Mountain Studies Institute
SAN JUAN MOUNTAINS COLORADO
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WEEKLY REPORT – RED & BONITA BULKHEAD TEST

DATE: October 8-14, 2020	**REPORT NO: 14**
TEST PHASE: Phase 4, Drain Down	**TO: Kerry Guy, James Hou**
PREPARED BY: Christoph Goss, PhD, PE, Morley Beckman, PE, and Erinn Johnson	**FROM: Deere & Ault, Mountain Studies Institute, U.S. Environmental Protection Agency, Environmental Restoration, and Tetra Tech**

Actions Taken This Week:

- Phase 4 is in full effect. R&B is draining down and is continuing to be monitored. Head behind the bulkhead dropped from approximately 31 ft on 10/7/20 to 5 ft on 10/14/20.
- R&B adit inspections and pressure readings were performed once per day by ER
- Adit flume measurements were taken three times per week by ER.
- Flow rates and pressures from various on-site instruments were monitored and recorded.
- Monitoring data was not collected this week by MSI. This is the off week for the bi-weekly testing schedule.
- The globe valve at R&B was fully opened on 10/9/20. The flow rate increased by about 60 gpm, and since has continued to drop from 505 to 380 gpm as of 10/14/20. As the mine pool dropped, the flows decreased. (See Figure 1).
- The IWTP has continued to handle the combined R&B and Gold King discharges.

Key Observations:

- The discharge out of Red & Bonita varied from 380 to 505 gpm this week (Figures 1 and 2). The discharge, as recorded manually by ER and automatically every 30 minutes by the data logger attached to the ultrasonic flow meter, was added to the figures last week. The readings generally correlate well.
- The head behind the bulkhead dropped this week from 31 feet to 5 feet. The rate of drop decreased from 5 feet per day to 3 feet per day. The slowing rate near the top of the mine pool is particularly noticeable in the VWP data on Figure 2.
- The water level reached the estimated top of stope elevation of 22 ft sometime between 10/8/20 and early 10/9/20. On October 12, the mine pool reached 10'. Water quality has been monitored at the plant for sludge and debris.
- Flow rates at Gold King continue with daily fluctuation cycles between approximately 340 to 355 gpm, (Figures 1 and 2). Average daily flow rates continue to be less volatile than prior to 9/9/20 and are generally fluctuating less than 20 gpm daily.
- The data from American Tunnel and Mogul Mine will not be updated this week due the off week of testing. Figure 3 is shows the existing data for reference.

- Water levels in NFPZ-1 following typical seasonal cycle (Figure 4). Level in NFPZ-1 peaked in mid-August and is dropping as part of the typical cycle. The somewhat flatter curve coming down suggests a possible influence from either the Red & Bonita bulkhead test or possibly from senescence. Senescence is when there is cell death in plants, usually associated with the change in color of the leaves, which causes plants to no longer take up water thereby leaving more water in the ground.
- ATPZ-2 (water level behind American Tunnel Bulkhead 3) remained fairly steady (Figure 4).
- In Red & Bonita, flows through Flume 1, Flume 2 and Flume 3 have significantly decreased since reopening the globe valve and lowering the mine pool elevation behind the bulkhead. Flume 1 is now dry as of the 10/9/20 Adit Report. Flume 2 decreased to about 0.3 gpm. Flume 3 has decreased to about 0.03 gpm (Figure 5). The relationship between the flume flows (groundwater inflow into the adit) is direct and with little lag.
- Seepage within R&B has continued to decrease around the bulkhead after the globe valve was opened. The overhead seeping has stopped in the adit.
- Pressure readings from VWP are in good agreement with pressure gauges. However, as we get closer to the "extreme end" of the mine pool elevation there may become less agreement. The VWP is approximately 6 feet above the floor and will stop reading when the level drops below that. In addition, the VWP reads in B-units which must be converted to digestible data, and as equations move closer to the endmember data they tend to have less accuracy. The check valve behind the bulkhead may lead to inaccurate readings at the bulkhead pressure gauges at low head.
- The IWTP continues to effectively treat all Red & Bonita flows. The flows have been decreasing from Red & Bonita as the head has decreased.

Actions for Next Week:

- Continue to monitor the pressure behind the bulkhead while drain down and treatment of outflow water continues.
- As R&B drains down there is potential for an increase in metals or solid materials, which could cause issues at the plant. The drain down will continue at a rate that is sustainable for the IWTP.
- Measure pressure gauges and pipe sensor in R&B once per day (ER).
- Three time per week take flume measurements in R&B (ER).
- Photograph conditions in R&B at end of test.
- Bi-weekly inspections of some sampling sites and emergent flow sites in the area (MSI). Inspections will occur next week.
- ER main crew will demobilize in a week. EPA removal will manage work. MSI will to continue to monitor.
- Following the fast turnaround lab testing and flows, EPA will evaluate later next week if flows can be returned to Cement Creek.
- EPA is scheduled to have MSI install a second pipe discharge and flume below Red & Bonita on Tuesday (10/20/20) next week.
- Clean Gold King flow control structure weir, inspect components, and close flow control structure for season.
- Close pressure gauge/sampling pipe valves at R&B.

Observations by Location at Originally Planned Sites (See Bulkhead Test Execution Plan):

Location	Observations
Adams Mine	Not observed this week.
Adams Mine – North Adit	Not observed this week.
Adit 268-20	Not observed this week.
Adit 268-21	Not observed this week.
American Tunnel	Not observed this week.
ATPZ-2	Not observed this week.
Blackhawk Mine	Not observed this week.
Gladstone Seeps & Springs	Not observed this week.
Gold King Level 7	Not observed this week.
Lead Carbonate Mine	Not observed this week.
Mogul Mine	Not observed this week.
Mogul Mine – South Adits	Not observed this week.
Natalie / Occidental	Not observed this week.
NFPZ-1	Not observed this week.
North Fork Seeps & Springs	Not observed this week.
Pride of Bonita	Not observed this week.
Red & Bonita	See key observations above.
Red & Bonita / Adams Mine Gulch Seeps & Springs	Not observed this week.
Terry Tunnel	Not observed this week.
2020 Seeps & Springs	Not observed this week.

Figure 1: Head Behind Red & Bonita Bulkhead and Gold King Flows vs. Time (Current Testing Period)
Figure 2: Gold King Flow and Red & Bonita Head vs. Time (Full Testing Period)
Figure 3: Adit Flows and Piezometers vs. Time
Figure 4: NFPZ-1 and ATPZ-2 vs. Time
Figure 5: Red & Bonita Adit Flume Flows

Attachment A: Week 14 Photo Log (includes MSI photos from last week)
Attachment B: Updated MSI maps of seepage locations

FIGURES

FIGURE 1: Head on Red & Bonita Bulkhead and Gold King Flow Rate

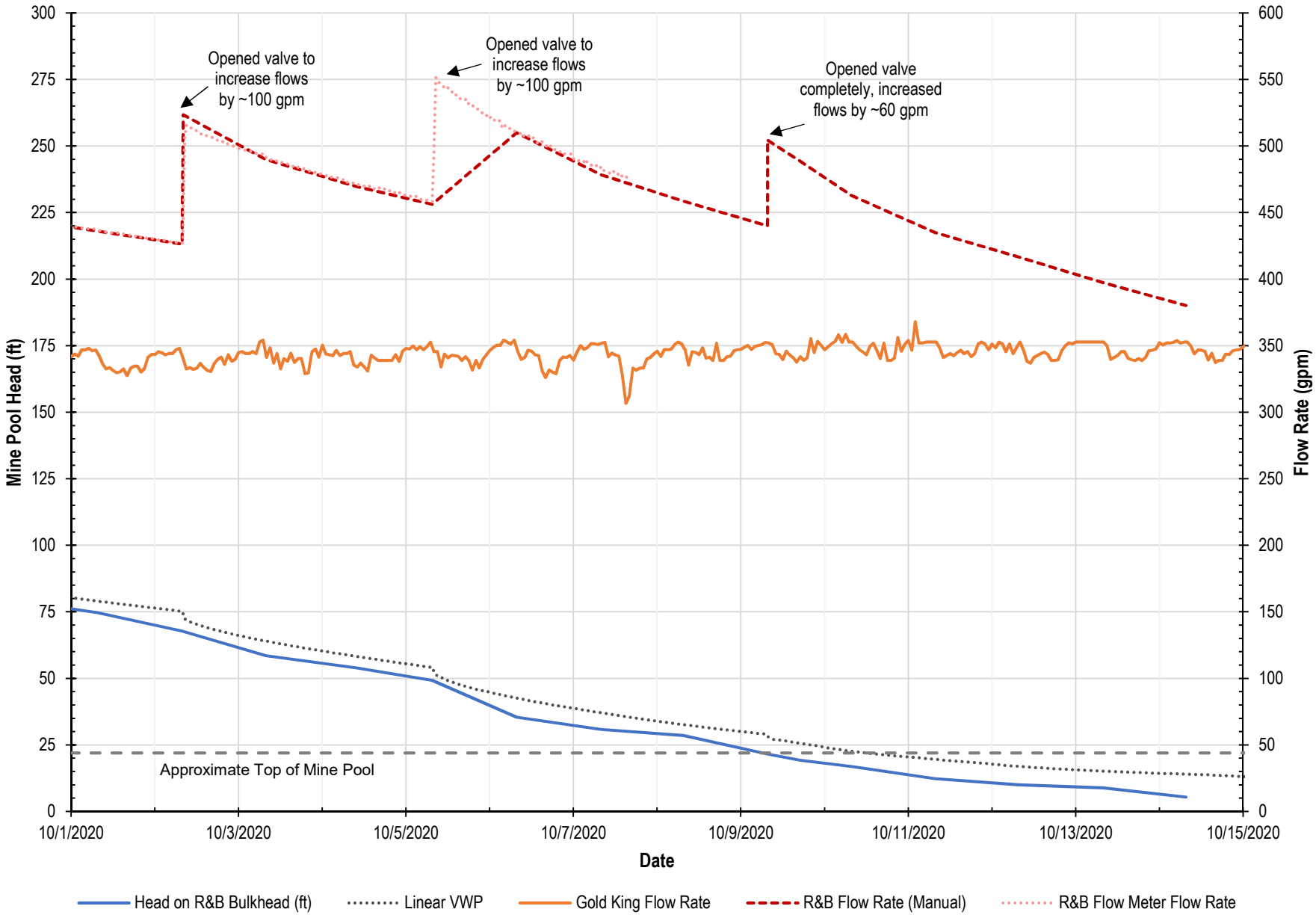


FIGURE 2: Head on Red & Bonita Bulkhead and Gold King Flow Rate - Full Time Period

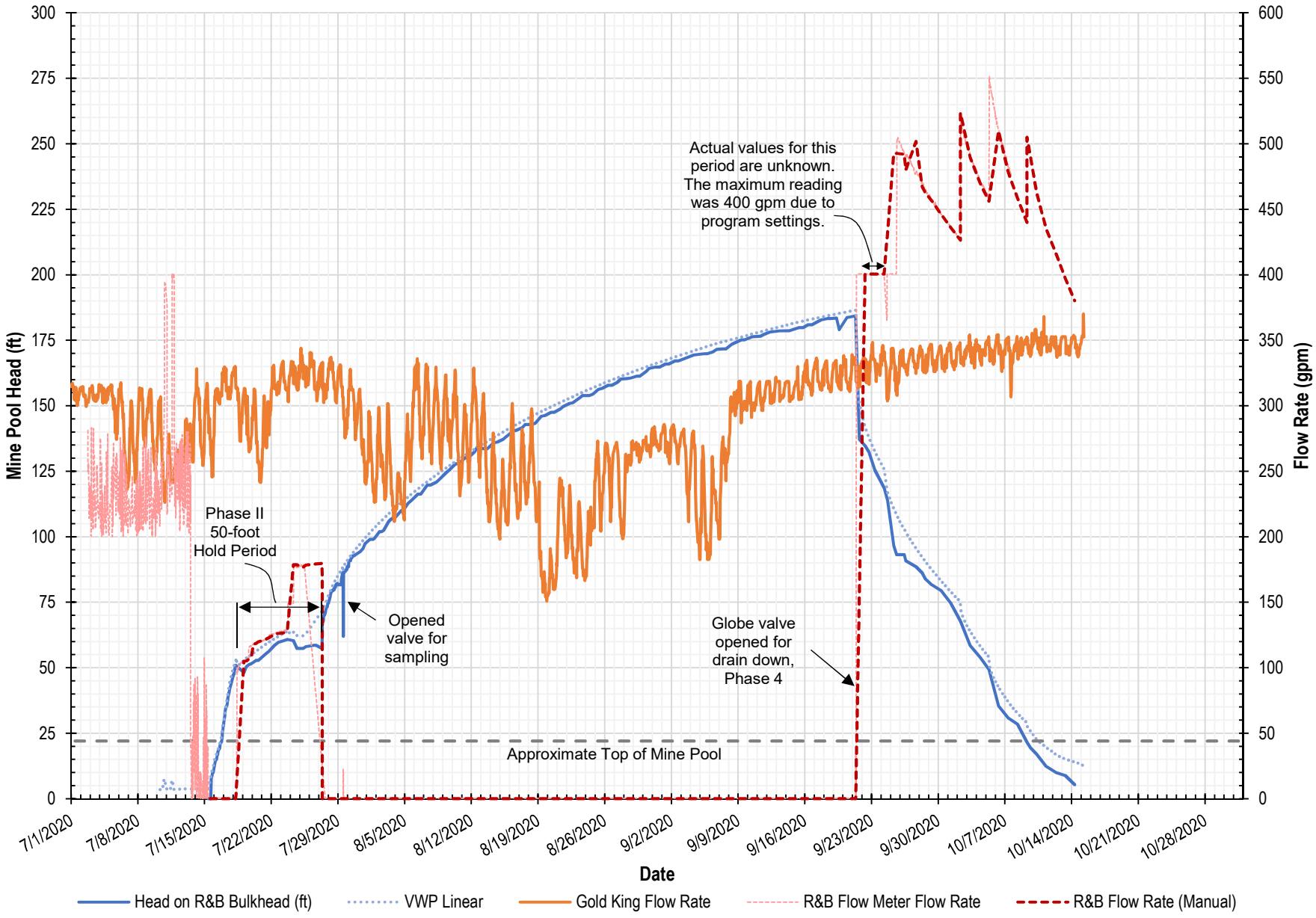


FIGURE 3: Adit Flows and Water Levels

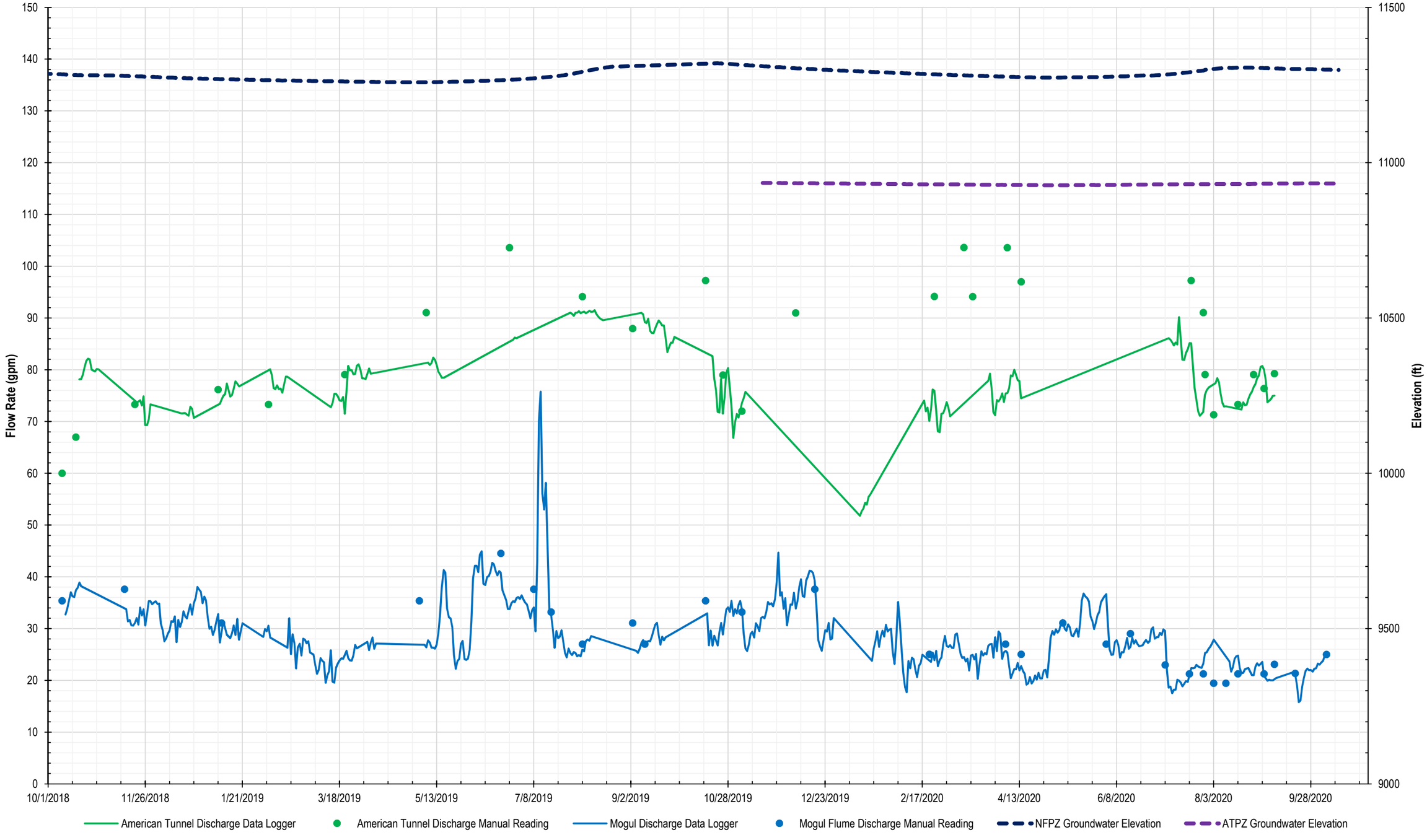


FIGURE 4: Groundwater Elevations

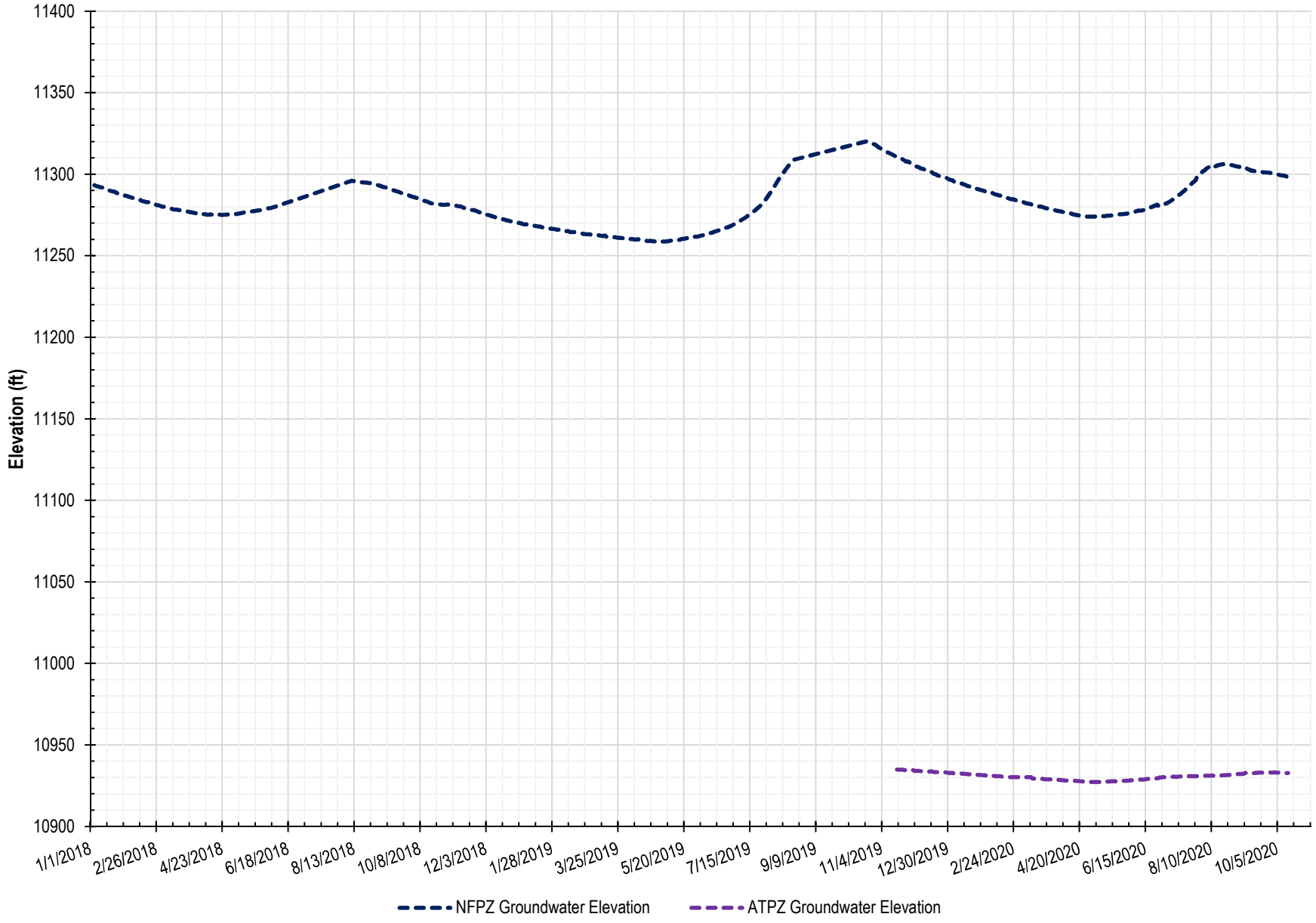
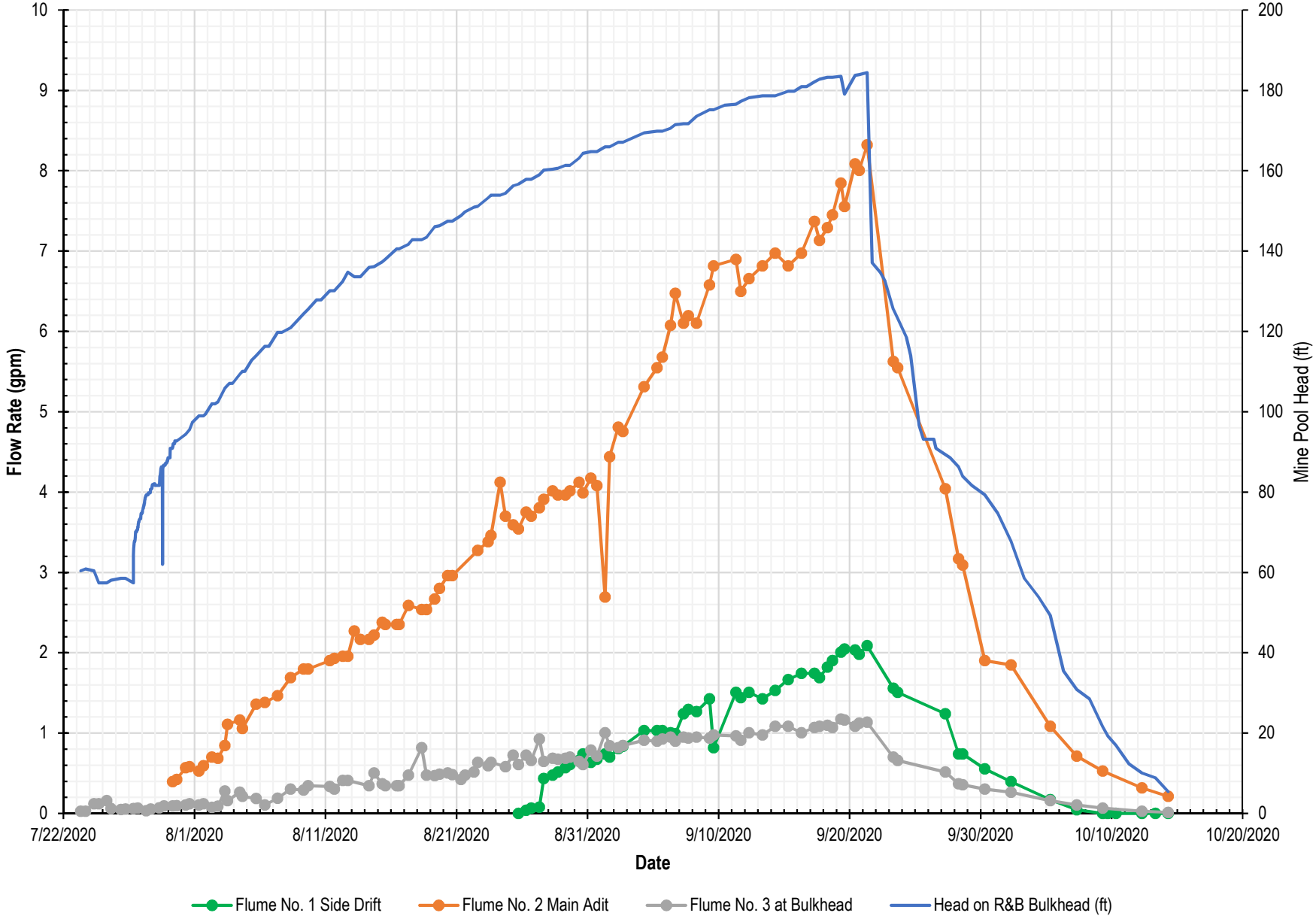


FIGURE 5: Red & Bonita Adit Flume Flow Rates



ATTACHMENT A: PHOTOGRAPHS

PHOTO 1

DATE TAKEN: 10/13/2020

LOCATION:

Gladstone IWTP Stilling Basin

COMMENTS:

Photo from this week of the out flows from R&B (right) and Gold King (left) into the stilling basin.

PHOTO 2

DATE TAKEN: 10/06/2020

LOCATION:

Sample Location SS060

COMMENTS:

Last week at sampling location SS060, along CR-53, south of Mogul Mine

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PHOTO 3

DATE TAKEN: 10/06/2020

LOCATION:

Spring location SS105

COMMENTS:

Last week's sampling location SS105, South of the Mogul Mine

PHOTO 4

DATE TAKEN: 10/06/2020

LOCATION:

Sampling Location SS300

COMMENTS:

Last week's sampling location SS300, near Cement Creek, South of the Mogul Mine

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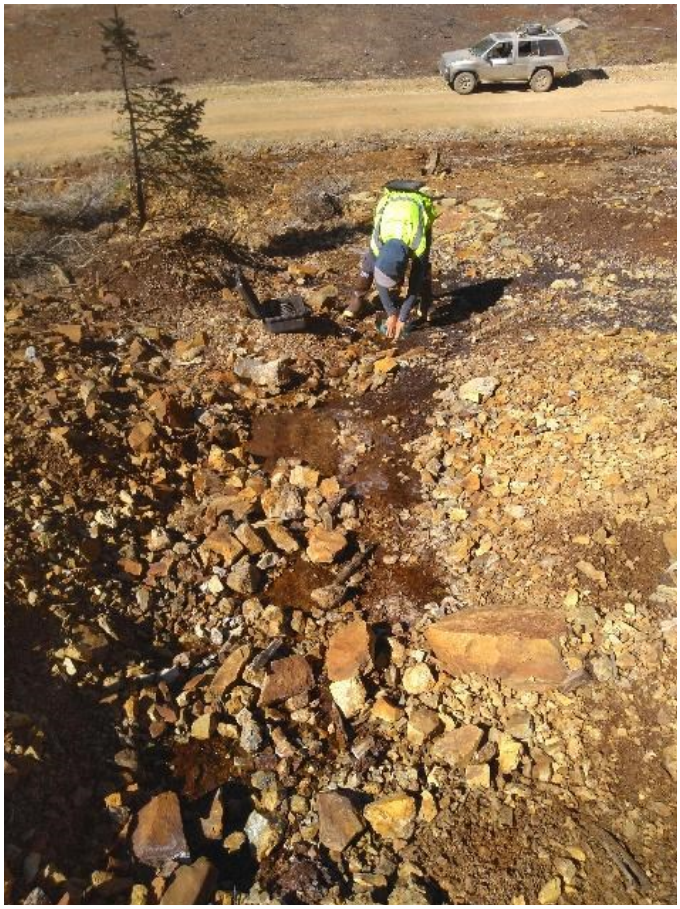

PHOTO 5

DATE TAKEN: 10/07/2020

LOCATION:

Seepage Location SS408

COMMENTS:

Last week's sampling location SS408, below the R&B portal

PHOTO 6

DATE TAKEN: 10/05/2020

LOCATION:

Seepage Location SS413

COMMENTS:

Last week's sampling location SS413, between CR 51 and CR 52.

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PHOTO 7

DATE TAKEN: 10/06/2020

LOCATION:

Seepage Location SS415

COMMENTS:

Last week's sampling location SS415, below the R&B fen, near Cement Creek

PHOTO 8

DATE TAKEN: 10/05/2020

LOCATION:

New Seepage Location SS425

COMMENTS:

Last week's new sampling location SS425, along CR 52

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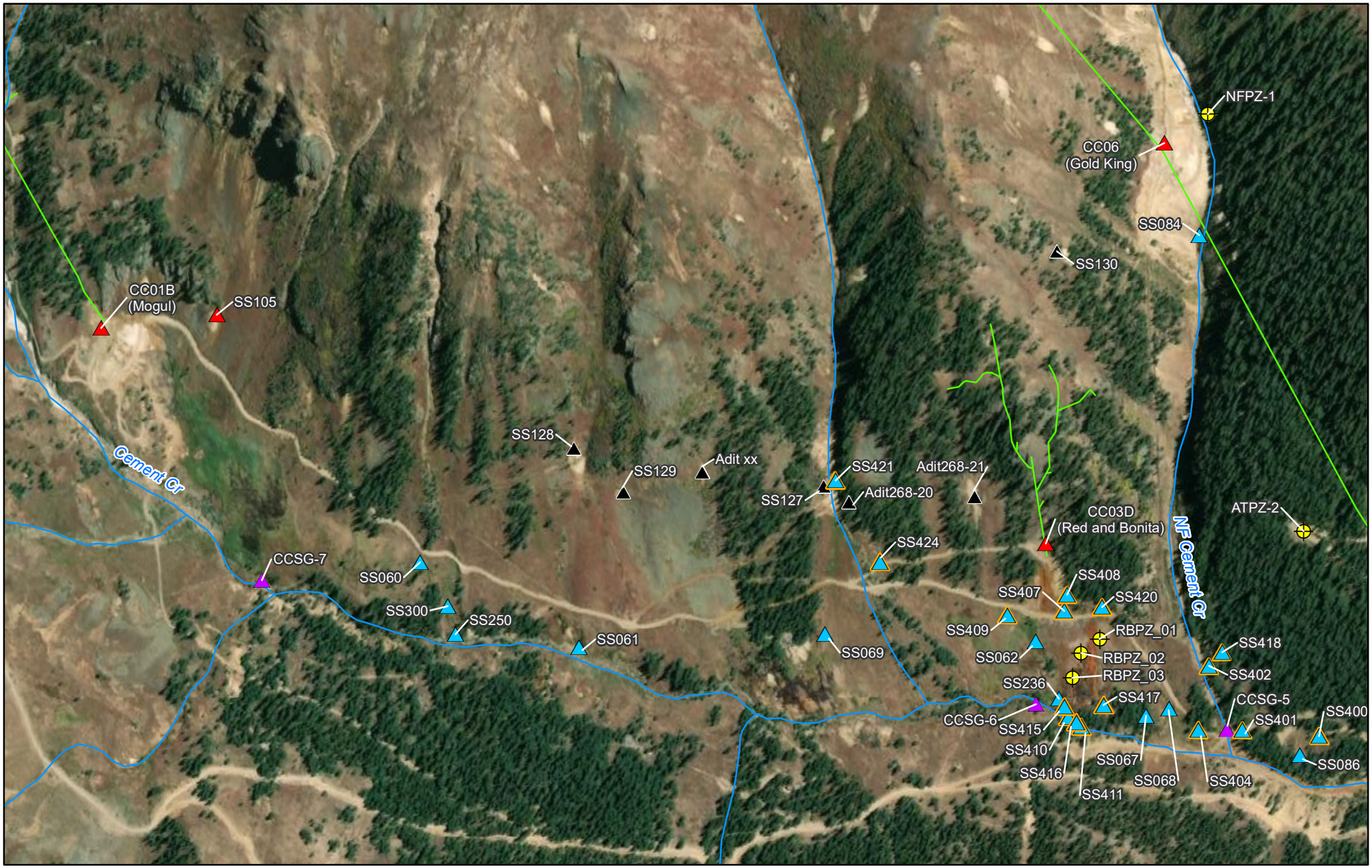
ATTACHMENT B: MSI OBSERVATION SUMMARY



Red and Bonita Test Closure Monitoring Locations

Map 1: Red and Bonita and Northern Vicinity

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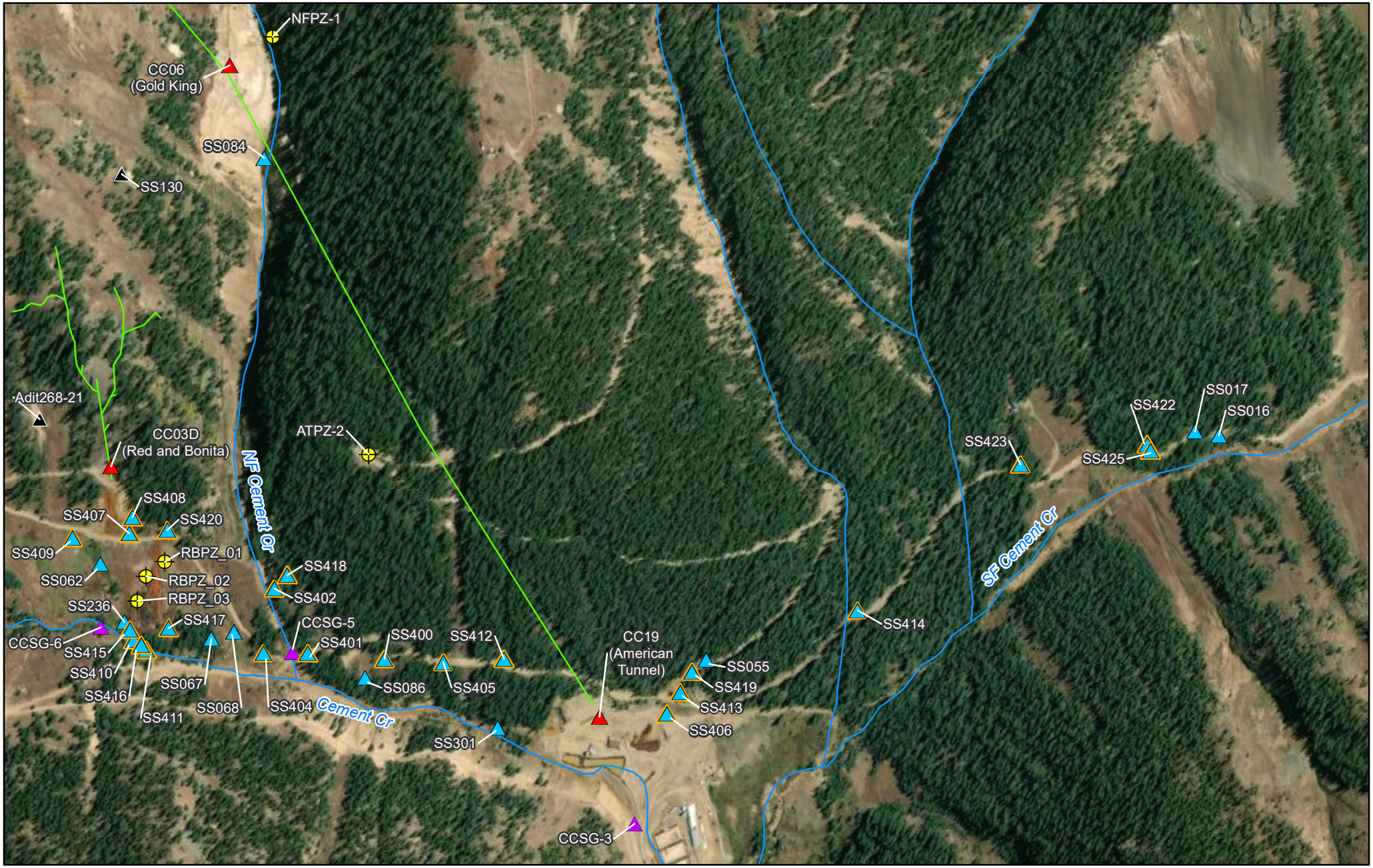
Red and Bonita Test Closure Monitoring Locations

- Draining Mine
- Dry Mine
- Well
- Known Seep/Spring Source
- Newly Emergent Seep/Spring Source
- Surface Water
- Mine Workings

0 300 600 1,200 1,800 2,400 3,000 Feet



Red and Bonita Test Closure Monitoring Locations

Map 2: Red and Bonita and Southern Vicinity

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Red and Bonita Test Closure Monitoring Locations

- Draining Mine
- Dry Mine
- Well
- Known Seep/Spring Source
- Newly Emergent Seep/Spring Source
- Surface Water
- Mine Workings

0 300 600 1,200 1,800 2,400 3,000 Feet