

**Mining and Reclamation Permit Application
Willow Creek Mine
Volume 14A**

Prepared For:



CYPRUS
Plateau Mining

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**SUMMARY OF CURRENT SITE CONDITIONS
CASTLE GATE MINE
CARBON COUNTY, UTAH**

CHAPTER 12 - WILLOW CREEK REFUSE REMOVAL PROJECT

DATE: November 1996

CURRENT CONDITIONS:

The Castle Gate Mine is currently dormant. No coal is currently being mined, removed, or processed at the mine.

The Willow Creek site is presently reclaimed, and the adits were sealed under a separate permit. However, removal of refuse from the site was completed and is being followed by mine development. Refuse was transported to and deposited on the Refuse Disposal pile. Operation phase monitoring and maintenance will commence once refuse removal begins.

SECTION 12.1
GENERAL CONTENTS

12.1.1 MINIMUM REQUIREMENTS FOR LEGAL, FINANCIAL, COMPLIANCE AND RELATED INFORMATION

12.1.1.1 Introduction

The Willow Creek Refuse Removal Project (project) site is located approximately 10 miles north of Price, Utah and 110 miles southeast of Salt Lake City, as shown on Figure 12-1-1. The project is in Willow Creek Canyon, a steep and narrow drainage that discharges to the Price River. Access to the area from Price is via Highway 6 north to Highway 191 and east approximately 1.5 miles.

The Willow Creek Refuse Removal Site area is approximately 27.5 acres in size. The permit and disturbed area boundary is outlined on Exhibit 12-1-1.

In May of 1986, the western portion of the Blackhawk permitted reserve was transferred to Castle Gate Coal Company. The eastern reserves remained with Blackhawk Coal Company (Blackhawk) a subsidiary of Indiana Michigan Power Company, a subsidiary of American Electric Power. The Willow Creek Refuse Removal Site area is part of these eastern reserves and is under lease to Cyprus Amax Minerals Company by Blackhawk Coal Company.

The Blackhawk site referenced below is a major portion of the Willow Creek Refuse Removal Project discussed in this chapter.

Blackhawk executed an agreement with UDOGM's Abandoned Mine Lands Program (AML) dated May 16, 1989 which agreed to allow underground development waste from

various AML projects to be disposed of on a portion of the Blackhawk eastern reserve. Blackhawk provided a 9.5 acre site on the north end of the disturbed site area for the waste disposal.

The AML plan for the site reduced the highwall, stabilized and enhanced 1,500 feet of streambank, and attempted to returned the land to a more natural contour. AML assumed all responsibilities for regulatory compliance for their portion of the Blackhawk site. A copy of the agreement between Blackhawk and AML is included in Appendix 12-1-1.

Amax Coal Company proposes to remove the refuse placed as part of the AML Project and consolidate it with the refuse at the Castle Gate Prep Plant site. The operation will include: access road, staging area, maintenance yard, topsoil storage area, office, and sediment control structures (see Section 12-5). The site topography will be returned to a pre-AML condition. This chapter of the Castle Gate Mine permit application addresses the UDOGM rules applicable to the refuse removal operation.

This chapter presents the baseline data, operating plan, and reclamation plan covering the proposed activities within the site area. Reports in the appendices are provided only to present baseline data.

12.1.1.2 Identification of Interests

Willow Creek Refuse Removal Site is presently controlled by Amax Coal Company, a subsidiary of Cyprus Amax Coal Company, a subsidiary of Amax Energy Inc. which is wholly owned by Cyprus Amax Mineral Company, a Delaware corporation.

12.1.1.2.2 Applicant and Operator

APPLICANT:

Amax Coal Company
Willow Creek Refuse Removal Project
C/O Cyprus Plateau Mining Corp.
Post Office Box PMC
Price, Utah 84501
(801) 637-2875

OPERATOR:

Amax Coal Company
One Riverfront
20 N.W. 1st Street
Evansville, Indiana 47708
(812) 421-3900

RESIDENT AGENT:

C. T. Corporation System
50 West Broadway, 8th Floor
Salt Lake City, Utah 84101
(801) 364-5101

The Operator will be responsible for payment of the "Abandoned Mine Land Reclamation Fee".

12.1.1.2.3 Ownership and Control

The officers and directors of Amax Coal Company are:

Chapter 12, Section 1
 Castle Gate Mine
 Willow Creek Refuse Removal Project

July 1995

OFFICERS:

<u>Title</u>	<u>Name</u>	<u>Social Security Number</u>	<u>Date Assumed Office</u>
President	W. Mark Hart	234-82-5837	January 3, 1995
Senior Vice President	Gerald J. Malys	165-36-0198	December 20, 1993
Senior Vice President, General Counsel and Secretary	Philip C. Wolf	317-50-5623	December 20, 1993
Senior Vice President, Sales and Marketing	Nicholas P. Moros	042-40-2347	December 20, 1993
Vice President, Sales and Marketing	Donald J. Drabant	355-44-4943	December 20, 1993
Vice President, Labor, Safety and Government Relations	Chris L. Crowl	526-84-8182	December 20, 1993
Vice President	G.E. Vajda	303-46-6591	January 3, 1995
Vice President and General Manager	Arthur T. Palm	310-44-3090	May 11, 1995
Vice President and General Manager	Jerry R. Kempf	307-58-4015	April 3, 1995
Vice President and Treasurer	Francis J. Kane	088-52-4169	January 11, 1994
Vice President and Controller	Frank J. Wood	230-74-0342	December 20, 1993
Assistant Treasurer	Farokh S. Hakimi	093-42-6402	December 20, 1993
Director of Tax	J. David Flemming	301-48-5865	December 20, 1993
Assistant Secretary	Kathleen J. Gormley	391-62-9820	December 20, 1993
Assistant Secretary	Greg A. Walker	262-82-8649	December 20, 1993
Assistant Secretary	Morris W. Kegley	306-52-2454	June 27, 1991
Assistant Secretary	Dale E. Huffman	557-86-5790	July 15, 1994
Assistant Secretary	Susan E. Chetlin	210-46-8811	April 3, 1995

Resignations:

		<u>Date Resigned</u>
President	A. Frank Dunham	December 20, 1993
Vice President	Frederick L Alvarez	December 20, 1993
Vice President	J. Mark Cook	December 20, 1993
Vice President and Secretary	Wayne E. Gresham	December 20, 1993
Vice President	Richard B. Meschke	December 20, 1993
Vice President	Robert S. Tevault	December 20, 1993
Assistant Secretary	Phyllis A. Elkins	December 20, 1993
Assistant Secretary	Robert P. Kobza	December 20, 1993
Director	Helen M. Feeney	November 15, 1993
President	Donald E. Hudson	January 3, 1995
Assistant Secretary	Michael R. Peelish	January 3, 1995
Director	Donald P. Brown	December 30, 1994
Vice President and General Manager	E. Wayne Parke	May 9, 1995

DIRECTORS:

Philip C. Wolf	317-50-5623	November 15, 1993
Gerald J. Malys	165-36-0198	November 15, 1993
Gerald R. Spindler	233-74-2870	January 3, 1995

An organizational chart outlining the sequence of ownership and business information pertaining to Cyprus Amax Minerals Company, Amax Energy Inc., Cyprus Amax Coal Company, and Amax Coal Company can be found in Chapter 2, Appendix 2-3.

Correspondence regarding the operations of Willow Creek Refuse Removal Project should be addressed to:

W. John Borla, P.E.
Cyprus Plateau Mining
P.O. Box PMC
Price, Utah 84501

12.1.1.2.4 Coal Mining and Reclamation Operation Owned or Controlled

Identification numbers of applications or permits issued to Amax Coal Company are contained in Section 2, Appendices 2-3 and 2-4.

Permits and operations held by the subsidiaries, officers and directors of Cyprus Amax Minerals Company are located in Appendix 2-4.

12.1.1.2.5 Legal or Equitable Owner of the Surface and Mineral Properties

The legal or equitable owner of the surface to be affected by operations is:

Blackhawk Coal Company
One Memorial Drive
P.O. 700
Lancaster, OH 43130-0700

The legal or equitable owner of the coal is:

Blackhawk Coal Company
One Memorial Drive
P.O. 700
Lancaster, OH 43130-0700

However, no coal will be mined on the site as part of these proposed operations.

No area within the lands to be affected by surface operations is under a real estate contract.

12.1.1.2.6 Owners of Record of Property Contiguous to Proposed Permit Area

Contiguous Surface: United States of America
Department of Interior
Bureau of Land Management
Price Coal Office
900 North 700 East
Price, Utah 84501

Boyd Marsing
2077 E. 1750 S.
Wellington, Utah 84542

Carbon County
Carbon County Courthouse
Price, Utah 84501

Utah Power and Light
Highway 10
Price, Utah 84501

Contiguous Subsurface: State of Utah
Division of State Lands
411 Empire Building
231 East 400 South
Salt Lake City, Utah 84111

State of Utah, Lands & Forestry Division
355 West North Temple
3 Triad Center, Suite 400
Salt Lake City, Utah 84180

United States of America
Department of Interior
Bureau of Land Management
Price Coal Office
900 North 700 East
Price, Utah 84501

Carbon County
Carbon County Courthouse
Price, Utah 84501

12.1.1.2.7 MSHA Numbers

Table 2-1 in Chapter 2 of this permit includes the MSHA ID Numbers for the Willow Creek site.

12.1.1.2.8 Interest in Contiguous Lands

There are not outstanding interests in lands, options, or pending bids made by the Applicant for lands contiguous to the permit area.

12.1.1.3 Violation Information

Neither the Applicant, nor any of its subsidiaries, affiliates, or persons controlled by or under common control with the Applicant has had a Federal or State mining permit suspended or revoked in the last five years, nor forfeited a mining bond or similar security deposited in lieu of bond.

Violation notices received by the Applicant during the proceeding three years are contained in Appendix 2-7.

12.1.1.4 Right-of-Entry Information

The right-of-entry is conveyed by Cyprus Amax Minerals Company, then to Amax Coal Company in behalf of Cyprus Western Coal Company it's subsidiary. Amax Coal Company also a subsidiary of Cyprus Amax Minerals Company, has the right to enter and conduct operations at the Willow Creek site. Right-of-entry is conveyed by lease and/or sublease from Blackhawk Coal Company.

The Willow Creek Refuse Removal area is located in Carbon County, Utah: SW1/4 of Section 31, Township 12 South, Range 10 East; NW1/4 of Section 6, Township 13 South, Range 10 East; NE1/4 of Section, Township 13 South, Range 9 East.

12.1.1.5 Status of Unsuitability Claims

To the best of the Applicant's knowledge, no portion of the area to be permitted is designated, or under study for being designated, unsuitable for mining. The Applicant does not intend to conduct coal mining or reclamation operations within 300 feet of any occupied dwelling.

At a hearing held May 11, 1995 with UDOGM and the applicant it was determined that the interest of the public and landowners would be protected in the event of mining or reclamation operations being conducted within 100 feet of U. S. Highway 191 (Appendix 12-1-1). Cyprus Plateau Mining has submitted an encroachment application for U. S. Highway 191 to the Utah Department of Transportation, upon receipt the notice will be submitted to UDOGM and included in Appendix 12-1-1.

12.1.1.6 Permit Term

The anticipated mining progression during operation of the Castle Gate Mine are outlined on Exhibits 2-1 and 2-2, respectively. Reclamation operations for the Castle Gate property are discussed in Chapters 3, 7, 8, 9, and 10. Mining is not planned as part of this permit for the Willow Creek Refuse Removal site. Reclamation activities for the Refuse Removal site are discussed in Sections 12-3, 12-7, 12-8, 12-9 and 12-10 of this chapter.

12.1.1.7 Insurance and Proof of Publication

Certificates of Insurance issued to Amax Coal Company, are located in Appendix 2-5.

The newspaper advertisement of application for a permit and verification of the advertisement appear in Chapter 2, Appendix 2-5. Any future newspaper advertisement and verification will be submitted to the Division no later than 4 weeks after final publication and will be included in Chapter 2, Appendix 2-5.

12.1.1.8 Filing Fee

A permit filing fee was submitted with the original application and a certificate of verification included in Chapter 2, Appendix 2-6.

12.1.2 PERMIT APPLICATION FORMAT AND CONTENTS

Information within Chapter 12 applies to the Willow Creek Refuse Removal Project site. Reference is made to baseline information in other chapters within the Castle Gate Permit, however data provided in Chapter 12 applies only to the Refuse Removal site.

12.1.3 REPORTING OF TECHNICAL DATA

All technical data submitted in the permit application is accompanied by the names of persons or organizations that collected and analyzed the data. The technical data also contains the dates of collection and analysis of the data, and descriptions of the method used to collect and analyze data. All technical analyses were planned or directed by a professional qualified in the subject.

12.1.4 MAPS AND PLANS

The maps submitted in this permit application correspond to the format required by the regulations.

Those portions in the mine plan area in which underground coal mining activities occurred before August 3, 1977, and from August 3, 1977 to May 3, 1978 are presented for Mine #3 and #5 on Exhibits 2-1 and 2-2 of Chapter 2.

12.1.5 COMPLETENESS

The Applicant believes the available information in this permit application to be complete.

SECTION 12.2

SOILS

12.2.1 INTRODUCTION

This section of Chapter 12 (and Chapter 8 of this M&RP) contains all pertinent information relating to identification, management, and reclamation activities associated with soil resources at the proposed disturbed area of the Willow Creek Site (site).

12.2.2 ENVIRONMENTAL DESCRIPTION

The site is located adjacent to Willow Creek Canyon, a tributary drainage to the Price River approximately 10 miles north of Price, Utah. The area topography is dominated by plateaus separated by deeply incised canyons. Canyon walls are generally composed of laterally continuous sandstone cliffs and ledges interbedded with slope-forming shales and siltstones. Rock outcrops in the area consist of alternating layers of sandstone and shale with subordinate coal and limestone.

Elevations at the site area range from approximately 6,250 to 6,350 feet above sea level. Surficial materials at the site area consist of native soils and disturbed/reclaimed soils. Native soils in the site area are not cultivated due to their thin nature, a shortage of irrigation water, and a short growing season. The native residual and colluvial soils adjacent to the site area are usually very shallow, and consist predominantly of sand and silty sand loams formed on mixed residual and transported sandstone and shale. Materials within the disturbed and reclaimed area consist of waste rock and mixed coal refuse that was placed over a former highwall and capped with topsoil as part of a UDOGM Abandoned Mine Lands reclamation project in 1988. The native and reclaimed soils have high percolation rates and are highly susceptible to wind erosion, but the inherent erosion hazard from water is low.

12.2.2.1 Prime Farmland Investigation

No prime farmland exists in the site disturbed area. A Prime Farmland investigation of the Castle Gate property is discussed in Section 8.2 of this M&RP.

12.2.2.2 Soil Survey

A soil survey map of the site is presented in Exhibit 12-2-1. The native soils at the site include the Shupert-Winetti Complex and the Travesilla-Rock Outcrop-Gerst Complex (map units 107 and 121, Exhibit 8-1). Detailed soil map unit descriptions of the two complexes are contained in Appendix 8-1. Rangeland and Woodland Understory Productivity data for the two soils are listed on Table 8-2. The soil families, typical occurrence, and dominant features of the soil complexes are listed on Table 8.1b (Chapter 8).

12.2.2.2.1 Soils Map

Soil types at the site and adjacent areas are delineated on Exhibit 12-2-1.

12.2.2.2.2 Soil Identification

The methods and resources used to identify and describe soils at the site are discussed in Section 8.1-1.

12.2.2.2.3 Soil Description

Detailed soil map unit descriptions of the two native soil complexes are contained in Appendix 8-1.

12.2.2.2.4 Soil Productivity

Productivity data for the two native soils are listed on Table 8-2. In areas where prior mining and reclamation activities have disturbed the natural surface, soil textures and horizons have been altered by thorough mixing and the soils have lost their native identities. However, it is likely that the productivity characteristics of the mixed soils will be similar to those of the native soils.

12.2.2.3 Prime Farmland Soil Characterization

No prime farmland exists in the permit area (see Section 12.2.2.1).

12.2.2.4 Substitute Topsoil

The Applicant plans to utilize existing soil resources salvaged and stockpiled from the site. These soil resources will be supplemented with appropriate fertilizers and amendments (Section 12.2.3).

12.2.3 OPERATION PLAN

12.2.3.1 General Requirements

12.2.3.1.1 Removing and Storing Soil Methods

The methods described in Section 12.2.3.2 will be followed when removing and storing soil resources during refuse removal operations.

12.2.3.1.2 Suitability of Topsoil Substitutes/Supplements

See Section 12.2.3.3.2

12.2.3.1.3 Topsoil Handling and Reclamation Procedures Regarding Revegetation

Topsoil storage and handling is discussed in Section 12.2.3.4 and reclamation procedures are presented in Section 12.2.4.

12.2.3.1.4 Construction, Modification, Use, and Maintenance of Topsoil Storage Piles

The topsoil materials will be segregated and stockpiled as discussed in Section 12.2.3.4. The stockpiled materials will be selectively placed below the "trailer area" (see Exhibit 12-5-1) within the permit area.

12.2.3.2 Topsoil and Subsoil Removal

12.2.3.2.1 Topsoil Removal and Segregation

Prior to the removal of the refuse against the highwall, where practical all topsoil (emplaced by AML) will be removed and stockpiled. Soils from the previously disturbed project surface will be salvaged in two horizons where separate horizons exist, and salvaged to include the majority of the root mass and segregated.

All topsoil thicker than 6 inches will be removed as a separate layer from the subsoil, segregated, and stockpiled separately. Topsoil less than 6 inches thick will be removed

according to procedures outlined in Section 12.2.3.2.3. Stockpiles will be graded to gradual slopes (3H:1V) and seeded to promote surface stabilization.

12.2.3.2.2 Poor Topsoil

Topsoil that is of insufficient quantity or quality for sustaining vegetation will be removed as a separate layer and segregated. Such operations will be done with approval of the UDOGM, and in compliance with R645-301-233.100 (Section 12.2.3.3.1).

12.2.3.2.3 Thin Topsoil

Topsoil to be removed that is less than 6 inches thick will be removed with the immediately underlying unconsolidated materials. This material mixture will be treated as topsoil.

12.2.3.2.4 Minor Disturbances Not Requiring Topsoil Removal

Small Structures. Topsoil will not be removed prior to construction resulting in only minor disturbances. Such construction activities include work on small structures such as power poles, signs, and fence lines.

Vegetation. The Applicant will not remove topsoil for minor disturbances where such activity will destroy vegetation or cause erosion.

12.2.3.2.5 Subsoil Segregation

Due to the rockiness of subsoil in the area, when the B and C soil horizons occur they will not be individually segregated and stockpiled.

12.2.3.2.6 Timing

Soil removal will take place after all vegetation has been removed that could interfere with soil salvage. Soil salvage operations will occur prior to any surface disturbance activities.

12.2.3.2.7 Topsoil and Subsoil Removal Under Adverse Conditions

Where practical and available, salvageable soils will be removed to include the majority of the root mass and segregated (Telephone Conversation June 16, 1995, Henry Sauer, Senior Soil Specialist, UDOGM). In areas of surface disturbance, topsoil and subsoil will each be removed separately and segregated, except where natural conditions render such operations hazardous. The road construction soils (the road from the trailer to the topsoil stockpile) will be salvaged and stockpiled in compliance with commitments in this section.

Conventional Machines. In localities where steep grades, adverse terrain, severe rockiness, limited depth of soils, or other adverse conditions exist that render soil removal and segregation activities using conventional machines hazardous, soils will not be salvaged and stockpiled.

Substitute Topsoil. Importation of substitute topsoil should not be required.

12.2.3.3 **Topsoil Substitutes and Supplements**

12.2.3.3.1 Overburden Materials Supplementing and/or Replacing Topsoil

If it is necessary to increase the quantity or quality of the topsoil, selected overburden materials may be used as a topsoil supplement during reclamation operations. If overburden materials are used, the operator commits to demonstrating to the UDOGM prior to topsoil

emplacement that the resultant soil is equal or superior to the original soil in the support of revegetation efforts.

12.2.3.3.2 Suitability of Topsoil Substitutes and Supplements

If needed, the total quantity of the topsoil substitute material required to obtain a minimum 6-inch soil layer will come from the pad adjacent to the refuse pile and from slopes above the site which were disturbed during the active life of the prior operation. If needed, substitute topsoil material will be piled for storage during the recontouring process, mixed with the stockpiled topsoil, and spread over the regraded area prior to preparation for seeding.

12.2.3.3.3 Physical and Chemical Analyses

Physical and chemical analyses of the soil material will be performed during collection operations to determine if/what supplemental fertilizer is needed.

The applicant will take four additional soil samples from the highwall refuse to be evaluated for acid- and toxic-forming and alkalinity-producing properties using the laboratory methods in Table 6 of the "Guidelines for Management of Topsoil and Overburden for Underground and Surface Mining". Appendix 12-6-2 contains the location and analyses of samples from the highwall refuse taken in 1994.

Sampling and analyses will be performed in accordance with UDOGM guidelines (see Appendix 12-6-3).

Certification of Reclamation Topsoil Suitability. The suitability of the substitute topsoil shall be certified by an approved laboratory in accordance with at least one of the following: Soil Conservation Service (SCS) published data, SCS technical guides, state agricultural

agency, Tennessee Valley Authority, BLM - USFS published data, physical and chemical analyses results, field-site trials, and greenhouse tests.

12.2.3.3.4 Testing of Substitute Topsoil

Only substitute topsoil composed of on-site overburden and stockpiled topsoil will be tested as described in Section 12.2.3.3.3.

12.2.3.4 Topsoil Storage

12.2.3.4.1 Topsoil Stockpiling

Topsoil removed will be stockpiled for later use in reclamation operations when it is impractical to promptly redistribute the topsoil on regraded areas. The topsoil stockpile area will be isolated, with no means of access from the main surface area, to protect the topsoil from contaminants and unnecessary compaction that could interfere with vegetation. A topsoil storage sign will be installed at the base of each stockpile.

"Topsoil material used to cover the refuse pile against the highwall is suitable as substitute topsoil since this soil has produced and supported vegetation for the past 5 years (Telephone Conversation June 16, 1995, Henry Sauer, Senior Soil Specialist, UDOGM)". Salvageable topsoil will be removed from atop the refuse pile materials against the highwall at the Willow Creek site (as located on Exhibit 12-5-1).

12.2.3.4.2 Stockpiled Topsoil

Stable Stockpile Site. Stockpiled materials will be placed on a stable site within the permit area (see Exhibit 12-5-1).

Protection from Contaminants and Compaction. Stockpiled topsoil shall be protected from contaminants and unnecessary compaction. The stockpiles will be isolated, with no means of access from the main surface area. A topsoil storage sign will be installed at the base of each stockpile.

Wind and Water Erosion Protection. To protect the stockpiled soils from wind and water erosion, the soils will be revegetated with a quick-growing vegetative cover (Table 12-3-3) and by the installation of a total containment berm below the stockpile to trap sediment shed from the stockpile. This berm will consist of a 4-foot high, 2H:1V side-sloped berm along the sides and downstream portion of the topsoil stockpile, as indicated in Exhibit 12-7-5. According to calculations presented in Appendix 12-7-2, the runoff volume from the 100-year, 6-hour storm from the entire drainage area to the berm will easily be contained. Therefore, no discharge structures will be required. Sediment eroded from the topsoil stockpile will be collected behind the berm. If significant volumes are collected, the sediment will be excavated and returned to the topsoil stockpile to ensure adequate capacity.

Topsoil Redistribution. The stockpiled topsoil will not be moved until it is redistributed during reclamation operations, unless approved by the UDOGM.

12.2.3.4.3 Topsoil Stockpile Relocation

Stockpiled topsoil in jeopardy of being detrimentally affected by operations may be temporarily redistributed.

Host Site. Topsoil relocation may occur, provided that such action does not permanently adversely affect topsoil at the host site.

Topsoil Suitability. Topsoil relocation may occur, provided the topsoil is maintained in a condition more suitable for redistribution than if stockpiled.

12.2.4 RECLAMATION PLAN

12.2.4.1 General Requirements

Topsoil redistribution, amendments, and stabilization are discussed in Sections 12.2.4.2, 12.2.4.3, and 12.2.4.4, respectively.

12.2.4.2 Soil Redistribution

12.2.4.2.1 Soil Redistribution Practices

Soil Thickness. Topsoil will be distributed on all areas with slopes less than 1H:1.5V that are to be reclaimed. Topsoil redistribution procedures will ensure an approximate uniform thickness of six inches. During this time period, the topsoil will be allowed to settle and attain equilibrium with its natural environment. This procedure will be followed for all areas in which facilities such as road beds.

Compaction. To prevent compaction, soil-moving equipment will be operated on the spread topsoil only as necessary. Front-end-loaders and other wheel-mounted equipment may be used to transport and dump topsoil. However, to minimize compaction, only track-mounted equipment will be used to spread the topsoil. The topsoil will be disked and/or ripped prior to seeding.

Erosion. The Applicant will exercise care to minimize erosion during and after application of topsoil and will employ the measures necessary to ensure the stability of topsoil on graded slopes. Erosion control measures will include surface roughing and erosion mat placement on slope areas considered to be unstable (see Section 12.7). Methods used to evaluate success of revegetation and stabilization appear in Chapter 9 of this M&RP.

12.2.4.2.2 Regrading

Prior to topsoil redistribution, the disturbed area will be regraded to approximate the proposed final reclamation topography (Exhibit 12-5-2).

On slopes less than 1h:1.5v, regraded land will be scarified by a ripper-equipped tractor. The surface will be ripped to a depth of 6 inches to reduce surface compaction, provide a roughened surface to assure topsoil adherence, and promote root penetration.

12.2.4.2.3 Topsoil Redistribution on Impoundments and Roads

Reclamation of soils beneath abandoned roads will be accomplished by the same methods used for other disturbed areas at the site, but these soils will be ripped to a depth of 10 inches to reduce surface compaction.

12.2.4.3 Soil Nutrients and Amendments

Soil nutrients and amendments will be applied to the redistributed soil as necessary to establish the vegetative cover, based on the results of chemical analyses described in Section 12.2.3.3.3.

12.2.4.4 Soil Stabilization

12.2.4.4.1 Protection and Stabilization of Surface Areas

All reclaimed areas will be stabilized to control erosion by application of mulch and regrading of rills and gullies (see Section 12.7).

12.2.4.4.2 Mulch Application

To stabilize the topsoil, mulch will be applied to all areas that have been regraded and covered with soil. For further discussion of revegetation practices to be utilized see Chapter 9.

12.2.4.4.3 Rills and Gullies

The Applicant will fill, regrade, or otherwise stabilize any rills or gullies deeper than 9 inches which form in areas that have been regraded and topsoiled. The areas adjacent to any rills or gullies which have been filled, regraded or otherwise stabilized will be reseeded or stabilized, as appropriate.

Postmining Land Use and Revegetation. Rills and gullies that disrupt the postmining land use or re-establishment of vegetative cover will be regraded, and the topsoil will be replaced and reseeded.

Water Quality. Rills and gullies that contribute to the degradation of stream quality will be regraded, receive new topsoil, and be revegetated (see Section 12.7).

12.2.5 PERFORMANCE STANDARDS

12.2.5.1 Topsoil, Subsoil, and Topsoil Supplements Management

All topsoil, subsoil, and topsoil supplements shall be managed as outlined in Sections 12.2.3 and 12.2.4.

12.2.5.2 Stockpiled Topsoil and Subsoil

All stockpiled topsoil and subsoil will be managed according to plans outlined in Sections 12.2.3 and 12.2.4.

SECTION 12.3 BIOLOGY

12.3.1 INTRODUCTION

This chapter presents a description of the biological resources in the area of the Willow Creek Refuse Removal Site (site). Because this area is mountainous and in a narrow canyon, it is used primarily as wildlife habitat, with contiguous areas being used as rangeland and for recreation.

The site has previously been used for mining activities and Abandoned Mine Lands (AML) refuse disposal. Consequently, the natural contour has been altered, soils have been compacted and native plant communities have been disturbed. Portions of the permit area have been reclaimed and revegetated with species approved by UDOGM or other governing regulatory agencies.

Consultant's reports referenced in this plan are abbreviated as follows:

- Mariah - "Vegetation Data Report for Price River Coal Company's Mine Area, Helper, Utah", Mariah Associates, April - November 1981 (Appendix 9-1)
- FSW - Fauna of Southeastern Utah and Life Requisites Regarding their Ecosystems - 1990 (Appendix 12-3-1)
- Cyprus - Section 3.2, Vegetation Information, Willow Creek Coal Mine Permit submittal
Vegetation May 1995 (Appendix 12-3-2)
- Cyprus - Section 3.3, Fish and Wildlife Information, Willow Creek Coal Mine Permit
Wildlife submittal, May 1995 (Appendix 12-3-3)

During the course of the Mariah survey, a vegetation reference area was identified and marked to serve as a standard for final reclamation success along with the goal of establishing post-mining use as wildlife habitat.

12.3.1.1 Vegetative, Fish and Wildlife Resources

Vegetative, fish, and wildlife resource conditions in the project are discussed in Section 12.3.2.

12.3.1.2 Potential Impact to Vegetative, Fish, and Wildlife Resources

Potential impact to vegetative, fish, and wildlife resources and the associated mitigation plan are presented in Sections 12.3.3 and 12.3.4 of this chapter.

12.3.1.3 Description of Reclamation Plan

The reclamation plan used to restore the vegetative, fish, and wildlife resources to a condition suitable for the post-mining land use is presented in Section 12.3.4.

12.3.2 ENVIRONMENTAL DESCRIPTION

12.3.2.1 Vegetation Information

This section contains the environmental descriptions of the vegetation for the area of the Willow Creek Refuse Removal Project (project). Vegetation data used in this M&RP are located in Appendix 9-1 and 12-3-2.

12.3.2.1.1 Plant Communities Within the Proposed Permit Area

The vegetation within the proposed permit area is discussed in Appendix 12-3-2 (Section 3.2.2), and Chapter 9. The information in Tables 3.2-1 and 3.2-2 of Appendix 12-3-2 pertains to the permit boundary designated on Map 6 of the same appendix and not to the permit boundary designated on Exhibit 12-1-1, although the permit boundary on Exhibit 12-1-1 is within the permit boundary on Map 6.

The area to be disturbed during this operation was sampled by Cyprus Plateau Mining Corp. in 1994. The vegetation information for the area compiled in 1994 is found in Appendix 12-3-2.

12.3.2.1.2 Land Productivity Prior to Mining

The land productivity of the area was not measured in 1918 when the first disturbance occurred. The Applicant believes the land was undeveloped wildlife habitat prior to the original disturbance.

12.3.2.2 **Fish and Wildlife Information**

A summary of the fish and wildlife resource information for the permit and adjacent areas is contained in Sections 12.3.2.2.1 through 12.3.2.2.3.

12.3.2.2.1 Level of Detail

The scope and level of detail within this plan are sufficient to design the protection and enhancement plan for wildlife and fish in the area.

This assessment of wildlife resources has been compiled pursuant to guidelines issued by UDOGM. Appendices 9-1, 10-A through 10-E and 12-3-1 and 12-3-3 contain wildlife studies related to their resources in the project area.

12.3.2.2.2 Site-specific Resource Information

The following information was summarized from the Blackhawk permit submittal, a field reconnaissance performed by Larry Dalton of the Utah Division of Wildlife Resources (DWR) and a wildlife and raptor survey conducted in 1994. The reports and surveys are located in Appendix 12-3-1 and 12-3-3.

The Willow Creek Canyon disturbance is small in relation to other areas described in the Castle Gate Mine permit. All wildlife habitat is important; this section is a description of efforts to maintain and enhance the habitat which exists.

Piscinian (fish)

The permit area lies within the Willow Creek Drainage and adjacent to Willow Creek. There are a potential 67 species of fish within the drainage. Willow Creek, a Class IV fishery, is not within the Willow Creek Refuse Removal Project permit boundary, therefore fish habitat is not discussed in detail in this chapter. However, Appendix 12-3-3 does contain data pertaining to fish in Willow Creek and the Price River.

Reptiles and Amphibians

Five species of amphibians are believed to be potential inhabitants of the area. However, only three amphibious species are categorized as possible inhabitants of the permit area. See Appendices 12-3-1 and 12-3-3 for additional data.

Fifteen species of reptiles are believed to be potential inhabitants of the biogeographic area. However, eleven species of reptile are possible inhabitants of the permit area. Of the eleven the sagebrush, side-blotched, and short-horned lizards, are known inhabitants of the permit area based on visual observations. Of the two potential high-interest species, the collared lizard is most likely, but the milk snake is also a potential yearlong resident (Appendix 12-3-3).

All reptile and amphibian species are legally protected under state law by the Utah Division of Wildlife Resources. Due to the small size and predisturbance of the permit area, it is doubtful that the proposed action would seriously impact populations.

Avian Species

Of the 104 bird species categorized as potential inhabitants of the permit area, forty are known inhabitants based on visual observations during site reconnaissance surveys in 1994 or previous site-specific efforts by other researchers. See Appendix 12-3-3 for additional data.

There is a potential for eagles to pass through the canyon, but no nests exist within the permit boundary. Due to the small land area associated with the project and the limited duration of the excavation activities, disturbance to nesting habitat will be minimal. A raptor survey of the area is located in Appendix 12-3-3.

Small Mammals

Fifty mammal species are classified as possible residents of the permit area. Ten of these 50 species are known inhabitants based on visual observations during a 1994 site reconnaissance or previous site-specific efforts by other researchers. Of the 31 potential

State high-interest species possible in the region, 17 are either known, likely, or possible in the permit area (see Appendix 12-3-3).

The red bat is a summer resident of the West Tavaputs Plateau and utilizes riparian and piñon-juniper woodlands of the submontane ecological association for roosting. Occasionally individuals may utilize caves for roosting, and if so it would not be unexpected for these individuals to hibernate over winter.

The western big-eared bat is a year-round resident of the West Tavaputs Plateau. The bat roosts and hibernates in caves, mine tunnels, or suitable buildings located in the piñon-juniper woodland, mixed brush, and low elevation spruce-fir habitats of the submontane and montane ecological associations. Areas adjacent to the permit area qualify as this species' substantial value use area. Neither the red bat nor the western big-eared bat is known to inhabit the permit area.

Nuttal's cottontail and desert cottontail are known to inhabit areas similar to the permit area. The red and gray fox are also year-long inhabitants of the area. Short-tailed and long-tailed weasels, mink, badger, as well as striped and spotted skunks likely inhabit areas where water is readily available.

Small mammals (mice, moles, etc.) represent a significant part of the ecosystem on this site. The majority are herbivores and are the primary source of food for higher trophic levels. The potential exists for caving of burrows due to fracturing of strata during the movement of machinery and materials. Although this could temporarily alter the population, recovery would be imminent and rapid.

The dwarf shrew is a yearlong inhabitant of the West Tavaputs Plateau, however no visual observations were made during a 1994 site reconnaissance or by previous site-specific

efforts by other researchers. Because of limited population numbers, occupied habitats should be ranked as being high-priority for this species and should be reported to the DWR. Additional data concerning mammals is located in Appendix 12-3-3.

Mule Deer and Elk

According to the Cyprus Wildlife Report (Appendix 12-3-3), "mule deer (herd units 27b and 32) are common yearlong inhabitants of the West Tavaputs Plateau with substantial value use areas spanning all wildlife habitats from the cold desert to the montane ecological associations. Some vertical migration occurs in response to seasonal changes, resulting in concentration of deer populations in lowland areas during winter months. These concentration areas, known as winter range, are variably utilized depending on the severity of the winter. In all cases, this winter range is defined as high-priority for mule deer. During more severe winters and certain times of any given winter, the most concentrated use defines the most critical winter range for the general maintenance of the mule deer population. These critical winter range areas, with regard to the permit area, are shown on the Regional Wildlife Map (Map 7). In addition to winter range areas, the permit area offers high-priority summer range for herd unit 32. Although no specific areas are known, fawning grounds for this herd unit likely occur within the permit area. Use of fawning grounds during critical periods (June), would be considered to be of critical value to the mule deer population.

Rocky mountain elk are occasional inhabitants of the West Tavaputs Plateau with substantial use areas spanning all wildlife habitats from the submontane through the montane ecological association. The local elk population does not exhibit as strong a vertical migration as mule deer, however, such a migration does exist resulting in some concentration during the winter months. These concentration areas, known as winter range, are variably utilized depending on the severity of the winter. In all cases, winter range is defined as high-priority for elk. During more severe winters and certain times of any given winter, the most

concentrated use defines the most critical winter range for the maintenance of the elk population. These critical winter range areas, with regard to the proposed permit area, are represented on the Regional Wildlife Map (Map 7). Based on the mapping information, almost the entire permit area lies within the designated critical elk winter range. Although no specific areas are known, calving grounds for this herd unit likely occur within the permit area. Use of calving ground during critical periods (June), would be considered to be of critical value to the elk population."

With perennial flow in Willow Creek, the project area is used year-round by mule deer and elk, as well as other wildlife. Although the potential area of disturbance is not critical to the continued existence and perpetuation of the herd, it is important to maintain the habitat provided. The DWR has rated the winter range surrounding the area as high priority to the deer herd and the site is part of a critical elk winter range (see Exhibit 12-3-1).

Threatened and Endangered Plant and Wildlife Species. No sensitive, rare, endemic, threatened or endangered plant, fish or wildlife species (Appendix 12-3-3) listed on Table 12-3-1 and 12-3-2 are known to inhabit the project area.

A literature survey indicated no endangered or threatened plant species in the adjacent areas (Appendix 12-3-2, Section 3.2.1.2).

Habitats of Unusually High Value. The Applicant will conduct activities within the permit boundary with care to maintain (where possible) the existing wildlife habitat and revegetate with species that will not only benefit, but promote wildlife in the area.

Species of High Federal or State Interest. The species of interest to the state of Utah and the Federal government are listed on Tables 12-3-1 and 12-3-2. Surveys and studies in

the permit area have found no species of high federal or state interest. These species are unlikely to be present on the permit area, due to prior disturbance and revegetation efforts.

12.3.2.2.3 Fish and Wildlife Service Review

If requested, the Applicant authorizes the release of information pertaining to Sections 12.3.2.2 and 12.3.3.3 to the U.S. Fish and Wildlife Service Regional and Field office for their review.

12.3.2.3 Maps and Aerial Photographs

Maps of the permit area and adjacent areas have been provided in this M&RP as Exhibit 1-1 and 12-1-1. Maps and photographs throughout this chapter have been prepared to comply with regulatory guidelines.

12.3.2.3.1 Location and Boundary of Proposed Reference Area

The vegetation reference area for grassland-sagebrush is shown on Exhibit 12-3-2.

12.3.2.3.2 Elevations and Locations of Monitoring Stations

Elk and deer range are shown on Exhibit 12-3-1. The permit area contains no fish or wildlife monitoring stations.

12.3.2.3.3 Facilities for Protection and Enhancement

Sections 10.2, 12.3.3.3.3, 12.3.4.2.1, and 12.3.5.8.5 contain additional discussion pertaining to protective measures taken by the Applicant in behalf of wildlife. Enhancement to wildlife habitat within the disturbed area will be planned and coordinated with UDOGM and Wildlife Resources at the time of reclamation to insure the best technology available (at the time) is used. No enhancement is planned during the operational phase of the project due to the probable infringement on the privately owned land adjacent to the disturbed area. The surface is leased, not owned by the applicant.

12.3.2.3.4 Vegetation Type and Plant Communities

The vegetation type believed to have originally covered the disturbed area is Grassland-Sagebrush. See Exhibit 12-3-2 for locations of adjacent areas with Grassland-Sagebrush vegetative type.

12.3.3 OPERATION PLAN

12.3.3.1 Measures Taken to Minimize Disturbance/Mitigate Disturbance

No vegetative disturbance is anticipated beyond the permit and disturbed area boundary outlined on Exhibit 12-1-1. The Applicant will attempt to minimize any disturbance within the permit area during project operations.

Mitigation measures will include water (from existing water rights and/or the Castle Gate Prep Plant raw water pond) or other measures to control dust from the ancillary road, equipment pad and maintenance area. Protection measures in the form of sediment ponds,

sediment traps, silt fences, straw bales, rip-rap and gabion structures will be used to protect the stream.

12.3.3.2 Description of Anticipated Impacts of Subsidence

Subsurface disturbance will not occur, therefore subsidence from the proposed activities is not anticipated. Threatened or endangered species are not known to be present at the site. If such species are discovered, precautions will be taken to assure their continued existence and regulatory agencies will be notified.

12.3.3.3 Plan to Minimize Disturbances and Adverse Impacts

Potentially adverse impact on wildlife and related environmental values will be avoided or minimized through the implementation of mitigation measures. The Applicant will operate and maintain all systems and facilities under its control in a manner that minimizes impacts.

Personnel will be restricted to site facilities and strongly discouraged from venturing outside the permit boundary. All access roads to internal areas will be blocked by locked gates during non-operation periods.

Operations are scheduled to prevent any major disturbance during birthing and early development of wildlife species. Construction activities will not be conducted during crucial periods to raptors, if their nests are within sight or within one-half mile of the operation without previous approval by the Division of Wildlife Resources and Fish and Wildlife personnel. Activities within the permit area should be curtailed or ended by December of 1995 (predicated on project approval date). Habitat will be restored to equal or greater coverage than in the corresponding reference area.

12.3.3.3.1 Minimized Disturbance to Endangered or Threatened Species

The Applicant will apply all methods necessary to minimize disturbances or any adverse effects to species listed on Tables 12-3-1 and 12-3-2. No endangered or threatened species are known to inhabit the permit area.

12.3.3.3.2 Species and Habitats

All species and habitats within the permit area will be protected to the best of the Applicant's ability. Wildlife habitat protection will be considered in the construction of any proposed facilities. For additional information, see Section 12.3.3.3.3.

12.3.3.3.3 Protective Measures

General control and mitigation measures addressing potential operational related biological impacts will include the following:

- Minimizing the total area of disturbance,
- Limiting disturbance and operations in important resource areas,
- Design, construction (if need), and operation of facilities to minimize biological impacts including barriers to wildlife movements,
- Design and installation (if needed) of electrical equipment to minimize electrocution hazards,
- Establishment of stream buffer zones,
- Control and monitoring of surface discharges and water quality,
- Exclusion of wildlife from potentially hazardous areas, and
- Reclamation of disturbed areas when they are no longer needed.

Efforts will be made to minimize wildlife loss and/or harassment associated with operation. Employees and truck drivers will be instructed on the danger of animals on the road during dusk and night hours and the need to reduce speed to avoid colliding with animals.

The Applicant will make every effort to educate all employees associated with the operation to the value of the wildlife resources associated with the permit area. Each employee will be advised to not unnecessarily or without proper permits or licenses harass or take any wildlife.

Pre-existing power lines and transmission facilities were surveyed in August of 1981 by Ron Joseph of the U.S.F.W.S., and found to be either properly constructed to minimize danger or located so as not to pose a threat to perching raptors. Any future power lines will be constructed per guidelines approved by the regulatory agencies. Additional information regarding power lines is located in Section 12.3.5.8.5.

Operations are scheduled to prevent any major disturbance during birthing and early development of wildlife species.

12.3.4 RECLAMATION PLAN

The Reclamation Plan will include the seed mix and rate of seedlings per acre as well as stocking rates for shrub plantings, planting techniques, fertilization methods, and amount and frequency of applications. The fish and wildlife plan for the permit area is outlined in Section 12.3.4.2.

12.3.4.1 Revegetation

The reclamation plan for final revegetation is included in this section for lands disturbed by this project.

The short-term goal of this revegetation plan is the immediate stabilization of the disturbed sites through erosion control. This objective will be achieved through controlled grading practices, proper seedbed preparation to encourage rapid plant establishment, inclusion of rapidly establishing species in the seed mixture to be planted and mulch applications.

The long-term goals are to establish useful and productive wildlife habitat. These goals will be attained through the selection and placement of desirable and productive plant species, and a commitment to monitor and maintain revegetated areas throughout the bond liability period.

12.3.4.1.1 Schedule and Timetable

The planting of seeds (and seedlings, if needed) will be undertaken at the optimum time following disturbance activities. Ideally all seeding will be done during the fall in order to maximize revegetation success. It should be noted, however, that seeding using the interim seed mixture may occur during other seasons (on an as-needed basis) to control erosion or soil degradation.

The Applicant intends to have the project completed in December of 1995, however the completion date is predicated on the project approval date. The reclamation timetable and schedule is outlined in Figure 12-5-3.

12.3.4.1.2 Descriptions

Species and Amounts of Seed. All revegetated areas will be planted with either the interim or final reclamation seed mix (see Table 12-3-3 and 12-3-4, respectively).

Revegetation of the site will include the planting of shrub seedlings if the establishment of shrubs by seeding is insufficient to meet regulation requirements. Species, rate, and planting locations will be determined should the planting of seedlings become necessary. The Applicant and UDOGM will confer to make this determination.

The seed mixtures purchased to revegetate the permit area will meet the following requirements:

1. Seed stock must be from the year of planting or the previous year seed crops.
2. 70% Pure Live Seed (PLS).
3. A variety compatible with the seeding environment will be selected by the bidder for each species listed.
4. All seed furnished shall be those specified in the plan and shall be measured by PLS weight. All seed shall be tested by a certified seed analyst in a duly accredited seed testing laboratory. Each seed species (variety) shall be furnished with a tag which clearly lists: (1) botanical name, (2) common name, (3) collection location and elevation, (4) pure seed (%), (5) inert matter (%), (6) other crop seed (%), (7) weed seed (%), (8) noxious weed seed, (9) germination (%), (10) hard seed (%), (11) date tested, (12) lot number, (13) net weight, (14) name of seed testing laboratory, and (15) name and address of seed company.

Seed shall not contain prohibited noxious weed seed as listed by state seed law. Wet, moldy, or otherwise damaged seed shall not be accepted.

5. The seeds will be delivered to the site in Carbon County, Utah, in the fall of the reclamation year.

6. The seed shipment is subject to inspection by the Utah State Department of Agriculture.

The seeding will take place in the fall on the prepared sites after October 1 and prior to December 1. Reclamation will take place the following year on sites that cannot be seeded prior to December 1. The fall seeding will allow for a period of exposure to freezing conditions and to spring moisture for optimum germination conditions for all seed types in the mix. However, the Applicant reserves the right to use the interim seed mixture as required to establish a quick ground cover for erosion control when necessary.

When the species shown in the Species Lists are not available for planting, substitution of an equivalent native species will be made and reported to UDOGM.

Method Used for Planting and Seeding. The entire disturbed area will be revegetated by drilling, except where drilling is impractical or if seed size or consistency requires hand broadcasting.

The seed will be drilled on all sites where machinery can be operated. The action of the seed drill will turn the surface layer of soil and bury the fertilizer (95 lbs. of nitrogen, 50 lbs. of phosphates, and 60 lbs of potassium per acre) and mulch within the root zone. The seed drill will be set to plant the seed at 1/4 inch to 1/2 inch depths, but the presence of numerous rocks in the topsoil materials may vary the planting depth. This diversity of planting depths will facilitate the establishment of all the species in the seed mix.

Where necessary small areas will be seeded by hand broadcasting, and the seed covered by backdragging or raking. The fertilizer will be broadcast first, then the seeds broadcast and the mulch blown over the prepared area. The raking or backdragging with a

multiple chain will turn the fertilizer, chopped hay, and seed into the loose soil surface covering everything with a soil layer.

On slopes steeper than 2.5H:1V, erosion matting may be installed to cover the seedbed surface and protect the soil surface from erosion.

Final reclamation will take place during both site operation and closure. Areas that will not be redisturbed during operation or regrading will receive final reclamation, the remaining areas will be reclaimed during the Reclamation Plan Phase.

The objectives of the post-mining reclamation activities are to restore the surface disturbed area to a land use capability similar to that which existed prior to area disturbance and comparable to the standard set at the Grassland-Sagebrush reference area.

Mulching Techniques. Native hay mulch or alfalfa will be applied at the rate of 2 tons/acre following fertilization to provide sufficient organic matter. The hay/alfalfa will be chopped and blown onto the topsoiled areas and with the subsequent action of the seed drill be turned into the soil surface incorporating the fertilizer and hay. Thus, the surface of the drill-seeded sites will have the fertilizer and mulch in the upper 4-6 inches of topsoil and contour furrows to control surface erosion.

Mulching helps control weed emergence and hay/alfalfa will be selected to minimize introduction of undesirable weed species. Revegetation experience has shown that after several years, most weeds are naturally eliminated from the reclamation stands. If weeds should become a problem, mowing may be utilized where terrain permits. In extreme cases herbicides may be used when previous attempts to eradicate weeds have failed.

Irrigation, Pest and Disease Control. Irrigation should not be required to establish successful vegetative growth for final reclamation. All areas will be mulched to increase germination and to improve soil moisture. Furthermore, successful reclamation has been achieved in the adjacent areas without the use of supplemental irrigation.

Any necessary insect or rodent control plan will be guided by the U.S. Fish and Wildlife Service; The Utah State Cooperative Extension Service; and the Animal, Plant, Health Inspection Service.

Measures Proposed for Revegetation Success. Success of revegetation and stabilization of the permit area will be evaluated during the middle of each growing season, when cover and composition studies are most feasible. The statistical methods and sample adequacy levels described in "Vegetation Information Guidelines, Appendix A" will be used in monitoring percent cover and composition of revegetation attempts in disturbed areas. Erosion control is discussed in Section 12.7.4.2.

According to the Cyprus Vegetation Report (Appendix 12-3-2), "The only site specific information collected by Mariah pertinent to this area corresponds to their Willow Creek grass-sage reference area. According to this report, vegetative cover on this site was reported to equal 40 percent. Shrub density was reported to equal 17,782.3 stems per hectare (which is different than the current standard of reporting plants per acre). Production estimates from the USDA-SCS for this site were given as 850 to 900 pounds per acre. Range condition was not addressed in this evaluation. While the original report states that data for each sample site were presented in Appendix C, none of the documents examined during this study, including those in the UDOGM files, could be located which contained data showing anything other than generalized summaries." Continued efforts by the applicant have been unsuccessful in locating the missing data from Appendix C of the Mariah Report.

In consultation with the Division of Wildlife Resources, Paul Baker established a woody plant density success standard of 4000 per acre for the Willow Creek Refuse Removal Project. The reclamation of the project area will comply with the plant community described as grassland-sagebrush in the Mariah Report with the density success standard of 4000 per acre for woody plants.

The applicant proposes to control erosion through the use of properly designed and constructed sediment detention structures, recontouring of the reclamation soils, planting of approved reclamation and interim seed mixtures, soil enhancement, and moisture retention methods described in Section 12.3.4.1 to ensure germination and establishment of vegetation. The reclamation activities performed by AML have controlled the erosion of the highwall area and the applicant intends to return the area to a similar state upon final reclamation. Should the reclaimed area show signs of excessive erosion, steps will be employed to remedy the situation (i.e., recontouring distressed areas, reseeding with fast growing seed mix, erosion matting, etc.). See Sections 12.2.4.4.3 and 12.7 for discussions of rills and gullies.

12.3.4.1.3 Greenhouse Studies, Field Trials or Other Equivalent Studies

Should additional testing for the purpose of demonstrating that reclamation as required by the State Program can be accomplished, the Applicant will comply.

12.3.4.2 Fish and Wildlife

The fish and wildlife plan is a set of specifications and procedures to avoid potential adverse impact to wildlife and their habitat. Revegetation to sustain and improve wildlife habitat will be the primary concern of the Applicant following the termination of operations. The plan is consistent with Sections 12.3.3 and 12.3.5.8.

12.3.4.2.1 Enhancement Measures

Wildlife enhancement will be created by the development of micro-topographic features such as swales and rises created during regrading, by the establishment of rockpiles, and by the use of the vegetative species specified above. Where natural materials are available for the creation of snags and roosts, such snags and roosts will be constructed.

A fish ladder designed by Larry Dalton of the Division of Wildlife Resources was constructed below the culvert which crosses under the ancillary access road. The activities proposed for this operation will not disturb the ladder.

Wildlife habitat impacts will be mitigated using methods agreed upon by the applicant and the DWR. Negotiations on the mitigation methods will be conducted during September of 1995, with a final mitigation plan being submitted to UDOGM by the completion of the project. The implementation of the mitigation plan will take place in accordance with the schedule agreed upon by the applicant and the DWR.

12.3.4.2.2 Plants Used for Wildlife Habitat

The plant species in the reclamation seed mix are consistent with those presently grown in the permit and adjacent areas. Section 12.3.4.1.2 contains the proposed reclamation seed and shrub mix.

Nutritional Value. The nutritional value will be consistent with that of vegetation in the surrounding areas.

Cover. The goal of the Applicant is to establish plant species which will provide sufficient cover for the fish and wildlife of the area. See Section 12.3.4.1 for additional discussion.

Ability to Support and Enhance. The plant species to be used have been researched and approved by regulatory agencies and should have the ability to support and enhance the fish or wildlife habitat after the release of the performance bonds. Shrubs will be planted in clumps of no more than 200 per acre. These shrubs will be used in a revegetative effort to ensure establishment of Grassland-Sagebrush community over the disturbed site.

12.3.4.2.3 Cropland

Cropland is not a proposed post-mining land use, nor was it a pre-mining land use.

12.3.4.2.4 Residential, Public Service and Industrial Land Use

No residential, industrial or public service use is planned at the present time for the permit area following the termination of operation.

12.3.5 PERFORMANCE STANDARDS

12.3.5.1 General Requirements

The Applicant commits to conduct all operations in accordance with the plans submitted in Sections 12.3.3 through 12.3.4 of this chapter.

12.3.5.2 Contemporaneous Reclamation

The seed mixture (see Section 3.4.1.2) will be used to revegetate areas disturbed by project operations and all associated activities. The climate of the area was reviewed to assess the need for drought-tolerance in the species selected for the seed mixture. The vegetation reports were evaluated to determine seed mixture constituents, in light of production, cover, and diversity requirements. Plant species were selected on the basis of wildlife needs and requirements. In addition, the operation plan was reviewed to determine the need for species with quick establishment, rapid spreading, and high erosion control potentials.

When necessary small areas will be temporarily vegetated in order to protect soil and hydrologic resources. The goal of the temporary revegetation program is to stabilize disturbed areas that cannot be permanently reclaimed for several years. In areas requiring interim stabilization during operation, fertilizer will be applied at a rate of 95 lbs. of nitrogen, 50 lbs. of phosphates, and 60 lbs of potassium per acre. The interim seed mix proposed for use in all areas is shown on Table 12-3-3. This mix contains species intended to establish rapidly and effectively control erosion.

Contemporaneous reclamation will not be done in areas the Mine Health and Safety Regulations require to be kept barren of vegetation.

12.3.5.3 Revegetation: General Requirements

The long-term appearance and usefulness of the reclaimed permit area will be similar to that prior to disturbance and that found in adjacent undisturbed areas. Ultimately, the disturbed areas will be reclaimed to support wildlife habitat. The vegetative cover will be in accordance with the approved permit and reclamation plan. All species of vegetation to be

used in reclamation activities, whether planted by seed or seedlings, shall be approved by the appropriate regulatory agencies.

12.3.5.3.1 Vegetative Cover

The seed mix proposed for revegetation is intended to provide vegetative cover that will be diverse, effective and permanent. The seed mixture was selected with respect to the climate, potential seedbed quality, erosion control, drought tolerance, and the mixture's ability for quick establishment and spreading.

Diversity will be determined by ranking all species within the community by relative cover. The ranking determines the relative importance of each species. The number of species contributing greater than five percent of the relative importance in the reference area data designates the number of species, the life forms, and seasonality of the species to be established in the reclaimed area. No one species will make up greater than 50% of the reclaimed area importance value.

$$\text{Relative Cover (\%)} = \frac{\text{Cover (\%)} \text{ for Species}}{\text{Total Vegetation Cover (\%)}}$$

$$\text{Relative Cover} = \text{Relative Importance}$$

The revegetation sampling methods are those used to identify the undisturbed plant communities in the permit area. The continuity of the sampling method will allow for the ease of comparison of data from the communities and revegetation sites.

Native Species. The vegetative mixture will primarily comprise native species with any introduced species being approved by the appropriate government agencies. The vegetative

mixture will be capable of achieving post-mining land use as approved by UDOGM. Diversity of species should allow ultimate utilization of plants by wildlife.

The revegetative species will be purchased from suppliers who will certify their percentages of purity, germination, hard seed, and percentages of maximum weed seed contents.

Extent of Cover. The vegetative cover will be at least equal in extent to the natural vegetation of the reference area.

Stabilizing. The vegetative cover mixture is capable of stabilizing the soil surface from erosion (see Tables 12-3-3 and 12-3-4).

12.3.5.3.2 Reestablished Plant Species

Compatible. The reestablished plant species have been selected to ensure they are compatible with the approved post-mining use.

Seasonal Characteristics. The revegetation plant species will have the same growing season as vegetation in the adjacent and reference areas.

Self-generation. The reestablished plants are species capable of self-generation and plant succession.

Compatibility. The seed mix suggested for revegetation contains plants native to the area and compatible with the plant and animal species of the permit area.

Federal and Utah Laws or Regulations. The seed mixture purchased to revegetate the permit area will contain no poisonous or noxious plant. No species will be introduced in the area without being approved by UDOGM.

12.3.5.3.3 Vegetative Exception

The Applicant does not require a vegetative exception at this time.

12.3.5.3.4 Cropland

The permit area contains no designated cropland.

12.3.5.4 Revegetation: Timing

The Applicant will follow the recommended guidelines for revegetation as discussed in Section 12.3.4.1.1.

12.3.5.5 Revegetation: Mulching and Other Soil Stabilizing Practices

Suitable mulch and other soil stabilizing practices will be used on all areas that have been disturbed, regraded and covered by topsoil or topsoil substitutes. If an exception occurs regulatory agencies will be contacted concerning the specific exception.

The Applicant will exercise care to guard against erosion during and after application of topsoil and will employ the necessary measures to ensure the stability of topsoil on graded slopes.

12.3.5.6 Revegetation: Standards for Success

The standards for revegetation success are detailed in Section 12.3.4.1.2.

12.3.5.6.1 Success of Revegetation

The Grassland-Sagebrush reference area was selected, utilizing Mariah vegetation data, soils information, and aerial photographs, to represent the major vegetation type which is currently disturbed and which will be disturbed.

The reference area boundary was permanently marked in the field and sampled for cover and for shrub density. One corner of the reference area was delineated as the starting point, distances were selected, and random sampling was paced. Additional description of the reference area and cover and density data can be found in Chapter 9, Appendix 9-1.

The success standards for approval will be judged on the effectiveness of the vegetation for post-mining land use, the extent of cover in comparison to the reference area, and the standards outlined in Section 12.3.5.3.

Sampling Techniques. The Applicant will comply with the standards for success, statistical sampling techniques for measuring success, and the approved methods outlined in UDOGM's "Vegetation Information Guidelines, Appendix A".

Standards for Success. The sampling techniques for success will use a 90 percent statistical confidence interval. The standards for success will include criteria representative of lands in the area of the permit. Areas not achieving 90 percent of the cover in adjacent areas with similar vegetation will be reevaluated and augmented reclamation measures will be implemented to successfully vegetate those areas.

In consultation with the Division of Wildlife Resources, Paul Baker established a woody plant density success standard of 4000 per acre for the Willow Creek Refuse Removal Project. The reclamation of the project area will comply with the plant community described as grassland-sagebrush in the Mariah Report with the density success standard of 4000 per acre for woody plants.

12.3.5.6.2 Standards for Success

The standards for success will be applied in accordance with the post-mining land use of wildlife habitat.

The objective is to achieve a plant cover sufficient to control erosion and provide a plant community useful as wildlife habitat. The perennial grasses and forbs growing under the shrubs provide the moderating influence in stabilizing the soil surface. Additional wildlife enhancement features will include rock piles and clumped shrubs. All of the plant species are intended to provide forage for wildlife.

To ensure the vigor of the revegetation, grazing management may be required. If wildlife feeding becomes a problem in the initial few years of plant growth, steps may need to be taken to restrict their use of the revegetation. Wildlife management will be coordinated with the DWR.

The success of the methods used to control erosion will be measured by comparing runoff from the reclaimed areas with runoff from an undisturbed adjacent area. Erosion will be controlled such that contributions from the reclaimed area will be equal to or less than the sediment contributions from the undisturbed area.

12.3.4.1.3 Greenhouse Studies, Field Trials or Other Equivalent Studies

Should additional testing for the purpose of demonstrating that reclamation as required by the State Program can be accomplished, the Applicant will comply.

Grazing Land or Pasture Land. The ground cover and production of living plants on the revegetated area will be at least equal to those of the reference area. However, there is no area within the project area designated as pasture or grazing land.

Cropland. There is no area designated as cropland within the permit area.

Fish and Wildlife Habitat. The success of revegetation for wildlife habitat will be determined on the basis of shrub and vegetative ground cover growth. Minimum stocking and planting arrangements will be specified by UDOGM on the basis of local and regional conditions. To allow for bond release, shrubs will be healthy and at least 80 percent will be in place at least six growing seasons after reclamation. Ground cover success will not be less than that required to achieve the approved post-mining land use.

There is no fish habitat within the permit boundary.

Industrial, Commercial or Residential. The post-mining land use for the permit area is not designated for industrial, commercial or residential use.

Previously Disturbed Areas. Since 1979, revegetation has been conducted on portions of the site but there is no record of any revegetation being done prior. The Applicant will restore the vegetative ground cover to that of the reference area, and ground cover will be adequate to control erosion.

12.3.5.6.3 Siltation Structure Maintenance

Siltation structures will be maintained until removal is authorized by UDOGM and the disturbed areas have been stabilized and revegetated. The structures will be removed no sooner than two years after the last augmented seeding. For additional details on siltation structures, see Section 12.5.4.2.

12.3.5.6.4 Removal of Siltation Structures

The land on which siltation structures are located will be revegetated in accordance with the reclamation plan and Sections 12.3.5.3 and 12.3.5.7.

12.3.5.7 Revegetation: Extended Responsibility Period

The Applicant will be responsible for the success of revegetation for a period of ten years following seeding, fertilization, and irrigation of the reclaimed area. Sampling will comply with the UDOGM "Vegetation Information Guidelines" and following the monitoring schedule outlined in Table 12-3-5.

12.3.5.7.1 Extended Period Begins

The period of extended responsibility will begin the year after the last year of augmented seeding, fertilization, and irrigation or other work have been completed excluding approved husbandry practices.

Permanent revegetation efforts will be monitored according to the following schedule:

- First year following seeding — reconnaissance survey, transplant survival, and qualitative evaluation of revegetation.
- Second year — qualitative as well as quantitative sampling of cover, frequency, transplant survival, and woody plant density.
- Third year — qualitative and quantitative sampling of cover, frequency, transplant survival, and woody plant density.
- Fourth year — qualitative evaluation and woody plant density.
- Fifth year — all parameters listed during the second year.
- Sixth year — qualitative evaluation only.
- Seventh year — qualitative evaluation only.
- Eighth year — qualitative evaluation and woody plant density.
- Ninth year - all parameters listed during the third year, and production sampling.
- Tenth year — all parameters listed during the ninth year.

During the ninth and tenth years, revegetated areas and the reference area will be sampled for all parameters listed in order to test reclamation success. In the tenth year following revegetation, application for bond release will be made.

12.3.5.7.2 Vegetative Parameters

The qualitative sampling will take place annually in the summer months. The first year will require monthly visits, from April to September, to closely follow the progress of the seedlings and plantings. The second year will require visits in the spring and late summer to continue tracking the progress of the seedlings and plantings. The visits in years three (3)

through ten (10) will occur annually in the summer or be coordinated with the quantitative sampling schedule.

The qualitative sampling will consist of visiting the reclaimed site area and recording growth, species success, soil conditions, erosion, wildlife use, insect damage, and other special conditions. The qualitative sampling will incorporate needs identified under the UDOGM inspection program.

Vegetation parameters will equal or exceed the approved success standard during the last two years of the responsibility period. The success standards are outlined in Sections 12.3.5.6.1 and 12.3.5.6.2 of this chapter.

12.3.5.7.3 Husbandry Practices

The Applicant will comply with UDOGM-approved husbandry practices, which are normal conservation practices within the region. These practices may include disease, pest, and vermin control; and any pruning, reseeding, and transplanting required.

12.3.5.8 **Protection of Fish, Wildlife, and Related Environmental Values**

The Applicant will minimize disturbances and adverse impacts on fish, wildlife, and their related environments as outlined in Section 12.3.3.3. The Applicant will have a training program to educate their employees about wildlife needs and their importance.

The permit area does not support a stream or any habitat used by fish.

12.3.5.8.1 Existence of Endangered or Threatened Species

Project operations will not be conducted where operations might jeopardize the existence of any endangered or threatened species. The Applicant knows of no endangered or threatened species within the permit area.

Any state or federally listed endangered or threatened species will be reported to UDOGM upon its discovery. Operations will proceed in accordance with UDOGM's stipulations concerning the protection of species.

12.3.5.8.2 Bald and Golden Eagles

Operations will be conducted in a manner protective of the bald and golden eagle, however eagles are not known to inhabit the permit area. The Applicant will promptly report any golden or bald eagle nests found within the permit boundaries and will proceed with operations in accordance with UDOGM's stipulations.

12.3.5.8.3 Taking of Endangered or Threatened Species

The Applicant understands that there is no permission implied by these regulations for taking of endangered or threatened species, their nests or eggs.

12.3.5.8.4 Replacement of Wetland and Riparian Vegetation

No riparian habitat will be disturbed.

12.3.5.8.5 Manmade Wildlife Protection Measure

Electric Power Lines. Any additional power lines to be installed within the permit area will comply with the guidelines of REA Bulletin 61-10, "Power Line Contacts by Eagles and Other Large Birds" and regulatory agencies. No additional power lines are planned.

Potential Barriers. The wildlife inhabiting and utilizing the area of concern will likely have to acclimatize to planned activities. However, the Applicant will take measures to ensure safety and ease of movement through the permit area.

Fences, if built, will be constructed according to DWR specifications. The Applicant does not plan to build any additional fences at this time.

Pond Protection. Fences or other appropriate methods will be used to exclude wildlife from ponds containing hazardous concentrations of toxic materials. However, at this time the Applicant anticipates no ponds containing hazardous concentrations of toxic materials.

Highwall Protection. During removal of the refuse material against the highwall at the north end of the permit area, chain link fencing will be rock-bolted into place and covered with shotcrete to prevent debris from falling.

**SECTION 12.4
LAND USE AND AIR QUALITY**

12.4.1 LAND USE

This section includes descriptions of the pre- and proposed post-operation use(s).

12.4.1.1 Environmental Description

A statement of the conditions and capabilities of the land to be affected follows in this section.

12.4.1.1.1 Premining Land Use

The surface and subsurface lands within the permit area have historically been used for mining facilities and operations.

The first mine in the Willow Creek drainage was opened in 1890 by the Utah Fuel Company (Pleasant Valley Coal). Five portals provided entry and ventilation along the south bank of Willow Creek. The mine was the site of explosions in 1924 and 1928. The 1924 explosion caused 172 deaths. The majority of the miners killed were buried in a cemetery located on the south side of Willow Creek. The cemetery is now known as the Willow Creek Cemetery and lies adjacent to the present permit area.

The mine (Castle Gate No. 2) was operated continually by Utah Fuel from 1890 to 1950, by Kaiser Steel from 1950 to 1952, by Independent Coal & Coke from 1952 to 1968, and by North American Coal Company from 1968 to 1972. The mine was shut down in 1972. The facilities and reserves were sold to Kanahwa and Hocking Coal (Valley Camp, 1972-

1973), then McCulloch Oil (1973-1975) and finally to Franklin Real Estate in 1975. A second mine (Castle Gate No. 4) was opened by Independent Coal & Coke in 1958 and closed by North American Coal in 1970.

A narrow gauge rail line moved coal from the two mines along the north Willow Creek cliff face, through a tunnel to the old Castle Gate Prep Plant. Canyons west of the mines and north of Willow Creek were used for refuse disposal from 1938 to 1972.

During 1974 and 1975 the Willow Creek channel was realigned. The area north of Willow Creek was regraded in 1975, in preparation for construction of a portal, which was never opened. From 1975 to the present, the area north of Willow Creek has been used for refuse disposal and industrial equipment storage and as a staging area for the construction of a power transmission line in Crandall and Hardscrabble Canyons.

Land Use Map. Exhibits 9-1, 10-1, 12-4-1, 12-4-2 and 12-5-1 present land use information in the permit and adjacent areas.

Land Capability. The permit area is in a narrow canyon, with a secondary road running through the center of the canyon. There is no record indicating what the land may have been used for prior to mining; the Applicant assumes the area was wildlife habitat. The size of the site and soil are not conducive to agricultural use. The major plant community in the permit area is identified in Section 12.3.2.1.1.

Land Use Description. The permit area has primarily been used in conjunction with mining operations since 1890. The area is presently being used as wildlife habitat. The adjacent areas are used for grazing, recreation, watershed, wildlife and (in localized areas) small surface development to support the mining industry. The proposed post-mining land use is wildlife habitat.

There are no developed or inventoried recreation campgrounds within the permit area. The Willow Creek Cemetery is adjacent to the permit area. Proposed refuse removal operations will not interfere with the cemetery and the Applicant will continue to maintain access to the cemetery.

The permit area contains no oil, gas, or water wells, and no seeps or springs. Willow Creek flows along the south boundary of the site and is used extensively by wildlife in the area.

Cultural and Historic Resources Information. Cultural resource information and maps identifying cultural and historical study areas are located in Chapter 5 and Appendix 12-4-1 (under separate cover, due to confidentiality) of this M&RP. Due to the lack of life-sustaining resources, the development of the smaller canyon areas is limited. Some larger adjacent canyons contain remnants of abandoned towns and mining facilities.

There are no cemeteries, public parks, historic places, or units of the National System of Trails or the Wild and Scenic Rivers System located within the permit boundary. The Applicant agrees, however, to notify UDOGM and the Utah State Historical Society if previously unidentified cultural resources are discovered in the course of operations. The Applicant also agrees to have any such cultural resources evaluated in terms of National Register of Historic Places eligibility criteria. A study of the area completed in 1995 is contained in Appendix 12-4-1 (under separate cover, due to confidentiality). Protection of eligible cultural resources will be in accordance with UDOGM and Utah SHPO requirements.

12.4.1.1.2 Previous Mining Activity

The permit area has been associated with the mining industry since the turn of the century. The earliest recorded disturbance at this site was in 1958, but disturbance is likely to have started earlier (see Section 12.4.1.1.1).

12.4.1.2 Reclamation Plan

12.4.1.2.1 Postmining Land Use Plan

When operations have terminated, the intended post-mining land use is wildlife habitat. The proposed equipment maintenance pad and staging area will be reclaimed if no future mining occurs at this site.

12.4.1.2.2 Land Owner or Surface Manager Comments

The Applicant leases the surface area of the proposed operation from Blackhawk Coal Company per an agreement signed November 1, 1993.

12.4.1.2.3 Suitability and Capability

Because no mining is presently proposed on the site, final fills will not contain excess spoils.

12.4.1.3 Performance Standards

The performance standards for the areas to be reclaimed for post-operation land use are contained in this section.

12.4.1.3.1 Postmining Land Use

The proposed post-operation land use will be wildlife habitat. The land will be capable of supporting such a use in its proposed reclaimed condition.

12.4.1.3.2 Determining Premining Uses of Land

The pre-disturbance uses of the project area are unknown, however the area will be reclaimed to provide wildlife habitat similar to that of the surrounding area.

12.4.1.3.3 Criteria for Alternative Postmining Land Uses

No alternative post-operation land uses have been planned.

12.4.1.4 **Alternative Land Use**

No alternative post-operation land uses have been planned.

12.4.2 **AIR QUALITY**

This section includes descriptions of plans to comply with the Clean Air Act and applicable Utah or federal air quality statutes and regulations.

12.4.2.1 **Air Quality Standards**

Project operations will be conducted in compliance with the requirements of the Clean Air Act and the Utah Air Quality Regulations.

12.4.2.2 Compliance Efforts

During operations, fugitive dust emissions will be caused by loading, transportation, and redistribution of topsoil and by wind erosion of exposed pads, roads, and by vehicular traffic on unpaved roads and other surfaces.

During reclamation activities, the fugitive emissions will occur as a result of the loading, transportation, and redistribution of fill and topsoil. Other dust emissions will occur during regrading activities and mulching operations. These activities are planned to be of short duration (4.5 months). Because fugitive dust emissions during construction activities in rural areas are normally exempt from emission controls, emission controls will be limited to the watering of roads as required for safe and efficient work conditions. After completion of construction work, the reclaimed surfaces will be a temporary source of fugitive dust from wind erosion until vegetation cover is established (see Section 12.3.5).

12.4.2.3 Monitoring Program

An air monitoring program is not proposed at this site. On June 12, 1995 the Division of Air Quality was contacted in reference to the Willow Creek Refuse Removal Project. A determination was made by the Division of Air Quality that the Preparation Plant Air Quality Approval Order did not need to be amended to facilitate the removal project (see Appendix 12-4-2).

SECTION 12.5

ENGINEERING

12.5.1 INTRODUCTION

This section provides a discussion of general engineering aspects, an operation plan, a reclamation plan, design criteria, and performance standards related to the Willow Creek Refuse Removal Project (project). The proposed activities associated with the project have been or will be designed, located, constructed, maintained, and reclaimed in accordance with the operation and reclamation plans.

The project involves the removal of underground development waste at the site and the disposal of this waste at the Castle Gate Refuse Disposal Facility (Refuse Disposal Facility). The waste which will be removed originated from an off-site location and was hauled to the site under contract with the Utah Division of Oil, Gas and Mining (Division), Abandoned Mine Lands Program.

12.5.1.1 General Requirements

This section includes descriptions of the proposed operations together with the appropriate maps, plans, and cross sections. Methods and calculations utilized to achieve compliance with the design criteria are also presented.

12.5.1.2 Certification

Where required by the regulations, cross sections and maps in this section have been prepared by or under the direction of, and certified by, qualified registered professional engineers or land surveyors. As appropriate, these persons were assisted by experts in the fields of hydrology, geology, biology, etc.

12.5.1.2.1 Cross Sections and Maps

Previously Mined Areas. No previously mined areas exist within the project boundary, however, the area has been previously disturbed by activities associated with mining (e.g., equipment storage, railway, and construction staging area).

Surface Facilities. The material to be excavated from the Willow Creek site (site) will be disposed of at the Refuse Disposal Facility. Certified maps and cross sections associated with the Refuse Disposal Facility are presented in Chapter 3, Section 3.4 of the Castle Gate Mine Mining and Reclamation Plan (M&RP).

A certified map showing the location of topsoil stockpiles associated with the project is provided as Exhibit 12-5-1. No non-coal waste storage, coal storage and loading areas, or explosive storage and handling facilities will be associated with the project.

Locations of existing and proposed sedimentation ponds associated with the project are noted on Exhibit 12-5-1. Locations of five sediment traps which were constructed at the site during placement of the underground development waste under the Abandoned Mine Lands Program are also shown on Exhibit 12-5-1. No water treatment facilities exist at the site other than the sedimentation ponds.

The following facilities and activities will not exist or occur in conjunction with the project:

- o Coal preparation plant,
- o Coal cleaning,
- o Coal processing waste banks, dams, or embankments,
- o Explosives storage and handling,
- o Disposal of non-coal waste, and

- o Air pollution control facilities.

Hence, certified maps or cross sections of these facilities are not provided in this plan.

Surface Configurations. Certified maps showing the final (post-reclamation) surface configuration of the project disturbed area and the Refuse Disposal Facility are provided on Exhibit 12-5-2 and Exhibit 3.4-3, respectively.

Hydrology. Certified maps and cross sections associated with the hydrology of the project area are discussed in Section 12.7.

Geology. Certified maps and cross sections associated with the geology of the project area are discussed in Section 12.6.

12.5.1.2.2 Plans and Engineering Designs

All plans and engineering designs presented in this section were prepared by or under the direction of and certified by a qualified registered professional engineer.

Excess Spoil. No excess spoil will be generated from the project area.

Durable Rock Fills. No durable rock fills will exist in the project area.

Coal Mine Waste. The design of the Refuse Disposal Facility has been certified by a professional engineer experienced in the design of similar earth and waste structures. This certification is presented in Chapter 3, Section 3.4 of this M&RP.

Impoundments. The only impoundments associated with the project will be sedimentation ponds and traps. Pond 013 at the Castle Gate Prep Plant and the proposed sedimentation ponds at the site were designed by a professional engineer using current,

prudent, engineering practices. These designs were certified by a professional engineer experienced in the design and construction of impoundments. Details regarding the designs are discussed in Section 12.7.

The existing sediment traps at the site were installed under the Abandoned Mine Lands Program during emplacement of the underground development waste at the site. These traps were intended for temporary use during handling and reclamation of the waste materials.

Primary Roads. The only primary roads associated with the project will be those that exist within the Castle Gate Prep Plant area. The design of these roads (Roads P-1 and P-2) has been certified by a professional engineer as indicated in Figures 3.4-3 , 3.4-4 and 12-5-1.

Variance From Approximate Original Contour. A variance from the approximate original contour requirements of the R645 rules is not being proposed for this project.

12.5.1.3 Compliance with MSHA Regulations and MSHA Approvals

12.5.1.3.1 Coal Processing Waste Dams and Embankments

The Refuse Disposal Facility complies with the requirements of MSHA (30 CFR 77.216-1 and 30 CFR 77.216-2), as discussed in Section 3.4 of this M&RP.

12.5.1.3.2 Impoundments and Sedimentation Ponds

The sedimentation pond downstream from the Refuse Disposal Facility (Pond 013) meets the size criteria of 30 CFR 77.216(a). Therefore, this pond has been designed in accordance with the requirements of R645-301-533.600 and R645-301-742.222 (see Section 3.4-3(4)C of this M&RP). No other impoundments, sedimentation ponds, or sediment traps associated with any portion of the project meet the size criteria of 30 CFR 77.216(a).

12.5.1.3.3 Underground Development Waste, Coal Processing Waste, and Excess Spoil

No underground development waste, coal processing waste, or excess spoil will be disposed of in underground mine workings in conjunction with the project.

12.5.1.3.4 Refuse Piles

The Refuse Disposal Facility has been designed and constructed to meet the requirements of 30 CFR 77.214 and 30 CFR 77.215. Details of this design are presented in Section 3.4 of this M&RP.

12.5.1.3.5 Underground Openings to the Surface

No underground openings to the surface will be associated with the project.

12.5.1.3.6 Discharges to Underground Mines

No discharges will occur from the surface of the project to underground mine workings.

12.5.1.3.7 Surface Coal Mining and Reclamation Activities

No surface coal mining and reclamation activities will be associated with the project.

12.5.1.3.8 Coal Mine Waste Fires

If any fires occur within the project materials, these fires will be reported immediately to MSHA and the Division. Immediate remedial action will be taken as deemed necessary by Amax Coal Company to protect public health and safety as well as the environment. Following initial remedial efforts, a long-term plan will be formulated in discussion with MSHA and the Division to extinguish existing and prevent future fires.

There will be no open burning on the surface. All garbage will be contained in dumpster(s) and hauled by a licensed contractor. If flammable waste materials (oil, etc.) are generated, they will be contained and disposed of in accordance with regulations promulgated by the Utah Division of Solid and Hazardous Waste.

Should a fire occur, a front end loader or other heavy equipment will be used to excavate the hot spot and spread the material to cool. Water will also be used when necessary and appropriate to extinguish fires. The local fire department will be contacted when necessary.

12.5.1.4 Inspections

12.5.1.4.1 Excess Spoil

Excess spoil will not be generated in conjunction with the project.

12.5.1.4.2 Refuse Piles

Regular inspections of the Refuse Disposal Facility will be made during placement and compaction of the project materials. These inspections will be made by or under the direction of a registered professional engineer experienced in the construction of similar earth and water structures. These inspections will occur at least weekly throughout placement of the materials and will consist, as a minimum, of the collection of sufficient visual observations and field data to ensure that the materials are being placed in accordance with the criteria outlined in Chapter 3, Sections 3.1-8 and Appendix 3.4A of this M&RP. The frequency of the inspections will be increased if a danger or harm exists to public health and safety or to the environment. Inspections will continue until placement of the material has been completed.

A certified report will be prepared by a registered professional engineer and submitted to the Division as part of the annual report after all material from the project have been placed

in the Refuse Disposal Facility. This portion of the report will indicate whether or not the material was added as designed and in accordance with the approved plan and the R645 rules. This portion of the report will also include a discussion of any appearances of instability, structural weakness, and other hazardous conditions noted during the inspection. A copy of the inspection report will be maintained at the mine office.

12.5.1.4.3 Impoundments

Inspections of all sedimentation ponds at the site will be made at least quarterly. Inspections of Pond 013 will be performed at least weekly. No other mine-related impoundments exist in the permit area. These inspections will be made by or under the direction of a registered professional engineer or qualified person experienced in the construction of similar earth and water structures. Inspections will visually evaluate the dams, spillways, and appurtenant structures for cracks, settlement, leakage, and other signs of potential instability. In addition, information will be gathered during the inspections concerning depth and elevation of any impounded waters, existing storage capacity, existing or required monitoring procedures and instrumentation, and any other aspects of the structure affecting stability. Inspections will continue until removal of the structure or release of the performance bond.

12.5.1.5 Reporting and Emergency Procedures

12.5.1.5.1 Slides

If a slide occurs within the project area that may have a potential adverse effect on the public, property, health, safety, or the environment, Amax Coal Company will notify the Division by the fastest available means following discovery of the slide and will comply with any remedial measures required by the Division.

12.5.1.5.2 Impoundment Hazards

If any examination or inspection of an impoundment discloses that a potential hazard is associated with that impoundment that may have an adverse effect on the public, property, health, safety, or the environment, the person who examined the impoundment will promptly inform the Division of the finding and of the emergency procedures formulated for public protection and remedial action. If adequate procedures cannot be formulated or implemented, the Division will be notified immediately.

12.5.1.5.3 Temporary Cessation of Operations

If a temporary cessation of operations associated with the project is required, and this cessation will last for a period of 30 days or more or as soon as it is known that a temporary cessation will extend beyond 30 days, Amax Coal Company will submit to the Division a notice of intention to cease or abandon operations. This notice will include the following:

- o A statement of the exact number of surface acres which have been affected by activities at the project area prior to cessation of operations,
- o A discussion of the extent and kind of reclamation activities which will have been accomplished prior to cessation of operations, and
- o An identification of the backfilling, regrading, revegetation, environmental monitoring, underground opening closures, and water treatment activities that will continue during the temporary cessation.

During the temporary cessation, Amax Coal Company will secure surface facilities in areas where future operations are to be resumed under an approved permit.

12.5.2 OPERATION PLAN

12.5.2.1 General

12.5.2.1.1 Cross Sections and Maps

Previously Mined Areas. No previously mined areas exist within the project boundary, however, the area has been previously disturbed by activities associated with mining (e.g., equipment storage, railway, and construction staging area).

Existing Surface and Subsurface Facilities and Features. Exhibit 12-5-1 depicts the following information:

- o All buildings in and within 1000 feet of the project area, including an identification of the current use of the buildings;
- o The location of major electric transmission lines within, passing through, or passing over the project area. No pipelines or agricultural drainage tile fields exist within the project area. Likewise, no major electric transmission lines exist within the area of the Refuse Disposal Facility;
- o Each public road (i.e., Utah Highway 191) located in or within 100 feet of the project area;
- o The location of each sedimentation pond, trap, and containment berm within the project area.
- o For the location of the Refuse Disposal Facility (see Chapter 3, Exhibit 3.4-1).

Landowner, Right-of-Entry, and Public Interest. Exhibits 12-4-1 and 12-4-2 show the boundaries of lands and the names of present owners of record of those lands, both surface and subsurface, included in or contiguous to the project area. Amax Coal Company has a legal right to enter and begin operations on all of the lands within the project area.

Operations associated with the project will be conducted within 100 feet of the right-of-way line of a public road only where access roads join that right-of-way and along that portion of Utah Highway 191 where the waste materials from the site are hauled in route to the Refuse Disposal Facility. Therefore, Amax Coal Company is not seeking approval from the Division under R645-103-234.

A hearing concerning coal mining operations within 100 feet of the right-of-way of Utah Highway 191 was requested by Cyprus Plateau Mining. This hearing was held on May 11, 1995 by the UDOGM, with the conclusions from the hearing being contained in Appendix 12-1-1. Cyprus Plateau Mining has submit an application for an "encroachment permit" to the Utah Department of Transportation.

Mining Sequence and Planned Subsidence. Operations associated with the project will consist of removing approximately 450,000 cubic yards of underground development waste from the Willow Creek area and transporting this waste to the Refuse Disposal Facility. Hence, no coal will be mined and subsidence will not occur in conjunction with the project.

The underground development waste at the site originated from an off-site location and was hauled to the site under contract with the Utah Division of Oil, Gas and Mining, Abandoned Mine Lands Program. Removal and transportation of the waste material is anticipated to require a duration of about 4.5 months.

Land Surface Configuration. Existing surface contours associated with the project area are represented on Exhibit 12-5-1.

Surface Facilities. Because the project involves the excavation and removal of underground development waste over a 4.5-month period, many surface facilities normally associated with a mining operation will not be located at the site. Only the existing office trailer will be used during the project as a construction office. None of the following surface facilities will be used at the site during the project:

- o Coal storage and loading facilities,
- o Non-coal (non-waste rock) storage areas, and
- o Explosive storage and handling facilities.

The area to be disturbed in conjunction with the project, is shown on Exhibit 12-5-1 for the site and Exhibit 3.4-1 for the Refuse Disposal Facility.

Locations of proposed topsoil stockpiles associated with the project are shown on Exhibit 12-5-1. Common refuse that is generated on site during the project will be hauled by the contractor to a State-approved solid-waste disposal area.

Transportation Facilities. Roads that will be used in conjunction with the project are shown on Exhibit 12-5-1. The topsoil access road is an existing jeep trail that will be upgraded to a graveled road for the construction period. If the Willow Creek Mine Permit is approved, this road will be left in-place temporarily to handle the 1996 mine construction. If the permit is not approved, the road will be reclaimed as outlined in Section 12.7.6. A secondary loop road will be constructed to ease transportation handling in the area of the topsoil stockpile. The access road to the refuse removal area will also be upgraded. This upgrading will consist of road widening and extending the side-drainage culvert under the road. No rail systems or overland conveyor systems will be associated with the project. Drainage structures associated with the roads are discussed in Section 12.7. The cross section of the road is provided on Figure 12-5-1.

12.5.2.1.2 Signs and Markers

Mine and Permit Identification Signs. Mine and permit identification signs associated with the Refuse Disposal Facility have been placed on the road leading to the facility. Each identification sign contains the following information:

- o Mine name,

- o Company name,
- o Permanent program permit number as obtained from the Division,
- o MSHA identification number,
- o EPA permit number (not issued for this specific project), and
- o Federal Coal Lease numbers pertinent to the operation.

These signs will be retained and maintained until after the release of all bonds for the permit area.

A temporary sign will be placed at the location shown on Exhibit 12-5-1 identifying the project. This sign will contain the information noted above.

Perimeter Markers. Perimeter markers will be installed in a location which can be seen from the ground connectively from another marker.

Buffer Zone Markers. Stream buffer zone markers will be placed adjacent to Willow Creek in the area where excavation activities will occur. Each buffer zone marker will have dimensions of about 12 inches by 18 inches and will be labeled "Stream Buffer Zone - No Disturbing Beyond This Point".

Topsoil Markers. Markers will be placed on all topsoil stockpiles associated with the project. These markers will be labeled "Topsoil Storage Area".

12.5.2.2 Coal Recovery

No coal will be recovered in conjunction with the project.

12.5.2.3 Mining Methods

The project will involve the removal of underground development waste from the area noted on Exhibit 12-5-1 to the Refuse Disposal Facility. No mining of coal will occur in conjunction with the project.

As practical, topsoil that was previously emplaced on the underground development waste will be stripped from the pile prior to removal of the waste. The stripped topsoil will be placed on the topsoil stockpile near the west end of the site as noted on Exhibit 12-5-1.

It is currently anticipated that the underground development waste will be excavated and loaded at the site predominantly through the use of front-end loaders. If required, backhoes and dozers with rippers will also be used to facilitate more efficient excavation and loading of the waste. The waste will be hauled to the Refuse Disposal Facility.

12.5.2.4 Blasting and Explosives

Activities associated with the project will not require the use of blasting or explosives.

12.5.2.5 Subsidence

No subsidence will occur in conjunction with the project.

12.5.2.6 Mine Facilities

12.5.2.6.1 Mine Structures and Facilities

An existing office trailer (on a concrete pad) at the site will be used as a project office. The location of this facility is noted on Exhibit 12-5-1. The site has telephone and other utility poles, and a substation. These are the property of the corresponding utility companies or the

surface owner, Blackhawk Coal Company. The trailer is the only existing structure which belongs to the applicant.

The office trailer was placed at the site in 1992 and is in good functional condition. Because the trailer was installed specifically for use as an office and has been actively maintained since installation, it is considered adequate to meet the requirements of R645-301. No modifications or reconstruction are required for the office trailer to meet the requirements of R645-301. The office trailer will be retained at the site following completion of the project for use in future mining and reclamation operations at the site. The office trailer and pad will be removed during final reclamation.

12.5.2.6.2 Utility Installation and Support Facilities

Utility Installations. All activities in conjunction with the project will be conducted in a manner that minimizes damage, destruction, or disruption of services provided by electric lines, telephone transmission stations, water lines, and sewer lines which pass over, under, or through the project area. Although, no additional utility installations are planned, if such utilities are installed they will be retained following project activities for use in future mining and reclamation operations at the site. Utilities will be removed during final reclamation, if the surface owner agrees to their removal and the site is not used for future mining operations.

Support Facilities. Support facilities associated with the project (e.g., staging areas, etc.) will be operated in accordance with the permit issued for the project. Support facilities will be located, maintained, and used in a manner that:

- o Prevents or controls erosion and siltation, water pollution, and damage to public or private property,
- o To the extent possible, using the best technology currently available, minimizes damage to fish, wildlife, and related environmental values, and
- o Minimizes additional contributions of suspended solids to streamflow or runoff outside the permit area.

A dust suppression water pumping station is proposed to be located behind the office trailer. This structure will consist of a pumping station with a suction line being placed into Willow Creek. Drainage from this area will be collected in Pond WC-002, as discussed in Section 12.7. No additional support facilities are planned, if such facilities are built they will be removed following the project if not needed for future mining activities.

Water Pollution Control Facilities. Water pollution control facilities associated with the project will consist of sedimentation ponds, traps, and the containment berm surrounding the topsoil stockpile. All water pollution control facilities will be retained following project activities for use in either future mining operations or reclamation operations at the site.

The sedimentation ponds, traps, topsoil stockpile containment berm, and appurtenant structures have been or will be constructed, used, and maintained as discussed in Sections 3.4, 12.2.3.4, 12.5.3.3.7, and 12.7. Sanitary sewage generated at the site during project activities will be handled through portable toilets and through the septic tank.

12.5.2.7 Transportation Facilities

12.5.2.7.1 Road Classification

Roads P-1 and P-2 in the Prep Plant area, which will be used to access the Refuse Disposal Facility, have been classified in Section 3.4-7 and Table 3.4-18 of this M&RP as primary roads. Roads to be used within the Willow Creek site area are classified as ancillary roads. This classification is based on the fact that the waste material associated with the project is neither coal nor spoil (see R645-100-200). Furthermore, the project will have a duration of less than six months and the project roads in the Willow Creek area will not be retained as part of an approved post-mining land use.

12.5.2.7.2 Description of Transportation Facilities

No surface conveyors or rail systems will be constructed, used, or maintained in conjunction with the project.

Road Specifications. Descriptions of roads P-1 and P-2 in the Prep Plant area are provided in Section 3.4-7. These descriptions include a presentation of cross sections and discussions of slope stability and runoff control.

Within the Willow Creek site area, the road used to access the underground development waste and to haul the waste from the site will have a dirt surface and a 30-foot finished width. This dirt road will be upgraded and slightly realigned from an existing dirt road within the project area. The road will be generally at grade and will slope into the hillside, with an undisturbed drainage ditch being present where the road meets the toe of the hill. Existing sediment traps exist adjacent to the road at the locations noted on Exhibit 12-5-1.

The road within the site crosses Willow Creek at an existing culvert that was installed by others. This culvert will be replaced as part of the Refuse Removal Access Road construction. The new culvert will be an 8-foot diameter CMP culvert capable of handling the peak flow from the 100-year, 6-hour storm event. Design of the culvert is discussed in Section 12.7.

Between the Willow Creek site area and the Prep Plant area, the underground development waste will be hauled on Utah Highway 191. This road was constructed and is maintained by the Utah Department of Transportation.

Drainageway Alterations. No relocations of natural drainageways are anticipated within the permit area to accommodate the needs of the project. Upgrading of the Willow Creek crossing will occur taking into consideration the planned stream alteration section. A short section of channel will be required to channel flow to the existing channel.

Road Maintenance. Roads used in conjunction with the project will be maintained as necessary to provide safe and efficient transportation. Periodic repairs (including surface grading and repair, ditch grading and repair, etc.) will be made to the roads as needed to keep the roads in good working condition.

In the event of a catastrophic event that causes damage to the site or Refuse Disposal Facility access roads, Amax Coal Company will repair that portion of the road(s) that exists within the project area as soon as practical after the damage has occurred. Furthermore, if the catastrophic event affects Utah Highway 191 in an area which affects the project, Amax Coal Company will cooperate with the Utah Department of Transportation to promote rapid repair of the highway as soon as practical following catastrophic damage.

12.5.2.8 Handling and Disposal of Coal, Excess Spoil, and Coal Mine Waste

12.5.2.8.1 Coal Handling and Transportation

No coal will be removed, handled, stored, cleaned, or transported during the project.

12.5.2.8.2 Overburden

No overburden will be removed, handled, stored, or transported within the project area.

12.5.2.8.3 Spoil, Coal Processing Waste, Mine Development Waste, and Non-Coal Waste

Excess Spoil. No spoil will be generated in conjunction with the project.

Coal Mine Waste. No coal processing waste will be generated in conjunction with the project. In addition, no burning or burned coal mine waste will be associated with the project. Descriptions of the construction, use, maintenance, and reclamation of the Refuse Disposal

Facility (where the Willow Creek underground development waste will be disposed of) are provided in Section 3.4 of this plan.

Non-Coal Mine Waste. Non-coal mine waste generated during the project will be stored in receptacles provided by a licensed sanitation company and disposed of by the sanitation contractor at a State-approved solid-waste disposal area. Non-coal mine waste will not be disposed of at the Refuse Disposal Facility.

Underground Development Waste. The underground development waste associated with the project will be excavated from the site and hauled to the Refuse Disposal Facility as described in Section 12.5.2.3. At the Refuse Disposal Facility, the waste will be dumped from the trucks and spread using dozers, graders or other suitable equipment.

The waste will be spread in lifts that do not exceed 2 feet in thickness and will be compacted to approximately 90 percent of Standard Proctor density. Based on previous data collected at the Refuse Disposal Facility (see Appendix 3.4B and 3.4C), it is assumed that the underground development waste at the site will have a Standard Proctor density of about 105 to 110 pounds per cubic foot. To verify this value, a sample of the waste material will be collected during the first day of removal activities and analyzed for Standard Proctor density. Thereafter, samples will be collected and analyzed at a rate of approximately once every 50,000 cubic yards and when significant changes in the physical characteristics of the waste are observed. The applicant plans to take four samples in addition to the two samples taken in 1994 unless significant change in the waste's physical characteristics require more samples. See Appendix 12-6-2 for the results of the 1994 analyses.

Compaction of the underground development waste will be verified in the field using a nuclear density gauge. During the initial few days of the project, several density tests will be performed on the material being placed in the Refuse Disposal Facility to ensure that adequate compaction is occurring throughout the thickness of each lift. Thereafter, a minimum of five compaction tests will be performed each time samples are collected for

Standard Proctor analyses. Changes in procedures will be implemented as necessary to ensure adequate compaction.

During placement, the waste material will be crowned and sloped to direct drainage to the channels at the backs and sides of the fill. The slope on the top of the fill will be at least 1 percent but not exceed 3 percent. The grade of the fill face will not exceed 2H:1V. At each increment where the placement of the waste material measures more than 50 feet vertically, a 10- to 15-foot terrace will be constructed. The terrace will slope to the face of the fill and the to the side channels at 1 to 3 percent. All diversions, berms, channels, and roads associated with the Refuse Disposal Facility will be maintained according to the existing permit (see Section 3.4 of this M&RP).

Minimization of Acid, Toxic, and Fire Hazards. Data presented in Section 12.6.2.4.5 indicate that none of the underground development waste is acid forming. These same data indicate that the waste has the potential of being slightly toxic forming with respect to boron (Appendix 12-6-2). To verify the extent of the boron toxicity, samples for boron analyses will be collected from the underground development waste each time a sample is collected for Standard Proctor determination.

Prior to reclamation, any sediment which erodes from the Refuse Disposal Facility will be retained in Sedimentation Pond 013. As indicated in Section 3.4-3(4), sediment which is removed from the pond will be placed back on the Refuse Disposal Facility. Information regarding final reclamation of the Refuse Disposal Facility (including covering of the waste to minimize the minor boron toxicity) is presented in Sections 3.4-4 and 3.4-5.

No waste materials that constitute a fire hazard (e.g., grease, lubricants, paints, and flammable liquids) will accumulate in the project area (for additional information see Section 12.5.1.3.8).

12.5.2.8.4 Dams, Embankments, and Impoundments

Information regarding the construction, modification, use, maintenance, and removal of sedimentation ponds and sediment traps associated with the Refuse Disposal Facility and at the site is presented in Sections 3.4 and 12.7.

12.5.2.9 Management of Mine Openings

No underground mine openings exist within the project area.

12.5.3 OPERATIONAL DESIGN CRITERIA AND PLANS

12.5.3.1 General

This section contains a general plan for each sedimentation pond, sediment trap, and the containment berm surrounding the topsoil stockpile within the project area. No other water impoundments or coal processing waste banks, dams, or embankments exist in the permit area.

No minable coal exists beneath the sedimentation ponds, topsoil stockpile containment berm, or sediment traps. Thus, subsidence will not affect operation of the siltation structures.

12.5.3.2 Sediment Control

Sediment-control plans for the project are described in detail in Section 12.7. The sedimentation structures have been designed to convey runoff in a non-erosive manner. In addition to the use of sedimentation ponds, sediment traps, topsoil stockpile containment berm, and properly designed runoff-control facilities, sediment yields in the permit area will be minimized by:

- o Disturbing the smallest practicable area during project activities and
- o Contemporaneously reclaiming areas suitable for such reclamation.

12.5.3.3 Impoundments

12.5.3.3.1 Slope Stability

The only impoundments that are constructed, used, or maintained by Amax Coal Company in conjunction with the project are the sedimentation ponds and sediment traps. The stability of the embankment on Pond 013 downstream from the Refuse Disposal Facility is discussed in Section 3.4-3(5)E. Information regarding the stability of the proposed sedimentation pond to be constructed at the site is provided in Appendix 12-5-1 and Appendix 12-5-4.

The four existing sediment traps and two proposed sedimentation ponds at the Willow Creek site (located as shown on Exhibit 12-5-1) are all or will be predominantly excavated ponds without significant embankments. Personal communication between Ben Grimes and Mr. Mark Page has determined that only Pond 1 will require a Form 69 with the Division of Water Rights. All other ponds will be incised and do not require the form. The sediment traps and ponds have been designed and/or constructed in accordance with the recommendations of Appendix 12-5-1 to be stable under normal operating conditions.

The stability of the ponds and traps was also evaluated under rapid drawdown conditions (Appendix 12-5-4). For this evaluation, the worst-case condition for Pond 1 (the sedimentation pond to be constructed at the current location of the refuse) was assumed to be immediately after initial construction, when the pond is located closest to the edge of the pad adjacent to Willow Creek and the potential elevation of the water surface in the pond is at its highest point (i.e., the hydraulic head on the underlying soil is at its greatest). Sedimentation Pond WC 002 was evaluated under its design condition. In evaluating the stability of the sediment traps, the worst-case condition was assumed to exist at Trap 4. This

trap is the deepest of the sediment traps and is located approximately 40 feet above Willow Creek, thus providing the greatest head of all the sediment traps on the phreatic surface which might result from pond seepage.

Rapid drawdown conditions were modeled under the unlikely assumption that a continuous phreatic surface would be created from the pond or trap to the Willow Creek stream channel. This condition is considered unlikely due to the relatively short time frame normally expected for ponding to occur in the sedimentation structures. The results presented in Appendix 12-5-4 indicate that Pond 1, Pond WC-002, and the sediment traps will be generally stable under static, rapid drawdown conditions. However, under seismic loading and rapid drawdown, the embankments of the sedimentation structures may exhibit some instability. Therefore, to ensure the stability indicated in Appendix 12-5-1 for normal operating conditions, each of the traps and the pond will be operated to avoid rapid drawdown.

12.5.3.3.2 Foundation Considerations

No conditions were encountered during construction of the sedimentation ponds or traps which suggested that the foundations upon which the ponds were constructed would be unstable. Prior to construction of each sedimentation pond or sediment trap, all vegetative matter and topsoil was removed from the foundation area. Stability of Pond 013 has been enhanced through the installation of an embankment drainage control system (see Appendix 3.4A).

12.5.3.3.3 Slope Protection

The outslopes and inslopes of the sedimentation ponds and the sediment traps were revegetated following construction to minimize surface erosion and protect the ponds against sudden drawdown. Similarly, the slopes of Pond 013 have been protected with rock fragments.

12.5.3.3.4 Embankment Faces

Embankment inslopes and outslopes on the sedimentation ponds and sediment traps have been protected as outlined in Section 12.5.3.3.3.

12.5.3.3.5 Highwalls

No highwalls are located below the water lines of the existing sedimentation ponds or sediment traps. However, a portion of the highwall that will be exposed at the site during removal of the underground development waste will be inundated by the proposed sedimentation pond No. 1 to be constructed at the site. Additional information regarding this pond is presented in Section 12.7.

12.5.3.3.6 MSHA Criteria

Sedimentation Pond 013, downstream from the Refuse Disposal Facility, meets the size criteria of 30 CFR 77.216(a). Details regarding the design, operation, and embankment stability of this pond are presented in Section 3.4 of this M&RP. No other sedimentation ponds or traps associated with the project meet the size criteria of 30 CFR 77.216(a).

12.5.3.3.7 Pond Operation and Maintenance Plans

Each sedimentation pond has been designed in accordance with R645-301-740. Details of these designs are presented in Sections 3.4 and 12.7 of this M&RP.

The sedimentation ponds (i.e Pond 013 and the proposed pond to be constructed at the Willow Creek site) are or will be operated as containment structures, with primary and/or emergency spillways to discharge water during a storm that exceeds the design capacity. Each pond will be dewatered using a pump system, with the portable pump intake floating on

the surface of the water. The system will include an oil skimmer to prevent floating matter from being discharged from the pond during dewatering.

Maintenance that is required to keep the ponds in good working condition will be performed as soon as practical following inspection which discovers a maintenance need. Sediment will be removed from the ponds when it accumulates to 60 percent of the design sediment storage volume. This removed sediment will be disposed of at the Refuse Disposal Facility.

The existing sediment traps were installed under the auspices of the Abandoned Mine Lands Program during initial placement of the underground development waste. Information regarding these traps is presented in Section 12.7. The traps were designed to provide protection to Willow Creek during activities at the site. Due to their limited drainage areas and limited size, overflow structures have been installed in the traps. However, no dewatering structures have been installed in the traps.

The sediment traps will be retained during the project to provide continued protection to Willow Creek. If dewatering of the traps is deemed necessary, the water will be removed with the portable pump system described above. If sufficient sediment accumulates in the traps to require removal, this sediment will be disposed of at the Refuse Disposal Facility.

12.5.3.4 Roads

12.5.3.4.1 Location, Design, Construction, Reconstruction, Use, Maintenance, and Reclamation

Control of Damage to Public or Private Property. All roads to be used in conjunction with the project were designed in accordance with applicable county, UDOT, and Division standards. By designing according to these standards, damage to public or private property has been minimized.

Road Surfacing. The surface of road P-1 (at the entrance to the Castle Gate Prep Plant area) and Utah Highway 191 is asphalt. Road P-2 (accessing the Refuse Disposal Facility) is gravel. All ancillary roads will have a gravel or dirt surface. No acid- or toxic-forming materials have been or will be used in the road surfaces.

Slope Stability. The stability of road P-2 is discussed in Section 3.4-7. The factor of safety calculated for the road exceeds the safety factor of 1.3 required by R645-301-534.130. All other roads to be used in conjunction with the project have been or will be constructed essentially at grade. Thus, these roads are considered stable.

12.5.3.4.2 Environmental Protection and Safety

Safety and environmental protection were primary concerns during the design and construction of all roads to be used in conjunction with the project. The grade, width, and surface materials used for the roads were selected to be appropriate for the planned duration and use of the roads.

12.5.3.4.3 Primary Roads

General. Primary roads to be used or maintained by Amax Coal Company in conjunction with the project are P-1 and P-2 in the Prep Plant area. These roads were designed and constructed in a manner that provided protection to fish, wildlife, and related environmental values. The roads are being maintained by Amax Coal Company to meet their design standards throughout the life of the mining and reclamation activities. Catastrophic events will be repaired as soon as practical after the damage occurs.

The primary roads were designed and constructed and are used and maintained in a manner that prevents damage to public or private property. Only nonacid- and nontoxic-forming materials were used to surface the roads. The road embankments have a minimum static safety factor in excess of 1.3. Any portion of the roads within the permit area that is

not to be retained for use under an approved post-mining land use will be reclaimed immediately after it is no longer needed for mining and reclamation operations.

Road Alignment. The primary roads have been in existence for several years and have not experienced major stability problems. Thus, the roads are located on the most stable available surface, giving consideration also to safety and environmental protection.

Road Surfacing. Road P-1 is surfaced with asphalt while road P-2 is surfaced with gravel. These surfaces were designed to account for the anticipated volume of traffic as well as the weight and speed of vehicles using the road. No problems have been encountered with the road surfaces since their construction.

Road Maintenance. Both primary roads are maintained by Amax Coal Company. As required, Amax Coal Company repairs the road surface, blades the adjacent drainage ditches, fills potholes, and resurfaces the road. Where necessary, minor reconstruction of road segments will be undertaken, together with revegetation of road cuts and fills and removal of brush.

Road Culverts. All culverts along primary roads were installed and are maintained in accordance with manufacturers recommendations. Thus, these culverts have sustained the vertical soil pressure, the passive resistance of the foundation, and the weight of vehicles using the roads. No evidence of structural problems has been observed with the culverts.

12.5.3.5 Spoil

No spoil will be generated in conjunction with the project.

12.5.3.6 Coal Mine Waste

A description of disposal of the underground development waste to be removed during the project is provided in Section 12.5.2.8.3. Details regarding the Refuse Disposal Facility are presented in Section 3.4 of this M&RP. This information is summarized below.

12.5.3.6.1 Design

The Refuse Disposal Facility has been designed to meet a minimum static safety factor of 1.5. As indicated in Appendix 3.4C, the safety factor of the Refuse Disposal Facility is 4.6 under static conditions and 2.6 under seismic conditions. This design and the associated evaluations were based on the results of foundation and laboratory analyses of soils and waste at the site of the facility.

12.5.3.6.2 Waste Emplacement

Underground development waste will be placed at the Refuse Disposal Facility in a manner that enhances the stability of the waste pile. The waste will be placed in horizontal lifts that do not exceed two feet in thickness. The material will be dumped from the haul trucks or other suitable equipment. Dozers or graders will be used to rework and initially compact the dumped material. Additional compaction of each lift will be accomplished in a manner that ensures adequate compaction (e.g., by routing the loaded haul trucks over the lift surface in such a manner as to cover the entire area uniformly, through the use of sheeps-foot compactors, etc.). The underground development waste will be covered during reclamation to minimize public hazards and the potential for spontaneous combustion.

12.5.3.6.3 Excess Spoil Fills

No excess spoil fills will be associated with the project.

12.5.3.6.4 Impounding Structures Constructed of Coal Mine Waste

No impounding structures have been constructed of coal mine waste in the permit area.

12.5.3.6.5 Disposal of Coal Mine Waste in Special Areas

No coal mine waste will be disposed of in special areas in the permit area.

12.5.3.6.6 Underground Development Waste

A detailed description of the geotechnical investigations, design, construction, operation, maintenance, and reclamation of the Refuse Disposal Facility is provided in Section 3.4 of this M&RP.

12.5.3.6.7 Coal Processing Waste

No coal processing waste will be generated in conjunction with the project.

12.5.3.6.8 Coal Processing Waste Banks, Dams, and Embankments

No coal processing waste banks, dams, or embankments exist within the permit area.

12.5.3.6.9 Refuse Piles

A detailed description of the Refuse Disposal Facility is provided in Section 3.4 of this M&RP. This section contains:

- o A description of pre-disturbance soils at the site and the suitability of the site for reclamation,

- o Certification of the design and plans,
- o Compliance with applicable MSHA regulations,
- o A description of proposed inspection activities,
- o A description of the design, stability, operation, and reclamation of the waste-rock site, and
- o A discussion of runoff- and sediment-control plans associated with the site.

12.5.3.7 Regraded Slopes

12.5.3.7.1 Division Approval

No mining or reclamation activities will be conducted in the project area that require approval of the Division for alternative specifications or for steep cut slopes due to the inability of Amax Coal Company to meet regulatory requirements for:

- o Protection of fish, wildlife, and related environmental values (R645-301-358),
- o Certification of the design of primary roads (R645-301-512.250),
- o Road classification (R645-301-527.100),
- o Maintenance of roads to meet their design standards throughout their use or remediation of damage caused by catastrophic events (R645-301-527.230),
- o Location, design, construction, reconstruction, use, maintenance, or reclamation of roads in a manner that prevents damage to public or private property, utilizes nonacid- and nontoxic-forming substances in road surfacing, and achieves an acceptable static safety factor against slope failure (R645-301-534.100),
- o Design of roads to ensure environmental protection and safety (R645-301-534.200),
- o Design, location, surfacing, maintenance, and drainage of primary roads in a manner that allows continued use of the road (R645-301-534.300),

- o Retention of a road following reclamation that is not necessary as part of an approved post-mining land use (R645-301-542.600 and R645-301-762), and
- o Road drainage (R645-301-742.410, R645-301-742.420, and R645-301-752.200).

12.5.3.7.2 Regrading of Settled and Revegetated Fills

Amax Coal Company is not requesting a variance from the approximate original contour requirements of R645-301-553.600.

12.5.4 RECLAMATION PLAN

12.5.4.1 General

12.5.4.1.1 Commitment

It is currently planned that the Willow Creek site will be utilized after the project discussed in this chapter for surface facilities associated with a proposed underground mining operation. Under such a condition, a reclamation plan for this proposed operation will be prepared and submitted to the Division at a future time, accounting for the proposed design of the operation. If the decision is made to not proceed with the proposed Willow Creek mining operation, Amax Coal Company will close, backfill, or otherwise permanently reclaim all affected areas in accordance with the R645 regulations after completion of the Willow Creek Refuse Removal Project.

Reclamation of the Refuse Disposal Facility is discussed in Section 3.4 of this M&RP. This facility will be closed, backfilled, or otherwise permanently reclaimed in accordance with the R645 regulations and the permit. The plan which is presented below covers only reclamation of the Willow Creek site under the assumption that the site will not be further developed for future mining activities.

12.5.4.1.2 Surface Coal Mining and Reclamation Activities

No surface coal mining and reclamation activities will be conducted in the project area.

12.5.4.1.3 Underground Coal Mining and Reclamation Activities

Although underground coal mining activities will not occur in conjunction with the Willow Creek Refuse Removal Project, the highwall that will be left following removal of the underground development waste will be similar to a highwall associated with an underground coal mining operation. Therefore, reclamation activities associated with the project will be discussed in this section.

Upon cessation of the project, all surface equipment, structures, or other facilities not approved by the Division as suitable for the post-mining land use or environmental monitoring will be removed and the affected lands reclaimed.

12.5.4.1.4 Environmental Protection Performance Standards

The plan presented herein is designed to meet the requirements of R645-301 and the environmental protection performance standards of the State Program.

12.5.4.2 Narratives, Maps, and Plans

12.5.4.2.1 Reclamation Timetable

A timetable for the completion of each major step in the reclamation plan is presented in Figure 12-5-3.

12.5.4.2.2 Plan for Backfilling, Soil Stabilization, Compacting, and Grading

The regrading plan for the Refuse Disposal Facility is presented in Section 3.4-4. The regrading plan for the Willow Creek site was designed to meet the objectives of balancing cut and fill quantities, maintaining a geotechnically stable surface configuration, and controlling erosion. Major features of the Willow Creek reclamation plan are:

- o Implementation of interim reclamation sediment-control measures and removal of the operational sediment control structures,
- o Backfilling to remove highwalls to the extent possible within the objectives noted above (cut and fill balance, site stability, and erosion control),
- o Placement of topsoil on the regraded slope, and
- o Revegetation of the topsoiled areas.

Reclamation of the Willow Creek site will occur in three primary phases. In the first phase, the office trailer and the associated concrete pad will be removed and salvaged or landfilled. An interim sedimentation pond will then be constructed in the area of the confluence of UD-1 and the Willow Creek stream channel, adjacent to the area from which the refuse was excavated. The excavation will then be backfilled, topsoiled, and revegetated.

Once revegetation of the former refuse area is sufficient to allow removal of the reclamation sedimentation pond, the second phase of reclamation will begin. This phase will involve removal of the reclamation sedimentation pond followed by rough-grading, topsoiling, and revegetation of the area between the former refuse area and the stream crossing. The stream crossing will then be removed, the office pad area will be reclaimed, and the topsoil-stockpile area will be reclaimed.

Phase III of reclamation will occur once revegetation of the area reclaimed in Phase II is sufficient to permit removal of the sediment-control structures. At that time, the sediment

traps adjacent to the office pad and the topsoil stockpile will be removed and the area occupied by those structures will be reclaimed.

The estimated cut quantity for the Willow Creek site is 239,630 cubic yards with an estimated fill quantity of 235,807 cubic yards (see Appendix 12-5-2). The minor difference between the two numbers (less than 2 percent) will be made up in compaction. Fill materials required for reclamation will be obtained primarily from the area immediately adjacent to the highwall (i.e., the original materials removed to form the highwall prior to placement of the underground development waste in the area). Regrading activities will continue until the final surface configuration defined by Exhibit 12-5-2 has been achieved. Details regarding topsoil placement and revegetation following regrading are provided in Sections 12.2 and 12.3, respectively.

Building Demolition. Prior to significant regrading activities at the site, the existing office trailer will be removed from the area. To the extent possible, this structure will be salvaged. Those materials requiring off-site disposal will be placed in a licensed landfill. Final decisions regarding salvage or disposal of the structure will be made just prior to reclamation following an assessment of the salvageability of the structure.

Sedimentation Pond and Dam Removal and Interim Sediment Control. Sedimentation Pond No. 1 will be removed during pad regrading and backfilling of the highwall excavation. This will be accomplished using backhoes, loaders, dozers, and other appropriate earthmoving equipment. Similarly, the sediment traps at the site will be backfilled during site regrading activities.

Immediately following removal of the sedimentation pond and the sediment traps, silt fences will be installed at the downstream edge of the pond or trap locations, noted on Exhibit 12-5-2, to control erosion. These silt fences will be installed using a supportive backing and burying the toe of the filter fabric as noted in Figure 12-5-4.

On a temporary basis, straw-bale dikes may be installed as necessary to control localized erosion prior to the establishment of revegetation efforts. If installed, locations of the straw-bale dikes will be selected to reduce sediment contributions to runoff based on field observations. Straw-bale dikes will be installed by keying the bales into the ground as noted in Figure 12-5-4.

Backfilling and Compaction. All vegetation, organic matter, and debris will be cleared from areas to receive fill. The cut material from site regrading will be placed as fill and graded to facilitate drainage. Topsoil will be placed on the final slope using methods that minimize compaction (see Section 12.2 of this chapter).

12.5.4.2.3 Final Surface Configuration Maps and Cross Sections

A final surface configuration map for the Willow Creek site are provided on Exhibit 12-5-2. No facilities related to the project operations will remain in the project area following reclamation. Information regarding the final surface configuration of the Refuse Disposal Facility is provided in Section 3.4-4.

12.5.4.2.4 Removal of Temporary Structures

All surface structures associated with the project will be removed as outlined in Section 12.5.4.2.2. A description ensuring that all structures, the sedimentation pond, and sediment traps have been removed will be provided to the Division before seeking bond release or abandoning the project area.

12.5.4.2.5 Removal of Sedimentation Ponds

Information regarding removal of the sedimentation ponds associated with the Willow Creek Refuse Removal Project is provided in Section 12.5.4.2.2. The timetable for removal of these ponds is indicted in Figure 12-5-3.

12.5.4.2.6 Roads

The ancillary access road associated with the project will be regraded to blend with the surround topography. Where backfilling of the road will occur, placement and compaction of the backfill material will be as indicated in Section 12.5.2.4.2.

Proposed reclamation contours following closure of the ancillary access road are presented in Exhibit 12-5-2. The stream crossing will be retained to permit site access in case maintenance of the reclaimed surface becomes necessary. This culvert will be removed at the end of the reclamation period prior to bond release.

Following regrading of the road, topsoil will be applied to the regraded surfaces and the area will be revegetated. Topsoiling and revegetation activities are discussed in Sections 12.2 and 12.3, respectively.

12.5.4.2.7 Final Abandonment of Mine Openings and Disposal Areas

Abandonment of Openings. No mine openings will be associated with the Willow Creek Refuse Removal Project.

Disposal of Excess Spoil. No excess spoil will exist in conjunction with the project.

Disposal of Coal Mine Waste. All underground development waste associated with the project will have been disposed of at the Refuse Disposal Facility prior to reclamation. Information regarding reclamation plans for this facility is provided in Section 3.4-4.

Disposal of Non-Coal Mine Wastes. All non-coal mine waste generated from mining and reclamation operations will be disposed of as outlined in Sections 12.5.2.1.1 and 12.5.2.8.3. Following cessation of mining activities, non-coal mine waste that is still temporarily stored at the site will be removed and disposed of at the Carbon County Landfill.

Non-coal waste that is generated during the course of reclamation (i.e., as a result of building demolition) will likewise be disposed of at an off-site location (either the Carbon County Landfill or an alternative state-approved solid-waste disposal area).

12.5.4.2.8 Estimated Cost of Reclamation

The estimated cost to reclaim the project surface area is provided in Appendix 12-5-3.

12.5.5 RECLAMATION DESIGN CRITERIA AND PLANS

12.5.5.1 Casing and Sealing of Underground Openings

No underground openings will be associated with the Willow Creek Refuse Removal Project.

12.5.5.2 Permanent Features

12.5.5.2.1 Small Depressions

During final grading and spreading of topsoil, small depressions may be left in the soil to retain moisture, minimize erosion, and assist revegetation. No other small depressions are planned.

12.5.5.2.2 Permanent Impoundments

No permanent impoundments will be left following reclamation.

12.5.5.3 Backfilling and Grading

Plans for backfilling and grading of the site upon reclamation have been presented in Section 12.5.4.2.2. This plan was designed to comply with the applicable requirements of R645-301-500 and R645-301-700. As indicated in Section 12.5.4.2.2, backfilling and grading operations will be conducted in a controlled manner.

12.5.5.3.1 Disturbed Area Backfilling and Grading

Disturbed Areas. The disturbed area associated with the project will be graded to achieve approximate original contour. Furthermore, the backfilling and grading plan has been designed to eliminate highwalls at the site. No spoil piles exist. With the exception of the small depressions discussed in Section 12.5.5.2.1, no depressions will be retained at the site following reclamation.

Slope Stability. Backfilled and regraded slopes have been designed to not exceed the angle of repose. Final reclamation slopes have been designed to be stable (see Appendix 12-5-1), thus preventing slides.

Erosion and Water Pollution. Temporary sediment-control measures will be implemented during and following backfilling and regrading as outlined in Section 12.5.4.2.2. As vegetation becomes established on the reclaimed surfaces, erosion potentials will be further minimized. By minimizing erosion, water pollution will also be precluded. Additional water-quality concerns do not exist at the site.

Post-Mining Land Use. The disturbed area will be backfilled and regraded in a manner that supports the approved post-mining land use.

12.5.5.3.2 Spoil and Waste

Spoil. No spoil will be associated with the project area.

Refuse Piles. Details regarding the design, operation, final surface configuration, and final grading of the Refuse Disposal Facility is provided in Section 3.4 of this M&RP. As noted in that Section, the waste-rock disposal site has achieved a long-term static safety factor well in excess of the minimum acceptable static safety factor of 1.3 as required by R645-301-553.260.

Coal Processing Waste. No coal processing waste is associated with the Willow Creek Refuse Removal Project.

12.5.5.3.3 Exposed Coal Seams, Acid- and Toxic-Forming Materials, and Combustible Materials

Exposed Coal Seams. The coal seam which will have been exposed at the base of the highwall as a result of removal of the underground development waste from the Willow Creek site will be covered with a minimum of four feet of nontoxic and noncombustible materials during final backfilling and grading. This cover material will consist of material removed during grading of the site (see Section 12.5.4.2.2), subsoil, and/or topsoil.

Acid- and Toxic-Forming Materials. As noted in Section 12.6.2.4.5, acid- or toxic-forming materials are generally not present in the refuse. To verify the absence of acid- and toxic-forming materials prior to reclamation seeding (assuming the site is not converted to an active mining operation), the soils beneath the removed refuse materials will be sampled as follows:

- o The area where the refuse materials were removed will be gridded on 50 foot centers,
- o Five sampling sites will be randomly selected within the grid area and sampled,

- o Samples will be submitted to a certified laboratory and tested for acid and toxic properties, and
- o Laboratory results will be reviewed and the results submitted to UDOGM.

All runoff from the site during reclamation will be channeled through proper control measures (See Section 12.7.6).

Combustible Materials. No combustible materials will be associated with the project.

12.5.5.3.4 Cut-and-Fill Terraces

No terraces will be cut into regraded slope at the Willow Creek site.

12.5.5.3.5 Highwalls From Previously Mined Areas

The highwall which will exist following removal of the underground development waste from the site will be covered during reclamation.

12.5.5.3.6 Approximate Original Contour

The highwall area (AML site) will be backfilled and regraded to approximate original contour. All reasonably available material will be placed against the highwall to assure long-term stability and provide for effective drainage. The slope of the backfill will permit vegetation to become established, thereby ensuring compatibility with the post-mining land use of wildlife habitat. The final surface configuration of the fill will be similar to the pre-project configuration.

12.5.5.3.7 Backfilling and Grading - Thin Overburden

No surface coal mining and reclamation activities involving thin overburden occur within the project area.

12.5.5.3.8 Backfilling and Grading - Thick Overburden

No surface coal mining and reclamation activities involving thick overburden occur within the project area.

12.5.5.3.9 Regrading of Settled and Revegetated Fills

No regrading of settled and revegetated fills is anticipated in the project area.

12.5.6 PERFORMANCE STANDARDS

Reclamation operations at the Willow Creek Refuse Removal Project will be conducted in accordance with the approved permit and the requirements of R645-301-510 through R645-301-553.

SECTION 12.6 GEOLOGY

12.6.1 INTRODUCTION

This section concerns the geologic resources in the area of the proposed Willow Creek Site (site). Because Chapter 6 of this mining and reclamation plan (M&RP) contains a detailed discussion of geologic resources and conditions at the Castle Gate Coal Mine, the information is not repeated here. Rather, this section primarily consists of references to sections in Chapter 6 which address UDOGM Rules regarding information applicable to the site.

12.6.1.1 General Requirements

The geologic resources in the area of the proposed site are discussed in Sections 6.1 and 6.2 of Chapter 6 of this M&RP. No underground mining will be conducted, thus, plans for subsidence monitoring are not addressed in this Section.

12.6.1.2 Certification

All maps, plans, and cross-sections referenced in this section have been certified by a professional engineer licensed in the state of Utah.

12.6.2 ENVIRONMENTAL DESCRIPTION

Chapter 6, Sections 6.1 and 6.2 of this M&RP contain descriptions of the geologic resources in the area of the proposed site.

12.6.2.1 General Requirements

Sections 6.1 and 6.2 of this M&RP present regional and site-specific geologic information for the proposed area.

12.6.2.2 Cross Sections, Maps and Plans

Exhibit 12-6-1 of this M&RP depicts the geology of the site area. Exhibit 6-2 in Chapter 6 of this M&RP shows the locations and surface elevations of existing drillholes in the area. Drillhole logs are presented in Appendix 12-6-1.

Figure 6-1 (Chapter 6) is a stratigraphic section of the Book Cliffs region. Figure 6-2 (Chapter 6) is a generalized stratigraphic section of the Willow Creek area. Exhibit 6-2A of this M&RP are geologic cross-sections through the area.

No oil or gas wells are located on the Castle Gate property.

12.6.2.3 Geologic Determinations

The information required by UDOGM to make a determination of the acid- or toxic-forming characteristics of the site materials is presented in Section 12.6.2.4.5 of this chapter. The information required by UDOGM to make a determination as to whether the reclamation plan (described in Section 12.5.4) can be accomplished is presented in Chapter 6 of this M&RP. The information required to prepare the subsidence control program is addressed in Section 6.3 of Chapter 6 of this M&RP.

12.6.2.4 Geologic Information

12.6.2.4.1 Regional Setting

The regional geologic setting of the site is discussed in Section 6.1 of Chapter 6 of this M&RP.

12.6.2.4.2 Stratigraphy

Site stratigraphy is discussed in Sections 6.1 and 6.2 of Chapter 6 of this M&RP.

12.6.2.4.3 Structure

Exhibit 6-2A depicts cross sections through the area. Structural features in the site area are discussed in Section 6.1 of Chapter 6 of this M&RP.

12.6.2.4.4 Surface and Groundwater Impact

Surface and groundwater impact are discussed in Section 12.7 of this chapter.

12.6.2.4.5 Coal Geology

The characteristics of coal in the site area are described in Section 6.2 of Chapter 6 of this M&RP.

Acid, Toxic, and Alkaline Chemical Analyses (waste rock). Chemical analyses for acid- and toxic-forming and alkalinity-producing materials from the waste rock collected at the site are presented in Appendix 12-6-2. Using Table 2 in the Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining (Appendix 12-6-3), all analyte values are acceptable, with the exception of boron in sample 94-12-2R, which was analyzed

at 7.2 mg/Kg (2.2 mg/Kg in excess of the "Unacceptable" level). Sections 12.5.5.3 and 12.2.3.3 contain additional information concerning acid- and toxic-forming and alkalinity-producing materials.

Acid, Toxic, and Alkaline Chemical Analyses (coal seam). Because no coal mining will be conducted at the site, coal analyses are not presented in this chapter.

Cross-Sections, Maps and Plans. Geologic cross-sections and maps are discussed in Section 12.6.2.2.

Drill Logs and Chemical Analyses. See Appendices 12.6-1 and 12.6-2.

12.6.2.4.6 Test Boring and Drillhole Data

The drill logs and chemical analyses required by regulations 645-301-624.310 through 645-301-624.330 are presented in Appendices 12-6-1 and 12-6-2, respectively. Locations of seven test borings are shown on Exhibit 12-6-1. Descriptions of samples obtained from the test borings indicate that coal refuse in the stockpile is as much as 60 feet thick. Comparison of 1976 site topography (prior to the stockpiling of coal refuse) and geologic maps of the Willow Creek area suggest the coal refuse overlies unconsolidated colluvium and Blackhawk Formation sandstone.

Lithologic Logs. Lithologic logs of drillholes are presented in Appendix 12-6-1.

12.6.2.5 Additional Geologic Information

It is not anticipated that additional geologic data will need to be collected for this site.

12.6.2.6 Sampling Waivers

Amax Coal Company does not request a sampling waiver for this site.

12.6.2.7 Description of the Overburden Thickness and Lithology

Overburden thickness and characteristics are discussed in Section 6.3 of this M&RP.

12.6.3 OPERATION PLAN

12.6.3.1 Casing and Sealing of Exploration Holes

Test hole TH-02 was completed as a monitoring well with 1-inch diameter PVC casing and screen. The screened interval is from 119.6 to 99.6 feet below ground level, and bentonite grout was emplaced from 92.2 feet to the surface. The remaining test holes were backfilled to surface with cuttings.

12.6.3.2 Subsidence Monitoring

The monitoring of subsidence resulting from Castle Gate Mine operations is discussed in Sections 6.2 and 6.3 of Chapter 6 of this M&RP. Because no mining is presently planned for the site, no additional subsidence monitoring plan has been developed.

12.6.4 PERFORMANCE STANDARDS

12.6.4.1 Exploration Drillholes

Aside from the geotechnical boreholes discussed in Section 12.6.2.4.6, exploratory drilling is not proposed as part of the Willow Creek Site plan.

SECTION 12.7 HYDROLOGY

12.7.1 INTRODUCTION

This section provides a discussion of hydrologic resources at the site of the Willow Creek Refuse Removal Project (project). In addition, a discussion is presented of operation plans and potential impacts to the hydrologic balance as a result of the project.

12.7.1.1 General Requirements

This section includes descriptions of the existing hydrologic resources, proposed operations, potential impacts to the hydrologic balance, and applicable hydrologic performance standards. Methods and calculations utilized to achieve compliance with the hydrologic design criteria are also presented.

12.7.1.2 Certification

Where required by the regulations, cross sections and maps in this section have been prepared by or under the direction of, and certified by, qualified registered professional engineers or land surveyors.

12.7.1.3 Inspection

Impoundments will be inspected in accordance with the requirements of R645-301-514.300, as described in Section 12.5.1.4.3 of this chapter.

12.7.2 ENVIRONMENTAL DESCRIPTION

12.7.2.1 General Requirements

This section contains a description of the existing hydrologic resources within the proposed project and adjacent areas that may be affected by the Willow Creek Refuse Removal Project.

12.7.2.2 Cross Sections and Maps

12.7.2.2.1 Subsurface Water

Discussions and cross sections concerning groundwater are presented in Section 12.7.2.4.1.

12.7.2.2.2 Surface Water

Discussions and maps concerning surface water are presented in Section 12.7.2.4.2.

12.7.2.2.3 Monitoring Stations

Locations of historic monitoring stations used to gather the baseline data required for preparation of this section are shown on Exhibit 12-7-1. Also presented on Exhibit 12-7-1 are the UPDES discharge points for both existing and proposed sediment traps and pond.

12.7.2.2.4 Water Wells

No water supply wells exist within the project or adjacent areas.

12.7.2.2.5 Topographic Maps

A topographic map showing existing contours at the project and adjacent areas is provided as Exhibit 12-5-1.

12.7.2.3 Sampling and Analysis

Analyses of samples collected in the project area have been performed in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" or the methodology outlined in 40 CFR 136 and 434.

12.7.2.4 Baseline Information

12.7.2.4.1 Groundwater Information

A discussion of regional and local groundwater conditions is provided in Chapter 7, Sections 7.1 and 7.3 of this M&RP. Information presented in this section will concentrate on groundwater conditions in the immediate vicinity of the Willow Creek site.

Fifteen drill holes were installed at the Willow Creek site and adjacent areas as part of a geotechnical investigation (see Appendix 12-6-1). Groundwater was encountered in only 3 of the 15 drill holes. No groundwater was encountered within the coal refuse.

Data obtained from the geotechnical drill holes were used to construct the cross section shown on Figure 12-7-1. These data suggest that groundwater occurs at depths of at least 20 feet below the bottom of the refuse. Hence, groundwater will not be encountered during project. Data collected from drill holes TH-01 and TH-02 indicate that the flow of groundwater beneath the coal refuse is toward Willow Creek.

No wells or springs are known to exist within the project or adjacent areas. However, water rights have been filed on water encountered within four mines in the area. Locations of these water rights are shown on Exhibit 12-7-2. Data concerning these water rights are summarized in Table 12-7-1. All underground water rights in the area were filed in conjunction with coal mining. Section 7.4 contains additional discussion concerning water rights. A water right controlled by the applicant will be used when water is to be diverted for use in dust suppression. When necessary a "change in point of diversion" will be filed and approved by the Division of Water Rights.

No water-quality data are available for the waters encountered in the old mine workings noted on Exhibit 12-7-1. However, samples were collected from point B-27 (Exhibit 12-7-1), at Cross Cut No. 3 of the old Royal Mine, for the period of March 1985 through April 1992. These data are provided in Appendix 12-7-1 and summarized in Figure 12-7-2.

According to the data contained in Appendix 12-7-1, the mine water encountered at B-27 was typically a calcium/magnesium bicarbonate water, with total dissolved solids (TDS) concentrations which averaged 647 milligrams per liter (mg/l) and ranged from 275 to 1060 mg/l during the period of record. TDS concentrations tended to be highest in the fall and winter months, although variations in this generality have were also observed.

The water encountered at B-27 was slightly alkaline, with a pH which has averaged 8.2 and ranged from 7.4 to 8.6. No seasonal variations in pH are apparent.

Total iron concentrations at station B-27 averaged 2.52 mg/l and ranged from <0.02 to 12.70 mg/l during the period of record. Total manganese concentrations averaged 0.09 and ranged from 0.01 to 0.46 mg/l. Both total iron and total manganese concentrations appear to have been directly proportional to suspended solids concentrations. Since these samples represented groundwater flowing into the mine, elevated suspended solids concentrations (and the associated elevations in total iron and total manganese

concentrations) were probably more a function of sampling error than natural variation. No seasonal variations in the concentrations of total iron and total manganese are apparent.

No water quality samples were collected from the geotechnical drill holes. The quality of this water (i.e., groundwater beneath the Willow Creek refuse material) is assumed to be similar to that collected at station B-27.

12.7.2.4.2 Surface Water Information

A discussion of regional and local surface water conditions is provided in Chapter 7, Sections 7.2 and 7.3 of this M&RP. Information presented in this section will concentrate on surface water conditions in the immediate vicinity of the Willow Creek site.

The refuse is located immediately northwest of Willow Creek, approximately 1.2 miles upstream from the confluence of Willow Creek and the Price River. No other permanent water bodies occur within the project or adjacent area.

The locations of surface-water rights in the project and adjacent areas are shown on Exhibit 12-7-2. Information regarding these rights are summarized in Table 12-7-2. These rights are used for dust suppression, stock watering, and industrial purposes (steam generation). It is of note that the rights shown in Sec. 36, T. 12 S., R. 9 E. are plotted as shown in the records of the Utah Division of Water Rights but are used to divert water from the Price River for steam generation at the power plant located near the confluence of Willow Creek and the Price River. Therefore, these rights are probably not actually located as plotted.

The U.S. Geological Survey has maintained a gaging station on Willow Creek approximately 4.2 miles upstream from the site for the period of October 1962 through September 1989. During the 27-year period of record, the flow of Willow Creek at that gaging station has averaged 9.56 cubic feet per second (6,930 acre-feet per year). Extremes

for the period have ranged from a maximum of 836 cubic feet per second on August 6, 1973 to no flow on many days.

Monthly flows in Willow Creek are typically greatest during the period of April through June as a result of snowmelt runoff. Annual peak flows frequently occur during the summer months in response to localized, high-intensity thunderstorms.

Samples have been collected from Willow Creek at the locations shown on Exhibit 12-7-1 for periods varying from 5 to 15 years. These data are provided in Appendix 12-7-1 and summarized in Figures 2-7-3, 2-7-4, and 2-7-5 as well as Table 12-7-3.

According to the data contained in Appendix 12-7-1 and Table 12-7-3, Willow Creek typically contains a calcium/magnesium bicarbonate water, with TDS concentrations which have averaged 587 mg/l at B-1, 619 mg/l at B-2, and 604 mg/l at B-3 during the various periods of record. The water is slightly alkaline, with average pH values of 7.9, 8.1, and 8.2 at B-1, B-2, and B-3, respectively. A slight inverse relationship exists in Willow Creek between TDS concentrations and flow rates. No seasonal variations are apparent with respect to pH.

Total suspended solids concentrations at B-1, B-2, and B-3 have averaged 300, 608, and 363 mg/l, respectively. These concentrations tend to be directly proportional to flow rates, although outliers are not uncommon.

Total iron concentrations have averaged 14.62 mg/l at B-1, 16.17 mg/l at B-2, and 12.17 mg/l at B-3. Total manganese concentrations have averaged 0.20, 0.15, and 0.15 mg/l at stations B-1, B-2, and B-3, respectively. Both total iron and total manganese concentrations tend to be directly proportional to suspended solids concentrations.

An evaluation of the Willow Creek water quality data using Student's t test indicates that no significant differences exist in TDS concentrations between each of the three Willow

Creek sampling stations at a confidence interval of 90 percent. Similarly, concentrations of total suspended solids, total iron, and total manganese are not significantly different between the stations.

The t test indicated that significant differences exist between pH values at B-1 and each of the two downstream stations. However, the variation in average pH values between B-1 and the other stations is minor (7.9 vs. 8.1 and 8.2). In addition, no significant differences occur between pH values at B-2 and B-3 (i.e., those stations which lie immediately up- and downstream from the Willow Creek site, respectively).

Data presented in Section 12.6 regarding the acidity of the materials to be involved in the project indicate that there is no significant potential for acid drainage to occur from the project site.

12.7.2.4.3 Geologic Information

Information regarding the geology of the project area is discussed in Section 12.6 of this chapter.

12.7.2.4.4 Climatological Information

Information regarding the climatology of the Willow Creek site is presented in Chapter 11 of this M&RP.

12.7.2.4.5 Supplemental Information

The information presented in this section is considered adequate for defining the magnitude of potential impacts to the hydrologic balance from implementation of the project.

12.7.2.4.6 Survey of Renewable Resource Lands

Because the Willow Creek Refuse Removal Project does not involve underground mining, no subsidence will occur. Hence, renewable resource lands will not be impacted by subsidence as a result of the project.

12.7.2.4.7 Alluvial Valley Floors

Conditions related to Alluvial Valley Floors at the Willow Creek site are addressed in Chapter 7, Appendix 7-3. As indicated, "the Division has made the determination that present and future mining will not change the status or condition of the water resources, soils, or geology relating to alluvial valley floors in or adjacent to the mine plan area. Mining will not interrupt or cause diminution of the existing groundwater or irrigation waters in a significant manner."

12.7.2.5 Baseline Cumulative Impact Area Information

The U.S. Office of Surface Mining Reclamation and Enforcement has previously prepared a Cumulative Hydrologic Impact Assessment for the area which includes the Willow Creek site. No additional information is required to supplement that assessment as a result of the project.

12.7.2.6 Modeling

Modeling techniques were not used in lieu of actual surface and groundwater data to assess local conditions and potential impacts in conjunction with the project.

12.7.2.7 Alternative Water Source Information

As noted in Section 12.7.2.8, the project will not result in contamination, diminution, or interruption of an underground or surface source of water.

12.7.2.8 Probable Hydrologic Consequences Determination

This section addresses the probable hydrologic consequences of the Willow Creek Refuse Removal Project. Mitigating measures are discussed generally in this section and in detail in Section 12.7.3 of this chapter.

12.7.2.8.1 Potential Impacts to Surface and Groundwater

Potential impacts of the project on the quality and quantity of surface and groundwater flow may include:

- o Contamination from acid- or toxic-forming materials;
- o Increased sediment yield from disturbed areas;
- o Increased total dissolved solids concentrations;
- o Flooding or stream flow alteration;
- o Impacts to surface water availability;
- o Hydrocarbon contamination from the use of hydrocarbons in the permit area;
and
- o Contamination of surface water from spillage of refuse during hauling operations.

These potential impacts are addressed in the following sections of this chapter.

7.2.8.2 Baseline Hydrologic and Geologic Information

Baseline geologic information is presented in Section 12.6 of this chapter. Baseline hydrologic information is presented in Sections 12.7.2.4.1 and 12.7.2.4.2 of this chapter.

7.2.8.3 PHC Determination

Potential Impacts to the Hydrologic Balance. Potential impacts to the hydrologic balance are addressed in the following subsections of this chapter.

Acid- or Toxic- Forming Materials. Information on acid- and toxic-forming materials is presented in Sections 12.2.3, 12.5.5, and 12.6. These data show that no acid-forming materials exist within the refuse. Thus, no potential exists for the generation of acidic leachate.

Section 12.6 indicates that the refuse exhibits a slight toxicity with respect to boron. All refuse material will be excavated from the Willow Creek site and properly disposed of at the Castle Gate Refuse Removal Facility. Hence, toxic-forming materials will not impact the local hydrologic balance.

Sediment Yield. The potential impact of the project on sediment yield is an increase in sediment in the surface waters downstream from disturbed areas. Sediment-control measures (including sedimentation ponds and traps) have been and will be installed to minimize this impact. These facilities will be regularly inspected (see Section 12.5.1.4) and maintained. The sediment-control measures designed for the site are considered adequate for minimizing the impacts of increased sediment yield on adjacent streams.

During reclamation, Alternative Sediment Control Measures will be implemented as outlined in Section 12.7.6. These measures may include proper surface soil preparation, application of wood fiber hydromulch, and the use of silt fences and straw-bale dikes. The

proposed sediment control measures to be implemented during reclamation will preclude adverse impacts to the environment.

Acidity, Total Suspended Solids, and Total Dissolved Solids. No acid-forming materials are associated with the project. Probable impacts of the project on the total suspended solids concentrations of surface water in the project area were addressed previously in this section. Impacts to TDS concentrations will be minimized since groundwater will not be encountered and pumped to local surface waters during the project.

Flooding or Streamflow Alteration. Runoff from all disturbed areas will flow through sedimentation ponds or other sediment-control devices prior to discharge to adjacent undisturbed drainages. Three factors indicate that these sediment-control devices will minimize or preclude flooding impacts to downstream areas as a result of project operations:

1. The sediment-control facilities have been designed and will be constructed to be geotechnically stable. Thus the potential is minimized for breaches of the sediment-control devices to occur that could cause downstream flooding.
2. The flow routing that will occur through these sediment-control devices will reduce peak flows from the disturbed areas. This will preclude flooding impacts to downstream areas.
3. By retaining sediment on site in the sediment-control devices, the bottom elevations of stream channels downstream from the disturbed areas will not be artificially raised. Thus, the hydraulic capacity of the stream channels will not be altered.

Reclamation activities will not alter Willow Creek. Thus, this stream channel will maintain its current hydraulic capacity. Thus, flooding in the reclaimed areas will be precluded. Interim sediment-control measures and maintenance of the reclaimed areas during the post-operation period will preclude deposition of significant amounts of sediment in downstream channels following reclamation, thus maintaining the hydraulic capacity of the channels and precluding adverse flooding impacts.

Groundwater and Surface Water Availability. As noted in Section 12.7.2.4.1, the potentiometric surface lies at least 20 feet below the coal refuse at the Willow Creek site. Hence, groundwater will not be encountered and its availability will not be reduced as a result of the project.

Surface runoff will be retained on site in the sedimentation ponds and traps. The retention of this water will decrease the quantity of water which flows into Willow Creek. According to the Utah Division of Water Resources (1975), the mean annual yield of watersheds in the vicinity of the Willow Creek site is slightly less than 1 inch. Assuming a yield of 1 inch for the 28.8-acre area which will drain to sedimentation ponds and traps at the site, and assuming that all of this water is retained on site, the average annual flow of Willow Creek will be reduced by 2.4 acre-feet, a reduction of 0.03 percent based on the 27-year period of record. This impact is not considered significant.

Potential Hydrocarbon Contamination. Diesel fuel, oils, greases, and other hydrocarbon products will be used at the site during project operations. These products may spill onto the ground during servicing and maintenance of equipment. The probable future extent of the contamination caused by diesel and oil spillage is expected to be small due to the short-term nature of the project. In addition, spillage will be minimized to avoid the loss of an economically valuable product. In the event of a significant hydrocarbon spill, the following steps will be followed: The spill will immediately be contained with either earthen berms or absorbent booms ("pigs"); both the site construction manager and Cyprus environmental representative will be notified; and the hydrocarbon product and contaminated soil will be cleaned-up and properly disposed of in a hazardous waste landfill. Hence, hydrocarbon contamination will be minimal and will not adversely impact the local hydrologic balance.

Refuse Haulage. During haulage of the refuse from the Willow Creek site to the Castle Gate Refuse Removal Facility, spillage of refuse materials may occur. This spillage will be minimized by not overfilling the haul trucks. However, in the event of accidental spillage of a significant quantity of refuse, the following steps will be taken: both the construction

manager and Cyprus environmental representative will be notified; equipment to clean-up the refuse spill would be mobilized immediately; and cleaned-up refuse material will be conveyed to the Castle Gate refuse pile for disposal. If the refuse spill were to occur during a rainstorm event, some of this material may wash into local streams. Possible impacts to the surface water are an increase in total suspended solids concentrations and turbidity from the fine coal particulates. Due to the short-term nature of the project, the probability of a significant spill occurring in an area sufficiently close to a stream channel to introduce coal to the stream bed is considered small.

In addition to spills, wind may carry particulates from the open top of the haul trucks into creeks near the road. The impact from fugitive dust is considered to be insignificant due to the small amounts lost during haulage in the project and adjacent areas.

12.7.2.9 Cumulative Hydrologic Impact Assessment

The U.S. Office of Surface Mining Reclamation and Enforcement has previously prepared a Cumulative Hydrologic Impact Assessment for the area which includes the Willow Creek site. Activities associated with the project are not anticipated to alter the conclusions of that assessment.

12.7.3 OPERATION PLAN

12.7.3.1 General Requirements

This section includes an operation plan which addresses the following:

- o Groundwater and Surface Water Protection and Monitoring Plan;
- o Design Criteria and Plans;
- o Performance Standards; and
- o Reclamation Plan.

12.7.3.1.1 Hydrologic-Balance Protection

Groundwater Protection. Groundwater will not be encountered in conjunction with the project. By excavating the refuse and disposing of it in a location which has been designed to accept such refuse, the project will further minimize the infiltration of acidic, toxic, or other harmful byproducts to the groundwater system.

Surface Water Protection. To protect the hydrologic balance, project operations will be conducted to handle earth materials and runoff in a manner that minimizes acidic or toxic drainage, prevents, to the extent possible, additional contributions of suspended solids to streamflow outside the permit area, and otherwise prevents water pollution. Additionally, adequate runoff- and sediment-control facilities will be maintained to protect local surface waters.

12.7.3.1.2 Water Monitoring

Groundwater Monitoring. As noted in Section 12.7.2.4.1, the potentiometric surface exists at least 20 feet beneath the bottom of the refuse at the Willow Creek site. Hence, it is improbable that groundwater will be either encountered or impacted during the project.

One of the geotechnical holes at the Willow Creek site was converted to a monitoring well (TH-02). The location of this monitoring well is noted on Exhibit 12-7-1. During project site activities, water levels will be measured in this monitoring well on a monthly basis to assist in verifying the lack of impact. All resulting data will be submitted to the Division at 3 month intervals or at the end of the project.

It is currently anticipated that the Willow Creek site will be constructed for use as a mine entry following removal of the existing refuse. If the decision is made to reclaim the site rather than using it as a surface entry, monitoring of water levels in the on-site monitoring

well will continue on a quarterly basis through the post-reclamation period. The resulting data will be provided to the Division in the annual monitoring report.

Additional groundwater monitoring will occur in the project area in accordance with plans outlined in Chapter 7, Section 7.5 of this M&RP.

Surface Water Monitoring. During project site activities, water samples will be collected on a monthly basis from Willow Creek at stations located both up- and downstream of areas that will be disturbed (i.e., at the approximate locations of stations B-2 and B-3 shown on Exhibit 12-7-1). These samples will be analyzed for total suspended solids, total dissolved solids, total iron, total manganese, and pH. All resulting data will be submitted to the Division at 3 month intervals or at the end of the project.

If the decision is made to reclaim the site rather than using it as a surface entry, monitoring of Willow Creek will continue on a quarterly basis through the post-reclamation period. Samples will be collected at stations B-2 and B-3 and analyzed for the parameters indicated above. The monitoring requirements may be modified in the future in consultation with the Division if the data demonstrate that such a modification is justified. The resulting data will be provided to the Division in the annual monitoring report.

As indicated on Exhibit 12-7-1, seven UPDES discharge points exist for the site. Three of these points, 017, 018, and 019, are currently permitted. The remaining four points are included to handle the new discharge points that will be required for this proposed operation. Therefore, a UPDES permit modification is being requested from Utah Division of Water Quality to cover these additional points. In the event of discharge from the sediment pond or any of the sediment traps, water quality samples will be collected in accordance with the UPDES permit requirements. Appendix 12-7-3 presents a copy of the existing UPDES permit. To date no discharge has occurred from any of the existing sediment traps, therefore, no samples have been collected.

Additional surface water monitoring will occur in the project area in accordance with plans outlined in Chapter 7, Section 7.5 of this M&RP.

12.7.3.1.3 Acid- and Toxic-Forming Materials

As indicated in Section 12.6, no acid-forming materials have been discovered in the refuse. However, a slight toxicity with respect to boron has been identified. All materials removed from the Willow Creek site will be placed in the Castle Gate Refuse Removal Facility. The treatment of these materials will be handled as indicated in Chapter 3, Section 3.4 of this M&RP.

12.7.3.1.4 Transfer of Wells

Before final release of the bond associated with the project, the monitoring well at the site will be sealed in a safe and environmentally sound manner in accordance with R645-301-631, R645-301-738, and R645-301-765. No wells exist that will require transfer of ownership.

12.7.3.1.5 Discharges

No discharges will occur into or from underground mine workings in conjunction with the project.

12.7.3.1.6 Stream Buffer Zones

Except for maintenance, topsoil and access facilities, and where required for excavation of the refuse material, Willow Creek will be protected by 100 foot stream buffer zone. In those areas where project activities will occur within less than 100 feet of the stream, operational drainage structures, as described in Section 12.7.4, will ensure that the hydrologic balance of this area is not disturbed. The drainage control structures proposed for this

operation, consisting of undisturbed and disturbed area diversions, sedimentation pond and sediment traps, will ensure that disturbed area runoff and sedimentation from events up to the 10-year, 24-hour event are controlled. Therefore, project activities should not cause or contribute to the violation of applicable Utah or Federal water standards and should not adversely effect the water quantity and quality or other environmental resources of the stream.

Stream Channel Diversions. No permanent stream channel diversions will occur in conjunction with the project. Temporary diversions will be constructed to divert runoff from undisturbed ephemeral drainages away from the project area. These temporary diversions have been designed in accordance with R645-301-742.300.

Buffer Zone Designation. The area surrounding the streams that is not to be disturbed will be designated as a buffer zone and marked as specified in R645-301-521.260.

12.7.3.1.7 Cross Sections and Maps

The locations of water rights for current users of surface water flowing into, out of, and within the project and adjacent areas is provided on Exhibit 12-7-2. Discharges associated with the project will occur only in the event of outflow from the sedimentation ponds or traps.

The location of all water diversion, collection, conveyance, treatment, storage, or discharge facilities planned for use in conjunction with the project are shown on Exhibit 12-5-1. Locations of each station to be used for water monitoring during project operations are presented on Exhibit 12-7-1. The proposed construction details and cross sections for the sedimentation ponds and traps are provided in Appendix 12-7-2.

Other Cross Sections and Maps. Other relevant cross sections or maps are presented and discussed in Section 12.5 of this chapter.

12.7.3.1.8 Water Rights and Replacement

Rule R645-301-731.800 applies to surface mining only. No surface mining will occur in conjunction with the Willow Creek Refuse Removal Project.

12.7.3.2 Sediment Control Measures

The sediment control measures to be implemented in conjunction with the project have been designed and will be constructed and maintained to prevent additional contributions of sediment to streamflow or to runoff outside the project area. In addition, these measures have been designed to meet applicable effluent limitations, and minimize erosion to the extent possible. The proposed structures to be used to control runoff in the project area include sedimentation ponds, sediment traps, and silt fences. The area of the topsoil stockpile will be protected by a containment berm as discussed in Section 12.2.3.4 of this chapter.

12.7.3.2.1 Siltation Structures

The siltation structures within the project area will consist of the sedimentation ponds and sediment traps, as described in Section 12.7.3.2.2.

12.7.3.2.2 Sedimentation Ponds

Two sedimentation ponds and four sediment traps will be used to control sediment at the Willow Creek site. Detailed descriptions of sediment-control facilities to be employed at the Willow Creek site are provided in Section 12.7.4.2.2. Information regarding the runoff and sediment controls at the Castle Gate Refuse Removal Facility is provided in Section 3.4 of this M&RP.

Compliance Requirements. All sedimentation ponds and traps will be maintained until removal for either additional site construction or site reclamation. When a pond or trap is

removed, the land occupied by the pond or trap will be revegetated in accordance with the reclamation plan defined in Section 12.5.4. The pond and traps have been designed in accordance with R645-301-742.200 through R645-301-742.240.

MSHA Requirements. MSHA requirements defined in 30 CFR 77.216 are not applicable to the sediment-control structures at the Willow Creek site.

12.7.3.2.3 Diversions

All diversions constructed in conjunction with the project will be constructed and maintained in accordance with R645-301-742.100 and R645-301-742.300.

12.7.3.2.4 Road Drainage

A description of road drainage near the Castle Gate Refuse Removal Facility is provided in Section 3.4 of this M&RP. Road drainage at the Willow Creek site will be provided by grading the improved dirt road to roadside ditches which will drain to the appropriate sediment traps. Water collected from the road surface will be diverted by the use of swales in the road and diversion ditches to the sediment traps. Appendix 12-7-2 presents the design calculations.

All roadside ditches will be maintained and repaired as needed during project activities. Following project activities, the dirt roads will either be removed as part of site construction or reclaimed.

The culvert which currently conveys flows in Willow Creek under the site access road will be removed as part of the road construction and replaced with an 8-foot diameter CMP culvert which is sized to handle the peakflow from the 100-year, 6-hour storm event. TerraMatrix has sized and designed this culvert as part of the Willow Creek Mining and Reclamation Permit Application. Other than the removal of the existing culvert and installation

of the new culvert, no other activities will occur within the channel. Based on inlet control conditions, this new culvert is capable of passing a peak flow of approximately 1,320 cfs. The 100-year, 6-hour peak flow for the Willow Creek channel in this reach is 815 cfs. Therefore, the culvert size will be more than sufficient. The culvert will be roughly 190 feet in length with a gradient that allows fish movement. The culvert inlet and outlet inverts will be set to allow fish movement and will be determined in conjunction with the Division of Wildlife Resources and Utah State Engineer's Office, using sound engineering practice to ensure that no head cutting will occur. Appendix 12-7-4 presents the peak flow determination and culvert sizing calculations. The culvert slope and alignment have been designed in consultation with Mr. Bill Bates of the Utah Division of Wildlife Resources. The slope was set at a grade which will allow fish migration through the culvert under normal flows. In addition, two skylights will be provided, at a spacing of no more than 100 feet apart, to provide light for fish movement.

12.7.3.3 Impoundments

12.7.3.3.1 General Plans

Runoff control at the Willow Creek site will consist of two sedimentation ponds and four sediment traps. The design of these facilities is described in Section 12.7.3.2.2.

Certification. All maps and cross sections of the sedimentation ponds and sediment traps have been prepared by or under the direction of and certified by a qualified, registered, professional engineer.

Maps and Cross Sections. Proposed design details and cross sections for the sedimentation ponds and sediment traps are provided in Appendix 12-7-2 and Exhibit 12-7-5.

Narrative. A description of each sedimentation pond is presented in Sections 12.7.3.2.2 and 12.7.4.2 of this chapter.

Subsidence Survey Results. No underground coal mining will occur beneath the sedimentation ponds or sediment traps within the project area. Therefore, there will be no effect to these structures from subsidence.

Hydrologic Impact. The preliminary hydrologic and geologic information required to assess the hydrologic impacts of the impoundments can be found in Sections 12.7.2.4 and 12.6, respectively.

Design Plans and Construction Schedule. There are no additional structures proposed for project operation at this time. Designs of all existing structures have been described within Section 12.5 of this chapter.

12.7.3.3.2 Permanent and Temporary Impoundments

Requirements. All impoundments have been designed and will be constructed using current, prudent engineering practices. Specific foundation design and construction criteria are presented in Section 12.5. Specific hydrologic design criteria for each impoundment are presented in Section 12.7.4.3. All impoundments will be inspected regularly based on the schedule contained in Section 12.5.1.4.3.

Permanent Impoundments. There will be no permanent impoundment structures within the project area at this time.

Temporary Impoundments. The sedimentation ponds and sediment traps to be installed at the Willow Creek site are considered temporary impoundments.

Hazard Notifications. The sedimentation ponds and traps will be examined for structural weakness and erosion in accordance with the schedule presented in Section 12.5.1.4.3. A report of these findings will be submitted to the Division as indicated in Section 12.5.1.4.3.

12.7.3.4 Discharge Structures

The discharge structures associated with the project consist of spillways on Sediment Trap 3 and Pond WC-002. These spillways are designed in Section 12.7.4.4. Sedimentation Pond No. 1, Traps 1, 2, and 4, and topsoil stockpile containment berm are designed as non-discharging structures. The spillways constructed on the sedimentation pond downstream from the Castle Gate Preparation Plant Facility are described in Section 3.4 of this M&RP.

12.7.3.5 Disposal of Excess Spoil

No excess spoil will be generated in conjunction with the project.

12.7.3.6 Coal Mine Waste

Areas designated for the disposal of the refuse to be excavated from the Willow Creek site are constructed and maintained as described in Section 3.4 of this M&RP.

12.7.3.7 Noncoal Mine Waste

Noncoal mine waste generated during the project will be disposed of as described in Section 12.5.

12.7.3.8 Temporary Casing and Sealing of Wells

The groundwater monitoring well identified on Exhibit 12-7-1 will be operated and maintained as described in Section 12.7.4.8.

12.7.4 DESIGN CRITERIA AND PLANS

12.7.4.1 General Requirements

This section includes site-specific plans that incorporate minimum design criteria for the control of drainage from disturbed areas.

12.7.4.2 Sediment Control Measures

12.7.4.2.1 General Requirements

Design. Sediment control measures have been designed and will be constructed and maintained to:

- o Prevent additional contributions of sediment to stream flow or to runoff outside the permit area;
- o Meet the effluent limitations defined in R645-301-751; and
- o Minimize erosion to the extent possible.

Measures and Methods. The sediment control measures to be implemented at the Willow Creek site include practices to be carried out within to the disturbed area. Sediment control methods include:

- o Retention of sediment within the disturbed area;
- o Diversion of runoff from undisturbed areas and through disturbed areas in a manner that prevents additional erosion; and
- o Provide silt fences, sediment traps, and other measures that reduce overland flow velocities, reduce runoff volumes, or trap sediment.

12.7.4.2.2 Siltation Structures

General Requirements. Additional contributions of suspended solids and sediment to stream flow or runoff outside the project area will be prevented to the extent possible using various siltation structures. The proposed sediment traps will be upgraded before excavation of the refuse materials from the Willow Creek site begins. Upon construction, each structure will be certified by a qualified, registered professional engineer.

All siltation structures which impound water have been designed and will be constructed and maintained as described in Sections 12.5, 12.7.3.3, and 12.7.4.3.

Sedimentation Ponds. Sediment control at the Willow Creek site will be provided through the use of two sedimentation ponds and four sediment traps. None of the sediment-control devices at the Willow Creek site will meet the MSHA size criteria defined in 30 CFR 77.216.

Each sediment-control device is designed to operate individually rather than in series. These facilities are described as follows:

Sedimentation Pond No. 1: This pond will be incised into the fill and pad fill material during the initial phases of refuse excavation at the downstream toe of the refuse material as shown on Exhibit 12-5-1. The pond will collect runoff and sediment from the sloped refuse pile. As the refuse pile is excavated, the pad on which the pond is to be located will eventually slope away from the pond and into the highwall. Once this occurs, the initially-excavated pond will no longer capture runoff and the refuse excavation will act as the pond.

As indicated in Appendix 12-7-2, Sedimentation Pond No. 1 has been designed to store the runoff from the 25-year, 24-hour storm event (1.25 acre-foot) and approximately 1.25 years of anticipated sediment yield. The pond will be excavated with inslopes of 2.5H:1V. The pond has been designed as a total containment structure, due to the limited life of the

structure and the increasing size of the pond with the refuse excavation. Initially, the pond has a greater than required runoff containment volume. Therefore, no spillway has been included in the design.

Upon completion of refuse excavation, when runoff impounds against the excavated highwall, the sedimentation pond will have a storage capacity of 15.7 acre-feet and a natural embankment height of 19.8 feet. Data provided in Appendix 12-7-2 indicate that runoff from the 100-year, 24-hour event will contribute 1.89 acre-feet to the final configured pond. Hence, the final pond has been designed for total containment, with sufficient capacity to store anticipated runoff and sediment for several years. Inslopes on the final sedimentation pond will meet the recommendations of Appendix 12-5-2 for long-term stability.

Sedimentation Pond WC-002: This pond currently exists as a sediment trap from the AML project. It will be enlarged by incising into the pad materials during the pad and topsoil access road construction as shown on Exhibit 12-5-1. The pond will collect runoff and sediment from the maintenance pad area above the road.

This pond was designed by TerraMatrix, as part of the Willow Creek Mining and Reclamation Plan Application. Therefore, rather than design and build an alternative pond to be located in approximately the same area, the pond designed for the mining operation will be included and built during the refuse removal project. As indicated in Appendix 12-7-4, the sediment pond has been designed with a total of 0.27 acre-foot of storage. This will include the runoff from the 10-year, 24-hour storm event (0.18 acre-foot) and approximately 2 years of anticipated sediment yield (0.09 acre-foot). The pond will be excavated with 2H:1V inslopes, with a drop inlet spillway and an open channel emergency spillway. The spillway has been designed to safely pass the peak flow from the 25-year, 6-hour precipitation event without erosion. The conservative assumption was made during spillway design that there would be no attenuation of the peak flow due to routing through the pond. The crest of the emergency spillway will be incised into the in-place compacted earthen fill, while the channel down the embankment face will be lined with riprap to control erosion.

Sediment Traps: Four sediment traps will be used at the Willow Creek site to control runoff and sediment yield. Three of these traps (Traps 1, 2, and 4) will be located adjacent to the site access road and one (Trap 3) will be located adjacent to the office trailer/maintenance pad.

Each of the sediment traps is currently existing. All four of the existing traps will require enlarging. As noted in Appendix 12-7-2, each trap is designed or exists as a depression, to collect sediment and water, and Trap 3 is designed with an open channel outlet structure. Traps 1, 2, and 4 are designed as total containment structures due to the limited life of the traps.

Table 12-7-4 presents a summary regarding the sediment traps at the Willow Creek site. Due to the short-term nature of the Willow Creek Refuse Removal Project (approximately 4.5 months), the sediment traps were designed to contain the anticipated sediment yield that would occur during a period of less than one year. Furthermore, Trap 3 was designed to contain the runoff from the 10-year, 24-hour precipitation event, while the total containment traps (1, 2, and 4) will be sized to handle the runoff from the 25-year, 24-hour storm event. Trap 3 has a spillway capable of handling the peakflow from the 25-year, 6-hour precipitation event.

Outflow from sediment Trap 3 will be non-erosive. As was the case with the sedimentation pond, the sediment trap outflow channel was designed using the conservative assumption that the peak flow entering the trap would not be reduced by routing through the trap.

Other Treatment Facilities. No treatment facilities other than sedimentation ponds and traps will be located within the project area.

Exemptions. No requests will be made for alternate sediment control areas in conjunction with the project.

12.7.4.2.3 Diversions

General Requirements. All diversions within the project area have been designed to minimize adverse impacts to the hydrologic balance, to prevent material damage outside the permit area, and to assure the safety of the public. Furthermore, all diversions and diversion structures have been designed and will be located, constructed, maintained, and used to:

- o Be stable;
- o Provide protection against flooding and resultant damage to life and property;
- o Prevent, to the extent possible, additional contributions of suspended solids to stream flow outside the permit area; and
- o Comply with all applicable local, state, and federal laws and regulations.

All diversions within the project area are temporary and will be removed when no longer needed. The diversions will be reclaimed in accordance with the reclamation plan defined in Section 12.5.

Peak discharge rates from the contributing drainage areas were calculated for use in designing the diversion structures. The storm runoff calculations for the temporary diversion structures were based on the 10-year, 6-hour precipitation event of 1.40 inches. Curve numbers used to calculate runoff were based on standard texts and professional judgement, as indicated in Appendix 12-7-2. A description of the methods used to determine the peak discharge rates is also presented in Appendix 12-7-2.

The drainage areas associated with the Willow Creek site are shown on Exhibit 12-7-3. A summary of watershed characteristics associated with the diversions is presented in Table 12-7-5.

The proposed location of each diversion is noted on Exhibit 12-5-1. The minimum capacity and freeboard of each diversion was determined based on the minimum ditch slope, while the maximum velocity and minimum riprap protection was calculated based on the maximum ditch slope. Slopes were estimated from the site contour map (Exhibit 12-5-1). A description of the methods used to determine diversion capacities, flow velocities, and riprap sizes is presented in Appendix 12-7-2.

Diversion of Perennial and Intermittent Streams. No diversions of perennial or intermittent streams will occur in conjunction with the project.

Diversion of Miscellaneous Flows. Diversion ditches and culverts have been utilized within the project area to divert miscellaneous flows from disturbed and undisturbed area drainages. A summary table of the minimum channel geometry, channel slope, peak discharge, maximum flow velocity, and minimum freeboard values for each diversion within the project area is presented in Table 12-7-6. All calculations are contained in Appendix 12-7-2. Each diversion was designed to adequately pass the peak flow from the 10-year, 6-hour precipitation event under non-erosive conditions.

Each diversion was designed as a triangular ditch with 2H:1V side slopes and a minimum depth of 0.5 to 1 foot. UD-1 will discharge to an 18-inch CMP culvert, UC-1, under the Refuse Removal Access Road. This culvert will discharge onto an existing gabion drop structure that was installed under contract with the Division when the refuse was placed at the site. UD-2 will discharge to an existing 24-inch CMP culvert, UC-2, which is located under the Refuse Removal Access Road. UD-3 will discharge directly to Willow Creek. UD-4 will collect undisturbed runoff from above the topsoil storage area and convey it around the storage area to the containment berm discussed in Section 12.2.3.4. UD-5 and UD-6 will collect undisturbed drainage from the area of the topsoil storage access road and convey these drainages to natural channels. Calculations for these structures are summarized in Tables 12-7-5 and 12-7-6 and presented in Appendix 12-7-2.

12.7.4.2.4 Road Drainage

All Roads. All of the roads associated with the project have been or will be constructed to include adequate drainage control. None of the roads will be located in the channel of an intermittent or perennial stream. All roads have been located to minimize downstream sedimentation and flooding. Drainage from the road surface will be conveyed to the adjacent sedimentation ponds and sediment traps by the use of swales and triangular ditches. Two culverts, UC-1 and UC-2, will be utilized to convey undisturbed runoff under the Refuse Removal Access Road. Design calculations for the swales, ditches and culverts are presented in Appendix 12-7-2. The designs for the road swales and ditches to convey water to the sediment traps are summarized in Table 12-7-7. The location of these structures are shown on Exhibit 12-7-5.

Primary Roads. Roads which access the Castle Gate Refuse Removal Facility have been classified as primary roads (see Section 12.5.2.7.1). These roads have been located on stable surfaces and constructed in a manner that minimizes erosion. These roads do not ford any stream channels. Drainage control associated with these roads is discussed in Section 3.4 of this M&RP.

12.7.4.3 Impoundments

Impoundments associated with the project will consist of the sedimentation ponds and traps. All pertinent information regarding these impoundments is presented in Sections 3.4, 12.7.3.2.2, and 12.7.4.2.2.

12.7.4.4 Discharge Structures

The discharge structures within the project area consist of the spillways associated with the sedimentation ponds and traps. Detailed information regarding each discharge structure is presented in Sections 3.4, 12.7.3.2.2, and 12.7.4.2.2.

12.7.4.4.1 Erosion Protection

Discharge structures associated with the sediment-control facilities were designed to convey the discharge in a non-erosive manner. Calculations in support of these designs are presented in Appendix 12-7-2.

12.7.4.4.2 Design Standards

All discharge structures within the project area were designed and constructed according to standard engineering design procedures.

12.7.4.5 Disposal of Excess Spoil

No excess spoil will be generated in conjunction with the project.

12.7.4.6 Coal Mine Waste

12.7.4.6.1 General Requirements

All refuse excavated in conjunction with the project will be placed in the Castle Gate Refuse Removal Facility in a controlled manner to minimize adverse effects of leachate and surface water runoff on surface and groundwater quality and quantity. A description of the methods of placement can be found in Section 12.5.2.8.3.

12.7.4.6.2 Refuse Piles

A detailed description of the Castle Gate Refuse Removal Facility can be found in Section 3.4 of this M&RP.

Based on the size, configuration, and open graded structure of the waste rock fill and its location at the site, no underdrains or rock core chimney drains were required. There are no springs or seeps within the fill area which require special treatment.

All surface precipitation falling on the Refuse Removal Facility is channelled to Pond 013 located downstream from the toe of the facility. All surface drainage from the areas above the site is diverted around the disposal facility using diversion ditches.

No permanent impoundments will exist on the completed refuse pile.

12.7.4.6.3 Impounding Structures

No impounding structures associated with the project will be constructed of coal mine waste or used to impound coal mine waste.

12.7.4.6.4 Return of Coal Processing Waste to Abandoned Underground Workings

No coal processing waste will be associated with the Willow Creek Refuse Removal Project.

12.7.4.7 Disposal of Noncoal Mine Waste

Disposal of noncoal mine waste will occur as outlined in Section 12.5.

12.7.4.8 Casing and Sealing of Wells

The monitoring well at the Willow Creek site (TH-02) has been cased to prevent acid or other toxic drainage from entering ground or surface water, to minimize disturbance to the hydrologic balance, and to ensure the safety of people, fish and wildlife, and machinery in the

project area. The drill log and completion diagram for the monitoring well are contained in Appendix 12-6-1. No other water wells exist in the project or adjacent areas.

12.7.5 PERFORMANCE STANDARDS

All operations associated with the project will be conducted to minimize disturbance to the hydrologic balance within the project and adjacent areas, to prevent material damage to the hydrologic balance outside the permit area, and to support approved post-operation land uses.

12.7.5.1 Water Quality Standards and Effluent Limitations

Discharges of water from disturbed areas associated with the project will be in compliance with all Utah and Federal water quality laws and regulations and with effluent limitations for coal mining contained in 40 CFR Part 434.

12.7.5.2 Sediment Control Measures

All sediment control measures will be located, maintained, constructed, and reclaimed according to plans and designs presented in Sections 12.7.3.2, 12.7.4.2, and 12.7.6.

12.7.5.2.1 Siltation Structures and Diversions

Siltation structures and diversions will be located, maintained, constructed, and reclaimed according to plans and designs presented in Sections 12.7.3.2, 12.7.4.2, and 12.7.6.3.

12.7.5.2.2 Road Drainage

All roads will be located, designed, constructed, reconstructed, used, maintained, and reclaimed according to plans and designs presented in Sections 12.7.3.2.4, 12.7.4.2.4, and 12.7.6.2. All roads have been designed to:

- o Control or prevent erosion, siltation, and the air pollution attendant to erosion by stabilizing and/or maintaining all exposed surfaces in accordance with current, prudent engineering practices;
- o Control or prevent additional contributions of suspended solids to stream flow or runoff outside the project area;
- o Neither cause nor contribute to, directly or indirectly, the violation of effluent standards given under Section 12.7.5.1;
- o Minimize the diminution to or degradation of the quality or quantity of surface- and ground-water systems; and
- o Refrain from significantly altering the normal flow of water in stream beds or drainage channels.

12.7.5.3 Impoundments and Discharge Structures

Impoundments and discharge structures will be located, maintained, constructed, and reclaimed as described in Sections 12.7.3.3, 12.7.3.4, 12.7.4.3, 12.7.4.5, and 12.7.6.

12.7.5.4 Disposal of Excess Spoil, Coal Mine Waste and Noncoal Mine Waste

Disposal areas for the Willow Creek refuse and noncoal mine waste will be located, maintained, constructed, and reclaimed as described in Sections 3.4, 12.5, 12.7.3.6, 12.7.3.7, 12.7.4.6, 12.7.4.7, and 12.7.6.

12.7.5.5 Casing and Sealing of Wells

The monitoring well at the Willow Creek site will be managed as described in Sections 12.7.3.8, 12.7.4.8, and 12.7.6.5.

12.7.6 RECLAMATION

12.7.6.1 General Requirements

It is currently planned that the Willow Creek site will be utilized, after the project discussed in this chapter, for surface facilities associated with a proposed underground mining operation. If such an operation does not develop, a reclamation plan for the site has been prepared, accounting for the proposed design of the excavation operation. If the decision is made to not proceed with the proposed Willow Creek mining operation, Amax Coal Company will permanently reclaim all affected areas in accordance with the R645 regulations after completion of the project.

A detailed reclamation plan for the site (under the assumption of immediate site closure following excavation of the refuse materials) is presented in Section 12.5.4. In general, all temporary structures will be removed and reclaimed. Diversion structures will be reclaimed or renovated, if necessary, to meet the requirements of R645-301 and R645-302 and to conform to the approved reclamation plan. Locations of structures associated with the reclamation plan are presented on Exhibit 12-7-4.

12.7.6.2 Roads

The dirt road used for access to the refuse at the Willow Creek site will be reclaimed immediately after it is no longer needed for coal mining and reclamation operations.

12.7.6.2.1 Restoring the Natural Drainage Patterns

All natural drainage patterns will be restored.

12.7.6.2.2 Reshaping Cut and Fill Slopes

All cut and fill slopes will be reshaped to be compatible with the post-operation land use and to complement the drainage pattern of the surrounding terrain.

12.7.6.3 Siltation Structures

12.7.6.3.1 Maintenance of Siltation Structures

All siltation structures will be maintained until removed in accordance with the approved reclamation plan.

12.7.6.3.2 Removal of Siltation Structures

The disposition of the sedimentation pond and traps during reclamation is discussed in Section 12.5.4.2.2. Calculations concerning interim sedimentation ponds and traps are presented in Appendix 12-7-2. When a siltation structure is removed, the land on which the siltation structure was located will be regraded and revegetated in accordance with the reclamation plan presented in Section 12.5.4.

12.7.6.4 Structure Removal

The only structure at the Willow Creek site requiring removal upon reclamation is the office trailer. This structure will be removed as soon as its use is no longer required for reclamation operations.

12.7.6.5 Permanent Casing and Sealing of Wells

When no longer needed for monitoring or other use approved by the Division upon a finding of no adverse environmental or health and safety effects, or unless approved for transfer as a water supply well, the on-site monitoring well (TH-02) will be capped, sealed, backfilled, or otherwise properly managed, as required by the Division.

TABLE 12-7-1
SUMMARY OF GROUNDWATER RIGHTS

Water Right No.	Quantity	Source	Use	Period of Use
3592	0.923 cfs	Kenilworth Mine	Industrial (Coal mining)	1 Jan - 31 Dec
3593	1.810 cfs	Castle Gate No. 2 Mine	Domestic and Industrial (Coal mining)	1 Jan - 31 Dec
3595	0.030 cfs	O'Connor No. 1 Mine	Industrial (Coal mining)	1 Jan - 31 Dec
4133	0.300 cfs	Castle Gate No. 1 Mine	Industrial (Coal mining)	1 Jan - 31 Dec

TABLE 12-7-2
SUMMARY OF SURFACE WATER RIGHTS

Water Right No.	Quantity	Source	Use	Period of Use
224	10.00 cfs	Price River	Industrial (power plant usage)	1 Oct - 1 Apr
766	3.50 cfs	Price River	Industrial (power plant consumption)	1 Jan - 31 Dec
3598	---	Willow Creek	Stock watering	1 Jan - 31 Dec
t18472	2.00 AF	Price River	Industrial (Dust suppression)	14 Nov 1994 - 13 Nov 1995 ^(a)

^(a) Temporary water right valid only through November 13, 1995

TABLE 12-7-3
SUMMARY OF SURFACE-WATER QUALITY DATA

Station	Mean (mg/l)	Standard Dev. (mg/l)	Maximum (mg/l)	Minimum (mg/l)
Total Dissolved Solids				
B-1	587	146.8	1198	365
B-2	619	156.3	910	348
B-3	604	175.0	1070	100
Total Suspended Solids				
B-1	300	1349.3	7750	0.5
B-2	608	1686.8	8770	1
B-3	363	815.4	4105	<1
pH				
B-1	7.9	0.60	9.1	6.8
B-2	8.1	0.52	9.4	6.9
B-3	8.2	0.41	9.6	7.1
Total Iron				
B-1	14.62	44.55	246.0	0.02
B-2	16.17	59.93	332.0	0.01
B-3	12.17	40.36	235.0	0.02
Total Manganese				
B-1	0.20	0.43	1.73	<0.01
B-2	0.15	0.31	1.40	<0.01
B-3	0.15	0.31	1.56	<0.01

TABLE 12-7-4
SUMMARY OF SEDIMENT TRAP DATA

Trap Number	Storage Volume (AF)			Outflow Velocity ^(b) (ft/s)
	Runoff	Sediment	Total	
1	0.25 ^(h)	0.03 ^(c)	0.20	(g)
2	0.08 ^(h)	0.01 ^(d)	0.07	(g)
3	0.23 ^(e)	0.04 ^(d)	0.27	2.78
4	0.33 ^(h)	0.02 ^(e)	0.26	(g)

- ^(a) Trap designed to contain runoff from the 10-year, 24-hour precipitation event.
- ^(b) 25-year, 6-hour precipitation event outflow.
- ^(c) Designed to contain approximately 9 months of sediment yield.
- ^(d) Designed to contain approximately 6 months of sediment yield.
- ^(e) Designed to contain approximately 3 months of sediment yield.
- ^(f) Designed to contain approximately 108 months of sediment yield.
- ^(g) The total containment structure - no outflow.
- ^(h) Trap designed to contain runoff from the 25-year, 24-hour precipitation event.

TABLE 12-7-5
SUMMARY OF WATERSHED DATA

Watershed	Curve Number	Area (acres)	Time of Concentration (hours)
UD-1	75	47.7	0.16
UD-2	75	9.7	0.14
UD-3	80	0.1	0.06
UD-4	75	1.07	0.07
UD-5	75	0.48	0.08
UD-6	75	1.25	0.10

TABLE 12-7-6
SUMMARY OF DIVERSION CHANNEL DESIGN PARAMETERS

Channel Number	Slope (%)		Peak Flow (cfs) ^(a)	Maximum Velocity (ft/s) ^(b)	Minimum Channel Depth (ft)	Freeboard (ft) ^(c)
	Maximum	Minimum				
UD-1	4.6	1.4	2.55	4.2	1.0	0.31
UD-2 (Upper) ^(d)	12.0	3.2	0.55	4.1	1.0	0.67
UD-2 (Lower) ^(e)	50.0	10.0	0.55	6.2 ^(f)	1.0	0.72
UD-3	50.0	10.0	0.02	3.0	0.5	0.42
UD-4	20.0	1.75	0.08	3.0	0.5	0.32
UD-5 (swale)	2.0	0.5	0.03	0.4	0.5	0.48
UD-5 (ditch)	20.0	2.0	0.03	2.4	0.5	0.38
UD-6 (swale)	2.0	0.5	0.08	0.6	0.5	0.46
UD-6 (ditch)	10.0	2.0	0.08	2.4	0.5	0.32

^(a) Based on 10-year, 6-hour precipitation event

^(b) Based on maximum channel slope

^(c) Based on minimum channel slope

^(d) Portion of diversion adjacent to access road

^(e) Portion of diversion on slope adjacent to Willow Creek

^(f) Requires riprap with $D_{50} = 6$ inches. All other channels require no riprap.

TABLE 12-7-7

SUMMARY OF SEDIMENT TRAP SWALES AND INLET
 DIVERSION CHANNEL DESIGN PARAMETERS

Inflow Channel		Slope (%)		Peak Flow (cfs)	Maximum Velocity (ft/s)	Minimum Channel Depth (ft)	Freeboard (ft)
		Min	Max				
Trap 1	Swale	0.5	2.0	1.02	1.46	0.5	0.33
	Ditch	5.0	33.0	1.02	6.20 ^(a)	1.0	0.61
Trap 2	Swale	0.5	2.0	0.28	0.94	0.5	0.42
	Ditch	5.0	12.0	0.28	3.45	1.0	0.76
Trap 3	Swale	0.5	2.0	1.54	1.67	0.5	0.29
	Ditch	3.0	8.0	1.54	4.54	0.5	0.29
	Outlet Ditch	0.05	50.0	1.95	8.52	1.0	0.24
Trap 4	Swale	0.5	2.0	1.57	1.68	0.5	0.29
	Ditch	5.0	20.0	1.57	5.73 ^(a)	1.0	0.55

^(a) Requires 6-inch D₅₀ riprap protection.

SECTION 12.8
BONDING AND INSURANCE

12.8.1 BONDING DEFINITIONS AND DIVISION RESPONSIBILITIES

This chapter provides information regarding the bonding for reclamation operations at the Willow Creek Refuse Removal Project (project). The Applicant has on file with UDOGM a bond or bonds made payable to UDOGM for performance of all the requirements of the State Program for the Amax Coal Company permitted areas. See Appendix 3-2 and associated tables for bonding information pertaining to these areas. Upon approval of bond estimates to reclaim the Willow Creek permit area by UDOGM, the bond amount for Amax Coal Company\Castle Gate Mine will be increased and a revised copy of the bond submitted to UDOGM.

12.8.2 REQUIREMENT TO FILE A BOND

The permit and disturbed area covered by the bond is outlined on Exhibit 12-1-1. The performance bond period is for the duration of reclamation operations including the extended period designated by UDOGM. The bond is in the form of a performance bond and is described in Section 12.8.6.

12.8.3 DETERMINATION OF BOND AMOUNT

The present bond should be sufficient to assure the completion of the reclamation plan. However, if an adjustment in the bond coverage is necessary, the amount will be increased/decreased per UDOGM's requirements. The most current formulas for calculation of the bond will be used to determine the coverage necessary for reclamation (Means, 1995). The reclamation bond estimate for the Willow Creek Refuse Removal Project is

\$2,361,388.53. Additional details concerning the estimate can be found in Section 12.5.4, 12.5.5, and Appendix 12-5-4.

12.8.4 GENERAL TERMS AND CONDITIONS OF THE BOND

The performance bond is in the amount determined by UDOGM as described in Section 12.8.3 and payable to UDOGM. In the event the company issuing the bond becomes insolvent, UDOGM will be notified by the permittee. The bonding company and permittee will notify UDOGM of any changes in the bonding terms for Amax Coal Company/Castle Gate Mine or Willow Creek Refuse Removal Project. Duration of the bond is described in Sections 12.8.2 and 12.8.5.

12.8.5 BONDING REQUIREMENTS FOR UNDERGROUND COAL MINING

The Applicant qualifies for a long-term period of liability and therefore will comply with the stipulation that the bond coverage be extended 30 days prior to the expiration of the bond term. A performance bond for a new term will be submitted to UDOGM 30 days prior to expiration of coverage.

12.8.6 FORMS OF BONDS

The bond for the Applicant has been executed by National Fire Insurance of Hartford. The surety bond will be noncancellable during its term except with the prior consent of UDOGM.

12.8.7 REPLACEMENT OF BONDS

Should a replacement bond be required, the replacement bond will be submitted to and approved by UDOGM prior to the cancellation of the original bond.

12.8.8 REQUIREMENTS TO RELEASE PERFORMANCE BONDS

The Applicant will comply with the requirements described in Section R-614-301-880 of UDOGM regulations when applying for the release of performance bonds.

12.8.9 TERMS AND CONDITIONS FOR LIABILITY INSURANCE

The Applicant's insurance policy provides for personal injury and property damage protection concurrent with the amounts designated in R614-301-890.100. Said Certificates of Insurance are applicable to coal mining and reclamation operations as proposed in this M&RP. The Willow Creek Refuse Removal Project is not a coal mining operation, therefore, the afore mentioned insurance will pertain to its general and reclamation operations.

The insurance policy will be maintained in full force during the life of the permit including the liability period necessary to complete all reclamation operations. The policy will include a rider stating that UDOGM be notified of any changes in the policy including termination or failure to renew.

TABLE 12-3-1

Federally Listed and Proposed Endangered Species in Utah
 January 1995

Species		Status
<u>Plants</u>		
Arizona willow	<u>Salix arizonica</u>	PE
Autumn buttercup	<u>Ranunculus aestivalis</u>	E
Barneby reed-mustard	<u>Schoenocrambe barnebyi</u>	E
Barneby ridge-cress	<u>Lepidium barnebyanum</u>	E
Clay reed-mustard	<u>Schoenocrambe argillacea</u>	T
Clay phacelia	<u>Phacelia argillacea</u>	E
Dwarf bear poppy	<u>Arctomecon humilis</u>	E
Heliotrope milk-vetch ⁵	<u>Astragalus montii</u>	T
Jones cycladenia	<u>Cycladenia humilis</u> var. <u>jonesii</u>	T
Kodachrome bladderpod	<u>Lesquerella tumulosa</u>	E
Kodachrome pepper-grass	<u>Lepidium montanum</u> var. <u>stellae</u>	PE
Last chance townsendia	<u>Townsendia aprica</u>	T
Maguire daisy	<u>Erigeron maguirei</u> var <u>maguirei</u>	E
Maguire daisy	<u>Erigeron maguirei</u>	PT
Maguire primrose	<u>Primula maguirei</u>	T
Navajo sedge ⁵	<u>Carex specuicola</u>	T
San Rafael cactus	<u>Pediocactus despainii</u>	E

TABLE 12-3-1

Federally Listed and Proposed Endangered Species in Utah (Continued)

<u>Plants (Continued)</u>		<u>Status</u>
Shrubby reed-mustard	<u>Schoenocrambe suffrutescens</u>	E
Siler cactus	<u>Pediocactus sileri</u>	T
Uinta Basin hookless cactus	<u>Sclerocactus glaucus</u>	T
Ute Ladies'-tresses	<u>Spiranthes diluvialis</u>	T
Welsh's milkweed ⁵	<u>Asclepias welshii</u>	T
Winkler cactus	<u>Pediocactus winkleri</u>	PE
Wright fishhook cactus	<u>Sclerocactus wrightiae</u>	E
<u>Mammals</u>		
Black-footed ferret ¹	<u>Mustela nigripes</u>	E
Utah prairie dog	<u>Cynomys parvidens</u>	T
<u>Birds</u>		
American peregrine falcon ^{2, 9}	<u>Falco peregrinus anatum</u>	E
Bald eagle ^{4, 10}	<u>Haliaeetus leucocephalus</u>	E
Southwestern willow flycatcher ⁵	<u>Empidonax traillii extimus</u>	PE
Whooping crane ³	<u>Grus americanus</u>	E
Mexican spotted owl	<u>Strix occidentalis lucida</u>	T

TABLE 12-3-1

Federally Listed and Proposed Endangered Species in Utah (Continued)

Fish

Bonytail chub ⁵	<u>Gila elegans</u>	E
Colorado squawfish ⁵	<u>Ptychocheilus lucius</u>	E
Humpback chub ⁵	<u>Gila cypha</u>	E
Lahontan cutthroat trout	<u>Oncorhynchus (Salmo) clarki henshawi</u>	T
June sucker ⁵	<u>Chasmistes liorus</u>	E
Razorback sucker ⁵	<u>Xyrauchen texanus</u>	E
Virginia River chub	<u>Gila robusta seminuda</u>	E
Virgin spinedace	<u>Lepidomeda mollispinis mollispinis</u>	PT
Woundfin	<u>Plagiopterus argentissimus</u>	E

Reptiles

Desert tortoise ⁵	<u>Gopherus agassizi</u>	T
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Snails

Kanab ambersnail ⁹	<u>Oxyloma haydeni kanabensis</u>	E
Utah valvata snail ⁹	<u>Valvata utahensis</u>	E

TABLE 12-3-1

Federally Listed and Proposed Endangered Species in Utah (Continued)

- ¹ Known historically, including two confirmed sightings in Utah in 1982.
- ² Nests in Utah.
- ³ Migrates through Utah, no resident populations.
- ⁴ Wintering populations (only three known nesting pairs in southeastern Utah).
- ⁵ Critical habitat designated.
- ⁶ Critical habitat proposed.
- ⁷ Emergency listing.
- ⁸ Only known historically.
- ⁹ The Arctic Peregrine falcon is protected as endangered (Utah) or threatened while migrating through the 48 conterminous states under similarity of appearance provision.
- ¹⁰ The bald eagle was proposed to be downlisted to threatened in Utah as of 1994.

E - Endangered PE - Proposed Endangered T - Threatened PT - Proposed Threatened

For additional information contact: U.S. Fish and Wildlife Service, 145 East 1300 South, Salt Lake City, Utah 84115, Telephone: (801)524-5001

TABLE 12-3-2
Native Utah Wildlife Species of Special Interest
Revised 1990^f

Mammals		Status
Grizzly Bear	<u>Ursus horribilis</u>	EX
Fisher	<u>Martes pennanti</u>	EX
Black-footed Ferret*	<u>Mustela nigripes</u>	EN
Wolf	<u>Canis lupus</u>	EN
Utah Prairie Dog*	<u>Cynomys parvidens</u>	T
Dwarf Shrew	<u>Sorex nanus</u>	S
Desert Shrew	<u>Notiosorex crawfordi</u>	S
Red Bat	<u>Lasiurus borealis</u>	S
Mexican Big-eared Bat	<u>Plecotus phyllotis</u>	S
Spotted Bat	<u>Euderma maculatum</u>	S
Big Free-tailed Bat	<u>Tadarida macrotis</u>	S
Abert's Squirrel	<u>Sciurus aberti navajo</u>	S
Belding's Ground Squirrel	<u>Spermophilus beldingi</u>	S
Richardson Ground Squirrel	<u>Spermophilus richardsoni</u>	S
Thirteen-lined Ground Squirrel	<u>Spermophilus tridecemlineatus</u>	S
Spotted Ground Squirrel	<u>Spermophilus spilosoma</u>	S
Yellow Pine Chipmunk	<u>Eutamias amoenus</u>	S
Rock Pocket Mouse	<u>Perognathus intermedius</u>	S

TABLE 12-3-2 (Continued)

Native Utah Wildlife Species of Special Interest

Mammals (Continued)		Status
Wyoming Pocket Mouse	<u>Perognathus fasciatus</u>	S
Merriam's Kangaroo Rat	<u>Dipodomys merriami</u>	S
Desert Kangaroo Rat	<u>Dipodomys deserti</u>	S
Cactus Mouse	<u>Peromyscus eremicus</u>	S
Rock Mouse	<u>Peromyscus difficilis</u>	S
Southern Grasshopper Mouse	<u>Onychomys torridus</u>	S
Stephen's Woodrat	<u>Neotoma stephensi</u>	S
Mexican Vole	<u>Microtus mexicanus</u>	S
Wolverine	<u>Gulo gulo</u>	S
River Otter	<u>Lutra canadensis</u>	S
Canada Lynx	<u>Lynx canadensis</u>	S
Birds		
Passenger Pigeon	<u>Ectopistes migratorius</u>	E
California Condor	<u>Gymnogyps californianus</u>	EX
American Peregrine Falcon*	<u>Falco peregrinus anatum</u>	EN
Bald Eagle*	<u>Haliaeetus leucocephalus</u> (Linnaeus)	EN
Whooping Crane*	<u>Grus americana</u>	EN

TABLE 12-3-2 (Continued)

Native Utah Wildlife Species of Special Interest

Birds (Continued)		Status
Arctic Peregrine Falcon	<u>Falco peregrinus tundrius</u>	T
Mountain Plover	<u>Charadrius montanus</u>	S
Snowy Plover	<u>Charadrius alexandrinus</u>	S
Long-billed Curlew	<u>Numenius americanus</u>	S
Yellow-billed Cuckoo	<u>Coccyzus americanus</u>	S
Lewis' Woodpecker	<u>Melanerpes lewis</u>	S
Western Bluebird	<u>Sialia mexicana</u>	S
Ferruginous Hawk	<u>Buteo regalis</u>	S
Swainson's Hawk	<u>Buteo swainsoni</u>	S
American White Pelican	<u>Pelecanus erythrorhynchos</u>	S
Double-crested Cormorant	<u>Phalacrocorax auritus</u>	S
Caspian Tern	<u>Sterna caspia</u>	S
Purple Martin	<u>Progne subis</u>	S
Bell's Vireo	<u>Vireo bellii</u>	S
Grasshopper Sparrow	<u>Ammodramus savannarum</u>	S
Greater Roadrunner	<u>Geococcyx californianus</u>	S
Spotted Owl	<u>Strix occidentalis</u>	S
Osprey	<u>Pandion haliaetus</u>	S

TABLE 12-3-2 (Continued)

Native Utah Wildlife Species of Special Interest

Birds (Continued)		Status
White-faced Ibis	<u>Plegadis chihi</u>	S
Great Blue Heron	<u>Ardea herodias</u>	SQ
American Bittern	<u>Botaurus lentiginosus</u>	SQ
Western Grebe	<u>Aechmophorus occidentalis</u>	SQ
Black-crowned Night Heron	<u>Nycticorax nycticorax</u>	SQ
Pileated Woodpecker	<u>Dryocopus pileatus</u>	SQ
Red-headed Woodpecker	<u>Melanerpes erythrocephalus</u>	SQ
Mountain Bluebird	<u>Sialia currucoides</u>	SQ
Yellow-breasted Chat	<u>Icteria virens</u>	SQ
Fox Sparrow	<u>Passerella iliaca</u>	SQ
Fish		
Utah Lake Sculpin	<u>Cottus echinatus</u>	E
Bonytail Chub*	<u>Gila elegans</u>	EN
Colorado Squawfish*	<u>Ptychocheilus lucius</u>	EN
Humpback Chub*	<u>Gila cypha</u>	EN
Woundfin*	<u>Plagopterus argentissimus</u>	EN
June Sucker*	<u>Chasmistes liorus mictus</u>	EN

TABLE 12-3-2 (Continued)
Native Utah Wildlife Species of Special Interest

Fish (Continued)		Status
Virgin River Chub*	<u>Gila robusta seminuda</u>	EN
Razorback Sucker*	<u>Xyrauchen texanus</u>	EN
Lahontan Cutthroat Trout* (Not native to Utah)	<u>Salmo clarki henshawi</u>	T
Least Chub	<u>Lotichthys phlegethontis</u>	T
Virgin River Spinedace	<u>Lepidomeda mollispinis</u>	T
Leatherside Chub	<u>Gila copei</u>	S
Bear Lake Sculpin	<u>Cottus extensus</u>	S
Roundtail Chub	<u>Gila robusta robusta</u>	S
Colorado Cutthroat Trout	<u>Salmo clarki pleuriticus</u>	S
Bonneville Cutthroat Trout	<u>Salmo clarki utah</u>	S
Bonneville Cisco	<u>Prosopium gemmiferum</u>	S
Bonneville Whitefish	<u>Prosopium spilonotus</u>	S
Bear Lake Whitefish	<u>Prosopium abyssicola</u>	S
Piute Sculpin	<u>Cottus beldingi</u>	SQ
Reptiles and Amphibians		
Relict Frog	<u>Rana onca</u>	E

TABLE 12-3-2 (Continued)

Native Utah Wildlife Species of Special Interest

Reptiles and Amphibians (Continued)		Status
Gila Monster	<u>Heloderma suspectum</u>	EN
Desert Tortoise*	<u>Gopherus agassizi</u>	EN
Western Spotted Frog	<u>Rana pretiosa</u>	T
Desert Iguana	<u>Dipsosaurus dorsalis</u>	S
Chuckwalla	<u>Sauromalus obesus</u>	S
Desert Night Lizard	<u>Xantusia vigilis</u>	S
Western (Utah) Banded Gecko	<u>Coleonyx variegatus utahensis</u>	S
Zebra-tailed Lizard	<u>Callisaurus draconoides rhodostictus</u>	S
Many-lined Skink	<u>Eumeces multivirgatus gaigeae</u>	S
Plateau Whiptail	<u>Cnemidophorus velox</u>	S
Arizona Toad	<u>Bufo microscaphus microscaphus</u>	S
Pacific Tree Frog	<u>Hyla regilla</u>	S
Speckled Rattlesnake	<u>Crotalus mitchellii pyrrhus</u>	S
Mojave Rattlesnake	<u>Crotalus scutulatus scutulatus</u>	S
Sidewinder Rattlesnake	<u>Crotalus cerastes cerastes</u>	S
Utah Black-headed Snake	<u>Tantilla planiceps utahensis</u>	S
California Kingsnake	<u>Lampropeltis getulus californiae</u>	S

TABLE 12-3-2 (Continued)

Native Utah Wildlife Species of Special Interest

Reptiles and Amphibians (Continued)		Status
Desert Glossy Snake	<u>Arizona elegans</u>	S
Utah Blind Snake	<u>Leptotyphlops humilis utahensis</u>	S
Mojave Patch-Nosed Snake	<u>Salvadora hexalepis mojavnensis</u>	S
Arizona Lyre Snake	<u>Trimorphodon lambda</u>	S
Utah Mountain Kingsnake	<u>Lampropeltis pyromelena infralabialis</u>	S
Utah Milk Snake	<u>Lampropeltis triangulum taylori</u>	S
Great Plains Rat Snake	<u>Elaphe guttata emoryi</u>	SQ
Western Smooth Green Snake	<u>Opheodrys vernalis blanchardi</u>	SQ

- E - Extinct: Any species that has disappeared in the world.
- EX - Extirpated: Any species that has disappeared, as a part- or full-time resident, from the state since 1800.
- EN - Endangered: Any species, subspecies or subpopulation which is threatened with extinction resulting from very low or declining numbers, alteration and/or reduction of habitat, detrimental environmental changes, or any combination of the above. Continued survival is unlikely without implementation of special measures.
- T - Threatened: Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
- S - Sensitive: Any species which, although still occurring in numbers adequate for survival, has been greatly depleted or occurring in limited areas and/or numbers due to a restricted or specialized habitat. A management program, including protection or habitat manipulation, is needed.
- SQ - Status Questioned: Insufficient data available on which to base a reliable assessment as to status.

List currently under revision, February 1995.
 * Denotes Federally classified endangered or threatened species found in Utah.

Utah Division of Wildlife Resources, 1596 West North Temple, Salt Lake City,
 Utah 84116-3195.

TABLE 12-3-3
Interim Reclamation Species List

<u>SPECIES</u>	<u># pls/acre</u>
Annual grain Oats, spring wheat, or barley	100
Total Seed	100

TABLE 12-3-4

Final Reclamation Species List

<u>SPECIES</u>	<u># pls/acre</u>
Agropyron smithii Western wheatgrass	3.0
Agropyron spicatum Bluebunch wheatgrass	2.0
Amelanchier utahensis Utah Serviceberry	1.0
Artemisia ludoviciana Louisiana sagebrush	0.1
Artemisia tridentata vaseyana Mountain big sagebrush	0.2
Aster glaucodes Blueleaf Aster	0.5
Atriplex canescens Fourwing saltbush	3.0
Ceratoides lanata Winterfat	1.5
Cercocarpus ledifolius Curl-leaf mountain mahogany	1.0
Chrysothamnus nauseosus albicaulis Whitestem rubber rabbitbrush	0.5
Elymus cinereus Basin wildrye	2.0
Agropyron dasystachyum Thickspike wheatgrass	2.0
Linum lewisii False flax	1.0
Melilotus officinalis Yellow sweetclover	0.5
Oryzopsis hymenoides Indian Ricegrass	2.0
Penstemon palmeri Palmer Penstemon	0.2
Petalostemum purpureum Purple prairie clover	0.5

TABLE 12-3-4 (Continued)
Final Reclamation Species List

<u>SPECIES</u>	<u># pls/acre</u>
Poa ampla Bluegrass	0.2
Rhus trilobata Skunkbrush	1.5
Sporobolus cryptandrus Sand dropseed	0.1
Total Seed	22.8

TABLE 12-3-5
Reclamation Monitoring Schedule

	YEAR									
	1	2	3	4	5	6	7	8	9	10
QUALITATIVE SAMPLING	X	X	X	X	X	X	X	X	X	X
QUANTITATIVE SAMPLING										
Cover		X	X		X				X	X
Frequency		X	X		X				X	X
Woody Plant Density		X	X	X	X			X	X	X
Transplant Survival	X	X	X		X					
Productivity									X	X

TABLE 12-7-1
SUMMARY OF GROUNDWATER RIGHTS

Water Right No.	Quantity	Source	Use	Period of Use
3592	0.923 cfs	Kenilworth Mine	Industrial (Coal mining)	1 Jan - 31 Dec
3593	1.810 cfs	Castle Gate No. 2 Mine	Domestic and Industrial (Coal mining)	1 Jan - 31 Dec
3595	0.030 cfs	O'Connor No. 1 Mine	Industrial (Coal mining)	1 Jan - 31 Dec
4133	0.300 cfs	Castle Gate No. 1 Mine	Industrial (Coal mining)	1 Jan - 31 Dec

TABLE 12-7-2
SUMMARY OF SURFACE WATER RIGHTS

Water Right No.	Quantity	Source	Use	Period of Use
224	10.00 cfs	Price River	Industrial (power plant usage)	1 Oct - 1 Apr
766	3.50 cfs	Price River	Industrial (power plant consumption)	1 Jan - 31 Dec
3598	---	Willow Creek	Stock watering	1 Jan - 31 Dec
t18472	2.00 AF	Price River	Industrial (Dust suppression)	14 Nov 1994 - 13 Nov 1995 ^(a)

^(a) Temporary water right valid only through November 13, 1995

TABLE 12-7-3
SUMMARY OF SURFACE-WATER QUALITY DATA

Station	Mean (mg/l)	Standard Dev. (mg/l)	Maximum (mg/l)	Minimum (mg/l)
Total Dissolved Solids				
B-1	587	146.8	1198	365
B-2	619	156.3	910	348
B-3	604	175.0	1070	100
Total Suspended Solids				
B-1	300	1349.3	7750	0.5
B-2	608	1686.8	8770	1
B-3	363	815.4	4105	< 1
pH				
B-1	7.9	0.60	9.1	6.8
B-2	8.1	0.52	9.4	6.9
B-3	8.2	0.41	9.6	7.1
Total Iron				
B-1	14.62	44.55	246.0	0.02
B-2	16.17	59.93	332.0	0.01
B-3	12.17	40.36	235.0	0.02
Total Manganese				
B-1	0.20	0.43	1.73	<0.01
B-2	0.15	0.31	1.40	<0.01
B-3	0.15	0.31	1.56	<0.01

TABLE 12-7-4
SUMMARY OF SEDIMENT TRAP DATA

Trap Number	Storage Volume (AF)			Outflow Velocity ^(b) (ft/s)
	Runoff	Sediment	Total	
1	0.25 ^(h)	0.03 ^(c)	0.20	(g)
2	0.08 ^(h)	0.01 ^(d)	0.07	(g)
3	0.23 ^(a)	0.04 ^(d)	0.27	2.78
4	0.33 ^(h)	0.02 ^(e)	0.26	(g)

- ^(a) Trap designed to contain runoff from the 10-year, 24-hour precipitation event.
- ^(b) 25-year, 6-hour precipitation event outflow.
- ^(c) Designed to contain approximately 9 months of sediment yield.
- ^(d) Designed to contain approximately 6 months of sediment yield.
- ^(e) Designed to contain approximately 3 months of sediment yield.
- ^(f) Designed to contain approximately 108 months of sediment yield.
- ^(g) The total containment structure - no outflow.
- ^(h) Trap designed to contain runoff from the 25-year, 24-hour precipitation event.

TABLE 12-7-5
SUMMARY OF WATERSHED DATA

Watershed	Curve Number	Area (acres)	Time of Concentration (hours)
UD-1	75	47.7	0.16
UD-2	75	9.7	0.14
UD-3	80	0.1	0.06
UD-4	75	1.07	0.07
UD-5	75	0.48	0.08
UD-6	75	1.25	0.10

TABLE 12-7-6

SUMMARY OF DIVERSION CHANNEL DESIGN PARAMETERS

Channel Number	Slope (%)		Peak Flow (cfs) ^(a)	Maximum Velocity (ft/s) ^(b)	Minimum Channel Depth (ft)	Freeboard (ft) ^(c)
	Maximum	Minimum				
UD-1	4.6	1.4	2.55	4.2	1.0	0.31
UD-2 (Upper) ^(d)	12.0	3.2	0.55	4.1	1.0	0.67
UD-2 (Lower) ^(e)	50.0	10.0	0.55	6.2 ^(f)	1.0	0.72
UD-3	50.0	10.0	0.02	3.0	0.5	0.42
UD-4	20.0	1.75	0.08	3.0	0.5	0.32
UD-5 (swale)	2.0	0.5	0.03	0.4	0.5	0.48
UD-5 (ditch)	20.0	2.0	0.03	2.4	0.5	0.38
UD-6 (swale)	2.0	0.5	0.08	0.6	0.5	0.46
UD-6 (ditch)	10.0	2.0	0.08	2.4	0.5	0.32

^(a) Based on 10-year, 6-hour precipitation event

^(b) Based on maximum channel slope

^(c) Based on minimum channel slope

^(d) Portion of diversion adjacent to access road

^(e) Portion of diversion on slope adjacent to Willow Creek

^(f) Requires riprap with $D_{50} = 6$ inches. All other channels require no riprap.

TABLE 12-7-7

**SUMMARY OF SEDIMENT TRAP SWALES AND INLET
 DIVERSION CHANNEL DESIGN PARAMETERS**

Inflow Channel		Slope (%)		Peak Flow (cfs)	Maximum Velocity (ft/s)	Minimum Channel Depth (ft)	Freeboard (ft)
		Min	Max				
Trap 1	Swale	0.5	2.0	1.02	1.46	0.5	0.33
	Ditch	5.0	33.0	1.02	6.20 ^(a)	1.0	0.61
Trap 2	Swale	0.5	2.0	0.28	0.94	0.5	0.42
	Ditch	5.0	12.0	0.28	3.45	1.0	0.76
Trap 3	Swale	0.5	2.0	1.54	1.67	0.5	0.29
	Ditch	3.0	8.0	1.54	4.54	0.5	0.29
	Outlet Ditch	0.05	50.0	1.95	8.52	1.0	0.24
Trap 4	Swale	0.5	2.0	1.57	1.68	0.5	0.29
	Ditch	5.0	20.0	1.57	5.73 ^(a)	1.0	0.55

^(a) Requires 6-inch D₅₀ riprap protection.

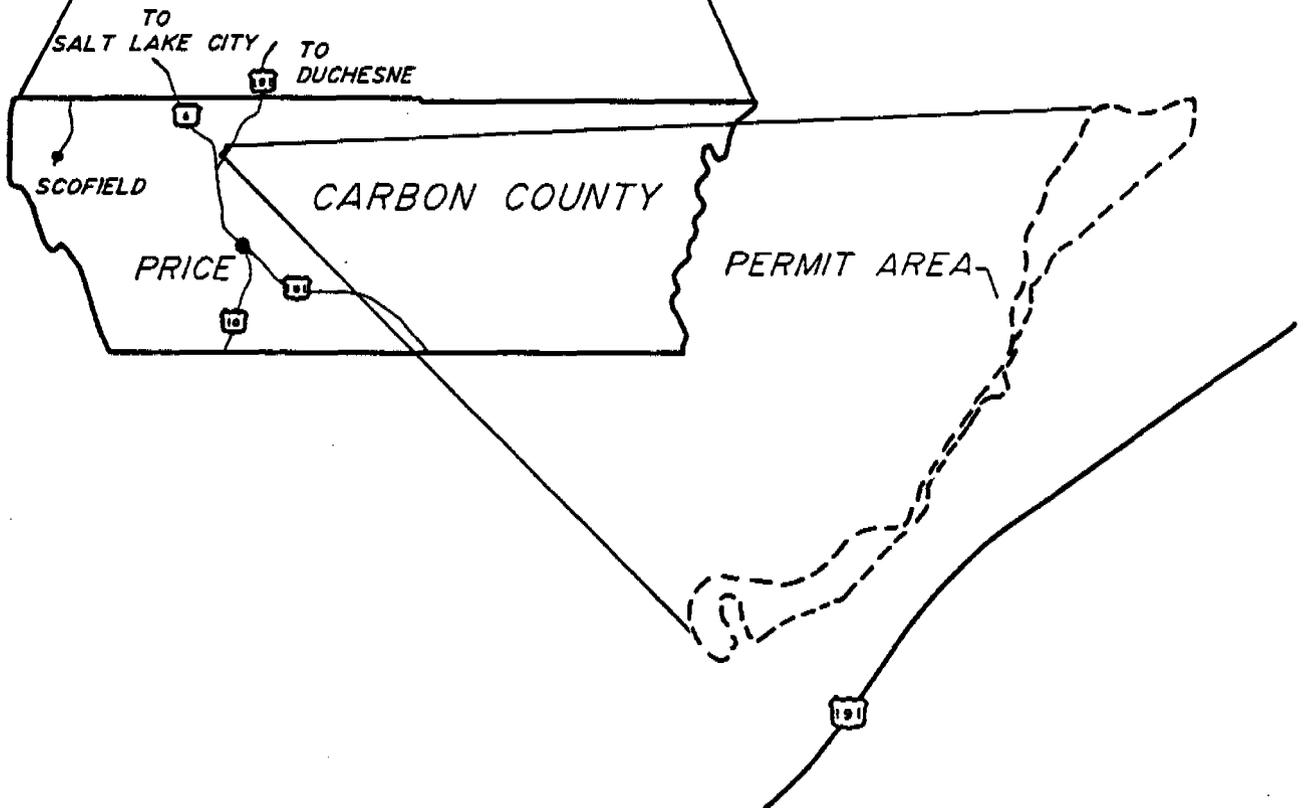
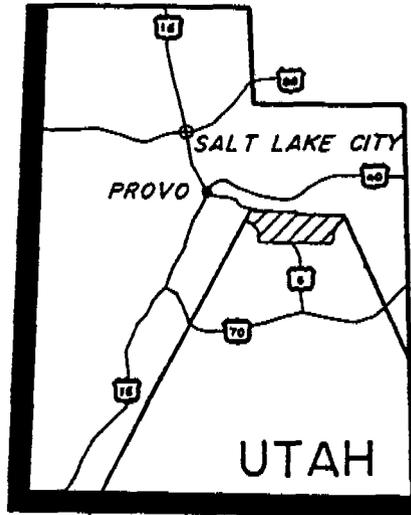
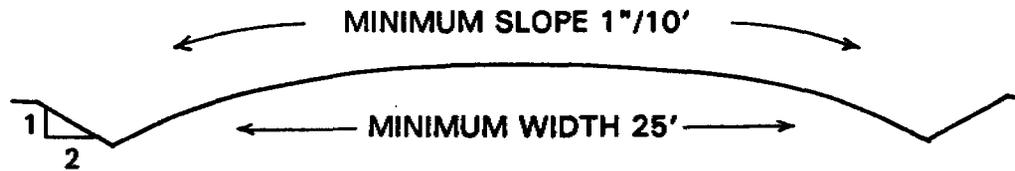


FIGURE 12-1-1 SITE LOCATION MAP.



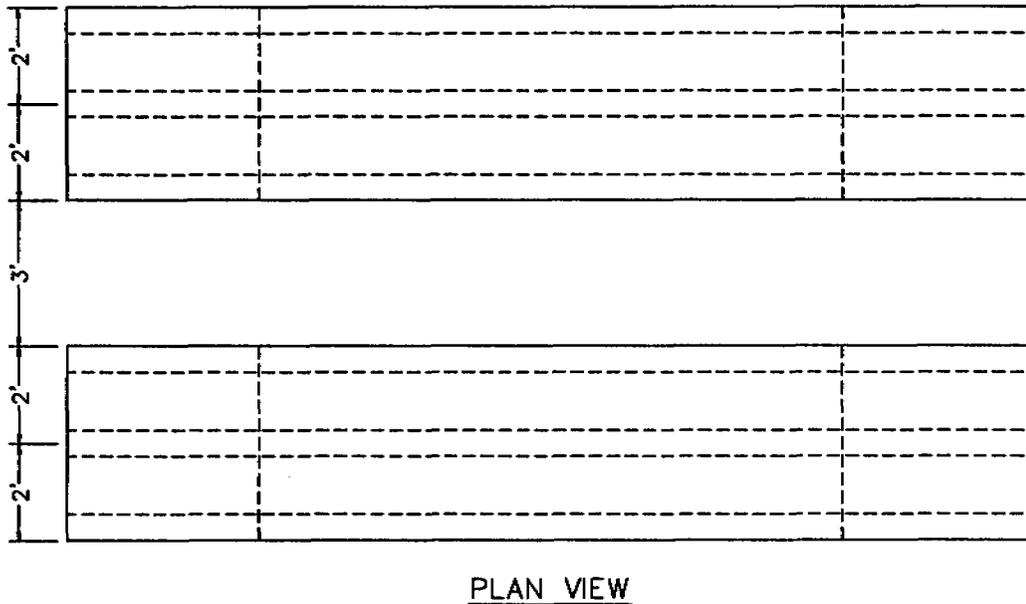
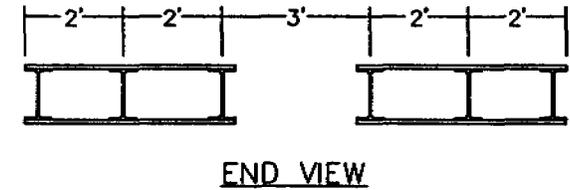
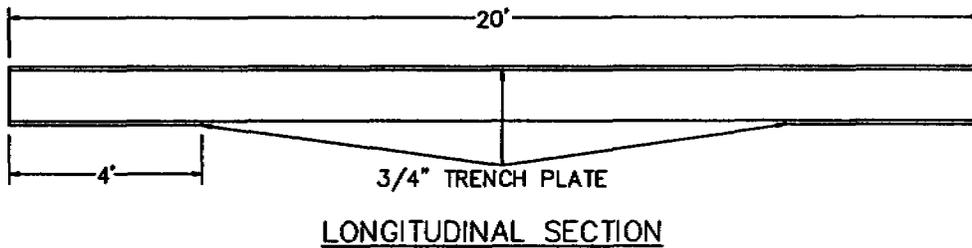
ANCILLARY ROAD
TYPICAL SECTION

SURFACE TREATMENT - GRAVEL



DITCHES WILL BE USED WHERE
NECESSARY TO CONVEY FLOW.
MINIMUM DITCH DEPTH: 1.0'
REFERENCE APPENDIX 12-7-2
FOR GENERIC DIVERSION.

FIGURE 12-5-1 ANCILLARY ROAD TYPICAL SECTION.



NOTES:

1. USE W12 X 30 BEAMS 20' LONG, CENTERED OVER THE EXISTING STREAM CULVERT.
2. SUPPORT EACH END OF THE STRUCTURE WITH 4 FEET OF 3/4 INCH TRENCH PLATE.
3. USE 3/4 INCH TRENCH PLATE TO COVER EACH SET OF BEAMS.
4. TACK WELD TRENCH PLATE TO BEAMS AT 4 FOOT O.C.
5. DESIGN SHOWS PLAN VIEW FOR SINGLE TRAFFIC LANE.



FIGURE 12-5-2 STREAM CROSSING DIAGRAM.

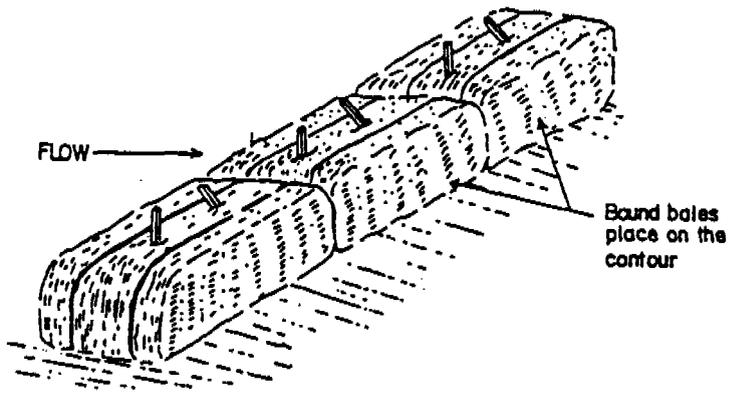
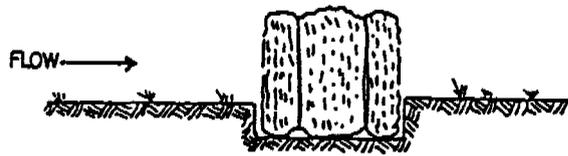


12-F-3

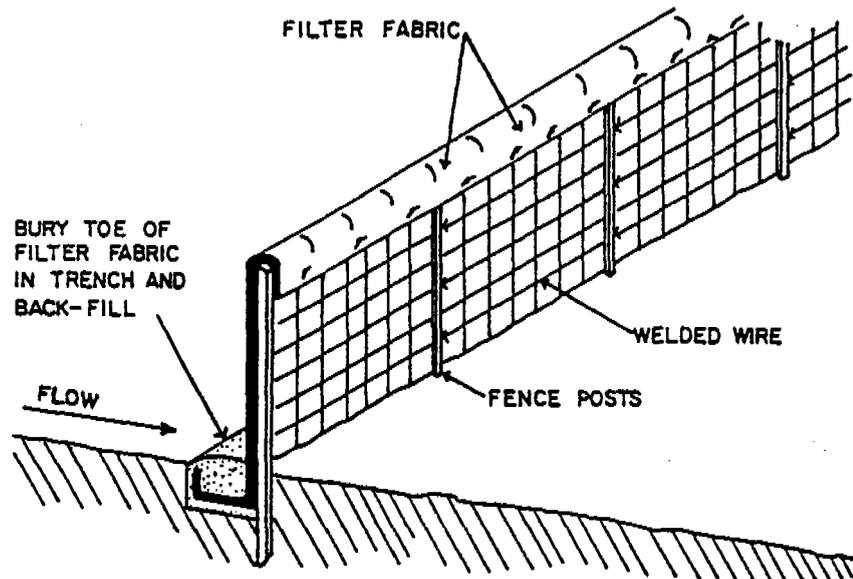
Task	Months From Start of Reclamation					
	1	2	3	4	5	6
Demolition	■					
Rough Grading	■					
Topsoil Distribution				■		
Revegetation						■

Note: 1. Schedule assumes that weather conditions are conducive to reclamation.
 2. Monitoring to occur following above reclamation activities.

FIGURE 12-5-3 RECLAMATION TIMETABLE.



STRAW-BALE DIKE



SILT FENCE

SOURCE: BARFIELD ET AL. (1981)

FIGURE 12-5-4 STRAW-BALE DIKE & SILT FENCE INSTALLATION PROCEDURES.



12-F-6

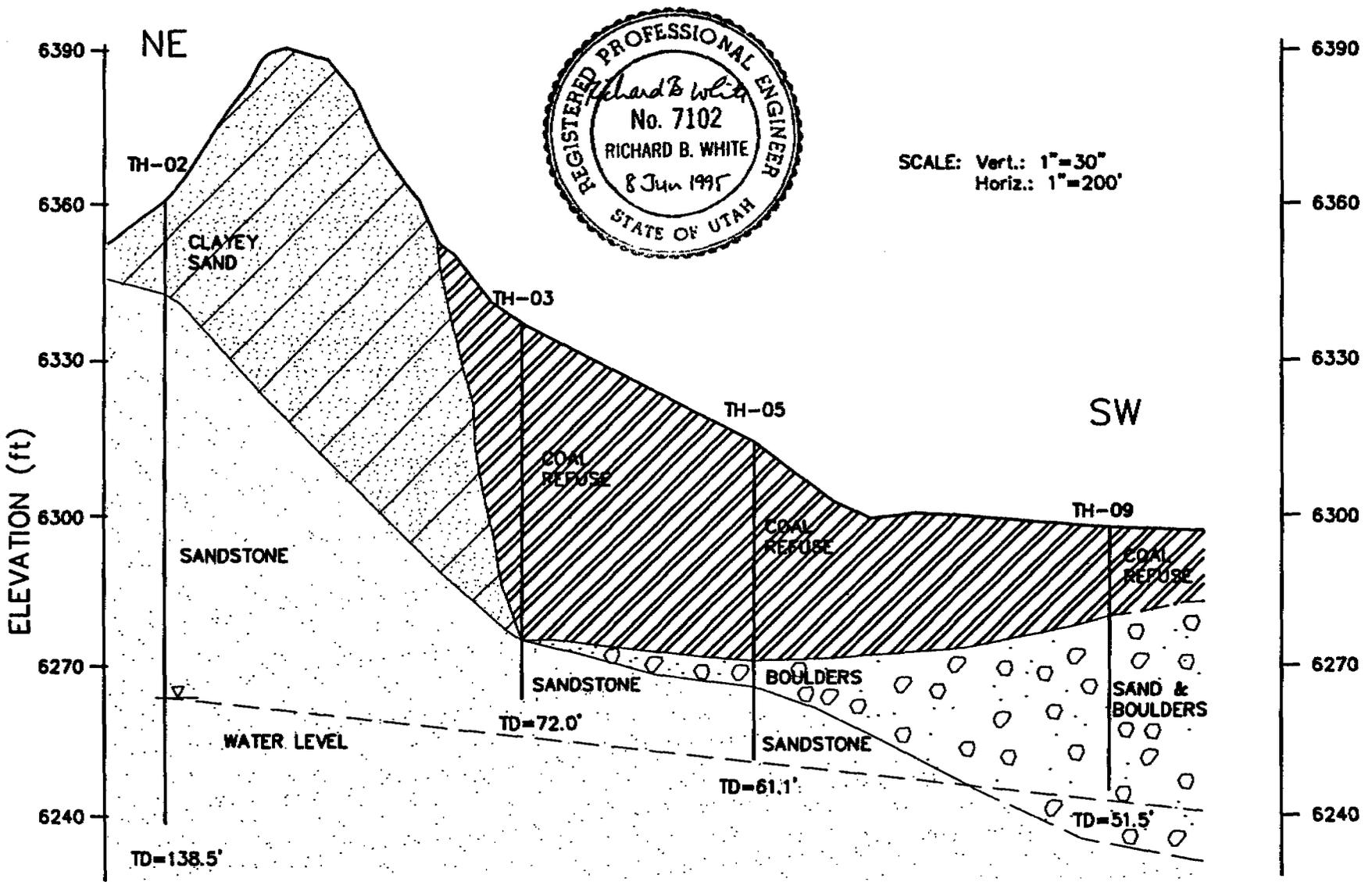


FIGURE 12-7-1. DRILLHOLE CROSS SECTION



12-F-7

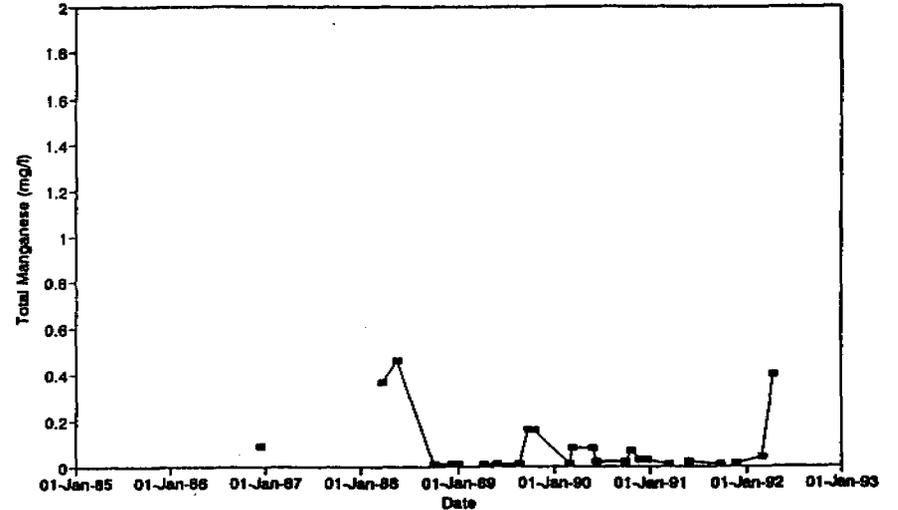
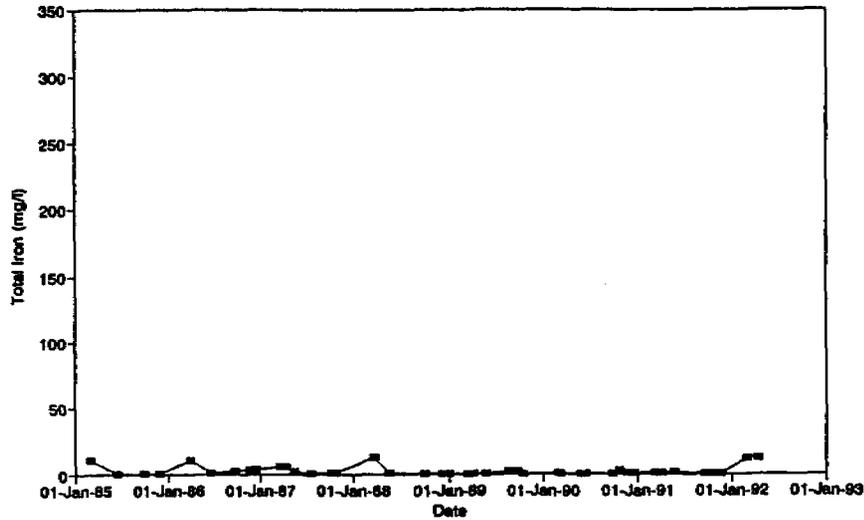
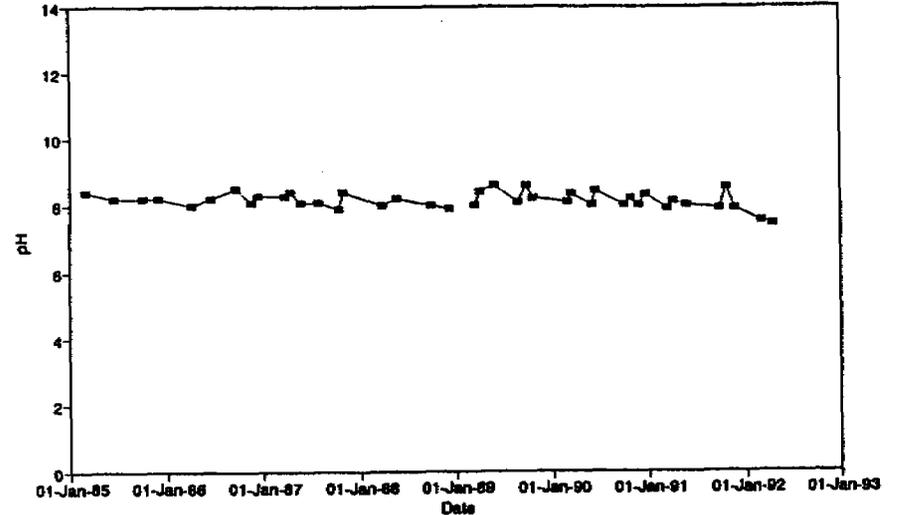
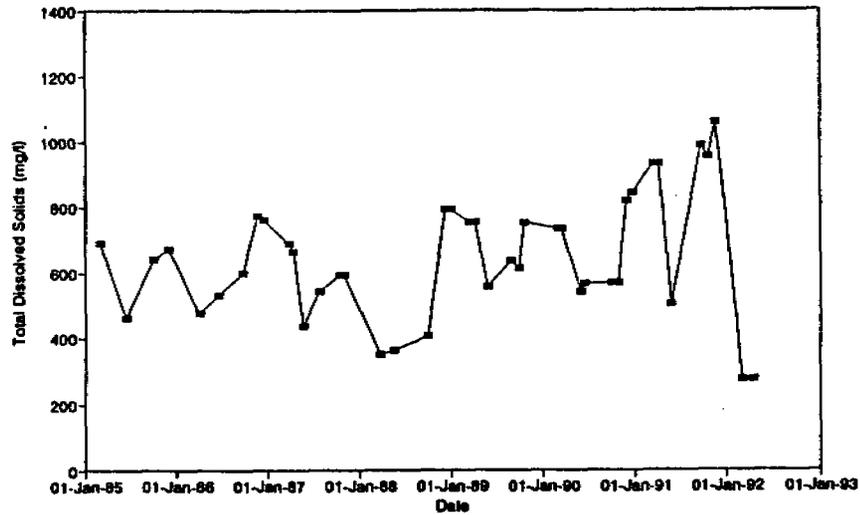


FIGURE 12-7-2 WATER QUALITY DATA SUMMARY - STATION B-27.



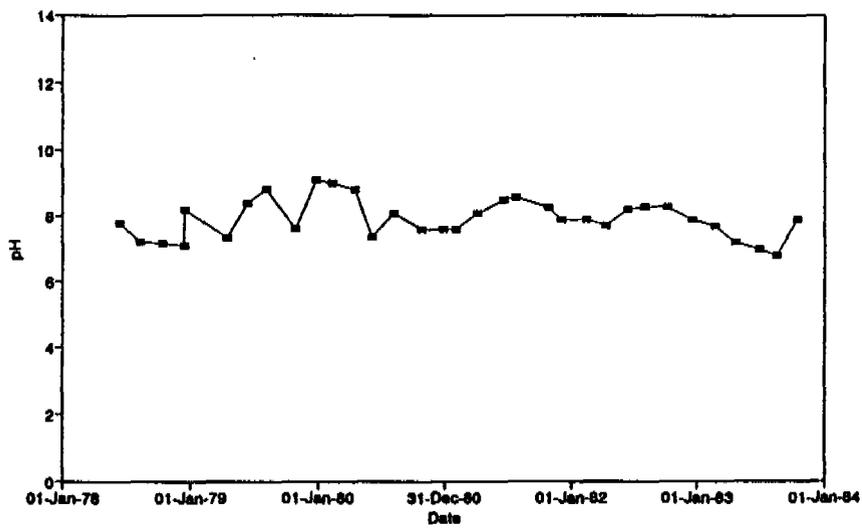
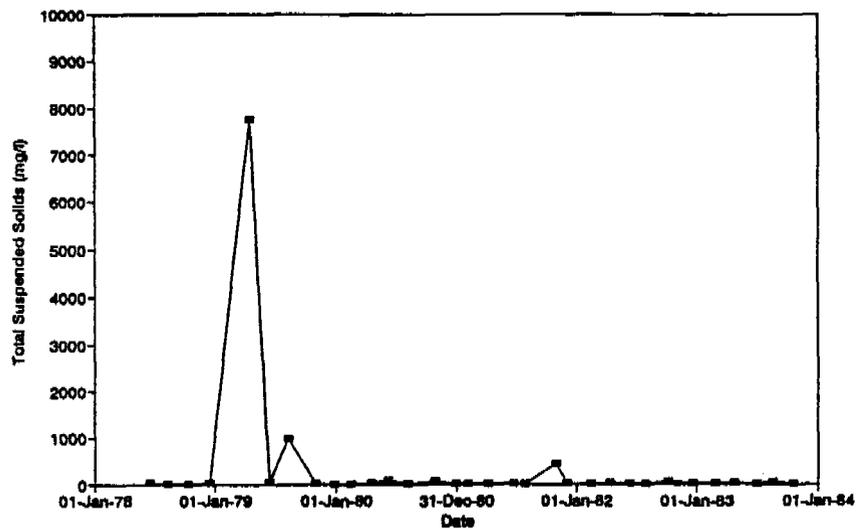
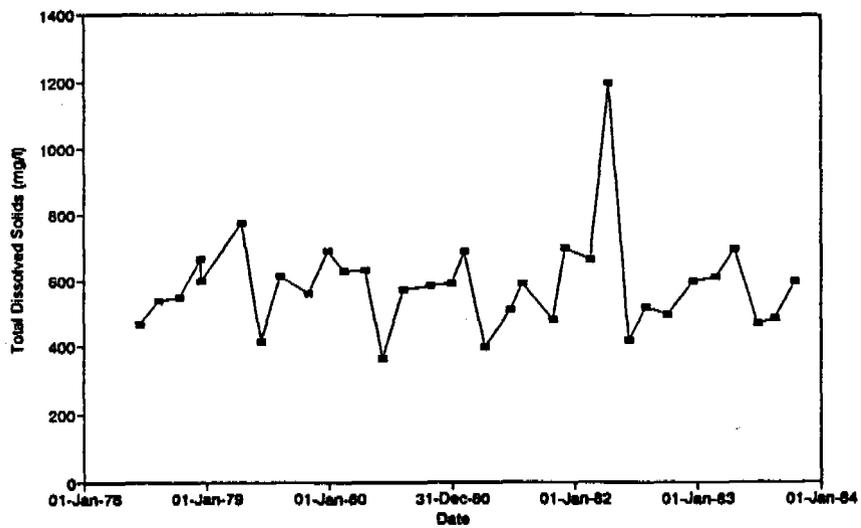


FIGURE 12-7-3

WATER QUALITY DATA SUMMARY - STATION B-1.



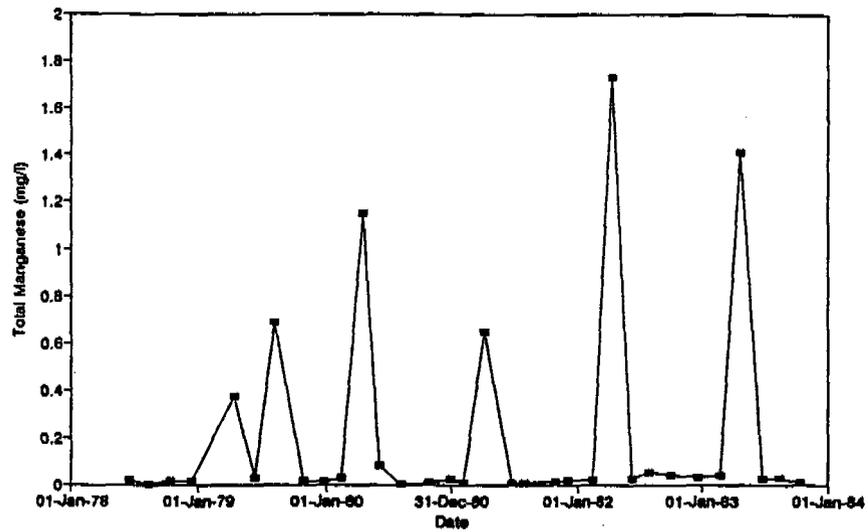
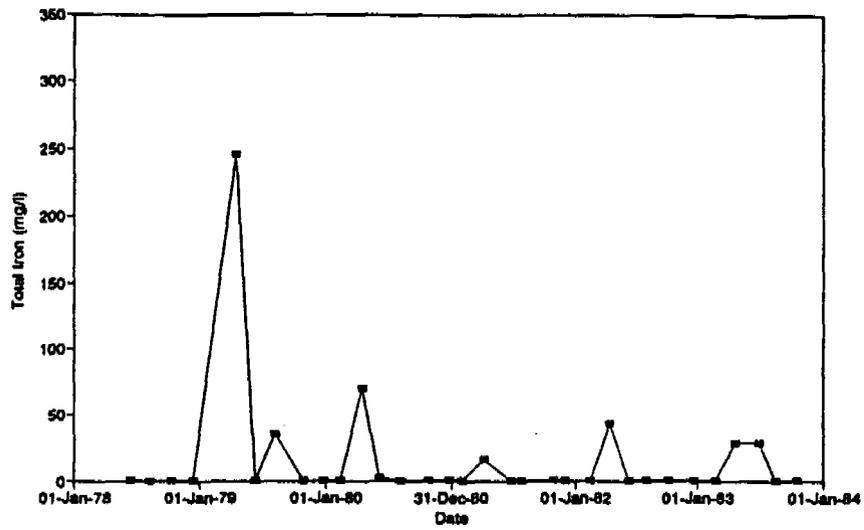


FIGURE 12-7-3 WATER QUALITY DATA SUMMARY - STATION B-1
(Continued).



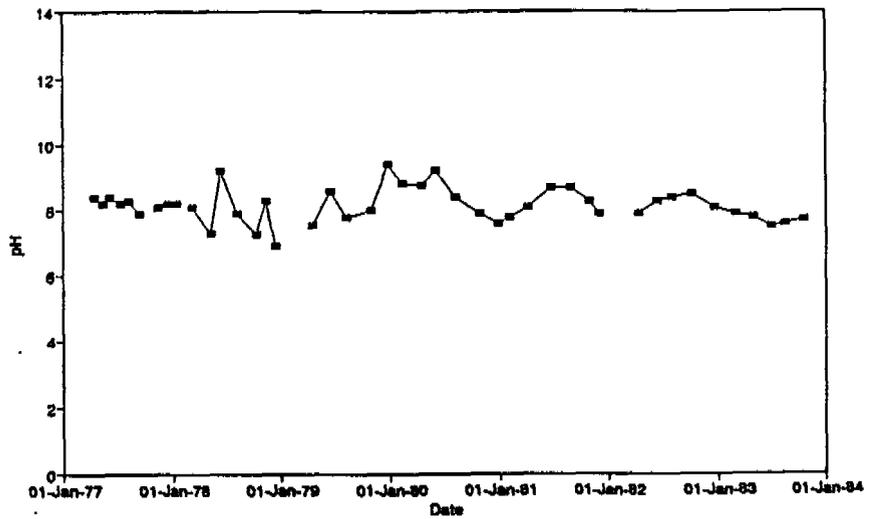
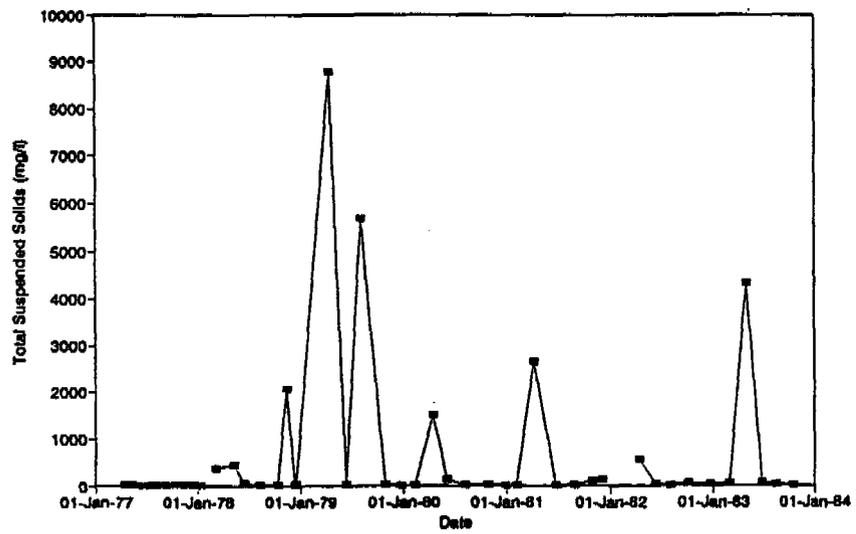
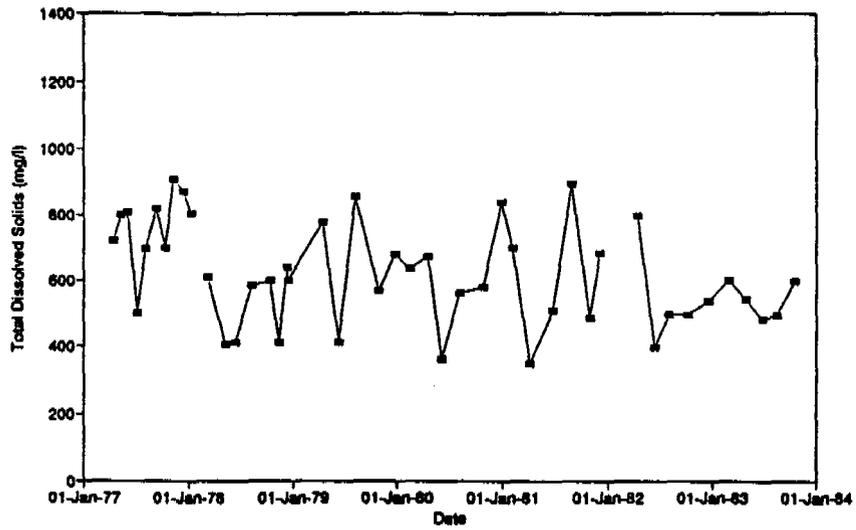


FIGURE 12-7-4

WATER QUALITY DATA SUMMARY - STATION B-2.



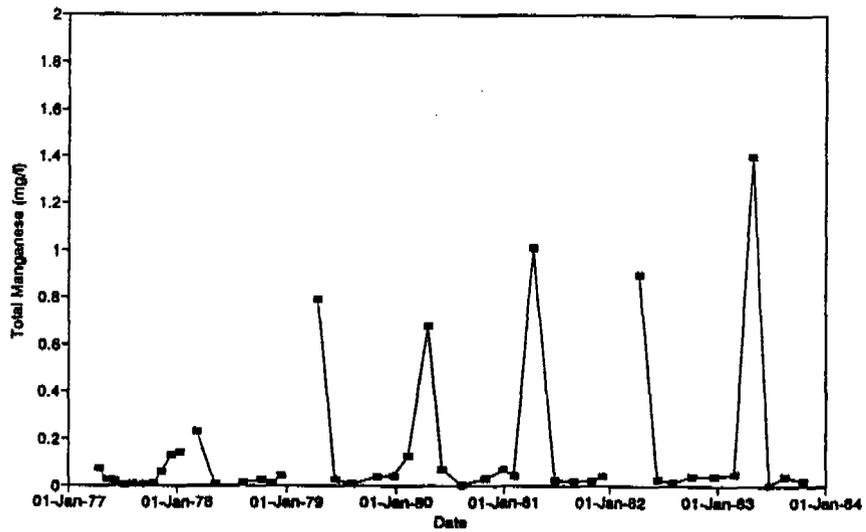
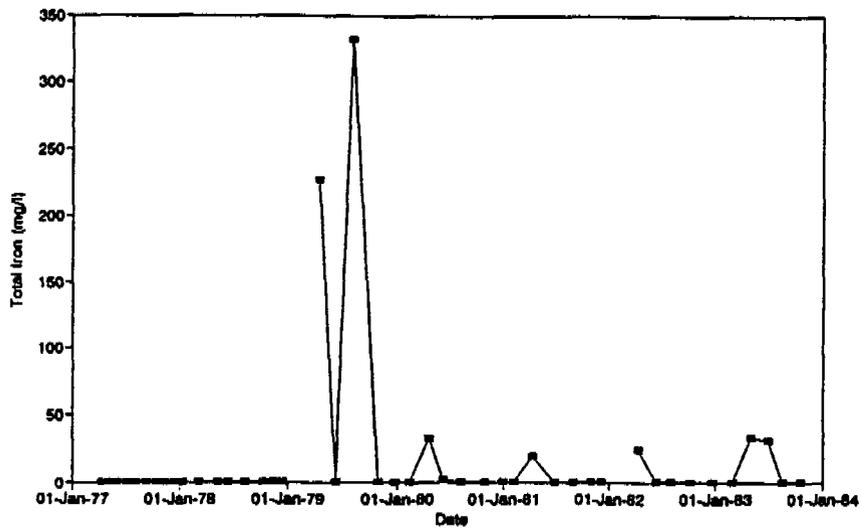


FIGURE 12-7-4 WATER QUALITY DATA SUMMARY - STATION B-2 (Continued).



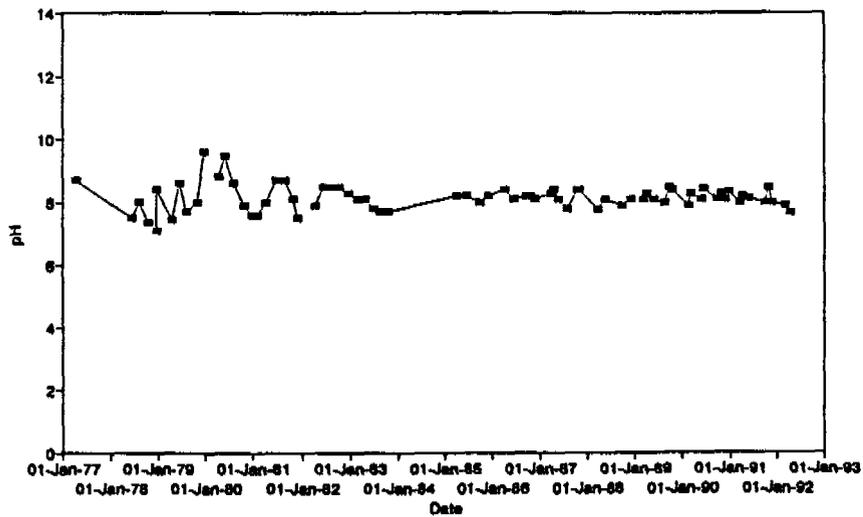
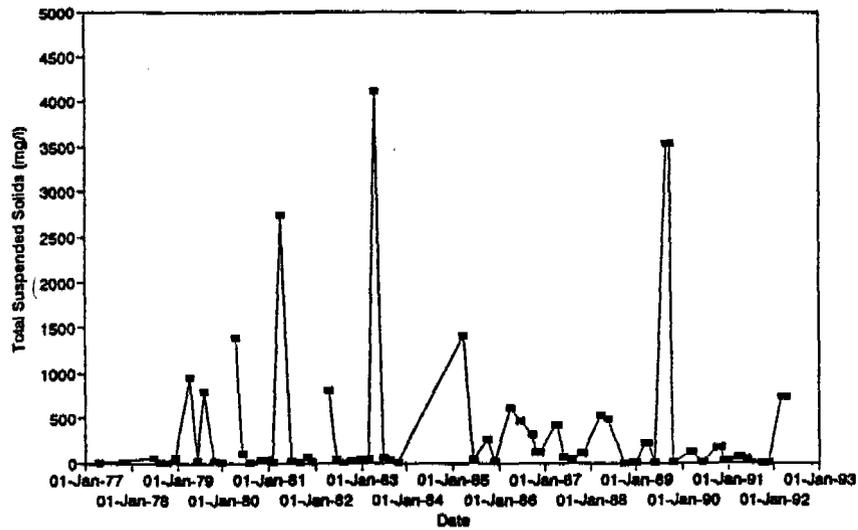
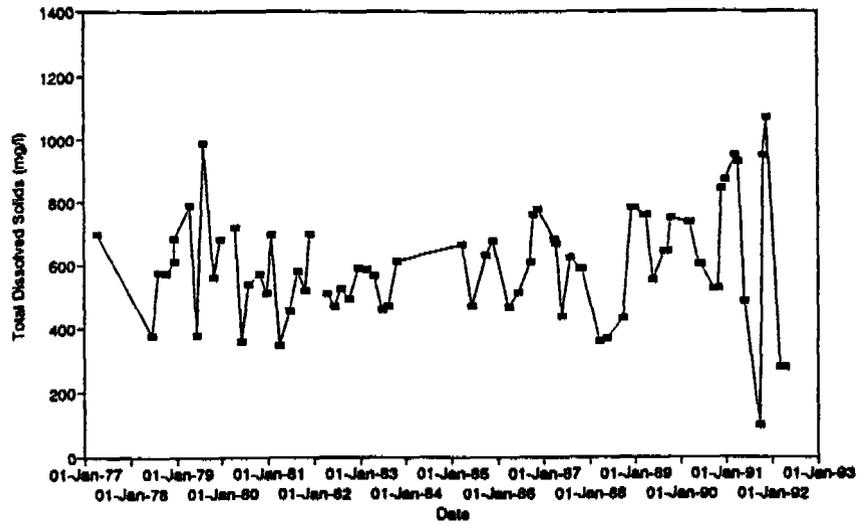


FIGURE 12-7-5 WATER QUALITY DATA SUMMARY - STATION B-3.



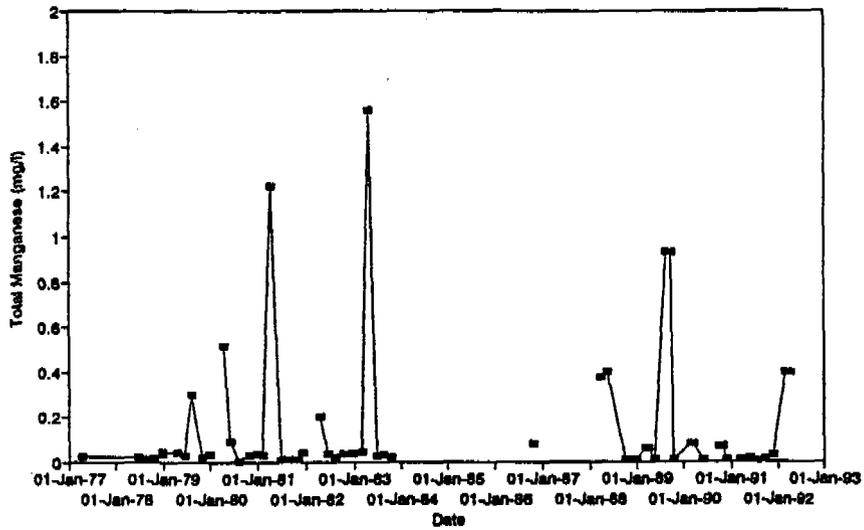
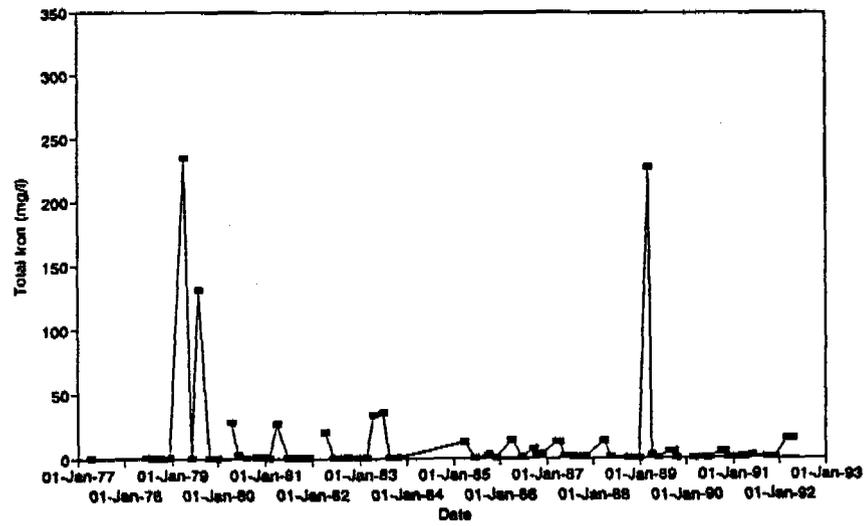


FIGURE 12-7-5 WATER QUALITY DATA SUMMARY - STATION B-3
(Continued).



APPENDIX 12-1-1
AML AGREEMENT
AND
CORRESPONDENCE

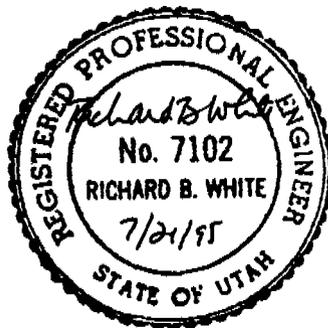


EXHIBIT 1

AML MEMORANDUM

AGREEMENT
BY AND BETWEEN
BLACKHAWK COAL COMPANY,
and
UTAH DIVISION OF OIL, GAS & MINING

This Agreement is made and entered into by and between the Utah Division of Oil, Gas & Mining ("the Division") and Blackhawk Coal Company ("Blackhawk").

Recitals

- A. The Division's Abandoned Mine Reclamation Program ("AMRP") requires a waste disposal area to complete the reclamation of the Willow Creek Project, the Price River Coal Pile Project, and other nearby abandoned waste piles (the "Reclamation"). These waste piles currently create a safety hazard from burning coal; negative environmental impacts on stream sediment load, aquatic life, and air and water quality; and a negative economic impact from clogged irrigation ditches downstream.
- B. Blackhawk owns the only site in close proximity which is capable of safely receiving the large amounts of coal waste. Approximately nine-and-one-half acres of this site are part of a permitted area which is due for reclamation this year under the authority of the Division's Coal Regulatory Program ("CRP").
- C. Because Blackhawk is currently responsible for reclaiming the permitted site under a Reclamation Permit, and because some of the abandoned coal waste piles are located on Blackhawk's property, Blackhawk wishes to assist the AMRP in the Reclamation by providing the nine-and-one-half acre site on the north end of its permitted area for a waste disposal area.
- D. An assessment has been made of the advantages to the Division and to Blackhawk and the provisions herein will benefit all parties:
 1. A virgin site will not have to be disturbed for a disposal area or for obtaining cover material, since an already disturbed site will be provided to allow completion of the Reclamation.

Blackhawk, Utah DOGM Agreement

2. Some aspects of reclamation will be enhanced in comparison to the earlier Blackhawk Reclamation Plan: the highwall at the site will be greatly reduced; stabilization and enhancement will take place along 1500 feet of streambank; and the area will be returned to a more natural contour, approximating its original landform prior to creation of the large pad in pre-Act time.
 3. The AMRP will save approximately \$500,000 in reclamation costs by using this nearby disposal area.
 4. Blackhawk will cooperate in the Reclamation, saving additional state share reclamation fund money.
 5. Blackhawk will save reclamation money because only the remaining permitted acreage will need to be reclaimed by Blackhawk under the authority of the CRP.
- E. The Division and Blackhawk favor the Reclamation at the site by the AMRP and wish to enter into this Agreement to facilitate that purpose.
- F. Precedent has been set in other states for removing acreage from Title V permitted sites for use as Title IV waste disposal areas and the Office of Surface Mining Reclamation and Enforcement (OSMRE) has addressed the issues of eligibility and reclamation standards in *Placement of Excess Spoil from AML Projects on Lands Affected by Mining After August 3, 1977*, a memorandum received April 27, 1984 by the Division, and in the Federal Assistance Manual, Chapter 4-06-30, *Site Eligibility for AMLR Projects*. These documents are attached hereto and hereby made a part hereof, marked Exhibit A.

Agreement

NOW THEREFORE, in consideration of the mutual obligations and undertakings contained in this Agreement, Blackhawk and the Division agree to the following:

1. The Division through its CRP, agrees to approve an amendment to the present permit site to reduce the site by nine-and-one-half acres as shown on the map, attached hereto and hereby made a part hereof, marked Exhibit B.

Blackhawk, Utah DOGM Agreement

2. Blackhawk agrees to the permitting responsibility to the CRP for the remaining acreage under Blackhawk's permit.
3. Blackhawk agrees to execute a Right of Entry for the AMRP use of the nine-and-one-half acres to be released in Paragraph 1 above, plus additional surrounding acreage to the stream edge and up the hillside from the pad, as outlined on the attached map, Exhibit B, and known as the AMRP Willow Creek Reclamation Disposal Site ("Reclamation Site"). The terms of the Right of Entry are attached hereto as Exhibit C and made a part hereof.
4. Upon completion of the Reclamation, the AMRP agrees to remove the drainage culvert which bisects the original permitted site and to establish drainage for the Reclamation Site. The AMRP will also make provisions for drainage from the undisturbed area which may need to bypass the Reclamation Site. Blackhawk agrees to tie drainage from the undisturbed area, upslope from its permit area, into the drainage leading into Willow Creek. The drainage provisions which will replace the culvert will be agreed upon by the AMRP and Blackhawk. The AMRP agrees to install gabion structures through the steep part of the channel down to Willow Creek, and Blackhawk agrees to bear the costs of the gabions and their installation.
5. The AMRP agrees to maintain in good and operable condition the steel and concrete reinforced culvert bridge at the entrance to the Blackhawk property, until completion of the Reclamation.
6. Blackhawk agrees to have the access road to the Reclamation Site in good and operable condition. The AMRP agrees to maintain the road in the same condition during haulage of material to the Reclamation Site, and upon completion of the Reclamation, return it to the condition prior to haulage. After that time, Blackhawk agrees to accept responsibility for maintenance and disposition of the road under the terms of the amended Reclamation Plan approved by the CRP.

Blackhawk, Utah DOGM Agreement

7. Blackhawk agrees to share in the cost of reclamation of the AMRP Reclamation Site. Blackhawk's cost shall constitute the amount spent on gabions, gabion installation, and revegetation of the AMRP Reclamation site and will not exceed \$45,000.
8. Blackhawk agrees to provide a consultant to be available for technical consultation on the joint reclamation, as cited in Paragraphs # 4 through #7 above, between the AMRP and Blackhawk.
9. The AMRP will make a good faith effort to complete the Reclamation by November 15, 1990. If the AMRP is unable to complete the reclamation by this time, then an extension of this Agreement will be considered.
10. Except as set forth in this Agreement, neither party shall undertake any activity, expressed or implied, nor make any representation which purports to bind the other.
11. Modification of this Agreement shall be in writing and approved by all parties hereto.

This Agreement shall become effective when signed by both parties to this Agreement and shall remain in effect for the term of the Reclamation, but no longer than April 1, 1991, unless terminated with thirty days written notice by either party.

BLACKHAWK COAL COMPANY

UTAH DIVISION OF OIL, GAS & MINING


J. P. Katlic, President and
Chief Operating Officer

APPROVED
LEGAL-FSD
JC


Dianne R. Nielson
Director

APPROVED AS TO FORM:


Barbara W. Roberts
Utah Assistant Attorney General

DATED this 16 day of May, 1989.



United States Department of the Interior

OFFICE OF THE SOLICITOR
WASHINGTON, D.C. 20540

EXHIBIT A-1

MEMORANDUM

RECEIVED

APR 27 1984

TO: Phyllis Thompson, Chief
AML Reclamation Division
Office of Surface Mining

DIVISION OF OIL
GAS & MINING

Jerry Ennis, Chief
Division of Federal Reclamation Programs
Office of Surface Mining

FROM: Edward H. Bonekemper, III, Assistant Solicitor
Branch of Governmental Relations
Division of Surface Mining

SUBJECT: Placement of Excess Spoil from AML Projects on
Lands Affected by Mining After August 3, 1977

This responds to an issue raised by both the Federal and State Abandoned Mine Land Programs concerning the legality of placing excess spoil material from AML project sites on lands adversely affected by mining after the enactment of the Surface Mining Control and Reclamation Act of 1977, Pub. L. 95-87 (SMCRA). Since spoil material may be used to reclaim or partially reclaim post-SMCRA affected sites, your respective offices have inquired whether such expenditures violate the provisions of Section 404 which limit the expenditure of funds only for the reclamation of eligible lands. Within certain parameters, I believe that it does not.

Issue

Whether excess spoil material from a bona fide AML site may be placed on an unreclaimed area mined after August 3, 1977?

Answer

Spoil material generated by a bona fide AML project may be placed on areas mined and left unreclaimed after August 3, 1977 under the following conditions: (1) the disposal effort should not significantly increase the costs of completing the AML project; (2) the disposal activity should be limited to those actions necessary to properly dispose of the material in question; and (3) the disposal site should only be as large an area as is technically required.

Discussion

A. Case History - St. Charles Watershed Project

The St. Charles Watershed Project includes approximately 8,000 acres of land and entails the cleaning out of several miles of stream channel affected by the silt and sediment runoff from abandoned mines in the watershed. The State of Virginia has proposed, as part of this cooperative agreement project, to dispose of the stream channel material on at least two and potentially six sites which are commonly referred to as two-acre exempt sites.

According to the Commonwealth of Virginia, the proposed two-acre exempt sites are small face-up operations and application of the shadow definition would still qualify these sites for the two-acre exemption in Section 528(2) of SMCRA. The sites are not contiguous, are not connected by haul roads and were mined by several different companies. The proposed two-acre exempt sites are in the general proximity of the AML sites, and access is readily available. The material from the stream channel is a fine textured, non-toxic material which will support vegetation using conventional techniques.

If disposal of the excess spoil is not allowed on the two-acre exempt sites, the material will have to be placed on already revegetated areas or virgin areas in the watershed area. This would involve a certain amount of grading and vegetation so that the disposal site is not left in a degraded condition.

B. Disposal versus Reclamation

The present controversy can be resolved by analysing and distinguishing the activities performed. Operations limited to those activities deemed necessary to dispose of the excess spoil material either on or off the AML project site are not reclamation projects subject to the requirements of Section 404 of SMCRA. I classify such activities, instead, to be necessary though incidental parts of on-going AML projects. In such cases the costs of hauling, disposing, grading and revegetating the excess material are merely incorporated into the costs of completing the project.

I can find nothing in the statute or legislative history which would necessarily constrain OSM's discretion in this area. OSM has two choices: either dispose of the excess material on site if possible or dispose of it off-site. If the material must be disposed of off the AML site, I can find no logical reason or legal basis that would dictate the manner or location of disposal. In fact, I find it highly unlikely that Congress would favor creating a new disposal site and disturbing virgin land instead of placing any excess material on existing disposal sites or on already disturbed lands. The mere fact that the disposal

operation results in partial or full reclamation of a previously disturbed area is an added benefit but does not, by itself, alter the basic character of the operation. Certain AML projects, such as landslides, burning refuse piles and stream channel clean-outs, generate excess material that requires disposal in some location. How the disposal is accomplished and the location selected are programmatic and policy decisions for which OSM has discretionary authority.

Limitations on this authority occur, however, when the basic character of the disposal operation is changed. That is, if the disposal operation is enlarged beyond that deemed necessary and proper to dispose of the excess material, the operation then takes on the characteristics of a separate and independent reclamation project which would, of course, be subject to the eligibility requirements in Section 404 of SMCRA.

The line between what constitutes a disposal operation in contrast to a separate and independent reclamation project is not always apparent. For example, consider a situation where the project officer has a choice between placing the excess spoil on an undisturbed site approximately one mile from the AML site or placing it on a post-1977 disturbed site two miles away. The longer distance in the latter case would result in slightly higher costs but the program would recognize the additional benefits of not unnecessarily disturbing virgin land as well as partially reclaiming the disturbed site in question. Does the slight increase in costs change the basic nature of the operation? In terms of this hypothetical, I think not. Here the slight increase in costs could be justified when balanced against the short- and possibly long-term adverse environmental effects caused by disrupting the ecosystem of the undisturbed land.

Consider, however, a slightly different example. Once again the project officer has two alternatives: an undisturbed site one mile away and a post-1977 affected area ten miles away. An analysis of the alternatives shows that disposal of the material on the closest site will not result in any long term adverse impacts on the area's ecology nor will it unduly restrict the future utility of the land. On the other hand, disposal on the latter site would more than double the costs of the disposal operation. Despite such additional costs, however, the project officer selects the site ten miles away since it provides multiple benefits; that is, it disposes of the material, avoids unnecessary disruption of an area's ecology and eliminates an existing threat to the public health and safety. Is this decision an abuse of OSM's discretionary authority? Again, the answer is probably not.

Despite the additional costs, the essential character of the disposal operation remains intact. No additional reclamation is performed on the post-1977 site over what is deemed necessary and proper to backfill and regrade the material. The disposal site

only as large as is technically required to dispose of the material and the overall effect on the project's costs are not significant.

The point of this example is not to argue whether the scope for the disposal operation has been changed; rather, it is meant to demonstrate that OSM has a certain latitude in designing and carrying out its reclamation projects. Whether OSM follows the least or most cost effective alternative available is a policy and programmatic decision. I find nothing in the statute or the legislative history of Title IV which circumscribes the agency's discretion to design the scope of its reclamation projects. The design of a project is the prerogative of the agency and should not be overturned unless clearly arbitrary and capricious under the specific circumstances.

Consider one final situation. Here the facts are the same as in the preceding example except that the Regulatory Authority has determined that an operator has some continuing reclamation responsibility for the post-1977 affected site. Does this additional fact disqualify the site? Again the answer is no. The disposal of the excess material is not a reclamation project, and therefore it is not subject to the eligibility requirements in Section 404. The existence or non-existence of continuing reclamation responsibility does not affect OSM's authority to dispose of the excess material. I realize, however, that there may be several sound policy reasons for not disposing excess material on this type site. The purpose of this example, though, is to demonstrate that this would be a policy decision and not a legal requirement.

To assist OSM in analyzing these types of cases, I have listed below several conditions that should be considered before excess spoil from AML projects is placed on post-1977 affected lands:

1. The disposal effort should not significantly increase the costs of completing the AML project;
2. The disposal activity should be limited to those actions necessary to properly dispose of the material; and
3. The disposal site should only be as large an area as is technically required.

C. St. Charles Watershed Project

Without the specific facts concerning the disposal sites in the St. Charles Watershed Project, I am unable at this time to provide an opinion as to the legality of the proposed actions. Each disposal site, however, should be analyzed based on the above factors before a decision to fund these activities is made.

Summary

Spoil material generated by a bona fide AML project may be placed on areas mined and left unreclaimed after August 3, 1977 under the conditions discussed in this memorandum. OSM and the states with approved AML programs, appear to have considerable latitude in designing their projects including the discretion to fund more costly alternatives. This discretion is limited, however, to achieving the purposes of Title IV. It is not and should not be viewed as a license to effect reclamation using AML funds which could not be otherwise legally accomplished.

cc: James R. Harris
William B. Schmidt
Brent Wahlquist
Marshall Cutsforth
Jim Fary
Anna Norton, Field Solicitor's Office, Pittsburgh
William Stanley, Field Solicitor's Office, Pittsburgh
Glenn Tiedt, Regional Solicitor's Office, Denver
Gerry Thornton, Regional Solicitor's Office, Tulsa

MANUAL.....FEDERAL ASSISTANCE
PART 4.....ABANDONED MINE LAND RECLAMATION PROGRAM

CHAPTER 4-06
CHARACTERISTICS OF AMLR FEDERAL ASSISTANCE

4-06-00	Types of AMLR Federal Assistance
10	Eligibility
20	Extraction of Coal as an Incidental Part of an AML Reclamation Project
30	Site Eligibility for AMLR Projects
40	Allowable Costs
50	Unallowable Costs
60	Grant/Cooperative Agreement Periods
70	Overtime Compensation on Federally- Assisted Construction Contracts

4-06-30 SITE ELIGIBILITY FOR AMLR PROJECTS

A. Policy. It is OSMRE's policy that eligibility determinations are the primary responsibility of the State/Tribe under an approved AMLR Plan. (Note: If an ineligible project is funded, the appropriate procedures will apply to recover such funds.) Eligibility determinations shall be prepared as part of each State grant application according to the procedures set forth in the State AMLR Plan. The following policies are set forth to assist the Field Offices in reviewing specific eligibility issues.

1. Active Mining. Whenever it is necessary, as part of an AML reclamation project, to gain access across or to affect property which has been used or affected by mining after August 3, 1977, reclamation on these sites will be confined to repairing the damage caused by the use of these sites to support AML reclamation activities.

If further reclamation activities are necessary to repair damages caused by accessing an eligible site, such activities must be fully documented and justified in the project narrative prior to the authorization of funds.

CHARACTERISTICS OF AMLR FEDERAL ASSISTANCE

PAGE 4

4-06-30.A (Continued)

2. Bond Forfeiture. Pre-SMCRA State/Tribal reclamation bonds will render a site ineligible only if the amount forfeited is sufficient to pay the total cost of the necessary reclamation. In cases where the the forfeited bond is insufficient to pay the total cost of reclamation, additional monies from the AML Fund may be sought. (See Preamble to 30 CFR Part 870.)

When assets have been recovered or obtained from all parties responsible for the reclamation, and the assets obtained are insufficient to meet all reclamation costs, the property in question will remain eligible for reclamation to the extent that additional funds are required.

When all assets of the responsible parties are identified and legal proceedings instituted to recover such assets, and the monies, if recovered, are not sufficient to cover all the reclamation costs, the properties will remain eligible as long as the administering agency enters into a binding contract with the State/Tribal Attorney General's Office or appropriate State/Tribal office, providing that any recovered funds will be turned over to the appropriate AMLR account.

3. Eligible Sites Reaffected by Post-SMCRA Activities. When a site (e.g., coal refuse pile, slurry pond or wildcat) meets the eligibility criteria in Section 404 of SMCRA, and has been reaffected by mining after August 3, 1977, this site will remain eligible for AMLR funding despite such post-SMCRA mining if the following conditions are met:

- a. The post-SMCRA mining did not substantially increase or alter the environmental damage presented by the pre-SMCRA mining;
- b. The total costs of the reclamation activities are not increased by the post-SMCRA mining; and
- c. There is no known responsible party, or, if the responsible party is known, monies that are or may be recovered are insufficient to pay the total cost of reclamation.

Recovered monies, where and when available, must either be used as part of the reclamation activities or be deposited in the appropriate AMLR account.

4-06-30.A.3 (Continued)

If these conditions are not met, that portion of the site unaffected by the post-SMCRA mining activities will still remain eligible. If this situation occurs, the project can be altered to include only the eligible portion, if feasible, or funds from non-AMLR sources may be used to pay for the percentage of the project deemed to be ineligible.

4. Hazardous Substances. If the proposed project involves the transfer, removal or reclamation of any hazardous substances, the eligibility opinion should provide a statement that the State/Tribal Attorney General's Office or the Agency's chief legal counsel has reviewed the proposed project plans and that they comply with all applicable State/Tribal and Federal laws concerning removal or reclamation of such substances.
5. Eligibility Opinions on Federal Reclamation Program Sites. The determination of eligibility on Federal Reclamation Program (FRP) sites should be done by a State/Tribal Attorney General's Office or by the AMLR agency's legal counsel because eligibility determinations are usually issues concerning State/Tribal law. If a State/Tribe does not provide a determination of eligibility for a FRP project, then the determination of eligibility should be done by the appropriate Regional or Field Solicitor's Office.
6. Multi-Use Sites. Multi-use sites are sites on which the land or other property was adversely affected by mining prior to August 3, 1977, and which was subsequently used in whole or in part for some non-mining activity. Such properties remain eligible for AMLR funding only to the extent that mining related problems exist, and that they have not been altered or increased by non-mining activities. Under certain circumstances, the intervening use may shift reclamation responsibility away from the AMLR program.
7. Public Use Facilities. Projects for the repair or replacement of public facilities (Priority 5), such as roads or bridges, which were damaged as a result of mining activities, may be eligible if the legal opinion confirms that the damage is a result of past mining activities and not from normal deterioration or lack of repair by local authorities.

4-06-50 (Continued)

3. Costs for activities which significantly alter the approved program and were not approved through appropriate revisions; and
4. Construction costs in an administrative agreement.

4-06-60 GRANT/COOPERATIVE AGREEMENT PERIODS

- A. Cooperative agreements shall normally be approved for a period of one year and may be entered into at anytime during the course of a year. Extensions of time may be granted at the requests of the State with adequate justification. (See Chapter 1-81).
- B. Construction grants shall normally be approved for a period of three years with projects beginning and ending during the life of each grant. Administrative grants are awarded for a period of one year.
- C. Special 10% Set-Aside Grants shall normally be approved for a period of 30 days (see chapter 4-20).

4-06-70 OVERTIME COMPENSATION ON FEDERALLY-ASSISTED CONSTRUCTION CONTRACTS

- A. Section 329 of the Contract Work Hours and Safety Standards Act [40 U.S.C. 327 et seq.] specifies three categories of contracts which are covered by the Act. It has been determined that none of these categories is applicable to contracts funded by OSMRE Abandoned Mine Land Reclamation Program construction grants to States/Tribes. The United States is not a party to such contracts; they are not made on behalf of the United States; and, although they involve grant funds, the grants are not made pursuant to a statute specifying wage standards for such work.
- B. Therefore, the provisions of the Contract Work Hours and Safety Standards Act regarding overtime compensation on federally-assisted construction contracts do not apply to OSMRE AML construction grants.

INGRESS-EGRESS/RIGHT OF ENTRY CONSENT FOR
RECLAMATION, MONITORING & MAINTENANCE

by

BLACKHAWK COAL COMPANY

The undersigned, Blackhawk Coal Company (hereafter the Holder), does hereby consent to the following activities by the Utah Division of Oil, Gas & Mining, Department of Natural Resources and its agents, employees or contractors (hereinafter collectively referred to as the Division):

1. Ingress and Egress along a designated route on the following described land:

NE4 of Sec. 1, T13S, R9E, SLBM and NW4 NW4 of Sec. 6, T13S, R10E, SLBM

For the purpose of access to the Abandoned Mine Land Program ("AMRP") Willow Creek Reclamation Disposal Site ("Reclamation Site") from the Willow Creek Pile and from U.S. Route 191.

2. Duly authorized employees, agents and/or contractors of the Division may enter upon the hereinafter described lands to perform reclamation activities to eliminate hazards created by past mining activities that affect the public's health, safety and general welfare; including but not limited to the following:
Soil test pits, transportation and burial of coal refuse, covering refuse material with on-site soil material, installation of proper drainage and the revegetation of disturbed areas.

The Division may also enter upon hereinafter described lands to monitor the success of the reclamation after construction and to maintain the intended level of reclamation at the Willow Creek Project reclamation sites in Carbon County, Utah, more particularly described as follows:

Reclamation Site

SW4 SW4 of Sec. 31, T12S, R10E, SLBM

And more specifically described in the Memorandum of Agreement between the Division and the Holder, dated May 16, 1989:

Attached hereto and hereby made a part hereof.

Sediment Ponds

E2 NW4 NW4 and SW4 NE4 NW4 and NW4 NW4 NW4 of Sec. 1, T13S, R9E, SLBM

Area west of the D&RGW Railroad tracks and east of U.S. Route 6

Peacock Pile (east pile)

SE4 SW4 NE4 Sec. 1, T13S, R9E, SLBM

Area south of Willow Creek

Willow Creek Pile

NE4 SW4 NE4 and SE4 NW4 NE4 of Sec. 1, T13S, R9E, SLBM

Area north of U.S. Route 191

Canyon Mouth Pile

SE4 NE4 NE4 of Sec. 1, T13S, R9E, SLBM

Area north of U.S. Route 191 and south of Willow Creek

Cemetery Pile

N2 NW4 NW4 of Sec. 6, T13S, R10E, SLBM

Area north of U.S. Route 191 and south of Willow Creek

Upper Willow Creek Piles

S2 NE4 SW4 and N2 NW4 SE4 and SE4 NE4 NE4 SW4 and SE4 SW4 NE4 of Sec. 31, T12S, R10E, SLBM

Area north of U.S. Route 191 and south of Willow Creek

Hardscrabble Portals

E2 SE4 NW4 and W2 SW4 NE4 of Sec. 10, T13S, R9E, SLBM

Area west of the Hardscrabble Canyon road

3. The Division proposes to use adjacent and/or nearby material if appropriate, for reclamation of the mine site area.
4. The Division expressly assumes liability for any and all injuries (including death) sustained by its employees, agents and contractors because of the Division's activities on said lands. Furthermore, the Division expressly waives liability of the Holder for any and all injuries (including death) and property damage sustained by Division employees on said lands.

Blackhawk Coal Company reserves all rights with respect to the above described lands, including, but not limited to, the right of access at all times for the purpose of inspecting the Division's activities.

- 5. Except as herein set forth in this ingress-egress/right of entry consent, neither the Division nor Holder shall undertake any activity, either expressed or implied, nor make any representation which purports to bind the other.
- 6. All work performed shall be conducted in a professional manner in accordance with all applicable laws and regulations. Further, duly authorized personnel of the Division are granted permission to inspect work at reasonable times.
- 7. It is expressly understood that all costs incurred for studies and reclamation work shall be the sole liability of the Division with the exception of costs agreed to be paid by Blackhawk, set forth in the Memorandum of Agreement.
- 8. If the Division anticipates the conduct of activities on lands of Holder other than those specifically described herein the Division will request permission from Holder for its intended activities prior to entry on those lands.

Dated this 16th day of May, 19 89.

DIVISION OF OIL, GAS & MINING

BLACKHAWK COAL COMPANY

By: *Dianne R. Nielson*
 Name: Dianne R. Nielson
 Title: Director

By: *J.E. Katlic*
 Name: J.E. Katlic
 Title: President

APPROVED
LEGAL
cc

By: *Mary Ann Wright*
 Name: Mary Ann Wright
 Title: AMR Administrator

Blackhawk Coal Company

Approved as to form:

Barbara W. Roberts
 Barbara W. Roberts
 Assistant Attorney General

BEFORE THE DIVISION OF OIL, GAS AND MINING
DEPARTMENT OF NATURAL RESOURCES
STATE OF UTAH

--ooOoo--

IN THE MATTER OF CYPRUS : FINDINGS
PLATEAU MINING COMPANY, :
PROPOSED WILLOW CREEK : CAUSE NO. PRO/007/038
MINE, AND AMAX COAL COMPANY, : CAUSE NO. ACT/007/004-95B
CASTLE GATE MINE, CARBON :
COUNTY, UTAH :

--ooOoo--

On May 11, 1995, a public hearing was held before Lowell P. Braxton, Division of Oil, Gas and Mining, Department of Natural Resources, in accordance with Utah Admin. R. 645-103-234 and Utah Code Ann. § 40-10-24(4)(c) at the Carbon County Courthouse, Price, Utah.

The hearing was requested by Cyprus Plateau Mining Company and AMAX Coal Company to seek public comment in the matter of conducting mining operations within 100 feet of the outside right-of-way of Highway 191 in Willow Creek Canyon, as documented in permit applications designated PRO/007/038 and ACT/007/004-95B, respectively.

Notice of the public hearing was appropriately given and a stenographic record was made by a registered professional reporter.

The hearing commenced at 3:00 p.m. and concluded at 4:02 p.m.

No comments regarding conduct of mining within 100 feet of Highway 191 were made at the hearing.

Based on appropriate notice and lack of adverse public comment, the Division finds that the interests of the public and affected landowners will be protected from the mining activities proposed to take place within 100 feet of the outside right-of-way of Highway 191.

DATED this 6th day of July, 1995.

STATE OF UTAH
DIVISION OF OIL, GAS AND MINING



Lowell P. Braxton
Associate Director, Mining

T-226 (10/88)
HIGHWAY RIGHT OF WAY
ENCROACHMENT

013813

PERMIT

District No. _____ Price _____ Date 7/25/95 Application of Cypress Plateau Mining Co.
By Ben Grimes, Title Sr. Staff Project Engineer
Address PO Drawer N PMC Price, Utah 84501, Phone () 636-2227

is hereby granted, subject to UDOT's Regulations For The Accommodation of Utilities on Federal-Aid and Non Federal-Aid Highway Right of Way, Regulations for the Control and Protection of State Highway Rights of Way, Standard Specifications for Road and Bridge Construction, Specifications for Excavation of State Highways, State Occupational Safety and Health Laws, Manual on Uniform Traffic Control Devices, Instructions to Flaggers, the approved plans, and any special limitations set forth herein, permission for the purpose of Set up truck crossing locations during the removal of approx 488,000 ton of coal waste material

within the right of way limits of Highway No. 101, Milepost No. 157-159, in Carben County, in the following locations: Approx 3/4 mile north-east of the junction with Hwy 6.

Receipt of \$20.00 permit fee is hereby acknowledged. The work permitted herewith shall commence, Sept. 1, 19 95 and shall be diligently prosecuted to completion. The work shall be completed and all disturbed surfaces or objects restored on or before Dec. 31, 19 95. In the event work is commenced under this permit and the permittee fails or refuses to complete the work, the Utah Department of Transportation may, at its election, fill in or otherwise correct any existing deficiencies at the expense of and subject to immediate payment by the permittee.

Permittee shall execute a bond in the minimum amount of \$ NA, as determined by the District Director, to insure faithful performance of the permittee's obligation. The bond shall remain in force for three years after completion of the work.

Before work permitted herewith is commenced, the permittee shall notify Dave Babcock 637-1100x442, Permits Officer, and commencement of said work is understood to indicate that the permittee will comply with all instructions and regulations of the Utah Department of Transportation (as listed above) with respect to performance of said work, and that he will properly control and warn the public of said work to prevent accident and shall indemnify and hold harmless the Utah Department of Transportation from all damages arising out of any and all operations performed under this Permit.

Permittee shall not perform any work on State Highway right of way beyond those areas of operations stipulated on this permit.

If permittee fails to comply with Utah Department of Transportation regulations, specifications, or instructions pertinent to this permit, the District Director or his duly authorized representative, may by verbal order, suspend the work until the violation is corrected. If the permittee fails or refuses to comply promptly, the District Director or his authorized representative may issue a written order stopping all or any part of the work. When satisfactory corrective action is taken, an order permitting resumption of work may be issued.

Special Limitations TRUCK CROSSING WARNING warning signs (black on Orange) to be post mounted approx 500 ft in advance of crossing area. 3 orange flags required on each sign. Permittee responsible for damage to highway surface and must maintain it free of potholes and shoulder breakage during haul. Legal loads only allowed on highway. All trucks are required to STOP before entering highway.

Traffic Control Reference _____ Sect. 6
(Source) (Page)

See Application for Signature
(Signature of Permittee)

APPROVED BY: Dale Stapley
District Director

Maintenance Station No. _____

T226 (10/88)
 HIGHWAY RIGHT OF WAY
 ENCROACHMENT

013813

PERMIT

District No. _____ Price _____ Date 7/25/95 Application of Cypress Plateau Mining Co.
 By Ben Grimes, Title Sr. Staff Project Engineer

Address PO Drawer N PMC Price, Utah 84501, Phone () 636-2227

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within the right of way limits of Highway No. 191, Milepost No. 157-159, in Carbon County, in the following locations: Approx 3/4 mile north east of the junction with Hwy 6.

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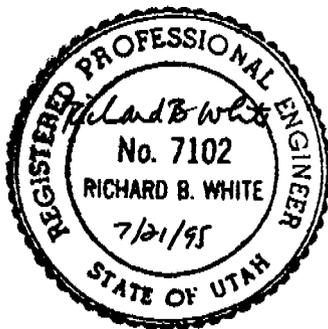
Traffic Control Reference UTCD Sect. 6
(Source) (Page)

See Application for Signature
 (Signature of Permittee)

APPROVED BY: Dave Stanley
 For District Director

Maintenance Station No. 105

APPENDIX 12-3-1
FAUNA OF SOUTHEASTERN UTAH AND LIFE REQUISITES
REGARDING THEIR ECOSYSTEMS



FAUNA OF SOUTHEASTERN UTAH
AND
LIFE REQUISITES REGARDING THEIR ECOSYSTEMS

LARRY B. DALTON

JENNIFER S. PRICE

LAURA A. ROMIN

PUBLICATION NO. 90-11

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Utah Department of Natural Resources

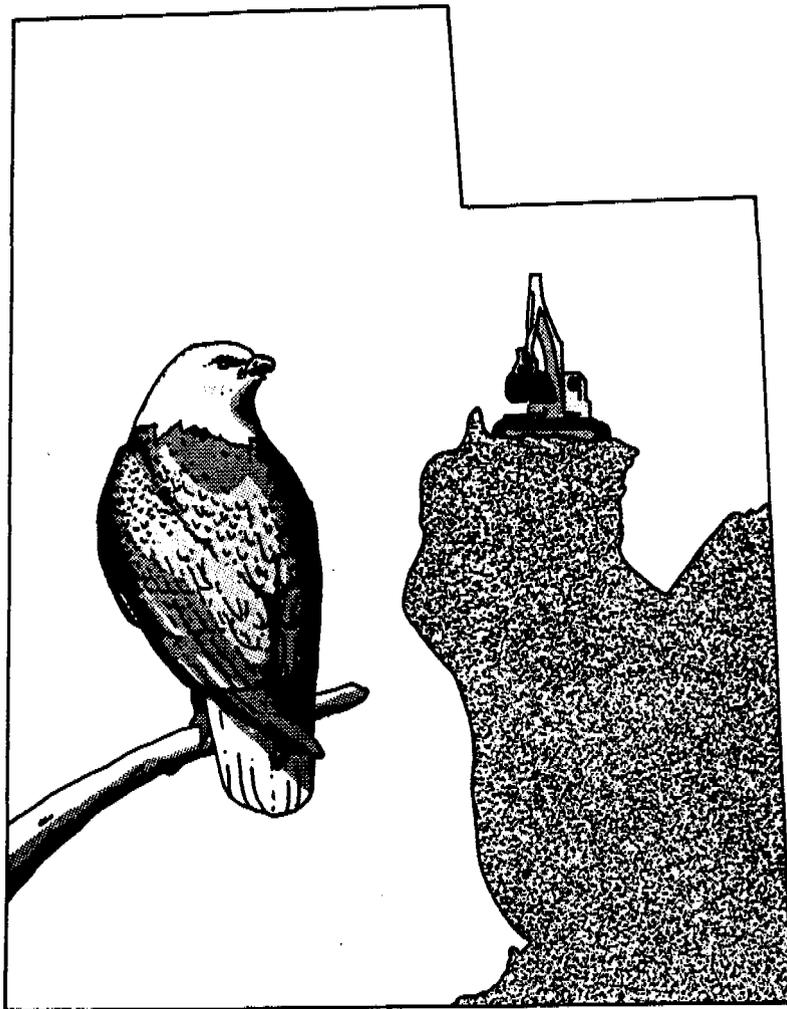
Division of Wildlife Resources

1596 West North Temple

Salt Lake City, Utah 84116

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Fauna of Southeastern Utah and **Life Requisites Regarding** their **Ecosystems**



Publication No. 90-11



Utah Division of Wildlife Resources
Department of Natural Resources

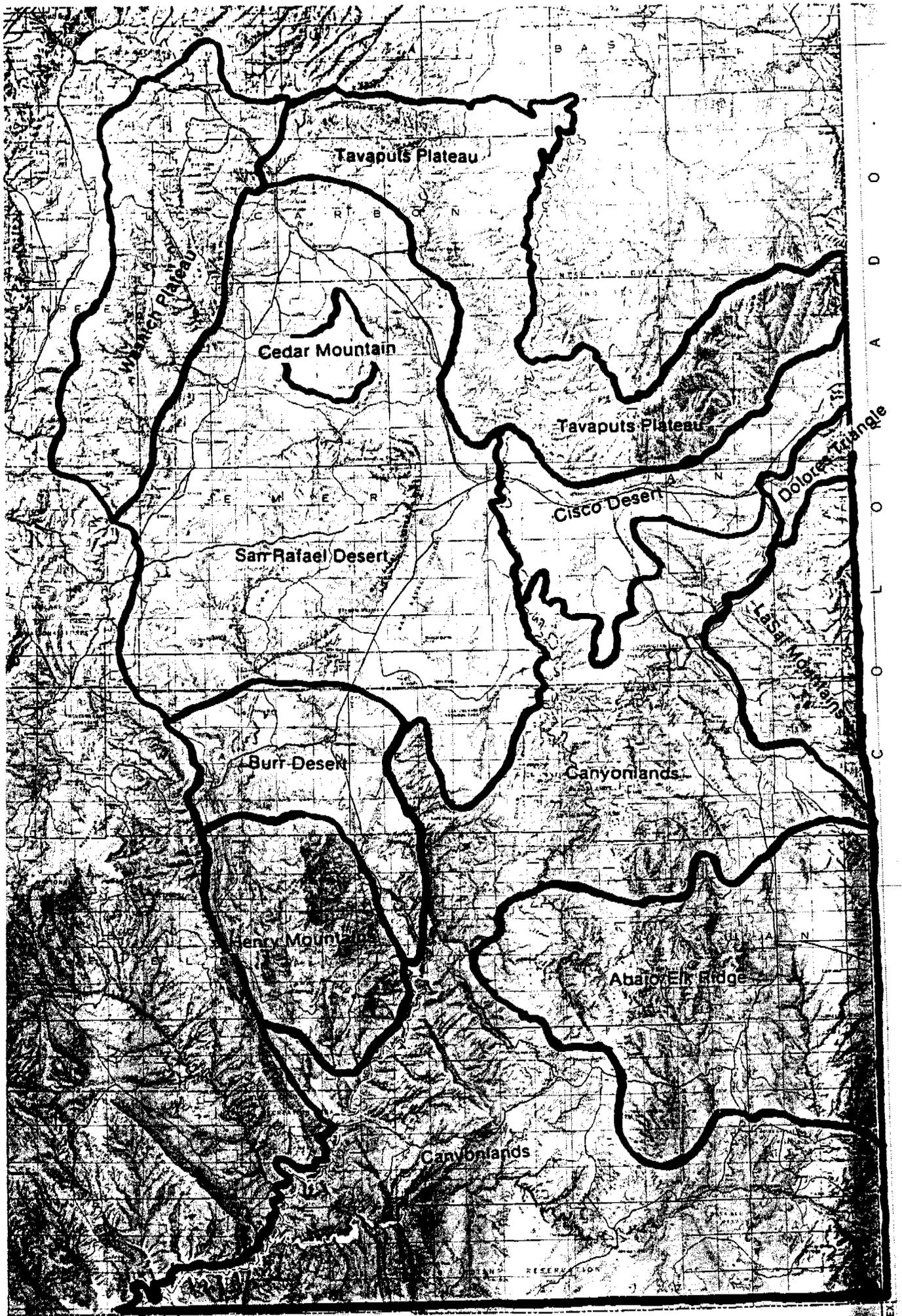


Figure 1. Southeastern Utah

METHODS

The authors surveyed published literature, unpublished agency studies and reports, as well as museum collections regarding southeastern Utah's wildlife. We also interviewed numerous professional wildlife ecologists and wildlife enthusiasts having expertise in the region. Direct observation of animals in the field along with specific sampling strategies helped determine our knowledge for many species.

After evaluating all of the information gathered, decisions were made concerning the likely inhabitation by vertebrate species of wildlife for each of the ecosystems within southeastern Utah. Those decisions also included a subjective but cumulative assessment of data by the authors concerning relative biological value of the various ecosystems to each species of wildlife. The evaluation also identifies the various ecological associations utilized by each wildlife species. This task segregated data for terrestrial species by geographic area within the region. Piscinian (fish) species were evaluated as per major drainage areas. Relative abundance for each species was decided upon and, in the instance of avifauna, seasons of use are identified. A brief evaluation of life requisites for each animal is given. Our focus is on crucial periods, critical valued use areas and important habitat needs for each species.

Species are arranged phylogenetically by family. Genus followed by species nomenclature are ordered alphabetically. Decisions on current acceptable common and scientific names follow Robins, et. al., 1980 and their preliminary draft to be released in 1991, for fish species and USDI/Fish and Wildlife Service, 1987, for amphibians, reptiles, birds, and mammals.

RESULTS

Southeastern Utah's Ecosystems

Eighteen ecosystems characterized as either upland (urban, agricultural, alpine, spruce-fir, aspen, ponderosa, sagebrush-grass, mountain brush, pinyon-juniper, saltbush-grass, blackbrush, grassland, and barren) or wetland (marsh, riparian, mesic meadow, stream, and lake) exist in southeastern Utah. Each ecosystem is defined by its dominant vegetation or some other dominant nonbiotic feature (Figure 2).

Upland Ecosystems

Uplands are characterized as xeric (dry or only small amounts of moisture) to mesic (moderate amounts of moisture) and only support vegetation from water that is available through local precipitation. A brief description of each upland ecosystem found in southeastern Utah follows.

"Urban ecosystems" encompass lands developed for urban, suburban, industrial and transportation purposes. Urban areas are situated within all ecological associations. Typically, ornamental vegetation predominates and natural vegetation is generally excluded. The presence of humans and man-made developments is apparent (Figure 2).

"Agricultural ecosystems" are characterized by cultivated croplands or pasture lands. They can be found in the cold desert and submontane ecological associations. Agricultural areas have been developed for crop production and animal husbandry. The presence of man is apparent, but substantially less than in urban areas (Figure 2).

"Alpine ecosystems" exist only in the montane zone above timberline, which usually begins around 10,000 feet. Dominating vegetation includes grasses, forbs, lichens and mosses. In areas with enough moisture, dwarfed willows or other stunted woody plants may occur (Figure 2).

"Spruce-fir ecosystems" occur only in the montane zone. Engelmann spruce (Picea engelmannii) and alpine fir (Abies lasiocarpa) are the most likely co-dominant species of this ecosystem. An array of other spruce or fir species may also dominate. Understory vegetation in this ecosystem is generally poorly developed due to shading. Conifers that grow near timber line are often dwarfed. This stunted conifer area is commonly referred to as krumholz (Figure 2).

"Aspen ecosystems" are dominated by quaking aspen (Populus tremuloides) and occur only in the montane zone. Aspen often lies between coniferous ecosystems and ponderosa or mountain brush ecosystems. Frequently aspen is only present as an inclusion in coniferous forests. As an ecosystem, aspen is declining in aerial distribution due to conifer invasion. A dense understory of grasses, forbs, and shrubs is generally present in aspen areas. In fact, aspen areas are recognized for their extraordinary production of forage for grazing ungulates (Figure 2).

"Ponderosa ecosystems" are dominated by the ponderosa pine (Pinus ponderosa) and occur only in the montane zone. The ponderosa pine is intolerant of shade and therefore predominates. It occurs on north as well as sunny, south-facing slopes. Old growth stands create the classical open forest setting, whereas stands managed for timber harvest support a more diverse understory (Figure 2).

"Sagebrush-grass ecosystems" are dominated by sagebrush (Artemisia spp.) and grass species. Forbs can be abundant. The relative abundance of each vegetation class varies with range condition. This ecosystem can also support a scattering of other shrubs and

trees. Sagebrush-grass ecosystems can be found in all ecological associations (Figure 2).

"Mountain brush ecosystems" are found only in the submontane ecological association. This ecosystem is often dominated by either gambel oak (Quercus gambeli) or maple (Acer spp.). However, other shrub species may be dominant and are almost always present. Grasses and forbs comprise the understory (Figure 2).

"Pinyon-juniper ecosystems" are dominated by pinyon pine (Pinus edulis) and juniper (Juniperus spp.). This ecosystem occurs only in the submontane ecological association. A diverse vegetative understory community is often lacking over wide expanses of the ecosystem. Thus, irregular shaped, but sometimes extensively sized openings have been created in the pinyon-juniper ecosystem for conversion to more productive sagebrush-grass, mountain brush or grassland settings (Figure 2).

"Saltbush-grass ecosystems" are dominated by a variety of saltbushes (Atriplex spp.) usually in association with Indian ricegrass (Oryzopsis hymenoides) and broom snakeweed (Gutierrezia sarothrae). Forbs are more or less abundant depending on range condition. This ecosystem only occurs in the cold desert ecological association (Figure 2).

"Blackbrush ecosystems" are dominated by blackbrush (Coleogyne ramosissima) and ephedra (Ephedra spp.). This ecosystem only occurs in the cold desert and submontane ecological associations. It can be dominated by blackbrush in pure stands to the exclusion of other shrubs. Grasses, particularly Indian ricegrass and galleta grass (Hilaria jamesii), as well as forbs are usually present. Their representation is dependent upon range condition (Figure 2).

"Grassland ecosystems" are present in all ecological associations. Dominant grasses vary with elevation and range conditions. Forbs and shrubs may be present in limited quantities, but grasses dominate the area (Figure 2).

"Barren ecosystems" occur in all ecological associations. Badlands, talus slopes and cliffs, as well as extensive sandstone formations typify this ecosystem (Figure 2).

Wetland Ecosystems

Wetlands in Southeastern Utah can be found in all ecological associations. They show a unique aquatic and terrestrial relationship. Wetlands are defined as either (1) permanently or seasonally flooded areas, or (2) areas that evidence domination by wetland plants as determined by aerial cover or (3) non-flooded areas that provide hydric soils within the rooting depth of vegetation, if any. Surface areas of wetlands may never be flooded, but can be periodically or continuously flooded. Moisture conditions among wetlands vary from hydric (an abundance of moisture) to mesic (moderate amounts of moisture) and even xeric (dry or only small amounts of moisture) on a seasonal basis. In all situations, moisture, particularly during the growing season, is significantly in excess of that otherwise available through local precipitation. This is in contrast to uplands which are entirely or largely dependent upon local precipitation for their water supply.

"Streams" (water courses), "lakes" (impoundments) as well as "marsh," "mesic meadow," and "riparian" wetlands may singly or in aggregation comprise a wetland ecosystem. Streams are the potentially wetted zone for flowing water in perennial, ephemeral, or intermittent channels. Lakes are the zones represented by the high water level of man-made or natural impoundments that permanently or temporarily hold standing water. Marsh, mesic meadow, and riparian wetlands represent a zone that is often, but not necessarily transitional between uplands and stream or lake areas. Some wetland plants, due to their high water volume demand, are considered hydrophytic and are obligated to only survive in wetland ecosystems. Other wetland plants are not hydrophytic and are

considered facultative to surviving in either wetland or upland ecosystems. Upland plants in contrast to wetland plants can only survive in upland ecosystems. Marshes are characterized by emergent grass-like vegetation. Mesic meadows are characterized by obligate and facultative wetland species of grasses and/or forbs. Riparian areas are characterized by a dominance of obligate and facultative woody wetland species, (Figure 2).

Piscinlan Species	Indigenous/exotic	Relative Abundance by Ecological Association ¹			
		Cold Desert (3,700 - 5,800 Ft.)	Submontane (5,500 - 8,500 Ft.)	Montane (6,500 - 12,721 Ft.)	
<p>(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value</p> <p>Family: Salmonidae *cutthroat trout <u>Oncorhynchus clarki</u></p> <p>These indigenous game fish inhabit cold, clear waters of all elevations. They do well in small streams. Optimum DO concentrations are >7ppm at water temperatures ≤59°F and ≥9ppm at water temperatures >59°F. It has been reported that feeding behavior stops at turbidity levels >35ppm. Spawning occurs from March through mid June when water temperatures exceed 40°F. At 50°F, the eggs will incubate for 41 days. Clean gravel/cobble zones (0.08 to 2.5 inch diameter), having a substrate depth and a depth of flowing water each of at least 6 inches, provide optimum conditions for redd development. The Yellowstone (<u>O.C. bouvieri</u>), Snake River (<u>O.C. ssp.</u>), and Colorado (<u>O.C. pleuriticus</u>) subspecies inhabit southeastern Utah.</p>	Drainage Areas arranged by stream order	Stream	Stream	Stream	Lake
	<p>Lake Powell</p> <p>San Juan River</p> <p>Recapture Creek</p> <p>Montezuma Creek</p> <p>Halls Creek</p> <p>Bullfrog Creek</p> <p>Dirty Devil River</p> <p>Fremont River</p> <p>Muddy Creek</p> <p>Colorado River</p> <p>Green River</p> <p>San Rafael River</p> <p>Ferron Creek</p> <p>Cottonwood Creek</p> <p>Huntington Creek</p> <p>Price River</p> <p>Willow Creek</p> <p>White River</p> <p>Scofield Tributaries</p> <p>Nine Mile Creek</p> <p>Indian Creek</p> <p>Kane Springs Creek</p> <p>Mill Creek</p> <p>Dolores River</p> <p>East Coyote Wash</p> <p>LaSal Creek</p> <p>Granite Creek</p>	Stream	Stream	Lake	Stream

1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental

Amphibian Species (*) high-interest because of economic, aesthetic, educational, scientific, or ecological value	Relative Abundance ¹	indigenous/exotic Distribution by Geographic Area	Relative Biological Value of Ecosystems: critical (C), high-priority (H), substantial (S), limited (L)														
			Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow
<u>Great Basin spadefoot</u> <u>Scaphiopus intermontanus</u>	C C C C C C C C C C C C	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	S S	C C													
<u>Mexican spadefoot</u> <u>Scaphiopus multiplicatus</u>	k k k k l l k k k k k k l	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	L S	C C													

These insectivorous, nongame toads inhabit cold desert, submontane, and montane zones. They are nocturnally active at air temperatures of 54-69°F. Breeding occurs during May-July rains in springs and temporary pools. Females probably produce just one clutch a year. Metamorphosis from egg to adult is rapid and can occur in as little as two weeks. These toads require loose soil that can be easily burrowed into for overwintering. Underground burrows are also utilized during dry periods.

These insectivorous, nongame toads inhabit submontane and montane zones. Breeding occurs during May-July rains at perennial or intermittent waters. Eggs hatch within 2 days, and metamorphosis to adult occurs within 4 to 6 weeks. They inhabit the Four Corners area on the Navajo Indian Nation, and they may be found in that same habitat type north of the San Juan River.

1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Table 3. Numbers (#) of reptilian species that now (1990) inhabit geographic areas and the proportion (%) of that total which inhabit each ecosystem by ecological association within southeastern Utah.

Geographic Areas (Elevation in feet)/# Proportion (%) of species that inhabit each ecosystem by (1) Cold Desert (3,700-5,800 ft.); (2) Submontane (5,500-8,500 ft.); and (3) Montane (6,500-12,721 ft.) ecological associations.

	UPLANDS															WETLANDS																																												
	URBAN			AGRICULTURAL			ALPINE			SPRUCE/FIR			ASPEN			PONDEROSA			SAGEBRUSH/GRASS			MOUNTAIN BRUSH			PINYON/JUNIPER			SALTBUCH/GRASS			BLACKBUSH			GRASSLAND			BARREN			MARSH			MESIC MEADOW			RIPARIAN			STREAM			LAKE								
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3															
Wasatch Plateau (5,500-10,741)/17	18	18		59			0			53			71	88	65	88	88		82									76	53		53	35		12	12		24	24		94	76		12	12		12	12													
Tavaputs Plateau (5,500-10,118)/18				50			28			33			50	94	50	94			89									89	44		67	17		6	6		17	17		83	56		6	6		6	6		6	6										
Cedar Mountain (5,500-7,664)/14																93			93									93			86			7			7			71			7			7			7											
Henry Mountains (5,500-11,506)/18				44			11			17			33	100	39	94			94									94	33		83	28		11	6		11	6		78	39		6	6		6	6		6	6		6	6							
Abajo/Elk Ridge (5,500-11,362)/23	9			56			22			26			30	96	43	91			91									91	39		70	25		9	4		17	13		74	48		4	4		4	4		4	4		4	4		4	4				
LaSal Mountains (5,500-12,721)/22	4			6			23			27			41	91	41	91			91									86	36		59	23		9	4		18	14		82	50		4	4		4	4		4	4		4	4		4	4		4	4	
Dolores Triangle (3,937-7,428)/17				47	47									94	94	94			94									88	88		70	70		6	6		6	6		76	76		6	6		6	6		6	6		6	6		6	6				
San Rafael Desert (4,120-7,920)/18	11	11		50	50									94	94	89			89									94	89		83	78		6	6		6	6		78	78		6	6		6	6		6	6		6	6		6	6				
Burr Desert (4,500-6,522)/17	6			41										94	88	82			82									94	82		94	82		6	6		6	6		71	71		6	6		6	6		6	6		6	6		6	6				
Cisco Desert (3,937-5,300)/18	6			50										94					94									89			72			6			6			78			6			6			6			6			6					
Canyonlands (3,700-10,388)/31	6	6		48	48		19			22			35	80	35	77			77									87	77		64	19		6	3		13	13		10	68		71	42		3	3		3	3		3	3		3	3		3	3	

Reptilian Species	Relative Abundance	indigenous/exotic	Relative Biological Value of Ecosystems:																			
			critical (C), high-priority (H), substantial (S), limited (L)	Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake	
(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value																						
tree lizard <u>Urosaurus ornatus</u>	C C C C C C C C C C C C	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	S L C C L L L L C C C C C	These nongame lizards inhabit cold desert, submontane, and montane zones. They are insectivorous and diurnal. Rocky areas are required for shelter, nesting sites, and feeding areas. Scattered pinyon-juniper stands are also critical for feeding. Breeding occurs in May and June with as many as 6 clutches of 3-13 eggs deposited. Eggs hatch after 2 1/2 months. Only the northern subspecies (<u>U.g. wrighti</u>) inhabits southeastern Utah.																		
side-blotched lizard <u>Uta stansburiana</u>	C C C C C C C C C C C C	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	S L S S S H C C	These insectivorous nongame lizards inhabit arid and semi-arid open shrublands of cold desert and submontane zones. They are diurnally active from May-October at air temperatures of 68-84°F. Breeding begins by April and the young appear in late July or August after an incubation period of 60-100 days. Three clutches of 2-6 eggs are laid in moist soil. The validity of subspecies classification is uncertain.																		

1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Table 4. Numbers (#) of avian (bird) species that now (1990) inhabit geographic areas and the proportion (%) of that total which inhabit each ecosystem by ecological association within southeastern Utah.

Geographic Areas (Elevation in feet)/#	UPLANDS															WETLANDS																																						
	URBAN			AGRICULTURAL			ALPINE			SPRUCE/FIR			ASPEN			PONDEROSA			SAGEBRUSH/GRASS			MOUNTAIN BRUSH			PINYON/JUNIPER			SALTBUH/GRASS			BLACKBRUSH			GRASSLAND			BARREN			MARSH			MESIC MEADOW			RIPARIAN			STREAM			LAKE		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3									
Wasatch Plateau (5,500-10,741)/231	40	24		46			31			30			32	31	19	38						41						22	15		10	7		47	35		31	27		88	65		32	27		32	28							
Tavaputs Plateau (5,500-10,118)/232				46			31			29			32	31	18	37						40						22	15		9	6		49	35		32	27		90	65		32	27		33	28							
Cedar Mountain (5,500-7,664)/111																60			65									39			17			28			19			96			5			5								
Henry Mountains (5,500-11,506)/217				47			35			34			37	34	20	43			46									23	15		11	7		41	31		32	33		88	67		31	24		27	24							
Abajo/Elk Ridge (5,500-11,362)/225	38			47			34			32			35	33	20	41			45									16			12	8		42	32		31	28		89	68		27	25		28	23							
LaSal Mountains (5,500-12,721)/228	38			47			33			32			35	32	19	41			44									15			11	7		42	32		31	27		89	67		27	29		28	25							
Dolores Triangle (3,937-7,428)/239				39	46											37			40									19	16		10	10		49	46		34	32		74	87		34	31		35	32							
San Rafael Desert (4,120-7,920)/232	30	34		41	45											34			39									20	17		10	10		51	46		35	32		76	85		36	33		36	33							
Burr Desert (4,500-6,522)/173	39			49												43			53									28	23		14	13		39	31		27	22		72	87		21	16		21	16							
Cisco Desert (3,937-5,300)/102	58			85																		46						51			22			44			22			85			7			7								
Canyonlands (3,700-10,388)/258	27	34		44	43		29			27			30	25	30	19	36		40									18	15		24	22	12	10	10	7	46	43	31	31	29	47	64	83	58	31	29	24	31	29	25			

Avian Species	Seasonal Status	Relative Abundance	Distribution by Geographic Area	Relative Biological Value of Ecosystems:																			
				Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Pohderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake		
(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value Family: Gruidae *whooping crane <u>Gru americana</u>	Tr/e		Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	C																			
	Tr/e			H																			
	k			H																			
	k			H																			
	k			H																			
	k			H																			
	Tr/e																						
	Tr/e																						
	k																						
	k																						
Tr/e																							
*sandhill crane <u>Gru canadensis</u>	Tr/u		Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	C																			
	Tr/u			H																			
	k			H																			
	Tr/u			H																			
	Tr/u			H																			
	Tr/u			H																			
	Tr/u																						
	Su/u																						
	k																						
	k																						
Tr/u																							

Whooping cranes are an endangered species that occur at all elevations. They winter outside of Utah in prairies, grain fields, and marshes. They summer in mountain meadows and marshes. Peak migration periods are April-June and August-November. The population trend of the whooping crane is increasing due to management strategies.

Most of these birds are migrants passing through during the spring (April 3 to June 8) and fall (August 28 to November 25). They utilize all elevations. In recent years, two pairs are known to have nested at or nearby Desert Lake Waterfowl Management Area. Nesting occurs on the ground from May-July. Eggs incubate for 30 days and fledging occurs in another 67 to 75 days. They feed upon small rodents, frogs, and insects. Their population trend is stable. Harvest of these birds is not yet allowed in southeastern Utah.

1. Seasonal status: (Y) yearlong resident; (W) winter resident; (Su) summer resident; (Tr) transient
 2. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Avian Species	Seasonal Status	indigenous/exotic	Relative Biological Value of Ecosystems: critical (C), high-priority (H), substantial (S), limited (L)
<p>(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value</p>		<p>Distribution by Geographic Area</p>	<p>Urban Agricultural Alpine Spruce/Fir Aspen Ponderosa Sagebrush/grass Mountain brush Pinyon/juniper Saltbush/grass Blackbrush Grassland Barren Marsh Mesic Meadow Riparian Stream Lake</p>
<p>Franklin's gull <u>Larus pipixcan</u></p>	<p>Su/c Su/c k Su/c Su/c Su/c Su/c Su/c k k Su/c</p>	<p>Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands</p>	<p>C H C C C C C H C C C C C C The population trend of these nongame birds is stable. They are found at all elevations and breed at wetland areas from April to November, where colonial nesting occurs. Both parents incubate the eggs for 24-25 days, however, they will desert the nest if disturbed. They young can fly at 32 days of age. Coots will compete for their nest sites. These birds often follow plows and catch insects in the air. They also feed on fish, frogs, and mollusks.</p>
<p>black tern <u>Chlidonias niger</u></p>	<p>Su/c Su/c k Su/c Su/c Su/c Su/c Su/c k k Su/c</p>	<p>Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands</p>	<p>C C C C C C C C C C C C C C C C C C Black terns occur at all elevations. Their population trend is stable. Small colonies nest in marshes from May through June. Nests are built on the ground, in marsh vegetation, or on muskrat houses. Incubation lasts 21-22 days followed by a 3-4 week nestling period. Insects comprise the primary food source for black terns.</p>

1. Seasonal status: (YI) yearlong resident; (Wt) winter resident; (Su) summer resident; (Tr) transient
2. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Avian Species	Seasonal Status ¹	Indigenous/exotic	Relative Biological Value of Ecosystems:																					
			critical (C), high-priority (H), substantial (S), limited (L)	wellands	Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake		
(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value																								
*mourning dove <u>Zenaidura macroura</u>	Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	S C S C C C S C C S S H S C	Mourning doves are popular game birds which feed upon grains and seeds. Nests are loosely constructed with twigs. They are usually built in trees, shrubs, cacti, or on the ground. Most breeding and nesting activity occurs between March and September. A 13-14 day incubation period is followed by a 12-14 day nestling period. Mourning doves occur at all elevations. They have adapted well to man's intrusion upon their environment but their population trend is declining in the western states for unknown reasons.																				
Family: Cuculidae *yellow-billed cuckoo <u>Coccyzus americanus</u>	Su/r Su/r Su/r Su/r Su/r Su/r Su/r Su/r Su/r Su/r Su/r Su/r	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	S S C C C C C C C C C C	These nongame birds are found in submontane second growth forest and desert riparian ecosystems. Their population trend is unknown. Nests are frail twig platforms. Nesting occurs from June through July. Both parents incubate the eggs for 9-11 days followed by a short 7-8 day nestling period. These birds consume seeds, fruit, and insects (particularly caterpillars).																				

1. Seasonal status: (Y) yearlong resident; (Wt) winter resident; (Su) summer resident; (Tr) transient
2. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (s) scarce; (l) very limited

Avian Species	Seasonal Status ¹ Relative Abundance ²	indigenous/exotic	Relative Biological Value of Ecosystems:																	
			Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake	
(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value																				
common poorwill <u>Phalaeoptilus nuttallii</u>	Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c k Su/c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Eik Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	H	C	C								S	S	S					
Family: Apodidae white-throated swift <u>Aeronautes saxatalis</u>	Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Eik Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands																		

H C C S S S
 These nongame birds are found in open country of submontane ecological associations. Their population trend is stable. Nesting occurs from May-July. Eggs are laid on bare ground, rocks, or in gravel and incubated for 18 days. Young fledged at 4 weeks of age. Parents have been known to move young to different nest sites during the brooding period.

S S S S S S C S S
 These nongame birds are found in desert and submontane ecological associations. Their population trend is unknown. Nests are twiggy brackets saliva-glued to crevices or caves in precipitous areas. Nesting occurs in June and July. These birds may often stray many miles away from their nesting and roosting sites in search of food. They feed almost entirely on flying insects caught in the air.

1. Seasonal status: (YI) yearlong resident; (Wt) winter resident; (Su) summer resident; (Tr) transient
 2. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Avian Species	Seasonal Status ¹ Relative Abundance ²	Indigenous/exotic	Relative Biological Value of Ecosystems:																			
			Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake		
(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value																						
<u>broad-tailed hummingbird</u> <u>Selasphorus platycercus</u>	Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	H	C	C	C	H	S	H	H	S	S	H									
<u>rufous hummingbird</u> <u>Selasphorus rufus</u>	Su/c Su/c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	S	S	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H

The population trend of these nongame birds is unknown. They occur at all elevations. Lower valleys are utilized in April and May, while nesting occurs near streams at higher elevations. Depending on the availability of flower nectar, the birds will generally nest in June and July. Nests are lichen-covered cups located in trees or shrubs. A 14-17 day incubation period is followed by a 21-26 day nestling time. Management practices that provide small forest openings with edge appear beneficial to this bird.

Rufous hummingbirds occur at submontane and montane elevations. These nongame birds are present in the region from mid June to late September. Their population trend is unknown. These birds nest colonially in trees or shrubs and form cup-shaped nests covered with lichen. Nesting occurs from April-July. Eggs hatch after 12-14 days of incubation and the young fledge in another 20 days. Flower nectar availability limits species distribution.

1. Seasonal status: (Y) yearlong resident; (W) winter resident; (Su) summer resident; (Tr) transient
 2. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Avian Species	Seasonal Abundance ¹	indigenous/exotic	Relative Biological Value of Ecosystems:																		
			Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake	
(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value																					
Say's phoebe <u>Sayornis saya</u>	Y1/c Y1/c Y1/c Y1/c Y1/c Y1/c Y1/c Y1/c Y1/c Y1/c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	S C	S	S	C	C	C	C	S	C	C	S	C	H						
ash-throated flycatcher <u>Myiarchus cinerascens</u>	Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c Su/c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	H H	C	H	C	C	C	S												

These nongame birds prefer areas with low shrubs or scattered trees at desert and submontane elevations. Their population trend is unknown. Nests are cups or brackets of mud, moss, or grass located on structures, ledges, or rock walls. Nesting occurs from May through July. They will usually raise two broods, incubating each for about 2 weeks. The young will fledge at 14-16 days of age. Adults feed primarily on flying insects, but occasionally fruit and small reptiles are taken.

These nongame birds move around constantly over large areas of desert and submontane elevations. Nests are built in cavities of trees, yuccas, mesquite, and wooden posts. Nesting occurs in May and June. The female incubates the eggs for 15 days and the young are fledged at 14-16 days of age. As the name suggests, their principle food is flying insects. Their population trend is stable.

1. Seasonal status: (Y1) yearlong resident; (W1) winter resident; (Su) summer resident; (Tr) transient
 2. Relative Abundance: (c) common; (u) uncommon; (f) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Avian Species (*) high-interest because of economic, aesthetic, educational, scientific, or ecological value	Seasonal Status Relative Abundance	indigenous/exotic Distribution by Geographic Area	Relative Biological Value of Ecosystems: critical (C), high-priority (H), substantial (S), limited (L) Urban Agricultural Alpine Spruce/Fir Aspen Ponderosa Sagebrush/grass Mountain brush Pinyon/juniper Saltbush/grass Blackbrush Grassland Barren Marsh Mesic Meadow Riparian Stream Lake
black-billed magpie <u>Pica pica</u>	Y1/c Y1/c Y1/c Y1/c Y1/c Y1/c Y1/c Y1/c Y1/c Y1/c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	S C S L L L S C C S S S S S C The population trend of these nongame birds is stable. They are often found in small groups at all elevations. Nesting is often colonial and occurs from April-June. Nests are huge, domed masses of sticks built in willow thickets, trees, or shrubs. The females will incubate one clutch of eggs for about 18 days. The young fledge at 22-28 days of age. These birds are omnivorous and often feed upon road kills.
Family: Paridae black-capped chickadee <u>Parus atricapillus</u>	Y1/c Y1/c k Y1/c Y1/c Y1/c Wt/c Wt/c Wt/c Wt/c Y1/c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	H H C C C H C S C These nongame, omnivorous birds occur at all elevations. They tend to inhabit low elevation riparian ecosystems during the winter and ascend to coniferous-deciduous forests for breeding. Nesting occurs from March-June. Nests are constructed in natural tree cavities. The females incubate the eggs for 12-13 days. The young are fledged after another 15-16 days. They will disperse a few weeks later and will not return to their birth place. The population trend of this species is unknown.

1. Seasonal status: (Y1) yearlong resident; (Wt) winter resident; (Su) summer resident; (Tr) transient
2. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Avian Species (*) high-interest because of economic, aesthetic, educational, scientific, or ecological value	Seasonal Status ¹ Relative Abundance ²	indigenous/exotic Distribution by Geographic Area	Relative Biological Value of Ecosystems:															
			critical (C), high-priority (H), substantial (S), limited (L)	Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow
ruby-crowned kinglet <u>Regulus calendula</u>	Y1/c Y1/c k Y1/c Y1/c Y1/c Wt/c Wt/c Wt/c k Y1/c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	S C S C S S S S C C S C S S S C	These nongame birds summer in montane forests and descent to desert and submontane ecosystems in the winter. Their population trend is unknown. Nests are suspended 2 to 50 feet up in conifer trees. During the June and July nesting season, the female incubates the eggs for 12 days. The young are probably ready to fly after another 12 days. Clearcutting and selection harvesting have adverse effects on these birds. Ruby-crowned kinglets are insectivorous.														
golden-crowned kinglet <u>Regulus satrapa</u>	Y1/u Y1/u k Y1/u Y1/u Y1/u Wt/u Wt/u Wt/u k Y1/u	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	C S C S S C C S S C C S S C	This nongame species summers in montane forests and moves to submontane ecosystems during the winter months. The population trend of these birds is unknown. Nests are moss balls (with the entrance at the top) built in conifers. The birds will not tolerate habitat changes during their June and July nestling season. Incubation and fledging each require about 2 1/2 weeks. These birds catch insects in the air as well as on twigs.														

1. Seasonal status: (Y1) yearlong resident; (W1) winter resident; (Su) summer resident; (Tr) transient
2. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Avian Species (*) high-interest because of economic, aesthetic, educational, scientific, or ecological value	Seasonal Status ¹ Relative Abundance ²	indigenous/exotic Distribution by Geographic Area	Relative Biological Value of Ecosystems: critical (C), high-priority (H), substantial (S), limited (L)																	
			Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake
Lark bunting <u>Calamospiza melanocorys</u>	Tr/0 Tr/0 Tr/0 Tr/0 Tr/0 Tr/0 Tr/0 Tr/0 Tr/0 Tr/0	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	S	H																
Lapland longspur <u>Calcarius lapponicus</u>	k k k k k k Wt/0 Wt/0 Wt/0 Wt/0 Wt/0	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	C	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H

Lark buntings frequent desert and submontane ecological associations. They sometimes appear sporadically as small flocks in agricultural areas. This nongame species is seen during spring (May) and fall (October) migrations. Their diet consists of insects and seeds.

Lapland longspurs frequent open habitats of desert elevations. These nongame birds are often associated with horned larks and snow buntings. Their population trend is unknown. Nests are grassy, feather-lined depressions on the ground. These birds eat mostly seeds but also take insects and fruit.

1. Seasonal status: (YI) yearlong resident; (WI) winter resident; (Su) summer resident; (Tr) transient
 2. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (I) threatened, (o) occasional; (a) accidental; (i) unknown to inhabit area

Table 5. Numbers (#) of mammalian species that now (1990) inhabit geographic areas and the proportion (%) of that total which inhabit each ecosystem by ecological association within southeastern Utah.

Geographic Areas (Elevation in feet)/#	UPLANDS												WETLANDS																																									
	URBAN			AGRICULTURAL			ALPINE			SPRUCE/FIR			ASPEN			PONDEROSA			SAGEBRUSH/GRASS			MOUNTAIN BRUSH			PINYON/JUNIPER			SALTBRUSH/GRASS			BLACKBRUSH			GRASSLAND			BARREN			MARSH			MESIC MEADOW			RIPARIAN			STREAM			LAKE		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3						
Wasatch Plateau (5,500-10,741)/80	25	19		30			23			50	46		51	66	46	66	66	66	68									51	36		65	24		29	25		28	24		76	58		4	6		4	5							
Tauputs Plateau (5,500-10,118)/79				29			50	47		53	71	47	72	76		48	39		43	27								48	39		43	27		29	25		27	23		80	58		4	6		4	5							
Cedar Mountain (5,500-7,664)/58										86	79		88						45									69			45			29			28			84			0											
Henry Mountains (5,500-11,506)/66				29			58	53		59	78	52	77	83					45	32								59	44		45	32		30	26		29	27		83	61		5	5		5	3							
Abajo/Elk Ridge (5,500-11,362)/77	27			29			52	47		55	70	44	71	74					74									40			43	29		25	22		23	22		77	53		4	4		4	3							
LaSal Mountains (5,500-12,721)/78	27			29			52	47		55	70	44	71	74					74									40			43	29		25	22		23	22		77	53		4	4		4	3							
Dolores Triangle (3,937-7,428)/72				21	25					53	69		71	74					74									44	42		33	43		21	26		19	24		56	76		6	6		6	6							
San Rafael Desert (4,120-7,920)/72	26	28		35	32					64	75		68	71					71									47	47		53	61		24	31		61	76		6	6		6	6		6	6							
Burr Desert (4,500-6,522)/62	29			32						65	73		71	74					74									53	52		52	56		26	27		63	76		5	5		5	5		5	5							
Cisco Desert (3,937-5,300)/47	38			47						80									40									70			40			26			72			2			4											
Canyonlands (3,700-10,388)/85	24	24		27	32					47	55	41	67	68					68									44	39		45	53	33	40	24	20	25	22	19	22	20	53	72	51		5	5	5	5	5	4			

Mammalian Species (*) high-interest because of economic, aesthetic, educational, scientific, or ecological value	Relative Abundance	indigenous/exotic Distribution by Geographic Area	Relative Biological Value of Ecosystems: critical (C), high-priority (H), substantial (S), limited (L)														
			Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow
<p><u>California myotis</u> <u>Myotis californicus</u></p>	<p>C C C C C C C C C C C C</p>	<p>Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands</p>	<p>H S S H H H H H H C H California myotis are found at all elevations. The population trend of these nongame bats is unknown. They roost in crevices and caves. Breeding occurs from September-October. Small nursery colonies are formed and single young are born between mid May and mid June. They can fly at 2 months of age. This nongame species is entirely insectivorous.</p>														
<p>long-eared myotis <u>Myotis evotis</u></p>	<p>C C k C C C C k k k k</p>	<p>Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands</p>	<p>H C C C C C C These nongame animals inhabit submontane and montane zones. They roost in buildings, mine tunnels, caves, and trees. Their population trend is unknown. Single young are born in June or July within small nesting colonies. They are insectivorous and forage for beetles among trees and over ponds.</p>														

1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Mammalian Species	Relative Abundance ¹	indigenous/exotic	Relative Biological Value of Ecosystems:														
			Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow
<p>(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value</p> <p>Townsend's big-eared bat <u>Plecotus townsendii</u></p>	<p>c c c c c c c c c c c c</p>	<p>Distribution by Geographic Area</p> <p>Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands</p>	<p>L S S S L S S L S L S L L L C C H</p> <p>Although their population trend is unknown, these nongame bats are threatened with extirpation because of increased human disturbance to caves. They occur at all elevations. Colonial behavior occurs in nurseries and during hibernation. A single young is born in late May or early June. They may leave the caves with adults at 6 weeks of age. These bats are nocturnal foragers in search of moths.</p>														
<p>Family: Molossidae *big free-tailed bat <u>Nyctinomops macrotis</u></p>	<p>k k k k k k k r k k r r</p>	<p>Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands</p>	<p>L S S S S S C C H</p> <p>These nongame bats roost in caves, mine tunnels, bridges, and attics at desert elevations. Some roosts are only used during spring and fall migrations. Their population trend is unknown. Single young are born from mid June to early July in large nursery colonies. They can fly in about 5 weeks. Moths are the preferred food.</p>														

1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Mammalian Species	Relative Abundance ¹	indigenous/exotic	Relative Biological Value of Ecosystems:														
			Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow
<p>(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value</p> <p>Family: Ursidae *black bear <u>Ursus americanus</u></p>	<p>C C O O n C C n O k O n</p>	<p>Distribution by Geographic Area</p> <p>Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountains Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands</p>	<p>H H H L H S S C C C</p> <p>The population trend is increasing for these submontane and montane game animals. Mating occurs from June-July. Females can give birth every other year between January and February to as many as 5 cubs while in their dens. Cubs stay with the female through their second winter. Grasses and forbs are eaten from spring to early summer, when the diet switches to insects and larvae. Carrion is taken when available. Berries and mast are preferred in the fall. These bears prefer forested habitats that contain open meadows.</p>														
<p>*grizzly bear <u>Ursus arctos</u></p>	<p>*k *k k *k *k *k k k k k k</p>	<p>Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands</p>	<p>C C C C H S L S C C C</p> <p>Grizzly bears were once abundant in remote mountainous regions of southeastern Utah(*). This endangered species has now been extirpated from all wildlands of Utah. The future of these magnificent bears is uncertain.</p>														

1. Relative Abundance: (c) common; (u) uncommon; (f) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Mammalian Species	Relative Abundance	indigenous/exotic	Relative Biological Value of Ecosystems:																		
			Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake	
<p>(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value</p>																					
<p>Family: Procyonidae *ringtail <u>Bassariscus astutus</u></p>	<p>C C</p>	<p>Distribution by Geographic Area</p> <p>Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Eik Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands</p>	<p>H H H C Ringtails inhabit rocky areas of desert and submontane ecosystems. The population trend is stable for these furbearers. Dens are in caves, crevices, hollow trees, rock piles, or unused buildings. One litter per year is born in May or June. The young begin to walk at 35-42 days of age and leave their mother in August or September. Ringtails are carnivorous, nocturnal, and partially colonial. Water must be available within one-half mile of the den site.</p>																		
<p>*raccoon <u>Procyon lotor</u></p>	<p>C C</p>	<p>Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Eik Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands</p>	<p>H C These omnivorous furbearers occur from desert through submontane elevations. Their population trend is unknown. The male raccoon may travel miles in search of a mate from January to March. Dens are located in hollow trees, logs, rock crevices, or burrows. Clearcutting can seriously reduce the availability of den sites. One to 7 young are born from April to May after a 63 day gestation period. Weaning occurs after 2-4 months and the young will be independent by winter. Adults occupy home ranges of 0.6 to 4 square miles.</p>																		

Mammalian Species	Relative Abundance ¹	indigenous/exotic	Relative Biological Value of Ecosystems:																		
			Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake	
(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value																					
*badger <u>Taxidea taxus</u>	c c c c c c c c c c c c c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	S L S H H H H S H H S H H H H S H																		
*striped skunk <u>Mephitis mephitis</u>	c c c k c c c c c c c c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	S H H H H S S S L L S L S L S L S C																		

These carnivorous furbearers prefer to inhabit open areas of all elevations where there is sufficient soil for burrowing. Prey availability and human disturbance are limiting factors. Mating takes place from August through September. Implantation occurs by February and 2-5 young are born in April. Nursing lasts through June and by late summer the young have dispersed. Male home range sizes are 590 to 1440 acres, while females occupy 390 to 4200 acres.

These furbearers prefer forest edges with soils appropriate for burrowing. However, they are adaptable to a variety of habitats at all elevations. Home range sizes can be 30 to 1860 acres, depending on habitat suitability. Breeding occurs from February-May with a brief delayed implantation. Two to eleven young are born from April-June after a 59 to 77 day gestation period. The young will have weaned at 2 months of age. Insects, rodents, birds, and fruit are eaten. Next to man, the great horned owl is the biggest predator of skunks.

1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Mammalian Species	Relative Abundance	Indigenous/exotic	Relative Biological Value of Ecosystems:																			
			critical (C), high-priority (H), substantial (S), limited (L)	Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake	
(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value																						
*spotted skunk <u>Spilogale putorius</u>	C C C C C C C C C C C C	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	L S L L L L H H H H S S S C H S C	<p>Rocky, brushy areas at all elevations are the preferred habitat for these furbearers. They use burrows of other animals for their dens, as well as old logs and brush piles. Mating occurs from September-October and implantation is delayed for 180 to 200 days. After a 50 to 65 day gestation period, 4 young are born sometime from April-July. They will be weaned after 2 months. The bulk of their diet consists of rodents and insects, although fruit is consumed during the fall.</p>																		
*river otter <u>Lutra canadensis</u>	*r *r k k k *r r *r k k r	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	C C C C C C C C C C C C	<p>These carnivorous furbearers inhabit all elevations along streams or lakes with abundant fish life. They use abandoned beaver dens. Trapping, human disturbances, or air and water pollution have reduced their range. Males establish a 40 mile long home range, but may live 2 to 3 miles apart. Otters mate in the spring and 2 to 5 young are born the following March or April. They will be independent at 8 months of age. Potential reintroduction sites exist(*).</p>																		

1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area.

Mammalian Species	Relative Abundance ¹	indigenous/exotic	Relative Biological Value of Ecosystems:																
			Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake
(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value																			
Family: Felidae *mountain lion <u>Felis concolor</u>	c c u c c c c u u o c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	L S S H H H L L L C S H	This game species is found at all elevations. Human encroachment is probably the biggest threat to these secretive animals. Deer are the preferred prey of the lion, and may make up 75% of their winter diet. Dens are generally in rock shelters or caves. Although breeding occurs throughout the year, most young (1-6 per litter) are born from April-September after a 82-96 day gestation period. The young will be weaned at 6 weeks of age, but will remain with their mother for up to 2 years.															
*lynx <u>Lynx canadensis</u>	r r k r r r k k k k r	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	L C C C S H H C C	These solitary furbearers inhabit submontane and montane elevations. Agriculture and clearcutting have reduced the animal's range, although some conversion of mature to secondary growth forests can be beneficial. The 9-10 year population cycle of the lynx can be closely tied to that of the snowshoe hare's. Timber and brush piles are used for den sites. Mating occurs from February-April, producing a litter of 1-4 young after a 63-74 day gestation period. The young can walk at 4 weeks of age, but will remain with the mother for 1 year.															

1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Mammalian Species	Relative Abundance	Distribution by Geographic Area	Relative Biological Value of Ecosystems:																	
			Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/Juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake
(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value																				
*wapiti <u>Cervus elaphus</u>	C C C C n C C C O K K 1	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	C	H	C	C	C	S	H	H	H	H	H	H	L	C	C	C		
*mule deer <u>Odocoileus hemionus</u>	C C C C C C C C 1 n 1 1 C	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	L	S	S	H	C	H	C	C	C	C	S	S	S	L	H	H	C	

C H C C C S H H H L C C
Wapiti inhabit all elevations. Forest edges and aspen are critical for calving from 5-15 to 7-5. The rut occurs during September and October, followed by an 8 to 9 month gestation period. Calves will nurse for up to 8 months. Altitudinal migration is displayed by this game animal and they occupy winter range from 12-1 to 4-15. Herbaceous plants are the preferred food, but woody vegetation will supplement the winter diet. Fire can create prime habitat for the elk. The Rocky Mountain subspecies (C. C. Nelsoni) inhabits the region.

L S S H C H C C C S S S L H C
These herbivorous, game animals are found at all elevations, but will exhibit seasonal altitudinal migrations. They occupy winter range from 12-1 to 4-15. South facing slopes are critical for winter food availability. The rut occurs during November and December. After a 6-7 month gestation period, the precocial young are born from 5-15 to 7-5. Weaning beings at 5 weeks of age. Continued fire suppression can reduce critical deer habitat.

1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Mammalian Species	Relative Abundance ¹	indigenous/exotic	Relative Biological Value of Ecosystems:																		
			Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake	
(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value																					
Least chipmunk <u>Tamias minimus</u>	C C C C C C C C C C C	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	H H H H C S S C C																		
Colorado chipmunk <u>Tamias quadrivittatus</u>	k C k C C C C C k C k C	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	H H H H H H S H																		

1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Mammalian Species	Relative Abundance	indigenous/exotic	Relative Biological Value of Ecosystems:																		
			Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake	
(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value																					
Family: Heteromyidae Ord's kangaroo rat <u>Dipodomys ordii</u>	c c c c c c c c c c c c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	H S H H H H H H H H H H H H H H H H H H H																		
plains pocket mouse <u>Perognathus flavescens</u>	c c c c c c c c c c c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	H H																		

These nongame animals prefer sandy soils at desert and submontane elevations. Their population trend is unknown. This species is active all year but seldom appear above ground in cold weather. Days are spent in deep burrows in the sand, which they plug to maintain temperature and humidity. January-March and August-October are the breeding seasons. After a 29-30 day gestation period, 2-5 young are born. They are independent after 8 weeks. They eat insects and seeds and will drink water when available.

Plains pocket mice inhabit sandy soils at desert and submontane elevations. The population trend of these nongame mice is unknown. Burrows are constructed under cacti or low shrubs. The breeding season occurs from April-August with the birth of 2-5 young. Usually two litters are born a year. The mice subsist primarily on seeds.

1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Mammalian Species	Relative Abundance ¹	indigenous/exotic	Relative Biological Value of Ecosystems:																		
			Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake	
(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value																					
desert woodrat <u>Neotoma lepida</u>	c c c c k k k c c c k	Indigenous Wasatch Plateau Tavapuis Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	Distribution by Geographic Area																		
Mexican woodrat <u>Neotoma mexicana</u>	k k k k c c c k k k c	Indigenous Wasatch Plateau Tavapuis Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	Distribution by Geographic Area																		

S L S S C

Desert woodrats inhabit valley floors or rocky slopes at desert and submontane elevations. The population trend is unknown for these nongame residents. Dens are built of debris and located under rocks, on the ground, along cliffs, and sometimes in trees. Availability of suitable nest sites is a limiting factor. Usually 2 or more litters of 2 to 3 premature young are born after a gestation period of 30-36 days. Their eyes are open at 13 days of age and they are weaned after 4 weeks. They feed mostly on seeds, acorns, cacti, or fruit.

H H H H C

These nongame mammals inhabit rocks and cliffs at all elevations. Their population trend is unknown. Nests are built with vegetation and other debris in rocky crevices, hollow trees, brush piles, or buildings. They eat green plants, berries, nuts, acorns, and fungi. Breeding occurs from March through May with two litters of 2-4 young being born. Gestation lasts for 31-34 days.

Mammalian Species	Relative Abundance	indigenous/exotic	Relative Biological Value of Ecosystems:																		
			Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake	
(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value		Distribution by Geographic Area																			
sagebrush vole <u>Lagurus curtatus</u>	k c k k c c c k k k c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	C	S																	
long-tailed vole <u>Microtus longicaudus</u>	c c c c c c c c c k c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	S	S	S	S															

Sagebrush voles inhabit areas of loose soil at submontane elevations. The population trend is unknown for this nongame species. Shallow burrows lined with shredded sagebrush bark and grass are constructed near sagebrush. Breeding occurs all year, producing up to 3 litters of 4 to 6 young after 25 day gestation periods. The young are weaned after 3 weeks. The voles feed on grass heads and other green plants in the summer, and bark and twigs of sage and various roots in the winter.

These nongame voles inhabit submontane and montane ecological associations. Their population trend is unknown. Nests are located aboveground in the winter and below in the summer. A litter of 4 to 8 young is born between May and October, although the peak breeding season occurs in June and July. The young are mature by 3 weeks of age. Diet includes grasses, bulbs, and bark of small twigs.

1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Mammalian Species	Relative Abundance	indigenous/exotic	Relative Biological Value of Ecosystems:																
			Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake
(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value																			
black-tailed jack rabbit <u>Lepus californicus</u>	c c c c c c c c c c c c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	H	C	S	S	S	S	S	S	S	S	S	S					
white-tailed jack rabbit <u>Lepus townsendii</u>	c c c c c c c c c c c	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	H	C	S	S	S	S	S	S	S	S	S	S					

These nongame animals are found at desert and submontane elevations. Their population trend is stable. Breeding can occur year-round. One to 4 litters per year are born in deep depressions lined with hair. There is a 41-47 day gestation period. The 1 to 8 young are weaned in 2-3 weeks and dispersed at 4 weeks of age. Jack rabbits occupy home range sizes of 49-74 acres. They also concentrate in winter feeding areas. They feed on lush vegetation in the summer and woody and dried vegetation in the winter.

The population trend is stable for these nongame animals of desert and submontane elevations. Breeding occurs from late April-early May. Four young are born, concealed in vegetation, after a 30-43 day gestation period. They can forage for themselves in 15 days and will disperse after another 3-4 weeks. They feed mostly on green vegetation in the summer and buds, bark, and twigs in the winter. Competition with the black-tailed species and habitat loss threatens populations. Home range size averages 173 acres.

1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

Mammalian Species	Relative Abundance	indigenous/exotic	Relative Biological Value of Ecosystems:																							
			Urban	Agricultural	Alpine	Spruce/Fir	Aspen	Ponderosa	Sagebrush/grass	Mountain brush	Pinyon/juniper	Saltbush/grass	Blackbrush	Grassland	Barren	Marsh	Mesic Meadow	Riparian	Stream	Lake						
(*) high-interest because of economic, aesthetic, educational, scientific, or ecological value	*desert cottontail <u>Sylvilagus auduboni</u>	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	C	C	S	S	S	S	S	H	H	H	H	H	H	H	H	H	H	H	H					
			These game animals occur at desert and submontane elevations. Their population trend is stable. Breeding occurs year-round. At least two litters of 1 to 6 young are born from April through July after a 25-35 day gestation period. Nests are fur-lined depressions or abandoned burrows of badgers, prairie dogs, or pocket gophers. Young begin to venture from the nest at 2 weeks of age and are weaned at 3-4 weeks of age. They eat herbaceous vegetation, mesquite, bark, twigs, and cacti. Adults occupy home ranges of 2-15 acres.																							
			*Nuttall's cottontail <u>Sylvilagus nuttalli</u>	C C C k C C C k k k k C	Indigenous Wasatch Plateau Tavaputs Plateau Cedar Mountain Henry Mountains Abajo/Elk Ridge LaSal Mountains Dolores Triangle San Rafael Desert Burr Desert Cisco Desert Canyonlands	C	S	S	S	C	H	S	H	H	H	H	H	H	H	H	H	H	H			
						These game animals inhabit submontane and montane elevations. They prefer thickets, loose rocks, and cliffs. Their population trend is stable. Breeding occurs from February through July. Their nests are shallow depressions lined with fur. Litters of 3 to 8 young are born 2 to 5 times a year, usually between April and July. There is a 28-30 day gestation period. They are weaned at about one month of age. This rabbit prefers grasses and forbs but also consumes sagebrush most of the year.																				

1. Relative Abundance: (c) common; (u) uncommon; (l) limited; (r) rare; (e) endangered; (t) threatened; (o) occasional; (a) accidental; (k) unknown to inhabit area

