DOGM & DWQ REVIEW COMMENTS
ON THE

1998 UPDATE OF THE RECLAMATION PLAN
AND
MINE WATER MANAGEMENT PLAN, JUNE 2000
SUBMITTED BY
KENNECOTT UTAH COPPER CORPORATION
FOR THE
BINGHAM CANYON MINE

February 9, 2001 - VERSION

NOTE: These comments are formatted according to the headings in the volume titled "1998 Update of the Reclamation Plan" (1998 Update). Headings from the original 1998 document which include comments are included for ease of reference. Comments in this review which were specific to the content of the 2000 Addendum document (Mine Water Management Plan, June 2000) are shown below in italicized print to assist your review.

1.3.1 NATIONAL HISTORICAL SITE REGISTRY

Please describe the precise area covered by the national historic registry listing. **Please provide**:

- the criteria which the Bingham Canyon Mine satisfied in order to be listed. **Please describe** reclamation limitations imposed by this listing and other restrictions for active mines listed on the registry. (AG) (-DWQ-)

Based on DOGM's review of information relating to the National Historic Preservation Act of 1966, owners of private property listed in the National Register are free to maintain, manage, or dispose of their property as they choose provided that no federal monies are involved. Based on this information, it would be incorrect to infer that listing on the National Register precludes any legal requirement under the Utah Mined Land Reclamation Act for KUCC to reclaim any portion of the privately owned Bingham Canyon Mine open pit area. (DJ, AG)

1.3.5 CERCLA SITES AND NRDC FOR ACID PLUME

The submission stated other contaminated sites may be identified in the future and as such remediation will be required after closure. **Please provide**:

- a current list and map of the candidate sites for CERCLA listing. (TM)

Please note that changes in the present reclamation plan for the Bingham Canyon Mine due to EPA actions will need to be reviewed and approved by DOGM and other appropriate state agencies prior to implementing these changes. (DJ)

2.0 GENERAL RECLAMATION STRATEGY

2.1 RECLAMATION TIMING

DOGM is in agreement with the flow chart for reclamation options described as Table 1. Facilities which <u>may</u> have a viable post-mine use in the future would be considered part of the current

reclamation responsibility of KUCC, until that future time when those facilities have a confirmed and verifiable post-mine use. (AG)

2.2 SELECTION OF RECLAMATION ACTIONS - General Reclamation Strategy

2.2.1 CLOSURE ISSUES

DOGM agrees that in areas with overlapping boundaries, the later permit takes precedence for reclamation requirements of any new disturbance or new construction. Facilities permitted in 1978 which have remained unchanged, but are now in overlapping areas would be reclaimed as described in the original 1978 permit. DOGM will need to make a case by case determination of permit inclusion for facilities within overlapping permit areas. (AG)

Reclamation and decommissioning of monitoring wells and access to these wells will need to be addressed in the closure plan. **Please provide**:

- a list of the monitoring wells and a description of the reclamation and decommissioning to close out these wells; and
- a map of their locations and access routes. (DJ, AG)

2.2.2 POSSIBLE POST CLOSURE LAND USES

The current closure plan identifies several possible post-mining land uses for different portions of the permit area without selecting one use. Post-mine land uses are typically identified at the beginning of operations rather than at the termination. Changes to the post mine land use are allowed, although some changes may also require changes in the reclamation plan. ***Please identify*** *the most likely post mine land use for specific areas based on current information. (AG)*

Please provide:

- a map(s) identifying the areas for each proposed post mining land use. (LK)

2.2.3 RECLAMATION STRATEGY

Please provide:

- a map(s) showing the specific reclamation treatments for all areas within the permit boundary. Show location and depth of topsoil replacement, and areas that will receive substitute topsoil and amendments (including type and rate of amendments) on this reclamation treatments map. **Please describe** seed mixes (including species and rates), seed bed preparations, and seeding methods to be used. **Please describe** revegetation success standards for all areas. Normally this is 70% of the vegetation ground cover that was assumed to be present prior to mining activities. (LK)

2.2.4 DATA REQUIREMENTS

Please provide:

- *a larger version of drawing 451-T-3533 Mine Closure Plan for DOGM files. (AG)*

Please provide:

- *copies of the detailed maps identifying individual facilities for each plant as mentioned under section 1.2.2 Scope of Work, item 6 of the 2000 Addendum. (AG)*

The section describing cleanup standards mentions post closure sampling and characterization to confirm potential exposures and possibly direct the final closure alternative depending on sampling results. ***Please describe*** *all proposed pre-reclamation characterization in the reclamation plan sections. (AG)*

2.3 RECLAMATION OF BUILDINGS AND STRUCTURES - General Reclamation Strategy

Each of the facilities in Table 2 with the entry of "Leave in Place" under the "Closure Approach" column will require a written justification explaining why each feature should be left to support the approved post mine land use. This justification will need to be reviewed by DOGM to determine if these features can be formally accepted as having a viable post-mine land use. (AG)

Some of the surface facilities listed on Plate 3 from the 1998 Update do not appear on Table 2 of this submission. It is possible that some facilities have been grouped together for the Table 2 listing. **Please describe** the groupings used, or explain the absence of all features from Plate 3 on Table 2. (AG)

The last paragraph of this section mentions that where necessary, fill material will be imported, drainages will be reconstructed, and the land surface will be graded and contoured. This general statement makes it difficult to assess the amount of reclamation work required to adequately reclaim these areas. Typical reclamation plans for large mine operations quantify volumes of fill material or topsoil, and describe the acreage to be graded. **Please describe** these reclamation tasks in quantitative terms or describe measures being taken by KUCC to quantify these reclamation tasks which will be performed "where necessary." (AG)

3.0 MINE AREA

Underground block caving actions may result in slope stability problems within the pit and affect the integrity of the areas surrounding the pit. **Please describe** potential impacts of block caving on final closure of the pit. **Please describe** the projected acid generating potential (AGP) of the material to be encountered by the underground mining. (DJ).

3.1 CLOSURE ISSUES - Mine Area

Please describe the minimum public access, if any, which must be maintained to the mine under the National Historic Site designation. Where does funding for long term maintenance of this public access come from? (AG)

Please describe surface and ground water discharge from the Bingham permit area in a more detailed manner showing potential sources, discharge points, and treatment facilities. (TM)

Please describe the financial guarantees in place, if any, to cover the long term post-closure management of water discharge permits, groundwater monitoring, and maintenance of monitoring wells? (AG)

The plan in the 2000 Addendum states a "preferred alternative" is to allow the pit to flood to an undetermined level. According to the plan, the quality of the likely pit water will "not meet water quality standards acceptable for irrigation water, drinking water or discharge to surface waters, and also exceeds water quality standards for the principal aquifer in the southwestern Jordan and Tooele valleys." The Addendum further states "Allowing the pit to fill with water of this quality also may create an area of high pressure with water quality which is unacceptable for recharge into the aquifer."The high pressure head generated by the pit lake could also serve to move poor quality water near the east side leach and Dry Fork areas into the principal aquifer at a higher rate.

Based on this information, the preferred alternative by DWQ and DOGM with respect to minimizing future effects on surrounding water quality and improving would be to keep the pit dewatered. Accordingly, ***please provide****:*

- *a table describing all of the flows in and around the mine (i.e. shafts, tunnels, wells, storm water, etc.) which includes the estimated flow and water quality of each source. In this table please include the ultimate disposition of the water, e.g. treatment or discharge, and assume that the pit will remain dry. Any possible effects on the tailings line and impoundment from all sources such as Dry Fork, the Jordan Valley remediation project and any other source of acid rock drainage must be evaluated and discussed. (DOGM, DWQ)*

The plan states the local municipalities and water purveyors may ultimately assume costs of continued dewatering of the pit. From DOGM's point of view, KUCC would still retain reclamation responsibility for the pit and dewatering activity unless a permit transfer was approved. (DJ)

Please provide*:*

- *information on acid base accounting (ABA) or geochemical studies for the pit walls and pit benches which KUCC has completed to date.* ***Please describe*** *any ongoing geochemical characterization of these pit features. (AG)*

Please describe *measures to manage surface drainage above and around the pit as part of the final reclamation of the pit area. Controlling surface drainage on the upper benches within the pit would also seem to be advantageous. (AG)*

Treating pit discharge water and pumping the effluent from this treatment to the expanded tailings impoundment or existing impoundment would be considered an amendment or revision to the current mine plans subject to review and approval by the DOGM. ***Please provide****:*

- *the appropriate submission to DOGM if these activities are proposed. (AG)*

Will additional funding be set aside to construct a facility that will process the predicted flow from the pit area when it becomes necessary? The present facility is designed to handle 1,200 gpm. The sizing of this facility does not take into account handling water recovered from the pit or the Dry Fork Plume (presently projected at 250 to 500 gpm) and any other water sources. (DJ)

Please note that construction of a sedimentation pond or wetlands may also be subject to review and approval by DOGM depending on the specific details of these facilities. (AG)

The closure plan gives a pump rate for the Dry Fork plume, however the final correction action for this plume is currently under review and has not been accepted. The necessary pump rate for containment of this plume has not yet been determined. - DWQ -

What evidence does KUCC have that the Dry Fork Dump extraction well provides containment of this plume? Where and how will the water pumped from this area be treated? (DJ)

***Please describe** the location and affected area for the proposed lime treatment for the Bingham Canyon Mine. How will the bonding for this facility be handled? The operational capacity of this lime treatment is described as 1,200 gpm. The projected flow from the Bingham Canyon area is 1,200 gpm without taking into account any other water sources. Pit pumping presently produces 1,200 to 2,000 gpm. The contact meteoric water is projected to be 1,200 gpm and there is an undocumented flow from the waste dumps referenced in your permit application The construction of a 1,200 gpm plant will not have any excess capacity for water from these additional sources. How will additional quantities of water be treated? **Please describe** how the disposal of the lime sludge from this facility on waste dumps will impact the quality of effluents emanating from this area. **Please describe** the final reclamation treatments for these lime sludge disposal areas. (DJ)*

Water treatment, pumping, and discharge facilities associated with an underground mining operation would be subject to regulation and review by DOGM. Construction of a new water pipeline, lime treatment facility or sedimentation pond would need to be permitted as an amendment or revision to the appropriate KUCC permit. (AG)

*KUCC states that access to the pit perimeter "could be" restricted. DOGM Minerals Rules require posting of signs and control of public access to facilities which pose a threat to public safety. **Please describe** measures to mitigate the hazard to public safety around the perimeter of the open pit as part of final reclamation for this area. (DJ, AG)*

A stability analysis of the pit walls may be requested by DOGM at a future time depending on the final reclamation details for the pit area. (AG)

Where will the 40 acre sedimentation pond mentioned in the plan be located? Will this be of sufficient size to accommodate KUCC's estimated flows from all the waste streams presently projected to be directed to this pond? This facility will likely be subject to Ground Water Permitting requirements at the time of its construction. (DJ - DWQ)

The option of a solid waste repository for the pit area requires further evaluation. Although pit inflows could be controlled by peripheral pumping, additional facilities will need to be in place to treat water from precipitation events that collect in the bottom of the pit. (DJ)

*A facility for the treatment of water from the large Bingham Canyon reservoir is proposed to be built upon closure. **Please describe** where this facility will be built and the acreage required. **Please describe** where the effluent and waste by-products from this plant will be discharged (or disposed of) after the Copperton Concentrator has closed. (DJ)*

The Large Bingham Canyon reservoir (1600 acre ft capacity) has been scheduled to store waters from all sources prior to treatment. If a portion of the capacity is being utilized for this

purpose, the projected flow of 1,669 acre feet from a 100 year storm event would cause this pond to overflow. Where will the excess solutions be stored prior to treatment? (DJ)

3.2 POSSIBLE POST CLOSURE LAND USE - Mine Area

DOGM recognizes there are many possible post closure land uses of the mine area. Rather than comment on all the possibilities, we request that KUCC select the most likely post-mine land use scenario at this time, and provide information focusing on that scenario. The post-mine closure land use can be changed at a later time by submitting data which supports a different scenario. (AG)

3.3 RECLAMATION STRATEGY - Mine Area

Please provide:

- *a tentative schedule of reclamation activities using the current prediction for the end of surface mining as the end of active operations. Although the Minerals Rules do not limit reclamation activities to a specific time period after active mining operations cease, it would be advisable for KUCC to schedule and complete as many reclamation tasks as possible during active operations. (AG)*

Please describe *monitoring and sampling activities which will be required for the mine area for an extended period of time after reclamation is complete for areas currently permitted with DOGM. (AG)*

3.4 DATA REQUIREMENTS - Mine Area

Please describe the elevation and location where the Elton tunnel daylights outside of the pit and provide this location on the appropriate map(s). (AG)

3.5 TENTATIVE RECLAMATION ACTIONS - Mine Area

Approximately 700 acres of the upper pit benches are identified as having acceptable soil geochemistry for revegetation. **Please provide**:

- justification for omitting these areas from revegetation treatments, or describe options for reseeding these areas, such as hydroseeding, aerial seeding, etc. (LK, AG)

4.0 MINE WASTE DISPOSAL AREA

DOGM believes clarification is warranted for statements in the 2000 Addendum under the waste and leach dump section. This section states that the current waste rock dumps are not subject to jurisdiction under the Utah Mined Land Reclamation Act (Act) because the disturbance was created prior to enactment of the law in 1977, and that there is no legal requirement for KUCC to reclaim the waste rock dumps. As clarification, it is true that disturbances created prior to the Act are not subject to the requirements of the Act provided these disturbances have not been impacted or utilized since that date. Features or disturbances in existence prior to the Act which have continued to be utilized are subject to the reclamation requirements under the Act. The reclamation requirements and performance standards take into consideration the nature and extent of the pre-Act disturbances and site conditions using baseline documentation.

Furthermore, the KUCC Mining and Reclamation Plan of 1976 states that no major revegetation is planned (for the waste dumps) because the waste material contains natural sulfide mineralization which becomes acidic when exposed to meteoric waters and the atmosphere. The 1976 Plan states after dumps become inactive for dumping, other steps will be implemented so that all dumps are left in a safe and stable condition. Techniques to accomplish this may include terracing and hydraulic methods. The 1976 Plan also states that if and when revegetation practices or methods are developed which would make vegetation economically practicable, such practices and methods will be employed on the dumps.

The 2000 Addendum mentions slides have occurred in the various areas of the dumps in the past and also makes the assumption that 10,000 cubic yards of material per year will require removal. This information demonstrates that additional measures are needed to leave the dumps in a safe and stable condition as described in the 1976 permit.

Given these clarifications and statements in the approved Mining and Reclamation Plan, the Division disagrees with the broad statement inferring that all waste rock dumps in their entirety are exempt from the Act. (AG, DJ)

4.1 CLOSURE ISSUES - Mine Waste Disposal Area

The preferred alternative stated in the plan does not provide for reclamation of the waste rock dumps, even though this is not protective of ground water in the area. The "recommended alternative action" discussed in the plan as slope reduction, reclamation and vegetation to minimize infiltration, will provide much greater protection of ground water. ***Please provide*** *the following:*

- *a list of the waste dumps which prioritizes their reclamation;*
- *a map of the dumps identifying each by name and using color coding and/or cross hatching to identify the estimated reclamation date and treatment. Please include the dump name and estimated date of reclamation;*
- *the rational for the dump prioritization in the text of the closure plan;*
- *the final estimated footprint of the regraded or reduced slope dumps; and*
- *a time-line with major milestone dates for dump reclamation. The time line should include the reclamation activities described in the plan and major time points in the mine operation such as the end of open pit mining, beginning of underground block caving, when such decisions may be made, and closure dates of the mine with/without underground mining.- DWQ -*

DOGM agrees that reduction of waste rock slopes is one method which could eliminate or greatly reduce stability hazards and also allow for surface treatments to reduce infiltration and leaching of meteoric waters. Reclamation of inactive dump areas should begin as soon as possible to distribute costs during active operations and take advantage of time. A measure not contemplated in this section is the construction of step-out or toe dumps adjacent to the existing dumps to improve stability, reduce slope angles, and break up continuous slopes. This would increase the disturbed area footprint and place waste dump materials beyond the cutoff wall system, but this would also increase the probability of revegetation success on the dump materials which could potentially reduce infiltration by meteoric waters. The long term structural and geochemical stability from this modification would outweigh the impact of the increased disturbance footprint, and greatly reduce the costs for perpetual water treatment. This modification and improved revegetation success would also decrease the visual impact of the dumps and enhance the adjacent property values. ***Please provide****:*

- *a plan for reduction and revegetation of waste dump slopes, or provide justification for other reclamation treatments. (AG)*

***Please describe** the perpetual monitoring and maintenance of facilities to capture and/or treat water contacting the dumps in the final reclamation description for the mine waste area. **Please describe** the funding in place for proposed long term maintenance and operation of the groundwater and surface water collection systems for the mine waste disposal area. (AG)*

Mine waste areas examined during the 8/10/00 site inspection demonstrated that portions of the waste dumps will support vegetation using conventional revegetation techniques. **Please provide**:

- the characterization information currently available identifying dumps which may support vegetation;
- a written description and location map for those areas currently identified as having favorable revegetation soil chemistry. **Please describe** the soil characteristics and acreage for these areas. The Division encourages KUCC to continue efforts in characterizing the waste dump materials. (AG)

DOGM encourages KUCC to continue investigating the use of vegetation, chemical treatments, and runoff controls, as means to reduce costs for a perpetual water treatment facility. (AG)

*DOGM encourages KUCC to continue mapping waste rock soil chemistry and identifying plant species which are volunteering on the dump surfaces. **Please provide**:*

- *the results of such information for use in determining appropriate reclamation treatments, if any, for waste rock dump areas. (AG)*

***Please describe** how the calcium sulfate sludge from stormwater treatment and the sludge from treatment of waste rock effluent treatment will be managed. Disposal of these materials within an existing mine permit area will require DOGM review and approval as an amendment or revision to the appropriate plan. (AG)*

The 2000 Addendum uses the terms natural and artificial leach water to refer to what is previously defined as contact water. Please clarify what the terms "natural and artificial leach water" refer to in relation to the waste rock, or use other defined terms such as meteoric contact water and applied leach water. Please be consistent with the terminology used. (AG)

4.4 DATA REQUIREMENTS - Mine Waste Disposal Area

Please provide:

- both a flow model and a water quality model to predict groundwater and surface water characteristics associated with the mine waste disposal areas. (TM)

4.5 TENTATIVE RECLAMATION ACTIONS - Mine Waste Disposal Area

Proposed reclamation of the waste areas requires review and approval by the Division, including the possible use of neutralizing materials and passivation products on the mine waste disposal areas. (DJ)

A number of facilities under this category are described as being left in place for long term water management. **Please provide**:

- a description and justification for all mine facilities which are proposed to remain. DOGM will review this information and make a decision accepting or rejecting the proposed post-mine use. (AG)

This section does not specifically state that all flat waste rock dump surfaces will be revegetated. DOGM will require that all flat dump surfaces receive the appropriate revegetation treatments to ensure revegetation success, unless KUCC can provide adequate justification for not revegetating these areas. (AG)

This section does not describe concurrent or ongoing reclamation of waste rock dumps. DOGM would encourage concurrent reclamation of inactive waste rock dumps when possible to distribute the reclamation costs during active mining and provide the advantage of a longer time frame for establishment of vegetation. **Please describe** any concurrent reclamation taking place, or explain why this reclamation is not feasible. (AG)

5.0 EXCESS MINE WATER DISPOSAL AREA

5.1 COMPLETED RECLAMATION PROGRAM

The excess mine water disposal area was reclaimed in 1994 and 1995. These reclaimed areas have not been formally released by DOGM, therefore they would still be included as affected acreage for the Bingham Canyon large mine permit. Permit areas which are proposed for an alternate post-mining land use require Division review and approval. (AG)

5.2 POST CLOSURE LAND USE

The need to restrict the amount of water that can be applied to the excess water disposal area seems contradictory under an agricultural designation. Is this designation the best possible post-mine use considering this restriction? (DJ)

6.0 ORE TRANSFER AREA - MINE TO PROCESS

6.4 DATA REQUIREMENTS - Ore Transfer Area - Mine to Process

The 1976 plan included a conveyor system from the mine area to the grinding plant near Copperton. Please explain why this submission does not describe such a conveyor system in the operations or reclamation sections, or modify this section to include the conveyor system. (AG)

6.5 TENTATIVE RECLAMATION ACTIONS - Ore Transfer Area - Mine to Process

This section mentions that all sites except for those located on waste rock disposal areas will be regraded to conform with the surrounding land surfaces and natural drainages will be reestablished. **Please describe** all ore transfer areas and the proposed reclamation for these areas. (AG)

7.0 ORE PROCESSING FACILITIES

7.5 TENTATIVE RECLAMATION ACTIONS - Ore Processing Facilities - Mine to Process

This section of the submission assumes one half of the Bonneville facilities will have a viable post-mine land use. Please explain whether this is a general assumption, or if specific facilities have

been identified as having a post mine land use. **Please describe** any specific facilities and infrastructure proposed to have a post-mine land use and provide justification for these uses. DOGM will need to review this information to determine if this proposed post-mine use is acceptable. (AG)

8.0 TAILINGS DISPOSAL

8.1 TAILINGS CLOSURE - Tailings Disposal

The use of the tailings impoundment as a repository for waste from a water treatment plant associated with the NRDC has the potential to change the characteristics of the tailings and impact the current reclamation plans. Please characterize the waste stream and the potential impacts of this waste stream on the reclamation of the tailings. (TM)

ACIDIFICATION POTENTIAL

On page two of this section, a statement is made that "Due to the presence of fine grained layers within the tailings, the depth of oxygen penetration is very limited, generally less than four to six feet. These layers will remain at or near saturation." Page four states that hydraulic conditions that will occur during closure will be "decreased water levels within the impoundment of approximately 33 feet." Will decreasing water levels increase oxygen penetration? Please explain what impact the dewatering effort will have if saturation is a necessary component for reducing oxygen penetration. (DJ)

8.2 SUMMARY OF EXISTING CLOSURE PLANS - Tailings Disposal

Recent developments associated with the proposed NRDC remediation describe directing the waste stream from water treatment plants to the tailings impoundment. The addition of this waste stream to the tailings impoundment may necessitate modification to the ongoing tailings characterization work and submission of an amendment or revision to the current tailings reclamation plan. (DJ)

Changes to the tailings stream into the tailings impoundment will require DOGM review and approval as an amendment or revision to the currently approved plan. (AG)

9.0 EXCESS WATER MANAGEMENT AREA

9.5 TENTATIVE RECLAMATION ACTIONS - Excess Water Management Area

Please provide:

- a description and justification for all mine facilities under this heading which are proposed to remain unreclaimed for DOGM review. **Please describe** the plans for long term management and maintenance of the facilities under this heading which are proposed for long term or perpetual use. (AG)

10.0 CERCLA SITES

Activities under the NRDC agreement which will affect operation or reclamation of facilities within the mine permit area will require DOGM review and approval. The perpetual use of mine facilities in connection with water treatment under the NRDC agreement would likely have an

overlap in jurisdiction by DOGM and the other regulatory entities involved with the agreement. (AAG)

11.0 FUTURE AND ON GOING RESEARCH IN SUPPORT OF CLOSURE

Please include an update on the reclamation research projects being done in support of mine closure in the annual report submitted to DOGM. (AG)

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