*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 7

## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section Number</th>
<th>Section Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>R645-301-700</td>
<td>HYDROLOGY</td>
<td>7-1</td>
</tr>
<tr>
<td>R645-301-710</td>
<td>INTRODUCTION</td>
<td>7-1</td>
</tr>
<tr>
<td>R645-301-711</td>
<td>GENERAL REQUIREMENTS</td>
<td>7-2</td>
</tr>
<tr>
<td>R645-301-712</td>
<td>CERTIFICATION</td>
<td>7-8</td>
</tr>
<tr>
<td>R645-301-713</td>
<td>INSPECTION</td>
<td>7-9</td>
</tr>
<tr>
<td>R645-301-720</td>
<td>ENVIRONMENTAL DESCRIPTION</td>
<td>7-9</td>
</tr>
<tr>
<td>R645-301-721</td>
<td>GENERAL REQUIREMENTS</td>
<td>7-9</td>
</tr>
<tr>
<td>R645-301-722</td>
<td>CROSS SECTIONS AND MAPS</td>
<td>7-9</td>
</tr>
<tr>
<td>R645-301-723</td>
<td>SAMPLING AND ANALYSIS</td>
<td>7-9</td>
</tr>
<tr>
<td>R645-301-724</td>
<td>BASELINE INFORMATION</td>
<td>7-15</td>
</tr>
<tr>
<td>R645-301-725</td>
<td>BASELINE CUMULATIVE IMPACT AREA INFORMATION</td>
<td>7-23</td>
</tr>
<tr>
<td>R645-301-726</td>
<td>MODELING</td>
<td>7-24</td>
</tr>
<tr>
<td>R645-301-727</td>
<td>ALTERNATIVE WATER SOURCE INFORMATION</td>
<td>7-24</td>
</tr>
<tr>
<td>R645-301-728</td>
<td>PROBABLE HYDROLOGIC CONSEQUENCES (PHC) DETERMINATION</td>
<td>7-24</td>
</tr>
<tr>
<td>R645-301-729</td>
<td>CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT (CHIA)</td>
<td>7-25</td>
</tr>
<tr>
<td>R645-301-730</td>
<td>OPERATION PLAN</td>
<td>7-26</td>
</tr>
<tr>
<td>R645-301-731</td>
<td>GENERAL REQUIREMENTS</td>
<td>7-26</td>
</tr>
<tr>
<td>R645-301-732</td>
<td>SEDIMENT CONTROL MEASURES</td>
<td>7-32</td>
</tr>
<tr>
<td>R645-301-733</td>
<td>IMPoundMENTS</td>
<td>7-33</td>
</tr>
</tbody>
</table>
R645-301-734. DISCHARGE STRUCTURES ..................... 7-37
R645-301-735. DISPOSAL OF EXCESS SPOIL ................ 7-37
R645-301-736. COAL MINE WASTE .............................. 7-37
R645-301-737. NON-COAL MINE WASTE ...................... 7-38
R645-301-738. TEMPORARY CASING AND SEALING OF WELLS .... 7-38
R645-301-740. DESIGN CRITERIA AND PLANS ................. 7-38
R645-301-741. GENERAL REQUIREMENTS ..................... 7-38
R645-301-742. SEDIMENT CONTROL MEASURES .................. 7-38
R645-301-743. IMPOUNDMENTS ................................. 7-45
R645-301-744. DISCHARGE STRUCTURES ...................... 7-47
R645-301-745. DISPOSAL OF EXCESS SPOIL .................. 7-47
R645-301-746. COAL MINE WASTE .............................. 7-49
R645-301-747. DISPOSAL OF NON-COAL MINE WASTE ......... 7-51
R645-301-748. CASING AND SEALING OF WELLS ............... 7-51
R645-301-750. PERFORMANCE STANDARDS ..................... 7-51
R645-301-751. WATER QUALITY STANDARDS AND EFFLUENT LIMITATIONS ...................... 7-52
R645-301-752. SEDIMENT CONTROL MEASURES .................. 7-52
R645-301-753. IMPOUNDMENTS AND DISCHARGE STRUCTURES .......... 7-53
R645-301-754. DISPOSAL OF EXCESS SPOIL, COAL MINE WASTE AND NON-COAL MINE WASTE .... 7-53
R645-301-755. CASING AND SEALING OF WELLS ............... 7-53
R645-301-760. RECLAMATION ..................
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>R645-301-761</td>
<td>GENERAL REQUIREMENTS</td>
<td>7-53</td>
</tr>
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<td>R645-301-762</td>
<td>ROADS</td>
<td>7-53</td>
</tr>
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<td>R645-301-763</td>
<td>SILTATION STRUCTURES</td>
<td>7-53</td>
</tr>
<tr>
<td>R645-301-764</td>
<td>STRUCTURE REMOVAL</td>
<td>7-54</td>
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<tr>
<td>R645-301-765</td>
<td>PERMANENT CASING AND SEALING OF WELLS</td>
<td>7-54</td>
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</table>
CHAPTER 7, HYDROLOGY

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.

R645-301-700. HYDROLOGY
R645-301-710. INTRODUCTION

It should be noted that the entire sedimentation and control plan, including impoundments, diversions and reclamation hydrology are discussed in Appendix R, Sedimentation and Drainage Control Plan.

R645-301-711. GENERAL REQUIREMENTS

See Sections R645-301-711.100 through R645-301-711.500

R645-301-711.100. EXISTING HYDROLOGIC RESOURCES

Existing Groundwater Resources
Regional Groundwater Hydrology

The groundwater resources of the Wasatch Plateau have not been studied to any great extent. The region has been characterized generally as one of regional groundwater recharge. The lithologic nature of the upper cretaceous strata generally makes them unsuitable as significant aquifers. Much of the precipitation that falls in the Wasatch Plateau is removed by overland flow and evapotranspiration. The water that does enter the ground moves only short distances before discharging as springs and seeps, generally in the higher elevation areas. The regional water table is probably several hundred feet below the surface, and probably coincides with the bottoms of the major streams, i.e., Price River.

\footnote{Price and Arnow, 1974}
The principal water bearing formations of the Wasatch Plateau are the sandstone units of the Mancos Shale Group. These include the Emery and Ferron Sandstones. The sandstone units occur in the southern part of Emery County and probably do not extend into the Gordon Creek area. The basal unit of the Mesa Verde Group, the Star Point Sandstone, is probably the principal aquifer in the Gordon Creek area; however, this unit is stratigraphically located several hundred feet in elevation higher than the loadout facility. Price and Arnow (1979) do not identify the Gordon Creek area as a region for potential large scale groundwater development.

The Mancos formation consists of approximately 5,000 feet of dark blue-gray shale with several prominent members. The loadout facility is located in the Upper or Masuk Shale Member of the Mancos. This formation is characterized as a yellow to blue-gray sandy shale and is not regarded as an aquifer (please see Figure VII-1). Little data is available on the groundwater potential of the shales in the Lower Gordon Creek Area, since they are located below the minable coal seams and above the river bottoms, and thus have not been studied specifically. The extremely low groundwater potential of the general area, however, is supported by a field reconnaissance of the surrounding area. The drainages within a 1/2 mile radius of the loadout site are all ephemeral and no springs or seeps are known to exist within this distance, indicating a complete lack of groundwater in the shale unit in this area. The nearest water to be found in the general area is in a small seep in Garley Canyon about 1/2 mile to the southwest, and the Gordon Creek drainage located some 1-1/2 miles to the south. The flows are generally intermittent and are characterized by poor quality and a high salt content, typical of low volume flow in the Mancos Shale. Some groundwater has been measured in the Lower Mancos Shale units in Castle Valley, i.e., C.V. Spur. These areas are below the water tables of the Price River and various canals, and are likely fed by those units. An examination of available data in the MRP show groundwater quality in these areas is inconsistent and highly alkaline, commonly containing total dissolved solids in excess of 10,000 mg/l.

The spring/seep in Garley Canyon is located in the NW 1/4 NW 1/4 of Section 4, Township 13 South, Range 9 East, S.L.B.M.,

Fisher, 1960

2Fisher, 1960
approximately 3/4 miles southwest of the loadout facility, as shown on Plate 15. The spring outcrops at an elevation of approximately 6,155.0 feet, in the main drainage of Garley Canyon, near the Utah Railroad Crossing. The spring is located in the Quarternary Alluvium; however, it is likely the recharge is from the alluvial terraces to the northwest, with the water surfacing near the point where the alluvium meets the more impermeable Mancos Shale below. The flow from the spring is extremely low - approximately 5 g.p.m. - and the quality is typically poor for water in this area. Andalex has filed for the water rights to this spring, and a copy of the certificate of water right is included as Appendix G. Also included in the appendix is a water sample analysis of the spring. The spring is presently used only for occasional wildlife and stock watering; however, this use is highly limited since the spring has not been developed for any specific purpose. Future use of the spring may include industrial water if IPA decided to develop and utilize the water for its loadout operation.

Mine Plan Area Groundwater Hydrology

The processing/loadout facility is located on a low slope within the Masuk Shale Member of the Mancos Formation. Ridges adjacent to the area are capped by a loose deposit of boulders and gravels derived from the sandstones and limestones of the eroded plateaus. These gravel deposits are believed to be late tertiary or early quaternary in age. Eight holes were drilled on site for a geotechnical analysis of soil foundation characteristics. Locations of the holes are shown on Figure No. 1 in Appendix C. The holes reached depths of 45', and show the top 15' to 20' to be a clayey silt and a gray shale below that depth. None of the holes intercepted any groundwater. Two additional holes were drilled up to 60' to set piling below the loadout, and no groundwater was intercepted in this drilling.

At the recommendation of the foundation consultant, Rollins, Brown, and Gunnell, the two deeper holes were left open to be monitored for groundwater infiltration. The 2-60' deep holes were left open for a period of two months and checked on a weekly basis. After two months, no groundwater had been detected in either hole and it was therefore concluded that groundwater did not exist in the area of drilling. No other data is available.

---

3 Spieler, 1931
The drainages within, and adjacent to the permit area, are all ephemeral and there are no springs or seeps in this area.

There are no groundwater resources present on or adjacent to the permit area. This conclusion is based on the following:

1. Regional groundwater evaluations show minor perched aquifers in the upper (Mesa Verde Group) formations and minor groundwater occurrences in the Mancos in the valley floor below the river and canal water tables.

The permit area lies within the Masuk Shale Member of the Mancos Formation, which is in between the recorded groundwater areas. This shale member is not regarded as a regional or localized aquifer;

2. The drainages within and adjacent to the permit area are all ephemeral. The presence of groundwater would likely be shown by springs, seeps, or at least intermittent flows in some of the deeply eroded natural drainages;

3. There are no springs or seeps known to exist within or adjacent to the permit area;

4. On-site drilling reached depths of 60' and encountered absolutely no groundwater.

Effects of Operations on Groundwater

Regional and on-site studies, reconnaissance, and drilling indicate a complete lack of groundwater in the permit area and surrounding area. If groundwater does exist below the permit area, it is likely several hundred feet down, near the level of the valley floor. Since the operations at this site are confined to the immediate surface and since no mining extraction or subsidence will occur here, there will be no effect of the operation on groundwater.

Mitigation and Control Plans

Since there are no groundwater resources or impacts expected at this site, there will be no need for mitigation and control.
plans for groundwater protection. The operation will, however, be conducted in a sound and environmentally conscious manner. There will be mitigation and control plans for surface water and these plans will ensure protection of surface water which may become recharge for groundwater sources elsewhere.

Groundwater Monitoring

Since groundwater does not occur on or adjacent to the permit area, there is no baseline water quality or quantity information available, other than the drilling information on the site that confirmed no groundwater is present. As a result, no groundwater monitoring program is proposed for this operation.

IPA will, however, perform a leachate test on the coal and reject materials stored on site as requested by the Division. IPA will gather a special sample of the coal processing waste material for a special one time characterization. IPA proposes to take this sample at approximately the center of the pile at a depth of approximately one foot. The sample will be a grab type sample unless the size of the specimen recovered is too large. If so, IPA will form a composite sample from four separate locations in a radius approximately 50 feet from the center of the pile. Only one sample will be required from this depth because in an ordinary coal processing waste year, only one two foot lift is added to the reject pile. As soon as this procedure has been approved by the Division, it will be implemented. The test will consist of saturating a representative sample of material with water for a period of 24 hours and then extracting a fluid sample. The leachate will then be analyzed for the normal surface water baseline parameters. This information will then be incorporated into the probable hydrologic consequences document for the facility.

The material to be leached will also be tested for acid- or toxic-forming potential at this time. The analysis will include the following parameters: pH, Ec, SAR, Se, B, Acid-Base Potential, % Organic Carbon, Saturation Percent, and Texture. If toxic- or acid-forming materials are found to occur, a plan will be developed to ensure that drainage from these materials will not be detrimental to vegetation or adversely affect surface waters.
The above described leachate analysis was conducted in 1994 and results were submitted to the Division in the Annual Report for that year. Additional sampling of the refuse material was also conducted in 2004 and analyzed for acid and toxic properties. The results of these tests are included in Appendix D.

Surface Water Hydrology

This section will provide a review of the surface water hydrology relevant to the Wildcat Loadout Facility, as well as methods and designs to control surface waters within compliance of DOGM regulations.

Methodology

The hydrologic study is based on a review of literature and available data obtained from the USGS, NOAA Atlas, and other mine permit applications. A field reconnaissance was also conducted to confirm the location and characteristics of surface water courses. Designs of control structures are based on requirements of the regulations.

Existing Surface Water Resources

Regional Surface Water Hydrology

Most of the regional area is drained by tributaries to the Green and Colorado Rivers. Principal tributaries are the Price and San Rafael Rivers and Muddy Creek. The Green River flows through the eastern edge of the Central Utah Region.

A USGS Report entitled "Hydrologic Reconnaissance of the Wasatch Plateau - Book Cliffs Coal Field Area, Utah" considers the development of coal resources in Central Utah. The IPA Loadout Facility lies near the coal resource areas, below the head waters of tributaries to the Price River. Much of the water from the Price River is diverted for irrigation use.

Approximately 50 to 70 percent of the stream flow occurs during the May - July snowmelt runoff period. Summer precipitation

\( ^4 \) Waddell and Others, 1981
does not usually produce more runoff than the snowmelt, although intense rainfall may produce high runoff in localized areas. Storms in this area are usually intense, but of relatively short duration. The 100 year -6 hour precipitation event is approximately 2.5 inches in the mountain areas, and only slightly less in the valleys (1.91 inches).

Water quality in the Price River and its' tributaries is good at the higher elevations. In most cases, surface waters at higher elevations have dissolved solid concentrations of less than 250 mg/l and are of a calcium bicarbonate type. At lower elevations, the surface water degrades to a sodium sulfate type with dissolved solids ranging from 250 to more than 6,000 mg/l. These changes are caused by irrigation return flows and natural runoff from areas underlain by Mancos Shale.

Mine Plan Area Surface Water Hydrology

There are no principal surface water courses found within 1/4 mile of the permit area, and no perennial streams within 1 mile of the permit area.

Wildcat Canyon, located approximately 3/8 mile to the north of the permit area, is an ephemeral drainage that drains a large portion of the area north of the Gordon Creek Road and leads into the Price River. No runoff from the permit area flows to Wildcat Canyon.

The North Fork of Gordon Creek is a perennial, low flow, and low quality stream, and is located approximately 1-1/4 miles to the south of the facility. No runoff from the permit area reaches this drainage.

A small ephemeral drainage known as Garley Canyon runs south of the permit area and eventually drains into the Price River approximately 3-1/2 miles southeast of the permit area. Runoff from the permit area would flow into the Garley Canyon drainage and eventually into the Price River but not before passing through a sedimentation pond.

Garley Canyon is a drainage formed in the eroding Mancos slopes below Pinyon - Juniper covered plateaus located west of the permit area. The natural drainage is highly eroded, due to the
sparse vegetative groundcover and resulting rapid runoff through the weathered Mancos Shale. This is typical of drainages within the Mancos Shale in this area, and results in a high sulfate, low quality water. Most of the water below the point where Garley Canyon meets the Price River, is diverted and used for irrigation.

The general drainage pattern of the area is shown on Plate 15.

Surface Water Quality

Surface water quality is described in Appendix J, Appendix M and in R645-301-512.240.

R645-301-711.200. POTENTIAL IMPACTS TO THE HYDROLOGIC BALANCE

See Appendix J - Probable Hydrologic Consequences and R645-301-711.100.

R645-301-711.300. COMPLIANCE WITH HYDROLOGIC DESIGN CRITERIA

IPA will follow its approved Sedimentation and Drainage Control Plan and comply with the UPDES Permit No. UTG-040008, issued May 31, 2003 (see Appendix K).

Water monitoring plans, as well as all hydrologic design details, are discussed in Section R645-301-512.240. All hydrologic design details are discussed in Appendix R.

IPA will comply with the Clean Water Act (33 U.S.C. Section 1251 et. seq.) and all other applicable water quality laws and health and safety standards.

R645-301-711.400. APPLICABLE HYDROLOGIC PERFORMANCE STANDARDS

All applicable hydrologic performance standards will be met.

R645-301-711.500. RECLAMATION ACTIVITIES

Reclamation and post-mining hydrology are discussed under
Sections R645-301-512.240 and R645-301-541 and Appendix R.

R645-301-712. CERTIFICATION

All cross-sections, maps and plans required have been prepared and certified according to R645-301-512.

R645-301-713. INSPECTIONS

All impoundment inspections are performed according to, and described under, Section R645-301-514.300.

R645-301-720. ENVIRONMENTAL DESCRIPTION

See R645-301-711.100.

R645-301-721. GENERAL REQUIREMENTS

See R645-301-711.100.

R645-301-722. CROSS SECTIONS AND MAPS

See R645-301-510.

R645-301-722.100. LOCATION AND EXTENT OF SUBSURFACE WATER

See R645-301-711.100.

R645-301-722.200. LOCATION OF SURFACE WATER BODIES

See R645-301-711.100.

R645-301-722.300 MONITORING STATIONS

See R645-301-723 and Plates 2A and 15.
The permit area, which is near part of the Wasatch Plateau Coal Field, is located in a mid-latitude steppe climate with the land...
below the cliffs approaching desert conditions. The nearest weather recording station is located approximately seven miles southeast of the Loadout in Price, Utah. Temperatures at the site are 3 to 5°F cooler than at Price, seven miles southeast and 1,500 feet lower.

Average monthly temperatures at Price range from 36.9°F in January to 90°F in July. Extreme temperatures of record are -31°F and 108°F. Due to the elevation and a predominance of clear skies and dry air, daily temperature ranges are rather large, averaging 24°F in winter and 32°F in summer. Average annual precipitation is 9.31 inches at Price. The 100-year 6-hour precipitation event is 1.9 inches. (Table VII-2). Snowfall is generally light, averaging 21.1 inches annually, at Price. Potential evaporation is about 36 inches per year. The area is almost completely surrounded by mountains which act as a barrier to storms approaching from every direction except south.

Source of Data

National Oceanic and Atmospheric Administration, National Climatic Center, Asheville, North Carolina.

Western Regional Climate Center, Reno, Nevada.

Climatological Factors

Precipitation

The precipitation in the area, which is largely controlled by elevation, varies from 0.50 inches per month to 1.22 inches per month, with an annual average of 9.31 inches.

The principal rainfall is in late summer/early fall when the area is occasionally subjected to thunderstorm activity associated with moisture-laden air masses moving in from the Gulf of Mexico.

Snowfall is generally light, averaging less than 22 inches annually.

The Monthly Climate Summary for the Period of Record (9/1/1968 - 6/30/2004) is shown below on Table VII-1.
## TABLE VII-1

**PRICE WAREHOUSES, UTAH (427026)**

Period of Monthly Climate Summary

**Period of Record:** 9/1/1968 to 6/30/2004

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<td>Average Min. Temperature (F)</td>
<td>13.4</td>
<td>19.7</td>
<td>27.6</td>
<td>34.6</td>
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<td>58.3</td>
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<td>16.7</td>
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<tr>
<td>Average Total Precipitation (in.)</td>
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<td>0.73</td>
<td>0.73</td>
<td>0.50</td>
<td>0.66</td>
<td>0.89</td>
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<td>0.59</td>
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<td>Average Total Snowfall (in.)</td>
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Percent of possible observations for period of record.

- Max. Temp.: 77.6%
- Min. Temp.: 77.7%
- Precipitation: 94.5%
- Snowfall: 93.1%
- Snow Depth: 88.3%

Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

INCORPORATED

SEPTEMBER 14, 2012

DIVISION OIL, GAS & MINING
### TABLE VII-2

**ESTIMATED RETURN PERIODS FOR SHORT DURATION PRECIPITATION**

(inches)

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#### DURATION

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<td>.65</td>
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<td>1.13</td>
<td>1.50</td>
<td>1.83</td>
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<tr>
<td>50</td>
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<td>.54</td>
<td>.75</td>
<td>.95</td>
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<td>2.47</td>
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<td>1.27</td>
<td>1.45</td>
<td>1.91</td>
<td>2.32</td>
<td>2.74</td>
</tr>
</tbody>
</table>

Table VII-3 shows the average monthly precipitation for the period 1936-1976.

The climatology summary by month for period 1936-1965 is given in Table VII-4.
Temperature

The average annual maximum temperature for the period 1968 - 2004 was 63.7 degrees. The annual mean temperature was 49.9 degrees and the annual minimum temperature was 36.1 degrees. See Table VII-1.

Summers are characterized by hot days and cool nights. However, the high temperatures are not oppressive since the relative humidity is low. The hottest month is July with the maximum temperature on most days nears 90 degrees and the lows in the upper 50's.

The winters are cold and uncomfortable, but usually not severe, due in part to the protecting influence of the mountain ranges to the north and east which prevent cold arctic air masses from moving into the area.

Temperatures of 100 degrees or higher during summer or 15 degrees below zero or colder during winter are likely to occur once every three years.

The freeze-free period, or growing season, averages about five months in length, from early May to early October.

Average Temperature values are given on Table VII-1.

Wind

The prevailing wind direction for the Price-Carbon County area for the period 1992-2002 is from the North for all months of the year. (Table VII-3) The average wind speed for this same period is shown to be 6.2 mph, with the lowest average speed of 4.7 mph in December, and the highest average speed of 7.7 mph in April, (Table VII-4).
TABLE VII-3

UTAH
Prevailing Wind Directions

<table>
<thead>
<tr>
<th>Station</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Ann</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRYCE CANYON AP, UT (KBCE)</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
</tr>
<tr>
<td>CANYONLANDS AP-MOAB, UT</td>
<td>NW</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>SW</td>
<td>SE</td>
<td>E</td>
<td>W</td>
<td>W</td>
<td>NW</td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEDAR CITY AP, UT (KCDC)</td>
<td>SSW</td>
<td>SW</td>
<td>SSW</td>
<td>SSW</td>
<td>SSW</td>
<td>SW</td>
<td>SSW</td>
<td>SW</td>
<td>N</td>
<td>SSW</td>
<td>SSW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOGAN AIRPORT, UT (KLGU)</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>S</td>
<td>N</td>
<td>N</td>
<td>N</td>
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</tr>
<tr>
<td>MILFORD AIRPORT, UT (KMLF)</td>
<td>S</td>
<td>SSW</td>
<td>S</td>
<td>SSW</td>
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<td>SSW</td>
<td>S</td>
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<td>S</td>
<td>S</td>
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<td></td>
</tr>
<tr>
<td>OGDEN AIRPORT, UT (KOGD)</td>
<td>SSE</td>
<td>S</td>
<td>SSE</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>OGDEN-HILLS AIRPORT, UT (KHIF)</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>PRICE-CARBON COUNTY AP, UT</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>PROVO MUNI AP, UT (KPVVU)</td>
<td>NW</td>
<td>NW</td>
<td>NW</td>
<td>NW</td>
<td>NW</td>
<td>NW</td>
<td>SE</td>
<td>SE</td>
<td>SE</td>
<td>SE</td>
<td>SSE</td>
<td>SSE</td>
<td></td>
</tr>
<tr>
<td>SALT LAKE CITY AP, UT (KSLC)</td>
<td>S</td>
<td>S</td>
<td>SSE</td>
<td>SSE</td>
<td>SSE</td>
<td>S</td>
<td>SSE</td>
<td>SSE</td>
<td>SE</td>
<td>SE</td>
<td>S</td>
<td>SSE</td>
<td></td>
</tr>
<tr>
<td>ST. GEORGE MUNI AP, UT (KSGU)</td>
<td>E</td>
<td>ENE</td>
<td>ENE</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>ENE</td>
<td>ENE</td>
<td>ENE</td>
<td>E</td>
<td>E</td>
<td>ENE</td>
</tr>
<tr>
<td>VERNAL AIRPORT, UT (KVEL)</td>
<td>W</td>
<td>W</td>
<td>WNW</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>W</td>
<td>WNW</td>
<td>W</td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WENDOVER AIRPORT, UT (KENV)</td>
<td>NW</td>
<td>NW</td>
<td>E</td>
<td>NW</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
</tbody>
</table>

Prevailing wind direction is based on the hourly data from 1992-2002 and is defined as the...
direction with the highest percent of frequency. Many of these locations have very close secondary maximum which can lead to noticeable differences month to month.

Http://www/wrcc/dri/edu/htmlfiles/westwinddir.html

**TABLE VII-4**

**UTAH**

<table>
<thead>
<tr>
<th>Prevailing Wind Speed (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station</td>
</tr>
<tr>
<td>BRYCE CANYON AP, UT (KBCF)</td>
</tr>
<tr>
<td>CANYONLANDS AP-MOAB, UT</td>
</tr>
<tr>
<td>CEDAR CITY AP, UT (KCDC) .</td>
</tr>
<tr>
<td>LOGAN AIRPORT, UT (KLGU) .</td>
</tr>
<tr>
<td>MILFORD AIRPORT, UT (KMLF) .</td>
</tr>
<tr>
<td>OGDEN AIRPORT, UT (KOGD) .</td>
</tr>
<tr>
<td>OGDEN-HILL AFB, UT (KHIF) .</td>
</tr>
<tr>
<td>PRICE-CARBON COUNTY AP, UT</td>
</tr>
<tr>
<td>PROVO MUNI AP, UT (KPVU) .</td>
</tr>
<tr>
<td>SALT LAKE CITY AP, UT (KSLC)</td>
</tr>
<tr>
<td>ST. GEORGE MUNI AP, UT (KSGU)</td>
</tr>
<tr>
<td>VERNAL AIRPORT, UT (KVEL) .</td>
</tr>
</tbody>
</table>
The above monthly average wind speeds are based on hourly observations from all reporting airports in the Western United states and based on data from 1992-2002. Some stations have at least 2 years of hourly data used for the averages. Averages for first order stations may differ from data seen in the LCD's due to a different period of record used and a possible change in the height of the wind instruments. The standard anemometer height for all current stations is 10 meters. 

Http://www/wrcc/dri/edu/htmlfiles/westwinddir.html
R645-301-724.410. CLIMATOLOGICAL FACTORS
See R645-301-724.400.

R645-301-724.411. AVERAGE SEASONAL PRECIPITATION
See R645-301-724.400.

R645-301-724.412. PREVAILING WINDS
See R645-301-724.400.

R645-301-724.413. SEASONAL TEMPERATURE RANGES
See R645-301-724.400.

R645-301-724.420. OTHER INFORMATION
N/A

R645-301-724.500. SUPPLEMENTAL INFORMATION
N/A

R645-301-724.700. STREAMS
See R645-301-711.100.

R645-301-725. BASELINE CUMULATIVE IMPACT AREA INFORMATION
See R645-301-512.240

R645-301-725.100. INFORMATION FROM FEDERAL OR STATE AGENCIES
See R645-301-512.240

R645-301-725.200. INFORMATION FROM APPLICANT
See R645-301-512.240

INCORPORATED
SEPTEMBER 14, 2012
DIVISION OIL, GAS & MINING
The permit area and adjacent areas contain no renewable groundwater or surface water resources; therefore water right protection or mitigation measures are not anticipated to be required at this operation. Also, this is a surface operation, with no underground mining or subsidence potential. All water used on site is hauled in.

**R645-301-728.** PROBABLE HYDROLOGIC CONSEQUENCES (PHC) DETERMINATION

Appendix J

**R645-301-728.100.** DETERMINATION OF PHC

Appendix J

**R645-301-728.200.** BASIS OF DETERMINATION

Appendix J

**R645-301-728.300.** PHC DETERMINATION FINDINGS

Appendix J

**R645-301-728.310.** ADVERSE IMPACTS TO HYDROLOGIC BALANCE

Appendix J
R645-301-728.320. ACID FORMING OR TOXIC FORMING MATERIALS
Appendix J

R645-301-728.330. IMPACT OF OPERATIONS
See R645-301-512.240

R645-301-728.331. SEDIMENT YIELD FROM DISTURBED AREA
See R645-301-512.240

R645-301-728.332. WATER QUALITY PARAMETERS
R645-301-512.240

R645-301-728.333. FLOODING OR STREAM-FLOW ALTERATION
N/A

R645-301-728.334. GROUND WATER AND SURFACE WATER AVAILABILITY
See R645-301-711.100 and Appendix J.

R645-301-728.335. OTHER CHARACTERISTICS
Appendix J

R645-301-728.340. IMPACT ON SURFACE OR GROUND WATER
Appendix J

R645-301-728.350. IMPACT ON STATE-APPROPRIATE WATER
Appendix J

R645-301-728.400. PERMIT REVISIONS
Appendix J
R645-301-729. CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT (CHIA)

(BY DIVISION)

R645-301-729.100. DIVISION ASSESSMENT

(BY DIVISION)

R645-301-729.200. PERMIT REVISIONS

N/A

R645-301-730. OPERATION PLAN
See R645-301-511.100.

R645-301-731. GENERAL REQUIREMENTS
See R645-301-511.100.

R645-301-731.100. HYDROLOGIC BALANCE PROTECTION
See R645-301-711-300.

R645-301-731.110. GROUND WATER PROTECTION
Appendix J and R645-301-711.100.

R645-301-731.111. GROUND WATER QUALITY
Appendix J and R645-301-711.100.

R645-301-731.112. SURFACE MINING OPERATIONS
N/A

R645-301-731.120. SURFACE WATER PROTECTIONS
Appendix J and R645-301-711.100.

R645-301-731.121. SURFACE WATER QUALITY

7-22
Appendix J, Appendix M and R645-301-711.100.

R645-301-731.122. SURFACE WATER QUANTITY PLAN

Appendix J and R645-301-711.100.

R645-301-731.200. WATER MONITORING

See R645-301-512.240.

R645-301-731.210. GROUND WATER MONITORING

There is no ground water monitoring at this site. See R645-301-711.100.

R645-301-731.211. GROUND WATER MONITORING PLAN

There is no ground water monitoring at this site. See R645-301-711.100.

R645-301-731.212. SAMPLING AND REPORTING DATA

See R645-301-512.240.

R645-301-731.213. NON-ESSENTIAL AQUIFERS

N/A

R645-301-731.214. DURATION

See R645-301-512.240

R645-301-731.214.1 SUITABILITY

See R645-301-512.240

R645-301-731.214.2 COMPLIANCE

See R645-301-512.240

R645-301-731.215. EQUIPMENT, STRUCTURES AND OTHER

7-23
DEVICES USED IN CONJUNCTION WITH MONITORING

See R645-301-512.240

R645-301-731.220. SURFACE WATER MONITORING

See R645-301-512.240

R645-301-731.221. SURFACE WATER MONITORING PLAN

See R645-301-512.240

R645-301-731.222 DESCRIPTION

See R645-301-512.240

R645-301-731.222.1 PARAMETERS

See R645-301-512.240

R645-301-731.222.2 POINT SOURCE DISCHARGES

See R645-301-512.240 and Appendix K

R645-301-731.223. SAMPLING AND REPORTING DATA

See R645-301-512.240

R645-301-731.224. DURATION

See R645-301-512.240

R645-301-731.224.1 SUITABILITY

See R645-301-512.240

R645-301-731.224.2 COMPLIANCE

See R645-301-512.240

7-24
R645-301-731.225.  EQUIPMENT, STRUCTURES AND OTHER DEVICES USED IN CONJUNCTION WITH MONITORING

See R645-301-512.240

R645-301-731.300.  ACID AND TOXIC FORMING MATERIALS

See R645-301-711.100, R645-301-528.300 and Appendix J.

R645-301-731.310.  DRAINAGE INTO SURFACE AND GROUND WATER

See R645-301-512.240

R645-301-731.311.  MATERIAL ADVERSELY AFFECTING WATER QUALITY

See R645-301-512.240

R645-301-731.312.  STORING MATERIALS

See R645-301-512.240

R645-301-731.320.  DISPOSAL PROVISIONS

See R645-301-512.240

R645-301-731.400.  TRANSFER OF WELLS

No transfer of wells has taken place, nor is any transfer anticipated.

R645-301-731.500.  DISCHARGES

See R645-301-512.240

R645-301-731.510.  DISCHARGES INTO AN UNDERGROUND MINE

N/A
DEMONSTRATION
PREVENTION OF DAMAGE
VIOLATION OF WATER QUALITY STANDARDS OR EFFLUENT LIMITATIONS
COMPLIANCE REQUIREMENTS
MEET WITH THE APPROVAL OF MSHA
DISCHARGE LIMITATIONS
WATER
COAL PROCESSING WASTE
FLY ASH
SLUDGE FROM ACID MINE DRAINAGE TREATMENT
See Appendix R.
Coal processing and reclamation operations will not cause or contribute to the violation of applicable Utah or federal water quality standards and will not adversely affect the water quantity and quality of other environmental resources of the stream.

STREAM DIVERSIONS

See Appendix R, Culvert Design

Buffer zone signs and markers

Cross sections and maps

Plate 2A.

WATER SUPPLY INTAKES

Water is trucked from Price for culinary use and is stored in one 12,000-gallon tank on the property.

MONITORING LOCATIONS

See R645-301-512.240 and Plate 15.

MAPS
See Volume II, R645-301-510.

R645-301-731.750. CROSS SECTIONS

See Volume II, R645-301-510.

R645-301-731.760. OTHER RELEVANT DRAWINGS

See Appendix R.

R645-301-731.800. WATER RIGHTS AND REPLACEMENT

Appendix G

R645-301-732. SEDIMENT CONTROL MEASURES

See Appendix R.

R645-301-732.100. SILTATION STRUCTURES

See Appendix R.

R645-301-732.200. SEDIMENTATION PONDS

See Appendix R.

R645-301-732.210. COMPLIANCE REQUIREMENTS

See Appendix R.

R645-301-732.220. MSHA REQUIREMENTS

N/A

R645-301-732.300. DIVERSIONS

See Appendix R.

R645-301-732.400. ROAD DRAINAGE
See Appendix R, Plate 2A, also R645-301-512.250.

R645-301-732.410. ALTERATION OR RELOCATION OF A NATURAL DRAINAGEWAY

See Appendix R.

R645-301-732.420. INLET PROTECTIONS

See Appendix R.

R645-301-733. IMPOUNDMENTS

See Appendix R.

R645-301-733.100. GENERAL PLANS

See Appendix R.

R645-301-733.110. CERTIFICATION

See Appendix R and Appendix H, also Plates 3A thru 3H.

R645-301-733.120. MAPS AND CROSS SECTIONS

See Plates 3A thru 3H., also R645-301-510.

R645-301-733.130. NARRATIVE

See Appendix R.

R645-301-733.140. SURVEY RESULTS

Appendix J

R645-301-733.150. HYDROLOGIC IMPACT

Appendix J

R645-301-733.160. DESIGN PLANS AND CONSTRUCTION SCHEDULE

7-30
See Appendix R.

R645-301-733.200. PERMANENT AND TEMPORARY IMPOUNDMENTS

See Appendix R

R645-301-733.210. REQUIREMENTS

See R645-301-512.240

R645-301-733.220. DEMONSTRATION FOR PERMANENT IMPOUNDMENTS

See R645-301-512.240

R645-301-733.221. ADEQUACY FOR INTENDED USE

See R645-301-512.240

R645-301-733.222. WATER QUALITY AND EFFLUENT LIMITATIONS

See R645-301-512.240

R645-301-733.223. WATER LEVEL

See R645-301-512.240

R645-301-733.224. FINAL GRADING

See R645-301-512.240

R645-301-733.225. DIMINUTION OF QUALITY AND QUANTITY OF WATER UTILIZED BY OTHERS

See R645-301-512.240

R645-301-733.226. SUITABILITY FOR POSTMINING LAND USE
See R645-301-512.240

**R645-301-733.230.** TEMPORARY IMPOUNDMENTS

See R645-301-512.240

**R645-301-733.240.** HAZARD NOTIFICATIONS

See R645-301-512.240

**R645-301-734.** DISCHARGE STRUCTURES

See R645-301-512.240

**R645-301-735.** DISPOSAL OF EXCESS SPOIL

See R645-301-512.230.

**R645-301-736.** COAL MINE WASTE

See R645-301-512.230.

**R645-301-737.** NON-COAL MINE WASTE

See R645-301-512.230.

**R645-301-738.** TEMPORARY CASING AND SEALING OF WELLS

N/A

**R645-301-740.** DESIGN CRITERIA AND PLANS

See Appendix R.

**R645-301-741.** GENERAL REQUIREMENTS

See Appendix R.

**R645-301-742.** SEDIMENT CONTROL MEASURES

INTEGRATED

SEPTEMBER 14, 2012

DIVISION OIL, GAS & MINING

7-32
See Appendix R.

R645-301-742.100. GENERAL REQUIREMENTS

See Appendix R.

R645-301-742.110. DESIGN

See Appendix R.

R645-301-742.111. PREVENTION

See Appendix R.

R645-301-742.112. EFFLUENT LIMITATIONS

Appendix K

R645-301-742.113. EROSION PROTECTION

See Appendix R.

R645-301-742.120. MEASURES AND METHODS

See Appendix R.

R645-301-742.121. RETAINING SEDIMENT WITHIN DISTURBED AREAS

See Appendix R.

R645-301-742.122. DIVERTING RUNOFF AWAY FROM DISTURBED AREAS

See Appendix R.

R645-301-742.123. DIVERTING RUNOFF USING PROTECTED CHANNELS

See Appendix R.

7-33

INCORPORATED
SEPTEMBER 14, 2012
DIVISION OIL, GAS & MINING
R645-301-724.124. PHYSICAL TREATMENT TO REDUCE FLOW OR TRAP SEDIMENT

See Appendix R.

R645-301-742.125. CHEMICAL TREATMENT

N/A

R645-301-742.126. IN-MINE TREATMENT

N/A

R645-301-742.200. SILTATION STRUCTURES

See Appendix R.

R645-301-742.210. GENERAL REQUIREMENTS

See Appendix R.

R645-301-742.211. DESIGN

See Appendix R.

R645-301-742.212. REQUIREMENTS

See Appendix R.

R645-301-742.213. SILTATION STRUCTURES WHICH IMPOUND WATER

See Appendix R.

R645-301-742.214. POINT SOURCE DISCHARGES

See R645-301-512.240 and Appendix K.

R645-301-742.220. SEDIMENTATION PONDS

See Appendix R.
R645-301-742.221.1 USE
See Appendix R.

R645-301-742.221.1 INDIVIDUALLY OR IN SERIES
See Appendix R.

R645-301-742.221.2 LOCATION
See Appendix R., Plate 2A

R645-301-742.221.3 DESIGN, CONSTRUCTION AND MAINTENANCE
See Appendix R.

R645-301-742.221.31 SEDIMENT STORAGE VOLUME
See Appendix R.

R645-301-742.221.32 DETENTION TIME
See Appendix R.

R645-301-742.221.33 DESIGN EVENT
See Appendix R.

R645-301-742.221.34 DEWATERING DEVICE
See Appendix R.

R645-301-742.221.35 SHORT CIRCUITING
See Appendix R.

R645-301-742.221.36 SEDIMENT REMOVAL
See Appendix R.

7-35
See Appendix R.

EXCESSIVE SETTLEMENT

See Appendix R.

EMBANKMENT MATERIAL

See Appendix R.

COMPACTION

See Appendix R.

MSHA SEDIMENTATION PONDS

N/A

OTHER SEDIMENTATION PONDS

See Appendix R.

OPEN CHANNEL SPILLWAY

See Appendix R.

LINING

See Appendix R.

TEMPORARY IMPOUNDMENT EXCEPTION

N/A

EXCEPTION TO LOCATION

N/A

IMPOUNDMENTS MEETING 30 CFR SEC.77.216(a)

N/A
N/A

R645-301-742.225.2. OTHER TREATMENT FACILITIES
N/A

R645-301-742.230. DESIGN EVENT
N/A

R645-301-742.231. REQUIREMENTS
N/A

R645-301-742.232. REQUIREMENTS
N/A

R645-301-742.240. EXEMPTIONS
N/A

R645-301-742.300. DIVERSEIONS
See Appendix R.

R645-301-742.310. GENERAL REQUIREMENTS
See Appendix R.

R645-301-742.310. REQUIREMENTS
See Appendix R.

R645-301-742.312. DESIGN
See Appendix R.

R645-301-742.312.1 STABILITY

7-37
See Appendix R.

R645-301-742.312.2  FLOOD PROTECTION

See Appendix R.

R645-301-742.312.3  SUSPENDED SOLIDS

See Appendix R.

R645-301-742.312.4  COMPLY WITH OTHER REGULATIONS

See Appendix R.

R645-301-742.313.  TEMPORARY AND PERMANENT DIVERGENS

See Appendix R.

R645-301-742.314.  ADDITIONAL DESIGN CRITERIA

See Appendix R.

R645-301-742.320.  DIVERSION OF PERENNIAL AND INTERMITTENT STREAMS

N/A

R645-301-742.321.  BUFFER ZONE REQUIREMENTS

N/A

R645-301-742.322.  DESIGN CAPACITY

N/A

R645-301-742.323.  DESIGN EVENT

N/A

INCORPORATED

SEPTEMBER 14, 2012

DIVISION OIL, GAS & MINING
R645-301-742.324. CERTIFICATION
N/A

R645-301-742.330. DIVERSION OF MISCELLANEOUS FLOWS
See Appendix R.

R645-301-742.331. REQUIREMENTS
See Appendix R.

R645-301-742.332. DESIGN
See Appendix R.

R645-301-742.333. DESIGN EVENT
See Appendix R.

R645-301-742.400. ROAD DRAINAGE
See Appendix R.

R645-301-742.410. ALL ROADS
See Appendix R.

R645-301-742.411. PROTECTION AND SAFETY
See Appendix R.

R645-301-742.412. INTERMITTENT OR PERENNIAL STREAM RESTRICTION
N/A

R645-301-742.413. DOWNSTREAM SEDIMENTATION AND FLOODING
See Appendix R.
R645-301-742.420. PRIMARY ROADS
See Appendix R.,

R645-301-742.421. EROSION PROTECTION
See Appendix R.

R645-301-742.422. STREAM FORDS
N/A

R645-301-742.423. DRAINAGE CONTROL
See Appendix R.
R645-301-742.423.1 PRIMARY ROAD DESIGN CRITERIA

See R645-301-512.250.

R645-301-742.423.2 DRAINAGE PIPES AND CULVERTS

See Appendix R.

R645-301-742.423.3 DRAINAGE DITCHES

See Appendix R.

R645-301-742.423.4 NATURAL STREAM CHANNELS

See Appendix R.

R645-301-742.423.5 REQUIREMENTS

See Appendix R.

R645-301-743. IMPOUNDMENTS

See Appendix R.

R645-301-743.100. GENERAL REQUIREMENTS

See Appendix R.

R645-301-743.110. MSHA IMPOUNDMENTS

N/A

R645-301-743.120. CERTIFICATION AND FREEBOARD REQUIREMENTS

See Appendix R.

R645-301-743.130. SPILLWAYS

See Appendix R.
R645-301-743.131. APPROVAL OF SINGLE OPEN CHANNEL SPILLWAY

See Appendix R

R645-301-743.131.1. NON-ERODIBLE CONSTRUCTION

See Appendix R

R645-301-743.131.2. EARTH- OR GRASS-LINED WITH NON-EROSIVE FLOWS

N/A

R645-301-743.131.3. REQUIRED DESIGN EVENT

See Appendix R

R645-301-743.131.4. NRCS CLASS B OR C DAMS

N/A

R645-301-743.131.5. MSHA IMPOUNDMENTS

N/A

R645-301-743.131.6. NON-MSHA IMPoundments

See Appendix R

R645-301-743.132. ALTERNATE SEDIMENT POND CRITERIA

N/A

7-42
R645-301-743.140. INSPECTIONS
See Appendix R.

R645-301-743.200. SPILLWAY DESIGN EVENT FOR PERMANENT IMPOUNDMENTS
See Appendix R.

R645-301-743.300. SPILLWAY DESIGN EVENT FOR TEMPORARY IMPOUNDMENTS
See Appendix R.

R645-301-744. DISCHARGE STRUCTURES
See Appendix R.

R645-301-744.100. EROSION CONTROL
See Appendix R.

R645-301-744.200. DESIGN
See Appendix R.

R645-301-745. DISPOSAL OF EXCESS SPOIL
See R645-301-512.230.

R645-301-745.100. GENERAL REQUIREMENTS
See R645-301-512.230.

R645-301-745.110. DISPOSAL AREA
See R645-301-512.230.

R645-301-745.111. EFFECTS ON SURFACE AND GROUND WATER
See R645-301-512.230.
R645-301-745.112. IMPOUNDMENTS ON FILL

N/A

R645-301-745.113. COVER

See R645-301-512.230.
R645-301-745.120.  DRAINAGE CONTROL
N/A

R645-301-745.121.  DIVERSEIONS
N/A

R645-301-745.122.  UNDERDRAINS
N/A

R645-301-745.200.  VALLEY FILLS AND HEAD-OF-HOLLOW FILLS
N/A

R645-301-745.210.  REQUIREMENTS
N/A

R645-301-745.220.  DRAINAGE CONTROL
N/A

R645-301-745.221.  RESTRICTIONS
N/A

R645-301-745.222.  RUNOFF CONTROL
N/A

R645-301-745.300.  DURABLE ROCK FILLS
N/A

R645-301-745.310.  REQUIREMENTS
N/A

INCORPORATED
SEPTEMBER 14, 2012
DIVISION OIL, GAS & MINING
R645-301-745.320. UNDERDRAINS
N/A
R645-301-745.330. RUNOFF CONTROL
N/A
R645-301-745.400. PRE-EXISTING BENCHES
N/A
R645-301-746. COAL MINE WASTE
See R645-301-512.230.
R645-301-746.100. GENERAL REQUIREMENTS
See R645-301-512.230.
R645-301-746.110. PLACEMENT
See R645-301-512.230.
R645-301-746.120. EFFECTS ON SURFACE AND GROUND WATER
See R645-301-512.230.
R645-301-746.200. REFUSE PILES
See R645-301-513.400.
R645-301-746.210. REQUIREMENTS
See R645-301-513.400.
R645-301-746.211. SEEPS AND SPRINGS
N/A
R645-301-746.212. UNCONTROLLED SURFACE DRAINAGE
R645-301-746.213. UNDERDRAINS

R645-301-746.220. SURFACE AREA STABILIZATION

R645-301-746.221. SLOPE PROTECTION

R645-301-746.222. IMPOUNDMENT RESTRICTIONS

R645-301-746.300. IMPOUNDING STRUCTURES

R645-301-746.310. COAL MINE WASTE

See R645-301-512.230.

R645-301-746.311. REQUIREMENTS

See R645-301-512.230.

R645-301-746.312. MSHA IMPOUNDING STRUCTURE

R645-301-746.320. SPILLWAYS AND OUTLET WORK

R645-301-746.330. DRAINAGE CONTROL
R645-301-746.340.  WATER STORAGE

N/A
R645-301-746.400. RETURN OF COAL PROCESSING WASTE TO ABANDONED UNDERGROUND WORKINGS

N/A

R645-301-746.410. HYDROLOGIC IMPACTS

N/A

R645-301-746.420. MONITORING WELLS

N/A

R645-301-746.430. PNEUMATIC BACKFILLING

N/A

R645-301-747. DISPOSAL OF NON-COAL MINE WASTE

See R645-301-512.230.

R645-301-747.100. REQUIREMENTS

See R645-301-512.230.

R645-301-747.200. PLACEMENT AND STORAGE

See R645-301-512.230.

R645-301-747.300. FINAL DISPOSAL

See R645-301-512.230.

R645-301-748. CASING AND SEALING OF WELLS

N/A

R645-301-750. PERFORMANCE STANDARDS

All coal mining and reclamation operations will be conducted to
minimize disturbance to the hydrologic balance within the permit and adjacent areas, to prevent material damage to the hydrologic balance outside the permit area and support approved postmining land uses in accordance with the terms and conditions of the approved permit and the performance standards of R645-301 and R645-302.

R645-301-751. WATER QUALITY STANDARDS AND EFFLUENT LIMITATIONS

Discharges or water from areas disturbed by coal processing and reclamation operations will be made in compliance with all Utah and federal water quality laws and regulations and with effluent limitations for coal mining promulgated by the U.S. Environmental Protection Agency set forth in 40 CFR Part 434.

R645-301-752. SEDIMENT CONTROL MEASURES

Sediment control measures must be located, maintained, constructed and reclaimed according to plans and designs given under R645-301-512.240, R645-301-732, R645-301-742 and R645-301-760.

R645-301-752.100. Siltation Structures and Diversions

See Appendix R.

R645-301-752.200. Road Drainage

See R645-301-512.250.

R645-301-752.210. Control of Erosion and Pollution

See Appendix R.

R645-301-752.220. Control of Suspended Solids

See Appendix R.

R645-301-752.230. Compliance with Effluent Standards

See Appendix R.
R645-301-752.240. MINIMIZE DIMINUTION OF DEGRADATION OF WATER QUALITY

See Appendix R.
ALTERATION OF STREAM FLOW OR CHANNELS
See Appendix R.

IMPOUNDMENTS AND DISCHARGE STRUCTURES
See Appendix R.

DISPOSAL OF EXCESS SPOIL, COAL MINE WASTE AND NON-COAL MINE WASTE
See R645-301-512.230.

CASING AND SEALING OF WELLS
N/A

RECLAMATION
See R645-301-240.

GENERAL REQUIREMENTS
See R645-301-240.

ROADS
See R645-301-512.250.

RESTORING NATURAL DRAINAGE PATTERNS
N/A

REGRADING
See R645-301-532.200.

SILTATION STRUCTURES
See Appendix R.
R645-301-763.100. RESTRICTIONS
See Appendix R.

R645-301-763.200. REQUIREMENTS
See Appendix R.

R645-301-764. STRUCTURE REMOVAL
See R645-301-240.

R645-301-765. PERMANENT CASING AND SEALING OF WELLS
N/A