Exhibit I - Soils Information

1.0 Existing Information

Based on the soil survey completed for the Fremont County Area by the Natural Resources Conservation Service (SCS 1995), the permit area is overlain by nine soil map units. These include the Kim loam, cool, 3 to 8 percent slopes (Map Unit 50); Louviers-Travessilla complex, 20 to 50 percent slopes (Map Unit 64); Nunn clay loam, 0 to 2 percent slopes (Map Unit 78); Otero fine sandy loam, 3 to 8 percent slopes(Map Unit 81); Riverwash (Map Unit 92); Roygorge very gravelly sandy clay loam, 25 to 50 percent slopes (Map Unit 98); Sedillo cobbly sandy loam, 4 to 25 percent slopes (Map Unit 100); Shanta loam, 0 to 3 percent slopes (Map Unit 104), and; the Ustic Torriorthents, bouldery - Rock outcrop complex, 35 to 90 percent slopes (Map Unit 120) map units. The following discussion summarizes the information developed for these units by the Natural Resources Conservation Service.

1.1 Kim loam, cool, 3 to 8 percent slopes

This map unit consists of well drained soils forming in alluvium and eolian parent materials on fans and fan terraces. This map unit would be disturbed by the proposed gravel pit, facilities area, and recycling pond. The Kim soil, making up about 95 percent of the unit, is characterized by loam textures, strong effervescence, and moderate alkalinity to a depth of 60 inches. The coarse fragment content less than 5 percent throughout the profile. The effective rooting depth is 60 inches or more. This soil is non-saline and non-sodic. The hazard of water erosion is moderate to very high.

1.2 Louviers-Travessilla complex, 20 to 50 percent slopes

Occurring on hills, and canyonsides, this unit consists of shallow, well drained soils. It is scheduled for disturbance by the sandstone and granite mining operations. The Louviers soil is forming in residuum from shale and siltstone and covers approximately 40 percent of the unit. This soil is characterized by very channery clay loams over clays to a depth of 16 inches. It is neutral to mildly alkaline, non-effervescent, non-saline, and non-sodic. The effective rooting depth is 10 to 20 inches.

The Travessilla soil is forming in residuum primarily from sandstone and comprises approximately 35 percent of this unit. This soil is typically channery sandy loams and sandy loams to hard sandstone bedrock at 9 inches. It is non- to strongly effervescent, mildly alkaline, nonsaline, and nonsodic. The effective rooting depth is 4 to 20 inches. The hazard of water erosion is very high.

1.3 Otero fine sandy loam, 3 to 8 percent slopes

This map unit consists of well drained soils forming in alluvium and eolian parent materials on sideslopes and fans. This map unit is not proposed to be disturbed. The Kim soil, making up about 95 percent of the unit, is characterized by loamy fine sand and

fine sandy loam textures, strong effervescence, and moderate alkalinity to a depth of 60 inches. The coarse fragment content less than 5 percent throughout the profile. The effective rooting depth is 60 inches or more. This soil is non-saline and non-sodic. The hazard of water erosion is slight to high.

1.4 Nunn clay loam, 0 to 2 percent slopes

This map unit consists of well drained soils forming on fans and fan terraces in loess and alluvium and is not scheduled for disturbance. The Nunn soil, making up about 90 percent of the unit, is typically characterized by clay loam textures to a depth of 60 inches. This soil is neutral to moderately alkaline, non- to strongly effervescent, and has a coarse fragment content less than 5 percent throughout the profile. The effective rooting depth is 60 inches or more. This soil is non-saline and non-sodic. The hazard of water erosion is slight.

1.5 Riverwash

The Riverwash unit occurs along the borders of Tallahassee Creek in the northern half of the project area and would be disturbed by haul road construction to a limited degree. Typically, the majority of this map unit is barren and consists of alluvial sand, gravel, and cobbles which are subject to scouring and alluvial deposition. Deeper soils occur as a part of this unit in small defined areas. The soils of this unit are non-saline and non-sodic.

1.6 Roygorge very gravelly sandy clay loam, 25 to 50 percent slopes

Overlying mountainsides, this unit consists of shallow, well drained soils. It is scheduled for disturbance by the granite mining operation. The Roygorge soil is forming in residuum from gneiss and granite and covers approximately 85 percent of the unit. This soil is typically characterized by very gravelly sandy clay loams over an indurated horizon at 11 to 12 inches. It is neutral, non-effervescent, non-saline, and non-sodic. Coarse fragment content ranges from 50 to 55 percent throughout the profile. The effective rooting depth is 8 to 20 inches.

1.7 Sedillo cobbly sandy loam, 4 to 25 percent slopes

This map unit consists of well drained soils forming on fan terraces in calcareous, gravelly and cobbly alluvium along the Arkansas River. The unit may be disturbed by rail spur construction. The Sedillo soil, making up about 85 percent of the unit, is typically characterized by extremely cobbly and stony loams and sandy clay loams over loams to a depth of 60 inches. This soil is neutral to moderately alkaline, non- to strongly effervescent, and has a coarse fragment content ranging from 5 to 75 percent throughout the profile, decreasing with depth. The effective rooting depth is 60 inches or more. This soil is non-saline and non-sodic. The hazard of water erosion is slight to very high.

1.8 Shanta loam, 0 to 3 percent slopes

Well drained soils forming on stream terraces in alluvial parent materials are characteristic of this unit. This unit is not scheduled for disturbance. The Shanta loam makes up approximately 85 percent of the unit. Representative textures for this soil series include loam surface and upper subsoil horizons over stratified sandy loam and loamy sand lower subsoil textures. This soil is mildly to moderately alkaline, slightly to strongly effervescent, and has a coarse fragment content less than 15 percent throughout the profile. The effective rooting depth is 60 inches or more. This soil is non-saline and non-sodic. The hazard of water erosion is slight.

1.9 Ustic Torriorthents, bouldery-Rock outcrop complex, 35 to 90 percent slopes

This map unit occurs on mountainsides near the eastern border of the permit area and is not proposed to be disturbed. The Ustic Torriorthents typically make up 55 percent of the unit while the rock outcrop portion overlies 30 percent of the unit. These components are intermingled on the side slopes. The Ustic Torriorthents are typically very shallow to moderately deep, well to excessively drained soils forming in residuum and colluvium from gneiss and granite parent materials. These soils are characterized by very gravelly loam and gravelly clay loam textures, varying effervescence, and neutral to moderate alkalinity. The coarse fragment content ranges from 25 to 40 percent throughout the profile. The effective rooting depth is 4 to 30 inches or more. This soil is non-saline and non-sodic. The hazard of water erosion is high to very high.

2.0 Site-specific Data Collection

A number of visits to the project area were completed as this project progressed. During these site visits it became apparent, when considering revegetation options, that the soil available for salvage and redistribution on site may not correspond with that indicated by the soil survey completed by the SCS. For example, the depth of soil suitable for salvage from Map Unit 50 was indicated to be from 12 to 60 inches depending upon chemical considerations. The percent of coarse fragments within the profile of the Kim series typically does not exceed 15 percent. This unit within the project boundaries, in part, is the area where aggregate is considered to occur at or near the surface and is the location of the deposit proposed to be mined. It was determined that the nature of the soils on site, *overlying areas proposed for disturbance*, should be examined in the field. The following methodology was used to determine potential salvage depths of suitable surficial soil materials overlying each NRCS map unit proposed for disturbance.

The SCS survey completed for portions of Fremont County was reviewed to become familiar with the general edaphic characteristics of the project area. In addition to the review of existing soils information, project maps were evaluated to locate dominant features of the project area and probable access routes to and from the acreage to be evaluated.

Following the review of existing information, field studies were completed. To begin the field studies, the proposed project area was traversed to become familiar with access routes and surficial soil conditions characteristic of the site as influenced by topography, vegetation, and geology. Observations were also made with respect to soil salvage potentials as expressed through topography and vegetation cover.

Each SCS map unit proposed for disturbance was then located on the ground. Within each unit, transects were walked to determine overall map unit characteristics and to select a sample point characteristic of the dominant soil of the unit. Sample points were selected to represent the dominant characteristics of the soils to be disturbed.

At each sample point, the surface soil was evaluated to a depth of from 12 to 18 inches or to bedrock if such occurred within these depths. Soil parameters assessed included texture, percent coarse fragment content (by volume), effervescence, and pH. Below the surface horizons, soils were excavated a depth of 5 feet, bedrock, or auger refusal to determine general soil depths and characteristics. General information recorded at each sample site included vegetation characteristics, physiography, slope, and aspect.

Approximately one-half quart of soil material was collected from the surface horizons of the major soils proposed to be disturbed. Five samples (S-1 through S-5) were collected. These samples were sent to the Soil and Plant Testing Laboratory on the Colorado State University campus for analysis. The analyses to be completed consisted of pH, texture (field method), percent organic matter, NH_4-N and NO_3-N (ppm), phosphorus (ppm), potassium (ppm), electrical conductivity (mmhos/cm), and lime estimate.

The following discussion is based on this site-specific analysis. Map I depicts the boundaries of the salvage units discussed below. Laboratory data sheets depicting results of the analysis of samples are included at the end of this exhibit.

2.1 Map Unit A - Facilities Site

Map Unit A is a convex valley/fan complex influenced by alluvial and colluvial action. The lower, eroded toe slopes of Map Unit C are included in this unit due to salvage considerations. Approximately 90 percent of this unit, where disturbance is proposed to occur, consists of the soil represented by sample S-2. This soil is approximately 40 inches deep to a hard layer impenetrable by a hand auger. The surface 18 inches of this soil has a very gravelly sandy clay loam texture and a pH of 8.2. The electrical conductivity of this sample is 0.4 mmhos/cm. Coarse fragment content of the soil to this depth is estimated to be 50 percent. Five percent of the area potentially to be disturbed consists of the soil represented by sample S-1 which occurs immediately adjacent to Tallahassee Creek. This soil is 60 inches deep and typically has a loamy sand to sandy loam texture, a pH of 8.2, and an electrical conductivity of 8.0 mmhos/cm in the upper 18 inches of the soil profile. There is less than 5 percent coarse fragments throughout the profile. The remaining 5 percent of this unit consists of drainages and rock outcrops located along the foothill toe slopes.

These soils are suitable for salvage to a depth of 18+ inches over 95 percent of the unit. The remaining 5 percent of the unit is not overlain with salvageable soils. Due to its proximity to the banks of Tallahassee Creek, the soil represented by sample point S-1 would not be disturbed to any great degree. If salvaged, this soil would be sufficiently diluted to eliminate the negative effects of the higher electrical conductivity value.

2.2 Map Unit B - Sandstone Quarry

An existing abandoned sandstone quarry and associated undisturbed rocky soils on convex, moderately steep sideslopes make up this unit. Of the area proposed to be disturbed, approximately 66 percent consists of rock outcrops, surface rock exposures, and soils less than 6 inches deep to bedrock. Shallow soils to a depth of 9 inches to bedrock (sample S-3) occur over the remaining 33 percent of the area proposed to be disturbed. This shallow soil typically has a gravelly sandy clay texture, a pH of 8.1, an electrical conductivity of 0.4 mmhos/cm, and exhibits approximately 35 percent coarse fragments throughout the profile.

Though suitable to marginally suitable for salvage (in terms of chemical and physical characteristics) to a depth of approximately 9 inches, salvage of this soil over the portion of the disturbed area where it occurs will be difficult. Salvageable depths occur in a mosaic with rock outcrops, surface rock exposures, tree stands, and very shallow soils making salvage operations potentially problematic, especially in terms of stockpiling. Given the proximity of the pit highwall and sandstone outcrop surfaces, safety is also of concern. Salvage of this soil should be considered opportunistic with the volume available for stockpile and reapplication uncertain.

2.3 Map Unit C - Granite Quarry

This unit occurs on steep, concave-convex, foothill sideslopes. Approximately 75 percent of the unit consists of rock outcrops, surface rock exposures, incised drainages between bedrock outcrops, and soils less than 6 inches deep to bedrock. Shallow soils ranging from 6 to 12 inches deep to bedrock (sample S-4) occur over the remaining 25 percent of the area proposed to be disturbed. This shallow soil typically has a very gravelly sandy clay texture, a pH of 8.2, and an electrical conductivity of 8.2 mmhos/cm. Approximately 50 percent coarse fragments occur throughout the profile with coarse fragment content decreasing as elevation increases.

This soil is marginally suitable for salvage to an average depth of 9 inches due to the high coarse fragment content. Deeper salvage is restricted by the presence of bedrock. As with the soil of Map Unit B, salvage of this soil will be difficult considering operational and safety factors. The soil occurs in a mosaic pattern with rock outcrops, surface rock exposures, tree stands, and very shallow soils. Both collection and transport of soils to stockpile areas will likely be inefficient. Salvage operations may occur opportunistically over this unit with the lower slope positions potentially supplying the majority of the volume of soil available for salvage.

2.4 Map Unit D - Gravel Quarry and Facilities Site

Map Unit D soils (sample S-5) overlie a nearly level, slightly convex gravel bar bordering Tallahassee Creek. Coarse soils ranging from 6 to 12 + inches deep overly approximately 60 percent of this unit. The remaining 40 percent of the unit consists of coarse soils less than 6 inches deep to a cobble layer and a cobble/rock deposit at the surface. The dominant soil typically has very gravelly sandy clay loam texture, a pH of 7.0, and an electrical conductivity of 0.3 mmhos/cm to a depth of 12 inches. Approximately 40 percent coarse fragments occur throughout the profile at the sample point though soils with lower coarse fragment contents are common.

On average, the soil overlying 60 percent of this unit in the area of disturbance is salvageable to a depth of approximately 9 inches. Deeper salvage is restricted by a high coarse fragment layer. The portion of the unit which is salvageable occurs in the southern portion of the area to be disturbed. It can be visually identified as the area having fewer surficial cobbles and stones and a lower percentage of cactus present. Conversely, the area proposed to be disturbed which is not overlain with salvageable soils lies along the northern edge of this unit and is overlain with a higher percentage of cobbles and rocks and supports a comparatively vigorous cactus population.

2.5 Map Unit E- Gravel Quarry and Facilities Site

This unit occurs on a nearly level bench, or terrace, below and to the east of Map Unit D and is immediately adjacent to the borders of Tallahassee Creek. Approximately 90 percent of this unit is overlain with soils 40+ inches deep. The remaining 10 percent consists of more shallow soils over a concentration of gravels, cobbles, and stones. This mapping inclusion occurs around the borders of the unit with Map Unit D and the slopes leading down to Tallahassee Creek. The dominant soil is the Kim loam as mapped by the SCS. As such, a soil sample was not collected from this unit.

The dominant soil of this unit is suitable for salvage to a depth of 18+ inches over 90 percent of this unit. Salvage may occur over the remaining 10 percent of the unit to varying depths opportunistically. The volume available from opportunistic salvage cannot be calculated with certainty.

REFERENCES

U.S.D.A. Natural Resources Conservation Service (SCS). 1995. Soil survey of Fremont County area, Colorado. U.S.D.A. Natural Resources Conservation Service. Canyon City, Colorado. 338 pp. + maps.

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DATE RECEIVED: 04-23-97
DATE REPORTED: 05-14-97

BILLING:

RESEARCH SOIL ANALYSIS

Lab #	Sample ID #	paste pH	paste EC mmhos/cm	Lime Estimate	% OM	AB-DTPA ppm NO_3-N	P	K	Zn	Fe	Mn	Cu	Texture Estimate
R7080	S-1 0-12	8.2	8.0	Medium	0.5	13	15.9	450	1.13	8.83	1.66	1.73	Loamy Sand
R7081	S-2 0-18	8.2	0.4	High	2.4	5	2.1	367	0.61	4.54	1.49	4.25	Sandy Clay Loam
R7082	S-3 0-9	8.1	0.4	High	1.8	6	1.8	171	1.91	4.10	2.06	2.86	Sandy Clay
R7083	S-4 0-12 granite quarry	8.2	0.4	High	1.7	4	2.8	126	2.32	7.99	2.35	4.06	Sandy Clay
R7084	S-5 0-12 bench	7.0	0.3	Low	1.1	6	17.4	274	7.41	17.7	2.17	4.07	Sandy Clay Loam