PITCH RECLAMATION PROJECT

COLORADO MINED LAND RECLAMATION BOARD

2017 ANNUAL RECLAMATION REPORT

RECLAMATION PERMIT NUMBER M-1977-004

Prepared for:

Division of Reclamation, Mining, and Safety

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EXECUTIVE SUMMARY

Homestake Mining Company of California (HMC) operated the Pitch Uranium Mine (mine) located in Saguache County, Colorado from 1979 until 1984. The mine extracted uranium ore and trucked it to their mill in Grants, New Mexico. In 1984, operations were suspended, and the mine was placed into care and maintenance. Incremental reclamation and revegetation of mine site disturbances were performed from 1985 to 1993. In 1993, HMC initiated the process of permanently closing the mine.

Since 1993, closure and reclamation activities have included pit wall grade-down and partial backfilling of the North Pit to reduce pit wall movement, contouring and revegetation of the approximately 230 acres of disturbed area, construction of a plug in the historical Pinnacle underground mine adit to reduce seepage and improve water quality, monitoring of slope stability in the North Pit and South Mine area, monitoring of the phreatic surface in the Indian and Tie Camp Rock dumps, construction of surface water controls, and dismantling and removal of the Radium Treatment Plant (RTP) and associated foundation materials and soils that were placed in the Tie Camp Disposal Cell.

During 2017, HMC maintained the remaining mine facilities and fulfilled permit and license-related compliance programs, which included the following activities:

- Monitored water quality at the Colorado Discharge Permit System (CDPS) permit (No. CO0022756) compliance point Outfall 001A (also known as SW-33) and submitted monthly discharge monitoring reports to the Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division per the requirements of the CPDS permit effective January 1, 2010.
- Performed inspection and reporting per the terms and conditions of the Radioactive Materials License issued by the CDPHE – Hazardous Materials and Waste Management Division (Permit No. 150-01), Amendment 15, and subsequent Amendment 16, which was issued on June 15, 2017.
- Monitored the drainage, stabilization, and reclamation in the constructed marsh areas near the location of the former RTP and the drainages upstream from the sediment control pond.
- Monitored pit wall slopes on the south and east walls of the North Pit, the east wall of the South Mine area, and the Indian and Tie Camp Rock Dumps.
- Monitored the drainage channel that was constructed in 2013 between the 10,800 and 10,600 benches on the east wall of the North Pit.
- Monitored erosion and drainage repairs on the northwestern side of the Indian Rock Dump above the clay and low-grade ore stockpiles.
- Installed and monitored three inclinometers on the Indian Rock Dump along the drainage ditch approximately halfway between the toe and the 10,300 bench to monitor slope stability during and after 2017 phosphate injection activities.
- Monitored the continued effectiveness of grading on the top three benches and slope face of the Tie Camp Rock Dump to reduce sedimentation on the benches and movement of stormwater and snowmelt off the benches and reduce erosion on the dump slope.
- Inspected cover repair completed in 2011 on the drainage channel on the Tie Camp Low Grade Ore Stockpile/Disposal Cell.
- Monitored precipitation at the onsite rain gauge, which recorded 21 inches of precipitation during the monitoring period from November 2016 through October 2017, compared with 20 and 23 inches during the 2016 and 2015 periods, respectively.

- Monitored groundwater levels in piezometers within and adjacent to the underground mine workings and monitored springs and seeps potentially influenced by the re-saturation of the underground mine workings.
- Monitored groundwater levels in piezometers in both the Indian and Tie Camp Rock Dumps.
- Continued noxious weed control.
- Monitored monuments and piezometers on the sediment control pond embankment per the requirements of the Colorado Division of Water Resources.
- Installed and operated the advanced monitoring system at SW-33, including water quality sondes (pH, oxidation-reduction potential, conductivity, turbidity, and temperature) and sensors (phosphate and radiometric).
- Installed a solar power system to power the advanced monitoring system.

HMC continued to evaluate Best Management Practices (BMPs) to achieve uranium mass load reduction at SW-33. Field activities in 2017 focused on expanded field implementation of the source control and treatment BMPs. The feasibility and potential uranium load reduction associated with surface improvements/infiltration management and physical water management options were also advanced in 2017. Specific field activities included:

- Installed eight recirculation/monitoring wells, including three wells in the underground mine workings area and five wells at the Indian Rock Dump.
- Completed surface improvements to facilitate injection system construction.
- Constructed and operated phosphate injection systems to facilitate uranium load reduction in the underground mine workings and Indian Rock Dump.
- Constructed and operated an in-ground Engineered Treatment Cell (ETC) containing blended zero valent iron media, and 55-gallon drum-scale ETCs containing biochemical reactor media.
- Constructed and tested the treatment residuals management system.
- Assessed the feasibility of and potential uranium load reductions associated with surface improvements/infiltration management and physical water management options.

The phosphate injection systems were successfully constructed and are fully operational. Activities conducted from 2015 through 2017 demonstrated the feasibility of in-situ uranium load reduction within source zones, and it is anticipated that downstream surface water uranium reductions will be observed with continued system operation.

1. INTRODUCTION

This 2017 Annual Reclamation Report (report) has been prepared to fulfill the Homestake Mining Company (HMC) annual reclamation reporting requirements to the Colorado Division of Reclamation, Mining, and Safety (DRMS) for Reclamation Permit Number (No.) M-1977-004 for the Pitch Reclamation Project. The Pitch Reclamation Project is located in Township 48 North, Range 6 East, Saguache County, Colorado (Figure 1). The Pitch Reclamation Project consists of approximately 230 disturbed acres situated at 10,000 to 11,000 feet above mean sea level (amsl) on fee land owned by HMC. Reclamation activities conducted by HMC at the Pitch Reclamation Project are provided on Figure 2, with activities conducted in 2017 presented separately from previous years. This report focuses on reclamation, monitoring, and remediation activities conducted at the Pitch Reclamation Project during the 2017 calendar year. Documentation of reclamation conducted in previous years is provided in prior annual reports.

2. LAND DISTURBED IN 2017

Surface disturbances in 2017 were associated with effectively conveying snowmelt and stormwater to minimize erosion and siltation on areas previously disturbed during historical mining. Additional surface disturbances in 2017 were associated with uranium load reduction Best Management Practices (BMPs) being implemented to establish the lowest practical level (LPL) for uranium at the Colorado Discharge Permit System (CDPS) permit (No. CO0022756) compliance point Outfall 001A (also known as SW-33). Associated activities included piezometer/inclinometer drilling and completion, placement of drill cuttings in the Tie Camp Disposal Cell, installation of platforms for two phosphate injection systems, engineered treatment cell (ETC) construction, and long-term reagent storage as described below. The activities summarized below were approved by DRMS in April 2017 under Technical Revision No. 8 (TR-8), which is included in Appendix A.

The following drilling activities resulted in surface disturbances of approximately 0.5 acre of previously disturbed or reclaimed ground:

- Four new piezometers installed at the 10,300 bench and one shallow piezometer near the toe of the Indian Rock Dump to facilitate phosphate injection activities.

- Three inclinometers installed along the drainage ditch approximately halfway between the toe and the 10,300 bench to monitor Indian Rock Dump slope stability during and after the 2017 phosphate injection activities.

- Three new piezometers installed into the underground mine workings, including two piezometers along the 10,600 level and one piezometer along the 10,500 level to facilitate phosphate injection activities.

- Two exploratory boreholes, including one borehole in the South Mine area adjacent to the underground mine workings to collect slope stability information, and one near the North Pit Lake outflow to collect additional geotechnical data.

Drill cuttings with counts per minute above background values were segregated and placed into an approximately 20-foot by 20-foot area excavated to approximately 4 feet deep, compacted and covered with sufficient existing cover material to obtain background gamma readings as required by the Radioactive Materials License (RML) and the associated Radiation Work Permit.

Two platforms were created to accommodate the phosphate injection systems. One platform was on the Indian Rock Dump 10,300 bench access road, and one was immediately east of piezometers P-4 and P-11 associated with the injection system of the underground mine workings. Surface disturbances associated with the platforms included grading/leveling of two approximately 25-foot by 50-foot areas. Riprap was placed adjacent to the platform at the underground mine workings to limit potential erosion on the associated slope (Photograph 1). The platforms associated with the underground mine workings and Indian Rock Dump phosphate injection system are shown in Photographs 2 and 3, respectively.

In 2017, a small ETC was constructed adjacent to the Tie Camp drainage. Surface disturbances to previously reclaimed ground included:

- Clearing of vegetation and leveling of ground surfaces leading up to and adjacent to the surface disturbance areas to facilitate access, staging, and handling of equipment and reagents.

- Mechanical excavation within a rectangular zone approximately 15 feet long by 5 feet wide by 3 feet deep (Photograph 4).

- Emplacement of piping and a riprap channel to route water to and from the Tie Camp drainage (Photograph 5).

Displaced alluvium was located adjacent to the excavated area for future use. Other areas identified above were used were used to stage treatment infrastructure. No grading or clearing of vegetation was conducted at these locations. Specifically:

- A chemical storage area with secondary containment and fencing (approximately 10 feet by 10 feet) was placed in the Tie Camp Disposal Cell area (Photograph 6).

- The treatment residuals management (TRM) dosing system included two separate stations of approximately 5 feet by 5 feet each. The dosing infrastructure was staged on Indian Rock drainage between the toe of the Indian Rock Dump and the sediment control pond, with one station along Indian Rock drainage just downstream of monitoring location IC (Figure 3) and immediately upstream of the beaver ponds and a second station near the Indian Rock drainage inflow to the sediment control pond.

The areas associated with uranium load reduction activities will continue to be used in 2018. The areas will be reclaimed once the infrastructure and piezometers/inclinometers are no longer being used as part of reagent injections and/or long-term monitoring program. Should select areas deemed to be no longer needed, they will be reclaimed. Eventual closure and reclamation will include plugging and abandonment of piezometers and/or inclinometers in accordance with Rule 16 of the Colorado Water Well Construction Rules. Following removal of piping and engineered structures associated with uranium load reduction BMPs, disturbed ground will be recontoured and revegetated, with grading for drainage, scarifying/harrowing, and fertilizing to be conducted as necessary for proper reclamation.

Photograph 1: Riprap being placed adjacent to the underground mine workings injection system platform

Photograph 2: Underground mine workings injection system platform

Photograph 3: Indian Rock Dump injection system platform

Photograph 4: Area excavated for the ETC

Photograph 5: ETC riprap channel used to route treated water to Tie Camp Drainage

Photograph 6: Chemical storage area with secondary containment and fencing

3. RECLAMATION ACTIVITIES IN 2017

During 2017, the primary maintenance and reclamation activities focused on regrading of roads to repair seasonal damage and maintain positive drainage to minimize erosion and noxious weed control. These reclamation activities are described in the following subsections. Several areas that were not reclaimed in 2017 are also discussed to illustrate the success of previous reclamation activities and summarize planned activities.

3.1 Drainage and Erosion Control – North Pit and South Mine Area

3.1.1 North Pit

Snowmelt, summer precipitation, and springs in the east wall of the North Pit have caused recurring erosion since the pit was developed almost four decades ago. A topographic low exists on the east wall of the North Pit between the 10,800 and 10,600 benches that concentrates surface drainage from a relatively large area above the crest of the east wall. In 2010, displacement in the 10,600 bench, coupled with snow pack and precipitation, caused a pond to form. The pond was graded and filled to re-establish appropriate drainage along the bench. The repairs were effective in keeping water from ponding on the 10,800 and 10,600 benches. In 2012, a diversion ditch was constructed to channel water from the 10,800 bench to the 10,600 bench and on to the “Spring” channel. This channel was effective until May 2015 when a sluff occurred on the east wall of the North Pit below the 10,800 bench. The area continues to be monitored following snowmelt to confirm that water does not pond on the 10,800 or 10,600 benches. Photograph 7, taken in 2017, shows that no additional sluffing has occurred on the east wall of the North Pit since 2015. Photograph 8 shows the diversion ditch in 2017. Photograph 9 was taken in October 2017 following fertilizer addition on the 10,800 bench above the diversion ditch. Straw bales were also placed for additional erosion control.

Photograph 7: East Wall of North Pit below the 10,800 bench in 2017 showing no additional sluffing

Photograph 8: East Wall of the North Pit in 2017 with the diversion ditch constructed in 2012 to channel water from the 10,800 bench to the 10,600 bench

Photograph 9: East Wall of the North Pit in 2017 from the 10,800 bench above the diversion ditch

3.1.2 South Mine Area

Monitoring in 2015 identified additional slope displacement on the east wall of the South Mine area, including redevelopment of tension cracks that showed both vertical and horizontal offsets. The total displacement of the tension cracks was on the order 1 to 2 feet. The heavy precipitation in late spring is likely the cause of the accelerated slope displacement and related tension crack development. In 2016, these cracks were graded closed, positive drainage of the bench was re-established, and a lower bench was added to the slope. However, the tension cracks reappeared in 2017 (Photograph 10). Additional control measures will be considered in 2018. Reclamation activities in the South Mine area was limited to monitoring of current roadways and slopes. Additional activities were conducted in the South Mine area in support of the installation of new piezometers and other injection/recirculation infrastructure as described in Section 4.

Photograph 10: Tension cracks redeveloped in 2017 in the East Wall of the South Mine area

3.2 Drainage and Erosion Control – Indian and Tie Camp Rock Dumps

3.2.1 Tie Camp Rock Dump

In 2012, repair work was completed on the top three benches and dump slope faces between benches to remove sediment build up that was directing snowmelt and stormwater down the dump face and creating rill erosion. Monitoring in 2017 showed that the repairs completed in 2012 have resolved issues on the top three benches and that the repairs continue to function. Photographs 11, 12, and 13, taken in 2017, show snowmelt and precipitation continue to move off the bench into the adjacent forested area with no sediment buildup and rill erosion on the face of the rock dump.

Photograph 11: Tie Camp Rock Dump upper bench

Photograph 12: Tie Camp Rock Dump looking down to the stilling basin from the bottom bench showing no signs of erosion in 2017

Photograph 13: Tie Camp Rock Dump slope face with no sign of rill erosion in 2017 between second and third benches

3.2.2 Indian Rock Dump

Erosion on the Indian Rock Dump was identified in 2010 (Photograph 14). Repairs were completed in 2012 and included grading and placement of boulders and riprap in the groin areas west of the Indian Rock Dump. The repairs continue to be effective in 2017 (Photograph 15).

Photograph 14: Indian Rock Dump groin area erosion in 2010

Photograph 15: Indian Rock Dump groin area in 2017 showing no additional erosion

3.3 Revegetation

In 2017, revegetation activities focused on fertilization of areas that have been previously revegetated, including the 10,800 bench on the east wall of the North Pit above the diversion ditch.

3.4 Noxious Weed Control

Noxious weed control was undertaken on isolated occurrences of Canadian Thistle and Scentless Chamomile (*Matricaria perforata*) on the site. Pest Away has assisted with noxious weed control since 2012, resulting in a large reduction in both noxious weeds. On August 15, 2017, Pest Away sprayed approximately 120 gallons of Milestone with Telar XP at 7ounces per acre and Escort XP w/R-11 Activator at 2 ounces per acre near roads and reclaimed areas. Pest Away returned on September 26, 2017 to spot-treat areas with approximately 55 gallons of the same mixture.

3.5 Access Road

The Pitch Uranium Mine (mine) access road was repaired and reseeded in 2016 due to sluffing that occurred in 2015. In 2017, the revegetation was not well established. The repaired areas will be reseeding again in 2018.

3.6 Constructed Marsh Areas

Reclamation-related activities in 2017 consisted of continued monitoring of the improvements to the constructed marsh area near the location of the former Radium Treatment Plant (RTP) and the drainages above the sediment control pond. Photograph 16 reflects the growth of cattails and sedges in 2017.

Photograph 16: Cattail and sedge growth near the former RTP site in 2017

3.7 Tie Camp Disposal Cell

In 2011, the surface water drainage channel on the Tie Camp Disposal Cell was repaired to correct erosion issues noted during an inspection by the Colorado Department of Public Health and Environment (CDPHE). The erosion was repaired in accordance with an approved plan and conditions in the RML and the Pitch Reclamation Project Procedures Manual. In 2014, waddles were placed in erosion areas to slow the movement of runoff and impede erosion from the face of the Tie Camp Disposal Cell. The repair work appears to have corrected drainage and erosion issues. Photograph 17 shows water flowing across the riprap repair area.

In 2017, drill cuttings from the installation of underground mine workings piezometers were placed into a small disposal excavation in the Tie Camp Disposal Cell. An approximate 20-foot by 20-foot excavation approximately 4 feet deep was created. Following drilling activities, the cell was backfilled with soil, ensuring background gamma measurements were at or below background conditions.

Photograph 17: Tie Camp Disposal Cell showing repaired area with water flowing across the riprap

4. MONITORING AND ANNUAL REPORTING

4.1 Slope Movement Vector Analysis

Survey monuments (monitoring points) have been installed at the Pitch Reclamation Project to monitor surficial slope displacement in the North Pit and South Mine areas. The area east of the North Pit and south of Northing 113,500 is referred to as the south wall of the North Pit, and the area east of the Pit Lake and north of Northing 113,500 is referred to as the east wall of the North Pit. Monitoring points are also present on the east wall of the South Mine area. There are currently 98 monitoring points in the North Pit and South Mine area to monitor surficial slope movement. Surveys are conducted as close to 1-year intervals as possible, allowing the magnitude of total displacement to be reported as a velocity in terms of feet per year. Ninety-two of the 98 monitoring points surveyed in 2017 had survey data from 2016 to compare with and determined displacement values.

Thirty-three of the 92 monitoring points had displacement values greater than associated survey error values compared to 44 monitoring points in 2016. This overall decrease in the number of monitoring points indicates a slowing of ground movement rates over the surveyed area. As discussed in Section 3, tension cracks redeveloped in the South Mine area in 2017. Additional grading and/or surface control will be conducted in 2018 to help avoid continued degradation of this area.

A detailed discussion of historical and 2017 monitoring point displacement data is presented in the 2017 Annual Survey Monitoring Report in Appendix A.

4.2 Inclinometer Evaluation

In 2017, three additional inclinometers were installed in the Indian Rock Dump to monitor the potential for movement (IN1, IN2, and IN3; Figure 3). These inclinometers supplement three slope inclinometers that were installed in 1998 to monitor areas of the North Pit (I98-1, I98-2, and I98-3). In general, IN1, IN2, and IN3, as well as I98-3, did not indicate movement during the period of observation in 2017. Inclinometers I98-1 and I98-2 indicated ground movement trends consistent with previous years of observation. Data from I98-1 and I98-2 show that slope creep is the primary form of ground movement. A detailed discussion of inclinometer data is described in the 2017 Annual Inclinometer Report included in Appendix A. Inclinometer installation activities in the Indian Rock Dump are described in Section 4.5.3.

4.3 Pinnacle Underground Mine Workings Monitoring

A concrete plug was constructed in the Pinnacle adit in September 1995. Authorization for the placement of the Pinnacle adit plug was requested by HMC in April 1995, and conditional approval was granted by the Colorado Division of Minerals and Geology (now DRMS) as TR-3 in May 1995. The intention of the plug was to seal the Pinnacle adit and allow the underground working and adjacent country rock to resaturate. The resaturation of the underground mine workings was expected to re-establish a geochemically reducing environment and lower the solubility of uranium and radium within the underground workings.

The Colorado Division of Minerals and Geology approval required HMC to monitor the effects of resaturation in the underground mine workings for 5 years or until hydrologic conditions stabilized. Components in the Monitoring Plan outlined in TR-3, included continuation of discharge water quality monitoring at SW-33, monitoring of groundwater resaturation levels, annual spring and seep surveys in areas downgradient from the underground mine workings, and monitoring for changes in water quality that could be attributable to resaturation. The stated purpose of the monitoring program is to verify the intended effectiveness of the adit plug. HMC has continued to monitor the following locations through 2017:

- Survey of springs and seeps
- Groundwater levels in piezometers installed in and adjacent to the underground mine workings

- Water quality and flow from the Pinnacle adit at sampling point PP-01
- Monitor discharges from the property at SW-33

4.3.1 Spring and Seep Monitoring

Spring and seep surveys were conducted to monitor changes in shallow groundwater conditions due to construction of the Pinnacle adit plug. These surveys have been conducted annually since July 1995 and were repeated in 2017. In general, flow from some springs and seeps increased for a brief period after the adit plug installation and have declined to a steady state since the spring of 1997. Small variances noted since 1997 can be attributable to a variety of conditions, including precipitation, depth of snow pack, timing of snowmelt, and the potential for infiltration with respect to frozen ground. The "active" spring and seep locations are shown on Figure 3. Spring and seep flow measurements since monitoring was initiated are presented in Table 1. Typically, the springs flow in the early summer months and then decrease rapidly to a point where there is little to no flow in the fall.

4.3.2 2017 Piezometer Completion

In 2017, three recirculation piezometers (P-13, P-14, and P-15) were installed within the underground mine workings to expand the phosphate injection/extraction well network. P-13 and P-15 were installed along the 10,600 bench and P-14 along the 10,500 bench (Figure 3). P-13 was screened in the underground mine workings to target the most permeable zones believed to be in hydraulic connection with the source of uranium, whereas P-14 and P-15 were drilled to pass through an underground mine drift and were screened in bedrock. P-14 was installed as an extraction well, while P-13 and P-15 were installed to operate alternately as injection or extraction wells depending on the recirculation sequence. The piezometers were designed in accordance with Colorado Office of the State Engineer Rules for Water Well Construction Rule 14, "Minimum Construction Standards for Monitoring and Observation Wells/Holes and Test Holes". A Colorado-licensed well driller was used to advance boreholes and to conduct piezometer installation, development, and sampling. Drilling activities are illustrated in Photographs 18, 19, and 20.

Photograph 18: Primary grout cone placed at 90 feet below ground surface in piezometer P-14

Photograph 19: Development pump being installed in piezometer P-14

Photograph 20: Concrete pad being constructed at piezometer P-13

4.3.3 Groundwater Levels

There are currently 12 active piezometers installed in or near the underground mine workings (P-4 through P-15). The locations of these piezometers are provided on Figure 3. These piezometers are used to monitor water levels throughout the underground mine workings area and/or to inject reagents (phosphate and tracers) as part of the uranium load reduction BMP infrastructure to further support LPL establishment, specifically:

- Piezometers P-4, P-5, P-11, and P-12 are located within and/or in immediate hydraulic connection of the underground mine workings. P-4 and P-5 were installed in 1995 prior to installation of the adit plug, whereas P-11 and P-12 were installed in 2015.
- Piezometers P-7, P-8, P-9, and P-10 are located outside of the underground mine workings, with P-7 located immediately upgradient of the adit plug. P-7 was installed as a replacement for P-6, which was monitored until approximately 1 year after plug grouting/construction. P-8 lies just to the north of the underground mine workings and was also constructed to monitor bedrock water levels upgradient of the Pinnacle adit plug. This is also the closest piezometer to the Chester Fault Zone. P-8 was converted to a dual-purpose inclinometer in 1999 by installing inclinometer casing inside the piezometer casing.
- Piezometers P-13, P-14, and P-15, screened outside of, but adjacent to the 10,300 bench, were installed in 2017 as additional uranium load reduction BMP infrastructure.

Water levels in the piezometers fluctuate seasonally, with the highest levels observed in late May or early June, coinciding with snowmelt (Figure 4). Spring and summertime water levels vary from year to year due to the magnitude and timing of snowmelt and heavy summer precipitation events; however, water levels under low-flow or "base-flow" conditions can be used to assess long-term trends. Overall, the base-flow water levels indicate a groundwater gradient to the north/northwest. This gradient is steepest on the southern end of the North Pit, as demonstrated by the decrease in water levels moving from piezometers P-4/P-11 toward P-7, and further to P-8. The complex geology and hydrogeology at the mine make it difficult to estimate water flow directions based on potentiometric surface alone. Despite the complexity, an observed northward groundwater gradient is consistent with the hypothesis that groundwater present in the underground mine workings and Chester Fault moves northward and discharges into the North Pit Lake. Although comparison with piezometer P-10 also suggests a westward gradient, note that comparison of P-4/P-11 with piezometer P-9 further to the west suggests that this gradient is minimal following transition from the Granite/Precambrian east of the Chester Fault (P-10), into the Belden and Leadville Formations west of the fault (Figure 4).

The following additional observations have been noted since the adit plug was installed in 1995. The discussion does not include detailed observations from piezometers P-13, P-14, and P-15, as the period of record for those wells is less than 1 year, and water levels in the piezometers are reflective of injection/recirculation activities, rather than regional water level trends:

- Base-flow water levels in piezometer P-7 have stabilized at just under 10,385 feet amsl. This value has not changed substantially since 2002, indicating that water levels behind the Pinnacle adit plug are stable.

- Water levels in piezometers P-4 and P-5, which are in direct hydraulic connection with the underground mine workings, have been very similar since 1997. Since their installation in 2015, water levels in piezometers P-11 and P-12 are also comparable to each other and comparable to P-4 and P-5. These results demonstrate that, despite backfilling and/or collapse of void space, there is minimal hydraulic resistance between the northern and southern ends of the underground mine workings.

- Piezometers in hydraulic connection with the underground mine workings (P-4, P-5, P-11, and P-12) show a stronger sensitivity to seasonal snowmelt (i.e., greater water level rise) compared to piezometers P-8, P-9, and P-10, suggesting more connection with infiltrating water. This is consistent with the fact that the underground mine workings are overlain by unconsolidated backfill in the South Mine area, which likely allows more snowmelt infiltration than the undisturbed bedrock. Seasonal response in piezometer P-7 is generally greater than P-8 and P-9, but less than observed in P-4, P-5, P-11 and P-12, suggesting an intermediate level of hydraulic connection with snowmelt infiltration.

- Base-flow water levels in piezometers P-4 and P-5 have been generally stable since 1997. Piezometer P-8 has consistently displayed the lowest water level in the mine vicinity, although it has increased approximately 15 feet since 1997. P-8 is located where the workings once day-lighted in the south wall of the North Pit. One possibility for the slow rise in water level near this piezometer is the continued collapse and compression of mine workings, disturbed bedrock, and material backfilled into the opened workings following mine activities, which has caused a decreased hydraulic conductivity and resulting head rise in this area.

Flow from the Chester Fault Zone into North Pit Lake is measured at CFS and CFS-2, which are springs located on the south wall of the North Pit (Figure 3). The flow from CFS has been measured since fall 1999 and has ranged from 0.1 to 7.2 gallons per minute (gpm). The flow from CFS-2 has been measured since fall 2002 and has a similar range from 0.4 to 5.2 gpm.

Between the October 21, 2015 and November 4, 2015 monitoring events, water levels in piezometers P-5 and P-12 exhibited a consistent drop of approximately 10.5 feet (Figure 4). The rapid and uniform nature of the drop suggested that it may have been due to a systematic field measurement error. Base-flow measurements in P-5 and P-12 collected in 2016 and 2017 were again consistent with water levels in piezometers P-4 and P-11 (prior to injection/recirculation activities).

During 2017 operation of the phosphate injection systems, overall water level increases were observed in the underground mine workings as illustrated by water level increases in piezometers P-13, P-14, P-15, P-5, and P-12, which were not used as injection wells in 2017. The fact that water levels in these piezometers remained consistent with the levels in piezometers P-4 and P-11 is indicative of the strong hydraulic connectivity across the underground mine workings. During injections, the water level decreased up to 20 feet in piezometer P-7, which can be attributed to water extraction. Due to water reinjection, water levels in P-4 and P-11 showed a steady-state increase of approximately 10 feet.

4.3.4 Pinnacle Adit Flow and Water Quality

The flow rate from the Pinnacle adit at PP-01 has been monitored since November 1993. The flow generally consists of a seasonal pattern of high flows during the short period of spring melt in late May or early June and stable flows of less than 10 gpm throughout the year (Figure 5). The spike in flows observed at PP-01 each spring are a result of snowmelt and runoff, likely from sources originating between the Pinnacle plug and the PP-01 monitoring point. The precise magnitude of the spring peak flow is not necessarily reflective of the maximum flow because high-flow conditions occur over a short period, and the timing of the flow measurements does not necessarily coincide exactly with peak flow. Once the snowmelt period is over, the flow rate at PP-01 decreases and stabilizes at normal levels.

Dissolved radium 226 and total uranium have been monitored at PP-01 since March 1994. After construction of the Pinnacle adit plug in September 1995, both dissolved radium 226 and total uranium concentrations have stabilized at reduced concentrations (Figure 6). These reduced total uranium and dissolved radium 226 were also observed in 2017.

4.4 Sediment Control Pond

Runoff from snowmelt and precipitation primarily flows across the property via the Indian Rock and Tie Camp drainages. In 1980, an approximately 80-foot-high earthen embankment was constructed at the confluence of Indian Rock and Tie Camp drainages to allow settlement of suspended solids from surface water prior to its release to Indian Creek. The embankment is a jurisdictional structure under the Colorado Division of Water Resources (Permit No. 280110). A Sediment Control Pond Embankment Report is submitted annually to the Colorado Division of Water Resources, providing the results of the embankment-monitoring program. The 2017 Sediment Control Embankment Report is provided in Appendix A.

4.4.1 Background

The embankment was designed as a zoned embankment with a 15.0-foot-thick clay core and both upstream and downstream rockfill shells constructed with compacted weathered sandstone. The pond has a surface area of approximately 5.4 acres with a corresponding capacity of 88.3-acre-feet. An emergency overflow spillway exists through the right abutment, with an outfall weir elevation of 9,900.0 feet amsl. In June 2000, seepage was observed on the downstream face of the embankment. Subsequent evaluation identified localized elevated phreatic surface within the embankment and the downstream shell. In 2001, a cutoff trench and clay blanket were installed on the upstream face over the seepage area. Seepage has not reappeared since the repair work.

4.4.2 Embankment Monitoring

The safety and efficiency of the sediment control pond embankment is monitored with a network of surface and subsurface systems. Following completion of construction in 1981, five permanent survey monuments (M1 through M5) and five piezometers (piezometers P-1 through P-5) were installed to monitor physical movement of the embankment and changes in phreatic surface within the embankment, respectively. In 2000, four additional piezometers (piezometers P-6 through P-9) were completed in the core of the embankment. Piezometer P-1 is located on the crest upstream side of the embankment. Piezometers P-2, P-3, P-6, P-7, P-8, and P-9 are located on the crest downstream side of the embankment. Piezometers P-4 and P-5 are location on the downstream slope of the embankment.

The 2017 monument survey was performed on October 5 and indicated minimal total vertical movement in the embankment. Results were consistent with previous measurements and within the range of survey error. Specifically, differences between the 2016 and 2017 surveys were between -0.01 and +0.01 foot. There was no significant vertical displacement since the initial settlement (1981 to 1984).

In 2017, the water level in the sediment control pond was maintained at 9,884 feet amsl from January to April. In the middle of May, the pond level rose to 9,888 feet amsl, the highest pond level recorded during the year, and decreased to 9,887 feet amsl by the end of May. From June to July, the pond level decreased from 9,886 feet amsl to 9,885 feet amsl. This pond level was maintained through December 4, which was the last day of pond level recording in 2017.

Water level trends measured in the piezometers between 2017 and 2016 are consistent with historical readings. A detailed discussion of piezometer monitoring is included in the 2017 Sediment Control Embankment Report provided in Appendix A.

4.4.3 Sediment Control Pond Silt/Turbidity Curtain Installation

A new silt/turbidity curtain was installed at the sediment control pond in early July 2017 to further control suspended solids that may not readily settle using iron- and aluminum-based dosing during treatment residuals management associated with establishing the LPL for uranium as described in Section 4.3.3. The existing silt/turbidity curtain remained near the outlet of Indian Rock drainage into the sediment control pond, while the new silt/turbidity curtain was installed closer to the SW-33 outlet to allow for additional

sediment deposition over a wider area. The new silt/turbidity curtain included 300 linear feet of geosynthetic curtain consisting of six sections. Each segment was 50 linear feet and consisted of an 8-inch polyvinyl chloride float secured to a submersible semipermeable curtain set to varying depths. Two of the six segments installed along the shoreline had a 12-foot curtain depth, and the remaining four sections had a 24-foot curtain depth so that the curtain touches the pond bottom. Each segment was stitched together using high-density zip ties through prefabricated eyelets and positioned around the SW-33 outlet. The curtain was anchored along the shore at four points using 6-inch-diameter wood beams set into the ground with concrete, and ¼-inch poly-coated steel cable was used to secure the curtain to the beams. Each cable was tightened using ratchet straps and fasteners.

Photograph 21 shows the new silt/turbidity curtain as seen from the sediment control pond embankment. The existing silt/turbidity curtain can be seen in the background.

Photograph 21: Sediment control pond silt/turbidity curtain as observed from the embankment

4.5 Rock Dumps

Monitoring and annual reporting associated with the Indian and Tie Camp Rock dumps are discussed in the following subsections. A more detailed discussion of the rock dumps is provided in the 2017 Annual Geotechnical Report, which was filed with DRMS in January 2018, and is provided in Appendix A.

4.5.1 2017 Indian Rock Dump Piezometer Completion

In 2017, one shallow piezometer (RD-05) was installed with a total depth of 36 feet near the toe of the Indian Rock Dump, and four piezometers (RD-06, RD-07, RD-08, and RD-09) were installed at the Indian Rock Dump 10,300 level at total depths of 206.5, 210, 208, and 212 feet, respectively (Figure 3). RD-05 was installed along the transect, normal to groundwater flow, that includes the RD-01, RD-02, and RD-03

piezometers installed in 2016. The four new injection piezometers were installed along an upgradient transect normal to groundwater flow adjacent to existing monitoring piezometer IC-10300R. Each piezometer was constructed with a 20-foot screen interval located at the bottom of the piezometer coincident with anticipated static water levels. The piezometers were designed in accordance with Colorado Office of the State Engineer Rules for Water Well Construction Rule 14, "Minimum Construction Standards for Monitoring and Observation Wells/Holes and Test Holes". A Colorado-licensed well driller was used to advance boreholes and to conduct well installation, development, and sampling. Photograph 22 shows the drill rig setup at RD-06, Photograph 23 shows a closeup of piezometer installation at RD-07, and Photograph 24 shows the surface completion at RD-05.

Photograph 22: Drilling RD-06 at the Indian Rock Dump using a standard truck-mount Terra Sonic International 150S drill rig

Photograph 23: Indian Rock Dump piezometer installation showing centralizer on RD-07

Photograph 24: Surface completion of RD-05 at the Indian Rock Dump

4.5.2 Rock Dump Water Levels

Historically, the water levels in rock dump piezometers show little fluctuation in the fall and winter months, with a temporary rise in response to the spring snowmelt or summer rain events. The extent that water levels rise each year depends on the fluctuation in snowpack and summer precipitation, and the location of the piezometers within the rock dumps. The onsite precipitation gage recorded 21 inches of precipitation during the 2017 monitoring period (November 2016 through October 2017), compared with 20 and 23 inches during the 2016 and 2015 periods, respectively, and 31 inches in 2014, consistent with the heavy snowpack observed that year.

In 2016 and 2017, injection activities associated with the Indian Rock Dump in-situ source zone treatment influenced water levels in the new and existing piezometers. After cessation of injection activities, piezometers returned to long-term water level trends.

In 2017, the Indian and Tie Camp Rock Dumps were inspected monthly in accordance with the recommended monitoring program. The inspections and monitoring conducted in 2017 indicate stable conditions for the Indian and Tie Camp Rock Dumps. Additional details are provided in the 2017 Annual Survey Monitoring Report in Appendix A.

4.5.3 Inclinometer Completion and Monitoring

To monitor Indian Rock Dump slope stability during and after 2017 phosphate injection activities, three inclinometers (IN1, IN2, and IN3) were installed in August 2017 along a drainage ditch located approximately halfway between the base of the Indian Rock Dump and the 10,300 bench (Figure 3). The IN1, IN2, and IN3 boreholes were advanced through waste rock into native ground to total depths of 63,138.5 and 25 feet below ground surface, respectively. The construction of inclinometers was completed using Slope Indicator® (SI) QC slotted casing. The borehole annulus was backfilled with 10/20 sized silica sand. Photograph 25 shows the drill rig setup at IN2, and Photograph 26 shows installation of the slope inclinometer casing at IN1.

Inclinometer readings were periodically collected during operation of the Indian Rock Dump phosphate injection system (August through September 2017). No slope movement was detected during or following injections. Additional details are provided in the 2017 Annual Survey Monitoring Report in Appendix A.

Photograph 25: Drilling IN2 with combination of ODEX® down-hole air hammer system and hollow-stem auger

Photograph 26: Installing slope inclinometer casing at IN1

4.6 Establishing the Lowest Practical Level for Uranium

Field activities in 2017 focused on construction of the systems to facilitate uranium load reduction and passivation, including the phosphate injection systems in the underground mine workings and Indian Rock Dump, the ETC and biochemical reactors (BCRs), and the TRM system. Required regulatory approvals/authorizations were obtained prior to initiation of field activities.

- United States Environmental Protection Agency Class V Underground Injection Control "authorization by rule".
- Chemical usage authorization from the CDPHE Water Quality Control Division (WQCD), which allowed reagents to be used that were not directly specified by the CDPS permit (No. CO0022756).
- TR-8 to the reclamation permit (No. M-1977-004), which focused on surface disturbances.

Copies of the regulatory approvals are provided in Appendix A.

Compliance with the conditions of the approvals/authorizations and CDPS permit conditions were maintained during and following the 2017 field activities. Field activities are summarized in the following subsections.

4.6.1 Phosphate Injection Systems

Activities associated with the phosphate injection system implementation included:

- Installation of eight recirculation/monitoring piezometers, including three in the underground mine workings area and five in the Indian Rock Dump, as described in Section 3.
- Completion of surface improvements to facilitate injection system construction.
- Oversight of inclinometer installation to support slope monitoring during injection activities.
- Design, construction, inspection, and operation of the phosphate injection systems.

Photograph 27 shows a portion of the interior of an injection system, including the reagent tank (fore-ground), mixing tank (background), dosing system (upper left), and bag filter (lower left).

The injection systems operated from August 2017 through late September 2017, and injection activities included:

- Underground mine workings: Almost five times the overall injection volume in 2017 relative to 2016 activities (720,000 and 150,000 gallons, respectively).
- Indian Rock Dump: Approximately 45 times the overall injection volume in 2017 relative to 2016 activities (1,124,000 and 25,000 gallons, respectively).

Both systems successfully delivered and distributed reagents throughout the target injection zone (underground mine workings) and into the saturated zone fill material (Indian Rock Dump) as demonstrated by phosphate and tracer dye concentrations. To date, significant decreases in uranium concentrations in downgradient surface water have not been observed. The delay in observed uranium reduction at SW-33 can be attributed to slow migration of the clean water front (i.e., migration of treated, uranium-reduced water from the injection zone) and desorption of residual uranium downgradient of phosphate injection zones.

Photograph 27: Injection system interior

4.6.2 Engineered Treatment Cells

The in-ground zero valent iron (ZVI) ETC, installed adjacent to Tie Camp drainage, is 3 feet deep, 5 feet wide, and 15 feet long, with approximately 33,000 pounds of blended ZVI media (65% iron and 35% sand by volume). The ETC operated from August 2017 through early October 2017, with near complete uranium removal initially, followed by up to 56% removal after system stabilization. Drum-scale BCRs containing organic-based media (woodchips, manure, hay) and ZVI operated from late July 2017 to early October 2017 demonstrated near complete uranium removal for the duration of operation. 2017 results suggest optimal treatment media is primarily composed of organic material (i.e., woodchips, manure, and hay) with a lesser fraction of ZVI to facilitate reducing conditions and provide additional uranium removal capacity. The ZVI media following placement in the ETC is shown in Photograph 28.

Photograph 28: Zero valent iron media

4.6.3 Treatment Residuals Management System

The TRM system was located on the Indian drainage between the toe of the Indian Rock Dump and the sediment control pond and constructed using iron and aluminum (ferric chloride and sodium aluminate) and polymer flocculant (Mineral Master MM-2480). Bench testing was conducted in early 2017 to determine optimal field dosing rates and to verify enhanced iron/aluminum precipitate removal with flocculant. Phosphate and secondary treatment byproducts were successfully controlled during load reduction field activities in 2015 through 2017; therefore, field implementation of the TRM system was not necessary in 2017. The TRM dosing system is shown in Photograph 29.

Photograph 29: TRN dosing system

4.6.4 Surface Water Management

In 2017, surface water management activities focused on advancing water segregation approaches and the associated implications, including:

- Diversion of water around North Pit Lake
- Drawdown of North Pit Lake
- Monitoring of lake stratification following drawdown

Routing of water around the lake resulted in a maximum diversion of approximately 37% and facilitated the rapid drawdown of North Pit Lake. The drawdown of the North Pit Lake was successful in providing useful information on the feasibility of lake level manipulation for water treatment and potential closure and reclamation purposes, as well as for informing lake recharge dynamics. Within the 8 feet of drawdown, no additional seeps were identified along Chester Fault, indicating that additional uranium-influenced groundwater discharge is occurring at depth. Temperature and conductivity loggers placed on a mooring line anchored to the lake bottom will monitor lake stratification through spring 2018. Photograph 30 shows the North Pit Lake after 6.5 feet of drawdown.

Photograph 30: North Pit Lake shoreline following 6.5 feet of drawdown

4.7 Advanced Monitoring System

In 2017, the advanced monitoring system was installed and operated at SW-33. The system, which is housed in the heated shed constructed in 2016 upgradient of SW-33, includes water quality sondes (pH, electrical conductivity, temperature, oxidation-reduction potential, and turbidity), a phosphate sensor, and a radiometric sensor to monitor radium 226, thorium 232, uranium 238, and uranium 232. A solar power system was also installed in 2017 to power the advanced monitoring system. Photograph 31 shows the solar panels installed on the sediment control pond embankment.

Photograph 31: Solar panels installed on the sediment control pond embankment

4.8 Colorado Discharge Permit System Monitoring

Monthly discharge monitoring reports (DMRs), pursuant to CDPS Permit No. CO-0022756, were submitted to the CDPHE WQCD throughout 2017. Analytical tests conducted for the DMRs at SW-33 consist of flow, dissolved radium 226, total radium 226/228, total uranium, pH, total suspended solids, total dissolved solids, oil and grease (visual only), potentially dissolved zinc, and whole effluent toxicity (WET). During 2017, analytical results were below the CDPS permit 30-day average or daily maximum limitations, and WET tests passed consistent with historical results. The 2017 DMRs are on file with the WQCD.

At the request of the WQCD, an early permit renewal application was submitted on December 2, 2013. In January 2014, the WQCD published a draft renewal permit for public review and comment. HMC provided comments to the WQCD on March 17, 2014. The CDPS permit was administratively extended on September 1, 2015. A final CDPS permit was not issued by the WQCD in 2017.

4.9 Radioactive Materials License

The RTP building, foundation, and sediments excavated from the upper portion of Indian Rock drainage below the former RTP area were placed in the Tie Camp Disposal Cell in 2001. Final grading and revegetation of the former RTP area was completed in 2003. With the removal of the RTP, radioactive source material and the associated treatment capacity were removed. HMC is authorized by the RML and associated license amendments to manage the Tie Camp Low-Grade Stockpile and Disposal Cell, and the sediment upstream of the sediment control pond embankment within the applicable guidelines. HMC requested a Radiation Safety Officer change on March 28, 2017, which was incorporated into License Amendment No. 16 issued by the CDPHE Hazardous Materials and Waste Management Division on July 25, 2017. The RML was renewed in April 2013 and will expire in April 2018. HMC is currently preparing the RML license renewal application. The 2017 Annual RML Letter Report is provided in Appendix A.

5. INSPECTIONS

DRMS (Dustin Czapla) conducted the annual inspection on June 26, 2017. No violations were noted during this inspection. The 2017 DRMS inspection report is included in Appendix A. Specific observations included:

- Adequate mine identification signage was noted at the entrance to the site.
- Roads: No problems were noted with any internal roads. The repair work conducted in 2015 on the failed slope along the access road appeared stable. The repair area has been seeded but vegetation is not yet well established.
- Tie Camp Rock Dump: The slope below the road still appeared stable and vegetation was well-established.
- Tie Camp Disposal Cell: Slopes were stable and vegetation was well established. Several mule deer were feeding in the area during the inspection.
- South Mine area: Some slope failure in the upper portion of the South Pit area that affects approximately 0.75 acre was noted. This is an area of recurring failure, and HMC is working to better understand the failure so that a more permanent fix can be developed. The failure poses no risk to public safety.
- North Pit: Monitoring of slope movement above the North Pit Lake continued. Efforts are ongoing to control erosion and drainage on the east wall of the north pit. A final reclamation/stabilization plan is not yet developed for this area. Discharge from the North Pit Lake was flowing through the valve and culvert as designed.
- Pinnacle Portal: Continued to discharge, and flow was measured through a v-notch weir and reported to the constructed marsh area above the facilities shop building.
- Indian Rock Dump: Slopes appeared stable and vegetation was becoming well established. No significant erosional features were noted.
- Sediment Control Pond: The sediment control pond appeared functional and the pond slopes appeared stable. The silt/turbidity curtain placed in the sediment control pond below the Indian Rock drainage inflow was maintained and still in place. No seepage or stability concerns were noted around the dam.

DRMS (Tony Waldron, Russ Means, and Travis Marshall) also conducted a site visit on September 18, 2017 to observe the load reduction/treatment approaches being implemented to establish the LPL for uranium. There were no other agency inspections/visits in 2017.

6. SURETY

HMC maintains a reclamation surety performance bond for the Pitch Reclamation Project in the form of a financial guarantee bond with Safeco Insurance Company of America in the amount of $2,263,000. A copy of the notification and surety form to DRMS is provided as Appendix B.

7. MONITORING AND RECLAMATION ACTIVITIES PLANNED FOR 2018

During 2018, the following monitoring and reclamation activities are tentatively scheduled or planned:

Pit Slope Stability

- Conduct annual surveys of the slope monitoring monuments and inclinometers.
- Conduct grading and/or surface control in the South Mine area to avoid continued degradation associated with the tension cracks in the east wall.
- Monitor the drainage channels on the east and south walls of the North Pit, the east wall of the South Mine area, and other areas throughout the property, and make improvements as necessary.
- Inspect and maintain the diversion ditch between the 10,800 and 10,600 benches on the east wall of the North Pit.

Tie Camp Disposal Cell

- Monitor the Tie Camp Disposal Cell for depressions where water could pond and manage the drainage off and around the cell.
- Monitor revegetation and reseed and/or fertilize as necessary.

Sediment Control Pond

- Clean sediment traps in the Indian and Tie Camp drainages above the sediment control pond.
- Inspect and monitor the sediment control pond embankment, including surveying the monuments, inspecting for seepage, removing tree seedlings on the upstream and downstream face of the embankment, monitoring the outlet pipe and cleaning the debris trap above the outlet pipe, and repairing rill erosion as need.
- Monitor the sediment control pond embankment piezometers monthly, or more often if it is necessary to store water above the clay blanket located on the upstream side of the sediment control pond embankment.
- Inspect the piezometers for silt buildup and pressure flush the piezometers as necessary to eliminate buildup of debris and silt.

Rock Dumps

- Inspect drainage and erosion repairs on the upper benches of the Tie Camp Rock Dump and the groin area on the western side of the Indian Rock Dump.
- Conduct manual water level readings in the piezometers in the Indian Rock Dump.
- Monitor Indian Rock Dump inclinometers to confirm slope stability during phosphate injection/recirculation activities.

Underground Workings

- Conduct manual water level readings in the piezometers in and near the underground mine workings.
- Install transducers in select piezometers to obtain additional water level readings within the underground mine workings prior to, during, and following phosphate injection/recirculation activities.

Revegetation and Weed Control

- Reseed and/or fertilize the access road near the slope failure repair area.

- Continue noxious weed control management using Milestone with Telar XP and Escort XP w/R-11 Activator.

General Maintenance and Permit Compliance Activities

- Grade roads for safe travel into and around mine.
- Evaluate approaches to demolish and remove the sand filtration plant located near the toe of the sediment control pond embankment, including review by the Engineer of Record, due to pipe penetration associated with the embankment.
- Conduct monthly and quarterly monitoring and reporting in accordance with the CPDS permit. Water quality monitoring will continue in 2018.
- Continue to monitor the constructed marsh area located in the drainage area near the former RTP and on the small sediment settling basins constructed upgradient from the sediment control pond, including placement of additional organic material (e.g., peat), transplanting cattails from similar elevations, and other enhancement activities to further promote sediment control.

Optimization of Source Control and Treatment BMPs

Full-scale field implementation of the source control and treatment technologies will focus on operation of the phosphate injection systems constructed in 2017 while still controlling phosphate from entering surface water, expansion of the ETCs, and investigation and design of surface water and shallow groundwater controls. Engineering optimization planned for 2018 includes:

- Additional injection system automation to allow for unattended 24-hour operation (if desired) and enhanced performance.
- Installation of telemetry hardware to allow for remote notification and data transmission.
- Installation of up to two additional extraction/injection wells in the underground mine workings area and incorporation into the system infrastructure.

In addition to continued operation and optimization of the phosphate injection systems to advance source zone uranium load reduction, the following additional BMP advancement activities are proposed for 2018:

- Construction of more comprehensive and robust TRM reagent delivery/distribution systems including direct North Pit Lake/sediment control pond uranium treatment systems.
- ETC expansion.
- Continued surface water and shallow groundwater investigations.
- Investigation of potential localized uranium sources in the Indian Rock Dump and Tie Camp Rock Dump to identify further opportunities for source load reduction.

TABLE

Table 1 Springs and Seeps Summary of Activity (1995-2017)

Station	Current Designation	Flow Rate Data* (gallons per minute)																						
		Spring 1995	Spring 1996	Spring 1997	Spring 1998	Fall 1998	Spring 1999	Fall 1999	Spring 2000	Fall 2000	Spring 2001	Fall 2001	Spring 2002	Fall 2002	Spring 2003	Fall 2003	Spring 2004	Fall 2004	Spring 2005	Fall 2005	Spring 2006	Fall 2006	Spring 2007	Fall 2007
TC-1	Inactive	*<1	no flow	*<1	no flow or dry	*<1	no flow or dry	no survey	*<1	*<1	no flow or dry	no flow or dry	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-2	Spring	*5	*5	*5	*5	*5	*1	no survey	0.6	*<1	0.8	0.3	no flow	0.2	1.5	0.3	0.6	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow
TC-3	Spring	*5	*5	*5	*5	*5	*1	no survey	0.5	*<1	0.8	0.5	no flow	0.4	3.8	0.4	0.9	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow
TC-4	Seep	*<1	no flow	*5	no flow	*5	no flow	no survey	1.2	no flow or dry	0.4	no flow or dry	no flow or dry	no flow or dry	4.3	no flow or dry	0.4	no flow or dry	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow
TC-5	Seep	*<1	no flow	*5	no flow	*5	no flow	no survey	0.5	no flow or dry	0.4	no flow or dry	no flow or dry	no flow or dry	1.7	no flow or dry	no flow or dry	no flow or dry	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow
TC-6	Inactive	*5	no flow	no flow	N-O	N-O	N-O	no survey	not observable	no flow or dry	no flow or dry	no flow or dry	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-7	Inactive	no flow	*20	no flow	no flow	no flow	no flow	no survey	no flow	no flow or dry	no flow or dry	no flow or dry	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-8	Inactive	no flow	no flow	*<1	*<1	*<1	*<1	no survey	*<1	no flow or dry	no flow or dry	no flow or dry	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-9	Seep	no flow	no flow	no flow	*<1	*<1	0.1	no survey	0.2	no flow or dry	0.1	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry
TC-10	Spring	First monitored in spring 1999					*1	no survey	1.5	0.9	0.5	0.5	0.4	0.6	1.2	0.6	1.7	0.6	0.9	0.5	0.7	0.5	0.9	0.5
TC-11	Inactive	First monitored in spring 2000							*<1	no flow	no flow or dry	no flow or dry	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-12	Inactive	First monitored in spring 2000							no flow	no flow	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-1	Inactive	*2	no flow	no flow	*<1	no flow	N-O	N-O	N-O	N-O	no flow or dry	no flow or dry	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-2	Spring/Seep	*<1	*<1	*<1	*<1	*<1	0.7	no survey	1.2	no flow	0.5	no flow or dry	no flow or dry	no flow or dry	2.1	0.3	0.9	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry
IC-3	Seep	*2	*2	*2-5	*<1	*<1	no flow	no survey	no flow	no flow	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry
IC-4	Spring/Seep	*10	*5	*20	*15	*1	*2.5	no survey	8.6	no flow	3.8	no flow or dry	no flow or dry	no flow or dry	28.4	no flow or dry	1.9	no flow or dry	20.9	no flow or dry	15.4	no flow or dry	37.2	0.4
IC-5	Inactive	no flow	no flow	no flow	*<1	no flow	no flow	no survey	*<1	*<1	no flow or dry	no flow or dry	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-6	Seep	*5	no flow	no flow	*2	*<1	no flow	no survey	1.3	no flow	0.5	no flow	0.5	no flow or dry	0.7	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry
IC-7	Inactive	no flow	no flow	no flow	no flow	no flow	no flow	no survey	*<1	<1	no flow or dry	no flow or dry	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-8	Inactive	3	no flow	no flow	*<1	no flow	no flow	no survey	*<1	no flow	no flow or dry	no flow or dry	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-9	Inactive	no flow	*<1	*<1	*<1	no flow	no flow	no survey	*<1	no flow	no flow or dry	no flow or dry	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-10	Spring	First monitored in spring 2003													16.8	4.2	13.4	4.9	14.5	4.1	11.9	5.6	15.3	5.7
IC-11	Inactive	First monitored in spring 2003													5.2	no flow or dry	no flow or dry	no flow or dry	N-O	N-O	N-O	N-O	N-O	N-O
CF-1	Re-named as	not present	variable	variable	no flow	*<1	Re-named as CFS, CFS-2 (CFS-2 added Fall 2002)																	
CF-2	CFS & CFS-2	not present	variable	variable	no flow	*<1																		
NP-1	Inactive	First surveyed in fall 1998				*<1	no flow	no survey	no flow	no flow	no flow or dry	no flow or dry	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
CFS	Spring	Not designated until fall 1999						1.8	2.6	no survey	2.3	no survey	0.6	0.5	no survey	1.5	3.1	1.7	4.6	1.6	3.4	1.8	2.8	2.5
CFS-2	Spring	Not designated until Fall 2002												0.4	no survey	0.7	1.1	0.6	2.1	0.6	1.2	0.9	0.4	0.7

Notes:
1) *flows visually estimated
2) "TC" indicates feature located in Tie Camp Creek drainage
3) "IC" indicates feature located in Indian Creek drainage
4) "CF" or "CFS" indicates feature located at south wall of North Pit Lake within the Chester Fault Zone.
5) "NP" indicates feature located at South Wall of North Pit Lake.
6) N-O = Not Observed for 1 year or more

For locations of springs and seeps currently designated as "Inactive", refer to maps contained in past reports.

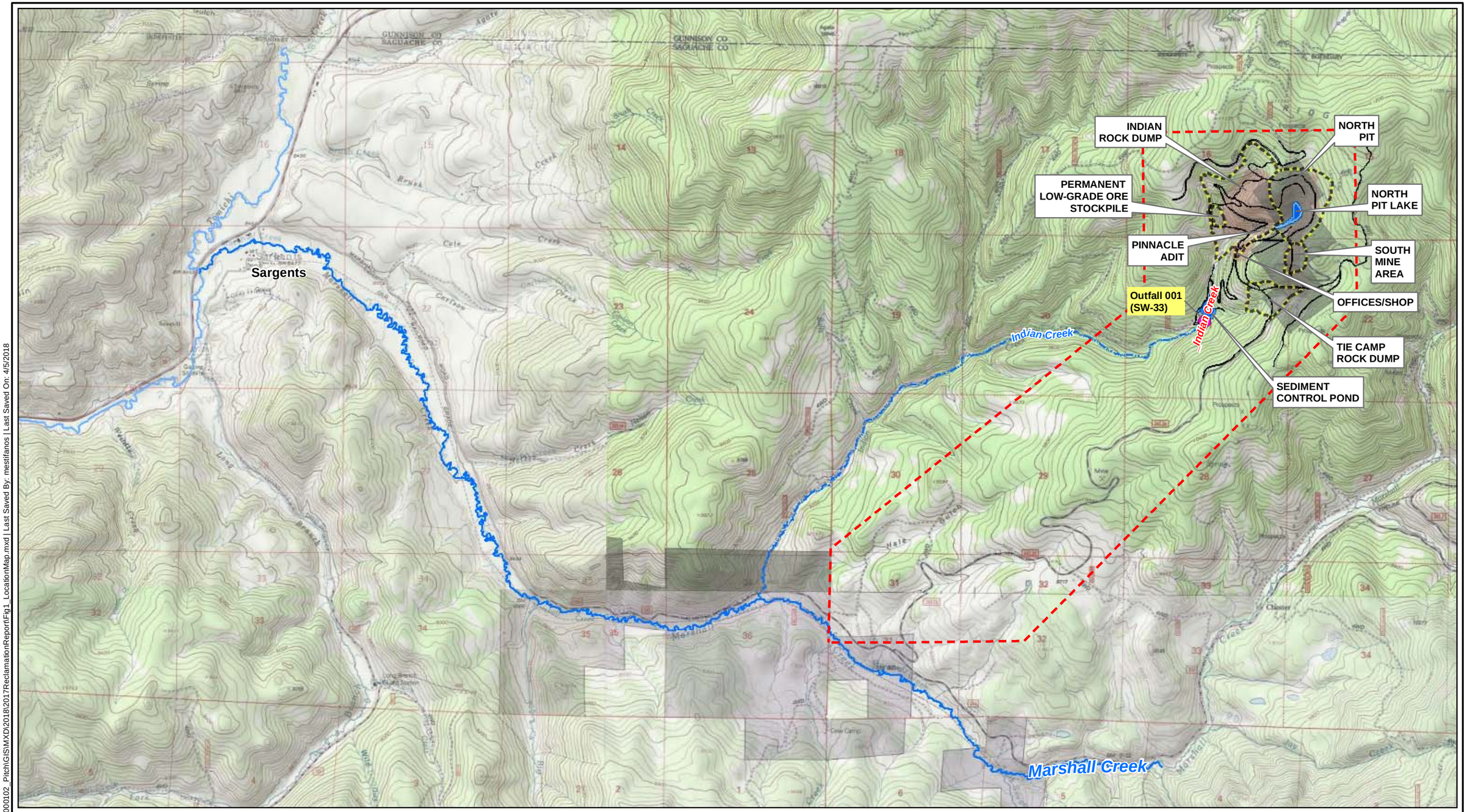
Table 1 Springs and Seeps Summary of Activity (1995-2017) Continued

Station	Current Designation	Flow Rate Data* (gallons per minute – gpm)																			
		Spring 2008	Fall 2008	Spring 2009	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014	Spring 2015	Fall 2015	Spring 2016	Fall 2016	Spring 2017	Fall 2017
TC-1	Inactive	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-2	Spring	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	some flow (no meas.)	N-O	N-O
TC-3	Spring	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	some flow (no meas.)	N-O	N-O
TC-4	Seep	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow or dry	N-O	N-O
TC-5	Seep	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow	some flow (no meas.)	no flow or dry	N-O	N-O
TC-6	Inactive	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-7	Inactive	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-8	Inactive	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-9	Seep	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry	N-O	N-O
TC-10	Spring	1.0	0.5	0.9	0.4	0.8	0.5	0.9	0.4	0.6	0.5	0.5	0.6	1.0	0.5	1.1	0.4	0.5	0.4	0.7	0.3
TC-11	Inactive	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-12	Inactive	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-1	Inactive	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-2	Spring/Seep	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	some flow (no meas.)	some flow (no meas.)	some flow (no meas.)	some flow (no meas.)	some flow (no meas.)	some flow (no meas.)	some flow (no meas.)	some flow (no meas.)	0.6	N-O	N-O
IC-3	Seep	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	no flow or dry	some flow (no meas.)	some flow (no meas.)	some flow (no meas.)	some flow (no meas.)	some flow (no meas.)	some flow (no meas.)	some flow (no meas.)	some flow (no meas.)	some flow (no meas.)	some flow (no meas.)	N-O	N-O
IC-4	Spring/Seep	44.8	0.6	25.0	0.2	20.3	no flow or dry	40.0	no flow or dry	no flow or dry	no flow or dry	3.3	no flow or dry	37.5	no flow or dry	30.0	no flow or dry	20	0.7	18.5	0.6
IC-5	Inactive	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-6	Seep	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	0.7	no flow or dry	1.4	no flow or dry	no flow or dry	no flow or dry	no flow or dry	no flow or dry	N-O	N-O
IC-7	Inactive	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-8	Inactive	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-9	Inactive	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-10	Spring	18.2	4.4	13.6	5.1	13.2	4.6	17.4	5.5	6.3	3.2	10.0	5.0	14.0	5.5	37.5	5.0	12.5	4.6	5.5	5.0
IC-11	Inactive	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-12	Spring	33.3	0.4	14.3	0.3	6.4	no flow or dry	17.6	0.4	no flow or dry	no flow or dry	4.0	no flow or dry	33.3	no flow or dry	14.0	no flow or dry	42.3	1.4	12.9	1.2
NP-1	Inactive	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
CFS	Spring	7.2	3.1	5.7	1.9	5.4	2.0	5.7	0.1	1.9	1.2	3.0	1.2	3.1	1.7	5.0	1.6	4.8	1.2	3.6	1.3
CFS-2	Spring	4.4	1.6	2.8	1.3	1.6	0.7	2.7	0.8	0.8	0.5	2.0	0.8	3.9	0.9	3.0	1.1	5.2	some flow (no meas.)	3.9	1.5

Notes:
1) *flows visually estimated
2) “TC” indicates feature located in Tie Camp Creek drainage
3) “IC” indicates feature located in Indian Creek drainage
4) “CF” or “CFS” indicates feature located at south wall of North Pit Lake within the Chester Fault Zone.
5) “NP” indicates feature located at South Wall of North Pit Lake.
6) N-O = Not Observed for 1 year or more

For locations of springs and seeps currently designated as “Inactive”, refer to maps contained in past reports.

FIGURES



Legend

- Sample Points
- Colorado Division of Reclamation, Mining, and Safety Permit Boundary
- Facility Areas
- Marshall Creek
- Indian Creek
- Tomichi Creek

Notes:

Source: USGS 7.5' Quadrangles of Sargents, Chester, Sargents Peak, and Paholone Peak, Colorado

N

0 3,000 6,000 Feet

HOMESTAKE

PITCH RECLAMATION PROJECT
HOMESTAKE MINING COMPANY
SARGENTS, COLORADO

LOCATION MAP

ARCADIS

FIGURE 1

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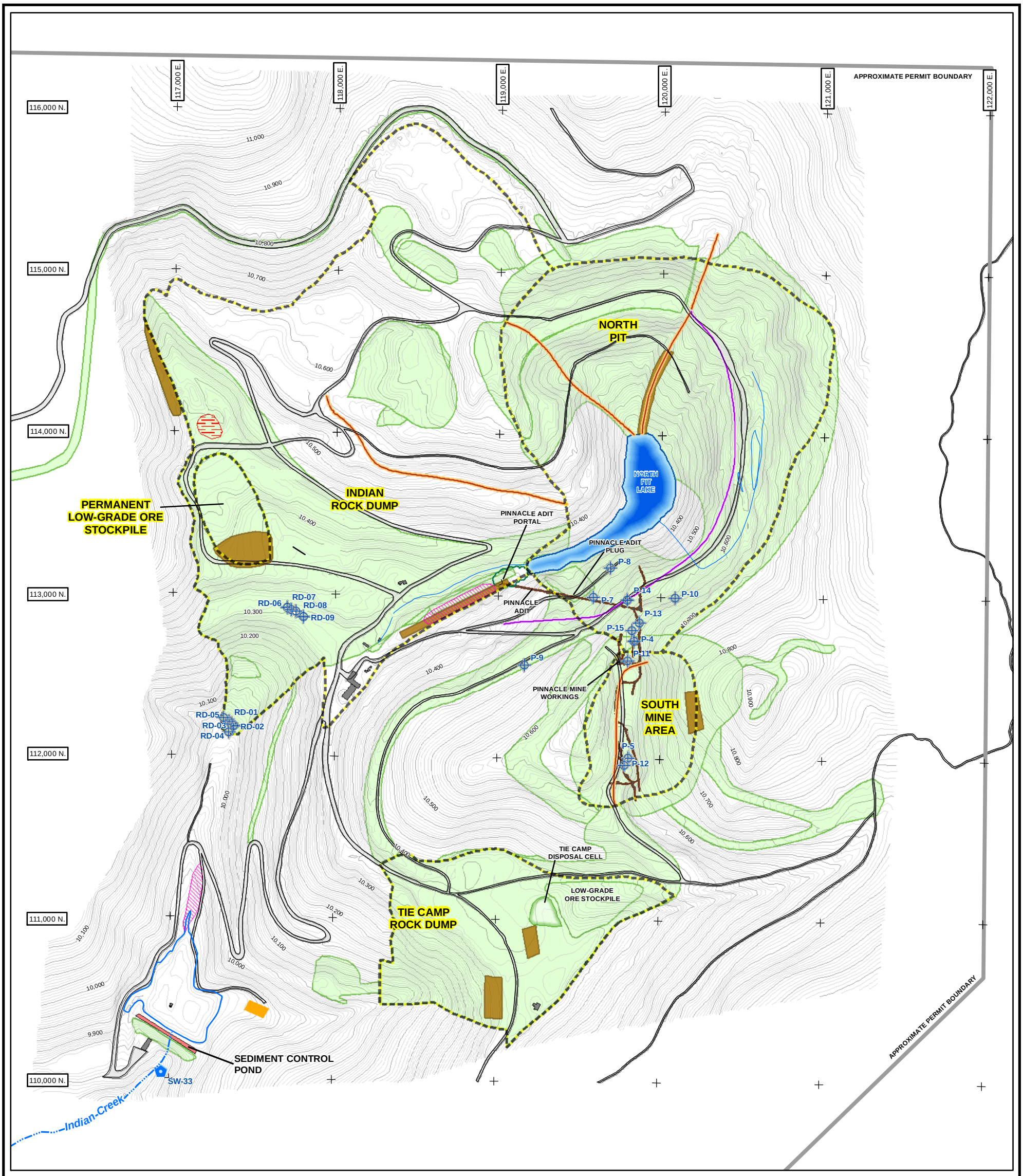

Legend

- Piezometers
- Colorado Discharge Permit System Compliance Point
- Facility Areas
- Buildings
- Clay-Fabric-Rock Lined Channel
- Riprap Lined Channel
- Areas of Earth Structure Repair
- Areas Revegetated
- Engineered Treatment Cell Area
- Marsh Area
- Clay Stockpile
- Drainage Improvement
- Underground Workings
- Sediment Pond Embankment
- Disposal Cell Tie Camp
- Road

Notes:

1. Base topography provided by Homestake Mining Company established in 1994.
2. Revegetated areas prior to 1998 provided by Golder Associates.
3. For illustrative purposes.

HOMESTAKE

PITCH RECLAMATION PROJECT
HOMESTAKE MINING COMPANY
SARGENTS, COLORADO

2017 RECLAMATION AREAS

ARCADIS

FIGURE
2

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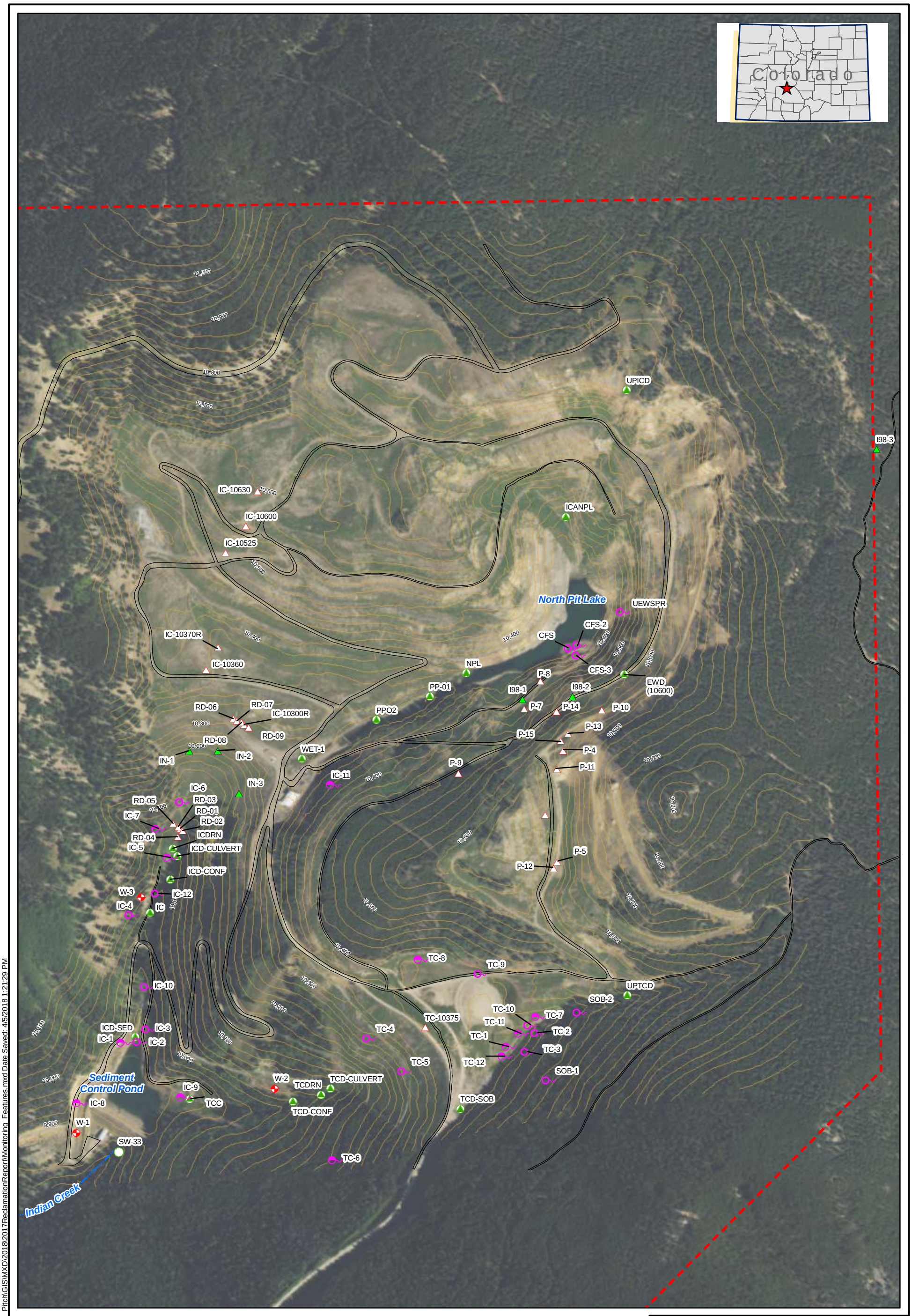

Legend

- Monitoring Well
- Inclinometer
- Piezometer
- Surface Water Sampling Point
- Active Seep/Spring
- Inactive Seep/Spring
- Colorado Discharge Permit System Compliance Point
- Colorado Discharge Permit System Boundary
- Contour 25 feet
- Roads

Feet
0 250 500

HOMESTAKE

PITCH RECLAMATION PROJECT
HOMESTAKE MINING COMPANY
SARGENTS, COLORADO

MONITORING LOCATIONS

ARCADIS

FIGURE
3

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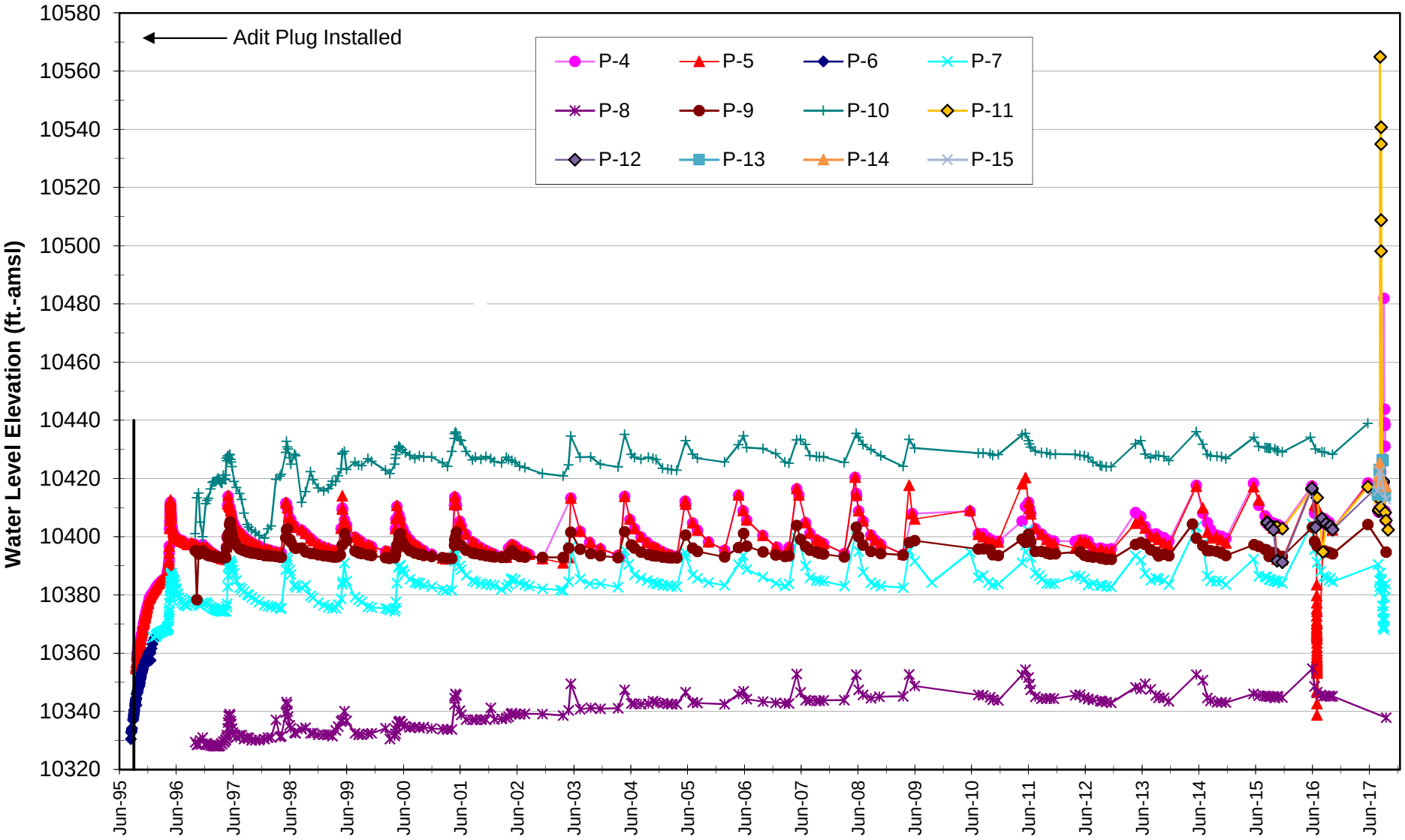
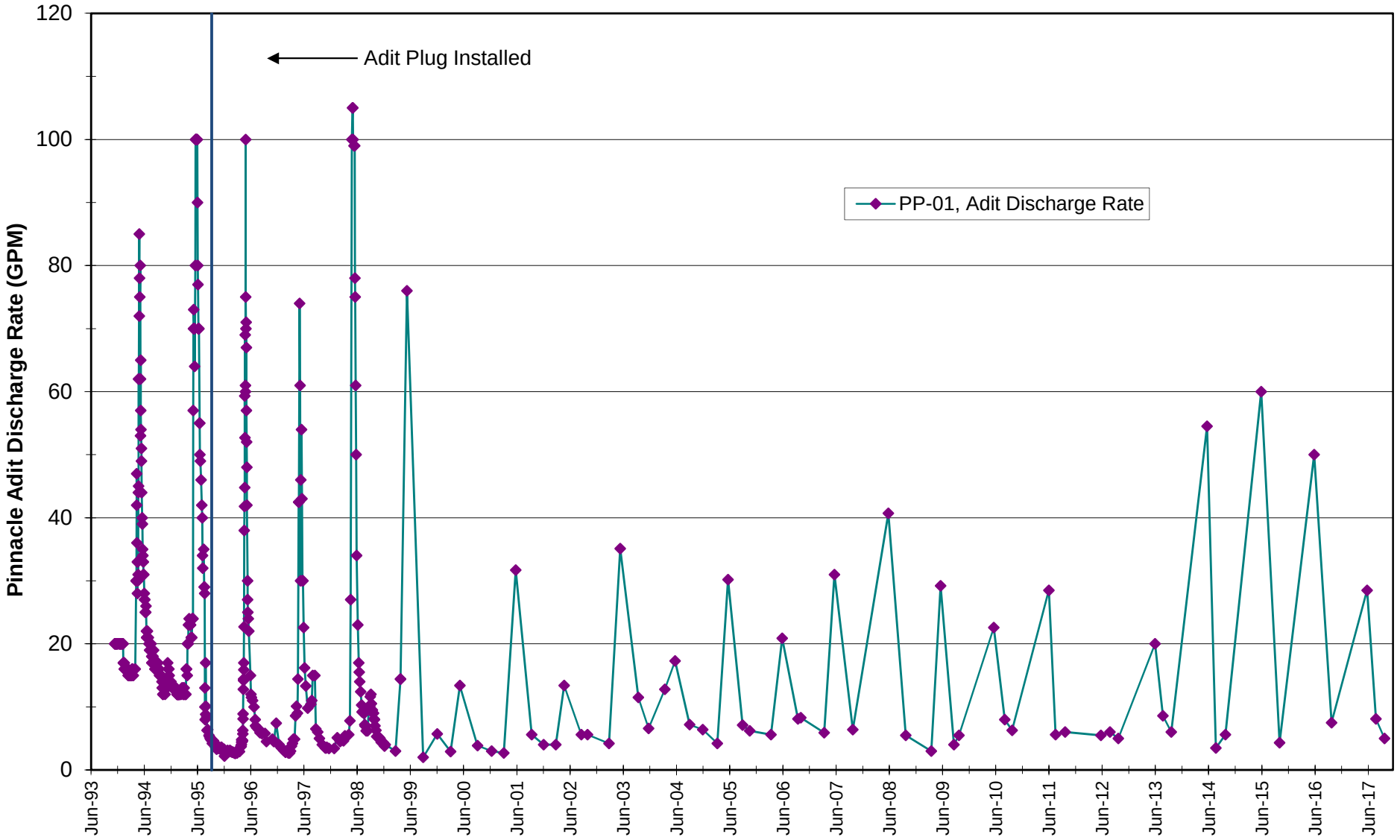


HOMESTAKE MINING COMPANY
PITCH RECLAMATION PROJECT
2017 Annual Reclamation Report

Figure 4: Water Level Elevation Data in P - Wells

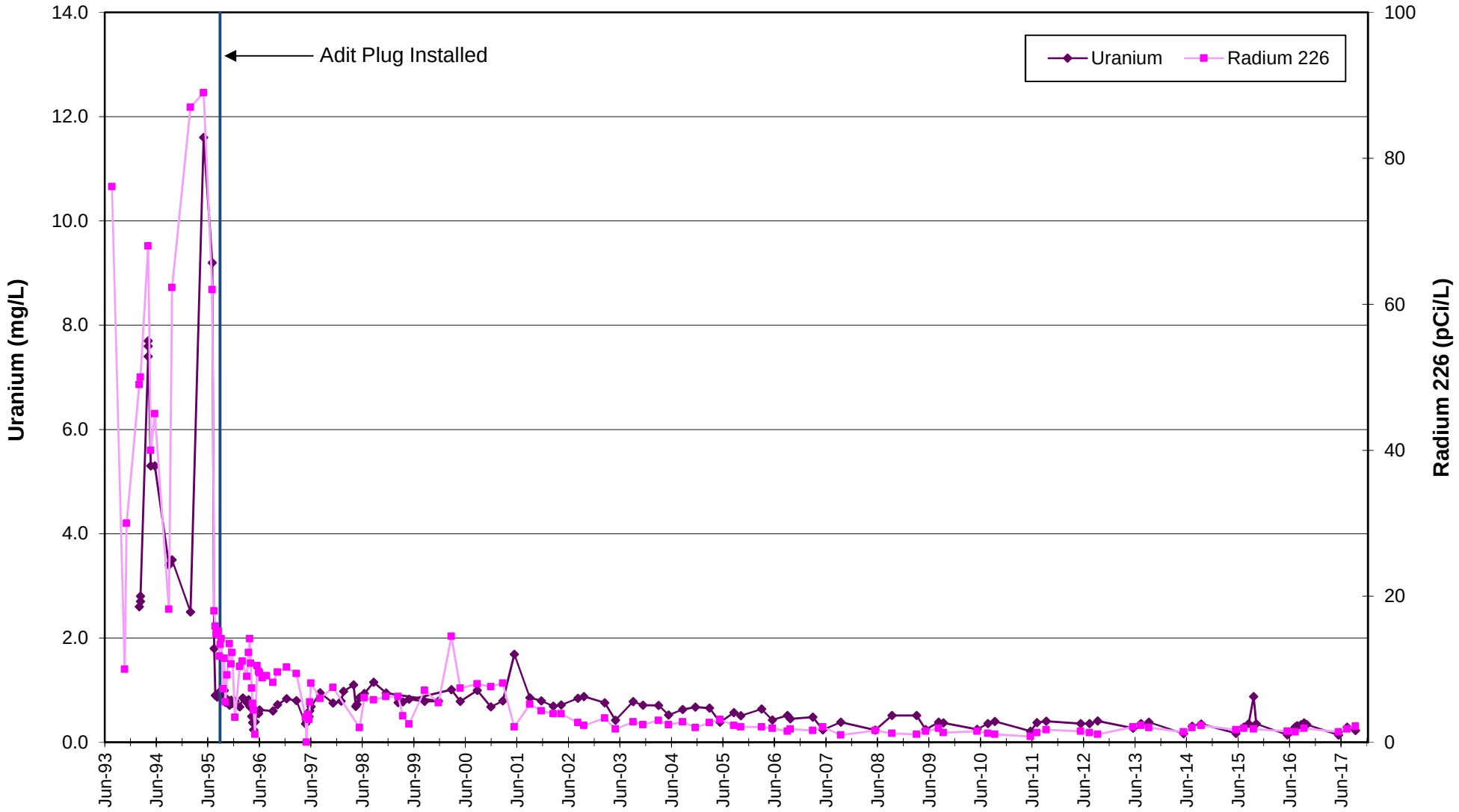
Date: April 2017



HOMESTAKE MINING COMPANY
PITCH RECLAMATION PROJECT
2017 Annual Reclamation Report

Figure 5: Hydrograph of Pinnacle Adit Discharge

Date: April 2017



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PITCH RECLAMATION PROJECT
2017 Annual Reclamation Report

Figure 6: Pinnacle Adit Discharge, Uranium and Radium Concentrations

Date: April 2017

APPENDIX A

2017 Project Documentation

COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

1313 Sherman Street, Room 215
Denver, CO 80203

April 24, 2017

Holton Burns
Homestake Mining Company
c/o Barrick Gold Corporation
P.O. Box 212
Toronto, Ontario, Canada M5J 2S1

RE: Pitch Project, Permit No. M-1977-004, Technical Revision (TR-8) Approval

Mr. Burns:

The Division of Reclamation, Mining and Safety (Division) approved the Technical Revision request (TR-8), which was submitted on April 21, 2016, addressing the following:

Installation of 1 exploration borehole at 10500 Erie Drift area, 3 recirculation/monitoring wells in the South Pit/underground mine workings area, and 5 recirculation/monitoring wells in the Indian Creek Rock Dump. Field-demonstration scale testing during the 2017 field season to validate "proof of concept" bench and field pilot testing and serve as the basis for full-scale design and implementation.

The terms of TR-8 approved by the Division are hereby incorporated into Permit No. M-1977-004. All other conditions and requirements of the permit remain in full force and effect.

If you require additional information, or have questions or concerns, please contact me at the Division's Grand Junction Field Office.

Sincerely,

Dustin Czapla
Environmental Protection Specialist
Department of Natural Resources
Division of Reclamation, Mining and Safety
101 South 3rd, Suite 301
Grand Junction, CO 81501
Phone: (970) 243-6299
Fax: (970) 241-1516

BGC ENGINEERING USA INC.
AN APPLIED EARTH SCIENCES COMPANY

HOMESTAKE MINING COMPANY

PITCH MINE

2017 ANNUAL SURVEY MONITORING

FINAL

PROJECT NO.: 0011216-01 DATE: January 31, 2018

BGC ENGINEERING USA INC.
AN APPLIED EARTH SCIENCES COMPANY
447 E. Main Street
Montrose, CO USA 81401
Telephone (970) 615-8056

January 31, 2018
Project No.: 0011216-01

Dale Davis
Homestake Mining Company
112 Marshall Street
P.O. Box 40
Sargents, Colorado 81248

Dear Mr. Davis,

Re: 2017 Annual Survey Monitoring – FINAL

Please find attached a final copy of our above-referenced report for your review and comment.

We trust this meets your current requirements.

Yours sincerely,

BGC ENGINEERING INC.
per:

Michael Henderson, PE, P.Eng.
Project Manager

EXECUTIVE SUMMARY

Pitch Mine is owned by Homestake Mining Company (HMC) as a subsidiary of the Barrick Gold Corporation. The mine is located in the Sawatch Range of Saguache County within the Gunnison National Forest five miles east of Sargents, Colorado and 18 miles southwest of Salida, Colorado.

HMC approached BGC Engineering Inc. (BGC) in October of 2016 with a Request for Proposal to become the Engineer of Record (EoR) for Pitch Mine. BGC's objective as the EOR is to assist HMC in complying with any applicable state, local, federal and enterprise requirements during the Pitch Mine Reclamation project. The goal is to guide Pitch Mine to their interim and final closure objectives. The EoR role for BGC is envisioned as a partnership with HMC, by providing ongoing engineering, monitoring and reporting services for the inactive Pitch Mine.

North Star Surveying Inc. (North Star) has periodically installed survey monitoring points at the Pitch Mine to monitor surface slope displacements. The earliest monitoring points were installed at the east and south walls of the North Pit in 1994, and were followed in subsequent years to cover more of the mine site and replace monitoring points that were destroyed due to re-grading and ground movement. Survey data was collected by North star during two time periods in 2017. The first time period was July 21 to August 1, 2017 as part of an early monitoring survey within a previously observed ground movement zone. The second time period was September 21 to October 6, 2017 as a part of the annual survey of all monitoring points. Comparison of the 2017 time periods with the 2016 annual survey data allowed for a review of potential driving forces.

The monitoring points were surveyed using a total station referencing the Pitch Mine grid and previously established control points. Displacement azimuths and magnitude were calculated by BGC using position and elevation values. A site visit was conducted by Michael Henderson, PE, P.Eng. and Elliot Matthews, EIT, of BGC with Dale Davis of HMC on October 5, 2017. There were 98 monitoring points surveyed in 2017 in the North Pit, South Pit and Indian Rock Dump (IRD). Ninety-two of the 98 monitoring points surveyed in 2017 had survey data from 2016 to compare with and determine displacement values. Thirty-three of the 92 monitoring points had displacement values greater than associated survey error values. A comparison of the 2017 survey program with the 2016 survey program show a decrease in the number of monitoring points showing displacements above associate survey error values.

Potential ground movement based on displacement values was measured in the North Pit- East Wall and North Pit- South Wall zones. Ground movement features including hummocky ground, scarps and tension cracks were observed in the South Pit zone. Displacements calculated from survey data supported observed ground movement features in the South Pit zone. No displacement was observed in the IRD or North Pit- West Wall zones. BGC recommends continuing the current survey methodology for the monitoring point inventory, enhanced monitoring techniques for the North Pit and South Pit zones, and applying monitoring point data and ground observations from the 2017 survey program to ongoing detailed review and mitigation design for the South Pit zone.

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APPENDIX E INDIAN ROCK DUMP MONITORING POINTS

LIST OF DRAWINGS

DRAWING 01 Overview
DRAWING 02 2017 Early Monitoring Point Survey
DRAWING 03 2017 Annual Monitoring Point Survey

LIMITATIONS

BGC Engineering Inc. (BGC) prepared this document for the account of Homestake Mining Company. The material in it reflects the judgment of BGC staff in light of the information available to BGC at the time of document preparation. Any use which a third party makes of this document or any reliance on decisions to be based on it is the responsibility of such third parties. BGC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document.

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1.0 INTRODUCTION

1.1. Location and Ownership

Pitch Mine is owned by Homestake Mining Company (HMC) as a subsidiary of the Barrick Gold Corporation. The mine is located in the Sawatch Range of Saguache County within the Gunnison National Forest five miles East of Sargents, Colorado and 18 miles southwest of Salida, Colorado (Drawing 01).

1.2. Objectives

1.2.1. Proposed Work

HMC approached BGC Engineering Inc. (BGC) in October of 2016 with a Request for Proposal (RFP) to become the Engineer of Record (EoR) for Pitch Mine. BGC's objective as the EOR is to assist HMC in complying with any applicable state, local, federal and enterprise requirements during the Pitch Mine Reclamation project. The goal is to guide Pitch Mine to interim and final closure objectives through establishing and maintaining a long-term client-consultant relationship (D. Davis, email, October 18, 2016).

1.2.2. Scope of Work

The EoR role is envisioned to function in partnership with HMC, providing ongoing engineering, monitoring and reporting services for the inactive Pitch Mine. The EoR will coordinate and collaborate with the local company representative and prime vendors, following the current Lowest Practical Limit and Best Management Practices programs, relevant to the Pitch Mine based on the Colorado discharge Permit System permit (Arcadis 2017). The EoR will work with the HMC representative(s) to advance the site towards interim and final closure (BGC 2016).

Scope of work for the 2017 Annual Survey Monitoring report satisfies the following items outlined in the BGC proposal in response to the HMC RFP (BGC 2016):

1. Collect existing geotechnical and monitoring data into one digital folder, providing access to Homestake and other consultants.
2. Perform routine annual and other inspections at the existing site facility and infrastructure (expect two site visits per year).
    - Provide an annual slope vector displacement report (in collaboration with North Star Surveying (North Star), who will provide data).
    - Monitoring, surveying and reporting of relevant field controls (piezometers, inclinometers associated with two open pits, waste rock management facilities, decant, dam, and spillway).
3. Provide an annual report for the State of Colorado, as needed or as requested by HMC. Reports will include three hard copies (for regulators and HMC) and one electronic copy for HMC records.

- Provide an annual geotechnical report for existing rock dumps and any geotechnical monitoring, reporting and evaluations as required by the state of Colorado.

4. Have ongoing site awareness and insight for planned activities aimed at remediating the site for years 2017-2019.

1.3. Survey Background

North Star has periodically installed survey monitoring points at the Pitch Mine to monitor surficial slope displacement. The earliest monitoring points were installed at the east and south walls of the North Pit in 1994 and were followed in subsequent years to cover more of the mine site and replace monitoring points that were destroyed due to re-grading or ground movement (Table 1-1). Annual data compilation and review of this data has been performed by various consulting parties since the initial installations. BGC assumed the role of EoR and reviewing party for survey data from Knight Piésold Consulting (Knight Piésold) for the 2017 survey program.

Table 1-1. Monitoring point change summary.

Survey Year	Number of Survey Monitoring Points Replaced	Number of Survey Monitoring Points Added	Number of Survey Monitoring Points Abandoned
1996	6	-	-
1997	-	14	-
1998-1999	-	5	-
2000	-	11	-
2001	-	1	-
2005	8	13	6
2010	?	2	-
2012	1	-	-
2014	-	2	-
2015	-	2	-
2016	-	4	-
2017	4	1	1

Note:

Survey history obtained from Knight Piésold. 2016. Pitch Reclamation Project Evaluation of Surface Slope Displacement During the 2015-2016 Monitoring Period, Rev C. document. Number of survey points abandoned includes monitoring points not shot in consecutive years. The number of monitoring points replaced were not specified in the 2010 survey report as indicated by the question mark. Dashed lines represent zero monitoring points for a given cell and survey year(s).

2.0 SURVEY DATA

Survey data was collected by North star during two time periods in 2017. The first time period was July 21 to August 1, 2017 as part of an early monitoring survey within a previously observed ground movement zone (Drawing 02). The second time period was September 21 to October 6, 2017 as a part of the annual survey of all monitoring points (Drawing 03). Comparison of the 2017 time periods with the 2016 annual survey data allowed for a review of potential driving forces. Survey data included elevation and position data from monitoring points within the mine's property boundaries. The monitoring points were collected using a total station referencing the Pitch Mine grid and previously established control points. Monitoring points included previously installed and new installed inclinometers as well as several piezometers. Displacement azimuths and magnitude were calculated by BGC using position and elevation values from two consecutive years of surveys. Data was plotted on a base topographic map using Pitch Mine's local coordinate system with arrows indicating the direction and magnitude of displacement.

A site visit was conducted by Michael Henderson, PE. P.Eng., and Elliot Matthews, EIT, of BGC with Dale Davis of HMC on October 5, 2017. Photos and visual observations were made of various zones and associated monitoring points within the mine. The site visit coincided with the end of the annual survey conducted by North Star.

2.1. Monitoring Points

Monitoring points are labeled in a format that describes the year of installation and prescribes an alpha-numerical or numerical identification. Previous iterations of survey monitoring points have used other formats to label monitoring points. The labelling format for monitoring points in this report are as described above with numbers and letters indicating the year of installation and an alpha-numerical identification. The associated control point used to survey each monitoring point is also included with each label in brackets.

There were 98 monitoring points surveyed in 2017 in the North Pit, South Pit and Indian Rock Dump (IRD) zones. Ninety-two of the 98 monitoring points surveyed in 2017 had survey data from 2016 to compare with and determine displacement values. The six monitoring points that did not have previous position data for comparison were designated in the Drawing 03 table as "N/A". Thirty-three of the 92 monitoring points had displacement values greater than associated survey error values. The rows associated with these monitoring points within the Drawing 03 table were highlighted in red. Arrows on Drawing 03 indicate direction and rate of movement for monitoring points with displacements greater than associated survey error values. Monitoring points with displacements less than associated survey error values were not plotted with an arrow.

The previous 2015 and 2016 survey programs indicated there were 44 monitoring points that had annual displacement magnitudes that were greater than survey error. A comparison of the 2017 survey program with previous survey programs show an overall decrease in the number of monitoring points showing displacements above associate survey error values.

2.2. Control Points and Coordinate System

Seven control points were used as stationary reference points for surveys (Table 2-1). Five of these seven control points were checked in 2010 and 2011 with the National Geodetic Survey (NGS) data from the Online Positioning User Service (OPUS). Control point Vern has not been checked since the installation of monitoring points against NGS data from the OPUS (T. Weber, email, January 23, 2018).

The Pitch Mine's local coordinate system was established early in the mine's life. The purpose of maintaining the local coordinate system was to allow continuity with historic data sets and the use of older maps without introducing error typical to cross-projection coordinate conversions. Error generated by the local coordinate system was calculated by North Star and is 0.1 feet per 1000 feet (Knight Piésold 2016).

Table 2-1. Control points for Pitch Mine.

Control Point	Date Checked (MM/DD/YYYY)	Zones with Points	Northing	Easting	Elevation	Description
North Pit	10/15/2010	NP-WW, NP-EW	115211.002	120074.588	10839.323	Permanent Tripod
Zorro	10/15/2010	NP-EW, NP-EW, SP	114408.55	118931.28	10729.11	Permanent Tripod
West Face	10/15/2010	NP-EW, NP-SW, SP	113887.339	119382.484	10572.286	Permanent Tripod
Vern	-	SP	111367.081	118100.995	10350.035	Permanent Tripod
South Pit	09/19/2011	SP	112083.479	119650.259	10582.12	Grouted Bedrock Cap
Red Cap	09/19/2011	IRD	111367.081	118100.995	10350.035	Capped Rebar
IC11-10300R	-	IRD	112872.02	117768.62	10297.76	Monitoring point used as a control point

Note:
Zones covered are described with acronyms: NP-WW = North Pit- West Wall; NP-EW = North Pit- East Wall; NP-SW = North Pit- South Wall; SP = South Pit; IRD = Indian Rock Dump; IRD = Indian Rock Dump. Coordinates are provided in local mine coordinates. Control points with dates are control points that have been checked against NGS data from the OPUS system. Control points without dates are control points that are not checked against NGS data from the OPUS system.

3.0 SURVEY ANALYSIS

BGC analyzed the survey data provided by North Star using ARCGIS and Excel software. North Star was unable to complete a survey of the 98 monitoring points in a single day, which is typical of annual surveys for Pitch Mine. A median survey date was taken from the spread of survey dates to establish a singular date for comparison with the 2016 survey program. The median date for was September 28 for the 2017 survey program and September 1 for the 2016 survey program (Knight Piésold 2016). Displacement vectors were adjusted based on these dates to reflect an annual movement rate in feet per year (Drawing 03).

3.1. Ground Movement Zones

BGC split Pitch Mine into survey zones based on previous named areas within the mine site (Photo 1). The zones were defined based on spatial relationships to engineered site features and pit wall slopes.

Survey zones are defined as follows:

- North Pit- West Wall: The zone is defined as the portion of the North Pit bordering the western side of the North Pit lake with a generally east-facing slope aspect. The survey monitoring points in the zone are west of 119,800 and north of 113,500 in local mine coordinates.
- North Pit- East Wall: The zone is defined as the portion of the North Pit bordering the eastern side of the North Pit lake and extending to the crest of the North Pit with a generally west-facing slope aspect. The survey monitoring points in the zone are east of 119,800 and north of 113,500 in local mine coordinates.
- North Pit- South Wall: The zone is defined as the portion of the North Pit bordering the southern side of the North Pit lake and extending to the intersection of the North and South Pits with a generally north-facing slope aspect. The survey monitoring points in the zone are south of 113,500 and north of 112,500 in local mine coordinates.
- South Pit: The zone is defined as the northern area of the originally planned south pit footprint. The zone extends from the intersection of the North Pit with the South Pit topographic saddle to Tie Camp Creek. Slopes have predominately west-facing aspects. The survey monitoring points in the zone are south of 113,100 and north of 111,700 in local mine coordinates.
- Indian Rock Dump: The zone is defined as the area between the western tip of the North Pit Lake and the western edge of the Pitch Mine property with a predominately southwest-facing slope aspect. The survey monitoring points in the zone are west of 118,000 and east of 117,300 in local mine coordinates.

3.2. Ground Movement Trends

3.2.1. North Pit- West Wall

The North Pit- West Wall zone contains two monitoring points. Movement above the associated survey error was not observed at the two points in the 2017 survey program (Appendix A). No

monitoring points were destroyed and no monitoring points were added to this zone. No site features indicating ground movement since the 2016 survey program were observed in the zone (Photo 2).

3.2.2. North Pit- East Wall

The North Pit- East Wall zone contains 39 monitoring points. Movement above the associated survey error was observed at 16 of the 39 points in the 2017 survey program (Appendix B). The displacements observed in the zone were distributed evenly over a wider area. The wider distribution of displacements indicated that potential ground movement is associated with previously observed ground movement mechanisms and not new concentrated ground movements. Displacement values ranged from zero to 0.39 feet (a zero to 0.36 feet/year ground movement rate). The maximum displacement observed was measured at MP96-65 near the center of the zone. No survey monitoring points were destroyed in the zone and no survey monitoring points were added to the zone. No new ground movement site features were observed in the zone (Photo 3).

3.2.3. North Pit- South Wall

The North Pit- South Wall contains 20 monitoring points. Movement above the associated survey error was observed at six of the 20 monitoring points in the 2017 survey program (Appendix C). The displacements observed were concentrated in the lower half of the slope near the center of the zone. Ground movement in this zone ranged from 0.01 to 0.15 feet (a 0.01 to 0.14 feet/year ground movement rate). The maximum displacement observed was measured at MP95-59 near mid slope in the center of the zone.

Notes from North Star indicated that MP97-75 was disturbed during well pad construction activities yielding an anthropogenic shift of 0.46 feet in a direction near-perpendicular to the slope fall line. The displacement data is not representative of potential ground movement and is thereby not comparable with the 2016 survey program. Future 2018 survey program measurements may be considered for comparison with the 2017 survey program position data to generate a potentially representative displacement value (T. Weber, email, January 18, 2018). No survey monitoring points were destroyed in the zone and no survey monitoring points were added to this zone. No new ground movement site features were observed in the zone (Photo 4).

3.2.4. South Pit

The South Pit contains 28 monitoring points. Potential ground movement above the associated survey error was observed at 11 of the 28 monitoring points in the 2017 survey program (Appendix D). Ground movement with nine of the monitoring points was observed in an area near the center of the zone. Ground movement in this area ranged from zero to 10.75 feet (a zero to 10.01 feet/year ground movement rate). The maximum annual ground movement has increased from 8.22 feet per year in the 2016 survey program to 10.01 feet per year in the 2017 survey program. Ground movement site features observed during the October 5, 2017 site visit include hummocky-disturbed ground, tension cracks and scarps. The maximum displacement observed

was measured at MP14-93 on the southern edge of the area amongst hummocky and deformed ground (Photo 5).

Notes from North Star indicated that two monitoring points (MP94-41 and MP97-75) were abandoned due to ground movement, one monitoring point (MP10-S8) was replaced by MP17-95 and one new monitoring point (MP17-94) was added in this zone (T. Weber, email, January 18, 2018). Monitoring points were measured in this area before and after an Arcadis Environmental Consultant's 2017 Pitch field-demonstration tests (tests). The tests included in situ source zone treatment of the underground mine workings, IRD and Tie Camp Rock Dump using varied methodologies of phosphate reagent injections (Arcadis 2017).

Monitoring points did not indicate that the tests added to ground movement over their duration (Drawing 02). Displacements measured by North Star for the area took place before the tests took place (Drawing 03). Potential driving forces for the movement may have included an increase in ground pore water pressure from seasonally higher snow melt, rainfall events and mechanical alteration from free-thaw cycles.

3.2.5. Indian Rock Dump

The IRD zone contains nine monitoring points. Movement above the associated survey error was not observed at the nine monitoring points in the 2017 survey program (Appendix E). No monitoring points were destroyed. Three monitoring points were added to this zone with the installation of inclinometers IN1, IN2 and IN3 (North Star 2017). No site features indicating ground movement since the 2016 survey program were observed in the zone (Photo 6).

4.0 CONCLUSIONS

No displacement was observed in the IRD based on ground observations and a review of monitoring point data. Displacement within the North Pit zones indicate a slope creep movement within the North Pit- East Wall and North Pit- South Wall that is consistent with previously observed ground movement trends in the 2016 survey program. The total number of displacements above associated survey error in the Pitch Mine have decreased in the Pitch Mine indicating a slowing of ground movement rates over a wide area. The South Pit zone has a localized area of increased ground movement rates on a west-facing slope as indicated by displacements and observations made in the 2017 survey program. Ground movement in this localized area has altered surface water drainage, increased ground disturbance and may be expected to continue in a negative way without mitigation.

5.0 RECOMMENDATIONS

BGC recommends the following courses of action based on the conclusions from the 2017 survey program.

- Continued Monitoring:
  - All Zones- Maintain the current survey methodology by using ground observations and monitoring point data review to check for changes in potential ground movement.
- Enhanced Monitoring:
  - North Pit and South Pit Zones- Additional enhanced monitoring techniques and review on an annual basis should be considered for these zones where ground movement is suspected and observed. Enhanced monitoring techniques may include ground-based photogrammetry, aerial photogrammetry and LIDAR (Light Detection and Ranging). Ground-based photogrammetry and LIDAR can be considered for areas with good view points and easier access. Aerial photogrammetry with a drone can be considered for areas with poor view points and difficult-to-access slopes.
  - An updated topographic base map of the Pitch Mine should be constructed using the local mine coordinate system. Current topographic data for the base map is outdated.
- Detailed Site Investigation and Mitigation:
  - South Pit- Monitoring point data and ground observations from the 2017 survey program should be applied to ongoing detailed review of south pit ground movements. The application of this information, in combination with the ongoing investigative efforts, can help provide information about potential driving force mechanisms and better define the extent of ground movement in this zone. Understanding these ground movement characteristics may contribute to a mitigation design.

6.0 CLOSURE

We trust the above satisfies your requirements at this time. Should you have any questions or comments, please do not hesitate to contact us.

Yours sincerely,

BGC ENGINEERING INC.
per:

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PHOTOS

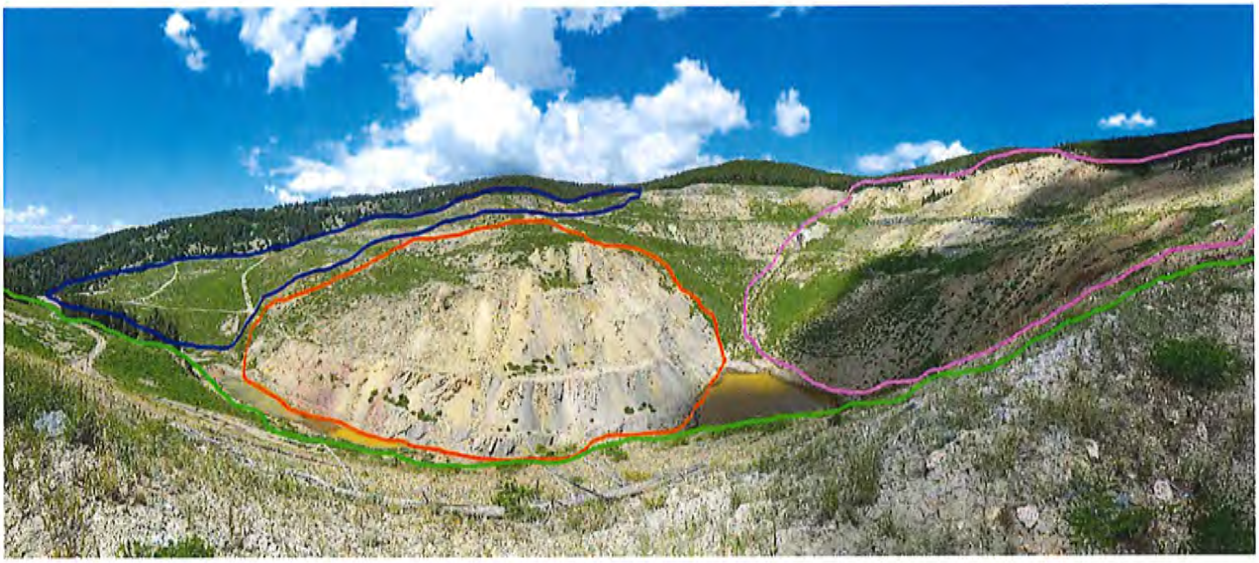


Photo 01. Site Overview: photo of the North Pit and IRD zones taken from the North Pit- South Wall. The blue zone corresponds to the IRD zone. The orange corresponds to the North Pit- West Wall. The Pink corresponds to the North Pit- East Wall. The green corresponds to the North Pit- South Wall.

Photo 02 **North Pit- West Wall: photo taken from North-Pit South Wall looking North.**

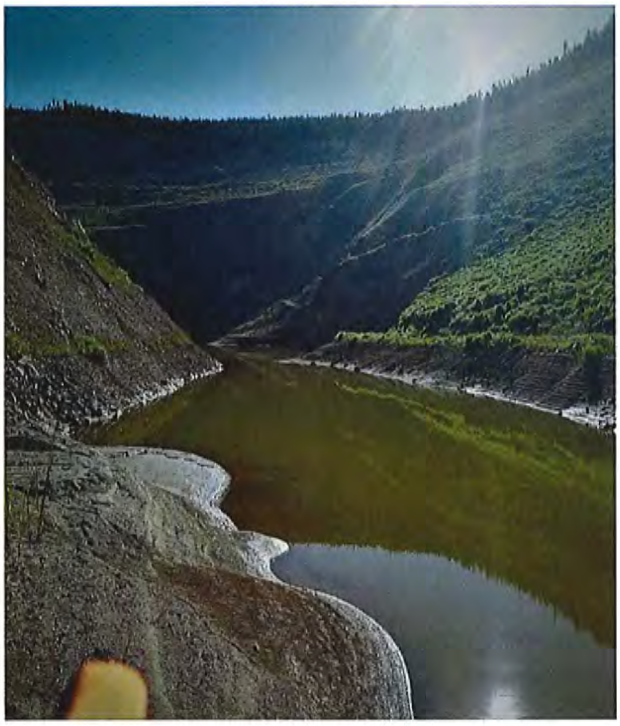


Photo 03. **North Pit- East Wall: photo taken from the western edge of the North Pit Lake looking East at the southern edge of the zone.**

Photo 04. North Pit- South Wall: photo taken looking east obliquely across the zone from the western edge of the zone.

Photo 05. South Pit: (TOP) photo taken looking southeast at a scarp below an access road. (BOTTOM) photo taken looking south across the west-facing slope near the zone of greatest measured surficial deformation.

Photo 06. Indian Rock Dump (IRD): photo taken from an access road to inclinometers IN1, IN2, and IN3 looking southwest towards the topographic base of the zone.

APPENDIX A
NORTH PIT- WEST WALL MONITORING POINTS

Appendix A- North Pit-West Wall monitoring points.

Monitoring Point ID	Control Point	Northing	Easting	Elevation	Error	2017 Displacement (feet)	Dip Direction	2017 Ground Movement Rate (feet/year)
MP94-10(NORTH-PIT)	North Pit	113504.05	119597.79	10384.87	0.18	0.10	145	0.09
MP94-16(NORTH-PIT)	North Pit	113599.93	119756.99	10346.34	0.16	0.02	205	0.02

Note:

Survey data was provided by North Star Surveying Inc. *Northing* and *Easting* coordinates are provided in local mine grid form. *Error* is the calculated survey error for each point and was provided by North Star Surveying (0.1 feet/100 feet). Survey data was set to the median dates of September 1, 2016 and September 28, 2017 to determine *2017 Displacement* and the *2017 Ground Movement Rate* values.

APPENDIX B
NORTH PIT- EAST WALL MONITORING POINTS

Appendix B- North Pit- East Wall monitoring points.

Monitoring Point ID	Control Point	Northing	Easting	Elevation	Error	2017 Displacement (feet)	Dip Direction	2017 Ground Movement Rate (feet/year)
MP94-41(41OFFSET-from-Zorro)	Zorro	115690.38	120569.36	10906.97	0.00	N/A	N/A	N/A
MP94-42(ZORRO)	Zorro	114149.33	121779.73	11045.47	0.29	0	0	0
MP96-65(ZORRO)	Zorro	114592.53	120430.24	10662.72	0.15	0.39	156	0.36
MP94-38(ZORRO)	Zorro	115027.85	120420.15	10811.9	0.16	0.38	152	0.36
MP94-37(ZORRO)	Zorro	115141.73	120530.3	10856.49	0.18	0.37	161	0.35
MP96-69(ZORRO)	Zorro	114206.5	120309.01	10543.73	0.14	0.36	181	0.34
MP94-29(ZORRO)	Zorro	114988.5	120779.57	10882.11	0.19	0.35	169	0.32
MP96-66(ZORRO)	Zorro	114246.25	120529.44	10628.24	0.16	0.33	192	0.30
MP94-36(ZORRO)	Zorro	115069.08	121009.74	10948.6	0.22	0.29	172	0.27
MP94-35(ZORRO)	Zorro	115126.33	121210.71	10999.46	0.24	0.28	174	0.26
MP94-34(ZORRO)	Zorro	115186.25	121416.65	11025.26	0.26	0.26	160	0.24
MP99-87(WEST-FACE)	West Face	114381.28	120150.74	10531.22	0.09	0.26	186	0.24
MP94-23(ZORRO)	Zorro	114637.49	120812.46	10861.08	0.19	0.25	170	0.24
MP94-18(ZORRO)	Zorro	114477.13	120900.53	10874.24	0.20	0.24	175	0.22
MP96-70(ZORRO)	Zorro	113856.86	120350.94	10539.9	0.15	0.24	184	0.22
MP94-12(ZORRO)	Zorro	114008.09	120976.94	10799.6	0.21	0.23	177	0.22
MP94-24(ZORRO)	Zorro	114223.48	121071.29	10874.58	0.21	0.21	165	0.19
MP96-67(ZORRO)	Zorro	113827.92	120540.68	10605.2	0.17	0.20	183	0.18

Monitoring Point ID	Control Point	Northing	Easting	Elevation	Error	2017 Displacement (feet)	Dip Direction	2017 Ground Movement Rate (feet/year)
MP99-85(WEST-FACE)	West Face	113853.8	120212.29	10488.47	0.08	0.19	194	0.17
MP94-27(ZORRO)	Zorro	114651.41	121390.29	10966.46	0.25	0.16	160	0.14
I98-3(ZORRO)	Zorro	114673.73	121872.12	11082.15	0.30	0.15	67	0.14
MP94-25(ZORRO)	Zorro	114211.66	121260.63	10912.91	0.23	0.14	167	0.13
I94-2(ZORRO)1.5""AC	Zorro	114512.95	121254.28	10941.18	0.23	0.14	179	0.13
MP94-28(ZORRO)	Zorro	114628.62	121205.22	10937.08	0.23	0.13	183	0.12
MP99-86(WEST-FACE)	West Face	114108.68	120100.47	10470.98	0.08	0.12	194	0.12
C94-1(ZORRO)2""AC	Zorro	114580.89	121251.07	10942.64	0.23	0.11	164	0.10
MP99-84(NORTH-PIT)	North Pit	113651.21	120032.12	10339.97	0.16	0.10	205	0.09
MP-88(WEST-FACE)	West Face	114795.09	120137.54	10644.86	0.12	0.09	92	0.09
MP94-39(ZORRO)	Zorro	115385.1	120456.55	10851.8	0.18	0.09	41	0.08
MP94-43(NORTH-PIT)	North Pit	115873.41	120444.45	10909.47	0.08	0.07	56	0.07
MP94-26(ZORRO)	Zorro	114200.38	121420.55	10941.87	0.25	0.06	194	0.06
MP99-89(WEST-FACE)	West Face	114515.28	119989.99	10527.08	0.09	0.04	134	0.04
MP99-82(NORTH-PIT)	North Pit	113967.34	119866.37	10358.32	0.13	0.04	205	0.03
MP94-40(NORTH-PIT)	North Pit	115680.04	120368.15	10877.67	0.06	0.04	295	0.03

Monitoring Point ID	Control Point	Northing	Easting	Elevation	Error	2017 Displacement (feet)	Dip Direction	2017 Ground Movement Rate (feet/year)
MP99-83(NORTH-PIT)	North Pit	113802.98	119942.66	10360.02	0.14	0.03	160	0.03
MP94-9(ZORRO)	Zorro	115271.84	121674.11	11102.52	0.29	0.03	250	0.03
MP99-81(ZORRO)	Zorro	114252.16	119909.49	10449.54	0.10	0.03	142	0.03
MP-52(ZORRO)	Zorro	114966.38	121854.37	11094.68	0.30	0.03	142	0.03
MP94-8(ZORRO)	Zorro	113716.43	120789.94	10730.73	0.20	0.00	190	0.00

Note:

Survey data was provided by North Star Surveying Inc. *Northing* and *Easting* coordinates are provided in local mine grid form. *Error* is the calculated survey error for each point and was provided by North Star Surveying (0.1 feet/100 feet). Survey data was set to the median dates of September 1, 2016 and September 28, 2017 to determine *2017 Displacement* and the *2017 Ground Movement Rate* values.

APPENDIX C
NORTH PIT- SOUTH WALL MONITORING POINTS

Appendix C- North Pit- South Wall monitoring points.

Monitoring Point ID	Control Point	Northing	Easting	Elevation	Error	2017 Displacement (feet)	Dip Direction	2017 Ground Movement Rate (feet/year)
MP97-75(WEST-FACE)-DISTURBED	West Face	112891.26	119916.13	10611.3	0.11	0.46	339	0.43
MP95-59(WEST-FACE)	West Face	113263.1	119677.34	10385.22	0.07	0.15	247	0.14
MP97-79(WEST-FACE)	West Face	113159.42	120057.9	10552.55	0.10	0.13	227	0.12
P-8(WEST-FACE)	West Face	113173.37	119686.95	10434.16	0.08	0.13	246	0.12
MP96-68(WEST-FACE)	West Face	113099.52	119913.88	10539.08	0.10	0.11	246	0.10
MP97-80(WEST-FACE)	West Face	113234.78	120201.87	10569.67	0.10	0.11	218	0.10
MP97-76(WEST-FACE)	West Face	113085.51	120258.61	10630.45	0.12	0.10	241	0.10
P-10(WEST-FACE)PUNCH-ON-HASP	West Face	112987.54	120087.54	10621.68	0.11	0.10	212	0.09
MP97-73(WEST-FACE)	West Face	112826.55	120212.22	10721.66	0.13	0.09	228	0.09
I98-2(WEST-FACE)	West Face	113069.37	119901.54	10537.33	0.10	0.09	250	0.08
MP94-44(ZORRO)	Zorro	113381.45	121068.16	10834.89	0.24	0.09	107	0.08
MP97-72(WEST-FACE)	West Face	112790.28	120124.52	10711.6	0.13	0.08	269	0.08
I98-1(WEST-FACE)	West Face	113051.18	119575.92	10423.93	0.09	0.08	232	0.08
MP97-78(WEST-FACE)	West Face	112976.17	119755.18	10530.17	0.10	0.07	236	0.07
MP97-77(WEST-FACE)	West Face	112887.38	119648.19	10518.73	0.10	0.06	258	0.06
P12-7R(WEST-FACE)	West Face	112991.17	119582.82	10443.43	0.09	0.05	232	0.05
MP94-47(ZORRO)	Zorro	113193.62	120683.88	10719.02	0.21	0.04	329	0.04
MP97-74(WEST-FACE)	West Face	112871.51	120284.8	10725.88	0.14	0.04	224	0.04
P95-4(WES-F)2""AC	West Face	112723.24	119837.27	10616.29	0.12	0.04	295	0.03

Monitoring Point ID	Control Point	Northing	Easting	Elevation	Error	2017 Displacement (feet)	Dip Direction	2017 Ground Movement Rate (feet/year)
P-9(WEST-FACE)	West Face	112569.13	119159.83	10482.76	0.13	0.01	295	0.01

Note:

Survey data was provided by North Star Surveying Inc. *Northing* and *Easting* coordinates are provided in local mine grid form. *Error* is the calculated survey error for each point and was provided by North Star Surveying (0.1 feet/100 feet). Survey data was set to the median dates of September 1, 2016 and September 28, 2017 to determine *2017 Displacement* and the *2017 Ground Movement Rate* values.

APPENDIX D
SOUTH PIT MONITORING POINTS

Appendix D- South Pit monitoring points.

Monitoring Point ID	Control Point	Northing	Easting	Elevation	Error	2017 Displacement (feet)	Dip Direction	2017 Ground Movement Rate (feet/year)
MP94-7(VERN)	Vern	111956.65	120307.14	10745.43	0.08	0	0	0
MP17-94(VERN)	Vern	111952.41	120245.79	10725.92	0.09	N/A	N/A	N/A
MP17-95(VERN)	Vern	112264.67	120351.39	10822.03	0.08	N/A	N/A	N/A
MP14-93(VERN)	Vern	111950.9	120206.78	10713.75	0.08	10.75	169	10.01
MP05-92(VERN)	Vern	112108.67	120296.94	10760.93	0.08	4.56	167	4.25
MP14-H5R(VERN)	Vern	112127.73	120339.53	10781.85	0.08	4.28	166	3.99
MP05-HS4(VERN)	Vern	112070.96	120355.21	10772.38	0.09	4.22	163	3.93
MP95-63(VERN)	Vern	112038.99	120186.58	10717.5	0.07	3.29	195	3.06
MP10-S7(VERN)	Vern	112036.85	120165.59	10709.87	0.07	2.58	189	2.40
MP05-S1(VERN)	Vern	112091.18	120193.5	10729.81	0.07	2.27	195	2.11
MP10-S9(VERN)	Vern	111997.79	120111.89	10687.97	0.07	0.28	176	0.26
MP94-50(ZORRO)	Zorro	112863.67	121152.8	10826.94	0.27	0.21	136	0.19
MP10-S5(VERN)	Vern	112205.85	120416.3	10826.13	0.09	0.17	154	0.16
MP94-45(ZORRO)	Zorro	112416.87	120583.71	10908.27	0.26	0.15	134	0.14
MP94-6(WEST-FACE)	West-Face	112598.43	120481.29	10839.95	0.17	0.07	250	0.06
MP94-48(ZORRO)	Zorro	113021.26	120929	10795.38	0.24	0.06	104	0.06
P95-5(SOUTH-PIT)	South-Pit	112000.76	119806.96	10560.98	0.02	0.06	62	0.06
MP99-91(VERN)	Vern	112567.53	119941.54	10656.39	0.04	0.03	160	0.03
MP10-S11(SOUTH-PIT)	South-Pit	111871.11	119875.85	10583.64	0.03	0.03	179	0.03

Monitoring Point ID	Control Point	Northing	Easting	Elevation	Error	2017 Displacement (feet)	Dip Direction	2017 Ground Movement Rate (feet/year)
P15-12(SOUTH-PIT)	South-Pit	111957.52	119782.65	10554.38	0.02	0.03	179	0.03
MP95-64(VERN)	Vern	112389.65	120109.67	10731.66	0.05	0.03	52	0.03
MP11-VENTRAISE(SOUTH-PIT)	South-Pit	111733.41	119839.17	10564.53	0.04	0.02	205	0.02
MP10-S12(SOUTH-PIT)	South-Pit	111839.49	119798.38	10561.56	0.03	0.02	205	0.02
MP99-90(VERN)	Vern	112123.77	119928.58	10629.17	0.05	0.02	115	0.02
MP10-S10(VERN)	Vern	111934.3	120014.56	10647.38	0.07	0.02	340	0.02
MP10-S6(VERN)	Vern	112167.54	120160.13	10723.27	0.07	0.02	250	0.02
MP97-71(WEST-FACE)	West-Face	112575.11	120225.54	10793.1	0.16	0.02	340	0.02
P15-11(VERN)	Vern	112600.35	119799.28	10604.2	0.03	0.01	115	0.01

Note:

Survey data was provided by North Star Surveying Inc. *Northing* and *Easting* coordinates are provided in local mine grid form. *Error* is the calculated survey error for each point and was provided by North Star Surveying (0.1 feet/100 feet). Survey data was set to the median dates of September 1, 2016 and September 28, 2017 to determine *2017 Displacement* and the *2017 Ground Movement Rate* values.

APPENDIX E
INDIAN ROCK DUMP MONITORING POINTS

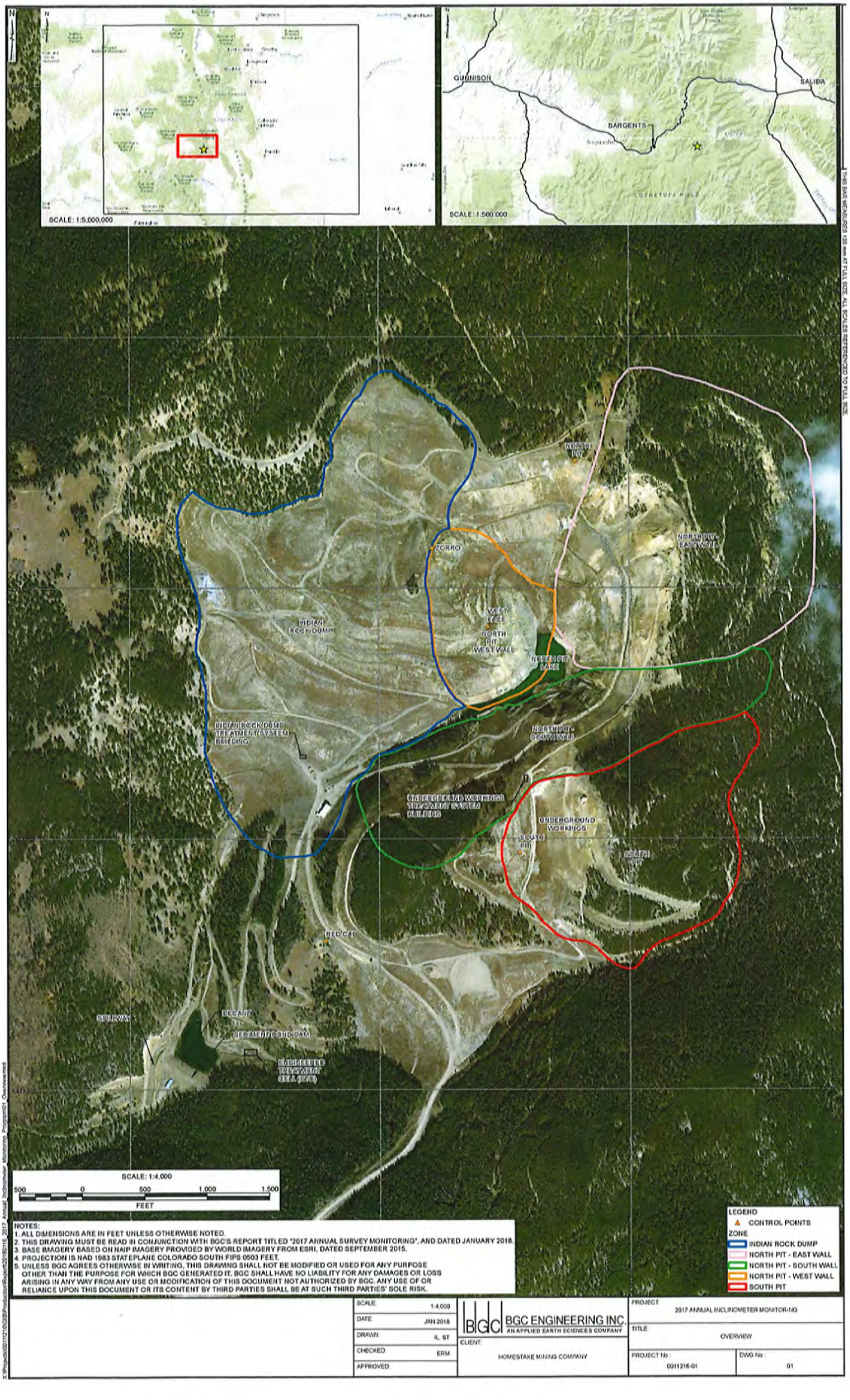
Appendix E- Indian Rock Dump monitoring points.

Monitoring Point ID	Control Point	Northing	Easting	Elevation	Error	2017 Displacement (feet)	Dip Direction	2017 Ground Movement Rate (feet/year)
IN1	-	112700.5	117414.2	10200.3	-	N/A	N/A	N/A
IN2	-	112702.7	117600.3	10200.21	-	N/A	N/A	N/A
IN3	-	112426.1	117740.5	10185.81	-	N/A	N/A	N/A
IC11-10300R(RED-CAP)	Red_Cap	112872.02	117768.62	10297.76	0.15	0.10	219	0.09
RD16-4(IC10300R)	IC11-10300R	112139.99	117346.2	10033.79	0.08	0.06	216	0.06
RD16-2(IC10300R)	IC11-10300R	112181.14	117377.41	10036.36	0.08	0.04	224	0.04
RD16-1(IC10300R)	IC11-10300R	112195.23	117362.11	10036.53	0.08	0.04	224	0.04
RD16-3(IC10300R)	IC11-10300R	112207.48	117348.39	10036.25	0.08	0.04	224	0.04
IC11-10370R(RED-CAP)	Red_Cap	113375.20	117596.64	10372.99	0.21	0.02	250	0.02

Note:

Survey data was provided by North Star Surveying Inc. *Northing* and *Easting* coordinates are provided in local mine grid form. *Error* is the calculated survey error for each point and was provided by North Star Surveying (0.1 feet/100 feet). Survey data was set to the median dates of September 1, 2016 and September 28, 2017 to determine *2017 Displacement* and the *2017 Ground Movement Rate* values. Survey points for IN1, IN2 and IN3 were not surveyed with control points. The position data was derived from a GPS method.

DRAWINGS



NOTES:
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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: HOMESTAKE MINING COMPANY

PROJECT: 2017 ANNUAL INCLINOMETER MONITORING

TITLE: OVERVIEW

PROJECT No.: 0011216-01

DWG No: 01

THIS BAR MEASURES 100 mm AT FULL SIZE. ALL SCALES REFERENCED TO FULL SIZE.

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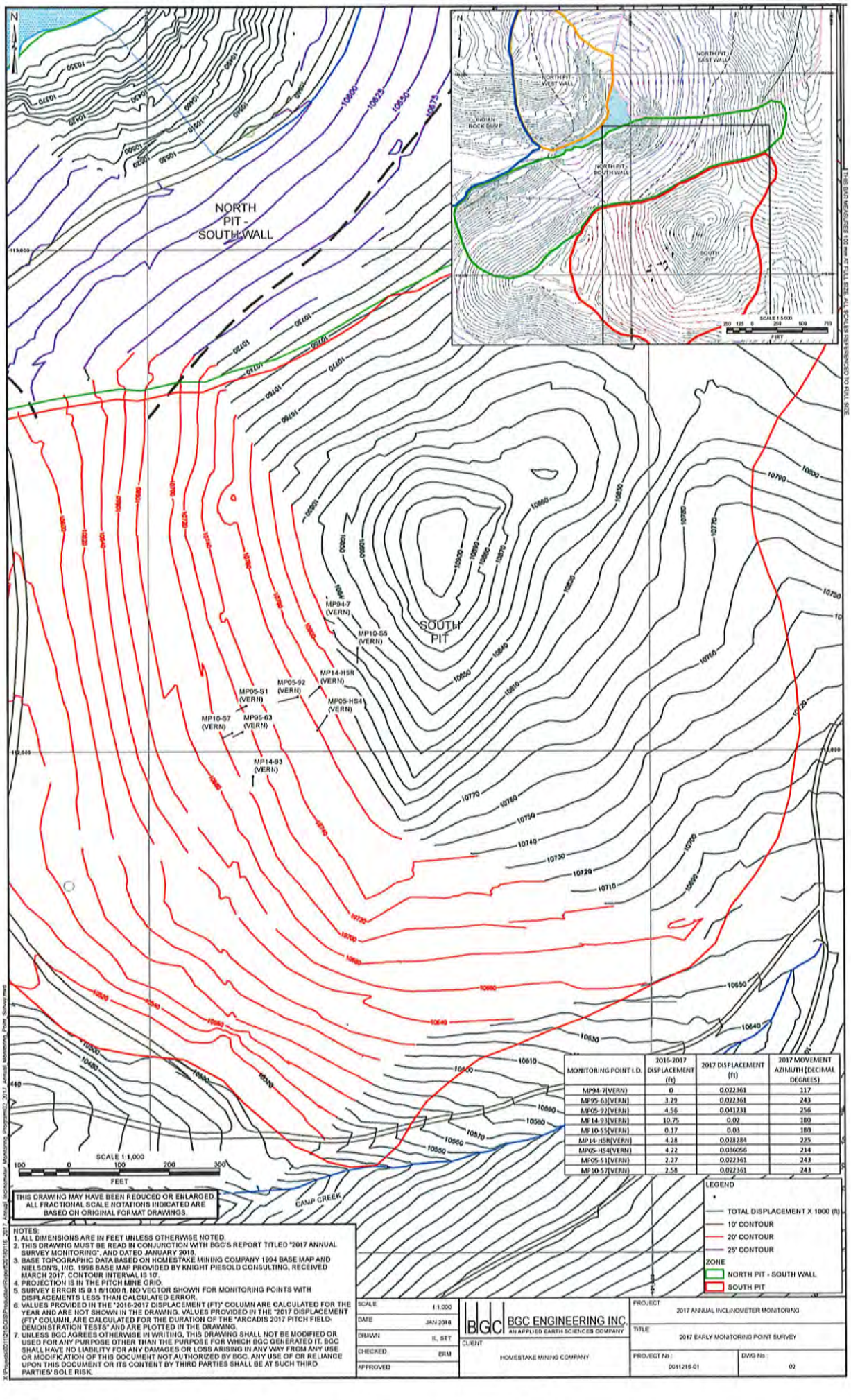

MONITORING POINT I.D.	2016-2017 DISPLACEMENT (ft)	2017 DISPLACEMENT (ft)	2017 MOVEMENT AZIMUTH (DECIMAL DEGREES)
MP94-7(VERN)	0	0.022361	117
MP95-63(VERN)	3.29	0.022361	243
MP05-92(VERN)	4.56	0.041231	256
MP14-93(VERN)	10.75	0.02	180
MP10-S5(VERN)	0.17	0.03	180
MP14-HSR(VERN)	4.28	0.028284	225
MP05-HS4(VERN)	4.22	0.036056	214
MP05-S1(VERN)	2.27	0.022361	243
MP10-S7(VERN)	2.58	0.022361	243

LEGEND
- TOTAL DISPLACEMENT X 1000 (ft)
- 10' CONTOUR
- 20' CONTOUR
- 25' CONTOUR

ZONE
- NORTH PIT - SOUTH WALL
- SOUTH PIT

NOTES:
1. ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "2017 ANNUAL SURVEY MONITORING", AND DATED JANUARY 2018.
3. BASE TOPOGRAPHIC DATA BASED ON HOMESTAKE MINING COMPANY 1994 BASE MAP AND NIELSON'S, INC. 1998 BASE MAP PROVIDED BY KNIGHT PIESOLD CONSULTING, RECEIVED MARCH 2017. CONTOUR INTERVAL IS 10'.
4. PROJECTION IS IN THE PITCH MINE GRID.
5. SURVEY ERROR IS 0.1 ft/1000 ft. NO VECTOR SHOWN FOR MONITORING POINTS WITH DISPLACEMENTS LESS THAN CALCULATED ERROR.
6. VALUES PROVIDED IN THE "2016-2017 DISPLACEMENT (FT)" COLUMN ARE CALCULATED FOR THE YEAR AND ARE NOT SHOWN IN THE DRAWING. VALUES PROVIDED IN THE "2017 DISPLACEMENT (FT)" COLUMN, ARE CALCULATED FOR THE DURATION OF THE "ARCADIS 2017 PITCH FIELD-DEMONSTRATION TESTS" AND ARE PLOTTED IN THE DRAWING.
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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: HOMESTAKE MINING COMPANY

PROJECT: 2017 ANNUAL INCLINOMETER MONITORING

TITLE: 2017 EARLY MONITORING POINT SURVEY

PROJECT No: 0011218-01

DWG No: 02

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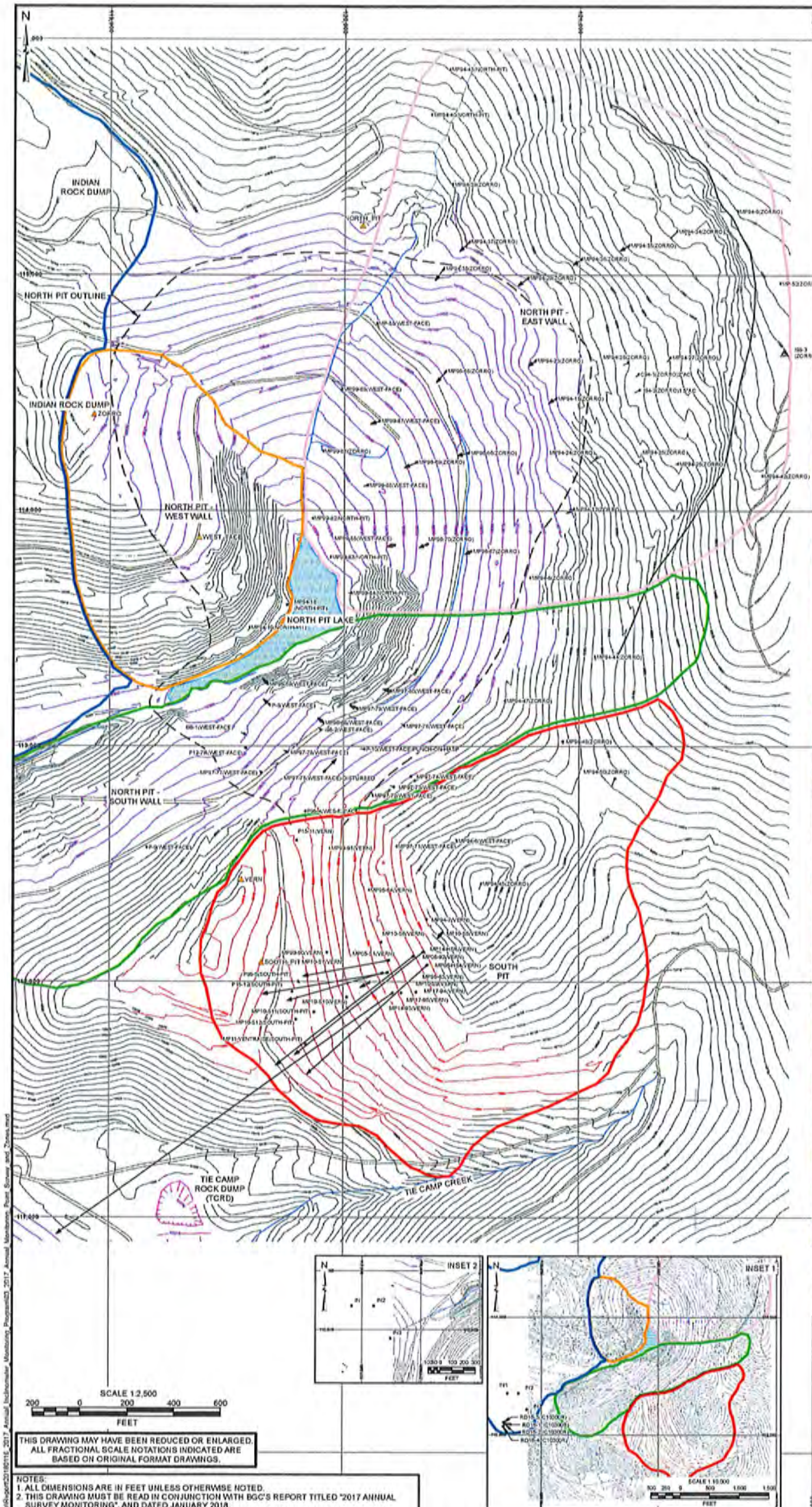

THIS BAR MEASURES 100 mm AT FULL SIZE. ALL SCALES REFERENCED TO FULL SIZE

MONITORING POINT ID	2017 MOVEMENT RATE (ft/year)	2017 MOVEMENT AZIMUTH (DECIMAL DEGREES)
[illegible]	[illegible]	[illegible]

*MONITORING POINTS IN RED INDICATE DISPLACEMENTS GREATER THAN CALCULATED ERROR
** MONITORING POINTS IN YELLOW INDICATE NEW 2017 MONITORING POINTS AND MONITORING POINTS THAT DO NOT HAVE COMPARABLE DATA.

LEGEND

- 2017 MONITORING POINT
- CONTROL POINT
- TOTAL DISPLACEMENT X 200
- 10' CONTOUR
- 20' CONTOUR
- 25' CONTOUR

ZONE

- INDIAN ROCK DUMP
- NORTH PIT - EAST WALL
- NORTH PIT - SOUTH WALL
- NORTH PIT - WEST WALL
- SOUTH PIT

THIS DRAWING MAY HAVE BEEN REDUCED OR ENLARGED. ALL FRACTIONAL SCALE NOTATIONS INDICATED ARE BASED ON ORIGINAL FORMAT DRAWINGS.

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4. PROJECTION IS IN THE PITCH MINE GRID.
5. SURVEY ERROR IS 0.1 ft/1000 ft. NO VECTOR SHOWN FOR MONITORING POINTS WITH DISPLACEMENTS LESS THAN CALCULATED ERROR.
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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: HOMESTAKE MINING COMPANY

PROJECT: 2017 ANNUAL SURVEY MONITORING

TITLE: 2017 ANNUAL MONITORING POINT SURVEY

PROJECT No.: 0011216-01

DWG No.: 03

BGC ENGINEERING INC.
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January 4, 2018
Project No.: 0011-216

Mr. Dale Davis, Site Supervisor
Homestake Mining Company
Pitch Reclamation Project
112 Marshall Street,
Sargents, CO 81249

Dear Mr. Davis,

Re: Pitch Reclamation Project – 2017 Annual Report
Sediment Control Embankment – Permit ID 280110

The Homestake Mining Company (Homestake) Pitch Reclamation Project Site is located approximately eleven miles south of Sargents, Colorado. Homestake operated the site as an open pit mine for the extraction of uranium ore from 1979 to 1984. Since 1984 to present, the project has been maintained by Homestake as it progressed into the final stages of closure and reclamation.

The sediment control embankment was constructed in 1980. The embankment was constructed below the confluence of the Indian and Tie Camp drainages to allow settlement of suspended solids from surface water prior releasing to Indian Creek. The embankment is a jurisdictional structure under the Colorado Division of Water Resources, with permit ID 280110.

The embankment is approximately 80 feet (ft) high at the maximum section and has a crest elevation of 9905.0 ft above mean sea level (amsl). The structure was designed as a zoned embankment with a 15.0 ft thick clay core and both upstream and downstream rockfill shells constructed with compacted weathered sandstone. The pond area has a surface area of approximately 5.4 acres with a corresponding capacity of 88.3 acre-feet. An emergency overflow spillway exists through the right abutment with an outfall weir elevation of 9900.0 ft amsl.

Following completion of construction in 1981, five piezometers and five permanent survey monuments were installed to monitor both changes in phreatic surface within the embankment and physical movements of the embankment, respectively. In 2000, four additional piezometers were installed along the crest of the embankment.

Seepage was observed on the downstream face of the embankment in June 2000 and discussed in both 2000 and 2001 annual reports. This seepage has not reappeared following the repair work

conducted in 2001. The following sections provide a summary of the monitoring conducted during 2017, discussing the monument and piezometer data.

1.0 Embankment Displacement Monuments

The survey monuments (M1 to M5) measure vertical displacement and are located near the upstream side of the embankment crest level, as shown on **Figure 1**. The five permanent survey monuments have been surveyed annually since 1981.

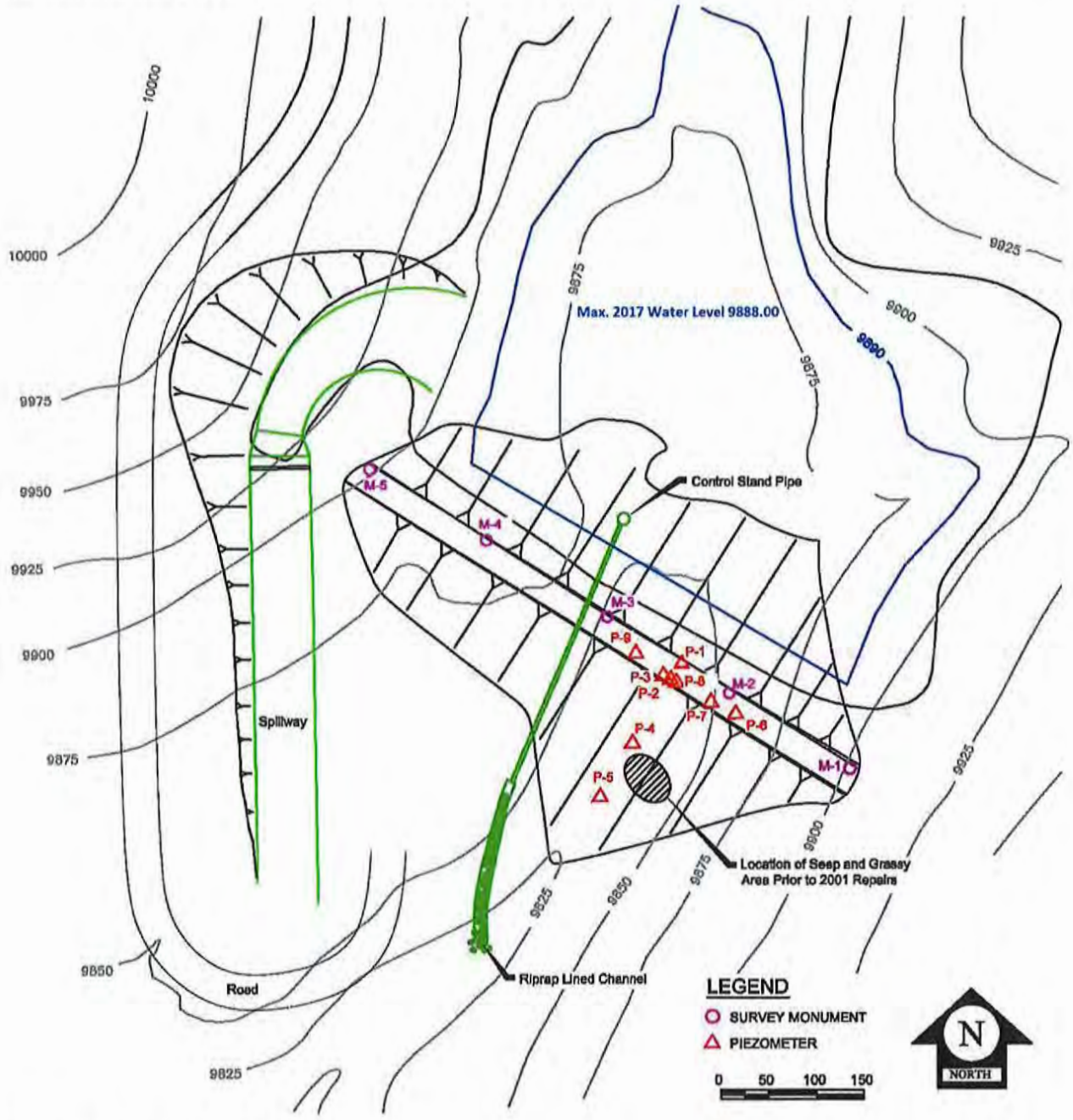

Figure 1: Monitoring station locations.

The 2017 annual survey was conducted on October 5, 2017 and the results of survey monitoring since the installation of the monuments are presented in **Table 1**.

As shown in **Table 1**, differences between the 2016 survey and the 2017 survey of embankment monitoring points are between -0.01 ft and +0.01 ft. Monument 1 (M1), Monument 2 (M2) and Monument 5 (M5) showed a +0.01 ft (moving down) difference between the 2016 and 2017 survey, consistent with previous measurements. Monument 3 (M3) and Monument 4 (M4) showed a -0.01 ft (moving up) difference between the 2016 and 2017 survey, consistent with previous measurements.

Table 1: Monument survey results since installation.

Date	Monument 1	Monument 2	Monument 3	Monument 4	Monument 5
3-Sep-81	9905.94	9905.26	9904.85	9906.06	9905.15
15-Sep-81	9905.93	9905.27	9904.85	9906.05	9905.17
1-Oct-81	9905.92	9905.24	9904.83	9906.02	9905.14
8-Oct-81	9905.92	9905.26	9904.85	9906.04	9905.18
16-Nov-81	9905.92	9905.25	9904.84	9906.06	9905.19
2-Dec-81	9905.91	9905.24	9904.83	9906.07	9905.10
17-Dec-81	9905.94	9905.27	9904.85	9906.05	9905.22
19-Jan-82	9905.90	9905.23	9904.82	9906.06	9905.16
2-Feb-82	9905.93	9905.25	9904.85	9906.09	9905.23
18-May-82	9905.87	9905.13	9904.66	9905.97	9905.21
3-Jun-82	9905.85	9905.09	9904.59	9905.94	9905.19
1-Jul-82	9905.83	9905.05	9904.55	9905.90	9905.16
6-Aug-82	9905.83	9905.05	9904.55	9905.71	9905.19
18-Nov-82	9905.78	9905.01	9904.53	9905.87	9905.20
7-Jun-83	9905.66	9904.87	9904.43	9905.82	9905.19
27-Sep-83	9905.43	9904.70	9904.31	9905.68	9905.17
2-Aug-84	9905.48	9904.71	9904.27	9905.64	9905.08
28-Jun-85	9905.48	9904.72	9904.34	9905.77	9905.23
16-Jul-86	9905.63	9904.90	9904.47	9905.79	9905.12
9-Sep-87	9905.67	9904.86	9904.46	9905.82	9905.03
20-Sep-88	9905.51	9904.72	9904.36	9905.75	9905.34

Table 1: Monument survey results since installation (continued).

7-Sep-89	9905.51	9904.73	9904.34	9905.68	9905.20
20-Sep-90	9905.45	9904.65	9904.25	9905.63	9905.15
25-Sep-91	9905.49	9904.70	9904.31	9905.66	9905.26
30-Sep-92	9905.47	9904.67	9904.29	9905.64	9905.23
23-Sep-93	9905.46	9904.67	9904.29	9905.62	9905.24
29-Jul-94	9905.47	9904.67	9904.27	9905.62	9905.24
27-Sep-95	9905.46	9904.66	9904.27	9905.62	9905.25
17-Sep-96	9905.46	9904.65	9904.26	9905.60	9905.26
13-Oct-97	9905.46	9904.67	9904.29	9905.63	9905.27
29-Sep-98	9905.45	9904.64	9904.26	9905.61	9905.27
7-Nov-99	9905.44	9904.64	9904.25	9905.60	9905.26
26-Oct-00	9905.45	9904.64	9904.26	9905.62	9905.29
15-Oct-01	9905.43	9904.64	9904.26	9905.59	9905.24
24-Sep-02	9905.46	9904.65	9904.26	9905.62	9905.27
8-Sep-03	9905.43	9904.62	9904.23	9905.58	9905.24
24-Sep-04	9905.44	9904.64	9904.27	9905.61	9905.27
23-Oct-05	9905.43	9904.63	9904.25	9905.58	9905.26
1-Oct-06	9905.44	9904.63	9904.25	9905.59	9905.27
20-Oct-07	9905.44	9904.62	9904.24	9905.59	9905.25
17-Oct-08	9905.44	9904.63	9904.24	9905.60	9905.27
23-Oct-09	9905.43	9904.61	9904.24	9905.57	9905.24
12-Sep-10	9905.44	9904.62	9904.24	9905.58	9905.24
24-Sep-11	9905.44	9904.62	9904.24	9905.59	9905.27
30-Sep-12	9905.43	9904.61	9904.24	9905.58	9905.27
23-Jul-13	9905.43	9904.61	9904.23	9905.58	9905.27
30-Jul-14	9905.41	9904.60	9904.22	9905.55	9905.26
25-Aug-15	9905.42	9904.60	9904.22	9905.56	9905.22
30-Aug-16	9905.43	9904.62	9904.22	9905.57	9905.27
5-Oct-17	9905.42	9904.61	9904.24	9905.58	9905.26
Differential 2017-2016	+0.01	+0.01	-0.01	-0.01	+0.01
Maximum Differential	-0.53	-0.67	-0.63	-0.54	+0.31

Key:
Maximum Elevation (Blue highlight)
Minimum Elevation (Green highlight)

A graph illustrating the vertical displacement since construction of the embankment is provided as **Figure 2**. There has not been significant movement since the initial settlement (1981 to 1984).

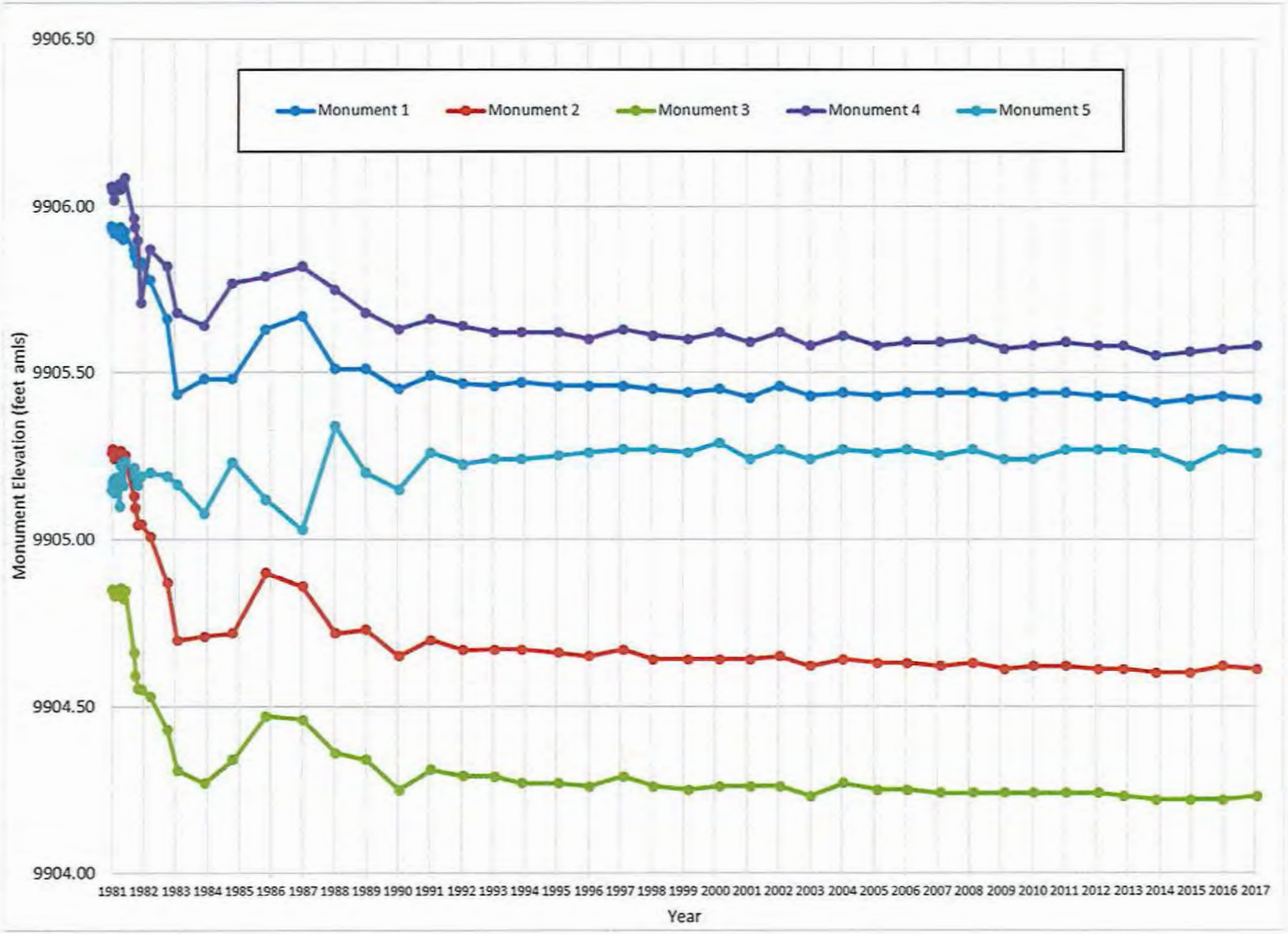

Figure 2: Vertical displacement monument survey.

2.0 Piezometer Evaluation

There are currently nine piezometers monitoring water levels in the embankment. The first five were installed when the embankment was completed in 1981. Four additional piezometers were installed along the crest of the embankment in 2000. The piezometers are named P1 through P9 on **Figure 1** (presented in **Section 1**) and called P-1 through P-9 on tables. This section will discuss the history and the evaluation of piezometers for 2017.

2.1. Piezometric History of the Sediment Control Embankment

In June 2000, seepage was observed on the downstream face of the embankment. Subsequent evaluations during 2000 determined there was a localized elevated phreatic surface within the embankment and the downstream shell. Remediation work was conducted in 2001 to identify the cause and repair the embankment. The repair consisted of installing a cutoff trench and clay blanket on the upstream face over the seepage area.

The top of the inclined clay blanket is at elevation 9885.5 ft amsl. A final engineering report detailing the repairs and performance was provided to the Colorado Division of Water Resources on January 7, 2003 (*Remedial Design As-Built Report*, Glasgow Engineering, November 2002). In May 2004, the pond level was increased by 10 ft. to an elevation of 9888.5 ft amsl. In May 2005, the water level in the pond reached a maximum elevation of 9893.5 ft amsl. This water level was the highest in the pond since the repair work performed in 2001, and it was seven feet below the spillway crest elevation of 9900.0 ft amsl. The water levels in P1, P4 and P8 responded with a quick rise in their piezometric levels corresponding to the water being temporarily stored above the repair level but the water levels in the piezometers dropped back quickly to normal levels as the pond water level dropped below 9885.5 ft. amsl.

Piezometer and pond water elevation data from year 2000 to present are presented in **Figure 3**.

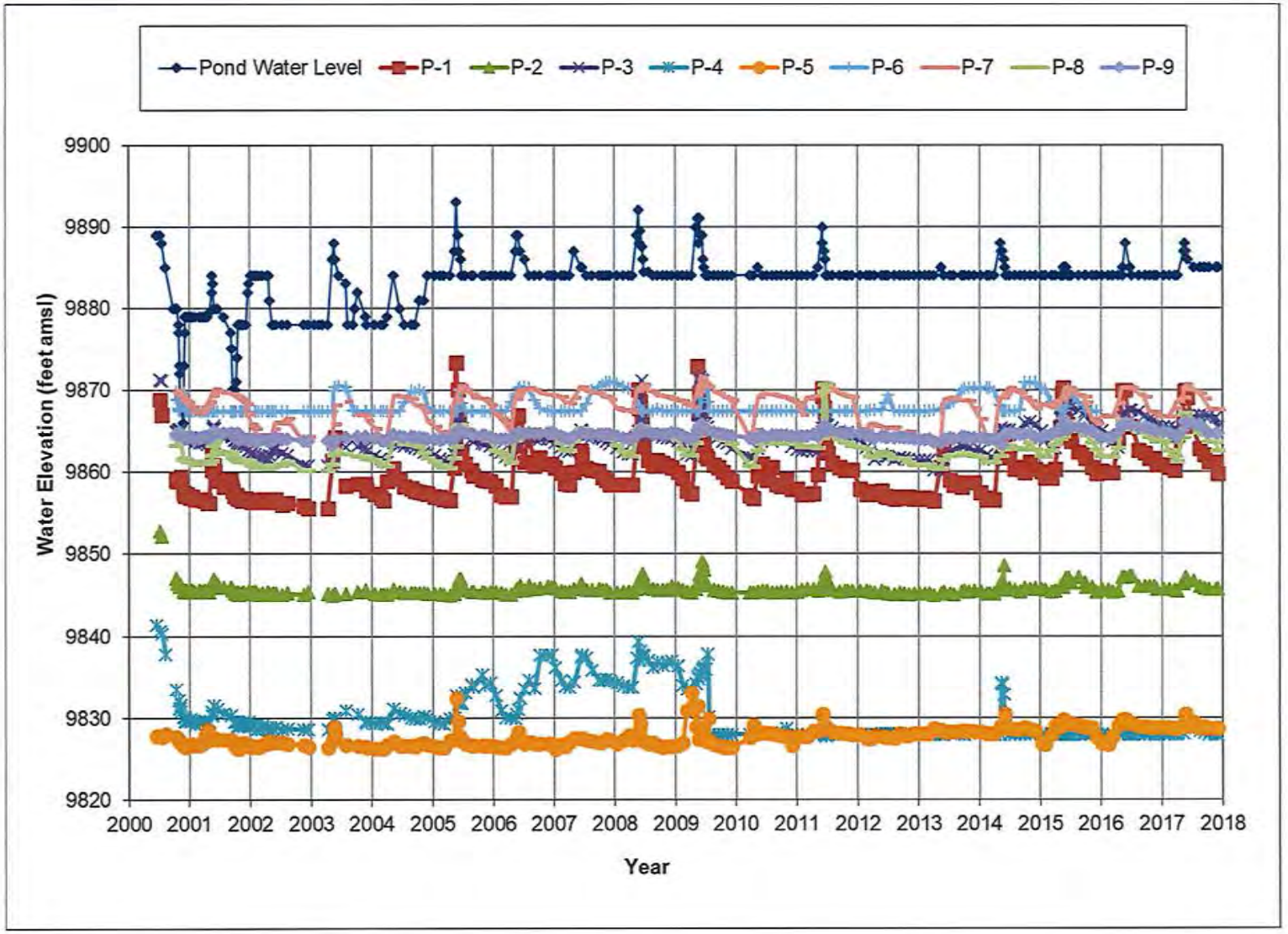

Figure 3: Impoundment piezometer history.

2.2. Piezometer Data Evaluation for 2017

The total precipitation for the period the November 2016 through October 2017 was roughly 527.8 mm (21 inches) as measured with the on-site precipitation gauge. This compares with precipitation from November 2015 to October 2016 of 518.3 mm ((20 inches) and from November 2014 to October 2015 of 591.4 mm (23 inches).

In 2017, the pond level was maintained at 9884 ft. amsl through January to April 2017. The pond level rose to 9888 ft. amsl on the middle of May 2017, which the highest pond level in the year and began decreasing by the end of May 2017 to 9887 ft. amsl. From June to July 2017, the pond level decreased from 9886 ft. amsl to 9885 ft. amsl, this pond level was maintained through December 4th, 2017 (last day of pond level recording for 2017).

The comparison between 2016 and 2017 is presented in **Table 2** below.

Table 2: Maximum change in water levels in Embankment piezometers for 2016 to 2017

	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	P-9
Maximum Elev. 2016 (ft. amsl)	9869.94	9847.26	9867.51	9828.30	9829.79	9870.86	9870.33	9866.28	9865.79
Maximum Elev. 2017 (ft. amsl)	9869.93	9847.11	9866.82	9829.34	9830.53	9870.01	9870.73	9867.16	9866.04
Difference Max. Elevations (ft.)	-0.01	-0.15	-0.69	+1.04	+0.74	-0.85	-0.40	+0.88	+0.25

The pond level rose above the clay blanket top elevation of 9885.5 ft amsl for approximately three weeks. Historically, water levels in the piezometers show a response to water levels in the impoundment. This is presented in **Table 3** and **Figure 4**.

Table 3: Piezometer water elevation data for 2017.

Piezometer No.	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	P-9	Pond Water Level
Surface Elevation (ft. amsl)	9905.68	9905.51	9906.60	9875.45	9847.79	9906.07	9906.00	9906.00	9906.29	N/A
Stand Pipe (ft.)	2.13	1.96	2.02	2.04	1.81	1.92	1.85	0.20	0.75	N/A
Collar Elecation (ft. amsl)	9907.81	9908.47	9908.62	9877.49	9849.60	9907.99	9907.85	9908.20	9907.04	N/A
Bottom of Pipe (ft. amsl)	9836.16	9836.82	9860.82	9828.14	9819.85	9862.25	9862.15	9857.83	9862.28	N/A
Total Depth (ft.)	70.00	68.69	45.78	47.31	27.94	43.82	43.85	48.17	44.01	N/A
1/15/2017	9860.79	9845.65	9865.50	9827.97	9828.80	9867.37	9866.75	9863.71	9864.82	9884.00
2/14/2017	9860.51	9845.66	9865.40	9827.97	9828.79	9867.38	9866.73	9862.56	9864.72	9884.00
3/18/2017	9860.13	9845.62	9865.30	9827.96	9828.77	9867.39	9867.75	9861.96	9864.32	9884.00
4/4/2017	9864.39	9845.49	9865.12	9827.95	9828.75	9867.39	9868.56	9861.25	9864.12	9884.00
5/10/2017	9866.71	9846.31	9866.60	9828.05	9829.15	9867.95	9869.07	9864.23	9865.12	9887.00
5/17/2017	9869.76	9846.95	9866.82	9828.77	9830.42	9869.83	9870.33	9866.95	9866.02	9888.00
5/24/2017	9869.93	9847.11	9866.69	9829.34	9830.53	9870.01	9870.73	9867.16	9866.04	9887.00
6/1/2017	9869.03	9846.79	9866.72	9829.28	9828.95	9869.65	9870.12	9866.40	9865.94	9886.00
7/11/2017	9865.51	9846.67	9866.70	9828.74	9829.50	9869.54	9869.91	9865.93	9865.84	9885.00
8/17/2017	9862.81	9846.04	9866.81	9828.39	9828.73	9868.46	9869.54	9864.76	9865.67	9885.00
9/12/2017	9862.03	9845.84	9866.82	9828.14	9828.95	9868.34	9868.89	9864.56	9865.17	9885.00
10/11/2017	9861.13	9845.72	9866.75	9827.99	9828.73	9867.39	9867.62	9863.66	9864.67	9885.00
11/21/2017	9861.11	9845.71	9866.65	9827.93	9828.73	9867.39	9867.60	9863.63	9864.67	9885.00
12/4/2017	9859.71	9845.72	9865.42	9827.92	9828.74	9867.39	9867.59	9862.62	9864.66	9885.00
2017 Average Water Level	**9863.83**	**9846.10**	**9866.24**	**9828.32**	**9829.11**	**9868.24**	**9868.65**	**9864.24**	**9865.13**	**9885.29**
2017 Max	9869.93	9847.11	9866.82	9829.34	9830.53	9870.01	9870.73	9867.16	9866.04	9888.00
2017 Min	9859.71	9845.49	9865.12	9827.92	9828.73	9867.37	9866.73	9861.25	9864.12	9884.00
2017 Max/Min Differential	10.22	1.62	1.70	1.42	1.80	2.64	4.00	5.91	1.92	4.00

On **Table 3**, blue colored letters symbolize maximum elevations and green colored letters symbolize minimum elevations in data.

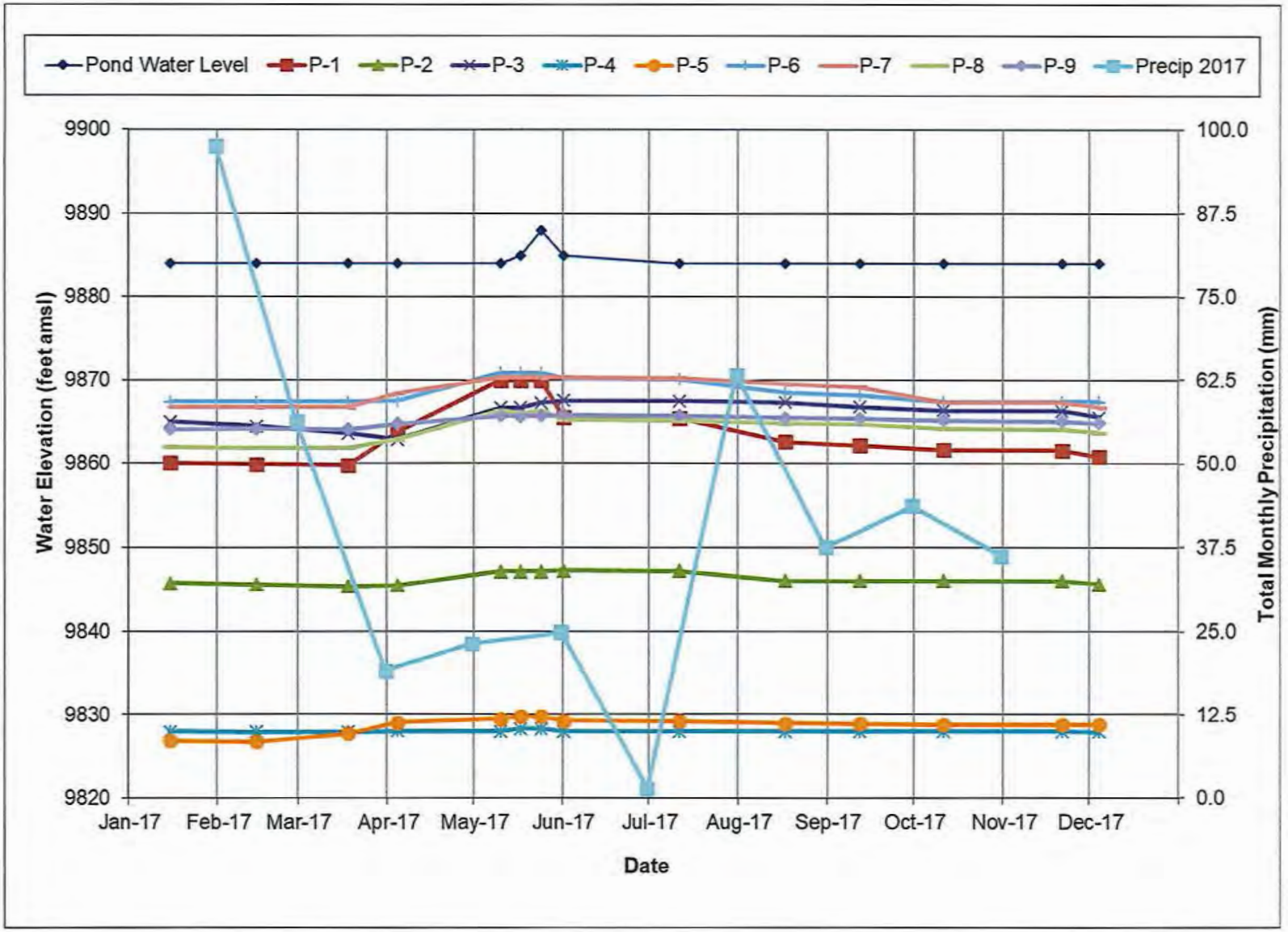

Figure 4: Year 2017 Sediment Embankment piezometer water elevations with monthly cumulative precipitation.

Piezometer P1 is located on the crest upstream side of the embankment. Piezometers P2, P3, P6, P7, P8 and P9 are located on the crest downstream side of the embankment. Piezometers P4 and P5 are location on the downstream slope of the embankment. The yearly changes are the difference between the maximum water level and the minimum water level for each piezometer using **Table 3**. Between 2016 and 2017, the following changes in the piezometer water levels were observed in Piezometers P1 through P9 located in the embankment:

- The water level in P1 increased by 10.22 ft. in 2017, compared with a rise of 9.86 ft. in 2016. This piezometer usually responds quickly to a rise in the water level in the pond then drops back down to normal levels by mid-Summer.
- The water level in P2 increased by 1.62 ft. in 2017 compared with a rise of 1.88 ft. in 2016.
- The water level in P3 increased by 1.70 ft. in 2017 compared with a rise of 4.62 ft. in 2016.
- The water level in P4 increased by 1.42 ft. in 2017 compared with a rise of 0.36 ft. in 2016. Historically, this piezometer shows little rise in the water level following the spring snow melt.
- The water level in P5 increased by 1.80 ft. in 2017 compared with a rise of 3.02 ft. in 2016.
- The water level in P6 increased by 2.64 ft. in 2017 compared with 3.50 ft. in 2016.
- The water level in P7 increased by 4.00 ft. in 2017 compared with a similar increase of 3.62 ft. in 2016.
- The water level in P8 increased by 5.91 ft. in 2017 compared with to rise of 4.43 ft. in 2016. T
- The water level in P9 increased 1.92 ft. in 2017 compared with a rise of 1.70 ft. in 2016.

2.3. Facility Maintenance History

Piezometer P4 is close to the seepage area noted in 2000 and it is monitored closely. From 2005 to 2009 it was observed that the water level in P4 was not falling back as rapidly as the other piezometers. It was noted that when the probe was pulled out of the P4 and P5 it was covered with silt. The silt buildup had not allowed the pipes to drain sufficiently to accurately reflect the phreatic surface in the embankment. In July 2009, both piezometers P4 and P5 were flushed with high pressure water, approximately 250 gallons at 80 to 90 psi, to minimize the silt and other debris that had built up in the standpipes. The high-pressure flushing resulted in the water levels in both piezometers falling back to normal levels within a few days over the next few years, with the average water level in P4 dropping by more than 4.00 ft.

In 2015, the water level rise in P4 was small due to the water level in the pond being kept below the elevation of the repair. In 2016, the water in the pond increased to 9888 ft. amsl

elevation for approximately two weeks in May due to snow melt with little rise in the water level in P4. A similar event occurred in 2017, with May being the month of pond increase to 9888 ft. amsl, elevating piezometer reading for approximately three weeks. **Figure 3** presents the piezometric data collected since their installation.

The flushing of P-7 and P-8 in late 2015, along with clearing of the drain line in 2009 has continued to keep water levels low in the downstream and toe section of the embankment. In 2016, with precipitation the lowest in the past three years, all piezometer levels were down relative to 2015 and 2014. In 2014, the water level in P4 increased by 6.31 feet but fell back rapidly. In 2016, the increase was only 0.36 ft. The high pressure flushing of P7 and P8 in late 2015 allowed water levels in both piezometers to rise and fall back quickly compared to their behavior in 2013 and 2014.

In 2014, maintenance included adding a debris trap above the outlet pipe and removal of pine seedlings on the downstream face of the embankment. The debris trap was cleaned in 2016 and pine seedlings were removed from the downstream face once again. No significant maintenance activities occurred in 2017.

3.0 Recommendations

The following are recommendations after reviewing the 2017 data and pertaining documents focusing on the Sediment Control Embankment.

3.1. Survey Monuments

It is recommended to have a survey report accompany the survey monument readings starting on 2018. This report should explain methods applied, equipment used, margin of error and field conditions.

3.2. Installation of New Piezometer

The only piezometer on the upstream crest side is P-1. This piezometer is in the clay core and is currently giving readings of phreatic levels lower than the water surface. To develop a better understanding of the pore water pressures affecting the embankment, a new piezometer close to P-1, upstream and at least 10 ft. away from the clay core is recommended.

3.3. Regular Piezometer Maintenance

In 2015 there was a flushing of piezometers that cleaned debris and silt, improving readings. It is recommended to continue this maintenance on an annual or biannual basis.

3.4. Drains Inspections

The drains are recommended to be camera inspected yearly to mitigate clogs and help maintain efficiency.

3.5. Piezometric Trigger Levels

The piezometer data reviewed showed a trend followed through typical snowmelt seasons. Best engineering practice considers the use of trigger levels to help determine if piezometric values pass certain thresholds that could affect embankment slope stability. It is recommended to conduct a slope stability study to establish piezometric trigger levels and associated action plans in case of exceedance.

3.6. Topographic Survey of Embankment

Throughout the history of the Sediment Control Embankment, repairs and maintenance have taken place. Through the review of *Remedial Design As-Built Report*, (Glasgow Engineering, November 2002), the downstream embankment slope was constructed as a 1.66:1 (horizontal:vertical) instead of the design slope of 2:1. A topographic survey of the embankment

would determine current conditions of the repaired slopes and will allow for updated surfaces for slope stability studies.

4.0 Conclusion

The 2017 survey results continue to indicate that the total vertical movement in the embankment is minimal, within historic levels, and lies within the range of survey error.

Water level trends measured in the piezometers between 2016 and 2017 are consistent with historic readings

5.0 Closure

BGC Engineering Inc. (BGC) prepared this document for the account of Homestake Mining Company. The material in it reflects the judgment of BGC staff in light of the information available to BGC at the time of document preparation. Any use which a third party makes of this document or any reliance on decisions to be based on it is the responsibility of such third parties. BGC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document.

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Yours sincerely,

BGC ENGINEERING INC.
per:

Michael E. Henderson, PE
Principal Geotechnical Engineer
Engineer of Record

Reviewed by:

Troy Meyer, PE, P.Eng.
Principal Geotechnical Engineer

Daniel Granda, PE
Geotechnical Engineer

REFERENCES

Glasgow Engineering (2002), "Sediment Control Embankment Evaluation and Remedial Design As-Built Report," Pitch Reclamation Project, November, 2002.

BGC ENGINEERING USA INC.
AN APPLIED EARTH SCIENCES COMPANY

HOMESTAKE MINING COMPANY

PITCH MINE

2017 ANNUAL INCLINOMETER MONITORING

FINAL

PROJECT NO.: 0011216-01 DATE: January 11, 2018

BGC ENGINEERING USA INC.
AN APPLIED EARTH SCIENCES COMPANY
447 E. Main Street
Montrose, CO USA 81401
Telephone (970) 615-8056

January 11, 2018
Project No.: 0011216-01

Dale Davis
Homestake Mining Company
112 Marshal Street
PO Box 40,
Sargents Colorado 81248

Dear Mr. Davis,

Re: 2017 Annual Inclinometer Monitoring

Please find attached a final copy of our above-referenced report for your review and comment.

We trust this meets your current requirements.

Yours sincerely,

BGC ENGINEERING INC.
per:

Michael Henderson, PE, P.Eng.
Project Manager

EXECUTIVE SUMMARY

Pitch Mine is owned by Homestake Mining Company (HMC) as a subsidiary of the Barrick Gold Corporation. The mine is located in the Sawatch Range of Saguache County within the Gunnison National Forest. Open pit mining operations ceased in 1984 following a pit wall failure on the east side (East Wall) of the North Pit in October of 1983. This 2017 annual inclinometer monitoring report is a component of the continuing engineer of record role established for BGC Engineering Inc. (BGC).

Six inclinometers were surveyed as a part of this monitoring report. The oldest set of inclinometers include I98-1, I98-2, and I98-3 and were surveyed on October 4 and October 5, 2017. The newest set of inclinometers included IN1, IN2 and IN3 and were installed in August of 2017. The inclinometers were surveyed on August 22-29, September 12-27, and October 3-5, 2017 as a part of a weekly inspection during the Arcadis 2017 pitch field-demonstration tests. BGC checked inclinometer installation parameters during initial site visits as a means of verifying as-built hole dimensions and checking for potential errors in depth values. DigiPro 2 (v2.12.4) software was used to process and plot inclinometer data collected using a DataMate II.

Inclinometers I98-1 and I98-2 indicated movement during the 2017 inclinometer monitoring cycle. Inclinometer I98-3 did not indicate movement for the 2017 inclinometer monitoring cycle. The inclinometers IN1, IN2 and IN3 installed in August of 2017 did not indicate movement during the Arcadis 2017 pitch field-demonstration tests.

The two deepest ground movement zones in I98-1, 46.5 feet below ground surface (bgs) and 70.5 feet bgs, are moving at similar rates. The ground movement rates increased from 0.01 and 0.04 inches per year, respectively, in the 2016 monitoring cycle to 0.06 inches per year, in the 2017 monitoring cycle. The shallowest ground movement zone at 20 (17) feet indicates an increase from the 2016 inspection cycle of 0.06 inches per year to 0.16 inches per year for the 2017 monitoring cycle. The two deepest ground movement zones in I98-2, 122 feet bgs and 212 feet bgs, are moving at similar rates. The ground movement rates increased from 0.00 and 0.02 inches per year, respectively, in the 2016 monitoring cycle to 0.03 inches per year, in the 2017 monitoring cycle. The shallowest ground movement zone at 20 (16.5) feet indicates an increase from the 2016 inspection cycle of 0.02 inches per year to 0.05 inches per year for the 2017 monitoring cycle. Ground movement trends within I98-2 indicate a lower propensity for discrete shear plane movement than inclinometer I98-1. Slope creep is the primary form of ground movement indicated by the slope inclinometer data for I98-1 and I98-2.

BGC recommends continuing the annual monitoring of inclinometers I98-1, I98-2, I98-3, IN1, IN2 and IN3 at Pitch Mine to track ground movement rates. Non-routine inclinometer surveys should be considered for site conditions that may cause increased ground movement such as pump tests, ground disturbance and anomalous rainfall events. Inclinometer surveys in subsequent years should be compared with the installation borehole logs to identify potential discrete geologic structures and geologic material types that may be contributing to ground movement.

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LIMITATIONS

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1.0 INTRODUCTION

1.1. Location and Ownership

Pitch Mine is owned by Homestake Mining Company (HMC) as a subsidiary of the Barrick Gold Corporation. The mine is located in the Sawatch Range of Saguache County within the Gunnison National Forest five miles East of Sargents, Colorado and 18 miles southwest of Salida, Colorado (Drawing 01).

1.2. Background

1.2.1. History

Uranium was discovered at the Pitch Mine site (Pitch Mine) in 1955 and was followed by mineral extraction starting in 1957. Mineral extraction began with underground mining techniques. Pinnacle Exploration Company (Pinnacle) was the initial operator, mining ore from the Pitch Tunnel (1958–1962). Production from the mine continued from 1968 to 1972 with solution mining of the underground workings (BGC 2016).

HMC acquired Pitch Mine from Pinnacle in 1972. Pitch Mine was operated using open pit extraction techniques from 1979 to 1984 from two pits (North and South Pits). The North Pit was developed during open pit operations and allowed to fill with groundwater after mining ceased. The South Pit never reached a depth or profile that could create a pit lake. Approximately 275,000 dry tons of ore were produced yielding 2.0 million pounds of yellowcake (U30) from the open pit mine operations (D. Davis, email, October 18, 2016).

Signs of slope instability began in 1980 within the East Wall of the North Pit. The most significant ground movement occurred in October 1983 and was attributed to an El Niño weather pattern (Agapito 1999). Dropping uranium prices in 1983 combined with safety concerns from continued mining at the base of the failed East Wall led to mine closure in 1984 (D. Davis, email, October 18, 2016).

1.2.2. Geology

Primary bedrock formations at Pitch Mine include the Belden Shale, Leadville Limestone, Chaffee Formation, Fremont Dolomite, Harding Quartzite and Manitou Dolomite. Composition of these bedrock formations include sandstone, shale, limestone, quartzite and dolomite. Basement rock is a combination of Precambrian biotite schist and pegmatites. Surficial geology is a mixture of colluvium from Oligocene-aged waterlaid and welded volcanic tuffs (Agapito 1999).

The dominant natural geologic structure at the site is the Chester fault zone and associated syncline (USGS 2011). The North Chester fault zone is a steeply dipping reverse fault that trends roughly north-south. Subsequent transverse-normal faults cut the Chester fault along a northeast-southwest trend (Agapito 1999).

1.2.3. Engineered Structures

Post-mining engineered structures at the Pitch Mine include graded slopes, waste rock dumps, access roads, water retaining structures and drainage features (Drawing 01).

Engineered Structures:

- Indian Rock Dump (IRD)
- Tie Camp Rock Dump (TCRD)
- North Pit Lake and Dam
- Sediment Pond
- North Pit
- South Pit
- North Pit Drainage Pipeline
- Underground Mine Workings.

1.3. Objectives

1.3.1. Proposed Work

HMC approached BGC in October of 2016 with a Request for Proposal (RFP) to become the Engineer of Record (EoR) for Pitch Mine. BGC's objective is to assist HMC in complying with any applicable state, local, federal and enterprise requirements during the Pitch Mine Reclamation project. The goal is to guide Pitch Mine to interim and final closure objectives through establishing and maintaining a long-term client-consultant relationship (D. Davis, email, October 18, 2016).

1.3.2. Scope of Work

The EoR role is envisioned to function in partnership with HMC, providing ongoing engineering, monitoring and reporting services for the inactive Pitch Mine. The EoR will coordinate and collaborate with the local company representative and prime vendors, following the current Lowest Practical Limit (LPL) and Best Management Practices (BMP) programs, relevant to the Pitch Mine based on the Colorado discharge Permit System permit (Arcadis 2017). The EoR will work with the HMC representative(s) to advance the site towards interim and final closure (BGC 2016).

Scope of work for the 2017 Annual Inclinometer Monitoring Report satisfies the following items outlined in the BGC proposal in response to the HMC RFP (BGC 2016):

1. Perform routine annual and other inspections at the existing site facility and infrastructure.
    - Perform inclinometer monitoring annually of three inclinometers, review/ annual Colorado Division of Reclamation and Mining Safety (Colorado- ORMS) report for North and South pit wall stability (HMC-Pitch will provide Data Mate and inclinometer equipment). Reporting will include three hard copies (for regulators and HMC) and one electronic copy for HMC records.

2. Provide an annual reporting for the State of Colorado (as needed or as requested by HMC reporting will include three hard copies (for regulators and HMC) and one electronic copy for HMC records).
    - Provide annual geotechnical report for existing rock dumps and any geotechnical monitoring, reporting and evaluations as required by the Colorado- ORMS.

1.3.3. Inclinometers

There are six active inclinometers installed at the Pitch Mine (Drawing 01). The oldest inclinometers were installed in 1998 to monitor deformation in the North Pit east and south walls and were initiated by a previously documented slope movement event (Knight Piesold 2017).

- I98-1 is positioned on the lower bench of the South Wall
- I98-2 is positioned on the upper bench of the South Wall
- I98-3 is positioned behind the head scarp above the East Wall.

Additional inclinometers were installed in 2017 in the IRD to monitor potential movement induced by the Arcadis Environmental Consultant's (Arcadis) 2017 pitch field-demonstration tests (Drawing 01). The tests included in situ source zone treatment of the underground mine workings, IRD and TCRD using varied methodologies of phosphate reagent injections (Arcadis 2017).

- IN1- is positioned on the western side of the IRD
- IN2- is positioned in the middle of the IRD
- IN3- is positioned on the eastern side of the IRD.

2.0 METHODOLOGY

2.1. Field Methods

2.1.1. Inclinometer Installation Characteristics

BGC checked inclinometer installation characteristics during initial site visits. A 300 feet weighted tape was used to sound the inclinometer depth in I98-1 and I98-2 to the nearest 0.5 feet. Inclinometer depth was sounded in I98-3 using the inclinometer cable and probe to the nearest 0.5 feet (Appendix D, Photo 1). Stickup was verified from ground surface to the top of inclinometer casing to the nearest inch using a tape measure (Appendix D, Photo 02). Ground surface was defined as the top of associated survey markers staked with rebar near the base of each inclinometer standpipe (Appendix D, Photo 3). The top of the casing was defined as the top of a capped casing (Appendix D, Photo 04).

Inclinometers were sounded using the inclinometer cable and probe for IN1, IN2 and IN3 with hole depth measurements rounded to the nearest 0.5 feet. A tape measure was used to measure the stickup for each inclinometer casing to the nearest 0.5 feet. Stickup was defined as the height from ground surface to the top of casing. Ground surface was defined as the top of a concrete apron at the base of each standpipe containing a survey marker for IN1, IN2 and IN3. The top of the casing was defined as the top of a capped casing.

2.1.2. Inclinometer Readings

A Durham Geo-Enterprises Inc. Digitilt Classic Inclinometer System was used to obtain inclinometer readings. This system includes a Digitilt DataMate II (P/N: 50310900, S/N: 1730028) readout computer for data collection, an attached Digitilt Classic Control cable (cable) and a Digitilt probe (probe). HMC has maintained use of a Digitilt Classic Inclinometer system since the first inclinometer readings and during all subsequent annual readings. Prior to 2017, an older-model Digitlt DataMate I was used as the readout device for annual readings. The switch to a Digitilt DataMate II was undertaken by HMC as a means of updating the readout system to be compatible with newer operating systems for data processing purposes.

A cable pulley system was used to lower and raise the inclinometer probe during readings of I98-1, I98-2 and I98-3 (Appendix D, Photo 06.) The pulley system rests on top of the inclinometer casing and is clamped to the top of the casing using two wingnuts (Appendix D, Photo 07). Limited spacing between the standpipe and the inclinometer casing interfered with tightening the wingnuts and fully fastening the pulley system to the top of the inclinometer casing (Appendix D, Photo 08). The wingnuts were hand tightened prior to placing the pulley system on top of the inclinometer casing. A quarter inch of potential movement is possible between readings if the pulley system is not well-seated on the casing during surveys.

The top of inclinometer casing was below the top of the standpipe for IN 1, IN2 and IN 3. This spacing did not allow for the use of the cable pulley system for lowering and raising the inclinometer. A cable-catch was made with the inclinometer casing cap (cap) from IN1 in place of the cable pulley system (Appendix D, Photo 09). Without the cable pulley system, the cable is shortened by one foot which makes the even-marked measurements along the cable offset by 1.25 feet (Appendix D, Photo 05). Cable measurements were adjusted by adding one foot to each indicated measurement to account for this change (i.e., a cable measurement of 110 feet corresponds to a depth of 111 feet from the top of casing). A hand saw and electric hand drill were used to cut a v-notch in the cap of IN1 to catch cable interval marks during retrieval of the inclinometer probe. Electric tape was used to keep the cap in place within the inclinometer casing during inclinometer surveys (Appendix D, Photo 10).

Azimuth values were carried over from previous surveys for I98-1, I98-2 and I98-3. Baseline azimuth readings for IN1, IN2 and IN3 were measured by BGC using a handheld compass and shooting bearings to the nearest four degrees. BGC field personnel marked the position of the A-axes on either side of the standpipe using a marker and electric tape. Bearings were shot outside of the magnetic influence of the steel standpipe to obtain consistent azimuth values. This was completed by standing several feet back from the standpipe prior to taking measurements.

3.0 DATA SUMMARY

3.1. Baseline Data

Inclinometers (I98-1, I98-2 and I98-3) had baseline and past data retained in an older model DataMate. The first baseline was established in 1998 following drilling and installation of the inclinometers. Subsequent baselines were re-established in 2003, 2006 and 2007 following data corruption. The current baseline date for I98-1 is August 8, 2007. The current baseline survey date for I98-2 and I98-3 is August 1, 2006 (Knight Piesold 2017). Depths defined by the provided baseline dataset matched the parameters verified by BGC during the initial site visit for I98-2 and I98-3. A depth discrepancy was observed in I98-1 between the baseline final hole depth of 150 feet and the BGC verified hole depth of 148 feet. Multiple measurements of I98-1 were completed with the cable and a weighted tape measure to confirm the discrepancy.

Inclinometers (IN1, IN2 and IN3) were installed between August 8, 2017 and August 15, 2017 before commencement of the Arcadis 2017 Pitch field-demonstration tests. The remediation injection program involved injecting water into the underground mine works from August 14, 2017 to September 26, 2017 (Chappell, D. and Gilbert, J. 2017). BGC used a tape measure, weighted tape and Suunto MC-2 handheld compass to measure the baseline inclinometer parameters for each inclinometer on August 22, 2017 (Table 3-1).

Table 3-1. Baseline inclinometer parameters.

Name	Depth Below ToC (ft)	Stickup Height (ft)	Final Hole Depth (ft)	Survey Start Depth (ft)	Survey End Depth (ft)	Cable Start Depth (ft)	Cable End Depth (ft)	Hole Depth Error (inches/ 100ft)	A_0 Azimuth (°)
I98-1	151.5	3.5	***148***	146.5	6.5	150	10	0.5	300
I98-2	259	3.0	256	253	1	256	4	0.8	315
I98-3	303	3.0	300	299	1	302	4	0.9	255
IN1	67	4.0	63	61	11	64	14	0.2	176
IN2	139	2.5	137.5	136.5	10.5	138	12	0.4	196
IN3	26	3.0	24	22	10	24	12	0.1	268

Notes:

Depth Below ToC is the depth below the top of casing. *Stickup Height* is defined as the distance between a capped casing and the top of an associated survey marker. *Final Hole Depth, Survey Start Depth* and *Survey End Depth* are measured in feet from ground surface. *Cable Start Depth* and *Cable End Depth* are the measurements on the cable observed at the beginning and end of each survey and do not reflect the actual depth below ground surface. *Hole Depth Error* is determined by the manufacturer using an error ratio of 0.3 inches/100 feet of hole depth. Error is rounded to the nearest 0.1 inches. *A_0 Azimuth* is defined as the direction of anticipated movement with respect to the A_0 groove.

3.2. 2017 Annual Inclinometer and Survey Monitoring Data

Inclinometer data for I98-1, I98-2 and I98-3 was collected on October 4 and October 5, 2017 using the DataMate II as a part of an annual monitoring cycle. Inclinometer data for IN1, IN2 and IN3 was collected on August 22-29, September 12-27, and October 3, 2017 as a part of a weekly

inspection cycle during the Arcadis 2017 Pitch field-demonstration tests. Inclinometer data was uploaded from the DataMate II to a laptop for processing and review. DigiPro 2 (v2.12.4) software was used to process and plot inclinometer data. Plotted inclinometer data was reviewed weekly for IN1, IN2 and IN3 to check for signs of movement in response to the Arcadis 2017 pitch field-demonstration tests.

Survey monitoring data was collected by North Star Surveying Inc. on July 21 and August 1, 2017 and September 21- October 6, 2017. The collected data included elevation and position data from survey monitoring points spread throughout the mine site. The survey monitoring points were shot from total station using the Pitch Mine grid and previously established control points. Survey monitoring points included the old and new inclinometers. Potential movement direction and magnitude were calculated by BGC by comparing the position and elevation data from the 2016 and September 21- October 6, 2017 surveys. Data was plotted on a base topographic map in the Pitch Mine grid with arrows indicating the direction and magnitude of potential movement (Drawing 02).

4.0 DATA VALIDATION

4.1. Checksums

Checksums are the sum of the zero and 180 degree readings for individual intervals. The zero and 180 degree readings are equal magnitude and opposite direction in an idealized survey, creating a zero checksum. The application of checksums compares a range of values to determine the validity of surveys. Large checksums are indicative of reading errors. Inclinometer reading error can come from several sources including debris caught in the inclinometer casing grooves, deformed casing segments and malfunctioning probe wheels and depth control accuracy (DGSI 2013).

4.2. Checksums Standard Deviation

Checksums standard deviation combines the checksums into a single value that defines the reading error for each axis (A-axis and B-axis) of an inclinometer. Subsequent standard deviations are compared to the baseline values taken during the inclinometer's baseline survey. Differences in A-axis standard deviation values are typically between three and five, and differences in B-axis deviation values are typically between seven and nine according to manufacturer specifications. These values can indicate potential error and have greater ranges when inclinometer installations are incorrectly installed, survey methodology is modified or the inclinometers are shallower in depth (DGSI 2013).

4.2.1. Baseline Standard Deviations

The baseline standard deviations for inclinometers I98-1, I98-2 and I98-3 were defined by the baseline inclinometer surveys from 2006 and 2007 (Table 4-1). The baseline standard deviation values observed in the older inclinometers indicate a deviation from manufacturer specification for I98-1 in the A-axis and B-axis and for I98-3 in the A-axis. The typical standard deviations for

inclinometers for IN1, IN2 and IN3 were defined by the first inclinometer surveys completed on August 22, 2017 (Table 4-1). The baseline standard deviation values for the newest inclinometers were at or below manufacturer-prescribed standard deviations for the A-axis and B-axis.

Table 4-1. Baseline mean and standard deviation.

Inclinometer #	Survey Date (MM/DD/YYYY)	A-axis Mean	Typical A-axis Std. Dev.	B-axis Mean	Typical B-axis Std. Dev.
I98-1	06/8/2007	-5.8	15.7	-13.0	15.3
I98-2	08/01/2006	-6.5	2.8	-3.9	5.1
I98-3	08/1/2006	-5.7	6.3	-7.6	8.6
IN1	08/22/2017	-0.7	3.0	6.4	3.9
IN2	08/22/2017	-7.0	1.6	9.8	4.7
IN3	08/22/2017	-3.6	1.6	10.7	3.6

Note:

Values in the table were taken from the "Validate Survey" function within DigiPro 2(v2.12.4) software. Baseline values for I98-1, I98-2 and I98-3 were established in 2006 and 2007 prior to BGC involvement at Pitch Mine. Baseline values for IN1, IN2 and IN3 were established during the first surveys completed by BGC at Pitch Mine.

4.2.2. 2017 Standard Deviations

The 2017 standard deviations for inclinometers I98-1, I98-2 and I98-3 were calculated after surveys were completed on October 4 and 5, 2017 (Table 4-2). The 2017 standard deviation values observed in the older inclinometers indicate a deviation from manufacturer specification for I98-3 in the B-axis. The 2017 standard deviations for inclinometers for IN1, IN2 and IN3 were calculated after the most recent inclinometer surveys were completed on October 3, 2017 (Table 4-2). The 2017 standard deviation values for the newest inclinometers were at or below manufacturer-prescribed standard deviations for the A-axis and B-axis.

Table 4-2. 2017 mean and standard deviation.

Inclinometer #	Survey Date	A-axis Mean	Typical A-axis Std. Dev.	B-axis Mean	Typical B-axis Std. Dev.
I98-1	10/4/2017	-6.8	5.2	5.6	9.0
I98-2	10/5/2017	-8.1	3.7	14.3	9.2
I98-3	10/5/2017	-6.9	3.0	18.3	10.7
IN1	10/3/2017	0.4	2.9	13.5	4.6
IN2	10/3/2017	-5.2	1.7	12.5	5.4
IN3	10/3/2017	-3.1	1.5	13.4	1.3

Note:

Values in the table were taken from the "Validate Survey" function within DigiPro 2(v2.12.4) software. Mean and standard deviation values in the table were taken from the most recent surveys for each inclinometer.

5.0 DATA CORRECTIONS

Potential sources of error associated with the Digitilt Classic System include limitations in the performance of equipment, anomalous installation characteristics, ground movement alterations to the installation characteristics, casing spiraling and varied measurement techniques (DGSI 2013). The combination of errors within datasets can alter associated data plots and create exaggerated displacements and false directions of movement (Appendix A).

5.1. Conventional Survey Methodology

The conventional alignment of inclinometer casing grooves and associated A-axes and B-axes is defined with respect to the anticipated direction of movement. The A_0 groove is conventionally defined as the anticipated downslope movement direction (DGSI 2013).

Conventional groove alignment was observed for the older and newer inclinometers; however, survey readings were obtained with an unconventional probe orientation in the older sets of inclinometers. The unconventional probe orientation manifests within inclinometer plots as flipped signage that creates plots that are opposite and equal in terms of displacement values (A_0 and B_0 values are negative). Unconventional probe orientation for surveys was maintained by BGC for the new and old inclinometers to reduce potential error generation in future surveys through a consistent survey methodology.

5.2. Depth Positioning and Measurement Technique Errors

Depth positioning and measurement technique errors occur from inconsistency in measurement technique and casing shortening (Mikkelson 2003). Depth positioning and measurement technique errors occur when readings are not taken at the same depth as the baseline survey, or the probe is not allowed sufficient time to equilibrate at each reading location. Data sets taken from incorrectly obtained surveys can be visually identified in inclinometer plots and either removed or taken into consideration (Choi and Stark 2008).

Depth positioning and measurement technique errors were identified and removed from I98-2 and I98-3 (Appendix B). Several datasets had survey end depths that did not match with baseline survey end depths in previous and the 2017 inclinometer monitoring cycle. Inclinometer plots indicated incorrect alignment of the probe (redundant measurement of the same axes).

Depths displayed on the inclinometer plots for I98-1, I98-2 and I98-3 represent cable measurements and not depths below ground surface. Stickup height must be subtracted from a given inclinometer plot depth to obtain a measurement referenced from ground surface. Depths displayed on the inclinometer plots for IN1, IN2 and IN3 represent depths referenced from ground surface. A modified stickup is subtracted from a given cable measurement to obtain a depth below ground surface. The modified stickup is one foot less that the stickup height to account for an additional foot from measuring from the top of casing, and not from the top of the traditional cable pulley system.

5.3. Unimplemented Corrections

Bias-shift error is a systematic error that creates a re-occurring non-real shift in inclinometer plots (DGSI 2013). Inclinometers are theoretically installed in stable ground beneath suspected movement zones. This installation protocol is based on borehole log assessments and creates a fixed base. Subsequent surveys generate a near-vertical plot in the lower portions of the inclinometer plots (Choi and Stark 2008). Bias-shift error is the most common error and is identifiable in the deepest portions of the inclinometer plots where deviations from verticality and error-generating phenomena such as insufficient probe warm-up are most likely to occur (Mikkelson 2003).

Bias-shift error was identified as a potential component in I98-1 inclinometer plots. The A-axis of I98-1 indicated the greatest potential for a bias-shift error with a drift in verticality observed in the lower portions of the graph. The B-axis of I98-1 did not indicate a potential bias-shift error. Shifts in the inclinometer plots are potentially associated with ground movement in the lower portions of the inclinometer. Borehole logs for the lower portions of the inclinometer casing are required to confirm the presence of potential ground movement and validate the use of bias-shift corrections.

Rotation error is generated by the combination of inclinometer casing inclination and sensor axis alignment shift (Mikkelson 2003). Rotation errors can also occur when a different probe is used to take measurements and can be identified graphically by comparing A-axis and B-axis inclinometer profile plots. A resemblance in graph shape and corresponding inclinometer casing profile indicates a reduction in rotation error prevalence. A difference in graph shape indicates rotation error may be prevalent (Choi and Stark 2008). No rotation error was suspected in the inclinometer plots. Graph shapes were similar in shape between the A-axis and B-axis and no new inclinometer probe was introduced into the survey record.

6.0 DATA ANALYSIS

6.1. 2017 Ground Movement

Inclinometers I98-1 and I98-2 indicated movement for the 2017 inclinometer monitoring cycle. Data from inclinometer I98-3 did not indicate movement for the 2017 inclinometer monitoring cycle. Surficial survey monitoring data for I98-3 indicates movement in the opposite direction of anticipated movement (Drawing 02). This data is suspected of reading error and was not taken into consideration for ground movement. Inclinometers IN1, IN2 and IN3 did not indicate movement during and after the Arcadis 2017 Pitch field-demonstration tests.

6.2. Ground Movement Trends

Inclinometer plots indicate that the ground movement trends observed in previous years for I98-1 and I98-2 are continuing. Three potential zones of ground movement and associated depths were identified in the inclinometer plots (Appendix B). Depths on either side of the ground movement zones were used to calculate annual ground movement rates and directions of ground movement (Appendix C).

6.2.1. Inclinometer I98-1

The two deepest ground movement zones in I98-1 are positioned at 50 (46.5) feet and 74 (70.5) feet and are moving at similar rates (Table 6-1). The ground movement rates increased from 0.01 and 0.04 inches per year, respectively, in the 2016 monitoring cycle to 0.06 inches per year, in the 2017 monitoring cycle. The shallowest ground movement zone at 20 (16.5) feet indicates an increase from the 2016 inspection cycle of 0.06 inches per year to 0.16 inches per year for the 2017 monitoring cycle. This rate of change represents the largest zone of movement in the 2017 monitoring cycle.

Ground movement trends within I98-1 indicate slope creep is the primary form of ground movement. The potential discrete movement observed at 20 (16.5) feet is limited by the calculated error associated with the inclinometer. Survey monitoring data supports slope creep on a limited scale. The movement from the I98-1 survey monitoring point indicates movement in the general direction of anticipated movement at a magnitude below calculated survey measurement error (Drawing 02).

Table 6-1. I98-1 ground movement trends.

Zone (ft)	Depth of Ground Movement (ft)	A_0 Azimuth (°)	Alpha Angle (°)	Movement Azimuth (°)	2014-2015 Ground Movement (inches)	2015-2016 Ground Movement (inches)	2016-2017 Ground Movement (inches)
10 (*6.5)	-	300	12	312	-	-	-
20 (*16.5)	18-26 (*14.5-22.5)	300	14	314	0.72	0.78	0.94
50 (*46.5)	46-54 (*42.5-50.5)	300	18	318	0.26	0.27	0.33
74 (*70.5)	72-86 (*68.5-82.5)	300	20	320	0.26	0.30	0.36

Note:

The *TOP* zone of movement is the uppermost inclinometer measurement and is applied as the ground surface measurement for comparison to survey monitoring point data. *Depth of Ground Movement* data includes uncorrected inclinometer plot values corresponding to cable measurements and corrected depth values below ground surface (*#). A depth below ground surface can be calculated by subtracting the associated stick-up heights from the inclinometer plot depths which is 3.5 feet for Inclinometer I98-1.

6.2.2. Inclinometer I98-2

The two deepest ground movement zones in I98-2 are positioned at 125 (122) feet and 215 (213) feet and are moving at similar rates (Table 6-2). The ground movement rates increased from 0.00 and 0.02 inches per year, respectively, in the 2016 monitoring cycle to 0.03 inches per year, in the 2017 monitoring cycle. The shallowest ground movement zone at 20 (17) feet indicates an increase from the 2016 inspection cycle of 0.02 inches per year to 0.05 inches per year for the 2017 monitoring cycle.

Ground movement trends within I98-2 indicate a lower propensity for discrete shear plane movement than inclinometer I98-1. Slope creep is the primary form of ground movement indicated

by the slope inclinometer data. Survey monitoring point data supports slope creep on a limited scale. The movement from the I98-2 survey monitoring point indicates movement in the general direction of anticipated movement at a magnitude below calculated survey measurement error (Drawing 02). Movement within the shallowest ground movement zone is in an uphill orientation contrary to the anticipated direction of movement. This orientation indicates potential error generated phenomena.

Table 6-2. I98-2 ground movement trends.

Zone (#)	Depth of Ground Movement (ft)	A_0 Azimuth (°)	Alpha Angle (°)	Movement Azimuth (°)	2014-2015 Ground Movement (inches)	2015-2016 Ground Movement (inches)	2016-2017 Ground Movement (inches)
4 (*1)	-	315	-21	294	-	-	-
20 (*17)	16-26 (*13-23)	315	-20	295	-0.25	-0.27	-0.32
125 (*122)	120-130 (*117-127)	315	-29	286	0.11	0.11	0.14
215 (*212)	210-220 (*207-217)	315	-31	284	0.15	0.17	0.20

Note:

The *TOP* zone of movement is the uppermost inclinometer measurement and is applied as the ground surface measurement for comparison to survey monitoring point data. *Depth of Ground Movement* data includes uncorrected inclinometer plot values corresponding to cable measurements and corrected depth values below ground surface (*#). A depth below ground surface can be calculated by subtracting the associated stick-up heights from the inclinometer plot depths which is 3.0 feet for Inclinometer I98-2.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Inclinometers IN1, IN2 and IN3 did not indicate movement during and after the Arcadis 2017 Pitch field-demonstration tests. Inclinometers I98-1, I98-2 and I98-3 indicate continuing ground movement trends consistent with previous monitoring cycles.

BGC recommends continued monitoring of inclinometers I98-1, I98-2, I98-3, IN1, IN2 and IN3 on an annual basis. Annual inclinometer surveys should be collected within the same month each subsequent year using the field methods established in the 2017 annual inclinometer monitoring cycle. Non-routine inclinometer surveys should be considered for inclinometers when conditions of heightened potential for ground movement occur. The decision to perform non-routine inclinometer surveys should be made through cooperative review of site conditions by HMC and BGC. Conditions for non-routine inclinometer surveys may include pump tests, ground disturbance and anomalous rainfall events.

Inclinometer borehole logs can be obtained from installation reports for the two sets of inclinometers from 1998 and 2017. Inclinometer surveys in subsequent years should be compared with inclinometer borehole logs to identify potential discrete geologic structures and geologic material types that may be contributing to or influencing ground movements. Strain rates associated with geologic material types should be considered during subsequent reviews of inclinometer data.

8.0 CLOSURE

We trust the above satisfies your requirements at this time. Should you have any questions or comments, please do not hesitate to contact us.

Yours sincerely,

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per:

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MH/TM/wn/mm

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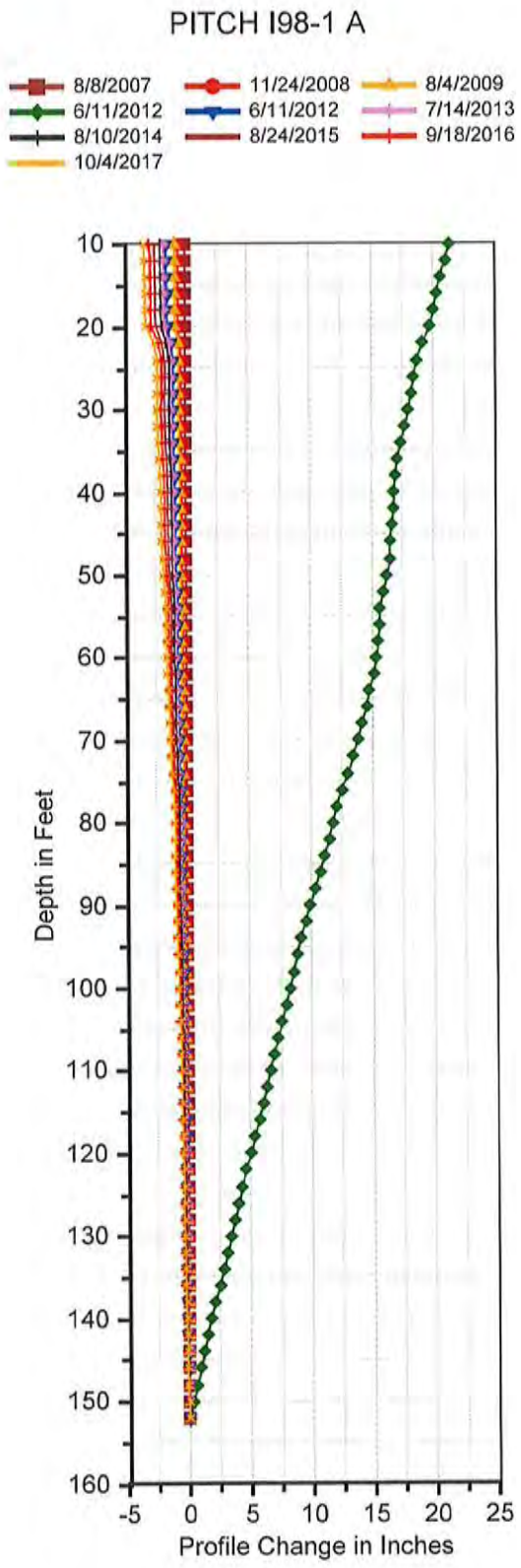
APPENDIX A
INCLINOMETERS – UNCORRECTED DATA PLOTS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8/4/2009
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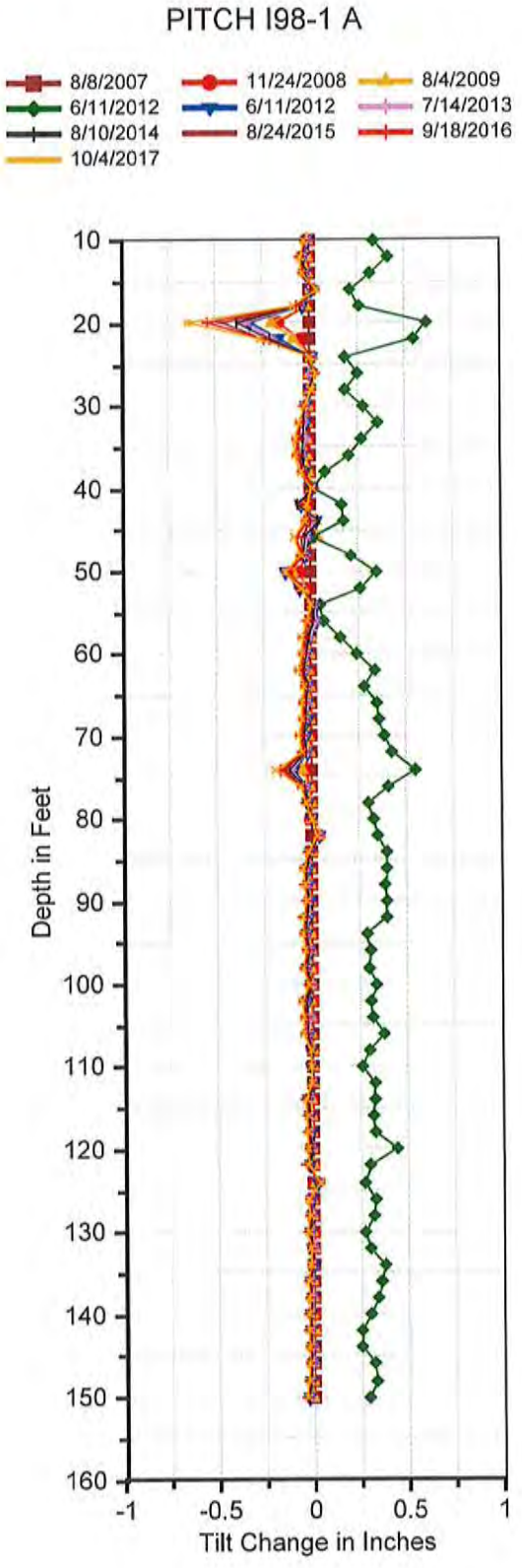
8/10/2014
8/24/2015
9/18/2016
10/4/2017
Depth in Feet
Profile Change in Inches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9/18/2016
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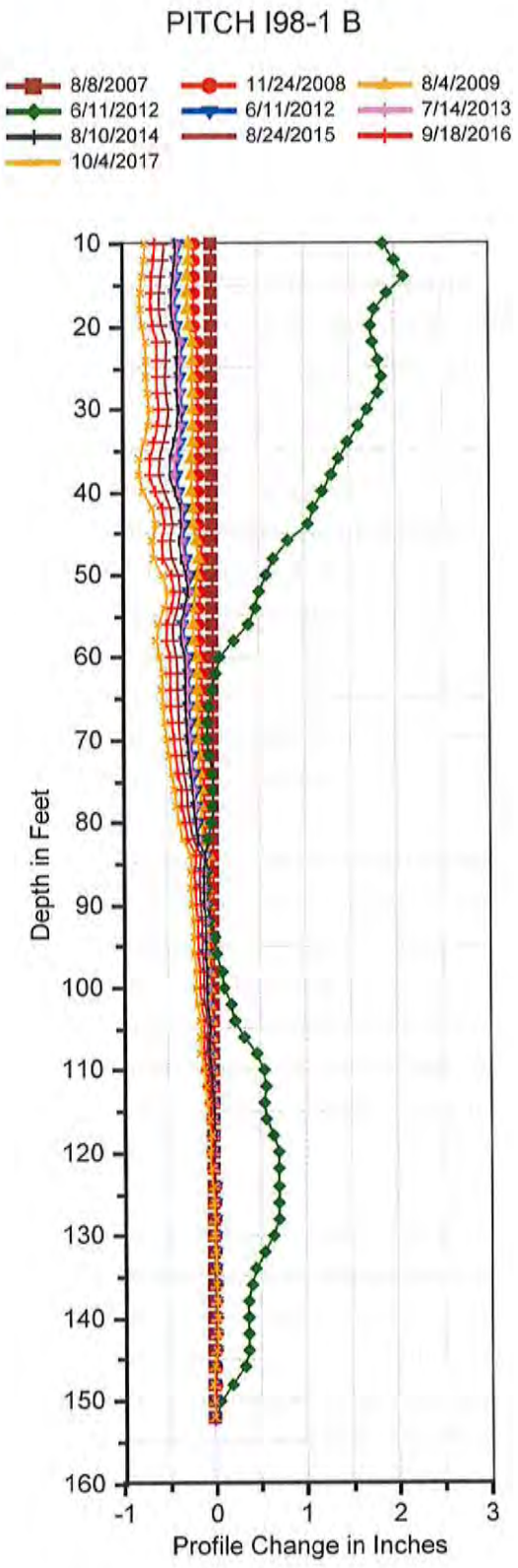
Depth in Feet
Tilt Change in Inches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10/4/2017
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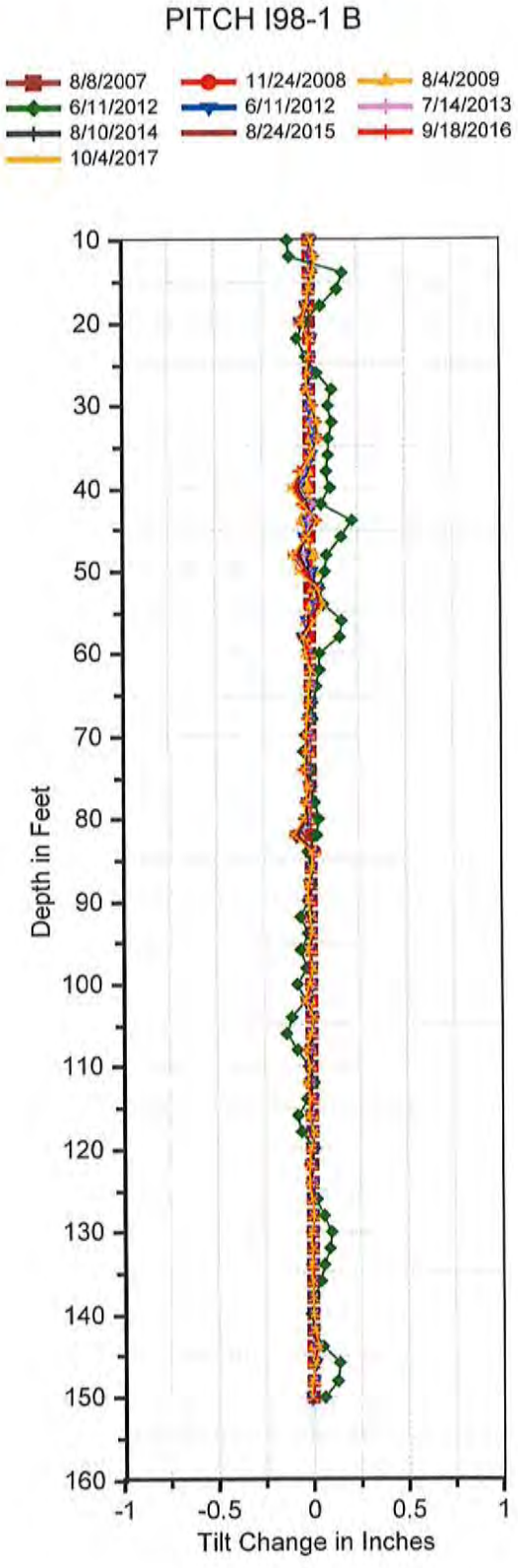
Profile Change in Inches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9/18/2016
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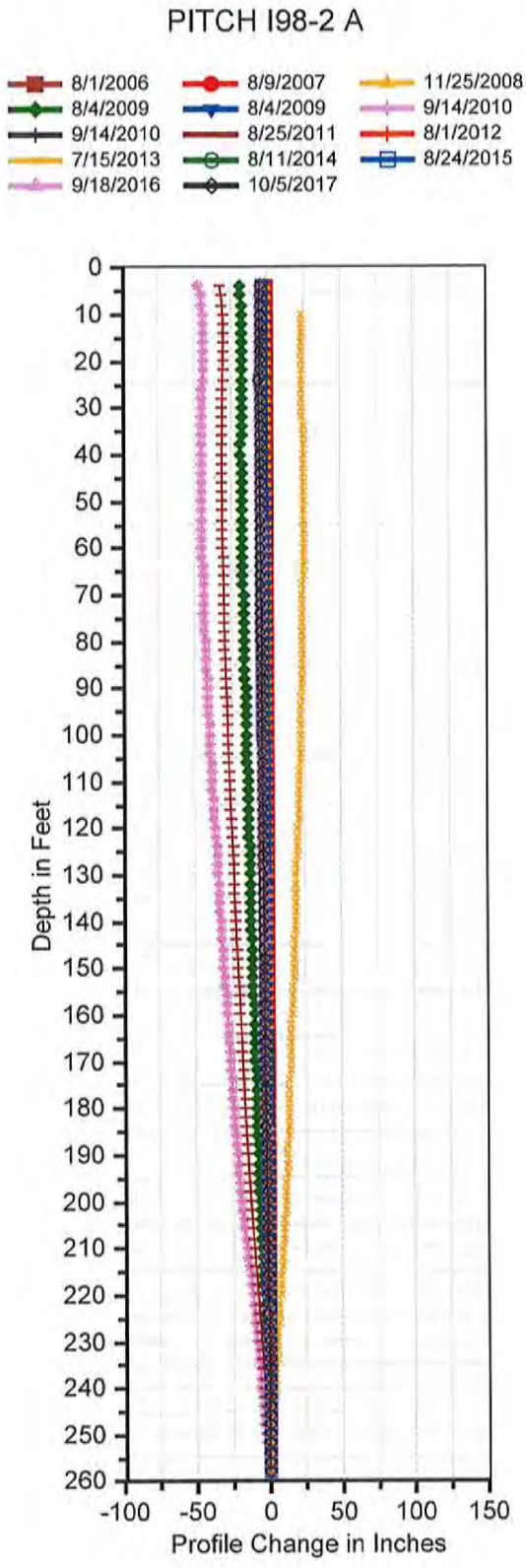
Tilt Change in Inches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8/24/2015
9/18/2016
10/5/2017
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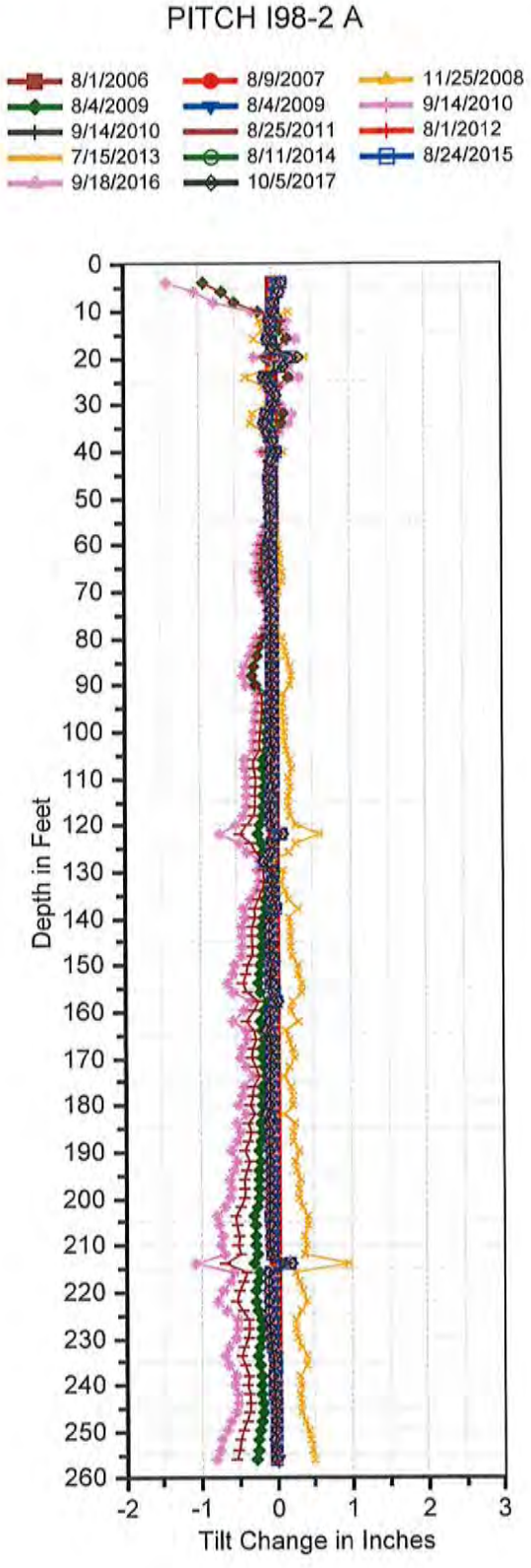
Profile Change in Inches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8/11/2014
8/24/2015
9/18/2016
10/5/2017
Depth in Feet
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120
130
140
150
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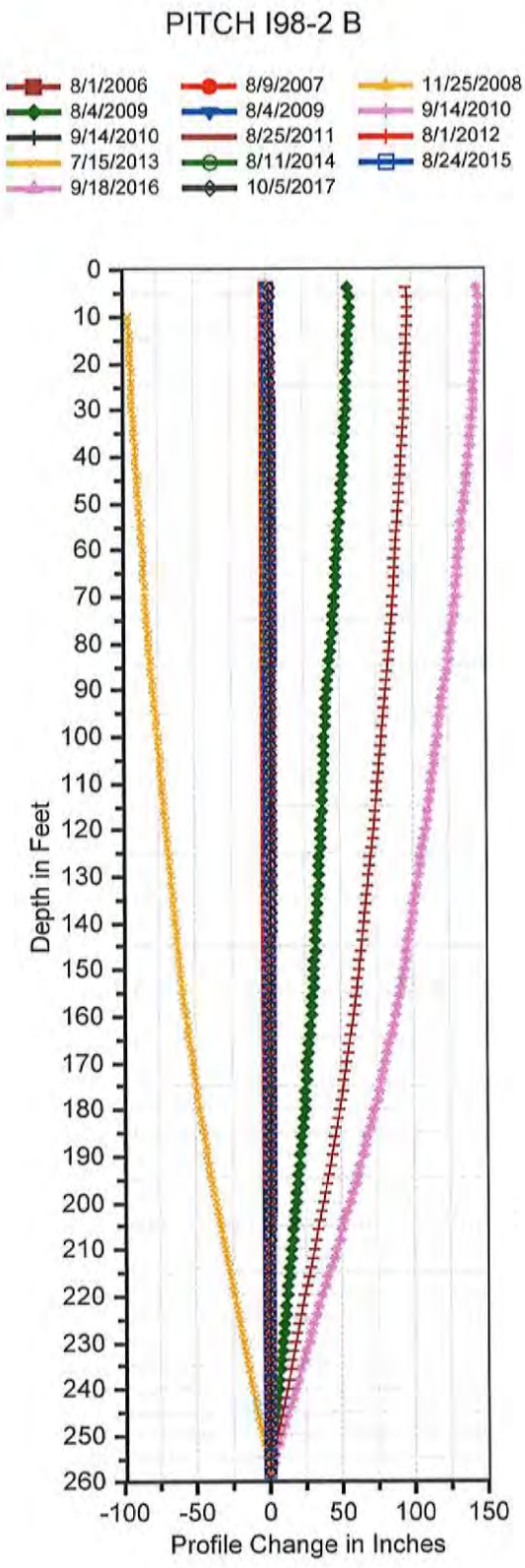
Tilt Change in Inches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8/1/2012
7/15/2013
8/11/2014
8/24/2015
9/18/2016
10/5/2017
Depth in Feet
0
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20
30
40
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90
100
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150
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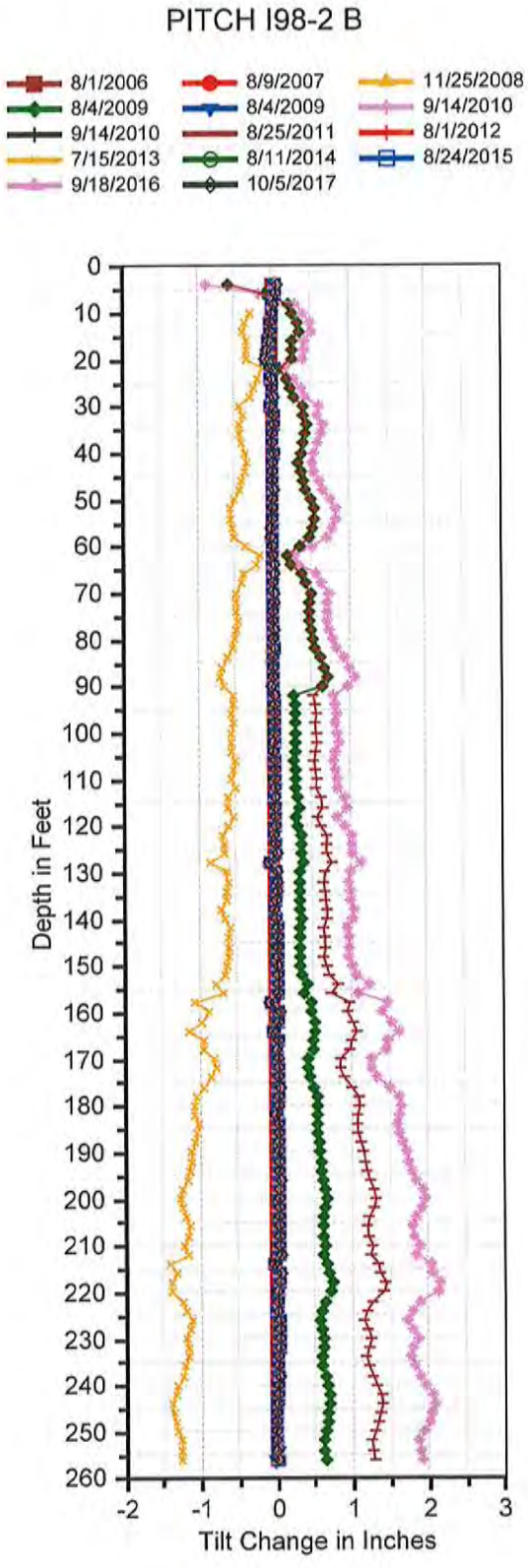
Profile Change in Inches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8/1/2006
8/9/2007
11/25/2008
8/4/2009
8/4/2009
9/14/2010
9/14/2010
8/25/2011
8/1/2012
7/15/2013
8/11/2014
8/24/2015
9/18/2016
10/5/2017
Depth in Feet
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20
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90
100
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120
130
140
150
160
170
180
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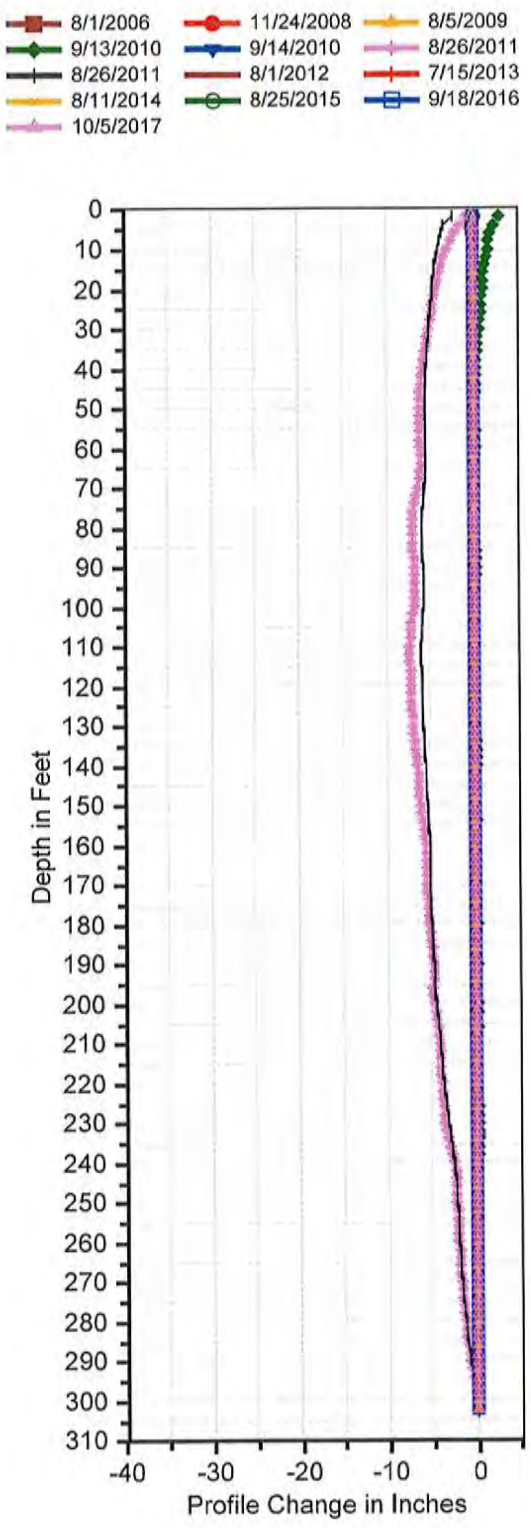
2
3
Tilt Change in Inches

PITCH I98-3 A



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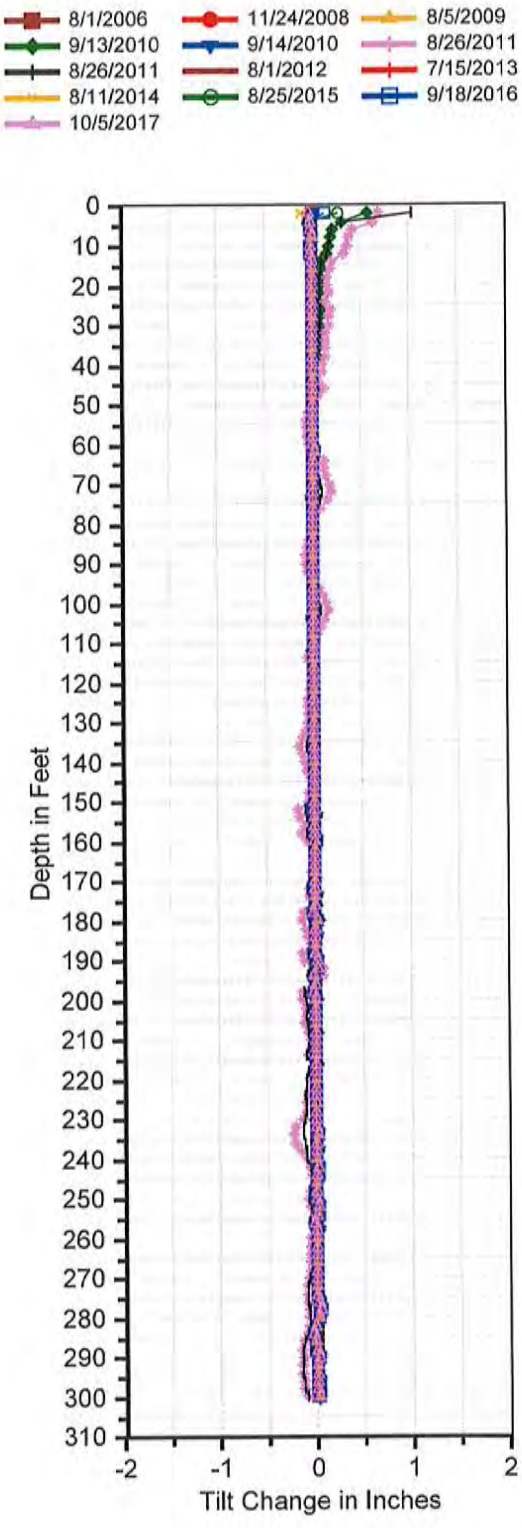

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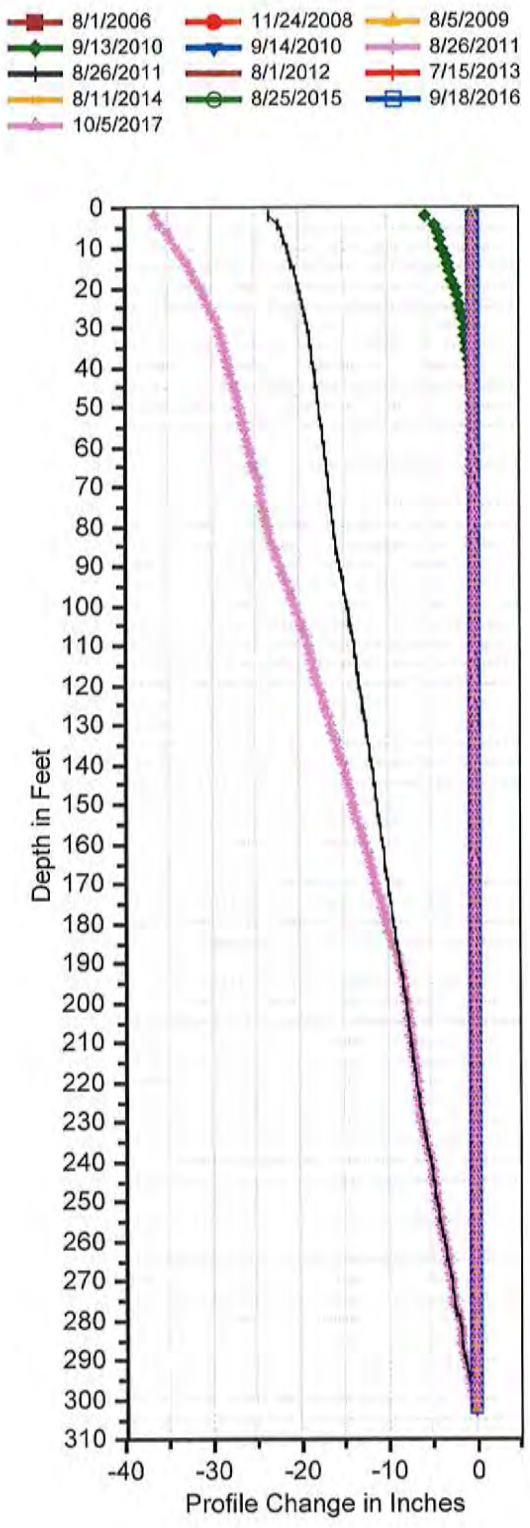

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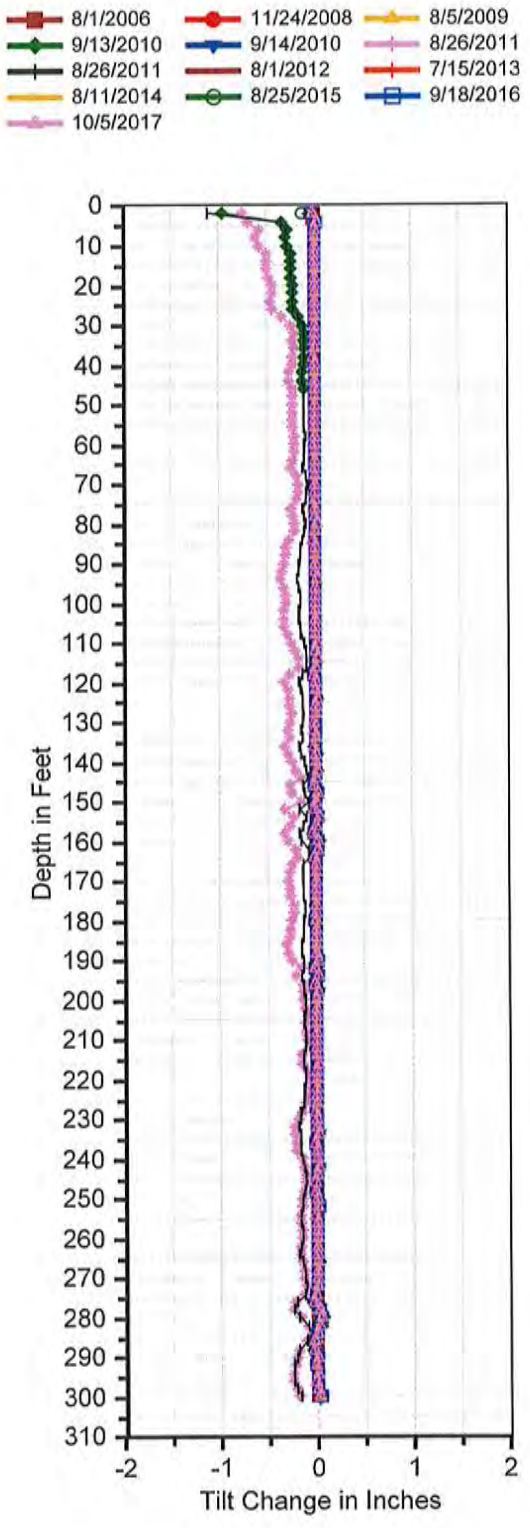
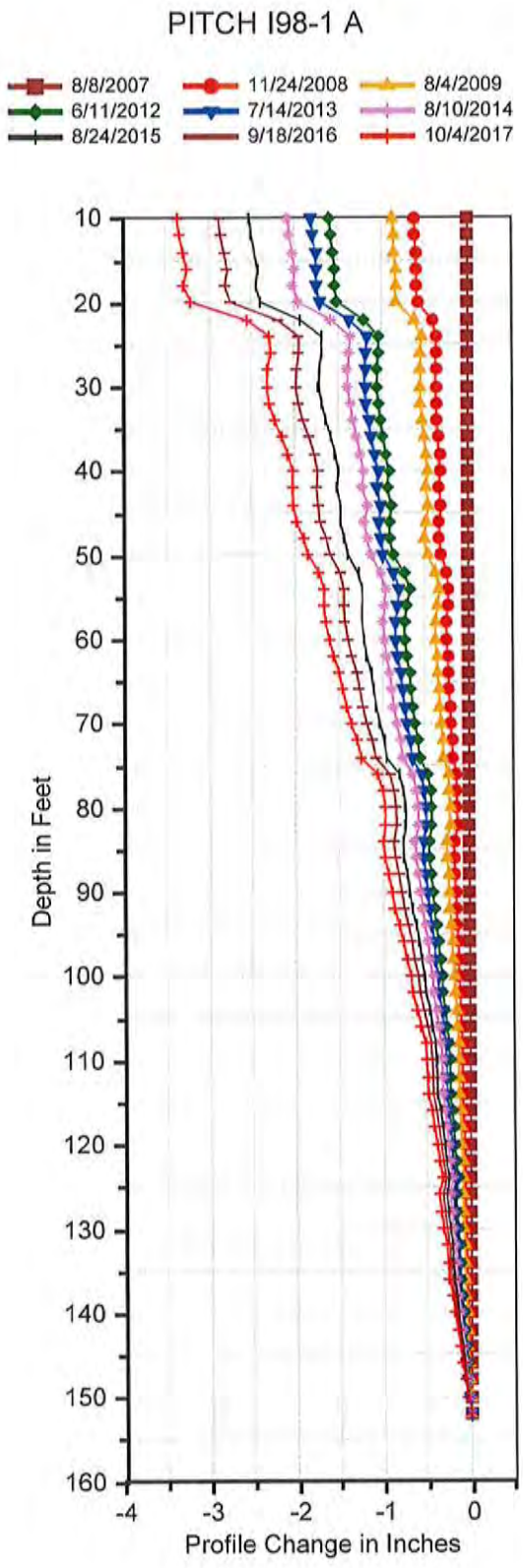


APPENDIX B
INCLINOMETERS - CORRECTED DATA PLOTS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6/11/2012
7/14/2013
8/10/2014
8/24/2015
9/18/2016
10/4/2017
Depth in Feet
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-1
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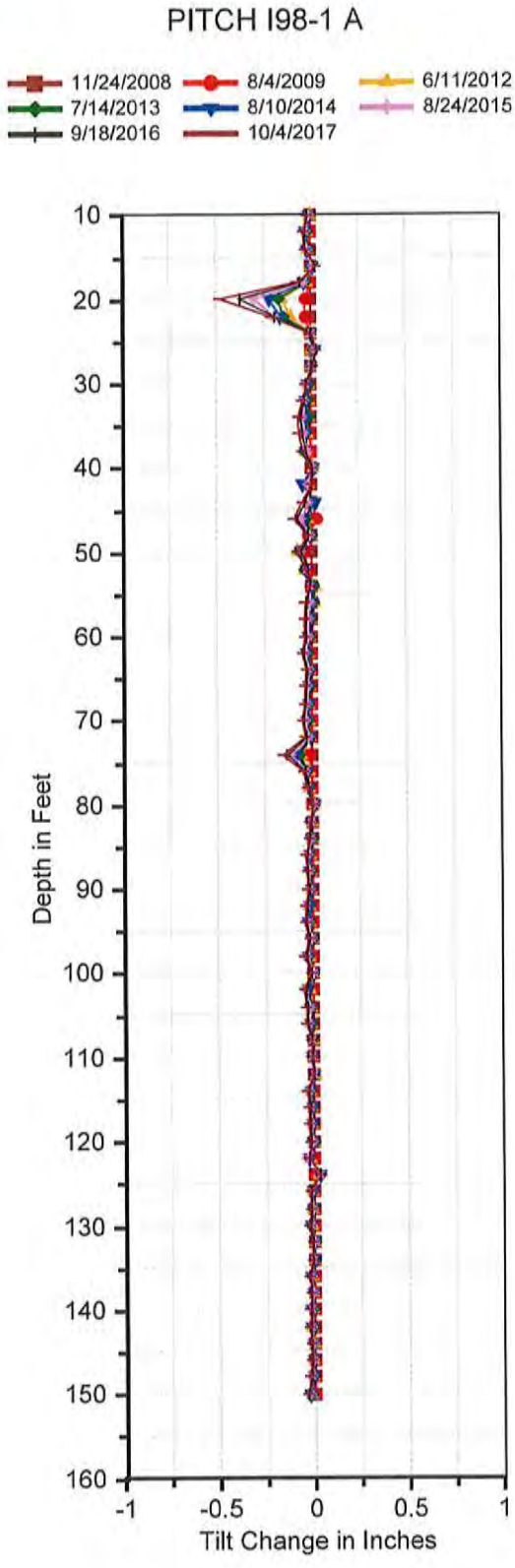
PITCH I98-1 A
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6/11/2012
7/14/2013
8/10/2014
8/24/2015
9/18/2016
10/4/2017
Depth in Feet
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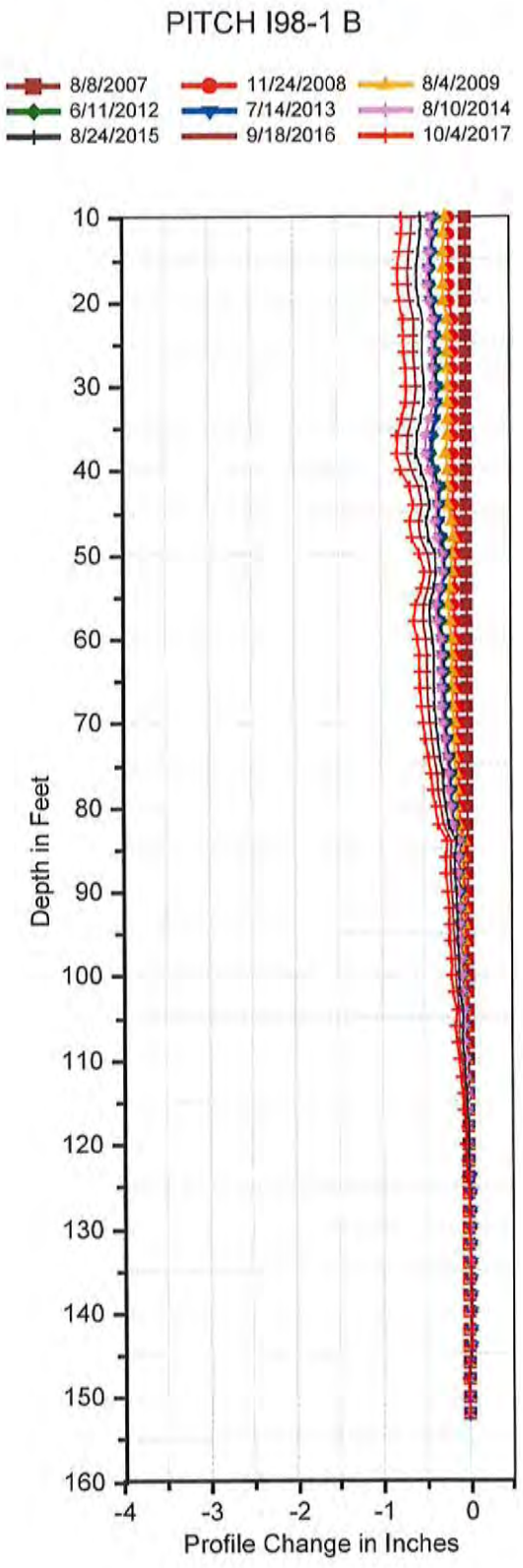
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8/24/2015
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10/4/2017
Depth in Feet
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-1
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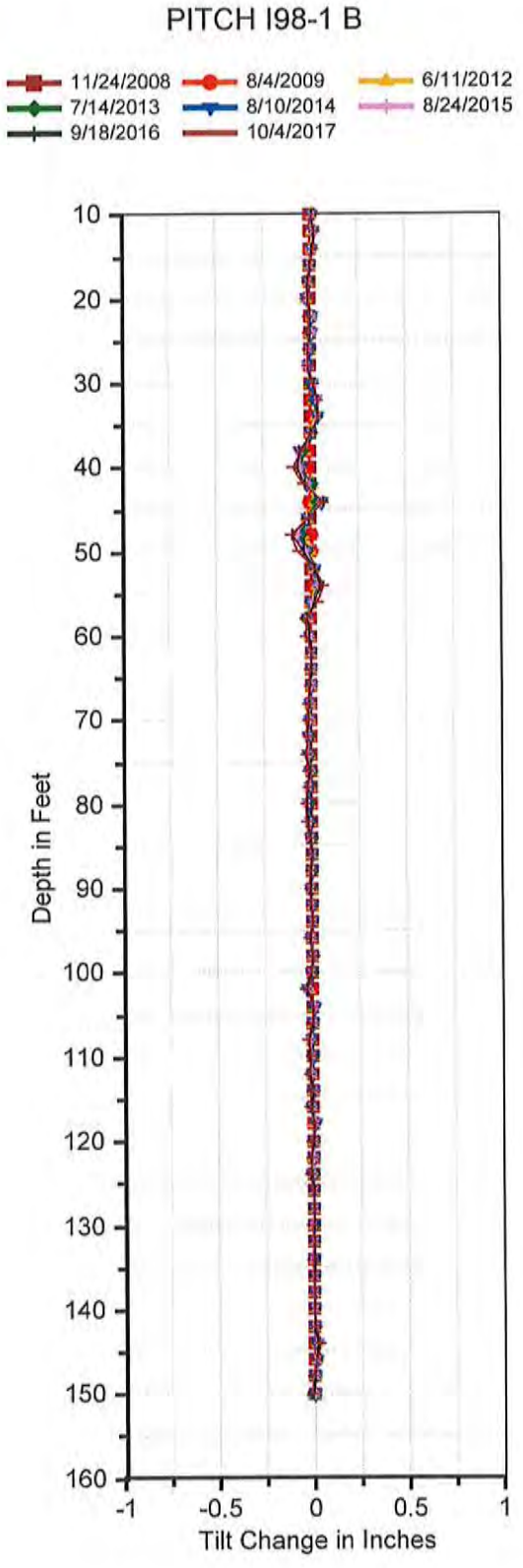
Profile Change in Inches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11/24/2008
8/4/2009
6/11/2012
7/14/2013
8/10/2014
8/24/2015
9/18/2016
10/4/2017
Depth in Feet
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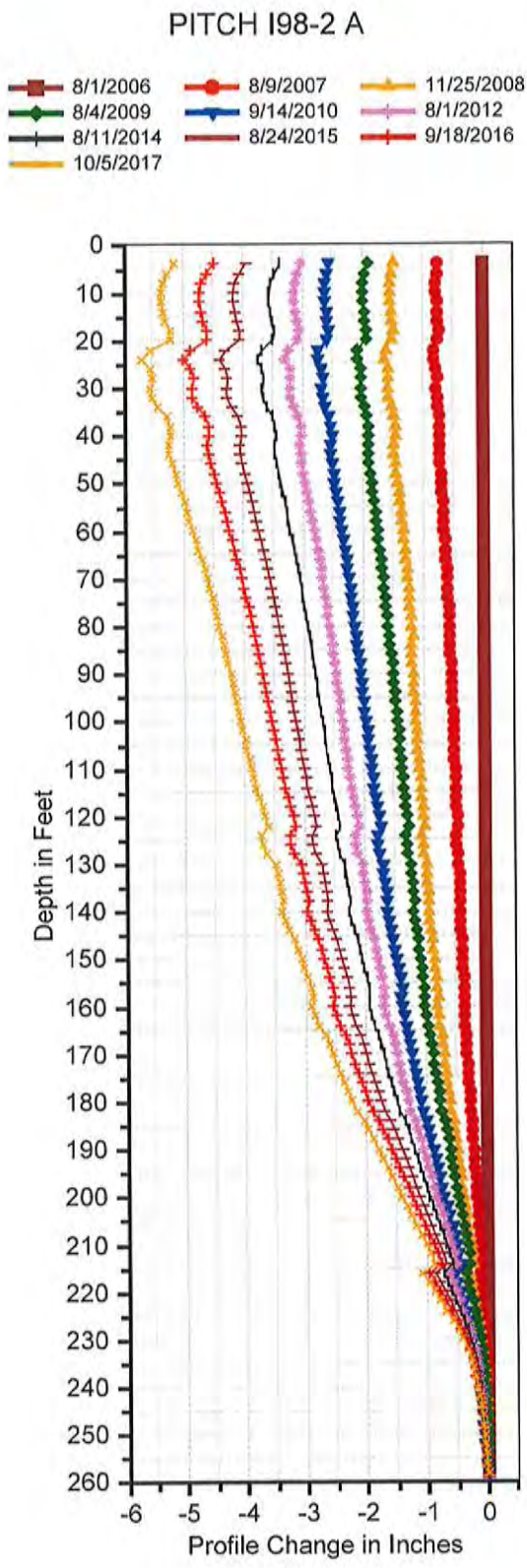
Tilt Change in Inches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8/4/2009
8/11/2014
10/5/2017
8/9/2007
9/14/2010
8/24/2015
11/25/2008
8/1/2012
9/18/2016
Depth in Feet
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260
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-4
-3
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-1
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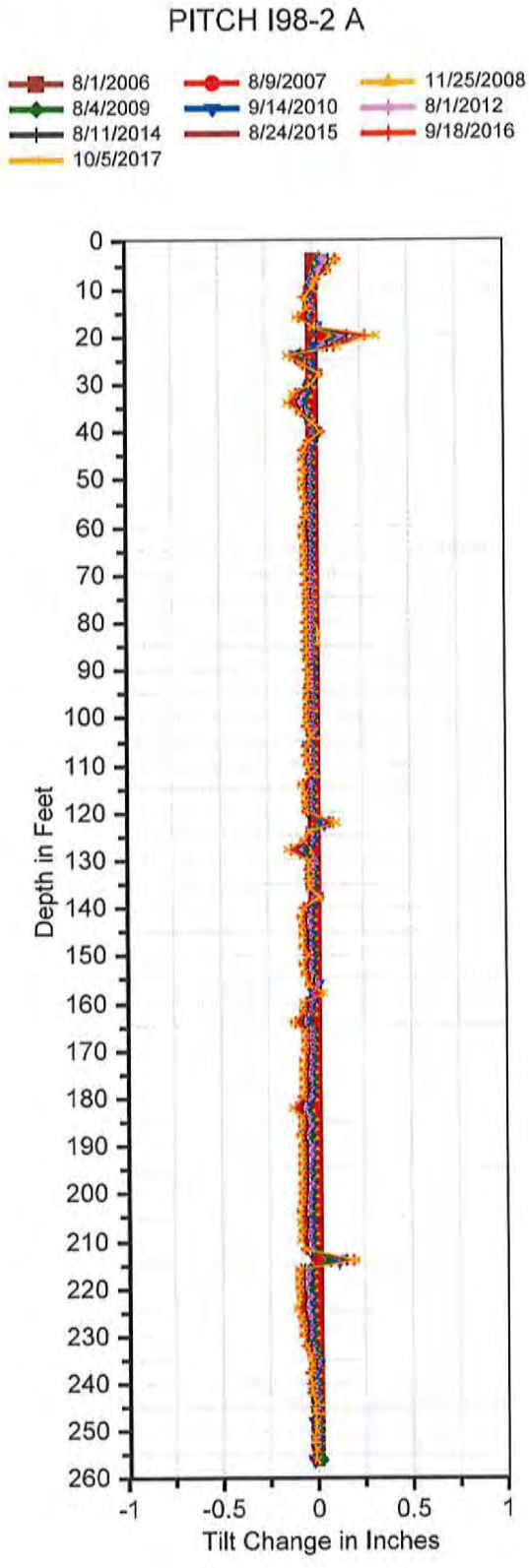
Profile Change in Inches


PITCH I98-2 A
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8/4/2009
8/11/2014
10/5/2017
8/9/2007
9/14/2010
8/24/2015
11/25/2008
8/1/2012
9/18/2016
Depth in Feet
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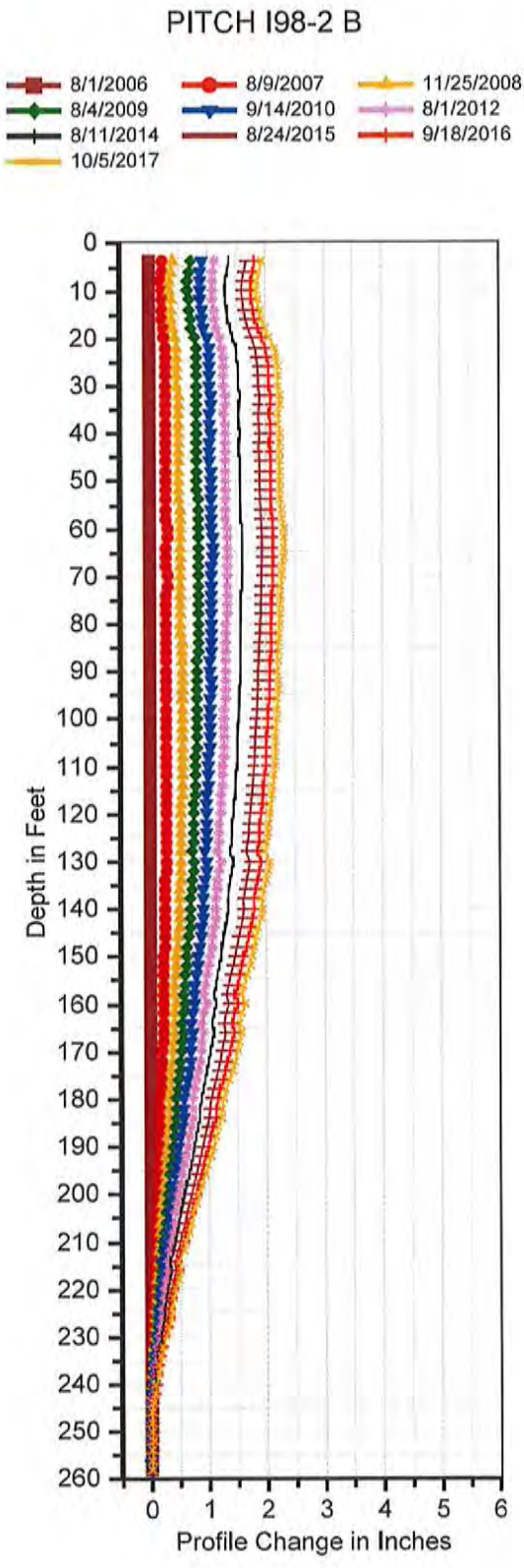
Tilt Change in Inches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8/9/2007
11/25/2008
8/4/2009
9/14/2010
8/1/2012
8/11/2014
8/24/2015
9/18/2016
10/5/2017
Depth in Feet
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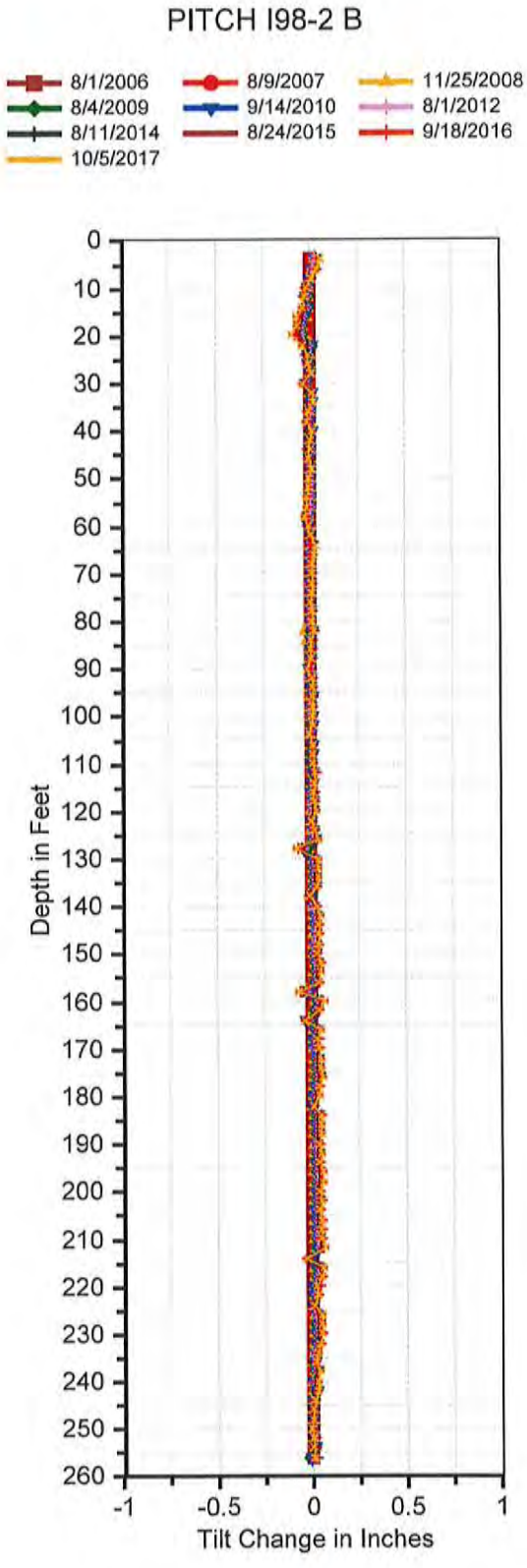
Profile Change in Inches


PITCH I98-2 B
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8/9/2007
11/25/2008
8/4/2009
9/14/2010
8/1/2012
8/11/2014
8/24/2015
9/18/2016
10/5/2017
Depth in Feet
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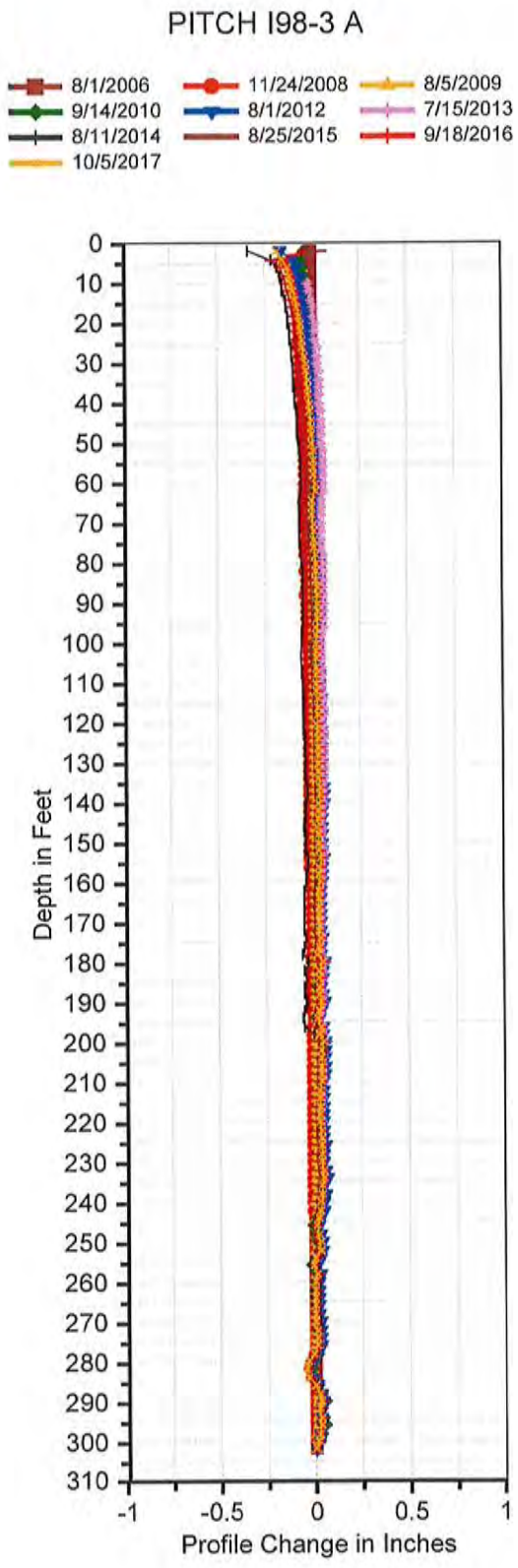
Tilt Change in Inches


PITCH I98-3 A
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9/14/2010
8/11/2014
10/5/2017
11/24/2008
8/1/2012
8/25/2015
8/5/2009
7/15/2013
9/18/2016
Depth in Feet
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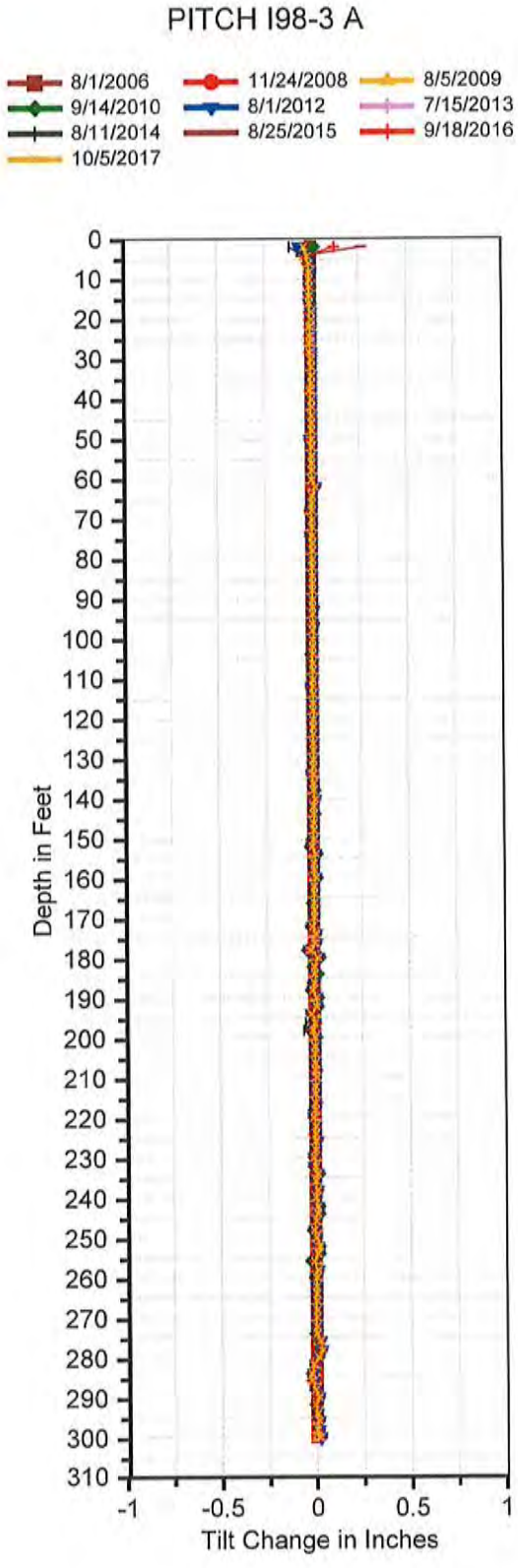
Profile Change in Inches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8/11/2014
10/5/2017
11/24/2008
8/1/2012
8/25/2015
8/5/2009
7/15/2013
9/18/2016
Depth in Feet
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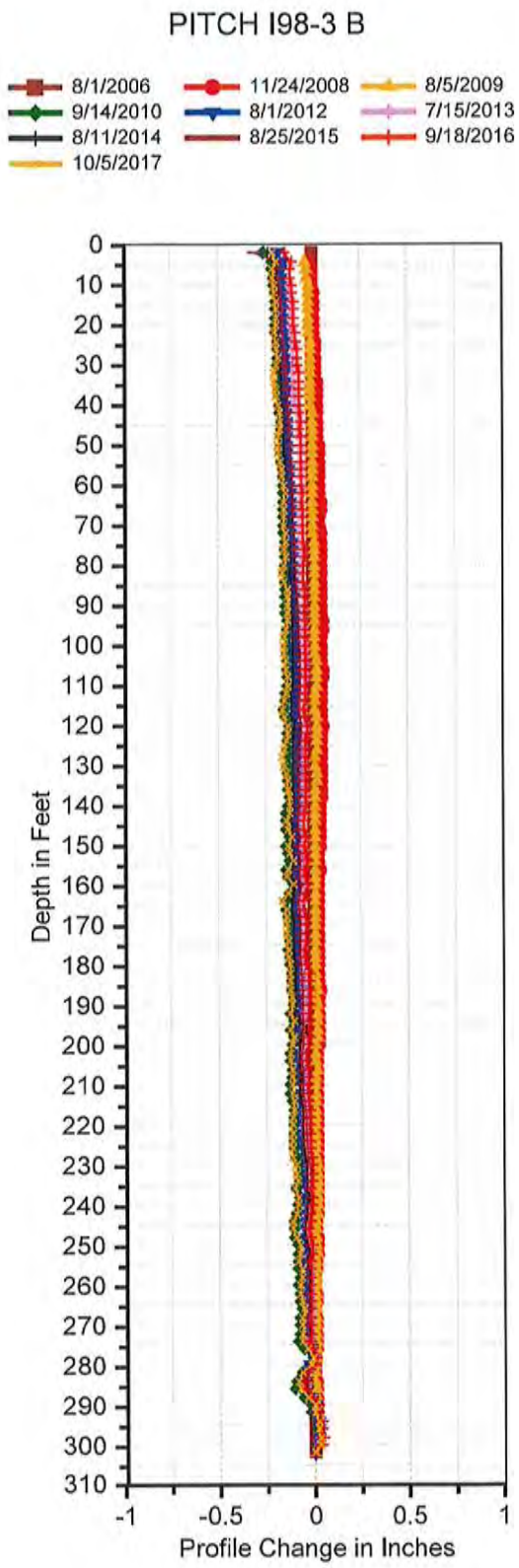
Tilt Change in Inches


PITCH I98-3 B
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11/24/2008
8/5/2009
9/14/2010
8/1/2012
7/15/2013
8/11/2014
8/25/2015
9/18/2016
10/5/2017
Depth in Feet
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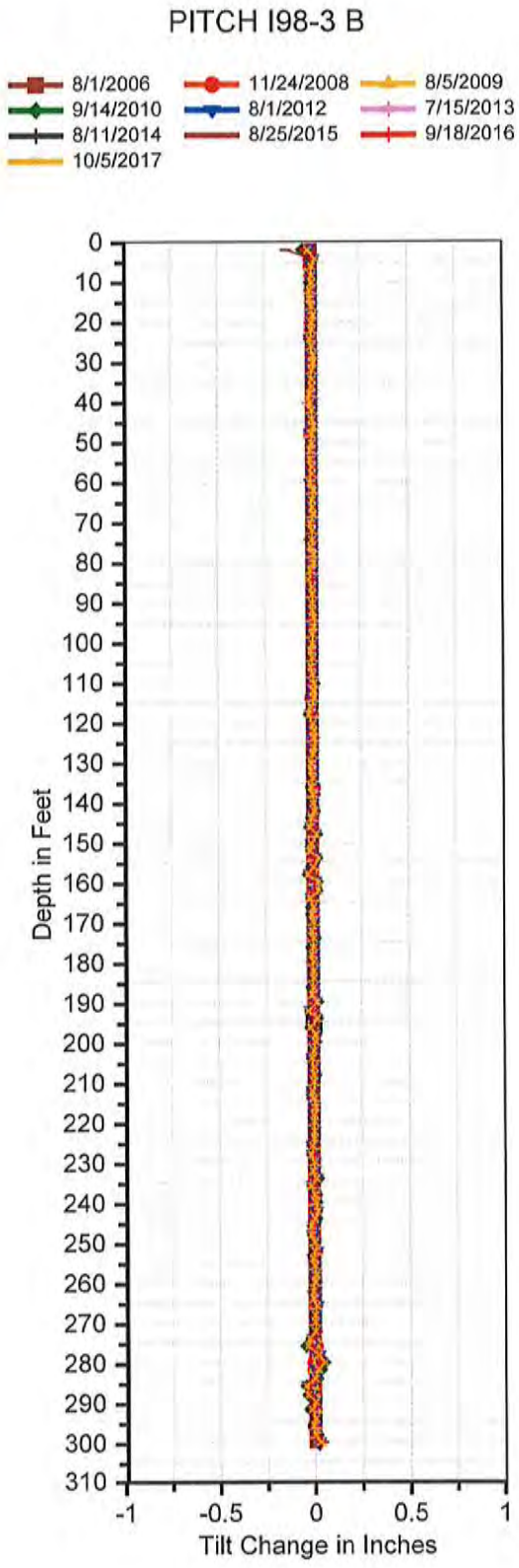
Profile Change in Inches


PITCH I98-3 B
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9/14/2010
8/1/2012
7/15/2013
8/11/2014
8/25/2015
9/18/2016
10/5/2017
Depth in Feet
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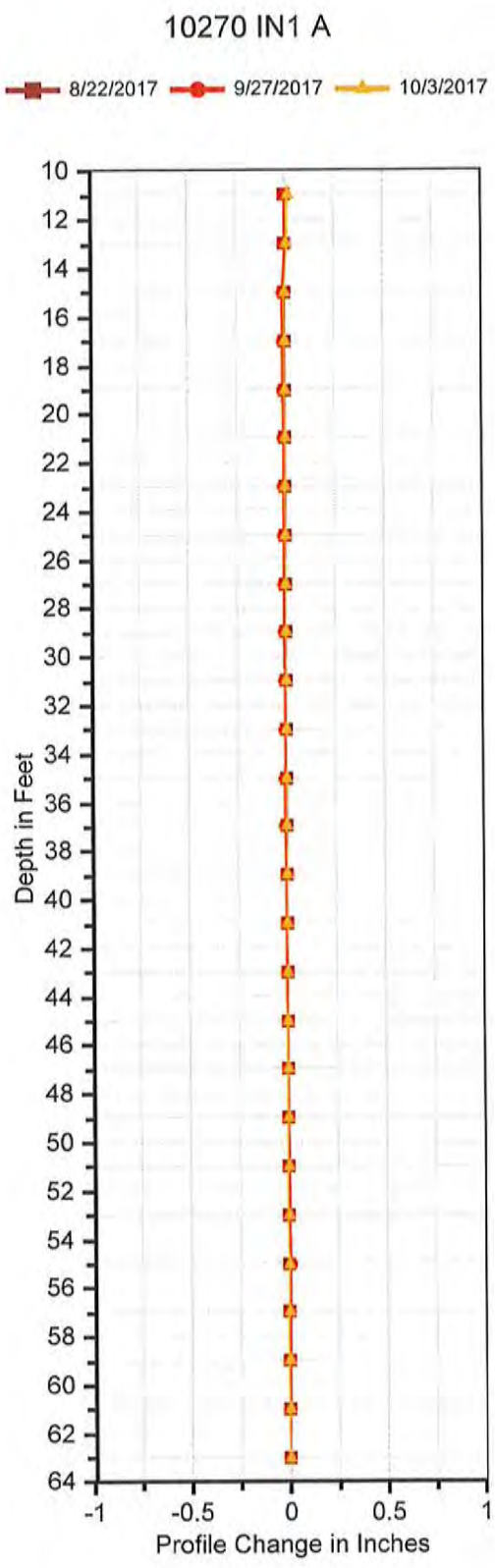
1
Tilt Change in Inches


10270 IN1 A
8/22/2017
9/27/2017
10/3/2017
Depth in Feet
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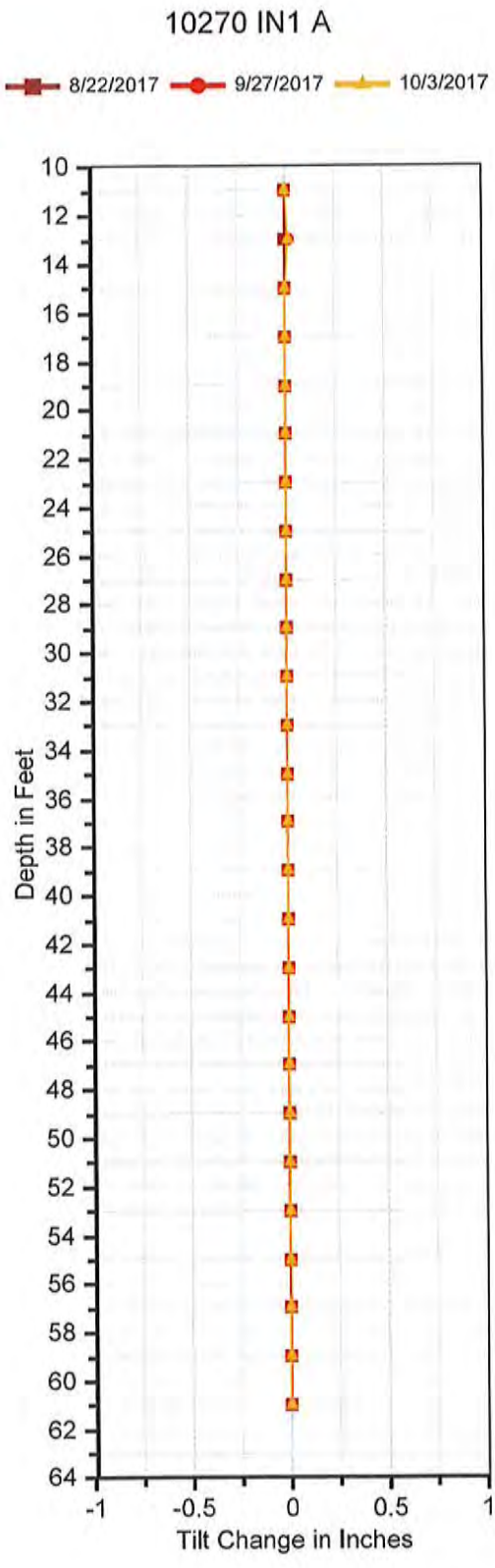
1
Profile Change in Inches


10270 IN1 A
8/22/2017
9/27/2017
10/3/2017
Depth in Feet
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22
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42
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54
56
58
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64
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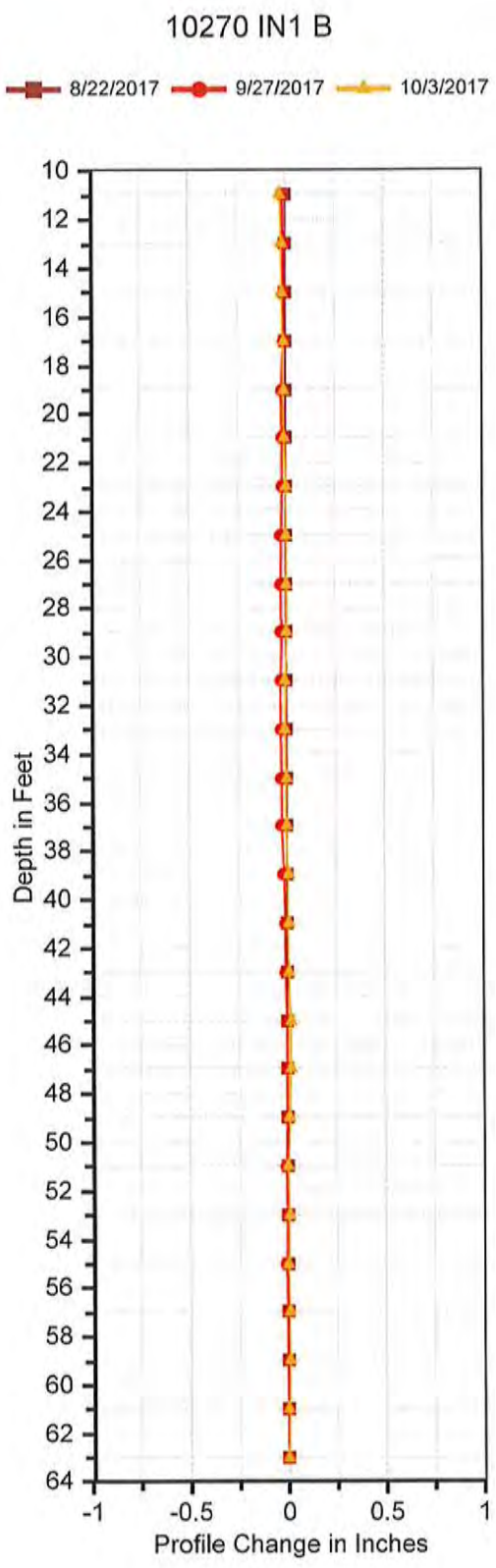
1
Tilt Change in Inches


10270 IN1 B
8/22/2017
9/27/2017
10/3/2017
Depth in Feet
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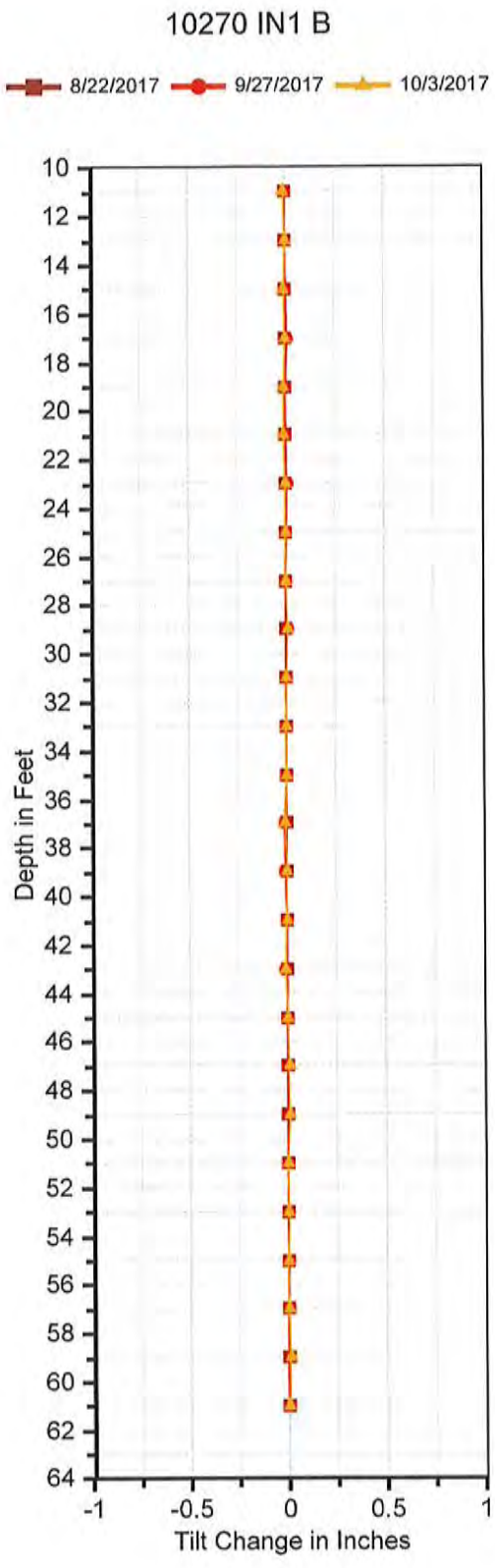
Profile Change in Inches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8/22/2017
9/27/2017
10/3/2017
Depth in Feet
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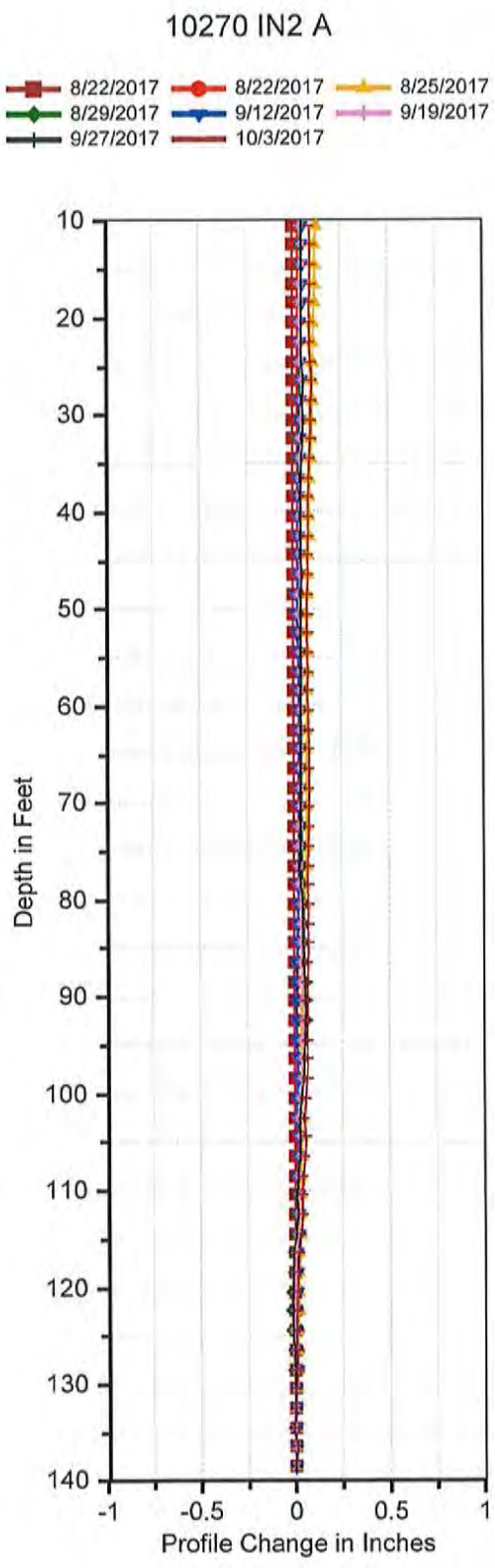
1
Tilt Change in Inches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8/22/2017
8/22/2017
8/25/2017
8/29/2017
9/12/2017
9/19/2017
9/27/2017
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Depth in Feet
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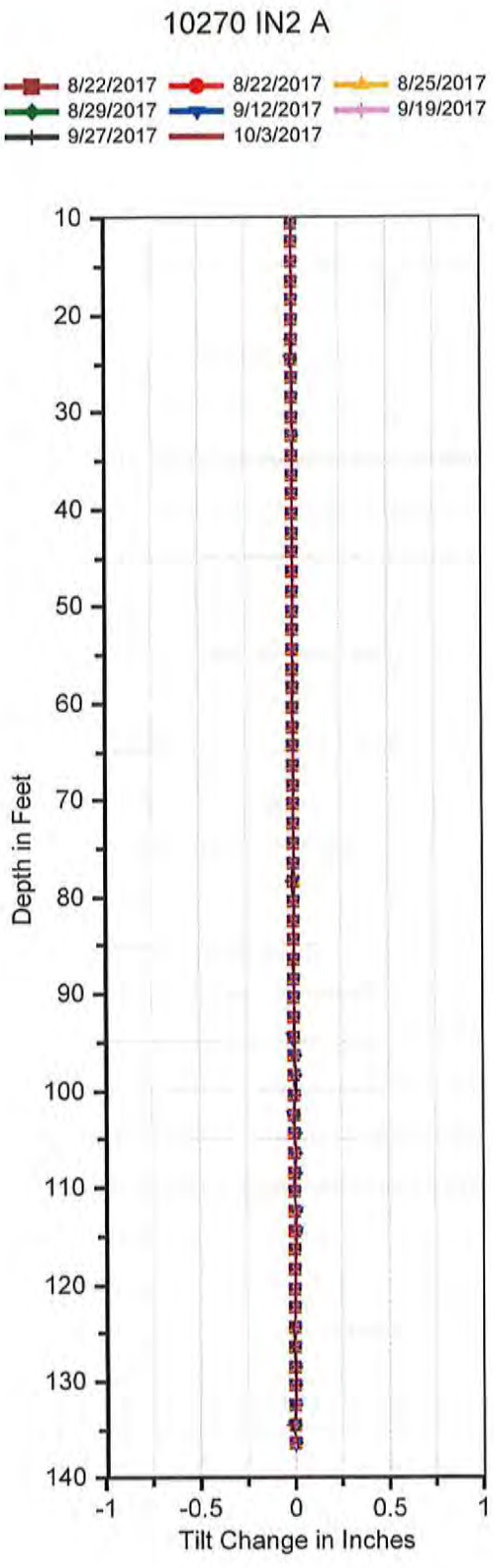
Profile Change in Inches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8/22/2017
8/22/2017
8/25/2017
8/29/2017
9/12/2017
9/19/2017
9/27/2017
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Depth in Feet
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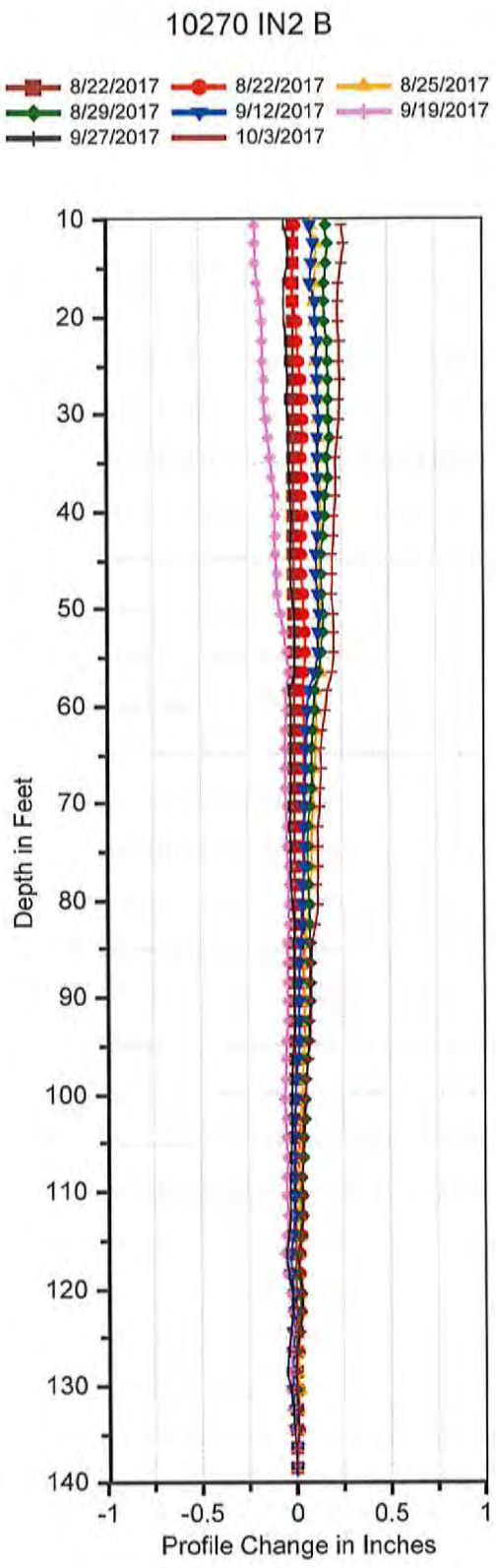
Tilt Change in Inches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8/22/2017
8/22/2017
8/25/2017
8/29/2017
9/12/2017
9/19/2017
9/27/2017
10/3/2017
Depth in Feet
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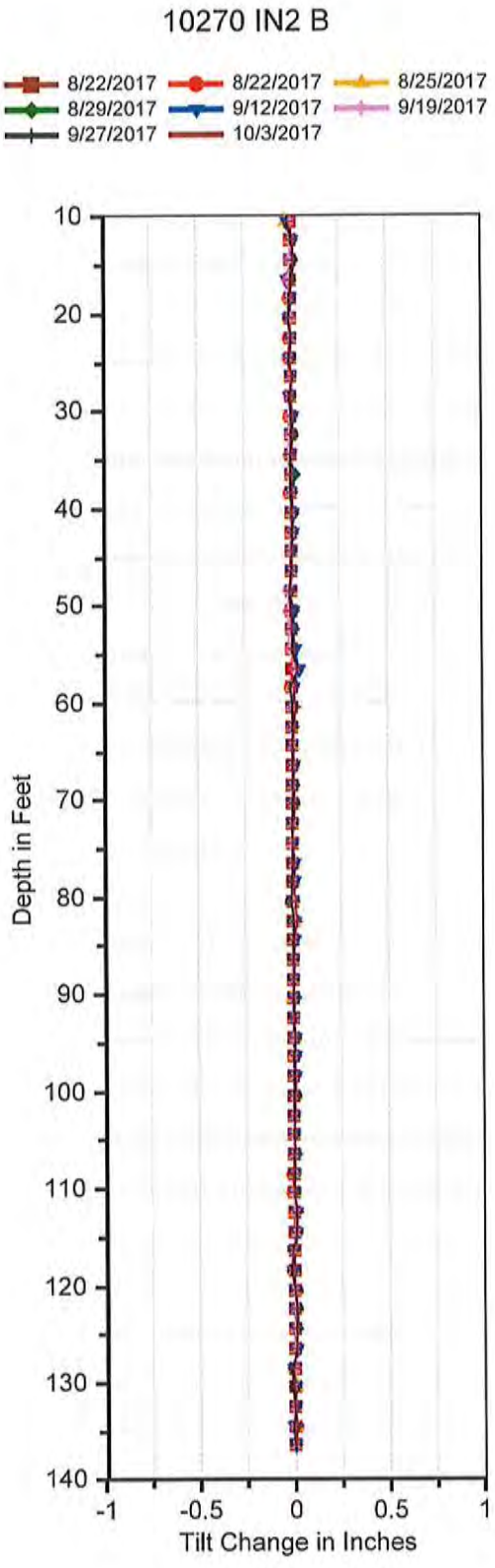
Profile Change in Inches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8/22/2017
8/25/2017
8/29/2017
9/12/2017
9/19/2017
9/27/2017
10/3/2017
Depth in Feet
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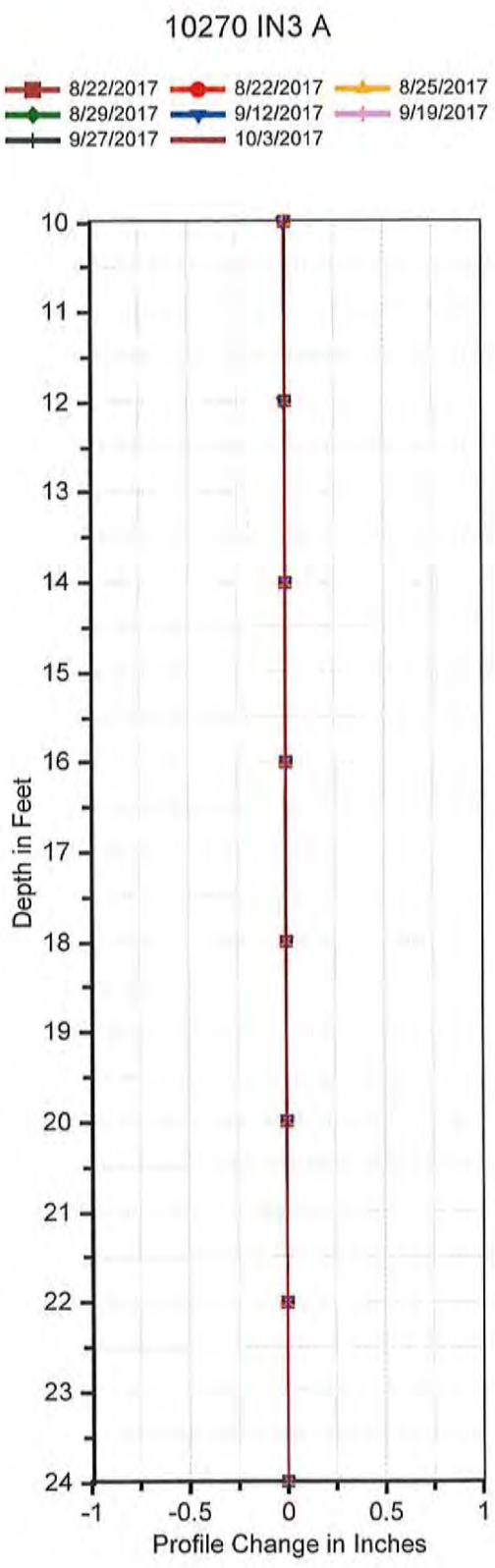
Tilt Change in Inches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9/19/2017
9/27/2017
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Depth in Feet
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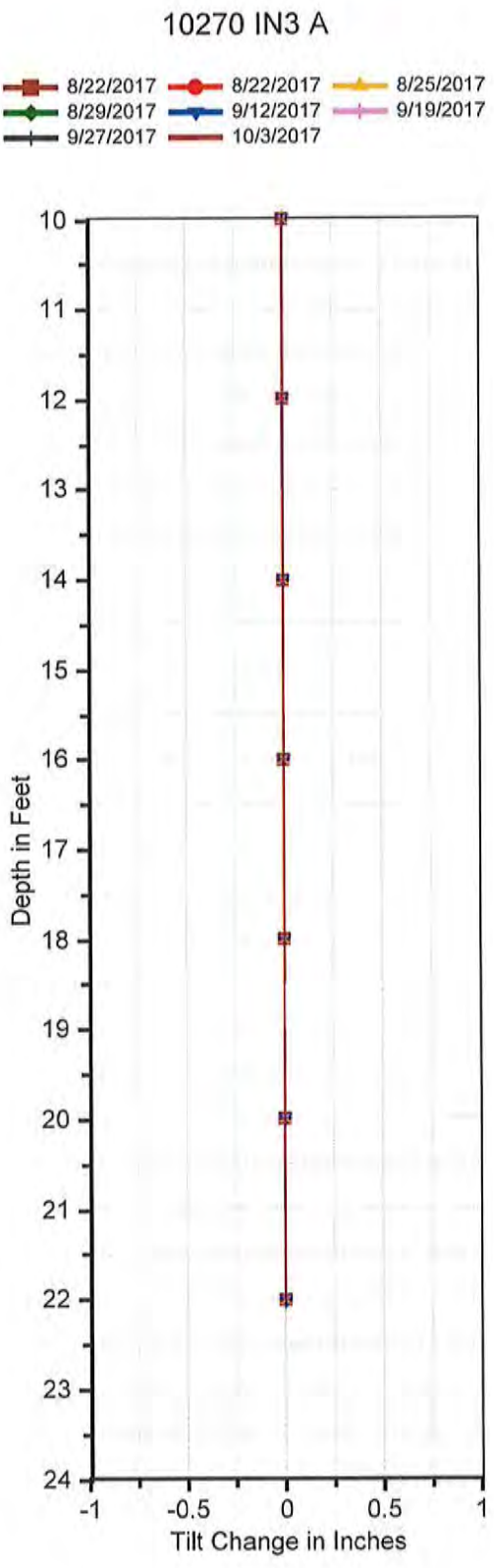
Profile Change in Inches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9/19/2017
9/27/2017
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Depth in Feet
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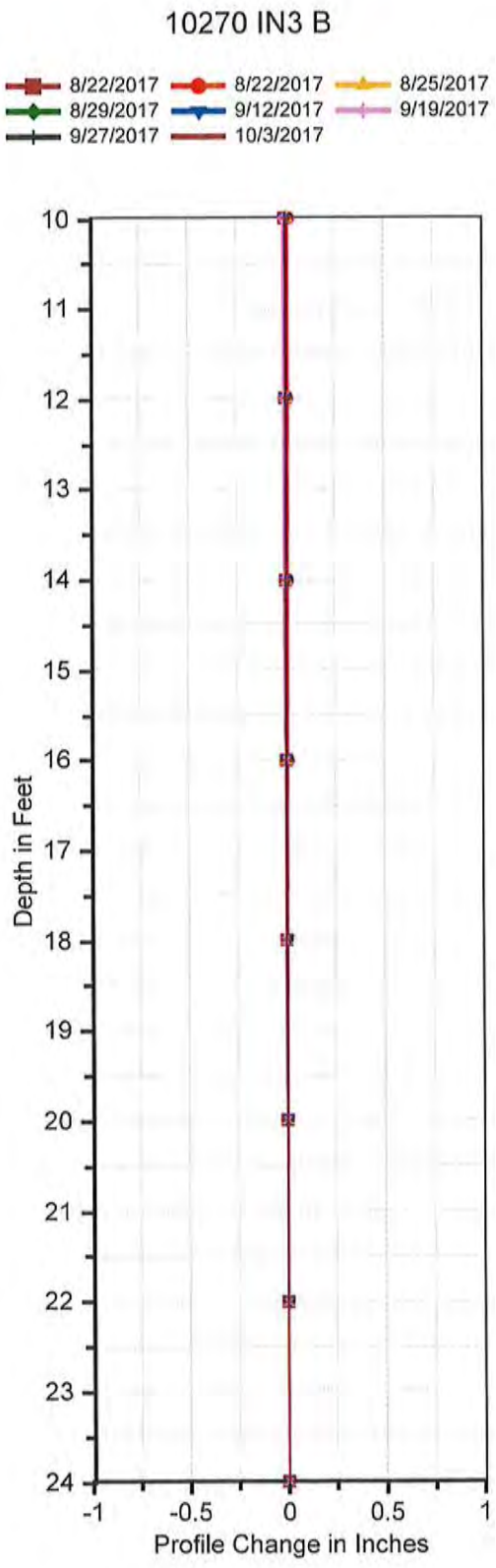
Tilt Change in Inches


10270 IN3 B
8/22/2017
8/22/2017
8/25/2017
8/29/2017
9/12/2017
9/19/2017
9/27/2017
10/3/2017
Depth in Feet
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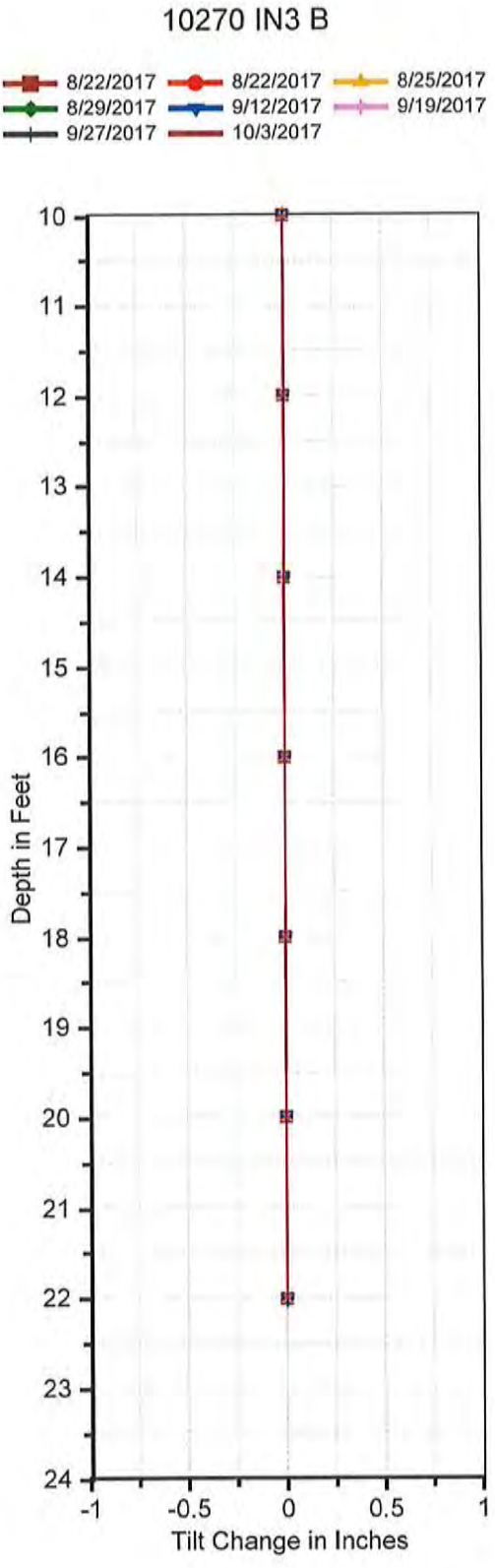
Profile Change in Inches


10270 IN3 B
8/22/2017
8/22/2017
8/25/2017
8/29/2017
9/12/2017
9/19/2017
9/27/2017
10/3/2017
Depth in Feet
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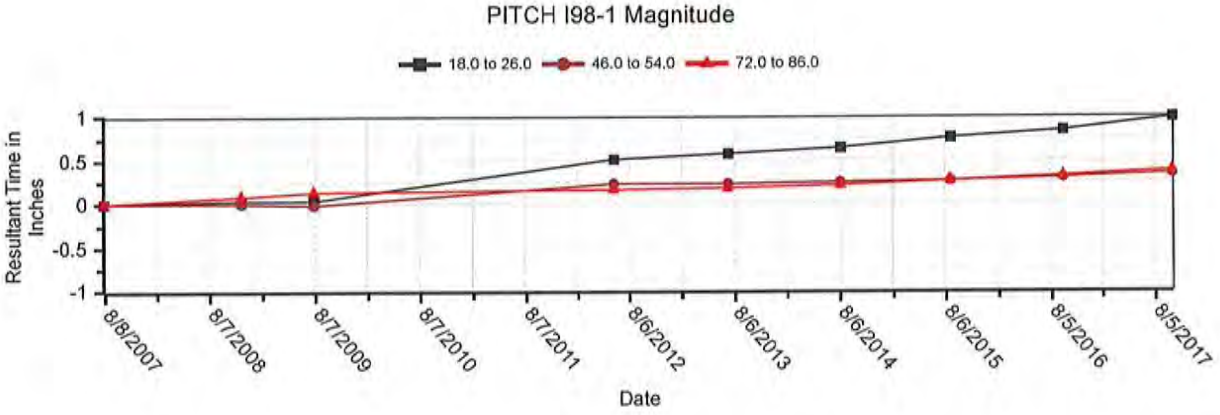
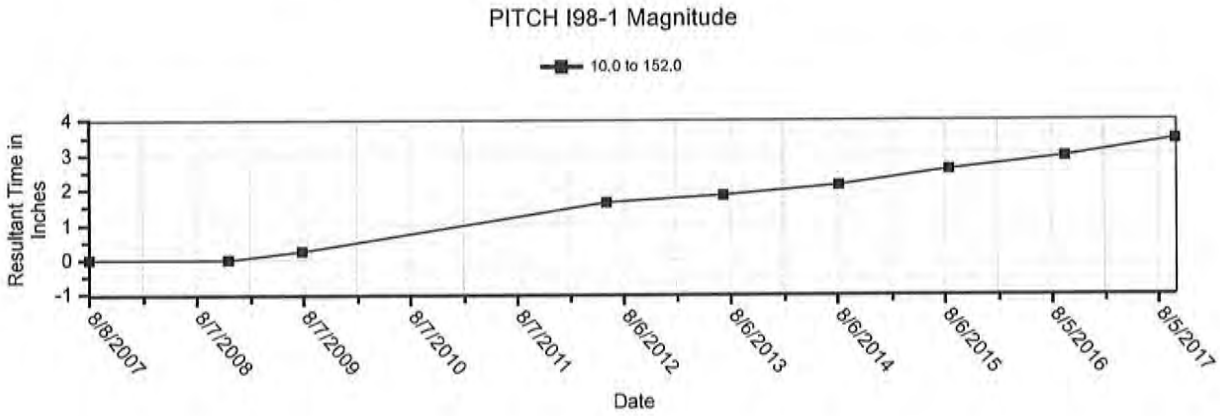
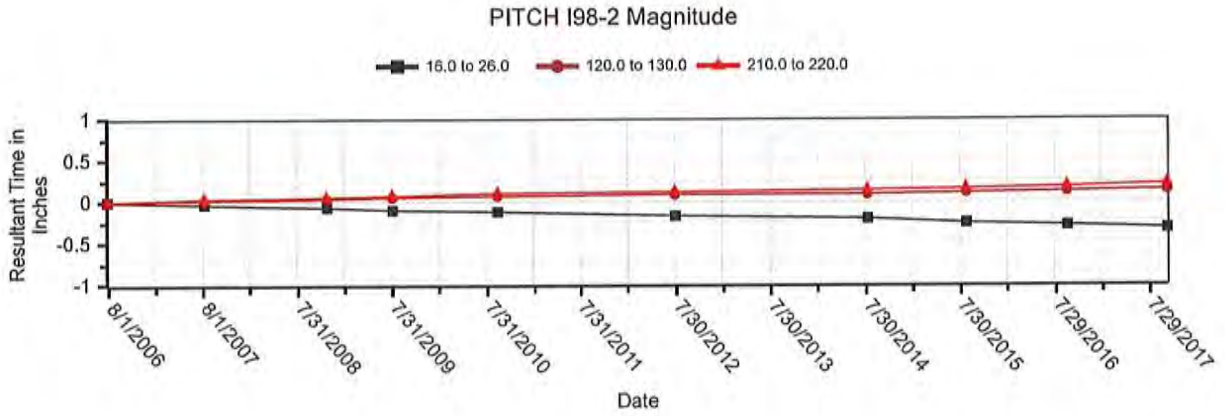
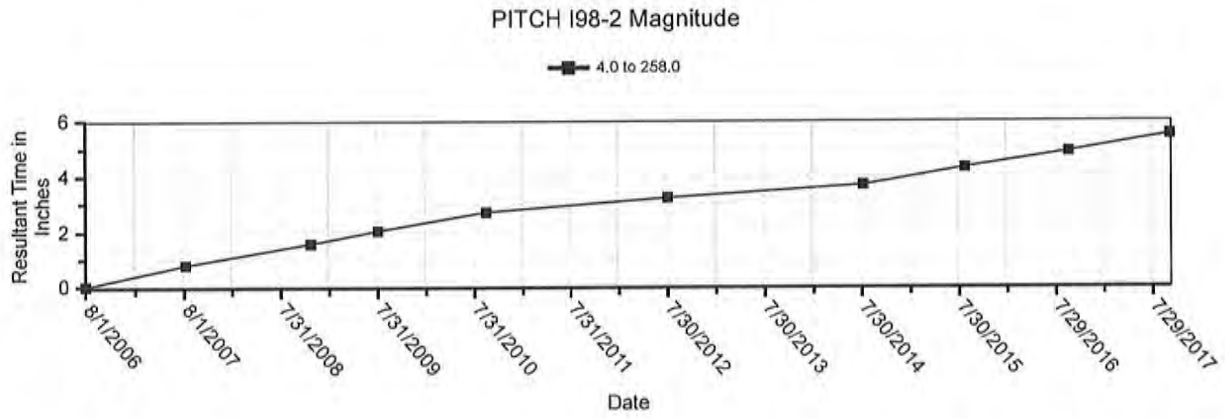
Tilt Change in Inches

APPENDIX C
MOVEMENT VS. TIME PLOTS


PITCH I98-1 Magnitude
18.0 to 26.0
46.0 to 54.0
72.0 to 86.0
Resultant Time in Inches
1
0.5
0
-0.5
-1
8/8/2007
8/7/2008
8/7/2009
8/7/2010
8/7/2011
8/6/2012
8/6/2013
8/6/2014
8/6/2015
8/5/2016
8/5/2017
Date


PITCH I98-1 Magnitude
10.0 to 152.0
Resultant Time in Inches
4
3
2
1
0
-1
8/8/2007
8/7/2008
8/7/2009
8/7/2010
8/7/2011
8/6/2012
8/6/2013
8/6/2014
8/6/2015
8/5/2016
8/5/2017
Date


PITCH I98-2 Magnitude
16.0 to 26.0
120.0 to 130.0
210.0 to 220.0
Resultant Time in Inches
1
0.5
0
-0.5
-1
8/1/2006
8/1/2007
7/31/2008
7/31/2009
7/31/2010
7/31/2011
7/30/2012
7/30/2013
7/30/2014
7/30/2015
7/29/2016
7/29/2017
Date


PITCH I98-2 Magnitude
4.0 to 258.0
Resultant Time in Inches
6
4
2
0
8/1/2006
8/1/2007
7/31/2008
7/31/2009
7/31/2010
7/31/2011
7/30/2012
7/30/2013
7/30/2014
7/30/2015
7/29/2016
7/29/2017
Date

APPENDIX D
INCLINOMETER PHOTOGRAPHS

Photo 01 Hole depth measured with a combination of cable and weighted tape measure.

Photo 02. Stickup measurement taken from concrete apron to top of a capped casing using the top of an open standpipe as an intermediate measurement reference point.

Photo 03. Ground surface for I98-1, I98-2 and I98-3 defined as the top of survey markers positioned near the base of each inclinometer standpipe.

Photo 04. Example of a capped casing. Stickup = Distance from concrete slab with survey marker to top of open standpipe (grey) – Distance from top of open standpipe to top of a capped casing (yellow "IN2" cap)

Photo 05. Length of probe adds 15 inches (1.25 feet) to every cable measurement.

Photo 06. A cable pulley system used to lower and raise probe and cable in I98-1, I98-2 and I98-3.

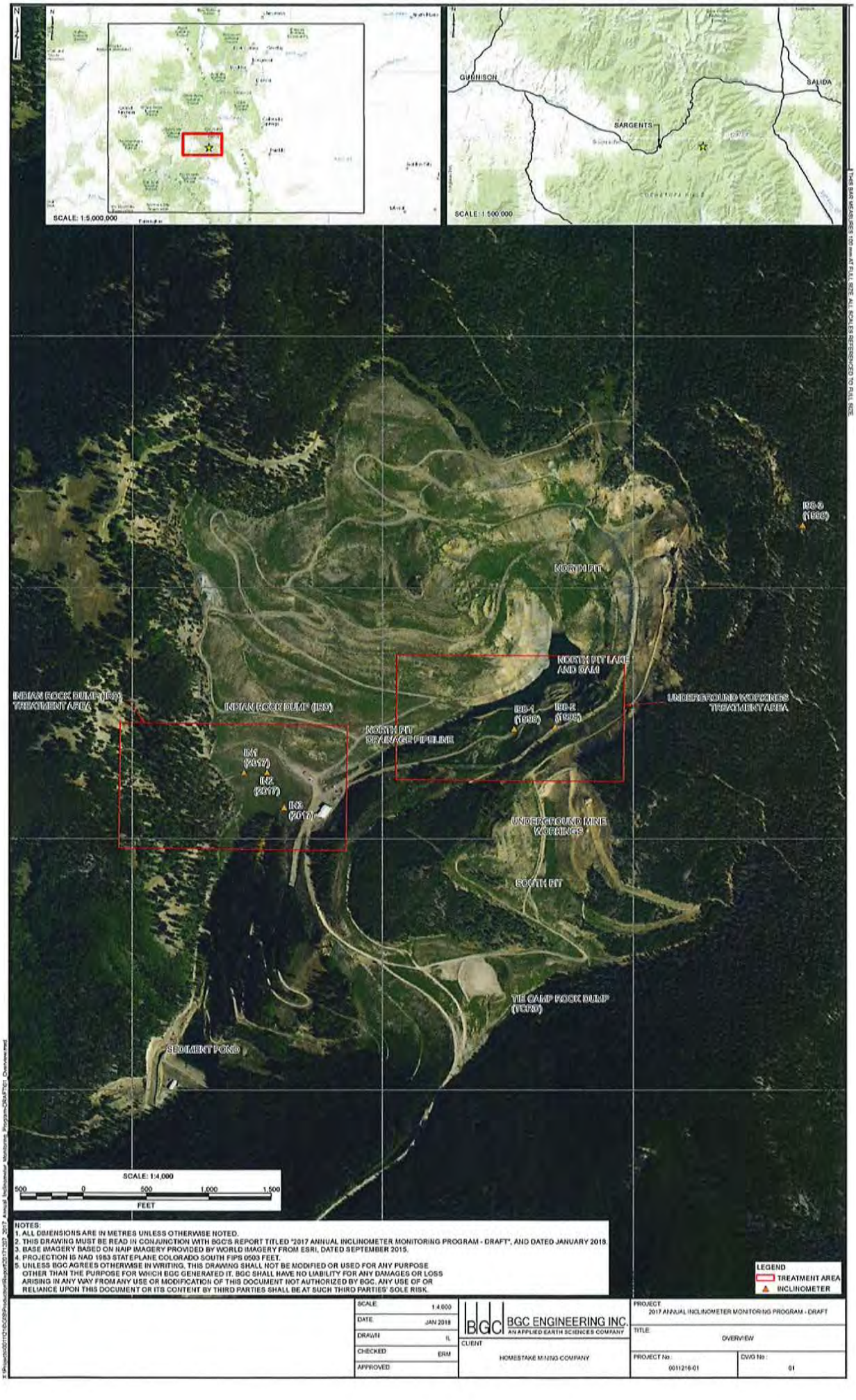
Photo 07. The tight space between the inclinometer casing and standpipe prevents complete fastening of the cable pulley system to the casing.

Photo 08. The cable pulley system has a gap between the designed seated position of the cable pulley system.

Photo 09. A handmade cable catch was made using the plastic cap form IN-1.

Photo 10. Electric tape was used to keep the cap in place within the inclinometer casing. Tape was removed after each use.

DRAWINGS



NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "2017 ANNUAL INCLINOMETER MONITORING PROGRAM - DRAFT", AND DATED JANUARY 2018.
3. BASE IMAGERY BASED ON NAIP IMAGERY PROVIDED BY WORLD IMAGERY FROM ESRI, DATED SEPTEMBER 2015.
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TREATMENT AREA
INCLINOMETER

SCALE:	1:4,000
DATE:	JAN 2018
DRAWN:	IL
CHECKED:	ERM
APPROVED:	

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: HOMESTAKE MINING COMPANY

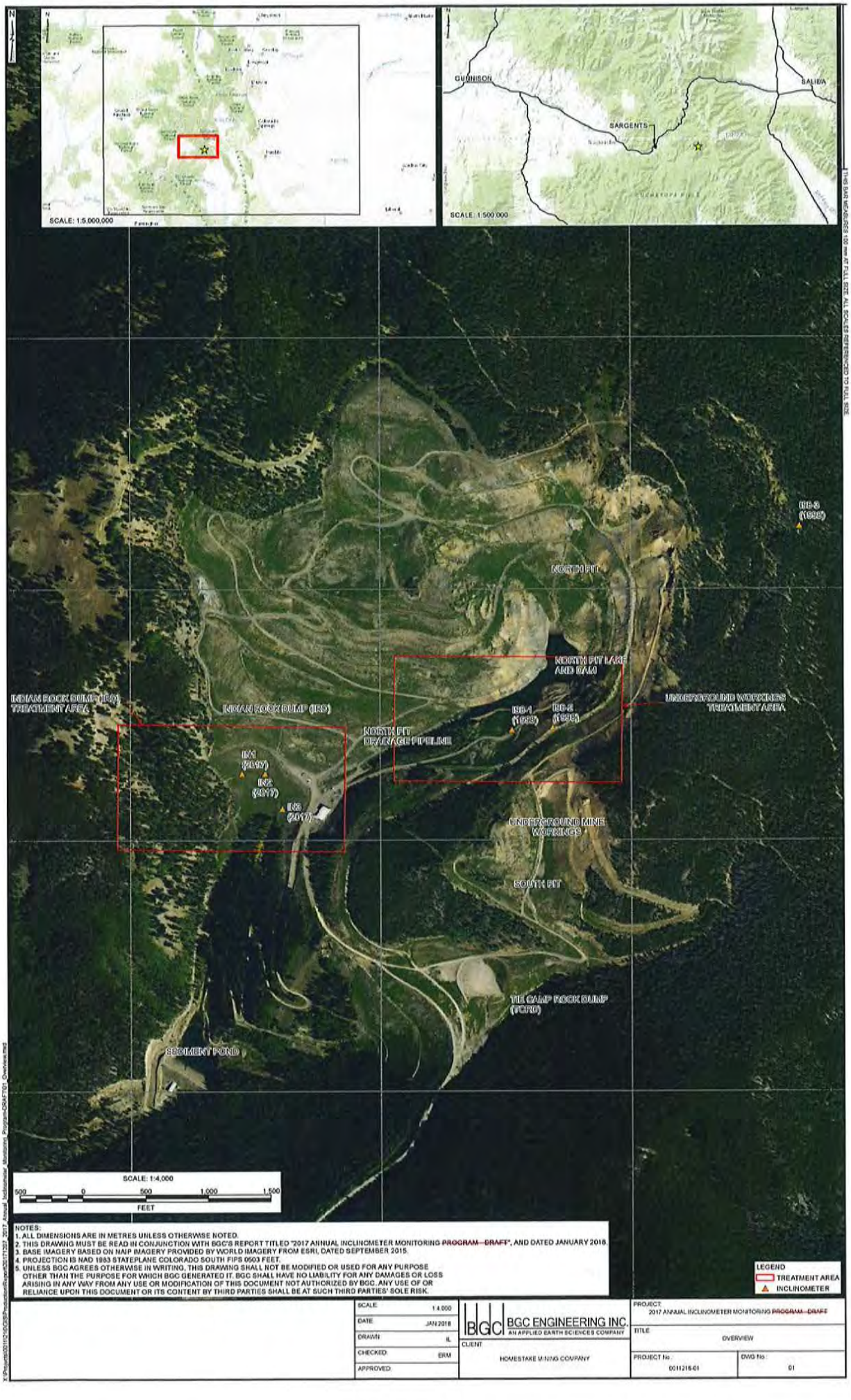
PROJECT: 2017 ANNUAL INCLINOMETER MONITORING PROGRAM - DRAFT

TITLE: OVERVIEW

PROJECT No.: 0011210-01

DWG No.: 01

I:\Projects\0011210\03\Publication\Report\2017\20180131_2017_Annual_Inclinometer_Monitoring_Program-DRAFT\01_Overview.mxd



NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "2017 ANNUAL INCLINOMETER MONITORING ~~PROGRAM – DRAFT~~", AND DATED JANUARY 2018.
3. BASE IMAGERY BASED ON NAIP IMAGERY PROVIDED BY WORLD IMAGERY FROM ESRI, DATED SEPTEMBER 2015.
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LEGEND
TREATMENT AREA
INCLINOMETER

SCALE	1:4,000
DATE	JAN 2018
DRAWN	IL
CHECKED	ERM
APPROVED	

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: HOMESTAKE MINING COMPANY

PROJECT: 2017 ANNUAL INCLINOMETER MONITORING ~~PROGRAM – DRAFT~~

TITLE: OVERVIEW

PROJECT No.: 0011216-01

DWG No.: 01

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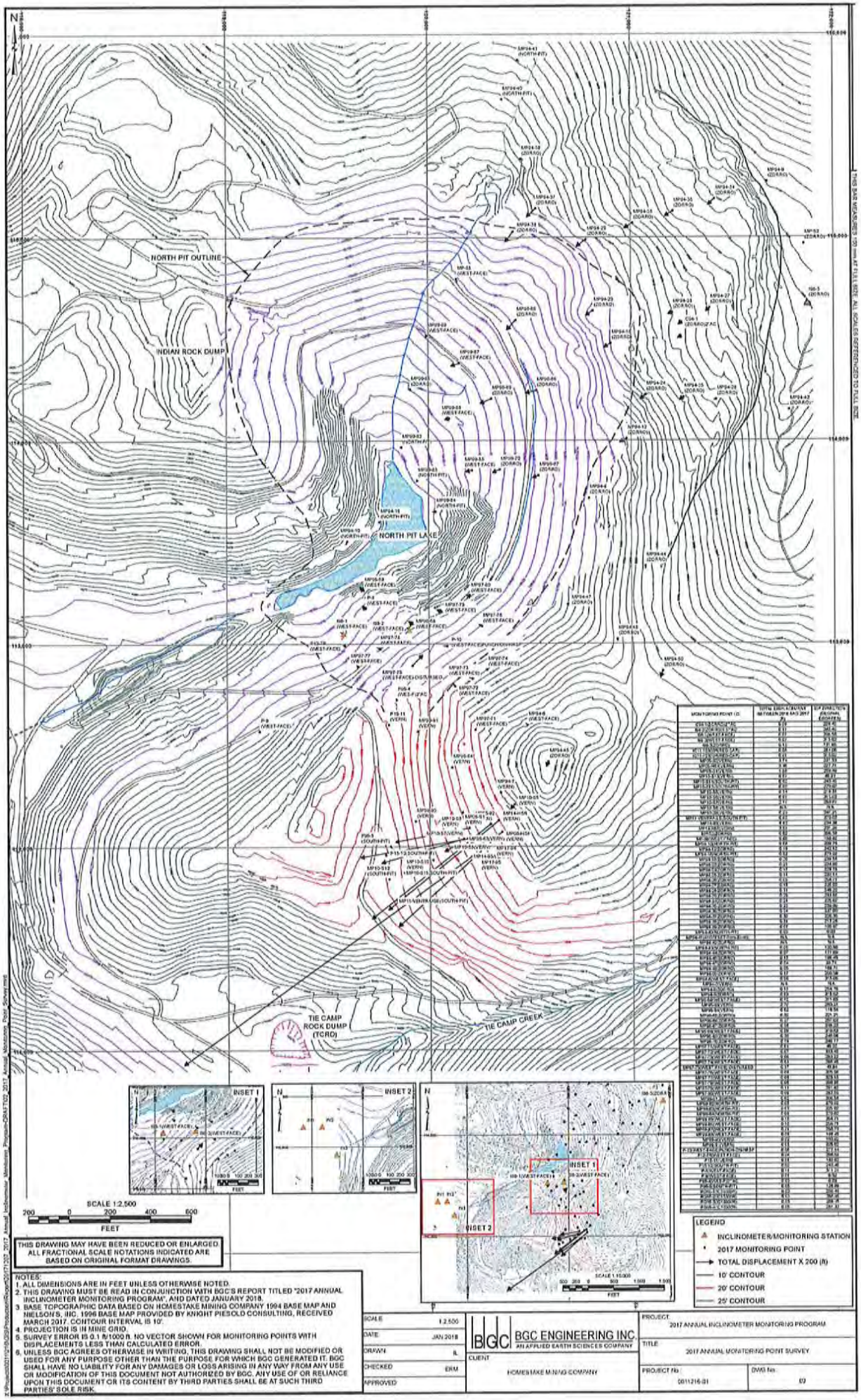

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NOTES:
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2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "2017 ANNUAL INCLINOMETER MONITORING PROGRAM", AND DATED JANUARY 2018.
3. BASE TOPOGRAPHIC DATA BASED ON HOMESTAKE MINING COMPANY 1994 BASE MAP AND NIELSON'S, INC. 1996 BASE MAP PROVIDED BY KNIGHT PIESOLD CONSULTING, RECEIVED MARCH 2017. CONTOUR INTERVAL IS 10'.
4. PROJECTION IS IN MINE GRID.
5. SURVEY ERROR IS 0.1 ft/1000 ft. NO VECTOR SHOWN FOR MONITORING POINTS WITH DISPLACEMENTS LESS THAN CALCULATED ERROR.
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DATE	JAN 2018
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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: HOMESTAKE MINING COMPANY

PROJECT: 2017 ANNUAL INCLINOMETER MONITORING PROGRAM

TITLE: 2017 ANNUAL MONITORING POINT SURVEY

PROJECT No: 0811216.01

DWG No: 07

Colorado Department of Natural Resources
Division of Reclamation, Mining and Safety
Attention: Mineral Division
1313 Sherman Street, Room 215
Denver, CO 80203

January 15, 2017

RE: HOMESTAKE PITCH RECLAMATION PROJECT
2017 ANNUAL GEOTECHNICAL REPORT (M-1977-004HR)

Dear Division:

Attached is the 2017 Annual Geotechnical Report for the waste rock management areas at the Homestake Mining Company Pitch Reclamation Project (Figure 1). The purpose of this report is to provide the results of ongoing geotechnical monitoring of the Indian and Tie Camp rock dumps at the Pitch Reclamation Project (Figure 2). The history of the rock dumps has been provided in previous annual geotechnical reports and is not repeated here. In 2017, the rock dumps were inspected monthly in accordance with the recommended monitoring program. The inspections indicate stable conditions for the Indian and Tie Camp rock dumps.

The Indian and Tie Camp rock dump piezometer water level readings are presented in this report. The 2017 monthly water level measurements are provided in Table 1 and shown on Figure 3. Water level data collected since 1996 are shown on Figure 4. As reflected on Figure 3 and Figure 4, the water levels in the rock dump piezometers show little fluctuation in the fall and winter months, with a temporary rise in response to the spring snow melt or summer rain events. The extent that water levels rise each year depends on the fluctuation in snow pack and summer precipitation, and the location of the piezometers within the rock dumps. The onsite precipitation gage recorded 21 inches of precipitation during the 2017 monitoring period (November 2016 through October 2017), compared with 20 and 23 inches during the 2016 and 2015 periods, respectively, and 31 inches in 2014 consistent with the heavy snow pack observed that year.

In 2017, four new piezometers (RD-06, RD-07, RD-08, RD-09) were installed at the 10300 level of the Indian Rock Dump and one shallow piezometer (RD-05) was installed near the toe of the Indian Rock Dump (Figure 2). These piezometers were approved by the Division in April 2017 under Technical Revision #8 (Division 2017a). These piezometers were used in combination with Piezometer 10300R, and four shallow piezometers (RD-01, RD-02, RD-03, RD-04) approved by the Division under Technical Revision #7, to facilitate large-scale *in situ* source zone treatment of uranium, with extraction from the piezometers at the toe of the Indian Rock Dump and injection into the piezometers at the 10300 level (Division 2016). Water level measurements collected in 2017 from the piezometers near the toe of the Indian Rock Dump and the 10300 level are shown on Figure 5 and Figure 6, respectively. Observed fluctuations in both the new piezometers and 10300R reflect the water level changes associated with the *in-situ* source zone treatment. After cessation of injection activities, piezometers returned to long-term water level trends (Figure 5 and Figure 6).

To further monitor slope stability, three inclinometers were installed in 2017 at the Indian Rock Dump, along the drainage ditch located approximately halfway between the base of the Indian Rock Dump and the 10300-bench (Figure 2). These inclinometers were approved in June 2017 by the Division under an addendum to Technical Revision #8 (Division 2017b).

Please feel free to contact me in the Sargents Colorado office (970) 641-4541 or via cell phone at (719) 530-1656 if you have any questions. Please note that effective February 1, 2018, Mr. Dave Wykoff will be assuming the role of Pitch Site Manager. A formal management change notice is forthcoming. In the meantime, Mr. Wykoff can be reached at (505) 252-9615 with any questions.

Sincerely,

Dale Davis
Pitch Site Manager

cc: Clark Burton – Homestake Mining Company
Dave Wykoff – Homestake Mining Company
Adam Sarman – Homestake Mining Company
Phillip DeDycker – Arcadis, U.S., Inc.

Homestake Pitch Reclamation Project

Annual Geotechnical Report (M-1977-004HR)

2017 Geotechnical Observations
Indian and Tie Camp Rock Dumps

1. Indian Creek Rock Dump

The following summary provides a description of the Indian Rock Dump water levels for 2017. The Indian Rock Dump is a generally south-facing, graded and reclaimed rock dump that can be separated into bench levels corresponding to ground surface elevation. The Indian Rock Dump was regraded in 1994 following procedures approved by the Division under Technical Revision #1 in February 1994. In 1995, several minor, localized areas of slope instability were noted, corrected, and reported in the 1995 Annual Geotechnical Report (HMC 1996). No significant changes in surface ground conditions were noted in 2017. Subsurface water is monitored in piezometers at the levels described below (Figure 2).

"10300 – 10100" Level

Site Description: Identical to that of past reports for 1996 through 2016.

2017 Observations: Field observations indicate that the repairs performed in 1995 were successful and no new areas of surficial instability were observed from 1996 through 2017. Piezometer 10300R is located in the central portion of the Indian Rock Dump and monitors subsurface water levels (Figure 2) In 2011, Piezometer IC10300 was replaced due to sediment buildup in the casing making it difficult to measure the rise in the water level. It was abandoned and replaced by Piezometer IC10300R, located approximately 30 feet west of Piezometer IC10300. Piezometer IC10300R appears to intersect the east branch of Indian drainage (under the Indian Rock Dump) just north of the confluence with the west branch. In 2017, the water level in Piezometer 10300R increased during the spring freshet by 8.9 feet, compared to 7.21 feet in 2016. In 2014, a year characterized by comparatively heavy snow pack, the water level in Piezometer IC10300R rose by 17.9 feet. Following the spring freshet of each year the water level approaches steady-state levels. The 10300R well is in an area affected by the 2017 *in situ* source zone treatment program. As such, short-term water levels fluctuated in response to these activities, but returned to steady-state levels later in the fall (Figure 5).

"10400 – 10370" Level

Site Description: In 1997 the face of the permanent low-grade stockpile was reconstructed on the Indian Rock Dump to reduce the potential for infiltration and promote more rapid runoff from the stockpile area.

2017 Observations: In 2011, Piezometer IC10370 was replaced by Piezometer IC10370R, on the 10,370 level of the Indian Rock Dump (Figure 2). Piezometer IC10370R is approximately 67 feet west of the Piezometer IC10370 location, which appears to intersect the west branch of Indian drainage below the Indian Rock Dump just north of the confluence with the east branch. The water level in Piezometer IC10370R rose by 5.2 feet in 2017 in response to spring snow melt, similar to the near 6-foot water level increases observed in

2016 and 2015. In 2014, the water level in Piezometer IC10370R increased by over 11 feet between January and June consistent with the heavy snow pack observed that year. Piezometer IC10360 is also located near Piezometer 10370R but does not intersect the Indian drainage. This piezometer had a maximum water level increase of 6.2 feet in 2017, compared to 8.8 feet in 2016, 6.5 feet in 2015, and 7.7 feet in 2014. The relatively consistent increase between the water level rise in 2014 and more recent observations may be attributed to the location being outside of the Indian drainage under the Indian Rock Dump.

"10600 – 10400" Level

Site Description: Identical to that of past reports for 1996 through 2016.

2017 Observations: Piezometer IC10440 was used to monitor subsurface water levels in this area of the rock dump until it became non-functional in 1996.Piezometer IC10525, which is also representative of this area of the rock dump, is described below in Section "10725 – 10525" Level.

"10650 – 10600" Level

Site Description: Identical to that of past reports for 1996 through 2016.

2017 Observations: Piezometers IC10630 and IC10600 monitor subsurface water in this area of the Indian Rock Dump. The water elevation in Piezometer IC10630 rose by 7.0 feet from March through June consistent with levels measured from 2014 through 2016 (7.5 to 7.6 feet). The response to spring snow melt and/or summer rain events is consistent with other rock dump piezometers. However, until 2014, Piezometer IC10630 was characterized by minimal water level change (maximum water level rise of 4.5 feet and average 1.3 feet).

As noted in previous reports, in October 2001, an obstruction was removed from Piezometer IC10600, which subsequently allowed it to be used for the collection of water level data. In 2017, the water level in Piezometer IC10600 increased by 8.4 feet during the spring freshet which is consistent with 2015 and 2016 high water levels (8.8 and 8.4 feet, respectively). During the same period in 2014, the water level elevation rose by 11.8 feet.

"10780 – 10650" Level

Site Description: Identical to that of past reports for 1996 through 2016.

2017 Observations: Visual inspection of the area revealed no evidence of settling or slumping of the rock dump material. The drainage channels are functioning as designed.

"10725 – 10525" Level

Site Description: Identical to that of past reports for 1996 through 2016. The minor overlap between this level and other bench designations reflects the original bench configuration.

2017 Observations: Piezometers IC10600 and IC10525 are used to monitor subsurface water in this area. Similar to Piezometer IC10600, in 2017 the Piezometer IC10525 water level rose by 8.2 feet in response to spring snow melt, consistent with the water level rise observed from 2014 through 2016 (7.9 to 9.0 feet).

"10800" Level

Site Description: Identical to that of past reports for 1996 through 2016.

2017 Observations: Visual inspection of the area in 2017 revealed no evidence of settling or slumping of the rock dump material and the drainage channels are functioning as designed.

The drainage on the western side of the upper portion of the Indian Rock Dump, just above the sericite stockpile, where the rock dump intersects native ground, underwent minor erosion prior to 2012. A low gradient diversion ditch, was built in 2012, allowing water from the channel to be diverted and dispersed at lower velocities. Boulders were placed above the steep section of the channel and rip-rap was placed below the boulders as energy dissipaters, such that flow velocities are reduced and sediment retention is enhanced. Observations in 2017 indicate that this repair continues to minimize erosion in this area.

Additional Indian Rock Dump Piezometers

Site Description: In 2017, one shallow piezometer (RD-05) was installed with a total depth of 36 feet near the toe of the Indian Rock Dump and four piezometers (RD-06, RD-07, RD-08, and RD-09) were installed at the Indian Rock Dump 10300 level at total depths of 206.5, 210, 208, and 212 feet respectively (Figure 2). RD-05 was installed along the transect, normal to groundwater flow, that includes the RD-01, RD-02, and RD-03 piezometers installed in 2016. The four new injection wells were installed along an upgradient transect normal to groundwater flow adjacent to existing monitoring well IC-10300R. Each piezometer was constructed with a 20-foot screen interval located at the bottom of the piezometer coincident with anticipated static water levels.

2017 Observations: Phosphate and tracer amended water was recirculated within the Indian Rock Dump as part of the 2017 *in situ* source zone treatment program. From mid-August through September 2017, approximately 1,124,000 gallons of water were recirculated within the Indian Rock Dump, with extraction from RD-02 and RD-05 and injection into RD-06, RD-07, RD-08, and RD-09. On September 23, 2017, IC-10300R was added to the injection system as an additional injection point.

Water levels in piezometers used for injection fluctuated within a range of approximately 10 feet during active injections (Figure 5). The short-term water level variations reflect rapid water level changes during injection activities, and when the injection system was stopped for monitoring and maintenance activities. Water levels associated with RD-02 and RD-05, the two piezometers used for extraction in 2017, suggest minimal water level change (7.8 and 7.5 feet, respectively) during extraction (Figure 6). The higher water level change for RD-02 and RD-05 during extraction than surrounding piezometers (RD-01, RD-03, RD-04) could be a result of the pumps being close to the water level surface. (i.e., splashing of water within the well providing an artificially high-water level). Mounding of subsurface water near injection piezometers dissipated soon after termination of injection, and extraction of water appeared to have little influence on the overall subsurface water level. The return to steady-state levels is illustrated by water levels collected in October and November 2017 for piezometers used for injection (RD-06, RD-09, IC300R) and extraction (RD-04) (Figure 5 and Figure 6).

Indian Rock Dump Inclinometer Installation

To monitor Indian Rock Dump slope stability during and after 2017 phosphate injection activities, three inclinometers (IN-1, IN-2, and IN-3) were installed in August 2017 along a drainage ditch located approximately halfway between the base of the Indian Rock Dump and the 10300-bench (Figure 2). The IN-1, IN-2, and IN-3 boreholes were advanced

through waste rock into native ground to total depths of 63,138.5, and 25 feet below ground surface, respectively. The construction of inclinometers was completed using Slope Indicator® (SI) QC slotted casing. The borehole annulus was backfilled with 10/20 sized silica sand.

Inclinometer readings were periodically collected during operation of the Indian Rock Dump phosphate injection system (August through September 2017). No slope movement was detected during or following injections.

2. Tie Camp Rock Dump

Similar to the Indian Rock Dump, the Tie Camp Rock Dump can be separated into bench levels corresponding to ground surface elevation. The Tie Camp Rock Dump was regraded in 1994 following procedures approved by the Division in Technical Revision #1 in February 1994. In 1995, localized areas of slope instability were corrected and reported in the 1995 Annual Geotechnical Report (HMC 1996). The Tie Camp Rock Dump has one piezometer at an elevation of 10,375 feet as discussed below.

"10400 – 10100" Level

Site Description: The Tie Camp Rock Dump was regraded in 1994 following procedures approved by the Division in February 1994. During 1995, minor, localized areas of slope instability were noted and corrected as summarized in the 1995 Annual Geotechnical Report (HMC 1996). Grading was performed in 2012 on the second and third benches from the top of the rock dump to control rill erosion due to the benches filling with silt. Field observations indicate that the repairs performed in 1995 and grading in 2012 were successful and only small areas of surficial instability were observed from 1996 through 2017.

2017 Observations: Piezometer TC10375 monitors subsurface water in the Tie Camp Rock Dump. In 2017, the maximum water level fluctuation was 4.3 feet (between March and June), after the spring freshet. This rise in water level is similar to what was observed in 2015 (4.3 feet) but lower than the 6.0 feet rise observed in 2016. These recent observations are below the seasonal fluctuations observed in 2014 (9.1 feet) when heavy snow pack was observed.

REFERENCES

Colorado Department of Natural Resources, Division of Reclamation, Mining, and Safety (Division). Pitch Project, Permit No. M-1977-004, Technical Revision (TR-8) Approval. Letter to Bill Ferdinand from Dustin Czapla. May.

Division. 2017a. Pitch Project, Permit No. M-1977-004, Technical Revision (TR-8) Approval. Letter to Holton Burns from Dustin Czapla. April.

Division. 2017b. Pitch Reclamation Project Colorado Division of Reclamation, Mining, and Safety Reclamation Permit No. M-77-004HR Technical Revision #8 Addendum. Verbal Approval provided by Dustin Czapla during 2017 Site Inspection. June.

Homestake Mining Company (HMC). 1996. Annual Geotechnical Report. January.

Table 1: Monthly Water Level Readings in Rock Dump Piezometers

Location	Indian						Tie Camp
Ground Surface Elevation (ft amsl)	10631.50	10603.80	10523.60	10380.50	10373.40	10297.80	10373.00
DATE	10630	10600	10525	10370R	10360	10300R	TC10375
12/15/16	201.90	**252.36**	**228.80**	201.00	223.76	188.63	169.10
1/15/17	201.90	252.34	228.76	201.24	224.12	186.60	169.20
2/4/17	202.00	252.30	228.70	201.20	225.00	187.20	169.20
3/18/17	**202.05**	252.10	228.60	**201.45**	**225.10**	187.30	**169.25**
4/4/17	201.26	250.00	226.50	199.20	223.10	185.13	167.10
5/10/17	196.20	246.14	**220.56**	**196.30**	219.23	**181.67**	**164.80**
6/1/17	**195.02**	**244.00**	224.40	196.68	219.72	181.93	164.92
7/11/17	196.00	247.87	225.64	197.43	**218.86**	182.10	165.27
8/17/17	197.62	249.50	226.72	197.64	219.03	183.56	166.56
9/12/17	198.67	249.74	227.72	198.27	220.68	188.98	167.92
10/11/17	200.40	251.13	228.00	198.32	221.02	190.56	168.36
11/20/17	200.76	251.85	228.00	198.75	222.00	**190.61**	168.63
12/4/17	200.82	251.87	228.23	199.80	222.36	190.58	168.72
Average Feet Below Ground Surface (ft bgs)	199.58	250.09	226.97	199.02	221.84	186.53	167.62
2016 Maximum Differential (ft bgs)	7.61	8.40	7.90	5.55	8.80	7.21	6.01
2017 Maximum Differential (ft bgs)	7.03	8.36	8.24	5.15	6.24	8.94	4.45

Notes:

Readings in **red** reflect the highest water level reading in ft bgs

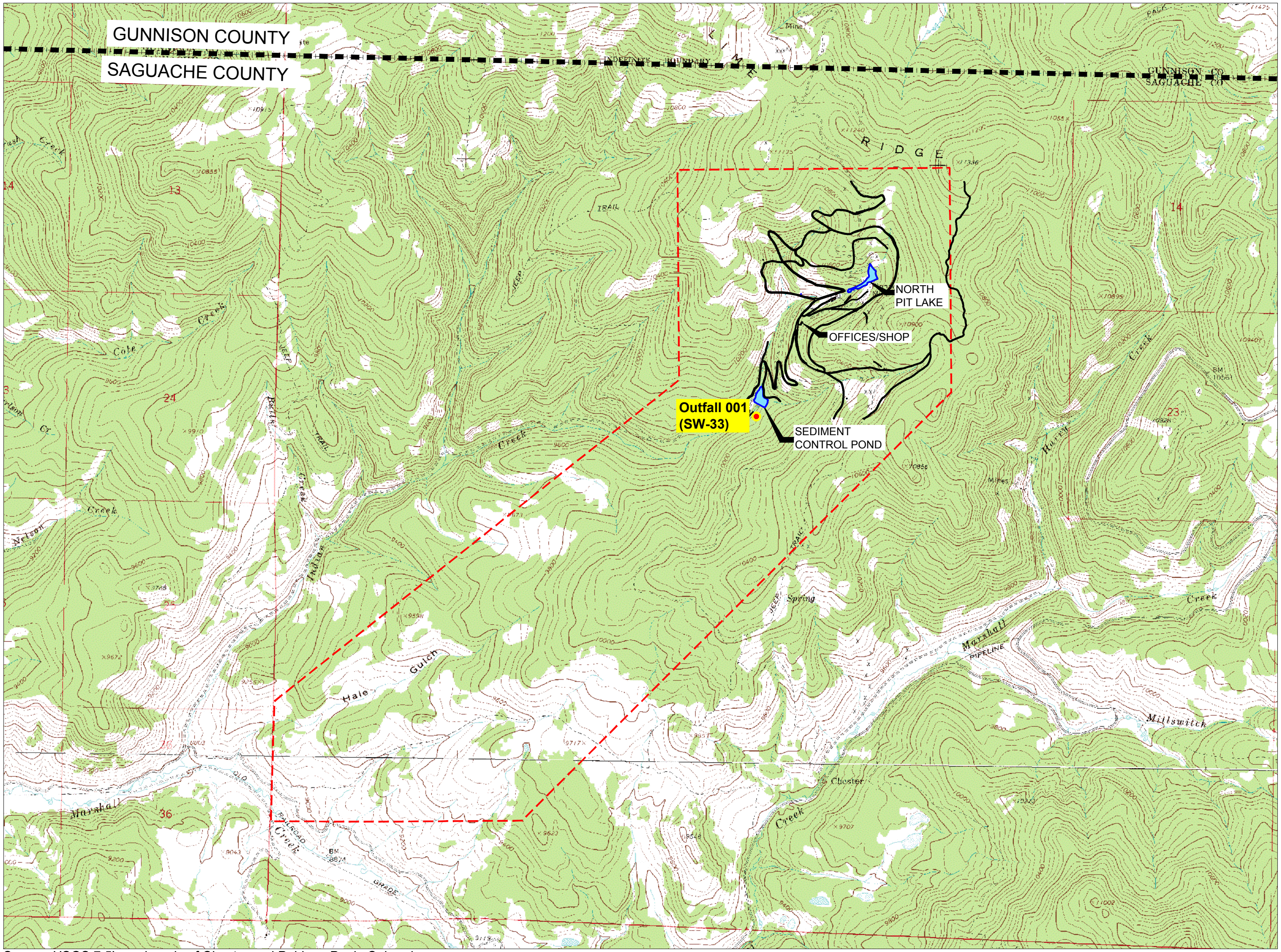
Readings in **green** reflect the lowest water level reading in ft bgs

ft bgs = feet below ground surface

ft amsl = feet above mean sealevel

R 5 E R 6 E

T 48 N



Source: USGS 7.5' quadrangle of Chester and Pahlone Peak, Colorado.

Legend

- Colorado Discharge Permit System (CDPS) Compliance Point
- Colorado Division of Reclamation, Mining, and Safety (DRMS) Permit Boundary
- Roads

N

0 2,000 4,000 6,000 Feet

PITCH RECLAMATION PROJECT
HOMESTAKE MINING COMPANY
SARGENTS, COLORADO

SITE LOCATION

ARCADIS

FIGURE 1

Z:\GIS\AO000102_Pitch\ACAD\Reclamation F1 03-01-16.dwg

LEGEND:

- Piezometer
- Inclinometer
- Elevation Contour

0 530 1,060 Feet

HOMESTAKE

PITCH RECLAMATION PROJECT
HOMESTAKE MINING COMPANY
SARGENTS, COLORADO

ROCK DUMP PIEZOMETER AND INCLINOMETER LOCATIONS

ARCADIS

FIGURE 2

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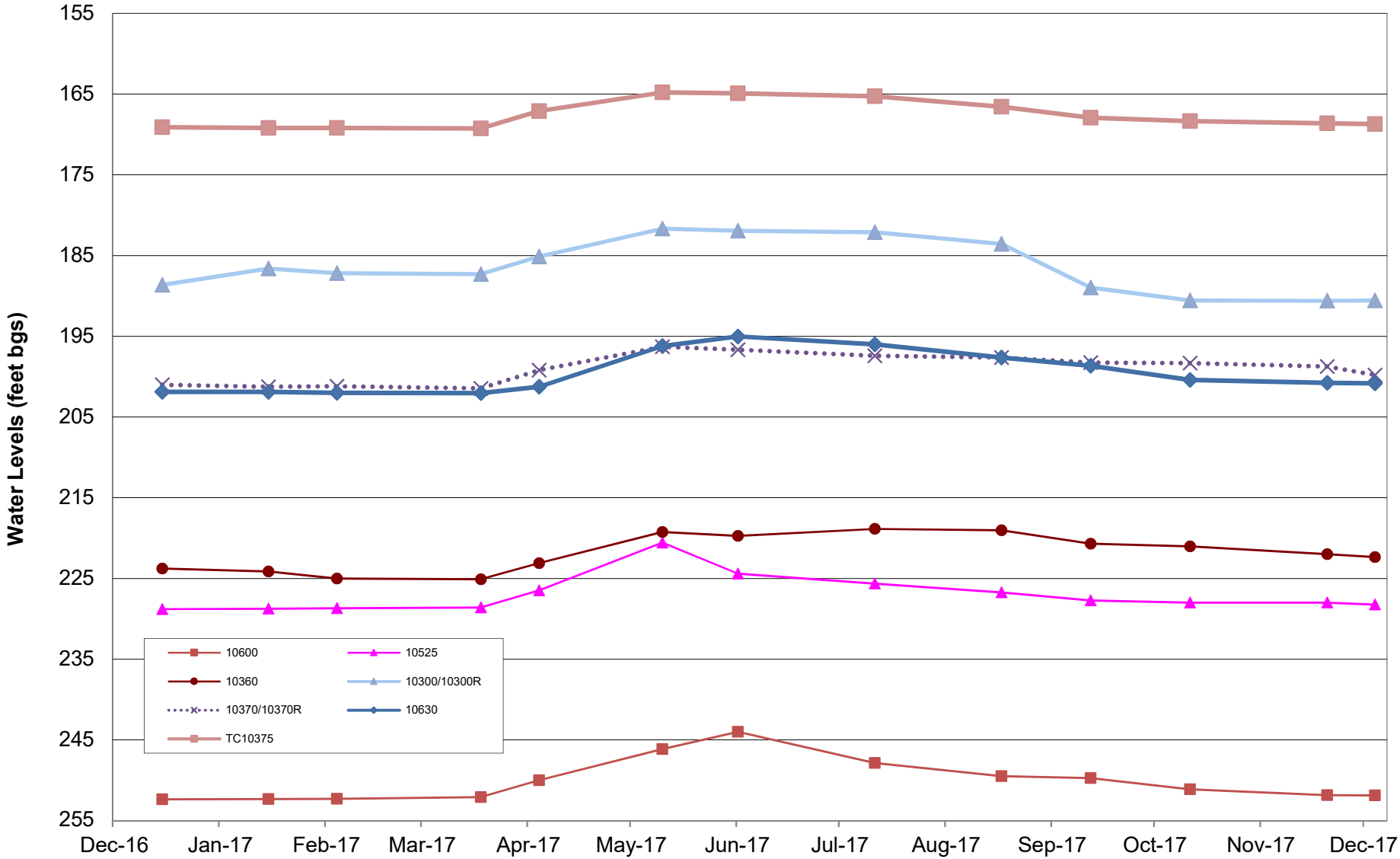

HOMESTAKE MINING COMPANY OF CALIFORNIA

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Figure 3: 2017 Water Levels in Indian and Tie Camp Rock Dump Piezometers

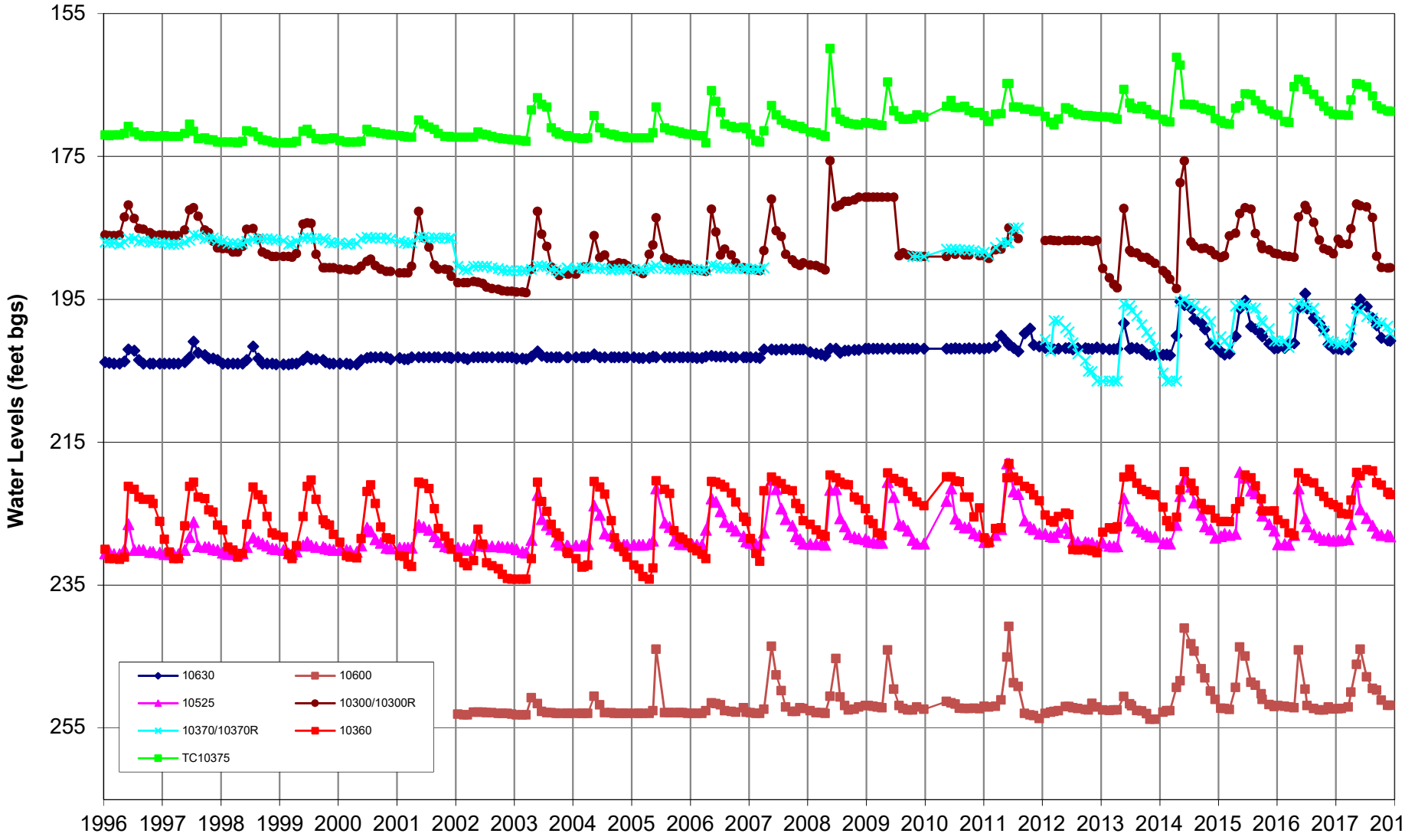

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Figure 4: Historical Water Levels in Indian and Tie Camp Rock Dump Piezometers

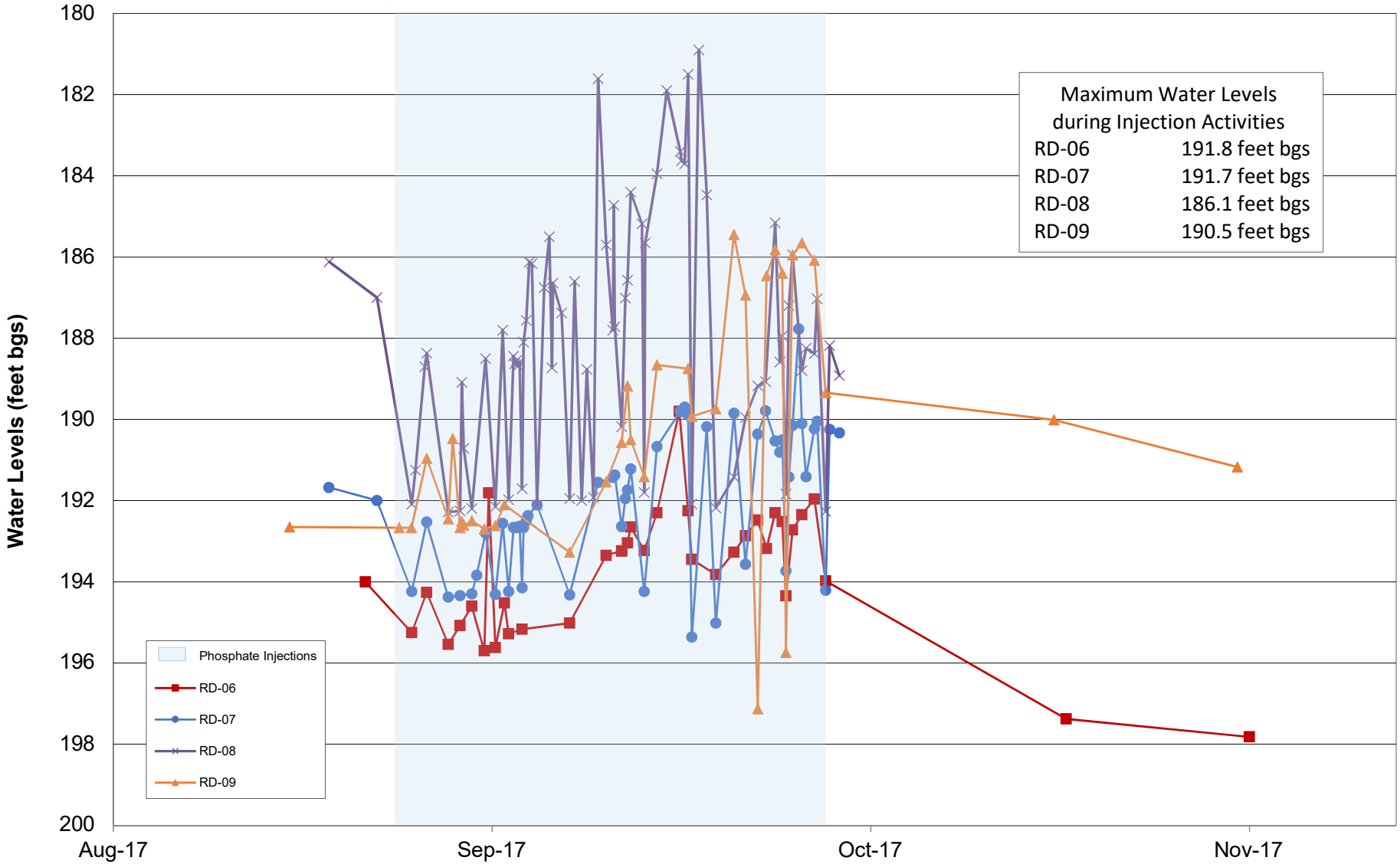

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Figure 5: Water Levels for Piezometers at the Indian Rock Dump 10300 Level

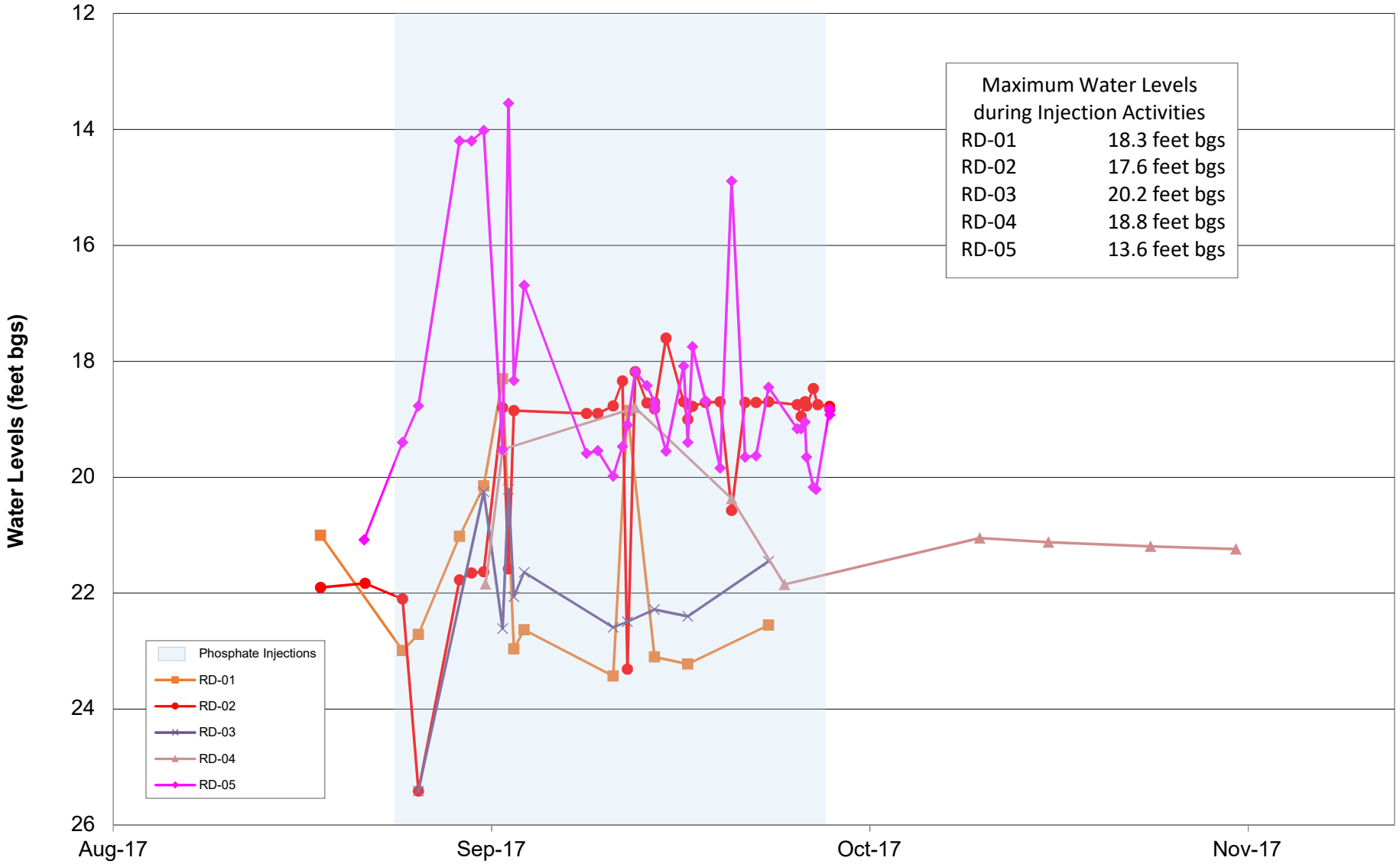

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Figure 6: Water Levels for Piezometers at the Toe of the Indian Rock Dump

COLORADO
Department of Public Health & Environment

Dedicated to protecting and improving the health and environment of the people of Colorado

Holton Burns, Director of Closure, Water Treatment and Uranium
Homestake Mining Company
PO Box 40
Sargents, CO 81248
hburns@barrick.com
ddavis@barrick.com

MEMORANDUM

TO: Homestake Mining Co

FROM: Jennifer Charles, Permit Writer 303-692-6430

DATE: 6/1/2017

RE: Approved Chemical Usage
Pitch Reclamation Project
Permit No: CO0022756

The Water Quality Control Division (the division) received a complete modification application requesting approval of various chemicals proposed for use at the Pitch Reclamation Project (CDPS permit CO0022756) on April 11, 2017; the request was submitted by the Homestake Mining Company (Homestake). In this request, Homestake proposes to use the chemicals identified in Table 1 (below) as part of their 2017 field program, which is intended to evaluate specific approaches for reducing uranium loading from the facility. Several of these chemicals were approved for use in prior chemical requests, however Homestake proposes to increase the quantity of these chemicals in the 2017 request. On April 25 and May 18, 2017, the division requested additional information pertinent to the request, which Homestake provided on May 4, 2017 and May 24, 2017, respectively. As part of the supplemental information provided to the division, Homestake removed SOLVE 127 from the list of chemicals proposed for use in 2017. The division reviewed the chemical approval request (and associated information), and approves use of the chemicals consistent with the provisions identified in this memorandum.

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Table 1 – Chemicals

Chemical Name	Purpose
Sodium monobasic phosphate	Continue to evaluate use as source control BMP for underground and rock dump
Phosphoric acid	Continue to evaluate use as source control BMP for underground and rock dump
Sodium tripolyphosphate	Evaluate use as source control BMP for rock dump
Sodium fluorescein	Tracer for injection into underground mine workings
Rhodamine WT	Tracer for injection into underground mine workings
Fish bone apatite	Evaluate use as a BMP for uranium treatment
Zero-valent iron	Evaluate use as a BMP for uranium treatment
Iron (ferric) chloride	Reaction with phosphate to limit soluble concentrations
Sodium aluminate	Reaction with phosphate to limit soluble concentrations
Calcium carbonate (limestone)	Reaction with phosphate to limit soluble concentrations, pH buffer for use with iron chloride
Calcium hydroxide (as quicklime [CaO] or slaked lime [Ca(OH)2])	Reaction with phosphate to limit soluble concentrations, pH buffer for use with iron chloride
Sodium carbonate	pH buffer for use with iron chloride
Sodium bicarbonate	pH buffer for use with iron chloride
Potassium chloride	Single piezometer tracer testing
Magnesium Oxide	Considered for further usage in drum-scale ETC testing
Cationic water soluble polymers (MM-2456, MM-2466, M2480)	Potentially used as flocculent for enhanced removal of iron and aluminum precipitates
Anionic water soluble polymers (MM2210, MM-6800)	Potentially used as flocculent for enhanced removal of iron and aluminum precipitates
SOLVE 215C (cationic water-soluble polymer)	Potentially used as flocculent for enhanced removal of iron and aluminum precipitates

Previous requests and performance

In July 2015, the division approved a chemical request from Homestake for various reagents and tracers proposed for use in conducting uranium mass load reduction pilot testing (i.e., sodium or potassium monobasic phosphate salts, phosphoric acid, sodium fluorescein, and sodium or potassium bromide). In June 2016, the division approved a subsequent chemical request for larger quantities of phosphate reagents, tracers, iron and aluminum based reagents, and solid phase reagents.

In the current chemical request, Homestake indicates that the 2015 and 2016 pilot testing reduced the concentration of uranium in the injection zone of the underground mine workings. Homestake documents that during the pilot testing, compliance with the current CDPS permit effluent limitations was maintained at SW-33 (Outfall 001), which the division verified through a review of DMRs and additional monitoring reports submitted by the permittee from July 2015 through February 2017. Additionally, Homestake indicates that the phosphorus sampling required as part of the 2015 and 2016 chemical approvals (during and following the pilot test), confirmed that phosphorus was not observed above the analytical method detection limit (<0.1 milligrams per liter [mg/l]). Total recoverable iron sampling as part of the 2016 chemical approval was not above 120 µg/l.

Current request

At present, Homestake requests approval for the chemicals identified in Table 1 to conduct expanded field testing in 2017 to continue to advance uranium load reduction alternatives towards full-scale design and implementation. Homestake will conduct the following field activities to achieve uranium load reduction downgradient of the treatment zones:

Expanded phosphate injection program. Larger scale injections will be required to achieve meaningful uranium reductions in downgradient surface water. The program will include groundwater extraction from wells, which will be piped directly to another set of monitoring wells with the addition of reagent stock solutions added to the recirculated water. Engineered treatment cell testing and treatment residuals

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management programs will be in place as control measures.

The division reviewed the MSDSs associated with the proposed chemical additives listed in Table 1, and determined the potential pollutants of concern for each chemical (see Table 2).

Table 2. Pollutants of Concern per Chemical

Chemical Name	Pollutants of Concern
Sodium monobasic phosphate	Phosphate, EC/SAR, TDS
Phosphoric acid	Phosphate, pH, TDS
Sodium tripolyphosphate	Phosphate, EC/SAR , TDS
Sodium fluorescein	pH, EC/SAR, Aquatic Toxicity, TDS
Rhodamine WT	EC/SAR, Aquatic Toxicity, Chloride
Fish bone apatite	pH, EC/SAR, TDS
Zero-valent iron	Iron, TDS
Iron (ferric) chloride	Iron, Chloride, TDS
Sodium aluminate	EC/SAR, Aluminum, TDS
Calcium carbonate (limestone)	pH, EC/SAR, TDS
Calcium hydroxide (as quicklime [CaO] or slaked lime [Ca(OH)2])	pH, EC/SAR, TDS
Sodium carbonate	pH, EC/SAR, TDS
Sodium bicarbonate	pH, EC/SAR, TDS
Potassium chloride	EC/SAR, Chloride, TDS
Magnesium Oxide	pH, EC/SAR, TDS
Cationic water soluble polymers (MM-2456, MM-2466, M2480)	pH, Aquatic Toxicity
Anionic water soluble polymers (MM2210, MM-6800)	pH, Aquatic Toxicity
SOLVE 215C (cationic water-soluble polymer)	pH, Aquatic Toxicity

Phosphate – Homestake plans to inject a total phosphate mass of 13,000 kg as PO_4 (4,240 kg as P) in 2017, which yields a maximum calculated Phosphorus concentration of 7.4 mg/l at outfall 001A (SW-33). Water quality samples obtained during the pilot studies in 2015 and 2016 with a phosphate mass of 1035 kg as PO_4 were measured at less than the detection limit of 0.1 mg/l.

Due to the proposed increase in injected phosphate mass, Homestake has committed to implementing the following operational procedures and treatment residuals management program, as provided in the May 24, 2017 correspondence:

- Operational Controls: The groundwater recirculation and dosing will be operated in a "back-recirculation" approach, in which water will be extracted from downgradient zones and reinjected upgradient. Within this approach, it is anticipated that phosphorus will be observed in re-extracted groundwater before it is observed in surface water further downgradient. If phosphorus is observed in re-extracted groundwater at levels indicating the potential for non-compliance at SW-33, the recirculation will continue with reduced/ceased phosphorus injections, in order to relocate phosphorus back upgradient for additional reaction and attenuation. As a result of these system modifications, the maximum concentration condition above will be avoided before the treatment residuals management program is initiated.

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• Treatment Residuals Management Program: If upstream total phosphorus concentrations indicate the potential for non-compliance at SW-33, the iron/aluminum reagent dosing program will be initiated. As an example, a 90% performance efficiency for removal of phosphorus would result in a decrease of the maximum concentration above to a value of 0.74 mg/L P, yielding compliance at SW-33. In practice, based on testing performed in 2016, it is anticipated that the actual phosphorus removal efficiency by iron and aluminum is expected to be over 90%.

Because of these operational and treatment controls, and Homestake's commitment to cease injection of phosphate in order to avoid exceeding the proposed regulatory limit of 1.0 mg/l as P, the division approves this increase in injected phosphate mass. Consistent with the 2015 and 2016 chemical approvals *weekly phosphorus monitoring is required. Homestake also indicated that weekly phosphorus monitoring will be conducted in Table 2 of the March 17, 2017 chemical approval request.*

EC/SAR and TDS – Many of the proposed chemicals may contribute to an increase in the EC/SAR levels of the discharge. In the information submitted to the division as part of the 2017 request, Homestake calculated that the maximum anticipated sodium concentration would be 59.6 mg/l based on the average flow rate at SW-33. EC was previously estimated by Homestake as 0.66 dS/m compared to a calculated WQBEL of 2.9 mg/l. Homestake calculated SAR at Outfall 001, including the sodium contributed from the treatment reagents, at 1.40, compared to a calculated WQBEL of 2.21 (using an EC of 0.66 dS/m). As the estimated SAR levels are more than 50% of the proposed WQBELs, quarterly monitoring is required for EC and SAR at this time.

The permit requires TDS monitoring and quarterly reporting. This requirement continues to be applicable under the new chemical approval.

pH – The permit requires pH monitoring, and establishes a limit of 6.5-9.0 s.u. This requirement and limit continue to be applicable under the new chemical approval.

Aquatic Toxicity (WET) - Many of these chemicals have the possibility to contribute to aquatic toxicity, and are being used in much higher quantities than previously applied. Therefore, the division requires that Homestake conduct the required quarterly whole effluent toxicity tests for the 2nd, 3rd and 4th quarters of 2017 during the time the field activities occur at the facility. As provided in correspondence to the division, the WET tests for the third and fourth quarter are tentatively scheduled for the week of July 10, 2017 and October 2, 2017 which will correspond with the timing of chemicals in the outfalls. Note that the automatic compliance response as required in the permit is applicable to 'report only' requirements for WET testing.

Chloride – As stated in a follow up email to the division on May 4, 2017, Homestake plans to apply a maximum total applied mass of 5000 kg of chloride. Given the dilution available, Homestake predicts these applied masses will yield a maximum chloride concentration of 95 mg/L at Outfall 001A (SW-33). As the total estimated concentration at Outfall 001 is 95 mg/l which is less than 50% of the chronic standard of 250 mg/l for Marshall Creek, the division will not require monitoring for chloride at this time.

Iron and Aluminum – Homestake plans to use zero-valent iron and ferric chloride, and sodium aluminate reagents, and will apply a maximum total applied mass of 2600 kg iron, and 2100 kg aluminum. These chemicals will be used for the "treatment residuals management program" and will be applied in the sediment control pond located immediately upstream of Outfall 001. The zero-valent iron will be used in the solid phase media engineered treatment cells.

Homestake states that the anticipated concentrations of iron and aluminum at Outfall 001 are not dependent on the total mass of the reagents applied upstream, but rather on the solubility of iron and aluminum at near-neutral pH. Homestake anticipates that pH at Outfall 001 will remain at approximately 8.3 s.u., and that at this pH, both iron and aluminum will precipitate within the sediment control pond directly upstream of Outfall 001. Homestake indicates that the sediment control pond and associated silt current will further minimize concentrations of total recoverable iron and aluminum through settling of suspended particles.

Given the applied masses, dilution ratios, and anticipated metal precipitation, Homestake estimates that the concentration for aluminum at Outfall 001 will be less than 0.3 mg/l (300 ug/l). While there is not an aluminum standard specified for Indian Creek, Regulation 31 specifies a chronic aluminum standard equal to

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e(1.3695[ln(hardness)]-0.1158) when the pH downstream of the outfall is greater than 7.0. As the Pitch Reclamation mine encompasses the entire headwaters of Indian Creek, the pH of the discharge at Outfall 001 is equal to the pH of the receiving stream, which is estimated to remain at approximately 8.3, as noted previously. At a hardness of 278 mg/l as $CaCO_3$ (estimated in the public noticed WQA), the chronic aluminum standard for the receiving stream is equal to 1438 ug/l.

Given the applied masses, dilution ratios, and anticipated metal precipitation, Homestake estimates that the concentration for total recoverable iron (from the zero-valent iron and ferric chloride reagents) at Outfall 001 will be less than 0.3 mg/l (300 ug/l). The standard for total recoverable iron in Indian Creek is equal to 1000 ug/l. The estimated concentration at Outfall 001 is less than 50% of the standard, however because of the increased masses added, and the dependency of the final total recoverable iron and aluminum concentrations at outfall 001 on both pH and settling control measures, *the division is requiring weekly monitoring for total recoverable iron and aluminum. Homestake indicated that weekly iron monitoring will be conducted in the March 17, 2017 chemical approval request.*

Based on a review of the information provided by Homestake in this request, the division approves the use of the chemicals identified in Table 1 of this correspondence consistent with the provisions identified in this memorandum, and the chemical approval request and follow up letters dated March 17, May 4, and May 24, 2017. The division determined that the use of these chemicals does not require a modification to the monitoring requirements and/or discharge limitations provided in the permit at this time. Note that all chemicals used in the treatment process that may be discharged to waters of the State must be used in accordance with all state and federal regulations, and in strict accordance with the manufacturer's instructions.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
Denver, CO 80202-1129
Phone 800-227-8917
www.epa.gov/region8

MAY 0 8 2017

Ref: 8WP-SUI

Mr. Holton Burns
Homestake Mining Company
P.O. Box 212
Toronto, Ontario Canada M5J 2S1

RE: CLASS V UIC PROGRAM
Rule Authorization: Aquifer Remediation Well
Change in Operation
Pitch Mine Reclamation Project
Saguache County
Sargents, Colorado
EPA File #CO50000-10920

Dear Mr. Burns:

The United States Environmental Protection Agency Region 8 Underground Injection Control Program staff has reviewed the application that was submitted by you or on your behalf for the Class V aquifer remediation injection well(s) at the above referenced location. Based on our understanding of the proposed program and limited potential for groundwater contamination, we have determined that a permit is not necessary at this time. Therefore, the change(s) proposed is currently "authorized by rule" in accordance with Title 40 Code of Federal Regulations (40 CFR) Sections 144.24 and 144.84(a). This authorization is based on information provided in your application and is valid for:

> injections of phosphate reagent and tracers into 3 new injection wells and 2 existing wells within the underground mine workings in a manner as described in your application, and is limited to the location(s) indicated in the application that we received on March 24, 2017.

All injection wells are regulated under the UIC Program in accordance with 40 CFR Parts 144 and 146, which have been promulgated under Part C of the Safe Drinking Water Act, 42 United States Code Sections 1421 through 1428. Your Class V injection well(s) is subject to periodic compliance Inspections which may include sampling and analysis of your fluids. Finally, be aware that under 40 CFR Sections144.12(c), (d), and (e), the EPA can require you to apply for a permit or close your injection well(s) under certain circumstances.

Please notify us if the potential for groundwater contamination increases. If you intend to change the proposed plan, please notify us in advance. Any changes in operating methods or any other conditions that may adversely impact groundwater MUST be approved in advance by the EPA.

Failure to comply with the above requirements will result in violations of UIC regulations and possible enforcement actions and penalties.

Please be advised that this rule authorization, change in operations, pertains solely to the UIC Program and does NOT relieve you from satisfying any other federal, state or local regulations that may apply.

Please contact Dennis Hotovec at (800) 227-8917, extension 312-6582 or (303) 312-6582, if you have any questions or need more information. More information on the EPA Region 8 Class V program can also be found online at:
http://www.epa.gov/uic/underground-injection-control-epa-region-8-co-mt-nd-sd-ut-and-wy

Sincerely,

Douglas Minter
UIC Unit Chief
Office of Partnerships and Regulatory Assistance

cc: Dale Davis
Homestake Mining Company
P.O. Box 40
Sargents, Colorado 81248

COLORADO
Department of Public
Health & Environment

Dedicated to protecting and improving the health and environment of the people of Colorado

June 15, 2017

Homestake Mining Company of California
P.O. Box 98, Grants,
New Mexico 87020

Attention: Randy Whicker, Radiation Safety Officer

Re: License Amendment - Colorado Radioactive Materials License Number CO 150-01

Enclosed is Radioactive Materials License Number CO 150-01, Amendment No. 16. The license has been amended as requested in correspondence from Dale Davis on behalf of Holton Burns dated March 28, 2017. Please review this document thoroughly.

Additionally, your license has been amended based on Departmental changes to the appearance and content of licenses. While most changes are of a formatting nature, there are also requirements that have been added, strengthened, or clarified in the license. Also, in some instances, license conditions may have been removed from the license where equivalent requirements have been incorporated into the Regulations. Again, we encourage you to review the license thoroughly and contact us should you have questions.

Please note that the mailing address, use location(s), maximum quantities of radioactive materials, and the radiation safety officer are specific conditions of your license. If you have questions about making changes to your licensed activities, please contact the Radiation Management Unit to discuss the requirements for an amendment of your license.

If you have any questions regarding this letter or your license please contact Shiya Wang at 303-692-3447 or shiya.wang@state.co.us. Additional questions or comments can be directed to me at 303-692-3371 or james.grice@state.co.us.

James H Grice III
Unit Leader
Radioactive Materials Unit
Hazardous Materials and Waste Management Division

Enclosure: CO 150-01, Amendment No. 16

CC: Dale Davis, Pitch site Manager

COLORADO
Department of Public Health & Environment

RADIOACTIVE MATERIALS LICENSE

Pursuant to the *Colorado Radiation Control Act*, Title 25, Article 11, *Colorado Revised Statutes*, and the State of Colorado *Rules and Regulations Pertaining to Radiation Control* (the Regulations) and in reliance on statements and representations heretofore made by the licensee designated below; a license is hereby issued authorizing such licensee to transfer, receive, possess and use the radioactive material(s) designated below; and to use such radioactive material(s) for the purpose(s) and at the place(s) designated below. This license is subject to all applicable rules, regulations, and orders now or hereafter in effect of the Colorado Department of Public Health and Environment and to any conditions specified below.

1. Licensee: Homestake Mining Company of California

2. Mailing Address: P. O. Box 98, Grants, New Mexico 87020

3. License Number: 150-01, Amendment Number 16

4. Expiration date: April 30, 2018

5. Authorized Storage/Use Location: approximately 10 miles east of Sargents, Colorado in portions of Sections 29, 30, 31, and 32, T48N, R6E, New Mexico Principal Meridian. Specifically, in the clay-lined and bermed low-grade ore stockpiles situated on the Indian Creek and Tie Camp waste rock-disposal sites and in a storage cell at the toe of the Indian Creek waste rock disposal site; and the sediment collection pond and associated embankment.

6. Designated Radiation Safety Officer(s): Randy Whicker

7. Radiation Safety Officer Contact Number: (970) 556-1174

8. Fee Category: 3.Q

9. Reference Number: SUA-940 (Pinnacle Exploration Company)

CONDITIONS

10. Authorized Radioactive Material and Uses:

    A. The licensee is authorized to possess any amount of naturally occurring uranium-series radionuclides, in particular the Radium-226 isotope in any naturally-occurring form contained in soils, sediments, and water. The licensee is authorized to maintain the sediment collection capabilities and, as required by final project closure, properly dispose of sediment in the sediment collection pond or in an on-site disposal cell.

11. Authorized Radioactive Material Users:

A. Radioactive material shall be handled by the RSO, or by individuals designated as users under the supervision of the RSO.

B. The licensee shall maintain a list of all individuals currently authorized to use radioactive materials. This list and documentation of each authorized user's training shall be available for review by the Department.

C. The licensee shall maintain at least one authorized user, which shall include the RSO, until termination of the license.

D. An authorized user shall be at the facility or immediately available at all times during licensed related activities.

E. Prior to designating an individual as RSO, the licensee shall provide the Department with documentation of the individual's training and experience.

F. Refresher training in health physics is required at least every two years for the RSO. The licensee shall maintain documentation of the date and content of the refresher training for review by the Department.

12. General Requirements:

A. The licensee shall comply with the provisions of the State of Colorado *Rules and Regulations Pertaining to Radiation Control*: Part 1, "General Provisions"; Part 3, "Licensing of Radioactive Material"; Part 4, "Standards for Protection Against Radiation"; Part 10, "Notices, Instructions and Reports to Workers; Inspections"; and Part 17, "Transportation of Radioactive Material".

B. Unless otherwise provided in this license, terms used herein are as defined in the Regulations.

C. The licensee shall not transfer possession and/or control of radioactive materials or items contaminated with radioactive material except: by transfer of waste to an authorized recipient; by transfer to a specifically licensed recipient; or, as provided otherwise by specific condition of this license pursuant to the requirements of Part 3, Section 3.22 of the Regulations.

D. Radioactive material authorized by Condition 10 of this license shall be stored and used in a manner that will preclude use by unauthorized personnel.

E. The licensee shall ensure that information listed in this license is correct and accurate. The licensee shall notify the Department in writing within ten (10) days whenever the information contained in Items 1 through 7 above is no longer current or determined to be incorrect.

F. The licensee may not transport radioactive material off site nor deliver radioactive material to a carrier for off-site transport, except for small quantities used to characterize site materials.

G. Within the scope of applicable statutes and lawful regulations thereunder, the licensee shall operate in full compliance with the requirements of each other division of the Department. Violation of such other requirements shall not by itself constitute violation of this license, unless the Department makes an independent finding of violation of the Regulations, or a condition of this license.

H. Where statements in referenced documents conflict, the most recent document shall prevail unless the Department determines otherwise.

I. The licensee shall not make any false statement, representation, or certification in any application, record, report, plan, or other document regarding radiation levels, tests performed or radiation safety conditions or practices.

J. The licensee shall not make any false statement, representation, or certification in any application, record, report, plan, or other document regarding radiation levels, tests performed or radiation safety conditions or practices.

K. When required, Department "approval", "authorization", or "concurrence" shall be obtained in writing from the Department, unless otherwise specified.

L. If any part of this license is held invalid, the remainder shall not be affected.

13. Occupational Dose Monitoring:

A. Dose monitoring and evaluation shall be consistent with License Condition 14.B.

14. Specific Radiation Safety Requirements:

A. Posting Exemption

The licensee is hereby exempted from the requirements of Part 4.28 of the Regulations for areas within any exclusion area boundary, provided all entrances to the property are conspicuously posted with the sign:

"Any Area or Container on this Property
May Contain Radioactive Materials."

B. Environmental, Health, and Safety Procedures Manual

The licensee shall operate according to and maintain a comprehensive written environmental, health, and safety procedures manual, approved by the Department, governing licensed activities. The procedures manual shall contain safety, monitoring, decontamination, and emergency procedures, including:

1) Administrative and operating procedures relating to radiological health and safety;

2) Instructions and precautions to keep exposures and releases ALARA;

3) Specific information on analytical equipment, laboratories, and procedures for each aspect of the monitoring program;

4) All procedures manual revisions shall be submitted to the Department for review and approval prior to implementation; and

5) No reduction in monitoring provisions shall be made without Department approval.

C. Reports of Accidents

1) Immediately upon discovery of any failure, or imminent threat of failure, in any process, diversion, or retention system which results or may result in a release of radioactive material into unrestricted areas, the licensee shall notify the Department by telephone at (303) 877-9757 (24-hour, 7-day emergency number).

2) The licensee shall document and maintain records for all incidents, accidents, and emergencies. The documentation shall be available for review by the Department.

D. Emergency Response

The licensee shall use plans approved by the Department to respond to emergencies such as radioactive material spills or treatment pond embankment failure. These plans shall include provisions for warning of personnel and for prompt retrieval of radioactive material released to uncontrolled areas.

15. Special License Requirements:

A. The licensee shall not operate any on-site water treatment plant without Department approval through a license amendment.

B. Financial Warranty:

The licensee shall maintain in effect a financial warranty acceptable to the Department in accordance with the requirements of Part 3.9.5 of the Regulations:

1) The licensee shall maintain in force a surety pursuant to Part 3 of the Regulations for decommissioning, decontamination, and reclamation of the site; past and present transport routes to the sediment pond; the on-site disposal areas; and the radioactivity-laden fraction of pond sediments.

2) License Condition 16.F specifies provisions in effect, as provided by the financial warranty for Division of Reclamation, Mining, and Safety Permit M1977-004, totaling $2,263,000.

3) Department incorporation into this license of the licensee's Financial Warranty for Permit M1977-004 relies on Part 3.9.5.4.5 of the Regulations and the Memorandum of Understanding between the Department and the Division of Reclamation, Mining, and Safety of the Department of Natural Resources.

4) Any surety agreement and surety instruments required by this license shall be subject to annual review for adequacy by the Department, and such other agencies as the Department designates, in accordance with Part 3.9.5.7 of the Regulations. Cost estimates may be adjusted upward or downward as current circumstances (including, but not limited to, inflation, regulations, technology, and work completed) require. The licensee shall submit proposed changes by June 30th each year.

5) The license and adequate surety shall remain in effect until final reclamation complies with applicable State and Federal regulations and final action on release is taken by the Department as provided by the license and financial assurance agreements between the licensee and the State.

6) Prior to seeking release of surety pursuant to this license, the licensee shall notify the Department of the request for release. The licensee shall also notify the Department of any intent to request modification, reduction or release of this surety. Upon determination by the Department that reclamation has been performed in compliance with this license, the Regulations, and the State law, the licensee shall be released from the surety requirements.

C. Recordkeeping requirements

1) The results of sampling, analyses, surveys, instrument calibrations, inspections, and audits, employee training, as well as any related reviews, investigations and corrective actions shall be documented and stored. The licensee shall maintain adequate safeguards against tampering and loss of records.

2) All such documentation shall be maintained until disposition is authorized by the Department. Personnel exposure records shall be preserved indefinitely.

D. The licensee shall, for the previous year ending December 31st, provide the Department by March 31st of each year, a report consisting of a letter that states that no activity took place, or describing any activity that took place. A copy of the Reclamation Report to the Division of Reclamation, Mining, and Safety within the Colorado Department of Natural Resources shall be provided to the Department annually.

E. Remedial Action

1) Prior to site closure, to assess radum-226 concentrations in all Radium Treatment Plant (RTP) drainage channels, the licensee shall conduct a soil and sediment sampling program approved by the Department. The risk assessment used for the removal of soils at the RTP will form the basis for clean up levels in the sediment pond.

2) Sediment pond solids shall be disposed of in place or within the on-site disposal cells in accordance with a design approved by the Division of Reclamation, Mining, and Safety as per License Condition 16.C and 16.D. If it is deemed viable to dispose of the solids within a disposal cell in the sediment pond area, an engineering design report will be prepared and submitted to the Department for approval. Disposal of any soils and sediments containing radium-226 concentrations above applicable standards shall be by a program approved by the Department. Any disposal on-site shall require a license amendment analogous to the action authorized by Amendment 08, which was effective August 15, 1994.

3) These decommissioned areas shall be returned to unrestricted use by decontamination to background radiation and toxic contaminant ranges acceptable to the Department, based on statistically defensible tests of contamination with depth, in accordance with applicable State and Federal regulations and policies in effect at the time.

F. Surface water at the Colorado Discharge Permit System discharge point shall be sampled at least quarterly and analyzed for natural uranium, dissolved radium-226, and suspended radium-226.

G. Change of Ownership

1) In furtherance of Part 3.15.2 of the Regulations, the licensee shall provide the Department with ninety (90) days advance notification of any proposed change in ownership or control of all properties used or to be used for activities authorized by this license.

2) The licensee may not transfer ownership or vacate any portion of the licensed site(s) without prior written authorization from the Department.

H. Bankruptcy

The licensee shall notify the Department, in writing, immediately following the filing of a voluntary or involuntary petition for bankruptcy under any Chapter of Title 11 (Bankruptcy) of the United States Code by or against:

1) The licensee;

2) An entity [as that term is defined in 11 U.S.C. 101 (14)] controlling the licensee or listing the licensed facility or licensee as property of the estate; or

3) An affiliate [as that term is defined in 11 U.S.C. 101 (2)] of the licensee.

This notification must indicate the bankruptcy court in which the petition for bankruptcy was filed and the date of the filing of the petition.

16. Licensee Commitments and Reference Documents:

The State of Colorado *Rules and Regulations Pertaining to Radiation Control* shall govern unless the licensee's statements, representations, and procedures contained in the application and correspondence are more restrictive than the Regulations. Except as specifically provided otherwise by this license, the licensee shall possess and use radioactive material described in Condition 10 of this license in accordance with the statements, representations, and procedures contained in:

A. License Renewal Application dated March 13, 2008, and March 15, 2013 and the correspondences; and

B. Division of Reclamation, Mining, and Safety permit, including Homestake's original 1977 application to this Division's predecessor the Mined Land Reclamation division (MLRD), as amended by the Homestake letters of January 16, August 31, and October 19, 1984 to MLRD, and as subsequently approved by the MLRD or Division of Reclamation, Mining, and Safety; and

C. Letter with attachment of May 3, 1989 from John Hardaway of Homestake to Edd Kray of the Department containing revised reclamation and surety commitments; and

D. Request for Amendment dated May 31, 1994; and

E. Letters with attachments dated June 2, 1994 and July 31, 1994 from Luke Russell of the Homestake Mining Company to Bruce Humphries and James Dillie of the Division of Minerals and Geology containing revised reclamation plans; and

F. Application for renewal submitted January 8, 1998; and

G. *Verification Sampling for Radium Treatment Plant Cleanup of the Pitch Reclamation Project* report by Shepherd Miller dated April 2002; and

H. Request for Amendment dated April 1, 2004; and

I. Request for RSO change dated March 28, 2017; and

J. ALARA Policy and Radiation Safety Operating Procedures dated June 2013.

FOR THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Date: 06/15/2017 By: _____

HOMESTAKE

PITCH RECLAMATION PROJECT

15 March 2018

Colorado Dept. of Public Health and Environment
Hazardous Materials and Waste Management Division
Radiation Management Program
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

Attn: Ms. Jennifer T. Opila – Radiation Program Manager

RE: Annual Letter Report – Pitch Reclamation Project Radioactive Materials License No. 150-012013

Dear Ms. Opila:

Radioactive Materials License (RML) Number (No.) 150-01, Amendment No. 15, Condition 15.D requires Homestake Mining Company of California (HMC) submit a letter report each year describing activities that took place at the Pitch Reclamation Project in the previous year, or no activities, as appropriate. License Condition 15.D also states that a copy of the Annual Reclamation Report issued to the Division of Reclamation, Mining and Safety (DRMS) within the Colorado Department of Natural Resources is to be provided to the Hazardous Materials and Waste Management Division, and License Condition 15.B (errata) provides that adequate surety be maintained. HMC hereby submits this letter report that documents license-related and other activities performed during 2017, planned activates for 2018, and surety information.

In addition to ongoing maintenance at the Pitch site, the following activities were undertaken in 2017:

- Monitored water levels in piezometers within and adjacent to the historical Pinnacle Mine underground workings.
- Conducted geotechnical monitoring of surface monuments in the east and south walls of the North Pit and the east wall of the South Pit area.
- Monitored slope inclinometers on the south wall of the North Pit and the crest of the east wall of the North Pit.
- Monitored the piezometers in the Indian and Tie Camp rock dumps.

- Monitored erosion repair and re-vegetation on the Indian and Tie Camp rock dumps.

- Monitored and maintained the surface drainage ditch on 10800 level of the east wall of the North Pit installed in 2011.

- Inspected and monitored surface monuments and piezometers in the Sediment Control Embankment.

- Monitored surface water discharges at the compliance point (Outfall 001A, also known as SW-33) in accordance with the Colorado Department of Public Health and Environment Water Quality Control Division (WQCD) Colorado Discharge Permit System (CDPS) permit # CO0022756.

- Inspected cover repair completed in 2011 on the drainage channel on the Tie Camp Low Grade Ore Stockpile/Disposal Cell.

- Inspected site for noxious weeds and sprayed approximately 6 acres for Canadian Thistle and Scentless Chamomile using 175 gallons of herbicide.

- Continued evaluating source control/treatment approaches to achieve uranium load reduction at SW-33 with the objective of defining the “Lowest Practical Level” (LPL) for uranium in Indian Creek. This included construction of two treatment systems installed to facilitate injection of a mixture of phosphoric acid and sodium monophosphate in the underground mine workings and Indian rock dump which immobilized dissolved uranium through phosphate precipitation. Non-reactive tracers, fluorescein or rhodamine WT, were also injected to aid in system performance assessment.

- Completed three new piezometers (P-13, P-14 and P-15) into the backfilled underground workings and five new piezometers (RD-05, RD-06, RD-07, RD-08, and RD-09) into and near the toe of the Indian rock dump to support LPL-related phosphate injections and performance monitoring. Piezometer installation was approved in a letter dated April 24, 2017 by the Colorado Division of Reclamation, Mining, and Safety (DRMS) under Technical Revision 8 (TR-8) of the Reclamation Permit No. M-1977-004. In addition, three new inclinometers (IN-1, IN-2, and IN-3) were installed in the Indian rock dump to support slope monitoring activities.

    - Activities associated with piezometer completion were conducted under my supervision (Randy Whicker, Radiation Safety Officer) following applicable policies and procedures in the Pitch Reclamation Project Manual of Standard Practices, and a Radiation Work Permit (RWP) dated June 15, 2017 for use as special instructions.

- Injected 1,844,000 gallons of recirculated groundwater containing a mixture of phosphoric acid and sodium monophosphate, using both the new and existing piezometers, into the underground workings and Indian rock dump areas. Chemical usage was approved by the Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division (WQCD) as documented in a memorandum dated June 1, 2017. Injection activities were also approved by the USEPA Region 8 Underground Injection Control (UIC) as documented in a letter dated May 8, 2017. Surface disturbance activities were approved by DRMS under TR-8 of the Reclamation Permit No. M-1977-004.

- Installed an in-ground zero-valent iron (ZVI) engineered treatment cell (ETC) adjacent to the Tie Camp drainage (3 feet deep, 5 feet wide, and 15 feet long) with approximately 33,000 pounds of blended ZVI media (65% iron and 35% sand). 330,000 gallons of water were rerouted from the Tie Camp drainage through the in-ground ETC to remove dissolved uranium prior to discharge into the Sediment Pond via Tie Camp drainage.

- Additional ETC reactive media were tested in two above-ground 55-gallon drum-scale ETCs (biochemical reactors) adjacent to the Tie Camp drainage. ETC reactive media consisted of a combination of organic-based reactive media (woodchips, manure, hay) and ZVI.

- Although compliance with the CDPS permit conditions and terms of the chemical approval was maintained at SW-33, with phosphorus concentrations not observed above 0.1 milligrams per liter (mg/L) in surface water, a treatment residuals management program was installed on Indian drainage between the toe of the Indian rock dump and the Sediment Pond and a system operations test was performed. In combination with bench tests, the field operations test demonstrated the feasibility and utility of an iron/aluminum-based strategy for removal of residual phosphate in surface water, if this system becomes necessary.

- Installed a silt curtain (a 300-foot geosynthetic curtain) at the Sediment Pond near the SW-33 outlet to control suspended solids in support of the treatment residuals management program.

- Conducted surface water management activities to advance water segregation approaches and determine associated implications. This included diversion of water from the east wall of the North Pit around the North Pit Lake via rerouting of water within the existing 10600 drainage ditch, drawdown of the North Pit Lake, and depth profiling of the North Pit Lake following drawdown. Following these activities, diverted water was rerouted back to the North Pit Lake and the North Pit Lake was refilled.

Water quality monitoring at the Pitch site during 2017, as required under CDPS Permit No. 000022756, demonstrated that discharges were within the permit limits as established by the WQCD.

All monitoring data, inspection records, employee training records, RWPs, as well as all RML related activities, reviews, investigations, and corrective actions (if any) are documented, stored, and maintained at the Pitch field office in Sargents, and are available for review upon request.

Anticipated activities in 2018 at the Pitch Reclamation Project will include the following:

- Continue inspection of the cover repair work completed in 2011 on the Tie Camp Low Grade Ore Stockpile/Disposal Cell.
- Continue inspection of roads and surface drainage within the Pitch site and repair as needed.
- Continue monitoring water levels in piezometers installed into and adjacent to the underground mine workings.
- Continue monitoring of phreatic surface water levels in the Indian and Tie Camp rock dumps.
- Visually inspect and monitor phreatic surface water levels and crest monuments of the Sediment Control Embankment.
- Collect water quality samples at SW-33 and report results as required by the CDPS permit conditions.
- Continue monitoring the surface monuments and inclinometers in the North Pit and South area.
- Continue site and facilities maintenance and weed control, as required.
- Continue advancement of uranium load reduction Best Management Practices (BMPs) at select locations across the Pitch site to determine an achievable and sustainable uranium LPL on Indian Creek. Detailed work plans are being developed and will be incorporated into the approvals/authorizations to be submitted to EPA, DRMS and the WQCD. Planned activities include:
    - Installation of additional piezometers in the underground mine workings for expansion of target treatment area.
    - Installation of an above-ground ETC for treatment of the Chester Fault Seeps which express from the underground mine workings.

- Continued development and testing of a treatment residuals management program employing iron- and aluminum-based reagents and polymer flocculants that will be effective in removing residual dissolved phosphate if phosphate occurs in surface water resulting from underground injections.

- Continued monitoring of treatment and source control at select piezometers and surface water locations across the Pitch Reclamation Project and at SW-33.

- Investigation of potential discrete uranium sources at the site. Temporary boreholes may be advanced, and piezometers may be installed at select locations.

- Additional investigations may be conducted to evaluate the feasibility of water diversions, covers, and drainage improvements for reducing uranium loads.

The 2018 field activities summarized above will follow the applicable policies and procedures in the Pitch Reclamation Project Manual of Standard Practices and special instructions will be documented by task specific RWPs.

Similar to 2017, all activities planned for the 2018 LPL work will be provided to the appropriate agencies for approvals, including:

- DRMS approval through a Technical Revision to the Reclamation Permit No. M-1977-004.
- CDPHE WQCD approval of proposed chemical usage.
- USEPA UIC Program approval of proposed injection activities.

Pursuant to License Conditions 15.B and 15.D, respectively, a surety bond of $2,263,000 is maintained for the Pitch Reclamation Project with Safeco Insurance Company of America. A copy of the surety bond is included in the Annual Reclamation Report due to DRMS in mid-April each year. A complete copy of the report is provided to the Hazardous Materials and Waste Management Division.

If you have any questions or require further information regarding this submittal, please contact me at 970-556-1174 or Dave Wykoff, Pitch Reclamation Coordinator, at 970-641-4541.

Sincerely,

Randy Whicker, RSO
Homestake Mining Company of California
Radiation Safety Officer
Pitch Reclamation Project

CC: C. Burton – Homestake
A. Sarman - Homestake
D. Wykoff – Homestake
P. DeDycker – Arcadis
file

COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

MINERALS PROGRAM INSPECTION REPORT
PHONE: (303) 866-3567

The Division of Reclamation, Mining and Safety has conducted an inspection of the mining operation noted below. This report documents observations concerning compliance with the terms of the permit and applicable rules and regulations of the Mined Land Reclamation Board.

MINE NAME: Pitch Project	**MINE/PROSPECTING ID#:** M-1977-004	**MINERAL:** Uranium	**COUNTY:** Saguache
INSPECTION TYPE: Monitoring	**INSPECTOR(S):** Dustin M. Czapla	**INSP. DATE:** June 14, 2017	**INSP. TIME:** 08:30
OPERATOR: Homestake Mining Company	**OPERATOR REPRESENTATIVE:** Dale Davis	**TYPE OF OPERATION:** 112d-1 - Designated Mining Operation	

REASON FOR INSPECTION: Normal I&E Program	**BOND CALCULATION TYPE:** None	**BOND AMOUNT:** $2,263,000.00
DATE OF COMPLAINT: NA	**POST INSP. CONTACTS:** None	**JOINT INSP. AGENCY:** None
WEATHER: Clear	**INSPECTOR'S SIGNATURE:**	**SIGNATURE DATE:** June 26, 2017

GENERAL INSPECTION TOPICS

This list identifies the environmental and permit parameters inspected and gives a categorical evaluation of each. No problems or possible violations were noted during the inspection. The mine operation was found to be in full compliance with Mineral Rules and Regulations of the Colorado Mined Land Reclamation Board for the Extraction of Construction Materials and/or for Hard Rock, Metal and Designated Mining Operations. Any person engaged in any mining operation shall notify the office of any failure or imminent failure, as soon as reasonably practicable after such person has knowledge of such condition or of any impoundment, embankment, or slope that poses a reasonable potential for danger to any persons or property or to the environment; or any environmental protection facility designed to contain or control chemicals or waste which are acid or toxic-forming, as identified in the permit.

(AR) RECORDS---------- Y	(FN) FINANCIAL WARRANTY-------- N	(RD) ROADS---------- Y
(HB) HYDROLOGIC BALANCE---------- Y	(BG) BACKFILL & GRADING---------- Y	(EX) EXPLOSIVES--------- N
(PW) PROCESSING WASTE/TAILING---- N	(SF) PROCESSING FACILITIES------- Y	(TS) TOPSOIL---------- Y
(MP) GENL MINE PLAN COMPLIANCE- Y	(FW) FISH & WILDLIFE---------- Y	(RV) REVEGETATION---- N
(SM) SIGNS AND MARKERS---------- Y	(SP) STORM WATER MGT PLAN---- N	(CI) COMPLETE INSP---- Y
(ES) OVERBURDEN/DEV. WASTE--------- N	(SC) EROSION/SEDIMENTATION--- Y	(RS) RECL PLAN/COMP-- Y
(AT) ACID OR TOXIC MATERIALS------- Y	(OD) OFF-SITE DAMAGE---------- N	(ST) STIPULATIONS------- N

Y = Inspected and found in compliance / N = Not inspected / NA = Not applicable to this operation / PB = Problem cited / PV = Possible violation cited

OBSERVATIONS

This inspection was conducted as part of the Division of Reclamation, Mining and Safety's (Division) normal monitoring program. Dale Davis, representing the Operator, was present during this inspection. Photographs are included with this report in order to illustrate some of the conditions observed.

The mine is located approximately six miles east of Sargents in Saguache County and accessed from Marshall Pass Road. The site is a 112d operation that includes a total of 2,912 permitted acres. The Division currently holds a financial warranty amount of $2,263,000 for this site.

Adequate mine identification signage was noted at the entrance to the site.

Roads: No problems were noted with any of the internal roads. The roads are well maintained. The repair work completed in 2015 on the failed portion of the access road appears stable. The repair area has been seeded, but vegetation is not yet well established.

Tie Camp Rock Dump: The slope below the access road still appears stable. Vegetation is well established on the slope.

Tie Camp Disposal Cell: Slopes are stable in this area and vegetation is well established. Several mule deer were feeding in this area during the inspection.

South Pit: The phosphate injection program continues in this area. Several more boreholes, as approved through TR-8, are to be drilled this season in this area. There has been some slope failure in the upper part of the south pit area. The failure affects approximately 0.75 acres. This is an area of recurring failure, so the operator plans to drill a borehole in the slope this season in order to better understand the failure so that a more permanent fix can be developed. The failure poses no risk to public safety.

North Pit: Slope movement above the North Pit continues to be monitored. A final reclamation/stabilization plan is not yet developed for this area. Efforts are ongoing to control erosion and drainage on the east wall of the north pit.

Discharge from the North Pit Lake flows through the valve and culvert as designed. The Pinnacle Portal continues to discharge and flow is measured through a v-notch weir. The discharge reports to a marsh area above the facilities shop building.






Indian Rock Dump: Slopes appear stable and vegetation is becoming well established. No significant erosional features were noted. Additional drilling will take place on the slope this season as part of the phosphate injection program. Inclinometers are to be installed on the slope as well, as proposed in TR-8.

Sediment Pond: The sediment pond appears functional and the pond slopes appear stable. A surface filter boom placed at the upper end of the pond is maintained and still in place. No seepage or stability concerns were noted around the dam.

No problems or violations were noted during this inspection.

Responses to this inspection report should be directed to Dustin Czapla at the Division of Reclamation, Mining and Safety, Grand Junction Field Office, 101 South 3rd Street, Room 301, Grand Junction, Colorado 81501, phone number (970) 243-6299.

Inspection Contact Address

Bill Ferdinand
Homestake Mining Company
460 West 50 North, Suite 500
Salt Lake City, UT 84101

APPENDIX B

LETTER OF SURETY

STATE OF COLORADO

DIVISION OF MINERALS AND GEOLOGY
Department of Natural Resources

1313 Sherman St., Room 215
Denver, Colorado 80203
Phone: (303) 866-3567
FAX: (303) 832-8106

FINANCIAL WARRANTY
CORPORATE SURETY

Operator: Homestake Mining Company

Operation: Pitch Mine

Permit No.: M77-004 Bond No.: 6068126

Warrantor: Safeco Insurance Company of America

Street: 400 Taylor Blvd.

City: Pleasant Hill

State: California Zip Code: 94523

Area Code: 925 Telephone: 969-2000

KNOW ALL MEN BY THESE PRESENTS, THAT:

WHEREAS, the Colorado Mined Land Reclamation Act, C.R.S. 1973, 34-32-101 et seq. (the "Act"), as amended, provides that no permit may be issued under the Act until the Mined Land Reclamation Board (the "Board") receives a Financial Warranty (or Warranties) as described in the Act.

WHEREAS, Homestake Mining Company (the "Operator"), a California corporation, has applied for a permit to conduct a mining operation known as Pitch Mine (the "Operation"), on certain lands in Saguache County, Colorado. These lands are described in the permit application, as amended and supplemented, and are referred to herein as the "Affected Lands".

WHEREAS, in the application for the permit, the Operator has agreed to be bound by all requirements of the Act and all applicable rules and regulations of the Board, as amended from time to time.

WHEREAS, in the application for the permit, the Operator has agreed with the Board to provide for reclamation of the Affected Lands that are now, or may become, subject to the permit, as required by law.

WHEREAS, the Operator and Safeco Insurance Company of America (the "Warrantor"), a corporation organized and existing under the laws of the State of Washington and duly authorized to transact a bonding and surety business in the State of Colorado are hereby and firmly bound unto the State in the sum of Two Million Two Hundred Sixty Three Thousand and no/100ths---------- Dollars ($2,263,000.00) for the life of mine or until such time as replacement is received, for the payment of which sum, well and truly made, we hereby bind ourselves and our personal representatives, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Board has determined, in accordance with the Act, that the estimated costs of reclamation of the Affected Lands are those amounts for the stated periods of time as set forth herein. Said amount may be amended from time to time to reflect revised estimates of said costs of reclamation.

WHEREAS, the Operator and the Warrantor, in accordance with the Act, has promised and hereby promises the Board that it will be responsible for all the estimated costs of reclamation with regard to the Affected Lands.

WHEREAS, the Board has determined that this Financial Warranty by the Warrantor equals the estimated costs of reclamation, as approved by the Board, with regard to the Affected Lands.

NOW, THEREFORE, the Operator and the Warrantor are held hereby firmly unto the State of Colorado in the amount of those sums for those periods of time as set forth herein, until this Financial Warranty is amended or released in accordance with applicable law.

The Board may, for good cause shown, increase or decrease the amount and duration of this Financial Warranty. The Operator shall have sixty (60) days after the date of notice of any such adjustment to increase the surety amount, but no such increase shall bind the Warrantor unless and until it shall have consented thereto in writing by the issuance of an additional Financial Warranty or by an endorsement to this Financial Warranty.

The Operator and the Warrantor shall notify the Board immediately of any event which may impair this Financial Warranty. If the Board receives such notice, or otherwise has reason to believe that this Financial Warranty has been materially impaired, it may convene a hearing in accordance with the Act for the purpose of determining whether impairment has occurred.

The obligation of the Operator and the Warrantor shall continue until the Board has released this Financial Warranty or has ordered it forfeited in accordance with applicable provisions of the Act. It is understood that periods of years may necessarily be required before determination can be made that reclamation of the Affected Lands has been satisfactorily completed. It is also recognized that, as reclamation is accomplished, the amount of this Financial Warranty may be reduced with the approval of the Board so that it reflects the then current estimated cost of the remaining reclamation of the Affected Lands. No revision, extension, or renewal of the permit, or of the time allowed to complete reclamation, shall diminish the Operator's or Warrantor's obligation under this Financial Warranty. No misrepresentation by the Operator which may have induced the Warrantor to execute this Financial Warranty shall be any defense to demand by the State under this agreement.

In any single year during the life of the permit, the amount of the Financial Warranty shall not exceed the estimated cost of fully reclaiming all lands to be affected in said year, plus all lands affected in previous permit years and not yet fully reclaimed. Reclamation costs shall be computed with reference to current reclamation costs.

The amount of this Financial Warranty is based upon estimates as to the cost of reclamation, and does not operate to liquidate, limit, enlarge or restrict the Operator's obligations to complete reclamation and to comply in all respects with the permit and with applicable laws and regulations governing reclamation, even though the actual cost thereof may substantially exceed the amount of this Financial Warranty.

The Warrantor shall not be liable under this Financial Warranty for an amount greater than the sum designated herein, unless increased by a later amendment to this Financial Warranty. This Financial Warranty shall be reviewed by the Board from time to time, and the Board may require an increase in the principal sum of this Financial Warranty (and a corresponding increase in the surety amount) to cover increases in the estimated costs of reclamation, but no such increase shall bind the Warrantor unless and until it shall have consented thereto in writing by the issuance of an additional Financial Warranty or by an endorsement to this Financial Warranty.

The Warrantor reserves the right to cancel this Financial Warranty, effective only upon an anniversary date, and only by giving written notice to that effect, mailed by Certified Mail, at least ninety (90) days prior to such anniversary date, addressed to both the Operator at its address herein stated, and to the Board at the address herein stated. In the event of such cancellation, this Financial Warranty shall nevertheless remain in full force and effect as respects the reclamation of all areas disturbed prior to the effective date of such cancellation, unless and until the Operator shall file a substitute Financial Warranty which: (1) assumes liability for all reclamation obligations which shall have arisen at any time while this Financial Warranty is in force; and (2) is accepted in writing by the Board.

In the event of such cancellation, if the Financial Warranty is not fully released, the amount of the continuing Financial Warranty available for the reclamation of areas disturbed and unreclaimed at the date of cancellation shall be fixed by the Board at the amount it determines necessary to complete such reclamation (which amount may not exceed the sum designated herein) and the Board shall concurrently identify such areas in writing, and notify the Warrantor and the Operator thereof. Thereafter, the obligation of the Warrantor shall be limited to reclamation of the areas so identified.

The consideration for the Warrantor's execution of this agreement is the promise of the Operator to pay the premiums, but failure by the Operator to pay such premiums shall not invalidate or diminish the Warrantor's obligation hereunder.

The Board may make demand upon the Warrantor for payment hereunder if the Board determines that reclamation which ought to have been performed by the Operator, or its successors or assigns, remains unperformed, and if Financial Warranty forfeiture procedures required by law have been initiated. No other condition precedent need be fulfilled to entitle the State to receive the amount so demanded. However, if, upon completion of reclamation by the State, the amounts expended for reclamation shall be less than the amount received from the Warrantor, the excess shall be promptly refunded to the Warrantor.

If demand is made upon the Warrantor for payment of an amount due to the Board hereunder, and if the Warrantor fails to make payment of such amount within ninety (90) days after the date of receipt of such demand, or if it should thereafter be determined, by agreement of the Warrantor or by final judgment of court, that the amount demanded was properly payable, the Warrantor agrees to pay to the Board, in addition to the amount demanded, interest at the prime rate in effect from time to time at The United Bank of Denver for the period commencing at the end of such ninety-day period and ending on the date of actual payment.

If the Board shall notify the Warrantor that the Operator is in default, and if the Board shall initiate any Financial Warranty forfeiture procedures required by law or regulation, the Warrantor may, in lieu of making payment to the Board of the amount due hereunder, cause the reclamation to be timely performed in accordance with all requirements of the Act and all applicable rules and regulations. In such event, when and if the reclamation has been timely performed to the satisfaction of the Board or Division, this Financial Warranty shall be released. If the reclamation shall not be so performed to the satisfaction of the Board or Division, this Financial Warranty shall remain in full force and effect.

This Financial Warranty shall be subject to forfeiture whenever the Board determines that any one or more of the following circumstances exist:

1. A Cease and Desist Order entered pursuant to Section 34-32-124 of the Act has been violated, and the corrective action proposed in such Order has not been completed, although ample time to have done so has elapsed; or

2. The Operator is in default under its Performance Warranty, and such default has not been cured, although written notice and ample time to cure such default has been given; or

3. The Operator and/or the Warrantor has failed to maintain its Financial Warranty in good standing as required by the Act; or

4. The Warrantor no longer has the financial ability to carry out its obligations in accordance with the Act.

The description of lands herein is for convenience of reference only, and no error in such description, nor any revision of the permitted mining area, nor the disturbance by the Operator of lands outside of the permitted mining area shall alter or diminish the obligations of the Operator and/or Warrantor hereunder, which shall extend to the reclamation of all such lands disturbed.

If this Financial Warranty applies to National Forest System lands, and if this Financial Warranty is accepted by the United States Forest Service ("U.S.F.S.") as the bond required under 36 C.F.R. 252.13, then the Operator, having requested that the Board and the U.S.F.S. accept this single Financial Warranty in lieu of the separate bonds which would otherwise be required by applicable law, hereby agrees that, notwithstanding any other provision hereof, or of law, this Financial Warranty shall remain in full force and effect until U.S.F.S. has advised the Board by written notice that the Operator's obligations to U.S.F.S., for which this Warranty is executed, have been satisfied, and until the financial warranty has been released by the Board.

If this Financial Warranty applies to lands under the jurisdiction of the State Board of Land Commissioners ("Land Board"), and if this Financial Warranty, in whole or in part, is accepted by the Land Board as the bond required under its applicable law and procedures, then the Operator, having requested that the State accept this Financial Warranty in lieu of the separate bonds which would otherwise be required by the Colorado Mined Land Reclamation Board or Division of Minerals and Geology and by the Land Board, hereby agrees that, notwithstanding any other provision hereof, or of law, this Financial Warranty shall remain in full force and effect until the Board is notified in writing by the Land Board that the Operator's obligations to the Land Board, for which this Warranty is executed, have been satisfied, and until the financial warranty has been released by the Board.

If all or any part of the Affected Lands are under the jurisdiction of the Bureau of Land Management, United States Department of the Interior (the "BLM"), and if, at the request of the Operator on this Financial Warranty, the BLM has, pursuant to 43 C.F.R. 3809.1-9, accepted this Financial Warranty in lieu of requiring a separate reclamation bond payable to the United States, then, notwithstanding any other provision of this Financial Warranty, or of law, the Operator and Warrantor hereby agree that this Financial Warranty shall not be released until the Board is advised in writing by the BLM that the Operator's obligations to the BLM, for which this Warranty is executed, have been satisfied, and until the financial warranty has been released by the Board.

This Financial Warranty may be executed in multiple copies, each of which shall be treated as an original, but together they constitute only one agreement, the validity and interpretation of which shall be governed by the laws of the State of Colorado.

The provisions hereof shall bind and inure to the benefit of the parties hereto and their successors and assigns.
The Effective Date of this bond is 30th day of June, 2000.

SIGNED, SEALED AND DATED this 16th day of June, 2000.

Safeco Insurance Company of America (SEAL)
Warrantor

By: _____
Katsuko Takata, Attorney-in-Fact

Homestake Mining Company (SEAL)
Operator

By: T. H. Wong

NOTARIZATION OF WARRANTOR'S ACKNOWLEDGEMENT

STATE OF California)
) ss.
COUNTY OF San Francisco)

The foregoing instrument was acknowledged before me this 16th day of June, 2000,
by Katsuko Takata as Attorney-in-Fact of Safeco Insurance Company of America

DORIS B. DIAZ
COMM. # 1181809
NOTARY PUBLIC - CALIFORNIA
SAN FRANCISCO COUNTY
My Comm. Expires May 22, 2002

CRS 2 CRS 2

Doris B. Diaz
NOTARY PUBLIC

My Commission expires: May 22, 2002

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

State of California
County of CONTRA COSTA } ss.

On JUNE 19, 2000 (Date), before me, MATTHEW TAYLOR, NOTARY PUBLIC (Name and Title of Officer (e.g., "Jane Doe, Notary Public")),

personally appeared T. H. WONG (Name(s) of Signer(s)),

☒ personally known to me
☐ proved to me on the basis of satisfactory evidence

to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity(~~ies~~), and that by his/~~her/their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

WITNESS my hand and official seal.

MATTHEW TAYLOR
Commission # 1232591
Notary Public - California
San Francisco County
My Comm. Expires Aug 20, 2003

Place Notary Seal Above

Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

Description of Attached Document
Title or Type of Document: FINANCIAL WARRANTY CORPORATE SURETY

Document Date: _____ Number of Pages: 7

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer
Signer's Name: _____
☐ Individual
☐ Corporate Officer — Title(s): _____
☐ Partner — ☐ Limited ☐ General
☑ Attorney in Fact
☐ Trustee
☐ Guardian or Conservator
☐ Other: _____

Signer Is Representing: _____

RIGHT THUMBPRINT OF SIGNER
Top of thumb here

NOTARIZATION OF OPERATOR'S ACKNOWLEDGEMENT

STATE OF _____)
) ss.
COUNTY OF _____)

The foregoing instrument was acknowledged before me this _____ day of _____, _____,
by _____ as _____ of _____.

_____
NOTARY PUBLIC

My Commission expires: _____

APPROVED:

State of Colorado
Mined Land Reclamation Board
Division of Minerals and Geology

By: _____ Date: _____
Division Director

SAFECO

POWER OF ATTORNEY

SAFECO INSURANCE COMPANY OF AMERICA
GENERAL INSURANCE COMPANY OF AMERICA
HOME OFFICE: SAFECO PLAZA
SEATTLE, WASHINGTON 98185

No. 8857

KNOW ALL BY THESE PRESENTS:

That SAFECO INSURANCE COMPANY OF AMERICA and GENERAL INSURANCE COMPANY OF AMERICA, each a Washington corporation, does each hereby appoint

**********KATSUKO TAKATA; San Francisco, California**********

its true and lawful attorney(s)-in-fact, with full authority to execute on its behalf fidelity and surety bonds or undertakings and other documents of a similar character issued in the course of its business, and to bind the respective company thereby.

IN WITNESS WHEREOF, SAFECO INSURANCE COMPANY OF AMERICA and GENERAL INSURANCE COMPANY OF AMERICA have each executed and attested these presents

this 4th day of January, 1993.

R A Pierson
R.A. PIERSON, SECRETARY

W. Randall Stoddard
W. RANDALL STODDARD, PRESIDENT

CERTIFICATE

Extract from the By-Laws of SAFECO INSURANCE COMPANY OF AMERICA
and of GENERAL INSURANCE COMPANY OF AMERICA:

"Article V, Section 13. - FIDELITY AND SURETY BONDS ... the President, any Vice President, the Secretary, and any Assistant Vice President appointed for that purpose by the officer in charge of surety operations, shall each have authority to appoint individuals as attorneys-in-fact or under other appropriate titles with authority to execute on behalf of the company fidelity and surety bonds and other documents of similar character issued by the company in the course of its business... On any instrument making or evidencing such appointment, the signatures may be affixed by facsimile. On any instrument conferring such authority or on any bond or undertaking of the company, the seal, or a facsimile thereof, may be impressed or affixed or in any other manner reproduced; provided, however, that the seal shall not be necessary to the validity of any such instrument or undertaking."

Extract from a Resolution of the Board of Directors of SAFECO INSURANCE COMPANY OF AMERICA
and of GENERAL INSURANCE COMPANY OF AMERICA adopted July 28, 1970.

"On any certificate executed by the Secretary or an assistant secretary of the Company setting out,

(i) The provisions of Article V, Section 13 of the By-Laws, and
(ii) A copy of the power-of-attorney appointment, executed pursuant thereto, and
(iii) Certifying that said power-of-attorney appointment is in full force and effect,

the signature of the certifying officer may be by facsimile, and the seal of the Company may be a facsimile thereof."

I, R.A. Pierson, Secretary of SAFECO INSURANCE COMPANY OF AMERICA and of GENERAL INSURANCE COMPANY OF AMERICA, do hereby certify that the foregoing extracts of the By-Laws and of a Resolution of the Board of Directors of these corporations, and of a Power of Attorney issued pursuant thereto, are true and correct, and that both the By-Laws, the Resolution and the Power of Attorney are still in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the facsimile seal of said corporation

this 16th day of June, 2000.

SAFECO INSURANCE COMPANY OF AMERICA CORPORATE SEAL 1953 STATE OF WASHINGTON

GENERAL INSURANCE COMPANY OF AMERICA CORPORATE SEAL 1923 State of Washington

R A Pierson
R.A. PIERSON, SECRETARY

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