GARY R. HERBERT
*Governor*

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*Lieutenant Governor*

# State of Utah

**DEPARTMENT OF NATURAL RESOURCES**

MICHAEL R. STYLER
*Executive Director*

**Division of Oil, Gas and Mining**

JOHN R. BAZA
*Division Director*

November 14, 2018

Ken Fleck, Manager of Geology and Environmental Affairs
Interwest Mining Company
P.O. Box 310
Huntington, Utah 84528

Subject: Conditional Approval of Reduce Hydrologic Monitoring Sites, PacifiCorp, Deer Creek Mine, C/015/0018, Task #5770

Dear Mr. Fleck:

The above-referenced amendment is approved conditioned upon receipt of 2 clean copies prepared for incorporation. Please submit these copies by December 14, 2018. Once we receive these copies, final approval will be granted.

A stamped incorporated copy of the approved plans will also be returned to you at that time, for insertion into your copy of the Mining and Reclamation Plan.

If you have any questions, please call me at (801) 538-5325.

Sincerely,

Daron R. Haddock
Coal Program Manager

DRH/sqs
O:\015018.DER\WG5770 HYDRO SITES\CONDITIONALAPPROVAL.DOC

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# Technical Analysis and Findings

## Utah Coal Regulatory Program

**PID:** C0150018
**TaskID:** 5770
**Mine Name:** DEER CREEK MINE
**Title:** REDUCE HYDROLOGIC MONITORING SITES

# Summary

The Permittee has submitted an amendment to reduce operational water monitoring sites for the Deer creek mine and transition to monitoring sites above and below reclaimed areas. The mine ceased coal extraction operations in early January 2015 and permanently sealed the remaining portals accessing the underground workings in December 2017. The Permittee is in the process of reclaiming the surface disturbances associated with the mining facilities in both Rilda and Deer Creek canyons. The current operational water monitoring plan was developed to detect changes to the hydrologic balance during active coal mining operations. Over three years have passed since the last coal was extracted from the mine. The Permittee is now proposing to reduce the number of monitoring sites within the MRP to only monitor surface water sites directly above and below reclamation disturbances through bond release. The Division has assigned Task #5770 to this amendment.

kstorrar

## Operation Plan

### Hydrologic Ground Water Monitoring

*Analysis:*

The amendment meets the State of Utah R645 requirements for Groundwater Monitoring.

This amendment proposes to remove 23 spring monitoring sites from the water monitoring program. A concise list of these springs is found in the 'Removed Sites' table on p. 35/1086 within the amendment. Maps, narratives, photographs, tables, graphs, and quality/quantity analyses on every spring during the period of monitoring are provided. The maps show each spring surface location in relation to the extent of surface subsidence, underground workings, surface topography, and geology. The narratives provide information regarding the federal coal lease each spring is located in or adjacent to, the presence or absence of subsidence in the area of the springs, the quality and quantity of the springs during the period of monitoring, the geologic mode of occurrence, and justification for removal. Spring discharge is graphed against the Palmer Hydrologic Index and East Mountain Precipitation. The graphed time period of monitoring for a lot of the sites begins in the early 1980's and extends up to the most recent date the spring was monitored.

Spring discharge rates pre- and post-mining in relation to mine workings is the primary focus for this analysis. The Palmer Hydrologic Drought Index is assumed to be the dominant driver of spring discharge rates in the area. By graphing spring discharge as the response variable against the explanatory variable Region 4 of the Palmer Hydrologic Drought Index for the monitoring month, a better understanding of longer term flow rates is hoped to be achieved. Every spring discharge dataset is broken into two time periods, pre-mining and post-mining as indicated on the spring discharge graphs in the amendment. A trend line is added to each scatter plot data set to determine the pre-mining and post-mining correlation of discharge rates vs. climate. Assuming mining has not impacted the spring discharge rate, there should be little to no difference in trend line slopes between the pre- and post-mining datasets for the springs. It is recognized that outliers such as the wet year of 2011 may be influencing trend lines one way or the other, so this method is only used as a guide providing only one of the multiple factors taken into account when analyzing each spring.

See section *I. SPRING MONITORING* in the attached 'Deer Creek Mine Water Monitoring Analysis' Technical Memorandum for a complete analysis of each individual spring site.

The amendment proposes to remove four piezometers and one well from the water monitoring program. The four piezometers are located in alluvial deposits at the base of Rilda Canyon near the old Rilda Right facilities pad. The well is also located in Rilda Canyon and is completed in the lower Blackhawk formation below the Hiawatha coal seam.

See section *II. WELL MONITORING* in the attached 'Deer Creek Mine Water Monitoring Analysis' Technical Memorandum for a complete analysis of each proposed well to be removed from the water monitoring program.

**kstorrar**

### Hydro Surface Water Monitoring

*Analysis:*

The amendment meets the State of Utah R645 requirements for Surface Water Monitoring.

The amendment proposes to remove eleven surface water monitoring sites from the hydrologic monitoring program. The sites are located along Indian creek, Meetinghouse Canyon creek, Huntington creek and Mill Fork Canyon creek. A concise list of these surface water monitoring sites is found in the 'Removed Sites' table beginning on p. 35/1086 within the amendment.

See section *III. SURFACE WATER MONITORING* in the attached 'Deer Creek Mine Water Monitoring Analysis' Technical Memorandum for a complete analysis of all the surface water monitoring sites proposed to be removed from the monitoring plan.

**kstorrar**

## Reclamation Plan

### Hydrological Information Reclamation Plan

*Analysis:*

The amendment meets the State of Utah R645 requirements for Hydrologic Reclamation monitoring.

The amendment proposes to continue monitoring surface water sites that will now fall above and below the reclaimed areas in Deer Creek and Rilda Canyon. The sites used to fall above and below the mine facilities and have been operationally monitored since the late 1970's and early 1980's along Deer Creek and since the late 1980's in Rilda Canyon to detect offsite impacts. Now these same sites will be located above and below the reclaimed areas and will be monitored to detect offsite impacts following reclamation.

The amendment will add monitoring of the new UPDES outfall 003 to the water monitoring program. This outfall is for potential mine water gravity discharge from the Mill Fork lease. The gravity drainage will be conveyed via the constructed pipeline from Rilda Right portals down Rilda and Huntington canyons to the power plants raw water holding pond. The mine water discharge may either be sent to the pond and consumed in the power plant or it may be discharged into Huntington Creek just upstream of the pond.

**kstorrar**

## DEER CREEK MINE WATER MONITORING ANALYSIS

### *I. SPRING MONITORING*

<u>Spring SPI-29</u>

This spring has been low to no flow for the duration of monitoring and often dries up during seasonal baseflow or October monitoring. It has a small contributing area being only 500 ft to 750 ft below the hydrologic divide. The spring was not undermined and the up-gradient contributing area was not subsided. Low flows are typically difficult to accurately measure particularly in dispersed wet areas damaged by livestock such as this spring. The pre-second mining trend line is a positive slope indicating a positive climate correlation, however it is a very low $R^2$ value showing flow rates vary widely for this site. Some of the highest flows have been recorded in drought years. While all post-mining years have recorded no-flow, the site was flowing in May 2018 and at the time of the Division's field inspection on November 8th, 2018. Flow rates observed were comparable to pre-mining discharge rates. Subsurface lateral flow paths that used to discharge at this spring source could have potentially been disrupted by the construction of the emergency road constructed just 20 feet upslope from the spring during Crandall Canyon Mine disaster relief efforts. Given the variability and dispersed nature of flows from this spring it is unlikely mining has influenced its discharge rates. This spring may be removed from the hydrologic monitoring program.

Monitoring dataset:
Pre-mining Aug 2001 – Jul 2014
Post-mining Oct 2014 – Oct 2017

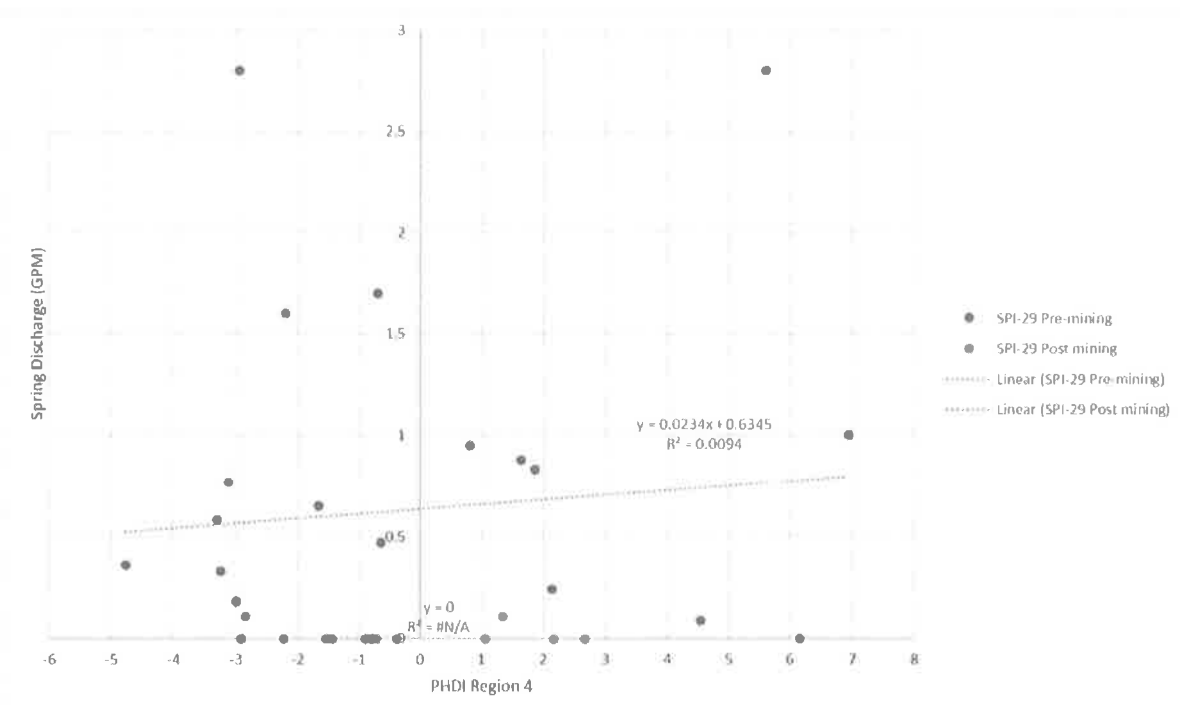


Figure 1. SPI-29 spring discharge vs. PHDI Region 4 pre- and post-mining trends.

Spring UJV-213

This spring is often very low flow and has been dry for a number of years. Second mining occurred east of the spring and up to two feet of subsidence occurred 400 ft away. The subsidence appears to be outside of the springs' contributing area. The Division conducted a field inspection of this site on November 8th, 2018. This springs contributing area is on a western aspect slope which is the driest aspect in the region. Western slopes are the stoss side of the prevailing winds often leaving them windblow and having less wintertime snow accumulation compared to the other three aspects. The PHDI shows the area has been in a drought beginning in 2012, probably affecting or drying out western aspects the most. Give all these variables it is unlikely mining has influenced its discharge rates. This spring may be removed from the hydrologic monitoring program.

Monitoring dataset:
Pre-mining Aug 2001 – Oct 2012
Post-mining Jul 2013 – Oct 2017

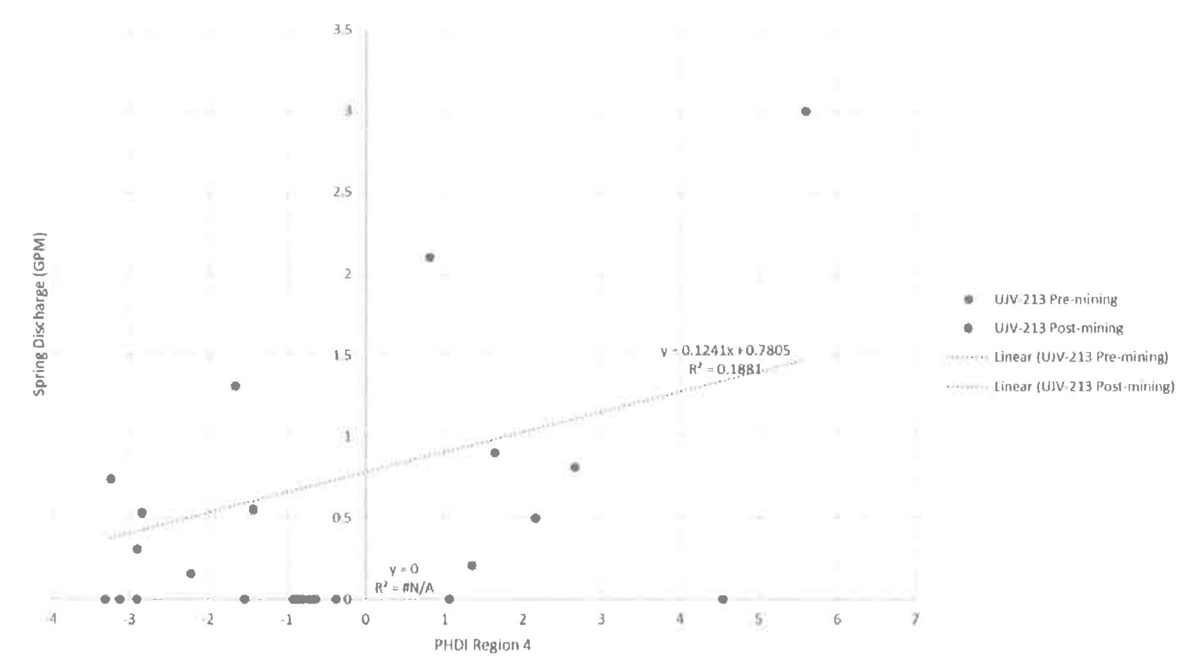


Figure 2. UJV-213 spring discharge vs. PHDI Region 4 pre- and post-mining trends.

<u>Spring JV-101</u>

Flows for this spring range from 0 to 1.7 GPM. The Division conducted a field investigation of this spring in October 2018 and found flows comparable to reported values. First mining took place under this spring for the bleeders running parallel and adjacent to the Joe's Valley fault. The closest subsidence of two feet is 200 ft away to the south. Both pre- and post-mining trend lines of flow vs. PHDI are positive and have similar slopes indicating mining did not likely impact spring discharge rates. This spring may be removed from the hydrologic monitoring plan.

Monitoring dataset:
Pre-mining Jul 2001 – Oct 2010
Post-mining Jul 2011 – Oct 2017

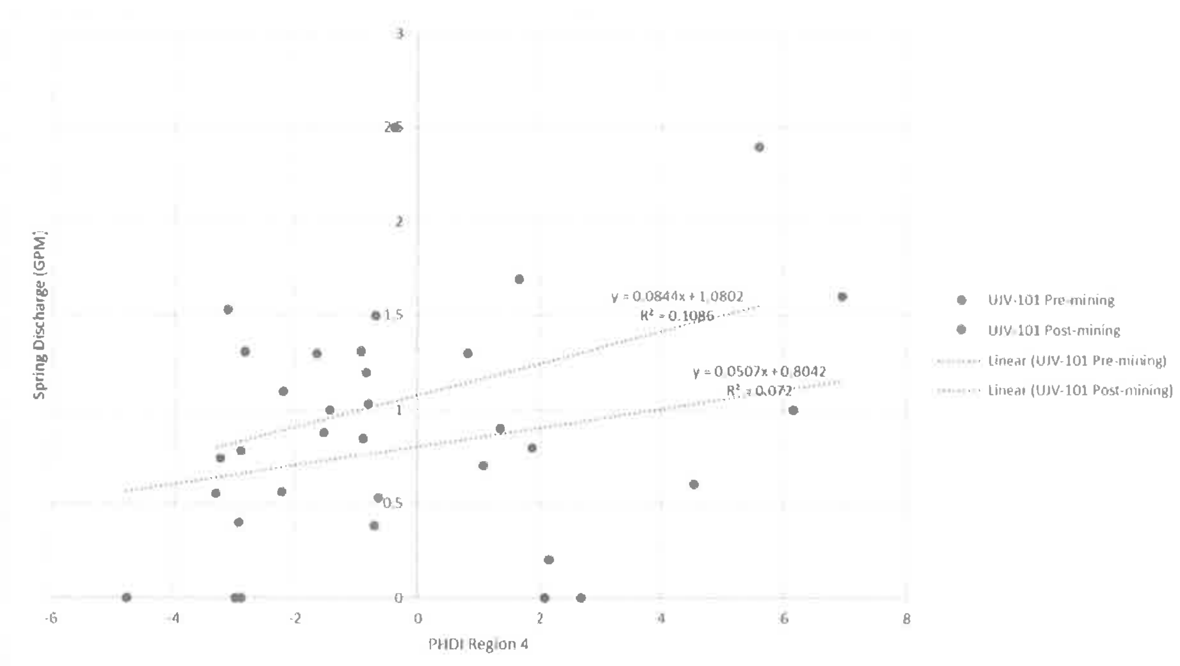


Figure 3. UVJ-101 spring discharge vs. PHDI Region 4 pre- and post-mining trends.

Spring JV-34
This spring is one of many discharging near the base of the alluvial fans extending off East Mountain and down into Joe's Valley. Since this spring is to the west of the Joe's Valley fault no mining took place in the area. Spring discharge rates appear to drop off in 2012 and do not recover. This is the same time period the area transitioned into drought which may be causing these lower flow rates. The trend line of spring discharge vs. PHDI has a positive slope. No zero flow values have been recorded for this spring when the PHDI is above zero. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Monitoring dataset:
Feb 2001 – Oct 2017

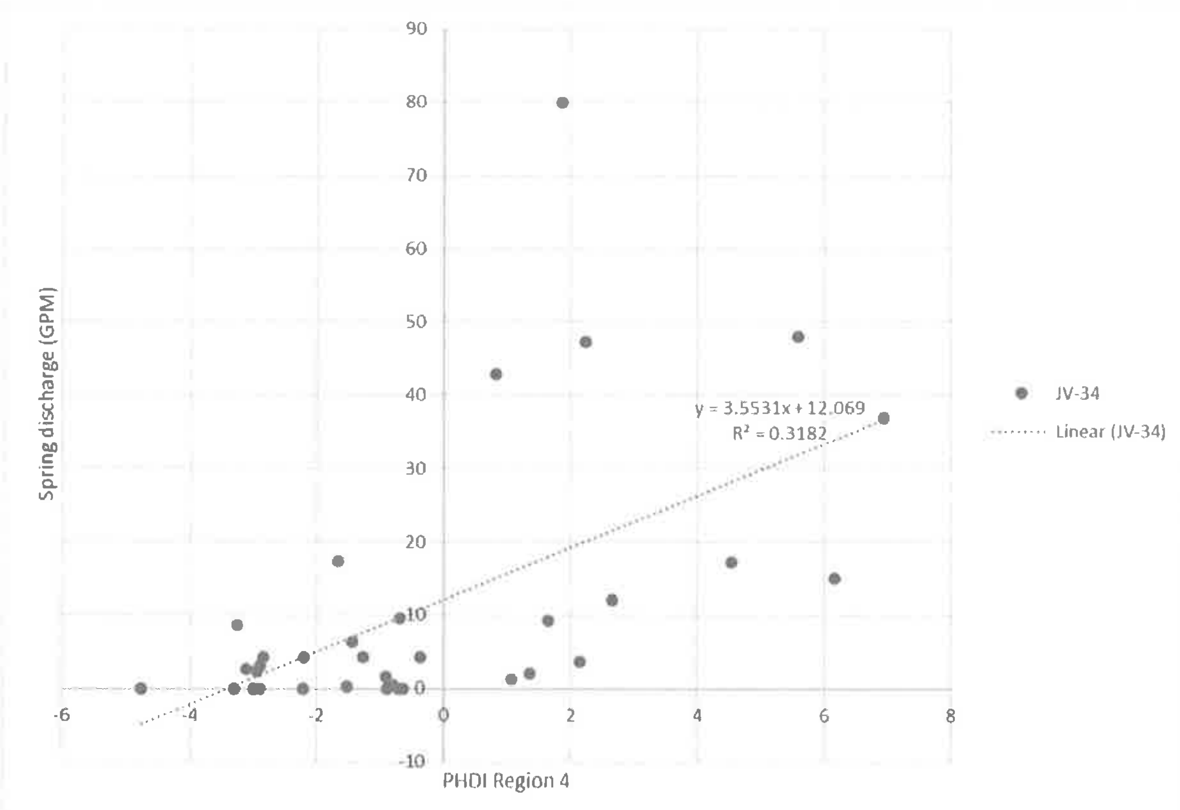


Figure 4. JV-34 spring discharge vs. PHDI Region 4 pre- and post-mining trends. Spring not undermined and west of Joe's Valley fault.

Spring JV-9

This spring sits within the same spring discharge zone as JV-34. It is at the base of an alluvial fan deposited in Joe's Valley. It is to the west of the Joe's Valley fault so no mining took place within the area of the spring. Spring discharge rates have always been low and have been recorded as zero a few times within the past couple years most likely due to the drought. The trend line of spring discharge vs. PHDI is positive, but flow rates are a bit more scattered than JV-34. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Monitoring dataset:
Feb 2001 – Oct 2017

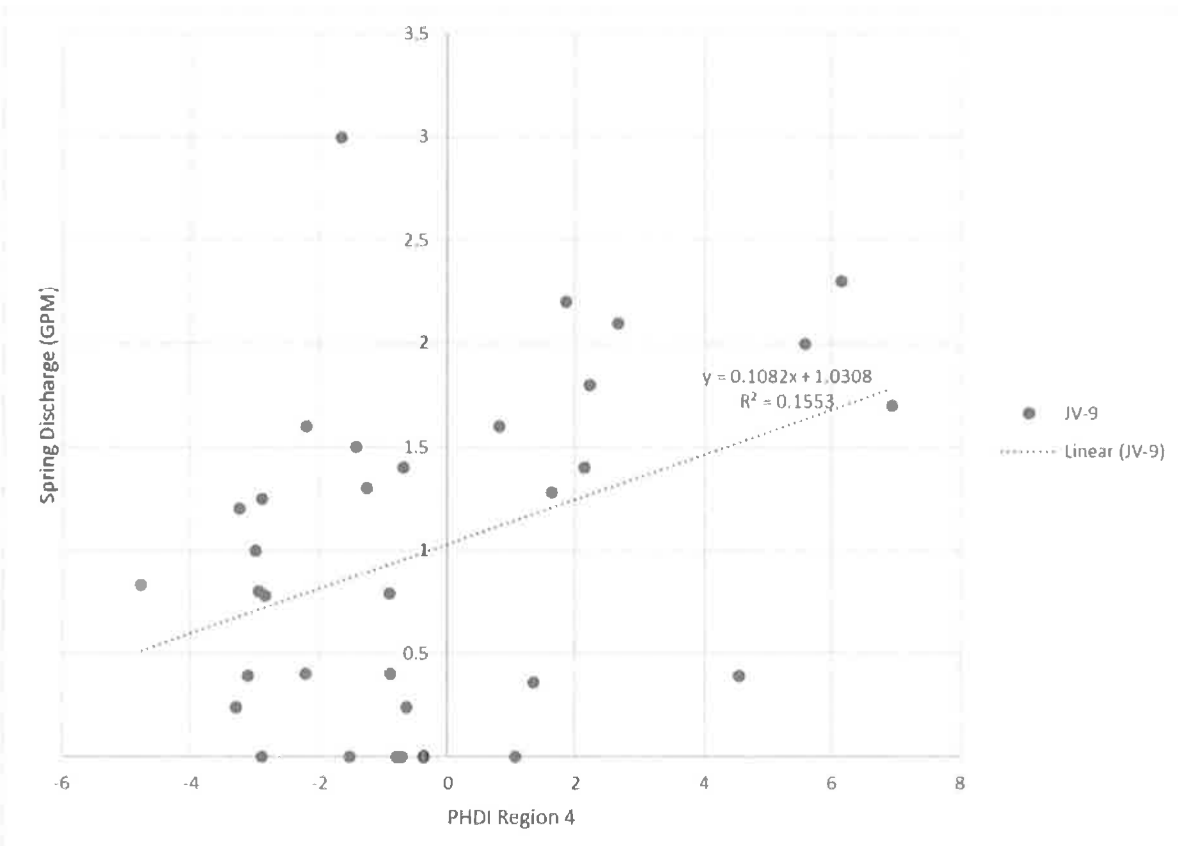


Figure 5. JV-9 spring discharge vs. PHDI Region 4 pre- and post-mining trends. Spring not undermined and west of Joe's Valley fault.

Spring UJV-206

This spring is near the southwestern corner of the Mill Fork lease. First and second mining is over 1200 feet away and occurred in 2005. Both pre- and post-mining trend lines of spring discharge vs. PHDI have positive slopes. Flow rates range from just under 1 GPM up to 6 GPM. The spring has a water right and is used as a water source for a cabin and a watering trough. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Monitoring dataset:
Pre-mining Jun 2001 – Oct 2004
Post-mining Jul 2005 – Oct 2017

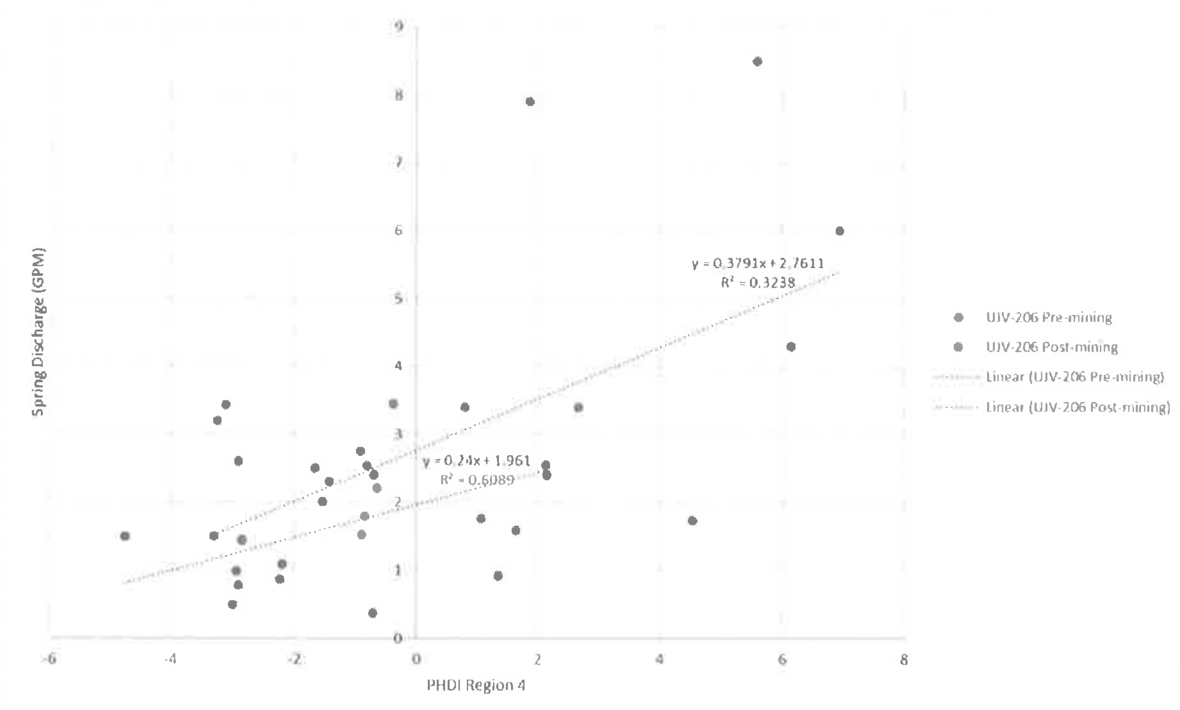


Figure 6. UJV-206 spring discharge vs. PHDI Region 4 for pre- and post-mining that occurred nearest to the spring.

Spring MF-219

First and second mining in the Blind Canyon seam took place under this spring. First mining in the Hiawatha took place under it as well. Subsidence occurred close by to the spring with an offset of up to 14 ft. As seen in Figure 7 post-mining flows have actually increased relative to Region 4 of the PHDI. The graph in the amendment shows the spring discharge has tracked East Mountain precipitation and the PHDI without being affected by mining. Discharge rates range from 0 to 13 GPM and the spring has continued to discharge at a steady rate following mining activities. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Monitoring dataset:
Pre-mining May 2001 – Jul 2009
Post-mining Oct 2009 – Oct 2017

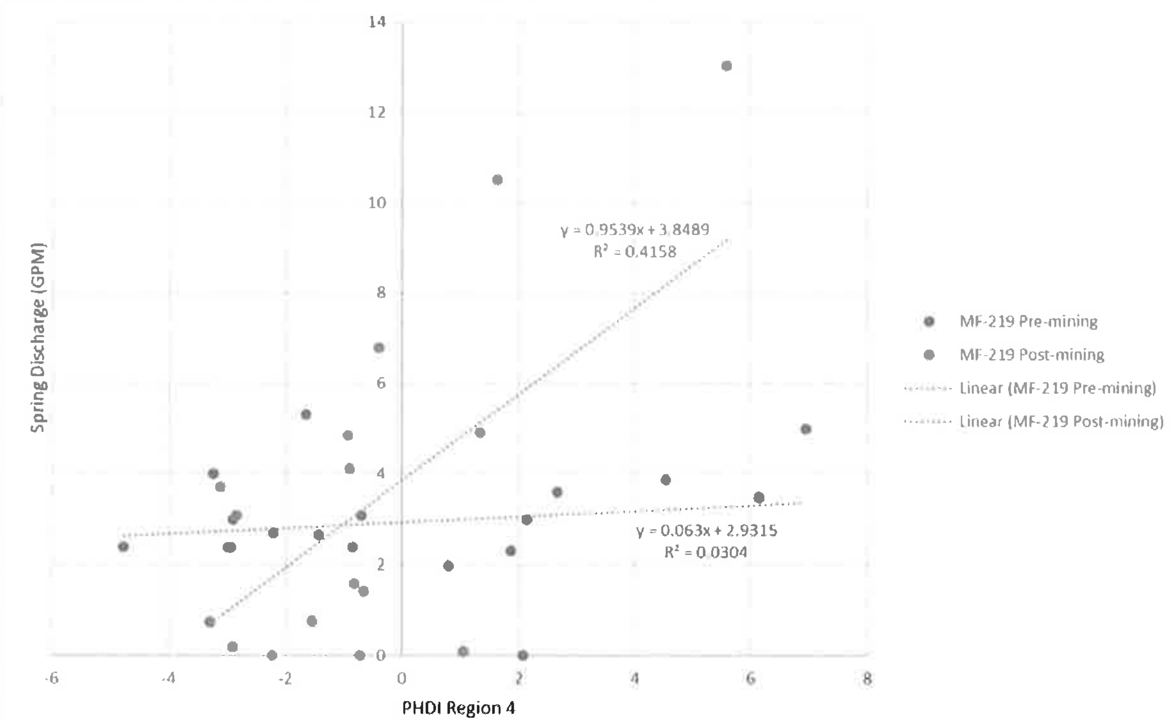


Figure 7. MF-219 spring discharge vs. PHDI Region 4 pre- and post-mining trends.

Spring SPI-26

This spring was not undermined. First mining took place more or less surrounding this spring for headgates, tailgates and endgates in both the Hiawatha and Blind Canyon seams. The closest subsidence is a few hundred feet to the east. While this spring was not undermined adjacent active mining took place around the same time as first mining in the Blind Canyon under MF-219. For this reason, graphed spring discharge is broken into a similar time data set as MF-219. The USFS water right 93-1410 is associated with this spring. It appears spring discharge has increased since active mining has occurred. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Monitoring dataset:
Pre-mining Nov 2001 – Oct 2008
Post-mining Jul 2009 – Oct 2017

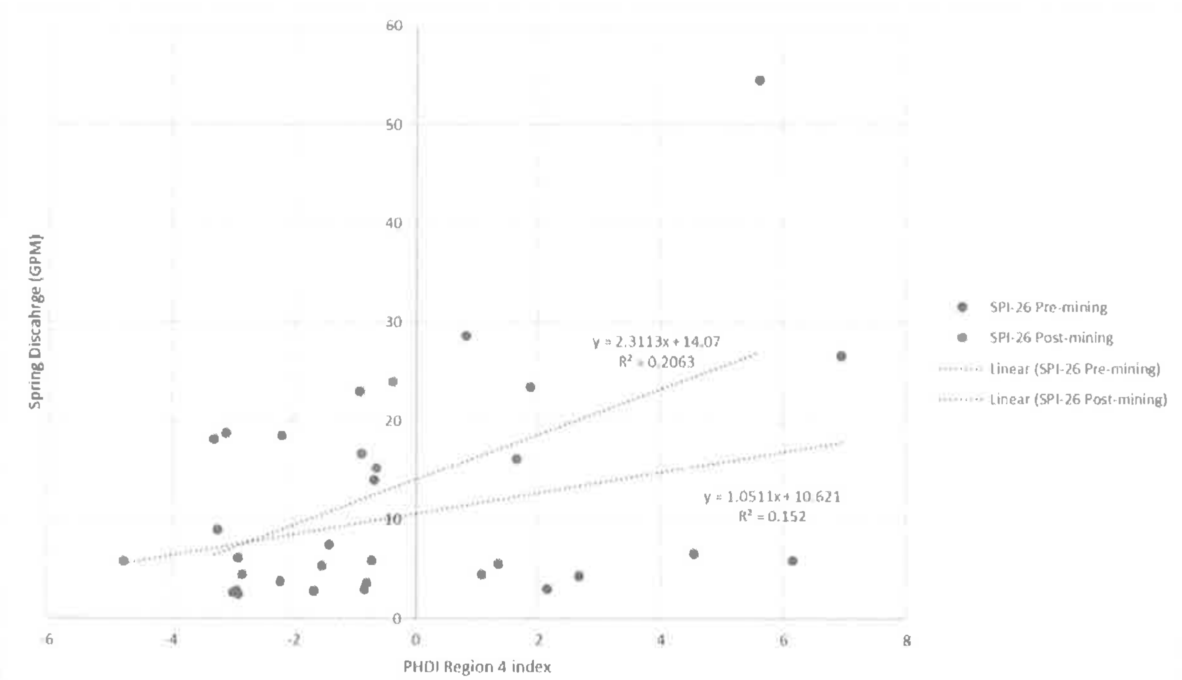


Figure 8. SPI-26 spring discharge vs. PHDI Region 4 pre- and post-mining trends. Pre- and post-mining datasets are divided around the same timeline of MF-219.

Spring MF-10
This spring was subsided by roughly 4 feet. Second mining took place in both the Blind Canyon and Hiawatha seams underneath this spring. Graphed spring discharge vs. the PHDI shows flow has trended higher after subsidence. Flows appear to be stable through time and have ranged from low single digits in GPM to as high as in the 40's and 50's GPM. The USFS has water right 93-1412 associated with this spring. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Monitoring dataset:
Pre-mining Jul 2001 – Oct 2008
Post-mining Jul 2009 – Oct 2017

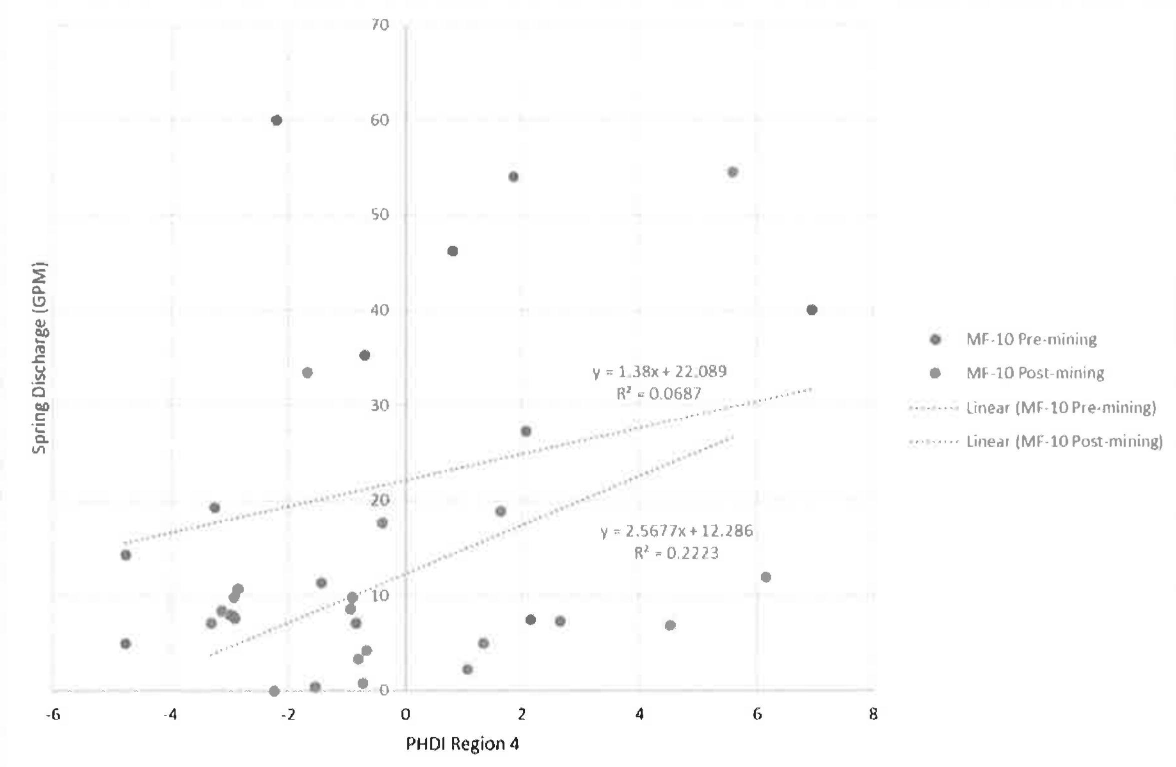


Figure 9. MF-10 spring discharge vs. PHDI Region 4 pre- and post-mining trends. Pre- and Post-mining datasets are divided at the time of 2009 second mining in Blind Canyon seam.

Spring MF-19B

The spring is above the sump area for the Mill Fork lease. It has only been first mined in the Hiawatha seam over 12 years ago. Graphed spring discharge vs. the PHDI shows flow has trended higher after mining in the area. Flows have always been relatively low at this site at only a few GPM, but appear to be stable through time. The USFS has water right 93-1413 associated with this spring. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Monitoring dataset:
Pre-mining Jul 2001 – Oct 2005
Post-mining Jul 2006 – Oct 2017

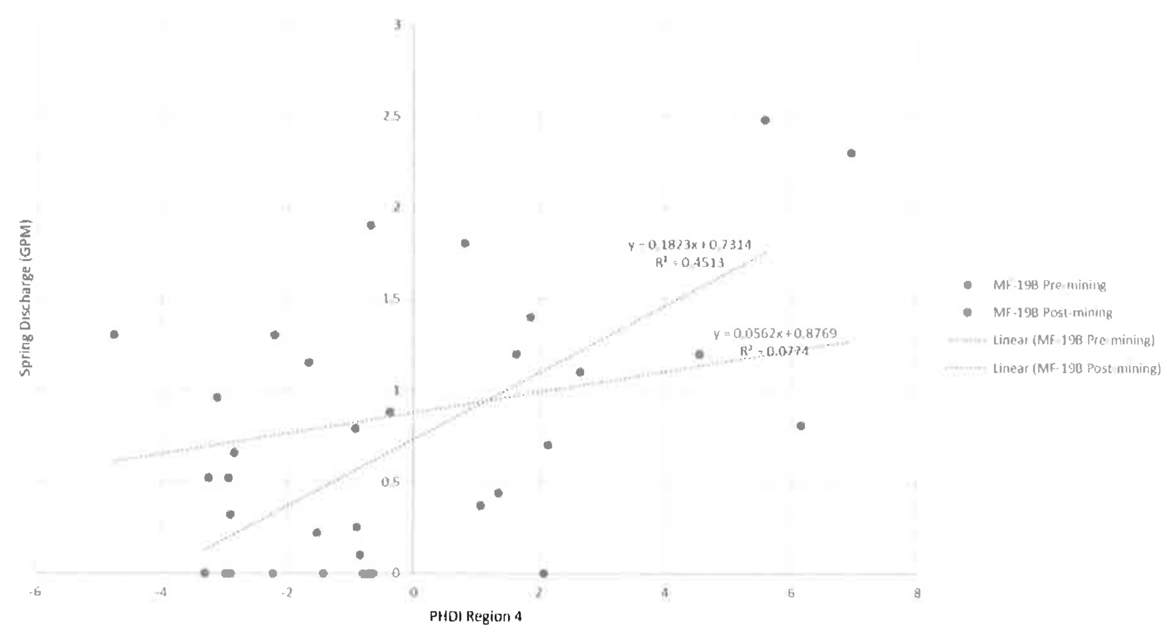


Figure 10. MF-19B spring discharge vs. PHDI Region 4 pre- and post-mining trends. Pre- and Post-mining datasets are divided at the time of first mining in 2006 in the Hiawatha seam.

<u>Spring RR-5</u>

This spring has not been undermined nor has the contributing catchment. First mining has taken place in the Hiawatha and Blind Canyon near this spring. The nearest second mining to this spring took place in 2009. The trend of this spring relative to the PHDI appears to have gone up since mining. Flows have been relatively consistent from this spring through time staying mostly within single digit GPM but it has spiked up past 30 GPM following mining. The USFS has water right 93-1571 associated with this spring. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Monitoring dataset:
Pre-mining Aug 2001- Oct 2008
Post-mining Jul 2009 – Oct 2017

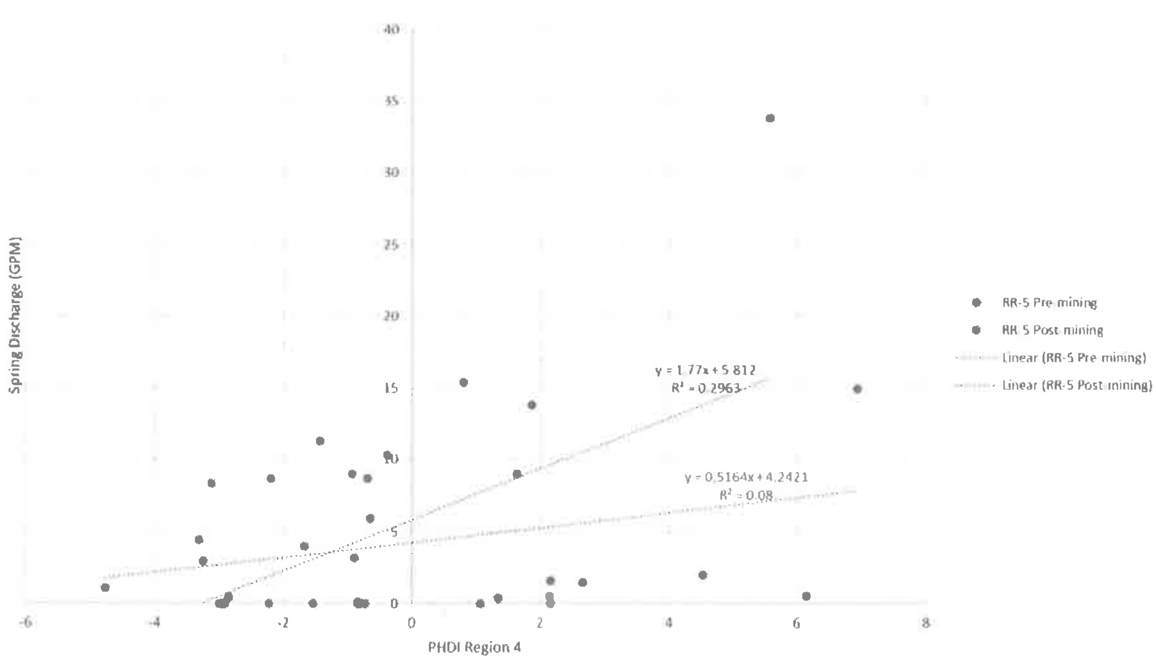


Figure 11. RR-5 spring discharge vs. PHDI Region 4 pre- and post-mining trends. Dataset is broken between pre- and post-mining around the time of nearby second mining in 2009.

Spring EM-216

This spring is located along the road leading up onto East Mountain. This spring was not undermined and the closest subsidence is nearly 1000 feet away. This spring is dry or has zero flow the majority of the time, with only recording flow five times out of the 35 times it has been monitored during the past 16 years. Given the low number of recorded flows graphing the data is not conducive to aid in making a determination. The few recorded flows are evenly spaced through the monitoring period before and after mining occurred nearby. The spring has a USFS water right 93-339. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Grants Spring

This spring is near the top of the drainage divide of East Mountain. The closest mining occurred more than 1500 feet to the north in late 2005. The spring discharge ranges from 0.5 to about 3 GPM. Flows appear to be consistent through time. The graph of discharge vs. PHDI Region 4 shows the pre- and post-mining trends are nearly the same (Figure 12). Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Monitoring dataset:
Pre-mining Jul 2003 – Oct 2005
Post-mining Jul 2006 – Oct 2017

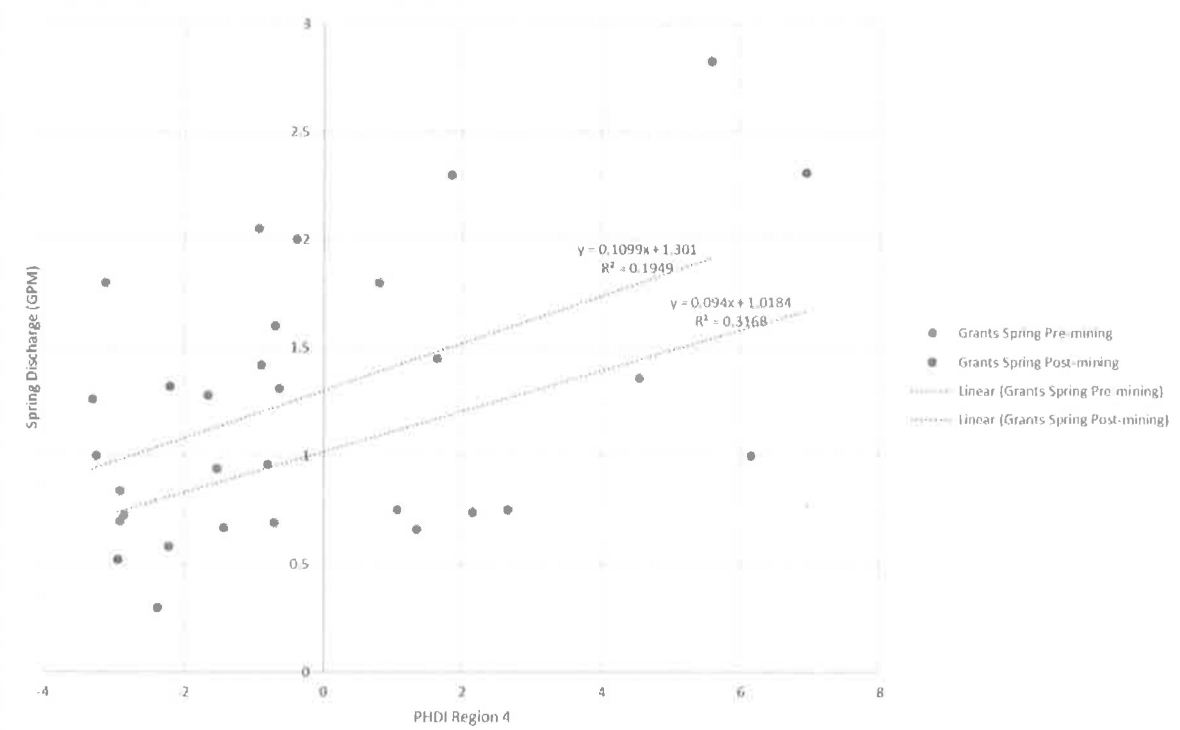


Figure 12. Grants Spring discharge vs. PHDI Region 4 Pre- and Post-mining trends

Spring RR-15

This spring is adjacent to the east end of the second panel mined in the Mill Fork Lease. The nearest second mining occurred 55 feet away from the spring in March 2006. The pre-mining trend appears to not correlate with the PHDI. Post-mining spring flows correlate positively with the PHDI. The spring discharge rates have stayed consistent through time ranging from about 10 to 55 GPM. It appears precipitation is a strong driver of the flow rates at the spring. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Monitoring dataset:
Pre-mining Nov 2001 – Oct 2005
Post-mining Jul 2006 – Oct 2017

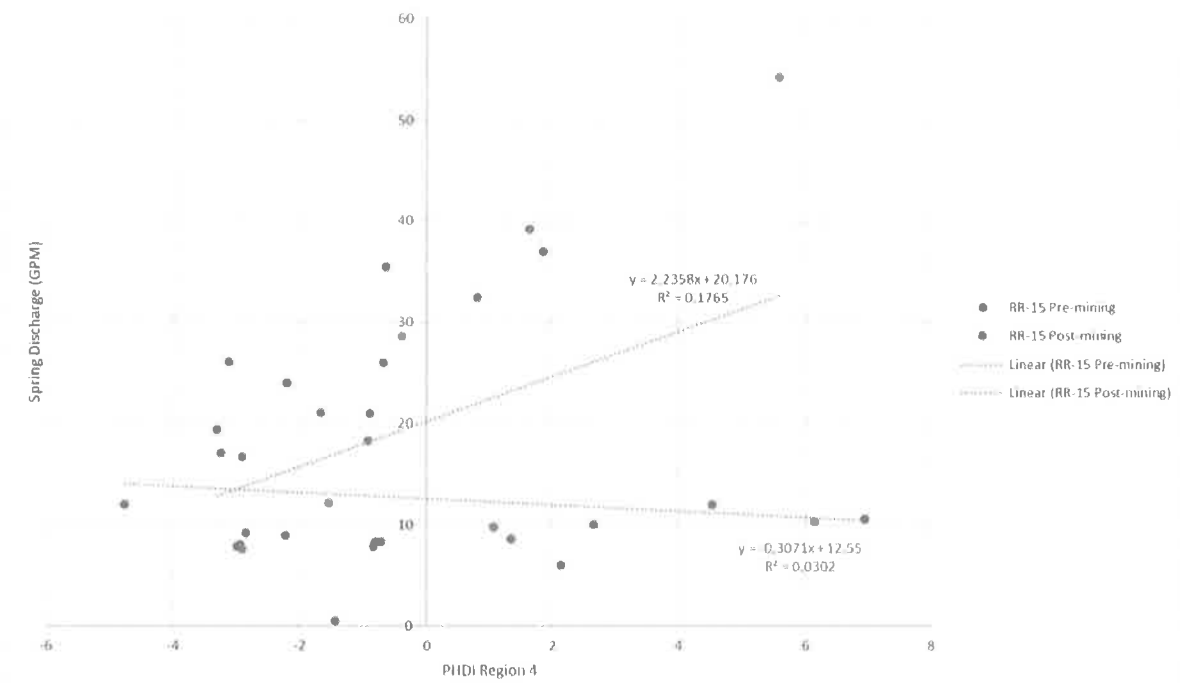


Figure 13. RR-15 spring discharge vs. PHDI Region 4 pre- and post-mining trends.

Spring RR-23A

This spring is located near the southeast corner of the Mill Fork lease and was one of the earliest sites to have first mining within the lease pass nearby. Pre- and post-mining trends of spring discharge vs. PHDI are similar (Figure 14) and the spring appears to consistently discharge at the same rate during the time it has been monitored. Spring flow rates range from 10 to 50 GPM. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Monitoring dataset:
Pre-mining Aug 2001 – Oct 2004
Post-mining Jul 2005 – Oct 2017

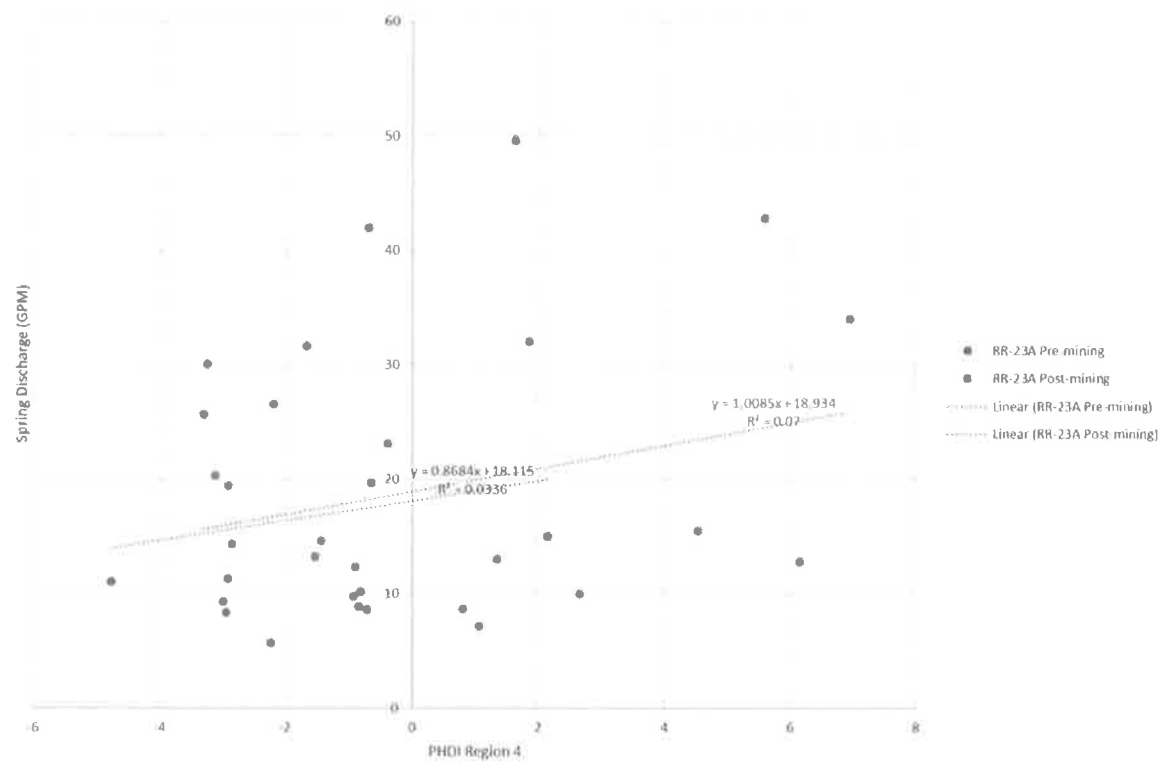


Figure 14. RR-23A spring discharge vs. PHDI Region 4 pre- and post-mining trends.

<u>Spring EM-Pond</u>
This spring is located south of the Mill Fork lease workings. The closest maximum subsidence from this site is 1,500 feet to the north. Flows have consistently been recorded between about 1 to 6 GPM for the duration of monitoring. The pre- and post-mining trend of discharge vs. PHDI Region 4 appear to be similar. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Monitoring dataset:
Pre-mining Aug 2001 – Oct 2004
Post-mining Jul 2005 – Oct 2017

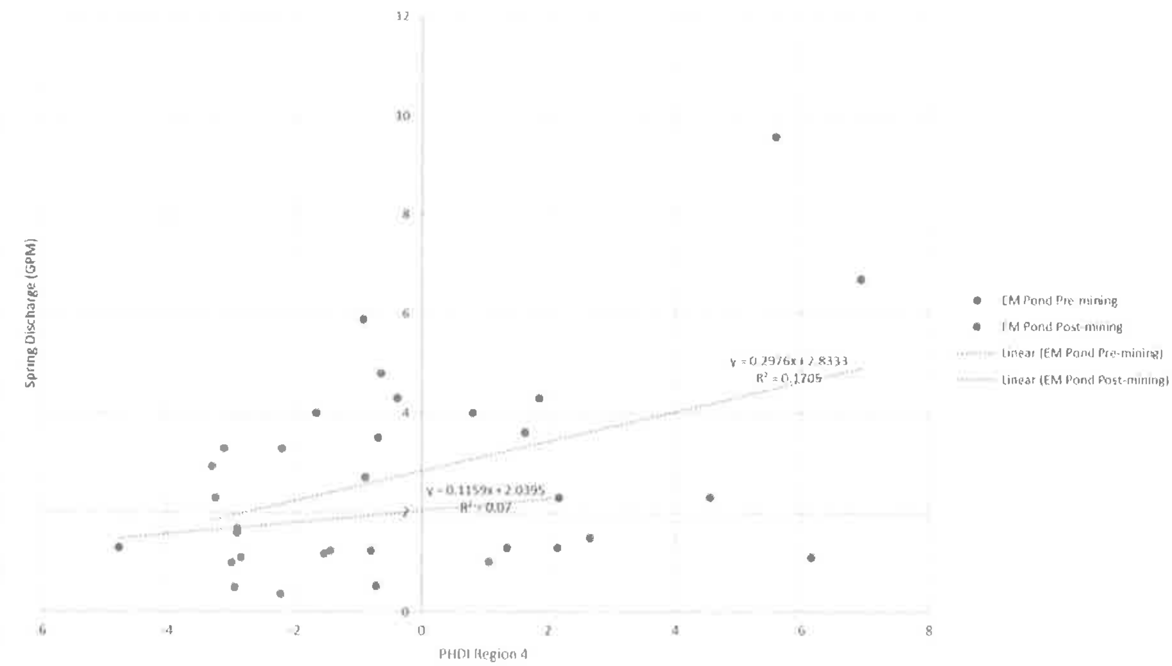


Figure 15. EM Pond spring discharge vs. PHDI Region 4 pre- and post-mining trends.

Spring MFR-30

No mining has taken place near this spring. Panels were originally planned to extend out east of the mains which would have undermined or nearly undermined this spring. However, since the mine did not end up mining panels east of the mains this spring has not been affected by mining activity. Discharge trends well with recorded precipitation and the PHDI graph provided in the amendment, therefore it is not graphed here. While flow rates for this spring are typically zero, when it does discharge the values have consistently been between 0.5 to 3 GPM. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Spring MFR-10

This spring is in the same situation as MFR-30. No mining has taken place near this spring. Panels were originally planned to extend out the east of the mains which would have undermined or nearly undermined this spring. However, since the mine did not end up mining panels east of the mains this spring has not been affected by mining activity. Discharge trends well with recorded precipitation and the PHDI graph provided in the amendment, therefore it is not graphed here. Flow rates at this spring generally are recorded between 10 and 45 GPM. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Spring MF-7

This spring is located east of the mains. The original Mill Fork lease mine workings layout showed this spring being undermined. The mine never extended panels to the east, so it was not undermined and instead only falls within about 1,500 feet of first mining and 1,700 feet of second mining. The discharge trends have consistently tracked with the precipitation data and the PHDI, therefore discharge vs. PHDI is not graphed here. Flow rates at this spring generally are recorded between 10 and 65 GPM. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Spring MF-213

This spring is located a great distance away from any mining activity. There is no first or second mining under or adjacent to the contributing catchment of the spring. The nearest mining activity is over a mile away. The discharge trends have consistently tracked with the precipitation data and the PHDI, therefore discharge vs. PHDI is not graphed here. Flow rates at this spring generally are recorded between 15 and 70 GPM. The USFS has water right 93-259 tied to this spring. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Little Bear Spring
This spring is a major water source for the Huntington Cleveland Irrigation Company and reports to a collection box at its source. Since it is such a major source it was important to monitor this spring for the duration of mining activities. The nearest mining activity is Genwal Mine workings that are over a mile to the northwest. Deer Creek workings are over two miles to the west. The discharge trends have consistently tracked with the precipitation data and the PHDI, therefore discharge vs. PHDI is not graphed here. Flow rates at this spring generally are recorded between 225 to 475 GPM. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Spring 80-50
This spring is on the ridge separating Rilda Right from Rilda Left just above the road running between the two old mine pads. There is no second mining within the contributing area of the spring and first mining through this ridge took place over 3,000 feet away. The discharge has consistently tracked with the precipitation data and the PHDI, therefore discharge vs. PHDI is not graphed here. Flow rates at this spring generally are recorded between 0 to 3.5 GPM. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Sheba Spring

This spring is located above the Deer Creek workings on the downthrown Roan's Canyon fault graben. The spring was not undermined during mining activities that took place over two and half decades ago. Discharge rates trend well with precipitation and PHDI for the duration of monitoring. The trends of spring discharge vs. PHDI are both positive and appears to have only lessened slightly post-mining. Flows have been recorded to range from 0 to 25 GPM. This spring is developed with a spring box and trough for livestock and continues to be a watering source for the grazers. Spring discharge rates appear to be unaffected by mining activities. This spring may be removed from the hydrologic monitoring plan.

Monitoring dataset:
Pre-mining Jul 1979 – Oct 1990
Post-mining Jul 1991 – Oct 2017

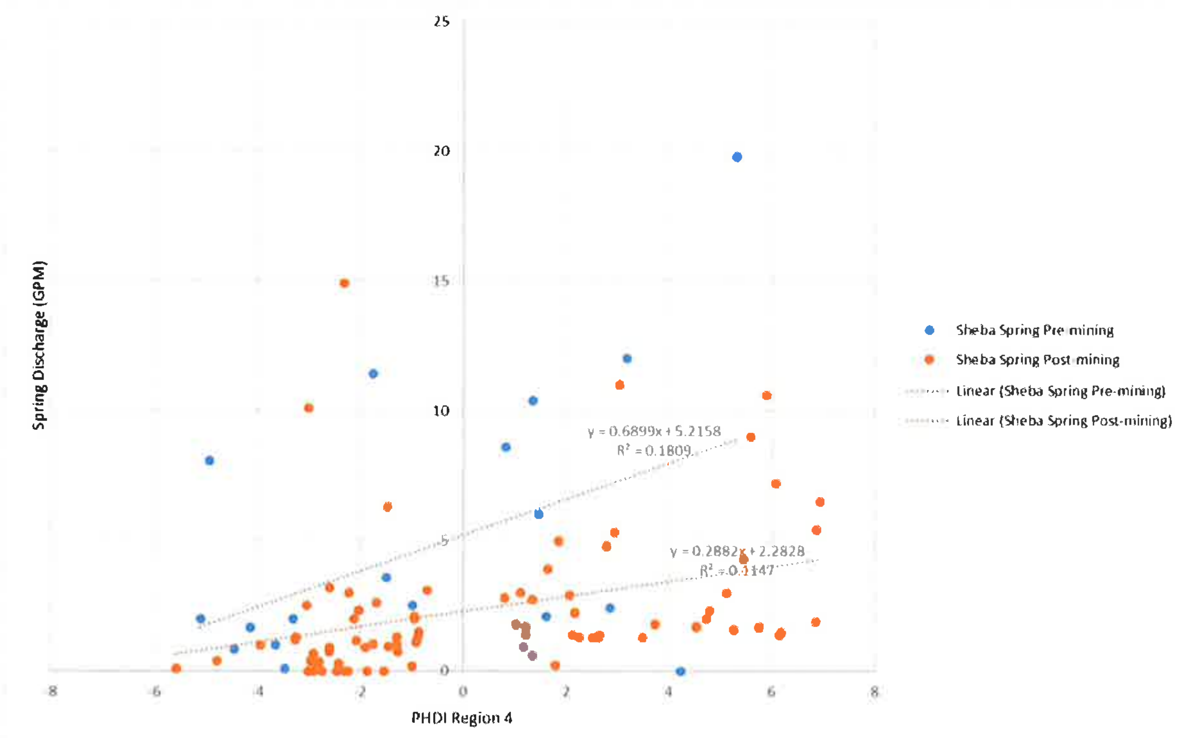


Figure 16. Sheba Spring discharge vs. PHDI Region 4 pre- and post-mining trends.

## *II. WELL MONITORING*

<u>Rilda Canyon Creek Piezometers: P-1, P-5, P-6, P-7</u>

The amendment proposes to remove monitoring requirements for the four piezometers in Rilda Canyon. These are shallow piezometers within the alluvial deposits along Rilda canyon creek. The depth to water level data is plotted in Figure 17. The water level data appears stable through time for all of the piezometers. Piezometer P-5 dropped then leveled out at a very consistent value. The groundwater level in this area probably dropped below the well casing and sampled values are the depth to the wet material at the bottom of the casing. NEWUSSD worked on their collection boxes upgradient of this well around this same time which may have caused this drop in groundwater level. Wells P-6 and P-7 show seasonal fluctuations in water level, but overall have been consistent through time. Well P-1 has been the same consistent level though time. It does not appear mining has impacted water levels in these wells. These wells may be removed from the hydrologic monitoring program.

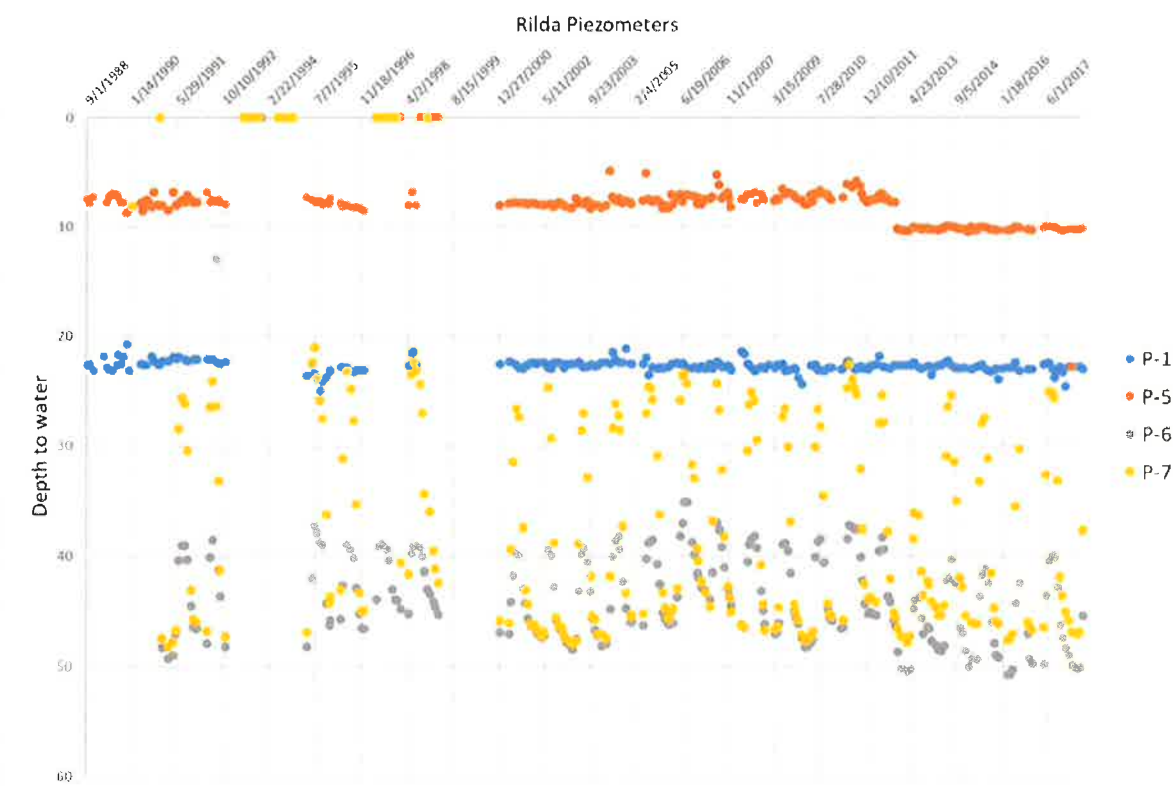


Figure 17. Rilda canyon piezometer measured depth to water level vs. date sampled.

Well EM-47

This well is screened in the lower Blackhawk below the Hiawatha coal seam. The groundwater within the sandstone lens in this zone is not under tremendous confined pressure because the unit outcrops not far downdip in the bottom of Rilda Canyon. The depth to water level graph (Figure 18) shows the well appears to respond to climatic and even seasonal variations. The well water level has not dropped much for the duration of monitoring. It does not appear mining has impacted the water level in this well. Well EM-47 may be removed from the hydrologic monitoring program.

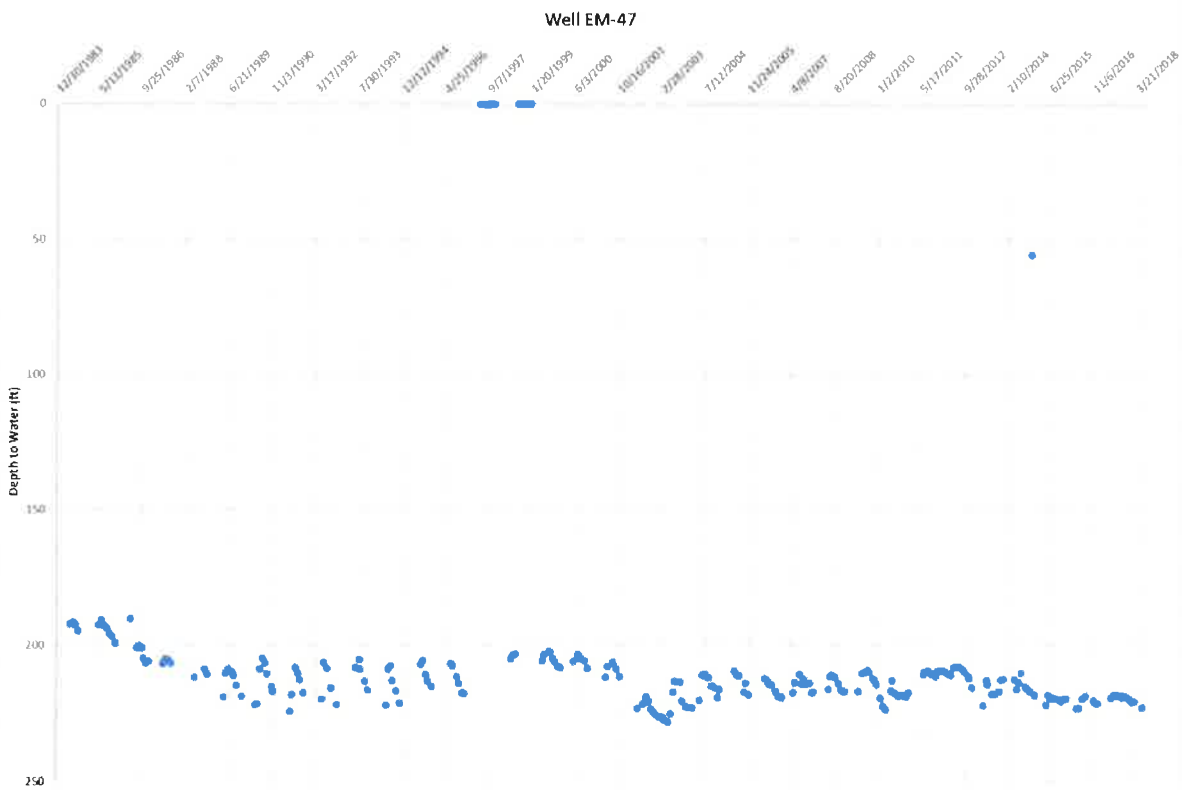


Figure 18. Well Em-47 depth vs. date monitored. Well installed in early 1980's and monitored through to the present.

### *III. SURFACE WATER MONITORING*

Indian Creek ICA, ICF, ICD, ICB

These sites are located along Indian Creek running through Upper Joe's valley, west of the Mill Fork Lease. Monitoring began at these sites in 2001. They are monitored only during baseflow conditions in October each year. Indian creek is west of the Joes Valley Fault, over a ½ mile west of the limit of the coal reserve. No mining took place underneath or directly adjacent to the stream so subsidence has not impacted channel along its length. The stream is used by grazers as a water source for irrigation and livestock. Graphing the PHDI vs. baseline flow shows all the sites have similar trend lines with positive correlations, or the wetter the climate the more flow in the stream and vice versa for drought years. It appears mining has not influence the flows in Indian Creek. These sites may be removed from the hydrologic monitoring program.

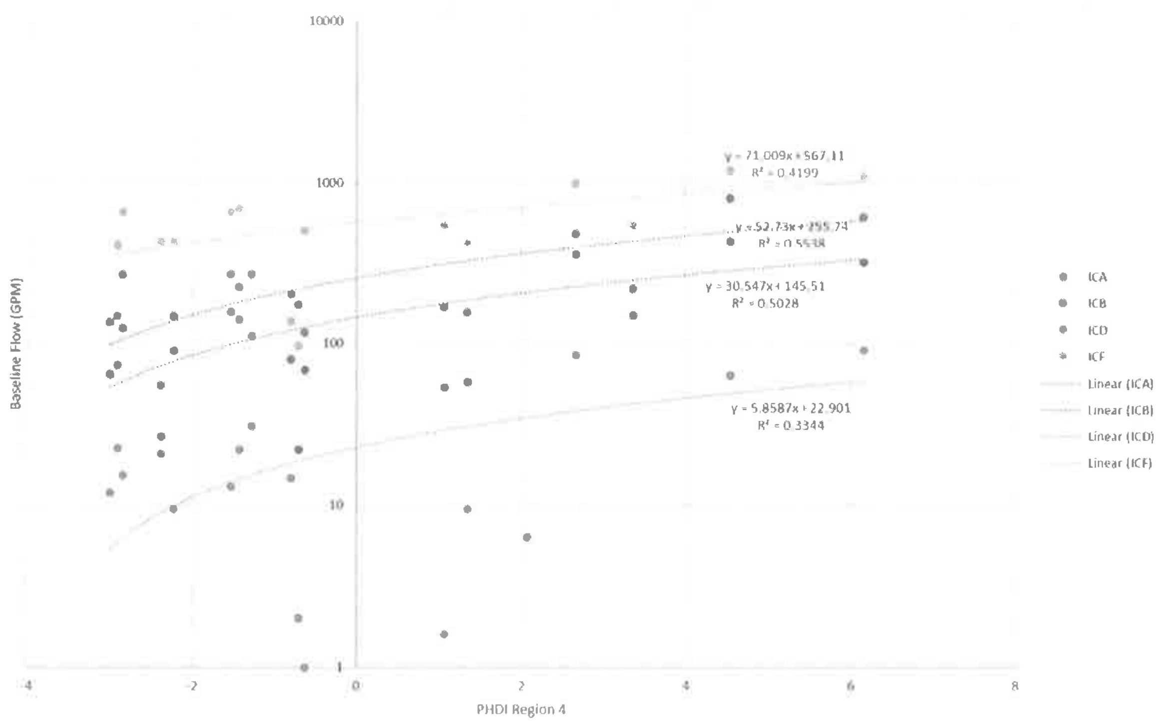


Figure 19. Indian creek baseline flows (GPM) vs. PHDI Region 4. Flow rates are log-transformed to normalize the dataset.

Huntington Creek HCC01, HCC02, HCC04

These sites were originally incorporated into the monitoring program at the request of the Division of Water Quality. Mine water discharge rates spiked in the early 1990's when workings progressed into and through the Roans Canyon Graben. Before this increase in mine water discharge the mine consumed all mine water discharge in the power plant adjacent to the mine. The elevated discharge rates overwhelmed the power plant's consumptive use and the mine was required to obtain a UPDES outfall in addition to the outfall already issued at the sediment pond. DEQ required the mine to monitor water quality in Huntington Creek above and below the confluence with Deer Creek to ensure the excess mine water did not degrade Huntington Creek. Flow for the three sites is measured at the USGS gauging station just upstream of Deer Creeks confluence with Huntington Creek. Flow has been reported monthly and quality has been reported quarterly for all three sites beginning in January 1995. It appears mining has not affected quantity or quality across these three sites for the duration of monitoring. These site may be removed from the hydrologic monitoring program.

Meetinghouse Creek MHC01
Monitoring of this surface water site began in 1984. It is monitored for flow monthly and quarterly for quality when it is flowing. A graph of surface flow rates is provided in the amendment. The stream appears to be intermittent/ephemeral with runoff typically occurring during snowmelt and summer monsoon events. The rest of the time the stream site has no flow. The site was not undermined and mining within the contributing watershed occurred in the late 1980's and early 1990's. The stream has flowed more consistently into the summer months when the PHDI ranges from 2 to 6 during climatic wet cycles. Recorded flows trend positively vs. the PHDI Region 4 (Figure 20). It appears mining has not affected quantity or quality for this site for the duration of monitoring. This site may be removed from the hydrologic monitoring program.

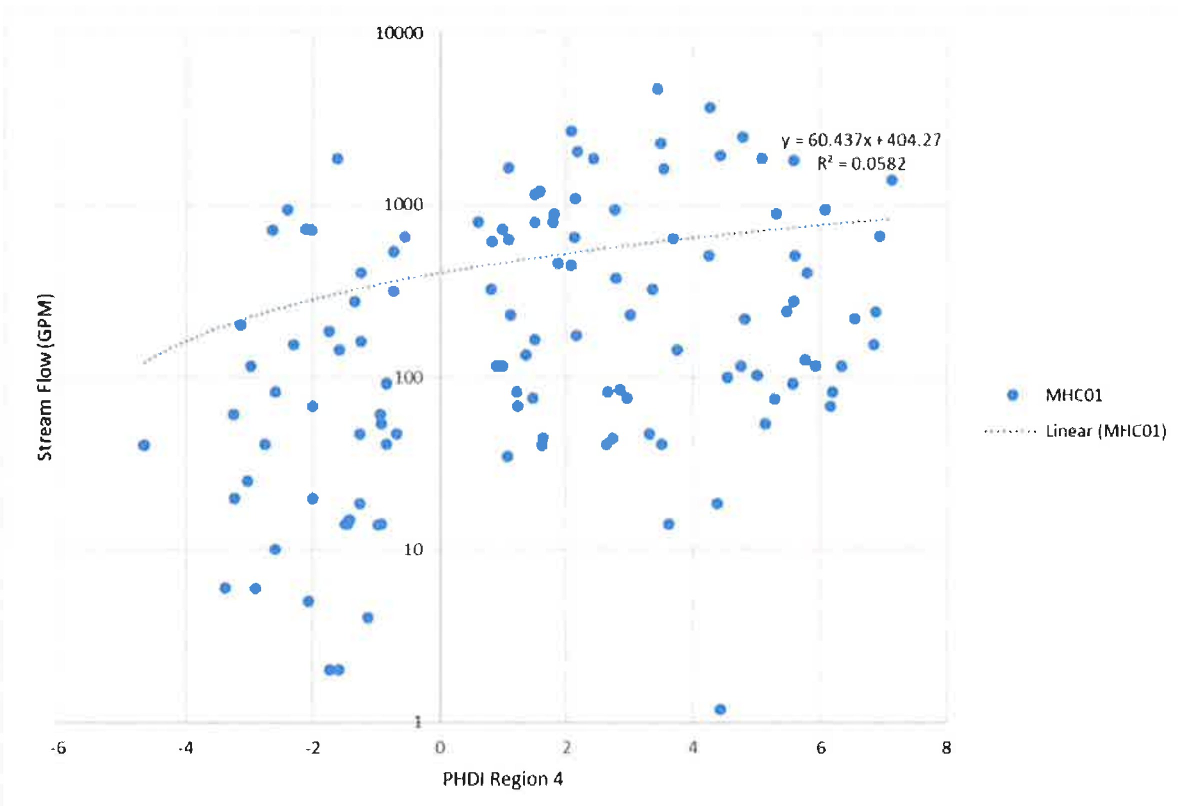


Figure 20. Recorded stream flows (GPM) along Meetinghouse creek vs. PHDI Region 4. Flow rates are log-transformed to normalize the dataset.

Mill Fork Canyon MFA01, MFB02, MFU03

Monitoring along Mill Fork canyon creek at MFA01 and MFB02 began in 1997 and MFU03 began in 2002. The sites are monitored for flow monthly and quarterly for quality when it is flowing. For the duration of monitoring the creek has flowed intermittently and ephemerally with no flow recorded at the monitoring points the vast majority of the time. Recorded flows plotted against the PHDI Region 4 shows there is a positive correlation between climate and flow rates (Figure 21). Site MFB02 is the lowest site along the creek and has quite a few more recorded flows than the other two sites. It likely receives groundwater discharge from the lower Blackhawk or Star Point formation outcrop in the bottom of the canyon bottom in addition to surface runoff. Mill Fork Creek has three point to point surface water rights running along its length. From top to bottom they are 93-198, 93-197, and 93-196 which terminates near MFA01. The upper catchment of the creek was second mined in both the Blind canyon and Hiawatha seams. It appears mining has not affected quantity or quality across these three sites for the duration of monitoring. These site may be removed from the hydrologic monitoring program.

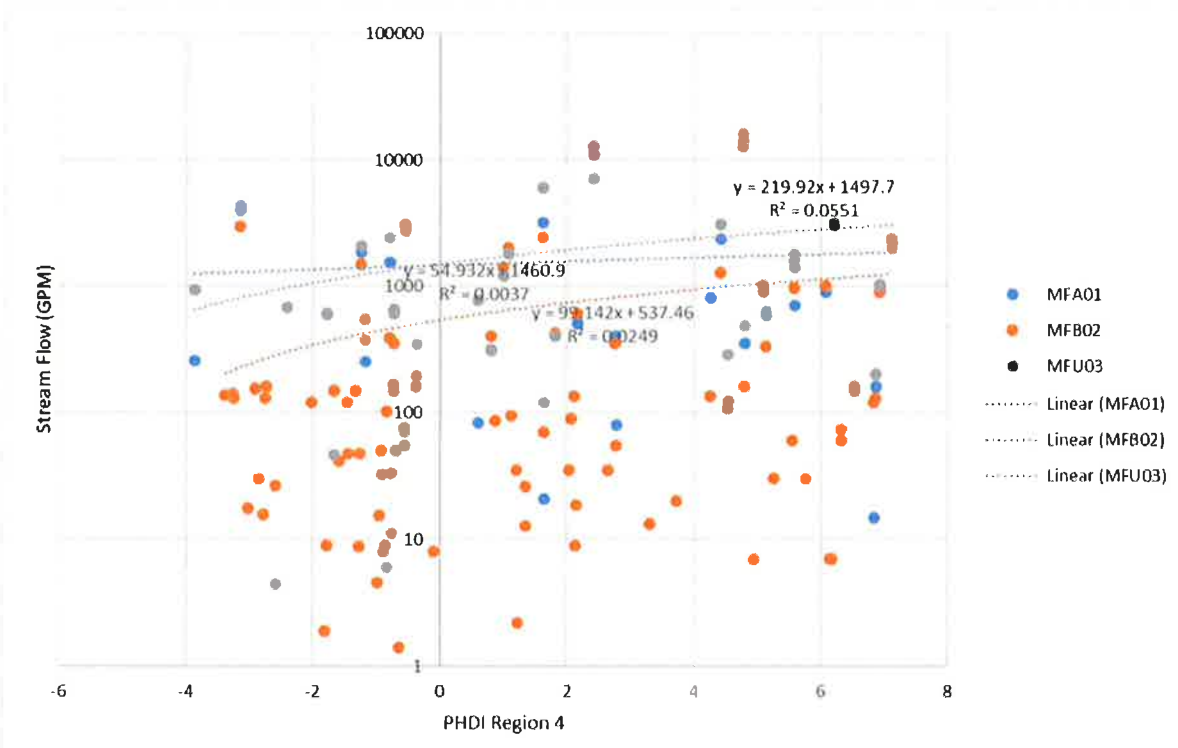


Figure 21. Recorded stream flows (GPM) along Mill Fork creek vs. PHDI Region 4. Flow rates are log-transformed to normalize the dataset.