4.8. HYDROLOGY AND WATER QUALITY

4.8.1 INTRODUCTION

The Hydrology and Water Quality chapter of the EIR describes the quality and quantity of existing groundwater and surface water resources within the Centennial and Brunswick Industrial Sites, including Wolf Creek and South Fork Wolf Creek. The chapter evaluates pre- and post-development drainage patterns and stormwater flows, and the potential for proposed mining operations to deplete groundwater and affect nearby domestic wells during initial and ongoing dewatering of the mine. The chapter also describes the proposed on-site water treatment system and evaluates the adequacy of the system to ensure that treated dewatered mine water would not violate water quality standards prior to discharging to South Fork Wolf Creek. The potential for treated mine water discharge to induce on- and off-site downstream flooding is also assessed within this chapter. Information used for this chapter was primarily drawn from reports prepared for the proposed project, as follows:

- Balance Hydrologics, Inc. *Geomorphic Assessment, South Fork Wolf Creek, Near Grass Valley, California*. March 2020 (Appendix K.1).
- EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project*. February 2021 (Appendix K.2).
- Itasca Denver, Inc. *Predictions of Groundwater Inflows to the Underground Mine Workings at the Idaho-Maryland Mine*. November 2020 (Appendix K.3).
- Linkan Engineering. *Idaho Maryland Water Treatment Plant Design Report*. February 2021 (Appendix K.4).
- Nevada City Engineering, Inc. *Preliminary Drainage Analysis and Detention Basin Sizing for Centennial and Brunswick Industrial Sites*. October 2019 (Appendix K.5).
- Nevada City Engineering, Inc. *Rise Grass Valley Inc. Floodplain Management Plan for Centennial Industrial Site of the Idaho Maryland Mine Project*. January 2020 (Appendix K.6).
- West Yost. *Peer Review of Groundwater Hydrology and Water Quality Analysis and Groundwater Model Reports for the Idaho-Maryland Mine Project, Nevada County, California*. August 27, 2020 (Appendix K.7).
- ECM. *Applicant Report Peer Review, Idaho Maryland Mine: Centennial and Brunswick Sites*. August 13, 2020 (Appendix H.7).
- Itasca Denver, Inc. *Groundwater Monitoring Plan, Idaho-Maryland Mine Project*. February 2021 (Appendix K.8).
- Rise Grass Valley Inc. *Well Mitigation Plan*. February 2, 2021 (Appendix K.9).

Surface water supply availability is addressed in Chapter 4.11, Public Services and Utilities, of this EIR.

4.8.2 EXISTING ENVIRONMENTAL SETTING

The section below describes regional groundwater and surface hydrology, existing drainage patterns on the Centennial and Brunswick Industrial Sites, including peak flows, existing groundwater and surface water quality, and mapped floodplains.

Regional Hydrology

The project sites are located within two watershed areas. The Centennial Industrial Site is located in the Upper Wolf Creek watershed, which encompasses approximately 2,250 acres upstream from the western end of the Centennial Industrial Site. The Brunswick Industrial Site is located in the South Fork Wolf Creek watershed, which encompasses approximately 1,450 acres and is upstream of a culvert where the creek passes underneath part of the City of Grass Valley. Figure 4.8-1 shows an overview of the Upper Wolf Creek and South Fork Wolf Creek watersheds.

Approximately 4,500 feet west of the Idaho-Maryland Mine underground workings, both Wolf Creek and South Fork Wolf Creek flow under the City of Grass Valley within culverts. South Fork Wolf Creek merges with the main channel of Wolf Creek within these culverts. Wolf Creek is tributary to the Bear River. On the downstream side of the City of Grass Valley, outflows from the City of Grass Valley wastewater treatment plant, and from the Northstar Mine water treatment system, flow into Wolf Creek. Both of these discharges occur under permits from the Regional Water Quality Control Board (RWQCB).

The average water-year rainfall from the Western Region Climate Center at Grass Valley 2 station from 1967-2017 is 52.81 inches. A water year is not a calendar year and begins on October 1 and extends to September 30 of the next calendar year. The maximum water year rainfall was 95.93 inches in 2017, while the minimum water year rainfall was 18.48 inches in 1977.

Much of the flow within Wolf Creek is due to releases of water by Nevada Irrigation District (NID) from the Deer Creek South (DS) Canal at the DS Canal Wolf Creek Release, located near the southwest end of Success Cross Road (NID, 2013). The NID Phase II Raw Water Master Plan (RWMP; NID, 2013) indicates that the average annual release of water from the DS Canal into Wolf Creek in 2007 was about 35 cubic feet per second (cfs) and is projected to increase to over 50 cfs by 2032. The DS Canal becomes the DS Canal Extension downstream of the Wolf Creek Release. NID reports that there is no consistent flow of water maintained within the DS Canal Extension (NID, 2013), so almost all of the flow from the DS Canal is discharged to Wolf Creek at the release location. The water from the DS Canal is NID "Upper Division" water sourced from higher elevations of the Deer Creek watershed above Scotts Flat Reservoir (NID, 2013). Water released by NID to Wolf Creek is eventually diverted to the Tarr Canal downstream of the City of Grass Valley.

In 2018, the releases to Wolf Creek averaged approximately 36 cfs. On April 17, 2019, EMKO measured the flow in Wolf Creek at the Centennial Drive bridge (at the intersection with Idaho-Maryland Road) at approximately 50 cfs. On that date, NID reports that the flow at DC 146 was 19.36 cfs. Thus, at the time of the measurements, almost 40 percent of the flow in Wolf Creek at Centennial Drive was due to NID releases from the DS Canal and the rest was due to natural runoff and groundwater discharge.

Although NID does not maintain flows within the DS Canal Extension, water is occasionally diverted through that canal section for maintenance purposes. According to NID, water used to flush a segment of the DS Extension in 2018 was released through the DS Canal Extension Spill II into a natural creek that flows under Brunswick Road and East Bennett Road before entering South Fork Wolf Creek.[1]

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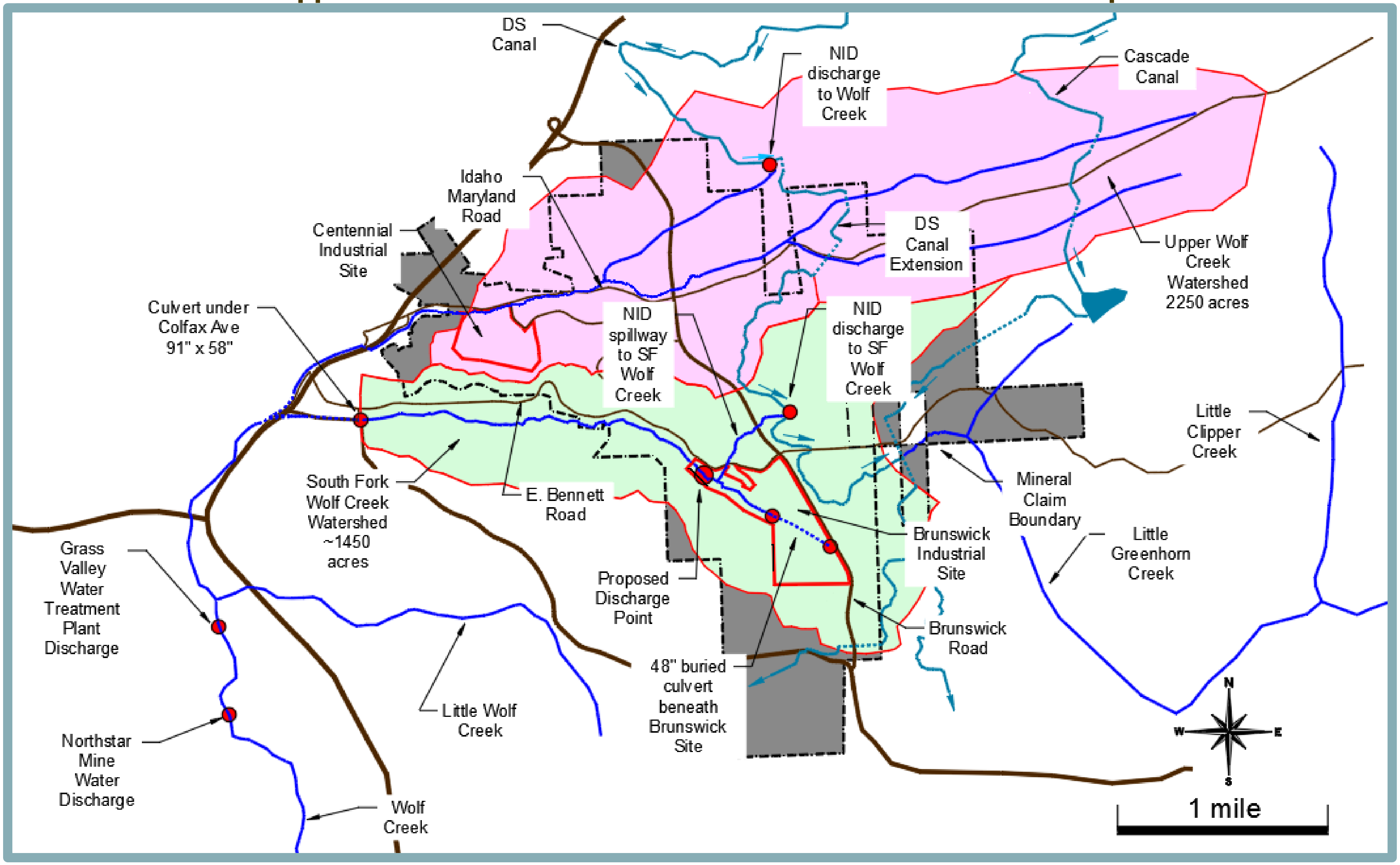
1 EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project* [pg. 16]. February 2021.

Figure 4.8-1
Upper Wolf Creek and South Fork Wolf Creek Watershed Map



Data provided by NID indicates that in 2018, NID made the following releases of water to South Fork Wolf Creek through the DS Canal Extension:

- March 6 to 10, 2018 – 8.78 cfs to 10.63 cfs;
- March 26 to April 4, 2018 – 6.15 cfs to 8.17 cfs; and
- April 24 to May 4, 2018 – 3.58 cfs to 13.64 cfs.

Peak flow rates for a 10-year, 24-hour storm event and a 100-year, 24-hour storm event have been reported by Cranmer Engineering, Inc. (Cranmer, 1986) as part of the development of the Storm Drainage Master Plan for the City of Grass Valley. For South Fork Wolf Creek at Hennessy School (i.e., the 2.75 square mile area of the watershed upstream of State Route [SR] 49), Cranmer (1986) calculated peak flow rates of 658 cfs for the 10-year, 24-hour storm, and 1,087 cfs for the 100-year, 24-hour storm. Thus, peak flow rates during significant storm events may be as much as two to three orders of magnitude (100 times to 1,000 times) greater than the base flow in, or the NID discharges to, South Fork Wolf Creek.

On April 17, 2019, EMKO measured the flow in South Fork Wolf Creek upstream of the natural creek discussed above at approximately 3.7 cfs, and downstream of the natural creek discussed above at approximately 6.5 cfs. Thus, the flow from the natural creek was approximately 2.8 cfs at that time. The DS Canal Extension was dry on April 17, 2019, so the flow in South Fork Wolf Creek consisted entirely of natural runoff and groundwater discharge.

On August 8, 2019, EMKO again measured the flow in South Fork Wolf Creek downstream of the natural creek. The flow on that date was less than one cfs. There was no flow in the natural creek at that time. Due to the lack of any measurable rainfall during the summer in the region, the flow in South Fork Wolf Creek at the time of the August 8, 2019 measurement is anticipated to consist entirely of groundwater discharge.

Additional evaluation of runoff from the South Fork Wolf Creek watershed has been conducted for the project by Balance Hydrologics, Inc. (Balance, 2020). In September 2019, Balance (2020) measured the flows just downstream of the natural creek described above and at Ophir Street, where the creek enters a box culvert, at 0.17 cfs and 0.40 cfs, respectively. In January 2020, Balance (2020) measured the flows at the same two locations at 1.5 cfs and 2.5 cfs, respectively. Balance (2021) installed a gaging station on the South Fork of Wolf Creek on Rise property on January 24, 2020. Measurements were recorded at 15-minute intervals to determine instantaneous flow and daily peak, average, and minimum flows. In addition, manual measurements were made 19 times between January 24, 2020 and January 20, 2021 to verify the readings from the gaging station. Based on the stream gaging data and manual measurements made in 2019 to January 2021, base flows range from 0.07 cfs in the summer to 6.5 cfs in the winter. Peak flow during the monitoring period occurred on April 5, 2020 at 33.4 cfs in response to a two-day rainfall event totaling approximately 10 inches.

Project Area Drainage

Nevada City Engineering, Inc. (2019) has conducted an evaluation of the runoff from the Brunswick and Centennial Industrial Sites using the unit-hydrograph method for estimating peak runoff and volumes, consistent with the Nevada County Land Use and Development Codes (LUDC), Chapter XVII Road Standards. The Brunswick Industrial Site storm drain systems are designed to capture flows from newly developed portions of the site and includes two catchment areas with a combined area of approximately 124 acres (see subareas B-1 & B-2 in Figure 4.8-

2). The peak flow rate, in cfs, from the combined catchment areas was evaluated by Nevada City Engineering, Inc. (2019) for storms with recurrence intervals of two years, 10 years, 25 years, and 100 years. The results of the unit-hydrograph evaluation for the point where the combined runoff from the two catchment areas discharge to South Fork Wolf Creek are provided in Table 4.8-1.

Table 4.8-1
Existing Peak Flows from Industrial Site Areas

Brunswick Industrial Site Storm Water Flows to South Fork Wolf Creek	
Return Period (years)	**Existing Peak Runoff (cfs)**
2	79
10	140
25	195
100	227
Centennial Industrial Site Storm Water Flows to South Fork Wolf Creek	
Return Period (years)	**Existing Peak Runoff (cfs)**
10	72
100	121

The peak runoff from the two catchments that include the Brunswick Industrial Site under existing conditions ranges from approximately 80 cfs for a two-year, 24-hour storm, up to almost 230 cfs for a 100-year, 24-hour storm (Nevada City Engineering, Inc., 2020).

The Centennial Industrial Site storm drain systems are designed to capture flows from newly developed portions of the site and has a single catchment area that encompasses approximately 70 acres (Nevada City Engineering, Inc., 2019), as shown as subarea C1 in Figure 4.8-3. The results of the unit-hydrograph evaluation from the Centennial Industrial Site to Wolf Creek for storms with recurrence intervals of 10 years and 100 years are provided in Table 4.8-1. The peak runoff from the Centennial Industrial Site under existing conditions ranges from approximately 70 cfs for a 10-year, 24-hour storm up to slightly more than 120 cfs for a 100-year, 24-hour storm (Nevada City Engineering, Inc., 2019).

The environmental baseline for the hydrology analysis of the Centennial Industrial Site is based on the existing conditions at the site and does not reflect the post-remediation condition that would exist following completion of the separate Centennial Industrial Site Clean-Up Project, as described in Section 1.3 of Chapter 1. The reason for this is the final surface topography and drainage conveyances will be subject to the California Department of Toxic Substances Control (DTSC) and County review and approval. The use of existing conditions at the Centennial Industrial Site for the hydrology analysis provides the most conservative approach for the drainage analysis for the following reasons.

The drainage calculations for existing conditions at the Centennial Industrial Site assume heavily wooded forest and understory cover as exists on the majority of the property at this time. Generally speaking, the existing Centennial land cover types generate less runoff compared to a post-remediated condition, whereon less absorption of runoff into the soil would occur. The on-site detention pond is designed and sized to reduce post-project stormwater flows exiting the site to not greater than existing values. Using this standard, the detention pond for the Centennial Industrial Site would be required to hold back a greater amount of project runoff in order to equal the existing runoff condition of wooded forest and understory cover, as compared to holding back project runoff to equal the runoff that would be generated from the post-remediation condition.

Figure 4.8-2
Brunswick Industrial Site – Predevelopment Hydrology Map

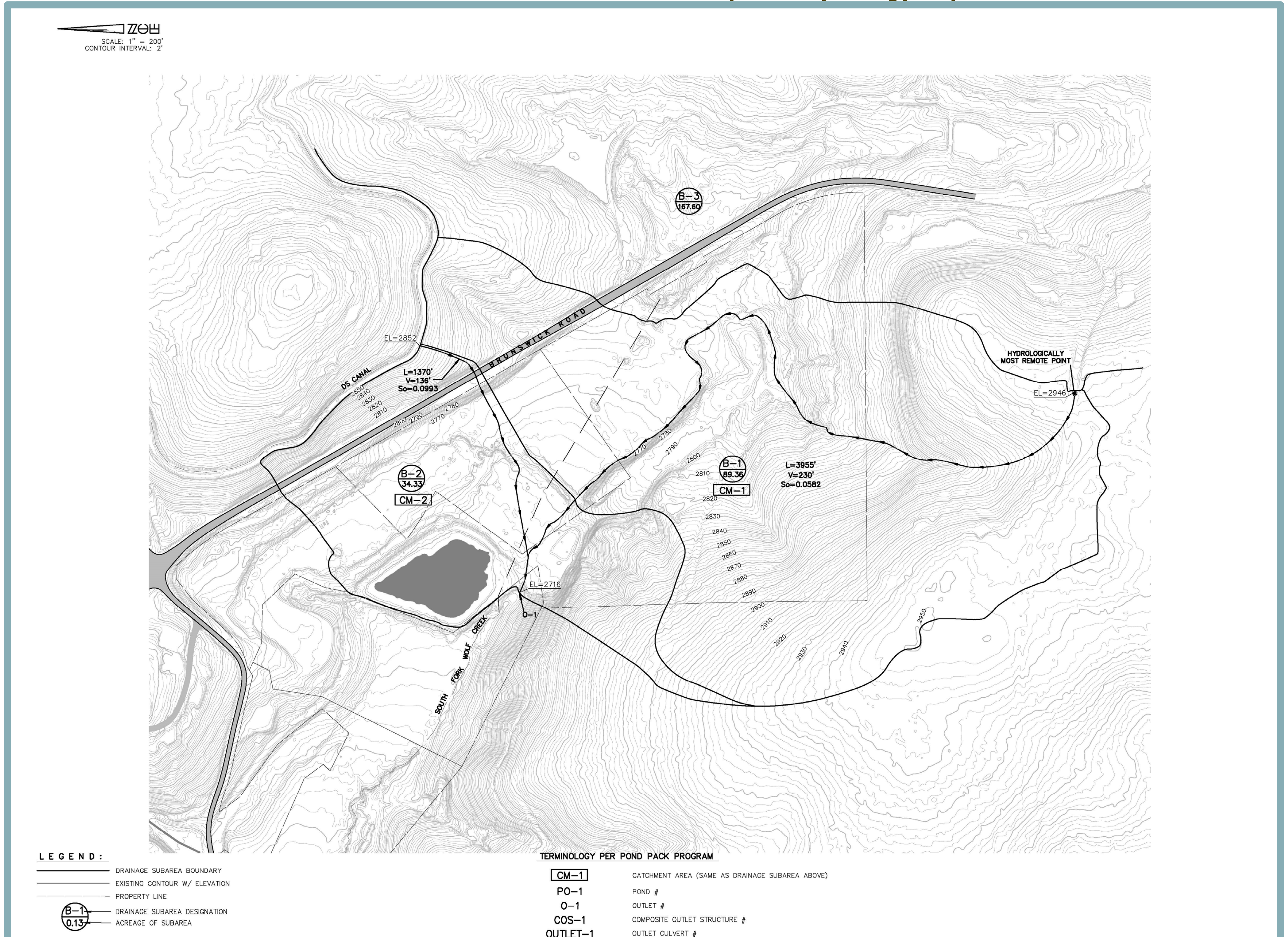
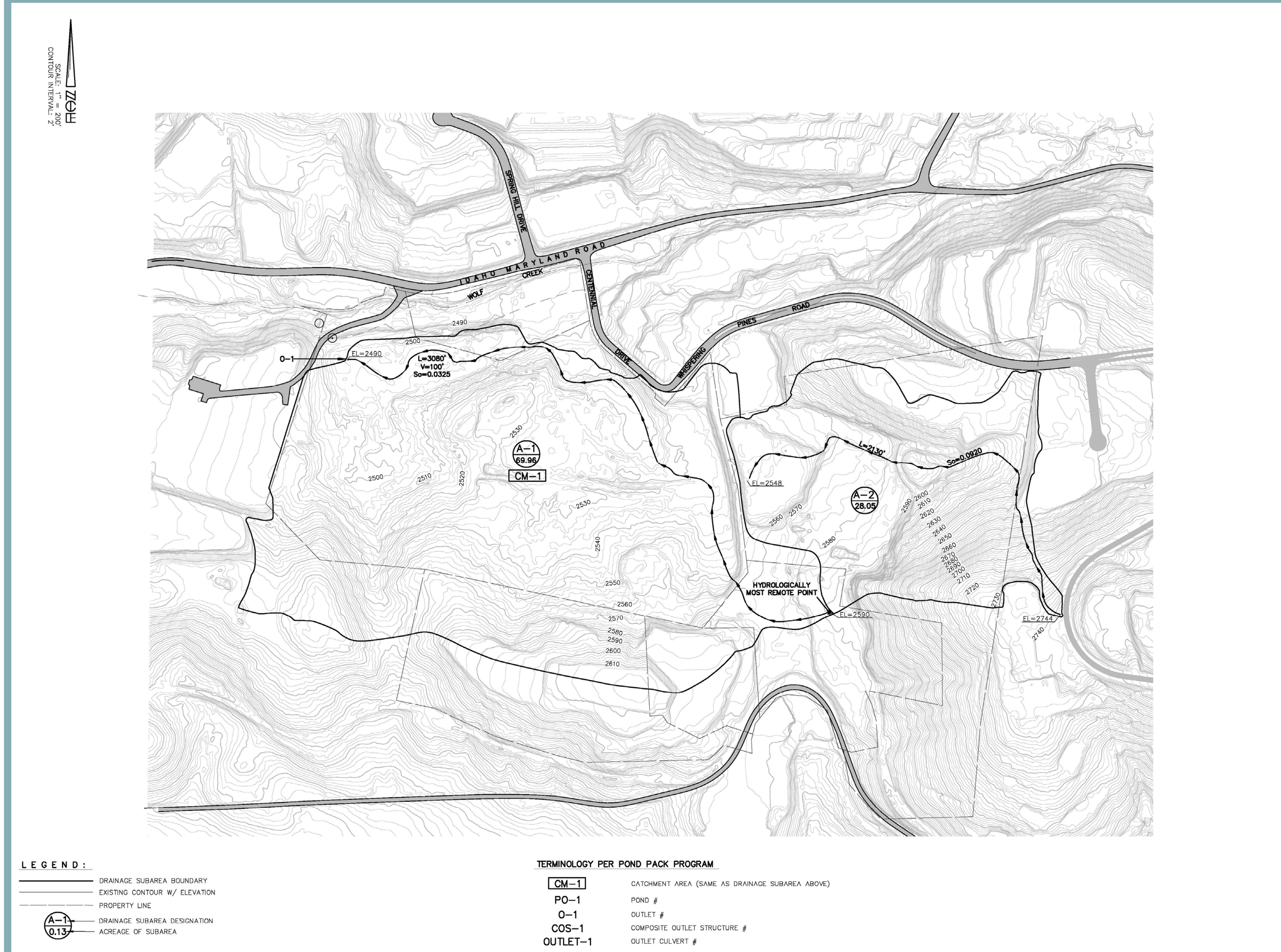


Figure 4.8-3
Centennial Industrial Site – Predevelopment Hydrology Map



Therefore, using the lower existing conditions target value will result in a larger detention requirement to reduce post-development runoff to pre-development (existing condition) levels.

Groundwater

Groundwater occurs within the near surface Quaternary and Tertiary deposits and in fractured bedrock at and near the project site. According to the California Department of Water Resources (DWR) Sustainable Groundwater Management Act (SGMA) Basin Prioritization Dashboard (DWR, 2019), there are no alluvial groundwater basins in the vicinity of the project site. The nearest groundwater basin is the South Yuba portion of the Sacramento Valley groundwater basin (DWR Basin No. 5-21.61), located more than 15 miles west of Grass Valley.

Regional Groundwater Occurrence within Fractured Bedrock

EMKO's review of driller logs in the area, identified that groundwater within the fractured bedrock occurs under both unconfined and confined conditions within the project area.[2] The groundwater surface generally mimics the topography, but with the depth to water being somewhat greater along ridges and near drainage divides and somewhat shallower at lower elevations and near drainages. Thus, groundwater tends to flow from the ridge areas down toward the main drainages, such that the surface topography of the watersheds also defines individual groundwater flow zones within the fractured bedrock aquifer system. The primary source of recharge is percolation of local rainfall, as evidenced by seasonal fluctuations in groundwater levels. The amount of recharge each year also appears to be relatively constant because almost all of the wells maintain a consistent magnitude of seasonal fluctuation from year to year and there are no long-term trends observed in most of the wells that can be correlated to variations in annual water-year rainfall.

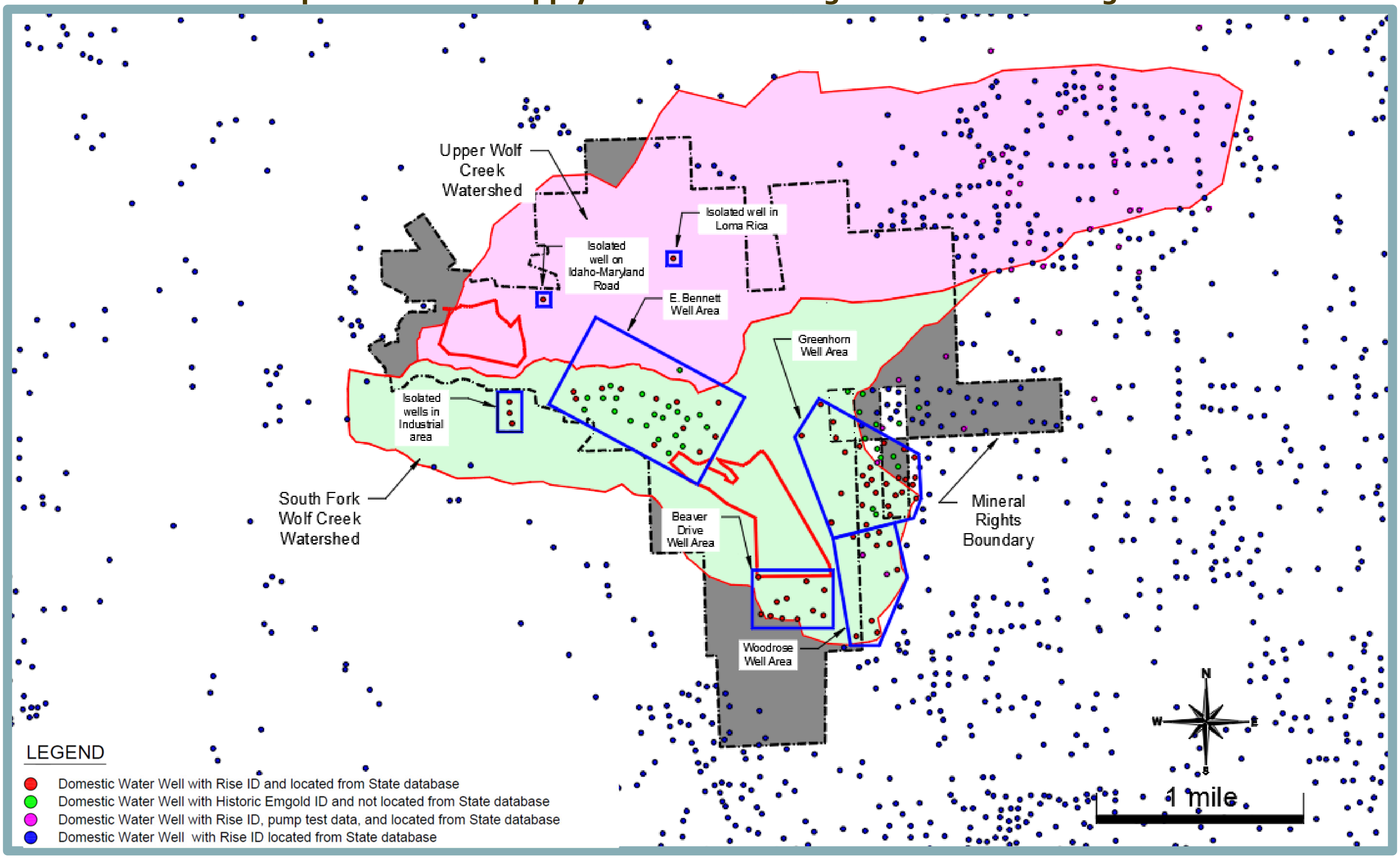
Several studies of groundwater conditions within fractured bedrock have been conducted in the area of the project. The U.S. Geological Survey (Page et al., 1984) conducted a study covering a 148-square mile area of southwestern Nevada County, including the segment of the Wolf Creek watershed from Grass Valley to the Bear River. The underlying bedrock consisted of similar rock types to those encountered at the project site, including hard, dense metavolcanic and igneous rocks of pre-Tertiary age. The study results found that the degree of fracturing in the bedrock, and thus the well yield, decreases with depth, with most of the available groundwater occurring above a depth of 215 feet below the ground surface (bgs). At depths shallower than 215 feet bgs, 70 percent of the wells evaluated produced more than five gallons per minute (gpm). However, at depths deeper than 215 feet bgs, 75 percent of the wells produced five gpm or less.

Groundwater Occurrence in Private Domestic Wells in the Project Area

As shown in Figure 4.8-4, there are relatively few domestic water wells within and to the west of the mineral rights boundary and increase in number and density east and south of the mineral rights boundary. EMKO located 38 well reports which included well draw down in pumping tests in a 1- to 2-mile vicinity of the project and compiled well report data for wells located in the project watersheds.

2 EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project* [pg. 19]. February 2021.

Figure 4.8-4
Map of Domestic Supply Wells and Underground Mine Workings



Private Domestic Well Areas

As previously discussed, groundwater within the fractured bedrock tends to flow from the ridge areas down toward the main drainages. Due to this flow pattern, the surface topography of the watersheds also tends to define the groundwater flow zones, or local fractured bedrock groundwater "basins". The private domestic wells that occur in the Wolf Creek and South Fork Wolf Creek watersheds are primarily located in four distinct areas, as shown on Figure 4.8-4 and described below.

1) East Bennett Area – A residential area located west of the Brunswick Industrial Site and adjacent to East Bennett Road. The properties in this area are currently not connected to NID's potable water supply system. The wells along East Bennett Road are primarily within the South Fork Wolf Creek watershed, although a few of them in the northeast part of this area are within the Wolf Creek watershed. This area generally overlies the main area of underground mine workings in the project vicinity. These wells are completed in the meta-andesite that forms the Brunswick Porphyrite Block. The majority of wells draw water from the fractured bedrock and the remaining wells draw water from the weathered bedrock.
2) Beaver Drive Area – A residential area south of the Brunswick Industrial Site. This small residential area is not served by NID's potable water supply system. However, the residential areas to the west and south of Beaver Drive are connected to the NID potable water supply system. Eight of the eleven wells draw water from the weathered rock aquifer. The wells in this area are located over 1,700 feet laterally southeast of the main underground mine workings. However, there is one lateral drift that extends under the northwest corner of the Beaver Drive domestic well area. This drift is at the B1300 level at an elevation of approximately 1,480 feet above mean sea level (msl) and approximately 1,380 to 1,470 feet bgs in the Beaver Drive area. Many of the wells in this area encountered the Tertiary andesite at ground surface, they all extend below this unit and are completed in the meta-andesite porphyry.
3) Greenhorn Area – A residential and agricultural area east of the Brunswick Industrial Site on the east side of Brunswick Road. This area is zoned for residential-agricultural uses (RA-3) and most properties with wells in this area are not served by the NID potable water supply system. The wells in this area are located over 1,000 feet laterally from the main underground mine workings. However, there is one lateral drift that extends into the northern part of the Greenhorn area. This drift is at the B1100 level at an elevation of approximately 1,700 feet msl and approximately 1,100 to 1,300 feet bgs east of Brunswick Road. Although some of the wells in this area encountered the Tertiary andesite at ground surface, they all extend below this unit into the underlying bedrock units.
4) Woodrose Area – A residential area east of the Brunswick Industrial Site on the east side of Brunswick Road. This area is zoned for residential-agricultural uses (RA-3) and most properties with wells in this area are not served by the NID potable water supply system. The wells in the Woodrose area are located east of Brunswick Road and near the southeastern edge of the South Fork Wolf Creek watershed. The wells in this area are located over 3,000 feet laterally from the main underground mine workings. Although some of the wells in this area encountered the Tertiary andesite at ground surface, they all extend below this unit and are typically completed in the underlying bedrock.

In addition to the four main areas listed above, additional areas or isolated wells are located inside or close to the boundaries of the mineral rights where groundwater supply wells are present, as shown on Figure 4.8-4 and described below:

1) Isolated Wells in Industrial Area – Several wells are located on industrial-zoned land south of the Centennial Industrial Site. This area is not served by NID's potable water supply system.
2) Isolated Well on Idaho-Maryland Road – One well is on industrial-zoned land east of the Centennial Industrial Site. This area is in the city limits of Grass Valley and is served with potable water.
3) Isolated Well in Loma Rica – One well is in the Loma Rica Ranch area which lies above the Mitchell Crosscut on the Idaho-1000 level. This area is within the city limits of Grass Valley but is largely vacant land.

Water Level Monitoring in Private Domestic Wells

The Idaho-Maryland Mining Corporation and its predecessors monitored water levels in up to 79 private domestic wells from 1995-2001, and again from 2003-2007, in accordance with conditions included in Use Permit U84-107 based on mitigation program requirements identified in a 1995 Environmental Impact Report (EIR). Review of the water-level hydrographs from the mitigation monitoring program indicates the following for three of the main areas listed above.

East Bennett Area

The groundwater levels generally follow the topography but are somewhat muted, with the depth to water being greater along ridges and near drainage divides and shallow at lower elevations and near drainages. The water levels in most wells follow a seasonal pattern, with annual fluctuations typically ranging from five feet to 25 feet in different wells between dry months and wet months. Within individual wells, the magnitude of the seasonal fluctuation remains consistent throughout the monitoring period. No long-term increasing or decreasing trends are observed and there are no apparent annual variations due to drought or above-normal rainfall years.

Beaver Drive Area

Less topographic influence occurs on the groundwater levels in this area, potentially because there is less variation in topography between well locations, in comparison to the East Bennett Area and the wells east of Brunswick Road. The seasonal fluctuations in the Beaver Drive area are larger than those in the other areas, ranging from 20 feet to 50 feet per year. While there are no long-term trends observed in the hydrographs, some of the wells may show annual differences due to variations in water-year rainfall totals.

Wells along the southwest drainage divide for the South Fork Wolf Creek watershed tend to have more variable and irregular data and do not exhibit the consistent seasonal variations that are observed in other wells in this area.

Greenhorn Area

Groundwater levels in the wells in the Greenhorn area east of Brunswick Road tend to vary with the topography, as in the East Bennett Area. The hydrographs show seasonal variations, with annual water level fluctuations ranging from 10 feet to 30 feet, but remaining very consistent within individual wells. No long-term trends, nor variations with changes in annual water-year rainfall are observed. Several NID canals traverse the area east of Brunswick Road. Comparison of the hydrographs for wells adjacent to canals and wells more distant from the canals does not indicate any direct influence of the canals on groundwater elevations or on seasonal fluctuations.

The primary source of recharge is percolation of local rainfall, as evidenced both by the seasonal fluctuations in the groundwater levels and by the fact that groundwater levels in the wells monitored are typically higher than the elevation of the nearest creek within the same watershed. Thus, the areas along ridges and near drainage divides, in addition to the slopes above the creeks, act as recharge areas while groundwater discharge may occur through fractures that are present at or near the elevation of the creeks. Groundwater recharge through fractures that are present at the ground surface in the higher parts of a watershed can produce the hydrostatic pressures that may be observed when those same fractures are encountered at depth in a well, creating the apparent confined aquifer conditions.

The water levels in the private domestic wells have seasonal fluctuations that may range from 10 feet to 50 feet between wet and dry times of the year but remain relatively consistent from year to year within each individual well. During the monitoring period, several years with below normal rainfall occurred (2001, 2004, and 2007), multiple years with above normal rainfall occurred (1995-1998 and 2006), and several years of near-normal rainfall occurred (1999, 2000, 2002, 2003, 2005). Despite large variations in annual rainfall from year to year, the seasonal water level cycles in individual wells remain consistent over time and the overall water levels shown on the hydrographs for each well do not fluctuate based on wet or dry climatic cycles.

Based on the lack of changes in the individual well hydrographs between wet and dry climatic cycles, the amount of recharge[3] appears to be consistent from year to year and is not affected substantially by drought or wet cycles. The consistent annual recharge may be due to the limitations of recharge in fractured bedrock, where the annual rainfall amount may be greater than the capacity of the fractures to accept additional flow. In this situation, increases or decreases in the annual rainfall due to climatic cycles does not have an appreciable effect on the amount of water that can be recharged because the capacity of the fractures to transmit water to the subsurface is already at its maximum.

Groundwater Occurrence in Mine Workings

Two separate systems of underground mine workings occur in the project site, the Union Hill Mine and the Idaho-Maryland Mine workings. Both sets of mine workings are currently flooded with water.

Fourteen shafts or tunnels connect the underground workings of the Idaho-Maryland Mine to the ground surface. Only the New Brunswick shaft is on the Brunswick Industrial Site. The majority of the historic mine workings have been covered by road pavement or structures. Only the surface connections at an elevation of 2,502 feet msl or lower discharge water to the surface, which includes the Eureka Drain, East Eureka Shaft, and the East Eureka Drain.

Mine Water Quantities

The total amount of water currently present within the Idaho-Maryland Mine underground workings is estimated at 1,183 acre-feet. The amount of water was estimated by Rise based on the calculated volumes of mine workings. Mine tunnels or drifts were assumed to be 100 percent open voids. Mine stopes were estimated to have 75 percent of their volumes backfilled. The backfill itself is assumed to have a porosity of 40 percent.

3 Previous evaluations conducted in the region (EMKO, 2011) and estimates conducted for EMKO's study of the proposed project, suggest that the rate of groundwater recharge overall in the Grass Valley area is approximately 10 to 12 inches per year, or about 20 percent of the total rainfall amount. Thus, the total recharge over the 287,000-acre NID service area is approximately 240,000 to 290,000 acre-feet per year.

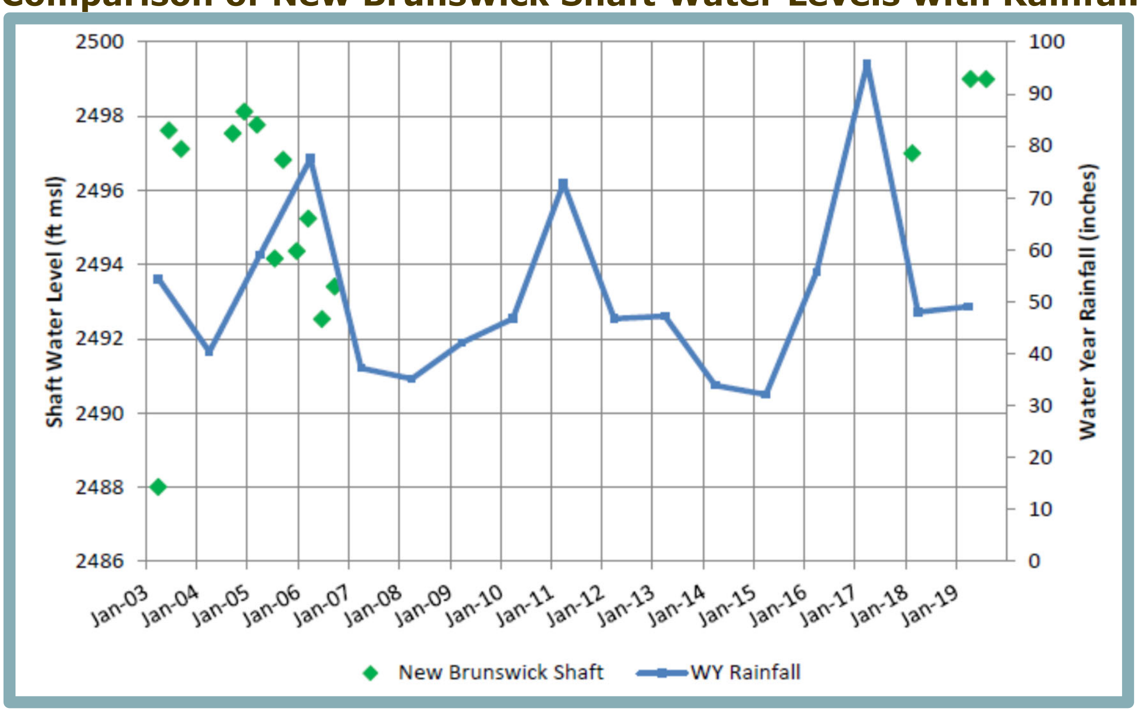
Water Levels in the New Brunswick Shaft

EMKO measured the depth to water in the New Brunswick shaft in February 2018, April 2019, and August 2019. In February 2018, the water in the shaft was 259 feet below the top of the collar (i.e., ground surface). In April 2019 and August 2019, the water in the shaft was 257 feet below the top of the collar. The collar is at an elevation of 2,756 feet msl. Thus, the water surface in the shaft was at 2,497 feet msl in February 2018 and at 2,499 feet msl in April 2019 and August 2019.

The Idaho-Maryland Mining Corporation measured water levels in the New Brunswick shaft at least 13 times between March 2003 and September 2006 (IMMC, 2007). The water level generally varied from 2,488 feet msl to 2,498 feet msl, with a median value of approximately 2,497 feet msl. Thus, over a 16-year period, the water level in the New Brunswick shaft has varied by approximately 11 feet, from 2,488 feet msl to 2,499 feet msl. These elevations are lower than the groundwater levels reported for wells along East Bennett Road, which are reported to range from 2,525 feet msl to 2,765 feet msl.

The data presented on Figure 4.8-5 demonstrate that the variations in the water level in the shaft do not occur on a seasonal basis and that there is not a consistent correlation between water levels in the shaft and rainfall. These observations from the underground mine workings contrast with those from the domestic wells, where there is a seasonal fluctuation between wet and dry parts of the year that remains consistent over many years. The differences in the magnitude and cyclicity of the water level fluctuations in the measurements from the New Brunswick Shaft versus those from the domestic wells indicate that there are not any direct connections (e.g., via fractures) between the domestic wells and any of the underground mine workings.[4]

Figure 4.8-5
Comparison of New Brunswick Shaft Water Levels with Rainfall



[4] EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project* [pg. 30]. February 2021.

Water Levels in Union Hill Mine

The Union Hill Mine is a smaller mine than the others in the project area, that closed in 1918 and has been flooded with water since that time. The Union Hill Mine is not connected to any of the other underground mine workings in the area but is in close proximity to the workings of the Brunswick Mine on the Brunswick Industrial Site. The Union Hill Mine workings are completely within the South Fork Wolf Creek Watershed.

At the Union Hill Mine, the water level has been observed to fluctuate seasonally. On April 17, 2019, EMKO observed the water level in the Union Hill shaft to be approximately 18 inches below the top of the shaft, while on August 8, 2019, it was approximately four feet below the top of the shaft. The top of the Union Hill shaft is at approximately 2,666 feet msl, so the water level in the Union Hill Mine ranges from approximately 2,665 feet msl to 2,656 feet msl. On April 17, 2019, the water level in the Union Hill shaft was 165 feet higher than the water level in the New Brunswick shaft.

The water levels in the Union Hill Mine are within the range of the water levels observed in the wells in the East Bennett area, which range from 2,525 feet msl to 2,765 feet msl. However, the water levels in the Union Hill Mine are lower than the water levels in the wells in the Beaver Drive area and in the area east of Brunswick Road, which are all greater than 2,700 feet msl.

The elevation of the bank of South Fork Wolf Creek at a location closest to the Union Hill shaft is approximately 2,658 feet msl. The bottom of the channel is a few feet below the bank. During the rainy season, the water level in the Union Hill Mine tends to be slightly higher than the elevation of South Fork Wolf Creek adjacent to the Union Hill shaft, whereas during the dry season, the water level in the Union Hill shaft may be comparable to the water level in South Fork Wolf Creek. Thus, the groundwater in the fractures that intersect the Union Hill Mine may provide flow to South Fork Wolf Creek at certain times of the year.

The Union Hill Mine workings are within 95 feet to 180 feet of workings of the Brunswick Mine at three to four different levels. During the post WWII period, the combined Idaho-Maryland Mine workings were completely dewatered. In 1956, the water level at the Union Hill Mine was reported to be within 20 feet of the top of the shaft, suggesting that the complete dewatering of the adjacent mine workings resulted in no more than 10 to 20 feet of water level decline in the Union Hill Mine.

Groundwater Flow from Drains

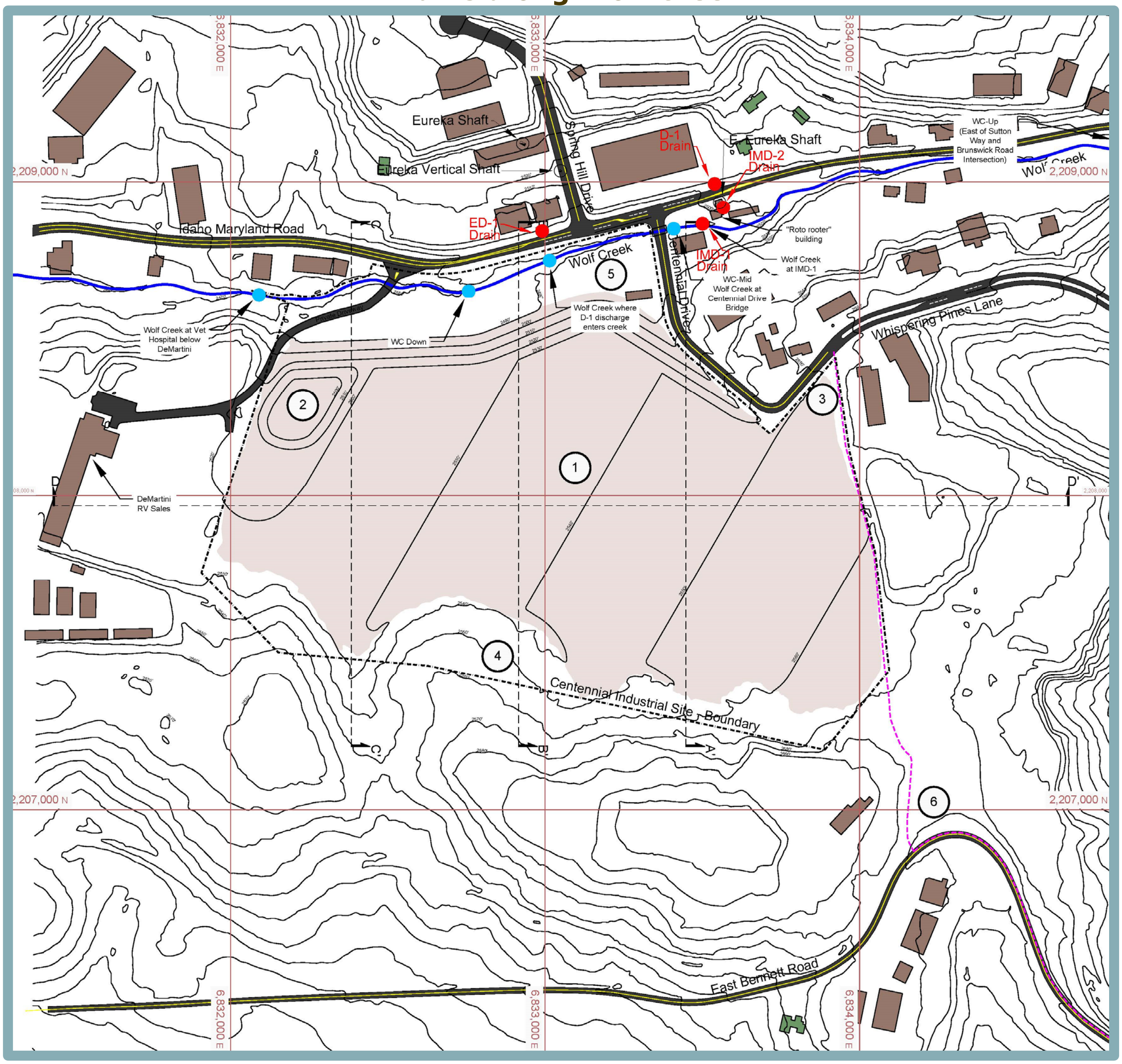
Several drains have been observed along Wolf Creek in the area of the East Eureka and Idaho shafts. In February 2018, EMKO verified that groundwater is continuing to discharge from these drains.

The drains present along Wolf Creek include (see Figure 4.8-6):

ED-1 – Eureka Drain

ED-1 is located at the northwest corner of Idaho Maryland Road and Spring Hill Road. Although the flow from this drain has been reported to be in the range of 100 gpm, field observations made by EMKO in February 2018 and December 2018 indicate that the drain was flowing at a rate of only a few gallons per minute at the time of those observations. On April 17, 2019, EMKO observed flows in the range of 20 to 25 gpm from this drain. The flow enters a culvert that passes under Idaho Maryland Road and discharges to Wolf Creek. It is assumed that this seep is occurring from the original Eureka shaft.

Figure 4.8-6
Drains along Wolf Creek



IMD-1 – East Eureka Shaft Drain

A 24-inch galvanized culvert drains water into Wolf Creek from the East Eureka shaft, which is located under the Roto-Rooter plumbing shop at 815 Idaho-Maryland Road, to the east of Centennial Drive. Todd Engineers (2007) reports the flow from this drain to be about 60 gpm. EMKO observed this drain to be flowing at a rate that was consistent with that reported by Todd Engineers (2007) on several occasions between February 2018 and December 2018. On April 17, 2019, EMKO measured the flow from this drain at approximately 100 gpm.

IMD-2 – East Eureka Shaft

A small steel pipe originates at a sump adjacent to the East Eureka shaft under the east end of the Roto-Rooter plumbing shop. EMKO observed water in the shaft at a depth of less than two feet below the top of the shaft in February 2018. Flow from this drain was minimal, in the range of 1-2 gpm, in February 2018.

D-1 – Unknown Origin

D-1 is located along the north side of Idaho Maryland Road across the street from the Roto-Rooter plumbing shop. A small box culvert allows water to discharge into the gutter from beneath the business park area up the hill from the drain. The water flows down the gutter to a drop inlet just east of Spring Hill Road, where it flows through a culvert under the road and into Wolf Creek. Field observations made in February 2018, December 2018, and April 2019 indicate that this drain flows consistently at a rate of only a few gallons per minute. Water quality data indicate that the discharge from D-1 may not be related to the underground mine workings in the area. Workings with connection to the Idaho-Maryland Mine are not noted in this area on the historic mine maps.

Bedrock Properties related to Groundwater Flow

The primary physical properties that define groundwater flow include the transmissivity and hydraulic conductivity. The transmissivity is a parameter that measures how much groundwater an aquifer may transmit for a given decrease in water level, for example when a well is pumped. The hydraulic conductivity is related to the permeability of the overall aquifer zone. The derivation of these properties primarily relates to porous media, such as sand and gravel-type aquifers, but they are often applied to fractured bedrock aquifers when there is a sufficient degree of fracturing and interconnection between fractures.

Aquifer properties are typically estimated by measuring the rate and total amount of decline in the groundwater surface elevation that occurs when a well is pumped. This decline in the groundwater surface as a result of pumping is commonly referred to as drawdown. EMKO reviewed 38 well completion reports within a 1- to 2-mile vicinity of the project, which contained information regarding the total drawdown that occurred and the pumping rate achieved during initial testing of the wells immediately after they were drilled.

A clear correlation exists between pumping rate and depth. The maximum pumping rate achieved was 125 gpm in a well with a total depth of 123 feet bgs. In contrast, at depths of 200 feet or deeper, the maximum reported pumping rate is 50 gpm. Below a depth of 300 feet, the maximum pumping rate reported was 10 gpm, and below a depth of 450 feet, the maximum pumping rate reported was only four gpm.

The information from the well completion reports can also be used to estimate the transmissivity in the fractured bedrock. As expected from the pumping rates, there is also a clear correlation between the transmissivity and depth. The two highest transmissivity values are approximately

8,780 $feet^2$/day and 6,930 $feet^2$/day, from wells that are 300 feet and 100 feet deep, respectively. The average transmissivity for wells shallower than 250 feet is 153 $feet^2$/day. Between depths of 250 feet and 400 feet, the average transmissivity is 15 $feet^2$/day. For wells between depths of 400 feet and 550 feet, the average transmissivity is 2.5 $feet^2$/day, while below a depth of 550 feet, the average transmissivity is 0.7 $feet^2$/day.

Similarly, Todd Engineers (2007) developed a relationship between the hydraulic conductivity and depth based on information from approximately 300 driller reports. Todd Engineers (2007) found that the hydraulic conductivity of the fractured bedrock penetrated by the domestic supply wells in their study area varied significantly with depth, with greater values at shallower depths where more fractures are prevalent, and with much lower values at deeper depths, where fractures may be either less common or have smaller aperture (open) widths.

The range of aquifer properties with depth in the fractured bedrock are part of the existing environmental setting, but can be used to estimate the effect of dewatering of the mine workings as part of the proposed project on groundwater levels in wells adjacent to and above the underground mine workings, as described in Section 4.8.4 of this chapter.

Historical Groundwater Inflow in Underground Mine Workings

The Idaho-Maryland Mine encompasses a system of underground tunnels, many raises, numerous winzes, four inclined shafts, and two vertical shafts. An estimated equivalent of 72.8 miles (117km) of underground tunnel occur at the Idaho-Maryland Mine, assuming typical drift dimensions of 7.5 feet x 8.5 feet.

The estimated groundwater inflow rate during the final years of the mines operation (i.e., the overall Idaho-Maryland Mine, including the Brunswick underground workings) prior to mine closure around 1955 is reported to have ranged from 500 gpm to 1,200 gpm seasonally, with an average of approximately 850 gpm.[5]

Several records exist of past dewatering from the Idaho-Maryland portion of the mine complex and from the Brunswick Mine. In the early part of the 1900s, mine workings at the Idaho-Maryland Mine extended to a depth of approximately 1,900 feet and were not connected to the Brunswick Mine. Maintenance dewatering is reported to have ranged from approximately 250 gpm for 10 months of the year to approximately 500 gpm for the remaining two months of the year, for an annual average pumping rate of approximately 300 gpm (Mine and Mineral Resources of Nevada County, California, 1918).

The mine was subsequently allowed to flood and again dewatered in 1919-1920. At this time the initial dewatering of the upper 1,000 feet of the mine occurred from September 24, 1919 to March 31, 1920, a period of approximately 190 days, where 89,500,000 gallons of water were handled at a dewatering rate averaging approximately 330 gpm over the period. (IMMC, 1920).

Initial dewatering of the Brunswick mine in 1933, before it was connected to the Idaho-Maryland mine, to a depth of approximately 950 feet bgs occurred at a rate of between 720-800 gpm over approximately 90 days (Clark, 2005).

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5 EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project* [pg. 36]. February 2021.

Conceptualization of Current Groundwater Movement

The existing geology, surface water, and groundwater conditions described above were used by EMKO to develop a conceptual model of groundwater movement in the fractured bedrock and existing underground mine workings. The conceptual model encompasses the environmental setting and provides a framework for evaluation of potential project effects with respect to hydrology and water quality, the latter of which is included in Section 4.8.4, Impacts and Mitigation Measures, of this chapter.

Groundwater Flow in Fractured Bedrock

The groundwater surface elevation in the three areas of private domestic wells in the Wolf Creek and South Fork Wolf Creek watersheds is consistently above the elevation of the creeks within the watersheds.

EMKO estimated the baseline, or existing, groundwater volumes that may flow through the fractured bedrock toward the creeks. Based on parameters evaluated by EMKO (refer to Section 3.5.1 of Appendix K.2 to this Draft EIR), the average discharge of groundwater to South Fork Wolf Creek from the three areas of domestic supply wells is approximately 1,000,000 gallons per day (gpd), or about 1.5 cfs. Using a groundwater recharge average rate of 10 to 12 inches per year in the project area, over the 1,500-acre South Fork Creek Watershed, the net groundwater recharge may be equivalent to an average annual rate of about 1.50 cfs to 1.75 cfs, which is within the range of the rate of groundwater discharge to South Fork Wolf Creek, as described above. Because the rate of groundwater discharge, and the rate of groundwater recharge, are generally within the same range, the groundwater in storage within the bedrock fractures is in balance and there should be no long-term trends of increasing or decreasing groundwater levels, outside of normal seasonal fluctuations.

The total outflow of groundwater to Wolf Creek from the project area under existing conditions is estimated by EMKO to be approximately 192,500 gpd, or about 0.3 cfs. The area that discharges to Wolf Creek parallel to and north of East Bennett Drive, overlying much of the existing underground mine workings, is about 225 acres, so that annual average groundwater recharge for this area is in the range of 185- to 225-acre feet per year. This volume of groundwater recharge is equivalent to an average annual rate of about 0.3 cfs, which is consistent with the rate of groundwater discharge to Wolf Creek within the project area. Thus, the rates of groundwater discharge and groundwater recharge are in balance in the part of the Wolf Creek watershed that includes the project area, consistent with the trends observed in the domestic supply wells.

While the rate of groundwater discharge to the creeks may remain relatively constant from year to year, the proportion of groundwater within the creeks will vary seasonally, depending on the amount of local runoff and the amount of NID canal water released to the creeks.

Groundwater Movement in Mine Workings

As previously discussed, the transmissivity and hydraulic conductivity of the fractured bedrock decrease rapidly with depth. Based on EMKO's work, at least 99 percent of natural groundwater flow in the bedrock fractures occurs above a depth of 500 feet bgs in the project area.[6] However, the extensive underground mine workings provide another mechanism for groundwater to move through the project area.

6 EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project* [pg. 64]. February 2021.

The elevation of the water in the New Brunswick shaft averages 2,497 feet msl. This elevation is about 25 feet to 265 feet below the static water level in the domestic supply wells in the East Bennett area. Thus, the underground workings connected to the New Brunswick shaft must have a connection to a point that allows the workings to be drained, resulting in a lower water level in the shaft than in the wells in the surrounding bedrock.

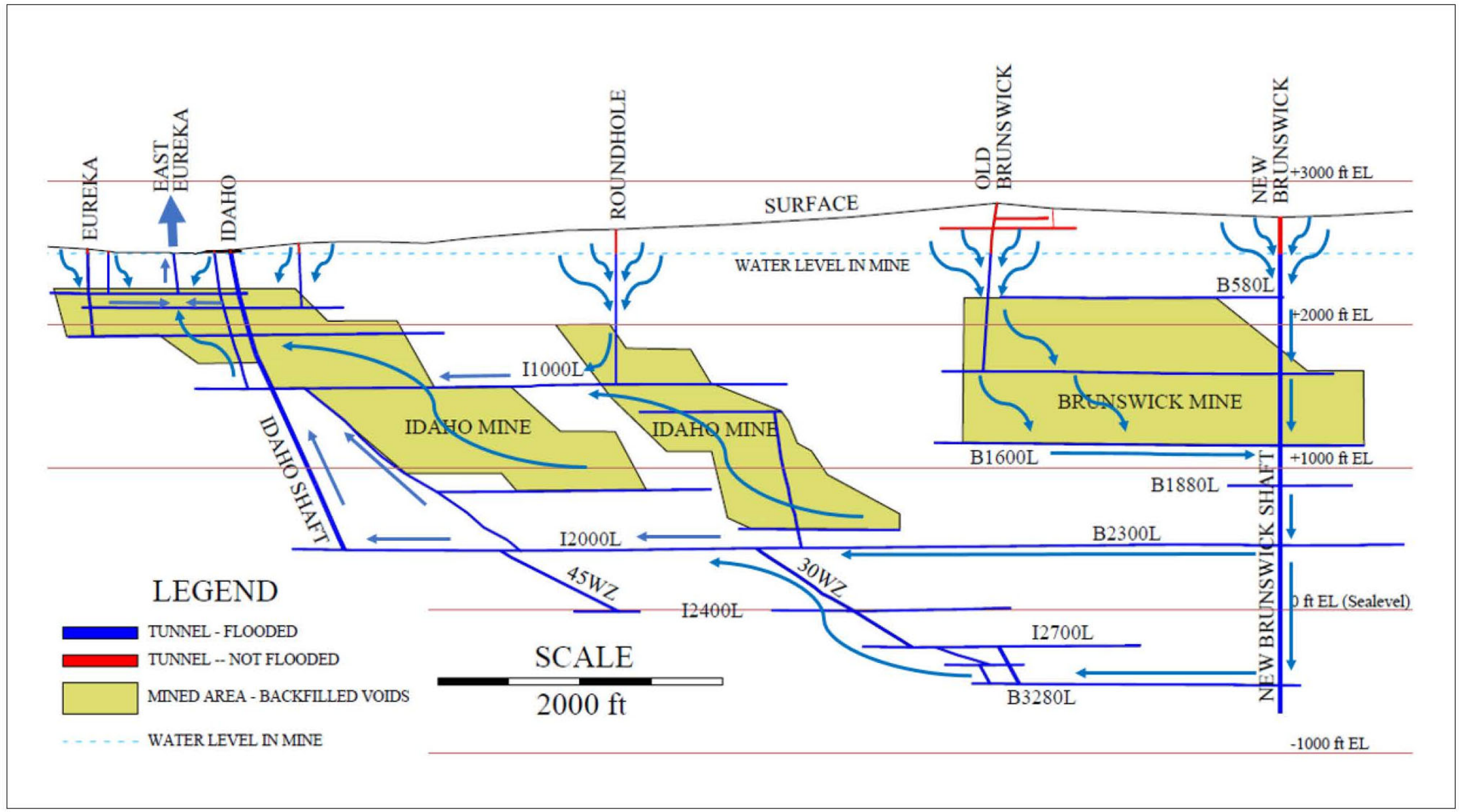
Groundwater in the Brunswick mine, as observed in the New Brunswick shaft, has a pathway to flow to the drains along Wolf Creek through tunnels in the B2300 and B3280 levels. Due to the direct hydraulic connection of relatively large open voids, the static water level in all the interconnected mine workings should be at approximately the same elevation. The elevations of the East Eureka drain (IMD-1) and Eureka drain (ED-1) range from approximately 2,497 feet msl to 2,502 feet msl, respectively. These elevations are comparable to the water levels measured by EMKO in the New Brunswick shaft in February 2019 and April 2019, and to the median water level for the measurements made by the Idaho-Maryland Mining Corporation from 2003 to 2006. Field observations made by EMKO in 2018 and 2019, as part of the proposed project's investigation, and descriptions by Todd Engineers (2007), indicate that the total flow from the drains may range from 60 gpm to 125 gpm (0.13 cfs to 0.28 cfs).

EMKO observed groundwater seeping into the New Brunswick shaft during sampling activities conducted in February 2018. To maintain a relatively constant water level in the underground mine workings, as reflected by the water level measurements reported from the New Brunswick shaft, the rate of water seepage into the shafts must be comparable to the rate that water is flowing from the drains. Otherwise, the water level in the shaft would increase or decrease over time, depending on whether the rate of inflow was greater than or less than the rate of discharge from the drains.

Several vertical shafts are part of the interconnected Eureka-Idaho-Maryland-Brunswick underground workings, as depicted on Figure 4.8-7. Todd Engineers (2007) has estimated that groundwater is seeping into each of the shafts at an average rate of approximately 20 gpm each. Observations made by EMKO in 2018 are consistent with this estimated rate of inflow for the New Brunswick shaft. If groundwater seepage is occurring from three or four shafts, as depicted on Figure 4.8-7, then the total rate of seepage into the shafts is in the same range as the outflow from the drains. Thus, groundwater that is seeping into the shafts above the water surface in the underground workings most likely migrates through the mine workings and eventually discharges at the drains along Wolf Creek.

Because the water level in the shafts appears to be consistently below the static groundwater levels in the wells in the East Bennett area, groundwater will continually seep into the shafts. As a result, the shafts act as "wells" that constantly draw groundwater from the surrounding shallow bedrock (i.e., above a depth of 500 feet, where the transmissivity is highest). The inflow of water into the shafts should create a local depression in the groundwater table surface around the shafts, referred to as a drawdown cone, or cone of depression.

Figure 4.8-7
Groundwater Movement in Mine Workings (Existing Condition)



EMKO prepared an analytical model to simulate the drawdown that might occur around the New Brunswick shaft (or any other vertical or near-vertical shaft in the East Bennett area) due to the constant seepage into the shaft. Based on the properties of the fractured bedrock, the analytical model indicates that the current seepage into the shaft results in drawdowns of the water table of 20 feet at the shaft location, about 8 feet at a distance of 500 feet from the shaft, and about 3.5 feet at a distance of 2,000 feet from the shaft. The drawdown cones around the shafts are part of the existing environmental setting for the project.

Itasca Denver, Inc. (Itasca, 2020b) used a numerical model to evaluate the effects of mining on groundwater levels. As part of that effort, Itasca (2020b) simulated drawdown of the groundwater surface under current conditions due to seepage into the shafts and other underground workings and the related discharge to Wolf Creek through the drains. The model results indicate that there is a small drawdown cone in the area of the New Brunswick shaft and Union Hill Mine of between five and 10 feet, a broad area of drawdown greater than 10 feet overlying an area along Brunswick Road extending from near the intersection with East Bennett Road northward to Idaho Maryland Road, and a small drawdown cone in the area of the Idaho shaft near Centennial Drive and Wolf Creek (see Figure 4.8-8).

Water Quality

Groundwater

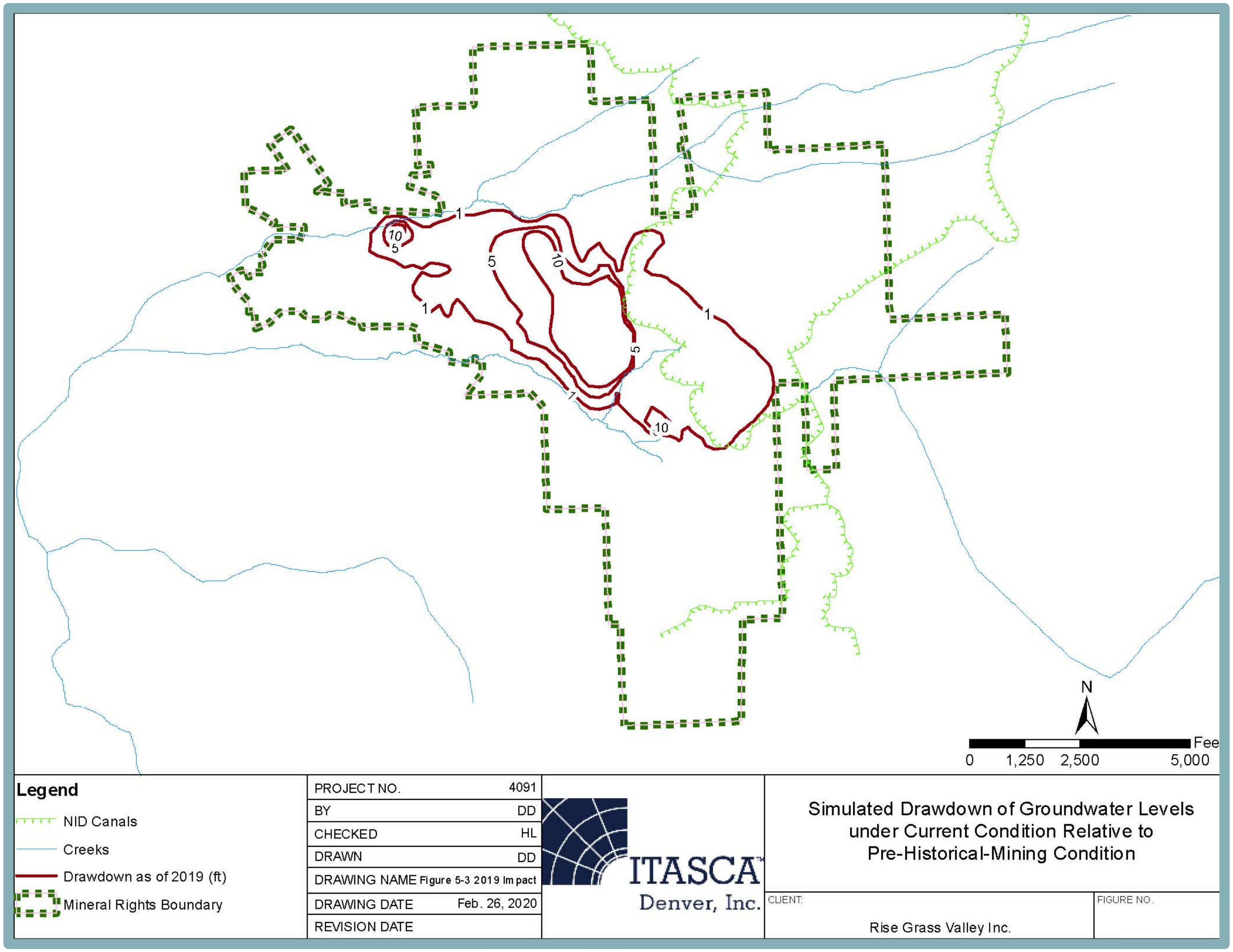
The primary constituents of interest in the water samples from the New Brunswick shaft and the drains are iron and manganese. Within the New Brunswick shaft, the iron concentration ranges from 1,400 micrograms per liter (µg/L) to 1,600 µg/L. While iron is not present in drain D-1, in the other three drains, the iron concentration ranges from 1,600 µg/L up to 4,800 µg/L. The secondary drinking water maximum contaminant level (MCL) and the National Pollutant Discharge Elimination System (NPDES) effluent limit for iron are both 300 µg/L.

Within the New Brunswick shaft, the manganese concentration ranges from 230 µg/L to 270 µg/L. Similar to iron, manganese is not present in drain D-1, while in the other three drains, the manganese concentration ranges from 200 µg/L up to 310 µg/L. The MCL and the NPDES effluent limit for manganese are both 50 µg/L.

Arsenic has been detected above its MCL and NPDES effluent limit of 10 µg/L in three of the drain samples, ranging from 37 µg/L in IMD-2 to 41 µg/L in IMD-1 to 59 µg/L in ED-1. The arsenic concentration at D-1 is 6.6 µg/L. The arsenic concentration does not exceed the MCL or NPDES effluent limit in any of the samples from the New Brunswick shaft.

The compound cis-1,2-dichloroethylene (cis-1,2-DCE) is detected in all samples from the New Brunswick shaft at concentrations ranging from 1.8 µg/L to 4.2 µg/L. This compound generally occurs as a breakdown product of the industrial solvent trichloroethylene (TCE) or the dry-cleaning solvent tetrachloroethylene (PCE). Neither of these parent compounds were detected in any of the water samples. The presence of cis-1,2-DCE in the water samples from the New Brunswick shaft could be due to two potential sources. One potential source is historic solvent use within the New Brunswick mine for equipment repair or maintenance. Any residual solvent could have broken down into cis-1,2-DCE within the reducing conditions that occur within the water in the mine. Water currently within the flooded mine workings has low dissolved oxygen levels, creating reducing conditions, as demonstrated by the reducing conditions and the dissolved oxygen levels measured in the samples from the shaft and the drains.

Figure 4.8-8
Simulated Drawdown of Groundwater Levels under Current Conditions



The second potential source is seepage of shallow groundwater into the New Brunswick shaft from the adjacent former SPI Mill site, located to the southeast. The Mill site was known to have industrial solvent impacts, including cis-1,2-DCE, in shallow groundwater in the past (SPI, 1999). The shaft has a general downward flow path to allow water seeping into the shaft from shallow depths to flow toward the other mines through tunnels at greater depths. The consistent presence and relatively uniform concentration of the cis-1,2-DCE indicates that if the source was due to historic solvent use in the New Brunswick mine, then the solvent use would have had to occur primarily within the shaft above the shallowest mine workings connected to the shaft, at the 580 feet level of the mine, or occurred relatively uniformly throughout the entire mine, both of which seem unlikely. Thus, the most likely source for the cis-1,2-DCE in the New Brunswick shaft is seepage of shallow groundwater from the Mill site into the upper part of the shaft and downward movement of this seepage within the shaft.

Previous water quality sampling was conducted in 1991 from the drains and the New Brunswick shaft (Condor, 1994). In 2006, the Idaho-Maryland Mining Corporation conducted groundwater sampling at several depths from the New Brunswick shaft, as reported by Walker and Associates, Inc. (2008). The reported water quality from 1991 and 2006 is consistent with the findings presented in this report. Thus, there does not appear to be any significant change in the water quality in the shaft, drains, or creeks over the last two to three decades.

Surface Water

Surface water within Wolf Creek and South Fork Wolf Creek is from three distinct sources in varying proportions: stormwater runoff from within the respective watersheds, discharge of groundwater through fractures and drains, and transfer of water from other watersheds through the NID canal system. Each of these water sources is expected to have a different water chemistry. As a result, the water chemistry measured in the creeks may vary seasonally or over time, depending primarily on the amount of local rainfall and the magnitude and duration of NID canal releases.

For samples collected from Wolf Creek in December 2018, the iron concentration ranged from 240 µg/L in the upstream sample to 310 µg/L in the downstream sample, and the manganese concentration ranged from 15 µg/L in the upstream sample to 35 µg/L in the downstream sample. The increasing concentration from upstream to downstream is indicative of the increasing proportion of groundwater discharge and flow from the drains as Wolf Creek passes through the project site area. A downstream sample was also collected from Wolf Creek in April 2019, with iron present at 220 µg/L and manganese present at 21 µg/L. The lower iron and manganese concentrations in the downstream sample in April 2019 reflect the greater proportion of flow due to releases from the DS Canal into Wolf Creek at that time, compared to December 2018.

Within South Fork Wolf Creek, the samples from April 2019 contained iron at 940 µg/L in the sample collected from the downstream end of the culvert passing under the former Mill site and 310 µg/L in the sample collected downstream near the drill pad location. The manganese concentration ranged from 140 µg/L in the sample collected from the downstream end of the culvert passing under the former Mill site to 57 µg/L in the downstream sample. The higher iron and manganese concentration in the water flowing out of the culvert may be reflective of groundwater seeping into the "leaky" culvert, whereas the lower concentrations downstream may be due to dilution by surface water flows from the smaller creek that joins the South Fork between these two locations.

The arsenic concentration does not exceed the MCL or NPDES effluent limit in any of the samples from Wolf Creek and South Fork Wolf Creek.

Flooding

According to the Federal Emergency Management Agency (FEMA) flood hazard maps for the Project area, Maps 06057C0631E, 06057C0632E, 06057C0633E, 06057C0650E (FEMA, 2019), the only part of either project site that is located within a flood hazard zone is the northern edge of the Centennial Industrial Site along Wolf Creek. The Centennial Site includes the main stem of Wolf Creek, a perennial stream. The main stem of Wolf Creek generally runs parallel to and immediately south of Idaho Maryland Road along the northern boundary of the Centennial Industrial Site.

The FEMA Flood Insurance Rate Map (FIRM) identifies Special Flood Hazard Areas (SFHA) along the north and south sides of Wolf Creek on the Centennial Industrial Site.[7] The SFHA encompasses 2.31 acres on the Centennial Industrial Site. Within the Centennial Industrial Site, a portion of the floodplain extends across developed and previously disturbed areas, including the former Hap Warnke Sawmill Site. In addition, the floodplain extends onto portions of the adjacent Idaho Maryland Road and Centennial Drive.

South Fork Wolf Creek Geomorphology

Given the proposed discharge of treated mine water into South Fork Wolf Creek, the geomorphology of the creek is particularly important. As a result, Balance Hydrologics, Inc. completed a geomorphic assessment of the South Fork Wolf Creek channel.[8]

At the proposed project's mine dewatering discharge location, the South Fork Wolf Creek channel banks consist of previous mining waste rock 3 to 12 inches in diameter, which is larger than the natural in-channel sediment found upstream and downstream. The waste rock serves to armor the channel making it less susceptible to erosion in response to increased flow.

As part of their analysis, Balance Hydrologics identified six reach designations of South Fork Wolf Creek based on channel slope, morphology, locations of tributaries, and/or channel type (i.e., natural channel vs. engineered channel or culvert). Two reaches, Reaches D and E, were determined to require further investigation and evaluation of potential off-site impacts related to increases in treated mine water discharge associated with the project (see Section 4.8.4, Impacts and Mitigation Measures, of this chapter). Thus, the following existing setting section focuses on Reaches D and E, shown in Figure 4.8-9. For a discussion of why the other reaches were dismissed from further investigation, please refer to Section 5.1.2 of Appendix K.1 to this Draft EIR). In short, reasons for dismissal include such characteristics as being located upstream of discharge point (Reach A), channel armoring (Reach B), channel stability resulting from cascade and step pool morphology (Reach C), and engineered channel (Reach F).

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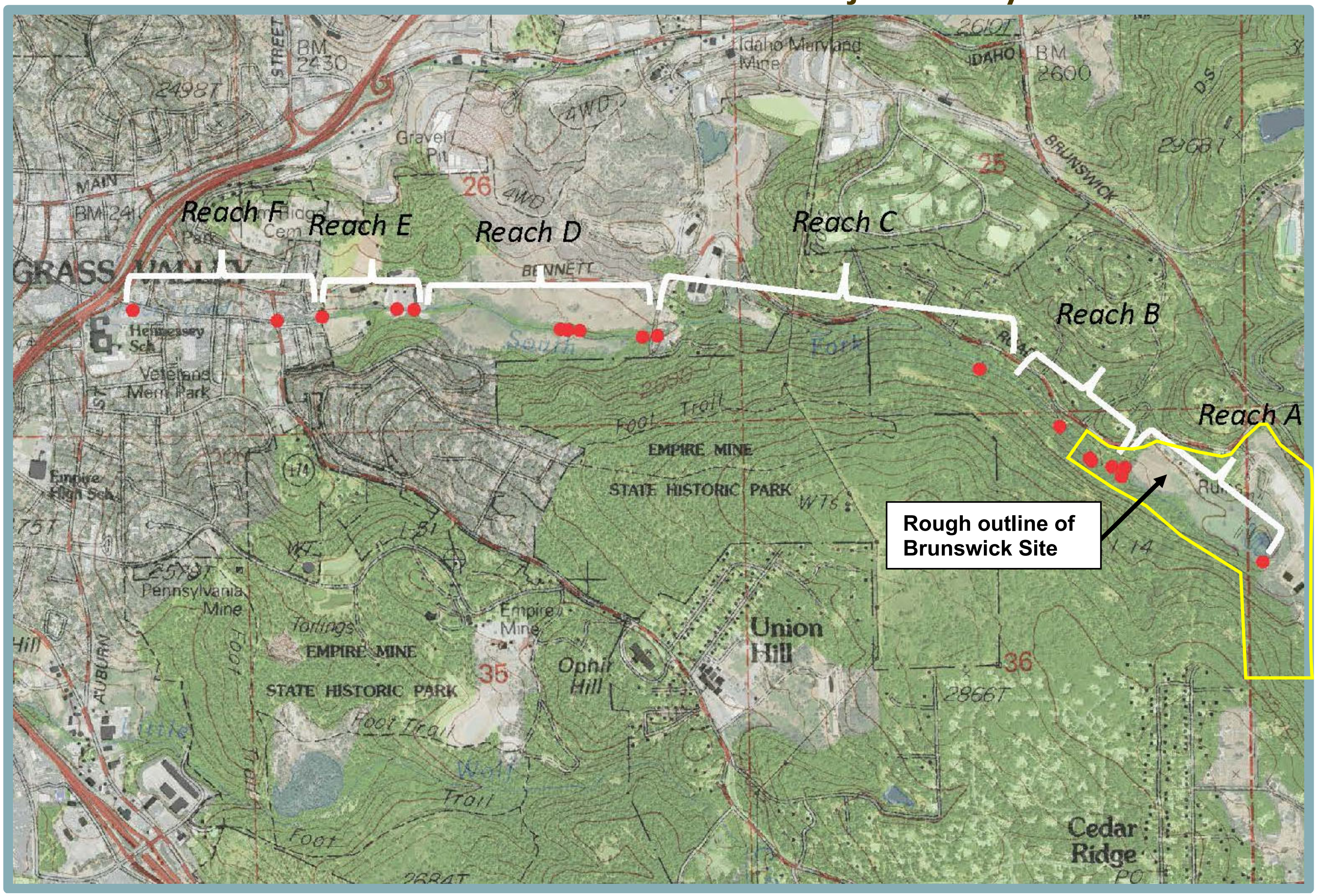
7 The FIRM Panel 0631E includes the Centennial Industrial Site.

8 Balance Hydrologics, Inc. *Geomorphic Assessment, South Fork Wolf Creek, Near Grass Valley, California*. March 2020.

Figure 4.8-9
South Fork Wolf Creek Reaches in Project Vicinity



Source: Balance Hydrologics, Inc. 2020. (Note: red dots indicate locations where channel was accessed, assessed, and photographed)

South Fork Wolf Creek - Reach D

Reach D receives runoff and sediment from a watershed of approximately 2.2 square miles (U.S. Geological Survey [USGS], 2019). The average reach slope was measured to be 0.5 percent. The reach is in an unconfined valley with an active floodplain and riparian zone and exhibits pool-riffle morphology, defined by an undulating bed with a sequence of sediment bars, pools, and riffles. Bars and riffles are comprised of mostly gravel-sized sediment.

South Fork Wolf Creek - Reach E

Reach E receives runoff and sediment from a watershed of approximately 2.3 square miles (USGS, 2019). The average reach slope was measured to be 1.3 percent and exhibits pool-riffle morphology. This reach has been highly modified with evidence of fill encroaching on the floodplain and channel. Reach E also receives stormwater runoff from some residential and urban areas.

4.8.3 REGULATORY CONTEXT

The following is a description of federal, State, and local environmental laws and policies that are relevant to the review of hydrology and water quality under the CEQA process.

Federal Regulations

The following section includes federal environmental goals and policies relevant to the CEQA review process pertaining to the hydrology and water quality aspects of the proposed project.

Federal Emergency Management Agency (FEMA)

The FEMA is responsible for determining flood elevations and floodplain boundaries based on U.S. Army Corps of Engineers (Corps) studies. FEMA is also responsible for distributing the FIRMs, which are used in the National Flood Insurance Program (NFIP). The FIRMs identify the locations of special flood hazard areas, including the 100-year floodplains.

FEMA allows non-residential development in the floodplain; however, construction activities are restricted within flood hazard areas, depending upon the potential for flooding within each area. Federal regulations governing development in a floodplain are set forth in Title 44, Part 60 of the Code of Federal Regulations (CFR). These standards are implemented at the State level through construction codes and local ordinances; however, these regulations only apply to residential and non-residential structure improvements. Although roadway construction or modification is not explicitly addressed in the FEMA regulations, the California Department of Transportation (Caltrans) has also adopted criteria and standards for roadway drainage systems and projects situated within designated floodplains. Standards that apply to floodplain issues are based on federal regulations (Title 23, Part 650 of the CFR). At the State level, roadway design must comply with drainage standards included in Chapters 800-890 of the Caltrans Highway Design Manual. CFR Section 60.3(c)(10) restricts cumulative development from increasing the water surface elevation of the base flood by more than one foot within the floodplain.

Federal Clean Water Act

The NPDES permit system was established in the federal Clean Water Act (CWA) to regulate municipal and industrial discharges to surface waters of the U.S. Each NPDES permit contains limits on allowable concentrations and mass emissions of pollutants contained in the discharge. Sections 401 and 402 of the CWA contain general requirements regarding NPDES permits.

Section 307 of the CWA describes the factors that the Environmental Protection Agency (EPA) must consider in setting effluent limits for priority pollutants.

Nonpoint sources are diffuse and originate over a wide area rather than from a definable point. Nonpoint pollution often enters receiving water in the form of surface runoff, but is not conveyed by way of pipelines or discrete conveyances. As defined in the federal regulations, such nonpoint sources are generally exempt from federal NPDES permit program requirements. However, two types of nonpoint source discharges are controlled by the NPDES program – nonpoint source discharge caused by general construction activities, and the general quality of stormwater in municipal stormwater systems. The 1987 amendments to the CWA directed the federal EPA to implement the stormwater program in two phases. Phase I addressed discharges from large (population 250,000 or above) and medium (population 100,000 to 250,000) municipalities and certain industrial activities. Phase II addresses all other discharges defined by EPA that are not included in Phase I.

Section 402 of the CWA mandates that certain types of construction activities comply with the requirements of the NPDES stormwater program. The Phase II Rule, issued in 1999, requires that construction activities that disturb land equal to or greater than one acre require permitting under the NPDES program. In California, permitting occurs under the General Permit for Stormwater Discharges Associated with Construction Activity, issued to the State Water Resources Control Board (SWRCB), implemented and enforced by the nine RWQCBs.

As of July 1, 2010, all dischargers with projects that include clearing, grading or stockpiling activities expected to disturb one or more acres of soil are required to obtain compliance under the NPDES Construction General Permit Order 2009-0009-DWQ. The General Permit requires all dischargers, where construction activity disturbs one or more acres, to take the following measures:

1. Develop and implement a Stormwater Pollution Prevention Plan (SWPPP) to include a site map(s) of existing and proposed building and roadway footprints, drainage patterns and stormwater collection and discharge points, and pre- and post- project topography;
2. Describe types and placement of Best Management Practices (BMPs) in the SWPPP that will be used to protect stormwater quality;
3. Provide a visual and chemical (if non-visible pollutants are expected) monitoring program for implementation upon BMP failure; and
4. Provide a sediment monitoring plan if the area discharges directly to a water body listed on the 303(d) list for sediment.

To obtain coverage, a SWPPP must be submitted to the RWQCB electronically and a copy of the SWPPP must be submitted to Nevada County. When project construction is completed, the landowner must file a Notice of Termination (NOT).

State Regulations

The following section includes the State regulations relevant to the CEQA review process pertaining to the hydrology and water quality aspects of the proposed project.

State Water Resources Control Board

The SWRCB and the RWQCBs are responsible for ensuring implementation and compliance with the provisions of the federal CWA and California's Porter-Cologne Water Quality Control Act. The project site is situated within the jurisdictional boundaries of the Central Valley RWQCB (CVRWQCB) (Region 5). The CVRWQCB has the authority to implement water quality protection standards through the issuance of permits for discharges to waters at locations within their jurisdiction.

Central Valley Regional Water Quality Control Board

As authorized by the Porter-Cologne Water Quality Control Act, the CVRWQCB primary function is to protect the quality of the waters within its jurisdiction for all beneficial uses. State law defines beneficial uses of California's waters that may be protected against quality degradation to include, but not be limited to: domestic; municipal; agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.

The CVRWQCB implements water quality protection measures by formulating and adopting water quality control plans (referred to as basin plans, as discussed below) for specific groundwater and surface water basins, and by prescribing and enforcing requirements on all agricultural, domestic, and industrial waste discharges. The CVRWQCB oversees many programs to support and provide benefit to water quality, including the following major programs: Agricultural Regulatory; Above-Ground Tanks; Basin Planning; CALFED; Confined Animal Facilities; Landfills and Mining; Non-Point Source; Spills, Leaks, Investigations, and Cleanups (SLIC); Stormwater; Total Maximum Daily Load (TMDL); Underground Storage Tanks (UST); Wastewater Discharges (including the NPDES); Water Quality Certification; and Watershed Management.

The CVRWQCB is responsible for issuing permits for a number of varying activities. Activities subject to the CVRWQCB permitting requirements include stormwater, wastewater, and industrial water discharge, disturbance of wetlands, and dewatering. Permits issued and/or enforced by the CVRWQCB include, but are not limited to, the NPDES Construction General Permit, NPDES Municipal Stormwater Permits, Industrial Stormwater General Permits, Clean Water Act Section 401 Permits, and Dewatering Permits.

General Permit for Limited Threat Discharges to Surface Waters

The Limited Threat General Order (R5-2016-0076-01) is a general Waste Discharge Requirements permit for Limited Threat Discharges to Surface Water. The discharge of treated water from the proposed mine into South Fork Wolf Creek is anticipated to be covered as a Tier 3 discharge of hard rock mine wastewater. Under Table 3 of the Limited Threat Discharge permit, Tier 3 discharges to surface water that are greater than 250,000 gpd (greater than 175 gpm) and/or that are longer than four months are allowed if the water to be discharged (with or without treatment) meets the applicable screening levels in the permit.

Effluent limitations are listed in Section V and screening levels are listed in Attachment I of the Low Threat Discharge permit. Rise will be required to file a Notice of Intent (NOI) for coverage under the Limited Threat Discharge permit, which will include a detailed description of the dewatering, treatment, and discharge components of the project. A Monitoring and Reporting Program (MRP) will also be required pursuant to the General Order, Attachment C. The MRP will specify monitoring station locations, sampling frequencies and methods, and monitoring report submittal requirements to the Regional Board.

Mining Waste Regulations

California Water Code Section 13050(q)(1) defines mining waste as follows:

> (q) (1) “Mining waste” means all solid, semisolid, and liquid waste materials from the extraction, beneficiation, and processing of ores and minerals. Mining waste includes, but is not limited to, soil, waste rock, and overburden, as defined in Section 2732 of the Public Resources Code, and tailings, slag, and other processed waste materials, including cementitious materials that are managed at the cement manufacturing facility where the materials were generated.

Title 27 of the California Code of Regulations (CCR), Sections 22470 et seq., Mining Waste Management Regulations, apply to all discharges of mining wastes and to owners/operators of a waste management unit for the treatment, storage, or disposal of mining waste. The Mining Waste Management Regulations further define "mining waste" as 'waste from the mining and processing of ores and mineral commodities. Mining waste includes: (1) overburden; (2) natural geologic material which have been removed or relocated but have not been processed (waste rock); and (3) the solid residues, sludges, and liquids from the processing of ores and mineral commodities" (CCR, Title 27, § 22480(a)).

The project will discharge mining waste, which is appropriately regulated under the Title 27 Mining Waste Management Regulations.

Title 27 identifies three “groups” of mining waste. Mining wastes shall be classified as Group A, Group B, or Group C mining wastes based on an assessment of the potential risk of water quality degradation posed by each waste.

- **Group A:** mining waste of Group A are wastes that must be managed as hazardous waste pursuant to Chapter 11 of Division 4.5, of Title 22 of the CCR, provided the RWQCB finds that such mining wastes pose a significant threat to water quality.
- **Group B:** mining waste of Group B are either: (A) mining wastes that consist of or contain hazardous wastes, that qualify for a variance under Chapter 11 of Division 4.5, of Title 22 of the CCR, provided that the RWQCB finds that such mining wastes pose a low risk to water quality; or (B) mining wastes that consist of or contain nonhazardous soluble pollutants of concentrations which exceed water quality objectives for, or could cause, degradation of waters of the state.
- **Group C:** mining wastes from Group C are wastes from which any discharge would be in compliance with the applicable water quality control plan, including water quality objectives other than turbidity.

In reaching decisions regarding classification of a mining waste as a Group B or Group C waste, the RWQCB can consider the following factors: (1) whether the waste contains hazardous constituents only at low concentrations; (2) whether the waste has no or low acid generating potential; and (3) whether, because of its intrinsic properties, the waste is readily containable by less stringent measures. Table 1.1 of Title 27 sets forth Summary Requirements for New and Existing Mining Units, which among other things, exempts Group C mining waste from requiring liners and leachate removal systems.

Regulations in Title 27 are administered by the RWQCB through the issuance of Waste Discharge Requirements (WDRs). Rise will need to submit a Report of Waste Discharge (RoWD) to the RWQCB to obtain WDRs for use of the engineered fill, which is a mining waste, to create the elevated pad areas at the Centennial and Brunswick Industrial Sites. The WDRs will also be required for use of the clay-lined pond in the treatment system for mine dewatering, as well as proposed underground backfill areas.

With respect to surface impoundments, the clay-lined pond, constructed in the 1980s, for the former Bohemia Lumbermill, was permitted by the RWQCB through WDRs as a Class II Designated Waste Management Unit, under former Title 23 of the CCR, Subchapter 15, Section 2532. According to the WDRs (Order No. 88-185 for Bohemia Incorporated Grass Valley Mill), the pond was to be lined with a two-foot-thick clay layer having a permeability not to exceed 1x 10^{-6} cm/s. Vector Engineering found that the "clay liner system was constructed in substantial accordance with the SWRCB Title 23, Subchapter 15, Section 2532 regarding construction of the natural liner system for Class II Designated Waste Management Units."[9] It is noted that Title 23, Subchapter 15, has been repealed, and the regulations are now included in Title 27.

Liner requirements are set forth in Title 27, Section 22490(f), Liners. This section sets forth a minimum thickness for synthetic liners of 40 millimeters.[10] Clay liners shall be of a minimum of two feet thick and shall be installed at relative compaction of at least 90 percent.

Title 27, Section 22510 also includes Closure and Post Closure regulations that overlap with reclamation requirements under the Surface Mining and Reclamation Act (SMARA), stating:

> The RWQCB shall issue WDRs which incorporate the relevant provisions of an approved mining and reclamation plan (see California Surface Mining and Reclamation Act, Public Resources Code, Section 2770, et seq.), prescribe additional conditions as necessary to prevent water quality degradation, and ensure that there will be no significant increase in the concentration of indicator parameters or waste constituents in ground or surface water, unless requirements are waived.

Section 22510(a) states that "New and existing Mining Units shall be closed so that they no longer pose a threat to water quality…"

Industrial Storm Water General Permit – Order No. 2014-0057-DWQ

Storm water discharges from industrial sites must be managed in accordance with this permit. Stormwater runoff that comes in contact with surface mining materials, such as rock piles at the Brunswick Industrial Site, must be regulated under this permit. For the Industrial General Permit (IGP), a SWPPP must be prepared and an NOI filed using the Stormwater Multiple Application and Report Tracking System (SMARTS) online tool, similar to what is required for the Construction General Permit.

The IGP authorizes discharges of industrial storm water to waters of the United States, so long as those discharges comply with all requirements, provisions, limitations, and prohibitions in the IGP.

Basin Plans

The Porter-Cologne Water Quality Control Act provides for the development and periodic review of water quality control plans (basin plans) that are prepared by the regional water quality control

9 NV5. *Idaho-Maryland Mine Project, Supplemental Geotechnical Information*. November 6, 2020.

10 According to the Regional Water Quality Control Board, industry practice, as well as the liners within the region most recently approved by the Regional Board, is 60-millimeter minimum thickness. (Personal communication between Jeff Huggins, Water Resources Control Engineer, Title 27 Permitting and Mining Unit, Central Valley Water Board, and Nick Pappani, Vice President, Raney Planning & Management, Inc., January 5, 2021).

boards. Basin plans designate beneficial uses of California's major rivers and groundwater basins, and establish narrative and numerical water quality objectives for those waters. Beneficial uses represent the services and qualities of a water body (i.e., the reasons why the water body is considered valuable), while water quality objectives represent the standards necessary to protect and support those beneficial uses. Basin plans are primarily implemented through the NPDES permitting system and by issuing waste discharge regulations to ensure that water quality objectives are met.

The RWQCB has adopted the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan) (RWQCB, 2018). The Basin Plan establishes: (a) the beneficial uses of water within the region; (b) the water quality objectives necessary to protect those uses, including an antidegradation policy; (c) the prohibitions, policies, and action plans, by which protections are implemented; and (d) the monitoring requirements, conducted to demonstrate attainment of water quality standards.

The Basin Plan does not specifically identify beneficial uses for South Fork Wolf Creek or its tributaries. The Basin Plan also does not name beneficial uses or regulatory criteria for Wolf Creek, to which South Fork Wolf Creek is tributary. The existing Basin Plan does identify present and potential beneficial uses for the Bear River (to which Wolf Creek flows), specifically naming:

- municipal and domestic supply;
- agricultural supply, including stock watering;
- hydropower generation;
- water contact recreation;
- non-contact water recreation, including aesthetic enjoyment;
- warm and cold freshwater habitat; and
- wildlife habitat.

Certain formally designated beneficial uses, such as cooling water, spawning or rearing habitat, are not named for the Bear River, and do not apply to South Fork Wolf Creek.

Discharges must comply with the state Antidegradation Policy (State Water Board Resolution 68-16) to maintain the highest water quality possible consistent with the maximum benefit to the people of California. Historical and on-going discharges of mercury related to mining in the Sierra Nevada foothills has resulted in the development of a TMDL for mercury. As documented by EMKO (see Tables 3-6, 3-7, and 3-9 of Appendix K.2 to this Draft EIR), mercury has not been detected in any of the water samples from the New Brunswick shaft, and has not been detected in any of the drains, nor in Wolf Creek, nor in South Fork Wolf Creek. Mercury was also not detected in the DI-WET leachate samples from the barren rock and tailings samples.

Dewatering Permits

General Construction

The proposed project is likely to include construction dewatering to be discharged to land; thus, the proponent may apply for coverage under State Water Board General Water Quality Order (Low Threat General Order) 2003-0003 or the Central Valley Water Board's Waiver of Report of Waste Discharge and Waste Discharge Requirements (Low Threat Waiver) R5-2018-0085. Small temporary construction dewatering projects are projects that discharge groundwater to land from excavation activities or dewatering of underground utility vaults. Dischargers seeking coverage under the General Order or Waiver must file a NOI with the CVRWQCB prior to beginning discharge.

Mine Dewatering

As previously discussed, the proposed project includes mine dewatering and discharge of the treated groundwater to the South Fork Wolf Creek. Thus, the proposed project will require coverage under a NPDES permit. Dewatering discharges are typically considered a low or limited threat to water quality and may be covered under the General Order for Limited Threat Discharges to Surface Water (Limited Threat General Order), discussed above. A complete NOI must be submitted to the CVRWQCB to obtain coverage under the Limited Threat General Order.

Sustainable Groundwater Management Act

The DWR has developed a Strategic Plan for its Sustainable Groundwater Management (SGM) Program. DWR's SGM Program will implement the new and expanded responsibilities identified in the 2014 SGMA. The expanded responsibilities include the following:

1) Developing regulations to revise groundwater basin boundaries;
2) Adopting regulations for evaluating and implementing Groundwater Sustainability Plans (GSPs) and coordination agreements;
3) Identifying basins subject to critical conditions of overdraft;
4) Identifying water available for groundwater replenishment; and
5) Publishing best management practices for the sustainable management of groundwater.

The SGMA applies to the 127 High and Medium Priority groundwater basins, which account for approximately 96 percent of groundwater use in California. The only groundwater basin regulated under the SGMA within Nevada County is the Martis Valley Groundwater Basin. The project site is not located near Martis Valley.

Local Regulations

Relevant goals and policies from the Nevada County General Plan and various other local regulations related to hydrology and water quality, are discussed below.

Nevada County General Plan

The following policies from the Nevada County General Plan related to hydrology and water quality are applicable to the proposed project:

Public Facilities and Services Element

Goal 3.1 Provide for public facilities and services commensurate with development type and intensity.

Policy 3.19A For all discretionary development, increases in stormwater runoff due to new development, which could result in flood damage to downstream residences, commercial, industrial, active natural resource management uses (i.e. farming, ranching, mining, timber harvesting, etc.), public facilities, roads, bridges, and utilities shall not be permitted. Required retention/detention facilities, where necessary, shall be designed such that the water surface returns to its base elevation within 24 hours after the applicable storm event.

The sizing of such facilities, when needed, shall be based upon the protection of downstream facilities.

Policy 3.19B — The County shall strongly encourage the use of geographically limited independent or dependent entities (Community Service Area, County Service Area, special district or equivalent entities) for the purpose of maintaining drainage facilities to handle stormwater runoff.

Policy 3.19C — For all discretionary projects, the County shall require that maintenance of all onsite drainage facilities and all offsite facilities constructed as part of the project is assured through a permanent legally-enforceable mechanism such as, but not limited to, a CSA or CSD.

Safety Element

Goal FH-10.3 Reduce the potential for injury, property damage, and environmental damage from flooding.

Policy FH-10.3.1 — Implement development standards to ensure new construction does not result in increased peak run-off or flood potential.

Policy FH-10.3.2 — Avoid increases in downstream flooding potential by protecting natural drainage and vegetative patterns through project site plan review, application of Comprehensive Site Development Standards, use of clustered development and project subdivision design. The Comprehensive Site Development Standards shall include measures applicable to all discretionary and ministerial projects to avoid downstream flooding resulting from new development. Such measures, shall include, but not be limited to:

a. Avoidance of stream channel modifications; and
b. Avoidance of excessive areas of impervious surfaces; and
c. Use of on-site retention or detention of stormwater.

Policy FH-10.3.3 — Nevada County shall continue to work with appropriate local, State, and Federal agencies, and in particular, FEMA and the National Flood Insurance Program in maintaining the most current flood hazard and floodplain information as a basis for project review in such areas in accordance with Federal, State, and local standards.

Water Element

Goal 11.1 Identify, protect and manage for sustainable water resources and riparian habitats.

Policy 11.4 — Cooperate with State and local agencies in efforts to identify and reduce to acceptable levels all sources of existing and potential point- and non-point-source pollution to ground and surface waters, including leaking fuel tanks, discharges from storm drains, auto dismantling and dump sites, sanitary waste systems, parking lots, roadways, logging and mining operations.

Policy 11.6A — New development shall minimize the discharge of pollutants into surface water drainages by providing the following improvements or similar methods which provide equal or greater runoff control: (a) include curbs and gutters on arterials, collectors, and local roads consistent with adopted urban street designs; and (b) oil, grease, and silt traps for subdivisions creating five or more parcels and commercial and industrial development of one acre or greater size. Maintenance of such facilities shall be assured through a legally enforceable mechanism.

Policy 11.9A — Approve only those grading applications and development proposals that are adequately protected from flood hazards and which do not add flood damage potential. This may include the requirement for foundation design which minimizes displacement of flood waters, as well as other mitigation measures.

Policy 11.9C — When constructed within a floodplain, require elevation of the habitable portions of residential structures to be above the 100-year flood level. Require flood-proofing or elevation of non-residential structures. Require that foundations do not cause floodwater displacement except where necessary for flood-proofing.
Also see: Chapter 1: Land Use Policy 1.22

Mineral Management

Goal 17.1 — Recognize and protect valuable mineral resources for current and future generations in a manner that does not create land use conflicts.

Policy 17.11 — Recognize the importance of water conservation and quality for the present and future needs of the County by:

a. Requiring the conservation of on-site water during mining operations; and
b. Requiring that off-site water discharge complies with State water quality standards; and
c. Requiring that any increase or decrease of off-site discharge is not detrimental to the downstream environment or downstream water users.

Policy 17.15 — Surface mining is conditionally permitted only in compatible General Plan designations as defined herein and on parcels zoned ME. Said mining shall be allowed only after impacts on the environment and nearby land uses have been adequately reviewed and found to be in compliance with CEQA.

Of particular importance shall be the impact of the operation on nearby land uses, water quantity and quality, noise and vibration impacts, and traffic associated with the operation. All other related impacts shall also be addressed.

Policy 17.24 — Regardless of the General Plan designation, subsurface mining shall be conditionally permitted throughout the County. Said mining shall be allowed only after impacts on the environment and affected surface land uses have been adequately reviewed and found to be in compliance with CEQA. Of particular importance shall be the impact of the operation on surface land uses, water quantity and quality, noise and vibration, land subsidence, and traffic associated with surface access. All other related impacts shall also be addressed.

Nevada County Land Use and Development Code

The Nevada County LUDC, Chapter II: Zoning Regulations, Sec. L-II 4.3.10 requires that for projects with development located within 100 feet of the limits of the 100-year floodplain, a Floodplain Management Plan prepared by a registered professional engineer and consistent with FEMA standards, shall be prepared that minimizes impacts to the floodplain. The purpose is to mitigate the impact of development on floodplains and to protect development and downstream users from potential hazards associated with flooding.

Nevada County LUDC, Chapter XII: Floodplain Management Regulations provides the floodplain management criteria for all development in areas of special flood hazard within the unincorporated areas of Nevada County.

The FEMA has identified the 100-year frequency floodplain along Wolf Creek, a perennial stream, in Nevada County. While FEMA does not exercise any jurisdiction over, or interest in lands outside the floodway and flood fringe, the County of Nevada has mandated that in certain instances as defined in its LUDC, Chapter XII, a Floodplain Management Plan must be prepared when development is within 100 feet of the 100-year floodplain boundary in order to minimize impacts to the floodplain.

Delineation of the 100-year floodplain (from the Flood Insurance Rate Map) on the Centennial Site Plan shows that the project footprint is outside the SFHA (100-year floodplain). However, approximately 0.55-acre of the engineered fill placement encroaches into the County of Nevada mandated 100-foot zone beyond the 100-year floodplain limit, necessitating a Floodplain Management Plan. A Floodplain Management Plan has been prepared for the Centennial Industrial Site in conformance with the requirements of the County of Nevada.

4.8.4 IMPACTS AND MITIGATION MEASURES

This section describes the standards of significance and methodology used to analyze and determine the proposed project's potential impacts related to hydrology and water quality. In addition, a discussion of the project's impacts, as well as mitigation measures where necessary, is also presented.

Standards of Significance

Consistent with Appendix G of the CEQA Guidelines, a significant impact would occur if the proposed project would result in any of the following:

- Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality;
- Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:
  - Result in substantial erosion or siltation on- or off-site;
  - Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;
  - 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 either during construction or in the post-construction condition; or
  - Impede or redirect flood flows;
- In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation; or
- Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.

The proposed project's impacts associated with topsoil erosion related to grading and excavation activities are discussed in Chapter 4.6, Geology, Soils, and Mineral Resources, of this EIR, whereas the potential channel erosion effects of treated mine discharge in South Fork Wolf Creek are evaluated in this chapter in the following section.

The project's potable water demand and effects on surface water supplies are addressed in Chapter 4.11, Public Services and Utilities, whereas effects on groundwater supplies is addressed in this chapter in the following section.

Method of Analysis

The impacts analysis for this chapter is based primarily on the Itaska and EMKO technical reports for the proposed project. As discussed below, these reports were peer reviewed by an independent third-party expert, under contract with the County.

Groundwater Flow Model

The groundwater flow model that was constructed for this investigation utilizes the numerical code *MINEDW*, which was developed by Itasca (2012) to solve 3-D groundwater flow problems with an unconfined (or phreatic) surface using the finite-element method. *MINEDW* is a commercial software that was thoroughly reviewed by Sandia National Laboratories (Corbet et al. 1998) and is approved by the Nevada Division of Environmental Protection for use in permitting applications (NDEP 2018). *MINEDW* has been used successfully at more than 100 mine sites located throughout the world and in diverse hydrogeologic and climatic conditions. The code has been in use for approximately 30 years, and its predictions have been validated by field data collected over many years.

The eastern boundary of the hydrologic study area (HSA) is a watershed divide (Sierra crest), while the other three sides are rivers/creeks. The western boundary is the Feather River, the northern boundary is the North Yuba River and South Fork Feather River, and the southern boundary is the Rubicon River and Raccoon Creek. The dimensions of the HSA are approximately 40 miles from north to south and 60 miles from east to west.

The bottom elevation of the model in the mine area is -3,445 feet msl, which is approximately 1,200 feet below the proposed project. The groundwater model domain encompasses approximately 2,810 square miles.

The conductivity, or *K,* values of the geologic units decrease with depth. Vertically, six main sub-units were assigned in the model for each geologic unit to simulate the decrease of the *K* values along the depth.

1. Fractured rocks – from the ground surface to 215 feet bgs;
2. Transition zone – from 215 to 300 feet bgs;
3. Upper bedrock – from 300 to 2,000 feet bgs;
4. Middle bedrock – from 2,000 to 4,000 feet bgs;
5. Lower bedrock – from 4,000 to 5,000 feet bgs; and
6. Deep bedrock – lower than 5,000 feet bgs.

The long-term average precipitation for the project area was estimated to be 53 inches per year based on precipitation records summarized by the Western Regional Climate Center. Groundwater recharge was estimated to be 10 to 12 inches per year in the project area (EMKO, 2021, pg. 18). In the HSA, the precipitation is high in the high-elevation areas to the east and low in the valley (west); however, due to the variation in geologic units and the depth of weathering, the proportion of the precipitation that recharges to the groundwater system is probably much higher to the west than that to the east, suggesting that the recharge is not directly proportional to the precipitation. Therefore, in the groundwater flow model, a uniform rate of 12 inches per year was assigned to the entire model domain.

Simulation of Underground Mine Workings

The underground mine workings evaluated include the previously operated Idaho-Brunswick Mine (including the Old Idaho, Old Brunswick, New Idaho, and New Brunswick Mines) and the proposed project. The existing mine workings comprise drifts, raises, and shafts. The extents are from the ground surface to a depth of 3,300 feet bgs. The vertical distance between levels is approximately 100 feet. The existing mine workings were simulated using 9,344 drain nodes, and the proposed project mining operation was simulated with 3,888 additional drain nodes. Drain nodes that were associated with the mine drifts and shafts remain numerically active until the end of mining. The starting times of the drain nodes were assigned gradually based on mine schedules and the elevations (from shallow to deep). Backfilling of the mined areas with cemented-paste backfill (CPB) was not simulated. Based on Itasca's other similar project experience, backfilling using CPB will likely reduce the amount of groundwater seepage into the underground mine workings. As such, Itasca's model could overestimate the amount of inflows and drawdowns; and therefore, may overestimate the impact on groundwater wells in the project vicinity.

Predictive Simulations

The predictive numerical simulations were conducted to assess the potential inflows to the mine workings, the effect on nearby domestic wells, and the potential effects on the creeks in the Mine area during mine development and production between the assumed years of 2020 and 2045 (Year 1 to Year 25), which is the current mine plan.

The simulation of future mining was assumed to start with the initial condition of when the underground mine workings were pumped dry, which would be similar to the hydraulic condition in 1956, when the historical Idaho-Brunswick Mine operation ended. Therefore, the simulated groundwater levels in 1956 were used as the initial condition for the predictive numerical model simulations.

The modeling effort (Itasca, 2020b) evaluated the base case conditions (i.e., 2019 water level) with 25 years of mining, along with following scenarios:

1) Sensitivity analysis evaluating increasing the hydraulic conductivity in the transition zone between the weathered zone and the underlying bedrock by a factor of five;
2) Sensitivity analysis evaluating increasing the hydraulic conductivity of the fault zones by a factor of 10;
3) Sensitivity analysis excluding the fault zones from the model;
4) Sensitivity analysis increasing recharge rate by 50 percent (18 inches per year);
5) Sensitivity analysis decreasing the recharge rate by 50 percent (6 inches per year); and
6) Expanded mining scenario with additional mining occurring in certain areas below a depth of 1,000 feet for an additional 40 years. The expansions in Scenario 6 would represent a major discovery of parallel veins, similar to those mined historically in the Brunswick mine, within the known mineralized system.

Water Quality Sampling

EMKO has conducted water sampling on three separate occasions for the proposed project. In February 2018, water sampling was conducted to identify overall water quality parameters, including general mineral and metal concentrations. EMKO collected water samples from the drains and directed collection of water samples from various depths in the New Brunswick shaft at that time. Samples were labeled based on their level below ground surfaces (samples NBS-265 through NBS-2300). Field parameters were also measured in Wolf Creek, South Fork Wolf Creek, and from the pond on the Brunswick Industrial Site.

Additional measurements are as follows:

- In December 2018, EMKO conducted water sampling to obtain data to support a NPDES discharge permit application for the dewatering program. Additional water samples were obtained from, and field parameters measured in, the New Brunswick shaft and Wolf Creek.
- In April 2019, EMKO measured field parameters and conducted water sampling on South Fork Wolf Creek, the East Eureka Drain (IMD-1), and on Wolf Creek.
- In August 2019, EMKO measured field parameters at the Centennial Drive bridge on Wolf Creek and at two locations on South Fork Wolf Creek.

- In September 2019, December 2019, and January 2020, Balance Hydrologics, Inc. (2020) measured water temperature, conductance, pH and turbidity in two reaches of South Fork Wolf Creek. The upstream measurements were made at the location of the proposed discharge point of the treated water from the mine. The downstream measurements were made at the location where the creek enters a box culvert at Ophir Street in the City of Grass Valley.

South Fork Wolf Creek Geomorphic Assessment

The geomorphic assessment of South Fork Wolf Creek completed by Balance Hydrologics, Inc. consists of several methodological steps, several of which are outlined here. For a full review of the employed methodology, refer to Section 4 of Appendix K.1 to this Draft EIR.

Delineation and Classification of SF Wolf Creek

Based on review of available maps, historical aerial photographs, and a reconnaissance of the channel, Balance characterized channel-reach morphology using a classification system presented by Montgomery and Buffington (1997). Balance delineated South Fork Wolf Creek into different reaches based on: (a) slope, (b) channel morphology, (c) stream order or proximity to other tributaries, and (d) land-use, including influence of urban infrastructure or channel modification. The classification system synthesizes stream morphologies into distinct channel types, which allows for assessment of conditions and potential response to watershed perturbations. Reach classifications allowed Balance to identify channel environments that may be most susceptible to changes in flow from the proposed dewatering program.

Hydrology

South Fork Wolf Creek is an un-gaged tributary; therefore, information about the hydrology is limited to existing studies, indirect calculations, interpretations of channel condition, land uses, and observations and measurements completed as part of this study. Estimates of common recurrence floods can be computed according Nevada County’s Hydrologic Manual, and are important for flood planning and infrastructure design and protection projects; however, these estimates do not address the more frequent but lower magnitude flows that move sediment and do work on the channel (i.e., “geomorphic flows”). Peak flow calculations from runoff modeling also do not typically account for seasonal or annual variability (i.e., wet year vs. dry year ambient conditions). Therefore, Balance conducted streamflow measurements and made observations of sediment transport during a low to moderate runoff event according to USGS standard practice for measuring discharge and sediment transport at a gaging station.

In addition to field observations and measurements, Balance staff estimated flows in the 1- to 10-year recurrence range by way of indirect field measurements, published regression equations, and unit-discharge from regional gaging stations.

Turbidity

Turbidity is a measure of relative clarity of the water or the scattering of light passing through water and is measured in nephelometric turbidity units (NTU). The higher the turbidity, the more light has been inhibited from passing through the water and sediment mixture. Material that causes water to be turbid includes clay, silt, inorganic and organic matter, algae, and plankton and other microscopic organisms. Turbidity is commonly used as a surrogate for measuring suspended-sediment concentration. Balance measured turbidity during multiple site visits to gain a better understanding of baseline turbidity conditions.

Channel Reconnaissance

Balance conducted a channel reconnaissance of accessible segments of the creek between September 25, 2019 and October 3, 2019. These visits occurred during an extended dry period that reflected summer baseflow conditions after an above-average precipitation year [WY2019: 67.3 inches; WRCC, 2020; NCDC, 2020]. During each visit, Balance evaluated channel and bed conditions, collected sediment samples, characterized bed sediment size and delineated South Fork Wolf Creek into distinct reaches based on geomorphic metrics. Observations during baseflow preceded observations and measurements made during elevated flows in January 2020. For the purposes of the assessment, "baseflow" is defined as the flow of water in the perennial creek during periods of no rainfall. Baseflow in perennial creeks can vary seasonally and from year to year.

Concurrent Monitoring Program: Streamflow and Sediment Transport

Sediment transport is usually considered in two parts: suspended sediment and bedload sediment. Suspended sediment consists of clay, silts, fine sands, and forest-floor duff such as seeds and pine needles and is suspended and transported by turbulence in the water column. Bedload sediment includes coarser sands, fine gravels, coarse gravels, cobbles, and (sometimes) boulders.

Balance initiated a baseline streamflow and sediment transport monitoring program in January 2020 at two different locations on South Fork Wolf Creek: 1) South Fork Wolf Creek upstream of the proposed point of discharge; and (2) South Fork Wolf Creek at Ophir Street. At each location, Balance installed fixed datums (staff plates) and near-continuous water-level recorders. Measurements were recorded at 15-minute intervals to determine instantaneous flow and daily peak, average, and minimum flows. In addition, manual measurements were made 19 times between January 24, 2020 and January 20, 2021 to verify the readings from the gaging station.

Preliminary Drainage Analysis and Detention Basin Sizing

Nevada City Engineering, Inc. prepared a preliminary drainage analysis and detention basin sizing for the Centennial and Brunswick Industrial Sites. Nevada County drainage requirements indicate that new storm drain systems and channels shall be designed to convey the 10- and 100-year, 24-hour storm event. Furthermore, SMARA states that erosion control methods shall be designed for the 20-year, 1-hour storm and shall control erosion and sedimentation during operations, as well as after reclamation is complete (see CCR, Title 14, Section 3706). The 2-, 10-, 25-, and 100-year, 24-hour storm events were analyzed in Nevada City Engineering's report, which more than satisfies the Nevada County requirements. Given that the 100-year, 24-hour event is greater than the SMARA required 20-year, 1-hour event, the 100-year, 24-hour results would provide a greater factor of safety in the drainage design.

Independent Peer Reviews

West Yost was retained by Raney to perform an independent third-party peer review of EMKO's Groundwater Hydrology and Water Quality Analysis Report,[11] Itasca's report entitled Predictions

[11] West Yost. *Peer Review of Groundwater Hydrology and Water Quality Analysis and Groundwater Model Reports for the Idaho-Maryland Mine Project, Nevada County, California*. August 27, 2020.

of Groundwater Inflows to the Underground Mine Workings at the Idaho-Maryland Mine,[12] Linkan's Water Treatment Plant Design Report,[13] and Itasca's Groundwater Monitoring Plan.[14]

West Yost found that Itasca's groundwater model was acceptably calibrated pursuant to industry practices. Itasca conducted a sensitivity analysis, which included separate model runs with increased hydraulic conductivity, adjusted fault structure, increased groundwater recharge rate and increased duration of planned mining operations by 40 years. In West Yost's professional opinion, the numerical model development, calibration and sensitivity analysis are adequate for the purpose of estimating the range of dewatering flow rates. West Yost concurs with the estimated flow rates used to evaluate the effects of dewatering conducted as part of the proposed project. Based on West Yost's peer review, the Itasca groundwater modeling report was updated to include an additional sensitivity analysis which considered decreasing the simulated recharge rate by 50 percent.

West Yost also peer reviewed the EMKO report and concurred with the findings and conclusions.

West Yost's technical peer review of Linkan's Water Treatment Plant Design Report confirmed that the proposed method of treatment would be adequate to successfully treat the mine water to comply with RWQCB effluent limitations, and identified items for Linkan Engineering to consider during the detailed design phase.

West Yost peer reviewed the proposed Groundwater Monitoring Plan (GMP) prepared by Itasca Denver and found that the 15 dedicated monitoring wells proposed in the GMP and Well Mitigation Plan provide adequate groundwater monitoring capability for the proposed project. West Yost recommended at least one year of baseline monitoring prior to initiating dewatering operations, rather than Itasca's original proposal of six months. The GMP was updated to include one year of baseline monitoring in accordance with West Yost's recommendation.

ECM was retained by Raney to perform an independent third-party peer review of the Geomorphic Assessment, South Fork Wolf Creek, prepared by Balance Hydrologics, Inc. ECM found the report to be adequate, and noted that it would be useful to acquire some additional flow and channel information in the future. This information has been collected since the preparation of the original report, and subsequently incorporated into the EMKO report.

Project Impacts and Mitigation Measures

The following discussion of impacts is based on the implementation of the proposed project in comparison with the standards of significance identified above.

4.8-1 Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality. Based on the analysis below and with implementation of mitigation, the impact is *less than significant*.

[12] *Ibid*.

[13] West Yost. *Peer Review of Water Treatment Plant Design Report for the Idaho-Maryland Mine Project, Nevada County, California. November 25, 2020*; West Yost. *Peer Review of Final Water Treatment Plant Design Report for the Idaho-Maryland Mine Project, Nevada County, California*. March 18, 2021.

[14] West Yost. *Idaho Maryland Mine – Review of Groundwater Monitoring Plan and Well Mitigation Plan*. January 11, 2021; West Yost. *RE: Idaho-Maryland GMP*. March 1, 2021.

As stated above, the proposed project's impacts associated with topsoil erosion related to grading and excavation activities are discussed in Chapter 4.6, Geology and Soils, of this EIR. Thus, the following section pertaining to construction will focus on the initial mine dewatering and the potential need to dewater areas where groundwater is encountered during grading and excavation activities.

Construction Dewatering

The Geotechnical Reports indicate that dewatering at the Brunswick Industrial Site and Centennial Industrial Site during earthwork grading would not be necessary, but identify the potential need to dewater the utility trench excavations and any other excavations if perched water or the groundwater table is encountered during winter operations.

If dewatering of utility trenches is required, temporary sediment basins would be constructed on-site in areas of planned disturbance to which the groundwater can be pumped. To receive coverage for these activities, the project applicant would apply for coverage under SWRCB General Water Quality Order (Low Threat General Order) 2003-0003, or the CVRWQCB's Waiver of Report of Waste Discharge and Waste Discharge Requirements (Low Threat Waiver) R5-2018-0085. Dischargers seeking coverage under the General Order or Waiver must file a NOI with the CVRWQCB prior to beginning discharge.

Mine Dewatering

The proposed project will include initial dewatering of the mine and subsequent ongoing mine dewatering during the life of the underground mining operations.

Initial Mine Dewatering

Initial dewatering of the underground workings would be accomplished using submersible and staged centrifugal pumps. Initial dewatering of the Idaho-Maryland mine would occur at a rate of 2,500 gpm, or 5.6 cfs. If this rate of dewatering is achieved it would take approximately 160 days (5.3 months) to dewater the underground workings, assuming an average groundwater inflow rate into the existing mine workings of 850 gpm and total water currently in the mine workings of 385 million gallons. The groundwater would be pumped through a new pipeline to an existing clay-lined settling pond for water treatment. The clay-lined pond has a total capacity of approximately 40 acre-feet.

Groundwater sampling conducted by EMKO Environmental has identified two constituents of concern, iron and manganese, above RWQCB discharge standards. As described above, groundwater will be pumped from underground workings to the existing 40-acre-foot, clay-lined settling pond. The settling pond would be used for water storage and removal of total suspended solids. An aeration system would be installed in the settling pond to oxygenate the water, which would precipitate (i.e., create a solid from a solution) a significant portion of dissolved iron and manganese. A small dose of chemical oxidant [sodium hypochlorite (NaOCl) or potassium permanganate (KMnO4)] will also be added to enhance the kinetics of the reaction under all surface conditions, such as seasonal variations. Settled solids and precipitated iron and manganese would be contained in the clay-lined settling pond, which would be removed approximately every 10 years. The solids removed from the pond would be hauled to an appropriate and approved landfill off-site.

Water would then be pumped to the proposed on-site water treatment plant (WTP) and filtered to remove the remaining iron and manganese. More specifically, filtration through natural, mined manganese dioxide (MnO_2) media would be the first step in the WTP. MnO_2 was identified as the preferred, primary form of treatment due to its efficient removal characteristics for iron and manganese, whereby it filters solids that are precipitated during the oxidation process (occurring in the pond), and will also act to catalytically oxidize and adsorb any residual soluble iron and manganese remaining in water conveyed to the WTP for treatment. According to the Water Treatment Plant Design Report, mined MnO_2 will remove the contaminants of concern (iron and manganese) to compliant levels, specified in the California RWQCB's NPDES permit No. CAG995002.[15] Based on current groundwater quality conditions, this level of treatment is sufficient to meet State discharge standards; however, the WTP design includes secondary treatment using granular activated carbon (GAC) vessels to add robustness in the event that influent water quality worsens during periods of active mining. GAC is an effective barrier for many water pollutants and can be reused. GAC can also serve to remove organics such as those found in drilling fluids and other mining-related additives. With the proposed treatment described in this chapter, and more fully in the Linkan Engineering Water Treatment Plant Design Report, all parameters would meet the screening levels and effluent limitations, as shown in Table 4.8-2.

The treatment process would also reduce the concentrations of arsenic and ammonia, both of which have been detected in low concentrations in surface seeps near the mine. Oxidized arsenic will be adsorbed by precipitated iron and then adsorbed by the MnO_2 filter media. The low concentrations of ammonia (NH_3) will be removed by the aeration process occurring in the pond.

As a contingency, sodium hydroxide, commonly used in water quality treatment processes to adjust pH, will be included in the State permitting efforts for the WTP should it become necessary to treat NH_3 in higher concentrations than have been previously detected. This may occur as a result of explosives used during periods of active mining.

Periodic backwashes of the MnO_2 and GAC media vessels, which would release filtered and adsorbed solids, would be directed to a mechanical solids separation process, such as centrifugation, or belt or drum filters, in order to segregate the solids from the pyrolusite media backwash stream that will be returned to the clay-lined pond. In this manner, the pond will remain unaffected by the solids generated by backwash events.

The water stored in the finish water tank would provide the final effluent which would be pH adjusted to meet regulatory compliance standards prior to being discharged to the South Fork Wolf Creek. It is anticipated that this pH adjustment, if necessary, would be performed by adding a small dose of sulfuric acid, commonly used in municipal treatment systems, to the treated effluent. Only fully treated water, meeting the State's discharge requirements, would be routed to South Fork Wolf Creek for discharge.

Consistent with NPDES Permit requirements, the WTP would have backup power source (i.e., generators) in the event of electric power failure or outage.

15 Linkan Engineering. *Idaho Maryland Water Treatment Plant Design Report* [pg. 2-10]. February 2021.

Table 4.8-2
Low Threat Discharge Permit Limits, Current Concentrations, and Treatment Goals

Tier 3 Constituent	Units	Screening Level	Tier 3 Effluent Limit		Existing Shaft	After Treatment
			Average Monthly	Maximum Daily		
Aluminum	ug/L	200	310	620	16	
Ammonia, as N	ug/L	NA	25	25	<100	<25
Iron	ug/L	300	470	930	1400	<300
Manganese	ug/L	50	80	160	230	<50
Nitrate + Nitrite	mg/L	10	10	20	<0.40	
pH	std units	6.5-8.5	6.0-9.0	6.0-9.0	6.8	
Settleable Solids	mL/L	0.1	--	0.1	NM	<0.1
Specific Conductance (EC)	umhos/cm	900			400	
Total Dissolved Solids (1)	mg/L	500	1000	1500	210	
Total Suspended Solids	mg/L	10	20	30	NM	<10
Turbidity	NTU	5			NM	<5
Antimony	ug/L	6	6	12	<5	
Arsenic	ug/L	10	10	20	2.1	<10
Beryllium	ug/L	4	4	8	<1.0	
Cadmium	ug/L	3.4	50	100	<0.25	
Chrome +3	ug/L	290	270	540	0.32	
Chrome +6	ug/L	10	8	16	NM	
Copper	ug/L	13	150	300	0.4	
Lead	ug/L	5.3	300	600	<0.50	
Mercury	ug/L	0.05	1	2	<0.050	
Nickel	ug/L	74	69	140	<5.0	
Selenium	ug/L	5	4.1	8.2	<5.0	
Silver	ug/L	8.2	3.1	6.3	<1.0	
Thallium	ug/L	1.7	1.7	3.4	0.12	
Zinc	ug/L	170	750	1500	5.5	
Cyanide	ug/L	5.2	4.3	8.5	2.2	
cis-1,2-DCE	ug/L	--	--	0.5	4.2	<0.5

NOTES: Source: EMKO, February 2021

Notes:

- Screening Levels and Effluent Limits are for Receiving Waters with Municipal and Domestic Supply Beneficial Use (MUN)
- TDS levels are part of the salinity standard. The values shown are the secondary MCL, upper level, and short-term maximum.
- For hardness-dependent metals, limits are based on the measured hardness of 180 mg/L from the pumped sample from the shaft (NBS Pump)
- pH, TSS, cadmium, copper, lead, mercury, and zinc effluent limits are based on Table 12 of the Low Threat Discharge Permit
- After Treatment levels only shown for constituents that currently exceed screening levels or effluent limits

Ongoing monitoring of influent and effluent (i.e., treated water) will be required by the State, in order for the applicant to receive coverage under the State's Limited Threat Discharge Permit (General Order R5-2016-0076; NPDES No. CAG995002). Monitoring of treated water would occur at a location specified by the State prior to the point of discharge at South Fork Wolf Creek. The owner will be required to submit quarterly monitoring reports to the State RWQCB, demonstrating compliance with the maximum daily effluent limitations specified in Section V of the NPDES permit. Compliance with the water quality standards and waste discharge requirements in Order No. R5-2016-0076 would prevent any degradation of surface water quality due to dewatering.[16]

Clay-Lined Pond

The clay-lined pond, constructed in the 1980s, for the former Bohemia Lumbermill, was permitted by the RWQCB through WDRs as a Class II Designated Waste Management Unit, under former Title 23 of the California Code of Regulations, Subchapter 15, Section 2532. According to the WDRs (Order No. 88-185 for Bohemia Incorporated Grass Valley Mill), the pond was to be lined with a two-foot thick clay layer having a permeability not to exceed $1x10^{-6}$ cm/s. Vector Engineering found that the "clay liner system was constructed in substantial accordance with the SWRCB Title 23, Subchapter 15, Section 2532 regarding construction of the natural liner system for Class II Designated Waste Management Units."[17] It is noted that Title 23, Subchapter 15, has been repealed, and the regulations are now included in Title 27.

Liner requirements are set forth in Title 27, Section 22490(f), Liners. This section sets forth a minimum thickness for synthetic liners of 40 millimeters.[18] As stated in the Project Description, the project includes installation of a synthetic liner over the existing clay liner, originally constructed in accordance with RWQCB specifications. The synthetic liner will meet the specifications in Title 27, Section 22490(f).

Ongoing Mine Dewatering

During mining, groundwater inflow into the underground workings would require dewatering. The dewatering would continue at a rate equal to the groundwater inflow into the mine, ranging from approximately 500 gpm to 1,200 gpm seasonally and averaging approximately 850 gpm or about 1.9 cfs. The maximum discharge rate permitted would be 2,500 gpm, which would allow flexibility for unexpected seasonal inflows, operational issues, and increased groundwater inflows from the expansion of the mine during operations. The treatment process for the ongoing mine dewatering would be as described above such that it would be covered under the State's Limited Threat Discharge Permit and treated at the WTP to meet maximum daily effluent limitations specified in the NPDES permit prior to discharge to South Fork Wolf Creek.

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16 EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project* [pg. 114]. February 2021.

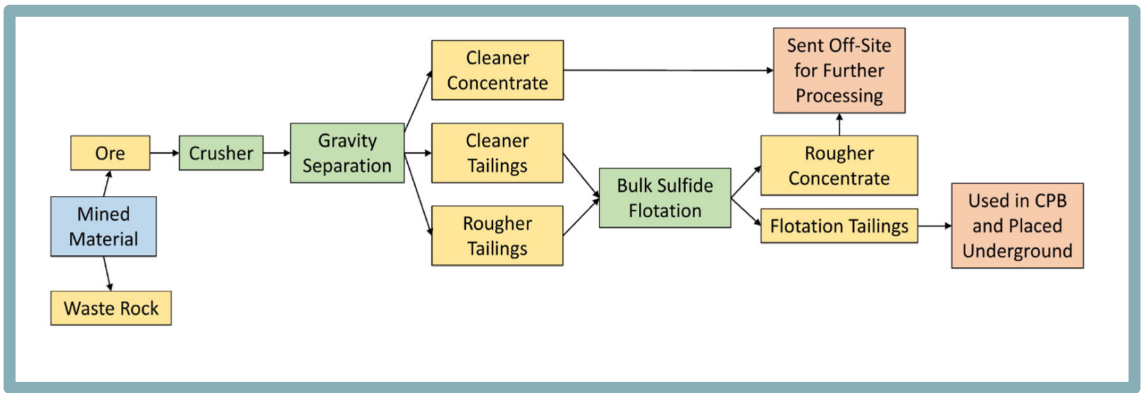
17 NV5. *Idaho-Maryland Mine Project, Supplemental Geotechnical Information*. November 6, 2020.

18 According to the Regional Water Quality Control Board, industry practice, as well as the liners within the region most recently approved by the Regional Board, is 60-millimeter minimum thickness. (Personal communication between Jeff Huggins, Water Resources Control Engineer, Title 27 Permitting and Mining Unit, Central Valley Water Board, and Nick Pappani, Vice President, Raney Planning & Management, Inc., January 5, 2021).

Water Within Underground Mine Workings

Approximately 50 percent of the sand tailings generated at the Process Plant would be used to backfill the underground workings. The backfill would be placed as cemented-paste backfill (CPB).

The process to create CPB at the project site would be generally as follows (see below diagram). The mined material would be separated into ore and waste rock. The ore would be crushed and then would undergo gravity separation to remove particulate gold. The gravity separation would yield fine-grained ore material called cleaner concentrate, intermediate grain size tailings called middlings or cleaner tailings, and tailings of a larger grain size called rougher tailings.



The cleaner tailings and rougher tailings then both undergo bulk sulfide flotation. The bulk sulfide flotation process is designed to separate the gold and associated sulfides from the rest of the tailing materials. The bulk sulfide flotation yields rougher concentrate and flotation tailings. The cleaner concentrate and rougher concentrate are both shipped offsite for further processing and gold recovery. The CPB used in the proposed project would be composed of flotation tailings (tailings that have had ore concentrate, sulfide, and trace metals removed by flotation), Portland cement as the binder material, and water.

Based on metallurgical and geochemical testing on mineralized drill core samples taken at the site, flotation tailings at the site were observed to have low sulfide content. As listed in Table 1 of the Desktop Study of Cemented Paste Backfill,[19] the unprocessed sample contained 1.6 percent sulfide sulfur, whereas the flotation tailings samples contained approximately 0.06 to 0.12 percent sulfide sulfur; the sulfide sulfur recovery was approximately 93 to 96 percent. Thus, only a trace amount of sulfide sulfur remains in the flotation tailings, effectively eliminating potential water quality issues associated with the use of high- sulfide tailings in CPB.

ECM peer reviewed Itasca's CPB study and noted that Itasca retained two companies to perform the tests of drill core samples to determine if underground paste backfill would be feasible at the project site. ECM has worked with both companies (McClelland Laboratories, Inc. in Reno, Nevada and ACZ Laboratories, Inc. in Steamboat Springs, Colorado), whom they note have excellent reputations for their quality work. Itasca

[19] Itaska Denver, Inc. *Desktop Study of Cemented Paste Backfill* [pg. 4]. February 24, 2020.

Denver Inc. is well qualified to review the McCelland and ACZ technical information and to produce their summary report.

According to ECM, there are two important considerations concerning the use of paste backfill. The first is that the mill can produce a product that has the proper physical characteristics. The second is that the material to be used to make the paste backfill is environmentally benign. McClelland and ACZ laboratory testing shows that the material is chemically benign and physically suitable to produce paste backfill. Based on ECM's review of Itasca's summary of both the flotation results and the analytical results, ECM believes that the results look reasonable and are consistent with what would be expected at this mine.[20]

More specifically, the acid-based testing performed by ACZ shows that there is actually a large excess of natural carbonate in the tailings, which results in acid neutralization potential ratios for this material that exceed 100 to one. This means that the rock that would be used as backfill will have a large excess calcium carbonate content as compared to the amount needed to neutralize sulfur that might remain in the tailings paste. This high neutralization ratio suggests that the insertion of the material back into the mine openings can be environmentally beneficial, given that the excess calcium carbonate content can serve to provide some localized neutralization of even the naturally occurring free sulfur that might remain within adjacent unmined portions of the vein.

Use of CPB for the project is an environmentally favorable method for tailings disposal because it can significantly reduce any potential release of metals from the tailings and would minimize the area of surface disturbance needed for tailings disposal. It is ECM's opinion that, based on the testing that has been performed, the material is suitable for paste backfill, and that the material can be successfully manufactured and transported to the intended location. Notwithstanding, Itasca has identified "site specific factors" that include selection of the proper binder (dominantly Portland cement with a low hexavalent chromium [Cr^{+6}] content), and the need for testing of the material, both as it is produced, and again after it has cured. The presence of chromium in cement has been identified as a potential water quality concern related to the use of CPB.

Chromium is a naturally-occurring trace component of the materials used to make cement. Hexavalent chromium (Cr^{+6}) is typically less than two percent of the total chromium content in cement,[21] while the total chromium itself is a very small component in the finished cement (approximately 200 ppm[22]). Thus, the fraction of Cr^{+6} in cement is usually only about 0.000004 (or 0.0004 percent) of the total mass of the cement before forming any admixtures (e.g., concrete or CPB). Studies also show that the amount of

[20] ECM. *Applicant Report Peer Review, Idaho Maryland Mine: Centennial and Brunswick Sites* [pg. 26]. August 13, 2020.

[21] National Center for Biotechnology Information, U.S. National Library of Medicine, National Institutes of Health. *Study on Cr(VI) Leaching from Cement and Cement Composites*. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5923866/. Accessed December 2021.

[22] ScienceDirect. *Analysis of the Chromium Concentrations in Cement Materials*. Available at: https://www.sciencedirect.com/science/article/pii/S1877705812028020?via%3Dihub. Accessed December 2021.

Cr^{+6} that leaches from admixtures, such as CPB, is much lower than that which leaches from neat cement.[23]

It is important to emphasize that the project's strategy for addressing the potential leaching of Cr^{+6} from CPB is not reactive (i.e., removal at the WTP), but rather proactive, whereby, as part of obtaining WDRs from the RWQCB for use of CPB, test work would be completed on CPB samples to verify that leaching of Cr^{+6} would not be an issue and use of the selected cement and CPB admixture would meet applicable regulatory requirements. In this way, the potential water quality effects related to chromium would be addressed through selection of the appropriate cement source and product, along with the proper CPB mixture, rather than by water treatment.

Nevertheless, it is only during the mining phase that Cr^{+6} could have any potential to leach from CPB, because that is when there would be air (oxygen) in the mine workings (Cr^{+6} can only form under oxidizing conditions). Once the mine re-floods, reducing conditions (very low dissolved oxygen levels creating a negative oxidation reduction potential) would return in the mine workings, which would prevent any leaching of Cr^{+6}. However, during mining, if there were any Cr^{+6} in the water within underground workings due to groundwater inflow, it would be reduced to Cr^{+3} (due to low oxygen levels in the water), which is relatively immobile in water and has a much lower impact on water quality than Cr^{+6}.[24] Once the water was pumped from the mine any Cr^{+3} would generally precipitate out of the water in the pond or be removed by the physical filtration unit in the WTP.

Blasting or backfilling with CPB would be conducted exclusively within the underground mine workings. Thus, any water that contacts those components would be present only within the mine workings and would be pumped out of the mine workings by the dewatering system. As a result, that water would not have the potential to flow into the fractured bedrock and flow toward any domestic supply wells. The dewatering causes a low pressure area around the underground workings such that groundwater inflow is toward the mine, not from the mine toward the domestic wells. The primary residual components of the ammonium nitrate-fuel oil (ANFO) used for blasting, ammonia and nitrate, are very soluble and mobile in water. This means that any blasting residuals would be continually removed from the mine over time through the dewatering system. The proposed WTP is designed to treat ammonia and other blasting residuals that might occur due to incomplete detonation. Thus, when the mine is allowed to flood again following the completion of mining, there is no reasonable potential that residuals from former blasting activities would cause a violation of any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality.

In addition, the proposed new mining activities would all occur at depths that are comparable to or much deeper than the historic mine workings. Most of the proposed additional mining, and potential exploration and expansion into new areas, would occur below depths of 1,000 feet (1,600 feet msl), a depth below the levels of the existing

[23] National Center for Biotechnology Information, U.S. National Library of Medicine, National Institutes of Health. *Study on Cr(VI) Leaching from Cement and Cement Composites*. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5923866/. Accessed December 2021.

[24] EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project* [pg. 115]. February 2021.

domestic supply wells (see Table 2-2, Itasca, 2020).[25] The substantial reduction in hydraulic conductivity at those depths, compared to the depths of the domestic supply wells, is further evidence that the proposed project would not adversely affect water quality in domestic wells.

Water currently within the flooded mine workings has low dissolved oxygen levels, creating reducing conditions, as demonstrated by the reducing conditions and the dissolved oxygen levels measured in the samples from the shaft and the drains.[26] The low oxygen levels and reducing conditions prevent the oxidation of sulfide minerals, such as pyrite, that are exposed within the surfaces of the underground workings. After dewatering, though, oxygen would be available from the air within the underground workings, potentially resulting in oxidation of sulfide minerals. Any acid generated during the oxidation would be quickly neutralized by the carbonate minerals in the host rock. However, the process of sulfide oxidation and subsequent neutralization would potentially create elevated total dissolved solids (TDS) levels in the water that would seep into the mine and be removed by the maintenance dewatering. The percentage of the mine workings that may encounter altered and mineralized rock is anticipated to be only a small fraction of the volume of the new underground workings to be constructed as part of the project. In addition, backfilling of stopes and other mineralized areas with CPB would reduce the number of exposed surfaces that may contain sulfide mineralization within the dewatered mine workings. If elevated TDS levels are generated during dewatering, the treatment system would need to be adjusted to meet applicable discharge standards and antidegradation requirements. The RoWD submitted to RWQCB would address this potential issue, provide a quantitative analysis of its potential, and define monitoring requirements and the measures that would mitigate such an occurrence if identified during operation of the treatment system.[27]

Post-Construction Stormwater Runoff within Brunswick Industrial Area

On-going operations at the New Brunswick shaft, the WTP, and the ore processing area would also require compliance with the Industrial General Permit, known as SWRCB Order No. 2014-0057-DWQ, NPDES General Permit No. CAS000001, Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Industrial Activity.

The Brunswick Industrial Site currently has approximately nine acres of impervious asphalt paving from previous land uses. Some of the existing asphalt areas would be removed and some would be reused. After completion of construction, the impervious surfaces and buildings would cover a total of approximately 15 acres of the Brunswick Industrial Site.

Rise would be required to submit a NOI for coverage under the Industrial General Permit and prepare an industrial Stormwater Pollution Prevention Plan (I-SWPPP). The I-SWPPP would address any activities that would have the potential to release pollutants to stormwater, including material and chemical storage, vehicle operation and

[25] EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project* [pg. 92]. February 2021.
[26] EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project* [Table 3-5]. February 2021.
[27] EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project* [pg. 108]. February 2021.

maintenance, and material handling and transport. In general, stormwater runoff from these industrial areas would be routed to the proposed detention basin for water quality and detention purposes, as further discussed in Impact 4.8-3 below.

Post-Construction Stormwater Runoff within Engineered Fill Areas

The project would involve creating fill areas at the Brunswick and Centennial Industrial Site areas. The engineered fill material would consist of 50 percent barren rock and 50 percent sand tailings from the primary ore processing operations. Ore processing would not involve the use of mercury or cyanide. Acid-base accounting analyses conducted by ACZ Labs demonstrates that the barren rock and the sand tailings have a net acid neutralization capacity such that the fill areas would not create acid mine drainage.

DI-WET leach tests conducted on the barren rock and sand tailings material extracted from the mine indicate that the bulk material proportions in the fill would not leach metals at concentrations above applicable water quality standards.[28] The conductivity and TDS in the water that leaches through the fill material is projected to be relatively low, based on the DI-WET tests. The Di-WET tests suggest that the pH of the water that percolates through the engineered fill could be above 9.0. This relatively high pH value, however, is inconsistent with the pH values measured in the New Brunswick shaft, the drains, and in surface water, which range from 5.78 to 7.8. The elevated pH from the DI-WET analyses may be a result of the fine crushing of the samples for the leaching tests. Whatever the reason, the pH results from the DI-WET tests are not consistent with site-specific measurements made under actual field conditions. Rise will be required as part of the project to submit a RoWD and obtain WDRs from the RWQCB for construction of the engineered fill areas. It is anticipated that the engineered fill would be a Group C mining waste.[29] Additional testing may be necessary as part of the RoWD to evaluate the expected pH of any rainfall that might percolate through the engineered fill. However, percolation is expected to be minimal because the engineered fill would be graded and compacted to allow runoff to be conveyed rapidly to the proposed stormwater detention ponds at both the Centennial and Brunswick Industrial Sites. The side slopes would be vegetated and have drainage channels at appropriate spacings. In any case, the WDRs will specify appropriate monitoring and limitations to prevent the discharge of water containing pH levels outside of applicable water quality standards.

Reclaimed Condition

Once mining is completed, dewatering ceases, and the underground workings are allowed to flood with groundwater, the same reducing conditions that occur under existing conditions within the mine workings would develop again, preventing oxidation of sulfide minerals. Water quality in the re-flooded mine workings would then have the same general pH, TDS, and other water quality conditions that occur under existing conditions. The underground workings are anticipated to refill over the next several years. Thus, any seepage from drains and fractures within the bedrock would have a comparable water quality to the discharge from the drains along Wolf Creek under existing conditions.

28 EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project* [pg. 108]. February 2021.

29 *Ibid*.

After mining is completed, and as underground mine workings fill with groundwater, water from the underground mine workings would begin to seep from the existing drains.[30] The water that would seep from the underground workings is anticipated to have similar water quality to the water that currently discharges from the existing drains. Specifically, it may contain elevated levels of iron and manganese. Therefore, the conditions after mining is completed would be similar to existing, or baseline, conditions, such that re-activation of the seeps would not represent a potentially significant impact under CEQA. Although part of the existing environmental setting, some of the seeps have elevated arsenic levels that could pose a threat to human health or the environment. However, despite these existing discharges from the drains, the reported concentrations of all metals and other constituents in the Wolf Creek samples are well below the NPDES water quality standards.[31]

The proposed mining areas would primarily be at equivalent or deeper depths than the existing underground mine workings, while the potential future expansion areas all involve mining at greater depths, typically more than 1,000 feet below the surface and deeper.[32] At those greater depths, the hydraulic conductivity is several orders of magnitude lower than it is at the depths of the domestic supply wells, due primarily to the lack of open fractures as a result of the large pressures exerted by the overlying rock mass (i.e., the lithostatic pressure). Given that the new mining activity would occur at equivalent or greater depths than the proposed mining, there is little or no potential for the proposed mining and mining in the future expansion areas to affect the quality of the groundwater in the domestic supply wells that are completed at much shallower depths.

Conclusion

The proposed project's construction and operations involve multiple activities that could result in adverse effects to water quality, including but not limited to the discharge of mine water containing iron and manganese, discharge of construction area dewatering water, erosion and sedimentation associated with the placement of engineered fill at the Centennial and Brunswick Industrial Sites, and use of CPB in the underground workings. However, as discussed above, all of these sources are proposed to be managed in a manner that would minimize potential water quality impacts. Furthermore, these activities would be regulated and monitored through permitting by the RWQCB, which would be required prior to the onset of mine dewatering and construction. Although the project's proposed water management and treatment, and adherence to permit requirements, would avoid significant impacts to water quality, the impact is considered ***significant*** for the purposes of this analysis and mitigation, specifying requirements for regulatory compliance, is identified as necessary to reduce the impact to less than significant.

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30 While the Eureka Drain, East Eureka Drain, and East Eureka Shaft, from which groundwater discharges, would be closed prior to initial mine dewatering, as discussed in the Geology and Soils chapter, the closure design would still allow groundwater to discharge from the near-surface features once the mine is allowed to flood during reclamation.

31 EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project* [pg. 116]. February 2021.

32 I.e., Expansion areas would represent a major discovery of parallel veins, similar to those mined historically in the Brunswick Mine, within the known mineralized system.

Mitigation Measure(s)

Implementation of the following mitigation measures would reduce the above impact to a *less-than-significant* level.

4.8-1(a) *The applicant shall submit a Notice of Intent (NOI) to the Central Valley Regional Water Quality Control Board (RWQCB) for coverage under the Limited Threat Discharge permit (General Order R5-2016-0076; NPDES No. CAG995002), at least six months prior to construction of the water treatment system; and the Notice of Applicability (NOA) shall be received before initial mine dewatering can begin and provided to Nevada County Planning Department. The NOI shall include evaluation of potential constituents of concern, including ammonia, arsenic, hexavalent chromium, iron, manganese, pH, total suspended solids, TDS, and cis-1,2-DCE, and demonstrate that water treatment plant (WTP) design shall successfully treat mine water to meet the water quality standards and treatment goals identified in the Limited Threat Discharge Order. Upon construction of the WTP, sampling shall be provided to the RWQCB demonstrating that the treated water meets the water quality standards and treatment goals specified in the Order. Ongoing monitoring of treated water shall occur at a location specified by the State prior to the point of discharge at South Fork Wolf Creek. The owner shall be required to submit quarterly monitoring reports to the State Regional Water Quality Control Board, demonstrating compliance with the maximum daily effluent limitations specified in Section V of the NPDES permit. The applicant shall submit to the County a copy of the NOI and evidence of the applicant's receipt of the NOA specified above prior to initial mine dewatering. The applicant shall submit copies of sampling and monitoring reports to the County at the time such reports are submitted to the RWQCB.*

The applicant shall also submit a Report of Waste Discharge (RoWD) and obtain Waste Discharge Requirements (WDRs) for use of the surface impoundment (i.e., Brunswick clay-lined pond) in the mine water treatment process. At a minimum, the liner of the clay-lined surface impoundment shall be upgraded to include a synthetic liner meeting the specifications in Title 27, Section 22490(f), of the California Code of Regulations. Prior to initial mine dewatering, the applicant shall submit to the Nevada County Planning Department a copy of the RoWD and evidence of the applicant's receipt of WDRs, as well as evidence of the completion of modifications to the clay-lined pond in compliance with the requirements.

4.8-1(b) *Prior to commencement of construction activities, the applicant shall submit a Notice of Intent (NOI) to the Central Valley RWQCB for coverage under the Construction General Permit applicable for any site on which construction is to occur and prepare a Construction Stormwater Pollution Prevention Plan (C-SWPPP). The applicant shall submit a copy of the NOI and C-SWPPP to the to the Nevada County Planning Department prior to the initiation of construction activities at a given site. C-SWPPP(s)* *shall be maintained and all BMPs and reporting requirements complied with until such time as terminated as a result of the completion of construction and permanent site stabilization or until an Industrial SWPPP becomes applicable to the site pursuant to Mitigation Measure 4.8-1(c).*

4.8-1(c) *Prior to commencement of operations at the Brunswick Industrial Site, the applicant shall submit a Notice of Intent (NOI) to the Central Valley RWQCB for coverage under the Industrial General Permit for the Brunswick Industrial Site and prepare an Industrial Stormwater Pollution Prevention Plan (I-SWPPP). The applicant shall submit a copy of the NOI and I-SWPPP to the to the Nevada County Planning Department prior to termination of the C-SWPPP.*

4.8-1(d) *Prior to placement of CPB in the mine, the applicant shall conduct strength, rheological, and geochemical testing using the final CPB formulation in order to confirm that no constituents (e.g., pH values or chromium) release above water quality standards from the final selected CPB formulation, as a result of the binder composition or the interaction between the binder and the tailings material. The applicant shall submit a RoWD to the Central Valley RWQCB for the use of CPB at least six months prior to the proposed initial use of CPB. The WDR permit shall be received by the applicant prior to initiating any mine backfilling using CPB. The applicant shall submit to the Nevada County Planning Department a copy of the RoWD and evidence of the applicant's receipt of WDRs prior to the use of CPB.*

4.8-1(e) *The applicant shall submit a RoWD and obtain WDRs from the Central Valley RWQCB for construction of the engineered fill areas. The WDR permit shall be received by the applicant prior to initiating any engineered fill placement activities at the Centennial or Brunswick Industrial Sites. Proof of coverage shall be provided to the Nevada County Public Works Department. As part of this process, the RWQCB will determine the appropriate mining waste classification for the proposed engineered fill, and will consider the following factors: (1) whether the waste contains hazardous constituents only at low concentrations; (2) whether the waste has no or low acid generating potential; and (3) whether, because of its intrinsic properties, the waste is readily containable by less stringent measures. The engineered fill areas shall be constructed in accordance with the Title 27 specifications, pursuant to the mining waste classification determined by the RWQCB. The applicant shall submit to the Nevada County Planning Department a copy of the RoWD and evidence of the applicant's receipt of WDRs prior to the placement of fill or fill site preparation disturbance at the Brunswick Industrial Site and Centennial Industrial Site.*

4.8-2 Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin. Based on the analysis below, with the implementation of mitigation the impact is *less than significant*.

The project site is not located within a groundwater basin that has been identified by DWR, and the nearest groundwater basin is located more than 15 miles to the west. Sustainable groundwater management programs must be implemented in groundwater basins that DWR has designated as medium or high priority, or that exhibit critical conditions of overdraft. Thus, the project could not impede sustainable groundwater management within a groundwater basin, because no such basin exists in the project vicinity.

Groundwater is present within fractured bedrock throughout the region and there are numerous private supply wells in the area. The existing shafts act as passive wells such that groundwater in the fractures that intersect the shafts flows downward into the mine workings and eventually is discharged from the drains along Wolf Creek. The current inflow of water into and out of the mine workings is approximately 60 gpm to 70 gpm. As shown in Figure 4.8-8, the inflow of groundwater into the shafts creates a small amount of drawdown in the groundwater surface in areas overlying the underground mine workings. Under existing conditions, the effect of this drawdown is limited to the East Bennett Road area.

Before exploration and mining can proceed, the water within the underground workings must be removed. Removal of the static water within the flooded mine workings is referred to as the "initial dewatering". As the water level in the mine is lowered during the initial dewatering, groundwater would flow into the mine workings through fractures and contribute to the volume of water that must be pumped during the initial period. Thus, the initial dewatering rate, reported in gpm, is a combination of removal of the static water and removal of groundwater that flows into the newly-dewatered mine workings. Once the initial dewatering is completed, continued pumping is necessary to remove the groundwater that would constantly flow into the mine through fractures within the bedrock and maintain a dry mine. For the purposes of this analysis, this is referred to as "maintenance dewatering". The estimated maintenance dewatering rate for the combined and expanded mines (i.e., the overall Idaho-Maryland mine including the Brunswick underground workings) prior to mine closure around 1955 is reported to have ranged from 500 gpm to 1,200 gpm seasonally, with an average of approximately 850 gpm.[33] The groundwater flow model prepared by Itasca predicts that the maximum and the stable min-inflow rates are approximately 1,100 and 900 gpm, respectively, based on the future mine plan the Rise provided.

As dewatering begins at the initial rate of up to 2,500 gpm (5.6 cfs), water from the surrounding fractured bedrock would also flow into the mine workings at approximately 850 gpm. Thus, the net dewatering rate would be approximately 1,650 gpm (2,500 gpm outflow/pumping – 850 gpm inflow). At this net initial dewatering rate, it would take 162

[33] EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project* [pg. 72]. February 2021.

days to dewater the underground mine workings. After that time, pumping of groundwater that seeps into the mine workings would continue at the inflow rate averaging 850 gpm.

As dewatering occurs, the water level within the underground workings would decrease from its current depth of approximately 250 feet bgs down to the maximum depth of the New Brunswick shaft at about 3,460 feet bgs. These depths are equivalent to elevations of approximately 2,500 feet msl and -700 feet msl, respectively. Thus, the water level within the mine workings would eventually decrease as much as 3,200 feet due to the project. As previously discussed, the transmissivity of the fractured bedrock decreases by several orders of magnitude at deeper depths, due to a reduction in the number of fractures and a decrease in the width of the fracture openings caused by increased lithostatic pressures at depth. As a result, dewatering of deeper tunnels and drifts would have less impact on groundwater levels in the fractured bedrock than would dewatering of shallower mine workings.

Dewatering Effects in East Bennett Area

A substantial number of underground mine workings exist within the East Bennett area. Figure 4.8-10 shows the mine workings within 600 feet of the ground surface. The shallower (within 600 feet of ground surface) workings are concentrated in the Brunswick Mine area, the Union Hill Mine area, and between the East Eureka Shaft and the Idaho Shaft in the Idaho #1 mine area near Wolf Creek. Based on historical accounts of dewatering, it appears that approximately two-thirds of the maintenance dewatering would come from the Brunswick Mine area, while one-third of the maintenance dewatering would come from the Eureka-Idaho-Maryland Mine area. In addition, based on the variation in the transmissivity and hydraulic conductivity of the fractured bedrock, 99 percent of groundwater inflow would occur within 550 feet of the ground surface, as previously discussed.

Based on the fractured bedrock aquifer properties and the maintenance dewatering rates, it is anticipated that the drawdown near the mine area would cause the water levels in several of the wells in the East Bennett area to be affected.

The range of the drawdown and the effect on the well would vary depending on well depth, distance from the mine workings, and the current well productivity (e.g., pumping rate in gpm).[34] Figure 4.8-11 shows the modeled drawdown that is predicted to occur at the end of the proposed mining period under the modeled Base-Case scenario (2045). The proposed mining plan, or "Base-Case" scenario evaluated by Itasca represents the exploration target over a 25-year period based on historic mapping and drill core sampling conducted to date.

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34 The water levels in the private domestic wells have seasonal fluctuations that may range from 10 feet to 50 feet between wet and dry seasons of the year but remain relatively consistent from year to year within each individual well. During the monitoring period, several years had below normal rainfall (2001,2004, and 2007), multiple years had above normal rainfall (1995–1998 and 2006), and several years had near normal rainfall (1999, 2000, 2002, 2003, and 2005). Despite large variations in annual rainfall from year to year, the seasonal water-level cycles in individual wells remain consistent and the overall water levels for each well do not fluctuate based on wet or dry climatic cycles.

Figure 4.8-10
Existing Mine Workings within 600 Feet of Ground Surface (Where 99% of Groundwater Inflow into the Mine is estimate to occur)

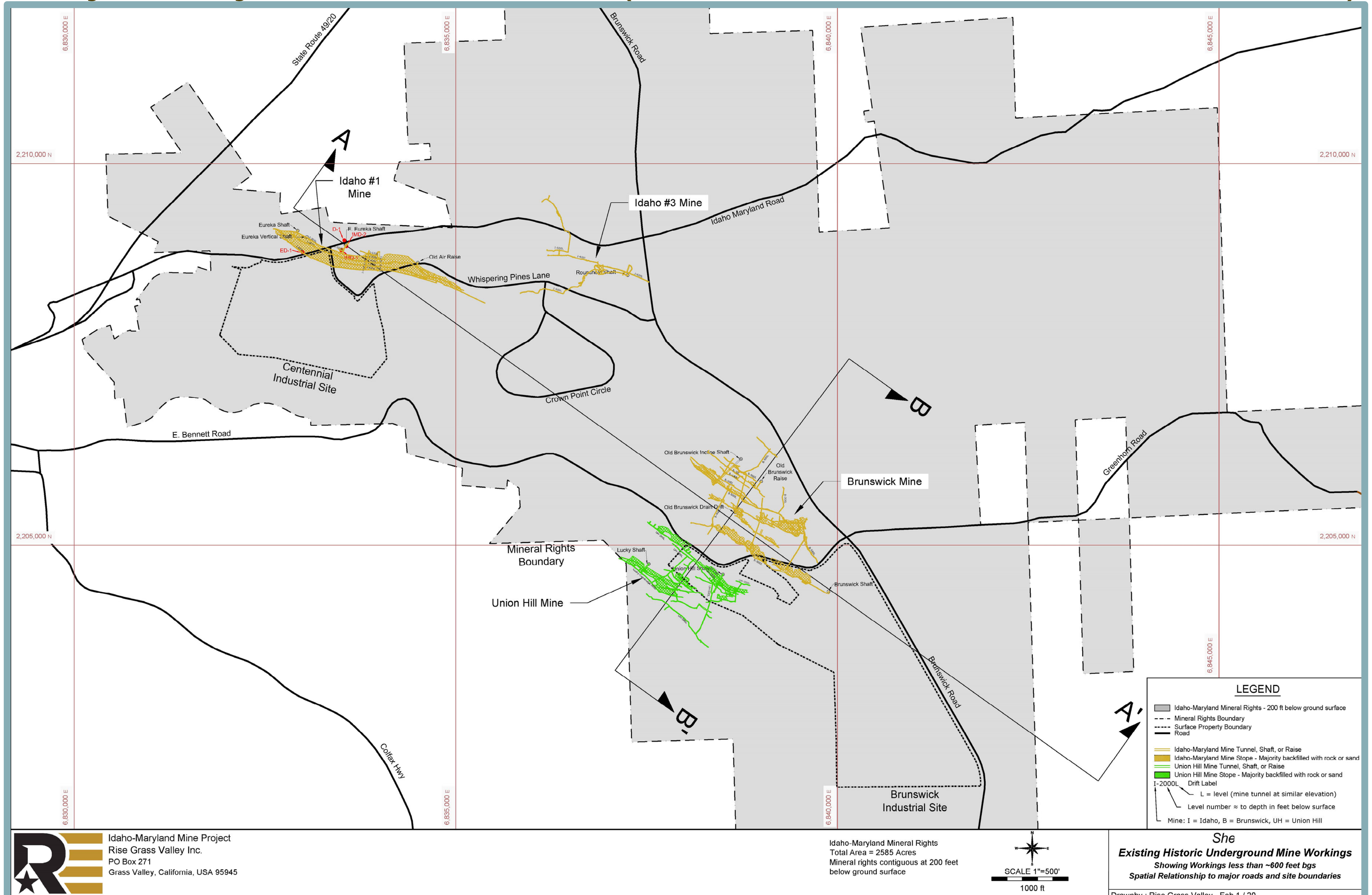
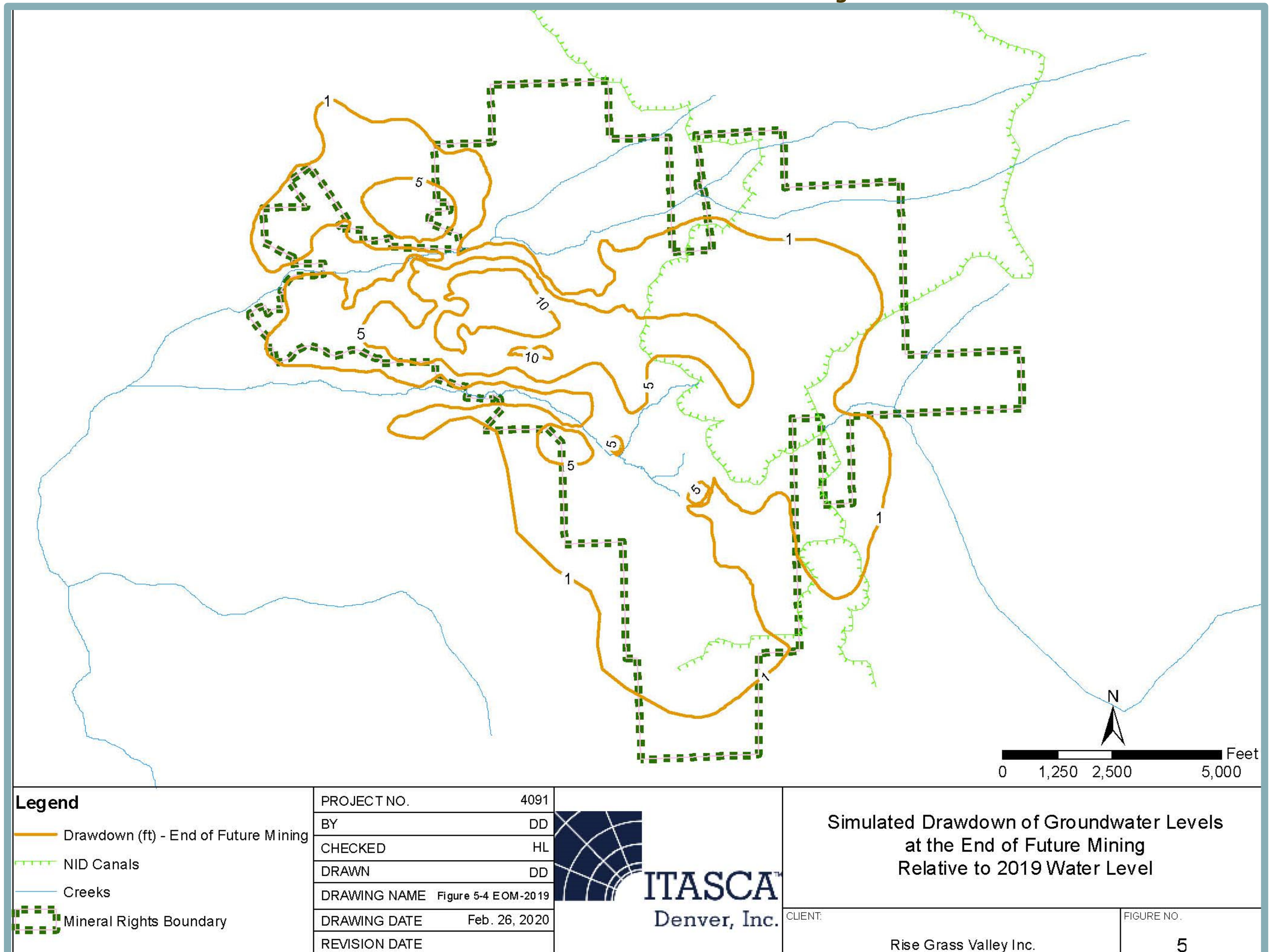


Figure 4.8-11
Simulated Drawdown of Groundwater Levels at End of Future Mining Relative to 2019 Water Level



The predicted drawdowns shown in Figure 4.8-11 are those that would occur in addition to the existing drawdown due to groundwater inflow to the mine under existing conditions, as previously discussed and shown in Figure 4.8-8. As shown in the figure, the drawdowns of the water table are generally within the mineral rights boundary. This is due to the low-*K* rocks where the deep mining would occur

Throughout the East Bennett area, the predicted drawdowns range from approximately five to 10 feet. Table 4.8-3 lists the known wells in the East Bennett area (including the Bennett Industrial area), along with the surface elevation, well depth, well yield, and water column height. Table 4.8-3 also specifies the predicted drawdown from the Itasca (2020b) model for each well, under the base case scenario and maximum drawdown under the most sensitive case. The predicted drawdown ranges from one foot to 10 feet in the East Bennett area, or from less than one percent of the total water column height to 40 percent of the total water column height.[35] It is also reiterated that backfilling of the mined areas with CPB was not simulated in the model. Based on Itasca's other project experience, the effect of CPB backfilling would likely reduce the amount of groundwater seepage into the underground mine workings. As such, Itasca's analysis may overestimate the amount of groundwater inflows and drawdowns.

Importantly, Itasca's groundwater modelling accounts for continual groundwater inflow into the underground mine workings (i.e., maintenance dewatering) as well as recharge into the fractured bedrock system, such that the groundwater drawdown levels shown in Figure 4.8-11 generally reflect a new state of equilibrium after initial dewatering of the mine. Further, the modelling shows that the new equilibrium is little affected by changes in the amount of recharge. For example, Itasca's Scenario 5 shows that the simulated groundwater inflows to the mine workings would decrease by approximately three percent to 870 gpm if the recharge rate in the model domain is decreased by 50 percent from average observed recharge for the area. The extent of the five-foot drawdown isopleth is larger than in the Base-Case Scenario, as decreased recharge impacts the shallow water-bearing zones more than the deep zone; however, the five-foot drawdown isopleth is generally still within the mineral-rights boundary.

Drawdowns within wells completed in unconfined aquifer conditions are sensitive to the amount of drawdown that occurs as a percent of the total water column. This sensitivity is due to the reduction in the effective transmissivity that occurs as the height of the water column decreases in unconfined aquifers. EMKO's analysis indicates that reductions in the water column of 20 percent to 40 percent could cause the production rate of the well to become unstable by incrementally decreasing the water column much more than would occur under existing conditions. For EMKO's analysis, a 100 percent factor of safety is applied to the potential reduction resulting in unstable conditions, such that a criterion of 10 percent of the water column is used to define wells that might be substantially affected by dewatering of the underground mine workings. Of the approximate 36 wells in the East Bennett and Bennett Industrial areas, there are three wells that have at least 10 percent reduction in the water column, under either the base case or most sensitive case, as highlighted in yellow in Table 4.8-3.

[35] However, the maximum predicted drawdown does not necessarily correlate with the highest percent of the total water column because wells with smaller water columns may have a higher percent effect than wells with large water columns.

Table 4.8-3 Well Parameters and Potential Effects of Mine Dewatering, East Bennett Area										
Rise Well ID	**1995 EIR Well ID**	**General Location**	**Elevation (ft) (Top of Well)**	**Well Depth (ft)**	**Well Yield (gal/min)**	**Water Column (ft)**	**Drawdown - Basecase (ft)**	**Drawdown - Max Sensitivity (ft)**	**Drawdown - Basecase (%)**	**Drawdown - Sensitivity Max (%)**
1		1 - E. Bennett Area	2,747	420	0.5	400	8	8	2.0%	2.0%
2	WS33	1 - E. Bennett Area	2,690	700	3	625	7	8	1.1%	1.3%
5	WS30	1 - E. Bennett Area	2,644	230	10	155	5	5	3.2%	3.2%
6	WS31	1 - E. Bennett Area	2,685	320	3	215	8	8	3.7%	3.7%
7	WS80	1 - E. Bennett Area	2,797	100	30	17.4	7	7	40.2%	40.2%
8	WS45	1 - E. Bennett Area	2,769	300	6.5	218	5	6	2.3%	2.8%
9	WS32	1 - E. Bennett Area	2,747	400	6	295	9	9	3.1%	3.1%
15		1 - E. Bennett Area	2,829	400	0	315	4	4	1.3%	1.3%
16		1 - E. Bennett Area	2,826	140	30	80	5	6	6.3%	7.5%
17		1 - E. Bennett Area	2,684	150	20	70	1	1	1.4%	1.4%
18		1a - Idaho Maryland Area	2,530	560	3	555	2	2	0.4%	0.4%
19	WS122	1 - E. Bennett Area	2,779	220	40	90	2	4	2.2%	4.4%
	WS116	1 - E. Bennett Area	2700	208	15	125.4	2	3	1.6%	2.4%

(Continued on next page)

Table 4.8-3 **Well Parameters and Potential Effects of Mine Dewatering, East Bennett Area**										
Rise Well ID	**1995 EIR Well ID**	**General Location**	**Elevation (ft) (Top of Well)**	**Well Depth (ft)**	**Well Yield (gal/min)**	**Water Column (ft)**	**Drawdown - Basecase (ft)**	**Drawdown - Max Sensitivity (ft)**	**Drawdown - Basecase (%)**	**Drawdown - Sensitivity Max (%)**
	WS113	1 - E. Bennett Area	2645	55	ND	54.5	1	1	1.8%	1.8%
	WS114	1 - E. Bennett Area	2710	208	ND	125.4	1	3	0.8%	2.4%
	WS119	1 - E. Bennett Area	2780	145	15	60	3	5	5.0%	8.3%
	WS44	1 - E. Bennett Area	2810	225	4.5	42	3	5	7.1%	11.9%
	WS29	1 - E. Bennett Area	2788	425	10	342.4	5	10	1.5%	2.9%
	WS233	1 - E. Bennett Area	2640	90	ND	56.7	1	1	1.8%	1.8%
	WS235	1 - E. Bennett Area	2805	200	20	81	2	4	2.5%	4.9%
	WS236	1 - E. Bennett Area	2635	199	ND	168	1	1	0.6%	0.6%
	WS240	1 - E. Bennett Area	2650	199	ND	164	4	5	2.4%	3.0%
	WS242	1 - E. Bennett Area	2695	155	15	97	4	4	4.1%	4.1%
	WS121	1 - E. Bennett Area	2690	155	15	72.4	1	3	1.4%	4.1%
	WS201	1 - E. Bennett Area	2860	425	3.5	151	5	5	3.3%	3.3%
	WS216	1 - E. Bennett Area	2770	199	ND	117	8	8	6.8%	6.8%

(Continued on next page)

Table 4.8-3
Well Parameters and Potential Effects of Mine Dewatering, East Bennett Area

Rise Well ID	1995 EIR Well ID	General Location	Elevation (ft) (Top of Well)	Well Depth (ft)	Well Yield (gal/min)	Water Column (ft)	Drawdown - Basecase (ft)	Drawdown - Max Sensitivity (ft)	Drawdown - Basecase (%)	Drawdown - Sensitivity Max (%)
	WS90	1 - E. Bennett Area	2590	72	ND	39.75	2	2	5.0%	5.0%
	WS124	1 - E. Bennett Area	2730	208	4	103	10	10	9.7%	9.7%
	WS125	1 - E. Bennett Area	2670	120	13	53	5	5	9.4%	9.4%
	WS243	1 - E. Bennett Area	2640	131	20	49	5	5	10.2%	10.2%
	WS118	1 - E. Bennett Area	2665	200	5	115	6	6	5.2%	5.2%
	WS237	1 - E. Bennett Area	2620	200	5	126	1	2	0.8%	1.6%
	WS110	1 - E. Bennett Area	2830	208	9	125.4	6	6	4.8%	4.8%
129		2 - E. Bennett Industrial Area	2515	140	50	130	1	1	0.8%	0.8%
130	WS95	2 - E. Bennett Industrial Area	2510	100	8	90	1	1	1.1%	1.1%
135		2 - E. Bennett Industrial Area	2535	200	6	180	2	2	1.1%	1.1%

Notes:

- Well Parameter Data Compiled from Well Completion Reports
- Bright yellow highlight indicates drawdown percentages greater than 10 percent of the existing water column in the well
- Pale yellow highlight indicates drawdown percentages between 7.5 percent and 10 percent of the existing water column in the well
- See discussion in Section 4.2.1 of Emko's *Groundwater Hydrology and Water Quality Analysis Report* for explanation of the effects of these drawdown percentages
- Downloaded from California Department of Water Resources Database: https://data.cnra.ca.gov/dataset/well-completion-reports

In addition, four wells are predicted to have a reduction in the water column of between 7.5 percent and 10 percent. These four wells are highlighted in pale yellow in Table 4.8-3, to identify wells that could be marginally affected. Figure 4.8-12 shows locations of wells in the East Bennett and Bennett Industrial areas, including affected wells and marginally affected wells.

It is also noted that public concerns have been expressed regarding a scenario in which mining operations encounter a fractured bedrock aquifer and drain out the water, thus, impacting groundwater supply wells. Fractures or geologic discontinuities decrease with depth due to the weight of overlying geologic materials. The mining would occur in the deeper geologic units where the fractures, if present, are closed or have smaller apertures, which would not transmit significant quantities of water. The scenarios addressed in the Itasca modeling cover a wide range of probable situations that may be encountered and the potential impacts to groundwater levels.

In other areas around the perimeter of the mine workings, the projected maximum drawdown in private wells is less than two feet. In all cases, based on the information available through the well completion reports, the maximum potential additional drawdown in the perimeter areas is less than 10 percent of the available water column in individual wells. The maximum drawdown is also substantially less than the normal seasonal fluctuation in the groundwater levels of 10 feet to 30 feet or more.

Thus, in the perimeter areas and including a safety factor of 100 percent in calculations, the project would not have any significant impact on groundwater supplies.[36]

Potential Future Exploration and Mining

Additional, deeper exploration and mining may occur as part of the project within the mineral rights boundary owned by Rise. The Itasca (2020b) finite element 3-D computer modelling was used to assess a range of possible future mining scenarios. The future scenarios would extend from 26 years to 60 years after project approval, if they were implemented. The majority of the potential future mining would occur at depths greater than 1,000 feet bgs, or approximately 1,600 feet msl.

At these depths, the hydraulic conductivity and transmissivity of the fractured bedrock is very low, and would not result in substantial additional dewatering (Itasca, 2020b). With only one minor exception, the predicted drawdowns from the potential future mining fall within the area of the maximum drawdowns under the worst-case sensitivity analysis for the Base-Case. In the one area that falls outside of the maximum sensitivity contours (North Brunswick rea), the additional drawdown due to future mining ranges from zero to one foot, or no more than 1.7 percent of the total water column height in the four wells in the area, which would not be considered significant.

The model simulations of the rate of groundwater inflow into the mine generally stabilize over the last 10 to 15 years of the 65-year model analysis[37]. This stabilization is because the additional mining occurring after 50 years is primarily progressing deeper (see Figure 4.8-13).

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36 EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project* [pg. 119]. February 2021.

37 See Itaska Report, Figure 5-11.

Figure 4.8-12
Well Locations and Itasca Drawdown

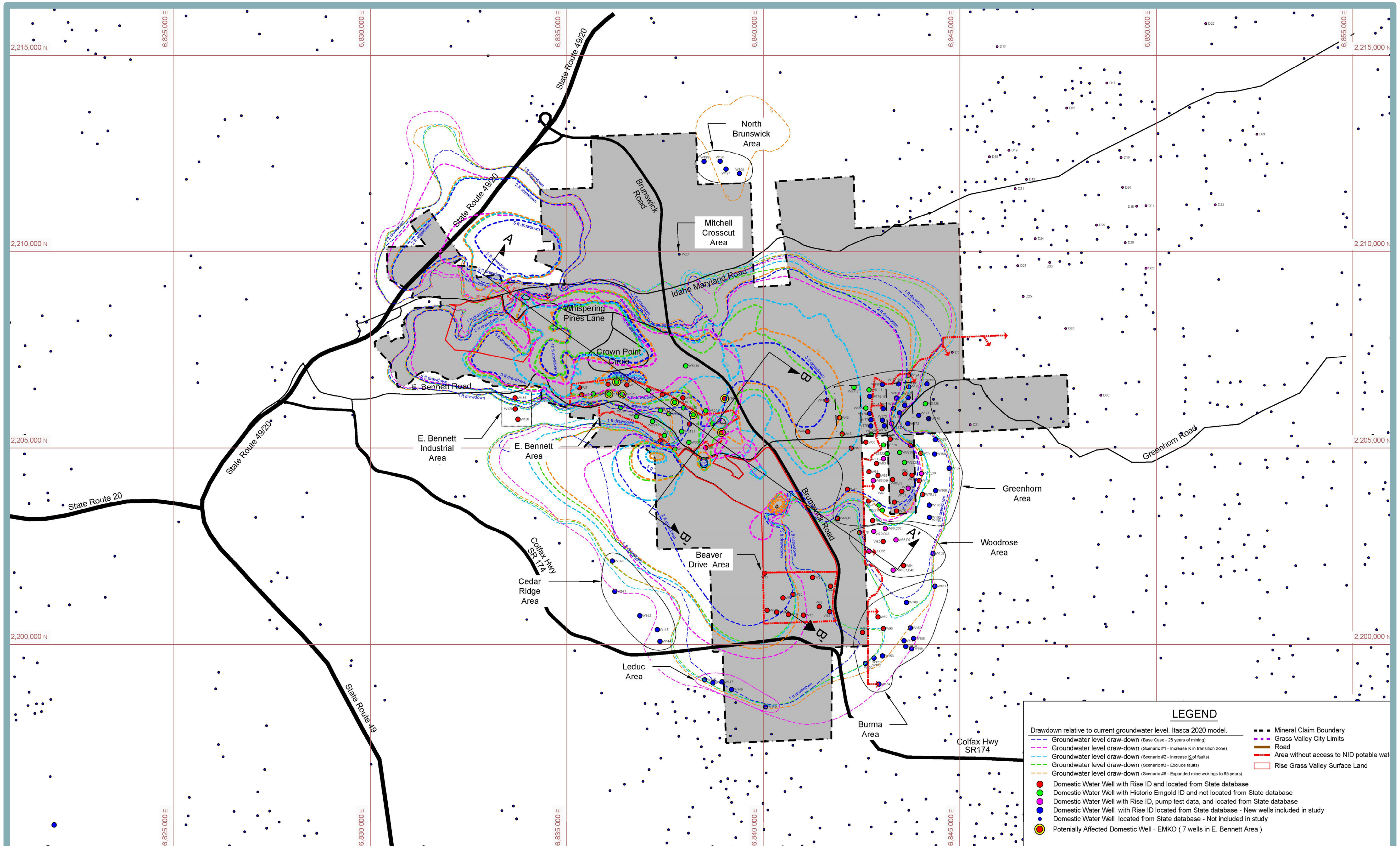
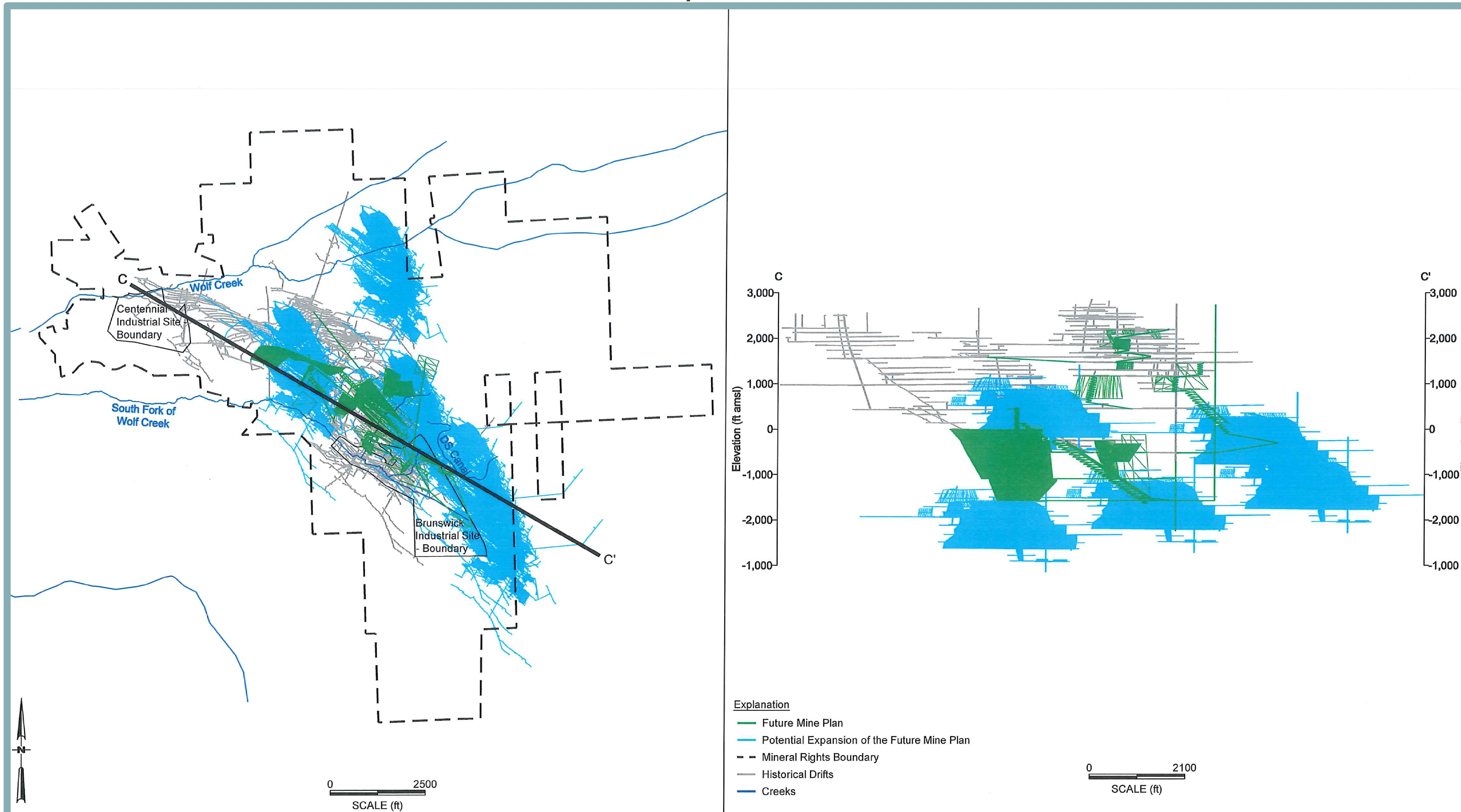


Figure 4.8-13
Potential Expansion of Future Mine



PROJECT NO.	4091-19
BY	DD
CHECKED	HL
DRAWN	RJN
DRAWING NAME	MINEPLAN
DRAWING DATE	27 FEB 2020
REVISION DATE	

ITASCA™ Denver, Inc.

Plan View and Cross-Section View of the Potential Expansion of the Future Mine Plan

CLIENT: Rise Grass Valley Inc.

The deeper mining would be occurring in areas where the hydraulic conductivity of the fractured bedrock, and thus the incremental additional volume of groundwater entering the mine, would be decreasing by several orders of magnitude compared to those at shallower depths where mining had been completed. Thus, any additional mining beyond year 65 would not measurably increase the rate of groundwater pumped from the mine and would not affect groundwater levels in wells in the area.

Post-Mining/Reclamation Groundwater Conditions

Once mining is completed, dewatering would cease and groundwater would begin to accumulate again within the underground mine workings. Given that the drains that currently exist along Wolf Creek would not be sealed while the mine is dewatered, water from within the mine would begin to discharge from those drains again once the water level in the mine reaches an elevation of approximately 2,500 feet msl. While substantial additional underground workings are anticipated to be constructed as part of the project, these new workings will be below 2,500 feet msl. Thus, once the mine fills with water again, the additional underground workings would be below the water level and would not contribute inflow into the mine as a passive "well". As a result, the rate of drainage would be expected to be the same as the current rate at which the drains flow, which is approximately 60 to 70 gpm, or 0.13 cfs to 0.16 cfs. Groundwater levels in the wells would recover to their approximate pre-project levels.

Groundwater Recharge

The development of new operating facilities at the New Brunswick shaft, the water treatment system, and fill areas would occur on land that has already been disturbed and partially paved for previous industrial activities on the mining site and the former Mill property. Therefore, the actions that would occur as part of the project in these areas would not result in the compaction of soils or installation of impermeable surfaces (e.g., pavement) in areas where those effects have not already occurred due to past activities. Installation of the potable water line would occur within East Bennett Road, consisting of paved, disturbed, and previously compacted soils due to the long history public right-of-way uses along the potable water line route. Thus, the project would not result in any appreciable new areas of compacted soils or impermeable surfaces that could substantially restrict or otherwise interfere with groundwater recharge.

Baseflow in South Fork Wolf Creek and Wolf Creek

Numerical modeling also indicates that dewatering could lower groundwater levels sufficiently to reduce the base flow in South Fork Wolf Creek by as much as 0.1 cfs, while dry season base flows in South Fork Wolf Creek have been measured at rates less than one cfs. However, the water that is pumped from the mine would be treated and then discharged to South Fork Wolf Creek at rates ranging from 5.6 cfs during initial dewatering to 1.9 cfs during maintenance dewatering. Thus, lowering of the groundwater table would not result in a reduction in base flows within South Fork Wolf Creek as a result of the project. Stream gage measurements conducted by Balance throughout 2020 and into 2021 confirm that any effects of dewatering on the base flow rate in South Fork Wolf Creek would be inconsequential because the proposed treated water discharge rate to the creek is much larger than the base flow rate and the modeled reduction in base flow.

Dewatering of the mine would also eliminate seepage from the drains and base flow in Wolf Creek. The base flow within Wolf Creek is approximately 25 cfs to 30 cfs. However, NID releases an average of approximately 35 cfs from the DS Canal to Wolf Creek on an annual basis. Itasca estimates that mine dewatering would reduce base flow in Wolf Creek by 0.75 cfs due to reduction in groundwater discharge. Dewatering would also eliminate flow from the drains, which ranges from 60 gpm to 125 gpm (0.13 cfs to 0.28 cfs). It is anticipated that surface water from Wolf Creek would be used for temporary dust control water for the Centennial Industrial Site during engineered fill placement, requiring approximately 125 gpm, or 0.28 cfs. Thus, the total reduction in base flow to Wolf Creek could be as much as 1.3 cfs. This flow reduction is minimal and would be barely perceptible compared to the base flow rate of 25 cfs to 30 cfs, the NID releases averaging 35 cfs, and winter storm flows from the upstream watershed. Although the number of measurements is limited, the observed baseflow in Wolf Creek at the Centennial Drive bridge ranges from about 40 to 100 times greater than the projected decrease in baseflow of 0.75 cfs.

Conclusion

The proposed mining operations could result in adverse effects to seven domestic water supply wells in the East Bennett area during the life of the mining operation. After reclamation, when the mine is allowed to flood, groundwater levels in the wells would recover to their approximate pre-project levels. As discussed in the Project Description chapter, pursuant to Nevada County General Plan Policy 17.12, the project would address this by installing a potable water supply line in East Bennett Road and providing individual well owners with a connection to the potable water line. While only seven wells are projected to be adversely affected, the applicant has prepared a Well Mitigation Plan (February 2, 2021) that would connect up to 30 properties in the East Bennett area to the NID potable water system. The properties would have the option to be connected to the potable water system prior to commencement of initial mine dewatering. The Well Mitigation Plan will obligate the applicant to fund the engineering, permitting, construction, and installation of main water piping and water meters to each property, as well as NID water charges for ongoing water supply. Property owners of vacant land or who are currently supplied by NID would not be eligible for reimbursement of NID water charges.

In addition, consistent with Itacsa's recommendations, a rigorous GMP will be implemented by the applicant to assess how the hydrogeologic system responds to mining, whether the measured results are within those modeled under the various scenarios discussed above. The GMP will select locations of the monitoring wells in order to provide spatial coverage throughout the project and adjacent areas. Monitoring well locations will range from within areas of higher predicted drawdowns to outlying areas with minimal predicted drawdowns. Monitoring wells in closer proximity to the mine will generally experience drawdowns before wells farther away. The measurements of water levels in the monitoring wells can be used to verify the groundwater drawdowns as dewatering progresses to provide sufficient time to predict adverse impacts to domestic wells before they occur so that appropriate mitigation measures can be implemented.

Without implementation of a groundwater monitoring program and Well Mitigation Plan, the project could result in a ***significant*** impact to groundwater supplies.

Mitigation Measure(s)

Implementation of the following mitigation measures would reduce the above impact to a *less-than-significant* level.

4.8-2(a) *The project applicant shall implement the Groundwater Monitoring Plan (GMP) prepared by Itasca Denver, Inc. (February 2021), as approved by the County. Implementation of the GMP shall be initiated prior to the dewatering of the mine and on an ongoing basis. Pursuant to the GMP, a network of monitoring wells shall be installed to the satisfaction of the Nevada County Environmental Health Department. Prior to construction of any monitoring wells within the County or City right-of-way, the applicant shall obtain an encroachment permit from the Public Works Department of the respective agency. Groundwater-level information shall be obtained from the project groundwater monitoring wells and collected on a quarterly basis, and submitted in report form to the Nevada County Environmental Health Department, and used to generate the following information:*

1) *Water-level monitoring data for a minimum of 12 months before commencement of dewatering of the mine.*
2) *Water-level hydrographs for each well showing the water-level variations over the monitoring period and a comprehensive well hydrograph showing long-term water levels for each well over the entire monitoring period.*
3) *Potentiometric-surface contour maps showing the groundwater elevations across the site. These may be produced for a subset of the shallow wells and a second subset for the deeper wells if it is judged that the shallow and deep well systems are in separate water-bearing zones. Alternatively, a combined potentiometric map that includes both shallow and deep well pairs may be constructed if it is judged that the shallow and deep wells are installed within the same water-bearing zone.*
4) *A projected water-level impact assessment for individual domestic wells shall be performed once dewatering of the underground mine workings commences, based on responses of the measured groundwater levels of the project monitoring wells. The projected groundwater drawdown shall be estimated for each domestic well in the project area. This impact assessment shall be performed by tabulating the variation of the measured water levels from the project monitoring wells over the monitoring period and during the dewatering of the underground mine workings and mining operations. For each domestic well, a projected and seasonally averaged water level shall be estimated based on the domestic well location and the background potentiometric conditions, which will serve as a baseline groundwater level and shall be developed prior to the initiation of dewatering of the underground mine workings.*

4.8-2(b) *If, based on the GMP, it is determined that mining operations are resulting in a significant impact to any well(s) (i.e., a 10 percent or greater reduction of the water column of any well), pursuant to Nevada County General Plan Policy 17.12, the project applicant shall be responsible for providing a comparable supply of water to such homes or businesses whose wells are significantly impacted, and if necessary, providing an immediate water supply until the source of the problem is determined and rectified. The comparable supply of water shall be provided to the satisfaction of the Nevada County Environmental Health Department. Such action could include extension of NID potable water or deepening of domestic water wells, in all cases paid for by the project applicant.*

4.8-2(c) *Prior to commencement of initial mine dewatering, the project applicant shall implement the Well Mitigation Plan (February 2, 2021, Rise Grass Valley, Inc.) by connecting 30 properties in the East Bennett area to the NID potable water system (see Figure 1 and Table 1 of the Well Mitigation Plan for specific property locations). The project applicant shall be responsible for fully funding the following for each property connection:*

1) *Engineering and Permitting*
2) *Construction of main water piping*
3) *Construction of service lateral piping*
4) *Installation of water meters at property line*
5) *Connection of water meters to house (If requested and authorized by property owner)*
6) *Closure of domestic water wells (If requested and authorized by property owner)*
7) *NID installation and capacity charges for a 5/8-inch meter connection.*
8) *Reimbursement for water charges, for monthly fixed service charges and use of up to 400 gallons per day, will continue until the sooner of the following occurs: 1) The property is sold by the owner after the NID connection is accomplished and paid for by Rise. 2) The property is annexed into the City of Grass Valley.*
9) *Of the 30 properties, it is anticipated that only APN 009-600-012 is not eligible for water cost reimbursement as it is currently vacant. Existing NID customers will not be eligible for reimbursement of NID water charges and will be confirmed through consultation with NID during the design process.*

Proof of satisfaction of this measure shall be provided to Nevada County Environmental Health Department for each property identified in the Well Mitigation Plan.

4.8-3 Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

i) Result in substantial erosion or siltation on- or off-site?
ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?
iii) Create or contribute to runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?
iv) Impede or redirect flood flows?

Based on the analysis below and with implementation of mitigation, the impact is *less than significant*.

Item 'i' pertains to substantial erosion or siltation on- or off-site. As discussed above, the proposed project's impacts associated with topsoil erosion related to grading and excavation activities are discussed in Chapter 4.6, Geology, Soils, and Mineral Resources, of this EIR, whereas the potential channel erosion effects of treated mine discharge in South Fork Wolf Creek are evaluated in this chapter in the following section.

Surface Water Runoff (items ii and iii)

Surface water runoff could be affected by the construction of buildings, pads, and other impermeable surfaces, by the placement of waste rock and tailings in and around the Brunswick and Centennial Industrial Sites, and by dewatering of the underground mine workings. In general, storm flows would be collected on-site by new storm drain systems and routed to proposed stormwater detention basins, which would be constructed as part of the project improvements for the Brunswick and Centennial Industrial Sites.

The fill areas at the Centennial Industrial Site and the Brunswick Industrial Site would be graded to minimize runoff. Stormwater conveyance channels would be constructed in accordance with Nevada County hydrology and hydraulics standards to convey the runoff from up to a 100-year storm event. Runoff from the fill areas would be conveyed to stormwater detention basins. The proposed detention basins at each site are intentionally located at the downstream toe of each engineered fill site, so that they may be constructed and made functional early in the process of the fill operations. Therefore, as the fill areas rise throughout the anticipated duration of this portion of the mining operation, flows would be directed to these facilities via the drainage pipes which proceed downhill from the surface of the fill, allowing the flows to be directed to the detention basins. These pipes in the proposed 3:1 slopes, at any given point in the process of placing the fills, would be extended up slope from the detention basins to the then current surface. Interceptor ditches and catchment sumps would be formed at the surface, and would be replaced periodically as the fill operation progress and the surface elevation rises. By this strategy, site drainage would continually be positively controlled throughout the process of the engineered fill placement operation.

The proposed detention basins would hold back the peak flows and release the water at a lower rate and at a later time than currently occurs from those site areas. As a result, the project would reduce peak storm flows in both Wolf Creek and South Fork Wolf Creek. The specific parameters and reductions in peak flows are discussed in the following sections.

Centennial Industrial Site

As previously discussed, the environmental baseline for the hydrology analysis of the Centennial Industrial Site is based on the existing conditions at the site and does not reflect the post-remediation condition that would exist following completion of the separate Centennial Industrial Site Clean-Up Project, as described in Section 1.3 of Chapter 1. The reason for this is the final surface topography and drainage conveyances will be subject to the California Department of Toxic Substances Control (DTSC) and County review and approval. The use of existing conditions at the Centennial Industrial Site for the hydrology analysis provides the most conservative approach for the drainage analysis, as discussed in Section 4.8-2, Existing Environmental Setting, of this chapter (see “Project Area Drainage” section).

Subsequent to remediation, as part of the proposed project improvements at the Centennial Industrial Site, a detention basin would be constructed at the downstream toe of the site, above Wolf Creek (see Figure 4.8-14). The detention basin is designed to contain stormwater runoff from the 100-year, 24-hour storm event and would have a surface area of 0.94-acre, a maximum depth of 7.7 feet, and a working volume of 6.2 acre-feet, with a minimum freeboard of 6.3 feet. The basin design incorporates an outlet structure connecting to an existing piped outfall into Wolf Creek, which would allow the pond to completely drain between storms (Nevada City Engineering, Inc., 2019). Table 4.8-4 shows the design peak flows from the outlet structure for the 10-year and 100-year storm events, compared to the existing runoff to Wolf Creek from the Centennial Industrial Site. The detention basin and outlet structure would reduce the peak discharge to Wolf Creek by 27 cfs for the 10-year storm and by 44 to 45 cfs for the 100-year storm.

Brunswick Industrial Site

At the Brunswick Industrial Site, a detention basin would be constructed at the downstream toe of the engineered fill placement slopes, above South Fork Wolf Creek (see Figure 4.8-15). The detention basin for the Brunswick Industrial Site is sized to detain storm flows to compensate for the quantity of treated mine water discharged to South Fork Wolf Creek, in addition to compensating for increased runoff from potential future industrial development of the site.[38]

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38 Nevada City Engineering, Inc. *Preliminary Drainage Analysis and Detention Basin Sizing for Centennial and Brunswick Industrial Sites* [pg. 2]. October 2019.

Figure 4.8-14
Centennial Industrial Site Post-Development Hydrology Map

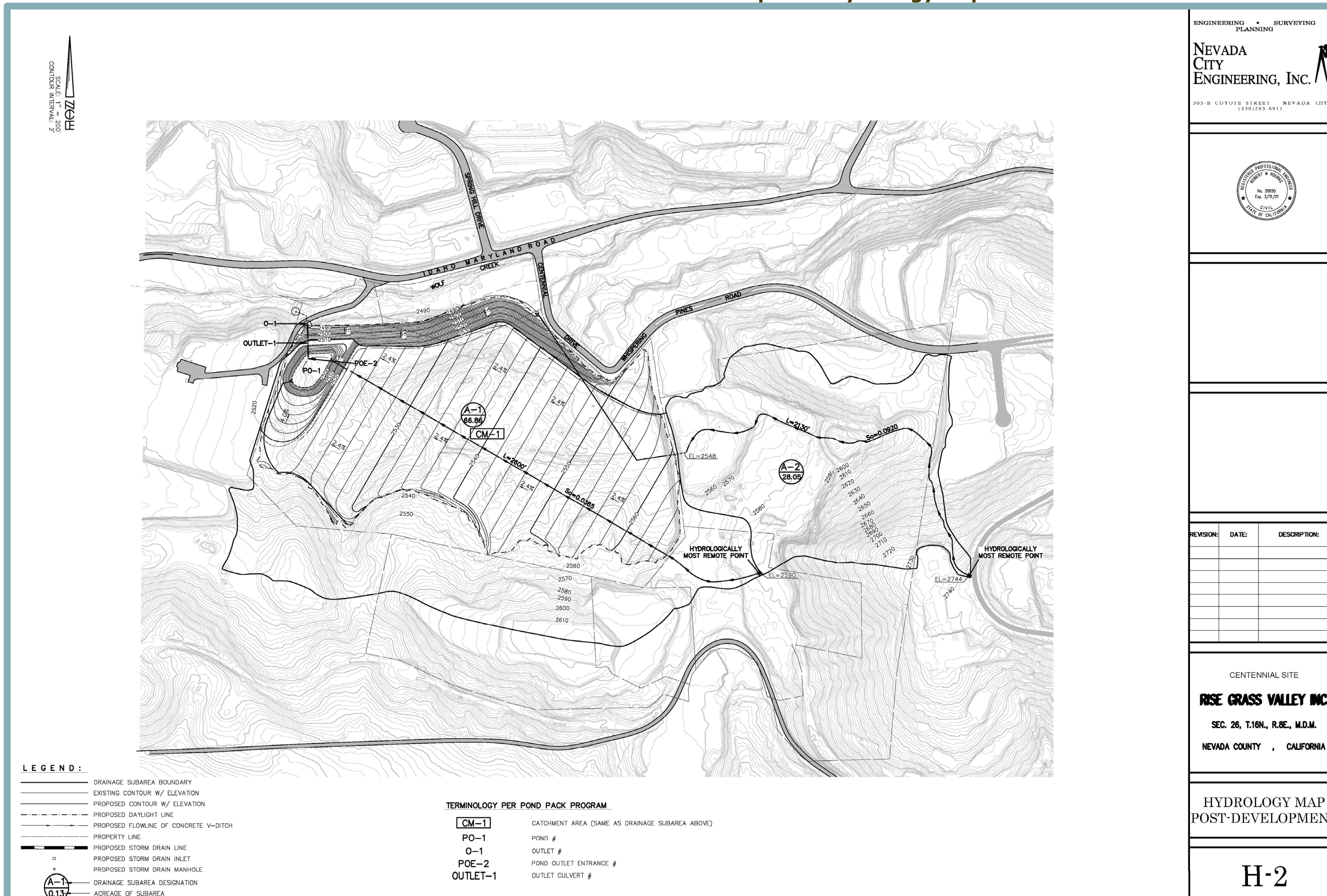

Figure 4.8-15
Brunswick Industrial Site Post-Development Hydrology Map

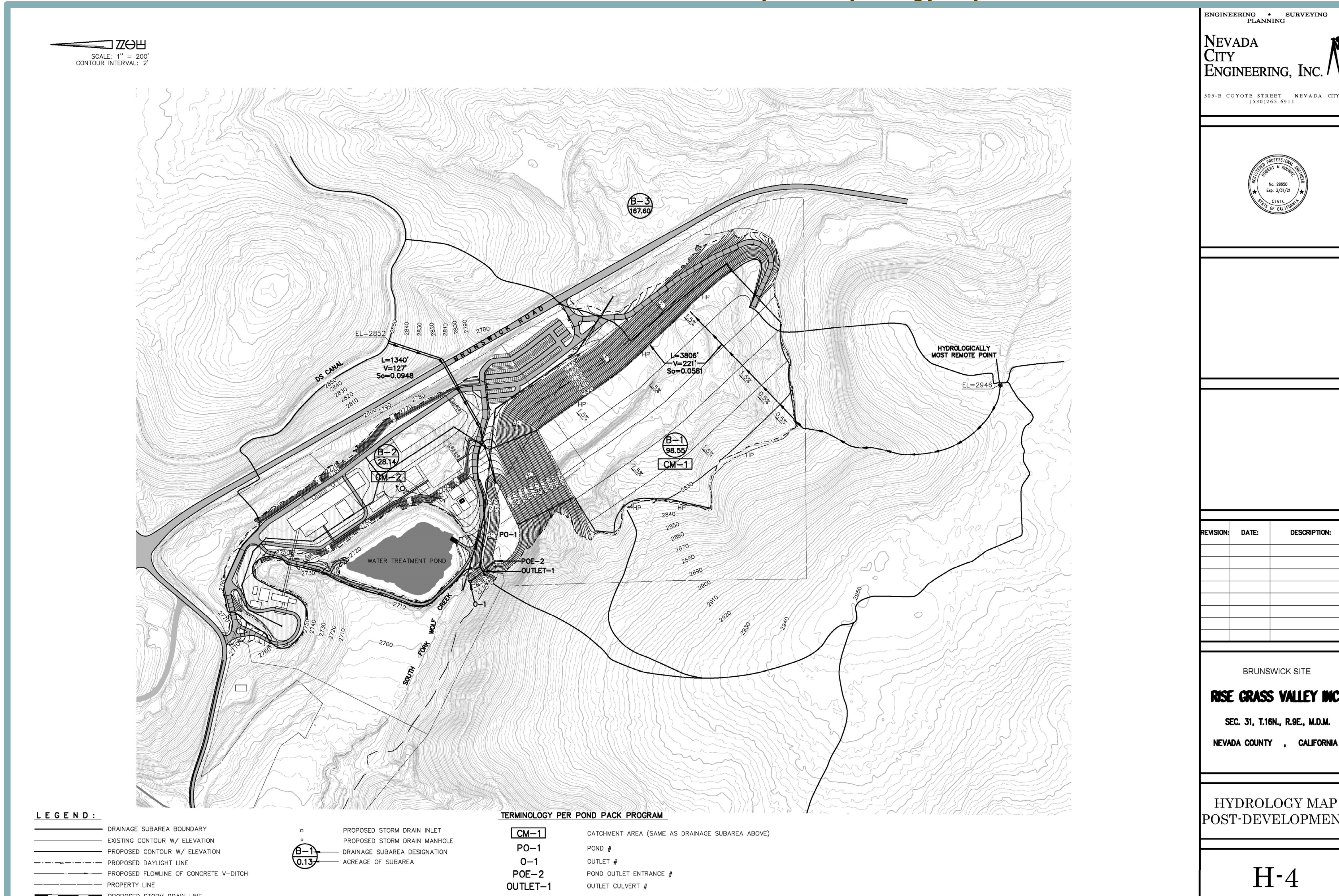

Table 4.8-4 Existing and Project Peak Flows from Industrial Site Areas			
Brunswick Industrial Site Storm Water Flows to South Fork Wolf Creek			
Return Period (years)	**Existing Peak Runoff (cfs)**	**Project Peak Runoff (cfs)**	**Reduction Due to Project (cfs)**
2	79	31	48
10	140	79	61
25	195	153	42
100	227	201	26
Centennial Industrial Site Storm Water Flows to Wolf Creek			
Return Period (years)	**Existing Peak Runoff (cfs)**	**Project Peak Runoff (cfs)**	**Reduction Due to Project (cfs)**
10	72	45	27
100	121	76	45

The hydrologic calculations and detention studies for both sites anticipate runoff at potential future industrial development levels, though industrial development is not proposed at this time, and separate environmental review and permitting through the County would be required prior to any on-site industrial development. Therefore, the sizing of the detention basins is conservative.

The detention basin would have a surface area of 1.45 acres, a maximum depth of 10.6 feet, and a working volume of 12.1 acre-feet with a minimum freeboard of 3.4 feet. The basin design incorporates an outlet structure that would allow the pond to completely drain between storms (Nevada City Engineering, Inc., 2019). Table 4.8-4 shows the design peak flows from the outlet structure for the two-year, 10-year, 25-year, and 100-year storm events, compared to the existing runoff to South Fork Wolf Creek from the same catchment areas. The detention basin and outlet structure reduce the peak discharge to South Fork Wolf Creek by over 48 cfs for the 2-year storm, by over 60 cfs for the 10-year storm, by over 40 cfs for the 25-year storm, and by over 25 cfs for the 100-year storm.

It is also noted that the deteriorated 48-inch buried culvert that runs underneath the Brunswick Industrial Site would be replaced and upgraded as part of the proposed project. South Fork Wolf Creek daylights from this existing 48-inch diameter culvert, which is approximately 1,600 feet long (RWQCB Order No. 88-185, December 18th, 1990). The 48-inch culvert is fed by surface drainage and road runoff on both the east and west sides of Brunswick Road. Additionally, perennial surface drainage from the west side of Brunswick Road drains north to the 48-inch culvert inlet. This drainage pattern would continue after implementation of the proposed project due to culvert replacement.

Clay-Lined Pond Capacity

For the dewatering operations, the water would initially be pumped to an existing clay-lined pond to the southeast of the shaft. The water would then be treated by a series of oxidation and filtration steps before being discharged. Based on a 2019 survey by Nevada City Engineering, Inc., the volume of the pond with two feet of freeboard below the elevation of the emergency overflow spillway is 23 acre-feet. The freeboard volume is 6.6 acre-feet. The spillway is also two feet below the lowest point on the berm surrounding the pond. At the maximum mine dewatering rate of 2,500 gpm, the pond has the capacity to hold the volume of water that would be dewatered during two days of pumping. At the maintenance dewatering rate of 850 gpm, the pond has the capacity to hold the volume of water that would be pumped over more than six days. The total runoff from the 6.4 acre watershed for the pond resulting from a 100-year, 24-hour storm would be approximately 5.7 acre-feet. Thus, the freeboard volume is more than adequate to retain the runoff from an extreme storm event. Overall, the existing clay-lined pond has more than adequate capacity to accommodate operational flexibilities for dewatering and water treatment, and to retain stormwater runoff from the area surrounding the pond.[39]

Impede or Redirect Flood Flows (item iv)

Placement and grading of materials to create the usable industrial areas would occur outside of any flood hazard zones. The dewatering discharge outfall would also be constructed in an area that is outside of a mapped flood hazard zone in South Fork Wolf Creek. The outfall, however, would be within waters of the U.S. so it would have to be constructed in accordance with the requirements of a CWA Section 404 permit from the Corps for dredge and fill activities within waters of the U.S. and a Fish and Game Code Section 1600 Streambed Alteration Agreement from the California Department of Fish and Wildlife (CDFW). A CWA Section 401 water quality certification would also be required from the RWQCB, in connection with the Corps' issuance of a CWA Section 404 permit. Under these permits, the outfall would need to be constructed in a manner that would not measurably reduce the capacity of the stream channel or flood plain of South Fork Wolf Creek. Therefore, the project would not impede or redirect flood flows.

Flows in South Fork Wolf Creek (item i)

After treatment, the water pumped from the mine would be discharged to South Fork Wolf Creek, downstream of the natural creek that NID uses to discharge water from the DS Canal Extension.

As previously discussed, base flow in South Fork Wolf Creek may range from 0.07 cfs in the summer to 6.5 cfs in the winter between storm events, at the location of the proposed discharge of the treated mine water.[40] During field monitoring in January 2020, Balance noted that small to moderate storm flows of 11 cfs upstream of the proposed discharge location and 17.3 cfs downstream of the proposed discharge location did not produce any evidence of bed sediment transport, meaning that there was no erosion or sedimentation occurring in the stream bed during the monitored storm flows. Sediment pebble count analysis conducted by Balance (2020) indicate that the flow rate at which sediment within the channel may become mobilized ranges from 20 cfs to 90 cfs.

With the addition of the maximum proposed discharge of 5.6 cfs and increasing measured baseflows by a 50 percent safety factor, post-project baseflows during non-storm periods would be expected to range between approximately 5.8 cfs and 15 cfs. These estimates are less than 23 cfs, the threshold for bedload sediment mobility and well below flows that commonly exhibit significant work on the channel (i.e., 1- to 2-year

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39 EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project* [pg. 106]. February 2021.

40 EMKO Environmental, Inc. *Groundwater Hydrology and Water Quality Analysis Report for the Idaho-Maryland Mine Project* [pg. 72]. February 2021.

flood). Balance therefore concludes that discharges during baseflow periods would not result in substantial erosion or siltation on site in South Fork Wolf Creek.[41] ECM is in agreement with Balance that the addition of 5.6 cfs to the South Fork of Wolf Creek drainage basin would have no significant effect on the stream channel or banks, or to the turbidity of the South Fork Wolf Creek.[42]

During larger storm events, the proposed detention pond on the Brunswick Industrial Site would reduce the peak flows within South Fork Wolf Creek by much more than 5.6 cfs, as shown in Table 4.8-4. Thus, under project conditions the overall peak storm flows would be lower than they are under existing conditions, resulting in less potential for erosion and sediment transport than under existing conditions.

The project would not discharge water to existing or planned drainage systems. Downstream of the project site, South Fork Wolf Creek flows into existing drainage improvements at Ophir Road that extend under the City of Grass Valley. The base flow plus the maximum project dewatering rate of 5.6 cfs would not exceed the capacity of the existing drainage facilities. During storm events, the detention basin at the Brunswick Industrial Site would reduce peak storm flows on South Fork Wolf Creek, thus providing additional capacity within the current drainage facilities under Grass Valley.

Conclusion

The drainage analyses discussed above conclude that the project would not significantly alter the drainage patterns of the sites in a manner which would result in substantial erosion or siltation on- or off-site, nor substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site, nor create or contribute to runoff water which would exceed the capacity of existing stormwater drainage systems, nor impede or redirect flood flows. West Yost's independent peer review concurs with this conclusion.[43] The combined flows from the treated water discharge and existing base flow in South Fork Wolf Creek would be below the levels that could potentially result in erosion or sediment transport. Peak storm flows at both the Centennial and Brunswick Industrial Sites would be reduced to levels less than existing conditions peak storm flows due to the detention basins that would be constructed below the engineered fill areas. The reduction in peak storm flows would reduce the potential for erosion and sedimentation within South Fork Wolf Creek and reduce utilization of existing capacity of storm drain systems under the City of Grass Valley. Although the project's proposed stormwater facilities design would avoid significant impacts associated with the potential to result in or contribute to runoff water in excess of storm drain system capacity, the impact is considered ***significant*** for the purposes of this analysis and mitigation, specifying requirements for regulatory compliance, is identified as necessary to reduce the impact to less than significant.

41 Balance Hydrologics, Inc. *Geomorphic Assessment, South Fork Wolf Creek, Near Grass Valley, California* [pg. 40]. March 2020.
42 ECM. *Applicant Report Peer Review, Idaho Maryland Mine: Centennial and Brunswick Sites* [pg. 5]. August 13, 2020.
43 West Yost. *Peer Review of Groundwater Hydrology and Water Quality Analysis and Groundwater Model Reports for the Idaho-Maryland Mine Project, Nevada County, California* [pg. 15]. August 27, 2020.

Mitigation Measure(s)

Implementation of the following mitigation measure would reduce the above potential impact to a *less-than-significant* level.

4.8-3 *As part of the Improvement Plan submittal process, the applicant shall submit a Final Drainage Report to the Nevada County Planning Department for review and approval. The Final Drainage Report may require more detail than that provided in the preliminary report, and will be reviewed in concert with the Improvement Plans to confirm conformity. The report shall address the Centennial and Brunswick Industrial Sites, be prepared by a Registered Civil Engineer, and shall, at a minimum, include: narrative describing existing conditions, the effects of the proposed improvements, all appropriate calculations, watershed maps, changes in flows and patterns, and proposed on- and off-site improvements to accommodate flows from this project, including treated mine water discharge and stormwater runoff. The Final Drainage Report shall demonstrate that the on-site storm drain systems are sized such that site runoff (in addition to treated mine discharge for the Brunswick Industrial Site) under the post-development condition will not exceed pre-development levels in the downstream channel(s) during the design storm events.*

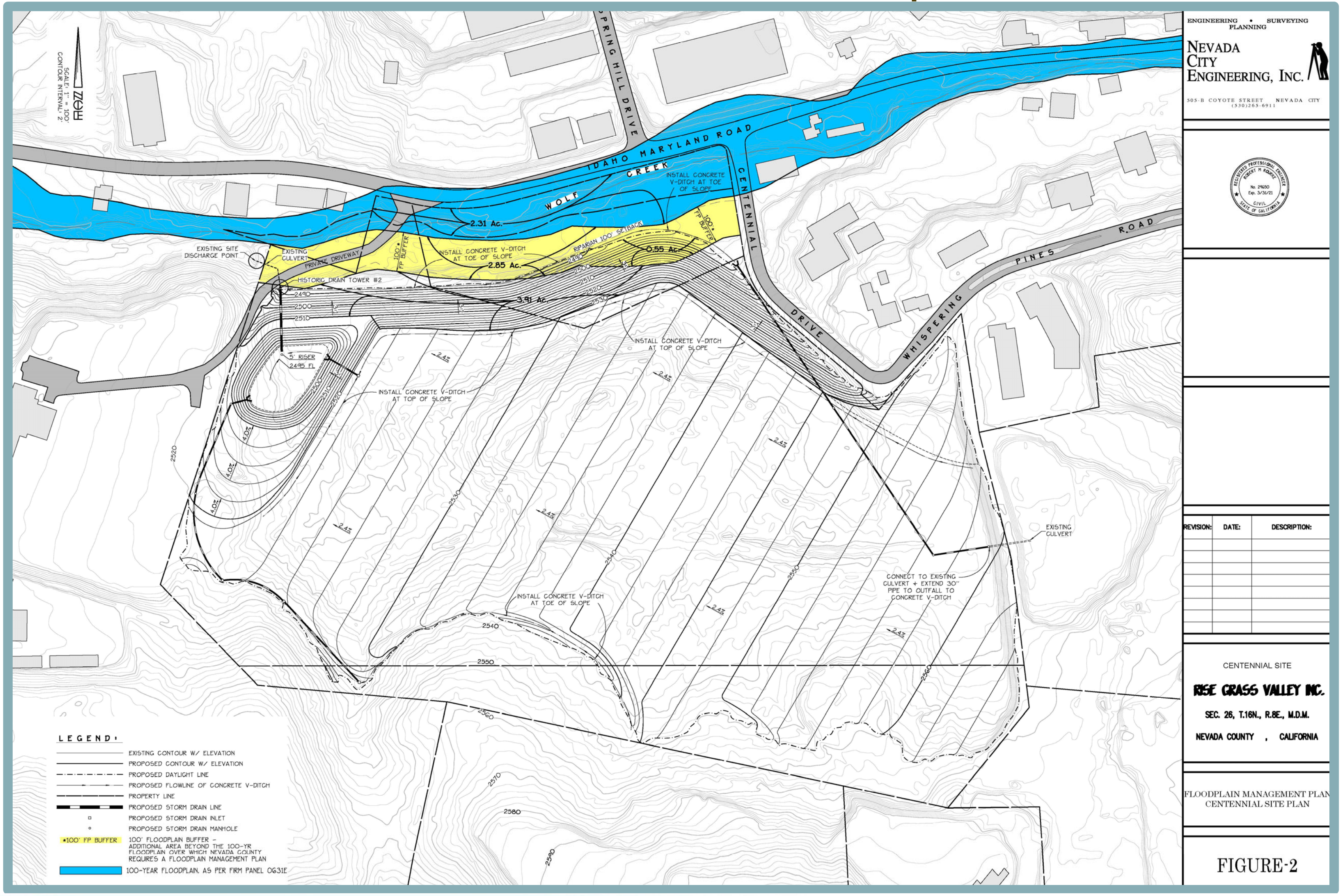
4.8-5 In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation. Based on the analysis below, and with implementation of mitigation, the impact is *less than significant*.

Due to its distance from the ocean and other large enclosed bodies of water, the project is not located in an area that would be subject to tsunamis or seiches.

According to the FEMA flood hazard maps for the project area, Maps 06057C0631E, 06057C0632E, 06057C0633E, 06057C0650E (FEMA, 2019), the only part of the project site that is located within a Special Flood Hazard Area (SFHA) is the northern edge of the Centennial Industrial Site along Wolf Creek. This SFHA encompasses 2.31 acres on the Centennial Industrial Site, as shown on Figure 4.8-16.

Development at the Centennial Industrial Site (disturbance and engineered fill placement) would be avoided on approximately 12 acres, which includes the main stem of Wolf Creek and an undisturbed zone containing Pine Hill flannelbush, a special-status plant species protected under the federal Endangered Species Act. In addition, as shown in Figure 4.8-16, the project footprint has been designed to remain outside the SFHA (100-year floodplain) of Wolf Creek. However, approximately 0.55-acre of the engineered fill placement encroaches into the County of Nevada mandated 100-foot zone beyond the 100-year floodplain limit, necessitating a Floodplain Management Plan. Limited use of heavy equipment for engineered fill placement within the 100-foot floodplain setback could result in a risk of release of pollutants should leaks from heavy equipment occur and the area becomes inundated.

Figure 4.8-16
Centennial Industrial Site – Wolf Creek Floodplain Limits



The Nevada County LUDC, Chapter II: Zoning Regulations, Section L-II 4.3.10 requires that for projects with development located within 100 feet of the limits of the 100-year floodplain, a Floodplain Management Plan prepared by a registered professional engineer and consistent with FEMA standards, shall be prepared that minimizes impacts to the floodplain. As a result, a Floodplain Management Plan was prepared pursuant to Section L-II 4.3.3.C of the Nevada County LUDC. The Floodplain Management Plan includes recommended mitigations and conditions that must be complied with to ensure that the operations at the Centennial Industrial Site would not result in adverse effects to the 100-year floodplain associated with Wolf Creek.

With respect to flood flows in Wolf Creek, as discussed in Impact 4.8-4, the Centennial Industrial Site design incorporates a stormwater detention pond, which has been sized to ensure that, under the post-project condition, the project would result in a net decrease in flows exiting the project site into Wolf Creek during the storm events analyzed.

Nevertheless, the proposed ground disturbance within the 100-foot buffer zone from the SFHA 100-year floodplain could result in ***significant*** impact.

Mitigation Measure(s)

Implementation of the following mitigation measure would reduce the above impact to a *less-than-significant* level.

4.8-5 *The applicant shall implement the Floodplain Management Plan prepared for the Centennial Industrial Site, as approved in its final form by Nevada County. Specifically, the applicant shall implement the mitigation measures and conditions identified in the Floodplain Management Plan, which include measures designed to mitigate the impact of development on the floodplain. Such measures generally include, but are not limited to, the following and shall be implemented in accordance with their specified timing (e.g., either prior to, during, or after ground disturbance activities within the 100-foot floodplain buffer):*

- *Grading and land disturbance within the limits of the SFHA (100-year floodplain) of Wolf Creek shall be avoided.*
- *Prior to commencing construction, the 100-year floodplain boundary shall be delineated by appropriate means on the Centennial Industrial Site to ensure that construction activities remain outside the 100-year floodplain.*
- *As early as practicable once the engineered fill development has begun, the detention basin proposed in the Preliminary Drainage Analysis & Detention Study by Nevada City Engineering, Inc. shall be installed and made operational. During the grading operation, erosion control measures should be maintained in place on the fill pad to avoid silt and runoff from the pad proceeding down the fill slope towards Wolf Creek, and to direct all runoff to the detention basin which is to be constructed at the northwest corner of the fill area. During this time all potential runoff from the engineered fill*

pad area shall concurrently be directed to this basin for both its detention and de-siltation benefits.

- *No significant increase in impermeable surfaces shall occur within 100 feet of the 100-year floodplain. The only added impervious surface shall be approximately 520 lineal feet of concrete V-ditch at the toe of the engineered fill slope. This will have no measurable impact on drainage runoff or flooding.*
- *Areas within 100 feet of the 100-year floodplain, which are disturbed due to construction activity, shall be regraded to a smooth, natural contour resembling their pre-development configuration, with the exception of approximately 0.55-acre of engineered fill located on the northeast corner of the proposed Centennial Industrial Site. Grading shall be done in such a manner as to smoothly convey flows through the property without accelerating their transit to downstream areas. All disturbed areas shall be subject to erosion control measures and protection during and after the engineered fill placement operation in order to stabilize any disturbed soil, thus eliminating the likelihood of increased erosion exiting the site toward downstream properties.*
- *Temporary disturbance of vegetation within 100 feet of the 100-year floodplain due to construction shall be remediated by appropriate replacement plantings as recommended by the project biologist and as pursuant to the project Reclamation Plan.*

4.8-6 Would the project conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan? Based on the analysis below, the impact is *less than significant*.

The current water quality control plan for the region is the Water Quality Control Plan for the Sacramento and San Joaquin River Basins, which is also referred to as the Basin Plan (CVRWQCB, 2019). The project would be required to operate under an applicable WDR permit from the CVRWQCB for placement of any waste material on land. The dewatering discharge to South Fork Wolf Creek would also need to comply with the requirements of the applicable NPDES permit Order R5-2016-0076 (NPDES No. CAG995002) for Limited Threat Discharges to Surface Water as a Tier 3 discharge. The WDR and NPDES requirements ensure that the project would not conflict with or obstruct implementation of the Basin Plan.

Discharges must comply with the state Antidegradation Policy (SWRCB Resolution 68-16) to maintain the highest water quality possible consistent with the maximum benefit to the people of California. Historical and on-going discharges of mercury related to mining in the Sierra Nevada foothills has resulted in the development of a TMDL for mercury. As documented by EMKO (see Tables 3-6, 3-7, and 3-9 of Appendix K.2 to this EIR), mercury has not been detected in any of the water samples from the New Brunswick shaft, and has not been detected in any of the drains, nor in Wolf Creek, nor in South Fork Wolf Creek. Mercury was also not detected in the DI-WET leachate samples from the barren rock and tailings samples.

As previously discussed, the project is not located in or near a DWR-designated groundwater basin. Therefore, there would be no sustainable groundwater management plans developed for groundwater in the project area. However, installation of the potable water supply line along East Bennett Road, prior to the initiation of mine dewatering, and offering hookup at no cost to well owners, would address any potentially significant decrease in groundwater supplies to existing groundwater users in the project vicinity.

Based on the above, the proposed project would not conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan, resulting in a ***less-than-significant*** impact.

Mitigation Measure(s)

None required.

Cumulative Impacts and Mitigation Measures

For detail regarding the cumulative setting for this EIR analysis, refer to Chapter 5, Statutorily Required Sections, of this EIR.

4.8-7 Cumulative impacts related to the violation of water quality standards or waste discharge requirements, groundwater quality, management, and recharge, and impacts resulting from the alteration of existing drainage patterns. Based on the analysis below, the project, in combination with other cumulative development, would result in a less-than-significant cumulative impact.

Impacts related to stormwater quality, groundwater, and drainage patterns are discussed separately below.

Stormwater Quality

Construction activities have the potential to affect water quality and contribute to localized violations of water quality standards if stormwater runoff from construction activities enters receiving waters. Runoff from additional construction sites within the project area could carry sediment from erosion of graded or excavated surface materials (addressed in Cumulative Impact 4.6-7 of the Geology, Soils, and Mineral Resources chapter), leaks or spills from equipment, or inadvertent releases of building products, which could result in water quality degradation if runoff containing such sediment or contaminants should enter receiving waters in sufficient quantities. Thus, construction activities associated with the proposed project, in combination with construction activities associated with other reasonably foreseeable projects in the Wolf Creek and South Fork Wolf Creek watersheds, could result in cumulative impacts related to water quality. However, all construction projects resulting in disturbance of more than one acre of land are required to comply with the most current Construction General Permit requirements. Conformance with the Construction General Permit would require preparation of SWPPPs for all such projects, and subsequent implementation of BMPs to prevent the discharge of pollutants. In addition, projects disturbing surfaces less than one acre, while not required to obtain coverage under the State's Construction General Permit, would be required to comply with their respective jurisdiction's regulations regarding stormwater quality during construction. Considering the existing permitting requirements for construction activity in the project area, cumulative construction within the Wolf Creek and South Fork Wolf Creek watersheds would be heavily regulated and impacts related to the degradation of water quality would be minimized to the extent feasible.

Regarding the potential for cumulative projects to impact stormwater quality during long-term operations, it is noted that industrial sites are required to have ongoing Industrial permits with the RWQCB that provide permanent water quality protection. Any new projects with Use Permits or Development Permits are required to record a stormwater maintenance covenant on their property prior to operations in conformance with General Plan Policy 3.19C. This provides a legally enforceable mechanism for long-term storm water facility maintenance. If the projects are one-acre or larger, they are also required to provide oil, grease and silt traps on the property pursuant to GP Policy 11.6A. These traps are maintained by the aforementioned storm water facility maintenance covenant.

With respect to potential cumulative projects within the City of Grass Valley, the City is covered under the State's Small (Phase II) MS4 General Permit NPDES No. CAS000004 Order No. 2013-0001-DWQ. As such, the City's Storm Drainage Design Standards require post construction storm water management for new development, including water quality treatment measures for projects creating and/or replacing more than 5,000 square feet of impervious surface.[44] Regulated projects under the City's Phase II MS4 are required to divide the project area into Drainage Management Areas and implement and direct water to appropriately-sized Site Design Measures and Baseline Hydromodification Measures to each drainage management area. Source control measures must be designed for pollutant-generating activities or sources consistent with recommendations from the California Stormwater Quality Association (CASQA) Stormwater BMP Handbook for New Development and Redevelopment, or equivalent manual, and must be shown on Improvement Plans.

Compliance with the foregoing regulations would ensure that potential impacts related to the discharge of pollutants are minimized to the extent feasible.

Groundwater

NID would provide potable water to the majority of cumulative projects. All cumulative projects within the City of Grass Valley would be served either by the City's water supply system, which relies on raw water purchased from NID (and treated by the City), or NID directly. As previously discussed, water supply for NID is currently derived from rain and mountain snowpack from Northern California's Sierra Nevada Mountains. Groundwater is not an existing nor is it a planned source of water available to the District. As a result, cumulative projects developed within the City of Grass Valley would not utilize groundwater, and thus, could not result in effects to groundwater depletion that could combine with the proposed project's effects to produce a cumulative impact.

NID also maintains extensive potable water systems within the areas east of Grass Valley where the majority of Nevada County cumulative projects are located (refer to

[44] City of Grass Valley. *City of Grass Valley Design Standards, Storm Drainage (SD)*. Available at: https://www.cityofgrassvalley.com/sites/main/files/file-attachments/section_9_storm_drainage.pdf?1566489346. Accessed February 5, 2021.

Figure 2-2 of the 2015 NID Urban Water Management Plan [UWMP]). While a small subset of cumulative projects could utilize well water, the incremental increase in groundwater use would not be expected to combine with the project's groundwater effects because the increase would be small (due to the small size of cumulative projects within outlying areas) and the nature of the fractured bedrock aquifer system (e.g., localized water-bearing fractures rather than one interconnected aquifer basin).

Drainage Patterns

As previously discussed, in general, storm flows would be collected on-site by new storm drain systems and routed to proposed stormwater detention basins, which would be constructed as part of the project improvements for the Brunswick and Centennial Industrial Sites.

The fill areas at the Centennial Industrial Site and the Brunswick Industrial Site would be graded to minimize runoff. Stormwater conveyance channels would be constructed in accordance with Nevada County hydrology and hydraulics standards to convey the runoff from up to a 100-year storm event. Runoff from the fill areas would be conveyed to stormwater detention basins. The proposed detention basins at each site are intentionally located at the downstream toe of each engineered fill site, so that they may be constructed and made functional relatively early in the process of the fill operations.

The proposed detention basins would detain peak flows and release the water at a lower rate over a longer duration than currently occurs from those site areas. As a result, the project would reduce peak storm flows in both Wolf Creek and South Fork Wolf Creek. It is also noted that the hydrologic calculations and detention studies for both sites conservatively anticipate runoff at potential future industrial development levels, though industrial development is not proposed at this time, and separate environmental review and permitting through the County would be required prior to any on-site industrial development.

For the Centennial Industrial Site, the detention basin would reduce the peak discharge to Wolf Creek by over 27 cfs for the 10-year storm and by over 44 cfs for the 100-year storm when compared to existing storm flows leaving the Site. At the Brunswick Industrial Site, the detention basin is sized to detain storm flows to compensate for the quantity of treated mine water discharged to South Fork Wolf Creek, in addition to compensating for increased runoff from potential future industrial development of the site. The Brunswick detention basin would reduce the peak discharge to South Fork Wolf Creek by over 48 cfs for the two-year storm, by over 60 cfs for the 10-year storm, by over 40 cfs for the 25-year storm, and by over 25 cfs for the 100-year storm, when compared to existing storm flows leaving the Site.

With little exception (e.g., Cumulative Projects #10 and #11), the cumulative projects identified in Figure 5-1 of the Statutorily Required Sections chapter, are located within either the Wolf Creek or South Fork Wolf Creek Watershed. Thus, stormwater runoff from these reasonably foreseeable projects, upon entering Wolf Creek or South Fork Wolf Creek, could combine with flows from the runoff from the Centennial and Brunswick Industrial Sites. However, similar to the proposed project, each cumulative project would be required to reduce its potential increase in peak flows to pre-development levels. For example, Nevada County LUDC Section L-II 4.3.10, requires the following:

> Projects that may result in flood damage to downstream land uses shall not be allowed. Where determined necessary, retention/detention facilities shall be designed to protect downstream users and ensure that the water surface returns to its base elevation within 24 hours after the storm event.

Based on this standard, the County requires all new development to have no additional runoff (pre- vs post-development).

Similarly, the City of Grass Valley Development Code, Section 17.62.100 requires projects to include design provisions to retain off-site natural drainage patterns, and limit the quantities and velocities of peak runoff to predevelopment levels.[45] For example, in accordance with these requirements, the Dorsey Marketplace Project was designed to include three detention facilities sufficient to reduce post-development stormwater runoff rates to pre-development levels.[46] Similarly, the first residential tentative map for the Loma Rica Ranch Specific Plan was conditioned to include stormwater measures (e.g,. site design, source control, runoff reduction) in accordance with City of Grass Valley standards.

As a result, not only would the project's incremental increase in stormwater runoff be reduced to a level below pre-development levels before entering Wolf Creek and South Fork Wolf Creek, but all other cumulative projects, whether in unincorporated Nevada County, or the City of Grass Valley, would be designed to reduce their incremental increase in stormwater flows prior to discharge to downstream waterways. As a result, the cumulative effect would not be considered significant.

Conclusion

As discussed throughout this chapter, implementation of the proposed project would result in reduction in stormwater flows due to on-site detention, minimization of effects to stormwater quality through incorporation of temporary and permanent stormwater BMPs, and while groundwater would be drawn down due to ongoing dewatering of the mine during the operational life of the project, the project includes installation of a new potable water line along East Bennett Road to supply potable water that would offset potential impacts to domestic wells from mine dewatering. Other cumulative development would similarly not be anticipated to adversely affect stormwater quality or lead to increases in stormwater runoff and downstream flooding due to compliance with state and local regulations governing stormwater treatment and reduction in peak flows.

Given the analysis presented in this chapter, the project, in combination with the cumulative list of projects, would result in a ***less-than-significant*** cumulative impact to water quality, drainage patterns and groundwater resources.

Mitigation Measure(s)

None required.

45 City of Grass Valley. *Grass Valley Development Code*. March 2007. Available at https://www.cityofgrassvalley.com/sites/main/files/file-attachments/develeopment_code_2020_website.pdf?1601573922. Accessed February 4, 2021.

46 Dudek. *Dorsey Marketplace Draft EIR* [pg. 13-13]. March 2019.