

are no longer needed, the ponds will be drained and the decant structures will be removed to allow free drainage of the pond areas. The embankments will be covered during the construction phase with whatever topsoil is available from the pond footprints and reseeded. It is expected that the vegetation cover present at the time of pond decommissioning will be adequate and redistributing the embankments for regrading and reseeding at this time would be undesirable.

In addition to the post mining drainage installation, the underdrain beneath the West (Badlands) spoil fill will have an alternate channel breached to the surface between the toe of the fill and the T5 pond site. This outlet will act as a secondary drain should there be problems with the long-term function of the lower stretch of the underdrain beneath the permanent road corridor.

10.8 TOPSOIL REPLACEMENT

All topsoil material recovered from mine disturbance areas including roads, sedimentation ponds, mining areas, and out-of-pit spoil dumps will either be stockpiled or directly replaced on regraded areas. All topsoil will be removed from stockpiles at the completion of mining and replaced on regraded areas. From a sequencing standpoint, topsoil replacement operations will lag behind active backfilling and grading by up to 200 feet or approximately 800 feet from the first active spoil ridge (see Figure D2-1, Typical Cross-Section for Mining and Reclamation). This 200 foot buffer needs maneuvering room for the shovel-truck operation to continue dumping backfill up to the design post-mining grade.

Topsoil replacement will involve recovery of topsoil materials from either removal areas or stockpiles using dozers, front-end loaders or shovels, and haul trucks; haulage to the replacement area; and replacement on backfilled and regraded areas using a dozer to spread the topsoil to achieve relatively uniform replacement depths. UCM will replace a minimum of 12-inches of topsoil on all mine disturbance areas except those exception areas previously discussed in Section 3.3 and 10.7 and, based on initial topsoil volumetric calculations, greater replacement depths may be possible for some areas. Replaced topsoil will be left in a roughened condition to minimize wind and

water erosion, increase surface moisture content, and to help hold and promote germination and establishment of seed. If compacted soils are a problem then the compacted area will be furrowed to help facilitate revegetation. Additional details relative to soil removal, storage, and replacement practices are provided in Section 3.0, Topsoil Handling.

10.9 REVEGETATION PLAN

10.9.1 Background

Following topsoil placement, all mine disturbance areas will be revegetated by seeding with a mixture of native and adaptive introduced species and planting a variety of woody plant species native to this area. Revegetation objectives are twofold. The first objective is to quickly establish a ground cover to control erosion. The second and primary revegetation objective is to encourage natural reinvasion of native vegetation. This second objective will be accelerated by the planting of native shrub species into the regraded areas. By encouraging reinvasion of native species the regraded land will more quickly be capable of providing cover and food for our postmining land use of wildlife habitat. Natural reinvasion with supplemental shrub plantings will encourage a natural and diverse regeneration of plant communities. Shrub establishment will provide cover and/or browse for a variety of wildlife.

10.9.2 Plantings

Mine reclamation areas will be seeded between May 15 and August 15 to provide for seed germination and adequate growing season to facilitate initial establishment for erosion control. The selected seed mixture is summarized on Table D10-1, Proposed Revegetation Seed Mixture, and consists of a variety of species dominated by indigenous native grasses. The selected species included in the revegetation seed mixture reflect UCM's reclamation experience over the past 25 years in the Healy area. Reseeded areas will be fertilized at the time of seeding and in year 3 and 5, at a minimum, following seeding in order to encourage rapid initial establishment and long-term growth. Fertilizer application will be at a rate of 400 pounds of 20-20-10

fertilizer per acre. Adjustments will be made to the fertilizer schedule based on annual monitoring. In most cases no surface preparation will be necessary prior to seeding since topsoil will be left in a roughened condition following placement; however, if excessive compaction in any area exists which would hinder seed germination and growth, the area will be furrowed prior to seeding. Both seed and fertilizer will be applied either aerially by fixed-wing aircraft or broadcast mechanically using a low-ground-pressure all-terrain vehicle.

TABLE D10-1
PROPOSED REVEGETATION SEED MIX

<u>Common Name</u>	<u>Pounds/Acre</u>
Nugget and/or Canada Bluegrass	3
Arctared and/or Boreal Red Fescue	19
Meadow Foxtail	1
Manchar Smooth Brome	10
Peace and/or Rangelander Alfalfa	2
Reed Canary Grass	1
Annual Ryegrass	6
Scaldis Hard Fescue	10
Tobin Rape Seed	2
Norcoast Bering Hairgrass	<u>2</u>
TOTAL	56

A variety of native woody plant species including felt-leaf willow, alder, and white spruce, will be transplanted in reclamation areas. Transplanting activities will be scheduled for June through August in order to take advantage of warmer conditions and increased soil moisture levels. Planting materials will include bare-root stock, cuttings, and tubeling transplants with ongoing evaluation of success rates for the various types of planting stock. Woody transplants will be established in clumps distributed over the reclaimed area to encourage effective propagation and provide an initial vegetative culture to support future natural seeding and reinvasion. Plantings will vary in shape and location to take

advantage of favorable slope and aspect conditions including wet areas, water drainage embankments for willow and cottonwood and drier areas for birch and spruce where feasible. Additional shrubs and woody species will be planted along the riparian area of PMTB-5 and 5A.

10.9.3 Monitoring

The annual report to DOM will give an updated summary of UCM revegetation efforts. When a sampling unit becomes a candidate for bond release additional vegetation monitoring will be implemented. Results from this monitoring will give us the option of making adjustments to our planting schedule if it appears that bond release criteria will not be achieved over the next 3-5 years.

The following bond release standards are proposed:

Erosion Control Standard

An erosion control standard of 70% ground cover which includes live vegetation, dead vegetative mat, incidental woody debris, stones or gravel and litter in quantities that will resist erosion.

UCM may request that DOM allow a lower standard in those areas where a lesser cover will control erosion and allow faster regeneration. Examples might include flat slopes or scarified areas downwind of planted seedlings.

The 70% standard is based on professional judgement as a value high enough to control erosion in the Two Bull Ridge area including slopes that are predominantly 4(H):1(V). It is an accepted fact that the higher the grass cover the lower the natural reinvasion of native species into newly seeded area. A lower standard would result in faster natural revegetation but would risk greater erosion.

Woody Vegetation Standard

An average of 450 woody stems per acre on at least two-thirds of any area for which bond release is requested. To be counted, each stem must be at least 8 inches tall, except for spruce and dwarf birch which may be 4 inches tall.

The standard is chosen to represent a level of stem establishment that indicates natural revegetation is occurring at a rate that will produce a permanent native vegetation community over time. It is adapted from the Division of Forestry Reforestation standard for Region II(Interior Boreal Forest).

The reasoning for the standard applying to two-thirds of the area is to recognize the benefits of diversity. Up to one third of the area may be open areas/grassland which, if disturbed throughout the area, will provide edge effect and provide more valuable habitat than a uniform vegetation community, even if that community is internally diverse.

Diversity Standard

In each area requested for bond release, at least three woody species must be present with at least 20% of the density being made up of at least two species.

10.9.4 Bond Release Methodology

The following bond release methodology will apply to any request for final bond release unless another methodology is mutually agreed by UCM and the Department of Natural Resources.

1. **Outline the boundary of a bond release area.** UCM will, as much as practical, request bond release for logical units. Examples might include a completed out-of-pit spoil pile, or all reclaimed areas within a 100 acre area or within a five year permit term. Because exact areas cannot be specified in advance(i.e., at the time of their permit application), UCM will jointly agree on bond release areas with the Department before bond release is requested.

2. **Outline 2/3 of the acreage to which the woody shrub and the diversity standards apply.** The woody shrub standard applies to 2/3 of any area on which final bond release is requested. The 1/3 of the area that is outside this standard may be outlined any time up to the time that final bond release is requested. The 1/3 area on which the standard does not apply may be in one part of the bond release unit, or be broken up into smaller areas spread throughout the unit. Distributing the non-woody shrub areas will serve to help spread out the edge effect and diversity for which the standard was devised.
3. **Site Visit By the Department.** After the two steps above have been completed, representatives of UCM and the Department will walk the area proposed for bond release. Cover will be measured using the method referenced for foliage cover in *Premining Vegetation Inventory, Hoseanna Creek Basin, Usibelli Coal Mine; November 1, 1992. Dot Helms (p 8-9)*, or any similar and generally accepted method of measuring ground cover.
4. **Establish sampling units for the erosion control standard(i.e., to measure ground cover) throughout the area proposed for bond release.** Sampling units may be located in any method designed to achieve random distribution throughout the area proposed for bond release. Cover will be measured using the method referenced for foliage cover in *Premining Vegetation Inventory, Hoseanna Creek Basin, Usibelli Coal Mine; November 1, 1992. Dot Helms (p 8-9)*, or any similar and generally accepted method of measuring ground cover.
5. **Establish sampling units to measure the number and type of and woody stems in the 2/3 of the acreage to which the woody shrub and diversity standards apply.** As with sampling units for the erosion control standard, sampling units may be located in any method designed to achieve random distribution throughout the area proposed for bond release.
 - Within randomly established plots of a standard size, all woody stems greater than eight inches (and spruce and dwarf birch greater than four inches) will be counted and characterized by species.

- Bond release will not be requested unless all sampling units have a minimum of 100 woody stems/?
- All stems growing from a single “clump” will be counted as a single stem.

10.9.5 Statistical Tests

Simple statistical tests may be necessary to determine whether the erosion control and woody stem standards have been met. The diversity standard is tested by directly comparing the total woody stem counts by species with the diversity standard. If the data distributions are skewed, then transformations such as logarithmic and arc sin will be considered.

With respect to the erosion control standard, measurements will be made on at least 10 sampling units to determine whether ground cover meets the erosion control standard. Measurements will also be made on at least 10 sampling units for woody density and diversity standards. Because the erosion control standard applies to the entire area requested for bond release, and woody vegetation and diversity standards apply to only two-thirds of the area, all sampling units will not be the same.

The following tests will be used to determine whether the criteria have been met.

Number of Sampling Units – For these tests, the minimum number of sampling units to be sampled will be determined according to the formula below:

$$n_{\min} = t^2 s^2 / (dx_{ave})^2$$

Where n_{\min} = Minimum number of sampling units in the bond release request;

t = t-value for a one-tailed t-test for 90% confidence and n-1 degrees of freedom

s = standard deviation of the observations from each sampling unit (cover, number of stems)

x_{ave} = arithmetic mean of the observations from each sampling unit (cover, number of stems)

d = percentage of mean required for adequacy of sampling = 10% (0.1) for cover and 20% (0.2) for stocking

Comparison against the standards (ground cover, number of woody stems) – The results from the sampling units will be compared against the standard using the formula below:

$$t_{n-1} \leq \frac{(x_{ave} - x_{std})}{(s/\sqrt{n})}$$

Where t = t-value for a one-tailed t-test with a .1 alpha error and n-1 degrees of freedom

x_{ave} = arithmetic mean of the individual sampling units (cover,number of stems)

x_{std} = 11 AAC 90.457(b) provides that success is achieved at 90% of the cover and stocking standards; therefore:

x_{std} for the number of woody stems is 90% of 450 or 405 stems/acre

x_{std} for ground cover is 90% of 65% or 58.5% (.585)

s = standard deviation of the sampling units

n = the number of sampling units

If, for each standard, the number of sampling units is greater than or equal to n_{min} as calculated above, and the calculated t-value is less than or equal to the standard value as indicated above, the appropriate standard (erosion control or woody vegetation density) will be considered to be achieved.

The diversity standard is tested directly comparing the total woody stem counts by species with the diversity standard. The test either passes or fails, and no more elaborate statistics are necessary.

10.10 RECLAMATION OF SUPPORT FACILITIES

The following support facilities will be reclaimed as part of the reclamation of the Two Bull Ridge Mine.

- Explosive Storage Facilities - These facilities would include magazines and tanks for storage of explosives, balsing agents and blasting accessories. Magazines typically used for this purpose are skid mounted and would simply be removed at the end of mining.

- Powerline - The overhead electrical transmission line providing power to run the dragline and other mine facilities will be removed when no longer needed for mining. The substation and associated facilities would also be removed at the same time.
- The highwall of the north road to the west out of pit spoil facility will be regraded to a 3:1 slope. Topsoiling of this facility will follow the topsoil plan for the other road and pond areas.

Reclamation of all support facilities will include removal of the facilities, clean up of the area to remove all trash and debris, grading as appropriate, topsoil and revegetation in accordance with the revegetation plan in Section 10.9.

10.11 RECLAMATION TIMETABLE

As previously noted in Section 10.1, reclamation will occur as an integral part of ongoing mining operations. Generally, reclamation will occur contemporaneously with progressive mining with backfilling and grading occurring in sequence with mining advance. By the end of the 2nd permit term, approximately 231 acres or roughly 41% of the area disturbed through the current permit term is scheduled to be reclaimed.

Under normal conditions, backfilling and grading will lag the last active spoil ridge by no more than four spoil ridges or 600 feet, whichever is less, with a 200 foot buffer zone between the leading edge of the final grading area and the topsoil replacement limit as illustrated by Figure D2-1, Typical Cross-Section for Mining and Reclamation. Areas where this will not be true are identified on Plate D2-3 (Reclamation Plan) as exception areas. The exception areas are generally areas which must remain open for extended periods during active mining to provide access for ongoing and future mining and reclamation operations. The exception areas will ultimately be reclaimed when they are no longer needed for access or other purposes with final reclamation of all mine

disturbance areas occurring within five years of completion of all active mining operations.

The two exception areas within the current permit term that will not be reclaimed are the in-pit haul roads to the west, central and east side of the main pit areas. It is anticipated that these haul road areas will be needed for the duration of the current permit term for pit access. When mining of the pit areas is complete, the haul roads will be regraded to approximate the postmining reclamation topography, and then available topsoil will be replaced, followed by reseeding.

One additional area that will not meet final reclamation during the current permit term is the pond sites located at various portions of the mine site. (see Plate D2-3, Reclamation Plan, for these locations).

10.12 RECLAMATION COSTS

The cost of reclaiming mining disturbances over the current term should be fairly constant through the 5 year period. The box cuts developed during the initial permit term have now been or are in the process of being backfilled by dragline and truck/shovel operations. The primary earthwork cost included in the bond calculation involves regrading the spoilside and highwall of a fully developed 3-seam pit in Phase I and Phase II and a truck/shovel 6 seam pit in Phase III. The estimated reclamation cost for the second permit term is summarized in Table D10-2. See Plate D2-2, Mine Plan, for the Phase locations.

Following are the assumptions that were used as the basis for estimation of the reclamation cost for the second term of the Two Bull Ridge mine plan.

2nd Permit Term

- A 2000' pit is open to 3 seam in the Phase I area. Regrading of this pit includes pushing in spoil from the west (old box cut area) and regrading the highwall down to establish an effective 3H:1V slope or flatter throughout the area.
- A 2400' pit fully developed to 3 seam in Phase II. Regrading of this pit includes pushing in spoil from the south (old box cut area) and regrading the highwall down to establish an effective 3H:1V slope or flatter throughout the area.
- A 2500' truck pit to 6 seam is developed in the Phase III area. Regrading of this pit includes primarily regrading of the highwall to cover the pit floor and establish an overall effective slope of 3H:1V throughout the pit area.
- A regrade allowance has been included to regrade any active dumping area in the West (Badlands) spoil disposal area. A worst-case scenario was used that included a regrade of the free-dump area along the northeast access point of the fill.
- The west permanent access road has been completed and the branch to the South Box Cut has been built. It is assumed that the permanent portion of the road and the branch road across Two Bull Creek is left in place as a post mining feature.
- Sediment ponds T1, T2, T3, T4, T5 and T6 and associated down drains have been constructed. It is assumed that decant structures would be removed and embankments regraded to stable slopes.
- Necessary post mining drainages have been constructed (12,800 lineal feet).
- Topsoil has been redistributed and spread to all disturbed areas.
- All disturbed areas have been seeded and fertilized, including portions that have already been seeded/fertilized during the first permit term but release has not yet been granted.

The above outlined approach will provide the State of Alaska with an adequate bond to reclaim the mine area under the circumstances that would yield the greatest cost during the current term of the permit. In general, the approach provides a bond to cover the estimated cost of reclamation when mine development has reached the point where the open pit is at its maximum size.