DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES
PMB 2020
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April 19, 2010

Mr. Richard E. Blubaugh, Vice President
Environmental, Health & Safety
Powertech (USA), Inc.
5575 DTC Parkway, Suite 140
Greenwood Village, CO 80111

Re: Underground Injection Control Permit Application, Dewey-Burdock Project, Fall River and Custer Counties, South Dakota

Dear Mr. Blubaugh:

The department reviewed Powertech (USA), Inc.'s revised application for a South Dakota Class III Underground Injection Control Permit (UIC), received February 5, 2010 for completeness, and in accordance with ARSD 74:55:01:03 has determined the application is incomplete. In general, the application lacks sufficient detail to address fundamental questions related to whether Powertech can conduct the project in a controlled manner to protect ground water resources. In addition, it appears Powertech has not adequately responded to the department's August 6, 2009 comments or developed the application in a manner consistent with requirements outlined in ARSD 74:55:01. The department will not consider the application complete until Powertech satisfactorily address all of the completeness issues identified within the enclosure.

The technical comments enclosed are preliminary and are based on issues noted during the completeness review. They do not represent a completed technical review, however, Powertech must adequately address all identified technical comments (including those identified in the department's August 6, 2009 letter) or the department will be unable to recommend a permit. The department will finalize its detailed technical review after Powetech has adequately addressed the noted completeness deficiencies. If you have any questions concerning this letter, please feel free to contact me at 605.773.3296 or at Brian.Walsh@state.sd.us.

Sincerely,

B. J. Walsh

Brian J. Walsh, Hydrology Specialist
Ground Water Quality Program

Enclosure

cc: Valois Shea, USEPA Region VIII, Denver, CO (w/enclosure)
Ronald Burrows, NRC, Washington, D.C. (w/enclosure)
Mike Cepak, SD DENR, Minerals and Mining Program, Pierre, SD (w/o enclosure)

South Dakota Department of Environment and Natural Resources
DRAFT Comments on the
Powertech (USA) Inc. Revised Dewey-Burdock Project
Underground Injection Control Permit Application
Dated February 2010

The department has reviewed Powertech's revised Underground Injection Control Permit Application dated February 2010 for completeness and determined the application is incomplete. Specific completeness deficiencies along with other general and technical comments are as follows:

General Comments

1. In accordance with South Dakota's In Situ Leach Mine rules, ARSD 74:29:11:01.01, the state UIC permit becomes part of the state mine permit. In addressing ARSD 74:55:01, Underground Injection Control – Class III Wells, Powertech should be cognizant that it needs to fully address ARSD 74:29:11:01.01, Underground injection control -- Class III Well permit required for mine permit, in the In Situ Leach Mining rules.

2. To expedite future reviews of the UIC and In Situ Leach Mine applications, the text should include references to which rules are being addressed. In large scale mine permit applications a table is provided listing each statute or rule and the corresponding section in the text that addresses the statute or rule (ARSD 74:29:02:01, Procedural completeness requirements, requires the applicant to indicate which sections of the mine permit application fulfill the statutory application requirements and describe how the information meets those requirements). In the case of this UIC permit application, this should include references to both ARSD 74:55:01 and 74:29:11 (see ARSD 74:29:11:01.01).

3. Where the rules (both ARSD 74:55:01 and 74:29:11) call for a plan, the plan should be included as an Appendix to the application as a stand alone document that can be easily retrieved. Otherwise, the "plan" tends to be hidden in the text of the application, may be spread over several sections, and may be difficult to retrieve. In addition to water quality monitoring plans, the following plans are required:

    a. 74:55:01:26(12)(g) A spill contingency plan.
    b. 74:55:01:26(16) A well maintenance plan.
    c. 74:55:01:26(17) A plan for replugging improperly plugged water wells, former monitor wells, abandoned wells, and exploration holes.
    d. 74:55:01:26(19) A plan for the disposal of drill cuttings
    e. 74:55:01:26(21) Contingency plans to cope with all shut-ins and well failures.
    f. 74:55:01:53 A plan for remedial action for excursion.
    g. 74:55:01:59 A plan for drill hole plugging and well repair, plugging, and conversion.
    h. 74:55:01:59.03 A corrective action plan for improperly sealed wells.

4. In reviewing the application as a whole, there is a lack of baseline water quality data from the non-production zones. In addition, for the production areas, there is a lack of water quality monitoring

data in the sand units above and below the production zone strata. Additional ground water quality baseline will be required in accordance with ARSD 74:55:01:35 before mining can occur at any of the mine units proposed in the application.

5. To comply with ARSD 74:55:01:03 Powertech must submit plans and specifications for injection facilities in accordance with ARSD 74:53:04.

6. The technical comments contained in this letter are in addition to the comments provided in the department's August 6, 2009 letter. The department expects Powertech to address all of the department's technical comments provided to date.

Completeness Issues

7. **Section 5.2 Site Geology**. ARSD 74:55:01:26(2) requires a description of the local on-site geology and the regional geology in areas determined relevant by the secretary. To meet this requirement Powertech needs to develop and submit detailed cross sections for all proposed well fields within the permit boundary. Powertech may base these cross sections on existing geophysical and lithologic data, but they need to depict discrete sand and shale units within the Inyan Kara Group and (to the fullest extent possible) the complex, channelized nature of the Inyan Kara sediments. As an example of the level of detail the department expects, the cross sections should be similar in detail to those presented by Powertech during the October 29, 2009 meeting with the department in Pierre, SD.

8. **Section 6.2.2.6 Inyan Kara Group**. ARSD 74:55:01:26(3) requires a hydrologic description of the production zone. To meet this requirement, submit additional information describing what Powertech considers aquitards within the Inyan Kara group and the role those aquitards will play during mining operations.

   The hydrologic description of the production zone must include maps that depict each of the eight (8) proposed well fields. Each map must display and label the locations of all known boreholes and wells (within respective well field boundaries) for which Powertech has geophysical or lithologic data representative of the Inyan Kara Group. Copies of the identified geophysical and lithologic logs must accompany each map. On each bore/well log, identify the discrete shale/clay units Powertech plans to use as upper and lower production pressure cell barriers. The department understands that final determination of pressure cell barriers will occur during well field development. However, in order to address area-wide hydraulic characterization Powertech must identify all potential barrier units within each of the proposed well fields.

   The hydraulic description of the production zone must also include basic information on the hydraulic characteristics of the shale/clay units Powertech will or may possibly use as production barriers. To meet this requirement, Powertech must characterize the vertical and horizontal hydraulic conductivity of each shale/clay unit that Powetech intends to use or may possibly use as an overlying or underlying production barrier within the eight (8) proposed well field areas.

9. **Section 9.9 Excursions**. This section addresses excursions in relation to the site monitoring program but does not address excursion monitoring, reporting, and remedial action in detail. Revise Section 9.9 to comply with the requirements of ARSD 74:55:01:50 to ARSD 74:55:01:53.02 inclusive.

10. **Section 9.10 Reporting**. This section only discusses quarterly reports. It does not address monthly reports or annual reports as required by ARSD 74:55:01:47 and ARSD 74:55:01:49(5). Revise Section 9.10 to comply with the requirements.

11. **Section 9.12 Groundwater Sample Collection Methods**. ARSD 74:55:01:46(4) requires the monitoring plan included in the permit to include monitoring ground water quality, including the control parameters, and fluid levels in monitoring wells completed above and below the production zone a minimum of once per month. This rule was only partially addressed in Sections 9.12, Groundwater Sample Collection Methods. No control parameters were listed as required. Revise this section to comply with ARSD 74:55:01:46(4).

12. **Section 11.3.3 Excursion Control**. The last paragraph of this section on page 11-8 states, "Considering that there are four regulatory agencies that are involved in this process, Powertech proposes to develop a single, coordinated procedure with all four agencies during the permitting and licensing process." In accordance with ARSD 74:55:01:26(14) Powertech's application will not be considered complete until the proposed excursion control procedure is submitted. The proposed excursion control procedure shall comply with the requirements of ARSD 74:55:01:52 to ARSD 74:55:01:53.02 inclusive.

    The department is willing to work with Powertech and the other regulatory agencies on an excursion control procedure acceptable to all parties. However, the proposed procedure must be submitted for the application to be considered complete.

13. **Section 11.6 Groundwater Restoration Methods**. This section does not specifically address restoration sampling procedures and reporting. Revise this section to comply with the requirements of ARSD 74:55:01:56 and ARSD 74:55:01:57.

14. **Section 11.6.2 Estimate of Post-Production Groundwater Quality**. ARSD 74:55:01:26(18) requires applicants submit a **proposed** restoration table for all ground water quality restoration values based on the geochemistry of the production zone and the chemistry of the injection solutions. ARSD 74:55:01:01(46) defines *production zone* as the geologic interval into which mining solutions are to be injected and recovery fluids extracted. Finally, ARSD 74:55:01:45.01 states that based upon the information submitted in accordance with ARSD 74:55:01:26(18), the department shall develop the ground water restoration tables.

    For the application to be considered complete, Powertech must develop a proposed restoration table. Powertech must develop this table based on Dewey – Burdock production zone baseline data and the chemistry of the injection solutions. As the Dewey – Burdock area is quite large; Powertech must consider different restoration tables for specific production zones.

15. **Section 13.1.1 Commercially Producible**. In order to support Powertech's proposed aquifer exemption boundary (ARSD 74:55:01:24), submit additional information supporting Powertech's claim that uranium is commercially producible in the Inyan Kara aquifer. If Powertech believes this information is confidential, it should be submitted separately and appropriately marked confidential.

16. **Section 14.0 Estimated Costs and Appendix L Restoration and Reclamation Cost Estimate**. This section does not provide the necessary information for the department to determine if the requirements of ARSD 74:55:01:26(20) have been satisfied. Revise this section to address the following issues.

    If the department had to take over the mine site during the production phase, it would end production activities and begin ground water restoration. The department would assume that restoration equipment might not be in place during the initial production phase, so there would be initial capital costs such as pump replacement and rental costs for a reverse osmosis unit. No capital costs for restoration equipment were included in the calculation tables. Revise the tables to include capital costs for restoration equipment.

    It appears closure costs for only two mine units are considered in Appendix L. Revise this section to clarify the number of mine units covered by the cost estimate.

    Referencing the Restoration and Operating Assumptions Tables in Appendix L, Powertech assumed a 10-foot thickness for the ore horizon. Is this an average thickness? Revise the application to include additional information justifying the use of a 10-foot ore horizon thickness.

    Referencing the Restoration and Operating Assumptions Tables in Appendix L, revise the application to include information on how the flare factor was derived and a description of the horizontal and vertical components of the flare.

    Parameter concentrations of the affected groundwater will not be precisely known until weeks or months into the production phase. Depending upon the parameters and concentrations found, the length of treatment may increase and the method of treatment may change. The contingency percentage may need to be increased to account for these unknowns.

    Please provide the sources of the unit costs used in the reclamation costs calculations. In addition, because the assumptions are scattered throughout the calculations and are difficult to follow, include a summary the assumptions used in the calculations.

    Finally, costs estimates for collecting and analyzing samples from surface water monitoring sites were not included in this application. Please address this issue as required by ARSD 74:55:01:26(20)(a)(vi).

<u>**Technical Comments**</u>

17. **Table 4.3-1 Excerpt from Water Well Agreement**. Please revise Section 4.3.2 to describe Denver Uranium's relationship to Powertech.

18. **Section 4.3.2 Proposed Project Features within the PAA.** This section states, "Powertech is aware of four wells historically used for drinking water within the AOR..." This section addresses only one of these wells. Revise this section to include additional information on the status of the other three wells.

19. **Section 4.4.1 Wells Monitored for Potential Corrective Action**. This section states, "For decades, it has been common practice in the area to allow free-flowing wells to continually discharge, largely to prevent freezing during winter. The attached map shows artesian wells within the AOR that will be monitored to determine if corrective action will be needed (Figure 4.2-3). This determination will be made during well field design phase." This statement is unclear as to what determination (wells to be monitored or need for corrective action) will be made during the well field design phase. Revise this section to clarify.

20. **Section 4.5 Operational Pumping Tests**. The revised application states, "Prior to the start-up of a well field, pumping tests will be conducted to demonstrate that communication between the production zone and the underlying or overlying aquifers is not occurring." Revise this section to include additional information about the design of the operational pumping test.

    This section goes on to state, "there may not be an underlying aquifer." This statement is incorrect. There is an underlying aquifer throughout the proposed mine area. Revise this section to correct this error.

    The second sentence also states that because the Morrison formation contains approximately one hundred feet of shale, it is therefore a confining unit. The presence of the Morrison Formation alone does not mean that a confining unit is present. While it is a possibility that the Morrison is a confining unit, sufficient data on the confining characteristics of the shale unit must be provided for the vicinity of the proposed mine area.

    Additionally, Figure 2.1 in Appendix B lists the Morrison thickness at 0 to 125 feet; the last sentence on page 5-10 states that the thickness ranges from 90 to 115 feet; and a statement on page 6-4, section 6.2.1.1.5, indicates that the Morrison Formation is 50-100 feet thick. Revise the application to clarify this discrepancy.

21. **Sections 5.2 Site Geology and 5.4 Stratigraphy.** The "channels" referenced in Sections 5.2 and 5.4 are not depicted in sufficient detail in the cross sections, structure maps or the isopach maps in the Exhibits. Revise these sections and exhibits to include more detail about the channels and their affect on the local hydrogeology.

22. **Section 5.4.2.2.2 Fall River Formation**. The last sentence in the first paragraph of this section states, "Analysis from core indicated the Dewey Fall River sandstone unit has a horizontal hydraulic conductivity of $2.2x10^{-3}$ cm/sec (6.1 feet per day [ft/day])." Revise the application to include this information in Section 6.0 Hydrologic Description.

23. **Section 5.4.2.2.3 Lakota Formation**. The second to last sentence in the second paragraph of this section states, "Analyses of core samples of these sandstones indicate these units exhibit high horizontal permeabilities, ranging from 2.6 x 10-3 cm/sec to 4.1 x 10-3 cm/sec (2697 millidarcies to 4161 millidarcies)." Revise the application to include this information in Section 6.0 Hydrologic Description.

24. **Section 5.4.2.2.3 Lakota Formation**. The fourth paragraph in this section deals with the Fuson Member and the last sentence in this paragraph states, "Analyses of core samples of these lithologies demonstrate low vertical permeabilities, ranging from 2.2 x 10-7 cm/sec to 7.8 x 10-9 cm/sec (0.228 millidarcies to 0.008 millidarcies)." Revise the application to include this information in Section 6.0 Hydrologic Description.

25. **Section 5.4.2.2.3 Lakota Formation**. The last paragraph on page 5-10 states that the "thickness of the shale – siltstone unit" ranges "from 30 to 80 feet." On figure 2.1 in Appendix B, the thickness is shown to be 0 to 160 feet. On page 5-11 is section 5.5.3 the thickness is described to be "approximately 60 to 100 feet." On page 6-7 in section 6.2.2.6 dealing with the Inyan Kara Group, the thickness is stated to vary "in thickness from 40 to 70 feet." Revise the application to clarify these discrepancies.

26. **Section 5.4.2.3.1 Morrison Formation**. The last sentence in this section states, "Analyses of core samples demonstrate that the Morrison clays have extremely low vertical permeabilities, ranging from 4.2 x 10-8 cm/sec to 3.9 x 10-9 cm/sec (0.043 millidarcies to 0.004 millidarcies)." Revise the application to include this information in Section 6.0 Hydrologic Description.

27. **Section 5.6 Subsidence**. This section discusses the effect of subsidence due to the removal of uranium species from the formation. Revise this section to discuss subsidence due to the removal of water from the aquifers, and the cones of depression caused by the bleed drawdown.

28. **Section 6.2.1.1.5 Inyan Kara Aquifer**. The fourth sentence in this paragraph states, "Regionally, the Inyan Kara exhibits a large effective porosity (0.17) and the aquifer can yield considerable water from storage (Driscoll et al., 2002). Within the Black Hills, transmissivity of the Inyan Kara ranges from 1 to 6,000 ft^2/day."

    Based on a review of the actual source of the effective porosity data, Siok (1972) which is an unpublished Master's thesis at the South Dakota School of Mines and Technology, and its characterization of 0.17 as a regional estimate of effective porosity, it is inappropriate to use this figure to calculate site-specific ground water velocity. Revise the application to include site-specific effective porosity information when calculating site-specific ground water velocities.

    Although information in this section would lead the reader to believe that the transmissivity range of 1 – 6,000 ft^2/day is perhaps characteristic of the proposed mine area, table 2.7-13 in the February 2009 application for NRC Uranium Recovery License limits this estimate of transmissivity to only the northern Black Hills. Revise the application to include site-specific transmissivity values to characterize the proposed mine area.

29. **Section 6.2.1.3 Regional Hydraulic Connection of Aquifers**. The last bullet on page 6-4 states, "Various sources have also suggested that breccia pipes serve as a path between aquifers. The majority of these features are believed to originate within the Minnelusa Formation and extend upward as high as the Inyan Kara (Gott et al., 1974). These breccia pipes are the result of dissolution of significant thicknesses of anhydrite from the upper Minnelusa and subsequent collapse. The greatest concentration of these breccia pipes has been noted within a few miles of the outcrop, although groups of pipes can be concentrated along joints and may extend as "high in the stratigraphic section as the Lakota Formation" (Braddock, 1963). The historical and recent drilling activities and pumping tests indicate the breccia pipes are not present within the project area Exhibit 6-1."

Some of the geology shown on Exhibit 6-1 is incorrectly reproduced from Gott and others (1974). Revise this Exhibit to accurately represent the surface geology.

The statement was made that, "The historical and recent drilling activities and pumping tests indicate the breccia pipes are not present within the project area Exhibit 6-1." Revise the application to describe how a pumping test would identify the existence of breccia pipes.

Information provided by Gott and others (1974, p. 33-35) regarding the water budget, water chemistry, and water temperature collectively provides compelling evidence of recharge to the Inyan Kara sediments from deeper ground water. If it is Powertech's conclusion that breccia pipes are absent and are not a source of water movement in the subsurface, revise the application to present an alternate explanation of the water budget, water chemistry, and water temperature supported with sufficient scientific data.

30. **Section 6.2.2.1 Local Characteristics of the Hydrostratigraphic Units**. The revised application states, "The site hydrostratigraphic units are generally consistent with regional units discussed above. However, the recent pumping tests have not indicated any communication with the Unkpapa within the proposed permit area. The reviewer is directed to Section 6.2 of Appendix B for explanation of the conversion from intrinsic permeability units to permeability/hydraulic conductivity units."

The Unkpapa Sandstone is the only hydrostratigraphic unit mentioned in this section and there is no information provided on the local characteristics except to state that there is no communication. Revise the application to discuss what type of communication the text refers to and include the local characteristics for the Unkpapa Sandstone. In addition, address if there other hydrostratigraphic units that should be mentioned in this section and if so, provide the local characteristics for those units.

This section refers the reader to Section 6.2 in Appendix B regarding calculation of hydraulic conductivity of certain core samples. The laboratory method employed for determining permeability of the core samples was to force air through a dried core sample rather than forcing water through the core samples. The core samples were first soaked in methanol to remove any salt present. Samples were then oven dried. Revise this section to explain why air was used instead of water to conduct the test, why the salt was removed from the core sample and what affect drying the core samples has on the internal structure and connectivity of the pore spaces.

The results of permeability testing in the laboratory were obtained from a very small number and volume of samples representing only parts of five holes in the approximately 15 square miles of the proposed mine area. The permeability of the Fall River sand in the Dewey area was determined using only one sample from test hole DB 07-32-4C. This permeability was then used to characterize the Fall River sand throughout the entire proposed mine area. The permeability of the Morrison Shale was determined using three samples from two test holes in the Burdock area. The permeability was then used to characterize the Morrison Shale throughout the entire proposed mine area. Similar characterizations were made for other hydrostratigaphic units using a very limited number and locations of samples. Revise this section to describe the scientific justification for making generalizations such as these in hydrologically complex areas.

Using core samples can be useful in developing an understanding of a larger hydrostratigraphic unit, but using core samples also biases any resulting data toward the more competent portions of the unit being studied. The friable, unconsolidated, and fractured portions of recovered core are commonly discarded in favor of the more cohesive, cemented, and unfractured portions for laboratory use. Revise the application to account for this potential bias.

No core samples from the ore zones were submitted to the laboratory for analyses of permeability for the stated reason that the laboratory would not accept such samples. Thus, no data are specifically available regarding one of the important components of the proposed mine area.

Because Section 6-3 in Appendix B also deals with core-related information, comments on that section will be provided here. The statement is made that, "The core data can be considered to be generally consistent with, and therefore independently confirming, the pumping test results." Revise the application to include statistical analyses that demonstrate a sufficient quantity and quality of data to support the previous statement.

Table 6.1 in Appendix B presents data on the porosity, air intrinsic permeability, particle density and water hydraulic conductivity of some core samples. The table lists sample numbers 4H and 4V as being from the Fuson Shale in well DB 07-11-11C and from depths of 412.30 and 412.45 feet, respectively. However, cross section D-D' (drawing 5.2) in Appendix B shows that a depth of 412 feet in this well is more than 125 feet below the base of the Fuson Shale. Revise the application to clarify this discrepancy.

Appendix B contains information from Core Lab Petroleum Services, which is the company that performed the permeability analyses of the core samples. The last page in Appendix B has two columns of core related data that are titled "% horizontal porosity" and "vertical porosity." If porosity is a measure of void space in a given volume, how can the porosity be different in the vertical and horizontal directions for the same volume of core? Revise this section to include an explanation of the porosity information provided by Core Lab Petroleum Services.

31. **Section 6.2.2.5 Morrison Formation Confining Unit**. The last sentence in this section states, "Analyses of core samples demonstrate that the Morrison clays have extremely low vertical permeabilities, ranging from 0.043 millidarcies to 0.004 millidarcies." The stated range in permeability is based on only two samples having data for both vertical and horizontal permeability and third sample having data only for horizontal permeability. These samples are from two test holes in the Burdock area. Data from core bias the information to only the competent portions of a geologic unit and it is inappropriate to characterize an entire geologic unit over the proposed mine area with such few samples from only two locations (holes). Revise this section to include additional information supporting the use of the Morrison as a lower confining unit.

32. **Section 6.2.2.6 Inyan Kara Group**. This section states, "Throughout most of the region, the Fuson is expected to be an effective confining unit." However, on page 2-161 of the February 2009 Application for NRC Uranium Recovery License, Technical Report, it is stated that "Where the Fuson is an ineffective confining unit, water could flow upward into the Fall River Formation. Because of this uncertain connectivity, the Fall River and Lakota Formations are considered to be one aquifer (the Inyan Kara aquifer) in this report." Revise the application to present a consistent interpretation and a discussion, including site-specific supporting data, which describes the area(s) in which Powertech expects the Fuson to be an effective confining unit and the area(s) in which the Fuson is expected to be an ineffective confining unit.

    In addition, the section discusses scouring and channeling in the Fuson. However, in examining Exhibit 6-2, Structure Map of the Fuson, there is no apparent channel scour present on the top of the Fuson. Revise the application to explain why no evidence of scouring is present on Exhibit 6-2 or revise Exhibit 6-2 to depict the scouring present in the Fuson.

33. **Section 6.2.2.7 Fluid Pressure of the Receiving Strata**. The revised application mentioned Figures 2.3 and 2.4 as representing the potentiometric surfaces of the Fall River and Lakota, respectively.

    Five out of the 12 data points on Figure 2.3 appear to be contoured incorrectly. Four out of the 12 data points on Figure 2.4 appear to be contoured incorrectly with one point being approximately 60 feet out of sync with the adjacent contours. These two maps (figures) are used in Appendix B, section 2.2, pages 2-3 and 2-4, to characterize the hydraulic gradients of the Lakota Formation and Fall River Sandstone, head difference between the two units, and possible ground-water flow directions. The discussion of gradients, head difference, and possible flow directions must be based on properly prepared maps that accurately represent field conditions. Revise the figures to correct these errors.

    The pumping well used for the pump test near the proposed Dewey mine site and the nearest monitoring well are 41 feet apart horizontally and are approximately 95 feet apart vertically/stratigraphically (Table 4.2, Appendix B). The difference in static water elevation in these two wells is approximately 18 feet. This shows that different sand horizons in the same named stratigraphic unit (the Fall River Sandstone in this case) can have very different water levels at essentially the same geographic location. The water level from the monitoring well was not used in Figure 2.3 while the water level from the pumping well was used. Revise this section to include a justification for using the wells that were chosen to construct Figures 2.3 and 2.4 and a justification for excluding wells that were not used.

The last paragraph on page 4-1 in Appendix B mentions an accuracy of ±3 feet for the water levels provided in Table 4.2 in that same appendix. This level of accuracy is insufficient for a discussion of gradients, head differences, and possible flow directions between the Fall River Sandstone and the Lakota Formation.

34. **Section 6.2.2.7.1 Hydraulic Connection Description of Receiving Units**. This section states, "In 2008, Knight Piesold, Powertech's engineering contractor, conducted two 72-hour pump tests on the Dewey-Burdock project. ..... These pump tests demonstrated that both the Lakota and Fall River Formations behave as single, confined aquifers." The pump test conducted in the Burdock area, where the pumping well was completed in the Lakota formation, showed a drawdown response in well 11-17, which was screened in the overlying, lower Fall River Sandstone (pages 2-174 and 2-175 in the February 2009 Application for NRC Uranium Recovery License, Technical Report). The connection is also stated on page 13-21 of the revised application where it is stated that "Hydraulic communication through the Fuson member between the Lakota and Fall River aquifers is evidenced by the response at observation well 11-17, screened in the lower Fall River formation." and "However, drawdown continued at the Fall River observation well 11-17, indicating that leakage was established through the underlying Fuson formation." The documented connection between the Fall River Sandstone and Lakota Formation is in conflict with the statement on page 6-8 of the application that the two units behave as single, confined aquifers. Revise the application to clarify this discrepancy.

35. **Section 6.2.3.1 Groundwater Velocity Evaluation**. The second paragraph of this section states, "Powertech has collected extensive amounts of data related to the Inyan Kara aquifer and other adjacent aquifers to the Inyan Kara in the Burdock area. Site specific data and analysis have led Powertech to conclusions different from the interpretations presented in Gott, et al., report. Although the Gott, et al., report presents a thorough and comprehensive set of groundwater geochemical data, the presented interpretations related to Inyan Kara aquifer recharge and groundwater velocity are not verified by Burdock site specific geologic and hydrogeologic investigations conducted by Powertech."

    Revise this section to include a description or listing of the data collected supporting Powertech's assertion that the site-specific data disputes the interpretations presented in Gott, et al.

    Although ground water velocity is mentioned in the above quote, the velocity data are not presented until section 6.2.3.3.1. In that section, an effective porosity of 0.17 is used to calculate flow velocity. Based on a review of the actual source of the effective porosity data, Siok (1972) which is an unpublished Master's thesis at the South Dakota School of Mines and Technology, and its characterization as a regional estimate of effective porosity, it is inappropriate to use this figure to calculate site-specific ground water velocity. Revise the application to include site-specific effective porosity information when calculating site-specific ground water velocities.

Additionally, the hydraulic gradient used to calculate the ground water flow velocity (page 6-11) for the entire Inyan Kara suite of sediments was taken from data specific to the Fall River Sandstone in just the Burdock area. It is inappropriate to use a gradient from a localized portion (stratigraphically and geographically) of the Inyan Kara suite of sediments that Powertech attempts to present as a discrete aquifer and then apply that gradient to the entire proposed mine area inclusive of all stratigraphic portions of the Inyan Kara Group.

The hydraulic conductivity used in the calculation of ground water flow velocity for the entire proposed mine area is also taken from just the Burdock area but not from the Fall River Sandstone as the hydraulic gradient was, but from the Lakota Formation. It is inappropriate to use a hydraulic conductivity from a localized portion (stratigraphically and geographically) of the Inyan Kara suite of sediments that Powertech attempts to present as a discrete aquifer and then apply that gradient to the entire proposed mine area inclusive of all stratigraphic portions of the Inyan Kara Group.

36. **Section 6.2.3.2 Exploration Drilling**. In this section it is stated that, "Tritium based calculations of Inyan Kara groundwater velocity in the Burdock area presented in the Gott, et al., report are predicated on a hypothetical hydrogeologic connection, and thus groundwater recharge of the Inyan Kara aquifer, from underlying aquifers such as the Minnelusa Formation via vertical collapse structure and breccia pipe flow pathways. The recent and historical exploration drilling conducted in the area by Powertech and other companies has not led to the identification of any such structural features (refer to Section 6.2.2.2 – Breccia Pipes)."

The discussion in Gott and others (1974) of the hydraulic connection and the supporting data provided by them are more comprehensive and scientifically sound than alternatives provided by Powertech. The Information provided by Gott and others (1974) regarding the water budget, water chemistry, and water temperature collectively provides compelling evidence of recharge to the Inyan Kara sediments from deeper ground water. If Powertech believes otherwise, then an alternate explanation of the water budget, water chemistry, and water temperature must be provided and must be supported with sufficient scientific data.

37. **Section 7.1.1.1 Well Completion**. The first paragraph on page 7-5 states, "The reamed drill holes shall be of sufficient diameter for adequate sealing and, at least two inches greater in nominal diameter than the outside diameter of the outer casing at that depth. The two inches is protects equivalent with regards to ARSD 74:55:01:31." ARSD 74:55:01:31 (1)(a) requires the spacing to be at least three inches greater in nominal diameter than the outside diameter of the outer casing at depth. Revise this section to comply with ARSD 74:55:01:31 (1)(a).

38. **Section 7.1.1.4 Mechanical Integrity Testing**. This section states, "A well must maintain 90 percent of this pressure (which equates to approximately 1 pounds per square inch per foot [psi/ft] of overburden above the bottom of the casing), whichever is less for a minimum of 10 minutes to pass the MIT test." The ten-minute timeframe proposed is inconsistent with the timeframes used for MIT's under the department's UIC Class II program. Revise this section to use a minimum 15-minute timeframe or provide evidence the 10-minute timeframe is the industry standard for MITs performed at in-situ leach mines.

39. **Section 7.1.1.6 Injection Pressure Limitation**. This section states, "During well field operations, pressure at the injection well heads will not exceed the maximum MIT pressure." However, Section 7.1.1.4 Mechanical Integrity Testing, states that during an MIT "the internal casing pressure will be increased to 125 percent of the maximum operating pressure of the well field." Does this mean that during well field operations, injection wellheads will be allowed to operate up to 125 percent of their maximum operating pressure? Revise these sections to clarify this issue.

40. **Section 7.3.1 Wells and/or Hole Improperly Plugged.** This section discusses Powertech's determination that improperly plugged wells or holes do not presently exist within the proposed production area. The department believes there is a strong possibility improperly plugged wells or holes do exist in the area, and although these holes may not have surface connection, they may act as subsurface conduits between the sand zones in the Lakota and Fall River formations. Revise this section to acknowledge the fact that improperly plugged wells or holes may exist within the proposed permit area.

41. **Section 7.4.1 Well Re-Plugging and Abandonment Plan**. Revise the last sentence of this section as follows, "...Powertech will plug the well or hole according to plugging requirements of SD DENR (ARSD 74:11:08 and ARSD 74:55:01:59)."

42. **Section 7.6.1.1 Pre-operational Plugging and Abandonment.** On page 7-10, it states that the test holes drilled by Powertech were plugged in accordance with ARSD 74:02:04:67. These holes were drilled under SDCL 45-6D, Uranium Exploration, and the complementary rules to these statutes, ARSD 74:11:08 Capping, Sealing, and Plugging Exploration Test Holes. The same reference to ARSD 74:02:04:67 is repeated at the bottom of page 7-12 (the reference should be ARSD 74:11:08). Revise this section to correct these errors.

    In addition, at the bottom of page 7-12, it states that a Natural Resource Project Engineer from the SD DENR Waste Management Division was on-site and witnessed the plugging of Powertech's exploration holes. It was actually a "Natural Resource Project Engineer from the SD DENR Minerals and Mining Program ..." Revise this section to correct this error.

43. **Section 7.6.1.2 Operational Plugging and Abandonment Plan.** In the second to last paragraph in this section, Powertech states, "Wells in which water is not encountered or only low-permeability formations such as clays, shales, or till are encountered will be backfilled with material free of contamination." The last sentence of the paragraph also states, "The wells will be backfilled with bentonite or cement." Will the wells mentioned in this paragraph be backfilled with material free of contamination or bentonite or cement? Revise this section to clarify this discrepancy.

44. **Section 7.6.1.2 Operational Plugging and Abandonment Plan**. The last paragraph of this section on page 7-15 states, "The EPA will be notified according to conditions in 40 CFR § 144.51 and the SD DENR will be notified based on the conditions in ARSD 74:55." Revise this paragraph as follows, "...SD DENR will be notified based on the conditions in ARSD 74:55:01:59 and 74:29:11."

45. **Section 7.6.3 Necessary Resources**. The first paragraph of this section states the plugging costs are based on wells approximately 600 feet deep. Table 7.6-2 shows the average well depth as 650 feet. Revise Section 7.6.3 to clarify this discrepancy.

46. **Section 7.6.3 Necessary Resources.** In Section 7.6.3, at the bottom of page 7-16, it states that, "The applicant will submit one surety instrument for well plugging and the agencies must agree who is the lead agency responsible." It may be that even if the agencies agree on one agency holding financial assurance, Powertech may need to submit separate bonds to the different agencies to account for various agency policies, rules, or citizen board requirements.

47. **Section 9.1.1 Summary of Investigation.** This section states, "The TVA groundwater investigation observed the water from Fall River and Lakota intermixed within some of the wells, thus representing a composite sample of the two formations." Revise this section to discuss which wells this was noted in and whether these wells are still open or have been abandoned.

48. **Section 9.2 Groundwater Quality.** In the first paragraph of this section, it states that the section addresses CI 3 of 6. Should this be CI 10(a)?

49. **Section 9.2.1.3 Not Fit for Human Consumption.** This section states, "During initiation of baseline sampling program, a single domestic well completed into the Lakota formation was present within less than one mile of the proposed aquifer exemption boundary." However, Exhibit 4-1 and Appendix C show at least three domestic wells (13, 16, and 42) that fall within the area discussed by this statement. Revise this section to clarify this discrepancy and provide additional information about all of the domestic wells within the area of review.

50. **Figure 9.2-2 Baseline Water Quality Monthly Sampled Sites, and Exhibit 12-1 Sampling Locations.** The two new baseline wells completed in October/November 2009 are not shown on Figure 9.2-2 or on Exhibit 12-1. Revise Figure 9.2-2 and Exhibit 12-1 to show the two new baseline wells completed in October/November 2009.

51. **Section 9.3 Comparison of Historic and Recent Ground Water Quality near Project.** Revise this section to include additional information that adequately supports the claim that aquifers in the project area are not being recharged by lower aquifers.

52. **Section 9.5.1 General Monitoring Procedures**. The first paragraph on page 9-39 states, "The first layer of overlying non-production zone monitoring wells will be evenly distributed through the production area with a minimum of one well for every four acres of production area. Should additional aquifers exist above the first monitoring layer; additional overlying monitors will be located in these aquifers with a minimum of one well position for every eight acres of production area." At this time, because mine unit specific data is not yet available, the department requires Powertech to revise this section to comply with ARSD 74:55:01:42 concerning the spacing of the non-production zone monitoring wells.

The department will consider alternate non-production zone monitoring well location and spacing if, during the mine unit specific monitoring program design process, Powertech can demonstrate alternate well spacing will provide adequate monitoring coverage.

53. **Section 9.5.1 General Monitoring Procedures**. The second paragraph on page 9-39 states, "Underlying wells will not be installed below the Lakota formation, primarily due to the presence of the approximately 100-foot-thick and relatively impermeable Morrison formation immediately below the Lakota formation." At this time, the department does not have enough information to confirm there is no need for underlying wells. In accordance with ARSD 74:55:01:42 Powertech shall propose monitor well spacing for underlying aquifers on a mine unit specific basis based on the results of each mine unit investigation and design. Proposed monitoring well spacing is subject to department approval. Revise this section to comply with ARSD 74:55:01:42.

54. **Section 9.6.1 Water Monitoring Network**. This section discusses the distance the monitoring well ring will be located from the production area. The 400-foot distance specified in ARSD 74:55:01:41 is a maximum distance. Actual placement of the monitor wells must be based on mine unit specific information.

55. **Section 9.6.1.3 Baseline Production Zone Wells**. This section states, "These wells (meaning baseline production zone wells) will be sampled three times each at intervals of two weeks to provide repeatability of the data." ARSD 74:55:01:35 and ARSD 74:29:11:07 require all baseline wells be sampled at least once every month for a minimum of six months before any mining activities. Revise Section 9.6.1.3 to comply with ARSD 74:55:01:35 and ARSD 74:29:11:07.

56. **Section 9.6.1.4 Non-Production Zone Monitoring Wells**. Revise this section to comply with the monitoring frequency described in ARSD 74:55:01:46 (4).

57. **Section 9.7.2 Wellhead Pressure**. The second paragraph does not appear to belong in this section. Review and revise as needed. In addition, the well spacing criteria discussed in this paragraph does not comply with ARSD 74:55:01:42.

58. **Section 9.8.1 Groundwater Quality**. This section states, "Production and monitoring zone wells will be sampled at least four times over a sufficiently spaced interval to indicate well field baseline." ARSD 74:55:01:35 requires all baseline wells be sampled at least once every month for a minimum of six months before any mining activities. Revise Section 9.6.1.3 to comply with ARSD 74:55:01:35.

59. **Section 9.10 Reporting.** In addition to the EPA, Powertech must submit the quarterly monitoring reports to the department. Revise this section to state the department will receive quarterly monitoring reports in accordance with ARSD 74:55:01:49.

60. **Section 9.10 Reporting**. This section states that excursions would be detected through the sampling of uranium, chloride, and sulfates. While chloride may be considered an acceptable parameter, revise this section to include an explanation of the use of uranium and sulfates as testing parameters

for excursions. In addition, explain the effectiveness of using these parameters for determining an excursion.

61. **Sections 10.0 Method of Operation, and 11.0 Groundwater Protection and Restoration.** Revise this section to describe the mining and ground water restoration sequence in areas of overlapping ore bodies (ore bodies in different sand units stacked on top of one another).

62. **Exhibit 10-1 Future Well Fields Custer and Fall River Counties**. No boundary line is shown between mine units Burdock III and V. Revise this exhibit to clarify this error.

63. **Section 10.1.1 Proposed Lixiviant.** In this section, Powertech states that preliminary leach tests may be useful, but there is "...potential for high variability to exist from one well field to another." Powertech provides results of leach tests in Section 10.3.2.2 that show ore concentrations. However, no site-specific leach test water quality data is provided. Revise this section to include the water quality data from the site-specific leach test.

64. **Section 10.3.2 Injection Fluid Compatibility**. This section indicates there is no concern with oxidizing the reduced zone because parameters within the reduced zone are already present within the oxygenated zone. However, the concentration of the parameters within the reduced zone may be much higher as the area essentially acts as a trap and concentrates the constituents into solid form. Revise this section to address which parameters will become mobile as a result of introducing an oxidizing lixiviant into the reduced zone.

65. **Section 10.3.2.2 Lixiviant Compatibility with Ore Body**. This section indicates that four samples were tested with the lixiviant. Only one of those samples was from the Lakota formation while the others were from the Fall River Formation. Revise this section to explain why the tests were limited on the Lakota when the majority of the uranium ore within this area seems to be located within the Lakota formation.

66. **Section 10.3.2.2.1 Ore Amenability to Solution Mining.** Revise this section to address whether vanadium will be recovered during the mining operation.

67. **Section 10.3.2.2.1 Mineralogy of the Ore Body**. This section only refers to uranium minerals that may be found within the ore body. This section must contain a full discussion of the various minerals that occur within the ore body because minerals other than those already mentioned within the section may also affect the reaction of the lixiviant in the ore. Clays may slow reactions down and metals released during oxygenation may prevent uranium from being removed from the formation. Revise this section to include a full mineralogical analysis.

68. **Table 10.5-1.** Identify the sources or data used to generate the numbers for this table.

69. **Section 10.9 Direction of Movement of Mining Solution**. This section mentions that the transmissivity values assumed in the modeling differ from the transmissivities determined from the pump tests. Revise this section to describe how the values used in the modeling were determined.

70. **Section 10.9.1 Discharge Estimate – Fall River Aquifer**. The first bullet in the first paragraph states that the assumed average thickness of the "Formation" is 120 feet. On page 5-10, the thickness of the Fall River Formation is said to range from 120 to 160 feet. In addition, on page 6-2 of Appendix B, a thickness of 165 feet was used to calculate the hydraulic conductivity in the Dewey area. Revise this section to include a justification for using a thickness of 120 feet to calculate discharge.

The fourth bullet in the first paragraph states that the assumed formation storativity is 4 x 10^{-5}. Revise this section to explain why this number was used instead of the median value of 4.60 x 10^{-5} or the average geometric mean of 5.23 x 10^{-5} that are listed in Table 4.3 in Appendix B.

The first sentence of the second paragraph states, "The overall transmissivity of 60 ft^2/day for the Fall River Formation assumed for the project area impact modeling is considerably less than the 255 ft^2/day determined in the 2008 pumping test at the Dewey project area (Knight Piesold, 2008)." Revise this section to explain how the 60 ft^2/day value was derived and include additional information justifying its use for the project area.

The second sentence in the second paragraph states, "However, a barrier boundary that was attributed to decrease in transmissivity surrounding the pumping well was also noted in the 2008 test." The text on page 4-3 and Table 4.2 in Appendix B contain conflicting information on when a boundary was noticed in the drawdown data. For well 32-5, page 4-3 states that the boundary was noticed at 0.6 days while Table 4.2 indicates that it was 0.7 days. For well 32-4C, page 4-3 states that the boundary was noticed at 0.7 days while Table 4.3 indicates it was 0.6 days. Revise the application to provide a consistent interpretation.

The last sentence in the second paragraph states, "The aquifer transmissivity and horizontal hydraulic conductivity of 0.5 ft/day are verified with an estimate of discharge and water balance." Revise this section to include the estimate of discharge and water balance and all necessary calculations.

The third sentence in the third paragraph states, "Hydraulic gradients based on recent measurements in the Fall River aquifer in the Project area range from about 0.005 to 0.01 ft/ft (Knight Piesold, 2008)." In the last paragraph on page 2-3 that continues onto page 2-4 in Appendix B, it states, "At the Burdock portion of the Site, the Fall River aquifer gradient flattens to about 14 ft per mile (0.0026 ft/ft) extending downgradient to the southwestern project boundary. At the Dewey portion of the Site, however, the groundwater gradient in the Fall River aquifer increases sharply to as much as about 52 ft per mile [0.01 ft/ft] within the central portion of the project area." Revise this section to include the justification for using the assumed gradient of 0.005 to 0.01 ft/ft when different gradients are presented in Appendix B.

71. **Section 10.9.2 Discharge Estimate – Lakota Aquifer**. The first bullet in the first paragraph states that the assumed average thickness of the "Formation" is 150 feet. On page 5-10, the thickness of the Chilson Member of the Lakota Formation is said to range from 100 to 240 feet. In addition, on page 6-2 in Appendix B a thickness of 170 feet the Lakota Formation was used to calculate hydraulic conductivity in the Burdock area. Revise this section to include the justification for using

a thickness of 150 feet to calculate discharge for the Chilson Member and the rest of the Lakota Formation.

The fourth bullet in the first paragraph states that the assumed formation storativity is 4×10^{-4}. Revise this section to explain why this number was used instead of the median value of 1.20×10^{-4} or the average geometric mean of 1.12×10^{-4} which are listed in Table 5.3 in Appendix B.

The first sentence of the second paragraph states, "The overall transmissivity of 300 ft^2/day (2,240 gallons per day per foot [gpd/ft]) for the Lakota Formation assumed for the Project area impact modeling is greater than the 2008 pumping test value of 140 ft^2/day at the Burdock site (Knight Piesold, 2008)." Revise this section to explain how the 300 ft^2/day value was derived and include additional information justifying its use in the project area.

The third sentence in the third paragraph states, "Hydraulic gradients based on recent measurements in the Lakota aquifer in the Project area are about 0.003 ft/ft (Knight Piesold, 2008)." Revise this section to explain why the gradient from just the Dewey area is used to represent the entire project area.

72. **Section 10.9.5 Fracture Pressure**. The fifth paragraph in this section states, "The formation fracture pressure proposed to be used for the project is 0.70 psi for every 1 foot of depth to the stop of the screened interval." Revise Section 10.9.5 to include justification for the use of 0.70 psi per foot as the appropriate factor for calculating fracture pressure at the site and to ensure compliance with ARSD 74:55:01:44. If this factor cannot be proven appropriate for the site, site-specific fracture testing will be required.

73. **Section 11.1.1 Injection, Production, and Monitoring Well Placement and Section 11.2.1 Production Zone Monitoring Well Placement Procedure.** Powertech only provides general statements in response to ARSD 74:55:01:26 (12)(d) and (12)(e). Revise these sections to include information that is more specific and to ensure compliance with ARSD 74:55:01:40, ARSD 74:55:01:41 and 74:55:01:42.

74. **Section 11.3 Spill Contingency Plan.** Review and revise this section as necessary to comply with SDCL 34A-12 Regulated Substance Discharges and ARSD 74:34:01 Regulated Substance Discharges and submit a stand alone spill contingency plan.

75. **Section 11.3.2.3.2 Emergency Shutdown**. This section mentions the emergency shutdown procedure for the production wells, but does not address the emergency shutdown procedure for injection wells. Revise this section to include the emergency shutdown procedure for injection wells.

76. **Section 11.3.3 Excursion Control.** This section states, "Most wells placed on excursion status were restored below their designated UCLs within 1 to 6 months (NUREG-1910, 2008)." The context of this statement is unclear as this line from NUREG-1910, 2008 refers to 17 wells that were placed on excursion status between 1999 and 2006 at the Crow Butte ISL mine in Nebraska that is currently mining under differing geologic conditions from those at the proposed Dewey Burdock project.

Revise this section to clarify the relevance of this statement in reference to Powertech's proposed Dewey-Burdock project.

77. **Section 11.4.1.1 Historic Exploration Drill Holes.** This section states, "If inadequately abandoned wells are identified during well field pumping tests, Powertech will require plugging and abandonment to be conducted as detailed in the South Dakota plugging standards (ARSD 74:11:08)." Revise this section to state Powertech will plug any improperly plugged or unplugged exploration test holes or wells identified at any time during mine operations.

78. **Section 11.5 Impacts and Mitigation Measures.** ARSD 74:55:01:26(15) requires an assessment from the mining operation and a description of the steps taken to mitigate those impacts. This section provides insufficient detail on steps to mitigate impacts from the mining operation. Revise this section to include additional information on the steps Powertech will use to mitigate impacts from the operation of the mine.

79. **Section 11.5.1.1.8.1 Drawdown Estimates**. The Dewey Fault is located to the north and west of the property boundary; not to the north and east as stated in this section. Revise this section to correct this error.

    Revise this section to include maps, graphs, calculations, and other supporting documentation regarding the calculations of estimated drawdown for the Fall River Sandstone and Lakota Formation.

80. **Section 11.5.1.1.10.1 Potential Excursions.** Revise this section to comply with ARSD 74:55:01:50 to ARSD 74:55:01:53.02 inclusive.

81. **Section 11.6.2 Estimate of Post-Production Groundwater Quality.** In the first paragraph of this section, it states that the section addresses CI 18(a). Should this be CI 4(18)(a)?

82. **Section 12.1.7.2 Air Particulate Sampling Results.** This section discusses the radionuclide concentrations in air. Some of the radionuclide concentrations are listed as negative concentrations. Revise this section to verify and explain these negative concentrations.

83. **Section 14.3 Future Operations.** The mining of additional well fields (in addition to those proposed in this application) would be considered a major modification and require an amendment of the UIC Class III permit in accordance with ARSD 74:55:01:26:02. Under the mining rules, the mining of additional well fields would require a new mine permit (reference ARSD 74:29:03:02(4), a change in the permit that may adversely affect groundwater is considered a major modification and a permit would be required).

84. **Appendix B Pumping Tests.** Drawings 4.1, 4.2, 5.1, 5.2, and 5.3 were not included in this revised application (they were included in the original application). Please submit these drawings and revise the application accordingly.

85. **Appendix C GW Quality Data.** Based on review of information in Appendix C-2 several errors were found within the ground water tables of Appendix C. Review the data and revise Appendix C-2 to make the necessary corrections.

86. **Exhibit 4-4.** This exhibit shows two deep disposal wells inside the permit boundary, however, Appendix L indicates that disposal will utilize four deep wells, possibly in Burns, Wyoming. Revise the application to explain this discrepancy.

87. **Exhibit 5-2.** Many of the cross sections noted on this map, particularly those within proposed well fields one and two, were not included in this application. Please submit these cross sections and revise the application accordingly.

88. **Exhibits 5-3 through 5-7.** The SP and resistivity logs included on these cross sections indicate that some of the major shale and sand units of the Inyan Kara may be mapable at this scale. Please include these units on the cross sections, or discuss reasons why they cannot be mapped.

89. **Exhibit 5-7, Structure Map of the Fall River.** As indicated in department comments provided to Powertech during an October 29, 2009, meeting in Pierre, SD, there is a missing contour in the area of the western-most labeled data point in section 29, T. 6 S., R. 1 E. The missing contour is "3100." Revise this exhibit to correct this error.

90. **Exhibit 5-8, Structure Map – Top of the Chilson Member of the Lakota Formation**
As indicated in department comments provided to Powertech during an October 29, 2009, meeting in Pierre, SD, the eastern-most two contours are not supported by any labeled data points and the "3201" data point in section 33, T. 6 S., R. 1 E. is on the wrong side of the contour line. Revise this exhibit to correct these errors.

91. **Exhibit 5-12, Isopach of the Fall River Formation.** As indicated in department comments provided to Powertech during an October 29, 2009, meeting in Pierre, SD, the data point labeled TRT61/110 in section 35, T. 6 S., R. 1 E. should have a "110" contour passing through it. The "140," "130," and "120" contours along the border of the SE¼ sec. 35 and the SW¼ sec. 36, in T. 6 S., R. 1 E. turn suddenly without any apparent supporting data. There is a data point labeled "DB08-1-7 / 65" in sec. 1, T. 7 S., R., 1 E. There should be five contours between this data point and the "120" contour to the west. Revise this exhibit to correct these errors.

92. **Exhibit 5-13, Isopach of the Chilson Member of the Lakota Formation.** As indicated in department comments provided to Powertech during an October 29, 2009 meeting in Pierre, SD, there is a possible error in contouring in the northwest corner of section 1 at the eastern edge of the map near a data point labeled DRW31 / 193. This data point occurs immediately next to a "180" contour. Although the data point is on the proper side of the contour and in that respect, is appropriately accommodated by the contour, it would appear that an alternate placement of the contour line might better accommodate the data. Please provide the complete data set for the map with appropriate index maps showing and labeling each data point so that an independent determination can be made.

93. **Exhibit 5-14, Isopach of the Fuson Member of the Lakota Formation.**

In accordance with department comments provided to Powertech during an October 29, 2009 meeting in Pierre, SD concerning the data point labeled as DWA 165 / 52 in section 29, T. 6 S., R.1 E., the placement of the contour was adjusted and is shown on Exhibit 5-14 to accommodate the data point. A consequence of moving the contour is that five other, unlabeled, data points are now on the opposite side of the contour line as compared to their relative position in NRC Supplemental Exhibit 3.2-3. Without having the information for most of the data points on the map, it is impossible to determine if the movement of the contour is appropriate when the entire data set is considered. If the contour, as it appears on Exhibit 5-14, is correctly placed, then there were five additional data points that were incorrectly contoured in NRC Supplemental Exhibit 3.2-3. Please explain how this is possible if a contouring software package was used to produce the map. Also, please provide the complete data set for the map with appropriate index maps showing and labeling each data point so that an independent determination can be made.

In accordance with department comments provided to Powertech during an October 29, 2009 meeting in Pierre, SD concerning the data point labeled as FTB21 / 42 in section 11, T. 7 S., R 1 E., the placement of the contour was adjusted and is shown on Exhibit 5-14 to accommodate the data point. A consequence of moving the contour is that approximately 40 other, unlabeled, data points are now on the opposite side of the contour line as compared to their relative position in NRC Supplemental Exhibit 3.2-3. Without having the information for most of the data points on the map, it is impossible to determine if the movement of the contour is appropriate when the entire data set is considered. If the contour, as it appears on Exhibit 5-14, is correctly placed, then there were approximately 40 additional data points that were incorrectly contoured in NRC Supplemental Exhibit 3.2-3. Please explain how this is possible if a contouring software package was used to produce the map. Also, please provide the complete data set for the map with appropriate index maps showing and labeling each data point so that an independent determination can be made.

A "50" isopach line is missing near the eastern edge of the map in sections 35, 2, and 1. Contours must appropriately accommodate all data on all maps. Revise this exhibit to correct this error.

94. **Exhibit 6-1, Location of Breccia pipe or collapse structure, Southern Black Hills, South Dakota**. As asked in department comments provided to Powertech during an October 29, 2009, meeting in Pierre, SD, why is the geology shown for only a small area of the map?

Additionally, alluvium is incorrectly shown in Sections 11, 12, 13, 14, 23, and 24, T. 6 S., R. 1 E. Sections 18 and 19, T. 6 S., R. 2 E. Revise the exhibit to correct these errors.

95. **Exhibit 6-2, Structure Map – Top of the Fuson Formation**. As indicated in department comments provided to Powertech during an October 29, 2009, meeting in Pierre, SD, the eastern-most contour is not supported by any labeled data points. Revise the exhibit to correct this error.

Typographical Errors

96. Throughout the application, South Dakota Administrative Rules and Codified Laws are inconsistently or incorrectly cited. Review and revise the application to correct these errors.

97. **Table of Contents**. The table of contents lists an Executive Summary to be found on page ES-1, however, no Executive Summary was included in the application. Please revise the application to clarify this discrepancy.

98. **Table of Contents.** Subsections of 11.5.1.1 are not listed. This includes Sections 11.5.1.1.1 Potential Surface Water Impacts from Construction to Section 11.5.1.1.10.2 Potential Spills.

99. **Section 9.2.1.1 Exceedances of Primary Drinking Water Standards.** The tables in this section appear to be sorted by decreasing concentrations, however on samples of the same concentrations, the collection dates are not in order. Revise the tables to correct this error.

100. **Section 9.2.1.2 Exceedances of Other Drinking Water Standards**. The first sentence of this section is unclear as to what EPA standards Powertech is referring too. Review and revise this section to clarify.

101. **Section 9.3.1.1 Conclusions**. The content of this section is not consistent with Section 9.3. It appears to be more relevant to the content of Section 9.2.1. Review and revise this section to clarify.

102. **Section 10.2.1 Chemical Reactions.** This section states, "The oxidation and dissolution reaction for coffinate is represented in Reaction 9." This reaction appears to be for the mineral coffinite, not coffinate. Revise this section to correct this error.

103. **Section 10.9 Direction of Movement of Mining Solution**. This section describes an injection rate of 4,000 to 4,500 gpm, however the application does not always specify if this rate is per well field or is the total injection rate for two well fields. Revise to clarify.

104. **Section 11.6.1 Groundwater Restoration Method(s).** This section states, "The proposed project restoration schedule, Table 10.7-2, shows the estimated schedule for restoration." Table 10.7-2 was not included in this application. Revise the application to clarify this discrepancy.

105. **Table 12.1-24.** For the additional Two NE Wells Requested by SD DENR, change "NE" to "NW".

106. **Appendix L.** The pages in Appendix L are inconsistently numbered. Review and revise as needed.

107. **Exhibit 5-2.** Not all cross sections included with this application are labeled on this exhibit. Revise the exhibit to include all of the cross sections submitted with the application.