5.6.12.2 Mitigation of Potential Cultural Resources Impacts

The following summary of protection of historic and cultural resources within the proposed permit area was obtained from the Draft Supplemental Environmental Impact Statement (Draft SEIS) for the Dewey-Burdock Project (NRC, 2012, p. xxxix):

> Within the area of potential effect at the proposed Dewey-Burdock site, 18 historic sites are either listed in the National Register of Historic Places (NRHP) or eligible for listing in the NRHP. Based on the proposed location of ISR facilities and infrastructure, avoidance of 12 of these sites is possible during the construction phase and, therefore, no impacts are anticipated. Avoidance and mitigation, such as fencing and data recovery excavations, are recommended for the remaining six NRHP-eligible sites. In addition, avoidance is recommended for two unevaluated historic burial sites located in proximity to proposed construction activities until their NRHP eligibility is determined. Avoidance and mitigation is also recommended for 4 unevaluated site[s] located within 76 m (250 ft) of proposed wellfields or land application areas.

The mitigation measures to protect historic and cultural resources will include but will not be limited to:

- Administering a historic and cultural resources inventory before engaging in any development activity not previously assessed by NRC or any cooperating agency.
- Any disturbances to be associated with such development will be addressed in compliance with the National Historic Preservation Act (NHPA), the Archeological Resources Protection Act, and their implementing regulations.
- Prior to construction, establishing an agreement between NRC, South Dakota State Historic Preservation Office (SHPO), BLM, interested Native American tribes, Powertech (USA) and other interested parties that outlines the mitigation process for each affected historic resource. As part of this agreement, Powertech (USA) will develop an Unexpected Discovery Plan that will outline the steps required if unexpected historic and cultural resources are encountered (Draft SEIS, p. xxxix).
- Avoidance, where possible, of eligible or potentially eligible sites.
- Fencing known historic properties in areas where construction, well field development, and ISR operations will occur so disturbance to these areas can be avoided.
- Making the location of historic properties known to employees in advance of ground disturbing activities.
- Addressing any disturbances in compliance with Powertech's (USA) Memorandum of Agreement (MOA) with the South Dakota State Archeologist and any future MOAs developed by Powertech (USA) or NRC under the NHPA. Powertech (USA) executed the MOA with the South Dakota State Archeologist in September 2008. The MOA, which is provided in Appendix 3.11-B, establishes procedures to avoid or mitigate

potential effects on archaeological and historic sites pursuant to SDCL 45-6D-14 and 45-6B. Provisions include:

- Investigating archeological or historic sites threatened or potentially threatened by proposed ground disturbing activity prior to disturbance to determine their significance or research potential.
- Notifying ARC at least 30 days in advance of surface disturbance that could potentially impact an archeological or historic site.
- Providing a quarterly report to ARC summarizing Powertech (USA)'s efforts to carry out the terms of the MOA.
- Temporarily halting surface disturbance activities if historic or archeological sites are discovered or unanticipated effects on historic or cultural sites are found during any phase of the project. Powertech (USA) will not resume activities until clearance to proceed is granted by ARC.

- Implementing mitigation measures if it becomes necessary to disturb an eligible or potentially eligible site, potentially including data recovery excavations coordinated with ARC.
- Immediately ceasing any work resulting in the discovery of previously unknown cultural artifacts to ensure that no unapproved disturbance occurs. Powertech (USA) will notify appropriate authorities per any license conditions and will not proceed with activities without appropriate approvals from NRC or other agencies as appropriate. Any such artifacts will be inventoried and evaluated, and no further disturbance will occur until authorization to proceed has been received. Powertech (USA) recognizes that the NHPA environment is not static, but rather is ongoing up to and through final financial assurance release following successful reclamation.

5.6.13 Noise

5.6.13.1 Potential Noise Impacts

Potential noise impacts will result from the operation of construction equipment, passenger vehicle and material shipment vehicle traffic, and, to a very limited extent, from the operation of ISR and wastewater facilities including center pivots if used for land application. The potential impacts to nearby receptors will be small due to the remote location, limited disturbance, and lack of nearby residences.

Section 3.12 describes how the minimum distance between a residence and the primary county road in the permit area (S. Dewey Road) is 3,700 feet. Based on the analysis in Section 3.12, the maximum anticipated noise from a heavy truck traveling on the S. Dewey Road at a residence within the permit area will be 41 dBA, which is well within the 55 dBA level identified by EPA as preventing activity interference and annoyance. Based on this analysis, increased vehicle

traffic associated with passenger vehicles and material shipment vehicles will not have significant impacts on nearby residences.

Noise originating from construction equipment will be apparent locally over the short term where construction activities are occurring. This primarily will include facility construction at the CPP and Satellite Facility and well field construction. Table 5.6-3 identifies typical noise levels 50 feet away from construction equipment. These noise levels were obtained from NRC guidance document NUREG-1910 (NRC, 2009). As described in Section 3.12, noise from point sources diminished by about 6 dBA for each doubling of distance according to the following relationship, where it is assumed that the noise radiation is uniform, non-directional, and freely propagating (Bell and Bell, 1994):

$$N_1 - N_2 = 20 \log (r_2/r_1)$$

In this equation, N_1 and N_2 are the noise levels (sound pressure levels) at points 1 and 2, and r_2 and r_1 are the distances from the receptor to point 2 and 1, respectively.

Table 5.6-3 includes estimates of noise levels from construction equipment using this relationship for distances of 1,600 feet and 5,900 feet, which are the minimum anticipated distances between a residence and a well field and CPP, respectively. This table shows that noise levels resulting from construction equipment typically will be lower than the annoyance threshold level even at the minimum distance from a residence. Since most construction activity will be located at a much greater distance from residences, the noise levels generally will be lower than those shown in Table 5.6-3. Due to distance and topographic interference, potential noise impacts likely will be within the range of normal baseline variability for most construction activities and most residences.

5.6.13.2 Mitigation of Potential Noise Impacts

Potential noise impacts include the generation of noise resulting from operating heavy equipment and process machinery. Noise from process machinery will be contained within process structures and, as such, should have no discernible impacts on the public or the environment. With respect to potential noise impacts from heavy equipment, typical mitigation measures that will be implemented at the project to minimize noise impacts may include the following:

- Minimize construction activities during the night.

Table 5.6-3: Noise Levels for Construction Equipment

Equipment Type	Noise Level at 50 feet[1] (dBA)	Noise Level at 1,600 feet[2] (dBA)	Noise Level at 5,900 feet[3] (dBA)
Heavy Truck	82-96	52-66	41-55
Bulldozer	92-109	62-79	51-68
Grader	79-93	49-63	38-52
Excavator	81-97	41-67	40-56
Crane	74-89	44-59	33-48
Concrete Mixer	75-88	45-58	34-47
Compressor	73-88	43-58	32-47
Backhoe	72-90	42-60	31-49
Front Loader	72-90	42-60	31-49
Generator	71-82	41-52	30-41
Jackhammer/Rock Drill	75-99	45-69	34-58
Pump	68-80	38-50	27-39

Notes: [1] NUREG-1910, Table 4.2-1 (NRC, 2009).
[2] Minimum anticipated distance between potential perimeter monitor well and nearby residence.
[3] Minimum distance between CPP and nearby residence.

- Use sound abatement controls on operating equipment and facilities.
- Use personal hearing protection for workers in any high noise areas.

These mitigation measures will ensure that noise levels will remain within relevant EPA guidelines for off-site receptors and OSHA standards for workers.

5.6.14 Visual and Scenic Resources

5.6.14.1 Potential Visual and Scenic Resources Impacts

Potential short-term impacts to visual and scenic resources during construction will result from surface disturbance activities and facility construction. Temporary disturbance areas will be reclaimed upon completion of construction and debris created during construction will be removed as soon as possible to limit the areal extent affected during construction.

The sources of potential longer-term impacts to visual and scenic resources will include the presence of the CPP, Satellite Facility, well head covers, header houses, access roads, overhead power lines, ponds, and wastewater disposal facilities (DDWs and/or land application systems). These potential longer-term visual and scenic resources impacts will remain until the completion of reclamation/decommissioning, upon which the permit area will closely resemble the pre-mining condition.

5.6.14.2 Mitigation of Potential Visual and Scenic Resources Impacts

Mitigation measures for potential visual and scenic resources impacts will include:

- Use exterior lighting only where needed to accomplish facility tasks and improve safety.
- Limit the height of exterior lighting units.
- Use shielded or directional lighting to limit lighting only to areas where it is needed.
- Design of facilities to minimize surface disturbance.
- Construction and placement of structures taking into consideration the topography in order to conceal well heads, plant facilities, and roads from public vantage points.
- Satisfy BLM guidelines by using building materials and paint that complement the natural environment.
- During construction of roads, consider the topography that a given road follows as well as the potential area of disturbance.

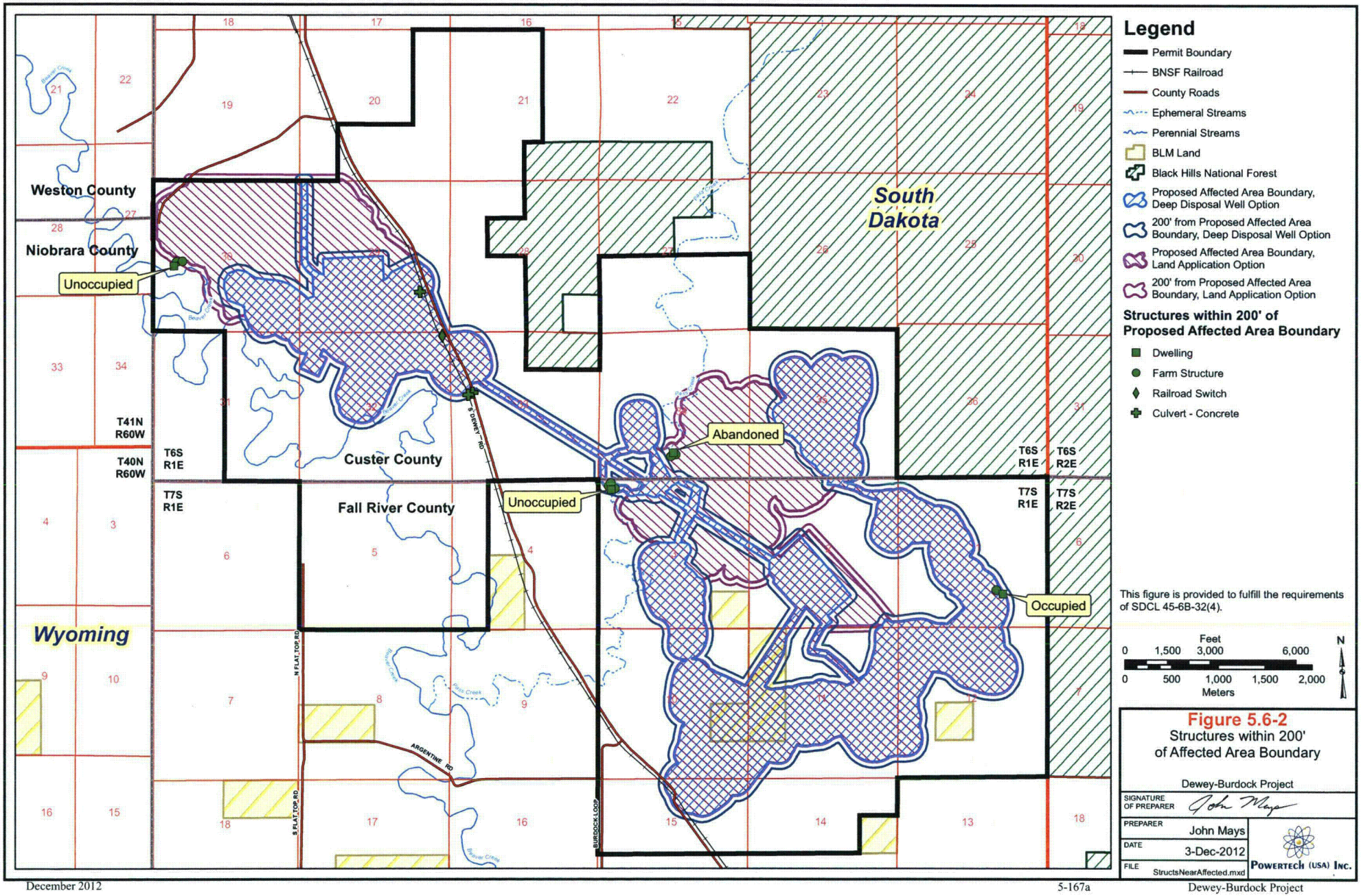
- Minimize access road construction through the use of existing roads.
- Locate access roads and utilities in common corridors where possible.
- Implement speed limit policies and dust control measures including routinely applying water spray to roads and construction areas to minimize fugitive dust.
- Promptly reclaim and reseed temporary disturbance areas.
- Promptly remove debris associated with construction activities.

5.6.15 Protection of Man-Made Structures

Figure 5.6-2 depicts man-made structures within 200 feet of the proposed affected area boundaries. These include dwellings, farm structures (e.g., barns and sheds), a railroad switch house, and concrete culverts. Following is a summary of how these structures will be protected in accordance with SDCL 45-6B-32(4).

Several dwellings and farm structures are within 200 feet of the proposed affected area boundaries. Currently these include one occupied dwelling, two unoccupied but habitable dwellings, and one abandoned dwelling that is not habitable. There are no habitable dwellings within potential well field pattern areas. It is anticipated that construction activities within 200 feet of dwellings or farm structures will be limited to the installation of perimeter monitor wells, pipelines and overhead power lines. Powertech (USA) does not anticipate drilling any wells within 50 feet or installing any pipelines within 25 feet of any habitable dwelling or any usable farm structures, except that Powertech (USA) may install small-diameter domestic water supply pipelines to replace domestic water supply wells as described in Section 5.6.3.2. Potential impacts will be minimized by avoiding these structures during facility design and construction.

The railroad, railroad switch house, and concrete railroad culverts will be protected by avoiding construction activities near the railroad. The only construction activity anticipated within 200 feet of the railroad is the installation of perimeter monitor wells in or near the railroad right-of-way in the vicinity of D-WF1 and B-WF2. Any perimeter wells inside the railroad right-of-way would be offset from the railroad a sufficient distance to allow the work to be performed safely and to protect the stability of the railroad. In addition, Powertech (USA) may install one or more plant-to-plant pipelines between the CPP and Satellite Facility. As depicted on Figures 5.3-1 and 5.3-2, such pipelines would cross the railroad right-of-way near the Satellite Facility. These pipelines, if installed, would be bored underneath the railroad, and the bored length would be encased in a protective material such as steel well casing. Any construction activities within the BNSF right-of-way would be coordinated with the railroad to avoid impacts.


Legend
Permit Boundary
BNSF Railroad
County Roads
Ephemeral Streams
Perennial Streams
BLM Land
Black Hills National Forest
Proposed Affected Area Boundary, Deep Disposal Well Option
200' from Proposed Affected Area Boundary, Deep Disposal Well Option
Proposed Affected Area Boundary, Land Application Option
200' from Proposed Affected Area Boundary, Land Application Option
Structures within 200' of Proposed Affected Area Boundary
Dwelling
Farm Structure
Railroad Switch
Culvert - Concrete
Weston County
Niobrara County
Custer County
Fall River County
South Dakota
Wyoming
Unoccupied
Abandoned
Unoccupied
Occupied
T41N R60W
T40N R60W
T6S R1E
T7S R1E
T6S R2E
T7S R2E
S DEWEY RD
N FLAT TOP RD
S FLAT TOP RD
ARGENTINE RD
BURDOCK LOOP
This figure is provided to fulfill the requirements of SDCL 45-6B-32(4).
Feet
0 1,500 3,000 6,000
0 500 1,000 1,500 2,000
Meters
N
Figure 5.6-2
Structures within 200' of Affected Area Boundary
Dewey-Burdock Project
SIGNATURE OF PREPARER
PREPARER John Mays
DATE 3-Dec-2012
FILE StructsNearAffected.mxd
POWERTECH (USA) INC.

No significant disturbance will occur to the S. Dewey Road as a result of the Dewey-Burdock Project. Powertech (USA) will coordinate the construction of access road approaches with Custer and Fall River counties.

5.7 Operations

During operation of the facility, Powertech (USA) via the company's Safety and Environmental Review Panel (SERP) will ensure that the facility will apply to all applicable laws and regulations. Powertech (USA) will maintain the health and safety of the workers, general public, and the environment while the facility is in operation. This includes maintaining potential occupational and public exposures to ionizing radiation ALARA in accordance with NRC license conditions.

5.7.1 Corporate Organization and Administrative Procedures

This section provides functional positions within the Powertech (USA) organization that have direct responsibility to ensure corporate commitment to operating the facility in a manner that is protective of human health and the environment, including the principle of ALARA. The organizational accountability of these functional positions is also presented.

5.7.1.1 Corporate and Facility Organization

The organizational structure of Powertech (USA) and the facility is shown in Figure 5.7-1. The organization structure defines the Chief Operating Officer (COO) as having direct supervision over the Vice President of Environmental Health & Safety Resources and the Facility Manager of the Dewey-Burdock Project.

5.7.1.2 Chief Operating Officer

The COO is empowered by the Board of Directors to have the responsibility and authority for the radiation safety and environmental compliance programs at all Powertech (USA) facilities. The COO is directly responsible for ensuring that Powertech (USA) personnel comply with corporate industrial safety, radiation safety, and environmental protection programs. The COO is also responsible for company compliance with all regulatory license/permit conditions/stipulations, regulations, and reporting requirements. The COO has the responsibility and authority to terminate immediately any activity that is determined to be a threat to employees, public health,

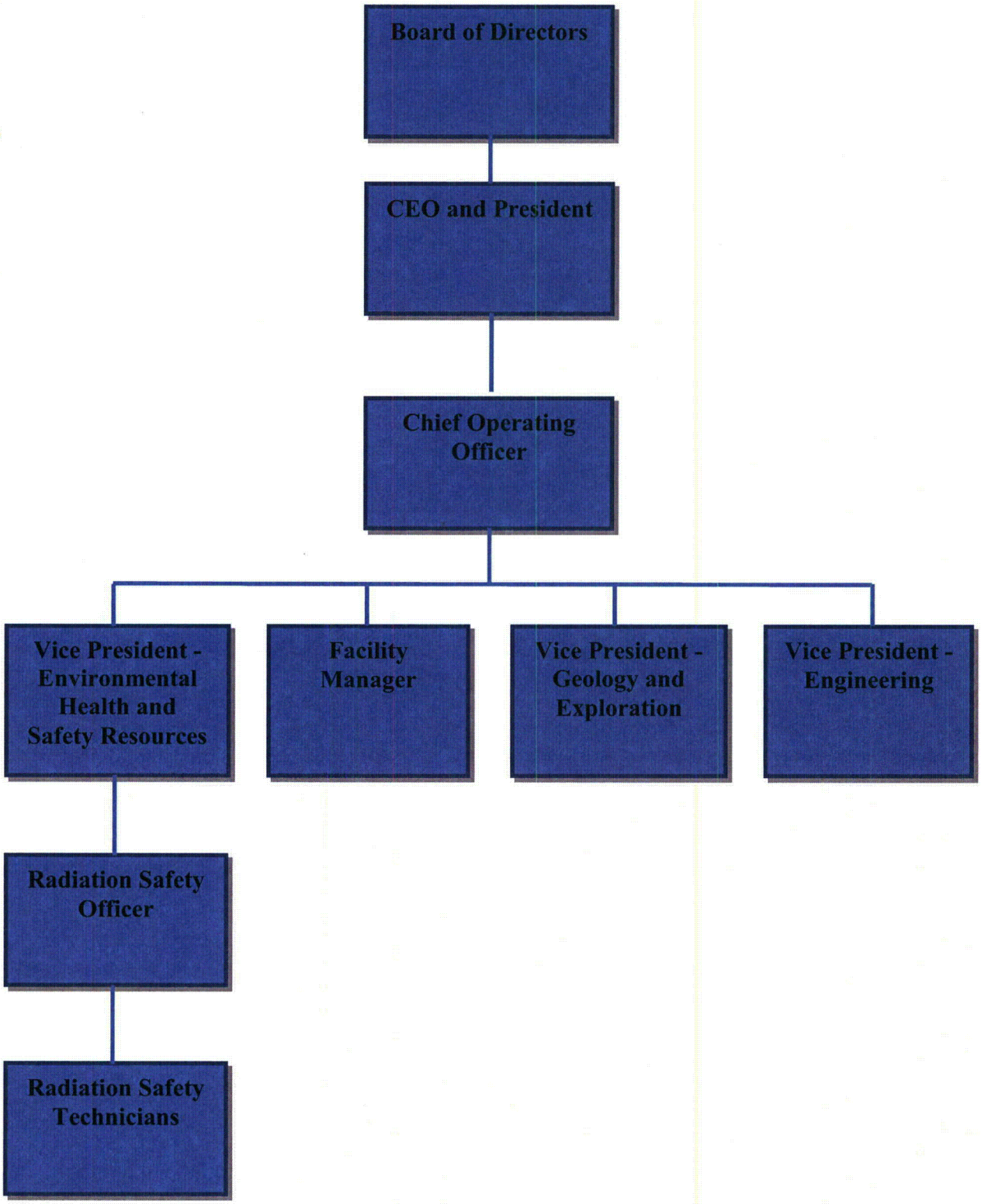


Figure 5.7-1: Organizational Structure

or the environment, or a violation of state or federal regulations. The COO has the authority to assign corporate resources (e.g., capital equipment, personnel, budget) to ensure corporate environmental, health, and safety goals and directives are met.

5.7.1.3 Vice President of Environmental Health & Safety Resources

The Vice President of Environmental Health & Safety Resources is responsible for all radiation protection, health and safety, and environmental programs for Powertech (USA) and ensuring these programs meet applicable regulatory requirements and industry best management practices. The Vice President is responsible for ensuring that all company operations comply with all applicable laws and regulations. The Vice President reports directly to the COO.

5.7.1.4 Facility Manager

The Facility Manager will be responsible for all operations at the project facility. The Facility Manager will be responsible for compliance with all applicable laws and regulations as well as corporate health, safety and environmental programs. The Facility Manager will have the authority to terminate immediately any operation of the facility that is determined to be a threat to employees, public health, or the environment, or a violation of laws or regulations. The Facility Manager reports directly to the COO. The Facility Manager has the authority to assign facility resources (e.g., capital equipment, personnel, budget) to ensure corporate environmental, health, and safety goals and directives are met. The Facility Manager will act promptly on recommendations made by the Radiation Safety Officer (RSO) to correct deficiencies identified in the radiation or environmental monitoring programs, but will not have the authority to unilaterally override the RSO's decision to suspend, postpone, or modify an activity.

5.7.1.5 Radiation Safety Officer

The RSO will be the person in charge of and responsible for the radiation protection and ALARA programs. The RSO will ensure that equipment and laboratory facilities are adequate for monitoring and evaluating the relative attainment of the ALARA objective. The RSO will develop, review, and enact changes in the program so that protection against uranium, radon and decay products and the ALARA principle are maintained during the operation of the facility. These changes include new equipment, process changes, and changes in the operating procedures.

The RSO will possess the authority to enforce regulations and administrative policies that may affect any aspect of the radiological protection program. The RSO will have the authority to suspend, postpone, or modify any activity that the RSO determines is not in compliance with

regulations and administrative policy. The RSO will also be a member of the SERP described in Section 5.7.2.3 and will meet the qualifications outlined in NRC guidance.

The RSO will report directly to the Vice President of Environmental Health & Safety Resources.

5.7.1.6 Radiation Safety Technicians

Powertech (USA) will utilize Radiation Safety Technicians (RSTs). The RSTs will be members of the radiation safety staff. Qualifications and training requirements will be in accordance with NRC license requirements. The RST will meet the minimum training requirements of the RSO and will be a qualified designee to replace the RSO in daily visual inspection of all work and storage areas in the facility to determine if standard operating procedures (SOPs) are being followed properly and good radiation practices are being implemented. The RST will perform this function when the RSO is not available, e.g., during off shifts.

5.7.2 Management Control Program

This section describes administrative controls within the Powertech (USA) organization that are intended to ensure the facility is operated in a manner that is protective of human health and the environment, including the principle of ALARA.

5.7.2.1 Routine Activities

All routine activities involving handling, processing, or storing of radioactive or hazardous material at the Dewey-Burdock Project will be documented by written SOPs. Each SOP will be reviewed and approved in writing by the RSO or RST prior to implementation. Any proposed changes to an SOP must also be reviewed and approved in writing by the RSO or the RST. The RSO will review each SOP at least annually to ensure it follows any newly established radiation protection practices.

Up-to-date copies of the SOPs, along with accident response and radiological fire protection plans, will be made available to all employees. All SOPs will be managed in a manner which allows for tracking of revisions and dates of the revisions.

5.7.2.2 Non-Routine Activities

Any activities with potential for significant exposure to radioactive material and not documented by existing SOPs will require radiological work permits (RWPs). RWPs are job-specific permits that will describe the details of the job to be performed, precautions necessary to maintain

radiation exposures ALARA, and the necessary radiological monitoring and sampling. The RSO or RST must review and sign off on the RWP before the associated work is to be performed.

5.7.2.3 Safety and Environmental Review Panel

A SERP consisting of at least three members will be established. One member will be the RSO. Another member will be someone with authority to implement managerial and financial changes (e.g., the Facility Manager). Another member will be someone with authority to make operational changes (e.g., the Production Superintendent, who will report to the Facility Manager). The SERP may include others on a temporary or permanent basis whenever the SERP requires additional technical or scientific expertise; these may be other employees or consultants. At least one member of the SERP shall be designated as chairman.

The purpose of the SERP will be to evaluate, discuss, approve, and record any changes to any SOP, the facility, or tests and experiments involving safety or the environment. The changes will not require an NRC license amendment pursuant to 10 CFR § 40.44 as long as the changes do not:

- Create a possibility of an accident unlike what is evaluated in the NRC license application (as updated),
- Create a possibility of a malfunction of a structure, system, or control unlike what is evaluated in the NRC license application (as updated), or
- Result in a departure from the method of evaluation described in the NRC license application (as updated) used in establishing the final safety evaluation report or the environmental assessment or technical evaluation reports or other analyses and evaluations for NRC license amendments.

Records of the evaluations made by the SERP will be made. Any change approved by the SERP will be documented in writing by showing the affected operating procedure, facility, and/or test and experiment before and after the change along with the date of the change. The SERP will evaluate each well field hydrogeologic data package as it is developed. The SERP evaluation will determine whether the results of the hydrologic testing and the planned ISR operations are consistent with SOPs and technical requirements stated in the NRC license. The evaluation will include review of the potential impacts to human health and environment. If anomalous conditions are present, the SERP evaluation indicates potential to impact human health or the environment, or it is required by NRC license conditions, the well field hydrogeologic data

package will be submitted to NRC for review. All well field packages and written SERP evaluations will be maintained at the site and available for regulatory review.

The SERP will have the authority to raise issues regarding the health and safety of the workers, general public, and/or the environment due to the operation of the facility to the Facility Manager and the Vice President of Environmental Health & Safety Resources.

An annual report will be prepared which describes actions taken by the SERP including changes to operating procedures, the facility, or tests and experiments that involve safety or the environment enacted since the previous report was issued. The report also will document the reason for each change, whether the change required an NRC license amendment, and the basis for determination.

5.7.2.4 Radioactive Material Postings

All entrances to the facility will be conspicuously posted with the following statement: "ANY AREA WITHIN THIS FACILITY MAY CONTAIN RADIOACTIVE MATERIAL."

5.7.2.5 Recordkeeping

All records will be maintained as hard copy originals or stored electronically.

The following information will be permanently maintained both on-site and at an off-site location until NRC license termination:

- Records of the results of measurements and calculations used to evaluate the release of radioactive effluents to the environment.
- Records of spills, excursions, facility stoppages, contamination events, and unusual occurrences.
- Records of inspections of ponds.
- Records of the occupational monitoring.
- Information related to the radiological characterization of the facility.
- Drawing and photographs of structures, equipment, restricted areas, well fields, and storage areas with radioactive materials and all of their modifications.
- Records of survey and calibrations will be maintained for at least 3 years.

All records will be stored in manner to prevent record loss from fire, flood, or other unforeseen events beyond the control of Powertech (USA). All records will be legible throughout the retention period described above.

5.7.2.6 Reporting

Powertech (USA) has committed to developing written operating procedures within the management control program to address all NRC license reporting requirements. These will be prepared after NRC license issuance but prior to ISR operations. Specific reporting requirements will include items such as reports of theft or loss of licensed material, notification of incidents, reports of exposures of radioactive material exceeding limits, and effluent monitoring reporting.

Powertech (USA) will prepare and submit reports in accordance with the requirements of SDCL 45-6B-36, ARSD 74:29:05:18 and ARSD 74:29:05:20. The following reports will be provided to DENR at the specific frequency.

Updated Baseline Surface and Groundwater Report

Powertech (USA) has committed to collecting additional surface water and groundwater samples prior to operations (refer to Sections 5.5.2 and 5.5.3). The results will be provided to DENR in an updated baseline surface and groundwater report prior to ISR operations.

Annual Environmental Monitoring Report

Powertech (USA) will prepare and provide to DENR an annual environmental monitoring report, which will include the results of the following operational monitoring programs.

- Operational groundwater monitoring, including domestic wells, stock wells, irrigation wells and monitor wells.
- Operational surface water monitoring, including streams and impoundments.
- Soil sampling, including soil samples collected from the air particulate monitoring locations and from the land application areas (if used).
- Vegetation sampling, including vegetation samples collected from the air particulate monitoring locations and from the land application areas (if used).
- Livestock and fish sampling.
- Environmental air monitoring, including air particulate and radon gas sampling at operational environmental air monitoring stations.

Annual Financial Assurance Report

Powertech (USA) will provide an annual financial assurance report to DENR within 60 days prior to the anniversary date of the permit each year including the following elements:

- Annual filing of map and fee in accordance with SDCL 45-6B-36.
- A brief discussion of the coming year's operational plans including any anticipated revisions that might require department or board approval.
- An annual disturbance and reclamation summary, including:
    - Total amount of disturbed lands;
    - Total amount of land that has undergone interim reclamation;
    - Total amount of land that has undergone final reclamation but has not yet satisfied the postclosure reclamation requirements; and
    - Total amount of land that has undergone final reclamation and has satisfied the postclosure reclamation requirements.
- An updated financial assurance cost estimate that accounts for economic and site-specific factors such as inflation, changes in costs of materials, changes in waste disposal costs, changes in specific reclamation costs such as well plugging, and changes in other site-specific decommissioning/reclamation costs such as the level of effort and duration required for groundwater restoration. The updated financial assurance cost estimate will account for the next year of proposed activities.

Land Application System Reporting

Powertech (USA) will establish and maintain records and prepare and submit reports for land application system operation in accordance with the requirements of ARSD 74:29:05.

Prior to operating the land application systems each year, Powertech (USA) will provide written notice to the DENR of the intent to implement land application. In accordance with ARSD 74:29:05:18, the written report will include the following information:

1) The date on which application will start;
2) The amount of solution to be applied to land;
3) The estimated duration of land application; and
4) The chemical characterization of the solution in the storage ponds.

Per ARSD 74:29:05:20, Powertech (USA) will submit a written report to DENR following each land application cycle, which is defined as the last land application operational period during each calendar year. Prior to the end of each year, Powertech (USA) will prepare and submit a written report including the following information for each of the land application systems (Dewey and Burdock):

1) The total amount of land application solution applied;
2) The total hydraulic loading rate per acre;
3) The total metals loading rate per acre, including all of the trace and minor elements and radiological parameters in Table 6.2-1;
4) The duration of the land application cycle;
5) All land application effluent and storage pond sampling data; and
6) A general discussion of the success of the system.

Well Completion Reports

Powertech (USA) will submit well completion reports within 1 month of completing each injection, production, or monitor well. Well completion will be defined as the point at which the well screen has been installed and initial well development has occurred. In accordance with SDCL 46-6-11, the well completion reports will be provided to DENR on a form supplied by the Chief Engineer.

Well Plugging Reports

Powertech (USA) will provide an annual well plugging report to DENR including the following elements for each plugged well in accordance with ARSD 74:02:04:71:

1) The name and complete mailing address of the owner;
2) The legal description of the well or hole location;
3) The completion date;
4) The casing or hole size, type of well, and well or hole depth;
5) A general description of the condition of the well;
6) A description of the plugging procedure;
7) The grout or material used to plug the well or test hole; and
8) The date and the signature of the license representative.

Postclosure Monitoring Report

During postclosure monitoring, Powertech (USA) will provide an annual report to DENR describing the following:

- Treatment system operation (if applicable);
- Operation of monitoring systems;
- Monitoring results; and
- Inspection and maintenance activities.

5.7.2.7 Historical and Cultural Resources Inventory

Powertech (USA) will administer a historic and cultural resources inventory before engaging in any development activity not previously assessed by NRC or any cooperating agency. Any disturbances to be associated with such development will be addressed in compliance with the NHPA, the Archeological Resources Protection Act, and their implementing regulations. Any disturbances also will be addressed in compliance with Powertech (USA)'s MOA with the South Dakota State Archeologist and any future MOAs developed by Powertech (USA) or NRC under the NHPA. Powertech (USA) executed the MOA with the South Dakota State Archeologist in September 2008. The MOA, which is provided in Appendix 3.11-B, establishes procedures to avoid or mitigate potential effects on archaeological and historic sites pursuant to South Dakota statutes 45-6D-14 and 45-6B.

Powertech (USA) will immediately cease any work resulting in the discovery of previously unknown cultural artifacts to ensure that no unapproved disturbance occurs. Powertech (USA) will notify appropriate authorities per any license conditions and will not go forward without appropriate approvals from NRC or other agencies as appropriate. Any such artifacts will be inventoried and evaluated, and no further disturbance will occur until authorization to proceed has been received. The procedure described in this section will continue up to and through final license termination.

5.7.3 Management and Audit Program

Powertech (USA) will conduct a management and audit program in accordance with NRC license requirements that will evaluate compliance with and effectiveness of the radiation protection, operational monitoring, and environmental monitoring programs. The management and audit program will function to ensure vigilance toward the protection of human health and the environment. It will be designed to provide quality assurance based upon reviews and evaluations of the effectiveness of radiation protection provided for workers and members of the public. A brief summary of the management and audit program includes:

- Daily health physics inspections to determine if good radiation practices are being implemented.
- Weekly health physics inspections of all facility areas to examine the general radiation control practices and observe the required changes in procedure and equipment.
- Monthly health physics review of all radiation monitoring and exposure data for the month.
- Implementation of a radiation protection program ensuring compliance with NRC license conditions.
- Establish the effluent control and monitoring systems and ensure effluent monitoring locations are optimized for the intended function.
- Implement a waste storage system that will include a pond monitoring program to ensure the ponds are operated and maintained in a manner that prevents the movement of waste(s) to undesirable areas. Contingency plans will be built into the program to address all reasonable system failures.
- Implementation of an annual ALARA and radiation protection program audit.

5.7.4 Qualifications for Personnel Implementing the Radiation Safety Program

Powertech (USA) will establish the minimum qualifications, including education and experience, for the RSO and RST in accordance with NRC license conditions.

5.7.5 Radiation Safety Training

Powertech (USA) will establish radiation safety training programs to ensure all employees and visitors have an adequate level of knowledge to recognize and be aware of potential radiological hazards associated with activities they will be involved with at the facility. Written procedures will be established for initial training, refresher training, visitor training, contractor training, RSO training, and training documentation.

5.7.6 Facility Security

The following describes the security measures that will be implemented to prevent unauthorized site access and removal or access of NRC-licensed materials stored within the permit area:

- All areas where licensed material is stored (e.g., well fields, CPP, Satellite Facility) will be fenced.
- All gates accessing areas where licensed material is stored will be posted as described in Section 5.7.2.4 and locked when facility personnel are not immediately available to prevent unauthorized access to or removal of licensed materials.

- Facility fences, gates, and postings will be inspected daily as part of the inspection programs.
- A 24-hour per day, 7-day per week staff will be on duty at the facility.
- Visitors to the facility will enter through an access point at the main CPP entrance where they will sign in and receive required radiation safety training.

Powertech (USA) will control and maintain constant surveillance of licensed material that is in a controlled or unrestricted area and is not in storage. An example of licensed material not being in storage is licensed material being transported from the Satellite Facility to the CPP. Passive and administrative controls to prevent unauthorized access to and removal of licensed material not in storage include:

- SOPs assessing the possible transportation security risks and identifying measures to mitigate these risks.
- Locks and/or tamper indicators on all openings where licensed material is kept.
- Off-site vehicles transferring licensed materials will always be secure if left unattended.
- Off-site vehicles transferring licensed materials will be visible by an employee at all times when left unattended outside of a restricted area.

The requirements of 49 CFR 172 will apply to shipments of licensed material which Powertech (USA) offers for transport for commercial use. Powertech (USA) will develop SOPs for these cases and will evaluate the ability of potential commercial contractors offering transportation services to comply with the requirements of 49 CFR 172 prior to entering into a contracting agreement.

5.7.7 Radiation Safety Controls and Monitoring

Active and passive effluent control techniques and monitoring will ensure that occupational and public doses of ionizing radiation will be ALARA. Effluent control techniques are briefly summarized in Section 5.6.9.2 and will include use of pressurized, downflow IX vessels, ventilation systems, modern vacuum yellowcake dryers, and emission control systems. Radiation safety monitoring is described in Section 5.6.9.2 and will include monitoring air quality and potential worker exposure within the processing facilities and environmental monitoring throughout the permit area.

6.0 RECLAMATION PLAN

6.1 Introduction

This reclamation plan was developed by WWC Engineering personnel including Mr. John Berry and Mr. Dale Brown and Powertech (USA) personnel including Mr. Richard Blubaugh and Mr. John Mays. These individuals are competent and have experience managing and planning for reclamation in accordance with ARSD 74:29:07:18.

The initial and most critical goal of reclamation is to stabilize the primary disturbance (surface and subsurface) to reduce off-site impacts. The overall long-term objective of reclamation is to return future areas of disturbance to a beneficial land use after ISR activities have ceased. During the period of active ISR, interim management of disturbed lands through revegetation techniques, sediment control, dust, and management of noxious weeds will be conducted to minimize potential impacts to land, water, air, wildlife, and humans. As uranium ISR and groundwater restoration are completed within various portions of the permit area, long-term reclamation treatments will be implemented to ensure the creation of a stable and environmentally sound postmining land use.

6.2 Groundwater Restoration

The plans for groundwater restoration are discussed below. Groundwater restoration in each well field will be conducted in accordance with NRC license requirements.

6.2.1 Target Restoration Goals

Groundwater restoration, or aquifer restoration, will be performed pursuant to NRC requirements to protect USDWs. The groundwater restoration program for all well fields will be conducted pursuant to 10 CFR Part 40, Appendix A, Criterion 5, which sets forth groundwater quality standards for uranium milling facilities. Currently, Criterion 5 states that groundwater quality at such facilities shall have primary goals of baseline (background) or an MCL, whichever is higher, or an alternate concentration limit (ACL). An ACL is a site-specific, constituent-specific, risk-based standard that demonstrates that maintaining groundwater quality at the requested level at a designated point of compliance (POC) will be adequately protective of human health and the environment at the point of exposure (POE) and that groundwater quality outside the boundary of the aquifer exemption approved by EPA will meet background (baseline) levels or MCLs. Satisfaction of prior class-of-use can be proposed as a factor in demonstrating justification for an ACL.

In the event that an ACL is requested, Powertech (USA) will be required by NRC license conditions to submit an ACL application to NRC staff in accordance with regulatory requirements under 10 CFR Part 40, Appendix A, Criterion 5(B)(5). Any ACL application will be in the form of a license amendment application that addresses, at a minimum, all of the relevant factors in 10 CFR Part 40, Appendix A, Criterion 5(B)(6), including but not limited to:

(a) Potential adverse effects on ground-water quality, considering:
- (i) The physical and chemical characteristics of the waste in the licensed site including its potential for migration;
- (ii) The hydrogeological characteristics of the facility and surrounding land;
- (iii) The quantity of ground water and the direction of ground-water flow;
- (iv) The proximity and withdrawal rates of ground-water users;
- (v) The current and future uses of ground water in the area;
- (vi) The existing quality of ground water, including other sources of contamination and their cumulative impact on the ground-water quality;
- (vii) The potential for health risks caused by human exposure to waste constituents;
- (viii) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;
- (ix) The persistence and permanence of the potential adverse effects.

(b) Potential adverse effects on hydraulically-connected surface water quality, considering:
- (i) The volume and physical and chemical characteristics of the waste in the licensed site;
- (ii) The hydrogeological characteristics of the facility and surrounding land;
- (iii) The quantity and quality of ground water, and the direction of ground-water flow;
- (iv) The patterns of rainfall in the region;
- (v) The proximity of the licensed site to surface waters;
- (vi) The current and future uses of surface waters in the area and any water quality standards established for those surface waters;
- (vii) The existing quality of surface water including other sources of contamination and the cumulative impact on surface water quality;
- (viii) The potential for health risks caused by human exposure to waste constituents;
- (ix) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and
- (x) The persistence and permanence of the potential adverse effects.

Should it become necessary to submit an ACL application, Powertech (USA) will follow relevant NRC guidance and policy in effect at the time that an ACL would be requested.

Prior to operation, the baseline groundwater quality will be determined through the sampling and analysis of water quality indicator constituents in wells screened in the mineralized zone(s)

across each well field. Section 5.5.1.2.1 describes the methods used to select baseline wells, sample the wells, and calculate baseline water quality statistics. Table 6.2-1 lists the parameters to be analyzed in baseline sampling. The target restoration goals (TRGs) will be established as a function of the average baseline water quality and the variability in each parameter according to statistical methods approved by NRC.

6.2.2 Groundwater Restoration Process

Groundwater restoration will be conducted in accordance with NRC license requirements in a manner that will protect human health and the environment. The methods for achieving this objective are discussed in the following sections.

6.2.2.1 Groundwater Restoration Methods

During groundwater restoration, Powertech (USA) will restore groundwater quality consistent with the groundwater protection standards contained in 10 CFR Part 40, Appendix A, Criterion 5(B)(5), in accordance with NRC license requirements. The technology selected will depend on the wastewater disposal option as described below. In the deep disposal well option, reverse osmosis (RO) treatment with permeate injection will be the primary restoration method. If land application is used, then groundwater sweep with injection of clean makeup water from the Madison Limestone or another suitable formation will be used to restore the aquifer. In either case, groundwater restoration will be conducted in accordance with NRC license requirements, which will establish the minimum number of pore volumes and the pore volume calculation method. Refer to Powertech (2011) for additional information.

6.2.2.1.1 Deep Disposal Well Option

In the deep disposal well option, the primary method of groundwater restoration will be RO treatment with permeate injection. In this method, water will be pumped from one or more well fields to the CPP or Satellite Facility for treatment. Treatment will begin with removal of uranium and other dissolved species in IX columns. The water then will pass through the restoration RO unit, which will remove over 90% of dissolved constituents using high pressure RO membranes. The treated effluent, or permeate, will be returned to the well field(s) for injection. The RO reject, or brine, will undergo radium removal in radium settling ponds and then will be disposed in one or more deep disposal wells.

The RO units will operate at a recovery rate of approximately 70%. Therefore, about 70% of the water that is withdrawn from the well fields and passed through the restoration RO unit will be

Table 6.2-1: Water Quality Parameter List

Test Analyte/Parameter	Units	Analytical Method
Physical Properties		
pH ≠	pH units	A4500-H B
Total Dissolved Solids (TDS) +	mg/L	A2540 C
Conductivity	µmhos/cm	A2510 B
Common Elements and Ions		
Alkalinity (as $CaCO_3$)	mg/L	A2320 B
Bicarbonate Alkalinity (as $CaCO_3$)	mg/L	A2320 B (as HCO_3)
Calcium	mg/L	E200.7
Carbonate Alkalinity (as $CaCO_3$)	mg/L	A2320 B
Chloride, Cl	mg/L	A4500-Cl B; E300.0
Magnesium, Mg	mg/L	E200.7
Nitrate, NO_3^- (as Nitrogen)	mg/L	E300.0
Potassium, K	mg/L	E200.7
Sodium, Na	mg/L	E200.7
Sulfate, SO_4	mg/L	A4500-SO4 E; E300.0
Trace and Minor Elements		
Arsenic, As	mg/L	E200.8
Barium, Ba	mg/L	E200.8
Boron, B	mg/L	E200.7
Cadmium, Cd	mg/L	E200.8
Chromium, Cr	mg/L	E200.8
Copper, Cu	mg/L	E200.8
Fluoride, F	mg/L	E300.0
Iron, Fe	mg/L	E200.7
Lead, Pb	mg/L	E200.8
Manganese, Mn	mg/L	E200.8
Mercury, Hg	mg/L	E200.8
Molybdenum, Mo	mg/L	E200.8
Nickel, Ni	mg/L	E200.8
Selenium, Se	mg/L	E200.8, A3114 B
Silver, Ag	mg/L	E200.8
Uranium, U	mg/L	E200.7, E200.8
Vanadium, V	mg/L	E200.7, E200.8
Zinc, Zn	mg/L	E200.8
Radiological Parameters[1,2]		
Gross Alpha††	pCi/L	E900.0
Gross Beta	pCi/L	E900.0
Radium, Ra-226[§]	pCi/L	E903.0

≠ Field and Laboratory
+ Laboratory only
††Excluding radon, radium, and uranium
[1] For alluvial compliance and interior well sampling, the concentrations of trace and minor elements and radiological parameters will be the dissolved portion, except mercury, which will be the total, unfiltered concentration in accordance with ARSD 74:54:01:04.
[2] The parameter list for alluvial compliance and interior wells also will include radon-222 and radium-228.

recovered as nearly pure water, or permeate. In order to avoid excessive restoration bleed and consumptive use of Fall River and Chilson groundwater, permeate will be supplemented with clean makeup water from the Madison Limestone or another suitable formation. Permeate and makeup water will be reinjected into the well field(s) at an amount slightly less than the amount withdrawn from the well field(s). This will be done to maintain a slight restoration bleed, which will maintain hydraulic control of the well field(s) throughout active aquifer restoration. The restoration bleed typically will be 1% of the restoration flow rate unless groundwater sweep is used in conjunction with RO treatment with permeate injection, in which case the restoration bleed will average approximately 17%. Refer to the "Optional Groundwater Sweep" discussion in Section 6.2.2.1.3.

6.2.2.1.2 Land Application Option

In the land application option, the primary method of groundwater restoration will be groundwater sweep with Madison Limestone water injection. A GDP application through DENR was submitted in March 2012 for the land application option. This method will begin the same as the method described above for RO treatment with permeate injection; water will be pumped to the CPP or Satellite Facility for removal of uranium and other dissolved species in IX columns. The partially treated water will undergo radium removal in radium settling ponds and then will be disposed in the land application systems.

RO will not be used if there are no deep disposal wells available to accept the RO brine. Instead, clean makeup water from the Madison Limestone or another suitable formation will be injected into the well field(s) at a flow rate sufficient to maintain the restoration bleed. As before, the restoration bleed typically will be 1% of the restoration flow rate unless the optional groundwater sweep method is used.

The water quality of the Madison Limestone is expected to be equal to or better than the baseline ore zone water quality, and injection of Madison Limestone water therefore will be similar to injection of permeate under the deep disposal well option.

6.2.2.1.3 Optional Groundwater Sweep

Although a 1% restoration bleed will be adequate to maintain hydraulic control of well fields undergoing active aquifer restoration, additional bleed may be required at times. For example, additional restoration bleed may be used to recover flare of ISR solutions outside of the well field pattern area. In addition to the restoration methods described above, Powertech (USA) may

withdraw up to one pore volume of water through groundwater sweep over the course of aquifer restoration. This will result in an average restoration bleed of approximately 17%.

6.2.2.2 Effectiveness of Groundwater Restoration Techniques

This section describes how the groundwater restoration process that will be conducted in accordance with NRC license requirements is the same process that has been used successfully at other NRC and agreement state-licensed facilities. The preferred groundwater restoration method is RO treatment with permeate injection. This is the aquifer restoration method that will be used if deep disposal wells are used to dispose treated wastewater. As described in Section 2.5.3 of NUREG-1910 (NRC, 2009), this method of aquifer restoration is responsible for returning "total dissolved solids, trace metal concentrations, and aquifer pH to baseline values." RO treatment with permeate injection has proven effective at achieving successful aquifer restoration as described in Uranium One (2008):

> Results of the effectiveness of groundwater sweep (or lack of it) were clearly demonstrated in the Christensen Ranch Wellfield Restoration report (CRWR) (COGEMA 2008[a]). Example plots from that report of mean well field water quality at the end of mining, groundwater sweep, RO and stabilization monitoring… indicate minimal improvement following groundwater sweep at MU3 and MU5 and an actual increase [in dissolved constituents] at MU6. Following application of RO, the TDS values at MU5 and MU6 decreased to levels below the target Restoration Goal. Uranium increased in MU5 and MU6 following groundwater sweep…and then was significantly lowered during RO. Approximately 1.8, 4.8 and 1.5 PVs of groundwater were removed from MU3, MU5 and MU6, respectively, during groundwater sweep. This water removal was totally consumptive by design, in that none of it was returned to the aquifer.
>
> Based on the results, minimal benefit, if any, was derived from [the groundwater sweep] phase of restoration. Eliminating groundwater sweep, an unnecessary, ineffective and consumptive step in the restoration process, will reduce the number of PVs required to reach restoration goals.
>
> Terminating RO once water quality has stabilized will minimize the consumptive use of groundwater and reduce the number of PVs of treatment.

6.2.2.3 Pore Volume Calculations and Restoration Pore Volumes

The formulas for determining the pore volume and the volume of restoration composite (RC) to be withdrawn during groundwater restoration are as follows:

Pore volume = (well field pattern area) x (thickness) x (porosity) x (flare factor)

RC volume = (pore volume) x (number of pore volumes for groundwater restoration)

The thickness is the average thickness of the mineralized zones as determined by down-hole radiological logging. This is the same as the average screened interval, since screens will be completed only across the targeted ore zone (see Section 5.3.3.1.1). The average thickness in the permit area is 4.6 feet.

The porosity (collective open space of the formation) of the ore zone within the permit area was determined by laboratory analysis of core samples. Based on 11 measurements of ore zone porosity from core samples of the Fall River and Chilson host sands, the average porosity of the ore zone sands within the permit area is 30 percent (0.30).

The proposed flare factor is 1.44, accounting for both horizontal and vertical flare of lixiviant during ISR operations. Support for the flare factor is contained in the numerical groundwater modeling results presented in Appendix 6.2-A. Appendix 6.2-A describes how horizontal flare from a modeled balanced well field was determined to be 1.19. Vertical flare is expected to be similar to or less than the horizontal flare since the horizontal conductivity is greater than vertical conductivity. An overall flare factor of 1.44 is supported by the numerical modeling results presented in Appendix 6.2-A.

The flare factor and number of pore volumes required for groundwater restoration are both a function of the properties of the particular sandstone formations and ore deposits, as well as the operational factors of aquifer bleed rates, the balancing of pattern flow rates, the use of RO during groundwater restoration and the timeliness of beginning groundwater restoration operations following cessation of recovery operations. For the Dewey-Burdock Project, the values of the flare factor and the number of pore volumes removed for groundwater restoration are comparable to those that have been approved recently for other ISR facilities and are consistent with the best practicable technology for groundwater restoration.

The overall (horizontal and vertical) flare factor for ISR uranium projects has varied from 1.44 at Irigaray/Christensen Ranch (COGEMA, 2008 and COGEMA, 2005) to 1.95 at Churchrock/Crownpoint (HRI, 2001). The overall well field flare factor for the Dewey-Burdock Project is estimated to be 1.44, which is equal to the flare factor in approved NRC license applications at ISR facilities located nearby in the State of Wyoming and is supported by numerical groundwater modeling.

The number of pore volumes, including flare, of groundwater to be removed to achieve aquifer restoration is estimated to be 6.0. This number has been proposed for NRC review and verification (Powertech, 2011) and is subject to change pending NRC review of the financial assurance estimate prior to ISR operations. This number is consistent with the best practicable technology that includes the following operational practices:

(i) Daily balancing of injection and extraction flow rates during production. This flow rate balancing is designed to ensure that a proper aquifer bleed is maintained both at the well field level and also within each 5-spot pattern within the well field.
(ii) Timeliness of beginning restoration operations. For any particular well field, aquifer restoration operations will begin as soon as is reasonably possible following the cessation of recovery operations.
(iii) Maintenance of aquifer bleeds. Hydraulic control of well fields through the net withdrawal of the aquifer bleed stream will be continuously maintained from the beginning of recovery operations until the end of active aquifer restoration.

While the number of pore volumes required for aquifer restoration historically has proven to have been significantly higher for some of the early ISR uranium projects, the methods and timing of restoration likely contributed to these larger numbers. The following information was obtained from the Moore Ranch license application (Uranium One, 2008).

> The average number of PVs extracted and treated/reinjected/or disposed was 13.6 for Irigaray and 12.4 for Christensen … Circumstances at both those ISR projects resulted in increased PVs to achieve restoration goals including the following:
>
> - Production and restoration were not conducted sequentially, and were plagued with extended periods of shut-in and standby, with delays of up to several years in some cases;
> - Groundwater sweep, the initial phase of restoration, was often largely ineffective and in some cases may have exacerbated the problem; and
> - RO was continued in some well fields after it was apparent that little improvement in water quality was occurring.
>
> Restoration was not performed immediately following the completion of production, and in some cases, there were long periods of inactivity during the production and restoration phases. At Irigaray, production was interrupted for a period of almost six years in MU1 through MU5 … Similarly, there was a three-year break in production in MU6 through MU9, when the operation was in standby status. Restoration did not commence at MUl through MU3 until a year after production had ended. At MU4 and MU5, restoration

operations did not begin until two years following production. Restoration commenced shortly after the end of production at MU6 through MU9. However the project was on standby status between the completion of groundwater sweep and the beginning of the RO phase of production, resulting in a break of one to two years, depending on the MU. Restoration was initiated sooner after the end of production at Christensen Ranch, with the exception of MU3 and MU4. However, there were periods of standby between groundwater sweep and RO treatment/injection of up to a year. These delays between and during production and restoration operations most likely increased the number of PVs required to complete aquifer restoration.

Pore volume and restoration composite calculations are presented in Appendix 6.7-A.

6.2.2.4 Potential Environmental Impacts of Groundwater Restoration

Based on the success of groundwater restoration at other ISR facilities, Powertech (USA) expects that the proposed groundwater restoration techniques will be successful at returning the production zones to TRGs. The purpose of restoring the groundwater to these indicator parameters is to protect USDWs adjacent the aquifer exemption boundary. Using proven best practicable technology for groundwater restoration combined with federal and state regulatory requirements will ensure that potential impacts to groundwater quality outside the production zone are mitigated.

The preferred method of restoration consists of using the groundwater treatment method with RO reject brines being treated for radium removal and disposed in Class V disposal wells. This method minimizes the amount of groundwater that will be consumed during restoration, and minimizes the surface disturbance to land within the permit boundary. Disposal of wastewater in deep disposal wells is the best practicable technology and is the standard method used at most ISR facilities. The alternate method of land application would consume more groundwater since none of the restoration water would be recycled to the well field, but would be used in a once-through process leading to land application.

The proposed restoration methods will consume groundwater. Groundwater recovered during groundwater restoration is typically disposed of directly in the wastewater system. Consumption of groundwater is an unavoidable consequence of groundwater treatment; potential impacts and water usage during operations is discussed in more detail in Section 5.6.3.

6.2.2.5 Groundwater Restoration Monitoring

Refer to Section 5.5.1.3 for a discussion of groundwater restoration monitoring, including monitoring the progress of active restoration, excursion monitoring during groundwater restoration, and stability monitoring.

6.3 Decontamination and Decommissioning

Following regulatory approval of successful groundwater restoration in all well fields, Powertech (USA) will decommission all well fields, processing facilities, ponds, and equipment within the permit area. Decontamination and decommissioning activities will be done in accordance with NRC license and DENR LSM permit requirements. During decommissioning, all well field equipment (including pumps, tubing, pressure transducers, well head covers and surface piping and equipment), pipelines, header houses, processing buildings/equipment, and pond liners will be surveyed for radiological contamination and decontaminated for unrestricted release, transferred to an NRC or NRC agreement state-licensed facility, or disposed at an appropriately permitted facility. Surface soils will be surveyed for radiological contamination and affected soils removed and appropriately disposed. Surface reclamation and revegetation will be conducted in accordance with DENR LSM permit requirements. The decontamination and decommissioning program described below will ensure that the permit area is closed in a manner that permits release for unrestricted use.

6.3.1 Disposal of Process Buildings, Equipment and Other Facilities

The procedures for removing and disposing of structures and equipment include the establishment of surface contamination limits, preliminary radiological surveys of process building surfaces, equipment and piping systems; strategic cleanup and removal of process building materials and equipment, sorting materials according to contamination levels and salvageability, and preparing materials for transport and offsite use or disposal. Although not mentioned hereafter, the procedures also apply to tools and other equipment, such as backhoes.

All decommissioning activities will be done in accordance with NRC license requirements and the provisions of ARSD 74:29:07:13.

6.3.1.1 Establishment of Surface Contamination Limits

Powertech (USA) will use surface contamination release limits approved by NRC to release material and equipment that potentially has come into contact with NRC licensed material.

Surface contamination release limits for surfaces on structures intended for unrestricted release following decommissioning are subject to Criterion 6(6) of Appendix A to 10 CFR 40. Acceptable dose-based surface contamination release limits will be established using the RESRAD-Build model or an equivalent model and will be provided in the final decommissioning plan, which will be submitted to NRC 12 months prior to any planned decommissioning. In the decommissioning plan, Powertech (USA) will assume that all premises, equipment, or scrap likely to be contaminated in excess of limits, but that cannot be measured, is contaminated in excess of limits and will be treated accordingly.

6.3.1.2 Preliminary Radiological Surveys and Contamination Control

Powertech (USA) will develop one or more characterization plans will be followed to demonstrate compliance with the surface contamination limits for building materials, systems, and equipment. The characterization plan(s) will include guidance and SOPs to conduct the preliminary surveys and control contamination. Powertech (USA) will prepare procedures for performing radioactivity measurements on the interior surfaces of pipes, drain lines, and ductwork, and include the procedures in the decommissioning plan. Such plans will include measurements at all traps and other access points where contamination is likely to be representative of system-wide contamination.

Areas within buildings showing evidence of possible penetration of process solutions will be evaluated for possible subsurface contamination. If building materials, slabs and soils beneath the slabs are not contaminated, the buildings shall be released for unrestricted use, provided the building surfaces meet the release criteria and radiological monitoring requirements of the characterization and verification plans. Otherwise, the buildings will be demolished, the slabs removed, and the underlying soils removed (if contaminated). All materials contaminated above release limits will be prepared for offsite disposal at a licensed disposal facility. Contamination control will be addressed using operational SOPs, in conjunction with radiological surveys.

Concrete slabs will be surveyed and if found to contain radionuclides in excess of the release limits, an attempt will be made to decontaminate the concrete slab(s). If after a second survey radionuclides are in excess of the release limits, the concrete will be broken up and disposed at a licensed 11e.(2) disposal site. If the survey results indicate that the concrete is not contaminated above release limits, it may be disposed in an appropriately permitted landfill, used for fill elsewhere, or left in place for use by the landowner.

6.3.1.3 Removal of Process Building and Equipment

Powertech (USA) will develop plans for the strategic removal of process building and equipment, based on inventory, the results of the radiological surveys, decontamination options and available methods, reuse/disposal pathways, and information obtained during the effort. To the extent possible, Powertech (USA) intends to decontaminate salvageable equipment for unrestricted release. Decontamination methods may include a combination of washing, high pressure sprays, or steam cleaning. Cleaned surfaces will be air-dried prior to radiological monitoring. The ALARA principle applies to decommissioning activities. As such, surface contamination will be reduced to levels as far below applicable limits as practical.

Powertech (USA) will document the results of radiological surveys for all building materials, systems, and equipment. These items will be sorted as follows:

- Salvageable and contaminated above release limits (not releasable but potentially disposable or transferrable)
- Salvageable and contaminated below release limits (releasable) for unrestricted use
- Not salvageable and contaminated above release limits (offsite disposal at a facility licensed to accept 11e.(2) byproduct material)
- Not salvageable and contaminated below release limits (offsite disposal at a permitted facility)

In the first case, the item may be transferred to another NRC or agreement state licensee. If it cannot be transferred or decontaminated to be released for unrestricted use, it will be disposed at a licensed disposal facility. In all cases, Powertech (USA) will strictly maintain an inventory of all process building and equipment and the results of radiological surveys.

6.3.1.3.1 Building Materials, Equipment and Piping to be Released for Unrestricted Use

Powertech (USA) will develop an approved SOP for release of items for unrestricted use and thoroughly document all items eligible for release for unrestricted use. To the extent possible, releasable items having a salvageable value will be sold on the industrial market. Releasable items having no net salvageable value will be sent to a municipal landfill.

6.3.1.3.2 Preparation for Disposal at a Licensed Facility

All materials and plant equipment unsuitable for unrestricted release will be prepared for offsite disposal at a licensed facility. Building materials, tools, and equipment destined for offsite

disposal will be prepared for transportation and disposal in accordance with 49 CFR and other applicable requirements.

6.3.1.4 Pond Decommissioning

All liquid waste from ponds will be disposed by deep well injection in one or more deep disposal wells within the permit area or by land application. Any sludge accumulated in the ponds and the primary pond liners will be removed and disposed as 11e.(2) byproduct material. The leak detection equipment, including piping, aggregate, and secondary liners, will be surveyed for contamination. The soil underneath the ponds also will be surveyed for radiological contamination. Any materials in which concentrations exceed limits for unrestricted use will be disposed as 11e.(2) byproduct material at a licensed disposal facility. All pond materials including secondary liners will be removed and disposed as 11e.(2) byproduct material or as solid waste. Confirmation surveying and sampling will be conducted in accordance with applicable requirements to ensure all contaminated material has been removed. The excess pond material used to construct pond embankments or stored in designated spoil stockpiles will be used to backfill the ponds. The backfill will be compacted to avoid subsidence. The area then will be contoured, topsoil replaced, and revegetated as described in Section 6.4.3.

6.3.2 Well Field Decommissioning

6.3.2.1 Injection, Production and Monitor Wells

All pumps and tubing will be removed from the wells along with well head covers and surface piping and equipment. Pressure transducers also will be removed from the wells. Piping, pumps, and equipment will be surveyed for radiological contamination and decontaminated or disposed following procedures described in Sections 6.3.1.2 and 6.3.1.3.

Injection, production and monitor wells will be plugged and abandoned following the procedures in Section 6.3.3.

6.3.2.2 Header House Decommissioning

During decommissioning of each well field, the affected header houses will be moved to a new location in the permit area, decontaminated for unrestricted release or disposed at licensed facility. The soil underneath and surrounding the header houses will be surveyed for radiological contamination and contaminated soil will be disposed at a licensed disposal facility. The area around each header house then will be contoured, topsoil replaced, and revegetated as described in Section 6.4.3.

6.3.2.3 Pipeline and Utility Decommissioning

Topsoil will be windrowed along pipeline and utility routes, and buried piping and utilities will be excavated. Piping will be decontaminated for unrestricted release or disposed in a licensed disposal facility. A grinder or shredder may be used to reduce the volume of disposed pipe material. Topsoil will then be replaced and the area will be seeded as discussed in Section 6.4.3.

6.3.3 Well Plugging and Abandonment

Powertech (USA) will plug all wells in accordance with ARSD 74:02:04:67 with bentonite or cement grout. The weight and composition of the grout will be sufficient to control artesian conditions and meet the well abandonment standards of the State of South Dakota. Cementing will be completed from total depth to surface using a drill pipe. Records will be kept of each well cemented including at a minimum the following information:

- well ID, total depth, and location
- driller, company, or person doing the cementing work
- total volume of grout placed down hole
- viscosity and density of the grout

Powertech (USA) will remove surface casing or cut off surface casing below ground and set a cement surface plug on each well plugged and abandoned.

6.3.4 Soil Decontamination

Surface soils will be cleaned up in accordance with NRC license requirements and DENR permit requirements. The following section describes the methods for establishing site-specific cleanup criteria, monitoring during excavation of contaminated soil, and verification sampling following clean up.

6.3.4.1 Cleanup Criteria

Surface soils will be cleaned up in accordance with requirements contained in 10 CFR Part 40, Appendix A, including considerations of ALARA goals and the chemical toxicity of uranium. In accordance with NRC license conditions, Powertech (USA) will establish a radium benchmark dose, determine the natural uranium soil standard as a function of background concentrations and potential impacts, and perform a uranium chemical toxicity assessment. Cleaning up soils within the permit area to meet cleanup criteria approved by NRC will ensure that public exposure is within permissible limits and that radionuclide levels in soil are ALARA.

6.3.4.2 Excavation Control Monitoring

The purpose of excavation control monitoring will be to guide the removal of contaminated material to the point where it is highly probable that an area meets the cleanup criteria.

Gamma surveys will be relied on to guide soil remediation efforts. At least 12 months prior to commencing reclamation, Powertech (USA) will submit a decommissioning plan to NRC that will contain descriptions of methodology for both pre- and post-reclamation gamma-ray surveys This will include the use of a methodology for gamma-ray surveys for excavation control monitoring and final status surveys that will provide 95% confidence that the survey units will meet the cleanup guidelines.

The post-operation (pre-decommissioning) radiological survey will consist of an integrated area gamma survey and confirmation soil sampling and analysis to verify the areas requiring cleanup. The areas that will receive particular attention are those that are expected to have higher readings than surrounding areas and include diversion ditches, surface impoundment areas, well fields (particularly those areas where spills or leaks may have occurred), process structures, storage areas, and on-site transportation routes for contaminated material and equipment. Areas associated with wastewater disposal also will receive close attention. The surveys will identify soil contamination that exceeds the cleanup criteria and will be used to guide the cleanup efforts. After cleanup, the surveys will be used, in conjunction with surface soil sample analyses, to verify cleanup to the site cleanup criteria. Remediation will continue in areas not meeting action levels. This iterative procedure will be applied until all areas are determined to meet the action levels.

6.3.4.3 Surface Soil Cleanup Verification and Sampling Plans

Powertech (USA) will comply with the NRC license cleanup standards to ensure that public exposure is within permissible limits and that radionuclide levels in soil are ALARA. Compliance with cleanup criteria will be evaluated in terms of soil concentrations, which will be supplemented by field surveys employing gamma-ray measurements. A final gamma survey of the affected area and buffer zone will be performed using the GPS-based equipment or conventional equipment. Affected areas are those areas that have greater potential to be impacted by uranium solutions, dried uranium product (yellowcake) or liquid or solid waste streams that contain uranium or other radionuclides associated with uranium recovery operations. The areas that are most likely to be considered affected areas include diversion ditches, surface impoundment areas, well fields (particularly those areas where potential spills or leaks may have occurred),

process structures, storage areas, on-site transportation routes for contaminated material and equipment, and areas associated with wastewater disposal.

A calculation of the potential peak annual total effective dose equivalent (TEDE) within 1,000 years to the average member of the critical group that would result from applying the radium standard (not including radon) on the site will be submitted to NRC for approval. Details will be provided in the decommissioning plan to be submitted for NRC review at least 12 months prior to decommissioning activities.

6.3.4.4 Quality Assurance

Prior to operations, Powertech (USA) will prepare a Quality Assurance Project Plan (QAPP) in accordance with NRC regulatory requirements. The QAPP will establish the quality assurance and control measures for field measurement, sample collection, and laboratory analysis for all decommissioning activities. The QAPP also will establish performance criteria for field and laboratory data precision, accuracy, completeness, and representativeness. The program will be designed to ensure that the permit area is closed in a manner that permits release for unrestricted (i.e., any) use.

Powertech (USA) management will check all aspects of data collection and input to verify that procedures are being followed. The collection and handling of samples from the facility decommissioning, soil cleanup, and other radiological cleanup areas will be reviewed and approved by management. Laboratory results for these samples will be evaluated and validated to requirements in the QAPP. Other aspects of the reclamation including adherence to the SOPs and adherence to the decommissioning plan will be evaluated periodically by Powertech (USA) management. The construction process will be monitored to confirm that appropriate physical and radiological safety procedures are followed. Excavation processes will be monitored to ensure that contaminated materials are not handled carelessly and that any spillage is collected and contained. The conveyance of contaminated materials through the site, e.g., to stockpiling areas, will be monitored to prevent dispersal of these materials in the environment. Construction and sampling activities will be documented and reviewed throughout the reclamation process.

6.3.5 Health Physics and Radiation Safety during Decommissioning

The health physics and radiation safety program for decommissioning will ensure that occupational radiation exposure levels will be kept ALARA during decommissioning. A radiation safety officer or radiation safety technician will be on site during any decommissioning activities where a potential radiation exposure hazard exists. In general, the radiation safety

program will be used as the basis for development of the decommissioning health physics program. Health physics surveys conducted during decommissioning will be guided by applicable NRC regulations and license conditions.

6.3.6 Records and Reporting Procedures

At the conclusion of site decommissioning and surface reclamation, a report containing all applicable documentation will be submitted to the NRC. Records of all contaminated materials transported to a licensed disposal site will be maintained for 5 years, or as otherwise required by applicable regulations at the time of decommissioning.

6.4 Plans and Schedules for Reclaiming Disturbed Lands

Final reclamation will be initiated during the course of ISR on affected lands that will not be disturbed again and where it will not adversely affect other ISR activities in accordance with ARSD 74:29:08:03. All disturbed lands will be reclaimed to meet the designated postmining land uses. All buildings and structures will be decontaminated to regulatory standards and demolished and trucked to an approved disposal facility. Baseline soils, vegetation, and radiological data will be used as a guide in evaluating the final reclamation. As required by ARSD 74:29:08:01, concurrent reclamation will be conducted during all phases of the operation.

6.4.1 Postmining Land Use Plan

Surrounding existing land uses include rangeland and woodland grazing, residential development, and agriculture. A multiple-use Reclamation Plan was formulated that is in keeping with the land use objective for the adjacent properties and will provide a significant beneficial use of the permit area at closure. The specific types of reclamation proposed are rangeland (ARSD 74:29:07:20) and agricultural or horticultural crops (ARSD 74:29:07:21). In conformance with ARSD 74:29:06:01, these reclamation types were discussed in conference with DENR and the property owners of the affected area in a meeting held on May 10, 2012. Appendix 6.4-A contains the postmining land use consultation forms for all landowners within the permit area. As discussed in Section 3.1.2, there are existing residences within the permit area. Powertech (USA) does not plan to build any homesites within the permit area.

According to ARSD 74:29:06:02 (2), the rangeland and agricultural or horticultural crop land use types must be compatible with surrounding lands and must be: (a) obtainable according to data on expected need and market; (b) supported by commitments from public agencies where appropriate; (c) practicable on the basis of private financial capability for completion of the proposed operation; (d) planned pursuant to a schedule included in the reclamation plan that

integrates the mining operation and reclamation with the postmining land use; (e) consistent with existing state and local land use plans and programs; and (f) of a beneficial use. Following is a description of how the postmining land uses of rangeland and agricultural or horticultural crops meet all of the criteria listed above.

(a) Obtainable According to Data on Expected Market and Need

Appendix 6.4-D describes how for rangeland, two of the criteria to determine revegetation success will be usable forage production and revegetation sustainability. These two parameters will demonstrate that the reclaimed rangeland has at least the same livestock carrying capacity as reference areas. For agricultural or horticultural cropland, the final bond release criterion will be a demonstration that the productive capacity is equal to or exceeds that of similar crop production areas in nearby comparison areas. Powertech (USA) will maintain adequate financial assurance to ensure that areas can be reclaimed to the approved postmining land uses.

(b) Supported by Commitments from Public Agencies where Appropriate

Powertech (USA) is not aware of the need for any commitments from public agencies to support the postmining land uses of rangeland or agricultural or horticultural cropland.

(c) Practicable based on Powertech (USA)'s Financial Ability to Perform Reclamation

As described in Section 6.7.1, Powertech (USA) will maintain financial assurance instruments to cover the cost of all reclamation and decommissioning activities, including reclamation and revegetation of affected areas.

(d) Planned Pursuant to a Schedule that Integrates Mining and Reclamation with Each Postmining Land Use

Sections 6.5 and 6.6 present the schedules for reclamation and reclamation monitoring. Well field reclamation will be carried out concurrently with ISR operations. After uranium recovery is no longer economical in each well field, groundwater restoration will be completed followed by well field reclamation. The minimum period of vegetation establishment for rangeland and agricultural or horticultural cropland prior to evaluation for final financial assurance release will be 3 years.

(e) Consistent with Existing State and Local Land Use Plans and Programs

The postmining land uses of rangeland and agricultural or horticultural cropland are the same as the predominant premining land uses in the proposed permit area. Therefore, they are expected to be consistent with existing state and local land use plans and programs.

(f) Beneficial Use

The postmining land uses of rangeland and agricultural or horticultural cropland are the same as the predominant premining land uses in the proposed permit area. These uses will have economic value to the landowners and thus they meet the definition of "beneficial use" in ARSD 74:29:01:01.

The proposed postmining land uses within the permit boundary are presented on Plate 6.4-1, which also depicts the proposed postmining topography. Due to limited disturbance, the proposed postmining topography is the same as the premining topography and is consistent with the postmining land use.

6.4.1.1 Rangeland

In conformance with ARSD 74:29:06:02(1), rangeland reclamation will follow guidelines established in ARSD 74:29:07:20 including: the reclaimed rangeland will have the capability to support a livestock carrying capacity that is equivalent to that of the surrounding area or to that of the reference area, if used; reclaimed slopes will not exceed 3:1 unless steeper slopes are approved by DENR; newly seeded areas will be fenced if it is necessary to preclude livestock or wildlife from impairing establishment of the required vegetation; and reclamation will be considered complete when the reclaimed range is capable of withstanding proper stocking rates for 2 consecutive years prior to bond release. Powertech (USA) has developed reclamation practices through consultation with the Custer County and Fall River County conservation districts and DENR to ensure that the requirements for reclaiming the land to rangeland are accomplished. Monitoring per the recommendations outlined in Powertech (USA)'s Dewey-Burdock Project Reclamation Performance Criteria document (provided in Appendix 6.4-D) will determine rangeland reclamation success. The monitoring plan has been developed in accordance with ARSD 74:29:06:02(3), which requires support and maintenance activities documenting successful implementation of reclamation.

6.4.1.2 Agricultural or Horticultural Crops

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

Alfalfa is the only crop currently proposed for reclamation of designated agricultural or horticultural cropland in the proposed permit area. Alfalfa is the only crop currently grown in the proposed permit area and is grown in several areas nearby, so comparative production figures from nearby areas will be readily available.

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

6.4.2 Interim Revegetation

Interim revegetation is the process of temporarily stabilizing grounds which are scheduled to be re-disturbed before the completion of mining. Portions of the permit area which will receive interim revegetation treatments include topsoil stockpiles, well fields, and pipelines. Because of the limited availability of salvageable topsoil material, some disturbed areas subject to interim reclamation will be directly seeded without the replacement of topsoil material. Straw mulch may be applied at the time of seeding to further improve and accelerate planting success; however, such applications will be site specific. Topsoil stockpiles which are to remain undisturbed for more than 2 years will be regraded to a stable configuration, bermed, and seeded in accordance with ARSD 74:29:08:02. Interim seeding will be done with the same seed mixture as the final seeding mixture shown in Table 6.4-1 to ensure that all interim reclamation is compatible with final reclamation when it occurs. The letter of concurrence with this seed mixture from the local NRCS office is provided in Appendix 6.4-B, and letters of concurrence with this seed mixture from landowners are presented in Appendix 6.4-A.

6.4.3 Surface Disturbance Reclamation

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

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

Table 6.4-1: Reclamation Seed Mixture

Seed Species	PLS Full Rate (lb/ac)	Percent in Mixture	PLS Rate (lb/ac)
Western wheatgrass	9.72	20	1.94
Sideoats grama	7.26	20	1.45
Slender wheatgrass	7.03	20	1.41
Green needlegrass	7.26	20	1.45
Little bluestem	4.57	20	0.91
Total		100	7.16

Source: NRCS, 2012; see Appendix 6.4-B

Note: This mix was specified by NRCS for a "drill" seeding application. If mix is to be broadcast, a packing/covering operation must be performed after the seeding. Also, seeding rates must be increased by 2.5 times for a broadcast operation.

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

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

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

6.4.3.1 Spoil Replacement and Grading

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

General Methods

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

Due to the nature of uranium ISR, there will be very few construction activities that will require significant grading or contouring during reclamation. Finish grading will be achieved with typical earth moving equipment such as motor graders. Disturbed areas will be contoured to blend in with the natural terrain. Reclaimed slopes will not exceed 3:1 unless DENR approves steeper slopes. The postmining contours will be approximately the same as premining contours, as shown on Plate 6.4-1.

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

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

traps, and sediment ponds. During final grading, Powertech (USA) will identify potential sources of pollution and determine BMPs to be used, including erosion and sediment controls.

In accordance with ASD 74:29:07:04(4) and (5), all disturbed areas will be graded to eliminate depressions that could accumulate water and to match premining topography, and any altered drainages will be returned to original functionality during the final grading process.

Specific Methods

Following is a description of the spoil replacement and grading methods for well field mud pits, processing facilities, land application areas, and access roads.

Mud Pits

As described in Section 5.3.7, topsoil will be separated from subsoil during excavation of mud pits. When use of each mud pit is complete, the subsoil will be redeposited in the mud pit followed by replacing topsoil. Prior to topsoil replacement, the subsoil will be graded to match premining topography.

CPP and Satellite Facility

During reclamation, the CPP and Satellite Facility process buildings and equipment will be removed as described in Section 6.3.1.3. The processing facility areas will be regraded to approximate premining topography, and topsoil stockpiled near the facilities will be replaced. Section 6.5 describes how facility reclamation, including the CPP and Satellite Facility, will occur following well field reclamation. The expected duration of final grading and reclamation activities at the CPP and Satellite Facility is approximately 2 years, as shown in Figure 5.2-1.

Land Application Areas

The topography in the land application areas will remain unchanged except for minor areas of grading to reduce slopes. Prior to disturbance, topsoil will be stripped from these areas. Topsoil will be temporarily replaced in the areas of minor grading. Topsoil may be spread on the catchment areas and catchment berms, or it may be temporarily stockpiled near the catchment areas for replacement during final reclamation. Following groundwater restoration in all well fields and disposal of all wastewater via deep disposal wells and/or land application, land application areas will be reclaimed. Disturbed areas will be regraded to approximate premining contours, including areas of minor grading to reduce slopes or construct catchment areas and catchment berms. Topsoil will be stripped prior to regrading and replaced after regrading. The

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

Access Roads

Access road reclamation is described in Section 6.4.3.3.

6.4.3.2 Topsoil Replacement

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

In areas of temporary disturbance such as those affected by the installation of monitor wells and pipelines, topsoil will be separated from subsoil during construction and replaced following subsoil replacement. The topsoil will be replaced over the entire disturbed area using a uniform depth based on the amount of topsoil that was salvaged.

In areas of poor baseline vegetative cover, Powertech (USA) may analyze the topsoil to determine whether fertilizer or other amendments will be required to establish and sustain a vegetative cover on reclaimed areas. See also Section 6.4.3.4 for a discussion of areas with low vegetative cover densities that likely will have low revegetation potential if disturbed. These include the Darrow Mine surface pits/spoil piles and the "alkali area." In only very limited areas, which are anticipated to include the historical mine pits and the alkali area, Powertech (USA) will sample the topsoil and subsoil prior to disturbance. If the evaluation demonstrates that its chemical or physical characteristics would seriously inhibit plant growth and that it is not feasible to remedy by chemical treatment, overburden replacement, or like measures, Powertech

(USA) will request that the revegetation performance criteria not apply for these limited areas as allowed by SDCL 45-6B-46(2).

6.4.3.3 Access Road Reclamation

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

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

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

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

6.4.3.4 Revegetation Methods and Final Seed Mix

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

Based on existing cropland within the permit area, alfalfa is the only agricultural or horticultural crop currently proposed for reclamation of designated agricultural or horticultural cropland in the permit area.

Seeding may be done with a rangeland drill or with a broadcast seeder where practical. If broadcast, the seeding rate will be increased in accordance with NRCS recommendations. After topsoil preparation is completed affected lands will be seeded during the first normal period of favorable planting conditions unless an alternative plan has been approved. Areas seeded with the rangeland seed mixture will not be treated with any type of soil amendment or irrigated to improve reclamation success unless required to address problems resulting from the land application of treated wastewater (see Section 6.8.4). Any gullies or rills that would preclude the successful establishment of vegetation or achievement of the postmining land use will be removed or stabilized as part of the revegetation and reclamation process. Techniques utilized to monitor reclamation success are discussed in Section 6.6.

Some areas have low baseline vegetative cover densities and likely will have low revegetation potential if disturbed. These include the Darrow Mine surface pits/spoil piles and the "alkali area." The historical mine pits and spoil piles have low revegetation potential primarily due to the physical characteristics of the soil (i.e., lack of organic matter). The alkali area is an area of known discharge from the Fall River and/or Chilson through historical exploration holes. This area may have high levels of salinity and alkalinity that are currently devoid of vegetation and would continue to inhibit vegetation if disturbed. In accordance with SDCL 45-6B-46(2), planting may not be required on affected land with chemical and physical characteristics that are "toxic, deficient in plant nutrients, or composed of sand, gravel, shale, or stone to such an extent to seriously inhibit plant growth and such conditions cannot feasibly be remedied by chemical treatment, fertilization, replacement of overburden, or like measures." In only very limited areas, which are anticipated to include the historical mine pits and the alkali area, Powertech (USA) will sample the topsoil and subsoil prior to disturbance. If the evaluation demonstrates that its chemical or physical characteristics would seriously inhibit plant growth and that it is not feasible to remedy by chemical treatment, overburden replacement, or like measures, Powertech (USA) will request that the revegetation performance criteria in Appendix 6.4-D not apply for these limited areas as allowed by SDCL 45-6B-46(2).

6.4.3.5 Weed Control and Refuse Management

Powertech (USA) will maintain an active weed control program for noxious weeds occurring on the property in accordance with ARSD 74:29:07:15 and SDCL 45-6B-43. Objectives of the program will be:

- Conduct a yearly property inspection.
- Identify locations of weed growth.
- Treat weeds annually through chemical control.

Powertech (USA) has consulted with the local weed and pest boards in preparation of the weed control program for the Dewey-Burdock Project. The weed control plan is provided in appendix 6.4-C along with consultation letters.

Along with the weed control program, Powertech (USA) will manage refuse according to state and federal requirements in accordance with ARSD 74:29:07:05. Powertech (USA) is not proposing to use any of the land in the permit area for deposit or disposal of refuse.

6.4.3.6 Erosion Control Practices

Erosion control measures will be implemented during all phases of construction, operation, reclamation, and closure. Refer to Section 5.3.9 for details on erosion control measures. Temporary sedimentation, erosion control, and drainage control structures will be removed when

no longer needed. Sediment and erosion control structures will be inspected on a quarterly basis to ensure compliance with all applicable reclamation, design, and operating criteria. Maintenance and repair work needed to keep the structures in proper operating order will be performed as necessary. This work will include the removal and proper disposal of sediment captured by the structures and repair or replacement of old ASCM structures. If during the term of the postclosure period erosion and sedimentation becomes a problem in any area, new structures will be installed to adequately address any problems. Conversely, if the need for sediment and erosion controls in an area becomes unnecessary, the synthetics will be removed for aesthetic purposes.

6.4.4 Revegetation of Land Application Areas

The revegetation techniques for land application areas will depend on the vegetation grown in the land application areas. If native vegetation is irrigated and the species composition of the native vegetation does not change significantly during irrigation, then reseeding is not anticipated to be necessary to meet the reclamation performance criteria. However, if the species composition of the native vegetation significantly changes during the course of land application, Powertech (USA) will develop a plan that either demonstrates that after termination of land application a permanent, self-perpetuating ground cover at least equal in character and extent to the original will remain or detail a revegetation program that has been approved by SDGF&P and the local conservation district.

If crops such as alfalfa or wheatgrass are planted in the land application areas, Powertech (USA) will revegetate the land application areas during reclamation by preparing the topsoil and using the seeding mixture and methods described in Section 6.4.3.4.

6.5 Reclamation Timetable

Reclamation will be carried out in an ongoing process concurrent with ISR operations in accordance with NRC license conditions and ARSD 74:29:08. It is anticipated that groundwater restoration, including stability monitoring, will be completed for each well field in less than 2 years. Decontamination, decommissioning, and surface reclamation will follow after regulatory approval of successful groundwater restoration. The reclamation for each well field will be carried out with all reasonable diligence. Each phase of reclamation, including each well field and final facility reclamation, is expected to be completed within 5 years in accordance with SDCL 45-6B-46. Figure 6.5-1 depicts the proposed project schedule including phased

decommissioning/reclamation for each well field. Facility reclamation (CPP, Satellite Facility, and ponds) will occur following well field reclamation.

6.6 Reclamation Monitoring

Powertech (USA) will monitor revegetation success for compliance with ARSD 74:29:07:06. The goal of the reclamation program is to stabilizes the soil and return the disturbed areas to a function similar to undisturbed areas. Primary revegetation success will be determined using performance standards for current carrying capacity and vegetative ground cover. The Dewey-Burdock Project Reclamation Performance Criteria document is included as Appendix 6.4-D. The minimum period of vegetation establishment for rangeland and agriculture land prior to evaluation for final financial assurance release will be 3 years. The success of the final revegetation and final financial assurance release will be determined by DENR.

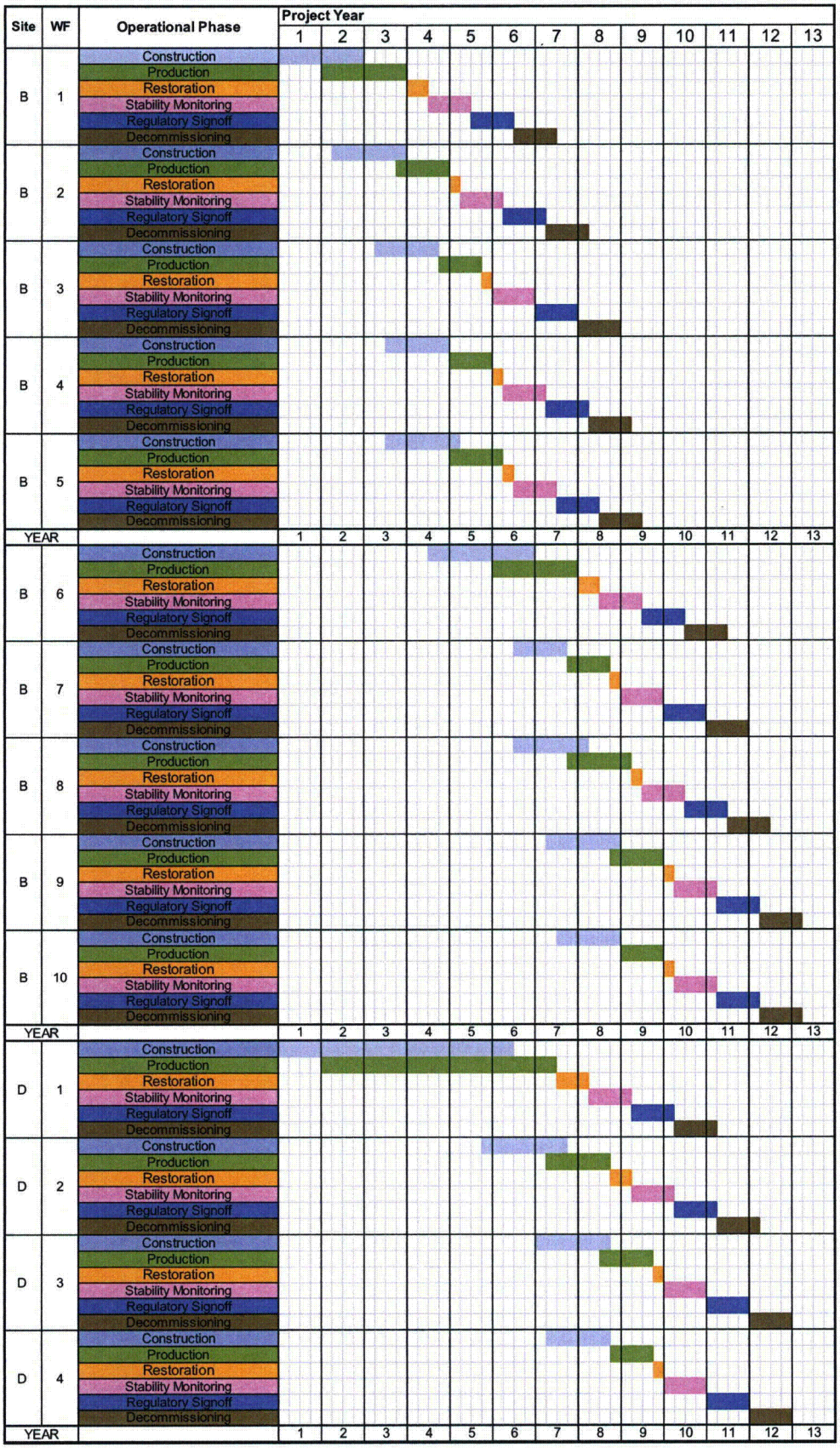


Figure 6.5-1

Proposed Project Operations and Restoration Schedule

Dewey-Burdock Project

SIGNATURE OF PREPARER	John Mays
PREPARER	John Mays
DATE	14-Sep-2012
FILE	OpRestSched.mxd

POWERTECH (USA) INC.

This figure is provided to fulfill the requirements of ARSD 74:29:02:05 and SDCL 45-6B-6(10).

6.7 Financial Assurance

6.7.1 Financial Assurance Estimate

In compliance NRC license conditions and with ARSD 74:29:02:08, Powertech (USA) will maintain financial assurance instruments to cover the cost of reclamation including the costs of groundwater restoration; well plugging and abandonment; decommissioning, dismantling and disposal of all buildings and other facilities; reclamation and revegetation of affected areas; and postclosure monitoring.

Powertech (USA) commits to supplying a financial assurance mechanism in a form and in an amount approved by NRC, DENR, EPA and BLM prior to the commencement of operations.

A financial assurance estimate is provided in Appendix 6.7-A. This appendix provides a summary of costs by year for the deep disposal well option and the land application option, respectively. The financial assurance model is based on the Dewey-Burdock Project being in operation for one full year prior to a third party taking over reclamation of the facility. Reclamation would include facility decommissioning, groundwater restoration, stability monitoring, well field reclamation, soil reclamation, and radiological surveys. The by-year costs are based on year 1 being the pre-operational construction phase, year 2 the full year of ISR operations, and year 3 the beginning of the financial assurance-funded reclamation activities. Groundwater restoration and stability monitoring would be conducted in years 3-4. Final decommissioning, including building demolition and soil reclamation, would be conducted during years 5-6.

The financial assurance estimate in Appendix 6.7-A assumes that the Dewey and Burdock portions of the permit area would be developed simultaneously. This would begin with construction of the CPP, Satellite Facility, and initial well field in each area. Subsequent well fields would be developed sequentially in both of the Dewey and Burdock portions of the permit area. As an alternative to this development scenario, Powertech (USA) is considering developing the Satellite Facility and Dewey-area well fields initially, followed by the CPP and Burdock-area well fields. If Powertech (USA) chooses to pursue this alternate development scenario, a revised financial assurance estimate will be provided, likely prior to LSM permit issuance.

The financial assurance cost estimate reflects costs as of 2009. The cost factors found in Appendix 6.7-A, Table 2 and elsewhere were obtained from vendor quotes, from the 2009 RS Means cost estimating handbooks, from recent ISR license applications, and from calculations as

described. All electrical power costs are conservatively based on a per kWh hour cost of $0.07; the results of a power study (Lyntek, 2010) showed estimated 2013 power costs of $0.0595 to $0.0691 per kWh, depending on the supplier. The costs of 11e.(2) byproduct material disposal, as listed in Appendix 6.7-A are based on the assumption that Powertech (USA) will secure a byproduct disposal contract with Denison Mines Corporation for disposal at their byproduct disposal facility at White Mesa, UT. The cost estimate is based on a transportation distance of 785 miles from the permit area to the White Mesa facility near Blanding, UT. Transportation costs to alternate 11e.(2) byproduct material disposal facilities will be similar or less. For example, the Pathfinder Mines Corporation Shirley Basin Facility is approximately 250 miles away, the Energy Solutions LLC Clive Disposal Site near Clive, UT is approximately 700 miles away, and the Waste Control Specialists LLC facility near Andrews, TX is approximately 900 miles away.

While it is likely that the facility buildings will have a salvage value, the demolition cost estimate assumes that all buildings will be shredded and disposed at an appropriate landfill. Decommissioning costs include a final gamma survey.

Labor costs associated with the reclamation operations will be a combination of contract labor and direct hires, listed in Appendix 6.7-A. A full-time Radiation Safety Officer will be employed through final decommissioning.

Powertech (USA) will revise these financial assurance cost estimates after NRC license and LSM permit issuance based on NRC, DENR, EPA and BLM approval of the methodologies for cost estimate calculations. In the event that additional factors are utilized for adding or subtracting from approved cost estimates, Powertech (USA) will provide a written explanation of such factors when submitting revised cost estimates after license and permit issuance.

Powertech (USA) commits to providing annual financial assurance updates to DENR as described in Section 5.7.2.6.

6.8 Postclosure Monitoring Plan

When ISR operations are completed and reclamation is in the final stages of vegetation establishment, Powertech (USA) will inspect and maintain activities to ensure compliance and reduction of potential environmental impacts in accordance with SDCL 45-6B-91. It is not anticipated that any new environmental impacts will be identified after this stage of the project.

Following is a description of the proposed postclosure monitoring plan for various environmental media.

6.8.1 Water Quality Monitoring

Postclosure surface water monitoring will be conducted to ensure that there will not be future impacts to surface water resources, including Beaver Creek, Pass Creek, potentially affected tributaries, and impoundments. Monitoring will be performed annually at the operational surface water monitoring sites described in Tables 5.5-2 and 5.5-3. The samples will be analyzed for the parameters listed in Table 5.5-4.

If land application is used, postclosure alluvial groundwater monitoring will be conducted for each perimeter of operational pollution (POP) zone as described in the GDP. Postclosure monitoring of bedrock groundwater resources is not proposed due to the following reasons:

1) An extensive operational monitoring program will be performed, including monitoring overlying and underlying hydrogeologic units and monitoring the perimeter of the production zone. This will ensure that any potential horizontal or vertical excursions are rapidly detected and corrected.

2) Ore zone groundwater quality will be restored in accordance with NRC license conditions. Prior to NRC approval of successful groundwater restoration, Powertech (USA) will demonstrate that the target restoration goals or ACLs have been achieved and that groundwater restoration has been conducted in a manner that will protect human health and the environment. This will be demonstrated through a minimum 12-month stability monitoring period following groundwater restoration activities.

3) Protection of USDWs outside of the aquifer exemption boundaries will be assured by EPA, which has the authority and responsibility to do so through administration of the Class III and V UIC permits.

4) NRC will release the site for unrestricted (i.e., DENR-approved postmining) use only after NRC approval of successful groundwater restoration, well field decommissioning, and site decommissioning. The timely return of the surface to the landowners will be the primary focus of the reclamation and decommissioning activities.

6.8.2 Air Quality Monitoring

No postclosure air quality monitoring is proposed for the Dewey-Burdock Project on the basis that no potential air quality impacts will remain following DENR approval of successful reclamation.

6.8.3 Vegetation Monitoring

Reclaimed land will be inspected on an annual basis, coinciding with the growing season, to ensure compliance with the final Reclamation Plan and postmining land use. If the vegetation is not achieving the goals of the final Reclamation Plan and postmining land use, steps will be taken to correct or mitigate the situation. If a change in the seed mixture is necessary to ensure vegetative success, these changes will be submitted to DENR for approval.

Monitoring methods used to document reclamation success are included in Powertech (USA)'s Dewey-Burdock Project Reclamation Performance Criteria (Appendix 6.4-D).

6.8.4 Land Application Monitoring

As discussed in Section 5.4.1.1.2, Powertech (USA) may use land application as a method of disposing treated wastewater. If land application is used, there could be potential impacts to the soil and vegetation from the buildup of salts, changes in SAR, buildup of radionuclides, buildup of metals and metalloids, and decrease in soil fertility.

In conformance with ARSD 74:29:05:19, Powertech (USA) has formulated a monitoring and mitigation plan to detect potential soil and vegetation impacts related to land application of treated wastewater. The specific monitoring and mitigation measures are addressed in Sections 5.5.6.1 and 5.5.7.1 and GDP Sections 6.4 and 6.5. Revegetation of land application areas is addressed in Section 6.4.4.

6.8.5 Sediment and Erosion Control Structures

Sediment and erosion control structures will be inspected on a quarterly basis to ensure compliance with all applicable reclamation, design, and operating criteria. Maintenance and repair work needed to keep the structures in proper operating order will be performed as necessary. This work will include the removal and proper disposal of sediment captured by the structures and repair or replacement of ASCMs as needed. If during the term of the postclosure period erosion and sedimentation becomes a problem in any area, new structures will be installed to adequately address any problems. Conversely, if the need for sediment and erosion controls in an area becomes unnecessary, the synthetics will be removed for aesthetic purposes.

6.8.6 Postclosure Financial Assurance

Prior to release of the reclamation financial assurance instrument by DENR, a portion of the reclamation financial assurance will be dedicated to the postclosure bond. A detailed financial

assurance estimate for postclosure activities will be submitted to DENR for approval prior to the beginning of the postclosure monitoring period.

6.8.7 Postclosure Monitoring Duration

Powertech (USA) will conduct postclosure monitoring for 30 years following operations, or until release of this requirement has been granted by DENR.

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