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Consolidation Coal Company
Western Region
2 Inverness Drive East
Englewood, Colorado 80112
(303) 770-1600

November 22, 1983

Mr. James Smith
Coordinator of Mined Land Development
Division of Oil, Gas, and Mining
4241 State Office Building
Salt Lake City, UT 84114

RE: Technical Review Responses
Emery Deep Mine
ACT/015/015, Folder No. 2
Emery County, Utah

Dear Mr. Smith:

Please find enclosed six copies of revised Plate 7-5 which was requested in technical question UMC 784.14(c) which pertains to the quantity of ground-water inflow and the associated drawdowns which will occur as mining operations continue.

As noted in Consol's letter of November 11, 1983 to you in which Consol's responses to technical questions that were identified during the Determination of Completeness Review dated October 27, 1983 were conveyed, Consol informed Mr. Lynn Kunzler of your staff on November 3, 1983 that a response to this question could not be provided by November 11, 1983. Mr. Kunzler subsequently informed Consol that the desired date for receipt of the narrative portion of this question was November 14, 1983, however, November 18, 1983 would be acceptable. The narrative portion of this question was mailed to your office on November 15, 1983. With regard to the revised Plate 7-5, Mr. Kunzler stated that November 25 was an acceptable receptance date. The enclosed revised Plate 7-5 is submitted in accordance with the new timetable and should be added to the ACR responses contained in Volume 13.

RECEIVED
NOV 25 1983
DIVISION OF
OIL, GAS & MINING

Eight copies of this submittal are being sent to Ms. Betty Thalhofer of the Office of Surface Mining and one copy is being sent to Ms. Deborah Richardson of Richardson Associates.

Thank you for your cooperation on this matter. If you have any questions please contact Mr. Holbrook or me at our Englewood office.

Sincerely,

Dave Schouweiler

Dave Schouweiler
Regional Permit Coordinator

DS/bp

cc: J. Higgins w/o Encl.
S. Jaccaud w/2 Copies
D. Richardson w/1 Copy
OSM 2/8 Copies

Consolidation Coal Company
Western Region
2 Inverness Drive East
Englewood, Colorado 80112
(303) 770-1600

December 22, 1983

Deborah L. Richardson
Richardson Associates of Denver
P.O. Box 5111
Denver, Colorado 80217

Dear Ms. Richardson:

Pursuant to our meeting at the OSM-Denver on December 5, 1983 Consol is providing revised inflow and drawdown predictions for our Emery Mine. These predictions are based on revised Plate 3-7 (5-year mine plan) which has been previously transmitted and an updated upper Ferron aquifer potentiometric surface map (Fall, 1983) which is also enclosed.

Certain other informational requirements (surface water salt loading, potential subsidence areas, etc.) are affected by the above revisions as noted in our meeting. Consol is currently addressing these related items and will forward a response as soon as possible.

If you have any questions please do not hesitate to contact me.

Sincerely,

Louie Meschede

Louis H. Meschede
Hydrologist

LHM/bap

cc: R. Holbrook w/o Encl.
J. Smith w/o Encl.
OSM w/o Encl.

Addendum Response to comment UMC 784.14(c)
(Ground-water inflow and drawdown effects)

The quantity of ground-water inflow which will enter the mine as operations continue and the associated drawdown effects have been reevaluated using the CONOSIM model which was developed by the Coal Research Division of Conoco Inc. These predictions were made using the new mine plan (revised Plate 3-7) and an updated (Fall, 1983) potentiometric surface map of the upper Ferron aquifer (enclosed).

The ground-water inflows that were generated are as follows:

Year	Average Ground-Water Inflow (cfs)
1984	1.7
1985	2.1
1986	2.6
1987	2.3
1988	2.0

These results show that as mining progresses toward the recharge zone, the inflow is expected to increase from its current average rate of 1.2 cfs to a peak 2.6 cfs. Following this peak, inflow will steadily decline and the expected average inflow after 5 years of mining will be about 2.0 cfs. These results are only slightly greater than those predicted for the previous mine plan and the 1979 potentiometric surface map using the CONOSIM model.

The attached map shows the maximum drawdowns expected as a result of the above ground-water inflows.

File ACT/015/015 Folder No. 2 & MRP's copy to Lynn for insertion into MRP's

CONSOL
Consolidation Coal Company
Western Region
2 Inverness Drive East
Englewood, Colorado 80112
(303) 770-1600

November 11, 1983

JIM
NOV 14 1983

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NOV 14 1983
DIVISION OF
OIL, GAS & MINING

Mr. James Smith
Coordinator Mined Land Development
Division of Oil, Gas and Mining
4241 State Office Building
Salt Lake City, UT 84114

RE: Technical Review Responses
Emery Deep Mine
ACT/015/015, Folder No. 2
Emery County, Utah

Dear Mr. Smith:

Please find enclosed six copies of the items requested in your letter to Mr. Richard Holbrook dated October 27, 1983. Included in this submittal are the following items:

1. Consol's responses to the technical questions that were identified during the Determination of Completeness Review dated October 27, 1983.

2. Revised Plates 3-7, 3-8 and 9-1.

3. Revised Chapter 12.0 - Geotechnical Information

Consol's responses to the technical questions should be added to the ACR responses contained in Volume 13 of the ACR responses. Plates 3-7 and 3-8 should be added to Volume 15 of the ACR responses and Plate 9-1 should be substituted for the Plate 9-1 presently included in Volume 15. Revised Chapter 12.0 should be substituted for the one currently in Volume 14 of the ACR response.

Eight copies of this submittal are being sent to Ms. Betty Thalhofer of the Office of Surface Mining and one copy is being sent to Ms. Deborah Richardson of Richardson Associates.

Thank you for your copperation on this matter. If you have any questions please contact Mr. Holbrook or me at our Englewood office.

Sincerely,

Dave Schouweiler

Dave Schouweiler
Regional Permit Coordinator

cc: J. Higgins w/o Encl.
S. Jaccaud w/2 Copies
D. Richardson w/1 Copy
OSM w/8 Copies

RESPONSES TO
DETERMINATION OF COMPLETENESS

Dated October 27, 1983

Consolidation Coal Company
Emery Deep Mine
ACT/015/015, Emery County, Utah

Comment:

The following technical deficiencies were identified during the Determination of Completeness (DOC) review. Although the Mining and Reclamation Plan (MRP) is apparently complete, these deficiencies must be adequately addressed prior to the completion of the Technical Analysis (TA).

UMC 782.17 Permit Term Information

Map 3-7, which shows anticipated mining over the next five years should be updated. Currently, Map 3-7 only shows anticipated mining through 1985. It is expected that the permit will run from 1984 to 1989. Due to the slow down in mining, it may be possible that the anticipated mining during the permit term is still in this area. If so, the applicant need only submit a table comparing the year of mining on Map 3-7 to the anticipated year of mining during the permit term. In addition, the actual permit boundary will only be the area encompassing the anticipated five years of mining. On Map 3-7, the permit boundary has been shown as much larger than the anticipated five years of mining. The applicant should provide a statement indicating that the permit boundary is only that area encompassed by the anticipated five years of mining for all maps showing the permit boundary.

Map 3-8 shows additional permit terms. On this map, the years 1980 to 1985 are shown for the area indicated as the permit boundary in Map 3-7. However, Map 3-7 indicates that mining will extend beyond the project five years. In addition, this map is most likely out of date due to the slow down in operations. Therefore, the applicant must provide a table correlating the dates shown on Map 3-8 to dates which reflect current projections. In addition, it would appear that the five year projection for 1980 to 1985 is incorrect and the areas should be revised to reflect information from Map 3-7.

Response:

Maps 3-7 and 3-8 have been revised and are included in this submittal. The permit boundary has not been changed since the revised mine plan includes additional submain and panel development that is required to produce a marketable product because of the quality variations expected within localized areas of the mine plan. This item was discussed with Mr. Lynn Kunzler of the DOGM on 11/8/83.

Comment:

UMC 783.19 Vegetation Information

The applicant should provide a map that overlays vegetation types over disturbed and proposed disturbed areas. This was done for the preparation plant, but not the mine area.

DETERMINATION OF COMPLETENESS

The applicant's response indicated that Plate 9-1 had been revised to include previously disturbed areas and proposed disturbance areas. However, no such areas could be identified on Plate 9-1. There are no legend entries for these types of areas, nor is there any indication of revision.

Response:

The map was completed prior to submission before but was inadvertently omitted from the submission materials. The corrected plate 9-1 has been included in these materials.

Comment:

UMC 783.22 Land-Use Information

Since the applicant is proposing to reclaim the surface facilities in part as rangeland, the grazing conditions, capacities and productivity of the existing lands must be described to provide a comparison with the postmining land-use.

DETERMINATION OF COMPLETENESS

The applicant has provided information showing the vegetation type, production, vegetation cover and major species on the rangelands within the mine disturbance boundary. However, the applicant should discuss the grazing history, including the number of animals and kinds of animals that have been used in the area. Also, please document the range condition (i.e., letter from Soil Conservation Service [SCS]).

Response:

The mine adjacent area has been in the past and is presently grazed by cattle and a few horses during the growing seasons. We do not have any specific data on numbers of cattle per unit area that are being grazed. However, a local rancher indicated that the general area carrying capacity was approximately 1 cow/125 acres on a year long basis. The Soil Survey of Emery County developed by the USDA-SCS indicates that the rangeland in the mine site area has the potential to produce 285 lbs. to 450 lbs. of forage/acre.

The USDA-SCS office in Price, Utah was contacted by phone on November 2, 1983 concerning the range condition letter needed from

them for the underground mine permit area. Mr. George Cook of that office indicated that he would be on the site for an evaluation on November 4th and get a letter to us on November 7th with his estimate of the range condition of the area in question. We have not yet received that letter, but will send it directly to DOGM as soon as we do receive it.

Comment:

UMC 784.11 Operation Plan: General Requirements

(b)(3) For the reclamation of the coal handlings and storage areas, the applicant must show either how coal will be removed from the site be properly disposed, or if coal will be left in these area, i.e., material left on the base of the areas mixed with overburden and not able to be utilized; the applicant must show that the coal will be covered with four feet of material unless testing shows that less material can be utilized. If the coal is to be hauled out, the applicant must show how much material is involved, where it will be disposed of and that the disposal area meets the requirements of the regulations. The cost associated with this activity must be included in the bond amount.

DETERMINATION OF COMPLETENESS

Information has been provided on the reclamation of these areas. Coal will be removed where it occurs in depths greater than four feet to a depth of four feet and the excavation will be backfilled with material in the road embankments. The applicant has not specifically stated that the coal that might exist in depths of less than four feet will also be covered with four feet of material. The applicant must provide information on the amount of cover that will be placed over coal that might exist at the site in depths of less than four feet.

Response:

Where coal exists in depths of less than four feet, the coal will be removed to the depth of contamination. This cost has been previously accounted for in the bond estimate. This material will be disposed of in the mine. Since the coal or gravel will have been completely removed, it will not be necessary to backfill the removal area.

Comment:

UMC 784.13 Reclamation Plan: General Requirements

(b)(4) Since no topsoil is available from the disturbed areas, the applicant needs to propose substitute material. As per UMC 817.22(e), the applicant must demonstrate that the substitute material is equal to or more suitable for sustaining the vegetation

than is the available topsoil and the substitute material is the best available to support the vegetation.

DETERMINATION OF COMPLETENESS

On the existing facilities sites, the applicant proposes excavation (to a maximum of four feet) of gravels and coal materials overlying the original surface. In "isolated" areas where gravels and coal materials extend beyond four feet in depth, "topsoil and dirt materials" from the reclaimed road and borrow site will be used as "fill" material. The applicant also proposes a revegetation demonstration site be established in an area where gravels and coal material will be excavated. The demonstration site will include seeding and transplanting. Since the applicant is proposing to use what is no longer topsoil, but a substitute medium, physical and chemical testing should be done in conjunction with the demonstration site to determine the suitability of the exposed surface material as a topsoil substitute. Also, the "topsoil and dirt material" from the reclaimed road areas and borrow site should be included in any testing and demonstration if they are to be substituted for topsoil. The applicant needs to supply a topsoil (or substitute material) balance showing whether or not there is sufficient material from the reclaimed road and borrow site. This should include an estimate of the surface area and depth of coverage.

Response:

Physical and chemical soil testing will be performed on the exposed surface materials of the existing facilities areas as a part of the demonstration site data gathering process. The "topsoil and dirt material" from the borrow site will also be tested as to its usefulness as a topsoil substitute. The yard area contains about 6 acres. If it were necessary to excavate 4 feet of material from the entire area, about 39,000 cu. yards of backfill would be required. About 11,000 cu. yards of backfill would come from the road near the bridge across Quitchupah Creek. About 6,000 cu. yards would come from the removal of the other mine roads. The remaining 22,000 cu. yards would come from the borrow area. Since the borrow area covers about one acre, it would be necessary to remove about 14 feet of material from the borrow area. Since the borrow area contains an embankment that is about 100 feet high, there is adequate material available to replace the coal or gravel removed during reclamation.

Comment;

(b)(5) The applicant must clarify which seed mixture will be used, those included in Chapter 10, Appendix C, or those in Chapter 3.

Although several seed mixes are proposed for different plant associations, please indicate which mix will be used for each vegetation type that is or will be disturbed.

Alternative species are listed with each seed mix. Specifically, what species will be used? What species will they replace?

It is suggested that the applicant develop new seed mixes, giving consideration to the native species in each vegetation type (as indicated in the vegetation study) and local conditions.

The applicant must provide justification for the use of introduced plant species and show that they are compatible with the plan and animal species of the area as required in UMC 817.112.

DETERMINATION OF COMPLETENESS

The applicant is proposing to use four seed mixes: Seed Plan A for the mixed desert shrub, annual forb and rock outcrop/ talus communities; Seed Plan B for the greasewood shrubland and riparian meadow communities; a separate seed mix for the evaporation lagoon; and, a separate seed mixture for the mine discharge sedimentation pond road. From this and the applicant's response to the ACR questions related to revegetation success, it appears that the applicant does not intend to reclaim areas based on the vegetation types which existed (or are presumed to have existed) prior to mining disturbance. Of particular concern is the use of Seed Plan B in revegetating both the greasewood shrubland and riparian meadow communities. There also seems to have been little consideration given to the pre-disturbance community(ies) that existed prior to disturbance at the evaporation lagoon and mine discharge sedimentation pond road. Although the applicant has provided some justification for the use of introduced species, the applicant should consider substituting them for other species due to their poor establishment during contemporaneous reclamation efforts to date (as per UMC 817.112, Introduced Species, should be necessary to achieve a quick, stabilizing cover). Why are there no forbs in Seed Plan A? Also, seeding rates appear to be quite low for several species. These rates should be revised in consultation with DOGM.

Response:

Subsequent to telephone discussions with Mr. Lynn Kunzler of the DOGM, it was decided that modifications in the seed plans were necessary to take care of all comments. The adjusted seed plans are as follows:

Seed Plan A

Species	Lbs. of PLS*/Acre	PLS*/Sq. Ft.
Indian ricegrass	3.0	13
alkali sacaton	0.5	20
galleta	2.5	9
western wheatgrass	3.0	9
winterfat	4.0	5
4-wing saltbush	4.0	6
rubber rabbitbrush	1.0	8
yellow sweetclover	1.5	9
desert globemallow	0.5	6
blueleaf aster	0.5	6
	20.5	91

* Pure Live Seeds

Seed Plan B

Species	Lbs. of PLS/Acre	PLS/Sq. Ft.
blue grama	0.75	12
streambank wheatgrass	3.0	11
sand dropseed	0.25	28
winterfat	4.0	5
4-wing saltbush	4.0	6
rubber rabbitbrush	1.0	8
big sagebrush	0.25	14
greasewood	2.5	16
yellow sweetclover	1.0	6
blue flax	1.0	7
evening primrose	0.5	6
	18.25	119

Seed Plan C

Species	Lbs. PLS/Acre	PLS/Sq. Ft.
western wheatgrass	5.0	13
slender wheatgrass	3.0	11
alkali sacaton	0.25	10
Spike Muhly (only one available)	0.25	9
alkalaigrass	0.5	13
yellow sweetclover	1.5	9
blueleaf aster	0.5	6
Indian blanket	1.0	4
	12.0	75

These three seed mixes were developed to take the place of those submitted previously. Seed Plan A will be seeded in the more arid sites and will replace the mixed desert shrub, annual forb and rock outcrop/talus sites. Seed Plan B will be seeded in the more mesic sites and will replace the greasewood community. Seed Plan C will be seeded to replace the riparian meadow sites and will be seeded into the wettest sites available. All seeding will be performed by a drill that is especially designed to seed native grass, forb and shrub seeds, with uniquely constructed seed boxes for handling a variety of seed sizes and weights.

Comment:

The method proposed to be used to determine the success of the vegetation as required in UMC 817.116 should be described.

DETERMINATION OF COMPLETENESS

The applicant should include a monitoring schedule and comparisons of woody plant density and diversity. Each revegetation area must be compared to the reference area for the vegetation type existing prior to disturbance or presumed to have existed prior to disturbance. Measurement techniques and statistical adequacy should be discussed.

Response:

The vegetation on the reclaimed sites will be monitored at intervals through the liability period. Parameters to be measured at monitoring intervals will be: vegetative cover, density, and frequency by species and group (grasses, forbs or shrubs). Monitoring will be done in years 2, 3, 5, and 7. Sampling will be done in mid July during each monitoring period. Samples will be randomly taken along permanently set transects. Sampling will be accomplished at a confidence interval which will determine a range in the mean value of 20 percent with a 0.20 probability of being wrong (80% confidence limits).

Because the postmining land use is to be rangeland and to be primarily utilized for livestock grazing, productivity and cover will be the measurements used for primary comparisons to the designated vegetative reference areas at the end of the liability period.

In 1980 a vegetation inventory was performed on the Emery Mine area. Four reference areas were set up at this time in consultation with DOGM. The reference areas have been fenced and protected since that time. These reference areas are "mixed desert shrubland", "greasewood", "riparian meadow" and "pinyon-juniper". The sites represent the majority of the mine vicinity area. Only three of the reference areas will be used for representing the mine disturbance area, these being the MDS, GW and RM sites. These

three vegetation types make up almost all of the disturbance area. There are two other vegetation types within the disturbance area (riparian shrubland and annual forb) but they make up such a small portion that it is unjustified to establish new reference areas for these small sites, thus their acreage is included in one of the other established reference areas. The rock outcrop/talus acreage is also included in the established reference areas. The reference area site representations will be as follows:

Mixed Desert Shrubland Ref. Area	Greasewood Ref. Area	Riparian Meadow Ref. Area
mixed desert shrubland community	greasewood community	riparian meadow
annual forb community	riparian shrubland community	
Rock outcrop/talus sites		

These representations will be weighted mean comparisons for cover and productivity and will come at the end of the liability period. Cover and production comparisons will be performed at 90% statistical confidence limits. Final comparisons will involve random sampling on both the reference areas and the reclaimed sites.

Actual measurement techniques to be utilized for obtaining cover and productivity data for comparisons will be submitted to the appropriate regulatory authorities for approval prior to their use.

Comment:

Temporary and contemporaneous reclamation should be addressed by the applicant, including: methods to be employed for seeding and mulching; seed mix(es) to be used for outslopes on dams, embankments, road cuts, etc.; and irrigation and pest (weed) control measures (if used) according to UMC 817.100.

DETERMINATION OF COMPLETENESS

The applicant indicates that there will be no additional disturbance. However, Table 9-2 (Vegetation) and Map 10-1 (Wildlife) indicate future areas of disturbance. The applicant should commit to revegetating any disturbed areas as contemporaneously as practicable. It is suggested that the same seed mixes, techniques, etc., that are proposed for final reclamation be used rather than that submitted in the ACR response (page 31). With proper monitoring, valuable site specific information could be obtained to modify final plans so as to maximize revegetation success.

Response:

As indicated before in the earlier ACR responses, future disturbance is not likely but is possible and therefore not ruled out. Consol will revegetate any disturbed areas as comtemporaneously as practicable.

The seed plan to be used for contemporeous reclamation will be the same as Seed Plan A in the final reclamation plans.

Comment:

(b)(8) The methodology for sealing mine entrances is described in 3.5.3.1. The applicant states that "the piezometric surface of the Ferron aquifer is well below the present mine openings; therefore, these openings need only be sealed against entrance of people, wildlife and surface runoff." Once pumping of the mine is terminated, however, this may not be the case, and ground water could exit through improperly sealed mining openings. This circumstance is made more likely by the fact that the Upper and Lower Ferron aquifers are known contributors of subsurface outflow to Quitchupah Creek and Christiansen Wash (page 7-55). The applicant should re-assess plans for sealing mine opening to preclude disruption of the hydrologic balance, and to comply with performance standards established in Subchapter K.

DETERMINATION OF COMPLETENESS

Information has been provided on the closure of the portals relative to potential discharge from the Ferron Sandstone. The applicant has provided plans for placement of a discharge pipe in the portals. Water from the pipe will discharge into the sedimentation ponds in the facilities area. The size of the pipe(s) must be provided to ensure that they will be of sufficient size to handle an "adequate" amount of outflow. Possibly the figure of 0.4 cfs could be utilized to size the pipes. The location of the piping to the sediment ponds must be shown on a plan view map. In addition, there is some concern surrounding the location of the pipe(s). They are shown on the diagram as being elevated to a certain extent. If ponding of the water should occur behind the backfilled material due to the position of the pipe, then discharge through the fill material could occur. It is probably advantageous, however, to locate the pipe in this manner to prevent discharge of sediment from the floor. The applicant should provide plans for sealing of the backfill material below the pipe to prevent discharge through the backfill.

Response:

An 8 inch plastic or PVC pipe will be used to facilitate outflow from the portal area. The drain pipe will be about 70 feet in length. Assuming a design flow of .4 cfs or 180 gal. per min., the friction loss through the pipe will be on the order of .05 feet. Since the outflow will discharge into the mine area, the water will flow naturally to the sedimentation pond. Because the flow will be small and the area is fairly flat, special stabilization procedures will probably not be necessary between the pipe outlet and the pond. If the discharge does cause some erosion in the reclaimed mine yard area, appropriate stabilization measures such as the installation of organic blankets will be taken.

It is doubtful that a significant flow will occur through the double concrete block wall and into the backfill material. However, to insure that the flow rate is minimized, the inside of the blockwall will be covered with an epoxy or bitumen sealent to an elevation one foot higher than the discharge elevation.

Comment:

UMC 784.14 Reclamation Plan: Protection of the Hydrologic Balance

(a)(2) Given that there is no assessment of the effects of degraded Quitchupah Creek waters on Ivie Creek, the impacts to water users (along Ivie and Muddy creeks) must be quantified or the applicant must justify why this should not be required. According to page 7-163, there are no surface water rights on or immediately adjacent to the mine area, but no information is given as to the presence of water rights on Ivie and Muddy creeks. If there are such rights, there is a potential for serious water quality impacts which must be addressed.

DETERMINATION OF COMPLETENESS

The applicant has provided information concerning the existence of surface water rights for Ivie Creek and portions of Muddy Creek. As a point of clarification, however, a discussion of surface water rights for Muddy Creek below its confluence with Ivie Creek should be presented. The information provided by the applicant did not clearly address the types of water rights that will be impacted below the confluence since this area was considered outside the influence of the mine. Information on the types of water rights near the gaging station below I-70 could prove to be valuable in assessing the significant of the impact of increased TDS loading to Muddy Creek, as the applicant has projected that the TDS contribution from the mine as measured at the station will increase from 9 percent to 18 percent during the five-year permit term.

Response:

Consol has contacted Mr. Louis Chadwick of the Utah Division of Water Rights (Price office) with regard to the existence of surface water rights for Muddy Creek below its confluence with Ivie Creek. Mr. Chadwick researched this question and informed us that for a distance of at least 15 miles downstream of the Muddy Creek - Ivie Creek confluence, no surface water rights are recorded. Mr. Chadwick further stated that there is no irrigation use or out-of-stream diversion for any use along this stream section, but that cattle water out of Muddy Creek along this reach when the adjacent BLM lands are being grazed. Consol does not anticipate any impact on grazing cattle downstream of the Muddy Creek - Ivie Creek confluence owing to increased TDS loading to the Quitchupah Creek watershed.

Comment:

A plan for disposing of sediment cleaned out of the ponds and stored above pond 3 should be provided for final reclamation and included in Section 3.5.3.3 of the permit application.

DETERMINATION OF COMPLETENESS

An explanation has been provided for the sediment storage pile reclamation plan. Now that the mine discharge pond has accumulated a significant amount of sediment, the applicant should also indicate where that material will be stored after clean-out.

Response:

The design sediment storage of the pond is 12.9 acre-feet. To date, approximately 3.2 acre-feet of sediment has accumulated. Using the design discharge of 1.4 mgd (the actual flow is approximately .8mgd) the pond will not need cleanout for 16 years. Therefore, there is no need for cleanout during this permit term.

Comment:

(c) The applicant should reevaluate the quantity of ground-water which will enter the mine as operations continue. The following factors should be incorporated into the analysis:

1. increase in the fracturing of the roof material to the Ferron Sandstone due to retreat mining and increase overburden depths, and

2. increase in the hydraulic head of water in the Ferron Sandstone.

Both of these factors would lead to an increase in the quantity of flow into the mine. Extrapolation of ground-water inflows in the existing mine may not be valid.

DETERMINATION OF COMPLETENESS

The applicant makes reference to a new computer simulation of mine inflows to be anticipated over the five-year permit term. This simulation was performed using the CONOSIM model.

In order to evaluate the reasonableness of the model results, the applicant should provide a narrative which explains the assumptions, boundary conditions, calibration values and other pertinent information which were utilized in the simulation. At this time, sufficient information to evaluate and verify the CONOSIM results has not been provided.

A similar analysis was apparently performed previously, as described on pages 7-88 to 7-91 of the permit application.

Again, little documentation was provided in the text so that the calculations could be verified. Of importance is that fact that these same calculations were also used to project five-year water level declines in the Upper Ferron Sandstone, shown on Plate 7-5 of the permit application. It appears the the CONOSIM results presented in the applicant's ACR response (page 44) supercede the calculated inflows presented on page 7-90 of the permit application. However, the applicant did not provide a corresponding five-year water-level decline projection map for the new CONOSIM inflow results. Since the two sets of projected inflows differ (as evidenced by the two years of overlap, 1984 and 1985) the applicant should revise Plate 7-5 to agree with the new CONOSIM inflow projections. If the applicant feels that the drawdowns shown in Plate 7-5 are still valid, he should state his reasons why and also provide all the necessary information utilized to initially prepare Plate 7-5. The brief discussion on page 7-89 is insufficient to assess the model and supporting calculations used to generate Plate 7-5.

The applicant has stated that the inflows to the mine were reevaluated using the CONOSIM model. Information must be provided on how the model handles increase in inflows due to fracturing of the roof materials and caving. Specifically, what was the height of caving anticipated and over what timeframe was the analysis done. As pillars fail, it can be expected that significant caving will occur. However, the problem is complex as is evident in the discussion on the lineament study. Three of the major roof falls were associated with "high long-term ground-water inflow areas" and other roof fall areas showed only moderate increases in inflow. How was this issue dealt with in the model? Is there any other field observations that might correlate water inflows and roof falls such as the height of the cave or tye type of roof material?

Response:

Consol contacted Mr. Lynn Kunzler of the DOGM on November 3, 1983 to inform the Division that a response to this question could not be provided by November 11, 1983. After consultation with Richardson and Associates, Mr. Kunzler informed Consol on November 7, 1983 that the desired date for receipt of the narrative portion of this question is November 14, 1983, however, November 18, 1983 would be acceptable. Mr. Kunzler also stated that November 25, 1983 was the new deadline date for receipt of the drawdown map requested under this question and that one copy of this map should be delivered directly to Richardson and Associates in Denver upon its completion.

Comment:

UMC 784.20 Subsidence Control Plan

The area that the applicant intends to leave whole pillars to protect surface structures and streams should be defined by the expected angle of draw. This angle may define an area where retreat mining should not occur which is greater than the one pillar width that the applicant intends to leave. An operations map should be provided showing where these pillars are to be left.

DETERMINATION OF COMPLETENESS

The angle of draw has been used by the applicant to define the area where pillars will be left to protect the surface. The applicant did not provide an operations map showing the location of these areas. These areas must be defined in order to evaluate whether or not all "significant structures" and renewable resources will be protected and that the mining operation will be conducted to protect these structures and renewable resources. The applicant states in Section 12.4.3.1 Subsidence Control, that final planning of mining sections "should" incorporate the application of steps 1 and 2 for surface protection. An operation plan must be provided which shows that the mining plan "will" incorporate these steps. This must be done for anticipated mining over the five-year permit term.

Response:

The only surface features that Consol specifically intends to protect at this time are Christiansen Wash and Quitchupah Creek. The buffer zones for these areas are shown on Plate 3.7, in accordance with section 12.4.3.1. All other features will be treated on a case by case basis during the final planning stages for each section, as outlined in section 12.4.3.1 Subsidence Control, (note the revision of this section).

The reasoning for this is two fold:

(1) Consol may choose to undermine surface features where upon any consequential damage will be mitigated per section 12.4.3.2 Subsidence Mitigation.

(2) Due to the nature of mine planning at Emery the exact design, timing, orientation, and layout of sections have been and most probably will be, determined by the current economic environment, quality constraints, seam conditions, and mining techniques employed. Therefore, defining a specific mine plan incorporating subsidence protection for features that Consol may not choose to protect, (within the context of the Permanent Regulatory Program) is most probably meaningless at this time.

The included information as well as the information in Chapter 12 of the application, represents Consol's most current evaluation of the conditions and impacts of mining in the Emery Coal Field. Data and techniques for these analyses were obtained from referenced documentation and analytical tests performed by the Conoco Mining Research Group.

The calculations of pillar strengths and safety factors as related to barrier protection of surface features have been confirmed by Dr. D. S. Choi of Conoco who is a recognized expert in his field.

Comment:

The Cultural Resources survey submitted in the ACR response for the preparation plant shows a study area which does not include the entire area overlying the underground workings. If there are structures which can be considered Cultural Resources, then protection of these structures must be addressed.

DETERMINATION OF COMPLETENESS

The applicant has stated that a Cultural Resources survey of the area will be conducted prior to mining under any unsurveyed area. The applicant must state a duration of time prior to mining that this will take place in order to ensure that there will be adequate time to evaluate the site and obtain approval from the regulatory authority for mitigation or removal plans.

Response:

The survey will occur at least 1 year prior to mining.

Comment:

TECHNICAL QUESTIONS RELATED TO SUBSIDENCE

The geotechnical section of the ACR Response was reviewed in greater detail to determine possible deficiencies at this time so that the TA phase will be able to be completed within the required timeframes.

The applicant has provided information relating to the prediction of the extent of subsidence at the Emery Mine. The approach primarily centered on the stability of pillars in the mine. That is pillar failure will lead to subsidence or if a stable pillar is constructed, no subsidence will occur.

Initially, the applicant identified a minimum size pillar and determined the depth at which failure of the pillar would occur and thus subsidence in Section 12.4.2.1. Areas where the depth of overburden was less than this predicted depth would not subside. The analysis which was utilized by the applicant closely followed

the method described by Holland (1962). The following questions concern this analysis:

The value for "K" that was used was 2,432 (psi feet$^{.5}$). Assuming that the "K" value would have been determined using methods proposed by Holland, K = ultimate compressive strength of the coal X (the edge dimension of the cube used to determine the compressive strength)$^{.5}$. The applicant has stated that the compressive strength of the coal is 5,000 psi. From Peng (1978, page 185) this would appear to be the strength of a two inch cube. Therefore, the "K" value would be equal to 7,071 psi inches$^{.5}$ or 2,041 psi feet$^{.5}$ compared to 2,432 used in the analysis. Information must be provided showing how the "K" value was determined or references sited showing that 2,432 is appropriate.

Response:

The value of compressive strength shown (5000 psi) is the ultimate compressive strength as measured on a cylindrical specimen measuring 2" in diameter by 4" high. According to D. S. Choi a better value would probably be in the range of 5,500 psi.

To account for the difference in shape between these samples and the ultimate compressive strength of a 2" cube the following equation must be used:

Relationship: $\sigma_c = \sigma_p/(.639 + .307\ w/h)$
Where: σ_c = Ultimate compressive strength of a 2" cube
w/h = Width-to-height ratio of specimen
At σ_p = 5000 psi
$\sigma_c = 5000/(.693 + (.307 \times .5))$
σ_c = 6,497

The USBM has also tested Emery Coal and obtained a value for σ_c of 6542.

The "K" value is then related to the ultimate compressive strength of a 2" cube by the following equation:

Relationship: $K = \sigma_c \sqrt{H}$
Where: K = a constant for a particular coal
H = cube height in feet
σ_c = ultimate compressive strength of a 2" cube

Performing this calculation for the σ_c values listed above yields 2411, 2652, and 2670 psi ft.$^{1/2}$, respectively.

As can be seen the value of 2432 psi ft.$^{1/2}$ used in section 12.4.2.1 is not only adequate but most probably conservative.

Comment:

It is not certain how the applicant determined the area supported by the pillar (AT). Upon evaluating figures 12-2 and 12-3, and figuring that the smallest stump shown would represent the 15 foot square pillar and by defining the tributary area as that area half the distance to the adjacent pillars, the tributary area appears to be 2,358 square feet and 1,693 square feet in the respective figures. This value would substantially alter the stability of the pillar stumps. The applicant must show how the tributary areas were defined.

A safety factor of one was used in the analysis. Since the evaluation has been used to evaluate the stability of the pillars to support the surface and prevent subsidence, the safety factor must be greater than one. Holland recommended a safety factor of two in his presentation.

Response:

It is Consol's intent in section 12.4.2.1 to provide a possible explanation for the occurrence of subsidence over partial pillar sections and at what overburden depth it might be expected. Because there are so many unknowns in determining the effects of partial pillar recovery the "failure of the smallest remaining stump" hypothesis was used in an attempt to establish a depth at which it could reasonably be expected that subsidence would occur. (Thus a safety factor of 1.0). Given this depth calculations can then be performed for theoretical surface deflections assuming a massive cave. It was not Consol's intent to perform a rigorous examination of the stability of partial pillar sections. Consol assumes that these areas are probably unstable in the longterm.

It was also not the purpose of this section to evaluate the stability of stumps to prevent subsidence, nor to define an overburden depth where subsidence will not occur, but rather to provide a background for a discussion of possible surface effects related to partial pillar extraction.

Given this foreword, the explanation of section 12.4.2.1 follows.

The total area supported by the "smallest remaining stump" was taken from figure 12-2, (note the revision of figure 12-2) since this is the most often used method that has been employed for partial extraction. The area (AT) of 1000 $ft.^2$ used in the calculations is incorrect. The actual area should be 2,000 $ft.^2$, which results in a depth of approximately 100 feet versus 200 feet.

If the safety factor were increased from 1.0 to 2.0 the calculated overburden depth resulting in failure of the

smallest remaining stump becomes 50 feet. While an overburden depth resulting in a pillar failure, of 100 feet does not seem too unreasonable, a depth of 50 feet is most certainly contrary to Consol's experience in the seam. It has been our experience that these small pillars are stable, (at least in the short term) to depths in excess of 400 feet.

A safety factor of 1.0 was used in this analysis because the object of the calculation was to find a depth at which it would be reasonably certain (given available data) that the smallest remaining stump would fail. Because these calculations are used for no other purpose, a factor of 1.0 is adequate. Obviously, the calculations are very conservative, in that the actual safety factor at 100 feet must be much greater than 1.0 for the section as a whole, or Consol would not be able to mine using this method at greater depths.

On the other hand, a safety factor of 1.75 is used in section 12.4.3.1 for the determination of barrier protection of surface structures. Consol uses a factor of safety of 1.5 extensively throughout the company, in mine design for longterm stability. Often safety factors as low as 1.3 are used. To date these have yielded satisfactory results.

The regulatory authority sites a safety factor in excess of 2.0 referenced by Holland (1962). According to D. S. Choi, two decades ago it was common practice to use high safety factors in mine design because: (1) The analytical techniques used to establish strength parameters were much less certain than contemporary ones and (2) most mines were shallow, (as compared to today's) thus a high safety factor did not result in a significant loss of minable reserves.

Comment:

In addition, he stated that if there is water in the workings, which would be the case at Emery after mining is complete and the water table has reestablished, that it would decrease the stability of the pillars. Therefore, the applicant should use a safety factor of at least two plus some additional amount for the conditions at the mine with respect to water. If the safety factor is not required, then additional information must be provided showing why this information must be referenced.

Response:

The effects of water inundation upon pillar stability is uncertain; however, note should be taken that there are areas in the mine that have been completely flooded for many years and are still standing. Also, the seam and the strata immediately in contact with it, act as water barriers prior to mining. This would seem to indicate that these strata are relatively impervious to water penetration and its effects.

Admittedly, no experimental data are available at present on the effects of water. For this reason the safety factor used in determining barrier protection of surface structures will be increased slightly to account for this uncertainly. This topic is discussed later on.

Comment:

The allocable load in bearing on the roof and floor rock must be evaluated. Holland has stated that this is approximately one-half to two-thirds of the unconfined compressive strength of these strata.

Response:

The unconfined compressive strength of the roof and floor material is generally in excess of 10,000 psi, which according to Holland makes their bearing capacity roughly equal to that of the pillar. This would seem to be in general agreement with actual performance in the mine. That is, when pressure has built to the extent that pillar failure is observed, it is usually accompanied by heaving of the floor, and fracturing of the roof.

Comment:

An analysis was also presented in Section 12.4.2.1 on the design of pillars at depths of greater than the 214 feet. Several parameters were identified for this analysis. The following questions concern the parameters identified:

> An average center to center pillar width (stump width) of 40 feet was used in the analysis. Why wasn't the minimum pillar width used in the above analysis? It will still be this minimum pillar width which will initially fail. Once this pillar fails, it is likely that additional stresses will be placed on adjacent larger pillars due to the sandstone layer in the roof material. This would then increase the pillar load, decrease the safety factor, and failure would be more likely. Once time effects are considered, failure would be reasonably certain. The applicant must evaluate failure based upon the weakest pillar in the system and also evaluate how the failure of this pillar will impact other pillars in the section.

Response:

It was not the intent of section 12.4.2.1 to design pillars for longterm stability in partial pillar sections. It is assumed that the stumps remaining, (after the current methods of partial extraction have been employed) are probably unstable. Also it would be beyond the scope of this document

to analyse the effects of pillar interaction and failure mentioned above.

The purpose of the discussion was to estimate the possible surface effects of subsidence. The referenced material (Peng 1981) assumes the complete collapse of pillars within the section. The average center to center pillar width is used to determine the available void space in the section that will allow subsidence to occur, and has nothing to do with pillar strength. Therefore, the section must be evaluated as a whole and thus the 40 feet average center to center distance. Note that this is a worst case estimate of surface deflection in that the entire section will most probably not collapse. Although, local areas may completely cave, causing some portion of the estimated subsidence to become evident.

Comment:

The applicant must identify how the angel of draw was determined.

Response:

An angle of draw at 18° is used in all pertinent calculations in the permit application. This is the maximum angle exhibited by similar strata over full extraction panels developed in some of Consol's eastern mines. The Shoemaker Mine, as an example, has a usual angle of draw of 13°.

In the Western coal fields the SUFCO No. 1 mine has a measured angle of draw of 11°, (J. E. O'Rourke). UP&L's Deer Creek Mine exhibits an angle of draw of less than 7° over its longwall areas, (F. K. Allgaier, USBM).

Therefore, Consol is certain that the use of an angle of draw of 18° over partial pillar sections at Emery is more than adequate.

Comment:

References must be supplied showing how the caving height factors and the equation for effective mining height were determined.

Response:

Caving height over full extraction panels as referenced in most literature on the subject (example Peng 1981) as being from 30 to 50 times the height of the excavated area. Also, D. S. Choi sights a height of 1/3 the panel width to account for the effects of various panel layouts, particularly very wide panels.

The caving dome is determined by the void spaces created by mining, material characteristics, and the width of the extracted area. The calculations shown in section 12.4.2.2 assume a worst case of 50 times the effective mining height.

Nominal Mining Height	=	9 feet
Extraction Ratio	=	72%
Caving Height Factor	=	50 times effective mining height

Effective Mining Height = Actual Mining Height x Extraction Ratio

= 9 x .72
= 6.48 feet

Note that the "effective" mining height represents the actual void space available for caving.

Caving Height = 50 x 6.48 = 324 feet

An alternative calculation using 1/3 the panel width would yield:

Nominal Panel width = 1000 feet
Caving factor = 1/3 nominal width

Height of Caving = 1000 x 1/3 = 333 feet

It is important to realize that complete collapse of the section is assumed in the above calculations. In reality the section will most probably not collapse completely, resulting in a caving profile somewhat less than demonstrated here.

Comment:

The design of pillars for control of subsidence is discussed in Section 12.4.3.1 of the ACR Response. Many of the above questions relate to this section also. In particular, the question on safety factor. Changes to this section may be appropriate once the above questions on Section 12.4.2.1 are addressed.

Response:

Due to the conservative estimate made of pillar strength and angle of draw as well as the proven effectiveness of a 1.5 safety factor, Consol is confident in the usage of this parameter under normal circumstances for protection of surface features. However, Consol does recognize the uncertainties imposed by water inundation of the mine workings. For this reason the safety factor referenced in section 12.4.3.1 shall be increased from 1.5 to 1.75.

Comment:

The applicant has requested that monitoring for subsidence be discontinued after two years above a mined section. Due to the time involved in pillar deterioration and thus the period of time until subsidence would be expected, the applicant should continue to monitor the site for a longer period of time. It is uncertain what this time would be. The applicant should commit to monitoring at least during this permit term to attempt to identify the effects of time on pillar deterioration. This timeframe should be reevaluated during the next permit review.

Response:

Consol recognizes that the effects of time on partial pillar sections are uncertain; therefore, the monitoring plan has been altered to include the permit term. However, to maintain cost efficiency, a distinction is made between partial pillar areas and areas overlying mains, submains, and bleeders. The distinction being the relative stability of both types of mine workings. Since the later type is much more stable, the intervals between monitoring of these areas is extended. Note the changes to section 12.4.4.

1 of 6

File ACT/015/015
Folder No. 2
copy to Lynn
Rick, Dave

Consolidation Coal Company
Western Region
2 Inverness Drive East
Englewood, Colorado 80112
(303) 770-1600

November 14, 1983

NOV 21 1983

Mr. James Smith
Coordinator Mined Land Development
Division of Oil, Gas and Mining
4241 State Office Building
Salt Lake City, UT 84114

RE: Technical Review Responses
Emery Deep Mine
ACT/015/015, Folder No. 2
Emery County, Utah

Dear Mr. Smith:

Please find enclosed six copies of Consol's narrative response to technical question UMC 784.14(c) which pertains to the quantity of ground-water inflow which will enter the mine as operations continue.

As noted in Consol's letter of November 11, 1983 to you in which Consol's responses to technical questions that were identified during the Determination of Completeness Review dated October 27, 1983 were conveyed, Consol informed Mr. Lynn Kunzler of your staff on November 3, 1983 that a response to this question could not be provided by November 11, 1983. Mr. Kunzler subsequently informed Consol that the desired date for receipt of the narrative portion of this question was November 14, 1983, however, November 18, 1983 would be acceptable. The enclosed response is in accordance with the revised timetable for this question and should be added to the ACR responses contained in Volume 13 of the ACR responses.

Eight copies of this submittal are being sent to Ms. Betty Thalhofer of the Office of Surface Mining and one copy is being sent to Ms. Deborah Richardson of Richardson Associates.

Thank you for your cooperation on this matter. If you have any questions please contact Mr. Holbrook or me at our Englewood office.

RECEIVED
NOV 16 1983
DIVISION OF
OIL, GAS & MINING

Sincerely,

Dave Schouweiler

Dave Schouweiler
Regional Permit Coordinator

cc: J. Higgins w/o Encl.
S. Jaccaud w/2 Copies
D. Richardson w/1 Copy
OSM w/8 Copies

RESPONSES TO
DETERMINATION OF COMPLETENESS

Dated October 27, 1983

Consolidation Coal Company
Emery Deep Mine
ACT/015/015, Emery County, Utah

UMC 784.14 Reclamation Plan: Protection of the Hydrologic Balance

Comment:

(c) The applicant should reevaluate the quantity of ground-water which will enter the mine as operations continue. The following factors should be incorporated into the analysis:

1. increase in the fracturing of the roof material to the Ferron Sandstone due to retreat mining and increase overburden depths, and

2. increase in the hydraulic head of water in the Ferron Sandstone.

Both of these factors would lead to an increase in the quantity of flow into the mine. Extrapolation of ground-water inflows in the existing mine may not be valid.

DETERMINATION OF COMPLETENESS

The applicant makes reference to a new computer simulation of mine inflows to be anticipated over the five-year permit term. This simulation was performed using the CONOSIM model.

In order to evaluate the reasonableness of the model results, the applicant should provide a narrative which explains the assumptions, boundary conditions, calibration values and other pertinent information which were utilized in the stimulation. At this time, sufficient information to evaluate and verify the CONOSIM results has not been provided.

A similar analysis was apparently performed previously, as described on pages 7-88 to 7-91 of the permit application. Again, little documentation importance was provided in the text so that the calculations could be verified. Of importance is that fact that these same calculations were also used to project five-year water level declines in the Upper Ferron Sandstone, shown on Plate 7-5 of the permit application. It appears that the CONOSIM results presented in the applicant's ACR response (page 44) supercede the calculated inflows presented on page 7-90 of the permit application. However, the applicant did not provide a

corresponding five-year water-level decline projection map for the new CONOSIM inflow results. Since the two sets of projected inflows differ (as evidenced by the two years of overlap, 1984 and 1985) the applicant should revise Plate 7-5 to agree with the new CONOSIM inflow projections. If the applicant feels that the drawdowns shown in Plate 7-5 are still valid, he should state his reasons why and also provide all the necessary information utilized to initially prepare Plate 7-5. The brief discussion on page 7-89 is insufficient to assess the model and supporting calculations used to generate Plate 7-5.

The applicant has stated that the inflows to the mine were reevaluated using the CONOSIM model. Information must be provided on how the model handles increase in inflows due to fracturing of the roof materials and caving. Specifically, what was the height of caving anticipated and over what timeframe was the analysis done. As pillars fail, it can be expected that significant caving will occur. However, the problem is complex as is evident in the discussion on the lineament study. Three of the major roof falls were associated with "high long-term ground-water inflow areas" and other roof fall areas showed only moderate increases in inflow. How was this issue dealt with in the model? Is there any other field observations that might correlate water inflows and roof falls such as the height of the cave or the type of roof material?

Response:

Consol contacted Mr. Lyn Kunzler of the DOGM on November 3, 1983 to inform the Division that a response to this question could not be provided by November 11, 1983. After consultation with Richardson and Associates, Mr. Kunzler informed Consol on November 7, 1983 that responses to this question could be submitted in two parts, one a response to the narrative portions of the above question and the other a submittal of the requested drawdown map. The response to the narrative portion follows and the submittal of the drawdown map will be in accordance with the November 25, 1983 revised timetable as stated by Mr. Kunzler (see November 11, 1983 letter to Mr. James Smith regarding technical review responses).

Modeling Assumptions

1. Most of the water entering the mine voids is from the upper Ferron Sandstone aquifer. Minor quantities may come from leakage from the Blue Gate Shale member, but these are considered insignificant. Seepages from the lower aquifers are negligible since some coal is left in the floor and there are thin layers of shale in the immediate floor strata.

2. The mining method of room-and-pillar does not cause massive caving of the roof until after the retreat mining of the coal pillars. The extent of the mine void is considered dynamic

from one simulation time period to the next (if desired). However, during any one time step, the void is assumed static. If massive caving occurs, the model can be instructed to evaluate and update nodal or block characteristics based on the concept developed by Snow (1968).

3. Recharge to the upper Ferron Sandstone aquifer occurs along the Joe's Valley-Paradise Fault graben, and possibly from precipitation at the outcrops as well as downward leakage from the Blue Gate Shale Member of the Mancos Shale.

4. The upper Ferron aquifer is treated as a confined groundwater system with the Blue Gate Shale and the thin shale layer in the floor of the IJ Coal Seam acting as the confining strata. Since CONOSIM is a double-porosity model, both fractured and unfractured flow characteristics are considered.

MODEL PARAMETERS AND BOUNDARY CONDITIONS

The map in Figure 1 shows the modeled area bounded by heavy lines. This area is approximately three by five miles in extent and includes the present and future mining areas.

Figure 2 is a typical three-dimensional grid network for CONOSIM model. The grid block dimensions varied from 0.002 mile at the mining faces to 0.95 mile at the outermost model boundaries. For the IJ Coal Seam, which is represented by a dark layer, the fracture and matrix porosities are 25 and 3 percent, respectively; and the permeability is 0.03 foot per day (fpd). For the shale layers, the following information was used:

Fracture porosity	30%
Matrix porosity	0.5%
Permeability in the x-direction	0.00038 fpd
Permeability in the y-direction	0.00001 fpd
Permeability in the z-direction	0.00001 fpd

All of the sandstone zones designated by SAND 1, SAND 2, and SAND 3 have fracture porosity of 20 percent, matrix porosity of 1 percent, and the z-directional permeabilities of 0.074 and 0.038 fpd, respectively. However, SAND 1 had 0.0668; SAND 2 had 0.56; and SAND 3 had 0.15 fpd permeabilities in the x-direction. Both the calibration and transient-predictive simulations were run for preferential water flow conditions. The aquifer characteristics used here were determined from pump and laboratory tests.

The illustration in Figure 3 is a two-dimensional reduction of Figure 2. This is done in order to show the types of boundary conditions utilized.

BOUNDARY TYPE 1 represents constant pressures or constant flow grid nodes. With reference to Figure 1, these nodes occur along the northwestern boundary (located at the graben).

BOUNDARY TYPE II are the noflow nodes.

BOUNDARY TYPE III represents leakage or discharge grid nodes.

Calibration of CONOSIM was accomplished by comparing the computed mine discharge during a steady-state simulation with the actual measured mine inflow. The computed inflow, using the parameters outlined previously, averaged about 1.42 cubic feet per second (cfs). The current mine inflow is about 1.2 cfs.

MODEL RESULTS

The simulation quantities generated are summarized below:

Year	AVERAGE INFLOW (cfs)
1984	1.5
1985	1.8
1986	2.4
1987	2.2
1988	1.9

MODEL CAPABILITIES AND LIMITATIONS

CONOSIM has an in-built index array which is interrogated either every interation or time step to check the status or condition of each node or element. Depending upon the user specified commands or requirements, appropriate signals are generated. These signals are conveyed to appropriate sub-programs where specific actions are executed. CONOSIM model has been documented in Owili-Eger (1980).

The caving height used in this exercise was about thirty times the mining height. When an element or block fractures and caves, the model generates new characteristics based on the approach developed by Snow (1968). The fractured material zones' interactions are handled numerically by the computer through the combination of altered hydraulic and elastic properties and the resulting pressures.

CONOSIM can handle up to 400 inflow nodes with either constant or time varying rates. Thus, the "high long-term groundwater inflow areas" and others, do not present any modeling difficulties.

Although CONOSIM is a powerful three-dimensional model, the complex nature of a dynamic mining environment coupled with geologic uncertainties cannot be overlooked. The hydrologic parameters generated are at best approximations. However, they have been obtained via the best available technology and are far too superior to analytical or empirical techniques. As additional data are obtained from actual inflows and water level monitoring (seasonal), our predictions can then be refined and upgraded.

REFERENCES

Owili-Eger, A. S. C., 1980. "Modeling Immiscible Gas-Water Flow in Deforming Mining Environments," paper presented at the SME-AIME Fall Meeting and Exhibit, Minneapolis, Minnesota, October 22-24, 1980, SME Preprint No. 80-312.

Snow, D. T., 1968. "Fracture deformation and changes of permeability and storage upon changes of fluid pressure," in Quarterly of the Colorado School of Mines, v63, ni, pp. 201-244.

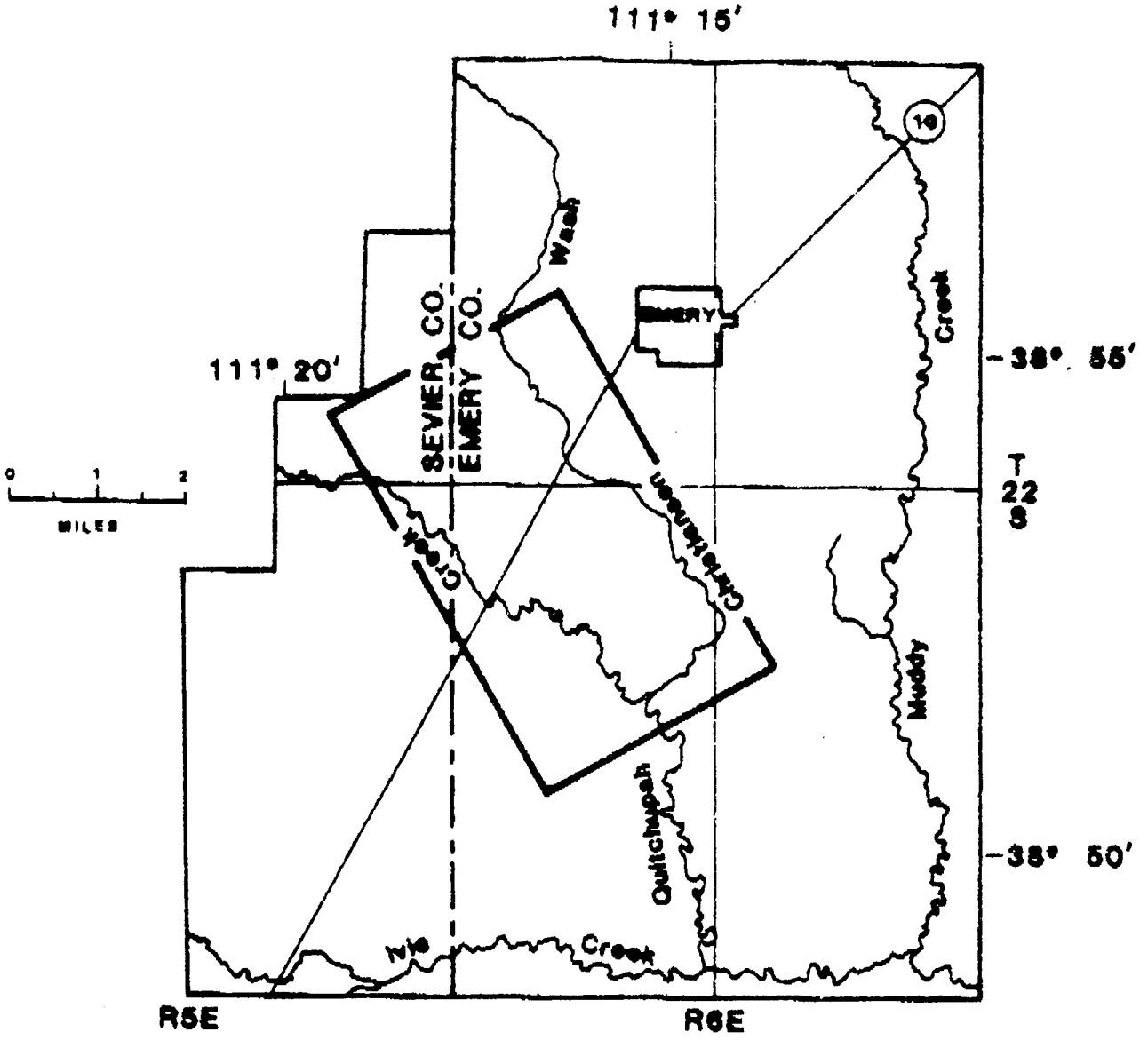

FIGURE 1.
AREAL OVERVIEW OF THE EMERY
MINE SHOWING CONOSIM REGION

Geologic Material	Young's Modulus ($\times 10^6$ psi)	Poisson's Ratio
Shale	1.30	0.05
Sandy Shale	1.48	0.06
Coal	0.37	0.16
Sandstone	1.33	0.06

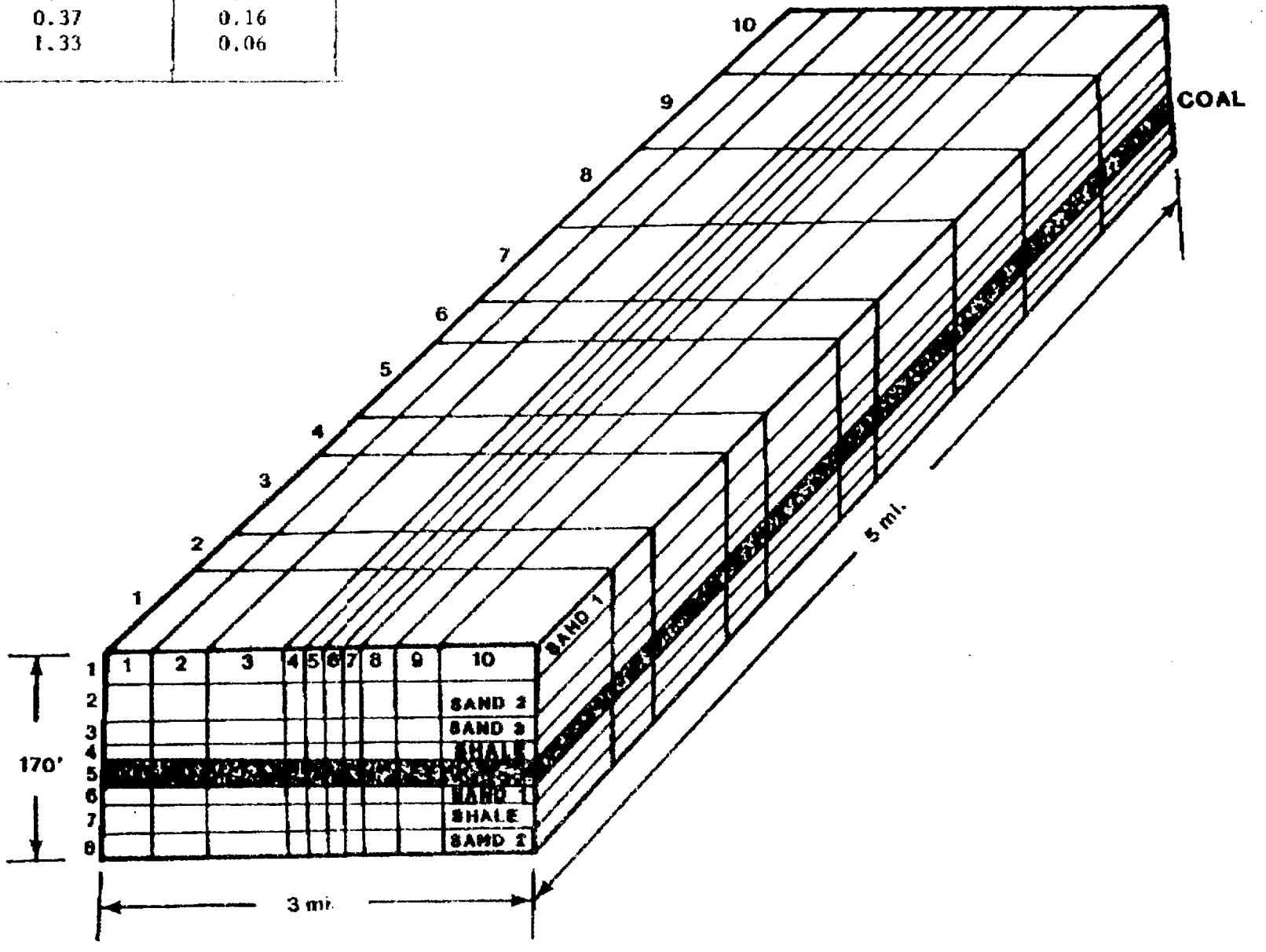

FIGURE 2.
THREE-DIMENSIONAL GRID FOR THE EMERY MINE INFLOW SIMULATION

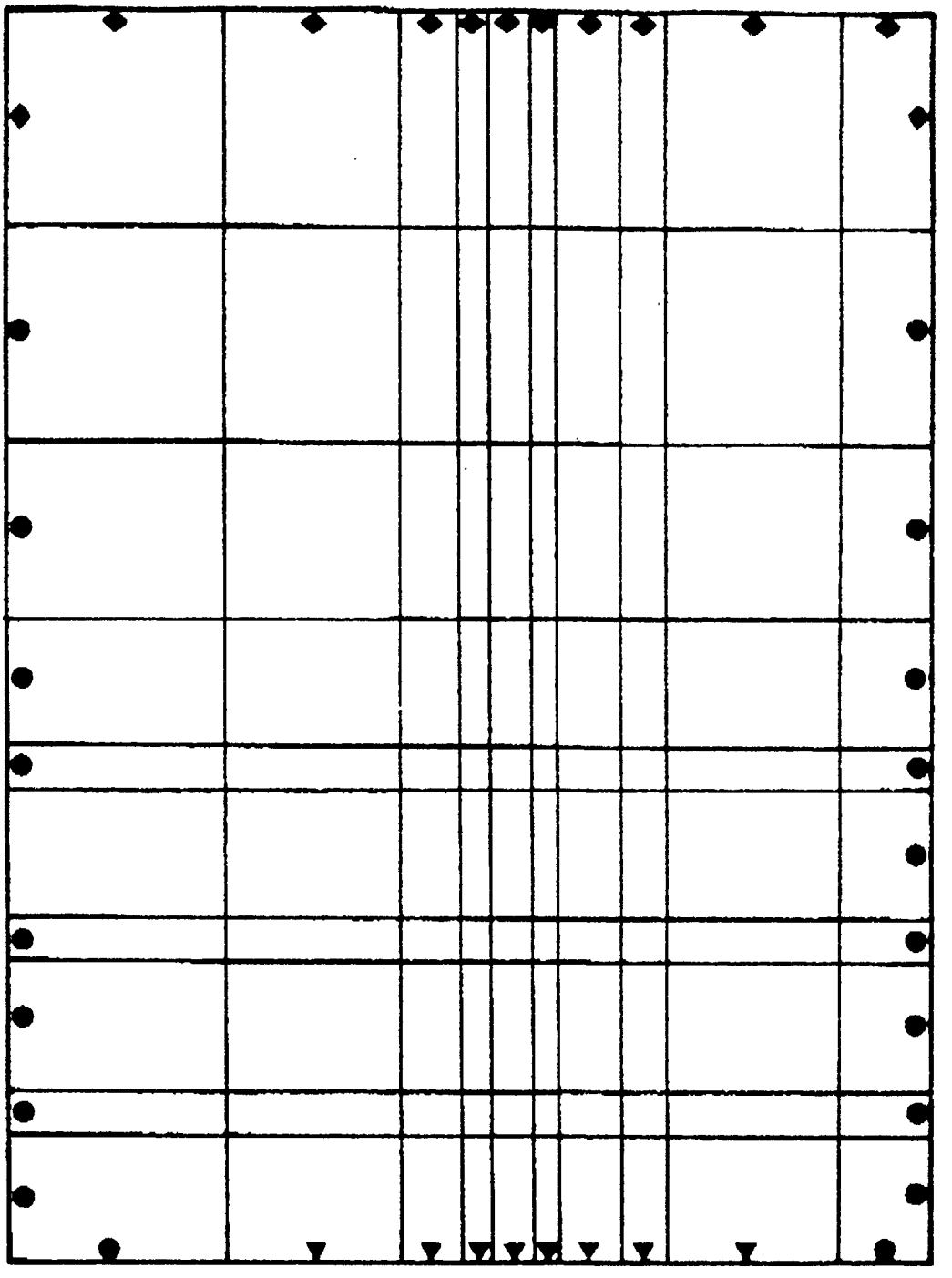

FIGURE 3.
TWO-DIMENSIONAL GRID SHOWING THE TYPES OF BOUNDARY CONDITIONS IMPOSED FOR CONOSIM SIMULATION AND CALIBRATION

1 8 5

Consolidation Coal Company
Western Region
2 Inverness Drive East
Englewood, Colorado 80112
(303) 770-1600

January 23, 1984

Deborah L. Richardson
Richardson Associates
8715 W. 95th Avenue
Broomfield, CO 80020

Dear Ms. Richardson:

As noted in our meeting at the OSM - Denver on December 5, 1983, recently revised inflow predictions and mine plans have bearing on certain other of the previous ACR deficiency responses. Namely, those to UMC 784.14(a)(1) and UMC 784.20 which were dated June 23, 1983 and submitted on October 7, 1983. Modified responses to these items are enclosed.

Upon submittal of this information it is my understanding that all of your informational requests pertinent to surface water will have been satisfied.

Please advise if you have any questions relating to the enclosed information.

Sincerely,

Louie Meschede

Louis H. Meschede
Hydrologist

LHM/bap

cc: S. Grace - OSM
J. Smith - DOGM
D. Schouweiler - Consol

REVISION OF DEFICIENCY RESPONSES
Dated June 23, 1983 and Submitted October 7, 1983

UMC 784.14(a)(1)

Under the heading "Surface Water" the response is to read as follows:

Groundwater which enters the mine from the upper Ferron aquifer is on the order of 750 to 1,250 mg/l TDS concentration (Tables 7-4 and 7-5). As previously noted, the average annual salt loading to surface water within the general mine area from the mine discharge for the period July 1980 to March 1982 was 2,336 tons/year. During the period April 1982 to April 1983 average annual salt loading increased to 3,577 tons/year due to increased flow into the mine. It should be noted that the average TDS value associated with the higher flow was reduced to 2,967 mg/l, down from an average of 3,964 mg/l during lower flow. The average annual discharge associated with the lower TDS value was 1.2 cfs. Average annual mine discharge is expected to increase over the 5 - year permit term as follows (see response to UMC 784.14 c):

Year	Predicted Average Annual Mine Discharge (CFS)
1984	1.7
1985	2.1
1986	2.6
1987	2.3
1988	2.0

It is unreasonable to expect that TDS concentration will be inversely proportional to mine discharge. Considering mine discharge and TDS data over the period July 1980 to April 1983, an approximate doubling of the mine discharge rate has produced an approximate one-quarter reduction in TDS concentration of the mine discharge water. Taking this line of reasoning, predicted TDS values associated with the expected mine inflow rates over the 5 - year permit term are as follows:

Year	Predicted Average Annual Discharge TDS Concentration (mg/l)
1984	2,500
1985	2,350
1986	2,200
1987	2,300
1988	2,400

Predicted average annual salt loads associated with the aforementioned predicted values of mine discharge and TDS concentration for the 5 - year permit term are then:

Year	Predicted Average Annual Mine Discharge Salt Load (Tons/Year)
1984	4,200
1985	4,850
1986	5,600
1987	5,200
1988	4,700

Assuming that average annual salt loading from other sources (natural runoff and irrigation return) remains relatively constant during the 5 - year permit term within the general mine area, the average annual salt load contribution from the mine discharge at Muddy Creek below I-70 would be expected to increase from 9% (contribution during period July 1980 to March 1982) to as much as 19% over the 5 - year permit term (see response to UMC 783.16). The contribution of mining to the average annual salt load pick up in the Emery irrigated area would likewise increase from 19% to as much as 37% within the 5 - year permit term. Irrigated agriculture and natural runoff would still be the primary contributors of salt to Muddy Creek below I-70 over the 5 - year permit term. No water rights exist downstream of the mine discharge point on Quitchupah Creek nor do they exist on Ivie Creek between the Quitchupah Creek and Muddy Creek confluences. As such, no effect on downstream water users is possible on these streams.

With regard to potential trace constituent contamination of surface water owing to the mine discharge water, it was stated on page 7-82 of the permit application that only a few of the trace elements which were sampled for were present in concentrations above the analytical detection limit and that these posed no water quality hazard.

UMC 784.20

Under the heading "Agricultural Land" the table is revised as follows:

NON-AVF IRRIGATED LANDS
POTENTIALLY AFFECTED BY LAND SUBSIDENCE
OVER THE 5 - YEAR PERMIT TERM

SURFACE LAND OWNER*
D. Jensen
Cedar Ridge (Sec. 20)
W. Staley
L. Andersen
E. Jensen
M. Jensen
J. Jensen
Cedar Ridge (Secs. 28 & 29)
J. Lewis (NE¼NE¼ Sec. 29)
E. Bryant (Sec. 29)
G. Olsen

* See Plate 4-1 (Permit Area Surface Ownership) for land location.

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Consolidation Coal Company
Western Region
2 Inverness Drive East
Englewood, Colorado 80112
(303) 770-1600

January 24, 1984

Deborah L. Richardson
Richardson and Associates
8715 W. 95th Avenue
Broomfield, CO 80020

Dear Ms. Richardson:

Last month, revised ground-water inflow and drawdown predictions for our Emery underground repermit application were submitted to you (UMC 784.14c). These predictions were based on revised Plate 3-7 (new 5-year mine plan) and an updated upper Ferron aquifer potentiometric surface map (Fall 1983), both of which have also been previously transmitted. Also last month at our meeting at the OSM-Denver, your firm requested that the revised drawdown predictions be examined in light of the drawdown that already has occurred in the upper Ferron sandstone aquifer in the period 1979 to 1983. In this way, total predicted drawdown at the end of the 5-year permit term would be made available and the effects on the upper Ferron aquifer could be anticipated. This letter and the enclosed information serve to provide this information.

The configuration of the potentiometric surface of the upper Ferron sandstone aquifer in 1979 is a matter of contention. Two maps depict this surface in 1979, Plate 7-4 of the repermit application and Figure 9 of Lines and Morrissey (1983). The major difference between the two maps is the water-level elevation used at well R-2(U) to prepare the surface. The repermit application uses a value of 6196 feet AMSL while the USGS uses a value of 6030 feet AMSL, a difference of 166 feet. The repermit application value was recorded by a pressure gage following completion and is a measurement which is much greater than all subsequent water-level readings at this well. Given the facts that no major mine disturbance is known to have occurred in the period 12/79 to 3/80 which could have influenced water levels to this degree and that many shut-in water levels in the Ferron sandstone are influenced by gas, it is likely that the USGS water level at well R-2(U) in 1979 is the better choice for potentiometric surface preparation. For these reasons the USGS map was used as the base map to compute drawdown in the upper Ferron aquifer.

In order to compute the drawdown in the upper Ferron sandstone in the period 1979 to 1983, the 1979 USGS map and Consol's Fall 1983 map were superimposed and the water level difference was noted at points of contour intersection. Subsequently, lines of equal drawdown were connected to show the drawdown configuration for the above period. This map showed a maximum drawdown of about 220 feet within the SE¼ of Section 29, T225, R6E, close to the suspected roof fall location.

Next, this drawdown map was superimposed on that of revised Plate 7-5 (transmitted in my letter of December 22, 1983) and intersecting drawdown contours were summed. Lines of equal drawdown were connected to achieve the predicted drawdown at the end of the 5-year permit term (year 1988). This map is enclosed (Plate 7-5A) and also shows that the area of maximum drawdown is expected in Section 29. It should be noted that these predicted drawdowns are constrained by the real available drawdown in 1979. That is, in some areas predicted drawdown exceeds available drawdown and therefore, in some locations the aquifer will be drained throughout.

In order to approximate these locations, the map of predicted drawdown at the end of the 5-year permit term (Plate 7-5A) was superimposed on the 1979 USGS potentiometric map. The water-level difference was noted at intersecting lines and these were contoured to yield the predicted upper Ferron aquifer potentiometric surface at the end of the 5-year permit term (Plate 7-5B). This map was in turn superimposed on an approximate structural map of the bottom of the upper Ferron sandstone. Areas where predicted potentiometric level lay below the base of the aquifer were shaded on Plate 7-5B to denote their potential for being drained due to mine interception of upper Ferron aquifer ground water. By the end of the 5-year permit term water-level declines of 250 to 350 feet may occur at the locations of the Bryant and Lewis wells (relative to 1979 base levels), however, the aquifer is expected to remain saturated at both of these locations.

Upon submittal of this information it is my understanding that all of your informational requests pertinent to ground water will have been satisfied.

Please advise if you have any questions relating to the above or enclosed information.

Sincerely,

Louis H. Meschede
Hydrologist

LHM/bap

cc: S. Grace - OSM
J. Smith - DOGM
D. Schouweiler - Consol

Reference: Lines, G. C., and Morrissey, D. J., 1983, Hydrology of the Ferron sandstone aquifer and effects of proposed surface-coal mining in Castle Valley, Utah: U.S. Geological Survey Water-Supply Paper 2195, 40p.

Consolidation Coal Company
Western Region
2 Inverness Drive East
Englewood, Colorado 80112
(303) 770-1600

October 7, 1983

State of Utah
Natural Resources
Oil, Gas and Mining
4241 State Office Building
Salt Lake City, Utah 84114

Attn: Jim Smith

Re: Apparent Completeness Review
Emery Deep Mine
ACT/015/015

Dear Jim:

I am delivering with this letter, six copies of our response to the Apparent Completeness Review of the permanent regulatory program permit application for the Emery Deep Mine. I have attached to this letter the original signed and notarized verification statement for the entire permit application. Our response is submitted as three additional volumes (Volumes 13, 14 and 15) to accompany the ten volumes of the original submittal and the two volumes of the preparation plant revision to the original submittal.

Concurrently with this delivery to you, we are delivering eight copies of this response to the Western Technical Center, Office of Surface Mining (Betty Thalhofer, Librarian) and one copy to Debbie Richardson, Richardson Associates of Denver. Two copies are being shipped to the Emery Mine, one of which will be delivered to the Emery County Courthouse by mine personnel upon receipt.

In addition to the Apparent Completeness Review responses and appended data and maps directly referenced therein, we have also included information pertaining to modification in the Emery Mine operations which have occurred since we originally submitted the application. They are:

1. On July 31, 1981, The Pittsburg & Midway Coal Mining Company (P&M), a wholly-owned subsidiary of Gulf Oil Corporation, assumed a 50% controlling interest in the Emery Mine through acquisition of the Kemmerer Coal Company. In those sections

of the permit application where reference is made to the Kemmerer Coal Company, "P&M, a subsidiary of Gulf Oil Corporation" should be substituted. The legal financial and compliance information for P&M is provided with this submittal.

2. On October 1, 1981, DOGM approved a reconstruction plan for the borehole pump access road. The correspondence pertaining to this revision to the permit is included. The information contained in "Plate 1," referenced in the revision, is shown in Plate 12A-2 of the permit application and therefore was not included.

3. On February 3, 1982, DOGM approved use of excess material from the borrow area previously approved. Because the reclamation plan for this modification superseded the initial approval, it was not included. The correspondence pertaining to the February 3, 1982 revision approval is included in this submittal.

4. On December 1, 1981, DOGM approved a bathhouse and powerline. The correspondence pertaining to this revision is included in this submittal.

5. On August 3, 1982, DOGM approved a new temporary coal stockpile in an area near the planned preparation plant. The correspondence pertaining to this revision is included in this submittal. The "Plate 8-1" referenced in the revision is the same as Plate 8-1 in the permit application and therefore was not included.

6. On August 19, 1982, Consol provided a map to DOGM showing internal drainage improvements made in the aforementioned coal stockpile. The original of that map is kept at the mine and was not available for printing and inclusion in this submittal. Mine personnel are mailing the requisite copies this date to the appropriate individuals for insertion in this submittal. The original transmittal correspondence is included in this submittal.

All of the above listed information and revisions (items 1 through 6) should be considered a part of the permit application currently being reviewed for approval.

A list of the contents of this submittal follows.

If you have any questions concerning this submittal, please contact me at your earliest convenience.

Sincerely,

Richard M. Holbrook
Supervisor
Environmental and Quality Control

RMH/kdb

cc: OSM w/8 copies
D. Richardson w/1 copy
S. Jaccaud w/2 copies
J. Higgins w/o enc.

ACR RESPONSE CONTENTS

Geologic Logs	Description of the lithology and stratigraphy of geochemically-tested intervals.
	Drill logs for all holes used in cross sections.
	Drill logs for all holes used to determine the Ferron subcrop on Plate 6-30.
Well Data	Drill logs, well completion reports, and monitoring data for surface mine (SM) and refuse disposal area (RDA) wells.
AVF Report	Alluvial Valley Floor assessment by Dan Kimball, October 3, 1983, containing a discussion of regional irrigation practices.

VOLUME 15

Plate 4-1	Revision to original plate-Surface Ownership
Plate 4-2	Revision to original plate-Coal Ownership
Plate 4-3	Revision to original plate-Surface and Coal Ownership
Plate 6-1	Revision to original plate-Drill Hole Locations
Plate 6-2 through 6-4	Revision to original plate-Cross Sections
Plate 6-5 through 6-7	Revision to original plate-Cross Sections
Plate 6-30	New plate showing Surficial Geology of the mine area
Plate 9-1	Revision to original plate-Vegetation Map
Plate 10-1	Revision to original plate-Select Wildlife Information
Plate 13-3	Revision to original plate-General Site Drainage Plan
Plate 13-4	Revision to original plate-Sedimentation Ponds
Plate 13-5a	New plate showing as-built mine discharge pond
Plate 15-19	Revision to original plate - Postmining Topography
Plate 15-21	New plate showing Bond Areas

RESPONSES TO
APPARENT COMPLETENESS REVIEW
dated
June 23, 1983
for
Consolidation Coal Company
Emery Deep Mine
ACT/015/015, Emery County, Utah

Comment: UMC 771.27

UMC 771.27 Verification of Application

The application must be verified under oath (i.e. notarized) by a responsible official of the applicant that the information contained therein is true and correct to the best of the official's information.

Response:

A replacement for page 1-4 of the permit application is provided and contains a signed and notarized statement of verification by the Supervisor of Environmental Quality Control for the Western Region of Consolidation Coal Company.

Comment: UMC 782.13

UMC 782.13 Identification of Interests

(a)(2) There are several discrepancies pertaining to permit area surface and coal ownership as contained in Sections 4.3.1, 4.3.2 and Plates 4-1, 4-2 and 4-3. The missing or conflicting data are discussed by section below and should be corrected by the applicant.

Section 19, Township 22 South, Range 6 East--Surface ownership. The name, address and phone number of A. Olsen has not been included in 4.3.1.; Plates 4-1 and 4-3 depict different Utah Power & Light boundaries; Plates 4-1 and 4-3 show, respectively, George Olsen and E. Olsen as owners of W½ SE¼ SW¼.

Section 20, Township 22 South, Range 6 East--Surface ownership. The SW¼ SE¼ and SE¼ SW¼ are owned by Dermis Jensen according to Plate 4-3; Plate 4-1 shows E. Bryant as owner. Plate 4-1 gives L. Mangum and Plate 4-3 gives D. Mangum as owners of SW¼ SW¼.

Section 21, Township 22 South, Range 6 East, Surface ownership. Plate 4-3 indicates that Dermis Jensen is owner of SW¼ NE¼. Plate 4-1 does not indicate this, nor is Jensen's name or address included in list of surface owners (page 4-2).

Section 28, Township 22 South, Range 6 East, Surface ownership. List of owners (page 4-3) includes John Lewis, however, neither Plates 4-1 nor 4-3 indicate that he owns surface property in Section 28.

Section 29, Township 22 South, Range 6 East, List of owners (page 4-3) and Plate 4-1 give R. Anderson, et al., as owners of SW¼ NW¼, NW¼ SW¼, however, Plate 4-3 gives George Olsen as owner. Plate 4-3 indicates Randall Jensen is owner of SE¼ NE¼; however, Plate 4-1 indicates Cedar Ridge. List of owners include L. Mangum; Plate 4-3 shows only Donald Mangum.

Section 30, Township 22 South, Range 6 East, Surface ownership. NE¼ NW¼, Plate 4-1 shows Earl Olsen as owner, Plate 4-3 shows George Olsen; list of owners includes James Olsen and John Lewis, neither of which are shown on Plate 4-1. Coal ownership. NW¼ SW¼, Plate 4-3 indicates lease from R. Lewis to Consolidation Coal Company (Consol), Plate 4-2 does not indicate Lewis ownership.

(e) Several inconsistencies are noted in surface and coal ownership contiguous to the permit area, which should be corrected or clarified by the applicant.

Section 19, Township 22 South, Range 6 East. Plate 4-1 indicates that the surface of NW¼ is owned by A. Olsen. His name and address has not bee provided in 4.3.1.

Section 21, Township 22 South, Range 6 East. Plate 4-1 indicates Dermis Jensen is surface owner of NE¼ NE¼, his name and address must be supplied in 4.3.1. The address of LDS must be supplied.

Section 22, Township 22 South, Range 6 East. Plate 4-1 and Section 4.3.1 indicate J. and L. Kingston are owners of E½ SW¼, SW¼ NW¼ and NW¼ SW¼; Plate 4-3 shows J. O. Kingsley as owner (surface).

Section 27, Township 22 South, Range 6 East. Plates 4-1, 4-2 and 4-3 indicate L. Hunter owns surface and coal of SW½ NE¼; his name and address must be supplied in 4.3.1 and 4.3.2.

Section 30, Township 22 South, Range 6 East. Supply the address of Ralph Lewis surface and coal owner of NW¼ NW¼. Also, Plate 4-2 indicates the coal here is owned by Emery County; this discrepancy needs to be corrected.

Section 25, Township 22 South, Range 5 East. Plate 4-1 indicates G. Lewis and Robert Lewis own tracts in SE¼. Names and addresses should be added to 4.3.1. Plate 4-2 shows that Kemmerer owns the coal in the W½ NE¼; the name and address must be added to 4.3.2.

Section 36, Township 22 South, Range 5 East. Plate 4-1 shows J. Lewis is owner of surface; 4.3.1 lists Robert Lewis.

Section 6, Township 23 South, Range 6 East. Sections 4.3.1 and 4.3.2 do not list the state as owner of surface and coal of SW¼ NW¼ as indicated on Plates 4-1 and 4-3. Also, addresses of state and federal leasors need to be included in 4.3.1 and 4.3.2.

Response:

Plates 4-1, 4-2, and 4-3 have been corrected. Sections 4.3.1 and 4.3.2 (pages 4-1 through 4-10) have been revised to provide a complete list of names and correct addresses.

Comment: UMC 782.15

UMC 782.15 Right of Entry and Operation Information

(a) The applicant needs to provide the dates of execution of surface leases with private individuals and identify the specific lands to which the documents pertain. The document descriptions must also specifically delineate the legal rights claimed by the applicant.

Response:

Consol has four leases with private individuals which provide certain surface rights. The rights claimed are:

> "the exclusive right to mine and remove all of the coal and the free and uninterrupted right of way into, through and under the said land at such points and in such points and in such manner as may be convenient or necessary for the purpose of all operations in said coal and in the horizons thereof, and the strata above or below the same, and in other coal now owned or leased or hereafter acquired by Lessee, its successors or assigns, including the right to explore, test drill, dig, mine, drain, ventilate, transport and carry away said coal and other materials and other coal and materials now owned or leased or which may hereafter be acquired by Lessee, its successors or assigns, by any mining methods (EXCEPT STRIP MINING) or machinery now or hereafter employed without being required to leave or provide subjacent or sublateral support for the overlying strata or surface or anything therein, thereon or thereunder. Water pipe lines shall be buried by Lessee below plow depth and wherever practicable boreholes and other facilities shall be located near fence and property lines. Lessee shall pay for damage caused by it to the growing crops on the leased premises.

Consol may enter upon the surface of the leased premises for the purposes of investigating, testing and exploring for coal, to provide for mine ventilation and also to conduct vegetation surveys, soil surveys, wildlife surveys, land surveys and to construct subsidence monitoring stations and to perform any other acts as may be required by any local, state or federal law or regulation."

The four leases are:

Lease #211041 Robert T. & Christy R. Lewis, Dated 10/3/74

Beginning at a point 675 feet north of SW corner of NW¼SW¼ Section 30, T225, R6E, thence north 462 feet, thence east 1320 feet thence south 462 feet to Utah State Road Row thence west 1320 feet to POB.

Lease #211042 George Q. & Bertha Olsen, Dated 10/4/74

Beginning at the NW corner of SW¼ of Section 29, T225, R6E thence east 80 rods, thence south 76 rods thence northwesterly 116 rods to POB and SW¼NW¼ of Section 29.

Lease #211054 John S. & Carolyn C. Lewis, Dated 11/12/80

Commencing 20 rods south of the NW corner of the southwest quarter of Section 29 T22S, R6E, and running thence south 60 rods; thence east 80 rods thence north 20 rods; thence northwesterly to the place of beginning.

Lease #211055 Randall D. Jensen & Delana R. Close, Dated 12/17/80 SE¼NE¼ Section 29, T22S, R6E.

Comment: UMC 783.14

UMC 783.14 Geology Description

The lack of drill log data makes it difficult to assess in detail the geologic setting of the operation. Drill log data should be provided in sufficient detail to answer the following concern:

1. To evaluate the accuracy of the cross-sections which have been submitted drill logs for holes used in constructing the cross-sections should be provided.

Response:

Copies of drill log summaries for all holes used in constructing the geologic cross sections are provided. These summaries provide lithologic and stratigraphic information for each drill hole which

has been obtained through review and interpretation of driller's log, electric logs, and coring information.

Comment: UMC 783.14

2. It is not possible to tell in most instances on which strata the chemical testing was done. Some of the holes sampled for analysis are shown on the cross-sections, but this identification is not complete.

Response:

Plates 6-2 through 6-7 have been revised to show all geochemical test holes contained within each cross-section. For each geochemical test hole, the sampled interval has been shown on the cross-section. In addition, a table has been prepared which lists lithology and stratigraphy of geochemically tested intervals for each hole.

Comment: UMC 783.14

3. Drill log data should be submitted in sufficient detail to identify the location of the outcrop of the Ferron Sandstone. Preferably the top of the outcrop of the sandstone unit should be shown on a map and drill logs used to develop this map supplied. This information is needed to be able to more accurately describe potential impacts of mining on the hydrologic system since the Ferron Sandstone will be substantially altered by mining (see related questions under UMC 783.15 and 784.14).

Response:

A geologic map (Plate 6-30) originally prepared for the surface mine permit application has been modified to supply information necessary for the prediction of hydrologic impacts within and adjacent to the proposed underground mine permit area. This map shows surficial geology within these areas including the Bluegate Shale, Ferron Sandstone, and Tununk Shale members of the Mancos Shale Formation; and, Quaternary alluvial and terrace deposits. Also, the approximate subcrop of the Ferron Sandstone within alluvial deposits is shown as established using available drill hole information and interpolation between Bluegate Shale and Ferron Sandstone outcrop areas. In addition, the map shows the surveyed locations of recently completed alluvial monitoring wells along Quitchupah Creek (RDA Series) and along Christiansen Wash (SM1 Series).

Drill log data for exploration drill holes used to establish the Ferron Sandstone subcrop have been provided along with borehole logs of the alluvial monitor wells.

Comment: UMC 783.14

Plate 7-8 indicates that coarse Quaternary deposits are present

throughout much of the permit area and may form shallow unconfined aquifers. However, with the exception of cross-section A-A', none of these deposits are shown on the cross-section. The applicant should clarify this apparent discrepancy.

Response:

The aforementioned surficial geology map was used along with available lithologic information from exploration drill holes to define the depth and extent of alluvial and terrace deposits within each cross-section. This information has been shown on the revised cross-sections (Plates 6-2 through 6-7).

Comment: UMC 783.14

The text states in 6.6.1 that lineaments and "highly jointed areas" may create roof control problems and that these areas have been mapped by Consol from aerial photographs. This information should be correlated with enhancement of subsidence impacts and groundwater inflows if possible. If there is any correlation, a copy of the map should be provided.

Response:

The Emery Mine was used as one of three case studies in a paper presented at the 73rd Annual Convention of the Mine Inspectors' Institute of America, Springfield, Illinois, June 19-22, 1983. The paper was Application of Remote Imagery Lineaments for Underground Coal Mines. by D. L. McCain and S. A. Cotten, Conoco, Inc., R & D Dept., Coal Research Division, Ponca City, Oklahoma. A copy of the paper is provided with this ACR response.

The authors made five conclusions from their study:

1. "Linear features from all images can reflect potential areas of ground control problems in underground mines, but this certainly is not true in every case."

2. "Verification of linear features must be made using ground observations."

3. "Potential ground stability problems associated with linears should be considered in light of local geologic conditions and predominant stresses."

4. "Until encountered underground, the actual effect of the linear-related structure is unknown."

5. "The uncertainity in linear-interpretation and variability of geologic conditions preclude establishment of blanket requirements for extraordinary roof control measures near linear features."

In describing conditions at the Emery Mine, the authors note:

"All the lineaments which pass over the mine do not or cannot affect the roof condition of the mine because for the most part, the mine has excellent roof. Above the mine, a major sandstone member of the geologic sequence which is exposed in Quitchupah Creek and Christiansen Wash [i.e., the Ferron Sandstone] shows numerous joints which have no direct bearing on unstable roof in the mine below."

In an effort to determine which lineaments may have been related to poor roof conditions, the authors made three assumptions:

1. The surface fracture zones which reach the coal seam and influence roof condition were produced by the same tectonic stresses which produced the Joes Valley-Paradise fault zone and therefore would be manifested as fracture zones at 30-degree angles to the fault line.

2. The deep fractures are likely to be water filled.

3. Unstable roof is most likely to occur where the linears are closely spaced or intersect.

After an analysis using these assumptions, they state that "unstable roof occurs in limited areas near parallel or intersection fractures, some of which are revealed by image analysis. Furthermore, bad roof areas in the west mains correlate well with a cluster of lineaments seen on the Sky Lab and aircraft photos primarily because the fracture zone thus represented is filled with groundwater." The west main to which the authors refer is "Old Main West". Although this area exhibits poor roof conditions, there has been no evidence of subsidence or unusual groundwater inflows.

Mine personnel have identified three unusually high long term groundwater inflow areas. All three are associated with major roof falls. These areas are shown on the attached figure (Figure 6-3). In addition to these three roof fall areas, there are three other major roof fall areas which have not produced unusually high groundwater inflows (generally, inflows increase in roof fall areas, but not to the degree exhibited in three major inflow areas). Of the six major roof fall areas, three occurred under areas where there are lineament features: Old Main West, 7th North, and 2nd Right. The three others occurred under areas where there are no lineament features: 6th South, 2nd East, and 3rd East.

Of the three water inflow areas, two are under areas with lineament features (7th North and 2nd Right) and one is not (2nd East) indicating, at best, a weak correlation between water inflow and lineaments. Any correlation is further weakened by the fact that the Old Main West roof fall areas did not produce unusually high inflows although they are under a cluster of lineament features which apparently are "filled with groundwater".

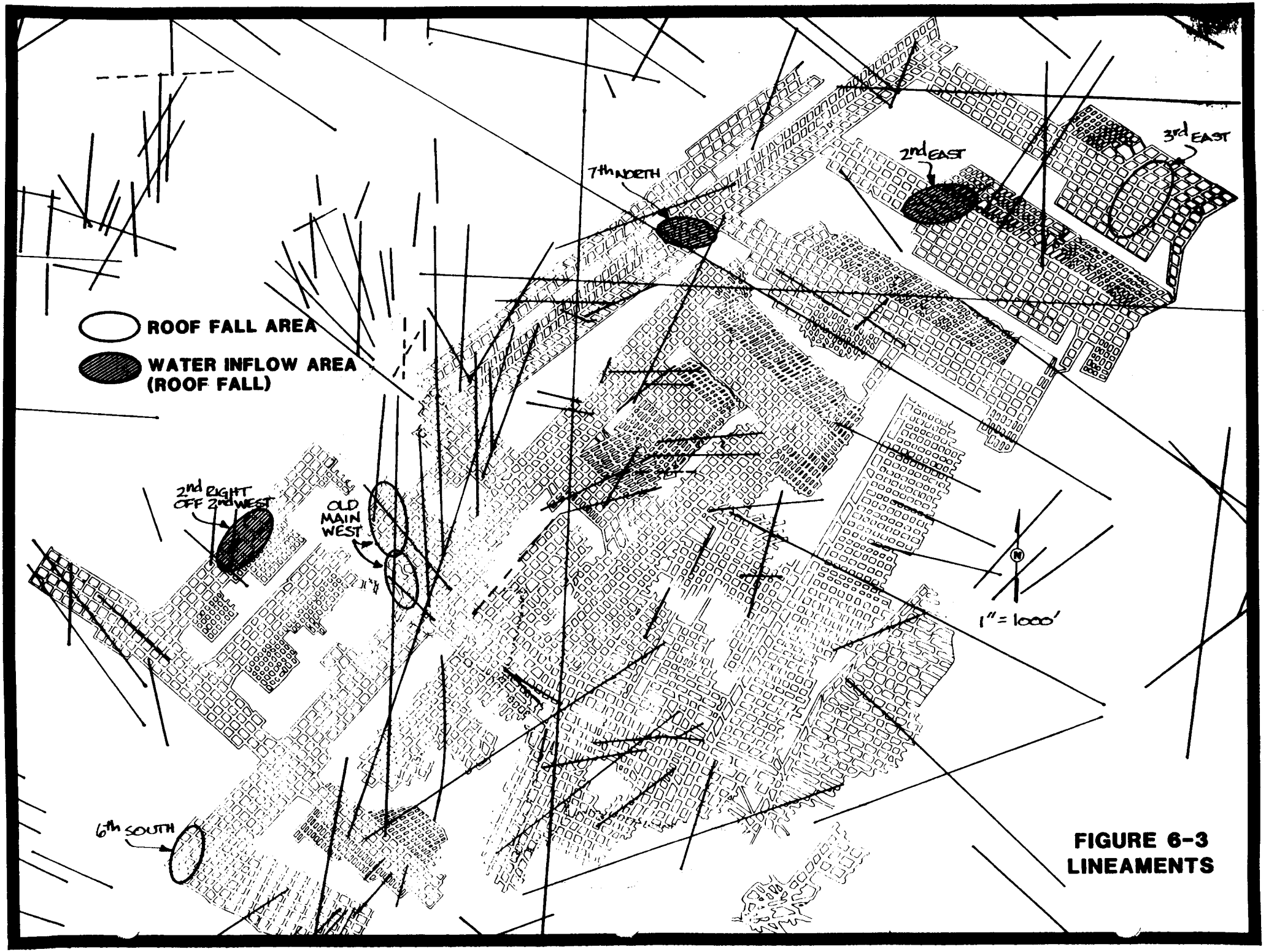


FIGURE 6-3
LINEAMENTS

Similarly, subsidence areas are not correlated with lineament features. Measurable subsidence has occurred in association with the 2nd Right and 2nd East roof fall areas and may possibly be occurring over the 3rd East roof fall area. The 2nd Right area is lineament associated, but the other two are not.

As indicated by the authors of the above quoted paper, and as demonstrated at the Emery Mine, linear features as mapped on the surface can reflect potential areas of geologic problems in underground mines, however until encountered underground, the actual effect of linear-related structures will remain unknown.

Comment: UMC 783.14

The applicant should identify on Plate 6-1 the location of the drill holes which were sampled for chemical analysis. Due to the number of holes drilled, it is difficult at best to locate any of these holes. The sampling which was done should be representative of the conditions to be encountered during mining and a reasonable distribution of samples should have been collected. In particular, coal seams, partings, and roof and floor rock should have been sampled to determine the potential for water quality degradation.

Response:

All geochemical test holes have been identified on Plate 6-1. A total of 24 geochemical test holes were drilled, of which 15 are within the proposed permit area. The strata tested includes roof, coal seam, parting, and floor material.

Comment: UMC 783.15

UMC 783.15 Ground Water Information

The discharge characteristics of the Upper Ferron Sandstone have not been adequately described by the applicant so that hydrologic impacts can be assessed. The discharge of groundwater to the alluvium in the creeks was not adequately evaluated. The value cited of .4 cfs was derived by USGS for a proposed surface mine and incorporated a reduction in flow to the alluvium due to drawdown by the mine. Also, this evaluation assumes that seepage from the Ferron occurs only downstream of the mine. Since the Ferron is located above the underground workings and apparently forms the cliff above the portals, it would be reasonable to assume that the discharge would occur where the Ferron was dissected by Christiansen Wash, just upstream of the surface facilities and to a certain extent in Quitchupah Creek. Therefore, the applicant should reevaluate the potential drawdown effects of mining on the streams. A map showing the outcrop of the Ferron would delineate where the discharge could be occurring had water not already been intercepted by mining. This would then show where discharges can be expected once mining is completed and the water levels reestablished. Figure 7-2 is not adequate to depict this because of the overlay of the Quaternary deposits.

Response:

The USGS used a three-dimensional finite-difference computer model of the Ferron sandstone aquifer to simulate groundwater flow in the vicinity of the Emery Underground Mine. The model was calibrated in a steady-state simulation using water levels and manmade discharges from the aquifer that were measured during 1979. As such, groundwater rates obtained from the use of the digital model provide the best available estimates of recharge and discharge quantities within the Emery Mine area.

The most significant discharges from the Ferron sandstone aquifer with respect to the potential effects of the Emery Underground Mine include: mine discharge, discharge to alluvium, discharge at springs, and well discharge.

As noted previously in the repermit application, groundwater of the upper Ferron sandstone aquifer seeps or flows into the mine and is discharged via pump to a sedimentation pond. During the period July, 1980 to March, 1982 the average discharge from this pond to an unnamed tributary of Quitchupah Creek was 0.6 cfs. During the period April, 1982 to April, 1983 average discharge from the pond increased to 1.2 cfs owing to a roof fall in the underground mine.

Discharge to alluvium occurs from the entire Ferron sandstone aquifer at various locations within the general mine area. The aforementioned USGS digital model simulated discharge to alluvium along an approximate 2.5 mile segment of Muddy Creek approximately 1 mile north of Miller Canyon along Muddy Creek, along an approximate 1.75 mile segment of Ivie Creek approximately 1.5 miles west of its confluence with Quitchupah Creek, along the approximate 1.5 mile reach of Christiansen Wash before its confluence with Quitchupah Creek, and along Quitchupah Creek just north and approximately 0.5 miles south of the Christiansen Wash confluence.

Discharges to alluvium along Christiansen Wash and Quitchupah Creek are most pertinent to the potential effects of mining. Along the aforementioned reaches of these streams, the Ferron sandstone subcrops beneath alluvium or is exposed on dipslopes adjacent to alluvium. Discharge to alluvium could occur by downward movement of groundwater within the Ferron sandstone to the alluvium or by subsurface outflow where the hydraulic head in the Ferron sandstone is greater than that within the alluvium. That portion of the discharge contributed from the outcrop will not be affected by underground mining. The portion derived from subsurface outflow will likely be affected by mining. However, considering that total calibrated discharge to alluvium from the entire Ferron sandstone aquifer from all locations within the general mine area was 0.4 cfs, it is likely that the flow derived from subsurface outflow from the upper Ferron sandstone aquifer along Christiansen Wash and Quitchupah Creek is less than 0.1 cfs. The interruption of such a small quantity of alluvial recharge water is not expected to noticeably affect either the quantity or quality of surface water within Christiansen Wash or Quitchupah Creek. Furthermore, no

surface water rights exist on Quitchupah Creek between the confluences of Christiansen Wash and Ivie Creek, nor do they exist on Ivie Creek between the Quitchupah Creek and Muddy Creek confluences.

With regard to the request that Consol provide a map of the Ferron sandstone outcrop, Consol has revised the surficial geology map prepared for the surface mine permit application. This map shows the Ferron sandstone outcrop and also its subcrop beneath alluvium along Quitchupah Creek and Christiansen Wash, areas where discharge to alluvium would be expected to be reestablished after mining.

Two springs are known to discharge from the Ferron sandstone aquifer within the general mine area and are shown on the surficial geology map. Spring SP-15 is believed to discharge from the upper Ferron sandstone aquifer and is appropriated for 0.1 cfs by Merlin Christiansen for stockwatering purposes. In 1979 the USGS recorded a flow of 6 gpm at this spring site. This spring is not expected to be affected by underground mining. Spring SP-16 is believed to discharge from the lower Ferron sandstone and is unappropriated. The USGS also measured the discharge of this spring in 1979 and found it to be issuing at 5 gpm. Likewise, this spring is not expected to be affected by underground mining.

Within the general mine area, well discharges from the Ferron sandstone aquifer include the Emery municipal well (approximately 90 gpm) and the Bryant and Lewis wells (approximately 30 gpm each). The Bryant and Lewis wells have been affected by underground mining in that they no longer flow at the land surface. Consol has furnished and installed pumps and surface ancillary facilities in order to replace these water supplies. No further effects to these wells are anticipated owing to present mining operations nor is any effect expected on the Emery municipal well.

Comment: UMC 783.15

On page 3-49 of the permit application, the applicant mentioned that additional wells had been put in and were to be monitored for water levels and water quality. If possible, this information should be incorporated into the permit application and interpreted as to mining impacts on the groundwater hydrology.

Response:

The additional wells referred to on page 3-49 were installed in September 1979 and data from them were included in the permit application through September 1980. It was decided at a meeting at Consol in Denver on September 13, 1983 between representatives of Consol, Richardson and Associates, OSM, and the Utah OGM, that sufficient information was available to predict mining effects on the groundwater hydrology.

Comment: UMC 783.15

In the ACR response for the preparation facility, well data for several wells which were monitored for water levels was submitted. However, the well identification was missing from the top of the page. The wells should be identified and located on a map if not already done so.

Response:

The wells referred to are the six refuse disposal area (RDA) monitoring wells installed in Quitchupah Creek alluvium in the N½ of Section 32, T225, R6E. Well data for these wells is supplied along with this ACR response and their surveyed locations are shown on the surficial geology map (Plate 6-30).

Comment: UMC 783.16

UMC 783.16 Surface Water Information

The applicant should quantify the relative contributions to stream flow by irrigation return flows (direct and through seepage), aquifer discharge and overland flow. Without this information on a seasonal basis, an evaluation of the surface water impacts cannot be performed.

Response:

Section 7.2.3.2 of the underground repermit application discussed streamflow and water quality variations within the general mine area on a seasonal basis. It was noted in this section that a wide assortment of natural and man-made influences affect the streamflow and water quality of Quitchupah Creek and Christiansen Wash. These influences significantly complicate their precise quantification and their study is beyond our scope. As noted in the aforementioned meeting of September 13, 1983, the Bureau of Reclamation has initiated a salinity study within the Dirty Devil River Unit which includes the Quitchupah Creek, Christiansen Wash, Ivie Creek, and Muddy Creek watersheds within the general mine area. Preliminary information is available from this study to quantify the relative contributions of salinity from natural runoff, irrigation drainage, and underground mine discharge sources within the general mine area.

A Public Involvement Newsletter for the Dirty Devil River Unit Study (Bureau of Reclamation, 1983) quantified salinity by gaging station within the Dirty Devil River Unit. The gaging station on Muddy Creek below Interstate 70 (I-70), which receives inflow from Quitchupah Creek, Christiansen Wash, and Ivie Creek represented 20% of the total Dirty Devil River Unit salinity. The sources of this salinity included natural runoff, irrigation drainage, and coal mine discharge. Coal mine discharge, according to this newsletter, accounted for less than 1% of the total Dirty Devil basin salinity

or less than 5% of the salinity at the gaging station at Muddy Creek below I-70.

Additional data are available from the Bureau of Reclamation study and from Consol mine discharge records with which to evaluate the relative contributions of salinity within the general mine area. The average salt discharge at Muddy Creek below I-70 for the period 1973 to 1982 was 26,700 tons/yr. Based on USGS and USBR flow and quality measurements the estimated salt load entering the Emery irrigated area is 15,800 tons/yr. which is mostly low TDS influent water. The difference between the incoming and outgoing salt loads, including a 1,100 ton/yr. out-of-basin diversion, indicates a salt pick-up of 12,000 tons/yr. in the Emery irrigated area and surrounding natural resource lands. This figure includes underground mine water discharge.

As previously noted, the average mine discharge for the period July, 1980 to March, 1982 was 0.6 cfs. The average TDS for this same period was 3964 mg/l which equates to an average salt load contribution of 2,336 tons/yr. This represents 9% of the average annual total salt load at Muddy Creek below I-70 and 19% of the average annual salt load pick-up in the Emery irrigated area. The remaining 81% of average annual salt load pick-up is primarily owing to irrigated agriculture with minor contribution from natural runoff. On a seasonal basis, salt load pick-up from irrigation return flow would be expected to predominate during late spring, summer, and early fall, whereas mine discharge and natural runoff would be expected to predominate during late fall, winter, and early spring.

Comment: UMC 783.16

Section 7.2.7 (referenced on page 7-158) is missing and should be provided.

Response:

The reference to "7.2.7" was a typographical error, it should be "7.2.6".

Comment: UMC 783.19

UMC 783.19 Vegetation Information

The applicant should provide a map that overlays vegetation types over disturbed and proposed disturbed areas. This was done for the preparation plant but not the mine area.

What is the source for the statement "14 threatened or endangered plant species are reported for Emery County?" What is the source for the report that S. Wrightiae is from the area?

Response:

Plate 9-1 has been revised to include previously disturbed areas and proposed disturbance areas.

The following document was the source for endangered plants:

USDI-BLM 1979. Reclaimability Analysis of the Emery coal field. Emery, Utah. EMRIA Report No. 16. Refer to page 125 for species list and page 126 for a species distribution map of the Emery area.

Comment: UMC 783.20

UMC 783.20 Fish and Wildlife Resources

(b) On page 10-15, Part 10.2.4, a more detailed description of consultation with appropriate agencies should be included, such as names of individuals and the date of contact (see UMC 771.23][d]).

The Wildlife Map 10-1, Appendix A, should include permit area boundaries and indicate areas of disturbance.

A description of the methods used to determine the values of prairie dogs as a prey species from predatory birds and mammals as discussed on page 10-=12, should be included.

Response:

Individuals contacted are:

Utah Division of Wildlife Resources (UDWR)

Larry B. Dalton
UDWR Wildlife Biologist
455 West Railroad Ave.
Box 840 Price, Utah 84501

Albert F. Regenthal
UDWR Wildlife Program Coordinator
1596 West North Temple
Salt Lake City, Utah 84116

Phil Wagner
UDWR State Raptor Biologist
1596 West North Temple
Salt Lake City, Utah 84116

USDI - Bureau of Land Management (BLM)

David Mills
Bureau of Land Management
Price River Resource Area
900 N. 700 E.
Price, Utah 84501

Sam Rawley
Bureau of Land Management
San Rafael Resource Area
P. O. Drawer AB
Price, Utah 84501

Larry Maxfield and Paul Sawyer
Biologists - BLM
Richfield District
150 E. 900 N.
Richfield, Utah 84701

USDA - Forest Service

John Erickson
USDA - Forest Service
Manti-LaSal National Forest
Ferron, Utah 84523

USDA - Soil Conservation Service (SCS)

Staff Biologist
Soil Conservation Service
Castle Dale, Utah 84513

Plate 10-1 has been revised to show the permit boundary, previously disturbed areas, and proposed disturbance areas.

At the Emery site, evidence of predation on prairie dogs was noted during surveys of colonies discussed on page 11. As quoted from page 62, "Coyote tracks were commonly recorded in prairie dog towns." While observing prairie dog towns as discussed on page 11, raptor species were observed hunting prairie dogs. Observations are documented in Table 10-19 and stated on page 88. The published literature has also documented the fact that prairie dog remains are quite common in eagle nests found in areas where prairie dogs occur.

Comment: UMC 783.22

UMC 783.22 Land-Use Information

Since the applicant is proposing to reclaim the surface facilities in part as rangeland, the grazing conditions, capacities and productivity of the existing lands must be described to provide a comparison with the postmining land-use.

Response:

The land area within the mine disturbance boundary is classified as native rangeland and is used primarily for livestock grazing and wildlife. The rangeland within this area is in "fair" range condition. There are six rangeland vegetation types found within the mine disturbance boundary, plus an additional category called

"disturbed area". The six vegetation types are listed below in order of their significance as far as the amount of area disturbed. Other pertinent descriptive data taken from the premining inventory is also listed.

Rangeland Vegetation Type	Total Production Lbs./Acre	Total Vegetation Cover	Major Species
greaswood (most common type)	1,400	24%*	greasewood
mixed desert shrubland	340	10%	shadscale
annual forb	183	6%	wildbuckwheat
Rock outcrop/talus	insignificant	insignificant	skunkbrush sumac
riparian shrubland	322	20%*	tamarisk
riparian meadow (least common type)	1,152	45%	alkali muhly

* herbaceous cover only

Only one of the six rangeland vegetation types is considered to be of much quality for grazing livestock, that being the riparian meadow. However, this type makes up a very small area within the mine disturbance boundary. Most of the sites are populated by unpalatable or only marginally palatable plant species and are also low in total productivity, thus having low grazing capacities.

Comment: UMC 783.25

UMC 783.25 Cross-sections, Maps and Plans

(a) The applicant should provide elevations of the drill holes for which drill logs will be submitted.

Response:

The drill log summaries for the geologic cross-sections provided with this response contain drill hole elevations.

Comment: UMC 784.11(b)(1)

UMC 784.11 Operation Plan: General Requirements

(b)(1) An analysis should be provided on the feasibility of reclaiming the evaporation lagoon. If significant salts have accumulated in that area, will it be possible to reclaim the site? If the soil in the bottom of the lagoon is toxic to the growth of plants, the applicant must provide plans for covering of that soil with suitable growth medium or removal and disposal. If this becomes necessary, costs for this activity must be included in the bond amount.

Response:

An inspection of the evaporation lagoon revealed that ponding in

the lagoon has been limited to an approximate 2500 square feet low spot in the 30,000 square feet bed of the lagoon. An analysis of the soils in the 2500 square feet ponding area has shown that salts have accumulated to a level that can be considered toxic. The remaining 27,500 square feet area shows no evidence of ponding or salt accumulation and supports the indigenous plant species of the area.

For bonding purposes we have used a 7000 square foot area as being toxic. This material will be removed to a depth of four feet and hauled to the refuse disposal area. This is approximately 1000 cubic yards and will be a negligible contribution to the 700,000 cubic yard refuse disposal area.

A portion of the lagoon embankment (1000 cubic yards) will be used to backfill the area from which the toxic material is removed. The remaining embankment material (approximately 2675 cubic yards) will be used as foundation fill for the preparation plant.

Comment: UMC 784.11(b)(3)

(b)(3) Coal handling and storage areas are discussed in Section 3.2.4, however, the applicant must also include a discussion of maintenance of these facilities.

For the reclamation of the coal handling and storage areas, the applicant must show either how coal will be removed from the site and be properly disposed of, or if coal will be left in these areas; i.e., material left on the base of the areas mixed with overburden and not able to be utilized; the applicant must show that the coal will be covered with four feet of material unless testing shows that less material can be utilized. If the coal is to be hauled out, the applicant must show how much material is involved, where it will be disposed of and that the disposal area meets the requirements of the regulations. The cost associated with this activity must be included in the bond amount.

Response:

Maintenance of the coal handling and storage areas occurs daily using a loader to clean up spillage from loading and unloading coal. When coal is added to a stockpile or storage area, the coal is compacted in order to minimize the chance of fire.

Prior to reclamation, the coal that can not be sold will be removed from the coal handling and storage areas. The coal will be placed in the abandoned underground workings under a disposal plan developed at that time and approved by MSHA and DOGM. If requested by MSHA, the coal will be placed in a side panel and the side panel will be sealed after all the coal has been removed from the surface. If areas of coal are encountered which are greater than four feet in depth, the coal will be removed to a depth of four feet and covered by a minimum of four feet of non-toxic fill material. Material obtained during the removal of the road

embankments will be used as backfill for these areas. It is difficult to predict how much coal will be hauled into the mine during reclamation since the depth will vary. For bond estimation purposes, it has been assumed that it will be necessary to remove an average of one foot of material over the entire facilities area. Multiplying the one foot of removal by the 24 acre facility area results in a total of 39,527 cu yds of removal. A total of $67,195 have been included in the bond estimate for the removal of coal from the facility area.

Comment: UMC 784.12(a)

UMC 784.12 Operation Plan: Existing Structures

(a) The applicant shall provide plans and calculations for drainage structures associated with mine yard roads if any other than those shown on Plate 13-5 exist. The applicant shall also provide a general description of the construction and materials of the mine yard roads in Section 3.2.3.42 of the permit application.

Response:

There are no other drainage structures associated with the mine yard roads other than those shown on Plate 13-5. The roads are constructed of materials located in the mine area. These roads are flat with no ditches. The exceptions are from the mine gate to the bottom of the hill, a section of about 150 feet, and the approaches to the Quitchupah Creek crossing, a section of about 400 feet. The section of road starting at the gate up to the mine yard is an asphalt paved road and is approximately 700 feet in length. The mine yard itself has about a 6 inch lift of gravel. The road crossing Quitchupah Creek has a sand and gravel base. The road leading to the portals has no base and was built from materials in that area.

Comment: UMC 784.13(a)

UMC 784.13 Reclamation Plan: General Requirements

(a) Plate 3-7 indicates that there will be a new portal developed in this permit term. If this is the case, then sufficient information must be supplied by the applicant on this area to show compliance with Subchapter K.

Response:

At the time the application was developed it was anticipated that a new portal would be necessary during the permit term. Because of reduced market conditions, the new portal will not be necessary during the permit term. If market conditions improve during the permit term such that a new portal is necessary, a permit modification will be requested which will contain sufficient information to show compliance with Subchapter K.

Comment: UMC 784.13(a)

The applicant must provide statements of compliance with UMC 817.131 and that signs will be constructed and used as per the requirements of UMC 817.11.

Response:

(UMC 817.131)

In areas which there are no current operations, but operations are to be resumed under an approved permit, the surface access openings to underground operations will be effectively supported and maintained and surface facilities will be secured. The provisions of the approved permit will be followed during any period of temporary abandonment. In the event that mining and reclamation operations are to be temporarily ceased for a period of 30 days or more, Consol shall provide to the Division, the notice and information as required in UMC 817.131(b).

(UMC 817.11)

During the permit term, signs and markers which conform to local laws and regulations and are constructed of durable material will be posted and maintained. The signs and markers will be easily seen and read and be of uniform design. The signs and markers will include the following:

1. Mine and permit identification signs will be displayed at each point of access from public roads to areas of surface operations and facilities on permit areas. These identification signs will show the name, business address, telephone number and identification number of the current regulatory program permit authorizing the mining activities.

2. Perimeter markers will clearly mark the perimeter of the areas affected by surface operations or facilities before beginning mining activities.

3. Buffer zone markers will be placed along streams when required by Section UMC 817.57 and shall be clearly marked to prevent disturbance of the stream by surface operations and facilities.

4. Blasting signs which state "Warning - Explosives In Use" will be placed at entrances to the areas of surface operations where surface blasting is being used. In addition the immediate vicinity of the blasting activities will be conspicuously flagged or posted as require by Section UMC 817.65(e).

5. Topsoil markers will be placed where topsoil or other vegetation-supporting material is segregated and stockpiled.

Comment: UMC 784.13(b)(2)

(b)(2) The applicant should provide a detailed breakdown of the costs which were developed for the bond estimate. The bond must be estimated assuming that a contractor would be required to do the work. As such contractor fees would have to be added to the bond amount. This estimate should incorporate the following concerns: [listed by item below]

Response:

The following is a detailed breakdown of the costs of the bond estimate. Between the time this application was submitted and the ACR deficiency list, an approval to construct the Preparation Plant and an approval to construct a coal stockpile were obtained from the DOGM. As a part of these approvals, separate performance bond amounts were approved and performance bonds were sent to the DOGM. To avoid double bonding of the prep plant and coal stockpile area, only those areas not bonded in the prep plant and coal stockpile areas have been included in this bond estimate. A separate instrument will be furnished for the approved amount for that portion of the total disturbance area not included in the prep plant bond and the coal stockpile bond. To maintain consistency, the reclamation unit costs used for the previously approved bonds have been used wherever possible. A new map (Plate 15-21) has included which shows the area bonded by the two previously approved bonds and the area included in this bond estimate.

Reclamation Bond Summary

Part I - Removal of Structures		
A,	Building Removal	$ 72,520
B.	Portal Closure	$ 13,768
	Subtotal	$ 86,288
Part II - Regrading		
A.	Pond, Road and Berm Removal	$ 65,212
B.	Backfilling and Grading	$ 72,126
	Subtotal	$137,338
Part III - Revegetation		$ 10,501
Part IV - Well Replacement		$140,000
Part V - Monitoring and Maintenance		
A.	Sediment Ponds	$ 10,000

B.	Reseeding	$ 1,399
C.	Rills and Gulleys	$ 934
D.	Erosion Control	$ 1,231
E.	Vegetation Monitoring	$ 3,539
	Subtotal	$ 17,103

Total Reclamation Cost	$391,230
10% Administrative and Contractual Cost	$ 39,123
Total Bond Amount	$430,353

Comment: UMC 784.13(b)(2)

A detailed breakdown of structures removal costs similar to what was presented in the response to the preparation plant ACR. In addition, the reference(s) utilized to develop these costs should be noted.

Response:

The following is a detailed breakdown of the structure removal cost. The unit costs are from 1981 Means Building Cost Data and were the same used in estimating the prep plant bond amount.

Detailed Breakdown of Bond Estimate

Structure Removal Cost

1. Stacker - Reclaim System
   200 Ft. x 180 Lb./Ft. x Ton/2000 Lb. x $92/Ton = $ 1,656

2. Tipple
   54,000 c.f. x $.14/c.f. = $ 7,560
   175 Ft. x 180 Lb./Ft. x ton/2000 Lb. x $92/Ton = $ 1,449

3. Tipple Control Station
   1000 c.f. x $.14/c.f. = $ 140

4. Stoker Oil Heater
   1500 c.f. x $.14/c.f. = $ 210

5. 100,000 Gallon Water Tank
   13,267 c.f. x $.14/c.f. = $ 1,857

6. Fresh Water Treatment Building
   4500 c.f. x $.14/c.f. = $ 630

7. Warehouse/Office Building
   120,000 Cu. Ft. x $.14/Cu. Ft. = $16,800

8. Bathhouses (3)
   12,000 Cu. Ft. x 3 x $.14/Cu. Ft. = $ 5,040

9.	Foreman's Office Building	
	8,000 Cu. Ft. x $.14/Cu. Ft.	= $ 1,120
10.	Sampling Trailer	
	5,000 Cu. Ft. x $.14/Cu. Ft.	= $ 700
11.	Storage Building	
	1,000 Cu. Ft. x $.14/Cu. Ft.	= $ 140
12.	Storage Trailers (2)	
	5,000 Cu. Ft. x 2 x $.14/Cu. Ft.	= $ 1,400
13.	Shift Change Building	
	6,000 Cu. Ft. x $.14/Cu. Ft.	= $ 840
14.	Tipple Shop	
	5,000 Cu. Ft. x $.14/Cu. Ft.	= $ 700
15.	Spare Office Trailer	
	5,000 Cu. Ft. x $.14/Cu. Ft.	= $ 700
16.	PCB Storage Building	
	1,000 Cu. Ft. x $.14/Cu. Ft.	= $ 140
17.	Mine Fan Building	
	18,000 Cu. Ft. x $.14/Cu. Ft.	= $ 2,520
18.	Mine Substation	
	1,000 Cu. Ft. x $.14/Cu. Ft.	= $ 140
19.	Borehole Pump Facility	
	10 tons x $92/ton	= $ 920
	Sealing Hole	= $ 500
20.	Truck Scales	
	1,000 Cu. Ft. x $.14/Cu. Ft.	= $ 140
	20 tons x $96/ton	= $ 1,920
21.	Explosive Storage	
	300 Cu. Ft. x $.14/Cu. Ft.	= $ 42
22.	Gaging Stations (2)	
	175 Cu. Ft. x 2 x $.14/Cu. Ft.	= $ 49
23.	Sewage Treatment System	
	1,000 Cu. Ft. x $.14/Cu. Ft.	= $ 140
24.	Bridge On Quitchupah Creek	
	Structure Removal	
	50 Cu Yd x $92/Cu Yd	= $ 4,600
	Road Removal -	
	650 LF x 450 Sq Ft/LF x 1 cy yd/27 Cu Ft	

x $1.70/Cu Yd	= $18,467
25. Buried Tank Cleaning and Sealing Lump Sum	= $ 2,000
Total For Structure Removal	= $72,520

Comment: UMC 784.13(b)(2)

The costs for backfilling and grading should show the volume of material to be handled, haul distances, equipment to be utilized and productivity of that equipment, and unit costs on a per yard or per hour basis. References utilized to develop this estimate must be documented.

Response:

A postmining topography map (Plate 15-19) for the total surface disturbance area is included with this submittal. Since the grading work for the prep plant area is included in a separate bond, it is not included in this estimate.

Very little grading will be required in the facilities area to achieve the post-mining topography since the area will remain virtually the same as it now exists. Grading quantities for the removal of the berms, dikes, ponds and roads are shown in the response for item (b)(3). The only other grading which will be required is the removal of the surface material in the facilities area. This will be necessary because during the period of active mining, a portion of the surface has become covered with coal fines. This material will be removed and hauled into the underground mine prior to revegetation. While much of the area will be ready for seedbed preparation after the facilities have been removed, it may be necessary to remove up to four feet of material in some other areas. In the 4 foot removal areas, material will be backfilled to about the existing elevation. The backfill material will come from material excavated from the road fills or from previously disturbed borrow areas. In order to determine a quantity for bond purposes, it is assumed that it will be necessary to remove 1 foot of material from the 24 acre facility area.

A grading unit cost of $1.70/cu. yd. is taken from 1981 Means Building Construction Data. It is assumed that the work will be performed by self-propelled scrapers with an average haul distance of 1,000 ft. at a rate of 95 cubic yards per hour.

24 acres x 43,560 sq.ft./acre x 1 ft. x 1 cu.yd./27 cu.ft.
= 39,527 cu.yds.

39,527 cu.yds. x $1.70/cu.yd. = $67,195

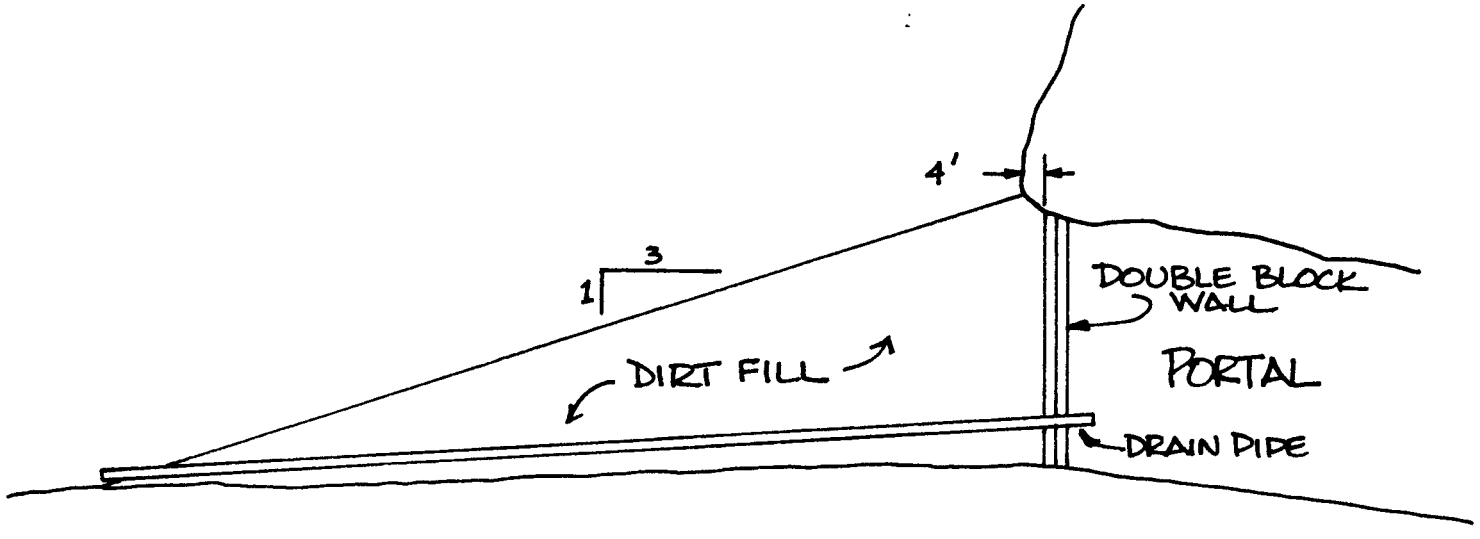
Comment: UMC 784.13(b)(2)

A breakdown of the cost related to closure of the portals must be provided.

Response:

The portals will be sealed with a double concrete block and mortar wall and backfilled with a minimum of 4 feet of fill material. For bond calculation, it is assumed that the wall would be constructed four feet inside the portal opening and the fill material would fill the opening and be sloped at 3:1 from the canyon wall. The concrete block and mortar wall will cost about $6.48/sq. ft. of portal opening and the backfill will cost about $1.70/cu. yd. The portal openings are about 400 sq. ft.

Blockwall; 400 sq. ft. x $6.48/sq. ft.	=	$ 2,592
Backfill 500 yd^3 x $1.70/$yd^3$	=	$ 850
Total Reclamation Cost Per Portal		$ 3,442
4 Portals $3,442 x 4	=	$13,768



Comment: UMC 784.13(b)(2)

The cost which were utilized for each stage of revegetation should be referenced.

Response:

The total area included in this estimate is 32.7 acres. The unit costs were taken from the costs provided by the OGM in the approval of the preparation plant.

Revegetation Costs (32.7 acres)

Seedbed Preparation 32.7 acres x $28.56/acre	=	$ 934
Maintenance Costs 32.7 acres x $28.56/acre	=	$ 934
Seeding Cost 32.7 acres x $170.59/acre	=	$ 5,578
Mulching Cost 32.7 acres x $122.00/acre	=	$ 3,989
Erosion Control 32.7 acres x $37.63/acre	=	$ 1,231
Reseeding 8.2 acres x $170.59/acre	=	$ 1,399
Monitoring 32.7 acres x $108.23/acre	=	$ 3,539
Total Revegetation Cost	=	$17,604

Comment: UMC 784.13(b)(2)

Maintenance costs should be included which consider such costs as repair of rills and gullies, monitoring of sediment pond discharge to determine when the ponds could be removed, maintenance of the ponds if they are to be left in place for a substantial period of time. If these costs are included in the monitoring costs, a detailed breakdown of that cost is needed.

Response:

The unit cost for seedbed preparation has been doubled to allow for the maintenance and repair of rills and gullies. An additional 25% of the seeding cost has been added to allow for any necessary reseeding. Vegetation monitoring costs of $108.23/acre are included with bond estimate.

After mining has been completed it is anticipated that the sedimentation ponds would require rather infrequent discharge sampling and maintenance because of the infrequent precipitation. A lump sum amount of $10,000 has been included for pond sampling and maintenance.

Comment: UMC 784.13(b)(2)

Costs for mitigation of impacts to water wells and impacts resulting from subsidence, if appropriate, must be included in the bond estimate (see comments under UMC 784.14 and 784.20).

Response:

Two water wells may be impacted by mining during this permit term. It is estimated that replacement of the wells will cost about $70,000 each therefore $140,000 has been included in the bond estimate for well replacement.

Comment: UMC 784.13(b)(3)

(b)(3) The applicant must supply contour maps or cross-sections sufficient to show the anticipated final surface configurations required by this part. The amounts of material to be backfilled to close portals and the amount of material to be graded in the sediment pond areas and the roads must be quantified and supporting calculations supplied. This information should be utilized to substantiate the bond amounts.

Response:

A post-mining contour map is included in this submittal (Plate 15-19). The amount of material to be used to close the portals was calculated to be about 500 cubic yards. The amount of material required for regrading the ponds and roads is itemized below.

1. Roadside Berms

   3700 LF x 12 sq ft/LF x 1 cu yd/27 cu ft = 1,644 cu yd

2. Dike Improvement

   400 LF x 600 sq ft/LF x 1 cu yd/27 cu ft = 8,889 cu yd

3. Main Sedimentation Pond

   400 LF x 500 sq ft/LF x 1 cu yd/27 cu ft = 7,407 cu yd

4. Secondary Sedimentation Pond

   100 LF x 150 LF x 5 ft depth x 1 cu yd/27 cu ft = 2,778 cu yd

5. Mine Discharge Sedimentation Pond

   1900 LF x 162 sq ft/LF x 1 cu yd/27 cu ft = 11,400 cu yd

6. Evaporation Lagoon

   775 LF x 93 sq ft/LF x 1 cu yd/27 cu ft = 2,675 cu yd
   Material from bottom of lagoon = 1,000 cu yd

7. Pond Road

   1200 LF x 15 sq ft/LF x 1 cu yd/27 cu ft = 667 cu yd

8. Pump Road

1100 LF x 22.5 sq ft/LF x 1 cu yd/27 cu ft = 917 cu yd

9. Tank Road

2100 LF x 7.5 sq ft/LF x 1 cu yd/27 cu ft = 583 cu yd

10. Mine Yard Roads (except road across the bridge)

3,350 LF x 36 sq ft/LF x 1 cu yd/27 cu ft = 4,467 cu yd

Total Material for Roads, Ponds & Berms = 42,472 cu yd

Total Cost for Regrading the Roads, Pond & Berms
38,360 cu yds x $1.70/cu yd = $72,126

Comment: UMC 784.13(b)(3)

Specific plans for the handling of the material coming from the reclamation of the lagoon must be provided. These plans should show where the material is to be placed, how it will be stabilized and what the water control structures will be.

Response:

See Response to Comment UMC 784.11 (b)(1).

Comment: UMC 784.13(b)(3)

Though the area is fairly flat lying, it may be to the applicant's benefit to grade along the contour where possible to prevent erosion in an area that will be difficult to revegetate. If this is not required, the applicant should provide information as to how grading will occur.

Response:

Slope grading will be performed along the contour where possible in order to minimize soil erosion in reclaimed areas.

Comment: UMC 784.13(b)(4)

(b)(4) Since no topsoil is available from the disturbed areas, the applicant needs to propose substitute material. As per UMC 817.22(e), the applicant must demonstrate that the substitute material is equal to or more suitable for sustaining the vegetation that is the available topsoil and the substitute material is the best available to support the vegetation.

Response:

The majority of the topsoil to be utilized for revegetation on the existing facilities sites will be the original topsoil material that is already there but has been covered up. The gravels and coal materials overlying the original surface will be excavated down to the original topsoil materials that were present before the mine and mine facilities were constructed on the site. The excavated materials will be disposed of the underground workings. The excavation will go down to a maximum of 4 feet. In a few isolated areas the gravels and coal materials may extend beyond this depth, if so, topsoil and dirt materials from the reclaimed road areas will be used as fill materials for this sites. If additional dirt is needed, the existing borrow site will be used.

A revegetation demonstration site will be established in the mine disturbance area. This site will have the undesirable gravels and/or coal materials removed from the surface down to the underlying topsoil layer. The site will be approximately 1/4 of an acre in size and will be planted to a variety of grasses and shrubs. Both seeds and transplants will be used. This demonstration site will be used to show the level of reclamation success that can be expected in the existing facilities area. The plan is currently being developed and will be presented to the DOGM staff for their input prior to field implementation. The Plots will be initiated in the spring of 1984.

Comment: UMC 784.13(b)(5)

(b)(5) The applicant must clarify which seed mixture will be used, those included in Chapter 10, Appendix C, or those in Chapter 3.

Although several seed mixes are proposed for different plant associations, please indicate which mix will be used for each vegetation type that is or will be disturbed.

Alternative species are listed with each seed mix. Specifically, what species will be used? What species will they replace?

It is suggested that the applicant develop new seed mixes, giving consideration to the native species in each vegetation type (as indicated in the vegetation study) and local conditions.

The applicant must provide justification for the use of introduced plant species and show that they are compatible with the plant and animal species of the area as required in UMC 817.112.

Response:

Two seed plans will be used to revegetate the mine disturbance area. Seed Plan A will be utilized to replace the mixed desert shrub, annual forb and rock-outcrop/talus communities disturbed by mining associated activities. Seed Plan B will be used to replace the disturbed acreages of greasewood shrubland and riparian meadow.

Seed Plan A will be seeded in the more arid sites while Seed Plan B will be seeded in the more mesic sites after regrading is completed.

All seeding will be performed by a drill that is specially designed to seed grass and shrub seed, with uniquely constructed seed boxes for handling seeds of a variety of sizes and weights.

Of the 13 species proposed to be utilized in revegetating the disturbance sites, four of them are introduced species: crested wheatgrass, pubescent wheatgrass, Russian wildrye, and alfalfa. None of these species are poisonous or noxious and are compatible with the plant and animal species of the region. These species are necessary to aid in achieving a quick and permanent stabilizing cover that enhances the control of soil erosion. All of these species have been studied in appropriate field trials (most of them extensively) and have demonstrated their ability at establishing effective cover capable of achieving the postmining land use.

SEED PLAN A

Species	lbs. of PLS*/acre	PLS*/sq. ft.
Crested wheatgrass	1.5	6
Indian ricegrass	1.0	4
Alkali sacaton	0.25	10
Western wheatgrass	2.0	6
Winterfat	4.0	5
4-wing saltbrush	4.0	6
Rubber rabbitbrush	1.0	8
Galleta	1.5	5
Totals	15.25	50

SEED PLAN B

Species	lbs. of PLS*/acre	PLS*/sq. ft.
Pubescent wheatgrass	5.0	10
Streambank wheatgrass	2.5	9
Crested wheatgrass	1.5	6
Russian wildrye	2.5	10
4-wing saltbrush	4.0	6
Rubber rabbitbrush	1.0	8
Winterfat	4.0	5
Big sagebrush	0.25	14
Alfalfa	1.0	5
Totals	21.7	73

Comment: UMC 784.13(b)(5)

The 104.2 acres of disturbed area shown on Table 9-2 as "nonaffected areas" should be clarified. If these areas are to be used for the mine operation, they should be included as part of the affected area and assigned to the vegetation community which existed on them prior to disturbance.

Response:

The "disturbed area" acreages shown in this table and on the premine vegetation map appear to have been greasewood shrublands before disturbance. This area is indeed included within the mine disturbance area (affected area) and will be reclaimed as such.

Comment: UMC 784.13(b)(5)

The methods proposed to be used to determine the success of the vegetation as required in UMC 817.116 should be described.

Response:

The vegetation on the reclaimed sites will be monitored at intervals through the liability period. Data will be collected primarily for cover and productivity. Some density measurements may also be taken.

Because the postmining land use is to be rangeland and to be primarily utilized for livestock grazing, productivity and cover will be the measurements used for primary comparisons to the designated vegetative reference areas. These reference areas will be the "mixed desert shrubland" and "greasewood" sites. No comparisons will be made until the last two years of the liability period at the earliest. Reference areas will be managed in a similar manner to the reclamation sites.

Actual measurement techniques to be utilized for obtaining cover and productivity data for comparisons will be submitted to the appropriate regulatory authorities for approval prior to their use.

Comment: UMC 784.13(b)(5)

The applicant should describe the proposed methods for weed control in the revegetated areas.

Response:

The revegetated acreages will be carefully managed for 2 or 3 years after seeding to control weeds, etc., and to ensure that the new vegetation is taking hold. Methods of weed control will probably be selective spraying of weeds by hand with approved herbicides. However, since actual reclamation of these sites will take place years from now, exact methods to be used will depend on the technology that exists at that time. All methods will be submitted

to the appropriate regulatory authority at or near reclamation time for approvals before implementation.

Comment: UMC 784.13(b)(5)

Temporary and contemporaneous reclamation should be addressed by the applicant, including: methods to be employed for seeding and mulching; seed mix(es) to be used for outslopes on dams, embankments, road cuts, etc.; and irrigation and pest (weed) control measures (if used) according to UMC 817.100.

Response:

At present all structures which fit into the contemporaneous reclamation category are already stabilized. However, if any new pond embankments, road cuts, etc. are built in the future, the seed plan for temporarily stabilizing those sites will be as follows:

Species	lbs. of PLS/acre
Crested wheatgrass	3
Streambank wheatgrass	3
Russian wildrye	3
Western wheatgrass	3.5
Yellow sweetclover	1.5
Totals	14.0

If approximate and necessary these sites will also be mulched at 2,000 lbs./acre with straw mulch and crimped in with a straight disk crimper.

Comment: UMC 784.13(b)(5)

As per UMC 817.115, the applicant should include a discussion of grazing management as it pertains to revegetated areas.

Response:

No grazing during the revegetation liability period is anticipated at this time. However if it becomes apparent that grazing will enhance revegetation, a grazing management plan will be submitted for approval prior to implementation.

Comment: UMC 784.13(b)(5)

The applicant must describe the methods to be used in planting and seeding the evaporation lagoon. The applicant must include in the plans for reclamation of the mine discharge sedimentation pond road a discussion of seed bed preparation which includes ripping the roadbed. Also, the applicant must describe the spray and curlex blanketing mulching methods in more detail, and the rate of application of mulching materials should be described for each proposed method, including the straw mulch method.

Response:

Methods for planting and seeding the evaporation lagoon are shown on page 3-54. The species listed on this page will be drilled seeded with a rangeland seeder which is equipped with seed boxes specially designed for seeding native grasses and shrubs. Seedbed preparation, seeding, etc. will be basically the same for the mine discharge sedimentation pond road. This site, however, will be ripped before the seedbed preparation process begins.

Straw mulch will be applied at a rate of 4,000 lbs./acre and anchored to the soil with a straight disk crimper.

If spray mulching or curlex blanketing are used the following information will be applicable:

Spray mulching is better known as hydromulching. This method utilizes a wood fiber mulch and an organic tackifier. The material is blown onto the surface of the affected site. The material is called "Conwed hydro mulch 2,000 fiber" and is mixed with a chemical mulch tackifier. Conwed hydro mulch 2,000 fibers are applied by hydraulic mulching equipment at the rate of 1,500 to 2,000 lbs./acre. The fibers and tackifier are premixed with water before spraying onto the site. This method is generally used to stabilize difficult erosion areas such as steep slopes and drainageways.

Curlex blanketing comes in rolls of a plastic photodegradeble netting attached to a wood fiber mulch blanket. The net and wood fiber roll is rolled out over the affected site and stapled down to hold the soil in place.

Comment: UMC 784.13(b)(5)

Seedbed preparation should include plans for ripping areas that have become compacted as a result of mining activities.

Response:

Ripping will be used as a part of the seedbed preparation process for all areas which have become compacted as a result of mining activities.

Comment: UMC 784.13(b)(5)

As per UMC 817.114, the applicant needs to provide a discussion of mulching and other soil stabilizing practices for all regraded and topsoiled areas, not just to those "with erosion problems." The applicant must also describe the rate of application of the straw mulch.

Response:

Straw mulch will be applied to all reclamation areas following the

regrading and retopsoiling process. The mulch will aid in controlling erosion, promoting germination of seeds, and increasing the moisture retention of the soil. After the mulch is blown onto the disturbed acreages, the mulch will be anchored to the soil with a straight disk crimper. The straw mulch will be applied at a rate of 2,000 lbs./acre on most acreages, however on acreages with higher erosion potentials, the rate will be 4,000 lbs./acre.

Comment: UMC 784.13(b)(7)

(b)(7) The applicant must provide a discussion of the proposed method for disposing of toxic-forming and fire hazard materials, such as waste oil, in addition to other general debris discussed on page 3-14.

Response:

No toxic-forming or fire hazard materials such as waste oil will be disposed in the mine area. These items are temporarily stored in the non-coal waste storage area (See Plate 3-2 for location) and periodically are removed and disposed in an approved private landfill. Coal fines (classed as a fire hazard material are sold as a product of the mine. Coal development wastes are generated in limited quantities during mining (1-3 tons per day). These wastes will be temporarily stored in the temporary coal stockpile area until the refuse disposal area is constructed with the preparation plant or until an alternative disposal area is designed, permitted and constructed.

Comment: UMC 784.13(b)(8)

(b)(8) The methodology for sealing mine entrances is described in 3.5.3.1. The applicant states that "the piezometric surface of the Ferron aquifer is well below the present mine openings; therefore, these openings need only be sealed against entrance of people, wildlife and surface runoff." Once pumping of the mine is terminated, however, this may not be the case, and groundwater could exit through improperly sealed mining openings. This circumstance is made more likely by the fact that the Upper and Lower Ferron aquifers are known contributors of subsurface outflow to Quitchupah Creek and Christiansen Wash (page 7-55). The applicant should re-assess plans for sealing mine opening to preclude disruption of the hydrologic balance, and to comply with performance standards established in Subchapter K.

Response:

Because the groundwater conditions at the time the portal was opened are unknown it cannot be determined for certain whether the upper Ferron Sandstone aquifer would discharge at the mine portal once pumping from the mine is terminated. Should discharge occur, no reasonable structure could be constructed which would preclude discharge at the mine portal. From an environmental effect and mitigation standpoint, it would be more advantageous to concentrate

discharge from the mine using a pipe outflow system at the mine portal. Such a system would allow quantification of discharge and also would allow point characterization of water-quality effluent. Therefore, Consol intends to manage possible effluent at the mine portal using such a piping and monitoring system. Potential discharge concentrated in this manner would be directed to existing sedimentation ponds within the mine facilities area which are operated in accordance with NPDES discharge requirements.

Comment: UMC 784.13(b)(8)

In addition, the applicant needs to describe plans for sealing of boreholes, wells and exploration wells.

Response:

In order to minimize disturbance to the prevailing hydrologic balance and to ensure the safety of people, livestock, wildlife, and machinery in the general mine area, boreholes and exploration drill holes are permanently closed by injecting cement or high-yield bentonitic mud into the opening from the total drilling depth to the land surface. Should any wells be retired from the existing groundwater monitoring plan they will be similarly closed to preclude hydrologic and safety impacts. Casing and well completion materials existing above the land surface associated with retired groundwater monitor wells will be removed.

Comment: UMC 784.14(a)(1)

UMC 784.14 Reclamation Plan: Protection of the Hydrologic Balance

(a)(1) The applicant must provide an analysis of the impacts of Total Dissolved Solids (TDS) loading and other applicable contaminants in both surface and ground waters and submit plans for mitigation of these impacts if necessary. it appears that the water entering the mine is from the Ferron Sandstone and that degradation of the water is occurring in the mine. To be able to assess impacts resulting specifically from mining, the applicant must evaluate the quality of the water in the Upper Ferron upgradient of mining, and then assess the quality of water downgradient of mining. Apparently, contamination of the Ferron Sandstone is occurring due to intercommunication between aquifers in existing wells. The applicant should make an estimate as to the extent of this degradation as compared to the degradation of these aquifers due to well contamination, then the apparent impact of mining is minimized. There appears to be only two wells for which quality data has been collected exclusively in the Upper Ferron and these are located just to the northeast of the mine. Most likely they do not represent the undisturbed condition of the aquifer. As such, unless there are other data available, there is not enough information to assess how the quality of the Ferron Sandstone aquifer is changing as a result of mining and well contamination because there are no data on the quality of the aquifer prior to any disturbance. This issue is critical in determining the life of

mine impacts on the hydrologic system. The mining operation could eventually intercept a significant portion of the water in the Upper Ferron as it moves from the recharge area in the fault zone. The question then becomes what is the effect of discharge from the Ferron Sandstone to the local streams. If the quality in that aquifer is good prior to disturbance, is it serving to dilute the dissolved solids levels in the streams thus enhancing their usefulness? If mining intercepts this water and degrades it to the extent that it apparently has been (the U.S. Geological Survey [USGS] well shows a TDS level of about 900 milligrams per liter [mg/l] while the mine discharge is between 4,000 to 7,000 mg/l), what will be the effect on downstream and downgradient water users? Also, since the undisturbed state of the aquifer is unknown, this difference in quality may even be more significant especially as mining moves closer to the recharge zone and could potentially intercept even higher quality water. This analysis must also include Muddy Creek and Miller Canyon (see related question under [a][3]).

Response:

The above comment on the potential effects of mining on the hydrologic balance addresses both groundwater, surface water, and interrelated groundwater - surface water concerns. For purposes of reply, these concerns will be addressed separately.

Groundwater

As noted in Section 7.1.5.2 of the permit application, water quality degradation of the upper Ferron Sandstone aquifer is possibly owing to the potential for downward leakage of poorer quality water from the overlying Bluegate Shale. Within this section of the permit application, reference was made to degradation of upper Ferron aquifer water by Bluegate Shale water in monitor wells completed, either intentionally or unintentionally, opposite both formations. The primary purpose of this reference was to note that this type of degradation was already occurring by mechanisms unrelated to mining. However, this reference was not intended to imply that degradation from this source was greater than that which could potentially occur to the upper Ferron Sandstone aquifer waters due to mining. Degradation of upper Ferron Sandstone aquifer water within the mine is likely much greater than that which is occurring within any of the few dually or improperly completed monitor wells.

The ACR comment above alludes to a lack of undisturbed upper Ferron aquifer data and also the potential for downgradient water quality degradation within the upper Ferron aquifer. Data from a few wells within the permit area and also data from many underground mine roof fall areas which were sampled from the ceiling represent the undisturbed upper Ferron aquifer water quality. These data were presented in Tables 7-4 and 7-5 of the groundwater portion of the permit application.

With regard to the requested assessment of the effects of mining on the water quality of the upper Ferron aquifer downgradient of mining, none were provided because none were anticipated at the time of the repermit application submittal. Groundwater from the upper Ferron drains into the mine, is collected at sumps and is pumped to a surface sedimentation pond and is finally discharged to Quitchupah Creek. It has been stated within the permit application that water quality deteriorated theretofore within the mine. Since discovery of subsidence some potential exists for degradation within the aquifer downgradient of mining panels located closest to the outcrop. However, little aquifer and no rights exist downgradient of these areas.

In the post-mine situation there is potential for water-quality degradation within the upper Ferron in mined and caved zones after water-level recovery. However, this is expected to be tempered by the dilution effect of better quality recharge water. No groundwater rights exist within the potentially affected area during the 5-year permit term.

As far as the lower and middle Ferron are concerned, a fairly uniform shale floor material impedes downward seepage of mine water into these lower formations.

Surface Water

Groundwater which enters the mine from the upper Ferron aquifer is on the order of 750 to 1,250 mg/l TDS concentration (Tables 7-4 and 7-5). As previously noted, the average annual salt loading to surface water within the general mine area from the mine discharge for the period July 1980 to March 1982 was 2,336 tons/year. During the period April 1982 to April 1983 average annual salt loading increased to 3,577 tons/year due to increased flow into the mine. It should be noted that the average TDS value associated with the higher flow was reduced to 2,967 mg/l, down from an average of 3,964 mg/l during lower flow. The average annual discharge associated with the lower TDS value was 1.2 cfs. Average annual mine discharge is expected to increase over the 5 - year permit term as follows (see response to UMC 784.14 c):

Year	Predicted Average Annual Mine Discharge (CFS)
1984	1.5
1985	1.8
1986	2.4
1987	2.2
1988	1.9

It is unreasonable to expect that TDS concentration will be inversely proportional to mine discharge. Considering mine discharge and TDS data over the period July 1980 to April 1983, an

approximate doubling of the mine discharge rate has produced an approximate one-quarter reduction in TDS concentration of the mine discharge water. Taking this line of reasoning, predicted TDS values associated with the expected mine inflow rates over the 5 - year permit term are as follows:

Year	Predicted Average Annual Mine Discharge TDS Concentration (mg/l)
1984	2,600
1985	2,400
1986	2,250
1987	2,300
1988	2,350

Predicted average annual salt loads associated with the aforementioned predicted values of mine discharge and TDS concentration for the 5 - year permit term are then:

Year	Predicted Average Annual Mine Discharge Salt Load (Tons/Year)
1984	3,850
1985	4,250
1986	5,300
1987	5,000
1988	4,400

Assuming that average annual salt loading from other sources (natural runoff and irrigation return) remains relatively constant during the 5 - year permit term within the general mine area, the average annual salt load contribution from the mine discharge at Muddy Creek below I-70 would be expected to increase from 9% (contribution during period July 1980 to March 1982) to as much as 18% over the 5 - year permit term (see response to UMC 783.16). The contribution of mining to the average annual salt load pick up in the Emery irrigated area would likewise increase from 19% to as much as 35% within the 5 - year permit term. Irrigated agriculture and natural runoff would still be the primary contributors of salt to Muddy Creek below I-70 over the 5 - year permit term. No water rights exist downstream of the mine discharge point on Quitchupah Creek nor do they exist on Ivie Creek between the Quitchupah Creek and Muddy Creek confluences. As such, no effect on downstream water users is possible on these streams.

With regard to potential trace constituent contamination of surface water owing to the mine discharge water, it was stated on page 7-82 of the permit application that only a few of the trace elements which were sampled for were present in concentrations above the analytical detection limit and that these posed no water quality hazard.

Groundwater - Surface Water Interrelationships

The discharge characteristics of the Ferron Sandstone aquifer have been expanded upon in the response to UMC 783.15. It was noted that discharge to Quitchupah Creek and Christiansen Wash within the permit area via subsurface outflow from the upper Ferron aquifer is likely less than 0.1 cfs. This water first discharges to poor quality alluvial groundwater which in turn must discharge to streams in order to contribute base flow. Considering the small quantity of subsurface outflow to alluvium, the poor quality of alluvial receiving waters, and the lack of surface water rights downstream of the discharge locations, it is doubtful that the temporary interruption of discharge of the upper Ferron aquifer to alluvium will have any noticeable effect on the water quality of streamflow within Quitchupah Creek or Christiansen Wash.

As noted in the permit application underground mining is not expected to affect the discharge (6 gpm) of the spring which issues from the upper Ferron aquifer in Miller Canyon. As such, no impacts are predicted along Miller Canyon nor on Muddy Creek between the confluences of Miller Canyon and Ivie Creek. Likewise, the spring which issues from the lower Ferron aquifer along Muddy Creek north of Miller Canyon is not anticipated to be affected by mining.

Comment: UMC 784.14(a)(2)

(a)(2) Given that there is no assessment of the effects of degraded Quitchupah Creek waters on Ivie Creek, the impacts to water users (along Ivie and Muddy creeks) must be quantified or the applicant must justify why this should not be required. According to page 7-163, there are no surface water rights on or immediately adjacent to the mine area, but no information is given as to the presence of water rights on Ivie and Muddy creeks. If there are such rights, there is a potential for serious water quality impacts which must be addressed.

Response:

No surface water rights exist on Ivie Creek between the confluence of Quitchupah Creek and the confluence of Ivie Creek with Muddy Creek. As such, impact to water users is not possible.

Muddy Creek below I-70 is considered to be beyond the "surface water adjacent area" of the proposed permit area owing to the significantly greater streamflow of Muddy Creek at this location as compared to that of Ivie Creek. Muddy Creek north of I-70 is included in the "surface water adjacent area" primarily due to the fact that Ivie Creek empties into it at this location and Ivie Creek in turn is the receiving water for Quitchupah Creek. Below Miller Canyon and above I-70 on Muddy Creek, mining would have virtually no potential effect on surface water excepting potential discontinuance of discharge of the spring which discharges from the upper Ferron aquifer at the head of Miller Canyon. As noted in the

permit application and in previous responses, underground mining within the 5 - year permit term is not expected to affect the discharge (6 gpm) of the above spring.

For background purposes, it should be noted that Miller Canyon drains, almost entirely, lands irrigated by Muddy Creek diversion waters southeast of Emery and that these waters comprise the bulk of the flow within Miller Canyon. Clearly, irrigated agriculture is the most significant source of streamflow and water quality effects within Miller Canyon, and thus is also the most significant source of any other effects that these discharges have downstream of Miller Canyon on Muddy Creek.

Consol has researched surface water rights on Muddy Creek and Ivie Creek as requested and has found the following surface water rights to exist; all are on Muddy Creek:

Appropriator	Quantity (cfs)	Location	Use
Marion Mortensen	3.0	SW¼S36,T22S,R6E	Irrigation
Lyle Anderson	2.3	NW¼S1,T23S,R6E	Irrigation
Lloyd Jensen	2.5	SW¼S12,T23S,R6E	Irrigation

No effect on these surface water users is anticipated due to mining.

Comment: UMC 784.14(a)(2)

The applicant must provide more specific plans as to the replacement of the wells which will most likely be impacted by mining. This should include plans for redrilling the wells or other alternatives as appropriate.

Response:

Two water-supply wells were identified in the permit application that could be affected by underground mining; the Bryant well and the Lewis well. As previously noted in the response to UMC 783.15, these wells have been affected by mining in that they ceased to flow at the land surface. Consol has furnished and installed pumps and surface ancillary facilities to replace these water supplies to the owner's satisfaction. No further discontinuance of water supply is anticipated at these wells, however, for bond purposes under the ACR comment of UMC 784.13b(2) Consol has assumed that new wells would be required. These wells would be completed in the lower portion of the Ferron Sandstone, a unit which supplies substantial quantities of good quality groundwater within the Emery area, particularly near the Joe's Valley-Paradise fault zone. These wells would likely be 800 to 900 foot deep.

Comment: UMC 784.14(a)(3)

(a)(3) A quantitative impact analysis must be provided concerning

the quantity of surface and groundwater which will be depleted in areas within and adjacent to the mine plan area particularly as it applies to agricultural production for the life of mine. If groundwater recharge to the creeks, seeps and springs is severly depleted, and assuming this represents the base flow or part of the flow in the creeks, how will this affect water quality, wildlife and aquatic habitats and water use. This analysis should include Quitchupah Creek downstream of the mine, Ivie Creek, Muddy Creek and water flows in Miller Canyon. It is not clear that Muddy Creek and Miller Creek are beyond the influence of mining because according to Plate 7-4, they are possibly recharged by the Upper Ferron. Ground water diverted to the mine may deplete flows in these areas. Effects of the flow reduction in Muddy Creek should be assessed under normal and low flow conditions.

Response:

Surface water is not used in the operation of the Emery Mine. Therefore, there will be no surface water depletion per se within and adjacent to the mine plan area.

In previous responses under UMC 783.15, UMC 783.16, and UMC 784.14, the disruption of discharge from the upper Ferron aquifer to alluvium of the Quitchupah Creek and Christiansen Wash watersheds within the mine area was quantified based on the USGS model calibration and the relative effects of this disruption were discussed. This disruption is not expected to affect water quality, wildlife, aquatic habitats, or water use along Quitchupah Creek downstream of the mine, Ivie Creek, Muddy Creek, or within Miller Canyon.

The potential effects of mining on Miller Canyon and Muddy Creek have been discussed under UMC 784.14(a)(2).

In the meeting of September 13, 1983 the principal source of recharge to alluvial groundwater systems within the mine area was stated to be irrigation return flow seepage. Water-quality data for alluvial monitor wells (SM1 and RDA series) are provided with this submittal. Their locations are shown on the surficial geology map (Plate 6-30). They indicate large water quality variation and exceedingly high TDS concentrations (SM1-3 greater than 30,000 mg/l) indicative of irrigation return waters which have been influenced to various degrees by flow across and/or seepage through saline geologic materials.

Comment: UMC 784.14(b)(1)

(b)(1) In Section 3.4.3.2 of the application, the applicant states that mining will be conducted so as to minimize water level declines. Specifically what does the applicant intend to do to minimize this impact.

Response:

As noted in the meeting of September 13, 1983 Consol wishes to delete this statement from the permit application.

Comment: UMC 784.14(b)(1)

The applicant has not adequately dealt with one part of the surface water control plan: the berms around the yard area. The narrative in Section 3.2.3.39 must be expanded to explain that some of the facility area runoff does not flow into a sediment pond, but is held in catchment areas adjacent to the berms as shown on Plate 13.3. In addition, that plate should clearly show that runoff from the stockpile area cannot flow into Quitchupah Creek, as it appears that there is a break in the berm section where that could possibly happen.

Response:

The water from near the office area and the truck scale area does not flow into a sediment pond but instead flows into a catchment area west of the office.

Plates 13-3 and 13-4 has been revised to show all the berms of the yard and stockpile area. This shows that runoff does not flow into Quitchupah Creek.

Comment: UMC 784.14(b)(1)

Drawings showing surface water control structures are generally adequate with the exception that plans for the mine discharge pond were not provided so that the design adequacy of the operation and reclamation plan for this structure can be evaluated.

Response:

A plan view and cross sections of the as-built pond have been added (Plate 13-5a).

The design storage volume for the pond is 19.3 acre-feet. The design flows are 1,401,150 gallons per day at a retention time of 36 hours. This results in an actual storage of 6.4 acre-feet with 12.9 acre-feet remaining for sediment and expansion. Due to sediment buildup since construction in 1976 the storage available is now 16.1 acre-feet. Excluding any future sediment buildup the pond is presently capable of treating flows up to 3,500,000 gallons per day using the same 36 hour retention time. Present flows average 800,000 gallons per day.

The pond was constructed in the late fall of 1976. Since the pond began discharging there have been 140 determinations of total suspended solids (TSS) for the pond's discharge. Of those samples, the maximum TSS is 44 mg/l, the mean TSS is 10.6 mg/l, and the median TSS value is 8 mg/l. Ninety-five percent of all TSS

determinations have been below 35 mg/l, ninety percent have been below 23 mg/l, and more than seventy-five percent have been below 15 mg/l.

Comment: UMC 784.14(b)(1)

A plan for disposing of sediment cleaned out of the ponds and stored above pond 3 should be provided for final reclamation and included in Section 3.5.3.3 of the permit application.

Response:

Most of the sediment will be used during the reclamation of pond 3 since this is an incised structure. If additional room is needed, the sediment will be placed in the coal storage area west of the office warehouse. The material will be placed in uniform layers and will be stabilized by compaction.

Comment:

Quantitative analyses for runoff, sediment volume and effluent limits are provided in Chapter 13. The choice of K factor (.35) should be further documented to show that it is reasonable for disturbed areas and stockpiles in the pond watersheds. The background calculations and the numbers provided for L and S as used in the USLE equation must be clearly referenced to a map showing surface drainage and disturbed areas. L and S should not be computed for the drainage basin slope, but rather for the landslope within the drainage basin. Thus, the L and S factor may increase substantially and significantly affect the gross erosion estimate. Additionally, the applicant should provide the 1:200 map mentioned on page 13-32.

Response:

A K value of 0.35 is a fairly conservative number which has been chosen for disturbed areas which have no documentation. Two references were checked to support this value.

The first is "Applied Hydrology and Sedimentology for Disturbed Areas", by Barfield, Warner, and Haan. Most of the disturbed areas are graveled with coal fines mixed in. K values for gravel, fine to moderately fine is 0.24 and for gravel medium to moderately coarse is 0.49. The average of these values is 0.365 therefore 0.35 is viable.

The second reference is "Preliminary Guidance for Estimating Erosion on Areas Disturbed by Surface Mining Activities in the Interior Western United States", by the EPA, July 1977 Edition. This states "generally, however, soil classification used for erosion prediction have been largely subjective and have only relative rankings." and also, " . . . the erodibility factor has been directly measured for only a few soils."

A check was made of the LS factors used in generating the designs for the existing ponds. The value for the Main Pond was found to be similar and for the Secondary Pond the value used for the design was found to be extremely conservative.

Plate 13-1 "Surface Control and Water Management Facilities" (scale: 1 inch = 500 feet), can be used in lieu of the referenced map on page 13-32.

Comment: UMC 784.14(b)(1)

The applicant must clarify that the sediment pond slide gate will be closed at all times until decanting is required. Otherwise, detention time calculations given on page 13-49 shall be expanded to minimum detention time required to achieve effluent limitations. To show this, the applicant may need to provide inflow/outflow hydrographs.

Response:

The sediment pond slide gate will be closed at all times except when the pond is being dewatered.

Comment: UMC 784.14(b)(3)

(b)(3) Based upon the above discussions and the response that the applicant provides as to the significance of these concerns, the groundwater monitoring plan may need to be revised.

Response:

The scope and nature of the existing groundwater monitoring plan were discussed with DOGM at a meeting on September 13, 1983. It was decided that this plan is adequate to determine the effects of underground mining within the area targeted for mining within the 5-year permit term.

Comment: UMC 784.14(c)

(c) The applicant should reevaluate the quantity of groundwater which will enter the mine as operations continue. The following factors should be incorporated into the analysis:

1. increase in the fracturing of the roof material to the Ferron Sandstone due to retreat mining and increase overburden depths; and

2. increase in the hydraulic head of water in the Ferron Sandstone.

Both of these factors would lead to an increase in the quantity of flow into the mine. Extrapolation of groundwater inflows in the existing mine may not be valid.

Response:

The quantity of groundwater which will enter the mine as operations continue has been reevaluated using the CONOSIM model which was developed by the Coal Research Division of the Research and Development Department of Conoco Inc. CONOSIM is a fully three-dimensional and coupled model with the capability of handling transient groundwater movement in a double-porosity medium with two fluids flowing simultaneously and/or preferentially. The model has the versatility of handling a wide range of problems and mining conditions (including fracturing and caving of roof material) and has the capability of simulating both complex and dynamic mine configurations and hydraulic head relationships.

The groundwater inflows that were generated using this model after incorporating into it the above factors are as follows:

Year	Average Ground-Water Inflow (cfs)
1984	1.5
1985	1.8
1986	2.4
1987	2.2
1988	1.9

These results show that as mining progresses toward the recharge zone, the inflow is expected to increase from its current average rate of 1.2 cfs to a peak 2.4 cfs. Following this peak, inflow will steadily decline and the expected average inflow after 5 years of mining will be about 1.9 cfs.

Comment: UMC 784.20

UMC 784.20 Subsidence Control Plan

On page 12-4 of the permit application, Consol states that on-going analyses were being conducted in the areas of subsidence and groundwater hydrology. If that investigation has been completed, it should be submitted. Also, if there is any additional subsidence data which has been collected since the permit application was completed, this should also be submitted.

The subsidence discussion does not clearly indicate that the pillar stumps that will be left to support the roof and prevent surface subsidence will be stable in the long-term. An analysis of this issue should be provided as it could be reasonably expected that these stumps will deteriorate and fail, subsiding the surface. This type of subsidence could be expected to create differential settlement on the surface and disrupt irrigation flows. If data are used from old sections of the operation in an analysis of this issue, comparison of the extraction ratio, seam depth and thickness, and coal and overburden characteristics between the areas should be made. If it cannot be shown that these pillars

will be stable in the long-term, then the applicant must submit information required by (c) and (d) of this part. If necessary, the cost of mitigation of impacts must be included in the bond amount.

The area that the applicant intends to leave whole pillars to protect surface structures and streams should be defined by the expected angle of draw. This angle may define an area where retreat mining should not occur which is greater than the one pillar width that the applicant intends to leave. An operations map should be provided showing where these pillars are to be left.

Response:

The Geotechnical (subsidence) section of the permit application (Chapter 12.0) has been completely revised.

As referenced in the ACR under UMC 784.20, Consol stated in the permit application that on-going analyses were being conducted in the areas of subsidence and groundwater hydrology. Specifically, this reference was made to on-going computer modeling efforts to predict mine inflow rates and drawdown effects for the upper Ferron Sandstone aquifer over the 5-year permit term assuming no subsidence. Beyond this, the documented model used to simulate the above parameters was one which had to be significantly modified to represent the natural hydrogeologic conditions at the Emery Mine. It was decided that this model was inadequate to simulate hydrogeologic response at the Emery Mine. Subsequently, the aforementioned CONOSIM model developed by the Coal Research Department of Conoco, Inc. was used. The predicted mine inflow rates associated with the use of this model are presented under the ACR response to UMC 784.14(c).

At the time of preparation of the repermit application, partial extraction mining had not caused subsidence at the Emery Mine. However, Consol has since found that surface subsidence has occurred and believes that additional subsidence may result from proposed partial pillaring mining practices. Accordingly, the anticipated effects of subsidence on groundwater renewable resources and agricultural land renewable resources which are dependent upon surface water for irrigation are presented. Owing to the complexities of predicting the exact physical effects of subsidence in the subsurface (fracture zone and caving height) and on the surface (occurrence of cracking if any, and the amount of vertical displacement), the following qualitative effects are theroized based on information presented in the revised chapter 12 (Geotechnical Information) which is submitted as a part of this ACR response.

Groundwater

Where overlain by the Bluegate Shale, the upper Ferron Sandstone aquifer extends from the base of the Bluegate to the base of the I zone coal complex and comprises an 80 to 100 foot zone of sandstone

and siltstone separated by interbeds of carbonaceous shale, mudstone, and/or coal. The overlying Bluegate Shale ranges from 0 feet at the Ferron outcrop to as much as 800 feet near the western permit boundary and is comprised of saline, bluish gray mudstone and siltstone with some sandstone interbeds. The Bluegate Shale largely serves to confine water within the upper Ferron Sandstone, however, near the outcrop of the upper Ferron Sandstone where the overlying Bluegate Shale is thin and weathered, the Bluegate contains groundwater which can naturally communicate with water within the upper Ferron Sandstone aquifer. Further down from the outcrop, it is possible that tectonically-produced fractures within the Bluegate Shale may contain small quantities of groundwater which may be in communication with the upper Ferron Sandstone. Where the Bluegate Shale is unexposed at the surface within the permit area, it is overlain by varying thickness of unconsolidated alluvial and pediment gravel materials. Maximum known thickness of alluvium within the permit boundary occurs within the valley of Quitchupah Creek in the NE¼ of Section 32 and is on the order of 75 feet. Groundwater depths within alluvium range from a few to as much as 30 feet.

Partial pillar removal during mining is expected to produce erratic cave zones above the mined-out I coal seam which are anticipated to produce fracturing and rubbilization of strata up to as much as 200 to 300 feet above the mined-out zone. These effects will increase permeability within the upper Ferron Sandstone within the rubble collapse zone and change ground-water movement within the aquifer and direct it towards the mine workings. As previously noted, Consol has predicted new mine inflow rates which take into account increased permeability owing to caving. In the long term, permeability values within the caved portions of the upper Ferron Sandstone are expected to decrease from the maximum value obtained when caving occurred to values that are still above those which existed in the aquifer prior to disturbance (Aston and Singh, 1983). After water level recovery from mining, this would produce differential zones within the aquifer which would have higher groundwater flow rates than existed prior to disturbance which would in turn locally alter original potentiometric surfaces within the aquifer. However, following disturbance by mining groundwater would be expected to move from the unaltered recharge zone located to the west toward discharge locations along the upper Ferron outcrop as in the premining condition.

As noted previously, the portion of the upper Ferron aquifer above the I coal zone averages about 80 feet throughout the permit area. In that caving could reach heights on the order of 200 to 300 feet it is possible that a portion of the Bluegate Shale could also be fractured and rubbilized during lower strata failure, however there is some argument that it will deform plastically (see revised Chapter 12). Should rubblization of the Bluegate Shale occur, it would lead to increased hydraulic communication between the upper Ferron aquifer and the Bluegate Shale over that which existed prior to disturbance. Prior to disturbance hydraulic head within the upper Ferron aquifer was above that of the Bluegate Shale.

Lowering of hydraulic head within the upper Ferron aquifer below that in the Bluegate due to discharge from the mine coupled with possible increased fracturing within the Bluegate could further enhance downward movement of poor quality groundwater from the Bluegate into the upper Ferron during mining. However, in that quantities of groundwater in fractures within the Bluegate are thought to be small and localized, this potential degradational effect on the groundwater of the upper Ferron is also expected to be minor and localized. Furthermore, should the Bluegate deform plastically for the most part, this potential effect will be reduced in scope. After mining, hydraulic head within the upper Ferron aquifer would be expected to rise above that of the Bluegate to its premining condition and preclude downward leakage of poor quality Bluegate water in the long term.

In areas where the depth of cover is greater than 200 but less than 300 feet and the overburden includes the upper Ferron aquifer, weathered Bluegate Shale, and saturated Quaternary alluvium or pediment deposits, rubblization could potentially occur through the Bluegate Shale and produce some potential for downward movement of alluvial and Bluegate water through the rubbilized zone and into the mine. This would serve to lower alluvial and Bluegate groundwater levels and mix lower quality groundwater with upper Ferron aquifer groundwater within the mine. For the most part, areas with this condition have already been mined by lower extraction methods and are not subject to caving. Some partial pillaring has occurred under areas that meet this condition, namely 1st right panel off of 2nd west submain and also 3rd east panel off of 7 north submain. There is a possibility that one Bluegate monitor well (AA-BG) may have been influenced in this manner, however, its water level has been erratic since its completion, well before any known land subsidence at the mine. Alluvial groundwater levels in wells on the other hand, have shown no sharp lowering or downward water trend since the completion. Therefore, the occurrence of this potential effect of mining is indeterminate at this time and will be evaluated as part of the on-going groundwater monitoring program.

Agricultural Land

Surface subsidence occurrence, control, and mitigation methods are discussed in the revised Geotechnical Information chapter of the permit application. Two areas of flood-irrigated agricultural land have been affected to date by surface subsidence. These include a field of J. Jensen in the NE¼ of Section 28, T22S, R6E and a field of J. Lewis in the SE¼ of the SW¼ of Section 29, T22S, R6E which may be an actively flood-irrigated AVF area. Both of these occurrences of surface subsidence have been at the extreme lower portions of their fields and therefore they have not affected their farming activities significantly.

Additional non-AVF agricultural lands which may possibly be affected by surface land subsidence over the 5-year permit term are listed in the table below. Those non-AVF lands farthest

downgradient along the watersheds of Christiansen Wash and Quitchupah Creek to the north of the mine facilities area are subject to the maximum potential subsidence while those furthest removed to the north within the permit area are subject to least potential subsidence (Plate 8).

Non-AVF Irrigated Lands
Potentially Affected by Land Subsidence
Over the 5-Year Permit Term

Surface Land Owner*
J. Jensen
Cedar Ridge (Secs. 28 and 29)
M. Jensen
W. Staley
E. Jensen
J. Lewis (NE¼NE¼ Sec. 29)
L. Anderson
Dewey Jensen
R. Anderson
R. Jensen
E. Bryant (Sec. 29)
D. Jensen
J. Mangum
Cedar Ridge (Sec. 20)
B. Wilson
G. & M. Anderson

* See Plate 4-1 (Permit Area Surface Ownership) for land location.

The majority of the non-AVF potentially affected irrigated lands occur within the lower reaches of the Christiansen Wash watershed. Owing to the proposed protection of perennial streams, the fact that only local depressions are expected to form as a result of surface subsidence, and the proposed mitigation measures, only temporary alteration of surface drainage patterns is anticipated.

Aston, T. R. C. and Singh, R. N., "A Reappraisal of Investigations into Strata Permeability Changes Associated with Longwall Mining", International Journal of Mine Water, Vol. 2, No. 1, March, 1983.

Comment: UMC 784.20

The Cultural Resources survey submitted in the ACR response for the preparation plant shows a study area which does not include the entire area overlying the underground workings. If there are structures which can be considered Cultural Resources, then protection of these structures must be addressed.

Response:

Prior to mining below areas that have not been surveyed for

cultural resources, the surface will be surveyed for structures. If a structure is present, the structure will be inspected by a competent archaeologist. If the archaeologist determines that the structure is a cultural resource, then a report will be submitted to the DOGM and the Division of State History. This report will contain a description of the structure and a recommendation as to the structure's historical significance. If the reviewing agencies find that the structure is a significant resource, then a plan will be submitted to either protect or mitigate the site. Mining will not occur beneath the site until approval has been obtained from the necessary regulatory agencies.

Comment: AVF

PRELIMINARY ALLUVIAL VALLEY FLOOR DETERMINATION

Within the Emery Mine plan area and adjacent lands, several streams exist which may qualify as Alluvial Valley Floors (AVF). These streams are: Quitchupah Creek, Christiansen Wash, Muddy Creek and Ivie Creek. The preliminary AVF findings for each of these streams are outlined below. Included with each is a justification as to why the finding was made. If a finding could not be made, a discussion explaining the circumstances is included.

Quitchupah Creek

A positive AVF determination is made for all portions of Quitchupah Creek, above the confluence with Christiansen Wash. The applicant contends that Quitchupah Creek is not an AVF on the basis that:

irrigation waters are not supplied solely from Quitchupah Creek;

the quality of Quitchupah Creek water would pose a salinity hazard if used alone; and

Storage facilities would be required to provide sufficient water for agricultural purposes.

The applicant's contentions are not sufficient to allow a negative AVF determination to be made. Although it is true that the irrigation waters diverted from Quitchupah Creek are vastly supplemented from the Muddy Creek diversions, there is sufficient water available in Quitchupah Creek alone to support irrigation. If the Muddy Creek waters were not available, Quitchupah Creek could probably support several hundred acres of flood irrigation activities, based on a mean annual water yield of 1,800 acre-feet. The areas irrigated by Quitchupah Creek alone would, therefore, not be as large as the irrigated area shown on Plate 8 of the application; however, it still would be of sufficient size to justify a positive AVF finding.

Quitchupah Creek is also being exclusively utilized for flood irrigation, contrary to the applicant's contentions. As shown on Plate 8 of the permit application, 100+ acres are being irrigated (without the use of storage facilities) in an alluvial area approximately two miles upstream from the permit boundary. This demonstrates that it is a regional practice to utilize water solely from Quitchupah Creek. In lieu of other information, this fact also shows that the water quality of Quitchupah in this area is adequate for irrigation use, and that irrigation activities can be established without the use of storage facilities.

At this time, a definitive finding cannot be made for the lower portion of Quitchupah Creek, below the confluence with Christiansen Wash. In this area, the terrain becomes more rugged, and as a consequence, the alluvial deposits are much more limited than what occurs above Christiansen Wash. No agricultural activities were identified in this area. The deposits are of sufficient width and

areal extent to qualify as potential AVF (page 1-5, OSM June 11, 1980 Alluvial Valley Floor Guidelines). However, it is unknown to what degree the lands in this area are flood irrigable, consistent with regional practice in the area. In order to demonstrate that the lands are not flood irrigable, the applicant must show that there is no regional precedence to practice flood irrigation on valley floor lands of similar physical condition to those encountered along Quitchupah Creek below Christiansen Wash.

The assumption can be made that irrigation activities have been confined to the areas above Christiansen Wash because of the large abundance of relatively flat bottom lands and pediment lands located north of the confluence. This can be readily seen on Plate 8 of the permit application. However, if these lands were not available, or if there were to be a change in land use in the areas above Christiansen Wash such that irrigation practices were not feasible, then it can also be assumed that the lands below the confluence along Quitchupah Creek would become much more attractive for agricultural purposes. The alluvial land along Quitchupah Creek below the confluence with Christiansen Wash must, therefore, be viewed as a potential AVF. A negative determination cannot be made at this time. Given the physical characteristics of lower Quitchupah Creek, a negative determination can only be made if it is shown that regionally, there is no precedence to utilize valley floor lands of similar size and condition. Such a regional inventory should consider those lands within several counties or tens of miles about the permit area (OSM June 11, 1980 OSM Guidelines). This information has not been provided in the permit application.

Muddy Creek

A positive AVF finding is made for Muddy Creek, at all areas shown on Plate 8 of the permit application where unconsolidated stream laid deposits are present. The positive finding is made on the basis of established agricultural activities, sufficient water

availability activities and sufficient areal extent of alluvial deposits. Muddy Creek also exhibits the highest overall water quality of the streams in the study area. Mean specific conductivity values above Emery are around 0.405 mmhos/cm, with a range of 0.198 to 0.264 mmhos/cm. This information is based on five samples. Downstream, the water quality degrades to the point where the mean specific conductivity value is 2.99 mmhos/cm at the Muddy Creek - Ivie Creek confluence. Muddy Creek is in part fed by Miller Canyon, a spring-fed tributary of Muddy Creek which may be subject to water loss as a result of drawdown in the Ferron Sandstone. The applicant must provide information regarding the importance of Miller Canyon water to the established agricultural activities located downstream of the Miller Canyon - Muddy Creek confluence, and on the nature of impacts which could occur in the Miller Canyon watershed.

Ivie Creek

A definitive finding cannot be made for Ivie Creek, although it is likely that Ivie Creek is also a potential AVF. The findings for Ivie Creek are analogous to those listed for lower Quitchupah Creek. In order to demonstrate that Ivie Creek is not an AVF, the applicant must show that it is not a regional practice to utilize similarly sized land parcels for irrigation. On the basis of size criteria, the alluvial lands along Ivie Creek quality for further consideration as potential AVF.

No agricultural activities exist along Ivie Creek in the study area. However, as explained for lower Quitchupah Creek, it may be feasible to utilize the alluvial lands along Ivie Creek for agricultural purposes if the more attractive lands above the confluence of Christiansen Wash and Quitchupah Creek were not available. Lack of agricultural activities along Ivie Creek, therefore, does not constitute proof that such activities are not possible.

The water quality of Ivie Creek is on the poor side and generally would not be recommended for irrigation under ordinary conditions, on the basis of very high salinity. Four water quality samples obtained from Ivie Creek showed mean specific conductance levels for 3.27 mmhos/cm. The range was 2.03 to 4.19 mmhos/cm. The applicant should, however, address the water quality of irrigation waters used in the region, in an effort to identify if irrigation is practiced using similar quality water. If there is a regional precedence to utilize similar quality water, then a negative AVF determination cannot be made on the basis of water quality alone.

Ivie Creek is generally out of the area which could be impacted by mining, with the exception of receiving water discharges routed through lower Quitchupah Creek. A positive AVF finding for Ivie Creek should not prove to be a barrier to mining, provided the applicant quantifies impacts to Ivie Creek as a result of mine water discharge, and adequately demonstrates that the impact is not significant.

Christiansen Wash

Although Christiansen Wash is the smallest drainage in the study area, it presents the most complex situation regarding an AVF determination. The wash traverses the irrigated lands which are fed by water diverted from Muddy Creek. No water, however, has historically been diverted directly from the Christiansen Wash channel. Christiansen Wash, therefore, does not present the same type of situation which exists along Quitchupah Creek whereby Quitchupah Creek waters are utilized contemporaneously with Muddy Creek irrigation waters. In order to make an AVF determination, one must analyze the Christiansen Wash AVF characteristics separately, as if the Muddy Creek diversion were not being utilized. Unfortunately, the flow characteristics and quality of Christiansen Wash are greatly influenced by irrigation return flows from the Muddy Creek irrigation water, so the characteristics of Christiansen Wash under natural conditions are generally unknown.

Christiansen Wash drains an area of 11 square miles, which is approximately 2.6 percent of the drainage area of Quitchupah Creek (415 sq. mi.). Both streams are perennial. Assuming that the overall basin yields are comparable, Christiansen Wash should, under natural conditions, yield approximately 47 acre-feet of water (2.6 percent of Quitchupah Creek's mean annual yield of 1,800

acre-feet). Given the four acre-feet/acre irrigation demands of the region, Christiansen Wash would be able to support, at a maximum, an area of only 11 acres in size, assuming that the total flow for the year would be available. This approach is also thought to be relatively conservative, since the majority of the Quitchupah Creek watershed exists in the upper reaches of the Wasatch Plateau, where higher amounts of precipitation would be expected. The same is not true for Christiansen Wash. Given this, the mean annual flow for Christiansen Wash under natural conditions should be slightly less than 47 acre-feet.

This information, coupled with the fact that Christiansen Wash has never been historically diverted for irrigation use, indicates that Christiansen Wash does not possess any AVF characteristics which may be considered significant. Given the AVF size criteria alone, Christiansen Wash would most likely not qualify as an AVF. The final declaration should consider regional practices; however, the preponderance of information indicates that Christiansen Wash is not an AVF.

Summary

Four perennial streams exist in the Emery Mine study area: Quitchupah Creek; Muddy Creek; Ivie Creek; and, Christiansen Wash. Both Quitchupah Creek and Christiansen Wash traverse through the permit area, Muddy Creek and Ivie Creek are located in the adjacent lands. Quitchupah Creek and Christiansen Wash are, therefore, subject to the greatest potential impact.

A positive AVF determination is made for Muddy Creek and upper sections of Quitchupah Creek, above the Quitchupah Creek - Christiansen Wash confluence. A positive determination is made on the basis of sufficient water availability, areal extent of alluvial deposits, and established artificial flood irrigation activities.

A potential AVF determination is made for lower Quitchupah Creek (below the Christiansen Wash confluence) and for Ivie Creek. Neither site is currently being utilized for agricultural activities within the study area. Both areas present less attractive conditions than those which exist in the upper portion of Quitchupah Creek, due to a much more limited extent of alluvium, and steeper topography. However, it appears both areas could be utilized for agricultural activities if necessary, and the extent of the deposits do meet the AVF size criteria. An assessment of regional practices would be necessary to make a final AVF determination.

A negative AVF determination is proposed for Christiansen Wash. Christiansen Wash has never been utilized for irrigation activities, and generally would not be able to support a land area compatible with the AVF size criteria. A review of regional practices should be performed prior to making the final determination.

Information Requested from the Applicant

The applicant should provide an assessment of regional irrigation practices, to determine if there is a regional precedence to utilize similarly sized alluvial lands possessing analogous biologic, geologic, soils and hydrologic characteristics as exist along lower Quitchupah and Ivie creeks. A negative determination cannot be made without this information. The scope and areal extent of the survey must be consistent with Part I of the OSM June 11, 1980 Alluvial Valley Floor Guidelines. In lieu of this information, a positive AVF determination can be supported.

If a positive determination is made for both lower Quitchupah Creek and Ivie Creek, the information requested in the ACR (under impacts to the hydrologic balance) will be sufficient to also address AVF impacts. The same holds true for Muddy Creek and Upper Quitchupah Creek. As a result, there is no need to request further information for AVF impacts at this time.

Response:

Preliminary Alluvial Valley Floor (AVF) Determination

At the meeting of September 13, 1983 between representatives of the OGM, OSM, Richardson and Associates, and Consol it was decided that Consol should provide the requested assessment of regional irrigation practices by the October 7, 1983 critical path date for permit application approval. To this end Consol contracted Mr. Dan

Kimball of Kaman Tempo Corporation. Kaman Tempo's report is provided and addresses regional irrigation practices in Emery and Carbon counties in central Utah. This report also presents additional information with respect to the AVF characteristics of the subject drainages and utilizes this information along with the identified regional irrigation practices to make AVF determinations. It should be noted that any AVF boundaries and acreages referred to in this response are considered preliminary and may be subject to change based on more detailed study of soils, water availability, local irrigation practice, and topographic information.

Operation of the Emery Mine is "grandfathered" under the existing Utah and Federal laws and regulations for mining in or adjacent to alluvial floors. Justification of "grandfathering" is through the following points:

- The Emery Mine has been producing coal in commerical quantities since 1975.

- Substantial and significant financial commitments were made prior to August 3, 1977, predicated on the applicants' ability to mine coal within and adjacent to an alluvial valley floor.

These commitments are based on, and evidenced by, the Notice of Intention to Commence Mining Operations and the Mining and Reclamation Plan dated June 16, 1977 and as recognized in R. W. Daniels, DOGM, letter to Consol dated May 11, 1978. The applicant requests that the Utah Division of Oil, Gas and Mining make a specific finding that the Emery Mine is "grandfathered for continued operation in and adjacent to an alluvial valley floor as provided by the laws and regulations.

The results of the most recent AVF investigations for each stream or reach of stream discussed in the ACR are summarized below.

Quitchupah Creek Above the Confluence of Christiansen Wash

This area represents that land upstream of the confluence of Quitchupah Creek and Christiansen Wash that was mapped as Qal (Plate 8 in Hydrology Section of permit application) along the main stream channel of Quitchupah Creek up to the Emery-Sevier county line. This point is within the Joe's Valley-Paradise fault zone and represents the western limits of both the groundwater and surface water adjacent areas. Land within this area meets the geomorphic and water availability criteria for AVF determination and is approximately 880 acres. Investigations within this area yield the following preliminary information:

- Farm areas with active flood irrigation using Quitchupah Creek water are approximately 110 acres south of the stream channel in the SW¼ of Section 29 and the SE¼ of Section 30, T22S, R6E (Plate 8).

- Farm areas with active flood irrigation using Muddy Creek waters, but with the potential for flood irrigation using Quitchupah Creek waters are approximately 220 acres and occur primarily to the north of the stream channel (Plate 8). These lands do not qualify as actively flood irrigated AVF areas since their present source of irrigation water is from another drainage. In addition, a small amount of this acreage may not in fact have the potential to be flood irrigated by Quitchupah Creek waters due to topographic limitations.

- The remaining land (about 550 acres) which meets the geomorphic and water availability criteria for a potential AVF is comprised of gullied land adjacent to the stream channel and other areas which are not conducive to flood irrigation according to SCS soil surveys. It is likely that isolated areas within this acreage comprise potentially irrigable soils which have not been historically flood irrigated owing to their size and relative unmanageability. All of the above land is suspected of not having AVF status due to the lack of potential for flood irrigation or owing to land management (size) constraints. These lands will be further investigated prior to making AVF determinations.

Quitchupah Creek Below Confluence With Christiansen Wash

This area represents that land from the confluence with Christiansen Wash that was mapped as Qal (Plate 8) along the stream channel of Quitchupah Creek down to the confluence with Ivie Creek.

- This land does not qualify as an AVF based on the absence of historical and existing flood irrigation and the absence of regional precedence to flood irrigate similar lands.

Christiansen Wash

This land extends from the headwater limits of Qal mapping (Plate 8) along the stream channel of Christiansen Wash to its confluence with Quitchupah Creek.

- This land does not qualify as an AVF based on historical irrigation practices, nonconducive terrain, water quality limitations, and no regional precedence to irrigate lands of similar condition.

Ivie Creek

This land extends from the western limits of Qal mapping (Plate 8) downstream along the stream channel of Ivie Creek to its confluence with Muddy Creek.

- This land does not qualify as an AVF based on historical irrigation practices, rough terrain and marginal soils, poor water quality, limited water availability, and the absence of

any precedence to irrigate lands of similar characteristics and condition within the region.

Hydrologic Impacts Downstream of Mining to ACR Potential AVF's and Muddy Creek AVF

- Quitchupah Creek below confluence with Christiansen Wash and Ivie Creek.

  As noted above, these streams have been determined to not qualify as AVF's. Therefore, no discussion of AVF hydrologic impacts is necessary.

- Muddy Creek AVF

  This land includes all areas along the stream channel of Muddy Creek where Qal was mapped (Plate 8). Active diversion of Muddy Creek waters to irrigate adjacent lands does occur, as evidenced by field mapping and the existence of surface water rights for irrigation uses, in areas of the Muddy Creek valley 2 to 3 miles west and southwest of the Emery Mine. As such, it satisfies the AVF criteria. However, there is virtually no possibility that underground mining could impact the established agricultural activities along this AVF.

  The only connection between mining and these AVF areas is the spring at the head of Miller Canyon which issues from the upper Ferron aquifer (1979 USGS discharge measurement of 6 gpm or about 0.01 cfs). As noted in the permit application and in various previous ACR responses, this spring is not expected to be influenced by underground mining during the 5-year permit term. If it were affected by mining, its discontinuance would have no effect on Muddy Creek AVF's downstream owing to continuance of stream flow along Muddy Creek which is on the average 2 to 4 orders of magnitude greater than the discharge of this spring.

Comment: Socioeconomics

Socioeconomics

Although the following is not required by the regulations of the Coal Mining and Reclamation Permanent Program, it would be very useful in completing the socioeconomic assessment that is required by the National Environmental Policy Act (NEPA):

1. The number of employees (construction, operation) by year that are associated with the coal preparation plant. Also, average annual salary information for mine workers would be useful.

2. Any information that might be available concerning where existing and/or future employees may reside and their mode of

transportation to work, i.e., carpool, private auto, busing program, etc.

3. Any data the company can provide concerning tax revenues contributed to the County and local municipalities.

It would also be useful to the analysis if the company would provide documentation of any past and/or future contributions or assistance given to communities surrounding the mine (e.g., financial contributions, employee transportation, housing assistance to employees, participation in community social/recreation programs, etc.).

Response:

The following information concerning the Emery Mine labor force, tax revenues paid to state and local governments, and philantropic contributions is provided by Consolidation Coal Company as an aid in completing the socioeconomic assessment required by the National Environmental Policy Act. Since it is not required by the Coal Mining and Reclamation Permanent Program, this information has not been incorporated in the repermit application.

Projected Annual Income of Mine Employees

The potential annual income of mine employees for the period 1978-84 is shown by table E-1. Annual income is based on contractual wage rates applied to 240 working days and includes vacation and holiday pay. Actual incomes will vary depending on absenteeism and overtime and bonus pay. Wage rates after 1984 are subject to future contract negotiations.

TABLE E-1

Projected Annual Income of Mine Employees

Year	Preparation Plant	Inside Labor Low Rate	Inside Labor High Rate
1978	$18,500	$16,800	$19,000
1979	19,400	18,200	21,100
1980	20,200	18,700	22,000
1981	24,100	22,200	24,500
1982	25,500	23,600	25,800
1983	27,700	25,700	27,900
1984	29,400	27,200	29,500

Labor Force-Proposed Preparation Plant

Plant construction is planned to be by outside contractor with the labor force needed determined and secured by the contractor. Construction is estimated to last 10-12 months with an average of eighty (80) employees.

Plant operation will require fifty-three (53) employees initially with a projected increase to fifty-six (56) during the third year of operation.

Emery Mine Employees - Geographic Distribution

Number and geographic distribution of Emery employees is shown by Table E-2 for selected months of 1982 and 1983 and is forecasted for 1984.

TABLE E-2

Geographic Distribution of Mine Employees

	June 1983	Sept. 1983	1984
Total Employees	241	17	139
Salina Area	33.2%	-	30%
Emery	31.1%	35.3%	35%
Ferron	24.1%	41.2%	25%
Castledale	6.2%	-	5%
Huntington	2.5%	-	-
Price	2.9%	23.5%	5%

Transportation to and from work has been by private vehicle with many of the employees participating in private car pools.

Tax Revenues Contributed to Local and State Governments

Total taxes paid by Emery Mine to local and state governments for the five year period 1978-1982 exceeded $1.7 million.

TABLE E-3

Summary Emery Mine Taxes

Description	1978	1979	1980	1981	1982
State Unemployment	$ 21,368	$ 39,398	$ 33,783	$ 32,986	$ 55,830
Real Estate & Property	36,826	61,558	62,822	64,469	85,143
Emery County Tax	-	-	33,850	80,384	118,771
Sales and Use Tax	37,334	82,992	95,443	217,871	248,637
Purchaser's Use Tax	37,670	50,368	32,184	41,389	48,611
Franchise Tax	10,271	27,761	29,153	21,287*	**
Total Tax	143,469	262,077	287,235	558,386	556,992

* Estimate
** Not paid to-date

Philanthropic Contributions to Area Communities

Consolidation Coal Company has been an annual contributor to United Way, local youth organizations, health agencies, and other civic causes. In addition CONSOL has made periodic grants to the College of Eastern Utah.

Consol also provides free coal for the Emery library, the senior citizens clubs of Emery and Ferron, and the Town of Emery.

TABLE E-4

Philanthropic Contributions

Description	1978	1979	1980	1981	1982	1983	1984 Projected
United Way Carbon-Emery Co.	$ 50	$ 0	$ 0	$1,500	$ 150	$1,000	$1,000
March of Dimes	0	0	0	50	50	100	100
Utah Heart Association	50	50	50	50	0	50	50
Emery County Clinic		1,500					
Carbon Hospital			500				
American Cancer Society	50	50				50	50
Boy Scouts Emery County		50	50	50	50	50	50
Boy Scouts Sevier County				50	50	50	50
Emery County Schools	500				120		
Civic Club - Emery Co.	150	500	250	250	550	550	550
Civic Club - Carbon Co.	150		250	250	250	250	
Carbon Emery Rec.		2,300	1,500		250	150	
Emery Little League				250	250	250	250
Ferron "T" League				200	200	200	200
Emery Ambulance Service	6,000						
College Eastern Utah		4,000			4,000	4,000	
Muscular Dystrophy		25					
Booster of Utah Symphony					15	15	
Emery County Nursing Home	100						
Ferron Civic Events						100	
Total	7,050	8,475	2,650	2,650	5,935	6,715	2,300

The Pittsburg & Midway Coal Mining Co.

1720 South Bellaire
Denver, Colorado 80222

September 30, 1983

Mr. Rick Holbrook
Consolidation Coal Company
2 Inverness Drive East
Englewood, Colorado 80112

Dear Rick:

Attached is P&M's adjudicatory permit information which you recently requested. The following statement should clarify the Gulf controlled properties/P&M interrelationship:

> The Pittsburg & Midway Coal Mining Co. is a wholly-owned subsidiary of Gulf Oil Corporation. Lands which are owned or leased by Gulf Oil Corporation are leased and subleased, respectively, to the Pittsburg & Midway Coal Mining Co. for development.

Should you need more information or specifics, please let me know.

Sincerely,

R. N. Mickelson
Project Coordinator

RNM/gj

Attachment

778.13 (a) The application contains the following names and addresses:

(1) The Pittsburg & Midway Coal Mining Co.
1720 South Bellaire Street
Denver, Colorado 80222
303-758-1700

(5) The Pittsburg & Midway Coal Mining Co.
1720 South Bellaire Street
Denver, Colorado 80222
303-758-1700

(6) COLORADO: The Corporation Company
1700 Broadway
Denver, Colorado 80202
303-839-1705

KANSAS: The Corporation Company, Inc.
First National Bank Building
c/o The Corporation Company, Inc.
Topeka, Kansas 66603
913-232-0564

KENTUCKY: C T Corporation System
Kentucky Home Life Building
c/o C T Corporation System
Louisville, Kentucky 40202
502-583-8588

MISSOURI: C T Corporation System
314 North Broadway
St. Louis, Missouri 63102
314-231-8380

NEW MEXICO: The Corporation Company
220 Otero Street
c/o The Corporation Company
P.O. Box 787
Santa Fe, New Mexico 87501
502-982-4374

WYOMING: C T Corporation System
1720 Carey Avenue
c/o C T Corporation System
Cheyenne, Wyoming 82001
307-634-1541

778.13 (b) The applicant is a corporation, incorporated under the laws of the State of Missouri.

(1) Directors

R. J. Goeken	Gulf Tower, P.O. Box 2227, Houston, Texas
S. A. Zagnoli	1720 South Bellaire Street, Denver, Colorado
R. M. Holsten	1720 South Bellaire Street, Denver, Colorado
J. C. Williams	1720 South Bellaire Street, Denver, Colorado
D. E. Willson	1720 South Bellaire Street, Denver, Colorado
J. K. Poage	1720 South Bellaire Street, Denver, Colorado

Officers

R. M. Holsten	Chairman of the Board - see above
R. M. Holsten	President - see above
Roy Coulson	Senior Vice President, 1720 South Bellaire Street, Denver, Colorado
J. C. Williams	Vice President - see above
B. G. McGrath	Vice President, 1720 South Bellaire Street, Denver, Colorado
J. K. Poage	Vice President, 1720 South Bellaire Street, Denver, Colorado
C. A. Boyce	Vice President and Secretary, Gulf Building, P.O. Box 1166, Pittsburgh, Pennsylvania
D. E. Willson	Assistant Secretary, 1720 South Bellaire Street, Denver, Colorado
William Bowman	Assistant Secretary, Gulf Building, P.O. Box 1166, Pittsburgh, Pennsylvania
Colin M. Short	Treasurer, Gulf Building, P.O. Box 1166, Pittsburgh, Pennsylvania
J. J. Earnest	Vice President and Comptroller, Gulf Building, P.O. Box 1166, Pittsburgh, Pennsylvania
J. F. Kelley	Assistant Comptroller, 2 Houston Center, P.O. Box 2227, Houston, Texas
E. E. Watson	Assistant Treasurer, 2 Houston Center, P.O. Box 2227, Houston, Texas
John J. Ross	Chief Tax Officer, Gulf Building, P.O. Box 1166, Pittsburgh, Pennsylvania
R. B. Marsh	Assistant Tax Officer, 2 Houston Center, P.O. Box 2227, Houston, Texas
L. G. Spencer	Assistant Tax Officer. 1720 South Bellaire Street, Denver, Colorado
W. L. Tappana	Assistant Secretary, 1720 South Bellaire Street, Denver, Colorado

(2) Gulf Oil Corporation
P.O. Box 1166
Pittsburgh, Pa. 15230

(3) The Pittsburg & Midway Coal Mining Co.
1720 South Bellaire Street
Denver, Colorado 80222

As of July 15, 1981, The Pittsburg & Midway Coal Mining Company assumed a 50% controlling interest in The North River Energy Company, Alabama. The address is:

North River Energy Company
234 Vestavia Center
Highway 82 West
Northport, Alabama 35476

As of July 31, 1981, The Pittsburg & Midway Coal Mining Company assumed a 50% controlling interest in the Emery Mine, Utah, through acquisition of the Kemmerer Coal Company. Consolidation Coal Company is the mine operator. The address is:

Consolidation Coal Company
P.O. Box 527
Emery, Utah 84522

(c) See (b) above.

778.13 (d) MIDWESTERN DIVISION

Permit Numbers

7073-77	27-72 S#3	2843-74 DR	18-74 S#3	254-7001
5749-76	27-71 R	27-75 S#1	18-74 S#4	5556-76
254-5002	2843-72 D	27-75 R	18-74 S#5	5892-76
054-5002	2843-72 S#1D	27-76	18-75	6139-77
289-5001	2843-72 S#2D	5477-76	18-76 R	6426-77
054-0030	2843-72 S#3D	5646-76	18-76 S#1	6493-77
27-70	2843-72 S#4D	5748-76	2852-72 D	6633-77
27-70 S#1	27-73	054-0037	2852-72 S#1D	089-0018
27-70 S#2	27-73 S#1	18-70	2852-72 S#2D	054-0058
27-70 S#3	27-74	18-71 R	2852-72 S#5D	0545-0070
27-70 S#4	27-74 S#1	18-73 S#2	2852-72 S#6D	254-0327
27-71	27-74 S#2	18-74	2852-72-S#7D	254-8001
27-71 S#1	27-74 S#3	18-74 S#1		8540026
27-71 S#2	27-74 R	18-74 S#2		8540027

Issuing Regulatory Authority

All the foregoing permits were issued by the Kentucky Bureau of Surface Mining Reclamation and Enforcement (KYBSMRE).

MSHA I.D. NUMBERS	MINE
15-02072	Paradise
15-02021	Colonial
15-11348	Pleasant Hill
15-06253	Drake IV
15-044520	Drake III

Permit Numbers

72-7	73-7
74-7	75-7
76-7	77-7
78-7	79-7
80-7	72-8
73-8	74-8
75-8	76-8
77-8	78-8
79-8	80-8

Issuing Regulatory Authority

All of the foregoing permits were issued by the Missouri Land Reclamation Commission.

Permit Numbers

76	88	02	LN-HR-S-502
06	07	10	LN-HR-S-501
10A	11	12	
13	14	15	
16	17	18	
19	20		

Issuing Regulatory Authority

All of the foregoing permits were issued by the Kansas Mined Land Reclamation Board.

Pending Permits

8540026 (Pleasant Hill)	KYBSMRE
8540027 (Colonial)	KYBSMRE

MSHA I.D. NUMBERS	MINE
23-00462	Empire
23-00881	Midway

NORTHWESTERN DIVISION
Permit Numbers

74-31 C/A
16, 25, 36, 42, 25-A1, 031, C-001-80

Issuing Regulatory Authority

All of the foregoing permits were issued by the Colorado Mined Land Reclamation Board.

Permit Numbers

Conversion to 1969 Law
379C, 379C-A1, 379C-A2, 379-A3
8-U-D Modification
379C-A4 TFN 1 1/51
379C-A5

Issuing Regulatory Authority

All of the foregoing permits were issued by the Wyoming Department of Environmental Quality. (Wyo. D.E.Q.).

Permit Number
CO-0010

Issuing Regulatory Authority

The foregoing permit was issued by the Federal Office of Surface Mining, Region V.

Pending Permits	Reviewing Regulatory Authority
So. Block Permit (Appl. #1-5/214)	Wyo. D.E.Q.

MSHA I.D. NUMBERS	MINE
05-00303	Edna
48-00086	Elkol Sorensen
48-01192	North Block

SOUTHWESTERN DIVISION
Permit Numbers

New Mexico Operating Permit #3
New Mexico Operating Permit #3-A1
Issuing Regulatory Authority

New Mexico Coal Surface Mining Commission (NMCSMC)

Pending Permits

New Mexico Operating Application (NMCSMC and OSM)

MSHA I.D. NUMBERS	MINE
29-00096	McKinley

NORTH RIVER ENERGY COMPANY
Permit Numbers

P-2310
P-2610
P-2311
P-2322
P-2611

Issuing Regulatory Authority

All of the foregoing permits were issued by the Alabama Surface Mining Reclamation Commission (ASMRC) to the North River Energy Corporation.

Permit Numbers

P-2701
P-2700
P-2699
P-2704
P-3004

Issuing Regulatory Authority

All of the foregoing permits were issued by the ASMRC to the North River Energy Company.

Permit Numbers

P-3221-63-85-S
P-3347-63-88-S
P-3222-32-88-U

Issuing Regulatory Authority

All of the foregoing permits were issued by the Alabama Surface Mining Commission (ASMC) to the North River Energy Company.

MSHA I.D. NUMBERS	MINE
01-000759	North River #1
01-02182	North River Surface Mine #1
01-02183	North River Mine #3

Pending Permits

No. River #2	No Number	(ASMC)
Meg #5	Appl. No. P3394	(ASMC)

EMERY MINE, UTAH (Consolidation Coal Co. - operator)

Permit Numbers	Issuing Regulatory Authority
Act/015/015	UT DNR, Oil, Gas & Minerals

MSHA ID Number

42-00079

Pending Permits	Reviewing Regulatory Authority
Repermitting Application (submitted 4/2/81)	UT OG&M; OSM
Surface Mining Application (submitted 4/82)	UT OG&M

Section 778.14

a) The applicant, any subsidiary, affiliate or persons controlled by or under common control with the applicant has not

(1) Had a Federal or State mining permit suspended or revoked in the last 5 years; or

(2) Forfeited a mining bond or similar security deposit in lieu of bond.

b) Not applicable

778.14(c)

NOTICES OF VIOLATIONS

MIDWESTERN DIVISION

MINE	NOV#/DATE	ISSUING AUTHORITY	BRIEF DESCRIPTION	DATE/TYPE PROCEEDING	CURRENT STATUS	ACTION TAKEN TO ABATE
Colonial	#011034/ 4-28-81	KyDNR	Alleged substandard water leaving permit area	Conference held 7-23-81 Pretrial conf. requested	Pending	
Drake IV	80-2-27-39/ 10-24-80	OSM	Failure to monitor ground H_2O in accordance with permit	2-12-81 Assessment conf. Fine waived	Abated	No remedial action required
Midway	ML-116/ 12-14-81	KS Mined Land Recl.	Failure to place energy dissipaters at pond discharged points	None	Abated	Energy dissipators installed
Midway	77-8-1/ 6-23-82	Mo. DNR	Failure to comply with delinquent reclamation schedule as approved by the Recl. Comm. on Nov. 24, 1981	None	Abated	Completed grading and seeding
Midway	P82-13-1/ 6-15-83	Mo. DNR	Failure to establish permanent vegetation during first normal seeding season	Informal Conference 8-12-83	Abated	Seeding completed

MIDWESTERN DIVISION (Continued)

MINE	NOV#/DATE	ISSUING AUTHORITY	BRIEF DESCRIPTION	DATE/TYPE PROCEEDING	CURRENT STATUS	ACTION TAKEN TO ABATE
Empire	82-7-1/ 6/23/82	Mo. DNR	Failure to control discharge	None	Abated	Water treatment begun
Empire	P82-12-1/ 6-23-82	Mo. DNR	Failure to control discharge	None	Abated	Water treatment begun
Empire	82-7-2/ 6-14-83	Mo. DNR	Failure to control discharge	None	Abated	Water treatment continued
Empire	P82-12-2/ 6-14-83	Mo. DNR	Failure to pass disturbed area surface drainage through sedimentation pond. Substandard water leaving permit area.		Pending Fine Assessment	Diversion repaired

SOUTHWESTERN DIVISION

MINE	NOV#/DATE	ISSUING AUTHORITY	BRIEF DESCRIPTION	DATE/TYPE PROCEEDING	CURRENT STATUS	ACTION TAKEN TO ABATE
McKinley	No No./ 1-16-81	U.S.G.S.	Drilling outside approved plan	None	Abated	Obtained Archeological Clearance
McKinley	82-2-4-1/ 7-6-82	OSM N.M. Area	Contamination of segregrated topsoil	9-7-82: Mine-Site hearing 12-3-82: Assess Conf.	Abated	Contaminated topsoil removed from storage $220 Fine Paid
McKinley	82-2-4-2/ 9-21-82	OSM N.M. Area	Failure to pass disturbed area surface drainage through sedimentation ponds	3/17/83: Access. Cont.	Abated	Check dams constructed $700 fine paid
McKinley	091/ 5-20-83	N.M.E.M.D.	Alleged uncontrolled runoff	Conference Assess-ment pending	Pending	Berms constructed
McKinley	092/ 6-3-83	N.M.E.M.D.	Failure to remove topsoil	Conference held	Abated	Topsoil removed
McKinley	83-II-7-2/ 9--8-83	OSM N.M. Area	Alleged failure to pre-vent additional contribu-tion of suspended solids to stream flow		Pending	

NORTHWESTERN DIVISION

MINE	NOV#/DATE	ISSUING AUTHORITY	BRIEF DESCRIPTION	DATE/TYPE PROCEEDING	CURRENT STATUS	ACTION TAKEN TO ABATE
Kemmerer	100212/ 5-4-83	Wyo. DEQ	Failure to properly salvage topsoil	None	Abated	Topsoil salvaged and buffer provided; $2,500 fine paid

EMERY MINE

MINE	NOV#/DATE	ISSUING AUTHORITY	BRIEF DESCRIPTION	DATE/TYPE PROCEEDING	CURRENT STATUS	ACTION TAKEN TO ABATE
Emery	81-3-10-2/ 7-01-81	UT O,G&M	1. Breached diversion berm 2. Failure to pass all drainage through sed. ponds	9-3-81/ Assessment Conference	Abated	1. Paid $200 fine Repaired berm and graded area as required 2. Constructed berm around borehole pump
	81-2-16-2/ 12-16-81	UT O,G&M	1. Operating without a permit; Failure to conduct mining in accordance with approved plan. 2. Failure to maintain sediment control structures	1-15-83 Assessment Conference	Abated	Repaired bale dikes; Paid $140 Fine
	83-7-1-1/ 1-20-83	UT O,G&M	1. Failure to dispose non-coal waste properly. 2. Failure to control coal fire.	None	Abated	No action required Paid $460 Fine

NORTH RIVER ENERGY

MINE	NOV#/DATE	ISSUING AUTHORITY	BRIEF DESCRIPTION	DATE/TYPE PROCEEDING	CURRENT STATUS	ACTION TAKEN TO ABATE
N.R. Und. #1			NO VIOLATIONS WITHIN LAST THREE YEARS			
N.R. Surface #1	80-2-58-95/ 12-15-80	OSM	Failure to save and store topsoil	None	Abated	Topsoil handling revised
	80-RWC-84/ 12-16-80	ASMRC	Failure to backfill adequately; Failure to save & store topsoil	None	Abated	Graded area and revised topsoil handling
	81-SAH-05/ 2-19-81	ASMRC	Broken berm allowed uncontrolled runoff	None	Abated	Berm repaired
	81-RWC-22/ 9-2-81	ASMRC	Failure to store and save topsoil	None	Abated	Consent Decree signed 1/19/82 Paid $2,500 fine 90 to revise plan
	81-2-106-12/ 6-26-81	OSM	Discharge failed to meet effluent standards	None	Abated	Appropriate corrections made
	83-RWC-12/ 5-30-83	ASMC	Failure to protect topsoil from wind and water erosion	None	Abated	Topsoil protected

NORTH RIVER ENERGY (Continued)

MINE	NOV#/DATE	ISSUING AUTHORITY	BRIEF DESCRIPTION	DATE/TYPE PROCEEDING	CURRENT STATUS	ACTION TAKEN TO ABATE
N.R. Surface #2	81-2-58-06/ 3-5-81	OSM	Substandard water leaving permit area	None	Abated	pH raised
	81-RWC-4/ 3-17-81	ASMRC	Substandard water leaving permit area	None	Abated	Lowered iron and raised pH of water
N.R. Surface #3	80-2-58-85/ 11-19-80	OSM	Substandard water leaving permit area	None	Abated	pH raised
	81-RWC-21/ 9-2-81	ASMRC	Substandard water leaving permit area	None	Abated	pH raised

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS, AND MINING
1588 West North Temple
Salt Lake City, Utah 84116
(801) 533-5771

October 1, 1981

Mr. Carl Muha
Consolidation Coal Company
Western Region
2 Inverness Drive East
Englewood, Colorado 80110

RE: Consolidation Coal Company
Emery Mine
Borehole Pump Access Road
Reconstruction Plan
ACT/015/015
Emery County, Utah

Dear Mr. Muha:

The Division of Oil, Gas and Mining has reviewed the reconstruction plan for the Borehole Pump access road submitted September 11, 1981. Certain operation and reclamation regulations have not been adequately addressed, however, these inadequacies do not justify delaying approval of the modification. Therefore, the Division grants approval of the reconstruction plan with the following stipulations:

Stipulation 9-23-1

The applicant will reclaim the 572 feet of road in accordance with UMC 817.166 (attached). The revegetation plan should be in accordance with UMC 817.111- 817.116 and must be approved by the Division in advance. This plan should include, but is not limited to:

a. A detailed timetable and schedule for completion of each major step of the reclamation and revegetation process;
b. A list of the species to be used, and the amounts per acre of seed (in terms of pure live seed) and/or seedlings to be used;
c. A description of methods to be used in planting and mulching techniques (including type of mulch, how applied and rate of application);
d. A discussion of irrigation and pest & disease measures to be used, if any.

Seeding will be done during the first available season. The applicant must state where the material (top soil) will be taken from for reclamation.

Stipulation 9-23-2

The applicant will show the location(s) of where the excavated road material will be stored, how it will be stabilized, etc.

Stipulation 9-23-3

The applicant will address the reclamation of the reconstructed road and turn-around area in accordance with UMC 817.166. This may be accomplished by either making reference to the pertinent sections of the MRP or submitting a reclamation plan for these areas.

Stipulation 9-23-4

The applicant will commit to standards for revegetation success. An existing reference area (RA) may be used provided the RA is of the same vegetation type that existed prior to disturbance (ie .. if the road goes through the mixed desert shrub community, then the RA for the mixed desert shrub community should be used.

Stipulation 9-23-5

The following information must be provided for the upgraded road:

1. Provide a guarantee that the turn-around area does not cross or interfere with any drainages;

2. Show location of any "cut or fill" areas or make a negative declaration of such;

3. Commit to a maintenance program as described in UMC 817.165; and

4. Provide information on the type of vehicle(s) and the amount of use the road will receive.

The above stipulations shall be addressed and submitted to the Division within 60 days of receipt of this approval.

If you have any questions on these stipulations or the time limitation for compliance, please contact Sally Kefer or Lynn Kunzler of my staff.

Sincerely,

JAMES W. SMITH, JR.
COORDINATOR OF MINED
LAND DEVELOPMENT

JWS:SK:vp

cc: Don Crane, OSM

Enclosure

(b) Class II Road maintenance shall include basic custodial care as required to protect the road investment and to prevent damage to adjacent resources. This includes maintenance to control erosion, repair of structures and drainage systems, removal of racks and debris, replacement of surface, and restoration of the road prism.

UMC 817.166 Roads: Class II: Restoration.

(a) Unless the Division approves retention of a Class II Road as suitable for the approved postmining land use, immediately after the road is no longer needed for operations, reclamation, or monitoring-

(1) The road shall be closed to vehicular traffic;

(2) The natural drainage patterns shall be restored;

(3) All bridges and culverts shall be removed;

(4) Roadbeds shall be ripped, plowed, and scarified;

(5) Fill slopes shall be rounded or reduced and shaped to conform the site to adjacent terrain and to meet natural-drainage restoration standards;

(6) Cut slopes shall be reshaped to blend with the natural contour;

(7) Cross drains, dikes, and water bars shall be constructed to minimize erosion;

(8) Terraces shall be constructed as necessary to prevent excessive erosion and to provide long-term stability in cut-and-fill slopes; and

(9) Road surfaces shall be covered with topsoil in accordance with UMC 817.24(b) and revegetated in accordance with UMC 817.111-817.116.

(b) Unless otherwise authorized by the Division, all road surfacing materials shall be removed, hauled or conveyed, and disposed of under UMC 817.89.

UMC 817.170 Roads: Class III: General.

(a) Each person who conducts underground coal mining activities shall design, construct or reconstruct, utilize, and maintain Class III Roads and restore the area to meet the requirements of UMC 817.171-817.176 and to control or minimize erosion and siltation, air and water pollution, and damage to public or private property.

Consolidation Coal Company
Western Region
2 Inverness Drive East
Englewood, Colorado 80110
303-770-1600

September 11, 1981

Ms. Sally Kefer
Reclamation Hydrologist
Division of Oil, Gas, and Mining
State of Utah
1588 West North Temple
Salt Lake City, Utah 84116

Dear Ms. Kefer:

This letter accompanies Consolidation Coal Company's proposed construction permit application to upgrade the existing access road to the borehole pump. Reconstruction work will begin on this structure as soon as your office has approved the design plan.

Design plans for the reconstruction of the tank and sedimentation pond access roads are included in the preparation plant permit application submitted on September 1, 1981. The tank road will be used to access the preparation plant while the sedimentation pond road will provide access to the waste disposal area for coarse refuse haulage trucks. Plans for these two roads are described in Volume 11, section 15.3.2.2.

The above information supercedes that found in section 13.3.4 of the Emery Permit Application.

If you have any questions about any information contained herein, please contact me at the above number.

Sincerely,

Mary Jo Ormiston

Mary Jo Ormiston
Civil Engineer

MJO/mcf
Attachment
cc: Ron Thompson

EMERY MINE
BOREHOLE PUMP FACILITY ACCESS ROAD
ROAD UPGRADE DESIGN

Introduction

The existing access road to the borehole pump facility at Consolidation Coal Company's Emery Mine requires upgrading construction. A design plan has been prepared to bring the existing road into compliance with current regulations. The plan is described in detail and construction drawings are included in the report that follows.

BOREHOLE PUMP ACCESS ROAD

Existing Conditions

The existing road is used as access to the mine dewatering pump located approximately 3/4 of a mile north of Emery Mine, as shown on Plate 1. The road is classified as a Class II structure. It was constructed prior to 1975.

A field investigation was conducted by Valley Engineering, Inc. in October of 1980 to examine the existing conditions of the access road. The results of the study are discussed in this section and the recommendations have been used to prepare this report.

Refer to Plate 2 for the plan view and profile of the existing access road. The fifteen foot wide structure follows the original terrain. The ground and roadway material at this site has been identified as decomposed Mancos shale and clay with little or no gravel. During precipitation events, travel on the saturated surface is difficult. The edges of the road are rutted due to poor drainage control. Several small cuts have been made to direct water off of the roadway, however, there are no major drainage ditches to provide for surface water runoff control.

Design Plan Summary

The proposed plan to upgrade the existing borehole pump access road is illustrated on Plate 3, and should be referred to. The reconstruction plan summary follows:

1. Stabilization. The existing material will be removed between stations 0 through 9+00 and replaced with a structural section that will assure the stabilization of the roadway, designed in accordance with Surface Mine Haulage Road Design Study, by Skelly & Loy.

2. Drainage. Parallel drainage ditches will be constructed along the roadway to provide for complete surface water runoff drainage control.

3. Reclamation. The portion of the existing road from stations 9+00 through 14+72 will be reclaimed. It is no longer necessary to maintain this portion of the access road. Instead, a gravel based turnaround area has been included in the upgrade design.

The plan to upgrade the existing borehole pump access road is in accordance with the following applicable regulations:

Coal Mining and Reclamation Permanent Program, Chapter I, Final Rules of the Utah Board and Division of Oil, Gas, and Mining. (Promulgated under UCA 40-10-1 et sef.).

The Permanent Regulatory Program of the U. S. Department of the Interior, Office of Surface Mining, Reclamation, and Enforcement.

The references that were used to prepare this report follow:

Standard Specifications for Road and Bridge Construction (State of Utah).

Hydrology and Sedimentology of Surface Mined Lands, Haan and Barfield, 1978.

"Emery Mine Soils Report", Valley Engineers, Inc., 1980.

"Emery Permit - Roads Study", Valley Engineers, Inc., 1980.

"Emery Permit - Soil Resources Information", James P. Walsh & Assoc., 1981.

"Surface Mine Haulage Road Design Study", Skelly & Loy, 1976.

Design Plan Details

This section describes the engineering design details of the proposed reconstruction plan:

1. Stabilization:

The portion of the roadway between stations 0 and 9+00 will be stabilized in the following manner:

a. Excavation.

The existing roadway and proposed turnaround area will first be excavated to a minimum depth of 20 inches, to provide for a stable sub-base. The nature of the existing material decomposed shale and clay and the deteriorated condition of the surface indicate necessary removal of the original material.

The excavated material will be stockpiled and used as replacement fill at the time of removal of the road during the reclamation phase of the Emery Mine. No topsoil is available for stockpiling.

Excavated material calculations:

Access Road

Length = 900 feet
Width = 15 feet
Depth = 20 inches

Turnaround

Area = 0.5 x 60 feet x 60 feet
Depth = 20 inches

Total volume removed: (900' x 15' x 20"/12) + (0.5 x 60' x 60' x 20"/12) = 25,500/27 = 950 cubic yards

b. Placement of Subbase.

14 inches of pit run gravel will be placed and compacted to provide a stable subbase for the surface material.

Total gravel volume required: (900' x 15' x 14"/12) + (0.5 x 60' x 60' x 14"/12) = 17,850/27 = 665 cubic yards

c. Placement of Surface Course.

6 inches of crushed aggregate will be placed and compacted for surface course. The surface will slope at 3/8 inch per foot from the centerline to the shoulder to provide drainage off the road.

Total volume crushed aggregate required: (900' x 15' x 6"/12) + (0.5 x 60' x 60' x 6"/12) = 7650/27 = 285 cubic yards

Refer to the typical structural section illustrated on Plate 3.

2. Drainage:

Drainage ditches will be constructed on each side of this road to carry water off the road surface, and keep water from adjacent areas from flowing into the roadway. Water entering the ditches north of station 6+50 will flow generally north along the road before re-entering the normal drainage. Water entering the ditches south of station 6+50 will flow south toward the paved road. The pump road joins the paved road at such an elevation that water in the pump road ditches will flow away parallel to the paved road toward natural drainage courses in both directions. Therefore, no culvert is necessary under the pump road near the paved road.

As the plan view shows, very little water will enter the road ditches from areas adjacent to the road. Therefore, an 18" V-ditch will be capable of handling the water for this road.

3. Reclamation:

As stated, the existing road from stations 9+00 through 14+72 will be reclaimed. Since earth material was not moved to build this structure initially, and no road surfacing work was provided, reclamation will consist of disking, conditioning, and seeding this area.

Emery Permits

cc Jones
Williamson
Higgins
Holbrook

STATE OF UTAH
NATURAL RESOURCES & ENERGY
Oil, Gas & Mining

4241 State Office Building • Salt Lake City, UT 84114 • 801-533-5771

Scott M. Matheson, Governor
Temple A. Reynolds, Executive Director
Cleon B. Feight, Division Director

February 3, 1982

Mr. Richard Holbrook, Supervisor
Environmental Quality Control
Western Region
2 Inverness Drive East
Englewood, Colorado 80110

RE: Use of Borrow Area
Excess Material
Consolidation Coal Company
ACT/015/015
Emery County, Utah

Dear Mr. Holbrook:

The Division of Oil, Gas and Mining has reviewed the request to utilize excess materials produced from a previously permitted borrow area as a foundation for the proposed bathhouse.

Since all outstanding DOGM comments on your reclamation plan for the borrow area have been addressed as of December 21, 1981, we see no problem with use of these materails as a solution to the final reclamation of this area.

If there are unconsolidated materials remaining after construction of the foundation, DOGM would prefer to see Consol utilize those excess materials rather than revegetate them in the current position beneath the highwall.

Stipulation 2-4-82-1-SK

If a potential future use is determined for an unused portion of materials, DOGM will require stockpiling and immediate stabilization in an area away from mining activity. On-going stabilization will be viewed as an essential measure until all materials are used.

Stipulation 2-4-82-2-SK

All areas that were disturbed during this project including the roads cut into the highwall and associated sidecast material will be stabilized for erosion control within three weeks of completion of the foundation.

As David Jones and I discussed on February 2, 1982, we will be happy to meet on-site at the time this stabilization work is initiated to make recommendations for stockpile location and stabilization. Please give us a one week notice and we'll arrange for a soil scientist and inspector to meet with members of your staff.

Sincerely,

Sally Kefer

SALLY KEFER
RECLAMATION HYDROLOGIST

SK/btb

Consolidation Coal Company
Western Region
2 Inverness Drive East
Englewood, Colorado 80110
303-770-1600

January 13, 1982

Ms. Sally Kefer
Division of Oil, Gas, and Mining
1588 West North Temple
Salt Lake City, Utah 84116

Dear Sally:

I have enclosed a brief operation and reclamation plan for using materials from the riprap borrow area and hereby request that our permit, ACT/015/015 be modified to allow use of the material as foundation fill for the construction of the bathhouse facilities.

If you have any questions, please contact me at your convenience.

Sincerely,

Richard Holbrook /mcf

Richard M. Holbrook
Supervisor,
Environmental Quality Control

RMH/mcf
Enclosure
cc: D. Jones
S. Jaccaud
D. Bray
D. Schouweiler

PERMIT MODIFICATION
OPERATION & RECLAMATION PLAN

IMMEDIATE USE:

Consol intends to use the unconsolidated material that has been pushed over and presently lies at the base of the highwall for foundation fill material in the construction of a bathhouse facility.

STATUS OF BORROW AREA:

The area above the highwall which was blasted to produce riprap has been bladed and will be reclaimed in spring as proposed in submittals to the Division dated September 25, 1981, October 31, 1981, and December 14, 1981. This area will not be used as a borrow area any longer, and the reclamation will be permanent.

HIGHWALL STABILITY:

The rock canyon wall was disturbed in the area where the access road was pushed to the top (located approximately at cross-section IV). In that area, the top of the wall has been rounded, and loose material on the slope will be removed to restore the original rock face. The canyon wall above the scrap yard originally consisted of three large, weathered boulders. These boulders were shot away for riprap resulting in a shorter, stabler wall, as shown in cross-section I. The rest of the canyon wall will be left in its original condition.

ROAD RECLAMATION:

The roads that were pioneered up the slope to facilitate recovery of blasted rock for riprap will be reclaimed so that no part of the slope exceeds 1.5 H to 1.0 V in unconsolidated material. These roads, and the material that will remain at the bottom of the highwall will be seeded with the same seedmix as the disturbed area above the canyon wall. Accordingly, the seedplan proposed to the Division on December 14, 1981 will be adjusted as shown below to account for the reseeding of approximately one additional acre.

RIPRAP RECOVERY AREA SEED PLAN
AREA = APPROXIMATELY 3 ACRES

SPECIES	LBS. OF PLS*	PLS*/SQ. FT.
Crested Wheatgrass	7.5	10
Western Wheatgrass	15.0	14
Indian Ricegrass	7.5	11
Galleta	7.5	9
Streambank Wheatgrass	15.0	18
Fourwing Saltbush	22.5	12
	75.0	74

* Pure Live Seeds

Consolidation Coal Company
Western Region
2 Inverness Drive East
Englewood, Colorado 80112
(303) 770-1600

February 12, 1982

Mr. James Smith
Coordinator of Mined Land Development
Division of Oil, Gas, and Mining
4241 State Office Building
Salt Lake City, Utah 84114

re: Bathhouse and Power Line Approval - Emery Mine

Dear Mr. Smith:

This letter is intended to fulfill Stipulation 11-25-81-5 of the approval for Consol's proposed Bathhouse and Transmission Line. This stipulation requires us to revise our reclamation bond estimate to include the additional reclamation costs for the proposed construction.

The following is a detailed breakdown of the additional reclamation costs necessitated by this construction:

Structure Removal - 128,000 cubic feet @ $.14/cf	$17,920
Foundation Removal - 200 cubic yards @ $76.00/cy	$15,200
Regrading - 5000 cubic yards @ $1.25/cy	$ 6,250
Transmission Line Removal 3 men x 10 days x $250/manday	$ 7,500
Revegetation costs are included with the original estimate	
Total Additional Estimated Reclamation Cost	$46,870

The total reclamation cost will be added to the reclamation cost for the Emery Deep Mine bond amount.

Thank you for your cooperation on this matter. If you have any questions, please contact me at our Englewood office.

Sincerely,

Dave Schouweiler
Permit Coordinator

DS/mcf
cc: J. Higgins
R. Holbrook
D. Jones

Emery Bathhouse

December 14, 1981

Consolidation Coal Company
Western Region
2 Inverness Drive East
Englewood, Colorado 80112
(303) 770-1600

Mr. James W. Smith, Jr.
State of Utah
Division of Oil, Gas, & Mining
4241 State Office Building
Salt Lake City, UT 84114

Dear Jim:

In response to Stipulation #3 of your letter of December 1, 1981, attached is a plan for contemporaneous reclamation of disturbance resulting from the construction of a power transmission line at our Emery Mine. We would appreciate your review of this plan.

To comply with Stipulation #4, also attached are approval letters from the State Division of Health, and the Southeast Utah Health Department regarding bathhouse wastewater treatment.

If you have any questions, please contact me.

Sincerely,

David W. Jones

David W. Jones

cc: D. Bray
R. Holbrook
K. Seaton

RECLAMATION OF DISTURBANCE RESULTING FROM POWER LINE CONSTRUCTION

Construction of the new power line at Emery Mine will cause disturbance to the land resulting from digging holes to set the poles and from driving a line truck across the ground to get to pole locations. Consol will reclaim these disturbed areas as outlined below.

Disturbance Resulting From Boring Holes:

Disturbance will consist of a small pile of soil and rock that was removed from the hole. Consol proposes to load and haul this material to waste following completion of the line, and seed any bare areas.

Disturbance Resulting From Running Equipment To Site:

Consol intends to reseed any areas in which vegetation is disturbed by vehicles. Although no rutting of the ground is anticipated in this area, if the truck does create ruts, they will be smoothed and reseeded.

Reseeding:

The seed mix used will be identical to that used for reclamation of a portion of the borehole pump road this winter, listed on the following page.

SPECIES	PLS*/SQ. FT.
Crested Wheatgrass	10
Western Wheatgrass	14
Indian Ricegrass	11
Galleta	9
Streambank Wheatgrass	18
Fourwing Saltbush	12
total	74

* Pure Live Seeds

Seeding will be performed by hand due to the localized nature of the disturbed areas, and will be done in the spring, following construction.

Scott M. Matheson
Governor

STATE OF UTAH
DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
150 West North Temple, P.O. Box 2500, Salt Lake City, Utah 84110

Alvin E. Rickers, Director
Room 426 801-533-6121

James O. Mason, M.D., Dr.P.H.
Executive Director
801-533-6111

DIVISIONS
Community Health Services
Environmental Health
Family Health Services
Health Care Financing and Standards

OFFICES
Administrative Services
Health Planning and Policy Development
Medical Examiner
State Health Laboratory

(801) 533-6146
December 9, 1981

David Jones, Engineer
Consolidation Coal Company
2 Inverness Drive East
Englewood, CO 80112

RE: Construction Permit
Wastewater Disposal Facilities
Emery Coal Mine

Dear Mr. Jones:

We have reviewed your proposal to discontinue your existing shower trailers at the Consolidation Coal Company Emery Coal Mine and construct a bath-house to provide shower and toilet facilities.

Inasmuch as the bath-house wastewater will be treated with the existing septic tank and subsurface absorption bed approved in our construction permit dated September 22, 1975, no additional construction permit will be needed from this office.

Sincerely,
UTAH WATER POLLUTION CONTROL COMMITTEE

Calvin K. Sudweeks
Executive Secretary

EHP:ch
CC: Southeastern District Health Department

SOUTHEASTERN UTAH
DISTRICT HEALTH DEPARTMENT

6 East Main
P.O. Box 800
Price, Utah 84501
(801) 637-3671

P.O. Box 803, East Carbon, Utah 84520 - 888-4411
P.O. Box 644, Castle Dale, Utah 84513 - 748-2252
94 East Center, Moab, Utah 84532 - 259-5602
P.O. Box 127, Monticello, Utah 84535 - 587-2231 ext. 19
P.O. Box 545, Blanding, Utah 84511 - 678-2723

December 7, 1981

Mr. Dave Jones
Consolidation Coal Company
#2 Inverness Drive East
Englewood, Colorado 80112

Dear Mr. Jones:

We would like to confirm our recent conversation regarding the use of the existing septic tank and drain field to serve the new bath house facility at your Emery mine.

As mentioned, we feel that this is an acceptable method of wastewater disposal. We appreciate your informing us of your plans.

Sincerely,

Gerald C. Story, Senior Sanitarian
Southeastern Utah District Health Dept.

GCS/at

STATE OF UTAH
NATURAL RESOURCES & ENERGY
Oil, Gas & Mining

4241 State Office Building • Salt Lake City, UT 84114 • 801-533-5771

Scott M. Matheson, Governor
Temple A. Reynolds, Executive Director
Cleon B. Feight, Division Director

December 1, 1981

Mr. David W. Jones
Consolidation Coal Company
Western Region
#2 Inverness Drive East
Englewood, Colorado 80112

RE: Approval for Minor Modification, Bathhouse and Associated Power Transmission Line
Emery Deep Mine
ACT/015/015
Emery County, Utah

Dear Mr. Jones:

Consolidation Coal Company (Consol) has proposed to construct a bathhouse and associated power transmission line at the Emery Deep Mine, Emery County, Utah. The bathhouse is to be located southeast of the existing mine office building on a site that had been previously used for a coal stockpile area. The power transmission line will run along the top of the canyon, transmitting power from the main substation to the office and bathhouse. Upon completion of the power line, the existing buried cable which presently supplies power to the office will be removed. (This was conveyed to Lynn Kunzler of the Division by David W. Jones in a telephone conversation on November 24, 1981.)

The Division hereby grants approval of the construction of the bathhouse and associated power transmission line according to the plans submitted to the Division on October 8, 1981, with the following stipulations:

Stipulation 11-25-81-1

Consol will construct all power poles so as to be safe to raptors and other large birds (see REA Bulletin 61-10 for guidelines).

Stipulation 11-25-81-2:

Reclamation of the bathhouse and associated power transmission line will be in accordance with an approved permanent reclamation plan (to be finalized during the course of the approval of the Emery Deep Mine Permit).

Stipulation 11-25-81-3:

Consol should submit to the Division by January 31, 1981, a contemporaneous reclamation plan for the "minimal" disturbance associated with the construction activities. This plan should be complete and satisfy the requirements of UMC 817.100, 817.111-.116.

Stipulation 11-25-81-4:

Consol must provide assurance to the Division that the additional waste water load can be efficiently treated in the current system. This assurance must be submitted to the Division before construction of the bathhouse or power line begins. If the present system will not handle the additional load, the Division of Water Pollution Control must be contacted on any modification to the system.

Stipulation 11-25-81-5:

According to the March 1981 submittal, these facilities were not included in the calculation of the reclamation costs used to determine the bond amount. Consol must revise the bond estimate to include the reclamation of these facilities. The revised bond estimate should be submitted to the Division by March 1, 1981.

Should you have any questions, please contact Sally Kefer or Lynn Kunzler of my staff.

Sincerely,

JAMES W. SMITH, JR.
COORDINATOR OF MINED
LAND DEVELOPMENT

cc: OSM

JWS/LMK/btb

Consolidation Coal Company
Western Region
2 Inverness Drive East
Englewood, Colorado 80112
(303) 770-1600

October 8, 1981

State of Utah
Division of Oil, Gas, and Mining
1588 West North Temple
Salt Lake City, UT

ATTN: Jim Smith

Dear Jim:

Consolidation Coal Company requests permission to construct a bathhouse and associated power transmission line at our Emery Mine. Attached are three copies of location prints for the bathhouse and power line, as well as a narrative addressing these proposed installations.

We would appreciate your review of this material. If you have any questions, please contact me.

Sincerely,

for David W. Jones
Civil Engineer

DWJ/bap

Attachments

cc: D. Bray
R. Holbrook
K. Seaton

BATHHOUSE

Site Location

The proposed bathhouse is to be located southeast of the existing mine facilities area as shown on the plan. The site has at times been used as a coal storage area, but is presently vacant.

Surface Water Control

The location is in a controlled drainage area and will not disturb any drainage patterns, as shown on the plan.

Topsoil

Any topsoil that ever existed at the site has been contaminated by having coal stockpiled on it. This layer of coal refuse will be removed and spread in the south yard area (the drainage controlled area south of Quitchupah Creek) where a stockpile is occasionally stored.

Reclamation

The bathhouse building will be reclaimed at mine closing along with the existing mine buildings. Please refer to the plan included in the repermitting application submitted in March, 1981.

POWER TRANSMISSION LINE

Purpose

This 8 KV class overhead line will bring power from the main substation to the bathhouse.

Construction Techniques

The line will be installed by an electrical contractor. Sockets for the poles will be augered in soil, and either drilled with rock bits, blasted, or jackhammered in rock, depending on the contractor's preference. Construction will take approximately two weeks.

Impacts

Impacts of installing this line will be very slight. Vehicles will reach the line location via the existing access road leading to to the mine water tank.

The only disturbance to the land will be from the trucks driving from the access road to the individual pole locations. The furthest distance from the road to a pole, the pole at the north rim of the canyon, will be 400 feet.

Raptor Protection

The power line will be designed and constructed in compliance with the raptor protection design requirements of USDA, OSM and OGM regulations.

STATE OF UTAH
NATURAL RESOURCES & ENERGY
Oil, Gas & Mining

Scott M. Matheson, Governor
Temple A. Reynolds, Executive Director
Cleon B. Feight, Division Director

4241 State Office Building • Salt Lake City, UT 84114 • 801-533-5771

August 3, 1982

Mr. Dave Schouweiler
Consolidated Coal Company
2 Inverness Drive East
Englewood, CO 80112

RE: Approval for New Coal Stockpile
Emery Deep Mine
ACT/015/015
Emery County, Utah

Dear Mr. Schouweiler:

The Division has reviewed Consol's plans (submitted July 22, 1982) for a new coal stockpile at the Emery Deep Mine.

The Division understands that an additional 2.5 acres will be disturbed in the Mixed Desert Shrub vegetation type. Prior to disturbance, ca. 6530 yd^3 of soil will be removed and stockpiled. Reclamation will proceed as per the approved reclamation plan for Consol's Preparation Plant using seed Plan A. The amount of the bond to cover reclamation for this project is $33,451 and will be added to the bond for the prep plant.

As per the above narrative, the Division hereby grants approval for the new coal stockpile.

Should you have any questions, please contact Lynn Kunzler of my staff.

Sincerely,

JAMES W. SMITH, JR.
COORDINATOR OF MINED LAND DEVELOPMENT

JWS/LMK/dc

cc: Allen Klein, OSM, Denver
Dean Bray, Consol, Emery
Lynn Kunzler, DOGM
ZC. B. Dunn
J. Higgins
R. Holbrook
K. Seaton
D. Jones

Consolidation Coal Company
Western Region
2 Inverness Drive East
Englewood, Colorado 80112
(303) 770-1600

July 22, 1982

Mr. James Smith Jr.
Coordinator of Mined Land Development
4241 State Office Building
Salt Lake City, Utah 84114

Re: New Coal Stockpile Area - Emery Mine

Dear Mr. Smith:

Due to a decrease in near term sales, it will be necessary to stockpile coal at our Emery Mine. We intend to use an area near the planned coal preparation plant for this purpose. This area is located east of the paved mine access road and northwest of the mine office as shown on Plate 15-1A. This area will provide storage space for about 150,000 tons of coal. In order to provide access to the stockpile, we intend to construct a portion of the plant access road. Drainage control will be provided by a 3' high berm which will route the runoff to a ditch. This ditch will route the water to the mine yard where it will be treated with the other mine yard runoff. A construction narrative is included as a separate attachment along with:

1. A plan view of the proposed stockpile and associated facilities: Plate 15-1A.

2. A soils map and anticipated disturbance boundary: Plate 8-1

3. A plan and profile for the access road: Drawing E-52-050-005.

4. The berm cross-section and ditch profile.

Bonding

With the exception of 2½ acres, the disturbance area for the coal stockpile was included in the bond amount calculated for the preparation plant. This included the amount necessary to respread topsoil, regrade the access road and revegetate the area. Since it will be necessary to

disturb an additional 2½ acres that was not included in the original bond, we propose to increase the preparation plant bond as follows:

1	Finish grading	- 5,000 cy.	@ $1.70/cy =	$ 8,500
2.	Topsoil respreading	- 6,530 cy	@ $1.70/cy =	11,101
3.	Revegetation	- 2.5 acres	@ $4,324/ac =	10,809
	Subtotal			$30,410
	10% Administration			3,041
	Total Additional Bond			$33,451

Reclamation

Construction of the coal stockpile will have no effect on our reclamation plans for this area except for the addition of 2½ acres. We plan on reclaiming the coal stockpile area as outlined in the approved preparation plant reclamation plan, and the additional 2½ acres will be reclaimed in the same manner as the previously approved area.

Conclusion

This is an emergency situation. This additional stockpile area is necessary in order to maintain a somewhat stable operation at Emery Mine. Therefore, your review and approval of this submittal by August 15, 1982 is requested and appreciated. I have included a surety bond for $2,592,992. This bond is for the amount determined as necessary for the preparation plant reclamation. We will appreciate your concurrence or comments on our proposed additional bond amount as soon as possible so that we can have the bond ready for submittal prior to approval.

On behalf of Consolidation Coal Company, I request approval of this modification to our approved permit. To the best of my knowledge, the information contained in this submittal is true and correct.

Thank you for your cooperation on this matter. If you have any questions, please contact me at 303-770-1600.

Sincerely,

Dave Schouweiler PE
Permit Coordinator

DAVID A. SCHOUWEILER REGISTERED PROFESSIONAL ENGINEER NORTH DAKOTA 2152

DS/ev
cc: B. Dunn
J. Higgins
R. Holbrook
S. Jaccaud
D. Jones

CONSTRUCTION METHODS

Site Preparation

The topsoil that exists at the site will be stripped in accordance with the soil survey made for this area. Recommended stripping depths range from 0" to 30". The topsoil will be stockpiled in the location proposed for this purpose and shown on Plate 15-1A.

Approximately 10,600 cy of topsoil will be stockpiled. The topsoil stockpile will be seeded with the following seed mixture.

Species	Lbs. of PLS*/Acre	PLS*/Sq. Ft.
Crested Wheatgrass	3.0	12
Streambank Wheatgrass	3.0	11
Western Wheatgrass	3.5	10
Russian Wildrye	3.0	12
Yellow Sweetclover	1.5	9
TOTAL	14.0	54

*PLS - Pure Live Seeds

After the topsoil has been removed and stockpiled, the area will be graded to provide a smooth, workable surface.

Road Construction

For access to the coal stockpile, we will construct a portion of the plant access road as proposed and conditionally approved by the Division of Oil, Gas, and Mining in the preparation plant submittal. The road will be constructed from Station 9+00 to Station 17+00 as located on drawing #E-52-050-005 (attached). The remainder of the road will be constructed in conjunction with the preparation plant.

Drainage Control

Water runoff from this stockpile will be channeled into the mine yard area to flow to the low area west of the office building. A berm will be constructed along the north edge of the stockpile to prevent runoff from entering the natural drainage. Ditches on the west and south sides of the stockpile will direct runoff from the stockpile toward an 18" corrugated metal pipe, installed at Station 9 + 40 of the plant access road. The culvert will discharge the water into the mine yard area.

Stockpile Construction

Coal will be hauled to site by truck. The coal will then be leveled and compacted with a front-end loader.

File

Consolidation Coal Company
Western Region
Emery Mine
P. O. Box 527
Emery, Utah 48522

August 19, 1983

Lynn Kunzler
Division of Oil, Gas, & Mining
4241 State Office Building
Salt Lake City, Utah 84114

RE: ACT/015/015
Consol - Emery Mine

Dear Mr. Kunzler:

Please find enclosed a map showing the diversion ditch we installed as outlined in our phone conversation of August 11, 1983. The ditch was installed to capture run-off coming from the steep slope to the west, and discharge it into the catch basin. The lower end of the ditch is riprapped to prevent erosion. This structure will prevent erosion damage to the catch basin slopes.

We also installed a small ditch to catch runoff from our new temporary stockpile area located just outside the mine gate, to the north. This ditch captures water from the stockpile area and discharges it into the main diversion for this area. This ditch will eliminate erosion of the slopes below the stockpile area.

Note that this structure is not shown on the enclosed map since an updated map of the area is not available at the mine.

Sincerely,

Ronald O. Hughes
Mine Engineer

VOLUME 9

Plates for Chapter 13.0

VOLUME 10

Plates for Chapter 13.0

Chapter 14.0 - Consultation and Coordination

1.4 Verification of Document

I certify that I have personally examined and am familiar with the information contained in this permit application and based on my inquiry of those individuals immediately responsible for obtaining the information, the submitted information is true and correct to the best of my knowledge.

10/5/83
Date

Richard M. Holbrook
Supervisor
Environmental Quality Control

Subscribed and sworn to before me this 5th day of October, 1983.

My commission expires 3/2/85.

Karen D. Greenlee
Notary Public
2 Inverness Drive East
Englewood, CO 80112

1.5 Correspondence

Correspondence or questions pertaining to this permit application should be directed to the following person:

Richard Holbrook
Consolidation Coal Company
2 Inverness Drive East
Englewood, CO 80112
(303) 770-1600

4.3.1 Surface Land Ownership Within and Adjacent to the Permit Area

The following information describes the surface land ownership within and adjacent to the permit area. Plate 4-1 shows surface land ownership in and adjacent to the permit area.

Section 19 T22S, R6E

Alonzo Olsen
82 S 2 W
Emery, Utah 84522
(801) 286-2263

George Olsen
15 E. Center
Orangeville, Utah
(801) 748-2522

James Olsen
647 N. Main
Spanish Fork, Utah 84660
(801) 798-3322

United States of America (BLM)
Lease No. U-5287
Utah State Offices
University Club Building
Salt Lake City, Utah
(801) 524-5330

D. Horne (Cedar Ridge Land & Livestock)
2496 Southwest Temple
Salt Lake City, Utah 84115
(801) 364-3339

Utah Power and Light
P.O. Box 899
Salt Lake City, Utah 84522
(801) 748-2570

Section 20 T22S, R6E

A. Petty c/o Gary Petty
360 W. Main
Emery, Utah 84522
(801) 286-2395

Glen R. Anderson
1462 W. 6235 S.
Murray, Utah 84107
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Randall D. Jensen
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Section 30 T22S, R6E

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Robert Lewis
07 W. 2 S.
Emery, Utah 84522
(801) 286-2424

Ralph Lewis
4053 S. 850 W.
Bountiful, Utah 84010
(801) 292-1240

George Lewis
75 East 3rd South
Salt Lake City, Utah 84103
Phone Unknown

	John Lewis 1163 E. 25th St. Idaho Falls, Idaho 83401 (208) 522-3646
	D. Horne 2496 Southwest Temple Salt Lake City, Utah 84115 (801) 364-3339
Section 31 T22S, R6E	Kemmerer Coal Company Frontier, Wyoming 83121 (307) 877-4452
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	Earl Bryant Emery, Utah 84522 (801) 286-2227
	John Lewis 1163 E. 25th St. Idaho Falls, Idaho 83401 (208) 522-3646
Section 32 T22S, R6E	Earl Bryant Emery, Utah 84522 (801) 286-2227
	Kemmerer Coal Company Frontier, Wyoming 83121 (307) 877-4452
Section 33 T22S, R6E	Kemmerer Coal Company Frontier, Wyoming 83121 (307) 877-4452
Section 34 T22S, R6E	Kemmerer Coal Company Frontier, Wyoming 83121 (307) 877-4452
	United States of America
Section 25 T22S, R5E	Rex Addley Emery, Utah 84522 (801) 286-2250
	George Lewis 75 E. 3rd South Salt Lake City, Utah Phone Unknown

	Robert Lewis 107 W. 2 S. Emery, Utah 84522 (801) 286-2424
	United States of America
Section 36 T22S, R5E	Robert Lewis 107 W. 2 S. Emery, Utah 84522 (801) 286-2424
	John Lewis 1163 E. 25th Street Idaho Falls, ID 83407 (208) 522-3646
Section 6 T23S, R6E	Kemmerer Coal Company Frontier, Wyoming 83121 (307) 877-4452
	State of Utah Lease #ML19799 State Lands & Forestry Nat. Resources & Energy 3100 State Office Building Salt Lake City, Utah 84114
	USA (BLM) Lease #U0101213
	Earl Bryant Emery, Utah 84522 (801) 286-2227
Section 5 T23S, R6E	Earl Bryant Emery, Utah 84522 (801) 286-2227
	United States of America (BLM) Lease No. U073039
Section 4 T23S, R6E	United States of America (BLM) Lease No. U073039
	United States of America (BLM) Not leased
Section 1, T235, R5E	United States of America (BLM) Not leased

4.3.2 Coal Ownership Within and Adjacent to the Permit Area

All the holdings described below that are shown as controlled by Kemmerer or Consol are subject to a 50/50 lease agreement between Consol and Kemmerer dated August 23, 1966 as amended 9/1/72 and 2/27/75, unless otherwise specified. The documents and lands listed pertain only to coal ownership. Plate 4-2 shows coal ownership in the permit area. Plate 4-5 shows other mines and prospects in the area.

Township 22 South, Range 6 East (SLM)

Section 19	NE¼SW¼ NW¼SE¼ E½SE¼ S½NE¼	Lease from USA (BLM) to Kemmerer and Consol dated 7/1/70 (#U-5287)* Utah State Offices University Club Building Salt Lake City, Utah (801) 524-5330
	SE¼SW¼	Deed from Emery County to Kemmerer Coal Co. dated 5/14/68
	SW¼SE¼	Deed from L. M. and S.M. Pratt to Kemmerer Coal Co. dated 6/22/49
	N½NE¼ NW¼	United States of America Not leased
	W½SW¼	Emery County 95 E. Main Castledale, Utah 84513 (801) 748-2474
Section 20	NW¼SW¼ S½S½ NE¼SE¼	Lease from United States of America (BLM) to Kemmerer and Consol dated 7/1/70 (#U-5287)
	NE¼ E½NW¼ NE¼SW¼ NW¼SE¼	Deed from San Rafael Fuel Co. to Kemmerer Coal Co. dated 10/1/58
	W½NW¼	United States of America Not leased
Section 21	W½ SE¼ W½NE¼ NE¼NE¼	Deed from San Rafael Fuel Co. to Kemmerer Coal Co. dated 10/1/58

	SE¼NE¼	Deed from L.M. and S.M. Pratt to Kemmerer Coal Co.
Section 22	NW¼NW¼	Deed from San Rafael Fuel Co. to Kemmerer Coal Co. dated 10/158
	SW¼SW¼	Deed from San Rafael Fuel Co. to Kemmerer Coal Co. dated 10/1/58
	SW¼NW¼ N½SW¼ SE¼SW¼	United States of America Not leased
	W½SE¼	Deed from I. Browning to Kemmerer Coal Co. dated 8/23/66
Section 27	S½ NW¼	Deed from San Rafael Coal Co. to Kemmerer Coal Co. dated 10/1/58
	N½NE¼	Deed from L.M. and S.M. Pratt to Kemmerer Coal Co. dated 6/22/49
	S½NE¼	Private ownership; Lorin Hunter 777 E. South Temple Salt Lake City, Utah (801) 328-2876
Section 28	NW¼	Deed from San Rafael Fuel Co. to Kemmerer Coal Co. dated 10/1/58
	NE¼	Deed from San Rafael Fuel Co. to Kemmerer Coal Co. dated 10/158
	S½	Deed from San Rafael Fuel Co. to Kemmerer Coal Co. dated 10/1/58
Section 29	NW¼NW¼ E½NW¼ W½NE¼ NW¼SE¼	Lease from United States of America (BLM) to Kemmerer and Consol dated 7/1/70 (#U-5287)
Beginning 20 rods South of the NW corner of the SW Quarter of Section 29, thence South 60 rods, thence East 80 rods, thence North 20 rods, thence Northwesterly to the place of beginning.		Lease from John and Carolyn Lewis to Consol and Kemmerer dated 11/12/80 1163 E. 25th Street Idaho Falls, ID 83401 (208) 522-3646

SW¼NW¼, beginning at the NW corner of the SW¼, thence E 80 rods, thence S 76 rods thence Northwesterly to the place of beginning.		Lease from George Olsen to Consolidation Coal Co. dated 12/17/80 15 E. Center Orangeville, Utah (801) 748-2522
	SE¼NE¼	Lease from R.D. Jensen and D.R. Close to Consolidation Coal Co. dated 12/17/80 520 E. 1 N. Cleveland, Utah (801) 653-2252
	NE¼NE¼ E½SE¼ SW¼SE¼ NE¼SW¼	Deed from San Rafael Fuel Co. to Kemmerer Coal Co. dated 10/1/58
	S½SW¼	Lease from State of Utah to Kemmerer Coal Co. dated 1/23/68 (#25005) State Land & Forestry Natural Resources & Energy 3100 State Office Building Salt Lake City, Utah
Section 30	S½NE¼ E½NW¼ NW¼SE¼ SW¼SE¼ SE¼SW¼	Deed from Emery County to Kemmerer Coal Co. dated 5/14/68
	N½NE¼ SW¼NW¼ NE¼SW¼	Deed from L.M. and S.M. Pratt to Kemmerer Coal Co. dated 6/22/49
	NW¼NW¼	Private ownership, Ralph Lewis 4053 S. 850 W. Bountiful, Utah 84010 (801) 292-1204
	SW½SW¼ S½NW¼SW¼	United States of America Not leased
	NE¼SE¼	Lease from John and Carolyn Lewis to Consolidation Coal Co. dated 11/12/80
	SE¼SE¼	Lease from State of Utah to Kemmerer Coal Co. dated 1/23/68 (#25005)
	N Portion of N½NW¼SW¼	Private ownership, Ralph Lewis 4053 S. 850 W. Bountiful, Utah 84010 (801) 292-1204

	S Portion of $N\frac{1}{2}NW\frac{1}{4}SW\frac{1}{4}$	Lease from Robert Lewis to Consolidation Coal Co. dated 10/3/74 107 W. 2 S. Emery, Utah 84522 (801) 286-2424
Section 31	$W\frac{1}{2}NE\frac{1}{4}$ $E\frac{1}{2}NW\frac{1}{4}$ $NW\frac{1}{4}NW\frac{1}{4}$	Deed from Emery County to Kemmerer Coal Co. dated 5/14/68
	$SW\frac{1}{4}NW\frac{1}{4}$ $W\frac{1}{2}SW\frac{1}{4}$ $SW\frac{1}{4}SE\frac{1}{4}$	See Note A.
	$E\frac{1}{2}NE\frac{1}{4}$	Deed from San Rafael Fuel Co. to Kemmerer Coal Co. dated 10/1/58
	$NW\frac{1}{4}SE\frac{1}{4}$ $NE\frac{1}{4}SW\frac{1}{4}$ $SE\frac{1}{4}SW\frac{1}{4}$	Lease from State of Utah to to Kemmerer Coal Co. dated 11/19/62 (#19797)
	$E\frac{1}{2}SE\frac{1}{4}$	Deed from L.M. and S.M. Pratt to Kemmerer Coal Co. dated 6/22/49
Section 32	$NW\frac{1}{4}$ $E\frac{1}{2}$	Deed from San Rafael Fuel Co. to Kemmerer Coal Co. dated 10/1/58
	$SW\frac{1}{4}$	Deed from L.M. and S.M. Pratt to Kemmerer Coal Co. dated 6/22/49
Section 33	All	Deed from San Rafael Fuel Co. to Kemmerer Coal Co. dated 10/1/58
Section 34	$N\frac{1}{2}$	Deed from San Rafael Fuel Co. to Kemmerer Coal Co. dated 10/1/58
	$S\frac{1}{2}$	United States of America Not leased
	Township 22 South Range 5 East (SLM)	
Section 25	$E\frac{1}{2}E\frac{1}{2}$	United States of America Not leased
Section 36	All	Utah State, not leased
	Township 23 South Range 5 East (SLM)	
Section 1	All	United States of America Not leased

Township 23 South 6 East (SLM)

Section 6	$N\frac{1}{2}NW\frac{1}{4}$ $NW\frac{1}{4}NE\frac{1}{4}$	See Note A.
	$NE\frac{1}{4}NE\frac{1}{4}$	Deed from L.M. and S.M. Pratt to Kemmerer Coal Co. dated 6/22/49
Section 5	$NW\frac{1}{4}NW\frac{1}{4}$	Deed from L.M. and S.M. Pratt to Kemmerer Coal Co. dated 6/22/49
	$E\frac{1}{2}$ $E\frac{1}{2}W\frac{1}{2}$ $W\frac{1}{2}SW\frac{1}{4}$ $SW\frac{1}{4}NW\frac{1}{4}$	Lease from United States of America (BLM) to Consol and Kemmerer dated 6/1/62
Section 4	$W\frac{1}{2}$	Lease from United States of America (BLM) to Consol and Kemmerer dated 6/1/62
	$E\frac{1}{2}$	United States of America Not leased

**NOTE A: The Kemmerer Coal Company has been paying taxes on these lands for a number of years. However, during the title investigations, the deed from Ira Browning to Kemmerer was found to be missing, but these lands are not included in the Browning estate. Therefore, it is Consol-Kemmerer's contention that these coal lands do indeed belong to Consol-Kemmerer, although judicial action will probably be necessary to clear them. The legal proceedings for these properties will be initiated in the near future.

U.S. Department of the Interior
Bureau of Reclamation
Durango Projects Office
835 Second Street
P.O. Box 640
Durango, CO 81301

Public Involvement Newsletter

July 1983

Colorado River Water Quality Improvement Program

Dirty Devil River Unit

This newsletter is the first of several intended to keep you informed on the progress of our salinity control investigation in the Dirty Devil River Basin. The purpose of the investigation is to find out where and how salt is picked up by ground and surface water and to formulate control methods. Salinity from the Dirty Devil Basin contributes significantly to the increasingly higher salinity levels found in the lower reaches of the Colorado River.

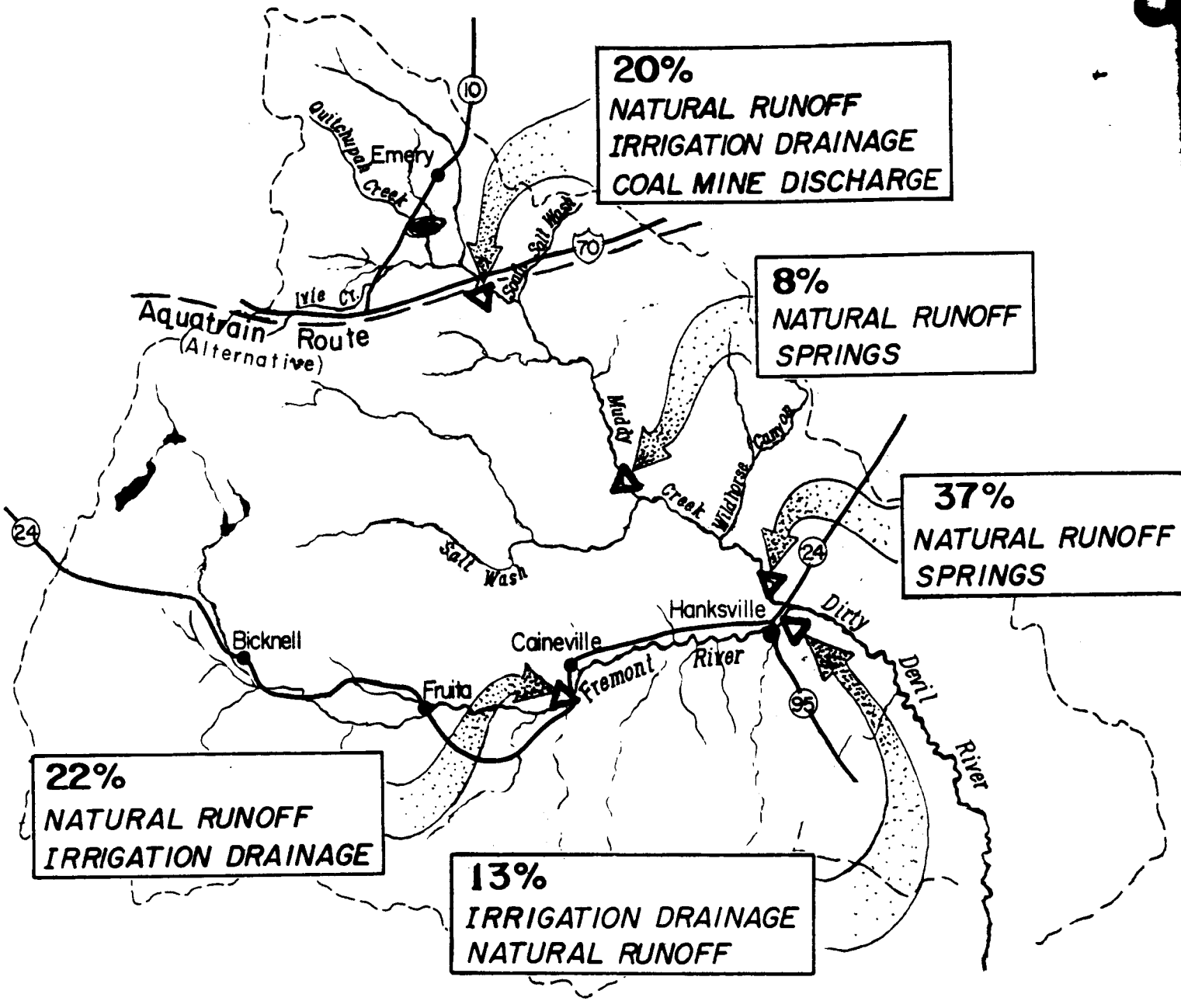
Salinity in the Colorado River causes various problems for municipal, industrial and agricultural water users downstream. Each increase of one milligram of salt per liter (mg/L) of river water* is estimated to cause damages of $540,000 per year.

The Dirty Devil River Unit is one of several salinity control projects in the Colorado River Basin. In Utah, the Price, San Rafael and Uinta River Basins are also being investigated to see what can be done to control the saline water originating there.

*This is the equivalent of one pound of salt per 120,000 gallons of water. The Dirty Devil River increases the concentration of the Colorado River by approximately 14 mg/L.

BREAKDOWN OF TOTAL BASIN SALINITY BY AREA

Figures at each gaging station (triangles) represent quantity of salt from drainage area between that station and next station upstream.



Approximately 140,000 tons of salt per year enters the Colorado from the Dirty Devil. That salt comes from the areas of the basin shown on the map. This conclusion is based on analysis of data collected by others over the past several years and measurements and observations we have made since initiating this study last summer. We've also gained some knowledge by talking to area ranchers and other residents who know about water movement and salinity in the basin. To confirm and refine our estimates, we need to collect more data.

In general, we're looking for locations where the water is of sufficient volume and the salt concentrated enough that control measures will be economical. The effectiveness of a method is measured by how much it will cost per unit of salt removed (expressed as "$ per mg/L").

Although about 61 percent of salt loading in the basin results from natural surface runoff, that salt is of such a low concentration or so difficult to control that it has poor cost-effectiveness. Point sources on the other hand, like springs and mine discharge, which account for about 24 percent of the total, are more cost-effective to control. Irrigation improvements can be cost-effective as well. Irrigation drainage accounts for about 15 percent of basin salinity.

LOWER MUDDY CREEK

This year we will be taking a closer look at South Wash (near Emery), Salt Wash and other tributaries in the lower end of the Muddy Creek drainage.

As the map shows, a large percentage of salt originates in this area in the form of springs and surface runoff. The springs and the concentrated saline groundwater associated with them may be controllable, probably by pumping the water from wells and disposing of it by injection into deeper wells or evaporation in shallow ponds. It could also be used:

- as powerplant cooling water;
- as process water for tar sands development;
- for power generation in a solar salt gradient pond; or
- as a transport medium in a pipeline.

The last alternative is the "Aquatrain" proposal--a plan to use saline water to carry coal and other products in a pipeline from Colorado, Wyoming and Utah to the west coast. The map shows a proposed Aquatrain route through the Dirty Devil Basin.

EMERY AREA

Salt entering Muddy Creek in this area comes from surface runoff and groundwater flowing over and through saline shales. Irrigation drainage, including canal seepage, contributes to saline groundwater.

Eliminating winter canal seepage by piping winter canal flows is a cost-effective salinity control measure. Piping or concrete lining the entire canal system is not cost effective based solely on salinity control; however, it could be if a portion of the costs are paid by the irrigation company.

A small portion of saline groundwater, less than 1 percent of the total basin salinity, is wastewater from Consolidated Coal's Browning Mine. We will study measures to control this flow.

Additional work in the Emery area will involve canal seepage studies, groundwater studies, and cost analyses of alternative control methods. The continued support of irrigation companies and people in the area will be essential in successfully implementing control measures.

FREMONT RIVER

We haven't found any significant salt sources in this area that would be economically controllable, so we are placing less emphasis on the Fremont in our investigation. Most of the Fremont salinity is caused by diffuse natural runoff with some irrigation drainage.

QUESTIONS? COMMENTS? Write or call collect Rege Leach, Study Team Leader, at (303) 247-0247.

We can give presentations on the study to interested groups.

WHAT DO YOU THINK OF THE NEWSLETTER?

We are planning to issue one about every 6 months. Let us know what information you'd like to see in it. Send us your name and address if you want to be placed on the mailing list.

We can also place you on the mailing list to receive *Salinity Update*, a newsletter issued by our Denver office that contains information on the salinity problem and the control program throughout the Colorado River Basin.

Extracted from: DRAFT Dirty Devil River Unit Plan of Study
Colorado River Water Quality Improvement Program

Bureau of Reclamation, Upper Colorado Region, Durango Project Office
June, 1983

EXISTING DATA AND PROPOSED DATA ACQUISITION PROGRAMS BY DISCIPLINE

HYDROSALINITY

Basic Data Requirements

The Dirty Devil study area contributes significant amounts of salt to the Dirty Devil River. This includes salts from vast areas of natural resource land (springs and surface runoff), irrigated agriculture near Emery, Caineville and Hanksville, and at least one significant point source of coal mine drainage water.

The ultimate requirements placed on the data must, therefore, isolate and quantify each of these salt-loading mechanisms in enough detail to evaluate the potentiality and feasibility for various types of corrective action. In addition, the data collection and analysis must be performed within the time and scheduling constraints set forth by the new "two-stage" planning process. Present schedules call for the Plan Formulation Working Document to be completed by November 1984.

Collection and Analysis of Existing Data

There has been a large amount of data collected in and many studies conducted on the Dirty Devil drainage basin by various governmental agencies and private entities. Yet, a review of these reports did not reveal any of these to be complete and comprehensive enough to deal with the hydrosalinity problem on a specific basis. Indeed, much of the data

collected was done over a relatively short duration (1 year or less) and with a low level of intensity. Thirty-five reports and studies obtained by the Durango Projects Office are listed in Appendix A. Due to the unstable stream channel conditions common in the study area, data collected by the USGS and Reclamation was of uncertain accuracy and reliability. As a result, the USGS has abandoned some of the gaging stations in the area.

The USGS and the Bureau of Reclamation are the only agencies which have undertaken any extensive long term water quality data collection programs. Unfortunately, reliable instantaneous water quality and flow data were collected rather infrequently. Generally, water quality samples with instantaneous measured flows were collected on a quarterly basis. Bureau of Reclamation streamflow measurements were often made with staff gages and by visual estimation by personnel from the local area. The poor rating curves and visually estimated flows produced errors of 50 to 150 percent. This data collection by resident observers was done on a weekly basis from 1975 to 1980 and twice monthly thereafter.

Preliminary analyses of these existing data produced fairly reasonable numbers for flow and salt loading on an average yearly basis. Average yearly discharge, shown in Table 1, compares instantaneous with average yearly discharge for the 8-year period from 1975 to 1982. Refer to the project map for station locations, Appendix B.

TABLE 1
INSTANTANEOUS AND AVERAGE DAILY FLOWS

Station	Average Flows Acre-Feet/Year Based On: Instantaneous Discharge Measurements	Avg. Daily Flows(USGS)	Average Salt Load Tons/Year Based On: Instantaneous Samples	Avg. Daily Flows(USGS)	Percent Difference
Muddy Creek near Emery 09330500	27,700	24,200	8,800	7,700	13.5
Muddy Creek Below I-70 09332100	11,400	12,200	24,800	26,700	7.3
Muddy Creek at Delta Mine 09332700	16,000	15,900	38,300	38,200	0.3
Muddy Creek at Mouth 09332800	34,200	20,000	152,700	89,300	52.4
Fremont River at Bicknell 09330000	47,500	49,300	22,600	23,500	3.8
Fremont River Above Caineville 09330230	45,700	45,400	30,400	30,200	0.7
Dirty Devil River Above Poison Spring Wash 09333500	64,400	69,600	133,000	143,700	7.7

Although many of these values are based on information containing large amounts of poor quality data, in most cases our analysis of these instantaneous samples yields average yearly values which closely approximate those derived from published average daily flow records. The reason for this phenomena is explained briefly in the following section on

uncertainty or in more detail in the Statistical Treatment of Experimental Data, by Hugh D. Young, McGraw Hill. Average yearly estimates are used in the preliminary basin salt and water budget described below and on the attached "Dirty Devil River Unit Flow and Quality Stations" map. See Appendix B, Map No. 65-406-409.

Salt and Water Budget

The numbers used in the salt and water budget are long-term flow-weighted mean values in tons and acre-feet per year. A summary of existing data for each station is shown in Appendix C.

Muddy Creek and Tributaries:

A. Irrigated Lands Around Emery

1. Based on USGS and USBR flow and quality measurements on Muddy Creek near Emery, Saleratus Creek, Ivie Creek, Ivie Creek Tributary, and Quitchupah Creek at Convulsion Canyon, the estimated salt load entering the irrigated area is 15,800 tons/year. Most of this loading occurs as low TDS concentrations, and is considered uncontrollable except by total impoundment and evaporation.

2. Based on average daily and instantaneous flows and instantaneous quality measurements made at the USGS gage on Muddy Creek below I-70, approximately 26,700 tons/year are leaving the irrigated area.

3. The difference between the incoming and outgoing salt loads, including an 1,100 ton out-of-basin diversion to the San Rafael basin through the Independent Canal, indicates a pick-up of 12,000 tons of salt per year in the Emery irrigated area and surrounding natural resource lands. This includes some mine drainage discharge, which contributes more than 2,000 tons/year. It appears that a portion of this mine discharge may be drainage from the irrigated area. Further investigation of this discharge will be made during the study.

B. Natural Resource Lands, Tributary to the Muddy Creek Between the USGS Gage Below I-70 and the Mouth of the Creek

1. The USGS gage on Muddy Creek above Hanksville Salt Wash at Delta Mine shows about 38,200 tons/year pass this point. This indicates a salt pick-up of 11,500 tons/year for the reach of Muddy Creek between this gage and the previous gage below I-70.

2. It is estimated that 15,300 tons/year enter Muddy Creek from Hanksville Salt Wash. This is based on minimal data collected by USBR at the gage 471, shown on Map No. 65-406-409, and is corroborated by the fact that this spring-fed tributary seems to have a fairly constant base flow rate of 2 cfs at an E.C. of 7,500 to 9,800 micromhos.

3. The USGS gage on Muddy Creek at the mouth was discontinued after 5 years of data collection due to the development of extremely poor gaging conditions. Using USGS average yearly flow, records at this site with quality data indicate approximately 89,300 tons/year of salt pass this

point. The salt pick-up between the gage at Delta mine above Hanksville Salt Wash and this location would be about 51,100 tons/year, including the salt load contribution of Hanksville Salt Wash.

Fremont River and Tributaries:

A. Irrigated and natural resource lands between the USGS gage on the Fremont River near Bicknell and the Fremont River at its mouth near Hanksville are included below.

1. Data from the gage near Bicknell indicates that about 23,500 tons/year pass this point. This salt load is associated with relatively high base flows and low TDS concentrations of around 336 mg/L. Very little water quality data is available here, but the quality does not appear to change significantly; nor is there any obvious source of salt loading.

2. Approximately 30,200 tons/year pass the USGS gage near Caineville. Using the long-term average numbers, a salt pick-up of 6,700 tons/year takes place between the Bicknell and Caineville gages. There is some dispersed irrigation of non-saline soils and some pick-up of salt from natural resource lands in that reach. No point source contributors have yet been identified. The relatively high base flows and low TDS concentrations of around 650 mg/L at the Caineville gage make finding a point source the only prospect of control in this reach.

3. There are no additional USGS gaging stations between the gage near Caineville and the mouth of the Fremont River. The only hydrosalinity records available in this reach were collected by the Bureau of Reclamation. Infrequent and/or poor flow monitoring of the Fremont River below Caineville is responsible for questionable estimates of salt loading from that point. A large number of water quality samples were included in the data collected, but there are very few reliable stream-flow measurements associated with them. It is estimated that 47,300 tons of salt per year leave the Fremont River at its mouth near Hanksville. The pick-up of 17,100 tons per year in this reach is attributable to both agriculture and natural resource lands.

Dirty Devil River and Tributaries

It does not appear that significant amounts of salt enter the Dirty Devil River between Hanksville and Poison Spring Wash. An EPA study stated the same conclusion. The numbers available for the Fremont and Muddy at their confluence show 136,600 tons/year entering the Dirty Devil River, with 143,700 tons per year passing the USGS gage above Poison Spring Wash. It appears that only 7,100 ton/year are picked up in this stretch of river, which can be attributed to natural runoff.

Table 2 summarizes the calculated uncertainty associated with the long-term flow-weighted mean values presented in the Salt Budget described above.

TABLE 2

UNCERTAINTY ASSOCIATED WITH LONG TERM FLOW WEIGHTED MEAN VALUES PRESENTED IN SALT BUDGET

Station	Avg. Yearly Value (Tons/Year)	Associated Uncertainty (Tons/Year)	(Percent)
Sum of: Muddy Creek Near Emery, Saleratus Creek, Ivie Creek, Ivie Creek Tributary, Quitchupah Creek at Convulsion Canyon	15,800	± 1,400	8.9%
Muddy Creek Below I-70	26,700	± 1,700	6.4%
Muddy Creek at Delta Mine	38,200	± 2,100	5.5%
Hanksville Salt Wash	15,300	± 2,500	16.3%
Muddy Creek at Mouth	89,300	± 14,000	15.7%
Fremont River Near Bicknell	23,500	± 1,200	5.1%
Fremont River Near Caineville	30,200	± 1,500	5.0%
Fremont River at Mouth	47,300	± 9,500	20.1%
Sums of Loading @ Confluence of Muddy & Fremont	136,600	± 23,500	17.2%
Dirty Devil River Above Poison Spring Wash	143,700	± 2,100	1.5%

The uncertainty was derived through a propogation of errors for each discrete sample using the method discussed in Statistical Treatment of Experimental Data, by Hugh D. Young, McGraw-Hill, Chapter IV and Observations and Least Squares, by Edward M. Mikhail, IEP-a, Dun-Dunnelley Publ., 1976, N.Y., Chap. 1-4. The equations were derived and developed for this specific application. It should be noted that the uncertainties computed are an estimate of the standard random deviation of errors only. These uncertainty estimates do not include the error resulting from projection of instantaneous samples over long time intervals, systematic errors occurring within the data collection program or natural variations of flow and salt concentrations occurring from one year to the next. The computed uncertainty value is merely an indicator of the "overall quality" of the data. The uncertainty or quality of a data set is as much a function of the quantity of samples as well as the quality of them. This could explain the comparison displayed in Table 1. The uncertainty values computed for all the years of record would not apply to any one year in particular because the decrease in the number of samples for one year would result in a higher degree of uncertainty. The work done on uncertainty estimation derivations may be reviewed upon request with the Durango Projects Office.

Overall Quality and Reliability of Existing Data Base

The overall perspective presented by a summary of the existing data is useful for establishing further data needs, collection requirements and monitoring locations. The existing data base also brings to light problems to overcome or avoid in collecting new data. A number of problems have plagued past collection efforts and have resulted in either

a loss of time, money and information or collection of information which is unreliable or questionable. Several of these problems are listed below:

A. There are few locations on the natural tributaries which are rateable for continuous monitoring of EC and flow. Also, due to flash-flooding, silt loads and shifting channels, any type of permanent station would be difficult to keep established.

B. Personnel used for collection of data must be trained in order to obtain quality information.

C. There is an indication that the USGS water quality information is obtained by sampling during higher flows in an attempt to extend the rating curves of their gaging stations rather than using systematic time or random sampling, resulting in biased data.

D. Because of adverse hydrologic and gaging conditions in the area, even the best possible data collection will likely have higher than normal levels of inaccuracy. With properly designed, installed, and operated monitoring stations, the hydrosalinity system can be more accurately defined.

Need for Additional Data

Review of the existing data base exposed many areas where data were unusable because they were unreliable or questionable, where there were

STATION 9330500 PROCESSED 83
MUDDY CREEK NEAR EMERY 490
SUMMARY SHEET

CHEMICAL BREAKDOWN ANALISIS

	E.C.	TDS	CA++	MG++	NA++	K+	CO3--	HCO3-	CL-	SO4--	P.H.	I FLOW	A FLOW
YEARS FROM	1971	1971	1975	1975	1975	1975	1975	1975	1975	1975	1975	1971	1971
YEARS TO	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1981
NUMBER OF SAMPLES	344	344	231	231	231	231	143	231	230	231	236	344	334
MEAN	439.0												
MG/L		259.3	42.4	27.6	16.4	1.0	8.1	237.7	6.5	44.9	8.3	37	38
FLOW WEIGHTED MEAN	404.2										8.3		
MG/L		234.3	40.7	24.9	12.7	1.0	7.4	227.2	5.5	32.1			
TONS/ACRE FT.		0.3185	0.0553	0.0338	0.0172	0.0013	0.0100	0.3087	0.0076	0.0436			
UNCERTAINTY(T/AF)		0.0103	0.0010	0.0010	0.0018	0.0000	0.0001	0.0022	0.0005	0.0096			
% OF MEAN		3.259%	1.917%	2.95%	10.492%	4.262%	1.954%	0.712%	7.318%	19.889%			
MAXIMUM	3970.0	3740.0	269.0	258.0	437.0	8.6	30.0	356.0	136.0	2166.0	9.9	279.00	263.00
MINIMUM	219.0	159.0	20.0	19.3	4.1	0.3	0.3	151.0	0.7	5.7	7.7	1.00	1.40

AVG. SALT DISCHARGE(TONS/Y)	9829.8	1534.1	939.2	479.5	38.2	279.5	8559.4	210.7	1209.3			
SALT UNCERTAINTY (TONS/YEAR)	377.3	51.5	38.0	52.0	1.9	9.4	244.2	16.4	242.8			
SALT UNCERTAINTY (PERCENT)	4.2731	3.3634	4.0472	10.8506	5.0799	3.3645	2.8534	7.8222	20.0802			

AVERAGE FLOW COMPUTED WAS * 27720.4 * ACRE FT./YEAR
AND ASSOCIATED UNCERTAINTY COMPUTED WAS * 2.76 * PERCENT

AVG. SALT DISCHARGE(TONS/Y)	7714.8	1340.3	820.6	418.9	33.4	244.2	7478.6	184.1	1056.6			
SALT UNCERTAINTY (TONS/YEAR)	460.4	71.7	47.6	48.6	2.1	13.1	377.7	16.3	216.6			
SALT UNCERTAINTY (PERCENT)	5.9686	5.3552	5.8091	11.6233	6.5705	5.3685	5.0505	8.8630	20.5081			

AVERAGE FLOW INPUT WAS * 24220.0 * ACRE FT./YEAR
AND ASSOCIATED UNCERTAINTY INPUT WAS * 5.00 * PERCENT

APPENDIX C

PROCESSED 04/22/83

STATION - 09331701
SALERATUS CREEK AT U-10 NEAR EMERY 480
SUMMARY SHEET

CHEMICAL BREAKDOWN ANALISIS

	E.C.	TDS	CA++	MG++	NA++	K+	CO3--	HCO3-	CL-	SO4--	P.H.	I FLOW	A FLOW
YEARS FROM	1975	1975	1975	1975	1975	1975	1977	1975	1975	1975	1975	1975	0
YEARS TO	1982	1982	1982	1982	1982	1982	1979	1982	1982	1982	1982	1982	0
NUMBER OF SAMPLES	294	294	294	294	294	294	5	294	294	294	294	211	0
MEAN	4399.7										7.9	0	0
MG/L		4270.7	289.5	293.8	494.1	10.0	23.0	339.8	159.7	2421.4			
FLOW WEIGHTED MEAN	4244.6										8.0		
MG/L		4070.4	277.2	276.4	478.2	8.9	25.3	332.9	154.6	2305.9			
TONS/ACRE FT.		5.5317	0.3767	0.3757	0.6499	0.0121	0.0343	0.4524	0.2102	3.1338			
UNCERTAINTY(T/AF)		0.0529	0.0051	0.0065	0.0090	0.0002	0.0030	0.0063	0.0043	0.0597			
% OF MEAN		1.498%	1.369%	1.74%	1.399%	2.290%	8.784%	1.402%	2.060%	1.619%			
MAXIMUM	9590.0	11000.0	591.1	809.4	1252.9	23.4	33.0	854.1	456.9	6018.2	8.4	10.00	0.00
MINIMUM	970.0	569.0	43.2	44.2	47.2	2.7	7.2	154.3	17.7	171.0	7.3	0.10	####.##

AVG. SALT DISCHARGE(TONS/Y)	2771.2	185.7	188.2	325.6	6.0	17.2	226.6	105.3	1569.9			
SALT UNCERTAINTY (TONS/YEAR)	231.8	15.7	15.8	27.1	0.5	2.0	18.9	8.9	131.7			
SALT UNCERTAINTY (PERCENT)	8.3670	8.3448	8.4143	8.3482	8.5443	12.0385	8.3504	8.4856	8.3894			

AVERAGE FLOW COMPUTED WAS * 500.9 * ACRE FT./YEAR
AND ASSOCIATED UNCERTAINTY COMPUTED WAS * 8.23 * PERCENT

PROCESSED /83

STATION 9999200
IVIE CREEK AT U-10 NEAR EMERY 479
SUMMARY SHEET

CHEMICAL BREAKDOWN ANALYSIS

	E.C.	TDS	CA++	MG++	NA++	K+	CO3--	HCO3-	CL-	SO4--	P.H.	I FLOW	A FLOW
YEARS FROM	1975	1975	1975	1975	1975	1975	1976	1975	1975	1975	1975	1975	0
YEARS TO	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	0
NUMBER OF SAMPLES	212	212	212	212	212	212	24	212	212	212	212	152	0
MEAN	1313.1										8.0	1	0
MG/L		1031.9	116.7	78.9	78.8	4.7	11.5	245.9	62.9	498.0			
FLOW WEIGHTED MEAN	1313.4										8.1		
MG/L		1029.9	115.2	75.2	83.9	4.3	11.2	234.5	63.5	493.6			
TONS/ACRE FT.		1.3724	0.1566	0.1022	0.1141	0.0059	0.0152	0.3187	0.0864	0.6572			
UNCERTAINTY(T/AF)		0.1711	0.0122	0.0125	0.0220	0.0003	0.0020	0.0083	0.0070	0.1117			
% OF MEAN		12.468%	7.829%	12.23%	19.315%	5.056%	13.59%	2.621%	8.194%	17.002%			
MAXIMUM	7430.0	7830.0	435.8	699.0	747.1	21.5	28.8	482.6	414.7	4495.6	8.5	14.00	0.00
MINIMUM	350.0	190.0	37.4	13.3	7.5	0.7	1.2	102.0	5.6	29.7	7.2	0.10	####.##

AVG. SALT DISCHARGE(TONS/Y)	1339.3	152.7	99.7	111.2	5.8	14.8	310.8	84.2	640.9			
SALT UNCERTAINTY (TONS/YEAR)	279.0	28.1	20.6	28.4	1.0	3.2	52.5	15.6	152.8			
SALT UNCERTAINTY (PERCENT)	20.8373	16.4576	20.7161	25.5429	17.4631	21.5484	16.9194	18.5155	23.8429			

AVERAGE FLOW COMPUTED WAS 975.1 ACRE FT./YEAR
AND ASSOCIATED UNCERTAINTY COMPUTED WAS 16.71 PERCENT

PROCESSED 04/25/83

STATION - 09331100
IVY CREEK TRIBUTARY NEAR EMERY 479
SUMMARY SHEET

CHEMICAL BREAKDOWN ANALISIS

	E.C.	TDS	CA++	MG++	NA++	K+	CO3--	HCO3-	CL-	SO4--	P.H.	I FLOW	A FLOW
YEARS FROM	1975	1975	1975	1975	1975	1975	1975	1975	1975	1975	1975	1975	0
YEARS TO	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	0
NUMBER OF SAMPLES	286	286	286	286	286	286	11	286	286	286	286	201	0
MEAN	6210.0										7.9	0	0
MG/L		6431.2	393.4	576.0	589.4	22.2	26.0	427.4	328.3	3683.4			
FLOW WEIGHTED MEAN	6218.6										7.9		
MG/L		6458.2	389.2	588.4	593.3	20.9	19.6	433.4	338.0	3703.9			
TONS/ACRE FT.		8.7767	0.5290	0.7996	0.8063	0.0284	0.0267	0.5890	0.4594	5.0336			
UNCERTAINTY(T/AF)		0.2790	0.0113	0.0271	0.0226	0.0005	0.0049	0.0134	0.0152	0.1436			
% OF MEAN		3.179%	2.149%	3.39%	2.808%	2.062%	18.568%	2.291%	3.329%	2.853%			
MAXIMUM	9080.0	10100.0	601.2	911.7	919.5	57.8	45.0	802.3	540.5	5494.7	8.6	15.00	0.00
MINIMUM	871.0	586.0	96.1	45.7	29.4	3.5	9.6	75.6	36.1	172.9	7.4	0.10	####.##

AVG. SALT DISCHARGE(TONS/Y)	3493.7	209.9	317.4	320.0	11.2	10.6	233.7	182.3	1998.0			
SALT UNCERTAINTY (TONS/YEAR)	399.6	23.5	36.6	36.4	1.2	2.2	26.3	20.9	227.5			
SALT UNCERTAINTY (PERCENT)	11.4726	11.2310	11.5341	11.3756	11.2147	21.5937	11.2589	11.5152	11.3867			

AVERAGE FLOW COMPUTED WAS " 396.9 " ACRE FT./YEAR
AND ASSOCIATED UNCERTAINTY COMPUTED WAS " 11.02 " PERCENT

PROCESSED 793

STATION 09331850
CONVULSION CANYON ON CUITCHUPA CRK-EMERY
SUMMARY SHEET

CHEMICAL BREAKDOWN ANALISIS

	E.C.	TDS	CA++	MG++	NA++	K+	CO3--	HCO3-	CL-	SO4--	P.H.	I FLOW	A FLOW
YEARS FROM	1980	1980	1980	1980	1980	1980	1981	1980	1980	1980	0	1980	1980
YEARS TO	1991	1991	1981	1981	1981	1981	1981	1981	1981	1991	0	1981	1981
NUMBER OF SAMPLES	8	7	8	8	8	8	5	7	8	8	0	8	8
MEAN	735.8										0.0	1	1
MG/L		442.5	69.7	43.3	25.1	2.7	4.6	307.1	16.1	137.5			
FLOW WEIGHTED MEAN	721.9							0.0			FLOW WEIGHTED MEAN		
MG/L		446.7	67.7	41.6	24.2	2.5	5.2	297.1	15.1	132.7			
TONS/ACRE FT.		0.0071	0.0020	0.0016	0.0029	0.0035	0.0071	0.0037	0.0205	0.1804			
UNCERTAINTY(T/AF)		0.0172	0.0019	0.0011	0.0006	0.0000	0.0002	0.0091	0.0004	0.0035			
% OF MEAN		2.154%	2.064%	2.02%	1.960%	2.170%	4.064%	2.278%	2.177%	1.975%			
MAXIMUM	890.0	891.0	91.0	58.0	30.0	3.9	9.0	400.0	24.0	170.0	0.0	2.00	1.60
MINIMUM	660.0	402.0	59.0	38.0	23.0	2.0	2.0	260.0	12.0	120.0	0.0	1.00	0.69
AVG. SALT DISCHARGE(TONS/Y)		514.7	79.0	48.0	27.9	2.9	6.0	342.3	17.4	153.0			
SALT UNCERTAINTY (TONS/YEAR)		24.5	3.6	2.2	1.3	0.1	0.3	16.4	0.8	7.1			
SALT UNCERTAINTY (PERCENT)		4.7645	4.7109	4.6946	4.6961	4.7580	5.8692	4.8031	4.7613	4.6723			

AVERAGE FLOW COMPUTED WAS " 947.9 " ACRE FT./YEAR
AND ASSOCIATED UNCERTAINTY COMPUTED WAS " 4.23 " PERCENT

PROCESSED 04/25/83

STATION - 09331950
CHRISTIANSEN WASH ABOVE QUITCHUPAH 494
SUMMARY SHEET

CHEMICAL BREAKDOWN ANALISIS

	E.C.	TDS	CA++	MG++	NA++	K+	CO3--	HCO3-	CL-	SO4--	P.H.	I FLOW	A FLOW
YEARS FROM	1978	1978	1978	1978	1978	1978	1978	1978	1978	1978	1982	1979	1978
YEARS TO	1982	1982	1982	1982	1982	1982	1981	1982	1982	1982	1982	1982	1981
NUMBER OF SAMPLES	172	171	172	172	172	172	43	171	172	172	172	149	159
MEAN	3150.7										8.1	2	3
MG/L		2704.5	166.3	174.2	392.2	8.2	16.7	383.1	58.6	1515.2			
FLOW WEIGHTED MEAN	2583.8										8.1		
MG/L		2139.7	140.9	141.6	304.6	7.6	15.4	357.9	45.9	1195.1			
TONS/ACRE FT.		2.9078	0.1915	0.1925	0.4140	0.0103	0.0210	0.4864	0.0624	1.6105			
UNCERTAINTY(T/AF)		0.0632	0.0027	0.0038	0.0105	0.0002	0.0007	0.0041	0.0014	0.0374			
% OF MEAN		2.175%	1.438%	2.00%	2.550%	1.935%	3.535%	0.850%	2.264%	2.326%			
MAXIMUM	5400.0	5450.0	340.0	343.4	799.0	16.8	39.6	860.0	255.0	2947.1	8.7	15.00	84.00
MINIMUM	743.0	490.0	50.0	30.0	66.0	1.9	2.0	178.0	11.0	217.0	7.5	0.30	0.37

AVG. SALT DISCHARGE(TONS/Y)	4943.1	325.5	327.3	703.8	17.5	35.7	826.8	106.1	2737.8			
SALT UNCERTAINTY (TONS/YEAR)	321.1	20.4	21.0	46.6	1.1	2.5	51.0	6.9	179.2			
SALT UNCERTAINTY (PERCENT)	6.4963	6.2880	6.4409	6.6311	6.4207	7.0686	6.1799	6.5267	6.5483			

AVERAGE FLOW COMPUTED WAS * 1669.9 * ACRE FT./YEAR
AND ASSOCIATED UNCERTAINTY COMPUTED WAS * 6.12 * PERCENT

PROCESSED '83

STATION 331900
QUITCHUPAH CREEK & CONSOLIDATED MINE 492
SUMMARY SHEET

CHEMICAL BREAKDOWN ANALISIS

	E.C.	TDS	CA++	MG++	NA++	K+	CO3--	HCO3-	CL-	SO4--	P.H.	I FLOW	A FLOW
YEARS FROM	1976	1976	1976	1976	1976	1976	1977	1976	1976	1976	1976	1976	1978
YEARS TO	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1981
NUMBER OF SAMPLES	280	279	279	279	279	279	80	279	279	279	279	275	160
MEAN	2546.0										8.1	3	10
MG/L		2049.8	127.0	100.1	369.5	6.8	13.3	348.0	66.0	1112.5			
FLOW WEIGHTED MEAN	1979.0										8.1		
MG/L		1414.5	100.2	70.5	250.1	5.4	12.4	320.5	49.0	731.0			
TONS/ACRE FT.		1.9223	0.1361	0.0958	0.3400	0.0073	0.0169	0.4355	0.0666	0.9935			
UNCERTAINTY(T/AF)		0.0317	0.0016	0.0015	0.0063	0.0001	0.0005	0.0036	0.0010	0.0193			
% OF MEAN		1.653%	1.199%	1.60%	1.864%	1.925%	3.533%	0.835%	1.620%	1.944%			
MAXIMUM	7430.0	7740.0	470.9	692.9	1126.4	50.8	63.6	1190.0	430.6	4495.6	8.9	25.00	442.00
MINIMUM	724.0	490.0	42.0	30.2	63.4	0.9	2.0	104.0	15.0	153.0	7.3	0.20	0.97

AVG. SALT DISCHARGE(TONS/Y)	5748.3	409.6	287.6	1020.2	22.1	50.7	1307.0	200.0	2981.1			
SALT UNCERTAINTY (TONS/YEAR)	265.1	18.4	13.3	45.2	1.0	2.8	57.8	9.2	141.8			
SALT UNCERTAINTY (PERCENT)	4.6491	4.5071	4.6306	4.7276	4.7124	5.6002	4.4240	4.6367	4.7598			

AVERAGE FLOW COMPUTED WAS ' 3000.6 ' ACRE FT./YEAR
AND ASSOCIATED UNCERTAINTY COMPUTED WAS ' 4.34 ' PERCENT

PROCESSED S 931

STATION 331921
QUITCHUPAH BELOW CHRISTIANSEN WASH 49S
SUMMARY SHEET

CHEMICAL BREAKDOWN ANALISIS

	E.C.	TDS	CA++	MG++	NA++	K+	CO3--	HCO3-	CL-	SO4--	P.H.	I FLOW	A FLOW
YEARS FROM	1976	1976	1976	1976	1976	1976	1977	1976	1976	1976	1976	1976	0
YEARS TO	1978	1978	1978	1978	1978	1978	1978	1978	1978	1978	1978	1978	0
NUMBER OF SAMPLES	101	101	101	101	101	101	20	101	101	101	101	101	0
MEAN	3486.0										8.0	3	0
MG/L		3030.1	168.7	147.7	531.7	7.8	16.0	356.9	82.4	1695.8			
FLOW WEIGHTED MEAN	2562.7										8.1		
MG/L		2136.3	133.8	106.0	365.2	6.3	14.6	318.9	59.3	1161.2			
TONS/ACRE FT.		2.9032	0.1819	0.1440	0.4964	0.0086	0.0193	0.4334	0.0807	1.5781			
UNCERTAINTY(T/AF)		0.1141	0.0053	0.0059	0.0199	0.0002	0.0009	0.0062	0.0027	0.0680			
% OF MEAN		3.930%	2.941%	4.13%	4.021%	2.663%	4.798%	1.444%	3.440%	4.314%			
MAXIMUM	6360.0	6500.0	345.6	339.0	1028.7	16.8	34.2	561.9	161.2	3646.4	8.4	13.70	0.00
MINIMUM	1040.0	711.0	60.1	36.9	110.3	2.3	6.0	176.3	23.7	303.5	7.5	0.30	####.##

AVG. SALT DISCHARGE(TONS/Y)	6798.0	425.1	336.8	1160.6	20.2	46.5	1013.3	188.7	3689.9			
SALT UNCERTAINTY (TONS/YEAR)	554.9	32.9	27.8	95.3	1.5	4.0	74.0	15.0	308.7			
SALT UNCERTAINTY (PERCENT)	8.1750	7.7481	8.2775	8.2191	7.6468	8.6260	7.3119	7.9507	8.3664			

AVERAGE FLOW COMPUTED WAS " 2338.0 " ACRE FT./YEAR
AND ASSOCIATED UNCERTAINTY COMPUTED WAS " 7.16 " PERCENT

PROCESSED 1783

STATIC 9331400
MUDDY CREEK 1 MILE ABOVE I-70 403
SUMMARY SHEET

CHEMICAL BREAKDOWN ANALISIS

	E.C.	TDS	CA++	MG++	NA++	K+	CO3--	HCO3-	CL-	SO4--	P.H.	I FLOW	A FLOW
YEARS FROM	1975	1975	1975	1975	1975	1975	1975	1975	1975	1975	1975	1975	0
YEARS TO	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	0
NUMBER OF SAMPLES	179	177	177	177	177	177	41	177	177	177	177	124	0
MEAN	2973.7										8.1	10	0
MG/L		2465.4	157.8	125.2	415.2	6.4	15.0	338.6	51.9	1420.9			
FLOW WEIGHTED MEAN	1735.0										8.2		
MG/L		1337.8	103.0	71.8	215.1	3.9	11.2	299.9	27.9	730.4			
TONS/ACRE FT.		1.8150	0.1400	0.0977	0.2923	0.0054	0.0153	0.4075	0.0378	0.9927			
UNCERTAINTY(T/AF)		0.2635	0.0136	0.0116	0.0482	0.0003	0.0010	0.0633	0.0063	0.1806			
% OF MEAN		14.495%	9.726%	11.96%	16.494%	5.836%	6.530%	15.544%	16.697%	18.199%			
MAXIMUM	10400.0	10700.0	470.9	510.5	2022.9	31.2	38.4	2554.0	202.7	6167.1	8.7	80.00	0.00
MINIMUM	84.0	220.0	37.6	19.4	9.8	0.7	2.4	165.9	3.5	21.6	7.6	0.10	####.##

AVG. SALT DISCHARGE(TONS/Y)	11919.6	918.1	640.5	1916.7	35.5	100.5	2672.1	248.0	6508.3			
SALT UNCERTAINTY (TONS/YEAR)	2159.2	133.9	103.5	379.5	4.3	12.7	506.7	49.4	1379.4			
SALT UNCERTAINTY (PERCENT)	18.1152	14.5827	16.1640	19.7515	12.3333	12.6765	18.9650	19.9211	21.1957			

AVERAGE FLOW COMPUTED WAS * 6556.1 * ACRE FT./YEAR
AND ASSOCIATED UNCERTAINTY COMPUTED WAS * 10.96 * PERCENT

PROCESSED 4/

STATION - 09332100
MUDDY CREEK BELOW I-70 NEAR EMERY -402
SUMMARY SHEET

CHEMICAL BREAKDOWN ANALISIS

	E.C.	TDS	CA++	MG++	NA++	K+	CO3--	HCO3-	CL-	SO4--	P.H.	I FLOW	A FLOW
YEARS FROM	1973	1973	1973	1973	1973	1973	1974	1973	1973	1973	1973	1973	1973
YEARS TO	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1982	1981
NUMBER OF SAMPLES	459	459	381	381	381	381	48	381	381	381	382	449	438
MEAN	2871.6												
MG/L		2460.2	152.3	137.3	374.1	7.3	16.4	309.5	83.7	1344.6	8.0	15	17
FLOW WEIGHTED MEAN	2003.1												
MG/L		1609.9	114.1	93.4	245.6	5.8	15.0	290.1	49.9	862.9	8.0		
TONS/ACRE FT.		2.1878	0.1550	0.1269	0.3337	0.0078	0.0204	0.3943	0.0678	1.1726			
UNCERTAINTY(T/AF)		0.0840	0.0049	0.0057	0.0164	0.0002	0.0023	0.0071	0.0034	0.0586			
% OF MEAN		3.840%	3.181%	4.50%	4.919%	3.580%	11.233%	1.814%	5.099%	5.000%			
MAXIMUM	7160.0	7690.0	440.8	702.0	948.2	20.7	36.0	553.3	3200.0	4383.2	9.8	176.00	229.00
MINIMUM	340.0	219.0	40.0	21.0	9.2	0.7	3.9	156.1	2.4	8.1	7.4	0.01	0.01

AVG. SALT DISCHARGE(TONS/Y)	24845.7	1761.0	1441.9	3790.5	89.5	232.7	4477.7	771.0	13317.2			
SALT UNCERTAINTY (TONS/YEAR)	2018.4	137.9	121.9	329.2	7.1	31.0	330.7	67.7	1162.9			
SALT UNCERTAINTY (PERCENT)	8.1240	7.8340	8.4565	8.6862	8.0046	13.3209	7.3854	8.7898	8.7327			

AVERAGE FLOW COMPUTED WAS * 11356.1 * ACRE FT./YEAR
AND ASSOCIATED UNCERTAINTY COMPUTED WAS * 7.15 * PERCENT

AVG. SALT DISCHARGE(TONS/Y)	26735.7	1894.9	1551.6	4079.8	96.3	250.4	4818.4	829.7	14330.3			
SALT UNCERTAINTY (TONS/YEAR)	1695.5	112.3	104.3	286.0	5.9	30.7	256.2	59.2	1013.4			
SALT UNCERTAINTY (PERCENT)	6.3046	5.9263	6.7277	7.0141	6.1500	12.2960	5.3190	7.1421	7.0717			

AVERAGE FLOW INPUT WAS * 12220.0 * ACRE FT./YEAR
AND ASSOCIATED UNCERTAINTY INPUT WAS * 5.00 * PERCENT

SALTLOAD INFORMATION

EMERY MINE

NPDES DISCHARGES

MEANLOAD = (SUM(CFS*TDS*0.002696))/SAM S AVELOAD = AVECFS*AVETDS*0.002696

TYPE: C = AVECFS AND MEANLOAD BASED ON AVERAGE DAILY FLOW FROM PUMP
A = AVECFS AND MEANLOAD BASED ON CONTINUOUS FLOW RECORDS

TABLE 1.

MONTH	AVEMGD	AVECFS	AVETDS	MEANLOAD	AVELOAD	TYPE	FLOWDAYS	SAMPLES
JUL80	0.441	0.68	4247	10.4	7.8	A	17	3
AUG80	0.359	0.56	4426	6.8	6.6	A	31	1
SEP80	0.413	0.64	4279	17.6	7.4	A	30	2
OCT80	0.364	0.56	4402	1.1	6.7	A	31	2
NOV80	0.372	0.58	4548	13.7	7.1	A	30	2
DEC80	0.428	0.66	4611	8.5	8.2	A	31	3
JAN81	0.368	0.57	4404	5.6	6.8	A	31	2
FEB81	0.337	0.52	4098	6.5	5.8	A	28	3
MAR81	0.459	0.71	3553	9.7	6.8	A	31	2
APR81	0.420	0.65	4188	7.1	7.3	C	3	2
MAY81	0.407	0.63	4316	7.3	7.3	C	2	2
JUN81	0.439	0.68	3963	7.3	7.3	C	1	1
JUL81	0.310	0.48	3815	4.9	4.9	C	2	2
AUG81	0.400	0.62	3758	7.0	6.3	A	31	2
SEP81	0.414	0.64	3128	2.7	5.4	A	30	2
OCT81	0.409	0.63	3682	7.4	6.3	C	3	2
NOV81	0.388	0.60	3587	5.8	5.8	C	3	3
DEC81	0.388	0.60	3781	6.1	6.1	C	3	3
JAN82	0.362	0.56	3844	5.8	5.8	C	1	1
FEB82	0.291	0.45	2870	3.5	3.5	C	1	1
MAR82	0.292	0.45	3747	0.3	4.6	A	31	2
APR82	0.716	1.11	2983	6.3	8.9	A	29	3
MAY82	0.821	1.27	2738	9.4	9.4	C	3	3
JUN82	0.832	1.29	2824	12.8	9.8	A	27	2
JUL82	0.924	1.43	3028	11.2	11.7	A	31	1
AUG82	0.822	1.27	2942	12.8	10.1	A	31	3
SEP82	0.713	1.10	2964	5.5	8.8	A	30	2
OCT82	0.731	1.13	2945	8.0	9.0	A	31	3
NOV82	0.733	1.13	2945	9.0	9.0	A	30	3
DEC82	0.763	1.18	3004	13.5	9.6	A	14	2
JAN83	0.937	1.45	2945	12.5	11.5	A	18	3
FEB83	0.725	1.12	3031	9.2	9.2	A	22	1
MAR83	0.856	1.32	2874	14.0	10.3	A	31	2
APR83	0.724	1.12	3344	10.1	10.1	C	3	3

1

TABLE 2

MONTH=JUL80

DATE	MGD	CFS	TDS	SALTLOAD
800701	0.439	0.68	4380	8.0
800716	1.060	1.64	4338	19.2
800717	0.614	0.95		
800718	0.588	0.91		
800719	0.194	0.30		
800720	0.045	0.07		
800721	0.336	0.52		
800722	0.155	0.24		
800723	0.853	1.32		
800724	0.090	0.14		
800725	0.110	0.17		
800726	0.840	1.30		
800727	0.090	0.14		
800728	0.498	0.77		
800729	0.536	0.83		
800730	0.814	1.26		
800731	0.233	0.36	4024	3.9

MONTH=AUG80

DATE	MGD	CFS	TDS	SALTLOAD
800801	0.394	0.61		
800802	0.200	0.31		
800803	0.078	0.12		
800804	0.575	0.89		
800805	0.452	0.70		
800806	1.105	1.71		
800807	0.142	0.22		
800808	0.181	0.28		
800809	0.834	1.29		
800810	0.071	0.11		
800811	0.207	0.32		
800812	0.368	0.57	4426	6.8
800813	0.963	1.49		
800814	0.090	0.14		
800815	0.291	0.45		
800816	0.394	0.61		
800817	0.071	0.11		
800818	0.750	1.16		
800819	0.116	0.18		
800820	0.724	1.12		
800821	0.090	0.14		
800822	0.717	1.11		
800823	0.103	0.16		
800824	0.032	0.05		
800825	0.149	0.23		
800826	1.157	1.79		
800827	0.433	0.67		
800828	0.032	0.05		
800829	0.323	0.50		

1

MONTH=AUG80

DATE	MGD	CFS	TDS	SALTLOAD
800830	0.065	0.10		
800831	0.026	0.04		

MONTH=SEP80

DATE	MGD	CFS	TDS	SALTLOAD
800901	0.071	0.11		
800902	1.092	1.69	4326	19.7
800903	0.213	0.33		
800904	0.821	1.27		
800905	0.252	0.39		
800906	0.155	0.24		
800907	0.032	0.05		
800908	0.776	1.20		
800909	0.343	0.53		
800910	0.963	1.49		
800911	0.058	0.09		
800912	0.207	0.32		
800913	0.084	0.13		
800914	0.090	0.14		
800915	1.202	1.86		
800916	0.414	0.64		
800917	0.297	0.46		
800918	0.873	1.35	4232	15.4
800919	0.194	0.30		
800920	0.187	0.29		
800921	0.032	0.05		
800922	0.233	0.36		
800923	1.118	1.73		
800924	0.220	0.34		
800925	0.116	0.18		
800926	0.123	0.19		
800927	0.905	1.40		
800928	0.071	0.11		
800929	0.194	0.30		
800930	1.041	1.61		

MONTH=OCT80

DATE	MGD	CFS	TDS	SALTLOAD
801001	0.084	0.13	4352	1.5
801002	0.401	0.62		
801003	1.105	1.71		
801004	0.084	0.13		
801005	0.032	0.05		
801006	0.459	0.71		
801007	0.284	0.44		
801008	0.343	0.53		

1

MONTH=OCT80

DATE	MGD	CFS	TDS	SALTLOAD
801009	1.060	1.64		
801010	0.233	0.36		
801011	0.194	0.30		
801012	0.032	0.05	4452	0.6
801013	0.427	0.66		
801014	0.271	0.42		
801015	0.310	0.48		
801016	1.105	1.71		
801017	0.103	0.16		
801018	0.032	0.05		
801019	0.032	0.05		
801020	0.756	1.17		
801021	0.233	0.36		
801022	0.465	0.72		
801023	0.627	0.97		
801024	0.420	0.65		
801025	0.078	0.12		
801026	0.032	0.05		
801027	0.853	1.32		
801028	0.343	0.53		
801029	0.032	0.05		
801030	0.420	0.65		
801031	0.439	0.68		

MONTH=NOV80

DATE	MGD	CFS	TDS	SALTLOAD
801101	0.995	1.54		
801102	0.097	0.15		
801103	0.123	0.19		
801104	1.041	1.61	4500	19.5
801105	0.129	0.20		
801106	0.129	0.20		
801107	0.847	1.31		
801108	0.065	0.10		
801109	0.032	0.05		
801110	0.407	0.63	4596	7.8
801111	0.265	0.41		
801112	0.556	0.86		
801113	0.827	1.28		
801114	0.284	0.44		
801115	0.310	0.48		
801116	0.071	0.11		
801117	0.879	1.36		
801118	0.646	1.00		
801119	0.459	0.71		
801120	0.549	0.85		
801121	0.246	0.38		
801122	0.343	0.53		
801123	0.058	0.09		

1

MONTH=NOV80

DATE	MGD	CFS	TDS	SALTLOAD
801124	0.175	0.27		
801125	0.995	1.54		
801126	0.233	0.36		
801127	0.200	0.31		
801128	0.032	0.05		
801129	0.032	0.05		
801130	0.129	0.20		

MONTH=DEC80

DATE	MGD	CFS	TDS	SALTLOAD
801201	1.150	1.78		
801202	0.834	1.29		
801203	0.052	0.08		
801204	0.071	0.11	4616	1.4
801205	0.989	1.53		
801206	0.284	0.44		
801207	0.032	0.05		
801208	0.446	0.69		
801209	0.995	1.54		
801210	0.284	0.44	4696	5.6
801211	0.039	0.06		
801212	0.155	0.24		
801213	0.963	1.49		
801214	0.478	0.74		
801215	0.032	0.05		
801216	0.116	0.18		
801217	0.911	1.41		
801218	0.168	0.26		
801219	0.155	0.24		
801220	0.950	1.47		
801221	0.097	0.15		
801222	0.149	0.23		
801223	0.989	1.53	4520	18.6
801224	0.103	0.16		
801225	0.032	0.05		
801226	0.084	0.13		
801227	1.015	1.57		
801228	0.142	0.22		
801229	0.491	0.76		
801230	0.982	1.52		
801231	0.078	0.12		

1

MONTH=JAN81

DATE	MGD	CFS	TDS	SALTLOAD
810101	0.032	0.05		
810102	0.381	0.59	4414	7.0
810103	1.053	1.63		
810104	0.103	0.16		
810105	0.297	0.46		
810106	0.259	0.40		
810107	0.116	0.18		
810108	0.562	0.87		
810109	0.045	0.07		
810110	0.233	0.36	4394	4.3
810111	0.685	1.06		
810112	0.989	1.53		
810113	0.194	0.30		
810114	0.207	0.32		
810115	0.200	0.31		
810116	0.187	0.29		
810117	0.989	1.53		
810118	0.103	0.16		
810119	0.213	0.33		
810120	0.801	1.24		
810121	0.052	0.08		
810122	0.194	0.30		
810123	0.989	1.53		
810124	0.103	0.16		
810125	0.032	0.05		
810126	0.155	0.24		
810127	0.821	1.27		
810128	0.200	0.31		
810129	0.162	0.25		
810130	0.963	1.49		
810131	0.084	0.13		

MONTH=FEB81

DATE	MGD	CFS	TDS	SALTLOAD
810201	0.045	0.07		
810202	0.498	0.77	4064	8.4
810203	0.666	1.03		
810204	0.175	0.27		
810205	0.123	0.19		
810206	0.685	1.06		
810207	0.517	0.80		
810208	0.032	0.05		
810209	0.472	0.73		
810210	0.226	0.35	3922	3.7
810211	0.407	0.63	4308	7.3
810212	0.750	1.16		
810213	0.090	0.14		
810214	0.045	0.07		
810215	0.032	0.05		

MONTH=FEB81

DATE	MGD	CFS	TDS	SALTLOAD
810216	0.355	0.55		
810217	1.053	1.63		
810218	0.239	0.37		
810219	0.679	1.05		
810220	0.407	0.63		
810221	0.103	0.16		
810222	0.032	0.05		
810223	0.239	0.37		
810224	0.175	0.27		
810225	0.769	1.19		
810226	0.097	0.15		
810227	0.284	0.44		
810228	0.239	0.37		

MONTH=MAR81

DATE	MGD	CFS	TDS	SALTLOAD
810301	0.032	0.05		
810302	0.478	0.74	4154	8.3
810303	0.679	1.05		
810304	0.149	0.23		
810305	1.002	1.55		
810306	0.123	0.19		
810307	0.381	0.59		
810308	0.084	0.13		
810309	0.032	0.05		
810310	0.898	1.39		
810311	1.060	1.64		
810312	0.103	0.16		
810313	0.103	0.16		
810314	0.084	0.13		
810315	0.032	0.05		
810316	0.788	1.22		
810317	0.905	1.40	2951	11.1
810318	0.071	0.11		
810319	0.032	0.05		
810320	0.032	0.05		
810321	0.375	0.58		
810322	1.015	1.57		
810323	0.097	0.15		
810324	0.918	1.42		
810325	0.801	1.24		
810326	0.847	1.31		
810327	0.381	0.59		
810328	0.989	1.53		
810329	0.420	0.65		
810330	0.310	0.48		
810331	1.008	1.56		

1

MONTH=APR81

DATE	MGD	CFS	TDS	SALTLOAD
810401	0.394	0.61	4226	6.9
810402	0.446	0.69		
810403				
810404				
810405				
810406				
810407				
810408				
810409				
810410				
810411				
810412				
810413	0.420	0.65	4149	7.3
810414				
810415				
810416				
810417				
810418				
810419				
810420				
810421				
810422				
810423				
810424				
810425				
810426				
810427				
810428				
810429				
810430				

MONTH=MAY81

DATE	MGD	CFS	TDS	SALTLOAD
810501				
810502				
810503				
810504	0.407	0.63	4328	7.4
810505				
810506				
810507				
810508				
810509				
810510				
810511				
810512				
810513				
810514				
810515				
810516				

1

MONTH=MAY81

DATE	MGD	CFS	TDS	SALTLOAD
810517				
810518	0.407	0.63	4304	7.3
810519				
810520				
810521				
810522				
810523				
810524				
810525				
810526				
810527				
810528				
810529				
810530				
810531				

MONTH=JUN81

DATE	MGD	CFS	TDS	SALTLOAD
810601				
810602				
810603				
810604				
810605				
810606				
810607				
810608				
810609				
810610				
810611				
810612				
810613				
810614				
810615				
810616				
810617				
810618				
810619				
810620				
810621				
810622				
810623	0.439	0.68	3963	7.3
810624				
810625				
810626				
810627				
810628				
810629				
810630				

1

MONTH=JUL81

DATE	MGD	CFS	TDS	SALTLOAD
810701	0.310	0.48	3826	5.0
810702				
810703				
810704				
810705				
810706				
810707				
810708				
810709				
810710				
810711				
810712				
810713				
810714				
810715				
810716				
810717	0.310	0.48	3804	4.9
810718				
810719				
810720				
810721				
810722				
810723				
810724				
810725				
810726				
810727				
810728				
810729				
810730				
810731				

MONTH=AUG81

DATE	MGD	CFS	TDS	SALTLOAD
810801	0.039	0.06		
810802	0.032	0.05		
810803	0.246	0.38	3836	3.9
810804	0.608	0.94		
810805	0.058	0.09		
810806	0.989	1.53		
810807	1.073	1.66		
810808	0.672	1.04		
810809	0.039	0.06		
810810	0.355	0.55		
810811	0.814	1.26		
810812	0.078	0.12		
810813	0.078	0.12		
810814	0.724	1.12		
810815	0.097	0.15		

1

MONTH=AUG81

DATE	MGD	CFS	TDS	SALTLOAD
810816	0.032	0.05		
810817	0.259	0.40		
810818	0.633	0.98		
810819	0.265	0.41		
810820	0.420	0.65		
810821	0.724	1.12		
810822	0.323	0.50		
810823	0.213	0.33		
810824	0.763	1.18		
810825	0.653	1.01	3680	10.0
810826	0.427	0.66		
810827	0.562	0.87		
810828	0.420	0.65		
810829	0.717	1.11		
810830	0.058	0.09		
810831	0.032	0.05		

MONTH=SEP81

DATE	MGD	CFS	TDS	SALTLOAD
810901	0.233	0.36		
810902	0.058	0.09	3472	0.8
810903	0.730	1.13		
810904	0.368	0.57		
810905	0.168	0.26		
810906	0.879	1.36		
810907	1.086	1.68		
810908	0.821	1.27		
810909	0.110	0.17		
810910	0.110	0.17		
810911	0.698	1.08		
810912	0.123	0.19		
810913	0.090	0.14		
810914	0.491	0.76		
810915	0.924	1.43		
810916	0.207	0.32		
810917	0.032	0.05		
810918	0.323	0.50		
810919	0.969	1.50		
810920	1.008	1.56		
810921	0.472	0.73		
810922	0.032	0.05		
810923	0.032	0.05		
810924	0.543	0.84		
810925	0.750	1.16		
810926	0.065	0.10		
810927	0.032	0.05		
810928	0.388	0.60	2783	4.5
810929	0.627	0.97		
810930	0.039	0.06		

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MONTH=OCT81

DATE	MGD	CFS	TDS	SALTLOAD
811001	0.271	0.42		
811002	0.569	0.88	3856	9.1
811003				
811004				
811005				
811006				
811007				
811008				
811009				
811010				
811011				
811012				
811013				
811014				
811015				
811016				
811017				
811018				
811019				
811020				
811021				
811022				
811023				
811024				
811025				
811026				
811027				
811028				
811029				
811030	0.388	0.60	3507	5.7
811031				

MONTH=NOV81

DATE	MGD	CFS	TDS	SALTLOAD
811101				
811102				
811103				
811104				
811105				
811106	0.388	0.60	3536	5.7
811107				
811108				
811109				
811110	0.388	0.60	3678	5.9
811111				
811112				
811113				
811114				
811115				

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MONTH=NOV81

DATE	MGD	CFS	TDS	SALTLOAD
811116				
811117				
811118				
811119				
811120				
811121				
811122				
811123				
811124				
811125				
811126				
811127				
811128				
811129				
811130	0.388	0.60	3546	5.7

MONTH=DEC81

DATE	MGD	CFS	TDS	SALTLOAD
811201				
811202				
811203				
811204				
811205				
811206				
811207	0.388	0.60	3618	5.9
811208				
811209				
811210				
811211				
811212				
811213				
811214				
811215				
811216				
811217				
811218				
811219				
811220				
811221				
811222				
811223				
811224				
811225				
811226				
811227				
811228				
811229	0.388	0.60	3762	6.1
811230	0.388	0.60	3962	6.4
811231				

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MONTH=JAN82

DATE	MGD	CFS	TDS	SALTLOAD
820101				
820102				
820103				
820104				
820105				
820106	0.362	0.56	3844	5.8
820107				
820108				
820109				
820110				
820111				
820112				
820113				
820114				
820115				
820116				
820117				
820118				
820119				
820120				
820121				
820122				
820123				
820124				
820125				
820126				
820127				
820128				
820129				
820130				
820131				

MONTH=FEB82

DATE	MGD	CFS	TDS	SALTLOAD
820201	0.291	0.45	2870	3.5
820202				
820203				
820204				
820205				
820206				
820207				
820208				
820209				
820210				
820211				
820212				
820213				
820214				
820215				

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MONTH=FEB82

DATE	MGD	CFS	TDS	SALTLOAD
820216				
820217				
820218				
820219				
820220				
820221				
820222				
820223				
820224				
820225				
820226				
820227				
820228				

MONTH=MAR82

DATE	MGD	CFS	TDS	SALTLOAD
820301	0.026	0.04	3730	0.4
820302	0.504	0.78		
820303	0.006	0.01		
820304	0.608	0.94		
820305	0.317	0.49		
820306	0.595	0.92		
820307	0.323	0.50		
820308	0.000	0.00		
820309	0.000	0.00		
820310	0.549	0.85		
820311	0.175	0.27		
820312	0.045	0.07		
820313	0.575	0.89		
820314	0.692	1.07		
820315	0.116	0.18		
820316	0.006	0.01	3764	0.1
820317	0.000	0.00		
820318	0.685	1.06		
820319	0.084	0.13		
820320	0.000	0.00		
820321	0.200	0.31		
820322	0.155	0.24		
820323	0.465	0.72		
820324	0.717	1.11		
820325	0.556	0.86		
820326	0.090	0.14		
820327	0.407	0.63		
820328	0.065	0.10		
820329	0.717	1.11		
820330	0.362	0.56		
820331	0.000	0.00		

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MONTH=APR82

DATE	MGD	CFS	TDS	SALTLOAD
820401	0.181	0.28	3698	2.8
820402	0.071	0.11		
820403	0.000	0.00		
820404	0.116	0.18		
820405	0.297	0.46		
820406	1.137	1.76		
820407	0.582	0.90		
820408	0.517	0.80		
820409	0.640	0.99		
820410	0.459	0.71		
820411	1.066	1.65		
820412	0.640	0.99		
820413	1.176	1.82		
820414	1.131	1.75		
820415	1.060	1.64		
820416	1.176	1.82		
820417	1.034	1.60		
820418	0.640	0.99		
820419	1.189	1.84	2520	12.5
820420	1.209	1.87		
820421	0.310	0.48	2732	3.5
820422	0.065	0.10		
820423	0.388	0.60		
820424	1.267	1.96		
820425	0.698	1.08		
820426	0.827	1.28		
820427	0.743	1.15		
820428	1.422	2.20		
820429				
820430	0.717	1.11		

MONTH=MAY82

DATE	MGD	CFS	TDS	SALTLOAD
820501				
820502				
820503	0.821	1.27	2732	9.4
820504				
820505				
820506				
820507				
820508				
820509				
820510				
820511				
820512				
820513				
820514				
820515				
820516				

MONTH=MAY82

DATE	MGD	CFS	TDS	SALTLOAD
820517				
820518				
820519	0.821	1.27	2718	9.3
820520				
820521				
820522				
820523				
820524				
820525				
820526				
820527				
820528	0.821	1.27	2764	9.5
820529				
820530				
820531				

MONTH=JUN82

DATE	MGD	CFS	TDS	SALTLOAD
820601				
820602				
820603				
820604	0.562	0.87		
820605	0.969	1.50		
820606	0.407	0.63		
820607	1.512	2.34		
820608	1.008	1.56		
820609	0.110	0.17		
820610	0.898	1.39		
820611	1.144	1.77		
820612	0.259	0.40		
820613	1.377	2.13		
820614	0.950	1.47		
820615	0.103	0.16		
820616	1.144	1.77	2792	13.3
820617	1.034	1.60	2856	12.3
820618	0.782	1.21		
820619	0.944	1.46		
820620	0.491	0.76		
820621	0.763	1.18		
820622	1.008	1.56		
820623	0.310	0.48		
820624	1.247	1.93		
820625	0.401	0.62		
820626	0.368	0.57		
820627	1.118	1.73		
820628	1.209	1.87		
820629	1.086	1.68		
820630	1.260	1.95		

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MONTH=JUL82

DATE	MGD	CFS	TDS	SALTLOAD
820701	0.155	0.24		
820702	1.435	2.22		
820703	0.388	0.60		
820704	0.259	0.40		
820705	1.435	2.22		
820706	1.422	2.20		
820707	0.659	1.02		
820708	0.711	1.10		
820709	1.066	1.65		
820710	0.672	1.04		
820711	1.034	1.60		
820712	0.472	0.73		
820713	0.821	1.27		
820714	1.209	1.87		
820715	1.344	2.08		
820716	1.370	2.12		
820717	0.608	0.94		
820718	1.331	2.06		
820719	1.002	1.55		
820720	1.176	1.82		
820721	0.711	1.10		
820722	1.331	2.06		
820723	0.730	1.13		
820724	1.021	1.58		
820725	1.486	2.30		
820726	0.220	0.34		
820727	1.021	1.58		
820728	0.885	1.37	3028	11.2
820729	1.370	2.12		
820730	0.459	0.71		
820731	0.827	1.28		

MONTH=AUG82

DATE	MGD	CFS	TDS	SALTLOAD
820801	0.097	0.15		
820802	1.280	1.98		
820803	1.370	2.12	2926	16.7
820804	0.175	0.27		
820805	1.137	1.76		
820806	0.194	0.30		
820807	1.008	1.56		
820808	1.053	1.63		
820809	0.692	1.07		
820810	0.963	1.49		
820811	0.394	0.61	2956	4.9
820812	1.021	1.58		
820813	0.711	1.10		
820814	1.247	1.93		
820815	0.724	1.12		

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MONTH=AUG82

DATE	MGD	CFS	TDS	SALTLOAD
820816	1.273	1.97		
820817	0.162	0.25		
820818	0.982	1.52		
820819	0.213	0.33		
820820	1.357	2.10	2944	16.7
820821	0.504	0.78		
820822	0.808	1.25		
820823	1.609	2.49		
820824	0.743	1.15		
820825	0.097	0.15		
820826	1.041	1.61		
820827	0.233	0.36		
820828	0.627	0.97		
820829	1.545	2.39		
820830	1.002	1.55		
820831	1.209	1.87		

MONTH=SEP82

DATE	MGD	CFS	TDS	SALTLOAD
820901	0.336	0.52	2902	4.1
820902	0.646	1.00		
820903	1.402	2.17		
820904	0.194	0.30		
820905	0.756	1.17		
820906	0.853	1.32		
820907	0.336	0.52		
820908	1.092	1.69		
820909	0.368	0.57		
820910	0.808	1.25		
820911	1.099	1.70		
820912	0.491	0.76		
820913	1.118	1.73		
820914	1.092	1.69		
820915	0.278	0.43		
820916	1.486	2.30		
820917	0.549	0.85	3026	6.9
820918	0.097	0.15		
820919	0.692	1.07		
820920	1.163	1.80		
820921	0.646	1.00		
820922	1.234	1.91		
820923	0.401	0.62		
820924	0.763	1.18		
820925	0.536	0.83		
820926	1.073	1.66		
820927	0.911	1.41		
820928	0.149	0.23		
820929	0.265	0.41		
820930	0.556	0.86		

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MONTH=OCT82

DATE	MGD	CFS	TDS	SALTLOAD
821001	1.525	2.36	2976	18.9
821002	0.388	0.60		
821003	0.853	1.32		
821004	1.571	2.43		
821005	0.847	1.31		
821006	0.103	0.16	2976	1.3
821007	0.898	1.39		
821008	0.381	0.59		
821009	0.097	0.15		
821010	0.530	0.82		
821011	1.493	2.31		
821012	0.698	1.08		
821013	0.097	0.15		
821014	0.317	0.49		
821015	0.323	0.50	2884	3.9
821016	0.459	0.71		
821017	1.338	2.07		
821018	0.239	0.37		
821019	1.273	1.97		
821020	0.407	0.63		
821021	1.222	1.89		
821022	0.271	0.42		
821023	0.737	1.14		
821024	0.905	1.40		
821025	0.271	0.42		
821026	1.467	2.27		
821027	0.524	0.81		
821028	1.467	2.27		
821029	0.801	1.24		
821030	0.220	0.34		
821031	0.937	1.45		

MONTH=NOV82

DATE	MGD	CFS	TDS	SALTLOAD
821101	0.918	1.42	2862	11.0
821102	1.222	1.89		
821103	0.911	1.41		
821104	0.220	0.34		
821105	1.318	2.04		
821106	1.073	1.66		
821107	1.241	1.92		
821108	1.008	1.56		
821109	0.123	0.19		
821110	0.931	1.44		
821111	0.439	0.68		
821112	0.149	0.23		
821113	1.066	1.65		
821114	0.963	1.49		
821115	1.215	1.88		

MONTH=NOV82

DATE	MGD	CFS	TDS	SALTLOAD
821116	0.226	0.35	2925	2.8
821117	0.401	0.62		
821118	0.931	1.44		
821119	1.008	1.56		
821120	0.427	0.66		
821121	1.196	1.85		
821122	0.452	0.70		
821123	0.291	0.45		
821124	1.060	1.64		
821125	0.795	1.23		
821126	0.136	0.21		
821127	0.213	0.33		
821128	0.704	1.09		
821129	0.317	0.49		
821130	1.041	1.61	3048	13.2

MONTH=DEC82

DATE	MGD	CFS	TDS	SALTLOAD
821201	1.383	2.14	3066	17.7
821202	0.187	0.29		
821203	0.989	1.53		
821204	1.551	2.40		
821205	1.079	1.67		
821206	0.343	0.53		
821207	0.291	0.45		
821208	1.053	1.63		
821209	0.375	0.58		
821210	1.247	1.93		
821211	0.304	0.47		
821212	0.265	0.41		
821213	0.853	1.32		
821214				
821215				
821216				
821217				
821218				
821219				
821220				
821221				
821222				
821223				
821224				
821225				
821226				
821227				
821228	0.763	1.18	2942	9.4
821229				
821230				
821231				

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MONTH=JAN83

DATE	MGD	CFS	TDS	SALTLOAD
830101				
830102				
830103				
830104				
830105				
830106				
830107				
830108				
830109				
830110				
830111				
830112				
830113				
830114	0.937	1.45	2380	9.3
830115	0.259	0.40		
830116	0.659	1.02		
830117	1.118	1.73		
830118	0.782	1.21		
830119	0.989	1.53		
830120	0.763	1.18		
830121	1.390	2.15		
830122	0.627	0.97		
830123	1.047	1.62		
830124	0.905	1.40		
830125	1.803	2.79		
830126	0.524	0.81	3282	7.2
830127	0.853	1.32		
830128	1.713	2.65		
830129	0.414	0.64		
830130	0.491	0.76		
830131	1.596	2.47	3174	21.1

MONTH=FEB83

DATE	MGD	CFS	TDS	SALTLOAD
830201	0.601	0.93		
830202	1.493	2.31		
830203	0.200	0.31		
830204	1.357	2.10		
830205	0.620	0.96		
830206	1.370	2.12		
830207	0.362	0.56		
830208	1.454	2.25		
830209	0.472	0.73		
830210	0.233	0.36		
830211				
830212				
830213				
830214				
830215				

MONTH=FEB83

DATE	MGD	CFS	TDS	SALTLOAD
830216				
830217	0.724	1.12	3031	9.2
830218	1.325	2.05		
830219	0.310	0.48		
830220	0.976	1.51		
830221	0.291	0.45		
830222	1.267	1.96		
830223	0.116	0.18		
830224	0.653	1.01		
830225	1.137	1.76		
830226	0.536	0.83		
830227	0.181	0.28		
830228	0.265	0.41		

MONTH=MAR83

DATE	MGD	CFS	TDS	SALTLOAD
830301	1.357	2.10		
830302	0.381	0.59		
830303	1.015	1.57		
830304	1.028	1.59		
830305	1.060	1.64		
830306	0.427	0.66		
830307	0.259	0.40		
830308	1.312	2.03		
830309	1.486	2.30		
830310	0.330	0.51		
830311	0.039	0.06		
830312	0.052	0.08		
830313	1.435	2.22		
830314	0.200	0.31		
830315	1.021	1.58	2460	10.5
830316	0.330	0.51		
830317	0.834	1.29		
830318	0.905	1.40		
830319	1.603	2.48		
830320	1.189	1.84		
830321	0.672	1.04		
830322	0.536	0.83		
830323	1.280	1.98	3288	17.6
830324	0.801	1.24		
830325	0.918	1.42		
830326	0.944	1.46		
830327	1.163	1.80		
830328	1.454	2.25		
830329	0.336	0.52		
830330	1.280	1.98		
830331	0.898	1.39		

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MONTH=APR83

DATE	MGD	CFS	TDS	SALTLOAD
830401				
830402				
830403				
830404	0.724	1.12	3266	9.9
830405				
830406				
830407				
830408				
830409				
830410				
830411				
830412				
830413				
830414				
830415				
830416				
830417				
830418				
830419				
830420				
830421				
830422				
830423				
830424				
830425				
830426	0.724	1.12	3214	9.7
830427	0.724	1.12	3552	10.7
830428				
830429				
830430				