Regulatory Issues Regarding Geomorphic Reclamation at the San Juan and La Plata Mines

Dave Clark, NM Mining and Minerals Division

The New Mexico Coal Program has a basic philosophy that mine reclamation should be enjoyable and fulfilling work, for both the operators and for us. Thirty years ago, many experts thought that reclaiming mines to meet SMCRA standards would be impossible in the San Juan Basin. There have been real problems that needed to be solved, but today our operators are winning national reclamation awards.

If a regulatory agency wants to see more than minimal compliance, it has to encourage new approaches by giving the operators some freedom of movement. Regulations need to be addressed, but working out solutions is what makes the job rewarding. Defined operating sideboards can be just as effective as prescriptive designs, and sideboards give an operator the confidence to try something new.

If the regulatory boot is applied too heavily, industry will spend a lot of their creative energy trying to remove the boot. A case in point is the recent effort, over about five years, by the Montana coal industry to re-write the coal statutes and regulations in that state. I would rather see that time and energy put into solving technical reclamation problems.

If an operator doesn't respond favorably, it is no problem to revert to an enforcement focused, minimal compliance approach. All of us regulators have plenty of experience with that.

We have had serious concerns with revegetation success at the San Juan Mine. The soils and overburden material are often of poor quality, and it's not uncommon for the mine to receive less than 6 inches of precipitation per year. The Los Lunas Plant Material Center estimated that without irrigation, the San Juan Mine could expect successful revegetation establishment in only 1 of 5 years. Revegetation on uniformly flat or gently sloping regraded areas sometimes failed to persist after it had been established with irrigation. And when revegetation did persist, it was predominantly made up of 2 grass species and one shrub. MMD had therefore been encouraging topographic diversity on reclamation to improve water harvesting and reduce the percent of south aspect slopes.

At the La Plata Mine, steeply dipping, multiple coal seams had to be mined by open pit methods. We had to accept the fact that the structurally controlled trellis drainage pattern that existed premine would have to be replaced with a dendritic drainage pattern on reclamation where the overburden had been pulverized.

The terrace and down drain method of slope construction has serious problems from MMD's perspective, and the geomorphic approach addresses those problems.

- continuing maintenance of terrace gradients and berms in consequence of differential settling, localized soil movement, extreme precipitation events, or burrowing activity;
- designs based solely on large storm events are subject to sediment deposition from smaller, more frequent events, resulting in flow blockage, diversion, and washouts;
- vegetation diversity is discouraged by uniformly graded, single aspect slopes, due to unvarying moisture harvest, wind exposure, and a lack of transition zones;
- vegetation is particularly difficult to establish on south and west facing slopes in an arid climate due to high evaporation rates.

Moving less dirt is not inherently bad, if it results in a better final product. And moving less dirt is often the most attractive short-term result of geomorphic reclamation from the operator's perspective. But more upfront planning and design is required. MMD's standard response to a revised post mine topography plan is that slopes must be no steeper or longer than currently approved; we had to become comfortable with the idea that steeper slopes may be effective for erosion control if they are shorter and flatten out with length.

We accepted some features that MMD didn't think were ideal in the early stages of development, so that operators and managers wouldn't get discouraged or annoyed. We offered constructive criticism for the next opportunity, rather than demand a redo.

We heard a question from other operators: "When did the rules change to require this?" We reminded them of the BTCA rules for sediment control:

Appropriate sediment control measures shall be designed, constructed, and maintained using the best technology currently available to:

(1) prevent, to the extent possible, additional contributions of sediment to stream flow or to runoff outside the permit area;
(2) meet the more stringent of applicable State or Federal effluent limitations; and
(3) **minimize erosion to the extent possible.**

Concerning rules, the only rule change that I think would be helpful in implementing geomorphic reclamation would be a requirement that all constructed channels (and that includes permanent pond inlets) be concave in longitudinal profile. Rock drop structures will eventually melt or blow out, and should be discouraged. Dam spillways might be an exception, although I imagine that spillways can be built with concave profiles, too.

When the operator proposed a drainage density standard that exceeded the premine drainage density because of the loss of bedrock control in stream channels, MMD recognized that we were negotiating with people who "get it".

We accepted a narrative, conceptual permit commitment to construct drainages, rather than requiring certified designs and as-builts for each feature. The operator was moving toward a new approach and needed to know that there was an allowable margin of error. This is the sideboards approach that I spoke of earlier. When the operator committed to a

minimum drainage density (feet of drainage bottom per acre of watershed) and the replacement of premine watersheds, we considered those to be acceptable sideboards for a workable hydrologic reclamation plan. RUSLE and SedCAD runs that were conducted on the earlier permitted post mine topography designs demonstrated that post mine erosion rates and sediment yields wouldn't exceed the premine condition. The extra drainage density produced when the geofluvial designs were draped over those basic watershed designs was clearly more conservative, because slopes were shortened. The proof was provided when large storm events on freshly soiled reclamation produced runoff that met NPDES standards before reaching sediment ponds.

At the 2003 Billings Symposium, some MMD staff and San Juan Coal Company staff went to dinner, and a company staffer made the statement that there was no way they would be able to mitigate spoil by laying out suitable mitigation material over poor quality spoil on a 2.5 acre grid, and build fluvial geomorphic slopes at the same time. My first unspoken reaction was: "That's what your permit says you'll do, and that's what you will do." But instead of me saying that, we started talking about the problems that they had encountered trying to combine standard spoil mitigation and geomorphic reclamation at McDermott Dump. In spite of good faith efforts to do just that, they knew that they had been unable to apply mitigation uniformly; there were discrepancies and they were uncomfortable with that.

The PATFM rule has to be addressed. But the standard methods of sampling and mitigating spoil on a 2.5-acre grid, which is very commonly used by the industry, is only one way to address the rule. We had spoil quality data that indicated about 10% of the spoil material was unsuitable as root zone material. The company had selectively handled pockets of suitable spoil material and stockpiled that material in quantities more than adequate to mitigate 10% of the reclaimed surface area.

MMD proposed that suitable spoil material be held in abeyance, and that revegetation success be monitored. If revegetation failed to adequately establish within 3 years on areas larger than ¼-acre, the operator, in consultation with MMD, would conduct an investigation of the probable cause of the failure. Mitigation material would be applied if spoil quality problems were identified as the most likely cause of failure. SJCC accepted this plan, with the addition that the suitable spoil stockpile be reclaimed, but would be subject to redisturbance and reshaping if mitigation material had to be borrowed. Essentially, a new drainage would be carved out of the reclaimed stockpile to remove suitable spoil. SJCC was pretty confident that redisturbing the mitigation material was unlikely. The plan was incorporated into the permit and approved.

The one hitch that has been seen so far in the application of this idea is that freshly regraded spoil has had a much higher proportion of unsuitable material than the surficial sampling of the stockpiled overburden indicated. Because La Plata is a modified open pit mine, most overburden stockpiles were in place for many years. It's pretty likely that salts had leached from near-surface stockpiled material deeper into the pile, and that those high salt concentrations were sometimes re-exposed when the pits were backfilled. So our 10% unsuitable figure may have been too low. I think that sampling freshly stockpiled overburden would give a better predictor of the suitability of freshly regraded

spoil. La Plata will provide a good test of the true suitability of high SAR spoils when adapted native vegetation is seeded.

Finally, MMD provides encouragement through state and federal award nominations. Public recognition of accomplishment does make a difference. Once operators begin to think of themselves as industry leaders, they tend to find their work enjoyable and fulfilling. And as mentioned at the beginning of this talk, that's right where we want them to be.