SOLDIER CREEK COAL COMPANY

Additions to the January
1984 Submittal

DOCUMENTS

SOLDIER CREEK COAL COMPANY
Additions to the January
1984 Submittal

MAPS

COLLATION INSTRUCTION

1) Remove old Chapter 13 from the previous submittal.

2) Include these additions to the January 1984 submittal as a separate volume of our Mining and Reclamation Plan. These additions will now be the new Chapter 13.

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CHAPTER 13

WASTE ROCK DISPOSAL SITE

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13.1 Scope

This chapter details the proposed development approximately 2.5 miles southwest of the main facilities called the Waste Rock Disposal Site. This area was chosen for a rock disposal site because of the barren nature of the soils, the geography of the area, the ability to access the land and the proximity of the site to the mine site. The area is shown on Map E017 and contains approximately 30 acres.

The disposal site will be used as a landfill for excess rock that is generated at Soldier Canyon Mine during mining operations. The rock will be taken from the mine, trucked down the canyon and deposited at the site. The disposal site will be used continuously throughout the life of the mine. The quality of the disposed rock is given in Chapter 6 and at the end of this chapter in the correspondence section.

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13.2 Identification of Interest

The legal and equitable owner of record of the waste rock disposal area is:

Surface - United States of America
U.S. Department of the Interior
Bureau of Land Management
Utah State Office
University Club Building
Salt Lake City, Utah 84111

Coal - United States of America
(address same as above)

The legal and equitable owners of record of areas contiguous to the waste rock disposal area are shown on Drawing C151. This drawing is located at the end of this chapter.

United States of America
(address same as above)

Sunedco Coal Company
7401 W. Mansfield Avenue
Suite 418
Post Office Box 35B
Lakewood, Colorado 80235

There are no leasehold interests for the surface or coal in the waste rock disposal area.

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13.3 Right of Entry

The legal description of the waste rock disposal area is:

S. 1/2, S. 1/2, S.W. 1/4, S.E. 1/4,
Section 24, T. 13 S., R. 11 E., S.L.B. & M.

N. 1/2, N.W. 1/4, N.E. 1/4,
Section 25, T. 13 S., R. 11 E., S.L.B. & M.

Soldier Creek Coal Company bases their right to enter and use this site for waste rock disposal on the acquisition of a right-of-way from the U.S. Department of the Interior, Bureau of Land Management. A copy of the right-of-way application is provided in the correspondence section of this chapter.

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13.4 Operational Plan

13.4.1 Initial Development

Initial development at the waste rock disposal area has been planned to start during the summer of 1985. The incipient work at the site will include the construction of a sedimentation pond and associated drainage structures, the construction of the topsoil drainage channel and berm, the relocation of the access road and some minor upgrading of the access road. Map E020 located at the end of this chapter depicts this initial development.

Construction of the sedimentation pond will be done using the soils found on site. The area to be used will have all vegetative matter removed and the embankment foundation scarified. The soil will be placed in successive layers of loose material not exceeding six inches in depth after compaction. The outslopes of the pond shall have a slope of 2:1 and the inner slopes shall have a slope of 2.5:1. Drawing C153 located at the end of this chapter shows the cross sections of the pond.

The sediment pond design calculations are given in Section 9 of this chapter. The total embankment height will be 10.0 feet and this will provide a total storage volume of 7.2 acre-feet. The embankment top width is 10 feet and the pond dimensions at this point are 270 feet by 150 feet. The emergency spillway will consist of a 30 inch corrugated metal pipe and riser, with a trash rack, anti-seep collars and an anti-vortex device. The dewatering or decant device will be a 6 inch metal pipe with a valve located on the outslope portion of the pond. The decant will also have a trash rack, anti-seep collars and an anti-vortex device.

The inlet end of the spillway will be 2.6 feet below the height of the dam and the decant device will be 5 feet below the dam height. Both devices will discharge into a riprapped portion of the existing drainage channel. An 18 inch culvert will be placed in the northwest portion of the dam directing the drainage from the topsoil stockpile into the pond. The culvert will discharge at a level 2 feet above the pond's bottom into a riprapped section of the pond. Both riprapped areas are for energy dissipation.

The pond is designed to meet the requirements of UMC 817.46, Hydrologic Balance: Sedimentation Ponds. Upon completion of the pond the area will be surveyed to assure the design heights are met and at this time a marker will be placed in the pond denoting the 60 percent design sediment capacity. When sediment reaches this mark it will be removed and mixed into the rock on site. All embankments will be stabilized by reclaiming them with the seed mixture listed in Section 8 of this chapter. Mulch will be added at the rate of 2 tons per acre and the embankments will be netted to further help stabilize the slopes.

All additional areas that are disturbed to the north and west of the sedimentation pond will be reclaimed by the means listed in the above paragraph. These areas will include the topsoil berm and the small drainage to the north of the pond. The dirt drainage channels will remain unseeded but will have jute netting placed in them to hinder soil erosion.

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The design calculations for the dirt drainage channel are shown in Section 9 of this chapter. Also, the design for the culvert under the access road is shown in the same section. This will be a 30 inch culvert and it will remain as a permanent structure after final reclamation. Map E020 depicts both of these structures and is located in Section 11 of this chapter.

13.4.2 Disposal Site Operations

Rock disposal site operations will begin following the completion of the sedimentation pond and associated drainage structures. The first operation will be the stripping of all vegetative matter from the area that will be used during the year for disposal. The vegetation will then be burned, buried or saved and used as mulch on the topsoil stockpile. Topsoil will then be salvaged and placed in the stockpile. The stockpile will be seeded with seed mixture #4 found in Chapter 9 and then it will have mulch crimped into and nutrients spread over the seeded topsoil.

This operation of salvaging topsoil will be carried out throughout the life of the site and/or the mine. Each spring the area that has been projected for use during the next year will be prepared as described above. The topsoil stockpile will have the previous years vegetative growth stripped in preparation for deposition of the salvaged topsoil. Compaction within the topsoil stockpile will be loosened prior to the deposition of each years topsoil. The vegetation stripped from the stockpile will be used as mulch on the newly placed topsoil.

The initial dumping of rock will begin at the lowest point upstream from the sedimentation pond. The area will then be brought up by successive lifts to the final contours shown or Map E019. The successive lifts will be formed into a series of slopes and benches. The slopes will be 2:1 and will rise 30 vertical feet. The benches will be 20 feet wide and will be sloped 5 percent toward the toe of the next rise.

The waste rock will be trucked to the site and dumped in designated areas. The rock in these areas will then be spread and compacted through the use of crawler-loader type of equipment. This type of equipment will be the only equipment in use at the waste rock site. Each year there will be a stadia survey of the depositional area to assure proper configuration of the area. During this survey, the sediment pond and associated drainage structures will be inspected for structural weakness, erosion and any potential hazardous conditions. This will be one of four times per year that the pond will be examined and all reports will be sent to the Utah Division of Oil, Gas and Mining.

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13.5 Reclamation Plan

Initial reclamation will begin during the deposition of waste rock material. This reclamation can begin in areas which have reached final contours and will not require future disturbances. All such areas will receive the appropriate amounts of topsoil, seed mixture, mulch and soil amendments as listed in Sections 7 and 8 of this chapter. These areas can then be monitored to establish the success of the proposed final reclamation activities.

Final reclamation of the Waste Rock Disposal Site will begin one year prior to the closure of the mine. The activities will consist of the redistribution of topsoil over the waste rock area, permanent recontouring of all areas except the sediment pond, final grading of the relocated public access road, final construction on any damaged drainage channels, seeding, mulching and the addition of all nutrients to the entire area.

The final grading of the public access road will be done to assure the road is in good condition. This grading will be done with the crawler-loader equipment and grades will be checked by surveying the road. Following regrading, the next project will be the redistribution of the topsoil from the stockpile. All vegetative matter will be stripped from the stockpile and the areas to receive the topsoil will be scarified prior to distribution. Damage done to any drainage channel will be repaired after all topsoil has been redistributed and compaction loosened.

The last reclamation activity on the site will be the reseeding of the area and the addition of the needed soil amendments. The seed mixture that will be used is mixture #5 listed in Section 8 of this chapter. The needed soil amendments are listed in Section 7 of this chapter. The depth of redistributed topsoil is also stated in the report by EarthFax Engineering, Inc. The seed will be drilled into all accessible areas and hand broadcast into the rest of the areas. All soil nutrients will be added to the seed mixture and applied at the same time. Mulch will be crimped into the soil and then all slopes will be netted as an additional method of soil stabilization.

The cost and timetable for these reclamation activities is as follows:

Starting July 1st

Regrading Public Access Road

	Hours		$/hr	Cost
1 - 955 Crawler-Loader	20	@	75.75	1,515.00
1 - General Foreman	20	@	15.65	313.00
1 - Equipment Operator	20	@	13.45	269.00
2 - Laborers	20	@	7.05	282.00
			Subtotal	$2,379.00

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Topsoil Redistribution, Scarification and Ditch Repair

	Hours		$/hr	Cost
2 - 955 Crawler - Loaders	60	@	75.75	$ 9,090.00
1 - Cat 950 Loader	60	@	96.75	5,805.00
3 - 10 Cubic Yard Dump Trucks	60	@	27.25	4,905.00
5 - Equipment Operators	60	@	13.45	4,035.00
3 - Laborers	60	@	7.05	1,269.00
1 - General Foreman	60	@	15.65	939.00
			Subtotal	$26,043.00

Soil Reclamation and Revegetation

				Cost
Seed Mixture	12.00 acres	@	$140.86/acre	1,690.32
Straw Mulch	12.00 acres	@	48.00/acre	576.00
Fertilizer	12.00 acres	@	110.00/acre	1,320.00
Netting	8.00 acres	@	620.00/acre	4,960.00
Staples	8.00 acres	@	29.00/case	232.00
			Subtotal	$ 8,778.32

	Hours		$/hr	Cost
2 - John Deere 301A	40	@	9.40	752.00
1 - General Foreman	40	@	15.65	626.00
2 - Equipment Operator	40	@	13.45	1,076.00
5 - Laborers	40	@	7.05	1,410.00
			Subtotal	3,864.00
			TOTAL	$41,064.32

The reclamation activity will end September 31st.

The sedimentation pond will be removed after the waste rock area has met vegetation standards. At this time, the pond will be removed and the area revegetated the following spring. This will take approximately two weeks and the cost is as follows:

Sediment Pond Removal and Revegetation

	Hours		$/hr	Cost
1 - 955 Crawler - Loader	20	@	75.75	1,515.00
1 - John Deere 301A	20	@	9.40	188.00
1 - General Foreman	40	@	15.65	626.00
1 - Equipment Operator	40	@	13.45	538.00
4 - Laborers	40	@	7.05	1,128.00
			Subtotal	$3,995.00

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				Cost
Seed Mixture	6.00 acres	@	$140.86/acre	845.16
Straw Mulch	6.00 acres	@	48.00/acre	288.00
Fertilizer	6.00 acres	@	110.00/acre	660.00
			Subtotal	$1,793.16
			TOTAL	$5,788.16

These costs will be included in the bonding requirements for Soldier Canyon Mine prior to the initial construction of the waste rock disposal area. Map E019 shows the post-mining contours of the waste rock area.

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13.6 Land Resources

The surface and coal ownership is shown on Drawing C153. The land use within the area is rangeland and wildlife habitat. The rangeland use is limited to transitional periods of movement up and down the canyon during the spring and fall months. Wildlife use is chiefly during early winter and early spring as the animals end and begin their migration.

One hundred percent of the waste rock disposal area was surveyed for any potential historic or cultural resources. A copy of the survey is included in the correspondence section of this chapter. The disposal site finds were two rock alignments, a check dam, some pieces of glass and earthenware.

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13.7 Soil Resources

The soil resources within the waste rock disposal area were surveyed by EarthFax Engineering, Inc. Their report, which follows, contains information on topsoil reclamation, topsoil placement and protection, needed nutrients and amendments and the soil series found within the area. Plate 1 can be found within the Maps and Drawings Section of this chapter.

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PROPOSED

WASTE-ROCK DISPOSAL AREA

TOPSOIL RESOURCES PROTECTION AND REDISTRIBUTION PLAN

Prepared for

SOLDIER CREEK COAL COMPANY

By

EarthFax Engineering, Inc.

July, 1984

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RECLAMATION: Topsoil Suitability

All of the soil series and phases of those series present at the proposed waste-rock disposal area are suitable for use in reclamation.

The Gerst Series is generally well suited for reclamation, however, the cobbly phase of the series would require some additional efforts to segregate the cobbles from the fines. The cobbles included with the Gerst soil are associated with the surface and are not normally found in the deeper horizons.

The Gerst Stony Loam, found on the north-facing hillslope, covers 5.10 acres and averages 24 inches in depth. After removing the surficial stones, the entire soil profile is suitable for use as topsoil or substitute topsoil. The important parameters governing suitability for reclamation for the Gerst Stony Loam are found in Table 1, TP #6.

The pH ranges from 8.0 to 8.3 and is well suited for reclamation. Additionally, the values for the ECe, ranging from .2 mmhos/cm to .4 mmhos/cm, and the SAR, ranging from .4 to 2.6, have good suitability for reclamation and substantiate that the soil is non-saline. The available water capacity (AWC) ranges from 6.5 to 9.2 percent and has a fair suitability rating for reclamation.

The texture, a loam to a silt loam, is well suited for reclamation. However, when the coarse fragments are included, the suitability rating is modified to a fair rating. The percent greater than 2mm ranges from 24.6 to 59.1 percent. Normally the 59.1 percent coarse fragments would correspond with a low AWC and therefore a poor suitability. But in the case of this soil, the 59.1 percent coarse fragments reflects the channery fragments of a highly weathered paralithic material which exhibits the properties associated with a fair suitability rating.

The entire Gerst Stony Loam profile will be salvaged and stockpiled for post-mining reclamation of the waste-rock disposal area. The Gerst Stony Loam covers 5.10 acres and will yield 16,452 cubic yards of topsoil or substitute topsoil material for use in reclamation (Table 2).

The Gerst-Badland Complex, which has developed on the toeslopes and on the south-facing hillslope, is generally well suited overall for reclamation use. Small isolated areas of badland or thin rock outcrops do occur and no appreciable soils have developed over these areas. These badland-rock-outcrop areas do not restrict either the use or the area for a waste-rock disposal area or the use of the Gerst-Badland soil for reclamation, it does reduce, however the available volumes from the area by about 12 percent.

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The Gerst-Badland complex averages 12 inches in thickness. No significantly restrictive use parameters occur within this soil phase which would prohibit its use as a topsoil or substitute topsoil material (Table 1). The pH for both horizons is 8.1. The ECe values, .2 mmhos/cm, and the SAR values, .5, indicate that the soil is non-saline and has good reclamation suitability. The AWC ranges from 7.4 to 7.8 percent and has a fair reclamation suitability.

The loam texture is rated as good, however, when the coarse fragments are considered the rating is modified to a fair reclamation suitability. Again, even though the coarse fragments vary from 17.9 up to 47.9, the higher percentage coarse fragments represent the paralithic shale materials which has a 7.4 percent AWC. (The coarse paralithic fragments are channery in shape and highly friable.)

The entire profile will be salvaged and stockpiled for post-mining reclamation of the waste-rock disposal area. The Gerst-Badland complex covers 14.00 acres and will yield 22,582 cubic yards of topsoil or substitute topsoil material for reclamation use.

The Gerst, .38 acres, and Gerst Cobbly, .24 acres, phases are located at the extreme eastern end of the proposed waste-rock disposal area. Although the proposed plans do not call for this area to be disturbed, the soils are suitable for reclamation usage. The soil averages 14 inches in depth, and is underlain by weathered paralithic materials. The ph is 8.0 for all horizons. The ECe values, ranging from .2 mmhos/cm to .3 mmhos/cm, and the SAR values, .4 to .6, indicate that salinity is not a problem.

The texture varies from a clay loam to a silt loam and a silty clay loam. The percentage of coarse fragments varies from 0.0 to 63.4 percent. The higher 63.4 percentage is representative of the channery paralithic shale material which has an AWC of 9.2 percent, corresponding with a fair reclamation suitability.

The Haverdad series is very well suited to reclamation usage. Only one phase of this series, the Haverdad Loam, was found in the proposed waste-rock disposal area. The Haverdad Loam covers 2.00 acres within the area. The larger area comprising 1.10 acres will be stripped of its soil resources, while the smaller 0.90 acre area will be used for a topsoil stockpile, with the topsoil resources from the other soils being stockpiled and protected there.

The pH varies from 7.9, in the upper horizon, to 8.3 in the two lowest horizons and has a good reclamation suitability rating. The ECe values ranging from .2 mmhos/cm to 1.0 mmhos/cm and the SAR values ranging from .4 to 1.2 are considered to

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have good suitability for reclamation. Only the SAR value for the C_4 horizon, 6.2, is considered to have fair reclamation suitability. The AWC values range from 6.0 to 13.7 percent. The AWC values which range from 6.0 to 7.4 percent are considered to have fair suitability, while the 13.7 percent AWC is considered to have good suitability for reclamation.

The texture for the upper three horizons is a loam, while the C_4 horizon has a silty clay loam texture. The loam soil has a good suitability rating while the silty clay loam has a fair suitability rating. The coarse fraction varies from 0.0 to 43.0 percent, with the C_4 horizon having the higher value. The upper three horizons have good ratings while the C_4 horizon has a fair reclamation suitability rating. The 43.0 percent coarse fraction in the C_4 horizon represents the channery, paralithic shale materials which exhibit the properties associated with a fair suitability rating.

The entire profile of the larger area of the Haverdad Loam soil will be stripped and stockpiled. Removal of the 48 inch profile from the 1.10 acre area will provide 7,097 cubic yards of topsoil material which is suitable for use in reclamation.

The Styrch series is generally well suited for reclamation use after the cobbly-stony fraction is removed. A total of 5.85 acres of the waste-rock disposal area is covered by the Styrch soils. Because of its relative high, elevated position on the landscape, the Styrch soils will not be disturbed during the proposed life of the project and the available soil volumes are therefore not included in the volumes to be stockpiles. However, the reclamation suitability for each phase of the Styrch series is provided to ensure a complete detailed description of the waste-rock disposal area is achieved.

The Styrch Loam phase, represented by test pit #5, is well suited for reclamation use. The pH values range from 8.0 to the C_3 of test pit #3, has a good suitability rating for AWC.

The texture of the fines varies from a loam to a sandy loam and a silt loam, all of which have a good reclamation suitability. There are stony to very stony horizons intermixed throughout the soil profile. If this soil were ever disturbed or the need ever arose for use of this soil the coarse fraction could be mechanically segregated from the fines. The coarse materials are suitable for use as rip-rap, and the fines are suitable for use as substitute topsoil.

The Styrch very stony loam covers approximately 3.05 acres in the upper elevations of the watershed. If the need ever arose approximately 9,578 cubic yards of fines and 6,412 cubic yards of coarse fragments (poorly graded) are available for use in reclamation. However, there are no plans which call

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for the disturbance of this soil. Also, there is not a need for the additional materials. Therefore, the inclusion of this data is for informational purposes only.

The Badland areas total 2.43 acres. No appreciable soils are present on these areas, as the slopes are steep and erosion is severe. When the badland areas are encountered within the waste-rock disposal area, they will be covered over by the designated fill material.

TABLE 2

SOIL RESOURCE VOLUMES
FOR AREAS WITH POTENTIAL FOR DISTURBANCE

Soil	Acres	Depth	Volume (yd^3)
Gerst-Badland	14.00	12"	22,582
Gerst Stony Loam	5.10	24"	16,452
Haverdad Loam	1.10	48"	7,097
Total	20.20	17"*	46,131

(* = Average soil salvage depth for the total 20.20 acres)

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TOPSOIL RESOURCES:Placement and Protection

The topsoil resources which could potentially be covered by waste-rock material will be salvaged prior to placement of the material. Only part of the designated area will be cleared at any given time in order to protect the topsoil resources and prevent unnecessary erosion. This clearing and salvage procedure will be based on the anticipated storage needs for a one year period. Annually, during the late summer the storage needs for the forth-coming year will be calculated. The needed storage area will then be staked, and the area within the staked boundary will be cleared of all surficial vegetation and the coarse rock fragments, if any. The vegetation will either be burned or buried. The coarse rock fragments will either be salvaged for later use or disposed of within the waste-rock disposal area (depending on the current and anticipated needs for rip-rap materials). The topsoil and subsoil will then be removed, without segregation of the soil horizons, and placed in the designated topsoil stockpile area (Plate 1). The topsoil and subsoil horizons will not be segregated during the stripping process because of the similiarity of the physical and chemical parameters within each distinct soil profile (Table 1).

The designated topsoil stockpile area is located at the extreme northwest perimeter of the disposal area, on portions of the Haverdad Loam and Gerst-Badland soils. The area covers approximately 1.7 acres and has sufficient storage capacity to hold the maximum potential topsoil, 46,131 cubic yards, which the disposal site could yield. The topsoil stockpile will be placed in the asymmetrically shaped bowl. The top of the pile will have a gentle, west-sloping surface which is bounded on the west by an embankment, constructed with the salvaged topsoil, having a 2.5 horizontal to one vertical sideslopes. The embankment will be constructed contigious to the western perimeter of the disposal area. As additional fill is annually added to the stockpile the embankment will be raised by the upstream method, without disturbing the previously stabilized and vegetated portions of the existing embankment.

The stockpiled topsoil materials will be protected from excessive erosion and instability by the following methods:

Construction of runoff control and diversion measures around the perimeter of the area.

Emplacement of the materials, in eighteen inch lifts, with a moderate compaction effort.

Completing necessary annual reclamation measures to ensure adequate stand of vegetative cover is established.

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Runoff control measures emplaced or constructed on the disposal facility will be diverted to the sediment pond located on the southwest perimeter of the area.

A sufficient level of compaction is necessary to ensure long-term stability of the emplaced soils. The soils will be placed in eighteen inch lifts, and will be compacted by a minimum of two passes of the earth-moving equipment.

Reclamation measures will be conducted on the stockpile after each disturbance of the area. It is anticipated that disturbance could occur annually, however there may be instances where the stockpile would not be disturbed for two or more years.

The vegetation in the area designated for the topsoil stockpile will be cleared off and disposed of. The salvaged topsoil will then be emplaced by the methods previously described. After completion of the salvage measures the surface of the stockpile will be prepared for reclamation. The surface of the area will be ripped, to a twelve inch depth, and then disced along the contour. The suggested rate, type and quality of fertilizer and seed mixture will then be applied. Next the mulch will be applied, at the rate of two thousand pounds per acre of native grass hay, straw or other acceptable materials, and crimp-disced into the soil. The reclamation measures will be conducted in late-summer and early fall to provide the greatest potential for establishment of an acceptable stand of vegetation.

Prior to the placement of the annual addition of materials the vegetative cover will be stripped off of the top of the stockpile and temporarily stored until the new materials have been emplaced. The temporarily stored vegetative material will then be redistributed over the surface of the newly emplaced material and disced into the upper six inches. The fertilizer, seed, and mulch would then be applied as previously described.

The topsoil stockpile will be inspected bi-annually to ensure excessive erosion or instability problems do not go unnoticed, and therefore unrepaired.

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TOPSOIL:Redistribution

When all mining operations have ceased and the waste-rock disposal area is no longer being utilized, then the area will receive final reclamation.

The surface of the waste-rock disposal area will be prepared for the redistribution of the topsoil resources by providing a uniformly smooth, gently sloping surface. The waste-rock itself which is exposed on the surface, will probably range from large sandstone to indurated siltstone fragments, will be rubbilized and compacted by a minimum of three passes of the large earth-moving equipment. The area will be staked on 200 foot center with the appropriate fill levels marked on each stake.

The vegetation on the topsoil stockpile will be removed and stored, and the redistribution efforts will begin. The topsoil will be spread in a uniform 16 inch layer over the entire surface of the previous disposal area. Random soil samples will be taken, with a push tube sampler, after the distribution is completed to ensure a uniform layer has been emplaced and to obtain soil samples for final laboratory analyses to determine the current nutrient and amendment requirements.

The soil will be ripped to a depth of twelve inches, along the contour and then disced to eliminate the detrimental effects of compaction. The suggested rate, type and quality of fertilizer, seed mixture and mulch will be applied. As a final reclamation effort the mulch will be crimp-disced into the soil.

Upon completition of the reclamation of the waste-rock disposal area, the previously used topsoil stockpile area will be reclaimed. The area will be ripped to a depth of twelve inches, along the contour, and disced. These efforts will eliminate the detrimental effects of compaction. The vegetation which was stripped from the surface of the topsoil stockpile will be redistributed over the surface of the previously used stockpile area, and disced into the soil. The suggested rate, type and quality of fertilizer, seed mixture and mulch will be applied, and the mulch crimp-disced into the surface of the soil.

The redistributed topsoil resources and exposed area will be protected from excessive erosion by; initially redistributing the topsoil at the uppermost elevations of the area to be reclaimed and working downslope, by having contemporaneous final reclamation measures being installed, as the topsoil is being redistributed further downslope, and by leaving the the runoff control facilities inplace until the area has established a successful stand of vegetation.

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TOPSOIL: Nutrient and Amendment Requirements

The nutrient level for the soils in the waste-rock disposal area are very similiar (Table 3). For fifteen seperate soil horizons, associated with the three main soil series and/or phases which will be disturbed, the level for the organic matter, nitrate-nitrogen, phosphorus and potassium are very similiar.

The percent organic matter varies from .9 to 1.8 percent. The addition of two thousand pounds per acre of mulch will supplement the organic matter and enhance the vegetative regrowth.

The nitrate-nitrogen level ranges from .1 to 3.5 parts per million (ppm), with only two horizons exhibiting levels above 2.0 ppm. The low OM levels coupled with the equally low nitrate-nitrogen levels will require the addition of 40 pounds per acre of nitrogen. This can be achieved by the addition of 88 pounds per acre of sulfur coated urea 45-0-0, a slow release fertilizer.

The phosphorus levels range from <.1ppm to 2.4 ppm. These low levels of phosphorus require the addition of 30 pounds per acre of phosphorus, which can be achieved by the addition of 65 pounds per acre of treble superphosphate, 0-46-0.

The potassium levels range from 52 ppm up to 172 ppm. Only one horizon exhibited a level which is slightly low, 55 ppm. No potassium will be added to the soil, as mixing of the soil horizons will be sufficient to raise the overall potassium concentrations to acceptable levels.

The fertilizer will be applied in the fall of the year when the areas are being reclaimed. This will hold true for either reestablishing the vegetation on the topsoil stockpile, or for final reclamation of the area. The fertilizer will either be applied by broadcasting, drilling or hydroseeding methods.

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TABLE 3

CURRENT SOIL NUTRIENT LEVEL

Soil	Depth	OM	No_3-N	P	K
Gerst-Badland	0-4	1.3	.3	1.0	133
" "	4-12	1.3	.9	2.9	101
Gerst-Cobbly	0-2	1.2	.6	3.9	153
" "	2-8	1.6	.9	.7	172
" "	8-14	1.5	.8	.2	70
Gerst-Stony	0-2	1.8	3.5	2.4	99
" "	2-8	1.7	.4	.2	74
" "	8-24	1.6	.8	.3	52
Haverdad Loam	0-3	1.2	2.1	2.1	110
" "	3-9	1.0	.1	.2	132
" "	9-26	.9	.3	.1	130
" "	26-48	.9	.4	.3	62
Styrch Stony	0-2	1.2	1.3	.9	137
" "	2-15	1.1	1.1	.3	78
" "	15-40	1.2	<.1	<.1	55

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TABLE 1

SOIL LABORATORY ANALYSES RESULTS

TP	Depth	pH	ECe	SAR	OM	AWC	SP	>2mm	Texture
1	0-2	8.0	.3	.5	1.2	9.0	35	21	CL LM
1	2-8	8.0	.3	.4	1.6	9.1	41	0	SI CL LM
1	8-14	8.0	.2	.6	1.5	9.2	39	63.4	SI LM
3	0-3	8.1	.2	.4	1.0	6.2	27	33.5	LM
3	3-16	8.0	.3	.4	1.4	6.7	32	18.3	LM
3	16-30	8.3	.4	.9	1.1	6.7	35	23.7	S LM
3	30-33	8.1	3.8	3.1	1.0	10.3	41	0.0	SI LM
4	0-2	8.1	.2	.5	1.2	7.1	30	14.2	LM
4	2-15	8.1	.3	.6	1.1	7.9	33	14.8	LM
4	15-40	8.1	.3	.8	1.2	6.5	34	23.9	LM
5	0-2	8.0	.4	.3	1.5	6.1	27	24.6	S LM
5	2-9	8.0	.2	.3	1.2	8.0	38	2.4	LM
5	9-14	8.1	.2	.3	0.7	6.8	36	4.7	SA LM
5	14-25	8.1	.2	.3	1.1	6.2	45	0.0	CL LM
5	25-37	8.3	.2	.5	0.7	13.7	44	0.0	SI CL LM
6	0-2	8.1	.4	.4	1.8	6.5	31	24.6	LM
6	2-8	8.0	.2	.4	1.7	9.2	37	32.1	SI LM
6	8-24	8.3	.4	2.6	1.6	9.2	36	59.1	SI LM
7	0-3	7.9	.4	.4	1.2	6.0	33	9.1	LM
7	3-9	8.2	.2	.7	1.0	6.5	31	0.0	LM
7	9-26	8.3	.3	1.7	0.9	7.4	35	3.4	LM
7	26-48	8.3	1.0	6.2	0.9	13.7	44	43.0	SI CL LM
8	0-4	8.1	.2	.5	1.3	7.8	31	17.9	LM
8	4-12	8.1	.2	.5	1.3	7.4	32	47.9	LM

ECe - Electrical conductivity in mmhos/cm of saturate extract
SAR - Sodium Adsorption Ratio
OM - Percent Organic Matter
AWC - Available Water Capacity in percent
SP - Saturation Percentage
>2mm - Percent by weight larger than 2mm in size
Texture - LM = Loam, SI = Silt, CL = Clay, SA = Sandy

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APPENDIX A

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GERST SERIES

The Gerst Soil Series mapping unit is located on mesa and terrace sideslopes at an elevation between 6,000 to 8,000 feet msl. The average annual precipitation is 12 to 14 inches, the mean annual air temperature is 45 to 50 degrees F. and the average annual freeze-free period is 100-120 days.

The Gerst Series is shallow and well drained. It formed in residuum and colluvium derived dominantly from sandstone and shale. Slopes are 100 to 200 feet in length, and concave-convex.

Typically the surface layer is light brownish grey, extremely stony loam about four inches thick. The underlying layer is gray and light brownish gray channery silt loam over weathered shale at a depth of 10-20 inches.

Permeability of the Gerst series is moderately slow. Available water holding capacity is about 6.5 to 9.8 percent. Effective rooting depth is 10 to 20 inches. The organic matter content of the surface is 1.5 to 2.5 percent. Runoff is rapid and the hazard of water erosion is high.

The potential vegetation is an overstory of pinyon and Utah juniper with a canopy of 15 percent. The understory vegetation is 40 percent grasses, 20 percent forbs, and 40 percent shrubs. Important plants are Salina wildrye, Indian ricegrass, birchleaf mountain mahogany, and Utah serviceberry.

The average productivity is low. Suitability of harvesting wood products on slopes of 15 to 50 percent is fair. Average yields are .5 to 1 cord per acre. The Gerst soil is in capability subclass VIIs. This unit is used for wildlife habitat and rangeland.

These soils are loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents.

A1--0-8 inches; light brownish grey (10YR 6/2) extremely stony loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine, few fine and many coarse root hairs; many fine and few medium pores; 10 percent cobbles, and 25 percent stones and boulders; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.0); clear smooth boundary.

C1--8-16 inches; grey (10YR 6/1) channery silt loam; dark greyish brown (10YR 4/2) moist; massive; hard, friable, sticky and plastic; common very fine, few medium and coarse roots; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.0); clear smooth boundary.

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C2--16-24 inches; light greyish brown (10 YR 6/2) channery silt loam, greyish brown (10YR 5/2) moist; massive; hard, friable, slightly sticky and plastic; few very fine and fine roots; 25 percent channery shale fragments; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.3); clear smooth boundary.

C3r--24 inches; partially weathered shale.

Paralithic contact varies between 20 and 28 inches.

The Gerst-Badland phase of this series is identical to this description with the exception of the paralithic contact being reduce to a depth of 12 to 16 inches and the inclusion of up to 10 percent badland areas and 2 percent rock outcrops.

The Gerst-Cobbly phase has up to 50 percent cobbles in its A1 horizon, and remains identical otherwise. The paralithic contact for this phase is 14 to 18 inches.

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HAVERDAD SERIES

The Haverdad series is a very deep, well drained soil formed on alluvial fans and valley floors. It formed in alluvium derived dominantly from shale and sandstone. Slopes are 200 to 300 feet in length, at 3 to 8 percent and concave-convex. The present vegetation in most areas is mainly Wyoming big sagebrush, blue gamma, winterfat, and bottlebrush squirreltail. Elevation is 5,500 to 6,900 feet msl. The average annual precipitation ranges from 8 to 14 inches, the mean annual air temperature is 45 to 49 degrees F. and the average annual freeze-free period is 110 to 135 days.

Typically the surface layer is light brownish grey loam about three inches thick. The underlying layers to a depth of 48 to 60 inches are pale brown and light yellowish brown loam to silty clay loam.

Permeability of this Haverdad Loam is moderate. Available water capacity is 6.0 to 13.7 percent. The organic matter content of the surface layer is 1.2 to 1.5 percent. Water runoff is slow and the hazard of water erosion is moderate.

This unit is used mainly for rangeland and wildlife habitat. The potential plant communities are 50 percent grasses, 10 percent forbs, and 40 percent shrubs.

This map unit is in capability subclass VIe, nonirrigated.

These soils are fine-loamy, mixed (calcareous), mesic Ustic Torrifluvents.

A1--0-3 inches; light brownish grey (10YR 6/2) loam, dark greyish brown (10YR 4/2) moist; weak thin platy structure parting to a weak granular; slightly hard, friable, slightly sticky and slightly plastic; few fine, medium and coarse roots; many very fine and few fine vesicular pores; moderately calcareous, carbonates are disseminated; slightly alkaline (pH 7.9); clear wavy boundary.

C1--3-9 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak medium subangular blocky; hard, friable, slightly sticky and plastic; few fine, medium and coarse roots; common very fine and fine pores; moderately clacareous, carbonates are disseminated; slightly alkaline (pH 8.2); clear wavy boundary.

C2--9-26 inches; light yellowish brown (10YR 6/3) loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and plastic; few fine roots; common very fine and fine pores; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.3); clear wavy boundary.

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C3--26-48 inches; pale brown (10YR 6/3) clay loam, yellowish brown (10YR 5/4) moist; very hard, firm, sticky and plastic; few fine roots; common very fine pores; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.3); clear wavy boundary.

C4r--48 inches paralithic; highly weathered channery shale.

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STYRCH SERIES

The Styrch series is a very deep, well drained soil on benches, and upper hillslopes. This soil formed in glacial outwash and alluvium derived dominantly from shale and sandstone. Bench slopes are 300 to 400 feet in length, at 3 to 15 percent slopes and concave-convex. Upper hillslopes are 100 to 200 feet in length, 30 to 70 percent, and concave-convex. The present vegetation is mainly pinyon, Utah Juniper, Salina wildrye, Indian ricegrass, black sagebrush, and birchleaf mountain mahogany. Elevations range from 5,300 to 7,500 feet, msl. The mean annual air temperature is 45 to 47 degrees F., the average annual precipitation is about 12 to 14 inches, and the average freeze-free period is 100 to 120 days.

Typically, the surface layer is pinkish grey very stony loam about 9 inches thick. The underlying layer us light grey and very pale brown loam about 32 inches thick. The next layer is very pale brown extremely cobbly sandy loam to a depth of 60 inches or more. A layer of secondary carbonate accumulation is at a depth of about 9 inches.

Permeability of the Styrch soil is moderately rapid. Available water holding capacity is about 6.2 to 8.0 percent. Effective rooting depth is 60 inches or more. The organic matter content is 1.5 to 2.0 percent in the surface layer. Runoff is medium and the hazard of water erosion is moderate.

This unit which is used primarily for wildlife habitat and rangeland has an overstory of pinyon and Utah juniper with an overstory of 30 percent. The understory vegetation is 45 percent grasses, 10 percent forbs, and 45 percent shrubs. Important plants are birchleaf mountain mahogany, black sagebrush, Salina wildrye and needleandthread. Suitability for rangeland use is poor because of the stoniness of the surface. The Styrch is in capability subclass VIIs, nonirrigated.

These soils are loamy-skeletal,mixed, mesic Ustollic Calciorthids.

A1--0-9 inches; pinkish grey (7.5YR 6/2) very stony loam, dark brown (7.5YR 4/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and many coarse roots; common very fine and few fine pores; 20 percent cobbles, and 10 percent stones; strongly calcareous, carbonates are disseminated; slightly alkaline (ph 8.0); gradual wavy boundary.

C1ca--9-14 inches; light grey (10YR 7/2) loam, greyish brown (10YR 5/2) moist; massive, hard, friable, slightly sticky and slightly plastic; common fine and many coarse roots; few

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very fine pores; strongly calcareous, carbonates are veined; moderately alkaline (ph 8.1); gradual wavy boundary.

C2ca--14-37 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; massive; hard, friable, slightly sticky and slightly plastic; m few fine and medium roots; many very fine and few fine pores; strongly calcareous, carbonates are disseminated to soft masses; moderately alkaline (pH 8.1); gradual wavy boundary.

C3--37-60 inches; very pale brown (10YR 8/4) very cobbly sandy loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, very friable; few fine roots; few fine pores; 30 percent cobbles, and 10 percent stones; strongly calcareous, carbonates are disseminated, moderately alkaline (pH 8.3).

Secondary carbonates are at a depth of 9-14 inches.

The Styrch Stony Loam varies from the Styrch Loam in that both the C1 and C2 horizons are very stony loams with 20 percent cobbles and 20 percent stones, whereas the Styrch loam does not have the coarse materials in the C1 and C2 horizons. Additionally the Styrch Stony Loam developed on 30 to 70 percent slopes.

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13.8 Vegetation Resources

The vegetative resources within the waste rock disposal area were surveyed using the Range Site methods by Robert M. Thompson. His report is included in this section and was prepared following vegetation information guidelines issued by the Utah Division of Oil, Gas and Mining.

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VEGETATION AT THE WASTE ROCK DISPOSAL SITE

PREPARED FOR

SOLDIER CREEK COAL COMPANY

BY
ROBERT M. THOMPSON

JULY 1984

This report summarizes the data collected on vegetation at the waste rock area. The method used to inventory and classify the data was the Range Site Method. Guidelines for the application of this method were obtained from the Utah Division of Oil, Gas and Mining. Data was collected June 22, 23 and July 10, 1984.

Occular estimation was used to determine plant species cover, percent composition and total ground cover. A 9.6 square foot circular plot or quadrat was used to randomly sample the site. There were 10 plots or quadrats located in each vegetation type.

Productivity data was obtained by clipping the plants in each plot. The plants were clipped by life forms; grasses, forbes, and shrubs. All clipped samples were dried and weighed to the nearest 0.1 gram. These weights were then rounded and converted to productivity in pounds per acre.

Other data obtained was the shrub and tree densities. This data was taken only in vegetation types with a tree-shrub overstory. The plot size used to obtain tree and shrub density was approximately 6.6 feet by 66 feet in size (one hundreth of an acre). All trees and shrubs within each study plot were counted according to age, size class and aerial cover.

The vegetation types found within the waste rock area were mapped and are shown on Map E018. Pre-mining and post-mining contours of the area are shown on Maps E017 and E019. The acreage of each vegetation type within the waste rock area are listed in Table 1. The major wildlife use of these vegetation types occurs during the late spring and early winter as the mule deer migrate up into their summer range and down into their winter range.

Table 1

VEGETATION TYPE	TOTAL AREA (acres)
1. Pinyon - Juniper - Mixed Mountain Brush	4.2
2. Salina Wildrye Grass - Locoweed - Black Sagebrush	2.3
3. Pinyon - Juniper - Black Sagebrush - Salina Wildrye Grass	8.8
4. Black Sagebrush - Salina Wildyre Grass - Indian Rice Grass	4.7
5. Big Sagebrush - Galleta Grass	2.0
6. Salina Wildrye Grass - Four Wing Saltbush	4.9
7. Mancos Shale Slopes	3.1

Information on all of the vegetation types is given in the following pages. There has been no mining related disturbance within the waste rock area.

Type #1. Pinyon - Juniper - Mixed Mountain Brush

This type occurs on the tops of ridges and high bench areas. Slopes range from 0 to 15 percent and have mostly a south aspect. The vegetation is dominated by Colorado pinyon (Pinus edulis) and Utah juniper (Juniperus osteosperma) with an understory of several species of mountain brush. True mountain mahogany (Cercocarpus montanus) is the most abundant of the understory shrubs in this vegetation type. Most of the trees and shrubs are mature or old plants and the type is in a late near climax ecological condition. Soils in this type are deep, rocky, well drained and droughty. The area is used by big game during migration periods and during winter months. Some livestock use was observed during the sampling. No listed sensitive, endangered or threatened plant species or their habitats were found in this vegetation type.

Sample adequacy for this vegetation type was determined using the formula given in the Utah Division of Oil, Gas and Mining's "Vegetation Information Guidelines".

	MINIMUM SAMPLE SIZE (plots or quadrats)
Cover	8.63
Productivity	10.20
Density	1.00

Plant species present, ground cover, productivity and tree/shrub densities were determined for this vegetation type and the information is listed below:

COMMON NAME	BOTANICAL NAME	PERCENT COMPOSITION	DRY WEIGHT PRODUCTION (lbs/acre)
Grasses			
Salina Wildrye	Elymus Salina	0.1	2
Needle-and-thread	Stipa comata	0.1	2
Indian ricegrass	Oryzopsis hymenoides	0.1	2
Forbs			
Crypthantha	Cryptantha spp.	56.2	124
Holboell rockcress	Arabis holboellii	26.1	60
-----	Chamaechaenactis scaposa	8.7	20
Navajo-tea	Thelesperma subnudum	8.7	20
		100	230

PRESENT GROUND COVER	PERCENT
Vegetative Cover	0.8%
Litter Cover	42.0%
Rocks	8.0%
Bare Soil	49.2%

Present Forage Production - 230 lbs/acre
Present Range Condition - Fair to Poor
Endangered and Threatened Species - None

Overstory Tree and Shrub Cover

COMMON NAME	BOTANICAL NAME	PERCENT COMPOSITION	STEMS PER ACRE	PERCENT AERIAL COVER
Pinyon	Pinus edulis	23.5	80	29.3
Utah juniper	Juniperus osteosperma	41.1	140	51.3
True mountain mahogany	Cercocarpus montanus	17.7	60	9.7
Nevada ephedra	Ephedra nevadensis	17.7	60	9.7
			340	

Type #2. Salina wildrye grass - Colton locoweed - Black sagebrush
(Elymus salina - Astragalus coltoni - Artemisia nova)

This type of vegetation occurs on a steep benchy southeastern slope. Salina wildrye (Elymus salina) and Colton locoweed (astragalus coltoni) are the dominate species within this type and make up approximately 93 percent of the vegetation composition. The area has been burned in the past and is now in an early ecological stage with many small plants and open bare soil. Soils are shallow, very rocky, well drained, silty clay in texture and contains approximately 20 to 30 percent rock fragments. The productivity is fair and there are no listed endangered, threatened or sensitive plant species or their habitats within this vegetation type. Livestock and big game presently graze this type.

	MINIMUM SAMPLE SIZE (plots or quadrats)
Cover	9.86
Productivity	10.06
Density	13.15

Plant species present, ground cover, productivity and tree/shrub densities were determined for this vegetation type and the information is listed below:

COMMON NAME	BOTANICAL NAME	PERCENT COMPOSITION	DRY WEIGHT PRODUCTION (lbs/acre)
Grasses			
Salina wildrye	Elymus salina	52.0	260
Indian ricegrass	Oryzopsis hymenoides	0.9	5
Neddle-and-thread	Stipa comata	0.2	2
Forbs			
Colton locoweed	Astragalus coltoni	41.0	230
Low fleabane	Erigeron pumilus	4.4	40
____	Schoencrambe linifolia	0.9	5
Shrubs			
Fourwing saltbush	Atriplex canescens	0.5	3
Black sagebrush	Artemisia nova	0.1	1
		100	546

PRESENT GROUND COVER	PERCENT
Vegetative Cover	5.6%
Litter Cover	18.0%
Rocks	47.2%
Bare Soil	29.2%

Present Forage Production - 546 lbs/acre
Present Range Condition - Fair
Endangered and Threatened Species - None

Overstory Tree and Shrub Cover

COMMON NAME	BOTANICAL NAME	PERCENT COMPOSITION	STEMS PER ACRE	PERCENT AERIAL COVER
Fourwing Saltbush	Atriplex canescens	60%	600	85.7
Black sagebrush	Artemisia nova	40%	400	14.3
			1000	

Type #3 Pinyon - Juniper - Black sagebrush - Salina wildrye grass (Pinus edulis - Juniperus osteosperma - Artemisia nova - Elymus salina)

This vegetation type occurs on the toe and lower side of slopes within the area. Scattered pinyon (Pinus edulis) and Utah juniper (Juniperus osteosperma) trees dominate this type. The trees are small, mostly 6 feet to 10 feet with "dbH" range of 4 inches to 10 inches. Most trees are mature with the exception of some young trees and/or seedlings at the fringe of this vegetation type. The understory is dominated by Salina wildrye (Elymus salina) and Colton locoweed (Astragalus coltoni). This type has a poor productivity potential and is presently in fair to poor range condition. The type is also in an early ecological development stage with Pinyon - Juniper trees invading the vegetation type. Soils are very shallow, rocky and well drained. Livestock and big game have used this vegetation type heavily in the past and fire has burned through the type.

Sample adequacy for this vegetation type was determined using the formula given in the Utah Division of Oil, Gas and Mining's "Vegetation Information Guidelines".

	MINIMUM SAMPLE SIZE (plots or quadrats)
Cover	9.70
Productivity	3.36

Data collected on plant species present, ground cover, productivity and tree/shrub densities is listed below:

COMMON NAME	BOTANICAL NAME	PERCENT COMPOSITION	DRY WEIGHT PRODUCTION (lbs/acre)
Grasses			
Salina wildrye	Elymus salina	70.0	168
Forbs			
Colton locoweed	Astragalus coltoni	17.7	42
Holboell rockcress	Arabis holboellii	0.5	1
Low fleabane	Erigeron pumilos	2.7	7
Cushion eriogonum	Eriogonum ovalifolium	0.5	1
----	Haplopappus nuttallii	5.4	13
Hearthleaf twistflower	Streptanthu cordantus	0.5	1
Shrubs			
True mountain mahogany	Cercocarpus montanus	0.5	1
Black sagebrush	Artemisia nova	1.7	5
Grease bush	Forsellesia nevadense	0.5	1
		100	240

PRESENT GROUND COVER	PERCENT
Vegetative Cover	1.6%
Litter Cover	5.2%
Rocks	36.0%
Bare Soil	57.2%

Present Forage Production - 240 lbs/acre
Present Range Condition - Poor
Endangered and Threatened Species - None

Overstory Trees and Shrub Cover

COMMON NAME	BOTANICAL NAME	PERCENT COMPOSITION	STEM PER ACRE	PERCENT AERIAL COVER
Pinyon	Pinus edulis	21.2	140	81.1
Utah juniper	Juniperus osteosperma	2.0	20	11.6
True mountain mahogany	Cercocarpus montanus	3.0	20	5.0
Black sagebrush	Artemisia nova	66.7	440	1.8
Grease bush	Forsellesia nevadense	6.1	40	0.5
			660	

Type #4 Black sagebrush - Salina wildrye grass - Indian ricegrass
(Artemisia nova - Elymus salina - Oryzopsis hymenoides)

This vegetation type occurs on mostly steep south facing slopes. The type is dominated by Salina wildrye (Elymus salina) and Black sagebrush (artemisia nova) with very few other plant species present. The soils are very shallow, well drained, clayey in texture and contains 20 to 30 percent rock fragments. This vegetation type is presently in an early development ecological stage and very unstable with heavy soil erosion. The plant species are also wildly scattered throughout the type and this is the reason for the low productivity potential. The vegetation type is sparsely used by big game and livestock.

Sample adequacy for this vegetation type was determined using the formula given in the Utah Division of Oil, Gas and Mining's "Vegetation Information Guidelines".

	MINIMUM SAMPLE SIZE (plots or quadrats)
Cover	1.99
Productivity	3.76

Data collected on plant species present, ground cover and productivity is listed below:

COMMON NAME	BOTANICAL NAME	PERCENT COMPOSITION	DRY WEIGHT PRODUCTION (lbs/acre)
Grasses			
Salina wildrye	Elymus salina	74.6	254
Forbs			
Hearthleaf twistflower	Streptanthu cordantus	3.0	10
Shrubs			
Black sagebrush	Artemisia nova	22.4	76

PRESENT GROUND COVER	PERCENT
Vegetative Cover	1.0%
Litter Cover	0.8%
Rocks	20.0%
Bare Soil	78.2%

Present Forage Production - 340 lbs/acre
Present Range Condition - Poor
Endangered and Threatened Species - None

Type #5 Big sagebrush - Galleta
(Artemisia tridentata - Hilaria jamesii)

This vegetation type occurs on the low alluvial fans and bench lands. Vegetative cover is dominated by Big sagebrush (artemisia tridenla) with a sparse understory of Galleta (Hilaria jamesii). Soils are deep, well drained, heavy clayey texture and less than 10 percent rock fragments. The productivity is potentially good. The type is in an early ecological condition and has been used heavily by livestock, big game and some road construction. Fire has burned through a large portion of this type in recent time. No listed sensitive, endangered or threatened species or their habitats were found in this vegetative type. Big sagebrush is rapidly increasing within this type.

Sample adequacy for this vegetation type was determined using the formula given in the Utah Division of Oil, Gas and Mining's "Vegetation Information Guidelines".

	MINIMUM SAMPLE SIZE (plots or quadrats)
Cover	3.35
Productivity	10.45

Plant species present, ground cover and productivity were determined for this vegetation type and the information is listed below:

COMMON NAME	BOTANICAL NAME	PERCENT COMPOSITION	DRY WEIGHT PRODUCTION (lbs/acre)
Grasses			
Salina wildrye	Elymus salina	10.5	40
Galleta	Hilaria jamesii	6.5	25
Indian ricegrass	Oryzopsis hymenoides	1.6	6
Bottlebrush squirreltail	Sitanion hystrix	8.9	35
Western wheatgrass	Agropyron smithii	5.3	20
Forbs			
Milkvetch	Astragalus par	18.3	70
King budbeak	Cordylanthus kingii	0.8	3
Gay penstemon	Penstemon laetus	0.3	1
Shrubs			
Plains pricklypear	Opuntia polyacantha	0.3	1
Broom snakeweed	Gutierrezia sarothrae	0.3	1
Big sagebrush	Artemisia tridentata	44.6	168
Black greasewood	Sarcobatus vermiculatus	2.6	10
		100	380

PRESENT GROUND COVER	PERCENT
Vegetative Cover	4.0%
Litter Cover	12.4%
Rocks	0.4%
Bare Soil	83.2%

Present Forage Production - 380 lbs/acre
Present Range Condition - Poor
Endangered and Threatened Species - None

Type #6 Salina wildrye grass - Fourwing saltbush
(Elymus salina - Antriplex canescens)

This vegetation type occurs mostly on the upper alluvial fans and upper slopes. Fourwing saltbush (Atriplex canescens) and Salina wildrye (Elymus salina) dominates the vegetation cover in this type. This vegetation type is presently in an early ecological condition with heavy soil erosion and a poor productivity potential. Soils are shallow, well drained and contain 10 to 20 percent rock fragments. The type is grazed by big game and livestock and is presently in poor range condition.

Sample adequacy for this vegetation type was determined using the formula given in the Utah Division of Oil, Gas and Mining's "Vegetation Information Guidelines".

	MINIMUM SAMPLE SIZE (plots or quadrats)
Cover	4.85
Productivity	8.92

Data collected on plant species present, ground cover and productivity is listed below:

COMMON NAME	BOTANICAL NAME	PERCENT COMPOSITION	DRY WEIGHT PRODUCTION (lbs/acre)
Grasses			
Salina wildrye	Elymus salina	76.3	160
Galleta	Hilaria jamesii	0.8	2
Forbs			
Low fleabane	Erigeron pumilus	0.2	1
Cushion eriogonum	Eriogonum ovalifolium	1.6	3
Shrubs			
Fourwing saltbush	Atriplex canescens	20.3	42
Black sagebrush	Artemisia nova	0.8	2
		100	210

PRESENT GROUND COVER	PERCENT
Vegetative Cover	5.2%
Litter Cover	18.4%
Rocks	24.0%
Bare Soil	52.4%

Present Forage Production - 210 lbs/acre
Present Range Condition - Poor
Endangered and Threatened Species - None

Type #7 Mancos shale slopes and open clay valley bottoms
Shrubby buckwheat - Salina widlrye grass
(Eriogonom corymbosum - Elymus salina)

This vegetation type occurs on the open mancos shale slopes and open clay bottoms. Vegetation is extremely sparse with only a few small clusters of plants. These pockets of vegetation make up less than one percent of the total ground cover. The vegetation type is in a very early ecological stage. It is a very unstable type and few plants have yet to become established in the area. This type is not suitable for livestock use and has limited use for big game.

Sample adequacy for this vegetation type was determined using the formula given in the Utah Division of Oil, Gas and Mining's "Vegetation Information Guidelines".

	MINIMUM SAMPLE SIZE (plots or quadrats)
Cover	2.00
Productivity	3.25

Plant species present, ground cover and productivity were determined for this vegetation type and the information is listed below:

COMMON NAME	BOTANICAL NAME	PERCENT COMPOSITION	DRY WEIGHT PRODUCTION (lbs/acre)
Grasses			
Salina wildrye	Elymus salina	0.1	1
Indian ricegrass	Oryzopsis hymenoides	0.1	1
Forbs			
Desert princesplume	Stanleya pinnata	9.0	9
Low fleabane	Erigeron pumilus	0.1	1
Shrubs			
Shrubby buckwheat	Eriogonum corymbosum	90.6	91
Black greasewood	Sarcobatus vermiculatus	0.1	1
		100	104

PRESENT GROUND COVER	PERCENT
Vegetative Cover	0.4%
Litter Cover	0.8%
Rocks	4.8%
Bare Soil	94.0%

Present Forage Production - 104 lbs/acre
Present Range Condition - Very Poor (mostly non-range)
Endangered and Threatened Species - None

Seed Mixture for Final Reclamation of the Waste Rock Disposal Site (Mixture #5):

Species		POUNDS/ACRE (PLS) RATE OF SEEDING Drilled	Broadcast
Grasses			
Crested wheatgrass	Agropyron cristatum	2.0	4.0
Western wheatgrass	Agropyron smithii	2.0	4.0
Indian ricegrass	Oryzopsis hymenoides	1.0	2.0
Forbs			
Ranger alfalfa	Medicago sativa	1.0	2.0
Yellow sweetclover	Melilotus officinalis	1.0	2.0
Small burnet	Sanguisorba minor	0.5	1.0
Scarlet globemallow	Sphaeralcea coccinea	0.5	1.0
Shrubs			
Big sagebrush	Artemisia tridentata	0.5	1.0
Fourwing saltbush	Atriplex canescens	1.5	3.0
Black greasewood	Sarcobatus vermiculatus	1.0	2.0
		11	22

13.9 Design Calculations

Sediment Pond Design - 1

The contributing drainage area is approximately 30.6 acres for the total site. This figure is slightly higher than the exact area and includes the 30 acre right-of-way with the exception of the land below the sediment pond.

The soils within the area and their associated hydrologic groups are:

Gerst	,	65%	-	D
Haverdad	,	07%	-	B
Styrch	,	20%	-	C
Badland	,	08%	-	D

Land use in the area is rangeland and the condition of the soils is poor.

The Curve Number, CN:

$$CN = (0.65)\ 89 + (0.07)\ 79 + (0.20)\ 86 + (0.08)\ 89$$

$$CN = 87.7$$

The amount of rainfall for short duration precipitation is:

10 year, 24 hour event	-	1.82 inches
25 year, 24 hour event	-	2.18 inches
100 year, 24 hour event	-	2.74 inches

These numbers were taken from the data for the Price station.

Average slope of the area is 22 percent. Length of slope is 1000 feet.

Water storage factor, S, in inches

$$S = \frac{1000}{CN} - 10, \qquad CN = 87.7$$

$$S = \frac{1000}{87.7} - 10, \qquad S = 1.403$$

Calculations for Direct Runoff Volume, Q, in inches is:

$$Q = \left(\frac{P - 0.2S}{P + 0.8S}\right)^2$$

Where: P is the storm rainfall event, i.e. 10 year 24 hour. S is watershed storage factor, 1.403.

10 year, 24 hour event

$$Q = \left[\frac{1.82 - 0.2\ (1.403)}{1.82 + 0.8\ (1.403)}\right]^2$$

$$Q = 0.806 \text{ inch}$$

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Volume of Runoff, R_v in cubic feet is:

$$R_v = (\text{total area})\ (\text{depth})$$
$$R_v = (30.6 \text{ acres})\ (43{,}560 \text{ ft}^2/\text{acre})\ (0.067 \text{ ft.})$$
$$R_v = 89{,}307 \text{ ft}^3.$$

25 year, 24 hour event

$$Q = 1.092 \text{ inches}$$
$$R_v = 121{,}348 \text{ ft}^3.$$

100 year, 24 hour event

$$Q = 1.566 \text{ inches}$$
$$R_v = 173{,}952 \text{ ft}^3.$$

Sediment yield, A, in tons per acre is:

$$A = R\ K\ (LS)\ (CP)$$

Where: R is the rainfall factor taken from tables, 20. K is the soil erodibility factor taken from tables, 0.32. CP is the control practice factor taken from tables, 0.8. LS is the length slope factor given by the following formula:

$$LS = \left\{\frac{\lambda}{72.6}\right\}^M \left\{\frac{(430X^2 + 30X + 0.43)}{6.613}\right\}$$

Where: λ is the slope length, 1000 feet. M is the exponent dependent on length, 0.5. X is the sin of the slope angle, 0.21.

$$LS = \left\{\frac{1000}{72.6}\right\}^{0.5} \left\{\frac{(430\ (0.21)^2 + 30\ (0.21) + 0.43)}{6.613}\right\}$$

$$LS = 14.419$$

So,

$$A = (20)\ (0.32)\ (14.419)\ (0.8) \quad A = 73.83 \text{ tons/acre}$$

Sediment Volume, S_v, in cubic feet is:

$$S_v = \frac{A\ (\text{area})}{\rho}$$

Where: ρ is the density of the sediment, 110 pounds per cubic foot.

$$S_v = \frac{(73.83)\ (30.6)\ (2000)}{(110)}$$

$$S_v = 41{,}076 \text{ ft}^3$$

Peak Runoff Rates

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Calculation of peak runoff from time consideration. t_c is the time of concentration in hours and t_L is the lag time in hours.

$$t_L = \frac{L^{0.8} \ (S + 1)^{0.7}}{1900 \ (y^1)^{0.5}}$$

Where: L is the hydraulic length of the watershed, 1000 feet. S is as previously defined, 1.403. y^1 is the land slope, 0.22.

$$t_L = \frac{(1000)^{0.8} \ (1.403 + 1)^{0.7}}{1900 \ (0.22)^{0.5}}$$

t_L = 0.521 hours

$t_L = t_L/0.6$

t_c = 0.521/0.6

t_c = 0.868 hours

Peak Discharge, q_p, in cubic feet per second

$q_p = q_p^1 \cdot AQ$

Where: A is the area of the watershed, 0.048 square miles. Q is the runoff, 25 year, 24 hour event, 1.092 inches. q_p^1 is the peak discharge verses the time of concentration as approximated by the following:

$$\log q_p^1 = 2.50963 - 0.6995 \log t_c - 0.14808 (\log t_c)^2 + 0.07074 (\log t_c)^3$$

t_c = 0.868 hours

$\log q_p^1$ = 2.5521

q_p^1 = 356.50

q_p = (356.50) (0.048) (1.092)

q_p = 18.69 cfs

Sediment Pond Design

Total volume needed in pond
Runoff volume - 121,348 ft^3
Sediment volume - 41,076 ft^3
Additional height needed in pond
Head for a 30 inch spillway - 1.6 ft
Freeboard requirements - 1.0 ft

Sediment Pond
Inner pond slopes 2.5:1
Outer pond slopes 2.0:1
30 inch vertically standing culvert for the spillway.
6 inch vertically standing pipe for the decant.

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Length - 270 feet
Width - 150 feet
Depth - 10 feet

Sediment pond volume, SP_v, in cubic feet

$$SP_v = 22{,}000X + 800X^2 + 12.5X^3$$

Where: X is the height, in feet, from the pond bottom

Total volume, storage capacity - 312,500 ft^3

Height of sediment pond needed for storage:
(from the bottom to the top)

Sediment Volume,	41,076 ft^3	=	1.8 feet
Runoff Volume,	121,348 ft^3	=	4.2 feet
30 inch culvert head		=	1.6 feet
Freeboard requirements		=	1.0 feet
			8.6 feet

Design height of 10 feet for the dam will be adequate.

Sediment Control for the Topsoil Stockpile - 2

Hydrologic Soil Group - C.
Land Use - Range.
Hydrologic Condition - Poor.
Runoff Curve Number, CN - 86.
Slope, y^1- 20%.
Length of Slope - 600 ft.
Area - 4.6 acres.

Direct Runoff Calculations

Direct Runoff, $Q = \frac{(P - 0.2S)^2}{P + 0.8S}$, in inches.

Where: P is the storm rainfall event in inches.
S is the maximum potential difference between P and Q at the beginning of the storm, defined as:

$$S = \frac{1000}{CN} - 10$$

$$S = \frac{1000}{86} - 10$$

$$S = 1.63$$

P, from the Price Station = 2.18 inches

$$Q = \frac{(2.18 - 0.2\ (1.63))^2}{(2.18 + 0.8\ (1.63))}$$

$$Q = 0.987 \text{ inches}$$

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Peak Runoff Calculations

Time Equations:

$$t_L = 0.6\ t_c = \frac{L^{0.8}\ (S + 1)^{0.7}}{1900\ (y^1)^{0.5}}$$

Where: t_L is the lag time in hours.
t_c is the time of concentration in hours.
S is as previously defined.
L is the hydraulic length of the watershed in feet.
y^1 is the land slope in percent.

$$t_L = \frac{(600)^{0.8}\ (1.63 + 1)^{0.7}}{1900\ (0.20)^{0.5}}$$

$$t_L = 0.387 \text{ hours}$$

$$t_c = \frac{t_L}{0.6}$$

$$t_c = 0.644 \text{ hours}$$

Peak Discharge, $q_p = q_p^1 A\ Q$, in cfs.

Where: A is the watershed area in square miles.
Q is the determined runoff in inches.
q_p^1 is the peak discharge verses the time of concentration as approximated by the following:

$$\log q_p^1 = 2.50963 - 0.6995 \log t_c - 0.14808\ (\log t_c)^2 + 0.07074\ (\log t_c)^3$$

$$t_c = 0.644 \text{ hours}$$

$$\log q_p^1 = 2.6309$$

$$q_p^1 = 427.464$$

$$q_p = (427.464)\ (4.6 \text{ acres})\ (0.00156\ \frac{\text{mile}^2}{\text{acre}})\ (0.987 \text{ inches})$$

$$q_p = 3.028 \text{ cfs.}$$

Ditch Design

Chezy - Manning Equation

$$Q = A\ \frac{1.486}{n}\ R^{0.6}\ S^{*0.5}$$

Where: Q is the discharge in cfs, q_p.
A is the cross sectional area of flow in sq. ft.
R is the hydraulic radius in ft.
S* is the slope in ft. per ft.
n is the coefficient of roughness.

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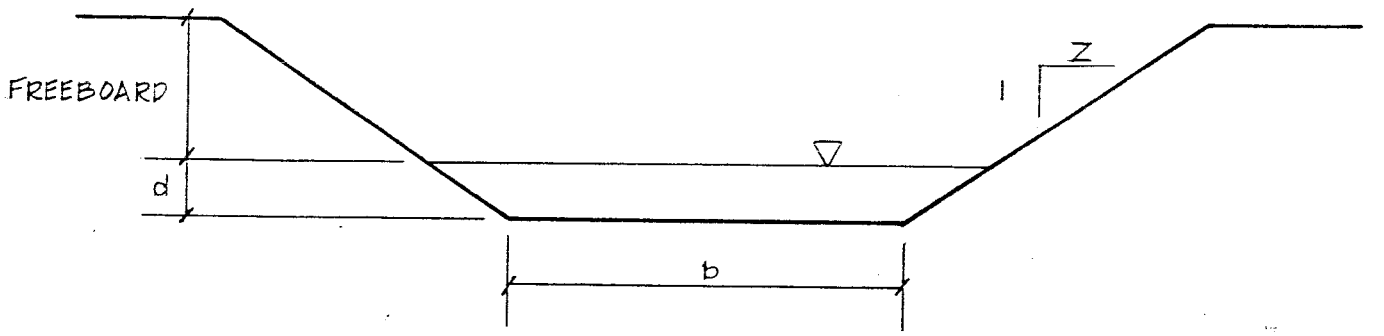
We will use a trapezoidal shaped ditch.



Equation derivation for trapezoidal shaped ditch.

$$\frac{q_p\ (n)}{1.486\ \ (S^*)^{0.5}} = \left\{\frac{bd + zd^2}{b + 2d\ \ z^2 + 1}\right\}^{0.\overline{6}} \left\{bd + zd^2\right\}$$

Using a known b, width of the channel and a known z the equation is solved for d, depth, by trial and error.

So,

q_p = 3.028 cfs.

n = 0.025

S* = 0.05

b = 2.00 ft.

z = 1.50

$$\frac{(3.028)\ (0.025)}{1.486\ (0.05)^{0.5}} = \left\{\frac{2.00\ (d) + 1.50\ (d)^2}{2.00 + 2\ (d)\ \ 1.5^2 + 1}\right\}^{0.\overline{6}} \left\{2.00\ (d) + 1.50\ (d)^2\right\}$$

If, d = 0.27

0.22782 = 0.23548

So we will use 0.27 ft. for d, depth.

The channel will be constructed as a trapezoid, 1.0 foot deep and 2.0 feet wide. This will provide 0.73 foot of freeboard and the velocity will be 4.66 fps. This channel will collect the runoff, as shown on Map E020 and direct it to a culvert and into the sediment pond. The culvert will be an 18 CMP culvert with corrugated anti-seep collars. The culvert will discharge into a riprapped portion of the sediment pond. The 18 inch CMP, using a nomograph, is of satisfactory size to handle the flow.

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Sizing Culvert for Road Improvement - 3

Hydrologic Soil Group - C.
Land Use - Range.
Hydrologic Condition - Poor.
Runoff Curve Number, CN-86
Slope, y^1 - 30%.
Length of slope - 1000 ft
Area - 23.2 acres

Direct Runoff Calculations

Direct Runoff, $Q = \frac{(P - 0.2S)^2}{P + 0.8S}$, in inches

$$S = \frac{1000}{CN} - 10$$

$$S = \frac{1000}{86} - 10 = 1.63$$

$$P = 2.18 \text{ inches}$$

$$Q = \frac{(2.18 - 0.2\ (1.63))^2}{(2.18 + 0.8\ (1.63))}$$

$$Q = 0.987$$

Peak Runoff Calculations

Time Equations:

$$t_L = 0.6\ t_c = \frac{L^{0.8}\ (S + 1)^{0.7}}{1900\ (y^1)^{0.5}}$$

$$t_L = \frac{(1000)^{0.8}\ (1.63 + 1)^{0.7}}{1900\ (0.30)^{0.5}}$$

$$t_L = 0.475 \text{ hours}$$

$$t_c = \frac{t_L}{0.6} = 0.792 \text{ hours}$$

Peak Discharge, $q_p = q_p^1\ AQ$, in CFS.

$$\log q_p^1 = 2.50963 - 0.6995 \log t_c - 0.14808\ (\log t_c)^2 + 0.07074\ (\log t_c)^3$$

$$t_c = 0.792 \text{ hours}$$

$$\log q_p^1 = 2.5789$$

$$q_p^1 = 379.210$$

$$q_p = (379.210)\ (23.2 \text{ acres})\ (0.00156\ \frac{\text{mile}^2}{\text{acre}})\ (0.987 \text{ inches})$$

$$q_p = 13.546 \text{ cfs.}$$

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So, using a nomograph and the peak discharge, 13.6 cfs, a 30 inch culvert will safely pass the design 25 year, 24 hours with a headwater depth of 2.0 feet.

Permanent Riprapped Drainage Channel - 4

This drainage channel will surround the waste rock pile and will catch drainage off the waste rock and the undisturbed areas. The channel will be constructed at the same time the pile is constructed.

Design event, precipitation:

100 year, 24 hour event - 2.74 inches

Hydrologic Soil Group - C
Post Mining Land Use - Range and Wildlife
Present Hydrologic Condition - Poor
Runoff Curve Number, CN - 86
Slope, y^1 - 30%
Length of Slope - 600 feet
Area - 24 acres

Direct Runoff Calculations

$$\text{Direct Runoff, } Q = \frac{(2.74 - 0.2\ (1.63))^2}{(2.74 + 0.8\ (1.63))}$$

$$Q = 1.441 \text{ inches}$$

Where: $S = 1.63$
$P = 2.74$

Peak Runoff Calculations

Time Equations:

$$t_L = 0.6\ t_c = \frac{(600)^{0.8}\ (1.63 + 1)^{0.7}}{1900\ (0.30)^{0.5}}$$

$$t_L = 0.316$$

$$t_c = \frac{0.316}{0.6} = 0.527$$

Peak Discharge, $q_p = q_p^1\ AQ$, in cfs

$$\log q_p^1 = 2.50963 - 0.6995 \log t_c - 0.14808\ (\log t_c)^2 + 0.07074\ (\log t_c)^3$$

$$\log q_p^1 = 2.6912$$

$$q_p^1 = 491.18$$

$$q_p = (491.18)\ (24.00)\ (0.00156)\ (1.441)$$

$$q_p = 26.5 \text{ cfs}$$

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The slope and design discharge are approximately equal to those used to design the drainage channel configuration shown in Table 3.2 of Chapter 3. Therefore, the same dimensions will be used for construction of this channel.

AUG 1 '84

13.10 References and Correspondence

AUG 1 '84

American Iron and Steel Institute, Handbook of Steel Drainage & Highway Construction Products, Washington, D.C.: The Lakeside Press, R.R. Donnelley & Sons Company, 1971.

E. D'Appalonia Consulting Engineers, Inc., Engineering and Design Manual: Coal Refuse Disposal Facilities, Washington, D.C.: U.S. Governmental Printing Office, 1975.

Simons, Li & Associates, Inc., Surface Mining Water Diversion Design Manual, Washington, D.C.: U.S. Governmental Printing Office, 1982.

Barfield B.J., Warner R.L., Haan C.T., Applied Hydrology and Sedimentology of Disturbed Areas, 1981.

IN REPLY REFER TO

2890
U-50167
(U-066)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Moab District
Price River Resource Area
P. O. Drawer AB
Price, Utah 84501

Mr. Christopher P. Allen
Soldier Creek Coal Company
P. O. Box I
Price, Utah 84501

MAR 26 1984

Dear Mr. Allen:

A request was made to delete the access road authorized in right-of-way U-50167. The subject road provides access to a sewage lagoon authorized under the same grant.

The United States does not consider your use of the road a casual use. Thus, continued use will require a right-of-way authorization.

As you have noted, the road is occasionally used by local ranchers. Their use is considered "casual". Consequently, a right-of-way authorization is not required.

Although this road is utilized by the general public, it is considered a BLM road. When your need for the road terminates, we would like to see the road left intact. Although the road, pipeline, and sewage lagoon are part of your "permit area", public use of the road would not allow us to authorize its reclamation.

If you have any questions, please contact Mark Mackiewicz.

Sincerely yours,

Lisa E. Bugger

Area Manager

RECEIVED
MAR 28 1984
SC3

AUG 1 '84

SUNEDCO COAL CO.
7401 W Mansfield Ave
Suite 418
Post Office Box 35B
Lakewood CO 80235
303 989 9280

March 19, 1984

Mr. Leon E. Berggren
Area Manager
Bureau of Land Management
Moab District
Price River Resource Area
P. O. Box AB
Price, Utah 84501

RE: Soldier Creek Coal Company
Request for Easement (2/8/84)
NE¼ of Sec. 25, T13S, R11E

Dear Mr. Berggren:

Pursuant to your letter requesting an easement across Sunedco property for Soldier Creek's use in access to a waste disposal site, Sunedco hereby grants the easement with the understanding that it would be subject to future modification should development plans for Sunedco's Coal Creek property require utilization of the land.

Should you require further clarification, please advise.

Very truly yours,

C. R. Williams
Director, Geology and
Property Management

CRW/as

cc: Mark Mackiewicz/Bureau of Land Management
[redacted] Paluso/Soldier Creek Coal Company
Don Ross/SoldierCreek Coal Company

RECEIVED
MAR 21 1984
SC3

AUG 1 '84

SOLDIER CREEK COAL CO.

Telephone (801) 637-6360

P.O. Box I
Price, Utah 84501

June 20, 1984

Mr. Mark Mackiewicz
Bureau of Land Management
Price River Resource Area
P.O. Drawer AB
Price, Utah 84501

Re: Right-of-Way Application
Waste Rock Disposal Area
Soldier Creek Coal Company

Dear Mark:

I have enclosed the completed right-of-way application for the waste rock disposal area. The area is approximately 30 acres and is described as follows:

S. 1/2, S. 1/2, S.W. 1/4, S.E. 1/4,
Section 24, T. 13 S., R. 11 E., S.L.B. & M.

N. 1/2, N.W. 1/4, N.E. 1/4,
Section 25, T. 13 S., R. 11 E., S.L.B. & M.

Also enclosed is a check for the payments of the advanced rental fees and monitoring costs.

If there are any questions on the right-of-way application, map or legal description please contact me.

Sincerely,

Christopher P. Allen
Mine Engineer

Enclosures

CPA/jb

AUG 1 '84

STANDARD FORM 299 (12-81)
Prescribed by DOI/USDA/DOT
P.L. 96-487 and Federal Register
Notice 6-3-81

APPLICATION FOR TRANSPORTATION AND UTILITY SYSTEMS AND FACILITIES ON FEDERAL LANDS

FORM APPROVED
OMB NO. 1004-0060
Expires May 31, 1983

FOR AGENCY USE ONLY
Application Number
Date filed

NOTE: Before filing the application, the applicant should completely review this package and schedule a preapplication meeting with representatives of the agency responsible for processing the application. Each agency may have specific and unique requirements to be met in preparing and processing the application. Many times, with the help of the agency representative, the application can be completed at the preapplication meeting.

1. Name and address of applicant *(include zip code)*
Soldier Creek Coal Company
P.O. Box I
Price, Utah 84501

2. Name, title, and address of authorized agent if different from Item 1 *(include zip code)*
J.T. Paluso
P.O. Box I
Price, Utah 84501

3. TELEPHONE *(area code)*
Applicant (801) 637-6360
Authorized Agent (801) 637-6360

4. As applicant are you? *(check one)*
a. [ ] Individual
b. [X] Corporation*
c. [ ] Partnership/Association*
d. [ ] State Government/State Agency
e. [ ] Local Government
f. [ ] Federal Agency
* *If checked, complete supplemental page*

5. Specify what application is for: *(check one)*
a. [X] New authorization
b. [ ] Renew existing authorization No. ____
c. [ ] Amend existing authorization No. ____
d. [ ] Assign existing authorization No. ____
e. [ ] Existing use for which no authorization has been received*
f. [ ] Other*
* *If checked, provide details under Item 7*

6. If an individual, or partnership are you a citizen(s) of the United States? [ ] Yes [ ] No

7. Project description *(describe in detail)*: (a) Type of system or facility, *(e.g. canal, pipeline, road)*; (b) related structures and facilities; (c) physical specifications *(length, width, grading, etc.)*; (d) term of years needed; (e) time of year of use or operation; (f) volume or amount of product to be transported; (g) duration and timing of construction; and (h) temporary work areas needed for construction. *(Attach additional sheets, if additional space is needed.)*

(a) The land will be used as a waste rock disposal site in conjunction with a coal mining operation.

(b) The related structures and facilities are a sediment pond, associated ditch system directing the drainage to the sediment pond and a few small buildings which will be used for storage.

(c) The size of the area will be 30 acres, more or less (see attached map)

(d) The term of years which we are requesting is 30 (thirty) years.

(e) The site will be used year round for rock disposal.

(f) The volume of material disposed of at the site will vary depending on mining conditions.

(g) The construction of the sediment pond and ditch system has temporarily been planned for summer 1985. The construction of the waste rock disposal site will be an ongoing operation.

(h) No temporary work areas have been planned for construction.

8. Attach map covering area and show location of project proposal — See Attached Map

9. State or local government approval: [ ] Attached [ ] Applied for [ ] Not required

10. Nonreturnable application fee: [X] Attached [ ] Not required

11. Does project cross international boundary or affect international waterways? [ ] Yes [X] No *(If "yes," indicate on map)*

12. Give statement of your technical and financial capability to construct, operate, maintain, and terminate system for which authorization is being requested.

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13a. Describe other reasonable alternative routes and modes considered.

b. Why were these alternatives not selected?

c. Give explanation as to why it is necessary to cross Federal lands.

14. List authorizations and pending applications filed for similar projects which may provide information to the authorizing agency. *(Specify number, date, code, or name.)*

Soldier Creek Coal Company has not filed for any similar projects.

15. Provide statement of need for project, including the economic feasibility and items such as: (a) cost of proposal *(construction, operation, and maintenance)*; (b) estimated cost of next best alternative; and (c) expected public benefits.

16. Describe probable effects on the population in the area, including the social and economic aspects, and the rural lifestyles.

17. Describe likely environmental effects that the proposed project will have on: (a) air quality; (b) visual impact; (c) surface and ground water quality and quantity; (d) the control or structural change on any stream or other body of water; (e) existing noise levels; and (f) the surface of the land, including vegetation, permafrost, soil, and soil stability.

18. Describe the probable effects that the proposed project will have on: (a) populations of fish, plant, wildlife, and marine life, including threatened and endangered species; and (b) marine mammals, including hunting, capturing, collecting, or killing these animals.

19. Name all the Department(s)/Agency(ies) where this application is being filed.

U.S. Department of Interior
Bureau of Land Management
Price River Resource Area
P.O. Drawer AB
Price, Utah 84501

I HEREBY CERTIFY, That I am of legal age and authorized to do business in the State and that I have personally examined the information contained in the application and believe that the information submitted is correct to the best of my knowledge.

AUG 1 '84

A CULTURAL RESOURCE SURVEY OF SELECTED PORTIONS OF THE SOLDIER CANYON MINE LEASE AREA

Prepared by:

Claudia F. Berry

For:

SOLDIER CREEK COAL COMPANY

Price, Utah

Under the direction of:

Dr. Richard A. Thompson

Principal Investigator

INTERNATIONAL LEARNING AND RESEARCH, INC.

484 South 300 East

Cedar City, Utah 84720

June 22, 1984

INTRODUCTION

International Learning and Research, Inc. conducted an archeological survey of 210 acres of land located within the permit area of Soldier Creek Coal Company. The 210 acres were delineated by the Office of Surface Mining (OSM), who determined that the areas encompassed within the 210 acres have "a high potential for containing historic and/or prehistoric sites." The permit area is located largely on private lands, although the southern portion of the area is on federal lands administered by the San Rafael Resource Area, Moab District, Bureau of Land Management. A 30-acre proposed waste rock disposal site south of the permit area was also surveyed. It lies wholly on federal land administered by the Bureau of Land Management. The survey was conducted by Claudia F. Berry and Thomas Zeidler from June 4 to June 6, 1984, and on June 14 and June 15, 1984.

The purpose of the archeological survey was to locate, record, and evaluate any cultural resources within the areas chosen by OSM for survey. We were requested to give particular attention to canyon walls where the potential for rock art or shelters was considered to be high. The survey was conducted under authority of Federal Antiquities Permit 82-UT-090 and Utah State Antiquities Permit 1032 in order to fulfill OSM requirements and to comply with the following: the Antiquities Act of 1906, the National Environmental Policy Act of 1969, Executive Order 11593, the National Historic Preservation Act of 1974, the Archaeological Resource Protection Act of 1979, and the Utah State Antiquities Act of 1973.

LOCATION AND SETTING

The Soldier Creek Coal Company's permit area is located in the Book Cliffs - Roan Plateau region of the Colorado Plateau (Stokes 1977), about 13 mi north of Wellington. The main road connecting Nine Mile Canyon and Myton on the north with Price and Wellington to the south runs through Soldier Creek Canyon past the Soldier Canyon Mine. The permit area includes a portion of the Soldier Creek Canyon, as well as steep cliff and canyon regions on the east and west. Elevations within this area range from 6700 ft at the mine to 8285 ft above sea level on prominent ridges overlooking an unnamed canyon to the west of Soldier Creek Canyon. The area is characterized by rugged topography comprised of Cretaceous and Tertiary age strata. South-facing cliffs and long narrow points look out across the Mancos shale valleys 4000 to 5500 ft below. Where streams cut through more resistant beds, perpendicular cliffs and sometimes shelters are formed. Within the permit area, however, all shelter areas observed by the survey crew (with one exception) were too small for human use. The single large shelter that was observed (located in the unnamed canyon west of Soldier Creek Canyon) had been used by modern hunters, but contained no evidence of prehistoric or historic use.

Water appears to be relatively plentiful within the area, at least in early summer. Running water was observed in all major canyons, as well as many side canyons. Several springs are located in canyon heads at elevations between 7800 and 8000 ft, although all those shown on the USGS topographic maps are located

outside the permit area.

Vegetation within the permit area is extremely varied and includes the following communities of the Upper Sonoran, Transition, and Canadian Life-zones: sagebrush; sagebrush-grasslands pinyon-juniper woodland; oak-maple shrubland; dry meadows; ponderosa pine, aspen, and douglas fir forests. With few exceptions, vegetation within the area is dense, with heavy ground cover or forest duff generally present. Even the more open sage-grassland communities found along some ridge tops and south-facing slopes contain very little open ground. Dramatic differences in vegetation type exist between north and south-facing slopes, and between canyon heads and canyon bottoms 1000 to 2000 ft lower in elevation.

While most of the permit area has not been altered in modern times in any way that would damage or destroy archeological sites, there has been extensive development along Soldier Creek Canyon. In addition to the mine and associated facilities, the modern road, an older dirt road, and a pipeline have all had considerable impact on the zone along the creek. Since the canyon is narrowest through the permit area, these have damaged or destroyed nearly all level areas along or above the creek bed where one might expect archeological sites. If any sites were present in the past, they would have been destroyed.

The proposed waste rock disposal site, in contrast to the permit area, is located in the Mancos Shale Lowlands at an elevation of 6200 to 6400 ft above sea level. Topographically, the site is characterized by low, flat benches separated by

narrow alluvial floodplains or gently rolling terrain. Vegetation includes open pinyon-juniper woodlands, low sagebrush, and shadscale communities.

LEGAL DESCRIPTION

Areas surveyed within the permit area are located in the following:

T13S, R11E; Sections 12, 13.

T13S, R12E; Sections 7, 8, 17, 18.

The proposed waste rock disposal site is located in:

T13S, R12E; SW 1/4, SE 1/4 Sec 24 and NW 1/4, NE 1/4 Sec 25. (see attached map)

RECORDS SEARCH

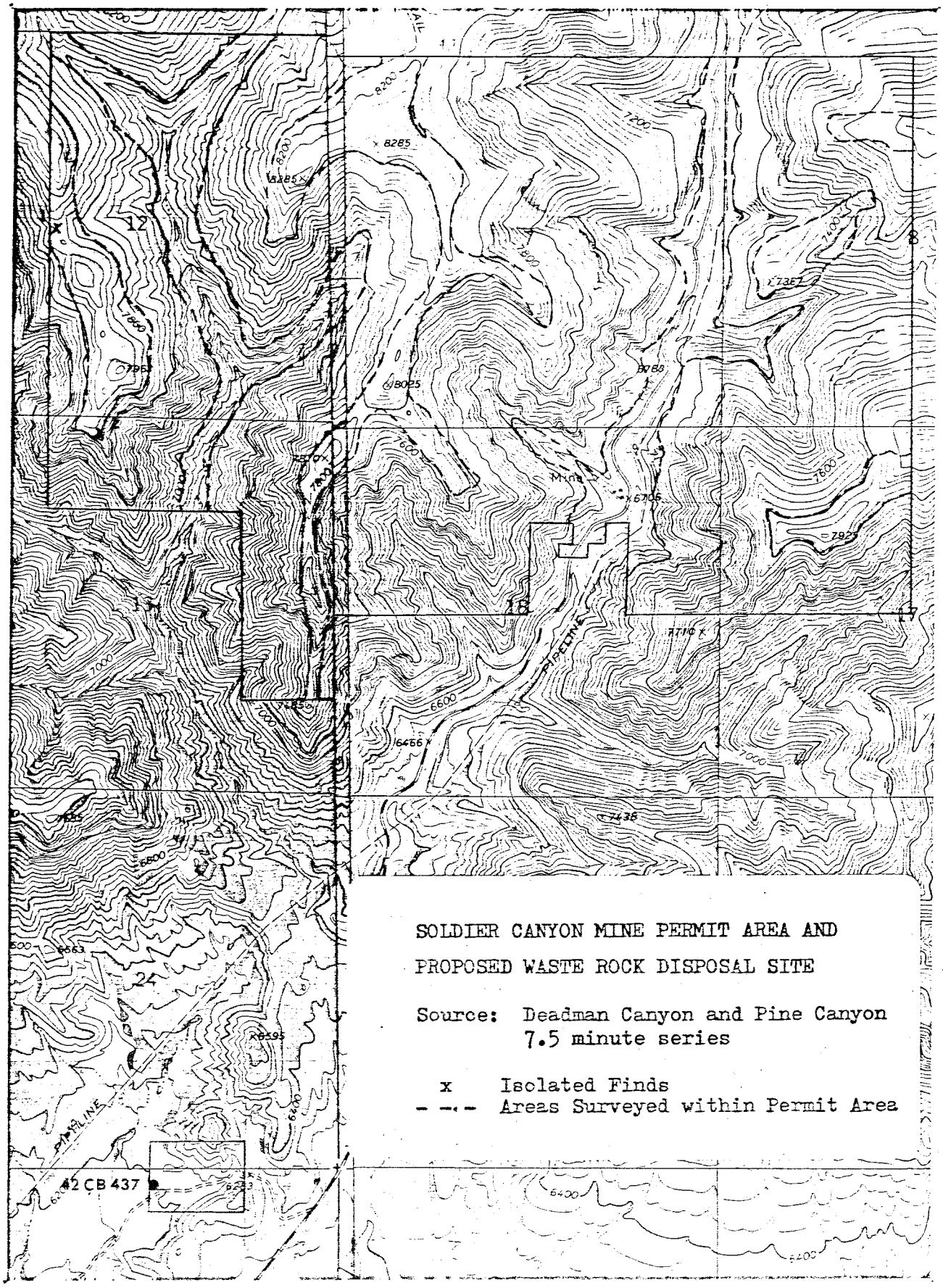
Before field work was started, a search was conducted of the records on file at the Antiquities Section of the Utah State Historical Society and at the Bureau of Land Management office in Price. These indicated that no archeological sites had been recorded within the permit area or the proposed waste rock disposal site. Previous surveys in the vicinity of the proposed waste rock disposal site had recorded several small lithic scatters, and intensive surveys along other major canyons, such as Dugout Creek and Pace Creek, had located historic mines and associated structures. North of the permit area, a lithic scatter had been recorded at the confluence of Soldier Creek and an unnamed tributary to the west. An unrecorded (?) rockshelter is also present here, but the nature and depth of cultural deposits is unknown.

SURVEY METHODS

All areas within the permit area designated by OSM as having "high potential for containing historic and/or prehistoric sites" were examined on foot. These areas are outlined on the attached map (Figure 1) by dashed lines and include the following: (1) Soldier Creek Canyon, (2) the unnamed canyon to the west of Soldier Creek Canyon, (3) three relatively flat points on the eastern side of the permit area, and (4) two long, narrow points west of Soldier Creek Canyon. Where topography and vegetation allowed, the surveyors covered the area in transects 15 m apart. However, the majority of the area designated for inspection was heavily vegetated, covered by forest duff, or was too steep and/or rocky to allow this type of survey coverage. In these instances, surveyors attempted to zigzag the area, inspecting all possible rockshelter locations and open areas. The waste rock disposal area did not present such problems, and the entire 30-acre plot was covered in transects placed 15 m apart.

A site was defined for the purpose of the survey as any evidence of human activity visible within a circumscribed area and which was at least 50 years old. Individual artifacts or single items broken into several pieces were treated as isolated finds. The single site encountered during the survey was recorded on an IMACS (Intermountain Antiquities Computer System) site form, photographed, and plotted on the USGS topographic map. Isolated finds were also plotted on topographic maps, described, and when appropriate, photographed and drawn.

Figure 1. Areas Surveyed



ARCHEOLOGICAL SITE

42CB437 This site is comprised of two alignments of sandstone boulders and a check dam constructed of dry-laid, unshaped pieces of sandstone located about 50 m away in a nearby dry wash. The alignments are oriented northeast-southwest and measure 8-9 m in length. Boulders in the alignments are 30-40 cm in diameter and are partially sunken into the ground. No artifacts were found in association. A few pieces of clear and amber glass, and a broken earthenware plate are present in the wash below the check dam. The artifacts may not be associated with the features since the wash in this locality is near a dirt road and might have been deposited at a different time.

Mining engineers at the Soldier Canyon Mine report seeing other rock alignments and check dams to the west of the proposed waste rock disposal site along the same dirt road. Their age and possible association(s) are not known.

ISOLATED FINDS

The two isolated finds recorded during the survey are shown on the attacted map with an "x" and are numbered. Isolated find #1 consists of the remains of one, possibly two, broken glass containers. The glass is scattered down two erosional channels near a cliff edge overlooking the canyon below and the Price Valley in the distance. The glass is deep purple in color, indicating a pre-1914 age, but no identifying marks were seen.

Isolated find #2 is a Desert side-notched projectile point

of tannish-lavender chert. It is located at the end of a long, point about 3 m from the cliff edge overlooking the canyon below and the Mancos Shale Lowlands in the distance. The tip and part of the base are missing. Desert side-notched points are diagnostic of the late prehistoric occupation of the region and are generally dated after approximately A.D. 1150 (Holmer and Weder 1980.

Isolated Find #1. Desert Side-Notched Point

EVALUATION AND RECOMMENDATIONS

The criteria for determination of significance are those found in the National Register of Historic Places, published in 36 CFR 60.4. These criteria specify that properties have the quality of significance if they are associated with important historical events, personages, or traditions, or if they, "...have yielded, or may be likely to yield, information important in prehistory or history." Other criteria, such as the condition of a site and its contribution to future research are important considerations for the evaluation of archaeological sites.

Given these criteria, 42CB437 is not considered to be significant and is not judged to be eligible for nomination to the National Register of Historic Places. It is recommended that archeological clearance be granted for the areas surveyed and the lease as a whole with the proviso that any significant resources discovered in the unsurveyed area during the conduct of mining operations should be brought to the attention of the San Rafael Resource Area BLM archeologist.

REFERENCES CITED

Holmer, Richard N. and Dennis G. Weder

1980 Common Post-Archaic Projectile Points of the Fremont Area. In Fremont Perspectives, edited by David B. Madsen, pp.55-68. Antiquities Section Selected Papers No. 16. Utah State Historical Society, Salt Lake City.

Stokes, William L.

1977 Subdivisions of the Major Physiographic Provinces in Utah. Utah Geology 4:1-17.

APPENDIX: IMACS SITE FORM

IMACS SITE FORM

Part A - Administrative Data

INTERMOUNTAIN ANTIQUITIES COMPUTER SYSTEM
Form approved for use by
BLM - Utah, Idaho, Nevada, Wyoming
Division of State History - Utah, Wyoming
USFS - Intermountain Region
NPS - Utah, Wyoming

*1. State No. 42CB437
*2. Agency No.
3. Temp No. Soldier Canyon #1

4. State Utah County Carbon
5. Project Soldier Canyon Mine Survey
*6. Report No.
7. Site Name
8. Class ☐ Prehistoric ☒ Historic ☐ Paleontologic ☐ Ethnographic
9. Site Type Rock alignments, check dam
*10. Elevation 6200 ft.
*11. UTM Grid Zone 12 531280 m E 4391340 m N
*12. NW of NW of NE of Section 25 T. 13S R. 11E
*13. Meridian
*14. Map Reference Deadman Canyon 7.5 minute
15. Aerial Photo
16. Location and Access Take well marked dirt road west off of main Soldier Canyon Rd. for a distance of .5 mi. Alignments are located about 15m north of the dirt rd.. Check dam is about 50m east of alignments in wash, and about 4m north of dirt access rd.

*17. Land Owner BLM
*18. Federal Admin. Units Forest District Moab Nat'l Park
*19. Planning Units (USFS only)
20. Site Description Site consists of two alignments of sandstone boulders aligned NE-SW. Northern end of both alignments stop 2-3 m from shallow wash draining to west. Alignments are 5.3 to 7.8 m apart and 8-9 m long. Boulders range up to 30-40 cm in diameter and are partially sunken in the ground with soil deeper on upslope side (east) of each alignment. Bushes and grasses which have grown up along the alignments indicate they have been here for some years. Area between alignments shows no signs of having been altered. Check dam in wash is located about 50 m east and upstream from alignments. It is made of flat, unshaped sandstone boulders; no mortar has been used.

*21. Site Condition ☐ Excellent (A) ☒ Good (B) ☐ Fair (C) ☐ Poor (D)
*22. Impact Agent(s) ongoing moderate erosion, cattle trampling

*23. Nat. Register Status ☐ Significant (C) ☒ Non-Significant (D) ☐ Unevaluated (USFS only) (Z)
Justify Site already mapped and photographed, no diagnostic artifacts

24. Photos CB84 1:1-8
25. Recorded by Claudia F. Berry
*26. Survey Organization Southern Utah State College *28. Survey Date 6/05/84
27. Assisting Crew Members Tom Zeidler

*Encoded data items

B.M. 8100.1
FS R-4 2300.2
5/83

Part A - Environmental Data

Site No.(s) 42CB437

*29. Slope 5 (Degrees) 265 Aspect (Degrees)

*30. Direction/Distance to Permanent Water 90 Bearing (Degrees) 9.25 x 100 Meters

*Type of Water Source ☐ Spring/Seep (A) ☒ Stream/River (B) ☐ Lake (C) ☐ Other (D)

Name of Water Source Soldier Creek

Distance to Nearest Other Water Source/Type 1.9 km, intermittent wash

*31. Geographic Unit Mancos Shale Lowlands

*32. Topographic Location (check one under each heading)

PRIMARY LANDFORM	PRIMARY POSITION	SECONDARY LANDFORM		SECONDARY POSITION
☐ mountain spine(A)	☐ top/crest/peak(A)	☐ alluvial fan(A)	☐ playa(M)	☐ top/crest/peak(A)
☐ hill(B)	☐ edge(B)	☐ alcove/rock shelter(B)	☐ port.geo.feature(N)	☐ edge(B)
☐ tableland/mesa(C)	☒ slope(C)	☒ arroyo(C)	☐ plain(O)	☒ slope(C)
☐ ridge(D)	☐ toe/foot/bottom/mouth(D)	☐ basin(D)	☐ ridge/knoll(P)	☐ toe/foot/bottom/mouth(D)
☒ valley(E)	☐ saddle/pass(E)	☐ cave(E)	☐ slope(Q)	☐ interior(G)
☐ plain(F)	☐ bench/ledge(F)	☐ cliff(F)	☐ terrace/bench(R)	☐ step(H)
☐ canyon(G)	☐ rimrock(G)	☐ delta(G)	☐ talus slope(S)	☐ riser(I)
☐ island(H)	☐ interior(H)	☐ detached monolith(H)	☐ island(T)	☐ patterned ground (N)
		☐ dune(I)	☐ outcrop(U)	☐ face(O)
		☐ floodplain(J)	☐ spring mound/bog(V)	☐ saddle/pass(P)
		☐ ledge(K)	☐ valley(W)	
		☐ mesa/butte(L)	☐ cutbank(X)	
			☐ riser(Y)	

Describe On gently sloping area below buttes to S, E, and N. Looks over gently rolling terrain between benches at base of Book Cliffs. Wash along N side of site. North of wash is shaley knoll with pinyon-juniper.

*33. On-site Depositional Context

☐ fan(A)	☐ outcrop(O)	☐ morraine(J)	☐ desert pavement(P)
☐ talus(B)	☐ extinct lake(F)	☐ flood plain(K)	☐ stream bed(R)
☐ dune(C)	☐ extant lake(G)	☐ marsh(L)	☐ aeolian(S)
☐ stream terrace(D)	☒ alluvial plain(H)	☐ landslide/slump(M)	☐ none(T)
☐ playa(E)	☒ colluvium(I)	☐ delta(N)	☐ residual(U)

Description of Soil gray, silty; no bedrock exposed

34. Vegetation

*a. Life Zone ☐ Arctic-Alpine(A) ☐ Hudsonian(B) ☐ Canadian(C) ☐ Transitional(D) ☒ Upper Sonoran(E) ☐ Lower Sonoran(F)

*b. Community ☒ - Primary On-Site ☒ - Secondary On-Site ☒ - Surrounding Site

Aspen(A)	Other/Mixed Conifer(G)	Grassland/Steppe(M)	Marsh/Swamp(S)
Spruce-Fir(B)	Pinyon-Juniper Woodland(H)	Desert Lake Shore(N)	Lake/Reservoir(T)
Douglas Fir(C)	Wet Meadow(I)	Shadscale Community(O)	Agricultural(U)
Alpine Tundra(D)	Dry Meadow(J)	Tall Sagebrush(P)	Blackbrush(V)
Ponderosa Pine(E)	Oak-Maple Shrub(K)	Low Sagebrush(Q)	Creosote Bush(Y)
Lodgepole Pine(F)	Riparian(L)	Barren(R)	

Describe low sage, greasewood, small juniper (1), grasses

*35. Miscellaneous Text

36. Comments/Continuations/Location of Curated Materials and Records

Personnel at mine report that check dams and rock alignments continue to the W along the dirt rd, and wash. They do not know anything about them, however.

List of Attachments: ☐ Part B ☐ Topo Map ☐ Photos ☐ Continuation Sheets ☐ Part C ☐ Site Sketch ☐ Artifact/Feature Sketch ☐ Other

Part C - Historic Sites

Site No.(s) 42CB437

1. Site Type rock alignments, stone ck dam

*2. Historic Theme(s) ?

*3. Culture

AFFILIATION	DATING	AFFILIATION	DATING
Euro-American ?	?		

*4. Oldest Date _____ Recent Date _____
How Determined? _____

5. Site Dimensions 9 m X 8 m *Area 72 sq m

*6. Surface Collection/Method
- [x] None (A)
- [ ] Grab Sample (B)
- [ ] Designed Sample (C)
- [ ] Complete Collection (D)

Sampling Method _____

*7. Estimated depth of fill
- [ ] Surface (A)
- [x] 0-20 cm (B)
- [ ] 20-100 cm (C)
- [ ] 100 cm + (D)
- [ ] Fill noted but unknown (E)

How Estimated some of stones in alignment had fallen, leaving holes ca. 20 cm deep
(If tested, show location on site map.)

*8. Excavation Status
- [ ] Excavated (A)
- [ ] Tested (B)
- [x] Unexcavated (C)

Testing Method _____

*9. Summary of Artifacts and Debris
- [x] Glass (GL)
- [ ] Metal (ME)
- [ ] Nails (NC, NW)
- [ ] Bone (BO)
- [x] Ceramics (CS)
- [ ] Fabric (FA)
- [ ] Leather (LE)
- [ ] Wire (WI)
- [ ] Tin Cans
- [ ] Ammunition (AM)
- [ ] Wood (WD)
- [ ] Rubber (RB)

Describe the few artifacts present were in the wash channel below the ck dam; none present at alignments. Do not know if artifacts are associated with either feature. Artifacts scattered 3-10m from ck dam.

*10. Ceramic Artifacts

#	TYPE	TRADE-MARKS	DECORATION
5	earthenware, blue	none	none

Describe probably from single plate; white, easily fractured paste, lt blue glaze

Part C - Historic Sites

Site No.(s) 42CB437

*11. Glass

#	MANUFACTURE	COLOR	FUNCTION	TRADEMARKS
1		amber	unkn	none
4		clear	unkn	none

Describe

12. Maximum Density-#/sq m (glass and ceramics) 6

*13. Non-Architectural Features (locate on site map)

- ☐ Trail/Road (TR)
- ☐ Tailings (MT, ML)
- ☒ Rock Alignment (RA)
- ☐ Dump (DU)
- ☐ Depression (DE)
- ☐ Cemetery/Burial (CB)
- ☐ Dam, Earthen (DA)
- ☐ Ditch (DI)
- ☐ Inscriptions (IN)
- ☐ Hearth/Campfire (HE)
- ☐ Quarry (QU)
- ☒ Other (OT) check dam

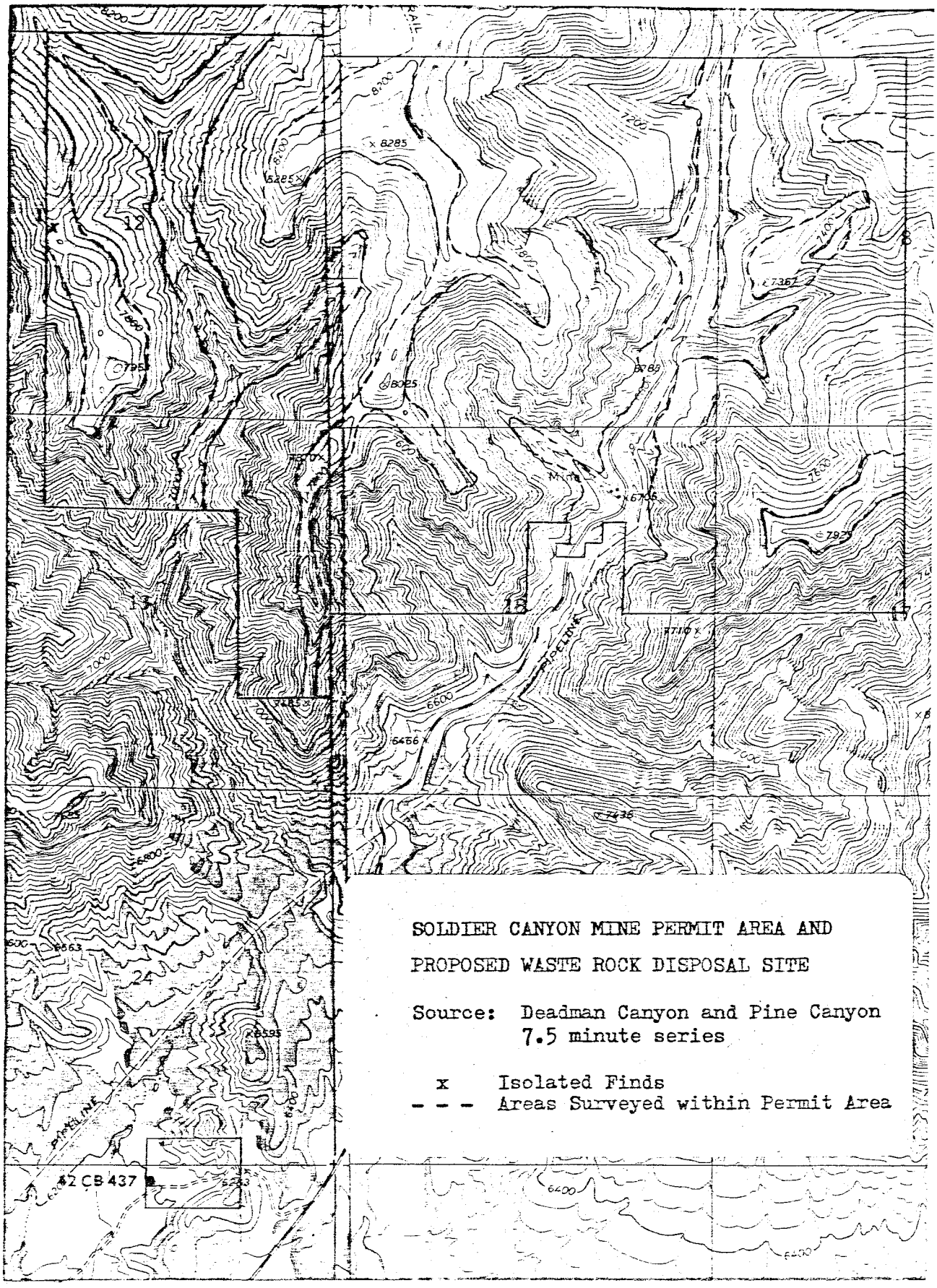
Describe see p. 1

*14. Architectural Features (locate on site map)

#	MATERIAL	TYPE	#	MATERIAL	TYPE

Describe

15. Comments/Continuations

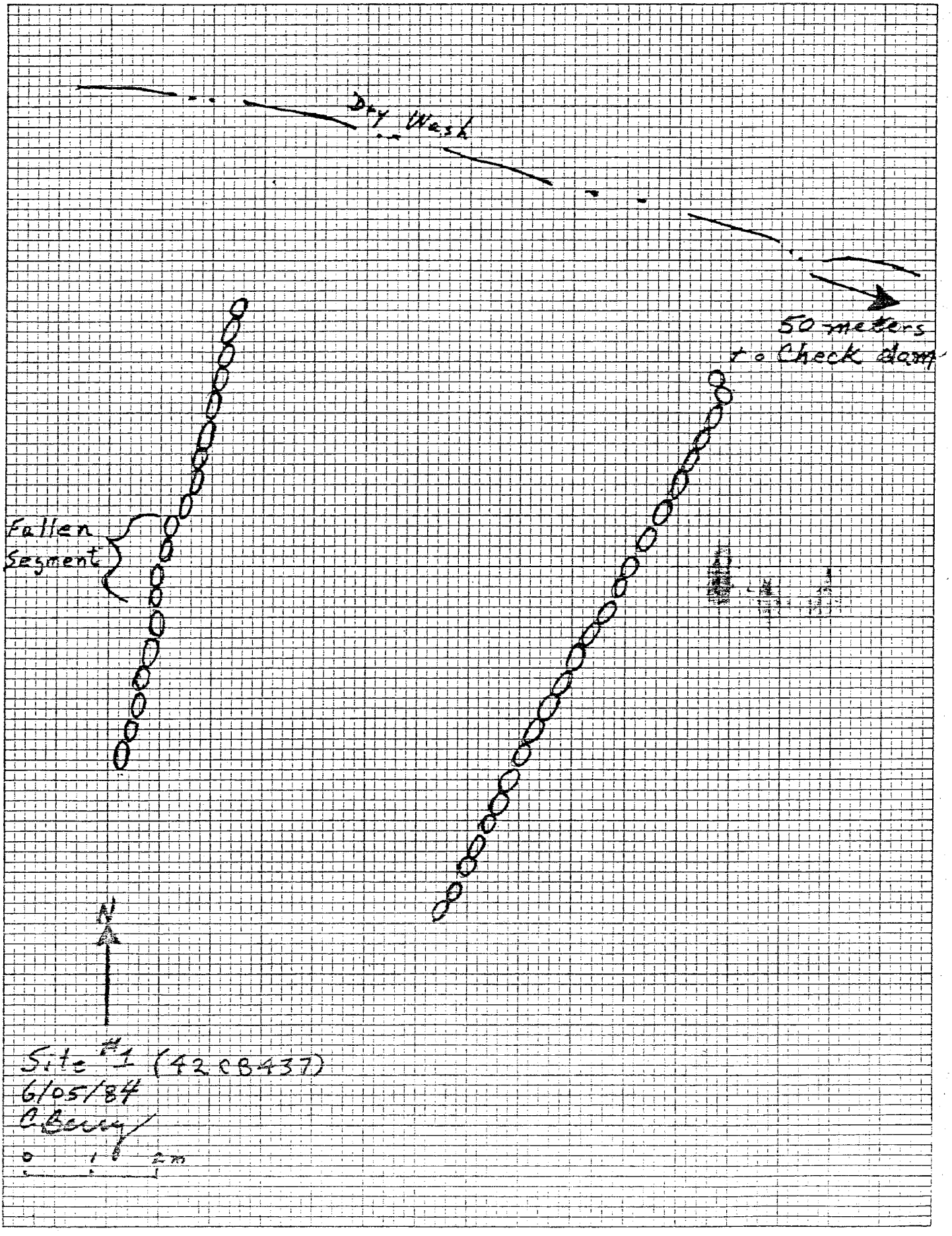


SOLDIER CANYON MINE PERMIT AREA AND PROPOSED WASTE ROCK DISPOSAL SITE

Source: Deadman Canyon and Pine Canyon 7.5 minute series

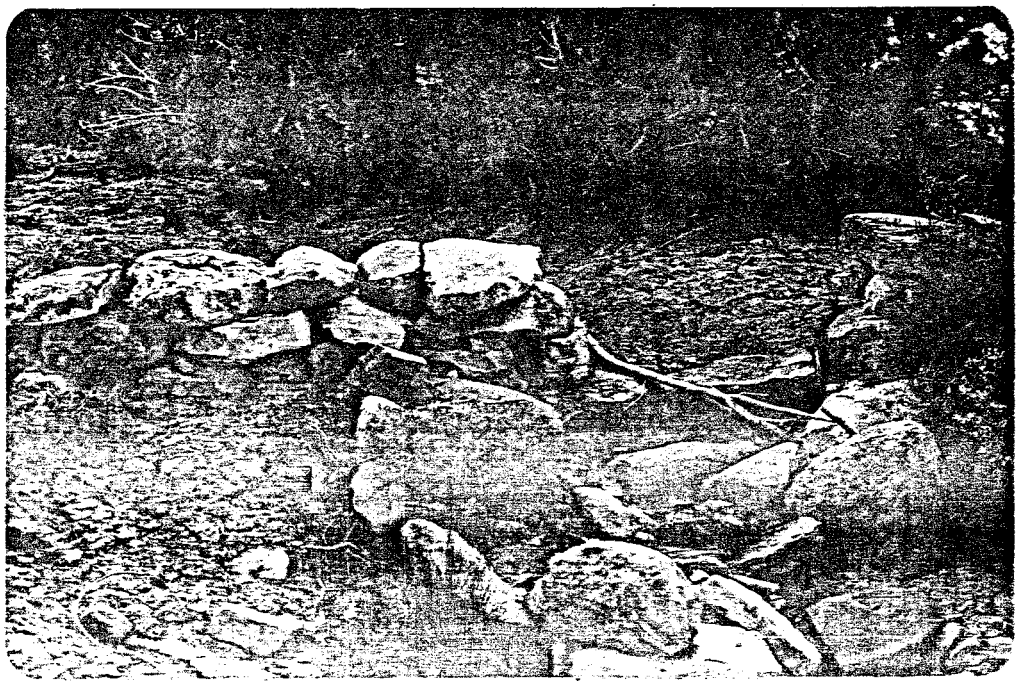
x Isolated Finds
- - - Areas Surveyed within Permit Area

#1



46 1610
K+E 5 X 5 TO THE CENTIMETER 18 X 24 CM.
KEUFFEL & ESSER CO. MADE IN U.S.A.

42CB437. Stone alignments looking ESE (CB84-1-3).



42CB437. Check dam, facing E (CB84-1-7).

1984 ersion

IMACS ENC DING FORM

To be completed for each site form.
For instructions and codes, see IMACS Users Guide.

Encoder's Name C. B ry

A

1 42-CB-437 State Site Number
2 Agency Site Number
6 Agency Report Number
10 Ø62ØØ Elevation
11 Zone 12 Easting 53128Ø Northing 4391340
12 NW NW NE 25 13 S ØØ1 E ¼ ¼ ¼ Sec. T. R.
13 1 Merid.
14 DEADMAN CANYON USGS Map
17 LM Owner
18 Forest 86 District/Par
19 Capab Anlys. Mgmt.
21 B Cond.
22 ER GR Impacts
23 D N.R.
26 SE Organ.
28 Ø6-Ø5-84 Survey Date
29 Ø5 Slope 265 Aspect
30 ØØØ ØØ9 B Water: degrees/dist./type
31 CAC Geog. Unit
32 EC CC 1st 2nd Location
33 H Dep.
34 E QOH 1 2 3 Vegetation
35 Misc. Text

B

2 Culture/Date
3 Area
4 Coll.
5 Depth
6 Exca. Status
7 Artifacts: #/type
8 Lithic Tools: #/type
9 # Flaking Stages
11 Ceramics #/type
13 Features: #/type
14 Architecture: #/material/type

C

2 ZZ Historic Themes
3 EA Cultures/Dating
4 Dates
5 ØØØ72 Area
6 A Coll.
7 B Depth
8 C Exca
9 Artifacts: #/type
10 BHANA Ceramics: #/type/idmrk/dec.
11 BZFZN9 BZLZN9 Glass: #/mnft./color/funct./idmrk./dec.
13 2RA 1OT Features: #/type
14 Architecture: #/material/type

LETTERING GUIDE A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 1 2 3 4 5 6 7 8 9 Ø

13.11 Maps and Drawings

AUG 1 '84

13.11.1 Map Certification

I, J.T. Paluso, do hereby certify that the following list of maps and revisions have been reviewed by me and were found to be complete and accurate as of the August 3, 1984 submittal.

C151	Surface Ownership
C153	Waste Rock Disposal Site Sediment Pond Sections & Details
D178	Waste Rock Disposal Site Sections and Details
Plate 1	Soils Map: Proposed Waste Rock Disposal Area
E017	Waste Rock Disposal Area
E018	Waste Rock Disposal Site - Vegetation Map
E019	Waste Rock Disposal Site Final Reclamation Contours and Cross Sections
E020	Waste Rock Disposal Site Sediment Pond and Topsoil Storage Pile

Registered Professional Engineer
No. 4028
J. THOMAS PALUSO
State of Utah

J. T. Paluso UT 4028

AUG 1 '84