

CHAPTER VIII
SOIL RESOURCES

PART 8.2 Methodology

According to standards of the National Co-operative Soil Survey and in accordance with the procedures set forth in U. S. Department of Agriculture Handbook 436 (Soil Taxonomy, 1975) and 18 (Soil Survey Manual, 1951). Soil maps included as maps J-1, J-2, J-3 with this application.

PART 8.3 Soil Resource Information of Mine Plan Area

8.3.1 Soils Identification

See "Soil Survey" included as Item VIII-1 with this Chapter.

8.3.2. Soils Description

See "Soil Survey" included as Item VIII-1 with this Chapter.

8.3.3 Present and Potential Productivity of Existing Soils

See "Soil Survey" included as Item VIII-1 with this Chapter.

PART 8.4 Prime Farmland Investigation and Determination

The land within the permit area has not been historically used as cropland, therefore applicant hereby issues a formal request for a negative determination as required under PART 783.27 (c).

PART 8.5 Soils, Physical and Chemical Properties of Soils and Results of Analyses, Tests and Trials

Not applicable, as per 817.22 or 784.13, topsoil will be stockpiled and redistributed as per reclamation plan. Do not plan to use any substitute materials. Soils will be tested and amended if necessary prior to redistribution as per PARTS 3.2.1 and 3.5.5.1 of this application

PART 8.6 Use of Selected Overburden Materials or Substitutes

Not applicable

PART 8.7 Plans for Removal, Storage and Protection of Soils

See PART 3.2.1. of this application.

CHAPTER VIII Continued-

PART 8.8 Plans for Redistribution of Soils

See PART 3.5.4.4 of this application.

PART 8.9 Nutrients and Soil Amendments

To be added to topsoil prior to or during redistribution. Amendments to soil as per "Soil Survey" recommendations (See Item VIII-1 included with this Chapter).

PART 8.10 Effects of Mining Operations on Soils, Nutrients and Soil Amendments to be used

None other than effects of storage and handling. Any nutrient loss will more than be rectified by amendments prior to redistribution.

PART 8.11 Mitigation and Control Plans

As specified throughout this application regarding topsoil handling, storage and amending nutrients prior to redistribution.

SOIL SURVEY
CRANDALL CANYON, EMERY COUNTY, UTAH

DECEMBER, 1980

Prepared for GENWAL CORPORATION

By

VALLEY ENGINEERING, INC.

Richfield, Utah

SOILS SURVEY

A soil survey was conducted in Crandall Canyon, a sub-canyon of Huntington Canyon in Emery County, Utah. This survey was made in conjunction with the proposed coal mine located approximately one mile up Crandall Canyon and owned by Genwal Corporation. The survey was made in compliance with the Surface Mining and Reclamation Act Part 783.21.

The survey was conducted in the fall of 1980. Fourteen representative sample groups were analyzed from the mouth of Crandall Canyon, up the canyon about 7000 feet to a point 1000 feet above the mine site. Of the fourteen sample groups, four distinct soil types were identified.

SOIL DESCRIPTIONS

The characteristics and description of soil types found are given here:

KENILWORTH SERIES: Soils of the Kenilworth series are stony, well drained, gently sloping to steep, and moderately coarse textured. They occupy high benches on old dissected outwash plains below very steep mountains along the western edge of Emery County. These soils have formed in a thick deposit of strongly to very strongly calcareous stony alluvium derived mainly from calcareous sandstone, quartzite, and limestone. The vegetation is mainly juniper and pinon. Elevations range from 6,000 to 7,200 feet. The annual rainfall is 8 to 12 inches, and the mean annual soil temperature is between 47° and 54° F. The frost-free season is 110 to 130 days.

In a typical profile, the surface layer is pale-brown, very strongly calcareous very stony sandy loam about 7 inches thick. The underlying material is pale brown and very pale brown stony sandy loam that is very

strongly calcareous and contains 25 to 50 percent cobblestones and stones.

The Kenilworth soils are used for range. Some areas have been cleared for reseeding, but inadequate rainfall and stones on the surface prevent the success of such work in many places.

Representative profile of a Kenilworth very stony sandy loam:

0 to 7 inches, pale-brown (10YR 6/3) very stony sandy loam, dark brown (10YR 4/3) when moist; moderate, fine granular structure; soft, very friable slightly sticky and slightly plastic; few large, plentiful, medium and fine roots; no pores; strongly calcareous; mildly alkaline (pH 7.7); clear, smooth boundary.

7 to 13 inches, very pale-brown (10YR 7/3) stony sandy loam, pale brown (10YR 6/3) when moist; weak, medium to coarse, angular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few medium and fine roots; few medium and fine pores; very strongly calcareous; moderately alkaline (pH 8.0); gradual, wavy boundary.

13 to 21 inches, pale-brown (10YR 6/3) stony sandy loam, brown (10YR 5/3) when moist; weak, medium to coarse, angular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few medium and fine roots; common fine and a few medium pores; strongly calcareous; moderately alkaline (pH 8.2); gradual, wavy boundary.

12 to 34 inches, pale-brown (10YR 6/3) stony sandy loam, brown (10YR 5/3) when moist; massive; hard, very friable, slightly sticky and slightly plastic; few medium and fine roots; few fine pores; strongly calcareous; strongly alkaline (pH 8.5).

Stones and cobblestones occupy from 0.1 to 3.0 percent of the surface, and they range from 3 inches to 4 feet in diameter. Limy horizons are within

3 to 9 inches of the surface. The Kenilworth soils generally are dry when not frozen. In the A1 horizon, the hue of 10YR; value is 5 or 6 when the soils are dry and is 4 or 5 when they are moist; and chroma is 2 or 3. The part of the profile between 10 and 40 inches is stony sandy loam to stony light loam that is less than 18 percent clay and is more than 15 percent sand coarser than very fine sand. The hue in this part is 10YR; value is 6 or 7 when the soils are dry and 5 or 6 when they are moist; and chroma is 3 or 4. The content of lime ranges from 30 to 45 percent. The content of stones and cobblestones ranges from 25 to 50 percent.

Kenilworth very stony sandy loam, 0 to 20 percent slopes, eroded (KeE2). The profile of this soil is the one described as typical of the series. This soil occurs in large areas. Sheet erosion is active. Lime-coated gravel and cobblestones are on the surface in many places, and coatings of lime are on stones 2 to 6 inches above the surface. These lime-coated stones indicate that erosion has removed soil from around them. Gullies 2 to 3 feet deep are common in places.

This Kenilworth soil is well drained and is moderately permeable. Runoff is medium, and the susceptibility to erosion is slight to moderate. The root zone is shallow or moderately deep. Depth of root penetration is restricted by limy layers and stones. This soil retains about 4.5 inches of water, but only about 3.5 inches of water is readily available to plants.

This soil is used mainly as spring and fall range. Deer use it also for winter range. In places juniper is cut for fence posts.

MIXED ALLUVIAL LAND (Mx) consists of unconsolidated alluvium that is typically stratified and widely variable in texture, color, and consistence. It occurs along stream channels and in most places has been deposited recently by streams. This material is subject to change through periodic

overflow, but it has remained in place long enough for plants to have become established. Typically, there has been no development of a soil profile, but in places the soil material near the surface is slightly darkened by organic matter. Drainage generally is restricted, and the soil material is mottled. Small areas in which the material is cobbly or stony are near the mounts of canyons. Away from the canyons, the sediments are finer textured.

This miscellaneous land type has little value for farming, except that it is used for grazing.

ROCK LAND(Ry) is a miscellaneous land type having a surface 50 to 70 percent covered by stones, boulders, and outcrops of shale and sandstone. Most of this land type is moderately eroded, but many areas are severely eroded. Soil characteristics are almost obscured by the stones and boulders. The slopes are very steep to perpendicular, but typically they are between 50 and 80 percent.

Included in mapping were gently sloping, deep fine sandy loams. Intermingled with the sandstone outcrops were inclusions of shallow fine sandy loams. Also included on some of the north-facing slopes in the mountains along the west side of the survey area were small areas of an unidentified soil.

This land type has almost no value for farming, although some areas have a sparse cover of grass, sagebrush, pinon, and juniper. This vegetation grows on all exposures, but it is dominant on north and west exposures. Small areas are accessible to livestock and wildlife, but most of the land type is too steep and rocky for grazing.

STONY ALLUVIAL LAND(St) consists of extremely stony alluvium from a variety of sedimentary rocks. It is mainly on the flood plains of live and ephemeral

streams, but it also occurs on mud rock flows adjacent to the flood plains. The texture ranges from sandy loam to loam. Gravel, cobblestones, and other stones 3 inches to 4 feet in diameter make up 25 to 80 percent of the soil material. The content of stones and cobblestones varies significantly within a few feet.

The present vegetation is scattered juniper trees, galleta-grass, rabbit-brush, and some big sagebrush.

SOILS PRODUCTIVITY AND CAPABILITY

The current plant productivity of the soil types in Crandall Canyon is given in the companion volume prepared by Valley Engineering entitled "Vegetation and Terrestrial Wildlife Report" for Genwal Corporation on the Crandall Canyon Site. A description of the capability units are given here:

CAPABILITY UNIT VIw-2 (Nonirrigated) This capability unit consists mainly of recently deposited alluvial soil material that is stratified and variable in texture and is called Mixed alluvial land. In addition, it includes soils of the Abbot and Killpack series. The Abbott soil is mainly along streams, and in places it is subject to stream overflow and to a fluctuating water table. The Killpack soil is moderately deep over shale. In many places below settlements, the surface layer is moderately to strongly saline.

CAPABILITY UNIT VIIc-S (Nonirrigated) This capability unit consists of deep, well-drained, nearly level very fine sandy loams, loams, and sandy clay loams, on mesas and benches. These soils are in the Minchey and Palisade series.

These soils are moderately to readily permeable. As a rule, they can retain 8 to 9 inches of water. All the soils usually are dry because of the limited amount of rainfall. The susceptibility to sheet erosion is moderate;

gullies have formed in some areas.

Unless these soils are irrigated, they are suited only to range, and they are used for that purpose. Reseeding of grasses and clearing of brush or other mechanical practices that would improve the range are not feasible.

CAPABILITY UNIT VIIs-SX (Nonirrigated) In this capability unit are deep, gently sloping to steep areas of Stony alluvial land and of Kenilworth very stony sandy loam, 0 to 20 percent slopes, eroded. These soils are near very steep mountains. They occupy the slopes of benches or mesas or are on recently formed flood plains of streams.

Permeability is moderate to rapid, and natural fertility is moderate to low. The susceptibility to sheet erosion is moderate; some gullies have formed. The soils retain about 4 inches of water but are dry most of the time.

These soils are used for range and are suited to that purpose. Reseeding of grasses and clearing of brush or other mechanical practices that would improve the range are not feasible.

CAPABILITY UNIT VIIIs-3 (Nonirrigated) This capability unit consists only of bare, steep ledges of Rock land on which plants do not grow. The only use is for wildlife habitat, water supply, and esthetic purposes.

As noted, all soil types are either VI, VII or VIII. These categories are the poorest soil categories for productivity, with I being the best and VIII being the poorest. Knowledge of these soil types, precipitation and slope, indicate that increase in productivity over present conditions is not probable.

Attached analysis of soil samples, analyzed by Utah State University, indicates that some artificial fertilization would be desirable to enhance

soil nutrient values. However, because of the steep slopes, most of the fertilizer would end up in the creek after the first rain storm and could cause more harm than good. We do not recommend supplemental fertilization.

APPENDIX

SOIL TEST REPORT
 and
 FERTILIZER RECOMMENDATIONS

Date received 12/3/80

Name Bill Wollen
c/o Valley Engineering
 Street 850 N. Main

Payment received \$ 70.00

Balance due \$ -0-

City, State Richfield, Utah 84701
 ZIP

Your USU Extension Agent Allen Edwards

LABORATORY REPORT

| Lab. No. | Sample No. | Crop | Soil Texture (Estimated) | Lime | pH | Soluble Salts EC _e | Organic Matter % | Plant Nutrient Index | | |
|----------|------------|------------------|--------------------------|------|-----|-------------------------------|------------------|----------------------|------------------|-----------------|
| | | | | | | | | Nitrate ppm N | Phosphorus ppm P | Potassium ppm K |
| \$-1510 | 1 | Forage & Pasture | Organic Mat. | 0 | 6.7 | .3 | | | 16 | 132 |
| \$-1511 | 2 | | Organic Mat. | 0 | 7.2 | .3 | | | 23 | 190 |
| \$-1512 | 3 | | Sandy Loam | ++ | 7.5 | .2 | | | 19 | 65 |
| \$-1513 | 4 | | Sandy Loam | ++ | 7.7 | .2 | | | 3.7 | 137 |
| \$-1514 | 5 | | Organic Mat. | ++ | 7.2 | .3 | | | 20 | 90 |
| \$-1515 | 6 | | Sandy Loam | ++ | 7.7 | .2 | | | 1.6 | 90 |

OK

ATTENTION GROWERS

These fertilizer recommendations are based on the soil analysis results, the information you supplied on the Description sheet, and on the average growing season for your area. They are guides developed from the best available scientific data, but may require some modification for your specific situation. Consult your Extension Agent for more details.

Remember that a high yield goal can be attained only when proper fertilization is used in combination with crop production management and climatic conditions consistent with that yield goal.

USU POLICY

It is the policy of the USU Soil Testing Laboratory to recommend only those nutrients that offer a reasonable possibility of increasing the yield of your crops, and in those amounts that should be necessary to achieve your yield capability. Ranges of nutrients are sometimes given, to permit some farm operator judgement.

FERTILIZER RECOMMENDATIONS FOR 19__ CROP

| Sample No. | Pounds of Nutrient per acre | | | | Special Notes |
|------------|-----------------------------|--|---------------------------------|-------|---------------|
| | Nitrogen (N) | Phosphorus (as P ₂ O ₅) | Potassium (as K ₂ O) | Other | |
| 1 | 35-50 | 0 | 0 | | 3 |
| 2 | 35-50 | 0 | 0 | | |
| 3 | 35-50 | 0 | 50-100 * | | |
| 4 | 35-50 | 50 | 0 | | |
| 5 | 35-50 | 0 | 0 | | |
| 6 | 35-50 | 60 | 0 | | |

*See referenced notes on the back of this sheet for explanations and special instructions.

* Potassium recommendations are only best guesses. No research data for your specific situation. Trials advisable.

P₂O₅ x .45 = P

K₂O x .82 = K

SOIL TEST REPORT
 and
 FERTILIZER RECOMMENDATIONS

Name Bill Wollen (Page Two) Date received _____
 Street _____ Payment received \$ _____
 City, State _____ ZIP _____ Your USU Extension Agent _____

LABORATORY REPORT

| Lab. No. | Sample No. | Crop | Soil Texture (Estimated) | Lime | pH | Soluble Salts EC _e | Organic Matter % | Plant Nutrient Index | | |
|----------|------------|------|--------------------------|------|-----|-------------------------------|------------------|----------------------|------------------|-----------------|
| | | | | | | | | Nitrate ppm N | Phosphorus ppm P | Potassium ppm K |
| \$-1516 | 7 | | Sandy Loam | ++ | 7.5 | .3 | | | 6.3 | 142 |
| \$-1517 | 9 | | Sandy Loam | ++ | 7.7 | .3 | | | 16 | 123 |
| \$-1518 | 10 | | Sandy Loam | ++ | 7.8 | .2 | | | 5.7 | 50 |
| \$-1519 | 11 | | Sandy Loam | ++ | 7.8 | .2 | | | 4.1 | 58 |
| \$-1520 | 12 | | Sandy Loam | + | 7.6 | .2 | | | 23 | 163 |
| \$-1521 | 13 | | Sandy Loam | ++ | 7.8 | .2 | | | 14 | 63 |

OK

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FERTILIZER RECOMMENDATIONS FOR 19 ___ CROP

| Sample No. | Pounds of Nutrient per acre | | | | Special Notes |
|------------|-----------------------------|--|---------------------------------|-------|---------------|
| | Nitrogen (N) | Phosphorus (as P ₂ O ₅) | Potassium (as K ₂ O) | Other | |
| 7 | 35-50 | 40 | 0 | | c |
| 9 | 35-50 | 0 | 0 | | |
| 10 | 35-50 | 40 | 50-100 * | | |
| 11 | 35-50 | 50 | 50-100 * | | |
| 12 | 35-50 | 0 | 0 | | |
| 13 | 35-50 | 0 | 50-100 * | | |

*See referenced notes on the back of this sheet for explanations and special instructions.

P₂O₅ x .45 = P

K₂O x .82 = K

SOIL TEST REPORT
 and
 FERTILIZER RECOMMENDATIONS

Name Bill Wollen (Page Three)
 Street _____
 City, State _____ ZIP _____

Date received _____
 Payment received \$ _____
 Balance due \$ _____

Your USU Extension Agent _____

LABORATORY REPORT

| Lab. No. | Sample No. | Crop | Soil Texture (Estimated) | Lime | pH | Soluble Salts EC _e | Organic Matter % | Plant Nutrient Index | | | |
|----------|------------|------|--------------------------|------|-----|-------------------------------|------------------|----------------------|------------------|-----------------|--|
| | | | | | | | | Nitrate ppm N | Phosphorus ppm P | Potassium ppm K | |
| S-1522 | 14 | | Fine Sandy Loam | ++ | 7.7 | .6 | | | 3.9 | 61 | |
| | | | | | OK | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

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FERTILIZER RECOMMENDATIONS FOR 19 __ CROP

| Sample No. | Pounds of Nutrient per acre | | | | Special Notes |
|------------|-----------------------------|--|---------------------------------|-------|---------------|
| | Nitrogen (N) | Phosphorus (as P ₂ O ₅) | Potassium (as K ₂ O) | Other | |
| 14 | 35-50 | 50 | 50-100* | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

*See referenced notes on the back of this sheet for explanations and special instructions.

P₂O₅ x .45 = P

K₂O x .82 = K