CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. R5-2002-0043

NPDES NO. CA0081809

WASTE DISCHARGE REQUIREMENTS

FOR

ORIGINAL SIXTEEN TO ONE MINE, INC.
SIXTEEN TO ONE MINE
SIERRA COUNTY

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

1. The Original Sixteen to One Mine, Inc. and Michael Miller (hereafter Discharger) submitted a Report of Waste Discharge, dated 28 May 1998, and applied for a permit renewal to discharge waste under the National Pollutant Discharge Elimination System (NPDES) from the gold ore extraction and treatment processes for Sixteen to One Mine.

2. On 3 December 1993, the Board adopted Waste Discharge Requirements Order No. 93-233 which implemented the Inland Surface Water Plan. The Plan was set aside by a Court decision and was no longer in effect. On 27 January 1995, the Board rescinded Order No. 93-233 and adopted Waste Discharge Requirements Order No. 95-004, which expired 3 December 1998.

3. The Discharger owns and operates Sixteen to One Mine, and a wastewater collection, treatment, and disposal system for processing gold ore. The mine is in Section 34, T19N, R10E, MDB&M, at Latitude 39°27'52" N and Longitude 120°50'28" W, as shown on Attachment A, which is part of this Order.

4. The Sixteen to One Mine covers approximately 40 acres in and around the town of Alleghany, Sierra County, California. Alleghany is approximately 65 miles northeast of the intersection of Interstate 80 and State Route 49 and 40 miles east of the town of Grass Valley. The mine has been in operation since 1896, except for a temporary closure in 1965. The mine and surface operations are located on the south side of Pliocene Ridge and on the north side of Kanaka Creek ravine. Surface operations include roads, maintenance shops, offices, a mill, ore and waste stockpiles, settling ponds, and supply areas. The terrain is steep, with slopes of up to 45 degrees, and covered in heavy vegetation. The mine consists of about 20 miles of tunnels. The layout of the mine operations is shown in Attachment B, which is a part of this Order.

5. The gold at Sixteen to One Mine is located in a complex vein system of white quartz deposited in metamorphic rock. Other minerals associated with the gold-bearing quartz include galena, arsenopyrite, and serpentine. The mine operation is a hard rock underground mine in which, the miners sink diagonal shafts from which the miners then create horizontal tunnels at various elevations. The quartz veins at Sixteen to One Mine allow relatively selective extraction of gold. Ore from the mine is grouped into three categories. Rare high-grade gold and quartz specimens are removed first, cleaned, appraised and sold directly. Other high-grade ore with visible gold is hand sorted and sent to a mill on-site where gold is extracted and formed into bars. Low-grade ore may be left underground or stockpiled on the surface until processing is cost-effective. Waste rock, which contains no ore, may be left underground, stockpiled aboveground, used for on-site road surfacing, or sold as aggregate or decorative rock.

6. Ore is processed on-site in a 10 ton per hour gravity mill. The milling process consists of two-stage crushing and grinding, and gravity concentration using a jig, bowls, and table. Using water, the ore is processed through cyclone separators, or centrifuge-like machines, which separate the gold from the waste material, or tailings, based on differences in density. The resulting ore concentrate is either melted or amalgamated, using mercury in a closed retort system in the mill, and shipped in barrels to an out of state smelter for gold extraction. The waste, or tailings, from the cyclone separators consists of quartz sand, fine sediment, and water. The tailings are sent to on-site settling ponds where settleable materials drop out of suspension. The clarified water is drawn off to a sump in the interior of the mine, for further settling. Mine drainage and ore process wastewater commingle in the mine and then discharge from the mine to Kanaka Creek from a portal known as 21 Tunnel. The waste quartz sand may be stockpiled or used for the same purposes as the waste rock. A schematic of the milling process, including the discharge point, is shown in Attachment C, which is a part of this Order.

7. The Report of Waste Discharge describes the combined discharge as follows:

Constituent	Long Term Average	Maximum Daily Value
Flow	0.28 million gallons per day (MGD)	0.50 MGD
Temperature (winter)	52.9 ˚F (11.6 ˚C)	59.4 ˚F (15.2 ˚C)
Temperature (summer)	56.8 ˚F (13.8 ˚C)	59.5 ˚F (15.3 ˚C)
Total Suspended Solids	12 mg/l	209 mg/l
Arsenic	513 µg/l	835 µg/l
	Minimum	Maximum
pH	6.67	8.80

8. The U.S. Environmental Protection Agency (USEPA) and the Board have classified this discharge as a minor discharge.

9. The Board adopted *The Water Quality Control Plan for the California Regional Water Quality Control Board, Central Valley Region, the Sacramento River Basin and the San Joaquin River Basin, Fourth Edition – 1998* (hereafter Basin Plan). The Basin Plan designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve water quality objectives for all waters of the Basin. These requirements implement the Basin Plan.

10. Treated wastewater and mine drainage are discharged to Kanaka Creek, a water of the United States, and tributary to the Middle Yuba River, Yuba River, Feather River, and the Sacramento River. The discharge point is described as Latitude 39°27'45" N and Longitude 120°50'20" W. As described in the Basin Plan, the discharge point and Kanaka Creek are in the Camptonville Hydrologic Subarea 517.42, Middle Yuba Hydrologic Area, Yuba River Hydrologic Unit, of the Sacramento Hydrologic Basin.

11. The Basin Plan on page IV-24.00, prohibits the direct discharge of municipal and industrial wastes into the Sacramento River from the confluence with the Feather River to the Freeport Bridge. The industrial wastewater from Sixteen to One Mine enters the prohibited reach of the Sacramento River. However, the discharge to Kanaka Creek commingles with the waters of the Middle Yuba River, Yuba River, and Feather River prior to entering the Sacramento River and does not constitute a direct discharge. Therefore, the discharge does not violate the Basin Plan prohibition.

BENEFICIAL USES

12. Section II of the Basin Plan defines Existing and Potential Beneficial Uses of California's waters. The Basin Plan states that protection and enhancement of existing and potential beneficial uses are primary goals of water quality planning. Regarding disposal of wastewater, the Basin Plan states "disposal of wastewaters is [not] a prohibited use of waters of the State; it is merely a use which cannot be satisfied to the detriment of beneficial uses." Kanaka Creek is not specifically identified in the Basin Plan. In Figure II-1 and Table II-1 of the Basin Plan, the nearest downstream body of water that is identified is the Yuba River, Sources to Englebright Reservoir. The bodies of water, encompassed by the phrase "Sources to Englebright Reservoir", include the Middle Yuba River and Kanaka Creek. The beneficial uses of the Yuba River, Sources to Englebright Reservoir, including Kanaka Creek and the Middle Yuba River, listed in Table II-1, are Municipal and Domestic Supply, Agricultural Supply including Irrigation and Stock Watering, Hydropower Generation, Water Contact and Non-contact Water Recreation including aesthetic enjoyment, Cold Freshwater Habitat, Cold Water Spawning Habitat, and Wildlife Habitat. Additional Beneficial Uses, listed on pages II-1.00 and II-2.00 that apply to Kanaka Creek and the Middle Yuba River, are Groundwater Recharge and Freshwater Replenishment. The Middle Yuba River and Kanaka Creek are sources of the Yuba River. As sources of the Yuba River, the beneficial uses listed above are applicable to Kanaka Creek and the Middle Yuba River. In addition, the Basin Plan states that the beneficial uses of any specifically identified water body, apply to its tributary streams.

Upon review of the flow conditions, habitat values, and beneficial uses of Kanaka Creek and the Middle Yuba River, the Board finds that the beneficial uses identified in the Basin Plan for the Yuba River are applicable to Kanaka Creek and the Middle Yuba River based on the following facts:

Municipal, Domestic, and Agricultural Supply

The State Water Resources Control Board (SWRCB) has issued water rights to existing water users downstream of the discharge for domestic and irrigation uses. The nearest domestic and irrigation water rights uses issued by the SWRCB are approximately 7.5 miles downstream of the discharge point on Kanaka Creek. Additional domestic and irrigation water rights have been issued on the Yuba River and Englebright Reservoir downstream of the discharge.

Riparian Rights, for landowners along streams and rivers, are not recorded with the SWRCB and have precedence over other water rights. There may be other domestic and irrigation uses along Kanaka Creek that are not registered with the State Board.

Page II-2.00 of the Basin Plan states, "*Water bodies within the basins that do not have beneficial uses designated in Table II-1 are assigned MUN designations in accordance with the provisions of State Water Board Resolution No. 88-63 which is, by reference, a part of this Basin Plan*."

Hydropower Generation

Existing downstream hydropower generation will not be affected by the discharge. The discharge does not preclude additional hydropower facilities from being constructed. The topography and flow conditions in Kanaka Creek and Middle Yuba River appear to be acceptable for hydropower generation.

Water Contact and Non-contact Water Recreation and Aesthetic Enjoyment

The discharge flows through areas where there is public access to Kanaka Creek and the Middle Yuba River. Contact recreational activities and mining activities involving contact with water occur along the downstream waterways. Kanaka Creek and the Middle Yuba River flow through Tahoe National Forest. Hikers and campers in the relatively uninhabited area near and downstream of the discharge point have a reasonable expectation that the waters of Kanaka Creek and the Middle Yuba River are as unpolluted as similar streams in the vicinity. Exclusion of adjoining property owners and the public is unrealistic.

Cold Freshwater Habitat, Cold Water Spawning Habitat, and Wildlife Habitat

The Yuba River, from the sources to Englebright Reservoir, has been designated a cold water stream, suitable for fish spawning and as habitat for cold water species. The Tributary Rule applies to Kanaka Creek and the Middle Yuba River, as sources of the Yuba River. There are no known barriers to prevent cold-water fish species from migrating to Kanaka Creek from the Yuba River.

Staff of the California Department of Fish and Game reported that Kanaka Creek maintains populations of rainbow trout and provides aquatic habitat for aquatic insects, reptiles, and amphibians. Habitat types include a mixture of pools and riffles, interspersed with reaches of bedrock. Spawning habitats are present in the deposited gravels in lower velocity areas. Riparian vegetation is relatively heavy and the canopy shading averages about 50%. Kanaka Creek has optimal temperatures and flows throughout the year. The Creek was extensively impacted by past mining practices with respect to bank and stream topography but has recovered sufficiently to display reasonable stability.

Information in the file indicates that temperatures in Kanaka Creek do create habitat suitable to cold-water species. The cold-water habitat designation necessitates that the in-stream dissolved oxygen (DO) concentration be maintained at, or above, 7.0 mg/l.

Groundwater Recharge

In areas where the groundwater elevation is below the bottom of streambed, water from the stream will percolate to groundwater. During dry weather, in places in California, flowing streams experience these conditions, thus providing groundwater recharge. Kanaka Creek is a low flow stream during dry weather conditions. During dry weather and low flow conditions, Kanaka Creek is likely to provide groundwater recharge. Groundwater is a source of domestic and irrigation water supply.

Freshwater Replenishment

The water in Kanaka Creek is hydraulically connected to the Middle Yuba, Yuba, Feather, and Sacramento Rivers. Kanaka Creek contributes to the quantity and may impact the quality of the water in the downstream waters.

The beneficial uses of any specifically identified water body apply to its tributary streams. The Board finds, based on hydraulic continuity, aquatic life migration, existing and potential water rights, and the reasonable potential for contact recreational activities that the beneficial uses of the Yuba River, Sources to Englebright Reservoir, apply to Kanaka Creek.

13. The beneficial uses of the underlying groundwater are municipal and domestic supply, industrial service and process supply, and agricultural supply.

DISCUSSION OF EFFLUENT LIMITATIONS

14. Based on the available information, the Board finds that the discharge from Sixteen to One Mine constitutes up to one-third the flow of Kanaka Creek during dry weather. Dry weather conditions occur primarily in the summer months but also occur throughout the year, particularly in low rainfall years. Significant dilution may occur during and after high rainfall events. However, due to the dry weather low-flow nature of Kanaka Creek and lack of dilution data from the Discharger, no credit for receiving water dilution is available. The beneficial uses of Kanaka Creek must be protected; therefore, the lack of available dilution during dry periods results in more stringent

effluent limitations to protect recreational uses, drinking water standards, agricultural water quality goals, and aquatic life, and therefore, the appropriate water quality criteria will be the effluent limitations.

15. Federal regulations require effluent limitations for all pollutants that are or may be discharged at a level that will cause or have the reasonable potential to cause, or contribute to an in-stream excursion above a narrative or numerical water quality standard. Based on information submitted as part of the application, in studies, and as directed by monitoring and reporting program, the Board finds that the discharge does have a reasonable potential to cause or contribute to in-stream excursions above water quality standards and objectives for the constituents discussed below. Effluent limitations and/or studies have been included in this Order.

    a. The Basin Plan identifies numerical Water Quality Objectives for Dissolved Oxygen (DO) of 7 mg/l, in waters designated for cold water and spawning beneficial uses. By the Tributary Rule, Kanaka Creek has the beneficial uses of cold and spawning waters. In addition, the Basin Plan identifies numerical Water Quality Objectives for Dissolved Oxygen in the Feather River from the Fish Barrier Dam at Oroville to the Sacramento River. The Yuba River, containing the discharge from Sixteen to One Mine, enters the Feather River between the Fish Barrier Dam at Oroville and the Sacramento River. The Water Quality Objective for Dissolved Oxygen and Table III-2, on page III-5.00 of the Basin Plan states that the more stringent Dissolved Oxygen objective of 8.0 mg/l applies to the Feather River from the Fish Barrier Dam at Oroville to the Sacramento River, in the period between 1 September and 31 May.

    Data in Table 1 (attached) show that effluent DO concentrations range between a low of 4.3 mg/l and a high of 18.1 mg/l. At times the DO in the effluent and the receiving water are below the 7 mg/l Water Quality Objective. However, on most occasions, the effluent DO concentration is low at the same that the upstream and downstream receiving water DO concentrations are low, and effluent DO is high when the upstream and downstream receiving water DO concentrations are high. It is not possible to determine whether low DO concentrations in the effluent cause low DO concentrations in the downstream receiving water in violation of the Receiving Water Limitation in the existing Order. However, when the upstream receiving water DO is below 7 mg/l, the discharge of low DO water from the mine may maintain or exacerbate low DO conditions downstream, especially during low flow conditions. Due to the dry weather low-flow nature of Kanaka Creek and lack of dilution data from the Discharger, no credit for receiving water dilution is available. The lack of available dilution during dry periods requires effluent limitations to protect beneficial uses. Therefore, this order contains an effluent limitation for DO of 7 mg/l. It is not likely that the DO in the effluent discharged from Sixteen to One Mine will have an impact on the 8 mg/l Water Quality Objective for DO, 55 miles downstream at the confluence with the Feather River.

    b. The Basin Plan Water Quality Objective for pH states "*The pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5…*" The Report of Waste Discharge describes the range of effluent pH to be 6.67 to 8.80. During dry weather conditions the flow in Kanaka Creek is relatively low and there is little or no dilution

of the effluent. Therefore, the appropriate water quality criteria will become the effluent limitations in the proposed Order. The proposed Order contains effluent limitations based on the Basin Plan Water Quality Objective.

c. The California Department of Health Services has recommended a Drinking Water Standard, Secondary Maximum Contaminant Level (MCL) for electrical conductivity (EC) of 900 µmhos/cm, with an upper level of 1600 µmhos/cm, and a short-term level of 2200 µmhos/cm. Table 1 of the Information Sheet shows a reported maximum effluent EC value of 2290 µmhos/cm. The average of the effluent data in Table 1 has been calculated to be 1185 µmhos/cm. The maximum upstream EC value (R1) in Table 1 is 193.8 µmhos/cm and the average has been calculated to be 80 µmhos/cm. The maximum downstream EC value (R2) in Table 1 is 922 µmhos/cm and the average has been calculated to be 182 µmhos/cm. The data shows that on one occasion, it appears that the discharge caused the downstream receiving water EC to be greater than the Secondary MCL (900 µmhos/cm) and on two occasions, the discharge appears to have caused the downstream receiving water EC to be greater than the recommended agricultural limit (700 µmhos/cm). The data in Table 1 shows that the EC in the effluent causes the EC of the receiving stream to increase, and on occasion the value of EC in the effluent exceeds the assimilative capacity of Kanaka Creek for EC. The effluent EC values exceed the drinking water standards and recommended agricultural limit and threaten the drinking water and agriculture beneficial uses of Kanaka Creek. Therefore, Effluent Limitations for EC based on the Secondary MCL have been included in this Order. The Effluent Limitations in the Order are a Monthly Average of 900 µmhos/cm and Daily Maximum of 1600 µmhos/cm.

   The Basin Plan identifies numerical Water Quality Objectives for Electrical Conductivity in the Feather River from the Fish Barrier Dam at Oroville to the Sacramento River. The Yuba River, containing the discharge from Sixteen to One Mine, enters the Feather River between the Fish Barrier Dam at Oroville and the Sacramento River. Table III-3, on page III-7.00 of the Basin Plan states that Electrical Conductivity in the Feather River from the Fish Barrier Dam at Oroville to the Sacramento River shall not exceed 150 micromhos/cm (90 percentile). It is not likely that the EC discharged from Sixteen to One Mine will have an impact 55 miles downstream at the confluence with the Feather River, however, the Effluent Limitations for EC are protective of the Water Quality Objective for EC in the Feather River.

d. Mercury is used in the amalgamation process, which is a closed system with the intent that no mercury will be discharged. However, the current and past use of mercury at the site presents a reasonable potential that mercury may be discharged from the site.

   The Basin Plan contains a list (known as the 303(d) List) of Water Quality Limited Segments (WQLSs) that "are those sections of lakes, streams, rivers, or other fresh water bodies where water quality does not meet (or is not expected to meet) water quality standards even after the application of appropriate effluent limitations for point sources". The Basin Plan goes on to state, "Additional treatment beyond minimum federal requirements will be imposed on dischargers to WQLSs. Dischargers will be assigned or allocated a maximum allowable load of critical pollutants so that water quality objectives can be met in the segment."

Due to the listing of mercury on the 303(d) list, as a pollutant causing impairment of the Sacramento-San Joaquin Delta, the discharge must not cause or contribute to increased mercury levels in fish tissue to meet the requirements of the anti-degradation policy described in Resolution No. 68-16 and the anti-degradation policy described in the Code of Federal Regulations 40 CFR 131.12(a)(1).

USEPA adopted the *National Toxics Rule* (NTR) on 5 February 1993 and the *California Toxics Rule* (CTR) on 18 May 2000. These Rules contain criteria for priority pollutants and water quality standards applicable to this discharge. The State Water Resources Control Board adopted the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (known as the State Implementation Plan or SIP), which contains guidance on implementation of the NTR and the CTR. The Human Health criterion (10^{-6} risk for carcinogens) in the CTR for mercury, for consumption of water and aquatic organisms, is 0.050 µg/l. USEPA acknowledges in the Code of Federal Regulations, 40 CFR Part 131, that Human Health criteria may not be protective of some aquatic or endangered species and that "more stringent mercury limits may be determined and implemented through use of the State's narrative criterion." In the CTR, the USEPA reserved the mercury criteria for freshwater and aquatic life and may adopt new criteria at a later date.

The Discharger has collected some mercury data (see Table I, attached). Mercury was detected at 0.5 µg/l, which exceeds the CTR human health criterion of 0.050 µg/l. The Code of Federal Regulations, 40 CFR 122.44(d)(1)(iii), states that when a discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above allowable numeric criteria for an individual pollutant, the NPDES permit must contain an effluent limit. In addition, the reported concentration is right at the detection limit of the analytical method used by the laboratory. However "clean techniques" were not used for the analyses. When used by laboratories, clean techniques are able to reduce the analytical method detection limit significantly. It is possible that mercury is present in the discharge from Sixteen to One Mine at concentrations below 0.5 µg/l. Lacking other criteria, the proposed Order contains an Effluent Limitation for mercury based on the CTR Human Health criterion of 0.050 µg/l.

In addition, the proposed Order contains a mass based Effluent Limitation of 0.053 g/day, calculated using the average daily dry weather flow (0.28 MGD), provided by the Discharger in the Report of Waste Discharge, and the 0.050 µg/l concentration based Effluent Limitation. The proposed Order contains a Provision that requires the Discharger to develop a loading assessment and source reduction work plan for mercury. The purposes of the work plan are to investigate the concentration and mass loading of mercury in the effluent from the milling process, in the discharge from the mine, and in the receiving water and, if necessary, identify corrective action to control mercury loadings. Clean techniques will be required in laboratory analyses. The work plan will include a schedule by which source control or treatment methods identified in the work plan shall be implemented. The Provision also allows the Board to reopen the proposed Order to add or change the mercury Effluent Limitations based on the adoption of new mercury criteria by USEPA and/or information produced in the assessment conducted by the Discharger.

e. The Basin Plan contains Water Quality Objectives for Chemical Constituents on page III-3.00. The Chemical Constituents objectives include Table III-1 for Trace Element Water Quality Objectives. Table III-1 contains water a quality objective of 10 µg/l for arsenic for the Sacramento River between Keswick Dam and the I Street Bridge. The Feather River, containing the discharge from Sixteen-to-One Mine, enters the Sacramento River between Keswick Dam and the I Street Bridge.

The Basin Plan also contains a list (known as the 303(d) List) of Water Quality Limited Segments (WQLSs) that "are those sections of lakes, streams, rivers, or other fresh water bodies where water quality does not meet (or is not expected to meet) water quality standards even after the application of appropriate effluent limitations for point sources". The Basin Plan goes on to state, "Additional treatment beyond minimum federal requirements will be imposed on dischargers to WQLSs. Dischargers will be assigned or allocated a maximum allowable load of critical pollutants so that water quality objectives can be met in the segment." The list of WQLSs includes Kanaka Creek as an impaired water body due to arsenic.

The report of waste discharge for Sixteen to One Mine indicates the discharge contains a maximum arsenic concentration of 835 µg/l with an average concentration of 513 µg/l. In addition, Table 1 of the attached Information Sheet includes arsenic data compiled from the Discharger's monitoring reports and samples collected by Regional Board staff. The maximum effluent arsenic concentration from Table 1 is 973 µg/l with an average concentration of 519 µg/l. Using the average daily dry weather flow of 0.28 million gallons per day (MGD) provided by the Discharger in the Report of Waste Discharge and the average concentration of 519 µg/l, the average amount of arsenic discharged during dry weather is 0.55 kg/day. Table 1 also shows that the arsenic discharged from the mine causes the downstream concentration of arsenic to increase. On two occasions, the downstream concentration of arsenic exceeded the receiving water limitation (360 µg/l) in the existing Order, in violation of the Order.

The Code of Federal Regulations, 40 CFR 122.44(d)(1)(iii), states that when a discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above allowable numeric criteria for an individual pollutant, the NPDES permit must contain an effluent limit.

The current USEPA Ambient Water Quality Criteria for arsenic (150 µg/l as a 4-day average and 340 µg/l as a 1-hour average) are lower than the receiving water limitation in the existing Order (360 µg/l); therefore, the proposed Order cannot use 360 µg/l as a limitation of any sort. In addition, by the Tributary Rule, and due to existing water rights, drinking water is a beneficial use of Kanaka Creek. Therefore, to protect the drinking water beneficial use, drinking water standards and human health criteria must also be applied to Kanaka Creek. During dry weather conditions the flow in Kanaka Creek is relatively low, therefore we must assume no dilution of the effluent, and therefore, the appropriate water quality criteria will become the effluent limitations in the proposed Order. The current Primary MCL for arsenic is 10 µg/l and other drinking water standards have even lower concentrations. The drinking water standards and human health criteria for arsenic all have concentrations lower than the

Ambient Water Quality Criteria. Therefore, to protect the drinking water beneficial uses, the drinking water standards or human health criteria must be used to establish effluent limitations rather than Ambient Water Quality Criteria.

The receiving water data for arsenic in Table 1 of the Information Sheet (R1) shows the maximum reported arsenic concentration was 293 µg/l, the minimum was none detected, and the average of the reported concentrations was calculated to be 12 µg/l. The 12 µg/l average exceeds the Primary MCL for arsenic of 10 µg/l. Therefore, the receiving water has no assimilative capacity for arsenic. To be protective of the drinking water beneficial use, the Primary MCL would become the effluent limitation. Comparing the effluent data in Table 1 to the Primary MCL of 10 µg/l, 92 of 94 effluent samples exceed the MCL.

Arsenic is an inorganic priority pollutant that is known to cause adverse human health effects, including cancer. For waters that are designated as municipal and domestic supply, the Basin Plan prohibits (1) chemicals in concentrations that exceed California drinking water Maximum Contaminant Levels (MCLs) and (2) toxic substances in toxic amounts. To determine what numeric receiving water limitations will properly implement the narrative toxicity objective, the Basin Plan requires the Board to consider material and relevant information submitted by the Discharger and others, as well as numerical criteria and guidelines for toxic substances developed by other agencies and organizations. Toxicity based numerical criteria for arsenic in drinking water include 10^{-6} incremental cancer risk estimates from USEPA and Cal/EPA ranging from 0.018 to 0.023 µg/l and USEPA's reference dose for health effects other than cancer of 2.1 µg/l. In addition, dischargers who cause the Proposition 65 Safe Harbor Level of 5 µg/l to be exceeded in sources of drinking water may face significant liability. Arsenic is a naturally occurring element. Natural background levels of arsenic in many California Waters exceed one or more of the above criteria. The Regional Board does not have the authority to require that natural background levels be improved upon. However, controllable water quality factors, such as the discharge of waste are not permitted to cause natural concentrations to increase.

This Order contains a concentration based Effluent Limitation of 10 µg/l as a Monthly Average. In addition, the proposed Order contains a mass based Effluent Limitation of 10.6 g/day, calculated using the average daily dry weather flow (0.28 MGD), provided by the Discharger in the Report of Waste Discharge, and the 10 µg/l concentration based Effluent Limitation. This Order also contains a Provision that requires the Discharger to study the concentration of arsenic in the effluent from the milling process, in the discharge from the mine, and in the receiving water, and to develop a source control program or determine other means of compliance. The Provision also allows the Board to reopen the proposed Order to add or change Effluent Limitations based on the adoption of new water quality criteria or objectives for arsenic and/or to include new effluent limitations based on the results of the arsenic study.

f. The Basin Plan identifies numerical Water Quality Objectives for the Sacramento River between Keswick Dam and the I Street Bridge. The Feather River, containing the discharge from Sixteen-to-One Mine, enters the Sacramento River between Keswick Dam and the I Street Bridge. The Board adopted numerical Trace Element Water Quality Objectives in the

Basin Plan, shown in Table III-1 on page III-3.00, for the Sacramento River, besides arsenic (see above) for barium, copper, cyanide, iron, manganese, silver, and zinc. To date the Discharger has not been required to provide information about the presence of these constituents in the wastewater and the toxic effects of these constituents on the receiving water are not known. This Order contains Provisions requiring the Discharger to provide information on the presence of these trace elements in the discharge and receiving water, so that effluent limitations may be calculated if necessary, and that allow the Board to reopen the Order to include effluent limitations.

g. This Order and the Basin Plan prohibit the discharge of toxic constituents in toxic amounts. Aluminum is an element that is found naturally in soils and the water that comes in contact with the soil. The USEPA has developed Drinking Water Standards and Ambient Water Quality Criteria for the Protection of Freshwater Aquatic Life for aluminum. To date, the Discharger has not been required to supply information regarding the concentrations of aluminum in the discharge and the toxic effects of aluminum in the effluent are not known. This Order contains provisions that require the Discharger to; provide information as to whether the levels of aluminum in the discharge cause or contribute to an in-stream excursion above a water quality objective; submit information so that effluent limitations may be calculated for aluminum in the discharge if concentrations of nitrate have a reasonable potential to cause or contribute to an in-stream excursion above a water quality objective; and allow the Board to reopen this Order and include effluent limitations for aluminum.

h. USEPA adopted the NTR on 5 February 1993 and the CTR on 18 May 2000. These Rules contain criteria for priority pollutants and water quality standards applicable to this discharge. The State Water Resources Control Board adopted the SIP, which contains guidance on implementation of the NTR and the CTR. Also, Findings No. 15.f and g, above, discuss the lack of data regarding aluminum, barium, copper, cyanide, iron, manganese, silver, and zinc in the discharge. This Order contains provisions that:

    i. Require the Discharger to provide information as to whether the levels of NTR and CTR constituents, USEPA Priority Pollutants, aluminum, barium, copper, cyanide, iron, manganese, silver, and zinc in the discharge cause or contribute to an in-stream excursion above a water quality objective;

    ii. Require the Discharger to submit information so that effluent limitations may be calculated for those constituents in the discharge that have a reasonable potential to cause or contribute to an in-stream excursion above a water quality objective; and

    iii. Allow the Board to reopen this Order and include effluent limitations for those constituents.

    On 10 September 2001, the Executive Officer issued a letter, in conformance with Section 13267 of the California Water Code, requiring the Discharger to prepare a technical report assessing water quality. This Order is intended to be consistent with the requirements for the technical report, in requiring sampling for NTR, CTR, and additional constituents, to determine the full water quality impacts of the discharge. The technical report requirements

are intended to be more detailed than this Finding, listing specific constituents, detection levels, and acceptable time frames, and shall take precedence in resolving any conflicts.

VIOLATIONS OF EXISTING ORDER NO. 95-004/ ENFORCEMENT

16. The discharge from Sixteen to One Mine has violated discharge prohibitions, effluent and receiving water limitations, and monitoring and reporting requirements of existing Order No. 95-004, which was adopted January 1995. The Information Sheet, a part of this Order, contains a detailed list of the violations. The violations are as follows:

    a. On three occasions in 1997 and 1998 (19 February and 12 May 1997 and 5 February 1998) staff of California Department of Fish and Game observed the discharge of storm water laden with fine material into the North Fork of Kanaka Creek, approximately 300 feet from the confluence with Kanaka Creek and/or the deposition of materials from the stockpiles (ranging in size from fines to 6-inch diameter rocks or larger) into the flood plain and channel of Kanaka Creek. The discharges are violations of Discharge Prohibitions Nos. A.1 and A.2 and Receiving Water Limitations Nos. 6 and 8.

    b. Between January 1996 and December 1998, the Discharger reported the results of 25 effluent Suspended Solids samples. Of these samples, **12** were in violation of the Monthly Average Effluent Limitation and **7** were in violation of the Daily Maximum Effluent Limitation. In addition, the existing Order required the Discharger to collect monthly effluent samples for Suspended Solids. Between February 1995 and September 2001, there were 80 months but only 25 monthly samples. Therefore, the Discharger failed to submit the results of **55** effluent Suspended Solids samples.

    c. Between January 1996 and July 1998, the Discharger reported the results of 63 effluent Settleable Solids samples. Of these samples, **2** were in violation of the Monthly Average Effluent Limitation. In addition, the existing Order required the Discharger to collect monthly effluent samples for Settleable Solids. Between February 1995 and September 2001, there were 80 months but only 21 monthly samples. (Of the 63 samples noted above, many were collected weekly for several months.) Therefore, the Discharger failed to submit the results of **59** months of effluent Settleable Solids samples.

    d. Between February 1995 and 31 July 1998, the Discharger reported the results of 107 effluent pH samples. Of these samples, **3** were in violation of the Effluent Limitation. In addition, the existing Order required the Discharger to collect weekly effluent pH samples. Between February 1995 and September 2001, there were 360 weeks but only 107 samples. Therefore, the Discharger failed to submit the results of **253** weekly effluent pH samples.

    e. Between February 1995 and September 2001, the Discharger reported the results of only **one** bioassay of undiluted effluent, which had 100% mortality, in violation of the effluent limitation requiring 70% survival in one bioassay and a median of 90% survival in three or more consecutive bioassays. In addition, the existing Order required the Discharger to conduct quarterly Acute Toxicity tests on the effluent. Between February 1995 and

September 2001, there were 26 quarters but only 1 test. Therefore, the Discharger failed to submit the results of **25** effluent quarterly Acute Toxicity tests.

f. Between May 1996 and July 1998, the Discharger reported the results of 65 receiving water Dissolved Oxygen (DO) samples. Of these samples, **2** were in violation of the Receiving Water Limitation. In addition, the existing Order required the Discharger to collect monthly receiving water DO samples. Between February 1995 and September 2001, there were 80 months but only 24 monthly samples. (Of the 65 samples noted above, many were collected weekly for several months.) Therefore, the Discharger failed to submit the results of **56** months of receiving water DO samples.

g. Between May 1996 and December 1998, the Discharger reported the results of 21 receiving water turbidity samples. Of these samples, **17** were in violation of the Receiving Water Limitation. In addition, the existing Order required the Discharger to collect monthly receiving water turbidity samples. Between February 1995 and September 2001, there were 80 months but only 21 monthly samples. Therefore, the Discharger failed to submit the results of **59** months of receiving water turbidity samples.

h. Between January 1996 and July 1998, the Discharger reported the results of 107 receiving water pH samples. Of these samples, 26 were in violation of the Receiving Water Limitation. In addition, the existing Order required the Discharger to collect weekly receiving water pH samples. Between February 1995 and September 2001, there were 360 weeks but only 107 weekly samples. Therefore, the Discharger failed to submit the results of **253** weeks of receiving water pH samples.

j. Provision E.1 required that an arsenic study be conducted, implementation of a source control program, and submittal of various reports. The Discharger completed the first two tasks but failed to submit a Progress Report for the arsenic study, a Work Plan for the arsenic source control program, and the Final Report, in violation of Provision E.1

k. Provision E.4 of existing Order No. 95-004 required the Discharger to comply with Monitoring and Reporting Program No. 95-004. The Discharger was required to submit monitoring reports and collect samples. Between February 1995 and September 2001, there were 26 quarters, 80 months, and 360 weeks The Discharger failed to submit monitoring reports and collect samples as follows:

   i. No monitoring results or reports were submitted at all for **38** months (out of 80).

   ii. Weekly monitoring of effluent pH was required. The Discharger submitted the results of 107 weekly samples. Therefore, out of 360 weeks, the Discharger failed to submit the results of **253** effluent pH samples.

   iii. Weekly monitoring of effluent Temperature was required. The Discharger submitted the results of 80 weekly samples. Therefore, out of 360 weeks, the Discharger failed to submit the results of **280** effluent Temperature samples.

iv. Weekly monitoring of effluent Electrical Conductivity (EC) was required. The Discharger submitted the results of 113 weekly samples. Therefore, out of 360 weeks, the Discharger failed to submit the results of **247** effluent EC samples.

v. Monthly monitoring of effluent Settleable Solids was required. The Discharger submitted the results of 21 monthly samples. (Of the 63 samples noted above, many were collected weekly for several months.) Therefore, out of 80 monthly samples, the Discharger failed to submit the results of **59** effluent Settleable Solids samples.

vi. Weekly monitoring of effluent Arsenic concentrations was required. The Discharger submitted the results of 85 weekly samples. Therefore, out of 360 weekly samples, the Discharger failed to submit the results of **275** effluent Arsenic samples.

vii. Monthly monitoring of effluent Mercury concentrations was required. The Discharger submitted the results of 25 monthly samples. Therefore, out of 80 monthly samples, the Discharger failed to submit the results of **55** effluent Mercury samples.

viii. Monthly monitoring of effluent Suspended Solids was required. The Discharger submitted the results of 25 samples. Therefore, out of 80 monthly samples, the Discharger failed to submit the results of **55** effluent Suspended Solids samples.

ix. Quarterly effluent Acute Toxicity tests were required. The Discharger submitted the results of only 1 test. Therefore, out of 26 quarterly tests, the Discharger failed to submit the results of **25** effluent Acute Toxicity tests.

x. Weekly monitoring of receiving water Temperature was required. The Discharger submitted the results of 81 weekly samples. Therefore, out of 360 weekly samples, the Discharger failed to submit the results of **279** receiving water Temperature samples.

xi. Weekly monitoring of receiving water EC was required. The Discharger submitted the results of 107 weekly samples. Therefore, out of 360 weekly samples, the Discharger failed to submit the results of **253** receiving water EC samples.

xii. Weekly monitoring of receiving water pH was required. The Discharger submitted the results of 107 weekly samples. Therefore, out of 360 weekly samples, the Discharger failed to submit the results of **253** receiving water pH samples.

xiii. Monthly monitoring of receiving water DO samples was required. The Discharger submitted the results of 24 monthly samples. (Of the 65 samples noted above, many were collected weekly for several months.) Therefore, out of 80 monthly samples, the Discharger failed to submit the results of **56** receiving water DO samples.

xiv. Monthly monitoring of receiving water Turbidity samples was required. The Discharger submitted the results of 21 monthly samples. Therefore, out of 80 monthly

samples, the Discharger failed to submit the results of **59** receiving water Turbidity samples.

xv. Monthly monitoring of receiving water Arsenic was required. The Discharger submitted the results of 26 monthly samples. Therefore, out of 80 monthly samples, the Discharger failed to submit the results of **54** receiving water Arsenic samples.

17. On 19 February 1997, California Department of Fish and Game (DFG) staff observed discharges of fine materials and rocks to surface waters from Sixteen to One Mine. On 7 May 1997 Board staff issued an Administrative Civil Liability Complaint (ACLC), in the amount of $40,000 for the following:

a. The discharge of fine materials to North Fork Kanaka Creek and Kanaka Creek and for violation of turbidity limits in the permit.
b. Causing the streambed to be covered with silt.
c. Discharging waste piles to the streambed.
d. Failure to submit a Notice of Intent for the storm water discharges.
e. Failure to submit monthly monitoring reports required by the permit.
f. Violation of the Compliance Schedule in the permit for a study to evaluate arsenic.

18. On 12 May 1997, DFG staff again noted discharges of fine materials and rocks to surface water from Sixteen to One Mine. On 9 June 1997, Board staff issued a Notice of Violation (NOV) for failure to maintain the waste piles and allowing them to discharge into the creek.

19. On 19 September 1997, Administrative Civil Liability Order No. 97-210 (ACL) was adopted by the Board in the amount of $20,000 and was due by 19 October 97. The violations listed in the ACL were the same as those listed in the ACLC and in the NOV. In addition, between January 1996 and Feb 1997 the Discharger failed to perform weekly analyses and unilaterally reduced their frequency of monitoring after September 1995, resulting in failure to submit the results of 600 different analyses.

20. On 15 October 1997, the Discharger petitioned the State Board for review of the ACL. On 14 January 1997, the State Board dismissed the Discharger's petition. In early 1997, the Discharger brought a lawsuit against the Board regarding the ACL. On 8 March 1999, a Court decision was made against the Discharger, and a Court Order dated 22 March 1999, denied the Discharger's petition. As of 24 October 2001, the $20,000 ACL had not been paid.

21. As described in the Information Sheet, the California Code of Regulations, Title 23, Division 3, Chapter 9, Article 1, Section 2200(a)(1) contains an annual fee schedule that requires dischargers to submit annual fees based on the threat to water quality and the complexity of the discharge. It is the responsibility of Regional Board staff to determine the appropriate threat and complexity of the discharge. After review of these categories and constituents that have been discharged from Sixteen to One Mine, Board staff determined that the threat and complexity of the discharge are described in Categories "2" and "B". A 2-B rating corresponds to an annual fee of $2,000.

In late 1998, Board staff reassessed the threat and complexity of the discharge from 3-C to 2-B. In December 1998, the Discharger refused to agree to the upgrade and corresponding increase in annual fee. Rather than pay the annual fee of $2000 for a discharge ranked 2-B, the Discharger paid only $200 for a discharge ranked 3-C. The annual fee for a discharge ranked 3-C is $400, therefore, it is not clear why the Discharger paid $200. There followed, several exchanges of letters between Board staff, requesting full payment of the annual fees, and the Discharger refusing to pay the full amount. From fiscal year 1998 through 2000, the Discharger has failed to pay $5600 in annual fees. The information for fiscal year 2001 is not yet available.

22. This Order contains new Effluent Limitations for dissolved oxygen, pH, electrical conductivity, mercury, and arsenic, and more stringent Receiving Water Limitations for turbidity. This Order also contains Provisions with schedules for the Discharger to implement the necessary improvements to comply with the new limitations.

23. The Discharger violated Discharge Prohibitions and Effluent and Receiving Water Limitations in existing Order No. 95-004, as described in Findings Nos. 16, 17, and 18, above. The Discharger threatens to violate the new limitations in this Order. The accompanying Cease and Desist Order No. R5-2002-0044 contains a schedule for the Discharger to implement the necessary improvements to comply with Waste Discharge Requirements.

GENERAL INFORMATION

24. The action to adopt an NPDES permit is exempt from the provisions of Chapter 3 of the California Environmental Quality Act (CEQA) (Public Resources Code Section 21000, et seq.), which requires preparation of an environmental impact report or negative declaration in accordance with Section 13389 of the California Water Code.

25. The permitted discharge is consistent with the antidegradation provisions of 40 CFR 131.12 and State Water Resources Control Board Resolution 68-16. Compliance with these requirements will result in the use of best practicable treatment or control of the discharge. The impact on existing water quality will be insignificant.

26. Effluent limitations, and toxic and pretreatment effluent standards established pursuant to Sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 304 (Information and Guidelines), and 307 (Toxic and Pretreatment Effluent Standards) of the Clean Water Act (CWA) and amendments thereto are applicable to the discharge.

27. The discharge is presently governed by Waste Discharge Requirements Order No. 95-004 (NPDES No. CA0081809), adopted by the Board on 27 January 1995.

28. The Board has considered the information in the attached Information Sheet in developing the Findings of this Order. The attached Information Sheet is part of this Order.

29. 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.

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

31. This Order shall serve as an NPDES permit pursuant to Section 402 of the CWA, and amendments thereto, and shall take effect upon the date of hearing, provided EPA has no objections.

IT IS HEREBY ORDERED that Order No. 95-004 is rescinded and Michael Miller and the Original Sixteen to One Mine, Inc., its agents, successors and assigns, 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. Discharge Prohibitions:

1. Discharge of treated wastewater and mine drainage at a location or in a manner different from that described in the Findings, is prohibited.

2. The by-pass, overflow, and/or discharge of ore, tailings, waste rock, sediment, fine materials, waste solids and liquids, and other waste materials, except as described in Discharge Prohibition No. 1 above, are prohibited throughout the mining, milling, solids handling, collection, settling, treatment, storage, and discharge system.

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

4. The discharge or storage of waste classified as ‘hazardous’ or ‘designated’, as defined in Sections 2521(a) and 2522(a) of Title 27, is prohibited.

5. The direct discharge of storm water, from the mine site, to surface waters is prohibited, except as allowed by the General Permit for Discharges of Storm Water Associated with Industrial Activities.

B. Effluent Limitations: for discharge of combined mine drainage and/or process wastewater from the mine outfall.

1. Effluent shall not exceed the following limits:

Constituents	Units	Monthly Average	Daily Maximum
Electrical Conductivity	µmhos/cm	900	1600
Settleable Solids	ml/l	0.1	5.0
Total Suspended Solids	mg/l	20	30
	g/day [1]	21,224	31,836
Mercury	µg/l		0.050
	g/day [1]		0.053
Arsenic	µg/l	10.0	
	g/day [1]	10.6	

[1] Based upon an average daily dry weather flow of 0.28 MGD (280,000 gallons/day)
X mg/l x 0.001 g/mg x 3.79 liters/gallon x 280,00 gal/day = *Y* g/day
or
X µg/l x 0.000001 g/µg x 3.79 liters/gallon x 280,00 gal/day = *Y* g/day

2. The average daily dry weather flow shall not exceed 0.28 MGD.

3. The discharge to the receiving water shall not have a pH less than 6.5 nor greater than 8.5.

4. The discharge to the receiving water shall not have a dissolved oxygen concentration less than 7.0 mg/l.

5. Survival of aquatic organisms in 96-hour bioassays of undiluted waste shall be no less than:

Minimum for any one bioassay ---------- 70%
Median for any three or more consecutive bioassays -------- 90%

C. Receiving Water Limitations:

Receiving Water Limitations are based upon water quality objectives contained in the Basin Plan. As such, they are a required part of this permit.

The discharge shall not cause the following in the receiving water:

1. Concentrations of dissolved oxygen to fall below 7.0 mg/l. The monthly median of the mean daily dissolved oxygen concentration shall not fall below 85 percent of saturation in the main water mass. The 95th percentile concentration of dissolved oxygen shall not fall below 75 percent of saturation in the main water mass.

2. The ambient pH to fall below 6.5, exceed 8.5, or change by more than 0.5 units.

3. The ambient temperature to increase more than 5°F.

4. The turbidity to increase as follows:

    a. More than 1 Nephelometric Turbidity Unit (NTU) where natural turbidity is between 0 and 5 NTU.

    b. More than 20 percent where natural turbidity is between 5 and 50 NTU.

    c. More than 10 NTU where natural turbidity is between 50 and 100 NTU.

    d. More than 10 percent where natural turbidity is greater than 100 NTU.

5. Oils, greases, waxes, sediments, fine sediments, or other materials to form a visible film or coating on the water surface or on the stream bottom.

6. Oils, greases, waxes, floating material (liquids, solids, foams, and scums), or suspended material to create a nuisance or adversely affect beneficial uses.

7. Aesthetically undesirable discoloration.

8. Fungi, slimes, or other objectionable growths.

9. Deposition of material that causes nuisance or adversely affects beneficial uses.

10. Deposition of material that reduces or restricts the natural flow.

11. Aquatic communities and populations, including vertebrate, invertebrate, and plant species, to be degraded.

12. Taste or odor-producing substances to impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin or to cause nuisance or adversely affect beneficial uses.

13. Toxic pollutants to be present in the water column, sediments, or biota in concentrations that adversely affect beneficial uses; that produce detrimental response in human, plant, animal, or aquatic life; or that bioaccumulate in aquatic resources at levels which are harmful to human health.

14. Violation of any applicable water quality standard for receiving waters adopted by the Board or the State Water Resources Control Board pursuant to the CWA and regulations adopted thereunder.

D. Groundwater Limitations:

1. The Discharge shall not degrade groundwater quality.

E. Sediment Disposal:

1. Collected screenings, sludges, sediments, and other solids removed from liquid wastes shall be disposed of in a manner approved by the Executive Officer, and consistent with *Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste,* as set forth in Title 27, CCR, Division 2, Subdivision 1, Section 20005, et seq.

F. Provisions:

1. The treatment facilities shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return frequency.

2. The Discharger shall conduct the chronic toxicity testing specified in the Monitoring and Reporting Program. If the testing indicates that the discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above the water quality objective for toxicity, the Discharger initiate a Toxicity Identification Evaluation (TIE) to identify the causes of toxicity. Upon completion of the TIE, the Discharger shall submit a work plan to conduct a Toxicity Reduction Evaluation (TRE) and, after Board evaluation, conduct the TRE. This Order will be reopened and a chronic toxicity limitation included and/or a limitation for the specific toxicant identified in the TRE included. Additionally, if the State Water Resources Control Board adopts a chronic toxicity water quality objective, this Order may be reopened and a limitation based on that objective included.

3. The Discharger shall complete a study to assess the sources of arsenic and determine if source control measures or treatment are necessary to achieve compliance. The Discharger must comply with the following schedule to evaluate arsenic concentrations in effluent from the milling process, in the discharge from the mine, and in the receiving water, and to develop a source control program or treatment measures necessary to achieve compliance with this Order:

Task	Compliance Date
Submit Plan for Arsenic Study	**45 days after permit adoption**
Begin Study	**4 months after permit adoption**
Complete Study	**1 year after beginning study**
Submit Report on Arsenic Study	**1 year, 8 months after permit adoption**
Begin Implementation	**2 years, 6 months after permit adoption**
Full Compliance with Arsenic Effluent Limitations	**3 years after permit adoption**

The Discharger shall submit to the Board on or before each compliance date, the specified document or a written report detailing compliance or noncompliance with the specific date and task. If noncompliance is reported, the Discharger shall state the reasons for noncompliance and include an estimate of the date when the Discharger will be in compliance. The Discharger shall notify the Board by letter when it returns to compliance with the compliance schedule.

If after review of the study results it is determined that the discharge has a reasonable potential to cause or contribute to an exceedance of a water quality objective this Order will be reopened and effluent limitations for arsenic will be modified or added.

If new water quality criteria or objectives for arsenic are adopted, this Order will be reopened and effluent limitations for arsenic will be modified or added.

4. The Discharger shall complete a study to assess sources of mercury and determine if source control measures or treatment are necessary to achieve compliance. The Discharger shall comply with the following schedule to evaluate mercury concentrations in effluent from the milling process, in the discharge from the mine, and in the receiving water, and to develop a source control program or treatment measures necessary to achieve compliance with this Order:

Task	Compliance Date
Submit Plan for Mercury Study	**45 days after permit adoption**
Begin Study	**4 months after permit adoption**
Complete Study	**1 year after beginning study**
Submit Report on Mercury Study	**1 year, 8 months after permit adoption**
Begin Implementation	**2 years, 6 months after permit adoption**
Full Compliance with Mercury Effluent Limitations	**3 years after permit adoption**

The Discharger shall submit to the Board on or before each compliance date, the specified document or a written report detailing compliance or noncompliance with the specific date and task. If noncompliance is reported, the Discharger shall state the reasons for noncompliance and include an estimate of the date when the Discharger will be in compliance. The Discharger shall notify the Board by letter when it returns to compliance with the compliance schedule.

If after review of the study results it is determined that the discharge has a reasonable potential to cause or contribute to an exceedance of a water quality objective this Order will be reopened and effluent limitations for mercury will be modified or added.

If USEPA adopts new criteria for mercury, this Order will be reopened and effluent limitations for mercury will be modified or added.

5. There are indications that the discharge may contain constituents that have a reasonable potential to cause or contribute to an exceedance of water quality objectives: NTR and CTR constituents, EPA Priority Pollutants, aluminum, barium, copper, cyanide, iron, manganese, silver, and zinc. The Discharger shall comply with the following time schedule in conducting a study of the potential effects of these constituents in surface waters:

Task	Compliance Date
Begin Study	**2 months after permit adoption**
Submit Study Report	**1 June 2003**

The Discharger shall submit to the Board on or before each compliance due date, the specified document or a written report detailing compliance or noncompliance with the specific date and task. If noncompliance is reported, the Discharger shall state the reasons for noncompliance and include an estimate of the date when the Discharger will be in compliance. The Discharger shall notify the Board by letter when it returns to compliance with the time schedule.

If after review of the study results it is determined that the discharge has reasonable potential to cause or contribute to an exceedance of a water quality objective this Order will be reopened and effluent limitations added for the subject constituents.

On 10 September 2001, the Executive Officer issued a letter, in conformance with Section 13267 of the California Water Code, requiring the Discharger to prepare a technical report assessing water quality. This Order is intended to be consistent with the requirements for the technical report, in requiring sampling for NTR, CTR, and additional constituents, to determine the full water quality impacts of the discharge. The technical report requirements are intended to be more detailed than this Provision, listing specific constituents, detection levels, and acceptable time frames, and shall take precedence in resolving any conflicts.

6. The Discharger shall comply with all the items of the "Standard Provisions and Reporting Requirements for Waste Discharge Requirements (NPDES)", dated 1 March 1991, which are part of this Order. This attachment and its individual paragraphs are referred to as "Standard Provisions."

7. The Discharger shall comply with Monitoring and Reporting Program No. R5-2002-0043, which is part of this Order, and any revisions thereto as ordered by the Executive Officer.

8. When requested by USEPA, the Discharger shall complete and submit Discharge Monitoring Reports. The submittal date shall be no later than the submittal date specified in the Monitoring and Reporting Program for Discharger Self Monitoring Reports.

9. This Order expires on 1 March 2007 and the Discharger must file a Report of Waste Discharge in accordance with Title 23, CCR, not later than 180 days in advance of such date in application for renewal of waste discharge requirements if it wishes to continue the discharge.

10. Prior to making any change in the discharge point, place of use, or purpose of use of the wastewater, the Discharger shall obtain approval of, or clearance from the State Water Resources Control Board (Division of Water Rights).

11. 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 immediately forwarded to this office.

    To assume operation under this Order, the succeeding owner or operator must apply in writing to the Executive Officer requesting transfer of the Order. The request must contain the requesting entity's full legal name, the State of incorporation if a corporation, address and telephone number of the persons responsible for contact with the Board and a statement. The statement shall comply with the signatory paragraph of Standard Provision D.6 and state that the new owner or operator assumes full responsibility for compliance with this Order. Failure to submit the request shall be considered a discharge without requirements, a violation of the California Water Code. Transfer shall be approved or disapproved in writing by the Executive Officer.

I, GARY M. CARLTON, 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 1 March 2002.

GARY M. CARLTON, Executive Officer

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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. R5-2002-0043

NPDES NO. CA0081809

FOR

ORIGINAL SIXTEEN TO ONE MINE, INC.
SIXTEEN TO ONE MINE
SIERRA COUNTY

The Discharger shall not implement any changes to this Program unless and until the Regional Board or Executive Officer issues a revised Monitoring and Reporting Program. Specific sample station locations shall be established under direction of the Board's staff, and a description of the stations shall be attached to this Order.

SETTLING BASIN EFFLUENT MONITORING

Samples shall be collected from settling basin effluent as it leaves the last basin prior to entering the mine. Samples collected from the outlet structure of ponds will be considered adequately composited. Settling basin effluent monitoring shall include at least the following:

Constituents	Units	Type of Sample	Sampling Frequency
Flow	MGD	Measure	Daily
PH	--	Grab	Weekly
Temperature	°F	Grab	Weekly
Dissolved Oxygen	mg/l	Grab	Weekly
Electrical Conductivity @ 25°C	µmhos/cm	Grab	Weekly
Total Dissolved Solids	mg/l	Grab	Twice Monthly
Suspended Solids	mg/l, g/day [1]	Grab	Twice Monthly
Settleable Solids	ml/l	Grab	Twice Monthly
Mercury	µg/l, g/day [1]	Grab	Monthly
Total and Dissolved Arsenic	µg/l, g/day [1]	Grab	Weekly

[1] The Discharger shall calculate the mass using the flow data from the date of sample collection, as follows:

X mg/l x 0.001 g/mg x 3.79 liters/gallon x flow (gal/day) = *Y* g/day

or

X µg/l x 0.000001 g/µg x 3.79 liters/gallon x flow (gal/day) = *Y* g/day

EFFLUENT MONITORING

Effluent samples shall be collected downstream from the last connection through which wastes can be admitted into the outfall. Effluent samples should be representative of the volume and quality of the discharge. Samples collected from the outfall from the mine will be considered adequately composited. Time of collection of samples shall be recorded. Effluent monitoring shall include at least the following:

Constituents	Units	Type of Sample	Sampling Frequency
Flow	MGD	Measure	Daily
pH	--	Grab	Weekly
Temperature	°F	Grab	Weekly
Dissolved Oxygen	mg/l	Grab	Weekly
Electrical Conductivity @25°C	µmhos/cm	Grab	Weekly
Settleable Solids	ml/l	Grab	Twice Monthly
Suspended Solids	mg/l, g/day [2]	Grab	Twice Monthly
Mercury	µg/l, g/day [2]	Grab	Monthly
Total and Dissolved Arsenic	µg/l, g/day [2]	Grab	Weekly
Aluminum, Barium, Copper, Cyanide, Iron, Manganese, Silver, and Zinc	µg/l	Grab	Quarterly
Acute Toxicity [1]	% Survival	Grab	Quarterly
Priority Pollutants	mg/l	Grab	Twice Annually

[1] The acute toxicity bioassay samples shall be analyzed using EPA/600/4-90/027F, Fourth Edition, or later amendment with Board staff approval. Temperature and pH shall be recorded at the time of bioassay sample collection. Test species shall be fathead minnows (*Pimephales promelas*), with no pH adjustment unless approved by the Executive Officer.

[2] For comparison with the Effluent Limitations, the Discharger shall calculate the mass using the flow data from the date of sample collection, as follows:

X mg/l x 0.001 g/mg x 3.79 liters/gallon x flow (gal/day) = *Y* g/day

or

X µg/l x 0.000001 g/µg x 3.79 liters/gallon x flow (gal/day) = *Y* g/day

If the discharge is intermittent rather than continuous, then on the first day of each such intermittent discharge, the Discharger shall monitor and record data for all of the constituents listed above, after which the frequencies of analysis given in the schedule shall apply for the duration of each such intermittent discharge. In no event shall the Discharger be required to monitor and record data more often than twice the frequencies listed in the schedule.

RECEIVING WATER MONITORING

All receiving water samples shall be grab samples. Receiving water monitoring shall include at least the following:

Station	Description
R-l	100 feet upstream from the point of discharge into Kanaka Creek
R-2	300 feet downstream from the point of discharge

Constituents	Units	Station	Sampling Frequency
Flow	MGD	R-1	Weekly
pH	--	R-l, R-2	Weekly
Temperature	°F (°C)	R-l, R-2	Weekly
Dissolved Oxygen	mg/l	R-l, R-2	Weekly
Electrical Conductivity @25°C	µmhos/cm	R-l, R-2	Weekly
Turbidity	NTU	R-l, R-2	Weekly
Total and Dissolved Arsenic	µg/l, g/day [1]	R-l, R-2	Weekly
Mercury	µg/l, g/day [1]	R-l, R-2	Weekly
Priority Pollutants	mg/l	R-l, R-2	Annually
Aluminum, Barium, Copper, Cyanide, Iron, Manganese, Silver, and Zinc	µg/l	R-l, R-2	Annually

[1] The Discharger shall calculate the mass using the flow data from the date of sample collection, as follows:

X mg/l x 0.001 g/mg x 3.79 liters/gallon x flow (gal/day) = *Y* g/day

or

X µg/l x 0.000001 g/µg x 3.79 liters/gallon x flow (gal/day) = *Y* g/day

In conducting the receiving water sampling, a log shall be kept of the receiving water conditions throughout the reach bounded by Stations R-l and R-3. Attention shall be given to the presence or absence of:

a. Floating or suspended matter
b. Discoloration
c. Bottom deposits
d. Aquatic life
e. Visible films, sheens or coatings
f. Fungi, slimes, or objectionable growths
g. Potential nuisance conditions

Notes on receiving water conditions shall be summarized in the monitoring report.

THREE SPECIES CHRONIC TOXICITY MONITORING

Chronic toxicity monitoring shall be conducted to determine whether the effluent is contributing toxicity to the receiving water. The testing shall be conducted as specified in EPA 600/4-91/002. Chronic toxicity samples shall be collected at the discharge of the seepage disinfection system prior to its entering Kanaka Creek. Grab samples shall be representative of the volume and quality of the discharge. Time of collection samples shall be recorded. Dilution and control waters shall be obtained immediately upstream of the discharge into Kanaka Creek from an area unaffected by the discharge in the receiving waters. Standard dilution water can be used if the receiving water source exhibits toxicity and is approved by the Executive Officer. The sensitivity of the test organisms to a reference toxicant shall be determined concurrently with each bioassay and reported with the test results. Both the reference toxicant and effluent test must meet all test acceptability criteria as specified in the chronic manual. If the test acceptability criteria are not achieved, then the Discharger must re-sample and re-test within 14 days. Chronic toxicity monitoring shall include the following:

Species:	*Pimephales promelas, Ceriodaphnia dubia,* and *Selenastrum capricornutum*
Frequency:	Twice per year
Dilution Series:	None – the test shall be conducted using 100% effluent

	Dilutions (%)	Controls	
	100	Creek Water	Lab Water
% WWTP Effluent	100	0	0
% Dilution Water	0	100	0
% Lab Water	0	0	100

SEDIMENT MONITORING

A composite sample of sediment shall be collected when sediment is removed from the settling basins, and tested for the following metals:

Arsenic	Chromium	Lead	Nickel
Cadmium	Copper	Mercury	Zinc

Results of sampling shall be submitted annually. Sediment shall be disposed of in a manner approved by the Executive Officer, and consistent with *Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste,* as set forth in Title 27, CCR, Division 2, Subdivision 1, Section 20005, et seq.

REPORTING

Monitoring results shall be submitted to the Regional Board by the **first day of the second month following sample collection**. Quarterly and annual monitoring results shall be submitted by the **first day of the second month following each calendar quarter, semi-annual period, and year**, respectively.

In reporting the monitoring data, the Discharger shall arrange the data in tabular form so that the time and date of sample collection, the constituents, and the concentrations are readily discernible. The data shall be summarized to illustrate clearly whether the discharge complies with waste discharge requirements.

If the Discharger monitors any pollutant at the locations designated herein more frequently than is required by this Order, the results of such monitoring shall be included in the calculation and reporting of the values required in the discharge monitoring report form. Such increased frequency shall be indicated on the discharge monitoring report form.

By **30 January** of each year, the Discharger shall submit a written report to the Executive Officer containing the following:

a. The names and telephone numbers of persons to contact regarding the treatment facilities and discharge, for emergency and routine situations.

c. A statement certifying when the flow meter and other monitoring instruments and devices were last calibrated, including identification of who performed the calibration (Standard Provision C.6).

d. A statement certifying whether the current operation and maintenance manual, and contingency plan, reflect the facilities and discharge as currently constructed and operated, and the dates when these documents were last revised and last reviewed for adequacy.

The Discharger may also be requested to submit an annual report to the Board with both tabular and graphical summaries of the monitoring data obtained during the previous year. Any such request shall be made in writing. The report shall discuss the compliance record. If violations have occurred, the report shall also discuss the corrective actions taken and planned to bring the discharge into full compliance with the waste discharge requirements.

All reports submitted in response to this Order shall comply with the signatory requirements of Standard Provision D.6.

The Discharger shall implement the above monitoring program on the first day of the month following effective date of this Order.

Ordered by: _____
GARY M. CARLTON, Executive Officer

1 March 2002
(Date)

EAT/eat

INFORMATION SHEET

WASTE DISCHARGE REQUIREMENTS ORDER NO. R5-2002-0043
NPDES NO. CA0081809
ORIGINAL SIXTEEN TO ONE MINE, INC.
SIXTEEN TO ONE MINE
SIERRA COUNTY

SCOPE OF PERMIT

This renewed Order regulates the discharge of 0.28 MGD (average dry weather flow) of mill process wastewater from Sixteen to One Mine, an underground gold mine. This Order requires that fines and sediments be settled out of the process wastewater before discharge to Kanaka Creek and prohibits the discharge of solid waste materials to the creek.

SITE HISTORY, GEOLOGY, MINE DESCRIPTION

The Sixteen to One Mine covers approximately 40 acres in and around the town of Alleghany, Sierra County, California (see Attachment A). Alleghany is about 65 miles northeast of the intersection of I-80 and State Route 49 and 40 miles east of the town of Grass Valley. The mine has been in operation since 1896, except for a temporary closure in 1965. The mine and surface operations are located on the south side of Pliocene Ridge and on the north side of Kanaka Creek ravine. Surface operations include roads, maintenance shops, offices, a mill, ore and waste stockpiles, settling ponds, and supply areas. The layout of the mine operations is shown in Attachment B. The terrain is steep, with slopes of up to 45 degrees, and covered in heavy riparian vegetation. The mine consists of about 20 miles of tunnels.

The owner and operator of the mine, Original Sixteen to One Mine, Inc. was incorporated in 1911. In 1976, the mine was leased to a Nevada corporation, which was purchased by Lucky Chance Mining in 1983. Lucky Chance formed Kanaka Creek Joint Venture, which operated the mine between 1987 and 1991. In 1991, the lease was terminated and the Original Sixteen to One Mine, Inc. regained control of the mine. As of 1997, the company owned 24 patented and 53 unpatented claims in the Alleghany Mining District and 34 patented and 22 unpatented claims in the French Gulch Mining District. In 1999, the company purchased Plumbago Mine, which is almost two miles southeast of Sixteen to One Mine.

The initial underground investigation at Sixteen to One Mine included detailed geologic mapping, long-hole drilling, geochemical sampling and test mining in selected, accessible areas. The owner has explored and developed the northern and southern strike limits and up-and-down dip vein exposures. The Alleghany District is underlain by north and northwest trending beds of metamorphic rocks of the Carboniferous Calaveras group, primarily gabbro (often altered to amphibolite), chlorite schist, conglomerate, quartzite chert, phyllite, and slate. Numerous north-trending serpentine bodies occur within the rocks of the Calaveras group. The higher ridges in the area are capped by Tertiary andesite and basalt flows that often overlie auriferous Tertiary channel gravels.

Most of the gold in the Alleghany district is located in a series of quartz veins enplaned along numerous north trending reverse faults. The core of the Sixteen to One Mine is the Sixteen to One Vein, a strongly developed northwest to north striking massive quartz vein, dipping east to northeast at 40 to 50 degrees. The vein has been followed along strike for more than 8,000 feet. The vein averages 4 to 6 feet thick but ranges from less than 2 feet to more than 50 feet. It is situated in a major reverse fault and is hosted by well-foliated schist of the Tightner formation except in the upper part of the workings where the host is mostly quartzite of the Kanaka formation, which is also part of the Calaveras group. Numerous smaller veins branch off the Sixteen to One vein.

The gold at Sixteen to One Mine is located in a complex vein system of white quartz deposited in metamorphic rock. Other minerals associated with the gold-bearing quartz include galena, arsenopyrite, and serpentine.

The mine operation is a hard rock underground mine in which, the miners sink diagonal shafts or winzes from which the miners then create horizontal tunnels at various elevations. The mine produces a high-grade crystalline gold that requires relatively little processing or treatment in comparison to gold from other mines. Where other mines extract large volumes of rock to recover a small amount of gold, the quartz veins at Sixteen to One Mine allows more selective extraction of gold. Gold is located using underground metal detectors that can detect gold approximately 20 to 30 inches from the tunnel wall.

Ore from the mine is grouped into three categories. Rare high-grade gold and quartz specimens are removed first, cleaned, appraised and sold directly. Other high-grade ore with visible gold is hand sorted and sent to a mill on-site where gold is extracted and formed into bars. Low-grade ore may be left underground or stockpiled on the surface. Waste rock, which contains no ore, may be left underground, stockpiled aboveground, used for on-site road surfacing, or sold as aggregate or decorative rock.

The low-grade ore is also processed on-site in a 10 ton per hour gravity mill. The process consists of two-stage crushing and grinding, and gravity concentration using a jig, bowls, and table. Using water, the ore is processed through cyclone separators, or centrifuge-like machines, which separate the gold from the waste material, or tailings, based on the differences in density. The resulting ore concentrate is either melted or amalgamated, using mercury in a closed retort system in the mill, and shipped in barrels to an out of state smelter for gold extraction.

The waste, or tailings, from the cyclone separators consists of quartz sand, fine sediment, and water. The tailings are sent to on-site settling ponds where settleable materials drop out of suspension. The clarified water is drawn off for further settling, underground in the mine. The treated wastewater commingles with mine drainage and discharges from the mine to Kanaka Creek. The waste quartz sand is used for the same purposes as the waste rock. A schematic of the milling process, including the discharge point, is shown in Attachment C.

DISCHARGE POINT AND BENEFICIAL USES OF SURFACE WATER

Mill process water, from processing gold ore, commingled with mine drainage, is discharged from a portal of Sixteen-to-One Mine, known as 21 Tunnel. The water is discharged to Kanaka Creek, which is tributary to the Middle Yuba River, Yuba River, Feather River, and the Sacramento River. As described in the Basin Plan, the discharge point and Kanaka Creek are in the Camptonville Hydrologic Subarea 517.42, Middle Yuba Hydrologic Area, Yuba River Hydrologic Unit, of the Sacramento Hydrologic Basin. The confluence of the Yuba and Feather Rivers is approximately 55 miles downstream of the discharge point.

The *Water Quality Control Plan for the California Regional Water Quality Control Board, Central Valley Region, Sacramento River and San Joaquin River Basins, Fourth Edition – 1998* (Basin Plan) on page IV-24.00, prohibits the direct discharge of municipal and industrial wastes into the Sacramento River from the confluence with the Feather River to the Freeport Bridge. This industrial wastewater enters the prohibited reach of the Sacramento River. However, the discharge to Kanaka Creek flows into the Middle Yuba River, Yuba River, and Feather River prior to entering the Sacramento River and does not constitute a direct discharge. Therefore, the discharge does not violate the Basin Plan prohibition.

Section II of the Basin Plan defines Existing and Potential Beneficial Uses of California's waters. The Basin Plan states that protection and enhancement of existing and potential beneficial uses are primary goals of water quality planning. Regarding disposal of wastewater, the Basin Plan states on page II-1.00, "*disposal of wastewaters is not included as a beneficial use. This is not to say that disposal of wastewaters is a prohibited use of waters of the State; it is merely a use which cannot be satisfied to the detriment of beneficial uses.*" Kanaka Creek is not specifically identified in the Basin Plan. In Figure II-1 and Table II-1 of the Basin Plan, the nearest downstream body of water that is identified is the Yuba River, Sources to Englebright Reservoir. The bodies of water, encompassed by the phrase "Sources to Englebright Reservoir", include the Middle Yuba River and Kanaka Creek. The beneficial uses of the Yuba River, Sources to Englebright Reservoir, including Kanaka Creek and the Middle Yuba River, listed in Table II-1, are Municipal and Domestic Supply, Agricultural Supply including Irrigation and Stock Watering, Hydropower Generation, Water Contact and Non-contact Water Recreation including aesthetic enjoyment, Cold Freshwater Habitat, Cold Water Spawning Habitat, and Wildlife Habitat. Additional Beneficial Uses, listed on pages II-1.00 and II-2.00 that apply to Kanaka Creek and the Middle Yuba River, are Groundwater Recharge and Freshwater Replenishment. The Middle Yuba River and Kanaka Creek are sources of the Yuba River. As sources of the Yuba River, the beneficial uses listed above are applicable to Kanaka Creek and the Middle Yuba River. In addition, on page II-2.00, in the paragraph commonly know as the "Tributary Rule", the Basin Plan requires that the beneficial uses of any specifically identified water body apply to its tributary streams.

Upon review of the flow conditions, habitat values, and beneficial uses of Kanaka Creek and the Middle Yuba River, the Board finds that the beneficial uses identified in the Basin Plan for the Yuba River are applicable to Kanaka Creek and the Middle Yuba River based on the following facts:

Municipal, Domestic, and Agricultural Supply

The State Water Resources Control Board (SWRCB) has issued water rights to existing water users downstream of the discharge for domestic and irrigation uses. The nearest domestic and irrigation water rights uses issued by the SWRCB are approximately 7.5 miles downstream of the discharge point on Kanaka Creek. Additional domestic and irrigation water rights have been issued on the Yuba River and Englebright Reservoir downstream of the discharge.

Riparian Rights, for landowners along streams and rivers, are not recorded with the SWRCB and have precedence over other water rights. There may be other domestic and irrigation uses along Kanaka Creek that are not registered with the State Board.

Page II-2.00 of the Basin Plan states, "*Water bodies within the basins that do not have beneficial uses designated in Table II-1 are assigned MUN designations in accordance with the provisions of State Water Board Resolution No. 88-63 which is, by reference, a part of this Basin Plan*."

Hydropower Generation

Existing downstream hydropower generation will not be affected by the discharge. The discharge does not preclude additional hydropower facilities from being constructed. The topography and flow conditions in Kanaka Creek and Middle Yuba River appear to be acceptable for hydropower generation.

Water Contact and Non-contact Water Recreation and Aesthetic Enjoyment

The discharge flows through areas where there is public access to Kanaka Creek and the Middle Yuba River. Contact recreational activities and mining activities involving contact with water occur along the downstream waterways. Kanaka Creek and the Middle Yuba River flow through Tahoe National Forest. Hikers and campers in the relatively uninhabited area near and downstream of the discharge point have a reasonable expectation that the waters of Kanaka Creek and the Middle Yuba River are as unpolluted as similar streams in the vicinity. Exclusion of adjoining property owners and the public is unrealistic.

Cold Freshwater Habitat, Cold Water Spawning Habitat, and Wildlife Habitat

The Yuba River, from the sources to Englebright Reservoir, has been designated a cold water stream, suitable for fish spawning and as habitat for cold water species. The Tributary Rule applies to Kanaka Creek and the Middle Yuba River, as sources of the Yuba River. There are no known barriers to prevent cold-water fish species from migrating to Kanaka Creek from the Yuba River.

Staff of the California Department of Fish and Game reported that Kanaka Creek maintains populations of rainbow trout and provides aquatic habitat for aquatic insects, reptiles, and amphibians. Habitat types include a mixture of pools and riffles, interspersed with reaches of bedrock. Spawning habitats are present in the deposited gravels in lower velocity areas. Riparian vegetation is relatively heavy and the canopy shading averages about 50%. Kanaka Creek has optimal temperatures and flows throughout the

year. The Creek was extensively impacted by past mining practices with respect to bank and stream topography but has recovered sufficiently to display reasonable stability.

Information in the file indicates that temperatures in Kanaka Creek do create habitat suitable to cold-water species. The cold-water habitat designation necessitates that the in-stream dissolved oxygen (DO) concentration be maintained at, or above, 7.0 mg/l.

Groundwater Recharge

In areas where the groundwater elevation is below the bottom of streambed, water from the stream will percolate to groundwater. During dry weather, in places in California, flowing streams experience these conditions, thus providing groundwater recharge. Kanaka Creek is a low flow stream during dry weather conditions. During dry weather and low flow conditions, Kanaka Creek is likely to provide groundwater recharge. Groundwater is a source of domestic and irrigation water supply.

Freshwater Replenishment

The water in Kanaka Creek is hydraulically connected to the Middle Yuba, Yuba, Feather, and Sacramento Rivers. Kanaka Creek contributes to the quantity and may impact the quality of the water in the downstream waters.

THREAT TO WATER QUALITY AND COMPLEXITY OF DISCHARGE

The California Code of Regulations, Title 23, Division 3, Chapter 9, Article 1, Section 2200(a)(1) contains an annual fee schedule that requires "*Each person for whom waste discharge requirements have been prescribed pursuant to Section 13263 of the Water Code shall submit to the State Board, an annual fee…*" Section 2200(a)(2) states "*The fee rating is based on the discharge's threat to water quality (TTWQ) and complexity (CPLX), defined as follows:*

THREAT TO WATER QUALITY

Category "1" – Those discharges of waste which could cause long-term loss of a designated beneficial use of the receiving water. Examples of long-term loss of beneficial use would include the loss of a drinking water supply, the nature of an area used for water contact recreation, or the posting of an area used for spawning or growth of aquatic resources, including shellfish and migratory fish.

Category "2" - Those discharges of waste which could impair the designated beneficial uses of the receiving water, cause short-term violations of water quality objectives, cause secondary drinking water standards to be violated, or cause a nuisance.

Category "3" *Those discharges of waste which could degrade water quality without violating water quality objectives, or cause a minor impairment of designated beneficial uses compared with Category 1 and Category 2.*

COMPLEXITY

Category "A" *Any major NPDES discharger; any discharge of toxic wastes; any small volume discharge containing toxic waste or having numerous discharge points or ground water monitoring; any Class I waste management unit.*

Category "B" *Any discharger not included above which has physical, chemical, or biological treatment systems (except for septic systems with subsurface disposal), or any Class II or Class III waste management units.*

Category "C" *Any person for whom waste discharge requirements have been prescribed pursuant to Section 13263 of the Water Code not included in Category "A" or Category "B" as described above. Included would be dischargers having no waste treatment systems or that must comply with best management practices, discharges having passive treatment and disposal systems, such as septic systems with subsurface disposal systems, or dischargers having waste storage systems with land disposal."*

After review of these categories and constituents that have been discharged, Board staff determined that the threat and complexity of the discharge are described in Categories "2" and "B". The discharge from Sixteen to One Mine has caused short-term violations of the water quality objectives, as described in Category "2", for turbidity, sediment deposition, and arsenic and these violations could impair beneficial uses. Sixteen to One Mine discharges to Kanaka Creek, which is on the list (known as the 303(d) List) of Water Quality Limited Segments. Therefore the Threat to Water Quality of the discharge falls into Category 2, at least. Category "A" includes "major" dischargers and toxic waste. Category "B" includes discharges that are not in Category "A" but have a physical, chemical, or biological treatment system. The sedimentation basins at Sixteen to One Mine are considered physical treatment. Sixteen to One Mine is not a "major" discharger, and assuming the discharge is not toxic waste, the appropriate Complexity of the discharge falls into Category B and the overall designation as Category 2-B is correct.

LOW FLOW – NO DILUTION

Based on the available information, Kanaka Creek is a low-flow stream during dry months. The beneficial uses of Kanaka Creek must be protected, however, due to the low-flow nature of Kanaka Creek, no credit for receiving water dilution is available. Dry weather conditions occur primarily in the summer months but also occur throughout the year, particularly in low rainfall years. Significant dilution may occur during and after high rainfall events. However, the lack of available dilution during dry periods results in more stringent effluent limitations to protect recreational uses, drinking water standards, agricultural water quality goals, and aquatic life.

CONSTITUENTS OF CONCERN

The gold mining process generates waste rock and fines, or spoils. The material in the spoils ranges from fine particles to large rocks. Spoils may be used for on-site road maintenance or the spoils and gold-bearing ore may be stockpiled wherever there is space to do so. The gold-bearing ore may be milled on-site. The milling process involves the use of mercury and water and results in the separation of the gold from remaining rock. The waste materials from milling process are deposited in settling basins on the surface and within the mine. The rocks and fine materials themselves, mercury, and the elements and minerals that form the native rocks and ores all pose a threat to water quality if discharge to surface water.

Fine Materials and Rocks

Fine soil particles are present in the settling ponds, while rocks and fine materials are present in the waste piles and ore stockpiles. Because of the steepness of the terrain, if care is not taken when forming or moving stockpiles, or when performing maintenance on the roads, the rocks and fine materials will have a high probability of falling into Kanaka Creek. The discharge of rocks into the stream will reduce the size of the stream channel and change the nature of the stream. When discharged to flowing waters, sediments will settle out depending on their density and the velocity of the water in the creek. More dense objects will settle out of the water near the discharge point and less dense objects will travel farther downstream before they settle out. Some objects will be retained in suspension in the water, reducing clarity and increasing turbidity. Sediments that settle out of the water onto the streambed, or an increase in turbidity can result in destruction of fish and invertebrate habitat.

On three occasions in 1997 and 1998, staff of California Department of Fish and Game observed the discharge of storm water laden with fine material into the North Fork of Kanaka Creek, approximately 300 feet from the confluence with Kanaka Creek and the deposition of materials from the stockpiles (ranging in size from fines to 6-inch diameter rocks or larger) into the flood plain and channel of Kanaka Creek. In the existing Order No. 95-004, these discharges violated Discharge Prohibitions regarding the location of discharge and bypass or overflow of wastes and Receiving Water Limitations for turbidity and "deposition of material that causes a nuisance or adversely affects beneficial uses".

The existing Order contains a turbidity receiving water limitation that is not consistent with the Basin Plan Water Quality Objective. The proposed Order contains receiving water limitations for turbidity based on Basin Plan Water Quality Objectives and Discharge Prohibitions and deposition limitations similar to those in the existing Order.

Electrical Conductivity

Electrical Conductivity (EC) or Specific Conductance is one parameter used to characterize the chemical characteristics of water. The salinity of water is determined by measuring EC. The EC of water is used as a surrogate measure of total dissolved solids (TDS) concentration. The conductivity of a solution is a measure of the ability of that solution to conduct an electrical current. Because the electrical current is

transported by ions in solution, the conductivity increases as the concentration of ions increases. The concentration of ions increases as the concentration of dissolved solids increases.

The California Department of Health Services has recommended a Drinking Water Standard, Secondary Maximum Contaminant Level (MCL) for EC of 900 µmhos/cm, with an upper level of 1600 µmhos/cm, and a short-term level of 2200 µmhos/cm. To protect the beneficial use of water for agricultural use, studies have recommended an Agricultural Water Quality Goal of 700 µmhos/cm, for an average value of EC. By the Tributary Rule, drinking water and agricultural uses are beneficial uses of Kanaka Creek.

In addition, the Basin Plan identifies numerical Water Quality Objectives for Electrical Conductivity in the Feather River from the Fish Barrier Dam at Oroville to the Sacramento River. The Yuba River, containing the discharge from Sixteen to One Mine, enters the Feather River between the Fish Barrier Dam at Oroville and the Sacramento River. Table III-3, on page III-7.00 of the Basin Plan states that Electrical Conductivity in the Feather River from the Fish Barrier Dam at Oroville to the Sacramento River shall not exceed 150 µmhos/cm (90 percentile).

Table 1 of the Information Sheet shows a reported maximum effluent EC value of 2290 µmhos/cm in the discharge from Sixteen to One Mine. The average of the effluent data in Table 1 has been calculated to be 1185 µmhos/cm. The maximum upstream EC value (R1) in Table 1 is 193.8 µmhos/cm and the average has been calculated to be 80 µmhos/cm. The maximum downstream EC value (R2) in Table 1 is 922 µmhos/cm and the average has been calculated to be 182 µmhos/cm. The data shows that on one occasion, the discharge caused the downstream receiving water EC to be greater than the Secondary MCL (900 µmhos/cm) and on two occasions, the discharge caused the downstream receiving water EC to be greater than the recommended agricultural limit (700 µmhos/cm). The data in Table 1 shows that the EC in the effluent causes increases in the EC of the receiving stream, and on occasion the value of EC in the effluent exceeds the assimilative capacity of Kanaka Creek for EC. The effluent EC values exceed the drinking water standards and recommended agricultural limit and threaten the drinking water and agriculture beneficial uses of Kanaka Creek. Therefore, Effluent Limitations based on the Secondary MCL have been included in this Order. The Effluent Limitations in the Order are a Monthly Average of 900 µmhos/cm and Daily Maximum of 1600 µmhos/cm. It is not likely that the EC discharged from Sixteen to One Mine will have an impact 55 miles downstream at the confluence with the Feather River, however, the Effluent Limitations for EC are protective of the Water Quality Objective for EC in the Feather River.

Dissolved Oxygen

The Basin Plan identifies numerical Water Quality Objectives for Dissolved Oxygen (DO) of 7 mg/l, in waters designated for cold water and spawning beneficial uses. By the Tributary Rule, Kanaka Creek has the beneficial uses of cold and spawning waters. In addition, the Basin Plan identifies numerical Water Quality Objectives for Dissolved Oxygen in the Feather River from the Fish Barrier Dam at Oroville to the Sacramento River. The Yuba River, containing the discharge from Sixteen to One Mine, enters the Feather River between the Fish Barrier Dam at Oroville and the Sacramento River. The Water Quality Objective for Dissolved Oxygen and Table III-2, on page III-5.00 of the Basin Plan states

that the more stringent Dissolved Oxygen objective of 8.0 mg/l applies to the Feather River from the Fish Barrier Dam at Oroville to the Sacramento River, in the period between 1 September and 31 May.

Data in Table 1 (attached) show that effluent DO concentrations range between a low of 4.3 mg/l and a high of 18.1 mg/l. At times the DO in the effluent and the receiving water are below the 7 mg/l Water Quality Objective. However, on most occasions, the effluent DO concentration is low at the same that the upstream and downstream receiving water DO concentrations are low, and effluent DO is high when the upstream and downstream receiving water DO concentrations are high. It is not possible to determine whether low DO concentrations in the effluent cause low DO concentrations in the downstream receiving water in violation of the Receiving Water Limitation in the existing Order. However, when the upstream receiving water DO is below 7 mg/l, the discharge of low DO water from the mine may maintain or exacerbate low DO conditions downstream, especially during low flow conditions. Due to the dry weather low-flow nature of Kanaka Creek and lack of dilution data from the Discharger, no credit for receiving water dilution is available. The lack of available dilution during dry periods requires effluent limitations to protect beneficial uses. Therefore, this order contains an effluent limitation for DO of 7 mg/l. It is not likely that the DO in the effluent discharged from Sixteen to One Mine will have an impact on the 8 mg/l Water Quality Objective for DO, 55 miles downstream at the confluence with the Feather River.

pH

The Report of Waste Discharge describes the range of effluent pH to be 6.67 to 8.80. The Basin Plan Water Quality Objective for pH states "*The pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5…*". During dry weather conditions the flow in Kanaka Creek is relatively low, therefore we must assume no dilution of the effluent, and therefore, the appropriate water quality criteria will become the effluent limitations in the proposed Order. The proposed Order contains effluent limitations based on the Basin Plan Water Quality Objective.

Mercury

Mercury is used in the amalgamation process, which is a closed system with the intent that no mercury will be discharged. However, the current and past use of mercury at the site presents a reasonable potential that mercury may be discharged from the site.

The Basin Plan contains a list (known as the 303(d) List) of Water Quality Limited Segments (WQLSs) that "are those sections of lakes, streams, rivers, or other fresh water bodies where water quality does not meet (or is not expected to meet) water quality standards even after the application of appropriate effluent limitations for point sources". The Basin Plan goes on to state, "Additional treatment beyond minimum federal requirements will be imposed on dischargers to WQLSs. Dischargers will be assigned or allocated a maximum allowable load of critical pollutants so that water quality objectives can be met in the segment."

Due to the listing of mercury on the 303(d) list, as a pollutant causing impairment of the Sacramento-San Joaquin Delta, the discharge must not cause or contribute to increased mercury levels in fish tissue

to meet the requirements of the anti-degradation policy described in Resolution No. 68-16 and the anti-degradation policy described in the Code of Federal Regulations 40 CFR 131.12(a)(1).

USEPA adopted the *National Toxics Rule* (NTR) on 5 February 1993 and the *California Toxics Rule* (CTR) on 18 May 2000. These Rules contain criteria for priority pollutants and water quality standards applicable to this discharge. The State Water Resources Control Board adopted the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (known as the State Implementation Plan or SIP), which contains guidance on implementation of the NTR and the CTR. The Human Health criterion (10^{-6} risk for carcinogens) in the CTR for mercury, for consumption of water and aquatic organisms, is 0.050 µg/l. USEPA acknowledges in the Code of Federal Regulations, 40 CFR Part 131, that Human Health criteria may not be protective of some aquatic or endangered species and that "more stringent mercury limits may be determined and implemented through use of the State's narrative criterion." In the CTR, the USEPA reserved the mercury criteria for freshwater and aquatic life and may adopt new criteria at a later date.

The Discharger has collected some mercury data (see Table I, attached). Mercury was detected at 0.5 µg/l, which exceeds the CTR human health criterion of 0.050 µg/l. The Code of Federal Regulations, 40 CFR 122.44(d)(1)(iii), states that when a discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above allowable numeric criteria for an individual pollutant, the NPDES permit must contain an effluent limit. In addition, the reported concentration is right at the detection limit of the analytical method used by the laboratory. However "clean techniques" were not used for the analyses. When used by laboratories, clean techniques are able to reduce the analytical method detection limit significantly. It is possible that mercury is present in the discharge from Sixteen to One Mine at concentrations below 0.5 µg/l. Lacking other criteria, the proposed Order contains an Effluent Limitation for mercury based on the CTR Human Health criterion of 0.050 µg/l.

The proposed Order contains a concentration based Effluent Limitation for mercury of 0.050 µg/l as a Daily Maximum. In addition, the proposed Order contains a mass based Effluent Limitation of 0.053 g/day, calculated using the average daily dry weather flow, provided by the Discharger in the Report of Waste Discharge, and the 0.050 µg/l concentration based Effluent Limitation as follows:

0.28 MGD = 0.28 million gallons per day = 280,000 gallons per day = 280,000 gal/day

0.050 µg/liter x 3.785 liters/gallon = 0.189 µg/gal

0.189 µgrams/gal = 0.000000189 grams/gal

0.000000189 grams/gal x 280,000 gal/day = 0.05292 grams/day ≈ 0.053 g/day

The proposed Order contains a Provision that requires the Discharger to develop a loading assessment and source reduction work plan for mercury. The purposes of the work plan are to investigate the concentration and mass loading of mercury in the effluent from the milling process, in the discharge from the mine, and in the receiving water and, if necessary, identify corrective action to control mercury loadings. Clean techniques will be required in laboratory analyses. The work plan will include a schedule by which source control or treatment methods identified in the work plan shall be

implemented. The Provision also allows the Board to reopen the proposed Order to add or change the mercury Effluent Limitations based on the adoption of new mercury criteria by USEPA and/or information produced in the assessment conducted by the Discharger.

Arsenic

Arsenopyrite (FeAsS), consisting of arsenic, iron, and sulfur ions, is a common mineral that occurs naturally in the material in the mine. After mining activity has exposed arsenopyrite to oxygen, water, and acid conditions, it will break down into elemental metallic arsenic and iron sulfide (FeS). The arsenic is then picked up by the water in the mine and may be discharged to surface water.

At Sixteen to One Mine, our concern is the arsenic discharged into surface waters from the mine and mining and ore processing activities. Arsenic as a free element is rarely encountered in natural waters. The chemistry of arsenic in water is complex, consisting of chemical, biochemical, and geochemical reactions that together control the concentration, oxidation state, and form of arsenic in water. In water, arsenic may exist in both an organic and inorganic form, either in the trivalent or pentavalent state. The form of arsenic that is present in solution (soluble) is dependent on environmental conditions such as oxidation reduction potential, pH, organic content, suspended solids, and sediment. Four arsenic species common in natural waters are: the inorganic oxides, trivalent arsenic(III) and pentavalent arsenic(V); and the organic arsenic forms, methanearsonic acid, and dimethylarsenic acid. In aerobic water, arsenic(III) is slowly oxidized to arsenic(V) at neutral pH, but the reaction proceeds more quickly in strongly alkaline or acidic solutions. Soluble inorganic arsenic(V) predominates under normal conditions since it is thermodynamically more stable in water than arsenic(III). Inorganic forms of arsenic are generally considered to be more toxic than organic forms. However, trivalent forms of arsenic (both inorganic and organic) are more toxic to humans and aquatic organisms but are usually only present under anaerobic conditions. In aerobic conditions like those in Kanaka Creek, the receiving stream for the discharge from Sixteen to One Mine, inorganic pentavalent arsenic(V) will predominate.

The amount of pollutant that will accumulate in fish is important to estimate as a route of exposure to populations of concern. Bioaccumulation in fish occurs both through uptake across the gill membranes and other external body surfaces (bioconcentration) and through ingestion of contaminated food (biomagnification). Arsenic **does not** appear to progressively accumulate through the food chain.

The compounds of arsenic (including inorganic arsenic(V), the form of arsenic found most often in surface waters) are systemic poisons that may result in death at high enough doses and have been demonstrated to produce acute and chronic toxicity affects in humans, vertebrates, fish, invertebrates, and plants. The relative toxicities of the various forms of arsenic vary from species to species. Arsenic is also one of a very few *known human carcinogens* that also includes benzene, vinyl chloride, and ionizing radiation. For these chemicals, cancer cases in humans have been documented as being directly related to chemical exposure. This is the strongest type of evidence for the relationship between cause and effect.

ARSENIC WATER QUALITY STANDARDS AND OBJECTIVES

California Toxics Rule

USEPA adopted the list of Priority Pollutants in 1982 (including arsenic) and the *California Toxics Rule* (CTR) on 18 May 2000. The CTR contains criteria for priority pollutants and water quality standards applicable to the discharge from Sixteen to One Mine. The State Water Resources Control Board adopted the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (known as the State Implementation Plan or SIP), which contains guidance on implementation of the CTR. The criteria in the CTR for arsenic are Maximum Concentration (1-hour average) and Continuous Concentration (4-day average) for Protection of Freshwater Aquatic Life, discussed below in *Ambient Water Quality Criteria.* Prior to adoption of the CTR in 2000, the Ambient Water Quality Criteria were recommended for the protection of aquatic life and were referenced as such by the Regional Board. The Ambient Water Quality Criteria could be included as the basis for effluent limitations based on the Toxicity Water Quality Objective on page III-8.00 in the Basin Plan, also known as the Narrative Water Quality Standard for Toxicity or Narrative Toxicity Standard. After adoption of the CTR in 2000, the Ambient Water Quality Criteria for arsenic may be used to establish effluent limitations without reference to the Narrative Toxicity Standard.

Ambient Water Quality Criteria

In 1984, USEPA's Ambient Water Quality Criteria for the Protection of Freshwater Aquatic Life indicated that "*freshwater aquatic organisms and their uses should not be affected unacceptably if the four-day average concentration of arsenic(III) does not exceed 190 µg/l more than once every three years on the average and if the one-hour average concentration does not exceed 360 µg/l more than once every three years on the average*." The existing Order includes a receiving water limitation for arsenic of 360 µg/l based on the 1984 Criteria. Current arsenic criteria (effective September 1996), for the protection of freshwater aquatic life state that freshwater aquatic organisms should not be affected unacceptably if the four-day average concentration of arsenic(III) does not exceed 150 µg/l more than once every three years on the average and if the one-hour average concentration does not exceed 340 µg/l more than once every three years on the average. The receiving water limitation in the existing Order is not protective of water quality and is not consistent with current water quality standards and criteria.

Drinking Water Standards – Primary MCL

In the USEPA's Drinking Water Standards, the previous Primary MCL (Maximum Contaminant Level) for arsenic in drinking water, 50 µg/l, was developed in the 1940s. This concentration did not reflect current information on health effects and in January 2001, USEPA adopted a new MCL of 10 µg/l for arsenic. However, in order to conduct reviews of scientific and economic analyses, the effective date for the new standard was delayed until 22 February 2002. On 19 July 2001, USEPA proposed a range of MCL options for arsenic – 3 µg/l, 5 µg/l, 10 µg/l, and 20 µg/l – and requested additional technical comments by 31 October 2001. On 31 October 2001, USEPA affirmed the appropriateness of the 10 µg/l MCL for arsenic and it becomes effective 22 February 2002. MCLs are based on total recoverable concentrations. Page III-3.00 of the Basin Plan includes the following Chemical Constituents Water Quality Objective; "*At a minimum,*

water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs) specified in…Title 22 of the California Code of Regulations, which are incorporated by reference into this plan…This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect." According to the California Safe Drinking Water Act, Title 22 MCLs must be updated to include new USEPA MCLs or more stringent limits.

Integrated Risk Information System (IRIS) Standards
USEPA's Integrated Risk Information System (IRIS) toxicologic database contains a reference dose for non-cancer health effects equal to 2.1 µg/l of arsenic in drinking water and a one-in-a-million incremental cancer risk estimate of 0.02 µg/l. The California Office of Environmental Health Hazard Assessment (OEHHA) has published a cancer potency factor equal to 0.023 µg/l at the one-in-a-million cancer risk level.

Basin Plan Water Quality Objectives
The Basin Plan contains Water Quality Objectives for Chemical Constituents on page III-3.00. The Chemical Constituents objectives include Table III-1 for Trace Element Water Quality Objectives. Table III-1 contains water a quality objective of 10 µg/l for arsenic for the Sacramento River between Keswick Dam and the I Street Bridge. The Feather River, containing the discharge from Sixteen-to-One Mine, enters the Sacramento River between Keswick Dam and the I Street Bridge.

Water Quality Limited Segment
The Basin Plan contains a list (known as the 303(d) List) of Water Quality Limited Segments (WQLSs) that "are those sections of lakes, streams, rivers, or other fresh water bodies where water quality does not meet (or is not expected to meet) water quality standards even after the application of appropriate effluent limitations for point sources". The Basin Plan goes on to state, "Additional treatment beyond minimum federal requirements will be imposed on dischargers to WQLSs. Dischargers will be assigned or allocated a maximum allowable load of critical pollutants so that water quality objectives can be met in the segment." The list of WQLSs includes Kanaka Creek as an impaired water body due to arsenic.

CONSIDERATIONS FOR SETTING ARSENIC LIMITATIONS

The report of waste discharge for Sixteen to One Mine indicates the discharge contains a maximum arsenic concentration of 835 µg/l with an average concentration of 513 µg/l. In addition, Table 1 (attached) includes arsenic data compiled from the Discharger's monitoring reports and samples collected by Regional Board staff. The maximum effluent arsenic concentration from Table 1 is 973 µg/l with an average concentration of 519 µg/l. Using the average daily dry weather flow of 0.28 million gallons per day (MGD) provided by the Discharger in the Report of Waste Discharge and the average concentration of 519 µg/l, the average amount of arsenic discharged during dry weather is 0.55 kg/day. Table 1 also shows that the arsenic discharged from the mine causes the downstream concentration of arsenic to increase.

On two occasions, the downstream concentration of arsenic exceeded the receiving water limitation (360 µg/l) in the existing Order, in violation of the Order.

The Code of Federal Regulations, 40 CFR 122.44(d)(1)(iii), states that when a discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above allowable numeric criteria for an individual pollutant, the NPDES permit must contain an effluent limit.

The current USEPA Ambient Water Quality Criteria for arsenic (150 µg/l as a 4-day average and 340 µg/l as a 1-hour average) are lower than the receiving water limitation in the existing Order (360 µg/l); therefore, the proposed Order cannot use 360 µg/l as a limitation of any sort. In addition, by the Tributary Rule, and due to existing water rights, drinking water is a beneficial use of Kanaka Creek. Therefore, to protect the drinking water beneficial use, drinking water standards and human health criteria must also be applied to Kanaka Creek. During dry weather conditions the flow in Kanaka Creek is relatively low, therefore we must assume no dilution of the effluent, and therefore, the appropriate water quality criteria will become the effluent limitations in the proposed Order. As discussed above, the current Primary MCL for arsenic is 10 µg/l and other drinking water standards have even lower concentrations. The drinking water standards and human health criteria for arsenic all have concentrations lower than the Ambient Water Quality Criteria. Therefore, to protect the drinking water beneficial uses, the drinking water standards or human health criteria must be used to establish effluent limitations rather than Ambient Water Quality Criteria.

Looking at the receiving water data for arsenic in Table 1, the maximum reported arsenic concentration was 293 µg/l, the minimum was none detected, and the average of the reported concentrations was calculated to be 12 µg/l. The average of 12 µg/l exceeds the Primary MCL for arsenic of 10 µg/l. Therefore, the receiving water has no assimilative capacity for arsenic. To be protective of the drinking water beneficial use, the Primary MCL would become the effluent limitation. Assuming the Primary MCL of 10 µg/l is the effluent limitation, and comparing the effluent data in Table 1 to the Primary MCL, 92 of 94 effluent samples would exceed the limitation.

Arsenic is an inorganic priority pollutant that is known to cause adverse human health effects, including cancer. For waters that are designated as municipal and domestic supply, the Basin Plan prohibits (1) chemicals in concentrations that exceed California drinking water Maximum Contaminant Levels (MCLs) and (2) toxic substances in toxic amounts. To determine what numeric receiving water limitations will properly implement the narrative toxicity objective, the Basin Plan requires the Board to consider material and relevant information submitted by the Discharger and others, as well as numerical criteria and guidelines for toxic substances developed by other agencies and organizations. Toxicity based numerical criteria for arsenic in drinking water include 10^{-6} incremental cancer risk estimates from USEPA and Cal/EPA ranging from 0.018 to 0.023 µg/l and USEPA's reference dose for health effects other than cancer of 2.1 µg/l. In addition, dischargers who cause the Proposition 65 Safe Harbor Level of 5 µg/l to be exceeded in sources of drinking water may face significant liability. Arsenic is a naturally occurring element. Natural background levels of arsenic in many California Waters exceed one

or more of the above criteria. The Regional Board does not have the authority to require that natural background levels be improved upon. However, controllable water quality factors, such as the discharge of waste are not permitted to cause natural concentrations to increase.

Taking into consideration all of the above, the proposed Order contains a concentration based Effluent Limitation for arsenic of 10 µg/l as a Monthly Average. In addition, the proposed Order contains a mass based Effluent Limitation of 10.6 g/day, calculated using the average daily dry weather flow (0.28 MGD), provided by the Discharger in the Report of Waste Discharge, and the 10 µg/l concentration based Effluent Limitation as follows:

0.28 MGD = 0.28 million gallons per day = 280,000 gallons per day = 280,000 gal/day

10 µg/liter x 3.785 liters/gallon = 37.85 µg/gal

37.85 µgrams/gal = 0.00003785 grams/gal

0.00003785 grams/gal x 280,000 gal/day = 10.598 grams/day ≈ 10.6 g/day

The proposed order also contains a Provision that requires the Discharger to study the concentration of arsenic in the effluent from the milling process, in the discharge from the mine, and in the receiving water, and to develop a source control program or determine other means of compliance. The Provision also allows the Board to reopen the proposed Order to add or change Effluent Limitations based on the adoption of new water quality criteria or objectives for arsenic and/or to include new effluent limitations based on the results of the arsenic study.

Trace Elements

The Basin Plan identifies numerical Water Quality Objectives for the Sacramento River between Keswick Dam and the I Street Bridge. The Feather River, containing the discharge from Sixteen-to-One Mine, enters the Sacramento River between Keswick Dam and the I Street Bridge. The Board adopted numerical Trace Element Water Quality Objectives in the Basin Plan, shown in Table III-1 on page III-3.00, for the Sacramento River, besides arsenic (see above) for barium, copper, cyanide, iron, manganese, silver, and zinc. To date the Discharger has not been required to provide information about the presence of these constituents in the wastewater and the toxic effects of these constituents are not known. This Order and the Basin Plan prohibit the discharge of toxic constituents in toxic amounts. The proposed Order contains Provisions requiring the Discharger to provide information on the presence of these trace elements in the discharge and receiving water, so that effluent limitations may be calculated if necessary, and that allow the Board to reopen the Order to include effluent limitations.

Aluminum

The proposed Order and the Basin Plan prohibit the discharge of toxic constituents in toxic amounts. Aluminum is an element that is found naturally in soils and the water that comes in contact with the soil. The USEPA has developed Drinking Water Standards and Ambient Water Quality Criteria for the Protection of Freshwater Aquatic Life for aluminum. To date, Discharger has not been required to

supply information regarding the concentrations of aluminum in the discharge and the toxic effects of aluminum in the effluent are not known. This Order contains provisions that require the Discharger to; provide information as to whether the levels of aluminum in the discharge cause or contribute to an in-stream excursion above a water quality objective; submit information so that effluent limitations may be calculated for aluminum in the discharge if concentrations of nitrate have a reasonable potential to cause or contribute to an in-stream excursion above a water quality objective; and allow the Board to reopen this Order and include effluent limitations for aluminum.

VIOLATIONS OF THE EXISTING PERMIT

The existing permit, Waste Discharge Requirements Order No. 95-004, NPDES No. CA0081809, was adopted by the Board on 27 January 1995 and contains an expiration date of 3 December 1998.

I. On three occasions in 1997 and 1998 (19 February and 12 May 1997 and 5 February 1998) staff of California Department of Fish and Game observed the discharge of storm water laden with fine material into the North Fork of Kanaka Creek, approximately 300 feet from the confluence with Kanaka Creek and/or the deposition of materials from the stockpiles (ranging in size from fines to 6-inch diameter rocks or larger) into the flood plain and channel of Kanaka Creek. The discharges are violations of the following orders in the existing Order No. 95-004:

A. Discharge Prohibitions:

1. Discharge of treated wastewater and mine drainage at a location or in a manner different from that described in Findings No. 3 and 4 is prohibited.

2. The by-pass or overflow of wastes to surface waters is prohibited, except as allowed by the attached Standard Provision and Reporting Requirements A.13.

And

D. Receiving Water Limitations:

Receiving Water Limitations are based upon water quality objectives contained in the Basin Plan. As such, they are a required part of this permit.

The discharge shall not cause the following in the receiving water:

6. Turbidity to increase more than 20 percent over background levels.

8. Deposition of material that causes nuisance or adversely affects beneficial uses.

II. Between January 1996 and December 1998, the file shows that the Discharger reported the results of 25 effluent Suspended Solids samples. Of these samples, **12** were in violation of the Monthly Average Effluent Limitation and **7** were in violation of the Daily Maximum Effluent Limitation as follows:

B. Effluent Limitations: for discharge of combined mine drainage and process wastewater.

1. Effluent shall not exceed the following limits:

Constituents	*Units*	*Monthly Average*	*Daily Maximum*
Total Suspended Solids	*mg/l*	*20*	*30*

III. Between January 1996 and July 1998, the file shows that the Discharger reported the results of 63 effluent Settleable Solids samples. Of these samples, **2** were in violation of the Monthly Average Effluent Limitation as follows:

B. Effluent Limitations: for discharge of combined mine drainage and process wastewater.

1. Effluent shall not exceed the following limits:

Constituents	*Units*	*Monthly Average*	*Daily Maximum*
Settleable Solids	*ml/l*	*0.1*	*5.0*

IV. Between February 1995 and 31 July 1998, the file shows that the Discharger reported the results of 107 effluent pH samples. Of these samples, **3** were in violation of the Effluent Limitation as follows:

B. Effluent Limitations: for discharge of combined mine drainage and process wastewater.

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

V. Between February 1995 and September 2001, the file shows that the Discharger reported the results of only **one** bioassay of undiluted effluent, which had 100% mortality. The effluent limitation is as follows:

B. Effluent Limitations: for discharge of combined mine drainage and process wastewater.

4. Survival of aquatic organisms in 96-hour bioassays of undiluted waste shall be no less than:

Minimum for any one bioassay----------70%
Median for any three or more consecutive bioassays---90%

VI. Between May 1996 and July 1998, the file shows that the Discharger reported the results of 65 receiving water Dissolved Oxygen (DO) samples. Of these samples, **2** were in violation of the Receiving Water Limitation as follows:

D. Receiving Water Limitations:

Receiving Water Limitations are based upon water quality objectives contained in the Basin Plan. As such, they are a required part of this permit.

The discharge shall not cause the following in the receiving water:

1. Concentrations of dissolved oxygen to fall below 7.0 mg/l.

VII. Between May 1996 and December 1998, the file shows that the Discharger reported the results of 21 receiving water turbidity samples. Of these samples, **17** were in violation of the Receiving Water Limitation as follows:

D. Receiving Water Limitations:

Receiving Water Limitations are based upon water quality objectives contained in the Basin Plan. As such, they are a required part of this permit.

The discharge shall not cause the following in the receiving water:

6. Turbidity to increase more than 20 percent over background levels.

VIII. Between January 1996 and July 1998, the file shows that the Discharger reported the results of 107 receiving water pH samples. Of these samples, **26** were in violation of the Receiving Water Limitation as follows:

D. Receiving Water Limitations:

Receiving Water Limitations are based upon water quality objectives contained in the Basin Plan. As such, they are a required part of this permit.

The discharge shall not cause the following in the receiving water:

7. The normal ambient pH to fall below 6.5, exceed 8.5, or change by more than 0.5 units.

IX. Provision E.1 required that an arsenic study be conducted, implementation of a source control program, and submittal of various reports. The Discharger completed the first two tasks but failed to submit a Progress Report for the arsenic study, a Work Plan for the arsenic source control program, and the Final Report, as required, in violation of Provision E.1, as follows:

E. Provisions:

1. The Discharger shall comply with the following time schedule to evaluate the variability of arsenic concentrations in effluent and receiving water related to seasonal and operational variations:

Compliance Task	*Date*
a. Information Gathering on Arsenic in Discharge	

and Receiving Water

Submit Plan of Study	***1 March 1995***
Initiate Study	***1 May 1995***
Progress Report on operations which may effect arsenic variability	***1 September 1995***

b. Source Control of Arsenic

Submit Workplan To Develop Source Control Program	***1 November 1995***
Submit Final Report and Source Control Program	***1 February 1996***

X. Provision E.4 of existing Order No. 95-004 required the Discharger to comply with Monitoring and Reporting Program No. 95-004, as follows:

E. Provisions:

4. The Discharger shall comply with the attached Monitoring and Reporting Program No. 95-004, which is part of this Order, and any revisions thereto, as ordered by the Executive Officer.

The Discharger failed to submit monitoring reports and collect samples. The Order was adopted in January 1995. Between February 1995 and September 2001, there were 26 quarters, 80 months, and 360 weeks The Discharger failed to submit monitoring reports and collect samples as follows:

1. No monitoring results or reports were submitted at all for **38** months (out of 80).

2. Weekly monitoring of effluent pH was required. The Discharger submitted the results of 107 weekly samples. Therefore, out of 360 weeks, the Discharger failed to submit the results of **253** effluent pH samples.

3. Weekly monitoring of effluent Temperature was required. The Discharger submitted the results of 80 weekly samples. Therefore, out of 360 weeks, the Discharger failed to submit the results of **280** effluent Temperature samples.

4. Weekly monitoring of effluent Electrical Conductivity (EC) was required. The Discharger submitted the results of 113 weekly samples. Therefore, out of 360 weeks, the Discharger failed to submit the results of **247** effluent EC samples.

5. Monthly monitoring of effluent Settleable Solids was required. The Discharger submitted the results of 21 monthly samples. (Of the 63 samples noted above, many were collected weekly for several months.) Therefore, out of 80 monthly samples, the Discharger failed to submit the results of **59** effluent Settleable Solids samples.

6. Weekly monitoring of effluent Arsenic concentrations was required. The Discharger submitted the results of 85 weekly samples. Therefore, out of 360 weekly samples, the Discharger failed to submit the results of **275** effluent Arsenic samples.

7. Monthly monitoring of effluent Mercury concentrations was required. The Discharger submitted the results of 25 monthly samples. Therefore, out of 80 monthly samples, the Discharger failed to submit the results of **55** effluent Mercury samples.

8. Monthly monitoring of effluent Suspended Solids was required. The Discharger submitted the results of 25 samples. Therefore, out of 80 monthly samples, the Discharger failed to submit the results of **55** effluent Suspended Solids samples.

9. Quarterly effluent Acute Toxicity tests were required. The Discharger submitted the results of only 1 test. Therefore, out of 26 quarterly tests, the Discharger failed to submit the results of **25** effluent Acute Toxicity tests.

10. Weekly monitoring of receiving water Temperature was required. The Discharger submitted the results of 81 weekly samples. Therefore, out of 360 weekly samples, the Discharger failed to submit the results of **279** receiving water Temperature samples.

11. Weekly monitoring of receiving water EC was required. The Discharger submitted the results of 107 weekly samples. Therefore, out of 360 weekly samples, the Discharger failed to submit the results of **253** receiving water EC samples.

12. Weekly monitoring of receiving water pH was required. The Discharger submitted the results of 107 weekly samples. Therefore, out of 360 weekly samples, the Discharger failed to submit the results of **253** receiving water pH samples.

13. Monthly monitoring of receiving water DO samples was required. The Discharger submitted the results of 24 monthly samples. (Of the 65 samples noted above, many were collected weekly for several months.) Therefore, out of 80 monthly samples, the Discharger failed to submit the results of **56** receiving water DO samples.

14. Monthly monitoring of receiving water Turbidity samples was required. The Discharger submitted the results of 21 monthly samples. Therefore, out of 80 monthly samples, the Discharger failed to submit the results of **59** receiving water Turbidity samples.

15. Monthly monitoring of receiving water Arsenic was required. The Discharger submitted the results of 26 monthly samples. Therefore, out of 80 monthly samples, the Discharger failed to submit the results of **54** receiving water Arsenic samples.

PERMITTING AND ENFORCEMENT HISTORY

3 December 1993	The Board adopted Waste Discharge Requirements Order No. 93-255, which implemented the Inland Surface Water Plan (ISWP). Expiration date was 3 December 1998.
27 January 1995	The ISWP was set aside by Court Decision and was, therefore, no longer in effect. Order No. 93-255 was rescinded, all references to the ISWP were deleted, and the current Waste Discharge Requirements Order No. 95-004 (NPDES No. CA0081809) was adopted. The expiration date, 3 December 1998, from Order No. 93-255 was retained in the current Order No. 95-004. On 2 June 1998, the Discharger submitted a Report of Waste Discharge, for renewal of the permit.
26 September 1995	Letter from Discharger requesting reduction in monitoring requirements.
8 February 1997	Resident complains to Fish and Game about turbidity in Kanaka Creek.
19 February 1997	Fish and Game investigated the complaint and observed that a large volume of very fine material was being discharged to the North Fork of Kanaka Creek and Kanaka Creek from two sources at Sixteen-to-One Mine. One of the settling ponds had been discharging a large volume of silt to the North Fork of Kanaka Creek, covering 85% to 100% of the streambed of the North Fork of Kanaka Creek and extending 300 feet to the confluence with Kanaka Creek. Approximately 200 yards downstream in Kanaka Creek, silt had covered 15% to 20% of the shoreline areas and up to 80% in the pools with slow-moving water. Fish and Game observed that the waste piles on-site were unstable, eroding, and that nothing was in place to prevent the waste material from slipping downhill into Kanaka Creek. Material from one pile had already fallen into the floodplain and channel of Kanaka Creek.
25 February 1997	Letter from Discharger requesting reduction in monitoring requirements.
7 May 1997	Regional Board issued Administrative Civil Liability Complaint (ACLC), in the amount of $40,000 for: 1. The discharge of fine materials to North Fork Kanaka Creek and Kanaka Creek and for violation of turbidity limits in the permit. 2. Causing the streambed to be covered with silt. 3. Discharging waste piles to the streambed. 4. Failure to submit a Notice of Intent for the storm water discharges. 5. Failure to submit monthly monitoring reports required by the permit. 6. Violation of the Compliance Schedule in the permit for a study to evaluate arsenic.

12 May 1997	Fish Game observed a new discharge of spoils into Kanaka Creek. When the Discharger cleaned out one of the sedimentation basins, they did not prevent materials from sliding downhill into the creek.
27 May 1997	Payment of the fine was due and a hearing was to be conducted on 20 June 1997 if the Discharger declined to pay. Discharger requested extension of hearing date.
9 June 1997	Board staff issued a Notice of Violation (NOV) for failure to maintain the waste piles and allowing them to discharge into the creek. The Discharger was required to submit a plan to stabilize the piles and report on the current plant operations.
11 June 1997	Board letter to Discharger agreeing to extend possible hearing date to 8 August 1997.
16 June 1997	Board letter to Discharger denying request to consider reduced monitoring until Discharger complies with arsenic study schedule in existing Order No. 95-004.
10 July 1997	Letter from Economics Unit, Office of Statewide Consistency, reporting that the Discharger could afford to pay the recommended $40,000 fine.
23 July 1997	Board letter to Discharger stating that the proposed Administrative Civil Liability (ACL) Order had been placed on the agenda for the 19 September 97 hearing.
19 September 1997	ACL Order No. 97-210 was adopted by the Board in the amount of $20,000 and was due by 19 October 97. The violations listed in the ACL were the same as those listed in the ACLC and in the NOV. In addition, between January 1996 and Feb 1997 the Discharger failed to perform weekly analyses and unilaterally reduced their frequency of monitoring after September 1995, resulting in failure to submit the results of 600 different analyses.
15 October 1997	The Discharger petitioned the State Board for review of the ACL.
14 January 1998	State Board dismissed the Discharger's petition.
5 February 1998	Fish and Game photos taken this date show silt being discharged to the North Fork of Kanaka Creek.
29 May 1998	Letter from Discharger notifying Board staff that they were going to reduce the monitoring.

2 December 1998	Previously, the Regional Board upgraded the threat and complexity of the discharge from 3-C to 2-B. The Discharger refused to agree to the upgrade and corresponding increase in annual fee. Rather than pay the annual fee of $2000 for a discharge ranked 2-B, the Discharger paid only $200 for a discharge ranked 3-C. It is not clear why the Discharger paid $200 because the annual fee for a discharge ranked 3-C is $400.
4 January 1999	Regional Board letter to the Discharger stating the reasons that the 2B ranking is appropriate for the mine discharge rather than 3C and requiring payment of the additional $1800.
12 January 1999	The Regional Board received a copy of the lawsuit (Petition for Writ of Mandate) brought against the Board by the Discharger regarding the ACL.
19 January 1999	Letter from the Discharger to the Regional Board refusing to agree to the new 2B designation and pay the $1800.
3 March 1999	Petition for Writ of Mandate filed in Sierra County Superior Court, Original Sixteen to One Mine, Inc. v California Regional Water Quality Control Board, Central Valley Region.
12 March 1999	Regional Board letter to the Discharger explaining that Kanaka Creek is on the 303d list of impaired water bodies and that the 2B ranking is appropriate and requiring the Discharger to pay the remaining $1800.
22 March 1999	Superior Court Order and Judgment Denying Petition for Writ of Mandate.
19 May 1999	Letter from the Discharger to the Regional Board, reporting to the Board that they are out of compliance. In the past the Discharger requested reduction in monitoring requirements, the Discharger informed Regional Board staff that they were planning to reduce the monitoring frequency, and Board staff did not respond so the Discharger reduced the monitoring.
4 January 2000	Letter from Discharger to State Board reporting that they were only going to pay an annual fee of $200.
2 May 2000	Letter from Discharger to Attorney General's office stating that they were not going to pay the $20,000 fine but were willing to fund $20,000 for a program to study remedies for mine wastes "in lieu of payment to the general account".
23 October 2001	Tentative Waste Discharge Requirements and Cease and Desist Order mailed to the Discharger.

28 November 2001	Tentative Waste Discharge Requirements and Cease and Desist Order mailed to the Discharger. This Notice advised the recipients to disregard the 23 October 2001 tentative documents. A new arsenic drinking water standard was adopted by U.S.EPA, and Board staff revised the tentative documents to incorporate the new arsenic standard.
22 January 2002	NOV sent to Discharger for failure to submit monitoring reports, a Progress Report on the arsenic study, and a Work Plan and Final Report on arsenic source control. All reports along with any new data are due by 15 February 2002.

The Discharger has not yet paid the $20,000 ACL. As of December 2001, the Discharger has failed to pay $7,600 in annual fees.

Table 1 – Sixteen to One Mine – Monitoring Results

Date	Flow (mgd)			Arsenic (µg/l)			pH			EC (µmhos/cm)			Hardness (mg/l CaCO3)	
	Effluent	R1	R2	Effluent	R1	R2	Effluent	R1	R2	Effluent	R1	R2	R1	R2
3 Jan 91	0.16	7.98	8.14	NS	84	43								
21 Feb 91	0.22	8.83	9.05	NS	293	152								
19 Mar 91	0.256	22.05	22.30	639	0	26								
23 Apr 91	0.256	54.80	55.00	NS	0	0								
20 May 91	0.336	37.68	38.02	NS	0	11								
3 Jun 91	0.17	20.40	20.57	717	0	8								
29 Jul 91	0.14	1.56	1.70	NS	0	10								
28 Aug 91	0.17	2.23	2.49	NS	114	180								
18 Sep 91	0.288	1.408	1.696	194	7	708								
31 Oct 91	0.39	1.77	2.16	NS	5	151								
4 Dec 91	0.35	4.63	4.98	NS	0	10								
21 Feb 92	0.35	46.23	46.58	835	0	0								
21 May 92	0.35	4.65	5.00	NS	0	194								
26 Jun 92	0.35	2.77	3.12	NS	6.6	110								
29 Jul 92	0.35	1.75	2.10	NS	8	847								
27 Aug 92	0.35	1.146	1.496	NS	8	281								
24 Sep 92	0.35	1.078	1.428	850	8	168								
27 Oct 92	0.35	1.50	1.85	NS	8	254								
16 Dec 92	0.26	9.98	10.24	NS	0	82								
31 Jan 93	0.23	17.40	17.60	NS	0	17.5	8.3	7.6	7.6	1630	62	NS		
24 Feb 93	0.39	46.80	47.20	NS	0	6	8.4	7.6	7.6	1520	66	66		
29 Mar 93	0.44	58.14	58.58	321	0	0	7.9	7.6	7.6	600	44	48		
29 Apr 93	0.44	39.92	40.36	NS	0	0	8.4	7.5	7.6	1590	41	44		
20 May 93	0.44	23.68	24.12	NS	0	31.5	8.2	7.8	7.8	1670	54	121		
16 Jun 93	0.40	19.02	19.42	290	0	15	8.0	7.6	7.7	677	65	87		
7 Jul 93	0.32	12.43	12.75	NS	0	33	8.1	7.8	7.9	946	96	179		
24 Aug 93	0.42	3.26	3.68	NS	8	134	8.2	7.8	8.0	1733	120	452		
21 Sep 93							8.3	7.8	8.1	1710	123	544		
7 Oct 93				640	7	180							60	140
15 Oct 93							8.3	7.9	7.7	1900	79	194		
18 Oct 93							8.0	7.6	8.0	1685	122	487		
20 Dec 93							8.4	7.5	7.4	1140	94	121		
20 Jan 94							8.4	7.6	8.0	1790	93	338		
24 Feb 94							8.1	7.5	7.6	608	82	101		
23 Mar 94							8.4	7.6	7.6	1860	53	71		
3 May 94							8.4	7.3	7.6	1870	56	146		
28 Jun 94							8.4	7.8	8.1	1800	102	532		
26 Jul 94							8.3	7.9	8.2	1990	124	659		
17 Aug 94				2	ND	ND								
23 Aug 94							8.3	8.1	8.2	2040	144	804		
27 Sep 94							8.3	7.9	8.2	1890	149	827		
31 Oct 94							8.1	7.7	8.0	1150	141	505		
30 Nov 94							8.3	7.4	7.7	1050	95	195		
28 Dec 94							8.1	7.5	7.6	748	74	100		

Date	Flow (mgd)			Arsenic (µg/l)			pH			EC (µmhos/cm)			Temp (˚F)			Set Sol	Sus Sol	Hg (µg/l)	Ac Tox	DO (mg/l)		Turb (NTU)	
	Eff	R1	R2	Eff	R1	R2	Eff	R1	R2	Eff	R1	R2	Eff	R1	R2	Eff	Eff	Eff	Eff	R1	R2	R1	R2
31 Jan 95							8.2	7.1	7.3	1280	39.0	46.0											
27 Feb 95							8.2	7.3	7.5	714	43.0	57.0											
30 Mar 95							8.2	7.4	7.4	1080	55.0	68.0											
14 Apr 95							8.3	6.5	8.4	1080	41.0	55.5											
21 Apr 95							8.2	6.5	7.7	806	49.3	57.5											
1 May 95							8.3	6.2	7.3	1125	30.4	34.6											
5 May 95							8.2	6.4	7.2	1145	35.2	43.9											
12 May 95							8.25	6.47	7.83	NS	NS	NS											
18 May 95							8.20	6.49	8.03	NS	NS	NS											
26 May 95							8.23	7.00	7.89	1313	45.2	64.0											
2 Jun 95							8.30	6.70	7.73	1347	49.1	73.7											
9 Jun 95							7.90	7.15	7.64	667	59.5	76.5											
16 Jun 95							8.00	6.91	7.90	571	51.7	63.4											
23 Jun 95							7.95	6.76	7.77	676	66.4	87.9											
27 Jun 95							7.98	6.83	7.65	1449	68.2	121.1											
7 Jul 95							8.15	6.84	8.05	1502	94.6	169.4											
14 Jul 95							8.00	7.42	7.80	1468	88.9	186.9											
21 Jul 95							7.95	7.24	8.05	1075	93.3	179.7											
28 Jul 95							7.89	7.46	8.01	973	98.0	185.2											
31 Jul 95							7.83	7.68	7.97	870	102.6	190.6											
4 Aug 95							7.90	7.42	7.97	830	107.8	195.5											
11 Aug 95							7.92	7.44	7.97	1659	113.1	293.0											
18 Aug 95							7.80	7.20	7.74	1090	118.3	243.0											
25 Aug 95							7.75	7.25	7.80	1250	120.0	220.0											
31 Aug 95							7.85	7.31	7.90	1603	120.8	186.5											
7 Sep 95							8.00	7.38	8.01	1462	122.4	349.0											
14 Sep 95							7.85	7.20	7.95	1250	125.6	292.0											
22 Sep 95							7.80	7.20	7.85	1650	124.6	420.0											
29 Sep 95							7.70	6.85	7.70	1480	127.6	192.6											
Jan 96	0.495	96.31	96.80	148	3	3	6.75	6.90	6.72	335	29.0	30.5	51.1	43.3	33.9	0	14	0					
Feb 96	0.387	28.65	29.04	663	0	12	7.70	6.10	7.56	1200	47.0	68.6	52.8	39.6	39.9	0	28	0	100%				
Mar 96	0.405	61.17	61.57	708	0	5	7.70	7.35	7.00	1200	31.1	40.7	53.8	40.8	41.5	0	12	0					
Apr 96	0.423	25.85	26.27	411	0	9	7.04	7.00	7.14	950	40.1	922.0	NR	48.3	53.1	0	21	0					
May 96	0.423	31.30	31.72	720	2	16	NR	NR	NR	1251	51.0	74.9	55.4	49.4	50.2	0	30	0.5		7.7	6.5	0.35	0.7
Jun 96	0.416	30.50	30.92	NR	NR	NR	8.15	7.61	7.59	1186	32.1	66.7	54.9	50.1	50.2	NR	NR	NR		8.6	8.1		
Jul 96	0.395	23.81	24.20	NR	NR	NR	7.98	7.39	7.56	1356	27.4	49.2	54.1	50.5	50.6	NR	NR	NR		7.9	7.5		
Aug 96	0.310	26.29	26.60	NR	NR	NR	7.86	7.53	7.31	1131	47.1	89.4	55.7	52.6	53.2	NR	NR	NR		7.4	7.2		
Sep 96	0.210	18.35	18.56	675	8	159	8.18	7.26	7.44	1539	38.2	100.0	54.3	50.7	51.0	<0.01	22	<0.2		8.2	7.8	0.2	3
Nov 96	82.37	728.2	979.5	NR	NR	NR	7.25	8.21	7.58	1815	56.9	148.0	55.8	47.7	47.8	NR	NR	NR		6	7.1		
Dec 96	101.8	High	High	NR	NR	NR	7.69	7.64	7.62	1454	23.5	33.7	53.8	49.8	49.5	NR	NR	NR		14	16		
Dec 96	32.80	4588	NR	NR	NR	NR	7.10	7.55	8.11	1453	47.9	91.8	54.1	46.8	45.9	NR	NR	NR		19	19		
Dec 96	60.00	High	High	700	3	7	6.74	7.59	8.06	929	23.1	32.0	53.1	48.9	47.7	NR	NR	NR		9.1	10		

Date	Flow (mgd)			Arsenic (µg/l)			pH			EC (µmhos/cm)			Temp (˚F)			Set Sol	Sus Sol	Hg (µg/l)	DO (mg/l)			Turb (NTU)	
	Eff	R1	R2	Eff	R1	R2	Eff	R1	R2	Eff	R1	R2	Eff	R1	R2	Eff	Eff	Eff	Eff	R1	R2	R1	R2
8 Jan 97	0.42	74.28	74.70				7.28	7.67	7.18	1270	50.9	65.9	52.3	43.7	43.3				10.50	11.80	12.50		
14 Jan 97	0.36	83.72	84.08				6.92	6.93	7.15	1127	54.9	88.8	47.1	41.2	42.4				9.00	11.90	11.60		
28 Jan 97	0.50	NR	NR				6.67	7.00	7.16	930	35.4	46.8	52.0	44.2	45.0								
7 Feb 97	0.42	59.30	59.72				7.31	7.71	8.18	825	45.0	65.9	49.5	42.4	42.4				6.90	7.60	7.50		
12 Feb 97	0.30	44.97	45.27				7.08	7.95	8.06	1225	81.8	48.2	54.3	47.3	47.7				13.50	16.30	15.60		
19 Feb 97	0.29	44.98	45.27				7.28	7.35	7.53	1338	48.0	79.2	53.1	45.0	45.0				5.40	5.90	6.20		
27 Feb 97	0.39	21.68	22.07				9.05	5.20	6.20	1078	51.0	100.4	48.3	41.4	43.2				5.30	6.30	6.20		
6 Mar 97	0.39	11.98	12.36				7.31	7.99	7.83	1454	55.6	129.2	53.8	43.2	43.0				5.00	7.40	6.80		
14 Mar 97	0.65	20.24	20.89				8.00	8.30	8.54	687	57.1	66.9	49.6	46.6	46.9				6.80	6.60	6.80		
20 Mar 97	0.39	30.85	31.24	297	<2	3	6.96	7.18	7.32	539	44.1	50.8	50.5	47.7	47.7	<0.1	32	<0.5	5.90	6.40	6.10	0.20	0.63
27 Mar 97	0.39	23.49	23.88	809			7.38	6.59	6.65	1239	99.8	216.0	56.5	51.3	50.5				6.10	6.50	6.80		
7 Apr 97	0.32	16.49	16.82	350			7.57	7.67	7.67	1395	54.2	125.2	54.1	47.5	47.8				5.30	6.30	6.30		
17 Apr 97	0.32	20.15	20.47	754			7.55	6.36	6.32	1379	63.8	161.2	58.1	56.1	53.6				4.50	5.00	4.90		
22 Apr 97	0.33	19.88	20.21	814	6	37	7.65	6.06	6.13	1420	54.1	124.0	54.5	50.2	49.5	<0.1	18	<0.5	4.80	4.50	4.30	0.32	0.61
29 Apr 97	0.29	20.87	21.16	718			7.66	6.68	6.71	1336	66.9	139.0	54.3	49.1	50.0	0			6.20	7.10	7.00		
5 May 97	0.32	18.36	18.68	711			7.73	6.77	6.89	1402	67.7	167.4	56.5	54.9	54.0	0			6.50	7.10	7.00		
16 May 97	0.23	19.68	19.91	503	4.6	32.6	7.53	6.42	6.32	1024	81.7	127.1	56.3	57.0	57.4	0			6.70	7.20	7.20		
22 May 97	0.17	19.45	19.62	519			7.31	5.75	5.82	1032	79.0	116.6	54.0	54.0	54.1	0			6.90	7.20	7.30		
28 May 97	0.17	19.21	19.38	831			7.75	6.46	6.75	1742	81.6	287.0	56.5	54.9	55.8	0	15	<0.5	6.70	7.10	7.10	<0.10	0.13
30 May 97																							
5 Jun 97	0.17	12.33	12.49	381			7.34	6.55	6.64	770	72.8	112.2	52.5	49.3	49.8	0			7.00	7.40	7.20		
13 Jun 97	0.22	11.10	11.32	426			7.52	7.28	7.49	1015	84.8	101.3	55.2	54.1	52.3	0			7.20	7.40	7.50		
18 Jun 97	0.39	12.85	13.24	843			7.51	6.85	7.21	1775	102.4	331.0	57.2	57.4	57.6	0			6.50	7.00	6.80		
23 Jun 97	0.39	14.21	14.60	757			7.60	7.16	7.12	1808	101.3	306.0	56.8	59.0	59.4	0	33	<0.5	8.60	8.60	8.80	0.10	0.50
2 Jul 97	0.11	13.31	13.42	371	4.2	96.4	7.33	7.04	7.21	913	112.9	121.9	54.7	57.0	58.6	0			9.50	9.50	9.50		
9 Jul 97	0.11	3.57	3.68	517			7.36	7.12	7.29	1151	117.3	134.0	54.7	58.3	59.4	0			8.70	8.70	8.50		
14 Jul 97	0.23	2.03	2.25	680			7.64	7.79	7.84	1715	123.5	442.0	57.7	65.1	64.2	0			8.30	8.10	7.90		
22 Jul 97	0.19	3.20	3.40	737			7.80	7.68	7.43	1781	123.0	382.0	57.0	64.8	64.0	0			8.50	8.80	8.70		
28 Jul 97	0.20	2.46	2.65	679			7.61	7.70	7.74	1791	141.3	456.0	57.4	64.9	64.9	0	14	<0.5	8.70	8.10	7.90	0.10	0.70
5 Aug 97	0.26	1.48	1.74	13.7	7.4	133	8.29	8.08	8.20	1339	133.1	181.1	54.9	57.2	57.7	0			9.40	9.80	8.90		
13 Aug 97	0.26	1.00	1.26	16			7.57	7.64	7.55	1960	141.2	526.0	59.4	62.4	62.4	0			8.60	8.80	8.20		
21 Aug 97	0.17	1.80	1.97	12.8			7.89	7.75	7.72	1559	137.6	442.0	56.7	59.0	59.7	0			8.10	7.60	7.50		
29 Aug 97	0.17	1.75	1.92	8			7.97	7.92	8.10	1869	156.3	531.0	57.0	56.7	58.3	0	20	<0.5	6.00	6.40	6.20	0.20	1.30
4 Sep 97	0.11	0.80	0.91	426	14.2	14.8	7.30	7.39	7.08	1986	136.5	316.0	55.0	57.2	58.3	0			4.90	5.20	5.00		
10 Sep 97	0.16	1.13	1.29	742			7.58	8.17	8.00	1960	150.5	606.0	59.5	60.4	59.9	0			7.00	6.90	6.90		
20 Sep 97	0.11	3.00	3.10	334			7.43	7.68	7.66	934	159.2	163.0	59.5	57.9	55.9	0			6.60	6.40	6.50		
26 Sep 97	0.29	3.02	3.31	387			7.30	7.41	7.54	950	147.1	170.9	53.6	54.9	55.4	0	5	<0.5	7.80	7.70	7.60	0.15	0.15
2 Oct 97	0.16	3.26	3.42	293	8.6	18										0							
9 Oct 97	0.11	3.00	3.10	290			7.62	7.71	7.55	903	128.1	144.4	52.7	49.6	48.4	0			9.80	11.00	11.10		
17 Oct 97	0.11	1.57	1.68	350			7.58	7.38	7.57	999	159.5	170.2	55.8	52.7	50.0	0			7.90	8.10	7.60		
21 Oct 97	0.22	1.99	2.21	697			7.69	7.69	8.04	2290	155.2	690.0	55.2	46.0	49.5	0			8.30	10.20	9.70		
29 Oct 97	0.11	1.00	1.11	379			7.30	7.57	7.68	1007	129.3	156.8	52.5	45.3	46.0	0	8	<0.5	9.30	10.30	10.10	<0.10	0.15
7 Nov 97	0.11	1.91	2.02	427	7.5	12.3	7.82	7.38	7.76	1538	122.4	186.3	52.3	45.1	45.7	0			7.90	9.80	10.00		
10 Nov 97	0.18	1.11	1.29	407			7.96	8.49	8.28	911	134.6	206.0	50.0	45.0	46.0	0			9.60	10.50	10.50		
19 Nov 97	0.22	10.35	10.56	931			7.34	7.60	7.22	792	67.7	88.4	48.2	42.8	43.5	0.4			10.10	11.30	11.00		
25 Nov 97	0.09	2.63	2.72	397			7.86	7.75	7.59	825	92.9	99.5	50.0	46.4	46.2	0	16	<0.5	9.80	10.50	10.20	1.00	0.20
5 Dec 97	0.19	3.46	3.65	529	4.3	10.5	NR	NR	NR	1168	110.8	170.9	50.2	42.1	43.0	0							
10 Dec 97	0.27	7.49	7.76	377			7.27	7.75	7.75	801	77.0	137.8	45.7	37.4	37.8	0			11.40	13.20	12.80		
18 Dec 97	0.27	16.98	17.25	407			7.60	8.34	8.21	1110	57.9	75.9	49.5	40.1	40.3	0			11.10	13.00	13.50		
29 Dec 97	0.11	4.42	4.53	344	3.8	7.2	7.48	8.16	7.92	827	90.8	113.5	47.1	36.5	37.6	0	72	<0.5	12.50	14.30	14.50	0.10	0.15

Table 1 (continued) – Sixteen to One Mine – Monitoring Results

Date	Flow (mgd)			Arsenic (µg/l)			pH			EC (µmhos/cm)			Temp (°F)			Set Sol	Sus Sol	Hg (µg/l)	DO (mg/l)			Turb (NTU)	
	Eff	R1	R2	Eff	R1	R2	Eff	R1	R2	Eff	R1	R2	Eff	R1	R2	Eff	Eff	Eff	Eff	R1	R2	R1	R2
6 Jan 98	0.16	5.66	5.82	419			7.31	8.06	7.91	926	69.8	78.9	48.2	37.4	36.5	0			13.5	14.9	14.5		
13 Jan 98	0.26	692.23	692.49	334			6.88	7.33	5.70	511	35.9	38.1	46.8	41.9	42.3	0			13.9	15.1	14.7		
21 Jan 98	0.16	41.17	41.33	246			7.54	8.00	7.95	433	40.1	42.1	46.2	37.2	38.3	0			14.1	15.8	15.4		
30 Jan 98	0.22	105.54	105.76	275	8.4	8.3	7.67	7.39	7.51	598	47.2	52.1	46.9	40.6	41.0	0	17	<0.5	16.8	18.1	17.5	1.40	1.30
6 Feb 98	0.27	126.73	127.00	429			7.90	7.35	7.35	216	42.0	42.0	46.2	40.1	41.7	0			18.0	18.1	17.9		
11 Feb 98	0.16	34.33	34.49	528			6.93	7.04	7.29	524	56.7	72.0	47.7	42.4	41.9	0			8.4	9.6	9.2		
20 Feb 98	0.22	46.80	47.01	261			6.98	7.49	7.40	445	64.6	66.7	47.3	40.6	40.8	0			8.6	9.5	9.3		
24 Feb 98	0.22	33.74	33.96	212	<2.0	2.9	6.84	7.40	7.27	474	71.2	74.5	47.1	39.2	39.6	0	31	<0.5	8.6	9.6	9.7	0.30	0.32
4 Mar 98	0.22	46.80	47.01	281			7.18	7.48	7.61	454	64.4	60.0	47.5	41.2	41.4	0			8.5	9.8	9.7		
10 Mar 98	0.38	23.50	23.88	878			7.30	7.30	7.35	1657	67.4	100.6	52.0	38.5	39.9	0			9.1	11.3	10.2		
17 Mar 98	0.38	79.00	79.38	820			7.18	7.61	7.62	1343	44.2	62.0	55.4	45.7	45.5	0			9.2	10.7	10.2		
26 Mar 98	0.44	160.53	160.97	746	<2.0	8.4	7.40	7.65	7.81	1216	39.8	51.3	53.1	44.4	45.1	0.3	232	<0.5	10.2	12.3	11.8	0.77	2.50
3 Apr 98	0.11	65.38	65.48	NS			7.09	7.55	7.72	445	51.3	64.3	45.9	39.0	39.6	0			9.1	10.8	11.1		
10 Apr 98	0.43	30.61	31.04	NS			7.13	7.81	7.75	1306	59.1	78.9	53.2	42.8	43.2	0			8.6	10.5	10.3		
16 Apr 98	0.11	58.10	58.21	NS			7.24	7.76	7.67	436	47.8	76.9	48.6	40.1	41.0	0			9.4	10.4	10.1		
4 Jun 98				406																			
9 Jun 98				540																			
17 Jun 98				246																			
25 Jun 98				900	<2.0	20.6				1460							78	<0.5				0.20	0.50
2 Jul 98	0.02	6.45	6.47	NS			6.69	7.82	7.48	101.5	69.2	99.4	56.3	51.8	55.4	0			6.3	5.7	5.9		
8 Jul 98	0.02	6.11	6.13	NS			6.13	6.80	6.32	320	72.1	96.4	56.3	53.6	55.0	<0.1			6.5	6.1	6.2		
14 Jul 98	0.02	5.52	5.54	NS			6.11	5.80	5.52	840	87.3	126.5	57.0	58.3	58.8	<0.1			5.9	6.2	6.2		
23 Jul 98	0.02	4.29	4.31	NS			6.74	7.42	7.50	624	93.3	101.7	55.6	59.5	59.9	0			5.5	4.6	4.4		
31 Jul 98	0.02	4.64	4.66	NS			6.95	7.02	7.52	928	193.8	126.2	55.8	59.7	60.1	0			5.5	4.6	4.4		
5 Aug 98				624																			
11 Aug 98				378																			
19 Aug 98				347																			
25 Aug 98				264	8.0	12.1				686							41	<0.5				0.30	0.60
2 Sep 98				357																			
9 Sep 98				501																			
16 Sep 98				692																			
23 Sep 98				381																			
30 Sep 98				509	6.1	60.8				1320							15	<0.5				0.25	0.55
7 Oct 98				752																			
14 Oct 98				373																			
21 Oct 98				405																			
29 Oct 98				730	8.4	111				1880							24	<0.2				0.21	2.4
4 Nov 98				797																			
12 Nov 98				973																			
18 Nov 98				723																			
25 Nov 98				218																			
2 Dec 98				287	2.9	4.7				750							6	<0.2				0.40	0.55
10 Dec 98				664																			
16 Dec 98				676																			
23 Dec 98				691																			
28 Dec 98				750	5.9	42.9				1720							19	<0.2				0.40	0.65

ND – Not Detected

NR – Not Reported

NS – Not Sampled