4.8 Hydrology and Water Quality

Issues (and Supporting Information Sources):	*Potentially Significant Impact*	*Less Than Significant with Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
8. HYDROLOGY AND WATER QUALITY—Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☒	☐	☐	☐
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion of siltation on- or off-site?	☐	☐	☒	☐
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?	☒	☐	☐	☐
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐
f) Otherwise substantially degrade water quality?	☐	☐	☒	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other authoritative flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☒	☐	☐	☐
j) Expose people or structures to a significant risk of loss, injury or death involving inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

4.8.1 Setting

Surface Water

The Idaho-Maryland, New Brunswick, and Round Hole sites are situated in hilly terrain with moderately steep slopes in an area that lies between the west-flowing Wolf Creek to the north and South Fork Wolf Creek to the south. Ground surface elevations at the three sites range from 2,500 feet above mean sea level (msl) (Idaho-Maryland site) to 2,800 msl (New Brunswick site).

The Idaho-Maryland site and Round Hole site lie within the Wolf Creek drainage basin while the South Fork Wolf Creek drainage basin (1,700 acres or 2.7 square miles in size) encompasses the New Brunswick site. These two basins are part of the larger Bear River watershed. Wolf Creek is the closest perennial surface water source and extends the northernmost portion of the Idaho-Maryland site property line. Wolf Creek is also a major component of the Nevada Irrigation District's (NID) distribution system, which supplies water for irrigation to ranching and agricultural operations downstream. The South Fork Wolf Creek, located approximately 300 ft south of the New Brunswick site, can average flows of approximately 0.68 cubic feet per second (cfs) during the dry season (May through October) and can reach 5.5 cfs in wet weather and spring months.

Idaho-Maryland Site

The 101-acre Idaho-Maryland site formerly contained the Idaho-Maryland Mining Company tailings area, which was closed in 1956. Wolf Creek borders the Idaho-Maryland site along its northern boundary. Overland surface water flows across the site in a north-northwesterly direction. An unconsolidated earthen berm on the eastern border separates the Idaho-Maryland site from the industrial water supply pond located up-gradient on the adjacent Milco property. Historically, the Idaho-Maryland ditch was constructed to convey water from Wolf Creek to provide water for the industrial pond. A culvert extending under the berm allows pond water to seep onto the Idaho-Maryland site, forming a small wetted area west of the berm. The wet area, which according to the MATEC Wetland Assessment, does not appear to be jurisdictional[1], contains mixed willow vegetation and interspersed cottonwood trees and nonnative annual grasses. An additional drainage[2] originating on the DeMartini property to the west enters and flows across the Idaho-Maryland site. This drainage currently conveys storm water runoff. Mine discharge water is currently discharging under the force of gravity from three locations on the Idaho-Maryland site. These discharge points flow into Wolf Creek and contribute to base flow in the creek. The location and quality of the discharge are discussed below.

New Brunswick Site

The New Brunswick site was developed as a gold mill site associated with the historical Idaho-Maryland Mine operations. The surface drainage currently flows generally to the southwest and empties into the South Fork Wolf Creek, which flows through the southwest portion of the site. Upstream of the New Brunswick site, the South Fork Wolf Creek flows through a culvert beneath the former lumber mill (located adjacent and east of the site). The creek exits the culverted section at the southeastern portion of the New Brunswick site. A few small surface streams that convey storm water runoff extend across the site and drain into the South Fork Wolf Creek.

Round Hole Site

From a hydrologic perspective, the Round Hole site is rather insignificant given its relatively small size and location within a previously developed area. The 1-acre site sits atop a hill that

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1 Note that a jurisdictional determination by the Army Corps of Engineers has not occurred.

2 Note, this drainage is a by product of past reclamation on the Demartini property

slopes down in all directions, but the dominant surface water drainage direction for the entire parcel is controlled by north-northwest facing hill slopes. Drainage from the Round Hole site eventually flows to the upper reaches of the Wolf Creek drainage basin. The site is bordered on the north and east by Idaho Maryland Road and Brunswick Road, respectively. The roadways do not deliver stormwater runoff onto the site because they are at the base of the hill and roadway runoff is managed by a system of storm drains and gutters.

Surface Water Quality

Since 1989, IMMC has collected and submited for analysis, surface water samples from upstream and downstream points along the Wolf Creek and South Fork Wolf Creek and at locations on the IMMC property. The majority of the surface water data were collected between March 2003 and December 2005. Current documentation provided by IMMC indicates that 24 sites are currently within the IMMC monitoring program. Surface water sample sites include: various points on Wolf Creek adjacent to the IMMC property, the potential discharge point for the New Brunswick shaft dewatering site, locations adjacent to the Idaho-Maryland site, and various locations along the South Fork Wolf Creek. Surface water samples are analyzed for a variety of general chemistry parameters, metals, and chemical constituents, including, but not limited to: total dissolved solids, dissolved oxygen, arsenic, lead, mercury, pH, surfactants, E. Coli, and PCBs. Based on a preliminary review conducted as part of this MEA, it appears that the IMMC Wolf Creek watershed surface water data will provide technically adequate baseline water quality data to evaluate whether the project would result in significant, adverse changes in surface water quality.

The Wolf Creek Community Alliance (WCCA) collects surface water quality data for Wolf Creek and South Wolf Creek. WCCA is a non-profit organization formed to protect, enhance, and restore Wolf Creek, its tributaries and watershed. WCCA is a collaborative group of scientists, farmers, ranchers, conservationists, and government agencies. In 2004, the WCCA joined other volunteer monitoring groups in the United States in initiating a Citizen Water Quality Monitoring Program. The WCCA gathers ambient water quality data throughout the Wolf Creek/South Wolf Creek watershed in Nevada County (WCCA, 2005). The WCCA have sampled twelve sites within the Wolf Creek watershed including the headwaters of Wolf Creek, Olympia Creek, Wolf Creek in the industrial area, in the City of Grass valley and before the confluence with the Bear River. The WCCA samples surface water for temperature, dissolved oxygen, pH, conductivity, turbidity, ammonia and nitrates. Water samples collected from the top and bottom of the watershed are analyzed for E.coli, total coliform, and arsenic. Samples have also been collected for iron and manganese. Based on a preliminary review of the WCCA Citizen Water Quality Monitoring Program Annual Report (December 2005), it appears that the surface water quality data collected by the WCCA will assist the CEQA analysis by providing additional data and a means to verify data previously collected by IMMC. Combined, the IMMC and WCCA surface water data should provide a reliable data set for baseline water quality in the Wolf Creek/South Fork Creek watershed

Groundwater

Groundwater beneath the proposed site is influenced by a series and fractures and faults in the underlying bedrock, a condition geologists refer to as fracture flow. A discussion of the bedrock type is provided in Section 4.6, *Geology, Soils, Seismicity and Mineral Resources*. The amount of water bedrock can transmit depends on the number and size of fractures in the rock. These fractures also control the direction of flow. Fault structures can represent dense, impermeable barriers to groundwater flow. In complex bedrock systems, such as that found beneath the project area, fractures sets and faults cause a diverse array of groundwater flow rates and patterns. This type of groundwater system can be referred to as anisotropic (not the same in all directions) and heterogeneous (containing a mixture of conditions). In contrast, a groundwater system that is located, for example, in a valley underlain by hundreds of feet of sand and gravel possesses generally consistent geologic materials and structure resulting in somewhat predictable groundwater volumes, velocities, and flow direction. Accurately defining groundwater quantities and behavior of flow in a geologic setting similar to that beneath the project site can be difficult, even with modern groundwater computer models.

Over the years since the Idaho-Maryland Mine closed, groundwater has infiltrated into the mine workings. In order to conduct underground exploration and development, the groundwater that has inundated the subsurface mine workings must be removed through dewatering. At the New Brunswick site, a stable groundwater level occurs in this vertical mine shaft at a level of 260 feet below the mineshaft collar. Dewatering operations planned as part of the proposed project would dewater the mine workings to a depth of 3,200 feet. The 1995 Dewatering and Exploration Project EIR (1995 EIR) analyzed the potential impacts that mine dewatering would have on local domestic groundwater wells. The analysis was necessary because the subsurface workings may be in hydraulic connection with shallow groundwater and, in some instances, mine dewatering could also pull water levels down in local domestic wells. Preliminary review of water depth measurements in the local domestic wells suggest that wells range from 10 to 100 feet deep with the deepest, nearby domestic water well is at a depth of 200 feet. Data also indicates that the domestic wells tap the water table and fluctuate with seasonal changes in the weather.

Mine Water Quality

In 1991, water samples were obtained from the New Brunswick shaft at depths of 580 feet, 900 feet, 1,300 feet, 1,600 feet, 2,300 feet, and 3,280 feet. Water samples were also obtained from four locations where mine water was discharged into Wolf Creek.[3] The results of the 1991 sampling effort indicated that, with the exception of a slightly elevated concentration of manganese, the water from within the mine satisfies 1991 state and federal water quality standards for irrigation and agricultural purposes but showed that iron, manganese, and arsenic

3 Water samples of mine discharge were collected from sample locations: **IMD-1**, a galvanized pipe (reportedly lying beneath the Roto-Rooter building) discharging mine water into Wolf Creek from the north bank; **IMD-2**, an old steel pipe located 25 feet upstream from IMD-1 reportedly discharging both mine and surface water runoff; **ED-1**, located at the northwest corner of Idaho-Maryland Road approximately 600 feet west of IMD-1. This flows at a consistent rate of 100 gallon per minute and is believed to be interconnected with the Eureka mine workings; and **DRAIN**, located on the north side of Idaho-Maryland Road and flows throughout the year. This discharge point drains a seep located at a higher elevation than other sites.

exceeded 1991 Drinking Water Standards. Water samples collected at mine discharge points indicated that arsenic concentrations in mine water were higher than arsenic concentrations in the New Brunswick shaft. The 1991 data from the New Brunswick shaft show relatively low arsenic levels. This limited discharge water data could indicate that the mine water became enriched in arsenic, manganese, and iron at some point near the discharge to the waterway. It was believed that the high arsenic levels at the discharge points were caused by water traveling through collapsed drifts prior to surfacing and exiting the mine (Nevada County, 1995). Mine discharge water sampling conducted in 1991 also tested pH and found that it was just over 7 and considered neutral. Deposits in the mine can have high calcium carbonate concentrations and result in higher values of pH.

In January 2006, the Idaho-Maryland Mine Corporation conducted analysis of several groundwater samples from the New Brunswick shaft. The samples were collected from depths of 310 feet, 580 feet, 876 feet, 1,300 feet, 1,600 feet, 2,300 feet, and 3,280 feet. A state-certified testing laboratory analyzed the water samples for several organic and inorganic compounds including metals, surfactants (i.e., soaps, detergent), pesticides, volatile compounds, and semi-volatile organics. These data are currently under review but preliminary results indicate that, based on select analytes (arsenic, manganese, iron, hardness total dissolved solids, and dissolved oxygen) the water quality within the New Brunswick shaft is relatively uniform from 310 feet to 3,280 feet. For instance, the highest arsenic concentration was 2.8 parts per billion (ppb) at 580 feet and the lowest was 2.4 ppb at 3,280 feet. Hardness ranged from a high of 187 ppm at 1,600 feet to a low of 179 parts per million (ppm) at 3,280 feet. The highest concentration of iron was 1,900 ppm at 580 feet and the lowest was 1,570 ppm at 3,280 feet; the average iron concentration through the water column was 1,675 ppm. The concentrations for arsenic are below the state and federal maximum contaminant level of 10 ppb for drinking water. The preliminary review of the analytical results show that no pesticides, volatile organic compounds, or semi-volatile organic compounds were detected in the New Brunswick shaft water samples. The water quality data obtained from the New Brunswick shaft will provide a reasonable and current assessment of mine water quality with depth and will be necessary baseline data to effectively calibrate the mine water treatment system proposed as part of this project.

Domestic Groundwater Quality

Direct data on domestic water quality is limited because neither the State nor the County requires testing and reporting of water quality in private domestic wells. The groundwater wells in the areas adjacent to the MEA study are drilled and set in a variety of bedrock types and geologic structures, and therefore, the composition and quality of groundwater extracted from the subsurface can vary significantly depending on location. It is probably safe to assume that, considering the geology, some domestic groundwater is considered hard and contains elevated concentrations of metals including iron and manganese. As is the case with many private domestic water systems set in bedrock geology, it is likely that some households in the study area choose to treat their well water to reduce metals concentrations and improve the taste and odor.[4] In other cases, water treatment is not preferred or considered necessary.

Flooding

South Fork Wolf Creek has a history of isolated flooding during the winter months (November 15 through April 15). The storm drainage facilities downstream from the New Brunswick site are over-capacity during a 10-year storm event (Nevada County, 1995). A series of storm drainage facilities exist along South Fork Wolf Creek before the waterway joins with Wolf Creek. These facilities include culverts on private lots that cross under driveways, an open box culvert near Hennessy School, and the box culvert at Highway 174 undercrossing, which travels beneath the streets on Grass Valley (Nevada County 1995).

4.8.2 Regulatory Context

Federal

Clean Water Act

The Clean Water Act (CWA) established the basic structure for regulating discharges of pollutants into the waters of the U.S. and gave the U.S. Environmental Protection Agency (USEPA) the authority to implement pollution control programs such as setting wastewater standards for industry. The CWA sets water quality standards for all contaminants in surface waters. The statute employs a variety of regulatory and non-regulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. The Corps has jurisdiction over all waters of the U.S. including, but not limited to, perennial and intermittent streams, lakes, and ponds, as well as wetlands in marshes, wet meadows, and side hill seeps. Under Section 401 of the CWA every applicant for a federal permit or license for any activity which may result in a discharge to a water body must obtain State Water Quality Certification that the proposed activity will comply with state water quality standards. The CWA applies to the projects proposed discharge of mine water to Wolf Creek and South Fork Wolf Creek.

Executive Order 11988

Under Executive Order 11988, the Federal Emergency Management Agency (FEMA) is responsible for management of floodplain areas defined as the lowland and relatively flat areas adjoining inland and coastal waters subject to a one percent or greater chance of flooding in any given year (the 100-year floodplain). FEMA requires that local governments covered by federal flood insurance pass and enforce a floodplain management ordinance that specifies minimum requirements for any construction within the 100-year floodplain.

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[4] Elevated iron and manganese can stain household fixtures and reduce water flow efficiency in some plumbing systems.

California Toxics Rule

On May 18, 2000, the USEPA finalized the California Toxics Rule (CTR) to reinstate water quality criteria for toxic pollutants in the State's rivers, streams, lakes, enclosed bays, and estuaries. The State of California has been without numeric water quality criteria for many priority toxic pollutants as required by the Federal Water Pollution Control Act (CWA), necessitating this action by the EPA. These Federal criteria are legally applicable in California for inland surface waters, enclosed bays and estuaries for all purposes and programs under the CWA. The CTR would apply to creeks adjacent to the site and in regulating discharge of mine water.

State

Porter-Cologne Water Quality Control Act

The Porter-Cologne Act (Division 7 of the California Water Code) provides the basis for water quality regulation within California and defines water quality objectives as the limits or levels of water constituents that are established for reasonable protection of beneficial uses. The State Water Resources Control Board (SWRCB) administers water rights, water pollution control, and water quality functions throughout the state, while the Central Valley Regional Water Quality Control Board (RWQCB) conducts planning, permitting, and enforcement activities. The Porter-Cologne Act requires the RWQCB to establish water quality objectives, while acknowledging that water quality may be changed to some degree without unreasonably affecting beneficial uses. Beneficial uses, together with the corresponding water quality objectives, are defined as standards, per Federal regulations. Therefore, the regional plans form the regulatory references for meeting State and Federal requirements for water quality control. Changes in water quality are only allowed if the change is consistent with the maximum beneficial use of the State, does not unreasonably affect the present or anticipated beneficial uses, and does not result in water quality less than that prescribed in the water quality control plans. The Act will apply to discharges of mine water to Wolf Creek and South Fork Wolf Creek.

Clean Water Act Section 401 Water Quality Certification

Section 401 of the Clean Water Act requires an applicant for any federal permit that proposes an activity which may result in a discharge to "waters of the United States" obtain certification from the state that the discharge will comply with other provisions of the Act. Certification is provided by the RWQCB. Any local or jurisdictional water quality programs must also be addressed when constructing in areas that influence the quality of surface and groundwater.

Central Valley Regional Water Quality Control Plan

The preparation and adoption of water quality control plans (Basin Plans) is required by the California Water Code (Section 13240) and supported by the Federal Clean Water Act. Section 303 of the Clean Water Act requires states to adopt water quality standards which "consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses." According to Section 13050 of the California Water Code, Basin Plans consist of a designation or establishment for the waters within a specified area of beneficial uses to be protected, water quality objectives to protect those uses, and a program of implementation needed for achieving the objectives. Because beneficial uses, together with their corresponding water quality objectives, can be defined per Federal regulations as water quality standards, the Basin Plans are regulatory references for meeting the State and Federal requirements for water quality control. One significant difference between the State and Federal programs is that California's basin plans establish standards for groundwater in addition to surface water. Adoption or revision of surface water standards is subject to the approval of the USEPA.

The Basin Plan does not specifically identify beneficial uses for Wolf Creek, but does identify present and potential uses for the Bear River, to which Wolf Creek is tributary. The Basin Plan identifies the following beneficial uses for the Bear River: municipal and domestic supply, agricultural irrigation and stockwatering, hydropower generation, water contact recreation (including canoeing and rafting), non-contact water recreation, warm freshwater aquatic habitat, cold freshwater aquatic habitat, warm fish migration habitat, cold fish migration habitat, warm spawning habitat, cold spawning habitat, and wildlife habitat. Other beneficial uses identified in the Basin Plan apply to Wolf Creek, including groundwater recharge and freshwater replenishment.

Groundwater Ambient Monitoring and Assessment Program

The Groundwater Ambient Monitoring and Assessment Program, administered by the State Water Resources Control Board (SWRCB), is a recently enacted program that provides a comprehensive assessment of water quality in water wells throughout the state. The program has two main components: the California Aquifer Susceptibility Assessment and the Voluntary Domestic Well Assessment Project.

Groundwater Quality Monitoring Act

The Groundwater Quality Monitoring Act (AB599, Water Code, §10780 et seq.) requires the SWRCB to develop a comprehensive monitoring program in a report to the legislature. Section 10781 states that in order to improve comprehensive groundwater monitoring and increase the availability to the public of information about groundwater contamination, the SWRCB, in consultation with other responsible agencies, shall follow a list of actions such as forming an interagency task force.

General Order for Dewatering and Other Low Threat Discharge to Surface Waters Permit

If dewatering is required during construction, the discharge of construction water would require permits either from the RWQCB for discharge to surface creeks and groundwater or from local agencies for discharge to storm or sanitary sewers. The contractor would be required to obtain necessary permits for dewatering to comply with permit requirements for sampling and monitoring of the groundwater to identify water quality and suitability for discharge to creeks or canal systems; thereby protecting surface water quality.

NPDES General Construction Storm Water Permit

The RWQCB administers the National Pollution Discharge Elimination System (NPDES) storm water permitting program in the Central Valley region. Construction activities disturbing one acre or more of land are subject to the permitting requirements of the NPDES General Permit for Discharges of Storm Water Runoff Associated with Construction Activity (General Construction Permit). The City must submit a Notice of Intent to the RWQCB to be covered by the General Construction Permit prior to the beginning of construction. The General Construction Permit requires the preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must be prepared before construction begins.

NPDES Industrial Storm Water Permit

Persons whose discharges are composed entirely of industrial storm water runoff may be eligible to be regulated under a General Industrial Storm Water Permit issued by the SWRCB rather than an individual NPDES permit issued by the RWQCB. The General Industrial Storm Water Permit regulates storm water runoff from eligible industrial activities including mining and oil and gas facilities.

Waste Discharge Requirements Permit

The RWQCB administers the Waste Discharge Requirements (WDR's) Permit Program pursuant to California Water Code Section 13260. Section 13260 states that persons discharging or proposing to discharge waste that could affect the quality of the waters of the State, other than into a community sewer system, shall file a Report of Waste Discharge containing information which may be required by RWQCB.

Local

Nevada County General Plan[5]

The Nevada County General Plan includes the following relevant goals and objectives related to water and water quality:

- Goal 11.1: Identify, protect and manage for sustainable water resources and riparian habitats.
- Objective 11.2: Preserve surface and sub-surface water quality and, where feasible, improve such quality.
- Objective 11.3: Preserve and, where economically feasible, restore the density and diversity of water-dependent species and continuous riparian habitats based on sound ecological principles.

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5 Under the proposed project, Nevada County plans and policies would only apply to the New Brunswick site, which would not be annexed into the City of Grass Valley as part of this proposed project.

- Objective 11.4: Preserve the integrity and minimize the disruption of watersheds and identified critical water courses.

(Nevada County, 1996).

City of Grass Valley General Plan

The City of Grass Valley General Plan includes the following goals and objectives designed to identify and manage natural resources to prevent waste, destruction, or neglect:

Conservation/Open Space

- Goal 1-COSG: Provide a balance between development and the natural environment, protecting and properly utilizing Grass Valley's sensitive environmental areas/features, natural resources and open space lands.
- Objective 1-COSO: Inventory of sensitive environmental areas and features.
- Goal 2-COSG: Protect, enhance and restore hydrologic features, including stream corridors, flood plains, wetlands, and riparian zones.
- Goal 6-COSG: Assure compliance with and understanding of air and water quality regulations and standards.
- Objective 15-COSO: Protection of ground- and surface water quality.
- Objective 16-COSO: Inclusion of air and water quality consideration in land use decisions rendered by the Planning Commission and City Council.

Safety

- Goal 1-SG: Reduce the potential risk of death, injury, property damage, and economic and social dislocation resulting from hazards.
- Objective 2-SO: Reduction of risk from exposure to hazards related to past and present mining, including shafts, tunnels, tailings and toxic materials.
- Objective 3-SO: Reduction of risk from exposure to flood hazards.
- Objective 5-SO: Reduction of risk from exposure to hazardous materials, including contaminated sites.

(City of Grass Valley, 1999).

City of Grass Valley Storm water Prevention Program

The City of Grass valley has developed the Storm water Management Program (SWMP) to comply with a statewide general permit for discharging storm water to Water of the state. The

SWMP addresses a wide variety of activities conducted in urbanized areas of Grass valley that are sources of pollutants in storm water. The SWMP has been developed primarily through efforts of the Public Works Department in collaboration with other City departments. The City of Grass Valley was identified by the California State Water Resources Control Board (SWRCB) as a municipality that would be subject to the *General Permit for Discharges of Storm Water From Small Municipal Separate Storm Sewer Systems* (referred to as “Small MS4 General Permit” where MS4 stands for Municipal Separate Storm Sewer System) because 1) it discharges storm water to sensitive water bodies (Yuba and Bear Rivers) listed as impaired, and 2) the area’s population density is greater than 1,000 residents per square mile (in fact, there are more than 2,600 residents per square mile). To comply with the permit, the City must implement best management practices (BMPs) that reduce pollutants in storm water to the “maximum extent practicable” (MEP). MEP is the technology-based standard established by Congress in CWA §402(p)(3)(B)(iii). Technology based standards establish the level of pollutant reductions that dischargers must achieve. MEP is generally a result of emphasizing pollution prevention and source control BMPs as the first lines of defense in combination with treatment methods serving as additional lines of defense, where appropriate.

Consistent with USEPA guidance, the Small MS4 General Permit requires the City to develop and implement six “minimum control measures” (referred to as “program elements” for the SWMP). These six program elements are: 1) Public Education and Outreach, 2) Public Involvement and Participation, 3)Illicit Discharge, 4) Construction Activities, 5) New Development and Redevelopment, and 6)Municipal Operations. In addition, the City may choose to include other program elements applicable to the community environment. In choosing control measures and their associated BMPs for these program elements, the City considers technical feasibility, effectiveness, cost, and public acceptance (City of Grass Valley, 2003).

City of Grass Valley Community Design Guidelines

In February 2002, the City adopted Community Design Guidelines, which include erosion control design criteria (City of Grass Valley Community Design Guidelines, 2002). The guidelines are a summary list of erosion and sediment control guidelines taken by permission from the Nevada County Resource Conservation District and incorporated by reference in the Grass Valley Design Review Manual. These guidelines include general erosion control guidelines, temporary erosion control guidelines, and permanent erosion control guidelines.

4.8.3 Impacts Discussion

Methods

This section considers the potential impacts of the proposed project associated with hydrology, groundwater, and water quality. Developing the environmental setting and determining the level of significance of the impacts discussed below required review of available hydrology and water quality studies and direct technical input from the geochemists and hydrologists at William Walker and Associates. The 1995 IMMC Dewatering and Exploration EIR provided essential setting information for regional hydrology and was a very important source to analyze potential impacts associated with groundwater impacts, especially those related to dewatering domestic wells. The 1995 EIR provided the background, analytical methodology, conclusions and mitigation measures necessary to address whether the project would adversely impact domestic wells of residents within the study area. Professional Geologist Thomas Knoch of GeoSolutions assisted in the groundwater analysis because of his experience in regional groundwater issues and prior experience at the mine.

Surface water data provided through IMMC and the analysis of deep water samples from the Brunswick shaft, collected in 1991 and 2006, were reviewed in an effort to determine the need for additional data and the interconnection between mine water and its effect on Wolf Creek system once dewatering begins. William Walker and Associates provided a Technical Memorandum which detailed issues related to mine dewatering from a geochemical standpoint and provided recommendations for future study of surface flow in the Wolf Creek system. Walker's contribution also provided necessary data to address outstanding issues related to flooding impacts resulting from dewatering discharge.

Surface water quality data collected through the Wolf Creek Community Alliance provides a means to compare and verify other data. Other data sources included deep rock core data provided by IMMC, which was used to determine the degree of fracturing in the bedrock and to verify the presence of fracture flow hydrogeology. Combined, the data and information used for this section enabled the analysts to determine the degree of significance of surface water and groundwater impacts and the need for additional data sources and study.

Results

The general issue areas are outlined in the checklist table at the beginning of this chapter. Various issues identified in the checklist are considered to have no impact to the proposed project and are discussed briefly below.

The proposed project would not place housing or structures within a previously mapped 100-year flood hazard area or place structures in a flood hazard area resulting in impeded or redirected flood flows.

The proposed project does not include construction of buildings intended for private or public housing. The proposed site developments are located outside of the floodplain setback for Wolf Creek. The commercial/industrial structures proposed under the project would be placed outside the 100-year flood hazard zone of Wolf Creek and South Fork Wolf Creek. In the event of a 100-year flood, the proposed project sites would not be affected, nor would the proposed placement of the buildings result in upstream flooding (impede flows) or downstream flooding (redirected flows).

The proposed project would not expose people to hazards associated with inundation by seiches, tsunamis or mudflows.

The manmade bodies of water (detention basins and settling ponds) proposed as part of the project would not have adequate surface area to generate a seiche. The level of seismic shaking expected for this area would not be strong enough to generate wave motion. Tsunamis form in the open ocean and would therefore not be a concern for the project. The relatively thin soil mantle overlying bedrock is not conducive to causing damaging mudslides.

Impacts

Impact 4.8-1: Proposed project construction and/or long term operation may violate water quality standards or waste discharge requirements or could substantially degrade water quality within Wolf Creek and South Fork Wolf Creek. This would be a less than significant impact.

Water quality could temporarily be affected during project construction or over the long term by the discharge of mine water into Wolf Creek and South Fork Wolf Creek or from contaminants washed from the site into the creeks. Grading and preparation of the Idaho-Maryland site and the New Brunswick site could result in areas of exposed soil that are susceptible to wind and water erosion. Construction activity and erosion of exposed soil could increase the amount of sediments that enter the receiving water of Wolf Creek and South Fork Wolf Creek. This potential impact would be reduced by complying with existing regulatory requirements. The RWQCB would require notification from the applicant upon start of construction and the applicant would be required to prepare a SWPPP to address potential water quality issues during construction. The SWPPP would outlines various procedures to reduce sedimentation and would list Best Management Practices (BMPs) which would be required to control runoff, and keep sediment, construction debris and petroleum-based fuels from entering the surface water from the construction site. BMPs could include silt fences, vegetated swales, source control, and temporary protection of exposed soil. To prevent increased erosion during construction and operation, the proposed project requires all roads, structures, and buildings to have drains or ditches to capture and redirect surface water to a storm water detention pond. Existing vegetation would be retained wherever possible to reduce erosion of surface soil. Areas disturbed by construction would be revegetated, as practicable (MACTEC, 2005).

During construction and operation at the Idaho-Maryland site, surface water draining from the east and west adjacent properties would be collected in two collection ditches (MACTEC, 2005). The east ditch would discharge via a diffuser into Wolf Creek[6]. Water collected in the west ditch would be combined with the discharge water from the storm water settling pond and be dissipated through a second diffuser into Wolf Creek. Considering that there are existing regulatory controls to manage temporary water quality issues during construction in addition to the projects proposed management of surface water through stormwater detention, this impact is less than significant.

Under the proposed project, water extracted from the mine would be discharged to Wolf Creek and South Fork Wolf Creek. Recent samples and analysis of water collected from the New

6 The proposed water diffuser consists of two perforated pipes set in the bottom of the creek and covered with river rock. The diffuser spreads the water across the width of the creek thereby reducing the potential erosion caused by concentrated discharge flows.

Brunswick mine shaft indicate that the water quality is consistent with depth and relatively free of heavy metals, volatile organic compounds, and pesticides. Once extracted, the project proposes to treat the water prior to discharge to the creeks. At the Idaho-Maryland site, mine water removed from the decline and local underground workings would be contained in a mine water settling pond and treated before being redirected to the storm water detention pond. When the contaminant concentrations reach water quality criteria set forth by the CTR, it would be discharged into Wolf Creek via a diffuser. The mine dewatering at the New Brunswick would be handled by a similar water treatment system and discharged to the South Fork Wolf Creek through a streambed diffuser. The project would be required to obtain a NPDES permit from the RWQCB. Given that the mine water does not contain contaminants capable of adversely impacting the creeks and that the applicant proposes to treat the water prior to discharge under a NPDES discharge permit, water quality impacts associated with dewatering is considered less than significant.

Impact 4.8-2: Mine dewatering activities proposed under the project could reduce groundwater levels or entirely dewater certain high risk domestic groundwater supply wells in the vicinity of the Idaho-Maryland mine site. This would be a potentially significant impact.

The analysis completed for the 1995 EIR determined that if the mine was dewatered, the unique geologic and groundwater conditions underlying the Idaho-Maryland Mine could result in the partial or complete dewatering of local, domestic groundwater wells. Groundwater in the project area is contained in and flows through fractures in bedrock and because of this fracture flow regime, the groundwater flow and quantity varies considerably with location and can not be predicted with certainty. Furthermore, the hydraulic separation between the deeper groundwater and the shallow groundwater supplying the domestic wells can not be assumed. In 1994-1995, the hydrogeologic system was analyzed assuming that distances between all known mine workings and domestic water wells in the immediate area would remain constant or static. This assumption was important because subsurface conditions being anisotropic and heterogeneous could not yield a hydrogeologic assessment to determine whether mine dewatering would affect domestic water wells. In an anisotropic and heterogeneous hydrogeologic system, trends in data are not tightly constrained. Therefore, data representing subsurface conditions cannot generate normal distribution(s) with certainty(s) on classical probability(s) (GeoSolutions, 2005).

The 1995 EIR realized that results of a groundwater study alone could not provide the certainty needed to thoroughly analyze this potential groundwater impact. Analysts therefore developed mitigation which included monitoring the groundwater response during dewatering. They devised a schedule that could provide the affected high risk residents an alternative water source in the event that the groundwater levels in their wells began to decline after dewatering was underway. The alternative water source would be supplied by the Nevada Irrigation District (NID) via a trunk line. The mitigation was designed so that the need for trunk line design and construction and individual residential hook ups to the trunk line depended on the risk level and/or results of periodic groundwater level monitoring.

The 1995 study analyzed groundwater/bedrock parameters and considered the distance and the spatial orientation of the groundwater wells to the underlying mine workings. That analysis identified potential impacts of mine dewatering at 64 local domestic wells and divided those wells into three groups:

- **Westerly group** consisting of 28 wells; 20 of which were situated on the southerly facing hillside along the northerly side of South Fork Wolf Creek. Eight wells were located outside of this cluster (four within the creek channel and four on hilltops and ridgelines).
- **Southeasterly group** consisting of 13 wells located atop a knob that appeared to be the result of headwater erosion by South Fork Wolf Creek. All wells were located in the Creek's watershed and west of its channel where stream flows were intermittent.
- **Easterly group** consisting of 23 wells in the easterly part of the study area where higher land elevations occur. Many wells are near and below an open unlined NID irrigation ditch that directs water through this area from a northeasterly source. Twenty of the wells are located within the watershed of South Fork Wolf Creek and easterly to its channel where stream flows are intermittent. The remaining three wells were located easterly and outside of the Creek's watershed.

Based on the analysis, the 1995 EIR identified the following conclusions for partial or complete dewatering of the wells:

- 11 wells were **high risk** meaning partial or complete dewatering is probable and complete dewatering is highly probable
- 1 well was **moderate risk** meaning partial dewatering is probable and complete dewatering is possible
- 30 wells were **low risk** meaning partial dewatering is improbable and complete dewatering is highly improbable
- 22 wells were **very low** risk meaning partial and complete dewatering is highly improbable.

Given that the proposed project would dewater the Idaho-Maryland Mine under similar conditions as analyzed in the 1995 EIR, the possibility that mine dewatering could affect local domestic groundwater supply wells is considered a potentially significant impact

Future Study

Any future assessment should be a continuum of the previous assessment utilizing the same type of statistical analyses assessing conditional probabilities with use of the multiplication rule based on near exact distances between wells and closest mine working(s). This assessment would be needed to update the presence and location of domestic water wells and evaluate the potential risk of dewatering those wells as a result of mine dewatering activities. Future mine operations will not be static; instead they will be dynamic as new underground workings are developed. At this time, the exact locations of future workings are unknown by the MEA team. If locations of workings remain an unknown, then distances between all workings and all wells will not be available and the hydrogeologic assessment will become mathematically indeterminate (Geo Solutions, 2005).

It should be noted that the future analyses of groundwater and the potential effects from mining would benefit from the domestic water well data gathered under the IMMC Well Monitoring Program. IMMC sponsors and maintains the Well Monitoring Program in an effort to gather baseline groundwater elevation data of the private well users in the area. Since 1995, many of the private wells in the area have entered the program. Unlike the 1995 study, future groundwater study would have the advantage of over 10 years of baseline groundwater elevation data, which would be a useful tool in distinguishing expected seasonal groundwater level fluctuation from water level reductions caused by gradual mine dewatering.

Impact 4.8-3: The proposed project would alter the topography of the Idaho-Maryland site and to a lesser extent, the New Brunswick and Round Hole sites. Although site alteration would occur with construction and development, the site improvements would improve drainage and reduce future erosion, sedimentation and localized flooding. This would be a less than significant impact.

The primary drainage on to the Idaho-Maryland site originates from the upgradient Milco property, located east of the site. Drainage runs onto the project site through a culvert buried within the earthen berm. The project proposes to capture this water in a north-running ditch immediately adjacent to the berm and divert it to Wolf Creek through a diffuser into the streambed. This scheme would improve the existing condition. Another north trending ditch along the west property line is proposed to capture surface flow entering the Idaho-Maryland site from the adjacent property to the west. This drainage diversion would divert the captured runoff into Wolf Creek through a similar second diffuser. Drainage ditches would redirect natural drainages around the new buildings and structures and then allow the flow to resume the existing pattern and direction. Currently the natural drainage pattern on the property flows north into Wolf Creek. The new drainage would be directed by ditches around the new structures and buildings and collected in a storm water detention pond, which would be emptied into Wolf Creek using the second diffuser. Storm water detention ponds are proposed as part of the drainage plan to reduce peak run-off levels and reduce the potential of uncontrolled, concentrated flow into Wolf Creek.

The most substantial change to existing topography would take place at the Idaho-Maryland site because it would involve the majority of new construction. Proposed topographic changes at the New Brunswick and Round Hole sites are not substantial and therefore not considered potential impacts to erosion and sedimentation. The drainage scheme provided for the Idaho-Maryland site appears adequate to accommodate the change in natural drainage. These improvements would likely reduce the amount of erosion and sedimentation occurring at the site under existing conditions. The use of stormwater detention basins to control peaks and meter flow and the diffusers designed to distribute flow would reduce the potential erosion and sedimentation that could occur due to uncontrolled discharges to Wolf Creek. Graded surfaces at design slopes would further reduce erosion by improving surface sheet flow across the site. Considering the proposed changes to manage surface water flow, this impact is less than significant.

Impact 4.8-4: The project would require the discharge of mine water into Wolf Creek (from the Idaho-Maryland site) and South Fork Wolf Creek (from the New Brunswick site). The increased flows during high flows could increase the potential for flooding downstream and the flows during dry months could increase base flows and result in increased bank erosion. This would be a potentially significant impact.

Mine water is currently discharging under the force of gravity from the Idaho-Maryland site. With project implementation, mine water would continue to be evacuated from discharge points at the Idaho-Maryland site and a new discharge would be established at the New Brunswick site. There would be an initial phase of dewatering that would occur to reduce mine water level to a depth that facilitates the construction of the decline and exploration program. When the initial dewatering is completed, dewatering would continue throughout the life of the project. The mine dewatering program operations would be managed from the New Brunswick site. At the Idaho-Maryland site, mine water would be evacuated from the decline as it is constructed and maintained. At that site, mine water flowing from the decline and local underground workings would be contained in a mine water-settling pond and then treated at an on-site water treatment plant before being redirected to the storm water detention pond. At the New Brunswick site, mine water would be pumped at a rate of up to 2,700 gallons per minute (gpm) to dewater the underground workings to at least the 3,300 feet. Once the initial dewatering is completed, the dewatering rate would range between 500 gpm and 1,200 gpm, varying by season.

The discharge flows added to Wolf Creek from the Idaho-Maryland site would be controlled through detention at the Idaho-Maryland site and therefore could be effectively managed to reduce downstream flooding or bank destabilization. However, the discharge at the New Brunswick site would not be controlled through detention and may result in measurable effects downstream, especially in reaches of Wolf Creek closer to the city of Grass Valley. Private culverts downstream, for example, may not be engineered to accommodate 10-year storm flows. As such, these facilities may periodically reach capacity before the City's facilities when mine discharge water combines with natural winter flows (MACTEC, 2005). The 1995 EIR suggests that the flat cobble channel and cohesive soil conditions in the South Fork Wolf Creek reduce its potential to erode. Furthermore, the 1995 EIR states that high winter flows would cause erosion in the channel with or without the added flows from the projects dewatering discharge.

There remains some uncertainty as to the effect on the Wolf Creek/South Fork Wolf Creek system from the project's proposed discharge of mine water. Potential impacts that may be realized from increased flow to Wolf Creek and South Fork Wolf Creek could include measurable bank destabilization at certain times in a year or downstream flooding. Without acceptable data, the uncertainty surrounding the potential for an impact can not be resolved and therefore, this is considered a potentially significant impact. The mitigation measure provided in the 1995 EIR (monitor flow and cease discharge if a problem is identified) may be adequate for high flow periods but may not adequately address potential bank instability associated with increased base flow during the dry season. Additional discussion of a supplemental surface water study is provided in the Data Gaps section at the end of this chapter.

Impact 4.9-5: The structural integrity of the berm separating the Milco Property and the Idaho-Maryland site is unknown. In the event of an earthquake or a static failure within the earthen structure, water could be discharged in the pond to the Idaho-Maryland site. This would be a potentially significant impact.

The age, construction, and materials used to construct the berm are not certain. Ground motion or other non-seismic failure could cause a rupture at some location within the berm, which could possibly result in a failure and localized flooding within the Idaho-Maryland site. Floodwaters would likely do minor damage considering the proposed site drainage facilities such as drainage ditches and stormwater detention. The rupture in the berm would likely be gradual and not catastrophic allowing the drainage system time to accommodate the sudden increase in flow. Operations at the ceramics facility and elsewhere on the Idaho-Maryland site may be temporarily interrupted.

4.8.4 Data Gaps

1. If possible, the South Fork Wolf Creek and Wolf Creek flows should be updated and made available for baseline data prior to project implementation, especially the mine dewatering and discharge phase. Updated data may capture increased runoff in the creek system due to development within the vicinity of project site. If flow data from another source, (i.e. Wolf Creek Community Alliance) is not available, baseline flow monitoring should be strongly considered as part of the project. Monitoring should be implemented prior to additional discharges from the Idaho-Maryland site and prior to initiating proposed mine dewatering at the New Brunswick. (Walker and Associates, 2006). *See* **Appendix B** for Walker and Associates Technical Memorandum.

2. Erosion potential should be determined by segments within the creeks and downstream of the proposed discharge point. Typically the segments can be 500 to 1,000 feet in length. Each segment should be characterized to ensure that erosion or flooding would not be affected by addition of discharge water to the Creek (Walker and Associates, 2006).

3. If available, baseline historic and current water quality data for both Wolf Creek and South Fork Wolf Creek would provide a baseline for future comparison after mine water begins entering the system (Walker and Associates, 2006).

4. In 2006, the shaft was re-sampled at several different depths for a comprehensive list of analytes. These data are pending and should be reviewed prior to drawing conclusions as to mine water chemistry. Based on the reviewed available data, it is recommended that:

   - The new shaft water chemistry data be reviewed and compared to the data collected in 1994. This would elucidate changes in water quality and allow for a detailed geochemical assessment of the data, including metal speciation calculations and saturation index calculations for common minerals. The data from each level can be compared to the rock type to determine the effect of wall rock on shaft water chemistry. This may help with predicting long-term water quality changes in pumping during mine operation (Walker and Associates, 2006).

   - Samples of surface discharge should be collected and compared to the 1994 data. As before, rock samples should also be collected to determine sources of arsenic and metals if possible.

   - Upstream samples should be collected to assess the potential influence of mine seeps on downstream water quality.

5. It is recommended that a hydrologic assessment be performed that will show to what extent the release of mine water would increase stream flows throughout the year. Since normal winter flows have been found to approach 6 cfs, this flow should not be exceeded during dewatering. Adequate creek baseline flow data will be needed (See Data Gap Item No. 1).

6. The applicant needs to provide data regarding locations of new mine workings (at least the most shallow) before a risk assessment can be performed on all wells (formerly analyzed during the 1995 study).

   Reliable information as to the documentation of the location(s) of all wells (new and old) within ½ mile distance from any existing and proposed underground workings of the mine will be needed. To achieve control over spatial data relating old/new wells to old/new workings, it is recommended that all these locations be included into one transit survey. The applicant using old mine maps could acquire required control over existing mine workings and a new or recent surface survey could acquire control over all wells, if not already performed. New or proposed mine workings could then be added. Both systems, including all workings/all wells, could be combined using a common benchmark. The design of this combined system must achieve control over distances between all existing wells (old and new) to all underground mine workings (existing and proposed).

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