenneth Landau, Assistant Executive Officer
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Prosecution Team:
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Discharger Atlantic Richfield (R5-2013-XXXX and R5-2013-YYYY)
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William.Duffy@dgslaw.com

Discharger United States Forest Service (R5-2013-XXXX only)
Michael R. Hope, Attorney
Office of the General Counsel
United States Department of Agriculture

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Golden, CO 80401
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Michael.hope@usda.gov

Ex Parte Communications

Designated Parties and Interested Persons are forbidden from engaging in ex parte communications regarding this matter. An ex parte communication is a written or verbal communication related to the investigation, preparation, or prosecution of the CAOs between a Designated Party or an Interested Person and a Board Member or a member of the Board's Advisory Team (see Gov. Code, § 11430.10 et seq.). However, if the communication is copied to all other persons (if written) or is made in a manner open to all other persons (if verbal), then the communication is not considered an ex parte communication. Communications regarding non-controversial procedural matters are also not considered ex parte communications and are not restricted.

Hearing Time Limits

To ensure that all participants have an opportunity to participate in the hearing, the following time limits shall apply: the Central Valley Water Board's Prosecution Team shall have a total of **45 minutes** to present evidence (including evidence presented by witnesses called by the Prosecution Team), cross-examine witnesses (if warranted), and provide a closing statement; the remaining Designated Parties shall have a combined total of **45 minutes** to present evidence (including evidence presented by witnesses called by the Designated Party), cross-examine witnesses (if warranted), and provide a closing statement. Each Interested Person shall have 3 minutes to present a non-evidentiary policy statement. Participants with similar interests or comments are requested to make joint presentations, and participants are requested to avoid redundant comments. Participants who would like additional time must submit their request to the Advisory Team so that it is received no later than the deadline listed under "Important Deadlines" below. Additional time may be provided at the discretion of the Advisory Team (prior to the hearing) or the Board Chair (at the hearing) upon a showing that additional time is necessary. Such showing shall explain what testimony, comments, or legal argument requires extra time, and why it could not have been provided in writing by the applicable deadline.

A timer will be used, but will not run during Board questions or the responses to such questions, or during discussions of procedural issues.

Submission of Evidence and Policy Statements

The Prosecution Team and all other Designated Parties must submit the following information in advance of the hearing:

1. All evidence (other than witness testimony to be presented orally at the hearing) that the Designated Party would like the Central Valley Water Board to consider. Evidence and exhibits already in the public files of the Central Valley Board may be submitted by reference, as long as the exhibits and their location are clearly identified in accordance with California Code of Regulations, title 23, section 648.3. Board members will not generally receive copies of materials incorporated by reference unless copies are provided, and the referenced materials are generally not posted on the Board's website.
2. All legal and technical arguments or analysis.
3. The name of each witness, if any, whom the Designated Party intends to call at the hearing, the subject of each witness' proposed testimony, and the estimated time required by each witness to present direct testimony.

4. The qualifications of each expert witness, if any.

Prosecution Team: The Prosecution Team's information must include the legal and factual basis for its claims against each Discharger; a list of all evidence on which the Prosecution Team relies, which must include, at a minimum, all documents cited in the Cleanup and Abatement Orders, Staff Report, or other material submitted by the Prosecution Team; and the witness information required under items 3-4 for all witnesses, including Board staff.

Remaining Designated Parties (including the Dischargers): All remaining Designated Parties shall submit comments regarding the Cleanup and Abatement Orders along with any additional supporting evidence not cited by the Central Valley Water Board's Prosecution Team no later than the deadline listed under "Important Deadlines" below.

Rebuttal: Any Designated Party that would like to submit evidence, legal analysis, or policy statements to rebut information previously submitted by other Designated Parties shall submit this rebuttal information so that it is received no later than the deadline listed under "Important Deadlines" below. "Rebuttal" means evidence, analysis or comments offered to disprove or contradict other submissions. Rebuttal shall be limited to the scope of the materials previously submitted. Rebuttal information that is not responsive to information previously submitted may be excluded.

Copies: Board members will receive copies of all submitted materials. The Board Members' hard copies will be printed in black and white on 8.5"x11" paper from the Designated Parties' electronic copies. Designated Parties who are concerned about print quality or the size of all or part of their written materials should provide an extra nine paper copies for the Board Members. For voluminous submissions, Board Members may receive copies in electronic format only. Electronic copies will also be posted on the Board's website. Parties without access to computer equipment are strongly encouraged to have their materials scanned at a copy or mailing center. The Board will not reject materials solely for failure to provide electronic copies.

Other Matters: The Prosecution Team will prepare a summary agenda sheet (Summary Sheet) and will respond to all significant comments. The Summary Sheet and the responses shall clearly state that they were prepared by the Prosecution Team. The Summary Sheet and the responses will be posted online, as will revisions to the proposed Order.

Interested Persons: Interested Persons who would like to submit written non-evidentiary policy statements are encouraged to submit them to the Advisory Team as early as possible, but they must be received by the deadline listed under "Important Deadlines" to be included in the Board's agenda package. Interested Persons do not need to submit written comments in order to speak at the hearing.

Prohibition on Surprise Evidence: In accordance with California Code of Regulations, title 23, section 648.4, the Central Valley Water Board endeavors to avoid surprise testimony or evidence. Absent a showing of good cause and lack of prejudice to the parties, the Board Chair may exclude evidence and testimony that is not submitted in accordance with this Hearing Procedure. Excluded evidence and testimony will *not* be considered by the Central Valley Water Board and will not be included in the administrative record for this proceeding.

Presentations: Power Point and other visual presentations may be used at the hearing, but their content shall not exceed the scope of other submitted written material. These presentations must be provided to the Advisory Team at or before the hearing both in hard copy and in electronic format so that they may be included in the administrative record.

Witnesses: All witnesses who have submitted written testimony shall appear at the hearing to affirm that the testimony is true and correct, and shall be available for cross-examination.

Evidentiary Documents and File

The Cleanup and Abatement Orders and related evidentiary documents are on file and may be inspected or copied at the Central Valley Water Board office at 11020 Sun Center Drive, Rancho Cordova, CA 95670. This file shall be considered part of the official administrative record for this hearing. Other submittals received for this proceeding will be added to this file and will become a part of the administrative record absent a contrary ruling by the Central Valley Water Board's Chair. Many of these documents are also posted on-line at:

http://www.waterboards.ca.gov/centralvalley/board_decisions/tentative_orders/index.shtml

Although the web page is updated regularly, to assure access to the latest information, you may contact Jeffrey Huggins (contact information above) for assistance obtaining copies.

Questions

Questions concerning this proceeding may be addressed to the Advisory Team attorney (contact information above).

IMPORTANT DEADLINES

All required submissions must be received by 5:00 p.m. on the respective due date.

4 October 2013	▪ Prosecution Team sends proposed Hearing Procedures to Dischargers and Advisory Team.
10 October 2013	▪ Objections due on Hearing Procedure. ▪ Deadline to request "Designated Party" status. Electronic *or* Hard Copies to: All other Designated Parties, All known Interested Persons, Prosecution Team Attorney, Advisory Team Attorney Electronic *and* Hard Copies to: Prosecution Team Primary Contact, Advisory Team Primary Contact
14 October 2013	▪ Deadline to submit opposition to requests for Designated Party status. Electronic *or* Hard Copies to: All other Designated Parties, All known Interested Persons, Prosecution Team Attorney, Advisory Team Attorney Electronic *and* Hard Copies to: Prosecution Team Primary Contact, Advisory Team Primary Contact
18 October 2013	▪ Advisory Team issues decision on requests for designated party status. ▪ Advisory Team issues decision on Hearing Procedure objections.
18 October 2013	▪ Prosecution Team's deadline for submission of information required under "Submission of Evidence and Policy Statements," above. Electronic *or* Hard Copies to: All other Designated Parties, All known Interested Persons ▪ Electronic *and* Hard Copies to: Advisory Team Primary Contact, Advisory Team Attorney
1 November 2013	▪ Remaining Designated Parties' (including the Discharger's) deadline to submit all information required under "Submission of Evidence and Policy Statements" above. This includes all written comments regarding the CAOs. ▪ Interested Persons' comments are due. Electronic *or* Hard Copies to: All other Designated Parties, All known Interested Persons, Prosecution Team Attorney, Advisory Team Attorney Electronic *and* Hard Copies to: Prosecution Team Primary Contact, Advisory Team Primary Contact
8 November 2013	▪ All Designated Parties shall submit any rebuttal evidence, any rebuttal to legal arguments and/or policy statements, and all evidentiary objections. ▪ Deadline to submit requests for additional time. ▪ If rebuttal evidence is submitted, all requests for additional time (to respond to the rebuttal at the hearing) must be made within 3 working days of *this* deadline. Electronic *or* Hard Copies to: All other Designated Parties, All known Interested Persons, Prosecution Team Attorney, Advisory Team Attorney Electronic *and* Hard Copies to: Prosecution Team Primary Contact, Advisory Team Primary Contact
14 November 2013[†]	▪ Prosecution Team submits Summary Sheet and responses to comments. Electronic *or* Hard Copies to: All other Designated Parties, All known Interested Persons Electronic *and* Hard Copies to: Advisory Team Primary Contact, Advisory Team Attorney
5/6 December 2013	Hearing

[†] *This deadline is set based on the date that the Board compiles the Board Members' agenda packages. Any material received after this deadline will not be included in the Board Members' agenda packages.*

Exhibit 30

Davis Graham & Stubbs LLP

William J. Duffy
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December 6, 2013

David Coupe, Senior Staff Counsel
c/o San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Kenneth Landau, Assistant Executive Officer
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, Suite 200
Rancho Cordova, CA 95670

Re: Walker Mine and Walker Mine Tailings Sites, Plumas County – Atlantic Richfield Company Objections to Proposed Hearing Procedures

Dear Mr. Coupe:

This letter sets forth the Atlantic Richfield Company's ("Atlantic Richfield") comments and objections concerning the Prosecution Team's November 22, 2013 proposed hearing procedures (the "Proposed Procedures") for the two draft Cleanup and Abatement Orders (the "Draft CAOs") applicable to the Walker Mine Site (the "Mine Site") and Walker Mine Tailings Site (the "Tailings Site") (collectively, the "Sites"). Atlantic Richfield is identified as the sole "Discharger" in the current Draft Mine Site CAO, while Atlantic Richfield and the United States Forest Service ("USFS") are each identified as a "Discharger" for the Tailings Site CAO. The Proposed Procedures contemplate a two-hour hearing before the Regional Water Quality Control Board for the Central Valley Region (the "Regional Board") to consider and resolve all matters among the Regional Board, Atlantic Richfield and the USFS related to the two Draft CAOs. The Proposed Procedures are deficient for all the reasons explained below. Further, as described below and also in the enclosed alternate procedures, Atlantic Richfield believes that a bifurcated hearing structure with issues of jurisdiction and liability presented first will best serve the Regional Board's interests in efficiently and fairly adjudicating the parties' rights and obligations.

The Proposed Procedures ignore two fundamental circumstances: (1) The complexity of the legal and factual / technical issues the Regional Board must consider and resolve before deciding whether to adopt or modify the Draft CAOs; and, (2) The interrelationship of the Sites resulting from their proximity and historical development as a single integrated mine operation. The Prosecution Team's neglect of these fundamental circumstances causes several deficiencies in the Proposed Procedures and results in a truncated framework that will severely prejudice Atlantic Richfield's due process right to develop and present all the legal and factual arguments

in its defense. Specifically, Atlantic Richfield hereby objects to the following deficiencies in the Proposed Procedures:

1. The proposed hearing is not long enough to allow for presentation of all argument and evidence relevant to the numerous issues raised in the Draft CAOs. The Prosecution Team's proposed two-hour hearing would afford the Prosecution Team one hour for presenting its case, while requiring Atlantic Richfield and USFS to share one hour of presentation time. Atlantic Richfield respects the Regional Board's time and its undoubtedly crowded docket. However, the proposed two-hour hearing is wholly inadequate for an orderly presentation of the parties' arguments and evidence in a manner that efficiently discharges the Regional Board's responsibility to conduct a full and fair inquiry into the merits.

2. The proposed hearing date is too soon to allow Atlantic Richfield to develop the various factual / technical evidence and legal arguments in its defense. Further, the Prosecution Team has offered no substantial basis to support a March 2013 hearing and appears to have taken much more time to develop its own case. Electronic copies of historical documents that the Prosecution Team provided with the Draft CAOs indicate the electronic files were created in February 2013 and file names on the CD of documents more recently received in response to Atlantic Richfield's first Public Records Act request suggest the Prosecution Team was compiling records as early as December 2011. Atlantic Richfield's due process rights will not be protected if it is forced to prepare for a March 2013 hearing without any substantial basis.

3. The Proposed Procedures lack a reasonable period of pre-hearing exchange to ensure adequate disclosure of key facts. A brief summary of the procedural timeline thus far demonstrates that there is no compelling reason to limit appropriate pre-hearing procedures to meet an arbitrary schedule that the Prosecution Team has already delayed considerably. The Draft CAOs were first transmitted to Atlantic Richfield and the USFS on April 29, 2013; Atlantic Richfield responded to the Draft CAOs on June 3, 2013 (after receiving an extension of the Prosecution Team's original May 20, 2013 deadline). Four months later, on October 2, 2013, the Prosecution Team provided notice of a December hearing and issued its first set of proposed hearing procedures. When the Prosecution Team proposed separate hearings on the Draft CAOs for each Site during the U.S. government shutdown, the Regional Board appropriately rejected the Prosecution Team's proposal based on "overlapping issues" as to the Sites (by email from David Coupe to the Prosecution team, Atlantic Richfield, and USFS

on October 11, 2013).[1] The Prosecution Team then issued the Proposed Procedures along with substantive revisions of the Draft CAOs dated November 22, 2013 that will frame the issues for hearing.[2]

4. The Proposed Procedures will not efficiently resolve the preliminary question of the parties' contested liability as alleged "Dischargers" at the Sites, including the Regional Board's own liability. Many of the issues involved in the Draft CAOs raise preliminary issues regarding the Regional Board's jurisdiction and the parties' alleged liability that could bar consideration of any further issues. It will be most efficient for the Regional Board to address these fundamental questions of jurisdiction and liability first before proceeding to address the complex factual questions inherent in the Draft CAOs.

5. The Proposed Procedures do not include USFS as a party to the Mine Site CAO. The USFS is an indispensable party to the proceedings for both Sites because it unquestionably bears an interest in both Sites, is at least a former owner of the lands underlying both Sites, and possesses witnesses as well as large amounts of documentary evidence relevant to both Sites. The Prosecution Team's failure to name USFS as a party to the Mine Site CAO prejudices Atlantic Richfield by denying it access to crucial evidence. Failing to include USFS as a party also will inefficiently use the Regional Board's time and will prevent the Regional Board from properly considering USFS's potential liability for both Sites.

6. Similarly, the Proposed Procedures also fail to include the Regional Board as a party to either CAO. If given a fair opportunity, Atlantic Richfield expects to discover and present evidence that the Regional Board itself also may be responsible for work contemplated by the Draft CAOs due to its own activities at the Mine Site and its settlements with other responsible parties. A procedural framework that denies Atlantic Richfield this opportunity does not comport with the Regional Board's due process obligations.

7. The Proposed Procedures do not articulate the Prosecution Team's burden of proof. The burden of proof borne by the Prosecution Team is a fundamental legal issue that will guide the entirety of any proceedings regarding the Draft CAOs.

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[1] Despite the Regional Board's rejection of separate hearings for each Site, and despite the Prosecution Team's November 22, 2013 proposal that the hearings for each Site be unified ("Given the overlap between the parties, issues, alleged facts and evidence, the Central Valley Water Board will consider both CAOs during the same hearing," Proposed Procedures at p. 1), the Prosecution Team has persisted in suggesting separate Mine and Tailings Site hearings during subsequent communications.

[2] Important to the revised Draft CAOs, the Regional Board has abandoned its pursuit of an alter ego theory of liability against Atlantic Richfield. The Prosecution Team confirmed that intent in subsequent communications and thus comments pertinent to an alter ego theory of liability are not included here.

Ambiguity as to the Prosecution Team's burden, or an attempt to use a burden lower than that which would apply in civil court, will severely prejudice Atlantic Richfield's ability to defend against the allegations in the Draft CAOs.

8. The Proposed Procedures and the Draft CAOs appear to assume that Atlantic Richfield may be held jointly and severally liable for any and all costs or remedial activities the Regional Board determines may be necessary at the Sites. This assumption is unsupported and contrary to law.

The Regional Board must structure any hearing, and the process leading up to the hearing, to afford Atlantic Richfield and the USFS a full and fair opportunity to present evidence relevant to their alleged liability for the actions contemplated in the Draft CAOs. Because the above-described deficiencies in the Proposed Procedures would violate Atlantic Richfield's due process rights, Atlantic Richfield urges the Regional Board to reject the Proposed Procedures and adopt Atlantic Richfield's alternative procedures. The remainder of this letter elaborates on the bases for Atlantic Richfield's objections and explains why its alternative procedures would result in a more efficient and legally defensible process.

I. The Draft CAOs Raise Complex Legal and Factual Issues That Will Take Significant Time to Develop and Present to the Regional Board.

Many of the deficiencies in the Proposed Procedures result from the Prosecution Team's failure to appreciate the complexity of the numerous legal and factual / technical issues raised by the Draft CAOs. Some of the unique issues presented by these interrelated Sites are described below. As a fundamental point of departure, Atlantic Richfield (including its predecessors) never owned or operated the Sites, but instead was merely a shareholder in the publicly-traded company responsible for most of the mining known to have occurred at the Sites. The Draft CAOs thus require the Prosecution Team to present evidence and legal authority supporting an exception to the ordinary rule that it is the corporation – and not its shareholders – that bears responsibility for any liability arising from corporate operations. Further complicating the Prosecution Team's effort to impose liability for the work set forth in the Draft CAOs is the fact that the United States, through the USFS, once owned and managed all of the land area encompassed by the Sites, and continues to own and manage the land underlying the Tailings Site. In 2005, the USFS entered into a consent decree with Atlantic Richfield, and USFS is presently conducting remedial actions at the Tailings Site pursuant to its presidentially delegated authority under the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"). USFS's involvement with the Sites raises several issues, most notably, the likelihood that CERCLA Section 113(h) bars any remedial actions at the Sites until USFS has completed its remedial efforts. The Regional Board itself also may be responsible for work

contemplated by the Draft CAOs due to its own activities at the Mine Site and its settlements with other responsible parties.[3]

The most important of the complex and important legal and factual / technical issues that will require the Regional Board's attention are briefly described below:

- CERCLA's Pre-Enforcement Review Bar: CERCLA Section 113(h) prevents any court or administrative agency from exercising jurisdiction over "challenges" to CERCLA cleanups. Consistent with CERCLA's goal of ensuring safe, efficient, and effective federal cleanups, case law in the U.S. Court of Appeals for the Ninth Circuit defines "challenge" broadly to include actions that "interfere with" or even those which seek to "improve upon" an ongoing CERCLA cleanup. The extent to which CERCLA 113(h) bars state-lead action at the Sites is a threshold legal issue implicating the Regional Board's jurisdiction to establish a competing cleanup plan. Resolving this legal question will also require the Regional Board to consider highly technical and scientific evidence regarding the interrelationship between the Sites.

- CERCLA's Bar on PRP Cleanups: CERCLA Section 122(e)(6) also limits interference with CERCLA cleanups by barring a "potentially responsible party" from "undertak[ing] *any* remedial action at the facility unless such remedial action has been approved by the President." The Draft CAOs thus raise multiple questions of both law and fact about the interplay between the federal CERCLA remediation program and the Prosecution Team's Draft CAOs, including whether Atlantic Richfield, USFS, and / or the Regional Board meet CERCLA's definition of "potentially responsible party," and whether the Sites constitute a single "facility."

- Shareholder Non-Liability: The general rule under state and federal law is that a corporate shareholder is not liable for the acts of the corporation, including any corporate operations that caused pollution. Atlantic Richfield's predecessors – first, International Smelting & Refining Company which was then succeeded by The Anaconda Company – were merely shareholders in the Walker Mining Company. Shares of Walker Mining Company traded publicly on the Salt Lake City and New York Curb Exchanges. The Regional Board has indicated it intends to prove an exception to the usual rule of shareholder non-liability by

[3] Atlantic Richfield has submitted two Public Records Act requests to the Board for production of such settlements and other records relevant to the allegations set forth in the Draft CAOs. The Prosecution Team has replied to the first of these requests (and a pending informal request for records) in a November 25, 2013 letter producing records and asserting claims of privilege and work product concerning correspondence "related to" its Witness List, Witness and Expert Witness Declarations, Evidence List and Legal Statement. Atlantic Richfield will seek more information as to the basis of these claims.