Table 1.1-2: Administrative Rules of South Dakota (Continued)

Regulation	Information Required	Permit Application Reference
ARSD 74:29:06:04	Alternative postmining land use.	Noted
ARSD 74:29:06:05	Approval for future mineral exploration.	Noted
ARSD 74:29:06:06	Confidential information.	Noted
ARSD 74:29:07:01	General requirements for all reclamation types.	Section 6.4
ARSD 74:29:07:02	Minimizing of adverse impacts.	Section 5.6
ARSD 74:29:07:02 (1)	Design of facilities to minimize surface disturbance.	Sections 5.3, 5.6.2.2 and 5.6.14.2
ARSD 74:29:07:02 (2)	Clearing of land in small sections.	Sections 5.3.3 and 5.3.7
ARSD 74:29:07:02 (3)	Visual screening	Section 5.6.14
ARSD 74:29:07:02 (4)	Minimize impacts to surface and groundwater.	Sections 5.3.3, 5.3.9, 5.6.3, 5.6.4 and 6.2
ARSD 74:29:07:02 (5)	Control of access.	Section 5.7.6
ARSD 74:29:07:02 (6)	Preventative measures to minimize harmful impacts to wildlife.	Sections 5.6.11.1.2 and 5.6.11.2
ARSD 74:29:07:02 (7)	Location of waste facilities, spoil piles, and topsoil stockpiles to facilitate implementation of reclamation and to minimize environmental impacts.	Section 5.3
ARSD 74:29:07:02 (8)	Minimizing the production of mine waste and spoil.	Section 5.4.3
ARSD 74:29:07:02 (9)	Design and location of facilities so they are compatible with surrounding land uses (i.e. waste facility and haul road).	Section 5.3
ARSD 74:29:07:02 (10)	Integration of mine operations planning with the Reclamation Plan.	Sections 5.3 and 6.4
ARSD 74:29:07:03	Grading and Backfilling - Necessity	Section 6.4.3.1
ARSD 74:29:07:04 (1)	Reclaimed slopes must be visually and functionally compatible with surrounding area, suitable for the postmining land use, structurally stable, and not exceed the angle of repose for fill slopes or other slopes composed of unconsolidated material.	Section 6.4.3.1; Plate 6.4-1
ARSD 74:29:07:04 (2)	Erosion and sedimentation control during final grading, and protection of areas outside of the affected land.	Sections 5.3.9 and 6.4.3.1
ARSD 74:29:07:04 (3)	Grading and backfilling timetable.	Sections 6.4.3.1 and 6.5; Figures 5.2-1 and 6.5-1
ARSD 74:29:07:04 (4)	Depressions not allowed.	Section 6.4.3.1
ARSD 74:29:07:04 (5)	Drainages preserved.	Section 6.4.3.1
ARSD 74:29:07:04 (6)	Highwall reduction.	Not applicable, since highwalls will not be used.
ARSD 74:29:07:04 (7)	Landforms must blend in with and complement the visual continuity of the surrounding area.	Section 6.4.3.1
ARSD 74:29:07:05	Disposal of refuse.	Section 5.4
ARSD 74:29:07:06 (1)	Vegetative species and composition postmining land use.	Section 6.4.3.4

Table 1.1-2: Administrative Rules of South Dakota (Continued)

Regulation	Information Required	Permit Application Reference
ARSD 74:29:07:06 (2)	Vegetative success - reference areas.	Section 6.4.3.4; Appendix 6.4-D
ARSD 74:29:07:06 (3)	Reference areas.	Appendix 6.4-D; Plate 6.4-2
ARSD 74:29:07:06 (4)	Seeding and planting.	Section 6.4.3.4; Appendix 6.4-B
ARSD 74:29:07:07 (1)	Salvageable topsoil.	Section 5.3.7
ARSD 74:29:07:07 (2)	Interim reclamation.	Sections 6.4.2 and 6.4.3.2
ARSD 74:29:07:07 (3)	Topsoil analyzed to determine if fertilizer or other amendments required.	Sections 5.3.7 and 6.4.3.2
ARSD 74:29:07:07 (4)	Signing of topsoil stockpiles.	Section 5.3.7
ARSD 74:29:07:07 (5)	Estimate of topsoil to complete reclamation.	Sections 5.3.7 and 6.4
ARSD 74:29:07:07 (6)	Use of excess topsoil for reclamation purposes elsewhere.	Section 6.4.3.2
ARSD 74:29:07:07 (7)	Separation of rocks and trees from topsoil.	Section 5.3.7
ARSD 74:29:07:07 (8)	Segregation of topsoil and subsoil stockpiles.	Section 5.3.7
ARSD 74:29:07:08 (1)	Compliance with South Dakota water rights laws and regulations.	Section 5.6.3.1.2
ARSD 74:29:07:08 (2)	Compliance with South Dakota water quality laws and regulations.	Sections 5.6.3.2 and 5.6.4.2
ARSD 74:29:07:08 (3)	Compliance with dredge and fill laws in Sections 401 and 404 of the Clean Water Act.	Sections 5.6.4.1.3 and 5.6.4.2
ARSD 74:29:07:08 (4)	Removal of temporary or large sedimentation, erosion, or drainage control structures.	Section 5.3.9
ARSD 74:29:07:08 (5)	Permanent diversion structure design.	Section 5.3.9.1
ARSD 74:29:07:08 (6)	Diversion of unchannelized surface water.	Section 5.3.9
ARSD 74:29:07:09 (1)	Surface runoff diversions - side slopes and erosion protection.	Section 5.3.9
ARSD 74:29:07:09 (2)	Surface runoff diversions - stable sides in rock.	Section 5.3.9
ARSD 74:29:07:09 (3)	Surface runoff diversions - erosion protection.	Section 5.3.9
ARSD 74:29:07:09 (4)	Surface runoff diversions - culverts or bridges where necessary.	Section 5.3.9
ARSD 74:29:07:09 (5)	Surface runoff diversions - minimize hazards to humans, wildlife or livestock.	Section 5.3.9
ARSD 74:29:07:09 (6)	Surface runoff diversions - diversions around milling or processing facilities must be capable of carrying the flow from the 6-hour PMP event.	Section 5.3.9
ARSD 74:29:07:09 (7)	Surface runoff diversions - all other diversions must be capable of carrying a minimum of the 2-year, 6-hour event.	Section 5.3.9
ARSD 74:29:07:09 (8)	Surface runoff diversions - may not discharge on topsoil storage areas, spoil, or other unconsolidated material.	Section 5.3.9

Approximately 87 percent of the total number of sites recorded are prehistoric. Historic sites comprise approximately 5 percent of total sites recorded, while multi-component (prehistoric/historic) sites comprise the remaining 8 percent.

The small number of Euro American sites documented was not unanticipated given the peripheral nature of the permit area in relation to the Black Hill proper. The disparity existing between the number of historic and prehistoric sites observed in the permit area is also not unexpected; however, the sheer volume of sites documented in the area is noteworthy. The land evaluated as part of the Level III cultural resources evaluation has an average site density of approximately one site per 48.8 acres. Even greater site densities were reported in 2000 during the investigation of immediately adjacent land parcels for the Dacotah Cement/BLM land exchange (Winham et al., 2001). This indicates that the permit area is not unique, in regard to the number of documented sites, and is typical of the periphery of the Black Hills.

The high density of sites observed in the permit area, specifically those of prehistoric affiliation, is both consistent with previous findings in the immediate vicinity (Winham et al., 2001) and strongly indicative of the intense degree to which this landscape was being exploited during prehistoric times. Data indicate a slight rise in the number of sites observed from earlier periods into the Middle Plains Archaic, and then a major increase into the Late Plains Archaic/Plains Woodland period before an equally significant drop-off into Late Prehistoric times. In general, this trend is largely consistent with the majority of available paleodemographic data from the region (Rom et al., 1996). Despite the high density of sites within the permit area, there is a lack of evidence indicative of extended or long-term settlement localities in the region. Though the reason behind this phenomenon remains unclear, the bulk of preliminary data from the current investigation appear to mirror this trend.

The landscape comprising the permit area is erosional in nature, leading to many sites being heavily deflated. The extend of the erosion processes is evidenced by the large number of sites recommended by Augustana as not eligible for listing on the National Register of Historic Places because of their location on deflated landforms. This equates to approximately half of the total number of identified sites in the permit area. Notable exceptions to these deflated localities include the valleys and terraces along Beaver and Pass Creeks, as well as many places within and adjacent to some of the more heavily wooded areas.

Nearly 200 hearths were identified within 24 separate sites areas during Augustana's investigation. These features varied considerably from one another in both size and form (and

for the access roads and well fields will be placed near the roads and well fields to minimize the haul distance.

The estimated topsoil stockpile volumes for the processing facilities and ponds are 100,000 to 200,000 cubic yards in the Burdock area and 50,000 to 100,000 cubic yards in the Dewey area. These are estimated values based on the approximate topsoil stripping limits and topsoil salvage depths obtained from the baseline soil survey. Prior to stripping, the precise topsoil stripping limits will be determined based on construction-level designs, and the salvage depths will be determined based on additional testing. In the initial Burdock well field, the anticipated topsoil salvage depth is estimated to range from 0 to 3 feet and average approximately 1.0 foot (from the baseline soil survey in Appendix 3.3-A). In the initial Dewey well field, the anticipated topsoil salvage depth is estimated to range from 0 to 1.67 feet and average approximately 0.15 foot. The total anticipated topsoil stripping area over the life of the Dewey-Burdock Project is estimated to be approximately 250 acres in the deep disposal well option and 440 acres in the land application option. The maximum area of construction disturbance and associated topsoil stripping at any one time will be approximately 100 acres in the deep disposal well option and 300 acres in the land application option.

In the processing areas and the first well field in each of the Dewey and Burdock areas, Powertech (USA) will analyze the topsoil prior to stripping to determine whether fertilizer or other amendments will be required to establish and sustain vegetative growth during reclamation. Prior to sampling, Powertech (USA) will submit a sampling and analysis plan that includes sampling density and parameters to DENR for review and verification. The sampling results and evaluation of whether adequate nutrients are available and whether fertilizer or other amendments will be required to establish and sustain vegetative growth will be submitted to DENR for review and verification prior to topsoil stripping. The need for topsoil sampling in the subsequent well fields will be coordinated with DENR based on the results of the initial sampling and the success of interim revegetation in the initial Dewey and Burdock well fields.

Salvaged topsoil will be stored in designated topsoil stockpiles in accordance with SDCL 45-6B-40. These stockpiles will be located such that losses from wind erosion are minimized. Additionally, topsoil stockpiles will not be located in any drainage channels or other locations subject to flooding. Berms will be constructed around the perimeter of stockpiles and the stockpiles will be seeded with the approved seed mix to help minimize erosion. Additionally, all topsoil piles will be identified with highly visible signs.

During excavations of mud pits associated with exploration drilling and delineation drilling activities, topsoil will be separated from the subsoil with a backhoe. First the topsoil will be removed and placed at a separate location and then the subsoil will be removed and deposited next to the mud pit. Usually within 30 days of the initial excavation, use of the mud pit will be complete, the subsoil will be redeposited in the mud pit followed by replacing topsoil. During the construction of well fields and pipeline ditch construction, topsoil and subsoil will be temporarily accumulated near the excavation during construction, then redistributed after construction activities are complete. The temporary stockpiles will be marked in the field, constructed to minimize wind erosion, and placed outside of drainages.

In only limited instances will more material be excavated (spoil) than is required for facility construction. This will include pond and diversion channel construction. Spoil will be handled in accordance with ARSD 74:29:07:14 requirements. Spoil will be stockpiled separately from topsoil stockpiles and identified with highly visible signs. The footprint of the spoil stockpiles will have the topsoil stripped prior to placement of the spoil. The spoil stockpiles will be located

submergence. Figures 5.3-10 and 5.3-11 show that all ISR wells and monitor wells will be sealed.

Estimates of peak flood discharges and water levels produced by floods on Pass Creek, Beaver Creek and local small drainages are provided in Section 3.5.2.3 and Appendix 3.5-A. Plate 3.5-1 depicts the modeled flood inundation areas for all surface water features during the 100-year, 24-hour storm event in relation to proposed facilities and infrastructure. As described in Appendix 3.5-A, HEC-HMS models were used to calculate peak discharges, and HEC-RAS models were used to compute water-surface profiles and inundated areas for the respective runoff events.

Any disturbance to the prevailing hydrologic balance of the affected land and of the surrounding area and to the quality and quantity of water in surface water systems both during and after ISR operations and during reclamation will be minimized in accordance with SDCL 45-6B-41. No diversions will be constructed on perennial stream channels, and only relatively minor quantities of surface runoff will be captured in sediment ponds. Therefore, little or no impacts to the surface water hydrologic balance will occur. Surface water quality will be protected through erosion control BMPs and sediment control measures described below. Section 5.6.5 describes mitigation measures to protect surface and groundwater from potential leaks or spills.

5.3.9.1 Diversion Channels

Following is a description of the diversion channels that will be constructed within the permit area for the processing facilities and ephemeral stream channels.

Diversion channel designs for the processing facilities in the DDW option are provided on Plates 5.3-13 and 5.3-14. These supersede the diversion channel designs for the processing facilities in the DDW option in Appendix 5.3-B. In accordance with ARSD 74:29:07:09(6), the diversions around the CPP, Satellite Facility and associated radium settling ponds and central plant pond have been designed for the 6-hour PMP event. Diversions were not designed for the PMP event around the storage ponds or spare storage ponds, since a) these ponds will store only treated water en route to the land application that will not contain radionuclides in excess of allowable discharge limits, b) the treated water storage ponds are not associated with uranium processing or wastewater treatment, and c) NRC guidance in Regulatory Guide 3.11 indicates that diversion designs for isolated areas where pond failure would neither jeopardize human life nor create damage to property or the environment beyond Powertech (USA)'s financial assurance capabilities do not need to use extremely conservative flood design criteria. Powertech (USA) will not change the use of the treated water storage ponds or spare storage ponds without obtaining DENR authorization through a technical revision or permit amendment, the application

for which would include diversion designs for the 6-hour PMP event. In the land application option, no diversions will be required around the processing facilities, radium settling ponds or central plant pond due to the small drainage area above these facilities.

With the exception of Beaver Creek, all stream channels within the permit area are ephemeral. Pass Creek above the permit area could be considered intermittent, but it is ephemeral within the permit area since there is no groundwater component and flows only occur in response to precipitation or snowmelt events. No diversions are planned on Beaver Creek or Pass Creek, and no diversions are planned on perennial or intermittent streams.

Plates 5.3-6 and 5.3-7 provide the locations of planned ephemeral stream channels within the permit area. The designs for the diversions associated with the initial well fields and land application areas are presented on Plates 5.3-9 through 5.3-11. Diversion designs for future well fields, if needed, will be provided to DENR for review and verification prior to construction.

Diversions of ephemeral channels will be designed to maintain channel velocities equal to or less than 5 feet per second for the discharge from a 2-year, 6-hour precipitation event and have the ability to contain the discharge from a 100-year, 24-hour precipitation event.

Interim revegetation will be performed on the bottoms and side slopes of all diversions to reduce erosion. In instances where the diversion channel velocity during the design storm exceeds 5 feet per second, other erosion control measures will be implemented such as geosynthetic liners, geosynthetic filter media, or riprap. Diversions will be constructed with 3:1 or shallower side slopes to reduce the risk of slope failure, promote interim revegetation, and allow safe passage for humans, wildlife and livestock. Diversion bottom elevations will tie to undisturbed upstream and downstream channel elevations to eliminate increased erosion potential. Diversions will not discharge onto topsoil or spoil stockpiles or other unconsolidated material such as newly reclaimed areas. Culvert or bridge crossings over the diversions are not planned. If it becomes necessary to cross a diversion in the future, Powertech will submit design drawings to DENR for review and approval prior to construction.

5.3.9.2 Erosion Control

Powertech (USA) will minimize erosion of disturbed, reclaimed and native areas through proper land management and farming techniques. Typically, following ground disturbance, areas will be prepared and seeded as soon as possible to reduce the possibility of erosion. Also, erosion control measures will be used to reduce overland flow velocity, reduce runoff volume or trap sediment. Examples include rip-rap, vegetative sediment filters, check dams, mulches, cover crops, and other measures. Plates 5.3-6 through 5.3-8 show the sediment control measures that will be used in the permit area.

used (typically November through early March). Additional design information for the land application systems is presented in the GDP. Figure 5.3-1 depicts the proposed facilities in the land application option.

Each of the two land application systems will have up to 315 acres of irrigated area and an additional 65 acres of center pivots on standby. Each of the two land application systems is designed for an average annual application rate of 310 gpm and an instantaneous application rate of 297 to 653 gpm.

In the land application option, groundwater withdrawn during aquifer restoration will not be treated with RO. Instead, the aquifer restoration water will be disposed directly in land application systems following treatment to remove uranium and radium. The water balance for the land application option is presented in Section 5.3.3.5.3.

Following is a summary of how the proposed land application systems satisfy specific site evaluation and compatibility criteria in ARSD 74:29:05:16.

Potential Impacts to Wildlife Grazing in Land Application Areas (ARSD 74:29:05:16(1))

Potential impacts to wildlife grazing in the land application areas will be minimized through treating the land application effluent prior to application, monitoring vegetation within land application areas, and evaluating the monitoring results annually to detect potential increasing trends in constituent concentrations. As a condition of the GDP, the land application water quality will be required to meet effluent limits established by DENR that are protective of groundwater quality. Section 5.4.1.1.4.1 describes the anticipated land application water quality. Trace metal concentrations are anticipated to be at or below ARSD 74:54:01:04 human health standards. Radionuclide concentrations will be below 10 CFR Part 20, Appendix B, Table 2, Column 2 effluent limits for release of radionuclides to the environment. The suitability of land application vegetation to wildlife grazing will be verified through annual vegetation monitoring in the land application areas. Section 5.5.6.2 describe how vegetation in the land application areas will be sampled each year. Section 5.5.6.2 describes how this information will be evaluated annually and the results reported to DENR to determine whether there is any risk to wildlife.

Compatibility with Site Geology and Soils ((ARSD 74:29:05:16(2) and (4))

The site geology is well suited to land application. The depth to alluvial groundwater, where encountered, is greater than the maximum anticipated infiltration depth of the land application water. The Graneros Group shales will prevent the land application water from reaching bedrock

aquifers. The thickness of the Graneros Group is approximately 500 to 550 feet beneath the proposed Dewey land application area and approximately 25 to 250 feet beneath the proposed Burdock land application area. Refer to Cross Sections 3.2-23 through 3.2-27, which depict the thickness of the Graneros within the proposed land application areas.

Geologic conditions make it unlikely that land applied water will reach the alluvium. These conditions include the limited presence of alluvium in the Dewey land application area and the thickness and composition of the material beneath the land application areas. In the Dewey area, most of the planned primary pivot areas do not overlie alluvium. Of the 315 acres of primary center pivots planned in the Dewey area, only about 55 acres (17 percent) occur within the extents of mapped alluvium (refer to Figure 6.1-1 in the GDP application). While most of the planned Dewey standby pivot areas overlie mapped alluvium, the potential for land applied water to reach the alluvium in the standby areas is much lower, since Powertech (USA) does not anticipate using these areas regularly.

In all potential land application areas (Dewey and Burdock), the thickness and composition of the material between the pivot areas and alluvial groundwater, where present, will act to prevent land applied water from reaching alluvial groundwater. In the Burdock area, the depth to the top of the alluvial gravel within the planned pivot areas ranges from about 12 to 35 feet and is typically 15 to 25 feet. The depth to alluvial groundwater, where present, is typically 13 to 35 feet. In the Dewey area, there are only limited areas in which the planned pivot areas overlie saturated alluvium. Based on ambient sampling conducted in support of the GDP application, the depth to alluvial groundwater, where present beneath the potential Dewey pivot areas, is anticipated to be at least 18 feet. By comparison, the SPAW model simulations predict that the land application water will not percolate deeper than 8 feet.

The soil hydraulic properties beneath the land application areas will help prevent the migration of water into the alluvial groundwater. Soils sampled from test pits in and around the land application areas predominantly contain clay and silt, with lesser amounts of sand and virtually no gravel to depths of 7 to 10 feet. The SPAW modeling simulations considered permeability measurements from soil samples collected in the land application areas.

Compatibility with Groundwater and Surface Water Systems (ARSD 74:29:05:16(3)

Land applied water has a very low potential to reach groundwater or to flow through the alluvium and reach Beaver Creek or Pass Creek based on geologic conditions, Powertech (USA)'s commitment to plug and abandon existing wells within the land application areas,

operating plans, and the implementation of extensive monitoring systems. Each of these is described below with the exception of geologic conditions, which was described previously.

Plugging and Abandoning Existing Wells

Powertech (USA) has not identified any existing wells within the proposed Dewey land application area. Within the proposed Burdock land application area, there are two existing wells, including one former domestic well (well 43) and one stock well (well 15). Prior to operation of the Burdock land application system, both of these wells will be plugged and abandoned with bentonite or cement grout in accordance with the procedures in ARSD 74:02:04:67. This will eliminate the potential for vertical migration of land applied solutions through existing wells.

Operating Plans

The land application rate has been designed specifically to minimize percolation below the rooting zone. The typical application rate is about 19 inches during the land application season of approximately April through October. This is a typical agronomic rate for growing alfalfa and grasses in this region.

Monitoring Systems

Groundwater monitoring will allow Powertech (USA) to track the movement of land applied water through the subsoil beneath the land application areas, determine whether land applied water reaches the alluvium, and track changes in alluvial water quality within the POP zones to prevent migration of land applied water outside of the POP zones or into Beaver Creek or Pass Creek. Monitoring systems will include suction lysimeters installed beneath each land application and catchment area to track the movement of water through the subsoil, interior wells to track changes in alluvial water quality within the POP zones, and compliance wells established at the downgradient edges of the POP zones. Monitoring results from suction lysimeters and interior wells will provide early detection of potential migration of land applied water into and through the alluvium. Early detection of potential impacts will allow Powertech (USA) to adjust the operating parameters, such as the rate of application to various pivots, to avoid potential impacts to alluvial groundwater outside of the POP zone and to avoid potential impacts to Beaver Creek or Pass Creek.

The alluvial groundwater monitoring program associated with the GDP also will detect any potential impacts to Cheyenne River alluvium. The mapped Beaver Creek and Pass Creek alluvium are contiguous with the Cheyenne River alluvium, and the position of the interior and compliance monitor wells will ensure that any land applied water entering Beaver Creek or Pass Creek alluvium will be detected. There is no pathway for land applied water to eventually reach

the Cheyenne River alluvium without first passing a compliance well. Further, Powertech (USA) will monitor other alluvial wells farther downgradient in the Beaver Creek and Pass Creek alluvium (e.g., wells 677 and 678). Periodic monitoring of these downgradient alluvial wells will allow detection of any potential impacts from the land applied water on Beaver Creek, Pass Creek, or Cheyenne River alluvium.

If the results of monitoring show that groundwater outside of the POP zone or surface water in Beaver Creek or Pass Creek have potential to be impacted, Powertech (USA) will initiate a corrective action plan as described in the GDP application. Potential corrective actions include adjusting operating parameters and/or initiating a pump back or pump and treat system to recover alluvial groundwater.

Compatibility of Slopes with Land Application Systems (ARSD 74:29:05:16(5))

In the proposed Dewey land application area, the average slope is approximately 3.5 percent. The maximum slope is between 15 and 25 percent in a small area (approximately 5 acres) at the northern edge of one proposed land application area (refer to page 5.3-B-42 in Appendix 5.3-B). In the proposed Burdock land application area, the average slope is approximately 2 percent. Only about 2 acres of the proposed Burdock land application area has a slope greater than 15 percent (refer to page 5.3-B-43 in Appendix B). These slopes will be compatible with center pivot irrigation.

During final design of the land application systems and catchment areas, Powertech (USA) will evaluate any areas with slopes greater than 15 percent to determine whether they can be avoided or whether they require mitigation. The evaluation will consider the maximum manufacturer-recommended slope based on the center pivot climbing capability and ground clearance requirements. It also will consider whether regrading will be necessary to reduce the potential for runoff and erosion. It is currently anticipated that approximately 5 acres in the proposed Dewey land application area and 2 acres in the proposed Burdock land application area will be regraded to a maximum slope of 15 percent unless these areas are avoided during final design.

Potential for Erosion (ARSD 74:29:05:16(6))

The potential for erosion within the land application areas will be minimized through siting land application areas in relatively flat terrain, maintaining vegetation, optimizing the irrigation rate to avoid runoff, using low-impact sprinkler heads, and capturing any runoff in catchment areas. The average slopes in the proposed land application areas are 2 to 3.5 percent. Small areas with slopes greater than 15 percent are anticipated to be regraded to minimize the potential for erosion and to meet the maximum manufacturer-recommended slopes for the center pivots. Relatively

flat slopes along with maintenance of the land application areas in a vegetated state will limit the potential for erosion. The land application water will be applied at an agronomic rate to prevent runoff into the catchment areas. Should runoff from precipitation or snowmelt occur, the runoff and sediment will be captured in the catchment areas and will not reach perennial or ephemeral stream channels.

Daily inspections of the land application areas and catchment berms during operation of the land application systems will determine whether there are any unplanned effects such as erosion.

Distance to Flowing Streams (ARSD 74:29:05:16(7))

Beaver Creek is the only flowing stream within the proposed permit area. The minimum distance from a proposed Dewey land application area to Beaver Creek is approximately 280 feet. The minimum distance from a proposed Burdock land application area to Beaver Creek is approximately 1.1 miles.

Potential Impacts to Adjacent Land Uses (ARSD 74:29:05:16(8))

Land uses adjacent to the proposed land application areas includes livestock grazing on rangeland and recreational use (primarily hunting) on private lands. No effects from land application on adjacent land uses are anticipated due to the operation of land application systems to minimize overspray and due to Powertech (USA)'s commitment to limit hunting within the proposed permit area. Section 3.1.2 describes how Powertech (USA) will work with BLM, SDGF&P and private landowners to limit hunting within the proposed permit area to the extent practicable.

The land application systems have been sited and will be operated to avoid any potential impacts to nearby cropland. No cropland is within or immediately adjacent to the proposed land application areas, and the land application systems will be operated to avoid overspray as a condition of the GDP. As described above, potential impacts to alluvial groundwater will be limited by geologic conditions, plugging existing wells, applying water at an agronomic rate, and extensive monitoring. This in turn will prevent potential impacts to adjacent cropland via groundwater pathways.

Consideration of Weather Conditions (ARSD 74:29:05:16(9))

Prior to operation of the land application systems, Powertech (USA) will develop a standard operating procedure (SOP) for land application system operation that will include provisions to minimize overspray outside of the center pivot areas. The SOP will include using the results of

meteorological monitoring (wind speed, wind direction and temperature) to modify operating parameters. It will include maximum wind speed/wind direction combinations for land application system operation. The SOP also will address precipitation thresholds to avoid land application during heavy or prolonged precipitation events. Temperature thresholds also will be included to avoid land application when water cannot infiltrate due to frozen ground.

5.4.1.1.3 Wastewater Treatment

Prior to discharge to the storage ponds, Powertech (USA) will treat all wastewater associated with ISR operations to meet the requirements of 10 CFR 20, Appendix B, Table 2, Column 2, which are the established limits for discharge of radionuclides to the environment and include limits for natural uranium, radium-226, lead-210 and thorium-230 (see Table 5.4-1). Powertech (USA) anticipates that the GDP will include effluent limits established according to ARSD 74:54:01:04 groundwater standards and ambient alluvial water quality. Treatment will be accomplished by ion exchange for uranium removal followed by radium removal through co-precipitation with barium sulfate in radium settling ponds. It is not anticipated that thorium-230, lead-210 or other radionuclides will be present at concentrations above the limits. If concentrations in the storage ponds are above the release limits, the effluent will be treated as necessary to satisfy the GDP limits.

5.4.1.1.4 Treated Wastewater Quality

The types of wastewater that will be disposed in the DDWs or land application systems include production bleed, groundwater generated during aquifer restoration, affected groundwater generated during well development, and liquid process waste such as resin transfer water and the brine generated during uranium processing. Of these, the largest contributors will be the production bleed and groundwater generated during aquifer restoration.

Table 5.4-2 presents the estimated end-of-production water quality in the ISR well fields. This represents the untreated water quality extracted from the ore zone at the end of uranium recovery and at the beginning of aquifer restoration. This table represents the worst-case water quality

5.6.3.2 Mitigation of Potential Groundwater Impacts

Following is a list of mitigation measures for potential impacts to groundwater. Specific mitigation measures for potential impacts to water supply wells, corrective actions for excursions, and protection of groundwater quality in and around land application areas are provided below.

- Perform MIT on all wells prior to use and repeat every 5 years.
- Minimize groundwater use during operations by limiting production and restoration bleed to the minimum amount needed to ensure hydraulic well field control.
- Monitor well pressures to detect leaks.
- Install and operate an extensive monitoring system to detect potential horizontal or vertical excursions of ISR solutions.
- Plug and abandon or mitigate any of the following should they pose the potential to impact the control and containment of well field solutions within the permit area:
    - Historical wells and exploration holes
    - Holes drilled by Powertech (USA) for delineation and exploration
    - Any well failing MIT
- Maintain pumping and injection rates (well field balance) to ensure radial hydraulic flow into and through the production zone.
- Monitor to detect and define unanticipated surface spills, releases, or similar events that may infiltrate into the groundwater system.
- Implement a spill prevention and cleanup plan to minimize potential impacts to groundwater, including rapid response cleanup and remediation capability, techniques, procedures, and training.
- Monitor nearby domestic, livestock, irrigation, and designated monitor wells as appropriate during operations.
- Select restoration method to minimize water consumption during groundwater restoration.
- During groundwater restoration, monitor groundwater using standard industry practices to determine the progression and effectiveness of restoration.
- Implement an extensive land application monitoring system that includes compliance wells, intermediate wells, and vadose zone monitoring.
- Site land application areas at locations where natural conditions make it highly unlikely that the land application water will reach the alluvium.
- Apply land application water at agronomic rates.
- Treat the land application water and/or DDW water to remove radionuclides.

and results obtained. If an excursion is not corrected within 60 days of confirmation, Powertech (USA) will terminate injection into the affected portion of the well field until the excursion is retrieved, or provide an increase to the reclamation financial assurance obligation in an amount that is agreeable to NRC and that would cover the expected full cost of correcting and cleaning up the excursion. The financial assurance increase will remain in force until the excursion is corrected. The written 60-day excursion report will state and justify which course of action will be followed. If wells are still on excursion status at the time the 60-day report is submitted to NRC, and the financial assurance option is chosen, the well field restoration financial assurance obligation will be adjusted upward. When the excursion is corrected, the additional financial assurance obligations resulting from the excursion will be removed.

Protection of Groundwater Quality in and around Land Application Areas

Powertech (USA) will operate the proposed land application systems in accordance with an approved GDP, the primary purpose of which is to protect groundwater quality in accordance with State standards. Mitigation measures to protect groundwater quality in the land application areas are described above and include implementing an extensive land application monitoring system that includes compliance wells, intermediate wells and vadose zone monitoring; siting land application areas at locations where natural conditions make it unlikely that land application water will reach alluvial groundwater; applying land application water at agronomic rates; and treating land application water to remove radionuclides. These mitigation measures will ensure compliance with groundwater quality standards in and around the land application areas during and after ISR operations and during reclamation.

5.6.4 Surface Water

5.6.4.1 Potential Surface Water Impacts

Potential surface water impacts include increased sediment load due to surface disturbance, very limited stream channel disturbance, potential encroachment on wetlands, and potential water quality impacts from leaks or spills. Each of these is described below.

5.6.4.1.1 Potential Sedimentation

Construction activities within the well fields, along the pipeline corridors and roads, and at the CPP and Satellite Facility have the potential to increase the sediment yield of the disturbed areas. The potential impacts will be minimal due to the relatively small size of the disturbance areas relative to the watershed areas and due to the implementation of the sediment control plan described in Section 5.3.9 and the mitigation measures described in Section 5.5.4.2.

5.6.4.1.2 Potential Impacts to Stream Channels and Riparian Areas

As described in Section 5.3.9, Powertech (USA) has evaluated flood inundation boundaries and will construct facilities outside of these boundaries to avoid potential impacts to facilities from flooding and potential impacts to the stream channels. Some facilities must be located within stream channels, such as pipeline corridors and access roads. These will cross the stream channels perpendicular to the flow direction to minimize disturbance. Primary and secondary access road stream channel crossings will include culverts as described in Section 5.3.8.

Ephemeral stream channels also will be disturbed temporarily at the upstream and downstream ends of the diversion channels described in Section 5.3.9.1, which describes the erosion protection measures that will be used for diversion channels.

- Use sediment trapping devices such as hay or straw bales, fabric fences, and devices to control water flow and discharges to trap sediments moved by runoff.
- Maintain natural contours as much as possible, stabilizing slopes and avoiding unnecessary off-road travel with vehicles; maintaining natural contours as much as possible, stabilizing slopes and avoiding unnecessary off-road travel with vehicles.
- The land application of treated wastewater will occur at agronomic rates to avoid irrigation runoff into surface water; catchment areas also will prevent land application water from entering surface water.
- Prepare and implement a Stormwater Pollution Prevention Plan that is consistent with state and federal standards for construction and operation activities.
- Facilities will be constructed outside of flood inundation areas to the extent practicable.
- Best management practices will be utilized during ISR operations.

Powertech (USA) will comply with South Dakota surface water quality standards for surface water sites during and after ISR operations and during reclamation. Operational surface water monitoring will occur at 10 stream sampling sites listed in Table 5.5-3. Four of these sites are on stream segments with designated beneficial uses (Beaver Creek and the Cheyenne River). Section 3.5.4.1.1 describes how the sampled segments of Beaver Creek and the Cheyenne River have beneficial uses for warmwater semipermanent fish life propagation and limited-contact recreation. Section 3.5.4.1.1 describes how baseline samples collected from Beaver Creek met the ARSD 74:51:01:48 criteria for warmwater semipermanent fish life propagation waters except for some measurements of total suspended solids (TSS). Similarly, Cheyenne River baseline samples met the criteria except for some TSS measurements and one dissolved oxygen measurement.

Routine operational monitoring of surface water sites will be used to demonstrate compliance with the antidegradation policy for surface waters in ARSD 74:51:01:34, which requires existing beneficial uses to be maintained and protected. The mitigation measures described above will ensure that the Dewey-Burdock Project will not cause significant changes in surface water quality. To verify the effectiveness of mitigation measures, Powertech (USA) will analyze surface water samples for the parameter list in Table 5.5-4.

5.6.5 Spills and Leaks

5.6.5.1 Potential Impacts from Spills and Leaks

Potential impacts from spills and leaks include potential impacts to soil, surface water, and groundwater resulting from a spill or leak in the well fields, processing facilities, transportation vehicles, or ponds. Each of these is described below.

5.6.5.1.1 Well Fields and Pipelines

Well field features such as header houses, well heads or pipelines could contribute to pollution in the unlikely event of a release of ISR solution due to pipeline or well failure. A spill or leak in these areas could potentially impacts soils, surface water and groundwater. Potential impacts will be minimized by routine MIT of all injection, production and monitor wells and hydrostatic leak testing of all pipelines during construction; implementing an instrumentation and control system to monitor pressure and flow and immediately detect and correct an anomalous condition; and implementing a spill response and cleanup program in accordance with NRC license requirements and DENR permit conditions.

5.6.5.1.2 CPP and Satellite Facility

The CPP will serve as the hub for production operations at the project; therefore, the CPP will likely have the greatest potential for spills or accidents potentially resulting in the release of pollutants. Potential releases also could occur from the Satellite Facility. Potential releases could result from a tank or process vessel failure, pipe rupture, or transportation incident.

6.4.1.2 Agricultural or Horticultural Crops

In conformance with ARSD 74:29:06:02(1), agricultural or horticultural crops reclamation will follow guidelines established in ARSD 74:29:07:21. The reclaimed agricultural or horticultural land will have the capability of producing crops consistent with similar crop production areas in the surrounding region, and the reclamation will be considered complete when productive capability is equivalent to or exceeds similar crop production areas in the surrounding region for 2 consecutive crop years. Monitoring will be performed in accordance with ARSD 74:29:06:02(3), which requires support and maintenance activities documenting successful implementation of reclamation.

Alfalfa is the only crop currently proposed for reclamation of designated agricultural or horticultural cropland in the proposed permit area. Alfalfa is the only crop currently grown in the proposed permit area and is grown in several areas nearby, so comparative production figures from nearby areas will be readily available. Alfalfa production in reclaimed cropland will be compared with that in undisturbed areas within or adjacent to the permit area. According to the landowner who grows alfalfa within the proposed permit area, the average annual alfalfa production over the past 10 years is 1.75 tons per acre (personal communication between John Putnam and Lisa Scheinost, Powertech (USA), January 4, 2013). Powertech (USA) will provide DENR with annual crop yields within the permit area beginning in 2013, with updates each year prior to and during ISR operations and during reclamation.

All disturbed areas with a delineated postmining land use of agricultural or horticultural crops will have an alternate postmining land use of rangeland. In the event that these agricultural or horticultural croplands are not desired by the landowner to be used as cropland following reclamation, the land will be designated as rangeland and will follow guidelines established in ARSD 74:29:07:20 for rangeland reclamation, as described above.

6.4.2 Interim Revegetation

Interim revegetation is the process of temporarily stabilizing grounds which are scheduled to be re-disturbed before the completion of mining. Portions of the permit area which will receive interim revegetation treatments include topsoil stockpiles, well fields, and pipelines. Because of the limited availability of salvageable topsoil material, some disturbed areas subject to interim reclamation will be directly seeded without the replacement of topsoil material. Straw mulch may be applied at the time of seeding to further improve and accelerate planting success; however, such applications will be site specific. Topsoil stockpiles which are to remain

undisturbed for more than 2 years will be regraded to a stable configuration, bermed, and seeded in accordance with ARSD 74:29:08:02. Interim seeding will be done with the same seed mixture as the final seeding mixture shown in Table 6.4-1 to ensure that all interim reclamation is compatible with final reclamation when it occurs. The letter of concurrence with this seed mixture from the local NRCS office is provided in Appendix 6.4-B, and letters of concurrence with this seed mixture from landowners are presented in Appendix 6.4-A.

6.4.3 Surface Disturbance Reclamation

Due to the nature of ISR activities, minimal and intermittent surface disturbance will be associated with the project, and will be mainly associated with the CPP, Satellite Facility, and ancillary facilities such as ponds. Additional intermittent disturbance will occur in the well fields, including well drilling, pipe installations, and road construction.

Surface disturbances associated with the construction of the CPP, Satellite Facility, and ponds will be for the life of those activities. Topsoil will be stripped and stockpiled from these areas prior to construction. Disturbances associated with the well field drilling and pipeline installation are limited and will be reclaimed as soon as possible after these components are completed. The topsoil will be temporarily stripped and stockpiled from well field disturbance areas prior to well field construction. Surface disturbance associated with the development of

access roads also will occur; topsoil will be stripped from the road areas and stockpiled prior to construction.

The total anticipated topsoil stripping area over the life of the Dewey-Burdock Project is estimated to be approximately 250 acres in the deep disposal well option and 440 acres in the land application option.

Powertech (USA) will restrict grazing on newly seeded areas if it is necessary to preclude livestock or wildlife from impairing establishment of the required vegetation. Possible means to restrict grazing could include, but are not limited to, fencing and working with landowners to voluntarily withhold grazing from areas containing reclamation.

6.4.3.1 Spoil Replacement and Grading

Following is a description of the general spoil replacement and grading activities followed by specific methods for mud pits, processing areas, land application areas, and access roads.

General Methods

During reclamation, spoil will be replaced from areas previously excavated, including pond and diversion channels. Spoil will be replaced in lifts and compacted as necessary to match premining conditions.

Due to the nature of uranium ISR, there will be very few construction activities that will require significant grading or contouring during reclamation. Finish grading will be achieved with typical earth moving equipment such as motor graders. Disturbed areas will be contoured to blend in with the natural terrain. Reclaimed slopes will not be steeper than 3:1 unless DENR approves steeper slopes. The postmining contours will be approximately the same as premining contours, as shown on Plate 6.4-1. Protection of areas outside of the affected graded areas from slides or other damage will be accomplished by avoiding the use of highwalls, contouring disturbed areas to blend in with the natural terrain, and not constructing reclaimed slopes steeper than 3:1 unless DENR approves steeper slopes.

The finished, contoured surface will be ripped as needed prior to topsoil replacement to relieve compaction, aid infiltration, promote root penetration, and prevent topsoil slippage and instability.

A sediment control plan will be implemented during all project phases, including final grading, to reduce soil loss within the proposed permit area. The sediment control measures discussed in Section 5.3.9 will be maintained and inspected until contributing areas are reclaimed. Sediment control structures are described in Section 5.3.9.3 and include silt fence, check dams, sediment

anticipated duration of land application reclamation is 1 year. It will be done during the CPP and main facility decommissioning phase shown on Figure 5.2-1.

Access Roads

Access road reclamation is described in Section 6.4.3.3.

6.4.3.2 Topsoil Replacement

Refer to Section 5.3.7 for a description of topsoil handling during construction. In areas that will be disturbed for prolonged periods during the life of the project (i.e., more than one construction season), topsoil will be salvaged and stored in designated topsoil stockpiles. Topsoil will be removed by scrapers under most circumstances, although other mobile equipment may be used occasionally. The topsoil salvaged for pipeline construction corridors may be bladed to the side to permit pipeline construction and then bladed back after construction is complete. Field salvage operations will be monitored by qualified field personnel. Topsoil stripping depths will vary throughout the permit area, but are expected to average approximately 19.5 inches (refer to Appendix 3.3-A). During reclamation, topsoil temporarily stored in stockpiles will be redistributed over the originally disturbed area. The replacement depth will be calculated based on the stockpile volume and the area to be reclaimed. The amount of topsoil salvaged is estimated to be the same as the amount replaced, such that there is not anticipated to be excess or limited topsoil. Powertech (USA) does not anticipate using topsoil substitutes. The topsoil will be graded to blend with the adjacent topography.

In areas of temporary disturbance such as those affected by the installation of monitor wells and pipelines, topsoil will be separated from subsoil during construction and replaced following subsoil replacement. The topsoil will be replaced over the entire disturbed area using a uniform depth based on the amount of topsoil that was salvaged. The topsoil will be replaced at an approximately 1:1 ratio from the area from which it was stripped to ensure that sufficient topsoil will be available for final reclamation in accordance with ARSD 74:29:07:07(2)(c). Following topsoil replacement, interim revegetation will be performed to control erosion as described in Section 6.4.2. Interim revegetation will use the same seed mixture as the final seeding mix to ensure that the topsoil or subsoil capacity and productive capability is not diminished by the distribution and can be restored in accordance with the requirement of ARSD 74:29:07:07(2)(a). Revegetating areas of interim reclamation and using erosion control BMPs as necessary will ensure that the topsoil in areas of temporary disturbance will be protected from erosion in accordance with the requirement of ARSD 74:29:07:07(2)(b).

As described in Section 5.3.7, Powertech (USA) will analyze topsoil prior to stripping in the processing areas and the first well field in each of the Dewey and Burdock areas to determine whether fertilizer or other amendments will be required to establish and sustain vegetative growth during reclamation. In addition, in areas of poor baseline vegetative cover, Powertech (USA) may analyze the topsoil to determine whether fertilizer or other amendments will be required to establish and sustain a vegetative cover on reclaimed areas. See also Section 6.4.3.4 for a discussion of areas with low vegetative cover densities that likely will have low revegetation potential if disturbed. These include the Darrow Mine surface pits/spoil piles and the "alkali area." In only very limited areas, which are anticipated to include the historical mine pits and the alkali area (notwithstanding the processing areas and initial well fields, which are described in Section 5.3.7), Powertech (USA) will sample the topsoil and subsoil prior to disturbance. If the evaluation demonstrates that its chemical or physical characteristics would seriously inhibit plant growth and that it is not feasible to remedy by chemical treatment, overburden replacement, or like measures, Powertech (USA) will request that the revegetation performance criteria not apply for these limited areas as allowed by SDCL 45-6B-46(2).

6.4.3.3 Access Road Reclamation

All roads and portions of roads constructed and utilized for access to the facilities and well fields will be removed and reclaimed unless exempted from reclamation by the request of the landowner/lessee, in which case the landowner/lessee will accept the responsibility for their long-term maintenance and ultimate reclamation. In this case, Powertech (USA) will request in writing to the board that a road or portion of a road remain un-reclaimed in accordance with ARSD 74:29:07:12(10).

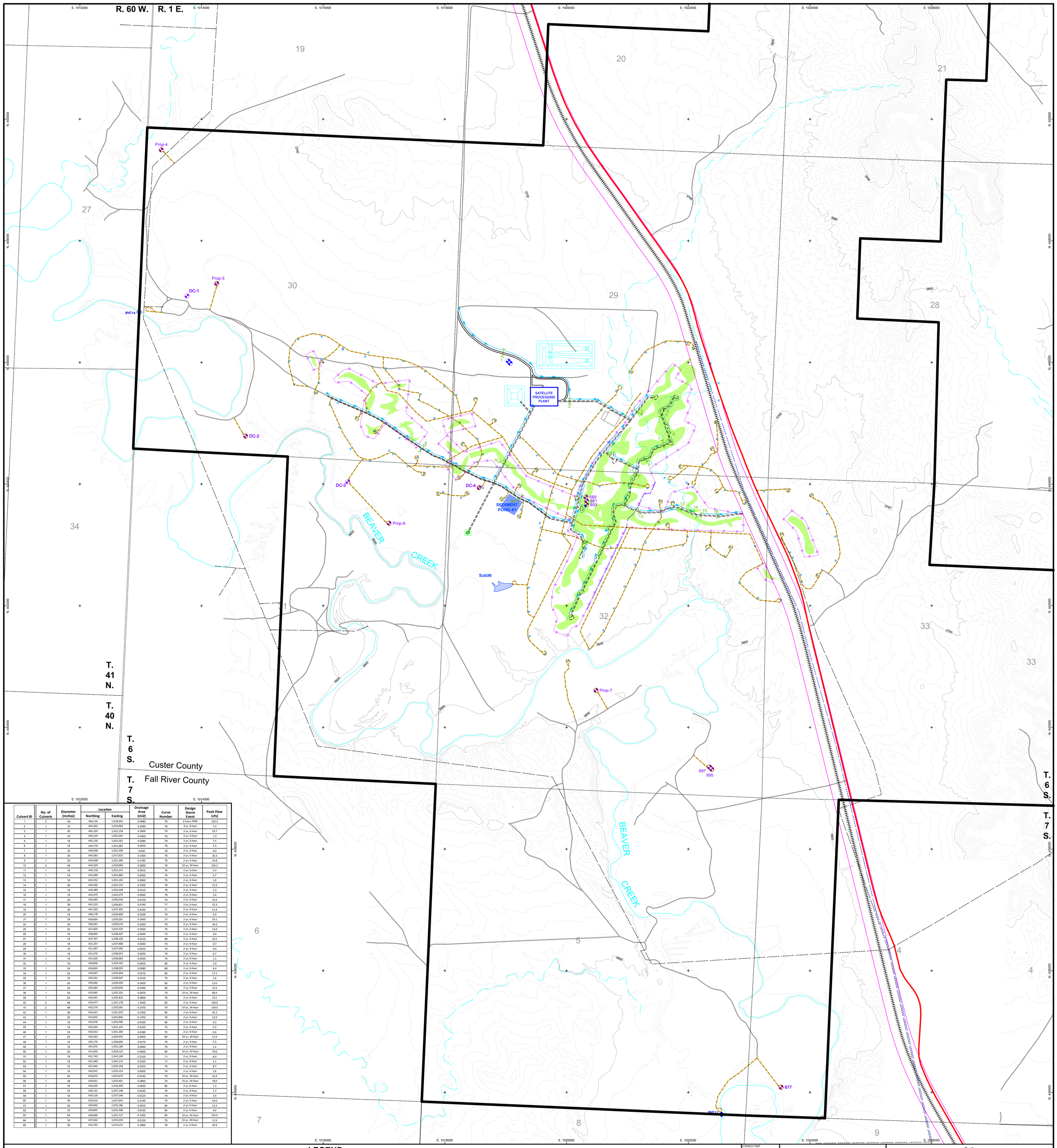
Prior to reclamation, any contamination which resulted from the ISR operation will be cleaned to NRC-approved standards and the contaminated material disposed offsite at an appropriately permitted facility.

Access roads will be reclaimed by removing imported road surfacing material and ripping road surfaces and shallow subsoil to loosen the subsoil. Culverts will be removed and premining drainages re-established. Any spoil temporarily stockpiled during access road construction will be replaced. Access road areas will be graded to approximate premining contours. Topsoil will be replaced in a uniform manner and the area revegetated.

Access roads will be reclaimed when they are no longer needed. Well field access roads will be reclaimed during reclamation of each well field unless they are used to access other well fields or monitoring locations. The primary access roads will be reclaimed during the CPP and main facility decommissioning phase shown on Figure 5.2-1. The expected duration of access road reclamation is less than 1 year for each access road, but may occur over several years due to phased well field decommissioning/reclamation.

6.4.3.4 Revegetation Methods and Final Seed Mix

The permanent seed mixture for the rangeland reclamation type is presented in Table 6.4-1. Per DENR regulations, the seed mix has been chosen to be compatible with the postmining rangeland use. The local conservation district, landowners and DENR were consulted when selecting the seed mix (Appendices 6.4-A and 6.4-B). To reduce wind and water erosion, topsoil stockpiles and other various temporary disturbances in the well field area will be seeded. The temporary seed mix is the same as the permanent seed mixture.



Culvert ID	No. of Culverts	Diameter (inches)	Location		Drainage Area (mi2)	Curve Number	Design Storm Event	Peak Flow (cfs)
			Northing	Easting				
1	2	48	446,156	1,018,955	0.0980	78	6-hour, PMP	232.5
2	1	18	445,362	1,019,903	0.0390	78	2-yr, 6-hour	7.5
3	1	30	445,193	1,021,159	0.2600	78	2-yr, 6-hour	25.7
4	1	18	445,219	1,021,591	0.0360	78	2-yr, 6-hour	7.3
5	1	18	445,330	1,021,561	0.0380	78	2-yr, 6-hour	7.5
6	1	18	444,779	1,021,682	0.0070	78	2-yr, 6-hour	2.5
7	1	18	444,638	1,021,599	0.050	78	2-yr, 6-hour	8.9
8	1	30	444,583	1,017,625	0.1920	78	2-yr, 6-hour	26.3
9	1	30	444,408	1,021,286	0.2780	78	2-yr, 6-hour	24.8
10	2	48	444,329	1,018,969	0.2890	78	10-yr, 24-hour	156.2
11	1	18	444,158	1,021,147	0.0010	78	2-yr, 6-hour	0.3
12	1	18	443,589	1,021,883	0.0020	78	2-yr, 6-hour	0.7
13	1	18	443,552	1,021,181	0.0060	78	2-yr, 6-hour	1.8
14	1	30	443,502	1,022,115	0.3930	78	2-yr, 6-hour	31.5
15	1	18	443,489	1,022,208	0.0110	78	2-yr, 6-hour	3.3
16	1	18	443,473	1,022,479	0.0030	78	2-yr, 6-hour	1.0
17	1	24	442,065	1,036,536	0.0750	79	2-yr, 6-hour	19.2
18	1	36	441,555	1,036,817	0.4740	77	2-yr, 6-hour	52.3
19	1	36	441,593	1,037,291	0.4430	77	2-yr, 6-hour	51.9
20	1	18	440,178	1,036,606	0.0200	79	2-yr, 6-hour	6.4
21	1	24	439,664	1,029,261	0.3640	21	2-yr, 6-hour	16.1
24	1	30	438,261	1,036,514	0.3020	78	2-yr, 6-hour	34.6
25	1	24	431,825	1,031,535	0.0560	79	2-yr, 6-hour	14.0
26	1	18	438,903	1,028,427	0.0440	73	2-yr, 6-hour	4.0
27	1	18	437,707	1,038,102	0.0150	88	2-yr, 6-hour	10.5
28	1	18	431,357	1,037,468	0.0020	79	2-yr, 6-hour	0.7
29	1	18	431,467	1,037,992	0.0010	79	2-yr, 6-hour	0.4
30	1	18	431,570	1,038,447	0.0020	79	2-yr, 6-hour	0.7
31	1	18	431,629	1,038,683	0.0030	79	2-yr, 6-hour	1.1
32	1	18	429,856	1,034,742	0.0050	80	2-yr, 6-hour	2.0
33	1	18	436,820	1,038,059	0.0080	88	2-yr, 6-hour	6.4
34	1	24	435,607	1,034,264	0.0570	80	2-yr, 6-hour	17.3
35	1	18	435,541	1,030,947	0.0120	76	2-yr, 6-hour	1.6
36	1	24	435,002	1,034,429	0.0450	80	2-yr, 6-hour	13.0
37	1	24	434,584	1,034,656	0.0440	80	2-yr, 6-hour	12.4
38	1	42	433,965	1,035,323	0.0870	79	10-yr, 24-hour	68.4
39	1	24	433,921	1,035,815	0.0800	79	2-yr, 6-hour	19.5
40	2	48	433,677	1,031,178	1.4420	80	2-yr, 6-hour	128.9
41	2	48	433,579	1,035,042	0.2470	79	10-yr, 24-hour	159.9
42	1	36	433,421	1,031,219	0.3350	80	2-yr, 6-hour	45.2
43	1	30	433,054	1,035,846	0.1970	79	2-yr, 6-hour	33.9
44	1	18	433,076	1,042,599	0.0100	68	2-yr, 6-hour	0.2
45	1	18	432,934	1,031,145	0.0120	70	2-yr, 6-hour	0.5
46	1	18	432,612	1,031,269	0.0180	70	2-yr, 6-hour	0.6
47	1	24	432,442	1,034,455	0.0050	80	10-yr, 24-hour	11.9
48	1	18	432,176	1,038,696	0.0170	79	2-yr, 6-hour	5.5
49	1	18	431,972	1,031,184	0.0040	79	2-yr, 6-hour	1.4
50	1	42	431,835	1,034,135	0.0660	80	10-yr, 24-hour	70.6
51	1	18	431,749	1,041,149	0.2120	71	2-yr, 6-hour	8.9
52	1	18	431,469	1,042,112	0.0320	71	2-yr, 6-hour	2.1
53	1	18	431,044	1,032,109	0.0310	79	2-yr, 6-hour	8.7
54	1	18	430,912	1,033,123	0.0050	79	2-yr, 6-hour	1.8
55	1	24	430,874	1,033,474	0.0140	79	10-yr, 24-hour	10.4
56	1	48	430,851	1,033,461	0.0860	79	10-yr, 24-hour	78.0
57	1	18	430,205	1,036,309	0.0030	80	2-yr, 6-hour	1.3
58	1	18	430,121	1,037,148	0.0240	79	2-yr, 6-hour	7.7
59	1	18	430,126	1,037,546	0.0120	79	2-yr, 6-hour	3.9
60	1	36	429,916	1,037,943	0.2140	79	2-yr, 6-hour	43.0
61	1	24	429,902	1,035,186	0.0410	80	2-yr, 6-hour	12.4
62	1	18	429,845	1,035,598	0.0130	80	2-yr, 6-hour	4.6
63	1	54	428,900	1,031,717	0.1050	80	10-yr, 24-hour	105.9
64	1	18	427,662	1,031,033	0.0130	78	10-yr, 24-hour	11.9
65	1	36	443,763	1,019,231	0.3800	78	2-yr, 6-hour	39.9

LEGEND

- PERMIT BOUNDARY
- COUNTY ROAD
- EXISTING ROAD
- PROPOSED PRIMARY ACCESS ROAD
- PROPOSED SECONDARY ACCESS ROAD
- PROPOSED LIGHT USE ROAD
- RAILROAD
- APPROXIMATE RAILROAD RIGHT-OF-WAY
- PERENNIAL STREAM CHANNEL
- EPHEMERAL STREAM CHANNEL
- PROPOSED ROAD DITCH
- PROPOSED OVERHEAD POWER
- EXISTING BLACK HILLS ELECTRIC
- PROPOSED WELL FIELD FENCE
- PROPOSED CULVERT
- ORE BODY
- FACILITY POND
- STAGING AREA
- MONITOR WELL
- MADISON WELL
- STREAM MONITORING LOCATION
- DEEP DISPOSAL WELL (SEE NOTE)
- PERIMETER MONITOR WELL
- EXISTING IMPOUNDMENT TO BE MONITORED

This plate is provided to fulfill the requirements of ARSD 74:29:07:12.

Note: This plate will be updated in the event that land application is used.

N

C.I. = 10'
Feet
0 125 250 500 750 1,000
0 62.5 125 250
Meters

CONSULTANT
WWC ENGINEERING

REVISIONS

#	DRAWN	CHECKED	APPROVED	DATE

REF

CHECK SCALES
If this bar does not measure 1 inch this map is not at its original scale

36" x 42"

SIGNATURE OF PREPARER

PLOT DATE 8 January 2013 | DATE 8 January 2013
DRAWN DAVE C. JOHNSON | PDF FILE
PREPARER DALE E. BROWN | CAD FILE K:\Powertech\11270\DWGS\ACCESS_ROADS.dwg
COORDS NAD 27, South Dakota State Plane South (feet)

POWERTECH (USA) INC.

Plate 5.3-5

Sheet 1 of 2

Access Roads

Dewey-Burdock Project

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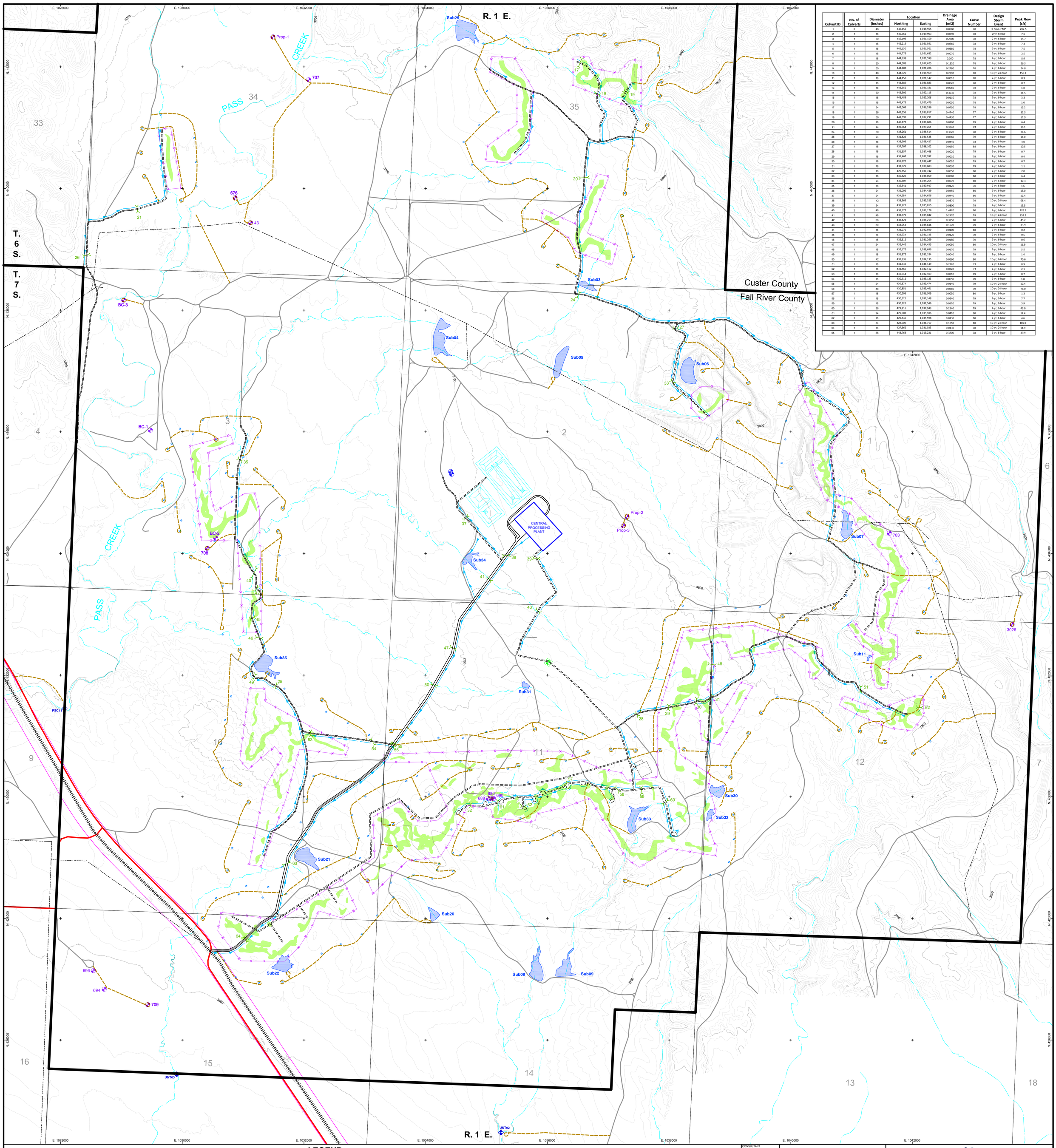

Culvert ID	No. of Culverts	Diameter (inches)	Location		Drainage Area (mi2)	Curve Number	Design Storm Event	Peak Flow (cfs)
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6	1	18	444,779	1,021,682	0.0070	78	2-yr, 6-hour	2.5
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15	1	18	443,489	1,022,208	0.0110	78	2-yr, 6-hour	3.3
16	1	18	443,473	1,022,479	0.0030	78	2-yr, 6-hour	1.0
17	1	24	442,065	1,036,536	0.0750	79	2-yr, 6-hour	19.2
18	1	36	441,555	1,036,817	0.4740	77	2-yr, 6-hour	52.3
19	1	36	441,593	1,037,291	0.4430	77	2-yr, 6-hour	51.9
20	1	18	440,178	1,036,606	0.0200	79	2-yr, 6-hour	6.4
21	1	24	439,664	1,029,261	0.3640	21	2-yr, 6-hour	16.1
24	1	30	438,261	1,036,514	0.3020	78	2-yr, 6-hour	34.6
25	1	24	431,825	1,031,535	0.0560	79	2-yr, 6-hour	14.0
26	1	18	438,903	1,028,427	0.0440	73	2-yr, 6-hour	4.0
27	1	18	437,707	1,038,102	0.0150	88	2-yr, 6-hour	10.5
28	1	18	431,357	1,037,468	0.0020	79	2-yr, 6-hour	0.7
29	1	18	431,467	1,037,992	0.0010	79	2-yr, 6-hour	0.4
30	1	18	431,570	1,038,447	0.0020	79	2-yr, 6-hour	0.7
31	1	18	431,629	1,038,683	0.0030	79	2-yr, 6-hour	1.1
32	1	18	429,856	1,034,742	0.0050	80	2-yr, 6-hour	2.0
33	1	18	436,820	1,038,059	0.0080	88	2-yr, 6-hour	6.4
34	1	24	435,607	1,034,264	0.0570	80	2-yr, 6-hour	17.3
35	1	18	435,541	1,030,947	0.0120	76	2-yr, 6-hour	1.6
36	1	24	435,002	1,034,429	0.0450	80	2-yr, 6-hour	13.0
37	1	24	434,584	1,034,656	0.0440	80	2-yr, 6-hour	12.4
38	1	42	433,965	1,035,323	0.0870	79	10-yr, 24-hour	68.4
39	1	24	433,921	1,035,815	0.0800	79	2-yr, 6-hour	19.5
40	2	48	433,677	1,031,178	1.4420	80	2-yr, 6-hour	128.9
41	2	48	433,579	1,035,042	0.2470	79	10-yr, 24-hour	159.9
42	1	36	433,421	1,031,219	0.3350	80	2-yr, 6-hour	45.2
43	1	30	433,054	1,035,846	0.1970	79	2-yr, 6-hour	33.9
44	1	18	433,076	1,042,599	0.0100	68	2-yr, 6-hour	0.2
45	1	18	432,934	1,031,145	0.0120	70	2-yr, 6-hour	0.5
46	1	18	432,612	1,031,269	0.0180	70	2-yr, 6-hour	0.6
47	1	24	432,442	1,034,455	0.0050	80	10-yr, 24-hour	11.9
48	1	18	432,176	1,038,696	0.0170	79	2-yr, 6-hour	5.5
49	1	18	431,972	1,031,184	0.0040	79	2-yr, 6-hour	1.4
50	1	42	431,835	1,034,135	0.0660	80	10-yr, 24-hour	70.6
51	1	18	431,749	1,041,149	0.2120	71	2-yr, 6-hour	8.9
52	1	18	431,469	1,042,112	0.0320	71	2-yr, 6-hour	2.1
53	1	18	431,044	1,032,109	0.0310	79	2-yr, 6-hour	8.7
54	1	18	430,912	1,033,123	0.0050	79	2-yr, 6-hour	1.8
55	1	24	430,874	1,033,474	0.0140	79	10-yr, 24-hour	10.4
56	1	48	430,851	1,033,461	0.0860	79	10-yr, 24-hour	78.0
57	1	18	430,205	1,036,309	0.0030	80	2-yr, 6-hour	1.3
58	1	18	430,121	1,037,148	0.0240	79	2-yr, 6-hour	7.7
59	1	18	430,126	1,037,546	0.0120	79	2-yr, 6-hour	3.9
60	1	36	429,916	1,037,943	0.2140	79	2-yr, 6-hour	43.0
61	1	24	429,902	1,035,186	0.0410	80	2-yr, 6-hour	12.4
62	1	18	429,845	1,035,598	0.0130	80	2-yr, 6-hour	4.6
63	1	54	428,900	1,031,717	0.1050	80	10-yr, 24-hour	105.9
64	1	18	427,642	1,031,033	0.0130	78	10-yr, 24-hour	11.9
65	1	36	443,763	1,019,231	0.3800	78	2-yr, 6-hour	39.9

LEGEND

- PERMIT BOUNDARY
- COUNTY ROAD
- EXISTING ROAD
- PROPOSED PRIMARY ACCESS ROAD
- PROPOSED SECONDARY ACCESS ROAD
- PROPOSED LIGHT USE ROAD
- RAILROAD
- APPROXIMATE RAILROAD RIGHT-OF-WAY
- PERENNIAL STREAM CHANNEL
- EPHEMERAL STREAM CHANNEL
- PROPOSED ROAD DITCH
- PROPOSED OVERHEAD POWER
- EXISTING BLACK HILLS ELECTRIC
- PROPOSED WELL FIELD FENCE
- PROPOSED CULVERT
- ORE BODY
- FACILITY POND
- STAGING AREA
- MONITOR WELL
- MADISON WELL
- STREAM MONITORING LOCATION
- DEEP DISPOSAL WELL (SEE NOTE)
- PERIMETER MONITOR WELL
- EXISTING IMPOUNDMENT TO BE MONITORED

This plate is provided to fulfill the requirements of ARSD 74:29:07:12.

Note: This plate will be updated in the event that land application is used.

C.I. = 10'
Feet
0 125 250 500 750 1,000
0 62.5 125 250
Meters

CONSULTANT
WWC ENGINEERING

REVISIONS

#	DRAWN	CHECKED	APPROVED	DATE

REF

CHECK SCALES
If this bar does not measure 1 inch this map is not at its original scale

36" x 42"

SIGNATURE OF PREPARER

PLOT DATE 8 January 2013 | DATE 8 January 2013
DRAWN DAVE C. JOHNSON | PDF FILE
PREPARER DALE E. BROWN | CAD FILE K:\Powertech\11270\DWGS\ACCESS_ROADS.dwg
COORDS NAD 27, South Dakota State Plane South (feet)

POWERTECH (USA) INC.

Sheet 2 of 2

Plate 5.3-5

Access Roads

Dewey-Burdock Project

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Township 7S, Range 1E, Fall River County, SD
Black Hills Meridian

Legal Description		Area (acres)	Surface Owner(s)	Mineral Owner(s)
Section 1	All	640	Daniel Properties, LLC	BLM Minerals
Section 2	All	640	Daniel Properties, LLC	Daniel Properties, LLC
Section 3	N½; SW¼; N½SE¼; SW¼SE¼	600	Donald and Pat Spencer	Donald and Pat Spencer
	SE¼SE¼	40	BLM	BLM Minerals
Section 4	W½W½	160	Putnam & Putnam, LLP	Putnam & Putnam, LLP
Section 5	All	640	Putnam & Putnam, LLP	Putnam & Putnam, LLP
Section 10	NE¼; W½SE¼; E½SW¼; SW¼NW¼SW¼; SW¼SW¼ minus 3.97 ac in NE portion	366.03	Peterson & Son, Inc.	Peterson & Son, Inc. Black Stone Minerals Company, LP Jean Swirczynski Roy Guess
	NW¼NW¼SW¼	10	TerraTecTonics Corporation	TerraTecTonics Corporation
	E½NW¼SW¼ minus lots in southern portion (1.44 ac)	18.56	Donald and Lynda Andersen	Donald and Lynda Andersen
	14 lots in southern portion of E½NW¼SW¼; 3.97 ac in NE portion of SW¼SW¼	5.1	Kathleen Stritar	Kathleen Stritar
	4 lots in southern portion of E½NW¼SW¼	0.31	Clifford James Lovell and Patricia C. Johnson	Clifford James Lovell and Patricia C. Johnson
	N½NW¼	80	Donald and Pat Spencer	Steven and Elizabeth Laesch Roger C. and Jeanette R. Laesch Christopher and Kelly Ann Viel Rev. Norman and Joyce Laesch Carol A. Laesch Barbara Jacqueline S. Laesch Ellison Frederick and Marilyn Laesch Helen L. and Carl Leroy Kellberg Rev. Richard and Irene L. Mueller William J. Laesch Allen G. and Barbara B. Wilson
	S½NW¼	80	Donald and Pat Spencer	Donald and Pat Spencer
	NE¼SE¼	40	BLM	BLM Minerals

APPENDIX 5.6-C

Conceptual Spill Contingency Plan

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Conceptual Spill Contingency Plan
Dewey-Burdock Project

COVER

The spill contingency plan will be organized with a cover page that includes the following:

Title:	Dewey-Burdock Project Spill Contingency Plan
Original preparation date:	To be determined (TBD)
Revision date:	TBD
Preparer:	TBD
Title of preparer:	TBD

1.0 INTRODUCTION

This section will describe the purpose of the spill contingency plan, which is to describe the spill prevention, containment, response, cleanup, recordkeeping, and reporting procedures for the Dewey-Burdock Project. It will describe how the spill response and reporting procedures will depend on the type and quantity of chemical or solution released and the location of the release. It will cross reference the emergency response plan that will be prepared and made available for regulatory inspection prior to operations.

2.0 EMERGENCY CONTACTS

This section will list contact information for local, state, and federal emergency response officials. Names and telephone numbers for spill response contractors and Powertech (USA) Inc. spill response personnel also will be provided. Example emergency contacts include:

- Powertech (USA) Inc. personnel
  - Facility manager
  - Vice President of Environmental Health & Safety
  - Radiation safety officer (RSO)
  - Radiation safety technicians (RSTs)
- Local contacts
  - Emergency medical, fire and law enforcement - 911
  - Hospitals and healthcare facilities
  - County emergency management offices - Custer and Fall River Counties
- State contacts
  - DENR
  - SDGF&P
- Federal contacts
  - NRC
  - EPA
  - BLM

  - USDOT
  - USFWS
  - USFS
- Spill and/or emergency response contractors

3.0 SITE LOCATION AND TRANSPORTATION ROUTES

This section will include a project location map and maps of the major routes for transporting chemicals to and from the site. Example transportation routes include:

- Shipment of uranium-loaded resin from the Dewey satellite facility to the Burdock CPP
- Shipment of uranium-loaded resin to and from the permit area (either to another CPP or from another satellite facility, if applicable)
- Shipment of yellowcake to a conversion facility in Metropolis, Illinois or Port Hope, Ontario, Canada
- Shipment of 11e.(2) byproduct material to a licensed disposal facility (e.g., the White Mesa site in Blanding, Utah)
- Shipment of used oil and hazardous waste to a recycling or disposal facility

This section also will describe the proximity of chemical storage areas, ponds, and pipelines to the nearest water(s) of the state as defined in ARSD 74:51 and ARSD 74:54.

4.0 APPLICABLE PERMITS AND LICENSES

This section will list all permits and licenses applicable to the spill contingency plan. For each applicable permit/license, the name, issuing agency, description, and relevant spill contingency conditions and requirements will be listed. Example permits/licenses include:

- Construction and industrial NPDES permits issued by DENR, which will include best management practices to prevent surface water contamination in the event of a spill or leak and will include reporting requirements for spills of petroleum products or hazardous chemicals
- Specific permit conditions included in the large scale mine permit issued by DENR
- Specific permit conditions included in the groundwater discharge permit issued by DENR, including the requirement to report within 24 hours any spill, leak, or accidental release which threatens a water of the state in accordance with ARSD 74:54:02:25
- NRC license conditions related to spills and leaks
- EPA Class III and V UIC permit conditions related to excursions with potential to impact nearby USDWs

5.0 MATERIAL INVENTORY

This section will include a table listing process-related chemicals, other chemicals stored or used at the site (e.g., petroleum products and small quantities of hazardous materials), and solutions

with potential for unplanned releases (e.g., process wastewater, production and restoration solutions in well field pipelines, treated wastewater in pipelines and land application areas, etc.). For each chemical or solution, the table will list the quantity and location stored or used on-site. This section also will include maps showing the locations where each chemical or solution is stored or used and the locations of spill response kits.

6.0 SPILL PREVENTION BEST MANAGEMENT PRACTICES

This section will describe the best management practices (BMPs) that will be used to prevent, monitor, and contain spills and leaks. Example BMPs include:

- Engineering controls such as secondary containment curbs, sumps, leak detection systems, pond liners, etc.
- Standard operating procedures (SOPs) for inspections, maintenance and monitoring to prevent major pond, tank or pipeline failures; SOPs for preventing transportation accidents; etc.
- Employee training requirements including training frequency and topics (i.e., procedures for spill prevention, containment, response and cleanup)
- Required spill contingency plan reviews and updates

7.0 SPILL RESPONSE AND CLEANUP PROCEDURES

This section will describe spill response procedures and personnel roles and responsibilities for each chemical or solution that may be spilled or leaked. It will describe chemical handling procedures and hazards, emergency spill response procedures, and the actions necessary to clean up affected areas once initial emergency response actions have been taken.

8.0 REPORTING AND RECORDKEEPING

This section will summarize the reporting requirements, including minimum reportable quantities and reporting timeframes, for each chemical and solution identified in the material inventory. This includes immediate notification requirements, typically within 4 to 24 hours, of any spill having the potential to affect human health or the environment, and written reporting requirements. This section also will identify documentation requirements for spills, leaks or accidental releases. Each spill report is anticipated to include:

- The date, time and location of the spill
- The type and volume of chemical or solution released
- The name, address and telephone number of the spill report preparer and the person responsible for reporting the spill (if applicable)
- The cause or suspected cause of the spill
- The total activity of each radionuclide released (if applicable)
- An explanation of the response actions taken
- An evaluation of the effectiveness of response and cleanup activities

- The immediate known impacts of the spill, including an evaluation of whether a water of the state was impacted or had the potential to be impacted
- A list of agencies notified and an evaluation of reporting criteria
- Copies of sampling results to determine the extent or severity of the spill or effectiveness of cleanup (if applicable)
- Recommendations for preventing recurrence.

9.0 MISCELLANEOUS

Additional information anticipated to be included in the spill contingency plan includes:

- Inventory of spill response equipment
- Spill reporting forms
- Employee training records
- Records of reviews and updates to the spill contingency plan

POWERTECH (USA) INC.

INSTRUMENT OF CONSULTATION (Page 1 of 1)

Part 1. LANDOWNER NAME, ADDRESS AND PROPERTY DESCRIPTION

Surface Owner:	Custer County Roads
Mailing Address:	
Legal Description of Property within Permit Boundary:	County Road Right of Way from the southeastern part of the Dewey-Burdock project to the northwestern part of the project.

Part 2. POST-MINING LAND USE

Proposed Post-Mining Land Use:	Rangeland
As the owner(s) of the property described, I/we have conferred with Powertech (USA) Inc. regarding the proposed post-mining land use and have determined that it is acceptable to me/us (ARSD 74:29:06:01).	
Signature(s):	X
Date:	12-20-12

Part 3. RECLAMATION SEED MIXTURE

Proposed Seed Mix developed by the Natural Resource Conservation Service (NRCS) in Hot Springs, South Dakota March 7, 2012:	Species	Pounds (pure live seed per acre)*
	Western Wheatgrass	1.94
	Sideoats Grama	1.45
	Slender Wheatgrass	1.41
	Green Needlegrass	1.43
	Little Bluestem	0.92
	Total	7.16
	*Seed mix is for "drill" seeding application. If mix is broadcasted, the seeding rate will be increased by 2.5 times.	
As the owner(s) of the property described, I/we have reviewed the proposed reclamation seed mix and find that it is acceptable to me/us (SDCL 45-68-39).		
Signature(s):	X	
Date:	12-20-12.	

POWERTECH (USA) INC.

INSTRUMENT OF CONSULTATION (Page 1 of 1)

Part 1. LANDOWNER NAME, ADDRESS AND PROPERTY DESCRIPTION

Surface Owner:	Fall River County Roads
Mailing Address:	
Legal Description of Property within Permit Boundary:	County Road Right of Way from the southeastern part of the Dewey-Burdock project to the northwestern part of the project.

Part 2. POST-MINING LAND USE

Proposed Post-Mining Land Use:	Rangeland
As the owner(s) of the property described, I/we have conferred with Powertech (USA) Inc. regarding the proposed post-mining land use and have determined that it is acceptable to me/us (ARSD 74:29:06:01).	
Signature(s):	X Michael A. Oates
Date:	12/6/12

Part 3. RECLAMATION SEED MIXTURE

Proposed Seed Mix developed by the Natural Resource Conservation Service (NRCS) in Hot Springs, South Dakota March 7, 2012:	Species	Pounds (pure live seed per acre)*
	Western Wheatgrass	1.94
	Sideoats Grama	1.45
	Slender Wheatgrass	1.41
	Green Needlegrass	1.45
	Little Bluestem	0.91
	Total	7.16
	*Seed mix is for "drill" seeding application. If mix is broadcasted, the seeding rate will be increased by 2.5 times.	
As the owner(s) of the property described, I/we have reviewed the proposed reclamation seed mix and find that it is acceptable to me/us (SDCL 45-6B-39).		
Signature(s):	X Michael A. Oates	
Date:	12/6/12	