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Montana Department of
ENVIRONMENTAL QUALITY

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July 23, 2013

Ms. Dicki Peterson
Western Energy Company
Rosebud Coal Mine Area B
P.O. Box 99
138 Rosebud Lane
Colstrip, MT 59323-0099

Permit ID: C1984003B
Revision Type: Amendment
Permitting Action: Deficiency
Subject: AM4, Application 00184; Fifth Round Acceptability Deficiency

Dear Dicki:

The Department of Environmental Quality (DEQ) has completed its acceptability review regarding Western Energy Company's (Western Energy) amendment application. The following deficiencies must be adequately addressed before DEQ can determine the application acceptable. These deficiencies are as follows:

ARM 17.24.313(1)(h): Please provide the letter from Great Northern Properties documenting their approval of the postmine land use shift as stated in your response.

ARM 17.24.315: The drainage control map, Exhibit D-2, was updated appropriately with flow arrows and an exhibit number; however, pond locations were removed. The approximate location of future ponds must be depicted.

ARM 17.24.321: No changes to Exhibit A-2 were made in regard to dragline walkways. In accordance with the performance standards of ARM 17.24.501, DEQ will require all spoils to be graded to the approved post mine topography within four mine passes of the active pit: no exceptions will be made for dragline walkways other than those depicted and approved in the permit.

In addition to responding to DEQ deficiencies, Western Energy added an electronic copy of Volume 1 to its response. The electronic Volume 1 includes numerous changes from the approved hardcopy. While there may be reasons for some of the changes, DEQ believes this information should be submitted under a separate revision and therefore did not include comments on the proposed new Volume 1.

ARM 17.24.314(3): The following deficiencies are associated with the PHC submitted for Areas A, B and C. DEQ appreciates the efforts Western Energy has put into providing the updated PHC. Having an updated PHC will greatly assist DEQ in completing the Environmental Assessment, Cumulative Hydrologic Impact Assessment (CHIA) and Written Findings for AM 4; therefore, DEQ has identified deficiencies that must be addressed to that we can proceed with the development of these documents.

General PHC Comments:

As the PHC is only for areas A, B, and C, please do not include data or references to other mine permit areas. For example:

- Figure 24B shows spoils water quality for Areas D and E, which are not covered by this PHC.
- Area F is shown on numerous figures in the PHC and the groundwater model (e.g. GM-8). Area F is a prospecting area, not a permit area. The use of water level measurements in Area F to extend the potentiometric surface maps is appropriate, but inclusion of Area F baseline water quality in the area A, B, and C PHC is not appropriate.
- Section 3.2.6.1, Water Quality Time Series, on pages 24 and 25 mainly discusses results from Area D.
- There is reference to Area F regarding alluvium & springs in the middle of RMGM-page 10. This paragraph should be left out as it does not add anything to the Area A, B, and C discussion. Also, at bottom of page re: faults.

The data used in the PHC are cumulative through 2011, although 2012 water year data is available and has been reported to the DEQ. Please indicate why the PHC does not include 2012 data. As the CHIA analysis will include 2012 data, the CHIA analysis may differ from or include information not included in the PHC.

The diminished alluvial aquifer recharge from reduced surface water flows was not adequately addressed in the PHC. Also, there was not enough discussion of groundwater-surface water interactions. Please include additional discussion of the interactions.

Please check all figure and table references for accuracy.

Specific PHC Comments:

p. 7, 1.0 Introduction – There is no reference in the text to Figure 2.

Please include a discussion why areas A, B, and C are the only mine areas represented in this PHC based on how they are separated hydrologically from areas D and E.

p. 9, 1.3.1- Existing PHC's - Please expand the discussion of groundwater/surface water interactions.

p. 10, 1.3.1.1 Surface Water - The surface water impacts section needs to be expanded to include quantitative results of modeling instead of only reassuring qualitative statements based on the assumption that the setting, including slope, aspect, drainage length and density, of the area disturbed by mining will be the same postmine as premine. One concern is the lack of postmine quantitative analysis of surface water quantity or quality. The discussion should include Western Alkaline Standards, where approved at the Rosebud Mine, for implementation after regrading is complete. Discussions with DEQ regarding an acceptable surface water analysis may help in expediting completion of the Area A, B, and C PHC.

p. 13, 1.4 Mining Progression – In the first paragraph "Figure B" should be "Figure 3B".

p. 16, 2.4 Precipitation – Figure 5 shows no precipitation in 1975. Missing data should be reported as such.

p. 18, 3.2 Local Surface Water Regime – The second paragraph refers to "East Rosebud Creek," but the correct name is "Rosebud Creek".

Figure 7: The weather station referred to as "Rosebud Creek near Colstrip" (data shown in Figure 8B) is not shown on the map.

p. 19, 3.2 Local Surface Water Regime – Table 3A: Please explain why there is no data after 2006. Some stations stopped reporting (decommissioned), but two on the Yellowstone remained active.

p. 20, 3.2.1 Local Setting – In the discussion of the East Fork Armells Creek (EFAC) groundwater sources downstream from the mine, please include Castle Rock Lake, the 2,250 acre-feet storage pond holding water piped from the Yellowstone River to supply the industrial needs of the power plant and municipal water to the town of Colstrip.

p. 20, 3.2.1 Local Setting – Please state evidence for baseflow in sections 8 and 15 in East Fork Armells Creek. On page 41, it is stated that the alluvium lies above the Rosebud coal between areas B and C. Please clarify which units are providing baseflow and if the Rosebud coal is contributing to flow in these reaches of EFAC.

p. 20, 3.2.2 Local Drainages - Cow Creek is not listed in the table as a drainage in Area B. However, Figure 9 shows the easternmost part of Area B in the Cow Creek drainage. Please consider where the drainage divide is drawn on Figure 9 and make the table and figure consistent regarding the Cow Creek drainage. Part of the confusion may result from pre- versus post-mine topography created by changes in Area E.

p. 21, 3.2.3.1 Flows - The last paragraph in this section states: "The data showed only three flow events exceeding five cfs at SW-55 and five events at SW-65 over a time period of about 28 years." So that a reader may completely understand the statement, the data should be qualified. Large time periods were not recorded due to instrumentation failures or frozen conditions which are not shown on the graphs. Please show the periods of no or suspect data on the graph or make a qualifier in the text regarding the integrity of the complete data record. The 2012 flows recorded at SW-55 and SW-65 are another reason to suspect the accuracy of data recorded on the Stevens recorders; although 2012 was a dry year, a number of days in April and May were above two cfs at SW-55. Additionally, greater detail could be shown on the graphs (figures 11 and 12) with a log scale Y-axis so that the detail of the smaller flows can be seen. It should also be noted that these data sets represent a period when a significant amount of the upstream watershed was cut off due to mining and impoundments, so that the recorded flows do not reflect the premine conditions.

The active surface water monitoring program shown in Figure 10 and listed in Table 4 is not current. Changes made in 2011 are not reflected in the 'active' monitoring locations.

There is no discussion of the most notable feature of figures 11 and 12, which is total lack of flows since late 1990s. One may assume this is mine influenced. Please discuss.

p. 21, 3.2.3.2 Water Quality – The water quality discussion of stream water is deficient. For example, there are more (including more recent) analyses of water samples from EFAC than the ones in Table 5. Also, the text refers to data in tables 5, 6 and 7, but there is no discussion of the data.

There should be discussion on the flow and quality impacts to EFAC from the Area A facilities, including ponds. There is a considerable stretch of the stream and underlying alluvium adjacent to Area A that is currently intermittent to perennial which may be a response to streamside ponds and the sanitary drain

field. Also, water quality analyses show a systematic change in water quality, including a rise in chloride levels, that are likely associated with activities in Area A. Please include mention of these impacts to EFAC in the analysis.

Table 7 identifies the MPDES discharge points, but the water quality discussion could be enhanced by discussion of water quality measurements taken as part of discharges associated with Rosebud Mine's MPDES permit and whether or not the mine typically meets the required water quality limits.

p. 22, 3.2.5 Impoundments –Water Quality- For the impoundment discussion, there should be a distinction between impoundments for the purpose of retaining sediment and mine water from entering receiving waters and impoundments for the purpose of providing for the postmine land use (e.g. livestock and wildlife water). Please indicate which impoundments are to remain as permanent ponds. Water quality in sediment ponds where cattle have no access is not pertinent to a discussion on postmine land use.

Please elaborate on what the sediment pond water quality illustrates. Without information on the dates of mining, regrading, and revegetation upstream of the ponds, the changes in TDS over time have little meaning to the discussion of water quality changes through time.

Please be advised that Table 10, Livestock Water Quality Criteria, are not the criteria used by DEQ and the analysis may differ in the CHIA from the PHC, as submitted. The criteria used by DEQ are the Suitability of Water for Livestock by Sigler and Bauder, 2012 and Beef Briefs by Hutcheson, 2001.

p. 23, 3.2.6.1 Spring Water Quality - springs are listed per groundwater aquifer in Table 12. Please include more detail regarding how a given aquifer was determined to be associated with each spring. More detail is also needed on the changes in spring water quality and quantity (e.g. is the change permanent or will water quality return to near baseline? Has there been a change in flow volume during or after mining?).

Several water quality tables have a "TDS Trend" column, but there is no explanation of what method is used to determine the presence or absence of a trend. Was it determined statistically or via professional judgment based on observation of data points?

p. 26, 3 Probable Hydrologic Consequences 3.1 Surface Water Quantity - Statements regarding the impacts of mining to surface water are vague and unsubstantiated. There is no supporting evidence why the surface water accretions to the alluvial groundwater system should return to premine conditions. Even though streams are ephemeral, the impact of reduced or increased flow must still be discussed. Also the term "accretions" may not be understood by the average reader. Please substitute "additions", "contributions", or "recharge" for "accretions".

p. 26, 3.3.1 Surface Water Quantity – The text states that surface water quantity should be the same postmine as premine, but no supporting evidence is presented. Modeling results or data from reclaimed areas which support this conclusion should be the basis for these statements.

p. 26, 3.3.2 Surface Water Quality - The text states that surface water quality will return to premine conditions, long term. Please provide supporting evidence such as model results or data from reclaimed areas to support this conclusion.

p. 27, 3.3.3 Springs - Please include discussion of the springs that have developed in reclamation. There is one in Area C Central and one in Area C North. At a minimum, location and field water quality data is available for them. Western Energy personnel may have flow data.

p. 27, 3.3.4 Erosion and Sediment Yield - The text states that mine reclamation will result in similar erosion and sediment yield as premine conditions. This conclusion should be supported by modeling results or data from reclaimed areas.

p. 28, 4.1.1 Regional geologic units should be listed in stratigraphic order (top to bottom).

p. 28, 4.2.1 Please describe the significance of differences in the upper and lower portions of Figure 18 in terms of groundwater flow between aquifers.

p. 29, 4.2.2.1 Alluvium – Please consistently refer to East Fork Armells Creek as such, rather than changing the name to E. Armells Creek.

Please substantiate/verify statements made about the impacts to alluvium. Does data indicate that ponds have helped alleviate reduced flow to Armells Creek due to mining through headwaters?

p. 31, 4.2.3 Hydraulic Properties - Figure 20A and 20B: It is understandable why premine water levels may need to be simulated, but why are current groundwater levels simulated and not reflective of current measurements? Simulated data are not as relevant as measured data in this part of the PHC.

p. 32, 4.2.3 Hydraulic Properties - Figure 28 seems out of place as it is referred in the text between Figures 20 and 21.

p. 32. - 2.4.1 What aquifer is represented by Table 15 – baseline from Area 49?

p. 32 and p. 101, 4.2.4.1 General Water Quality Evaluation , Table 16A- Why are there no premining data on overburden, interburden and sub-McKay? It is not clear that upgradient water is not changed or that changes in bedrock aquifer water qulaity is associated with spoil or another reason.

p. 33, 4.2.4.2 Detailed Groundwater Quality Evaluation - Statistical Analysis - The PHC evaluates changes (or the lack of change) to aquifer water quality two ways: statistically (two-tailed t-test) and well by well. The DEQ has numerous questions regarding the statistical analysis:

- Does the t-test assume a bell shaped normal distribution and does the data support this assumption? Does the data support the use of a t-test?
- Multiple factors influence water quality in wells, and each well may be influenced by different factors. Is it valid to use a t-test in this case?
- Elaborate on how baseline and postmine water quality samples were selected. Are postmine samples all from the same year or are they averages of values over many years? Are all postmine samples downgradient of mining or are some upgradient of mining?
- It is not clear which wells are used in the t-test. The variability in some wells over time leads one to question the use of a statistical method to determine whether or not a given aquifer is impacted by mining. With some wells there is uncertainty if mining could have caused the changes observed in a given well or if climate or local geology is responsible for the change (or lack of change) observed in a well.
- Please indicate why the two-tailed t-test was not performed on the alluvium. The statement that "alluvial groundwater quality is to be analyzed in the same manner" is vague and confusing.
- At what point was postmine chosen—after reclamation? Does drawdown correlate with change in water quality? What wells were chosen? Were all wells chosen? Are there enough wells through time to make assumptions?

p. 34, 4.2.4.2, Detailed Groundwater Quality Evaluation - Time Series Evaluation - DEQ questions the use of wells (and hydrographs) that have a few samples and no current data. It is hard to discuss these wells as meaningful in the present as there is no current data to substantiate a response. (The same question is applicable to p. 31, 4.2.3 Hydraulic Properties).

p. 33, 4.2.4.2 Detailed Groundwater Quality Evaluation – Statistical Analysis – The text states: "Table 18 summarizes the results of the t-tests on the major constituent concentrations for which livestock criteria are available. (Note: calcium, magnesium, sodium and bicarbonate are not in the table)." However, all of the omitted ions have established cattle criteria.

p. 45, 4.2.4.3 Water Quality Exceedances – The text states that "...cadmium concentrations in the groundwater from Colstrip area of 0.01 mg/L or lower..." Should this be "0.01 mg/L or higher" rather than lower?

p.47, 4.2.5 Groundwater Use. Impacts to wells is based upon a 3-mile radius of mining. This must be based on wells within the mine impact area as determined by the anticipated/predicted drawdown extent and the anticipated extent of water quality changes. Please identify specific wells likely to be impacted based on information available from public sources (e.g. GWIC) about the supply and well completion.

p. 46, 4.3 Probable Hydrologic Consequences. Is there substantiated, quantified support (well logs, geophysical logs, pump tests or other scientific observations) for the theory of a rubble layer at the base of the spoil?

p. 48, 4.3.2 Re-Establishment of Groundwater Levels and 4.3.3 Groundwater Quality - There needs to be more expanded discussion of recovery to date based on recharge to spoil. Recovery discussions/projections should be made for all of areas A, B, C.

The text suggests that the variability of TDS in Rosebud wells in Area B is attributable to alluvial groundwater, rather than spoils. Please discuss this possibility at greater length.

p. 50, 5.0 Summary - The list of impacts should include: "6) Changes in surface water quality due to discharge of spoils influenced groundwater." Discussion should note potential surface water quality effects.

The following comments address the Groundwater Model provided within the PHC for Areas A, B and C:

Figures and Tables

The pages of Figure 27 are not listed in the List of Figures. Please correct this omission.
The Era/Period Labels are misplaced on left geologic column in Figure GM-2. Please correct this figure.

In Figure GM-23, page 2, Zone G is colored light gray on a white background and its boundaries cannot be seen. Please use a more contrasting color to show this zone.

Figures GM-25 through GM-31 are incorrectly referenced in the text. Please correct the text references to these figures.

In Figure GM-27, page 4, the graph for well WM-109 does not match the others (same graph as on figure GM-27, page 2). Please include the correct WM-109 graph in Figure 27, page 4.

The references to several tables are incorrect: Section 3.1.1 refers to Table GM-3 and TM-3 where it should be GM-4, Section 3.1.3 refers to Table GM-5 where it should be GM-3, and Section 4.1.3 refers to Table I-5 where it should be GM-5. Please ensure all table references are correct.

For easier use, please sort Tables GM-1 and GM-2 by model layer.

Model Development

The specific versions of software used for model simulations and pre- and post-processing are not listed in the report. For example, the report cites the reference for MODFLOW88, but it is unlikely this version was used as significant improvements have been made to the program since that time. The report also discusses ARCView, which was replaced by ARCGIS several years ago. Please include the correct names and version numbers for all referenced software in the report.

The discussion of the model framework and construction in Section 2.1.4 is not complete. Please add more detail to this section including: Figures illustrating horizontal discretization, active extent of all layers, cross-sections of model layer thickness, and the location of the pumping well; a discussion of how model grid spacing transitions from the 250 ft grid to the 2,500 ft grid, and how this conforms to standard practice; a table showing the row and column widths for all rows and columns; and a description or illustration of the boundary condition parameters for all drain reaches.

Please explain why no alluvium is modeled between Area C and Area B Extension, or include the alluvium at this location in the model.

There are several permanent surface water features near the town of Colstrip (in particular Castle Rock Lake) which are not included in the model. Please include these features in the model or explain why they are not simulated.

Calibration Targets and Model Calibration

The report does not adequately describe the target selection process. How were "representative" wells selected from closely spaced wells, i.e. was a quantitative method or professional judgment used? What are the dates of the observed water levels for the targets (include dates in Table GM-1), and if water levels were measured after start of mining what is the justification for use of these measurements as premine conditions? If the measurements at targets occurred at different times, is there climatic bias in the target values? Could additional targets be included in areas of the model domain without coverage, such as Area A, Areas B and C in the Underburden, and outside the mine area (are there MBMG/GWIC wells which could be used)? Why are Interburden wells in Area E included, but no other targets from Areas D and E? Please include a more detailed discussion of the target selection process which addresses the above questions.

Please include observed water level contours on Figure GM19 for comparison with simulated results.

Please provide scaled statistics for each model layer.

Section 3.1.1 discusses how the model matches observed vertical gradients. On closer examination, the model appears to generally (under predict) gradients above coal seams (Overburden-Rosebud & Interburden-McKay) and (over predict) gradients below coal seams (Rosebud-Interburden & McKay-Underburden). Could adjustments to leakance fix this issue? Please include more detail in the discussion of vertical gradients.

Parameter Zonation

The discussion of parameter zonation in Section 3.1.2 lacks detail. Please include a discussion of: the rationale for including transmissivity/leakance Zone B in Layer 1, and how its shape was determined; why transmissivity/leakance Zones H and K in Layers 4 and 5 are the same shape as transmissivity/leakance Zone B; the rationale for transmissivity/leakance Zone J in Layer 5; and the rationale for recharge Zones I and J.

Sensitivity Analysis

The zone designations used in the sensitivity analysis for Transmissivity, Leakance, and Recharge do not match those on Figures 23 and 24. Also, the drain reaches are not identified anywhere in the report. The sensitivity analysis cannot be evaluated without knowing which zones are where. Please use the same zone designations throughout the report.

Transient Model

Section 4.0 of the report does not describe how time is discretized. Please include the lengths of each transient stress period in a table.

The transient model evaluation is entirely qualitative. Please include transient calibration targets in the model, perform a transient model calibration, and include transient model calibration statistics in the model report. Please also include spoil wells as targets in the transient model to demonstrate how well the model simulates the recovery after mining.

Section 4.1.2 discusses the potential of a combined coal/sandstone aquifer present in some locations. If this is the case, transmissivity would likely be higher in those locations as well as storativity. Can this area with sandstone over coal be delineated from geologic logs and included in model?

The transient model fit to observed drawdown curves is poor for several Area C-Central/East wells. WM-153, WM-186, WM-168, WR-168, and WR-126 show less drawdown than predicted by the model. Water levels in WR-126 and WM-186 have actually increased. Would increased recharge in the clinker north of this area improve the model calibration? Please include additional analysis/discussion of the anomalous results in this area.

Please feel free to contact Bob Smith at (406) 444-7444 with questions regarding this letter.

Sincerely,

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