Canyon Fuel Company, LLC
A Subsidiary of Bowie Resource Holdings, LLC

Skyline Mine
Gregg A. Galecki, Environmental Engineer
HC35, Box 380
Helper, Utah 84526
(435) 448-2636
Fax (435) 448-2632

C/007/0005
Received 8/12/15
Task ID #4883

August 10, 2015

Mr. Daron R. Haddock
Division of Oil, Gas, and Mining
1594 West North Temple
Salt Lake City, Utah 84114-5801

RE: North of Graben (NOG) Bleeder Shaft, Deficiency Response, Canyon Fuel Company, LLC, Skyline Mine, C/007/0005, Task ID 4883

Dear Daron:

Attached to this letter is pertinent information requesting approval to construct a ventilation shaft adjacent to Granger Ridge road, within lands managed by the Manti LaSal National Forest. The vent shaft, known as the NOG Bleeder Shaft, is necessary due to geologic conditions encountered underground that required turning two (2) separate mining districts into one, which modified the ventilation conditions. A field visit with Skyline, DOGM, and USFS personnel in 2014 proposed using a site on top of Granger Ridge and immediately adjacent to the existing road. Unfortunately, again due to geologic conditions, a prominent fault eliminated using the site that was initially proposed. However, the proposed design utilizes the area adjacent to the existing road and minimizes the associated disturbance to 1.7 acres.

The need for the shaft was unexpected, and will likely need to be in service by Fall 2016, with the shaft construction starting as early in 2016 as possible. Skyline personnel are hopeful the application can be approved by Fall 2015 with the pad being constructed before winter. The life of the installation will likely be approximately two (2) years; providing sufficient time to compete mining in the North Lease and remove equipment.

Attached to this cover letter are completed C1 and C2 (two pages) forms, and a technical deficiency response document, outlining how the identified deficiencies were addressed in Technical Memo Task ID 4883.. In addition, a total of seventeen (17) files have been uploaded to the Division Google Drive (Amendment081115) containing redline/strikeout text of the M&RP modified information, numerous plates and independent reports providing support for the proposed permit amendment.

If you have any questions regarding this information, please give me a call at (435) 448-2636.

Sincerely:

Gregg A. Galecki

Gregg A. Galecki
Canyon Fuel Company, LLC.
Environmental Engineer – Skyline Mines

APPLICATION FOR COAL PERMIT PROCESSING

Permit Change ☒ New Permit ☐ Renewal ☐ Exploration ☐ Bond Release ☐ Transfer ☐

Permittee: Canyon Fuel Company, LLC
Mine: Skyline Mine **Permit Number:** C/007/005
Title: NOG Bleeder Shaft
Description, Include reason for application and timing required to implement:
Installation of new bleeder shaft to ventilate the North Lease reserves. Task ID 4883

Instructions: If you answer yes to any of the first eight (gray) questions, this application may require Public Notice publication.

☒ Yes ☐ No 1. Change in the size of the Permit Area? Acres: 3.0 Disturbed Area: 1.7 ☒ increase ☐ decrease.
☐ Yes ☒ No 2. Is the application submitted as a result of a Division Order? DO# _____
☐ Yes ☒ No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
☐ Yes ☒ No 4. Does the application include operations in hydrologic basins other than as currently approved?
☐ Yes ☒ No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
☒ Yes ☐ No 6. Does the application require or include public notice publication?
☐ Yes ☒ No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
☒ Yes ☐ No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
☐ Yes ☒ No 9. Is the application submitted as a result of a Violation? NOV # _____
☒ Yes ☐ No 10. Is the application submitted as a result of other laws or regulations or policies?
Explain: _____
☐ Yes ☒ No 11. Does the application affect the surface landowner or change the post mining land use?
☐ Yes ☒ No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
☒ Yes ☐ No 13. Does the application require or include collection and reporting of any baseline information?
☒ Yes ☐ No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
☒ Yes ☐ No 15. Does the application require or include soil removal, storage or placement?
☒ Yes ☐ No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
☒ Yes ☐ No 17. Does the application require or include construction, modification, or removal of surface facilities?
☒ Yes ☐ No 18. Does the application require or include water monitoring, sediment or drainage control measures?
☒ Yes ☐ No 19. Does the application require or include certified designs, maps or calculation?
☐ Yes ☒ No 20. Does the application require or include subsidence control or monitoring?
☒ Yes ☐ No 21. Have reclamation costs for bonding been provided?
☐ Yes ☒ No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
☐ Yes ☒ No 23. Does the application affect permits issued by other agencies or permits issued to other entities?

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

Corey Heaps
Print Name

Corey Heaps 8-11-15
Sign Name, General Manager, Date

Subscribed and sworn to before me this 11 day of August, 20 15

Melissa S Willden
Notary Public

My commission Expires: 3-19, 20 19

Attest: State of Utah } ss:
County of Carbon

MELISSA S WILLDEN
Notary Public - State of Utah
My Commission Expires
March 19, 2019
Commission #682454

For Office Use Only:	Assigned Tracking Number:	Received by Oil, Gas & Mining

Form DOGM- C1 (Revised March 12, 2002)

APPLICATION FOR COAL PERMIT PROCESSING
Detailed Schedule Of Changes to the Mining And Reclamation Plan

Permittee: Canyon Fuel Company, LLC
Mine: Skyline Mine **Permit Number:** C/007/005
Title: NOG Bleeder Shaft - Page 1 of 2 Task ID #4883

Provide a detailed listing of all changes to the Mining and Reclamation Plan, which is required as a result of this proposed permit application. Individually list all maps and drawings that are added, replaced, or removed from the plan. Include changes to the table of contents, section of the plan, or other information as needed to specifically locate, identify and revise the existing Mining and Reclamation Plan. Include page, section and drawing number as part of the description.

			DESCRIPTION OF MAP, TEXT, OR MATERIAL TO BE CHANGED
☐ Add	☒ Replace	☐ Remove	Chapter 1 Legal, Financial Compliance Information pages 1-37, 1-38
☒ Add	☐ Replace	☐ Remove	Chapter 1, Appendix 118-A -Public Notice
☐ Add	☒ Replace	☐ Remove	Chapter 1, Plates 1.6-3
☒ Add	☐ Replace	☐ Remove	Chapter 2, Section 2.1 General Environmental Resources Summary: 2-4c2, 2-4e
☐ Add	☒ Replace	☐ Remove	Chapter 2, Section 2.2 Geology and Geotechnical: page 2-21(b)
☐ Add	☒ Replace	☐ Remove	Chapter 2, Section 2.7 Vegetation: pages 2-63a
☒ Add	☒ Replace	☐ Remove	Chapter 2, Section 2.9 Terrestrial Wildlife: REPLACE page 2-99, Figure 2.9.3-A, Tables 2.9-4 and 2.9-5; ADD pages 2-104 (g-3) and 2-104(L), Table 2.9-7, Figure 2.9.3-E,
☐ Add	☒ Replace	☐ Remove	Chapter 2, Section 2.10 Raptors: page 2-111b
☐ Add	☒ Replace	☐ Remove	Chapter 2, Section 2.11 Soils: page 2-120(L)
☐ Add	☒ Replace	☐ Remove	Chapter 2, Section 2.12 Soils: page 2-128, 2-131
☐ Add	☒ Replace	☐ Remove	Chapter 3, Section 3.2 Components of Operation: pages 3-31(b) and 3-72(c)
☒ Add	☐ Replace	☐ Remove	Chapter 3, Plates 3.2.4-5A through 3.2.4-5D
☐ Add	☒ Replace	☐ Remove	Chapter 4, Section 4.1 Reclamation Plan; page4-3(a)
☐ Add	☒ Replace	☐ Remove	Chapter 4, Section 4.2 Reclamation Timetable: page 4-6 Table4.2-1
☐ Add	☒ Replace	☐ Remove	Chapter 4, Section 4.3 Reclamation Bond; Reclamation Cost Estimate Summary Table, Demolition Summary Table, Earthwork Summary, Revegetation Summary Table
☒ Add	☐ Replace	☐ Remove	Chapter 4, Section 4.3 Reclamation Bond; NOG Bleeder Shaft Demolition sheet, NOG Bleeder Shaft Earthwork sheet
☐ Add	☒ Replace	☐ Remove	Chapter 4, Section 4.4 Backfill, Soil Stabilization, Compaction, Contouring, Grading; page 4-28
☒ Add	☐ Replace	☐ Remove	Chapter 4, Section 4.4 Backfill, Soil Stabilization, Compaction, Contouring, Grading; Plates 4.4.2-5A and 4.4.2-5B
☐ Add	☒ Replace	☐ Remove	Chapter 4, Section 4.6 Topsoil/Subsoil Handling Plan: Page 4-34(b), Page 4-38 (d) - Table 4.6-4, page 4-41(e)
☐ Add	☒ Replace	☐ Remove	Chapter 4, Section 4.7 Revegetation Plan: Page 4-50 (a)
☒ Add	☐ Replace	☐ Remove	Chapter 4, Section 4.7 Revegetation Plan: Table 4.7-10A pg 4-58(e), Table 4.7-10B pg 4-58(f)
☐ Add	☒ Replace	☐ Remove	Chapter 4, Section 4.9 Opening and Sealing Plan: Page 4-62(a)
☒ Add	☐ Replace	☐ Remove	Chapter 4, Section 4.9 Opening and Sealing Plan: Figure 4.9-D
☐ Add	☒ Replace	☐ Remove	Chapter 4, Section 4.11 Protection of Hydrological Balance: Page 4-72
☐ Add	☒ Replace	☐ Remove	Chapter 4, Section 4.12 Postmning Land Uses: Table 4.12-1 pg 4-75, Page 4-75(a), 4-81
☐ Add	☒ Replace	☐ Remove	Chapter 4, Section 4.18 Fish and Wildlife Plan: Page 4-103B
☐ Add	☒ Replace	☐ Remove	Chapter 4, Section 4.20 Transportation Facilities: Page 4-114(a)
☒ Add	☐ Replace	☐ Remove	Chapter 4, Plates 4.4.2-5A and 4.4.2-5B

Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan.	**Received by Oil, Gas & Mining**
Information was submitted electronically. Two (2) paper copies of the information will be submitted at final approval.	

APPLICATION FOR COAL PERMIT PROCESSING
Detailed Schedule Of Changes to the Mining And Reclamation Plan

Permittee: Canyon Fuel Company, LLC
Mine: Skyline Mine **Permit Number:** C/007/005
Title: NOG Bleeder Shaft 2 of 2 Task ID #4883

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			DESCRIPTION OF MAP, TEXT, OR MATERIAL TO BE CHANGED
☒ Add	☐ Replace	☐ Remove	Appendix A-2, Volume 2: Vegetation of the NOG Ventilation Site, 2014 Skyline Mine, Carbon County, Utah. Mt Nebo Scientific, Inc. (file name: Canyon15.Skyline14.NOG.rpt.final.pdf)
☒ Add	☐ Replace	☐ Remove	Appendix A-2 Volume 2: Order 2 Soil Survey for NOG Bleeder Shaft - Skyline, January 2015; Long Resources Consultants, Inc., (file name:NOG Soil Survey Report Jan 21 2015.pdf)
☒ Add	☐ Replace	☐ Remove	Appendix A-2, Volume 2: 2014 Wildlife Survey Report - NOG Graben Bleeder Shaft, Alpine Ecological, 3.28.15 (file name: 2014 Graben Survey Report.pdf)
☒ Add	☐ Replace	☐ Remove	Appendix A-4, Volume 2: CONFIDENTIAL FILE - A Cultural Resources Inventory for the Skyline Mine Expansion and Transmission Line Construction Project, Carbon and Emery Counties, Utah; Environment Planning Group, LLC., October 7, 2014 (file name: Bowie-Skyline Expansion Report_EPG.pdf)
☒ Add	☐ Replace	☐ Remove	Appendix A-5 Engineering Calculations, Section 25: North of Graben (NOG) Bleeder Shaft Area Hydrology Design Report; Earthfax Engineering Group, LLC., March 2015 (file name: NOG Bleeder Shaft Hydrology Design Report_Full.pdf)
☒ Add	☐ Replace	☐ Remove	Appendix A-5 Engineering Calculations, Section 25, North of Graben (NOG) Bleeder Shaft Area Slope Stablility Analysis; Earthfax Engineering Group, LLC., March 2015 (file name: Geotech Report-Full.pdf)
☒ Add	☐ Replace	☐ Remove	Appendix A-1, Volume 1, 2015Air Quality Permit DAQE-AN100920001-15
☒ Add	☐ Replace	☐ Remove	Appendix A-2, Volume 2, Technical Memo, Re: Western Yellow-billed Cuckoo (Coccyzus americanus), Alpine Eclological, 7/30/15 (file name: Technical Memo YBC 7 30 15.pdf)
☒ Add	☐ Replace	☐ Remove	IPaC Trust Resource Report – Skyline Mine Lease Area, generated July 2, 2015 (T&E spp – Skyline Lease Area FWS.pdf)
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
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Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan.	**Received by Oil, Gas & Mining**
Information has been submitted electronically. Two (2) paper copies of the information will be submitted at final approval.	

NOG Bleeder Shaft – Technical Deficiency Response

Task ID #4833

The following identifies how items in Task ID #4833 were addressed in the North of Graben (NOG) Bleeder Shaft application. Deficiencies are identified in bold lettering followed by the response.

Legal Description:

R645-301-112; Permit Area: For clarity all references to only 1.7 acres being disturbed in the 3.0 acre permit site have been removed. The permit area is consistently noted as 3.0 acres in the areas cited.

R645-301-121.200; Permit Area: Section 2.1 and 4.11 have been modified to clearly state that 3.0 acres will be added to the bonded area, but only 1.7 acres will be disturbed.

R645-301-411.142; Historical and Archeological Resource Information: Our archeologist is waiting on a confirmation from both the USFS and SHPO. Often it is difficult to get a response from both agencies when no items of concern were noted in the survey. It is hoped that the Division will consider moving forward or providing conditional approval upon receiving correspondence.

R645-301-321.200; Vegetation Resource Information: Table 2.12.2-1 has been updated to reflect AUM's removed from production by mine facilities.

R645-301-322, -301-330, -301-342 Fish and Wildlife Resource Information;

-Table 2.9-4 has been updated to reflect the most current (Updated from DWR website –updated 1/12/2012) Threatened & Endangered Species located in Carbon, Emery, and Sanpete Counties.
-Table 2.9.5 updated with DWR data from DWR website. Utah Sensitive Species List, updated March 29, 2011.
-Table 2.9-7 has been added, which demonstrates the specific Candidate, Threatened, and Endangered species which may be affected in the Skyline Mine lease area, (from US Fish and Wildlife Service report for the Skyline Mine lease area including Flat Canyon).
-USFWS IPaC Trust Report (Generated 7/02/2015) added to Appendix A-2, Volume 2.
-Figure 2.9.3-A has been updated and 2.9.3-B, C, & D have been added to demonstrate Skyline Mine's proximity to endangered mammal species.
-Page 2-99 and Figure 2.9.3-E address Skyline Mine's lease areas in relation to Sage Grouse Management Areas and specifically nesting/brood-rearing habitat, and winter habitat.
-Page 2-104(k) revised addressing yellow-billed cuckoo.
- Since the presence of the Yellow-billed Cuckoo is unlikely, no mitigation efforts are cited in Section 4.18.

R645-301-130; Soils Information: The Long Resources soil report has been modified to include appendices A through D.

R645-301-321.200; Land Use Information: Table 2.12.2-1 has been updated to reflect AUM's removed from production by mine facilities.

R645-301-521.123; Maps Existing Surface Configuration: Plate 3.2.4-5A has been modified to include the USFS road name and number: Granger Ridge 0221. Section 3.2, page 3-31(b) has been modified to

include a discussion that the road 0221 will remain open during construction and operation with a slight re-routing of the road to the north of its current location.

R645-301-521.133, -526.116; Existing Structures: As stated above, comments added to Section 3.2, page 3-31 (b) indicate that traffic control will not be a problem on the upper portion of the facility as the road will be re-routed north of the site, and the facility will be secured with a chain-link fence during operations. Also, traffic is minimal on USFS 0221 as terminates approximately ½-mile northeast of the site.

R645-301-420; Air Pollution Control Plan: Section 3.2 – Components of Operation, page 3-31(b) discusses dust control during the construction and operational phases. The emissions limit is 20% opacity where dust will be controlled with water sprays or chemically treated. The Skyline Air Quality permit has also been added to Appendix A-1 for reference.

R645-301-330; Fish and Wildlife Protection and Enhancement Plan: Page 2-104(k) revised addressing deer & elk– in process

R645-301-521.165, -231.100; Topsoil and Subsoil: Plate 3.2.4-5A has been modified to include elevations on the contour lines. Plate 3.2.4-5C has been modified to make the elevation lines more legible (larger font). Topsoil from the McCadden Family (and soil pit 14SK07) anticipate soil depths of approximately 19-inches Section 2.11, page 2-120(l) has been modified to state that no subsoil will be collected. Section 4.6 – Topsoil/Subsoil handling plan has been modified to state no subsoil will be collected and that small brush will be incorporated into the topsoil pile, with trees being stored in a brush pile within the permit area to be redistributed at reclamation.

R645-301-330; Vegetation: Section 4.7 Revegetation Plan page 4-50(a) already directs the reader to the interim seed mix listed in Table 4.7-10A. A discussion has been added that sediment control measures such as erosion control blankets, wattles, or straw bales will be used to control erosion during interim vegetation establishment. Similar statements were added to Section 3.2 page 3-31(b) when describing the construction and operation of the site.

R645-301-731.700, -742.220; Hydrologic Sediment Control Measures: Plates 3.2.4-5A and -5D have been included to clearly display and label all ditches, culverts, and other sediment control features. The area of the pad collecting precipitation and potentially sediment is outlined and labelled at ASCA 40 which is discussed in further detail in Section 3.2 page 3-72(c).

R645-301-830; Reclamation Plan: Questions/deficiencies related to the bond have been addressed in the following manner:

- A deduction in demolition volume has been added for no interior walls on all three (3 steel buildings
- Concrete demolition has been modified to show thickness is <15-inches
- Concrete demolition <15-inches uses a unit cost of $13.75 CY
- Fan removal (it will not be demolished) is now represented by RS Means heavy equipment 23 05 05.10 3600, $935/ton (the weight of the fan is approximately 4-tons)
- Have clarified that the Ventilation fan demolition is for the steel building, not the fan. The fan will be re-used
- A 50% reduction has been applied to the metal sheds – including the Fan structure

- The following line items have been added to the demolition sheet: culvert, number of gates, top rails, post and post foundations, and gate posts with the MS Means numbers used as suggested
- The gates will be opened manually
- Revegetation bond amounts addressed. Hay amounts were adjusted to reflect accurate acreages.

Chapter 1
Revised 7/23/2015

of Mine Workings Workings (Life of Mine)	Surface to 1,500' max	Surface to 2,300' max	Surface to 1,500' max

The anticipated number of total surface land acres to be affected (life of mines) is less than the combined total of the affected acreages for each of the three mines due to the overlapping of mining operations which is inherent to this multi-seam mining operation. The total surface acreage to be disturbed by surface facilities associated with underground mining is 122.31 acres.

The following information was based on projection for the next five years (2012-2016).

	Mine No. 1	Mine No. 2	Mine No. 3
Extent of Horizontal Workings	240 acres	375 acres	1,400 acres
Extent of Vertical Workings	Surface to 1,250'	Surface to 2,250'	Surface to 2,125'

Permit Area

The construction/installation of surface facilities at the mine site, loading area, conveyor belt route, well houses, water tank pad, waste rock disposal site, and South Fork Breakout, and Winter Quarters Ventilation Facility comprise the Permit Area. The permit area acreage listed adequately accommodate areas of disturbance.

PERMIT AREAS TO BE RECLAIMED

AREA	ACREAGE	
Loadout	13.86	
Portal Yard		42.55
Water tanks, water lines, and Well pads (water lines not reclaimed		0.60
Conveyor Bench	14.18	
Waste Rock Disposal Site and Road		32.48
South Fork Breakout		0.96
James Canyon Buried Power Line	0.30	
James Canyon Buried Pipeline		1.60
James Canyon Water Wells and Road		2.95
Winter Quarters Ventilation Facility		7.93
Winter Quarters Road (not reclaimed)		4.90
North of Graben (NOG) Shaft		3.00
TOTAL		~~122.31~~125.31

Legal Description of Permit Area

Township 12 South, Range 6 East, SLBM

Section 26: Portions of SW1/4SW1/4
Section 34: Portions of NE1/4NE1/4

Township 12 South, Range 7 East, SLBM

Section 32: Portion SE1/4SE1/4

Township 13 South, Range 6 East, SLBM

Section 1: Portions of S1/2NW1/4, S1/2NE1/4
Section 13: Portions of S1/2S1/2
Section 23: Portions of SE1/4NE1/4
Section 24: Portions of NE1/4SW1/4
Section 25: Portions of S1/2S1/2
Section 35: Portions of NE1/4, S1/2
Section 36: Portions of N1/2NW1/4

Township 13 South, Range 7 East, SLBM

Section 4: Portions of SW1/4NW1/4, NW1/4SW1/4
Section 5: Portions of E1/2NE1/4
Section 6: Portions of S1/2N1/2
Section 17: Portions of S1/2S1/2
Section 18: Portions of S1/2S1/2
Section 19: Portions of N1/2N1/2

Township 14 South, Range 6 East, SLBM

Section 2: Portions of W1/2NW1/4
Section 3: Portions of SE1/4NE1/4

See Plate 1.6-3 for graphic illustration of Permit Area

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)

ss.

County of Carbon,)

I, Jenni Fasselin, on oath, say that I am the Publisher of the Sun Advocate, a twice-weekly newspaper of general circulation, published at Price, State of Utah a true copy of which is hereto attached, was published in the full issue of such newspaper for 4 (Four) consecutive issues, and on the Utah legals.com website, the first publication was on the 12th day of May, 2015, and that the last publication of such notice was in the issue of such newspaper dated the 2nd day of June 2015.

Jenni Fasselin

Jenni Fasselin – Publisher

Subscribed and sworn to before me this 2nd day of June, 2015.

Linda Thayn

Notary Public My commission expires January 10, 2019 Residing at Price, Utah

Publication fee, $ 403.20

LINDA THAYN
NOTARY PUBLIC-STATE OF UTAH
COMMISSION# 680835
COMM. EXP. 01-10-2019

LEGAL NOTICE

Canyon Fuel Company, LLC, has filed a complete application with the Division of Oil, Gas and Mining for a revision of the existing Mining and Reclamation Plan, C/007/0005 for the Skyline Mine. Canyon Fuel Company, LLC operates the Skyline Mines with surface facilities located in Eccles Canyon which is approximately 4 miles so hwest of the town of Scofield, Utah. The revision includes the addition of a ventilation shaft and associated pad adjacent to Granger Ridge road

Underground coal mining will take place in coal reserves owned or leased by Canyon Fuel Company, LLC. A legal description of the proposed areas for these new surface facilities is described as follows:

Proposed Additional Areas Authorized for Coal Mining and Reclamation Activities

Township 12 South, Range 6 East, SLBM

Section 26: Portions of SW1/4SW1/4
Section 34: Portions of the NE1/4NE1/4

Total acres within the affected area: 3.0 acres for the ventilation facility

The address of the applicant is: Canyon Fuel Company, LLC
225 North 5th Street, Suite 900
Grand Junction, CO 8 501

After filing, copies of this permit application will be available for inspection at the following location: Utah Division of Oil, Gas and Mining, 1594 West North Temple, Suite 1210, Salt ake City, Utah, and the Utah Division of Oil, Gas, and Mining website under the Coal Permit files.

Written comments or requests regarding this permit renewal must be made within 30 days of the last publication of this notice, and may be addressed to the Utah Division of Oil, Gas and Mining, 1594 West North Temple, Suite 1210, Salt Lake City, Utah 84114-5801.

Published in the Sun Advocate May 12, 19, 26 and June 2, 2015.

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)

ss.

County of Emery,)

I, Jenni Fasselin, on oath, say that I am the Publisher of the Emery County Progress, a weekly newspaper of general circulation, published at Castle Dale, State of Utah and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for 4 (Four) consecutive issues, and on the Utah legals.com webwsite; the first publication was on the 12th day of May, 2015, and that the last publication of such notice was in the issue of such newspaper dated the 2nd day of June, 2015.

Jenni Fasselin

Jenni Fasselin – Publisher

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Linda Thayn

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Published in the Emery County Progress May 12, 19, 26 and June 2, 2015.

Section 2.1
Enviro Resources

North of Graben (NOG) Bleeder Shaft

Preliminary studies for permitting construction of the NOG Bleeder Shaft was conducted in 2014. The bonded permit area is approximately 3.100 acres, with approximately 1.7 acres being disturbed with construction activities. The area surveyed for cultural resource was significantly larger than the area to be disturbed. Both Class I and Class III cultural resource inventories were conducted in the area. Two(2) isolated occurrences and one (1) new cultural resources sites were identified in the vicinity of the site, but none of the sites will be impacted. In addition, the sites were documented and evaluated for eligibility for inclusion in the National Register of Historic Places, but determined not to be eligible. See CONFIDENTIAL FILE for Environmental Planning Group (EPG) report, "A Cultural Resources Inventory for the Skyline Mine Expansion and Transmission Line Construction Project, Carbon and Emery Counties, Utah."

Revised 7-23-15 2-4c2

2.1.2 Threatened and Endangered Species

No currently approved threatened or endangered species, plant or animal, have been identified on the project or adjacent areas with the exception of an occasional transient Bald Eagle, which may pass through the project area during the winter. The mining operation has no impact on these transitory birds. However, a northern goshawk, a candidate for T&E listing, has been identified as a resident adjacent to the permit area. A plan for monitoring and protection of raptors may be found in Sec. 4.18.

Should any threatened or endangered species be identified in the future, their discovery will be promptly reported to the Division.

The Scofield Waste Rock site was expanded into approximately 5 acres of previously undisturbed ground in 2007. Surveys were conducted to identify T&E species of both plants and animals. The surveys did not find any such species. Species listed in Carbon County are found in different elevations and habitats. Results of the surveys are located in Appendix A-2, Volume 2. Additional discussions on vegetation and wildlife are discussed in

Winter Quarters Ventilation Facility

Permitting of the Winter Quarters Ventilation Facility consists of permitting approximately 7.93 acres located along the base of the south-facing slope. Improvements to the existing road encompass approximately 4.9 acres of previously disturbed ground; additional disturbance was added. Particular attention was taken to stay outside the stream buffer zone of Winter Quarters Creek keeping construction activities a minimum of two (2) bankfull widths from the stream. Surveys were conducted to identify T&E species of both plants and animals. The surveys did not find any such species.

Revised: 7-22-10 2-4d

North of Graben (NOG) Bleeder Shaft

The NOG Bleeder Shaft consists of approximately 3.100 acre permit area located on a south-facing slope approximately 200 feet below the existing Granger Ridge USFS road. The total watershed area contributing to the pad is approximately 0.8 acres. The site includes a 0.19 acre topsoil stockpile area,a short access road, the pad, and a minor re-routing of the existing road to utilize flat ground on top of the ridge to minimize the disturbance associated with the pad. Surveys were conducted to identify T&E species of both plants and animals. Surveys (provided in Appendix A-2)did not note any such species. Although habitat for the three-toed woodpecker exists in the area, none were identified.

Revised 7-23-15 2-4e

Section 2.2
Geology

north of Winter Quarters Canyon. The ventilation facility will include a 20-foot diameter vertical shaft, and / or a 20-foot wide slope driven at 18 degrees down, and 8-foot diameter escape shaft. The 20-foot shaft will have a 12-inch thick concrete liner, the slope will have a 8-inch thick concrete invert with the ribs and roof having a minimum 3-inch thick shotcrete liner, and the escape shaft will have a 6-inch concrete liner. When sealing at reclamation, the shaft(s) per 30 CFR Part 75.1711-1 and R645-301-551 will be completely backfilled to the surface using an engineered fill. When sealing the slope, sealing will consist of solid, substantial, incombustible material, such as concrete blocks, bricks or tile, or shall be completely filled with incombustible material for a distance of at least 25 feet into the opening. See Section 4.9 for additional details.

2.2.13 North of Graben (NOG) Bleeder Shaft

The NOG Bleeder Shaft is constructed to provide adequate ventilation for completion of the North of Graben mining district. The shaft was necessary due to encountered geologic conditions that required turning two (2) separate mining districts into one (1). The facility will include one (1) 5-foot diameter, unlined shaft. When sealing at reclamation, the shaft will be completely backfilled to the surface using an engineered fill, per 30 CFR Part 75.1711-1 and R645-301-551. Figure 4.9-C illustrates the backfilling of the shaft.

2.2.144 Subsidence Monitoring

Please refer to Section 4.17 - Subsidence Control Plan for details of the Subsidence Monitoring program and commitments to mitigate any effects due to subsidence.

Section 2.7
Vegetation

INCORPORATED
08/23/10
Division of Oil, Gas & Mining

2.7.9 North of Graben (NOG) Bleeder Shaft

The NOG Bleeder Shaft is constructed to provide adequate ventilation for completion of the North of Graben mining district. The shaft was necessary due to encountered geologic conditions that required turning two (2) separate mining districts into one (1). The facility will include one (1) 5-foot diameter, unlined shaft. The area permitted for the bleeder shaft is approximately 3.0 acres, with a disturbed area of approximately 1.7 acres. Both soils and vegetation information specific to the site were collected in 2014 prior to construction. In general the NOG Bleeder Shaft site encompasses a mix of musk thistle, cheatgrass, bluebunch wheatgrass, and aspen on south-facing hillside located approximately 200 feet downhill from the existing Granger Ridge USFS road. A portion of the new access road will be constructed is located in an aspen area that had been disturbed previously by other activities, and appears to have been later re-seeded. Attempts were made to minimize the size of the pad utilizing the existing flat areas adjacent to the USFS road, but geologic conditions prohibited placing the shaft on the road. No threatened or endangered species were identified. The vegetation report is located in Appendix A-2, Volume 2 (Vegetation of the NOG Ventilation Site 2014, Mt Nebo Scientific).

Section 2.9
Terrest. Wildlife

2.9.3 Endangered and Threatened Species

Passage of the Endangered Species Act of 1973 (Public Law 23-205) provided a legal basis for establishment of lists of endangered and threatened plants and wildlife (Tables 2.9-4, 2.9-5, and 2.9-6). According to National Wildlife Federation (1977), Dalton (1978) and the Federal Register (1979), there are no endangered or threatened species of amphibians or reptiles, or any threatened mammals that inhabit the south-eastern region of Utah. Dalton (1978), however, indicates that one endangered species, the black-footed ferret, might be found in the Wasatch Plateau east of the Skyline Drive. Durrant (1952) reports that he knows "...of no occurrence of the black-footed ferret north of the Colorado River in Utah...". There are unconfirmed reports of black-footed ferrett sightings east of Castle Dale and Ferron in Emery County, Utah. Many hours have been spent trying to verify the presence of these animals. Up to now these efforts have been unsuccessful. Observations on all of the Skyline lease and immediate surrounding areas show no signs of prairie dog colonies nor sufficient ground squirrel populations to support ferret populations (Fig. 2.9.3-A).

In recent decades, the bald eagle has recovered from the endangered status and is now listed as threatened. Despite the recovery, very few nests have been identified in Utah as of 2000. The golden eagle is quite common in Utah and is not listed as threatened or endangered. The Skyline Mine permit area was flown in 2005 by DWR and no nests were identified for either eagle.

Threatened and Endangered, and sensitive species were re-evaluated in 2012 as part of the North Lease modification which extended the area approved for mining into portions of the Fish Creek drainage. The lease modification encompasses approximately 770 acres. A pre-survey investigation determined only the Western Toad needed a survey. The survey for the Western Toad was conducted in 2013 and determined they were not in the area. See Appendix Volume A-2 for Alpine Ecological report.
In 2010, the Greater Sage grouse became a candidate species under the ESA. Figure 2.9.3-E shows Skyline Mine lease areas in relation to UDWR Sage Grouse Management Areas from 2014 data. These are areas where leks, brood rearing habitat, and winter habitat occur. Skyline Mine's lease areas are located within the overall boundary of a Sage-Grouse Management Area, but do not overlap any nesting/brood-rearing habitat or winter habitat (see Figure 2.9.3-E).

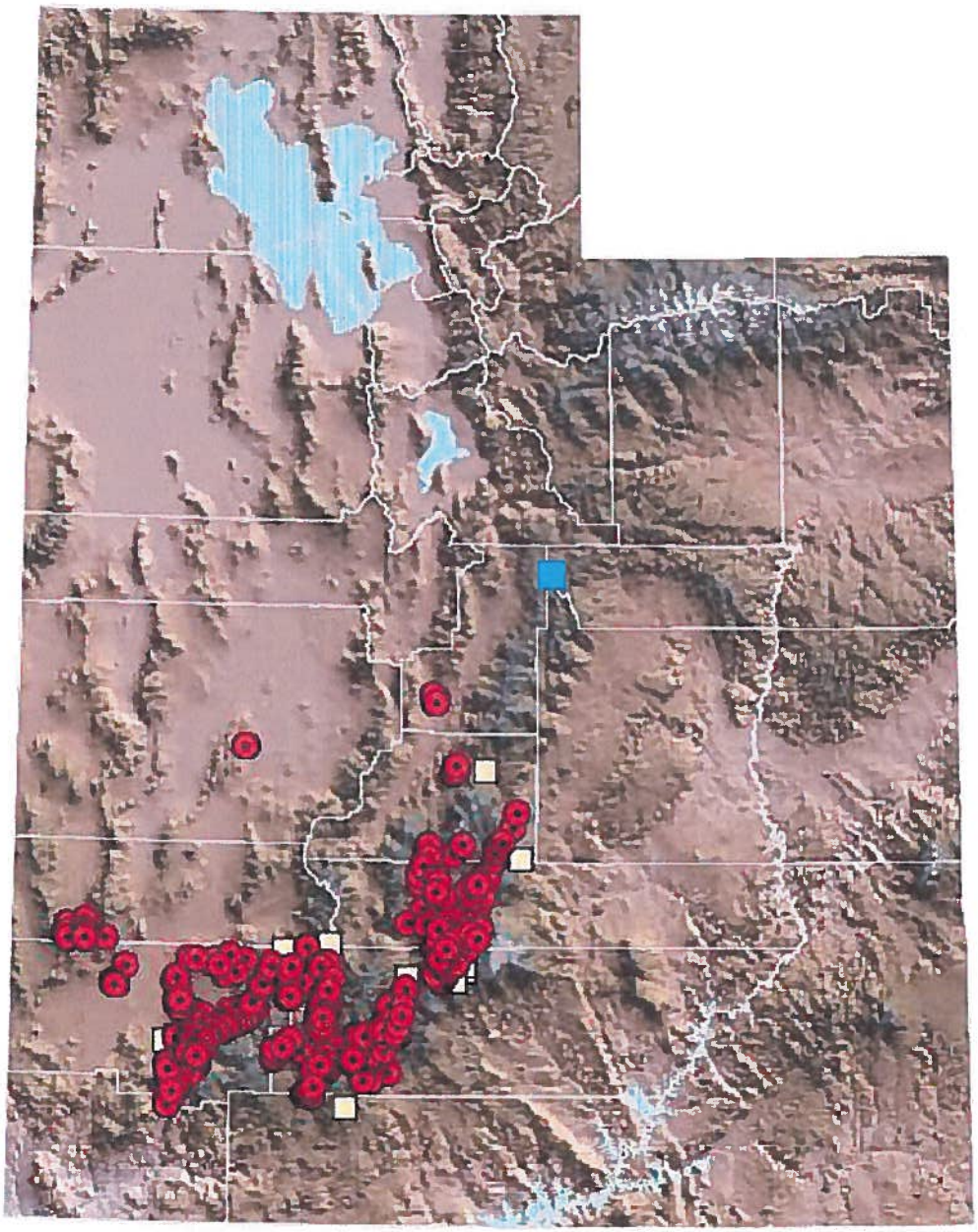
2.9.4 Impact Analysis and Protection of Wildlife

Numerous precautions were taken during construction of Skyline Mine to protect the wildlife resources. While the disturbances during the operational phase are greatly reduced, the following concerns have been and are still being considered: (1) surface disturbance, (2) loss of habitat, (3) noise, (4) human activity and (5) air pollution. Any one, all or a combination of the above perturbations can impact terrestrial vertebrates.

Figure 2.9.3-A

Distribution of endangered mammalian species in Utah in relation to the Skyline lease area. Modified from Utah Division of Wildlife Resources – Utah Natural Heritage Program "Vertebrate Information Compiled by the Utah Natural Heritage Program: A Progress Report" by William R. Bosworth, III December 2003. Publication Number 03-45

Utah prairie-dog *Cynomys parvidens*

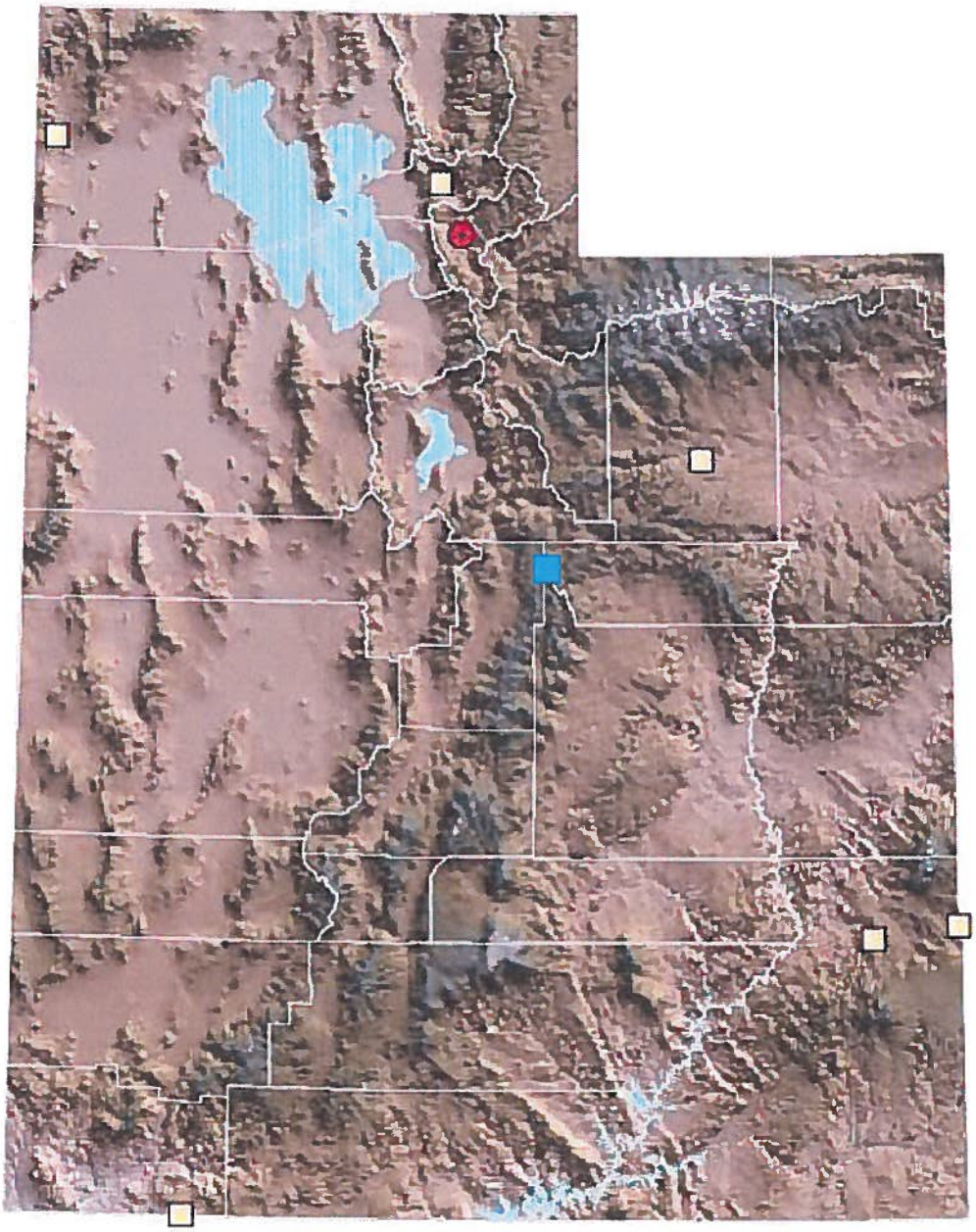


The distribution of records of the Utah prairie-dog (Cynomys parvidens). Red circles represent records since 1983, inclusive, and yellow squares represent records before 1983. Blue rectangle represents the Skyline lease area.

Figure 2.9.3-B

Distribution of endangered mammalian species in Utah in relation to the Skyline lease area. Modified from Utah Division of Wildlife Resources – Utah Natural Heritage Program "Vertebrate Information Compiled by the Utah Natural Heritage Program: A Progress Report" by William R. Bosworth, III December 2003. Publication Number 03-45

Gray wolf *Canis lupus*

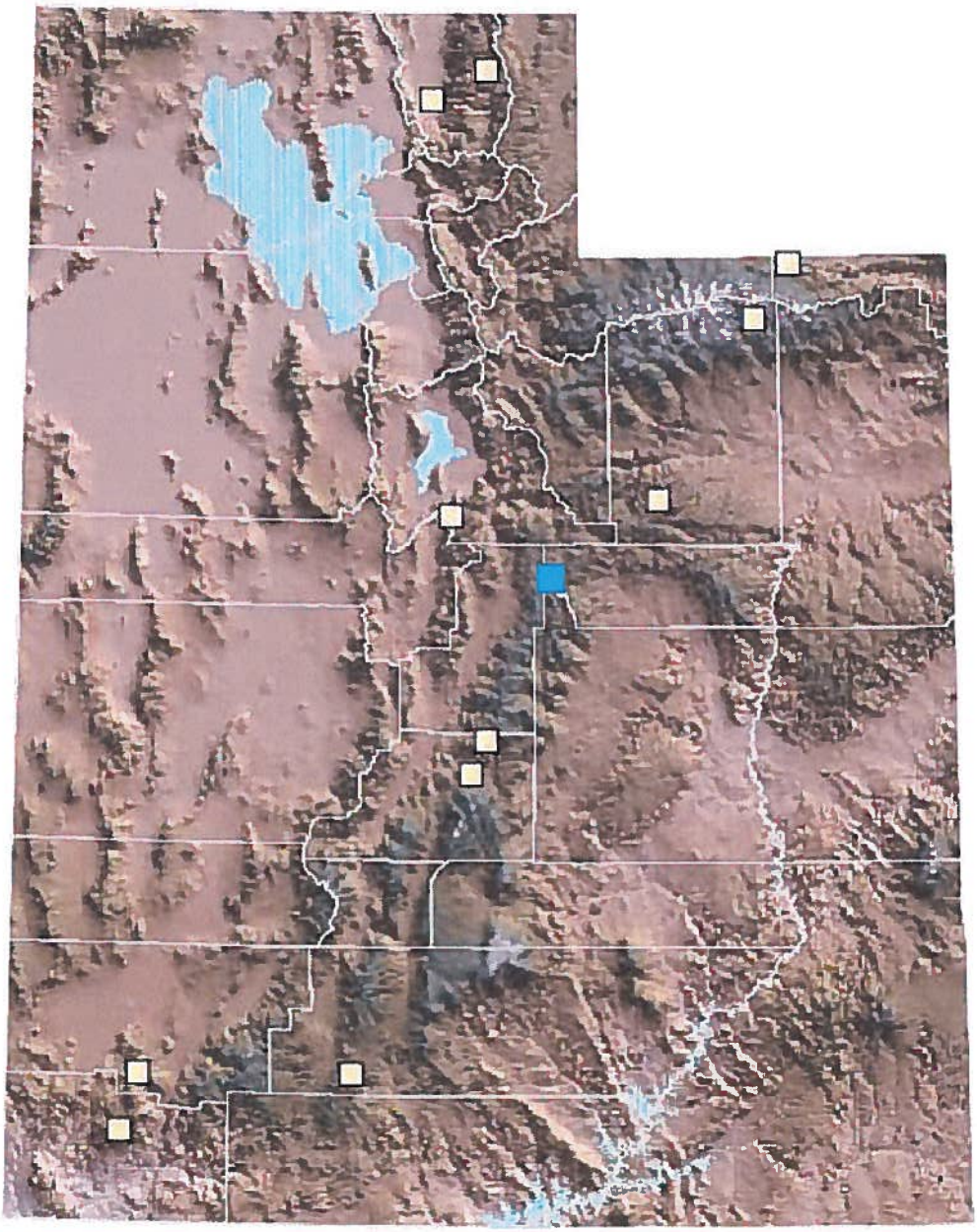


The distribution of records of the Gray wolf (Canis lupis). Red circles represent records since 1983, inclusive, and yellow squares represent records before 1983. Blue rectangle represents the Skyline lease area.

Figure 2.9.3-C

Distribution of endangered mammalian species in Utah in relation to the Skyline lease area. Modified from Utah Division of Wildlife Resources – Utah Natural Heritage Program "Vertebrate Information Compiled by the Utah Natural Heritage Program: A Progress Report" by William R. Bosworth, III December 2003. Publication Number 03-45

Grizzly bear *Ursus arctos*

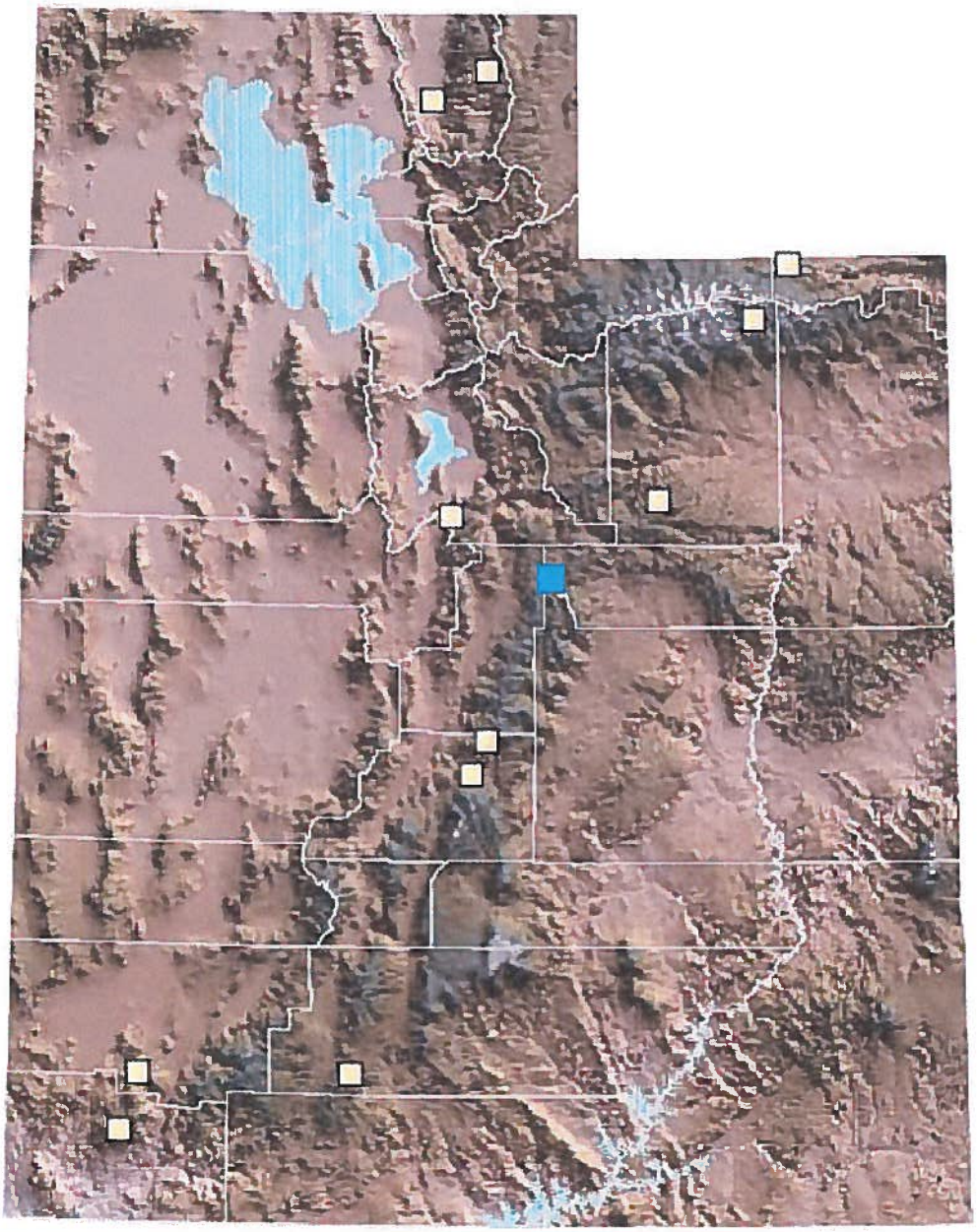


The distribution of records of the Grizzly bear (*Ursus arctos*). Yellow squares represent records before 1983. Blue rectangle represents the Skyline lease area.

Figure 2.9.3-D

Distribution of endangered mammalian species in Utah in relation to the Skyline lease area. Modified from Utah Division of Wildlife Resources – Utah Natural Heritage Program "Vertebrate Information Compiled by the Utah Natural Heritage Program: A Progress Report" by William R. Bosworth, III December 2003. Publication Number 03-45

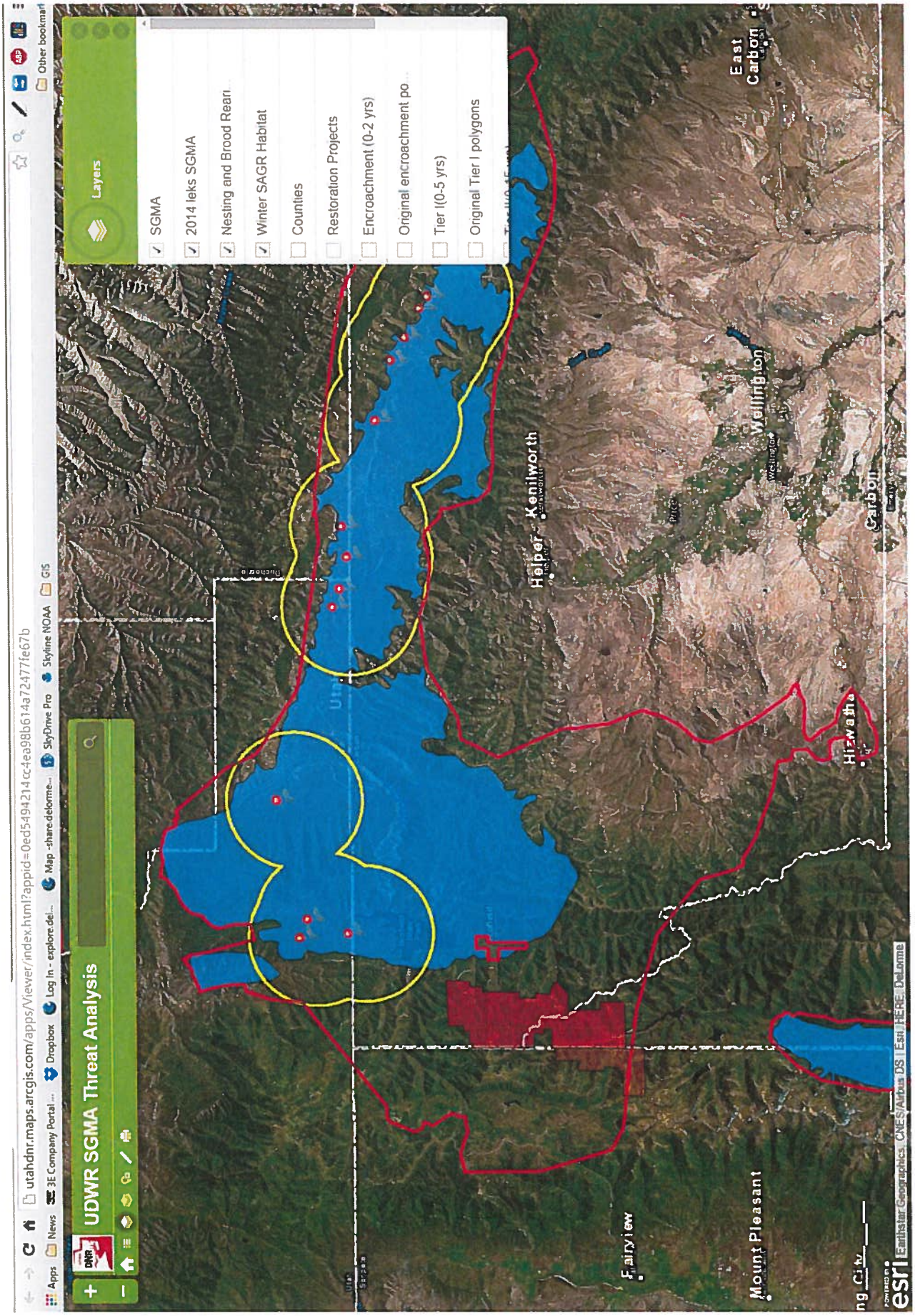
Canada lynx *Lynx canadensis*



The distribution of historical records of the Canada Lynx (*Lynx canadensis*). Yellow squares represent records before 1983. Blue rectangle represents the Skyline lease area.

Figure 2.9.3-E

Sage Grouse Management Areas Relative to Skyline Mine



*Data from Utah Division of Wildlife Resources SGMA Threat Analysis Management Map (http://utahdnr.maps.arcgis.com/apps/Viewer/index.html?appid=0ed5494214cc4ea98b614a72477fe67b)

Habitat Loss

The amount of habitat loss due to surface disturbance is minimal when considering the extent of similar surrounding habitat, and areas of contemporaneous reclamation that were previously disturbed prior to the current mining activities. Disturbed areas will be minimized to approximately 3 acres as the area is contemporaneously reclaimed. Noise and human activity in the expansion area is consistent with the historic mining activities. Also, wildlife studies indicates the surrounding area is used as a migratory route between summer and winter ranges. Enhancement measures at reclamation will include the planting of seeds and woody species seedlings that are diverse and palatable to wildlife, and a pond to be used by both wildlife and livestock. The pond is being left intact at the landowner=s request - historically the pond has only periodically retained a very limited water supply.

2.9.7 WILDLIFE OF THE NORTH OF GRABEN (NOG) BLEEDER SHAFT

The NOG Bleeder Shaft is within the North Lease where multiple wildlife surveys have been conducted. Tables 2.9-1 through 2.9-3 provide a historic species list of mammals, amphibians, and reptiles whose published ranges exist in the general area of the Skyline Mine. Tables 2.9-4 and 2.9-5 have been updated (2015) to include the federally listed threatened, endangered, candidate, and sensitive species in Carbon, Emery, and Sanpete Counties. In addition, Figure 2.9.3-A has been modified and updated and Figures 2.9.3-B, 2.9.3-C, & 2.9.3-D have been added to illustrate the endangered mammalian species in relation to the Skyline Mine lease areas. Table 2.9-4, Threatened, Endangered, and Candidate species list has been updated. Table 2.9-5, Utah Sensitive Species List has been updated. Table 2.9-7, has been added which summarized the Threatened, Endangered, and Candidate species likely to occur in the entire lease area. This table was generated from data included in the US Fish & Wildlife Service Information Planning and Conservation (IPaC) Trust Resource Report for Skyline Mine Lease area. (See IPaC Report in Appendix A-2, Volume 2). The Yellow-billed cuckoo has recently been listed at Threatened. Although the IPaC report and county list indicates the possibility of their presence, the project area is above the known elevation range of the species, and there is no suitable habitat in the area. (See Appendix A-2, Volume 2 for Alpine memo dated July 2015).

The area is considered critical summer habitat for deer and elk. During development of the facility, daily activity will include vehicle traffic and construction activities. After construction, the use of the area will return to historic uses, with only an exhaust fan operation remaining. Construction of the pad will occur in Fall of 2015, so the critical summer fawning/walving period will not be impacted. Construction of the fan facility will occur in spring/summer of 2016, since the ventilation facility is needed by Fall of 2016. If construction begins after June 1st, when the peak fawning/calving period begins, the area will be surveyed to detect the presence of any potentially fawning/calving individuals. This will consist of walking the area 1000 feet below the construction area. If any individuals are encountered, they will be monitored, and construction will not begin until the individual is no longer in the area (See Alpine memo dated July 2015). After construction, the impacts will be minimal since the fan system that is being installed will be equipped with an Exhaust Silencer with an overall pressure level of 76dBA at 36" from the fan. Access will be limited by a locked gate.

No sage grouse habitat exists in the area. Figure 2.9-~~8~~6 has been added which shows Utah DWR's Sage Grouse Management Area threat analysis, including habitat areas. Skyline Mine lease area is shown relative to the Sage Grouse Management Areas. A wildlife survey report conducted in 2014 which addressed goshawk, raptors, American three-toed woodpecker, and Threatened and Endangered species determined no species of concern would be impacted by the construction of the shaft (See Appendix A-2, Volume 2 for Alpine Ecological report and Alpine memo dated July 2015).

Table 2.9-4
County Lists for Carbon, Emery and Sanpete Counties of Federally Listed Threatened (T), Endangered (E), and Candidate Species

Carbon County

Common Name	Scientific Name	Status
Uinta Basin Hookless Cactus	*Sclerocactus wetlandicus*	T
Graham Beardtongue	*Penstemon grahamii*	T Proposed
Humpback Chub	*Gila cypha*	E
Bonytail	*Gila elegans*	E
Colorado Pikeminnow	*Ptychocheilus lucius*	E
Razorback Sucker	*Xyrauchen texanus*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Black-footed Ferret	*Mustela nigripes*	E Extirpated
Gray Wolf	*Canis lupus*	E

Emery County

Common Name	Scientific Name	Status
Jones Cycladenia	*Cycladenia humilis var jonesii*	T
Last Chance Townsendia	*Townsendia aprica*	T
Barneby Reed-mustard	*Schoenocrambe barnebyi*	E
San Rafael Cactus	*Pediocactus despainii*	E
Winkler Pincushion Cactus	*Pediocactus winkleri*	T
Wright Fishhook Cactus	*Sclerocactus wrightiae*	E
Humpback Chub	*Gila cypha*	E
Bonytail	*Gila elegans*	E
Colorado Pikeminnow	*Ptychocheilus lucius*	E
Razorback Sucker	*Xyrauchen texanus*	E
Greater Sage-grouse	*Centrocercus urophasianus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	T
Mexican Spotted Owl	*Strix occidentalis lucida*	T
Black-footed Ferret	*Mustela nigripes*	E Extirpated
Canada Lynx	*Lynx canadensis*	T
Gray Wolf	*Canis lupus*	E

Sanpete County

Common Name	Scientific Name	Status
Heliotrope Milkvetch	*Astragalus montii*	T
Greater Sage-grouse	*Centrocercus urophasianus*	C
Utah Prairie-dog	*Cynomys parvidens*	T
Brown (Grizzly) Bear	*Ursus arctos*	T Extirpated
Canada Lynx	*Lynx canadensis*	T

Disclaimer: This list was compiled using known species occurrences and species observations from the Utah Natural Heritage Program's Biodiversity Tracking and Conservation System (BIOTICS); other federally listed species likely occur in Utah Counties. This list includes both current and historic records. (Last updated on January 12, 2012).

DEFINITIONS

E
A taxon that is listed by the U.S. Fish and Wildlife Service as "endangered" with the probability of worldwide extinction.

E Experimental
An "endangered" taxon that is considered by the U.S. Fish and Wildlife Service to be "experimental and non-essential" in its designated use areas in Utah.

E, T, or C Extirpated
An "endangered," "threatened," or "candidate" taxon that is "extirpated" and considered by the U.S. Fish and Wildlife Service to no longer occur in Utah.

E or T Proposed
A taxon "proposed" to be listed as "endangered" or "threatened" by the U.S. Fish and Wildlife Service.

T
A taxon that is listed by the U.S. Fish and Wildlife Service as "threatened" with becoming endangered.

C
A taxon for which the U.S. Fish and Wildlife Service has on file sufficient information on biological vulnerability and threats to justify it being a "candidate" for listing as endangered or threatened.

For additional information contact: U.S. Fish and Wildlife Service (801-975-3330)

State of Utah
Department of Natural Resources
Division of Wildlife Resources

Utah Sensitive Species List

March 29, 2011

This list has been prepared pursuant to Utah Division of Wildlife Resources Administrative Rule R657-48. By rule, wildlife species that are federally listed, candidates for federal listing, or for which a conservation agreement is in place automatically qualify for the *Utah Sensitive Species List*. The additional species on the *Utah Sensitive Species List*, "wildlife species of concern," are those species for which there is credible scientific evidence to substantiate a threat to continued population viability. It is anticipated that wildlife species of concern designations will identify species for which conservation actions are needed, and that timely and appropriate conservation actions implemented on their behalf will preclude the need to list these species under the provisions of the federal Endangered Species Act. Please see Appendix A for the rationale behind each wildlife species of concern designation.

Utah Sensitive Species List

Fishes

Federal Candidate Species

Least Chub*	*Iotichthys phlegethontis*

Federally Threatened Species

Lahontan Cutthroat Trout (introduced)	*Oncorhynchus clarkii henshawi*

Federally Endangered Species

Humpback Chub	*Gila cypha*
Bonytail	*Gila elegans*
Virgin Chub	*Gila seminuda*
Colorado Pikeminnow	*Ptychocheilus lucius*
Woundfin	*Plagopterus argentissimus*
June Sucker	*Chasmistes liorus*
Razorback Sucker	*Xyrauchen texanus*

Conservation Agreement Species*

Bonneville Cutthroat Trout	*Oncorhynchus clarkii utah*
Colorado River Cutthroat Trout	*Oncorhynchus clarkii pleuriticus*
Virgin spinedace	*Lepidomeda mollispinis mollispinis*
Roundtail Chub	*Gila robusta*
Bluehead Sucker	*Catostomus discobolus*
Flannelmouth Sucker	*Catostomus latipinnis*

Wildlife Species of Concern

Northern Leatherside Chub	*Lepidomeda copei*
Southern Leatherside Chub	*Lepidomeda aliciae*
Desert Sucker	*Catostomus clarkii*
Yellowstone Cutthroat Trout	*Oncorhynchus clarkii bouvieri*
Bear Lake Whitefish	*Prosopium abyssicola*
Bonneville Cisco	*Prosopium gemmifer*
Bonneville Whitefish	*Prosopium spilonotus*
Bear Lake Sculpin	*Cottus extensus*

*Least chub is a Federal Candidate Species and a Conservation Agreement Species.
See Appendix A for the rationale behind each wildlife species of concern designation.

Utah Sensitive Species List

Amphibians

Federal Candidate Species

Relict Leopard Frog (extirpated)	*Rana onca*

Federally Threatened Species
(None)

Federally Endangered Species
(None)

Conservation Agreement Species

Columbia Spotted Frog	*Rana luteiventris*

Wildlife Species of Concern

Western Toad	*Bufo boreas*
Arizona Toad	*Bufo microscaphus*
Great Plains Toad	*Bufo cognatus*

See Appendix A for the rationale behind each wildlife species of concern designation.

Utah Sensitive Species List

Reptiles

Federal Candidate Species
(None)

Federally Threatened Species

Desert Tortoise	*Gopherus agassizii*

Federally Endangered Species
(None)

Conservation Agreement Species
(None)

Wildlife Species of Concern

Zebra-tailed Lizard	*Callisaurus draconoides*
Western Banded Gecko	*Coleonyx variegatus*
Desert Iguana	*Dipsosaurus dorsalis*
Gila Monster	*Heloderma suspectum*
Common Chuckwalla	*Sauromalus ater*
Desert Night Lizard	*Xantusia vigilis*
Sidewinder	*Crotalus cerastes*
Speckled Rattlesnake	*Crotalus mitchellii*
Mojave Rattlesnake	*Crotalus scutulatus*
Cornsnake	*Elaphe guttata*
Smooth Greensnake	*Opheodrys vernalis*
Western Threadsnake	*Leptotyphlops humilis*

See Appendix A for the rationale behind each wildlife species of concern designation.

Utah Sensitive Species List

Birds

Federal Candidate Species

Yellow-billed Cuckoo	*Coccyzus americanus*
Greater Sage-grouse	*Centrocercus urophasianus*
Gunnison Sage-grouse*	*Centrocercus minimus*

Federally Threatened Species

Mexican Spotted Owl	*Strix occidentalis lucida*

Federally Endangered Species

California Condor (experimental)	*Gymnogyps californianus*
Whooping Crane (extirpated)	*Grus americana*
Southwestern Willow Flycatcher	*Empidonax traillii extimus*

Conservation Agreement Species*

Northern Goshawk	*Accipiter gentiles*

Wildlife Species of Concern

Bald Eagle	*Haliaeetus leucocephalus*
Grasshopper Sparrow	*Ammodramus savannarum*
Short-eared Owl	*Asio flammeus*
Burrowing Owl	*Athene cunicularia*
Ferruginous Hawk	*Buteo regalis*
Black Swift	*Cypseloides niger*
Bobolink	*Dolichonyx oryzivorus*
Lewis's Woodpecker	*Melanerpes lewis*
Long-billed Curlew	*Numenius americanus*
American White Pelican	*Pelecanus erythrorhynchos*
Three-toed Woodpecker	*Picoides tridactylus*
Sharp-tailed Grouse	*Tympanuchus phasianellus*
Mountain Plover	*Charadrius montanus*

*Gunnison sage-grouse is a Federal Candidate Species and a Conservation Agreement Species.

See Appendix A for the rationale behind each wildlife species of concern designation.

Utah Sensitive Species List

Mammals

Federal Candidate Species
(None)

Federally Threatened Species

Utah Prairie-dog	*Cynomys parvidens*
Brown/Grizzly Bear (extirpated)	*Ursus arctos*
Canada Lynx	*Lynx canadensis*

Federally Endangered Species

Black-footed Ferret (experimental, non-essential in Duchesne and Uintah counties)	*Mustela nigripes*
Gray Wolf	*Canis lupus*

Conservation Agreement Species
(None)

Wildlife Species of Concern

Preble's Shrew	*Sorex preblei*
Townsend's Big-eared Bat	*Corynorhinus townsendii*
Spotted Bat	*Euderma maculatum*
Allen's Big-eared Bat	*Idionycteris phyllotis*
Western Red Bat	*Lasiurus blossevillii*
Fringed Myotis	*Myotis thysanodes*
Big Free-tailed Bat	*Nyctinomops macrotis*
Pygmy Rabbit	*Brachylagus idahoensis*
Gunnison's Prairie-dog	*Cynomys gunnisoni*
White-tailed Prairie-dog	*Cynomys leucurus*
Silky Pocket Mouse	*Perognathus flavus*
Dark kangaroo Mouse	*Microdipodops megacephalus*
Mexican Vole	*Microtus mexicanus*
Kit Fox	*Vulpes macrotis*

See Appendix A for the rationale behind each wildlife species of concern designation.

Utah Sensitive Species List

Mollusks

Federal Candidate Species
(None)

Federally Threatened Species
(None)

Federally Endangered Species

Kanab Ambersnail	*Oxyloma kanabense*

Conservation Agreement Species
(None)

Wildlife Species of Concern

California Floater	*Anodonta californiensis*
Western Pearlshell	*Margaritifera falcata*
Southern Tightcoil	*Ogaridiscus subrupicola*
Eureka Mountainsnail	*Oreohelix eurekensis*
Lyrate Mountainsnail	*Oreohelix haydeni*
Brian Head Mountainsnail	*Oreohelix parawanensis*
Deseret Mountainsnail	*Oreohelix peripherica*
Yavapai Mountainsnail	*Oreohelix yavapai*
Cloaked Physa	*Physa megalochlamys*
Utah Physa	*Physella utahensis*
Wet-rock Physa	*Physella zionis*
Longitudinal Gland Pyrg	*Pyrgulopsis anguina*
Smooth Glenwood Pyrg	*Pyrgulopsis chamberlini*
Desert Springsnail	*Pyrgulopsis deserta*
Otter Creek Pyrg	*Pyrgulopsis fusca*
Hamlin Valley Pyrg	*Pyrgulopsis hamlinensis*
carinate Glenwood Pyrg	*Pyrgulopsis inopinata*
Ninemile Pyrg	*Pyrgulopsis nonaria*
Bifid Duct Pyrg	*Pyrgulopsis peculiaris*
Bear Lake Springsnail	*Pyrgulopsis pilsbryana*
Black Canyon Pyrg	*Pyrgulopsis plicata*
Sub-globose Snake Pyrg	*Pyrgulopsis saxatilis*
Southern Bonneville Pyrg	*Pyrgulopsis transversa*
Northwest Bonneville Pyrg	*Pyrgulopsis variegate*

See Appendix A for the rationale behind each wildlife species of concern designation.

Table 2.9-7

Federally Listed Threatened(T), Endangered(E), Candidate(C),
and Birds of Conservation Concern (BCC) Species in the Skyline Mine Permit Area*

Common Name	Scientific Name	Status
BIRDS		
Greater Sage Grouse	*Centrocercus Urophasianus*	C
Mexican Spotted Owl	*Strix Occidentalis Lucida*	T
Southwestern Willow Flycatcher	*Empidonax Traillii Extimus*	E
Yellow Billed Cuckoo	*Coccyzus Americanus*	T
FISHES		
Bonytail Chub	*Gila Elegans*	E
Colorado Pikeminnow (Squawfish)	*Ptychochelius Lucius*	E
Humpback Chub	*Gila Cypha*	E
Razorback Sucker	*Xyrauchen Texanus*	E
Flowering Plants		
Barneby Reed-Mustard	*Schoenocrambe Barnebyi*	E
Jones Cycladenia	*Cycladenia Humulis var Jonesii*	E
MIGRATORY BIRDS		
Bald Eagle	*Haliaeetus Leucocephalus*	BCC
Black Rosy Finch	*Leucosticte Atrata*	BCC
Brewer's Sparrow	*Spizella Breweri*	BCC
Burrowing Owl	*Athene Cunicularia*	BCC
Calliope Hummingbird	*Stellula Calliope*	BCC
Cassin's Finch	*Carpodacus Cassinii*	BCC
Ferruginous Hawk	*Buteo Regalis*	BCC
Fox Sparrow	*Passerella Iliaca*	BCC
Golden Eagle	*Aquila Chrysaetos*	BCC
Juniper Titmouse	*Baeolophus Ridgwayi*	BCC
Loggerhead Shrike	*Lanius Ludovicianus*	BCC
Long-Billed Curlew	*Numenius Americanus*	BCC
Olive-Sided Flycatcher	*Contopus Cooperi*	BCC
Peregrine Falcon	*Falco Peregrinus*	BCC
Pinyon Jay	*Gymnorhinus Cyanocephalus*	BCC
Prairie Falcon	*Falco Mexicanus*	BCC
Sage Thrasher	*Oreoscoptes Montanus*	BCC
Short-Eared Owl	*Asio Flammeus*	BCC
Swainson's Hawk	*Buteo Swainsoni*	BCC
Williamson's Sapsucker	*Sphyrapicus Thyroideus*	BCC
Willow Flycatcher	*Empidonax Traillii*	BCC

*List generated for Skyline Mine Permit Area from US Fish & Wildlife IPAC Trust 7/2/2015
(See Appendix A-2 Volume 2 for IPaC Trust Resource Report for Skyline Mine Lease Area)

2.10
Raptors

July 1, 2005. Details of the method of the survey are outlined in Appendix A-2, ABiological Studies in Winter Quarters Canyon Creek and Woods Canyon Creek - A Study Plan@. Results of the survey will be provided in Appendix A-2, Volume 2 when completed.

Raptor surveys were conducted in 2005, 2007, 2008, 2009, 2011, and 2013 in the Winter Quarters area associated with drilling programs. Those surveys and the presence or lack of presence of raptors has not prohibited our work in the area. The raptor surveys are located with the respective exploration permits for each year. A summary report addressing the affects on raptors with the addition of the Winter Quarters Ventilation Facility is included in Appendix A-3, Volume 2. In 2009, an additional survey of the Northern goshawk, flammulated owl, and other comprehensive wildlife was conducted with similar results. No long term detrimental affects associated with the ventilation facility are anticipated. The 2011 survey identified a newly established goshawk nest in the lease modification area. This nest will continue to be monitored in future annual surveys, with additional lands to be monitored as mining advances in the North Lease modification area.

The North of Graben (NOG) Bleeder Shaft area is within the North Lease area and has been monitored for raptors on an annual basis. Based on the 2014 survey, no raptors will be affected by the proposed construction of the shaft. A specific raptor survey was conducted in 2014 specifically for the NOG Bleeder Shaft area with no nests being found. See Appendix A-2, Volume 2 for Alpine Ecological report.

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THREATENED & ENDANGERED SPECIES

No threatened or endangered species have been documented in studies surrounding the Winter Quarters Ventilation Facility that would prohibit construction. See Appendix A-2, Volume 2 and Appendix A-3, Volume 2 for reports.

Because no surface disturbance in planned for the North Lease Tract Area, no impact to endangered, threatened, or otherwise sensitive species should occur.

Section 2.11

~~Land Use~~

Soils

North of Graben (NOG)Bleeder Shaft

A detailed description of the soils associated with the NOG Bleeder Shaft is available in Appendix A-2, Volume 2, titled, "Order 2 Soil Survey of the North of Graben (NOG) Bleeder Shaft Area" (January 16, 2015). The survey conducted by Long Resources Consultants, Inc. provides a comprehensive assessment of the various soils within the area. The permit area encompasses approximately 3.0 acres. The soil type is represented by the McCadden Family, with shallow soil depths overlying shallow sandstone bedrock. It is considered to have good-to-fair available water capacity, and fair-to-good reclamation material with pH values ranging 6.2 - 7.0 and a saturation range of 44.1 - 72 percent. The estimated total salvage depth includes approximately 19-inches of topsoil from the McCadden Family, with approximately 2-inches of subsoil. The subsoil will not be recovered.

Section 2.12
Land Use

TABLE 2.12.2-1

GRAZING POTENTIAL FOR THE AREA TO BE AFFECTED BY MINING SURFACE OPERATIONS AND FACILITIES

(Does not include State Highway SR-264)

Surface Facilities Area	General Area Classificatio	Land Area (Acres)	Average Forage Production (lbs/ac)	Total Animal Unit Month (AUM)	Grazing Potential- Animal Unit Month (AUM) with 25% Harvest Efficiency for proper grazing utilization
1 Portal Yard Area	Spruce Fir	16.47	0	0.0	0.00
	Aspen	7.93	586	5.9	1.47
	Sagebrush	2.50	917	2.9	0.73
	Disturbed	8.50	0	0.0	0.00
	Riparian	1.00	182	0.2	0.06
Subtotal		36.40		9.0	2.25
2 Conveyor Corridor	Aspen	3.20	586	2.4	0.59
	Sagebrush	5.77	917	6.7	1.67
Subtotal		8.97		9.1	2.27
3 Railroad Loadout Area	Grass-Forb	10.32	746	9.7	2.44
	Spruce Fir	3.50	0	0.0	0.00
	Riparian	0.04	182	0.01	0.00
Subtotal		13.86		9.8	2.44
4 Waste Rock Disposal Are	Disturbed	12.81	0	0.0	0.00
Subtotal		12.81		0.0	0.00
5 Water Tank & Well Pads	Aspen	0.26	586	0.2	0.05
South Fork Breakout	Spruce-Fir	0.96	0	0.0	0.00
Subtotal		1.22		0.2	0.05
6 WQ Vent Pad	Sagebrush	2.36	1300	3.9	0.97
Subtotal		2.36		3.9	0.97
7 NOG Bleeder Shaft	Grass-Aspen	3.00	586	2.2	0.56
Subtotal		3		2.2	0.56
8 Swens Vent Pad	Sagebrush	9.7	917	11.3	2.81
Subtotal		9.7		11.3	2.81
9 Powerline	Aspen	6.3	586	4.7	1.17
Subtotal		6.3		4.7	1.17
TOTAL		94.62		50.13	12.52

TBR (Timber) Management Unit - Emphasis is on management for production and use of wood - fiber for a variety of wood products.

UC (Utility Corridor) Management Unit - Emphasis is on providing transportation corridors for major cross-country pipelines, electrical transmission lines and telephone lines. This unit currently contains a gas transmission pipeline constructed and operated under a Forest Service special-use permit issued to Questar Pipeline Company (main line 41).

RPN (Riparian) Management Unit - Emphasis is on management of riparian areas and all the component ecosystems. The units consist of a zone approximately 100 feet measured horizontally from the edge of all perennial streams and springs, and from the shores of lakes and other still water bodies.

MMA (Minerals Management Area) Management Unit - Emphasis is on making land surface available for existing and potential major mineral developments.

In the "Land and Resource Management Plan" the Forest Service lists specific objectives pertaining to management of resources and resource uses on National Forest System lands. The Forest Service portion of the disturbed area (portal area) is currently identified as a Minerals Management (MMA) Unit. After completion of coal mining activity, the area will revert to a Range (RNG) Management unit. Similarly, the 3.0 acres permitted by the NOG Bleeder shaft will revert to a Range (RNG) Management unit once mining is complete.

COMPATIBILITY OF MINING OPERATION WITH FOREST SERVICE MANAGEMENT EMPHASIS AND OBJECTIVES

All mining activities related to the Forest Service "Land and Resource Management Plan" will be coordinated with the appropriate Forest Service personnel prior to implementation. While the mine is located on the Forest Service land boundary, creating primarily visual and traffic pattern related impacts, these effects are considered to be rather short term and will be essentially eliminated upon mine closure.

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A - Section 5.2

Components of Operation

Disturbed area ditches are temporary and designed to convey runoff from a 10-year, 24-hour storm event. The Un-disturbed upper road ditch and associated culvert are considered permanent and were designed to convey runoff from a 100-year, 6-hour storm event (See Plate 3.2.4-3D for pond designs and Winter Quarters Ventilation Shaft Pad Runoff and Sediment Control Design Report-Volume 5, Section 24 for calculations).

North of Graben (NOG) Bleeder Shaft

The NOG Bleeder Shaft is constructed to provide adequate ventilation for completion of the North of Graben mining district. The shaft was necessary due to encountered geologic conditions that required turning two (2) separate mining districts into one (1). An associated fan will be powered from within the mine, with the exception of during startup of the fan where a diesel-powered generator will be used to start the fan. The approximately 3.0 acre permitted area will include an access road, a 50-foot by 80-foot pad housing a fan, and a topsoil storage area. On the existing road located approximately 200-ft uphill from the pad, a second smaller fenced area approximately 25-foot by 40-foot will include a generator housed in a shed and a 300-gallon fuel tank housed in a secondary containment for spills. There is no associated sediment pond due to the small nature of the site, and a sediment collection area located on the pad that is designed to let water leave the site through a culvert once sediment has been retained. Total acreage draining to the pad is 0.8 acres. The peak flow in the road ditch resulting from a 10-year, 24-hour event is estimated at 1.86 cfs, with a maximum velocity of 4.97 fps. The ditch will be lined with D50 riprap of 3-inch rock. The site is considered an Alternate Sediment Control Area (ASCA). Plates 3.2.4-5A through 3.2.4-5C illustrate the pad and road designs, cross sections, and watersheds of the site. Located in Appendix A-5, Section 25 are two (2) reports outlining both the hydrologic design and slope stability of the pad, topsoil pile, and road.

Sediment control structures used during construction such as silt fencing and straw bales will remain in place for one year after construction and will be removed anytime thereafter. Erosion control blankets, wattles, or straw bales will be used to control erosion during interim vegetation establishment.

During both construction and during any operational use of the roads, dust will be controlled to comply with the existing Air Quality permit. Section II.B.1.i of said permit indicates visible emissions will not exceed 20% opacity, and shall be treated using water or chemically treated for dust control (Section II.B.1.k). See Appendix A-1 for complete Air Quality pemit DAQE-AN100920001-15. Road access to USFS road 0221 – Granger Ridge road will be uninterrupted during construction as the road will be diverted slightly to the north of its original location prior to construction and while facilities are adjacent to the road. Road 0221 has very little traffic as it terminates approximately ½-mile east of the facility. The minimal footprint of the facility that is immediately adjacent to the road will be secured with a chain-link fence. The road will be returned to the original location at reclamation.

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provide the primary sediment control. Following construction of the retaining wall and sediment pond, the area will be roughened, seeded, and mulched. Once vegetation is sufficiently established, the silt fences will be removed.

Area 39. This 1.01 acre area addresses both the undisturbed area between the upper undisturbed ditch (UDW-4 from Earth Fax report) and the primary portion of the WQVF access road (DW-5 from Earth Fax report). Sediment from the area is controlled by a catch basin that incorporates a wattle to trap sediment prior entering a culvert taking water under the road (Plate 3.2.4-3A). The ditch has been widened in the vicinity of catch basin to accommodate the installation of the wattles. The outfall of the culvert, althought not having a erosive velocity, is armored with riprap to further reduce any sediment loading.

Area 40: The NOG Bleeder Shaft pad is an area that addresses runoff from both small undisturbed area UW1, and disturbed areas DW3, DW5, and DW6 that include the cutbank/highwall, road, and pad. The area contributing runoff to the pad is approximately 0.8 acres. The pad is designed to slope back (or north) into the northwest section of the pad. Water will be able to collect and drop out sediment prior to being discharge off the site via a culvert. Sediment can reach a height of 0.40 feet prior to needing cleaning which will accommodate approximately 160 cu-ft of sediment storage. See Appendix A-5, Section 25 for the Earthfax Hydrology Design report.

On all areas not reporting to a sediment pond, and classified as Alternate Sediment Control Areas, the alternate sediment control measure such as straw bales, silt fences, catch basins, excelsior mats, etc. will be maintained until there is adequate vegetative cover to properly filter any surface runoff (see Sec. 20, Vol. 5 for design). When this can be demonstrated, the alternate control measures will be removed and the area reclassified as an "Exempt area". (See Sec. 21, Vol. 5 for Demonstrations) On all areas classified as Exempt Areas, if they should become redisturbed they will be reclassified as ASCA areas and will have the runoff treated with a designed treatment.

Chapter 4, Sec. 4.1
Revised 7/23/2015

4.1.1 Reclamation Plan - Rock Disposal Site

Reclamation activities will be conducted on portions of the affected areas as twenty foot lifts are filled to design capacity. The final contours of the rock disposal site are presented in Drawing 4.16.1-1B. Part of diversion ditch DD-16 will be removed during final reclamation as needed. Diversion ditch UD-6 will remain after final reclamation. Part of the disturbed are affected by the disposal operation will, at the request of the property owner=s representative, be leveled off and reclaimed to native rangeland for subsequent use as a corral. The access road to the site will not be reclaimed except for the removal of the guard rail (Exhibit 4.1.1-1).

4.1.2 Reclamation Plan - Winter Quarters Ventilation Facility

Reclamation activities will include removing any existing structures such as the fan structure, retaining walls, a mobile field office for emergency evacuation, substation with associated pad, fencing, etc. Compliant to both State Regulations R645-301-551 and MSHA 30 CFR 1711, both the vent shaft and emergency escape shaft will be sealed and backfilled with an engineered fill. The shafts will be backfilled above the pad surface with the excess fill allowed to settle for approximately one year prior to removing the pad (See Section 4.9 for details)closed with a six-inch thick concrete cap or other equivalent means and vented with a two-inch diameter or larger pipe extending a minimum of 15-feet above the surface of the shaft(s). Consistent with the same regulations, the slope will be sealed with solid, substantial, incombustible material such as concrete blocks, bricks or tile, or shall be completely filled with incombustible material for a distance of at least 25-feet into the opening. Once all structures are removed and openings sealed, the slopes will be reclaimed to the approximate original contours (AOC) using extreme surface roughening (pocking) as the primary form of sediment control. The site will be reseeded as outlined in Section 4.7 of the M&RP, and the sediment pond removed. In the event the extreme surface roughening shows signs of failure, additional work will be conducted to insure sediment is controlled on site. Improvements that were made to the preexisting Winter Quarters Canyon road while the WQVF was operational will remain intact for the landowner as outlined in the easement of the lease.

4.1.3 Reclamation Plan – North of Graben (NOG) Bleeder Shaft

Reclamation activities will include removing any structures such as the fan structure, diesel engine, fuel tanks, etc. Compliant to both State Regulations R645-301-551 and MSHA 30 CFR 1711, the shaft will be backfilled with an engineered fill. The shaft will be backfilled above the pad surface with excess fill, allowed to settle for approximately one year prior to removing the pad (See Section 4.9 for details), closed with a six-inch concrete cap or other equivalent means and vented with a two-inch diameter or larger pipe extending a minimum of 15-feet above the surface of the shaft. Once all structures are removed and the shaft sealed, the slopes will be reclaimed to the approximately original contour (AOC) using extreme surface roughening as the primary form of sediment control. The site will be reseeded as outlined in

Section 4.7 of the M&RP. In the event of re-vegetation not achieving reclamation standards, additional work will be conducted to insure sediment control on the site.

4.2

Reclamation Table

TABLE 4.2-1

RECLAMATION TIMETABLE

	Task	Phase I		Phase II					Phase III			Phase IV
	Recovery of Underground Equipment											
	Seal Mine Portals											
	Remove Winter Quarters Fan and housing											
	Remove NOG Shaft fan and housing											
Demolition												
	Mine Site - Lower Bench											
	Winter Quarters Ventilation Facility											
	Mine Site - Middle Bench											
	Mine Site - Upper Bench											
	Overland Conveyor											
	Rail Loadout Facilities											
	Remaining Facilities (pump houses, wells, water tanks)											
Earth Work												
	Seal and Backfill Winter Quarters Mine Openings											
	Install Interim Sediment Control											
	Backfill and Compact											
	Remove Sedimentation Ponds											
	Topsoil Replacement											
	Back fill and compact NOG Shaft											
	Revegetation											

Section 4.3
Reclamation Bond

Skyline Mine TC/007/005
2015 NOG Bleeder Shaft
Task # 4883

Total Required Bond Amount
2015 Dollars

Revised July 23, 2015

Bonding Calculations

Direct Costs

Subtotal Demolition and Removal	$2,158,853	
Subtotal Backfilling and Grading	$1,666,868	
Subtotal Revegetation	$318,681	
Direct Costs Subtotal	$4,144,403	

Indirect Costs

Mob/Demob	$414,440	10.0%
Contingency	$207,220	5.0%
Engineering Redesign	$103,610	2.5%
Main Office Expense	$281,819	6.8%
Project Management Fee	$103,610	2.5%
Subtotal Indirect Costs	$1,110,699	26.8%

Total Cost 2014	**$5,255,102**	

Escalation factor		5
Number of years		0.019
Escalation	$518,569	
Reclamation Cost Escalated	$5,773,671	

Reclamation Bond Amount (rounded to nearest $1,000) 2019 Dollars	**$5,774,000**

Posted Bond March 18, 2015	$5,799,000
Difference Between Cost Estimate and Bond	$25,000
Percent Difference	0%

Demolition Costs

Revised July 23 2015

Ref.		Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density		Number	Unit	Swell Factor		Unit	Cost
	Shop Warehouse 01																			394012
	Administration Bld 02																			27154
	Mine No 1 Transfer Tower 03																			44110
	BC 2 Drive House 04																			9422
	BC 3 Drive House 05																			40300
	Crusher Raw Coal 06																			29295
	Truck Loadout 07																			7090
	Railcar Loadout 08																			23377
	Conveyors 8 total 09																			99678
	Water Tanks Two 10																			6318
	Pump House 11																			1126
	Well House Three 12																			4756
	Water Treatment Bld 13																			17830
	Misc Storage Bld 14																			3598
	Overland Conveyor 15																			95092
	Guard Rail 16																			18195
	Rock Dust Bld 17																			5743
	Overland Dust Collector 18																			1296
	Substation 19																			1797
	Power Line 20																			528
	Cap Magazine 21																			34
	Fuel Storage 22																			2634
	Propane Tanks 23																			470
	Stacking Tube 24																			4900
	Reclaim Tunnel 25																			40535
	Slope Proctection Apron 26																			15574
	Concrete Lined Ditch 27																			431
	Raw Coal Silo 28																			14063
	Parking Area Middle 29																			2178
	Truck Loadout Foundation 30																			206
	Road Pad Lower 31																			3372
	Silo Rail Loadout 32																			124659
	Loadout Foundation RR 33																			5124
	Pavement Rail Loadout 34																			80964
	Steel 35																			11075
	James Canyon 36																			126205
	Culvert Backfilling 37																			8667
	Channel Construction 38																			520548
	Equipment 39																			265747
	Portal Face Door 40																			6297
	Concrete Building 41																			1750
	Winter's Quarters Ventilation																			72809
	North of Graben Bleeder Shaft																			19894
	Total																			2158853

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	North of Graben Bleeder Shaft 43																			
	Steel																			
	Ventilation Shaft																			
	Three (3) sheds - Fan, Fuel, Generator	Steel Bld large*	02 41 16 13 0020	0.27	CF						6500					CF		6500	CF	1755
	CHAIN LINKFENCE																			
	Chainlink Removal (2 pads)	8'-10'	02 41 13.60 1700	2.98	/LF	480												480	LF	1430
	Chainlink Rails	Fence top and bottom rail	02 41 13.62 1400	0.66	LF	480												480	LF	317
	Concrete demolition	Footings 2' thick and 3' wide Gate posts	02 41 16.17 1140	21.1	LF	3									4			3	LF	253
	Concrete demolition	Footings 2' thick and 3' wide Line post	02 41 16.17 1140	21.1	LF	2									29			2	LF	1224
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.67	/CY						2.1							2.1	CY	4
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	31 23 23 20 1014	2.95	/CY															
	Disposal Costs	City Sanitation - Price, UT	02 41 16 17 4200	4.33	/CY						2.1							2.1	CY	
	Culvert Removal	18-inch CMP culvert removal	02 41 13.4 0100	1.66	LF	40												40	LF	66
	GATES																			
	Chain link Gates	10' Wide heavy duty gate	02 41 13.62 0200	83	EA										2				EA	166
	Loading Cost	Front end loader 3 CY	31 23 16 42 1300	1.67	/CY						1.8								CY	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	31 23 23 20 1014	2.95	/CY						1.8								CY	
	Disposal Costs	City Sanitation - Price, UT	02 41 16 17 4200	4.33	/CY						1.8								CY	
	Ventilation Fan Removal (not demolition)	Heavy Equipment	23 05 05 10 3600	935	ton													4	Ton	3740
	Subtotal																			8955
	Concrete																			
	Bleeder Shaft Pad	Concrete demo </= 15-inches thick		13.75	CY													150	CY	2062.5
	Generator pad	Concrete demo </= 15-inches thick		13.75	CY													150	CY	2062.5
	Fuel pad	Concrete demo </= 15-inches thick		13.75	CY													45	CY	619
		Concrete demo </= 15-inches thick		13.75	CY													30	CY	412.5
	Loading Cost																1.3	488	CY	
	Disposal Costs	Front end loader track 3 CY		2.05	CY													488	CY	1000
	Loading Cost	Disposal on site		9.8	CY													488	CY	4782
	Subtotal																			10939
	Subtotal																			
	Total																			19894

* shows 50% reduction in volume for steel sheds - no interior walls
- Concrete unit cost for <15-inches per Nielson Construction 2014
NO FAN Demolition - the fan will be disassembled and used at a future location
Chain link gates will be opened manually

Earthwork Costs

Revised January 2015

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Portal 01															71677
Water Tank 02															12626
Lower Terrace 03															199039
Middle Bench 04															263112
Upper Bench West Fork 05															139434
Southwest Fork 06															99702
Loadout Faclities 07															191024
South Fork Portal Area 08															74000
Waste Rock Disposal 09															413660
Pond Enlargement Interim 10															1899
Pond Diversion DU2 Interim 11															460
Interim Sediment Control 12															5335
Overland Conveyor 13															1875
James Canyon 14															0
Winter Quarters 15															123885
North of Graben Bleeder Shaft 16															69140
Total															1666868

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
NOG Bleeder Shaft 16															
Sealing Shaft - 5-foot diameter, 1,420 foot depth															
(+) 6 inch rock	20.38				20.38	1	20.38	CY	27				27	CY	550
2 inch - 4inch Rock	29.29				29.29	1	29.29	CY	9				9	CY	264
Gravel	29.29				29.29	1	29.29	CY	179				179	CY	5243
Sand	23.08				23.08	1	23.08	CY	4				4	CY	92
Bentonite	35.35				35.35	1	35.35	CY	19				19	CY	672
Concrete	120				120	1	120	CY	25				25	CY	3000
Fill Material	7				7	1	7	CY	1656				1656	CY	11592
966 G serious II ROPS	21000	119.32	0.1	63.03	325.53	1	325.53	HR	67	HR	1		67	HR	21811
Eq Op Medium Equiment				61.72	61.72	1	61.72	HR	67	HR	1		67	HR	4135
Subtotal															**47359**
Subtotal															
Subtotal															
Backfilling and grading															
CAT 345BL II	17095	113.1	0.1	61.72	292.97	1	292.97	HR					12	HR	3516
D10R semi EROPS	31000	352.27	0.1	61.72	642.97	1	642.97	HR					16	HR	10288
Pickup Crew 4x4 ton	1105	15.55	0.1	59.27	83.28	1	83.28	HR					20	HR	1666
CLAB				36.65	36.65	1.5	54.98	HR					20	HR	1100
Foreman average outside				76.35	76.35	1	76.35	HR					20	HR	1527
Subtotal															**11876**
Topsoil															
D10R semi EROPS	31000	352.27	0.1	61.72	642.97	1	642.97	HR					20	HR	12859
Pickup Crew 4x4 ton	1105	15.55	0.1	59.27	83.28	1	83.28	HR					20	HR	1666
CLAB				36.65	36.65	1	36.65	HR					20	HR	733
Foreman average outside				76.35	76.35	1	76.35	HR					20	HR	1527
Subtotal															**9905**
TOTAL															**69140**

Ref.	Description	Materials	Means Referen Number	Unit Cost	Unit	Length	Width	Height	Diame	Area	Volum	Weigh	Densit	Time	Numb	Unit	Quant Factor	Unit	Cost
	Vegetation Costs																		
	Skyline Mine																		
	South Facing Slopes 1H:3H or Greater																		
	Seeding	South Facing Slope Seed 1H : 3H or gentler	Skyline	208	/AC					39.81						AC	39.81	AC	8280
	Mulch	Hay 1" material only 029105000250	Reveg0	600	/AC					39.81						AC	39.81	AC	1585
	Fertilizer	Fertilizer Hyrdor Spread Mat. Only	Reveg0	10.346	/MSF					39.81						AC	1734	MSF	17940
	Equipment	Hydro Spreader (equip. & labor) B-81	Reveg0	23.016	/MSF					39.81						AC	1734	MSF	39910
	Subtotal																		67715
	North Facing Slopes																		
	Seeding	North Facing Slopes Seed	Skyline	208	/AC					20.33						AC	20.33	AC	4229
	Mulch	Hay 1" material only 029105000250	Reveg0	600	/AC					20.33						AC	20.33	AC	413
	Fertilizer	Fertilizer Hyrdor Spread Mat. Only	Reveg0	10.35	/MSF					20.33						AC	886	MSF	9170
	Equipment	Hydro Spreader (equip. & labor) B-81	Reveg0	23.014	/MSF					20.33						AC	886	MSF	20390
	Subtotal																		34202
	Riparian Habitat																		
	Seeding	Riparian Habitat Seed	Skyline	50	/AC					0.04						AC	0.04	AC	2
	Mulch	Hay 1" material only 029105000250	Reveg0	600	/AC					0.04						AC	0.04	AC	0
	Fertilizer	Fertilizer Hyrdor Spread Mat. Only	Reveg0	0	/MSF					0.04						AC	2	MSF	0
	Equipment	Hydro Spreader (equip. & labor) B-81	Reveg0	21.41	/MSF					0.04						AC	2	MSF	50
	Subtotal																		52
	Soth to West Facing Slopes																		
	Seeding	Riparian Habitat Seed	Skyline	49	/AC					39.81						AC	39.81	AC	1960
	Mulch	Hay 1" material only 029105000250	Reveg0	600	/AC					39.81						AC	39.81	AC	1585
	Fertilizer	Fertilizer Hyrdor Spread Mat. Only	Reveg0	10.346	/MSF					39.81						AC	1734	MSF	17940
	Equipment	Hydro Spreader (equip. & labor) B-81	Reveg0	23.016	/MSF					39.81						AC	1734	MSF	39910
	Subtotal																		61395
	North to East Facing Slopes																		
	Seeding	Riparian Habitat Seed	Skyline	49	/AC					20.33						AC	20.33	AC	996.17
	Mulch	Hay 1" material only 029105000250	Reveg0	600	/AC					20.33						AC	20.33	AC	12198
	Fertilizer	Fertilizer Hyrdor Spread Mat. Only	Reveg0	10.35	/MSF					20.33						AC	886	MSF	9170
	Equipment	Hydro Spreader (equip. & labor) B-81	Reveg0	23.014	/MSF					20.33						AC	886	MSF	20390
	Subtotal																		42754
	Waste Rock																		
	Seeding	Waste Rock Slopes Seed	Skyline	71.82	/AC					12.81						AC	12.81	AC	920
	Mulch	Hay 1" material only 029105000250	Reveg0	600	/AC					12.81						AC	13	AC	164
	Fertilizer	Fertilizer Hyrdor Spread Mat. Only	Reveg0	10.341	/MSF					12.81						AC	558	MSF	5770
	Equipment	Hydro Spreader (equip. & labor) B-81	Reveg0	23.011	/MSF					12.81						AC	558	MSF	12840
	Subtotal																		19694
	James Canyon																		
	Seeding	Waste Rock Slopes Seed	Skyline	72.16	/AC					4.85						AC	4.85	AC	350
	Mulch	Hay 1" material only 029105000250	Reveg0	600	/AC					4.85						AC	4.85	AC	24
	Fertilizer	Fertilizer Hyrdor Spread Mat. Only	Reveg0	10.332	/MSF					4.85						AC	211	MSF	2180
	Equipment	Hydro Spreader (equip. & labor) B-81	Reveg0	23.033	/MSF					4.85						AC	211	MSF	4860
	Subtotal																		7414
	Riparian Stem Supplement																		
	Stems	Bare root seedlings, 11" to 16" med. soil	02915 4	1.42	Ea										9800	Ea	13916	EA	19550
	Subtotal																		19550
	Silt Fence Interim Vegetation																		
	Stems	Bare root seedlings, 11" to 16" med. soil	02915 4	1.42	Ea	20000										LF	20000	EA	30460
	Subtotal																		30460
	Reveg Loadout Sediment Pond																		
	Seeding	Riparian Habitat Seed	Skyline	67	/AC					0.3						AC	0.3	AC	20
	Mulch	Hay 1" material only 029105000250	Reveg0	600	/AC					0.3						AC	0.3	AC	180
	Fertilizer	Fertilizer Hyrdor Spread Mat. Only	Reveg0	10	/MSF					0.3						AC	13	MSF	130
	Equipment	Hydro Spreader (equip. & labor) B-81	Reveg0	23.077	/MSF					0.3						AC	13	MSF	300
	Subtotal																		1500
	Winter Quarters Ventilation Facility Bond																		
	REVEGETATION																		
	Winter Quarters Ventilation Facility																		
	South facing slopes																		
	Seeding	south facing slope seed mix		208	/AC					2.36						AC	2.36	/AC	490
	Mulch	Hay 1" material only 029105000250		600	/AC					2.36						AC	2.36	/AC	1416
	Fertilizer	Fertilizer Hyrdor Spread Mat. Only		2.4272	/MSF					2.36						AC	103	/MSF	250
	Equipment	Hydro Spreader (equip. & labor) B-81		26.693	/MSF					2.36						AC	103	/MSF	2770
	Tublings																		
	Quaking Aspen	Bare root seedlings, 11" to 16" med. soil		1.79	ea					2.36						AC	400	AC	1960
	Blue Elderberry	Bare root seedlings, 11" to 16" med. soil		1.79	ea					2.36						AC	400	AC	1960
	Subtotal																		14170
	North of Graben Bleeder Shaft Bond																		
	REVEGETATION																		
	North of Graben Bleeder Shaft																		
	South facing slopes																		
	Seeding	North of Graben Bleeder Shaft seed mix		200	/AC					1.7						AC	1.7	/AC	340
	Mulch	Hay 1" material only 029105000250		600	/AC					1.7						AC	1.7	/AC	1020
	Fertilizer	Fertilizer Hyrdo Spread Mat. Only		0.5803	/MSF					1.7						AC	74.1	/MSF	43
	Equipment	Hydro Spreader (equip. & labor) B-81		6.7476	/MSF					1.7						AC	74.1	/MSF	500
	Tublings																		
	Quaking Aspen	Bare root seedlings, 11" to 16" med. soil		1.79	ea					1.7						AC	200	AC	360
	Red Elderberry	Bare root seedlings, 11" to 16" med. soil		1.79	ea					1.7						AC	20	AC	36
	Mountain Snowberry	Bare root seedlings, 11" to 16" med. soil		1.79	ea					1.7						AC	100	AC	180
	Subtotal																		2369
	Revegetation																		
	25% of Initial Seeding																		17407
	Subtotal																		17407
	Total																		318681

* Hay material only: assume 2 tons/ac (1 to 2 tons recommended in The Practical Guide to Reclamation in Utah pp.112-113)
*2014 R.S. Means and 2014 Nevada SRCE use $0.15/lb ($300/ton)

4.4

Revised 7/23/15

Backfill, Soil Stabilization
Compaction, Contouring,
Grading

4.4.2 Grading and Final Contour

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All highwalls and cutslopes will be reclaimed using geotechnically stable fill slopes with surfaces that have been sufficiently roughened with deep gouging. The operational bench slopes will be graded back to the approximate original contour at a two horizontal to one vertical slope (2h:1v) or shallower upon abandonment, utilizing a bulldozer working along the slopes. A geotechnical analysis will be made of this slope at the time of reclamation and design adjustment made as necessary to insure slope stability. The sediment pond at the portal area will be removed during the initial reclamation phase.

The reclamation plan is shown on in maps 4.4.2-1A, 4.4.2-1AA. 4.4.2-1B. 4.4.2-1BA, 4.4.2-1B1 and 4.4.2-1AC. Costs and mass balance data associated with reclamation may be found in the Engineering Calculations, Volume 5.

Grading operations will be possible at the railroad load-out site which will be returned to the approximate original contour and shown on Maps 4.4.2-1C and 4.4.2-1D. Water Tank final reclamation contours are shown on Maps 4.4.2-1E and 4.4.2-1F. The waste rock disposal site final reclamation contours are shown on Map 4.16.1-1B.

The Winter Quarters Ventilation Facility grading and final contour plan will be similar to the sites listed above. Once excess material has been used in sealing the slope and shaft as outlined in Sections 4.1.2 and 4.9, any retaining walls, highwalls or cutslopes will be reclaimed using geotechnically stable fill slopes with the final surface being roughened with deep gouging. The pad will be graded back to the approximate original contour, unless the post-mining land use changes. The sedimentation pond will be removed once sufficient re-contouring of the pad has taken place. See Plates 4.4.2-3A and 4.4.2-3B for the reclaimed site configuration.

The North of Graben (NOG) Bleeder Shaft is similar to all previously listed sites. Once the shaft has been filled as outlined in 4.1.2 and 4.9, any cut-slopes will be reclaimed with the final surface being roughened with deep gouging. The pad will be graded back to the original contour. Plates 4.4.2-5A and -5B illustrate the reclaimed surface.

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4.6
Topsoil / Subsoil
Handling Plan

Topsoil to be removed from the North of Graben (NOG) Bleeder Shaft area will be collected from the disturbed area as construction advances. Based on the Order 2 Soil survey (See Appendix A-2, Long Resources Consultants, Inc.) the depth of suitable topsoil will be approximately 19-inches. Construction will take place predominantly on the south-facing slope (Soil Profile 14SKY07) dominated by quaking aspen, mountain big sagebrush and grasses. Brush and topsoil will be salvaged simultaneously and stored in the designated topsoil storage area. Larger trees will be placed in a brush pile within the disturbed area to be redistributed at reclamation. A small portion of the existing US Forest service road will be re-routed to utilize flat, previously disturbed areas adjacent to the road. The north slope is dominated by Englemann spruce, and other conifers.

The soils identified in the survey are classified as loam and sandy-loam. The slope is 41 percent. The taxonomic classification is McCadden family, lithic Haplocryolls loamy-skeletal, miexed superactive. At site 14SKY07, which is most representative of the site, the EC values rangefrom 0.23-.037dS/m,Sodium Absorption Ration (SAR) 0.14-0.21, and an estimated Available Water Capacity range of 0.76-1.35 in/ft. - all acceptable ranges to use the available material. The topsoil stockpile is designed to store approximately 1,129 cu-yds of material. The topsoil stockpile will be located at the west end of the disturbed area where the pad access road leaves the USFS road (See Plates 3.2.4-5A through -5C). See Section 4.6.3 for Topsoil Protection measures.

4.6.2 Topsoil Stockpile

Topsoil is stored within areas of the permit boundary which will not be routinely disturbed (See Maps 3.2.1-1, 3.2.1-3, 3.2.4-3A, 3.2.8-2, 3.2.11-1, and Volume 5 Section 24). Four topsoil stockpile areas are utilized: the first at the portal area, the second at the loadout facility, the third at the South Fork Breakout area, the thirdfourth at the waste rock disposal site, and the fourthifth at the Winter Quarters Ventilation Facility.

Long-Term Topsoil Storage Areas

Sub-Total	13.86		30,879
Portal Yard Area			
South Slopes	20.03	18	48,473 (USFS)
North Slopes	16.37	12	26,410 (USFS)
Sub-Total	36.40		74,883*
Water Tank and Well Pads	.19	12	306 (USFS)
	.07	12	113 (Private)
Sub-Total	.26		419
Waste Rock Disposal Site	7.68	12***	10,147***(Private)
			2,198***(Private)
			12,345***(Private)
South Fork Breakout Area			
South Slope	.30	30	1,210 (USFS)
North Slope	.66	12	1,065 (USFS)
Sub-Total	.96		2,275*
Winter Quarters Ventilation Facility			
North Slope	1.69*1.1	1812	40902,662? (Private)

*1.69 acres does not include acreage of topsoil pile; total disturbed area including topsoil pile area equal 2.36 acres

Sub-Total	1.69		4090

CHANGE TO		TEXT		
Table 4.6-4	Page 4-38(c)	Table 4.6-4	Page 4-38(c)	Date 08/10/9

TABLE 4.6-4 (Continued)
TOPSOIL REDISTRIBUTION

	Acreage	Planned Depth Inches	Cubic Yds
Overland Conveyor Route	.39	12	629 (Private)
NOG Bleeder Shaft 1.7*		19	4,388 (USFS)

*1.7 acres is only the disturbed area. The permit area encompasses approximately 3.0 acres.

		48,05643,966 (Private)
		77,46481,852 (USFS)
GRAND TOTAL	58.60156.9160.30	125,520129,908**

*Both of these areas are located on National Forest lands and 78,281-593 cubic yards of National Forest topsoil was removed and stored from these area. The topsoil over and above that planned for redistribution that came from National Forest lands will be redistributed on National Forest lands, as directed by the Manti-LaSalt National.

**77,46481,852-cubic yards are need for revegetation on National Forest lands and 43,966 cubic yards are needed for revegetation on private lands. As indicated in Section 2.11, there is 79,281 cubic yards of topsoil available for revegetation on National Forest Lands and 44,526 cubic yards of topsoil available for revegetation on private lands.

***2,198 cubic yards are available at the Scofield site. The remainder of the topsoil will come from the portal yard stockpile or other outside source.

CHANGE TO		TEXT		
Table 4.6-4	Page 4-38(d)	Table 4.6-4	Page 4-38(d)	Date 3-24-1008/10/934-6-15-07/23/201

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Topsoil redistribution will commence once removal of all facilities and modification of the pad site to achieve the approximate original contours (AOC) is completed. Distribution of the topsoil will take place immediately prior to re-vegetation activities to minimize erosion. Topsoil will be placed with a bulldozer or comparable machinery to approximate grade. Following topsoil placement to approximate grade, a trackhoe or comparable machinery will deep-gouge or roughen the surface prior to commencement of re-vegetation activities.

4.6.7 NOG Bleeder Shaft Topsoil Redistribution

The topsoil redistribution will start one-year after the shaft has been backfilled to allow for settling, any facilities have been removed, and the earthwork has regarded the road and pad to the approximate original contours (AOC). Re-vegetation activities will immediately follow the distribution of topsoil to minimize erosion. Topsoil will be placed with a bulldozer or comparable machinery to approximate grade, followed by deep-gouging of the surface.

Revised: ~~12-30-09~~~~4-6-15~~ 07/23/2015

4.7.10, Table 4.7.10A
Table 4.7.10B

4.7.9 Winter Quarters Ventilation Facility (WQVF)

Refer to both Section 2.7 and the Mt. Nebo Vegetation report located in Appendix A-2, Volume 2 for a discussion of the vegetation for the WQVF. The interim and final revegetation seed mixes for the WQVF area are listed in Tables 4.7-8A through 4.7-8C. Reclamation success standards are based on the reference area(s) identified in the Mt. Nebo report. Noxious plants invading the WQVF permit area will be controlled by hand-grubbing, and/or approved herbicides. Surveillance will be monitored annually during the liability period.

4.7.10 NOG Bleeder Shaft

Refer to both Section 2.7 and the Mt. Nebo Vegetation report located in Appendix A-2 Volume 2 for a discussion of the vegetation of the NOG Bleeder Shaft site. Portions of the area were previously disturbed and re-vegetated, while other portions are undisturbed. Both the interim and final re-vegetation seed mixes are listed in Tables 4.7.-10A and -10B. Reclamation success standards are based on the reference areas identified in the Mt. Nebo report. Noxious weeds will be controlled during the liability period. Sediment control structures used during construction such as silt fencing and straw bales will remain in place for one year after construction and will be removed anytime thereafter. Erosion control blankets, wattles, or straw bales will be used to control erosion during interim vegetation establishment.

Table 4.7-10A

Interim Revegetation seed Mixture for the North of Graben Bleeder Shaft

Species [a)]	Rate [b)] (# PLS/Ac)	Seeds/ft^2
Forbs		
Achillea millefolium (Common yarrow)	0.6	51
Rudbeckia occidentalis (Western coneflower)	1	51
Grasses		
Bromus carinatus (Mountian brome)	8	15
Elymus trachycaulus (Slender wheatgrass)	8	25
Poa secunda (Sandberg bluegrass)	3	46

a) Depending on commercial availability, species can be substituted by a qualified botanist

b) Rates based on broadcast seeding methods

Table 4.7-10B

Final Revegetation seed Mixture for the North of Graben Bleeder Shaft		
Species [a]	**Rate** [b] **(#/ac or Lbs PLS/Ac)**	**Seeds/ft^2**
Shrubs and Trees [c]	**(#/ac)**	
Populus tremuloides (Quaking Aspen)	200	n/a
Sambucus racemosa (Red Elderberry)	20	n/a
Symphoricarpos oreophilus (Mountain snowberry)	100	n/a
Forbs	**(Lbs PLS/ac)**	
Achillea millefolium (Common yarrow)	0.6	46
Rudbeckia occidentalis (Western coneflower)	1	51
Heliomeris miltiflora (Showy goldeneye)		
Grasses	**(Lbs PLS/ac)**	
Bromus carinatus (Mountian brome)	8	51
Elymus trachycaulus (Slender wheatgrass)	8	15
Elymus spicatus (Bluebunch wheatgrass)	6	26
Poa secunda (Sandberg bluegrass)	3	25

a) Depending on commercial availability, species can be substituted by a qualified botanist
b) Rates based on broadcast seeding methods
c) Containerized Planting as appropriate

A. 4
Revised 7/23/15

75.1771. Shafts or other opening to the surface from an underground mine will be capped, sealed and backfilled, or otherwise properly managed, as required by the Division. Permanent closure measures will be designed to prevent access to mine workings by people, livestock, fish and wildlife, and to keep acid or other toxic drainage form entering groundwater or surface waters.

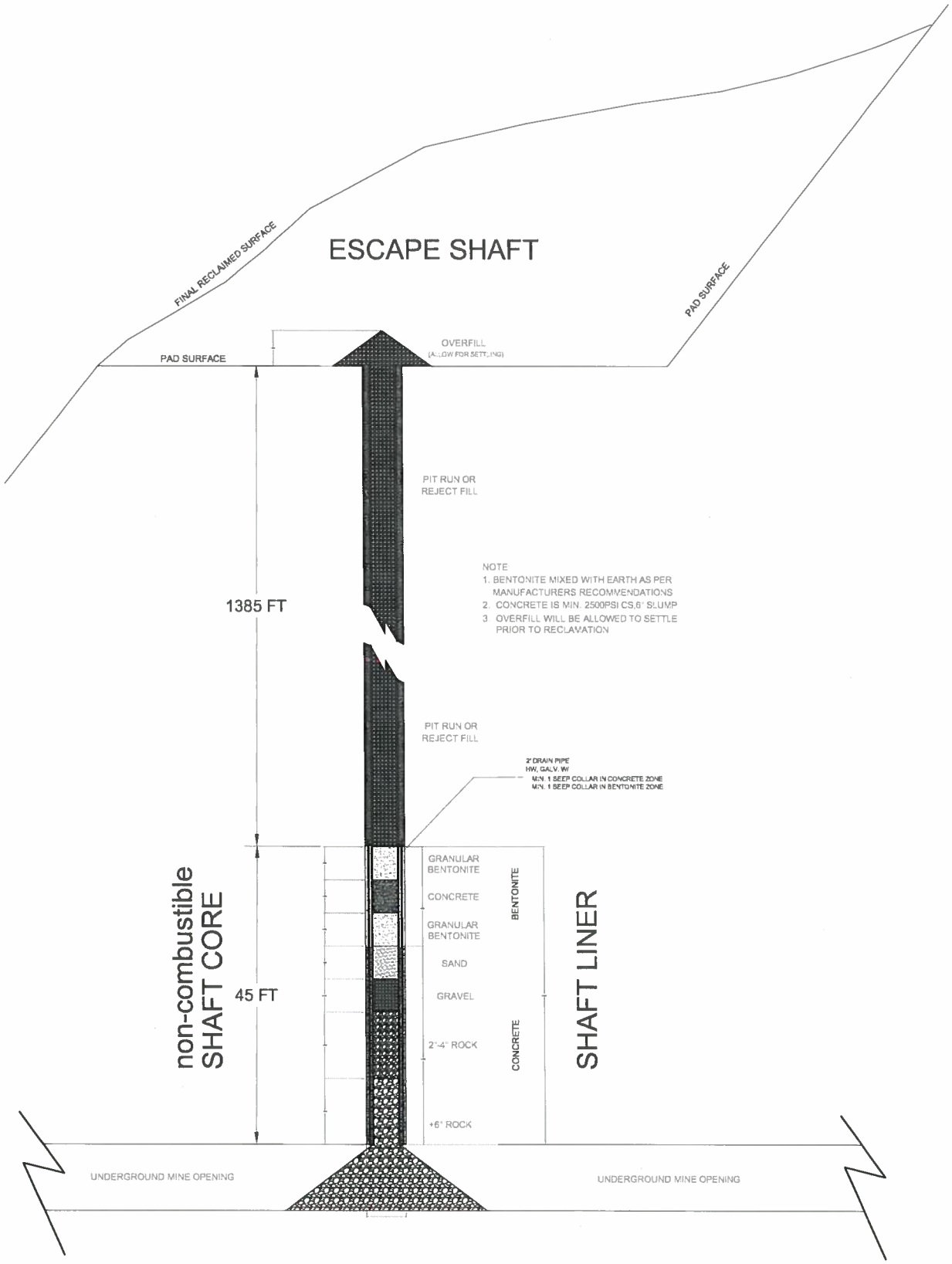
Figure 4.9-B illustrates how the WQVF shafts will be reclaimed through backfilling. The bottom 50-feet of the shaft will be filled with non-combustible material as follows: starting at the bottom with large, course 6+ inch rock for approximately 20 feet (including mine area); followed by successively by smaller rock; culminating with a 5-foot bentonite layer, 5-foot concrete layer, and an additional 5-foot bentonite layer. The remainder of the shaft will be filled to the surface with pit run or other reject fill. The bottom 50 feet of the shaft has been designed to both minimize accumulation of gas and filling of the shaft with water - should either condition occur. The shaft(s) reclamation design addresses both mass stability and movement in multiple ways: grading of the fill from coarse to fine minimized movement while allowing pore space for possible saturation; the bentonite-concrete layers (~15 total feet) are utilized as both a cap and seal, providing a barrier for both saturation and mass movement; and finally, once the shaft is full to the surface, a 20-foot mound is placed over the former opening to accommodate additional compaction. The mound provides approximately an additional 5 percent of material for compaction. It is proposed the shaft be filled and allowed to settle for approximately one (1)year prior to completely reclaiming the WQVF pad to approximate original contours (AOC).

A shaft in the North of Graben area (NOG Bleeder Shaft) will be abandoned in the same fashion. Figure 4.9-D illustrates the abandonment. Notable differences include the diameter of the shaft (5-feet) and the depth (~1,400-feet). The shaft will not be lined and since the shaft was drilled using the raise-bore method, all the backfill material will need to be imported to the site.

Mine Entries

In compliance with 30 CFR 75.1711-2, seals will be installed in all entries as soon as mining is completed and the mine is to be abandoned. (See Figure 4.9-A for typical portal seal.) The seals will be located at least 25 feet inside the portal entry. The opening will be sealed with solid, substantial, incombustible material, such as concrete blocks, bricks or tile, or shall be completely filled with incombustible material. Figure 4.9-C illustrates a cross section of the WQVF seal. The WQVF seal has incorporated a water-tight seal in the event water is encountered at reclamation.

ADDITION TO:		TEXT		
Section 4.9	Page 4-62(a)	Section 4.9	Page 4-62(a)	Date 3-24-1002/23/06



Skyline Mine NOG Bleeder Shaft Shaft Detail			
Canyon Fuel Company, LLC Skyline Mines			
HCR 35 BOX 380, HELPER, UT, 84526 435-448-2832	DATE: 7/23/15	CK.BY: GGalecki	REVISION:
CAD FILE:	SCALE: Not Scaled	DR.BY: TEarl	0
DWG. NO.: 4.9-D			7/23/15

Section 4.11

concern of any gravity discharge during the operation of the mine. Mine water can be discharged from this location when discharge parameters are met. A Utah Pollution Discharge Elimination System (UPDES) water discharge point was added to the Skyline Mine water discharge permit in December 2009 to accommodate discharging water to Winter Quarters Creek both from the sedimentation pond and potentially future mine water discharge.

The Winter Quarters decline slope portal is at an elevation of 8120 feet which is down dip and at a lower elevation than portions of the Mine workings. To safeguard against a gravity discharge at reclamation, should the mine flood to the portal level, both the shafts and slope have been sealed and backfilled to prevent any discharge at reclamation (See Section 4.9).

4.11.10 North of Graben (NOG) Bleeder Shaft

The NOG Bleeder shaft includes a 3.0 acre bonded permit area, with approximately 1.7 acres of disturbance with a 50-ft by 80-ft pad, 784-ft road, topsoil pile, diesel storage tanks, generator, and a 5-ft diameter shaft. The site is adjacent to an existing USFS road located at the top of Granger Ridge. No pond is necessary for sediment control due to minimal disturbance. The shaft opening is located approximately 1,400 feet above the mine workings eliminating concern of any gravity discharge during the operation of the shaft.

4.12

TABLE 4.12-1

PROPOSED POSTMINING LANDUSE

Area	Present Ownership	Premining Landuse	Proposed Postmining Use	Alternative Use	Capacity To Support Proposed Use	Relationship To Existing Landuse Policies
Mine Site and Exploratory Excavations	USFS	Wildlife/ Grazing Habitat	Wildlife/ Grazing Habitat	Picnic Area	Adequate	Compatible
Conveyor and Pipeline	Private	Grazing/ Wildlife Habitat	Wildlife Habitat	Grazing/ Wildlife Habitat	Wildlife	Adequate	Compatible
Main Access Road	State	Forest Compatible Access and Service Road	State Road	None	Adequate
Loadout	Private	Grazing, Picnic and Stock Pens*	Grazing/ Wildlife Habitat	Wildlife	Adequate	Compatible
Waste Rock Disposal	Private	Grazing/ Wildlife Habitat	Grazing/ Wildlife Habitat	Wildlife	Adequate Compatible
South Fork Breakout	USFS	Wildlife/ Grazing Habitat	Wildlife/ Grazing Habitat	Wildlife Habitat	Adequate	Compatible
James Canyon	USFS/Private	Wildlife/ Grazing Habitat	Wildlife/ Grazing Habitat	Wildlife Habitat	Adequate	Compatible
Winter Quarters Ventilation Facility	Private	Grazing Mining Wildlife	Grazing Wildlife	Compatible	Adequate	Adequate
NOG Bleeder Shaft	USFS	Wildlife	Wildlife	Adequate	Adequate	Compatible

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* Note: The loadout area picnic facilities and stock pens are not proposed to be included in the proposed post-mining use. The permittee is the landowner of this site and is not in the recreation or livestock business, and therefore, elects not to reestablish the picnic and livestock facilities. This land was purchased by quit-claim deed dated, May 24, 1991, for the area occupied by the loadout facilities in 5-1/2S E1/4, Section 1), T.13S R.7E SLBM. There is no pending litigation subject to the quit-claim deed. The grantor reserves the coal rights under the lands.

The owner's representative requests that the pit fill be leveled off so that it can be used for corrals. The leveled-off fill will be reclaimed to native rangeland per the Reclamation Plan.

4.12.7Winter Quarters Ventilation Facility (WQVF)

The pre-mining land use was native rangeland providing habitat for grazing and wildlife, with associated impacts from mining and timber harvesting. The WQVF pad site and access are all on private land. The pre-existing road will not be reclaimed and any associated road improvements will remain. At reclamation, the mine openings will be sealed and/or backfilled, the pad, pad-access road, and associated facilities will be removed and the Approximate Original Contour (AOC) be returned. Once the reclamation commitments have been achieved, the pre-mining land uses will be adequately re-established.

4.12.8 NOG Bleeder Shaft

The pre-mining land use provided habitat for grazing and wildlife with associated impacts from timber harvesting. At reclamation, the mine opening will be backfilled, capped, the pad, access road, and associated facilities will be removed and the approximate original contours (AOC) will be returned. At the completion of reclamation activities, the pre-mining land uses will be adequately re-established prior to liabilities being released.

4.18

Waste Rock Site

Fish and Wildlife Enhancement Measures:

$ Species to be planted and the rates per acre will follow the specifications in Table 4.7-6A.

$ Seeds and seedlings planted during reclamation will include diverse palatable species.

$ See Section 2.9 for additional discussion of Wildlife at the Waste Rock site.

Winter Quarters Ventilation Facility (WQVF)

Fish and Wildlife Enhancement Measures:

$Species to be planted and seeded and rates per acre are outlined in Mt Nebo Report (Appendix A-2, Volume 2).

will be used in reclamation as outlined by Dr. Shiozawa (Appendix A-3, Volume 2)

• Photo documentation of the pre-disturbed stream wcollected for re-construction of the stream bank morphology

• The WQVF was specifically designed to be constructed a minimum of two (2) stream widths from the stream channel, thus providing a buffer zone of riparian and other upland vegetation to minimize impacts and maintain appropriate habitat.

• During construction, operation, and reclamation of the WQVF site, noxious plants invading the permit area will be controlled by hand-grubbing, and/or approved herbicides. Surveillance will be monitored annually during the liability period.

NOG Bleeder Shaft

Fish and Wildlife Enhancement Measures:

- Species will be planted and seeded as outlined in Section 4.7
- During construction, operation, and reclamation of the site, noxious plants invading the site will be controlled by approved herbicides. Monitoring and treatment will continue annually during the liability period.

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4.20.5 Winter Quarters Ventilation Facility Road

The pre-existing road in Winter Quarters Canyon is classified as an ancillary road based on the following criteria: it is not used to transport coal or spoil; it is not used for access or other purposes for a period in excess of six months; and it will not be retained for a specifically approved postmining land use. The access is primarily across private land. Although improvements to the road were made by the Mine, the improvements were included in the easement of the lease and will not be altered during reclamation.

The approximately 450 foot access road built for the Winter Quarters Ventilation Facility pad will be removed during reclamation. See Plates 3.2.4-3b and -3e for detailed road illustrations and Plates 4.4.2-3A and 4.4.2-3B for reclamation details.

4.20.6 North of Graben (NOG) Bleeder Shaft Road.

The NOG Bleeder Shaft access road is classified as an ancillary road since 1) it is not used to transport coal or spoil: 2) it is not used for access or other purposes for a period in excess of six (6) months; and 3) it will not be retained for a specifically approved post-mining land use. The access is located on land exclusively managed by the US Forest Service. The approximately 780-foot road built for the NOG Bleeder Shaft will be removed during reclamation. See Plates 3.2.4-5A through -5D for detailed road illustrations and Plates 4.4.2-5A and -5B for reclamation details.

2014 Wildlife Survey Report

NOG Graben Bleeder Shaft

Northern Goshawk Protocol, Raptors,
American three-toed woodpecker, and
General Wildlife Survey

Prepared for:

Skyline Mine
Gregg Galecki
Environmental Engineer
Canyon Fuel Company, LLC

Prepared By:

Alpine Ecological
HC 80 Box 570
Greenwich, UT 84732

3.28.15

1.0 Introduction

The following narrative is submitted pursuant to requirements regulating potential impacts to terrestrial threatened, endangered, candidate and sensitive species and their associated habitats. The following report details the results of wildlife surveys conducted for the NOG Graben Bleeder Shaft Project; surveys included northern goshawk (*Accipiter gentilis*), American three-toed woodpecker (*Picoides dorsalis*), general raptor, and general wildlife surveys No other special status wildlife species were identified as a result of the pre-field research. The areas surveyed are displayed on Figure 1.

Pre-field research was completed by Alpine wildlife biologists who utilized GIS data from the Utah Division of Wildlife Resources' (UDWR) Utah Threatened, Endangered, and Sensitive Species Occurrences shapefiles and mapping services. Research included historic records, species ecology, life history, known distributions, and habitat requirements.

2.0 Project Description

Skyline Mine proposed to construct a bleeder shaft in the Granger Ridge Area. As required by UDOGM, northern goshawk, American three-toed woodpecker, general raptor, and general wildlife surveys were conducted around the proposed shaft site and associated buffer area (Survey Area).

3.0 Habitat

South and East facing slopes, at higher elevations are dominated by quaking aspen communities with large open areas. These open areas are typically grass and tall forb communities. The North and West facing slopes are dominated by conifer communities. The tree species within the conifer community are mostly dead or dying, and the area has an abundance of deadfall due to beetle infestations. Because of the deadfall and dead trees the forbs and grasses within the conifer communities are very diverse and most areas have a solid understory. The tops of the ridges in the survey area vary with some being dominated by shrub communities such as mountain big sagebrush, elderberry or chokecherry while others are dominated by grass and tall forb communities.

4.0 Methodology

Northern Goshawk broadcast acoustical surveys were conducted following U.S. Department of Agriculture (USDA) Forest Service, 2006, Northern Goshawk Inventory and Monitoring Technical Guide pp.3.13-15. Using GIS, survey transects were established 250 meters apart throughout the survey area which extended 0.5 miles beyond the project footprint. Broadcast calling stations were then established every 200 meters along each transect. Upon arrival at each broadcast calling station, the surveyor looked and listened before broadcasting the pre-recorded alarm calls. Utilizing FoxPro game calls, pre-recorded northern goshawk alarm calls were broadcast for approximately 10 seconds followed by 30 seconds of looking and listening. After turning 120 degrees the

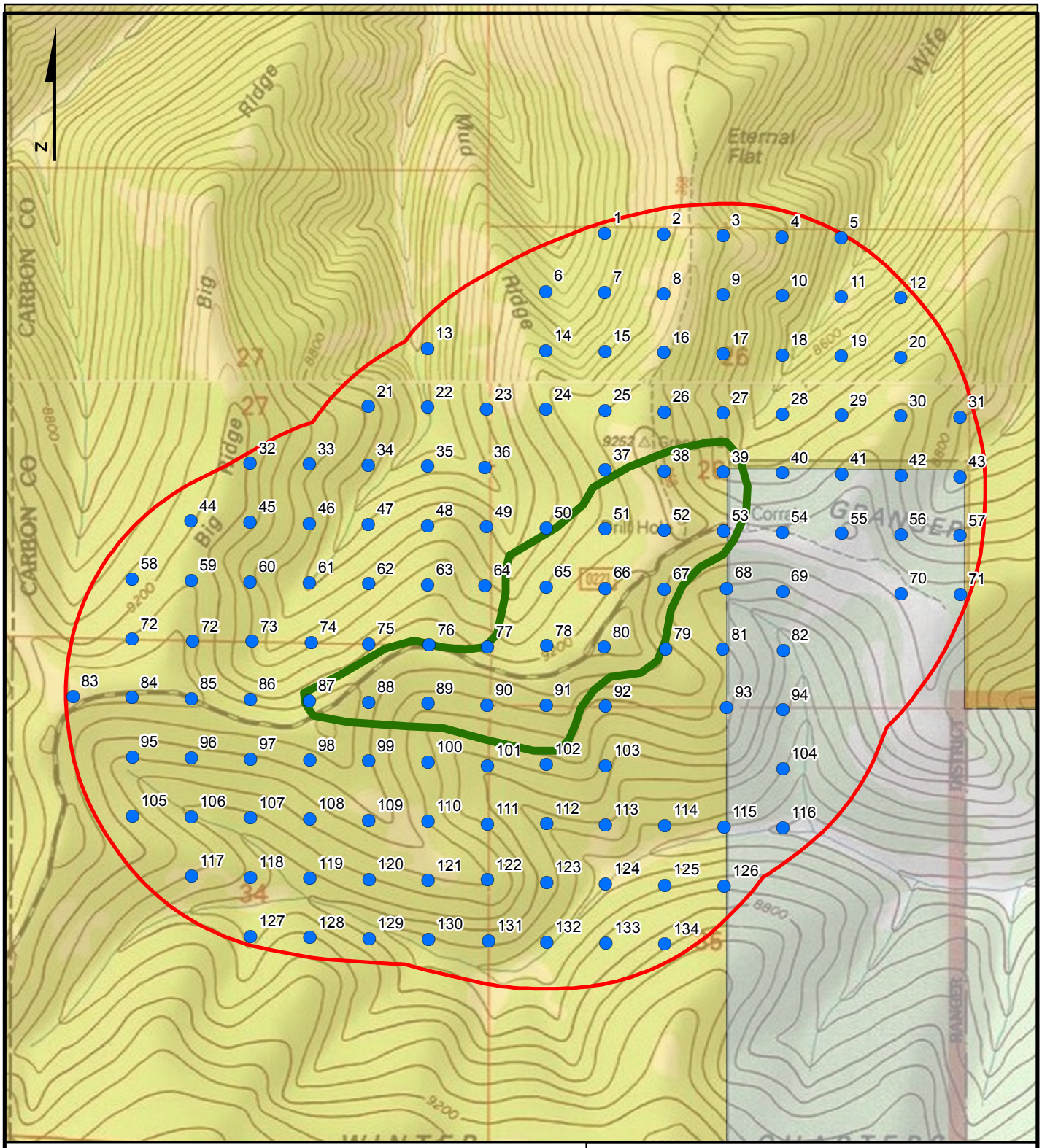
sequence was then repeated. Once the sequence of 10 seconds of calling and 30 seconds of looking and listening was completed 3 times and no response was elicited the surveyor then repeated the sequence before moving to the next calling station. Surveys were timed in accordance to the survey requirements outlined in the 2006 Technical Guide and were based on local knowledge of nesting chronologies in the area and coordination with the US Forest Service. Additionally, surveyors searched for foraging raptors between calling stations when vantage points were available. This survey was conducted twice as outlined in the protocol. There are a 134 call stations within the Survey Area.

American three-toed woodpecker surveys are conducted simultaneously with the northern goshawk survey in areas of suitable habitat. Biologists listened for drumming activity while at the call stations and inventoried for three-toed woodpeckers in suitable habitat while walking linear transects between call stations.

General raptor and wildlife surveys were conducted along transects designed during the northern goshawk protocol surveys.

5.0 Survey Results

There were no raptor observations documented within the Survey Area. Red tailed hawks were observed, on two separate occasions, soaring to the east of the Survey Area, while biologists traveled along the Granger Ridge Road. Common ravens (*Corvus corax*) were also observed along Granger Ridge Road and within the Survey Area. There were no other raptor species observed during the course of the inventory. No other special status species were observed during the course of the inventory. There were no audio or visual observations of American three-toed woodpecker during the course of the 2014 surveys.



BASE MAP:1:24,000 USGS Quad (Accessed at ArcGIS Online)

Goshawk Call Stations
0.5-Mile Buffer
Potential Shaft Location
Ownership
BLM
Private

1,000 500 0 Meters

1 in = 473 meters

NOG Bleeder Shaft

FIGURE - 1

DATE DRAWN 07/30/2014

State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Alan Matheson
Executive Director

DIVISION OF AIR QUALITY
Bryce C. Bird
Director

DAQE-AN100920001-15

July 13, 2015

Carl Winters
Canyon Fuel Company, LLC
A Subsidiary of Bowie Resource Partners, LLC
HCR 35, Box 380
Helper, UT 84526

Dear Mr. Winters:

Re: Approval Order: Modification to Approval Order DAQE-AN0092007-03 to Increase Haulage of Coal and to Add Stacking Tube
Project Number: N10092-0001

The attached document is the Approval Order for the above-referenced project. Future correspondence on this Approval Order should include the engineer's name as well as the DAQE number as shown on the upper right-hand corner of this letter. The project engineer for this action is Mr. Maung Maung, who may be reached at (801) 536-4153.

Sincerely,

Bryce C. Bird
Director

BCB:MM:kw

cc: Southeastern Utah District Health Department

STATE OF UTAH

Department of Environmental Quality

Division of Air Quality

APPROVAL ORDER: Modification to Approval Order DAQE-AN0092007-03 to Increase Haulage of Coal and to Add Stacking Tube

Prepared By: Mr. Maung Maung, Engineer
Phone: (801) 536-4153
Email: mmaung@utah.gov

APPROVAL ORDER NUMBER

DAQE-AN100920001-15

Date: July 13, 2015

Canyon Fuel Company, LLC
Skyline Mines
Source Contact:
Jeremiah Armstrong, Environmental Compliance Manager
Phone: (435) 448-2645
Email: jarmstrong@bowieresources.com

Bryce C. Bird
Director

Abstract

Canyon Fuel Company has requested a modification to its existing AO DAQE-AN0092007-03. The proposed modification would consist of the following: 1) the installation of additional tube stacker chute and associated coal conveyor extension; 2) an increase in the truck haulage at each of the existing truck load-outs, and the conversion of the rail load-out, including an associated conveyor extension, to allow loading and haulage by truck in addition to railcars; and 3) the removal of the 4 million tons per year coal throughput limits for each of the individual stockpiles.

The Skyline Mines is located in Carbon County which is an attainment area of the NAAQS for all pollutants. NSPS subpart Y regulations apply to this source. NESHAP and MACT regulations do not apply to this source. Title V of the CAAA applies to this source as an area source.

The recalculated PTEs totals of NO_x, SO_2, VOC and CO for the existing AO (as submitted in the latest NOI) are different from the past calculated PTEs for the existing AO. In another words, recalculated PTEs for the source are lower for NO_x, SO_2 and VOC, and higher for the CO than the PTEs in the existing AO. The PTEs of PM_{10} and $PM_{2.5}$ which was not identified before are higher than the PTEs in the existing AO. It is not clear how this situation of differences came about. However, it could possibly be the emission factors may have changed over time, and different assumptions were used in preparations for the previous modifications. The new calculations have been checked and verified. The assumptions and the calculations in the latest NOI are accurate. The recalculated emissions along with the new resulting PTEs are acceptable.

The emission increase of PM_{10} triggers air dispersion modeling per air quality rules R307-410-3. The modeling was performed, and the result indicated that there will be no violation of the NAAQS.

The emissions, in TPY, will increase as follows: PM_{10} = 11.42, $PM_{2.5}$ = 2.28.

The increases in emissions, in TPY, will change the potential to emit totals as follows: PM_{10} = 22.90, $PM_{2.5}$ = 5.01, NO_x = 12.33, CO = 10.36, SO_2 = 0.07, VOC = 0.68, formaldehyde = 0.01, hexane = 0.22, Total HAPs = 0.23 and CO_2 e = 14,893. $PM_{2.5}$ emissions are a subset of PM_{10} emissions.

This air quality AO authorizes the project with the following conditions and failure to comply with any of the conditions may constitute a violation of this order. This AO is issued to, and applies to the following:

Name of Permittee:	**Permitted Location:**
Canyon Fuel Company, LLC A Subsidiary of Bowie Resource Partners, LLC HCR 35, Box 380 Helper, UT 84526	Skyline Mines Eccles Canyon Scofield, UT 84526

UTM coordinates: 482,700 m Easting, 4,392,500 m Northing, UTM Zone 12
SIC code: 1222 (Bituminous Coal Underground Mining)

Section I: GENERAL PROVISIONS

I.1 All definitions, terms, abbreviations, and references used in this AO conform to those used in the UAC R307 and 40 CFR. Unless noted otherwise, references cited in these AO conditions refer to those rules. [R307-101]

I.2 The limits set forth in this AO shall not be exceeded without prior approval. [R307-401]

I.3 Modifications to the equipment or processes approved by this AO that could affect the emissions covered by this AO must be reviewed and approved. [R307-401-1]

I.4 All records referenced in this AO or in other applicable rules, which are required to be kept by the owner/operator, shall be made available to the Director or Director's representative upon request, and the records shall include the two-year period prior to the date of the request. Unless otherwise specified in this AO or in other applicable state and federal rules, records shall be kept for a minimum of two (2) years. [R307-401-8]

I.5 At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any equipment approved under this AO, including associated air pollution control equipment, in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Director which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source. All maintenance performed on equipment authorized by this AO shall be recorded. [R307-401-4]

I.6 The owner/operator shall comply with UAC R307-107. General Requirements: Breakdowns. [R307-107]

I.7 The owner/operator shall comply with UAC R307-150 Series. Inventories, Testing and Monitoring. [R307-150]

Section II: SPECIAL PROVISIONS

II.A The approved installations shall consist of the following equipment:

II.A.1 **Canyon Fuel Company - Skyline Mines**
An underground coal mine

II.A.2 **Main Conveyor (8,000,000 tons per year throughput)**
Drive - Long Airdox, 84 inches wide, 2,000 HP
Rollers - Continental Conveyor, 84 inches wide
Belt - George Duck Belt

II.A.3 **Two Crushers (1,500 tph throughput each)**
Jeffrey Flex Tooth, 611 Feet Flextooth
Gundlach Roll, 4060-S-2159

II.A.4 **Two Screens (70 tph throughput each)**
Thunderbird, 5162.4-14 Inclined Screen
Allis Minerals, Low-Head Horizontal Screen

II.A.5 **Tube Stacker Chutes No. 1 and No. 2 (one is new)**
Chute located in upper mine site stockpiles

II.A.6 **Stoker Bin**
Bin located at lower mine site - 1,900 tons

II.A.7 **Rock Bin**
Bin located at lower mine site - 400 tons

II.A.8 **Three Coal Silos**
ROM Silo located at upper mine site - 8,000 tons
Silo No. 1 located at lower mine site - 15,000 tons
Silo No.2 located at lower mine site - 15,000 tons

II.A.9 **Conveyors**
Various Transport Conveyors including a new conveyor extension for the new Tube Stacker Chute

II.A.10 **Three Load-out Stations**
Tipple Truck Load-out, upper mine site
Stoker Truck Load-out, lower mine site
Rail Load-out, lower mine site

II.A.11 **Three Fabric Filter baghouses**
Day Model 72RF10 for ROM silo area
Day Model 72RF10 for ROM silo area
Day Model 72RF10 for crusher area

II.A.12 **Two Fabric Filter Baghouses**
Dynaclone Model 6A for storage silos

II.A.13 **One Fabric Filter Baghouse**
Dynaclone Model 7A for rail load-out

II.A.14 **Fifteen (15) Space Heaters**
Natural gas-fired heaters at various locations

II.A.15 **Two Boilers**
Natural gas-fired boilers manufactured by Kewanee Boiler Corp. and model number L3W-125-G. They are each rated at 5 MMBtu for main shop building heat.

II.B Requirements and Limitations

II.B.1 **Requirements and Limitations**

II.B.1.a The owner/operator shall notify the Director in writing when the new equipment has been installed and is operational. To ensure proper credit when notifying the Director, send your correspondence to the Director, attn: Compliance Section.

If the owner/operator has not notified the Director in writing within 18 months from the date of this AO on the status of the construction and/or installation, the Director shall require documentation of the continuous construction and/or installation of the operation. If a continuous program of construction and/or installation is not proceeding, the Director may revoke the AO. [R307-401-18]

II.B.1.b Coal shall be transferred only by enclosed conveyor. Inter-site truck haulage between the upper mine site and lower mine site may be used only during conveyor emergency periods. The direct offsite shipments by truck of coal and waste material combined total shall not exceed 8,000,000 tons per rolling 12-month period. The direct offsite shipments by truck of coal from each individual load-out shall not exceed 4,500,000 tons per rolling 12-month period. [R307-401-8]

II.B.1.b.1 Compliance with the limitations shall be determined on a rolling 12-month total. The owner/operator shall calculate a new 12-month total by the twentieth day of each month using data from the previous 12 months. Records shall be kept for all periods when the plant is in operation. Records, including rolling 12-month totals, shall be made available to the Director or Director's representative upon request and the records shall include the two-year period prior to the date of the request. The records of shipments shall be determined by supervisor monitoring and maintenance of an operations log. The records shall be kept on a monthly basis. [R307-401-8]

II.B.1.c Conveyor transfer points shall contain flaps on entry and discharge ends. [R307-401-8]

II.B.1.d The upper elevation silo (8,000 ton capacity) shall be controlled by two baghouses, Day Model 72RF10 or equivalent. The baghouses shall be operated when the coal being transported is dry (less than 4% moisture) or whenever opacity readings exceed 20%. [R307-401-8]

II.B.1.e All crushing and screening operations shall be enclosed, vented and controlled by one baghouse, Day Model 72RF10 or equivalent. Baghouses shall be operated when the coal being worked is dry (less than 4% moisture) or whenever opacity reading exceed 7%. [R307-401-8]

II.B.1.f The two lower elevation silos, rated at 15,000 ton capacity each, shall be controlled by two baghouses, Dynaclone Model 6A or equivalent. The baghouses shall be operated when the coal being transported is dry (less than 4% moisture) or whenever opacity readings exceed 20%. [R307-401-8]

II.B.1.g The Headhouse (rail load out) shall be controlled by one baghouse, Dynaclone Model 7A or equivalent. Storage at train loadout facilities shall be enclosed with venting to fabric filter baghouses. The baghouse shall be operated when the coal being transported is dry (less than 4% moisture) or whenever opacity readings exceed 20%. [R307-401-8]

II.B.1.h Visible emissions from the following emission points shall not exceed the following values:

A. All conveyor transfer points - 20% opacity
B. Conveyor drop points - 20% opacity
C. All other points - 20% opacity

Opacity observations of emissions from stationary sources shall be conducted in accordance with 40 CFR 60, Appendix A, Method 9. [R307-401-8]

II.B.1.i Visible emissions from haul road traffic and mobile equipment shall not exceed <u>20% opacity</u>. Visible emissions determinations for traffic sources shall use procedures similar to Method 9, but the requirement for observations to be made at 15-second intervals over a six-minute period shall not apply. Six points, distributed along the length of the haul road, shall be chosen by the director or his/her representative. An opacity reading shall be made at each point when a vehicle passes the selected points. Opacity readings shall be made no less than one half vehicle length behind the vehicle and no less than one half the height of the vehicle. The accumulated six readings shall be averaged for the compliance value. [R307-401-8]

II.B.1.j The following production limits shall not be exceeded:

A. 600,000 tons maximum capacity in the upper elevation stockpile

B. 8,000,000 tons maximum throughput from the upper elevation stockpile and lower elevation stockpile combined

C. 300 tons maximum capacity in the emergency storage pile

D. 500,000 tons maximum capacity in the lower elevation stockpile

E. 8,000,000 tons coal produced per rolling 12-month period. [R307-401-8]

II.B.1.j.1 Compliance with the limitations shall be determined on a rolling 12-month total. The owner/operator shall calculate a new 12-month total by the twentieth day of each month using data from the previous 12 months. Records of production shall be kept for all periods when the

plant is in operation. Records of production including rolling 12-month totals, shall be made available to the Director or Director's representative upon request and the records shall include the two-year period prior to the date of the request. The records of production shall be determined by examination of company coal sales records and examination of company throughput records for the points in question. The records shall be kept on a monthly basis. [R307-401-8]

II.B.1.k All unpaved roads and other unpaved operational areas that are used by mobile equipment shall be water sprayed and/or chemically treated to control fugitive dust. The application of water or chemical treatment shall be used. Treatment shall be of sufficient frequency and quantity to maintain the surface material in a damp/moist condition. Records of water treatment shall be kept for all periods when the plant is in operation. The records shall include the following items:

A. Date of treatment

B. Number of treatments made, dilution ratio, and quantity

C. Rainfall received, if any, and approximate amount

D. Time of day treatments were made

[R307-401-8]

II.B.1.l The speed of vehicles on the haul roads shall not exceed 25 miles per hour. [R307-401-8]

II.B.1.m The Eccles Canyon road (State Highway U-96) is paved, and the owner/operator shall clean all coal spills on the road immediately. There shall be no "track out" of fugitive dust from unpaved roads onto the paved haul roads. [R307-401-8]

II.B.1.n Water sprays or chemical dust suppression sprays shall be installed at the following points (unless a baghouse controlling enclosed equipment is installed) to control fugitive emissions:

A. All crushers

B. All screens

C. All conveyor transfer points

The sprays shall operate whenever dry conditions warrant or as determined necessary by the Director. Water sprays are not required during freezing weather conditions. [R307-401-8]

II.B.1.o The moisture content of the material shall be maintained at a value of no less than 4 percent of water by weight. The moisture content shall be tested, if directed by the Director, using the appropriate ASTM method. [R307-401-8]

II.B.1.p The storage piles shall be watered to minimize generation of fugitive dusts as dry conditions warrant during recovery operations only or as determined necessary by the Director. [R307-401-8]

II.B.1.q The coal fines content of the stored coal shall not exceed 5.1 percent by weight, and that of the haul roads and pile areas shall not exceed 10 percent by weight. The coal fines content shall be determined, if directed by the Director, using appropriate ASTM method. The coal fines content is defined as all material passing a #200 U. S. Standard Sieve. [R307-401-8]

II.B.1.r The sulfur content of any fuel oil burned shall not exceed 15 ppm by weight as determined by ASTM Method D-4294-89 or approved equivalent. The sulfur content shall be tested, if directed by the Director. [R307-401-8]

Section III: APPLICABLE FEDERAL REQUIREMENTS

In addition to the requirements of this AO, all applicable provisions of the following federal programs have been found to apply to this installation. This AO in no way releases the owner or operator from any liability for compliance with all other applicable federal, state, and local regulations including UAC R307.

NSPS (Part 60), A: General Provisions
NSPS (Part 60), Y: Standards of Performance for Coal Preparation and Processing Plants
Title V (Part 70) Area Source

PERMIT HISTORY

This AO is based on the following documents:

Is Derived From	NOI dated January 23, 2015
Supersedes	AO DAQE-AN0092007-03 dated June 24, 2003
Incorporates	Additional Information dated March 3, 2015

ADMINISTRATIVE CODING

The following information is for UDAQ internal classification use only:

Carbon County
CDS SM
NSPS (Part 60), Title V (Part 70) Area Source, Attainment Area,

ACRONYMS

The following lists commonly used acronyms and associated translations as they apply to this document:

40 CFR	Title 40 of the Code of Federal Regulations
AO	Approval Order
BACT	Best Available Control Technology
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CDS	Classification Data System (used by EPA to classify sources by size/type)
CEM	Continuous emissions monitor
CEMS	Continuous emissions monitoring system
CFR	Code of Federal Regulations
CMS	Continuous monitoring system
CO	Carbon monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent - 40 CFR Part 98, Subpart A, Table A-1
COM	Continuous opacity monitor
DAQ/UDAQ	Division of Air Quality
DAQE	This is a document tracking code for internal UDAQ use
EPA	Environmental Protection Agency
FDCP	Fugitive dust control plan
GHG	Greenhouse Gas(es) - 40 CFR 52.21 (b)(49)(i)
GWP	Global Warming Potential - 40 CFR Part 86.1818-12(a)
HAP or HAPs	Hazardous air pollutant(s)
ITA	Intent to Approve
LB/HR	Pounds per hour
MACT	Maximum Achievable Control Technology
MMBTU	Million British Thermal Units
NAA	Nonattainment Area
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOI	Notice of Intent
NO_x	Oxides of nitrogen
NSPS	New Source Performance Standard
NSR	New Source Review
PM_{10}	Particulate matter less than 10 microns in size
$PM_{2.5}$	Particulate matter less than 2.5 microns in size
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
R307	Rules Series 307
R307-401	Rules Series 307 - Section 401
SO_2	Sulfur dioxide
Title IV	Title IV of the Clean Air Act
Title V	Title V of the Clean Air Act
TPY	Tons per year
UAC	Utah Administrative Code
VOC	Volatile organic compounds

A CULTURAL RESOURCES INVENTORY FOR THE SKYLINE MINE EXPANSION AND TRANSMISSION LINE CONSTRUCTION PROJECT, CARBON AND EMERY COUNTIES, UTAH

Prepared for:

Canyon Fuel Company, LLC
A Subsidiary of Bowie Resource Partners, LLC

For Submittal to:
U.S. Department of Agriculture
U.S. Forest Service
Manti-La Sal National Forest

Prepared by:

Andrew T. Yentsch, M.S., RPA

Environmental Planning Group, LLC
208 East 800 South
Salt Lake City, Utah 84102

Utah Public Lands Policy Office Permit No. 89

Utah Antiquities Project No. U-14-EO-0753f

EPG Cultural Resources Report No. SLC-2014-06

October 7, 2014

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ABSTRACT

In June of 2013, Canyon Fuel Company, LLC, a subsidiary of Bowie Resource Partners, LLC, requested Environmental Planning Group, LLC (EPG) of Salt Lake City, Utah, to complete Class III cultural resources inventories of four discontinuous parcels in Carbon and Emery Counties, Utah, for the Skyline Mine Expansion and Transmission Line Construction Project. The survey areas are located on U.S. Forest Service (Manti-La Sal National Forest) administered land. The inventories were conducted in anticipation of a proposed mine expansion and construction of two new, 12.5-kilovolt transmission lines. The inventories were conducted to meet the requirements of Section 106 of the National Historic Preservation Act for the proposed activity. The purpose of this inventory was to identify, record, and determine the extent and significance of cultural resources within the Project area.

A Class I cultural resources file search was completed for the four parcels, as well as for a 1-mile area surrounding each parcel. Class III cultural resources inventories were completed for 245 acres (99.15 hectares) of U.S. Forest Service (Manti-La Sal National Forest) administered land located approximately 5 miles (8.05 kilometers) west of Scofield, Utah. The Project area encompasses portions of Sections 26, 27, 34, and 35, Township 12 South, Range 6 East; and Sections 13, 23, 24, 26, and 27, Township 13 South, Range 6 East. The cultural resources surveys were conducted by EPG archaeologists on August 7, 2014, and September 29, 2014. All cultural resources work was carried out under authority of Utah State Antiquities Project Number U-14-EO-0753f and Public Lands Policy Coordination Office Permit Number 89 (Andrew T. Yentsch).

Five Isolated Occurrences (IO1 through IO5) and three new cultural resources sites (42CB3253, 42CB3254, and 42EM4583) were identified, documented, and evaluated for eligibility for inclusion in the National Register of Historic Places (NRHP). None of the sites are recommended eligible for inclusion in the NRHP. Therefore, the Project will have no adverse effect on those sites.

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LIST OF ACRONYMS

AERC	Archaeological Environmental Research Corporation
B.P.	Before the present
BLM	Bureau of Land Management
BYU-OPA	Brigham Young University-Office of Public Archaeology
CMT	Culturally modified tree
CFR	Code of Federal Regulations
EPG	Environmental Planning Group, LLC
GLO	General Land Office
GPS	Global positioning system
IMACS	Intermountain Antiquities Computer System
IO	Isolated occurrence
MOAC	Montgomery Archaeological Consultants
NAD83	North American Datum, 1983
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
SHPO	State Historic Preservation Office
SWCA	SWCA Environmental Consultants
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator

INTRODUCTION

In June of 2013, Canyon Fuel Company, LLC, a subsidiary of Bowie Resource Partners, LLC, requested Environmental Planning Group, LLC (EPG) of Salt Lake City, Utah, to complete Class III cultural resources inventories of four discontinuous parcels in Carbon and Emery Counties, Utah, for the Skyline Mine Expansion and Transmission Line Construction Project (Project). The inventories were conducted in anticipation of a proposed mine expansion and construction of two new, 12.5-kilovolt transmission lines. The survey areas consist of four non-contiguous parcels located on U.S. Forest Service (USFS) (Manti-La Sal National Forest) administered land. The inventories were conducted to meet the requirements of Section 106 of the National Historic Preservation Act for the proposed activity. The purpose of the inventories was to identify, record, and determine the extent and significance of all observable cultural resources in the Project area to assist in the identification of locations requiring protection, additional treatment, or mitigation.

Prior to conducting fieldwork, a Class I cultural resources file search was completed for four non-contiguous parcels, as well as for a 1-mile area surrounding each parcel. This file search was conducted primarily to determine whether or not known cultural resources had been previously documented within the boundaries of the Project area, and secondarily to assess the type or types of cultural resources that may be encountered during the investigation.

Class III cultural resources inventories were completed for 245 acres (99.15 hectares) of USFS (Manti-La Sal National Forest) administered land located approximately 5 miles (8.05 kilometers) west of Scofield, Utah. The Project area encompasses portions of Sections 26, 27, 34, and 35, Township 12 South, Range 6 East; and Sections 13, 23, 24, 26, and 27, Township 13 South, Range 6 East.

The cultural resources surveys were conducted by EPG archaeologists on August 7, 2014, and September 29, 2014. EPG archaeologist Andrew T. Yentsch served as principal investigator and directed the Project. He was assisted by John Curl and Suzy Eskenazi. All cultural resources work was carried out under authority of Utah State Antiquities Project Number U-14-EO-0753f and Public Lands Policy Coordination Office Permit Number 89 (Andrew T. Yentsch). All field notes and photographic materials from the Project are on file at EPG's office in Salt Lake City, Utah.

Five Isolated Occurrences (IO1 through IO5) and three new cultural resources sites (42CB3253, 42CB3254, and 42EM4583) were identified, documented, and evaluated for eligibility for inclusion in the National Register of Historic Places (NRHP). None of the sites are recommended eligible for inclusion in the NRHP. Therefore, the Project will have no adverse effect on those sites.

Project Description

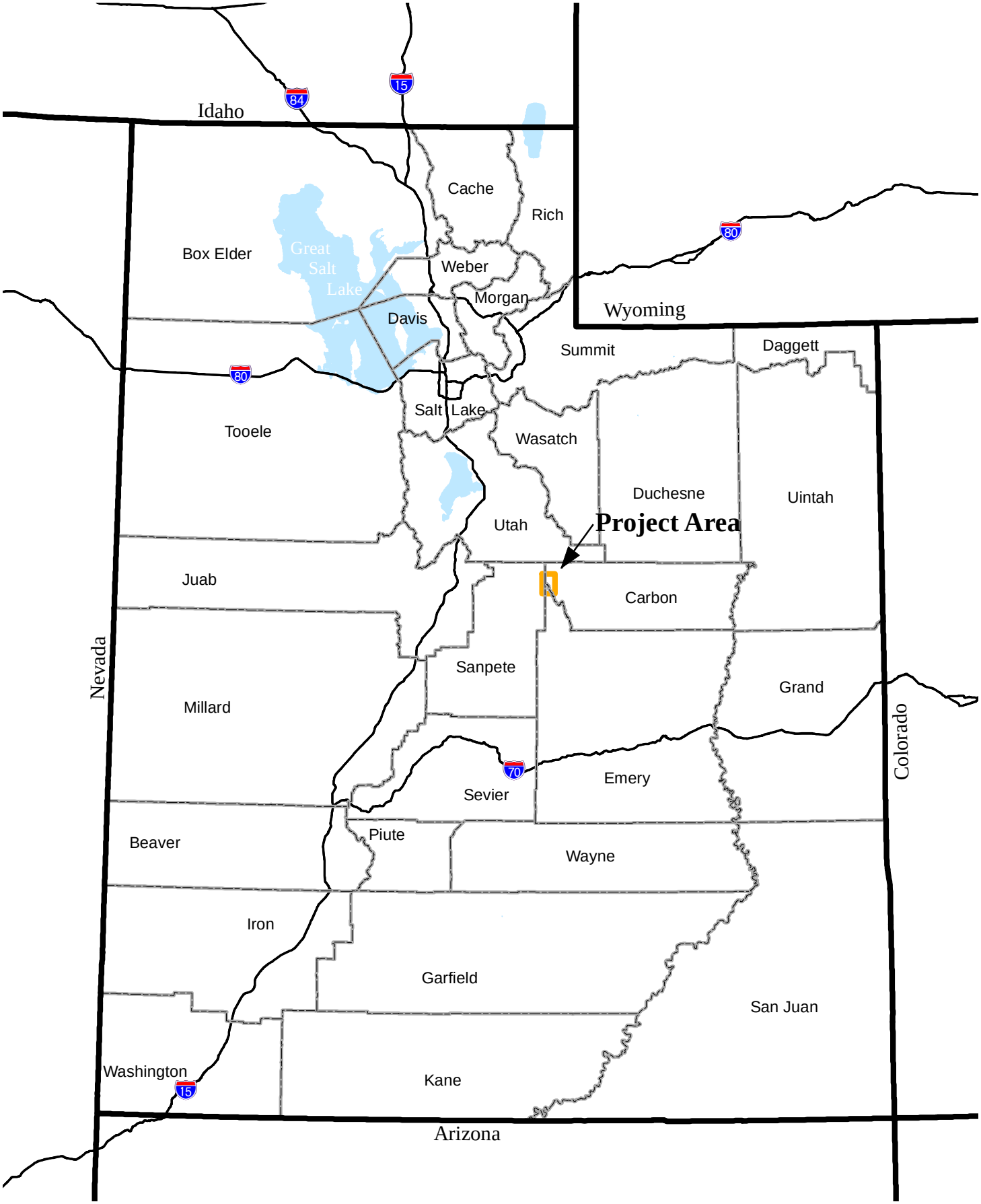
The Skyline Mine Expansion and Transmission Line Construction Project area, hereafter referred to as the Project area, is located in south-central Utah, approximately 5 miles (8.05 kilometers) west of the community of Scofield, Utah (Figure 1). The Project area consists of three non-

contiguous, disconnected block parcels and one linear corridor centered roughly on the Skyline Mine in Eccles Canyon. The survey locations are presented in Figures 2-1 and 2-2. Topographic map coverage of the Project area is provided by the Scofield Reservoir, Utah (1991); and Scofield, Utah (1991) 7.5-minute U.S. Geological Survey (USGS) quadrangles.

The first parcel consists of a 160.53-acre (64.96 hectare) area for a new Bleeder Shaft pad covering portions of Sections 26, 27, 34, and 35, Township 12 South, Range 6 East. Due to signage forbidding access and sheep grazing at the time of the survey, approximately 24.01 acres (9.72 hectares) were not surveyed in the northernmost portion of this parcel (refer to cross-hatched area in Figure 2-1). The second parcel consists of an area covering 7.75 acres (3.14 hectares) for a new Stacker Tube Mine Site Expansion area due west of the existing facilities at the Skyline Mine. This facility covers portions of the southwest corner of Section 13, Township 13 South, Range 6 East. The third parcel consists of a 2.7-mile-(4.3 kilometer) long transmission line running from the Skyline Mine facility to Swen's Canyon to the southwest. This linear corridor encompasses portions of Sections 13, 23, 24, 26, and 27, Township 13 South, Range 6 East. Per discussions with the USFS (Manti-La Sal National Forest) archaeologist, a 200-foot (61 meter) wide corridor was surveyed; a total of 64.12 acres (25.95 hectares). The fourth and final parcel consists of a 12.99-acre (5.26 hectare) area for a new pad at the mouth of Swen's Canyon. This facility covers a portion of the northwest corner of Section 27, Township 13 South, Range 6 East.

ENVIRONMENTAL OVERVIEW

The Project area lies in the Wasatch Plateau Section of the Basin and Range – Colorado Plateau Transition Physiographic province (Stokes 1986:247). This Transition Zone exhibits characteristics of both the Basin and Range and Colorado Plateau Physiographic provinces. The Basin and Range Province is characterized by broad flat desert valleys and basins divided by parallel, north-south trending mountain ranges; while the Colorado Plateau Province includes higher elevations and a generally more mountainous environment (Fenneman 1931). The Wasatch Plateau is the largest of eight elevated tablelands that trend north-to-south through central and southern Utah, known collectively as the High Plateaus of Utah (Geary 1996:2). The Wasatch Plateau is the only one capped entirely by sedimentary rocks (Stokes 1986:247). The Price/Spanish Fork Rivers form the northern boundary of the Plateau, and Salina Canyon marks the southern border. The Wasatch Plateau is an erosional remnant undergoing geological removal along a ragged eastern margin and a summit protected by thin resistant Paleocene-age Flagstaff Limestone (Stokes 1986:247). The eastern edge is a continuation of the Book Cliffs. The western edge of the Wasatch Plateau is marked by an abrupt descent of beds along the Wasatch Monocline (Stokes 1986:247). Huntington Creek, south and west of the Project area, is one of several permanent streams traversing the Plateau. Elevations in the Project area range from about 8,700 feet (2,652 meters) to more than 9,655 feet (2,943 meters) above mean sea level.



General Project Location
Figure 1

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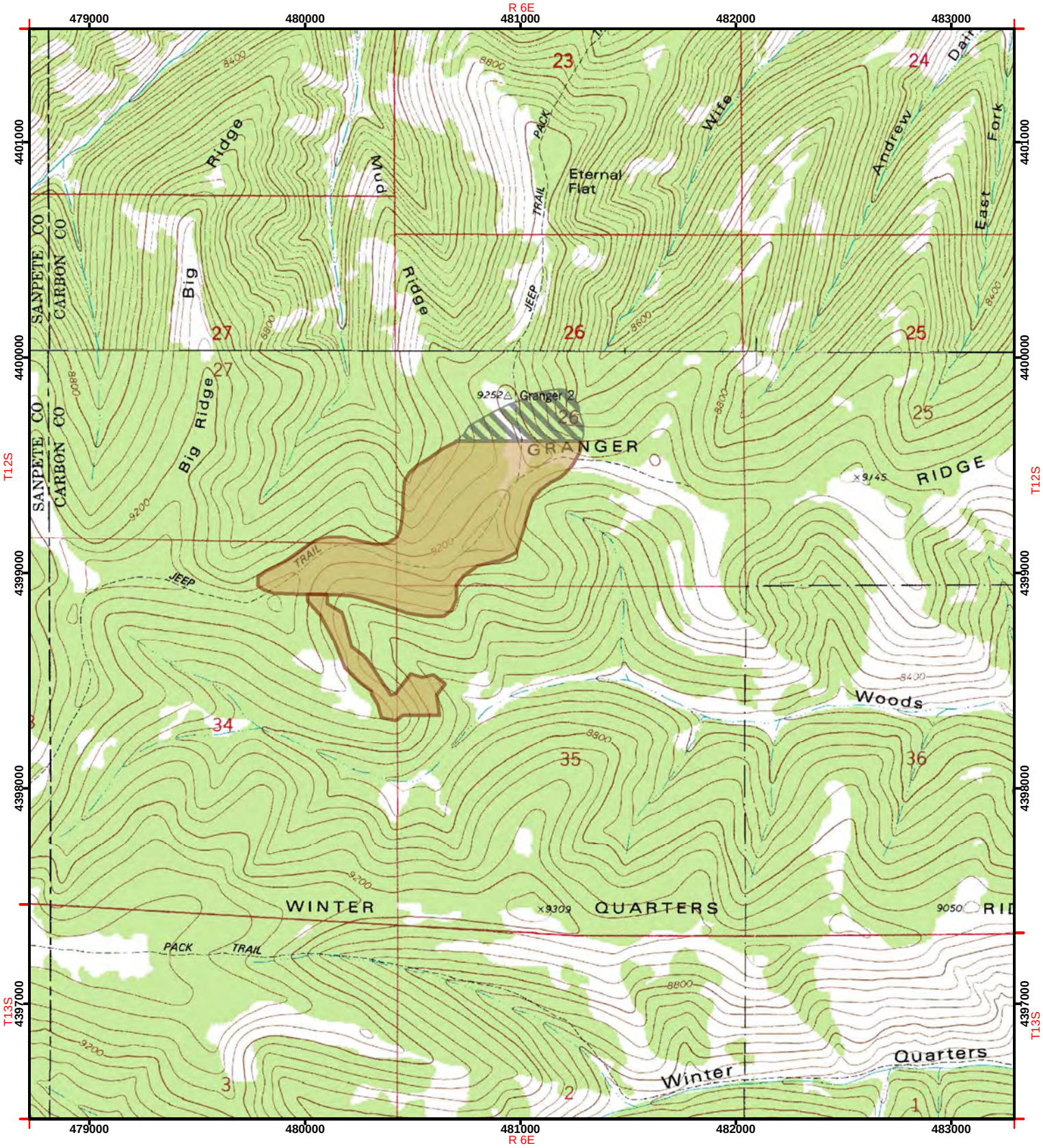

Legend

Project Reference

- Location of Areas Surveyed
- Location of Areas Not Surveyed Access Denied

0 100 200 400 600 800 1,000 Meters

0 300 600 1,200 1,800 2,400 3,000 Feet

USGS Quadrangle: Scofield Reservoir; Scofield

1:24,000

UTM 12 North
North American 1983

FIGURE 2-1 DETAILED PROJECT LOCATION MAP

BOWIE RESOURCES - SKYLINE MINE EXPANSION AND TRANSMISSION LINE CONSTRUCTION PROJECT

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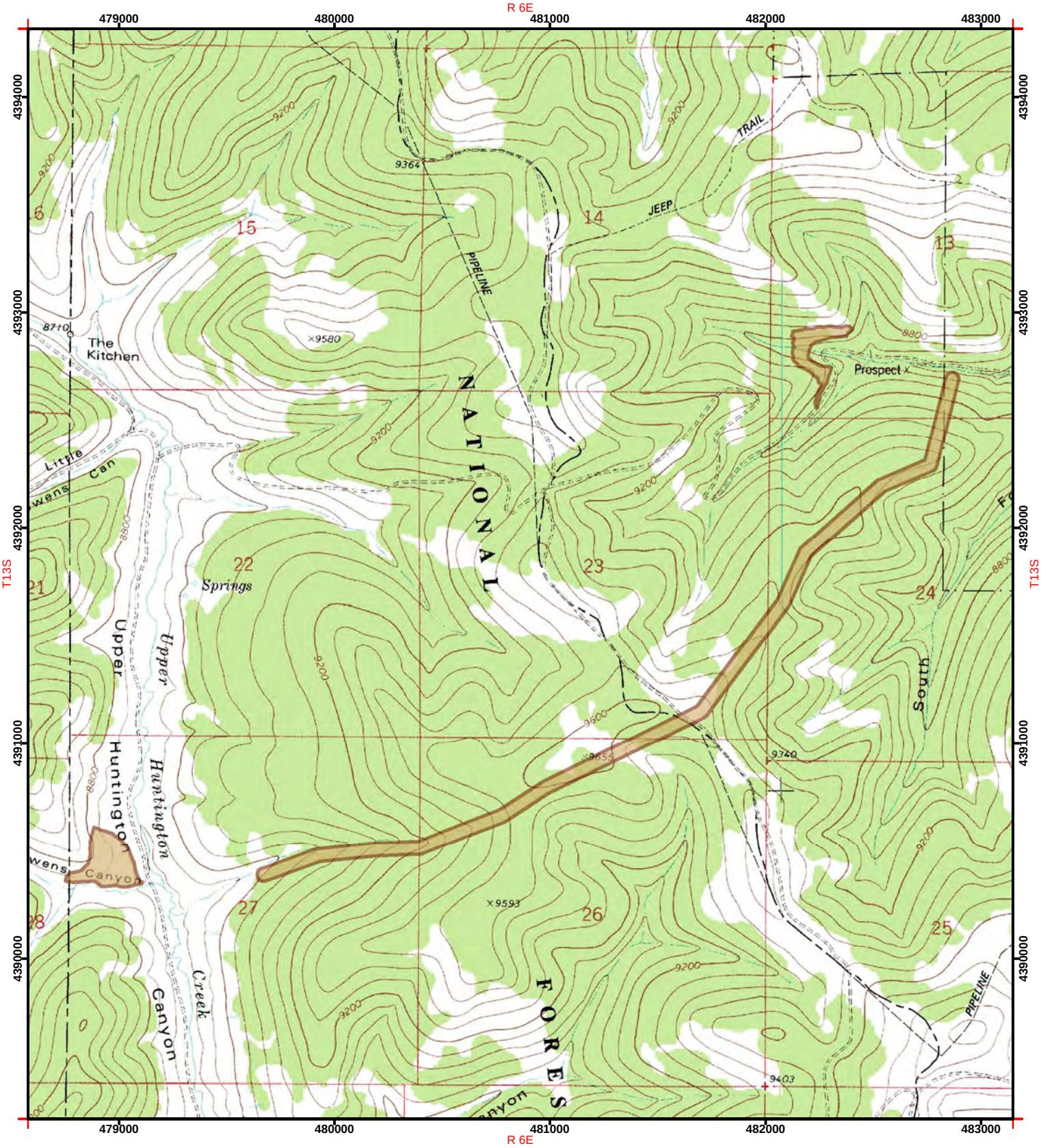

Legend

Project Reference

- Location of Areas Surveyed
- Location of Areas Not Surveyed Access Denied

0 100 200 400 600 800 1,000 Meters

0 300 600 1,200 1,800 2,400 3,000 Feet

USGS Quadrangle: Scofield
1:24,000
UTM 12 North
North American 1983

FIGURE 2-2 DETAILED PROJECT LOCATION MAP

BOWIE RESOURCES - SKYLINE MINE EXPANSION AND TRANSMISSION LINE CONSTRUCTION PROJECT

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Soils

Sediments consist predominantly of well-drained sandy and stony loams of the Curecanti family-Pathead complex, as well as stony and clay loams of the Trag-Croydon complex (Natural Resources Conservation Service [NRCS] 2014).

These sediments occur on mountain slopes and flanks and are composed mostly of colluvium and/or slope alluvium over residuum derived from weathered sandstone and shale (NRCS 2014).

Vegetation

Plant communities occurring in and immediately surrounding the Project area contain taxa characteristic of the Canadian Life Zone (Cronquist et al. 1972). Vegetation is dominated by species associated with the Greasewood/Shadscale vegetation community. Observed plants include quaking aspen (*Populus tremuloides*), Engelmann spruce (*Picea engelmanii*), sagebrush (*Artemisia* spp.), yarrow (*Achillea millefolium*), grasses, and herbaceous plants. Non-native Russian thistle (*Salsola* spp.) was also observed throughout the Project area.

The vegetation communities here have been subjected to more than 100 years of grazing activities that have altered the natural distribution of plants in the area. Visible disturbances consist of road construction and maintenance and grazing trails associated with ranching and grazing activities.

CULTURAL OVERVIEW

The prehistory of the eastern Great Basin and northern Colorado Plateau is commonly divided into several periods, each thought to represent a distinct subsistence strategy and way of life. While terminology sometimes differs between researchers, the basic periods are (1) Paleoindian (12,000 to 9,000 B.P. [Before the present]); (2) Archaic (8,500 to 1,500 B.P.); (3) Formative (1,500 to 600 B.P.); and (4) Late Prehistoric (600 to 150 B.P.). Many descriptions of the prehistoric archaeological complexes of the region have appeared elsewhere, and should be consulted for a fine-grained and comprehensive description of each (Aikens and Madsen 1986; Madsen and Simms 1998; Marwitt 1986; Kelly 1997; Janetski 1991; Callaway et al. 1986; Jennings 1978; Simms 2008).

The European-American history of the region has also been documented by other researchers (Watt 1997; Geary 1996), whose works should be reviewed for a detailed description of the events and individuals relevant to this period. Briefly, the first Euroamerican settlers in the region consisted of stockmen from Utah Valley—S. J. Harkness, T. H. Thomas, William Burrows, O. G. Kimball, D. D. Green, A. H. Earl, and R. McKecheney who were attracted by the immense ranges for their cattle—who brought their herds to Pleasant Valley (where Scofield Reservoir is today) in 1875 (Dilley 1900).

Coal was discovered in Pleasant Valley in 1875, and 2 years later a small mine was opened on the western slopes of the canyon. The winter of 1877 came early and was very severe, stranding

the miners and keeping them snowbound until the following February. The ordeal led the miners to name their forced camp "Winter Quarters," which became one of the first commercial coal mines in the state (Carr 1972:73). Most the first miners at Winter Quarters were Mormon converts from the coal districts of Wales, England and Scotland. The Denver and Rio Grande Western Railroad Company acquired the Pleasant Valley Coal Company in 1882 and undertook the development of a new mine on Mud Creek, a mile from Winter Quarters. As the local Mormon Bishop, David Williams, controlled the local miners, the Pleasant Valley Coal Company brought in Chinese laborers to work the Mud Creek mine. Soon a large contingent of Finns was recruited, along with Italian, Greek, and other Scandinavian workers (Geary 2002). Scofield had a population of roughly 700 people in 1890 (Carr 1972:74).

Mining thrived in Pleasant Valley until 1900, when an errant spark touched off the fine haze of coal dust deep underground, and the Winter Quarters #4 mine exploded (Carr 1972:73; Powell 1994:491). One hundred men were killed instantly, and another ninety-nine died from the poisonous afterdamp, making this one of the worst coal mine disasters in history (Carr 1972:73; Powell 1994:491).

Mining continued, and Scofield, sustained by several mines in Pleasant Valley, was still the largest town in Carbon County. In 1915, Scofield's citizens made an attempt to have the county seat moved to their community from Price, Utah. By the 1920s, however, the coal industry in Pleasant Valley was in decline, and most mines ceased operation, causing the town to lose nearly all 2,000 of its residents. The Winter Quarters mines continued to operate until 1928 (Carr 1972:73).

During this same period, roughly 1875 to the 1950s, the small community of Clearcreek thrived. Located in the southern end of Pleasant Valley, Clearcreek began as a small logging and milling camp supplying timbers for the mines around Winter Quarters and Scofield during the 1870s and 1880s (Carr 1972:75). High quality coal deposits were discovered around 1896 and mine development began immediately. In 1900, the Utah Fuel Company, a subsidiary of the Denver and Rio Grande Western Railroad Company, built 25 homes and duplexes, a hotel, store, hospital, schoolhouse, and water system (Carr 1972:75). Between 1910 and 1920, operations produced roughly 2,000 tons of coal per day, and the town boasted a population of roughly 600 (Carr 1972:75). This production was short-lived, however, and by 1930 only 250 people remained. By the middle 1950s, the town was virtually abandoned. Today, Clearcreek is a quiet summer resort (Carr 1972:75).

The Skyline mine, located in Eccles Canyon south of Scofield, began production in the early 1980s, when Coastal Corporation bought the leases from Energy Fuels Company and developed three sets of mine entries, the #1 mine, #2 mine and #3 mine. The #2 mine closed in the mid to late 1980s and the #1 in the 1990s. The #3 mine has been operating almost the entire time (excerpted from http://geology.utah.gov/utahgeo/energy/coal/coaltour/mines/skyline.htm).

PREVIOUS PROJECTS AND RECORDED CULTURAL RESOURCES

A file search for previously recorded cultural resource sites and previously conducted surveys within 1-mile of the current Project area was conducted on July 14, 2014, by EPG archaeologist

Andy Yentsch at the Utah Division of State History, Utah State Historic Preservation Office (SHPO), in Salt Lake City. In addition, the NRHP, the Utah State Register of Historic Places, the Utah Linear Sites Database, and the historic sites database at the SHPO were examined to determine if additional historic resources, historic structures, or historic sites not in the SHPO archaeological records have been documented in the vicinity of the Project area. The searches identified 55 cultural resources projects and 33 cultural resources sites within 1 mile of the current Project area (Table 1). Five of these projects occur within the current Project area. No previously recorded sites are located in the current Project area.

TABLE 1
PREVIOUS CULTURAL RESOURCES PROJECTS WITHIN 1 MILE OF THE PROJECT

State Project No.	Report Title	Organization
U75AF0067	Archaeological Reconnaissance During 1975 in the Scofield Locality	Archaeological Environmental Research Corporation (AERC)
U76AF0179	Access Routes & Drill Stations-Winter Quarters Area	AERC
U76AF0189	Access Roads and Drill Stations on Winter Quarters. P#184.	AERC
U76FS0180	Eccles Canyon Timber Sale	USFS
U79AF0477	Archaeological Reconnaissance in the Vicinity of Eccles Canyon	AERC
U79AF0478	Archeological Survey in the Eccles Canyon Locality	AERC
U80AF0705	Whiskey Creek Canyon-Pleasant Valley Project Area	AERC
U80AF0711	Archeological Surface Evaluations in the Skyline Project	AERC
U80BL0710	Cultural Investigation of Two USGS Drill Sites	Bureau of Land Management (BLM)
U81AF0924	Cultural Resources Evaluations above Huntington Canyon/Scofield Reservoir	AERC
U81AF0925	Road Realignment in the Eccles Canyon Locality	AERC
U81AF0983	Six Seis Lines in the Upper Eccles Canyon Vicinity	AERC
U81BC0950	Husky Oil Brooks Fed. 9-33 Road Upgrade	BYU - Office Of Public Archaeology (BYU-OPA)
U81BC0951	Soldier Summit/Clear Creek Coastal Coal Mine Tap	BYU-OPA
U82BC0838	Husky Oil Brooks Fed. 6-35 Road and Drill Site	BYU-OPA
U84AF0474	Four Proposed Coal Exploration Wells/Winter Quarters Ridge	AERC
U84AK0060	Cultural Resources Inventory near Clear Creek for Valley Camp of Utah	Archaeological Research Consultants
U84DF0396	Hist Coal Mining in Bear Canyon, Scofield, and along Gordon Creek	Desert West
U88AF0323	Mine Portal Breakout in Eccles Canyon	AERC
U89DH0594	Mainline #41 Reroute: Questar Skyline Mine	Dames and Moore
U90AF0463	Conveyor Corridor in Eccles Canyon	AERC
U90AF0480	3 Wells & Access-Winter Quarters Canyon/Granger Ridge	AERC
U90AF0488	Conveyor Corridor--Eccles Canyon--No. 2	AERC
U90FS0451	Addendum Questar Pipeline Main Line #41	USFS
U90FS0452	Addendum Questar Pipeline Main Line	USFS
U92AF0380	Two Seismic Lines in the Skyline Lease Area	AERC
U92FS0240	Eccles Sheep and Goat Allotment Spring Development	USFS
U93FS0404	1993 Price District Spring Developments	USFS
U93FS0426	Burnout Gate & Pontown/Paradise Structures	USFS
U94FS0347	Price District Water Trough and Guzzlers	USFS
U94FS0452	Huntington Canyon Interpretive Sites	USFS

TABLE 1 PREVIOUS CULTURAL RESOURCES PROJECTS WITHIN 1 MILE OF THE PROJECT		
State Project No.	**Report Title**	**Organization**
U95AF0252	Drill/Seismic Investigations-Upper Huntington & Winterquarters CB/EM/SP	AERC
U95FS0577	CRI of 8 Communication Sites	USFS
U96AF0524	Winter Quarters Canyon Drill Holes & Access Routes	AERC
U97AF0422	2 Drill Holes & Access in Upper Huntington Canyon	AERC
U97AF0586	Maxon Technologies Skyline Mine Drill Holes	AERC
U97SC0457	Anschutz Access	Senco-Phenix
U99MM0366	Ruby Pipeline	Metcalf Archaeological Consultants
U99SC0569	Skyline Mine Subsidence Area and Access Road	Senco-Phenix
U99ST0355	Questar Main Line 104 Pipeline 40/41 Loop	SWCA
U00ST0740	Williams Pipeline	SWCA
U01EP0728	Upgrade of the Powerline Near Boardinghouse Canyon For Skyline Coal	Earth Touch
U01FS0580	Boardinghouse Canyon Gas Well Access Road	USFS
U01FS0581	Boardinghouse Canyon Coal Subsidence Reclam.	USFS
U01MQ0458	Talon Scofield Coal Mine Survey	Montgomery Archaeological Consultants (MOAC)
U01MQ0459	Canyon Fuels Flat Canyon Coal Inventory	MOAC
U01MQ0543	Canyon Fuels James Canyon Drill Location	MOAC
U02EP0409	Winter Quarters	Earth Touch
U02FS0480	Water Measuring Device Cleveland Reservoir Telemetry Station Electric Lake	USFS
U03EP0760	Three drill locations for winter quarters SUFCO mine	Earth Touch
U05EP0710	Winter Quarters Drilling	Earth Touch
U05FS1530	West Scofield	USFS
U06EP0818	Winter Quarters 2006 Drilling	Earth Touch
U06EP1857	Woods Canyon 2007 Drilling	Earth Touch
U09EP0054	Woods Canyon Drilling - Skyline	Earth Touch

GENERAL LAND OFFICE MAPS REVIEW AND FIELD INVESTIGATION

As part of the records search, a search of the General Land Office (GLO) survey plats available at the BLM Internet public access site (www.ut.blm.gov/ LandRecords/search_plats.cfm) was conducted on July 15, 2014. All available GLO maps for the Project area were reviewed for the presence of historic features and transportation routes (GLO 1883a, 1883b, 1894, 1896, 1938, and 1939). The purpose of these record searches was to identify potential historic resources (e.g., features, transportation routes, and telecommunications lines) that could be encountered during the field inventory. The review identified no historic resources located in the Project area.

METHODOLOGY

Intensive-level (Class III) cultural resources inventories were completed for 245 acres (99.15 hectares) of USFS (Manti-La Sal National Forest) administered property in Carbon and Emery Counties, Utah, centered roughly on the Skyline Mine, west of the community of Scofield, Utah.

The Project area was identified using a differentially correctable Trimble GeoXT GeoExplorer 2008 Series handheld global positioning system (GPS) unit in conjunction with aerial photographs, topographic landforms, access roads, and Project maps as points of reference.

The Class III pedestrian survey was completed by two archaeologists walking parallel transects spaced no more than 15 meters (50 feet) apart. Ground surface visibility was at or near 100 percent over the entire Project area.

For the purposes of this inventory, the criteria set forth in the BLM Guidelines (BLM 2002:6) were used to define sites and isolated occurrences (IOs). A site was defined as 10 or more artifacts representing a single artifact class in a 30-foot (10-meter) area, or at least 15 artifacts representing two artifact classes in a 30-foot (10-meter) area, that date prior to 1964. IOs were defined as a group of nine or fewer artifacts located in a 30-foot (10-meter) area and dating prior to 1964.

All archaeological sites more than 50 years old encountered during the inventory were documented on Intermountain Antiquities Computer System site forms (IMACS 1992). Pursuant to Utah SHPO guidelines, all sites were photographed using color digital photography. Photographs were taken of diagnostic artifacts, cultural features, and site overviews. Cultural resources site boundaries, cultural features, and notable natural topographic features were mapped.

Recordation of IOs included the collection of Universal Transverse Mercator (UTM) coordinates, a brief description of any defining attributes or characteristics, and a description of any distinguishing trademarks. IOs also were photographed to aid in further analysis.

All site and isolate locations were documented in the field with a differentially correctable Trimble GeoXT, GeoExplorer 2008 Series GPS unit using North American Datum, 1983 (NAD83) coordinates. After differential correction and plotting, the data is presented in units based on NAD83. GPS data were post-processed using GPS Pathfinder Office version 5.30 software. Maps were created by projecting sites onto geo-referenced 7.5 minute USGS quadrangle maps using ESRI ArcGIS 10 software.

National Register of Historic Places Evaluation Criteria

Cultural resources include archaeological, historical, or architectural sites, districts, buildings, structures, places, and objects. The significance of a cultural resource depends on whether or not it contains data, or the potential for data, of importance to either current archaeological method and theory or regional prehistory or history. Sites are evaluated by applying the criteria outlined in 36 Code of Federal Regulations (CFR) 60.4, which states:

> The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:
>
> (A) are associated with events that have made a significant contribution to the broad patterns of our history; or

(B) are associated with the lives of persons significant in our past; or

(C) embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(D) have yielded, or may be likely to yield, information important in prehistory or history.

Recommendations regarding site eligibility for the NRHP were made based on retention of historic integrity and the four criteria outlined above. Based on experience and professional judgment, sites found not to retain integrity and/or meet these criteria are recommended not eligible for the NRHP. Those sites found to retain integrity and meet one or more of the four criteria, as set forth in 36 CFR 60.4, are recommended eligible for the NRHP. Individual site NRHP recommendations, based on the four criteria, are provided in the site discussion.

INVENTORY RESULTS AND RECOMMENDATIONS

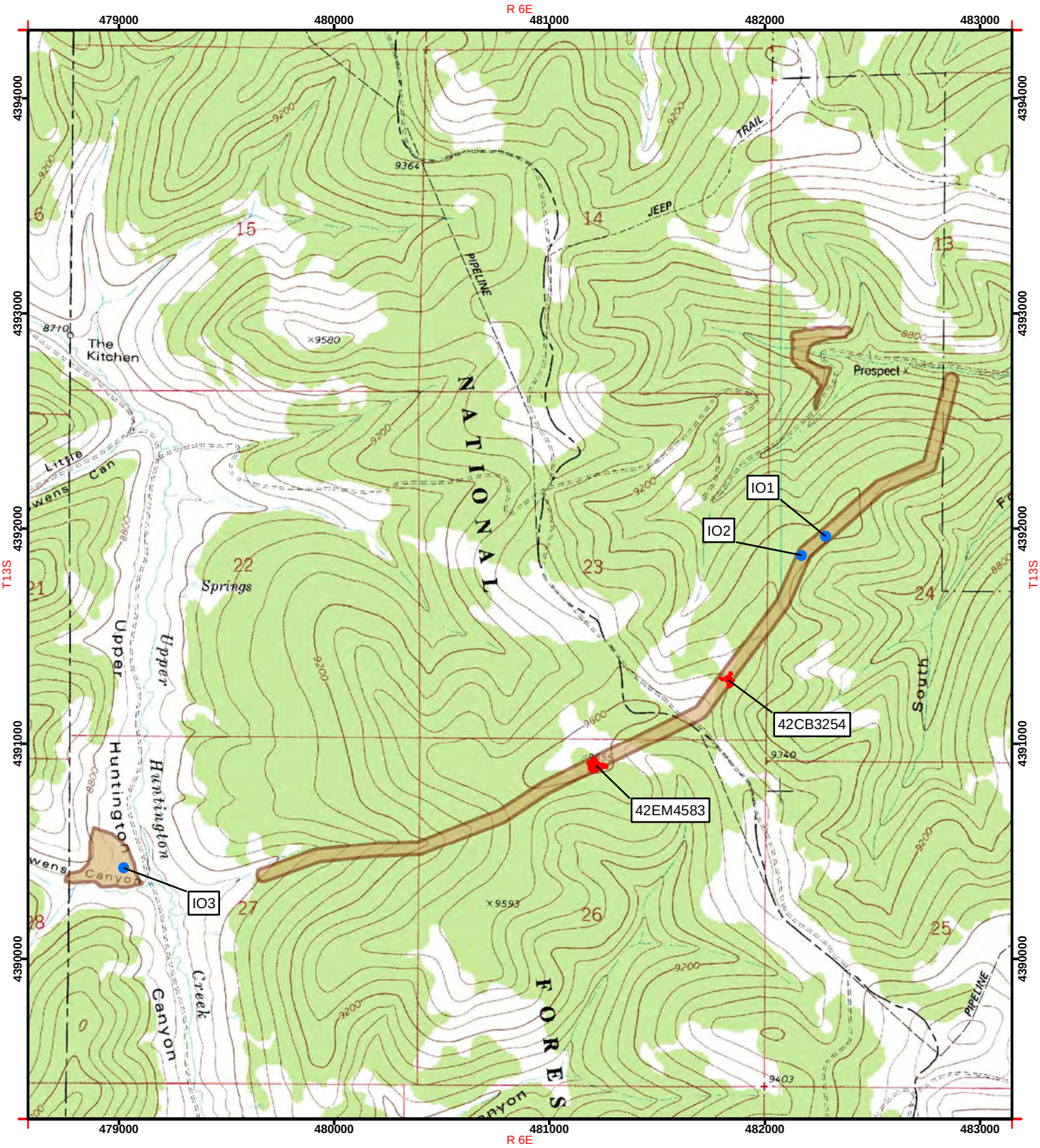
Class III cultural resources inventories were completed for the Project by EPG archaeologists Andy Yentsch and John Curl on August 7, 2014; and by Andy Yentsch and Suzy Eskenazi on September 29, 2014. The purpose of the cultural resources inventories was to locate, record, and assess the significance of all cultural resources located in the Project area. Three new cultural resources sites (42CB3253, 42CB3254, and 42EM4583) and five IOs were encountered and documented during the pedestrian surveys completed for the Project (Figures 3-1 and 3-2).

Isolated Occurrences

Five IOs (IO1 through IO5) were identified, documented, and mapped *in situ* during the pedestrian surveys (Table 2; Figures 3-1 and 3-2). These items do not meet the standards for a site as defined in the *Guidelines for Identifying Cultural Resources* (BLM 2002:6). Recordation consisted of a description of the items, including type and measurements, and photographs were taken. Object locations were mapped based on UTM data gathered using a differentially correctable Trimble GeoXT, GeoExplorer GPS unit, and the items comprising IO3 were left *in situ.*

TABLE 2
ISOLATED OCCURRENCES RECORDED IN THE PROJECT AREA

Isolate Number	Description	UTM Easting	UTM Northing
IO1	Single dendroglyph/aspen carving dating 1911.	482284	4391963
IO2	Single dendroglyph/aspen carving dating 1911.	482172	4391874
IO3	Three (3) chert interior core reduction flakes in a 5 meter area.	479021	4390423
IO4	Single dendroglyph/aspen carving dating 1898.	480138	4398661
IO5	Single dendroglyph/aspen carving dating to the 1940s.	480180	4398606



Legend

Project Reference

- Isolate
- Cultural Site
- Location of Areas Surveyed
- Location of Areas Not Surveyed Access Denied

0 100 200 400 600 800 1,000 Meters

0 300 600 1,200 1,800 2,400 3,000 Feet

USGS Quadrangle: Scofield
1:24,000
UTM 12 North
North American 1983

FIGURE 3-2 - Location of Recorded Historic Properties and Isolates

BOWIE RESOURCES - SKYLINE MINE EXPANSION AND TRANSMISSION LINE CONSTRUCTION PROJECT

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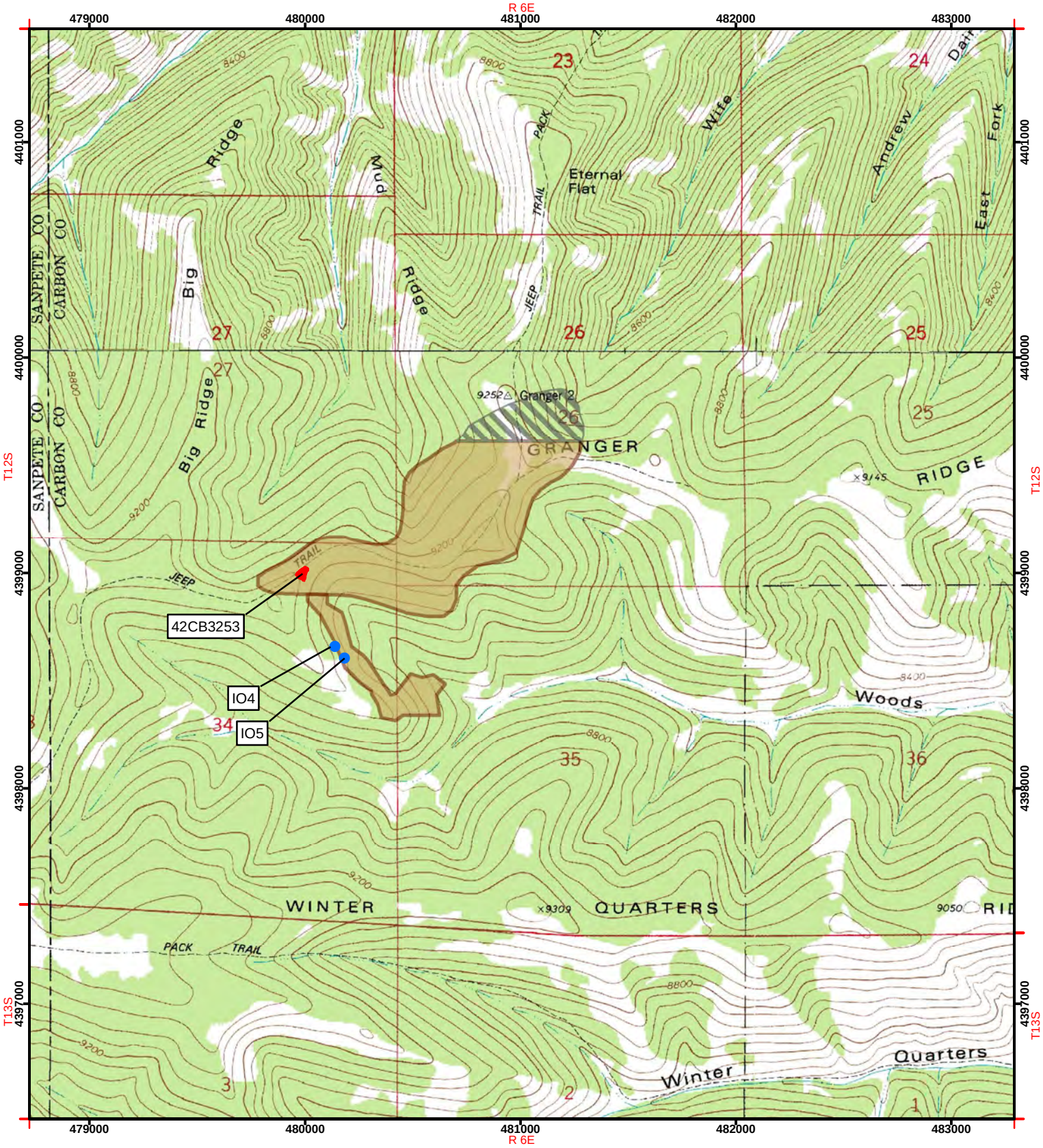

Legend

Project Reference

- Isolate
- Cultural Site
- Location of Areas Surveyed
- Location of Areas Not Surveyed Access Denied

0 100 200 400 600 800 1,000 Meters

0 300 600 1,200 1,800 2,400 3,000 Feet

USGS Quadrangle: Scofield Reservoir; Scofield

1:24,000

UTM 12 North
North American 1983

FIGURE 3-1 - Location of Recorded Historic Properties and Isolates

BOWIE RESOURCES - SKYLINE MINE EXPANSION AND TRANSMISSION LINE CONSTRUCTION PROJECT

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IO1

IO1 consists of a single culturally modified tree (CMT). This tree displays three illegible initials and the date "1911". The tree measures 135 centimeters in circumference. The inscription measures 32.3 centimeters high and 36.1 centimeters wide. Other, out-of period inscriptions occur on trees in the immediate area.

Photograph 1 Close up of IO1, a single Aspen carving with the date "1911." Initials not really legible. View is to the southwest.

IO2

IO1 consists of a single CMT. This tree displays three illegible initials and the date "Aug. 31, 1911." The tree measures 201 centimeters in circumference. The inscription measures 28.2 centimeters high and 47.4 centimeters wide. Other, out-of period inscriptions occur on trees in the immediate area.

Photograph 2 Close up of IO2, a single Aspen carving with the date "Aug. 31, 1911." Initials not really legible. View is to the southwest.

IO3

IO3 consists of three pieces of white-and-brown mottled chert lithic debitage found on the north side of the mouth of Swen's Canyon. All three pieces represent interior core reduction flakes and were found within 5 meters of each other.

Photograph 3 Plan view of IO2, three chert flakes found in a 5-meter area.

IO4

IO4 consists of a single CMT. This tree displays the name "RH Jackson", carved in print-form, and the date "1898". The tree measures 141.5 centimeters in circumference. The inscription measures 46.2 centimeters high and 107.5 centimeters wide. No other inscriptions were observed in the immediate area.

Photograph 4 Close up of IO4, a single Aspen carving with the date "1898." View is to the southwest.

IO5

IO5 consists of a single CMT. This tree displays the name "Dale Allred", carved in script, and the date "194_". The last digit in the date is not legible. The tree measures 246.4 centimeters in circumference. The inscription measures 46.2 centimeters high and 82.3 centimeters wide. No other inscriptions were observed in the immediate area.

Photograph 5 **Close up of IO5, a single Aspen carving with the date in the 1940s. The last digit in the date is not legible. View is to the southwest.**

Cultural Resources Sites

Three new cultural resources sites (42CB3253, 42CB3254, and 42EM4583) were encountered during the present inventory (Table 3 and Figures 3-1 and 3-2), all of which represent clusters of CMTs/aspen carvings. All encountered sites were evaluated for NRHP eligibility. None of the sites are recommended eligible for the NRHP. As such, the present Project will have no adverse effect on the sites and no further action will be needed. Site documentation, including IMACS site forms, photographs, site location maps, site sketch maps, and encoding forms are provided in Appendix A.

TABLE 3
CULTURAL RESOURCES SITES IDENTIFIED

Smithsonian Number	Site Type	NRHP Recommendation	Recordation Type
42CB3253	CMT/aspen carvings	Not eligible	New
42CB3254	CMT/aspen carvings	Not eligible	New
42EM4583	CMT/aspen carvings	Not eligible	New

42CB3253

Site Type:	CMTs/aspen carvings
Cultural/Temporal Affiliation:	1908-1963
Site Dimensions:	65 by 55 m (3,575 m^2)
NRHP Recommendation:	Not eligible

Site Description

Site 42CB3253 consists of an historic sheep camp and several CMTs/aspen tree carvings on a relatively flat, but northeast-trending ridgeline on the south side of Granger Ridge. A well-used bladed road runs through the northern periphery of the site. The site measures 65 m (N-S) by 55 m (E-W). The site consists of one thermal feature (F1), and both historic and modern CMTs located in a large aspen grove on the east-southeast side of a northeast-trending road. Nine in-period inscriptions were noted on eight aspen trees dating between 1908 and 1963. Historic inscriptions consist of individual names, initials, and/or a date. Out-of-period and modern carvings and graffiti were observed on approximately 14 trees. No artifacts were observed. It is unknown whether or not the thermal feature is associated with historic or modern camping activities in the area.

Site Interpretation

Site 42CB3253 represents a seasonal campsite/rest area used by sheep-herders while moving their herds from one area to another during the course of the year. Documented inscriptions demonstrate use of the area between 1908 and 1963 and to the present.

National Register Recommendation

Site 42CB3253 contains several historic and modern CMTs/aspen tree carvings. Although interesting, the carvings consist entirely of names and dates; no artistic images are present. The names represented in the aspen art are not known to be associated with historically significant people in the region. Although the series of carvings demonstrate multiple uses of this location for over 100 years, this site is not likely to provide additional data important to furthering the understanding of the historic occupation of the region. Therefore, site 42CB3253 is recommended not eligible for the NRHP.

42CB3254

Site Type:	CMTs/aspen carvings
Cultural/Temporal Affiliation:	1900-1954
Site Dimensions:	75 by 71 m (5,325 m^2)
NRHP Recommendation:	Not eligible

Site Description

Site 42CB3254 consists of several dendroglyphs/ aspen tree carvings on a relatively flat, but southwest-trending ridgeline northeast of the Trough Springs Ridge Road. The site measures 75 m (N-S) by 71 m (E-W). The site consists of both historic and modern CMTs. Fourteen in-period inscriptions were noted on 12 aspen trees dating between 1900 and 1954. Historic inscriptions consist of individual names, initials, and/or a date. Out-of-period and modern carvings and graffiti were observed on approximately 10 trees. No artifacts, sediment staining, or features were observed.

Site Interpretation

Site 42CB3254 represents a seasonal campsite/rest area used by sheep-herders while moving their herds from one area to another during the course of the year. Documented inscriptions demonstrate use of the area between 1900 and 1954 and to the present.

National Register Recommendation

Site 42CB3254 contains several historic and modern CMTs/aspen tree carvings. Although interesting, the carvings consist entirely of names and dates; no artistic images are present. The names represented in the aspen art are not known to be associated with historically significant people in the region. Although the series of carvings demonstrate multiple uses of this location for over 100 years, this site is not likely to provide additional data important to furthering the understanding of the historic occupation of the region. Therefore, site 42CB3254 is recommended not eligible for the NRHP.

42EM4583

Site Type:	CMTs/aspen carvings
Cultural/Temporal Affiliation:	1896-1955
Site Dimensions:	75 by 91 m (6,825 m^2)
NRHP Recommendation:	Not eligible

Site Description

Site 42EM4583 consists of several dendroglyphs/aspen tree carvings on a relatively flat, but southwest-trending ridgeline southwest of the Trough Springs Ridge Road. The site measures 75 m (N-S) by 91 m (E-W). The site consists of both historic and modern CMTs. Eight in-period inscriptions were noted on eight aspen trees dating between 1896 and 1955. Historic inscriptions consist of individual names, initials, and/or a date. Out-of-period and modern carvings and graffiti were observed on approximately 30 trees in the area. No artifacts, sediment staining, or features were observed.

Site Interpretation

Site 42EM4583 represents a seasonal campsite/rest area used by sheep-herders while moving their herds from one area to another during the course of the year. Documented inscriptions demonstrate use of the area between 1896 and 1955 and to the present.

National Register Recommendation

Site 42EM4583 contains several historic and modern CMTs/aspen tree carvings. Although interesting, the carvings consist entirely of names and dates; no artistic images are present. The names represented in the aspen art are not known to be associated with historically significant people in the region. Although the series of carvings demonstrate multiple uses of this location for over 100 years, this site is not likely to provide additional data important to furthering the understanding of the historic occupation of the region. Therefore, site 42EM4583 is recommended not eligible for the NRHP.

PROJECT SUMMARY

This report has been completed to provide cultural resources clearance for the potential Skyline Mine Expansion and Transmission Line Project in Carbon and Emery Counties, Utah. A total of 245 acres (99.15 hectares) were surveyed for this Project, resulting in the identification of three new cultural resources sites (42CB3253, 42CB3254, and 42EM4583), as well as five isolates (IO1 through IO5). The sites were thoroughly documented and evaluated for eligibility for inclusion in the NRHP. None of the sites are recommended eligible for inclusion in the NRHP. Therefore, the Project will have no adverse effect on those sites. Ultimately, clearance to proceed with the proposed mine expansion and transmission line construction discussed here is subject to agency review of this cultural resources evaluation by the USFS.

These investigations were conducted using techniques considered to be adequate for evaluating cultural resources available for visual inspection, and which could be adversely affected by the Project. However, should additional cultural resources be discovered during the course of construction activities, a report should be made immediately to the lead archaeologist at the appropriate land-management agency.

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Vegetation of the NOG Ventilation Site

2014

Skyline Mine
Carbon County, Utah

Aspen/Grass Reference Area

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INTRODUCTION

To continue mining in their North Graben (NOG) district, Canyon Fuel Company plans to construct a ventilation facility that will include a 1,425 ft bleeder shaft to accommodate an exhaust fan for the Skyline Mine. A short access road, a 50 ft x 80 ft pad, a topsoil pile, a backup generator and fuel tank will all be necessary for the facility. Total disturbance associated with the new site will be approximately 1.5 acres in which Canyon Fuel is proposing a permit area of about 4.2 acres.

The Skyline Mine is a coal mine with its surface facilities located about 5 miles by road (or 4 air-miles) southwest of the town of Scofield in Carbon County, Utah. The new ventilation facility will be located near Granger Ridge within the Manti-La Sal National Forest and approximately 4.5 air-miles north-northwest of Scofield. Located primarily in aspen stands (and the more open grasslands between them), elevation of the proposed permit area ranges from 8,900 ft to 9,200 ft above sea level.

METHODS

Quantitative Sampling

Methodologies used for this study were performed in accordance with the vegetation guidelines supplied by the State of Utah, Division of Oil, Gas and Mining (DOGM). In the growing season of 2014, quantitative and qualitative data were recorded in the plant communities proposed for disturbance along with the reference area that was chosen for future revegetation success standards.

Transect & Quadrat Placement

Random/regular placement of sample quadrats were designed to provide unbiased accuracy of the data compiled. This was accomplished by establishing several transect lines in the study areas. At regular intervals along the transect lines, random numbers were generated and used to measure distances at right angles from the line to determine sample locations.

Whether these random numbers were odd or even determined which side of transect line a given quadrat was placed.

Cover, Frequency & Composition

Cover estimates were made by employing ocular methods with meter square quadrats. Species composition and relative frequencies were also assessed from the quadrats. Plant nomenclature follows *A Utah Flora* (Welsh et al. 2008).

Density

Density estimates for the woody plant species on the proposed disturbed and reference areas were made using a distance method called the point-quarter technique. In this method, random points were placed on the sample sites and measured into four quarters. The distances to the nearest woody plant species were then recorded in each quarter. The average point-to-individual distance was equal to the square root of the mean area per individual.

Sample Adequacy

Sample adequacy for cover and density was attempted using the following formula.

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

where,

nMIN	= minimum adequate sample
t	= appropriate confidence t-value
s	= standard deviation
x	= sample mean
d	= desired change from mean

Threatened, Endangered, Candidate & Sensitive Species

The inventory of federally listed threatened, endangered and candidate plant species for Carbon County, Utah was consulted prior to field work in the study areas. Additionally, the State of Utah, Department of Natural Resources' biodiversity database was also consulted with regard to threatened, endangered or otherwise sensitive Species (TES) in the area. Finally, the USDA Forest Service Intermountain Region's list of proposed, endangered, threatened and sensitive species for the Manti-La Sal National Forest was consulted for possible impacts to such taxa by the proposed project. When applicable, these information sources would be used to drive sensitive species field surveys if any such species or habitats were known to be at or near the proposed new projects.

Photographs & Study Area Map

Several color photographs were taken of the sample areas some of which have been included in this report. An aerial image map showing the study area has also been prepared and included herein.

RESULTS

Aspen/Grass (Previously Disturbed)

A portion of the new access road that will be constructed in conjunction with the ventilation facility is located in an aspen area that had been disturbed previously by other activities. This area also appears to have been later re-seeded.

The vegetation in this previously disturbed area was sampled separately for comparison purposes. The only overstory species recorded here was aspen (*Populus tremuloides*). The most common understory plants were musk thistle (*Carduus nutans*), cheatgrass (*Bromus tectorum*), bluebunch wheatgrass (*Elymus spicatus*), mountain brome (*Bromus carinatus*), Sandberg's bluegrass (*Poa secunda*) and slender wheatgrass (*Elymus trachycaulus*). For a list of all species encountered in the sample quadrats, refer to Table 1.

Figure 1: Aspen/Grass (Previously Disturbed)

The total living cover for this area was estimated at 78.00%, of which 62.75% was from understory and 15.25% from overstory cover (Table 2-A). The composition of the understory cover was comprised of 62.46% grasses, 22.65% forbs and 14.89% trees and shrubs (Table 2-B).

When woody species density was measured, the total was only 174 individuals per acre (Table 3), with the dominant two species being aspen and red elderberry (*Sambucus racemosa*).

Aspen/Grass (Undisturbed)

Most of the remaining disturbance caused by the proposed construction activities for the access road, pad and topsoil pile will be in aspen communities and the associated open herbaceous areas between the aspen stands. Because there were several options and the *precise* location of the ventilation facility pad was still under consideration during the time that the vegetation data needed to be recorded (the growing season), a much larger area was sampled to represent the general plant community types once the final pad site was determined. Ultimately, the pad site will be placed within one of the general plant communities sampled.

The dominant overstory species for this community by far was aspen, but white fir (*Abies concolor*) was also encountered in the sample quadrats. The most common understory species were: mountain brome, bluebunch wheatgrass, musk thistle, western coneflower (*Rudbeckia occidentalis*) and aspen (Table 4).

Figure 2: Aspen/Grass (Undisturbed)

The total living cover for the Aspen/Grass community was estimated at 78.50%. The understory cover was 49.50% and overstory was 29.00% (Table 5-A). The composition for the understory consisted of 50.84% grasses, 31.79% forbs and 17.37% trees/shrubs (Table 5-B).

The total density for this area was also relatively inconsequential at 218 plants per acre, of which were mostly aspen trees (Table 6).

Aspen/Grass (Reference Area)

The plant community chosen to represent future revegetation success standards was located about 3.5 air-miles south of the ventilation facility. It was also used as a reference area for the proposed new powerline that runs from the mine's surface facilities to Swens Canyon. Called the Aspen/Grass Reference Area, this community's overstory was comprised of only quaking aspen. The understory dominants consisted of mountain brome, Sandberg's bluegrass and slender wheatgrass (Table 7).

Figure 3: Aspen/Grass (Reference Area)

Total living cover in this area was estimated at 80.33%; of that total, overstory and understory cover were estimated at 23.17% and 57.17%, respectively (Table 8-A). The composition of the understory here was comprised of 62.39% grasses, 23.07% forbs and 14.54% trees/shrubs (Table 8-B).

Like the community it was chosen to represent for final revegetation success standards, this area also had relatively few woody species per acre. The total woody species density was estimated at 68 plants per acre and consisted of quaking aspen and red elderberry (Table 9).

The summary tables referenced above are found on the following pages. *Subsequent to the summary tables, the following information has been provided*:

- Statistical comparisons data sets,
- An analysis of the threatened, endangered, candidate & sensitive species in the area,
- A final summary of the report,
- An aerial map of the study areas.

Data Summary Tables

Table 1: Skyline Mine Total cover, standard deviation and frequency by species (2014).

NOG Ventilation Facility Access Road
Aspen/Grass (Previously Disturbed) n=20

	Mean Percent	**Standard Deviation**	**Percent Frequency**
OVERSTORY			
Populus tremuloides	15.25	19.97	40.00
UNDERSTORY			
TREES/SHRUBS			
Populus tremuloides	1.00	4.36	5.00
Sambucus racemosa	8.50	13.61	30.00
FORBS			
Achillea millefolium	2.75	6.22	20.00
Carduus nutans	11.25	14.04	50.00
Lathyrus lanszwertii	0.25	1.09	5.00
Urtica dioica	0.50	2.18	5.00
GRASSES			
Bromus carinatus	6.75	10.87	35.00
Bromus tectorum	10.50	16.27	35.00
Elymus smithii	2.00	8.72	5.00
Elymus spicatus	8.75	10.94	45.00
Elymus trachycaulus	5.00	6.52	40.00
Poa secunda	5.50	12.34	30.00

Table 2: Skyline Mine. Total Cover and composition (2014).

NOG Ventilation Facility Access Road
Aspen/Grass (Previously Disturbed) n=20

	Mean Percent	**Standard Deviation**
A. TOTAL COVER		
Overstory Cover (o)	15.25	19.97
Understory Cover (u)	62.75	6.42
Litter	13.00	9.14
Bareground	11.95	6.46
Rock	12.30	7.25
Total Living Cover (o+u)	78.00	16.84
B. % COMPOSITION		
Shrubs	14.89	22.03
Forbs	22.65	20.85
Grasses	62.46	22.03

Table 3: Skyline Mine. Woody Species Density (2014).

NOG Ventilation Facility Access Road
Aspen/Grass (Previously Disturbed) n=20

SPECIES	**Number/Acre**
Artemisia tridentata	4.35
Chrysothamnus nauseosus	6.52
Chrysothamnus viscidiflorus	6.52
Populus tremuloides	84.81
Sambucus racemosa	65.23
Symphoricarpos oreophilus	6.52
TOTAL	**173.96**

Table 4: Skyline Mine Total cover, standard deviation and frequency by species (2014).

NOG Ventilation Facility Topsoil Pile, Access Road & Pad Site

Aspen/Grass (Undisturbed) n=30

	Mean Percent	**Standard Deviation**	**Percent Frequency**
OVERSTORY			
Abies concolor	1.67	8.98	3.33
Populus tremuloides	27.33	21.01	70.00
UNDERSTORY			
TREES/SHRUBS			
Populus tremuloides	4.67	7.30	33.33
Sambucus racemosa	1.17	4.41	6.67
Symphoricarpos oreophilus	0.67	3.59	3.33
FORBS			
Achillea millefolium	0.50	1.98	6.67
Carduus nutans	5.83	9.49	33.33
Lathyrus lanszwertii	2.33	4.23	23.33
Rudbeckia occidentalis	5.33	9.03	33.33
Thalictrum fendleri	0.67	3.59	3.33
Tragopogon dubius	0.67	3.59	3.33
Urtica dioica	0.33	1.80	3.33
Viola adunca	0.50	1.50	10.00
GRASSES			
Bromus carinatus	10.50	11.21	53.33
Elymus spicatus	10.17	14.40	10.00
Elymus trachycaulus	2.67	5.12	23.33
Poa secunda	3.50	11.63	13.33

Table 5: Skyline Mine. Total Cover and composition (2014).

NOG Ventilation Facility Topsoil Pile, Access Road & Pad Site

Aspen/Grass (Undisturbed) n=30

	Mean Percent	**Standard Deviation**
A. TOTAL COVER		
Overstory Cover (o)	29.00	20.75
Understory Cover (u)	49.50	16.09
Litter	14.83	8.11
Bareground	28.10	17.94
Rock	7.57	8.58
Total Living Cover (o+u)	78.50	17.23
B. % COMPOSITION		
Shrubs	17.37	27.97
Forbs	31.79	25.22
Grasses	50.84	26.23

Table 6: Skyline Mine. Woody Species Density (2014).

NOG Ventilation Facility Topsoil Pile, Access Road & Pad Site

Aspen/Grass (Undisturbed) n=30

SPECIES	**Number/Acre**
Abies concolor	5.44
Abies lasiocarpa	1.81
Populus tremuloides	193.94
Sambucus racemosa	16.31
TOTAL	**217.50**

Table 7: Skyline Mine Total cover, standard deviation and frequency by species (2014).

NOG VENTILATION FACILITY

Aspen/Grass (Reference Area) n=30

	Mean Percent	**Standard Deviation**	**Percent Frequency**
OVERSTORY			
Populus tremuloides	23.17	23.43	56.67
UNDERSTORY			
TREES/SHRUBS			
Populus tremuloides	3.50	11.19	10.00
Sambucus racemosa	2.50	7.72	16.67
FORBS			
Achillea millefolium	2.00	5.26	13.33
Cymopteris sp.	0.67	1.70	13.33
Helianthella uniflora	5.17	6.77	46.67
Lathyrus lanszwertii	1.33	2.87	20.00
Orthocarpus tolmiei	0.33	1.80	3.33
Rudbeckia occidentalis	2.83	7.38	13.33
Taraxacum officinalis	0.67	2.13	10.00
Viguiera multiflora	1.00	2.38	16.67
GRASSES			
Bromus carinatus	18.17	17.39	63.33
Elymus lanceolatus	0.17	0.90	3.33
Elymus spicatus	1.50	6.47	6.67
Elymus trachycaulus	8.17	11.65	40.00
Poa secunda	9.17	18.12	16.67

Table 8: Skyline Mine. Total Cover and composition (2014).

NOG VENTILATION FACILITY

Aspen/Grass (Reference Area) n=30

	Mean Percent	**Standard Deviation**
A. TOTAL COVER		
Overstory Cover (o)	23.17	23.43
Understory Cover (u)	57.17	17.50
Litter	13.80	5.76
Bareground	25.23	18.88
Rock	3.80	2.79
Total Living Cover (o+u)	80.33	15.65
B. % COMPOSITION		
Trees/Shrubs	14.54	31.53
Forbs	23.07	19.96
Grasses	62.39	29.26

Table 9: Skyline Mine. Woody Species Density (2014).

NOG VENTILATION FACILITY

Aspen/Grass (Reference Area) n=30

SPECIES	**Number/Acre**
Populus tremuloides	61.54
Sambucus racemosa	6.84
TOTAL	**68.38**

Statistical Analyses

Specific parameters for those plant communities that would be disturbed by the proposed construction activities were compared statistically with the reference area, or that area that could be used for revegetation success standards following final reclamation of the site. When **total living cover** values of the Aspen/Grass (Previously Disturbed) and the Aspen/Grass (Undisturbed) were compared statistically to the reference area, the differences were non-significant (Figure 4-A).

When the **total woody species density** values of these same communities were compared to the reference area, the differences were statistically significant (Figure 4-B). This, however, may be unimportant because none of these communities – those proposed for disturbance or the reference area – had high density values. Therefore, the final revegetation standard for woody species density could be set at the reference area value *or* the current proposed disturbance area values; either standard would be appropriate of final reclamation.

Figure 4. STUDENT'S T-TEST - NOG Bleeder Site at the Skyline Mine. Total living cover and woody species density comparisons between the proposed disturbed and reference areas (2014).

A. Total Living Cover

Aspen/Grass (Previously Disturbed): $\bar{x}$=78.00; s=16.84; n=20
Aspen/Grass (Reference Area): $\bar{x}$=80.33; s=15.65; n=30
t = 0.5003; df = 48; SL= NS

Aspen/Grass (Undisturbed): $\bar{x}$=78.50; s=17.23; n=30
Aspen/Grass (Reference Area): $\bar{x}$=80.33; s=15.65; n=30
t = 0.4306 ; df = 58; SL= NS

B. Woody Species Density

Aspen/Grass (Previously Disturbed): $\bar{x}$=173.96; s=163.62; n=20
Aspen/Grass (Reference Area): $\bar{x}$=68.38; s=39.98; n=30
t = 3.3819; df = 48 ; SL= p<0.01

Aspen/Grass (Undisturbed): $\bar{x}$=217.50; s=149.74; n=30
Aspen/Grass (Reference Area): $\bar{x}$=68.38; s=39.98; n=30
t = 5.2699; df =58; SL= p<0.01

$\bar{x}$= sample mean
s = sample standard deviation
n = sample size
NS = non-significant
t = Student's t-value
df = degrees of freedom
SL = significance level
p = probability level

Threatened, Endangered, Candidate & Sensitive Species

Table 10 provides a list of potential threatened, endangered, candidate and sensitive plant species known to occur in Carbon County as well as in the Manti-La Sal National Forest. The table also provides information about the likelihood of occurrence for each species in the proposed new ventilation site at the Skyline Mine.

Table 10: Federally listed threatened, endangered and candidate species for Carbon County[1], Utah (last updated January 12, 2012). The table also includes proposed, endangered, threatened and sensitive plant species in the Manti-La Sal National Forest[2] (last updated February 13, 2013).

ENDANGERED		**SITE-SPECIFIC NOTES**
THREATENED		
Astragalus montii [2]	Heliotrope milkvetch	This endemic plant is known to occur in Utah only on the Flagstaff Limestone formation in Sanpete and Sevier Counties and usually near or above 11,000 ft. elevation. The project area is not within the above-mentioned Utah counties. The study area is well below the elevation range for this species, and Flagstaff Limestone does not occur in the study area. The proposed project will not impact this plant species.
Penstemon grahamii [1] *(proposed)*	Graham penstemon	Graham penstemon is uncommon and is mostly found on shale and talus ledges in the Green River formation. This formation does not outcrop in the study area. There should be no impacts to this species as a result of proposed construction.

Table 10: Federally listed threatened, endangered and candidate species for Carbon County[1], Utah (last updated January 12, 2012). The table also includes proposed, endangered, threatened and sensitive plant species in the Manti-La Sal National Forest[2] (last updated February 13, 2013).		
Sclerocactus wetlandicus [1]	Uinta Basin fishhook cactus	*Sclerocactus wetlandicus* (also known as *S. glaucus* and *S. whipplei var. roseus*) generally occurs on cobblely, gravelly, or rocky surfaces on river terrace deposits along the White and Green Rivers of Utah. *S. wetlandicus* occurs on varying exposures, but is more abundant on south facing exposures, and on slopes to about 30 percent grade; it is most abundant at the point where river terrace deposits break from level tops to steeper side slopes. Plant communities and species associated with this species are bud sage, shadscale, black sagebrush and horsebrush. The above habitats and geologic formations are not found in the study area. Experience by the author with field studies/collections of this species resulted in the opinion that there is little chance for it to be present in the study area. This plant will not be impacted by the ventilation pad site or access road proposed by the Skyline Mine.
CANDIDATE		
SENSITIVE		
Allium geyeri var. chatterleyi [2]	Chatterley onion	This plant is a San Juan County, Utah endemic, probably collected in the Manti-La S al National Forest in the southeast portion of the state. The project area is significantly out of the range of the species. There should be no impact to this species as a result of construction in the study area.
Androsace chamaejasme ssp. carinata [2]	Sweet-flowered rock jasmine	The boreale rockjasmine is an alpine tundra plant and is known to be collected in La Sal Mountains in San Juan and Grand Counties, Utah. The project area is out of the range for the known collections of the species. There should be no impact to this species as a result of construction in the study area.

Table 10: Federally listed threatened, endangered and candidate species for Carbon County[1], Utah (last updated January 12, 2012). The table also includes proposed, endangered, threatened and sensitive plant species in the Manti-La Sal National Forest[2] (last updated February 13, 2013).		
Aquilegia flavescens var. rubicunda [2]	Link Canyon columbine	Knowing its habitat from experience by the author collecting this species resulted in the opinion that there is very little chance it would be present in the study area. There should be no impact to this species as a result of construction in the study area.
Astragalus iselyi [2]	Isely's milkvetch	The plant is known to occur on the west foothills of the La Sal Mountains in desert shrub and pinyon-juniper communities in Grand and San Juan Counties, Utah – mostly in Mancos Shale, Morrison and Paradox formations. The project area is outside the range for the known collections of the species. There will be no impact to this species as a result of construction in the study area.
Cryptantha creutzfeldtii [2]	Creutzfeldt-flower cryptanth	This plant has been collected in Mancos Shale, mostly in salt desert communities. The habitat is not found in the study area. Also, experience by the author with field studies/collections of this species resulted in the opinion that there is little chance it would be present in the study area. There will be no impact to this species as a result of construction in the study area.
Cymopterus beckii [2]	Pinnate spring-parsley	The endemic plant is known to occur only in Kane, San Juan and Wayne Counties, Utah, or well beyond the range of the project area. This plant will not be impacted by the ventilation pad site or access road proposed by the Skyline Mine
Draba abajoensis [2]	Abajo peak draba	In Utah, this plant has been collected in the Abajo Mountains in the southeast portion of the state, or well beyond the project area. There will be no impact to this species as a result of construction in the study area.

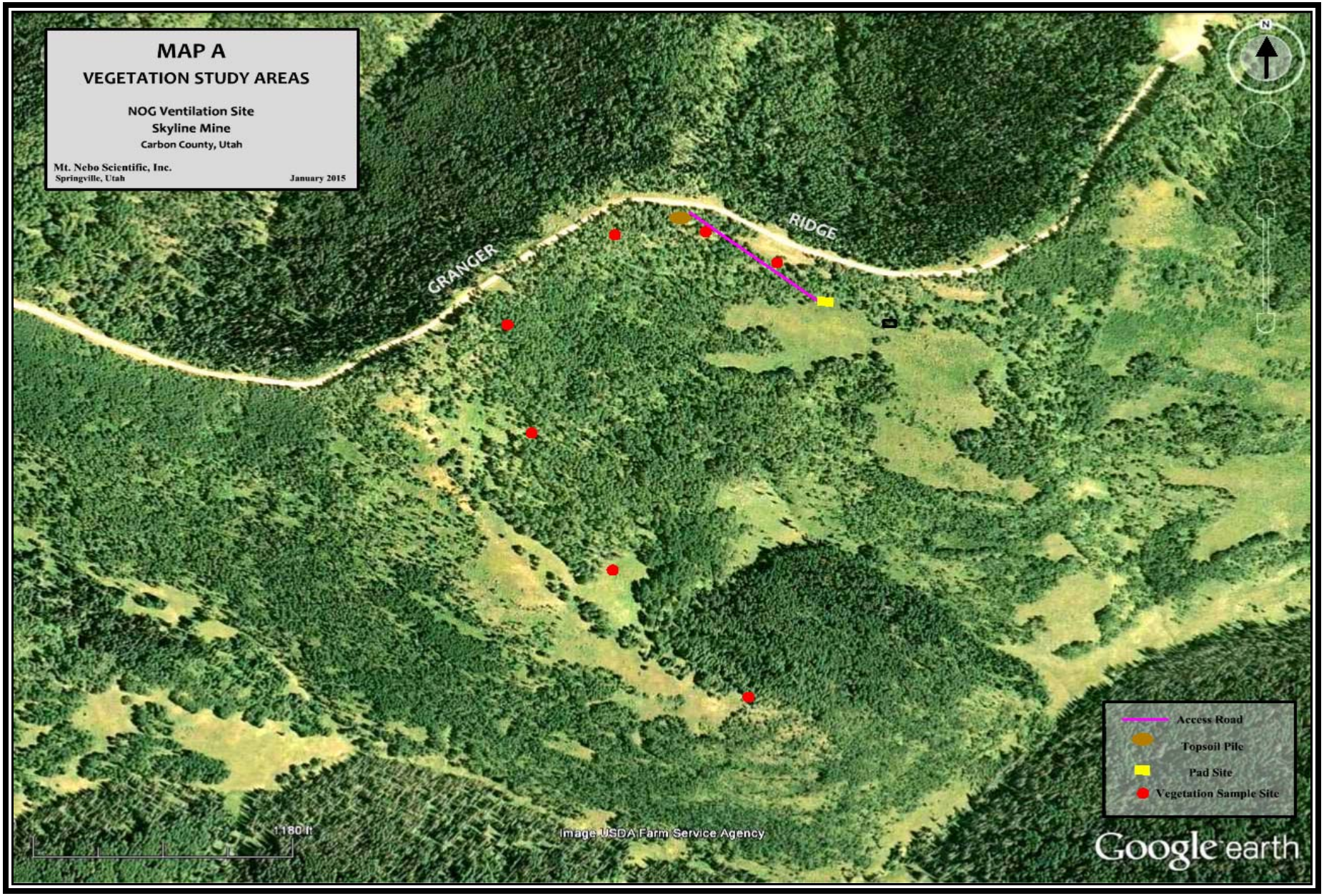
Table 10: Federally listed threatened, endangered and candidate species for Carbon County[1], Utah (last updated January 12, 2012). The table also includes proposed, endangered, threatened and sensitive plant species in the Manti-La Sal National Forest[2] (last updated February 13, 2013).		
Erigeron abajoensis [2]	Abajo daisy	This plant is an endemic known in Garfield, Piute, San Juan and Wayne Counties and not in Carbon and Emery Counties where the proposed construction is located. There is very little chance this species would occur in the study area so no impact is expected.
Erigeron carringtonae [2]	Carrington daisy	This plant is known to occur almost exclusively on the Flagstaff Limestone formation in Sanpete and Emery Counties. The study area is well below the elevation range of this species and Flagstaff Limestone does not occur in the area. The proposed project will not impact this plant species.
Erigeron kachinensis [2]	Kachina daisy	In Utah, this endemic plant species in known only in hanging gardens in San Juan County. The habitat and range for this species suggested there is almost no chance of impacts to it by the proposed construction.
Hedysarum occidentalis var. canone [2]	Canyon sweetvetch	Experience by the author with field studies/collections of this species resulted in the opinion that there is little chance it would be present in the study area. The study area does not have the habitat for this species. The project will not impact this plant.
Lomatium latilobum [2]	Canyonlands lomatium	In Utah, this plant species in known to occur on Entrada sandstone in Grand and San Juan Counties. The habitat and range for this species suggested there is almost no chance of impacts to it by the proposed construction.
Salix arizonica [2]	Arizona willow	Although this willow could occur relatively close to the project area, it is a riparian species. No impacts to riparian habitat is expected by the proposed construction projects. This plant will not be impacted by the ventilation pad site or access road proposed by the Skyline Mine

Table 10: Federally listed threatened, endangered and candidate species for Carbon County[1], Utah (last updated January 12, 2012). The table also includes proposed, endangered, threatened and sensitive plant species in the Manti-La Sal National Forest[2] (last updated February 13, 2013).		
Senecio musiniensis [2]	Musinea groundsel	This endemic plant is known to occur almost exclusively on ridgetops in the Flagstaff Limestone formation on talus slope on Musinea Peak in Sanpete County, Utah. The habitat and range for this species suggested there is almost no chance of impacts to it by the proposed construction.
Silene petersonii [2]	Maguire campion	This endemic plant is known to occur on plateau margins in Flagstaff and Claron formations in Garfield, Iron, Sanpete and Sevier Counties in Utah. The project area is not within the above counties. Also, the geology does not occur within the study area. The proposed project will likely not impact this plant species.

SUMMARY

Canyon Fuel Company has designed and engineered a ventilation facility to be constructed for the Skyline Mine near Granger Ridge located within the Manti-La Sal National Forest in Carbon County, Utah. The ventilation facility and its components will include: a pad, access road, topsoil pile, 1,425 ft bleeder shaft, exhaust fan, backup generator and fuel tank.

Construction of the site will necessitate disturbance to the vegetation supported in the area. The plant communities impacted will be Aspen/Grass types, some of which have were disturbed before, whereas others were present in their native condition. The plant communities types proposed for new disturbance were quantitatively sampled along with a reference area chosen to be used for final revegetation success standards. Additionally, a summary table prepared of the potential threatened, endangered, candidate and sensitive plant species known to occur in Carbon County, Utah as well as in the Manti-La Sal National Forest suggests there will likely be no impact to any of the species listed on that table by the proposed new construction site at the Skyline Mine.


MAP A
VEGETATION STUDY AREAS
NOG Ventilation Site
Skyline Mine
Carbon County, Utah
Mt. Nebo Scientific, Inc.
Springville, Utah
January 2015
GRANGER
RIDGE
Access Road
Topsoil Pile
Pad Site
Vegetation Sample Site
1180 ft
Image USDA Farm Service Agency
Google earth

Skyline Mine
North of Graben (NOG) Bleeder Shaft Area
Slope Stability Analysis

Canyon Fuel Company
Skyline Mine
Scofield, Utah

March 2015

REGISTERED PROFESSIONAL ENGINEER
No. 168246
RICHARD B. WHITE
15 Apr 2015
STATE OF UTAH

EarthFax EarthFax Engineering Group, LLC.

Engineers / Scientists
www.earthfax.com

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SKYLINE MINE
NOG BLEEDER SHAFT AREA
SLOPE STABILITY ANALYSIS

CHAPTER 1

INTRODUCTION

Canyon Fuel Company (Canyon Fuel) is planning the construction of a bleeder shaft along the existing road along the north side of Woods Canyon approximately 3.8 miles west of Scofield, Utah (the site), near Neihart, Montana. Surface facilities associated with this site will include a fan, an earthen pad, a site access road, and a remote topsoil stockpile.

The purpose of this report is to summarize the methods and findings of geotechnical analyses performed for the site. As shown in Plate 3.2.4-5A- Layout, the proposed operational site will be constructed through a combination of excavation and utilizing the native or imported material to construct working surfaces. A berm or silt fence will be installed around the perimeter of the topsoil stockpile and the shaft pad to contain sediment and runoff discharges from the disturbed areas. Additionally, a road side ditch will direct runoff off from the road and upstream area to the berm or silt fence at the shaft pad. Significant ponded water is not anticipated at this site and therefore was not analyzed as part of the slope stability analysis. The slope stability analysis has been checked for the applicable criteria outlined by the Utah Division of Oil, Gas, and Mining (R645-301-500). This document has been prepared for Canyon Fuel Company by EarthFax Engineering Group, LLC, and contains the following information:

- Location and background information;
- Evaluation of the topsoil stockpile, access roadway and shaft pad;
- Results and recommendations based on the slope stability evaluation.

Slope stability geometry and outputs are included as attachments to this document.

CHAPTER 2
BACKGROUND INFORMATION

Long Resource Consultants, Inc. (LRC) conducted a field investigation, including the collection of soil samples, for characterizing the soil profile and soil types representative of the site. Soil samples were analyzed for grain size distribution, texture, K-factor, structure and permeability. For the project location, two soil samples are representative of the site (samples 14SKY06 and 14SKY07). Soil profile descriptions and laboratory results are provided in Attachment B, along with a site map showing soil sample locations. Soil data specific to the geotechnical analyses are listed in Table 1. From the soil data collected, soil types were correlated to typical soil strength values for analysis and modeling. These values (including unit weight, permeability, cohesive strength, angle of internal friction) are listed in Table 1. It is strongly recommended that soil conditions be verified during construction. If conditions differ or vary from what is presented in this report, a qualified geotechnical engineer should be contacted to reevaluate or give further guidance.

The LRC field investigation generally encountered Sandy Loam topsoil throughout the site. The field log for sample 14SKY06 contains a note that describes an exposed sandstone outcrop at that sample location. From the soil profile description of 14SKY07, it is reasonable to anticipate a typical 19 inch layer of Sandy Loam topsoil overlaying fractured sandstone. The actual rock structure of the sandstone is unknown and should be evaluated during construction. Previous reports from other bleeder shaft projects in the area indicate shale bedrock underneath the sandstone, but the field soil investigation conducted by LCR did not verify this information. If conditions differ or vary from what is presented in this report, a qualified geotechnical engineer should be contacted to reevaluate or give further guidance.

CHAPTER 3
EVALUATION METHODS

Slope stability analyses were performed using the slope stability software *Slide 5.0 ("Slide")* by Rocscience. This program uses an iterative procedure to evaluate the factor of safety against rotational shear failure for tens of thousands of potential failure surfaces that may develop within a given slope. Each trial failure surface is discretized into small slices and the driving and resisting forces/moments are calculated for each according to Bishop's Simplified Method of Slices and Janbu Simplified Method of Slices. These forces are then summed over the entire failure surface to obtain a factor of safety defined as the sum of the resisting forces divided by the sum of the driving forces. Therefore, a factor of safety less that 1.0 indicates an imminent potential for slope failure.

The analysis discussed herein relied on soils data collected during the LCR field investigation, as this investigation encompassed the same general area as the proposed shaft pad. Stability analyses were performed for three locations throughout the site: topsoil stockpile, access roadway, and shaft pad. The engineering properties summarized in Chapter 2 were assumed for this evaluation. Details on each of the slope-stability scenarios analyzed and soil properties used for these analyses are included in the following subsections. Geometries of each of the analyses are included in Attachment A.

3.1 Topsoil Stockpile

One scenario was analyzed for this section, which reaches from the north side of Granger Ridge Road south through the proposed topsoil stockpile and down slope to the undisturbed, existing grade. This scenario evaluated the stability of the topsoil stockpile with side slopes of 1.5H:1V (horizontal to vertical) constructed on top of exposed sandstone bedrock. It is our understanding that the topsoil stockpile will be constructed to a maximum height of 20 feet with a maximum side slope of 1.5H:1V.

3.2 Roadway

One scenario was analyzed for this section, located approximately halfway along the length of the road from Granger Ridge Road to the shaft pad. The analyzed section reaches from upslope of the roadway cut to beyond the down slope fill of the roadway. This scenario evaluated the stability of the roadway cut and embankment fill. A ditch parallels the road that, in reality, will only be filled intermittently and with a limited quantity of water incapable of saturating all underlying soils. Ponded water is not anticipated at this site and therefore was not analyzed as part of the slope stability analysis.

3.3 Shaft Pad

One scenario was analyzed for this section. Perpendicular to the shaft pad, this section reaches from up slope of the shaft pad cut to down slope of the embankment fill. It is our understanding that the shaft pad will be constructed with cut and fill slopes of 2H:1V. This scenario evaluatedthe stability of the shaft pad cut and embankment fill

CHAPTER 4
RESULTS

The soil properties used as input for *Slide* analyses are summarized in Table 1. As discussed above, these data are taken from the LCR field investigation, laboratory testing results, and correlated typical values. In the interest of conservatism, soil properties and analyses were assumed to provide worst-case estimates of geotechnical conditions at the operational shaft pad site. Reclamation of the site will return the operational phase to its former existing topography and slope stability would expect to hold the same factor of safety as modeled in the operational phase, if constructed with the same recommendations.

The calculated minimum factors of safety for the various scenarios described above are summarized in Table 2. As shown in this table, the minimum factor of safety for against slope failure of the topsoil stockpile is expected to be 1.7. The minimum factor of safety for the access roadway is 4.6. The shaft pad minimum factor of safety is 2.8 globally and 2.9 for the pad embankment fill.

The minimum acceptable factor of safety promulgated by DOGM for the spoil stockpile is 1.5 (R645-301-535.110). The minimum static safety factor for all roadway embankments is 1.3 (R645-301-535.130). The factors of safety calculated in this slope stability analysis are therefore considered acceptable. Topsoil stockpile and the constructed embankments are expected to remain stable under the geometry and loading conditions presented herein.

CHAPTER 5
RECOMMENDATIONS

The results of this investigation apply to the slope geometries and soil conditions discussed above. If actual conditions differ from those assumed in this report, topsoil stockpile, pond embankment, access road and sediment basin embankment slope stability should be re-evaluated as necessary.

The following recommendations are specific to the design and construction of the shaft pad and any sandstone bedrock excavation:

- From the soil profile descriptions provided by LRC, it is likely to anticipate fractured sandstone underlying the topsoil. The friable fractured sandstone should be removed to expose competent sandstone bedrock. The actual rock structure of the sandstone is unknown and should be evaluated during construction. If conditions differ or vary from what is presented in this report, a qualified geotechnical engineer should be contacted to reevaluate or give further guidance.
- It is recommended that the final exposed cut slope be designed to mitigate rockfall and erosion concerns, especially for the cut slope adjacent to the shaft pad. This would include, but not be limited to, removing all loose rocks throughout the face and rocks along the top of the cut face to prevent rockfall hazards. Surface drainage should be continually monitored for effects of erosion on the bedrock.
- Shear strengths for design and analysis are generally based on preconstruction rock mass conditions. Rock slopes are commonly excavated by drill and blast techniques. If improperly used, these excavation techniques can significantly alter the material properties of the rock mass comprising the slope. These alterations are more commonly evident as loosened rock which results in a reduction of strength. Excavation techniques should be properly evaluated and implemented for the conditions encountered.
- Stability and surface conditions should be continually monitored during and after construction of the pad.

The following recommendations are specific to the design and construction of the topsoil stockpile:

- New lifts should be placed only over existing lifts that have had time to drain and provide a stable base for a new lift. Areas which remain wet and soft should be allowed more time to dry and/or be scarified, if necessary.

- The stockpile surface should be graded to facilitate drainage away from recently placed fill toward surface drainage courses. It may be advantageous to bulldoze shallow ditches at each lift elevation to improve surface drainage.
- Care should be taken not to fill over any frozen material which has not been properly drained and compacted.
- It may often be necessary to place soil material, allow time for drying, and then to compact the lift.
- In the unlikely event that severe material handling, placement and compaction problems are encountered, consider temporarily flattening of stockpile face slope angles or utilizing artificial waste rock stabilization measure. Other measures may be considered on a case-by-case basis.

The following recommendations are specific to the design and construction of the roadway and embankments:

- The embankment should be placed on a well-prepared and compacted subgrade free from any organic soils, vegetation, debris, frozen soils, soft soils, or other deleterious materials.
- The embankments should be well keyed into the underlying subgrade and adjacent slopes.
- Embankment soils should be compacted with an appropriate compactor to at least 95% of the Standard Proctor maximum dry density (ASTM D698) at ±2% of the soil's optimum moisture content. Compacted lifts should not exceed 8 inches in thickness.
- The inside slope of the access road ditch should be armored with 3 inch diameter protective rock to form a liner.
- It is recommended that topsoil be placed on the outer slope of constructed embankments and vegetation established in order to reduce the potential for erosion.
- Embankments should be regularly inspected for signs of damage, erosion, and piping and repairs made as necessary.

CHAPTER 6
LIMITATIONS

The conclusions and recommendations presented in this report are based upon both the results of field and laboratory tests and correlated typical soil strength values for analysis and modeling. It should be recognized that soil materials are inherently heterogeneous and that conditions may exist throughout the site which could not be defined during this investigation and analyses. It is recommended that a soils engineer observeconditions during excavation to verify the existing in-situ conditions. If, during construction, conditions are encountered which appear to be different than those presented in this report, EarthFax should be advised in order that appropriate action be taken.

CHAPTER 7

REFERENCES

Long Resource Consultants, Inc. 2014. *Order 2 Soil Survey of the North of Graben (NOG) Bleeder Shaft Area at the Skyline Mine.*

Rocscience Inc. 2009. Slide 5.0 Toronto, Ontario

U.S. Army Corps of Engineers. 1994. Engineering and Design Rock Foundations. Engineer Manual 1110-1-2908. Department of the Army. Washington, D.C.

Utah Division of Oil, Gas, and Mining. 1996. Utah Coal Mining Regulations. Salt Lake City, Utah.

Wyllie, Duncan., & Mah, Christopher. *Rock Slope Engineering, Civil and Mining.* 4th ed. New York: Spon Press, 2008.

TABLE 1

Summary of Soil Properties

Sample ID Depth (in)	Grain Size Analysis				Typical Soil Values			
	Sand	Silt	Clay	Very Fine Sand	Unit Weight (lb/ft³)	Permeability (ft/s)	Cohesive Strength (psf)	Angle of Internal Friction (degrees)
14SKY06 0 [(a)]	-	-	-	-	-	-	-	-
14SKY07 0-4 [(b)]	62	32	6	8	115	8.2e-6	200	33
14SKY07 4-11 [(b)]	62	30	8	19.6	115	8.2e-6	200	33
14SKY07 11-19 [(b)]	62	31	7	14.2	115	8.2e-6	200	33
Fractured Sandstone Bedrock [(c)]	-	-	-	-	135	-	1040	34

*Samples 14SKY06 and 14SKY07 were analyzed as a homogenous soil for slope stability models.

(a) Sandstone outcrop. Landform note, no physical sample collected.
(b) Sandy Loam. Soil sample was analyzed for particle size. Other soil properties were based on typical values for the anticipated conditions at the project site.
(c) Fractured sandstone bedrock. Soil properties were based on typical values for the anticipated conditions at the project site[1].

[1]Wyllie, Duncan., & Mah, Christopher. *Rock Slope Engineering, Civil and Mining.* 4th ed. New York: Spon Press, 2008.

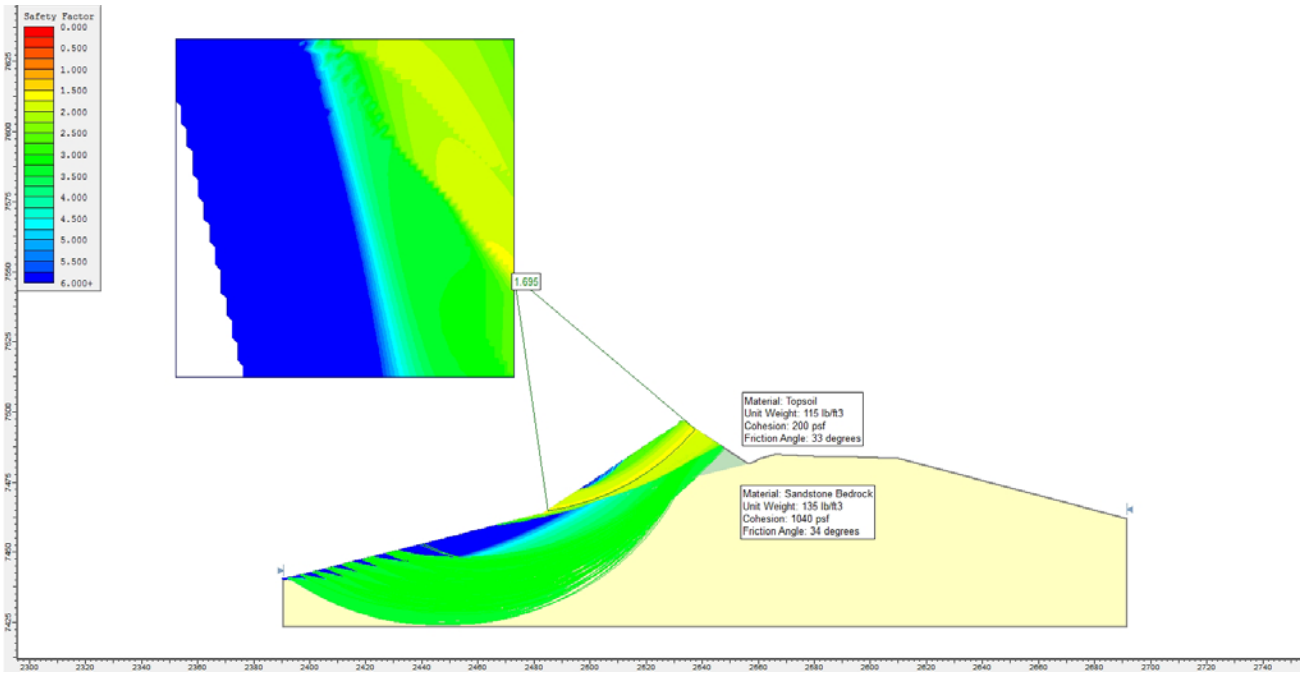
TABLE 2

Summary of *Slide* Analysis

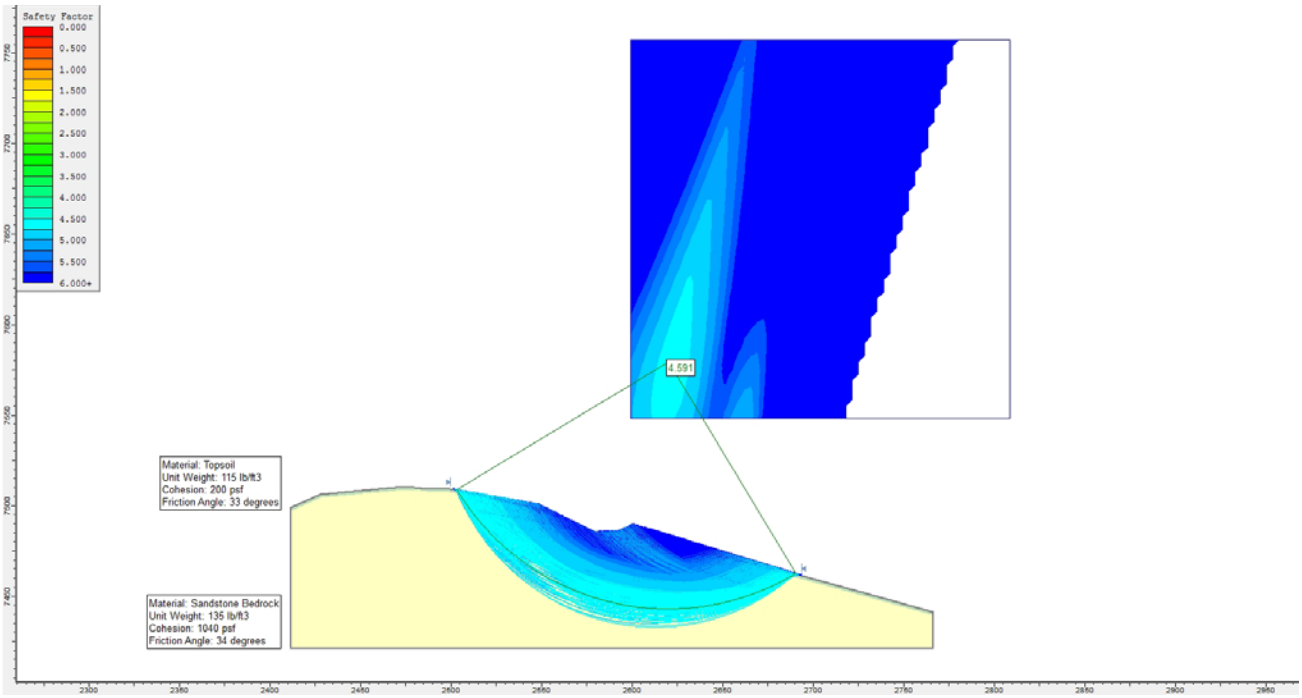
Location/ Condition	Minimum Factor of Safety	Minimum Acceptable Factor of Safety
Topsoil Stockpile	1.7	1.5
Access Roadway	4.6	1.3
Shaft Pad	2.8	-

ATTACHMENT A

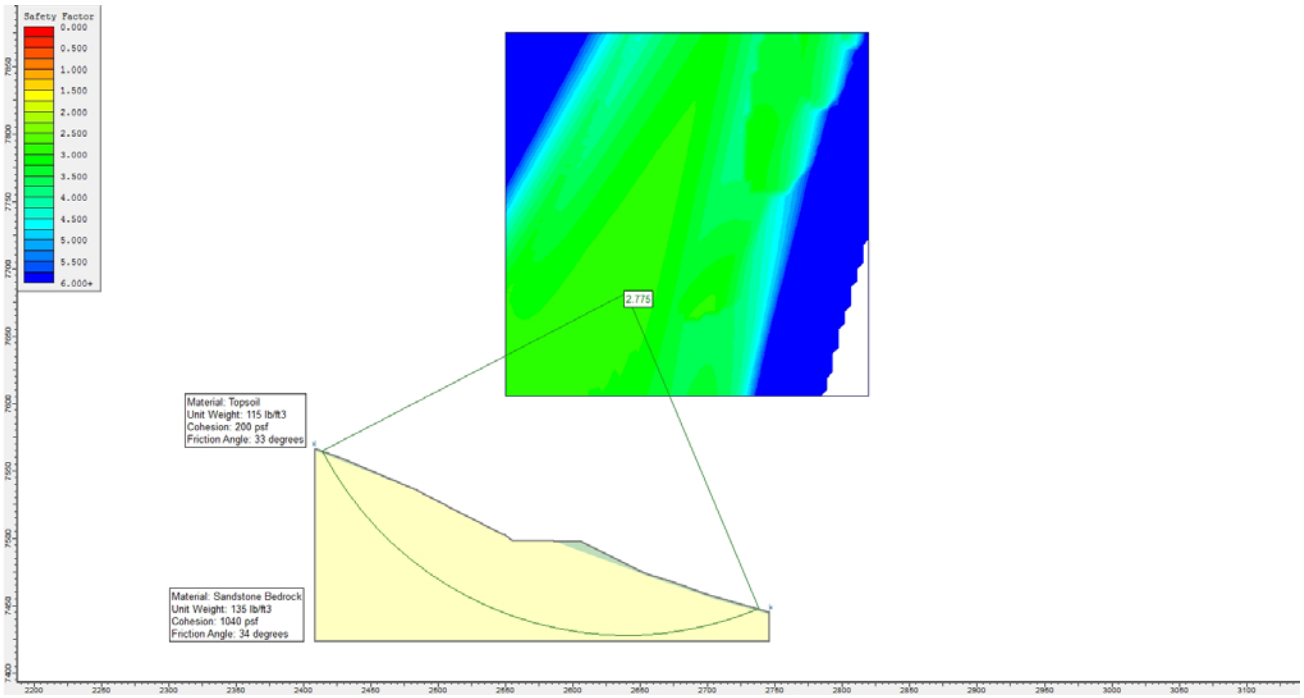
Slide Geometry and Output



Topsoil Stockpile: Stockpile placed on top of exposed sandstone bedrock.



Access Roadway: Access Roadway cut into topsoil and bedrock.



Shaft Pad: Shaft pad cut into topsoil and bedrock.

ATTACHMENT B

Long Resource Consultants, Inc.

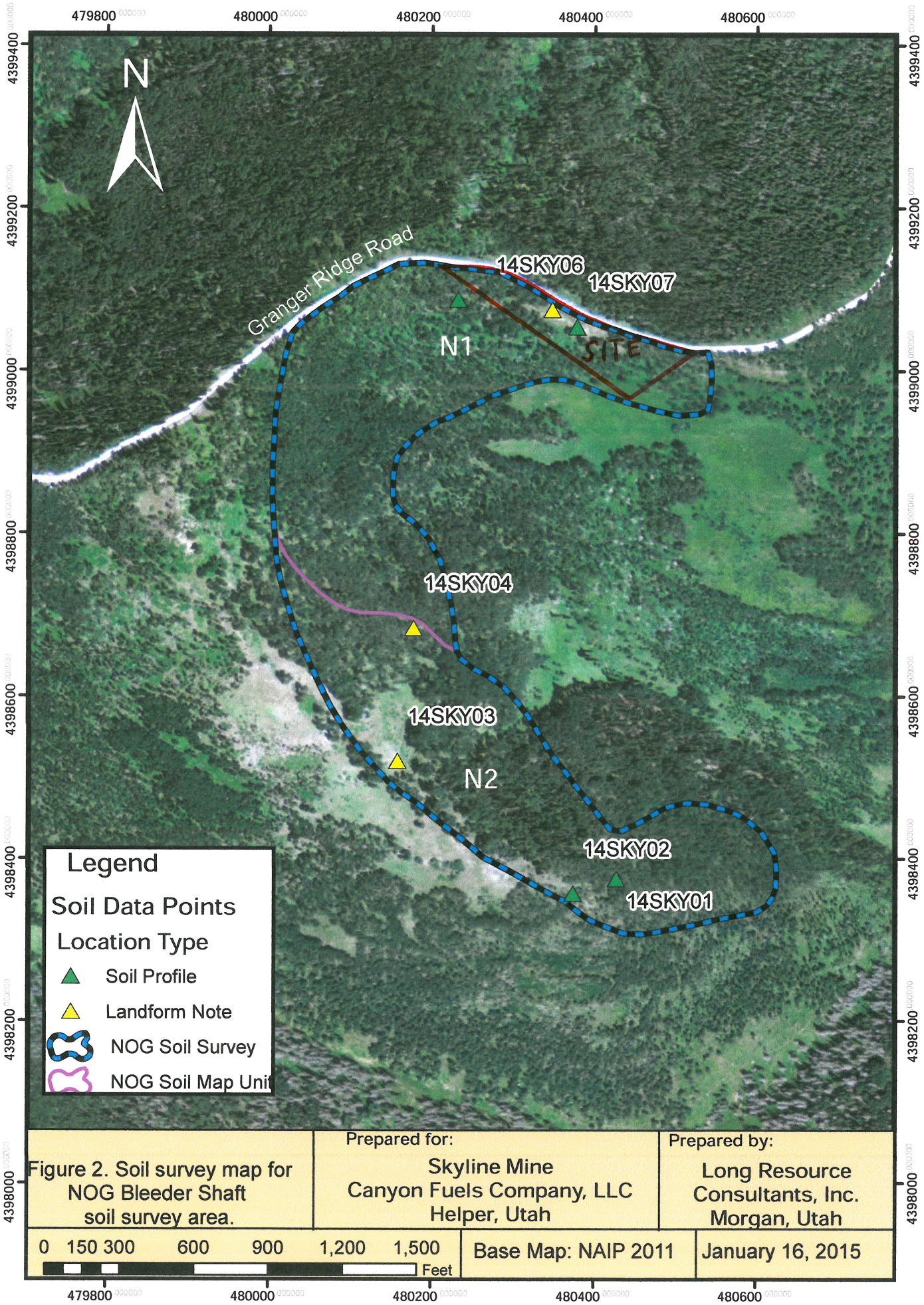


Figure 2. Soil survey map for NOG Bleeder Shaft soil survey area.

Prepared for:
Skyline Mine
Canyon Fuels Company, LLC
Helper, Utah

Prepared by:
Long Resource Consultants, Inc.
Morgan, Utah

Base Map: NAIP 2011

January 16, 2015

14SKY06

Pedon ID: 14SKY06
Description Date: 9/18/2014
Describer: Robert Long

Site Notes: sandstone outcrop

UTM: 480346E, 4399075N -- Datum NAD83, Zone 12
Legal Description: Section 34, Township 12 South, Range 6 East of the 29 Meridian

Landscape: mountains
Landform: mountain slope
Geomorphic Component: Free face
Profile Pos: Shoulder

Slope:
Elevation: 2822 meters (9258.5 feet)
Aspect: 225
Shape: up/down: Convex; **across:** Convex
Runoff: High

14SKY07

Pedon ID: 14SKY07
Description Date: 9/18/2014
Describer: Robert Long

Soil Name As Correlated: McCadden family
Current Taxonomic Class: Loamy-skeletal, mixed, superactive Lithic Haplocryolls
Current Taxon Kind: Family

County or Parish: UT007 - Carbon
State or Territory: UT - Utah
UTM: 480377E, 4399054N -- Datum NAD83, Zone 12
Legal Description: Section 34, Township 12 South, Range 6 East of the 29 Meridian

Landscape: mountains
Landform: mountain slope
Geomorphic Component: Upper third of mountainflank
Profile Pos: Shoulder
Slope: 41 percent
Elevation: 2816 meters (9238.8 feet)
Aspect: 225°
Shape: up/down: Convex; **across:** Linear

Drainage: Well drained
Runoff: High
Erosion: Class 1 - Sheet erosion

Primary Earth Cover: Grass/herbaceous cover;
Existing Vegetation: AGROP2 - wheatgrass (*Agropyron*)

Surface Fragments: 10 percent subangular sandstone gravels

Parent Materials: residuum weathered from sandstone

Particle Size Control Section: 25 to 48 centimeters (9.8 to 18.9 inches)
Diagnostic Features: Mollic epipedon: 0 to 28 centimeters (0 to 11 inches), Cambic horizon: 11 to 28 centimeters (4.3 to 11 inches) and Lithic contact: 28 centimeters (11 inches)
Restrictions: Lithic bedrock: 28 centimeters (11 inches)

A --- 0 to 11 centimeters (0 to 4.3 inches); black (10YR 2/1) moist, gravelly sandy loam; dark grayish brown (10YR 4/2) dry; 62 percent sand; 32 percent silt; 6 percent clay; weak fine subangular blocky parting to moderate medium granular structure; very friable, slightly hard, nonsticky, nonplastic; common medium roots throughout, common fine roots throughout and common very fine roots throughout; 2 percent flat subangular sandstone flags and 20 percent subangular sandstone gravels; electrical conductivity of 0.37 mmhos/cm by EC meter, saturated paste; noneffervescent by HCl, 1 normal; slightly acid, pH 6.4, pH meter; clear smooth boundary; CaCO3 1.4 Percent.

Bw1 --- 11 to 28 centimeters (4.3 to 11 inches); very dark grayish brown (10YR 3/2) moist, cobbly sandy loam; brown (10YR 5/3) dry; 62 percent sand; 30 percent silt; 8 percent clay; moderate medium subangular blocky structure; very friable, hard, slightly sticky, nonplastic; common medium roots throughout, common fine roots throughout and common very fine roots throughout; 5 percent subangular sandstone cobbles and 15 percent subangular sandstone gravels; electrical conductivity of 0.24 mmhos/cm by EC meter, saturated paste; noneffervescent by HCl, 1 normal; neutral, pH 7, pH meter; clear smooth boundary; CaCO3 0.6 Percent.

Bw2 --- 28 to 48 centimeters (11 to 18.9 inches); very dark grayish brown (10YR 3/2) moist, very cobbly sandy loam; grayish brown (10YR 5/2) dry; 62 percent sand; 31 percent silt; 7 percent clay; weak medium subangular blocky structure; very friable, slightly hard, slightly sticky, nonplastic; common fine roots throughout and common very fine roots throughout; 5 percent flat subangular sandstone channers, 15 percent sandstone cobbles and 25 percent subangular sandstone gravels; electrical conductivity of 0.23 mmhos/cm by EC meter, saturated paste; noneffervescent by HCl, 1 normal; neutral, pH 6.9, pH meter; abrupt smooth boundary; CaCO3 0.9 Percent.

R --- 48 centimeters (18.9 inches); fractured sandstone.

Inter-Mountain Labs
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Your Environmental Monitoring Partner

Soil Analysis Report

Canyon Fuel Company
HC 35 Box 380
Helper, UT 84526

Report ID: S1410053001

Project: Skyline Mine Topsoil
Date Received: 10/1/2014

Date Reported: 10/29/2014
Work Order: S1410053

Lab ID	Sample ID	Depths cm	Sand %	Silt %	Clay %	Texture	Very Fine Sand %	Total Carbon %	TOC %
S1410053-001	14SKY01	0-15	53.0	39.0	8.0	Sandy Loam	22.7	4.7	4.5
S1410053-002	14SKY01	15-38	47.0	44.0	9.0	Loam	14.2	3.3	3.2
S1410053-003	14SKY01	38-58	47.0	44.0	9.0	Loam	19.2	2.3	2.2
S1410053-004	14SKY02	0-29	59.0	33.0	8.0	Sandy Loam	3.3	5.1	5.0
S1410053-005	14SKY05	0-14	58.0	31.0	11.0	Sandy Loam	6.8	2.8	2.7
S1410053-006	14SKY05	14-36	58.0	30.0	12.0	Sandy Loam	15.0	2.0	1.9
S1410053-007	14SKY05	36-58	58.0	30.0	12.0	Sandy Loam	11.5	1.8	1.7
S1410053-008	14SKY07	0-11	62.0	32.0	6.0	Sandy Loam	8.0	3.7	3.5
S1410053-009	14SKY07	11-28	62.0	30.0	8.0	Sandy Loam	19.6	1.3	1.2
S1410053-010	14SKY07	28-48	62.0	31.0	7.0	Sandy Loam	14.2	1.5	1.4
S1410053-011	14SKY08	0-9	44.0	41.0	15.0	Loam	6.4	3.3	3.2
S1410053-012	14SKY08	9-36	34.0	51.0	15.0	Silty Loam	18.1	1.7	1.7
S1410053-013	14SKY09	0-13	58.0	33.0	9.0	Sandy Loam	12.2	3.8	3.6
S1410053-014	14SKY09	13-30	56.0	33.0	11.0	Sandy Loam	16.4	1.7	1.6
S1410053-015	14SKY10	4-15	58.0	35.0	7.0	Sandy Loam	20.4	2.3	2.2
S1410053-016	14SKY10	15-34	54.0	39.0	7.0	Sandy Loam	19.8	3.1	3.0
S1410053-017	14SKY10	34-56	62.0	32.0	6.0	Sandy Loam	25.5	2.4	2.3
S1410053-018	14SKY10	56-80	82.0	14.0	4.0	Loamy Sand	12.7	22.4	22.0
S1410053-019	14SKY10	80-130	90.0	10.0	<0.1	Sand	7.6	1.2	1.1
S1410053-020	14SKY10	130-160	92.0	8.0	<0.1	Sand	9.2	0.5	0.5

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Skyline Mine
North of Graben (NOG) Bleeder Shaft Area
Hydrology Design Report

Canyon Fuel Company
Skyline Mine
Scofield, Utah

March 2015

REGISTERED PROFESSIONAL ENGINEER
No. 168246
RICHARD B. WHITE
1 Apr 2015
STATE OF UTAH

EarthFax EarthFax Engineering Group, LLC.

Engineers / Scientists
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SKYLINE MINE
NOG BLEEDER SHAFT AREA
HYDROLOGY DESIGN REPORT

CHAPTER 1

INTRODUCTION

Canyon Fuel Company (Canyon Fuel) is planning to construct a bleeder shaft pad along the existing road on the north side of Woods Canyon approximately 3.8 miles west of Scofield, Utah (the site). Site surface facilities will consist of a fan, an earthen pad, an access road, and a remote topsoil stockpile. To prevent adverse hydrologic impacts downstream of the site, Canyon Fuel will construct a storm water runoff conveyance system including berms or silt fences and a road side ditch.

The purpose of this document is to present design information for the planned runoff and sediment controls. A berm or silt fence will be installed around the perimeter of the topsoil stockpile and the pad to contain sediment and runoff discharges from the developed areas. Additionally, a road side ditch will direct runoff off from the access road and upstream area to the berm or silt fence at the pad. The runoff and sediment controls have been designed to conform to the applicable criteria outlined in the Utah Administrative Code Titles R645-300 and 301. This document has been prepared for Canyon Fuel by EarthFax Engineering Group, LLC (EarthFax), and contains the following information:

- Location and background information;
- Hydrologic analyses to determine runoff and sediment discharge for design storm events;
- Sediment control design criteria;

Engineering calculations are included as attachments to this document.

CHAPTER 2
LOCATION AND BACKGROUND INFORMATION

The general layout of the proposed shaft pad (the pad), access road, and topsoil stockpile (the stockpile) is shown on Plate 3.2.4-5A. The total watershed area contributing to the pad is 0.8 acres, which includes 0.4 acre of disturbed area and 0.4 acres of undisturbed area. The total watershed area contributing to the stockpile is 0.19 acre of disturbed area. A berm or silt fence will be installed around the stockpile to contain runoff and sediment from the stockpile. A ditch along the cut-slope side of the access road will direct runoff from the road and upstream area to a culvert along the downstream end of the access road. Runoff and sediment from the pad and area upstream of the pad will be directed into a berm or silt fence along the north and west side of the pad. From the silt fence or berm runoff will flow west and then south into the culvert at the downstream end of the access road. Due to the small size of the development the pad and stockpile are being developed as an Alternate Sediment Control Area (ASCA) in accordance with R645-301-742.240. Construction is planned for the summer of 2015.

The ASCA system has been designed to safely convey site runoff as specified in the Utah Administrative Code Titles R645-301-742 and 751. Thus, the conveyance systems have been designed to comply with the following criteria:

- The conveyance system will safely convey the peak flow resulting from a 10-year, 24-hour storm event.
- Berms or silt fences, culvert, and ditches will be installed according to standard engineering practices.
- Berms or silt fences will be installed to contain one year of calculated sediment yield.
- Berms and ditches will be constructed from native or imported materials and not from coal mine waste rock.

CHAPTER 3
HYDROLOGICAL DESIGN

3.1 Hydrology Introduction

Storm water discharge for the area was calculated using Carlson Hydrology 2014. The curve number (CN) values were determined using vegetation cover and type and soil types. The vegetative and soil information was provided by the Order 2 soil survey report for the site by Long Resource Consultants, Inc. (Long Resource). The soils were described as a mixture of loam with some gravel and clay. To be conservative hydrologic soil group C was assumed. The vegetative condition in undisturbed area was assumed to be fair with an Oak-Aspen and mountain brush mixture. In disturbed areas, a curve number of 86 was assumed (i.e., similar to the value reported by the NRCE Natural Engineering Handbook for dirt roads in areas of hydrologic soil group C and equivalent to the value provided in the Carlson Hydrology software for poor vegetative cover with less than 50% grass cover).

Design storm magnitudes were taken from the National Oceanic and Atmospheric Administration (NOAA) ATLAS 14, Point Precipitation Frequency Estimates web page (http://hdsc.nws.noaa.gov/hdsc/pfds/sa/ut_pfds.html). Site watershed areas and average slopes were calculated from a 1-foot contour interval topographic map provided by Skyline Mine using AutoCAD 2014 software. Off-site watershed areas and average slopes were calculated from 5-foot contour interval topographic map provided by Skyline Mine using AutoCAD 2014 software. All storm runoff calculations are included in Attachment A.

3.2 Drainage Area Characteristics

The drainage area contributing to the site watershed is delineated in Plate 3.2.4-5B. As indicated previously, the total area contributing to the pad is 0.8 acres, which includes 0.4 acre of

disturbed area and 0.4 acres of undisturbed area. The total area contributing to the stockpile is 0.19 acre of disturbed area. Disturbed Watershed 3 (DW-3) and approximately 75% of Undisturbed Watershed 1 (UW-1) contribute runoff to the access road ditch and culvert. DW-5 and approximately 25% of UW-1 contribute runoff to the berm or silt fence along the north and west side of the pad. Runoff to the stockpile area is contributed by DW-1 and UW-2. Watersheds DW-2 and DW-4 consist of the areas downstream of the pad and road and will not contribute runoff to the site. Runoff from DW-6 will be directed away from the pad via a berm or silt fence. Runoff from DW-7 will drain along the existing road above the site.

3.3 Runoff Volume Calculations

Estimated runoff volumes and associated calculations are presented in the Carlson Hydrology worksheets in Attachment A. Total runoff volume resulting from the 10-year, 24-hour storm event contributing to the access road ditch was 2,130 cubic feet (cf). Total runoff volume resulting from the 10-year, 24-hour storm event at the pad was 1,363 cf. Total runoff volume resulting from the 10-year, 24-hour storm event at the stockpile was 710 cf.

3.4 Runoff Conveyance System Details

Peak flow calculations for the access road ditch are presented in Attachment A. Rock lining size was determined in accordance with the U.S. Department of Transportation Table provided in Attachment A. For design details, see Plate 3.2.4-5C. The access road ditch will have a maximum slope of 16% with 1:1 horizontal:vertical side slopes with a liner consisting of 3 inch diameter rock and a depth of 1 foot. The ditch will be excavated into native materials. No coal waste or deleterious material will be used in ditch construction. The peak flow in the ditch resulting from a 10-year, 24-hour event was estimated to be 1.86 cfs, with a maximum velocity of 4.97 fps and depth of 0.50 foot.

Runoff from UW-1, DW-3, and DW-5 will flow into a culvert under the access road. UW-1 contributes 300 cf of runoff to the culvert with a peak flow of 0.30 cfs. DW-3 contributes 1,830 cf of runoff to the culvert with a peak flow of 1.56 cfs. DW-5 contributes 1,363 cf of runoff to the culvert. No flow information was available for DW-5. However, overall slopes and cover are similar to DW-3. DW-5 consists of an area approximately 75% the size of DW-3. Additionally, runoff from DW-5 is approximately 75% of DW-3. Therefore, it is reasonable to assume the peak flow of DW-5 is also 75% of DW-3 or approximately 1.17 cfs. The total peak runoff for the culvert will be 3.03 cfs.

A 10 foot wide section of the berms will be armored with gravel at the lowest topographic point to act as an emergency spillway. A 10 foot wide and 5 foot gravel pad will placed downstream of emergency spillway. If a silt fence is used a 10 foot wide and 5 foot long gravel pad will be placed along the downstream side of the lowest topographical point to act as an emergency spillway. For the silt fence spillway detail see Plate 3.2.4-5D.

CHAPTER 4
SEDIMENT CONTROL CALCULATIONS

4.1 Sediment Volume Calculations

The average annual anticipated sediment yield from the watersheds was calculated using the Universal Soil Loss Equation as developed by the Utah Water Research Laboratory (Israelsen et al., 1984). This method estimates the average annual sediment yield per acre based on the following equation:

$$A = R \cdot K \cdot LS \cdot VM$$

Where A = Average annual sediment yield in tons per acre
R = Precipitation factor based on site location
K = Soil erodibility factor
LS = Slope length and steepness factor
VM = Erosion control factor

Results from these calculations are included in Table 1. Input variables used in this analysis are included in Attachment B. Derivations of each factor in the sediment yield equation for each watershed are summarized below:

- The value for R was obtained from an isoerodent precipitation map of Utah (Israelsen et al., 1984) and adjusted using figures from (Israelsen et al., 1984).
- Values for K were obtained for the InterMountain Labs soil analysis found in Long Resource soils report in Attachment B.
- Values for LS were calculated using the algorithms provided by Israelsen et al. (1984). Slope angles were read from the topographic map of the site (1 and 5 foot contour interval).
- Values for VM were taken from a table provided by Israelsen et al. (1984).

This method assumes that all the soil mobilized by erosion in the entire watershed travels down slope along berms or silt fences and the access road ditch within the watersheds (i.e., a sediment delivery ratio of 1.0). Thus, the sediment volume predicted by this equation is conservatively high. Only sediment yields for the watersheds contributing to the site were calculated. DW-2 and DW-4 do not contribute sediment or runoff to the site.

The average annual sediment yield in tons per acre for each watershed was multiplied by that watershed's area to find the annual weight of sediment participated from the area. This value was then divided by the saturated density of the affected soil types to find a volume (the saturated density was used since erosion would occur during precipitation events and would thus involve saturated soil). Finally, the volumes for each watershed were summed to determine the total annual yield of the area draining into the berm or silt fence around the pad and topsoil stockpile. The maximum calculated annual sediment yield for the area draining to the berm or silt fence for pad and the stockpile are 367 cf and 73 cf, respectively.

4.2 ASCA Berm and Silt Fence Capacities

The berm around pad will be constructed with 2:1 (horizontal:vertical) side slopes and a minimum height of 1 foot. The berm will be approximately 120 feet in length, allowing for 1,500 cf of sediment storage. Sediment behind the berm will be cleaned when sediment reaches 60% of the maximum volume or an elevation within 0.4 foot from the top of the 1-foot tall berm. If a silt fence is constructed, sediment behind the silt fence will be cleaned when sediment reaches 60% of the maximum volume or an elevation within 1.2 feet from the top of the 3-foot tall silt fence.

The south section of berm around the topsoil stockpile will be constructed with 2:1 (horizontal:vertical) side slopes and a minimum height of 1 foot. The berm will be approximately 80 feet in length, allowing for 160 cf of sediment storage. Sediment behind the berm will be cleaned when sediment reaches 60% of the maximum volume or an elevation within 0.4 feet from the top of

the 1-foot tall berm. If a silt fence is constructed, sediment behind the silt fence will be cleaned when sediment reaches 60% of the maximum volume or an elevation within 1.2 feet from the top of the 3-foot tall silt fence.

CHAPTER 5
REFERENCES

Carlson Hydrology, 2014. Carlson Maysville, Kentucky.

Israelson, C. Earl, Joel E. Fletcher, Frank W. Haws, and Eugene K. Israelson, 1984. *Erosion and Sedimentation in Utah: A guide for Control*, Hydraulics and Hydrology Series UWRL/H-84/03, Utah Water Research Laboratory, College of Engineering, Utah State University, Logan, Utah. 89 p.

National Oceanic and Atmospheric Administration, 2015. *Point Precipitation Frequency Estimates*

U.S. Department of Transportation. 1978. Use of Riprap for Bank Protection. Hydrology Engineering Circular No. 11. Federal Highway Administration. Washington, D.C.

TABLE 1

Sediment Yield Volumes

Watershed	Sediment Yield (tons/acre-year)	Area (acres)	Sediment Yield (cf/year)
UW-1	8.6	1.47	243
DW-1	19.4	0.20	73
DW-5	41.8	0.38	305

ATTACHMENT A

Hydrology Calculations

NOAA Atlas 14, Volume 1, Version 5
Location name: Helper, Utah, US*
Latitude: 39.7410°, Longitude: -111.2120°
Elevation: 9088 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.147 (0.126-0.176)	0.189 (0.162-0.227)	0.261 (0.221-0.312)	0.322 (0.270-0.387)	0.417 (0.341-0.502)	0.501 (0.403-0.604)	0.596 (0.469-0.722)	0.706 (0.540-0.862)	0.881 (0.646-1.09)	1.04 (0.733-1.31)
10-min	0.224 (0.192-0.268)	0.288 (0.246-0.346)	0.397 (0.336-0.475)	0.491 (0.412-0.589)	0.635 (0.520-0.764)	0.762 (0.612-0.920)	0.908 (0.714-1.10)	1.07 (0.822-1.31)	1.34 (0.983-1.67)	1.58 (1.12-2.00)
15-min	0.278 (0.238-0.333)	0.357 (0.306-0.429)	0.493 (0.417-0.589)	0.608 (0.510-0.730)	0.787 (0.644-0.948)	0.945 (0.759-1.14)	1.13 (0.885-1.36)	1.33 (1.02-1.63)	1.66 (1.22-2.07)	1.96 (1.38-2.48)
30-min	0.374 (0.320-0.448)	0.481 (0.412-0.577)	0.663 (0.561-0.794)	0.819 (0.687-0.983)	1.06 (0.868-1.28)	1.27 (1.02-1.54)	1.52 (1.19-1.83)	1.79 (1.37-2.19)	2.24 (1.64-2.78)	2.64 (1.86-3.34)
60-min	0.463 (0.396-0.555)	0.595 (0.509-0.715)	0.821 (0.695-0.982)	1.01 (0.850-1.22)	1.31 (1.07-1.58)	1.57 (1.27-1.90)	1.88 (1.48-2.27)	2.22 (1.70-2.71)	2.77 (2.03-3.44)	3.27 (2.31-4.13)
2-hr	0.573 (0.493-0.682)	0.726 (0.622-0.863)	0.960 (0.820-1.15)	1.17 (0.987-1.40)	1.50 (1.24-1.80)	1.79 (1.45-2.16)	2.13 (1.69-2.58)	2.52 (1.94-3.07)	3.13 (2.31-3.88)	3.69 (2.63-4.67)
3-hr	0.640 (0.559-0.753)	0.802 (0.699-0.942)	1.03 (0.895-1.21)	1.23 (1.07-1.46)	1.56 (1.33-1.85)	1.84 (1.53-2.19)	2.18 (1.78-2.60)	2.56 (2.04-3.09)	3.18 (2.44-3.91)	3.74 (2.78-4.68)
6-hr	0.838 (0.746-0.955)	1.04 (0.925-1.18)	1.27 (1.13-1.46)	1.48 (1.31-1.69)	1.78 (1.55-2.04)	2.05 (1.76-2.37)	2.38 (2.01-2.77)	2.74 (2.28-3.22)	3.35 (2.71-4.00)	3.90 (3.09-4.73)
12-hr	1.08 (0.976-1.20)	1.33 (1.20-1.48)	1.61 (1.45-1.80)	1.85 (1.66-2.07)	2.19 (1.94-2.46)	2.45 (2.15-2.77)	2.74 (2.38-3.11)	3.10 (2.65-3.56)	3.70 (3.11-4.31)	4.26 (3.52-5.02)
24-hr	1.24 (1.11-1.40)	1.54 (1.37-1.74)	1.87 (1.66-2.11)	2.13 (1.89-2.41)	2.49 (2.20-2.81)	2.76 (2.42-3.13)	3.04 (2.65-3.44)	3.31 (2.87-3.77)	3.73 (3.14-4.35)	4.30 (3.55-5.07)
2-day	1.50 (1.33-1.71)	1.86 (1.65-2.12)	2.26 (2.00-2.58)	2.59 (2.28-2.95)	3.03 (2.65-3.45)	3.37 (2.93-3.84)	3.72 (3.21-4.25)	4.07 (3.48-4.67)	4.54 (3.85-5.24)	4.90 (4.11-5.68)
3-day	1.70 (1.50-1.95)	2.11 (1.86-2.42)	2.58 (2.26-2.96)	2.96 (2.59-3.39)	3.47 (3.02-3.97)	3.87 (3.34-4.43)	4.27 (3.66-4.91)	4.68 (3.98-5.39)	5.23 (4.39-6.06)	5.65 (4.70-6.58)
4-day	1.91 (1.68-2.20)	2.37 (2.08-2.73)	2.90 (2.53-3.34)	3.32 (2.90-3.83)	3.90 (3.39-4.50)	4.36 (3.75-5.02)	4.82 (4.11-5.56)	5.29 (4.47-6.10)	5.92 (4.94-6.88)	6.41 (5.28-7.48)
7-day	2.34 (2.05-2.71)	2.90 (2.54-3.36)	3.56 (3.11-4.12)	4.08 (3.56-4.73)	4.80 (4.16-5.57)	5.36 (4.61-6.22)	5.92 (5.06-6.90)	6.50 (5.51-7.59)	7.28 (6.10-8.57)	7.88 (6.54-9.33)
10-day	2.69 (2.35-3.12)	3.34 (2.92-3.87)	4.09 (3.56-4.74)	4.68 (4.06-5.43)	5.47 (4.72-6.36)	6.07 (5.21-7.07)	6.68 (5.69-7.79)	7.29 (6.17-8.53)	8.10 (6.76-9.52)	8.71 (7.22-10.3)
20-day	3.64 (3.18-4.25)	4.54 (3.97-5.29)	5.57 (4.86-6.52)	6.39 (5.55-7.49)	7.47 (6.45-8.77)	8.29 (7.11-9.76)	9.13 (7.76-10.7)	9.96 (8.40-11.8)	11.1 (9.19-13.1)	11.9 (9.79-14.2)
30-day	4.49 (3.91-5.19)	5.57 (4.87-6.46)	6.79 (5.91-7.89)	7.74 (6.71-8.98)	8.96 (7.73-10.4)	9.89 (8.49-11.5)	10.8 (9.21-12.6)	11.7 (9.91-13.7)	12.9 (10.8-15.1)	13.8 (11.4-16.2)
45-day	5.60 (4.89-6.53)	6.96 (6.08-8.12)	8.48 (7.38-9.91)	9.65 (8.37-11.3)	11.2 (9.64-13.1)	12.3 (10.6-14.4)	13.5 (11.5-15.8)	14.6 (12.4-17.2)	16.0 (13.4-19.0)	17.1 (14.2-20.4)
60-day	6.68 (5.85-7.68)	8.31 (7.30-9.58)	10.1 (8.87-11.7)	11.5 (10.1-13.3)	13.3 (11.6-15.4)	14.6 (12.6-16.9)	15.9 (13.7-18.5)	17.2 (14.7-20.0)	18.9 (15.9-22.1)	20.1 (16.8-23.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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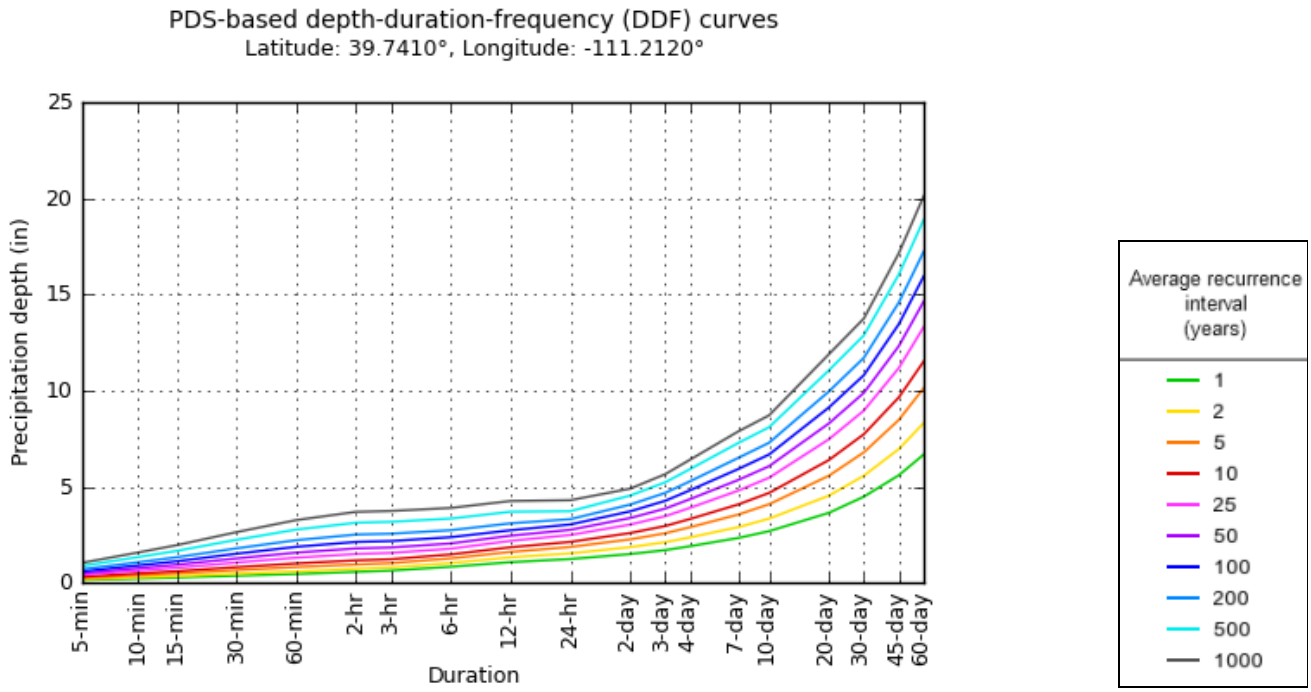
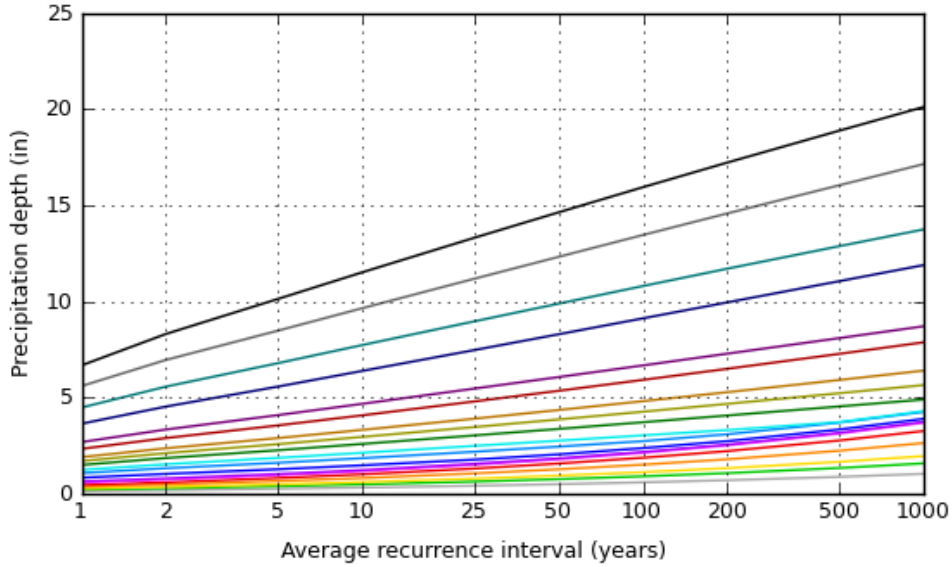
PF graphical





NOAA Atlas 14, Volume 1, Version 5

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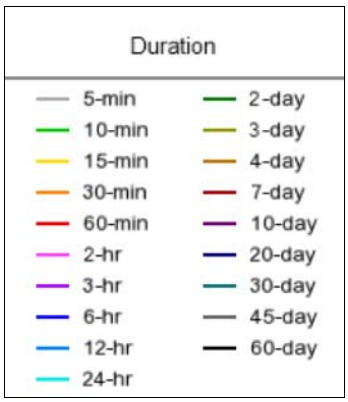

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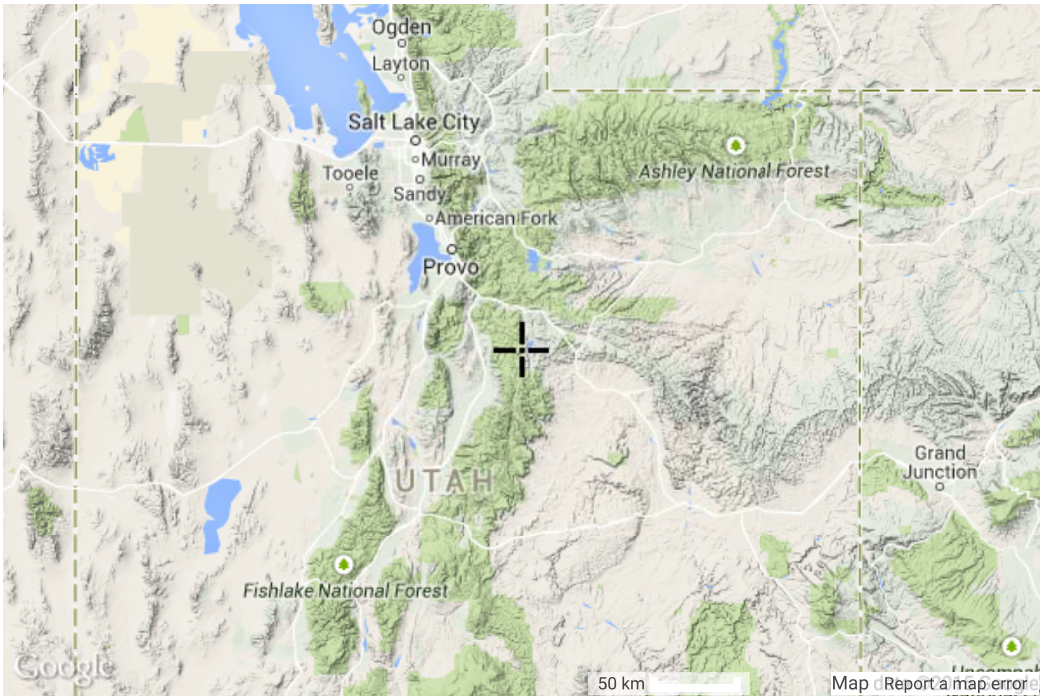
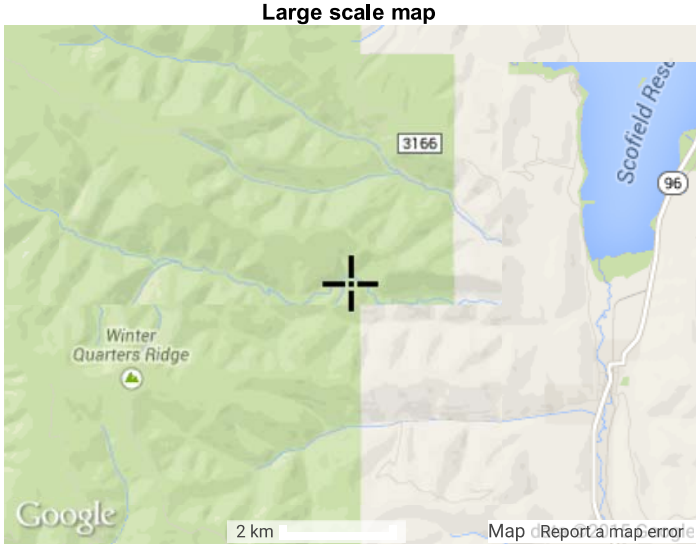
Maps & aerials

Small scale terrain



Large scale terrain

Large scale map



Large scale aerial

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National Oceanic and Atmospheric Administration
National Weather Service
Office of Hydrologic Development
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Runoff Curve Number and Runoff Mon Feb 16 08:58:24 2015

Project: NOG Bleeder Shaft By: Date: 02/16,
Location: UW1 Checked: Date:
Present

1. Runoff Curve Number (CN)

Cover description	CN	Soil Group	Area(Sq.Ft.)
Oak-Aspen & Mt brush (Fair)	57	C	63833.300

CN (weighted): 57.0
Total Area: 63833.300 Sq.Ft.

2. Runoff

Return Period:	10-Year	
Rainfall, P:	2.19	in
Runoff, Q:	0.0564	in
Runoff Volume:	0.0069	Acre-Ft

Runoff Curve Number and Runoff Mon Feb 16 08:57:24 2015

Project: NOG Bleeder Shaft By: Date: 02/16
Location: UW2 Checked: Date:
Present

1. Runoff Curve Number (CN)

Cover description	CN	Soil Group	Area(Sq.Ft.)
Oak-Aspen & Mt brush (Fair)	57	C	2051.800

CN (weighted): 57.0
Total Area: 2051.800 Sq.Ft.

2. Runoff

Return Period:	10-Year	
Rainfall, P:	2.19	in
Runoff, Q:	0.0564	in
Runoff Volume:	0.0002	Acre-Ft

Runoff Curve Number and Runoff Mon Feb 16 08:58:59 2015

Project: NOG Bleeder Shaft By: Date: 02/16
Location: DW1 Checked: Date:
Present

1. Runoff Curve Number (CN)

Cover description	CN	Soil Group	Area(Sq.Ft.)
Open Space-Poor (<50% grass)	86	C	8579.400

CN (weighted): 86.0
Total Area: 8579.400 Sq.Ft.

2. Runoff

Return Period:	10-Year	
Rainfall, P:	2.19	in
Runoff, Q:	0.9953	in
Runoff Volume:	0.0163	Acre-Ft

Runoff Curve Number and Runoff Mon Feb 16 08:59:23 2015

Project: NOG Bleeder Shaft By: Date: 02/16,
Location: DW2 Checked: Date:
Present

1. Runoff Curve Number (CN)

Cover description	CN	Soil Group	Area(Sq.Ft.)
Open Space-Poor (<50% grass)	86	C	7410.500

CN (weighted): 86.0
Total Area: 7410.500 Sq.Ft.

2. Runoff

Return Period:	10-Year	
Rainfall, P:	2.19	in
Runoff, Q:	0.9953	in
Runoff Volume:	0.0141	Acre-Ft

Runoff Curve Number and Runoff Mon Feb 16 09:00:22 2015

Project: NOG Bleeder Shaft By: Date: 02/16
Location: DW3 Checked: Date:
Present

1. Runoff Curve Number (CN)

Cover description	CN	Soil Group	Area(Sq.Ft.)
Open Space-Poor (<50% grass)	86	C	22047.600

CN (weighted): 86.0
Total Area: 22047.600 Sq.Ft.

2. Runoff

Return Period:	10-Year	
Rainfall, P:	2.19	in
Runoff, Q:	0.9953	in
Runoff Volume:	0.0420	Acre-Ft

Runoff Curve Number and Runoff Mon Feb 16 09:00:44 2015

Project: NOG Bleeder Shaft By: Date: 02/16,
Location: DW4 Checked: Date:
Present

1. Runoff Curve Number (CN)

Cover description	CN	Soil Group	Area(Sq.Ft.)
Open Space-Poor (<50% grass)	86	C	6122.300

CN (weighted): 86.0
Total Area: 6122.300 Sq.Ft.

2. Runoff

Return Period:	10-Year	
Rainfall, P:	2.19	in
Runoff, Q:	0.9953	in
Runoff Volume:	0.0117	Acre-Ft

Runoff Curve Number and Runoff Mon Feb 16 09:01:14 2015

Project: NOG Bleeder Shaft By: Date: 02/16,
Location: DW5 Checked: Date:
Present

1. Runoff Curve Number (CN)

Cover description	CN	Soil Group	Area(Sq.Ft.)
Open Space-Poor (<50% grass)	86	C	16417.700

CN (weighted): 86.0
Total Area: 16417.700 Sq.Ft.

2. Runoff

Return Period:	10-Year	
Rainfall, P:	2.19	in
Runoff, Q:	0.9953	in
Runoff Volume:	0.0313	Acre-Ft

Runoff Curve Number and Runoff Mon Feb 16 09:01:43 2015

Project: NOG Bleeder Shaft By: Date: 02/16,
Location: DW6 Checked: Date:
Present

1. Runoff Curve Number (CN)

Cover description	CN	Soil Group	Area(Sq.Ft.)
Open Space-Poor (<50% grass)	86	C	3403.100

CN (weighted): 86.0
Total Area: 3403.100 Sq.Ft.

2. Runoff

Return Period:	10-Year	
Rainfall, P:	2.19	in
Runoff, Q:	0.9953	in
Runoff Volume:	0.0065	Acre-Ft

Runoff Curve Number and Runoff Mon Feb 16 09:02:08 2015

Project: NOG Bleeder Shaft By: Date: 02/16
Location: DW7 Checked: Date:
Present

1. Runoff Curve Number (CN)

Cover description	CN	Soil Group	Area(Sq.Ft.)
Open Space-Poor (<50% grass)	86	C	12184.300

CN (weighted): 86.0
Total Area: 12184.300 Sq.Ft.

2. Runoff

Return Period:	10-Year	
Rainfall, P:	2.19	in
Runoff, Q:	0.9953	in
Runoff Volume:	0.0232	Acre-Ft

Channel Design (Non-Erodible) Thu Feb 19 09:26:25 2015

Channel Type: Triangular, Equal Side Slopes
Dimensions: Left Side Slope 1.50:1
Right Side Slope 1.50:1

Wetted Perimeter: 1.80
Area of Wetted Cross Section: 0.38

Channel Slope: 16.0000
Manning's n of Channel: 0.0420

Discharge: 1.86 cfs
Depth of Flow: 0.50 feet
Velocity: 4.97 fps

Channel Lining: Rock
Freeboard: 0.50 feet

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Culvert

Label	Diameter (in)	Discharge (cfs)	Slope (ft/ft)	Depth (ft)	Velocity (ft/s)
Culvert	18	3.03	0.01	0.78	3.27

ATTACHMENT B

Sediment Calculations

STEP-BY-STEP PROCEDURE FOR DETERMINING EROSION

The following step-by-step procedures l lead one through the proper use of appro- ate tables, figures, maps, and graphs in s handbook for determining sheet erosion.

1. Determine as precisely as is practi- le the latitude and longitude of the struction site in question.

nple: A construction site near Park City. From an appropriate map, the loca- tion is determined to be 40°38'52"N, 111°30'53"W.

2. Using the location information from enter the appropriate iso-erodent map and ermine the annual R value for the site. nember that these R values for Utah include wmelt as well as rainfall.)

mple: From Salt Lake City iso-erodent (R) values map (in map pocket) the R value is determined to be 13.

3. Estimate as nearly as possible the gth of time the site will be exposed to sive forces.

mple: The site will be exposed for approx- imately 8 months, beginning in January.

4. With the information from number 3, er Figure 1 and read the percentage of ual R for each month or fraction thereof t the site will be exposed. These individ- percentages are added together to give a centage for the total time period. This al percentage is then multiplied by the ual R value from number 2 to obtain the per value of R to use in the soil loss ation.

mple: From Figure 1, Zone II distribution graph (and Table 1), the cumulative percentage of R for 8 months is 68 percent. (Enter the bottom of the distribution graph at the end of the 8th month [follow dotted line], move vertically until graph is inter- cepted, then horizontally to the left and read 68 percent on the percentage scale.) Therefore, the proper value of R to use in the equation is

$$0.68 \times 13 = 8.84$$

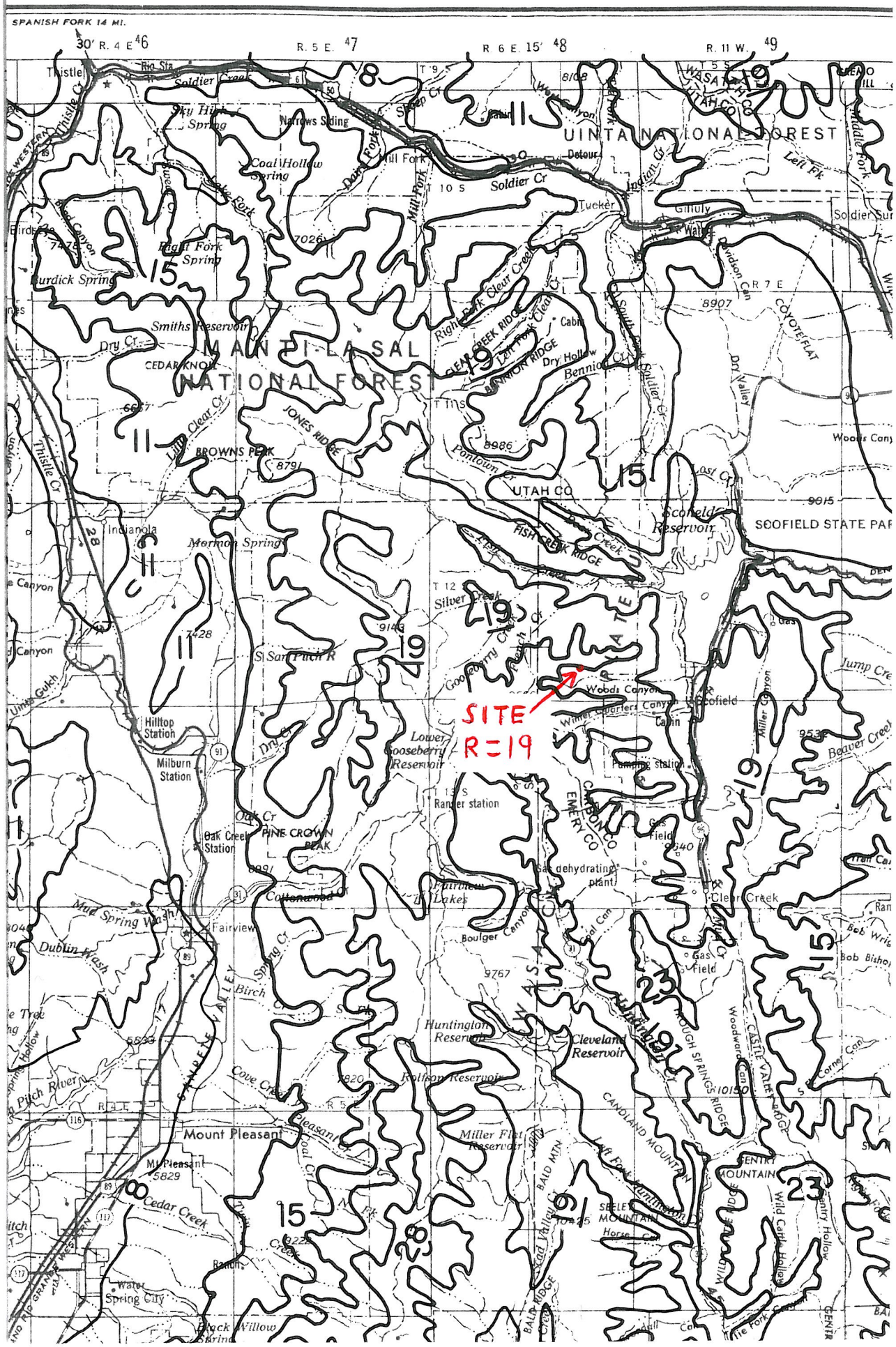
R values shown on the maps are based on a 2-year recurrence interval. Other recurrence intervals will require larger values of R and thus greater protection for exposed areas of construction. For purpose of this example, let us use a recur- rence interval of 100 years. Then from Figure 9 we read a ratio of EI/R of about 2.51. (Follow the 100 year recurrence interval line vertically until it intercepts the diagonal, then move horizontally and read the appropriate EI/R value.) The R value to use in the equation then is 2.51 x 8.84 = 22.19.

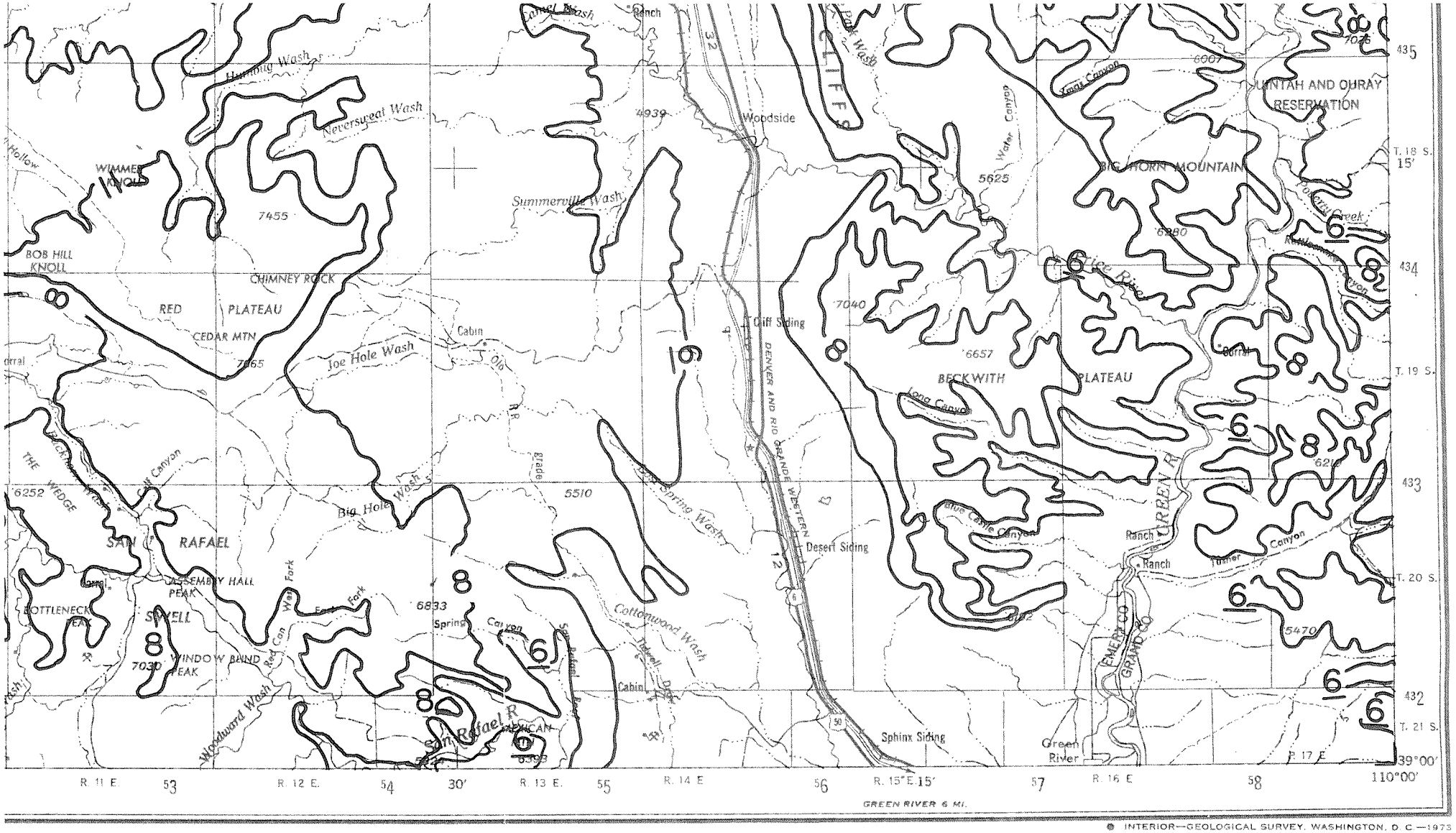
5. With the location information from number 1, enter an appropriate soil survey map and determine the soil erodibility factor K for the site in question. A better way than using a soil survey map is to take appropriate samples at the site and analyze them for particle size, percent organic matter, soil structural class, and relative permeability. With this information, use the nomograph in Figure 2 to determine the K factor.

In the absence of both of these, enter the soil erodibility map in the map pocket and determine the approximate value for K.

Example: From the colored soil erodibility index map in the map pocket, the K factor is near the boundary between yellow and green (value range 0.21 to 0.40). Soil samples were col- lected at the site and analyzed. Then using Figure 2 the actual value of K was determined to be 0.31.

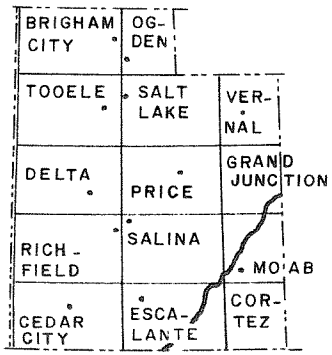
6. Determine slope steepness as percent gradient. (For example, 2.5:1 slope equals a gradient of 40 percent.)


SPANISH FORK 14 MI.
R. 4 E.
R. 5 E.
R. 6 E.
R. 11 W.
UINTA NATIONAL FOREST
MANTI-LA SAL
NATIONAL FOREST
UTAH CO
SCOFIELD STATE PAR
Scofield Reservoir
Thistle
Soldier Creek
Sky Hill Spring
Narrows Siding
Coal Hollow Spring
Soldier Cr
Tucker
Gilluly
Right Fork Spring
Burdick Spring
Smiths Reservoir
Dry Cr
CEDAR KNOLL
JONES RIDGE
BROWNS PEAK
Indianola
Mormon Springs
Silver Creek
Woods Canyon
Scofield
SITE
R=19
Hilltop Station
Milburn Station
Lower Gooseberry Reservoir
Ranger station
Oak Creek Station
PINE CROWN PEAK
Cottonwood
Fairview
Mud Spring Wash
Dublin Wash
Boulger Canyon
Clear Creek
Huntington Reservoir
Cleveland Reservoir
Rolfson Reservoir
Cove Creek
Mount Pleasant
Miller Flat Reservoir
Cedar Creek
Spring City
Black Willow Spring
CANDLAND MOUNTAIN
CASTLE VALLEY RIDGE
WILDCAT RIDGE
BALD RIDGE
Wild Cattle Hollow
Beaver Creek
Jump Creek
Miller Canyon
Dry Valley
COYOTE FLAT
Woods Canyon
Bob Wright
Bob Bishop



INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—1973

LOCATION DIAGRAM



Note:
R values shown are for rain and snowmelt together. R value for snowmelt alone = $R_s = 0.23881\,R + 1.34328$.

MEAN ANNUAL ISO-ERODENT (R) VALUES

Units of R
English R = foot tons/acre/hour
Metric Rm = meter tonnes/hectare/hour
Rm = 1.735 x R

UTAH WATER RESEARCH LABORATORY UTAH STATE UNIVERSITY LOGAN, UTAH 1983

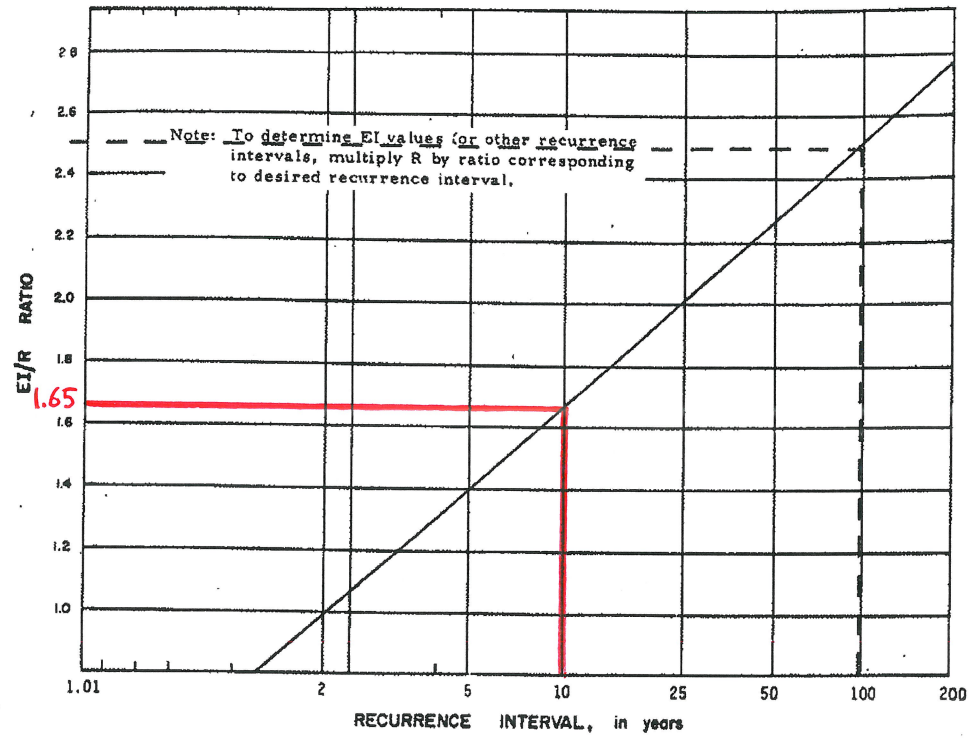


Figure 9. The relationship between the EI/R ratio and recurrence interval.

Example: The slope at the site is 2 to 1 or 50 percent.

7. Determine the slope length in feet.

Example: The measured length of the slope is 350 ft.

8. Using data from numbers 6 and 7 enter Table 2 and determine the topographic factor, LS. (For multiple slopes, follow the procedure detailed in Appendix C.)

Example: The LS value from Table 2 for a 50 percent slope, 350 feet long, is 33.34.

9. The product of values determined in 4, 5, and 8 is the R·K·LS value, or potential erosion.

Example: $A = R \cdot K \cdot LS = 22.19 \times 0.31 \times 33.34$

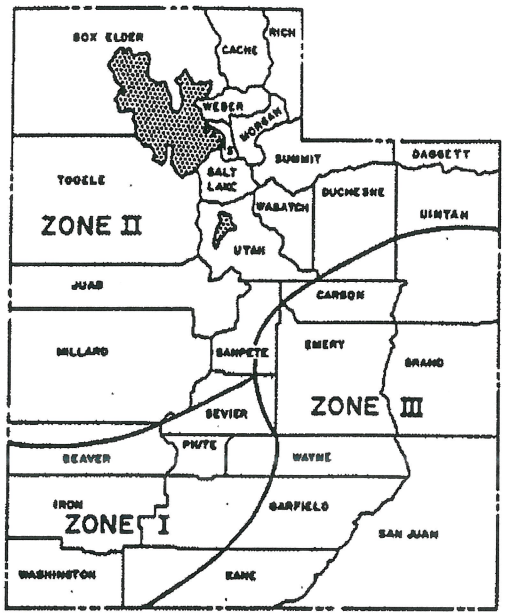
$= 229.34$ t/ac/yr

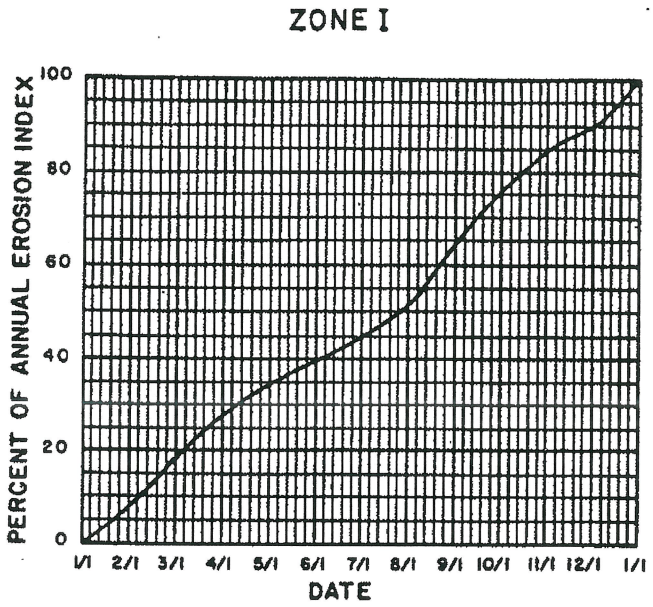
10. The amount of mulch required to reduce the potential erosion to the amount of 1 ton/acre can be determined from Figures 3 through 6. Other control measures are listed in Table 3 together with their approximate VM values. The VM value of any particular control measure, multiplied by the R·K·LS value determined in number 9, will give an indication of the effectiveness of that particular measure in controlling erosion.

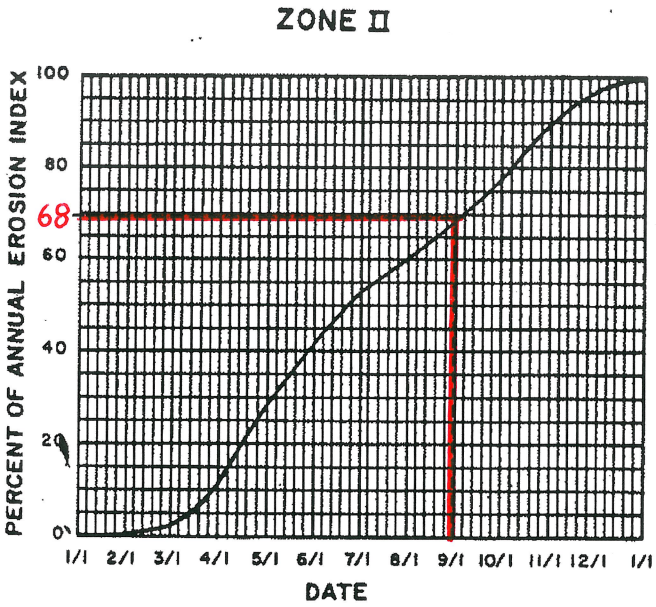
Example: Control measures: One may select from several alternatives, such as the following.

$A = R \cdot K \cdot LS \cdot VM$

If R·K·LS = 229.34 and we wish to reduce it to say <10 tons/acre/yr the VM required = 10/229.34 = 0.04. Any one of several treatments having







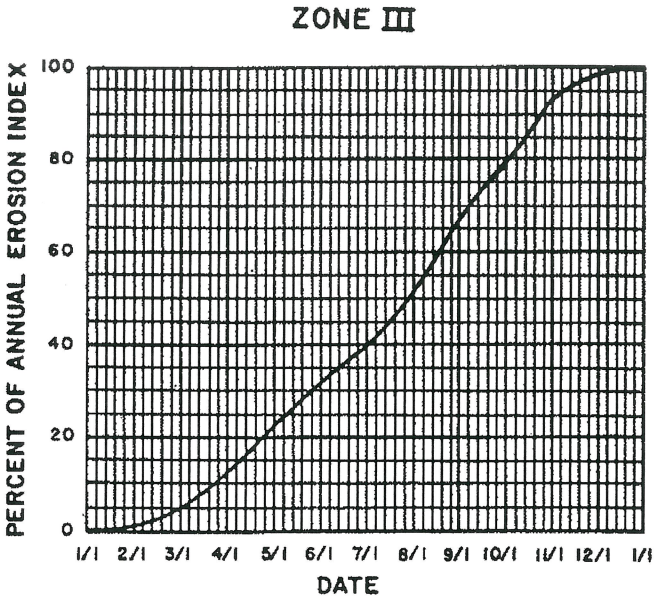


Figure 1. Erosion index distribution curves.

Table 2. LS values.

Slope Ratio	Slope Gradient "S" (%)	Slope Length "l" (ft.) (λ = summation of "l" segments)																						
		10	20	30	40	50	60	70	80	90	100	150	200	250	300	350	400	450	500	600	700	800	900	1000
	0.5	0.06	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.09	0.10	0.10	0.11	0.11	0.12	0.12	0.13	0.13	0.13	0.14	0.14	0.14	0.15	0.15
100:1	1	0.08	0.09	0.10	0.10	0.11	0.11	0.12	0.12	0.12	0.12	0.14	0.14	0.15	0.16	0.16	0.16	0.17	0.17	0.18	0.18	0.19	0.19	0.20
	2	0.10	0.12	0.14	0.15	0.16	0.17	0.18	0.19	0.19	0.20	0.23	0.25	0.26	0.28	0.29	0.30	0.32	0.33	0.34	0.36	0.37	0.39	0.40
	3	0.14	0.18	0.20	0.22	0.23	0.25	0.26	0.27	0.28	0.29	0.32	0.35	0.38	0.40	0.42	0.43	0.45	0.46	0.49	0.51	0.54	0.55	0.57
	4	0.16	0.21	0.25	0.28	0.30	0.33	0.35	0.37	0.38	0.40	0.47	0.53	0.58	0.62	0.66	0.70	0.73	0.76	0.82	0.87	0.92	0.96	1.00
20:1	5	0.17	0.24	0.29	0.34	0.38	0.41	0.45	0.48	0.51	0.53	0.66	0.76	0.85	0.93	1.00	1.07	1.13	1.20	1.31	1.42	1.51	1.60	1.69
	6	0.21	0.30	0.37	0.43	0.48	0.52	0.56	0.60	0.64	0.67	0.82	0.95	1.06	1.16	1.26	1.34	1.43	1.50	1.65	1.78	1.90	2.02	2.13
	7	0.26	0.37	0.45	0.52	0.58	0.64	0.69	0.74	0.78	0.82	1.01	1.17	1.30	1.43	1.54	1.65	1.75	1.84	2.02	2.18	2.33	2.47	2.61
12½:1	8	0.31	0.44	0.54	0.63	0.70	0.77	0.83	0.89	0.94	0.99	1.21	1.40	1.57	1.72	1.85	1.98	2.10	2.22	2.43	2.62	2.80	2.97	3.13
	9	0.37	0.52	0.64	0.74	0.83	0.91	0.98	1.05	1.11	1.17	1.44	1.66	1.85	2.03	2.19	2.35	2.49	2.62	2.87	3.10	3.32	3.52	3.71
10:1	10	0.43	0.61	0.75	0.87	0.97	1.06	1.15	1.22	1.30	1.37	1.68	1.94	2.16	2.37	2.56	2.74	2.90	3.06	3.35	3.62	3.87	4.11	4.33
	11	0.50	0.71	0.86	1.00	1.12	1.22	1.32	1.41	1.50	1.58	1.93	2.23	2.50	2.74	2.95	3.16	3.35	3.53	3.87	4.18	4.47	4.74	4.99
8:1	12.5	0.61	0.86	1.05	1.22	1.36	1.49	1.61	1.72	1.82	1.92	2.35	2.72	3.04	3.33	3.59	3.84	4.08	4.30	4.71	5.08	5.43	5.76	6.08
	15	0.81	1.14	1.40	1.62	1.81	1.98	2.14	2.29	2.43	2.56	3.13	3.62	4.05	4.43	4.79	5.12	5.43	5.72	6.27	6.77	7.24	7.68	8.09
6:1	16.7	0.96	1.36	1.67	1.92	2.15	2.36	2.54	2.72	2.88	3.04	3.72	4.30	4.81	5.27	5.69	6.08	6.45	6.80	7.45	8.04	8.60	9.12	9.62
5:1	20	1.29	1.82	2.23	2.58	2.88	3.16	3.41	3.65	3.87	4.08	5.00	5.77	6.45	7.06	7.63	8.16	8.65	9.12	9.99	10.79	11.54	12.24	12.90
4½:1	22	1.51	2.13	2.61	3.02	3.37	3.69	3.99	4.27	4.53	4.77	5.84	6.75	7.54	8.26	8.92	9.54	10.12	10.67	11.68	12.62	13.49	14.31	15.08
4:1	25	1.86	2.63	3.23	3.73	4.16	4.56	4.93	5.27	5.59	5.89	7.21	8.33	9.31	10.20	11.02	11.78	12.49	13.17	14.43	15.58	16.66	17.67	18.63
	30	2.51	3.56	4.36	5.03	5.62	6.16	6.65	7.11	7.54	7.95	9.74	11.25	12.57	13.77	14.88	15.91	16.87	17.78	19.48	21.04	22.49	23.86	25.15
3:1	33.3	2.98	4.22	5.17	5.96	6.67	7.30	7.89	8.43	8.95	9.43	11.55	13.34	14.91	16.33	17.64	18.86	20.00	21.09	23.10	24.95	26.67	28.29	29.82
	35	3.23	4.57	5.60	6.46	7.23	7.92	8.55	9.14	9.70	10.22	12.52	14.46	16.16	17.70	19.12	20.44	21.68	22.86	25.04	27.04	28.91	30.67	32.32
2½:1	40	4.00	5.66	6.93	8.00	8.95	9.80	10.59	11.32	12.00	12.65	15.50	17.89	20.01	21.91	23.67	25.30	26.84	28.29	30.99	33.48	35.79	37.96	40.01
	45	4.81	6.80	8.33	9.61	10.75	11.77	12.72	13.60	14.42	15.20	18.62	21.50	24.03	26.33	28.44	30.40	32.24	33.99	37.23	40.22	42.99	45.60	48.07
2:1	50	5.64	7.97	9.76	11.27	12.60	13.81	14.91	15.94	16.91	17.82	21.83	25.21	28.18	30.87	33.34	35.65	37.81	39.85	43.66	47.16	50.41	53.47	56.36
	55	6.48	9.16	11.22	12.96	14.48	15.87	17.14	18.32	19.43	20.48	25.09	28.97	32.39	35.48	38.32	40.97	43.45	45.80	50.18	54.20	57.94	61.45	64.78
1⅔:1	57	6.82	9.64	11.80	13.63	15.24	16.69	18.03	19.28	20.45	21.55	26.40	30.48	34.08	37.33	40.32	43.10	45.72	48.19	52.79	57.02	60.96	64.66	68.15
	60	7.32	10.35	12.68	14.64	16.37	17.93	19.37	20.71	21.96	23.15	28.35	32.74	36.60	40.10	43.31	46.30	49.11	51.77	56.71	61.25	65.48	69.45	73.21
1½:1	66.7	8.44	11.93	14.61	16.88	18.87	20.67	22.32	23.87	25.31	26.68	32.68	37.74	42.19	46.22	49.92	53.37	56.60	59.66	65.36	70.60	75.47	80.05	84.38
	70	8.98	12.70	15.55	17.96	20.08	21.99	23.75	25.39	26.93	28.39	34.77	40.15	44.89	49.17	53.11	56.78	60.23	63.48	69.54	75.12	80.30	85.17	89.78
	75	9.78	13.83	16.94	19.56	21.87	23.95	25.87	27.66	29.34	30.92	37.87	43.73	48.89	53.56	57.85	61.85	65.60	69.15	75.75	81.82	87.46	92.77	97.79
1¼:1	80	10.55	14.93	18.28	21.11	23.60	25.85	27.93	29.85	31.66	33.38	40.88	47.20	52.77	57.81	62.44	66.75	70.80	74.63	81.76	88.31	94.41	100.13	105.55
	85	11.30	15.98	19.58	22.61	25.27	27.69	29.90	31.97	33.91	35.74	43.78	50.55	56.51	61.91	66.87	71.48	75.82	79.92	87.55	94.57	101.09	107.23	113.03
	90	12.02	17.00	20.82	24.04	26.88	29.44	31.80	34.00	36.06	38.01	46.55	53.76	60.10	65.84	71.11	76.02	80.63	84.99	93.11	100.57	107.51	114.03	120.20
	95	12.71	17.97	22.01	25.41	28.41	31.12	33.62	35.94	38.12	40.18	49.21	56.82	63.53	69.59	75.17	80.36	85.23	89.84	98.42	106.30	113.64	120.54	127.06
1:1	100	13.36	18.89	23.14	26.72	29.87	32.72	35.34	37.78	40.08	42.24	51.74	59.74	66.79	73.17	79.03	84.49	89.61	94.46	103.48	111.77	119.48	126.73	133.59

Table 3. Typical VM factor values reported in the literature.[a]

Condition	VM Factor
1. Bare soil conditions	
freshly disked to 6-8 inches	1.00
after one rain	0.89
loose to 12 inches smooth	0.90
loose to 12 inches rough	0.80
compacted bulldozer scraped up and down	1.30
same except root raked	1.20
compacted bulldozer scraped across slope	1.20
same except root raked across	0.90
rough irregular tracked all directions	0.90
seed and fertilizer, fresh	0.64
same after six months	0.54
seed, fertilizer, and 12 months chemical	0.38
not tilled algae crusted	0.01
tilled algae crusted	0.02
compacted fill	1.24-1.71
undisturbed except scraped	0.66-1.30
scarified only	0.76-1.31
sawdust 2 inches deep, disked in	0.61
2. Asphalt emulsion on bare soil	
1250 gallons/acre	0.02
1210 gallons/acre	0.01-0.019
605 gallons/acre	0.14-0.57
302 gallons/acre	0.28-0.60
151 gallons/acre	0.65-0.70
3. Dust binder	
605 gallons/ac Fiber Glass Roving	1.05
1210 gallons/acre	0.29-0.78
4. Other Chemicals	
1000 lb. Fiber Glass Roving with 60-150 gallons asphalt emulsion/acre	0.01-0.05
Aquatain	0.68
Aerospray 70, 10 percent cover	0.94
Curasol AE	0.30-0.48
Petroset SB	0.40-0.66
PVA	0.71-0.90
Terra Tack	0.66
Wood fiber slurry,[b] 1000 lb/acre fresh	0.05-0.73
Wood fiber slurry,[b] 1400 lb/acre fresh	0.01-0.36
Wood fiber slurry,[b] 3500 lb/acre fresh	0.009-0.10
Portland Cement and Latex 1000 lbs/ac + 8 gal/ac	0.13
1500 lbs/ac + 12 gal/ac	0.006
5. Seedings	
temporary, 0 to 60 days	0.40
temporary, after 60 days	0.05
permanent, 0 to 60 days	0.04
permanent, 2 to 12 months	0.05
permanent, after 12 months	0.01
6. Brush	0.35
7. Excelsior blanket with plastic net	0.04-0.10
8. Mulch (see Figures 3, 4, 5, 6)	

[a]Note the variation in values of VM factors reported by different researchers for the same measures.

[b]This material is commonly referred to as hydromulch.

the critical exposed area will be reduced. A construction operation scheduled in phases is especially valuable in dealing with long slopes, because stabilizing the upper portion of the slope will protect the lower area.

For each phase of construction, control measures which will serve to protect exposed areas and adjacent property, such as sediment traps, basins or ponds, and diversion ditches, should be installed before clearing and grading begin. Structures such as these do not decrease erosion but serve to catch the sediment after it has left the source area. Design drawings for such structures are readily available from local offices of the Soil Conservation Service and from other sources and are not included in this handbook. Even though much research remains to be done in order to determine the true efficiencies and optimum designs of sediment basins and traps, existing designs may be used effectively to prevent sediment from leaving rights-of-way and entering streams, lakes, or adjacent properties. The amount of sediment captured in such structures can be measured or calculated and subtracted from the total soil loss, determined by the equation, to estimate actual loss. Where areas are to be left for long periods of time, temporary measures such as vegetation, berms, down drains, and mulch covers should be installed to protect and stabilize the exposed soil surface, and then permanent control measures should be implemented as soon as is practical.

Much can be done to minimize erosion and sedimentation if problems are anticipated and provided for before development begins, and if control measures are implemented in a timely manner.

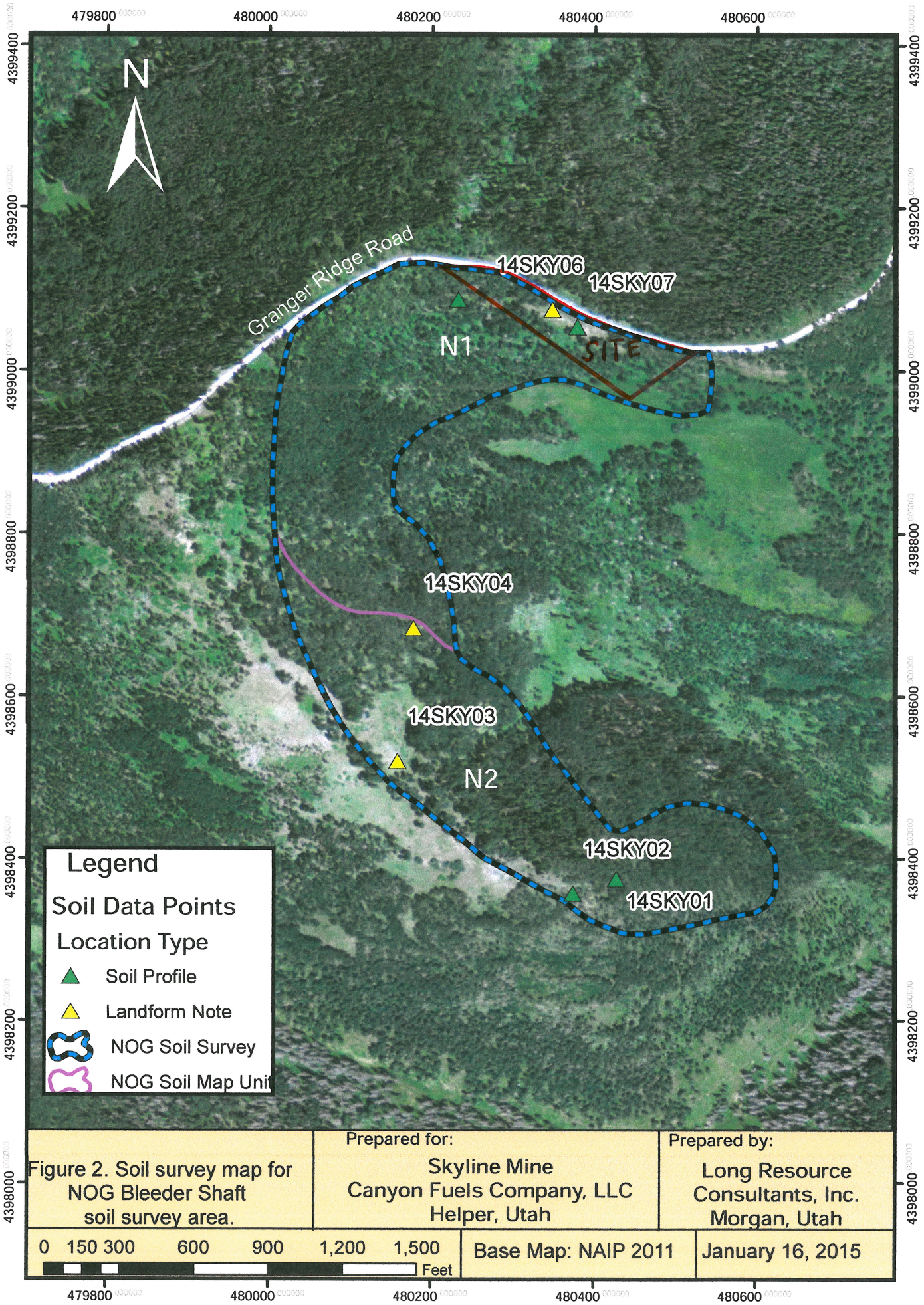


Figure 2. Soil survey map for NOG Bleeder Shaft soil survey area.

Prepared for:
Skyline Mine
Canyon Fuels Company, LLC
Helper, Utah

Prepared by:
Long Resource Consultants, Inc.
Morgan, Utah

Base Map: NAIP 2011

January 16, 2015

Inter-Mountain Labs, Inc
1673 Terra Ave, Sheridan, Wyoming, 82801
(307) 672-8945

Soil Analysis Report
Canyon Fuel Company, LLC.
HC 35 Box 380
Helper, Utah 84526

Project ID: Skyline Mine Topsoil
Date Received: 10/1/2014

Report ID: S1410053001
Date Reported: 10/30/2014
Work Order: S1410053

Lab ID	Sample ID	Organic Matter %	Sand %	Silt %	Clay %	Very Fine Sand %	Texture	K-factor (t.ac.h/100acft.tf.in)	Structure s	Permeability p	M
S1410053-001	14SKY01(0-15cm)	9.1	53.0	39.0	8.0	22.7	Sandy Loam	0.09	2	2	5676.4
S1410053-002	14SKY01(15-38cm)	6.4	47.0	44.0	9.0	14.2	Loam	0.21	2	3	5296.2
S1410053-003	14SKY01(38-58cm)	4.4	47.0	44.0	9.0	19.2	Loam	0.31	2	3	5751.2
S1410053-004	14SKY02(0-29cm)	10.1	59.0	33.0	8.0	3.3	Sandy Loam	0.02	2	2	3339.6
S1410053-005	14SKY05(0-14cm)	7.1	58.0	31.0	11.0	6.8	Sandy Loam	0.08	2	2	3364.2
S1410053-006	14SKY05(14-36cm)	5.3	58.0	30.0	12.0	15.0	Sandy Loam	0.15	2	2	3960.0
S1410053-007	14SKY05(36-58cm)	5.0	58.0	30.0	12.0	11.5	Sandy Loam	0.14	2	2	3652.0
S1410053-008	14SKY07(0-11cm)	7.9	62.0	32.0	6.0	8.0	Sandy Loam	0.08	2	2	3760.0
S1410053-009	14SKY07(11-28cm)	3.2	62.0	30.0	8.0	19.6	Sandy Loam	0.25	2	2	4563.2
S1410053-010	14SKY07(28-48cm)	4.0	62.0	31.0	7.0	14.2	Sandy Loam	0.20	2	2	4203.6
S1410053-011	14SKY08(0-9cm)	6.3	44.0	41.0	15.0	6.4	Loam	0.15	2	3	4029.0
S1410053-012	14SKY08(9-36cm)	3.7	34.0	51.0	15.0	18.1	Silty Loam	0.35	2	3	5873.5
S1410053-013	14SKY09(0-13cm)	8.2	58.0	33.0	9.0	12.2	Sandy Loam	0.08	2	2	4113.2
S1410053-014	14SKY09(13-30cm)	4.2	56.0	33.0	11.0	16.4	Sandy Loam	0.21	2	2	4396.6
S1410053-015	14SKY10(4-15cm)	4.7	58.0	35.0	7.0	20.4	Sandy Loam	0.24	2	2	5152.2
S1410053-016	14SKY10(15-34cm)	6.0	54.0	39.0	7.0	19.8	Sandy Loam	0.20	2	2	5468.4
S1410053-017	14SKY10(34-56cm)	4.5	62.0	32.0	6.0	25.5	Sandy Loam	0.26	2	2	5405.0
S1410053-018	14SKY10(56-80cm)	35.0	82.0	14.0	4.0	12.7	Loamy Sand	-0.40	2	2	2563.2
S1410053-019	14SKY10(80-130cm)	1.6	90.0	10.0	0.1	7.6	Sand	0.03	1	1	1758.2
S1410053-020	14SKY10(130-160cm)	1.0	92.0	8.0	0.1	9.2	Sand	0.03	1	1	1718.3
S1410053-021	14SKY12(0-20cm)	8.0	46.0	39.0	15.0	17.5	Loam	0.13	2	3	4802.5
S1410053-022	14SKY12(20-50cm)	4.6	46.0	37.0	17.0	18.5	Loam	0.23	2	3	4606.5
S1410053-023	14SKY12(50-84cm)	2.9	48.0	36.0	16.0	18.7	Loam	0.29	2	3	4594.8
S1410053-024	14SKY13(18-36cm)	1.9	74.0	23.0	3.0	13.5	Loamy Sand	0.21	2	2	3540.5
S1410053-025	14SKY13(36-55cm)	1.1	75.0	22.0	3.0	12.5	Loamy Sand	0.21	2	2	3346.5
S1410053-026	14SKY14(0-23cm)	2.9	64.0	28.0	8.0	21.3	Sandy Loam	0.26	2	2	4535.6
S1410053-027	14SKY14(23-51cm)	1.6	66.0	28.0	6.0	18.1	Sandy Loam	0.28	2	2	4333.4

These Results apply only to the samples tested.

Reviewed by: Karen Secor
Karen Secor, Soil Lab Supervisor

EARTHFAX ENGINEERING, INC.
ENGINEERS / SCIENTISTS

PROJECT NOG Bleeder PAGE 1 OF 1
COMPUTED TAJ DATE 2/24/2015
CHECKED RBW DATE 3/2/2015

$A = R \times K \times LS \times VM$

R = 19 × 0.68 (8 months, Figure 7) × 1.65 (10-year, Figure 9) = 21.3
K = 0.08 (0-11cm) K = 0.24 (11-28cm) K = 0.20 (28-48cm)

R from Israelsen et. Al, Figure 7 and 9.
K from Inter Mountain Labs Soil Analysis Report in Long Resource Report.
LS from Israelsen et. Al, Table 2, Combined L and S values.
VM from Israelsen et. Al, Table 3.

UW-1 (only 25% reports to pad)
L = 200 ft S = 0.35 LS = 14.46 K = 0.08 (Top 11cm) VM = 0.35 (Brush)
A = 21.3 × 0.08 × 14.46 × 0.35 = 8.6 ton/ac-yr

Sediment Load = 8.6 ton/ac-yr (15,958 sf / 43,560 sf/ac)(1 CY / 1.4 ton/CY) = 2.3 CY/yr

DW-1
L = 50 ft S = 0.50 LS = 12.60 K = (11cm × 0.08 + 17cm × 0.24 + 20cm × 0.20 / 11cm + 17cm + 20cm) = 0.19
VM = 0.38 (Seeded after 12 months)
A = 21.3 × 0.19 × 12.60 × 0.38 = 19.4 ton/ac-yr

Sediment Load = 19.4 ton/ac-yr (8,579 sf / 43,560 sf/ac)(1 CY / 1.4 ton/CY) = 2.7 CY/yr

DW-5
L = 100 ft S = 0.50 LS = 17.82 K = 0.20 (Bottom 20 cm)
VM = (85% × 0.38 (Seeded after 12 months) + 15% × 1.48 (Compacted fill))
VM = 0.55
A = 21.3 × 0.20 × 17.82 × 0.55 = 41.8 ton/ac-yr

Sediment Load = 41.8 ton/ac-yr (16,418 sf / 43,560 sf/ac)(1 CY / 1.4 ton/CY) = 11.3 CY/yr

Order 2 Soil Survey

of the

North of Graben (NOG) Bleeder Shaft Area

at the

Skyline Mine

Located West of Scofield, Utah

Prepared for

Canyon Fuels Company

by

Long Resource Consultants, Inc.
Morgan, Utah

January 16, 2015

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B Soil Profile Location Photographs
C Soil Profile Box Photographs
D Laboratory Analysis

Section One

Purpose of Soil Survey

The purpose of this report is to summarize the results of an Order 2 soil inventory conducted for Canyon Fuels Company at a proposed bleeder shaft location near the Skyline mine in Carbon County, Utah.

The soil survey area is approximately 3.8 miles west northwest of Scofield, Utah. This soil survey was prepared so that the Skyline mine could: 1) identify suitable sources of topsoil and subsoil; 2) determine potential depths and quantities of topsoil and subsoil; 3) identify potential impacts of construction activities on the soil resource; and 4) develop a reclamation plan for the proposed construction area.

"Canyon Fuel Company, LLC, plans to construct a ventilation facility adjacent to the Granger Ridge road located approximately four (4) miles north-northwest of the primary mine site. The site is necessary to provide exhaust ventilation to complete mining in the Skyline North of Graben district (NOG). The site will include a 5-foot diameter vertical shaft, exhaust fan, and a diesel-powered emergency generator to be used during start-up of the fan. The disturbance for the pad includes a short access road, a 50-foot by 80-foot pad, and a topsoil pile. The footprint of the disturbance will be approximately 1.5 acres, with a permitted area of approximately 4.2 acres (Galecki 2015)."

Project Area

The NOG Bleeder Shaft soil survey area is near the north end of the Wasatch Plateau west of Scofield, Utah on Granger Ridge near the top of Woods Canyon. The NOG soil survey is accessed by driving approximately 6.8 miles north along the Granger Ridge road from the SR 264 highway summit, Figure 1. The soil survey area is located in portions of Sections 26, 34, and 35 in Township 12 South, Range 6 East, Salt Lake base meridian (Utah AGRC 2014b). The soil survey area is on the Scofield, Utah 7.5 minute USGS quadrangle (Utah AGRC 2014c). Elevation ranges from approximately 9,000 feet (2,744 meters) to nearly 9,300 feet (2,836 meters) on the mountain sideslope (Utah AGRC 2014c).

Because there were multiple proposed locations and the precise location of the NOG Bleeder Shaft was still under consideration during the time the soil survey field work was conducted, a much larger area was evaluated and sampled. The final pad and access road location will be within the soil survey area.

The NOG Bleeder Shaft soil survey area encompasses three proposed project areas:

- NOG Bleeder Shaft construction pad;
- *Access Road* from Granger Ridge Road to NOG Bleeder Shaft construction pad; and
- *Topsoil Stockpile(s)* adjacent to the access road and construction pad.

The soil survey area encompasses approximately _____ acres.

Vegetation

Composition of the subalpine ecological communities are directly related to aspect. North slopes are dominated by Englemann spruce, subalpine fir, Douglas fir, and quaking aspen. South slopes are dominated by quaking aspen, mountain big sagebrush, grasses, and high mountain shrubs. The aspen ecological type is dominant in the soil survey area.

Climate

An official U.S. Weather Bureau station is located near the Skyline Mine, Table 1. The Skyline mine surface facilities are approximately 4 miles south southeast of the soil survey area at 8,710 foot elevation. The weather station name is Scofield - Skyland Mine, Utah. The period of available records is July 1, 1984 through February 28, 2013 (WRCC 2014). The moisture regime is ustic and udic, characterized by deep winter snowfall and summer thunderstorms. Soil temperature regime is cryic, characterized by very cold winters and moderate summers (USDA Manti 2014 and USDA NRCS 2014a).

Table 1. Summary of weather data for the Scofield - Skyland Mine, Utah weather station.

	Ave Max Temp (F)	Ave Min Temp (F)	Ave Total Precip (in)	Ave. Total Snowfall (in)	Ave Total Snow Depth (in)
January	32.9	11.2	2.84	44.8	18
February	33.3	12.0	2.85	44.8	19
March	39.7	17.7	2.49	32.5	10
April	46.9	23.8	2.57	23.8	3
May	56.5	31.0	1.82	7.2	0
June	68.1	38.8	1.13	0.5	0
July	75.9	46.3	1.44	0.0	0
August	73.9	44.8	1.53	0.0	0
September	65.0	37.0	1.79	0.6	0
October	52.7	28.0	2.23	10.0	1
November	39.3	17.8	2.46	31.6	4
December	32.2	10.6	2.63	40.9	12
Annual	51.4	26.6	25.78	236.6	6

Source: Western Regional Climate Center, November 2014.
Period of Record: July 1, 1984 to February 28, 2013.

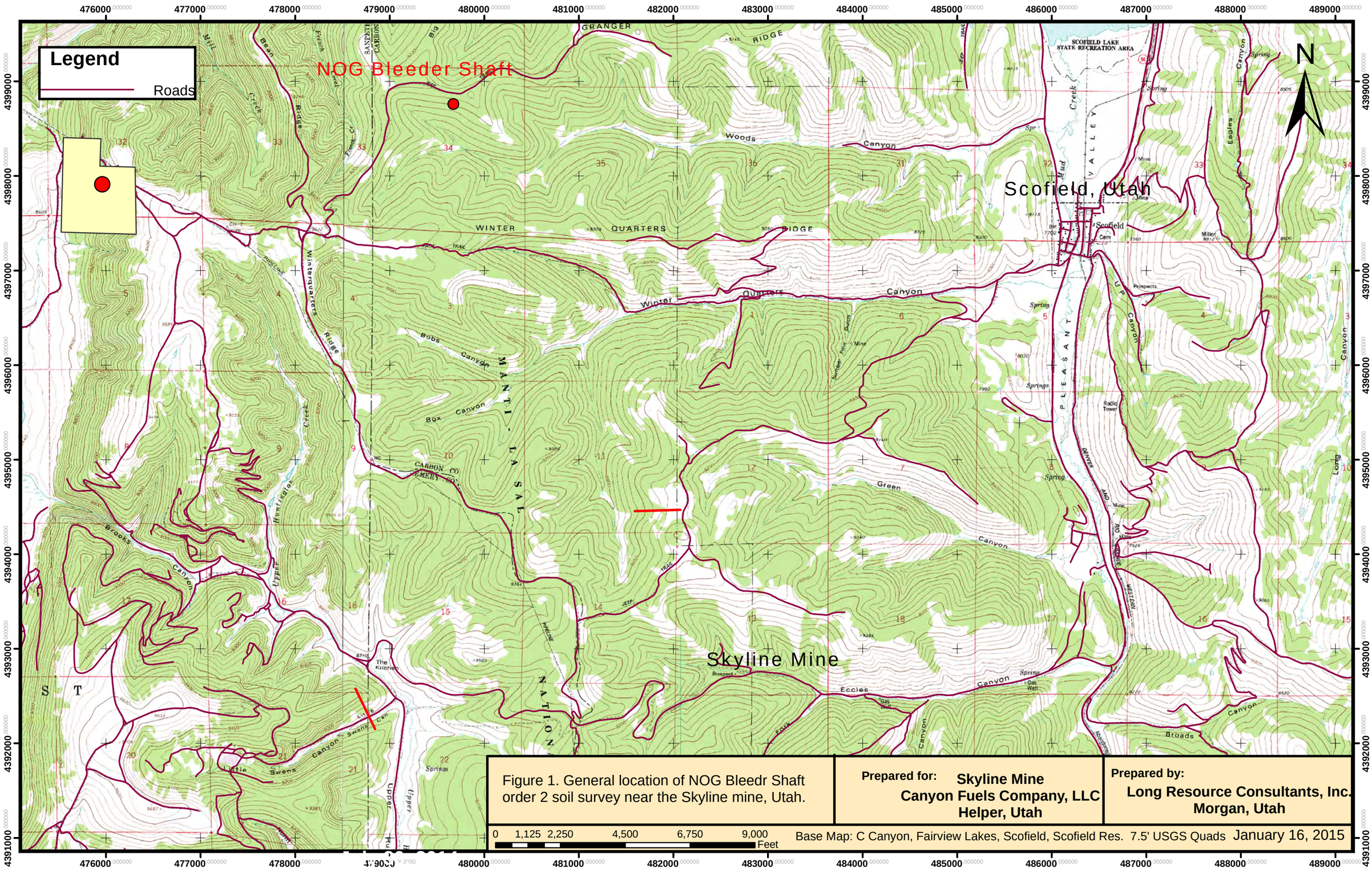

Figure 1. General location of NOG Bleedr Shaft order 2 soil survey near the Skyline mine, Utah.

Prepared for: **Skyline Mine**
Canyon Fuels Company, LLC
Helper, Utah

Prepared by:
Long Resource Consultants, Inc.
Morgan, Utah

Base Map: C Canyon, Fairview Lakes, Scofield, Scofield Res. 7.5' USGS Quads January 16, 2015

Geology

The Castlegate Formation (Kc) is the dominate geologic formation in the NOG Bleeder Shaft soil survey area (Knowles 1996). It is a member of the Upper Cretaceous Group. Castlegate Formation sandstone beds "...are chiefly gray differing from the underlying Blackhawk sandstone (Kbh) which are commonly some shade of brown (Weiss 1990)."

How this Soil Survey was Made

This soil survey was made in accordance with the guidelines for an order 2 soil survey as detailed in the *Soil Survey Manual* (USDA NRCS 1993) and *National Soil Survey Handbook* (USDA NRCS 2014b). Soils were classified using the *Keys to Soil Taxonomy, Twelfth Edition* (USDA NRCS 2014c). Haplocryolls are the dominant taxonomic Great Group.

Evaluation of Soils

Soils were examined, described, and sampled in hand dug pits (4). Miscellaneous landform notes (3) were also recorded. Soil profile descriptions and samples were collected on September 18, 2014. The soil survey map, Figure 2, details the locations of the soil profiles and miscellaneous notes that were examined, sampled, and analyzed within the NOG Bleeder Shaft soil survey area.

Soil Profile Descriptions

Soil profile descriptions were completed for each soil sample and miscellaneous landform location. Soil colors (Munsell 2012) were evaluated in the office under natural lighting using the profile box samples collected at each location. Soil *Pedon Description Forms* (USDA NRCS 1997) were completed for each soil pit using the methods detailed in the *Field Book for Describing and Sampling Soils*, version 3.0 (Schoeneberger et. al., 2012). All soil descriptions were completed by Robert E. Long, Certified Professional Soil Scientist and entered into a Pedon PC database (Soil Survey Staff 2012). Soil profile descriptions are in Appendix A. Photographs of the soil profile locations are in Appendix B.

The geomorphic setting for each soil profile location was determined based on the *Geomorphic Description System* (USDA NRCS 2008).

Soil sample locations are coded by the year that the sample was collected (2014). For example, soil sample location 14SKY05 was the fifth soil description location (08) collected at the Skyline mine (SKY) in 2014 (14).

Soil samples of each horizon were collected in new gallon size plastic freezer bags and in micromonolith profile boxes. The sealed sample bags were shipped to Inter Mountain Laboratory in Sheridan, Wyoming for analysis. Box samples were used for further examination

of soil profile characteristics and retained as a record of each soil profile. Photos of the soil profile boxes are in Appendix C.

Soil Profile Locations

The location of each soil sample location was determined with a hand-held GPS (Garmin GPSMAp 60st™) in the UTM NAD83 coordinate system. The X and Y coordinates for each soil profile location are listed as part of the profile description in Appendix A.

Digital Mapping

The soil survey map, Figure2, was produced using ARCMap software (version 10.2.1). Digital natural color aerial photography (NAIP 2011), USGS topographic maps, Public Land Survey Sections (PLSS), and a Utah transportation layer were downloaded from the Utah Automated Geographic Reference Center (Utah AGRC 2014a-d).

Analysis of Soil Samples

Soil samples (10) from 4 representative soil profiles collected from within or immediately adjacent to the NOG Bleeder Shaft soil survey area were sampled by soil horizon and submitted for chemical and physical analysis. Results of the laboratory analysis of soil samples are in Appendix D.

Soil samples were analyzed for parameters outlined by Utah Division of Oil Gas and Mining's (DOGM) *Guidelines for Management of Topsoil and Overburden* (DOGM 2008), Table 2.

Table 2. Soil analysis parameters for topsoil and overburden (Utah DOGM, 2008).

Parameter	Unit
Paste pH	s.u.
Saturation percent	%
Electrical Conductivity (ECe)	dS/m
Organic Matter Percent	%
Soluble Na, Mg, and Ca	meq/l
Sodium Adsorption Ratio	
Particle Size Analysis (report very fine sand, sand, silt, and clay)	%
CaCO3 Percent	%
Total Organic Carbon	%

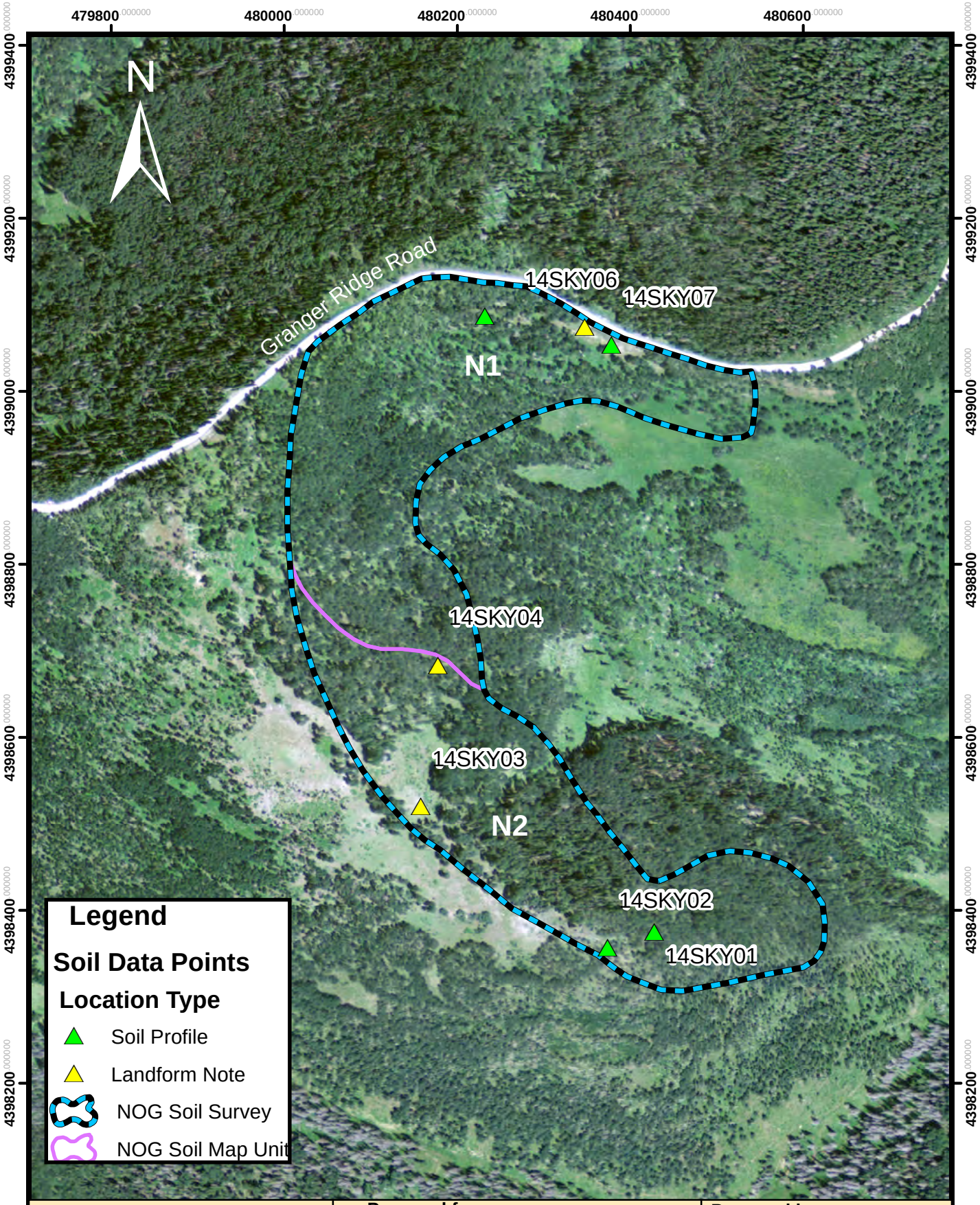

Figure 2. Soil survey map for NOG Bleeder Shaft soil survey area.

Prepared for:
Skyline Mine
Canyon Fuels Company, LLC
Helper, Utah

Prepared by:
Long Resource Consultants, Inc.
Morgan, Utah

0 150 300 600 900 1,200 1,500 Feet

Base Map: NAIP 2011

January 16, 2015

Existing Soil Survey

The NOG Bleeder Shaft soil survey is in an area previously mapped as part of the Manti-LaSal National Forest soil survey (UT645).

Manti LaSal National Forest

An order 3 soil survey has been conducted in the Manti LaSal National Forest (MLNF). Figure 3 shows the relationship of the MNLF soil map units to the NOG Bleeder Shaft soil survey. Table 3 lists the MNLF order 3 soil map units that occur within or adjacent to the NOG Bleeder Shaft soil survey (USDA - Manti 2014). Table 4 lists the taxonomic classification of each soil family as listed in the data files received from the Manti LaSal National Forest (USDA - Manti 2014).

Soils mapped by the MLNF are characterized by dark surfaces (mollic and pachic epipedons) and accumulations of illuvial clay (argillic horizons) in some soil families. The amount of soils that are shallow to bedrock (lithic contact) is of limited extent in the MLNF soil map units. The dominant physiographic setting of the MLNF map units is mountain sideslopes which is similar to the NOG Bleeder Shaft. The soil temperature regime of all the MLNF soil map unit components is cryic.

Table 3. Manti LaSal National Forest order 3 soil survey map units within the NOG Bleeder Shaft soil survey .

Map Unit[1]	Soil Map Unit[1]	Vegetation[1]	NOG Survey Acres[2]
560	Lucky Star - Skylick families, 30-60% slopes	Aspen	51.0
713	Lucky Star - Adel families, 30-60% slopes	Aspen	0.0
820	Lucky Star - Bundo - Adel families, 30-60%	Spruce, fir, aspen	0.0

1. Manti LaSal National Forest soil survey map unit symbol (USDA - Manti 2014).
2. Area calculated as plane acres within NOG soil survey area using ARCMap software (v10.2.1).

Table 4. Taxonomic classification of soil families mapped in the Manti LaSal National Forest order 3 soil survey within the NOG Bleeder Shaft soil survey.

Soil Family	Taxonomic Classification[1]
Adel	Pachic Haplocryolls fine-loamy, mixed, superactive
Bundo	Ustic Palecryalfs loamy-skeletal, mixed, superactive
Lucky Star	Typic Palecryolls loamy-skeletal, mixed, superactive
Skylick	Pachic Palecryolls fine-loamy, mixed, superactive

1. The edition of *Keys to Soil Taxonomy* was not specified in the data received from the MLNF.

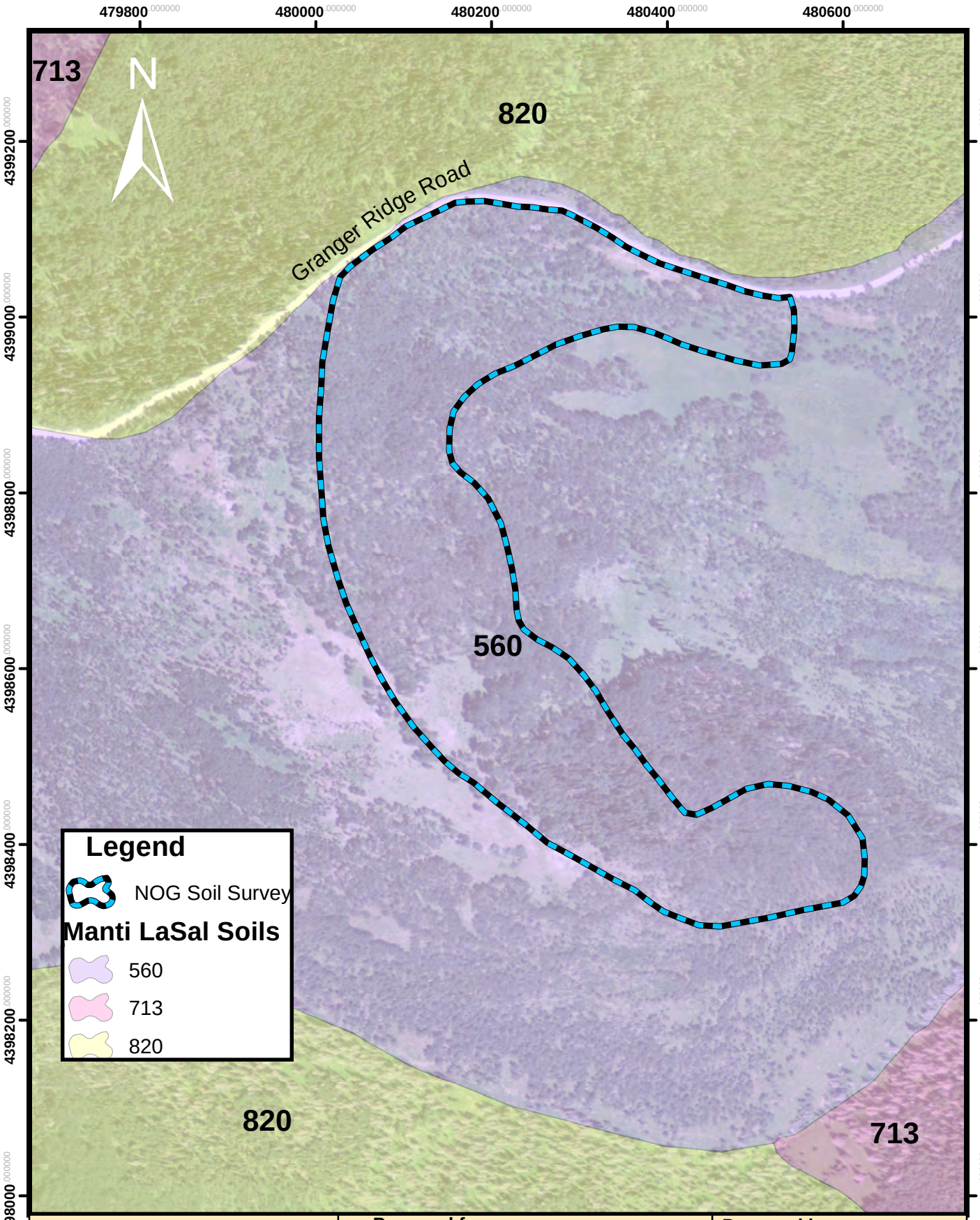

Figure 3. Manti LaSal NF soil suvey map units.

Prepared for:
Skyline Mine
Canyon Fuels Company, LLC
Helper, Utah

Prepared by:
Long Resource Consultants, Inc.
Morgan, Utah

0 150 300 600 900 1,200 1,500 Feet

Base Map: NAIP 2011

January 16, 2015

Section Two

Soil Characteristics

Soils in the NOG Bleeder Shaft soil survey area are characterized by depth to sandstone bedrock, coarse soil texture, dark soil surface color (mollic or pachic), and absence of a zone of illuvial clay accumulation (no argillic horizon). The location of each soil profile described in the NOG Bleeder Shaft soil survey is shown in Figure 2.

Cambic horizon

Soils in the NOG Bleeder Shaft soil survey area have strong cambic horizons. This indicates that some soil development has taken place. However, none of the soil profiles showed any indications of illuvial clay accumulation and there was not enough clay increase between horizons to meet the requirements for an argillic horizon based on the laboratory analysis.

Depth to Bedrock

Sandstone bedrock (lithic contact) influences the soil depth in the soil profiles in the survey area. The depth to fractured sandstone bedrock was less than 50 cm (20 inches) from the mineral soil surface in profiles 14SKY02 and 14SKY07. Fractured sandstone that may be bedrock (lithic contact) was observed at 58 cm (23 inches) in profiles 14SKY01 and 14SKY05. Field observations at 14SKY01 and 14SKY05 did not definitively identify a lithic contact, but did indicate that it may be relatively close to the 58 cm (23 inches) hole depth.

Soil pH

The soil pH ranges from 6.2 to 7.0 in the soil profiles described and sampled in the NOG Bleeder Shaft soil survey area. Soils with a pH of 6.5 to 8.2 are considered *Good* (DOGM 2008). Soils with pH from 6.0 to 6.4 are considered to be *Fair* (DOGM 2008). Although the soil pH is *Fair* in some soil profiles, based on the *Guidelines for Management of Topsoil and Overburden* (DOGM 2008), they are native soils that are supporting good grass, shrub, and tree communities.

Soil Texture

Soil textures in the NOG Bleeder Shaft soil survey area included loam and sandy loam. The percent clay ranged from 6 to 12 percent. The taxonomic particle size classes are coarse-loamy and loamy-skeletal (coarse-loamy range). Three of the four soil profiles were skeletal with greater than 35 percent rock fragments in the control section.

Soil Families

Soils in the NOG Bleeder Shaft soil survey area were classified to the taxonomic family using the *Keys to Soil Taxonomy, Twelfth Edition* (USDA NRCS 2014c). Three distinct soil families were identified in the soil survey area. The priority for soil family name selection was based on the following criteria:

1. Soil family name was previously used by either the Manti LaSal National Forest as part of the previous order 3 mapping completed in and adjacent to the NOG Bleeder Shaft soil survey area.
2. Soil family name was previously used by the NRCS on another soil survey in Utah.
3. Soil family name was previously mapped by the NRCS in a state adjacent to Utah.
4. Soil family name is from an established soil series (USDA 2015).

The soil profiles described in the NOG Bleeder Shaft soil survey are listed in Table 5.

Table 5. Taxonomic classification of soil profiles described and sampled in the NOG Bleeder Shaft soil survey area.

Profile	Family	Taxonomic Classification
14SKY01	Hobacker	Pachic Haplocryolls loamy-skeletal, mixed, superactive
14SKY02	McCadden	Lithic Haplocryolls loamy-skeletal, mixed, superactive
14SKY03	Rock Outcrop	
14SKY04	Bench	
14SKY05	Hailman	Pachic Haplocryolls coarse-loamy, mixed, superactive
14SKY06	Rock Outcrop	
14SKY07	McCadden	Lithic Haplocryolls loamy-skeletal, mixed, superactive

Potential suitability of soils (Good, Fair, or Poor) in these soil family descriptions are based on the *Guidelines for Management of Topsoil and Overburden* (DOGM 2008).

Hailman Family

Pachic Haplocryolls coarse-loamy, mixed, superactive

Representative soil profile: 14SKY05

Hailman family soils occur on concave and linear sloping to very steep mountain sideslopes. They have thick dark surfaces (pachic) and are coarse textured with less than 18 percent clay in the control section. Hailman family soils have a *Good* Available Water Capacity (AWC). These soils may have sandstone bedrock within 100 cm (40 inches) of the soil surface.

The Hailman family soils are a *Fair* source of reclamation material due to the pH of 6.4 throughout the representative soil profile. While the soil pH rates the typifying profile for Hailman family soils as *Fair,* there is a well established quaking aspen and grass community growing at the location.

Native vegetation is quaking aspen, grasses, and forbs.

The Hailman soil series was established in Wasatch County, Utah. Hailman family soils were a dominant soil in the Powerline Corridor soil survey area (Long 2014).

Hobacker Family

Pachic Haplocryolls loamy-skeletal, mixed, superactive

Representative soil profile: 14SKY01

Hobacker family soils occur on very steep convex linear mountain sideslopes. They have thick dark surfaces (pachic), are coarse textured with less than 18 percent clay and greater than 35 percent rock fragments in the control section. Hobacker family soils have *Fair* Available Water Capacity (AWC).

Native vegetation is mountain quaking aspen with scattered dead subalpine fir.

The Hobacker family soils are a *Fair* source of reclamation material to 51 cm (20 inches) based on pH (6.3 to 6.6) in the representative soil profile and the saturation percent (55.4 to 66.6).

The Hobacker soil series was established in Lincoln County, Wyoming.

McCadden Family

Lithic Haplocryolls loamy-skeletal, mixed, superactive

Representative soil profile: 14SKY07

McCadden family soils are shallow to sandstone bedrock (less than 20 inches) and occur on mountain ridges and shoulders. They have dark surfaces (mollic) and are coarse textured with less than 18 percent clay and greater than 35 percent rock fragments in the control section. McCadden family soils have *Good* to *Fair* Available Water Capacity.

Native vegetation is dominated by quaking aspen and grasses.

McCadden family soils are a *Fair* to *Good* source of reclamation material limited by pH and saturation percent. Soil pH ranges from 6.2 to 7.0. Saturation percent ranges from 44.1 to 72.0 percent. They are also limited by the shallow depth to sandstone bedrock.

The McCadden soil series was established in Utah County, Utah. McCadden family soils were a dominant soil in the Powerline Corridor soil survey area (Long 2014).

Section Three

Soils Legend

Soils in the NOG Bleeder Shaft survey area were described with two soil map units, Table 6.

Table 6. Soil map unit composition.

Map Unit	Pct	Family	Taxonomic	Typifying Profile	Vegetation
	%				
N1	Hailman - McCadden families complex, 20 to 70 percent slopes				
	70	Hailman	Pachic Haplocryolls coarse-loamy, mix, super	14SKY05	Aspen grass
	15	McCadden	Lithic Haplocryolls loamy-skeletal, mix, super	14SKY07	Aspen grass
	10	Hobacker	Lithic Haplocryolls loamy, mixed, superactive		Aspen grass
	5		Sandstone Outcrops	14SKY06	
N2	Hobacker - McCadden families complex, 15 to 80 percent slopes				
	70	Hobacker	Lithic Haplocryolls loamy, mixed, superactive	14SKY01	Aspen Conifer
	15	McCadden	Lithic Haplocryolls loamy-skeletal, mix, super	14SKY02	Aspen grass
	10	Hailman	Pachic Haplocryolls coarse-loamy, mix, super		Aspen grass
	5		Sandstone Outcrops	14SKY03	

Map Unit Descriptions

Potential suitability of soils (Good, Fair, or Poor) in these map unit descriptions are based on the *Guidelines for Management of Topsoil and Overburden* (DOGM 2008).

N1 Hailman - McCadden families complex, 20 to 70 percent slopes

The N1 soil map unit is located on steep to very steep south and east facing mountain sideslopes in Woods Canyon. This map unit is dominated by soils that are moderately deep and shallow to fractured sandstone. Map unit N1 comprises 26.7 of the NOG soil survey area.

The map unit consists of 70 percent Hailman family soils on mountain sideslopes and 15 percent McCadden family soils on mountain shoulders. Soil profile 14SKY05 is representative of Hailman family soils in map unit N1. Soil profile 14SKY07 is representative of McCadden family soils in map unit N1. Also included in this map unit are 10 percent Hobacker family soils on convex mountain sideslopes, 5 percent sandstone outcrop and other similar soils.

Native vegetation consists of quaking aspen and grasses with scattered subalpine fir.

This soil map unit is limited by steep to very steep slopes and depth to sandstone. These soils are a *Good* to *Fair* source of topsoil and subsoil for reclamation that are limited by soil pH, saturation percent, and depth to sandstone.

N2 Hobacker - McCadden families complex, 20 to 65 percent slopes

The N2 soil map unit is located on steep to very steep south and east facing mountain sideslopes in Woods Canyon. This map unit is dominated by soils that are moderately deep and shallow to fractured sandstone. Map unit N2 comprises 24.3 of the NOG soil survey area.

The map unit consists of 70 percent Hobacker family soils on convex mountain sideslopes and 15 percent McCadden family soils on mountain ridges and shoulders. Soil profile 14SKY01 is representative of Hobacker family soils in map unit N2. Soil profile 14SKY02 is representative of McCadden family soils in map unit N2. Also included in this map unit are 10 percent Hailman family soils, 5 percent sandstone outcrop and other similar soils.

Native vegetation consists of quaking aspen and grasses with scattered subalpine fir.

This soil map unit is limited by steep to very steep slopes and depth to sandstone. These soils are a *Good* to *Fair* source of topsoil and subsoil for reclamation that are limited by soil pH, saturation percent, available water capacity, and depth to sandstone.

Section Four

Topsoil and Subsoil Salvage

Areas within the NOG Bleeder Shaft soil survey that will require salvage and stockpiling of topsoil and subsoil include the *Construction Pad* and the *Access Road*.

Soil Limiting Features

Low Available Water Capacity

The coarse soil textures in the NOG Bleeder Shaft soil survey area results in *Fair* Available Water Capacity (AWC) in 40 percent of the soil horizons. AWC values were estimated using the *Soil Water Characteristics* model (Saxton 2009). This model adjusts the AWC for texture, organic matter, rock fragments and salinity. The estimated AWC values are listed in Table D-2 in Appendix D.

Table 7 lists the estimated AWC suitability for each soil profile based on criteria set forth in the *Guidelines for Management of Topsoil and Overburden* (DOGM 2008). Table 8 lists the AWC suitability by soil map unit.

Table 7. Suitability of topsoil and subsoil suitability for soil profiles.

Soil Profile	Soil Family	Topsoil AWC Suitability[1]	Subsoil AWC Suitability[1]
14SKY01	Hobacker	Good	Fair
14SKY02	McCadden	Fair	---- [2]
14SKY03	Sandstone Outcrop		
14SKY04	Bench		
14SKY05	Hailman	Good	Good
14SKY06	Sandstone Outcrop		
14SKY07	McCadden	Fair	---- [2]

1. Suitability based on criteria set forth in *Guidelines for Management of Topsoil and Overburden* (DOGM 2008).
2. Subsoil included in topsoil rating for these shallow soils.

Table 8. Suitability of topsoil and subsoil AWC by soil map units, based on the dominate soil type in each map unit.

Soil Profile	Topsoil AWC Suitability[1]	Subsoil AWC Suitability[1]
N1	Good	Good
N2	Good	Fair

1. Suitability based on criteria set forth in *Guidelines for Management of Topsoil and Overburden* (DOGM 2008).
2. Subsoil included in topsoil rating for these shallow soils.
NA Not Applicable

Shallow Soils

Shallow soils are a limiting soil feature in soil map units N1 and N2 which have major components that are shallow (McCadden family). The estimated average topsoil salvage depth for each of these map units is 14 inches or greater. Use of substitute soil is not anticipated to be necessary for either soil map unit.

Topsoil and Subsoil Salvage Depths

Topsoil and subsoil salvage should be expected to vary within the soil map units. Salvage operations should be monitored to avoid mixing of topsoil and subsoil. Table 9 lists the estimated average topsoil and subsoil salvage depths for each soil map unit. Actual salvage depths should be expected to vary in the field and should be monitored during construction.

Topsoil and subsoil stockpiles should be protected from wind and water erosion.

Table 9. Estimated average topsoil and subsoil salvage depths based on weighted averages.

Map Unit	Map Unit Name	Estimated Average Topsoil Salvage Depth[1]	Estimated Average Subsoil Salvage Depth[1]	Estimated Average Total Salvage Depth[1]
		inches	inches	inches
N1	Hailman - McCadden families complex, 20-70% slopes	19	2[2]	21
N2	Hobacker - McCadden families complex, 15-80% slopes	14	6	20

1. Estimated salvage depths are based on weighted averages that take into account the contribution of each soil map unit component based on its percent occurrence in the map unit.
2. Subsoil salvage depths less than 6 inches should be salvaged with the topsoil.

Replacement of Topsoil and Subsoil

Topsoil and subsoil should be replaced in the reverse order of how they were removed. Subsoil replaced first followed by replacement of the topsoil. Reduction of soil compaction in either or both the topsoil and subsoil may be required prior to seeding.

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Appendix A

Soil Profile Descriptions

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Profile Descriptions 1
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Profile Descriptions

- Representative soil profile descriptions were described and sampled on September 18, 2014.

- Soil textures (USDA) and the percents sand, silt, and clay listed with these soil profile descriptions are the laboratory analysis results. Complete laboratory analysis results are in Appendix D.

- Electrical conductivity (ECe), saturated paste pH, and percent calcium carbonate values listed with these soil profile descriptions are the laboratory analysis results. Complete laboratory analysis results are in Appendix D.

- Soil profile data (field and selected laboratory analysis parameters) was entered into a database using Pedon PC software (Soil Survey Staff 2014).

14SKY01

Pedon ID: 14SKY01
Description Date: 9/18/2014
Describer: Robert Long

Site Notes: small landslides in area.
Pedon Notes: Text: Unable to dig past 58 cm due to heavy rock layer, could be bedrock (unable to move with spade).

Soil Name As Correlated: Hobacker family
Current Taxonomic Class: Loamy-skeletal, mixed, superactive Pachic Haplocryolls
Current Taxon Kind: Family

County or Parish: UT007 - Carbon
UTM: 480426E, 4398376N -- Datum NAD83, Zone 12
Legal Description: Section 35, Township 12 South, Range 6 East of the 29 Meridian

Landscape: mountains
Landform: mountain slope
Geomorphic Component: Upper third of mountainflank
Profile Pos: Backslope
Slope: 72 percent
Elevation: 2747 meters (9012.5 feet)
Aspect: 45°
Shape: up/down: Convex; **across: linear**

Runoff: Very high
Erosion: Class 4 - Sheet erosion

Primary Earth Cover: Tree cover;
Existing Vegetation: POTR5 - quaking aspen (*Populus tremuloides*); ABLA - subalpine fir (*Abies lasiocarpa*); RUDBE - coneflower (*Rudbeckia*); BRMA4 - mountain brome (*Bromus marginatus*)

Surface Fragments: 10 percent subangular sandstone gravels;

Parent Materials: sandstone
Particle Size Control Section: 25 to 58 centimeters (9.8 to 22.8 inches)

Diagnostic Features: Mollic epipedon: 0 to 58 centimeters (0 to 22.8 inches) and Cambic horizon: 15 to 58 centimeters (5.9 to 22.8 inches)

A --- 0 to 15 centimeters (0 to 5.9 inches); very dark brown (10YR 2/2) moist, gravelly sandy loam; dark grayish brown (10YR 4/2) dry; 53 percent sand; 39 percent silt; 8 percent clay; weak medium subangular blocky parting to moderate medium granular structure; very friable, slightly hard, nonsticky, nonplastic; common medium roots, common fine roots and common very fine roots; 15 percent subangular sandstone gravels; electrical conductivity of 0.29 mmhos/cm by EC meter, saturated paste; noneffervescent by HCl, 1 normal; neutral, pH 6.6, pH meter; clear smooth boundary; CaCO3 1.1 Percent.

Bw1 --- 15 to 38 centimeters (5.9 to 15 inches); very dark grayish brown (10YR 3/2) moist, gravelly loam; brown (10YR 4/3) dry; 47 percent sand; 44 percent silt; 9 percent clay; moderate medium subangular blocky structure; very friable, slightly hard, nonsticky, nonplastic; common coarse roots, common medium roots, common fine roots and common very fine roots; 15 percent subangular sandstone gravels; electrical conductivity of 0.2 mmhos/cm by EC meter, saturated paste; noneffervescent by HCl, 1 normal; slightly acid, pH 6.3, pH meter; clear smooth boundary; CaCO3 1 Percent.

Bw2 --- 38 to 58 centimeters (15 to 22.8 inches); black (7.5YR 2.5/1) moist, extremely cobbly loam; brown (7.5YR 4/2) dry; 47 percent sand; 44 percent silt; 9 percent clay; moderate medium subangular blocky and moderate fine subangular blocky structure; very friable, slightly hard, nonsticky, nonplastic; common coarse roots throughout, common medium roots throughout, common fine roots throughout and common very fine roots throughout; 40 percent subangular sandstone cobbles, 15 percent subangular sandstone stones, and 15 percent subangular sandstone gravels; electrical conductivity of 0.15 mmhos/cm by EC meter, saturated paste; noneffervescent by HCl, 1 normal; slightly acid, pH 6.3, pH meter; Unable to dig past 58 cm due to heavy rock layer- either extremely cobbly/stony or bedrock (rock would not move with spade); CaCO3 0.9 Percent.

14SKY02

Pedon ID: 14SKY02
Description Date: 9/18/2014
Describer: Robert Long

Soil Name As Correlated: McCadden family
Current Taxonomic Class: Loamy-skeletal, mixed, superactive Lithic Haplocryolls
Current Taxon Kind: Family

County or Parish: UT007 - Carbon
State or Territory: UT - Utah
UTM: 480373E, 4398358N -- Datum NAD83, Zone 12
Legal Description: Section 34, Township 12 South, Range 6 East of the 29 Meridian

Landscape: mountains
Landform: mountain slope
Geomorphic Component: Upper third of mountainflank
Profile Pos: Summit
Slope: 16 percent
Elevation: 2764 meters (9068.2 feet)
Aspect: 115°
Shape: up/down: linear; across: convex

Runoff: Low
Erosion: Class 1 - Sheet erosion

Primary Earth Cover: Tree cover;
Existing Vegetation: POTR5 - quaking aspen (*Populus tremuloides*); BRMA4 - mountain brome (*Bromus marginatus*); POPR - Kentucky bluegrass (*Poa pratensis*); LESAS - Salina wildrye (*Leymus salinus ssp. salinus*)

Surface Fragments: 3 percent subangular sandstone gravels

Parent Materials: residuum weathered from sandstone
Bedrock: Sandstone at 29 centimeters (11.4 inches)

Particle Size Control Section: 0 to 29 centimeters (0 to 11.4 inches)
Diagnostic Features: Mollic epipedon: 0 to 29 centimeters (0 to 11.4 inches) and Lithic contact: 29 centimeters (11.4 inches)

Restrictions: Lithic bedrock: 29 centimeters (11.4 inches)

A --- 0 to 29 centimeters (0 to 11.4 inches); black (10YR 2/1) moist, very cobbly sandy loam; very dark grayish brown (10YR 3/2) dry; 59 percent sand; 33 percent silt; 8 percent clay; weak medium subangular blocky structure; very friable, slightly hard, nonsticky, nonplastic; common medium roots, common fine roots and common very fine roots; 5 percent subangular sandstone stones, 15 percent subangular sandstone gravels and 30 percent subangular sandstone cobbles; electrical conductivity of 0.2 mmhos/cm by EC meter, saturated paste; noneffervescent by HCl, 1 normal; slightly acid, pH 6.2, pH meter; abrupt smooth boundary; CaCO3 1.2 Percent.

R --- 29 centimeters (11.4 inches).

14SKY03

Pedon ID: 14SKY03
Description Date: 9/18/2014
Describer: Robert Long

Site Notes: sandstone outcrop below shoulder of mountain.

Soil Name As Described/Sampled: sandstone outcrop

UTM: 480157E, 4398521N -- Datum NAD83, Zone 12
Legal Description: Section 34, Township 12 South, Range 6 East of the 29 Meridian

Landscape: mountains
Landform: mountain slope
Geomorphic Component: Free face
Profile Pos: Backslope
Slope: 57 percent
Elevation: 2779 meters (9117.5 feet)
Aspect: 45°
Shape: up/down: ; across:

Bedrock: Sandstone at 0 centimeters (0 inches)

14SKY04

Pedon ID: 14SKY04
Description Date: 9/18/2014
Describer: Robert Long

Site Notes: Structural bench or landslide - aspen show only limited evidence of any recent movement. Site should be evaluated by an engineer or geologist before construction of a site or access road.

Soil Name As Described/Sampled: bench

UTM: 480177E, 4398684N -- Datum NAD83, Zone 12
Legal Description: Section 34, Township 12 South, Range 6 East of the 29 Meridian

Landscape: mountains
Landform: structural bench
Geomorphic Component: Upper third of mountainflank
Profile Pos: Backslope
Slope: 50 percent
Elevation: 2765 meters (9071.5 feet)
Aspect: 45°

Runoff: High

14SKY05

Pedon ID: 14SKY05
Description Date: 9/18/2014
Describer: Robert Long

Pedon Notes: Text: too rocky to dig below 58 cm. Rocks would not budge with spade (may be bedrock).
Soil Name As Correlated: Hailman family
Current Taxonomic Class: Coarse-loamy, mixed, superactive Pachic Haplocryolls
Current Taxon Kind: Family

County or Parish: UT007 - Carbon
State or Territory: UT - Utah
UTM: 480231E, 4399088N -- Datum NAD83
Legal Description: Section 34, Township 12 South, Range 6 East of the 29 Meridian

Landscape: mountains
Landform: mountain slope
Geomorphic Component: Upper third of mountainflank
Profile Pos: Backslope
Slope: 43 percent
Elevation: 2823 meters (9261.8 feet)
Aspect: 145°
Shape: up/down: Linear; **across:** Linear

Drainage: Well drained
Runoff: High
Erosion: Class 1 - Sheet erosion

Primary Earth Cover: Tree cover;

Existing Vegetation: POTR5 - quaking aspen (*Populus tremuloides*); BRMA4 - mountain brome (*Bromus marginatus*); CIRSI - thistle (*Cirsium*); LESAS - Salina wildrye (*Leymus salinus ssp. salinus*)

Surface Fragments: 5 percent subangular sandstone gravels

Parent Materials: residuum weathered from sandstone
Particle Size Control Section: 25 to 58 centimeters (9.8 to 22.8 inches)

Diagnostic Features: Mollic epipedon: 0 to 58 centimeters (0 to 22.8 inches) and Cambic horizon: 14 to 58 centimeters (5.5 to 22.8 inches)

A --- 0 to 14 centimeters (0 to 5.5 inches); very dark grayish brown (10YR 3/2) moist, sandy loam; dark grayish brown (10YR 4/2) dry; 58 percent sand; 31 percent silt; 11 percent clay; moderate medium granular structure; very friable, slightly hard, nonsticky, nonplastic; 10 percent subangular sandstone gravels; electrical conductivity of 0.21 mmhos/cm by EC meter, saturated paste; noneffervescent by HCl, 1 normal; slightly acid, pH 6.4, pH meter; clear smooth boundary; CaCO3 0.9 Percent.

Bw1 --- 14 to 36 centimeters (5.5 to 14.2 inches); very dark grayish brown (10YR 3/2) moist, sandy loam; dark grayish brown (10YR 4/2) dry; 58 percent sand; 30 percent silt; 12 percent clay; moderate medium subangular blocky parting to moderate fine granular structure; very friable, slightly hard, nonsticky, nonplastic; 10 percent subangular sandstone gravels; electrical conductivity of 0.19 mmhos/cm by EC meter, saturated paste; noneffervescent by HCl, 1 normal; slightly acid, pH 6.4, pH meter; clear smooth boundary; CaCO3 1.1 Percent.

Bw2 --- 36 to 58 centimeters (14.2 to 22.8 inches); very dark grayish brown (10YR 3/2) moist, sandy loam; dark grayish brown (10YR 4/2) dry; 58 percent sand; 30 percent silt; 12 percent clay; structure; very friable, slightly hard, nonsticky, nonplastic; 10 percent subangular sandstone gravels; electrical conductivity of 0.18 mmhos/cm by EC meter, saturated paste; noneffervescent by HCl, 1 normal; slightly acid, pH 6.4, pH meter; CaCO3 0.7 Percent.

Rocks below 58 cm would not budge with shovel and too rocky to dig below 58 cm;

14SKY06

Pedon ID: 14SKY06
Description Date: 9/18/2014
Describer: Robert Long

Site Notes: sandstone outcrop

UTM: 480346E, 4399075N -- Datum NAD83, Zone 12
Legal Description: Section 34, Township 12 South, Range 6 East of the 29 Meridian

Landscape: mountains
Landform: mountain slope
Geomorphic Component: Free face
Profile Pos: Shoulder

Slope:
Elevation: 2822 meters (9258.5 feet)
Aspect: 225
Shape: up/down: Convex; **across:** Convex
Runoff: High

14SKY07

Pedon ID: 14SKY07
Description Date: 9/18/2014
Describer: Robert Long

Soil Name As Correlated: McCadden family
Current Taxonomic Class: Loamy-skeletal, mixed, superactive Lithic Haplocryolls
Current Taxon Kind: Family

County or Parish: UT007 - Carbon
State or Territory: UT - Utah
UTM: 480377E, 4399054N -- Datum NAD83, Zone 12
Legal Description: Section 34, Township 12 South, Range 6 East of the 29 Meridian

Landscape: mountains
Landform: mountain slope
Geomorphic Component: Upper third of mountainflank
Profile Pos: Shoulder
Slope: 41 percent
Elevation: 2816 meters (9238.8 feet)
Aspect: 225°
Shape: up/down: Convex; **across:** Linear

Drainage: Well drained
Runoff: High
Erosion: Class 1 - Sheet erosion

Primary Earth Cover: Grass/herbaceous cover;
Existing Vegetation: AGROP2 - wheatgrass (*Agropyron*)

Surface Fragments: 10 percent subangular sandstone gravels

Parent Materials: residuum weathered from sandstone

Particle Size Control Section: 25 to 48 centimeters (9.8 to 18.9 inches)
Diagnostic Features: Mollic epipedon: 0 to 28 centimeters (0 to 11 inches), Cambic horizon: 11 to 28 centimeters (4.3 to 11 inches) and Lithic contact: 28 centimeters (11 inches)
Restrictions: Lithic bedrock: 28 centimeters (11 inches)

A --- 0 to 11 centimeters (0 to 4.3 inches); black (10YR 2/1) moist, gravelly sandy loam; dark grayish brown (10YR 4/2) dry; 62 percent sand; 32 percent silt; 6 percent clay; weak fine subangular blocky parting to moderate medium granular structure; very friable, slightly hard, nonsticky, nonplastic; common medium roots throughout, common fine roots throughout and common very fine roots throughout; 2 percent flat subangular sandstone flags and 20 percent subangular sandstone gravels; electrical conductivity of 0.37 mmhos/cm by EC meter, saturated paste; noneffervescent by HCl, 1 normal; slightly acid, pH 6.4, pH meter; clear smooth boundary; CaCO3 1.4 Percent.

Bw1 --- 11 to 28 centimeters (4.3 to 11 inches); very dark grayish brown (10YR 3/2) moist, cobbly sandy loam; brown (10YR 5/3) dry; 62 percent sand; 30 percent silt; 8 percent clay; moderate medium subangular blocky structure; very friable, hard, slightly sticky, nonplastic; common medium roots throughout, common fine roots throughout and common very fine roots throughout; 5 percent subangular sandstone cobbles and 15 percent subangular sandstone gravels; electrical conductivity of 0.24 mmhos/cm by EC meter, saturated paste; noneffervescent by HCl, 1 normal; neutral, pH 7, pH meter; clear smooth boundary; CaCO3 0.6 Percent.

Bw2 --- 28 to 48 centimeters (11 to 18.9 inches); very dark grayish brown (10YR 3/2) moist, very cobbly sandy loam; grayish brown (10YR 5/2) dry; 62 percent sand; 31 percent silt; 7 percent clay; weak medium subangular blocky structure; very friable, slightly hard, slightly sticky, nonplastic; common fine roots throughout and common very fine roots throughout; 5 percent flat subangular sandstone channers, 15 percent sandstone cobbles and 25 percent subangular sandstone gravels; electrical conductivity of 0.23 mmhos/cm by EC meter, saturated paste; noneffervescent by HCl, 1 normal; neutral, pH 6.9, pH meter; abrupt smooth boundary; CaCO3 0.9 Percent.

R --- 48 centimeters (18.9 inches); fractured sandstone.

Appendix B

Soil Profile Location Photographs

Photo B - 1. Soil profile location 14SKY01, Hobacker family, Pachic Haplocryolls loamy-skeletal, mixed, superactive. Soil was too rocky to dig below 58 cm (23 inches) which may be fractured sandstone bedrock. Dominant vegetation is quaking aspen with scattered subalpine fir. Coneflower and mountain brome are also present. An organic surface layer of leaves, needles, and twigs is not present in this area. Slope is 72 percent to the northeast (45°) at 9,011 foot elevation. Subalpine fir and Englemann spruce are dominant downslope.

Photo B - 2. Soil profile location 14SKY02, McCadden family, Lithic Haplocryolls loamy-skeletal, mixed, superactive. Dominant vegetation is quaking aspen, mountain brome, and Kentucky bluegrass. Bedrock is Castlegate sandstone. Viewpoint is looking generally northwest with slope breaking to the north (right in photo) where 14SKY01 is located downslope. Slope is 16 percent to the southeast (115°) at 9,066 foot elevation.

Photo B - 3. Location 14SKY03, Castlegate sandstone outcrops (around shovel in center of photo) on very steep 57 percent northeast slope (45°) at 9,116 foot elevation. Vegetation consisted of grasses, coneflower, and scattered elderberry. Open area is surrounded by quaking aspen.

Photo B - 4. Location 14SKY04 on bench area in quaking aspen grove. There was some concern that the area may be susceptible to landslides. But, there was only limited evidence of curved aspen bases as seen in this photo. Area should be evaluated for stability by an engineer or geologist if an access road or pad location is to be built in this area. Castlegate sandstone outcrops at 14SKY03 are located at far back right in photo. Slope is 30 to 70 percent to the northeast (45°) at 9,069 foot elevation.

Photo B - 5. Soil profile location 14SKY05, Hailman family, Pachic Haplocryolls coarse-loamy, mixed, superactive. Dominant vegetation is quaking aspen, mountain brome, and thistle. Soil was too rocky to dig below 58 cm (23 inches) which may be fractured Castlegate sandstone bedrock. Slope is 43 percent to the southeast (145°) at 9,260 foot elevation. Granger Ridge Road is just above top of slope in this photo. Proposed access road would pass through this area.

Photo B - 6. Location 14SKY06, Castlegate sandstone outcrop on shoulder of slope. Granger Ridge Road is on the right. Elevation is approximately 9,257 feet. View is toward west northwest from vicinity of soil profile location 14SKY07. Profile location 14SKY05 is approximately 380 feet west northwest from outcrop into the quaking aspen.

Photo B - 7. Soil profile location 14SKY07, McCadden family, Lithic Haplocryolls loamy-skeletal, mixed, superactive. View is looking upslope to the northwest. Truck is parked on side of Granger Ridge Road. Area was previously disturbed and planted to a mixture of grasses. Slope is 41 percent to the southwest (225°) at 9,240 foot elevation. Castlegate sandstone outcrops in area (14SKY06 is downslope of truck).

Appendix C

Soil Profile Box Photographs

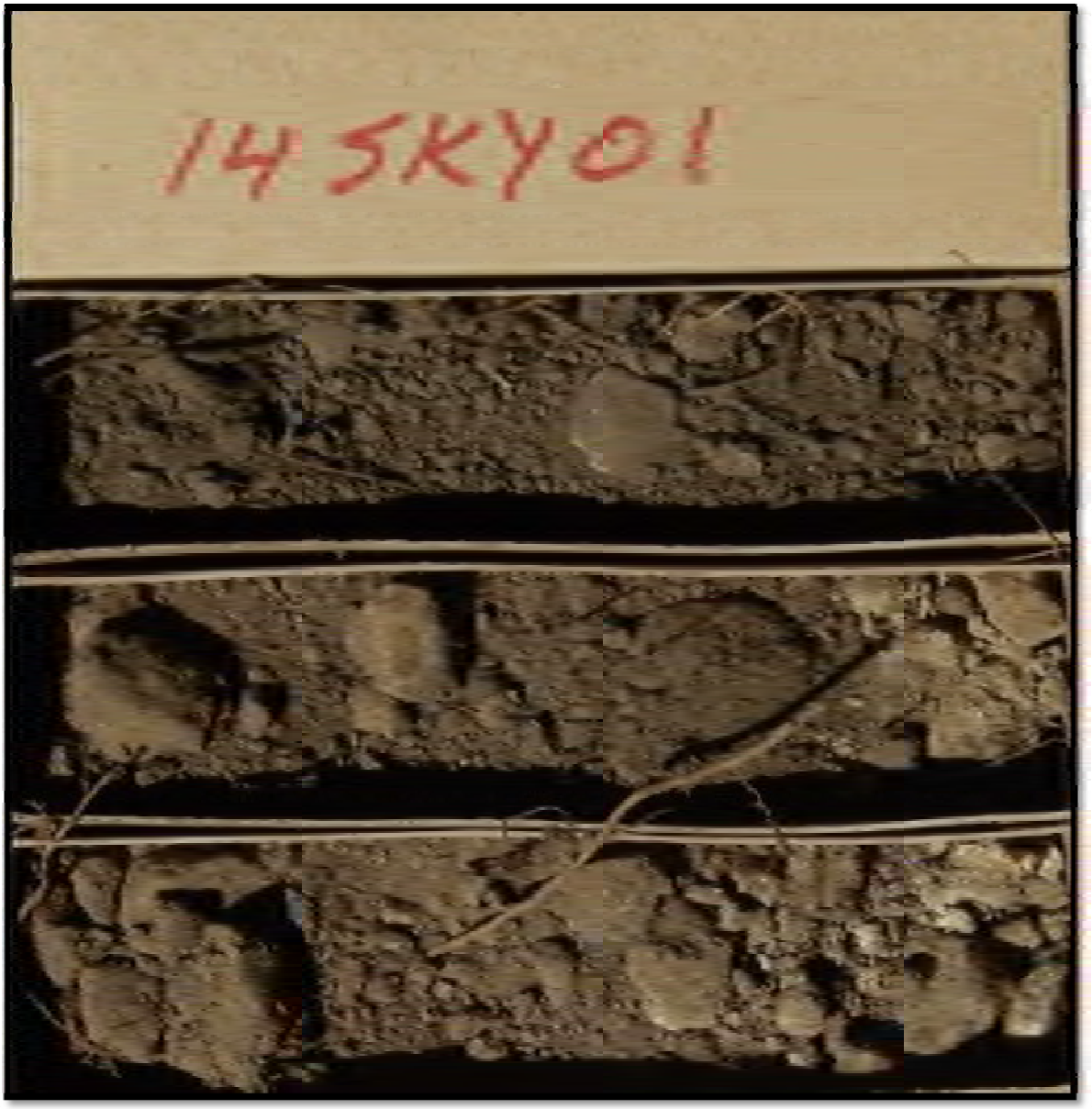

Photo C - 1. Soil profile 14SKY018, Hobacker family soil; Pachic Haplocryolls loamy-skeletal, mixed, superactive. Top of profile is at top of photo.

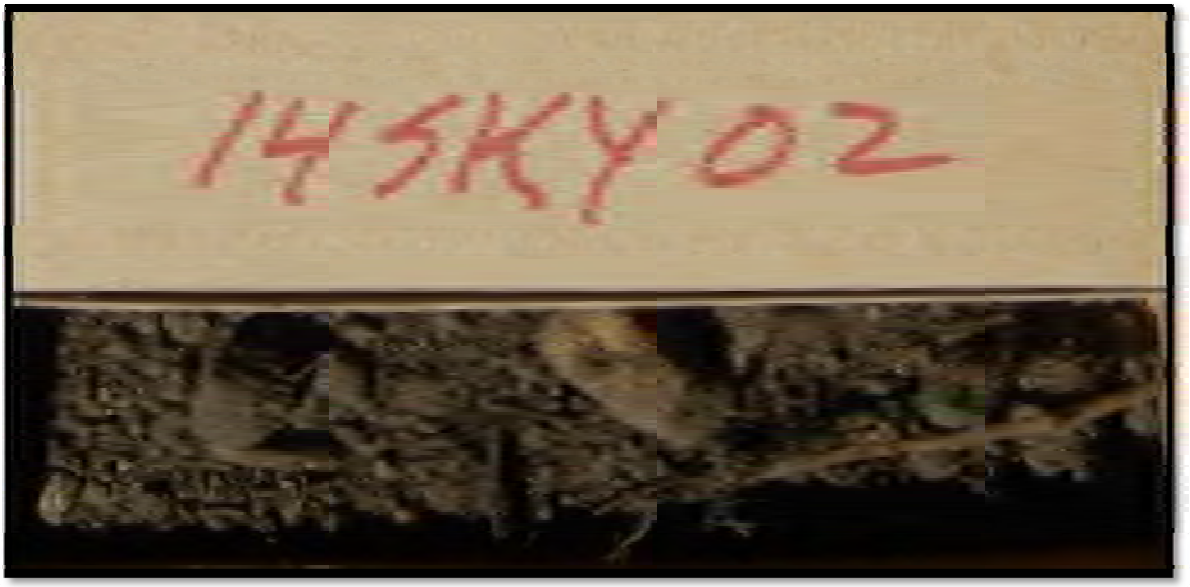

Photo B - 1. Soil profile 14SKY03, McCadden family, Lithic Haplocryolls loamy-skeletal, mixed superactive. Sandstone bedrock was at 29 cm (11 Inches).

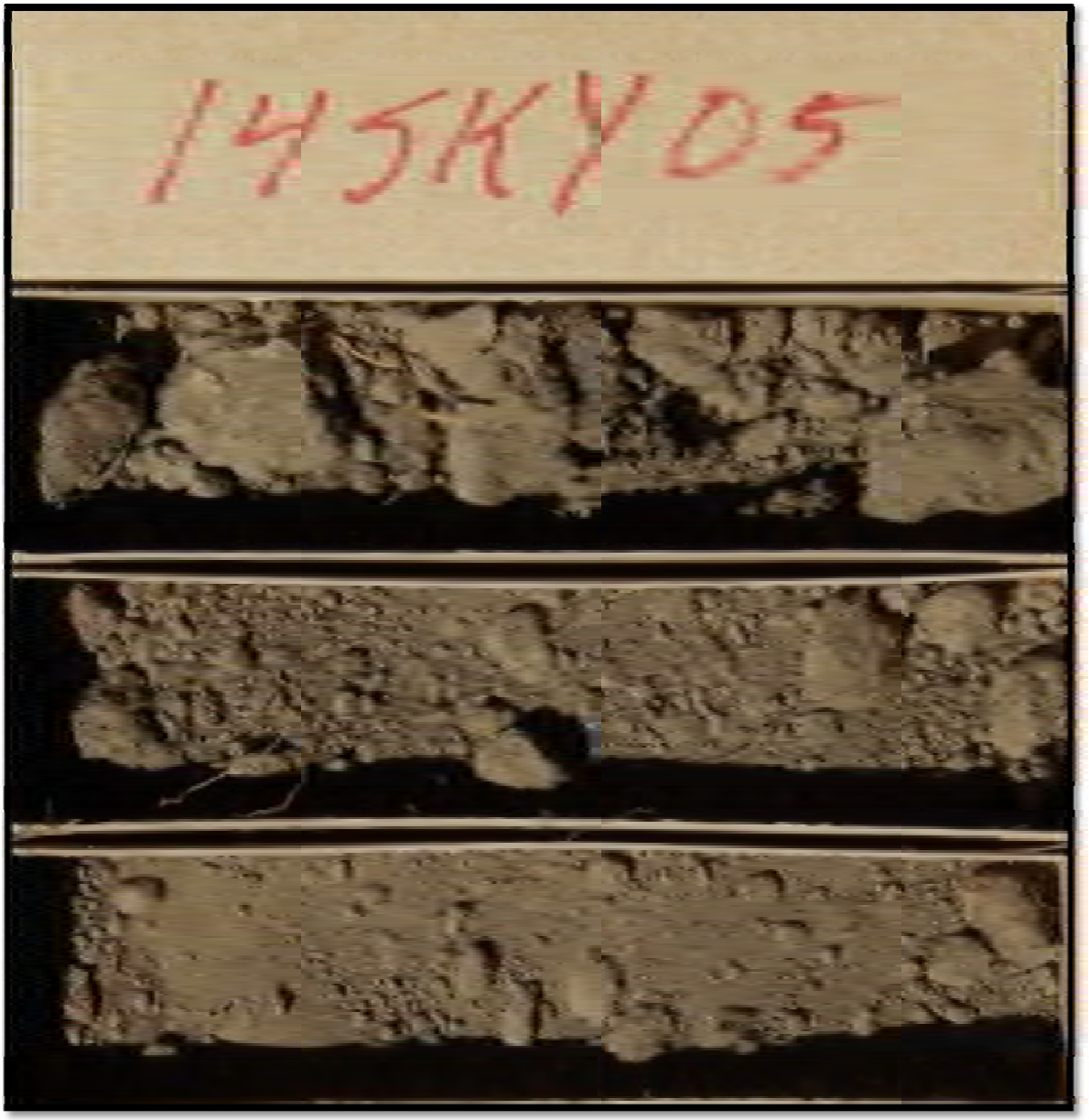

Photo B - 2. Soil profile 14SKY05, Hailman family, Pachic Haplocryolls coarse-loamy, mixed, superactive. Top of profile is at top of photo.

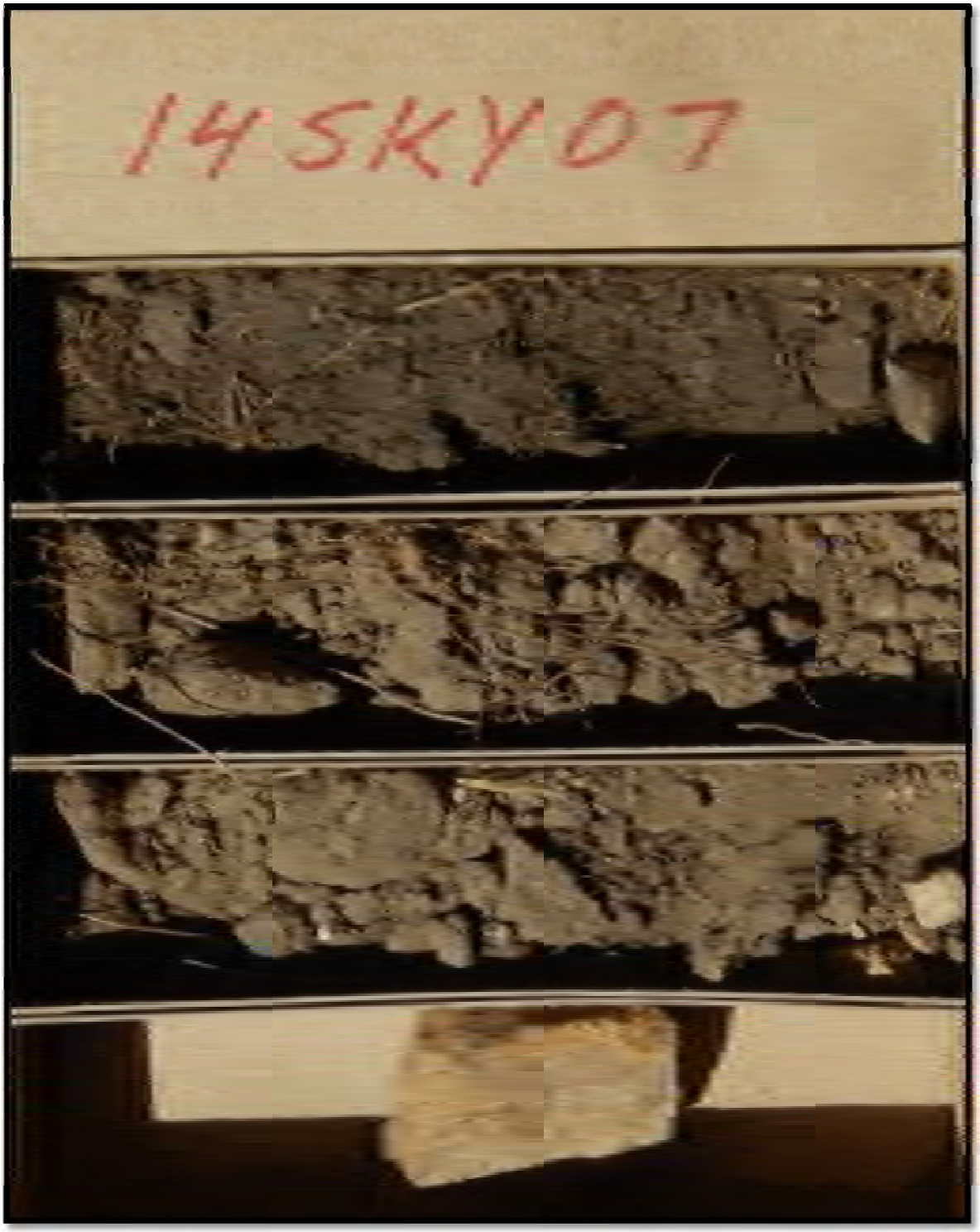

Photo B - 3. Soil profile 14SKY07, McCadden family, Lithic Haplocryolls loamy-skeletal, mixed, superactive. Sandstone bedrock was at 48 cm (19 Inches). Top of profile is at top of photo.

Appendix D

Laboratory Analysis

Table D-1. Summary of laboratory analysis of soil samples collected at the Skyline mine in September 2014.

SampleID	Begin Depth	End Depth	pH	Saturation	Electrical Conductivity	Organic Matter LOI	CO3	PE Calcium	PE Magnesium	PE Sodium	SAR	Sand	Silt	Clay	Texture	Very Fine Sand	Total Carbon	TOC
			s.u.	%	dS/m	%	%	meq/L	meq/L	meq/L		%	%	%		%	%	%
14SKY01	0	15	6.6	66.6	0.29	9.1	1.1	1.49	0.43	0.19	0.19	53.0	39.0	8.0	Sandy Loam	22.7	4.7	4.5
14SKY01	15	38	6.3	61.2	0.20	6.4	1.0	1.41	0.36	0.16	0.17	47.0	44.0	9.0	Loam	14.2	3.3	3.2
14SKY01	38	58	6.3	55.4	0.15	4.4	0.9	1.00	0.35	0.16	0.20	47.0	44.0	9.0	Loam	19.2	2.3	2.2
14SKY02	0	29	6.2	72.0	0.20	10.1	1.2	1.07	0.39	0.17	0.20	59.0	33.0	8.0	Sandy Loam	3.3	5.1	5.0
14SKY05	0	14	6.4	53.8	0.21	7.1	0.9	1.27	0.40	0.21	0.23	58.0	31.0	11.0	Sandy Loam	6.8	2.8	2.7
14SKY05	14	36	6.4	56.2	0.19	5.3	1.1	1.46	0.40	0.22	0.23	58.0	30.0	12.0	Sandy Loam	15.0	2.0	1.9
14SKY05	36	58	6.4	53.1	0.18	5.0	0.7	1.18	0.33	0.20	0.23	58.0	30.0	12.0	Sandy Loam	11.5	1.8	1.7
14SKY07	0	11	6.4	63.4	0.37	7.9	1.4	2.02	0.57	0.16	0.14	62.0	32.0	6.0	Sandy Loam	8.0	3.7	3.5
14SKY07	11	28	7.0	44.1	0.24	3.2	0.6	1.52	0.24	0.20	0.21	62.0	30.0	8.0	Sandy Loam	19.6	1.3	1.2
14SKY07	28	48	6.9	47.7	0.23	4.0	0.9	1.45	0.31	0.20	0.21	62.0	31.0	7.0	Sandy Loam	14.2	1.5	1.4

DOGM Suitability	Good	Fair	Poor	Unacceptable

Table D-2. Estimated available water capacity for Skyline mine soil profiles sampled in September 2014.

SampleID	Begin Depth	End Depth	Electrical Conductivity	Organic Matter LOI	Sand	Clay	Texture	Estimated Available Water Capacity[1]	Estimated Available Water Capacity[1]
			dS/m	%	%	%		inch/foot	in/in
14SKY01	0	15	0.29	9.1	53.0	8.0	Sandy Loam	1.68	0.14
14SKY01	15	38	0.20	6.4	47.0	9.0	Loam	1.70	0.14
14SKY01	38	58	0.15	4.4	47.0	9.0	Loam	0.91	0.08
14SKY02	0	29	0.20	10.1	59.0	8.0	Sandy Loam	0.90	0.08
14SKY05	0	14	0.21	7.1	58.0	11.0	Sandy Loam	1.53	0.13
14SKY05	14	36	0.19	5.3	58.0	12.0	Sandy Loam	1.39	0.12
14SKY05	36	58	0.18	5.0	58.0	12.0	Sandy Loam	1.37	0.11
14SKY07	0	11	0.37	7.9	62.0	6.0	Sandy Loam	1.35	0.11
14SKY07	11	28	0.24	3.2	62.0	8.0	Sandy Loam	1.06	0.09
14SKY07	28	48	0.23	4.0	62.0	7.0	Sandy Loam	0.76	0.06
14SKY08	0	9	0.21	6.3	44.0	15.0	Loam	1.56	0.13
14SKY08	9	36	0.17	3.7	34.0	15.0	Silty Loam	1.32	0.11
14SKY09	0	13	0.25	8.2	58.0	9.0	Sandy Loam	1.72	0.14
14SKY09	13	30	0.14	4.2	56.0	11.0	Sandy Loam	1.38	0.12
14SKY10	4	15	0.27	4.7	58.0	7.0	Sandy Loam	1.24	0.10
14SKY10	15	34	0.14	6.0	54.0	7.0	Sandy Loam	1.43	0.12
14SKY10	34	56	0.11	4.5	62.0	6.0	Sandy Loam	0.87	0.07
14SKY10	56	80	0.11	35.0	82.0	4.0	Loamy Sand	0.64	0.05
14SKY10	80	130	0.08	1.6	90.0	<0.1	Sand	0.28	0.02
14SKY10	130	160	0.08	1.0	92.0	<0.1	Sand	0.24	
14SKY12	0	20	0.31	8.0	46.0	15.0	Loam	1.93	0.16
14SKY12	20	50	0.18	4.6	46.0	17.0	Loam	1.65	0.14
14SKY12	50	84	0.15	2.9	48.0	16.0	Loam	1.53	0.13
14SKY13	18	36	0.15	1.9	74.0	3.0	Loamy Sand	0.87	0.07
14SKY13	36	55	0.12	1.1	75.0	3.0	Loamy Sand	0.77	0.06
14SKY14	0	23	0.17	2.9	64.0	8.0	Sandy Loam	1.06	0.09
14SKY14	23	51	0.22	1.6	66.0	6.0	Sandy Loam	0.56	0.05
14SKY14	51	108	0.10	0.8	80.0	3.0	Loamy Sand	0.38	0.03
14SKY15	0	18	0.11	3.6	60.0	6.0	Sandy Loam	1.36	0.11
14SKY15	18	44	0.09	2.0	58.0	7.0	Sandy Loam	1.30	0.11
14SKY15	44	74	0.07	1.6	62.0	5.0	Sandy Loam	0.88	0.07
14SKY15	74	110	0.06	0.9	70.0	1.0	Sandy Loam	0.70	0.06

1. Available water capacity estimated by using Soil Water Characteristics model (Saxton 2009).

DOGM Suitability	Good	Fair	Poor	Unacceptable

Inter-Mountain Labs
Your Environmental Monitoring Partner
1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Date: 10/29/2014

CLIENT: Canyon Fuel Company
Project: Skyline Mine Topsoil
Lab Order: S1410053

CASE NARRATIVE

Report ID: S1410053001

Samples 14SKY01, 14SKY02, 14SKY05, 14SKY07, 14SKY08, 14SKY09, 14SKY10, 14SKY12, 14SKY13, 14SKY14, and 14SKY15 were received on October 1, 2014.

Samples were analyzed using the methods outlined in the following references:

U.S.E.P.A. 600/2-78-054 "Field and Laboratory Methods Applicable to Overburden and Mining Soils", 1978
American Society of Agronomy, Number 9, Part 2, 1982
USDA Handbook 60 "Diagnosis and Improvement of Saline and Alkali Soils", 1969
Wyoming Department of Environmental Quality, Land Quality Division, Guideline No. 1, 1984
New Mexico Overburden and Soils Inventory and Handling Guideline, March 1987
State of Utah, Division of Oil, Gas, and Mining: Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining, April 1988
Montana Department of State Lands, Reclamation Division: Soil, Overburden, and Regraded Spoil Guidelines, December 1994
State of Nevada Modified Sobek Procedure
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition

All Quality Control parameters met the acceptance criteria defined by EPA and Inter-Mountain Laboratories except as indicated in this case narrative.

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Inter-Mountain Labs
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Soil Analysis Report

Canyon Fuel Company
HC 35 Box 380
Helper, UT 84526

Report ID: S1410053001

Project: Skyline Mine Topsoil
Date Received: 10/1/2014

Date Reported: 10/29/2014
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Lab ID	Sample ID	Depths cm	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter LOI %	CO3 %	PE Calcium meq/L	PE Magnesium meq/L	PE Sodium meq/L	SAR
S1410053-001	14SKY01	0-15	6.6	66.6	0.29	9.1	1.1	1.49	0.43	0.19	0.19
S1410053-002	14SKY01	15-38	6.3	61.2	0.20	6.4	1.0	1.41	0.36	0.16	0.17
S1410053-003	14SKY01	38-58	6.3	55.4	0.15	4.4	0.9	1.00	0.35	0.16	0.20
S1410053-004	14SKY02	0-29	6.2	72.0	0.20	10.1	1.2	1.07	0.39	0.17	0.20
S1410053-005	14SKY05	0-14	6.4	53.8	0.21	7.1	0.9	1.27	0.40	0.21	0.23
S1410053-006	14SKY05	14-36	6.4	56.2	0.19	5.3	1.1	1.46	0.40	0.22	0.23
S1410053-007	14SKY05	36-58	6.4	53.1	0.18	5.0	0.7	1.18	0.33	0.20	0.23
S1410053-008	14SKY07	0-11	6.4	63.4	0.37	7.9	1.4	2.02	0.57	0.16	0.14
S1410053-009	14SKY07	11-28	7.0	44.1	0.24	3.2	0.6	1.52	0.24	0.20	0.21
S1410053-010	14SKY07	28-48	6.9	47.7	0.23	4.0	0.9	1.45	0.31	0.20	0.21
S1410053-011	14SKY08	0-9	5.6	64.2	0.21	6.3	0.7	1.13	0.39	0.17	0.20
S1410053-012	14SKY08	9-36	6.1	49.9	0.17	3.7	0.6	1.18	0.30	0.25	0.29
S1410053-013	14SKY09	0-13	6.7	70.3	0.25	8.2	1.5	1.36	0.38	0.18	0.19
S1410053-014	14SKY09	13-30	6.0	55.1	0.14	4.2	0.6	0.77	0.23	0.15	0.21
S1410053-015	14SKY10	4-15	6.7	48.0	0.27	4.7	1.0	1.94	0.65	0.17	0.15
S1410053-016	14SKY10	15-34	6.2	45.2	0.14	6.0	0.8	0.98	0.41	0.19	0.23
S1410053-017	14SKY10	34-56	6.2	29.1	0.11	4.5	0.8	0.66	0.25	0.22	0.32
S1410053-018	14SKY10	56-80	6.1	74.7	0.11	35.0	3.8	0.74	0.23	0.38	0.55
S1410053-019	14SKY10	80-130	6.4	34.5	0.08	1.6	0.5	0.54	0.15	0.16	0.27
S1410053-020	14SKY10	130-160	6.1	33.9	0.08	1.0	0.1	0.51	0.14	0.18	0.31

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

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Canyon Fuel Company
HC 35 Box 380
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Report ID: S1410053001

Project: Skyline Mine Topsoil
Date Received: 10/1/2014

Date Reported: 10/29/2014
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S1410053-021	14SKY12	0-20	6.6	57.0	0.31	8.0	1.3	1.73	0.45	0.18	0.17
S1410053-022	14SKY12	20-50	6.6	42.7	0.18	4.6	1.0	1.00	0.37	0.23	0.28
S1410053-023	14SKY12	50-84	6.4	42.3	0.15	2.9	1.0	0.81	0.25	0.19	0.25
S1410053-024	14SKY13	18-36	5.7	37.0	0.15	1.9	0.2	1.30	0.31	0.18	0.20
S1410053-025	14SKY13	36-55	6.0	28.8	0.12	1.1	0.2	0.96	0.25	0.25	0.32
S1410053-026	14SKY14	0-23	6.1	48.1	0.17	2.9	0.7	0.75	0.27	0.22	0.30
S1410053-027	14SKY14	23-51	5.8	32.1	0.22	1.6	0.4	0.93	0.37	0.24	0.29
S1410053-028	14SKY14	51-108	6.0	30.7	0.10	0.8	0.6	0.50	0.25	0.19	0.30
S1410053-029	14SKY15	0-18	5.7	43.8	0.11	3.6	0.3	0.60	0.23	0.17	0.26
S1410053-030	14SKY15	18-44	5.7	38.5	0.09	2.0	0.4	0.42	0.18	0.18	0.32
S1410053-031	14SKY15	44-74	5.7	36.8	0.07	1.6	0.1	0.32	0.14	0.16	0.33
S1410053-032	14SKY15	74-110	5.7	28.7	0.06	0.9	0.3	0.20	0.10	0.18	0.45

These results apply only to the samples tested.

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Karen Secor, Soil Lab Supervisor

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S1410053-001	14SKY01	0-15	53.0	39.0	8.0	Sandy Loam	22.7	4.7	4.5
S1410053-002	14SKY01	15-38	47.0	44.0	9.0	Loam	14.2	3.3	3.2
S1410053-003	14SKY01	38-58	47.0	44.0	9.0	Loam	19.2	2.3	2.2
S1410053-004	14SKY02	0-29	59.0	33.0	8.0	Sandy Loam	3.3	5.1	5.0
S1410053-005	14SKY05	0-14	58.0	31.0	11.0	Sandy Loam	6.8	2.8	2.7
S1410053-006	14SKY05	14-36	58.0	30.0	12.0	Sandy Loam	15.0	2.0	1.9
S1410053-007	14SKY05	36-58	58.0	30.0	12.0	Sandy Loam	11.5	1.8	1.7
S1410053-008	14SKY07	0-11	62.0	32.0	6.0	Sandy Loam	8.0	3.7	3.5
S1410053-009	14SKY07	11-28	62.0	30.0	8.0	Sandy Loam	19.6	1.3	1.2
S1410053-010	14SKY07	28-48	62.0	31.0	7.0	Sandy Loam	14.2	1.5	1.4
S1410053-011	14SKY08	0-9	44.0	41.0	15.0	Loam	6.4	3.3	3.2
S1410053-012	14SKY08	9-36	34.0	51.0	15.0	Silty Loam	18.1	1.7	1.7
S1410053-013	14SKY09	0-13	58.0	33.0	9.0	Sandy Loam	12.2	3.8	3.6
S1410053-014	14SKY09	13-30	56.0	33.0	11.0	Sandy Loam	16.4	1.7	1.6
S1410053-015	14SKY10	4-15	58.0	35.0	7.0	Sandy Loam	20.4	2.3	2.2
S1410053-016	14SKY10	15-34	54.0	39.0	7.0	Sandy Loam	19.8	3.1	3.0
S1410053-017	14SKY10	34-56	62.0	32.0	6.0	Sandy Loam	25.5	2.4	2.3
S1410053-018	14SKY10	56-80	82.0	14.0	4.0	Loamy Sand	12.7	22.4	22.0
S1410053-019	14SKY10	80-130	90.0	10.0	<0.1	Sand	7.6	1.2	1.1
S1410053-020	14SKY10	130-160	92.0	8.0	<0.1	Sand	9.2	0.5	0.5

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Karen Secor, Soil Lab Supervisor

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S1410053-022	14SKY12	20-50	46.0	37.0	17.0	Loam	18.5	2.5	2.3
S1410053-023	14SKY12	50-84	48.0	36.0	16.0	Loam	18.7	1.2	1.1
S1410053-024	14SKY13	18-36	74.0	23.0	3.0	Loamy Sand	13.5	0.9	0.8
S1410053-025	14SKY13	36-55	75.0	22.0	3.0	Loamy Sand	12.5	0.3	0.3
S1410053-026	14SKY14	0-23	64.0	28.0	8.0	Sandy Loam	21.3	1.4	1.4
S1410053-027	14SKY14	23-51	66.0	28.0	6.0	Sandy Loam	18.1	0.8	0.7
S1410053-028	14SKY14	51-108	80.0	17.0	3.0	Loamy Sand	16.5	0.4	0.3
S1410053-029	14SKY15	0-18	60.0	34.0	6.0	Sandy Loam	24.0	1.3	1.2
S1410053-030	14SKY15	18-44	58.0	35.0	7.0	Sandy Loam	22.5	0.9	0.8
S1410053-031	14SKY15	44-74	62.0	33.0	5.0	Sandy Loam	21.5	0.9	0.8
S1410053-032	14SKY15	74-110	70.0	29.0	1.0	Sandy Loam	20.5	0.2	0.2

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Inter-Mountain Labs, Inc
1673 Terra Ave, Sheridan, Wyoming, 82801
(307) 672-8945

Soil Analysis Report
Canyon Fuel Company, LLC.
HC 35 Box 380
Helper, Utah 84526

Project ID: Skyline Mine Topsoil
Date Received: 10/1/2014

Report ID: S1410053001
Date Reported: 10/30/2014
Work Order: S1410053

Lab ID	Sample ID	Organic Matter %	Sand %	Silt %	Clay %	Very Fine Sand %	Texture	K-factor (t.ac.h/100acft.tf.in)	Structure s	Permeability p	M
S1410053-001	14SKY01(0-15cm)	9.1	53.0	39.0	8.0	22.7	Sandy Loam	0.09	2	2	5676.4
S1410053-002	14SKY01(15-38cm)	6.4	47.0	44.0	9.0	14.2	Loam	0.21	2	3	5296.2
S1410053-003	14SKY01(38-58cm)	4.4	47.0	44.0	9.0	19.2	Loam	0.31	2	3	5751.2
S1410053-004	14SKY02(0-29cm)	10.1	59.0	33.0	8.0	3.3	Sandy Loam	0.02	2	2	3339.6
S1410053-005	14SKY05(0-14cm)	7.1	58.0	31.0	11.0	6.8	Sandy Loam	0.08	2	2	3364.2
S1410053-006	14SKY05(14-36cm)	5.3	58.0	30.0	12.0	15.0	Sandy Loam	0.15	2	2	3960.0
S1410053-007	14SKY05(36-58cm)	5.0	58.0	30.0	12.0	11.5	Sandy Loam	0.14	2	2	3652.0
S1410053-008	14SKY07(0-11cm)	7.9	62.0	32.0	6.0	8.0	Sandy Loam	0.08	2	2	3760.0
S1410053-009	14SKY07(11-28cm)	3.2	62.0	30.0	8.0	19.6	Sandy Loam	0.25	2	2	4563.2
S1410053-010	14SKY07(28-48cm)	4.0	62.0	31.0	7.0	14.2	Sandy Loam	0.20	2	2	4203.6
S1410053-011	14SKY08(0-9cm)	6.3	44.0	41.0	15.0	6.4	Loam	0.15	2	3	4029.0
S1410053-012	14SKY08(9-36cm)	3.7	34.0	51.0	15.0	18.1	Silty Loam	0.35	2	3	5873.5
S1410053-013	14SKY09(0-13cm)	8.2	58.0	33.0	9.0	12.2	Sandy Loam	0.08	2	2	4113.2
S1410053-014	14SKY09(13-30cm)	4.2	56.0	33.0	11.0	16.4	Sandy Loam	0.21	2	2	4396.6
S1410053-015	14SKY10(4-15cm)	4.7	58.0	35.0	7.0	20.4	Sandy Loam	0.24	2	2	5152.2
S1410053-016	14SKY10(15-34cm)	6.0	54.0	39.0	7.0	19.8	Sandy Loam	0.20	2	2	5468.4
S1410053-017	14SKY10(34-56cm)	4.5	62.0	32.0	6.0	25.5	Sandy Loam	0.26	2	2	5405.0
S1410053-018	14SKY10(56-80cm)	35.0	82.0	14.0	4.0	12.7	Loamy Sand	-0.40	2	2	2563.2
S1410053-019	14SKY10(80-130cm)	1.6	90.0	10.0	0.1	7.6	Sand	0.03	1	1	1758.2
S1410053-020	14SKY10(130-160cm)	1.0	92.0	8.0	0.1	9.2	Sand	0.03	1	1	1718.3
S1410053-021	14SKY12(0-20cm)	8.0	46.0	39.0	15.0	17.5	Loam	0.13	2	3	4802.5
S1410053-022	14SKY12(20-50cm)	4.6	46.0	37.0	17.0	18.5	Loam	0.23	2	3	4606.5
S1410053-023	14SKY12(50-84cm)	2.9	48.0	36.0	16.0	18.7	Loam	0.29	2	3	4594.8
S1410053-024	14SKY13(18-36cm)	1.9	74.0	23.0	3.0	13.5	Loamy Sand	0.21	2	2	3540.5
S1410053-025	14SKY13(36-55cm)	1.1	75.0	22.0	3.0	12.5	Loamy Sand	0.21	2	2	3346.5
S1410053-026	14SKY14(0-23cm)	2.9	64.0	28.0	8.0	21.3	Sandy Loam	0.26	2	2	4535.6
S1410053-027	14SKY14(23-51cm)	1.6	66.0	28.0	6.0	18.1	Sandy Loam	0.28	2	2	4333.4

These Results apply only to the samples tested.

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Inter-Mountain Labs, Inc
1673 Terra Ave, Sheridan, Wyoming, 82801
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Soil Analysis Report
Canyon Fuel Company, LLC.
HC 35 Box 380
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Project ID: Skyline Mine Topsoil
Date Received: 10/1/2014

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Lab ID	Sample ID	Organic Matter %	Sand %	Silt %	Clay %	Very Fine Sand %	Texture	K-factor (t.ac.h/100acft.tf.in)	Structure s	Permeability p	M
S1410053-028	14SKY14(51-108cm)	0.8	80.0	17.0	3.0	16.5	Loamy Sand	0.21	2	2	3249.5
S1410053-029	14SKY15(0-18cm)	3.6	60.0	34.0	6.0	24.0	Sandy Loam	0.30	2	2	5452.0
S1410053-030	14SKY15(18-44cm)	2.0	58.0	35.0	7.0	22.5	Sandy Loam	0.35	2	2	5347.5
S1410053-031	14SKY15(44-74cm)	1.6	62.0	33.0	5.0	21.5	Sandy Loam	0.35	2	2	5177.5
S1410053-032	14SKY15(74-110cm)	0.9	70.0	29.0	1.0	20.5	Sandy Loam	0.35	2	2	4900.5

These Results apply only to the samples tested.

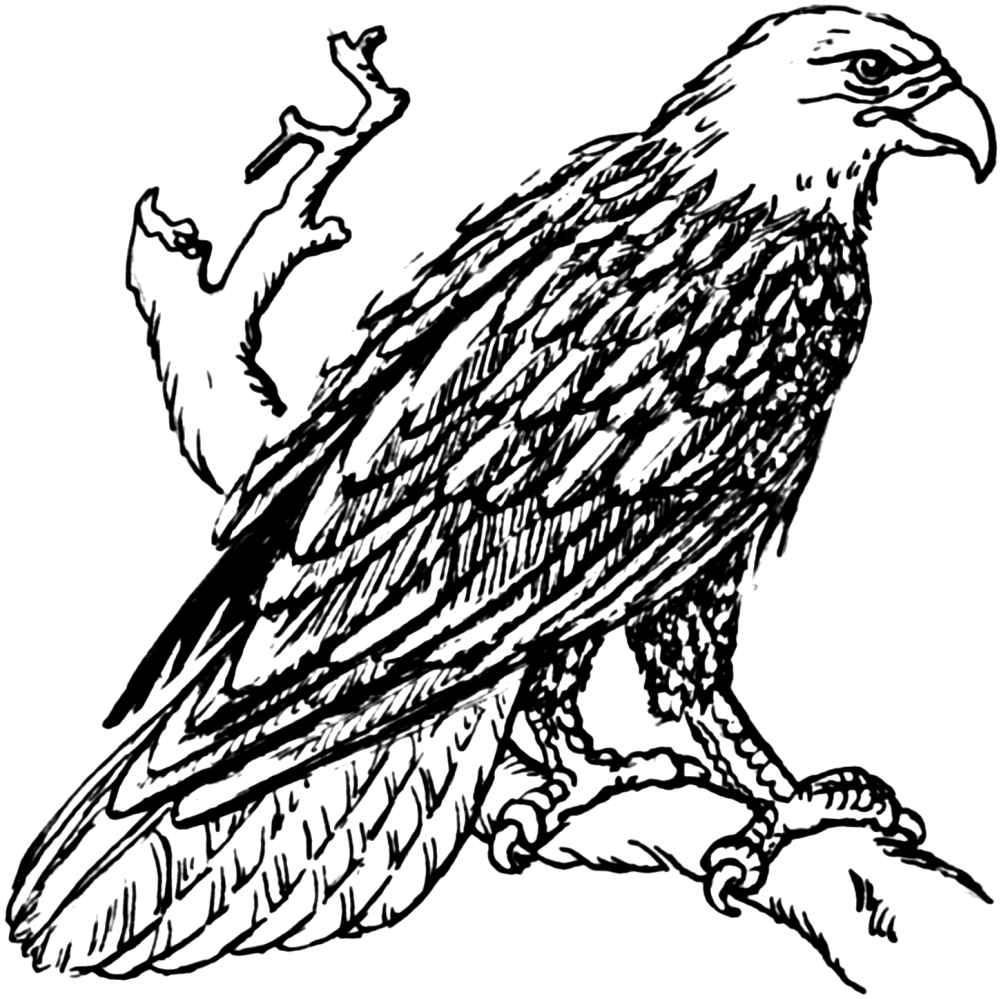
Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

U.S. Fish & Wildlife Service

Skyline Mine Lease Area

IPaC Trust Resource Report

Generated July 02, 2015 10:44 AM MDT



US Fish & Wildlife Service

IPaC Trust Resource Report

Project Description

NAME

Skyline Mine Lease Area

PROJECT CODE

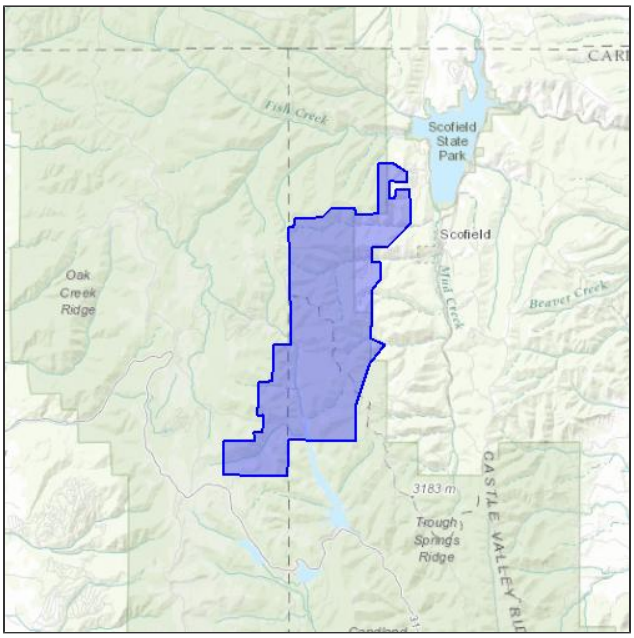
X54ID-AVDTR-CXNMN-PXYKP-TMZNUM

LOCATION

Carbon, Emery and Sanpete counties, Utah

DESCRIPTION

No description provided



U.S. Fish & Wildlife Contact Information

Species in this report are managed by:

Utah Ecological Services Field Office
2369 West Orton Circle, Suite 50
West Valley City, UT 84119-7603
(801) 975-3330

Endangered Species

Proposed, candidate, threatened, and endangered species that are managed by the Endangered Species Program and should be considered as part of an effect analysis for this project.

This unofficial species list is for informational purposes only and does not fulfill the requirements under Section 7 of the Endangered Species Act, which states that Federal agencies are required to "request of the Secretary of Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action." This requirement applies to projects which are conducted, permitted or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can be obtained by returning to this project on the IPaC website and requesting an Official Species List from the regulatory documents section.

Birds

Greater Sage-grouse Centrocercus urophasianus **Candidate**

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B06W

Mexican Spotted Owl Strix occidentalis lucida **Threatened**

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B074

Southwestern Willow Flycatcher Empidonax traillii extimus **Endangered**

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B094

Yellow-billed Cuckoo Coccyzus americanus **Threatened**

CRITICAL HABITAT
There is **proposed** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B06R

Fishes

Bonytail Chub Gila elegans **Endangered**

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E020

Colorado Pikeminnow (=squawfish) Ptychocheilus lucius **Endangered**

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E006

Humpback Chub Gila cypha **Endangered**

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E000

Razorback Sucker Xyrauchen texanus **Endangered**

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E054

Flowering Plants

Barneby Reed-mustard Schoenocrambe barnebyi **Endangered**

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2QU

Jones Cycladenia Cycladenia humilis var. jonesii **Threatened**

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q1V7

Critical Habitats

Potential effects to critical habitat(s) within the project area must be analyzed along with the endangered species themselves.

There is no critical habitat within this project area

Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

You are responsible for complying with the appropriate regulations for the protection of birds as part of this project. This involves analyzing potential impacts and implementing appropriate conservation measures for all project activities.

Bald Eagle Haliaeetus leucocephalus **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B008

Black Rosy-finch Leucosticte atrata **Bird of conservation concern**
Year-round

Brewer's Sparrow Spizella breweri **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HA

Burrowing Owl Athene cunicularia **Bird of conservation concern**
Season: Breeding

Calliope Hummingbird Stellula calliope **Bird of conservation concern**
Season: Breeding

Cassin's Finch Carpodacus cassinii **Bird of conservation concern**
Year-round

Ferruginous Hawk Buteo regalis **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B06X

Fox Sparrow Passerella iliaca **Bird of conservation concern**
Season: Breeding

Golden Eagle Aquila chrysaetos **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DV

Juniper Titmouse Baeolophus ridgwayi **Bird of conservation concern**
Year-round

Loggerhead Shrike Lanius ludovicianus **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FY

Long-billed Curlew Numenius americanus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B06S

Olive-sided Flycatcher Contopus cooperi **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0AN

Peregrine Falcon Falco peregrinus **Bird of conservation concern**

Year-round

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FU

Pinyon Jay Gymnorhinus cyanocephalus **Bird of conservation concern**

Year-round

Prairie Falcon Falco mexicanus **Bird of conservation concern**

Year-round

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0ER

Sage Thrasher Oreoscoptes montanus **Bird of conservation concern**

Season: Breeding

Short-eared Owl Asio flammeus **Bird of conservation concern**

Season: Wintering

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HD

Swainson's Hawk Buteo swainsoni **Bird of conservation concern**

Season: Breeding

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B070

Williamson's Sapsucker Sphyrapicus thyroideus **Bird of conservation concern**

Season: Breeding

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FX

Willow Flycatcher Empidonax traillii **Bird of conservation concern**

Season: Breeding

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0F6

Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. If your project overlaps or otherwise impacts a Refuge, please contact that Refuge to discuss the authorization process.

There are no refuges within this project area

Wetlands

Impacts to NWI wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

Project proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate U.S. Army Corps of Engineers District.

DATA LIMITATIONS

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Freshwater Emergent Wetland

PEMB	43.7 acres
PEMC	42.4 acres

Freshwater Forested/shrub Wetland

PSSB	15.7 acres
PSSA	9.47 acres
PSSBb	0.833 acre

Freshwater Pond

PABFh	6.14 acres
PABGb	0.491 acre
PABF	0.17 acre

PUSCx 0.143 acre

Lake

L1UBHh 421.0 acres

L2USCh 2.41 acres

Technical Memorandum

To: Gregg Galecki
Environmental Engineer
Skyline Mine

From: Alpine Ecological
HC80 Box 570
Greenwich, UT 84732

Date: 7/30/2015

Re: **Western Yellow-billed Cuckoo (Coccyzus americanus)**
Habitat Assessment

The information presented herein was extracted from the United States Fish and Wildlife Service's western yellow-billed cuckoo survey protocol titled **A Natural History Summary and Survey Protocol for the Western Distinct Population Segment of the Yellow-billed Cuckoo** dated April 22, 2015; and the Services' **Guidelines for identification of suitable breeding and nesting habitat for western yellow-billed cuckoo in Utah**. The Assessment Area includes the Mine Site, surrounding lease holdings, and a 0.5 mile buffer.

Background

The western population of the yellow-billed cuckoo was petitioned for listing as a federally endangered species in 1999. In 2002 the western DPS was determined to be warranted but precluded for listing by higher priority species. On October 3, 2013 the proposed rule to list the western DPS of the Yellow-billed Cuckoo as a Threatened species was published in the Federal Register (78 FR 61621) and on October 3, 2014 the final listing rule was published (79 FR 59992) and the listing went into effect November 3, 2014 (Halterman 2015).

Habitat Requirements

Breeding western yellow-billed cuckoos are riparian obligates and currently nest almost exclusively in low to moderate elevation riparian woodlands with native broadleaf trees and shrubs that are 20 hectares (ha) (50 acres (ac)) or more in extent within arid to semiarid landscapes (79 FR 59992). They are most commonly associated with cottonwood–willow–dominated vegetation cover, but the composition of dominant riparian vegetation can vary across its range (Halterman 2015).

At the landscape level, the amount of cottonwood–willow-dominated vegetation cover and the width of riparian habitat influence western yellow-billed cuckoo breeding distribution. Riparian patches used by breeding cuckoos vary in size and shape, ranging from a relatively contiguous stand of mixed native/exotic vegetation to an irregularly shaped mosaic of dense vegetation with open areas. Yellow-billed cuckoos mainly nest in patches that are as large as 80 ha (several hundred ac); for example, San Pedro River, Arizona or Elephant Butte Reservoir, New Mexico, but they will nest in areas as small as 20 ha (Beal Lake Conservation Area at Havasu National Wildlife Refuge in Arizona. They have not been found nesting in isolated patches 0.4–0.8 ha (1-2

ac) or narrow, linear riparian habitats that are less than 10-20 meters (m) (33-66 ft) wide, although single birds have been detected in such isolated patches or linear habitats during migration or the early breeding season (mid-late June) (Halterman 2015).

Guidelines for identification of suitable breeding and nesting habitat for western yellow-billed cuckoo in Utah

Step 1: Identify and delineate all riparian habitats within 0.5 mile of the proposed action, below the elevation of 8,500 feet.

Step 2: Identify suitable cuckoo breeding and nesting habitat, including associated foraging areas. Riparian patches used by breeding and nesting cuckoos vary in size and shape, ranging from a relatively contiguous stand of mixed native/exotic vegetation to an irregularly shaped mosaic of dense vegetation with open areas. The following parameters characterize suitable breeding and nesting cuckoo habitat:

- Vegetation that is predominantly multi-layered, with riparian canopy trees and at least one layer of understory shrubby vegetation;
- Patches of multi-layered vegetation (as described above) that are at least 12 acres (5 ha) or greater in extent and separated from other patches of suitable habitat by at least 300 meters;
- Somewhere within a patch, the multi-layered riparian vegetation (as described above) should be at least 100 meters wide by 100 meters long. This is to avoid patches that may be long enough to meet the minimum area (12 acres) but are so narrow that they are unsuitable-- 750 m x 75 m (length x width) for example; and,
- Open areas, or gaps of multi-layered vegetation within a patch are less than 300 meters.

Breeding and nesting cuckoos will forage in riparian patches that have an overstory canopy only and are within 300 meters (m) of the edge of suitable breeding and nesting habitat. Identify suitable foraging habitat of nesting cuckoo to include single layer overstory canopy that is within 300 meters of suitable breeding and nesting habitat.

Suitable Habitat Evaluation

The vegetation across the Assessment Area is very diverse and is somewhat consistent throughout the survey area. Vegetation is dependent on elevation, slope, and available water resources. Riparian areas are dominated by typical high elevation riparian species. The bottoms of the valleys are typically drier and dominated by mountain big sagebrush and silver sagebrush communities. South and East facing slopes, at higher elevations are dominated by quaking aspen communities. However, there are some areas that are open on South and East facing slopes. These open areas are typically grass and tall forb communities. However, a significant number of the open areas are dominated by false hellebore. The North and West facing slopes are dominated by conifer communities. The tree species within the conifer community are mostly dead or dying, and most areas have an abundance of deadfall due to beetle infestations. Because of the deadfall and dead trees the forbs and grasses within the conifer communities are very diverse and most areas have a solid understory. The tops of the ridges in the Assessment Area vary with some being dominated by shrub communities such as mountain big sagebrush, elderberry or chokecherry while others are dominated by grass and tall forb communities. Some of the ridge tops are dominated by cluster tarweed. Cottonwood and tamarisk are not known to occur within the Assessment Area. Riparian habitats with vegetation that is predominantly multi-layered, with riparian canopy trees and at least one layer of understory shrubby vegetation that is

also a minimum of 12 acres in size and 100 meters in width are not present in the Assessment Area.

The elevation range of the Assessment Area is approximately 8,000-10,000 ft; the Skyline Mine site is approximately 8,650 feet in elevation. A significant portion of the Assessment Area falls outside of the elevation range identified in Service's Habitat Identification Guidelines. Only the lower elevations North and East of the Mine Site meet the Step 1 criteria for consideration.

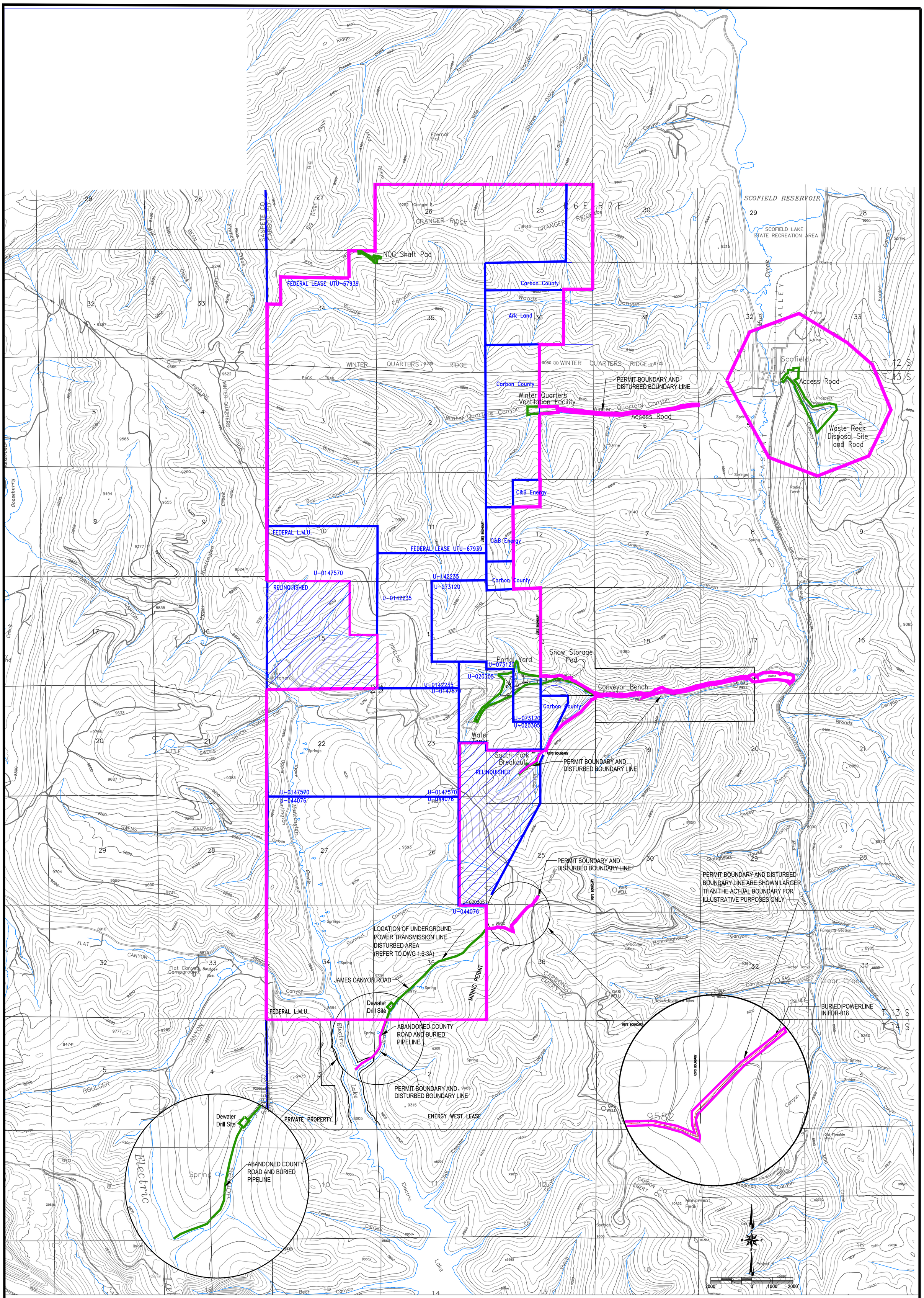
Of the remaining areas to be considered in step 2, none of the riparian habitats contain vegetation that is predominately multi-layered, with riparian canopy trees with at least one layer of understory shrubby vegetation. Patch sizes required by yellow-billed cuckoo of at least 12 acres or greater and separated by at least 300 meters from the nearest suitable patch size are not present in the Assessment Area. Riparian patch sizes within the Assessment Area are limited in width due to topographical restraints. These riparian habitats are typically very narrow, less than 25 meters in width, and typically lack any over story canopy. This excludes the remaining riparian areas from consideration in Step 2 of the Guidelines.

According to the Service's Guidelines for the identification of suitable breeding and nesting habitat of western yellow-billed cuckoo in Utah, none of the habitats within the Assessment Area meet the criteria of suitable breeding and nesting habitat for western yellow-billed cuckoo. Upon review of the Services Guidelines and Survey Protocol suitable western yellow-billed cuckoo habitat is not present in the Assessment Area and does not warrant further consideration.

References

Halterman, M.D., M.J. Johnson, J.A. Holmes and S.A. Laymon. 2015. A Natural History Summary and Survey Protocol for the Western Distinct Population Segment of the Yellow- billed Cuckoo: U.S. Fish and Wildlife Techniques and Methods, 45 p.

Guidelines for identification of suitable breeding and nesting habitat for western yellow-billed cuckoo in Utah. United States Fish and Wildlife Service. Western Yellow-billed Cuckoo Training. June 2015



ADJACENT AREA SITE DESCRIPTION:
Active Lease Areas, Permit Boundary, and 1/2 Mile beyond Waste Rock Disposal Site

13,525 ACRES SITE PERMIT BOUNDARY

PERMIT AREA	SITE DESCRIPTION
13.86	RAIL LOADOUT
42.55	PORTAL YARD
0.60	WATER TANKS, TRANSMISSION LINES (not reclaimed) & WELL PADS
0.96	SOUTH FORK PORTALS
14.18	CONVEYOR BENCH
32.48	WASTE ROCK DISPOSAL SITE
7.93	WINTER QUARTERS VENTILATION FACILITY
4.90	WINTER QUARTERS ROAD (not reclaimed)
1.60	JAMES CANYON BURIED PIPELINE
0.30	JAMES CANYON BURIED POWER LINE
2.95	JAMES CANYON WATER WELLS AND ROAD
122.31	

LEASE ACREAGE WITHIN ADJACENT AREA

FEDERAL COAL	ACREAGE
U-0147570	1532.70
U-0142235	520.0
U-073120	557.22
U-044076	2489.32
U-020305	279.40
UTU-67939	4061.52
TOTAL	9,440.16

NON-FEDERAL COAL	ACREAGE
C&B COAL	120.00
CARBON COUNTY	811.25
ARK LAND COMPANY	240.00
TOTAL	1,171.25

NOT ALL ACREAGE FOR EACH LEASE IS WITHIN THE PERMIT BOUNDARY, REFER TO PART 1, TABLE 1.114.

LEGEND

ADJACENT AREA: Areas Authorized for Coal Mining and Reclamation Activities (SEE CHIA FOR HYDROLOGIC ADJACENT AREA)

PERMIT BOUNDARY

LEASE BOUNDARY

NOTES:
1. COORDINATE BASE ON MINE GRID DATA.
2. MAP DIGITIZED FROM 1:24000 USGS QUADRANGLE MAPS, SCOFIELD, UTAH AND FAIRVIEW LAKES, UTAH.
3. MINE FACILITY, CONVEYOR, AND NEW ECCLES CANYON ROAD LOCATIONS FROM EXISTING RECORD DATA AND INCORPORATED TO MAP IN BEST FIT LOCATIONS.
4. UTM GRID TICK VALUES SHOWN ARE IN METERS.

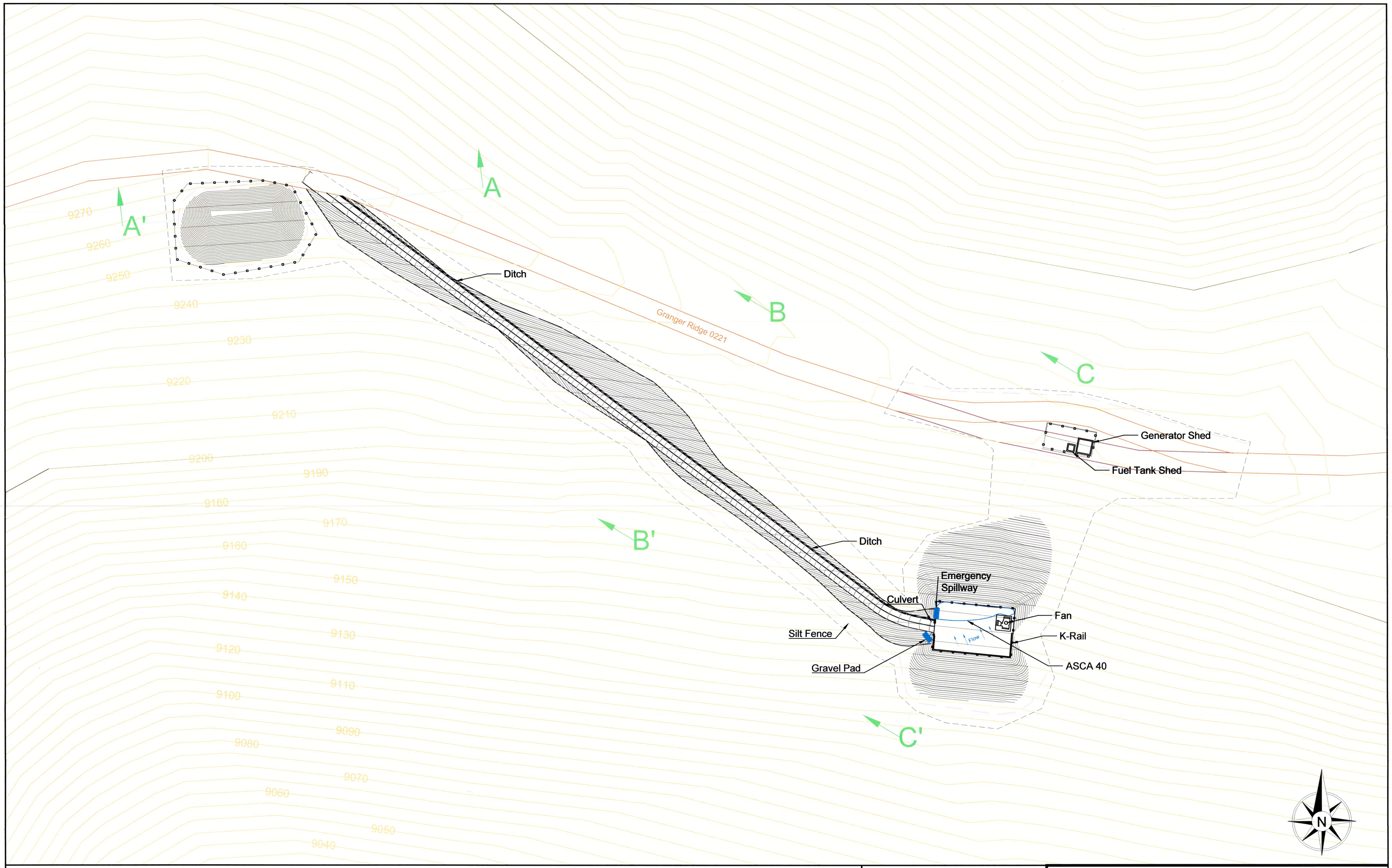
BASE PREPARED BY INTERMOUNTAIN AERIAL SURVEYS, SALT LAKE CITY, UTAH – M96147

DATE	No.	REVISIONS	DR. / CHKD.
AUG 02	1		/ VSM
NOV 02	2		/ VSM
JUNE 07	3	MODIFIED PERMIT BOUNDARY (IBC & WASTE ROCK) SKYLINE MINES PERMIT AREA, LEASE AREAS.	BR / GG
MAR 2010	4	ADDED ADJACENT AREA, MODIFIED PERMIT AND LEASE BOUNDARIES	AB / GG
JUL 2010	5	ADDED WINTER QUARTERS ACCESS ROAD	AB / GG
AUG 2010	6	MODIFIED ADJACENT AREA	AB / GG
OCT 2012	7	Modified Adjacent Area with Lease Mod. and Relinquishments	GG / GG
July 2014	8	Corrected permit boundary to include water line from Tanks	GG / GG
April 2015	9	Added the NOG shaft pad	TE / GG
			/
			/

SKYLINE MINE PERMIT AREA

Canyon Fuel Company, LLC
Skyline Mines
HC35 BOX 380, HELPER, UTAH 84526
435-448-6463

SCALE: 1" = 2000'	DATE: 9/24/01	CK.BY: G. Galecki	REVISION: 9
DWG. NO.: 1.6-3		DR.BY: JLP/CDH	7/23/15
CAD FILE: 1.6-3REV9_4-6-15			



Legend

- Existing 5' Contours
- Operational 1' Contour
- Silt Fence
- Fence
- Ditch
- Permit Area

Disturbed Area is 1.7 Acres

Permit Area is 3.0 Acres

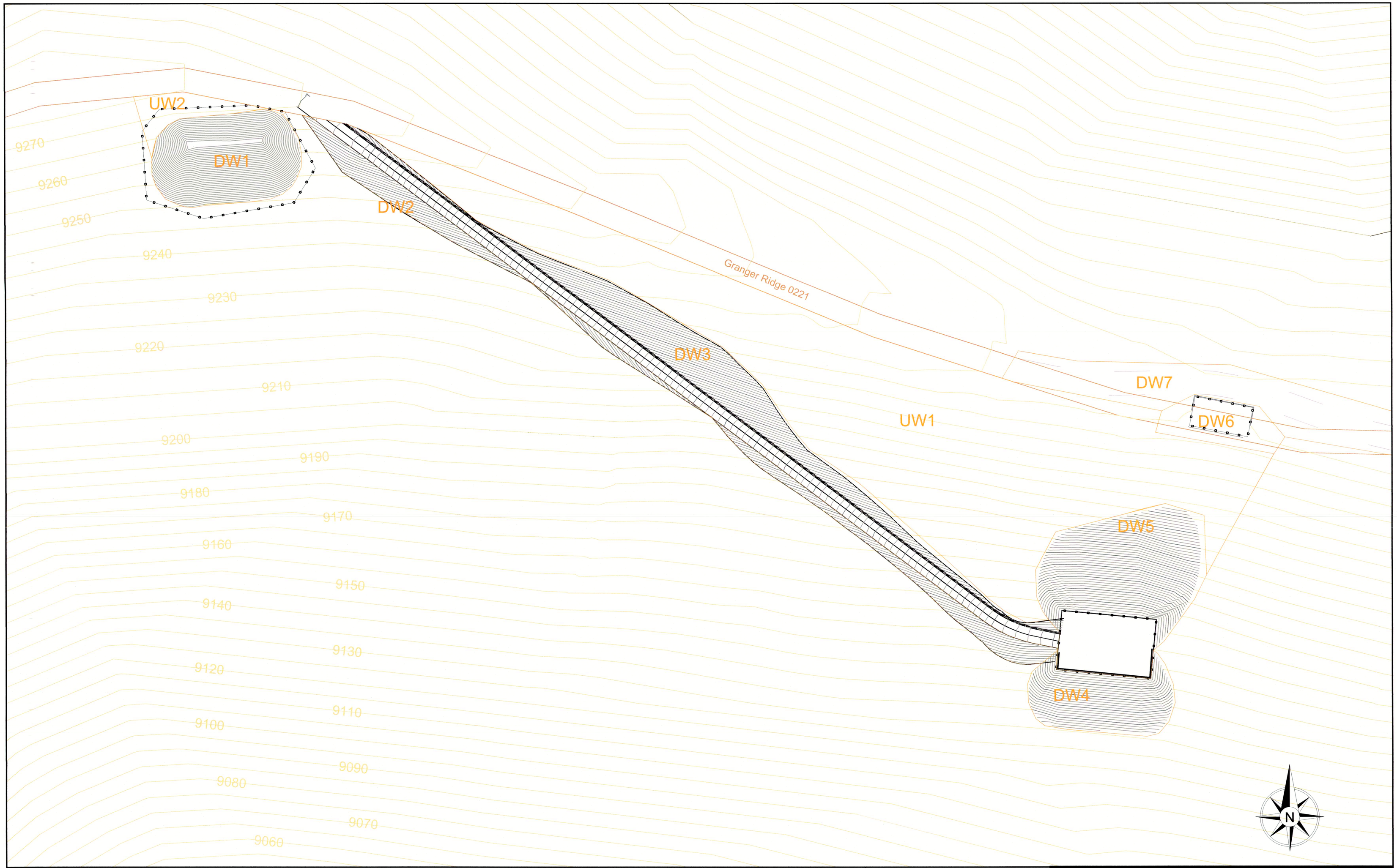
Seal:

REGISTERED PROFESSIONAL ENGINEER
CARL W WINTERS
NO 22 157958-2202
STATE OF UTAH

Skyline Mine
NOG Shaft Pad
General Layout

Canyon Fuel Company, LLC
Skyline Mines

HCR 35 BOX380, HELPER, UT, 84526 435-448-2632	DATE: 7/23/2015	CK.BY:GAG	REVISION: 0 7/23/2015
CAD FILE:	SCALE: 1"=60'	DR.BY:TWE	
DWG. NO.: 3.2.4-5A			



DW Developed Watershed

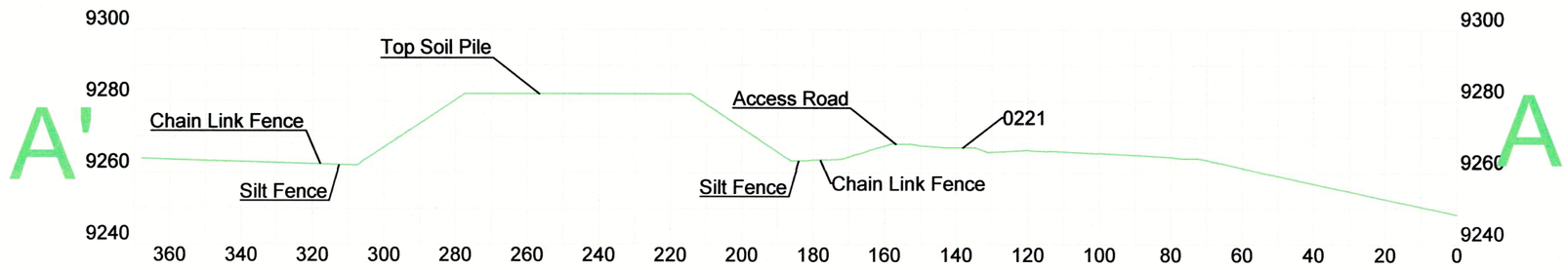
UW Undeveloped Watershed

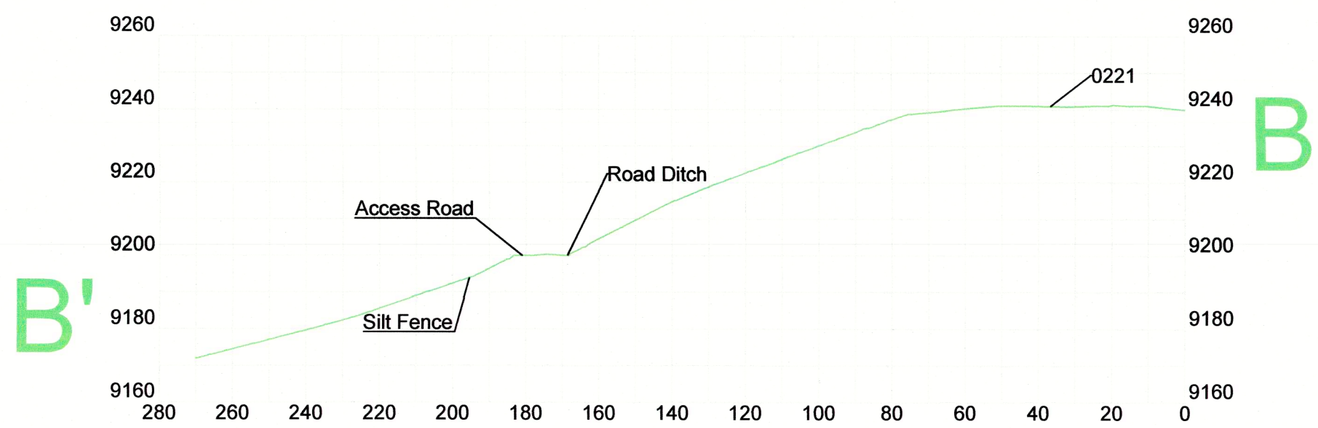
Seal:

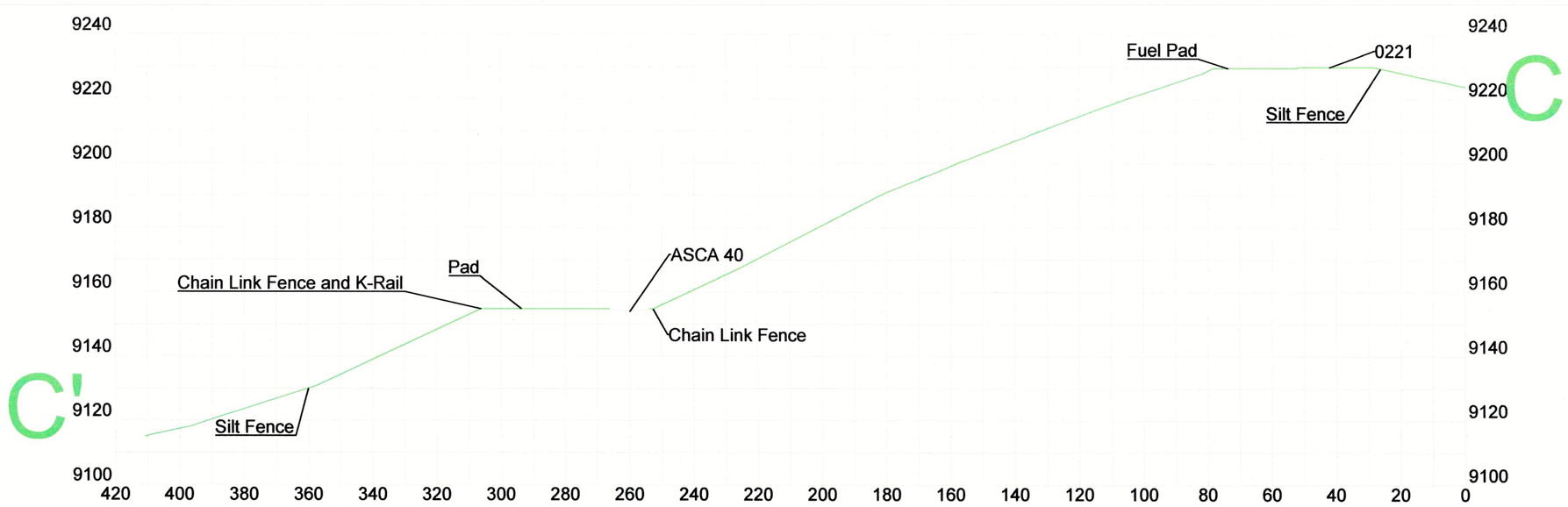
Skyline Mine
NOG Bleeder Shaft
Watershed Map

Canyon Fuel Company, LLC
Skyline Mines

HCR 35 BOX380, HELPER, UT, 84526 435-448-2632	DATE: 7/23/15	CK.BY:GGalecki	REVISION: 0
CAD FILE:	SCALE: 1"=100'	DR.BY:TEarl	7/23/15
DWG. NO.: 3.2.4-5B			

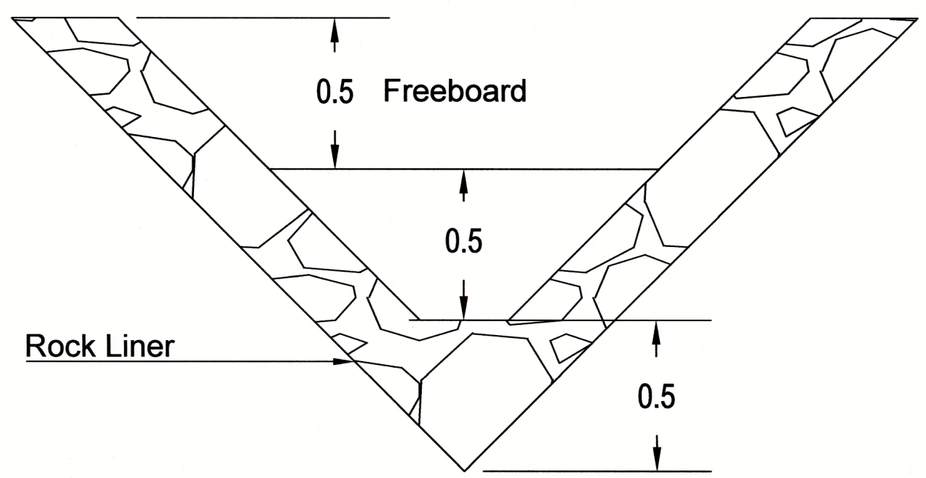






0' 50' 100' 150' 200'

Access Road Ditch Detail



0' .5' 1' 1.5' 2'

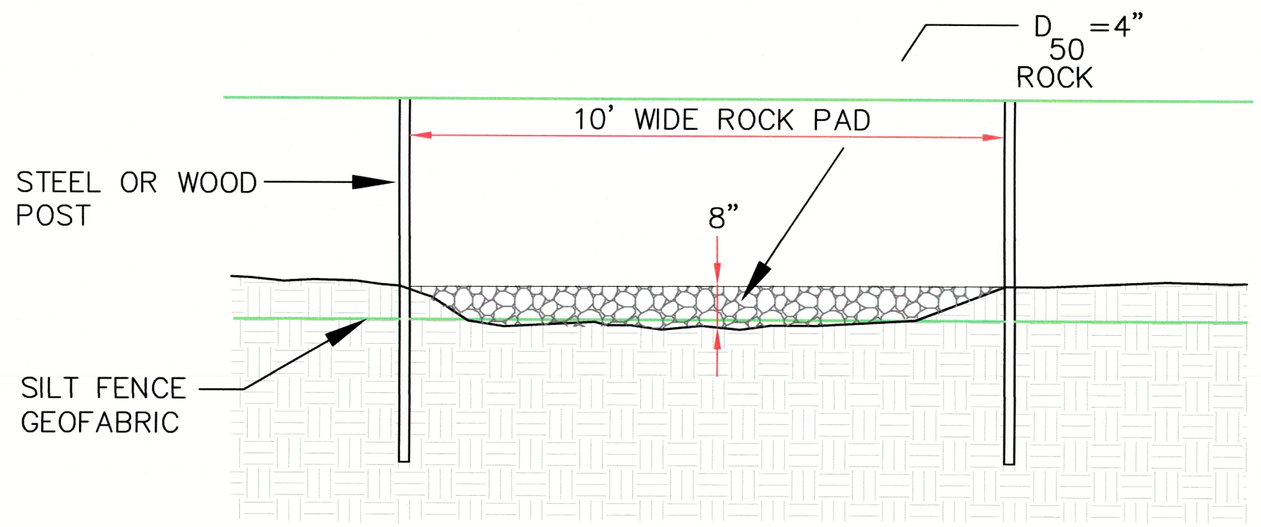
Seal:

Skyline Mine
NOG Bleeder Shaft
Profiles and Ditch Detail

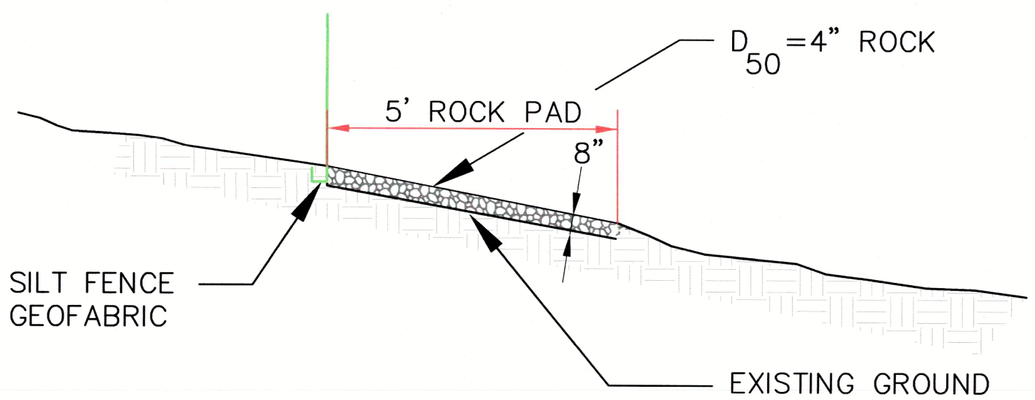
Canyon Fuel Company, LLC
Skyline Mines

HCR 35 BOX380, HELPER, UT, 84526 435-448-2632	DATE: 7/23/15	CK.BY:GGalecki	REVISION: 0
CAD FILE: 2015 NOG Bleeder Shaft\Plates	SCALE: Shown	DR.BY:TEarl	7/23/2015
DWG. NO.: 3.2.4-5C			

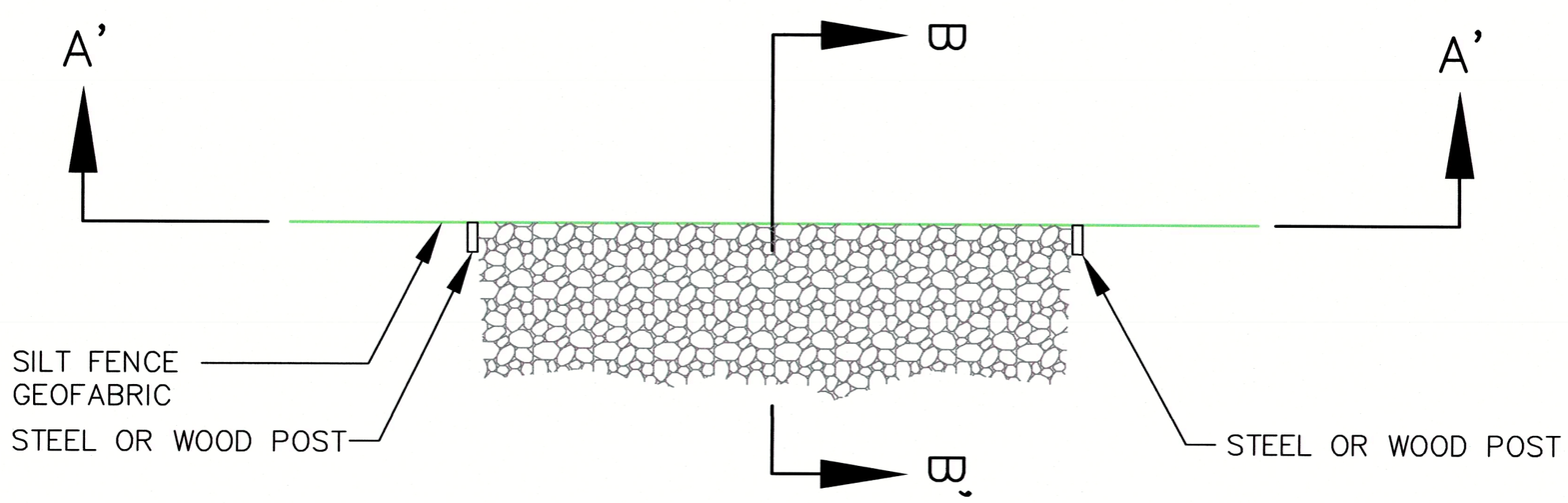
Gravel Pad



CROSS SECTION A



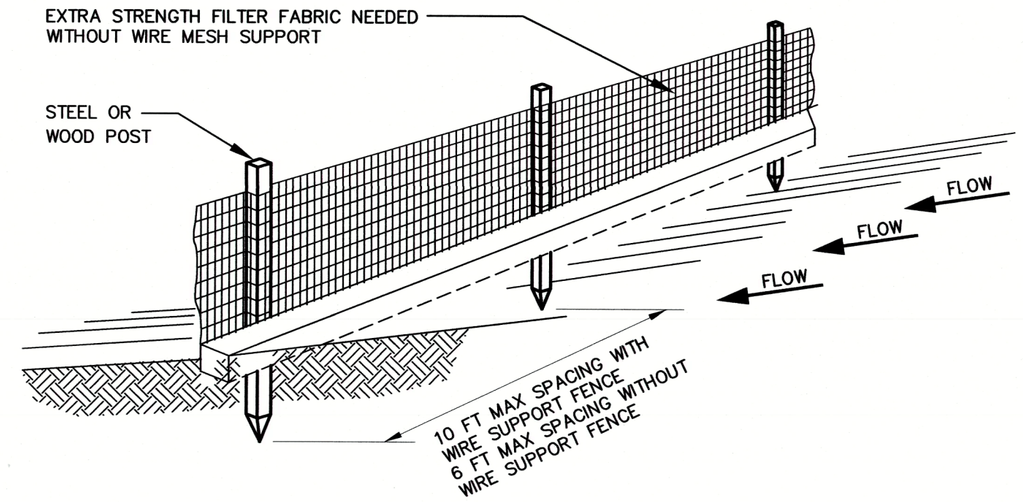
CROSS SECTION B–B'

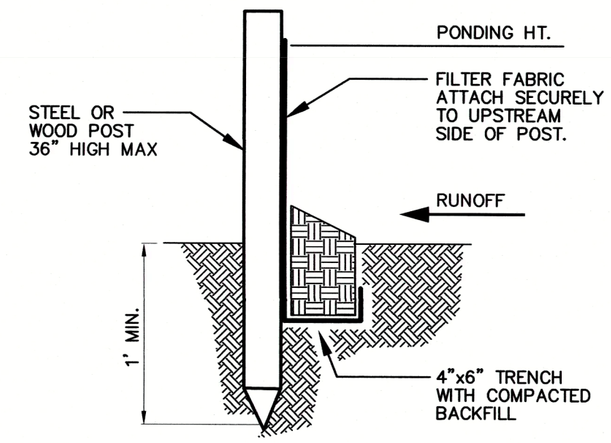


PLAN

INSTALL ALONG TOPOGRAPHIC LOW POINT

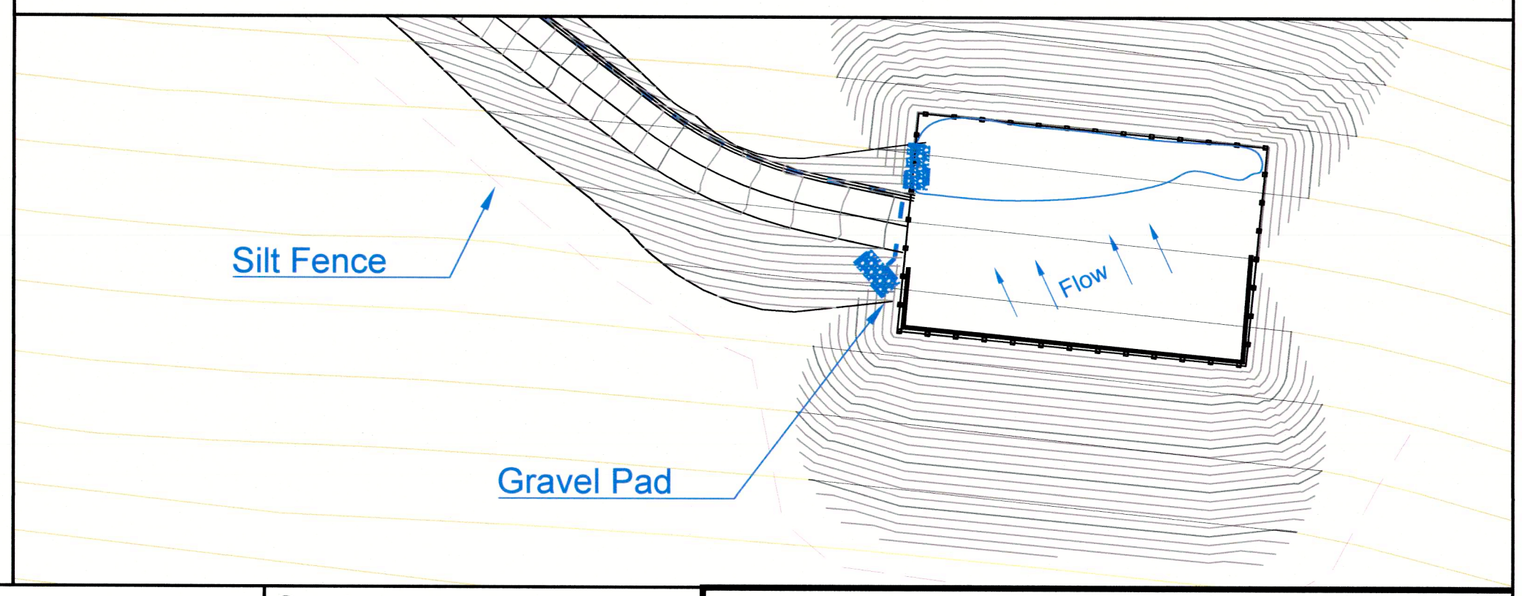
Silt Fence



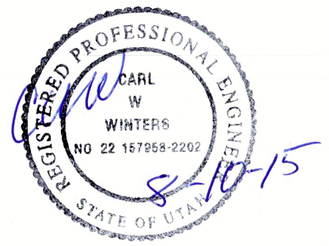


NOTES:

1. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT SEE PLAN VIEW.
2. REMOVED SEDIMENT SHALL BE PLACED ON THE WASTE ROCK PILE. CAN BE PERMANENTLY STABILIZED.
3. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.



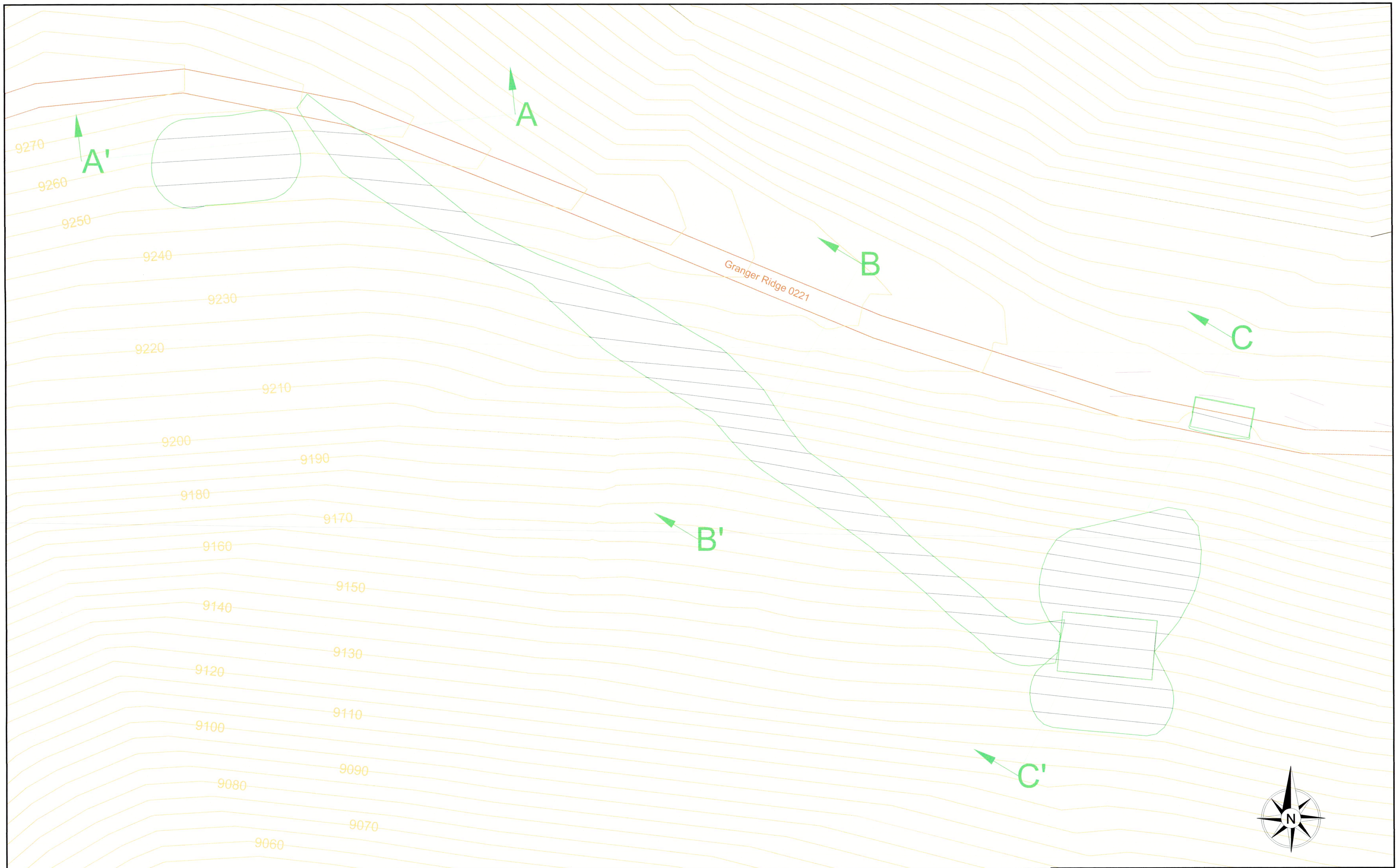
Seal:



Skyline Mine
NOG Bleeder Shaft
Sediment Control Structures

Canyon Fuel Company, LLC
Skyline Mines

HCR 35 BOX380, HELPER, UT, 84526 435-448-2632	DATE: 7/23/15	CK.BY: GGalecki	REVISION: 0 7/23/15
CAD FILE:	SCALE: NTS	DR.BY: TEarl	
DWG. NO.: 3.2.4-5D			



Legend

- Existing 5' Contours
- 5' Reclaim Contours
- Pad Outline

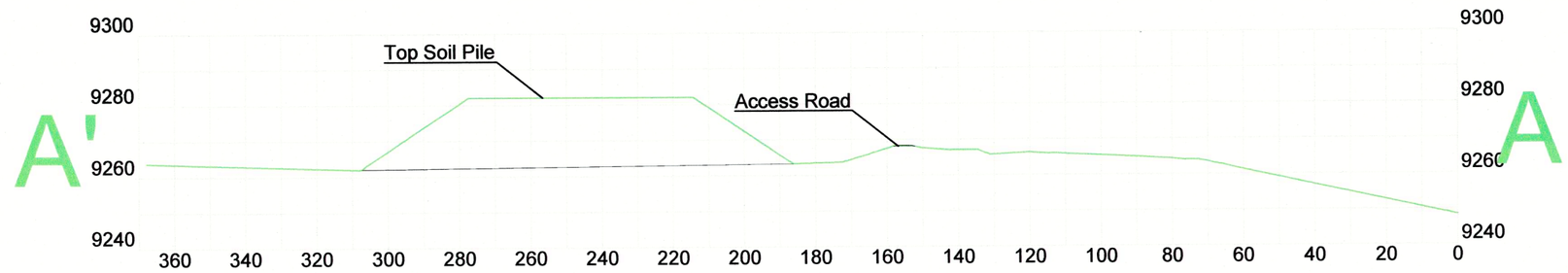
Seal:

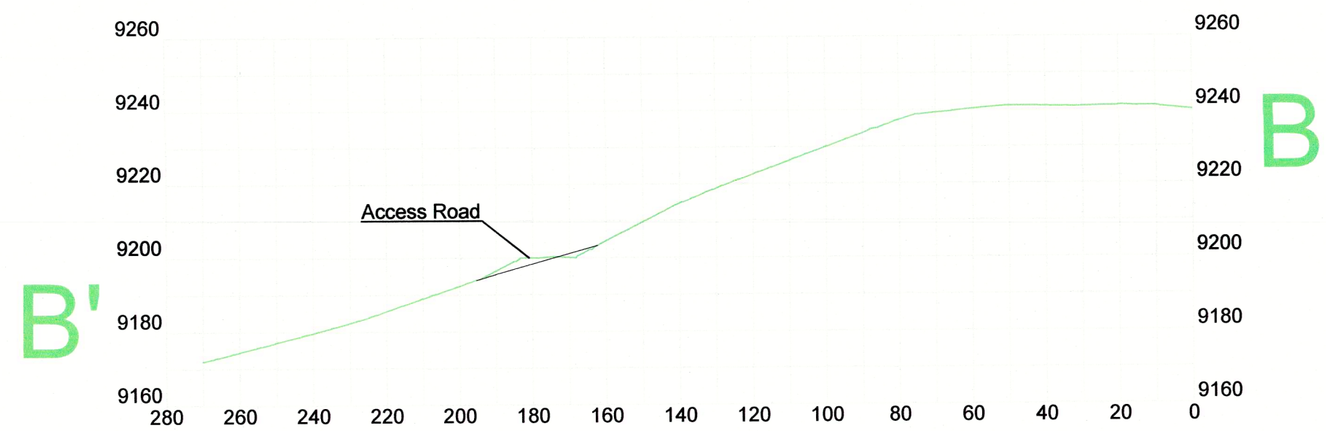
REGISTERED PROFESSIONAL ENGINEER
CARL W WINTERS
NO 22 157058-2202
STATE OF UTAH

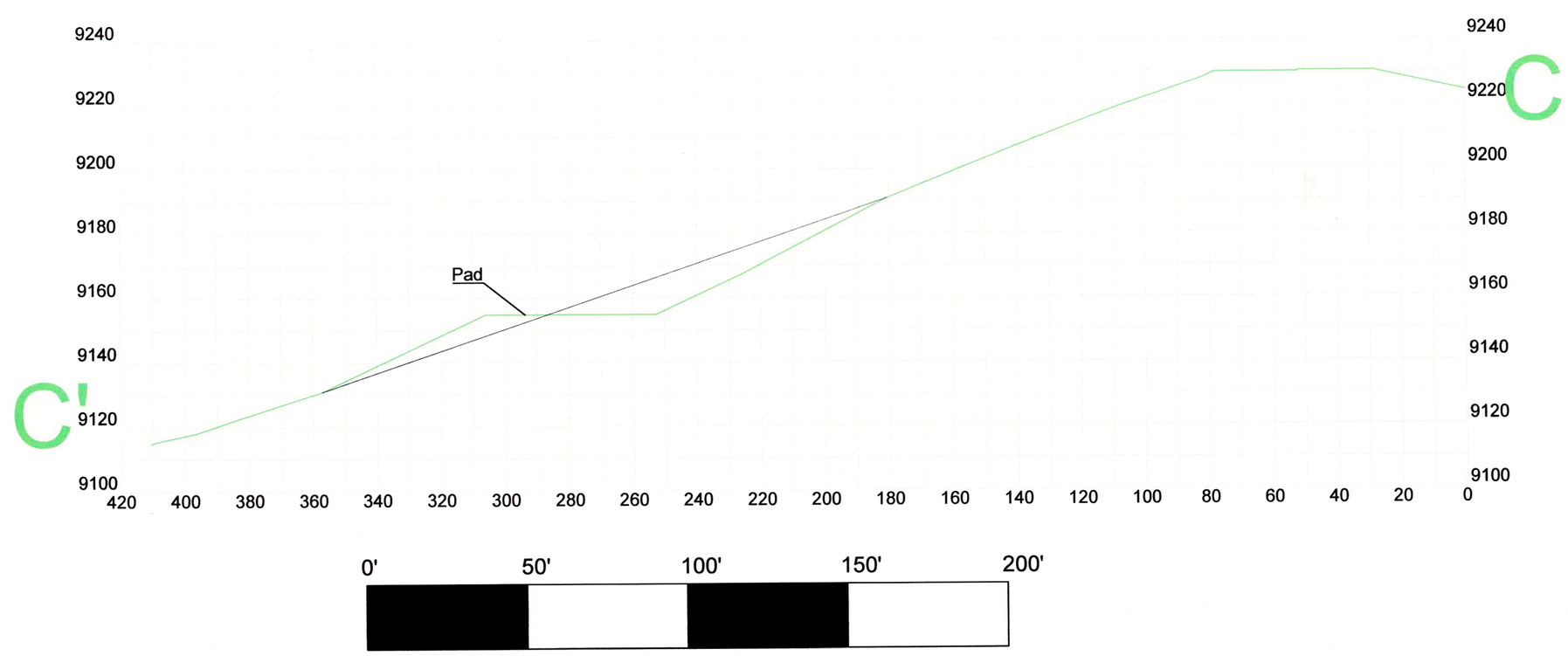
Skyline Mine
NOG Bleeder Shaft
Reclaim Surface

Canyon Fuel Company, LLC
Skyline Mines

HCR 35 BOX380, HELPER, UT, 84526 435-448-2632	DATE: 7/23/15	CK.BY: GGalecki	REVISION: 0 7/23/15
CAD FILE:	SCALE: 1"=100'	DR.BY: TEarl	
DWG. NO.: 4.4.2-5A			







Legend

Operational Surface

Reclaimed Surface

Seal:

REGISTERED PROFESSIONAL ENGINEER
CARL W WINTERS
NO 22 157958-2202
STATE OF UTAH
5-10-15

Skyline Mine
NOG Bleeder Shaft
Reclaim Surface Profiles

Canyon Fuel Company, LLC
Skyline Mines

HCR 35 BOX380, HELPER, UT, 84526 435-448-2632	DATE: 7/23/15	CK.BY: GGalecki	REVISION: 0 7/23/15
CAD FILE: 2015 NOG Bleeder Shaft\Plates	SCALE: Shown	DR.BY: TEarl	
DWG. NO.: 4.4.2-5B			