

ANDALEX RESOURCES INC.

ACT 007/019

~~Superseded~~  
10/7/02  
PGL  
CP&H Assoc  
Chemical



**ANDALEX**  
**RESOURCES, INC.**  
Tower Division

P.O. BOX 902  
PRICE, UTAH 84501  
PHONE (801) 637-5385  
TELECOPIER (801) 637-8860

January 7, 1994

State of Utah  
Department of Natural Resources  
Division of Oil, Gas & Mining  
355 West North Temple  
3 Triad Center, Suite 350  
Salt Lake City, Utah 84180-1203

Attn: Daron Haddock  
Permit Supervisor

Re: ACT 007/019, Longwall Conversion

Dear Mr. Haddock:

Enclosed for your review is the additional material which has been requested by Mr. Wayne Western, of your staff, pursuant to a meeting held in Andalex's offices on January 6, 1994.

Of primary importance are our updated mining maps showing our next five-year projections, including longwall mining first in the Pinnacle Mine Gilson Seam, followed by longwall mining in the Aberdeen Seam. Also included are our five-year projections (as currently known) for mining in the Apex Mine Lower Sunnyside Seam and the Pinnacle Mine Centennial Seam.

The text discussion which accompanies these maps pertains to two main concerns. First, because of a justifiable angle of draw of 20° used on our property (justification included), Andalex will not create subsidence outside of our approved permit area. This subsidence projection is shown on our five-year mine plan.

Second, we have described the subsidence monitoring program which will be initiated prior to longwall mining. This is a detailed monitoring program over our first longwall mining which will be used to establish baseline information pertaining to angle of draw and degree of subsidence. This information will be used for monitoring and permit planning for successive longwall mining on our leases.

INCORPORATED  
EFFECTIVE:

JAN 12 1994

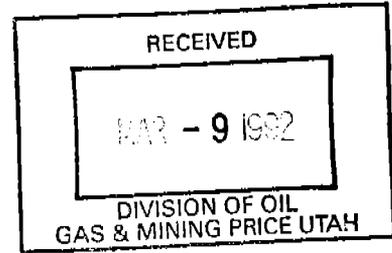
UTAH DIVISION OIL, GAS AND MINING

007/019 #2



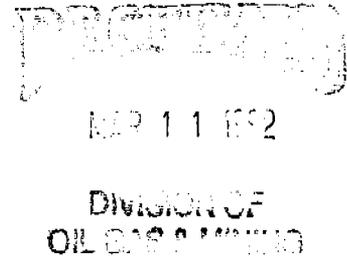
**ANDALEX**  
**RESOURCES, INC.**  
Tower Division

P.O. BOX 902  
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March 9, 1992

State of Utah  
Department of Natural Resources  
Division of Oil, Gas & Mining  
355 West North Temple  
3 Triad Center, Suite 350  
Salt Lake City, UT 84180-1203



Attn: Daron Haddock, Permit Supervisor  
re: Division Order 92-A

Dear <sup>Daron</sup>Mr. Haddock:

Enclosed for your review are two copies each of replacement text and plates. Along with two pages from the table contents, we have copied a replacement from page 133 to 190. Many of these pages were not revised however, we felt it would be easier for the Division to insert the entire section. Pages which have been revised are referenced with a 03/05/92 date. Also included are revisions to plates 8, 9 and 12 from which data was gathered (digitized). Also enclosed are replacement pages for insertion into Appendix "O".

I believe the enclosed will answer the spillway (Pond C) amendment including dewatering, walkways and etc. as well as cleaning out discrepancies which have existed from place to place in the text.

Please call with questions.

Sincerely,

  
Michael W. Glasson  
Senior Geologist

MWG/jo

Enclosures

State of Utah  
Department of Natural Resources  
Division of Oil, Gas & Mining  
January 7, 1994  
Page Two

We are confident, following our meeting, that this information will enable the Division to approve our permit change application.

Thank you for your time and assistance in this matter.

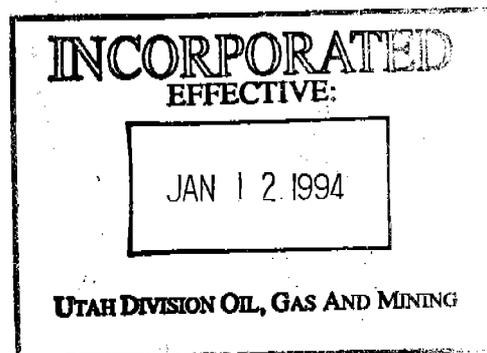
Sincerely,

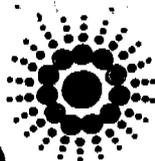


Michael W. Glasson  
Senior Geologist

MWG/rr

Enclosures





**ANDALEX**  
**RESOURCES, INC.**  
Tower Division

P.O. BOX 902  
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October 29, 1993

State of Utah  
Department of Natural Resources  
Division of Oil, Gas & Mining  
355 West North Temple  
3 Triad Center, Suite 350  
Salt Lake City, Utah 84180-1203

Attn: Daron Haddock  
Permit Supervisor

Re: ACT 007/019; Longwall Mine Plan

Dear Mr. Haddock:

Enclosed please find Andalex's application for a Permit Revision involving a change from 100% continuous miner production to longwall production using continuous miner support. We have been issued an approval by the Bureau of Land Management to modify our R2P2 to longwall mining. The BLM's approval order (letter attached) is based on the attached plates 26-28.

This change to longwall mining does not involve any coal resources which were not included in our room-and-pillar mining plan. As such, where our PHC has not identified any adverse consequences under room-and-pillar, the recovery of the same reserve by longwall will not produce adverse hydrologic consequences. By the same token, where Andalex currently operates under an approved subsidence monitoring plan, we will continue to use the same plan with the new mining method. Again, this will suffice where no new reserves are being added.

Please call with questions.

Sincerely,

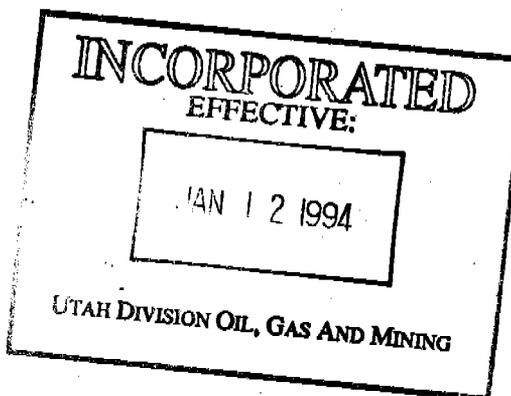
Michael W. Glasson  
Senior Geologist

Enclosures: Permit Change Application  
BLM Letter  
MRP Text  
Plates

RECEIVED

JAN 25 1994

DIVISION OF  
OIL, GAS & MINING



## Application for Permit Change Detailed Schedule of Changes to the Permit

Title of Change: Longwall Mining System

Permit Number: ACT / 007 / 019

Mine: Centennial

Permittee: Andalex Res. Inc.

Provide a detailed listing of all changes to the mining and reclamation plan which will be required as a result of this proposed permit change. Individually list all maps and drawings which are to be added, replaced, or removed from the plan. Include changes of the table of contents, section of the plan, pages, or other information as needed to specifically locate, identify and revise the exiting mining and reclamation plan. Include page, section and drawing numbers as part of the description.

### DESCRIPTION OF MAP, TEXT, OR MATERIALS TO BE CHANGED

			DESCRIPTION OF MAP, TEXT, OR MATERIALS TO BE CHANGED			
<input checked="" type="checkbox"/>	ADD	<input type="checkbox"/>	REPLACE	<input type="checkbox"/>	REMOVE	Volume I, Table of Contents, Page xx
<input type="checkbox"/>	ADD	<input checked="" type="checkbox"/>	REPLACE	<input type="checkbox"/>	REMOVE	Volume I, Pages 88-96, 213
<input type="checkbox"/>	ADD	<input checked="" type="checkbox"/>	REPLACE	<input type="checkbox"/>	REMOVE	Volume II, Plates 26-31, 40, 41
<input type="checkbox"/>	ADD	<input type="checkbox"/>	REPLACE	<input checked="" type="checkbox"/>	REMOVE	Volume II, Plates 32, 33, 39, 42
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**INCORPORATED**

EFFECTIVE

JAN 12 1994

UTAH DIVISION OIL, GAS AND MINING

Any other specific or special instructions required for insertion of this proposal into the Mining and Reclamation Plan?

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JAN 25 1994

DIVISION OF  
OIL, GAS & MINING



# APPLICATION FOR PERMIT CHANGE

Title of Change: <p style="text-align: center;">Longwall Mining System</p>	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <b>INCORPORATED</b>                      EFFECTIVE  <div style="border: 1px solid black; padding: 2px; display: inline-block; margin: 5px 0;">                         JAN 12 1994                     </div> </div>	Permit Number: ACT / 007 / 019 Mine: Centennial Permittee: Andalex Res. Inc.
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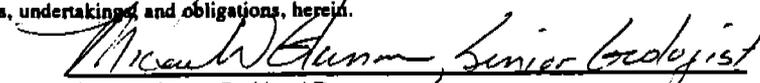
Description, include reason for change and timing required to implement: Maximize Economically Recoverable Coal Resource, Improve Life of Project Overall Economics. To be implemented (mining by longwall method) by mid-1994

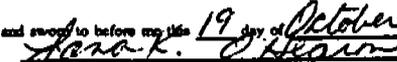
UTAH DIVISION OIL, GAS AND MINING

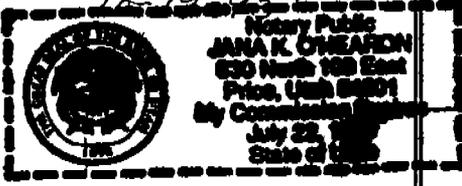
- |   |  |  |
|---|--|--|
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 1. Change in the size of the Permit Area? _____ acres <input type="checkbox"/> increase <input type="checkbox"/> decrease.               |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 2. Change in the size of the Disturbed Area? _____ acres <input type="checkbox"/> increase <input type="checkbox"/> decrease.            |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 3. Will permit change include operations outside the Cumulative Hydrologic Impact Area?  |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 4. Will permit change include operations in hydrologic basins other than currently approved?   |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 5. Does permit change result from cancellation, reduction or increase of insurance or reclamation bond?                                  |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 6. Does permit change require or include public notice publication?  |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 7. Permit change as a result of a Violation? Violation # _____   |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 8. Permit change as a result of a Division Order? D.O.# _____  |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 9. Permit change as a result of other laws or regulations? Explain: _____  |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 10. Does permit change require or include ownership, control, right-of-entry, or compliance information?                                 |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 11. Does the permit change affect the surface landowner or change the post mining land use?  |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 12. Does permit change require or include collection and reporting of any baseline information?  |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 13. Could the permit change have any effect on wildlife or vegetation outside the current disturbed area?                                |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 14. Does permit change require or include soil removal, storage or placement?  |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 15. Does permit change require or include vegetation monitoring, removal or revegetation activities?                                     |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 16. Does permit change require or include construction, modification, or removal of surface facilities?                                  |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 17. Does permit change require or include water monitoring, sediment or drainage control measures?                                       |
| <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No            | 18. Does permit change require or include certified designs, maps, or calculations?  |
| <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No            | 19. Does permit change require or include underground design or mine sequence and timing?  |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 20. Does permit change require or include subsidence control or monitoring?  |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 21. Have reclamation costs for bonding been provided or revised for any change in the reclamation plan?                                  |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 22. Is permit change within 100 feet of a public road or perennial stream or 500 feet of an occupied dwelling?                           |
| <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No | 23. Is this permit change coal exploration activity <input type="checkbox"/> inside <input type="checkbox"/> outside of the permit area? |

Attach 3 complete copies of proposed permit change as it would be incorporated into the Mining and Reclamation Plan.

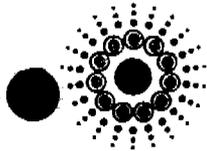
I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations, herein.

  
 Signed - Name - Position - Date  
 Michael W. Hann, Senior Geologist, 10/19/93

Subscribed and sworn to before me this 19 day of October, 19 93.  
  
 Notary Public  
 My Commission Expires: July 22, 19 97  
 State of Utah  
 County of Carbon



RECEIVED  
 Received by Oil, Gas & Mining  
 JAN 25 1994  
 DIVISION OF  
 OIL, GAS & MINING  
 ASSIGNED PERMIT CHANGE NUMBER



**ANDALEX**  
**RESOURCES, INC.**  
 Tower Division

P.O. BOX 902  
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 TELECOPIER (801) 637-8800

INCORPORATED  
 EFFECTIVE:  
 JUN 15 1995  
 UTAH DIVISION OIL, GAS AND MINING

June 15, 1995

RECEIVED  
 JUN 15 1995  
 DIVISION OF OIL  
 GAS & MINING PRICE UTAH

State of Utah  
 Department of Natural Resources  
 Division of Oil, Gas & Mining  
 355 West North Temple  
 3 Triad Center, Suite 350  
 Salt Lake City, Utah 84180-1203

Attn: Daron Haddock, Permit Supervisor

94 E

Re: ACT 007/019, Reformatted Plan and Mid-Term Review Response

Dear Mr. Haddock:

Enclosed are three (3) copies each of revised maps and text as outlined by the requirement section of the Technical Analysis. In cases where information required by the section has already been submitted, I have described its location in the following summary.

Due to the number of changes required by the Division's Technical Analysis, rather than attempting to make changes for page-by-page insertions the entire reformatted plan has been reprinted and submitted. Please note that pages numbers of this new MRP will not correspond exactly to the previous reformatted submittal.

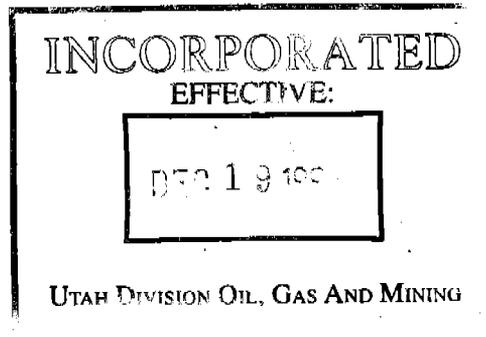
PERMIT APPLICATION:

- 1) The right-of-way to the Aberdeen Seam and fan portal (U-64158) is shown on Plate 4.

Identification of Interests:

- 1) See 111.200.
- 2) See 112.310. Officers and directors of Andalex Resources B.V. are the officers and directors of Andalex Resources, Inc. as shown in 112.310. There are no other companies, I.D. numbers, officers or directors.
- 3) See 112.500. This text agrees with Plates 2 & 3.

State of Utah  
Department of Natural Resources  
Division of Oil, Gas & Mining  
Attn: Daron Haddock  
June 15, 1995  
Page Two



- 4) Attached is the previous five-year nationwide violation information for Andalex. This should replace any existing violation information in Appendix B. This is the most current information. Attachment I-6 may also be included in Appendix B. (enclosed)
- 5) Acreage figures in various parts of the plan are correct.
- 6) See Plate 4.

Unsuitability Claims:

- 1) See 301-115.

Permit Term, etc.:

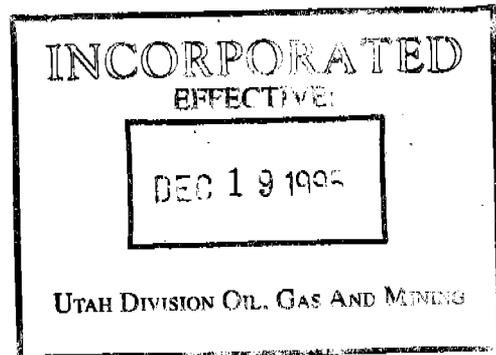
- 1) See 117.200.
- 2) Reference to UMC has been eliminated.
- 3) See 301-123. and final page of reformatted MRP.
- 4) There were no coal mining or reclamation operations by Andalex prior to 1980. Any previously existing disturbed areas are within Andalex's disturbed area and are part of its final reclamation plan.
- 5) These references have been corrected.

RESOURCE INFORMATION:

Historic and Archaeological Resources:

- 1) See 411.140. Appropriately, the information has been deleted as instructed. Reference Appendix C.
- 2) See 411.141, 411.142, 411.143, 411.144, 411.145. Reference Appendix C.
- 3) See 411.141, 411.142, 411.143, 411.144, 411.145. Reference Appendix C.

State of Utah  
Department of Natural Resources  
Division of Oil, Gas & Mining  
Attn: Daron Haddock  
June 15, 1995  
Page Three



Fish and Wildlife Resources:

- 1) See Plate 34.
- 2) See 301-310. and Appendix A.

Soil Resource Information:

- 1) Samples have been taken of the two substitute topsoil areas and will be included in Appendix M. (results have not been received)
- 2) See Plate 6.

Land-Use Resources:

- 1) See 411.230.

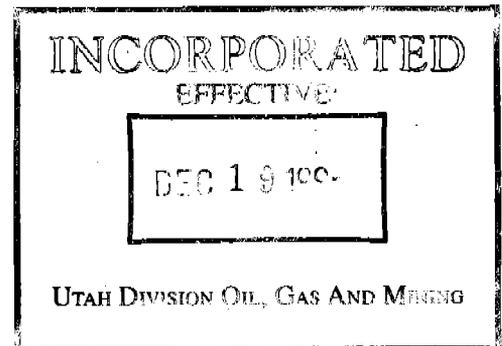
Geologic Resources:

- 1) See 611.200.
- 2) References have been changed.
- 3) References to Figure III-3 have been removed.
- 4) See Appendix E for two missing logs.
- 5) Drill hole information is proprietary to Cyprus/Amox.
- 6) References have been changed to correspond with the new format.
- 7) See 624.340.

Hydrologic Resources:

- 1) See 711.300.
- 2) A detailed PHC on the AEP lease was performed and submitted to the Division. See Appendix L.
- 3) See 711.300.

State of Utah  
Department of Natural Resources  
Division of Oil, Gas & Mining  
Attn: Daron Haddock  
June 15, 1995  
Page Four



Maps, Plans and Cross Sections:

- 1) All necessary certifications are made.
- 2) See Plates 26, 27, 28 and 29.
- 3) See Plates 26, 27, 28 and 29.
- 4) See Plates 26, 27, 28 and 29.
- 5) See Figure IV and Appendix L.
- 6) See 711.500. and Figure IV-11.
- 7) Andalex believes Plate 15 adequately satisfies this requirement.
- 8) Andalex maintains there are no aquifers of any areal or vertical extent within or adjacent to the permit area. All aquifers are perched and are not mappable.
- 9) There are none within proposed permit or adjacent areas.

OPERATIONAL PLAN:

General Operational Plan:

- 1) See 512.240.
- 2) Regarding 528.300, spoil, coal processing waste, mine development waste, and non-coal waste are not used in dams, embankments, or other impoundments by Andalex.

Existing Structures:

- 1) See Plate 6 for existing structures.

Coal Recovery:

- 1) See the Resource Recovery and Protection Plan (R2P2) on file with BLM & Price River Resource Area, 900 North 700 East, Price, Utah 84501. This document is considered proprietary.

State of Utah  
Department of Natural Resources  
Division of Oil, Gas & Mining  
Attn: Daron Haddock  
June 15, 1995  
Page Five

Subsidence Control:

- 1) See 724.600.
- 2) See 724.600.

Slide and Other Damage:

- 1) See 301-531.

Fish and Wildlife:

- 1) See 301-310.
- 2) Incorrect references have been corrected.

Interim Stabilization of Disturbed Areas:

- 1) See 515.100.

Maps, Plans and Cross Sections:

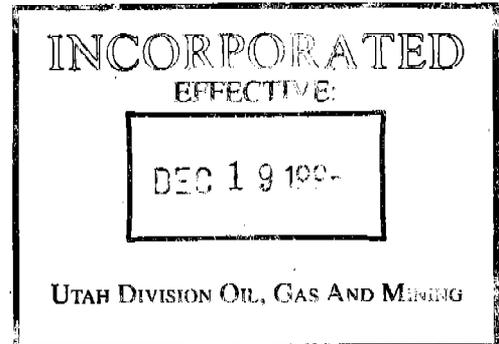
- 1) See 301-512.
- 2) Road remains. See 541.300 (1).
- 3) See Figure IV-11.

Topsoil and Subsoil Operations Plans:

- 1) See 301-224.
- 2) Plate 37 is currently being redrawn for legibility. The plate will include information pertaining to topsoil protection.

Road Systems:

- 1) See 301-142.
- 2) See 512.250.
- 3) See 301-142.
- 4) The geotechnical analysis described at R645-301-527.250 is not required.



State of Utah  
Department of Natural Resources  
Division of Oil, Gas & Mining  
Attn: Daron Haddock  
June 15, 1995  
Page Six

- 5) The main road through the minesite will be left as part of the post-mining land use. All other roads will be reclaimed including steep slopes in accordance with the reclamation plan outlined in 535.410.

Spoil and Waste:

- 1) See 512.230.
- 2) See 512.230.
- 3) See 512.230.
- 4) The approval for the construction of the Left Hand Fork fan was received May 25, 1995. A survey of all eagle nests within the permit area, including the nest nearby the fan installation, was conducted May 24, 1995 with personnel from the Utah Division of Wildlife Resources. It was determined that all nests were inactive this season. Construction of the Left Hand Fork fan installation will commence shortly.
- 5) See 529.100.
- 6) Reference to lump coal has been removed from the plan.

Hydrologic:

- 1) See 711.300.
- 2) See 731.510.
- 3) References to 731.300 were not found.

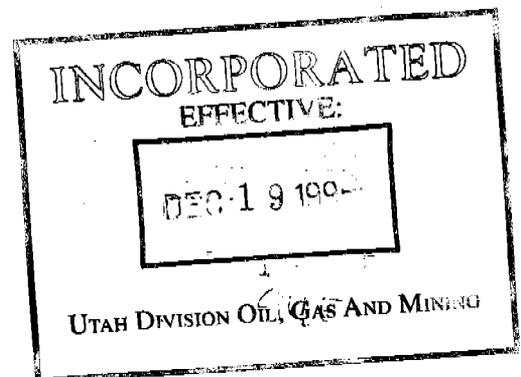
RECLAMATION PLAN:

General Reclamation Plan:

- 1) See 301-551.

Post-Mining Land Use:

- 1) See reclamation plan outlined in 535.410. Also, it should be noted that the main road through the minesite will be left intact as part of the post-mining land use.



State of Utah  
Department of Natural Resources  
Division of Oil, Gas & Mining  
Attn: Daron Haddock  
June 15, 1995  
Page Seven

- 2) Water monitoring in 413.320 has been eliminated as it is compliance-related to the operational plan and not the reclamation plan.

Topsoil Redistribution:

- 1) Acreage has been adjusted.

Geologic:

- 1) See 525.170.
- 2) Information in Part 600 which deals with casing and sealing of exploration holes is currently referenced to 301-551. Other references to 301-525 are referring to subsidence-related issues and other references to 611.100 pertain to specific geologic information. Also, references to Appendix E relate to specific drilling information. Andalex believe these are referenced appropriately.

Reclamation Hydrology:

- 1) See 711.500., 711.300, & 724.400

Revegetation:

- 1) See 301-331.
- 2) See 341.210.
- 3) Reference to 817.97(d)(7) has been removed.
- 4) See 301-240, Reclamation Time Table, Phase I.
- 5) See 301-240. and 301-331., Reclamation Time Table, Phase I.
- 6) Section 353.100 to 353.250 has been added.
- 7) Andalex believes that reclamation of the site is the equivalent of wildlife enhancement as revegetation which will support post-mining land use (wildlife) will be established.

INCORPORATED  
EFFECTIVE:

DEC 19 1995

UTAH DIVISION OIL, GAS AND MINING

195

State of Utah  
Department of Natural Resources  
Division of Oil, Gas & Mining  
Attn: Daron Haddock  
June 15, 1995  
Page Eight

Additional Division Recommendations:

- 1) Surface roughness has been established as important for revegetation success. Andalex will make every effort to leave surfaces as rough as possible. See 301-331.
- 2) See 301-331, Mulching Techniques.
- 3) See 301-331, Reference Areas.

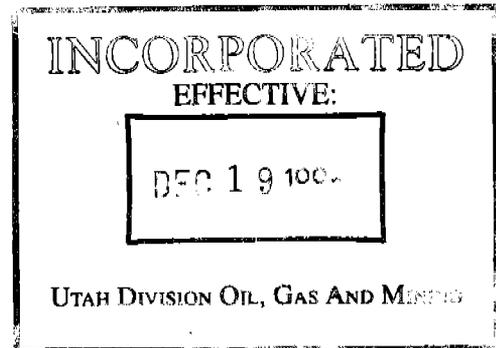
The above referenced information, along with revised and certified Plates, should adequately address the technical analysis findings of the Division of Oil, Gas and Mining. Please call with questions.

Sincerely,



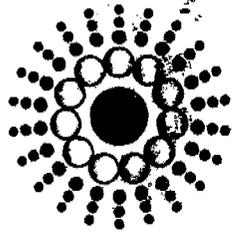
Michael W. Glasson  
Senior Geologist

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R645-301-110.

**LEGAL, FINANCIAL, COMPLIANCE AND INFORMATION**

**Legal, Financial, Compliance and Information**

The objective of this chapter is to set forth all relevant information concerning ownership and control of Andalex Resources, Inc., the ownership and control of the property to be affected by mining activities and all other information and documentation required.

Please note that right-of-entry information for all new Leases is included in Appendix J, "Other Approvals".

**Compliance Information**

a) Suspension and Revocation

Andalex Resources, Inc., affiliates or persons controlled by or under common control with Andalex haven't had a mining permit suspended or revoked within the last five years.

b) Forfeiture of Bond

Andalex Resources, Inc., affiliates or persons controlled by or under common control with Andalex have not forfeited a mining bond or similar security in lieu of bond.

c) History of Violations

Appendix B contains a listing of all violations received within the last three years prior to the date of this application by Andalex and affiliated companies.

R645-301-111.

**INTRODUCTION**

**Introduction**

This underground mining permit application is being submitted for renewal and modification by Andalex Resources, Inc. Andalex added three new leases consisting of 320 acres federal lease (#U-05067 Sunedco); 903 acres federal lease (#UTU-66060 Graves); 240 acres fee to its existing approved Centennial Project. The leases contain approximately 8.75 million tons of recoverable coal. Andalex now proposes to add federal coal lease UTU-69600 (AEP) containing 802 acres and 3.0 million tons of recoverable coal. All reserves on this lease will be mined simply as an underground extension of the existing, approved, and currently operating

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Mine Plan Cross Reference  
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Pinnacle and Aberdeen Mines. With the longwall expansion in the Aberdeen Mine a new fan installation will be required in the left hand fork of Deadman Canyon. (See Left Fork drawings.) Access to and handling and extraction of all coal will be through existing Pinnacle, Aberdeen, and Apex Mine facilities.

### Overview and Summary of Project

Mining operations at the Pinnacle Mine began on October 3, 1980, according to the Mining and Reclamation Plan approved by the State of Utah, Department of Natural Resources, Division of Oil, Gas, and Mining. The mining began on the Zion's fee lease and extended onto Andalex's federal leases according to federal approval granted in 1982. Andalex also opened the Apex Mine late in 1982. Current mining activity is occurring in the Gilson Seam and Lower Sunnyside Seam. Mining commenced in the Aberdeen Seam in mid 1988. Mining commenced in the Centennial Seam in 1990. The coal is classified as High Volatile B bituminous in the Lower Sunnyside, Gilson and Centennial Seams and as High-volatile A bituminous in the Aberdeen Seam.

The proposed mine plan area is located approximately 10 miles north-northeast of Price, Utah in Carbon County in T13S and R11E (See Figure I-2 and Plate 1). With the addition of the Sunedco Lease the Graves Lease, and the AEP lease, the coal property contains approximately 5,063 acres. Two hundred acres are fee surface and coal leased from the Zion Security Corporation. Two hundred forty acres are fee surface and coal and are leased from the Sunedco Coal Company. The remaining 4,623 acres are federal leases consisting of SL-027304 (236 acres), SL-063058 (400 acres), U-010581 (1,842 acres), U-05067320 (acres), U-52341(120 acres), UTU-66060 (903 acres), and UTU-69600 (802 acres), and which includes lease modifications acquired in 1981. Please see Plate 4.

This property is located in the Book Cliffs coal field and includes Alrad Canyon, Deadman Canyon, Starpoint Canyon, Straight Canyon, and Hoffman Creek Canyon areas with coal outcropping along the cliffs between 7,000 feet and 7,700 feet elevations. The topography is very rugged, the Book Cliffs being dissected by box canyons created by ephemeral streams. Large sandstone boulders eroded from the cliffs are scattered along the sides of the canyons. The land is undeveloped, used primarily for grazing, and there are no areas of national importance in the region. Mountain-Brush vegetative type covers most of the area.

There are no perennial streams or bodies of water on the property. Ground water recharge is from precipitation in the vicinity. Water supply for mine development and culinary usage is supplied by wells that have been drilled.

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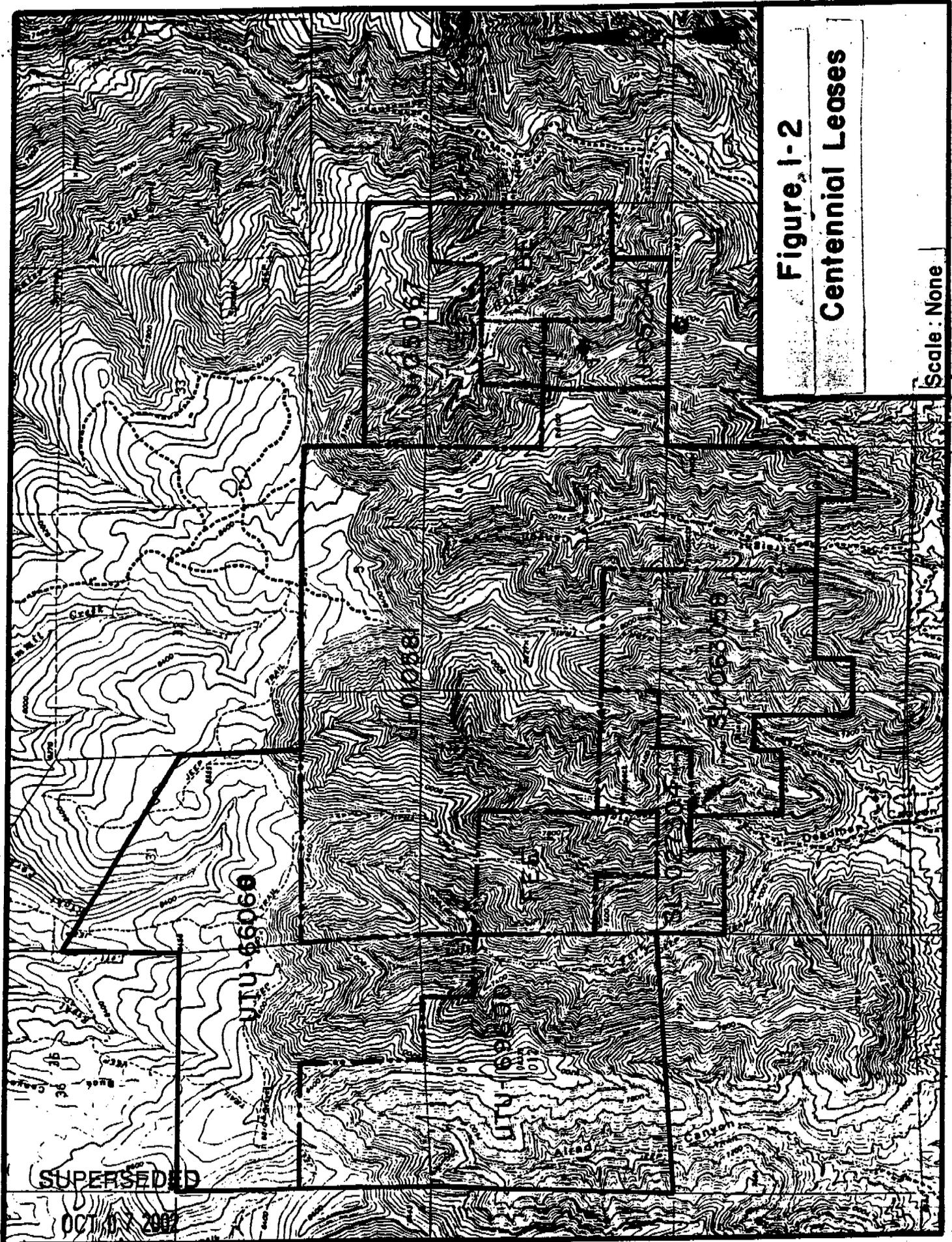


Figure 1-2  
Centennial Leases

Scale: None

Figure I-2  
Insert map

Need drawing

SEE PAGE 4.

Historically, coal mining has been the only industry in the permit area and there are several abandoned mines located on the property. No oil or gas wells exist in the area.

Access to the mine plan area is by an existing paved county road which has been upgraded and is maintained by Carbon County. It is used as an access road as well as a haul road. All surface and support facilities necessary for present operations have been completed and are located on the Zion's fee or on rights-of-way granted by the Bureau of Land Management. This is also a small private easement granted to Andalex from Gladys M. Artman for a small portion of pond E. All proposed facilities are indicated in this application. Andalex has acquired all applicable state and federal licenses, permits, and rights-of-way necessary to conduct mining activities on the Zion's fee property and contiguous federal leases.

Estimated remaining coal reserves as of 3-24-93 in the four beds (in place) of minable thickness totals 50.8 million tons, with recoverable coal estimated at 30.5 million tons. To date, 9.3 million tons have been produced leaving an estimated 21.2 million tons. Production schedule estimates 1,200,000 tons to be produced in 1993 increasing to 1.5 million by 1995.

If the extraction rate of 1.5 million tons is accomplished according to schedule, the project life will be about 15 years. The theoretical life is closer to 20 years however, due to the existence of unleased federal coal logically accessible through only the existing and future Andalex mine workings. Some of this coal is contained in the Graves (U-66060) and AEP (UTU-69600) Leases.

The mining method being employed is gateroad development utilizing continuous miners with final extraction by longwall. Certain fringe area reserves, inadequate for longwall panels, will be by room-and-pillar method.

Upon cessation of mining activities, reclamation activities will commence as soon as is practicable, according to the plans outlined in this application. The land will be restored according to available technology to as nearly its original condition as is possible.

This operation does not face any of the mining complications caused by faults, intrusives, excessive water, or large quantities of gas. The mine plan area is located in a region where mining has been the major industry; therefore, the nearby communities are geared for coal operations. The labor supply is excellent and well trained. With these considerations, and Andalex's prudent management, the

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Centennial Project will be a model mining operation in the Carbon County area with very minimal environmental and socioeconomic impact.

### Organization of Application

This underground mining permit application has been organized in accordance with the general requirements for format and contents as outlined in the R645- Coal Mining Rules.

## R645-301-111.100. OBJECTIVES

### Objectives

The objective of this chapter is to set forth all relevant information concerning ownership and control of Andalex Resources, Inc., the ownership and control of the property to be affected by mining activities and all other information and documentation required.

Please note that right-of-entry information for all new Leases is included in Appendix J, "Other Approvals".

## R645-301-111.200. RESPONSIBILITY

Andalex Resources, Inc., is responsible for submission of information and will pay abandoned mine reclamation fees.

## R645-301-111.300. APPLICABILITY

The requirements of R645-301-100 apply to Andalex Resources, Inc.

## R645-301-112. IDENTIFICATION OF INTERESTS

### a) Permit Applicant

Andalex Resources, Inc.  
Tower Division  
P.O. Box 902  
Price, Utah 84501  
(801) 637-5385

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b) Legal and Equitable Owners of Record

Earth work for the Aberdeen Mine was completed in 1989. Surface facilities for the Aberdeen Mine were completed early in 1990. All existing facilities are located either on land owned by Zions Securities Corporation or on federal land. The addresses of these owners of record are as follow:

Bureau of Land Management (801) 524-3004  
Utah State Office  
324 South State Street  
Salt Lake City, Utah 84111

Zion Securities Corporation (801) 363-3841  
10 East South Temple  
Salt Lake City, Utah 84111

All coal to be mined on the permit area is owned by the federal government, Zion Securities Corporation, Sunedco Coal Company or AMCA Coal Leasing, Inc. The addresses of these owners of record are as follow:

Bureau of Land Management  
Utah State Office  
324 South State Street  
Salt Lake City, Utah 84111

AMCA Coal Leasing, Inc.  
PO Box 902  
Price, Utah 84501

Zion Securities Corporation  
10 East South Temple  
Salt Lake City, Utah 84111

Sunedco Coal Company  
7401 West Mansfield Avenue  
Suite 418  
P.O. Box 35-B  
Lakewood, Colorado 80235

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**R645-301-112.100. TYPE OF BUSINESS**

Andalex Resources, a corporation organized and existing under the laws of Delaware and qualified to do business in Utah, has opened two underground mines known as the Pinnacle and Apex Mines. Mining commenced in the Aberdeen Mine in mid-1988. These mines are located on fee and federal lands in Carbon County, Utah. Andalex, the designated operator, along with AMCA Coal Leasing, Inc., its land acquisition and development branch, control all federal and fee mining leases within the proposed mine plan area. This underground mining permit application has been prepared by Andalex Resources and is being submitted for review and approval by the appropriate regulatory authorities.

**R645-301-112.200. NAMES, LOCATIONS, RESIDENT AGENT**

Resident Agent who will accept service of process for Andalex Resources, Inc., Tower Division, Centennial Mines, ACT/007/019:

Michael W. Glasson  
Andalex Resources, Inc.  
Tower Division  
P.O. Box 902  
Price, Utah 84501

Also, see Page 442 for notarized statement pertaining to completeness and accuracy.

**R645-301-112.300. OTHER THAN SINGLE PROPRIETORSHIPS**

Andalex Resources, Inc., Tower Division, holds the exclusive coal operating interests in the permit area.

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R645-301-112.310. OFFICERS AND SHAREHOLDERS

POSITIONS HELD - BEGINNING AND ENDING DATES ANDALEX RESOURCES, INC.				
NAME	AFFILIAT DATE	POSITION HELD	BEGIN DATE	ENDING DATE
PETER B. GREEN	01/05/88	DIRECTOR	01/05/88	.....
	01/05/88	CHAIRMAN	05/11/90 ✓	.....
ROBERT ANDERSON, JR.	01/03/78	DIRECTOR	01/03/78	07/12/95
	1/03/78	PRESIDENT	08/20/90	07/01/94
	01/03/78	VICE CHAIRMAN	07/01/94	07/12/95
JOHN BRADSHAW	02/05/90	VP FINANCE	02/05/90	.....
	02/05/90	SECRETARY	03/01/94	04/24/95
RONALD C. BEEDIE	01/05/88	DIRECTOR	01/05/88	.....
DOUGLAS H. SMITH	03/07/94	SR. VICE PRESIDENT	03/07/94	07/01/94
	03/07/94	PRESIDENT	07/01/94	.....
	03/07/94	DIRECTOR	07/01/94	.....
SAMUEL C. QUIGLEY	02/24/95	VICE PRESIDENT WESTERN OPERATIONS	02/24/95	.....
GORDON ULRICH	07/01/94	DIRECTOR	07/01/94	.....
HOWARD RATTI	06/13/95	VICE PRESIDENT	06/13/95	.....
G. CHRISTOPHER VAN BEVER	04/24/95	SECRETARY	04/24/95	u/1/97
MARY JEAN MITCHELL GREEN	12/31/85	DIRECTOR	12/31/85	05/11/90
	12/31/85	CHAIRMAN	12/31/85	05/11/90
KENNETH O. TAYLOR	01/01/81	VICE PRESIDENT	01/01/81	03/31/93
FMMETT ANDERSON	12/31/85	VICE PRESIDENT	12/31/85	08/11/89
JAMES D. POWELL	12/31/85	VICE PRESIDENT	12/31/85	08/11/89
BRUCE FERRIELL	11/18/86	SECRETARY	11/18/86	10/12/93
MALCOLM THOMAS	09/29/89	VICE PRESIDENT	09/29/89	12/01/93
DENNIS HALLIBURTON	12/31/85	VICE PRESIDENT	12/31/85	10/19/87
CHARLES MILLS	10/14/88	VICE PRESIDENT	10/14/88	10/01/89
DENNIS PERREY	12/31/85	CONTROLLER	12/31/85	02/08/90
W. KEITH SMITH	07/09/81	VICE PRESIDENT	07/09/81	05/01/90
GARY LIVINGSTONE	01/05/88	PRESIDENT	01/08/88	08/20/90

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The address for all of the above is:

Andalex Resources, Inc.  
1201 Hurstbourne Place  
9300 Shelbyville Road  
Louisville, Kentucky 40222-5156

#### Principal Shareholders

The capital stock of Andalex Resources, Inc., is 100 percent owned and controlled by Andalex Resources B.V., a Netherlands company:

Andalex Resources, Inc.  
1201 Hurstbourne Place  
9300 Shelbyville Road  
Louisville, Kentucky 40222-5156

#### R645-301-112.320. OWNERSHIP AND CONTROL RELATIONSHIP TO APPLICANT

The capital stock of Andalex Resources, Inc., is 100 percent owned and controlled by Andalex Resources B.V., a Netherlands company:

Andalex Resources, Inc.  
1201 Hurstbourne Place  
9300 Shelbyville Road  
Louisville, Kentucky 40222-5156

Other names under which the principal shareholder has or is operating coal mining activities in the United States within the last five years preceding the date of this application are listed below:

Andalex Resources, Inc., Tower Division  
Andalex Resources, Inc., Cimarron Division  
AMCA Coal Leasing, Inc.  
West Ken Coal Corporation  
Andalex Resources, Inc., Little Creek Division

Andalex Resources, Inc., holds the exclusive coal operating interests in the permit area. The employer identification number is 61-0931325.

#### R645-301-112.400. PENDING, CURRENT AND PREVIOUS COAL PERMITS

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and its affiliates is included in Appendix B.

**R645-301-112.500. SURFACE AND MINERAL OWNERSHIP**

**Owners of Record of Surface and Subsurface Contiguous Areas**

Names and addresses of all owners of record for all surface and subsurface areas contiguous to and within the permit area are listed below and indicated on Plates 2 and 3.

**Subsurface Owners**

Franklin Real Estate Company (American Electric Power)  
#2 Broadway  
New York, New York (contiguous)

Bureau of Land Management  
Utah State Office  
136 East South Temple  
Salt Lake City, Utah 84111 (contiguous & within)

State of Utah  
School Trust Lands Administration  
355 West North Temple  
3 Triad Center, Suite 400  
Salt Lake City, Utah 84180 (contiguous)

Andalex Resources, Inc.  
PO Box 902  
Price, Utah 84501 (within)

Sunedco Coal Company  
7401 West Mansfield Avenue  
Suite 418  
P.O. Box 35-B  
Lakewood, Colorado 80235 (contiguous & within)

Zion Security Corp.  
10 East South Temple  
Salt Lake City, Utah 84111 (within)

Mathis Land Co.  
Sunnyside Star Route  
Price, Utah 84501 (contiguous & within)

**Surface Owners**

Bureau of Land Management  
Utah State Office  
136 East South Temple  
Salt Lake City, Utah 84111 (contiguous & within)

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**DIV OF OIL GAS & MINING**

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Gladys R. Artman  
P.O. Box 22  
Mountain City, Georgia 30562 (contiguous & within)

F. and D. Shimmin  
711 North 5th East  
Price, Utah 84501 contiguous)

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*Andalex Resources, Inc.  
Mine Plan Cross Reference  
To Coal Mining Rules R645  
Updated - Technical Analysis 6/15/95*

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Sunedco Coal Company  
7401 West Mansfield Avenue  
Suite 418  
P.O. Box 35-B  
Lakewood, Colorado 80235 (contiguous & within)

R. and E. Nelson  
583 Sundial Drive  
Moab, Utah 84532 (within)

Mathis Land Co.  
Sunnyside Star Route  
Price, Utah 84501 (contiguous & within)

J & S Critchlow (Cave, et.al)  
144 South 1650 East  
Price, Utah 84501 (contiguous & within)

Andalex Resources Inc.  
P.O. Box 902  
Price, Utah 84501 (within)

Zion Security Corporation  
10 East South Temple  
Salt Lake City, Utah 84111 (within)

State of Utah  
School Trust Lands Administration  
355 West North Temple  
3 Triad Center, Suite 400  
Salt Lake City, Utah 84180 (contiguous & within)

**R645-301-112.600. ADJACENT SURFACE AND MINERAL OWNERSHIP**

**Interests in Contiguous Lands**

The Uintah-Southwest Utah Federal Coal Leasing Program has been dropped by the U.S. Department of Interior; therefore, previous expressions of interests by this company are no longer valid. However, existing unleased federally owned coal resources remain of interest to Andalex at such time as currently controlled reserves have been exhausted.

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Andalex Resources, Inc.  
Mine Plan Cross Reference  
To Coal Mining Rules R645  
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Revised 03/02

**DIV OF OIL GAS & MINING**

**MAY 17 2002**

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**DIV OF OIL GAS & MINING**

R645-301-112.700.            MSHA    NUMBERS    FOR    ALL    MINE-  
   ASSOCIATED STRUCTURES

The Centennial Project includes the development of three separate mines. All are currently in operation. The names and M.S.H.A. I.D. numbers for existing mines and all sections are as follow:

Pinnacle Mine - M.S.H.A. I.D. #42-01474  
Apex Mine - M.S.H.A. I.D. #42-01750  
Aberdeen Mine - M.S.H.A. I.D. #42-02028

All coal from the newly acquired AEP Lease will be mined simply as an underground extension of the existing Pinnacle and Aberdeen Mines.

R645-301-112.800.            STATEMENT    OF    ALL    LANDS    AND  
   INTERESTS    IN    LANDS

The Uintah-Southwest Utah Federal Coal Leasing Program has been dropped by the U.S. Department of Interior; therefore, previous expressions of interests by this company are no longer valid. However, existing unleased federally owned coal resources remain of interest to Andalex at such time as currently controlled reserves have been exhausted.

R645-301-113.                    VIOLATION    INFORMATION

History of Violations

Appendix B contains a listing of all violations received within the last three years prior to the date of this application by Andalex and affiliated companies.

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**R645-301-113.100. COMPLIANCE INFORMATION**

Andalex Resources, Inc., affiliates or persons controlled by or under common control with Andalex haven't had a mining permit suspended or revoked within the last five years.

Andalex Resources, Inc., affiliates or persons controlled by or under common control with Andalex have not forfeited a mining bond or similar security in lieu of bond.

Appendix B contains a listing of all violations received within the last three years prior to the date of this application by Andalex and affiliated companies.

**R645-301-113.110. SUSPENDED OR REVOKED PERMITS**

Andalex Resources, Inc., affiliates or persons controlled by or under common control with Andalex haven't had a mining permit suspended or revoked within the last five years.

**R645-301-113.120. FORFEITED BONDS**

Andalex Resources, Inc., affiliates or persons controlled by or under common control with Andalex have not forfeited a mining bond or similar security in lieu of bond.

**R645-301-113.200. EXPLANATION OF PERMIT OF BOND FORFEITURE**

N/A

**R645-301-113.210 PERMIT AND BOND IDENTIFICATION**

The following is a list of all other licenses and permits under applicable state and federal land-use, air and water quality, water rights and health and safety laws and regulations held by Andalex in order to conduct underground coal mining activities.

All permits listed are up to date and current. The NPDES Permit for the Centennial Project has been renewed in the form of a General permit (UTG 040008).

Andalex Resources, Inc.  
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Updated Technical Analysis 6/15/95

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OCT 07 2002 94E

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State:

- 1) State of Utah  
Department of Natural Resources  
Division of Oil, Gas and Mining  
355 West North Temple, Suite 350, 3 Triad Center  
Salt Lake City, Utah 84116

- Mining and Reclamation Plan for Andalex Resources'  
Centennial Project

- Permit I.D. Number ACT/007/019
- Approved January 4, 1982
- Permit Renewed March 2, 1987, January 1992

- 2) State of Utah  
Department of Health  
Division of Environmental Health  
150 West North Temple  
P.O. Box 2500  
Salt Lake City, Utah 84110

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**AUG 28 2002**

- Air Quality Construction and Operation Permit **DIV OF OIL GAS & MINING**  
Approved June 13, 1980  
Reapplied June 2, 1988 (modification)  
Approved June 23, 1989
- Water Quality - Sediment and Drainage  
Approved May 14, 1980
- Septic and Culinary Plan (2)  
Approved September 17, 1980 (Office Site)  
Approved May 8, 1980 (Bathhouse Facility)

Federal:

- 1) Environmental Protection Agency  
Region VIII  
1860 Lincoln Street  
Denver, Colorado 80295

- National Pollutant Discharge Elimination System (NPDES)  
Permit I.D. - UT-0023507  
Issued April 25, 1982  
Renewed August 31, 1989
- Prevention of Significant Deterioration of Air Quality (PSD)  
Unissued: Determined by the E.P.A. to be unnecessary

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To Coal Mining Rules R645  
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**DIV OF OIL GAS & MINING**

- 2) Bureau of Land Management  
Utah State Office  
Federal Building  
Salt Lake City, Utah 84111
- Access Road Right-of-Way  
Permit Number U-45966  
Granted September 1, 1980
  - Buried Telephone Cable Right-of-Way  
Permit Number U-36739  
Granted November 20, 1978
  - Power Transmission Line Right-of-Way  
Permit Number U-36741  
Granted November 20, 1978, assigned to UP&L
  - Material Storage Site Right-of-Way  
Permit Number U-45965  
Granted September 11, 1980
  - Aberdeen Mine Right-of-Way  
Permit Number UTU-62045  
Granted June 6, 1988

- 3) Mine Safety and Health Administration (M.S.H.A.)  
P.O. Box 25367  
Denver, Colorado 80225  
(District 9)

Pinnacle Mine I.D. 42-01474  
Apex Mine I.D. 42-01750  
Aberdeen Mine I.D. 42-02028

- Roof Control Plan  
Reviewed and approved every six months
- Ventilation System and Methane and Dust Control Plan  
Reviewed and approved every six months
- Smoking Prohibition Plan  
Approved August 4, 1992
- Training Plan  
Approved November 27, 1990
- Instruction Program: Firefighting and Evacuation Plan  
Approved August 4, 1992

Andalex Resources, Inc.  
Mine Plan Cross Reference  
To Coal Mining Rules R645  
Updated - Technical Analysis 6/15/95

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- SCSR Storage Plan  
Approved May 18, 1992
- Chest X-Ray Plan  
Approved March 15, 1990

R645-301-113.220. REGULATORY AUTHORITIES INVOLVED

See above

R645-301-113.230. CURRENT STATUS OF PERMIT AND BOND

See above

R645-301-113.240. ADMINISTRATIVE OR JUDICIAL  
PROCEDURES

Appendix B

R645-301-113.250. CURRENT STATUS OF PROCEEDINGS

Appendix B

R645-301-113.300. LIST OF ALL VIOLATIONS NOTICES

Appendix B

R645-301-113.310. IDENTIFICATION OF VIOLATIONS

Appendix B

R645-301-113.320. DESCRIPTION OF VIOLATIONS

Appendix B

R645-301-113.330. LOCATION OF VIOLATIONS PROCEEDINGS

Appendix B

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Andalex Resources, Inc.  
Mine Plan Cross Reference  
To Coal Mining Rules R645  
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Appendix B

**R645-301-114.**

**RIGHT-OF-ENTRY INFORMATION**

Andalex Resources, Inc., in sublease agreement with AMCA Coal Leasing, Inc., currently holds approximately 5175.00 acres of private and federal coal leases in this permit area. The number will increase to 5415.00 acres with the addition of the Mathis Tract I.B.C. Andalex basis its legal right to enter and conduct mining activities in the permit area pursuant to the language contained in the Federal Coal Leases, Section 2, Rights of Lessee as follows:

"The lessor, in consideration of any bonus paid (or to be paid if deferred), rents and royalties and other conditions hereinafter set forth, hereby grants and leases to the lessee the exclusive right and privilege to mine and dispose of all coal ... subject to the conditions, limitations and prohibitions provided in this lease and in applicable acts and regulations, the right to construct all works, buildings, structures, equipment, and appliances which may be necessary and convenient for the mining and preparation of the coal for market, and subject to the conditions herein provided, to use so much of the surface as may reasonably be required in the exercise of the rights and privileges herein granted..."

A similar right to enter and conduct underground mining activities is contained in the private lease agreement with the Zion Securities Corporation as follows:

"During the life of the lease, so long as lessee is not in default hereunder, it may freely prospect, mine and develop the lease premises, extract and sell such coal therefrom as it may elect, and use the surface and underground thereof for all lawful purposes including the exploration and mining to be conducted therein and thereon. It may also use the leased lands in connection with the mining and development of other lands which it may own, lease, or acquire as a part of its general mining operations in the area."

Legal right-of-entry information for the Hoffman Creek federal and fee leases as well as the Graves Lease has been inserted into Appendix J, "Other Approvals". Also included in this appendix is our legal right-of-entry to the right-of-way which was added for the Aberdeen facilities (#UTU-62045) and the Right-of-Entry

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Mine Plan Cross Reference  
To Coal Mining Rules R645  
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information for the Mathis Tract. None of the leases' rights-of-entry is a subject of pending litigation.

The Federal Coal Leases are described as follows (please see Plate 4):

SL-027304:

Tract 1: T.13S., R.11E., SLM, Utah  
(original lease) Sec. 7, S 1/2 SE 1/4,  
Sec. 18, NW 1/4 NE 1/4.

Tract 2: T.13S., R.11E., SLM, Utah  
(lease modification) Sec. 7, lot 4;  
Sec. 18, lot 1, N 1/2 NE 1/4 NW 1/4,  
SW 1/4 NE 1/4 NW 1/4 containing 236 acres, more  
or less.

This lease was originally assigned to W.F. Olsen on September 1, 1925. On May 1, 1959, the lease was assigned to F.H. Larson and then to Centennial Coal Associates on February 1, 1973. AMCA Coal Leasing, Inc., acquired the lease in February, 1977 and subsequently added Tract 2 through lease modification criteria on October 26, 1981.

SL-063058:

Tract 1: T.13S., R.11E., SLM, Utah  
(original lease) Sec. 8, S 1/2 SW 1/4;  
Sec. 17, N 1/2 NW 1/4, SE 1/4 NW 1/4;  
Sec. 18, NE 1/4 NE 1/4.

Tract 2: T.13S., R.11E., SLM, Utah  
(lease modification) Sec. 17, SW 1/4 NW 1/4, NE 1/4 NW 1/4 SW 1/4,  
W 1/2 NW 1/4 SW 1/4,  
Sec. 18, E 1/2 SE 1/4 NE 1/4, NW 1/4 SE 1/4 NE  
1/4, SW 1/4 NE 1/4, E 1/2 NE 1/4 SE 1/4  
containing 400 acres, more or less.

The original lease of 80 acres was assigned to C.D. Sutton on August 3, 1942. On July 27, 1950, the lease was amended to embrace 200 acres. An additional 40 acres was added December 13, 1951. The leases were posted to F.H. Larson on May 1, 1970 and then to Centennial Coal Associates on February 1, 1973. AMCA Coal Leasing, Inc., acquired the lease in February, 1977 and subsequently added Tract 2 through the federal lease modification criteria.

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U-010581:

Tract 1: T.13S., R.11E., SLM, Utah  
(original lease) Secs. 5, and 6, all;  
Sec. 7, lot 1, NE 1/4, NE 1/4 NW 1/4,  
N 1/2 SE 1/4;  
Sec. 8, N 1/2, N 1/2 S 1/2,  
S 1/2 SE 1/4;  
Sec. 9, W 1/2 SW 1/4;  
Sec. 17, N 1/2 NE 1/4.

Tract 2: T.13S., R.11E., SLM, Utah  
(lease modification) Sec. 17, S 1/2 NE 1/4, N 1/2 NE 1/4 SW 1/4,  
NE 1/4 SE 1/4, N 1/2 NW 1/4 SE 1/4 containing  
1,842 acres, more or less.

This lease was assigned to C.D. Sutton on February 1, 1956. On May 1, 1970 the lease was assigned to F.H. Larson and then to Centennial Coal Associates on February 1, 1973. AMCA Coal Leasing, Inc., acquired the lease in February, 1977 and subsequently added Tract 2 through the federal lease modification criteria.

U-52341:

T.13S., R.11E., SLM, Utah  
Sec. 9, E 1/2 SW 1/4, SW 1/4 SE 1/4 containing  
120 acres, more or less.

This lease was acquired by AMCA Coal Leasing, Inc., in November, 1983 through the emergency lease criteria and subsequently relinquished in December 1987 after reserves were depleted. Forty(40) acres of this lease are still included as part of the permit area and are described as: T.13S., R.11E., Sec. 9, NE1/4 SW1/4 containing 40 acres.

U-05067

T.13S., R.11E., SLM, Utah  
Sec. 4, S 1/2  
Sec. 9, NW 1/4 NE 1/4  
W 1/2 NW 1/4  
NE 1/4 NW 1/4 containing 320 acres, more or less.

UTU-66060

T.12S, R.11E., SLM, Utah  
Sec. 31, Lots 3-6, 12-22  
  
T.13S, R.10E., SLM, Utah  
Sec. 1, Lots 1-4, S 1/2 N 1/2, SE 1/4  
Sec. 12, Lot 1

12/17/96, 07/24/97

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**MAY 17 2002**

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Tract 2: T.12S., R.11E., SLM, Utah  
(lease Sec. 31, Lot 12 ;  
modification) Sec. 32, W ½ SW 1/4, SW 1/4 NW 1/4, entire  
lease containing 1093.32 acres more or less.

UTU-66060 (Graves Lease) is subject to the terms and conditions set forth in the Federal Coal Lease issued by the Bureau of Land Management October 3, 1994. Specifically, Part I, section 2 of the lease "grants and leases to the Lessee the exclusive right and privilege to drill for, mine, extract, remove , or otherwise process and dispose of the coal deposits in, upon, or under the lands described below" as Tract 1 (Original Lease) and Tract 2 (Modification).

ANDALEX estimates that there are approximately 518,000 recoverable tons included within the 160 acre lease modification. This number of recoverable tons however is subject to the mineability of the coal. That is, The Aberdeen coal seam pinches out in a north-easterly direction. Also, the depth of cover increases dramatically to the north which could restrict recovery.

The private fee leases are described as follows:

The Mathis Tract - Incidental Boundary Change - Fee Lease

T.12S., R.10E., SLM, Utah  
IBC: Section 36: S1/2S1/2, S1/2N1/2S1/2, containing 240 acres.

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T.13S., R.11E., SLM, Carbon County, Utah  
Sec. 7: S1/2 NW1/4  
N1/2 SW1/4  
SE1/4 SW1/4 containing 200 acres, more or less

The name and address of the lessor is Zion Securities Corporation, 10 East South Temple Street, Salt Lake City, Utah. This lease was originally made and entered into between Zion's and Centennial Coal Associates on August 1, 1972. AMCA Coal Leasing Inc. acquired the lease in February, 1977.

T.13S., R.11E., SLM, Carbon County, Utah  
Sec. 9: SE1/4 NW1/4  
S1/2 NE1/4  
NE1/4 NE1/4  
N1/2 SE1/4 containing 240 acres, more or less

The name and address of the lessor is Sunedco Coal Company, 7401 West Mansfield Avenue, Suite 418, P.O. Box 35-B, Lakewood, Colorado 80235. AMCA Coal Leasing, Inc. acquired the lease in June, 1988.

UTU-69600

T.13S., R10E. SLM, Carbon County, Utah  
Sec 1: SW1/4  
Sec 12: lots 2-11, W1/2 W1/2, NE1/4 SW1/4 containing  
802 acres, more or less

The name and address of the lessor is American Electric Power Service Corporation, Fuel Supply Department, P.O. Box 700, Lancaster, Ohio 43130. This agreement was executed on May 1, 1992.

BLM Right-of-Way U-62045

T.13S., R.11E., SLM, Carbon County, Utah  
Sec. 18: SE1/4 NE1/4 NW1/4 containing 10 acres, more or less.

BLM Right-of-Way UTU-64158 (Left Fork Fan)

T.13S., R.10E., SLM, Carbon County, Utah  
Sec. 13: Lot 1 (portions of)

T.13S., R.11E., SLM, Carbon County, Utah  
Sec. 18: Lot 2, NE1/4SW1/4 (portions of) containing 1.45 acres, more or less.

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**MAY 17 2002**

DIV OF OIL GAS & MINING

The lessor is the Department of the Interior, Bureau of Land Management, 324 South State Street, Salt Lake City, Utah 84111.

Private Land Easement

T.13S., R.11E., SLM, Carbon County, Utah  
Sec. 18: A portion of NE1/4 NE1/4 SE1/4 NW1/4 containing  
1.5 acres, more or less.

This easement has been granted by Mrs. Gladys Artman whose address is P.O. Box 22, Mountain City, Georgia 30562.

**R645-301-114.100. DOCUMENTATION**

Appendix J

**R645-301-114.200. SEVERED SURFACE AND MINERAL ESTATES**

Appendix J

**R645-301-114.210. WRITTEN SURFACE OWNER CONSENT FOR  
COAL EXTRACTION**

Appendix R

**R645-301-114.220. CONVEYANCE EXPRESSLY GRANTING RIGHT  
TO MINE COAL**

Appendix J

**R645-301-114.230. DOCUMENTATION OF LEGAL AUTHORITY TO  
MINE COAL**

Appendix J

**R645-301-114.300. ADJUDICATION OF PROPERTY RIGHTS  
DISPUTES**

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**R645-301-114.300. ADJUDICATION OF PROPERTY RIGHTS DISPUTES**

The Division does not have the authority to adjudicate property rights disputes.

**R645-301-115. STATUS OF UNSUITABILITY CLAIMS**

Carbon County has authorized mining and reclamation activities within 100 feet of County Road 299. (See Appendix B)

**R645-301-115.100. IDENTIFICATION OF LANDS UNSUITABLE**

The permit area is not within an area designated unsuitable for the surface effects of underground coal mining activities or under study for designation in an administrative proceeding initiated under those acts. Further, there are no occupied dwellings within 300 feet of the permit area including the Hoffman Creek area.

**R645-301-115.200. CLAIMS OF EXEMPTION BY COMMITMENT PRIOR TO JANUARY 4, 1977**

None.

**R645-301-115.300. MINING AND RECLAMATION OPERATIONS WITHIN 300 FEET OF AN OCCUPIED DWELLING OR WITHIN 100 FEET OF A PUBLIC ROAD**

None.

**R645-301-116. PERMIT TERM**

The starting and termination dates as well as the horizontal and vertical extent of the proposed underground mining activities over the total life of the permit are indicated on the revised Pinnacle underground layout map included as Plate 30. This plate has been revised to indicate mining on the new Hoffman Creek Lease as soon as approval is received. Also refer to the underground layout maps for the Apex and Aberdeen Mines (see Plates 29 and 31). Refer to plate 41.

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**OCT 07 2002**

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Mine Plan Cross Reference  
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R645-301-116.100.

**SCHEDULE OF PHASED MINING AND  
RECLAMATION ACTIVITIES**

All surface facilities have been constructed for the Pinnacle, Apex and Aberdeen Mines. Earthwork for the Aberdeen Mine was completed in 1989. The surface facilities for the Aberdeen Mine were completed in early 1990. No additional surface facilities are required for any new leases. There will be no additional construction activities or surface disturbance whatsoever in Hoffman Creek or Alrad Canyon.

However, Andalex does intend to add a fan installation in the left-hand fork of Deadman Canyon at some point in time. This installation will be according to measures outlined by the Bureau of Land Management as part of Right-of-Way U-64158. (Copy of Right-of-Way is included in Appendix B.) The location of this breakout is shown on Plate 29 (R.O.W.).

Mining in the Gilson seam began in October, 1980 with a single unit's production. As mining progresses, additional units will be added with three production units and the longwall scheduled to be operating by mid-1994. A systematic mining plan will be followed to assure maximum recovery. All planning and scheduled production, however, will be contingent upon the coal market. Upon the conclusion of mining activities in the area, the scheduled reclamation phase will begin immediately.

Andalex will fill, regrade and stabilize rills and gullies over 9 inches in depth. Further, Andalex has agreed to interim stabilization of all slopes and embankments within the disturbed area and has done so. One slope located at the bottom of the office driveway, has been attempted through hydroseeding, fertilizing and mulching techniques on three separate occasions. No significant erosion problems have occurred, Andalex will notify the Division in the event of any slides or other damage.

Andalex will cover acid or toxic forming materials if any are encountered. Andalex will advise the Division in the event of a temporary shutdown, such as a letter sent to the Division when Andalex's Apex Mine was temporarily closed.

R645-301-116.200.

**PERMIT TERM IN EXCESS OF FIVE  
YEARS**

The requested term of this permit is five years. Andalex will then apply for five year extensions over the life of the mine.

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R645-301-116.210.      **COMPLETENESS AND ACCURACY FOR  
LONGER TERM**

N/A

R645-301-116.220.      **DEMONSTRATION OF NEED FOR LONGER  
TERM**

N/A

R645-301-117.      **INSURANCE, PROOF OF PUBLICATION  
AND FACILITIES OR STRUCTURES USED  
IN COMMON**

Appendix B contains certificates of liability insurance covering personal injury and property damage resulting from this operation. Andalex commits to mitigate all subsidence related damage to renewable resources, including, but not limited to water, grazing, and wildlife habitat including raptor nests.

R645-301-117.100.      **LIABILITY INSURANCE**

Appendix B

R645-301-117.200.      **NEWSPAPER PUBLICATION**

A copy of the newspaper advertisement of this Mining and Reclamation Plan and proof of publication of the advertisement is filed with the Division and made part of the complete application. Also, please refer to this chapter for the public notice and proof of publication for the newly acquired Sunedco Lease.

R645-301-117.300.      **FACILITIES USED IN COMMON**

The Centennial Project includes the development of three separate mines. All are currently in operation. The names and M.S.H.A. I.D. numbers for existing mines and all sections are as follow:

Pinnacle Mine - M.S.H.A. I.D. #42-01474  
Apex Mine - M.S.H.A. I.D. #42-01750  
Aberdeen Mine - M.S.H.A. I.D. #42-02028

Andalex Resources, Inc.  
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All coal from the newly acquired AEP Lease will be mined simply as an underground extension of the existing Pinnacle and Aberdeen Mines.

R645-301-118.

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AFFIDAVIT OF PUBLICATION

STATE OF UTAH)

ss.

County of Carbon,)

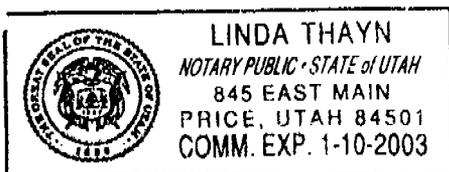
I, Kevin Ashby, on oath, say that I am the Publisher of the Sun Advocate, a twice-weekly newspaper of general circulation, published at Price, State a true copy of which is hereto attached, was published in the full issue of such newspaper for 4 (Four) consecutive issues, and that the first publication was on the 6th day of November, 2001, and that the last publication of such notice was in the issue of such newspaper dated the 27th day of November, 2001.

*Kevin Ashby*  
Kevin Ashby - Publisher

Subscribed and sworn to before me this 27th day of November, 2001.

*Linda Thayne*  
Notary Public My commission expires January 10, 2003 Residing at Price, Utah

Publication fee, \$ 273.96



**NOTICE**

Andalex Resources Inc., P.O. Box 902, Price, Utah has filed an application for a five-year permit renewal (ACT/007/019) for its Centennial Mines with the Utah Division of Oil, Gas and Mining. The permit area is located on U.S. Geological Survey 7.5 minute quadrangle maps, Deadman Canyon and Helper, and is further described as follows:

Township 13 South, Range 11 East, SLBM, Section 4: S1/2; Section 5: All; Section 6: All; Section 7: All; Section 8: All; Section 9: All but SE 1/4 SE1/4; Section 17: N1/2, NE1/4 SE 1/4, N1/2 NW1/4 SE1/4, N1/2 NE1/4SW1/4, NE1/4NW1/4 SW1/4, W1/3 NW1/4 SW 1/4; Section 18: N1/2N1/2, SW1/4 NE1/4, NW1/4SE1/4NE1/4, E1/2 SE1/4 NE1/4, E1/2 NE1/4 SE1/4, and Lot 2, NE1/4 SW1/4 (a portion containing 1.45 acres, more or less), and a portion of NE1/4 NE1/4 SE1/4NW1/4 containing 1.5 acres, more or less.

Township 14 South, Range 10 East, SLBM, Section 1: All, Section 12: All, Section 13: Lot 1 (Portions of BLM ROW UTU-64158).

Township 12 South, Range 11 East, SLBM, Section 31: Lots 3-6 and Lots 12-22; Section 32: W1/2 SW1/4, SW1/4 NW1/4.

Copies of this application and the permit are available for inspection at the Utah Division of Oil, Gas and Mining office in Salt Lake City, 1594 West North Temple, Suite 1210, Salt Lake City, Utah and at the Carbon County Courthouse, 120 East Main, Price, Utah.

Written comments, objections or requests for informal conferences on the application should be addressed: Utah Coal Program, Department of Natural Resources, Division of Oil, Gas and Mining, 1594 West North Temple, Suite 1210, P.O. Box 145801, Salt Lake City, Utah 84114-5801.

Published in the Sun Advocate November 6, 13, 20 and 27, 2001

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R645-301-120.

**PERMIT APPLICATION FORMAT AND  
CONTENTS**

Summary of Table of Contents

- R645-301-100. General
- R645-301-200. Soils
- R645-301-300. Biology
- R645-301-400. Land Use and Air Quality
- R645-301-500. Engineering
- R645-301-600. Geology
- R645-301-700. Hydrology
- R645-301-800. Bonding and Insurance

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R645-301-121.            **REQUIREMENTS**

R645-301-121.100.       **CURRENT INFORMATION**

Information is current.

R645-301-121.200.       **CLEAR AND CONCISE**

Information is clear and concise.

R645-301-121.300.       **FORMAT REQUIREMENTS**

To facilitate review of the application, each chapter listed above has been further divided into specific parts and sections. These can be found listed in the detailed table of contents appearing at the beginning of this text along with the page numbers on which they appear. This table of contents also contains lists of figures, tables, plates, exhibits, and appendices to facilitate cross referencing between chapters.

Exhibits include appropriate supporting documents, reports and publications and are included as appendices.

Maps which were not reduced to fit into the text are included in a separate volume as plates. All maps and plans are submitted in accordance with the requirements.

R645-301-123.            **APPLICATION FOR PERMITS, CHANGES,  
RENEWALS, OR TRANSFERS**

Text deleted as instructed by Technical analysis.

R645-301-130.            **REPORTING AND TECHNICAL DATA**

Persons and Consultants Involved

The following persons and/or organizations were involved in collection and analysis of the technical data set forth in this application.

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Andalex Resources, Inc.  
Mine Plan Cross Reference  
To Coal Mining Rules R645  
Updated Technical Analysis 6/15/95

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1. In-House Consulting Services

- a) Andalex Resources, Inc. - AMCA Coal Leasing, Inc.  
Samuel C. Quigley - Western Project Manager  
Michael W. Glasson - Senior Geologist  
Allen D. Emmel - Environmental Planning Coordinator

2. Outside Consulting Services

- a) Dan W. Guy - Registered Professional Engineer  
(State of Utah No. 4548)  
Price, Utah  
- Sedimentation and Drainage Control Plan  
(April, 1980)  
  
- Wastewater Disposal System; Pinnacle Mine  
(April, 1980)  
Office Building (September, 1980)
- b) Bruce T.S. Ware - Registered Land Surveyor  
Price, Utah
- c) A and W Surveying  
Price, Utah
- d) Commercial Testing & Engineering Co.  
Denver, Colorado
- e) Standard Laboratories  
Huntington, Utah
- f) Western Testing and Engineering  
Helper, Utah
- g) VanCott, Bagely, Cornwall and McCarthy  
Attorneys at Law  
Salt Lake City, Utah
- h) Rollins, Brown, and Gunnell  
Provo, Utah
- i) Brigham Young University  
Provo, Utah  
Department of Zoology  
Clayton M. White  
(Raptor Study)  
Department of Anthropology/Archaeology  
Dr. Ray T. Matheny  
(Archaeological Survey)

- j) Earth Environmental Consultants  
Albuquerque, New Mexico
- k) Vaughn Hansen Associates  
Salt Lake City, Utah  
(Hydrology Study)
- l) Horrocks Engineers  
American Fork, Utah

Coordination and Consultation with Governmental Agencies

The following governmental agencies were consulted in the preparation of information set forth in this application.

U.S. Department of Agriculture  
Soil Conservation Service  
Price, Utah  
(Soil and Vegetation Survey)

U.S. Department of the Interior  
Bureau of Land Management  
Price, Utah  
Salt Lake City, Utah

Office of Surface Mining, Reclamation and Enforcement  
Denver, Colorado

U.S. Geological Survey  
Salt Lake City, Utah

State of Utah:  
Department of Natural Resources  
Division of Oil, Gas, and Mining  
Salt Lake City, Utah

Antiquities Section (Consulting Services Branch)  
Salt Lake City, Utah  
(Archaeological Survey)

Department of Natural Resources  
Division of Fish and Wildlife  
Salt Lake City, Utah

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References:

AMCA Coal Leasing, Inc., 1978. Mining and Reclamation Plan, Zion's Fee. Submitted to the State of Utah, Department of Natural Resources, D.O.G.M.

Centennial Coal Associates, 1976. Mining Application. Submitted to the U.S. Geological Survey.

Doelling, H.H., 1972. Central Utah Coal Fields. U.G.M.S. Monograph Series No. 3.

U.S.D.A., 1978. Soil Survey and Interpretations of the Coal Creek Emery Portion of the Price River and Emery County Areas, Carbon and Emery Counties, Utah. S.C.S.

U.S.D.I., 1979. Final Environmental Statement, Development of Coal Resources in Central Utah, Parts 1 and 2.

U.G.M.S., 1966. Central Utah Coals. U.G.M.S. Bulletin No. 80.

**R645-301-131. TECHNICAL DATA REQUIREMENTS**

Where applicable, technical data submitted has been identified as to who prepared the information and is stamped by that registered professional engineer (P.E.).

**R645-301-132. TECHNICAL ANALYSES REQUIREMENTS**

Analyses are prepared by a qualified professional engineer.

**R645-301-140. MAPS AND PLANS**

**R645-301-141. MAP FORMATS**

## PHASES OF OPERATIONS AND MINING ACTIVITY

Mining operations at the Pinnacle Mine began on October 3, 1980, according to the Mining and Reclamation Plan approved by the State of Utah, Department of Natural Resources, Division of Oil, Gas, and Mining. The mining began on the Zion's fee lease and extended onto Andalex's federal leases according to federal approval granted in 1982. Andalex also opened the Apex Mine late in 1982. Current mining activity is occurring in the Gilson Seam and Lower Sunnyside Seam. Mining commenced in the Aberdeen Seam in mid 1988. Mining commenced in the Centennial Seam in 1990. The coal is classified as High Volatile B bituminous in the Lower Sunnyside, Gilson and Centennial Seams and as High-volatile A bituminous in the Aberdeen Seam.

The proposed mine plan area is located approximately 10 miles north-northeast of Price, Utah in Carbon County in T13S and R11E (See Figure I-2 and Plate 1). With the addition of the Sunedco Lease the Graves Lease, and the AEP lease, the coal property contains approximately 5,063 acres. Two hundred acres are fee surface and coal leased from the Zion Security Corporation. Two hundred forty acres are fee surface and coal and are leased from the Sunedco Coal Company. The remaining 4,623 acres are federal leases consisting of SL-027304 (236 acres), SL-063058 (400 acres), U-010581 (1,842 acres), U-05067 320 (acres), U-52341(120 acres), UTU-66060 (903 acres), and UTU 69600 (802 acres), and which includes lease modifications acquired in 1981. Please see Plate 4.

This property is located in the Book Cliffs coal field and includes Alrad Canyon, Deadman Canyon, Starpoint Canyon, Straight Canyon, and Hoffman Creek Canyon areas with coal outcropping along the cliffs between 7,000 feet and 7,700 feet elevations. The topography is very rugged, the Book Cliffs being dissected by box canyons created by ephemeral streams. Large sandstone boulders eroded from the cliffs are scattered along the sides of the canyons. The land is undeveloped, used primarily for grazing, and there are no areas of national importance in the region. Mountain-Brush vegetative type covers most of the area.

There are no perennial streams or bodies of water on the property. Ground water recharge is from precipitation in the vicinity. Water supply for mine development and culinary usage is supplied by wells that have been drilled.

Historically, coal mining has been the only industry in the permit area and there are several abandoned mines located on the property. No oil or gas wells exist in the area.

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Access to the mine plan area is by an existing paved county road which has been upgraded and is maintained by Carbon County. Maintenance consists of paving, chipping, patching, culvert work, ditch work, signs, snow removal, painting, patrolling (county sheriff), etc., as needed. Andalex assumes no responsibility for road maintenance or repair. The road is used as an access road as well as a haul road. It should be noted that in the event of a catastrophic event which damaged the road, Andalex would pursue all avenues to assist Carbon County in reparation of the road. All surface and support facilities necessary for present operations have been completed and are located on the Zion's fee or on rights-of-way granted by the Bureau of Land Management. This is also a small private easement granted to Andalex from Gladys M. Artman for a small portion of pond E. All proposed facilities are indicated in this application. Andalex has acquired all applicable state and federal licenses, permits, and rights-of-way necessary to conduct mining activities on the Zion's fee property and contiguous federal leases.

Estimated remaining coal reserves as of 3-24-93 in the four beds (in place) of minable thickness totals 50.8 million tons, with recoverable coal estimated at 30.5 million tons. To date, 9.3 million tons have been produced leaving an estimated 21.2. Production schedule estimates 1,200,000 tons to be produced in 1993 increasing to 1.5 million by 1995.

If the extraction rate of 1.5 million tons is accomplished according to schedule, the project life will be about 15 years. The theoretical life is closer to 20 years however, due to the existence of unleased federal coal logically accessible through only the existing and future Andalex mine workings. Some of this coal is contained in the Graves (U-66060) and AEP, (UTU-69600) Leases.

The mining method being employed is gateroad development utilizing continuous miners with final extraction by longwall. Certain fringe area reserves, inadequate for longwall panels, will be by room-and-pillar method.

Upon cessation of mining activities, reclamation activities will commence as soon as is practicable, according to the plans outlined in this application. The land will be restored according to available technology to as nearly its original condition as is possible.

This operation does not face any of the mining complications caused by faults, intrusives, excessive water, or large quantities of gas. The mine plan area is located in a region where mining has been the major industry; therefore, the nearby communities are geared for

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coal operations. The labor supply is excellent and well trained. With these considerations, and Andalex's prudent management, the Centennial Project will be a model mining operation in the Carbon County area with very minimal environmental and socioeconomic impact.

**R645-301-142.100. PRIOR TO AUGUST 3, 1977**

None by Andalex Resources. Several mines were operated by other independent companies or individuals in areas presently consumed by Andalex's surface facilities. Andalex's encroachment onto these previously disturbed areas transferred the responsibility for reclamation to Andalex. The specific locations of disturbed areas prior to Andalex's mining activities is irrelevant.

**R645-301-142.200. AFTER AUGUST 3, 1977**

All of Andalex's surface facilities and mining operations began after August 3, 1977.

**R645-301-142.210. PRIOR TO MAY 3, 1978**

See R645-301-142.100.

**R645-301-142.220. SMALL OPERATOR'S EXEMPTION PRIOR TO JANUARY 1, 1979**

N/A

**R645-301-142.300. AFTER MAY 3, 1978 (OR JANUARY 1, 1979 FOR SMALL OPERATOR'S EXEMPTION) AND PRIOR TO APPROVAL OF STATE PROGRAM**

N/A

**R645-301-142.400. AFTER ISSUANCE OF PERMIT BY THE DIVISION**

The following is a list of all other licenses and permits under applicable state and federal land-use, air and water quality, water rights and health and safety laws and regulations held by Andalex in order to conduct underground coal mining activities.

All permits listed are up to date and current. The NPDES Permit for the Centennial Project has been renewed in the form of a General permit (UTG 040008).

State:

- 1) State of Utah  
Department of Natural Resources  
Division of Oil, Gas and Mining  
355 West North Temple, Suite 350, 3 Triad Center  
Salt Lake City, Utah 84116

- Mining and Reclamation Plan for Andalex Resources' Centennial Project  
Permit I.D. Number ACT/007/019  
Approved January 4, 1982  
Permit Renewed March 2, 1987, January 1992

- 2) State of Utah  
Department of Health  
Division of Environmental Health  
150 West North Temple  
P.O. Box 2500  
Salt Lake City, Utah 84110

- Air Quality Construction and Operation Permit  
Approved June 13, 1980  
Reapplied June 2, 1988 (modification)  
Approved June 23, 1989

- Water Quality - Sediment and Drainage  
Approved May 14, 1980

- Septic and Culinary Plan (2)  
Approved September 17, 1980 (Office Site)  
Approved May 8, 1980 (Bathhouse Facility)

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Federal:

- 1) Environmental Protection Agency  
Region VIII  
1860 Lincoln Street  
Denver, Colorado 80295
  - National Pollutant Discharge Elimination System (NPDES)  
Permit I.D. - UT-0023507  
Issued April 25, 1982  
Renewed August 31, 1989
  - Prevention of Significant Deterioration of Air Quality (PSD)  
Unissued: Determined by the E.P.A. to be unnecessary
  
- 2) Bureau of Land Management  
Utah State Office  
Federal Building  
Salt Lake City, Utah 84111
  - Access Road Right-of-Way  
Permit Number U-45966  
Granted September 1, 1980
  - Buried Telephone Cable Right-of-Way  
Permit Number U-36739  
Granted November 20, 1978
  - Power Transmission Line Right-of-Way  
Permit Number U-36741  
Granted November 20, 1978, assigned to UP&L
  - Material Storage Site Right-of-Way  
Permit Number U-45965  
Granted September 11, 1980
  - Aberdeen Mine Right-of-Way  
Permit Number UTU-62045  
Granted June 6, 1988
  
- 3) Mine Safety and Health Administration (M.S.H.A.)  
P.O. Box 25367  
Denver, Colorado 80225  
(District 9)  
  
Pinnacle Mine I.D. 42-01474  
Apex Mine I.D. 42-01750

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Aberdeen Mine I.D. 42-02028

- Roof Control Plan  
Reviewed and approved every six months
- Ventilation System and Methane and Dust Control Plan  
Reviewed and approved every six months
- Smoking Prohibition Plan  
Approved August 4, 1992
- Training Plan  
Approved November 27, 1990
- Instruction Program: Firefighting and Evacuation  
Plan  
Approved August 4, 1992
- SCSR Storage Plan  
Approved May 18, 1992
- Chest X-Ray Plan  
Approved March 15, 1990

R645-301-150.

**COMPLETENESS**

Per Division.

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R645-301-200.

SOILS

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**R645-301-210.**

**INTRODUCTION**

As the "Mathis" incidental boundary change is simply an extension of underground mine workings under roughly 2,600 to 3,000 feet of cover there will be absolutely no effect on soils.

**R645-301-211.**

**PREMINING SOIL RESOURCES**

The soils map, shown as Plate 18 in Volume II, is a combination of the information provided by both EEC and SCS. EEC performed the work on the north and south one-thirds of the disturbed area and the SCS performed the work on the one-third in the middle. This was for the original Pinnacle Mine approval on the Zion's Fee area (please see second half of Appendix M).

The acreages given by EEC in the soils report does not include the entire disturbed area since we know that the SCS surveyed roughly one-third of the disturbed or "to be" disturbed area. The correct acreages as planimetered by Andalex staff is 34.2 acres. This of course includes the area where the Aberdeen Mine has been developed. The area of disturbed Brycan is approximately 8 acres and the Datino is 4 acres within the SCS survey. EarthFax Engineering has performed the Order 1 soil survey for the left fork fan installation. (See Appendix M.)

**R645-301-212.**

**STOCKPILING AND REDISTRIBUTION**

**Topsoil Handling During Operations**

Removal

The area from which topsoil has been removed is 34.2 acres and includes poorly developed soils. Using dozers and front end loaders, the soil was scraped from the surface and dumped at a site near the facility location. The topsoil was removed as a separate operation from areas to be disturbed by surface installations such as roads and areas upon which support facilities are sited. The left fork topsoil will be salvaged according to EarthFax.

Storage

The topsoil storage areas are shown on Plate 6. The topsoil has been segregated, stockpiled, and protected from wind and water erosion and contaminants through revegetation and the use of berms.

Surveys conducted on the topsoil piles which were drawn into plans and profiles are now included in the plan in Volume II, Plates 37 and 36. This shows volumes stored currently.

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Revised 03/02

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The completed disturbance which reports to sedimentation Pond E is 9.96 acres. Please review the top soil summaries which show totals.

The new substitute topsoil pile plan and profile is included.

The new substitute topsoil will be protected by the use of straw dikes and earthen berms.

Disturbed areas no longer required for the conduct of mining operations have been revegetated. Upon completion of mining activities, topsoil will be distributed and reclamation will commence as outlined. Andalex will adhere to all UDOGM guidelines.

R645-301-220. ENVIRONMENTAL DESCRIPTION

Appendix M.

R645-301-221. PRIME FARMLAND INVESTIGATION

Appendix M

R645-301-222. SOIL SURVEY

Appendix M

R645-301-222.100. SOIL MAP

Plate 18

R645-301-222.200. SOIL IDENTIFICATION

Appendix M

R645-301-222.300. SOIL DESCRIPTION

Appendix M

R645-301-222.400. SOIL PRODUCTIVITY

Appendix M

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R645-301-223.

## SOIL CHARACTERIZATION

Appendix M

R645-301.224.

## SUBSTITUTE TOPSOIL

Two test plot locations were decided upon based on certain known parameters. The 5,240 yard substitute material area chosen was once designated as substitute topsoil. Now that the shop building is in place, this should not have any impact on the suitability of the material. The second location depicted on Plate 6 near the Apex Truck Loadout is very similar, if not identical material, to the shop pad material (the revegetation test will ultimately prove this). To prove the materials suitability, Andalex has proposed to test the material using the approved seed mixture on the locations shown on Plate 6. The area of the test plots are both currently heavily vegetated indicating good potential. These test plots will be monitored for two years and evaluated for growth and species success. It is anticipated that these areas will succeed and solve the deficit problem.

These pads were constructed in 1982 during the construction of the Apex Mine. The Shop pad and the Apex truck loadout pad both have out-slopes which we currently feel contain suitable topsoil substitute material. In 1982 these slopes were groomed with heavy equipment and graded prior to being hydroseeded with the interim seed mixture and then hydromulched. Mulch in the amount of one ton per acre was used at the time. In 1990 the approved seed mixture was hand broadcasted onto these same slopes which were already fairly heavily vegetated. The seed was raked in to the extent possible and no additional mulch was used because of the vegetative cover in place. Also, samples have been taken of this substitute material (three separate locations at each site) and have been sent in to a qualified soil testing laboratory. These samples will be tested for parameters outlined in Table 6 "Guidelines for Overburden and Topsoil Management", 1988. Results of these tests will be included in the permit as soon as they are available.

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Topsoil Pile Summary, Existing

(See Plates 6 and 37)

Topsoil Pile A	35,731 cubic feet
Topsoil Pile C	6,829 cubic feet
Topsoil Pile F	60,290 cubic feet
Topsoil Pile G	167,980 cubic feet
Topsoil Pile J	94,500 cubic feet

Topsoil Pile Summary, Proposed

(See Plates 6 and 38)

Topsoil Piles J contains 94,500 cubic feet which includes the original Topsoil Pile B which was moved during the construction of the Aberdeen Mine.

Based on the size of the disturbed area and the amount of topsoil required (6"), we have calculated that there is a 8,000 yd.<sup>3</sup> topsoil deficit. The topsoil substitutes will make up this deficit.

The test plots previously discussed regarding the topsoil deficit is further discussed here.

Two test plot locations were decided upon based on certain known parameters. The first location is south of the shop building and contains 5,240 cubic yards. The second location is southwest of the Apex Mine truck loadout and contains 1,700 cubic yards (see Plate 6). The 5,240 yard substitute material area chosen was once designated as substitute topsoil. Now that the shop building is in place, this should not have any impact on the suitability of the material. The second location depicted on Plate 6 near the Apex Truck Loadout is very similar, if not identical material, to the shop pad material (the revegetation test will ultimately prove this). To prove the materials suitability, Andalex has proposed to test the material using the approved seed mixture on the locations shown on Plate 6. The area of the test plots are both currently heavily vegetated indicating good potential. These test plots will be monitored for two years and evaluated for growth and species success. It is anticipated that these areas will succeed and solve the deficit problem. The first quantitative monitoring study will take place in the summer of 1992.

Topsoil substitute storage area signs have been placed strategically at the two substitute storage areas at the minesite. They will clearly mark the location of these storage area.

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R645-301-230.

## OPERATION PLAN

### Topsoil Handling During Operations

#### Removal

The area from which topsoil has been removed is 34.2 acres and includes poorly developed soils. Using dozers and front end loaders, the soil was scraped from the surface and dumped at a site near the facility location. The topsoil was removed as a separate operation from areas to be disturbed by surface installations such as roads and areas upon which support facilities are sited. Approximately 750 cubic yards of topsoil will be stored in the left hand fork of Deadman Canyon for use during reclamation of the left fork fan installation. (See Plate LF-1.)

#### Storage

The topsoil storage areas are shown on Plate 6. The topsoil has been segregated, stockpiled, and protected from wind and water erosion and contaminants through revegetation and the use of berms.

Surveys conducted on the topsoil piles which were drawn into plans and profiles are now included in the plan in Volume II, Plates 37 and 36. This shows volumes stored currently.

The completed disturbance which reports to sedimentation Pond E is 9.96 acres. Please review the top soil summaries which show totals and deficiencies in R645-301-224.

The new substitute topsoil pile plan and profile is included.

The new substitute topsoil will be protected by the use of straw dikes and earthen berms.

R645-301-231.

## GENERAL REQUIREMENTS

R645-301-231.100

## REMOVAL AND STORAGE

See R645-301-212.

R645-301-231.200.

## SUITABILITY OF TOPSOIL SUBSTITUTES

See R645-301-224.

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R645-301-231.300. TESTING PLAN  
 See R645-301-224.

R645-301-231.400. TOPSOIL HANDLING AND STORAGE AREAS  
 See R645-301-212.

R645-301-232. TOPSOIL AND SUBSOIL REMOVAL  
 See R645-301-212.

R645-301-232.100. TOPSOIL SEGREGATION  
 See R645-301-212.

R645-301-232.200. INSUFFICIENT QUANTITY OR POOR  
 QUALITY

See R645-301-224.  
 R645-301-232.300. TOPSOIL LESS THAN SIX INCHES THICK  
 N/A

R645-301-232.400. TOPSOIL REMOVAL FOR MINOR  
 DISTURBANCES  
 N/A

R645-301-232.410. SMALL STRUCTURES  
 N/A

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R645-301-232.420.      **PROTECTION OF EXISTING VEGETATION  
AND EROSION PROTECTION**

Disturbed areas no longer required for the conduct of mining operations have been revegetated. Upon completion of mining activities, topsoil will be distributed and reclamation will commence as outlined in re Reclamation. Andalex will adhere to all UDOGM guidelines.

R645-301-232.500.      **SUBSOIL SEGREGATION**

N/A

R645-301-232.600.      **TIMING**

All soils have been removed with the exception of the fan break-out location in the left fork. This will be done in the autumn of 1994.

R645-301-232.700.      **TOPSOIL AND SUBSOIL REMOVAL UNDER  
ADVERSE CONDITIONS**

N/A

R645-301-232.710.      **IMPRACTICABILITY**

N/A

R645-301-232.720.      **IMPORTING TOPSOIL MATERIAL**

N/A

R645-301-233.      **TOPSOIL      SUBSTITUTES      AND  
SUPPLEMENTS**

See R645-301-224.

R645-301-233.100.      **SELECTED OVERBURDEN MATERIALS**

See R645-301-224.

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R645-301-233.200.

SUITABILITY OF TOPSOIL SUBSTITUTES  
AND SUPPLEMENTS

See R645-301-224.

R645-301-233.300.

PHYSICAL AND CHEMICAL ANALYSES

Appendix M

R645-301-233.310.

SCS PUBLISHED DATA

Appendix M

R645-301-233.320.

SCS TECHNICAL GUIDES

Appendix M

R645-301-233.330.

OTHER PUBLISHED DATA

Appendix M

R645-301-233.340.

RESULTS OF FIELD-SITE TRAILS OR  
GREENHOUSE TESTS

Appendix M

R645-301-233.400.

DEMONSTRATION OF INSUFFICIENT  
TOPSOIL AND SUITABILITY OF  
SUBSTITUTE MATERIALS

See R645-301-224.

R645-301-234.

TOPSOIL STORAGE

See R645-301-212, 224.

R645-301-234.100.

STOCKPILING AND REDISTRIBUTION

See R645-301-212.

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- R645-301-234.200. STOCKPILING REQUIREMENTS  
See R645-301-212.
- R645-301-234.210. PLACEMENT  
See R645-301-212.
- R645-301-234.220. PROTECTION  
See R645-301-212.
- R645-301-234.230. VEGETATIVE COVER  
Appendix M
- R645-301-234.240. REHANDLING  
N/A
- R645-301-234.300. LONG-TERM STORAGE AND DISTRIBUTION  
See R645-301-212.
- R645-301-234.310. CAPABILITY OF HOST SITE
- R645-301-234.320. SUITABILITY FOR REDISTRIBUTION  
See R645-301-212.

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**Timetable of Major Reclamation Steps**Introduction

As this is an underground mine, there will be a limited amount of surface disturbance, consequently, reclamation will be uncomplicated.

All disturbed areas no longer required for the conduct of mining operations were immediately revegetated. In the future, any areas no longer required for operations will also be immediately reclaimed and revegetated. The only new surface disturbance required at this time will be for a mine-fan break-out in the left fork of Deadman Canyon.

When buildings and final site preparation had been completed, the soil was revegetated to prevent erosion.

When the project is expired, all buildings and extraneous material will be removed, all mine openings will be covered and sealed, roads will be regraded and using the most advanced technology at the time, Andalex will re-establish the terrain to as nearly the original as practical. The area will be reseeded and vegetation re-established in accordance with recommendations from the regulatory authorities.

Reclamation Timetable

This timetable represents the general sequence which will be used for final reclamation. The bond estimate has the costs broken down on a site by site basis; however, actual work will be performed simultaneously at all the sites. For example, all structures and buildings will be removed prior to any recontouring. This will allow us to have certain equipment for certain jobs the shortest time possible. It should also be noted that this project may coincide with a salvage project thereby reducing Andalex's cost; however, this is not reflected in the bond estimate. Detail of work involved in various jobs (portal seals, revegetation, etc.) is found elsewhere in this chapter. The addition of the AEP Lease will have no impact on the reclamation schedule or cost.

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Phase I

- Job 1. Portal Seals (include fan removal)
- a. 4 Apex
  - b. 7 Pinnacle
  - c. 7 Aberdeen (includes left fork)
  - d. 5 Wells
- Job 2. Building Removal
- a. 1 Shop
  - b. 1 Main Office
  - c. 3 Trailers (2 warehouse, 1 lab)
  - d. 3 Lamphouses
  - e. 3 Bathhouses
- Job 3. Structure Removal
- a. 3 Mine Conveyor Structures
  - b. 3 Truck Loadouts
  - c. 1 Substation
  - d. Power distribution lines
  - e. 4 Water Tanks
  - f. 5 Fuel Tanks
  - g. Main and Side Culverts \* (includes left fork)

- Job 4. Recontouring & Regrading\*
- a. 105,500 yds.<sup>3</sup> fill material
  - b. Enlarge Pond E, Remove B and C

- Job 5. Compaction, Scarification
- a. 33.5 acres (not including Pond E)
  - b. Additional sediment measures, i.e., check dams

- Job 6. Topsoil Redistribution
- a. 34.2 acres (additional approved substitute hauled in if necessary)

\* Culverts will be removed starting at the north end so that natural drainage may be re-established as the culvert is removed.

- Job 7. Revegetation
- a. 2.15 acres shrubs
  - b. 14.32 acres drainage (except Pond E)
  - c. 17.03 acres slopes

Job 8. Commence Monitoring

a. Revegetation

1. Woody plants will be quantitatively monitored in years 4 and 8
2. Success for woody plants will be based on a minimum 2,000 plants-per-acre in stream bottoms and on east-facing slopes; 1,500 plants-per-acre on west-facing slopes.

b. Slope Stability

- c. Water Monitoring including inlet and discharge at Pond E\*\*

\*\* Sampling of this water will consist of grab samples taken quarterly if any runoff occurs. Andalex's experience with this drainage is that runoff may occur every several years so that monitoring of this runoff will take place infrequently. Quarterly reports will indicate whether or not any runoff has occurred. The samples will be tested to assure that state and federal water quality requirements are being met.

Phase II

Starts When Phase I Monitoring Allows. Sedimentation Pond E will not be removed until the revegetation requirements of 817.111-.117 are met. This includes the revegetation of the entire disturbed area with the exception of Pond E. Also, Pond E will not be removed until the drainage entering the ponds meets applicable state and federal limitations. When Pond E is removed and revegetated, additional sediment control measures will be placed downstream from the revegetated area such as straw dikes until revegetation has been deemed complete by Phase II Monitoring.

Job 1. Done Simultaneously

- a. Remove (recontour) Pond E
- b. Remove remaining culvert

Job 2. Compact & Scarify Location

Job 3. Distribute Remaining Topsoil

Job 4. Revegetate

Job 5. Continue Monitoring until Bond is released

Please note that the earthwork involved will be done during the dry season to avoid unnecessary erosion of regraded areas. Water will be implemented if dust becomes a problem.

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## Reclamation Cost and Bonding

### Introduction

An estimate is provided in the Reclamation Cost Projection. Notably changed from the original bond estimate is the addition of the shop/warehouse complex, the removal of which will have to be added to the reclamation cost. The original estimate has also been revised to reflect current prices and wage estimate has also been revised to reflect current prices and wage schedules. Andalex frequently requires the use of dirt contractors and is therefore current on equipment rental costs, labor costs, and productivity, since we have a great deal of experience with construction projects. Andalex has used its experience in construction and earth moving projects to estimate the amount of time which will be required and the equipment needed for individual reclamation activities. Andalex has also been involved with several revegetation projects from which it drew estimates. Andalex has provided, as Plate 15, accurate as built versus reclaimed cross sections which show the mass balance for earthwork. The approximate original contours will be achieved using the material cut out to create the fill areas. No material will be hauled in. Maps depicting accurately the surface facilities including topsoil areas, structures and facilities are included in Volume II and also specific topsoil maps and cross sections are included. Andalex expects to return topsoil to a depth of up to 6" around the surface area of 34.2 acres.

Phase I of the reclamation will include, chronologically, structure removal including culverts, portal sealing, well sealing, regrading, recontouring, distribution of topsoil and revegetation. Additional sediment control during Phase I such as straw dikes and rock check dams will be implemented as shown on Plate 16. Once Phase I is adequately achieved, Phase II will commence which includes the removal of sediment structure E and revegetation of this area. This is followed by monitoring, noting that monitoring had begun during Phase I. See 5.8 re Monitoring. This section discusses the extended period of liability as being ten years if necessary. The entire permit area receives less than 26 inches of annual precipitation; therefore, it is generally accepted that Andalex is subject to an extended period of liability. Obviously if revegetation is deemed successful prior to this ten year period, Andalex will request bond release. Andalex has not proposed any selective husbandry practices.

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## Cost of Reclamation

### Detailed Estimate

A detailed cost projection is included.

### Calculations

Calculations of the estimate are included following this page. Calculations for cuts and fills were made and are summarized following the bond estimate. This summary shows the mass balance for the entire disturbed area including the Aberdeen site, as taken from Plates 14 and 15. Station numbers are referenced on Plate 14 and cross sections are shown on Plates 15-1, 2, and 3. Similarly, topsoil piles have been surveyed for the existing minesite and are summarized following the cut and fill summary. Because of deficits Andalex has committed to testing topsoil substitute areas.

### Bond or Surety Arrangement

Andalex currently holds a bond, approved by UDOGM in the amount of \$1,080,000.00 and it is included in this MRP in Appendix B.

### Reclamation Plan (before bond estimate)

The productivity of equipment is somewhat difficult to predict, and therefore, Andalex feels that conservative estimates were in order. There are many variables which contribute to the productivity of a particular machine, including operator skill, type of material, and the condition of the material.

It is obvious that a front-end loader, for example, can move more topsoil from a pile than, for example, a bouldery conglomerate of highly compacted material.

However, for the purpose of this analysis, it should be assured that based on means cost data the following prices on earthwork can be used:

Open Dozer grading : \$2.25/yd  
Fill Placement : \$1.16/yd  
Topsoil Placement: \$1.16/yd  
Topsoil Hauling: \$4.55/yd  
Compaction: \$.21/yd

The following cost projection reflects hourly rates. An additional earthwork estimate can be found following the mass balance estimates.

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Regarding the left hand fork fan installation, the specific time table for this project will coincide with the reclamation of the right hand fork minesite. The bond estimate now includes this fan installation and is still well within Andalex's existing bond amount. The specific schedule for reclamation of the fan will begin with the cut slope backfill, followed by removal of the culvert from the left fork drainage and, finally, by streambed reclamation the same as will be performed in the right hand fork. According to comments received by the majority of the surface lands managers, the access road to the left hand fork fan installation will be reclaimed by recontouring to the extent possible (this road has been in existence for over 50 years) and revegetated. One of the surface owners (Gladys Artman) has specifically indicated her desire to leave the road in place, therefore, her permission will be required to reclaim the road. Topsoil redistribution and revegetation will follow the culvert removal. During both construction and reclamation phases, Andalex will provide adequate supplementary sediment control in the form of silt fences and/or straw berms to prevent additional sediment loads to the drainage.

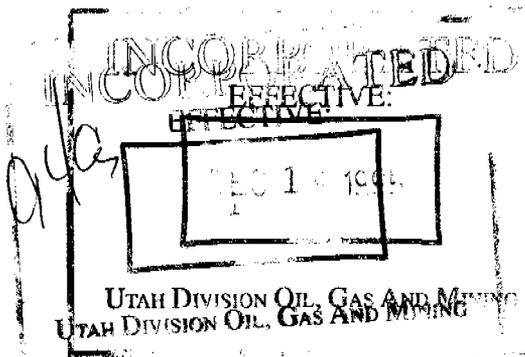
Andalex has supplied the Division with a Drawing entitled "Left Hand Fork Cut/Fill". This drawing has a notation which indicates that the existing contours will reflect the reclamation contours (post-mining).

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Reclamation Cost Projection  
Centennial Project

Lower Sunnyside Mine

Restoration to pre-mining land use will require:

	<u>Job Description</u>	<u>Equipment</u>	<u>Hours</u>	<u>Cost</u>
1.	Coal Pile Storage Area			
	a. Seal portals, remove conveyor, etc.	Loader	8	\$ 640
	b. Fill pad	Loader	55	4,400
	c. Contour slope including stream channel	D-7	50	4,000
	d. Compact	Loader	15	1,200
	e. Replace topsoil	Loader	23	1,840
	f. Grade topsoil	Grader	15	1,050
	g. Revegetate	Drill	7	350
	h. Stake	Engineer	14	700
	Total Coal Pile Area:			\$14,180
2.	Roads			
	a. Recontour	D-7	5	\$ 400
	b. Compact	Loader	3	240
	c. Replace topsoil	Loader	2	160
	d. Grade topsoil	Grader	2	140
	e. Revegetate	Drill	1	50
	Total Roads:			\$ 990
3.	Seal Wells (2)			
	a. Fill, cement			\$ 800
	Total Wells:			\$ 800
4.	Material Storage Area (including topsoil pile)			
	a. Remove all structures	5 man crew	120	\$ 9,000
	b. Recontour including stream channel	D-7	30	2,400
	c. Compact	Loader	4	320
	d. Replace topsoil	Loader	8	640
	e. Grade topsoil	Grader	4	280
	f. Revegetate	Drill	2	100
	g. Stake	Engineer	14	700
	Total Material Storage:			\$13,440

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Gilson (Pinnacle Mine)

Restoration to the pre-mining land use will require:

	<u>Job Description</u>	<u>Equipment</u>	<u>Hours</u>	<u>Cost</u>
1.	Mine Portal Area			
a.	Seal portals, remove conveyor, etc.	Loader	8	\$ 640
b.	Fill pad	Loader	12	960
c.	Contour slope	D-7	8	640
d.	Compact	Loader	4	320
e.	Replace topsoil	Loader	6	480
f.	Grade topsoil	Grader	4	280
g.	Revegetate	Drill	2	100
h.	Stake slope	Engineer	4	200
	Total Portal:			<u>\$ 3,620</u>
2.	Roads (1 mile)			
a.	Recontour	D-7	20	\$ 1,600
b.	Compact	Loader	10	800
c.	Topsoil	Loader	8	640
d.	Grade	Grader	8	560
e.	Revegetate	Drill	4	200
	Total Roads:			<u>\$ 3,800</u>
3.	Coal Pile Area			
a.	Fill pad	Loader	16	\$ 1,280
b.	Contour slope including stream channel	D-7	20	1,600
c.	Compact	Loader	4	320
d.	Topsoil	Loader	6	480
e.	Grade	Grader	4	280
f.	Revegetate	Drill	2	100
g.	Stake	Engineer	4	200
	Total Stockpile Area:			<u>\$ 4,260</u>
4.	Seal Wells			
a.	Fill, cement		8	<u>\$ 1,000</u>
	Total Wells:			<u>\$ 1,000</u>
5.	Material Storage & Building Areas			
a.	Remove all structures (including shop/warehouse)	5 man crew	240	\$27,000
b.	Recontour including stream channel	D-7	30	2,400
c.	Compact	Loader	4	320
d.	Replace topsoil	Loader	8	640
e.	Grade	Grader	4	280
f.	Revegetate	Drill	2	100
	Total Material:			<u>\$30,740</u>

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Aberdeen Mine

Restoration to the pre-mining land use will require:

<u>Job Description</u>	<u>Equipment</u>	<u>Hours</u>	<u>Cost</u>
1. Mine Portal Area			
a. Seal portals, remove conveyor, etc.	Loader	8	\$ 640
b. Fill pad	Loader	24	1,920
c. Contour slope	D-7	16	1,280
d. Compact	Loader	8	640
e. Replace topsoil	Loader	12	960
f. Grade topsoil	Grader	8	560
g. Revegetate	Drill	4	200
h. Stake slope	Engineer	8	400
Total Portal Area:			<u>\$ 6,600</u>
2. Coal Pile Area (including topsoil storage and sedimentation pond)			
a. Fill pad	Loader	50	\$ 4,000
b. Contour slope including stream channel	D-7	50	4,000
c. Compact	Loader	15	1,200
d. Replace topsoil	Loader	22	1,760
e. Grade topsoil	Grader	15	1,050
f. Revegetate	Drill	7	350
g. Stake slope	Engineer	14	700
Total Stockpile Area:			<u>\$13,060</u>

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Office Site

Restoration to pre-mining land use will require:

<u>Job Description</u>	<u>Equipment</u>	<u>Hours</u>	<u>Cost</u>
1. Office Site			
a. Remove structures	5 man crew	50	\$ 3,750
b. Recontour	D-7	8	640
c. Compact	Loader	4	320
d. Replace topsoil	Loader	4	320
e. Grade topsoil	Grader	4	280
f. Revegetate	Drill	2	100
g. Stake slope	Engineer	4	200
Total Office Site:			\$ 5,610
2. Seal Well (1)			
a. Fill, cement		4	\$ 400
Total Well:			\$ 400
3. Roads 1/4 Mile			
a. Recontour	D-7	5	\$ 400
b. Compact	Loader	3	240
c. Replace topsoil	Loader	2	160
d. Grade topsoil	Grader	2	140
e. Revegetate	Drill	1	50
Total Roads:			\$ 990

Total Projected Reclamation Costs:

Lower Sunnyside Mine	\$ 29,410
Gilson (Pinnacle) Mine	43,420
Aberdeen Mine	19,660
Office Site	7,000
Monitoring (5 years)	10,000
Total Reclamation, 1987 \$	\$109,490
Contingency 10%	10,950
Grand Total*	\$120,440

\* Please note that as no reclamation is required for the Centennial Seam Mine no costs for reclamation are described above.

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MASS BALANCE SUMMARY

Station	CUT		FILL	
	ft <sup>2</sup>	yds <sup>3</sup>	ft <sup>2</sup>	yds <sup>3</sup>
-1 + 00	520	963	160	2148
0 + 00	0	815	1000	1889
1 + 00	440	1000	20	407
2 + 00	100	1074	200	1259
3 + 00	480	3333	480	1519
4 + 00	1320	2593	340	2259
5 + 00	80	2889	880	1852
6 + 00	1480	6778	120	2704
7 + 00	2180	9037	1340	4074
8 + 00	2700	8259	860	2556
9 + 00	1760	6000	520	4297
10 + 00	1480	6444	1800	6519
11 + 00	2000	6259	1720	5593
12 + 00	1380	9222	1300	5074
13 + 00	3600	7037	1440	6148
14 + 00	200	370	1880	8852
15 + 00	0	370	2900	5815
16 + 00	200	407	240	2111
17 + 00	20	1889	900	5593
18 + 00	1000	2889	2120	8185
19 + 00	560	2000	2300	5319
20 + 00	520	4444	572	3059
21 + 00	1880	8704	1080	3185
22 + 00	2820	8556	640	3037
23 + 00	1800	3741	1000	3370
24 + 00	220	1148	820	2963
25 + 00	400	926	780	4519
26 + 00	100	2630	1660	10222
27 + 00	1320	4444	3860	7407
28 + 00	1080	3111	140	1741
29 + 00	600	2222	800	2815
30 + 00	600	2074	720	2222
31 + 00	520	1889	480	1741
32 + 00	500	1482	460	2185
33 + 00	300	2037	720	1815
34 + 00	800	3111	260	852
35 + 00	880	3185	200	1630
36 + 00	840	1963	680	3482
37 + 00	220	1741	1200	5407
38 + 00	720	2741	1720	4037
39 + 00	760	3000	460	6111
40 + 00	860	2704	2840	5593
41 + 00	600	1444	180	1148
42 + 00	180	482	440	963
43 + 00	80	148	80	148

\* Total Cut = 147,555 yds<sup>3</sup>;      \* Total Fill = 163,825 yds<sup>3</sup>

\* Ratio of fill to cut = 1.11:1.00. This allows for an expansion factor of 1.11 or 11% on the cut material.

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As Constructed Earthwork Volume (Aberdeen Mine)

Cut	63,506 yds. <sup>3</sup>
Fill	66,625 yds. <sup>3</sup>
Topsoil	3,500 yds. <sup>3</sup> (Piles H & J)

As Constructed Earthwork Volumes  
(including Aberdeen Site)

Cut	117,273 yds. <sup>3</sup>
Fill	112,969 yds. <sup>3</sup>
Topsoil	8,500 yds. <sup>3</sup>

For purposes of reclamation costs for earthwork, the following estimates can be used. Please keep in mind that as built cross sections for the Aberdeen Mine will aid in the final earthwork estimates.

Open Grading (including 10% swell factor)  
66,625 + 6663 = 73,288 @ \$2.22  
112,969 + 11,297 = 124,266 @ \$2.25  
197,554 @ \$2.25 = \$444,500  
Topsoil Hauling and Placement  
22,000 + 2200 = 24,200 @ \$5.71 = \$138,000  
Compaction  
158,294 @ \$.21 = \$33,242  
Total Earthwork: \$615,742

There is a 8,000 yd.<sup>3</sup> topsoil deficit. The topsoil substitutes will make up this deficit.

The test plots previously discussed regarding the topsoil deficit is further discussed here.

Two test plot locations were decided upon based on certain known parameters. The 5,240 yard substitute material area chosen was once designated as substitute topsoil. Now that the shop building is in place, this should not have any impact on the suitability of the material. The second location depicted on Plate 6 near the Apex Truck Loadout is very similar, if not identical material, to the shop pad material (the revegetation test will ultimately prove this). To prove the materials suitability, Andalex has proposed to test the material using the approved seed mixture on the locations shown on Plate 6. The area of the test plots are both currently heavily vegetated indicating good potential. These test plots will be monitored for two years and evaluated for growth and species success. It is anticipated that these areas will succeed and solve the deficit problem.

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R645-301-241.

**GENERAL REQUIREMENTS**

R645-301-242.

**SOIL REDISTRIBUTION**

Soil is to be redistributed to a depth of 6-inches across the entire 34.2 acre disturbed area.

R645-301-242.100.

**CRITERIA FOR REDISTRIBUTION**

The only criteria is that it will be redistributed to a depth of 6 inches.

R645-301-242.110.

**UNIFORMITY AND CONSISTENCY**

The soil will be redistributed uniformly and consistent with the regraded contours.

R645-301-242.120.

**PREVENTION OF COMPACTION**

Once redistributed, unnecessary compaction from equipment will be avoided.

R645-301-242.130.

**PROTECTION FROM WIND AND WATER EROSION**

The topsoil will be protected from wind and water erosion through mulching.

R645-301-242.200.

**REGRADING AND TREATMENT**

Not applicable, unless unacceptable rills and gullies are observed.

R645-301-242.300.

**EMBANKMENTS OF PERMANENT  
IMPOUNDMENTS OR ROADS**

N/A

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**R645-301-242.310. PREVENTION OF SEDIMENTATION**

Pond E will be in place until the release of Phase I reclamation.

**R645-301-242.320. OTHER METHODS OF STABILIZATION**

Other methods may include excelsior matting on steep slopes and rip-rap.

**R645-301-243. SOIL NUTRIENTS AND AMENDMENTS**

As needed to be determined through Phase I monitoring.

**R645-301-244. SOIL STABILIZATION**

See R645-301-242.

**R645-301-244.100. EROSION CONTROL AND AIR POLLUTION**

See R645-301-242.

**R645-301-244.200. SOIL STABILIZING PRACTICES**

See R645-301-242.

**R645-301-244.300. RILLS AND GULLIES**

See R645-301-242.

**R645-301-244.310. DISRUPTION OF POSTMINING LAND USE  
OR ESTABLISHMENT OF VEGETATIVE  
COVER**

Vegetative cover will be in accordance with revegetation practices found in R645-301-331.

**R645-301-244.320. CAUSE OR CONTRIBUTE TO A VIOLATION  
OF WATER QUALITY STANDARDS**

Andalex will not violate water quality standards. This will be demonstrated through monitoring practices.

R645-301-250.

**PERFORMANCE STANDARDS**

All performance standards will be adhered to.

R645-301-251.

**SOIL REMOVAL**

See R645-301-212.

R645-301-252.

**SOIL STORAGE AND REDISTRIBUTION**

See R645-301-212.

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R645-301-300.

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Vegetation Information**Introduction**

Mountain-Brush, Desert Shrub, Pinion-Juniper Woodland, Sagebrush-Grass, Conifer-Aspen, and minor stream-side vegetative types cover the total mine plan area. Most of the area is covered by the Mountain-Brush type while the Pinion-Juniper Woodland type is predominant in the mine mouth area as well as the access routes and utility corridors; this area has been reseeded with a mixture as recommended by the U.S.D.A. S.C.S. (please see Soil Survey and Vegetation Inventory in Appendix M). Appendix M now also includes soils and vegetation information pertaining to the newly acquired AEP Lease. Because there will be no additional surface disturbance on the lease area, a First Order Survey is not deemed necessary.

As the "Mathis" incidental boundary change is simply an extension of underground mine workings under roughly 2,600 to 3,000 feet of cover there will be absolutely no effect on vegetation, fish or wildlife.

Andalex has selected and marked three reference areas in the field for vegetation. The Division has reviewed and approved these reference areas. Areas chosen include all types of vegetation conditions such as drainage areas, shallow slopes and steep slopes. Andalex contacted the SCS to help evaluate the condition of these sites. Please see SCS letter in Appendix M. It should be noted that Andalex does have the benefit of a revegetation test plot located on one of the topsoil piles. The drainage area reference area is the most adaptable to the left fork fan installation.

The revegetation map now shows the acreages for the three range types. Shrub clumps make up 2.15 acres, drainage areas make up 15.02 acres and steep slopes make up 17.03 acres. Total disturbed area, including the Aberdeen Mine left fork fan and road is 35.34 acres.

New vegetation mapping will be created for the entire permit area of the Centennial Mine including the Mathis Incidental Boundary area. The mapping will be done by Mt. Nebo Scientific, Inc. Springville, Utah.

The vegetation map will be created by using new and/or current available aerial photography with field work accomplished as a means for ground-truthing. Aerial photography used will be from appropriate periods of the growing season. Field verification work will be conducted during the growing season of 2002. The final vegetation map will be provided to the State of Utah, Division of Oil, Gas & Mining in December 2002.

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**Source of Data**

Department of the Interior, 1979. Final Environmental Statement, Development of Coal Resources in Central Utah; Part 1 Regional Analysis; Part 2 Site Specific Analysis.

United States Department of Agriculture, Soil Conservation Service, May, 1980. Soil Survey and Interpretations, Vegetation Survey.

Centennial Coal Associates, May, 1976 Mining Application. Submitted to the United States Geologic Survey, Conservation Branch.

A.M.C.A. Coal Leasing, June, 1978 Mining and Reclamation Plan (Zion's fee). Submitted to the State of Utah, Department of Natural Resources, Division of Oil, Gas, and Mining.  
Revised 8/8/95

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The Conifer-Aspen becomes fairly extensive in the more moist sites and at higher elevations. Elevations range from about 7,000 to 9,000 feet. Aspen predominates at the lower elevations with associated species being serviceberry, snowberry, Oregon grape, mountain brome, and peavine. Douglas fir is scattered throughout the area above 7,500 feet elevation. A few big red pine, white pine, and fir are found in the upper canyon bottoms. Understory grasses present include curly grass, indian rice grass, shadscale, black sage, and crested wheatgrass.

Identified species of noxious or poisonous weeds in the area are halogeton, cockleburr, loco, and copperweed. There are no concentrated areas or serious problems from these poisonous plants.

Some of the most important vegetation species are listed in Table III-10 following this page.

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TABLE III-10

Vegetation Possibly Occurring in Area

<u>Common Name</u>	<u>Scientific Name</u>
<u>Grasses:</u>	
curly grass	Hilaria jamesii
indian rice grass	Oryzopsis hymenoides
squirreltail	Sitanian hystix
needle and thread grass	Stipa commata
no eatum grass	Aristida fendleriana
western wheat grass	Agropyron smithii
bull grass	Elymus salinus
<u>Shrubs:</u>	
nuttal saltbush	Atriplex nuttallii
mat saltbush	Atriplex corrugata
shadscale	Atriplex confertifolia
fourwing saltbush	Atriplex canescens
big sagebrush	Artemisia tridentate
black sagebrush	Artemisia arbuscula nova
greasewood	Sarobatus vermiculatus
small rabbitbrush	Chrysothamnus viscidiflorus
big rabbitbrush	Chrysothamnus nauseosus
mountain-mahogany	Cercocarpus montanus
serviceberry	Amelanchief alnifolia
curlleaf mahogany	Cercocarpus ledifolius
squaw apple	Peraphyllum ramosissimum
snowberry	Symphoricarpos oreophilus
<u>Trees:</u>	
juniper	Juniperus osteosperma
pinion	Pinus edulis
ponderosa pine	Pinus ponderosa
aspen	Populus temuloides
limber pine	Pinus flexilis
douglas fir	Pseudotsuga menziesii
gambel oak	Quercus gambelii

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## Extent of Cover

Since the elevations and terrain varies drastically from steep walled canyons to high ridges, vegetation density also varies. Percent cover is greater at the higher elevations and on the gentler topography. The Bureau of Land Management estimates cover of 25 to 30 percent at the higher elevations and 10 to 12 percent on the lower canyon sides and bottoms.

## Shrub Height

Shrub height varies over the lease area. Topography, aspect, elevation, and soil cause these modifications.

## Area to be Disturbed

The surface area disturbed is very minimal, 34.2 acres as shown on Plate 7. It should be again stressed that there will be no additional surface disturbances and no additional surface facility construction on the new AEP Lease area. Mining on the AEP Lease will simply be an extension of existing underground workings. Site of the present surface facilities is located in an area that has been previously impacted by mining activities. Actual plant communities which have been disturbed are the Pinion-Juniper and associated species and similar impact is foreseen on vegetation overlying the remainder of the lease area at the proposed surface facilities' sites. Extreme care will be taken however, to disturb as little vegetation as possible and revegetation has been immediately carried out on all disturbed areas no longer needed for the mining operation.

## Fish and Wildlife Resources and Plan

### Introduction

The mine plan area is located in the West Tavaputs Plateau, a region which supports about 360 vertebrate wildlife species. The abundance and distribution of wildlife in the lease area is directly related to present land use activities and capabilities. Use of this area by certain species is limited to lack of perennial water. Mammal and bird species possibly occurring in the lease area are listed in Table III-11. Please refer to Plate 34 which has been revised to include the AEP Lease. A "Species List of Vertebrate Wildlife that Inhabit Southeastern Utah", compiled by the Utah State Division of Wildlife Resources, can now be found in Appendix A.

## Source of Data

Department of the Interior, 1979. Final Environmental Statement - Development of Coal Resources in Central Utah, Parts 1 and 2.

Utah Department of Natural Resources, Division of Wildlife Resources.

## Habitats

Previously described vegetation provides fair to excellent habitat for a variety of wildlife species.

## Species (See Table III-11)

### Mammals

Mammals occurring in the area can be divided into two groups, game species and non-game species.

The main game species include mule deer, mountain lion, black bear, elk, and cottontail rabbits. Mule deer, however, are the most important wildlife resources in the area. Mountain lion are present but little information is available due to their ranging habits. Generally, their movement coincides with the migration of deer. Black bear may occasionally be found in the vegetated canyons, usually along the cliff face. They normally inhabit the Book Cliffs to the north but little data is available on their populations. The permit area is within the lower limits of the elk range, however, elk are generally found north of the mine plan area at higher elevations. Cottontail rabbits are distributed throughout the area.

Non-game mammals include several species of small animals inhabiting the area. Predator species such as coyote and bobcat occasionally are found in the area and depend on small rodents and rabbits for their source of food. Information on non-game species is generally unavailable.

Additional information on species, habitat, and status, can be found in Appendix A.

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TABLE III-11

List of Animals Possibly Occurring in Lease Area

<u>Common Name</u>	<u>Scientific Name</u>
<u>Mammals:</u>	
Badger	Taxidea taxus
Black Bear	Ursus americanus
Bobcat	Lynx rufus
Coyote	Canis latrans
Deer mouse	Peromyscus maniculatus
Desert Cottontail	Sylvilagus audubonni
Elk	Cervus elaphus
Ground Squirrel	Spermophilus tridecelineatus
Least Chipmunk	Eutamias minimus
Mountain Lion	Felis concolor
Mule Deer	Odocoileus hemionus
Porcupine	Evethizon dorsatum
Striped Skunk	Mephitis mephitis
White-tailed Jackrabbit	Lepus townsendii
<u>Birds:</u>	
Brewers Sparrow	Spizella breweri
Blue Grouse	Dendragapus obscurus
Common Nighthawk	Chordeiles minor
House Sparrow	Passer Domesticus
Lark Sparrow	Chondestes grammacus
Magpie	Pica pica
Mourning Dove	Zenaidura macroura
Pinion Jay	Gymnorhinus cyanocephala
Red-tailed Hawk	Buteo jamaicensis
Robin	Turdus migratorius
Ruffed Grouse	Bonasa umbellus
Sage Grouse	Centrocercus urophasianus
Sparrow Hawk	Falco sparverius
Turkey Vulture	Cathartes aura
Vesper Sparrow	Poocetes gromineus

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## Birds

### **Raptors**

The turkey vulture and red-tailed hawk frequent the area. A variety of other raptors breed in the Price area; however there is a poor density of raptors throughout the mine plan area. A raptor survey performed for Andalex Resources of the proposed permit area by Clayton M. White of Brigham Young University is attached as Appendix D. Please see Plate 34. This Plate now includes information from the raptor survey performed in May, 1994, by the Utah DWR and the Utah DOGM. Also refer to letter from USFWS found in Appendix J indicating clearance for our powerline distribution regarding raptors.

### **Other**

Sage grouse inhabit the sagebrush flats at the foot of the cliffs. Blue and ruffed grouse may occasionally be found in the vegetated canyons of the area. Chukkers can be found around the cliffs. Mourning doves are generally distributed throughout the area, however, the lack of perennial water limits dove nesting habitat in the area. Other representative birds include the magpie, bluebird, robin, and several species of sparrow.

### **Reptiles and Amphibians**

The most prominent species of reptiles include the rattlesnake and sagebrush lizard. No aquatic fauna are present in the area.

### **Fish**

There are no active fisheries as there are no permanent bodies of water or perennial streams in the area. No aquatic fauna are found.

### **Threatened or Endangered Species**

There have been no known threatened or endangered species on or near the lease area according to a survey conducted by the Utah Division of Wildlife Resources (Boner 1977).

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## Impacts of Operation

Construction of all roads, powerlines, and surface facilities has been completed. The earthwork and surface facilities for the Aberdeen Mine are complete. The fish and wildlife information contained in this MRP pertains to the entire permit area which includes the Aberdeen minesite. The only potential impact to wildlife as a result of construction (golden eagle nests) has been addressed thoroughly and a negative impact determination was made. Regarding temporary interruption of wildlife habitat, this has also been addressed in the Fish and Wildlife Plan and the Reclamation Plan. Therefore, no additional impact of operations on wildlife is anticipated. Wildlife education has been implemented through the training department. All new employees will receive wildlife education training.

### **Fish & Wildlife Plan (please see Appendix A).**

There will be no additional surface disturbance required on any new coal leases. Consequently, there will be no additional disturbance or adverse impacts on fish and wildlife or related environmental values. Please refer to Plate 34, Revised Wildlife Distribution Map included with this submittal.

Andalex will make every possible effort to minimize disturbances to wildlife habitat in the area and where possible enhance that habitat during reclamation. It should be noted that there is no aquatic life in the permit area as these canyons are dry except as a result of direct precipitation (ephemeral streams). Please note that the Hoffman Creek drainage is also ephemeral. Straight and Alrad Canyons are also ephemeral drainages. Andalex has performed numerous mitigative measures including extensive revegetation. Andalex has performed all mitigative measures outlined in the Fish and Wildlife Plan (Appendix A) with the exception of the use of swareflex reflectors.

Andalex has advised and encouraged employees to avoid unnecessary disturbances to all wildlife regardless of the season, but especially the depleted winter season or the breeding season. Hunting and all wildlife regulations are adhered to.

The largest part of Andalex's road is screened from view by vegetative cover. During revegetation, Andalex will use seed mixtures which are favorable for wildlife enhancement.

To date, Andalex has had no use for poisons for rodent control or any other use.

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Andalex has maintained small islands of natural vegetation within the site, but upon final reclamation, we do not intend to remove natural revegetation from other sites and transplant it. Andalex does not intend to encapsulate seed and fertilizer for release over several years. All disturbed slopes have been revegetated.

Snake dens will be reported to the DWR.

Berry producing shrubs have naturally re-occurred within the disturbed area for avifauna species. No avifauna will be disturbed within Andalex's minesite and in particular, raptors and their nests. Andalex's powerline was constructed under the guidance of the Utah DWR.

Lodges, nests, and dens for all mammals will be protected from disturbance. Andalex has reduced speed limits posted within the minesite and the entire length of the haulroad year-round (20 mph and 40 mph). Swareflex reflectors will not be implemented.

There are no unpaved sections of the haul road and swareflex reflectors are not being used. Andalex has demonstrated mitigation of impacted habitat through revegetation efforts on areas in and outside the permit area. We have had employee wildlife education sessions in the past and may perhaps in the future. A description of the values of wildlife as well as methods for avoiding impacts to wildlife could be written into a form which could be passed out during annual employee training. The Division of Wildlife Resources may be able to assist Andalex with this idea. The powerline was constructed under strict guidelines and has been thoroughly checked by both the Utah DWR and the U.S. Fish and Wildlife Service. Both agencies are pleased with the design and the as-built facilities. Andalex is willing to adhere to reasonable and practical recommendations given by any agency and has for the most part taken the advice of the DWR on most all occasions as outlined in the Wildlife Resources, Appendix A. Special condition #7 was answered by posting 40 mph speed limits, year round.

To the extent possible, Andalex will commit to prevent, control, and suppress range, forest, and coal fires within the permit area. The control of range and forest fires may very well be out of Andalex's hands and it may only be possible for Andalex to report these incidences to organizations such as the BLM who are equipped to handle these situations.

Andalex has committed to continuing wildlife education as part of its employee training. This will be coordinated with the local office of UDWR through the use of videos and possibly guest speakers. All new employees will review our wildlife education tape.

Andalex, through raptor surveys conducted, has identified Golden Eagle nests which could be impacted by subsidence. Andalex is committed to acquiring necessary take permits prior to longwall mining under these sites. Andalex is also committed to additional mitigation which might include measures to prevent nesting on those nests which could be affected by subsidence or removal of nests for scientific study. Please refer to Plate 34 for the most current raptor nesting information including the raptor survey conducted in May, 1994, with the Utah Division of Wildlife Resources and the Utah Division of Oil, Gas and Mining. Three nests have been identified as being located within potential subsidence impact zones. They are identified on Plate 34 and a take permit application for these nests is on file with the U.S. Fish and Wildlife Service. The longwall panel affecting these nests will not be removed prior to the acquisition of this permit.

Andalex has committed to compensation for livestock lost as a result of subsidence which in turn is a direct result of underground mining activities. Also, major cracks caused by subsidence which are demonstrated to be a direct result of underground mining will be repaired.

**R645-301-311. VEGETATIVE, FISH AND WILDLIFE RESOURCES**

See R645-301-310.

**R645-301-312. POTENTIAL IMPACTS**

See R645-301-310 "Area to be Disturbed".

**R645-301-313. RESTORATION OR ENHANCEMENT**

See R645-301-240.

**R645-301-320. ENVIRONMENTAL DESCRIPTION**

See R645-301-310.

**R645-301-321. VEGETATION INFORMATION**

See R645-301-310.

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R645-301-321.100. POTENTIAL FOR REESTABLISHING  
VEGETATION

Appendix M

R645-301-321.200. PREMINING PRODUCTIVITY

Appendix M

R645-301-322. FISH AND WILDLIFE INFORMATION

See R645-301-310.

R645-301-322.100. PROTECTION AND ENHANCEMENT PLAN

Appendix A

R645-301-322.200. SITE-SPECIFIC RESOURCE INFORMATION

Appendix A

R645-301-322.210. THREATENED OR ENDANGERED SPECIES

See R645-301-310.

R645-301-322.220. HABITATS OF UNUSUALLY HIGH VALUE  
FOR FISH AND WILDLIFE

SEe R645-301-310.

R645-301-322.230. OTHER SPECIES OR HABITATS  
REQUIRING SPECIAL PROTECTION

N/A

R645-301-322.300. FISH AND WILDLIFE SERVICE REVIEW

Appendix A

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**R645-301-323. MAPS AND AERIAL PHOTOGRAPHS**

Appendix A

**R645-301-323.100. REFERENCE AREAS**

See R645-301-331 "Reference Areas".

**R645-301-323.200. MONITORING STATIONS**

N/A

**R645-301-323.300. ENHANCEMENT FACILITIES**

N/A

**R645-301-323.400. PLANT COMMUNITIES**

See R645-301-310.

**R645-301-330. OPERATION PLAN**

**Maps and Plans**

Most of the maps and plans previously submitted as part of the approved Mining and Reclamation Plan, are applicable. Where necessary, the original maps have been revised to indicate the addition of new leases and rights-of-ways and the revisions are indicated in this submittal in Volume II.

- 1) All necessary maps and plans to complete this section are found in Volume II of the submittal and also in the appendices, specifically,
  - a) Underground coal mining activities to be conducted and lands to be affected by surface facilities are shown on Plates 6, 29, 30, 31 and 41.
  - b-1) Buildings, utilities, and facilities are depicted on Plates 6 and 7.

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- 2) The area to be affected is shown on several plates, including 4, 5, 6, and 41. These last four plates show the sequence of mining in the four seams over the five year term of the permit. Plate 29, 30, 31, 41 has been revised to show immediate development in the Gilson Seam as soon as approval is achieved. Reclamation will not take place until after all four seams are mined out. This activity is depicted on Plates 15, 16, 17, and 20.
- 3) Plate 6 depicts the entire disturbed area for which a performance bond is posted. The acreage is shown on Plate 5.
- 4) Coal storage and loading areas are shown on Plate 6. No cleaning takes place.
- 5) Plate 6 shows a non-coal waste storage area as well as topsoil storage areas. Plates 36 and 37 show the topsoil piles in detail.
- 6) All water diversions and other water facilities are shown on Plates 6, 8, 9, 11, 12, and 13. Also, typical diversions for disturbed area and undisturbed areas are shown in the Sedimentation and Drainage Control.

Diversion ditches as they exist are shown on Revised Plate 6. Topographic detail has been added to Plate 8 to allow determination of watershed slopes within the disturbed area.

Topographic detail has been added to Plate 8 to allow determination of watershed slopes within the disturbed area. Plate 16 has been revised to show drainage during the reclamation period before and after removal of sediment ponds (Phase I).

Plate 17 shows final drainage details.

Plate 9 shows delineations of watershed areas.

The main culvert will be removed entirely during the reclamation/earthwork phase except under Pond E. Pond "E" will be enlarged, and the entire drainage area above will flow into the restored channel RC-1 and through Pond "E-PM". Once revegetation and water quality standards have been met, Pond "E-PM" will be removed and reclaimed.

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- 7) There is no coal processing waste at the Centennial facility. There are no pollution control facilities other than sedimentation ponds on the permit area. Waste rock from the Centennial Mine rock tunnels has been disposed of underground in the Pinnacle Mine.
- 8) Specific facilities are not used to protect or enhance wildlife with the exception of the powerline which was built according to strict guidelines issued by the Division of Wildlife Resources and the U.S. Fish and Wildlife Service regarding raptor protection. The powerline design is included in Volume I as Appendix I (powerline design). Also, speed limits are posted within the permit area.
- 9) The two powder magazines are shown on Plates 6 and 7.
- 10) Plates 6, 7, 8, and 9 show these facilities associated with protection of the hydrologic balance including sedimentation ponds and storage of non-coal waste. There are no permanent impoundments, coal processing wastes or underground development wastes. Any underground development waste or excess spoil which was generated while putting in the Aberdeen portals, has been used as stock pile pad material at the Aberdeen Minesite. The volume of this material is minimal.
- 11) Plates 16 and 17 show the final reclamation contours and configuration of the surface for Phases I and II respectively.
- 12) Subsidence monitoring points are shown on Plate 25. An additional station was added to Plate 25 to cover pillar extraction on the new AEP Lease. Also new stations were added under the Graves and Hoffman Creek Leases. Water monitoring location are shown on Figure IV-11. Additional water monitoring will be added as station 12-1 in Alrad Canyon below the AEP lease.
- 13) There will be no facilities left on the permit area permanently with the exception of the roads through the right fork of Deadman Canyon. The left hand fork road will be reclaimed. After the completion of underground mining, all facilities will be removed with the exception of one downstream sedimentation pond. This pond will be removed upon final reclamation.

c) Maps, plans, and cross sections required under

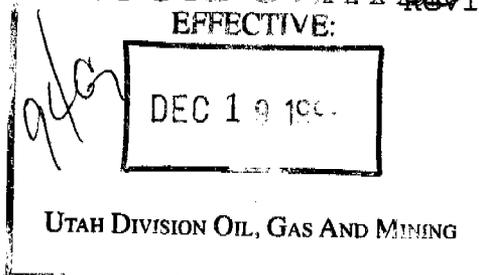
- b) (5), (6), (10), and (11) have been prepared under the direction of, and certified by a registered professional engineer. Assistance has come from a registered land surveyor.

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will be tested according to the most advanced technology. Samples will be taken to determine any deficiencies which would affect the growth of newly revegetated areas. Any deficiencies will be corrected by adding to the soil chemical fertilizers, organic mulch, or any other substances recommended by the regulatory authority. Preparation techniques such as disking will be incorporated.

#### **Species and Amounts of Seeds and Seedlings**

The seed mixtures outlined for steep slopes and drainage areas developed by UDOGM (12-10-86) will be used. Shrub clumps will be planted as shown on Plate 20. This constitutes an area of 2.15 acres (Drainage areas are 15.02 and Slopes are 17.03). Species shall include serviceberry, mountain big sagebrush, squawbush, blue elderberry, mountain snowberry, and mountain mahogany. They will be planted at a rate of 1,000 containerized plants per acre using fertilizer and crimped straw for stabilization. Drainage area seed mix will be used around and among the shrub clumps beneath the straw stabilization. Re Reference Areas. Plate 20 in Volume II shows that Andalex will plant the drainage mixture around and beneath the shrub clumps (transplants). These transplants listed above will be used in the drainage areas as depicted on Plate 20.

#### **Planting and Seeding Methods**

Where possible the areas will be disked using conventional farm equipment. Andalex will make every effort to leave surfaces to be reseeded as rough as possible (one method could be gouging by a trackhoe). The seed will be spread using a rangeland drill where possible. Areas which cannot be seeded mechanically will be hand seeded or hydroseeded. Steeper slopes will be raked to provide a slight soil cover for the seed. Steep slopes may also be hydroseeded and hydromulched.

#### **Mulching Techniques**

Vegetative cover will be promptly re-established following cessation of mining activities to stabilize erosion. Mulch will be used and re-seeding will occur during the first normal period for favorable growth following regrading. Mulch will be applied to all reseeded areas. Where hydromulching cannot be used, straw mulch (at the rate of 1-1/2 to 2 tons/acre) will be crimped either mechanically or by hand. Hydromulch will be used on steep slopes and straw will be used wherever possible.

Andalex would plan on using organic mulch (wood fiber). It will be used wherever seeds are planted. These areas are shown on Plate 20 and constitute 34.2 acres. The rate of application will be one ton per acre. The remaining acres are shrub plantings which will be stabilized with the drainage area seed mix and crimped straw.

## Management Practices, e.g., Irrigation, Pest, and Disease Control

Andalex does not anticipate irrigation will be used because of the lack of water in the area. Vegetative growth will be subject to normal rainfall and winter snowfall. As a contingency irrigation by mechanical methods could be used if revegetation of the transplants is unsuccessful. Vegetation will be protected from both wildlife and livestock by drift-fences until the reclaimed areas have been adequately re-established. Upon approval, the fences will be removed. Pesticides and herbicides will be used as necessary. Should any persistent pesticides be needed, the Division's approval will be obtained prior to their use.

## Measures to Determine Success

Revegetation will be closely monitored. Areas which fail to support sufficient growth to stabilize conditions will be tested and reseeded until a proper cover is established. Vegetation reference areas will be consulted to determine success. Physical examinations will be conducted to note any species which are not thriving or regenerating. If this occurs, species will be substituted at the recommendation of the regulatory authority. Any other species will be added at the time of reclamation upon recommendation of the regulatory authority. The company will maintain close contact with the Bureau of Land Management in all of its revegetation efforts, and incorporate their suggestions into its over all plan. All reclaimed areas will be monitored and maintained by the constant observation of Andalex until the surety release is granted.

Revegetation monitoring parameters to be measured are growth rate, plant density and percent cover. We would expect to monitor or supervise monitoring at least monthly during the first two growing seasons. From experience with interim revegetation at the minesite, we have learned that two growing seasons are needed to establish any success. After this we would know whether reclamation was progressing successfully.

Monitoring will take place during years 1, 2, 5, 9, and 10. Years 9 and 10 will include estimates of cover, wood density, productivity, and composition, both on reclaimed areas and on reference areas. Parameters sampled on reclaimed areas will meet or exceed 90% of the reference area standard with a 90% confidence level. Andalex will use approved sampling methods and will use the same method for both reclaimed and reference areas.

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In 1983, Andalex planted several shrub species which are part of our approved transplant mixture on topsoil pile F. These plantings were not performed under the direction of the Division and were merely for Andalex's reference. Andalex will attempt a new test plot with our approved transplant mixture in 1992 in the same area. Monitoring, both qualitative and quantitative, will be performed in years 1, 2, 5, 9, and 10. Data will be submitted to the Division as part of the annual report starting in 1993.

#### Reference Areas

The reference areas to be used by Andalex Resources in revegetation are shown on Plate 9 which is a Watershed and Revegetation Reference Areas Map. These reference areas have been described by the Soil Conservation Service with regard to condition and production. This description can be found in Appendix M following EEC's soils and vegetation survey.

There are three reference areas, each one acre in size, two of which are located on slopes and one in a drainage area. Reference area R-1 will be used in conjunction with the seed mixture for drainage areas. Areas R-3 and R-4 will be used in conjunction with the seed mixture for slopes and will also be used in conjunction with drainage areas to establish the success of Gamble's Oak. See plate 9.

Each reference area established will be re-evaluated every five years prior to permitting.

The new Left Hand Fork fan installation will have its own separate topsoil storage area. Andalex will utilize this topsoil storage area to test shrub species in the coming years beginning in the fall of 1995.

Standards for success for woody species is 2000 woody plants-per-acre for stream bottom areas and east-facing slopes; 1500 woody plants-per-acre for west-facing slopes.

Sediment Pond E - PM will be maintained until removal is authorized by the Division and the disturbed area has been stabilized and revegetated. In no case will the structure be removed sooner than two years after the last augmented seeding.

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**IMPACTS OF SUBSIDENCE ON RENEWABLE  
RESOURCE LANDS**

Subsidence

**Survey of Structures and Renewable Resource Lands**

There are no structures present other than those constructed for mining operations, on the permit area. The land is presently used for grazing and wildlife habitat which constitutes a renewable resource area. It should be noted that geographic areas above Andalex's 5 year mine plan do not include any area suitable for grazing, nor do they contribute significantly to the long-range productivity of water, food or fiber products. Andalex commits to mitigate all subsidence related damage to renewable resources including, but not limited to water, grazing, and wildlife habitat including raptor nests.

R645-301-333.

**USING THE BEST TECHNOLOGY  
CURRENTLY AVAILABLE TO MINIMIZE  
DISTURBANCE AND IMPACT**

**Preventive Measures**

Subsidence due to mining on the Andalex property will not occur outside of the approved permit area. Stations have been set up as required for constant monitoring of subsidence movements. (See 6., Monitoring.) The only absolute preventive measure possible is to leave coal in place. This is in direct contrast to maximum economic coal recovery.

Resources on the lands above Andalex's mining plan consist only of wildlife habitat with very limited grazing access.

Subsidence monitoring stations will be established as necessary along the first proposed longwall mining. (See 6., Monitoring and Plate 28.) The results of this monitoring program will define monitoring and permitting needs in the future.

R645-301-333.100.

**PROTECTION OF THREATENED AND  
ENDANGERED SPECIES**

There have been no known threatened or endangered species on or near the lease area according to a survey conducted by the Utah Division of Wildlife Resources (Boner 1977).

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R645-301-333.200.      **SITE-SPECIFIC      PROTECTION      OF  
THREATENED AND ENDANGERED SPECIES**

See R645-301-310.

R645-301-333.300.      **PROTECTIVE MEASURES DURING ACTIVE  
PHASES OF MINING OPERATIONS**

Appendix A

R645-301-340.      **RECLAMATION PLAN**

See R645-301-240.

R645-301-341.      **REVEGATATION**

See R645-301-240.

R645-301-341.100      **SCHEDULE AND TIMETABLE**

See R645-301-240.

R645-301-341.200.      **DESCRIPTION**

See R645-301-240.

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R645-301-341.210.

SPECIES AND AMOUNTS PER ACRE OF SEEDS AND/OR SEEDLINGS USED \*

SPECIES (SLOPES)	# PLS/acre
<u>Grasses:</u>	
<u>Agropyron smithii</u> Western wheatgrass	3.0
<u>Agropyron spicatum</u> Bluebunch wheatgrass	2.0
<u>Agropyron trachycaulum</u> Slender wheatgrass	2.0
<u>Bromus marginatus</u> Mountain brome	3.0
<u>Oryzopsis hymenoides</u> Indian ricegrass	2.0
<u>Poa sandbergii (secunda)</u> Sandberg bluegrass**	0.25
<u>Forbs:</u>	
<u>Artemisia ludoviciana</u> Louisiana sagebrush**	0.1
<u>Hedysarum borealis</u> Northern sweetvetch	1.0
<u>Linum lewisii</u> Lewis flax	1.0
<u>Melilotus officinalis</u> Yellow sweetclover	0.5
<u>Penstemon strictus</u> 'Bandera' Rocky Mtn. penstemon	0.25
<u>Shrubs:</u>	
<u>Amelanchier alnifolia</u> Serviceberry	1.0
<u>Artemisia tridentata vaseyana</u> Mountain big sagebrush**	0.2
<u>Cercocarpus ledifolius</u> Curlleaf mountain mahogany	1.0
<u>Cercocarpus montanus</u> True mountain mahogany	1.0
<u>Chrysothamnus nauseosus albicaulis</u> Whitestem rubber rabbitbrush**	1.0
<u>Purshia tridentata</u> Bitterbrush	3.0
<u>Symphoricarpos oreophilus</u> Mountain snowberry	1.0
Total	23.3

Rate is pounds Pure Live Seed/Acre for drill seeding. Broadcast seeding is double the drill rate.

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SPECIES (DRAINAGE AREAS)	<u># PLS/acre</u>
<u>Grasses:</u>	
<u>Agropyron riparium</u>	2.0
Western wheatgrass	
<u>Agropyron trachycaulum</u>	2.0
Slender wheatgrass	
<u>Bromus marginatus</u>	3.0
Mountain brome	
<u>Elymus cinereus</u>	2.0
Great Basin wildrye	
<u>Phalaris arundinacea</u>	0.5
Reed canarygrass	
<u>Poa pratensis</u>	0.1
Sandberg bluegrass**	
<u>Forbs:</u>	
<u>Achillea millifolium</u>	0.1
Yarrow	
<u>Artemisia ludoviciana</u>	0.1
Louisiana sagebrush**	
<u>Hedysarum borealis</u>	1.0
Northern sweetvetch	
<u>Melilotus officinalis</u>	0.5
Yellow sweetclover	
<u>Osmorhiza occidentalis</u>	2.0
Sweet anise	
<u>Shrubs:</u>	
<u>Amelanchier alnifolia</u>	1.0
Serviceberry	
<u>Artemisia tridentata vaseyana</u>	0.1
Mountain big sagebrush**	
<u>Rhus trilobata</u>	1.0
Squawbush	
<u>Sambucus cerulea</u>	1.0
Blue elderberry	
<u>Symphoricarpos oreophilus</u>	1.0
Mountain snowberry	
Total	17.4
<u>Trees (transplants):</u>	
<u>Populus angustifolia</u> (Narrowleaf cottonwood)	250
<u>Acer negundo</u> (Box Elder)	250
<u>Prunus virginiana</u> (Chokecherry)	250
<u>Quercus gambelii</u> (Gambel oak)	250
Total	1000

Rate is pounds Pure Live Seed/Acre for drill seeding. Broadcast seeding is double the drill rate.

\*This seed mixture and shrub list will be used for interim reclamation in the left hand fork fan installation and on the new topsoil pile. This seed mixture and shrub list will also be used for final reclamation. Also, this shrub list will be attempted on the new topsoil pile in the left hand fork.

\*\*Big sage, Louisiana sage, rabbit brush and bluegrass will be broadcast behind the drill where possible.

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R645-301-341.220. METHODS USED IN PLANTING AND SEEDING

See R645-301-240.

R645-301-341.230. MULCHING TECHNIQUES

See R645-301-240.

R645-301-341.240. IRRIGATION AND PEST CONTROL MEASURES

See R645-301-240.

R645-301-341.250. METHODS USED TO DETERMINE REVEGETATION SUCCESS

See R645-301-240.

R645-301-341.300. STUDIES AND TESTING TO DEMONSTRATE FEASIBILITY OF REVEGETATION PLAN

See R645-301-240.

R645-301-342. FISH AND WILDLIFE

See R645-301-310.

R645-301-342.100. ENHANCEMENT MEASURES

Appendix A. Andalex will endeavor to use the best technology current available to enhance wildlife habitat during the reclamation phase of its operation. This will include, but not be limited to water sources (if available), thermal cover, escapeways, hiding and loafing places, and travelways. ANDALEX will consult with the Division of Wildlife Resources, at the time of final reclamation, to determine exactly what reclamation designs, planting arrangements, and artificial structures would best enhance a wildlife habitat.

R645-301-342.200. PLANT SPECIES SELECTION

See R645-301-341.210.

R645-301-342.210. NUTRITIONAL VALUE

Appendix A

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R645-301-342.220. COVER AND PROTECTION

Appendix A

R645-301-342.230. ABILITY TO SUPPORT AND ENHANCE HABITAT

Appendix A

R645-301-342.300. CROPLAND

N/A

R645-301-353. REVEGETATION: GENERAL REQUIREMENTS

R645-301-353.100. VEGETATIVE COVER

The vegetative cover will be as stated in the following categories.

R645-301-353.110. DIVERSITY, EFFECTIVENESS AND PERMANENCE

The vegetative cover will be diverse, effective and permanent. Standards for reclamation success will be evaluated accordance with DOGM's "Vegetation Information and Monitoring Guidelines", Appendix A. The success of final reclamation will be judged on the effectiveness of the vegetation for the postmining land use and the extent of cover compared to the extent of cover for the reference area. Ground cover, production or stocking will be considered equal to the approved success standard when it reaches 90% of the success standard. Statistical adequacy of all statistical sampling will be determined using the following formula:

$$N_{min} = \frac{t^2 s^2}{(dx)^2}$$

- where:
- t = the value from appropriate t-table\*, (2-tail test for pre-mine studies, 1-tail test for success studies)
  - s = the sample standard deviation,
  - d = the desired change in the mean,
  - x = the sample mean of the parameter in question
  - \* = All parameters are to be tested at the 90% confidence level with a 10% change in the mean (d = .1).

Ground cover will be estimated by using one of the methods listed in "Vegetation Information Guidelines" Appendix A.

Andalex does not propose to stock shrubs or trees during interim or final revegetation.

Production measurements will be made in accordance with DOGM's "Vegetation Information Guidelines" Appendix A. Estimates may be made by the methodology which the vegetation consultant feels is the most suitable method to used for the work being performed.

An evaluation of species composition will be made, including species present, form and diversity.

For a postmining land use of grazing and wildlife habitat, the ground cover and production will be equal to or greater than a reference area. The Division's "Vegetation Information Guidelines", Appendix A will be utilized for the evaluation of the success of revegetation. Appendix B will be references for calculating diversity.

Siltation structures will be maintained until the disturbed area is revegetated and stabilized. They will remain in place at least two years after the last augmented seeding. Siltation structures may include straw bales, silt fences or filter baskets. Removal will be contingent upon revegetation and stabilization of the area as well as DOGM concurrence. Following removal, the area will be revegetated in accordance with the reclamation plan.

**R645-301-353.120. NATIVE OR DESIRABLE INTRODUCED SPECIES**

The vegetative cover will be comprised of species native to the area, or of introduced species where desirable and necessary to achieve the approved postmining land use and approved by the Division.

**R645-301-353.130. EXTENT OF COVER**

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

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**R645-301-353.140. STABILIZING SOIL FROM SURFACE EROSION**

The vegetative cover will be capable of stabilizing the soil surface from erosion.

**R645-301-353.200. REESTABLISHED PLANT SPECIES**

The reestablished plant species will:

**R645-301-353.210. COMPATIBILITY WITH APPROVED POST-MINING LAND USE**

The reestablished plant species will be compatible with the approved postmining land use.

**R645-301-353.220. SEASONAL CHARACTERISTICS OF GROWTH**

The reestablished plant species will have the same seasonal characteristics of growth as the original vegetation.

**R645-301-353.230. SELF-REGENERATION AND PLANT SUCCESSION**

The reestablished plant species will be capable of self-regeneration and plant succession.

**R645-301-353.240. COMPATIBILITY WITH AREA PLANT AND ANIMAL SPECIES**

The reestablished plant species will be compatible with the plant and animal species of the area.

**R645-301-353.250. COMPLIANCE WITH OTHER APPLICABLE LAWS OR REGULATIONS**

The reestablished plant species will meet the requirements of applicable Utah and federal seed, poisonous and noxious plant; and introduced species laws or regulations.

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R645-301-400.

LAND USE AND AIR QUALITY

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**R645-301-410.**

**LAND USE**

As the "Mathis" incidental boundary change is simply an extension of underground mine workings under roughly 2,600 to 3,000 feet of cover there will be absolutely no effect on land use.

**R645-301-411.**

**ENVIRONMENTAL DESCRIPTION**

Due to the rugged topography and sparse rainfall, the land area is presently used only for grazing, wildlife habitat, and outdoor recreation. Historically, the land has also been used for coal mining.

**R645-301-411.100.**

**PREMINING LAND USE INFORMATION**

The initial development of the Book Cliffs Coal Field was started in the early 1890's. By the early 1900's practically the entire field had been prospected. Mines in the lease area were not active until the 1920's because the cliffs were less accessible and the coal beds were thinner.

The Knight-Ideal mines, now held by Andalex Resources are located adjacent to the Hoffman Creek lease area. Initial prospecting took place at this location in 1906 and extensive mining began in 1948 and ceased in 1958. During this period, 1,680,000 tons of coal were produced from the Gilson seam. The Knight-Ideal Mine is contiguous to our Sunedco leases (U-05067) in Hoffman Creek. By mining this lease, Andalex will recover all minable coal between Centennial and Knight-Ideal.

Three mines on or adjacent to the lease area in Deadman Canyon were the Zion, Olsen, and Sutton (Blue Flame) mines. The Zion was located on the Zion's fee lease and the Olsen and Sutton were on SL-027304. The first two produced from the Gilson seam and the last produced from the Aberdeen or Castlegate "A" seam. Production figures are not reliable but it is estimated that between 216,000 tons and 720,000 tons may have been produced from the Sutton mines. The Olsen mines produced about 18,000 tons and the Zion mine around 240,000 tons, between 1924 and 1944.

There was also a prospect entry driven in the Lower Sunnyside Seam (the Hileman) on lease U-010581 from which production was insignificant, approximately 1,400 tons. Mining ceased in the area in 1964.

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Revised 03/02*

R645-301-411.110.

**USES OF THE LAND AT THE TIME OF  
FILING APPLICATION**

The Deadman Canyon area as well as the Straight and Hoffman Canyons would fall into two land use categories: 1) Fish and Wildlife habitat and recreation lands, and 2) Range Lands. County zoning regulations (1974) indicate all lands involved in the lease application area are within zone M and G1 which is for mining and grazing. Current land use consists of grazing and deer hunting. For recreational purposes the land is suitable for deer hunting. Other recreational uses for the permit area could include hiking, cross-country skiing, four wheeling, camping, and snowmobiling in winters with adequate snow cover. The lack of water prevents the establishment of a chukker/partridge population. Usually there are no elk in the area although an animal or two may occasionally wander onto the area.

There are no oil and gas wells or water wells other than those water wells drilled by Andalex for use in mining activities, on the lease area. Also, there are no oil and gas wells or water wells in adjacent areas.

The area is eight air miles from Price, but the unavailability of water precludes any development for residential or summer homes.

R645-301-411.120.

**LAND USE DESCRIPTION IN  
CONJUNCTION WITH OTHER  
ENVIRONMENTAL RESOURCES  
INFORMATION**

Livestock grazing has been the most intense use of the lease area. However, due to the expansive cliff formations and the roughness of the canyon walls, grazing has been principally limited to the canyon bottoms and extreme tops to the north of the lease boundary.

Mule deer are found within the lease area as well as the usual small mammals, predators, and passerine and raptorial birds.

Outdoor recreation in the lease area is limited and usually related to enjoyment of the open space and associated scenic facilities and hunting for wild animals. The number of people using the area is small due to the rough terrain, poor roads, and lack of water.

The AEP Lease Area has the same land-use as that of the original permit area.

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R645-301-411.130. EXISTING LAND USES AND LAND USE CLASSIFICATION

R645-301-411.140. CULTURAL AND HISTORIC RESOURCES INFORMATION

Most of the maps previously submitted as part of the Mining and Reclamation Plan are applicable. Where necessary, original maps have been revised to indicate the newly acquired lease areas and these revisions are included with this submittal as figures or as plates in Volume II. An archaeological clearance for the Left Hand Fork fan installation can be found in Appendix C along with all other previously conducted archaeological surveys.

R645-301-411.141. CULTURAL AND HISTORIC RESOURCES MAPS

See Appendix C.

R645-301-411.141.1 PUBLIC PARKS AND LOCATIONS OF ANY CULTURAL OR HISTORICAL RESOURCES

N/A

R645-301-411.141.2 CEMETERIES

There are no cemeteries or burial grounds in or within 100 feet of the permit area.

R645-301-411.141.3 NATIONAL SYSTEM OF TRAILS OR THE WILD AND SCENIC RIVERS SYSTEM

N/A

R645-301-411.142. COORDINATION WITH THE STATE HISTORIC PRESERVATION OFFICER (SHPO)

Appendix C.

R645-301-411.142.1 PREVENTION OF ADVERSE IMPACTS

Appendix C.

R645-301-411.142.2    VALID EXISTING RIGHTS OR JOINTS  
AGENCY APPROVAL

Appendix C.

R645-301-411.143.    IMPORTANT    HISTORIC    AND  
ARCHAEOLOGICAL RESOURCES THAT MAY  
BE ELIGIBLE FOR LISTING ON THE  
NATIONAL REGISTER OF HISTORIC  
PLACES

Appendix C.

R645-301-411.143.1    COLLECTION    OF    ADDITIONAL  
INFORMATION

Appendix C.

R645-301-411.143.2    CONDUCTING FIELD INVESTIGATIONS

Appendix C.

R645-301-411.143.3    OTHER APPROPRIATE ANALYSES

Appendix C.

R645-301-411.144.    APPROPRIATE    MITIGATION    AND  
TREATMENT MEASURES

Appendix C.

R645-301-411.145.    EXCEPTIONS

Appendix C.

R645-301-411.200.    PREVIOUS MINING ACTIVITY

Previous activity consisted of small "dog hole" punch mines used for domestic coal in the 1930's, 1940's and 1950's.

OK

**R645-301-411.210. TYPE OF MINING METHOD USED**

Previous mining was using conventional sections.

**R645-301-411.220. COAL SEAMS OR OTHER MINERAL STRATA MINED**

The coal seams previously mined were Lower Sunnyside, Gilson and Aberdeen.

**R645-301-411.230. EXTENT OF COAL OR OTHER MINERALS REMOVED**

The extent of removed coal was not significant, roughly 2,000,000 tons over 30 years.

**R645-301-411.240. APPROXIMATE DATES OF PAST MINING**

Approximately 1930-1960.

**R645-301-411.250. USES OF LAND PRECEDING MINING**

See R645-301-411.140.

**R645-301-412. RECLAMATION PLAN**

See R645-301-240.

**R645-301-412.100. POSTMINING LAND USE PLAN**

The post-mining land use will consist of livestock grazing with wildlife habitat and some recreation.

**R645-301-412.110. ACHIEVEMENT OF PROPOSED POSTMINING LAND USE**

See R645-301-412.100.

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**R645-301-412.120. RANGE OR GRAZING LAND USE**

See R645-301-412.100.

**R645-301-412.130. ALTERNATE POSTMINING LAND USE**

N/A

**R645-301-412.140. CONSISTENCY WITH SURFACE OWNER  
PLANS AND APPLICABLE UTAH AND  
LOCAL LAND USE PLANS**

**Socioeconomic Impacts**

The proposed project is located in an area where coal mining is the major industry, therefore, the community is geared for coal operations. The labor supply is excellent, well-trained, and available. Most people in this area have a very favorable attitude towards the increased coal activity. They look forward to growth in the area which will increase population, home construction, and provide other facilities for community use.

The need for development of additional housing, school space, and changes in present community services would be among the greatest impacts, due to the increase in population. Positive effects of the project will be to increase the number of jobs, payroll, and taxes thus helping to build the community.

**Land Use Changes**

The nature of an underground mine of this type and size requires minimal surface disturbance. There will be no additional surface disturbance whatsoever with the addition of any new leases. There will be no change in land-use status from pre-mining to post-mining use. The limited resources both physical and scenic will dictate no future change in land status. Considering the extent and nature of similar lands in the Book Cliffs, no uses other than those previously discussed can be forecast.

Deadman Canyon has been unsightly since the earliest mining began in the 1920's, the new mine surface facility and portal site will be in the same area as the old mine tipplles and waste dumps. These waste dumps are numerous and located throughout the canyon bottom and consist of coal fines which were unmarketable during the earlier mining history. This coal waste has been recovered, reprocessed, and cleaned up during the new operation. This new operation will actually be a significant reclamation phase to the canyon area.

During and after completion of mining operations, the land will continue to be used for grazing and hunting. No future change is dictated in the land status. Please refer to Appendix R for surface owner comments. Existing surface owners did not feel any change in postmining land use was dictated. Surface disturbances will be very minimal and all disturbed land will be restored in a timely manner, according to the Reclamation Plan to conditions that are capable of supporting the uses they were capable of supporting before mining.

No grazing land has been impacted by Andalex's minesite or permit area as none exists within the disturbed area. As far as wildlife habitat is concerned, two things should be pointed out. First, Andalex has successfully provided new vegetation and food sources through revegetation within the deer winter range in acreages greatly exceeding the disturbed or "impacted" area. These areas include large acreages along the haul road and powerline corridor. Second, and perhaps more importantly, on Andalex's minesite, wildlife abounds. There are large numbers of small mammals of many varieties including, but not limited to, squirrels, chipmunks, mice and rabbits. There are large numbers of all types of birds, including large and small raptors hunting in the area. The DWR has indicated that our powerline has provided important hunting opportunities for large raptors. Deer are commonly observed within our disturbed area feeding on revegetated slopes. Revegetation within our disturbed area is mitigation in itself to the impacted area.

**R645-301-412.200. LAND OWNER OR SURFACE MANAGER  
COMMENTS**

Appendix R.

**R645-301-413.300. SUITABILITY AND COMPATIBILITY**

Appendix R.

**R645-301-413. PERFORMANCE STANDARDS**

**R645-301-413.100. POSTMINING LAND USE**

See R645-301-412.100.

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R645-301-413.110. CAPABILITY OF SUPPORTING  
POSTMINING LAND USE

See R645-301-412.100.

R645-301-413.120. HIGHER OR BETTER USES

See R645-301-412.100.

R645-301-413.200. DETERMINING PREMINING USES OF LAND

See R645-301-412.100.

R645-301-413.210. PREMINING USES OF LAND NOT  
PREVIOUSLY MINED

See R645-301-412.100.

R645-301-413.220. POSTMINING LAND USE FOR LAND THAT  
HAS BEEN PREVIOUSLY MINED AND NOT  
RECLAIMED

See R645-301-412.100.

R645-301-413.300. CRITERIA FOR ALTERNATIVE  
POSTMINING LAND USES

N/A

R645-301-413.310. LIKELIHOOD FOR ACHIEVEMENT LAND  
USE

Post-mining land use as proposed shall be achieved.

R645-301-413.320. HAZARDS TO PUBLIC HEALTH OR  
SAFETY, OR THREAT OF WATER  
DIMINUTION OR POLLUTION

This section deleted as instructed in the Technical Analysis.

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R645-301-413.330.

PROHIBITED LAND USES

N/A

R645-301-413.331.

IMPRACTICAL OR UNREASONABLE

N/A

R645-301-413.332.

INCONSISTENT WITH APPLICABLE LAND  
USE POLICIES

N/A

R645-301-413.333.

UNREASONABLE DELAY IN  
IMPLEMENTATION

N/A

R645-301-413.334.

VIOLATION OF FEDERAL, UTAH OR  
LOCAL LAW

N/A

R645-301-414.

PERMIT REVISIONS REQUESTING  
APPROVAL OF ALTERNATE POSTMINING  
LAND USE

N/A

R645-301-414.100.

FILING DEADLINES

N/A

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R645-301-414.200.

**SIGNIFICANT ALTERATION FROM MINING  
OPERATIONS IN THE ORIGINAL PERMIT**

N/A

R645-301-414.300.

**OTHER REQUIREMENTS**

N/A

R645-301-420.

**AIR QUALITY**

As the "Mathis" incidental boundary change is simply an extension of underground mine workings under roughly 2,600 to 3,000 feet of cover there will be absolutely no effect on air quality.

Air Pollution Control Plan and Compliance with Air Quality Laws

**Existing Environment**

The permit area is located in a Class II air quality area.

**Air Quality Impact Analysis**

Please see the following section, section 3 re Emission Estimates.

**Emission Estimates**

Emission estimates are included as Appendix F in the form of an emission inventory. This inventory has been reviewed and approved by the Utah Bureau of Air Quality and the E.P.A. It has been re-approved to increase our production restriction on the basis the haul road has been paved by Carbon County. Air quality permit in appendix F.

**Proposed Controls**

Since this is an underground operation, no air quality problems are anticipated. The only changes in air quality will be attributable to minor road dust and exhaust mine dust. Methods of control are spray systems, chemical treatment, enclosures, pavement, and other fugitive dust control practices outlined in 30 CFR 817.95.

There will be no additional fugitive emissions or air pollution associated with the newly acquired AEP Lease.

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## PSD Permit and Compliance with Air Quality Laws

The Environmental Protection Agency has determined that this project does not need a PSD air quality permit. This is based on our fugitive and non fugitive dust emissions inventory which assumes facilities necessary for 1.5 mm tons per year production. Further, the mine is not subject to the PSD regulations because of the new definition of a major source. (Refer to letter dated March 21, 1980 in Appendix J). All applicable air quality laws will be complied with and fugitive dust control practices, as required under 30 CFR 817.95, will be followed.

Andalex has been issued a new approval order for the mines and the Wildcat Loadout for 1.5 million tons per year. These were inspected and met compliance during the summers of 1989-1992.

### R645-301-421. CLEAN AIR ACT AND OTHER APPLICABLE LAWS

See R645-301-420.

### R645-301-422. UTAH BUREAU OF AIR QUALITY

See R645-301-420.

### R645-301-423. SURFACE COAL MINING AND RECLAMATION ACTIVITIES EXCEEDING 1,000,000 TONS PER YEAR

See R645-301-420.

### R645-301-423.100. COMPLIANCE WITH FEDERAL AND UTAH AIR QUALITY STANDARDS

See R645-301-420.

### R645-301-423.200. FUGITIVE DUST CONTROL PLAN

See also Appendix F

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**ENGINEERING**

The Mathis incidental boundary change will not require any changes to engineering practices currently employed at the Aberdeen Mine. The change simply involves an extension of underground mine workings and does not involve the surface in any way. See 301-522 and 301-525 for additional comments on subsidence. See also IBC PHC, Appendix L.

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Most of the maps previously submitted as part of the Mining and Reclamation Plan are applicable. Where necessary, original maps have been revised to indicate the newly acquired lease area and these revisions are included with this submittal as figures or as plates in Volume II. Plates which have been changed to show the location of the incidental boundary change are included.

It should be noted that no man made surface or subsurface features are located in or around the Mathis Tract I.B.C. or on adjacent proposed Federal and State Lease Applications shown on Plate I-A.

All categories within this section have been addressed, primarily in Volume II of the MRP which contains most of the plates.

- a) Surface and subsurface ownership of lands contiguous to the permit area are shown on Plates 2 and 3.
- b) The leases for which we have the legal right of entry are shown on Plate 4.
- c) Andalex has submitted a permit modification to include the new AEP Lease recently acquired. Also, a permit will be sought in 1993 for a new fan installation immediately adjacent to Andalex's leases in the left hand fork in Deadman Canyon.
- d) There are no buildings within 1,000 feet of the permit area except those used as part of the mining operation. They are shown on Plates 6 and 7.
- e) There are no surface or subsurface man-made features within, passing through or passing over the permit area except the powerline, telephone cables, culverts, and etc., installed for the operation of this mine. See Plate 6 for their locations.
- f) These reference areas are shown on Plate 9 as R-1, R-3 and R-4. They are each 200 feet square approximately.
- g) The only user of surface water within this immediate hydrologic area is Andalex (Refer to Figure 5, Appendix L, which shows additional water use on Emma Park in the form of stock watering). Water rights for this area are found in Appendix L Tables 1 and 5. The intake location for this water into the mine is located on Plate 6. Disturbed area runoff is collected in a culvert and taken directly into the mine. Andalex controls this water right. If a discharge were to occur from any sediment pond (this has yet to occur), it would discharge into the Deadman Canyon drainage (Plate 21) which is ephemeral.

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- h) County Road 299 starts at highway 6 in Price and terminates at Andalex Resources' minesite (Plate 1).
- i) There are no public parks nor any cultural or historical sites eligible for listing in the National Register in or adjacent to the mine plan area.
- j) There are no cemeteries or burial grounds in or within 100 feet of the permit area.
- k) There is no land which is within the boundaries of any units of the National System of Trails or the Wild and Scenic Rivers System including study rivers.

Cross Sections, Maps, and Plans

Most of the cross sections, maps, and plans of the approved plan remain applicable. Where necessary, original maps have been revised to indicate the addition of the newly acquired lease area and are included in this submittal, primarily in Volume II.

All categories within this section have been addressed. Specifically,

- a) Plates 26, 27, and 28 show all the test borings locations and elevations. Specific information relating to these drill holes and the strata encountered can be found in Appendix E (coal quality, description of other strata). Info regarding roof & floor analyses is in Appendix E.
- b) Monitoring stations for water quality are shown on Figure IV-11. Fish and wildlife monitoring stations were not set up for this application. However, refer to Plate 34 which depicts wildlife distribution. Air quality monitoring was not required for this application. Figure 6 in Appendix L shows proposed monitoring stations. Andalex has adhered to the locations shown on Figure IV-11 which is included in Andalex's operating plan.
- c) Refer to Appendix E for specific drill hole lithologies as well as data on quality and chemical characteristics.
- d) Crop lines and strikes and dips can be found on the coal thickness isopachs in Volume II, Plates 26, 27, 28, and 40.
- e) All old workings in the three coal seams to be mined are shown on Plates 29, 30, and 31. There are no old workings in the Centennial Seam. (plate 41)

- f) All subsurface water on the permit area exists in perched aquifers. The Aberdeen sandstone is the lowest water bearing unit within the permit area and is discussed in this chapter, Geology. The only water well drilled on the property which has been used with any frequency (well #1) has not depicted any seasonal variation. It is always a low producer.
- g) There are no surface waters within the permit area. All drainages (natural) are shown on the topography on Plate 21. All constructed drainages are shown on Plates 6 and 7. There are no irrigation ditches. Appendix L, which is the Hydrologic Inventory, contains Figure 4 which clearly depicts the location of springs in the permit area and adjacent areas. This figure, along with Figures 5 and 6, depict the areal extent of the inventory. See Plate 1 for other spring locations in the adjacent area (Emma Park).
- h) N/A
- i) Plate 6 shows the location of temporary storage for underground development waste and excess spoil which can be stored in an area which was previously used as a sediment pond. Plate 6 now also shows the location of a new area above the Apex Mine which can be used for temporary and permanent storage of coal mine development waste such as sediment pond material. All dams and impoundments are shown on Plates 6 and 7, and detailed on Plates 11, 12, and 13. There are no other water treatment or air pollution control facilities on the permit area.
- j) There are no oil or gas wells within the permit area. Three water wells are shown on Plate 6. Well number 1 is 220 feet deep; number 2 is 100 feet deep, and number 3 is 120 feet deep. Also, there are no oil or gas wells located in the adjacent areas.
- k) Plates 14 and 15 accurately depict the area currently affected by mining as well as the area to be affected. They show the slopes as they exist as well as after construction and upon final reclamation.

R645-301-511.

#### GENERAL REQUIREMENTS

See R645-301-510.

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R645-301-511.100.      PROPOSED      COAL      MINING      AND  
RECLAMATION OPERATIONS

See R645-301-510.

R645-301-511.200.      POTENTIAL      IMPACTS      TO      THE  
ENVIRONMENT

See R645-301-510.

R645-301-511.300.      RECLAMATION

See R645-301-240.

R645-301-512.      CERTIFICATION

See Volume II and R645-301-510.

R645-301-512.100.      CROSS SECTIONS AND MAPS

See R645-301-510.

R645-301-512.110.      MINE WORKINGS TO THE EXTENT KNOWN

Introduction

**Mine Property**

The coal leases owned by Andalex Resources are located in the Deadman Canyon area of the Book Cliffs coal field. The property is located about 10 miles north-northeast of Price, Utah in Carbon County. Mining has progressed onto all of Andalex's federal leases except the AEP Lease which will occur immediately upon approval. As is shown on the enclosed Plate 6, development into all seams involves separate surface facilities which are located adjacent to each other in Deadman. The newly discovered Centennial coal seam which is an isolated pocket of recoverable coal will be accessed from the Pinnacle Mine via rock slopes. There will be three rock slopes constructed each of which will be approximately 500' in length. The three tunnels will be for intake air, return air, and belt line. No waste rock will be removed from the Pinnacle Mine

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either during or after construction. All waste rock will be disposed of underground.

### **Economic Geology**

This project is located in a region where coal mining has historically been the only industry. The main coal-bearing rocks occur in the Blackhawk Formation of the Upper Cretaceous Mesa Verde Group. Several small operations have mined coal in the Deadman Canyon area over the past 70 years. These mines, however, merely scratched the surface of the estimated reserve. There are no other economically recoverable, replenishable or non-replenishable resources within this property.

### **Exploration**

All exploration and drilling programs have been completed. The drilling and exploration activities were supplemented by mine samples and outcrop information, and the results used to estimate the coal reserves of the lease area. Numerous samples were taken from the outcrops of the Lower Sunnyside, Gilson, and Aberdeen seams, as well as from mine faces in the Hileman, Zion's, Star Point, and Blue Flame No. 1 mines. Samples have been taken from the Centennial Seam at 89-1-CP and underground. See appendix E.

A five hole drilling program was conducted by Centennial Coal Associates in 1971. A seven hole drilling program was conducted by Andalex in 1977. These programs were supplemented by two holes drilled west of the property by North American Coal Company in 1948 and one drilled by Pacific, Gas and Electric in 1980. All drill sites are shown on Plates 26, 27, and 28. Refer to Appendix E.

### **Reserves**

By U.S. Geological Survey definition, approximately 30% of the entire reserve is classified as "measured". The remainder is classified as indicated, based on all available measurements.

Total coal reserves in the four seams have been estimated at 50.8 million tons. Recoverable coal has been estimated at 30.5 million tons (9.3 million has been mined to date). Andalex expects an initial recovery rate of about 35 percent and upon final pillar extraction, total recovery is expected to be more than 65 percent. Cover ranges from 0 feet to more than 2,700 feet on the northern end of the property.

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## Underground Operation and Facilities

Mine Layout (Refer to Plates 26, 27, 28 and 29).

### Multiple Seam Considerations

There are four economic seams present on the property. The uppermost seam is the Lower Sunnyside which varies from four to six feet thick. The second highest seam is the Centennial Seam which varies from four to eight feet thick. The third seam is the Gilson Seam which also varies from 4' to 8' thick. The lowermost seam is the Aberdeen which varies from four to thirteen feet in thickness. The bottom two seams are separated by a 200 foot interval which includes a massive sandstone. The Gilson and the Centennial Seams are separated by approximately 130' and the Centennial and Lower Sunnyside Seams are separated by 80' including a massive sandstone. It should be noted that the area in which the Centennial Seam is to be mined does not contain any reserves in either the Lower Sunnyside nor the Gilson Seams. Only the Aberdeen Seam is present where the Centennial Seam is to be mined. The mine plans for each seam are shown on Plates 26, 27, 28 and 29.

### Portals

Portals for the present mining operations in the Aberdeen, Gilson and Lower Sunnyside seams are located in Deadman Canyon as shown on Plate 6. The portal areas consist of a conveyor portal, two air intake portals, and an 88" fan portal.

Portals have been enlarged above the coal seam to facilitate men and equipment at the mine opening. Steel sets have been used to support mine roof in the portal areas. The Aberdeen portals have been constructed in a similar fashion, facilitating air intake, conveyor, and an exhaust fan.

The portals are generally 6' high and 20' wide in the Pinnacle and Aberdeen Mines and 4.5' high in the Apex Mine. The portal mine pads consist of approximately one acre. Located on these pads are the fans, conveyor portals, air intake portals, and mine water storage tanks. It should be noted that the mining of the Centennial Seam did not require new portals on the surface. The Centennial Seam is accessed via rock tunnels from the existing Pinnacle Mine.

### Mains, Submains, and Slopes

A five entry system is being used (two intake portals) and using a continuous miner, the entries are being driven to the property line. Generally, entries on 80 foot centers with crosscuts every 80 feet are being driven on the strike and dip of the coal seam. Development mining for the longwall panels are on 5th entry and 3rd

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entry systems. Refer to Plates 26 through 29. There exists only one return air portal on the surface, however, two exist underground making the five entry system.

### **Shafts and Interconnecting of Slopes**

Mining plans called for rock tunnels to be constructed from the existing Pinnacle Mine up to the Centennial Seam mining area. These rock slopes are each approximately 500' in length. The three tunnels consist of an intake air tunnel, a return air tunnel, and a belt tunnel. Coal is transported via the belt tunnel and transferred on to the existing Pinnacle Mine conveyor belts. These tunnels were constructed in the Spring of 1990 and mining has commenced.

### **Longwall Panels**

The mining sequence calls for the development of panels longwall using 2, 3 and 5 entry systems. These panels will be generally 650 to 800 feet in width and up to 800 feet in length.

### **Barrier Pillars**

A barrier pillar will be left between the bleeders and the longwall panels. A barrier will also be left wherever old mine workings are skirted such as the Olsen Mine on the east side of Deadman Canyon in the Gilson Seam.

### **Bleeder System**

A bleeder system will be maintained and pillars left to provide for ventilation, eventually extending around all mined out areas.

### **Ventilation**

The ventilation plan calls for a fan of sufficient capacity to provide air to each working section to control methane and dust; there has been small amounts only found to date in any of the old works or new faces. The longwall faces will be ventilated with a live brattice system consisting of a line curtains. The conveyor systems will be isolated from intake and return except in 2 entry gate systems when the belt will double as the intake. All ventilation requirements of the Coal Mine Health and Safety Act will be met. This ventilation plan will be strictly adhered to, in order to insure safety of all personnel. Please note that the Centennial Seam mining area is ventilated by the existing Pinnacle Mine fan system. The new left fork fan installation will provide additional required ventilation for the Aberdeen Mine longwall faces.

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## Roof Control

All Andalex Mines operate under an approved M.S.H.A. roof support plan which calls for bolting on five foot centers with a minimum 42" bolt length in our development entries. Roof control in the longwall faces will be accomplished using hydraulic shields. The roof in all four seams is a massive sandstone (60'+) and offers excellent support in itself. The old mine workings which were rehabilitated for the Pinnacle Mine main entries had stood unsupported for 40 years. This roof control plan will be strictly adhered to, in order to insure the safety of all personnel.

## Explosives and Blasting

All blasting performed underground will conform to both state and federal regulations governing explosives and blasting in underground coal mines. The rock tunnels to the Centennial Seam were constructed by professional hard rock mining company.

All surface blasting activities necessary for present operations have been completed in compliance with sections 817.61 through 817.68 of Chapter VIII of Title 30 of the Code of Federal Regulations.

Blasting consisted of portal highwall construction for purposes of stability. A powder magazine has been set up on one of the surface pads, located in a remote area. It is built to conform to all regulations, such as segregation, regarding such a structure (see plate 6). All blasting operations shall be conducted by experienced, trained, and competent persons who understand the hazards involved and who possess a valid certificate as required by Title 30 of the Code of Federal Regulations.

## General Safety Measures

A great emphasis is put on assuring a safe mine operation and the mine and surface facilities will be operated within prudent standards to insure the health and safety of all employees. The facilities will be carefully inspected by company-trained safety engineers and state and federal mine inspectors.

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The operation will abide by Utah State Coal Mine Regulations and the 1969 Federal Coal Mine Health and Safety Act. In addition, these regulations will be supplemented by a company safety policy. Various training programs will be utilized such as the following:

- Methane Measurements
- Roof and Rib Control
- Oxygen Deficiency Testing
- Ventilation
- First Aid
- Mine Rescue
- Mine Electrical Certification
- Self Rescue Training
- Use of Personal Protective Equipment
- Recognition of Electrical Hazards
- General Accident Prevention
- Mine Communications
- Job Safety Training

Many of the training programs will run continuously, such as those involving roof control and ventilation. Other programs are held annually with many oriented toward new employees.

**Mine Development (Refer to Plates 26, 27, 28 and 29).**

#### **Room and Pillar**

Room and pillar design will be employed in fringe areas surrounding the longwall panels as conditions allow.

#### **Pillar Extraction**

Once development in fringe areas is completed, pillar extraction will commence as conditions permit. Final pillar extraction will result in a total recovery rate of approximately 65 percent.

#### **Cycle and Sequence of Mining**

As mining progresses, the following equipment will be added to start up additional mining areas and increase production (currently four units have been employed):

- 4th Mining Unit - January, 1990
- Longwall - August, 1994

As there are four coal seams of minable thickness on the leases, a systematic plan of mining will be followed to assure maximum recovery of the coal reserves. When mining is progressing concurrently in two seams, the room and pillar design and layout will be columnized to assure maximum roof support.

## Underground Equipment

### Production Units

In each mine, the longwall development entry systems, will be mined with a drum-type continuous miner similar to the Joy 12 CM. Presently, Joy 12 CM-11's and 14 CM's are being used in the operation. Coal is transported by shuttle car (Joy) to a loading point consisting of a Long Airdox Feeder Breaker or similar machine, which will discharge onto a 42" panel conveyor or a 42" main conveyor. Roofbolting is and will be accomplished by a Lee Morse Roof Bolter or a similar type machine. The longwall panels will employ a Joy, 4-LS or similar shearer. Coal will be discharged into a pan face conveyor which will carry the coal to a crusher 1 stage loader for transportation by belt conveyor to the surface. Roof support will be by hydraulic shields. Additional production units will be added as previously outlined.

### Belt Conveyors

The feeder breaker or state loader will discharge the coal onto either a 48" panel conveyor or a 42" main conveyor. The conveyor will transport the coal to the outside, where it will be discharged to a live stockpile, (see Plate 6). Currently, Long Airdox conveyor belt drives are being used. For the longwall installations, the same, or similar drives will be employed.

### Water System

Water for mining use, such as for providing face fire protection and dust suppression, will be obtained from Water Well No. 1, shown on Plate 6. Water is also collected from the disturbed area via a system of culverts to underground workings connected to the Pinnacle Mine. This water will be pumped to the Mine Water Storage Tank and from there into the mine using a high pressure pump. Several sumps have been cut in the mine for the purpose of reclaiming water as most available water will be needed. Enough water is currently generated from the formation and coal seam that Andalex currently discharges approximately 50% of the time through approved UPDES point 002.

### Power System and Communication Facilities

A 7200 volt, 3 phase, 60 hertz power distribution system has been taken underground from a 2500 KW substation located on the surface plant area. The primary feed into the substation is 46,000 volts from the Utah Power and Light Company transmission system located approximately 6 miles south, adjacent to the airport. This 46 KV line taps Utah Power and Light's Helper - Columbia 46 KV line, at structure #89. The powerline was designed according to Utah Power and Light's specifications. After approval by Utah Power and

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light, it was installed by a private local contractor at the expense of Andalex Resources. Within the minesite area, the power is reduced to 7200 volts for the primary underground usage. This is fracture reduced up to 2300 to 6000, 480 and 240 volts for equipment operation. Surface power is on a 480 volt system. Electrical Specifications for the Deadman Canyon Mine Substation are included as Appendix I.

A 25-pair telephone communications cable is buried along the existing Deadman Canyon road, with its origin at Carbon County Airport approximately 7.5 miles from the minesite. Currently, 13 pairs are in use with additional capacity to add as the mine facilities expand. This cable was designed, supplied and installed by Mountain Bell Telephone at the expense of Andalex Resources. Mountain Bell is responsible for maintenance

The mine permit area has no utilities or services through it other than those which are accurately depicted on Plate 6. All utilities have been constructed under the close scrutiny of the Utah DWR and the U.S. Fish and Wildlife Service.

#### **Other Equipment**

Other equipment being utilized includes mantrips, rock dusters, tractors, rubber tired scoops, power cables, communication equipment, and miscellaneous section tools. The mine is also equipped with emergency tools and necessary supplies in the unlikely event that a fire or explosion should occur, in accordance with M.S.H.A. regulations.

#### **Surface Equipment**

Surface equipment includes a Cat 980-B front-end loader. Also, there is a grader for road maintenance. Other equipment such as diesel scoops and tractors will be utilized on the surface from time to time for material haulage. There are two bulk rock dust silos on the surface.

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## Employment

Andalex Resources is an Equal Employment Opportunity Employer. The type of hourly employees to be hired are highly skilled personnel, including miner operators, shuttle car operators, roof bolters, mechanics, and electricians. All hourly employees will be properly trained and certified where necessary in accordance with M.S.H.A. regulations. Currently, Andalex Resources' employs 75 hourly wage earners. Employment at the mine will not change significantly with the installation of the longwall. The Pinnacle Andalex's Mines, are located in Carbon County near the town of Price. Since this area is supported to a large degree by coal mining and other related industries, it is anticipated that a labor force will always be readily available.

Management and other salaried employees will consist of the Manager of Mines, the General Superintendent, the Mine Superintendents, the Mine Foremen, Safety Personnel, Secretarial and Clerical, Geologists, and Engineers (see Table IV-1).

## Schedule of Development and Mining

There are four economic seams present on the property; mining plans are based on simultaneously developing longwall panels in 3 of the 4 seams. The incremental increases listed below represent the first eight years of production (from 1982):

<u>Year</u>	<u>Production Rate Tons/Year</u>
1st year (1982)	700,000
2nd year (1983)	350,000
3rd year (1984)	300,000
4th year (1985)	650,000
5th year (1986)	700,000
6th year (1987)	400,000
7th year (1988)	700,000
8th year (1989)	1,100,000

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Mining progression for the life of the mine is shown on Plates 26, 27, 28, and 29, and will increase from 1,100,000 tpy current to 1.5 mm tpy by 1995 and will stay at this rate until mining is completed making a mine life of approximately 15-20 years.

	<u>Estimated</u> <u>Year</u> <u>Production</u>	<u>Recoverable Tons</u> <u>Remaining</u>
1993	1,200,000	21.2 million
1994	1,200,000	20.0
1995	1,500,000	18.5
1996	1,500,000	17.0
1997	2,000,000	15.5
Duration	2,000,000	10 years

To date, Andalex has mined approximately 20% of its Lower Sunnyside Reserve, 80% of its Gilson Reserve, 5% of its Aberdeen Reserve and 20% of its Centennial Reserve (The Centennial Reserve consisted originally of approximately 2.5 million recoverable tons).

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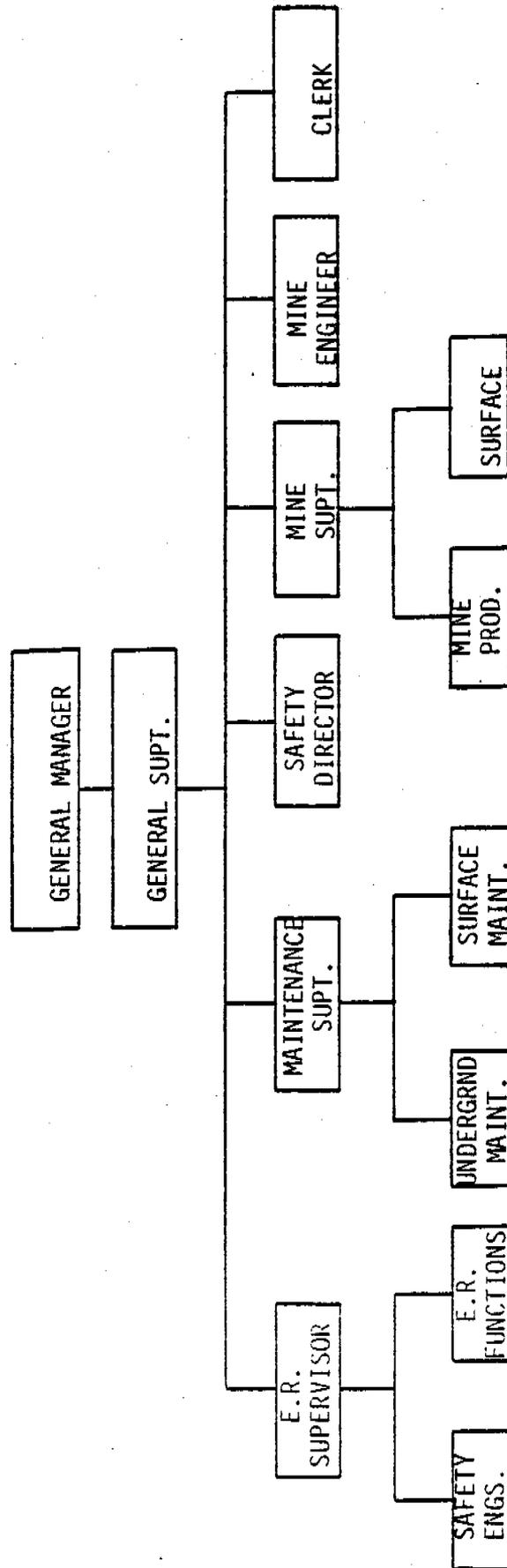


TABLE IV-1

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## Support Structures and Buildings

Support structures and buildings are shown on Plates 6 and 7.

## Parking Areas

Parking areas have been covered with gravel and magnesium chloride and will be maintained. These are shown on Plate 6. The main office parking area is paved.

## Storage Areas

There are several storage areas at the site. These include the Material Storage Area No. 1, Raw Coal Pile Area, Material Storage Area No. 2, and the Topsoil Storage Area. All areas are shown on Plate 6.

## Water Supply

Water for use in the mine is described. Water for culinary use is hauled in approved water haulers from Price City. There is a sump cut in the mine from which water can be reclaimed as all available water will be needed. Since all mining is down dip from the portals, little water will exit from the mine. Information concerning the wells and water analysis is presented as Appendix L.

## Landscaping

All disturbed areas have been graded to the most moderate slope possible to assure stability. Vegetative cover has been promptly re-established to stabilize erosion. Revegetation was accomplished by Andalex under the recommendations of the U.S. Department of Agriculture, Soil Conservation Service and the Division of Oil, Gas, and Mining.

## Signs, Markers, Fences, and Gates

Signs of a uniform design, showing the company name, business address, and telephone number as well as the identification number of the current regulatory program permit authorizing the underground mining activities, have been placed at all access points to the permit area. These signs have been placed to be easily seen, are made of a durable material, and conform to local laws and regulations. The topsoil storage area is clearly marked.

As this is an underground mine, there will be no blasting conducted on the surface with the exception of highwall construction. When blasting for highwall construction does occur, conspicuous signs and flagging will be posted as required by 30 CFR Parts 817.11 (f) and 817.65 (e).

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As the Left Hand Fork is classified as a intermittent drainage, stream buffer zone markers will be placed within 100 feet of the drainage disallowing access except for the disturbed site.

As there are no perennial streams or a stream with a biological community on the permit area, buffer zone markers will not be necessary. The perimeters of all areas affected by surface operations and facilities are clearly marked. These signs and markers shall be maintained during all activities and retained and maintained until after the release of all bonds for the permit area.

## **R645-301-512.120. SURFACE FACILITIES AND OPERATIONS**

See Volume II.

Support structures and buildings are shown on Plates 6 and 7 and LF-1.

### **Parking Areas**

Parking areas have been covered with gravel and magnesium chloride and will be maintained. These are shown on Plate 6. The main office parking area is paved.

### **Storage Areas**

There are several storage areas at the site. These include the Material Storage Area No. 1, Raw Coal Pile Area, Material Storage Area No. 2, and the Topsoil Storage Area. All areas are shown on Plate 6.

## **R645-301-512.130. SURFACE CONFIGURATIONS**

See Volume II, Plates 6 and 7.

## **R645-301-512.140. HYDROLOGY**

### **Introduction**

Water quality monitoring stations will be set up at the wells as shown on Figure IV-11, and also at the sedimentation pond discharge structures.

### **Sewage System**

The nature of the overburden in the area offers excellent drainage. As a result, a septic system with drain fields conforming to the state codes has been established to handle the waste water disposal

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from the bathhouse and office facilities. The drain fields are located in native material (valley fill) east of the bath houses in the parking area. Enclosed as Appendix G are the two septic system plans as designed by a Utah Registered Professional Engineer and approved by the State of Utah Department of Health.

#### **Water Treatment**

Based on the State of Utah, Department of Health review of the septic systems, water treatment is not needed. (Personal communication, Mr. Gerald Story, Utah Department of Health, Price, Utah).

#### **Drainage Control - Diversions, etc.**

The drainage control plan is presented in this Chapter.

#### **Sediment Control**

The sedimentation plan is presented in this Chapter.

### **R645-301-512.150. GEOLOGIC CROSS SECTIONS AND MAPS**

#### **Introduction**

The proposed permit area is in Book Cliffs which is the major physiographic feature in the region. The cliffs rise from a base at approximately 5,500 feet in elevation, to over 8,500 feet. Numerous canyons dissect the Book Cliffs. Soldier Creek and Coal Creek are the major area drainages. The permit area exhibits extreme topographic relief and is mountainous with steep cliffs and deeply incised drainages. With the exception of the Mancos Shale Formation, the Fiasco, Deadman, Straight Canyons, Hoffman Creek Canyon, Graves Lease and AEP Lease exhibit similar stratigraphic and topographic characteristics.

#### **Tectonic Setting**

The major coal seams of the Book Cliffs Coal Field lie within the Cretaceous Mesa Verde group which overlies the thick shales of the Cretaceous Mancos formation. The Mesa Verde group consists of the Star Point Sandstone, Blackhawk formation and Price River formation. The major coal seams lie within the Blackhawk formation.

The Tertiary Wasatch and Green River formations, along with the Price River formation, form the Roan Cliffs, the Tavaputs Plateau and the southern rim of the Uintah Basin. Lithologies present include fluvial, deltaic, and marine sandstones, mudstones, and shales.

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## Geologic History

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

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

Unconformities and thinning of various members indicate that volcanic activity to the west caused sediments to fill the basin faster than it could subside, causing the shoreline to be pushed eastward. When lulls in this activity developed, the incoming sediments diminished and the sea moved westward once more. With each pulse, the boundaries of the depositional environments moved eastward and then returned westward. The sandstone tongues of the Mesa Verde, which project into the Mancos, were deposited at these times.

After the sea retreated, the area continued to receive sediments under continental conditions which lasted well into Eocene time. In Oligocene time, the area began to rise in earnest. Erosion attacked the newly formed formation creating the present mountain ranges and cliffs.

## Stratigraphy

The main coal bearing beds in the region occur in the Blackhawk formation. There are various more or less distinct coal beds or zones as listed below from top to bottom according to stratigraphic position.

Upper Sunnyside Bed  
Lower Sunnyside Bed  
Centennial Bed  
Rock Canyon Bed  
Fishcreek Bed  
Gilson Bed  
Kenilworth Bed  
Castlegate "B" Bed  
  
Castlegate "A" Bed

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These zones are lenticular and reach minable thickness only in certain areas. The Lower Sunnyside Bed is the major bed in the area.

### Structure

The Book Cliffs are basically a homocline (dip slope) dipping into the Uintah Basin with the cliff front roughly paralleling the strike of the feature. The strike of the beds is generally parallel to the face of the Book Cliffs. The beds are mostly uniform with dips of from 3° to 8° to the north and northeast toward the Uintah Basin.

Occasional faults cut the coal measures but are of small displacement and have been of little consequence in mining. The most serious group of faults lies in the Sunnyside area. These faults, which have a maximum separation of 200 feet, effect mining, but, fortunately, are not closely spaced.

### History of Mining

Mining has been the major industry in the region for many years.

Coal was discovered in the Wasatch Plateau in 1874 and exploration soon spread to the Book Cliffs. Mines began operating in the area in 1889. The Castlegate and Sunnyside area was first developed, the areas in between being developed later. Coal was usually discovered away from settled areas and towns were built for employees by the companies.

Production from mines generally increased until 1920, but began to decline in the 1920's and 1930's. World War II brought production back to the 1920 levels and production continued to increase until 1957 when production again declined.

Book Cliff mines to present have produced about 75 percent of Utah's coal annually. Well over 200 million tons of coal have been extracted from the coal measures of the area. Much coal remains and numerous mines are presently operating in the area.

### Geologic Hazard

There are occasional faults cutting the coal measures of the area. They are of relatively small displacement. The most serious faults occur in the Sunnyside area. There is no indication of faulting within our lease area.

Faults in the Sunnyside district of the Book Cliffs field have been thought, by some, to have a causative relationship to the bounces experienced there. The outcrops on the lease premises and our own aerial photos have been carefully studied. In our judgement, no faults cut the lease area. The bulk of the tonnage to be mined

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is under less than 1,500 feet of cover, with only a very limited amount of coal under cover, up to 2,700 feet. Water inflows have never been a problem in the Book Cliffs field. The dip of the coal measures prevents entrapment of personnel, in any event.

### Stratigraphy

The coal seams in the Blackhawk formation are listed stratigraphically:

- Upper Sunnyside Bed
- Lower Sunnyside Bed
- Centennial Bed
- Rock Canyon Bed
- Fishcreek Bed
- Gilson Bed
- Kenilworth Bed
- Castlegate "B" Bed
- Castlegate "A" Bed (Aberdeen)

Only the Lower Sunnyside, Centennial, Gilson, and Castlegate "A" beds are formed in commercial thickness on the Centennial Property. Andalex has discovered a new coal seam which is referred to as the Centennial Seam. This coal was originally thought to have been in the Lower Sunnyside Seam. This coal has been accessed through rock tunnels from the existing Pinnacle Mine. Waste from these rock tunnels was disposed of in the Pinnacle Mine. The Mine in the Centennial Seam as well as the Mine in the Aberdeen Seam will both progress onto the Graves Lease. Andalex is applying for approval for the new AEP Lease in the Centennial and Aberdeen Seams only. Stratigraphic sections of the coal beds are shown in Figures III-1, III-2, and III-3. Seam thicknesses are shown on Plates 26, 27, 28, and 29.

### Structure

The structure between Deadman and Soldier Canyons is relatively simple. Structure contours are aligned basically east-west. The coal beds dip northward at approximately six degrees. No faults are thought to exist in the Deadman Canyon area.

### History of Mining

Several small operations have mined a considerable amount of coal over the past 70 years in the Deadman Canyon Area. Mining ceased in the area in 1964. These mines, however, merely scratched the surface of the reserve. The remaining recoverable reserve is estimated to be greater than twenty-eight million tons and ranging in cover from 0 to 2,700 feet.

## Identification of Strata

Strata disturbed by surface operations consist of sandstone and siltstone of a colluvial nature.

## Design of Boring and Sampling Program

Sites - Numbers, Location and Relationship to the Disturbed Area

The number, locations, and relationship of drill holes and sampling are indicated on Plates 26, 27, and 28.

Methodology - Sample Collection, Compositing of Samples for Each Strata, Laboratory Analyses

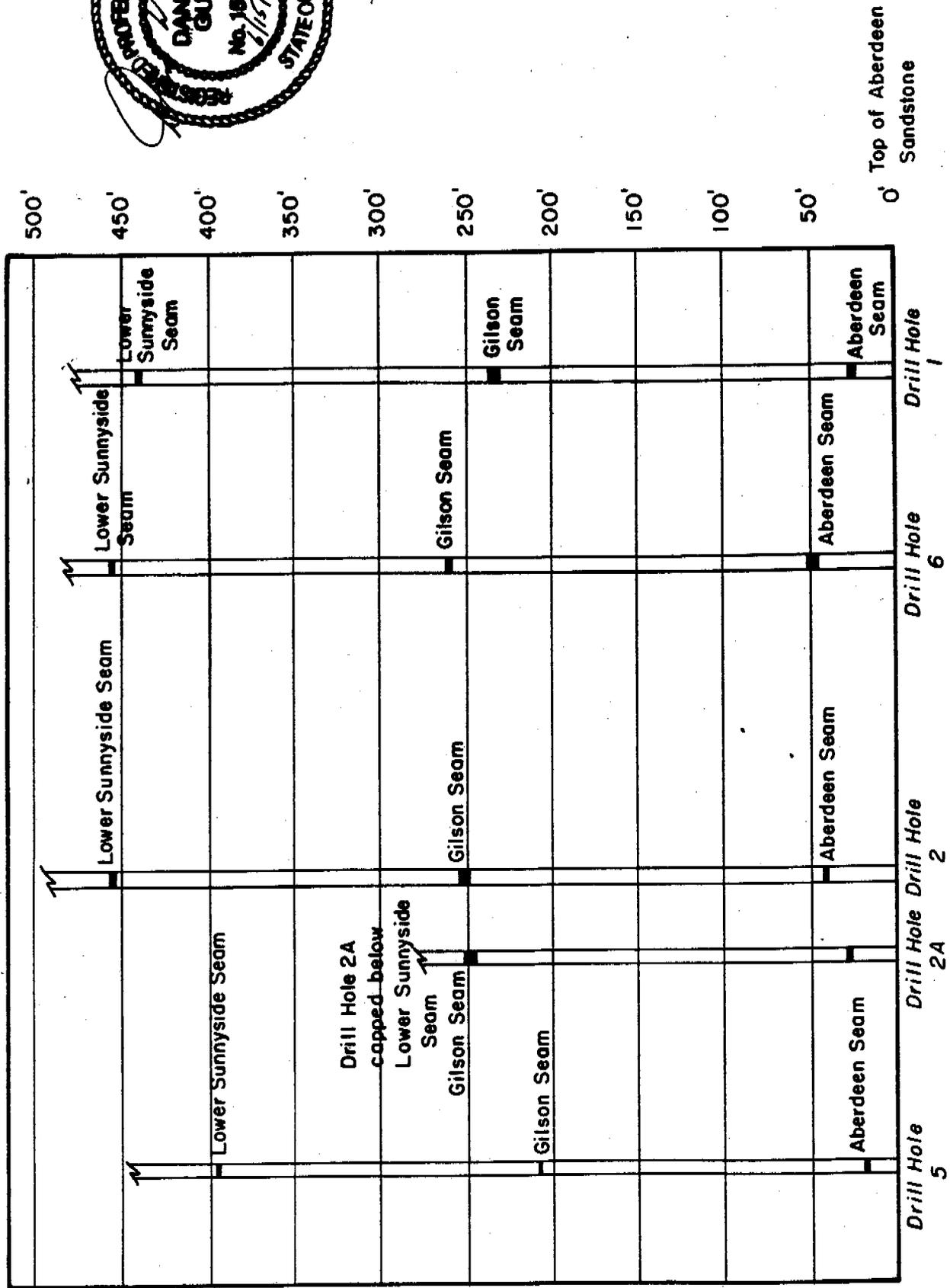
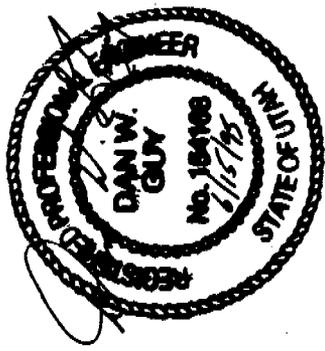
Samples of the immediate floor and roof below and above each seam were sampled using conventional core drilling equipment. Also, samples of the overburden which was disturbed in surface operation has been sampled by "grab" methods, as well as auger drilling.

## Data

Field Log and Description of Samples - Lithologic Classification, Description, and Hydrologic Aspects

In November and December, 1971, a five-hole drilling program was conducted by Centennial Coal Associates, supplemented by mine samples and outcrop information, and the results used to estimate the coal reserves of the leases. Pertinent information on these drill holes is given in Table III-1 and Appendix E. Complete lithologic logs of each drill hole are included in Appendix E. Numerous samples were taken from the outcrops of the Lower Sunnyside, Gilson, and Aberdeen seams, as well as from mine faces in the Hileman, Olsen, Star Point, and Blue Flame No. 1 mines. Information from those samples as well as the location of the drill holes is shown on Plates 26, 27, and 28.

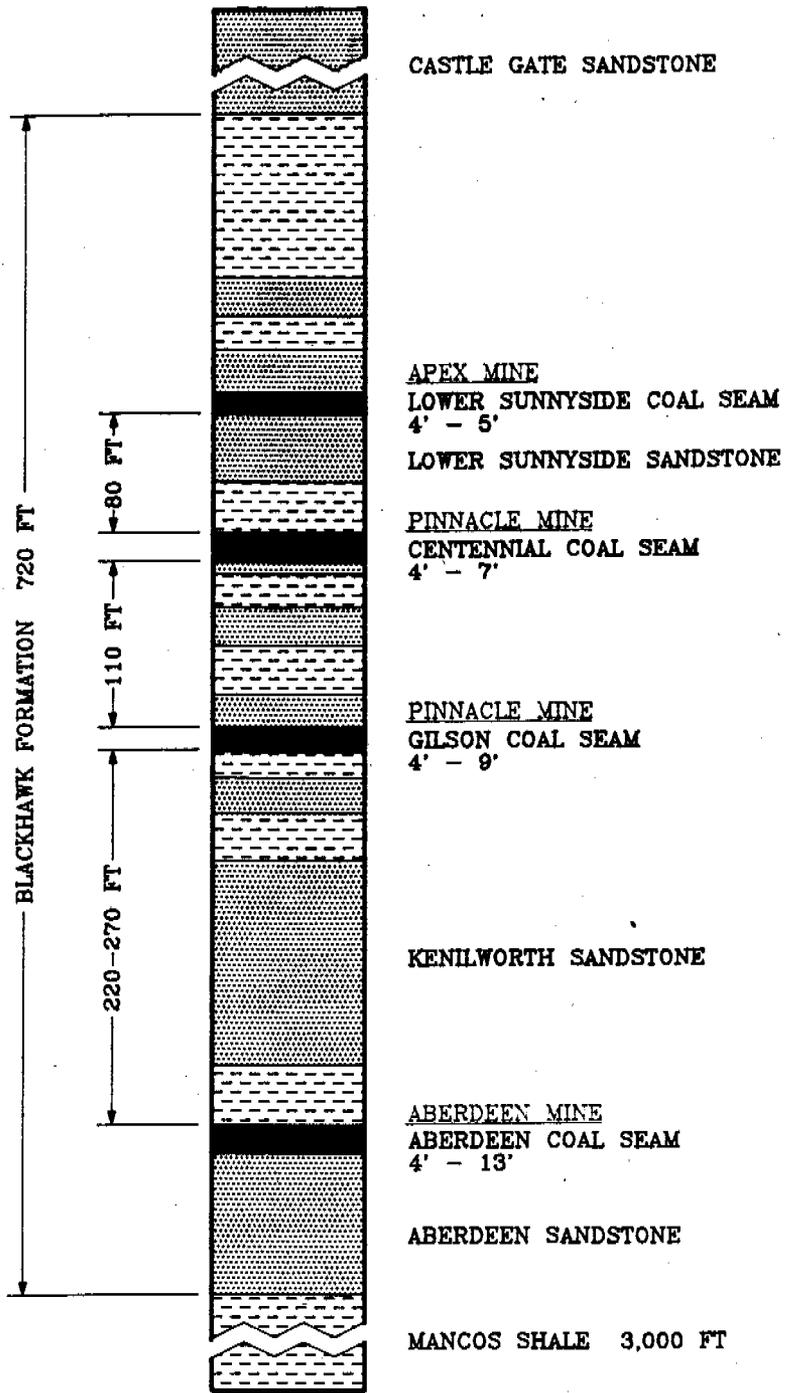
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Stratigraphic Sections  
Figure III-1

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CENTENNIAL PROJECT  
DEADMAN CANYON



GENERALIZED SECTION, BLACKHAWK FORMATION  
NOT TO SCALE

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GENERALIZED SECTION

ACAD REFERENCE PLATES

In October and November, 1977, a seven-hole drilling program was conducted by Andalex in order to better define the coal reserves for mine planning on the Zion's fee. Pertinent information on these drill holes is presented in Table III-2. Complete lithologic logs of each drill hole are included in Appendix E. Locations are indicated on Plates 26, 27, and 28. Andalex drilled six holes underground and one on the surface in the summer of 1989 (Drill hole numbers 89-1-AP, 89-2-AP, 89-3-AP, 89-1-PIN, 89-2-PIN, 89-3-PIN, 89-1-CP). These holes were primarily to substantiate the existence of the new Centennial Seam.

Andalex has also acquired lithologic logs of two drill holes completed by North American Coal Corp., in 1948 and one by Pacific Gas & Electric in 1980. Although these holes are not located within the permit area, but to the west and east of its boundary, the information has been utilized in estimating reserves. Pertinent information is given in Table III-3. Complete lithologic logs are included in Appendix E and their location is indicated on Plates 26, 27, 28, and 29.

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TABLE III-2  
Andalex Drill Holes

<u>Number</u>	<u>Location</u>	<u>Total Depth</u>	<u>Coal Seams</u>
77-1-CP	NE1/4 SE1/4 SW1/4 Sec. 7 T13S, R11E, SLBM Elevation - 7,555 ft.	675 ft.	Gilson Aberdeen
77-2-CP	SE1/4 NE1/4 SW1/4 Sec. 7 T13S, R11E, SLBM Elevation - 7,520 ft.	690 ft.	Gilson Aberdeen
77-3-CP	SE1/4 SE1/4 NW1/4 Sec. 7 T13S, R11E, SLBM Elevation - 7,425 ft.	868 ft.	Lower Sunnyside Gilson Aberdeen
77-4-CP	SE1/4 SE1/4 SW1/4 Sec. 7 T13S, R11E, SLBM Elevation - 7,070 ft.	105 ft.	Aberdeen
77-5-CP	SE1/4 SE1/4 SW1/4 Sec. 7 T13S, R11E, SLBM Elevation - 7,085 ft.	85 ft.	Aberdeen
77-6-CP	NE1/4 NE1/4 NW1/4 Sec. 18 T13S, R11E, SLBM Elevation - 7,080 ft.	80 ft.	Aberdeen
77-7-CP	NE1/4 NE1/4 NW1/4 Sec. 18 T13S, R11E, SLBM Elevation - 7,010 ft.	45 ft.	Aberdeen
89-1-AP	SW1/4 SE1/4 NW1/4 Sec. 7 T13S, R11E, SLBM Elevation - 7,239 ft.	460 ft.	Centennial Aberdeen
89-2-AP	NE1/4 NW1/4 SW1/4 Sec. 7 T13S, R11E, SLBM Elevation - 7,283 ft.	90 ft.	Centennial
89-3-AP	SW1/4 SE1/4 NW1/4 Sec. 7 T13S, R11E, SLBM Elevation - 7,169 ft.	90 ft.	Centennial
89-4-PIN	SE1/4 NE1/4 SE1/4 Sec. 8 T13S, R11E, SLBM Elevation - 6,951 ft.	260 ft.	Aberdeen

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Table III-2 (Continued)

<u>Number</u>	<u>Location</u>	<u>Total Depth</u>	<u>Coal Seams</u>
89-2-PIN	SW1/4 NW1/4 SW1/4 Sec. 8 T13S, R11E, SLBM Elevation - 7,014	250 ft.	Aberdeen
89-3-PIN	NW1/4 SE1/4 SW1/4 Sec. 7 T13S, R11E, SLBM Elevation - 7,483 ft.	240 ft.	Aberdeen
89-1-CP	SE1/4 SE1/4 SW1/4 Sec. 6 T13S, R11E, SLBM Elevation - 8,307 ft.	1,880 ft.	Centennial Aberdeen

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TABLE III-3

North American Drill Holes

<u>Number</u>	<u>Location</u>	<u>Total Depth</u>	<u>Coal Seams</u>
DH-NACC-6	SE1/4 SE1/4 SE1/4 Sec. 1 T13S, R10E, SLBM Elevation - 7,460 ft.	Approx. 1,020 ft.	Centennial Gilson Aberdeen
DH-NACC-7	SW1/4 NE1/4 SE1/4 Sec. 12 T13S, R10E, SLBM Elevation - 7,192 ft.		Gilson Aberdeen

Pacific Gas and Electric Drill Hole

<u>Number</u>	<u>Location</u>	<u>Total Depth</u>	<u>Coal Seams</u>
CC9-1	NW1/4 NW1/4 NW1/4 Sec. 9 T13S, R11E, SLBM Elevation - 7,225 ft.	Approx. 930 ft.	Lower Sunnyside Gilson Aberdeen

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Laboratory Analyses - Chemical Acidity, Toxicity, Alkalinity, and Physical (Erodibility and Compaction) Properties

Complete laboratory analysis is included in Appendix E. Appendix E has been updated to include coal quality information pertaining to the Centennial Seam.

Identification of Potential Acid, Toxic or Alkaline Producing Horizons

Refer to Appendix E for the laboratory analyses. Andalex has committed to sampling roof and floor material in all four coal seams in the most recently mine areas. This material will be analyzed for identification of Potential Acid, Toxic or Alkaline Producing Horizons. As this material is collected it will be placed into Appendix E with the rest of the laboratory data.

Location of Subsurface Water at Face-Up Areas

No water was encountered at face-up areas.

Stratigraphy

There are four coal seams of minable thickness in the mine plan area. All four are part of the Blackhawk Formation of the Cretaceous Mesa Verde Group. The Blackhawk consists of three members. Stratigraphically, from bottom to top, they are the Aberdeen Member, the Kenilworth Member, and the Sunnyside Member (see Figure III-2).

The bottom coal seam is the Aberdeen (also known as the Castlegate "A" Seam). It is found in the Aberdeen Member of the Blackhawk. This coal seam rests directly on approximately 150 feet of basal sandstone. This sandstone is of littoral marine origin and is known as the Aberdeen Sandstone. The coal seam ranges from 4 feet to 13 feet in thickness over the property. Above the seam is approximately 90 feet of interbedded sandstone, siltstone, and carbonaceous shale containing coal riders.

The second seam is the Gilson Seam and ranges in thickness from 4 feet to 8 feet over the property. The Gilson is part of the Kenilworth Member of the Blackhawk. Directly below the Gilson is approximately 90 feet of interbedded sandstone, siltstone, and carbonaceous shale with coal riders. Below this is approximately 70 feet of barrier beach sandstone known as the Kenilworth Sandstone. Above the Gilson is approximately 100 feet of interbedded sandstone, siltstone, shale, and coal riders.

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The third seam is the Centennial Seam ranging from 4' to 8' in thickness. The Centennial Seam is part of the Sunnyside member of the Blackhawk. The Centennial Seam lies approximately 40' below the Lower Sunnyside Sandstone. Below the Centennial Seam is approximately 130' of interbedded sandstone, siltstone, shale, and coal riders.

The top seam is the Lower Sunnyside Seam, ranging from 4 feet to 5 feet in thickness. The Lower Sunnyside is part of the Sunnyside Member of the Blackhawk. Below the coal seam is approximately 50 feet of barrier beach sandstone known as the Lower Sunnyside Sandstone. Above the coal seam is about 250 feet of interbedded sandstone, siltstone, shale, and coal riders.

Above the Blackhawk, the Castlegate Sandstone and Price River Formation of the Mesa Verde Group can be found over various parts of the property. The North Horn Formation is also present in certain areas of the property. Total overburden on the mine plan area ranges from 0 to 2,700 feet.

There are unleased federally owned coal reserves adjacent to the permit area. Andalex has assumed ownership on part of this coal contained in the Graves Tract which is now a part of this MRP. Andalex will access this lease from the existing underground workings as has been done in the past when Andalex has added new leases. In addition to the Graves Tract there is still some unleased federal adjacent to the Centennial property which is of questionable value. The Centennial coal seam is accessed from the existing Pinnacle Mine which is in the Gilson Seam. It is accessed via rock tunnels which are approximately 500' in length. The Centennial and Aberdeen Seams on the AEP Lease will be accessed through an extension of existing underground workings.

The Aberdeen sandstone in our vicinity is 80 to 100 feet thick. Its lateral extent is from Castlegate to well east of the Centennial property. It is a very well known geologic marker in the Book Cliffs coal field. It is a medium grained, tightly cemented, cross bedded sandstone which contains very little or no water. It has been drilled into in every exploration hole in our leases. All other aquifers or water tables within our leases are perched.

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## Structure

Structure contours are aligned basically east-west. The coal beds dip northward at approximately six degrees. No faults are known to exist in the mine plan area. Overburden ranges from 0 to 2,700 feet.

## Hydrologic Aspects

All groundwater exists as perched aquifers in the mine plan area. Due to the lenticular nature of the geology in the area, any groundwater is isolated and very limited. Please see Water Quality Data in Appendix L. Also, please note that the Sunedco property recently acquired by Andalex was included in the Vaughn Hansen/Andalex Hydrologic Inventory prepared for the original PAP and the emergency lease (please see Appendix L). Also included in Appendix L are the Graves and AEP PHC's.

The occurrence the Division has referred to where Andalex intercepted groundwater was actually not groundwater per se but water which had accumulated in old mine workings over a number of years (45 to 50 years). This was a one time occurrence. Water accumulates in small burned out voids because they are down dip from the burned outcrop. Andalex uses the practice of advanced drilling to avoid these areas. This is the only water which has been or will be encountered as the Andalex permit area is free from faulting or any other means of water conveyance.

## Location of Subsurface Water

Some of the sandstone beds of the Blackhawk Formation are water bearing in the mine plan area. Most of the beds are dry however, and partially drained of water near the cliff faces. Groundwater is perched due to the lenticular geology and any groundwater is isolated. The geology and specifically the lenticular nature of the beds on the new AEP lease are the same as what has been described in the original permit area. Also, any water bearing units are small in areal extent. The lowermost aquifer known in this area is the Aberdeen Sandstone, which is monitored below the lowermost coal seam. The newly acquired AEP Lease is included in the Andalex Hydrologic Inventory.

## Source of Data

Analysis was performed on rib samples and core samples obtained during the exploration activities described. Results of these analyses are listed according to seam in Appendix E.

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Analysis was performed by: Commercial Testing and Engineering Company, 10775 East 51st Avenue, Denver, Colorado 80239, and other commercial testing laboratories.

### Coal Seams

#### Total Sulfur Content

Please see Appendix E.

#### Other Characteristics

Please see Appendix E.

#### Stratum Immediately Overlying each Coal Seam to be Mined

#### Lithology (See Figures III-2 and III-3).

Aberdeen Coal Seam (Castlegate "A") - overlying this seam is interbedded sandstone, siltstone, and carbonaceous shales of the Aberdeen Member of the Blackhawk.

Gilson Coal Seam - overlying this seam is interbedded sandstone, siltstone, and shale with coal riders of the Kenilworth Member of the Blackhawk.

Centennial Coal Seam - overlying is interbedded sandstone, siltstone, and shale, and coal riders of the Sunnyside Member of the Blackhawk.

Lower Sunnyside Seam - overlying this seam is interbedded sandstone, siltstone, shale and coal riders of the Sunnyside Member of the Blackhawk.

It should be noted however, that the immediate "roof" over each seam is a sandstone unit, over which is found the silts, shales, and various coal riders.

#### Pyritic Content (Laboratory Analyses)

Complete analyses of these strata are included in Appendix E.

#### Potential Alkalinity (Laboratory Analyses)

Complete analyses of these strata are included in Appendix E.

Stratum Immediately Underlying Each Coal Seam to be Mined

**Lithology (See Figure III-2 and III-3).**

Aberdeen (Castlegate "A" Seam) - underlying this seam is basal sandstone of littoral marine sandstone, the Aberdeen Sandstone of the Aberdeen Member.

Gilson Seam - underlying this seam is interbedded sandstone, siltstone, shale, and coal riders of the Kenilworth Member.

Centennial Seam - underlying this seam is interbedded sandstone, siltstone, and shale, and coal riders of the Kenilworth Member.

Lower Sunnyside Seam - underlying this seam is barrier beach sandstone, the Lower Sunnyside Sandstone of the Sunnyside Member.

It should be noted however, that the immediate "floor" below the seams is sandstone in the case of the Lower Sunnyside and Aberdeen; and beneath the Gilson, and Centennial, siltstone.

**Pyritic Content (Laboratory Analyses)**

Complete analyses of these strata are included in Appendix E.

**Potential Alkalinity (Laboratory Analyses)**

Complete analyses of these strata are included in Appendix E.

**Clay Content (Laboratory Analyses)**

Complete analyses of these strata are included in Appendix E.

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R645-301-512.200. PLANS AND ENGINEERING DESIGNS

Existing Structures

All existing structures are situated on the Zion's fee land, on federal lease SL-027304, or on right-of-way UTU-62045 and are shown on Plate 6. There are no structures existing as part as Andalex's facility which were constructed prior to 1980. Originally it was anticipated that all buildings and structures were to be completed during the first five year permit term. Obviously this is not the case since the Aberdeen Mine has only recently been completely finished to this date. Plate 6 depicts the Aberdeen Mine with the surface facilities completed in early 1990. A new fan for the Aberdeen Mine will be constructed in the left fork of Deadman Canyon. Underground rock tunnels access the Centennial Seam. See 1.1, 2.1-1, 2.1-4.

Existing structures include the following:

Bathhouse (3)	14' x 60'
Mine Water Storage Tanks (3)	12' x 16'
Warehouse (1)	14' x 60'
Lamphouse (2)	40' x 40'
Main Substation	60' x 100'
Office Building	28' x 60'
Mine Fans (4)	88"
Portals (15)	6' x 20'
Culinary Water Tanks (3)	12' x 10'
Shop	80' x 120'

The Aberdeen Mine surface facilities will include one additional bathhouse, and one lamphouse.

Upon completion of mining activities, the portals will be sealed according to existing state and federal regulations and all buildings and structures not being utilized as part of the reclamation sequence, will be removed.

Construction Schedule

All of the above structures have been completed. The earthwork for the Aberdeen Mine was completed in 1989. The surface facilities were in early 1990. Construction has been located and carried out so as to prevent and control erosion, siltation, water pollution, and damage to property. All facilities have been designed and constructed and will be maintained and used in a manner which prevents damage to wildlife and related environmental values. Any future construction will be conducted in a similar manner according

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to regulations regarding protection of the hydrologic system, etc. The rock tunnels for the Centennial Seam development were constructed in the spring of 1990 and completed late in 1990. As previously discussed this mining will require no new surface facilities except the left fork fan installation (1994). It should be noted that no construction activities will occur within one-half mile of the Golden Eagle nest located in the left hand fork during the nesting season, February 15 through July 15, if it is determined that the nest is active. Also, to minimize disturbance to wintering elk and deer there shall be no construction activities from December 1 through April 15. Except for snow removal, all routine maintenance will be accomplished from inside the mine.

Upon completion of construction of the left hand fork fan installation, Andalex will perform a slope stability study to ensure that all road embankments of a minimum static safety factor of 1.3. This study will also determine that the cut and fill slopes of the pad have a minimum static safety factor of 1.3. It should be noted that the construction of the pad will be consistent with common construction practices including limiting the thickness of lifts to a maximum of four (4) feet.

Reclamation of the pad, which is shown on the Cut Fill Cross Section Plates, will occur immediately after cessation of mining. Reclamation will consist of culvert removal with appropriate drainage protection, and regrading and backfilling to the original contour. Recontouring of the access road will take place following cessation of mining activities. As this road has been in place for many years sufficient fill material may not be available for complete recontouring; however, every effort will be made to achieve the approximate original contour. This will be followed by replacement of topsoil and permanent revegetation. At all times during reclamation appropriate sediment control such as straw dikes and silt fences will be employed to prevent additional sediment contributions to the drainage system.

### Construction Methods

#### **Major Equipment**

The portal and building sites were leveled using dozers, trucks, and loaders. At the building sites, the topsoil was removed and transported to a nearby area for storage.

All surface pads have been graveled and all other disturbed areas (pond embankments, etc.) have been reseeded.

R645-301-512.210.  
N/A

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R645-301-512.220. DURABLE ROCK FILLS

N/A

R645-301-512.230. COAL MINE WASTE

There has been no development waste or excess spoil to date excepting sedimentation pond material. In the event sediment pond material were to catch fire, it would be compacted. MSHA and the Division have approved the disposal of sediment pond material (coal mine wash) underground. Therefore, inspections are not required.

Coal Processing Waste

N/A - Text removed as directed in Technical Analysis Requirements.

Coal Refuse

Please refer to Plate 6 for location of disposal areas.

R645-301-512.240. IMPOUNDMENTS

Three sedimentation ponds have been constructed so far as shown on Plate 6. Pond A, as its capacity was not required, is now being used for snow storage and topsoil storage. The sedimentation and drainage control plan has been designed according to OSM regulations and the design and construction certified by a Utah Registered Professional Engineer. No other embankments, or other impoundments have been built nor are any proposed.

General Description

The Andalex Deadman Canyon Project is comprised of three mines located closely together in Deadman Canyon. The Pinnacle Mine, Apex Mine, and the Aberdeen Mine are all presently in operation mining the Gilson and Lower Sunnyside Seams and the A Seam. The Centennial Seam is mined via rock tunnels from the existing Pinnacle Mine. Surface runoff from the Pinnacle Mine and Apex Mine is controlled by Settling Basin B and Pond C. Engineering Design for these ponds have been presented to the Division of Oil, Gas, and Mining on 4-3-80 and 8-21-81. Surface runoff from the Aberdeen Mine is controlled by Pond E. Designs for these basins and ponds are shown on Plates 11, 12, and 13 included herein.

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The mines are located in the Right Fork of Deadman Canyon. This is an ephemeral drainage flowing only from direct runoff and eventually reaches the Price River some 12 miles to the south. The major drainages in the minesite area will be routed under the site through large culverts. The existing minesite has a disturbed area of 34.2 acres. Please note that a certain percentage of the disturbed area does not report to sedimentation ponds. Please refer to Plates 7 and 8 for these areas. Actual disturbed area reporting to basins and ponds is approximately 26 acres. Sediment pond designs include undisturbed areas reporting to ponds. In order to minimize additional sediment loading to the main drainage, these ponds and basins will collect runoff from these approximately 27 acres. Berms will be placed on the lower edge of all disturbed areas to prevent runoff from reaching natural drainages before it has passed through the sedimentation ponds except in small area exemptions. Ponds are designed for maximum runoff including the chidister water. Areas draining to Pinnacle and Apex portals are to be included.

Sedimentation Pond Specifications

**Location**

The ponds are located over the main drainage of the Right Fork of Deadman Canyon. The main canyon drainage is routed through a 36-42" culvert located under the ponds. The sites are located downslope of the disturbed areas to simplify collection of runoff water (please see Plate 8).

**Design**

The ponds are designed to fully collect sediment load from a 10-year 24-hour area. Pond "C" has additionally 1 runoff from a 100-year 6-hour storm by a registered professional engineer for the ponds can be found at the

27 { 6.57 to Mines  
 14.79 to Pond C  
 12.21 to Pond E  
 0.99 to ASCAS  
 0.09 to SAE  
 34.65

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**Construction**

The construction of the ponds have been completed as per the specifications set forth in the Construction Specifications sheet (part 2.3).

**Capacity**

Each pond is designed to contain the runoff and sediment load from a 10-year 24-hour precipitation event in the area of drainage. In addition, each pond has an overflow capacity in excess of that

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The mines are located in the Right Fork of Deadman Canyon. This is an ephemeral drainage flowing only from direct runoff and eventually reaches the Price River some 12 miles to the south. The major drainages in the minesite area will be routed under the site through large culverts. The existing minesite has a disturbed area of 34.2 acres. Please note that a certain percentage of the disturbed area does not report to sedimentation ponds. Please refer to Plates 7 and 8 for these areas. Actual disturbed area reporting to basins and ponds is approximately 26 acres. Sediment pond designs include undisturbed areas reporting to ponds. In order to minimize additional sediment loading to the main drainage, these ponds and basins will collect runoff from these approximately 27 acres. Berms will be placed on the lower edge of all disturbed areas to prevent runoff from reaching natural drainages before it has passed through the sedimentation ponds except in small area exemptions. Ponds are designed for maximum runoff including the chidister water. Areas draining to Pinnacle and Apex portals are to be included.

### Sedimentation Pond Specifications

#### **Location**

The ponds are located over the main drainage of the Right Fork of Deadman Canyon. The main canyon drainage is routed through a 36-42" culvert located under the ponds. The sites are located downslope of the disturbed areas to simplify collection of runoff water (please see Plate 8).

#### **Design**

The ponds are designed to fully contain the expected runoff and sediment load from a 10-year 24-hour precipitation event in this area. Pond "C" has additionally been shown to fully contain the runoff from a 100-year 6-hour storm. The design has been certified by a registered professional engineer. A certification statement for the ponds can be found at the end of Appendix N.

#### **Construction**

The construction of the ponds have been completed as per the specifications set forth in the Construction Specifications sheet (part 2.3).

#### **Capacity**

Each pond is designed to contain the runoff and sediment load from a 10-year 24-hour precipitation event in the area of drainage. In addition, each pond has an overflow capacity in excess of that

Pond - 150' x 100'  
Pond - 100' x 100'

6  
required for a 25-year ~~24~~-hour event. Pond "C" has been designed to contain and pass the runoff from a 100-year 6-hour event.

### Safety Precautions

The ponds were built as per specifications and under supervision of a qualified, registered professional engineer. The ponds are inspected quarterly for safety and compliance. Inspection reports are maintained on-site, and submitted to the Division on an annual basis. Ponds will be cleaned at minimum when sediment reaches 60% of designed sediment volume. Measuring devices will be installed in the ponds to show when the ponds have filled with sediment to the clean-out level (please see plates 11, 12, and 13). Drainage directly into the Pinnacle and Apex Portals is not part of the calculation for sediment pond sizing. (Pond C)

### Monitoring

Water monitoring stations will be established at the outlet of the ponds. Sample parameters and frequencies shall be as per specification of the NPDES permit.

### Maintenance

The ponds shall be inspected after each storm and the sediment cleaned as necessary. In no event shall sediment be allowed to build beyond 60% of sediment design capacity.

### Seeding

An approved seed mix will be applied to all feasible disturbed areas in an effort to minimize erosion and sediment loading to the ponds. The proper seed mixture for this area has been obtained through the local BLM.

### Culverts

All culverts are shown on Plate 9. Calculations for sizing are also included. It should be noted that all culvert sizes were arrived at and approved through consultation with the DOGM hydrologic engineer.

### Calculations

The following reflects the calculations for sizing and details of each separate pond. Plates 6 through 13 show pond locations and volumes as well as watershed areas.

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## Construction Specifications for Sedimentation Ponds

All construction of sedimentation ponds have been performed under the direction of a qualified registered professional engineer.

Dams are constructed with primary overflows at least 2 ft. from the top, and emergency overflows at least 1.5 ft. from the top. The areas of the pond construction had been examined for topsoil, and if present in removable quantities such soil was removed separately and stored in an approved topsoil storage location.

In areas where fill was to be placed, natural ground was removed for at least 12" below the base of the structure.

Native materials were used where practical. Fill was placed in lifts not exceeding 15" and compacted prior to placement of the next lift. Compaction of all fill materials is at least 95%.

Grouted rip-rap or culverts have been placed at all inlets and outlets to prevent scouring. Each pond is fitted with an inverted inlet to the primary overflow, to prevent the passage of oil into the discharge.

Slopes of the dams are not steeper than 2.0:1, inside and outside, with a total of the inslope and outslope not less than 5:1. The inside slope of Pond E exceeded the steepness of 2:1. In part these slopes are incised and in part are constructed in from fill. Because of the steepness of these side slopes an investigation of stability was performed by Palmer Wilding Engineers. The conclusion was that the stability analysis is adequate and a stable section with respect to shear under static loading conditions is indicated. Please Appendix K.

Tops and external slopes of the dams were planted with an approved seed mix to prevent erosion and promote stability. Compaction of the slopes were at least 95%. Top width of dams are not less than  $(H + 35)/5$ .

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Primary Settling Basins (Formerly Pond B)

**General Notes**

The primary settling basins (formerly Pond B) are located above Pond "C". A disturbed area of 9.42 acres drain into the settling basins as shown on Plate 8. These basins collect sediment and runoff from this area; however, since they are a series of cells, any overflow from the basins will be cleaned and go into Pond "C".

It is proposed that 18" culverts be added between cells B-1 and B-2, and between B-2 and B-3. An 18" culvert already exists between cells B-3 and B-4. These culverts will prevent breaching of the dikes between cells during major runoff events. The inflow to the basins is from culverts CD-12 and CD-13, which is a total of 2.79 cfs, as shown on Table IV-3C. Based on the Manning's Equation for culverts (p.169-C), the required diameter to carry a flow of 2.79 cfs is only 0.95 feet; therefore, the 18" culvert overflows are more than adequate to pass the design flow. The placement of the culverts will not affect the maximum water levels or sediment storage capacity of the basins.

The basins are cleaned when sediment accumulations reach 50% of the original volume. The original volume was 0.540 acre feet, and the sediment cleanout level (0.270 acre feet) is at the culvert inlet level between cells B-2 and B-1 as shown on certified Plate 11.

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Pond C

1. Use 1.82" for 10 year - 24 hour event  
Use 1.91" for 100 year - 6 hour event

\*2. Disturbed Watershed - 14.79 acres

3. Runoff Curve No. = CN = 90

4. Area Runoff = Q (in.) =  $(P-0.2S)^2 / (P+0.8S)$ ; Where:

$$S = (1,000/CN) - 10$$

$$Q_{10/24} = 0.942 \text{ in./12} = 0.0785 \text{ ft.}$$

$$Q_{100/6} = 1.018 \text{ in./12} = 0.0848 \text{ ft.}$$

$$\text{Disturbed Volume}_{10/24} = 14.79 \text{ ac.} \times 0.0785 \text{ ft.} = \underline{1.161 \text{ ac. ft.}}$$

$$\text{Disturbed Volume}_{100/6} = 14.79 \text{ ac.} \times 0.0848 \text{ ft.} = \underline{1.254 \text{ ac. ft.}}$$

5. Undisturbed Watershed - 30.89 acres

6. Runoff Curve No. = CN = 70

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7. Area Runoff:

$$Q_{10/24} = 0.180 \text{ in./12} = 0.0150 \text{ ft.}$$

$$Q_{100/6} = 0.208 \text{ in./12} = 0.0173 \text{ ft.}$$

$$\text{Undisturbed Volume}_{10/24} = 30.89 \text{ ac.} \times 0.0150 \text{ ft.} = \underline{0.463 \text{ ac. ft.}}$$

$$\text{Undisturbed Volume}_{100/6} = 30.89 \text{ ac.} \times 0.0173 \text{ ft.} = \underline{0.534 \text{ ac. ft.}}$$

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8. Sediment Storage:

$$\text{**Disturbed Area } 14.79 \text{ ac.} \times 0.05 \text{ ac. ft./ac.} = \underline{0.740 \text{ ac. ft.}}$$

$$\text{***Undisturbed Area } 30.89 \text{ ac.} \times 0.016 \text{ ac. ft./ac.} = \underline{0.494 \text{ ac. ft.}}$$

$$\text{Total Sediment Storage Volume Required} = \underline{1.234 \text{ ac. ft.}}$$

$$60\% \text{ Cleaning Point} = \underline{0.740 \text{ ac. ft.}}$$

9. Direct Precipitation into Pond

Area of Ponds = 0.39 acres.

Volume  $_{10/24}$  = 0.39 ac. x 1.82 in./12 in./ft. =  
0.059 ac. ft.

Volume  $_{100/6}$  = 0.39 ac. x 1.91 in./12 in./ft. =  
0.062 ac. ft.  
ft.

10. Total Required Pond Volume

Volume  $_{10/24}$  = 1.161 + 0.463 + 1.234 + 0.059 =  
2.917 ac. ft.

Volume  $_{100/6}$  = 1.254 + 0.534 + 1.234 + 0.062 =  
3.084 ac. ft.

11. Pond Volume at Outlet

18" cmp oil skimmer = 3.321 ac. ft.

36" cmp overflow = 4.264 ac. ft.

12. Conclusions:

A. Pond size is adequate to contain the runoff and sediment load from a 10 year - 24 hour precipitation event.

B. Pond size is also adequate to contain the runoff and sediment load from a 100 year - 6 hour precipitation event.

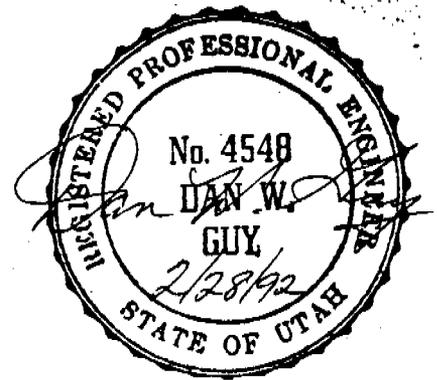
\* Includes runoff to "Primary Settling Basins" (Formerly Pond B)

\*\* Does not include sediment to "Primary Settling Basins". The sediment factor of 0.05 acre-ft./acre is considered conservative due to the extensive paving (roads and loadout area), and the grouted or paved ditches to the pond.

The USLE calculation for Disturbed Areas (Table IV-9) shows the actual expected sediment yield to be much lower than the 0.05 figure used.

\*\*\* Sediment yield taken from the USLE calculations on Table IV-10, "Sediment Yield for Undisturbed Areas".

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**STAGE-VOLUME DATA  
FOR  
POND "C"**

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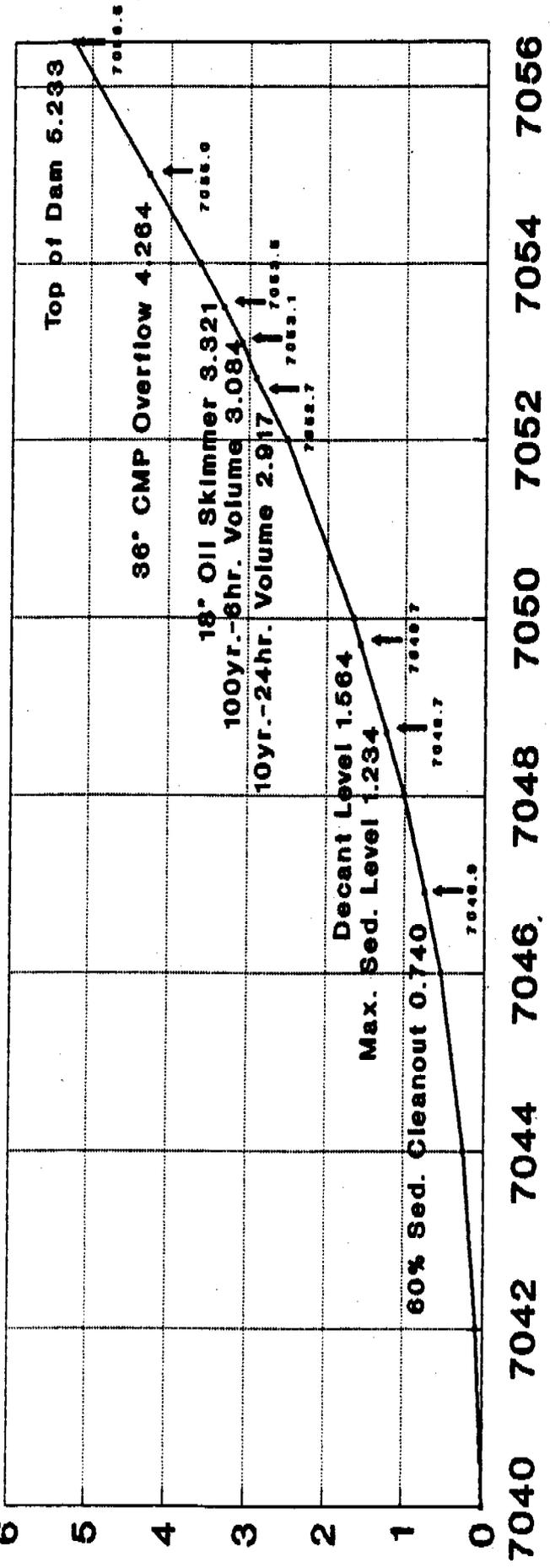
<u>STAGE</u>	<u>ELEVATION</u>	<u>VOLUME (Ac. Ft.)</u>	<u>ACC. VOL. (Ac. Ft.)</u>
Bottom	7040.0	-	-
	7042.0	0.082	0.082
	7044.0	0.162	0.244
	7046.0	0.293	0.537
60% Sed. Cleanout	7046.9	0.203	0.740
	7048.0	0.266	1.006
Max. Sed. Level	7048.7	0.228	1.234
Decant Level	7049.7	0.330	1.564
	7050.0	0.099	1.663
	7052.0	0.862	2.525
10yr.- 24 hr. Volume	7052.7	0.392	2.917
100yr.- 6 hr. Volume	7053.1	0.167	3.084
18" Oil Skimmer	7053.5	0.237	3.321
	7054.0	0.297	3.618
36" CMP Overflow	7055.0	0.646	4.264
Crest of Embankment	7056.5	0.969	5.233

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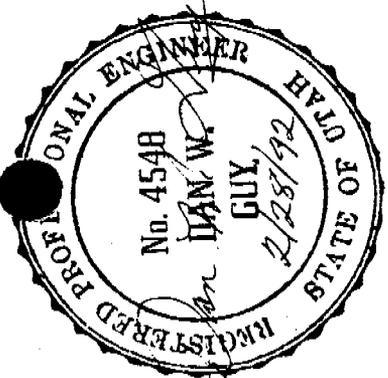
# STAGE-VOLUME CENTENNIAL POND C

VOLUME (Ac. Ft.)



STAGE (Elev. - Ft.)

— Stage-Volume Curve



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## Pond "C" - General Notes

The sizing of Pond C is based on the drainage areas delineated on Plate 8 - "Drainage Map". As can be seen from this Plate, a portion of the minesite drainage goes into the Pinnacle Mine, the old Chidister Portal, and the Apex Mine. The actual disturbed area draining directly to Pond "C" was planimetered from this Plate and determined to be 10.72 acres. The disturbed area flowing to the "Primary Settling Basins" was measured to be 4.07 acres. This flow drains to Pond "C" and is therefore considered in the sizing; however, the projected sediment load to the Primary Settling Basins is not considered in sizing Pond "C", since the basins could be completely full of sediment before it could impact Pond "C". As stated earlier, the Primary Settling Basins will be cleaned when sediment accumulation reaches one-half of the total basin volume; therefore, sediment from this area will not impact Pond "C".

In addition, a certain amount of undisturbed area does not flow into the undisturbed drainage culverts, and thus drains onto the mine site (see plates 8 and 9). The portion of this drainage that flows to Pond "C" was measured at 30.89 acres, and is included in the Pond "C" sizing calculations.

Runoff Curve numbers used in the calculations were: 90 for disturbed areas and 70 for undisturbed areas.

An "As-Constructed" plan and profile of Pond "C" is shown on Plate 12. This plate has been certified by a registered, professional engineer. Also shown on this plate is a proposed sediment marker, and maximum and cleaning point depths for sediment. The cleaning point for sediment is at 60% of the maximum design depth for sediment storage. This point will be clearly marked on the sediment marker.

Also shown on Plate 12 is the location of each of the pond inlets. Inlets are either grouted concrete or culvert, and do not require rip-rap or other additional erosion protection.

Pond "C" will be removed during the earthwork portion of reclamation. The culvert will also be removed and the main channel restored throughout the area. All reclaimed area above will then drain into Pond "E" below.

Decanting for Pond C, as needed, will be accomplished with pumps located at the minesite. Decanted water will be pumped into the primary spillway once the 24 hour retention time has been met. An access ramp will be constructed to allow for inspection and sampling at the overflow riser pipe.

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Pond E

1. Use 1.82" for 10 year - 24 hour event
2. Disturbed Watershed - 12.21 acres
3. Runoff Curve No. = CN = 90
4. Area Runoff = Q (in.) =  $(P-0.2S)^2/(P+0.8S)$ ; Where:  
     $S = (1,000/CN) - 10$   
     $P = 1.82"$   
     $Q \text{ (in.)} = [1.82-0.2(1.11)]^2/[1.82+0.8(1.11)] =$   
     $\frac{2.553}{2.709} = .94 \text{ in.} = .0785 \text{ ft.}$   
    Volume = 12.21 acres x 0.0785 ft. = 0.959 acre-ft.
5. Undisturbed Watershed - 12.20 acres
6. Runoff Curve No. = CN = 70
7. Area Runoff = 12.20 ac. x 0.2 in./12 = 0.203 acre-ft.
8. Sediment Storage Volume  
    12.21 acres x 0.1 acre-ft./acre = 1.221 acre-ft. \*  
    60% Cleaning Point = 0.733 acre-ft.
9. Direct Precipitation into Pond  
    Area of Ponds = 0.500 acres  
    0.500 acres x 1.82 in. x 1/12 ft./in. = 0.076 acre-ft.
10. Total Required Pond Volume  
    0.959 + 0.203 + 1.221 + 0.076 = 2.459 acre-ft.
11. Pond Volume @ Outlet (Principle Spillway)  
    Total Pond Volume = 2.569 acre-ft. (As constructed)

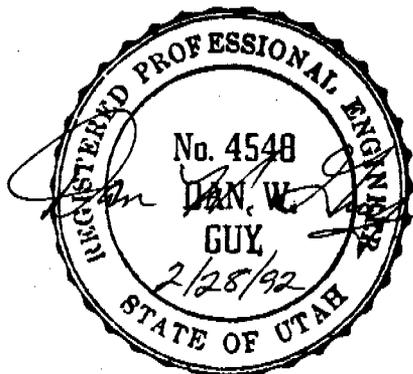
12. Conclusion: Pond size is adequate to contain the runoff and sediment load from a 10 year - 24 hour precipitation event in the area of drainage to the pond.

\* Due to the elevation of the decant inlet, the maximum sediment storage volume is .930 ac-ft. However the 60% cleanout level will not be exceeded and the total pond volume takes into account the disturbed area of 12.21 acres.

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**STAGE-VOLUME DATA  
FOR  
POND "E"**

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<u>STAGE</u>	<u>ELEVATION</u>	<u>VOLUME (Ac. Ft.)</u>	<u>ACC. VOL. (Ac. Ft.)</u>
1.5' Above Bottom	6936.0	-	-
	6938.0	0.040	0.040
	6940.0	0.070	0.110
	6942.0	0.106	0.216
	6944.0	0.141	0.357
	6946.0	0.180	0.537
60% Sed. Level	6947.8	0.196	0.733
	6948.0	0.025	0.758
Decant/Max. Sed. Level	6949.3	0.172	0.930
	6950.0	0.092	1.022
	6952.0	0.316	1.338
	6954.0	0.376	1.714
	6956.0	0.444	2.158
	10yr.- 24hr. Volume	6957.2	0.301
Principle Spillway	6957.6	0.110	2.569
Emergency Spillway	6958.6	0.562	3.131
Top of Dam	6961.0	-	-

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Pond "E" - PM

**Post Mining Sediment Control**

1. Use 1.82" for 10 year - 24 hour event.
2. Disturbed (Reclaimed) Watershed - 34.2 acres
  - a. Runoff Curve No. = 90
  - b. Runoff Volume = 2.740 ac. ft.
3. Undisturbed Watershed = 805.50 acres
  - a. Runoff Curve No. = 70
  - b. Runoff Volume = 13.425 ac. ft.
4. Sediment Storage Volume = 0.150 ac. ft. (Upper Cell)
5. Direct Precipitation into Pond
  - a. Use 0.5 acres
  - b.  $0.5 \text{ ac.} \times 1.82 \text{ in.} \times 1/12 = 0.076 \text{ ac. ft.}$
6. Expected Flow (10 yr. - 24 hr. event) = 88.94 cfs
7. Inflow Velocity (from RC-1) = 8.78 fps
8. Pond Configuration
  - 3 cells: 2 Gravel Filter Dikes and 1 Compacted Earthen Dam
9. Pond Capacity - 1.592 ac. ft.

**Note:** Pond is designed to clean and discharge runoff. Sediment will be removed by gravel filter dikes, and cleaned from pond when maximum sediment storage level is reached. Ponds will be cleaned when the 0.150 acre feet capacity of the upper cell is reached.

**Pond "E" - General Notes**

Pond "E" is to control runoff from the Aberdeen Mine. The disturbed area to drain to this pond is 12.21 acres. Pond E for the Aberdeen minesite was constructed prior to any other disturbance of the drainage area which report to the ponds.

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Plate 13 shows the plan and profile of the pond. Also shown on this plate is a sediment marker and the level of the sediment 60% cleaning point. The constructed height of the dam includes a 5% settling factor. The elevations on Plate 13 are final.

Grouted rip-rap or culvert is used on all pond inlets; therefore, additional rip-rap or energy dissipators are not required.

Twelve 60" x 60" anti-seepage collars were installed on the main culvert beneath the pond. The collars are of concrete or a standard, manufactured design. Collar sizes and numbers are based on the following:

Flow length = 340'  
Increase in flow length = 10% or 34'  
Use 60" x 60" anti-seep collars  
Each collar increases flow length by 2 x 8" or 3';  
therefore, use 12 anti-seep collars.

An emergency spillway has been constructed to convey overflow from the pond into undisturbed diversion UD-4 as shown on Plates 8 and 13. This spillway consists of 12" D50 grouted rip-rap as shown on Figure IV-6. The dimensions of this spillway are shown of Figure IV-6.

Pond E was constructed prior to any disturbance of the drainage area to the pond.

As built certified drawings of Sediment Pond E have been submitted.

#### **Pond "E" - PM - General Notes**

Upon reclamation, Pond "E" will be enlarged and left in place until revegetation standards are met, as shown on Plate 16. The culvert will be removed, and the pond will be reconstructed to clean and discharge the entire runoff from the drainage area above. Pond sizing calculations are shown on the page entitled "Pond E - PM", "Post-Mining Sediment Control". Andalex will commit to the concept of allowing the entire undisturbed and reclaimed area to drain into this one structure if approved.

The rationale for removing all upper ponds and diversions is based on the following:

1. Pond E is the lowermost structure, and can be rebuilt and later removed and reclaimed with minimum damage to the reclaimed site.

2. The upper site can be reclaimed in a more natural and permanent manner, as shown on the post-mining topography map, Plate 17, without leaving temporary structures such as diversions, ponds, etc. Once vegetation is established, it will not have to be re-disturbed.
3. The extensive use of loose-rock check dams in the restored drainages will serve as effective sediment and erosion control, and will promote the establishment of a riparian area along the drainage.

Because of the large size of the undisturbed drainage above (805.5 acres), upon reclamation, it is proposed to construct a series of filtering ponds to clean and discharge the water rather than try to fully contain the runoff. The expected flow from a 10-year 24-hour event for the entire undisturbed and reclaimed area is 88.94 cfs at a velocity of 8.78 fps. The total volume of water would be approximately 16.2 acre-ft. It is proposed to build a 3-celled system with 2 gravel filter dikes and concrete grouted overflows. The upper 2 cells will act as filters for sediment removal, and the lower cell will become a settling basin for final cleaning prior to discharge. The pond discharge will be sampled per NPDES requirements to check for compliance with effluent standards.

It is expected that effluent standards will be met by this structure; similar filtering ponds have cleaned and discharged up to 1,000,000 gallons per day of sediment-laden mine water and remained in compliance.

The rationale for proposing such a filtering discharge system is based on the following:

1. The main purpose of sediment ponds or any other treatment facility is to control and minimize water pollution by causing the water to meet effluent standards; this type of system will accomplish this purpose:
2. Acceptable practices to control and minimize water pollution include:
  - (i) Stabilizing the disturbed area through land shaping;
  - (ii) Diverting runoff;
  - (iii) Achieving vegetation standards;
  - (iv) Regulating channel velocity of water;

- (v) Lining channels with rock or vegetation;
- (vi) Mulching;
- (vii) Selectively placing and sealing acid-forming and toxic-forming materials;
- (viii) Designing mines to prevent gravity drainage of acid waters;
- (ix) Sealing;
- (x) Controlling subsidence; and
- (xi) Preventing acid mine drainage.

The planned reclamation at this site will meet the above criteria;

3. All surface drainage from the disturbed area, including areas that have been graded, seeded, or planted, shall be passed through a sedimentation pond, a series of sedimentation ponds, or a treatment facility before leaving the permit area.

The proposed pond will be equipped with a sediment marker, and cleaned as needed. The pond will also be fitted with a combined primary and emergency spillway, sized and protected to handle the 25-year 6-hour event.

When revegetation standards are met on the reclaimed site, the Pond "E -PM" will be removed, the main channel restored, and the area reseeded according to the approved plan.

#### Pond Discharge Structures

##### **Principle Spillways**

Pond C has a single spillway consisting of a 36" cmp riser pipe located 1.5' below the top of the dam at elevation 7,055.0. This pipe discharges directly into the main 42" culvert located beneath the pond. An 18" cmp skimmer pipe is located in the side of the 36" riser 1.5' below the riser inlet at an elevation of 7,053.5. This pipe will be the first to discharge, and will act as an oil skimmer since the pipe inlet is inverted with the intake approximately 1' below water level. Pond C will be decanted as needed by the use of a pump. Decanted water will go into the 36" riser and be discharged into the 42" cmp passing beneath the disturbed area.

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The Pond E principle spillway consists of a 30" riser pipe, connected to the 42" culvert beneath the ponds. A decant device is also attached to the riser pipe for de-watering, and is controlled by a hand-operated valve. Both the riser pipe and decant are constructed to minimize oil from entering the discharging water. Please see Plate 13 for details on the spillway structures for Pond E.

### Emergency Spillways

The emergency spillway for Pond E is the open notch type with a trapezoidal cross section. The spillway is of grouted rip-rap as shown on Figure IV-6. The spillway dimensions are as shown on the Figure IV-6. This is located 12" above the principal spillway and 2' below the top of the dam. This structure is rip-rapped through the point of discharge and into the main channel. This spillway provides an added safety factor to protect the dam in the event of overlad on the culvert discharge.

### Pond E - PM Spillway

Pond E - PM will be constructed with an open-notch spillway in the lower cell to allow for safe discharge of runoff from the reclaimed area as well as the contributing undisturbed area. The spillway will be of grouted rip-rap and dimension as shown on Figure IV-6. Calculations for the spillway are shown.

The spillway for Pond C consists of an open 36" culvert which empties directly into the main 42" culvert which drains the main canyon. This spillway is open at the top and extends to within 2.5' of the top of the dam. At right angle to this spillway culvert is an 18" culvert to handle pre-design overflow conditions. This 18" pipe has an inverted inlet to skim oil and grease and flotsam from the water. This is considered a single spillway; however, the following discussion will explain how the pond meets the criteria for exemption of combination spillways required by R645-301-742-223.

### Pond C - Exemption from R645-301-742-223

The following will describe how Pond C meets the criteria for exemption of the combination spillway requirements of R645-301-742.223 as provided in R645-301-742.225.2:

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1 - Storage - The pond has been shown to be adequately sized to safely control the 100 year - 6 hour precipitation event. The pond will not only contain the 100 year - 6 hour event (including sediment), but the overflow will safely pass the runoff from such an event if necessary.

2 - Dewatering - Water can be safely removed from the pond in accordance with current, prudent engineering practices. For this pond, water will be removed by the use of a portable pump system. The following is a description of details relating to the dewatering operation:

a - The pump to be used is an electric 220 volt unit. The pump will be powered by a portable generator set. These units will be available on an as-needed basis.

b - The pump will dewater at a rate of approximately 350 gallons per minute. At 1.0' above the maximum sediment elevation, the 10 year - 24 hour volume is 1.683 acre-feet. At the proposed pumping rate, the pond would be dewatered in approximately 26 hours.

c - The decant water will be discharged directly into the 36" cmp overflow. Any discharge will be done in accordance with the UPDES permit conditions. Samples will also be taken as required.

d - The pump inlet line will be equipped with a floating intake and an oil skimming device. A typical drawing is included as Figure IV-13.

e - The 36" outlet pipe will be visibly marked to show the limit of the decant level. This marker will be placed 2' above the maximum sediment level. This allows for the 18" oil skimmer shown on Figure IV-13, plus the required 1' shutoff above maximum sediment elevation. The pump will be turned off when the water level is drawn down to this marker.

f - All storm water will be retained in the pond for a minimum of 24 hours, or until effluent limitations will be met prior to decanting.

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g - Sedimentation Pond C to this date has never discharged. It is unlikely at any future date that the pond will discharge water. However, if a discharge ever occurs Andalex will construct an access ramp at that time. The access ramp will consist of a walk-way from the bank to the top of the stand-pipe. It will be equipped with hand rails and safety chains.

#### **Certification Statement**

A certification statement by a qualified, registered professional engineer that the pond will safely control the 100 year - 6 hour precipitation event, is included with this section.

#### **Location**

The pond is located where failure could be expected to cause loss of life or serious property damage. In accordance with the requirements, the pond is designed and constructed to safely control the runoff from a 100 year - 6 hour precipitation event. (See related table and certification with this section for designs, and Plates 8 and 12 for location and "As-Constructed" details of the pond).

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**Calculations:**

The following pond spillway calculations have been shown separately for each sediment pond at this site. Each of the sheets is separately certified by a registered professional engineer, as required. (appendix N)

**Pond C - Spillway Calculations**

Design Parameters

(1) Disturbed Drainage Area (a.c.)	14.79
(1) Undisturbed Drainage Area (a.c.)	30.89
Runoff Curve No. (Dist.)	90
Runoff Curve No. (Undist.)	70
(2) Time of Concentration (hrs.)	0.176
Land Slope (%)	6.25
Hydraulic Length (ft.)	1200

Overflow

10 yr. - 24 hr. Event (in.)	1.82
Peak Flow 10/24 (cfs)	27.56
25 yr. - 6 hr. Event (in.)	1.50
Peak Flow 25/6 (cfs)	18.06
100 yr. - 6 hr. Event (in.)	1.91
Peak Flow 100/6 (cfs)	30.35
(3) Oil Skimmer Diameter (in.)	18
Overflow Diameter (in.)	36
(4) Required Head 10/24 (ft.)	0.98
(4) Required Head 25/6 (ft.)	0.74
(4) Required Head 100/6 (ft.)	1.05

- Notes:
- (1) Digitized from Plate 8.
  - (2) Taken from Table IV-3A; Total Flows from DD-1, DD-2, & DD-3
  - (3) Reference Only - Not included in calculations.
  - (4) Taken from Stage Volume Curve - 36" riser only.

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## Pond E - Spillway Calculations

### Design Parameters

(1) Disturbed Drainage Area (ac.)	12.21
(1) Undisturbed Drainage Area (ac.)	12.20
Runoff Curve No. (Dist.)	90
Runoff Curve No. (Undist.)	70
(2) Time of Concentration (hrs.)	0.289
Land Slope (%)	8.00
Hydraulic Length (ft.)	1200

### Primary Overflow

10 yr. - 24 hr. Event (in.)	1.82
Peak Flow 10/24 (cfs)	14.55
Riser Diameter (in.)	30"
Required Head (ft.)	0.73

### Emergency Overflow

25 yr. - 6 hr. Event (in.)	1.50
Peak Flow 25/6 (cfs)	9.96
Structure Area Used (ft. <sup>2</sup> )	18.00
Required Structure Area (ft. <sup>2</sup> )	2.40
Depth of Flow (ft.)	0.41
Slope (%)	5.00
Velocity (fps)	4.15

Notes: (1) Digitized from Plate 8.  
(2) Taken from Table IV-3A; DD-4.

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Pond E - PM - Spillway Calculations

Design Parameters:

(1) Disturbed Drainage Area (ac.)	34.91
(1) Undisturbed Drainage Area (ac.)	805.50
Runoff Curve No. (Dist.)	90
Runoff Curve No. (Undist.)	70
(2) Time of Concentration (hrs.)	1.02
Land Slope (%)	19.83
Hydraulic Length (ft.)	10,200

(3) Overflow

10 yr. - 24 hr. Event (in.)	1.82
Peak Flow 10/24 (cfs)	88.94
25 yr. - 6 hr. Event (in.)	1.50
Peak Flow 25/6 (cfs)	45.77
Structure Area Used (ft. <sup>2</sup> )	18.0
Slope of Spillway (%)	33.3
Required Structure Area 10/24 (ft. <sup>2</sup> )	5.58
Required Structure Area 25/6 (ft. <sup>2</sup> )	3.54
Depth of Flow 10/24 (ft.)	0.84
Depth of Flow 25/6 (ft.)	0.58
Velocity 10/24 (fps)	15.94
Velocity 25/6 (fps)	12.94

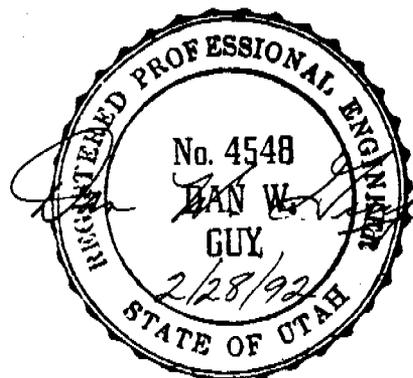
- Notes: (1) From Plates 8 & 9; Includes B.T.C.A. Areas  
(2) Taken from Table IV-4  
(3) Single, open channel spillway

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**STAGE-DISCHARGE DATA  
FOR  
SEDIMENT POND "C"**

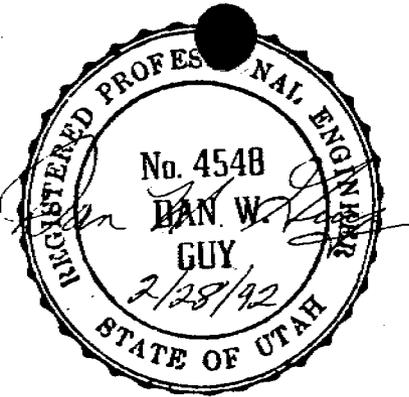
<u>Elevation</u>	<u>Qw</u>	<u>Qo</u>	<u>Qp</u>
7055.00	0	0	42.66
7055.50	*10.00	24.07	43.25
7055.74	*18.00	29.28	43.52 (25/6)
7055.98	*27.43	33.69	43.80 (10/24)
7056.00	*28.27	34.04	43.82
7056.05	*30.42	34.88	43.88 (100/6)
7056.50	51.94	*41.68	44.39

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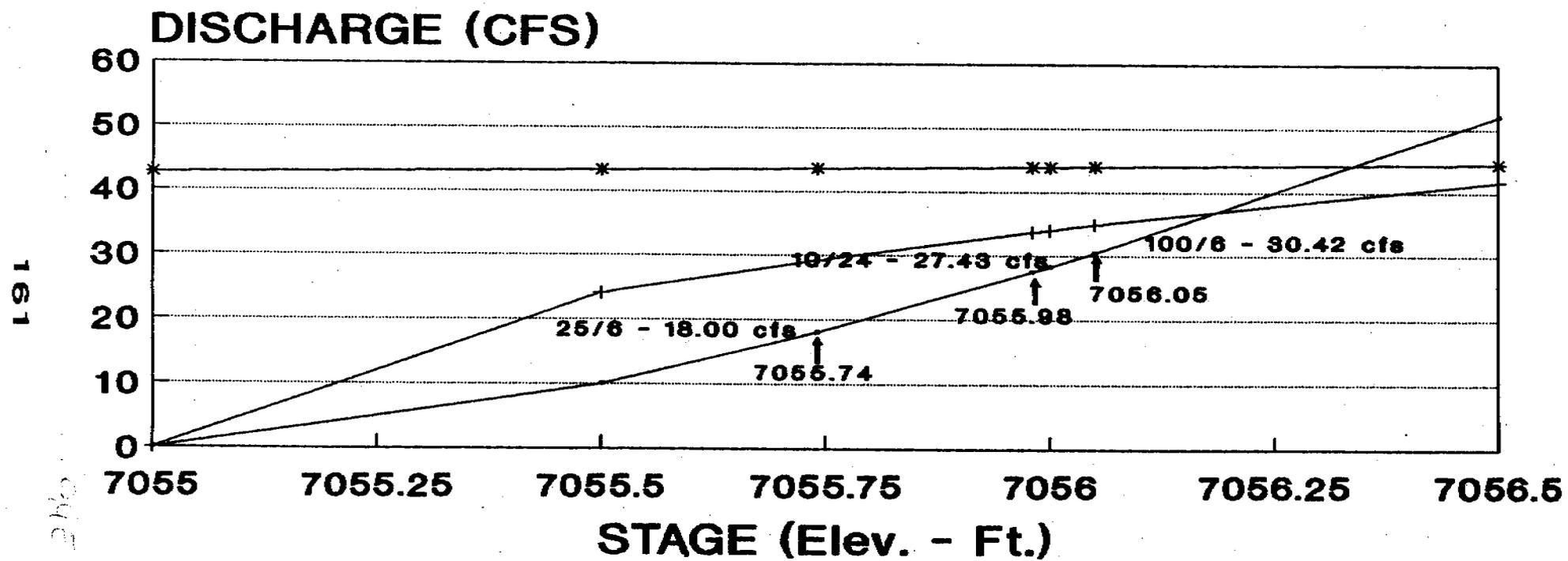
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- Notes: (1)  $Q_w = \text{Weir Flow} = CLH^{3/2}$ ;  $C=3.0$
- (2)  $Q_o = \text{Orifice Flow} = C'a\sqrt{2gH}$ ;  $C'=0.6$
- (3)  $Q_p = \text{Pipe Flow} = a(2gH')^{1/2} / (1+K_e+K_b+K_cL)^{1/2}$   
 $L=1600'$ ;  $K_e=1.0$ ;  $K_b=0.5$ ;  $K_c=0.0246$ ;  $H'=H+18.1$
- (4) For 36" Overflow Culvert only. Effects of 18" Oil Skimmer have been ignored.



# STAGE-DISCHARGE CENTENNIAL POND C



## STAGE-VOLUME CURVE

— Weir Flow    + Orifice Flow    \* Pipe Flow

Note: Does not include 18" Oil Skimmer.

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CERTIFICATION STATEMENT

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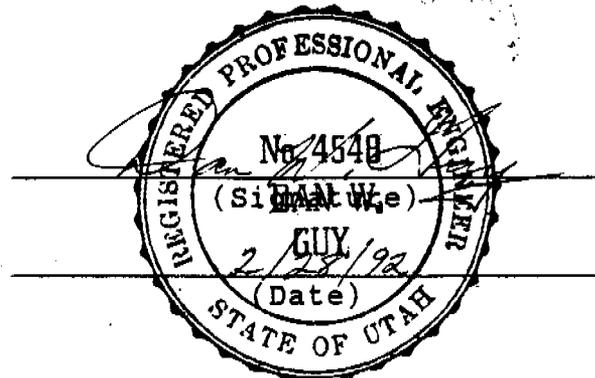
CENTENNIAL MINES

SEDIMENT POND "C"

In accordance with the requirements of R645-301-742.225.2, I, Dan W. Guy, Registered Professional Engineer, State of Utah No. 4548, do hereby certify that the Centennial Mines Sediment Pond "C" will safely control the 100 year - 6 hour design precipitation event.

This certification is based on the calculations and discussions pertaining to Pond "C" in Chapter IV, Section K.2 of the Centennial Mines M.R.P. and the "As-Constructed" map of Pond "C" (Plate 12).

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CHANNEL FLOW CALCULATIONS

FOR: POND "E" - EMERGENCY SPILLWAY

Bed Slope =	.05	
Manning's N =	.04	
Bottom Width =	5	feet
Channel Side Slope =	.5	
Flow Depth =	.6950414	feet
Cross Sectional Area =	4.441372	square feet
Wetted Perimeter =	8.10832	feet
Hydraulic Radius =	.547755	feet
Discharge =	24.74	cubic feet / sec
Velocity =	5.570351	feet / sec

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## Culverts

### General

Culverts have been sized as per the designations on Plates 8 and 9, and are placed to drain on a minimum of .0556 (1 ft./18 ft.) slope. Undisturbed drainage culverts (shown on Plate 9) are fitted with trash racks in drainages where introduction of rocks and other debris into the main culvert is foreseen as a problem. The main culvert inlet (C-1a) is fitted with a trash rack. All disturbed area culverts are designated with a CD- number as shown on Plate 8. These culverts handle much smaller flows and are thus not fitted with trash racks in most cases.

The undisturbed area culverts (C-0 through C-13) flow into the main culvert. The main culvert outlets at section C-15, which is protected from erosion as described on Table IV-7. Disturbed area culverts (CD-1 through CD-7) as shown on Plate 8 discharge onto grouted rip-rap surfaces for protection from erosion. Energy dissipators are also employed where necessary to reduce velocities and prevent erosion from culvert discharges (see Plate 8).

### Maintenance

Culverts shall be inspected regularly, and cleaned as necessary to provide for passage of designed flows. Inlets and outlets shall also be maintained so as to prevent plugging or undue restriction of water flow.

### Size Justification

The following note on the undisturbed culverts is for reference only, to show the original design criteria. Due to the complicated nature of the undisturbed culvert flows, it was decided that a drainage system analysis would be used to demonstrate the ability of the system to pass the design event. This system analysis is provided in Appendix O and shows the existing system to be more than adequate for the design storm event.

### Undisturbed Area Culvert Size Determination\*

#### Source:

"Applied Hydrology and Sedimentology for Disturbed Areas",  
Barfield, Warner and Haan, 1983.

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Peak Flow - SCS-TR-55 Method For Type II Storms:

$$qp = qp^1AQ;$$

A = Watershed in square miles;

Q = Runoff volume in inches;

$qp^1$  = Discharge from Fig. 2.40

qp = Peak Discharge in cfs.

Source:

B.L.M. State Engineer

Manning Equation:

$$D = \frac{2.16Qn}{\sqrt{s}}^{0.375}$$

D = Diameter (feet)

Q = QP = Peak Discharge (cfs)

n = roughness factor (0.02 for steel culvert)

s = slope (0.0556% = 1 foot for 18 feet)

Using the above formulas, minimum culvert sizes were calculated based on 100% runoff from a 10 year - 24 hour storm.

\* Reference Only - See Appendix O for justification of culvert sizes.

**Watershed and Culvert Sizing Map (Plate 9)**

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Mine Plan Cross Reference  
To Coal Mining Rules R645  
Updated - Technical Analysis 6/15/95

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TABLE IV-2

<u>Culvert</u>	<u>Watershed Area (acres)</u>	<u>Culvert Needed (in.)</u>	<u>Culvert Used (in.)</u>
C-0	36.65	13	18
C-1a	469.51	22	36
C1	506.16	22	36
C2	23.03	12	18
C3	529.19	23	36
C4	77.29	16	30
C5	606.48	23	36
C6	26.87	12	18
C7	633.35	24	42
C8	45.25	14	30
C9	678.60	25	42
C10	18.16	10	18
C11	696.73	25	42
C12	55.31	14	18
C13	752.04	27	42
C15	752.04	27	42

Note: Culvert C14 flow has been routed to diversion UD-4,  
and C14 has been eliminated.

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## Diversion Structures

### General

Diversion ditch locations are shown on the Surface Facilities Map and Drainage Map, Plate 8. The direction of flow is also shown. All diversions are classed as temporary, and will be removed upon final reclamation.

Note: <sup>(1)</sup> The runoff curve number of 65 was used only for calculation of the undisturbed culvert diversions. All other diversions, culverts, and pond designs are based on a more conservative runoff curve number of 70 for undisturbed drainages.

<sup>(2)</sup> Brycan is Hydrologic Soil Group B, Datino (stoney) is also Hydrologic Soil Group B; reference "SCS, National Engineering Handbook, Section 4, 1972".

### Specifications

Diversions along the upslope side of the road will be as per specifications on the haul road design. At a minimum, these, and any other diversions shown, will meet the minimum size specifications on the Diversion Ditch Summary sheet (Table IV-3B). Disturbed divisions DD-1 and DD-8 through DD-11 are sized to carry the runoff from a 2 year - 6 hour precipitation event in the area, per requirements of R645-301-742.330 "Division of Miscellaneous Flow". There are no divisions of intermittent or perennial flows.

Undisturbed diversions and drainage control for primary roads are sized to carry runoff from a 10 year - 6 hour precipitation event in the area.

Calculations for the 10 year - 24 hour runoff are included only for sediment pond sizing purposes.

### Maintenance

All diversions will be maintained so as to pass the volumes of water for which they were designed. Sloughage will be cleaned out along with regular road maintenance procedures, and any blockage will be removed as soon as practicable after occurrence. Velocities will be controlled as needed to prevent excessive scouring.

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## Diversions and Conveyance of Overland Flow

There are two types of diversions at this property: undisturbed and disturbed. The undisturbed diversions are labeled UD-1, through UD-5, and C-1 through C-15, and carry undisturbed drainage around and under the disturbed area. All undisturbed diversions are in place, and are shown on Plate 8, along with respective drainage areas. Cross sections of the undisturbed diversions are shown on the "Undisturbed Diversion Ditch Typical" (Figure IV-4). Design calculations are shown on the tables entitled "Diversion Design" (Table IV-3), "Diversion Ditch Summary Sheet" (Table IV-3B) "Main Channel Culvert Design" (Table IV-4), and "Side Drainage Culvert Design" (Table IV-5).

The disturbed diversions carry disturbed drainage to the sediment ponds. The existing disturbed diversions are labeled DD-1, through DD-11 and are shown on Plate 6 "Support Facilities - As Constructed" and on Plate 8 "Support Facilities - Surface Area Drainage and Topography". The diversion DD-4 is shown on Plate 7 "Aberdeen Mine Surface Facilities - As Constructed". Cross sections of the disturbed diversions are shown on the Division Ditch Typical" (Figure IV-3) Design calculations are shown on the table entitled "Disturbed Diversion Design" (Table IV-3A) and on the "Diversion Ditch Summary" (Table IV-3B).

Peak flows for all diversions were calculated by the SCS-TR55 Method for Type II storms using the computer program: Office of Surface Mining Watershed Model, Version: Storm 6.20, by Gary E. McIntosh.

A runoff curve number of 70 was used for all undisturbed areas, except for the undisturbed culvert diversions, which use a CN of 65. A CN of 90 was used for the disturbed area.

The curve numbers are based on Table 2.20 "Runoff Curve Numbers for Selected Agricultural, Suburban, and Urban Land Use" (Antecedent Moisture Condition II), page 82 of "Applied Hydrology and Sedimentology for Disturbed Areas", Barfield, Warner, and Haan, 1983.

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A runoff curve number of 65 was selected for the undisturbed culvert diversion areas, based on the following:

- (1) Land Use Description - Wood or Forest Land: thin stand, moderate to poor cover, no mulch.
  - (a) The above description was selected from SCS soils and vegetation data in Appendix M, wherein the site is described as not-desirable as rangeland due to the steep slopes and moderately sparse vegetative cover. The predominant vegetation is trees or large shrubs (pine, juniper, oak, sagebrush) with a mixture of grasses (wildrye, bluegrass, etc.). This land form and vegetation type best fits the Wood or Forest Land Category.
- (2) Hydrologic Soil Group - B.
  - (a) The undisturbed soils of the permit area are predominantly bouldery loam or bouldery fine sandy loam, as described in the SCS report in Appendix M. These soils are further defined as deep and well-drained with moderate permeability and infiltration rates. This description fits the SCS Hydrologic Soil Group B very well.
- (3) The runoff curve number of 65 is further supported by an on-site visit and professional judgement of a respected professional engineer/hydrologist from Horrocks, Carollo Engineers. In his opinion, a curve number of 65 best fits the site conditions, based on the site visit, and Richard H. McCuen's, "A Guide to Hydrologic Analysis Using SCS Methods".
- (4) Appendix O, which is the calculations performed by Horrocks Engineering reflects a curve number of 65. Tables IV-4 and IV-5 are also included and use a curve number of 70. Both calculations show adequately sized culverts; the curve number of 70 is slightly more conservative.

The Curve Number of 90 for the disturbed area is based on Hydrologic Soil Group B, Streets and Roads, with a weighted average of 40% paved area and 60% gravel area.

The outlet of C-15 (Main-Channel Culvert) shows a velocity of 7.28 fps, which could be slightly erosive in this area; however, existing boulders at this outlet range from 12 to 36 inches in diameter and function as an adequate energy dissipator and erosion control device. Based on past history of storms with little or no evidence of erosion, at this point

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it is not felt necessary to install additional protection. Erosion protection parameters are shown on the "Erosion Protection" (Table IV-7), for reference only, to show that the existing natural rock is adequate size for erosion control.

The culvert outlet will be visually examined after each major storm to ensure that erosion is not occurring. If erosion does become evident as determined by visual observation, protection will be installed according to the design on the table entitled "Erosion Protection" (Table IV-7).

Velocities on undisturbed diversions UD-1, UD-3 and UD-5 and portions of UD-2 and UD-4 are less than 6.0 fps, and are not considered erosive. Velocities on disturbed diversions DD-1, through DD-11 are also less than 6.0 fps, and are not considered erosive on this site.

Velocities on the upper and lower portion of UD-2 and the lower 150' of UD-4 are greater than 6.0 fps, and are considered potentially erosive; therefore, rip-rap will be placed at these locations (see Plate 8). Rip-rap or liner is placed as described in Table IV-7, and is sized according to Figure IV-12. Diversion UD-2 has been observed to be non-erosive.

Undisturbed diversion UD-2 was resurveyed in November 1992. Based on this survey, the diversion can be divided into four separate components, as follows:

Upper Section - This is the extreme upper end of the diversion near the disturbed area boundary. This is a fairly steep, rocky area, and is quite inaccessible to equipment. The average grade through this section is 12.33%. The ditch is protected by a liner, which appears to have been effective in preventing erosion over the last 10 years. The liner will be maintained throughout this section;

Undisturbed Section - This is an area below the upper (lined) section and the office pad section. The drainage flows through an undisturbed, vegetated area for approximately 100 feet, at an average slope of 12.11%. There is no evidence of erosion through this area;

Office Pad Section - This is an extremely flat portion of the diversion with an average grade of 3.50% for approximately 200 feet. Velocities through this section are non-erosive, and this is the only portion of the diversion which has required periodic maintenance for silt cleaning;

Lower Section - This section is approximately 100 feet in length with an average slope of 41.60%. The ditch is ripped through this section.

Flow calculations are provided in Table IV-3 for the various sections, and erosion protection requirements are provided in Table IV-7. The diversion has been in place for approximately 10 years, and has required only minimal maintenance for silt clean out in that time. It has been designed, located, constructed, maintained, used and will be removed in accordance with requirements of R645-301-742.300.

A loose rock check dam will be placed at the discharge point of UD-4 for energy dissipation. The dam will be constructed as described in Figure IV-9 and located as shown on Plate 8.

All diversion ditches are sized and maintained to at least the minimum requirements of R645-301-742.330 "Diversion of Miscellaneous Flows" and R645-301-742.423 "(Road) Drainage Control". There are no diversions of intermittent or perennial drainages at this minesite. Ditch sizes, including flow depths and minimum size for maintenance are summarized on Table IV-3B, "Division Ditch Summary". Computer backup sheets for all calculations are provided in Appendix O.

#### **Stream Channel Diversions**

Re-establishment of drainages is shown on Plates 15 and 16 which are reclamation contours and cross sections. The cross sections show cut and fill which has occurred on-site versus the original contours and reclaimed contours.

The reclamation plans for the drainage in the area consist of replacing each of the culverts C-1 through C-15 with restored channels. The undisturbed diversions UD-1 and UD-2 will also be removed and replaced with appropriate sized channels, corresponding to the channels at culverts C-4 and C-12 respectively. The restored channels are all sized to carry the runoff from a 100 year - 24 hour precipitation event. Cross sections of the restored channels are shown in the "Restored Channel Typical" (Figure IV-10). Design calculations are summarized in the table entitled "Restored Channel Designs" (Table IV-6).

Culverts C-1, C-3, C-5, C-7, C-9, C-11, C-13, and C-15 will be replaced by the Main Channel RC-1, and culverts C-2, C-4, C-6, C-8, C-10, C-12, and C-14 will be replaced by the Side Channels entitled RC-2, RC-4, ....RC-14, respectively.

The only restored channels with erosive velocities for this area (greater than 4.5 fps) are RC-1, RC-4, and RC-12. Erosion protection is planned for these channels, as shown on the table entitled "Erosion Protection" (Table IV-7). All other restored channels are expected to have non-erosive velocities, and will not require erosion protection.

Loose rock check dams will be placed at the exit of each side drainage prior to entering RC-1. Please see Figure IV-9, for a typical section of the Loose Rock Check Dams.

#### Hydrologic Balance:

#### **Sedimentation Ponds**

The sedimentation ponds are shown on Plates 11, 12 and 13. Pond C is constructed as shown on Plate 6 "Support Facilities - As Built". There will be no Pond D. Pond E has been constructed (Plate 13), and is shown on Plate 7 "Aberdeen Mine Surface Facilities - As Constructed". The plans and profiles shown on Plate 12 are for Pond C, as constructed. Plate 13 (Pond E) plans and profiles are as built.

All elevations of inflow and discharge are shown on the plates. Also, the embankment slopes are shown not to exceed 5:1 as required. The embankment widths are greater than the required width of height of embankment plus 35 feet divided by 5' as required. (Please note the different horizontal and vertical scales used on the section views of Pond C. Horizontal and vertical scales for Pond E are the same.)

Previous Pond "B" has been redesignated as "Primary Settling Basins" since all the runoff from the basins reports to Sediment Pond "C" (See Plate 11).

#### **Sediment Pond "C"**

Design specifications for Sediment Pond "C" are shown in this submittal.

#### **Sediment Pond "E"**

Design specifications for Sediment Pond "E" are covered under this submittal.

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**Discharge Structures**

Discharge structures from the sediment ponds have been included.

**Permanent and Temporary Impoundments**

The sedimentation pond E will remain in place after reclamation, until adequate revegetation is established on the reseeded areas. At this time, the pond will be removed and reclaimed.

**Discharge of Water into an Underground Mine**

The Drainage Map, Plate 8, delineates various drainage areas on the site. Based on planimeter areas from this map, the following areas are drained into the respective mines:

<u>Mine</u>	<u>Disturbed (ac.)</u>	<u>Undisturbed (a.c)</u>
Pinnacle Mine	0.81	0.13
Apex	1.23	2.06
Old Chidister Mine	4.53	16.21

The water flowing into the mines is strictly from surface runoff, and the quantity is thus highly variable. Because this is such a dry canyon, it is necessary to capture as much water as possible to allow for underground mining operations. The water is directed into storage sumps in the mine, where it is settled and used for dust suppression. Any water going into the mine is used in sprays or remains in the sumps. Water flowing into the mines is strictly from surface runoff, and the quantity is thus highly variable. Because this is such a dry canyon, it is necessary to capture as much water as possible to allow for underground mining operations. The water is directed into storage sumps in the mine, where it is settled and used for dust suppression. Any water going into the mine is used in sprays or remains in the sumps.

Andalex owns the rights to this water.

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Hydrologic Balance:

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**Water Quality Standards and Limitations.**

**Sediment control for Office Facilities**

The office facilities area is a small paved parking area and runoff from a portion of this area will report to Sediment Pond "E" as shown on Plate 8. The remaining portion is classified as a B.T.C.A. Area (2.19-2).

Andalex Resources, Inc.  
Mine Plan Cross Reference  
To Coal Mining Rules R645  
Updated - Technical Analysis 6/15/95

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Natural runoff from above the office area is diverted to the south of the pad, and flows in an open ditch down to the lower (road) level where it enters an 18" culvert going into the 42" culvert carrying undisturbed drainage off site. Straw bales are maintained in the open ditch to minimize sediment in the undisturbed flow.

Most of the office pad and access road are paved. Runoff from a portion of the pad and road flow down a grouted ditch along the north and south sides of the road, through a culvert and then down the east side of the main paved road. From here the runoff flows into Pond E. See Plate 8. Sediment contributions from the office facilities area are negligible (if any) due to the pavement and concrete grouted ditch. Straw bales are also maintained along the main haul road to minimize sediment loading from this area.

#### **Disturbed Area Drainage not Reporting to Sediment Ponds**

Please refer to Plate 8 in Volume II of the PAP for exempt "Alternate Sediment Control Area" or (ASCA) (areas not reporting to sedimentation ponds). There are 3 areas, 2 of which are shown on Plate 8 as ASCA's and a third in Appendix U as an SAE, with a total area of 1.08 acres or 3.2% of the Disturbed Area:

- (1) ASCA #1 - 0.72 acres - near the office, which includes a topsoil storage pile, UD-2, a portion of the main office pad and a portion of the weather station outslope.
  - (a) Treatment: As a result of a 10 year - 24 hour storm, there would potentially be a discharge of 2,462 cubic feet of runoff from this area. Alternate sediment controls consist of straw dikes, vegetation on the topsoil pile, chemically treated gravel parking areas and paved parking areas.
- (2) ASCA #2 - 0.27 acres - Substation area.
  - (a) Treatment: A 10 year - 24 hour storm will potentially have a discharge of 923 cubic feet of runoff from this area. Alternate sediment controls on this site consist of a graveled surface, a straw dike and snow fences.
- (3) Small Area Exemption (SAE) #1 - 0.09 acres - Left Fork Fan Powerline area.
  - (a) Treatment: A 10 year - 24 hour storm will potentially have a discharge of 308 cubic feet of runoff from this area. As these are power poles, there will be no sediment runoff.

These three areas are exempt from the requirement that the drainage report to a sedimentation pond (817.42a) as provided for in 817.42b. The drainage from these areas will meet the effluent standards of 817.42 and State and Federal water quality standards for the receiving waters. In order to assure this, any discharge from these ASCA's will be monitored for suspended solids, total suspended solids and total dissolved solids.

There are three additional undisturbed diversions constructed just inside the disturbed area boundary (UD-1, UD-3 and UD-4). These ditches carry only undisturbed runoff from the areas above, are well vegetated, and discharge directly to the main channel undisturbed drainage without further treatment. Only undisturbed diversion UD-2 is included as a ASCA (#1), due to the fact that it also picks up drainage from a topsoil storage pile and a portion of the office pad as described on the previous page.

#### NPDES Permit

Three point sources are included in Andalex's new NPDES Permit issued in May of 1989. Quarterly reports are submitted to the Utah Department of Health and the EPA.

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TYPICAL

SCS - TR55 Method of Diversion Calculation

1. Find Drainage Area - Plate 8 or 9
2. Find Runoff from Appropriate Event:  
 $Q = \frac{(P-0.2S)^2}{(P+0.8S)}$ ; where: P = Precip. in inches  
S =  $\frac{1,000}{CN} - 10$
3. Find Hydraulic Length of Watershed - Plate 8 or 9
4. Find Land Slope - Plate 8 or 9
5. Calculate Lag Time;  $t_L = \frac{L^{0.8}(S+1)^{0.7}}{1900 y^{0.5}}$

CN = 70 for Undisturbed  
CN = 90 for Disturbed

where:  $t_L$  = Lag Time in Hrs.  
L = Hydraulic Length in ft.  
S =  $\frac{(1,000 - 10)}{CN}$   
y = Land Slope in %

6. Find Time of Concentration;  $t_c = \frac{t_L}{0.6}$
- \*\*7. Find Peak Flow (qp) from:  $qp = qp^1 A Q$   
where qp = Peak Flow in cfs  
qp<sup>1</sup> = Peak Discharge from Figure 2.40, page 115\*\*\*.  
A = Drainage Area in Square Miles  
Q = Runoff (from #2 above)

- \*\*8. Find Velocity of Flow from:  
 $V = \frac{1.49 R^{0.67} S^{0.5}}{n}$

where: V = Velocity in fps  
n = Manning's Number for ditch  
R = Hydraulic Radius in ft. =  $\left( \frac{\text{Area}}{\text{Wetted Perim.}} \right)$   
S = Slope in ft./ft.

- \*\*9. Find Required Ditch Area by dividing peak flow by the velocity.  
 $Q = AV; A = \frac{Q}{V}$

V

\*\*10. Find depth of flow by applying required area to ditch size.

\* Where undisturbed and disturbed flows enter the same ditch, a weighted curve number is used, calculated by:

$$\frac{(\text{Area Undisturbed})(70) + (\text{Area Disturbed})(90)}{(\text{Total Area})}$$

\*\* Items 7 through 10 can also be calculated by the computer program "Office of Surface Mining Watershed Model", Version: Storm 6.20, by Gary E. McIntosh.

\*\*\* "Applied Hydrology and Sedimentology for Disturbed Areas", Barfield, Warner and Haan, 1983.

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TABLE IV-3

UNDISTURBED DIVERSION DESIGN

<u>Structure</u>	<u>UD-1</u>	<u>UD-2</u> (PAD)	<u>UD-3</u>	<u>UD-4</u>	<u>UD-5</u>
Drainage Area (acres)	87.78	56.20	23.87	26.14	16.90
Time of Conc. (hours)	0.24	0.21	0.22	0.06	0.14
Runoff Curve Number (CN)	70	70	70	70	70
Manning's Number (n)	0.038	0.038	0.040	0.040	0.040
Ditch Slope (%)	6.75	3.50	6.75	4.50	3.79
Hydraulic Length (ft.)	2850	2800	1400	600	1800
Land Slope (%)	47.22	58.33	56.67	66.67	62.50
10 yr. 6 hr. Event (in.)	1.25	1.25	1.25	1.25	1.25
Time of Conc. (hrs.)	0.24	0.21	0.22	0.06	0.14
Peak Flow 10/6 (cfs)	1.35	0.99	0.11	0.47	0.29
Required Area 10/6 (ft <sup>2</sup> )	0.37	0.37	0.06	0.20	0.15
Flow Depth 10/6 (ft)	0.61	0.61	0.24	0.45	0.39
Velocity 10/6 (fps)	3.65	2.64	1.88	2.32	1.93
10 yr. -24 hr. Event (in.)	1.82	1.82	1.82	1.82	1.82
Peak Flow 10/24 (cfs)	7.94	4.75	2.03	3.45	1.59
Req'd Area 10/24 (ft <sup>2</sup> )	1.40	1.21	0.52	0.90	0.54
Flow Depth 10/24 (ft <sup>2</sup> )	1.18	1.10	0.72	0.95	0.73
Velocity 10/24 (ft <sup>2</sup> )	5.69	3.91	3.90	3.82	2.95

- Notes:
- 1- Ditch slopes measured from Plate 8.
  - 2- UD-2 slope measured directly in field.
  - 3- Peak flows by SCS-TR55 Method using "Storm 6.20" computer program.
  - 4- Manning's number based on Table 3.1, p. 159, under Small Drainage Ditches - earth Lined, "Applied Hydrology and Sedimentology Disturbed Areas", Barfield, Warner and Haan, 1983.
  - 5- See Appendix O for computer back-up.
  - 6- All calculations are based on minimum ditch size - "V" shape with 1:1 side slopes. Ditch configurations may vary in field.

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TABLE IV-3 (cont'd)

UNDISTURBED DIVERSION DESIGN

<u>Structure</u>	<u>UD-2</u> (upper)	<u>UD-2</u> (lower)	<u>UD-4</u> (max)	<u>UD-5</u> (max)
Drainage Area (acres)	56.20	56.20	26.14	16.90
Time of Conc. (hrs.)	0.21	0.21	0.06	0.14
Runoff Curve Number (CN)	70	70	70	70
Manning's Number (n)	0.025	0.040	0.040	0.040
Ditch Slope (%)	12.33	42.60	20.00	17.75
Hydraulic Length (ft.)	2800	2800	600	1800
Land Slope (%)	58.33	58.33	66.67	62.50
10 yr.-6 hr. Event (in.)	1.25	1.25	1.25	1.25
Peak Flow 10/6 (cfs)	0.99	0.99	*10.43	0.29
Req'd Area 10/6 (ft. <sup>2</sup> )	0.17	0.15	1.18	0.08
Flow Depth 10/6 (ft.)	0.41	0.39	1.09	0.29
Velocity 10/6 (fps)	5.80	6.49	8.81	3.44
10 yr.-24 hr. Event (in)	1.82	1.82	1.82	1.82
Peak Flow (cfs)	4.75	4.75	*13.41	1.59
Req'd Area (ft. <sup>2</sup> )	0.55	0.49	1.43	0.30
Flow Depth 10/24 (ft)	0.74	0.70	1.20	0.55
Velocity 10/24 (fps)	8.59	9.61	9.38	5.27

\* Includes discharge from Pond E Emergency Spillway.

- Note:
1. Ditch slopes measured from Plate 8.
  2. UD-2 Slopes Measured Directly in Field; UD-2 (Upper) is a lined channel. UD-2 (lower) is rip-rapped.
  3. Peak flows by SCS-TR55 Method using "Storm 6.20" computer program.
  4. The Manning's number is based on Table 3.1, page 159, under Small Drainage Ditches - Earth Lined, "Applied Hydrology and Sedimentology for Disturbed Areas", Barfield, Warner, and Haan, 1983.
  5. See Appendix O for computer back-up.
  6. All calculations are based on minimum ditch size-"V" shape with 1:1 side slopes. Ditch Configurations may vary in field.

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TABLE IV-3A

DISTURBED DIVERSION DESIGN  
(MISCELLANEOUS FLOWS-2YR.-6 HR. DESIGN)

<u>Structure</u>	<u>DD-1</u>	<u>*DD-8</u>	<u>*DD-9</u>	<u>DD-10</u>	<u>DD-11</u>
Drainage Area (acres)					
Disturbed	3.31	-	-	0.34	5.35
Undisturbed	5.40	-	-	-	6.12
Time of Conc. (hrs.)	0.08	0.327	0.327	0.11	0.08
Runoff Curve Number (CN)					
Disturbed	90	-	-	90	90
Undisturbed	70	-	-	-	70
Weighted CN	78	-	-	90	79
Manning's Number (n)	0.040	0.040	0.040	0.040	0.040
Ditch Slope (%)	6.25	6.25	6.25	6.25	5.25
Hydraulic Length (ft.)	200	1200	1200	300	800
Land Slope (%)	6.25	6.25	6.25	6.25	56.25
2 yr.-6 hr. Event (in)	0.80	0.80	0.80	0.80	0.80
Peak Flow 2/6 (cfs)	0.08	0.07	0.07	0.05	0.13
Required Area 2/6 (ft <sup>2</sup> )	0.05	0.04	0.04	0.03	0.07
Flow Depth 2/6 (ft.)	0.22	0.21	0.21	0.18	0.26
Velocity 2/6 (fps)	1.69	1.63	1.63	1.50	1.90
10 yr.-24 hr. Event (in.)	1.82	1.82	1.82	1.82	1.82
Peak Flow 10/24 (cfs)	3.49	2.88	2.88	0.31	4.75

\* Based on 1/2 flow from DD-3, which is 0.13 cfs for 2 yr.-6 hr.event. See Appendix O.

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TABLE IV-3A (Continued)

DISTURBED DIVERSION DESIGN  
(PRIMARY ROAD DRAINAGE - 10YR.-6HR. DESIGN)

<u>Structure</u>	<u>DD-2</u>	<u>DD-3</u>	<u>DD-4</u>	<u>*</u> <u>DD-5</u>	<u>**</u> <u>DD-6</u>	<u>DD-7</u>
Drainage Area (acres)						
Disturbed	4.07	7.41	12.21	-	-	1.28
Undisturbed	-	25.49	12.20	-	-	6.12
Time of Conc. (hrs.)	0.04	0.327	0.289	0.289	0.289	0.08
Runoff Curve Number (CN)						
Disturbed	90	90	90	-	-	90
Undisturbed	-	70	70	-	-	70
Weighted CN	90	75	80	-	-	74
Manning's Number (n)	0.040	0.040	0.040	0.040	0.040	0.040
Ditch Slope (%)	6.25	6.25	6.25	11.91	5.95	5.56
Hydraulic Length (ft.)	200	1200	1200	-	-	800
Land Slope (%)	6.25	6.25	8.00	-	-	56.25
10 yr. -6 hr. Event (in)	1.25	1.25	1.25	1.25	1.25	1.25
Peak Flow 10/6 (cfs)	1.70	0.90	1.67	0.56	0.84	0.20
Required Area 10/6 (ft <sup>2</sup> )	0.47	0.30	0.40	0.16	0.28	0.10
Flow Depth 10/6 (ft.)	0.69	0.24	0.68	0.40	0.53	0.31
Velocity 10/6 (fps)	3.62	2.96	3.60	3.49	2.98	2.03
10yr.-24hr. Event (in.)	1.82	1.82	1.82	1.82	1.82	1.82
Peak Flow 10/24 (cfs)	3.50	5.75	8.06	2.69	4.03	1.92

\* Based on 1/3 flow for DD-4

\*\* Based on 1/2 flow for DD-4

Notes:

1. Ditch Slopes measured from Plate 8.
2. Peak flows by SCS-TR55 Method using "Storm 6.20" Computer program.
3. The Manning's Number is based on Table 3.1, page 159, under Small Drainage Ditches - Earth Lined, "Applied Hydrology and Sedimentology for Disturbed Areas", Barfield, Warner, and Haan, 1983.
4. See Appendix O for computer back-up.
5. All calculations are based on minimum ditch size- "V" shape with 1:1 side slopes, except DD-3 which has a 1' bottom width. Ditch configurations may vary in field.

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**TABLE IV -3B**  
**DIVERSION DITCH SUMMARY**

<u>DITCH NO.</u>	<u>FLOW</u> (cfs)	<u>REQ'D FLOW DEPTH</u> (ft.)	<u>REQ'D FLOW AREA</u> (ft <sup>2</sup> )
UD-1	1.35	0.61	0.37
UD-2 (PAD)	0.99	0.61	0.37
UD-2 (UPPER)	0.99	0.41	0.17
UD-2 (LOWER)	0.99	0.39	0.15
UD-3	0.11	0.24	0.06
UD-4	0.47	0.45	0.20
UD-4 (MAX)	10.43	1.09	1.18
UD-5	0.29	0.39	0.15
UD-5 (MAX)	0.29	0.29	0.08
DD-1	0.08	0.22	0.05
DD-2	1.70	0.69	0.47
DD-3	0.90	0.24	0.30
DD-4	1.67	0.68	0.46
DD-5	0.56	0.40	0.16
DD-6	0.84	0.53	0.28
DD-7	0.20	0.31	0.10
DD-8	0.07	0.21	0.04
DD-9	0.07	0.21	0.04
DD-10	0.05	0.18	0.03
DD-11	0.13	0.26	0.07

- Notes:
- 1- Flows for UD ditches and primary road ditches (D-2 through DD-7) based on 10 yr.-6hr. event (1.25).
  - 2- Flows for Ditches DD-1 and DD-8 through DD-11 based on 2yr.-6hr. event (0.80").
  - 3- All calculations based on minimum ditch size - "V" ditch with 1:1 side slopes, except DD-3, which has a 1' bottom width. Ditch configurations may vary in field.
  - 4- Ditches will be maintained to minimum depth and/or area shown in this table.

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METHOD OF CULVERT CALCULATION  
(TYPICAL)

See Appendix N for calculation reference

1. Find Drainage Area - Plate 9
2. Find Runoff from Appropriate Event:  
 $Q = \frac{(P - 0.2S)^2}{(P + 0.8S)}$ ; Where: P = Precipitation in Inches.  
S =  $\frac{1,000}{CN} - 10$

or CN = 70

3. Find Hydraulic Length of Watershed - Plate 9.
4. Find Land Slope - Plate 9
5. Calculate Lag Time;  $t_L = \frac{L^{0.8}(S+1)^{0.7}}{1,900 Y^{0.5}}$

where:  $t_L$  = Lag Time in Hrs.  
L = Hydraulic Length in Ft.  
S =  $\frac{1,000}{CN} - 10$   
Y = Land Slope in %.

6. Find Time of Concentration;  $t_c = \frac{t_L}{0.6}$

- \*\*7. Find Peak Flow (qp) from:  $qp = qp^1 AQ$   
where: qp = Peak Flow  
qp<sup>1</sup> = Peak Discharge from Figure 2.40, page 115\*.  
A = Drainage Area in Square Miles  
Q = Runoff (from #2 above)

8. Find Required Culvert Size by Manning's Equation:

$$D = \left( \frac{2.16 Qn}{\sqrt{s}} \right)^{0.375}$$

where: D = Required Culvert Diameter in Ft.  
Q = Peak Flow (qp) from 7.  
n = Manning's Number (0.025 for culv.)  
s = Slope in ft./ft.

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\* "Applied Hydrology and Sedimentology for Disturbed Areas",  
Barfield, Warner and Haan, 1983.

\*\* Item 7 can also be calculated by using the computer program  
"Office of Surface Mining Watershed Model", Version: Storm  
6.20, by Gary E. McIntosh.

TABLE IV-3C

DISTURBED AREA CULVERT DESIGN  
(Drainage to Old Works)

<u>Structure</u>	<u>CD-1</u>	<u>CD-2</u>	<u>CD-8</u>
Drainage Area (ac.)	---	---	---
Undisturbed	10.09	6.12	10.09
Disturbed	3.25	1.28	3.25
10 yr. - 6 hr. event (in.)	1.25	1.25	1.25
Time of Conc. (hrs.)	0.10	0.10	0.10
Curve Number	---	---	---
Undisturbed	70	70	70
Disturbed	90	90	90
Manning's Number	0.025	0.025	0.025
Culvert Slope (%)	5.56	5.56	5.56
Peak Flow (cfs)	1.73	0.72	1.73
Velocity	4.41	3.49	3.08
D Req'd (ft.)	0.71	0.51	0.71
D in Place (ft.)	1.00	1.00	1.50

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TABLE IV-3C (Continued)

DISTURBED AREA CULVERT DESIGN

<u>Structure</u>	<u>CD-4</u>	<u>CD-5</u>	<u>CD-6</u>	<u>CD-7</u>
10 yr. - 6 hr. Event (in.)	1.25	1.25	1.25	1.25
Manning's Number (n)	0.025	0.025	0.025	0.025
Culvert Slope (%)	5.56	5.56	5.56	5.56
Peak Flow	1.50*	1.55**	2.33***	4.65****
Velocity	4.26	4.29	4.75	5.65
D Req'd (ft.)	0.67	0.68	0.79	1.02
D in Place (ft.)	1.50	1.50	2.00	2.00

\* Based on 1/2 flow from DD-3.  
 \*\* Based on total flow from DD-5.  
 \*\*\* Based on total flow from DD-6.  
 \*\*\*\* Based on total flow from DD-4.

Note: All culverts have adequate headwater to allow flow.

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TABLE IV-3C (Continued)

CULVERT CD-3  
(Inlet to Sed. Pond "C")

10-yr.6-hr. Event	1.25"
Mannings Number	0.025
Culvert Slope	3.30%
Peak Flow	3.00 cfs
Velocity	4.16 fps
D. Required	0.96 ft.
D. In Place	1.50 ft.

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- NOTES:
1. Peak flow is based on entire flow from Diversion DD-3.
  2. Details for Diversion DD-3 are on Table IV-3A.
  3. Culvert slope is based on actual field measurement.
  4. A headwall of 4' exists at the culvert inlet, which is adequate to allow the calculated peak flow of 3.00 cfs.
  5. Please refer to Plate 8 for CD-3 location and drainage areas.

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**TABLE IV-3C (Continued)**  
**DISTURBED AREA CULVERT DESIGN**

<u>STRUCTURE</u>	<u>CD-9</u>	<u>CD-10</u>	<u>CD-11</u>	<u>CD-12</u>	<u>CD-13</u>
10yr.-6hr. Event (in)	1.25	1.25	1.25	1.25	1.25
Manning's Number (n)	0.025	0.025	0.025	0.025	0.025
Culvert Slope (%)	8.00	6.25	8.00	5.56	6.25
Peak Flow 10/6 (cfs)	0.31*	0.31*	0.31**	0.92**	1.87***
Velocity 10/6 (fps)	3.29	3.00	3.29	3.77	4.70
Diam. Req'd. (ft.)	0.35	0.36	0.35	0.56	0.71
Diam. In Place (ft.)	1.50	1.50	1.00	2.00	1.50

\* Based on 1/3 flow from DD-11.

\*\* Based on entire flow from DD-11.

\*\*\*\* Based on entire flow from DD-2.

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**TABLE IV-3C (Continued)**  
**DISTURBED AREA CULVERT DESIGN**

<u>STRUCTURE</u>	<u>CD-14</u>	<u>CD-15</u>	<u>CD-16</u>	<u>CD-17</u>	<u>CD-18</u>
10yr.-6hr. Event (in)	1.25	1.25	1.25	1.25	1.25
Manning's Number (n)	0.025	0.025	0.025	0.025	0.0025
Culvert Slope (%)	3.50	3.50	6.25	5.56	57.74
Peak Flow 10/6 (cfs)	1.35*	2.84**	4.65***	4.65***	0.29
Velocity 10/6 (fps)	3.51	4.20	5.90	5.65	6.79
Diam. Req'd. (ft.)	0.70	0.93	1.00	1.02	0.23
Diam. In Place (ft.)	1.50	1.50	2.00	2.00	1.50

- \* Based on entire flow from DD-1.
- \*\* Based on entire flows from DD-2, DD-10 & DD-11
- \*\*\* Based on entire flow from DD-4.

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TABLE IV-4

MAIN CHANNEL CULVERT DESIGN

<u>Structure</u>	(optional) <u>C-1a</u>
Drainage Area	469.51
10 yr. - 24 hr. Event	1.82
Time of Conc. (hrs.)	1.02
Curve number	70
Manning's Number	0.025
Ditch Slope (%)	5.56
Peak Flow	22.12
Structure Area Used (ft. <sup>2</sup> )	7.07
Velocity (fps)	9.20
Hydraulic Length	10,200
Land Slope	19.83
Headwater Req'd (ft.)	2.22
D Req'd (ft.)	1.84
D in Place	3.00

Note: See Appendix O for culvert justification.

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TABLE IV-4 (cont'd)

MAIN CHANNEL CULVERT DESIGN

<u>Structure</u>	<u>C1</u>	<u>C3</u>	<u>C5</u>	<u>C7</u>
Drainage Area	506.16	529.19	606.48	633.35
10 yr. - 24 hr. Event	1.82	1.82	1.82	1.82
Time of Conc. (hrs.)	-	-	-	-
Curve number	70	70	70	70
Manning's number	0.025	0.025	0.025	0.025
Ditch Slope (%)	5.56	5.56	5.56	5.56
Peak Flow	23.12	23.62	26.02	26.72
Structure Area Used (ft. <sup>2</sup> )	7.07	7.07	7.07	9.62
Velocity (fps)	9.20	9.20	9.20	9.20
Hydraulic Length	-	-	-	-
Land Slope	-	-	-	-
Headwater Req'd (ft.)	N/A	N/A	-	-
D Req'd (ft.)	1.86	1.88	1.95	1.97
D in Place	3.00	3.00	3.00	3.50

Note: See Appendix O for culvert justification.

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TABLE IV-4 (cont'd)

MAIN CHANNEL CULVERT DESIGN

<u>Structure</u>	<u>C9</u>	<u>C11</u>	<u>C13</u>	<u>C15</u>
Drainage Area	678.60	696.73	752.04	752.04
10 yr. - 24 hr. Event	1.82	1.82	1.82	1.82
Time of Conc. (hrs.)	-	-	-	-
Curve number	70	70	70	70
Manning's number	0.025	0.025	0.025	0.025
Ditch Slope (%)	5.56	5.56	5.56	5.56
Peak Flow	29.82	32.42	38.92*	38.92*
Structure Area Used (ft. <sup>2</sup> )	9.62	9.62	9.62	9.62
Velocity (fps)	9.20	9.20	9.20	9.20
Hydraulic Length	-	-	-	-
Land Slope	-	-	-	-
Headwater Req'd (ft.)	-	-	-	-
D Req'd (ft.)	2.06	2.12	2.27	2.27
D in Place	3.50	3.50	3.50	3.50

Note: See Appendix O for culvert justification.

Note: All culverts are within capacity for open-channel flow.

\* If design peak flows for primary spillways from Ponds C and E are included, the peak flows for C-13 and C-15 are 65.6 cfs and 90.9 cfs respectively.

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TABLE IV-5

SIDE DRAINAGE CULVERT DESIGN

<u>Structure</u>	<u>C-0</u>	<u>C-2</u>	<u>C-4</u>	<u>C-6</u>
Drainage Area	36.65	23.03	77.29	26.87
10 yr. - 24 hr. Event	1.82	1.82	1.82	1.82
Time of Conc. (hrs.)	0.12	0.08	0.24	0.22
Curve number	70	70	70	70
Manning's number	0.025	0.025	0.025	0.025
Ditch Slope (%)	4.00	4.00	10.00	4.00
Peak Flow	5.65	3.90	8.77	4.17
Structure Area Used (ft. <sup>2</sup> )	1.767	1.767	1.767	1.767
Velocity (fps)	6.18	6.18	8.73	6.18
Hydraulic Length	1300	850	2850	1400
Land Slope	51.43	61.54	47.22	56.67
Headwater Req'd (ft.)	1.35	1.12	*2.40	1.02
D Req'd (ft.)	1.10	0.96	*1.30	0.98
D In Place (ft.)	1.50	1.50	1.50	1.50

\* Available headwater at culvert inlet is greater than that required to allow for surge storage and passage of flows.

Headwater = distance from base of culvert to top of headwall.

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TABLE IV-5 (cont'd)

SIDE DRAINAGE CULVERT DESIGN

<u>Structure</u>	<u>C-8</u>	<u>C-10</u>	<u>C-12</u>
Drainage Area	45.25	18.16	55.31
10 yr. - 24 hr. Event	1.82	1.82	1.82
Time of Conc. (hrs.)	0.14	0.11	0.21
Curve Number	70	70	70
Manning's Number	0.025	0.025	0.025
Ditch Slope (%)	4.00	4.00	10.00
Peak Flow	7.09	2.65	6.50
Structure Area Used (ft. <sup>2</sup> )		4.91	3.14
Velocity (fps)	6.18	4.90	9.77
Hydraulic Length	1600	1250	2800
Land Slope	58.62	63.16	58.33
Headwater Req'd (ft.)	1.25	0.98	1.60
D Req'd (ft.)	1.20	0.83	1.16
D In Place (ft.)	2.50	2.00	1.5

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TABLE IV-6

RESTORED CHANNEL DESIGNS\*

<u>Structure</u>	<u>Main Channel</u>	<u>Side Channel*</u>	<u>RC-2</u>	<u>RC-4</u>
	<u>RC-1</u>	<u>RC-0</u>		
Drainage Area	469.22	34.55	22.18	71.83
100 yr. - 6 hr. Event	1.91	1.91	1.91	1.91
Time of Conc. (hrs.)	3.19	0.18	0.09	0.44
Curve number	70	70	70	70
Manning's Number	0.040	0.040	0.040	0.040
Ditch Slope (%)	6.60	4.00	4.00	10.00
Peak Flow	60.31**	2.64	1.93	4.12
Min. Structure Area (ft. <sup>2</sup> )	27.00	8.00	8.00	8.00
Req'd Area (ft. <sup>2</sup> )	7.26	0.84	0.67	0.83
Depth of Flow (ft.)	1.03	0.35	0.30	0.35
Velocity (fps)	8.31	3.16	2.86	4.98
Hydraulic Length	10,200	1,300	850	2,400
Land Slope (%)	19.80	51.40	61.50	47.00
Erosion Protection (Y/N)	Y	N	N	Y

\* In areas where these side drainages cross the road after final reclamation, road dips at least as substantial as the restored channels shown in Table IV-6 will be put in place. Locations of these are shown on Plate 17.

\*\* Includes Reclaimed Area.

Note: Ditch Slopes measured from Plate 17.  
Areas from Plate 17-A

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TABLE IV-6 (cont'd)

RESTORED CHANNEL DESIGNS\*

<u>Structure</u>	<u>RC-6</u>	<u>RC-8</u>	<u>RC-10</u>	<u>RC-12</u>	<u>RC-14</u>
Drainage Area	28.74	46.92	20.74	58.20	24.37
100 yr. - 6 hr. Event	1.91	1.91	1.91	1.91	1.91
Time of Conc. (hrs.)	0.20	0.24	0.18	0.53	0.20
Curve number	70	70	70	70	70
Manning's Number	0.040	0.040	0.040	0.040	0.040
Ditch Slope (%)	4.00	4.00	4.00	10.00	4.00
Peak Flow	2.15	3.39	1.60	3.12	1.82
Min. Structure Area (ft. <sup>2</sup> )	8.00	8.00	8.00	8.00	8.00
Req'd Area (ft. <sup>2</sup> )	0.73	0.99	0.60	0.69	0.65
Depth of Flow (ft.)	0.31	0.41	0.26	0.30	0.29
Velocity (fps)	2.96	3.43	2.68	4.55	2.80
Hydraulic Length	1,400	1,600	1,250	2,800	1,300
Land Slope (%)	57.00	58.60	63.20	58.30	46.80
Erosion Protection (Y/N)	N	N	N	Y	N

\* In areas where these side drainages cross the road after final reclamation, road dips at least as substantial as the restored channels shown in Table IV-6 will be put in place. Locations of these are shown on Plate 17.

Note: Ditch Slopes measured from Plate 17.

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TABLE IV-6 (con't)

RESTORED CHANNEL DESIGNS  
(Sub-Areas) \*

<u>Structure</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
Drainage Area (ac.)	4.72	1.09	8.73	24.37	4.37	24.00	12.74
100 yr.-6 hr. event (in.)	1.91	1.91	1.91	1.91	1.91	1.91	1.91
Time of Conc. (hrs.)	0.08	0.07	0.13	0.22	0.09	0.20	0.17
Curve Number	70	70	70	70	70	70	70
Peak Flow (cfs)	0.42	0.10	0.72	1.78	0.38	1.78	0.99
Hydraulic Length (ft.)	600	400	800	1,500	700	1,200	1,100
Land Slope (%)	66.67	55.17	58.33	66.67	60.00	60.87	60.00

\* These areas drain directly to RC-1 by sheet flow, without entering other channels. See Plate 17-A.

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TABLE IV-6 (con't)

RESTORED CHANNEL DESIGNS

<u>Structure</u>	<u>*Reclaimed Area</u>
Drainage Area (ac.)	32.34
100 yr.-6 hr. event (in.)	1.91
Time of Conc. (hrs.)	0.54
Curve Number	90
Peak Flow (cfs)	23.17
Hydraulic Length (ft.)	49.50
Land Slope (%)	6.60

\* This area drains directly to RC-1 by sheet flow, without entering other channels. See Plate 17-A.

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TABLE IV-6 (con't)

RESTORED CHANNEL DESIGNS

Peak flow for RC-1 is based on the total of peak flows for RC-1 (Upper) plus channels RC-0 through RC-14, plus sub-areas 1 through 7, plus the reclaimed area. Peak flows for each of these are shown in Appendix P.

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TABLE IV-7

EROSION PROTECTION

Structure	*Main Channel	Restored Main Channel	Restored Side Channel	Restored Side Channel
	C-15	RC-1	RC-4	RC-12
Flow (cfs)	-	-	4.12	3.12
Slope (%)	5.56	6.60	10.00	10.00
Velocity (fps)	9.20	8.31	4.98	4.55
Rip-rap Size (D <sub>50</sub> )	15"	12"	6"	6"
Bedding (-3/4" gravel)	25"	20"	10"	10"
Length of Protection (ft.)	20'	All	All	All
Width of Protection (ft.)	10'	12'	6'	6'
Rip-Rap Depth	18"	15"	8"	8"

	UD-1	UD-4 (Max.)	UD-5 (Max.)	DD-3	DD-4 (Max.)
Flow (cfs)	20.57	14.82	4.75	15.18	14.55
Slope (%)	6.75	20.00	17.75	6.25	8.00
Velocity (fps)	7.25	9.67	6.98	6.28	6.82
Rip-rap Size (D <sub>50</sub> )	9"	15"	9"	9"	9"
Bedding (-3/4" gravel)	15"	25"	15"	15"	15"
Length of Protection (ft.)	All	150'	150'	All	All
Width of Protection (ft.)	5'	5'	5'	4'	4'
Rip-Rap Depth	12"	18"	12"	12"	12"

\* For Reference Only. Natural Rip-rap is more than adequate for erosion protection.

Note: Rip-Rap shall be graded according to the following:

$D_{15} = 0.42D$ ;  $D_{50} = 1D$ ;  $D_{85} = 1.6D$ .

For Median Diameter of 12",  $D_{15} = 5"$ ,  $D_{50} = 12"$ ,  $D_{85} = 19.25"$ .

For Median Diameter of 21",  $D_{15} = 9"$ ,  $D_{50} = 21"$ ,  $D_{85} = 34.00"$ .

	<u>UD-2</u> (upper)	<u>UD-2</u> (lower)
Flow (cfs)	13.87	13.87
Slope (%)	12.33	42.60
Velocity (fps)	10.63	11.90
Rip-Rap Size (D50)	N/A**	12"
Bedding (-3/4" gravel)	N/A**	20"
Length of Protection (ft.)	150'	100'
Width of Protection (ft.)	5'	5'
Rip-Rap Depth	N/A**	15"

\*\* UD-2 (upper) is protected by a channel liner.

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During the earthwork portion of the reclamation suitable rip-rap will be segregated and stored on site for later use in the stream channel restorations it will not be necessary to haul rip-rap in from an outside source. Also native material will be used for the filter blanket under the rip-rap. This material can be used because of its sandy nature it will not be necessary to haul gravel in.

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TABLE IV-8

VALUES FOR MANNING'S N AND MAXIMUM PERMISSIBLE VELOCITY OF FLOW IN OPEN CHANNELS

Ditch lining		Manning's n	V <sub>max</sub> fps <sup>1</sup>
1. Natural earth			
a. Without vegetation			
(1)	Rock		
(a)	Smooth and uniform .....	0.035-0.040	20
(b)	Jagged & Irregular .....	0.040-0.045	15-18
(2)	Soils		
Coarse grained			
Gravel and gravelly soils			
Unified USDA			
GW	Gravel	0.022-0.024	6-7
GP	Gravel	0.023-0.026	7-8
GM	Loamy	d 0.023-0.025	3-5
	Gravel	u 0.022-0.020	2-4
GC	Gravelly Loam		
	Gravelly Clay	0.024-0.026	5-7
Coarse grained			
Sand and sandy soils			
SW	Sand	0.020-0.024	1-2
SP	Sand	0.022-0.024	1-2
SM	Loamy	d 0.020-0.023	2-3
	Sand	u 0.021-0.023	2-3
SC	Sandy Loam	0.023-0.025	3-4
Fine grained			
Silts and clays			
50	CL	Clay Loam	
		Sandy Clay Loam	0.022-0.024
		Silty Clay	
LL	ML	Silt Loam	
		Very Fine Sand	0.023-0.024
50	OL	Silt	
		Mucky Loam	0.022-0.024
	CH	Clay	0.022-0.023
LL	MH	Silty Clay	0.023-0.024
	OH	Mucky Clay	0.022-0.024
Highly Organic			
PT	Peat	0.022-0.025	2-3

<sup>1</sup>Maximum recommended velocities

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Table IV-9  
Sediment Yield  
for  
Disturbed Area

Using the Universal Soil Loss Equation:

A = RKLSCP; Where:

$$R = 16.53 \text{ from } R = 27P_{2.6}^{2.2}; P_{2.6} = 0.8 \text{ inches}$$

K = 0.50 from Table 5.5 (Ref. Below)

LS = 2.5 Length/Slope factors from Fig. 5-15 (Ref. Below)

Average Length = 1200'

Average Slope = 6.25%

CP = 1.0 from Table 5.A.1 (Ref. Below)

Based on combination of compacted surface and pavement with grouted ditches.

$$*A = 16.53 \times 0.50 \times 2.5 \times 1.0 = \underline{20.6625 \text{ tons/acre/year}}$$

Sediment Yield = A = 0.010 ac./ft./acre/yr.

- Notes: (1) Reference: "Applied Hydrology and Sedimentology for Disturbed Areas", Barfield, Warner and Haan, 1983.
- (2) Sediment Yield based on a weight of 100 lbs./cu. ft.

\* Included for reference only. A more conservative figure of 0.05 ac. ft./acre has been used for Pond C, and 0.1 ac. ft./acre has been used for Pond E sizing.

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Table IV-10  
Sediment Yield  
for  
Undisturbed Areas

Using the Universal Soil Loss Equation:

A = RKLSCP; Where:

$$R = 16.53 \text{ from } R = 27P_{2.2, 2.6}^{2.2}; P_{2.5} = 0.8 \text{ inches}$$

$$K = 0.37 \text{ from Table 5.5 (Ref. Below)}$$

$$LS = \text{Average Length/Slope Factor from Equation} = 56.04$$

$$LS = \left( \frac{L}{72.6} \right)^{0.5} \left( \frac{430X^2 + 30X + 0.43}{6.613} \right);$$

$$L = \text{Avg. Slope Length} = 1,000'$$

$$X = \sin \theta; \theta = \text{Avg. Slope Angle} = 26.57^\circ (50\%)$$

$$C = 0.1 \text{ from Table 5.A.3 (Ref. Below)}$$

25% Canopy Cover; 40% Ground Cover

$$P = 1 \text{ (No. Control Practice)}$$

$$A = 16.53 \times 0.37 \times 56.04 \times 0.1 = \underline{34.275 \text{ tons/acre/yr.}}$$

$$\text{Sed. Yield} = \frac{34.275 \times 2,000}{100 \times 43,560} = \underline{0.016 \text{ ac. ft./acre/yr.}}$$

- Notes: (1) Reference: "Applied Hydrology and Sedimentology for Disturbed Areas", Barfield, Warner and Haan, 1983.
- (2) Sediment yield based on a weight of 100 lbs./cu. ft.

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Table IV-11  
Minesite Drainage Area Summary

<u>Drainage No.</u>	<u>Area (ac.)</u>	<u>Type</u>	<u>Drains To:</u>
1	4.23	Undisturbed	Pond E
2	5.40	"	Pond C
3	3.00	"	Old Works (Chidister Mine)
4	3.12	"	" " "
5	11.97	"	Pond C
6	2.06	"	Apex Mine
7	1.12	"	Old Works (Chidister Mine)
8	0.55	"	" " "
9	1.01	"	" " "
10	7.41	"	" " "
11	0.13	"	Pinnacle Mine
12	13.52	"	Pond C
13	6.20	"	Pond E
14	1.77	"	" "
15	12.21	Disturbed	" "
16	6.04	"	Pond C
17	4.07	"	Catch Basin B
18	1.28	"	Old Works (Chidister Mine)
19	0.81	"	Pinnacle Mine
20	4.68	"	Pond C
21	3.25	"	Old Works (Chidister Mine)
22	1.23	"	Apex Mine
Total =			95.06;

Disturbed = 33.57 Acres;  
Undisturbed = 61.49 Acres

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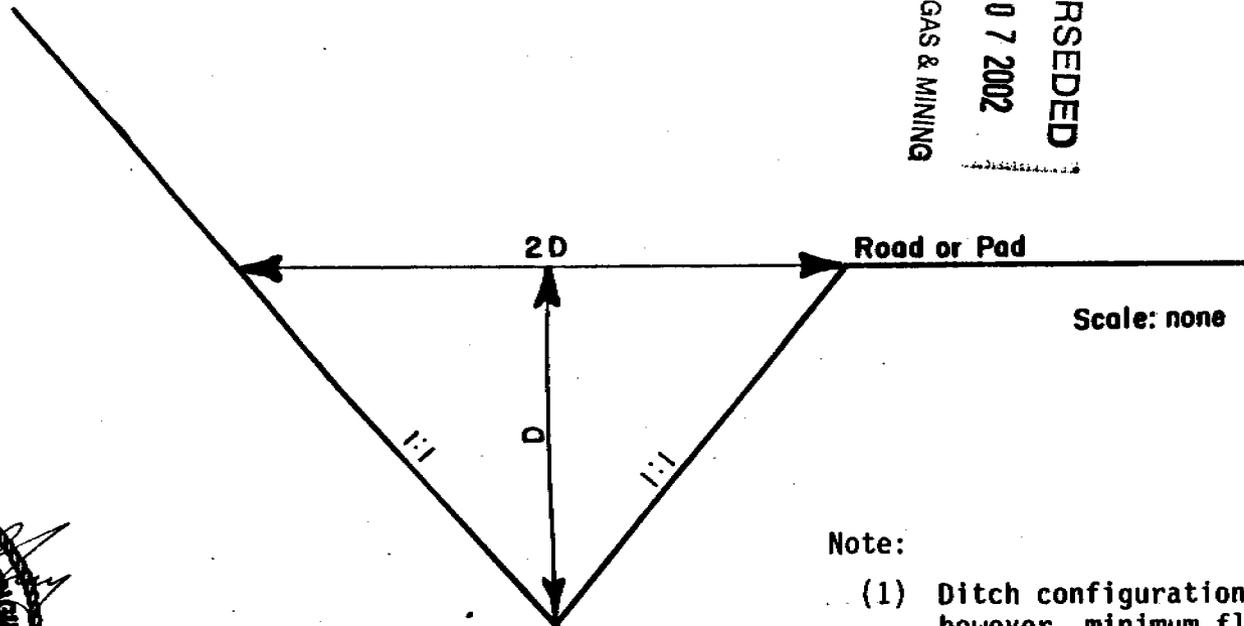
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- Notes: (1) Areas disturbed from Plate 8 (and Plate 9 as necessary).
- (2) Does not include diverted undisturbed drainage.

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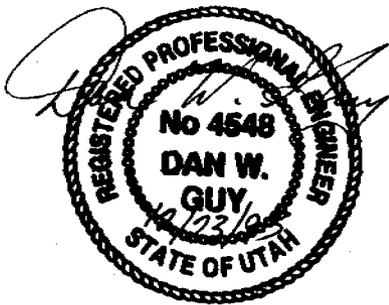
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Note:

- (1) Ditch configuration may vary; however, minimum flow depth and/or flow area will be maintained per Table IV-3B.
- (2) Applies to all disturbed diversion ditches except DD-3, which has a one-foot bottom width.

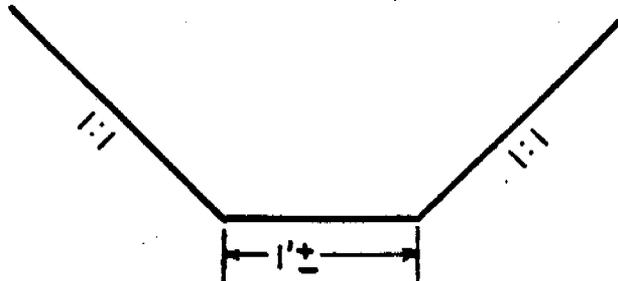
Typical Disturbed Diversion Ditch  
Figure IV-3



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FIGURE IV-3A

Typical SECTION FOR TRAPEZOIDAL DITCH

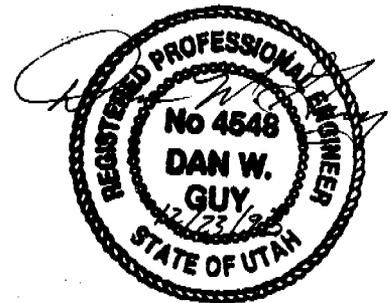


Note: Ditch configuration may vary slightly in field; however, minimum depth and/or area will be maintained to dimensions shown on Table IV-B.

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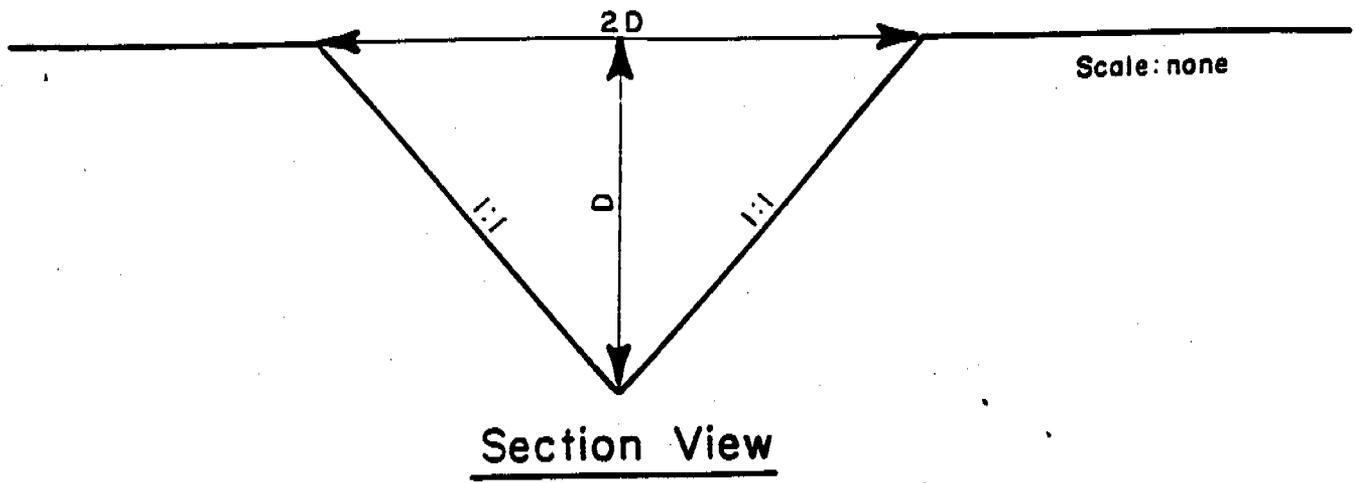
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Typical Section for Trapezoidal Ditch

Figure IV-3A

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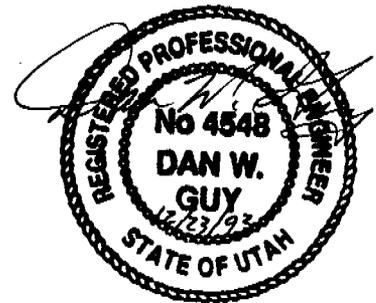
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Note: Ditch configuration may vary; however, minimum flow depth and/or flow area will be maintained per Table IV-3B

Typical Undisturbed Diversion Ditch  
Figure IV-4

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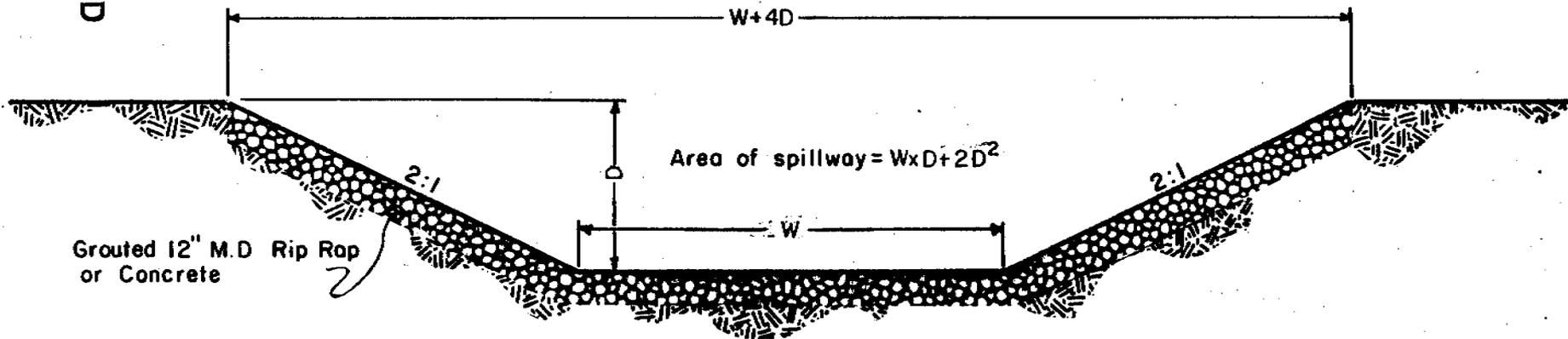
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Structure	W	D
Pond E	5.0'	2.0'
Pond E - PM	5.0'	2.0'

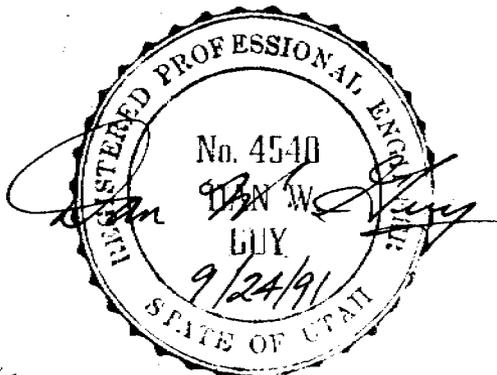
**LEGEND**

D - Spillway depth  
W - Spillway Bottom Width

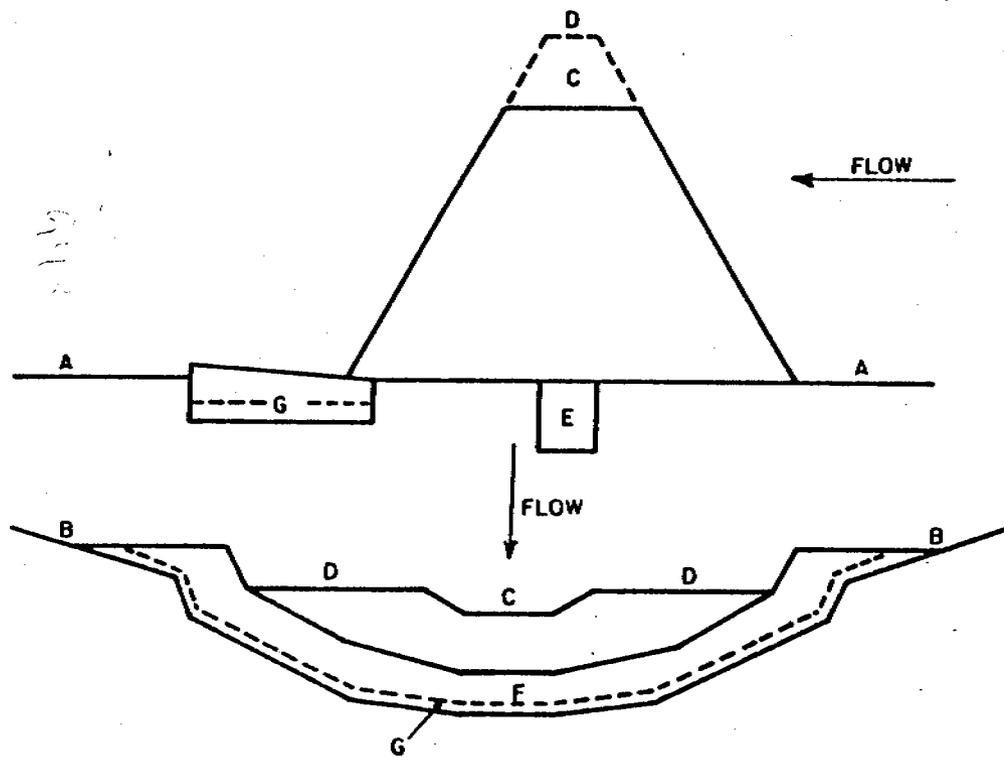
Typical Section of Emergency Spillway

Scale: None  
Date: 3/6/92

FIGURE IV-6



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Construction Plans for a Loose-Rock Check Dam/Stilling Basin

1. Section of the dam parallel to the centerline of the gully.
  2. Section of the dam at the cross section of the gully.
- A = original gully bottom; B = original gully cross section; C = spillway; D = crest of free board; E = excavation for key; F = excavation for apron; G = filter blanket.

Notes:

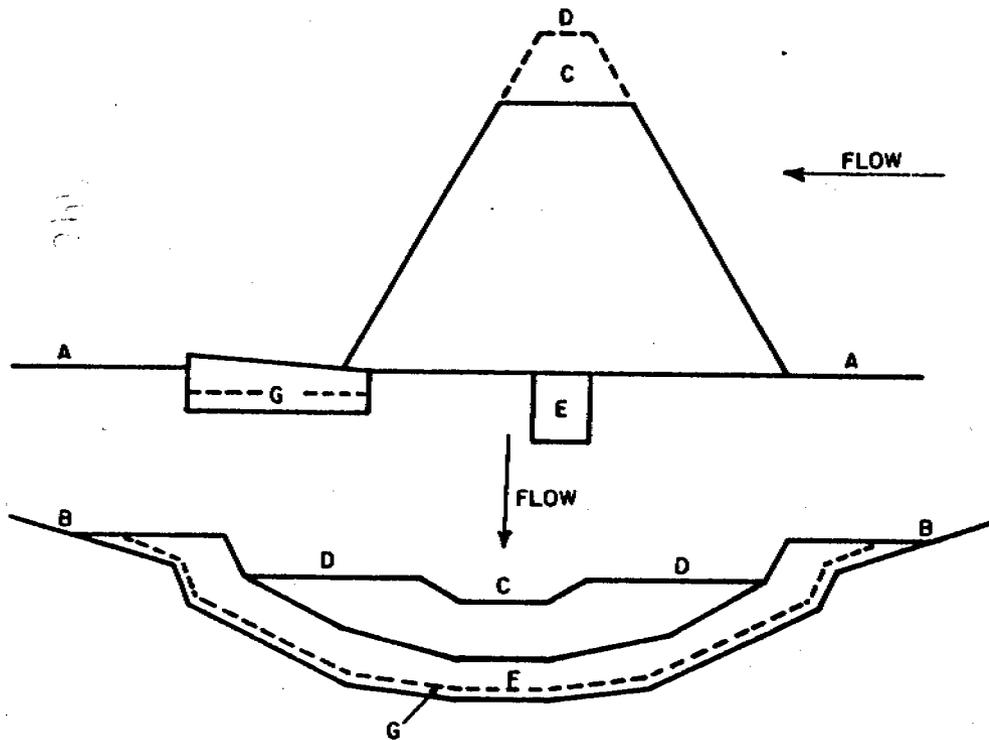
1. A well-graded distribution of angular rock from 6-24 inches must be used. The angle of rest for this angular rock should correspond to a slope ratio not less than 1.5 to 1.0. The structure shall be 24-30 inches high. The angular rock shall be placed so as to form a 36 inch wide by 6 inch deep notch in the center of the creek channel to form a centralized spillway.
2. The keyway must be 24 inches wide and deep and excavated into the streambed and banks. The keyway into the banks must be 36 inches deep.
3. The apron section must be 15 feet long and placed with an adverse slope of 6 inches over the 15 feet length. A filter blanket (3 inch minus material, 6 inches deep) must be placed under aprons. Riprap side slope protection measures for the length of the apron and 2 feet above the gabion crest must be included. The angle of rest for the 6-24 inch well-graded material used to construct the gabion must be strictly adhered to. The apron will be at least 10 feet wide.

Loose Rock Check Dam  
(Restored Main Drainage Channel)  
Figure IV-8

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Construction Plans for a Loose-Rock Check Dam/Stilling Basin

1. Section of the dam parallel to the centerline of the gully.
2. Section of the dam at the cross section of the gully; A = original gully bottom; B = original gully cross section; C = spillway; D = crest of free board; E = excavation for apron; F = excavation for apron; G = filter blanket.

Loose Rock Check Dam  
(Restored Side Drainage Channel)  
Figure IV-9

Notes:

1. A well-graded distribution of angular rock from 6-24 inches must be used. The angle of rest for this angular rock should correspond to a slope ratio not less than 1.5 to 1.0. The structure shall be 24-30 inches high. The angular rock shall be placed so as to form an 18 inch wide by 5 inch deep notch in the center of the creek channel to form a centralized spillway.
2. The keyway must be 24 inches wide and deep and excavated into the streambed and banks. The keyway into the banks must be 36 inches deep.
3. The apron section must be 10 feet long and placed with an adverse slope of 6 inches over the 10 feet length. A filter blanket (3 inches minus material, 6 inches deep) must be placed under aprons. Riprap side slope protection measures for the length of the apron and 2 feet above the gabion crest must be included. The angle of rest for the 6-24 inch well-graded material used to construct the gabion must be strictly adhered to. The apron will be at least 8 feet wide.

DIV OF OIL GAS & MINING

OCT 07 2002

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