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DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

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March 13, 1992

Mr. Bob Eccli
U. S. Fuel Company
P. O. Box A
Hiawatha, Utah 84527

Dear Mr. Eccli:

Re: Revision of Permit Renewal Deficiencies, U. S. Fuel Company, Hiawatha Mines Complex, ACT/007/011, Folder #3, Carbon County, Utah

On March 5, 1992 we forwarded to you a Technical Deficiency Review, Permit Renewal, dated March 4, 1992 for Hiawatha Mines.

Several final revisions were inadvertently omitted from the Technical Deficiency Review. Enclosed are replacement pages 75 through 91. Actual changes are in Sections R645-301-623; R645-301-724.100; R645-301-724.200; and R645-301-724.320.

Please do not hesitate to call me if you have any questions.

Sincerely,

Daron R. Haddock

Daron R. Haddock
Permit Supervisor

Enclosures
cc: BTeam
HIAWREVI.LTR

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March 5, 1992

Mr. Bob Eccli
U. S. Fuel Company
P. O. Box A
Hiawatha, Utah 84527

Dear Mr. Eccli:

Re: Permit Renewal Deficiencies, U. S. Fuel Company, Hiawatha Mines Complex, ACT/007/011, Folder #3, Carbon County, Utah

A technical review has been conducted on your application for permit renewal for the Hiawatha Mines Complex. As a result of the review, the Division has determined that there are a number of technical items that still need to be addressed. These items are discussed in the attached technical review document. Please review the document and provide a response to those items listed under the deficiency sections as quickly as possible. Your response should be formatted for insertion to your Mining and Reclamation Plan and should be one package rather than a number of piece-meal responses.

You should be aware that any deficiencies must be addressed or attached to your permit as conditions of permit renewal. If you have any questions regarding any of these requirements, please don't hesitate to call.

Sincerely,

Daron R. Haddock

Daron R. Haddock
Permit Supervisor

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TECHNICAL DEFICIENCY REVIEW
PERMIT RENEWAL

U. S. FUEL COMPANY
HIAWATHA MINES
ACT/007/011
MARCH 4, 1992

INTRODUCTION

This document contains information derived from a review of U. S. Fuel Company's newly submitted Mining and Reclamation Plan. Mine plan deficiencies found in that review have been identified under the deficiency heading in each section. Some of the deficiency sections contain possible methods for resolving the deficiency. In order for the Applicant to be in compliance with the Utah Coal Mining Regulations each of the items discussed in the deficiency sections must be addressed.

R645-301-120.	**Permit Application Format and Contents.**
R645-301-121.	**The permit application will:**
R645-301-121.200.	**Be clear and concise; and**

Proposal:

Item 1

Borrow Area soils were sampled and analyzed in Chapter II (pg. 5-13).

Item 2

Of the profiles described at the borrow sites, page 12 presents the Borrow Area D typical pedon of a loamy, mesic Ustic Torrifluvent.

Item 3

Chapter II Tables are incorrectly numbered. Information in Table II-6 and II-7 is missing. Samples and Areas sampled in Tables II-14, II-15, and II-16 are identified differently than in the narrative and on Exhibits II-2 and II-3. Analytical results are provided in Table 13 for ten samples from the preparation plant. However, the narrative describes only eight sample locations.

Item 4

The Unit train underpass soils evaluation is discussed (page 19). The location of this structure is not specified on any exhibits.

The plan states that 1,177 yd_3 of topsoil will be removed and placed east of Slurry Pond #5.

Item 5

Topsoil storage information is incompletely provided under the section R645-301-231.400 in the Table of Contents. This section begins on page 43.

Item 6

Page 63 of the MRP indicates that North Fork seed mix is located in Appendix V-1 and the earthwork calculations are found in Appendix V-2.

Item 7

The total disturbed area in the mine permit boundary is 332 acres (Table III-8, pg. 55, Chapter III). Reclamation does not include 6.6 acres of roads, 15.2 acres of rail yard, and 66.3 acres of the Hiawatha town = 93 acres of disturbance which will not be reclaimed (pg. 48, Table III-7, Chapter III). This results in 332 acres total - 93 acres not to be reclaimed = 239 acres to be reclaimed.

Item 8

In Middle Fork (pg. 37 of Chapter II, Table VIII-6 of Chapter VIII), a salvage depth of 1.5' from three designated areas will produce 10,620 yd^3 to cover the 10 acre mine pad 6 inches deep.

In South Fork (pg. 41 of Chapter II, Table VIII-8 of Chapter VIII), a salvage depth of 1.5' from two designated areas will produce 6,337 yd^3 to cover the 9.3 acre mine pad 6 inches deep.

Item 9

Information regarding horizonation in Borrow Area C is conflicting. Table II-4 describes a C_1, C_2, AB_1 horizon sequence. The C_4 layer is not included. The profile description for the Haverdad Loam shows a C_4 after 46 inches and no further description after 60 inches (page 10). Please correlate the narrative on page 10 of Chapter II and Table II-4.

For Area D, the profile description provided of the Haverdad loam in the SCS Survey differs from the one presented on page 12 of the MRP. The MRP eliminates any A horizon, although there is 2% organic matter in the top layer of soil. In addition, the profile described in the MRP goes down to 60 inches. The soils at the test pit were sampled and analyzed down to 34 inches only. Please check these points.

Analysis:

Item 1

Some borrow area pedons were described. Others are either not described or only

partially described. i.e., page 5, Borrow Area A; page 8, Borrow Area D.

Item 2

The Borrow Area D pedon begins with a C1 horizon, although in Table II-5 the Organic matter percentage is reported at 2.02%. The lack of an A horizon at this profile seems improbable. A typing error is likely.

Item 3

There are two Table II-5's and no Table II-2 in Chapter II. Information on borrow areas B & C is missing from Tables II-6 and II-7.

Item 4

Please clarify the status of the unit-train underpass construction. Has the structure been built? Was 1,177 yd_3 of topsoil removed and placed east of Slurry Pond #5? If so, do the topsoil volumes for this location reflect the addition? Was interim or final reclamation performed? If so, an evaluation of the success of the reclamation procedures used at this site may be pertinent to the revegetation of the preparation plant 'in situ' soils. Available stockpiled topsoil amounts to 10,333 yd^3 (including the unit train overpass soil). The figure drops to 8,556 yd^3 without the unit train overpass soil.

Item 5

Descriptions of the 5 topsoil piles are located throughout the narrative. Information is found on pg. 19, pg. 37, pg. 42, pg. 43, pg. 52, pg. 53, and pg. 61. Much of the information is misplaced in the reclamation plan under R645-301-241.

Item 6

North Fork soil interim reclamation and earthwork volumes are not found in Appendix V-1 and V-2. The cut and fill volumes were located in Chapter VIII. Please clarify the location of earthwork cut and fill volumes in the plan.

Item 7

Compare this figure of 239 acres with the total estimated acreage requiring reclamation derived from the Reclamation Cost Estimate Tables in Chapter VIII. These tables show that the total area to receive topsoil (including 52 acres of borrow areas) is 281 acres. After accounting for the 52 acres of borrow area, this is 10 acres less than the 239 acres derived from information in Chapter III. Please correct the discrepancy between the acreage provided in Chapter VIII, Chapter II and Chapter III, concerning acreage to be reclaimed.

Item 8

There is some confusion in the plan between the salvage depth and the area of salvage

for Middle Fork. Although page 37 of Chapter II specifies areas of salvage for substitute topsoil, page 11 of the Reclamation Cost Estimate Middle Fork Facilities Area indicates that six inches will be salvaged and stored from the entire 21 acre disturbed site. After cut and fill operations, topsoil will be replaced over the 21 acres. Thirty seven acres will be scarified, 25 acres will be drill seeded, and 12 acres will be hydroseeded. The discrepancy between the topsoil plan described in Chapter II for Middle Fork and the plan described in Chapter VIII, Table VIII-6 must be resolved. Will there be 6 inches of salvage from the entire site after removal of the 6 inch contaminated top layer? Followed by intensive soil recovery 1.5 ' deep at Areas A, B, and C of Middle Fork?

The same confusion exists for South Fork. Chapter II indicates that there will be 1.5' of salvage from Areas A and B to respread over 9.3 acres of the mine pad. Table VIII-8 indicates that there will be 4,033 yd^3 salvaged from 5 acres, and that 7.4 acres will have contaminated materials removed. Topsoil will be graded over 15 acres. Twenty acres will be ripped, 11 acres will be drilled and 9.7 acres will be hydroseeded. Please clarify the discrepancies.

Deficiencies:

1. Describe pedons for all borrow site sample pit locations.

2. Review pedon descriptions at the borrow sample sites for accuracy, especially page 12 of the MRP for borrow Area D, as per item #2 of R645-301-121.200 technical deficiency.

3. Correct the numbering of the Tables included in Chapter II. Provide complete information in all Tables, particularly Table II-6 and II-7. Be consistent throughout the narrative, Exhibits and Tables when identifying samples and Areas sampled, especially in Tables II-13, II-14, II-15, and II-16.

4. Clarify the status of the unit-train loadout disturbance and update sections of the plan accordingly.

5. Consolidate all topsoil pile information in one location under the Table of Contents heading R645-301-231.400.

6. Correct the reference (page 63 of the MRP) for the location of the seed mix and earthwork calculations for North Fork operations and reclamation. Please clarify all references to cut and fill volumes and reclamation contour maps in Chapter II of the narrative. Correctly identify their location in Chapter VIII.

7. Please correct the discrepancy between the acreage provided in Chapter VIII and Chapter II and Chapter III concerning acreage to be reclaimed.

8. Correlate areas of soil salvage and in Middle and South Forks with the activities described in the Table of Reclamation Cost Estimates in Chapter VIII and with the substitute topsoil locations identified in Chapter II. Correlate the areas of topsoil redistribution described in Chapter II with those described in the seed mix Tables of Chapter III.

9. Please correlate the narrative profile description for Borrow Area C on page 10 of Chapter II and the profile described in Table II-4 for a test pit located in Borrow Area C. Evaluate the profile description provided on page 12 of the MRP for Borrow Area D for its accuracy and completeness.

R645-301-122. Referenced Materials.

Proposal:

There is no 'Literature Cited' section in the Table of Contents or in the narrative. Chapter II, page 20, refers to a citation of Donahue, 1977.

Analysis:

Please detail this reference and include a 'Literature Cited' section with the narrative and the Table of Contents for Chapter II.

Deficiencies:

1. Include a 'Literature Cited' section in the narrative and Table of Contents for Chapter II.

R645-301-130. Reporting of Technical Data.

Proposal:

Throughout Chapter II, tables are presented which summarize the analytical data gathered from mine slurry ponds, refuse, borrow sites, road cuts, pad fills etc. Original laboratory sheets are not presented except in the case of Attachment 1 to Appendix II-3.

Soil sampling methodology is described as a composite sample by depth.

Sodium absorption ratios (SAR's) are calculated using concentration values expressed in mg/L in all Tables.

Analysis:

In some cases the narrative indicates a year that samples were taken and the laboratory which analyzed the samples, but not in all cases. Technical evaluation of these tables is hindered by the limited knowledge of time span between sampling and analysis and methods of analysis.

Recognizing the fact that many of these samples were analyzed almost a decade ago, the Division would appreciate viewing the original laboratory analysis sheets which will provide date of sampling, date of analysis, and perhaps methodology used.

SAR is by definition the ratio of the concentration of sodium in milliequivalents/liter divided by the square root of the sum of the average concentration of calcium and magnesium expressed in milliequivalents/liter. The use of concentration expressed in milligrams per liter results in a very different erroneous value for SAR.

Deficiencies:

1. Present the original laboratory analysis reports for each set of information presented in the Tables in Chapter II.

2. Reference laboratory methodology for each sample parameter on each sample date.

3. Calculate and correct the reported SAR values using the following formula:

$$SAR = [Na\ meq/L] \div \sqrt{[([Ca\ meq/L] + [Mg\ meq/L]) \div 2]}$$

R645-301-200. SOILS.
R645-301-221. Prime Farmland Investigation.

Proposal:

Chapter II includes the January 1983 Soil Conservation Service document as Attachment II-1, page 2. The letter determines that there are no prime farmlands in the map

area. No map is included with the letter.

Analysis:

The letter provided does not describe the location of soils evaluated for prime farmland determination. From the letter submitted, the location of the soils evaluated can not be determined. All soils to be affected by mine operations or borrow areas must be evaluated.

Borrow soils in Area A are located in SCS map unit #53, which is the Hernandez family, moist 1 - 6% slopes. These soils are classified as fine-loamy, mixed mesic Ustollic Calciorthids. The Hernandez family may be prime farmland when irrigation water is available.

Borrow soils in Area B and C are located within the SCS soil mapping unit #50 which is the Haverdad Loam, moist, 1 to 5% slopes. The soil is classified as fine-loamy, mixed (calcareous), mesic Ustic Torrifluvents. The Haverdad loam map unit may also be prime farmland when irrigation water is present.

Deficiencies:

1 Submit the map which accompanied this evaluation of the mine operations areas.

2. Evaluate the borrow areas for prime farmland potential.

R645-301-222. Soil Survey.

Proposal:

Chapter II includes Soil Types Exhibits II-1 (Hiawatha Area), II-2 (Middle Fork Area), II-3 (South Fork Area). These maps are presented on a 1'=500" scale or 1 = 6000. The exhibits delineate substitute soil sites, sample sites, test pits, field trial test plots, and topsoil pile locations.

Appendix II-1 presents survey information from a 1980 SCS survey entitled "Soil Survey and Interpretations for U.S. Fuel Company Mine Area," during which Jim Borchert was the project leader. This survey concentrates on Middle Fork and South Fork mine areas.

Appendix II-2 compiles information from the adjacent Manti La Sal Forest Service (FS) survey, for the Middle and South Fork mine areas. Included on page 9 of Appendix II-2 is an evaluation of 1990 range productivity by soil type, authored by George S. Cook, Range Conservationist for the SCS.

Soil information for the Hiawatha/Preparation Plant/Slurry Pond Area and the Borrow sites is provided from composite sampling of sites located on Exhibit. II-1. Analyses are presented in Table II-1 through II-3, II-5 and Table II-13. Some pedon descriptions of the borrow area sites are provided within Chapter II (see comments under R645-301-121.100 and R645-301-121.200).

Soil Survey Item 1

Appendix II-1 of Chapter II presents "Soil Survey And Interpretations for U.S. Fuel Co. Mine Area," conducted in 1980 by the Soil Conservation Service.

Borrow area soils analyses are provided within Chapter II. Some pedon descriptions are also within the body of the Chapter.

A disturbance at North Fork for the fan portal construction is mentioned (page 43). A disturbance for construction of the unit-train overpass is also discussed on page 19 of the plan.

Soil Survey Item 2

Exhibits II-1, II-2, II-3 are soil survey maps of Hiawatha, South Fork, and Middle Fork mine areas. The scale of these maps is 1" = 500'.

Soil Survey Item 3

Reference is made in Chapter 3 to Slurry Pond 3 and associated test pits.

Analysis:

Environmental Description

The climate regime is 14 - 20" of rainfall with a frost free season of 60 - 100 days. The elevation is between 7,400' and 8,000'. The operations area is located in Carbon County, T15S R8E.

Most of the mine disturbance has occurred without removal of the topsoil layer. The soil formed from colluvium and alluvium derived from sandstone and shale of the Blackhawk formation and is classified as Cryoboralfs, Mollic Cryoboralfs, Haploborolls on the north slopes and Calciorthents, Ustorthents, Ustochrepts, and Torriorthents on the South slopes and Torrifluvents in the drainageways. The mine pad areas have a soil/coal mixed surface layer.

Piles of waste rock and coal consist of angular fragments to seven inches in size.

Limiting factors for revegetation are steep slopes, erosion hazard, infertility and moderate to low water holding capacity and topsoil deficit.

Productivity

The productivity ratings provided for the soils at the end of Appendix II-2 do not key the soils to reference areas which have been established for the mine site. Evaluation of the productivity of reference areas is required for determination of the effectiveness of reclamation treatments during interim reclamation and prior to bond release.

The productivity ratings provided are for a small portion of the soils in the mine area, only the FS map unit 712 is located in the mine area and this is a complex of Adel/Bundo/Roxal soils.

In general, north facing slopes with deep soils (Adel, Bundo) can be expected to have high productivity except where the overstory shades out the undergrowth. Information on the Roxal soils which are shallow rigdetop soils does not apply.

The soil survey is deficient and must be updated according to R645-301-222, R645-301-122.100 and R645-301-122.200. The following discussion describes deficiencies in the survey.

Soil Survey Item 1

The survey presents alot of extraneous and dated information. For instance, of the twenty-three soils described in the Appendix, only nine are located in or adjacent to the disturbed area of the Hiawatha mine. Of those nine, six series names are no longer used by the SCS in their Carbon County Soil Survey of 1988; i.e., "Brycan", "Ildefonso", "Norte", "Shingle", "Zillion", "Beardall".

Appendix II-1 survey excludes the borrow site soils which are within the permit area and which have been sampled by U.S. Fuel. Results of this sampling, including pedon descriptions for all borrow test pit sites must be added to the survey of the mine area.

Also excluded from the survey were the soils in the North Fork fan disturbance (1.1 acres). The North Fork fan location is not specified, so that a general idea of soil identification can not be obtained from the SCS survey.

The soils at the unit train underpass were surveyed at some point. The narrative portion of the survey is found on page 19 of the plan, but no sample information is presented.

Soil Survey Item 2

Soil maps II-1, II-2, II-3 require Section, Township and Range markings, North arrows, and the certification of a registered, professional engineer. Several sample soil profile locations are listed on the Exhibits: 464, 463, 332, 276, 462, 505, and 506. Soil pit #472 was inadvertently left off the exhibits. Only Profiles 464, 332, 462, and 506 were noted in the accompanying soil survey.

Soil Survey Item 3

Slurry Pond 3 has been decommissioned and can not be found on any exhibits. However, references to the sample sites within Slurry Pond 3 require that this slurry pond is located on the map. Also missing from the exhibits is test sample site 8 in the upper storage yard.

Deficiencies:

1. Update the soil survey information found in Appendix II-1 of the 1992 permit document according to R645-301-222, R645-301-122.100 and R645-301-122.200. Remove excess information and present the most accurate, concise portrayal of the soils within the permit area and disturbed area boundaries (including borrow areas North Fork fan, and Unit-train overpass) using the methodology prescribed in the National Soil Survey Handbook 460 and the information available through the 1988 published SCS soil survey. Include a description of all soil profiles located on the accompanying Exhibits.

2. Revise Exhibit II-1, II-2, and II-3 to correspond with the new survey information provided in item #1 above. Include on the revised exhibits all sample pit locations described in the narrative. The information required under R645-301-140, including North arrow, Township, Range and Section numbers and the certification of a registered, professional engineer are also required on these Exhibits.

3. Present in the MRP additional exhibits which expand the information presented on the existing soil maps, according to R645-301-222, R645-301-122.100 and R645-301-122.200. The additional exhibits will correspond with the new soil survey information for South and Middle Forks, Hiawatha/Preparation Plant/Slurry Pond Area, and the Borrow area. Locate on these maps the topsoil storage piles, borrow areas, revegetation test plots (Appendix. III-5), and interim revegetation test areas (Appendix III-4). These additional exhibits will be drawn on a scale of 1" = 100' or 1'=200' to match the corresponding surface facilities map. The maps will have Township, Range, and Section markings, include disturbed area and permit area boundaries where

appropriate, have a North arrow, and the certification of a registered, professional engineer.

4. Locate Slurry Pond 3 and associated test pits on Exhibit II-1. Include on Exhibit II-1 the location of sample site 8 in the upper storage yard.

5. Include in the expanded survey maps described in item #3 of R645-301-222, the information gathered from the borrow areas.

6. Present recent productivity information for the reference areas at the mine site and tie these in to the soil types present in the reference areas, see also deficiency #2 under R645-301-321.

R645-301-224. Substitute Topsoil.

Proposal:

In Chapter VIII, U.S. Fuel indicates that 281 acres will be reclaimed. (Please see item #7 under R645-301-121.200.) A total of 8,556 yd^3 is stored in stockpiles around the Hiawatha site. (Please see discussion under item #4, R645-301-121.200.) Approximately 6,000 yd^3 of this will be returned to the South and Middle Fork disturbance areas. The preparation plant will utilize the remaining 2,500 yd^3 of this topsoil.

There exists a deficiency of cover and topsoil for the South, Middle, and North Fork, the preparation plant, the storage yard, the refuse and slurry. These areas total over 200 acres. An exact figure is not provided. (Please see discussion under item #7, R645-301-122.200.)

U.S. Fuel Co. proposes to utilize 313,598 yd^3 of borrowed topsoil for the slurry ponds (111.5 acres), for North Fork (1.1 acres), for a portion of the preparation plant (37.7 acres), and a portion of the South Fork loadout (acreage not provided, see page 51). A total of 150.3+ acres; 313,598 yd^3 will cover 150.3 acres 16 inches deep. Although U.S. Fuel presents bonding costs estimates for 16" of cover over the slurry and refuse, the proposal is for 6 inches of cover. To justify this depth, study plots were developed in 1984 and evaluated for 5 years. The results are found in Appendix III-5.

To obtain 313,598 yd^3, four borrow areas have been specified within the permit area. The first to be developed is Area A (lower storage yard). The second is Area D (south side of Miller Creek). The third and fourth areas to be developed will be on the North side of Miller Creek and will require fording the stream. (Since management of Areas B and C are

the same, the rational for dividing the area in two is not clear.)

The southwestern portion of the preparation plant and upper storage yard (53.4 acres) will be reclaimed using the 'in situ' soils/coal mix.

In South Fork (9.3 ac) and Middle Fork (10 out of 20.6 disturbed acres), U.S. Fuel proposes to utilize 10,620 yd^3 from Middle Fork and 6,337 yd^3 from South Fork (mine pads, berms, embankments and other soils) for substitute topsoil. For a total of 16,957 yd^3 over 19.3 acres, which will be six inches deep.

Field trials are described in Appendix III-5.

Analysis:

Final reclamation of coal mine waste materials is covered by regulation R645-301-553.260. This regulation refers to R645-301-553.250, which requires that prior to the approval of any reduction in the four foot cover over coal mine waste, the Division must find that the lesser cover will provide protection from erosion and a suitable life-support for revegetation.

R645-301-553.252. *Following final grading of the refuse pile, the coal mine waste will be covered with a minimum of four feet of the best available, nontoxic and noncombustible material... The Division may allow less than four feet of cover material based on physical and chemical analyses which show that the requirements of R645-301-244.200 and R645-301-353 through R645-301-357.*

Toward this end, the MRP provides the results of composite sampling of the borrow soils, the 'in situ' soils of the preparation plant, and the top layer of fill at the mine pads. These analyses are discussed under R645-301-233. The evaluation of the field trials is discussed below.

Appendix III-5

Appendix III-5 describes the construction of two study sites in 1984. The objective of study site 1 was to evaluate the depth of topsoil required to result in successful reclamation of the refuse. The objective of the study site number 2 was to evaluate the potential of all borrow areas to be revegetated after salvage of 22 inches to 6 feet of soil.

For study site number 1, the variables evaluated were:

1) age of refuse: old or new

2) depth of topsoil placement over the refuse: 6, 12 or 16 inches deep
3) type of seed mix: 2 different mixes.

This resulted in 12 treatments, and no replications. Each plot was a rectangle 33' x 16.5'. Allowance for edge effects reduced the size of the plots by one foot on all sides (see pg. 23, Appendix. III-5). There were no blanks. The slope was 0. A two foot depth of refuse was compacted prior to topsoil placement. The surface was disced. Fertilization and mulching remained the same throughout the treatments. Fertilization rate was not specified. The mulch rate was 1 T/ac. The method of mulch application was not specified.

For study site number 2, one foot of topsoil was removed and a variable was evaluated:

1) type of seed mix: 2 different mixes

This resulted in two treatments, and no replications. Each plot was a rectangle 33' X 66'. Allowance for edge effects reduced the size of the plots by one foot on all sides. There were no blanks. Fertilization and mulching remained the same throughout the treatments. Fertilization was not specified. Mulching rate was 1 T/ac. Method of mulch application was not specified.

Method of evaluation was by estimation of percent cover. No reference areas were specified. Evaluations of the plots after the second (1985), third (1986), and fifth (1988) growing seasons failed to support the hypothesis that 6 inches of cover will be adequate for reclamation of coal mine waste. The observation was made by the Consultant, BioWest, Inc., that there could be no comparison between treatments (1986), that there was not enough individuals growing in each treatment plot to provide a statistical evaluation of the data (1988), that coal fines blowing onto the site caused "bare spots" (1986 and 1988), that cross over seeding confused statistical analysis of seed treatments (1988). An observation that old refuse was superior to new refuse was supported at the 5% significance level after 5 years. Total plant cover after 5 years was 45% for all new refuse treatments and 52% for all old refuse treatments. This cover was predominantly an unseeded, weed species: cheat grass, *Bromus tectorum.* Study evaluations were to continue into the 7th (1990), 9th (1992) and 10th years. But, no further evaluations were found (pg. 27 of Appendix III-5).

I do not agree with the consultant's conclusion that "12 inches is sufficient to establish the best plant cover attainable," especially in light of the dramatic increase mean cover value seen between 12" and 16" cover on old refuse.

I do not recommend approval of less than four feet of cover on the coal mining waste, because of the inconclusive nature of the evaluations provided of study site #1. Another

study might be developed that could substantiate two feet of cover as adequate. The experimental layout should be developed in conjunction with the Division.

The design of study #2 failed to realize the objective of the study. Only 1' of topsoil was removed from study site #1 prior to seeding and fertilizing the site. U.S. Fuel's plan calls for large areas of topsoil salvage depth down to six feet. The horizon at six foot depth is considerably more harsh in terms of texture, structure, organic matter content and fertility. This study does not validate the reclamation plan for the borrow areas. Cover on this site after 5 years was between 15 and 24%. This study does not demonstrate the ability of U.S. Fuel to reclaim the C3 and C4 horizons which will remain after borrowing. A separate study should be designed in cooperation with the Division to explore this possibility.

Appendix III-5 also outlines three test plots that were constructed at higher elevations in 1984. The hypothesis to be proven was that existing mine pad soils can be reclaimed without the importation of topsoil, using the methodology described in the MRP. The plots were designed to test the worst case scenario (pg. 24, Appendix. III-5).

Exhibits II-2 and II-3 show the location of soil samples taken in Middle and South Forks. The test plots were located by site number 6 (Middle Fork) and site number 10 (South Fork), see Exhibit III-5 for exact locations. Each plot was 10'x 20'. The surface was ripped, disced and fertilized. One seed mix (mix #3), one fertilizer rate, and one mulch rate (1 T/ac) and application type (crimped hay or straw) was used.

A field trial for the seed mix #4 on a riparian area was staked out over 20' x 50'. Soil preparation, fertilization, mulching are not mentioned, but are assumed to be similar to the two mine pad plots described above. Evaluations of mine pad and riparian plots are similar in frequency and parameters measured to study sites 1 and 2 described above.

After two growing seasons (1985), cover was 53 - 71% on the mine pad soils. Over 5 years the diversity of species improved in the mine pads, but the total cover decreased to 30 - 40%. Still, the consultant describes an "excellent stand of seeded and seral plants" in the mine pad plots, productivity was between 788 - 1088 lbs/ac. The riparian seeding was less successful.The riparian plot continued to increase to 375 lbs/ac production and 33% cover by the end of five years.

I agree with U.S. Fuel that the substitute topsoil material selected will provide a successful growth medium in South and Middle Forks. There is some question as to the intention of U.S. Fuel for following this plan in light of their Reclamation Cost Estimate Tables (please see item #8 of R645-301-121.200). I do request, however, that two feet of

unconsolidated growth medium is placed on top of the compacted fill. Please see comments under R645-301-244, Reclamation Plan.

Deficiencies:

1. See further discussion under R645-301-233.

2. Specify the expected acreage at the South Fork loadout which is to receive borrowed topsoil.

3. Develop test plots in conjunction with the Division that have the objective of determining that 2 feet of cover is as adequate as four feet over the coal mine waste. Develop test plots in conjunction with the Division that have the objective of determining that the C3 and C4 horizons of Hernandez loam and Haverdad loam can be reclaimed using the methodologies described in the MRP. Provide for adequate evaluation and statistical analysis based on a reference area comparison.

R645-301-230. Operation Plan.

Proposal:

General information is on page 4. Presently, topsoil is stored in 5 piles all of which are located on Exhibit II-1 near the Middle Fork and South Fork road junction, slurry ponds 4 and 5 and the storage yard. No topsoil is stored at the King IV and King VI portal pad areas. All topsoil storage piles are surrounded by berms and an effective cover of non-noxious plants, side slopes are kept to a minimum. No fertilizer was used in plant establishment and none is planned for interim establishment. No further seeding will be performed unless it is deemed necessary. Four different seed mixes are used on the piles depending on their locations. Itemized below is a description of each topsoil pile and the MRP page location.

Unit Train, pg. 19 of the MRP

1,777 yd^3 from Unit Train placed east of Slurry Pond #5, slopes 3:1, diversion around pile, broadcast seeded with mix #1, to be used during final reclamation for refuse cover because the overpass will remain permanent.

Slurry Pond 5 Expansion, pg. 52 of the MRP

1.028 yd^3 of topsoil was salvaged in 1983. Dimensions are 48'x68'x8.5', slope is not provided. The soil was seeded and is protected from erosion with a diversion ditch.

Refuse Pile Extension by Pond 4, pg. 52 of the MRP

1,488 yd^3 was salvaged in 1988 for expansion of the refuse storage area. The pile is 130' x60' x6', slope is 37° (1.25h:1v). The soil was seeded and is protected by a berm-ditch around the toe.

Middle Fork Stockpile, pg. 37 of the MRP

354 yd^3 piled in a diameter of 50' and 4' deep the top is flat the side slopes are 30° (1.5h:1v). Results of a composite sample are provided in Tables II-18 and II-19.

South Fork Stockpile, pg. 42 and 61 of the MRP

1,206 yd^3 was salvaged from construction of the conveyor line, coal pile and truck loadout. Configuration of the pile is described in a separate location (please see R645-301-121.200). The total volume is shaped into three subpiles. They measure 45'x55'x6', slope of 25° (2h:1v); 35' diameter x 4' deep, slope of 40° (1.25h:1v); 145'x52'x4' deep, slope of 35° (1.3h;1v). This soil was broadcast seeded with mix #1 and mulched with tackifier. Further information of this stockpile is located in Appendix II-3, "Topsoil Plan for the King VI Mine," July 6, 1982.

North Fork Topsoil, pg. 43 and 63 of the MRP

Quantity of material salvaged during construction of the fan portal is not disclosed. The disturbed acreage is 1.1 acres. The location is not disclosed on any soils exhibit. The soil was redistributed over the outslopes of the fan portal in 1980. (Please see item #6 under R645-301-121.200).

Lower Storage Yard, pg. 53 of the MRP

4,480 yd^3 were salvaged when 5.5 acres were fenced for the storage yard (a portion of Borrow Area A). A 6" depth was salvaged and placed in a pile 515'x50'x? depth, slope is 27°(2.h:1v). Vegetation is established on the pile as the sole protection from wind and water erosion. See Table II-21 for analysis of these soils.

Total yardage stored in piles according to the MRP is 10,333 yd^3. If the Unit train soils were not salvaged, then the total is 8,556 yd^3.

All piles were tested for nutrient levels and results are presented in Table form throughout the plan (see comments under R645-301-130). For all stockpiled topsoil, final

reclamation will involve the application of 40 lbs of Nitrogen and 30 lbs of P_2O_5. Redistributed soil will be resampled prior to seeding by a grab composite sample.

Analysis:

Previous inspections of the topsoil piles indicate that the vegetative cover is very slim. As per the commitment on page 4, the lower storage yard pile requires reseeding. This commitment should be expanded to include roughing the surface through gouging, mulching and fertilizing at the time of reseeding stockpiles which do not have adequate cover as compared with the reference area for the location.

Was the unit train topsoil ever stored as described on page 19 of the MRP? The table showing analytical results is missing for this topsoil pile.

The North Fork disturbance is estimated to require 887 yd^3 of borrow material from Area D, if there can be none found at the site during final reclamation. If adequate survey information was provided for North Fork, the Division could evaluate the potential of the subsoil at North Fork to provide plant growth medium. Please include the North Fork location and soils information in the updated survey requested under R645-301-222.

Please provide information on the total volume of Slurry Pond #5 stockpile, does the total volume include both the pond expansion and salvage from the unit train overpass? The seeding of the Slurry Pond #5 topsoil storage pile is not included in this discussion.

The protection of the topsoil salvaged from the extension of the refuse pile (below Slurry Pond #4) should include a berm/ditch which surrounds the pile, as per page 4 of Chapter II. Protection at the toe end will not protect the pile from upstream runoff from the slurry and refuse, should their diversion ditches breech.

The lower storage yard topsoil stockpile is protected only by vegetation from wind and water. On an inspection in the Fall of 1991, it was noted that the cover is non-existent on this pile. Even the flat top is void of vegetation. The plan must include a commitment to gouging the surface of the pile top and slopes, fertilizing, seeding, and mulching this pile early in the spring of 1992. As per page 4 of Chapter II, a berm must be formed around the pile.

Page 13 of Chapter II indicates that Borrow soils will be analyzed after redistribution, prior to seeding. Does U.S. Fuel also intend to sample topsoil redistributed from stockpiles and from mine pads, embankments, etc. The specifics of topsoil sampling after

redistribution should be outlined in more detail on page 4 of Chapter II of the MRP. How many samples/acre per location will be taken? What parameters will be measured? The Division suggests that the top 12 inches is composite sampled for the macronutrients: nitrogen, phosphorus, and potassium; and micronutrients, copper, manganese, molybdenum, and zinc which may have limited availability due to the high pH values in the soils.

Deficiencies:

1. Provide a commitment in the MRP to gouge the surface, reseed, fertilize and mulch any topsoil piles which do not have adequate cover as compared with the reference area for the location.

2. Clarify whether the unit train topsoil was salvaged and stored as described. Indicate whether Pond #5 stockpile includes soil salvaged from the unit train overpass. Revise total yardage in Slurry Pond #5 topsoil pile accordingly. Submit the table of analytical results for this unit train topsoil.

3. Clarify the amount of topsoil redistributed on the 1.1 acre disturbance at North Fork. Indicate the seed mix used for interim reclamation of this site. Provide soil survey information for North Fork as per deficiencies under R645-301-222.

4. Include information on the seed mix used on topsoil stockpiled by Slurry Pond #5 and #4.

5. Revise the plan to state that the berm/ditch will surround the stockpile located below Slurry Pond #4 and the lower storage yard as per general descriptions on page 4 of Chapter II of the MRP.

6. Commit to improving vegetation on the surface of the lower storage yard topsoil pile through gouging the top and slopes, fertilizing, seeding, and mulching this pile early in the spring of 1992, and placing a berm around the base of the pile which will also be vegetated, but not gouged.

7. Indicate the depth of the lower storage yard topsoil pile.

8. Include with the information on page 4 of Chapter II of the MRP a total volume of all topsoil stored in piles at Hiawatha.

9. Specify details concerning the analysis of topsoil and substitutes after redistribution, prior to seeding on page 4 of Chapter II of the MRP. How many samples/acre per location will be taken? What parameters will be measured?

R645-301-233.300. Results of Physical and Chemical Analyses of Overburden and Topsoil

Proposal:

Information on substitute topsoil analysis is provided in the plan by site location from pages 4 to 43 of Chapter II. U.S. Fuel proposes to utilize mine pads, embankments and berms as sources of substitute topsoil material for portions of the King VI (South Fork) and portions of the King IV (Middle Fork) reclamation plans. A 6" cover is proposed.

Borrow material will be imported from presently undisturbed land. Recovery of the proposed 313,598 yd^3 from the borrow site will result in 16 inches of cover. However, U.S. Fuel presents a case for 6" of cover over the slurry ponds, refuse and preparation plant, North Fork and South Fork areas to receive the borrow material. This would reduce the amount of soil necessary to 121,242 yd^3.

All other disturbed areas will be reclaimed with 'in situ' soils.

Appendix III-5 provides a discussion and evaluation of five reclamation plots on slurry and borrow substitute soil, in riparian area, and on mine pad soils in Middle fork and South fork. The plots were initiated in 1984 and evaluated in 1985, 1987 and 1989. Evaluations were to continue in the years 1990, 1992 and 1993 (7th, 9th and 10th years, see page 27 of Appendix. III-5).

An outline of the sampling methodology and expected volumes for overburden or slurry at each site and is provided below.

Middle Fork (pg. 37 of Chapter II, Table VIII-6 of Chapter VIII).

Six composite samples were pulled from an eighteen inch depth from areas A, B, & C at King IV pad on 12/83. The three areas cover 3.39 acres. A salvage depth of 1.5' from these designated areas will produce 10,620 yd^3 to cover the 10 acre mine pad 6 inches deep.

South Fork (pg. 41 of Chapter II, Table VIII-8 of Chapter VIII).

Six composite samples were pulled from an eighteen inch depth from Areas A and B at King VI pad on 12/83. The two areas cover 2.62 acres. A salvage depth of 1.5' from these designated areas will produce 6,337 yd^3 to cover the 9.3 acre mine pad 6 inches deep. Samples of other topsoil substitutes along the South Fork road is discussed in Appendix II-3, "Topsoil Plan for the King VI Mine," a 1982 BioWest report.

Preparation Plant 'In Situ' Soils (pg. 29 Chapter II, Table VIII-4 Chapter VIII.)

Eight composite samples were pulled from varying depths (1.5 to 3.5' deep) at locations shown on Exhibit II-1. (Sample 8 is not shown on this exhibit, however. Please see comments under R645-301-121.100, item #3.) Analyses are provided in Table 13. (Table 13 provides analytical results for samples 1 - 10. The narrative describes eight sample locations. Please refer R645-301-120.121.) The upper 6-8 inches of soils is contaminated with coal and will be removed. An eighteen inch depth will be salvaged from 53 acres for topsoiling to produce 129,349 yd^3. This will be used along with 10,807 yd^3 from the preparation plant area to cover the 53 acre site (six inches deep).

North Fork Area, pg. 43 Chapter II, Table VIII-9 Chapter VIII.

A 1.1 acre site was disturbed. An unidentified quantity of topsoil was respread over the surface of the outslope of the disturbance. Reclamation may require hauling 887 yd^3 of topsoil from Borrow Area D. Total area to be revegetated including the road to the site is 7.4 acres.

Refuse and Slurry Ponds, pg. 20 - 29 Chapter II

At the preparation plant, 37.7 acres of refuse and 111 acres of slurry ponds will be covered with six inches of borrow soils from Borrow Areas A through D. Reclamation of the refuse and slurry ponds will be identical. The proposal calls for using refuse and slurry as a substitute soil material. Reducing the required 4 feet of cover over non-toxic/non-acidic coal mine waste (R645-301-553.260) down to 6 inches of topsoil from the borrow area. Therefore, composite samples were taken from an 18 inch depth at four locations on coal refuse/slurry embankments of the four ponds (1, 3, 4, 5). Pond #1 was sampled twice more. All samples were analyzed in 1983.

Borrow Area Soils, pg. 4 - 18 Chapter II, Tables II-1 through II-7, Table VIII-10 Chapter VIII.

Size of the borrow area is 52 acres. Four areas A - D are described.

Borrow Area A was sampled with a test pit. The results are shown in Table II-1.

The plan calls for removing six feet of soil from the 20 acres of borrow area A. This will yield 194,084 yd^3 of soil. The "C_2" horizon will remain after stripping. The investigation included eighteen inches of the material which will be utilized in final reclamation of this borrow area site. This soil is Hernandez loam.

Borrow Areas B and C are located on the north side of Miller Creek. The area of B is 12.35 acres. The area of C is 8.9 acres. Borrow Area B was sampled north down to 84 inches. Borrow Area C was sampled down to 80 inches. The plan calls for salvage of the top 4.5 ' of soil in areas B and C which will yield 89,661 yd^3 from Area B and 64,251 yd^3 from Area C. Both areas B and C are described as the Haverdad Loam soil. A typical profile is described. The specific profiles sampled are not described. The C_4 horizon will remain in Areas B and C for reclamation.

Borrow Area D is a loamy, mesic Ustic Torrifluvent. It is located on the South side of Miller Creek. This soil is also a Haverdad loam according to the SCS Carbon County Survey of 1988. The plan calls for salvage of the top 1.83 feet from the 10 acres site, which will yield 30,114 yd^3. Soils were sampled down to 34 inches. The profile is described down to 60 inches. The C_3 horizon will be left from 22 inches down for reclamation.

Analysis:

South and Middle Fork Substitute Soil Suitability

Some of the material appears suitable for plant growth as shown in Tables II-14, Table II-15, and Table II-16. There are locations with high organic matter contents, aluminum, selenium and SAR's all of which indicate contamination from salts and coal. (Reported SAR's value are erroneously calculated in the soil characteristics tables for all sites. Please see comments under R645-301-130 for calculation of SAR values.) Potential toxicity to plant growth from SAR and aluminum must be avoided. The soil must be resampled by depth at the time of final reclamation to determine which areas will become backfill and which may be suitable for topdressing. The top six inches should not be sampled. Sampling should begin from 6" down to 4'. These samples should be analyzed for nitrogen; phosphorus; potassium; aluminum using the method described in ASA Mono No.9, Method 16-3, page 281 for exchangeable aluminum; water soluble sodium, magnesium and calcium; and hot water soluble selenium. Methods not specifically mentioned above are described in the Division's "Guidelines for the Use and Management of Topsoil and Overburden," Table #1 and Table #6.

For South Fork and Middle Fork, soils should be resampled after demolition of

surface facilities to determine what depth of the mine pad will be placed as backfill and what will be used as topsoil. At present a sample trench 20' deep, dug with a backhoe, would provide adequate evaluation of the suitability of the entire profile and may lead to the discovery of the buried surface horizon.

Preparation Plant 'In Situ' Soils

The most limiting factor for these soils will be available water capacity. With only a six inch depth of cover provided, there will not be enough storage of water in the soils for plant survival. A two foot un-compacted layer and additions of organic matter will improve AWC, as discussed below.

Refuse and Slurry Pond Substitute Cover

To approve the use of 6" of cover over coal mine waste materials during final reclamation, regulations R645-301-553.260 and R645-301-553.250 apply. Evaluation of the potential for the slurry and refuse to provide an adequate growth medium based on the analyses performed follows. The samples analyzed show that the micronutrient and macronutrient balance is not optimum for plant growth. The values of nitrogen, potassium, and phosphorus are all low. The plan calls for fertilization with these elements. Values of selenium, iron, aluminum and boron are elevated in the coal refuse. No acid/base potentials are portrayed for the slurry. Acid/base potentials of roof and floor (Appendix VII-2) show a potential for acidic leachate may exist (please see additional discussion under R645-301-623). The saturation percentage is high in Pond 3, indicating a very fine texture which will lead to a waterlogged condition above field capacity. The available water capacities of the refuse is poor. The values of 0.7 to 1.3 inches per 12 inches of medium translates to 0.06 to 0.11 in/in AWC.

Borrow Area Soils, pg. 5 - 18 of Chapter II

Horizon depths for each pit in each borrow area were not included. Profile descriptions begin on page 8, but are incomplete.

Area A:

Soils will be removed (72 inches) down to the C_2 horizon. The soil is low in macronutrients: N, P, and K. The SAR's are low, calcium predominates in the soil extract. The Carbon County Soil Survey on page 118 shows a calcium accumulation at 14 to 60 inches for this strongly calcareous Hernandez soil type. Notes of the profile during excavation of this soil pit would be helpful. A typical pedon description for borrow area A was not provided in the soil survey. No profile description of the pit was included. No field notes or laboratory sheets were included. Soils were investigated down to a 78" depth. The lower 6 inches investigated will become the rooting zone for reclamation at Borrow Area A.

What is the texture and quality of the soils from 78 to 102 inches? What is the depth to bedrock or an impermeable layer?

Area B:

Soil will be removed (54 inches) down to the C_4 horizon. This soil sample has extremely high values for organic matter (40.9%) in the top 6 inches. This is not a typographical error, as it seems to be substantiated by the high nitrate-nitrogen value also reported. In fact, all N, P, K values are high and suspect for this location: N = 34 ppm, P = 27 ppm, K = 400 ppm. Compare with the top 6 inches at borrow area C: N = 0.4 ppm, P = 0.5 ppm, K = 122 ppm. The C_4 horizon is a silty clay or a clay. The saturation percentage is 74%. This indicates an extremely fine textured soil which is not well aerated when wet, in which water is tightly held in interstitial spaces and is unavailable to plants for growth.

Area C:

Soil will be removed (54 inches) down to the C_4 horizon. Below 52 inches is the AB_1 (Table II-4) to a depth of 80 inches for reclamation of the borrow site (please see deficiency #9 R645-301-121.200). Seen in both Borrow Area B and C, is an accumulation of calcium at approximately two feet, with a corresponding increase in the electrical conductivity (EC) of the soil. The high EC reading in the absence of high sodium indicates saline but not sodic soil for these two borrow Areas. No profile descriptions were provided to evaluate the potential of a caliche layer.

Area D:

Twenty two inches will be removed from Borrow Area D, down to the C_4 horizon. The profile description provided in the MRP is questionable (please see deficiency #9 under R645-301-121.200). The soils were sampled and analyzed down to 34 inches only. Below 22 inches, the remaining 12 inches of the C_4 horizon was described as extremely cobbly, loamy sand with 75% rock fragments. The value of this layer for reclamation is questionable due to its limited AWC.

After evaluation of Appendix II-5 (R645-301-224) and the above soil qualities, the ability of U.S. Fuel to reclaim the borrow sites is in doubt. Removal of such large quantities of material from a relatively small area will reduce the success of reclamation of the borrow areas, even with fertilization.

The Division suggests three other strategies. First is a removal method that leaves strips soil pillars that are approximately 15' wide on 120' centers running the length of the borrow area. Height of the pillars would be kept to 4'. During final reclamation, these

pillars would be graded to a 6 inch depth to provide a source of microorganism inoculum and seed for reclamation. This would require additional area, but would improve greater areas of range as pointed out in Appendix III-5.

A second suggestion is to evaluate the potential of the material underneath the slurry for its practical application as a cover material. This would involve determining the depth of the remaining slurry in each pond, the depth to the piezometric surface, and the cost of removing the remaining fines from the soil surface to expose the cover material. This method would reduce the total area disturbed and eliminate costs of additional borrow area reclamation associated with increased cover requirements.

A third alternative is to experiment with other sources of organic matter, such as dried, domestic sewage sludge which can be applied to the slurry along with topsoil and disced in. This treatment would enhance fertility, organic matter, water holding capacity. The sludge could be conveniently loaded onto empty railroad cars returning from Salt Lake City and Provo. I am aware of several water treatment plant Operators who are anxious to develop an end use for their dried sludge. Please contact me at the Division for more information. This alternative is further discussed under R645-301-240.

Deficiencies:

1. Potential toxicity to plant growth from SAR and aluminum must be avoided. The soil must be resampled by depth at the time of final reclamation to determine which areas will become backfill and which may be suitable for topdressing. The top six inches should not be sampled. Sampling should begin from 6" down to 4'. These samples should be analyzed for nitrogen; phosphorus; potassium; aluminum using the method described as 16-3 in the American Association of Agronomy monograph No 9. Methods of Soil Analysis. Part 2, 2nd Ed., page 281; water soluble sodium, magnesium and calcium; and hot water soluble selenium. Methods not specifically mentioned above are described in the Division's "Guidelines for the Use and Management of Topsoil and Overburden," Table #1 and Table #6.

2. Provide field notes with profile descriptions for each pit in each borrow area. Provide complete profile descriptions in the narrative.

3. In Area A, what is the texture and quality of the soils from 78 to 102 inches? What is the depth to bedrock or an impermeable layer?

4. Describe Area D soils down to at least 58 inches so that the reclamation environment for the soils is known.

5. Evaluate alternative plans for borrow material sources and borrow reclamation techniques.

R645-301-240. Reclamation Plan.

Proposal:

From the reclamation cost estimate tables in Chapter VIII, it is approximated that topsoil will be replaced on 149 acres of slurry ponds, 53 acres of preparation plant refuse, 21 acres at Middle Fork, 5 acres at South Fork, 1 acre at North Fork, and 52 acres of Borrow areas. Thus, the total approximate acreage to receive topsoil is 281 acres.

From the Tables III-5 and III-6, topsoil will be applied on riparian areas only of King VI and King IV mines. Mine pads, roads and sediment ponds will not be topsoiled according to page 60 of Chapter III. This is contrary to the statements made in Chapter II. Please clarify the areas to receive topsoil in all reclamation locations. Specify volumes to be applied and source location.

A total of 8,556 yd^3 is stored in stockpiles around the Hiawatha site (see discussion under R645-301-230). The preparation plant will utilize 2,500 yd^3 of this.

Soil Redistribution, pg. 76 Chapter II

Fill will be compacted in lifts. The final lift will not be compacted. A "smooth, irregular surface" will be achieved.

Slopes of 2h:1v or greater will be roughened prior to the redistribution of six inches of topsoil. Overburden or slurry will be scarified 6 inches deep along the contour (if necessary) prior to topsoiling. Areas to receive topsoil are stated differently from Chapter II to Chapter VIII. Areas of topsoil salvage also vary from Chapter II to Chapter VIII.

Topsoil will be evenly placed using grade stakes and a endump truck or road grader. After topsoiling, fertilization and scarification 4-6 inches will occur to control erosion (where necessary). All reclamation timetables show fertilization after scarification. This is one ton of surface mulch which will be applied over all areas. The application technique will depend upon the slope and method of seeding. Slopes greater than 2h:1v will have stapled netting

(page 56, Chapter II).

Reclamation Plan for Hiawatha Area, pg. 46 Chapter II, pg. 8 Table VIII-4 Chapter VIII:

Remove 6" of contaminated soil from 53 acres. Salvage 1.5 feet of topsoil from the same 53 acres and stockpile near the Middle and North Fork junctions. Protect this stockpile with strawbale dikes and diversions during regrading. Backfill and grade 53 acres. Redistribute topsoil over the regraded area. (The present grade is the final grade on the remaining 37 acres of the Preparation plant. The present surface soil is the final surface soil on 37 acres at the Preparation Plant.) All 91 acres will be ripped to 12", disced, seeded and mulched.

Slurry Ponds and Refuse pg. 70 Chapter II, Exhibits in Chapter VIII:

The following activity will commence after surface facilities are eliminated and saleable coal is removed. Regrade piles and lessen embankment slopes. Structural foundations covered. Remove sediment ponds and diversions. Final slopes of the pond will be as little as 5h:1v or as steep as 2h:1v. Cover slurry with 16 inches of borrow material (requiring 312,901 yd^3 for 149 acres of refuse and preparation plant area). Cover sediment ponds with 2,500 yd^3 of stockpiled topsoil. Take 12 random samples (pg. 51), disc and fertilize according to sampling and Table II-7. Seed and mulch.

Road Reclamation, pg. 60 Chapter III, pg. 45 Chapter II:

Roads will be ripped. Asphalt will be removed and placed as backfill in the slurry ponds. Seed mix #3 will be applied as modified by field trials. The standard for success will be the reference areas.

Reclamation Plan South Fork and Middle Fork Chapter II:

1.5 feet of topsoil will be salvaged from areas specified on Exhibit. II-1 and II-3 for use in reclamation of 10 acres in Middle Fork and 9.3 acres in South Fork. Concrete structures will be buried by grading. Highwalls will be terraced to control erosion and reduce the slope (page 56).

South Fork loadout will be reclaimed with the stockpile stored at the mouth of the canyon. This stored material will be supplemented with approximately 810 yd^3 of borrow from Area A. In South Fork, a visual determination of suitable topsoil (page 60) will be employed to segregated topsoil material from fill. This statement is contrary to the isolation of the 1.5' of material from Areas A and B as designated in Exhibit II-3 and earlier in Chapter II. Six inches of cover or less will be applied by test plot analogy.

North Fork, pg. 63 Chapter II

Either "suitable" cover will be segregated at the time of backfilling or 887 yd^3 will be trucked to the site from borrow area D. The cover will be 6 inches deep. The 1.1 acres of portal disturbance will be hydroseeded. The road will be drill seeded. The area will be scarified, but according to Reclamation Cost Estimate Table VIII-9 only the road disturbance leading to the portal will be fertilized prior to seeding.

Analysis:

Appendix III-4

The interim revegetation plan was developed in 1982 to evaluate seed mixes and steep slope revegetation methodology. Seven test areas included the slopes of the conveyor, coal pile and truck turnaround area, under the stacker conveyor and on the sediment pond outslopes and South Fork (lambs trailer) soil stockpile. Seed, fertilizer and tackifier were hydraulically applied uniformly to the test plots. The treatments employed were:

1) erosion control netting overlain with 1T/ac wood fiber hydromulch
2) 1/2 T/ac hydrostraw mulch overlain by nylon netting and overlain with 1/2 T/ac wood fiber mulch
3) straw hydromulch at 1 T/ac overlain with nylon netting.
4) 1 T/ac wood fiber mulch.

Treatments 1 and 2 were employed on the steepest slopes (no value assigned). Treatments 3 and 4 were used on the lesser slopes.

Although evaluations after one year (8/7/83), are not available for all treatment locations, conclusions can be drawn through comparison of steep techniques used side by side in the same location. In the steeper areas of the conveyor slopes, treatment #2 was superior to treatment #1, enabling 25% living cover compared with 2% living cover on adjacent slopes. Evaluation of treatments 3 and 4 is less clear, each providing equivalent protection for plant growth in the canyons. For further comment on mulching techniques, please see Paul Baker's discussion under the R645-301-341.230.

For slopes greater than 3h:1v, the successful technique of 1/2 T acre straw overlain by nylon netting and 1/2 T/ac of wood fiber mulch along with the techniques of gouging should provide good erosion control and water holding basins for plant establishment. The gouge in the surface is performed with a track hoe. Basins or small depressions are left in the surface to trap and hold water allowing it to percolate downwards instead of running off. Regardless of mulching technique used, the Division requests gouging on slopes greater than

3h:1v.

A two foot layer of uncompacted growth medium must be placed over the compacted fill for final reclamation. Four feet must be placed over asphalt and concrete structures which remain. Therefore, the reclamation plan must include unconsolidated material placement on top of the compacted fill to a depth of 18 inches prior to six inches of topsoil placement.

Please see comments under item #8, R645-301-122.200 for soil redistribution plans in Middle and South Forks.

The use of slurry as a substitute soil medium presents several problems for plant growth.

Page 83 of Appendix II-1 provides a discussion of the properties associated with successful rangeland seeding. The ability of a soil to provide a productive environment for plant establishment takes into account the annual precipitation, available water capacity, the rooting depth, abrupt changes in texture, surface texture, rock fragments in the surface, slope and saltiness (electrical conductivity).

The proposed reclamation plan for the Hiawatha area will produce a growth medium that is "poor" to "very poor" as a result of synergy between the following soil/slurry properties: abrupt textural change between the imported 6" layer of topsoil and the slurry fines; low available water holding capacity of the fines which will represent the largest portion of the root zone; and a combination of ustic moisture and mesic temperature regimes. A poor rating, according to the guide, results in successful planting of a limited number of species in 4 to 5 years out of 10 (50% of the time). A very poor rating results in seeding success in about 3 or less years out of 10 (less than 30% of the time).

This poor rating can be improved by manipulation of some of the variables. To increase the success rate to 70% (7 years out of 10), increase the cover over the slurry to greater than 20 inches. Increasing the water holding capacity through a heavy application of topmulch and/or incorporation of organic matter within the soil profile will also improve the success of seeding to 70% or more. Providing supplemental irrigation for the reclamation site has the effect of changing the soil moisture regime and will also improve germination and survival success to 70% or more.

The present plan limits all efforts for successful reclamation. The Division suggests that one or more of the above enhancements for seeding success are incorporated into the

Hiawatha reclamation plan. The consultant's report in Attachment I of Appendix II-3 suggests mulching at a level of 1.5 - 2.0 T/ac for the South Fork location. Instead, the plan calls for 1.0 T/ac at all locations. This is a harsh site. Limiting the input at the onset of reclamation will result in failure, as have the test plots. The most prudent course is to set the stage for successful germination and survival prior to the first attempt at seeding.

Deficiencies:

1. The reclamation plan must include unconsolidated material placement on top of the compacted fill to a depth of 18 inches prior to six inches of topsoil placement for all reclamation sites, leaving a total of two feet of uncompacted growth medium.

2. Please clarify the areas to receive topsoil in all reclamation locations on the exhibit specified in deficiency #3 under R645-301-222.

3. Locate on the map request under deficiency #3 of R645-301-222 the area to receive 6" of topsoil removal followed by 1.5' of soil salvage at the Hiawatha preparation plant.

4. Identify a ripping depth of 18 to 24 inches for all surfaces, including roads and slopes, prior to topsoil redistribution. Commit to gouging of slopes greater than 3h:1v for erosion control.

5. Commit to fertilization of all reclaimed sites prior to seeding.

6. Revise the reclamation plan for the Hiawatha slurry and refuse sites to include methods a, b, and c below and supporting test trials (as outlined in deficiency #3 under R645-301-224):

   a. a minimum of 24" of cover over the slurry and refuse areas

   and

   b. 1.5 T/ac of topmulch (per consultant's recommendation in Attachment I of Appx. II-3), or mulch treatment #2 as described in Appendix III-4.

   and

   c. irrigation, if the above treatments are unsuccessful and reseeding is required.

R645-301-321 Vegetation Information

Proposal:

Biowest performed vegetation studies in the permit area in 1980 and 1981. A total of twelve vegetation reference areas were established, but six of these were in the Mohrland area which is not now proposed for development by the Applicant. Page 14 of Appendix 3-2 states that the reference areas are in poor to fair range condition but that fencing is unlikely to help since the area is not overgrazed.

Vegetative types that were probably disturbed when the mines and associated areas were disturbed are mountain brush, mixed conifer, pinyon-juniper, sagebrush, and riparian. Data includes species lists of each area studied; relative densities by species and absolute cover by vegetation, litter, rock, and soil; tree and shrub density; and tree size composition. Productivity for several ecological sites was provided by the Soil Conservation Service.

Analysis:

Further calculations of absolute cover by species, standard deviations, and comparisons between areas disturbed and reference areas are desirable but not required. Most of these computations can be made with the information supplied.

Ecological site productivity data is presented in Chapter 2. The plan does not relate these sites to references areas, disturbed areas, or areas proposed to be disturbed; however, Tables 51-59, which show similarity between reference areas and disturbed areas, and areas proposed to be disturbed, do contain the needed productivity figures except for the topsoil borrow sites as discussed below.

No baseline vegetation information is presented for the topsoil borrow areas which would be disturbed at the time of reclamation, nor is any sampled area correlated to the borrow areas. These borrow areas are in pinyon-juniper and sagebrush habitat types, but no information is given to show that they might be similar to areas that have already been sampled. Also, Table 4 in Appendix III-2 does not correlate these areas with reference areas. Reference area PJR5 probably has the most similar vegetation, but that cannot be verified without data.

The plan does not present vegetative cover data for reference areas MBR1, MCR2, and PJR5. Tables 51, 52, and 55 show "total aerial cover" for these reference areas, but they do not define this phrase. One is led to believe that it only refers to cover from trees.

If total aerial cover includes all vegetative cover, this needs to be stated and the figures must be broken down by species. PJR5 is the reference area proposed to be used to evaluate the success of coal refuse sites, and data is needed to measure success of the test plots on coal refuse with varying amounts of topsoil. Data from the others is needed to establish baseline cover and to be able to evaluate test plots 3 and 4.

Woody species density is not presented for reference area MBR1 near the King 4 and 5 portals. Shrub density is not shown for reference areas MCR2 and PJR5. This information is needed to establish woody species density standards for success in accordance with R645-301-356.231.

Appendix III-2 does not give any information on reference area RR13. Table III-9 says that RR13 is a designated reference area but that no density data are available. The standard of success for trees in riparian areas as estimated in Table III-9 is 138 trees per acre, but Table III-6 calls for planting 800 trees and 2250 shrubs (including 1000 coyote willow which is elsewhere classified as a tree) per acre. These plans need to be substantiated with baseline data not contained in the plan. Reference area RR13 must be evaluated for woody species density, species and cover composition, and productivity.

As an alternative to sampling RR13, the Applicant may consider changing the status of RA13 to a reference area if this site is representative of riparian areas and if it has not been and will not be disturbed. An on-site evaluation should be coordinated with the Division before this change is proposed.

Some of the baseline information required but not in the plan may be available. Lynn Kunzler, formerly of the Division, said that data deficiencies were corrected in about 1987. If this data is available, it needs to be included in the plan.

Reference areas are used to judge revegetation success and need to be maintained in fair or better range condition. If the cause of poor condition ratings is wildlife depredation, there may be nothing that can be done to correct the problem. The reference areas need to be evaluated again to see if they have improved in the last eleven years and what can be done if they have not.

Because the reclamation plan calls for planting sedge (Carex rossii or other Carex sp. as available) and subspecies of sagebrush (Artemisia tridentata), specific and subspecific information is needed for these plants so that evaluation of the technical adequacy of the seed mixes can be made. Sagebrush subspecies can be identified at any time based on gross plant morphology, so the information can be provided before the permit renewal deadline. Sedges,

however, are much more difficult to identify, so this information will need to be obtained at the first opportunity next spring or summer.

Deficiencies:

1. The Applicant must provide subspecific and specific information for sagebrush (Artemisia tridentata) and sedges (Carex sp.) occurring in the reference areas and disturbed areas.

2. The reference areas must be evaluated by the Soil Conservation Service for range condition and productivity during the next growing season, and an evaluation of alternatives for improving their condition must be made if any are still in poor condition. See also deficiency 6 under R645-301-222.

3. The plan must include baseline vegetative cover data by species for reference areas MBR1, MCR2, and PJR5.

4. Complete woody species density figures must be provided for reference areas MBR1, MCR2, and PJR5.

5. Reference area RR13 must be evaluated for woody species density, species and cover composition, and productivity. Alternatively, the Applicant may propose changing sampling site RA13 to a reference area if this area has not and will not be disturbed and if it can be shown to be representative of other riparian areas.

6. The vegetation in topsoil borrow sites must be correlated with vegetation sampling areas and reference areas or new sampling in these areas must be performed.

R645-301-322 Fish and Wildlife Information

Proposal:

The plan includes general and site-specific information furnished by the Division of Wildlife Resources (DWR). Much of the DWR report states that certain types of areas are

high-priority or critical but does not specifically refer to the permit and disturbed areas. Maps included with the plan, however, show some deer and elk critical winter range as being in the permit area.

Attachment III-1 is a copy of the "Guidelines for Fish and Wildlife and Habitat Information Pursuant to UMC 783.20" with comments for each of the types of surveys shown. Some of the required information is not applicable, but "DONE" is typed by several of the sections.

Analysis:

Attachment III-1 indicates that raptor use of the areas to be disturbed has been performed. I'm not certain when Attachment III-1 was first prepared and if there has been any additional disturbance since then; however, any information that the Applicant has on raptor nests and aerie territories, especially near surface disturbances, must be included in the plan. DWR may have additional site-specific information on raptor nests in the area. Birds that build nests near surface disturbances are considered to be accustomed to the disturbance and not in need of special protection, but their nests must not be disturbed.

The plan does not discuss threatened or endangered plant species. Canyon sweetvetch (Hedysarum occidentale var. canone) is classified by the Fish and Wildlife Service as a category C2 species proposed for possible listing as threatened or endangered and has been collected in the Hiawatha and Mohrland areas. While no future disturbance is planned for areas where this plant is likely to grow, reclamation activities could potentially affect it. As a candidate species, the plant does not have legal protection; however, populations should still be identified and avoided if possible. Some information is probably available from the U. S. Fish and Wildlife Service and/or the Utah Natural Heritage Program within the state Department of Natural Resources. Field work will still need to be performed in the growing season.

Deficiencies:

1. The Applicant must include all available information on raptor nests in the permit area, particularly in the area of surface disturbance.

2. The Applicant must identify populations of canyon sweetvetch (Hedysarum occidentale var. canone) within and near areas that have been disturbed.

R645-301-323 Maps and Aerial Photographs

Proposal:

Maps of the area show mule deer, elk, and moose habitat and terrestrial use areas. Four vegetation maps show vegetation type boundaries, reference areas, and sampling sites. No monitoring stations or facilities used to protect and enhance wildlife and related environmental values are proposed.

Analysis:

Exhibit III-3, the Terrestrial Use Areas map, contains abbreviations "s-sa-yl h-sa-su" and c-ba-st" in the legend. No definition of these is given.

Deficiencies:

1. Exhibit III-3 must be revised to give expanded names of the abbreviations in the legend.

R645-301-330 Operation Plan

Proposal:

Disturbances will be consolidated as far as possible. Interim revegetation will be used on topsoil stockpiles, slopes of sediment ponds, and on road embankments.

Subsidence will be monitored through yearly aerial surveys and monitoring of ground control survey monuments. Significant damage to structures will be repaired or the structures replaced. Material damage or significant diminution of the value of foreseeable uses of lands will be restored to the extent reasonably possible to the satisfaction of the surface owner. Significant wildlife and livestock watering sites that are diminished and found necessary to be replaced will be mitigated by constructing watering ponds, troughs, or pipelines from alternate water sources.

Wildlife impact avoidance measures are provided by DWR. These include a system of educating employees on how to avoid disturbances; keeping coal out of streams; protecting any bird nests, especially those of raptors; reporting nests, roost trees, dens, and lodges to DWR; and having contracts for coal haulage requiring personnel to use extreme caution and

reduce speeds between November 1 and May 15.

Specific commitments made by the Applicant include providing the DWR wildlife education program, discouraging employees from carrying weapons in their vehicles, terminating any worker found poaching on company time, and cooperating with authorities in investigating other poaching on company property. The coal conveyor in the South Fork area has a deer crossing that, according to DWR correspondence, meets their criteria. Habitats that have been destroyed through construction will be restored to original or better condition. U. S. Fuel worked to revegetate an area that burned in 1984. Water is provided to the BLM for wildlife and cattle uses on land southeast of the permit area.

Analysis:

The Applicant is in compliance with this regulation.

Deficiencies:

None

R645-301-341.100 Revegetation: Timing

Proposal:

Reclamation timetables for different areas are shown in Tables II-22 through II-25 and II-29. Seeding and planting will take place September 1 to October 15 in the area of the Hiawatha Processing Plant and Loadout Facility, September 15 to September 30 in Middle Fork, October 1 to October 15 in South Fork, September 1 to September 15 in North Fork, and October 1 to October 15 at the substitute topsoil borrow sites.

Analysis:

Seed should be planted as late in the year as possible. The equipment schedule and weather conditions will probably dictate when particular areas can be seeded, but later seeding dates than those proposed would probably be more likely to succeed. The following schedule is suggested:

Hiawatha Processing Plant and Loadout Facility	10/15 - 10/30
Middle Fork	10/01 - 10/15

South Fork	10/01 - 10/15
North Fork	09/15 - 09/30
Substitute Topsoil Borrow Sites	11/1 - 11/15

This schedule leaves the lower elevation processing plant, loadout facility, and substitute topsoil sites until last. Some flexibility should be called for in the plan to accommodate contractors' schedules and weather conditions. The Applicant should understand that seed can be broadcast on a few inches of snow without decreasing the chances for success. Drilling, however, must be done when soil is relatively dry.

The planting schedule must be revised to show dormant season planting for tree and shrub nursery stock. This may be in the fall, probably mid- to late October, or early spring, probably April.

Deficiencies:

1. The planting schedule or methods must be revised to show dormant season planting of tree and shrub nursery stock or must show other methods to establish transplants, such as irrigation during the late spring and summer.

R645-301-341.210 Species and Quantities of Seeds and Seedlings

Proposal:

Tables III-3 through III-6 show seed and planting mixes proposed for use on various areas of the property. Table III-9 also has a planting mix which is to be used in mixed conifer, pinyon-juniper, and riparian habitats.

Analysis:

The seed mixes shown in Tables III-3 through III-6 are those that were used for the test plots established in 1984. Some revision of these mixes is appropriate because some of the test plot results are now available, some of the species in the mixes are not available commercially, some other species than those in the mixes are probably better adapted than the ones shown, and because the quantities of seed proposed to be planted are considerably higher than current literature suggests.

The use of the planting mixes in Table III-9 in association with the mixes shown in Tables III-3 through III-6 is not clear. For example, the King 4 & 5 area is to be planted with seed mix 3 in Table III-5 which includes 500 tree seedlings per acre for mixed conifer habitat. Table III-9 shows the mixed conifer habitat in this area (3.5 of the 13.8 acres) as receiving a total of 3556 seedlings per acre to match the reference area. This discrepancy needs to be clarified in the plan or changed altogether, as suggested below, for each of the proposed seed mixtures where seedling planting is proposed in Table III-9.

The seed mixes shown in Tables III-3 and III-4 are generally acceptable, but there are a few problems that need to be corrected. Seed mix 1 performed better in test plot 1 at a coal refuse site and at test plot 2 at a topsoil borrow site, so seed mix 2 could be eliminated.

Seed mix 1 in Table III-3 contains prince's plume which is not normally available in seed. This species should be deleted from the mixture. The subspecies of big sagebrush shown in this mixture, basin big sage, is not particularly palatable to wildlife or livestock and should be changed if possible. This table also shows more seed being planted than is currently recommended, so some reduction in quantities could be made. The following mixture is offered as a suggested revision to seed mix 1 based on test plot data and information from the two closest reference areas, PJR5 and SBR3. Further revision may be needed depending on any new information that may be collected from these sites and from the test plot evaluations done this year.

Species	Pounds Pure Live Seed per Acre
Shrubs	(Broadcast Seed)
Birchleaf Mountain Mahogany Cercocarpus montanus	2
Fourwing Saltbush Atriplex canescens	3
Winterfat Ceratoides lanata	2
Wyoming Big Sage Artemisia tridentata wyomingensis	0.2
Black Sage Artemisia nova	0.2
Grasses	
Slender Wheatgrass	2

Elymus trachycaulus	
Western Wheatgrass	2
Elymus smithii	
Indian Ricegrass	3
Stipa hymenoides	
Needle and Thread Grass	2
Stipa comata	
Bottlebrush Squirreltail	1
Elymus elymoides	
Sand Dropseed	0.1
Sporobolus cryptandrus	
Forbs	
Cicer Milkvetch	1
Astragalus cicer	
Blue Flax	1
Linum lewisii	
Yellow Sweet Clover	1
Melilotus officinalis	
Palmer Penstemon	1
Penstemon palmeri	
Scarlet Globemallow	1
Sphaeralcea coccinea	

The reference area standard for woody species density in the mixed conifer areas is not realistic or necessarily desirable, so it is not necessary to plant the number of seedlings proposed for this habitat type in Table III-9. As shown in Table III-9, 3556 trees per acre, equates to single trees planted 3.5 feet apart in a uniform grid. Most of these trees would not be expected to survive. Although the reference area contains this many trees, size class data shows that they are almost all small. Forest Service recommendations are generally to plant trees on a 9-foot spacing which corresponds to about 538 trees per acre. With 90% survival, 484 trees would remain. The 484 trees per acre will be considered the standard for success, and the Applicant may reduce the number of trees planted in the mixed conifer habitat type appropriately. The Applicant may want to increase the number of trees planted at final reclamation in case mortality is greater than 10%.

The following alternative to Table III-5 is suggested for mixed conifer sites:

Nursery Stock Species	Plants/Acre
White Fir Abies concolor	130
Smooth (Rocky Mountain) Maple Acer glabrum	80
Blue Spruce Picea pungens	138
Douglas Fir Pseudotsuga menziesii	100
Quaking Aspen Populus tremuloides	90

Seeds	Pounds Pure Live Seed Per Acre
Shrubs	(Broadcast Seed)
Saskatoon Serviceberry Amelanchier alnifolia	2
Mountain Big Sage Artemisia tridentata vaseyana	0.5
Curlleaf Mountain Mahogany Cercocarpus ledifolius	1
Squawbush Rhus trilobata	1
Snowberry Symphoricarpos oreophilus	1
Grasses	
Bluebunch Wheatgrass Elymus spicatus	3
Mountain Brome Bromus carinatus	3
Orchardgrass (Paiute) Dactylis glomerata	0.5
Needle and Thread Grass Stipa comata	1
Salina Wild Rye, or, if not available, Western Wheatgrass Elymus salina or Elymus smithii	2

Indian Ricegrass Stipa hymenoides	3
Timothy Phleum pratense	0.1
Basin Wild Rye Elymus cinereus	1
Forbs	
Northern Sweetvetch Hedysarum boreale	1.5
Alfalfa Medicago sativa	2
Scarlet Globemallow Sphaeralcea coccinea	0.5
Showy Goldeneye Vigueira multiflora	0.2

This seed mix is necessarily diverse because it would be used in moderately divergent habitat types, namely mixed conifer, pinyon-juniper, and mountain brush. Orchardgrass and timothy are both introduced grasses, but they are included at reduced rates since they both did very well in the test plots. The species of timothy used in the test plots was almost certainly P. pratense rather than P. alpinum.

Pinyon-juniper habitat in South Fork does not consist of a dense stand of pinyon and juniper; however, after consulting with DWR, it was decided that it is not necessary to replace these trees since cover for big game is available nearby.

Other non-riparian habitat types outside of the Hiawatha/prep plant/slurry pond areas should also be planted with seed mixture 3.

Seed and planting mixtures for the riparian areas are in Tables III-6 and III-9. Table III-9 shows a standard of 138 woody plants per acre for the riparian areas which is apparently from "RR13". As discussed above, RR13 vegetation data is not shown in the plan.

The planting mix in Table III-6 corresponds somewhat to what is in RA13, a riparian sampling site in Middle Fork, and is acceptable. The planting list from Table III-9 should not be used. The Applicant may want to consider the use of cuttings or container stock for some of the transplants. Cuttings are reported to work well for willows and may be less

expensive than nursery stock.

The seed list in Table III-6 shows species that are not commercially available and that are not normally grown from seed, such as Carex rossii or other Carex as available, fringed brome, Baltic rush, alpine timothy, Richardson's geranium, and American vetch. Recently, increased emphasis has been placed on revegetation of riparian areas, and some of these species may become available, more likely as plants than seeds, in the near future. Because they are not available now, however, the following alternative to the seed mix in Table III-6 is proposed:

Species	Pounds Pure Live Seed Per Acre (Broadcast Seed)
Shrub	
Snowberry Symphoricarpos oreophilus	1
Grasses	
Western Wheatgrass Elymus smithii	2
Mountain Brome Bromus carinatus	3
Orchardgrass Dactylis glomerata	0.5
Kentucky Bluegrass Poa pratensis	0.5
Timothy Phleum pratense	0.1
Basin Wild Rye Elymus cinereus	1
Forbs	
Alfalfa Medicago sativa	1
Silky Lupine Lupinus sericeus	2
Northern Sweet Vetch Hedysarum boreale	1.5
Arrowleaf Balsamroot Balsamorhiza sagittata	2

The Applicant needs to show methods to establish other forbs that are not available commercially and which are important components of the riparian areas, especially sedges but possibly also Baltic rush and American bulrush. Some of these may be available from the Lone Peak State Nursery as early as 1994, but other methods of establishing these plants, such as from plugs from undisturbed areas or by contracting a nursery to propagate them, needs to be shown now. This needs to include species, planting rates and arrangements. It may not be desirable to put some transplants more than a few feet away from the stream while others could be successfully planted some distance from it. The Applicant should consult with the Army Corps of Engineers before proposing to disturb undisturbed riparian areas.

It should be emphasized that the seed and planting mixes shown above are suggestions, and the Applicant is strongly encouraged to seek further consultation before accepting them.

In addition to the above clarifications and changes, the plan must specify precisely where planting and seed mixes are to be used. The use of a separate revegetation map that contains this information is strongly preferred. For example, the same seed mix will be used in the Middle Fork Mine Pad area for both mixed conifer and mountain brush habitats, but the plan needs to show exactly where the planting mix for the mixed conifer habitat type will be used versus just the seed mix.

Tables III-3 and III-4 state that seed mix 1 will be used on slurry impoundments and sagebrush-dominated soil borrow areas, and seed mix 2 will be used on sagebrush-dominated soil borrow areas. The text states that seed mix 1 will be used on areas affected by coal refuse and other coal materials and that seed mix 2 will be used on the alluvial fan sites. As discussed under the sections where changes to these mixes are suggested, seed mix 1 performed best and should be used in all of the topsoil borrow sites and coal refuse-affected areas, and mix 2 could be eliminated.

The use of seed mix 4 is especially confusing. Page 74 of Chapter 2 states that seed mix 4 will be used to revegetate the regraded road surfaces, but page 60 of Chapter 3 says that mix 3 will be used on "the mine pads, roads, and sediment ponds in South, Middle and North Fork". Chapter 3 says that seed mix 4 will only be used in riparian areas which undoubtedly includes some of the areas disturbed by roads. These contradictions need to be clarified. Any limited use of a species that will be transplanted, such as only within a certain distance of the stream or only in a certain soil type, in association with seed and planting mix 4 must also be discussed.

The plan must discuss the quality and handling of seed and seedlings to be used. The Applicant must not accept seed sold in violation of the Utah Seed Act. Any seed that is purchased in advance must be stored properly, i.e. away from temperature extremes, moisture, and animals (insects and rodents), and for no more than about nine months. The Applicant must attempt to obtain origin verified seed from locations with similar conditions to the mine. Alternatives to origin verified seed include using certified seed of named, adapted varieties and using locally-collected seed labeled with county and elevation of collection as required by the Utah Seed Act for tree and shrub seeds.

Nursery-grown planting stock should also be from plants in the area of the mine. The Applicant must show methods to obtain adapted planting materials or to contract with a nursery for them. To obtain these materials, it may be necessary to collect seeds, such as from conifers, and other propagules, such as cuttings, on site. The nursery needs to be able to supply dormant materials so should be a local nursery if possible. Nursery stock must be planted while still dormant. Plants should be kept in cold storage until planted but taken out a day ahead of time to harden the stock. They should not be exposed to wind or the sun and must be kept moist at all times.

Deficiencies:

1. Seed and planting mixes must be revised to reflect results of the test plots and of species identification performed on big sagebrush and sedges. Species shown in the seed and planting mixes must either be available commercially or U. S. Fuel must show how seed and plants of species not normally available through commercial channels will be obtained.

2. The use of the planting mixes in Table III-9 in association with the seed and planting mixes in Tables III-3 through III-6 must be discussed more clearly. These tables should be consolidated as far as possible.

3. U. S. Fuel must show where various seeding and planting treatments will be used, preferably on a map.

4. The application must show methods of establishing plants of important components of the riparian areas, i.e. sedges, rushes, and bulrushes, which are not normally available commercially.

5. The application must include transplant and seed handling procedures that will protect these materials until they are used.

6. U. S. Fuel must include a commitment not to accept seed sold in violation of the Utah Seed Act and to attempt to obtain adapted ecotypes through using origin verified seed, certified seed of adapted varieties, or seed labeled to show county and elevation of collection.

7. The Applicant must show methods to obtain adapted dormant nursery materials.

R645-301-341.220 Planting and Seeding Methods

Proposal:

Seed will be drilled where slopes are level enough and areas to be reclaimed are large enough. Otherwise, seed will be broadcast by hand using portable spreaders. Other parts of the plan, especially Chapter 2, discuss using hydroseeding. Hydromulch may be added to the hydroseeding mixture.

Nursery stock will be planted in clumped arrangements in portions of the mine pad and riparian areas.

Analysis:

This analysis section includes comments on the plan as presented. An alternative to the proposed seeding and mulching methods is presented in the mulching methods section below.

This section should include criteria for determining which seeding method will be used, such as stating that slopes less than 3:1 will be drilled.

Page 62 of Chapter 3 and page 47 of Chapter 2 imply that fertilizer and/or mulch may be mixed with the seed in hydroseeding operations. Fertilizer in hydroseeding mixtures reduces seed viability by up to 50%, and mulch applied with the seed reduces seed contact with the soil and thus seedling survivability.

The plan needs to discuss how trees and shrubs will be clumped. This is a desirable means of planting them, but sizes of clumps, or at least minimum and maximum sizes, for each community type and spacing within the clumps needs to be specified.

Deficiencies:

1. This section of the application must include criteria for determining which planting method will be used.

2. Any references in the plan to mixing mulch or fertilizer with seed in hydroseeding mixtures must be deleted. Fertilizing, seeding, and mulching must be done in three separate operations.

3. The application must show how trees and shrubs will be clumped, including minimum and maximum sizes of clumps and spacing within clumps, for each habitat type.

R645-301-341.230 Mulching Techniques

Proposal:

Mulch in the form of hydromulch, hay, or straw will be applied at the rate of one ton per acre. The mulch used will vary depending on the site, slope, method by which the seed is applied, and other variables. It will be anchored by tackifiers, crimping, or using netting that has been tacked to the soil.

Analysis:

Hay and straw can be a significant source of noxious weed seeds. Hay and straw used for mulch must be certified noxious weed free. A list of sources can be obtained from the Utah Department of Agriculture.

As with the section on seeding, this section of the application should include general criteria for determining which mulching method will be used. In areas where straw or hay will be crimp-disced to anchor it, discing prior to seeding should not be done so that the number of passes and the amount of soil compaction and loss of structure can be minimized. The anchoring process should be done on the contour, however, and needs to leave a

roughened surface. This might be done by using a notched or offset disc. Areas with steep slopes that have been scarified through gouging as described below should be disturbed as little as possible to preserve the integrity of furrows, terraces, or other features that are created.

Appendix III-4 contains an interim revegetation plan for areas near the King 6 mine. Results cannot be considered conclusive since monitoring was only done the first year after method application. The most successful method for steep slopes was hydraulic application of 1/2 ton per acre of straw mulch overlain by nylon netting and 1/2 ton per acre of hydromulch. U. S. Fuel should consider using this method for steep slopes.

Attachment 1 of Appendix II-3 contains recommendations of the Applicant's consultant that 1.5 to 2 tons per acre of straw or hay be used as a mulch. Literature studies also suggest that 1.5 tons per acre is an optimal amount of mulch after which increased costs give diminishing returns.

Slopes greater than 3h:1v must be stabilized by creating gouges. This technique has proven to be very effective in creating areas for water to accumulate and for seeds to germinate. Gouges are basically pits dug in the soil after topsoil replacement that are approximately 18 inches wide by 24 inches long by 9 inches deep (the dimensions can vary).

The following methodology is presented as an alternative to the seeding and mulching methods proposed by the Applicant. These methods could be used in most or all areas and would simplify the plan without significantly changing the cost.

After topsoil and fertilizer application, slopes greater than about 4h:1v should be roughened in some way, such as through terracing, creating furrows with disc pitters, or by gouging with a backhoe or land imprinting equipment. Slopes greater than 3h:1v must be gouged to increase stability. Seed would then be broadcast with a cyclone spreader, hydroseeder, or similar equipment, and raked lightly to cover it. Mulch as 1.5 tons per acre of straw or hay would be spread around the area and anchored using either tackifier or netting. As an alternative to increasing mulch, method #2 from the interim revegetation plan could be used on steeper slopes.

These methods are similar to those proposed but incorporate recommendations from literature sources, the Applicant's consultant, and Division personnel. A roughened surface is desirable to create microsites for moisture accumulation and seed germination, especially on slopes. Broadcast seeding helps to preserve the roughness while light raking covers the seeds somewhat and allows them to be in better contact with the soil and moisture. Straw or

hay with tackifier or netting has been shown to reduce erosion more than hydromulch. It also increases seedling establishment compared to hydromulch.

Deficiencies:

1. Where straw or hay mulch is used, U. S. Fuel must use certified noxious weed free straw or hay.

2. The application must include general criteria for determining which mulching technique will be used. Any site that will have hay or straw mulch crimp-disced to anchor it must not be scarified through discing beforehand.

3. Slopes greater than 3h:1v must be scarified by gouging.

4. The Applicant must use mulching methods which have been proven to be most successful at U. S. Fuel's test plots or in other similar areas. The use of 1.5 tons per acre of anchored straw or hay, or of 0.5 tons per acre of hydraulically-applied straw mulch overlain by nylon netting and 0.5 tons per acre of hydromulch are suggested methods that have been shown to be successful.

R645-301-341.240 Irrigation and Pest and Disease Control

Proposal:

No irrigation or pest and disease control is proposed.

Analysis:

The Applicant may want to consider limited irrigation for transplants for the first season after they are planted and should at least have a contingency plan that includes irrigation if the season is exceptionally dry.

Hopefully, pest and disease control will not be needed. Again, however, the application should contain a contingency plan stating that disease and pest control are not anticipated but that the Division will be notified and consulted if they need to be performed.

Deficiencies:

1. The application must contain contingency plans for disease and pest control and for irrigating transplants in case there are unforeseen problems with pests, diseases, or drought.

R645-301-341.250 Success Determination Measures

Proposal:

During the second and succeeding years, revegetated and reference areas will be sampled quantitatively using m^2 quadrats for cover by species, density by species, and soil, rock, and litter cover. An adequate sample size will be assured using a minimum sample size formula. The application states that Division guidelines allow sampling to be considered adequate when 40 or 50 quadrats have been observed even if the formula for sampling adequacy has not been satisfied.

Trees, saplings, and larger shrubs will be sampled by the point-quarter method. Productivity measurements will be taken when cover and density values for woody plants and understory vegetation at reclaimed areas are similar to those at the corresponding reference areas. This will be done by the clipped quadrat method using 15 to 40.5 m X .5 m = .25 m^2 quadrats.

Comparison of reclaimed areas to reference areas will be by unpaired t-tests. The application presents hypotheses to be tested and gives a decision rule.

Analysis:

There are some apparent typographical errors in this section that need to be corrected. On page 63, the correct formula for determining the minimum sample size is:

$$N = \frac{t^2 s^2}{p^2 x^2}$$

In the last paragraph on page 64, the null hypothesis should be H_0: $x_d - x_r = 0$. In two other places in this paragraph, "s_d" is substituted for "x_d". In the statement about the size of the plots to be used for productivity measurements, there should be a space between "40" and ".5".

The hypotheses discussed on page 64 do not take into account rule R645-301-356.120. which says that ground cover, production, or stocking will be considered equal to the approved success standard when they are not less than 90% of the success standard with 90% statistical confidence. The standard proposed in the plan is more stringent than the regulations, so the proposed standard cannot be considered a deficiency.

Maximum sample sizes have been deleted from the latest revision of the "Vegetation Information Guidelines" because of a specific directive from the Office of Surface Mining. Although these guidelines are not yet approved, this part of them should be accepted soon, probably before permit renewal, and this approval would require the Operator to update the plan then. Reference to maximum sample sizes is not a deficiency now, however.

Rule R645-301-356.231 states that minimum stocking and planting arrangements will be specified by the Division after consultation with and approval by Utah agencies responsible for the administration of forestry and wildlife programs. This rule is pending some changes that will specify how this consultation will occur. The standard established through this rule supersedes the reference area standard; however, this does not preclude the reference area from being used. Consultation has been performed, and the tentative standards decided upon are:

Habitat Type	Success Standard for Trees and Shrubs (number per acre)
Mixed Conifer	484 trees 3723 shrubs
Pinyon-Juniper	
Mine pad areas	2590 shrubs, no trees
Other areas	2185 shrubs, no trees
Mountain Brush	3000 shrubs
Riparian	2448 trees and shrubs
Sagebrush	4500 shrubs

These standards are tentative because tree and shrub density information is not presented for all of the reference areas (see stipulation to obtain this data under R645-301-322 above). Some of the standards are based on sampling site data, but there is no tree or shrub density data whatsoever for the mountain brush habitat type.

The application needs to contain other methods to be used to determine if revegetation has been successful according to the requirements of R645-301-353. The application contains general commitments for these standards, but specific methods need to be included.

These methods need to include narrative discussion of the diversity, utility, effectiveness, and seasonality of reestablished communities. Quantitative measures available, such as indexes of similarity and diversity contained in the "Vegetation Information Guidelines, Appendix B", also need to be included in this analysis.

Deficiencies:

1. Typographical errors on pages 63 and 64 must be corrected.

2. The plan must include tree and shrub density standards as specified.

3. The application must contain methods of evaluating the diversity, utility, effectiveness, and seasonality of reestablished vegetation including quantitative measures of diversity and similarity to reference areas.

R645-301-341.300. Field Trials

Proposal:

Five test plots were established in 1984, one on refuse materials, one in a substitute topsoil location, two near mine pads, and one in a riparian area. Appendix III-5 shows the results of monitoring these plots through 1988.

Analysis:

The plan for establishing the test plots indicates that tree and shrub nursery stock were to be used; however, there is no indication in the results, the test plot plan, or the current MRP that this was actually done. Since some of the species in the seed mixes are not normally available commercially, it is likely that some substitutions were made. A former U. S. Fuel employee has indicated to me that this may have happened with a few species. It is impossible to ascertain with certainty if these problems exist in the plan, but U. S. Fuel should make attempts to find records of the work that was done.

The Applicant proposes to monitor revegetation success of the test plots in the seventh, ninth, and tenth years. Monitoring in the seventh year would have been in 1990, and no test plot monitoring was done then. Unless U. S. Fuel has seventh year monitoring

data, the MRP should state that seventh year monitoring was not performed. The commitment to monitor in the seventh year does not appear to be in the current MRP or enforcement action might be taken. Ninth year monitoring will need to be done in 1992.

Determination of success of the test plots cannot be made without the additional baseline data required under R645-301-321 above. Test plot 1 contained 41-77% vegetative cover in 1988, but about half of this cover was from downy brome, a troublesome weed. Reference area PJR5 contained 46% total aerial cover in 1980, but since there is no species breakdown or definition of this cover, it is impossible to tell how successful the test plot has been and if using smaller amounts of topsoil than usually required would be acceptable.

Test plot 2 on a topsoil borrow site shows an average of about 20% vegetative cover. Seed mix 1 performed better than seed mix 2. Since the plan does not relate topsoil borrow sites to reference areas, however, it is impossible to judge the success of this test plot, either.

The other test plots have the same problems: since there is inadequate baseline data for the reference areas, success of the test plots cannot be thoroughly evaluated.

Further analysis and deficiencies are found under R645-301-224.

Deficiencies:

1. U. S. Fuel must either present results of seventh year test plot monitoring or the MRP must state that seventh year monitoring was not performed.

R645-301-342 Fish and Wildlife Plan

Proposal:

Revegetation will seek to enhance forage values of reclaimed sites. Stream channels and riparian habitat will be restored.

Plant species have been chosen based on their nutritional value for wildlife and their ability to enhance wildlife habitat. The plants will be grouped and distributed in a manner to maximize the edge effect, cover, and other benefits.

Analysis:

The Applicant is in compliance with this regulation.

Deficiencies:

None.

R645-301-350 Performance Standards

Proposal:

This section of the plan contains general commitments to meet the requirements of the performance standards. Under R645-301-357, the plan states that no response is necessary.

Analysis:

This section of the plan requires no more than the general commitments given. Under R645-301-357, the section that deals with the extended responsibility period, however, the plan needs to show what this period is. Several reclamation timetables in Chapter 2 state that final acceptance will be after five years. If the Applicant claims five years to be the appropriate responsibility period under this regulation, that statement should be made here. It is unlikely, however, that with the vegetation types present this area receives 26 inches or more annual precipitation.

Deficiencies:

1. The application must state the appropriate extended responsibility period under R645-301-357 and in Tables II-22 through II-25 and II-29.

R645-301-411 Environmental Description

Proposal:

Coal mining has been conducted in the area since the early 1900's. Land use is and will remain primarily wildlife habitat with limited grazing.

At the time of the filing of the application, land uses in the area were mining, grazing, wildlife habitat, and outdoor recreation. The permit area contains some timber resources as documented by a 1929 Forest Service survey, but there has been little logging since that time. There are no oil and gas wells on U. S. Fuel property, but there is a large potential in the area.

The area is zoned for recreation, forestry, grazing, and mining under local county zoning ordinances.

No cultural or historic resources are known from the area. Appendices IV-1 and 2 contain archaeological surveys that were performed in 1983 and 1981 at the time of proposed disturbances. No sites were found. No resources were identified in a check with the Division of State History, either.

Coal production has been continuous over the past 80 years. Total production has been about 50,000,000 tons by room and pillar methods.

Analysis:

Two items need to be addressed in the plan for this section to be technically complete. The Town of Hiawatha is within the permit area and contains a cemetery as identified on several maps. According to the maps, the cemetery is within the area of one of the slurry ponds, but this may be inaccurate. This cemetery needs to be discussed in this section of the plan.

The plan also needs to discuss and contain a map, if they are present, of public parks in and adjacent to the permit area and any land within the permit area which is within the boundaries of any units of the National System of Trails or the Wild and Scenic Rivers System, including study rivers. If not present, a negative declaration needs to be made.

Deficiencies:

1. The application must discuss the cemetery within the Town of Hiawatha and public parks within and adjacent to and units of the National System of Trails or the Wild and Scenic Rivers within the permit area.

R645-301-412 Reclamation Plan

Proposal:

After the recoverable coal reserves have been extracted, it is expected that the current status of the existing land use area will remain unchanged.

The post-mining land use of the equipment storage yard east of slurry pond 5 will be wildlife and grazing. The equipment storage yard south of the mine office building will be dedicated to the town of Hiawatha for use as municipal vehicle storage and equipment and maintenance facilities.

Attachment IV-2 contains an agreement dated February 8, 1984, between U. S. Fuel and the town of Hiawatha for retention of access roads and related drainage control structures serving coal mine facilities in the Left, Middle, and Right Forks of Miller Creek. These roads are to serve as access for maintenance and repair of vital municipal and culinary water supply systems. The town of Hiawatha agrees to accept and maintain the roads and related structures in compliance with maintenance standards existing at the time of transferral.

Surface ownership of lands in the permit area is shown in Exhibit IV-1. Most of the permit area surface land is owned by U. S. Fuel, but there are some areas on the west side of the permit area that are owned by the U. S. Forest Service. The east side of the permit area contains utility and railroad corridors.

Final fills containing excess spoil will be regraded as discussed in Chapter 5. Chemical analyses of the spoil material are contained in Chapter 2, and Appendix III-5 contains revegetation test plot information.

Analysis:

The wording of the first paragraph of this section implies that no reclamation will occur after recoverable coal reserves have been extracted. This statement must be reworded.

This section of the plan needs to restate the intended land uses for all parts of the permit area. These are discussed briefly on page 1 of the chapter.

Page 73 of Chapter 2 states that the roads in South Fork, Middle Fork, and North Fork will be reclaimed beginning at the upper end of the roads and progressively proceed

toward the town of Hiawatha until the entire length of the haul and access roads have been completed. Chapter 5, engineering, references Chapter 2 for details of road reclamation. No retention of roads is mentioned in either of these sections. The existing MRP, dated after the agreement with the town of Hiawatha, also proposes to reclaim the roads. This discrepancy between Chapter 4 and Chapters 2 and 5 must be resolved and the post-mining land use of the roads approved.

If the Applicant proposes to retain the roads, further detail is needed on what water supply system facilities need to be maintained by the town of Hiawatha

The plan is required to contain copies of comments concerning the proposed post-mining land use by the legal or equitable owners of record of the surface of the proposed permit area and Utah and local governments agencies which would have to initiate, implement, approve, or authorize the proposed use of the land following reclamation. These comments are not in the plan. A statement from U. S. Fuel, a surface owner, is not needed.

Deficiencies:

1. The proposed post-mining land use for the roads must be identified in the plan and must be consistent within the plan. If the Applicant proposes to retain the roads, further information must be provided on what water supply system facilities need to be maintained by the town of Hiawatha.

2. The plan must contain copies of comments concerning the proposed post-mining land use by the legal or equitable owners of record of the surface of the proposed permit area and Utah and local governments agencies which would have to initiate, implement, approve, or authorize the proposed use of the land following reclamation.

3. Wording on page 8 which implies that no reclamation will occur after mining has ceased must be revised. Also, the reclamation plan section of this chapter must restate the intended land uses for all parts of the permit area.

R645-301-420 Air Quality

Proposal:

U. S. Fuel conducts all mining and reclamation activities according to requirements of the Clean Air Act. New installations have been reviewed by and received approval from the Utah Bureau of Air Quality.

Annual production is less than 1,000,000 tons. Fugitive dust is controlled by enclosed facilities, conveyor belt covers, transfer chute covers, and watering of unpaved haul roads.

Analysis:

The plan needs to contain a copy of the most recent Air Quality Approval Order issued by the Bureau or Division of Air Quality. This is needed to adequately describe coordination and compliance efforts which have been undertaken by the Applicant with the Division of Air Quality.

Deficiencies:

1. The Applicant must submit a copy for insertion into the plan of the most current Air Quality Approval Order.

R645-301-500 ENGINEERING.
R645-301-512 Certification.

Proposal:

The Applicant has stated that all maps and cross-sections that apply to this section have been prepared by, or under, the direction of a qualified, registered professional engineer whose stamp and signature can be found on the individual documents.

Analysis:

All of the maps and cross-sections that the Applicant has submitted in order to comply with the engineering section have all been stamped and signed by a professional engineer with the exception of V-13c. That cross-section has not been signed or stamped.

Some maps and cross-sections needed for the technical review have not been submitted. The Applicant needs to identify what surface facilities and mine openings are pre SMCRA. The Applicant has stated that in Chapter II under general reclamation that the slurry ponds and embankments would not be restored to the approximate original contours. If there is to be a variance from the approximate original contour then Applicant needs to summit a certified design. No designs for approximate original contours were submitted.

Deficiencies:

1. The Applicant needs to submit a copy of drawing V-13c that has been stamped and signed by a qualified registered professional engineer. The Applicant needs to either submit maps and cross-sections that are required under R645-301-512.260 for variance from approximate original contours.

R645-301-513 Compliance with MSHA Regulations and MSHA Approvals.
R645-301-513.100 Coal Processing and Waste Dams and Embankments

Proposal:

United States Fuel Company states that it maintains three slurry impoundments, that include coal processing waste embankments, that meet the criteria for MSHA approval. Designs and approval from MSHA for those ponds is shown in Appendix V-1. The designs for the slurry ponds were done by a registered professional engineer and approved by MSHA.

Analysis:

The names and identification number for those impoundments should be included in the text. From information found in Appendix V-1 it appears that those embankments are slurry ponds 1, 4, and 5. The registered professional engineer who designed the structures used the specification stated in 30 CFR 77.216-1 and 30 CFR 77.216-2. MSHA has approved the structures design and construction plans.

Only one failure surface per structure was analyzed. It is possible that failure could occur on a surface other than the one analyzed. Either additional surfaces need to be examined or, since the structures were designed and constructed prior to SMCRA, then the Operator needs to certify that the structures meet the performance standards.

Deficiencies:

1. The Applicant needs to include the names and MSHA identification numbers associated with the three slurry ponds in the permit text. The Applicant also needs to analyze the structures on more than one failure surface to insure that design standards are met. An alternative to meeting design standards is to meet performance standards.

R645-301-513.200 Impoundments and Sedimentation Ponds

Proposal:

The Applicant has identified four impoundments that require design specifications as stated in 30 CFR 77.216 and MSHA approval. They are the three slurry ponds mentioned in R645-301-313.100 and the underground reservoir in the Hiawatha No. 2 Mine. The designs and MSHA approvals are presented in Appendix 1 and 2.

Analysis:

The Applicant has met the criteria to use the design specification stated in 30 CFR 77.216 on the failure surfaces that were analyzed and have MSHA approval. Since failure can occur on several surfaces the Applicant needs to examine other surfaces to show that the design standards are met or that the performance stands are met.

Deficiencies:

The Applicant needs to identify the structures in the text by name and MSHA identification numbers and give the reference to the maps that show the location of the underground reservoir. The Applicant needs to show that several potential failure surfaces meet either the design or performance standards.

R645-301-513.300 Underground Development Waste, Coal Processing Waste and Excess Spoil

Proposal:

The Applicant states that no coal processing waste or excess spoil is proposed to be

deposited in underground mine workings.

The last sentence states, "Except for content of combustible material, this practice is not in conflict with MSHA regulations."

Analysis:

The mining and reclamation plan cannot conflict with MSHA regulations. The Applicant must either not place waste or spoil underground or commit to remove the combustible material.

Deficiencies:

1. The Applicant needs to commit that the disposal of any waste or spoil underground will be done in accordance with a plan approved by MSHA and the Division and current practices will not be in violation of MSHA regulations.

R645-301-513.400 Refuse Piles

Proposal:

The Applicant has two refuse piles in the permit area. The plans for the piles are presented in Appendix V-3.

Analysis:

The Applicant needs to identify the refuse piles in the text by name and MSHA identification number. The plans in Appendix V-3 do not have any maps, cross-sections or engineering calculations.

Deficiencies:

1. The Applicant needs to identify the refuse piles by name and MSHA identification number in the text. The Applicant also needs to provide maps, cross-sections and engineering calculations used to design and construct the piles.

R645-301-513.500 Capping and Sealing of Mine Openings

Proposal:

The Applicant states that all abandoned mines have been sealed and that all openings that are not currently being used have been gated and locked.

Analysis:

There are some portals that are in the permit area that were abandoned or closed prior to SMCRA. Those portals need to be identified on the surface maps. Those portals that were used after SMCRA also need to be identified on surface maps.

Deficiencies:

1. The Applicant appears to be in compliance with this section. Surface maps should be provided to show those portals that must meet SMCRA closure standards.

R645-301-513.600 Discharges into Underground Mines

Proposal:

The Hiawatha No. 2 Mine is used as a water storage reservoir for culinary and mining purposes at the King 4, 5 and 6 Mines. The Applicant has received permission from the Division and MSHA to divert water into the Hiawatha No. 2 Mine.

Analysis:

The water that is discharged into Hiawatha No. 2 Mine is later withdrawn and used for culinary water. There is no evidence that discharging water into the mine has an adverse impact on water quality.

Deficiencies:

1. The Applicant appears to be in compliance for this section.

R645-301-513.700 Mining Within 500 Feet of an Active Underground Mine

Proposal:

The Applicant states that no surface mining or reclamation activities are proposed within 500 feet of an active underground coal mine.

Analysis:

The Applicant appears to be in compliance.

Deficiencies:

No additional action needs to be taken.

R645-301-513.800 Coal Mine Waste Fires

Proposal:

The coal waste fire plan is presented in Appendix V-4. The plan complies with 30 CFR 77.215 and 77.216.

Analysis:

The Applicant's plan meets the standards required in CFR 77.215 and 77.216.

Deficiencies:

The Applicant appears to comply with MSHA and Division requirements.

R645-301-514 Inspections
R645-301-514.100 Excess Spoil

Proposal:

The Applicant states that no removal or placement of excess spoil is currently anticipated. If the need arises the Applicant will submit inspection plan to the Division prior to placement.

Analysis:

This regulation has not been addressed. The Applicant either needs to commit that no spoil will be produced or taken to the surface, or an inspection plan must be approved.

Deficiencies:

1. The Applicant is not in compliance. The Applicant either needs to commit to not generating any spoils that will be disposed of on the surface or submit an inspection plan for placing spoils in surface facilities.

R645-301-514.200 Refuse Piles

Proposal:

There are two refuse piles which have been given names and MSHA identification numbers. The Applicant proposes to meet the MSHA inspection requirements of having a registered professional engineer inspect the structures annually and the Division requirements of a quarterly inspection.

Analysis:

The Applicant proposal appears to be in compliance with MSHA and Division requirements.

Deficiencies:

The Applicant is in compliance.

R645-301-514.300 Impoundments

Proposal:

The Applicant states that there are four impoundments that require inspections. Three of the structures are slurry ponds that are inspected weekly and an annual report describing any changes in the geometry and configuration of the impoundment is submitted to MSHA and the Division.

The fourth impoundment is the underground reservoir that is inspected monthly, except during winter, and reports are submitted annually to the Division.

Analysis:

The Applicant will inspect the slurry ponds weekly and submit an annual report noting any changes in their geometry. That inspection schedule meets MSHA and the Division requirements. The underground reservoir is inspected on a monthly basis except in winter, which meets Division requirements.

Deficiencies:

The Applicant appears to be in compliance.

R645-301-515 Reporting and Emergency Procedures

Proposal:

The Applicant has committed to contact the Division in the event a slide or a potential impoundment hazard occurs. The Applicant has also committed to contact the Division in the event of a temporary cessation of operations.

Analysis:

The Applicant's plans appear to be adequate to handle and report an emergency.

Deficiencies:

The Applicant is in compliance.

R645-301-520 Operation Plan
R645-301-521 General

Proposal:

The Applicant has submitted a brief statement in which he states that all maps and cross-sections required in this section have been supplied and certified by a registered professional engineer.

Analysis:

The Applicant has submitted maps and cross-sections that have been certified. There is no cross-reference between the drawings and the regulations, nor is there any narrative or calculations to support any of the requirements.

The Applicant has made no mention about the signs and markers required under R645-301-521.200 to R645-301-521.270.

Deficiencies:

1. The Applicant has not stated what maps and cross-sections have been submitted to meet the requirements of R645-301-521.100 through R645-301-521.190. The Applicant needs to submit a map that shows the entire permitted area and the location of the five areas. The five areas are: 1) North (Right) Fork of Miller Creek Surface facilities; 2) Middle Fork of Miller Creek Surface Facilities; 3) South Fork of Miller Creek Surface Facilities, 4) Hiawatha Processing Plant and Waste Disposal Sites; and 5) Substitute Topsoil Borrow Site. The Applicant needs to submit a map(s) that shows the location of all surface facilities that were closed or abandoned prior to the enactment of SMCRA.

2. The Applicant needs to address the signs and markers requirements set forth in R645-301-521.100 through R645-301-521.270

R645-301-522 Coal Recovery

Proposal:

The Applicant states that most of the reserves have been extracted. Present and future coal mining will concentrate on recovering the limited reserves that can still be recovered.

Analysis:

The Applicant needs to submit a copy and make reference to his resource recovery protection plan. The Applicant has recently changed his mining plans and anticipates mining a lower tonnage of coal than specified in the mining plan. The Applicant needs to update this section.

Deficiencies:

1. The Applicant is not in compliance because no reference is made to the resource recovery protection plan, nor does the recovery plan take into account the anticipated annual production.

R645-301-523 Mining Methods

Proposal:

The Applicant has outlined the mining methods that could be used for each of the mining operations. The operations described suggest mining will occur on a much larger scale than what is currently being performed or anticipated.

Analysis:

The mining methods described by the Applicant are production rates that far exceed the current or anticipated level.

Deficiencies:

1. The Applicant needs to note any changes in the mining methods that have or will result from the decreased production rates.

R645-301-524 Blasting and Explosives

Proposal:

Explosives are used infrequently in underground mining activities and are stored in magazines on the surface. The use of explosives on the surface is not anticipated because all the surface facilities and portals have been constructed.

Analysis:

The Applicant appears to have limited need for explosives in underground applications.

Deficiencies:

The Applicant needs to commit to follow all of the regulations in Section R645-301-524 that would apply to his operation.

R645-301-525 Subsidence

Proposal:

The Applicant has outlined the subsidence plan approved by the Division in 1989 and has committed to continue using the plan.

Analysis:

The plan has some deficiencies, which are: 1) there is no map showing the surface extent of possible subsidence and the location of any nonrenewable resources; 2) there is no geologic data, such as the physical parameters of the coal and over burden, or calculations to support the claim the subsidence will only occur in areas where there has been pillar extraction; and 3) surface surveying of monuments and subsidence stations over areas of pillar extraction will be conducted at least every two years.

Deficiencies:

1. The Applicant will provide a map that shows the extent of possible subsidence and the location of any nonrenewable resources.

2. Provide geologic data and a model to support claims about subsidence; and 3) surface surveying of monuments and subsidence stations over areas of pillar extraction will be conducted at least every two years.

R645-310-526 Mine Facilities

Proposal:

The Applicant has provided a description of the mine facilities in the mining and reclamation plan. At present the Applicant does not propose to construct or remodel any existing mining facilities.

Analysis:

The Applicant's description of the surface facilities appears adequate.

Deficiencies:

The Applicant is in compliance.

R645-301-527 Transportation Facilities

Proposal:

The Applicant has described the transportation facilities and committed to maintain them as required in this section.

Analysis:

The Applicant has met the requirements for describing the transportation facilities and the associated commitments. The Applicant needs to provide geotechnical analysis for all steep road cuts.

Deficiencies:

1. The Applicant needs to provide the geotechnical analysis for steep road cuts.

R645-301-528 Handling and Disposal of Coal, Overburden, Excess Spoil and Coal Mine Waste
R645-301-528.100 Coal Removal, Handling, Storage, Cleaning and Transportation Areas and Structures

Proposal:

The Applicant states that the information required in this section has been presented under R645-301-520 Operational Plan and R645-301-540 Reclamation Plan.

Analysis:

The references sighted by the Applicant are not sufficient to locate the information.

Deficiencies:

1. The Applicant either needs to state the information required in this section or site the specific references where that information can be found.

R645-301-528.200 Overburden

Proposal:

The Applicant states that no additional overburden is proposed to be removed during this permit term.

Analysis:

The anticipated mining plan calls for no additional overburden to be produced.

Deficiencies:

1. The Applicant needs to commit to not removing any additional overburden without first submitting a plan and receiving the Division's approval.

R645-301-528.310 Excess Spoil

Proposal:

The Applicant states that no excess spoil is proposed to be generated during the term of this permit.

Analysis:

It is unlikely that the Applicant will need to produce any excess spoil under the current mining plan.

Deficiencies:

1. The Applicant needs to commit to not conducting any activities that could generate excess spoil unless they submit a plan and receive approval from the Division.

R645-301-528.320 Coal Mine Waste

Proposal:

The Applicant proposes to dispose of coal mine waste in the slurry ponds or refuse piles.

Analysis:

The Applicant's proposal to place coal mine waste in approved storage areas appears adequate.

Deficiencies:

The Applicant is in compliance.

R645-301-528.321 Return of Coal Processing Waste to Abandoned Underground Mines

Proposal:

The Applicant states that no coal processing waste has been, or is proposed to be, disposed of in underground mine workings.

Analysis:

The proposal is in compliance with past and present mining procedures.

Deficiencies:

1. The Applicant needs to commit that no coal processing waste will be disposed of in underground mine workings without the express approval of the Division and MSHA.

R645-301-528.322 Refuse Piles

Proposal:

The Applicant proposes to use two refuse piles that have already been approved by MSHA and the Division.

Analysis:

The Applicant's proposal appears to be adequate provided that the refuse piles are constructed and maintained according to MSHA and the Division's specifications.

Deficiencies:

The Applicant is in compliance.

R645-301-528.323 Burning and Burned Waste Utilization

Proposal:

The Applicant has present a coal mine waste fire plan in Appendix V-4. The plan has been approved by MSHA and the Division.

Analysis:

The Applicant's proposal appears adequate.

Deficiencies:

The Applicant is in compliance.

R645-301-528.330 Noncoal Waste

Proposal:

The Applicant's proposal is to continue to have several temporary storage sites for non-coal mine wastes and then have the waste transported to an approved permanent waste

storage site.

Analysis:

The Applicant needs to state whether or not the waste disposal site is a state approved landfill.

Deficiencies:

1. The Applicant is not in compliance with this regulation until it is determined that the permanent waste storage site is a state approved landfill.

R645-301-528.340 Underground Development Waste

Proposal:

The Applicant states that there will be very little underground waste generated. When waste is generated it is usually placed in the mine. Any waste that is brought to the surface is placed in the approved refuse piles.

Analysis:

The Applicant's proposal appears to be adequate.

Deficiencies:

The Applicant is in compliance.

R645-301-528.400 Dams, Embankments and Other Impoundments

Proposal:

The Applicant has identified the dams, embankments and other impoundments in the text of this section and has cross-referenced the facilities with surface maps.

Analysis:

The Applicant's response appears to be adequate.

Deficiencies:

The Applicant is in compliance.

R645-301-529 Management of Mine Openings

Proposal:

The Applicant proposes to close all mine openings according to MSHA and Division requirements. However, the Applicant has not stated what type of reclamation is planned for mine openings abandoned prior to the passage of the Surface Mining Control and Reclamation Act of 1977.

Analysis:

The Applicant has committed to properly seal all mine openings. There are mine and mine openings that were abandoned prior to the enactment of SMCRA located within the permitted area. The Applicant needs to identify what mine and openings come under the jurisdiction of SMCRA and which do not.

Deficiencies:

1. The Applicant needs to provide the Division with a list of mine and mine openings and state which ones fall under the jurisdiction of SMCRA.

R645-301-530 Operational Design Criteria and Plans

Proposal:

The Applicant states that the operational design criteria and plans for structures specified in this section are discussed and referenced under R645-301-520.

Analysis:

The Applicant's response is not acceptable. Either the requirements of this section must be addressed or adequate cross-references must by given.

Deficiencies:

The Applicant needs to adequately address the requirements of this section.

R645-301-540 Reclamation Plan

Proposal:

The Applicant has divided the permit area into five subareas and has addressed each area individually.

Analysis:

The narratives are not cross-referenced with the regulations. Nor does the Applicant identify the pre-SMCRA disturbed area. R645-301-553.252 states that a minimum of 4 feet of best available, nontoxic and noncombustible material be placed over refuse piles, unless the Division has determined that a lesser amount is warranted. The Division has not determined that less than 4 feet of cover over the refuse piles is warranted. The Applicant needs to either show that less than 4 feet of cover is warranted for the refuse pile or increase the amount to 4 feet.

Deficiencies

1. The Applicant needs to provide maps of the permitted area and outline the pre-SMCRA disturbed area. The Applicant needs to either modify his plans so that 4 feet of material will be placed on the refuse piles or show that a lesser amount is justified.

R645-301-600. GEOLOGY
R645-301-620. Environmental Description
R645-301-622. Cross-Sections, Maps and Plans

Proposal:

Locations of surface collared test borings are shown on the General Geology map, Exhibit VI-1. Locations of two subsurface collared drill holes are on Exhibit VII-1. Elevations of collars and coal seams in most of the borings are in Table VI-2.

Nature, depth, and thickness of the coal seams to be mined, of coal or rider seams above the seams to be mined, and total overburden thickness are shown in cross-section on Exhibit VI-2.

Nature and thickness of the overburden strata and of the stratum immediately below the lowest coal seam to be mined are given in generalized sections in Figures 2 through 5.

Analysis:

Locations for subsurface drill holes, other than 72-8 and 77-1, are only given as general locations along the cross-sections of Exhibit VI-2. Elevations for the "DH-" series of borings are not listed in Table VI-2. From comparison of Exhibits VI-1 and VI-2, boring DH-8 appears mislocated on Exhibit VI-1.

Table VI-3 lists core samples that were taken from floors and roofs of seams at elevations given in Table VI-2. No other core samples are identified even though numerous boreholes have been drilled.

Exhibits VII-5 and -6 show information on depth and thickness for some overburden strata, but in an area south of the mine permit.

Deficiencies:

1. Locations of all test borings should be shown on at least one map. Accurate elevation information for all borings should be either on a plan, a map, cross-sections, or in a table. Locations and elevations for all core samplings should be shown; if there are none, except those shown in Table VI-2, this should be clarified.

2. If they are available, then measured vertical sections of outcrops, geophysical logs, descriptions of borehole cuttings, and core samples should be used to compile information on nature, depth, and thickness of strata overlying and immediately beneath the coal seams in the permit area. If the necessary detailed information is not available in the permit area, then the reasons for using data from an adjacent area should be stated, along with assumptions and potential pitfalls in applying these data to the permit area.

3. Locations of the cross-sections on Exhibits VII-5 and -6 should be shown on a map.

R645-301-623. Geologic Information - detail

Proposal:

Analyses for pyritic, organic, and sulfate sulfur in the coal, and for pyritic sulfur and acid/base potential in roof and floor rock are given. Results of analysis of coal refuse for acid- or toxic- forming material are given in Chapter II.

General effects of subsidence are discussed and related to thickness of overburden and thickness of coal removed. The area of expected subsidence is shown on Exhibit VII-7.

In Chapter II it is proposed that, as part of the reclamation plan, soil from borrow sites near the slurry containment ponds be used to cover the slurry material. The covered slurry and the borrow sites will then be reclaimed and vegetative cover restored.

Analysis:

The acid-forming potential for the coal seams and for strata immediately above and below the seams to be mined has been determined. It is stated that the floor and roof cores have also been analyzed for toxic-forming materials. If analysis was done for trace metals, salts, or additional parameters other than acidity and iron, results are not given.

The coal refuse material was analyzed for toxic-forming material, but only pH was determined, not acid/base potential.

The thickness of the coal to be mined and the thickness and nature of the overburden are needed in predicting the amount, extent, and nature of subsidence. However, subsidence is already ongoing over much of the permit area, where coal has been removed. The relationship between subsidence, thickness of removed coal, and the nature and thickness of

the overburden should be known. The nature and extent of surface disturbances caused by subsidence, including loss or change of spring and seep flow and diminution or capture of overland and stream flow should be predictable.

Exhibit VII-7 shows two springs outside the permit area that are within the area of potential subsidence.

The sites from which soil will be borrowed to cover the slurry piles are in the valley, from materials identified on the geologic map as gravel, alluvium, and Masuk Shale. Thickness of the gravel and alluvium at the borrow sites is not given. It is not determined that sufficient suitable material exists to cover the slurry with enough left in place to support revegetation of the borrow sites. Other concerns about the physical and chemical properties of these soils are discussed above under Soils - Section R645-301-233.300, in particular items 3 and 4. Groundwater concerns are in Hydrology - Section R643-301-724.

Deficiencies:

1. All analytical data on toxic-forming materials need to be included in the plan, especially for coal and strata overlying and underlying the seams to be mined. At least one sample from the cores or from the coal refuse should be analyzed for both acid/base potential and toxic-forming material. If all analytical results are included in Chapters II and VI, then the statement about analysis of the cores for toxic-forming materials needs to be clarified.

2. The permit area needs to be expanded to include all potentially impacted surface areas.

3. Determination should be made that there are sufficient quantities of suitable material available at the borrow sites to cover the slurry piles and to accomplish reclamation of the borrow sites and the covered slurry piles.

R645-391-624. Geologic Information - Minimum

Proposal:

The stratigraphy, lithology, and structure of the permit area and adjacent areas are described from the surface down to the Star Point Sandstone. The possible effects of regional and structural geology on groundwater occurrence, availability and movement are given briefly, with reference to more detailed descriptions in Chapter VII.

Only a few outside sources are cited as references for this Chapter. Chemical and engineering lab data are included in an appendix.

Groundwater occurrences in the mine workings are referred to in general terms. Location and water quantity and quality for surface springs and seeps are given in Chapter VII.

Analysis:

The references cited are not included in a references section, although these may be in another chapter. No mention is made of geologic practices that were used to obtain the information in this Chapter. See also R645-301-130.

The specific locations, quantity, and quality of in-mine flows are not given. Many flows are temporary and cease soon after being opened by the mine operations, but other flows are persistent and provide water for in-mine use with a substantial surplus for discharge to the surface.

Deficiencies:

1. References should be listed at the end of the Chapter, or a single master reference list should be located at a logical place somewhere in the Plan.

2. Any specific geologic practices, techniques, etc. used to derive the information in this Chapter should be at least briefly described; e.g., Is the geologic map based on field mapping or taken from another source? Are Figures 2 through 5 based on cutting descriptions, core descriptions, geophysical logs, outcrops, or a combination of sources?

3. Locations of persistent and measurable in-mine flows should be shown on a map or plan and appropriate cross-sections. Water quality and quantity, including seasonal variations, should be listed for these locations.

R645-301-630. Operation Plan
R645-301-640. Performance Standards

Proposal:

Boreholes have been plugged and abandoned according to a plan recommended by the U. S. G. S. Future boreholes will be plugged and abandoned following the same plan unless

they are approved as groundwater monitoring wells.

Analysis:

Boreholes used in the past have been abandoned and plugged and commitment is made to plug future boreholes. Water monitoring wells must be installed in accordance with Utah administrative rules for water well drillers. If any groundwater monitoring wells are anticipated, methods of installation and closure should be given in the plan.

Deficiencies:

1. Commit to follow Utah Code Section 73-3-25 and Utah Rules for Water Well Drillers for groundwater monitoring well installation and abandonment.

R645-301-700. HYDROLOGY
R645-301-720. Environmental Description
R645-301-721. General Requirements
R645-301-722. Cross-Sections and Maps
R645-301-722.100. Location and extent of subsurface water... areal and vertical distribution of aquifers, and portrayal of seasonal differences of head in different aquifers on cross-sections and contour maps;

Proposal:

Exhibits VII-5 and -6 show potential water bearing sandstones immediately above and below and between the coal seams, in an adjacent area south of the current permit area.

Analysis:

The use of cross-sections based on borehole data from an area south of the permit area has the advantage that the ground water system has not been drained or otherwise disrupted by mining and may provide a model for the groundwater system in the permit area. There are potential pitfalls in using data from outside the permit area, such as significant differences in lithology or stratigraphy, recharge, fracturing, etc.

The cross-sections do not show where groundwater was encountered during boring. Potential water bearing sandstone units within the Blackhawk Formation are depicted, but aquifers, on a local to regional scale, are not identified. The individual sandstones shown

are probably not aquifers, that is not individually capable of storing and delivering water in sufficient quantities for specific use(s).

The aquifers in this area may be better defined on the scale of formations or even groups of formations. This is reflected in the narrative in Section 724.600, Survey of Renewable Resource Lands. The information given in that Section should be included in the information provided on the cross-sections and maps.

Water has been encountered in the mine workings. Many of the sources cease to flow after a period of time, but enough persist to provide water for mine operations and for substantial discharge to the surface. Location, depth, and geology of persistent, measurable flows within the mine workings should be indicated on a map or plan. Groundwater was also encountered in the boreholes shown on Exhibits VII-5 and -6. The elevations and geology associated with this water should be shown on maps or cross-sections.

Deficiencies:

1. The locations of cross-sections VII-5 and -6 should be on a map in Chapter VII because the boreholes used to construct these sections are not on Exhibit VI-1 and there are already cross-sections labeled AA and BB on Exhibit VI-1. Any information on groundwater that was encountered in these holes should be included either on the cross-sections or in the narrative.

2. The aquifers above the coal seams in the permit area should be identified, at least by reference to Section 724.600, and their areal and vertical distribution should be on maps or cross-sections.

3. Locations of groundwater flow into the mine workings should be located on maps and cross-sections. If the information is available and a practical portrayal can be made, seasonal variations in quantity and quality should be shown.

R645-301-723. Sampling and Analysis

Proposal:

Commitment is made to meet the listed standards for all water analyses performed to meet the requirements of this Chapter.

Analysis:

The commitment to meet these standards seems adequate, however the labs used for the work are not identified.

Deficiencies:

1. The laboratory(ies) used to perform these analyses should be listed in the text or in the tables with the results.

R645-301-724. Baseline Information.

R645-301-724.100. Ground Water Information. The location and ownership for the permit and adjacent areas of existing wells, springs and other ground-water resources, seasonal quality and quantity of ground water, and usage. Water quality descriptions will include, at a minimum, total dissolved solids or specific conductance corrected to 25 degrees C, Ph, total iron and total manganese. Ground-water quantity descriptions will include, at a minimum, approximate rates of discharge or usage and depth to the water in the coal seam, and each water-bearing stratum above and potentially impacted stratum below the coal seam.

Proposal:

Locations of springs and seeps is given on Exhibit VII-3 and uses and ownership of groundwater rights is in Tables VII-3 and VII-4.

Data on groundwater quality and quantity from operational monitoring are given for springs in Tables VII-5 through VII-19 and for mine discharge waters in Tables VII-20 through -23. Information on sampling sites and on parameter selection and sampling frequency are given in Section 731.200

Analysis:

Operational data on groundwater quality and quantity have been collected according to the operational groundwater monitoring plan developed in accordance with Section 731.200, the Division's "Guidelines For Establishment of Surface and Ground-water Monitoring Programs"(January, 1986), and modifications approved by the Division. These data are given for years up to 1990.

According to Table 4 of DOGM's Guidelines for Establishment of Surface and

Ground Water Monitoring Programs for Coal Mining and Reclamation Operations, ground water quality is to be analyzed for all parameters on Table 3, the expanded or "baseline" list, during the year preceding repermitting. The sampling is to be done during low flow. These analyses are not included in this MRP submitted for permit renewal.

Although " no significant amount of information " about ground water depths is available from the mine workings, what information is available, such as elevation, location, and volume of measurable groundwater flow, and geology should be provided. Most in mine flow seems to come through the floor and drill hole 77-1 was reported to have produced a small artesian flow.

Price and Waddell, 1973 are referenced several times but are not in the References at the end of the section.

On page 3 the statement is made that direction of movement of water through the bedrock has been examined for a few local areas within the region; if this information applies to this mine permit area and adjacent areas then the information and an analysis of its applicability should be included in this section or Section 725.

Deficiencies:

1. Analyze ground water samples from all ground water monitoring stations for all parameters listed on Table 3 of the DOGM Guidelines for Establishment of Surface and Ground Water Monitoring Programs for Coal Mining and Reclamation Operations. The water samples should be taken during low flow, but in no case should the sampling be done later than September 15, 1992.

2. Any information on water sources within the mine should be given, such as elevations and locations, mine level or coal seam, geology, measured or estimated flows, water analyses, etc.

3. The reference for Price and Waddell, 1973 needs to be added to the References.

4. Include information and analysis from studies of local bedrock flow, in an appropriate place in this or other sections, to the extent such information applies directly to this mine permit or adjacent areas.

R645-301-724.200. Surface water information. The name, location, ownership and description of all surface-water bodies such as streams, lakes and

impoundments, the location of any discharge into any surface-water body in the proposed permit and adjacent areas, and information on surface-water quality and quantity sufficient to demonstrate seasonal variation and water usage. Water quality descriptions will include, at a minimum, baseline information on total suspended solids, total dissolved solids or specific conductance corrected to 25 degrees C, pH, total iron and total manganese. Baseline acidity and alkalinity information will be provided if there is a potential for acid drainage from the proposed mining operation. Water quantity descriptions will include, at a minimum, baseline information on seasonal flow rates.

Proposal:

Maps and tables provide the information on surface water location, uses, and ownership and NPDES/UPDES discharge points.

Data on surface water quality and quantity from operational monitoring are given for stream monitoring points in Tables VII-26 through -39. Information on sampling sites and on parameter selection and sampling frequency are given in Section 731.200

Analysis:

Information on location, uses, ownership, etc. is sufficient.

Operational data on surface water quality and quantity have been collected according to the operational surface water monitoring plan developed in accordance with Section 731.200, the Division's "Guidelines For Establishment of Surface and Ground-water Monitoring Programs"(January, 1986), and modifications approved by the Division. These data are given for years up to 1990.

According to Table 2 of DOGM's Guidelines for Establishment of Surface and Ground Water Monitoring Programs for Coal Mining and Reclamation Operations, surface water quality is to be analyzed for all parameters on Table 1, the expanded or "baseline" list, twice during the year preceding repermitting. Two samples are to be taken, one each at high flow and at low flow. These analyses are not included in this MRP submitted for permit renewal.

Deficiencies:

1. Analyze surface water samples from all surface water monitoring stations for

all parameters listed on Table 1 of the DOGM Guidelines for Establishment of Surface and Ground Water Monitoring Programs for Coal Mining and Reclamation Operations. One sample each should be taken at low flow and at high flow, but in no case should the sampling be done later than September 15, 1992.

R645-301-724.300. Geologic Information. Each application will include geologic information in sufficient detail, as given under R645-301-624, to assist in:

R645-301-724.310. Determining the probable hydrologic consequences of the operation upon the quality and quantity of surface and ground water in the permit and adjacent areas, including the extent to which surface- and ground-water monitoring is necessary; and

R645-301-724.320. Determining whether reclamation as required by the R645 Rules can be accomplished and whether the proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area.

Proposal:

Reference is made to Chapter VI - Geology, and other information at various locations in this Chapter.

Analysis:

Geology is covered by Chapter VI.

Piezometers have been noted in the embankments of the slurry ponds during DOGM inspections. No information from these piezometers is given in the plan. Information on groundwater quality, depth and the lithology in which it is found, beneath the slurry ponds and the proposed borrow sites, would be useful to both the operator and DOGM in evaluating such factors as availability of water to plants, evapotranspiration, and leaching of salts and their affect on the proposed reclamation.

Deficiencies:

1. The reference to Geology actually reads "Chapter VII" instead of Chapter VI; this typo error should be corrected.

2. Information on the depth, quality, and geologic setting of groundwater beneath

the slurry ponds and borrow sites, from piezometers, excavations or any other source, should be included and used in developing the reclamation plan.

R645-301-724.600. Survey of Renewable Resource Lands. For the purposes of UNDERGROUND COAL MINING AND RECLAMATION ACTIVITIES, the Applicant will provide a survey that shows whether aquifers or areas for the recharge of aquifers exist within the permit and adjacent area and whether subsidence, if it occurred, could cause material damage or diminution of reasonably foreseeable use of aquifers or areas for the recharge of aquifers. Renewable resource survey information will be incorporated into the subsidence control plan listed under R645-301-525.

Proposal:

The Star Point and Castlegate Sandstones and the North Horn and upper Price River Formations are identified as aquifers. The Blackhawk Formation is not an aquifer. Fracturing is a major factor in groundwater flow in the Star Point and Castlegate Sandstones and is a minor factor in the Price River and North Horn Formations The Bear Canyon Fault and related fractures are the main structural controls on springs. Hydraulic conductivity in sandstones is low but is several orders of magnitude larger than in shales. Shales isolate the aquifers vertically and can form a seal across faults to stop vertical flow along fault surfaces. Artesian flow occurs from the floors of the coal seams, and the recharge to the aquifers appears to come from updip, from the north, rather than from directly above.

Based on subsidence over other mines in the Wasatch Plateau, on subsidence over the mined areas of this permit area, and on empirical information from other areas, subsidence may be as much as 7.2 feet where the surface rock is the Blackhawk Formation and the overburden is thinnest. Cracks that form have the potential to intercept stream flow and subsurface flow to springs. Outcrops of the Castlegate Sandstone and Price River Formation should be similarly effected except the amount of subsidence will be proportionately less as overburden thickness increases.

In areas where the North Horn Formation is at the surface and the overburden is thickest, the subsidence should be much less. It probably will be detectable only by surveying and will consist of broad troughs without fracturing of the surface.

Analysis:

Aquifers have been identified in the permit and adjacent areas, and the general pattern of groundwater flow has been described. Recharge areas are described vaguely. Planned subsidence is part of the mine development plan and has already occurred over much of the permit area. Mining activity has already dewatered a large volume of the Blackhawk Formation and redirected substantial subsurface flow to Cedar Creek. Surface streams are ephemeral and interception of surface flow appears minimal.

The effect of subsidence on areas for recharge has not been directly addressed.

Projected subsidence for the current mining as shown on Exhibit VII-7 will occur mainly under the steep canyon walls eroded from Blackhawk Formation, Castlegate Sandstone, and Price River Formation. The springs with water rights shown on Exhibit VII-7 are on the North Horn or uppermost Price River Formations. If the subsidence projections are correct, these springs may be affected very little or not at all.

Deficiencies:

1. Recharge areas in or adjacent to the permit area are not identified, so the effect of mining and subsidence can not be determined. See Section 724.100; if studies of local flow apply to this permit area, the information should be included to help understand recharge.

R645-301-725. Baseline Cumulative Impact Area Information

R645-301-725.100. Hydrologic and geologic information for the cumulative impact area necessary to assess the probable cumulative hydrologic impacts of the proposed coal mining and reclamation operation and all anticipated coal mining and reclamation operations on surface- and ground-water systems as required by R645-301-729 will be provided to the Division if available from appropriate federal or state agencies.

R645-301-725.200. If this information is not available from such agencies, then the Applicant may gather and submit this information to the Division as part of the permit application.

R645-301-725.300. The permit will not be approved until the necessary hydrologic and geologic information is available to the Division.

Proposal:

Information in this report should be sufficient to allow the Division to assess the probable hydrologic impacts of mining and reclamation as proposed.

Analysis:

The requirements of Section 725.300 refer to information acquired by federal and state agencies in assessing a parcel prior to coal leasing. Since leasing and mining activity in this permit area predate SMCRA there is no such data available. The only available baseline data is what is presented by the Applicant as part of the permit application.

Deficiencies:

1. Deficiencies in data have been noted in previous sections and will be noted in following sections where appropriate.

R645-301-727. Alternative Water Source Information. If the probable hydrologic consequences determination required by R645-301-728 indicates that the proposed SURFACE COAL MINING AND RECLAMATION ACTIVITY may proximately result in contamination, diminution, or interruption of an underground or surface source of water within the proposed permit or adjacent areas which is used for domestic, agricultural, industrial or other legitimate purpose, then the application will contain information on water availability and alternative water sources, including the suitability of alternative water sources for existing premining uses and approved postmining land uses.

Proposal:

Several options are available for providing alternative water supplies. Selection of a course of action will be made in consultation with the Division.

No alternative water supply is seen to be needed for the major water user adjacent to the permit area, Castle Valley Special Services District, which takes water from Bear Canyon Spring in Huntington Canyon. The possible need for alternative supplies is seen for springs and seeps used for stock and wildlife watering within and immediately adjacent to the permit area.

The flow from the Mohrland Tunnel is proposed as the main source if an alternative water supply is needed.

Analysis:

The Division of Oil, Gas and Mining (DOGM) does not allocate water rights nor does DOGM negotiate, arbitrate or adjudicate disputes over water rights, allocation, or use. Language used by the Operator in this section of the MRP can be understood so as to imply that DOGM is the principal agency that will make decisions involving the need or appropriateness of alternative water supplies.

The purpose for this section is to require the Operator to examine potential problems that are discovered in the probable hydrologic consequences determination and then to determine the availability and suitability of alternative water sources for existing premining uses and approved postmining uses. DOGM may give an opinion on availability and suitability of alternative water supplies, but the user/owner of the affected water and the Division of Water Rights are the ones that will require satisfaction if problems arise.

Of the 800 gpm total water encountered in the mines as indicated on Figure VII-4, 649 gpm is shown as going to Hiawatha domestic & industrial supply and 101 gpm as average discharge to Cedar Creek. Table VII-41 shows U. S. Fuel's total water rights as 649 gpm. Is the development of an alternative water supply to come from the allocated 649 gpm or from the 101 gpm average discharge to Cedar Creek, and does U. S. Fuel have rights or a reasonable prospect of obtaining rights to the additional 101 gpm? On page 119 it is indicated that the total underground flow intercepted by the mine workings is 955 gpm. Why is this volume different from that used in Figure VII-4?

If the alternative supply is to come from the 101 gpm, there are other questions that need to be addressed, such as what effect would removal of all or part of this 101 gpm have in the Cedar Creek drainage? Will diversion of this flow effect the irrigation, stockwatering, and wildlife habitat enhancement experiment south and east of Mohrland?

Deficiencies:

1. The language in this section needs to make clear that DOGM may give an opinion on the availability and suitability of alternative water supplies but that the settlement of any disputes will be between the owner/user of the affected water, the Division of Water Rights, and the mine Operator.

2. The volume of water intercepted in the mine workings should be determined and a consistent, realistic number used throughout the MRP.

3. The right to use the portion of water from the Mohrland Tunnel that is proposed for the alternative water supply needs to be clarified. The effects of

diverting this water from its present use may need to be discussed.

R645-301-728. Probable Hydrologic Consequences (PHC) Determination
R645-301-728.100. The permit application will contain a determination of the PHC of the proposed coal mining and reclamation operation upon the quality and quantity of surface and ground water under seasonal flow conditions for the proposed permit and adjacent areas.
R645-301-728.200. The PHC determination will be based on baseline hydrologic, geologic and other information collected for the permit application and may include data statistically representative of the site.

Proposal:

A maximum potential depletion of streamflow of 19 gpm is determined for the North Fork of Miller Creek. Streamflow from other drainages will not be impacted.

Springs issuing from the North Horn Formation should not be affected by subsidence or other mine operations, although downstream flow may be intercepted by surface fractures. For springs issuing from formations below the North Horn, the maximum potential depletion is 28 gpm. Quality should not be affected by mining or reclamation operations.

Acid- and toxic-forming materials are not present in the permit area. Quality of surface and groundwater will not be degraded by mine discharge water, or infiltration of water from the slurry ponds.

Analysis:

Springs 4,5,6,7,and 8, listed on Table VII-43 and shown on Exhibit VII-7, issue from the North Horn Formation and flow into the South or Left Fork of Miller Creek. Table VII-43 shows a flow of 175 gpm from the springs but Table VII-42 shows flow of only 6 gpm in the upper portion of the South Fork of Miller Creek. If 175 gpm issue from these springs then substantially more than the 19 gpm of streamflow in the North Fork may be intercepted by subsidence cracks in the Miller Creek drainage. The narrative indicates the 175 gpm is a water right rather than flow.

The 22 gpm baseflow, shown on Table VII-42, from the potential subsidence zone in the Middle and South Forks of Miller Creek either is going into the alluvium and continuing to flow downgradient as part of the drainage baseflow, is naturally recharging the underlying aquifers, or has been intercepted by existing subsidence fractures. If it is not already being captured or recharged then it is subject to capture by future subsidence fractures and there is

either an actual or potential loss of 22 gpm in these two drainages.

References to Tables and Exhibits at the top of page 120 are confused.

Deficiencies:

1. Make certain that flow rates in streams and the springs that feed them are consistent and logical. Clarify water rights as opposed to actual flow in Tables VII-42 and -43 and in the narrative.

2. Include an analysis of where the 22 gpm from the South and Middle Forks of Miller Creek are going and the possible effects of subsidence.

3. Correct the typo errors at the top of page 120.

R645-301-730. Operation Plan.
R645-301-731. General Requirements.
R645-301-731.100. Hydrologic-Balance Protection.
R645-301-731.200. Water Monitoring.

Proposal:

The methods employed to protect the hydrologic balance are summarized.

Surface and groundwater monitoring plans, sampling sites, and parameter selection and sampling frequency are given in Section 731.200.

Data on groundwater quality and quantity from operational monitoring are given for springs in Tables VII-5 through VII-19 and for mine discharge waters in Tables VII-20 through -23 Data on surface water quality and quantity are in Tables VII-26 through -39.

Analysis:

Operational data on surface and groundwater quality and quantity have been and are being collected according to the operational surface and groundwater monitoring plan developed in accordance with Section 731.200, the Division's "Guidelines For Establishment of Surface and Ground-water Monitoring Programs"(January, 1986), and modifications approved by the Division. These data are given for years up to 1990.

The plan does not describe how the monitoring is to be used to determine the impacts

of the operation on the hydrologic balance.

There is no commitment to notify DOGM or other agencies if a sample indicates noncompliance with applicable Federal and State water quality laws and regulations.

There is no commitment to remove all equipment, structures, and other devices used in conjunction with monitoring when they are no longer needed.

Deficiencies:

1. Surface and groundwater monitoring data for 1991 need to be included.

2. A description of how these data may be used to determine the impacts of the operation on the hydrologic balance should be included.

3. A commitment must be made to notify DOGM and other appropriate Federal and State agencies if a sample indicates noncompliance with applicable water laws and regulations.

4. A commitment must be made to remove all equipment, structures, and other devices used in conjunction with monitoring when they are no longer needed.

R645-301-800 Bonding and Insurance

United States Fuel Company is currently bonded for $3,779,000, of which $1,450,000 is carried as a corporate surety bond with the Insurance Company of North America and $2,329,000 is a self bond. United States Fuel has estimated that their total reclamation amount will be $2,857,979. Details of U. S. Fuel's cost estimates are presented in Chapter VIII Table VIII-11 of their Mine and Reclamation Plan. U. S. Fuel has requested that the amount of the bond be reduced from $3,779,000 to $2,857,979.

U. S. Fuel assumed that the engineering and contingency costs would be 10% of the reclamation costs. The Division position is that engineering fees should be estimated at 10% and contingency fees at 15% of the reclamation project. Using U. S. Fuel's reclamation costs and the Division's position on engineering and reclamation cost the total reclamation cost would be $3,475,041. (See Table VIII-11A.)

U. S. Fuel assumes that they will need sixteen inches of topsoil on top of the refuse piles. The assumption was supposed to be verified with test plot data prior to commencement of reclamation work. As of today the test plots have not demonstrated that

16 inches is sufficient. Because of the poor showing of the test plots the Division now assumes that a minimum of 2 feet of topsoil must be used to reclaim the refuse piles. If 2 feet of cover is required then the reclamation costs would be $3,621,155. (See Table VIII-11B.)

R645-301-553.252 requires that 4 feet of the best available, nontoxic and noncombustible material be used to cover refuse piles unless the Division approves a lesser amount. The worst case scenerio would be if U. S. Fuel could not demonstrate that less than 4 feet cover is required. The bond estimate for the worst case scenerio would be $4,351,719. (See Table VIII-11C.)

Deficiencies:

None. Since the reclamation costs in all three scenerios are within 10% of U.S. Fuel's current bond, no changes are recommended at this time.

Table VIII-11A

RECLAMATION COST SUMMARY

	SITE	COST
1	HIAWATHA PROCESSING PLANT AND WASTE DISPOSAL AREA (assume 2 feet of cover over the refuse piles)	$1,593,475
2	MIDDLE FORK FACILITIES AREA	$ 388,192
3	SOUTH FORK FACILITIES AREA	$ 334,167
4	NORTH FORK FACILITIES AREA	$ 75,677
5	TOPSOIL BORROW AREAS	$ 90,138
6	EQUIPMENT MOBILIZATION/DEMOBILIZATION ($800/PIECE)	$ 12,000
7	SUPERVISION FOR ONE YEAR	$ 71,033
8	WATER MONITORING	$ 33,480
9	SUBTOTAL	$2,598,162
10	CONTINGENCY (15% OF SUBTOTAL)	$ 389,724
11	ENGINEERING (10% OF SUBTOTAL)	$ 259,816
12	SUBTOTAL	$3,247,702
13	ADJUSTMENT FOR ESCALATION @ 1.27%/YR FOR 5 YRS	$ 227,339
14	TOTAL RECLAMATION COST ADJUSTED TO 1996	$3,475,041

Table VIII-11B

RECLAMATION COST SUMMARY

	SITE	COST
1	HIAWATHA PROCESSING PLANT AND WASTE DISPOSAL AREA (assume 2 feet of cover over the refuse piles)	$1,702,718
2	MIDDLE FORK FACILITIES AREA	$ 388,192
3	SOUTH FORK FACILITIES AREA	$ 334,167
4	NORTH FORK FACILITIES AREA	$ 75,677
5	TOPSOIL BORROW AREAS	$ 90,138
6	EQUIPMENT MOBILIZATION/DEMOBILIZATION ($800/PIECE)	$ 12,000
7	SUPERVISION FOR ONE YEAR	$ 71,033
8	WATER MONITORING	$ 33,480
9	SUBTOTAL	$2,707,405
10	CONTINGENCY (15% OF SUBTOTAL)	$ 406,111
11	ENGINEERING (10% OF SUBTOTAL)	$ 270,741
12	SUBTOTAL	$3,384,257
13	ADJUSTMENT FOR ESCALATION @ 1.27%/YR FOR 5 YRS	$ 236,898
14	TOTAL RECLAMATION COST ADJUSTED TO 1996	$3,621,155

Table VIII-11C

RECLAMATION COST SUMMARY

SITE	COST
1 HIAWATHA PROCESSING PLANT AND WASTE DISPOSAL AREA (assume 4 feet of cover over the refuse piles)	$2,248,936
2 MIDDLE FORK FACILITIES AREA	$ 388,192
3 SOUTH FORK FACILITIES AREA	$ 334,167
4 NORTH FORK FACILITIES AREA	$ 75,677
5 TOPSOIL BORROW AREAS	$ 90,138
6 EQUIPMENT MOBILIZATION/DEMOBILIZATION ($800/PIECE)	$ 12,000
7 SUPERVISION FOR ONE YEAR	$ 71,033
8 WATER MONITORING	$ 33,480
9 SUBTOTAL	$3,253,623
10 CONTINGENCY (15% OF SUBTOTAL)	$ 488,043
11 ENGINEERING (10% OF SUBTOTAL)	$ 325,362
12 SUBTOTAL	$4,067,028
13 ADJUSTMENT FOR ESCALATION @ 1.27%/YR FOR 5 YRS	$ 284,691
14 TOTAL RECLAMATION COST ADJUSTED TO 1996	$4,351,719