July 15, 2014

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

William J. Froehlich, Chairman
Dr. Richard F. Cole, Special Assistant
Dr. Mark O. Barnett, Special Assistant

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

ANSWERING TESTIMONY OF ERROL LAWRENCE

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1. CONTENTION 2

1.1 The Application and FSEIS Appropriately Considered Potential Cumulative Impacts from Past Uranium Mining/Exploration and the Black Hills Ordinance Depot

Q.1. Do you agree with the statements by Dr. Moran that, "The Application and Final Supplemental Environmental Impact Statement (FSEIS) are inadequate to establish a hydrogeological baseline for the aquifers that would be impacted by the D-B Project" since "Both documents fail to analyze past uranium exploration and mining activities that have degraded the quality of much of the Dewey-Burdock area ground … waters. Neither the Application nor FSEIS presents baseline water quality data obtained prior to past mining activities and the contamination from the Black Hills Ordinance Depot. The Application and FSEIS do not address data from samples collected in the early periods of these mining activities." (Exhibit OST-1 at 16)?

A.1. No, I do not agree with Dr. Moran's statements. The statements are misleading and without basis. Dr. Moran does not present any data that suggest that much of the Dewey-Burdock Project area groundwater has been degraded by past uranium exploration and mining activities. In fact, my initial written testimony (Exhibit APP-037 at A.33) describes water quality data that contradict the claim that much of the groundwater within the project area has been degraded by uranium mining/exploration activities. As described in the revised Technical Report (TR), historical water quality data collected by Tennessee Valley Authority (TVA) from nine wells between 1979 and 1984 were compared to water quality data collected from the same wells by Powertech in 2007-2008. The results are provided in TR Appendix 2.7-J (Exhibit APP-021-DD). The nine wells were completed in the Fall River and/or Chilson aquifers and include four inside the project boundary and five outside the project area. The comparison between historical and recent data sets provided in Sec. 2.7.3.2.2 of the revised TR (Exhibit APP-015-B at 2-217 through 2-230b) shows very little variation in groundwater quality between the data sets. Table 2.7-40 (Exhibit APP-015-B at 2-223) provides a statistical comparison between the historical and recent data sets and shows that the concentrations of alkalinity, specific conductance, pH and total dissolved solids (TDS) are very similar. Piper diagrams, plots of the proportional concentration of major ions, indicate very little change in the water chemistry over the past 25 years. These data do not provide any indication of widespread groundwater quality degradation within or near the project area as a result of historical mining and exploration activities.

Additional evidence that water quality in the project area has not been degraded can be found in Keene's (1973) report on groundwater resources of the western half Fall River County (Exhibit OST-8), which is cited repeatedly in Dr. Moran's initial written testimony. Keene reported water quality from 14 wells completed in the Fall River or Lakota (Chilson) aquifer in Appendix E of Exhibit OST-8 (at 89-90). The TDS for those wells ranged from 829 to 3,189 mg/L. The range of TDS for the nine wells sampled by TVA and then later by Powertech was from 760 to 1,900 mg/L. As noted by Keene, TDS is a general indicator of the overall suitability of water for various uses (domestic, stock, irrigation). The range of TDS values observed in the Dewey-Burdock Project Fall River and Chilson wells is consistent with the range observed in Fall River and Chilson in other portions of the county where no uranium mining took place.

Contamination from the Black Hills Ordinance Depot has no relevance to the Dewey-Burdock Project. The Black Hills Ordinance Depot was located approximately 14 miles south of, and hydraulically downgradient (downstream) of, the Dewey-Burdock Project area. The NRC Safety Evaluation Report (SER, Exhibit NRC-134, Section 2.3.3.6) notes that investigations into groundwater impacts from the Black Hills Ordinance Depot (conducted by the U.S. Army Corps of Engineers) are limited to shallow aquifers that are hydraulically separated from the Fall River Formation by over 1,000 feet of low-permeability shales. Therefore any contamination from the Black Hills Ordinance Depot has not impacted, and will not impact, water quality at the Dewey-Burdock Project area. NRC staff's evaluation of potential impacts to or from the Black Hills Ordinance Depot are also found in the FSEIS at Section 5.5.2 and pages E–236-E–237 (Exhibit NRC-008-A-2 at 600-601 and Exhibit NRC-008-B-2 at 610-611).

As noted by the NRC staff in its initial written testimony at A.2.4, the purpose of determining preoperational baseline water quality is not to evaluate the impacts of past uranium mining or exploration activities, or other potential sources of groundwater contamination. Rather, preoperational baseline water quality provides a description of the existing environmental conditions such that corrective actions can be taken if impacts to groundwater quality are detected from the proposed action (ISR mining).

The NRC staff have indicated that Powertech has adequately assessed preoperational baseline groundwater quality, consistent with NRC guidance in Regulatory Guide 4.14 and NUREG-1569 and in accordance with federal regulations in 10 CFR Part 40, Appendix A, Criterion 7. This is addressed in my initial testimony at A.8 through A.32, which describes the frequency of sampling events, the distribution of sampling locations, the sampling methodology, the constituents analyzed, and the analytical methods and detection limits employed by Powertech for the Dewey-Burdock Project.

2. CONTENTION 3

2.1 Uranium Mineralization Is Contained within Fluvial Sandstones Similar to Those at ISR Facilities That Have Operated Safely for Decades

Q.2. Please respond to the allegation by Dr. Moran that, "It is not unusual for the inter-fingering sands, shales, etc. of sedimentary uranium deposits to be hydrogeologically-interconnected, when pumped, long-term" (Exhibit OST-1 at 19).

A.2. As stated in my initial written testimony at A.46, the GEIS (NUREG-1910) provides supporting information that the fluvial depositional systems found at the Dewey-Burdock Project are similar to those found at most or all ISR facilities (Exhibit NRC-0010-A at 160, emphasis added):

> "Several features are **common to most major sandstone roll-front uranium deposits and their host rocks in Wyoming, South Dakota, Nebraska, and New Mexico** (Rackley, 1972; McLemore, 2007). These features are: (1) **sandstones of fluvial origin** (i.e., produced by the action of a stream or river); (2) common association with arkosic (i.e., sediments with a considerable amount of the mineral feldspar) or micaceous sediment; (3) **siltstones and mudstones interbedded with sandstones**; …"

The Fall River Formation and Chilson Member of the Lakota Formation are the uranium-bearing units that are the target zones for proposed ISR at the Dewey-Burdock Project. These units are largely fluvial deposits and consist of channel sandstones and finer-grained overbank deposits. The Fuson Shale is a laterally-continuous, low-permeability unit ranging from 20 to 80 feet thick in the project area that separates the Fall River from the Chilson. Each of these units has been extensively mapped using the thousands of exploratory boreholes drilled within the project area.

In some cases the interbedded clay units found locally within the Fall River and Chilson are sufficiently continuous to further subdivide the Fall River and Chilson into discrete, mappable units. These interbedded clays may locally act as upper and lower confining units that will provide additional confinement beyond the major confining units (the Graneros Group above the Fall River Formation, the Morrison Formation beneath the Chilson Member, and the Fuson Shale between the Fall River and Chilson).

From an engineering perspective, uranium ISR is based on the hydraulic control of fluids in the subsurface through the use of wells. Well patterns (a series of injection and extraction wells) are designed to ensure that the lixiviant that is injected into the mineralized zone can be successfully recovered from extraction (also called production) wells. This is accomplished through the selection of appropriate design criteria for the well patterns based on the localized geology and the aquifer properties of the mineralized zone, including: the distance between injectors and extractors, rates of injection and extraction, completion intervals of the wells, and the appropriate bleed (over-production) to ensure that fluids cannot move outside of the hydraulic control of the extraction wells. The scale of a well pattern is typically between 70 to 100 feet between injectors. In other words, the scale of the well pattern is small enough to recognize and account for the effects of interfingering sands and shales and to design the injection and recovery rates and monitoring system accordingly.

2.2 The 2012 Numerical Groundwater Model Provides a Reasonable Representation of Site Hydrologic Conditions without Introducing Unsubstantiated Features Such as Faults or Breccia Pipes

Q.3. Dr. Moran has offered his expert opinion that, "Breccia pipes/solution or collapse features are present in the project area that are critical to analyzing the hydrological baseline and project impacts" (Exhibit OST-1 at 21). Dr. Moran also alleges that the "Petrotek (2012) hydrogeologic model does not consider [the] presence of faults fractures, breccia pipes or open boreholes etc. identified by available data" (Exhibit OST-1 at 23). Please respond to these allegations.

A.3. All available site-specific data collected to date refute Dr. Moran's expert opinion that there are collapse features in the Dewey-Burdock Project area. Nor is there evidence that faults, fractures or leaky boreholes are significantly affecting the hydrogeology within the project area. The numerical groundwater flow model (Exhibit APP-025) was based on the hydrogeologic conceptual model, which was developed from analysis of site-specific data, including geologic information from thousands of exploratory boreholes and available maps of surface geology, aquifer properties derived from pumping tests, and water level elevation data from the site monitor well network.

My initial written testimony at A.47 through A.51 describes extensive evidence against the presence of faults or fractures in the project boundary that would substantially impact groundwater flow. Although <u>regional</u> studies suggest that faults and fractures are present in the western Black Hills area, these studies do not support the presence of faults and fractures within the Fall River and Lakota Formations inside of the project area. Powertech prepared detailed geologic maps and cross sections of the Fall River, Fuson Shale and Chilson Member across the project area using thousands of boreholes. The results of the detailed mapping did not reveal any significant faulting or fractures. The Dewey Fault system located north of the project boundary is recognized and accounted for in the numerical groundwater model as a boundary effect. In the SER (Exhibit NRC-134 at 26), the NRC staff concurred with this assessment.

Similarly, A.52 through A.55 of my initial written testimony describe evidence that strongly supports the conclusion that there are no breccia pipes within the project area that substantially impact groundwater flow. Even though there is no evidence that breccia pipes are present within the project area, the model was used to simulate breccia pipe discharge into the Fall River and Chilson to assess how such a scenario would impact the groundwater flow system. Results of the "what if" scenarios indicate that even at a discharge rate as low as 200 gpm, a significant rise in the potentiometric surface would result that likely would be readily discernible under the current monitor well network and certainly would be identified with a wellfield-scale monitor network. Dr. Moran points out that in many cases, flow rates much larger than 200 gpm have been documented. A scenario where a much higher discharge rate was occurring from a breccia pipe into the Fall River or Chilson would be even more easily recognizable in the potentiometric surface of those aquifers.

A.56 through A.61 of my initial written testimony describe how historical exploration holes were plugged in accordance with State standards at the time of drilling and there is only one isolated area where unplugged or improperly plugged boreholes are suspected to occur. Further, Powertech will be required to demonstrate adequate confinement of each production zone to NRC and EPA staff prior to operating each wellfield. Because adequate confinement must be demonstrated prior to ISR, the model simulations are based on the assumption that any open boreholes will have been plugged adequately and will not substantially impact groundwater flow.

Since features such as faults, fractures, breccia pipes and open boreholes are not present or if at all only present in very limited instances across the site, they were not included in the development of the February 2012 numerical groundwater model (Exhibit APP-025), which provides a reasonable representation of site hydrologic conditions without introducing such unsubstantiated features.

Q.4. Dr. Moran's initial testimony states that "review of several forms of D-B area satellite imagery by myself and senior remote-sensing experts at Front Range Natural Resources, Ft. Collins, CO, shows clearly that this area is intersected by numerous faults and fractures. The imagery also shows evidence of circular geologic features at the land surface, indicating the presence of collapse structures" (Exhibit OST-1 at 21). How would you respond to this testimony?

A.4. Dr. Moran's statements are too vague to prepare a proper response. What does he mean by "D-B area satellite imagery"? How is the "D-B area" defined in this context? What is the resolution of the satellite imagery and has it been submitted as evidence? Who are the "remote-sensing experts" referred to and are they providing expert testimony in this proceeding? Has Dr. Moran made any attempts to field verify these proposed solution collapse structures?

Powertech geologists have conducted field surveys looking for solution collapse features and have been unable to locate any such features. And as has been previously discussed, Powertech has utilized several thousand borehole logs to map the subsurface structure at the Dewey Burdock Project area and has not identified any features that would be consistent with solution collapse features or substantial faulting. Powertech used color infrared (CIR) imagery to locate areas of groundwater discharge to the surface (which would be associated with a solution collapse structure), and did not identify such areas other than the "alkali area," where water seepage to the surface in an isolated area is attributed to historical exploration holes. Moreover, the probable maximum downgradient limit of dissolution of the Minnelusa Formation, or dissolution front, has been mapped by the USGS and is more than 6 miles northeast of the project area. This is described in my initial written testimony (Exhibit APP-037 at A.53) and supported by NRC staff in the FSEIS at Section 3.4.1.2 and page E-144 and in their initial testimony (Exhibit NRC-001) at A3.5 and A3.8.

Q.5. How do you respond to Dr. Moran's statement that, "Numerous authors state that breccia pipes/collapse structures allow upward flow of ground water from the Paleozoic formations to the Inyan Kara rocks at the southern margins of the Black Hills" (Exhibit OST-1 at 21)?

A.5. Dr. Moran has frequently cited regional geologic and hydrologic reports to make gross generalizations about site conditions at the Dewey-Burdock Project area while ignoring the large amount of data that is present and available within the project area. These regional studies referenced by Dr. Moran include Keene (1973), Bowles (1968), Gott et al. (1974), Braddock

(1963), Butz et al. (1980), Carter et al. (2003), Darton (1909), and Davis et al. (1961), among others. While these studies generally provide reasonable technical opinions, many of these studies cover areas of hundreds of square miles with relatively few data points actually within or even near the Dewey-Burdock Project area.

As an example, the study area of Keene (1973), which has been cited frequently by Dr. Moran in his testimony, is shown relative to the project area in Exhibit APP-067. Keene's study area was very large (approximately 800 square miles or 512,000 acres) relative to the project area (10,580 acres). It also is located predominantly south of the Dewey-Burdock Project area (approximately half of the Dewey-Burdock Project area is in Custer County, outside of the Keene study area). Keene used data available at the time, but he notes that he only had access to some "269 wells … and almost 200 oil and uranium tests" (Exhibit OST-8 at 9). Assuming all of these "oil and uranium tests" were wells/test holes, the density of data for the Keene study would be approximately one well/data point per 1,092 acres. In contrast, assuming a database of 4,000 wells and test holes, the density of data for the Dewey-Burdock Project area is approximately one well/data point per 2.6 acres (or more than 400 times the data density available to Keene).

On the figure in Exhibit APP-067, only one control point is shown that is near the Dewey-Burdock Project area (although it is slightly south of the project boundary) that was used for the development of a potentiometric surface of the Fall River. By comparison, Powertech presented a map of the Fall River potentiometric surface that was based on data from 18 wells within or very near the Dewey-Burdock Project area and another potentiometric surface map of the Chilson aquifer that was based on data from 11 wells (June 2011 TR RAI responses, Exhibit APP-016-C at PDF pages 59-60).

Keene's work should be used with caution as the geologic and hydrologic setting for most of the study area potentially is quite different than the Dewey-Burdock Project site, and Dr. Moran makes no demonstration of how the regional data in Keene and other studies are applicable to the Dewey-Burdock Project area.

The site hydrogeologic conceptual model presented in the application is based on subsurface data determined from several thousand boreholes, hydrologic data from an extensive monitor network (including water quality, aquifer properties and potentiometric data), CIR imagery, detailed assessment of historical mine workings, and site field investigations, all focused on the Dewey-Burdock Project area. Dr. Moran repeatedly refers to the lack of scientifically defensible data provided in the application when in fact there is an abundance of site-specific data supporting the hydrogeologic conceptualization of the project area.

Q.6. Please respond to Dr. Moran's allegation that "all of the relevant pumping tests indicated that the Dewey-Burdock sandstones behaved as leaky-confined aquifers" (Exhibit OST-1 at 19).

A.6. This contention was addressed in my initial testimony at A.80 through A.87. The initial interpretation of the TVA pumping test data (Boggs and Jenkins, 1980) was that the Fuson Member of the Lakota Formation behaved as a leaky aquitard separating the Fall River and Lakota (Chilson) aquifers. However, Boggs and Jenkins specifically state that the response in the overlying Fall River to pumping in the Chilson must be indicative of direct flow from one to another (i.e., such as would occur through unplugged exploration holes or a well completed in both formations, Exhibit APP-016-R at 2.7-K-26). Subsequent investigation by Powertech confirmed that well 668, which was installed by TVA for the purposes of pumping tests, is screened across the Chilson and Fall River (Exhibit APP-015-C at 5-21d). This well provided a direct pathway between the two aquifers. Further, when Powertech placed a temporary plug between the Fall River and Chilson completion intervals in this well, a difference in potentiometric head was observed. This demonstrates that the Fuson Shale is an effective confining unit except in limited areas where direct communication through Fuson is caused by improperly screened wells or unplugged boreholes.

The Dewey Pumping test conducted in the Fall River aquifer in 2008 by Knight Piésold (Exhibit APP-015-K at PDF page 80) did not result in drawdown in the Chilson aquifer, indicating that the Fuson Shale does not leak in that location.

It should be noted that the hydraulic conductivity of the Fuson Member was calculated from the TVA Burdock area pumping test (using the Neuman Witherspoon ratio method) as 1×10^{-3} to 1×10^{-4} ft/day compared to values for the Fall River of 0.4 ft/d and for the Chilson of 1.3 ft/d from the same test. This is a difference of two to three orders of magnitude. For the TVA Dewey test, the hydraulic conductivity for the Fuson was estimated to be 2×10^{-4} ft/d compared to a value of 3.1 ft/d for the Fall River, a difference of four orders of magnitude. The pumping test results compared favorably with the permeability results from core samples reported by Knight & Piésold (2008) which averaged 2.7×10^{-4} ft/d (Exhibit APP-015-K at PDF page 75). This difference in hydraulic conductivity between the production zone (Chilson or Fall River) and confining unit (Fuson Shale) is typical of what is seen at other ISR facilities and is more than adequate to safely conduct uranium ISR operations.

The SER indicates that, "To address uncertainties in the confining properties of the Fuson Shale in the Burdock area, the staff proposed the following license condition: *At least 60 days prior to construction, the licensee will propose in writing, for NRC review and written verification, a monitoring well network for the Fall River Aquifer in the Burdock area for those wellfields in which the Chilson Aquifer is the extraction zone*" (Exhibit NRC-134 at PDF page 55). This is included as license condition 12.8 in License SUA-1600 that was issued to Powertech for the Dewey-Burdock Project.

Q.7. How do you respond to Dr. Moran's statement that, "The Petrotek (2012) Model is Unreliable and Biased" (Exhibit OST-1 at 23)?

A.7. I assume Dr. Moran is referring to the numerical groundwater model that was presented as Exhibit APP-025. I extensively responded to Dr. Moran's statements regarding the adequacy of the model in my initial testimony at A.88 through A.102.

The NRC staff noted in the SER and its initial testimony that it conducted a detailed review of the numerical groundwater model including the development and calibration of the model. The NRC staff concluded that the model was "appropriately developed and sufficiently calibrated" (Exhibit NRC-134 at 52). "Therefore, the staff found the model sufficient to use as a predictive tool." (Exhibit NRC-001 at A3.27).

The model is used to assist the user as a decision-making tool, allowing the user to adjust the input parameters such as which wellfields(s) are in production and restoration at a given time and at what net flow rate and to evaluate the probable outcome. While there is no expectation of 100% accuracy, the model is the best tool available at the time it was developed to do predictive analysis of probable and reasonable outcomes.

The model inputs and calibration were based on site-specific data including hydraulic properties obtained from pumping test results and core samples, potentiometric data, observed drawdown during pumping tests, etc. Certain parameters were adjusted as necessary to improve calibration, but they remained within the general range of values determined from pumping tests conducted in the project area.

Several key assumptions are used in the model. The assumptions are generally conservative in nature or are strongly supported by site-specific data. One assumption was that the Dewey Fault system acts as a no-flow barrier. One of the key issues that the model was used to evaluate was whether or not the Inyan Kara aquifers could support ISR operations and the projected net groundwater withdrawal rates. During ISR operation there is a net removal of groundwater, creating an inward gradient toward the wellfields (a groundwater sink). Assuming the Dewey Fault system acts as a no-flow barrier limits the available area from which the Dewey-Burdock Project can withdraw groundwater from the Inyan Kara. This assumption is conservative in that it actually results in greater simulated drawdown than would occur if the Dewey Fault were not a barrier.

Another key assumption is that the underlying Morrison Formation acts as a no-flow boundary relative to the overlying Chilson aquifer system. Site evidence strongly supports this assumption. The Morrison Formation consists of laterally continuous shale approximately 100 feet thick. Core data indicate vertical permeability of the Morrison Formation ranging from 1.0×10^{-5} to 1.1×10^{-4} ft/d (3.9×10^{-9} to 4.2×10^{-8} cm/sec). Potentiometric data (hydraulic heads) collected from monitor wells completed in the Unkpapa aquifer (directly below the Morrison Formation) are consistently 50 to 100 feet higher than nearby wells completed in the Chilson aquifer. Pumping tests conducted in the Chilson showed no response in the Unkpapa monitor wells. These site-specific data demonstrate the hydraulic isolation between the units, supporting the assumption of a no-flow boundary for the Morrison Formation for modeling purposes. Furthermore, as the NRC points out in the SER, even if there were an artificial or natural discontinuity through the Morrison Formation, groundwater would move from the Unkpapa into the Chilson, not the other way around (Exhibit NRC-134 at PDF page 59).

A third key assumption used in simulating the Dewey-Burdock ISR operations is that there are no breccia pipes or faults resulting in substantial flow from the deeper aquifers into the Inyan Kara. As previously indicated in A.3 through A.5 of this answering testimony, no such features have been identified within the site boundaries, despite extensive field reconnaissance, detailed subsurface mapping (using thousands of borehole logs), water level data from the existing monitor well network, and evaluation of CIR imagery. Although the presence of breccia pipes within the project boundary is not likely, model simulations were conducted to assess what effects a large influx of groundwater from a hypothetical breccia pipe would look like with respect to the potentiometric surface. Results of the model simulations indicate that flows even as small as 200 gpm would cause a large aberration in the potentiometric surface in the form of a recharge mound that would be readily apparent from the existing monitor well network, and even more so from a wellfield network that would be in place prior to any mining operations. Results of the model simulations of a hypothetical breccia pipe support the assumption used in the operational model simulations that there are no breccia pipes within the project area that would provide a large influx of water to the Inyan Kara aquifer.

Q.8. How do you respond to Dr. LaGarry's statement that "Powertech reports horizontal flows within the uranium-bearing strata (the Inyan Kara Group) of up to 35.5 meters/day (Chilson Member) based on local conditions, and of up to 6,000 ft/day elsewhere in the Black Hills region (Exhibit INT-013 at 6-7)?

A.8. It is unclear where Dr. LaGarry's figure of 35.5 m/day horizontal groundwater velocity is derived. The 6,000 ft/day number is actually a transmissivity value (and is correctly reported by Powertech as 6,000 ft^2/day). Also, the transmissivity value Dr. LaGarry is referring to is reported for the combined Inyan Kara, not the Fall River or Chilson sub-units. Transmissivity divided by the saturated thickness of the aquifer gives the hydraulic conductivity. The hydraulic conductivity is then combined with the hydraulic gradient and the effective porosity using Darcy's Law to calculate groundwater velocity. The equation is as follows:

$$V = (K\, i)/ n$$

where V = groundwater velocity in ft/d
K = hydraulic conductivity in ft/d
i = hydraulic gradient in ft/ft
n = effective porosity (reported as a fraction).

The hydraulic gradient is simply the change in head between two points along a line parallel to the direction of groundwater flow divided by the distance between these two points.

The following site-specific parameter estimates are used in the calculation. For the Fall River, a hydraulic conductivity of 1 ft/d, a hydraulic gradient of 0.005 ft/ft and a porosity of 30 percent (0.30) are used to calculate a groundwater velocity of 0.017 ft/d (6.1 ft/yr). For the Chilson, a hydraulic conductivity of 2 ft/d, a hydraulic gradient of 0.003 ft/ft and a porosity of 0.30 are used to calculate a groundwater velocity of 0.02 ft/d (7.3 ft/yr).

Based on my experience working with over a dozen permitted ISR facilities, groundwater flow velocities on the order of 10 feet per year are typical for ISR facilities. Further, the USGS independently estimated the horizontal flow velocity in the Chilson aquifer to be 4.34 meters per year (Exhibit APP-041 at 36), which equates to about 14 feet per year. This value is of similar magnitude to Powertech's estimate and consistent with typical natural flow velocities at uranium ISR facilities.

Q.9. The CI Initial Position Statement at 4 refers to concerns raised by Susan Henderson about "the failure of the FSEIS to properly determine baseline ground water quality with consideration to the impact of prior open-pit and underground uranium mines, as well as the thousands of improperly plugged boreholes from prior uranium exploration (Exhibit INT-7 at 4-7)." Have you addressed these concerns previously?

A.9. Yes. My initial written testimony states that sufficient controls will be in place to prevent lack of confinement due to unplugged or improperly plugged exploration holes (e.g., see Exhibit APP-037 at A.56 through A.58). See also A.6 and A.7 above, which discuss the evidence that with one known exception leaky boreholes are not significantly allowing flow between the Inyan Kara and Chilson units.

Regarding impacts of prior open-pit and underground mining and its effect on baseline groundwater, refer to A.1 above. The data contradict the claim that much of the groundwater within the project area has been degraded. In any case, baseline data for the purposes of this ISR project refers to existing environmental conditions.

Q.10. The CI Initial Position Statement at 5 refers to "various concerns" raised by Dr. Richard Abitz. Have you addressed these or similar concerns elsewhere in your testimony?

A.10. These "concerns" are not articulated but seem to be related to Exhibit INT-002. This exhibit consists of a letter from Dr. Abitz to the Coloradoans Against Resource Destruction (CARD) regarding a baseline study apparently conducted for a project in Colorado. These "concerns" seem to deal with groundwater monitoring, air particulate monitoring, monitoring of radionuclides in air, and radon in air. While these general subject have been thoroughly addressed in the Dewey-Burdock license application, Dr. Abitz has not, to my knowledge, related any of these "concerns" to the Dewey-Burdock Project. Nor, to my knowledge, has Dr. Abitz provided any testimony or been offered as an expert witness in this proceeding. Therefore, I have not prepared any testimony in specific response to Exhibit INT-002.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	)	
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POWERTECH USA, Inc.	)	Docket No. 40-9075-MLA
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(Dewey-Burdock Project	)	
In Situ Uranium Recovery Facility)	)	

AFFIDAVIT OF ERROL LAWRENCE

I declare under penalty of perjury that my statements in prefiled Exhibits APP-066 (Errol Lawrence Answering Testimony) are true and correct to the best of my knowledge and belief.

Errol Lawrence

Executed in Littleton, CO
this 15th day of July, 2014