Regulation Of Surface Water Discharges From Abandoned Mines

Background

Discharges from historic abandoned mines affect surface waters throughout the state. Often the discharges originate from a distinct mine portal, tailings pile or waste rock disposal area. U.S. EPA considers these discharges point sources and they are regulated under a National Pollutant Discharge Elimination System (NPDES) permit, and the courts have agreed (although in some USEPA regions the NPDES permit approach is not vigorously applied). The most problematic mines discharge metals in concentrations that can impact beneficial uses, predominantly discharges that are toxic to aquatic life and/or threaten human health. Due to their large physical size, complexity of the natural distribution of the mineralized metal bearing ore, labyrinth of underground workings, myriad of chemical reactions taking place deep underground, and the often remote location and rugged, steep terrain, remediation of these mines is very costly and can take many years. At large abandoned mine sites it may be impossible, with today's technology, to remediate adequately to protect aquatic life beneficial uses or meet the water quality objectives designated for adjacent receiving waters.

This staff report describes the extent of the problem with surface water discharges from abandoned mines in the Central Valley Region, regulatory issues regarding permitting and compliance that place abandoned mines in a unique position separate from a "typical" industrial or municipal discharger, and describes tools and regulatory measures that are effective in significantly reducing the discharges and impacts from such mines.

Historic Abandoned Mines

The term "Abandoned Mine" describes a mine that is no longer operating and has not been reclaimed to where all physical and environmental hazards have been eliminated and the site stabilized against erosion. In this report, we refer to abandoned mines generally as mines that ceased operation before the current regulatory structure was in place, including the Federal Clean Water Act and the California Surface Mining and Reclamation Act (SMARA), each adopted in 1975. SMARA refers to these mines as "Historic Abandoned Mines". Prior to this time period, reclamation of mines, including addressing water quality issues, was very limited if it occurred at all. A recent mining operation that was properly permitted by today's standards and failed to be adequately reclaimed is not the subject of this report nor are the recommendations contained within applicable to such a mine.

The number of abandoned mines in California is difficult to accurately enumerate; however, the California Department of Conservation, Office of Mine Reclamation (OMR) has estimated there may be up to 47,000 abandoned mine "features" with approximately 67 percent on federal lands, 31 percent on private lands, and about 2 percent on State or local lands (Figure 1). In a March 2007 letter to Senator Feinstein, OMR estimated the number of priority abandoned mines in the state which contained either physical hazards (shafts, lack of oxygen, etc.) or environmental hazards (water quality problems, toxic chemicals or residues, etc.) at 117. This list was compiled with the input from federal and state agencies, including staff from the Central Valley Regional Water Quality Control Board (Regional Water Board) and State Water Resources Control Board (State Board). Of the 117 mines identified as priority mines, 55 were identified with water quality issues with priorities ranging from medium to high in the Central Valley Region. Of the 55 mines listed as having medium to high water quality issues, 9 were estimated to have remediation costs (either money spent or necessary to remediate environmental issues) between 10 million and 100 million dollars each, 29 estimated to cost between 1 million to 10 million dollars each, and 26 to cost between 100 thousand and 1 million dollars each.

While the numbers reveal a staggering cost in terms of dollars necessary to address the problem, they do not reveal the extent of the environmental damage. The discharge from the larger of these mines can eliminate typical aquatic lifeforms (except for a few exotic species that are adapted to extreme environments) from several miles of streams, to discharges that can impact water quality and the aquatic food chain for a hundred or more miles downstream.

Source of Surface Water Pollution

Pollutants discharging from abandoned mines are generally from the chemical reaction of water and oxygen with naturally occurring residual minerals in the ore body, tailings, or waste rock. There are several scenarios where such chemical reactions can result in the release of soluble pollutants. Rainwater infiltrates into the subsurface where it intersects the residual ore body and underground mine workings. When this oxygenated water contacts a reactive ore body such as those present in the Shasta Copper Mining District near Redding, it generates sulfuric acid. The acid in turn can solubilize other elements and minerals including copper, cadmium, lead, zinc, etc. The low pH, mineral laden water, referred to as acid mine drainage (AMD), is then collected in the mine workings and discharges from the mine portal where is can enter surface waters. The AMD is commonly toxic to aquatic life and can adversely impact the beneficial uses of the receiving waters. Common discharges may contain cadmium, copper, and zinc which are especially toxic to fish. Other discharges, including some where there is no acidity, may contain mercury, arsenic and other substances which pose a threat to human health.

Abandoned gold mines, especially those in the Mother Lode District of the Sierra Nevada foothills may have drainage that contains arsenic in concentrations that affect beneficial uses, specifically domestic drinking water supplies and, if precipitated into the stream sediments, may pose a threat to human health via dermal contact or inhalation of dried precipitates or tailings. These historic gold mines, especially the hydraulic surface mines, may contain residual mercury used to recover the gold values. The mercury not only poses a threat to aquatic life, but can enter the streams where it can bioaccumulate in the food chain and pose a threat to human health and the health of other high end predators.

Mercury mines in the Coast Ranges were commonly the source for the mercury used in the Sierra Nevada gold mines. Mercury released from the tailings of these abandoned mines is a significant source of mercury entering the Sacramento River Delta and the resident food chain.

Past Regional Board Regulatory Program

Many past NPDES permits issued for discharges from abandoned mines allowed the discharger to select between non-numeric effluent limits, (reduction of discharge flow and other best management practices (BMPs) or application of numeric limits required for active mines (requires access, power and construction of a treatment facility). Both required the discharger to meet the receiving water limits contained in the Basin Plan. A Cease and Desist Order would accompany these permits and require certain actions over the five year permit cycle with the goal to achieve compliance with the NPDES permit conditions at the end of the five year period (or sooner, if feasible). This allowed the Discharger to implement various remedial activities in an effort to reduce the discharges and meet the permit conditions.

Typical non-numeric effluent limits for a NPDES permit may read as follows:

Effluent Limits

1. The average annual discharge rate (lbs/day) of arsenic, cadmium, copper, lead, mercury, nickel, and zinc from any discreet discharge, including Discharge Numbers 1-9, shall be reduced by 99 percent from the rate prior to control .

2. The Discharge shall implement site-specific Best Management Practices (BMPs) to reduce or prevent pollutant discharge associated with AMD. The BMPs may include installation of concrete bulkhead seals, passive treatment systems, injection of neutralizing agents into underground workings, run-on and run-off controls, consolidation and capping of reactive waste rock, or other technologies, including new technologies as they are developed.

The Discharger would then conduct a detailed investigation of the discharge including the volume, concentration and variation of the pollutants, conditions which may affect the amount of water entering and exiting the underground mine workings and/or infiltrating into reactive waste rock piles. Remedial activities may include diversion of surface waters around the site to reduce the volume of AMD generated, plugging the mine portal with a concrete bulkhead seal to backup water sufficiently to cover the remaining ore body, rob it of oxygen and stop the acid generating chemical reaction, etc. Residual flows of AMD would be routed to passive treatment systems capable of further reducing the concentrations of pollutants in the discharge. Since each mine is unique in character, extent of underground workings, flow volumes, chemistry and location, a "cookbook" approach is not effective. Each mine must be evaluated and site specific activities designed for each. This is a necessarily iterative process where specific measures are undertaken, the results evaluated, and additional measures targeted for the residual contamination implemented. As discussed below, this approach has allowed for a significant reduction of loading and concentrations of metals to surface waters (over 90 percent reductions in some cases). However, compliance with receiving water quality objectives at larger mines where there are numerous non-point sources of mine drainage and even seeps directly into a stream have shown to be difficult and sometimes impossible. The examples of AMD mine remediation discussed below indicate the relative success of treating AMD with BPTC technology versus applying a BMP approach.

Iron Mountain Mine

An example of an extreme application of treatment technology failing to meet prescribed numeric effluent limits, is the large Iron Mountain Mine complex (IMM) northwest of Redding. Prior to remedial activities, the mine discharged approximately 650 pounds of copper and 1,800 pounds of zinc daily into the Sacramento River. The site was placed on the National Priorities List and remedial activities implemented by the U.S. EPA under the Federal Superfund program. Remedial activities have included surface water diversions, waste rock disposal, and treatment of the AMD. The treatment facility constructed by U.S. EPA uses lime neutralization to precipitate copper, cadmium, and zinc from solution and is considered to be the Best Available Technology. Over 200 million dollars has been spent on the site with an additional 700 million available for future operations of the AMD conveyance and treatment system. The treatment plant cost over 30 million to build and O&M costs range between 5 and 7 million dollars per year depending on precipitation which affects the generation of AMD. The treatment system is designed to treat a maximum of 8,000 gpm during extreme storm periods. Unless some other technology is developed in the future, treatment will be required for an estimated 2,000 years. Overall discharges of metals (copper, zinc and cadmium) to the Sacramento River have been reduced by 95 percent. Despite these enormous efforts, the effluent from the treatment plant cannot meet water quality objectives for cadmium and zinc, or objectives for sulfates, aluminum, iron and other metals. Further, the streams adjacent or immediately downstream from IMM, including lower Spring Creek and Bolder Creek, will never support a typical aquatic community due to the contribution of non-point sources that cannot be controlled. Any aquatic organisms that do live in these watercourses are limited to algae and invertebrates that are adapted to a low pH and high metal environment. Fish will never exist in these streams.

West Squaw Creek Mines
Another watershed near Redding affected by AMD is the West Squaw Creek drainage. The discharge from several mine portals previously flowed into small tributaries or directly into West Squaw Creek and thence to Shasta Lake. Aquatic life was severely impacted and fish kills were common in Shasta Lake at the mouth of the stream. Over the past 25 years, the mine owners have implemented remedial measures, including installation of concrete bulkhead seals, water diversions and passive biological treatment systems to reduce the metal concentrations in West Squaw by approximately 90 percent. However, the watercourse will not support fish or other pH or metal sensitive species due to diffuse seeps and other non-identifiable sources of AMD entering the creek. The passive treatment systems do not require electricity, chemical reagents, or continuous oversight and maintenance. This passive treatment approach may be ideal for some remote mines where no infrastructure (year-round accessible roads or electricity) is present. The discharges from these passive systems, like the IMM treatment plant cannot consistently meet water quality objectives or numeric effluent limits.

While the two examples discussed above are in the West Shasta Copper Mining District, other examples of discharges from abandoned mines can be found running the length of the Central Valley Region in the Sierra Nevada foothills to the east and the Coast Range to the west.

Current Regulatory Framework for Discharges from Abandoned Mines
The State Implementation Policy (SIP) requires a NPDES permit to contain numeric effluent limits for priority pollutants, including the metals commonly found in AMD discharged from the mine portals. Regional Water Board staff believes numeric effluent limits are not feasible in many instances, and that an alternative approach that has proven effective is more appropriate.

Experience with numerous mines that discharge AMD shows that remarkable reductions in the discharge of AMD can be achieved by implementing BMPs in lieu of numeric effluent limits. This is consistent with Resolution No. 79-149 *Amendment to Water Quality Control Plan and Acton Plan for Mining* contained in the Basin Plan. Resolution No. 79-149, lists BMPs which may be applied to abandoned mines (Figure 2). Since the resolution was adopted, additional BMPs have proven their worth and are commonly applied. Section 122.44(k)(3) of Title 40 of the Code of Federal Regulations states that BMPs may be required in NPDES permits in lieu of numeric effluent limits to control or abate the discharge of pollutants when numeric effluent limits are infeasible.

While no position has yet been taken by either the SWRCB or U.S.EPA, it is unlikely the SIP overrides the Code of Federal Regulations. Further, a letter from James Baetge, Executive Director of the SWRCB to the U.S. EPA, dated 18

January 1991, regarding the Leviathan and Penn Mine reflects the SWRCBs support of the use of BMPs when regulating these abandoned mines in NPDES permits (Figure 3).

Compliance with strict numeric effluent limits for pollutant discharges associated with the control of drainage from historic abandoned mines in remote regions with limited seasonal access, no infrastructure (including electricity), and highly variable discharge rates and waste constituent concentrations is not possible. The variability in discharge rate and constituent concentration is due to the discharge being directly related to storm water and rainfall events and changes with each significant storm event and over the seasons.

Numeric effluent limits have long been found to be infeasible for storm water discharges, and the SIP explicitly excludes storm water from coverage. The flows from inactive, historic mines are similar to storm water discharges in that the discharge from the mine portals are directly related to precipitation experienced at the site. The flow from the mine portals originates from the infiltration of precipitation into the subsurface where it is collected in the underground workings and discharged from the mine portal. Although the mine discharges are not storm water discharges, in this case, their similarity supports regulating them in a similar manner using BMPs.

As listed in Figure 2, BMPs may include surface water diversions, installation of concrete seals in the mine portals, collection of the portal discharges, and treatment. “Passive” treatment systems are a relatively new application of treatment technology which has been successful in significantly reducing metals in mine discharges. They are especially useful in remote locations, do not require electricity or chemical feed stock and may include such systems as anoxic limestone drains, sulfate reducing bio-reactors, constructed wetlands, oxidation ponds, etc. The effluent from these systems is subject to variations in the influent quality and the effectiveness of the physical, chemical, and biological mechanisms used in each. The efficiency of the treatment varies with changes in temperature, flow rates, and residence time.

The use of BMPs in lieu of numeric effluent limits is not appropriate for all situations where the discharge of AMD from abandoned mines must be regulated. For example, a discharge that is in close proximity to people that may pose a threat to human health due to a particular constituent (arsenic, lead, mercury, etc.) may require numeric effluent limits. An example may be the Empire Mine in Grass Valley where the discharge passes through a municipal park and residential area. However, for mines in close proximity to people, access is generally easy and infrastructure such as roads and electricity is immediately available. These mines would not be within the abandoned mines that staff is proposing to regulate through BMPs.

Consequences of Not Allowing a BMP Based Approach For Remote Mines
Requiring numeric effluent limits in NPDES permits where compliance is not feasible would place many Dischargers in constant violation of their permits and subject to mandatory minimum penalties (MMPs). Despite the best efforts of landowners and the U.S. EPA, including the expenditure of over $200+ million at IMM and over $12+ million at West Squaw Creek, numeric effluent limits developed following the SIP cannot and will never be met. Even if the discharge met SIP-based numeric limits, water quality objectives in the adjacent receiving waters could not be met, and designated beneficial uses relating to typical aquatic life cannot be achieved.

In these situations, there is no ability to stop the discharge by simply turning a valve or ceasing a specific industrial process to correct the problem. There is no choice as to whether an abandoned mine can discharge or not; it is a matter of the infiltration of precipitation into the surrounding country rock and its discharge from the mine portal. MMPs would be continuous, and would not result in a resolution to the problem.

The SIP allows for "interim" effluent limits in NPDES permits and a time schedule to bring the discharge into compliance. For several reasons, this process is not appropriate for abandoned mines. The SIP requires all existing dischargers to meet the requirements of the SIP by 2010 (SIP0Section 2.1), an impossible task for many. Current NPDES permits for discharges from abandoned mines have been accompanied by cease and desist orders (CDO) or have SIP-based compliance schedules in the permits. This provides a time schedule to implement various remedial activities with the goal to bring the discharges into compliance with the permit. In many instances, compliance with the permit conditions, especially numeric effluent limits and receiving limits, is not possible. Some mines have been working diligently on the problem for over 25 years with remarkable success in reducing metal discharges to surface waters, but still cannot meet numeric effluent limits prescribed by the SIP. Either the treatment systems employed cannot consistently meet effluent limits as discussed above, or the receiving waters cannot meet water quality objectives due to background or non-point sources, thus requiring even more strict, and unattainable, limits.

Allowing an additional five year permit cycle for sites which currently have NPDES permits and CDOs using numeric effluent limits will not avoid MMPs. For those that do not have CDOs, a CDO could only avoid MMPs for antoher five years, which experience has proven to be inadequate to meet SIP numeric limits.

An alternative allowed in the SIP (and the Clean Water Act) is to seek a case by case exemption from the numeric limits (SIP-Section 5.3). This is allowed if the receiving waters do not meet water quality objectives, but *beneficial uses are not affected.* In the case of many of the copper mines in the West Shasta Copper Mining District, the receiving waters are severely impacted and cannot support the designated beneficial uses such as a fishery[1]. Where receiving waters do support the beneficial uses but do not meet the water quality objectives, site specific water quality objectives (SSOs) are an option. However, experience has shown attempting to develop SSOs is resource intensive, both in personnel and time (years), and may not be accepted by U.S. EPA.

In the case of West Squaw Creek, Regional Water Board staff believes all reasonable remedial activities have been completed and the discharges and receiving waters still cannot meet the SIP standards and water quality objectives. In such an event, the SIP and Clean Water Act allows for the development of a use attainability analyses (UAA) and the development of SSOs (SIP-Section 5.2). A UAA is a scientific investigation of the watercourse that attempts to demonstrate the assigned beneficial uses cannot be attained. SSOs are then developed to protect the existing uses and incorporated in a Basin Plan Amendment. While such a process appears straight-forward, Regional Water Board staff has been working on such a process for 10 years for West Squaw Creek. The extensive time period is the result of long review times by SWRCB and U.S EPA, staff turnover requiring new staff in the review process to be brought up to speed, inconsistent reviews and requests for information, and a reluctance by U.S EPA to agree that all reasonable work has been achieved. The SIP requires this process to be completed in 5 years, an unrealistic time frame.

Currently in West Squaw Creek, approximately $12 million has been spent on remedial activities that have been successful in removing over 90 percent of the metals; however, under the SIP, many more millions will have to be spent to remove only a few percent of the original discharge rate of metals. The costs increase exponentially as the large, relatively easy sources are controlled and the smaller more difficult sources are addressed. The SIP assumes all sources of pollution can be solved. However, it is unlikely water quality objectives will ever be met in the West Squaw Creek (or IMM's Spring Creek) due to the high baseline concentration of metals entering the stream which causes an exceedence of the standards. Strict application of the SIP removes valuable resources from watercourses where the same amount of effort could achieve large reductions in metal discharges and requires the expenditure of resources towards what is believed to be an impossible goal.

Owners of Abandoned Mines Are Not Being Treated Equally

The SIP and the requirement for numeric effluent limits does not allow for a level playing field for all owners of abandoned mines. Similar to the U.S EPA when dealing with Superfund sites like IMM, Federal Land Agencies (Forest Service

[1] Where a use has not existed since 1975, the use may be de-designated if all applicable Clean Water Act requirements are met. However, it is unlikely that even a highly impaired waterbody would support no aquatic life whatsoever, so a site probably could not avoid SIP compliance requirements through use de-designation alone.

and Bureau of Land Management) claim they can also remediate their sites under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Under CERCLA, Superfund sites are not required to get an NPDES permit or any other permit from the Regional Water Board. In place, they can request the State provide them with applicable, relevant and appropriate requirements (ARARs). While the SIP and the Basin Plan are considered ARARs, if the U.S. EPA under Superfund, believes it is not practical to achieve, they can waive the ARAR on an interim basis, a relatively easy process. A permanent waiver can also be sought. Even where the ARAR is waived, the cleanup can incorporate the BMP approach described above.

Federal landowners claim the same exemption applies to all federal facilities in all cases, whether or not the sites are on the NPL (Superfund list) and whether or not any remediation is undergoing or actually planned.[2] Thus, many years may pass before a Federal Agency will even begin to address a site. Enforcement against a Federal Agency for failing to initiate or complete remedial activities at a site under these conditions is resource-intensive, legally complex and time consuming.

In contrast, a private owner of an abandoned mine discharging AMD to surface waters may be held to the strict standards of the SIP, including impossible to meet time schedules and numeric effluent limits. If a numeric effluent limit is exceeded, then MMPs are required, rapidly draining the financial resources of the private owner attempting to comply with what may be an impossible task.

Conclusions and Recommendations

Including numeric effluent limits in NPDES permits for many abandoned mines is impractical and not appropriate for the discharge being regulated. Unlike an industrial or municipal discharge, the regulation of the discharge of an abandoned mine is a battle against nature, albeit the problem has been greatly enhanced by past human activity. It is unlikely developers of the SIP envisioned the difficulties in applying the policy to such discharges and such regulation would be counterproductive. The results of past remedial efforts at abandoned mines have resulted in tremendous reductions in the discharge of metals to surface waters, yet they still cannot comply with effluent limitations based upon the SIP approach.

An alternative to the inclusion of numeric effluent limits in certain NPDES permits for abandoned mines is to replace them with BMPs as allowed by the regulations governing NPDES permits. These BMP based permits will be developed to provide protection of downstream beneficial uses and/or full compliance with receiving water WQ objectives where possible. There are numerous abandoned

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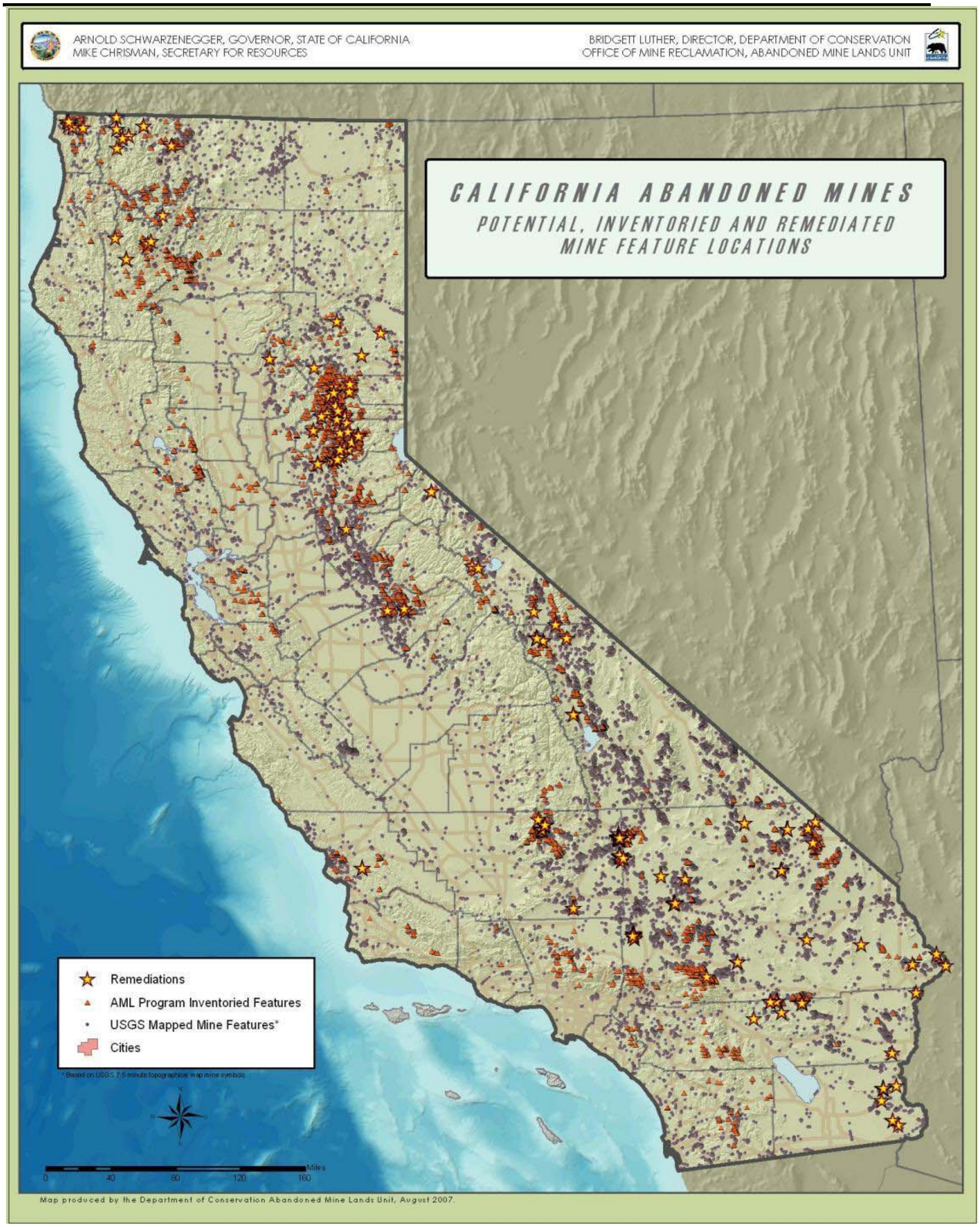
[2]While the Regional Water Board has not previously agreed with this position for non-NPL sites, the Regional Water Board has accommodated federal agencies that actively seek to address ARARs (through appropriate waivers or otherwise) and proceed with removal actions

mines where unidentifiable and diffuse discharges of mine drainage or natural mineralized water seeps have and will continue to impact downstream beneficial uses, irrespective of treatment and control of the mine’s point sources. In both these cases, implementation of BMPs will provide a level of protection the would not be improved through SIP compliance. This approach has been successful in many mines in the Shasta Copper Mining District and is appropriate where there is limited or no threat to human health, lack of infrastructure, and limited access.

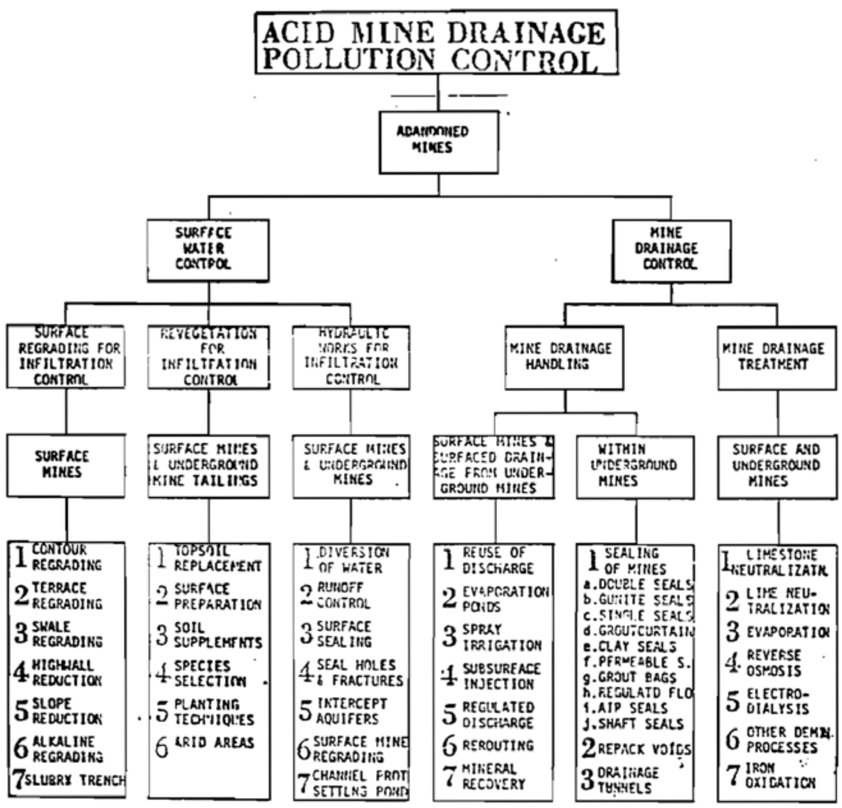
FIGURE 1



ARNOLD SCHWARZENEGGER, GOVERNOR, STATE OF CALIFORNIA
MIKE CHRISMAN, SECRETARY FOR RESOURCES
BRIDGETT LUTHER, DIRECTOR, DEPARTMENT OF CONSERVATION
OFFICE OF MINE RECLAMATION, ABANDONED MINE LANDS UNIT
CALIFORNIA ABANDONED MINES
POTENTIAL, INVENTORIED AND REMEDIATED MINE FEATURE LOCATIONS
Remediations
AML Program Inventoried Features
USGS Mapped Mine Features*
Cities
Miles
0
40
80
120
160
Map produced by the Department of Conservation Abandoned Mine Lands Unit, August 2007.

FIGURE 2

BEST MANAGEMENT PRACTICES AVAILABLE FOR
CONTROL OF AMD FROM ABANDONED MINES



adapted from unpublished literature
review by the Sanitary Engineering
Research Lab, U.C. Berkeley

37/3/5

FIGURE 3

W. Crooks

STATE OF CALIFORNIA

PETE WILSON, GOVERNOR

STATE WATER RESOURCES CONTROL BOARD
PAUL R. BONDERSON BUILDING
901 P STREET
P.O. BOX 100
SACRAMENTO, CALIFORNIA 95801

(916) 324-1362

Facsimile: (916) 323-0743

JAN 18 1991

Return to Ingo

Mr. Daniel W. McGovern (RA)
Regional Administrator
U.S. Environmental Protection Agency,
Region 9
75 Hawthorne Street, Room 1813
San Francisco, CA 94105

Dear Mr. McGovern:

INCLUSION OF LEVIATHAN CREEK [and Penn Mine] ON THE U.S. ENVIRONMENTAL PROTECTION AGENCY'S (EPA) SECTION 304(l) "SHORT LIST"

On September 28, 1990, EPA issued its final decision concerning the lists of waters, sources, and pollutants, and individual control strategies submitted by the State of California in accordance with Section 304(l) of the Clean Water Act. The "short list" required by paragraph (1)(c) of Section 304(l) includes Leviathan Creek (with Leviathan Mine as the point source), and the Mokelumne River (with Mine Run Dam/Mine Run Dam Reservoir as the point source). The State Water Resources Control Board (State Board) respectfully requests that these listings be withdrawn. Both water bodies have been adversely impacted by nonpoint sources of pollution (abandoned mine sites). We believe the most appropriate remediative approach is to address the sources of pollution (mine tailings and waste rock) including the use of wetlands and revegetation programs, rather than end-of-pipe treatment.

If EPA still considers these water bodies to be impaired by point sources of pollution, the issue merits a comparison with EPA's policy regarding the issuance of municipal storm water discharge permits. In a recent letter to State Board staff counsel, Ms. Elizabeth Miller Jennings, Mr. Harry Seraydarian responded to a petition for review of the terms and conditions of a municipal storm water discharge permit in the Santa Clara Valley. (Storm drains discharging into South San Francisco Bay from the Santa Clara Valley were included on the State's 304(l) short list.) Citing the definition of "effluent limitation" at 40 CFR 122.2 as: "...any restriction imposed by the Director on quantities, discharge rates, and concentrations of pollutants which are discharged from point sources into the waters of the United States, the waters of the contiguous zone, or the ocean", the letter concluded, in part, that "The NPDES permit conditions which would be included to ensure compliance with water quality standards would most commonly consist of numerical effluent limitations. However, given the above definition of 'effluent limitation', the conditions could also consist of other restrictions such as prohibitions or requirements that dischargers utilize specific types of controls."

JAN 23 PM 1:05 SACRAMENTO SWRCB

In a recent letter to Mr. Seraydarian from Mr. Harold Singer, the California Regional Water Quality Control Board, Lahontan Region described past efforts to control the effects of pollution from Leviathan Mine, as well as additional pollution control projects that will result in reasonable further progress toward the elimination of pollutant discharges to Leviathan Creek. EPA permit staff is also aware of the California Regional Water Quality Control Board, Central Valley Region's planned investigation for the control of pollutants entering the Mokelumne River from the abandoned Penn Mine site. I believe the permit conditions, if any, should reflect these efforts and focus on implementation of best management practices rather than require numerical effluent limitations.

Studies of acid mine drainage (AMD) sites have concluded that past efforts to neutralize or otherwise control acidic mine wastes have been effective only in the short term. Because the mineral source of the acid and toxic metals occurs in very large quantities at these abandoned mine sites, there is virtually no chance that the source of contaminants will be exhausted, even over many years' time. Once this process has begun, the formation of AMD is self-perpetuating and intractable. Effective long-term management of AMD is still the subject of intensive research. Under these conditions, the State Board considers effluent limitations based on State water quality standards to be inappropriate, and perhaps even unattainable at any cost.

If you require further assistance, please telephone Jesse M. Diaz, Chief, Division of Water Quality and Water Rights, at (916) 445-9552. The staff person working on this issue is Marcia Keesey, and she can be reached at (916) 324-1362.

Sincerely,

Original Signed By:

James W. Baetge
Executive Director

cc: Mr. Harry Seraydarian, Director (W-1)
Water Management Division
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street
San Francisco, CA 94105

Mr. Walter J. Bishop
East Bay Municipal Utility District
P.O. Box 24055
Oakland, CA 94623

Mr. Harold J. Singer, Executive Officer
California Regional Water Quality Control Board,
Lahontan Region
2092 Lake Tahoe Boulevard, Suite 2
South Lake Tahoe, CA 96150

Mr. William H. Crooks, Executive Officer
California Regional Water Quality Control Board,
Central Valley Region
3443 Routier Road, Suite A
Sacramento, CA 95827