0010

ACT/015/004

Soil Inventory

Huntington Canyon #4 Mine

Submitted by: Beaver Creek Coal Company

In Compliance With: Special Stipulation No. 10
Huntington Canyon #4 Mine
Mining and Reclamation Plan Approval

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1.0 INTRODUCTION

A soil survey of the Huntington Canyon #4 Mine was conducted to provide soil resource information to meet the requirements of the Utah Division of Oil, Gas & Mining and the Office of Surface Mining.

The mine site area has not been mapped by the USDA Soil Conservation Service (SCS). Figure 1, Soil Inventory of Huntington Canyon #4 Mine area was made by consultants hired by Beaver Creek Coal Company in July 1980. Map scale of Figure 1 is 1" = 500' (1:6,000). At the time of mapping, a large part of the area was mapped as disturbed land.

Map unit descriptions are site specific. Three map units are mapped and described.

Soil series descriptions are adapted from the SCS to be site specific. Detailed pedon descriptions are presented for the three major soil series at the site. Pedons were described in fresh road cuts to 60 inches or to bedrock, whichever was shallowest.

The three major soil series were sampled at the site. Samples were analyzed by Colorado Agricultural Consultants of Brighton, Colorado. Parameters tested were pH, electrical conductivity, saturation percent, soluble calcium magnesium and sodium, available potassium, texture class from percent sand silt clay and very fine sand, organic matter percent, phosphorous, lime, boron, ammonia-nitrogen, and nitrate-nitrogen.

Present and potential uses of the soils of the site have been evaluated based on SCS Soil Survey Interpretation information. The soils have no potential as cropland or pasture land. The soils have not been evaluated by the SCS for their potential production as rangeland but their capability groups are given.

The soils are evaluated as seedbed quality material for drastically disturbed land. The evaluation method used is that of the SCS. Each horizon of each pedon is rated as seedbed quality material based on the field description and the analytical data. Recommended use for each soil is given.

Soil names given in this report are tentative. The soils in this report are named for similar soils that are presently being mapped by the SCS in the area. In some cases the described pedons are outside of the accepted range in characteristics for the series and those differences are noted in the test.

The soils in this report have not been correlated by the SCS. Classifications are based on morphology as described in the field, and to a lesser degree on the analytical data. Where analytical data do not support the field descriptions, the soils are classified according to the field descriptions.

2.0 SERIES DESCRIPTIONS

2.1 Disturbed Land Fill Material

The disturbed land fill material consists of deep, rapidly permeable, well-drained materials. These materials are primarily fill derived from sandstone and shale. Annual precipitation is 12 to 20 inches. The mean annual soil temperature ranges from 38° to 45°F, and the frost free period is 60 to 120 days. The native vegetation has been removed.

The available water capacity is low, and permeability is moderate. These materials are used for fill slopes, facilities areas, and roadbeds. A representative sample of fill material, 100 feet north and 100 feet east of the southwest corner of section 16, T16S, R7E is:

> pale brown (10YR 6/3) gravelly loamy sand, brown (10YR 5/3) moist; massive, loose, nonsticky and nonplastic, calcareous, 30 percent gravels, 2 percent cobbles, 5 percent stones, 5 percent boulders.

2.2 Patmos Series

The Patmos series consists of moderately deep, moderately permeable, well-drained soils. These soils formed in colluvium derived from sandstone and shale. Annual precipitation is 12 to 20 inches. The mean annual air temperature ranges from 38° to 45°F, and the frost free period is 60 to 120 days. The native vegetation is Salina wildrye, low gray sage, and winterfat.

The available water capacity to a depth of 21 inches is about 2 to 4 inches, and permeability is moderate. These soils are used for watershed, and wildlife habitat.

The Patmos series is a member of the loamy-skeletal mixed (calcareous) frigid family of Typic Ustorthents. A representative profile of Patmos gravelly loam, strongly sloping, 1500 feet west and 700 feet north of the southeast corner of section 16, T16S, R7E is:

O2 3 to 0 inches; partially decomposed wood twig and leaf fragments.

A1 0 to 6 inches; brown (10YR 5/3) gravelly loam, brown-dark brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; calcareous; 25 percent gravels, 5 percent boulders; common fine roots; clear smooth boundary.

C1 6 to 26 inches; yellowish brown (10YR 5/4) gravelly loam; brown-dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; calcareous; 30 percent gravels, 5 percent cobbles, 2 percent stones and 2 percent boulders; common fine roots; band darkened by organic material from 6 to 9 inches; clear wavy boundary.

C2 26 to 38 inches; light yellowish brown (10YR 6/4) very cobbly loamy sand; single grain; loose, non-sticky and non-plastic, calcareous, 15 percent gravels, 15 percent cobbles, 5 percent stones and 2 percent boulders, abrupt smooth boundary.

R 38+ inches; weathered sandstone, shale and coal.

2.3 Podo Series

The Podo series consists of shallow, somewhat excessively-drained soils. These soils formed in colluvium. Annual precipitation is 16 to 30 inches. The mean annual air temperature is less than 42°, and the frost free period is less than 60 days. The native vegetation is salina wildrye and juniper.

The available water capacity to a depth of 11 inches is less than 2 inches, and permeability is moderately rapid. These soils are used for wildlife habitat and watershed.

The Podo series is a member of the loamy mixed (calcareous), frigid family of Lithic Ustorthents. A representative profile of Podo gravelly sandy loam, 900 feet west and 500 feet north of the southeast corner of section 16, T16S, R7E is:

A1 0 to 2 inches; light brown (7.5YR 6/4) gravelly sandy loam, brown-dark brown (10YR 4/4) moist; weak thin platy structure; soft, very friable; nonsticky and nonplastic, calcareous, 20 percent gravels, 5 percent cobbles, 5 percent stones (not sampled separately).

C1 3 to 13 inches; light brown (7.5YR 6/4) gravelly sandy loam, brown (10YR 5/4) moist; single grain structure, loose, nonsticky and nonplastic, calcareous, 15 percent gravels, 10 percent cobbles, 5 percent stones, some minor lime accumulations from 11 to 13 inches; fine earth material similar to C1 fills cracks in bedrock; abrupt wavy boundary.

R 13+ inches; weathered sandstone.

2.4 Quigley Series

The Quigley series consists of deep, moderately permeable, well-drained soils. These soils formed in colluvium and alluvium derived from sandstone and shale. Annual precipitation is 13 to 16 inches. The mean annual soil temperature ranges from 40° to 45°F. The native vegetation is big sage, rabbitbush, and lodgepole pine.

The available water capacity is greater than 0.1 in/in, and permeability is moderate. These soils are used for wildlife habitat, watershed and recreation.

The Quigley series is a member of the coarse-loamy mixed family of Typic Haploborolls. A representative profile of Quigley sandy loam, 400 feet west and 100 feet north of the southeast corner of section 17, T16S, R7E is:

A1 0 to 7 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; slightly hard, very friable, slightly sticky and slightly plastic, calcareous, 10 percent fine gravels; few fine and medium roots, clear smooth boundary.

C1 7 to 20 inches; brown (10YR 5/3) sandy loam, brown-dark brown (10YR 4/3) moist, moderate coarse subangular blocky, slightly hard, very friable, slightly sticky and slightly plastic, calcareous, 10 percent fine gravels of varicolored sandstone, few fine roots; diffuse boundary.

C2ca 20 to 38 inches; brown (10YR 5/3) sandy loam, brown-dark brown (10YR 4/3) moist; weak medium subangular blocky structure, slightly hard, very friable, slightly sticky and slightly plastic, calcareous, 15 percent fine gravels, 10 percent cobbles, 2 percent stones, few fine roots; few very fine filamentous lime threads, clear boundary.

C3ca 38 to 43+ inches; pale brown (10YR 6/3) gravelly loamy sand, dark yellowish brown (10YR 4/4) moist; loose, slightly hard, very friable; nonsticky and nonplastic; calcareous, gravels have thick undercoating of lime, 30 percent gravel, 10 percent cobblestones and boulders.

3.0 MAP UNIT DESCRIPTIONS

3.1 Map Unit: DL - Disturbed Land

This map unit is on mountain sideslopes and valley bottoms. The slope is variable. The native vegetation has been removed.

This unit is about 90 percent fill material. Included in this map unit are about 10 percent small areas of Patmos and Podo soils; as well as areas of rock outcrops, road cuts, and places where a thin layer of coal waste, fill or other disturbed materials overlie other soils.

The fill material is deep and well-drained. It is fill derived from sandstone and shale.

Typically, it is a pale brown gravelly loamy sand.

Permeability of the fill material is moderate. Available water capacity is low. Runoff is rapid and the erosion hazard for water is high.

The unit is mainly used for mining activities.

This map unit is in capability unit VII E.

3.2 Map Unit: PpE - Patmos-Podo Association, 60 to 90 Percent Slopes

This map unit is on steep mountain sideslopes. The slope is 60 to 90 percent. The native vegetation is mainly salina wildrye and juniper.

This unit is 50 percent Patmos gravelly loam, and 25 percent Podo gravelly sandy loam. The Patmos soil is on the mountain sideslopes, and the Podo soil is on the ridge crests and ledges above rock outcrops. Included in

this map unit is about 10 percent rock outcrops, and 15 percent other soils. Included areas make up about 25 percent of the total acreage. The Patmos soil is moderately deep and well-drained. It is formed in colluvium derived from sandstone and shale.

Typically, the surface layer is a brown gravelly loam about 6 inches thick. The subsoil is a yellowish brown gravelly loam about 20 inches thick. The substratum to a depth of 38 inches is a light yellowish brown very cobbly loamy sand. Weathered sandstone bedrock is at a depth of 20 to 40 inches.

Permeability of the Patmos soil is moderate. Available water capacity is moderate. Effective rooting depth is 40 inches. Runoff is rapid and the erosion hazard for water is high. Wind erosion hazard is slight.

The Podo soil is shallow and somewhat excessively-drained. It is formed in colluvium derived from sandstone and shale.

Typically, the surface layer is a light brown gravelly sandy loam, about 2 inches thick. The subsoil is light brown gravelly sandy loam about 11 inches thick. The substratum to a depth of 20 inches is a light brown gravelly sandy loam. Weathered sandstone bedrock is at a depth of less than 20 inches.

Permeability of the Podo soil is moderately rapid. Available water holding capacity is low. Effective rooting depth is less than 20 inches. Runoff is rapid and the erosion hazard for water is high. Wind erosion hazard is slight.

The unit is mainly used for watershed and wildlife habitat. It is also used for mining activities.

The present plant community is mainly salina wildrye and juniper.

The potential productivity data is not available.

This map unit is in capability unit VII E, not evaluated for range site.

3.3 Map Unit: QiC - Quigley Sandy Loam, 5 to 25 Percent Slopes

This map unit is on alluvial fans, toeslopes and valley bottoms. The slope is 5 to 25 percent. The native vegetation is mainly a sagebrush-grassland community.

This unit is 75 percent Quigley sandy loam, and 25 percent other soils. The Quigley sandy loam soil is on the fans and toeslopes. Included in this map unit is about 20 percent other soils. Stratified alluvial soils occur on the valley bottom along the stream. Also included are soils similar to Quigley but in skeletal families (loamy-skeletal mixed Typic Haploborolls). A few bouldery areas occur on the alluvial fans. Included areas make up about 25 percent of the total acreage.

The Quigley soil is deep and well-drained. It is formed in alluvium and colluvium derived from sandstone and shale.

Typically, the surface layer is a brown sandy loam about 7 inches thick. The subsoil is a brown sandy loam about 31 inches thick. The substratum to a depth of 60 inches or more is a pale brown gravelly sandy loam.

Permeability of the Quigley soil is moderate. Available water capacity is low. Effective rooting depth is 60 inches. Runoff is moderately low and the erosion hazard for water is moderate. Wind erosion hazard is slight.

The unit is mainly used for watershed, wildlife habitat and recreation. It is also used for mining activities.

The present plant community is mainly big sagebrush, rabbitbush, lodge-pole pine, oregon grape, and yarrow.

The potential productivity data is not available.

This map unit is in capability unit VIe, not evaluated for range site.

3.4 Map Unit: RL - Rockland

This map unit is on mountain sideslopes. The slope is 60 percent to vertical. The native vegetation is mainly scattered salina wildrye and juniper.

This unit is 90 percent rock outcrop, talus, and very shallow soils over sandstone bedrock. Included in this map unit is about 10 percent Podo soils.

The unit is mainly used for wildlife habitat and watershed.

This map unit is in capability unit VIII s.

4.0 SEEDBED QUALITY MATERIAL FOR DRASTICALLY DISTURBED LAND

4.1 Method of Evaluation

The criteria for evaluating topsoil as seedbed quality material are given in Table 4-1. References to topsoil means only those soil horizons suitable for use as seedbed quality material. The criteria include sodium adsorption ratio (SAR), electrical conductivity or salinity (EC), toxic materials, soil reaction (pH), available water holding capacity (AWHC), erosion factor (k), wind erosion group, texture, and percent coarse fragments.

Criteria are given for good, fair or poor sources of seedbed quality material (Table 4-1). "A good rating means vegetation is relatively easy to establish and maintain, the surface is stable and resists erosion, and the topsoil has good potential productivity. Material rated fair can be vegetated and stabilized by modifying one or more properties. Top dressing with better material or application of soil amendments may be necessary for satisfactory performance. Material rated poor has such severe problems that revegetation and stabilization is very difficult and costly. Top dressing with better material may be necessary to establish and maintain vegetation," (USDA, 1978).

4.2 Soil Chemistry and Physical Properties

Chemical and physical data for project area soils (Table 4-2) were collected to evaluate the soils as seedbed quality material for reclamation. Soil chemical and physical data are from analysis by Colorado Agricultural Consultants. Other sources of information used to evaluate soils for reclamation are manuscript SCS soil survey information and soil survey interpretation records.

Table 4-1

Seedbed Quality Material for Reclamation

Property	Limits			Restrictive Feature
	Good	Fair	Poor	
1. Sodium Adsorption Ratio (SAR)	<5	5-12	12	Excess Sodium
2. Salinity (MMHOS/CM)	<8	8-16	16	Excess Salt
3. Toxic Materials	Low	Medium	High	Toxicity
4. Soil Reaction (pH)[a]	5.6-7.8	4.5-5.5	<4.5	Too Acid
5. Soil Reaction (pH)	<7.9	7.9-8.4	8.4	Excess Lime
6. Available Water Capacity (IN/IN)	>.10	.05-.10	<.05	Droughty
7. Erosion Factor (K)	<.37	>.37	---	Erodes Easily
8. Wind Erod. Group	>3	>3	1, 2	Soil Blowing
9. USDA Texture	---	SCL, CL SICL	C[b] SIC[b] SC	Too Clayey
10. USDA Texture	---	LCOS, LS LFS, LVFS	COS, S, FS, VFS	Too Sandy
11. Coarse Frag. (WT PCT)				
3-10 in. (7.6-25.4 cm)	<15	15-35	>35	Large Stones
> 10 in. (725.4 cm.)	<3	3-10	>10	Large Stones

[a]Layers with high potential acidity should be rated poor.

[b]If in kaolinitic family, rate one class better if experience confirms.

From National Soils Handbook, NSH - Part II [403.6(a)], 1978.

Table 4-2

Soil Chemical and Physical Properties

Sample depth (in)	PH	EC	SAT%	NA	CA	MG	SAR	AK	TEXT	SN	SI	CL	VFS	N	OM	P	LM	B	NH3
Disturbed Land Fill / Hole: 18																			
Grab	7.6	2.1	34.7	4.00	12.07	3.84	1.4	210	SNLO	59	29	12	11	43	2.2	0	9.2	0.07	0.3
Patmos / Hole: 1																			
0-6	7.7	3.0	38.0	4.58	14.14	5.27	1.5	690	LO	50	39	11	18	14	13.1	5	9.1	0.48	0.9
6-26	7.4	5.0	37.0	2.82	14.89	27.01	0.6	330	SNLO	70	25	5	7	53	2.7	12	9.1	0.28	2.4
26-38	7.7	3.4	47.0	6.65	11.41	15.59	1.8	820	SNCLLO	58	26	16	6	64	2.5	0	9.2	0.39	1.2
Podo / Hole: 2																			
0-13	8.0	3.1	27.2	5.11	13.21	7.34	1.6	230	LOSN	80	14	6	8	4	2.3	0	9.2	0.17	0.6
Quigley-like / Hole: 17																			
0-7	7.7	2.0	36.0	3.86	12.17	1.85	1.5	310	SNLO	72	21	7	11	3	2.5	0	9.0	0.16	0.2
7-20	7.9	1.7	37.0	2.82	9.73	1.80	1.2	260	SNLO	63	25	12	14	2	1.8	0	9.1	0.10	0.1
20-38	7.9	1.7	36.1	2.89	9.98	1.85	1.2	260	SNLO	63	25	12	8	2	1.7	0	9.2	0.12	0.
38-43	7.8	1.9	36.8	2.83	10.86	1.81	1.1	250	SNLO	74	18	8	7	3	1.2	0	9.2	0.05	0.4

Soils were sampled by horizon and analyzed using standard agricultural techniques as specified in Table 4-2. The parameters tested were paste pH, electrical conductivity, moisture saturation percentage, SAR, organic matter, plant available phosphorus and potassium, particle size distribution, nitrate nitrogen, ammonia nitrogen, lime and boron. The techniques used were those of USDA Handbook 60 (1954), and American Society of Agronomy Monograph #9 (Black, 1965).

4.3 Suitability as Seedbed Quality Material for Reclamation of Disturbed Lands

Table 4-3 is an evaluation of topsoil for each horizon on each project area soil type. The evaluation is based on the soil chemical and physical data in Table 4-2 and the criteria of Table 4-1. The soils are rated good, fair, or poor sources of seedbed quality material. The overall rating given for each horizon is the rating for the most limiting criteria.

Vegetation is difficult to establish on soils with high SAR which indicates potential instability and water transmission problems (USDA, 1978). None of the soils tested have high SAR; all are rated good for this parameter.

Electrical conductivity is a measure of soil salinity. Excessive salts restrict plant growth, create problems in establishing vegetation and therefore also influence erosion and the stability of the surface. Toxic materials such as boron get into the food chain and are toxic to animals who eat the vegetation. Excessively high or low pH causes problems in establishing vegetation and as a result influence erosion and stability of the surface (USDA, 1978). All of the soils tested are low in salts and boron. pH of the Podo soil and of the subsoil of the Quigley soil is rated fair. pH of the other soils tested is rated good.

The available water capacity also is important in establishing vegetation. Soils with low available water capacity may require irrigation

Table 4-3

Evaluation of Topsoil Material

Series	Sample Point[a]	Depth (In)	SAR	Salinity	Toxic Materials[a] (Boron)	Soil Reaction	Available[e] Water Cap	Erosion Factor	Wind[b] Erodibility Group	USDA[c] Texture	Coarse[d] Frags	Overall Rating
Disturbed Land Fill Material	18	--	good	good	good	good	fair-poor	NA	NA	fair	fair-poor	FAIR
Patmos	1	0-6	good	good	good	good	good	good	good	good	fair	FAIR
		6-26	good	good	good	good	good	good	NA	good	fair	FAIR
		26-38	good	good	good	good	fair	good	NA	fair	fair	FAIR
Podo	2	0-13	good	good	good	fair	fair-good	fair	good	good	fair	FAIR
Quigley	17	0-7	good	good	good	good	good	NA	NA	good	good	GOOD
		7-20	good	good	good	good-fair	good	NA	NA	good	good	FAIR
		20-38	good	good	good	good-fair	fair-good	NA	NA	good	good	FAIR
		38-43	good	good	good	good	poor-fair	NA	NA	fair	good	POOR

[a]-evaluation based on WDEQ Guideline No. 3 for boron limits; less than 5 ppm boron is good.

[b]-from soil survey interpretation records, USDA SCS

[c]-from field description of soil texture; not taken from lab analysis.

[d]-from field description

[e]-evaluated based on field textures and estimated coarse fragments from U.S. Forest Service (1974)

NA - data not available

for establishment of vegetation (USDA, 1978). AWHC is evaluated according to the U. S. Forest Service (USDA, 1974) based on field texture and coarse fragments. AWCH is fair-poor for the fill material. It is rated fair to poor for the subsoil of the Quigley soil and Patmos soil. The podo is rated fair-good for AWHC.

The stability of the soil depends upon its erodibility by water and wind and its strength. Water erodibility is indicated by the k factor; wind erodibility is rated according to the wind erodibility group. K values for soils of the project area are from the best data available in the SCS Soil Survey Interpretation Records. Wind erodibility is based on SCS Soil Survey Interpretation Records for the surface horizons. Wind erodibility data are available for only the surface soils of the site. Data for these factors are not available for the Quigley soil or the fill material. The Patmos is rated good for both factors. Podo is rated fair and good for the erosion factor and wind erodibility group, respectively.

USDA texture also influences available water capacity and erodibility by wind or water. Texture influences soil structure, consistence, water intake rate, runoff, fertility, workability, and trafficability. Potential slippage hazard is related to soil texture, and although other factors also contribute, the ratings of soil texture represent one important factor (USDA, 1978). Texture is rated fair for the subsoils of the Patmos and Quigley soils and for the fill material. The other horizons tested are all rated good.

Testures for soils of the site were described in the field and the evaluations are based on the field determinations. Lab data on soil textures have been disregarded because it is thought that dispersion of silt and clay particles was not adequate, possibly because of high gypsum contents.

Coarse fragments influence the ease of excavation, stockpiling and respreading, and suitability for the final use of the land. A certain amount of coarse fragments can be tolerated depending upon the size and the intended use of the reclaimed area. If the size of rock fragments exceeds 10 inches (25 cm) the problems are more severe (USDA, 1978). Coarse fragments are evaluated based on pedon descriptions for soils of project areas. Coarse fragments are rated fair for the Patmos and Podo soils and for the fill material. Coarse fragments are rated good for the Quigley soil.

4.4 Depths of Suitable Topsoil Available for Reclamation

The depths of seedbed quality material available for reclamation of project areas are listed on Table 4-4 by map unit. The table includes the map unit, map unit components, depth of horizon, rating (from Table 4-3), percent of map unit, and the recommended depth of stripping and the restrictive features of the suitable material. Volumes of seedbed quality material available can be found in Table 4-5.

The disturbed land fill material has fair characteristics for reclamation. The restrictive features of the suitable material are large stones, sandy textures, low water holding capacity, and steep slopes. Reclamation of areas mapped as DL will have to contend with these restrictive features. Included in the map unit DL are areas of excessive large stones, rock outcrops and road cuts that will be difficult to reclaim without covering with better material. There are areas of coal waste that will need to be removed and disposed of properly. Map unit DL should not be used as a source of borrow material for reclamation because it is no better than any other soil in the mine area.

Map unit PpE, Patmos-Podo associations, 60 to 90 percent slopes is too steep for salvage of any topsoil. Efforts should be made to minimize disturbance on these slopes.

Table 4-4

Depths of Suitable Seedbed Material Available

(by map unit)

Mapping Unit	Component	Depth (in)	Rating	Percent of Map Unit	Available Depth Suitable Material (restrictive feature)
DL	Disturbed Land Fill	Variable	fair	90	variable (droughty large stones, sandy) slopes
	Inclusions	Variable	poor	10	0 inches
PpE	Patmos	38	fair	50	0 inches (slopes)
	Podo	13	fair	25	0 inches (slopes
	Inclusions	Variable	poor	25	0 inches
Qic	Quigley	0-7 7-38 38-43	good fair poor	75	7 inches (none) 31 inches (excess lime) droughty
	Other	Variable	poor	25	0 inches (see discussion)
RL	Rockland	0	poor	90	0 inches
	Podo	13	fair	10	0 inches

Table 4-5

Seedbed Quality Material Volumes

Seedbed Quality Material - Approximate Volumes

Mapping Units	Suitable Stripping Depth	Acreage	Volume - Bank Cubic Yards (BCY)
Quigley - QiC	7"	14	13,175
Quigley - QiC	31*	14	58,349
Stockpiled			200
Total Seedbed Quality Material Available			71,714

* To be used for reclaimed road cuts only.

The Quigley soil in map unit QiC occurs on 5 to 25 percent slopes and is rated good to 7 inches and fair from 7 to 38 inches. If areas of QiC are to be disturbed, the top 7 inches should be salvaged and used as seedbed quality material. The layer from 7 to 38 inches does not need to be saved unless it is borrowed and used to reclaim road cuts or excessively stoney areas that lack fine earth material. The alluvial soils in map unit QiC are subject to flooding and disturbance of these soils should be avoided. Skeletal soils and bouldery areas in map unit QiC are not sources of useable materials.

Map unit RL consists primarily of rock outcrops and talus and the unit is not a source of seedbed material. Small soil bodies do occur as inclusions in the unit but they are shallow, stoney and too steep to be of any use.

5.0 PRESENT AND POTENTIAL USES

5.1 Crops and Pasturelands

None of the soils mapped at the site have potential for crops or pasture-land.

The U. S. Department of Agriculture has the authority to identify farm-lands of national, state, or local importance. These farmlands are referred to as prime farmlands, farmlands of statewide importance, and unique farmlands. The SCS has determined that there are no prime farm-lands of statewide importance, or unique farmlands in the permit area.

5.2 Rangelands

The soils within the lease boundary have been used as rangeland in the past. Predicted forage production for rangeland soils during favorable, normal, and unfavorable years for various sites are not available for the soils. Capability classes for the rangeland soils (Table 5-1) are VII and VIII. The principal limitation is erosion. Capability units show, in a general way, the ability of soils to support cultivated crops. Soils in class VII have very severe limitations that make them unsuited to grazing, and woodland or wildlife. Soils in class VIII have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife or water supply or to aesthetic purposes.

Table 5-1

Estimated Potential Production - Forage

Soil Series	Potential Production Favorable/Normal/ Unfavorable Years (lbs/ac)[a]	Sites	Soil Capability Class
Patmos	NA	50-70% slopes	VIIE
Podo	NA	60% slopes	VIIIE
	NA	NA	NA

NA - data not available

REFERENCES

USDA, Soil Conservation Service. Soil Survey Staff, 1975. Soil Taxonomy - a basic system of soil classification for marking and interpreting soil surveys, USDA Agricultural Handbook No. 436.

USDA, 1978 Soil Conservation Service, National Soils Handbook (Compedium of SCS in-house memos, various dates) Part II (403.6[a]).

USDA, Soil Survey Staff, 1951, Soil Survey Manual, USDA Agricultural Handbook No. 18.

USDA, Forest Service, 1974; Branch of Soils, Division of Watershed Management, Rocky Mountain Region, Guidelines for Making Soil Interpretations.

Black, C. V., 1965. Methods of Soil Analysis. American Society of Agronomy No. 9, parts 1 and 2. Madison, Wisconsin. 1572 pgs.