T E C H N I C A L M E M O R A N D U M

Utah Coal Regulatory Program

March 23, 2004

TO: Internal File

THRU: Daron R. Haddock, Permit Supervisor

FROM: Gregg A. Galecki, Senior Environmental Scientist – Hydrology

RE: Snowmelt Runoff at the Belina Mine site, Lodestar Energy, Inc. (bankruptcy), White Oak Mine, C/007/0001

SUMMARY:

The following is an exercise in determining the amount of snowmelt runoff that will report to a non-designed capture basin, then hopefully to the designed Sedimentation Pond on the White Oak minesite. The purpose of the exercise is to determine the type of water management necessary to mitigate the potential of sediment leaving the site. The basin will capture water that would normally report to an undisturbed culvert and bypass the mine site. However during reclamation activities, the culvert was buried and not re-opened prior to finishing construction activities in 2003. The following is an approximation due to the limited amount of sublimation, evapotransporation, infiltration, and runoff (stream flow) data available. Available supporting data is attached.

Data

Acreage: 120-acres (reporting to disturbed area based on AUTOCAD drawings)
Elevation range: 9,000 – 9,600 feet (USGS maps)
Depth of Snow: 37 – 104 inches (based on snow coarse @ site, NRCS SnoTel data, Skyline Mine data)
Snow Water Equivalent (swe)*: 16.6 – 18 inches (based on snow coarse, SnoTel, Skyline data)
Soil Moisture Deficit: ~ 6 inches (NRCS – Price River basin; soil moisture data)
Sublimation: ~1/16 – 1/8 – inch/day (David Tarboton –Utah State University; general parameters)
Evapotranspiration: ??
Runoff Window*: ~April 15 – May 15 (NRCS Snotel data – spreadsheet attached)
Runoff Ratio: ~ 1/10 – 1/3 of SWE total (David Tarboton – Utah State Univerity; general range)

Size of temporary capture basin: ~ 2 acre-feet (estimated from AUTOCAD drawings; area multiplied by 5-ft depth)
Available Storage in Designed Sedimentation Pond: 5.01 acre-feet (Primary Spillway)
5.84 acre-feet (Emergency Spillway)

*SWE and Runoff Window do not account for additional storms or melt conditions prior to April 15.

Assumptions

The accuracy of the Acreage, Elevation, Snow Water Equivalent, Soil Moisture Deficit, and Runoff Window are well documented and supportable. However, without reliable stream runoff, sublimation, and Evapotranspiration data a precise calculation is not possible.

The following runoff approximations assume the temporary basin will contain approximately 2 acre-feet, and the sublimation, evapotranspiration, and infiltration are all adequately accounted for in the 67-90 percent of water that is not reported in the Runoff Ratio. The Runoff Ratio is a general historical range of runoff values (10%-33% provided by Utah State University meteorologist). The ratio does not consider a peak flow; once runoff begins it continues at a constant rate until complete. It is also assumes that once the temporary basin is full, it will remain full until runoff is complete and will continually discharge. Holding times were not considered to determine how much sediment drops out in the temporary basin.

The Runoff Window (attached spreadsheet) is based on NRCS SnoTel data. The NRCS data from a similar site indicates the snowpack is essentially eliminated from approximately April 15 through May 15 in most years. The NRCS data does not distinguish how much water is infiltrated, sublimated, transpired or runs off. In general, 120-acres with 17-inches of Snow Water Equivalent represents a total 170 acre-feet of water upstream of the minesite.

Calculations

Using a low runoff ratio of 0.1, approximately 17 acre-feet of water will report to the temporary capture basin. If it occurs over a 30-day period, once full the basin will spill over at a rate of 128 gpm. Using a high runoff ratio of 0.33, approximately 56 acre-feet of water will report to the temporary capture basin. Assuming a 30-day runoff period, once full the basin will spill over at a rate of 422 gpm. Using the highest 15-day snowpack removal numbers available for a similar snowpack year (1990, May 1-15, 12.1-inches), 120 acre-feet of water, 0.33 runoff ratio, over 15 days would spill over at a rate of approximately 600 gpm.

Runoff Ratio	Runoff Window	Discharge
0.1 (170 ac-ft on slope)	30 days	128 gpm
0.1 (170 ac-ft on slope)	15 days	256 gpm
0.33 (170 ac-ft on slope)	30 days	422 gpm*
0.33 (120 ac-ft ; May 1990)	15 days	600 gpm
0.33 (170 ac-ft on slope)	15 days	846 gpm

*Supported by White Oak water monitoring data.

If overflow is directed to the designed Sedimentation pond (UPDES UTG040021-004), the capacity of the pond at the Primary Spillway is 5.01 acre-feet and 5.84 acre-feet at the Emergency Spillway. The maximum designed discharge from the pond is 20 cfs, which is well below the anticipated flows. The question remains is what sediment storage is currently available. The last available pond inspection report (December 2001) indicated the pond was cleaned in 1999.

Additional Follow-up

The amount of storage available in the temporary capture basin and the Sedimentation Pond are approximated. Also, it is unclear whether overflow from the temporary capture basin will be directed to the designed Sedimentation Pond.

I recommend going to the site and 1) a better approximation of the size of the temporary capture basin using a hand-held GPS unit; 2) using the same method, approximate the remaining storage in the Sedimentation Pond; 3) try to determine whether overflow from the capture basin is currently directed to the Sedimentation Pond; 4) collect additional snow pack data. This could be conducted 30Mar04, accessing the site using snowshoes or skis.

Conclusion

If all the runoff is eventually directed to the designed Sedimentation Pond, the anticipated runoff flows can safely pass through the pond as designed. However the retention of sediment in the pond is dependent on the available storage. This has yet to be determined. It is anticipated that the majority of any erosion of the fill material on the disturbed site will likely be contained within the temporary retention basin and the Sedimentation Pond (assuming it isn't currently at capacity). Additional contributions of suspended solids to Whiskey Creek below the minesite will be dependant on peak flows and the retention time of the Sedimentation Pond. It is crucial that flow from the temporary capture basin be directed to the Sedimentation Pond and not allowed to flow to the creek. Direct flow from the temporary capture basin to the creek will

likely result in erosion of the fill material contributing an abundance of sediment to Whiskey Creek.

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