C/007/041 Incoming
#4247
K

Snell & Wilmer
L.L.P.
LAW OFFICES

Gateway Tower West
15 West South Temple
Suite 1200
Salt Lake City, Utah 84101-1531
801.257.1900
801.257.1800 (Fax)
www.swlaw.com

DENVER
LAS VEGAS
LOS ANGELES
LOS CABOS
ORANGE COUNTY
PHOENIX
SALT LAKE CITY
TUCSON

Denise A. Dragoo, Esq.
(801) 257-1998
ddragoo@swlaw.com

RECEIVED
JAN 11 2013
DIV. OF OIL, GAS & MINING

January 11, 2013
***Hand Delivered***

Mr. Daron Haddock
Coal Program Manager
Utah Division of Oil, Gas and Mining
1594 West North Temple
Salt Lake City, Utah

***RE: Revised Probable Hydrologic Consequences, West Ridge Resources, Inc., West Ridge Mine, C/007/0041, DO 12-A, Task ID #4143***

Dear Daron:

On behalf of West Ridge Resources, Inc., and in response to the Division's letter dated September 6, 2012, enclosed are three copies of the proposed revision to the West Ridge Mine Probable Hydrologic Consequences discussion set forth in Chapter 7, of the Mining and Reclamation Plan ("MRP"). West Ridge hereby provides the additional geologic information and the map requested by the Division. The executed Forms C-1 and C-2 are enclosed. The submittal includes the following:

***Chapter 7***
Replacement pages which revise the prior text of the MRP in the form of a redline strike-out version reflecting the proposed revisions pages 7-vi, 7-36, 7-38 and 7-39.

***Appendix 7-18***
The new Appendix 7-18, Petersen Hydrologic, LLC Report, "Investigation of Fault Systems and Fault-Related Groundwater Systems at West Ridge Mine," and accompanying mapped geologic conditions are proposed for addition to Chapter 7.

Please feel free to contact Erik Petersen or me should you have any questions.

Very truly yours,

Denise A. Dragoo

File in:
☐ Confidential
☐ Shelf
☒ Expandable
Date Folder 01/11/2013 C/ 0070041
Incoming

DD:jmc
cc: David Hibbs
Jay Marshall
Erik C. Petersen, P.G.

16428104.1

# APPLICATION FOR COAL PERMIT PROCESSING

Permit Change ☒ New Permit ☐ Renewal ☐ Exploration ☐ Bond Release ☐ Transfer ☐

**Permittee:** West Ridge Resources, Inc.
**Mine:** West Ridge Mine **Permit Number:** C/007/0041
**Title:** Response to Division Order 12-A
**Description,** Include reason for application and timing required to implement:

**Instructions:** If you answer yes to any of the first eight questions, this application may require Public Notice publication.

| Yes | No | Question |
|---|---|---|
| ☐ | ☒ | 1. Change in the size of the Permit Area? Acres: _______ Disturbed Area: _______ ☐ increase ☐ decrease. |
| ☒ | ☐ | 2. Is the application submitted as a result of a Division Order? DO# Division Order 12-A |
| ☐ | ☒ | 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area? |
| ☐ | ☒ | 4. Does the application include operations in hydrologic basins other than as currently approved? |
| ☐ | ☒ | 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond? |
| ☐ | ☒ | 6. Does the application require or include public notice publication? |
| ☐ | ☒ | 7. Does the application require or include ownership, control, right-of-entry, or compliance information? |
| ☐ | ☒ | 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling? |
| ☐ | ☒ | 9. Is the application submitted as a result of a Violation? NOV # |
| ☐ | ☒ | 10. Is the application submitted as a result of other laws or regulations or policies? *Explain:* |
| ☐ | ☒ | 11. Does the application affect the surface landowner or change the post mining land use? |
| ☐ | ☒ | 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2) |
| ☐ | ☒ | 13. Does the application require or include collection and reporting of any baseline information? |
| ☐ | ☒ | 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area? |
| ☐ | ☒ | 15. Does the application require or include soil removal, storage or placement? |
| ☐ | ☒ | 16. Does the application require or include vegetation monitoring, removal or revegetation activities? |
| ☐ | ☒ | 17. Does the application require or include construction, modification, or removal of surface facilities? |
| ☐ | ☒ | 18. Does the application require or include water monitoring, sediment or drainage control measures? |
| ☐ | ☒ | 19. Does the application require or include certified designs, maps or calculation? |
| ☐ | ☒ | 20. Does the application require or include subsidence control or monitoring? |
| ☐ | ☒ | 21. Have reclamation costs for bonding been provided? |
| ☐ | ☒ | 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream? |
| ☐ | ☒ | 23. Does the application affect permits issued by other agencies or permits issued to other entities? |
| ☐ | ☒ | 24. Does the application include confidential information and is it clearly marked and separated in the plan? |

**Please attach three (3) review copies of the application. If the mine is on or adjacent to Forest Service land please submit four (4) copies, thank you.** (These numbers include a copy for the Price Field Office)

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations, herein.

| David W. Hibbs | President | 1/11/13 | David W. Hibbs |
|---|---|---|---|
| Print Name | Position | Date | Signature (Right-click above choose certify then have notary sign below) |

Subscribed and sworn to before me this 11th day of January, 2013

Notary Public: Linda Kerns, state of Utah.
County of Carbon
My commission Expires: 03.27.13 }
Commission Number: 578211 } ss:
Address: 345 N 700 E. }
City: Price State: Ut Zip: 84501 }

LINDA KERNS
NOTARY PUBLIC • STATE of UTAH
COMMISSION # 578211
COMM. EXP. 03-27-2013

| For Office Use Only: | Assigned Tracking Number: | Received by Oil, Gas & Mining |
|---|---|---|
| | | RECEIVED<br>JAN 11 2013<br>DIV. OF OIL, GAS & MINING |

Form DOGM- C1 (Revised December 10, 2007)

# APPLICATION FOR COAL PERMIT PROCESSING
## Detailed Schedule Of Changes to the Mining And Reclamation Plan

**Permittee:** West Ridge Resources, Inc.
**Mine:** West Ridge Mine
**Permit Number:** C/007/0041
**Title:** Response to Division Order 12-A

Provide a detailed listing of all changes to the Mining and Reclamation Plan, which is required as a result of this proposed permit application. Individually list all maps and drawings that are added, replaced, or removed from the plan. Include changes to the table of contents, section of the plan, or other information as needed to specifically locate, identify and revise the existing Mining and Reclamation Plan. Include page, section and drawing number as part of the description.

| | | | DESCRIPTION OF MAP, TEXT, OR MATERIAL TO BE CHANGED |
|---|---|---|---|
| ☐ Add | ☒ Replace | ☐ Remove | Chapter 7 Page-vi, replace old page with new Page 7-vi |
| ☐ Add | ☒ Replace | ☐ Remove | Chapter 7 Page 7-36, replace old page with new Page 7-36 |
| ☐ Add | ☒ Replace | ☐ Remove | Chapter 7 Page 7-38, replace old page with new Page 7-38 |
| ☐ Add | ☒ Replace | ☐ Remove | Chapter 7 Page 7-39, replace old page with new Page 7-39 |
| ☒ Add | ☐ Replace | ☐ Remove | Add new appendix, Appendix 7-18 |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |
| ☐ Add | ☐ Replace | ☐ Remove | |

| Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan. | Received by Oil, Gas & Mining |
|---|---|
| | RECEIVED<br>JAN 11 2013<br>DIV. OF OIL, GAS & MINING |

Form DOGM - C2 (Revised December 10, 2007)

# CHAPTER 7
# REDLINE STRIKEOUT

# TABLE OF CONTENTS- APPENDICES
# R645-301-700 CHAPTER 7

alluvial springs will consist of full support development mining only. As no subsidence in these areas is anticipated, and because the springs are separated from the development mine entries by more than 2,600 feet of overburden, impacts to these springs are considered unlikely.

It is illustrative to compare the recommended minimum overburden thicknesses for coal mines as recommended by the SME in the Mining Engineers Handbook (See Chapter 10.6, "Mine Subsidence"). The Mining Engineers Handbook recommends that *for total extraction mining* a vertical distance between the mine and a water body *with potential for causing catastrophic damage* should be a minimum of 60 times the coal mining height. The same vertical separation distance is recommended for protection of aquifers overlying total extraction mining areas. (A similar standard has often been applied by Federal and State regulatory agencies in Utah coal mining permitting activities). Using a conservative estimate of a 10-foot coal seam thickness to be mined, the minimum overburden thickness required for protection of overlying surface water bodies and aquifers situated above total extraction areas would be 600 feet. Given that the overburden thickness above the proposed longwall Panel 22 ranges from about 2,800 to 3,500 feet, it is calculated that the overburden thickness present above Panel 22 is 4.6 to 5.8 times the minimum recommended by SME. Similarly, given that the vertical distance between the Panel 22 bleeder entries and the stream channel in the Right Fork of Whitmore Canyon exceeds about 2,650 feet, it is calculated that the overburden thickness there is 4.4 times the minimum thickness recommended by SME for *total extraction mining* below the creek. Given that only full support development entry mining will occur beneath the creek, it follows that the potential for adverse impacts to the creek bed as a result of the proposed development mining is negligible based on considerations set fourth by SME.

It should be noted that groundwater has previously been encountered in fault systems at the West Ridge Mine. Water bearing fault zones have also been occasionally encountered at other surrounding coal mines in the Book Cliffs coal mining district. If a water-bearing fault system were to be intercepted by the mine workings in the Panel 22 permit modification area, groundwater inflows from the fault system could occur. However, because of the thickness of the overburden in the area (> 2,700 feet), and the poor vertical water transmitting potential of the clay-rich overburden lithologies (which are known regionally to contain clay minerals that have the tendency to heal mining-induced fractures when wetted), the potential for a possible fault system to intercept shallow groundwater systems that could support springs or provide baseflow to streams is considered low (See Appendix 7-1). Geologic information regarding the fault system encountered in the mine and associated fault-related groundwater systems are provided in Appendix 7-18.

As mining progresses beneath the Right Fork of Grassy Trail Creek drainage, the rates of groundwater interception in each longwall panel area will be closely monitored. West Ridge Resources plans to install a total of six flow meters to

West Ridge Mine personnel indicate that relatively little water was encountered in the mine workings when mining near the outcrop occurred during the early years of mining activities. The water that was encountered was predominantly sourced from the mine roof in these areas (Personal communication, Gary Gray, 2012). As mining progressed rapidly down-dip under deeper cover, increased amounts of water began to be intercepted. Much of this water originated from upwelling from the mine floor. It seems likely that the floor water is derived largely from the underlying Sunnyside Sandstone member of the Blackhawk Formation which directly underlies the mined Lower Sunnyside Coal Seam at the West Ridge Mine.

The specific water-bearing stratums that yield water to the mine workings are not known. This is largely due to the fact that most of the water intercepted in the West Ridge Mine drains from mined-out longwall gob areas (Personal communication, Dave Shaver, 2011). Because these areas are completely inaccessible to personnel, it is not possible to identify the specific origins of the water entering the mine gob areas after mining. However, in the general sense, it has been observed that groundwater enters the mine workings through 1) sandstone paleochannels in the mine roof, 2) upwelling of groundwater from the mine floor, and 3) along fault and fracture damage zones. A discussion of the fault system and associated fault-related groundwater systems in the mine is provided in Appendix 7-18 It is likely that the bedrock fracturing associated with the longwall mining process enhances the permeability of water bearing strata adjacent to the mine openings through which groundwater enters the gob areas. The removal of the coal resource (which in most locations is largely impermeable) may also facilitate the inflow of groundwaters from overlying or underlying water-bearing strata.

While the exact source(s) of the intercepted mine waters are not known, it seems plausible that a major beach-barrier bar sandstone deposits within the Blackhawk Formation (such as the Sunnyside Member) could potentially contribute to the volume of water intercepted by the mine workings. The mined coal seam (the Lower Sunnyside Coal Seam) lies directly above the Sunnyside Sandstone Member. The Sunnyside Member is predominantly sandstone and is approximately 100 to 190 feet thick in the mine area (Mayo and Associates, 1998) which gives it a large potential groundwater storage volume. Additionally, large channel sandstone deposits are present in the upper unnamed member of the Blackhawk Formation, which is a shallow marine foreshore deposit that directly overlies the Lower Sunnyside Coal Seam. Appreciable groundwater storage volumes are potentially present in these channel sandstones. Other water-bearing sandstone units intersected by mining-induced fractures in the overburden geologic sequence could also potentially contribute water to the West Ridge Mine workings. As indicated previously, the carbon-14 and tritium data indicate that groundwater from the shallow, near-surface systems that support most springs in the area is not in good hydraulic communication with the deep, inactive-zone groundwaters encountered in the underground mine workings at the West Ridge Mine. Accordingly, it is considered exceedingly unlikely that shallow, active-zone groundwater systems that support springs and seeps in the area, or provide baseflow discharge to streams could be the source of the groundwater intercepted in the West Ridge Mine.

It should be noted that fault- and fracture-related groundwater inflows have been observed in the West Ridge Mine. As evidenced by the old carbon-14 dates and the absence of tritium in groundwaters encountered in the West Ridge Mine, it is evident that hydrodynamic communication with overlying active-zone groundwater systems has not been established through these faults or fractures (See Appendix 7-17 and 7-18). It is considered likely that the fault and fracture systems in the mine area provide pathways of enhanced secondary porosity which interconnect the mine openings with nearby, adjacent water-bearing strata. The abundant presence of soft shales, mudstones, and claystones, and the presence of hydrophyllic swelling clays in the rock strata likely limit the potential for fracture planes to remain open within these strata, particularly under the considerable confining pressures associated with the very thick overburden present at the West Ridge Mine.

The quantity of water utilized underground as mine process water is variable based on mining conditions. Typically, in total the amount utilized over the entire underground mining operation may amount to a few hundred gallons per minute. However, a substantial amount of the water (perhaps more than 50%) used underground is non-consumptive. After use, this water generally flows to sump areas where it is pumped from the mine as part of the mine discharge water.

# APPENDIX 7-18

Appendix 7-18

Petersen Hydrologic, LLC report

# Investigation of Fault Systems and Fault-Related Groundwater systems at the West Ridge Mine

**PETERSEN HYDROLOGIC**

11 January 2013

Mr. David Hibbs
West Ridge Resources, Inc.
P.O. Box 910
East Carbon, Utah 84520

RE: Geologic, solute chemical and isotopic investigation of the north-northwesterly fault zone and fault-related groundwater systems in the West Ridge Mine.

David,

At your request, we have performed an investigation of the north-northwesterly trending fault zone that has been encountered in several locations historically at the West Ridge Mine. This investigation includes a description of the geologic characteristics of the fault zone and an investigation of solute and isotopic compositions of groundwater systems associated with this fault zone. The results of this investigation are presented in this letter report.

***Introduction***

The West Ridge Mine, which is operated by West Ridge Resources, Inc., is located in "C" Canyon, approximately five miles north of the town of East Carbon, Utah. Mining operations at the West Ridge Mine commenced in 1999. A north-northwesterly fault zone has been intercepted by mine workings of the West Ridge Mine. The fault zone crosses diagonally through the middle of the mine workings (Plate 1). The purpose of this investigation is to investigate the geologic characteristics and the groundwater systems associated with this fault/fracture system.

2695 N. 600 E. LEHI, UTAH 84043 (801) 766-4006

### *Methods of Study*

On 19 October 2012 we visited the West Ridge Mine to investigate the geologic conditions associated with the north-northwesterly fault system and to collect samples of groundwater for solute geochemical and isotopic analysis. Locations for geologic investigation and groundwater sampling were selected in areas where the fault zone was exposed and accessible and where groundwater discharge was present (many old mining areas are now sealed and inaccessible).

The mine water sample was collected for solute chemical analysis and for unstable radiocarbon ($^{14}C$) and tritium ($^{3}H$) analysis. Solute chemical analyses were performed by Chemtech-Ford Laboratory of Murray, Utah. Tritium analysis was performed by the University of Miami, Tritium Laboratory in Miami, Florida. Radiocarbon and carbon-13 analyses are currently being performed by the Brigham Young University Laboratory of Isotope Geochemistry of Provo, Utah.

Groundwater discharge temperatures were measured using a Taylor brand digital thermometer. Specific conductance measurements were performed using an Extech brand model EC400 conductivity meter with automatic temperature compensation. The instrument was calibrated using NIST traceable conductivity standard solutions. The pH measurements were performed using an Oakton brand model pH Testr 30 with automatic temperature compensation, which was calibrated using NIST traceable pH standard solutions.

### *Presentation of Data*

The locations of the north-northwesterly trending fault and the in-mine fault-related groundwater sampling points are shown on Figure 1. The results of the laboratory solute chemical analyses are presented in Table 1. The results of the isotopic analyses are presented in Table 2. Isotopic and solute laboratory reporting sheets are included in the Appendix. A map showing the fault details and locations where the fault was intercepted by the underground mine workings is provided as Plate 1.

***Previous Investigations***

As part of a previous investigation, the north-northwesterly fault system has been investigated. On 2 July 2012, Petersen Hydrologic, LLC (2012) submitted a letter report to Mr. David Hibbs summarizing the results of an isotopic and solute chemical investigation of groundwater systems in the West Ridge Mine. As part of that investigation, groundwater samples were collected for solute and isotopic analysis from two locations associated with the north-northwesterly fault zone in the West Ridge Mine.

**New Sample Location**

As part of this investigation, a sample of groundwater discharging from the north-northwesterly fault system was sampled on 19 October 2012for solute and isotopic analysis. This sample (Mains XC 49 E4-E5) is located at the intersection of the north-northwesterly fault zone and the Mains entries in the central portion of the West Ridge Mine (Figure 1).

**Fault Zone Geologic Characteristics**

Faulting in the Book Cliffs area has been described by Weiss, Witkind, and Cashion (1990). Regionally, two main sets of normal, high-angle faulting have been identified. These include a set of northwest-striking faults and a set of northerly striking faults. The displacement on any one fault does not exceed 80 feet. The precise origins of these faults are not known, but possible origins may include movement associated with the dissolution of underlying salt deposits, or movement along deep seated fractures that break the crystalline rocks of the basement complex of the Uncompahgre uplift that underlies the area (Weiss et al, 1990).

Details of the north-northwesterly fault zone as encountered in the West Ridge Mine underground workings are shown on Plate 1. Included on Plate 1 are measurements of the local fault displacement magnitudes. As indicated on Plate 1, the relative movement along the fault zone is down on the west side of the fault, with displacement decreasing to the north. A similar trend of decreasing fault displacement to the north has been observed in the Sunnyside Fault zone immediately south of the West Ridge Mine area (Mayo and Associates, 1998). Where the fault has been intercepted by the mine workings, the displacement along the fault ranges from about 6 feet in the southernmost regions to essentially no offset north of the intersection with the Mains entries in the central portion of the mine. As shown on Plate 1, the fault locations north of the Mains entries are plotted as projections. While fractured zones along this trend are apparent in the field, there is no apparent displacement along the fault/fracture zone in these locations.

When the north-northwesterly fault zone was visited at the Mains XC 49 location on 19 October 2012, a series of minor fractures were observed, but no displacement along the fault zone was apparent. At this location, there were two sub-parallel fractures separated by approximately 16 inches in the mine roof. There was no open aperture associated with these fractures and the narrow (~1/4 inch) fracture planes were completely filled with mineral precipitate and/or pulverized coal. Minor fracturing in the bedrock exposed in the mine floor was also noted in this area.

Where the projected trend of the fault zone was inspected in the bleeder entries behind the number 16 longwall panel, minor fracturing of both the floor and roof rocks of the mine was observed. The observed strike of the fractures approximately coincided with the direction of the strike of the north-northwesterly fault zone where is has been mapped in the southern portion of the West Ridge Mine. No offset of the strata was noted at the location of the fracture system.

***Fault-Related Groundwater Systems***

A groundwater discharge location associated with the north-northwesterly trending fault system was sampled for solute and isotopic compositions as part of this investigation. In conjunction with previous investigations at the West Ridge Mine, two additional fault-related groundwater discharge locations were sampled previously.

The Mains XC 49 E4-E5 floor seep site monitored for this investigation was sampled on 19 October 2012. There was no groundwater discharge associated with the fracture zone in the mine roof. Rather, the fracture zone in the mine roof was completely dry in this area. However, at this location groundwater was observed upwelling from fractures in the mine floor at a measured rate of 3.66 gpm. The odor of hydrogen sulfide gas was present at the site and gas bubbles could be seen exolving from the discharging water at the site. The discharge temperature of this upwelling water was warm (24.3 °C). The measured pH at this site was near neutral at 7.17 units. The TDS of the discharge water (3,130 mg/L) is elevated relative to the two other fault related groundwaters sampled previously. The Mains XC 49 E4-E5 floor seep groundwater is of the sodium-sulfate geochemical type. This site was sampled for tritium and radiocarbon content during this sampling event. The tritium content of this sample (0.40 TU) is low. As of the date of this report, the results for the radiocarbon analysis were not yet available and thus groundwater mean residence time calculations for this groundwater could not be performed at this time.

As discussed previously, two additional fault-related groundwater discharge locations were sampled on 10 October 2011 as part of a previous investigation (See Appendix 7-17 of the West Ridge Mine MRP). These locations are situated further north along the same fracture zone trend as is the Mains XC 49 E4-E5 floor seep sampling location. These two sampling sites are located in the bleeder section behind the Panel 16 location. There was no observable offset in the fracture zone in this location. Groundwater discharge occurred from a fracture in the mine roof in this location (Back Bleeder XC 60.5 Entry 1 Roof Drip) at a very low rate (<0.05 gpm) and also from a fracture in the mine floor (Back Bleeder XC 60.5 Entry 2 Floor Seep) at approximately 1 gpm. The discharge temperatures of the roof drip and floor seep groundwaters at this location were 21.1 and 25.3 °C, respectively. The TDS concentrations of these groundwaters were 762 and 1,430 mg/L, respectively. The tritium contents of both of these fault-related groundwaters were very low (near the lower laboratory detection limit), indicating that the fault-related groundwaters have been isolated from the surface for at least the past 50 years. The calculated groundwater mean residence time for the roof drip sample was approximately 12,000 years, while the mean residence time for the floor seep water was approximately 21,000 years.

***Discussion***

Based on the information presented here, several important conclusions regarding the north-northwesterly fault system and the associated fault/fracture-related groundwater systems can be drawn. These include the following:

- The north-northwesterly fault system, which essentially dissects the West Ridge Mine, is not a major structural feature in the region. The offset on the fault ranges from about 6 feet in the southernmost intercepted length to near zero a few cross-cuts north of the intersection of the fault system with the Mains entries. No vertical offset has been identified in the northernmost extent of the system, although a fracture system with a trend matching that of the fault zone further south has been identified in that area.

- The current rates of groundwater discharge from the north-northwesterly trending fault system (in accessible regions of the West Ridge Mine) are small. The discharge from the single fracture-related roof drip sample was less than 0.05 gpm. No other appreciable roof drips were identified in the mine roof near the fault/fracture zone. The discharges from the Mains XC 49 E4-E5 floor seep sampling location was 3.66 mg/L while the discharge from the Back Bleeder SC 60.5 Entry 2 floor seep was approximately 1 gpm. In total, the rate of discharge from seepage from the mine floor at all visited locations was estimated to be less than about 10 gpm. Clearly, relative to the total discharge from the West Ridge Mine (which exceeds 2,000 gpm) these quantities of groundwater are not very significant. It is possible that greater rates of groundwater discharge from fault-related groundwater systems could be occurring in now inaccessible, mined-out areas, but this is not possible to verify. West Ridge Mine personnel indicate that currently most of the water entering the mine originates from mined-out longwall gob areas (Personal communication, Dave Shaver, 2012). Fracturing of overlying bedrock strata as a consequence of longwall mining activities can hydraulically connect the mine workings with shallowly overlying adjacent water bearing strata above the mine roof. This occurrence can appreciably enhance the vertical hydraulic conductivity of the overlying strata and result in increased rates of inflows to the mine gob areas. Whether the inflows into the sealed and inaccessible gob areas are related to fault-related groundwaters is not known.

- Isotopic age dating of fault-related groundwaters at the West Ridge Mine indicate that the sampled groundwaters are many thousands of years old. Low tritium contents indicates a lack of appreciable communication with overlying surface waters and shallow groundwaters. Groundwater sampled from sealed, mined-out gob areas from which appreciable groundwater discharge is currently occurring at the West Ridge Mine is also old and not in communication with the surface (see West Ridge Mine MRP, Appendix 7-17).

***References Cited***

Mayo and Associates, LC, 1998, Investigation of surface-water and groundwater systems in the West Ridge area, Carbon County, Utah, unpublished consulting report for Andalex Resources, Inc., Price, Utah.

Weiss, M.P., Irving, J.W. and Cashion, W.B., 1990, Geologic map of the Price 30' x 60' quadrangle, Carbon, Duchesne, Uintah, Utah, and Wasatch Counties, Utah, U.S. Geological Survey, Miscellaneous Investigations Series, Map I-1981.

Petersen Hydrologic, LLC, 2012, Letter report to David Hibbs, Isotopic and solute chemical investigation of groundwater systems at the West Ridge Mine, Unpublished consulting report for West Ridge Resources, Inc.

Please feel free to contact me should you have any questions in this regard.

Sincerely,

LICENSED PROFESSIONAL GEOLOGIST
ERIK CARL PETERSEN
No. 5373615-2250
STATE OF UTAH

Erik C. Petersen, P.G.
Principal Hydrogeologist
Utah PG #5373615-2250

.

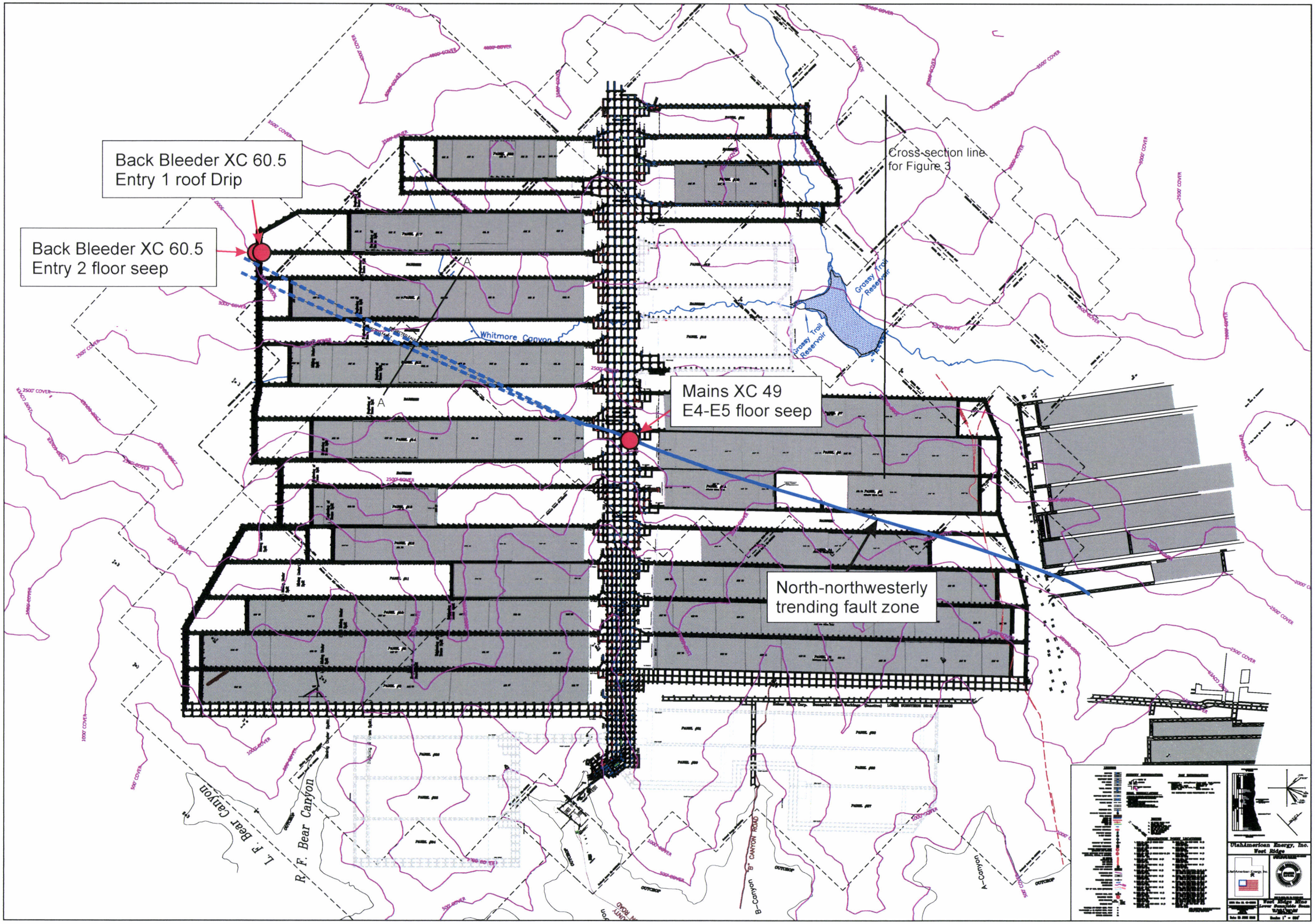


Figure 1 Fault-related groundwater sampling locations and north-northeast trending fault location at the West Ridge Mine workings.

**Table 1 Chemical compositions of fault-related groundwaters at the West Ridge Mine.**

| | Sample Date | Q (gpm) | T (°C) | pH (S.U.) | Sp. Cond. (µS/cm) | TDS (mg/L) | $Ca^{2+}$ (mg/L) | $Mg^{2+}$ (mg/L) | $Na^{+}$ (mg/L) | $K^{+}$ (mg/L) | $HCO_3^{-}$ (mg/L) | $SO_4^{2-}$ (mg/L) | $Cl^{-}$ (mg/L) | Fe(d) (mg/L) | Fe(t) (mg/L) | Mn(d) (mg/L) | Mn(t) (mg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Back Bleeder XC 60.5 Entry 1 Roof Drip | 10-Oct-11 | <1 | 21.1 | 8.34 | 890 | 762 | 42.85 | 37.34 | 88.34 | 20.06 | 429.7 | 130.62 | 13.24 | | | | |
| Back Bleeder XC 60.5 Entry 2 floor seep | 10-Oct-11 | 1 | 25.3 | 7.24 | 1,545 | 1,430 | 127.9 | 120.4 | 44.41 | 27.61 | 493.0 | 602.68 | 14.21 | | | | |
| Mains XC49 E4-E5 floor seep | 19-Oct-12 | 3.66 | 24.3 | 7.17 | 3,130 | 2,594 | 114 | 131 | 420 | 12.9 | 775 | 1100 | 41 | <0.02 | 0.02 | <0.005 | <0.005 |

Note: The values for total dissolves solids are a calculated summation of the analyzed dissolved species.

**Table 2 Isotopic compositions of fault-related groundwaters at the West Ridge Mine.**

| | Sampling date | Deuterium ($\delta^2H_{VSMOW}$) (‰) | Oxygen-18 ($\delta^{18}O_{VSMOW}$) (‰) | Carbon-13 ($\delta^{13}C$) (‰) | Carbon-14 ($^{14}C$) (pmC) | Tritium ($^3H$) (TU) |
|---|---|---|---|---|---|---|
| Back Bleeder XC 60.5 Entry 1 Roof Drip | 10-Oct-11 | -116.20 | -15.34 | -7.41 | 8.54 | 0.10 |
| Back Bleeder XC 60.5 Entry 2 floor seep | 10-Oct-11 | -117.00 | -15.57 | -9.61 | 3.32 | 0.10 |
| Mains XC49 E4-E5 floor seep | 19-Oct-12 | --- | --- | --- | --- | 0.40 |

# APPENDIX

Laboratory reporting sheets

Client: PETERSEN HYDROLOGIC
Recvd : 12/11/30
Job# : 3045
Final : 13/01/08

Purchase Order: Bill to: Erik Petersen
Contact: E. Petersen, 801/766-4006
2695 N. 600 E.
Lehi, UT 84043

West Ridge Project

| Cust LABEL INFO | JOB.SX | REFDATE | QUANT | ELYS | TU | eTU |
|---|---|---|---|---|---|---|
| PETERSEN - MAINS XC49E4&E5 | 3045.01 | 121019 | 1000 | 275 | 0.40 | 0.09 |

CHEMTECH-FORD LABORATORIES

# Certificate of Analysis

**Lab Sample No.: 1210231-01**

| | | | |
|---|---|---|---|
| ***Name:*** | **Petersen Hydrologic, LLC** | ***Sample Date:*** | 10/19/2012 12:00 PM |
| ***Sample Site:*** | West Ridge | ***Receipt Date:*** | 11/1/2012 11:21 AM |
| ***Comments:*** | Mains XC49 E4-E5 | ***Sampler:*** | Erik Petersen |
| ***Sample Matrix:*** | Water | ***Project:*** | Other |

| Parameter | Sample Result | Minimum Reporting Limit | Units | Analysis Date/Time | Analyst Initials | Analytical Method | CAS No. | Flag |
|---|---|---|---|---|---|---|---|---|
| **Inorganic** | | | | | | | | |
| Alkalinity - Bicarbonate (HCO3) | 775 | 1.0 | mg/L | 11/4/2012 13:00 | TSM | SM 2320 B | 71-52-3 | APH |
| Alkalinity - Carbonate (CO3) | ND | 1.0 | mg/L | 11/4/2012 13:00 | TSM | SM 2320 B | 3812-32-6 | APH |
| Alkalinity - CO2 | 579 | 1.0 | mg/L | 11/4/2012 13:00 | TSM | SM 2320 B | 124-38-9 | APH |
| Alkalinity - Hydroxide (OH) | ND | 1.0 | mg/L | 11/4/2012 13:00 | TSM | SM 2320 B | 14280-30-9 | APH |
| Alkalinity - Total (as CaCO3) | 636 | 1.0 | mg/L | 11/4/2012 13:00 | TSM | SM 2320 B | CTFID10279 | APH |
| Chloride | 41 | 5 | mg/L | 11/2/2012 7:30 | TSM | EPA 300.0 | 16887-00-6 | |
| Sulfate | 1100 | 25 | mg/L | 11/2/2012 7:30 | TSM | EPA 300.0 | 14808-79-8 | |
| **Metals** | | | | | | | | |
| Calcium, Dissolved | 114 | 0.2 | mg/L | 11/15/2012 17:34 | PNM | EPA 200.7 | 7440-43-9 | |
| Iron, Dissolved | ND | 0.02 | mg/L | 11/15/2012 17:34 | PNM | EPA 200.7 | 7439-89-6 | |
| Iron, Total | 0.02 | 0.02 | mg/L | 11/15/2012 17:38 | PNM | EPA 200.7 | 7439-89-6 | |
| Magnesium, Dissolved | 131 | 0.2 | mg/L | 11/15/2012 17:34 | PNM | EPA 200.7 | 7439-95-4 | |
| Manganese, Dissolved | ND | 0.005 | mg/L | 11/15/2012 17:34 | PNM | EPA 200.7 | 7439-96-5 | |
| Manganese, Total | ND | 0.005 | mg/L | 11/15/2012 17:38 | PNM | EPA 200.7 | 7439-96-5 | |
| Potassium, Dissolved | 12.9 | 0.5 | mg/L | 11/15/2012 17:34 | PNM | EPA 200.7 | 7440-09-7 | |
| Sodium, Dissolved | 420 | 0.5 | mg/L | 11/15/2012 17:34 | PNM | EPA 200.7 | 7440-23-5 | |



6100 South Stratler
Murray, UT 84107
801-262-7299 Office