



State of Utah
 DEPARTMENT OF NATURAL RESOURCES
 DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
 Governor
 Ted Stewart
 Executive Director
 James W. Carter
 Division Director

355 West North Temple
 3 Triad Center, Suite 350
 Salt Lake City, Utah 84180-1203
 801-538-5340
 801-359-3940 (Fax)
 801-538-5319 (TDD)

November 28, 1995

TO: Daron Haddock, Permit Supervisor

FROM: Paul Baker, Reclamation Biologist *PAB*

RE: Draft Review, Crandall Canyon Mining and Reclamation Plan, Castle Gate Mine, Amax Coal Company, ACT/007/004-95D, Working File, Carbon County, Utah

#2

SYNOPSIS

The majority of Division Order 94A concerned revising the Crandall Canyon mining and reclamation plan. The portion dealing with soils is item number 2 which says:

- 2) **R645-301-200. Soils.** The Permittee must demonstrate that adequate topsoil is available for the currently approved 6" final cover depth over the disturbed areas in Crandall Canyon. Mass balance calculations for topsoil as well as a discussion of the total acreage to receive topsoil and the volume of topsoil available within the disturbed area should be provided in the text of the plan. Any disturbed areas within the Crandall Canyon area or the access road area which will not receive topsoil as part of reclamation must be clearly delineated on the maps, and adequate reclamation treatments must be described for those areas in the plan. The Permittee must provide plans to show adequate soil/spoil preparation plans (i.e. deep ripping to 18-24 inches) prior to the application of borrow soils or hydroseeding. Testing of the regraded spoil for fertilization requirements (1 sample/2.5 acres) or other approvable methodology must be included in the reclamation plan. A field sampling program must be proposed and should be undertaken to determine the nature of the top four feet of material remaining in the location of the Crandall Canyon facilities after backfilling and grading to determine that the material is not acid/toxic forming. Spoil materials remaining on the site must be characterized for their acid/toxic forming potential. Testing parameters proposed should be in accordance with Division "Guidelines for Topsoil and Overburden Management." Any alternate plans or treatments regarding designs and demonstration of compliance with the requirements of this section for the Crandall Canyon area must also include any changes to other sections of the plan as such alternatives may necessitate.

Seedbed preparation techniques are mostly discussed in the review of the revegetation plan. Baseline soils resource information was not reviewed with the exception of new information. This application includes the results of sampling seven test pits.

ANALYSIS

TOPSOIL AND SUBSOIL OPERATION PLAN

Regulatory Reference: 30 CFR Sec. 817.22. UCA R645-301-200; R645-301-230

Analysis:

Substitute Topsoil Suitability

The 1984 Technical Analysis discusses soils salvaging in Crandall Canyon. According to this analysis, about 53,000 to 58,000 cubic yards of material was salvaged from 28 acres resulting in an average salvage depth of 15 inches. About 8,000 cubic yards of this was stored in Crandall Canyon, and the balance was presumably taken to Gravel Canyon. The application, however, indicates about 40,000 cubic yards of soil was taken to Gravel Canyon. Section 3.6 of the mining and reclamation plan says a total of about 97,000 cubic yards of soil is in Gravel Canyon. The application says the topsoil piles in Crandall Canyon were surveyed in 1995, and they contain a total of about 7890 cubic yards of soil. Of this, only 6680 cubic yards is currently considered usable because of noxious weeds on the lower stockpile.

The permittee intends to use nearly all of the soil in Gravel Canyon for reclamation of the Schoolhouse Canyon refuse pile. According to the application, the soil stored in Crandall Canyon could be used in Crandall Canyon in the area between Shafts 1 and 2.

Appendix 3.7S of the current application is a letter from EarthFax Engineering to Amax Coal Company and describes 1995 soil sampling in Crandall Canyon. Seven soil pits were excavated to evaluate topsoil and alternate topsoil conditions in Crandall Canyon. Topsoil stockpiled near the mouth of the canyon was also sampled. The samples were taken at various depth increments and analyzed according to the Division's "Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining." The application also gives narrative descriptions of the profiles and maps showing sampling locations.

Test pits EF-1 through EF-3 were in the lower pad area between Shaft 1 and pond 14. Pits EF-4 through EF-6 were in the upper pad area between pond 15 and the propane tanks. Pit EF-7 was south of Shaft No. 1 near the fans.

The letter from EarthFax Engineering to Amax Coal Company identifies a few problems with using pad materials for topsoil substitutes. Coal fines were abundant from 30 to 48 inches in pit EF-1, and pit EF-2 had about 2% coal in the form of coarse fragments near the surface. Sample EF-1-3 had a hot water soluble selenium concentration of 0.11 mg/kg which is slightly

above the Division's standard of 0.1 mg/kg.

On page 3.7-47, the application implies that the State considers selenium levels above 0.11 mg/kg to be unacceptable. This appears to be a typographical error; the correct value is 0.1 mg/kg.

Soils in the lower pad area had an average rock fragment content of 57%, and soil in the middle and upper pads averaged 32% rock fragment content. The Division's guidelines indicate more than 30% rock fragments is considered unacceptable, but the EarthFax letter says the Division will sometimes permit the use of soils with excessive rockiness in the event that all other parameters meet Division requirements. This statement is correct. Rocky soils can provide increased surface protection from erosion; however, soils with too many rock fragments will inhibit root growth.

Soil textures ranged from loam to loamy sand. The highest clay content value was 16.3%, but most samples had about 10% clay.

With the exception of some low values for plant nutrients and the one sample with a slightly elevated selenium content, soil chemical characteristics fell within acceptable ranges for all parameters. To correct the nutrient problems, the application includes recommendations for soil amendments.

The application gives some discussion of the amount of vegetation in the areas of the soil test pits. The lower pad area has relatively little vegetation. It was seeded for two consecutive years in 1992 and 1993 using a mixture of primarily introduced grasses. These grasses are vigorous and should have produced good growth if other conditions were right. Although the soils in this pad are compacted, they were loosened through discing before they were seeded.

The upper pad areas have moderate vegetative cover, but it does not appear to be as great as that in adjacent undisturbed areas or in the associated reference area. The amount of cover is approximately 30-40%, while the reference area had 53% cover when it was measured in 1981. This indicates a potential problem with using this soil either in place or as substitute topsoil for the lower pad.

R645-301-233 says selected overburden materials may be substituted for, or used as a supplement to topsoil if the operator demonstrates to the Division that the resulting soil medium is equal to, or more suitable for sustaining vegetation on nonprime farmland areas than the existing topsoil and results in a soil medium that is the best available in the permit area to support revegetation. The question is whether the material in the upper shaft area will provide a soil medium at least equal to what existed before mining or if the Division should require the applicant to use the topsoil stored in Gravel Canyon for Crandall Canyon reclamation.

As discussed above, it does not appear the chemical and physical characteristics of the substitute soils in the upper pad should limit vegetative growth. For this reason and because of the Division's observations that vegetation is less than what would be expected in the area, the operator should provide further data to demonstrate the proposed substitute topsoil meets the requirements of R645-301-233.100. Options for doing this include:

1. Gathering vegetative cover and production information from existing vegetation and comparing it to the revegetation success standard and to the potential production of premining soils.
2. Establishing field trials that would use the proposed reclamation techniques. Decreased amounts of vegetation could be caused by compaction or by initial low nutrient levels that could both be corrected. This should be shown in the field trials.

It is anticipated that field trials would show that adequate vegetation can be established.

Before mining, there was a jeep road in Crandall Canyon. This road was widened and improved for the mining operations. There is no discussion in the plan about what happened to topsoil from the road area. It is assumed no topsoil was salvaged. The application says access road development disturbed primarily the Curecanti and Uinta formation except for one stretch of "made land" near Highway 6.

The Soil Conservation Service *Soil Survey of Carbon Area, Utah* lists many chemical and physical characteristics of the soils in the area. Although the information is not specific to Crandall Canyon, the only factors that appear to have a potential of limiting revegetation success are the slopes and the amount of rocks in the soils. However, considering the information in the soil survey and the amount of vegetation growing on the road outcrops, the soils to be used to revegetate the road can be considered suitable for revegetation.

Topsoil Protection

The application says topsoil is stored in designated areas in stable piles. They were seeded with a mixture shown in the plan then mulched. Chapter 8 of the existing plan says all stockpiled resoiling materials will be protected from wind and water erosion by various means, including diverting runoff from storage areas, locating the piles in naturally-protected areas, and seeding, mulching, crimping, and using jute matting in extreme cases. A chain link fence will be installed at Gravel Canyon if unauthorized borrow becomes a problem.

Table 7-8 includes the two Crandall Canyon topsoil piles and the stockpile in Gravel Canyon among the areas where drainage would not report to a sediment pond. The sediment

control for these areas is listed as "vegetation." Division personnel have not seen problems with topsoil loss at any of these piles.

The lower topsoil pile in Crandall Canyon has an infestation of whitetop, a noxious weed, and there is also a lot of field bindweed in the area near it. The permittee has been trying since 1992 to control the whitetop but has not yet been successful. Until the whitetop is controlled, this topsoil should not be used. The permittee must continue its efforts to control this weed and should also try to control the nearby bindweed since it is a potential problem.

Findings:

This portion of the application is considered complete and accurate with the following exceptions:

1. The applicant needs to demonstrate that the proposed substitute topsoil materials are equal to or more suitable for sustaining vegetation than the premining topsoil and result in a soil medium that is the best available in the permit area to support revegetation. Although the recent soil sampling/testing has generally shown the chemical and physical characteristics are acceptable for revegetation, the amount of vegetation growing on these soils does not appear to be as great as would be expected for the area. Suggested methods are to show the existing vegetation meets revegetation standards or to establish field trials and try final revegetation techniques.
2. On page 3.7-47, the application implies that the cutoff for unacceptable levels of selenium is 0.11 mg/kg. This apparent typographical error should be corrected.

TOPSOIL AND SUBSOIL RECLAMATION PLAN

Regulatory Reference: 30 CFR Sec. 817.22. UCA R645-301-240

Analysis:

The applicant anticipates that only the facilities area will require application of additional topsoil during reclamation. It would require 14,520 cubic yards of topsoil to cover the area six inches deep, but only 6680 cubic yards is considered usable for reclamation. An additional 1210 cubic yards would become available if whitetop is controlled on the lowermost stockpile.

The applicant proposes to grade the lower pad area then take at least three samples based on vegetative cover and apparent coarseness of the soils. These would be analyzed for various

parameters as shown in the application. Soils found to be unacceptable for use as substitute topsoil would be used as backfill against cutslopes. If none of the soils in the lower pad area are considered acceptable, the applicant would cover the area with soil from stockpile No.2. It appears that the area could be covered about 12 inches deep.

The application says soils present west of Shaft No.2 and the LP tanks (middle and upper pads) appear to sustain moderate vegetation growth and the results of the soil study indicate they could be considered as substitute topsoil. The reference to Shaft No. 2 appears to be a mistake; the middle and upper pads are west of Shaft No. 1 according to Exhibit 3.7-3B. The application contains a commitment to sample soils in the middle and upper pads on 100-foot centers and to analyze these samples according to a group of parameters listed in the application. It says suitable topsoil identified in the upper and lower pad areas will be used to supplement the existing 6680 cubic yards of soil.

During reclamation construction, soil samples would be taken at a rate of one for every two and one-half acres and analyzed for pH, electrical conductivity, texture, total nitrogen, available phosphorous, and potassium. Soil amendments would be added based on the results of these analyses. This sampling would include soils placed on the access road.

Soil tests performed in 1995, together with brief descriptions of the vegetation, already give a good idea of what conditions will be encountered in grading and for reclamation. As discussed under "Topsoil and Subsoil Operation Plan," soils in the upper pad area are probably suitable for reclamation. However, since vegetation does not appear to be as great as would be needed for reclamation, the application needs to contain a demonstration that the soils are adequate to achieve revegetation success. With this demonstration, the samples taken on 100-foot centers would not be needed.

The lower pad area may contain some areas with suitable substitute soil material, but it appears a large part of the area has too many rock fragments. The proposed testing regime should serve to identify those areas with less reclamation potential where topsoil or substitute topsoil should be applied. The substitute topsoil from the upper pad area should only be used to cover the lower pad if field trials or other data indicate this substitute soil can be successfully revegetated. Areas of soil with suitable characteristics in the lower pad should be similar to the soils in the upper pad area. This would be shown in testing at the time of reclamation.

The Division Order requires the permittee to provide plans to show adequate soil/spoil preparation plans (i.e. deep ripping to 18-24 inches) prior to the application of borrow soils or hydroseeding. The application says all regraded areas will be scarified by deep ripping prior to spreading topsoil. A ripping depth of 18-24 inches is felt to be necessary to provide adequate uncompacted soil. The applicant should commit to rip or otherwise reduce compaction to at least this depth on all slopes where it is feasible.

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Analysis:

This portion of the application is complete and accurate with the following exception:

1. As required in the Division Order, the applicant needs to show adequate soil/spoil preparation plans including methods to reduce compaction to at least a depth of 18-24 inches prior to the application of borrow soils or hydroseeding.

RECOMMENDATIONS

Amax has satisfied most requirements of the soils portion of the Division Order. However, they need to demonstrate that proposed substitute soil materials can be successfully revegetated. Most Crandall Canyon soils have suitable chemical and physical characteristics, but those in the pad areas do not appear to be supporting as much vegetation as expected. Vegetation cover information or field trials could be used to show revegetation is feasible.

In addition, Amax should commit to reduce compaction to a depth of at least 18-24 inches prior to borrow soil application or hydroseeding.



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355 West North Temple
3 Triad Center, Suite 350
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November 17, 1995

TO: Daron Haddock, Permit Supervisor
FROM: Paul Baker, Reclamation Biologist 
RE: Draft Review, Crandall Canyon Mining and Reclamation Plan, Castle Gate Mine, Amax Coal Company, ACT/007/004-95D, Working File, Carbon County, Utah

#2

SYNOPSIS

The majority of Division Order 94A concerned revising the Crandall Canyon mining and reclamation plan. The portion dealing with biology is item No. 3. It says:

R645-301-300. Biology. The permittee must provide plans to protect reclaimed areas which show adequate seedbed preparation plans, separate application of seed and fertilizer so that they will not be mixed in the hydroseeder, plans for the use of the supplemental planting mix for ephemeral/intermittent drainages, including locations shown on the reclamation maps and timing of the planting operations, and the final revegetation plans for the cut and fill slopes associated with the Crandall Canyon facilities and access road. Planting, mulching, seeding, and seed mixes proposed should correspond with the information provided in Chapter IX. Reference areas or other standards for measuring success need to be provided in the plan for evaluation of the reclaimed areas to demonstrate reclamation success.

On April 20, 1995, the Division received a response to portions of the Division Order relating to Crandall Canyon, and a revised response was received September 15, 1995.

This review evaluates compliance with all applicable aspects of the biology regulations with the exception of those that apply to the entire mine or that do not affect the reclamation plan. The exceptions are fish and wildlife information, operational fish and wildlife protection plans, subsidence mitigation, and interim revegetation. These plans are presented elsewhere in the mining and reclamation plan.

ANALYSIS

VEGETATION INFORMATION

Regulatory Reference: R645-301-321

Analysis:

Baseline vegetation information is in Chapter 9, Appendix 9-1, of the existing mining and reclamation plan. Vegetation types in the Crandall Canyon disturbed area were mixed brush, conifer, grass-sage, riparian bottom, and previously disturbed. Three reference areas were established in Crandall Canyon. They are conifer, pinyon-juniper, and riparian bottom. The pinyon-juniper reference area would only be used for judging revegetation success in an area of Barn Canyon formerly proposed for disturbance. Additional reference areas that would be used for judging revegetation success in Crandall Canyon are the Castle Gate mixed brush and the Barn Canyon grass-sage reference areas.

The Crandall riparian reference area had vegetation cover of 47%. Dominant species included narrowleaf cottonwood, bluegrass, an aster, and some weedy plants. Some of the other woody plants were bigtooth maple, Gambel oak, snowberry, juniper, Douglas fir, and ponderosa pine. Thirty-six species were found in this reference area.

Vegetative cover in the Crandall conifer reference area was 74%, mostly from Douglas fir and ponderosa pine. Other frequently-occurring plants included snowberry and perennial grasses. Twenty-three species were encountered in this reference area.

The Crandall pinyon-juniper reference area had 53% total vegetative cover comprised primarily of intermediate wheatgrass, western wheatgrass, pinyon, juniper, and curlleaf mountain mahogany.

The two other reference areas proposed as standards for revegetation success are outside Crandall Canyon. The Castle Gate mixed brush and Barn Canyon grass-sage reference areas had 41 and 53% vegetative cover, respectively. Dominant species are typical for these vegetation communities, including *Agropyron* sp. (probably salina wild rye rather than a wheatgrass), sagebrush, Utah serviceberry, and fourwing saltbush.

Appendix 9-1 also includes raw data sheets which give complete lists of all species encountered in sampling. With this information, it is possible to determine the extent of cover of each species.

The Division normally requires sampling of areas proposed for disturbance before they

are disturbed. This information was apparently not gathered, and it would be impossible to obtain it now. Although this is considered a deficiency in the plan, it cannot be corrected.

Revegetation feasibility is discussed under "Revegetation."

Findings:

This section of the mining and reclamation plan is complete and accurate except that it does not contain baseline vegetation information for disturbed areas. However, since this information was apparently not gathered and since the area has already been disturbed, it is impossible to obtain it.

REVEGETATION

Regulatory Reference: R645-301-340

Analysis:

Revegetation Methods

Revegetation plans are contained in both Chapter 9 and the proposed amendment.

The Division Order specifically requires seedbed preparation plans. Section 3.7-5(4)(6) discusses alternative sediment control measures that include seedbed preparation. Possible measures to be used include surface ripping, contour furrowing, mulching, and surface roughening with mulch incorporation.

Mulch will be applied at the rate of two tons per acre prior to roughening the surface. The amendment contains a specific commitment to roughen the area by gouging the soil to a depth of 12 to 18 inches using the bucket of a track-mounted backhoe. Chapter 9 says wildlife habitat will be created by development of microtopographic features, such as swales and rises. Following seeding and fertilization, the site will be mulched again at a rate of two tons per acre.

The methods proposed are considered the best available seedbed preparation techniques for revegetation in this area of Utah. Gouging provides microtopographic features that trap water and increase seedling germination and establishment.

Seeding will commence immediately after seedbed preparation to minimize the potential for erosion. Chapter 9 says planting will typically occur after October 15 and before the

ground freezes. When necessary, spring planting may occur between March 15 and May 15. Drainages will be planted in April when possible. Unusually favorable weather conditions or compliance requirements may necessitate planting at other times.

The planting times discussed in Chapter 9 are standard for Utah. Spring seeding is not recommended but is sometimes necessary. Where it is necessary, it should be done as early as possible; May is usually too late (except in 1995).

Species list two as shown in Chapter 9 will be used to seed most areas, including cut slopes along the roads. Species list five will be used to seed areas within 20 feet of the edge of reclamation channels CCRD-23A, CCRD-23B, and CCRD-23C. The seed mixes will be mechanically or hand broadcast according to the accessibility of the area. The area will then be mulched and fertilized. Chapter 9 says native hay or straw mulch will be used except in areas that are hydroseeded where a wood fiber hydromulch will be applied at the rate of one ton per acre. The applicant does not propose to hydroseed Crandall Canyon.

North-facing slopes will be seeded with species list three, but willows and cottonwoods will be replaced by ponderosa pine, juniper, and Douglas fir. The rate and planting locations will be determined by the Division and the applicant.

Species list three was intended for a riparian area, but, with a few exceptions, it is appropriate for the north-facing slopes in Crandall Canyon. The exceptions are dogwood and the two species the applicant plans to exclude, cottonwoods and willows.

Planting rates for ponderosa pine, Douglas fir, and juniper should be specified in the application. A closed stand of mature conifers would probably have about 500 trees per acre, but, since the applicant is also planting shrubs and since the area would produce more wildlife forage with fewer trees, a total rate of about three hundred trees per acre is recommended.

Species lists two, three, and five meet regulatory requirements and include those species expected to be necessary to reestablish vegetative cover in Crandall Canyon. Cottonwoods and willows are listed as optional in species list five. The riparian area in Crandall Canyon has cottonwoods and willows, so they should be planted.

Chapter 9 discusses irrigation and pest and disease control. No irrigation is planned, but transplants will be watered on a case-by-case basis to minimize drought kill. No pest or disease control measures are anticipated to be necessary, but a plan will be developed in coordination with Carbon County Weed and Pest if needed. This plan would also be approved by the Division.

Revegetation Success Standards

Four reference areas will be used to determine revegetation success. Two of these, the Crandall riparian bottom and Crandall conifer, are in Crandall Canyon. The other two, the mixed brush and grass-sage, are outside Crandall Canyon. Section 3.7 does not specify which grass-sage and mixed brush reference areas would be used, but Table 3.3 in Appendix 9-1 indicates the applicant intends to use the Barn Canyon grass-sage and Castle Gate mixed brush reference areas. Appendix 3.7T is a map showing which reference areas would be compared to which revegetated areas. Judging from the data in Appendix 9-1, these reference areas are appropriate for comparing to reclaimed areas. Since the riparian species mix will be used within 20 feet of the edge of the channel, the Crandall riparian bottom reference area will be used for comparison in this same area.

With the exception of erosion control, Chapter 9 includes methods for judging the diversity, seasonality, and other characteristics of reestablished vegetation as required by R645-301-353 and R645-301-356. Absolute cover will be used to compute the Motyka Index. This index will then be used to compare reclaimed and undisturbed areas. Cover, production, and stocking, as applicable, will need to meet the requirements of R645-301-356.100 and R645-301-356.200.

In the proposed Section 3.7, the applicant proposes to judge erosion control success by comparing runoff from reclaimed areas with runoff from an undisturbed adjacent area. Erosion will be controlled such that sediment contributions from the reclaimed area will be equal to or less than the contributions from the undisturbed area. Should the reclaimed area show signs of excessive erosion, steps will be taken to remedy the situation through contour furrowing, ripping, surface roughening, or other techniques. The standard is acceptable, but it will require the operator to obtain upstream and downstream water quality samples. Any rills or gullies that either disrupt the postmining land use or vegetation reestablishment will need to be repaired.

According to Section 3.7 of the current mining and reclamation plan, the postmining land use for the Crandall Canyon area is undeveloped land. This is different from a wildlife or rangeland grazing postmining land use mainly in the degree of management it receives. Because the postmining land use is not wildlife, no specific woody plant density standard for success is being established. However, Amax will still need to meet diversity requirements which will necessarily include establishment of trees and shrubs.

Field Trials

The soils section of this review discusses the need to demonstrate that proposed substitute soil materials will be adequate for revegetating the area. The applicant needs to propose methods

of testing whether soils in the upper pad area will be suitable. Suggested methods are to establish field trials or to take measurements of existing vegetation growing on the substitute soil and compare these with measurements of vegetation in appropriate reference areas.

Fish and Wildlife Habitat

Chapter 9 says microtopographic features, such as swales and rises, will be created during regrading. Where rocks become available, Amax will construct rock piles. Snags and roosts will be constructed whenever materials become available. Wetland areas will be created where topography and hydrology lend themselves to their creation.

The applicant proposes to leave a depression in the area of pond 14 to catch water from a seep that is suspected to be in the area. However, in Section 3.5-5(1)(1) (page 3.7-33 of the current application), the application says no small depressions will be retained. This appears to be contradictory.

A warm season water source in Crandall Canyon is very desirable for wildlife habitat enhancement. Current Division personnel have never seen pond 14 without water, and the vegetation near this pond is indicative of a continual water source. The plan to leave a depression in the area of pond 14 should be very beneficial.

In Sections 3.7-5(3)(1) and 3.7-5(3)(5), the application says power poles being used for raptor habitat will not be removed in final reclamation. The applicant will need to determine whether the power poles are being used by raptors, and they may also need to modify them. Use would be evidenced by whitewash on the poles or regurgitated bones or portions of animal carcasses at the base. Any poles not being used are probably not needed for raptor habitat and should be removed. The Division of Wildlife Resources should be able to provide additional information about what modifications may be needed and which poles are in good locations.

Findings:

This portion of the application and Chapter 9 of the current plan are complete and accurate with the following exceptions:

1. Planting rates for ponderosa pine, Douglas fir, and juniper should be specified in the application.
2. The applicant needs to present information showing the proposed substitute soil material can be revegetated. The applicant could establish field trials or could obtain data showing that current vegetation cover in the upper pad areas approximates the cover in appropriate reference areas.

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3. Section 3.5-5(1)(1) says no small depressions will be retained, but the applicant proposes in other parts of the application to retain a small depression in the area of pond 14. This apparent contradiction should be resolved.

RECOMMENDATIONS

Amax has adequately addressed most regulatory requirements in this application for changing the Crandall Canyon mining and reclamation plan. The current application is a tremendous improvement over the application received in April.