5.6.3.1.5 Potential Subsidence in ISR Well Fields

There is no potential for subsidence in the ISR well fields due to limited drawdown in the ore zone and other aquifers and due to the nature of uranium ISR, which does not affect the structural integrity of the ore zone sands. Refer to Section 5.6.3.1.2 and Appendix 5.6-A, which describe how potential drawdown in the Inyan Kara aquifer will be limited, and the potentiometric water level is anticipated to recover to pre-ISR levels rapidly after the end of ISR activities. Section 5.6.3.1.2 also describes how potential drawdown in the Madison Limestone will be only a small portion of the confining pressure above the top of the Madison.

The following information from the ISR GEIS addresses subsidence potential in ISR well fields in the Nebraska-South Dakota-Wyoming Uranium Milling Region, which includes the proposed permit area (NRC, 2009, Section 4.4.3.2):

> "The removal of uranium mineral coatings on sediment grains in the target sandstones during the uranium mobilization and recovery process will result in a change to the mineralogical composition of uranium-producing formations. However, the uranium mobilization and recovery process in the target sandstones does not result in the removal of rock matrix or structure, and therefore no significant matrix compression or ground subsidence is expected. In addition, the source formations for uranium in the Nebraska-South Dakota-Wyoming Milling Region occur at depths of tens to hundreds of meters [hundreds of feet] ... and individual mineralization fronts are typically 0.6 to 7.5 m [2 to 25 ft] thick ... At these depths and thicknesses and considering that rock matrix is not removed during the uranium mobilization and recovery process, it is unlikely that collapse in the target sandstones would be translated to the ground surface. Therefore, impacts to geology from ground subsidence would be expected to be SMALL."

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 and corrective actions for excursions 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.

Mitigation of Potential Impacts to Water Supply Wells

The following procedures will be followed to evaluate and mitigate potential impacts to water supply wells. During the design of each well field, all nearby water supply wells will be evaluated for the potential to be impacted by ISR operations or the potential to interfere with ISR operations. If needed, this evaluation also will include groundwater modeling. The results of the evaluation will be contained within a well replacement plan described in the hydrogeologic data package for each well field (refer to Section 5.3.3.4).

At a minimum, all domestic wells within the permit area will be removed from drinking water use and all stock wells within ¼ mile of well fields will be removed from private use. Depending on the well construction, location and screen depth, Powertech (USA) may continue to use the well for monitoring or plug and abandon the well.

The well owner will be notified in writing prior to removing any well from private use. Powertech (USA) will work with the well owner to determine whether a replacement well or alternate water supply is needed.

Section 5.5.2 describes the operational groundwater monitoring plan that will be used to assess potential impacts to domestic, livestock and irrigation wells. The monitor well ring will provide advance warning before any wells outside the ring have potential to be impacted. If routine monitoring of a water supply well indicates diminished water quantity or quality, the well owner will be notified in writing and the well will be removed from use. Powertech (USA) will work with the well owner to determine if well replacement is necessary. Well replacement procedures are described below. The monitoring and well replacement or abandonment procedures to be implemented by Powertech (USA) will assure that there will be no effects on anyone or any water well outside the monitor well ring.

Water Supply Well Replacement Procedures

Replacement wells will be located an appropriate distance from the well fields and will target an aquifer outside of the ore zone that provides water in a quantity equal to that of the original well and of a quality which is suitable for the same uses as the original well, subject to the lease agreement and South Dakota water law.

Lease agreements for the entire permit area currently allow Powertech (USA) to remove and replace the water supply wells as needed. The following is an excerpt from the lease agreements

with each landowner. (Note: all lease agreements formerly held by Denver Uranium have been assigned to Powertech (USA).)

> *DENVER URANIUM shall compensate LESSOR for water wells owned by LESSOR at the execution of this lease, as follows: Any such water which falls within an area to be mined by DENVER URANIUM, shall be removed from LESSOR's use. Prior to removal, DENVER URANIUM shall arrange for the drilling of a replacement water well or wells, outside of the mining area, in locations mutually agreed upon between LESSOR and DENVER URANIUM, as may be necessary to provide water in a quantity equal to the original well and of a quality which is suitable for all uses the original water well served at the time such well was removed from LESSOR's use.*

An example of a replacement well is provided in Figure 5.6-1, which shows use of the project Madison well to supply water by pipeline to local stock tanks.

Excursion Control

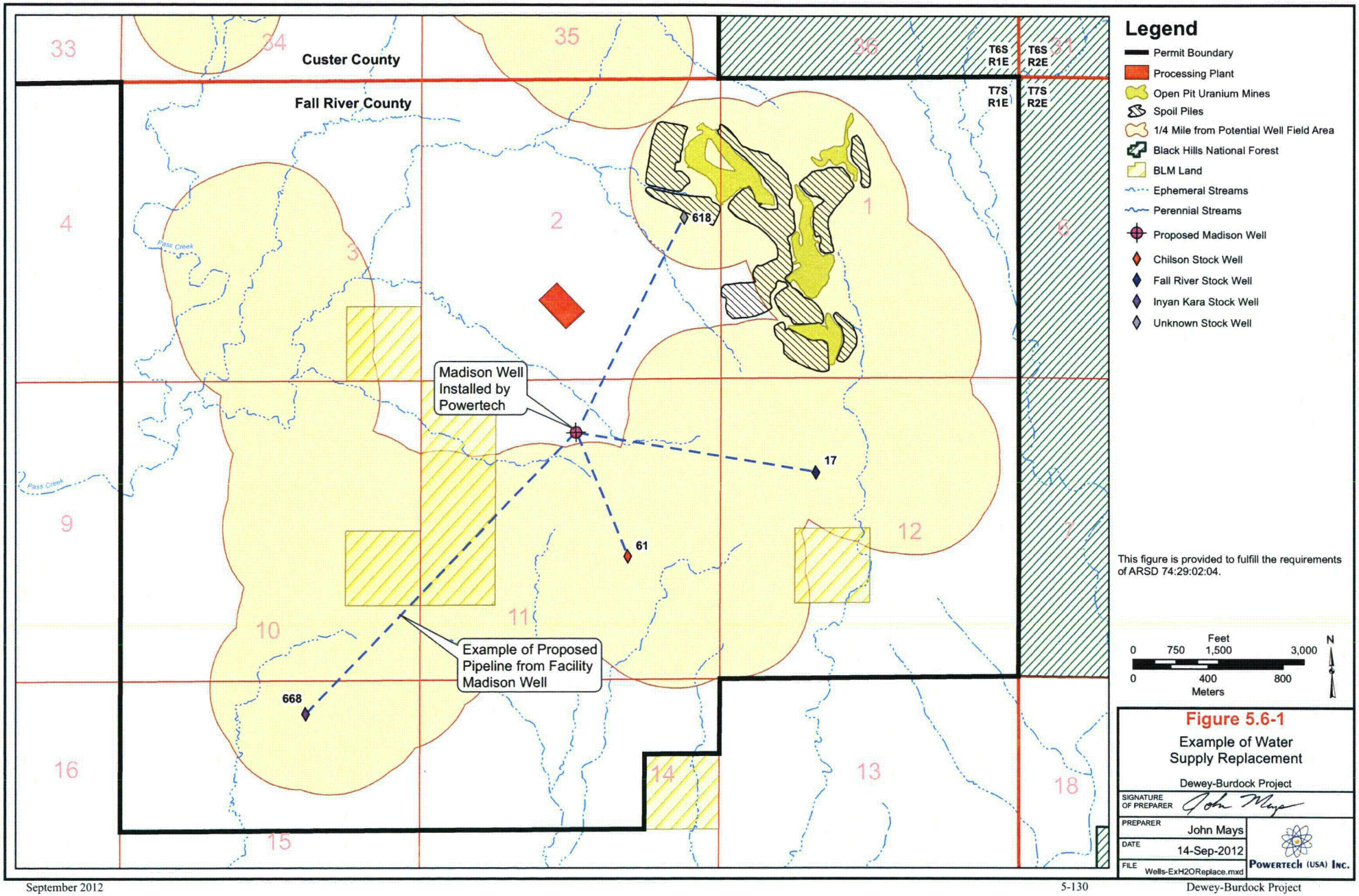
The following mitigation measures will be used to prevent potential horizontal or vertical excursions of ISR solutions.

Pre-operational excursion preventative measures will include, but will not be limited to:

1. Proper well construction and MIT of each well before use;
2. Monitor well design schema based upon delineation drilling to further characterize the zones of mineralization and to identify the target completion zones for all monitor wells; and
3. Pre-operational pumping tests with monitoring systems in place to obtain a detailed understanding of the local hydrogeology and to demonstrate the adequacy of the monitoring system.

Operational excursion preventative measures will include but will not be limited to:

1. Regular monitoring of flow and pressure on each production and injection well;
2. Regular flow balancing and adjustment of all production and injection flows appropriate for each production pattern;
3. Operation of bleed, and continuous measurement of bleed rate;
4. Monitoring hydrostatic water levels in monitor wells to verify the cone of depression; and


Custer County
Fall River County
T6S R1E
T6S R2E
T7S R1E
T7S R2E
Pass Creek
Pass Creek
618
17
61
668
Madison Well Installed by Powertech
Example of Proposed Pipeline from Facility Madison Well
Legend
Permit Boundary
Processing Plant
Open Pit Uranium Mines
Spoil Piles
1/4 Mile from Potential Well Field Area
Black Hills National Forest
BLM Land
Ephemeral Streams
Perennial Streams
Proposed Madison Well
Chilson Stock Well
Fall River Stock Well
Inyan Kara Stock Well
Unknown Stock Well
This figure is provided to fulfill the requirements of ARSD 74:29:02:04.
Feet
0 750 1,500 3,000
0 400 800
Meters
N
Figure 5.6-1
Example of Water Supply Replacement
Dewey-Burdock Project
SIGNATURE OF PREPARER
PREPARER John Mays
DATE 14-Sep-2012
FILE Wells-ExH2OReplace.mxd
POWERTECH (USA) INC.

5. Regular collection of samples from all monitor wells to determine the presence of any indicators of the migration of ISR solutions horizontally or vertically from the production zone.

6. Perform MIT on all wells prior to use and repeat every 5 years.

Monitor wells will be positioned to detect any ISR solutions that may potentially migrate away from the production zone due to an imbalance in well field pressure. The monitoring well detection system described in Section 5.3.3.1.2 is a proven method used at historically and currently operated ISR facilities. Prior to injecting chemicals into each well field, pre-operational pump testing will be conducted to demonstrate hydraulic connection between the production and injection wells and all perimeter monitor wells (see Section 5.3.3.3). The results of the pump testing will be included within the hydrogeologic data packages prepared for each well field as described in Section 5.3.3.4. Additional monitor wells will be installed within overlying and underlying hydrogeologic units. The pre-operational pump testing will demonstrate vertical confinement and hydraulic isolation between the production zone and overlying and underlying units. The monitoring system and operational procedures have proven effective in early detection of potential excursions of ISR solutions for a number of reasons:

- Regular sampling for indicator parameters (such as chloride) that are highly mobile can detect ISR solutions at low levels well before an excursion is created.
- Monitoring hydrostatic water levels in perimeter monitor wells will provide immediate verification of the cone of depression, draw rapid attention in the event of a change, and provide the ability for measurement and implementation of corrective response.
- Bleed will create a cone of depression that will maintain an inward hydraulic gradient toward the well field area.
- The natural groundwater gradient and slow rate of natural groundwater flow is small relative to ISR activities and the induced gradient caused by the production and restoration bleed.

Controls for preventing migration of ISR solutions to overlying and underlying aquifers consist of:

- Regular monitoring of hydrostatic water levels and sampling for analysis of indicator species;
- Routine MIT of all wells on a regular basis (at least every 5 years) to reduce any possibility of casing leakage;
- Completion of MIT on all wells before putting them into service or after work which involves drilling equipment inside of the casing;

- Proper plugging and abandonment of all wells which do not pass MIT or that become unnecessary for use;
- Proper plugging and abandonment of exploration holes with potential to impact ISR operations; and
- Sampling monitor wells located within the overlying and underlying hydrogeologic units on a frequent schedule.

These controls work together to prevent and detect ISR solution migration. Plugging any exploration holes that pose the potential to impact the control and containment of ISR solutions prevents connection of the production zone to overlying and underlying units. The EPA UIC requirements for MIT assure proper well construction, which is the first line of defence for maintaining appropriate pressure without leakage. Sampling the monitor wells will enable early detection of any ISR solutions should an excursion occur.

Excursion Corrective Actions

Powertech (USA) will implement the following corrective action plan for excursions occurring during production or restoration operations. Corrective actions to correct and retrieve an excursion may include but will not be limited to:

- Adjusting the flow rates of the production and injection wells to increase the aquifer bleed in the area of the excursion;
- Terminating injection into the portion of the well field affected by the excursion;
- Installing pumps in injection wells in the portion of the well field affected by the excursion to retrieve ISR solutions;
- Replacing injection or production wells; and
- Installing new pumping wells adjacent to the well on excursion status to recover ISR solutions.

In the event of an excursion, the sampling frequency will be increased to weekly. NRC will be notified within 24 hours by telephone or email and within 7 days in writing from the time an excursion is verified. DENR will be notified in writing within 7 days from the time an excursion is verified. In addition, if the excursion has potential to affect a USDW, EPA will be notified verbally within 24 hours and in writing within 5 days. A written report describing the excursion event, corrective actions taken and the corrective action results will be submitted to all involved regulatory agencies within 60 days of the excursion confirmation.

If wells are still on excursion status when the report is submitted, the report also will contain a schedule for submittal of future reports describing the excursion event, corrective actions taken,

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.

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.

Facilities potentially constructed in the cottonwood gallery riparian zone along Pass Creek include a limited number of access roads, pipelines and utility corridors. Following is a discussion of potential impacts associated with these facilities.

To a limited extent, access roads will be constructed within the cottonwood gallery riparian zone. Most of these roads will be light-use roads (tertiary access roads), which are described in Section 5.3.8 as essentially non-constructed, two-track trails. To the extent possible, existing two-track roads will be used. The route for any new light-use roads that will be required within the cottonwood gallery riparian zone will be selected to minimize impacts to the riparian zone and to minimize erosion.

One secondary access road is planned through the cottonwood gallery riparian zone. This road is depicted on Plate 5.3-5 (Sheet 2) in the NWNW Section 3, T7S, R1E. It is an existing road near a dwelling that crosses Pass Creek and the riparian zone using a well-established route. Since the proposed secondary access road will be an upgrade to an existing road, potential impacts to Pass Creek will be minimized. Powertech (USA) intends to continue to use the existing low-water crossing and not install a bridge or culvert at this location. Erosion control measures described in Section 5.3.9 will be used for any disturbance areas that could contribute sediment to Pass Creek.

The plant-to-plant pipeline(s), if constructed, will cross the riparian zone near the existing low-water crossing. In addition, a utility corridor consisting of an overhead power line and buried pipeline is planned across the Pass Creek riparian zone in the SESW Section 34, T6S, R1E (refer to Plate 5.3-1, Sheet 2). The pipeline and utility routes through the riparian zone will be selected to minimize potential impacts. The Pass Creek pipeline crossings will be trenched or bored. Mitigation measures to minimize impacts will include use of sediment control measures, avoiding construction during early spring while runoff from snowmelt is occurring, and complying with applicable U.S. Army Corps of Engineers permitting requirements.

Disturbance to the cottonwood gallery riparian zone will be relatively small due to the limited number of utility crossings and use of existing roads. Special care will be taken in this area to control sediment. During construction, silt fences, straw beds, and other sediment control measures will be used to minimize any potential water quality impacts.

5.6.4.1.3 Potential Impacts to Wetlands

The majority of the potential wetlands in the permit area occur along Beaver Creek and Pass Creek. Potential well field areas all occur away from Beaver Creek and Pass Creek, and potential wetlands along Beaver Creek and Pass Creek will not be impacted by construction activities. The remaining potential wetlands are dispersed throughout the permit area as small depressions and ponds, historical mine pits, and an area around a flowing artesian well. The wetlands within the historical mine pits are not planned to be disturbed. There may be some encroachment impacts to small, depressional wetland areas.

Construction, operation, or reclamation activities, which cause disturbance or impacts to jurisdictional wetlands, will be performed in accordance with appropriate Nationwide Permits issued by the U.S. Army Corps of Engineers, if applicable. These may include Nationwide Permit (NWP) 44 non-coal mining activities, which requires Pre-construction Notification (PCN) for all activities, NWP 12 utility line activities, which requires PCN for an area where a Section 10 permit is required, discharges that result in the loss of >0.1 acre, and NWP 14 linear transportation projects, which requires a PCN for 0.5 acre in non-tidal waters. NWP 44 has an acreage limit of 0.5 acre for Waters of the U.S. (WoUS). NWP 12 and 14 also have 0.5-acre disturbance limits. Impacts to Other Waters of the U.S. (OWUS) are not considered under the acreage limit. Appendix 3.8-B contains the USACE jurisdictional determination for the permit area.

5.6.4.1.4 Potential Surface Water Quality Impacts from Leaks or Spills

Potential surface water quality impacts from leaks or spills are addressed in Section 5.6.5.1. Mitigation measures are described in Section 5.6.5.2.

5.6.4.2 Mitigation of Potential Surface Water Impacts

The following procedures will be used to minimize the potential impacts to surface waters.

- Minimize disturbance of surface areas and vegetation which, in turn, will minimize erosion and runoff rates.
- Minimize physical changes to drainage channels unless changes are made to upgrade drainage.
- Use erosion and runoff control features such as proper placement of pipe, grading to direct runoff away from water bodies, and use of riprap (broken rock and/or concrete) at these intersections to make bridges or culverts more effective, if necessary.

- 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.

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.

Failure of a process vessel, tank, or pipeline within the CPP or Satellite Facility will be contained within the building via concrete containment curbs and directed into a sump (equipped with a level alarm) that will transport the solution the appropriate tank or disposal system. The concrete containment curb for the CPP has been designed to contain the entire contents of the two largest liquid-containing vessels (yellowcake thickeners) in the extremely unlikely event that both vessels should fail simultaneously and spill their entire contents. The sumps will provide additional temporary containment capacity such that the total containment capacity of curbs and sumps will be greater than 200% of the largest liquid-containing tank or vessel in the CPP. The Satellite Facility similarly will have a curb and sump system that together will provide approximately 350% of the volume of the largest liquid-containing vessel or tank (utility water tank).

The design of the CPP and Satellite Facility will be such that any spill will be contained within the respective building, regardless of sump pump operation. In the event of a total electrical failure, such that no pumps would be operational, a spill due to a vessel failure would be contained within the building in which the vessel failure occurred.

Chemical storage areas adjacent to the CPP will be provided with secondary containment as discussed in Section 5.3.1.

5.6.5.1.3 Transportation Vehicles

An accident involving transportation vehicles within or to and from the permit area could potentially release pollutants to the environment. Transportation vehicles will include, but are not limited to: vehicles delivering bulk chemical products, transport of uranium-loaded resin from the Satellite Facility or another satellite facility to the CPP, transport of solid 11e.(2) byproduct material from the project site to an approved disposal site, or transport of dried yellowcake product from the CPP.

Chemicals and products delivered to or transported from the permit area will be transported in accordance with all applicable federal and state regulations. As part of Powertech (USA)'s Environmental Management Program, emergency response procedures will be developed and implemented to ensure a rapid response to any transportation incidents. All personnel will be appropriately trained in emergency response procedures to facilitate proper response from Powertech (USA) employees in transportation incidents.

Potential impacts would differ according to material type, quantity and concentration. Transportation risks for yellowcake shipments, uranium-loaded resin shipments, process chemicals/fuel, and 11e.(2) byproduct material are described in the NRC license application. These are briefly summarized below.

Yellowcake Shipments

A specialized, appropriately licensed transportation company will transport the yellowcake to a conversion facility. Powertech (USA) will develop an Emergency Preparedness Program that will be implemented should a transportation accident occur. The primary potential impact associated with an accident involving the spill of yellowcake would be potential impacts to soil in the immediate spill area. The potential impacts will be minimized by implementing the Emergency Preparedness Program and salvaging affected soils.

Uranium-loaded Resin Shipments

Resin shipments typically will occur in bulk transport trailers. Resin shipments potentially will include uranium-loaded resin shipments between the Satellite Facility and CPP or between another satellite facility outside of the permit area to the CPP. They also would include barren or eluted resin shipments from the CPP to a satellite facility. A transportation accident involving uranium-loaded resin would have a lower risk than the relatively low risk from an accident involving yellowcake due to the much lower concentration of uranium in the resin and the chemical bond between the uranium and IX resin. The primary potential impact associated with an accident involving the spill of resin would be potential impacts to soil in the immediate spill area. The potential impacts will be minimized by salvaging affected soils.

Process Chemicals and Fuel

A number of shipments of chemicals and fuel will be made each week throughout operations. Process chemicals delivered to the permit area will include carbon dioxide, oxygen, salt, soda ash, barium chloride, hydrogen peroxide, sulfuric acid, hydrochloric acid, and caustic soda. All applicable DOT hazardous materials shipping regulations and requirements will be followed during shipment of process chemicals and fuel to minimize the potential for transportation accidents. Powertech (USA) also will develop standard operating procedures for unloading process chemicals and fuel within the permit area to minimize the potential for spills.

11e.(2) Byproduct Material

All solid 11e.(2) byproduct material generated in the permit area will be transported to an appropriately licensed disposal facility. Most of the solid 11e.(2) byproduct material shipping

will occur during site reclamation and decommissioning. The potential risk of a transportation accident is low, since solid 11e.(2) byproduct material is generally less radioactive than yellowcake and most of the waste will be in a solid form that is easy to contain. All applicable DOT regulations and requirements will be followed during shipment to minimize the potential for a spill resulting from a transportation accident. The primary potential impact associated with an accident involving the spill of solid 11e.(2) byproduct material would be potential impacts to soil in the immediate spill area. The potential impacts will be minimized by salvaging affected soils.

5.6.5.1.4 Ponds

A pond leak would have the potential to impact surface and groundwater in the vicinity of the pond. The risk and potential impacts will be minimized by natural conditions that make potential groundwater impacts unlikely, by the design and construction of liners and leak detection systems, and by routine inspection and monitoring. Natural conditions make it highly unlikely that a leaking pond would impact groundwater. In the Burdock area, the ponds will be underlain by approximately 50 to 100 feet of Graneros Group shales. The thickness of the Graneros Group beneath the Dewey area ponds will be approximately 500 feet. The confining properties of the Graneros Group will minimize the potential for vertical migration of solutions from a potential pond leak into groundwater.

Section 5.3.4.1 describes how the pond designs include lining systems that will vary according the pond use. At a minimum, ponds will be provided with a geosynthetic liner underlain by a clay liner. Ponds containing untreated wastewater or ponds used in the treatment process (e.g., radium settling ponds) will be provided with two geosynthetic liners, a clay liner, and a leak detection system. Routine inspection described in Section 5.3.4.5 includes daily checks for water accumulation in leak detection systems. The potential impacts from a primary liner leak will be minimized by implementing standard operating procedures to take the pond out of use and remove its contents to another pond. Sufficient freeboard will be maintained in each type of pond such that the contents of a leaking pond can be transferred to another pond with the same level of lining system.

5.6.5.2 Mitigation of Potential Impacts from Spills and Leaks

The following is a list of mitigation measures for potential impacts from spills and leaks.

- Conduct routine MIT of all injection, production and monitor wells.

- Perform leak testing on all pipelines and aboveground piping systems.
- Equip well field header houses with wet alarms for early detection of leaks.
- Bury well field pipelines for freeze protection and protection from vehicles.
- Implement engineering and administrative controls at the CPP to prevent both surface and subsurface releases to the environment, and to mitigate the effects should an accident occur.
- Train employees in the handling, storage, distribution, and use of hazardous materials.
- Provide rapid response cleanup and remediation capability, techniques, procedures, and training for potential spills.
- Develop written spill reporting procedures, including the procedures to report potential spills of reagents, fuel and other chemicals to the State of South Dakota and the personnel responsible for reporting spills.
- Design and construct ponds with lining and leak detection systems appropriate to the pond use.
- Perform routine inspection of pond leak detection systems to rapidly detect a potential leak from the primary liner.
- Implement standard operating procedures to take a pond out of use in the event of a leak and transfer its contents to another pond with the same lining system.
- Conduct fueling operations and storage of hazardous materials and chemicals in bermed/curbed areas and in a manner that minimizes potential impacts to surface water.
- Curb relevant facilities and structures at the CPP and Satellite Facility to minimize or eliminate escape of process fluids during spills.
- Perform all shipments of yellowcake, uranium-loaded resin, process chemicals/fuel, and 11e.(2) byproduct material in accordance with DOT regulations.
- Promptly salvage soils from any spill areas to avoid potential impacts to surface or groundwater.

5.6.6 Potential Accidents

The accident scenarios with potential to occur at the Dewey-Burdock Project are those typical of other ISR facilities. These scenarios have been evaluated in NUREG/CR-6733, A Baseline Risk-Informed, Performance-Based Approach for In Situ Leach Uranium Extraction Licensees (NRC,

2001), and are discussed below. Three primary engineering controls will include 1) downflow, pressurized IX columns, 2) building ventilation, and 3) use of a modern vacuum yellowcake dryer. Also included in the engineering controls will be alarms to indicate suboptimal operating conditions of the effluent control systems and concrete curbs and sumps to contain any process spills. Administrative controls such as training for emergency scenarios will be in place to provide appropriate worker protection in the event that the effluent control systems fail under an emergency situation. In brief, the engineering controls coupled with appropriate administrative controls will mitigate any potential health and safety impacts of system failures at the facility.

A series of potential accident scenarios which could occur at an ISR facility were evaluated in NUREG/CR-6733 and included the following:

- Yellowcake thickener failure and spill
- Radon release in enclosed process areas
- Pregnant lixiviant and loaded resin spills
- Yellowcake dryer hazard analysis

The estimated radiological consequence resulting from these accidents ranged from no significant radiological exposures, in the case of the thickener failure and pregnant lixiviant/loaded resin spill, to a significant radiological exposure which could result in doses to workers exceeding those allowed in 10 CFR Part 20. Due to the short-term nature of the above scenarios and assuming spills and releases are mitigated promptly, no scenario was expected to result in a significant radiological dose to members of the public.

During an accident, administrative controls will be in place such as standard operating procedures for spill response and cleanup, programs for radiation and occupational monitoring, and training for workers in radiological health and emergency response. Administrative controls coupled with proper use of PPE such as respirators are the best tools to reduce worker doses and will be provided.

Other approaches to mitigate system failures that may result in exceeding exposure limits include but are not necessarily limited to the following:

1) A team of responders, trained for radiation health and emergency response, will be available. Specific training will include: response monitoring, PPE use and response to fires, large lixiviant spills or IX system failure.

2) Powertech (USA) will train local emergency response personnel in the potential hazards present within the permit area.

3) A yellowcake thickener failure and spill would result in the immediate evacuation of normal operating personnel within the spill area and cleanup of the saturated product prior to drying. Employees performing the cleanup would utilize the appropriate PPE to minimize exposure to any product that may dry during cleanup. Yellowcake residue that may remain within the thickener area would be washed into a sump, thus mitigating the potential for exposure to employees.

4) Unplanned radon release into an enclosed area would result in manual shutdown of the release point (if automated shutoff system failed) and promotion of ventilation within the area manually (if automated ventilation system failed). Employees performing manual shutdown within the area of the release would utilize the appropriate PPE (such as atmosphere-supplying respirators designed to protect against gases) to minimize exposure to radon and radon decay products. Radon samples would be taken and if above normal working levels, normal operating workers would be evacuated and only return to normal duties within the release area upon re-establishment of normal working levels.

5) A pregnant lixiviant spill would be mitigated in a manner consistent with the location and degree of spill. Response personnel would utilize the appropriate PPE to protect against radon and radon decay products exposure as discussed above and cleanup would result.

6) A yellowcake dryer upset response would be dictated by the severity of the upset. Mitigation response may include a combination of additional site-specific response actions such as:

   - Workers, including the spill response team, will have access to respiratory equipment in the yellowcake dryer area.
   - All practicable measures will be taken to control emissions at the source. The operator will reduce exposure to airborne effluent releases by implementing emission controls (such as wetting) and institutional controls (such as extending the area of upset so as to exclude any personnel not responding to the upset).
   - Siting of the CPP near the center of the proposed license area will serve to protect against off-site exposures in the event of a yellowcake dryer upset.
   - Individual dose standards will be strictly implemented to assure exposures are limited and reduced to the maximum extent reasonably achievable and to limit contamination to the designated upset area.
   - All drying and packaging operations will terminate until cleanup is complete, the area has been cleared for potential exposure, and equipment has been restored to proper operating conditions and efficiencies.
   - Cessations, corrective actions and restarts will be reported to NRC within 10 days of the upset or off-normal performance.

5.6.7 Potential Natural Disaster Risk

NRC guidance in NUREG/CR-6733 evaluates potential risks associated with ISR facilities for the release of radioactive materials or hazardous chemicals due to the effects of an earthquake or tornado strike. The NRC determined that in the event of a tornado strike, chemical storage tanks could fail, resulting in the release of chemicals. This risk will be minimized by implementing the secondary containment measures for chemical storage described in Section 5.3.1. NUREG/CR-6733 concluded that the risk of a tornado strike on an ISR facility is very low and that no design or operational changes are necessary to mitigate the potential risks, but that it is important to locate chemical storage tanks far enough from each other to prevent contact of reactive chemicals in the event of an accident. Chemical storage tanks will be separated at the Dewey-Burdock Project as described in Section 5.3.1.

Considering the relative remoteness of the permit area, the potential consequences of a tornado strike would be considerably less than if the facilities were in a more populated area. Nevertheless, there are risks to workers that will be addressed. Powertech (USA) will prepare and have available onsite for regulatory inspection an Emergency Response Plan that will contain emergency procedures to be followed in the event of severe weather or other emergencies. Included in the plan will be procedures for notification of personnel, evacuation procedures, damage inspection and reporting. It also will address cleanup and mitigation of spills that may result from severe weather. In advance of preparing the Emergency Response Plan, Powertech (USA) offers the following discussion on these issues.

Initially, Powertech (USA) will provide adequate training to its employees and visitors regarding communication systems used at the facilities. In the event of a report of a tornado sighting in the vicinity of the facility, the Radiation Safety Officer (RSO), Radiation Safety Technician (RST) and/or Safety Engineer will ensure that the proper alarm (preset signal) has been sounded at both the Burdock and Dewey facilities. Additionally, all supervisors will be personally contacted via phone or radio and advised of the emergency. The supervisors and radiation safety staff will direct the evacuation of employees to one or more previously-specified nearby locations. Once it is safe to access the facilities, supervisory staff and radiation safety staff will begin the process of assessing potential damage to the facilities, including header houses and well heads. This process will include radiological surveys and assessment of potential non-radiological hazards as well. NRC, DENR, BLM and other regulatory agencies as appropriate will be notified and advised of the damage, if any was observed. After consultation with the regulatory agencies the cleanup and mitigation efforts will commence.

NRC determined that the potential radiological consequences of materials released and dispersed due to earthquake damage at an ISR facility are no greater than for a tornado strike. NUREG-0706 (NRC, 1980b) determined that mitigation of earthquake damage could be attained following adequate design criteria. NUREG/CR-6733 concluded that risk from earthquakes is very low at uranium ISR facilities and that no design or operational changes are required to mitigate the risk, but that it is important to locate chemical storage tanks far enough from each other to prevent contact of reactive chemicals in the event of an accident.

All buildings, structures, foundations, and equipment will be designed in accordance with recommendations in the latest versions of the International Building Code and ASCE-7 published by the American Society of Civil Engineers. Maps published in ASCE-7, and the latest version of the USGS Earthquake Ground Motion Tool, along with information regarding soil characteristics provided by the project professional geotechnical engineer, will be used to determine seismic loadings and design requirements.

5.6.8 Potential Fire and Explosion Risk

Accident Consequences – Fires and Explosions

An explosion, although unlikely, could result from: a prematurely sealed drum of yellowcake, in a dryer, from the use of propane in the thermal fluid heater or space heaters, or from the mixing of oxygen gas with combustible materials. Of these, an explosion from the drum of yellowcake has the greatest potential to impact radiological safety of the workers. An explosion in a sealed drum would be contained within the dryer room. Powertech (USA) will develop a standard operating procedure for measuring the temperature in yellowcake drums prior to drum sealing.

According to NRC, multiple hearth dryers pose a greater hazard than the vacuum dryers that will be used by Powertech (USA) (NUREG-1910, NRC, 2009). Multiple hearth dryers operate at higher temperatures and may be fed directly with gas. The vacuum dryers to be used at the Dewey-Burdock Project operate at lower temperatures and are not fed directly by gas. They therefore pose less of a hazard for explosion. In the unlikely event of an unmitigated explosion accident of a yellowcake dryer, doses to the workers could have a moderate impact depending on the type of accident, but exposure to the general public would result in a dose below the 10 CFR Part 20 public dose limit, resulting in only a small impact to the public (NUREG-1910).

Preventative and Mitigation Measures – Fires and Explosions

As noted in Section 5.3.1, the design criteria for chemical storage and feeding systems includes applicable sections of the International Building Code, International Fire Code, OSHA

regulations, RCRA regulations, and Homeland Security regulations. Propane-fired heating devices will be installed to meet applicable NFPA/FM safety standards. Additional measures for preventing fires and explosions include:

- The oxygen tanks will be located a safe distance from the CPP and other storage tanks and will be designed to meet industry standards of NFPA-50.
- Cleaning of equipment for oxygen storage and conveyance systems will follow the standards specified in CGA G-4.1.
- Powertech (USA) will develop emergency response procedures for oxygen accidents. All employees who may be exposed to hazards associated with oxygen will be properly trained with regard to the hazards, accident prevention and mitigation, and emergency response procedures.
- Header houses will be equipped with fans to provide continuous ventilation in order to prevent buildup of oxygen.
- The oxygen lines to each header house will be equipped with automatic low pressure shut-off valves to minimize the delivery of oxygen through a broken pipe or a valve stuck in the open position, which could potentially supply oxygen to a fire.
- Procedures will be in place for confined space work or hot work for monitoring of oxygen build-up prior to start of work.
- Fire extinguishers will be placed at accessible locations in all buildings and vehicles for quick response and training will be provided for appropriate personnel in use of fire extinguishers.
- Powertech (USA) personnel and local emergency responders will receive training for responding to a fire or explosion.
- The CPP and Satellite Facility are designed to contain and reduce the exposures to individuals in the event of an accident. Emergency response procedures would be implemented and employees would be directed as to what actions to perform in the event of an accident. For instance, a respiratory protection program will be in place and will be executed as necessary for worker protection during accident assessment and cleanup phases. In addition to the above mentioned protections other safeguards and mitigatory protocols are always in place during operation of a CPP facility. For example, a bioassay program for worker safety and contamination control programs involving personnel survey, clothing survey and equipment survey before release to unrestricted areas are common practices workers are subject to on a regular basis. These types of protocols are also utilized to assess if an accidental exposure took place during the course of an unintentional incident.

Preventative and Mitigating Measures – Wildfire

In order to protect facilities from wildfires, all facility buildings will be located within an area that is maintained in a vegetation-free state by the use of a crushed aggregate or asphalt surface

and by appropriate weed-control measures. The creation of this buffer zone is expected to prevent fire from damaging equipment that could lead to a chemical accident by acting as a firebreak.

Within the well fields, vegetation will be controlled around each header house and around each well head cover to reduce the amount of combustible material adjacent to these structures. In the event of an approaching wildfire, operators will be trained to shut down well field operations and, if necessary, to evacuate facilities until the danger to personnel has passed. Damage, if any, will be assessed and remediated prior to re-starting operations.

Powertech (USA) will maintain firefighting equipment on site and will provide training for local emergency response personnel in the specific hazards present in the permit area.

The emergency response plan will include descriptions of the following provisions of 29 CFR Part 1910:

- Notification and evacuation procedures
- Personal protective equipment
- General firefighting safety rules
- Reporting procedures
- Electrical and gas emergencies

5.6.9 Potential Radiological Impacts and Effluent Control System

5.6.9.1 Potential Radiological Impacts

In accordance with NRC guidance, Powertech (USA) modeled the potential radiological impacts on human and environmental receptors (e.g., air and soil) using site-specific radionuclide release estimates, meteorological and population data, and other parameters. The estimated radiological impacts resulting from routine site activities then were compared to applicable public dose limits as well as naturally occurring background levels. The complete analysis is available in the NRC license application. Following is a brief summary of the results.

The primary radioactive airborne effluent will be radon-222 gas. Radon-222 is dissolved in the pregnant lixiviant that comes from the well field into the facility for separation of uranium. At the locations where the lixiviant solution is initially exposed to atmospheric pressure and ambient temperatures, radon gas will be evolved. The locations where this will occur (IX vessels and shaker screens in the CPP and IX vessels in the Satellite Facility) will be provided with dedicated local exhaust, which will be vented outside of the buildings. Small amounts of radon-

222 also may be released from the well field, solution spills, filter changes, RO system operation during groundwater restoration, DDW surge tanks, land application areas, and maintenance activities.

The potential radiological impact analysis considered all potential exposure pathways from all potential sources in the permit area. Atmospheric radon gas is expected to be the predominant pathway for impacts on human and environmental media. Impacts of radon-222 releases can be expected in all quadrants surrounding the site, the magnitude of which is driven predominantly by wind direction and atmospheric stability. As a noble gas, radon-222 itself has very little radiological impact on human health or the environment. Radon-222 has a relatively short half-life (3.2 days) and its decay products are short lived, alpha emitting, nongaseous radionuclides. These decay products have the potential for radiological impacts to human health and the environment. Potential exposure pathways include ingestion, inhalation, direct exposure, and adsorption. All exposure pathways, with the possible exception of absorption, can be important depending on the environmental media impacted. All of the pathways related to emissions of radionuclides are evaluated by modeling, including potential exposure from air, water, soil, flora and fauna.

The potential radiological impact analysis concludes that the primary sources of radon-222 releases will be production well fields, the CPP and Satellite Facility. Lesser releases are anticipated to occur from DDWs, land application areas, and other minor activities. Modeling was used to simulate potential impacts to receptors including the nearest residence. The modeling shows that the maximum annual total effective dose equivalent (TEDE) for an adult at the nearest residence will be approximately 2% of the 10 CFR Part 20 public dose limit of 100 mrem/year. If land application is not used, the calculated TEDE is less than 2% of the public dose limit.

Powertech (USA) also evaluated the potential public and occupational doses for public exposure to radon decay products. Conservatively assuming that a worker not associated with the Dewey-Burdock Project (e.g., a rancher) is in the permit area for 2,000 hours per year, the expected annual occupational dose would be less than 2% of the of the public dose limit.

Modeled impacts to soils in the general permit area resulting from deposition of radium-226 indicate that the radium-226 concentration after ISR operations will be within the range of normal background variability observed during baseline characterization. In the land application areas, modeled impacts to soils show that the radiological impacts of the land application process

will be minimal and meet the criteria for license termination for unrestricted use in 10 CFR § 20.1402.

5.6.9.2 Effluent Control System

Potential radiological impacts to human and environmental receptors will be mitigated through implementation of an effluent control system satisfying NRC license requirements and using best available control technology. The effluent control system is described in detail in the NRC license application and will include controls for radon and radon decay products as well as controls for radionuclide particulates.

Radon

Potential impacts from radon will be controlled through use of pressurized, downflow IX vessels and ventilation systems. The IX vessels normally will operate as sealed, pressurized vessels, so that radon releases from the IX vessels only will occur during resin transfer operations. Dedicated local exhaust at the IX vessels and shaker screens will be directed to a manifold that is exhausted to the atmosphere outside the building via an induced draft fan. The primary release point will be located away from building intakes to prevent introducing exhausted radon back into the facility. Exhausting radon-222 gas to the atmosphere outside the plant minimizes opportunity for in-growth of radon particulate decay products in occupied work areas and therefore minimizes employee airborne exposure.

The general HVAC systems in the CPP and Satellite Facility will reduce employee exposure further by removing radon from plant air. The general HVAC systems will be exhausted through separate vents. These systems will be connected via ductwork and manifolds to the process vessels. Airflow through any openings in the vessels will be from the process areas into the vessels and then into the ventilation systems, maintaining negative flow into the vessels and controlling any releases. Tank ventilation of this type has been utilized successfully at other ISR facilities and proven to be an effective method for minimizing employee exposure. Redundant exhaust fans will direct collected gases to discharge piping that will exhaust to the outside atmosphere. Fan redundancy will minimize employee exposure should any single fan fail.

The general building ventilation systems will be designed to maintain air flow from the process areas with the least potential for airborne releases to areas with the most potential for airborne releases and then exhaust to outside areas. Ventilation systems will exhaust outside the buildings and draw in fresh air. During favorable weather conditions, open doorways and convection vents in the roofs will provide supplemental work area ventilation.

The CPP will be located near the center of the permit area, and the radon exhaust point will be located on or near the CPP roof. Based on use of modern ISR equipment, engineering controls such as building ventilation, and routine sampling and monitoring described below, radon effluent and worker exposure to radon decay products will be maintained at levels that are as low as reasonably achievable (ALARA).

An operational monitoring program will be utilized to measure radon-222 that may result in the atmosphere outside the buildings and other specified locations within the permit area. This will be done in accordance with NRC license conditions. Potential release points as well as general air in the plant will be sampled routinely for radon decay products to assure that concentration levels of radon and decay products are maintained ALARA. Results of monitoring obtained during initial plant operation will be used to adjust monitoring programs (location, frequency, etc.) and upgrade ventilation and/or other effluent control equipment as may be necessary.

Radionuclide Particulates

Potential radiological air particulate effluents will be generated primarily from dried uranium concentrate in the yellowcake drying and processing areas. The yellowcake drying and packaging area will be serviced by a dedicated ventilation system. By design, vacuum dryers do not discharge uranium. The vacuum drying system is proven technology, which is being used successfully at several facilities where uranium oxide is being produced, including ISR facilities. The off-gas treatment system of the vacuum dryers will include a baghouse, condenser, vacuum pump, and packaging hood. The potential radionuclide particulate releases from the drying process and associated off-gas treatment system are discussed below.

The yellowcake will be dried at approximately 250°F in the rotary vacuum drying process. The off-gases generated during the drying cycle will be filtered through a baghouse, which will be located on the top of the dryer, to remove particles down to approximately 1 micron in size. The gases then will be cooled and scrubbed in a surface condenser to further remove the smaller size fraction particulates and the water vapor during the drying process. Two rotary vacuum dryers will be located in a separate building attached to the CPP. This attached building will contain the dryers, the baghouses on the dryers, and a condenser scrubber and vacuum pump system for each dryer.

The vacuum dryers will be steel vessels heated externally and fitted with rotating plows to stir the yellowcake. Each drying chamber will have a top port for loading the wet yellowcake and a bottom port for unloading the dry powder. A third port will be provided for venting through the

baghouse during the drying procedure. The baghouse and vapor filtration unit will be mounted directly above the drying chamber so that any dry solids collected on the bag filter surfaces can be batch discharged back to the drying chamber. The baghouse will be heated to prevent condensation of water vapor during the drying cycle. It will be kept under negative pressure by the vacuum system.

The condenser will be located downstream of the baghouse and will be water cooled. It will be used to remove the water vapor from the non-condensable gases emanating from the drying chamber. The gases will be moved through the condenser by the vacuum system. Dust passing through the bag filters will be wetted and entrained in the condensing moisture within this unit. The vacuum pump will be rotary water sealed, providing negative pressure on the entire system during the drying cycle. It also will be used to provide negative pressure during transfer of the dry powder from the drying chamber to 55-gallon steel drums. The water seal of the rotary vacuum pump will capture entrained particulate matter remaining in the gas streams.

The packaging system will be operated on a batch basis. When the yellowcake is dried sufficiently, it will be discharged from the drying chamber through a bottom port into 55-gallon steel drums. A level gauge, a weigh scale, or other suitable device will be used to determine when a drum is full. Particulate capture will be provided by a sealed hood that fits on the top of the drum, which will be vented through a sock filter to the condenser and the vacuum pump system when the powder is being transferred.

There will be three discharge locations associated with the yellowcake drying and packaging system. These include: i) the yellowcake discharge valve located directly below the dryer, through which drums are filled with yellowcake, ii) the condensed water vapor that is removed from the condenser and recycled to the yellowcake thickener, and iii) very small amounts of air that are drawn through the vacuum pump and are exhausted into the dryer room of the CPP. The system of treating gases emanating from the dryer chamber with baghouse filters and water condenser is designed to capture virtually all particles from the vapor stream leaving the dryer (NUREG-1910, NRC, 2009). Furthermore, NUREG-1569 (NRC, 2003) states, "When a vacuum dryer is used for yellowcake, then dust emissions from drying may also be assumed to be negligible."

The emission control system will be instrumented sufficiently to operate automatically and to shut itself down for malfunctions such as heating or vacuum system failures. The system will alarm if there is an indication that the emission control system is not performing within operating

specifications. If the system is alarmed due to the emission control system, the operator will follow standard operating procedures to recover from the alarm condition, and the dryer will not be unloaded or reloaded until the emission control system is returned to normal service.

To ensure that the emission control system is performing within specified operating conditions, instrumentation will be installed that signals an audible alarm at the dryer and in the CPP control room if the air pressure (i.e., vacuum level) falls below the specified threshold. The operation of this system will be monitored routinely during dryer operations. The operator will perform and document inspections of the vacuum level hourly or more frequently during dryer operations. Additionally, the air pressure differential gauges for other emission control equipment will be observed and documented at least once per shift during dryer operations.

The discharge locations associated with the yellowcake drying and packaging systems will be monitored routinely via filter collection and radiochemical analysis in accordance with NRC license conditions. General plant air also will be monitored routinely for airborne radionuclides.

5.6.10 Air Quality

This section describes the potential non-radiological air quality impacts. Potential radiological impacts are described in Section 5.6.9.

5.6.10.1 Potential Air Quality Impacts

Potential air quality impacts during construction activities will include emissions from heavy equipment, vehicles, and drill rigs; dust from traffic; and dust from surface-disturbing activities. Most dust will be generated from vehicular traffic on the unpaved roads; therefore, speed limits will be imposed for employee vehicles and transport trucks in order to mitigate the amount of dust generated from unpaved roads. Temporarily disturbed areas also will be reseeded and restored as soon as possible to minimize erosion of soil and fugitive dust emissions.

During operation, non-radiological gaseous emissions will include fugitive dust, vehicle combustion emissions, and stationary source emissions, including propane heating emissions and carbon dioxide released during uranium processing in the CPP. Fugitive dust will be lower during operation than construction due to decreased surface disturbing activities.

Powertech (USA) has prepared a detailed emissions inventory for all project phases (construction, operation, aquifer restoration, and reclamation/decommissioning). The emissions inventory has been provided to NRC and will be provided to the DENR Air Program. Based on

the emissions inventory, stationary source emissions of criteria pollutants are not expected to meet the minor or major source thresholds for air quality construction permitting. This includes NO_x, PM_{10}, CO, SO_2, and hazardous air pollutants (which exclude CO_2).

5.6.10.2 Mitigation of Potential Air Quality Impacts

Mitigation measures for potential air quality impacts, including potential impacts to areas defined as critical air quality resources by SDCL 45-6B-92(8) such as nearby residences and recreation areas, will include but will not be limited to the following:

- Reduce fugitive dust emissions via standard dust control measures (e.g., water application on roads and disturbed areas and implementation of speed limits).
- Encourage employee carpooling.
- Reduce fugitive dust by coordinating dust-producing activities during construction and minimizing disturbed areas.
- Promptly reclaiming and reseeding disturbed areas.
- Maintain vehicles to meet applicable EPA emission standards.
- Obtain a South Dakota air quality permit, if required. Powertech (USA) has submitted a permit application to the DENR Air Quality Program requesting an exemption from South Dakota air permitting as a minor source of emissions. The permit application includes a detailed emissions inventory that demonstrates that total stationary sources of emissions of criteria pollutants will be well below the 25 tons/year threshold.
- Maintain emission control systems to ensure that the annual TEDE is within the 10 CFR Part 20 public dose limit (refer to Sections 5.6.9.1 and 5.6.9.2).
- Model potential air quality impacts. Powertech (USA) currently is performing detailed ambient air quality modeling that is being coordinated with NRC and EPA. The modeling will evaluate the potential impacts of emissions from the Dewey-Burdock Project on ambient air quality to nearby residences and potential near-field impacts within 50 km of the proposed permit area (including Jewel Cave National Monument). In addition, the modeling specifically will address potential impacts on air quality related values (AQRVs) at the Wind Cave National Park, the nearest Class I area. The modeling results will be publicly available and will be submitted to DENR upon request.

5.6.11 Ecological Resources

5.6.11.1 Potential Ecological Resources Impacts

The following section discusses the potential ecological impacts of operations at the project site.

5.6.11.1.1 Vegetation

Well field and production facilities will be constructed within Big Sagebrush Shrubland, Greasewood Shrubland, Ponderosa Pine Woodland, and Upland Grassland vegetation communities. Potential direct impacts include the short-term loss of vegetation (modification of structure, species composition, and aerial extent of cover types). Potential indirect impacts include the short-term and long-term increased potential for non-native species invasion, establishment, and expansion; exposure of soils to accelerated erosion; shifts in species composition or changes in vegetative density; reduction of wildlife habitat; reduction in livestock forage; and changes in visual aesthetics.

Construction activities and increased soil disturbance could stimulate the introduction and spread of undesirable and invasive, non-native species within the permit area. Non-native species invasion and establishment has become an increasingly important result of previous and current

disturbance in South Dakota. No threatened or endangered vegetation species were observed within the permit area; therefore, no impacts are anticipated.

Potential impacts to riparian areas and wetlands will be very limited. Section 5.6.4.1.3 describes mitigation of potential impacts to wetlands, including constructing facilities away from Beaver Creek and Pass Creek and conducting construction, operation, or reclamation activities that have the potential to disturb jurisdictional wetlands in accordance with appropriate USACE permits. Riparian areas occur primarily in a relatively narrow corridor along Pass Creek (refer to the mapped Cottonwood Gallery on Plate 3.7-1). A comparison between Plates 3.7-1 and 3.5-1 shows that the extents of the Cottonwood Gallery are generally within the 100-year flood inundation boundary along Pass Creek. Section 5.6.4.1.2 describes how Powertech (USA) will construct facilities outside of the flood inundation boundaries with few exceptions such as individual wells and pipelines. This is supported by Plate 3.5-1, which shows that facilities have been designed to avoid the Pass Creek flood inundation area including land application areas and well fields.

5.6.11.1.2 Wildlife and Fisheries

ISR uranium production is unlike open-pit mining, since it uses less intrusive extraction methods that have less impact on the surrounding area.

Despite the relatively limited surface disturbance, there are potential direct and indirect impacts on local wildlife populations. These potential impacts are both short-term (until successful reclamation is achieved) and long-term (persisting beyond successful completion of reclamation). However, the latter category is not expected to be significant due to the relatively limited habitat disturbance. The potential direct impacts on wildlife include: injuries and mortalities caused by collisions with project-related traffic or habitat removal actions such as topsoil stripping, particularly for smaller species with limited mobility such as some rodents and herptiles; and restrictions on wildlife movement due to construction of fences. The likelihood for the impacts resulting in injury or mortality is greatest during the construction phase due to increased levels of traffic and physical disturbance during that period. Overall traffic will increase from current levels and will persist during operations, but should occur at a reduced and possibly more predictable level than during the construction phase. Speed limits will be enforced during all construction and maintenance operations to reduce impacts to wildlife throughout the year, but particularly during the breeding season.

Most of the habitat disturbance associated with the ISR facilities will consist of scattered, confined drill sites for well fields that will not result in large expanses of habitat being dramatically transformed from its original character, as would be the case with open-pit mining. Therefore, most potential indirect impacts relate to the displacement of wildlife due to increased noise, traffic, or other disturbances associated with the development and operation of the project, as well as from small reductions in existing or potential cover and forage due to habitat alteration, fragmentation, or loss. Indirect impacts typically persist longer than direct impacts. However, because ISR results in fewer large-scale habitat alterations, there will not be a need for reclamation actions that result in dramatic differences between pre-mining and post-mining vegetative communities.

Multiple site visits and targeted surveys conducted for the baseline surveys, combined with existing agency databases that encompass the permit area and input from local residents, indicate that the permit area and surrounding vicinity are occupied by a wide variety of common wildlife and fish species, with only a few species of particular concern occurring in the area. The most notable species of interest is the bald eagle, which is still considered threatened at the state level. Bald eagle winter roost sites and a successful nest site were documented within the permit area during surveys conducted in 2007 and 2008. Two other species tracked by the SDNHP were confirmed or suspected to have nested in the permit area in 2008, the long-eared owl and long-billed curlew. Eight additional SDNHP species were documented in or near the permit area during baseline surveys. However, those observations consisted of birds flying over the area, or sightings made in the surrounding perimeter. No grouse leks have been recorded within 6 miles of the permit area during agency or project-specific surveys completed in recent years.

Suitable habitat (trees and native uplands) for all three nesting SDNHP species occurs in the permit area. However, the limited disturbance of ISR and the presence of apparently suitable (due to low density of other nesting individuals) alternate nesting habitat throughout the permit area and surrounding area combine to minimizing the potential for both direct and indirect impacts for those species and others that require similar habitats. One of those species, the long-eared owl, nested within 75 meters, but largely beyond view of, an existing gravel county road, suggesting the pair has at least some level of tolerance for vehicular traffic near active nest sites. Other wildlife species of concern, such as other nesting raptors, that occur in the area also may experience direct and/or indirect impacts from increased travel and noise in the area during project construction and operation. However, the presence of potential alternate nesting and foraging habitat in the immediate vicinity, the mobility of those species, and the location of most

nest sites relative to planned disturbance combine to reduce impacts to most nesting SDNHP birds as well as other species of interest.

Some vegetative communities present currently in the permit area can be difficult to reestablish through artificial plantings, and natural seeding of those species would likely take many years. However, the current habitat of greatest concern (Big Sagebrush Shrubland) occurs only in scattered stands that are relatively small and widely-spread across the permit area. Results from lek searches, breeding bird surveys, and small mammal trapping, as well as regular site visits in all seasons, strongly suggest that sage obligates other than pronghorn occur in limited numbers in the permit area, if at all. The vegetative communities that indicated the strongest associations between terrestrial species and habitats during baseline surveys (Cottonwood Gallery and Ponderosa Pine) will not be significantly impacted by construction or operation of the proposed project. It is possible that the potential implementation of land application systems may enhance nesting, brood-rearing, and/or foraging habitat for some species. Consequently, although individual animals associated with some specific habitats could be impacted by the proposed ISR operations, the small percentage of projected surface disturbance within the permit area relative to its overall size, and the low density of nesting efforts relative to habitat presence in that area, suggest that their populations as a whole will experience minimal impacts from the project. Advanced planning of construction siting and activities in concert with continued monitoring can reduce impacts further and assist with the development of mitigation options, if necessary. Potential impacts to these species and others are discussed in greater detail in the following sections.

5.6.11.1.3 Big Game

Big game could be displaced from portions of the permit area to adjacent areas, particularly during construction of the well fields and facilities, when disturbance activities will be greatest. Disturbance levels will decrease during actual ISR operations, and will consist primarily of vehicular traffic on new and existing improved and unimproved (two-track) roads throughout the permit area. Similar disturbance already is present in the area due to existing ISR exploration, ranching, and railroad operations. Pronghorn antelope would be most affected, as they are most prevalent in the area. However, no areas classified as crucial pronghorn habitat occur on or within several miles of the permit area, and this species is not as common in the general area as elsewhere within the region due to the limited presence of sagebrush in the area. Mule deer would not be impacted substantially given their somewhat limited use of these lands, the paucity of winter forage and security cover, and the availability of suitable habitat in adjacent areas.

SDGF&P does not consider the permit area to be within the crucial habitat range of any big game species. A letter from SDGF&P confirming this statement and updating the status of big game species as of May 2010 is provided in Appendix 5.6-B. Sightings of those species in that vicinity are often seasonal and less common.

5.6.11.1.4 Other Mammals

Medium-sized mammals (such as lagomorphs, canids, and badgers) may be displaced temporarily to other habitats during the initial construction activities. Direct losses of some small mammal species (e.g., voles, ground squirrels, mice) may be higher than for other wildlife due to their more limited mobility and likelihood that they would retreat into burrows when disturbed, and thus be potentially impacted by topsoil scraping or staging activities. However, given the limited area expected to be disturbed by the project, such impacts would not be expected to result in major changes or reductions in mammalian populations for small or medium-sized animals. This is supported by NRC guidance in NUREG-1910 (NRC, 2009), which states, "Displaced species may re-colonize in adjacent, undisturbed areas or return to their previously occupied habitats after construction ends and suitable habitats are reestablished." Few bats were recorded in the area despite extra efforts to observe them during the baseline surveys. Those that were seen were near water bodies near treed habitats, which are not currently scheduled for disturbance. The mammalian species known to be, or potentially, present in the permit area have shown an ability to adapt to human disturbance in varying degrees, as evidenced by their continued presence in other mining and residential areas of similar, or greater, disturbance levels elsewhere in the region. Additionally, small mammal species in the area have a high reproductive potential and tend to re-occupy and adapt to altered and/or reclaimed areas quickly.

5.6.11.1.5 Raptors

ISR activities in the permit area would not impact regional raptor populations, though individual birds or pairs may be affected. ISR activity could cause raptors to abandon nest sites proximate to disturbance, particularly if activities encroach on active nests during a given breeding season. Powertech (USA) will develop a bald eagle mitigation plan for review and verification by SDGF&P. A copy of the plan will be provided to DENR. Other potential direct impacts would be injury or mortality due to collisions with project-related vehicular traffic. Construction activities that occur within or near active raptor territories could also cause indirect impacts such as reduction or avoidance of foraging habitats for nesting birds. However, surface disturbance will only occur in a small percentage of the overall permit area, and the low density of nesting

raptors relative to the apparent availability of suitable habitat suggests that alternate nesting habitat is available for all known nesting raptor species in the permit area.

Eight intact raptor nests were documented within the project survey area (permit area and 1-mile perimeter) during 2008. Six of the eight nest sites are within the permit area, with the remaining two located in the 1-mile perimeter. USFWS guidelines recommend avoiding construction activities within 660 feet if the activity will be visible from a nest (USFWS, 2007). Construction activities in relation to bald eagles and other raptors will be addressed in the bald eagle mitigation plan previously described.

Except for the bald eagle, the same species that nest in the permit area are known to regularly nest and fledge young at or near surface mines and ISR facilities throughout the region. Those efforts have succeeded due to a combination of raptors becoming acclimated to the relatively consistent levels of disturbance and gradual encroachment of production operations, and successfully executed state-of-the-art mitigation techniques to maintain viable raptor territories and protect nest productivity. Some individuals nest on active production facilities themselves, including both great horned owls and red-tailed hawks. The lack of bald eagle examples is more likely related to the general absence of nesting bald eagles in the vicinity, rather than an increased sensitivity to production activities. Bald eagles are discussed further in Section 5.6.11.1.11. Due to the paucity of river cliffs in the permit area, falcons and other raptors known to nest in that habitat are not as abundant as those that nest in trees or even on the ground.

Based on the location of known nest sites relative to future construction sites, no raptor nests will be disturbed physically by the project during either construction or operations. Additionally, Powertech (USA) has incorporated the baseline wildlife information into the planning process and sited all plant facilities (areas of greatest sustained future disturbance) outside the recommended buffer zone for all raptor nests in the permit area, including the bald eagle nest site. Some new infrastructure will be located within the suggested buffer areas. However, pipelines will be buried, and new overhead power lines will be constructed using designs and specifications to reduce injuries and mortalities on overhead power lines. Land application center pivots, if used, can be put into place prior to the nesting season, and run automatically with little human contact once they are turned on. Additionally, new roads, power lines, and pipelines will be constructed in the same corridors to the extent possible to reduce overall disturbance, and along existing access roads when available to minimize new surface disturbance.

5.6.11.1.6 Upland Game Birds

ISR activities in the permit area would potentially impact the foraging and nesting habitat of mourning doves, though such disturbance is not expected to have any marked impacts on this species. No woody corridors will be disturbed by the proposed activities, and additional trees are present in the cottonwood gallery along the Cheyenne River, located approximately 2 miles south of the permit area. Additionally, doves are not restricted to treed habitats, nor are they subject to any special mitigation measures for habitat loss.

Annual monitoring surveys conducted by SDGF&P biologists and a year-round baseline study for the project have demonstrated that sage-grouse do not currently inhabit that area, and have not for many years. As described previously, those surveys encompassed the entire permit area and the vast majority of its 2.0-km (1.2-mi) perimeter, particularly as part of baseline monitoring. The nearest known sage-grouse lek is approximately 6 miles north of the permit area (SDGF&P records). Given the lack of sage-grouse observations in the area and the scattered stands of marginal quality sage-grouse habitat, the project will not result in negative impacts to existing or potential sage-grouse leks, or important sagebrush habitats.

5.6.11.1.7 Other Birds

The project could potentially impact nine avian species tracked by SDNHP that are known to occur or could potentially occur as seasonal or year-round residents. Direct impacts could include injury or mortality due to encounters with vehicles or heavy equipment during construction or maintenance operations. Indirect impacts could include habitat loss or fragmentation and increased noise and activity that may temporarily deter use of the area by some species. Surface disturbance would be relatively minimal and would be greatest during construction. Enforced speed limits and use of common right-of-way corridors will reduce impacts to wildlife throughout the year, particularly during the breeding season.

5.6.11.1.8 Waterfowl and Shorebirds

Construction and operation of the ISR project would have a negligible effect on migrating and breeding waterfowl and shorebirds. Existing habitat is limited and seasonally available in the permit area, so it does not currently support large groups or populations of these species. Multiple approaches are being considered to minimize impacts to wildlife that may be associated with the operation of the ponds. Any new treated water sources could enhance current habitat conditions for these species, though such effects would be temporary in nature.

5.6.11.1.9 Reptiles and Amphibians

As with waterfowl, potential habitat for aquatic and semi-aquatic amphibians and reptiles is limited within the permit area and occurs primarily along Beaver Creek in the western portion of the area. Other water bodies are ephemeral, and thus offer only short-term habitat. Activities associated with the project are not expected to disturb existing surface water or alter the topography in the area. Those species residing in rocky outcrops located in potential disturbance areas could be impacted by construction and maintenance operations. However, few non-aquatic herptile species were observed in the permit area and surrounding perimeter. Any impacts that would occur would affect individuals, but would not likely impact the population as a whole.

5.6.11.1.10 Fish and Macro-Invertebrates

The planned locations for new facilities and infrastructure do not overlap any perennial aquatic features; therefore, no loss of aquatic habitat would occur as the result of their construction. The risk of impaired water quality will be reduced or avoided through project siting, and implementation of standard construction erosion and sediment control measures. The location of project facilities (CPP, Satellite Facility, pipelines, well fields, access roads and power lines), as well as the proposed land application sites (center pivot irrigation sites), will avoid direct impacts to perennial streams.

Due to the arid climate and proposed location of new project facilities, operation of the well fields is not expected to alter aquatic habitat or water quality in perennial streams. No surface water will be diverted for use in the operation, and no process water will be discharged into aquatic habitat.

Pass Creek provides only seasonal drainage and does not support fish or significant amphibian habitat. Some of the proposed land application sites west of the Satellite Facility would be located in general proximity to Beaver Creek, the primary aquatic habitat in the project vicinity. All land application areas will be surrounded by catchment areas that will prevent runoff. Beaver Creek will not be directly affected by the well field operations or land application sites. Section 3.5.4.1.1 describes how Beaver Creek and the Cheyenne River near the permit area are classified as warmwater, semipermanent fisheries. No coldwater fisheries are present in the permit area, and no impacts to coldwater fisheries will occur as a result of the Dewey-Burdock Project.

5.6.11.1.11 Threatened, Endangered, or Candidate Species and Species Tracked by SDNHP

Federally Listed Species

As described in the preceding sections of this document, no federally listed vertebrate species were documented in the project survey area (permit area and 1-mile perimeter) during the year-long survey period, or during previous targeted surveys conducted for the original claims (TVA, 1979). Additionally, the USFWS has issued a block clearance for black-footed ferrets in all black-tailed prairie dog colonies in South Dakota except northern Custer County, and in the entire neighboring state of Wyoming. That clearance indicates that ferrets do not currently, and are not expected to, occupy the permit area. Only one small black-tailed prairie dog colony was present in the permit area itself during the 2007-2008 baseline surveys, and local landowners are actively working to remove the animals from their lands. Consequently, the proposed project will have no direct, indirect, or cumulative effects on black-footed ferrets.

State-Listed Species

ISR activities within the permit area are not likely to adversely affect bald eagles, the only state-listed species known to inhabit the permit area. Bald eagles were documented at winter roosts and an active nest within the permit area. However, most roost sites and the lone nest site are at least 1.0 mile from the nearest planned facility. Additionally, no more than two or three bald eagles were observed during any given winter survey despite the numerous available (and unoccupied) mature trees along Beaver Creek, Pass Creek, and the pine breaks located in and near the permit area. Three proposed land application sites (center pivot irrigation systems) would fall within the one-mile buffer of the bald eagle nest. However, those systems are typically automated, and the minimal disturbance associated with potential maintenance of those systems should not be significant enough to impact nesting or roosting bald eagles along Beaver Creek.

Potential direct impacts to bald eagles include the potential for injury or mortality to individual birds foraging in the permit area due to electrocutions on new overhead power lines. Although not expected, disturbance activities near an active nest could result in abandonment and, thus, the loss of eggs or young. The increased human presence and noise associated with construction activities, if conducted while eagles are wintering within the area, could displace individual eagles from using the area during that period.

Given the low number of wintering and nesting bald eagles in the permit area, potential impacts would be limited to individuals rather than a large segment of the population. The use of

existing or overlapping right-of-way corridors along with best management practices will minimize potential direct impacts associated with overhead power lines. If necessary, the majority of other potential impacts could be mitigated if construction activities were conducted outside the breeding season and/or winter roosting months, or outside the daily roosting period, should eagles be present within 1 mile of construction. Any bald eagles that might roost or nest in the area once the project is operational would be doing so in spite of continuous and ongoing human disturbance, indicating a tolerance for such activities.

Indirect impacts as a result of noise and human presence associated from project-related operations could include area avoidance by avian species. Potential winter foraging habitat could be further fragmented by linear disturbances such as overhead power lines and new roads associated with the project. Given the size of the project, those disturbances would occur within narrow corridors over relatively short distances. Nevertheless, the use of common right-of-way corridors to consolidate new infrastructure will reduce these potential indirect impacts.

The only other state-listed species recorded in the general area was the river otter. An otter carcass was discovered lodged in debris in the stream channel at fisheries sampling station BVC04 in mid-April 2008. That site is approximately 12 river miles upstream from the permit area boundary in eastern Wyoming. The carcass had washed away by the July 2008 fisheries sampling session. The monthly sampling at BVC04 during the monitoring period confirmed no additional observations of otters. Likewise, no evidence of otters was report by biologists along any drainage elsewhere in the survey area during the year-long baseline survey period. Given the fact that no stream channels will be physically impacted in the permit area, the lack of otter sightings or sign in the permit area itself, and the stringent water processing and water quality monitoring that will occur, this project is not likely to directly or indirectly impact river otters.

Species Tracked by SDNHP

Ten terrestrial species tracked by the SDNHP were recorded during baseline surveys, including the bald eagle. Seven of the ten were observed within the permit area, and three were seen in the 2-km perimeter. One additional species, the plains topminnow, was observed in Beaver Creek and the Cheyenne River, at least 1 mile outside the permit area. Three SDNHP species are known or suspected to have nested in the permit area in 2008. However, two of the three nest sites are at least 1 mile from the nearest planned new facility, and all three were closer to existing disturbances in 2008 than they would be to new activities outside those existing areas.

The seven SDNHP species recorded in or flying over the permit area could potentially experience the same type of direct and/or indirect impacts from construction and operation of the proposed operation as those described previously for other species: e.g., injury, mortality, avoidance, displacement and increased competition for resources. Those potential impacts will be minimized by the timing, extent, and duration of the proposed activities. Enforced speed limits during all phases of the project will further reduce potential impacts to wildlife throughout the year, particularly during the breeding season. Once facilities and infrastructure are in place, animals remaining in the permit area would demonstrate an acclimation to those disturbances.

5.6.11.2 Mitigation of Potential Ecological Resources Impacts

The following is a list of proposed mitigation measures for such potential impacts:

- Design fencing to permit big game passage to the extent practicable.
- Use existing roads when possible and limit construction of new access roads to provide for access to more than one well site or well field, if possible.
- Enforce speed limits to minimize collisions with wildlife, especially during the breeding season.
- Adhere to timing and spatial restrictions within specified distances of active raptor nests during the breeding season as determined by appropriate regulatory agencies.
- Develop a bald eagle mitigation/management plan for review and approval by the USFWS. The plan also will be provided to the SDGF&P for review and input, although the USFWS will have the final approval authority. The approved plan and any associated permits will be incorporated into the LSM permit. The bald eagle mitigation/management plan is anticipated to address the following:
    - Ensure that annual bald eagle monitoring and survey data for nest and winter roost sites are available within the permit area and buffer area for the life of mine to:
        - determine normal habitat use and movements,
        - determine the location and status of nests and winter roost sites, and
        - document the occurrence and outcome of nesting bald eagle pair(s).
    - Establish buffer zones protecting important bald eagle habitat where necessary and stipulating seasonal restrictions on ISR-related disturbances within buffer areas in order to avoid jeopardizing bald eagles during any project phase. Such buffer zones and their associated seasonal restrictions would be established:

- in keeping with current USFWS recommendations,
- around nest sites, and
- around documented winter roost sites).

- If necessary, obtain a USFWS-issued permit and any necessary State permits for eagle take and/or nest relocation or removal, the application for which would address the following:
  - demonstration that the proposed activity meets the requirements of 50 CFR § 22.26 or § 22.27, which contain the federal requirements for take and removal/relocation of eagle nests, respectively;
  - methods to relocate the nest(s) or construct an alternate nest and/or improve conditions at alternate nest sites, if mitigation measures are required around documented winter roost sites);
  - a demonstration that suitable nesting and foraging (including winter) habitat is available to the area nesting population of bald eagles that could accommodate any bald eagles displaced by the take or nest removal/relocation; and
  - implementation of monitoring and reporting procedures to determine the response of bald eagles to the take or nest relocation(s).

- If direct impacts to raptors or other migratory bird species of concern occur, a Monitoring and Mitigation Plan for those species will be prepared and approved by the USFWS, including one or more of the following provisions:
  - Relocation of active and inactive raptor nests that could be impacted by construction or operation activities in accordance with the approved raptor monitoring and mitigation plan.
  - Creation of raptor nests and nesting habitat through enhancement efforts such as nest platforms to mitigate other nest sites impacted by ISR operations.
  - Obtaining appropriate permits for all removal and mitigation activities.
  - Establishing buffer zones protecting raptor nests where necessary and restricting ISR-related disturbances from encroaching within buffers around active raptor nests from egg-laying until fledging to prevent nest abandonment, or injury to eggs or young.

  - Reestablishing the ground cover necessary to attract and sustain a suitable raptor prey base after drilling, construction, and future ISR operations and site reclamation/decommissioning
  - Required use of raptor-safe construction for overhead power lines according to current guidelines and recommendations by the USFWS

- Restore pre-mining native habitats for species that nest and forage in those vegetative communities.
- Restore diverse landforms, replace topsoil, and construct brush piles, snags, and/or rock piles to enhance habitat for wildlife.
- Conduct weed control as needed to limit the spread of undesirable and invasive, non-native species on disturbed areas.

Adjusting the timing of various construction, operational, and reclamation activities to avoid the breeding season can also be an effective way to minimize impacts related to such activities in the permit area. As a practical matter, worker crews conducting construction or reclamation activities typically work during daylight hours, so potential impacts to year-round residents, particularly more nocturnal species such as bats, rodents and others, should not be increased significantly. Following completion of construction in a given area, access roads would be blocked with berms or fencing to prevent use by casual traffic. Site reclamation/ decommissioning, including surface reclamation, will be completed in the same manner, with activities timed to minimize disturbance to nesting or migrating species. Relevant agency standards for reclamation will be followed and this phased, systematic approach will allow more mobile wildlife species to relocate into adjoining, undisturbed habitat and then return following completion of construction or reclamation in a particular area. Thus, the sequential, phased nature of this approach will decrease potential direct and indirect impacts on all wildlife species and their habitat.

5.6.12 Cultural Resources

5.6.12.1 Potential Cultural Resources Impacts

As discussed in Section 3.11, a Level III Cultural Resources Evaluation was conducted in the permit area. Personnel from the Archaeology Laboratory, Augustana College, Sioux Falls, South Dakota, conducted on-the-ground field investigations between April 17 and August 3, 2007. Potential impacts to historic and cultural resources will be minimized by implementing the mitigation measures described below.