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State of Utah
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August 26, 2001

To: [redacted] File

Thru: Daron Haddock, Permit Supervisor

From: Priscilla Burton, Soils Reclamation Specialist

Re: Follow-up Technical Field Visit OSM Evaluation Team Rooting Depth Study, Plateau Mining Corp., Star Point Mine, [redacted]006

Other Attendees: None

Date & Time: August 23, 2001. 11:00 - 13:30.

PURPOSE:

To take penetrometer readings of the compressive strength of the subsoil and refuse for comparison.

OBSERVATIONS:

The Soil Test CL 700 Pocket Penetrometer measures soil compressive strength by measuring the effort required to push the CL 700 "foot" into the soil material a depth of 1/4 inch. Ordinarily, this penetrometer is used to determine bearing capacity of a soil for foundations, where the value of cohesion is related to the unconfined compressive strength. Compressive strength is measured in Tons/sq.ft.

Two months have passed since the pits were dug at the refuse site and subsoil pile. Recent rains were evident either as thick mud in the base of pits or as standing water. The wetting front from this water actually facilitated measurement of the compressive strength. Readings could be made on moist soil and refuse, whereas, those areas that were dry were in-penetrable with the penetrometer.

Where possible, the measurements were taken in the immediate vicinity of the plant excavated by the Rooting Depth study team on June 12, 2001. However, in some instances a reading could only be made at a distance from the excavation on a side of the pit which still retained moisture. The results reported below will also be discussed in the 2001 OSM-Evaluation Team Rooting Depth study report.

TECHNICAL FIELD VISIT

Refuse Pile Pits Unconfined Compressive Strength **(Tons/sq.ft)**

	depth of standing H_2O	DRY	MOIST
Pit #1 subsoil		3.25	0.75
Pit #1 refuse	none- mud	in-penetrable	3.5
Pit #2 subsoil		no dry	1.25
Pit #2 refuse	none - mud	in-penetrable	4.0
Pit #3 subsoil			1.5
Pit #3 refuse	six inches	in-penetrable	4.0
Pit #4 subsoil		2.5	1.0
Pit #4 refuse	four inches	in-penetrable	4.5
Pit #5 subsoil		3.5	1.5
Pit #5 refuse	none-mud	in-penetrable	4.5

Subsoil Pile Pits Unconfined Compressive Strength **(Tons/sq.ft)**

	depth of standing H_2O	DRY	MOIST
Pit #1 surface		4.25	1.75
Pit #1 at depth	1 inch	no dry	1.75
Pit #2 surface		1.5	0.75
Pit #2 at depth	one foot	in penetrable	1.75
Pit #3 surface		3.0	1.25
Pit #3 at depth	na	in penetrable	3.0
Pit #4 surface		no dry	0.25
Pit #4 at depth	four feet	submerged	submerged
Pit #5 surface		no dry	0.75
Pit #5 at depth	three feet	submerged	submerged

RECOMMENDATIONS/CONCLUSIONS:

The measurements taken support hypothesis that compaction of the Star Point refuse has caused distortion of shrub root growth. Although both the refuse and subsoil were compacted at depth, the compressive strength of the moist subsoil is far less than that of the refuse. In fact, the compressive strength of the moist refuse was approximately equal to that of the dry subsoil. For plants, this translates into ease of growth for the roots. When moisture reaches depth in the subsoil, the soil becomes easier to penetrate and plant roots have no difficulty growing downwards into the compacted zone. When moisture reaches the refuse, the roots must exert far more pressure to grow into the refuse matrix.

The refuse pits were not nearly as full of water as the subsoil pits which indicates that the refuse drains more readily and does not hold water effectively. This observation is supported by the water level in the pits and by the wetting front in the pits. The subsoil pits had a wetting front which was at least two feet above the water line and moist to the surface in most instances. The refuse wetting front was only one foot above the water line and although the surface soil retained moisture, there was no connection between the standing water and the surface soil moisture.

The CL-701 Penetrometer Adapter Foot would be a useful accessory to purchase. The adapter foot is used for measuring the compressive strength of very soft materials. The adapter foot has a diameter of one inch compared to the 1/4 inch diameter of the pocket penetrometer. Since the effective area of the piston is increased sixteen times, the sensitivity of the measurement on soft, clay soils is also increased. Some of the measurements taken were at the very lowest end of the scale for the moist, surface soils and this adaptor would have been useful for accuracy.