

**SUE ANN SPENCER, P.G.  
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JELM, WY 82063**

March 31, 2017

Shannon Anderson  
Powder River Basin Resources Council  
Sheridan, WY


RE: Wireman Comments on the Revised RAMACO Brook Mine Permit Application

Dear Ms. Anderson:

As a current Wyoming registered Professional Geologist (P.G. 238), I am familiar with Mr. Mike Wireman's credentials and know him to be of good moral character, based on his work. I have also reviewed Mr. Wireman's comments on the Revised RAMACO Brook Mine Permit Application and find that his work meets the standards of a professional geologist registered in the State of Wyoming.

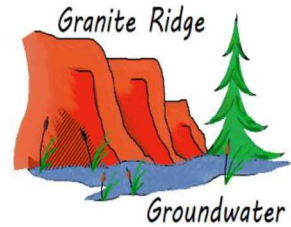
Thank you for this opportunity to be of service to your organization.

Respectfully Submitted,



Sue Ann Spencer, P.G.





**March 13, 2017**

**MEMORANDUM REPORT**

**TO: Shannon Anderson  
Powder River Basin Resources Council  
Sheridan, WY**

**FROM: Mike Wireman  
Granite Ridge Groundwater  
Boulder, CO**

**SUBJECT: Review of Revised RAMACO Brook Mine permit application**

Shannon,

I have completed a review of the Brook Mining Co., LLC Coal Mining Permit Application. The permit application proposes a highwall-auger / open pit coal mining project in north - central Sheridan County, Wyoming. I have reviewed the following documents related to the revised permit application:

- Appendix D6 –Hydrology
- Appendix D11 - Alluvial Valley Floors
- Appendix D5 –Topography, Geology And Overburden Assessment
- Revised mine plan
- Objections to the mine permit
- WY Administrative Rules - WDEQ / LQD - Chapters 2, 12, 19, 4 and 3
- WDEQ review comments on revised permit application

This memorandum provides my technical / scientific comments on the Revised Permit Application.

## **GENERAL FINDINGS**

1. There is significant uncertainty / speculation re: annual and total coal production. Estimates presented by Brook Mine representatives have varied significantly and differ from what is presented in the Revised Mine Plan. Accurate estimates of annual production are essential to allow WDEQ to review the mine permit application and to evaluate potential impacts to land, air and water resources.
2. Appendix D6 and Section M.5 of the Revised Mine Plan present a very incomplete characterization of the hydrogeology and surface water hydrology. It is my opinion that as a result the permit application is not sufficient to meet the requirements included in WS 35-11 – 406 (b) (xvii) or WS 35-11 406 (n) (iii). The sparse hydrologic data (spatially and temporally), the absence of a conceptual model that explains the limited data and the very large uncertainties associated with the groundwater modeling (Addendum MP.3) severely constrains the ability to develop and implement an adequate *“plan to minimize disturbances to the prevailing hydrologic balance at the mine site and in associated offsite areas ..”* or to design and operate the coal mining operation to *“prevent material damage to the hydrologic balance outside permit area”*. Detailed comments on Appendix D6 are presented below.
3. There is insufficient data and understanding to allow determination of probable cumulative hydrologic impacts to surface and groundwater systems as required per WDEQ LQD rules {Chapter 19 - Section 2(a) (1)}, which states that such determination is required to consider impacts from the proposed Brook mine and *“their interaction with the impacts of all anticipated mining upon all affected hydrologic systems.”* Section MP.6 of the revised Mine Plan presents a highly qualitative discussion of probable hydrologic impacts that is based on a number of questionable assumptions and does not include an assessment of cumulative impacts. This is important because of the large drawdowns that were caused by extensive coal bed methane development from 2000-2012 which reportedly lowered the groundwater levels in the coal seams from 40-80 feet in the eastern part of the Brook mine permit area. Impacts to hydrologic balance that result from lowering the water table /potentiometric surface include reduction (or drying up) of domestic well yields (there are 357 permitted wells within the permit area that are permitted for domestic and /or stock watering) and degradation of riparian / fish ecologies that rely on groundwater discharge. Detailed comments on Section MP.6 are presented below.
4. The proposed water management plan is inadequate. The analyses presented in the application regarding estimates of peak flow / runoff volume (flood) water that will need to be managed during mining operations is based on old (1973) precipitation data and did not consider extreme precipitation events. Given the occurrence of extreme events across the US and in Wyoming in recent years, it is important to model these events. Even without modeling extreme events, as discussed on page D6-3, the

peak flows on Tongue River, Goose Creek, and Slater Creek are an order of magnitude higher than mean flows. Will water management structures be designed to handle mean flows or peak flows? There is a significant concern that Brook mine will not maintain /operate all of the hydrologic control structures and that the hydrologic control plan will not be maintained and effective because it relies on many structures working.

5. The permit application does not adequately address air quality issues. The revised mine plan (Section MP.16.3) only states that the Brook mine will “incorporate air pollution control equipment” and apply for an Air Quality Permit from WDEQ / AQD. There is no discussion of sources or types of air contaminants that will need to be managed. There is no discussion of the air quality monitoring program that will need to be designed and implemented to assure compliance with applicable standards.
6. Appendix D6 (page D6-9) states that reaches of the Tongue River are on the CWA 303(d) list and that a TMDL has been established for Goose Creek. However there is no discussion regarding how the proposed mining operations will be affect the listings and be in compliance with the TMDL.
7. Brook mine proposes that – any surface water right that is disturbed or affected by their mining operations shall have that water right replaced with a similar water source until *“such time that the original water right’s functionality is restored”*. Who determines if functionality is restored? Is there a maximum time limit for providing replacement water? Also -Brook mine only agrees to replace impacted wells if they are adjudicated. This is not appropriate or sufficient since most domestic /stock wells are not adjudicated.
8. The bond estimate included with the revised mine permit is insufficient. The bond amount is only for minor reclamation activities. There is no bond amount included for remediation or mitigation of environmental impacts, including hydrologic impacts. This is a serious omission.
9. Subsidence associated with trench / highwall mining could significantly perturb the shallow groundwater flow system which delivers water to Slater Creek. Hydraulic conductivities of subsidence deposits can be much lower than the undisturbed formation. This could alter groundwater flow paths and the “hydrologic balance”. This would also affect the quality of water in Slater Creek.

## **HYDROLOGY - APPENDIX D6 and D5**

The following detailed comments are provided in support of Major Issues 2, 3, 4 and 5 above. The comments are intended to address the adequacy of the pre-mining hydrologic / hydrogeologic characterization completed in 2013 – 2014.

1. Overall the hydrogeologic characterization presented in Appendix D6 is very poor. The discussion is incomplete and based on extremely limited empirical data. There is no discussion or explanation for the apparently variably saturated conditions in the coal seams and the significant variability of water quality within and between water bearing units (coal seams and Ft. Union Formation above the coal). No conceptual model has been developed to describe the ground water flow systems in the Tongue River Member (including coal seams); the alluvial aquifer adjacent to the Tongue River; and the valley fill deposits in the Slater Creek valley.
2. No water quality data for the Tongue River above Goose Creek confluence or within the permit area is presented or discussed in Appendix D6. Water quality sampling stations should be established on the Tongue River upstream and downstream of the permit area (within ½ mile of permit boundaries). Appendix D6 should include a discussion of Tongue River water quality using data from the USGS station at Monarch WY (station 06299980) and the SCCD 2012 report. The data for the Tongue River at Decker is not representative of conditions near the mine permit area.
3. It is my opinion that the permit application is incomplete because there are no data for the USGS gage on Goose Creek after 1984. Pre-1984 data are not representative of present day.
4. There is a huge uncertainty re: temporal /spatial groundwater recharge. A sensitivity analysis included in Addendum MP-3 indicates that a change of 10-15% makes the model unstable.
5. The Tongue River Member of the Ft. Union Formation. is used extensively for water supply. As indicated on Table D6.2 -18 there are approximately 357 wells within the permit area and the adjacent 3 miles that are permitted for stock /domestic use. Section D6 .2 is deficient because it does not include a discussion on local aquifers within the Fort Union Tongue River Member including a discussion about which aquifer(s) are being used by domestic /stock wells and how vulnerable this important aquifer is to impacts from coal mining.
6. There is no discussion or data for the alluvial deposits along the Tongue River. As indicated on Exhibits D6.2-2 and D6.2-3, groundwater flow in the Masters and Carney coal seams is towards the Tongue River and likely discharges to the alluvial deposits along the north side of the River. However there are no monitoring wells in Tongue River alluvium and there is no water level, saturated thickness, or water quality data. No aquifer tests were conducted in the alluvium of Tongue River. This is a serious omission.
7. Appendix D6 contains very little site specific hydraulic conductivity data –only one value for each coal seam and only in the eastern part of the mine permit area. There is no site specific hydraulic conductivity data for the alluvial aquifers, overburden or interburden. A single storage co-efficient / specific yield value and a single porosity value were used for the entire formation. This significantly increases the error associated with the model predictions.

8. Groundwater flow in the coal seams is poorly characterized. This constrains the ability to estimate dewatering rates and volumes and to assess probable cumulative hydrologic impacts.
  - a. The potentiometric contours in Exhibits D6.2-2 and 6.2-3 indicate steep groundwater flow gradients –  $i = .02$  –  $.04$  ft/ft. Steep gradients result in higher flow velocities and higher discharge rates.
  - b. The potentiometric surface maps were made using average values –this limits interpretation and does not allow for seasonal comparisons.
  - c. Groundwater velocity estimates presented on page D6-19 (2-4 ft/yr for the Masters and 1-2.5 ft/yr for the Carney) are low. Using a  $k$  value of 0.55 ft/day from Table D6-4 (addendum D6-8) and a gradient of  $.08 / .09$ , velocity is calculated to be 10-19 ft/yr.
  - d. Appendix D6 should include a discussion of why the transmissivities vary so much for the coal seams.
  - e. On page D6-19 states that water level drawdowns from mining by Bighorn Coal are “superceded” by CBNG drawdowns, however there is no discussion about what this means. There should be a discussion of the cumulative drawdown impact from coal mining and production of CBNG. This baseline analysis is necessary before analysis of the probable hydrologic cumulative impacts of new mining can occur.
  - f. Page D6-19 -20 says that groundwater flow in 2 coal seams is NW-SE “although interrupted frequently” by faults. However the potentiometric surface maps (Exhibits D6.2-2 and D6.2-3) don’t show any change or alteration of contour lines as they cross faults.
  - g. The application contains a very poor discussion of coal seam discharge. On page D6-20 it says that there is no discharge from coal aquifers within the permit area and that there is no discharge from the Masters and Carney seams to Tongue River. This may be true –discharge is likely to Tongue River alluvium, which is not monitored.
  - h. Groundwater is stored and released from coal units (scoria) and is a source of recharge to Slater Creek alluvium. High water levels in Slater Creek alluvial wells occur in late winter indicating lag time or pulse flow. The permit application fails to properly analyze and disclose how this recharge will be affected by the intense mining in Slater Creek drainage.
9. While basin structure and topography exert some control on groundwater flow, lithology and secondary permeability features exert far greater control on flow.
10. It does not appear that Brook mine has data to support conclusion that the reach of Slater Creek that flows across the permit is a losing reach.
11. I concur with Big Horn Coal Company’s concern that proposed mining operations could cause drainage of saturated backfill in BHCC pits 1 and 2 located near the Tongue River / Goose Creek confluence. The bond to be posted by RAMACO should specifically identify this risk and the appropriate amount for remediation.
12. P D5-15 – Overburden chemistry (regulated analyte concentrations) data indicates significant exceedance of applicable standards. The mitigation presented in Appendix

- D5 for managing overburden with unacceptable concentrations of regulated analytes is vague and relies on in-situ methods. Post-closure monitoring should be conducted to help determine if there will be legacy sources of contaminants available to leach into groundwater, and such monitoring should be factored into the bond calculation.
13. There is inadequate monitoring of the underburden. There is only one monitoring well (409) in the east end of permit area screened in underburden. This is likely not representative of the underburden on the west end of the mine.
  14. Why were piezometers 578417 and 578408 constructed as 2 inch wells? It is very difficult to collect water quality samples from 2 inch wells.
  15. BHCC monitoring station HWC1-79 indicates that flow in Hidden Water Creek occurs primarily in late winter –yet there was no monitoring (flow rate / water quality sample) in late winter.
  16. Aquifer tests – Appendix D6 - Addendum D-8
    - a. It is unclear how the discharge rate of 0.33 gpm was determined as there was no step drawdown test.
    - b. The wells chosen for the aquifer testing are located in the far east end of the permit area and, given the variability in saturated conditions and water quality in the coal seams, it is unknown if the results from these wells are representative of hydraulic properties of the coal seams to the west.
    - c. The Slater Creek alluvial monitoring wells were not monitored during the aquifer tests. This was a serious omission. As determined by WDEQ there are AVF lands within the Slater Creek valley which might be impacted.
    - d. There should have been aquifer tests conducted using wells closer to Slater Creek alluvium or Tongue River alluvium to provide a more representative sample.
  17. Groundwater quality – there is considerable variation in ion chemistry between the alluvial wells and the coal wells and among the alluvial wells and coal wells. The baseline characterization provided in Appendix D6 (page D6-23, 24) does not provide any credible discussion or explanation of the geochemical processes and conditions that cause the variation. For instance, there is not sufficient data or analysis to support the conclusion that sulfate concentrations are higher in alluvial groundwater than in coal groundwater.
  18. The discussion on surface water –groundwater interaction (page D6-23) is wholly inadequate and inaccurate. The conclusion that there is no interaction is based on a highly qualitative comparison of ion chemistry between a single Slater Creek sample and a single Carney seam sample.

### **GROUNDWATER MODEL - ADDENDUM MP-3**

1. Addendum MP-3 (page MP-3-2) lists two primary goals for the modeling effort: *(1) identify potential impact (if any) to adjacent water rights and (2) estimate long term impacts from mining operations*". The first goal was addressed. The model was developed exclusively to look at the radial extent of drawdown associated with mine

related dewatering and the potential decline of water levels in nearby domestic /stock wells. However, the modeling effort did not address the 2<sup>nd</sup> goal.

2. The groundwater model simulations and predictions were derived based on extremely limited site specific data. As stated in Addendum MP-3 (page MP-3-10) the data *“provide a limited understanding of the location, continuity and hydrology of the coal seams”*. Hydraulic properties were obtained from only one location and for some parameters, average values or literature derived values were used for all nodes.
3. A sensitivity analysis presented in Addendum MP-3 -Section 4.8 concludes that the model is sensitive to changes in hydraulic conductivity –yet only one hydraulic conductivity value was obtained from each coal seam (at a single location) and this value was used for the coals across the entire model domain. There was no empirical hydraulic conductivity data for the other 4 layers in the model including the water bearing alluvial deposits.
4. The lack of sufficient field data meant that simplifying assumptions were made – especially with regard to groundwater flow in the Ft. Union Fm. above and below the coal seams and the alluvial aquifer along the Tongue River. The model did not benefit from a well developed conceptual model aimed at characterizing groundwater flow in and between the coal seams, the overlying and underlying Ft Union Fm. and the alluvial deposits along Slater Creek and the Tongue River. This is a critical constraint since most of the domestic / stock wells in the area are completed in the non-coal parts of the Ft. Union Fm. and the alluvial aquifer along the Tongue River. The modeling effort was limited to estimating drawdowns in the coal seams and did not include an assessment of hydrologic changes in the non-coal parts of the Ft. Union Fm, the Tongue River alluvium or the alluvium along Slater Creek. Modeling the coal seams as hydrologically isolated is not based on real data and is far too simplistic.
5. There is no data to help determine the hydraulic relationship (recharge –discharge) between the Ft. Union Fm (and / or the coal seams) and the alluvial aquifer and the Tongue River. There is no discussion or data regarding water levels /saturated thickness of the Tongue River alluvial aquifer. There is no data to determine losing /gaining reaches of the Tongue River. The model assumed some discharge from Carney coal to Tongue River alluvium –but also assumed some recharge of Masters coal via loss from the Tongue River, however there is no data to verify these assumed relationships.
6. No data or information was presented regarding water level trends in nearby CBM wells. Modeling the current CBM affected coal seam water levels as static is far too simplistic. If the drawdowns from CBM production have caused the coals to be partially saturated what will happen if the water levels recover in areas where coal has been removed? The modeling indicates groundwater level recovery of 90% after 10 years for the Carney and 20 years for the Masters. This does not account for water level fluctuations due to CBM production.
7. As stated on page MP-3-10 the model was *“constructed to provide a general understanding of regional impacts”*. Using model results to make predictions at the scale of the mine permit area results in large uncertainties associated with the estimates of groundwater level drawdowns. This is especially true for potential water level declines in the Tongue River alluvial aquifer.



8. The Section on **Impacts** (p MP3-4) in the Executive Summary of Addendum MP-3 is very confusing – *“To assess the impacts on water levels for all users within the region, water levels were monitored during the mining simulation at the locations of wells completed within specific aquifers, and along the Tongue River. The maximum modeled drawdown within one existing domestic well was 25.8 ft. However, the maximum drawdown observed at most wells was less than 2 ft. with almost no drawdown predicted at many wells. The maximum estimated drawdown due to mining at additional targets along the Tongue River alluvium is 0.5 feet.* This is apparently the only place in the mine plan or Appendix D6 where there is a discussion of the impacts predicted by the modeling effort. Where are the *locations of wells completed within specific aquifers?* Where is the *existing domestic well with the predicted drawdown of 25.8 ft.?* Where are the *additional targets along the Tongue River alluvium?* *The data is insufficient to draw appropriate conclusions.*

### **ALLUVIAL VALLEY FLOORS - APPENDIX D11**

The analysis presented in Appendix 11 is intended to satisfy requirements pursuant to WS 35-11 406 9n) (v) including a requirement that a coal mining operation *“not materially damage the quantity or quality of water in surface water or underground water systems that supply these alluvial valley floors”*. As discussed in Appendix 11, Brook mine has concluded that there are no AVFs in the Slater Creek drainage and therefore did provide information to satisfy the above requirement. However the WDEQ- LQD determined that there are AVFs in the Slater creek drainage within the permit area and that there may be additional AVFs on Slater Creek within ½ mile of the permit boundary (February 24, 2016 letter to Randall Atkins -WWC Engineering - from B. Kristiansen - WDEQ). This finding is supported by past subirrigation / flood irrigation agricultural activities. Limited subirrigation occurs on years with above average precipitation. Section D11.4.2 should discuss how many of past 50 years has been above average precipitation. Brook Mine should now submit a revised Appendix 11 that includes a plan to demonstrate how the mining operation will comply with WS 35-11 406 9n) (v).

Significant areas along the north and south sides of the Tongue River are underlain by AVFs. The Revised Mine Plan (section MP.25) states that there will be no direct mining on AVFs along the Tongue River or Goose Creek and therefore *“the essential hydrologic functions within Tongue River and Goose Creek AVFs shall be maintained”*. There is no discussion of potential impact that could occur from trench / highwall mining to the north of the Tongue River, which could reduce / alter discharge from the Tongue River Member of the Ft. Union Fm., (including the coal seams) to the Tongue River or Tongue River alluvium. This is directly related to one of the three *“essential hydrologic functions”* established by the WDEQ – *“ability to transmit groundwaters of suitable quality and quantity, to support subirrigation of certain areas”*. Brook mine should provide a discussion / assessment of the potential risk of reduced /altered discharge to alluvial valley floors along the Tongue River from trench/highwall mining on adjacent lands.

### **Detailed Comments – Appendix 11**

1. The conclusion that map unit entitled -Stream Terrace Deposits Uncorrelated does not meet criteria for designation as an AVF needs to be explained and supported by data /analysis.
2. The decision to not designate surficial deposits that meet the criteria for AVFs in lower Slater Creek is not supported by data.
3. Section MP.25 of the Revised Mine Plan states that a monitoring system will be established to *“ensure that essential hydrologic functions of the AVFs are maintained.”* The monitoring system will consist of analysis of periodic infrared aerial photography and alluvial monitoring wells located along the Tongue River and Goose Creek. Details of this monitoring program should be presented and a discussion of a contingency plan if the data show impacts to AVFs from coal mining.

## **WATER RESOURCE MONITORING**

1. An adequate water resource monitoring program should be based on a well developed conceptual model, which has not been completed. Pre-mining monitoring was focused on hydraulic testing of the two coal seams to be mined. Very limited data was obtained from four surface water monitoring stations and three non-coal groundwater monitoring wells. These data were not sufficient to develop a sound conceptual model that describes the hydrogeology, surface water hydrology and surface water-groundwater interaction.
2. Only four surface water monitoring locations were established for background characterization; two on Slater Creek and two on Hidden Water Creek. There were / are no pump samplers on the Hidden Water Creek locations so there is no water quality data to establish baseline conditions. No flow data for Slater Creek or Hidden Water Creek was obtained from Oct-March ( 6 months) – because the monitoring equipment was removed for winter.
3. The baseline monitoring period was too short for all four baseline locations – only one month in fall and one summer season. The lack of seasonal data precludes the establishment of annual hydrograph.
4. There were no monitoring stations established by Brook mine on the Tongue River. Both Appendix D6 and the Revised Mine Plan reference and provide data from two USGS stations on the Tongue River – one at Monarch and one near the Montana state line. While the station at Monarch will provide useful data, it is critical to establish monitoring stations upstream and downstream of the permit boundary to detect impacts from the proposed Brook mine.
5. Pre-mining groundwater monitoring did not include any monitoring wells in the alluvial deposits along the north side of the Tongue River. These deposits comprise a very important aquifer and are overlain by significant AVFs.
6. The discussion of the proposed operational monitoring network described in Section MP.7 is somewhat confusing:

- a. On page MP.47 it states that the operational surface water monitoring will be a continuation of pre- mining, baseline program. As discussed above this is inadequate. Section MP.7 includes information on how the location of any new surface water monitoring stations will be determined, however there is no discussion or commitment to establish additional surface water monitoring stations nor any discussion of potential locations.
  - b. Section MP.47 also states that the operational ground water monitoring will be a continuation of pre- mining, baseline program. Again, this is inadequate.
  - c. Ex. MP 7-1 depicts the three pre-mining alluvial monitoring wells along Slater Creek. On Table MP 7-4 five existing alluvial monitoring wells are listed. Two monitoring wells (578433 and 578434) are listed as being located in Sections 33 and 34 of T57NR84W. These two wells are not depicted on Ex. MP 7-1, nor is there any information about these two wells in Appendix D6 or the Revised Mine Plan. Table MP.7-4 also lists four proposed new alluvial wells. However there is no discussion of which geologic unit these wells are intended to monitor. Based on the locations given in Table MP.7-4 it appears these four wells are intended to monitor the alluvial deposits along Goose Creek and the Tongue River, but there is not analysis to support this conclusion. More information should be provided on these proposed wells and the permit should disclose whether WDEQ will require these wells to be installed.
  - d. Two observation wells (P62333.OW and 106680.OW) are shown on Figure 2.3-1 of Addendum MP-3. These wells appear to be located in the Tongue River alluvium. However there is no discussion of these wells in Appendix D6 or the Revised Mine Plan. Water level and water quality data from these wells should be presented and discussed.
7. The post-mining monitoring program that is discussed in Section RP.8.4 of the Reclamation Plan is very general and does not include any details on locations of proposed replacement monitoring wells or new monitoring wells. Brook mine proposes to continue the use of existing monitoring wells if they still exist after mining concludes.
- a. On Table RP.8-7 Monitoring well 578434 AI2 is listed as existing with a location and well construction information. However as indicated above on Table MP.7-4 this wells is listed as proposed.
  - b. Section RP.8.4 indicates that the pump tests will be conducted in the backfilled spoil to determine transmissivity and storage coefficient. There is no discussion of acceptable values for these parameters and what mitigation would be required if these values are not obtained.
  - c. Section RP.8.4 sates that groundwater monitoring will consist of annual water level monitoring and water quality sampling until a *“definite trend is established”* Establishing a trend with only annual monitoring could take many years. There is a real concern that Brook mine /RAMACO will not monitor long enough to establish trends. There is also a concern that water levels in the monitoring wells

will not recover for many years – so conducting the pump tests may not be possible.

8. There is no discussion or plan provided for “post-event inspections”
9. There should be a plan for monitoring quality of groundwater from dewatering that will be used for dust suppression.
10. The bond calculation should reflect all monitoring costs.

### **Detailed comments – Section MP.7**

1. Depth to water data should be included for ground water monitoring wells listed in Table D6.2-1.
2. Screened intervals in groundwater monitoring wells (Masters, Carney, alluvium) vary a lot – many are 20 feet, which is too long and results in dilution of groundwater samples.
3. There needs to be a citation for the low flow sampling method referred to on page D6.22.

### **REVISED MINE PLAN**

1. The mine plan does not discuss the risk of groundwater contamination (nitrate contamination) that may result from extensive blasting.
2. On page MP-4 it states that the height of tunnel associated with auger-highwall mining ranges from 2.5 to 28 ft. This is a large range and is unlikely to be correct. If it is a typo, it should be corrected.
3. Allowing placement of unsuitable overburden beneath ephemeral channel and spoil backfill in trenches or pits may create a legacy problem. The Reclamation plan (Section MP.8.4 indicates that pump tests /slug tests will be conducted post mining to demonstrate that there will be no major alteration of groundwater flow or chemistry. However there is no discussion of mitigation if post mine monitoring indicates unwanted changes.
4. Page MP-25 – there is no explanation of what “undisturbed” portions of Slater Creek means.
5. MP -25 says that Ex MP 5-1 shows ASCM areas and 9 trenches, however these are not depicted on EX MP 5-1. There should be a discussion /description of the ASCMs.
6. Page MP 26 – there is no discussion of why ASCMs greater than ½ mile from Tongue River / Goose Creek will not to be monitored per WDEQ/LQD Guideline Number 15.
7. Page MP-27 -waste water ponds need to be monitored for discharge to groundwater.

8. Description of flood control structures and plan to manage flood flows is weak. There is no disclosed basis for assuming that no flood waters will be received from lands disturbed by mining activities.
9. The mine plan will not follow WDEQ/LQD Guideline # 8 re: minimum flow for diversions. There is inadequate information on how the mine will prevent diversion discharges from having velocities that exceed permissible velocities.
10. There is no detailed information on pit dewatering – only gross estimates of the total required discharge. Also there is no discussion of treatment method for pit inflow if treatment is necessary.
11. MP.6 – PHI – numerous trenches will be aligned parallel to the Slater Creek channel plus surface pit mine–capture runoff, backfill will have different hydraulic properties than original material.
12. Stockpiles of overburden (40-75 ft high - 1.4 -13 acres) are potential point sources of contaminants. In years 6-12 all overburden stockpile locations are filled. There is a potential for leachate from these piles to migrate to groundwater or surface water. However there is no discussion of how this be mitigated.
13. The mine plan (MP.3.1) says roads will be reclaimed “unless retention is part of approved post mining land use.” It is important to make sure the roads are reclaimed and there is a concern that WDEQ will allow Brook mine to avoid road reclamation.
14. All wastewater ponds should be lined and monitored and costs should be appropriately considered in the bond calculation.