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ENERGY WEST Mining Co.
PO Box 310
Huntington, Utah 84528

April 23, 1997

Utah Coal Regulatory Program
Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801

ACT/015/019 #2

Attention: Mr. Robert Davidson

Copy Bob (all)

Re: Soil Survey Report of the Cottonwood /Trial Mountain Portal Area

Dear Robert,

As discussed in our telephone conversation on April 23, 1997, a copy of the above report is attached for your review in making a decision as to whether this report is adequate for satisfying parts of the deficiencies as defined in the Technical Analysis report for the Mid-Term review of the Cottonwood/Wilberg Permit. This report would be utilized as part of the requirements listed under Soils Resource Information to assist in complying with regulatory sections: R645-301-222, R645-301-223, R645-301-120, and R645-301-130.

Thank You for your help and assistance in satisfying the needs for further amendments to the permit.

Sincerely,

Richard Northrup

Richard Northrup
Env. Eng. Dept.

cc: Chuck Semborski
John Christensen

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SOIL SURVEY REPORT OF THE COTTONWOOD/TRAIL MOUNTAIN PORTAL AREA

FOR
ENERGY WEST/
PACIFICORP

Prepared by

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for

ENERGY WEST/PACIFICORP
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by

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Cert. Professional Soil Scientist, ARCPACS 2753

February 1993

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1.0 INTRODUCTION

This report is prepared subsequent to a field study performed to characterize the soil resources and potential soil reclamation material of the proposed Cottonwood/Trail Mountain Portal Area. The project site is approximately 3 acres in size and is located on canyon lower sideslopes just east of the Cottonwood Canyon road across from the PacifiCorp Trail Mountain underground coal mine near Huntington, Utah. The Trail Mountain Mine is approximately 15 miles west-northwest of Huntington, in Cottonwood Canyon of the Wasatch Plateau.

1.1 OBJECTIVES

The basic objectives of the field investigations were to map and sample the soils of the study area in sufficient detail to characterize their physical and chemical properties and depths to which they may be salvaged as a source of topsoil for reclamation purposes. Thus, the site-specific characteristics of the soil that may influence soil salvage, stockpiling, and redistribution were inventoried. A detailed soil survey, including mapping, description, sampling, laboratory characterization, data evaluation, and report preparation was needed to generate the required information.

The general objectives relating to the soil survey are as follows:

- Satisfy the soils requirements of the State of Utah Department of Natural Resources Division of Oil, Gas and Mining (UDOGM) as found in UDOGM Guidelines for Management of Topsoil and Overburden for Underground and Surface Mining (Leatherwood and Duce, 1988);
- Collect and review all pertinent existing soils, geologic, and other pertinent information to gain a basic understanding of the characteristics of the soils on site;
- Describe, sample, analyze (laboratory), evaluate, and report site-specific soils and soil substitute data;
- Prepare a soils map, depicting the soil map units and associated recommended suitable soil salvage depths, which can be used in reclamation planning; and
- Prepare a soils report to aid in the completion of the reclamation planning documents needed for final permit application approval.

2.0 METHODS - SCOPE OF WORK

2.1 DATA REVIEW AND EVALUATION

All existing soils and related discipline information for the general study area was compiled, reviewed, and evaluated prior to initiation of the soils field work. This review included: (1) the existing general soils information for the previous Cottonwood/Wilberg Mine Permit Area (revised 6-6-89), and (2) unpublished Manti-LaSal National Forest Service (FS) soils information for nearby Trail Mountain which includes map units on steep canyon sides which are similar to the Cottonwood/Trail Mountain study area. The Soil Conservation Service (SCS) Soil Survey of Carbon Area, Utah (Jensen and Borchert, 1988) does not include the study area, although the SCS survey includes information for similar canyon sideslope landscapes.

Project maps and air photos were also reviewed to become familiar with the study area and locate dominant topographic features of the project area as well as probable access routes to and from the acreage to be characterized.

It should be noted that all methods for soil survey work performed as part of this project are standard methods for detailed Order 1 soil surveys. All procedures and methods were in accordance with current SCS, FS, and State of Utah reclamation-related soil survey methods for coal mining and related projects. Furthermore, all technical specifications were in accordance with current standards and procedures of the USDA-SCS National Cooperative Soil Survey Program.

2.2 SOIL MAPPING

Mr. Jim Nyenhuis, a certified professional soil scientist/soil classifier (ARCPACS 2753), mapped soils and soil-substitute materials at the Order 1 level of intensity for all of the study area on October 30, 1993. The mapping was done on the best available base map(s) of the study area.

The purpose of the survey was to provide PacifiCorp with a detailed soils map of the study area that can be used for determination of suitable and unsuitable soil characteristics, as well as subsequent determination of soil salvageability. Therefore, site-specific characteristics of the soils

and soil-substitute materials that may influence soil suitability, salvage, stockpiling, and redistribution were emphasized.

All standards and procedures for soil mapping and profile description were in accordance with current SCS methods, as described in the recently revised Soil Survey Manual (Soil Survey Staff 1992); National Soils Handbook, as currently amended (Soil Survey Staff 1992); and Keys to Soil Taxonomy, fifth edition (Soil Survey Staff 1992), and applicable UDOGM topsoil and overburden guidelines (Leatherwood and Duce 1988).

Criteria to establish suitability of soil (topsoil) or soil substitute material were those contained in Table 2 of UDOGM "Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining" (Leatherwood and Duce 1988).

Upon initiation of soils field work, each soil type was located on the ground. Within each map unit, traverses were walked to determine overall map unit characteristics. Many soil auger holes were dug and examined in visually representative locations. Several artificial cut exposures that exist throughout the study area were also observed. Based on these preliminary observations, three sites characteristic of the three dominant soils were selected for detailed soil pedon description and sampling.

2.3 SOIL SAMPLING AND PROFILE DESCRIPTION

Each soil pedon was described according to current methods and standards of the National Cooperative Soil Survey. Descriptions were completed to a variable depth depending largely on rock fragment content of the substratum, and depth to shallow sandstone or shale bedrock. The following parameters were described, by horizon, for each soil pedon description: horizon symbol, depth, and boundary; color; texture; structure; consistence; coarse fragment content; and the amount, size, and depth of major roots. In addition, general site information was recorded at each sampling site including: existing dominant vegetation, physiography-landform, slope, aspect, erosion condition, drainage class, and depth to a saturated zone or ground water if encountered.

Each mapped soil type (established soil series or unnamed soil, or soil-substitute material) was fully described at a typical location a minimum of one time each. An adequate amount of

representative soil material was collected from each major soil horizon of undistributed soils at the sampling locations of the described soil pedons. These soil samples were submitted to the laboratory for the requested soil characterization. Subsequent to soil laboratory analysis, the remaining soil sample material was archived should any future analysis be required.

2.4 SOIL LABORATORY ANALYSIS

The UDOGM soils guideline requires laboratory analysis of soil samples. The samples were sent to Colorado State University's Soil Testing Laboratory for standard and special analyses as specified in Table 1 (Analytical Methods for Baseline Soils Data) of the UDOGM soils guideline (Leatherwood and Duce, 1988). Specified parameters include:

- Soil Color (Munsell notation) - determined in the field
- Soil Texture (% sand, silt, clay - hydrometer method)
- pH (standard units based on saturated paste)
- Organic Carbon (%)
- Saturation Percentage
- Alkalinity (meq/liter)
- Electrical Conductivity (EC) - mmhos/cm @ 25 degrees C
- CaCO3 (%)
- Soluble Potassium, Magnesium, Calcium & Sodium (meq/liter)
- Sodium Adsorption Ratio (SAR) - calculated from soluble K, Mg, Ca, and Na (meq/l)
- Exchangeable Sodium Percentage (ESP) - analyzed on samples with SAR greater than 12 for clay textured soils or greater than 15 for sandy textured soils
- Total N (Kjeldahl nitrogen %)
- Available Phosphorus (mg/kg NaHCO3 Olsen's P)
- Available Water Capacity (in/in), including g/cm3 bulk density
- Rock Fragments (% volume) - determined in the field

For this project, soil samples were not analyzed for:

- Selenium (extractable and/or total);
- Boron (hot water extractable); and
- Acid-Base Potential (with sulfur fractionation).

2.5 DATA EVALUATION AND REPORT PREPARATION

All field and laboratory data has been analyzed and evaluated using standard soil classification, and project-specific soil suitability and interpretation criteria. Natural, non-disturbed soils were classified according to current Soil Taxonomy criteria as stated in fifth edition of Keys to Soil Taxonomy (Soil Survey Staff 1992), and correlated to Utah SCS soil series as appropriate.

Correlation of site-specific soils with SCS soil series allows for reference to established SCS soil interpretations values such as hydrologic group number (for runoff modeling), "K" factors (for use in water erosion hazard evaluations), and "WEG" group number (wind erodibility group status for wind erosion hazard evaluation) for the site-specific soils. In addition, one may quantitatively determine the "K" factor and "WEG" from use of laboratory data and appropriate nomographs.

All soils have been evaluated against topsoil suitability criteria contained in the UDOGM guideline and deemed appropriate for this project. All unsuitable soil horizons or whole soils have been listed and the limitations described.

3.0 RESULTS AND DISCUSSION

3.1 SOIL SURVEY MAP

The distribution of each soil map unit on the study area is provided on an 1"=100' approximate scale topographic base map (Soil Map T) and also on an 1"=250' approximate scale air photo print enlargement, aerial flight dated 10-31-89, (Soil Map P) accompanying this report as Appendix A. The legend on the maps includes all map unit symbols and names, and typifying soil description/sample sites within the study area.

Two soil map units were mapped across the study area. The two map units are:

- Map Unit A: Lithic Ustorthents, Loamy-Skeletal - Rock Outcrop Complex, 40 to 60% slopes

- Map Unit B: Typic Ustorthents, Loamy-Skeletal, 20 to 40% slopes

3.2 SOIL MAP UNIT AND PROFILE DESCRIPTIONS

As stated above, two map units were set up and mapped across the study area. These were sufficient to characterize the soil resources on such a small study area of basically similar landscape features. Three soil profiles were described and sampled at representative locations distributed across the study area, TM-1, TM-2, and TM-3. Both TM-1 and TM-2 soils are included in Map Unit A. They are both classified as loamy-skeletal, mixed, frigid Lithic Ustorthents, with the main difference between them being that TM-1 was developed in shallow residuum from and over shale and TM-2 in shallow residuum from and over sandstone. Both were correlated to the Reva soil series. TM-3 typifies Map Unit B. It classified as a loamy-skeletal, mixed, frigid Typic Ustorthent, and is a deep soil developed in mixed colluvium from sandstone and shale. TM-3 was correlated to the Pathead soil series. Map Units A and B, as well as profile descriptions for Reva (TM-1, TM-2), and Pathead (TM-3), will be described in turn.

3.2.1 Map Unit A

Map Unit A is composed of 70% loamy-skeletal Lithic Ustorthents (Reva soil series), and 28% Rock Outcrop. Lithic Ustorthents are split evenly between those over shale (TM-1, 40%) and those over sandstone (TM-2, 40%). Included in Map Unit A is an unnamed, somewhat poorly to poorly drained, shallow soil that occupies a couple of very narrow (less than 1 to about 1.5 feet across), very short drainageways that are present within the study area, and drain downslope toward the Cottonwood Canyon road. This "soil" composes only 1 to 2% of the map unit and constitutes less than 0.2% of an acre in cumulative size. It was not sampled due to its small size and low percent of the study area.

Rock Outcrop are most often exposed areas of bedrock. These areas can be nearly vertical cliff walls or rubble lands. Rubble lands are those areas where the soils are covered by large boulders so close together that there is little soil area between the boulders.

Map Unit A occupies the steep, west-facing lower mountain sideslopes of Cottonwood Canyon across the road from the Trail Mountain Mine. Elevation ranges from about 7300 to 7400 MSL. Slopes are generally steep, averaging 40 to 60 percent. Soils are developing in shallow residuum from interbedded sandstone and shale. Underlying geology is the Upper Cretaceous Mesaverde Group Star Point or Blackhawk formation (Spieker, 1931). Broad vegetative type is pinyon-juniper with some mountain brush. Mean annual precipitation is about 14 to 18 inches. Mean annual air temperature is about 40 to 48 degrees F. Freeze-free period is about 60 to 100 days.

The Reva soil series was described and sampled at both the TM-1 and TM-2 representative locations. TM-1 is located on a steep, west-facing canyon sideslope with slope of 60 percent. Vegetation is Pinyon-Juniper with some mountain brush and grass. It is well drained and the shallow profile was dry at the time of sampling. The soil parent material is thin slopewash colluvium over residuum from mixed sedimentary rocks, primarily shale at this location. The "A" horizon is composed of three 1" bands of slopewash material. The surface is very cobbly. Permeability is very slow. Erosion is moderate at the sampling location although the hazard for water erosion is severe. A soil profile/landscape photograph of the Reva soil (TM-1) is included in Appendix B. The Reva pedon description at the TM-1 location is as follows:

A - 0 to 3" light yellowish brown (10YR 6/4) and very pale brown (10YR 8/4) shaly silty clay loam, yellowish brown (10YR 5/4) moist; 30% small shale chip coarse fragments; weak coarse platy structure; slightly hard, friable, very sticky and very plastic consistence; few fine and very fine roots; strongly effervescent; moderately alkaline (pH 8.2); gradual wavy boundary.

Cr - 3"+ slightly weathered shale.

The Reva TM-2 location is very similar to TM-1 except the soil is developing in slopewash colluvium and residuum from sandstone. TM-2 is on a steep, west-facing sideslope with 60% slope. Vegetation is Pinyon-Juniper. Drainage is well. Erosion condition is moderate; erosion hazard from water is severe. Permeability is moderately rapid. A soil profile/landscape photograph of the Reva soil (TM-2) is included in Appendix B. The Reva pedon description at the TM-2 location is as follows:

AC - 0 to 5" brown (10YR 5/3) very cobbly sandy loam, brown to dark brown (10YR 4/3) moist; 15% gravels, 20% cobbles, and 5% stones and boulders; weak massive structure; slightly hard, friable, slightly sticky and slightly plastic consistence; common medium, fine, and very fine roots; strongly effervescent; moderately alkaline (pH 7.9); clear wavy boundary.

R - 5"+ hard sandstone bedrock.

3.2.2 Map Unit B

Map Unit B is composed of 100% loamy-skeletal Typic Ustorthents (Pathead soil series). Due to the very small size of the one delineation of Map Unit B, no other soils or inclusions are present. Map Unit B occupies a west-facing, short fan at the bottom of a ridge sideslope. The fan was previously cut into when a subsoil storage location for a previous project was established. The artificial cut well exposes the Pathead soil profile. The Map Unit B delineation of this short fan starts at this cut and goes upslope for a short distance. Slopes range from 20 to 40 percent. The Pathead soil is developing in slopewash colluvium from mixed sedimentary rocks. Elevation is about 7305 to 7335 feet. Underlying geology, precipitation, temperature, and freeze-free period is similar to Map Unit A. Broad vegetative type is mixed with some Pinyon/Juniper, sage, and grass.

The Pathead soil series was described and sampled at the TM-3 location. It is well drained and the profile was dry at the time of sampling. Slope gradient at the sampling location is 35 percent. Two photographs (1 soil profile and 1 landscape) of the Pathead soil (TM-3) is included in Appendix B. The Pathead profile description is as follows:

A - 0 to 6" brown (10YR 5/3) very gravelly sandy loam, brown to dark brown (10YR 4/3) moist; 15% gravels, 10% cobbles, and 10% stones; moderate medium granular structure; slightly hard, friable, nonsticky and nonplastic consistence; common coarse, medium, fine, and very fine roots to 10"; moderately effervescent; moderately alkaline (pH 8.2); gradual wavy boundary.

C1 - 6 to 30" light yellowish brown (10YR 6/4) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; 15% gravels, 10% cobbles, and 10% stones; massive structure; slightly hard-hard, friable, nonsticky and nonplastic consistence; few coarse, medium, fine, and very fine roots 10 to 30"; moderately effervescent; moderately alkaline (pH 8.2); gradual boundary.

C2 - 30 to 48" light yellowish brown (10YR 6/4) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; 25% gravels, 10% cobbles, and 10% stones; massive structure; hard, friable, slightly sticky and slightly plastic consistence; moderately effervescent; moderately alkaline (pH 8.1); gradual wavy boundary.

C3 - 48 to 68"+ light yellowish brown (2.5Y 6/4) very gravelly sandy loam-loam, light olive brown (2.5Y 5/4) moist; 25% gravels, 10% cobbles, and 10% stones; massive structure; hard, friable, slightly sticky and slightly plastic consistence; strongly effervescent; moderately alkaline (pH 8.2).

3.3 SOIL LABORATORY RESULTS

The results of laboratory analysis of all soil samples collected during the field study and submitted to CSU's Soil Testing Laboratory are provided in Appendix C. Six soil samples were collected from three soil profiles.

One soil analysis methodology used by the CSU laboratory was slightly different from that recommended in Table 1 of the UDOGM guideline. CSU used a $NaHCO_3$ extract (Olsen's P) for

available phosphorus which is an acceptable substitute method based on previous discussion with Henry Sauer, UDOGM soil scientist (Sauer, 1993).

Coarse fragment percent was obtained in the field and reported with the lab data results, as well as listed on the field soil profile descriptions. The percent gravels (2mm-3"), cobbles (3-10"), and stones and boulders (>10") were determined by screening with a #10 2mm screen (for gravels) and ocular estimates (for cobbles, and stones and boulders).

Data for duplicate analyses are also included with the results and satisfy quality assurance/quality control (QA/QC) concerns. The duplicate values were comparable within normal limits for the soil parameters.

Results indicate the soils are (1) moderately alkaline with pH 7.9 to 8.2; (2) have generally low salinity, except for depths below 30" in the Pathead soil - Map Unit B; (3) have low sodicity with SAR values below 6.7; (4) have reasonable saturation percent values; (5) have very gravelly sandy loam textures when over sandstone, and silty clay loam textures when over shale; (6) have low nitrogen values; (7) and have moderate to high calcium carbonate contents.

3.5 SOIL SUITABILITY EVALUATION AND VOLUME OF SUITABLE SOIL FOR RECLAMATION

A reclamation potential suitability evaluation of each sampled soil profile was performed based on comparison with criteria and threshold values contained in Table 2 (Overburden Evaluation for Vegetative Root Zone) on page 16 of the UDOGM guideline (Leatherwood and Duce, 1988). A copy of the UDOGM table is included as Table 1 in this report. The following is a brief discussion of the reclamation suitability of the soils on the proposed Cottonwood/Trail Mountain Portal Area.

The Reva soil of Map Unit A (sample locations TM-1 and TM-2) basically has suitable chemical parameters. TM-1 has a high calcium carbonate content (43%) but this parameter is not part of the UDOGM suitability table. The problem with Map Unit A is physical. The very steep slopes (40 to 60% or more), rocky nature of the soil surface with many boulders present, very shallow

TABLE 1
SOIL SUITABILITY CRITERIA

UDOGM: Overburden Evaluation for Vegetative Root Zone*

Parameters	Good	Fair	Poor	Unacceptable
pH	6.1-8.2	5.1 to 6.1 8.2 to 8.4	4.5 to 5.0 8.5 to 9.0	less than 4.5 greater than 9.0
Ec mmhos/cm 25°C	0 to 2	2 to 8	8 to 15	greater than 15
Saturation %	25%-80%		less than 25% greater than 80%	
Texture	sl, l, sil, scl, vfsl, fsl	c, sicl, sc, ls, lfs	sic, s, sc, c, cos, fs, vfs	g, vcos
SAR	0-4	5-10	10-12 Fine Texture 10-15 Coarse Texture	12 Fine Texture 15 Coarse Texture
Selenium	less than 0.1 mg/Kg			greater than 0.1 mg/Kg
Boron	less than 5.0 mg/Kg			greater than 5.0 mg/Kg
Acid/Base Potential	greater than -5 tons $CaC0_3$ 1,000 tons material			less than -5 tons $CaCO_3$ 1,000 tons material
% Coal fines	Undetermined at this time			
Available water capacity (in/in)	greater than 0.10	0.05-0.10	less than 0.05	
Rock Fragments (% volumes)				
3 inches	0-15	15-25	25-30	greater than 30
3-10 inches	0-15	15-25	25-30	greater than 30
10 inches	0- 3	3-7	7-10	greater than 10

Many native species have their roots in soils that are determined unsuitable by these values. Occasionally soil materials rated good by these standards have poor vegetation success. Therefore, plant growth trails may be required where reestablishment of native species is desirable.

soil depths (3 to 5" to bedrock), moderate to high coarse fragment content of the soil profiles, and 28% of the map unit composed of rock outcrop negates the possibility of soil salvage.

By contrast, the Pathead soil of Map Unit B has some suitable soil which could be salvaged for use in reclamation. All chemical and physical parameters in the top 30 inches of the soil profile are suitable. Available water capacity is adequate. Below 30 inches, electrical conductivity (EC) values are poor (EC 8.7 for 30 to 48") to unacceptable (EC 24.6 for 48 to 68"), and rock fragment content is fair to poor (25% gravels). Slope gradients are less than 40 percent on which soil can be salvaged. As a result, a potential soil salvage recommendation of 30 inches (2.5 feet) is proposed for Map Unit B. Only one delineation of Map unit B is present on the study area, and it size is small, about 0.16 acre. A potential suitable soil volume of 645 cubic yards is available for salvage on the study area.

In summary, most of the proposed Cottonwood/Trail Mountain Portal Area has soil which can not be salvaged due to steep slope, surface and profile rock content, and very shallow soil depth of 3 to 5 inches. One small area, a Map Unit B delineation of 0.16 acre, has 2.5 feet of suitable soil which can be salvaged if needed. An approximate 645 cubic yards of soil material is available for salvage from Map Unit B for use in future reclamation activities.

4.0 REFERENCES

Jensen Earl H. and James W. Borchert. 1988. Soil Survey of Carbon Area, Utah.

Leatherwood James and Dan Luce. April 1988. Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining. State of Utah Department of Natural Resources Division of Oil, Gas, and Mining. Salt Lake City, Utah.

Sauer Henry. 1993. UDOGM Soil Scientist. Personal communication with J. Nyenhuis, August 16, 1993.

Spieker, Edmund. The Wasatch Plateau Coal Field, Utah. U.S.Geological Survey Bulletin 819. 1931.

Soil Survey Staff. 1992. Keys to Soil Taxonomy, 5th edition. Soil Management Support Staff Technical Monongraph No. 19. Blacksburg, Viriginia. 556p.

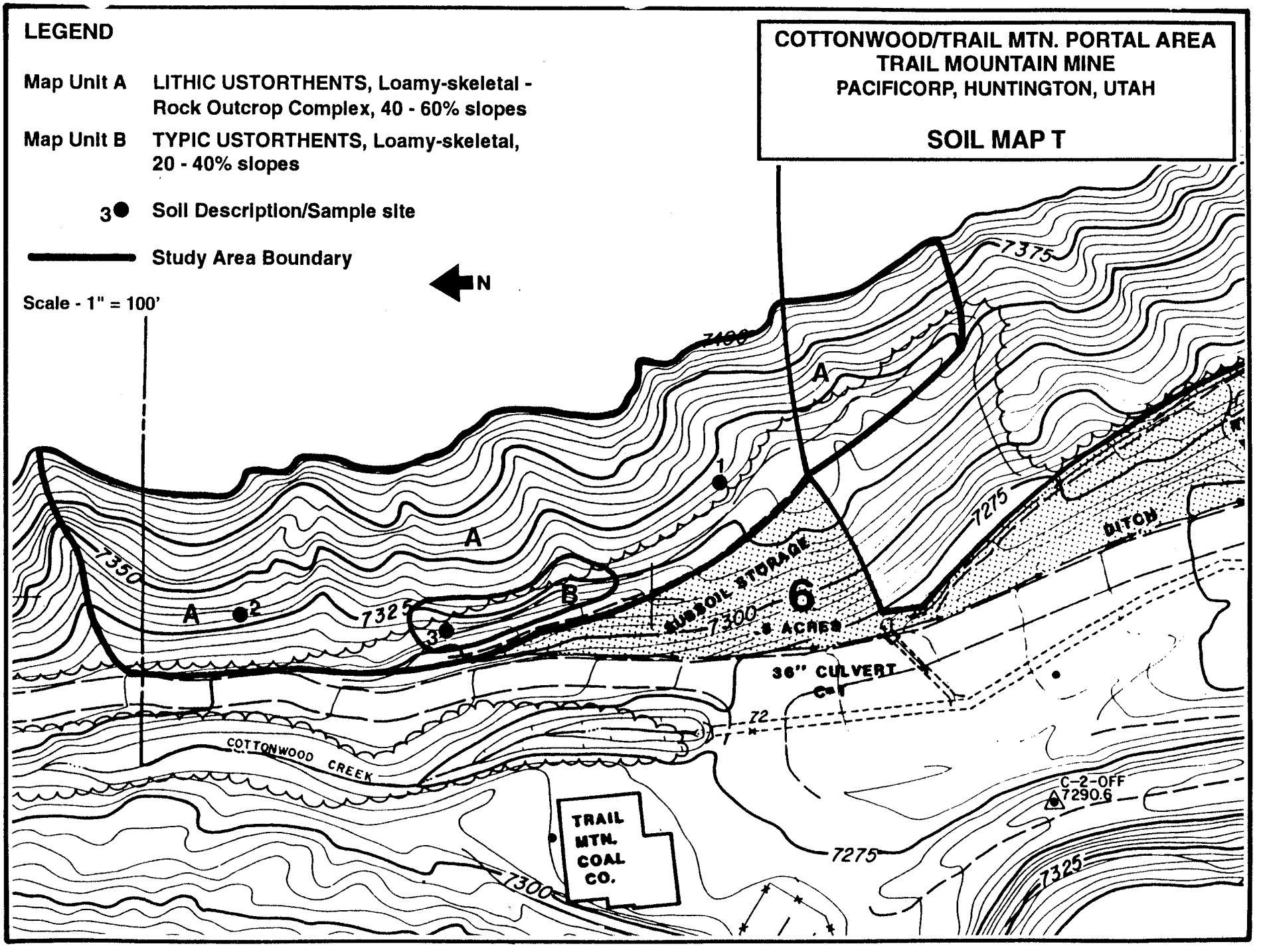
Soil Survey Staff. 1992. Soil Survey Manual. Agricultural Handbook (unnumbered at this time), Washington, D.C.

Soil Survey Staff. 1992, as amended. National Soils Handbook. Publication 430-VI-NSH. U.S. Government Printing Office, Washington, D.C.

APPENDIX A

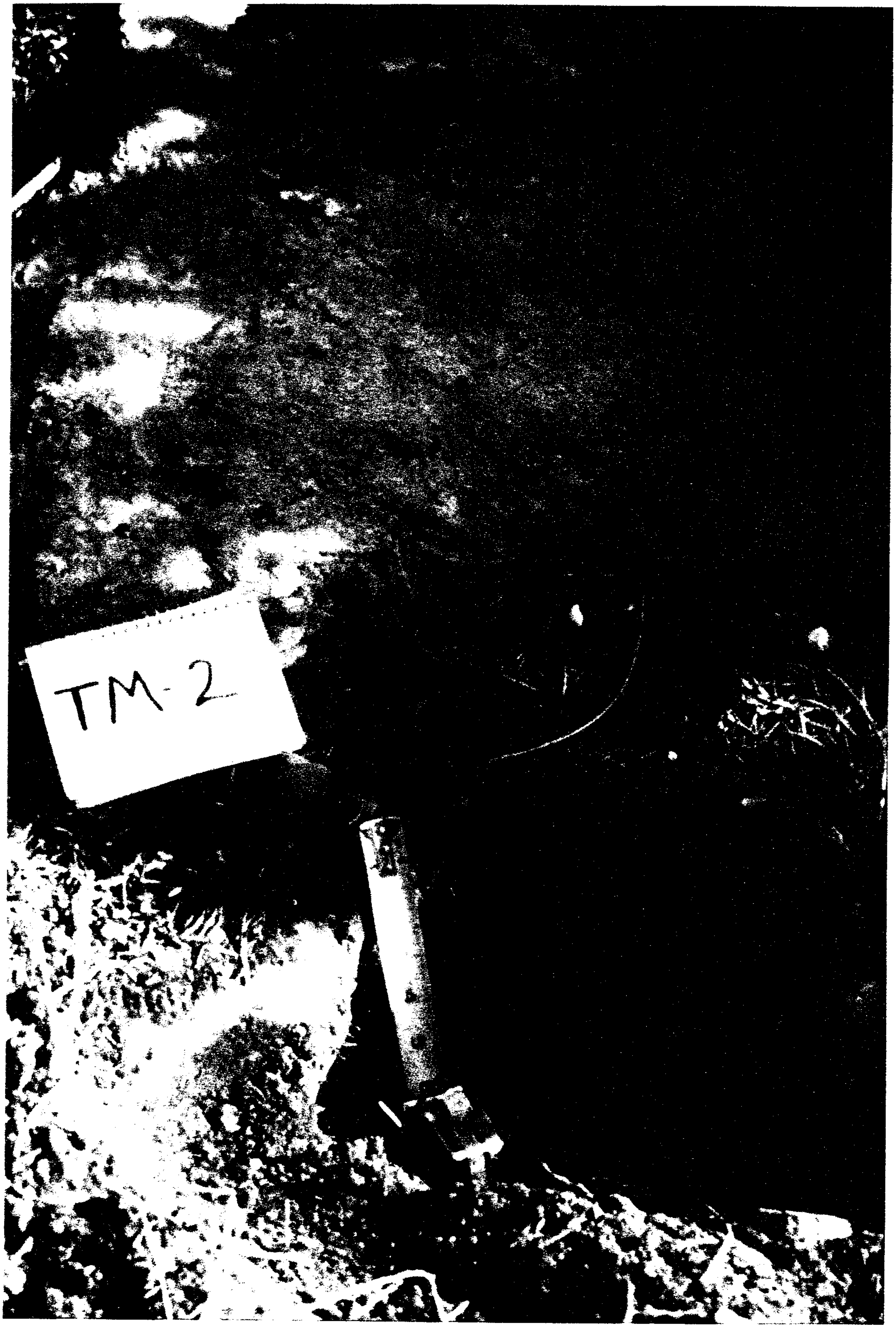
Soil Map P & Soil Map T

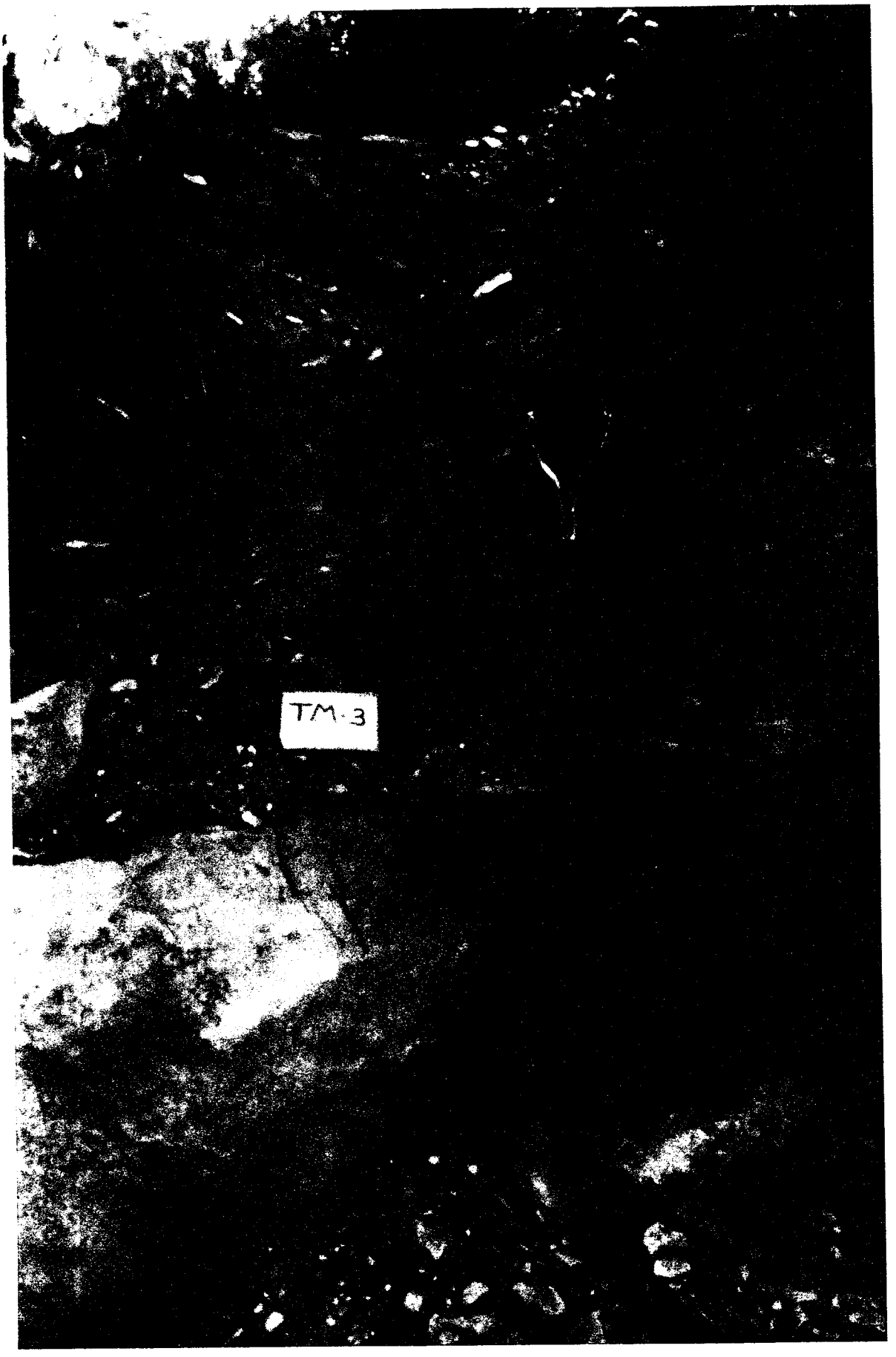

LEGEND
Map Unit A LITHIC USTORTHENTS, Loamy-skeletal - Rock Outcrop Complex, 40 - 60% slopes
Map Unit B TYPIC USTORTHENTS, Loamy-skeletal, 20 - 40% slopes
Soil Description/Sample site
Study Area Boundary
N
Scale - 1" = 250' (approx.)
COTTONWOOD/TRAIL MTN. PORTAL AREA
TRAIL MOUNTAIN MINE
PACIFICORP, HUNTINGTON, UTAH
SOIL MAP P
A
A
A
B
3


LEGEND
Map Unit A LITHIC USTORTHENTS, Loamy-skeletal - Rock Outcrop Complex, 40 - 60% slopes
Map Unit B TYPIC USTORTHENTS, Loamy-skeletal, 20 - 40% slopes
3 Soil Description/Sample site
Study Area Boundary
Scale - 1" = 100'
N
COTTONWOOD/TRAIL MTN. PORTAL AREA
TRAIL MOUNTAIN MINE
PACIFICORP, HUNTINGTON, UTAH
SOIL MAP T
7375
7350
7325
7300
7275
A
B
1
2
3
SUBSOIL STORAGE
6
.8 ACRES
DITCH
36" CULVERT
C=1
72
1
COTTONWOOD CREEK
TRAIL MTN. COAL CO.
C-2-OFF
7290.6

APPENDIX B

Soil Profile/Landscape Photographs


TM-2


TM-3

TM-3 Colluvial Fan Landscape

APPENDIX C

Soil Laboratory Results

Jim Nyenhuis
Professional Soil Scientist

Proposed East Portal Area
Trail Mountain Mine
Hunington, Utah

Colorado State University
Soil, Water & Plant Testing Laboratory
Room 6, Vocational Education Building
Fort Collins, CO 80523
303–491–5061
DATE: 12/16/93
BILLING:

For: Rick Collins
Mount Nebo Scientific
330 E 400 S Ste 6 – Box 337
Springville, UT 84663

DATE RECEIVED: 11/01/93
Page 1 of 3

RESEARCH SOIL ANALYSIS

Lab #	Sample ID #	---Paste-- pH	mmhos/cm E.C.	----meq/l------ Ca	Mg	Na	K	SAR	% SAT	-----mg/l----- CO_3	HCO_3	Alkalinity
R2603	TM–1 0–3"	8.2	0.6	2.8	2.2	0.8	1.3	0.5	37.1	<0.1	327.0	272.5
R2604	TM–2 0–5"	7.9	0.6	4.8	1.4	0.5	0.3	0.3	46.7	<0.1	375.8	313.2
R2605	TM–3 0–6"	8.2	0.9	4.0	2.0	3.2	1.0	1.8	31.4	<0.1	328.2	273.5
R2606	TM–3 6–30"	8.2	1.4	3.8	3.0	7.3	1.5	3.9	27.1	<0.1	323.3	269.4
R2607	TM–3 30–48"	8.1	8.7	15.0	82.2	46.5	1.3	6.7	33.2	<0.1	260.5	217.1
R2608	TM–3 48–68"	8.2	24.6	21.0	33.7	18.6	1.6	3.6	27.5	<0.1	253.2	211.0
	Duplicates											
R2604d	TM–2 0–5"									<0.1	377.0	314.2
R2605d	TM–3 0–6"	8.2	0.9	4.4	2.1	3.3	1.1	1.9	34.4	<0.1	326.4	272.0

Jim Nyenhuis
Professional Soil Scientist

Proposed East Portal Area
Trail Mountain Mine
Hunington, Utah

Colorado State University
Soil, Water & Plant Testing Laboratory
Room 6, Vocational Education Building
Fort Collins, CO 80523
303-491-5061
DATE: 12/16/93
BILLING:

For: Rick Collins
Mount Nebo Scientific
330 E 400 S Ste 6 - Box 337
Springville, UT 84663

DATE RECEIVED: 11/01/93

RESEARCH SOIL ANALYSIS

Lab #	Sample ID #	equivalent $CaCO_3$ (%)	TOC (%)	Sand (%)	Silt (%)	Clay (%)	Texture	*Coarse Fragments (%) Gravels (2mm-3")	Cobbles (3-10")	Stones, Boulders (>10")	% Total Kjeldahl N	mg/kg $NaHCO_3$ Olsen's P
R2603	TM-1 0-3"	43.4	1.97	8	52	40	Silt Clay/Silt Clay Loam	30	0	0	0.072	1.8
R2604	TM-2 0-5"	12.5	2.79	77	16	7	Loamy Sandy/Sandy Loam	15	20	5	0.185	3.7
R2605	TM-3 0-6"	23.8	1.54	68	22	10	Sandy Loam	15	10	10	0.107	3.2
R2606	TM-3 6-30"	17.9	1.02	68	19	13	Sandy Loam	15	10	10	0.051	<1.0
R2607	TM-3 30-48"	17.3	0.73	63	23	14	Sandy Loam	25	10	10	0.044	1.4
R2608	TM-3 48-68"	35.0	0.85	52	30	18	Loam/Sandy Loam	25	10	10	0.046	1.3
	Duplicates											
R2604d	TM-2 0-5"	10.4	2.98	78	15	7	Loamy Sand				0.191	2.2
R2605d	TM-3 0-6"											

*Coarse Fragments: Percent by volume determined by screening

Jim Nyenhuis
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Proposed East Portal Area
Trail Mountain Mine
Hunington, Utah

Colorado State University
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DATE: 12/16/93
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For: Rick Collins
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DATE RECEIVED: 11/01/93
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RESEARCH SOIL ANALYSIS

Lab #	Sample ID #	----% H_2O---- 1/3 Bar	15 Bar	Available Water Capacity	g/cm^3 Bulk Density
R2603	TM-1 0-3"	22.8	10.0	12.8	1.4
R2604	TM-2 0-5"	16.6	11.5	5.1	1.3
R2605	TM-3 0-6"	12.3	7.0	5.3	1.4
R2606	TM-3 6-30"	10.3	5.7	4.6	1.4
R2607	TM-3 30-48"	11.7	6.1	5.6	1.4
R2608	TM-3 48-68"	20.4	9.6	10.8	1.3
	Duplicates				
R2604d	TM-2 0-5"	17.2	11.3	5.9	1.3
R2605d	TM-3 0-6"				