July 15, 2014

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
POWERTECH (USA) INC.,	)	Docket No. 40-9075-MLA
	)	ASLBP No. 10-898-02-MLA-BD01
(Dewey-Burdock In Situ Uranium Recovery Facility)	)	
	)	

NRC STAFF'S REBUTTAL TESTIMONY

I. Introduction

Q1: Please state your name, position, and employer, and briefly describe your role in reviewing Powertech's application for a license related to the Dewey-Burdock Project.

A1a: My name is Po-Wen (Kevin) Hsueh. I am the Chief of the Environmental Review Branch in the NRC's Office of Federal and State Materials and Environmental Management Programs. My statement of my professional qualifications is found at Ex. NRC-002. As Branch Chief, I managed the NRC Staff's environmental review of the Dewey-Burdock application and its preparation of the Final Supplemental Environmental Impact Statement (FSEIS). I also managed the Staff's review under the National Historic Preservation Act (NHPA), including the Staff's consultation efforts under Section 106 of the NHPA.

A1b: My name is Haimanot Yilma. I am an Environmental Project Manager in the NRC's Office of Federal and State Materials and Environmental Management Programs. My

job duties are described in Ex. NRC-001 at A1a. My statement of professional qualifications can be found at Ex. NRC-003.

A1c: My name is Kellee Jamerson. I am an Environmental Scientist in the NRC's Office of Federal and State Materials and Environmental Management Programs. My job duties are described in Ex. NRC-001 at A1b. My statement of professional qualifications is found at Ex. NRC-004.

A1d: My name is Thomas Lancaster. I am a Hydrogeologist with the Uranium Recovery Licensing Branch in the NRC's Office of Federal, State and Materials and Environmental Management programs. My job duties are described in Ex. NRC-001 at A1c. My statement of professional qualifications is found at Ex. NRC-005.

A1e: My name is James Prikryl. I am a Senior Research Scientist in the Geosciences and Engineering Division of the Southwest Research Institute. My job duties are described in Ex. NRC-001 at A1d. My statement of professional qualifications is found at Ex. NRC-006.

A1f: My name is Hope Luhman. I am Vice President of Louis Berger's nationwide cultural resource management practice. My statement of professional qualifications is found at Ex. NRC-002. As Vice President at Louis Berger, I manage the archaeological, architectural, and historic preservation planning projects nationwide that involve historic and precontact resources. I serve as an archaeological and cultural resources consultant to the NRC for its NHPA-related activities. I advised the NRC staff on Section 106 consultation. I assisted in the preparation of the Programmatic Agreement under the NHPA.

Q2: Are you familiar with initial testimony and exhibits filed by the Oglala Sioux Tribe and the Consolidated Intervenors?

A2: (K. Hsueh, H. Yilma, K. Jamerson, T. Lancaster, J. Prikryl, H. Luhman) Yes. We have reviewed the testimony of both the Oglala Sioux Tribe and the Consolidated

Intervenors that is relevant to the contentions on which we will be testifying. We have also reviewed any relevant supporting information cited by the Oglala Sioux Tribe or the Consolidated Intervenors, including their exhibits.

Q3: What are the contentions on which you will be testifying?

A3a: (K. Hsueh) I will testify on Contention 1 (Cultural Resources).

A3b: (H. Yilma) I will testify on Contentions 1 (Cultural Resources).

A3c: (K. Jamerson) I will testify on Contention 1 (Cultural Resources).

A3d: (H. Luhman) I will testify on Contention 1 (Cultural Resources).

A3e: (T. Lancaster) I will testify on Contentions 2 (Baseline Groundwater Quality), 3 (Hydrogeology), and 4 (Groundwater Consumption).

A3f: (J. Prikryl) I will testify on Contentions 2 (Baseline Groundwater Quality), 3 (Hydrogeology), and 4 (Groundwater Consumption).

Contention 1A: The Staff Evaluated Impacts to Historic Properties as Required under NEPA and the NHPA

Q1.1: Have you reviewed the declarations and testimony presented as exhibits by the Oglala Sioux Tribe and the Consolidated Intervenors?

A.1.1: (H. Yilma, K. Jamerson; K. Hsueh, H. Luhman) Yes. We have reviewed all relevant exhibits, and we will discuss the statements made in Exs. OST-012, OST-014, OST-015, INT-001, INT-016 at 125, and INT-017 at 5–6.

Q1.2: In their testimony, the Intervenors' witnesses state that the Staff needed to consider the proximity of the Dewey-Burdock project to the Black Hills, a region culturally and historically significant to many Indian Tribes. Did the Staff do so?

A1.2: (H. Yilma, K. Jamerson; K. Hsueh) Yes. The Staff recognizes that many Tribes, including the Oglala Sioux Tribe, have important historical ties to the Black Hills. The Staff is also aware that the archaeological record demonstrates that human occupation within the Black Hills and the Dewey-Burdock region dates to the Archaic Period.

Q 1.3: Wilmer Mesteth, Michael Catches Enemy, and Dr. Louis A. Redmond contend the Staff did not identify and evaluate *all* cultural properties at the Dewey-Burdock site. Did the NRC Staff make a reasonable and good faith effort to identify properties eligible for inclusion on the National Register of Historic Places (NRHP)?

A 1.3: (H. Yilma, K. Jamerson; K. Hsueh, H. Luhman) Yes. Under the National Historic Preservation Act (NHPA) and its implementing guidance, identification efforts may involve a variety of research approaches. These approaches can include reviews of the archaeological, ethnographic, and academic literature; tribal consultation; ethnological or ethnographic studies; oral histories; sample field investigations; or field

surveys. Ex. NRC-047 at 1. The identification effort is expected to be reasonable; an agency is not required to identify every historic property within a project's area of potential effects. Exs. NRC-047 at 2, NRC-027; NRC-145-A and B.

In this case, the Staff made a reasonable and good faith effort to identify and evaluate properties eligible for inclusion on the NRHP. Exs. NRC-001 at A1.6, A1.10, A1.11, A1.15; NRC-008-A at Sections 3.9 and 4.9; NRC-019, NRC-155. The Staff invited all interested tribes, including the Oglala Sioux Tribe, to participate in these identification efforts. The Staff also provided all interested tribes a reasonable opportunity to identify historic properties, to advise on the identification and evaluation of such properties, to comment on the undertaking, and to participate in the resolution of adverse effects. Exs. NRC-015, NRC-054, NRC-018-B at 10-13.

Q1.4: The Tribe claims that it is unable to confirm whether the Staff conducted a comprehensive environmental review of cultural, archaeological, and tribal resources at the Dewey-Burdock site. How does the staff respond?

A1.4: Yes. (H. Yilma, K. Jamerson; K. Hsueh, H. Luhman) The Staff did, in fact, conduct a comprehensive environmental review of cultural, archaeological, and tribal resources at the proposed Dewey-Burdock site. Exs. NRC-001 at A1.2, A1.3, A1.6, A1.10, A1.11, A1.15; NRC-008-A at Sections 3.9 and 4.9. The Oglala Sioux Tribe had the same opportunity to participate in each phase of the Staff's review as the other consulting Tribes. Ex. NRC-015.

The Intervenors' expert, Dr. Redmond, challenges the comprehensiveness of this review and claims the FSEIS relies only on the archaeological investigations and eligibility determinations presented in Powertech application. Exs. INT-001, INT-016 at 125, INT-017 at 5-6. Dr. Redmond challenges the application, rather than the NRC analysis and evaluations as presented in the FSEIS and cultural resources supplement.

The Staff's review, however, goes well beyond merely relying on archaeological data submitted by Powertech as part of their application. The Staff used a wide-ranging body of data in identifying historic properties, developing the cultural resources impact determination, and making NRHP-eligibility determinations. The NRC did not only rely on the recommended eligibility determinations included in the Class III report. The Staff conducted its own independent analysis to determine eligibility determinations of archeological and tribal sites and used this analysis when making its cultural resources impact determination. The NRC's eligibility determinations have since been reviewed and concurred upon by the South Dakota State Historic Preservation Office. Ex. NRC-155. This information was incorporated into the FSEIS at Sections 3.9.3 and 4.9. Exs. NRC-001 at A1.2, A1.3, A1.4, A1.5, A1.9; NRC-008-A at Sections 3.9.3 and 4.9; NRC-019, NRC-018-B.

In addition, as a result of the Staff's independent assessment, the NRC staff asked Powertech to conduct additional evaluation of unevaluated sites that could be disturbed during construction and operation activities. In 2011, Powertech conducted subsurface testing on these sites and provided eligibility recommendations to the NRC. The NRC utilized this additional testing to make its own eligibility recommendation. Exs. NRC-0018-A at, NRC-008-A-1 at 3-76, NRC-136-A through C.

During its review the Staff considered the extensive Level III archaeological investigations conducted by the professional staff at the Archaeological Laboratory at Augustana College. The Staff also facilitated on-the-ground tribal surveys of the area of potential effects and published a tribal cultural survey report. Exs. NRC-001 at A1.3, A1.6, A1.7, A1.8; NRC-018-B at 11, 25-46; NRC-019. In addition, the Staff assessed visual and auditory impacts to cultural resources that may be affected by the Dewey-Burdock Project. Exs. NRC-025-A, NRC-025-B, NRC-026.

The Staff also took into account an extensive review of the ethnohistorical literature available on places of religious or cultural significance to tribes. Exs. NRC-001 at A1.5; NRC-008-A at 3-85 to 3-87, NRC-153. Furthermore, the Staff considered the SRI Foundation report *Overview of Places of Traditional and Cultural Significance* during its review. Exs. NRC-144, NRC-008-A at 3-88 to 3-91.

Q1.5: Does the ACHP recommend one methodology for identifying traditional cultural properties?

A 1.5 (H. Yilma, K. Jamerson; K. Hsueh, H. Luhman) No. The Tribe's experts argue that the tribal field surveys or the Dewey-Burdock site conducted in 2013 were inadequate because tribal surveyors did not use a uniform methodology. The ACHP guidance makes clear, however, that an agency need not use any particular method to identify historic properties. NRC-047 at 1–2. An agency determines how to identify historic properties after taking into consideration the parameters of the proposed project and available information about cultural resources. Ex. NRC-047.

Q 1.6 Please explain why the Staff decided to use an individual tribal survey approach.

A 1.6 (H. Yilma, K. Jamerson; K. Hsueh) The Oglala Sioux and many other tribes requested an opportunity to identify sites of cultural and historical significance to them in the Dewey-Burdock area. Ex. NRC-038-E at 102, 113–118, 180–188. The NRC staff consulted with the Tribes extensively to develop a tribal survey approach that would be agreeable to all. The NRC staff reviewed comparative information on costs and methodologies used in on-the-ground tribal surveys conducted by other federal agencies that followed ACHP guidance. Exs. NRC-47 at 2, NRC-071, NRC-060; NRC-18-B at 11, 16, 19–21, NRC-019 at 1–5, NRC-015 at 9–13, NRC-071. The NRC staff used this comparative information when reviewing the tribal survey proposals submitted by two tribes and by Powertech. Exs. NRC-015 at 9–13, NRC-023, NRC-018-B at 19. Because the proposals differed significantly in scope, level of effort, cost, and

methodology, the Staff considered alternative identification methods. Exs. NRC-018-B at 17–21, NRC-015 at 11–13, NRC-041. The Staff chose the individual survey approach because it allowed each tribe to evaluate the entire project area in a manner culturally appropriate for each tribe. In fact, a number of tribes had advised the Staff that only their members could identify these important sites. Exs. NRC-001 at A1.8, NRC-064, NRC-066, NRC-067. For example, the Oglala Sioux tribal leaders explained that only those with expertise in Sioux traditional cultural properties were competent to identify these specialized sites. Exs. NRC-001 at A1.10, NRC- 064 at 2, NRC-071, NRC-060, OST-012. For that reason, the Staff invited each tribe to participate in a site survey and choose an identification method appropriate for identifying sites of significance to the tribe. Exs. NRC-001 at A1.8, NRC-018-B at 21, NRC-068.

Q1.7: Did the Oglala Sioux Tribe participate in the tribal survey?

A1.7: (H. Yilma, K. Jamerson; K. Hsueh) No. The Oglala Sioux Tribe challenged the Staff's survey approach and declined to participate. Exs. NRC-001 at A1.13, NRC- 064 at 2, OST-012, OST-014. The Standing Rock Sioux, Rosebud Sioux, Sisseton-Wahpeton Oyate, and Yankton Sioux Tribes also rejected the Staff's approach to the tribal surveys. Exs. NRC-018-B at 17-21, NRC-015 at 11-13, NRC-065, NRC-066, NRC-067. However, seven tribes participated in the field surveys, and the Staff later published the results of the field investigations for public comment. Exs. NRC-001 at A1.7, NRC-018-B, Appendix B at 10–13, 25–46, NRC-019.

Q1.8: What methodologies were employed by the tribes that conducted the tribal surveys?

A1.8: (H. Yilma, K. Jamerson; K. Hsueh) The tribal representatives developed survey priorities and methods prior to beginning their field surveys. The Staff discusses these methods in the FSEIS at Appendix F, pages F-2 through F-4. Four survey priorities

were established, and surveyors focused survey efforts on visiting and assessing (1) known burial sites, (2) areas proposed for ground disturbance, (3) NRHP-listed or eligible sites, and (4) areas with the potential to be affected by Powertech's proposed land application of liquid waste. The participating tribes also agreed to collaborate and conduct the survey work as a single team, and they developed survey intervals and strategies to achieve maximum coverage of the Dewey-Burdock area. The field surveys methods are presented in detail in the FSEIS. Exs. NRC-008-A, Appendix F at F-2 through F-4, NRC-18-B, NRC-019.

Q1.9: Did the Staff publish its cultural resources findings for public comment?

A1.9: (H. Yilma, K. Jamerson; K. Hsueh) Yes. The staff published these findings in December 2013, in its *Summary Report Regarding the Tribal Cultural Surveys Completed for the Dewey-Burdock Uranium In-Situ Recovery Project.* Ex. NRC-019. The Tribe incorrectly claims the Staff did not issue a supplemental cultural resource report. Exs. OST-012 at 2, OST-014 at 3. The Staff's supplemental report, which contained its initial NRHP-eligibility determinations, was made available on the NRC's public website for 30-day comment period. Exs. NRC-019, NRC-056 through NRC-063. The Staff also provided the supplemental report to all consulting tribes in November 2013, and again in December 2013, when developing the Dewey-Burdock Programmatic Agreement. The Staff incorporated comments received on the FSEIS and the cultural resources supplement in its revisions to the Programmatic Agreement.

Contention 1B: The Staff Consulted Extensively and in Good Faith with Interested Tribes

Q1.10: Did the Staff consult with the Oglala Sioux Tribe on properties of religious and cultural significance to the Tribe?

A1.10: (H. Yilma, K. Jamerson; K. Hsueh) Yes. Over the last four years, the NRC staff has held numerous face-to-face meetings and teleconferences as part of our efforts to consult with the Oglala Sioux and other interested Tribes regarding cultural resources. We have also exchanged many e-mails, phone calls, and letters on these issues. The Staff provided each of the 23 consulting tribes many opportunities to contribute information on traditional cultural properties; we also extended them an opportunity to participate in a field survey of the Dewey-Burdock site. As we state in our initial testimony, the record demonstrates that the Staff made a reasonable and good faith effort to include the Oglala Sioux Tribe and other consulting Tribes in identifying and evaluating historic properties at the Dewey-Burdock site. We also included the Tribes when developing a programmatic agreement to mitigate impacts to historic sites. Exs. NRC-015, NRC-146, NRC-147, NRC-148.

Q1.11: Can you explain how the Dewey-Burdock Programmatic Agreement protects tribal interests in cultural resources and allows for continuing tribal participation in decisions on historic properties?

A1.11: (H. Yilma, K. Jamerson; K. Hsueh, H. Luhman) The Programmatic Agreement provides significant protection for cultural resources at the Dewey-Burdock site. The broadest protections are found in Stipulation 1 and Stipulation 13. Under Stipulation 1, Powertech must comply with all applicable provisions in the Programmatic Agreement as a condition its license. Under Stipulation 13, compliance with the Programmatic Agreement is a condition of both Powertech's NRC license *and* the Bureau of Land Management's Plan of Operations.

In response to concerns raised by the parties during the development of the Programmatic Agreement, the Staff included specific stipulations to ensure that Powertech manages cultural resources properly and allows interested Tribes the opportunity to participate in protecting such resources. Stipulation 2

describes the procedures for identifying and evaluating historic properties within the Dewey-Burdock license boundary. Stipulation 3 sets forth the mechanisms for the protection and evaluation of *unevaluated properties* within the area of potential affects (APE). Stipulation 4 describes how the assessment of effects will be conducted, while Stipulation 5 describes the steps the parties will undertake to resolve adverse effects.

In Stipulation 6, the Programmatic Agreement describes the procedure Powertech must follow for the future identification of cultural resources when installing power transmission lines in connection with the Dewey-Burdock Project. Stipulation 9 specifies the procedures for responding to unanticipated discoveries. Stipulation 10 describes the procedures that must be followed if human remains are discovered at the Dewey-Burdock site, while Appendix D to the Programmatic Agreement describes the treatment of human remains on state, private, and BLM lands.

In conclusion, the Programmatic Agreement both protects tribal interests in cultural resources and allows for continuing tribal participation in decisions on historic properties.

Q1.12: The Intervenors' witnesses nonetheless suggest that the Programmatic Agreement is insufficient to protect tribal interests. Can you address their claims?

A1.12: (H. Yilma, K. Jamerson; K. Hsueh, H. Luhman) President Brewer, Michael Catches Enemy, Wilmer Mesteth, and Dr. Redmond argue that the Programmatic Agreement unnecessarily defers the consideration and resolution of adverse impacts. Exs. INT-001, INT-016 at 125, INT-017 at 5-6, OST-012, OST-014, OST-015. They raise concerns that tribes will not be involved in future activities to resolve or mitigate adverse impacts, to evaluate unevaluated sites,

and to conduct identification outside the area of potential affects (APE). Dr. Redmond was specifically concerned that unevaluated sites would be treated as not eligible for the NRHP and that potentially significant sites might be ignored. Exs. INT-001, INT-016 at 125, INT-017 at 5-6.

These concerns have in fact been addressed in the Programmatic Agreement. The Oglala Sioux, Northern Cheyenne, Cheyenne River Sioux, and Standing Rock Sioux Tribes requested that the Programmatic Agreement include specific steps to ensure the tribes would be allowed to participate in the resolution of adverse effects, particularly in the development of mitigation and treatment plans. The Programmatic Agreement takes into account this input. Through Stipulations 4, 5, 6, 9, 10, and 14, the Programmatic Agreement guarantees continuing tribal participation in cultural resources decisions. Ex. NRC-018-A. The Staff would further note that, through revisions to the draft Programmatic Agreement, the Tribes also received assurances that unevaluated sites in the Dewey-Burdock area will be treated as eligible for the NRHP until an eligibility determination can be completed. Exs. NRC-018-A, Stipulation 3, NRC-008-A-1 at 4-164, 4-166, 4-171.

Contention 2: The Staff Adequately Analyzed Baseline Groundwater Quality

Q2.1: In Sections II.A and II.B of his testimony, Dr. Moran argues that the FSEIS inadequately addresses impacts from past uranium exploration and mining in the Dewey-Burdock area. Can you address his claims?

A2.1: (J. Prikryl, T. Lancaster) Dr. Moran argues that the FSEIS fails to analyze past uranium exploration and mining activities and contamination from the Black Hills Army Depot. He claims that activities at the Army Depot have degraded the quality of much of the Dewey-Burdock area groundwater. He also claims that analyzing impacts from past mining and other contamination is critical to assessing the baseline water quality and potential impacts of future mining activity at the Dewey-Burdock site.

As we explain in A2.4 of our initial testimony, the purpose of defining or establishing preoperational baseline water quality at an ISR site is not to evaluate the impacts of past mining activities on water resources. Preoperational baseline is a description of the *existing* environmental conditions within and adjacent to a project area. Preoperational baseline groundwater conditions at an ISR site are established as part of a project-wide groundwater monitoring program so that corrective actions can be taken if adverse water quality conditions resulting from ISR activities are detected.

As we further explain in A2.4 of our initial testimony, under regulations issued by the Council on Environmental Quality, the agency responsible for implementing the procedural provisions of NEPA, the environmental impacts that result from past actions are assessed as "cumulative effects" as defined in 40 C.F.R. § 1508.7. The Staff evaluates past actions, including past uranium mining activities and activities at the Black Hills Army Depot, and their potential environmental impacts in Chapter 5 of the FSEIS. In other words, the Staff considered the information mentioned by Dr. Moran,

but we appropriately discussed this information in the context of cumulative impacts, rather than in the context of preoperational water quality.

Finally, as we explain in A2.3 of our written testimony, Powertech's approach for defining preoperational baseline groundwater quality, as described in FSEIS Section 3.5.3.5, meets Criterion 7 in 10 C.F.R. Part 40, Appendix A. Under Criterion 7, at least one full year prior to any major site construction, the applicant or licensee must conduct a preoperational monitoring program to provide complete baseline data on a milling site and its environs.

In sum, the data on baseline water quality provided in Powertech's application documents and summarized in FSEIS Section 3.5.3.5 allowed the Staff to adequately characterize the environment that may be affected by the Dewey-Burdock Project and assess the Project's reasonably foreseeable impacts on existing groundwater quality.

Q2.2: In Section II.C of his testimony, Dr. Moran argues that the FSEIS lacks detailed information necessary to develop a reliable and scientifically defensible baseline analysis. Can you address this claim?

A2.2: (J. Prikryl, T. Lancaster) As we explain in A2.3 of our initial testimony, the baseline groundwater quality data presented in the FSEIS and Powertech's application is adequate to assess how the Dewey-Burdock Project may affect groundwater quality. The Staff summarizes Powertech's preoperational baseline groundwater quality results in FSEIS Section 3.5.3.5. Based on the information provided, Powertech's approach for defining preoperational baseline water quality meets Criterion 7 in C.F.R. Part 40, Appendix A, which states that at least one full year prior to any major site construction, the applicant or licensee must conduct a preoperational monitoring program to provide complete baseline data on a milling site and its environs.

As we explain in A2.18 of our initial testimony, Powertech followed guidance in NUREG-1569 (Ex. NRC-013) to establish preoperational baseline groundwater

conditions at the Dewey-Burdock site. The information presented in Powertech's application (Ex. APP-040-C) is consistent with the acceptance criteria for establishing baseline groundwater quality in Section 2.7.3(4) of NUREG-1569. Based on the sampling locations, the number of samples collected, the aquifers sampled, and the parameters analyzed—as presented in Powertech's application (Ex. APP-040-C) and as summarized in FSEIS Section 3.5.3.5—Powertech has provided scientifically defensible details regarding its methodology for acquiring baseline groundwater quality at the Dewey-Burdock site.

As we further explain in A2.8 of our initial testimony, the Staff reviewed the groundwater sampling methods and groundwater quality analytical results presented in Powertech's application and supporting documents. Based on this review, the Staff found that the sampling methods used to collect groundwater were consistent with standard industry practice. For example, as documented in Section 6.1.8.1 of Powertech's Environmental Report (Ex. APP-040-C), Powertech installed permanent pumps in wells and purged three well volumes before the well water was collected for analysis. With regard to analysis of groundwater samples, Powertech analyzed chemical constituents and parameters using appropriate Environmental Protection Agency (EPA) and American Society for Testing and Materials (ASTM) standard methods, as documented in Appendix 2.7-H of Powertech's Technical Report RAI Responses (Exs. APP-016-N, APP-016-O, APP-016-P, and APP-016-Q).

Q2.3: In Section III.C of his testimony, on page 17, Dr. Moran lists seven categories of information that are allegedly lacking in the FSEIS. He first claims that the FSEIS needs to provide information on "detailed hydrologic testing, including long-term aquifer testing, coupled with simultaneous water-quality sampling." Can you address his claim?

A2.3: (J. Prikryl, T. Lancaster) As we explain in A3.4 of our initial testimony, Dr. Moran attempts to link the collection and submission of data associated with wellfield hydrogeologic test packages for each wellfield, as described in FSEIS Section 2.1.1.1.2.3.4, with the project-wide hydrogeologic information provided in FSEIS Sections 3.4 and 3.5 to claim that the hydrogeological information in the FSEIS is inadequate. We would first note that the Staff has responded to comments from the Oglala Sioux Tribe concerning aquifer pumping tests that Powertech will conduct after license issuance. The Staff addresses this issue in its response to comments 116-000007, 127-000006, and 127-000007 in Section E.5.21.5 of the FSEIS. In its responses, the Staff explains why the information from the pumping tests associated with wellfield hydrogeologic test packages is not needed in order to finalize the FSEIS.

To further address this claim, we would note that under NRC regulations it is standard practice for operators of NRC-licensed ISR facilities to submit wellfield hydrogeologic data packages (as described in FSEIS Section 2.1.1.1.2.3.4) after license issuance but prior to operating the wellfield. The wellfield hydrogeologic data packages provide (i) detailed information on production and injection well patterns and locations of monitor wells; (ii) documentation of wellfield geology (*e.g.*, geologic cross sections and isopach maps of production zone sand and overlying and underlying confining units); (iii) pumping test results for each wellfield; and (iv) water quality data for each wellfield. These data must be obtained to demonstrate that the production and injection wells are hydraulically connected to the perimeter production zone monitor wells and hydraulically isolated from nonproduction zone monitor wells in underlying and overlying aquifer units. These data are also used to establish Commission-approved background water quality and upper contaminant levels (UCLs) in individual wellfields for aquifer restoration and excursion monitoring. The submission of wellfield hydrogeologic data packages at ISR facilities is required by a site-specific

condition in the NRC license for the facility. In Powertech's case, Condition 10.10 of its license (Ex. NRC-012) stipulates the information Powertech must submit to the NRC for review and evaluation prior to operating in specific Dewey-Burdock wellfields. Based on the current information and this license condition, the Staff was able to comply with NEPA by assessing the reasonably foreseeable effects of the Dewey-Burdock Project on groundwater resources.

Q2.4: Dr. Moran next claims the FSEIS needs to provide "*detailed* chemical compositions and volumes of all solid and liquid wastes and operating fluids, such as pregnant lixiviant solutions" (emphasis in original). Does the FSEIS provide this information?

A2.4: (J. Prikryl, T. Lancaster) This detailed information can only be collected after Powertech develops wellfields, operates in those wellfields, and generates solid and liquid wastes. With regard to waste volumes, this issue appears to be outside the scope of Contention 2. In any event, FSEIS Section 2.1.1.1.6.3 (at pages 2-53 to 2-55) provides estimates of the volumes of solid wastes the Dewey-Burdock Project will generate. As discussed in FSEIS Section 2.1.1.1.6.3, solid wastes generated at the project will include solid byproduct material, nonhazardous solid waste, and hazardous solid waste.

With regard to the chemical composition of pregnant lixiviant solutions, as we explain in A2.7 of our initial testimony, no leach testing on Dewey-Burdock ores was conducted. However, Table 2.2-1 of the GEIS (Ex. NRC-010-A at p. 2-7) provides a list of NRC-accepted constituents and water quality parameters that are expected to increase in concentration as the result of ISR activities and that are of concern to water use of an aquifer. Because the NRC analyzed this issue generically in the GEIS, the Staff did not need to review analyses of pregnant solutions resulting from leach testing in order to assess the reasonably foreseeable impacts of the Dewey-Burdock Project.

Q2.5: Dr. Moran next argues that the FSEIS needs to provide an "identification of chemical constituents that will be used for aquifer restoration and clean-up standards/criteria for each constituent." Does the FSEIS address these constituents or standards?

A2.5: (J. Prikryl, T. Lancaster) As we explain in A6.9 of our written testimony, Powertech is bound by license condition 10.6, which states that groundwater shall be restored to the numerical groundwater protection standards required by 10 C.F.R. Part 40, Appendix A, Criterion 5B(5). For aquifer restoration to be complete, Powertech must demonstrate that hazardous constituents in the water do not exceed either (i) Commission-approved background water quality; (ii) the MCLs provided in Criterion 5C; or (iii) an ACL that the NRC establishes in accordance with Criterion 5B(6). The Staff discusses these standards in FSES Section 2.1.1.1.4.2, "Restoration Monitoring and Stabilization." In Appendix B of the FSEIS, the Staff discusses the process for reviewing and approving ACLs.

Q2.6: Next, Dr. Moran states that the FSEIS should include a "[l]ist of chemical constituents that are likely to require an ACL based on similar projects." Can you address this claim?

A2.6: (J. Prikryl, T. Lancaster) In Section 2.11.5 of the GEIS (Ex. NRC-010-A at pages 2-48 to 2-51), the Staff discusses historical aquifer restoration data at NRC-licensed ISR facilities. In this section the Staff compares the baseline and post-restoration stability monitoring data on constituents that could not be returned to within a statistical range of baseline values and, therefore, could require an ACL. Based on the experiences at other ISR projects, predicting which constituents may require an ACL in connection with the Dewey-Burdock Project would be speculative. As noted above, however, in Appendix B of the Dewey-Burdock FSEIS the Staff discusses the process for reviewing and approving ACLs.

Q2.7: Dr. Moran argues that the FSEIS needs to discuss the actual waste disposal methods to be employed by Powertech. Does the FSEIS address this issue?

A2.7: (J. Prikryl, T. Lancaster) This issue does not relate directly to Contention 2, which concerns baseline water quality. Nonetheless, in FSEIS Sections 2.1.1.1.6.2 and 2.1.1.1.6.3 the Staff describes the methods that will be employed to dispose of liquid wastes and solid wastes at the Dewey-Burdock Project. With regard to managing liquid byproduct material, Powertech proposes deep Class V well injection, land application, or a combination of these methods. The Staff describes the liquid waste disposal systems for each of these methods in detail in FSEIS Section 2.1.1.1.2.4. As we explain in FSEIS Sections 2.1.1.1.2.4 and 4.1, whether Powertech uses deep well disposal is contingent on it obtaining a permit for Class V injection wells from the EPA. The EPA is currently reviewing Powertech's application for a Class V injection well permit (see SEIS Table 1.6-1). Whether Powertech uses land application, on the other hand, is contingent on it obtaining an approved groundwater discharge plan (GDP) from the South Dakota Department of Environment and Natural Resources (SDDENR). The SDDENR will permit land application only if Powertech demonstrates insufficient Class V disposal capacity. The SDDENR is currently reviewing Powertech's GDP application for land application (see SEIS Table 1.6-1).

Q2.8: Dr. Moran argues that the FSEIS should include "detailed analyses and data relating to the specific UIC well studies required by US EPA and EPA approval of the UIC well permits." Is he correct?

A2.8: (J. Prikryl, T. Lancaster) As the Staff notes in FSEIS Table 1.6-1, the EPA is currently reviewing Powertech's applications for Class III and Class V UIC injection well permits. The Staff has reviewed Powertech's applications for these permits (Exs. APP-042-A, APP-042-B, APP-042-C, APP-042-D, APP-016-S, APP-016-T, APP-016-U, APP-016-

V), and we have included relevant information from these permits in the FSEIS. For example, as the Staff states on page 2-51 of the FSEIS:

> The applicant submitted a permit application to EPA to construct four to eight UIC Class V deep injection wells to inject liquid byproduct material into the Minnelusa and Deadwood Formations; the application is currently under review (Powertech, 2011, Appendix 2.7-L). The first four of the proposed wells are detailed in the permit application. The depth from the ground surface to the disposal horizon for the 4 wells ranges from 492 to 1,076 m [1,615 to 3,530 ft] (Powertech, 2011, Appendix 2.7–L).

Q2.9: Dr. Moran argues that the FSEIS needs additional structural geologic information, including information on faults, breccia pipes, and human-induced connectivity. Can you address his claim?

A2.9: (J. Prikryl, T. Lancaster) This claim does not relate to Contention 2, but to Contention 3. The Staff addresses these issues—faults, breccia pipes, and human-induced connectivity (*e.g.*, exploration boreholes)—in our initial testimony at A3.5, A3.8, A3.10, A3.19, A3.24, A3.25, and A3.26. As we explain in these answers, the information on faults, breccia pipes, and exploration boreholes presented in the FSEIS is sufficient to assess the environmental impacts at the Dewey-Burdock site. Furthermore, as the Staff explains in its Safety Evaluation Report (SER) (Ex. NRC-134), detailed isopach maps, structure maps, and cross sections provided by Powertech do not indicate the presence of breccia pipe collapse structures, faults, geologic bed displacements, or joints at the Dewey-Burdock site.

Q2.10: In Section II.D of his testimony, Dr. Moran claims that almost none of the relevant information that the Staff relied upon in the FSEIS was collected by financially-independent parties. He claims that this information therefore does not provide a reliable basis for analysis. Is he correct?

A2.10: (J. Prikryl, T. Lancaster) No. As we explain in A3.19 of our initial testimony, the Staff reviewed and evaluated information from a number of sources (*e.g.*, Exs NRC-081, NRC-082, NRC-083, NRC-085, and NRC-086) to develop a discussion of breccia pipes and collapse features in the "Breccia Pipes" section on p. 3-19 of the FSEIS. These sources included USGS publications (*e.g.*, Exs. NRC-081, NRC-082, and NRC-083). The Staff also reviewed the USGS Quaternary Fault and Fold Database (Ex. NRC-139) to evaluate active faults with surface expression within and surrounding the Dewey-Burdock site (see Section 3.4.3 of the FSEIS).

Q2.11: Dr. Moran also argues that the Staff did not include the agency with the most long-term hydrogeologic experience in the Dewey-Burdock region, the Rapid City office of the United States Geological Survey (USGS), as a cooperating agency when preparing the FSEIS. Dr. Moran states that some relevant data collected by the USGS were not included in the FSEIS analysis, because it was considered by the Staff to be preliminary data. Can you address these claims?

A2.11: (J. Prikryl, T. Lancaster) With regard to including the USGS as a cooperating agency, the USGS has no permitting authority with respect to activities at the Dewey-Burdock Project (see Table 1.6-1 of the FSEIS) and, therefore, was not asked to participate as a cooperating agency. In addition, the USGS did not request to be a cooperating agency.

With regard to some relevant data collected by USGS not being included in the FSEIS analysis, we assume Dr. Moran is referring to a comment submitted by Powertech suggesting that USGS research involving reactive transport modeling be discussed in Section 1.7.3.4 of the FSEIS (see comment 128-000034 on page E-143 of FSEIS Section E5.21.7). In its response to this comment, the Staff explained why it did not include this information in the FSEIS:

Response: The NRC recognizes that USGS is conducting reactive transport modeling using the Dewey-Burdock ISR Project. The purpose of the modeling is to support the conceptual understanding of uranium roll-front formation, groundwater geochemistry, and long-term groundwater quality at uranium ISR sites (Johnson, 2011). NRC also acknowledges that initial results of the USGS reactive transport modeling presented at the NMA/NRC Uranium Recovery Workshop indicate the presence of reducing conditions downgradient of the uranium deposits. Furthermore, NRC agrees that uranium (and other dissolved constituents) mobilized by the ISR process will tend to precipitate (thereby restricting uranium migration) upon encountering reducing conditions downgradient of the uranium deposit. However, NRC believes—and USGS has acknowledged (Johnson, 2011)—that the reactive transport simulations require further refinement using site-specific conditions before being used to predict groundwater quality during and after uranium ISR activities at a specific site. These refinements would include information on current groundwater conditions, the ISR process (e.g., the chemistry of lixiviants), flow velocities, and solid-phase geochemistry (mineralogy and reducing capacity) of the producing formation. To date, USGS has not published any reactive transport simulation results using Dewey-Burdock site-specific information that could be used in assessing the environmental impacts at the proposed project site.

The USGS report to which the Staff refers is Johnson, R. H. "Reactive Transport Modeling for the Proposed Dewey-Burdock Uranium In-Situ Recovery Mine, Edgemont, South Dakota, USA." International Mine Water Association, Mine Water—Managing the Challenges. 2011 (Ex. NRC-156).

Q2.12: In Contention 2, the Consolidated Intervenors also refer to Dr. Abitz's testimony as support for their position. Can you address Dr. Abitz's testimony?

A2.12: (J. Prikryl, T. Lancaster) Dr. Abitz's testimony consists of a 2009 report addressing Powertech's application for the Centennial Project in Weld County, Colorado. The Intervenors rely on certain statements in this report to (i) argue that Powertech's application lacks details on the methodology for acquiring baseline groundwater quality data and (ii) question Powertech's proposed methods for baseline groundwater characterization.

The comments of Dr. Abitz were also raised by the Oglala Sioux Tribe as part of their contentions. The Staff addressed Dr. Abitz's comments in A2.18 and A2.19 of

our initial testimony. As we explain in A2.18 of our initial testimony, Powertech followed guidance in NUREG-1569 (Ex. NRC-013) to establish preoperational or baseline groundwater conditions at the Dewey-Burdock site (see FSEIS Section 3.5.3.5). The information presented in Powertech's application (Ex. APP-040-C) is consistent with the acceptance criteria for establishing baseline groundwater quality in Section 2.7.3(4) of NUREG-1569. As further described in A2.18, based on the sampling locations, the number of samples collected, the aquifers sampled and the parameters analyzed, Powertech has provided sufficient details regarding its methodology for acquiring baseline groundwater quality at the Dewey-Burdock site.

As we explain in A2.19 of our initial testimony, the Staff responded to comments setting forth claims Dr. Abitz made regarding the credibility of scientific methods employed to establish baseline groundwater quality. We respond to these comments in FSEIS Section E5.21.4, "Aquifer Exemption and Baseline Water Quality" (see response to comment 127-000010 on pages E-138 and E-139). As the Staff explains in A2.19 of our initial testimony, Powertech appropriately developed and implemented a preoperational groundwater monitoring program in accordance with Criterion 7 in Appendix A of 10 C.F.R. Part 40. As we further explain in A2.19, the Staff reviewed the groundwater sampling methods and groundwater quality analytical results presented in Powertech's application and supporting documents (see Section 6.1.8.1 of Powertech's Environmental Report (Ex. APP-040-C) and Appendix 2.7-H of Powertech's Technical Report RAI Responses (Exs. APP-016-N, APP-016-O, APP-016-P, and APP-016-Q)). Based on its review, the Staff found that the sampling methods Powertech used to collect groundwater were consistent with standard industry practice. For example, as documented in Section 6.1.8.1 of its Environmental Report, Powertech installed permanent pumps in wells and purged three well volumes before sampling the well water. Powertech analyzed the chemical constituents and

parameters in the sampled well water using appropriate EPA or ASTM standard methods, as documented in Appendix 2.7-H of Powertech's TR RAI Responses.

Finally, as we explain in A2.19 of our initial written testimony, Dr. Abitz based his comments on his review of documents associated with site characterization plans and procedures for the Centennial Project in Weld County, Colorado. To our knowledge, Dr. Abitz has not reviewed or commented on Powertech's Dewey-Burdock application or the FSEIS the Staff prepared for the Dewey-Burdock Project. In other words, Dr. Abitz's claims do not relate directly to the information that Powertech submitted in connection with the Dewey-Burdock application, nor to the Dewey-Burdock FSEIS.

Q2.13: The Consolidated Intervenors also refer to the testimony of Susan Henderson as support for their position on Contention 2. Can you address Ms. Henderson's testimony?

A2.13: (J. Prikryl, T. Lancaster) In Section III of her testimony, Ms. Henderson discusses past mining and exploration activities at the Dewey-Burdock site and reported contamination of aquifers beneath the Black Hills Army Depot. Ms. Henderson also discusses her concerns about granting Powertech an aquifer exemption and restoring aquifers to baseline conditions.

Ms. Henderson implies that the FSEIS fails to analyze past uranium exploration and mining activities that have degraded the quality of the Dewey-Burdock area groundwater, as well as contamination from the Black Hills Army Depot. She appears to suggest that an analysis of impacts from past mining and other contamination is needed to assess the baseline water quality and potential impacts of future mining activity at the Dewey-Burdock site.

As we explain in A2.4 of our written testimony, the purpose of defining or establishing preoperational baseline water quality at an ISR facility site is not to evaluate the impacts of past mining activities on water resources. Preoperational

baseline is a description of the existing environmental conditions within and adjacent to a project area. As such, preoperational baseline groundwater quality consists of a definition and evaluation of existing groundwater quality conditions. Furthermore, preoperational baseline groundwater conditions at an ISR facility site are established as part of a project-wide groundwater monitoring program so that corrective actions can be taken if adverse water quality conditions resulting from ISR activities are detected.

As further explained in A2.4 of our written testimony, under regulations issued by the Council on Environmental Quality, the agency responsible for implementing the procedural provisions of NEPA, the environmental impacts that result from past actions are assessed as "cumulative effects" as defined in 40 C.F.R. § 1508.7. The Staff evaluates past actions, including past uranium mining activities and activities at the Black Hills Army Depot, and their potential environmental impacts, in Chapter 5 of the FSEIS. In other words, the Staff considered the information mentioned by Ms. Henderson, but we appropriately discussed this information in the context of cumulative impacts, rather than in the context of preoperational water quality.

Contention 3: The Staff Thoroughly Reviewed the Hydrogeology of the Aquifers in which Powertech Plans to Operate

Q3.1: In Section III.A of his testimony, Dr. Moran disagrees with the Staff's analysis of hydrogeology in the FSEIS. He first claims that the Staff has disregarded the conclusions of numerous experts in stating, "Alluvial aquifers are separated from production zone and surrounding aquifers by thick aquitards (confining units) and, therefore, are not hydraulically connected to production zone and surrounding aquifers" (citing the FSEIS Executive Summary at p. xxxvi). Can you address his claim?

A3.1: (J. Prikryl, T. Lancaster) As we explain in A3.21 of our initial testimony, based on the information presented in FSEIS Section 3.5.3.2, the most reasonable conclusion is that alluvial aquifers are not in communication with production zone aquifers (*i.e.,* the Inyan Kara Group aquifers) or surrounding aquifers. None of the publications to which Dr. Moran refers suggests that alluvial aquifers within and surrounding the Dewey-Burdock site are in hydraulic communication with the Inyan Kara Group aquifers. Moreover, Dr. Moran provides no other support for his conclusion that alluvial aquifers are hydrogeologically interconnected with production zone aquifers. Furthermore, Dr. Moran does not identify any satellite imagery as documentary support for his claim that alluvial aquifers are hydraulically interconnected with Inyan Kara Group aquifers.

Q3.2: Dr. Moran next argues that Powertech's management and groundwater experts have made inconsistent statements about whether or not the Dewey-Burdock confining units are leaky. Is he correct?

A3.2: (J. Prikryl, T. Lancaster) Dr. Moran points to page 3-34 of the FSEIS, where the Staff states that all relevant pumping tests indicate that the Dewey-Burdock sandstones behave as leaky-confined aquifers. Dr. Moran states that the consultants who conducted the pumping tests reported the same conclusion. Dr. Moran claims that

these statements are inconsistent with page 3-36 of the FSEIS, where the Staff states, "Based on the results of the numerical model, the applicant concluded that vertical leakage through the Fuson Shale is caused by improperly installed wells and improperly abandoned boreholes." As we explain in A3.22 of our initial testimony, however, there is no inconsistency between these statements. On page 3-36 of the FSEIS, the Staff is merely documenting what Powertech has concluded based on its numerical modeling results.

Q3.3: Dr. Moran further argues that it is not unusual for sedimentary uranium deposits to be hydrogeologically-interconnected through inter-fingering sands, shales, and other pathways. Is he correct?

A3.3: (J. Prikryl, T. Lancaster) As we explain in A3.23 of our initial testimony, the Staff recognizes the interbedded and inter-fingering nature of sediments within the Fall River and Lakota Formations that host the uranium ores at the Dewey-Burdock site. The Staff also understands that groundwater may flow between the interbedded sediments when stressed by long-term pumping. The Staff took these possibilities into account when preparing the FSEIS. For example, as we document in FSEIS Section 2.1.1.1.2.3.2, in some areas of the Dewey-Burdock site multiple orebodies are vertically stacked with the Fall River Formation or the Chilson Member of the Lakota Formation with no substantial confining layers between the orebodies. In these areas, the stacked orebodies will be treated as a single production zone. For example, perimeter production zone monitor wells in these areas will be screened across the full thickness of the stacked orebodies, in order to detect any potential excursion of process-related fluids.

Q3.4: Citing Keene (1973), Dr. Moran claims that the FSEIS fails to address how ISR operations will be affected by the thousands of pre-existing boreholes in the

Dewey-Burdock area, many of which have never been plugged correctly. Does the FSEIS consider these boreholes?

A3.4: (J. Prikryl, T. Lancaster) As we explain in A3.24 of our initial testimony, the Staff recognizes that Keene (1973), to whom Dr. Moran refers, reported that uncased and improperly abandoned boreholes were flowing in the artesian areas of the Dewey-Burdock Project area (Ex. NRC-138). Keene suggested that reported head loss at the time of his report may have been partially caused by these uncased and improperly abandoned boreholes (Keene, 1973). As the Staff explains in the section on "Artificial Penetrations" on page 3-20 of the FSEIS, infrared aerial photography provided by Powertech identified only one location, the alkali flats area, that demonstrated the signature of leaking boreholes (see Ex. APP-016-C at TR RAI 2.7-9, pp. 201–210). No other leaky borehole locations were identified based on the infrared aerial photography (Ex. APP-016C at TR RAI 2.7-9). As Staff further explains, Powertech cannot confirm that all historic borings were properly plugged and abandoned. However, as the Staff documents in FSEIS Section 4.5.2.1.1.2.2 at page 4-64, Powertech has committed to plugging boreholes before beginning operations in specific wellfields.

Q3.5: In Section III.B of his testimony, Dr. Moran argues that the Staff needs to further analyze potential groundwater-flow pathways in and near the Dewey-Burdock area. He also claims that, contrary to certain statements in the FSEIS, upward flowing waters in wells and boreholes can interconnect and mix between the various vertical water-bearing zones without showing any expression at the land surface. Can you address these claims?

A3.5: (J. Prikryl, T. Lancaster) The Staff has considered all these potential groundwater-flow pathways in assessing the impacts from operations at the Dewey-Burdock Project. As we explain in A3.23 of our initial testimony, the Staff acknowledges the interbedded and inter-fingering nature of sediments within the Fall River and Lakota Formations

that host the uranium ores at the Dewey-Burdock site. The Staff also understands that groundwater may flow between the interbedded sediments when stressed by long-term pumping. The Staff took these possibilities into account when preparing the FSEIS. For example, as documented in FSEIS Section 2.1.1.1.2.3.2—and as we explain in A3.3 above—in some areas of the Dewey-Burdock site multiple orebodies are vertically stacked with the Fall River Formation or the Chilson Member of the Lakota Formation with no substantial confining layers between the orebodies. In these areas, the stacked orebodies will be treated as a single production zone. For example, perimeter production zone monitor wells in these areas will be screened across the full thickness of the stacked orebodies, in order to detect any potential excursion of process-related fluids.

With regard to fractures and faults, as the Staffs explains in A3.8 of our initial testimony, in FSEIS Section 3.4.3 we discuss faults within and surrounding the Dewey-Burdock site. As we explain, the Dewey Fault is located approximately 1.6 km [1 mi] north of the project boundary. The Long Mountain Structural Zone, which is located 11 km [7 mi] southeast of the project area, contains several small, shallow faults in the Inyan Kara Group. No faults have been identified within the proposed project area (Ex. NRC-082). Cross sections representing both the Dewey and Burdock areas that depict the geologic strata, potentiometric surfaces, and ore locations indicate that no faults or major joints are present in the project area. These cross sections are depicted in Exhibits 2.7-1a through 2.7-1j of Ex. APP-016-G.

With regard to breccia pipes and exploration boreholes, as we explain in A3.8 of our initial testimony, the Staff discusses breccia pipes and artificial penetrations (*i.e.*, exploratory boreholes) in FSEIS Section 3.4.1.2. As the Staff explains in this section, Powertech cannot confirm that all historic borings were properly plugged and abandoned. As the Staff documents in FSEIS Section 4.5.2.1.1.2.2 at page 4-64,

however, Powertech has committed to plugging boreholes before beginning operations in specific wellfields. Regarding breccia pipes, based on our review of information in USGS Professional Paper 763 (Ex. NRC-081), breccia pipes are not present at the Dewey-Burdock site. Furthermore, as explained in Section 2.3.3.3.2 of the SER (Ex. NRC-134), detailed isopach maps, structure maps, and cross sections provided by Powertech do not indicate the presence of collapse structures at the Dewey-Burdock site.

With regard to oil and gas test wells, as we explain in A3.8 and A3.11 of our initial testimony, FSEIS Section 3.2.3 addresses these wells within and surrounding the Dewey-Burdock site. As we note, all relevant oil and gas test wells are dry holes that were plugged and abandoned.

Finally, as we explain in A3.24 of our written testimony, the Staff is unaware of any language in the FSEIS stating that upward-flowing waters in wells and boreholes cannot interconnect and mix between the various vertical water-bearing zones without showing any expression at the land surface. In fact, the Staff states the opposite in the FSEIS. For example, as the Staff explains in FSEIS Section 3.5.3.2 at pages 3-34 through 3-36, based on numerical groundwater modeling results, Powertech concluded that hydraulic connection between the Fall River and Chilson Aquifers through the intervening Fuson Shale is caused by improperly installed wells or improperly abandoned boreholes.

Based on the aforementioned information presented in the FSEIS, the Staff reasonably concluded that interfingering sediments, faults and fractures, breccia pipes, and oil test wells are not expected to provide pathways connecting production zone aquifers to surrounding aquifers. One possible exception is improperly installed or abandoned boreholes. The Staff took these boreholes into account when assessing

the environmental impacts of the Dewey-Burdock Project, as reflected in FSEIS Section 4.5.2.1.1.2.2 at page 4-64.

Q3.6: In Section III.C of his testimony, Dr. Moran argues that the FSEIS and Application rely on the erroneous claim that no significant geologic features are present at the Dewey-Burdock Project site that could allow migration of water vertically and horizontally. Is he correct?

A3.6: (J. Prikryl, T. Lancaster) As we explain in A3.25 of our initial testimony, Dr. Moran's argument lacks merit. With regard to breccia pipes and collapse features, the Staff reviewed information from a number of sources (*e.g.*, Exs.NRC-081, NRC-083, NRC-085, and NRC-086) to develop a discussion of these features in the FSEIS (see the section on "Breccia Pipes" on page 3-19 of the FSEIS). With regard to faults, the Staff consulted the USGS Quaternary Fault and Fold Database (Ex. NRC-139) to evaluate active faults with surface expression within and surrounding the Dewey-Burdock site (see Section 3.4.3 of the SEIS). We further note that the information concerning breccia pipes and collapse features in Butz, et al. (1980) (Ex. NRC-084), which Dr. Moran cites, was taken primarily from Gott, et al. (1974) (Ex. NRC-081). The Staff used Gott, et al. (1974) as a source of information when discussing breccia pipes and collapse features in the SEIS. Thus, the Staff considered substantially the same information as that which Dr. Moran cites.

With regard to recharge of the Inyan Kara by the Minnelusa Formation occurring in part through the fault zones cited in Keene (1973), the Staff recognizes that the Minnelusa Formation could potentially recharge the Inyan Kara Group along faults. However, as the Staff explains in FSEIS Section 3.4.3, no faults have been identified within the Dewey-Burdock Project area (Ex. NRC-082). In addition, cross sections representing both the Dewey and Burdock areas that depict the geologic strata, potentiometric surfaces, and ore locations indicate that no faults or major joints are

present in the project area. These cross sections are depicted in Exhibits 2.7-1a through 2.7-1j of Ex. APP-016-G. The Dewey Fault, located approximately 1.6 km [1 mi] north of the project boundary, and the Long Mountain Structural Zone, located 11 km [7 mi] southeast of the project area, are the closest structural features that could potentially provide avenues for recharge of the Inyan Kara Group from the Minnelusa Formation.

Finally, Dr. Moran's claim that lineaments and topographic features in satellite imagery show the presence of numerous faults and fractures at the Dewey-Burdock site, as well as possible collapse features, is speculative without ground trothing. The American Geological Institute's *Dictionary of Geological Terms* (Third Edition, 1984) defines a lineament as a linear topographic feature of regional extent that is *believed* to reflect crustal structure. In this case, the site-specific hard data supplied by Powertech and the available published data reviewed by the Staff do not support Dr. Moran's speculation. This hard data is summarized in A3.5, A3.8, A3.10, A3.19, A3.25, and A3.26 of our initial testimony. Furthermore, as explained in the SER (Ex. NRC-134), detailed isopach maps, structure maps, and cross sections provided by Powertech do not indicate the presence of collapse structures, faults, geologic bed displacements, or joints at the Dewey-Burdock site.

.**Q3.7: In Section III.D of his testimony, Dr. Moran argues that the FSEIS does not adequately consider breccia pipes or collapse features that may be present in the Dewey-Burdock area. How did the Staff address these features?**

A3.7: (J. Prikryl, T. Lancaster) As we explain in A3.25 of our initial testimony, the Staff reviewed information on breccia pipes and collapse features from a number of sources (*e.g.,* Exs. NRC-081, NRC-082, NRC-085, and NRC-086) to develop a discussion of these features in the FSEIS (see the section on "Breccia Pipes" on p. 3-19 of the FSEIS). The Staff recognizes that these sources state that breccia pipes allow upward

flow of groundwater from the Paleozoic Formations to the Inyan Kara rocks. In fact, in FSEIS Section 3.5.3.1, the Staff discusses hydraulic communication between the Inyan Kara and Minnelusa Formations through breccia pipes. Although these sources have identified breccia pipes and collapse features along the margins of the Black Hills northeast of the Dewey-Burdock site, none of these sources reported breccia pipes or collapse features within the Dewey-Burdock Project area.

As we explain in A3.26 of our initial testimony, the Staff specifically requested information from Powertech on the location of breccia pipes in order to understand how the Dewey-Burdock Project may potentially affect water resources (Ex. NRC-016-B at TR RAI P&R-12, pages 45–58). As part of its response, Powertech provided color infrared (CIR) satellite imagery for an approximately 10-square-mile area, including the project area and surrounding vicinity (see response to TR RAI 2.7-9 in Ex. APP-016-C). The Staff examined this imagery to identify anomalies that suggested groundwater discharges at or near the surface, such as upward flow through breccia pipes, open boreholes, or natural springs.

Finally, Dr. Moran claims that Plate 2 in Appendix 3.2-C of Powertech's Large Scale Mine Permit Application shows evidence of solution features such as breccia pipes. As we explain in A3.26 of our initial testimony, however, if the USGS authors considered areas described as "topographic depressions" or "structures of possible solution origin" to be probable locations of solution features, such as breccia pipes, they would have clearly mapped these features as being "collapse features or breccia pipes." They did not.

Q3.8 In Section III.E, Dr. Moran claims that Powertech's license allows it to delay conducting detailed hydrogeologic testing and establishing detailed aquifer cleanup standards until after the NRC has given project approval. Can you address this claim?

A3.8: (J. Prikryl, T. Lancaster) This claim lacks merit. As we explain in A3.4 of our initial testimony, Dr. Moran attempts to link the collection and submission of data associated with wellfield hydrogeologic test packages, as described in Section 2.1.1.1.2.3.4 of the SEIS, with the project-wide hydrogeologic information provided in Sections 3.4 and 3.5 of the SEIS to claim that the hydrogeological information in the SEIS is inadequate. As we further explain in both A3.4 of our initial testimony and A2.3 above, however, it is standard practice for operators of NRC-licensed ISR facilities to submit wellfield hydrogeologic data packages (as described in FSEIS Section 2.1.1.1.2.3.4) after license issuance but prior to operating the wellfield. In Powertech's case, Condition 10.10 of its license (Ex. NRC-012) stipulates the information Powertech must submit to the NRC for review and evaluation prior to operating in specific wellfields. Powertech's future submittal of this information does not mean that the Staff currently lacks the information necessary to characterize the Dewey-Burdock area and consider how the Dewey-Burdock Project may affect the environment. In any event, to the extent Powertech's hydrogeologic data packages show that operations in a particular wellfield will have impacts significantly different from those considered in the FSEIS, the NRC's regulations may require the Staff to supplement the FSEIS.

Q3.9: In Section III.F, Dr. Moran argues that the Petrotek (2012) groundwater model is unreliable and biased because it does not consider the presence of faults, fractures, breccia pipes, open boreholes, and other features identified by available data. Can you address this claim?

A3.9: (J. Prikryl, T. Lancaster) As we explain in A3.27 of our initial testimony, the Staff conducted a detailed review of Powertech's groundwater model (Exs. NRC-134 and NRC-135). As the Staff explains in its Safety Evaluation Report (SER) at Section 2.4.3.6, Powertech prepared its groundwater model to study the current hydrogeologic conditions at the Dewey-Burdock site and assess the effects of ISR operations on the

groundwater flow regime at and around the site. Powertech developed the model using the site-specific geologic and hydrologic information described in FSEIS Sections 3.4.1 and 3.5.3. Powertech first calibrated its model using a steady-state calibration that was accomplished by adjusting hydraulic conductivity, recharge, and hydraulic heads at the general head boundaries to synchronize actual well head measurements with modeled heads (Ex. APP-025). Powertech performed a transient calibration by simulating the two 2008 pumping tests at the Dewey-Burdock site and adjusting storativity values and hydraulic conductivity. Powertech completed its model development with a verification exercise and sensitivity analysis (Ex. APP-025).

The Staff reviewed the development and calibration of Powertech's groundwater model. The Staff concluded that the model was appropriately developed and sufficiently calibrated. (Exs. NRC-134 and NRC-135). Therefore, the Staff found the model sufficient to use as a predictive tool.

One significant conclusion resulting from the groundwater model is that the Fuson Shale is not leaky through the rock matrix itself. Powertech drew this conclusion because the model could not duplicate observed drawdown in the Fall River Aquifer as the Chilson Aquifer was pumped. Consequently, as the Staff explains in FSEIS Section 3.5.3.2, Powertech concluded that any leakage through the Fuson Shale is caused by improperly completed wells or improperly abandoned boreholes.

Q3.10: In addition to relying on Dr. Moran's testimony, the Consolidated Intervenors refer to the testimony of Dr. Hannan LaGarry. Dr. La Garry argues that the aquifers in the Dewey-Burdock area are poorly confined due to secondary porosity in the form of faults, joints, old boreholes, the problem of artesian flow, and the horizontal flow of water within uranium-bearing strata. Can you first address his claims regarding faults and joints?

A3.10: (J. Prikryl, T. Lancaster) Based on regional studies of tectonics and faulting in northwestern Nebraska and southwestern South Dakota, Dr. LaGarry argues that the absence of joints and faults in the vicinity of the proposed Dewey-Burdock site is likely a false perception because joints and faults are ubiquitous in this region.

As we explain in FSEIS Section 3.4.3, the Staff consulted the USGS Quaternary Fault and Fold Database (Ex. NRC-139) to evaluate active faults with surface expression within and surrounding the Dewey-Burdock site. As we further explain in SER Section 2.3.3.2.2 (Ex. NRC-134 at p. 26), a review of USGS information confirms that while faults and folds occur north and east of the site, no such structures are found onsite (Ex. NRC-082). In addition, cross sections representing both the Dewey and Burdock areas that depict the geologic strata, potentiometric surfaces, and ore locations indicate that no faults or major joints are present in the project area. These cross sections are depicted in Exhibits 2.7-1a through 2.7-1j of Ex. APP-016-G. Based on a review of this site-specific information, no faults or major joints were identified on the Dewey-Burdock Project site. The Dewey Fault, located approximately 1.6 km [1 mi] north of the project boundary, and the Long Mountain Structural Zone, located 11 km [7 mi] southeast of the project area, are the closest known structural features that could provide avenues for transmitting waters from deep aquifers to shallower aquifers or from shallow aquifers to the land surface.

Q3.11: Dr. LaGarry next argues that, due to thin or breached confining layers, there is insufficient hydrogeological confinement in the Dewey-Burdock area. Can you address Dr. LaGarry's argument?

A3.11: (J. Prikryl, T. Lancaster) According to Dr. LaGarry, Powertech conceded in its initial application that upper confining layers in the Dewey-Burdock area are thin and that breaches exist. Dr. LaGarry argues that confinement therefore does not exist at the Dewey-Burdock site.

The Staff assumes that the upper confining layer to which Dr. LaGarry is referring is the Fuson Shale, which separates the Chilson aquifer from the overlying Fall River aquifer at the Dewey-Burdock site. As documented in FSEIS Section 3.5.3.2, the Fuson Shale varies from approximately 6 to 24 m [20 to 80 ft] in thickness across the Dewey-Burdock site (Ex. APP-016-B and APP-050). As explained in FSEIS Sections 3.5.3.2 and 4.5.2.1.1.2.2, hydraulic communication (*i.e.*, leakage) between the Fall River and Chilson aquifers through the intervening Fuson Shale in the Burdock area has been identified based on aquifer pumping tests. As further explained in FSEIS Sections 3.5.3.2 and 4.5.2.1.1.2.2, based on the results of numerical modeling using site-specific geologic and hydrologic information (Ex. APP-025), Powertech concluded that vertical leakage through the Fuson Shale is caused by improperly installed wells or improperly abandoned boreholes. Powertech has committed to locating and plugging improperly abandoned boreholes before beginning operations in wellfields (see FSEIS Section 4.5.2.1.1.2.2).

With regard to thinning of the Fuson Shale at the Dewey-Burdock site, exploratory drilling data and isopach contours (*i.e.,* maps showing the thickness of a bed or formation throughout a geographic area) of the Fuson Shale in the Burdock area identified an approximately 1.6 km [1.0 mi]-wide, northwest-trending channel within the basal Fall River aquifer that has scoured the underlying Fuson Shale (see SEIS Section 3.5.3.2 and SEIS Figure 3.5-6). As documented in FSEIS Section 4.5.2.1.1.2.2, the Staff independently constructed isopach maps for the Fuson Shale underlying the Burdock area using different statistical methods (*e.g.,* based on the satellite imagery provided, kriging, and inverse distance). The resultant isopach maps for the Fuson Shale were in good agreement with the isopach map for the Fuson Shale that Powertech provided (see FSEIS Figure 3.5-6). As further explained in FSEIS Section 3.5.3.2, the existing drilling data confirmed the thinnest section of the

Fuson Shale {i.e., less than 9 m [30 ft]} is approximately 305 m [1,000 ft] outside the northern boundary of the initial Burdock area wellfield (BWF-1) (see FSEIS Figure 3.5-6).

In the FSEIS the Staff also takes into account the interbedded and inter-fingering nature of sediments within the Fall River and Chilson Aquifers that host the uranium ores at the Dewey-Burdock site. For example, as the Staff documents in FSEIS Section 2.1.1.1.2.3.2, in some areas of the Dewey-Burdock site multiple orebodies are stacked vertically with the Fall River Formation or the Chilson Member of the Lakota Formation with no substantial confining layers between the orebodies. As the Staff has explained above, in these areas the stacked orebodies will be treated as a single production zone.

Q3.12: Dr. LaGarry next raises the issue of perforations by new and existing wells. Can you address his claims?

A3.12: (J. Prikryl, T. Lancaster) Dr. LaGarry states that, according to the FSEIS, Powertech cannot confirm that all historic borings were properly plugged and abandoned. He claims that an infrared map of a portion of the Burdock area shows an alkali pond area that Powertech concedes was formed as a result of unplugged borings. Furthermore, Dr. LaGarry states that aquifer testing and a numerical groundwater model developed by Powertech show a hydrogeological connection between the Lakota and Fall River aquifers through the intervening Fuson Shale in the Burdock area resulting from improperly installed wells or improperly abandoned exploration holes. Based on this assessment, Dr. LaGarry argues there is no confinement and transmission of lixiviant into the environment surrounding the site is extremely likely.

As documented in FSEIS Section 3.4.1.2 at page 3-20, the Staff recognizes that Powertech cannot confirm that all historic borings were properly plugged and abandoned. The Staff also recognizes that Powertech has stated that unplugged

borings appear to explain the presence of the alkali pond area shown on an infrared photo. In addition, as documented in FSEIS Section 3.5.3.2 at page 3-34, the Staff recognizes that aquifer pumping tests demonstrated a hydraulic connection between the Fall River and Chilson aquifer through the intervening Fuson Shale in the Burdock area of the site. As further documented in FSEIS Section 3.5.3.2 at page 3-36, Powertech concluded based on numerical groundwater modeling results that vertical leakage through the Fuson Shale is caused by improperly installed wells or improperly abandoned boreholes. However, as the Staff documents in FSEIS Section 4.5.2.1.1.2.2 at page 4-64, Powertech has committed to identifying and plugging abandoned boreholes before beginning operations in specific wellfields.

Q3.13: Dr. LaGarry next argues that artesian flow could transmit lixiviant onto the land surface and into surface water and alluvium. Is he correct?

A3.13: (J. Prikryl, T. Lancaster) The Staff considered this possibility, but found it highly unlikely, for reasons stated in the FSEIS. As documented in FSEIS Section 4.5.2.1.1.2.2 at page 4-60, the Staff recognizes that artesian wells are present within and surrounding the Dewey-Burdock site. As the Staff explains in this section, 107 water wells were identified within 2 km [1.2 mi] of the project site. Twenty-six (26) of these wells were identified as flowing artesian wells screened in either the Fall River Aquifer (12 artesian wells) or the Chilson Aquifer (14 artesian wells).

As we explain in FSEIS Section 4.5.2.1.1.2.2 at page 4-60, Powertech has committed to monitoring all domestic wells within 2 km [1.2 mi] of its wellfields and all stock wells within the Dewey-Burdock area. Powertech's commitment is memorialized in License Condition 12.10 (Ex. NRC-012), which states that all domestic, livestock, and crop irrigation wells within 2 km [1.2 mi] of the boundary of any wellfield, as measured from the perimeter monitoring well ring, will be included in the routine

environmental monitoring program provided that well owners consent to sampling and the condition of the well renders it suitable for sampling.

In addition, Powertech is bound by license condition 11.5 (Ex. NRC-012), which states that monitoring for excursions shall occur twice monthly, and no more than 14 days apart in any given month during operations, for all wells where UCLs have been established. As stipulated in license condition 11.4 (Ex. NRC-012), UCLs will be established in overlying aquifer(s), underlying aquifer, and perimeter monitoring areas of the production zone aquifer. Powertech's excursion monitoring is explained in FSEIS Sections 2.1.1.1.3.1.2 and 7.3.1.2 and includes details on monitor well placement, establishment of UCLs, sampling intervals, reporting requirements, and corrective actions if an excursion is detected.

Furthermore, Powertech is bound by license condition 10.7 (Ex. NRC-012), which states that Powertech must maintain a net inward hydraulic gradient at a wellfield, as measured from the surrounding perimeter monitoring well ring, starting when lixiviant is first injected into the production zone and continuing until initiation of the stabilization period. As the Staff explains in FSEIS Section 4.5.2.1.1.2.2, Powertech plans to maintain an inward hydraulic gradient in production aquifers during ISR operations by maintaining a 0.5 to 3 percent production bleed rate. The inward hydraulic gradient will ensure that groundwater flows toward the production zone, and that horizontal excursions will not occur.

Q3.14: Dr. LaGarry states that horizontal flow within the uranium-bearing strata are of concern and that such flow can rapidly redirect lixiviant from the mine site and into unexpected breaches in the confining layers. Is this a concern?

A3.14: (J. Prikryl, T. Lancaster) As previously explained, Powertech is bound by license condition 10.7 (Ex. NRC-012), which states that it must maintain a net inward hydraulic gradient at a wellfield, as measured from the surrounding perimeter monitoring well

ring, starting when lixiviant is first injected into the production zone and continuing until initiation of the stabilization period. As the Staff explains in FSEIS Section 4.5.2.1.1.2.2, Powertech plans to maintain an inward hydraulic gradient in production aquifers during ISR operations by maintaining a 0.5 to 3 percent production bleed rate. The inward hydraulic gradients will ensure that groundwater flows toward the production zone, and that horizontal excursions will not occur.

In addition, Powertech is bound by license condition 11.5 (Ex. NRC-012), which states that monitoring for excursions shall occur twice monthly, and no more than 14 days apart in any given month during operations, for all wells where UCLs have been established. Powertech's excursion monitoring is explained in FSEIS Sections 2.1.1.1.3.1.2 and 7.3.1.2 and includes details on monitor well placement, establishment of UCLs, sampling intervals, reporting requirements, and corrective actions if an excursion is detected.

Q3.15: In Contention 3 the Consolidated Intervenors also refer to Susan Henderson's testimony. Ms. Henderson states that she is concerned with Powertech "essentially dumping mining residues back into the aquifers in huge quantities." Can you address her concern?

A3.15: (J. Prikryl, T. Lancaster) The aquifer contamination concerns raised in Ms. Henderson's testimony do not appear to be within the scope of Contention 3, which concerns hydrogeological confinement. Nonetheless, as the Staff explains in its response to several commenters' (including Ms. Henderson's) concerns about groundwater contamination, during the uranium recovery process the groundwater in the production zone becomes progressively enriched in uranium and other metals typically associated with uranium (Ex. NRC-009-A at Section E5.21.1, pages E-129 to E-120). The most common metals are arsenic, selenium, vanadium, iron, manganese, and radium. Uranium dissolution and mobilization occurs when lixiviant (leaching

solution) is injected into the orebody and uranium-laden solutions are recovered (see FSEIS Section 2.1.1.1.3.1).

As the Staff explains in FSEIS Section 2.1.1.1.2.3.1, before ISR operations begin, the portion of the aquifer(s) designated for uranium recovery must be exempted from the Underground Source of Drinking Water (USDW) designation, in accordance with the Safe Drinking Water Act (SDWA) and pursuant to 40 CFR Part 146. An aquifer or aquifer portion that meets the criteria for an USDW may be determined to be an "exempted aquifer" if (i)(a) it does not currently serve as a source of drinking water and (b) it cannot now and will not in the future serve as a source of drinking water because it is mineral-, hydrocarbon- or geothermal-energy-producing; or (ii) it can be demonstrated by an applicant as part of a permit application for a Class III operation to contain minerals that, considering their quantity and location, are expected to be commercially producible. Hence, groundwater in exempted aquifers cannot be considered a source of drinking water even after aquifer restoration is complete.

As the Staff explains in FSEIS Section 2.1.1.1.3.1.3, Powertech proposes to implement an operational groundwater monitoring program that meets the requirements of 10 CFR Part 40, Appendix A, Criterion 7A. This program will be designed to detect and correct any condition that could lead to the unintended spread of uranium-bearing lixiviant either horizontally or vertically outside of the production zone, which could lead to an excursion. The purpose of the groundwater monitoring program is to ensure that groundwater quality in aquifers outside exempted zones is not impacted by ISR operations. Powertech's groundwater monitoring program is detailed in FSEIS Section 7.3.1.2.

Q3.16: In Contention 3 the Consolidated Intervenors also refer to the testimony of Dayton Hyde. Can you address Mr. Hyde's concerns?

A3.16: (J. Prikryl, T. Lancaster) Most of Mr. Hyde's arguments fall outside the scope of Contention 3. Mr. Hyde addresses issues such as land use, aesthetics, and surface water and groundwater contamination. These issues are unrelated to whether in the FSEIS the Staff adequately analyzed the hydrogeology in the Dewey-Burdock area. In fact, Mr. Hyde does not specifically challenge any of the FSEIS sections that are relevant to the issue raised in Contention 3.

The Staff acknowledges that Mr. Hyde refers to geologic faults and fractures in southwestern South Dakota, suggesting that these features may be present at the Dewey-Burdock site. This same issue was raised more specifically by Dr. Moran, however, and the Staff has previously addressed Dr. Moran's arguments. For example, in A3.8 of our initial testimony we explain that the available information shows that faults and fractures are not present at the Dewey-Burdock site.

Q3.17: The Consolidated Intervenors also cite testimony from Linsey McLean as support for their position on Contention 3. Can you address her testimony?

A3.17: (J. Prikryl, T. Lancaster) The testimony of Ms. McLean does not appear to be related to the subject of the contention, which concerns the adequacy of hydrogeological information. Nor does Ms. McLean's testimony appear to allege any specific deficiency in the FSEIS. Most of Ms. McLean's testimony relates to the toxicity of wastewater generated by the ISR process and the potential health effects of constituents in wastewater generated by the ISR process (*e.g.*, arsenic and selenium) on humans and wildlife. To the extent Ms. McLean is claiming that the FSEIS fails to include adequate hydrogeological information to demonstrate the ability to contain fluid migration and assess potential impacts to groundwater, we do not understand the nature of the claim, and we are thus unable to respond to it.

Q3.18: Finally, the Consolidated Intervenors cite the testimony of Dr. Donald Kelley as support for their position. Can you respond to his arguments?

A3.18: (J. Prikryl, T. Lancaster) The testimony of Dr. Kelley does not appear to be related to the subject of any of the Consolidated Intervenors contentions [*i.e*., the failure to adequately analyze baseline groundwater quality (Contention 2), failure to include hydrogeological information to demonstrate fluid containment (Contention 3), and failure to analyze groundwater quantity impacts (Contention 4)]. Nor does Dr. Kelley's testimony allege any specific deficiency in the FSEIS. Dr. Kelley's testimony describes potential public-health issues related to the metallic-ion-enriched fluids (including radionuclides) generated by the ISR process. To the extent that Dr. Kelley is claiming a deficiency in the FSEIS based on the Consolidated Intervenors contentions, we do not understand the nature of the claim.

Contention 4: The Staff Fully Considered the Quantity of Groundwater To Be Used during the Dewey-Burdock Project

Q4.1: In Section IV.A of his testimony, Dr. Moran argues that the Staff presents differing water use volumes in different sections of the FSEIS. Dr. Moran further argues that the FSEIS underestimates the volumes of water that are lost or contaminated during the ISR process. Is he correct?

A4.1: (J. Prikryl, T. Lancaster) As we explain in A4.9 of our initial testimony, the FSEIS includes reliable long-term consumptive water use estimates for all phases of the Dewey-Burdock Project. These estimates provide the expected volumes of water that will be lost and no longer available for present or future use due to ISR activities. For example, as the Staff explains in FSEIS Section 4.5.2.1.1.1, Powertech estimates that groundwater consumption during the 2-year construction phase will be 21.8 million gallons in the Dewey area and 30.6 million gallons in the Burdock area. As we further explain in A4.9 of our initial testimony, Powertech used estimated production and aquifer restoration bleed rates based on proposed mining process flow rates to estimate groundwater consumption during the operations and aquifer restoration phases of the project (Exs. APP-027-A and APP-049). As the Staff explains in FSEIS Section 4.5.2.1, Powertech estimated that up to 274.2 ac-ft (89.3 million gallons) of water annually will be withdrawn from the Inyan Kara aquifer, primarily for operations phase activities (Ex. APP-049). As the Staff further explains in FSEIS Section 4.5.2.1, Powertech estimated that up to 888.8 ac-ft (289 million gallons) of water annually will be withdrawn from the Madison aquifer, primarily for aquifer restoration activities (Ex. APP-027-A). As the Staff illustrates in FSEIS Figure 2.1-1 and discusses in FSEIS Sections 2.1.1.1.3.4 and 2.1.1.1.4.3, the operations and aquifer restoration phases are expected to last 8 and 9 years, respectively.

With regard to estimating the volume of water that is contaminated during the ISR process, the Staff notes that Powertech is bound by license condition 10.6, which states that groundwater shall be restored to the numerical groundwater protection standards required by 10 C.F.R. Part 40, Appendix A, Criterion 5B(5). As the Staff explains in A6.9 of our initial testimony, for aquifer restoration to be complete, Powertech must demonstrate that hazardous constituents in the water do not exceed either (i) Commission-approved background water quality; (ii) the MCLs provided in Criterion 5C; or (iii) an ACL the NRC establishes in accordance with Criterion 5B(6). The Staff discusses these standards in FSEIS Section 2.1.1.1.4.2, "Restoration Monitoring and Stabilization."

Q4.2: In Section IV.B of his testimony, Dr. Moran argues that the FSEIS fails to provide a water balance. Dr. Moran argues further that the water balance provided on page 2-36 of the FSEIS (Figure 2.1-14) lacks the basic components of a water balance, including detailed, measure data on volumes of water entering the system and losses. Can you address this claims?

A4.2: (J. Prikryl, T. Lancaster) As the Staff explains in A4.5 of our initial testimony, a water balance for the Dewey-Burdock Project is provided in FSEIS Section 2.1.1.1.2.2 (Ex. NRC-008-A at p. 2-34 to 2-36). The mine process water balance illustrated in FSEIS Figure 2.1-14 includes detailed information on production rates, aquifer bleed rates, reinjection rates, makeup water rates, and liquid waste disposal rates for the operations and aquifer restoration phases of the project. In addition, the Staff reviewed and evaluated the regional and local water balances conducted by the SDDENR as part of Powertech's water rights permit applications for the Inyan Kara and Madison aquifers (Exs. APP-027-A, APP-028, APP-048, and APP-049). The Staff discusses the findings of the SDDENR reports on Powertech's water rights permits in Sections 4.5.2.1 and E5.21.1 of the FSEIS. The regional and local water balances for

the Inyan Kara and Madison aquifers conducted by the SDDENR include available information on annual recharge (*e.g*., precipitation, streamflow recharge, and groundwater inflow) and annual withdrawals (*e.g*., existing and future water rights permits appropriating water for municipal, residential, rural water system, and agricultural uses).

With regard to Dr. Moran's claim that the FSEIS lacks data on volumes of water entering and leaving the system, as we explain in A4.18 of our testimony, the Staff recognizes that the mine process water balance illustrated in FSEIS Figure 2.1-14 is presented in terms of flow rates rather than volumes. However, Dr. Moran fails to acknowledge that the flow rates presented in Figure 2.1-14 are used to calculate the annual volumes of water that will be withdrawn from the Inyan Kara and Madison aquifers during the operations and aquifer restoration phases of the project (Exs. APP-027A and APP-049). For example, as the Staff explains in FSEIS Section 4.5.2.1, Powertech's water permit application for the Inyan Kara aquifer proposes to appropriate up to 33.8 ha-m [274.2 ac-ft] of water annually at a withdrawal rate of 558 Lpm [170 gpm] (Ex. APP-049). In other words, the Staff provides the underlying data needed to assess the reasonably foreseeable environmental impacts of the Dewey-Burdock Project.

Q4.3: In Contention 4, the Consolidated Intervenors also cite the testimony of Susan Henderson as support for their position. Can you address Ms. Henderson's relevant testimony?

A4.3: (J. Prikryl, T. Lancaster) In Section II of her testimony, Ms. Henderson states, "Of grave concern to me is the potential for Powertech to use vast amounts of water, (8,500+ gallons per minute for 20 years) and to pollute the aquifers essentially dumping mining residues back into the aquifers in huge quantities." Ms. Henderson states further, "I note that the Powertech application calls for a 500 gallon per minute

well from the Madison. I know of no Madison water deposit in the area that would deliver such a large amount of water."

The Staff previously responded to similar comments concerning groundwater quantity and contamination from Ms. Henderson in Appendix E of the FSEIS (see FSEIS Section E5.21.1 at pp. E-125 to E-128 and FSEIS Section E5.21.2 at pp. 129-130).

As the Staff explains in its response to several commenters' (including Ms. Henderson's), concerns about groundwater consumptive use, Powertech's water rights permit application for the Inyan Kara aquifer proposes to appropriate up to 33.8 ha-m [274.2 ac-ft] of water annually (Ex. NRC-009-A at Section E5.21.1, pages E-125 to E-128). This water would be used primarily during the operations phase of the Dewey-Burdock Project, which will continue for approximately 8 years (see FSEIS Figure 2.1-1). The application proposes a gross withdrawal (pumping) rate of 32,172 Lpm [8,500 gpm] (Ex. APP-049). The consumptive use of water will be a small portion of the gross withdrawal rate. As described in the application, approximately 2 percent of the water {558 Lpm [170 gpm]} is production bleed, which will be disposed of as liquid waste (Ex. APP-049). The remaining water (approximately 98 percent) will be recirculated and reinjected back into the aquifer as part of the ISR process.

Based on a review of Powertech's water permit application, which included an analysis of water availability and existing water rights, the SDDENR concluded (i) approval of the application will not result in average annual withdrawals from the Inyan Kara aquifer that exceed the average annual recharge to the aquifer; (ii) there is reasonable probability that there is at least 33.8 ha-m/yr [274.2 ac-ft/yr] of unappropriated water available from the aquifer; (iii) SDDENR Water Rights Program observation well data indicate that unappropriated water is available from the Inyan Kara aquifer; and (iv) there is a reasonable probability that the withdrawals proposed in

the application can be made without unlawful impairment of existing water rights or domestic wells (Ex. APP-048). The Staff added text to SEIS Section 4.5.2.1 to document the SDDENR's review of Powertech's water permit application for the Inyan Kara aquifer.

As the Staff further explains in FSEIS Section E5.21.1 at pages E-125 to E-18, Powertech's water permit application for the Madison aquifer proposes to appropriate 109.6 ha-m [888.8 ac-ft] of water annually, at a withdrawal rate of 2,085 Lpm [551 gpm] (Ex. APP-027-A). This water would be used primarily during the aquifer restoration phase of the project. The amount of water that will be withdrawn from the Madison aquifer will depend on the liquid waste disposal method that will be used as part of the ISR process. The use of land application will require a diversion rate of 2,085 Lpm [551 gpm], and using deep Class V injection wells will require a withdrawal rate of 606 Lpm [160 gpm] (Ex. APP-027-A). Based on a review of the application, which included an analysis of water availability and existing water rights, the SDDENR concluded that (i) there is reasonable probability that unappropriated water is available in the Madison aquifer to supply the proposed appropriation; (ii) approval of the application will not result in average annual withdrawals from the Madison aquifer that exceed the average annual recharge to the aquifer; and (iii) there is a reasonable probability that the withdrawal proposed in the application can be made without impacting existing rights, including domestic users (Ex. APP-028). The Staff added text to SEIS Section 4.5.2.1 to document the SDDENR's review of Powertech's water permit application for the Madison aquifer.

In sum, based on the SDDENR's review of Powertech's water rights applications for the Inyan Kara and Madison aquifers (Exs. APP-028 and APP-048) and the results of the groundwater consumptive use impact analysis presented in FSEIS Section 4.5.2.1, the Staff concluded that groundwater consumptive use associated with ISR

activities at the Dewey-Burdock Project will have small impacts on the Inyan Kara and Madison aquifers.

Q4.4: In Contention 4, the Consolidated Intervenors also cite Dayton Hyde's testimony as support for their position. Can you address Mr. Hyde's arguments?

A4.4: (J. Prikryl, T. Lancaster) Mr. Hyde does not specifically challenge any of the FSEIS sections that are relevant to the issue raised in Contention 4. The Staff acknowledges that Mr. Hyde refers to water as a precious commodity in his area. Issues related to consumptive groundwater use were raised more specifically by Dr. Moran, however, and the Staff has previously addressed Dr. Moran's arguments. For example, in A4.5 of our initial testimony we explain the water balances for the Inyan Kara and Madison aquifers conducted by the SDDENR, which showed that estimated annual withdrawals are less than recharge and that there is reasonable probability that there is unappropriated water available to supply Powertech's proposed groundwater appropriations.

Q4.5: Finally, in Contention 4 the Consolidated Intervenors refer to the testimony of Marvin Kammera. Can you address this testimony?

A4.5: (J. Prikryl, T. Lancaster) Mr. Kammera states, "Powertech wants to use some 8,000 gallons per minute for up to 20 years of Inyan Kara water. In our semi-arid region, such a use (really a misuse) of the precious limited water that we have is a terrible mistake." The Staff has responded to similar comments concerning groundwater quantity impacts in FSEIS Section E5.21.1 at pages E-125 to E-128. As the Staff explains in this section, Powertech's water rights permit application for the Inyan Kara aquifer proposes to appropriate up to 33.8 ha-m [274.2 ac-ft] of water annually (Ex. APP-049). This water would be used primarily for the ISR process during the operations phase of the proposed project, which will continue for approximately 8 years (see FSEIS Figure 2.1-1). The application proposes a gross withdrawal (pumping) rate of 32,172 Lpm [8,500 gpm]

(Ex. APP-049). The consumptive use of water will be a small portion of the gross withdrawal rate.

As described in Powertech's application, approximately 2 percent of the water {558 Lpm [170 gpm]} is production bleed, which will be disposed of as liquid waste (Ex. APP-049). The remaining water (approximately 98 percent) will be recirculated and reinjected back into the aquifer as part of the ISR process.

As stated above, the Staff added text to FSEIS Section 4.5.2.1 to document the SDDENR's review of Powertech's water permit application for the Inyan Kara aquifer, which showed that estimated annual withdrawals are less than recharge and that there is reasonable probability that there unappropriated water is available to supply Powertech's proposed groundwater usage.

July 15, 2014

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
POWERTECH (USA) INC.,	)	Docket No. 40-9075-MLA
	)	ASLBP No. 10-898-02-MLA-BD01
(Dewey-Burdock In Situ Uranium Recovery Facility)	)	
	)	

AFFIDAVIT OF PO WEN (KEVIN) HSUEH

I declare under penalty of perjury that my statements in prefiled Exhibits NRC-151 (NRC Staff's Initial Testimony) and NRC-002 (Statement of Professional Qualifications of Po Wen (Kevin) Hsueh) are true and correct to the best of my knowledge and belief.

_____

Executed in Accord with 10 CFR 2.304(d).
Po Wen (Kevin) Hsueh
Branch Chief, Environmental Review Branch
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Executed in Baltimore, Maryland

July 15, 2014

July 15, 2014

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
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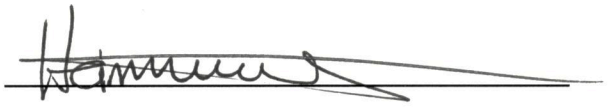
	)	ASLBP No. 10-898-02-MLA-BD01
(Dewey-Burdock In Situ Uranium Recovery Facility)	)	
	)	

AFFIDAVIT OF HAIMANOT YILMA

I declare under penalty of perjury that my statements in prefiled Exhibits NRC-151 (NRC Staff's Initial Testimony) and NRC-003 (Statement of Professional Qualifications for Haimanot Yilma) are true and correct to the best of my knowledge and belief.



Haimanot Yilma

Executed in Rockville, Maryland

July 15, 2014

July 15, 2014

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
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(Dewey-Burdock In Situ Uranium Recovery Facility)	)	
	)	

AFFIDAVIT OF KELLEE L. JAMERSON

I declare under penalty of perjury that my statements in prefiled Exhibits NRC-151 (NRC Staff's Initial Testimony) and NRC-004 (Statement of Professional Qualifications for Kellee L. Jamerson) are true and correct to the best of my knowledge and belief.

Kellee L. Jamerson

Executed in Rockville, Maryland

July 15, 2014

July 15, 2014

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
POWERTECH (USA) INC.,	)	Docket No. 40-9075-MLA
	)	ASLBP No. 10-898-02-MLA-BD01
(Dewey-Burdock In Situ Uranium Recovery Facility)	)	
	)	

AFFIDAVIT OF THOMAS LANCASTER

I declare under penalty of perjury that my statements in prefiled Exhibits NRC-151 (NRC Staff's Initial Testimony) and NRC-005 (Statement of Professional Qualifications for Thomas Lancaster) are true and correct to the best of my knowledge and belief.

Thomas Lancaster

Executed in Rockville, Maryland

July 15, 2014

July 15, 2014

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
POWERTECH (USA) INC.,	)	Docket No. 40-9075-MLA
	)	ASLBP No. 10-898-02-MLA-BD01
(Dewey-Burdock In Situ Uranium Recovery Facility)	)	
	)	

AFFIDAVIT OF JAMES PRIKRYL

I declare under penalty of perjury that my statements in prefiled Exhibits NRC-151 (NRC Staff's Initial Testimony) and NRC-006 (Statement of Professional Qualifications for James Prikryl) are true and correct to the best of my knowledge and belief.

James Prikryl

San Antonio, Texas
July 15, 2014

July 15, 2014

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
POWERTECH (USA) INC.,	)	Docket No. 40-9075-MLA
	)	ASLBP No. 10-898-02-MLA-BD01
(Dewey-Burdock In Situ Uranium Recovery Facility)	)	
	)	

AFFIDAVIT OF HOPE LUHMAN

I declare under penalty of perjury that my statements in prefiled Exhibits NRC-151 (NRC Staff's Initial Testimony) and NRC-152 (Statement of Professional Qualifications of Hope Luhman) are true and correct to the best of my knowledge and belief.

Hope E. Luhman

Executed in San Antonio, Texas

July 15, 2014