Twin Peaks Mine Above Ground Facilities Improvement Plan

An infiltration trench is used to prevent overland flow of mine drainage at the Twin Peaks Adit (**Figure 1**). Prior to trench construction, drainage from the adit flowed across and through mine waste. The trench receives all of the drainage from the Twin Peaks Adit and prevents contact of the mine drainage with waste rock or tailings. Infiltration of the drainage through native soil and rock also prevents overland flow of the mine drainage to surface water. Drainage is intercepted at the mouth of the adit and routed through a pipeline into the trench. Multiple valves and check dams within the trench are used to direct drainage into specific trench segments to allow maintenance, if necessary, while continuing to control the drainage.

Trench characteristics are summarized in **Table 1** below.

Table 1: Twin Peaks Adit Infiltration Trench Characteristics

Location	Length (feet)	Depth (feet)	Bedrock	Drainage Flow (gallons per minute)
Twin Peaks Adit	600	2 to 3	Serpentinite	2 to 35

Monitoring wells are not present at the Twin Peaks infiltration trench. The slopes below the infiltration trench are periodically inspected for signs of seepage (aquatic vegetation, vigorous vegetation during the dry season, and wet or moist soil). No evidence for seepage from the Twin Peaks infiltration trench has been observed and the acid rock drainage is considered to infiltrate to bedrock beneath the infiltration trench. Infiltrating water beneath the Twin Peaks infiltration trench is expected to ultimately seep to Bateman Creek down slope from the infiltration trench via foliation and fractures in the intervening rock. Thus, monitoring of water quality in Bateman Creek up and downstream from the Twin Peaks Mine would detect any impacts of the infiltrating water.

Improvements to the existing infiltration trench at the Twin Peaks portal will consist of replacing the existing pipe manifold at the Adit Portal, re-plumbing the distribution system, and installing a settling/filtration basin to facilitate effective solids management. Re- plumbing will allow more effective operations under seasonal changes in flow, improved level controls between trench reaches, and facilitate isolating separate reaches of each trench for maintenance such as widening and sloping trench bottoms. In addition, access to the trenches will be improved to increase worker safety. Diversion of runoff from slopes above the trenches would also be completed at locations where concentrated flow enters the trenches.

Adit Portal. The existing pipe manifold directs water via gravity into distribution pipes that conduct the water to the infiltration trench. The existing manifold is undersized resulting in backing up of water due to accumulation of solids, and the potential for overflow to the adjacent waste rock and tailings during peak flow events. The existing manifold will be replaced with a new concrete cast-in-place manifold equipped with multiple, valve controlled, 8-inch outlets. Associated piping will be connected to the outlet manifold.

Settling/Filtration Basin. A settling/filtration basin is necessary to allow capture and management of the iron oxide precipitate that periodically flushes from the adit. Capturing this precipitate will decrease plugging in the infiltration trench and will reduce the likelihood for overflow during peak flow events. Due to limited space at the adit and proximity to tailings and waste rock, the best location for the settling/filtration basin is at the mid-point of the infiltration trench about 300 feet north of the adit portal.

This location was selected because it is about 10 feet lower than the portal, and is located at a ridge spine that will provide greater stability than adjacent steeper slopes.

Based on estimates of sludge volume (about 4 cubic yards per year), the settling/filtration basin would be designed as follows:

Previous testing on Twin Peaks sludge demonstrated that the majority of the sludge settling occurred within the first one hour and suspended materials are nearly absent following two days of settling in a stagnant system. Extended residence times would result in better water clarity, less suspended material and would provide more sludge holding capacity. Because space is limited on site, the proposed settling pond at the Twin Peaks Adit will be constructed as large as practically possible and will be equipped with an infiltration drain to facilitate solids removal through filtration.

The settling/filtration basin would be about approximately 40 feet long, 20 feet wide, and 5 feet deep. The effluent would be designed to exit at the bottom of the settling/filtration basin through pipes configured to distribute flow to the infiltration trenches. Prior to entering the pipes the water would pass through a sand layer, and a geomembrane to remove the iron oxide precipitates. It is expected that the filtration system will plug and blind off over time. In order to maintain flow through the filtration system for extended periods of time it will be designed in a manner to allow for sequential vertical plugging starting at the lower central portion of the filter. As the sludge blinds off the flow, the water level will raise in the basin exposing fresh surfaces for filtration to occur. This will allow water to continuously pass through the filter until the entire filter is blinded off. At this point the sludge would have to be removed from the basin. A cleanout to allow backflushing is also provided to ensure that the pipes remain open.

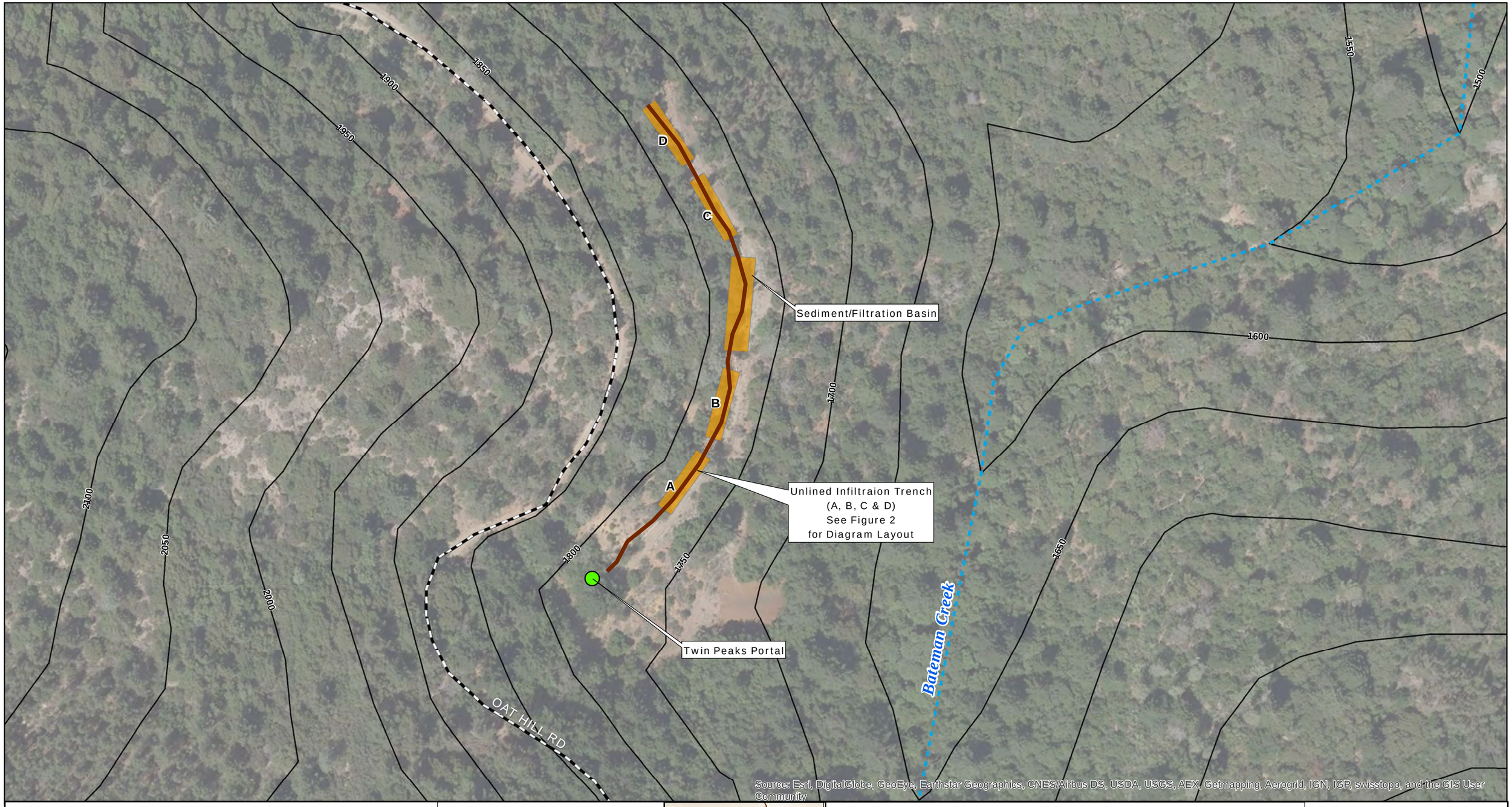
The settling/filtration basin would provide increased settling times to capture solids during lower flow periods, and would pass through filtered flow during higher flow periods. A design is provided in **Figure 2**. The drain would report to the infiltration trench.

Replumbing Distribution System. Piping would be reconfigured to minimize maintenance requirements and allow distribution of drainage to one, some, or all of the trench segments at a given time.

Maintenance consists of cleaning out accumulated solids. To facilitate solids removal, the new pipe will be equipped with cleanouts to allow solids removal. The pipes will be sloped so that solids will drain to the infiltration trench. Eight-inch acid resistant HDPE pipe will be used and equipped with six-inch laterals. Laterals will be equipped with junction boxes to allow inspections and facilitate flow control. Flow control will be attained through use of stand-pipes and plugs. Stand pipes will provide for distributing flows among trench segments, while plugs will allow isolation of a segment for maintenance.

The pipe would conduct raw unfiltered drainage to the settling/filtration basin, filtered drainage would report via the drains at either end of the basin to distribution piping. Distribution piping would conduct the filtered drainage to the desired infiltration trench segments.

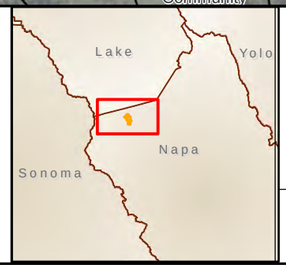
Infiltration Trench. Grading will be completed to lower the elevation of the infiltration trench and increase the head between the adit and the settling/filtration basin and to provide enough grade to distribute filtered drainage from the settling/filtration basin to the infiltration trench segments via gravity. This will entail reducing the infiltration trench elevation by about 3 to 4 feet.



Legend

- Roads
- Creeks
- 50ft Contour
- Existing Trench
- Proposed InfiltrationTrench Locations
- Twin Peaks Portal

0 25 50 100 150 200 Feet



Burleson Consulting, Inc.

Twin Peaks Mine
Project Features
Infiltration Trench Layout

Source: Bing Maps aerial imagery web mapping service; Napa County GIS Department 2011; Burleson Consulting 2012.

Figure 1

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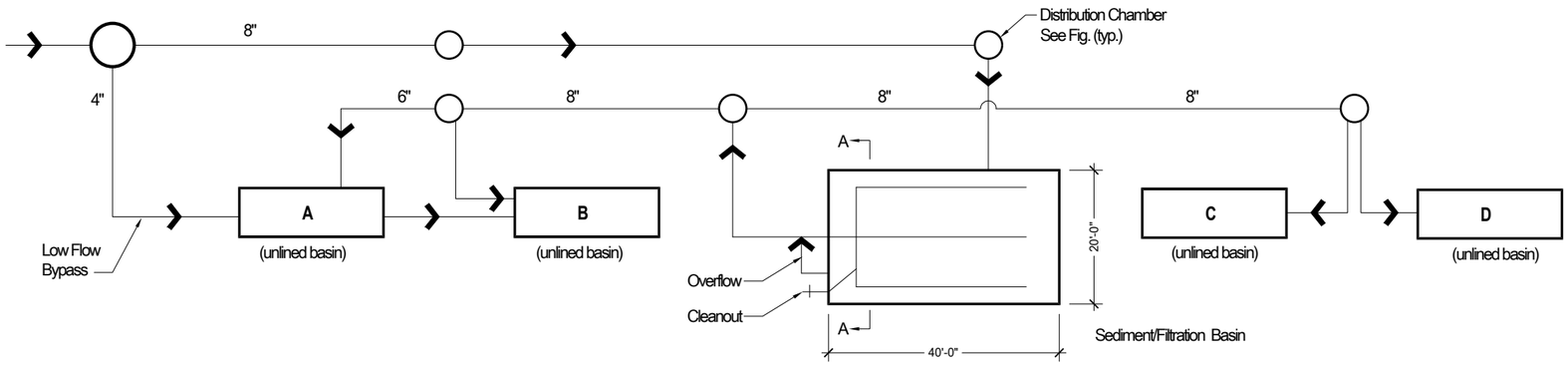
Notes:
-Infiltration trenches 6' X 75' (A, B, C & D) spaced apart to reduce mass saturation
-Low Flow Bypass to prevent slow Floc buildup in main pipe

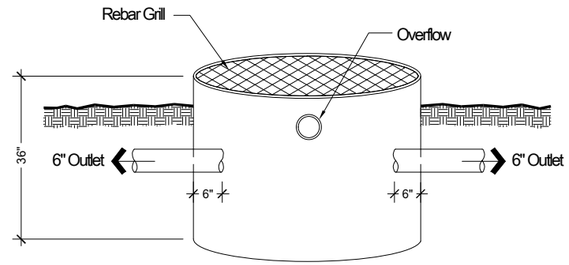
Infiltration Layout Diagram

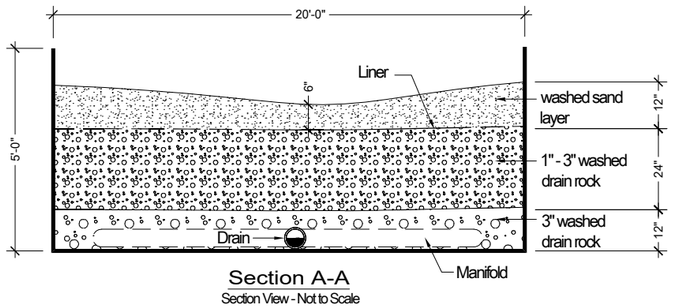
Not to Scale



Distribution Chamber

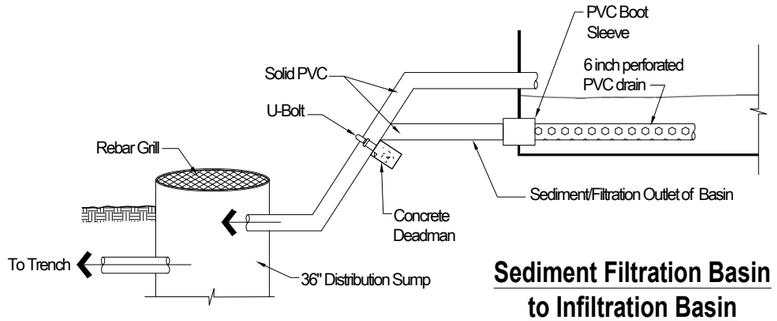
Section View - Not to Scale





Section A-A

Section View - Not to Scale

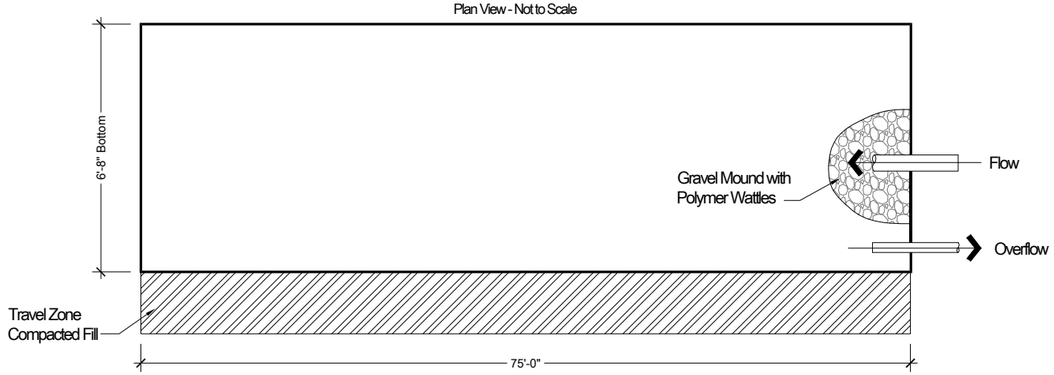


Sediment Filtration Basin to Infiltration Basin

Section View - Not to Scale

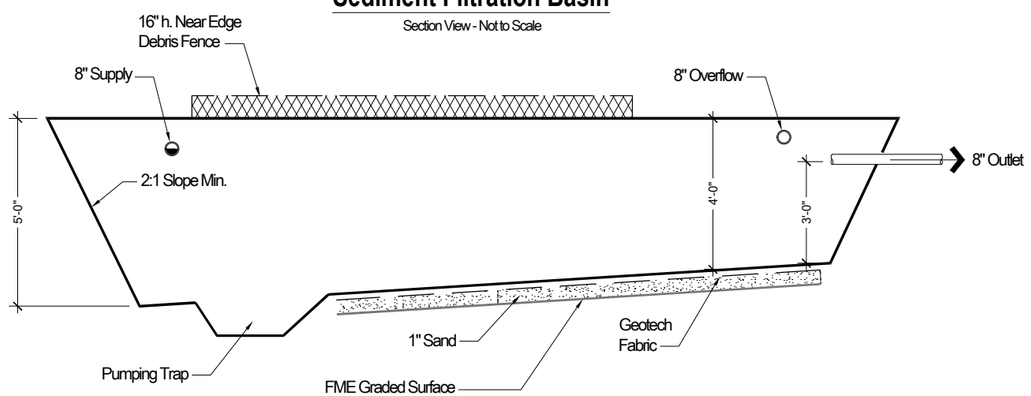
Infiltration Trench

Plan View - Not to Scale



Sediment Filtration Basin

Section View - Not to Scale



Twin Peaks Mine
Project Features
Infiltration Trench Improvements

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Burleson Consulting,Inc.

Figure 2