*Please note – on May 11, 2011, Intermountain Power Agency ("IPA") acquired the Wildcat Loadout from Andalex Resources, Inc. ("Andalex"). References to Andalex will therefore occur herein. However, permit actions from May 11, 2011 forward will be the responsibility of IPA, regardless whether Andalex is referenced as the responsible party for such actions.
## CHAPTER 6

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CHAPTER 6, GEOLOGY

HISTORICAL NOTE: In 2004, the Division issued an Order DO-04 for wind-blown fines which had accumulated outside the disturbed area, primarily in the area southwest of the main coal storage pile below sediment Pond B. A complete description of the mitigation plan proposed for DO-04 is included in Appendix P.

A proposed crude oil unloading station, storage system, and railcar loading stations will be located on the west side of the Utah Railroad tracks. These facilities will be bonded before any implementation or construction is started.

Introduction

The Wildcat Loadout is in the Gordon Creek area of the Wasatch Plateau which is one of the major physiographic features in the region. The plateau rises from a base at approximately 6,000 feet in elevation to over 9,000 feet.

Spring Canyon and Ford Ridge (Forge Mountain) are the major topographic features of the area. The Price River Canyon and Spring Canyon are the major area drainages.

Geologic Setting (Stratigraphy and Structure)

The permit area sits on the Masuk Member of the Mancos Shale. The Mancos Shale in this area is in access of 5,000 feet thickness. The Mancos Shale in the area is mainly dark bluish, gray shale which becomes sandy towards the top. The oldest unit of the Mesa Verde Group is the Star Point Sandstone. It lacks coal and consists of three sandstone tongues. The beds of sandstone range in thickness from one to ten feet in most parts. The Mesa Verde Group immediately
overlies the Mancos Shale. Overlying the starpoint sandstone, is the Blackhawk formation, also of the Mesa Verde Group. The major coal seams of the entire region lie within the Blackhawk formation. The Blackhawk formation consists of cliffy sandstone beds and lagoonal sediments.

Immediately, but disconformably overlying the Blackhawk formation, is the Castlegate sandstone, also of the Mesa Verde Group. It is a single bed of massive sandstone about 450 to 500 feet thick. Above the Castlegate sandstone are 900 to 1,000 feet of sandstone, shale, and sandy shale beds, a unit called the Price River Formation which is also a member of the Mesa Verde Group.

Structure

In the Wasatch Plateau, the cliff fronts roughly parallel the strike of the beds with gentle dips to the northwest. The Mancos Shale in this area exhibits the same trends.

The Wasatch Plateau contains three complex north trending fault zones of large lateral extent. This has a tendency to disrupt mining activities on the Wasatch Plateau but will have no impact on the Wildcat Loadout Facility as this is strictly a surface facility.

History of Mining

Mining and its related activities have been the main industry in this region for many years.

Coal was discovered in the Wasatch Plateau as early as 1874. Coal exploration eventually spread to the Book Cliffs. As early as 1889, mines started operating in the area. The Castlegate and Sunnyside area was developed first. As the coal way usually discovered away from settled areas, the companies built houses for their employees.

There was increased production until 1920, thereafter declining during the 1920's and 1930's. However, as a result of the second World War, production bounced back to the 1920 levels and this production increase went up until 1957 when production once again declined.

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Up to 75 percent of Utah's annual coal production has come from mines in the Book Cliffs.

Coal already extracted from the coal measures of the area is well over 200 million tons. Much coal remains and many mines are presently operating in the area.

Historically, coal loading activities had been the sole use for this permit area, even prior to being leased to Andalex Resources.

Geologic and Tectonic History

During the Triassic and Jurassic periods, the area of the Book Cliffs was relatively stable, but gradually subsided and received sediments. The area, assumed to have been a relatively flat lowland, was occasionally covered by a shallow sea of short geologic duration. A thick red bed sequence suggests tropical conditions. During the Triassic times, the sediments probably came from all directions but, during the Jurassic time, the major source areas were mainly to the south and west.

During the early Cretaceous, a trough developed in the Colorado Rockies and the sea invaded the area. Gradually, the sea crept westward as the trough continued to subside, reaching the east edge of the Colorado Plateau by the early part of the Upper Cretaceous.

Unconformities and thinning of various members indicate that volcanic activity to the west caused sediments to fill the basin faster than it could subside, causing the shoreline to be pushed eastward. When hills developed as a result of this activity, the incoming sediments diminished, causing the sea to move westward once more. With each pulse, the boundaries of the depositional environments moved eastward and then returned westward. This was the period the sandstone tongues of the Mesa Verde group which project into the Mancos, were deposited. This is known as the Star Point Sandstone.

Despite the fact that the sea retreated, the area continued to
receive sediments under continual conditions, a condition known to have lasted well into the Eocene time. The area began to rise in full earnest during Oligocene time. Erosion attacked the previously deposited formations, and in consequence, forming the present mountain ranges and cliffs.

Geologic Hazard

Although there are faults present in the area, they will have no impact on the Wildcat Loadout Surface Facility.

Detailed Description of Strata to be Disturbed by Surface Operations

Identification of Strata

The strata disturbed by surface operations consists of a slightly sandy shale. Surface disturbance was primarily in loose sediments and coal dumps.

R645-301-611.200. PROPOSED OPERATIONS

See R645-301-551. and R645-301-529.100.

R645-301-612. CROSS SECTION, MAPS AND PLANS

See R645-301-510.

R645-301-620. ENVIRONMENTAL DESCRIPTION

See R645-301-510.

R645-301-621. GENERAL REQUIREMENTS

See R645-301-510.

R645-301-622. CROSS SECTIONS, MAPS AND PLANS

Plate 12

R645-301-622.100. TEST BORINGS AND CORE SAMPLINGS

6-4
Appendix C

R645-301-622.200. COAL SEAMS AND BURDEN
N/A

R645-301-622.300. COAL OUTCROPS
N/A

R645-301-622.400. GAS AND OIL WELLS

There are no oil or gas wells within the permit area. In 2002, a drill pad was constructed by Conoco Phillips Company for a gas well adjacent to the east permit boundary, and actually encroached on the permit as shown on Plates 1 and 2; however, to date, no drilling has been done and future drilling will not occur within the permit boundary.

R645-301-623. GEOLOGIC INFORMATION

See R645-301-611.100.

R645-301-623.100. POTENTIALLY ACID OR TOXIC FORMING STRATA

Appendix C

R645-301-623.200. RECLAMATION REQUIREMENTS

See R645-301-240.

R645-301-623.300. SUBSIDENCE CONTROL PLAN
N/A

R645-301-624. GEOLOGIC INFORMATION

See R645-301-611.100.

R645-301-624.100. DESCRIPTION
Alternative Water Supply Information

The Wildcat activities will not result in any contamination, diminution, or interruption of any surface water sources within the proposed permit area. Naturally drainages have been diverted around the disturbed area. It should be noted that these are ephemeral drainages. As no springs or seeps exist on or near the permit area, there are no groundwater sources to be disrupted. Andalex has water rights on the seep in Garley Creek and upon completion of activities this water right could be transferred for another use. To date, Andalex has not developed this water. If developed, it will be used for dust suppression.
R645-301-624.300. TEST BORINGS AND DRILL CORES

Appendix C

R645-301-624.310. LOGS

Appendix C
ACID OR TOXIC FORMING MATERIALS

Appendix C, R645-301-513.300.

CHEMICAL ANALYSES

Appendix C

ROOF AND FLOOR MATERIALS

N/A

ADDITIONAL INFORMATION

Appendix C

WAIVER FROM COLLECTION AND ANALYSIS

N/A

OVERBURDEN

N/A

OPERATION PLAN

See R645-301-511.100.

CASING AND SEALING OF EXPLORATION HOLES AND BOREHOLES

See R645-301-551.

TEMPORARY CASING AND SEALING OF DRILLED HOLES

N/A

PERMANENT CASING AND SEALING OF EXPLORATION HOLES AND BOREHOLES
See R645-301-551.
R645-301-632. SUBSIDENCE MONITORING
N/A

R645-301-632.100. DEGREE OF SUBSIDENCE
N/A

R645-301-632.200. MONITORING LOCATIONS
N/A

R645-301-640. PERFORMANCE STANDARDS
See R645-301-551 and R645-301-529.100.

R645-301-641. ALL EXPLORATION HOLES AND BOREHOLES
See R645-301-551 and R645-301-529.100.

R645-301-642. MONUMENTS AND SURFACE MARKERS
N/A