Co-Op Coal Company plans to extract all coal reserves, to the extent allowed by economics, safety conditions and prudent mining practice, from the lands it controls.

The "upper seam" in this area is the Upper Bear Canyon Bed, which is probably just a split off the main Bear Canyon Seam in which the mine is located. This seam lies only 15' to 20' above the Bear Canyon Seam at the mine-site, and is evidenced only by a ledge and some burning. Speiker and Doelling have both referred to a probable upper split of the Bear Canyon Seam in this area, likely with a small lateral extent and little, if any, mining potential. An additional seam outcrops about 200' above the mine portals; however, this is one of the "upper beds" listed on Table 1, page 6-15, and apain, is not considered to have any economic potential due to limited lateral extent and extreme burning of seams in this horizon (Doelling p. 6-14).

Due to the burning, questionable lateral extent and inability to trace these upper seams (or splits), and due to the close proximity of the Upper Bear Canyon split to the main bed

presently being mined, there are no plans to enter or mine these upper seams.

These seams (or splits) are not considered as mineable reserves; therefore, the seam presently being mined is considered the uppermost, mineable seam in the area. This is consistent with mining practices recommended for multiple seam areas.

The reserves shown on Table 3-1 reflect mineable coal only in Bear Canyon and Hiawatha Seams. These reserve estimates are based on numerous outcrop measurements as well as in-seam measurements, both in Bear Canyon and Trail Canyon. (See Fig. 3.4-1 thru 3.4-4). Based on these measurements, and using a 2500' radius of influence froma known coal height, it was determined that an average coal height of 10' was an acceptable (although conservative) figure to use for the Bear Canyon Seam. By the same method, an average height of 5' was determined for the Hiawatha Seam. The reserves in place were then calculated by multiplying the number of acres of mineable coal by 1742 tons/acre ft. (80 lbs./cu. ft. coal in place) times the average coal height for

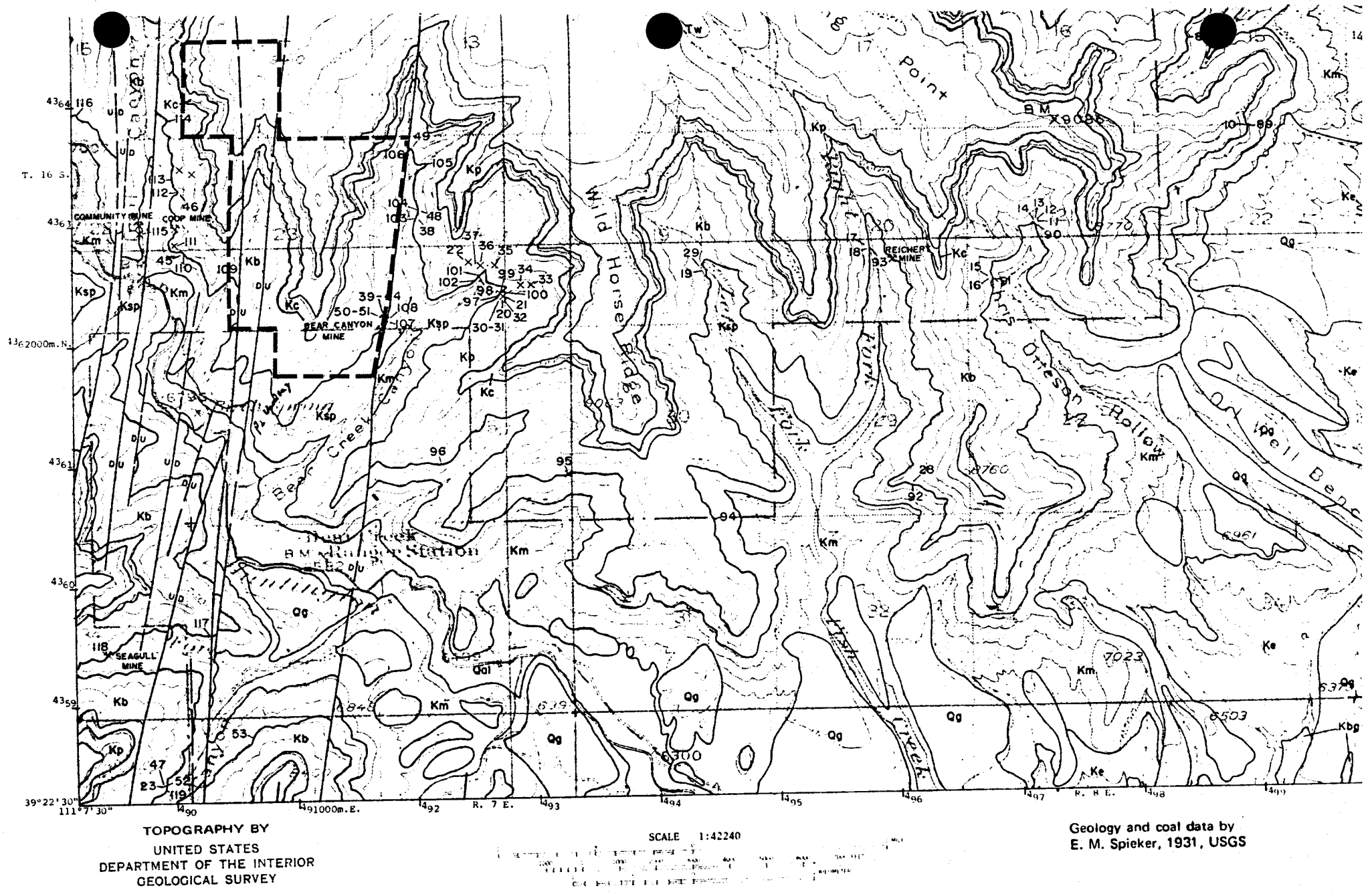
TOPOGRAPHY BY
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
SCALE 1:42240
Geology and coal data by
E. M. Spieker, 1931, USGS
PERMIT AREA
Coal and geology map, Hiawatha NE quadrangle

FIGURE 3.4-1

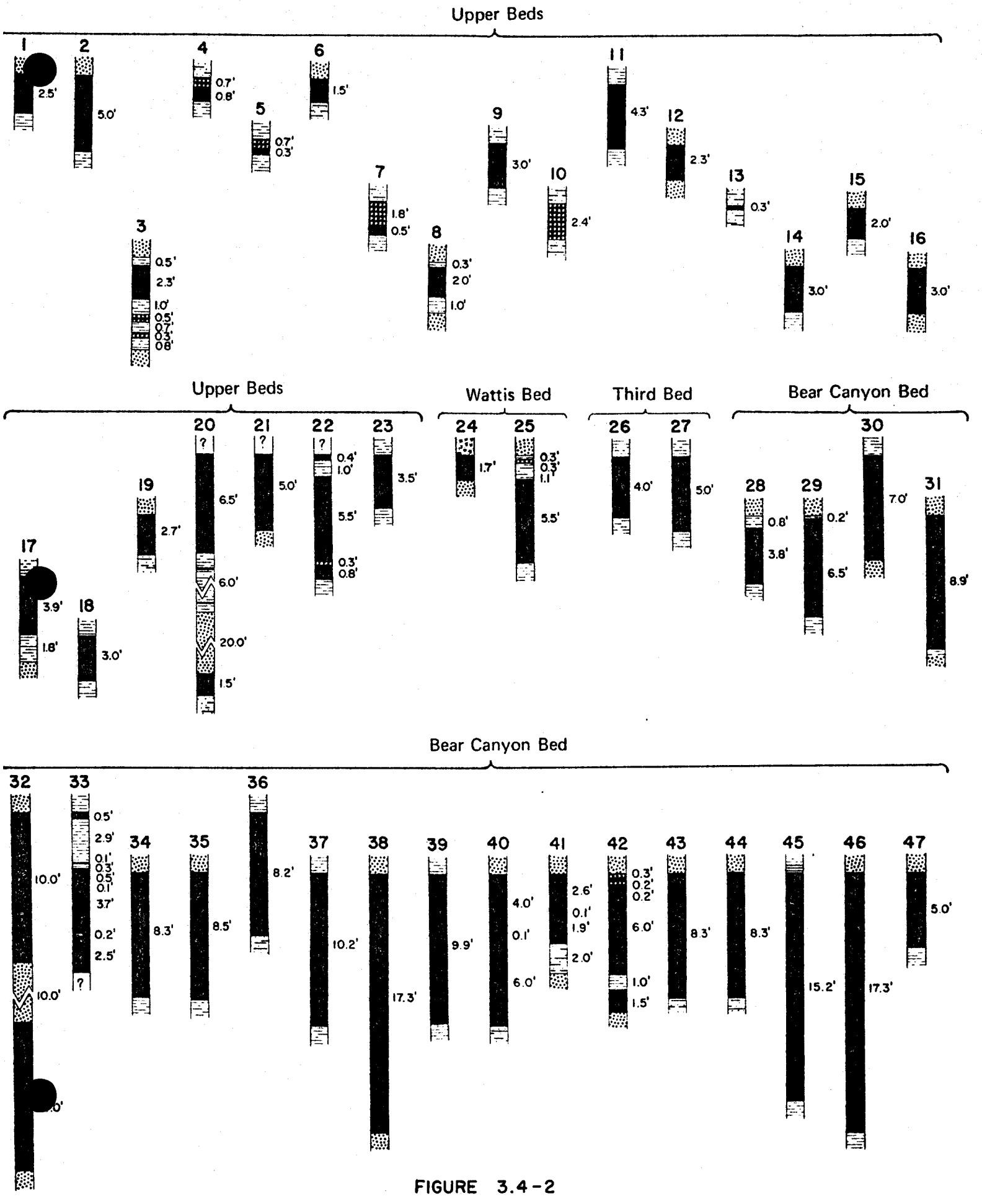
Upper Beds
1
2.5'
2
5.0'
3
0.5'
2.3'
1.0'
0.5'
0.7'
0.3'
0.8'
4
0.7'
0.8'
5
0.7'
0.3'
6
1.5'
7
1.8'
0.5'
8
0.3'
2.0'
1.0'
9
3.0'
10
2.4'
11
4.3'
12
2.3'
13
0.3'
14
3.0'
15
2.0'
16
3.0'
Upper Beds
Wattis Bed
Third Bed
Bear Canyon Bed
17
3.9'
1.8'
18
3.0'
19
2.7'
20
?
6.5'
6.0'
20.0'
1.5'
21
?
5.0'
22
?
0.4'
1.0'
5.5'
0.3'
0.8'
23
3.5'
24
1.7'
25
0.3'
0.3'
1.1'
5.5'
26
4.0'
27
5.0'
28
0.8'
3.8'
29
0.2'
6.5'
30
7.0'
31
8.9'
Bear Canyon Bed
32
10.0'
10.0'
33
0.5'
2.9'
0.1'
0.3'
0.5'
0.1'
3.7'
0.2'
2.5'
?
34
8.3'
35
8.5'
36
8.2'
37
10.2'
38
17.3'
39
9.9'
40
4.0'
0.1'
6.0'
41
2.6'
0.1'
1.9'
2.0'
42
0.3'
0.2'
0.2'
6.0'
1.0'
1.5'
43
8.3'
44
8.3'
45
15.2'
46
17.3'
47
5.0'

FIGURE 3.4-2

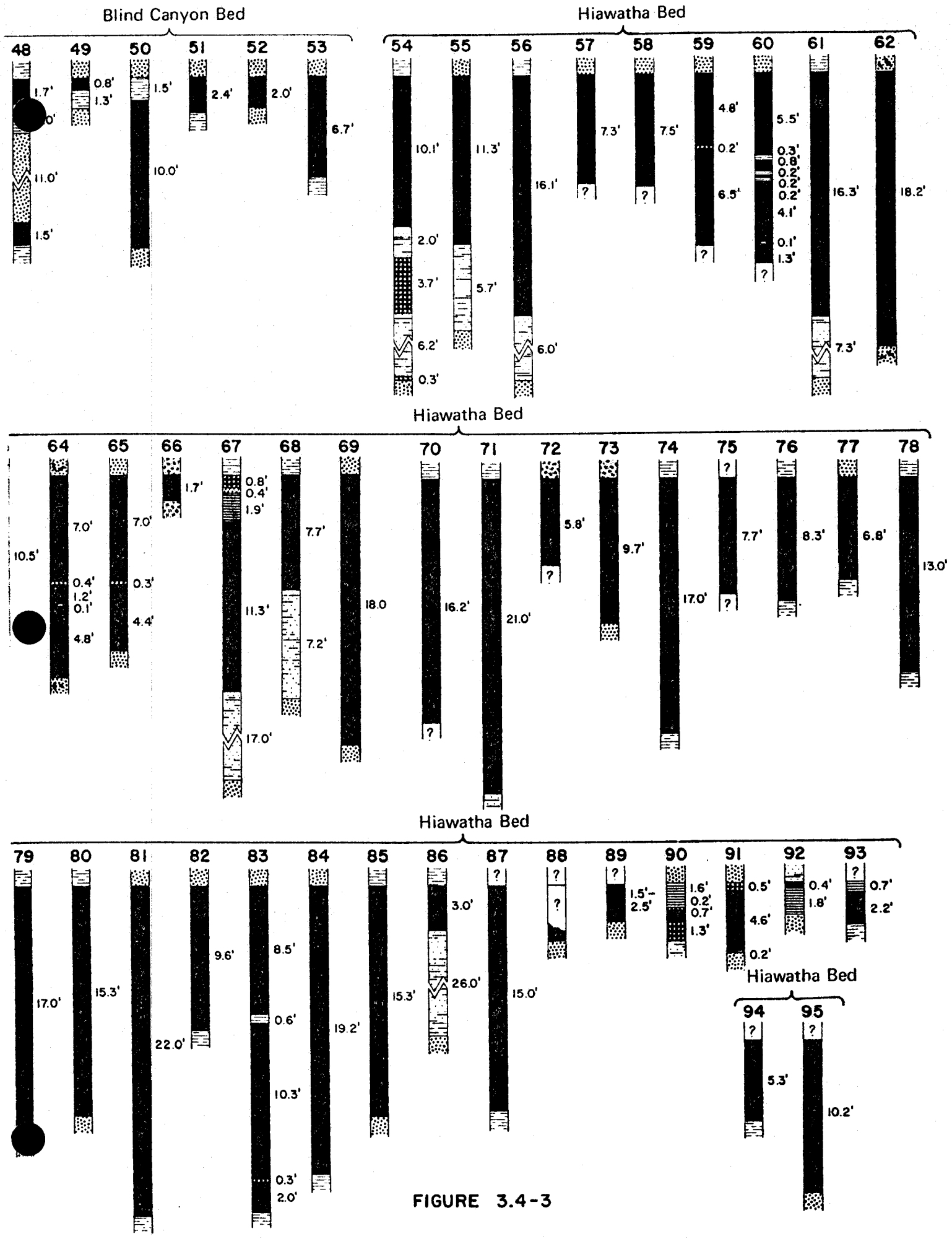
Blind Canyon Bed
48
49
50
51
52
53
1.7'
0'
11.0'
1.5'
0.8'
1.3'
1.5'
10.0'
2.4'
2.0'
6.7'
Hiawatha Bed
54
55
56
57
58
59
60
61
62
10.1'
2.0'
3.7'
6.2'
0.3'
11.3'
5.7'
16.1'
6.0'
7.3'
?
7.5'
?
4.8'
0.2'
6.5'
?
5.5'
0.3'
0.8'
0.2'
0.2'
0.2'
4.1'
0.1'
1.3'
?
16.3'
7.3'
18.2'
Hiawatha Bed
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
10.5'
7.0'
0.4'
1.2'
0.1'
4.8'
7.0'
0.3'
4.4'
1.7'
0.8'
0.4'
1.9'
11.3'
17.0'
7.7'
7.2'
18.0
16.2'
?
21.0'
5.8'
?
9.7'
17.0'
?
7.7'
?
8.3'
6.8'
13.0'
Hiawatha Bed
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
17.0'
15.3'
22.0'
9.6'
8.5'
0.6'
10.3'
0.3'
2.0'
19.2'
15.3'
3.0'
26.0'
?
15.0'
?
?
1.5'–
2.5'
1.6'
0.2'
0.7'
1.3'
0.5'
4.6'
0.2'
0.4'
1.8'
?
0.7'
2.2'
Hiawatha Bed
94
95
?
5.3'
?
10.2'

FIGURE 3.4-3

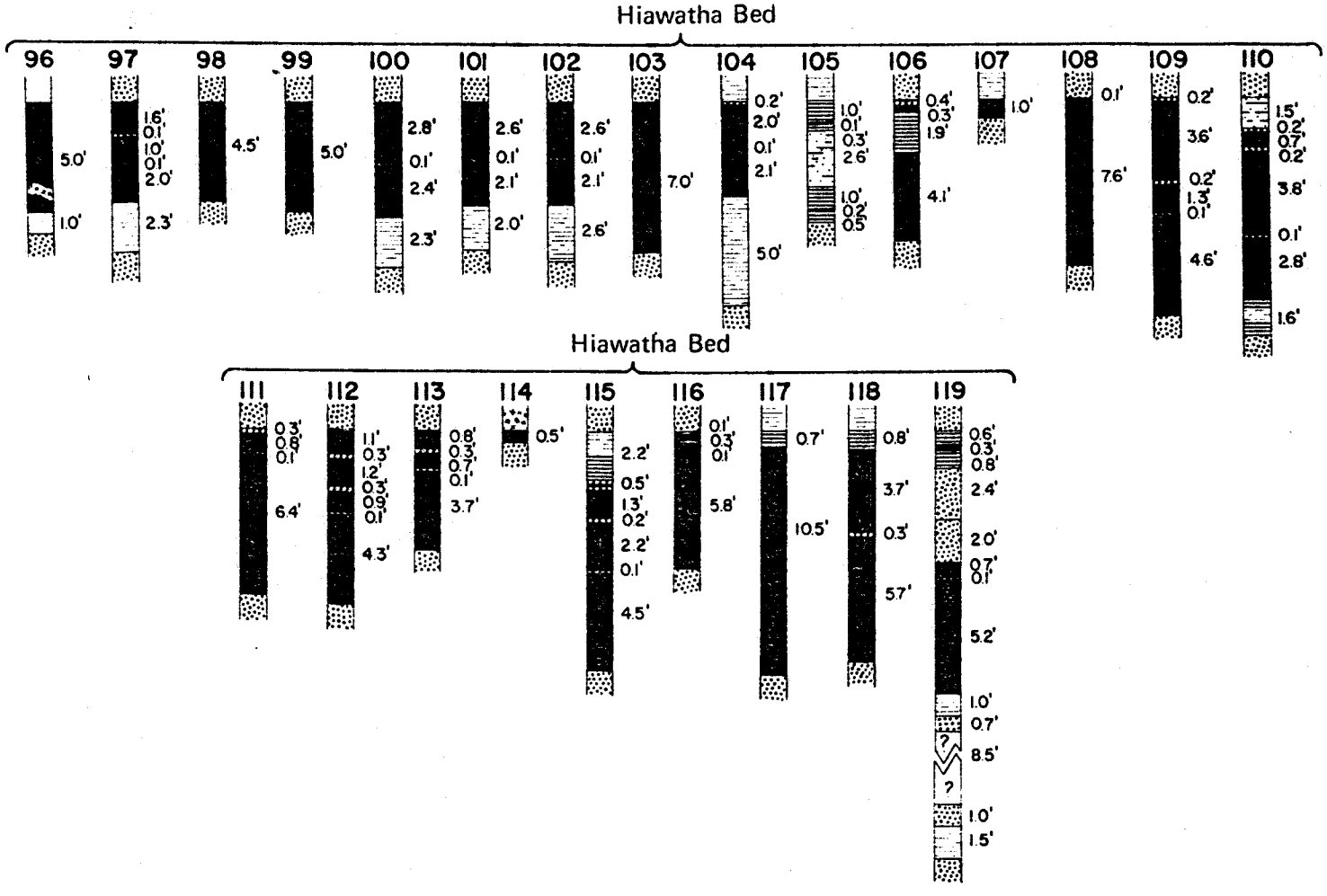
Hiawatha Bed
96
5.0'
1.0'
97
1.6'
0.1'
1.0'
0.1'
2.0'
2.3'
98
4.5'
99
5.0'
100
2.8'
0.1'
2.4'
2.3'
101
2.6'
0.1'
2.1'
2.0'
102
2.6'
0.1'
2.1'
2.6'
103
7.0'
104
0.2'
2.0'
0.1'
2.1'
5.0'
105
1.0'
0.1'
0.3'
2.6'
1.0'
0.2'
0.5'
106
0.4'
0.3'
1.9'
4.1'
107
1.0'
108
0.1'
7.6'
109
0.2'
3.6'
0.2'
1.3'
0.1'
4.6'
110
1.5'
0.2'
0.7'
0.2'
3.8'
0.1'
2.8'
1.6'
Hiawatha Bed
111
0.3'
0.8'
0.1'
6.4'
112
1.1'
0.3'
1.2'
0.3'
0.9'
0.1'
4.3'
113
0.8'
0.3'
0.7'
0.1'
3.7'
114
0.5'
115
2.2'
0.5'
1.3'
0.2'
2.2'
0.1'
4.5'
116
0.1'
0.3'
0.1'
5.8'
117
0.7'
10.5'
118
0.8'
3.7'
0.3'
5.7'
119
0.6'
0.3'
0.8'
2.4'
2.0'
0.7'
0.1'
5.2'
1.0'
0.7'
?
8.5'
?
1.0'
1.5'

FIGURE 3.4-4

each seam. The recoverable coal reserves was then estimated by multiplying the in-place reserve by a recovery factor of 50%. A 60% recovery factor could be used based on actual recovery experience by Co-Op Mining Company in the seams in this area; however, the 50% factor was used to assure the reserve estimate is conservative.

Co-Op plans to enter the Hiawatha Seam at a later date, although , at this time it is not known precisely when that will occur, or at what location. It is possible that access to the lower Hiawatha Seam may prove to be most economic through new portals in the outcrop; however, as mining progresses, and fault locations and displacements are better delineated, it may become even more feasible and less environmentally destructive to enter the lower seam through rock tunnels. In any event, Co-Op will commit to provide the Division with complete plans for entering the lower seam prior to taking such action. These plans will be submitted as a modification to this MRP and will be submitted in a timely manner to allow for review and approval prior to com-

mencing work on entering the Hiawatha Seam.

3.4.3.2.2 Recovery Rate

Mining recovery of the above reserves is projected to be 50% of the total inplace raw coal tonnage.

The operation will produce 200,000 tons of raw coal per year with at least 3 miner sections working 240 days. This is 833 tons per day with 2 production shifts operating.

This rate of production (considering a lower rate during the initial buildup years plus the tonnage still to be mined in the area of old workings) will make the projected mine life 50 years.

3.4.3.2.3 Justification for Mining Engineering Techniques

Co-op Coal Company plans to extract all coal reserves, to the extent allowed by economics, safety conditions and prudent mining practice, from the lands it controls.

3.4.3.2.2 Recovery Rate

Mining recovery of the above reserves is projected to be 60% of the total in-place raw coal tonnage.

The operation will produce 200,000 tons of raw coal per year with at least 3 miner sections working 240 days. This is 833 tons per day with 2 production shifts operating.

This rate of production (considering a lower rate during the initial buildup years plus the tonnage still to be mined in the area of old workings) will make the projected mine life 50 years.

3.4.3.2.3 Justification for Mining Engineering Techniques

Mining techniques and operating procedures adopted by Co-op for this property are based upon current engineering principles and modern equipment in relation to existing knowledge of the property, natural conditions and production desired. Approaches are not those of the Co-op staff alone; they are the result of consultation with reputable consulting mining engineers of this country as well, all of whom are familiar with western U.S. coal conditions.

Mine layout has considered the seam condition and minable areas so that all recoverable coal can be reached. Main entries are designed for maximum protection throughout their life with adequate capacity to supply ventilating air to working areas as well as trouble-free haulage systems for coal, men and materials.

3.4.3.2.4 Justification for Non-Recovery

Only that coal required by law to be left in place and that which is economically or physically unrecoverable because of adverse natural conditions or safety considerations will not be recovered.

Mine layout assures that all areas of coal within the permit boundaries are accessible to mining.

Even in the suspected area of faulting, plans have been made to locate panels between and parallel to the faults for maximum recovery.

3.4.3.2.5 Access to Future Reserves

Not Applicable

3.4.4 Economic Validity of Operation

Economic information provided in this application is in compliance with OSM and DOGM regulations 782.16 (b) AND (784.13(b)(6). Reclamation costs are discussed in Section 3.6.7.

3.4.5 Equipment Selection

Co-op Mining Company will utilize the equipment described in the following list for its mining operation and will acquire any additional equipment as required to maintain a sound mining operation.

3.4.5.1 Surface Equipment

Vibrating screens
crushers
conveyors
Front end loaders
road grader
crawler tractor
fork lift

3.4.5.2 Underground Equipment

continuous miner
electric shuttle cars
belt lie with feeder-breaker
roof bolter
scoop
service vehicle
personel carrier
boss buggy
rock dusters
water pumps
supply tractor
stopper
power center

3.4.6 Mine Safety, Fire Protection and Security

The mine complies with all federal, state and local

regulations on safety, fire control and security in underground and surface areas, as discussed below.

3.4.6.1 Signs

Signs used on the property are constructed of suitable material, employ uniform and standard designs and conform to local ordinances and codes. They will be maintained during the conduct of all activities to which they pertain. The gate at the main entrance will be posted with a sign containing the company name, address, telephone number and identification number. Table 3.4.6.1 lists signs and duration of maintenance and placement. Surface blasting is not planned at this underground mine. If such blasting becomes necessary for some reason, "Blasting Area" signs will be posted on access roads and on public roads within 200 feet. In addition, the blasting area will be conspicuously flagged in the vicinity of charged holes. All other requirements of the Utah DOGM mining regulation pertaining to surface blasting will also be satisfied.

In the event that surface blasting becomes

Table 3.4.6.1

Sign Maintainance

Stream Buffer Zone Signs	Until Bond Release
*Perimeter Markers	Until Bond Release
Vegetation Reference Area	Until Bond Release
Mine Identification Signs	Until Bond Release
Top Soil Signs	Until soil is redistributed
Blasting & Warning Signs	Until all hazardous activity is concluded
Road & Caution Signs	Until Bond Release
Flammable Materials Signs	Until all such material is removed
Hazardous Material Sign	Until all such material is removed

*Perimeter Markers- The permimeter of the mine disturbance area is marked with steel rods approximately 4' in length (roof bolts) and are painted a flourescent orange on top. The rods are placed in such a manner that a person can site from one rod to the next and the line can be clearly determined.

regulations on safety, fire control and security in underground and surface areas, as discussed below.

3.4.6.1 Signs

Signs used on the property are constructed of suitable material, employ uniform and standard designs and conform to local ordinances and codes. They will be maintained during the conduct of all activities to which they pertain. The gate at the main entrance will be posted with a sign containing the company name, address, telephone number and identification number.

Surface blasting is not planned at this underground mine. If such blasting becomes necessary for some reason, "Blasting Area" signs will be posted on access roads and on public roads within 200 feet. In addition, the blasting area will be conspicuously flagged in the vicinity of charged holes. All other requirements of the Utah DOGM mining regulation pertaining to surface blasting will also be satisfied.

In the event that surface blasting becomes

necessary, the entrance to the property from the public road will be posted with a sign stating, "Warning! Explosives in Use" and explaining the blast warning and all-clear signals and the marking of blast areas.

Topsoil stockpile areas are marked with "Topsoil" signs.

Access roads will be posted with speed, direction and traffic information signs.

3.4.6.2 Fences and Gates

The entrance to the area on the public road will be fenced off with a gate across the road. Because of the rugged terrain, additional fencing is not necessary.

3.4.6.3 Hazardous and Flammable Materials Contingency Plan

Co-op Mining Company has reviewed the Environmental Protection Agency's list of hazardous material issued under the Resource Conservation and Recovery Act. It is felt at this

time that the operation does not use or generate hazardous materials. Flammable materials are stored according to State Fire Marshall regulations.

3.4.6.3.1 Acid-Forming

This mine produces no acid-forming materials. The coal samples in the permit area are representative of all coal material on the property, and are not acid-forming.

3.4.6.3.2 Toxic Forming

This mine produces no toxic-forming material. However, a small amount of toxic materials are stored on-site. These materials will be in an area bermed and contained. (See Appendix 3-G).? Roads

3.4.6.3.3 Flammable (Fire Protection)

The Bear Canyon Mine anticipates no long term storage of coal and thus, the risk of coal storage piles burning is very remote. However, in the event that routine monitoring and inspection reveals ignition to be imminent (hot spots) material in that area will be excavated, removed to a safe place and spread out to stop further heating.

Combustible non-coal materials such as paper, used oil and wood will be collected routinely, transported to an approved sanitary land fill and disposed of.

Diesal fuel and gasoline are stored in tanks with capacities of 1,000 and 5,000 gallons. The tanks are located and positioned so as not to affect any slope or shaft opening. The storage tanks will be protected from corrosion by cathodic coat protection or other effective methods considered most compatible with existing soil conditions. The tanks will be inspected to ensure no leakage into the surrounding soil. All surface tanks will have protective berm constructed within 90 days of permit approval; Also, the tanks are located so as any major spillage runs directly to the sediment pond. (See Plate 2-2). Loose coal and the coal faces are sprayed with water prior to and during cutting by the water sprays on the machines. In addition, routine periodic (20-minutes) inspection and tests are made for methane gas during this operation.

Buildings and structures are protected against fire by the location of adequate numbers, sizes and types of fire extinguishers in compliance with regulations. Water is available from the surface water distributing system.

3.4.6.3.3.1 Facilities

Discussed above under Section 3.4.6.3.3

3.4.6.3.3.2 Coal Stockpiles

Monitored daily.

Refuse Piles

Co-Op does no produce processed coal and does not produce coal refuse.

3.4.6.3.4 Explosives

This is an underground mine using continuous mining methods which does not necessitate the need for blasting. In the event blasting would be necessary it would be in accordance with existing federal and state laws.

All surface work, such as site preparation is completed at this time. No surface blasting is anticipated in the permit term.

3.4.6.4 Compliance with Regulations

Co-Op Mining Company will comply with all federal and state regulations pertaining to the operation of this mine within the permit area.

3.4.6.4.1 Routine Reports

All routine reports pertaining to the operation will be submitted to the proper governmental agencies, in particular those required under CFR 30 Chapter 75.1800-1808.

3.4.6.4.2 Reporting of Accidents

All accidents will be reported to MSHA in accordance with CFR 30 Chapter 1 Subpart B par. 80.1080.12; Subpart C par.

80.20-80.24; and Subpart D par. 80.30-80.33. Such reporting will also include the Utah DOGM.

3.4.6.4.3 Corrective Action Accidents

Immediately after an accident, an on-site investigation will be initiated by company safety personnel accompanied by federal and state officials if required. The investigation and report will determine the cause of the accident, contributing factors and methods for prevention. Corrective action will be taken immediately. All data will be reviewed with mine personnel at their regular safety meetings and pertinent data will be incorporated into safety training classes.

Federal, state and other appropriate officials will be notified of all accidents in accordance with current regulations.

3.4.6.4.4 Good Housekeeping

The company believes that neat, clean

working areas are conducive to greater safety, pride and productivity. Its practice will be therefore, to require that supplies and materials be stored neatly in designated areas, that trash be cleaned up daily and transported to control areas for disposal and that spillage of coal or other materials be reduced to a minimum. Inadvertent spillages will be removed as soon as possible.

3.4.6.4.5. Mine Maps

Maps of underground section working will be updated by Section Foremen using their own measurements of face advance and width. Sections will be regularly and accurately surveyed by the Salaried Personel and all mine maps will be kept up to date and filed. These records will be reported to the appropriate agencies as required by current regulations.

3.4.6.4.6 Mine Records

Mine operating records will be maintained daily to show progress, production, work-force, conditions, ets. These records will be maintained in the mine files and will be accessible to authorized personnell when necessary.

3.4.7 Operations Schedule

The mine operating schedule as outlined is, of course, subject to change from a variety of causes, i.e., strikes, changes in market, underground mining conditions, surface transportation, etc. However, the following data show the projected performances.

3.4.7.1 Annual Production for Permit Time

If the market conditions warrant, annual production could reach 200,000 tons, and increase to 400,000 tons, (projection) by the year 1995. Prior to the 200,000 ton, an approval from the Executive Secretary in accordance with Sec. 3.1 UAR will be gained.

3.4.7.2 Operating Schedule

The mine will operate 240 days per year, 5 days per week to produce the above ton-

3.4.6.4.6 Mine Records

Mine operating records will be maintained daily to show progress, production, workforce, conditions, etc. These records will be maintained in the mine files and will be accessible to authorized personnel when necessary.

3.4.7 Operations Schedule

The mine operating schedule as outlined is, of course, subject to change from a variety of causes, i.e., strikes, changes in market, underground mining conditions, surface transportation, etc. However, the following data show the projected performances.

3.4.7.1 Annual Production for Permit Time

Annual production; 200,000 Tons, increased to 400,000 Tons, (projection).

3.4.7.2 Operating Schedule

The mine will operate 240 days per year, 5 days per week to produce the above ton-

ages. It will use a total of 30 + miners working 3 shifts per day and producing 400 + ton per shift per unit.

3.4.7.3 Employment

Total personnel will be 35, 5 of whom will be salaried and 30 hourly employees.

3.4.8 Mine Permit Area

3.4.8.1 Acreage and Delineation

The permit area comprises approximately 900 acres located and outlined as shown on Plate 2-1.

The permit area is made up of properties owned in fee by COP Development Company.

3.4.8.2 Mining Sequences

Plate 2-3 show the mining sequence on the property each year for the first five years and each five years thereafter for the life of the mine.

3.4.8.3 Acreage in Each Scheduled Sequence of Underground Activity (Not Surface Disturbance)

YEAR	ACREAGE
1984	11
1985	11
1986	11
1987	11
1988	13
1989-1993	65
1994-1998	65
1999-2003	65

3.4.9 Mine Plan Area

The "mine plan area" is defined for the purposes of this section to consist of the permit area.

The permit area has been discussed previously (Section 3.4.8).

The tentative acreages to be disturbed for each activity described above are as follows:

3.4.8.3 Acreage in Each Scheduled Sequence

YEAR	ACREAGE
1984	11
1985	11
1986	11
1987	11
1988	13
1989-1993	65
1994-1998	65
1999-2003	65

3.4.9 Mine Plan Area

The "mine plan area" is defined for the purposes of this section to consist of the permit area.

The permit area has been discussed previously (Section 3.4.8).

The tentative acreages to be disturbed for each activity described above are as follows:

Mine Shop Area		.75 acres
Mine Access Road	5.7	2.15 acres
Portal and Pad Areas	3.26	5.1 acres
Sediment Treatment Area		.5 acres
Scales Area	1.66	1.42 acres
	11.12 AC	9.92 AC

3.5 ENVIRONMENTAL PROTECTION

3.5.1 Preservation of Land Use

COP Development Company, which is the legal owner of affected surface operations, anticipates that the postmining land uses of the affected areas will remain the same as the premining land uses. These uses are identified in Chapter 4. State or local governments have not proposed any changes in land use following reclamation.

Once operations in an area have ceased, the disturbed area will be scarified, sloped and seeded before the next growing season. The site will be reseeded with a mixture of seed such as mountain varities of wheatgrass, hard fescue, or species

transmission facilities will be constructed to be raptor protected. See Appendix 10-C.

Co-Op is further committed to report the presence of any Golden eagles observed on the property to the Division.

specified by the Division of Oil, Gas, and Mining. Grass will be maintained by fertilization or reseeding until stable up to five years. (See Interim Reclamation Plans - Appendix 3-C.

The proposed mine access roads to the mine portal will be reclaimed and revegetated. This will accomplish a dual purpose of controlling runoff and revegetating the hillsides with vegetation comparable to existing growth.

Co-op Coal Company will cooperate with all state and local land use plans and programs.

Emery County zoning ordinances classify the Bear Canyon Mine plan area as Industrial Mining.

3.5.1.1 Projected Impacts of Mining on Current and Future Land Use

The management objectives and the impacts from the Bear Canyon Mine per-

taining to these objectives are described in detail in Chapter 4.

Impacts

Approximately 10 acres of soil will be disturbed within the permit area. This includes loadout areas, offices, shops and substations, roads, portal areas and the topsoil storage area.

The reduction in desirable plant species will temporarily reduce forage production and wildlife capacities.

The short-term negative impact of vegetation removal would be outweighted by the positive impacts of revegetation and improved fire protection and prevention.

Wildlife in the area will adapt to the operation in a relative short time as witnessed by existing coal operations. Proposed construction may temporarily disrupt wildlife if human disturbance is not kept to a minimum. These

topics are discussed in detail in the Wildlife Report, Chapter 10.

3.5.1.2 Control Measures to Mitigate Impacts

Reclamation activities in the permit area will be directed toward minimizing the overall impact of coal mining. This can be accomplished by careful planning of the disturbed areas that must be later reclaimed.

The mine surface operation facilities proposed, will be returned to a wildlife/grazing habitat at the conclusion of the mining operation. The premining and proposed postmining uses are therefore identical for all areas. (Chapter 4)

The initial step in the reclamation plan is to seal all large diameter openings. This will be accomplished by backfilling these openings with non-combustible material. The seals will be designed so that

mine drainage, if any, will not enter surface water bodies. For a more detailed description of the sealing of openings see Section 3.6.3.1, Sealing of Mine Openings, Drill Holes, Wells, etc.

The next step in reclamation would be the removal of all surface structures, equipment and road blacktop. Next, all solid waste generated in abandonment operation will be collected and removed from the reclaiming areas. Additional information concerning this aspect of the reclamation plan is presented in Section 3.6.3.2., Removal of Surface Structures.

Backfilling of the subterranean portion of the silos, holes and depressions will be the next reclamation activity. Once backfilling is completed, drainages will be returned and disturbed areas will be graded and recontoured. A detailed description of this reclamation phase is

found in Section 3.6.4, Backfilling and Grading Plans.

A suitably permanent and diverse vegetative cover, as required by the appropriate land management agency, will be established on all affected land. (See Sec. 9.5 and 10.5 for details).

Land reclamation will take place as soon as possible after surface disturbance. All cut and fill slopes resulting from construction of the access road will be stabilized and revegetated at the first seasonal opportunity. Areas occupied by support facilities such as roads, office buildings, shops and coal handling structures will not be reclaimed until conclusion of the mining operation.

3.5.2 Protection of Human Values

There are no public parks nor historical sites worthy of preservation in the permit area.

3.5.2.1 Projected Impact of Mining on Human Values, Historical and Cultural

The projected impact of mining on cultural resources can be direct or indirect. Direct impacts are a direct consequence of project development and operation, such as earthmoving. Indirect impacts arise from activities that are not strictly part of the project developement and operation, such as changes in local populaton.

3.5.2.2 Control Measures to Mitigate Impacts

Co-Op is committed to take all necessary steps to remedy any adverse impacts from slides and to notify the Division by the fastest available means to safeguard human and environmental values.

3.5.3 Protection of Hydrologic Balance

Co-op Mining Company will conduct all mine site operations in such a way as to minimize potential impact to surface and ground water quality.

Water originating in or flowing through disturbed areas will be collected by a drainage control system and the additional suspended material allowed to settle in a sediment treatment facility before discharge into the natural

drainage system. No permanent changes to the natural drainage channels are anticipated. Postmining land use will be similar to premining use, and the hydrological aspects of the reclamation effort have been planned accordingly.

Present mine portals are designed to ensure that water will not be discharged from the mine, once the water right issue is resolved and the present discharge will be utilized.

In compliance with 30 CFR 75.1711-2, seals will be installed in all entries as soon as mining is completed and the mine is to be abandoned. The seals will be located at least 25 feet inside the portal mouth entry.

Culinary water usage at the mine site will qualify as a public water supply and will meet State of Utah primary and secondary water standards.

3.5.3.1 Projected Impacts of Mining on the Ground Water Hydrologic Balance

Geology largely controls the occurrence and quality of water in any region. Since the region surrounding the mine plan area consists of the same geologic formation, the effects of mining on hydrologic balance should be the same throughout the area. Further, it can be assumed that the impacts from future mining will be the same as the minor impacts that have resulted from the mining of the past 50 years.

The existing hydrologic balance will be discussed in detail in Chapter 7, Hydrology.

3.5.3.2 Control Measures to Mitigate Impacts

No significant impacts to the ground water system are expected from the mining operation. The ground water monitoring plan, discussed in Section 3.5.3.3, will provide

a means to follow the possible effect of the mining activities on the ground water system. No surface or ground water will be discharge into the mine under any circumstances. If mine water is encountered at the working face, which on an areawide basis generally yields less than 10 gal./min. per active face, it will be collected in the face area and pumped to impoundments located within the mine. The impoundments will be designed to allow sufficient time for suspended solids to settle. If necessary, mechanical devices will be installed to remove grease and oil that might be present in the water before it is used for dust suppression.

The construction of proposed surface facilities will result in increases of the suspended solids concentration increases, however are expected to be temporary because of compliance with the regulatory requirements that sediment control features be provided for all areas of surface disturbance.

Water quantity will remain generally unaffected due to the geological conditions in the mine area. Therefore, there will be little or no impact, adverse or otherwise, on the hydrologic system.

State and federal regulations (30 CFR 817.54 and UMC 817.54) require that an alternate water supply be provided to replace any water supplies in the area, Co-op Mining Company will provide this alternate supply if needed. Several alternate sources of supply exist:

1) Water from springs could be piped to the affected site.

2) Water rights could be purchased for springs damaged by Co-op Mining Company, or, alternate water shares could be substituted. (See App. 3.3.6., Proof of Ownership).

3) A well could be drilled at the affected site to provide an alternate supply (since artesian conditions do not exist).

4) Water produced in the mine could be piped to the affected site.

5) Water shares presently owned could be transferred.

Alternative 4 may mean treating of poorer quality water and pumping to overcome elevation differences.

In the unlikely event that mining adversely affects a water source, the Co-op Mining Company will select an alternative after considering all possibilities of each site-specific circumstance.

3.5.3.3 Ground Water Monitoring Plan

An ongoing ground water monitoring program will be conducted.

3.5.3.4 Projected Impacts of Mining on the Surface Water Hydrologic Balance

The occurrence and quality of water in any region is highly controlled by geology. The majority of the mine plan area is strong structurally and consists of the same geologic formations. It is presumed that mining activities will have little adverse impact on the area hydrologic system.

3.5.3.5 Control Measures to Mitigate Impacts - Surface Water

Runoff from all disturbed areas will be passed through sediment treatment facilities. Any discharge from facilities will be monitored in accordance with NPDES permit standards and state and federal regulations.

The effects of the mining operation on the surface water system will be analyzed through the surface water monitoring plan described in the next section. In the unlikely event that monitoring shows that the surface water system is being adversely

TABLE 3-6

COMPREHENSIVE WATER QUALITY ANALYTICAL SCHEDULE

FIELD MEASUREMENTS	LABORATORY MEASUREMENTS
Discharge	Iron, total
pH	Magnesium, total
Temperature, Air	Total Dissolved Solids
Temperature, Water	Total Suspended solids*

*Surface waters only

affected by mining activities, additional steps will be taken to rectify the situation in consultation with state and federal regulatory agencies.

3.5.3.6 Surface Water Monitoring Plan

An ongoing hydrologic monitoring program will be conducted.

As required, water quality data collected from surface water monitoring stations will be submitted within 60 days of the end of each quarter, depending upon the speed of the laboratory analyses.

3.5.4 Preservation of Soil Resources

Co-op Mining Company is prepared to meet the requirements specified by 30 CFR 784.15. Backfilling, soil stabilization, compacting, grading and any other necessary operations will be performed when necessary with the best technology available, as approved by the regulatory agency. Section 3.6, Reclamation Plan, provides a detailed discussion

affected by mining activities, additional steps will be taken to rectify the situation in consultation with state and federal regulatory agencies.

3.5.3.6 Surface Water Monitoring Plan

An ongoing hydrologic monitoring program will be conducted if in the event they are deemed necessary.

As required, water quality data collected from surface water monitoring stations will be submitted within 60 days of the end of each quarter, depending upon the speed of the laboratory analyses.

3.5.4 Preservation of Soil Resources

Co-op Mining Company is prepared to meet the requirements specified by 30 CFR 784.15. Backfilling, soil stabilization, compacting, grading and any other necessary operations will be performed when necessary with the best technology available, as approved by the regulatory agency. Section 3.6, Reclamation Plan, provides a detailed discussion

of the reclamation effort.

3.5.4.1 Projected Impacts of Mining on Soil Resources

Since the Bear Canyon Mine is an underground mine at the site of an old works, the overall impact of mining on soils will be minor. The impacts of surface operations and mining facilities on soil resources consist of coverage of soil by facilities, disturbance of soils during construction activities, erosion created by removing vegetation, reduced forage growth due to nutrient degradation, reduced wildlife capacity and particulate emissions to the air. However, the abandoned mine had large accumulations of debris which has now been cleaned up, which to a large degree constitutes enhancement.

3.5.4.2 Control Measures to Mitigate Impacts

The objective of the proposed backfilling,

soil stabilizing, compacting, contouring and grading process is to create a reclaimed surface that provides a variety of topographic features to enhance postmining land use.

Section 4.5.1, Postmining Land Use, and Section 3.6, Reclamation earthwork activities to be conducted. This section summarizes the steps to be taken in the backfill, soil stabilization, compaction, contouring and grading program.

Topsoil Removal and Protection

Before any new construction or mining activity that will disturb the surface of native undisturbed areas, topsoil will be removed from the affected area after vegetation has been removed. The topsoil will be segregated from any other material removed and stockpiled separately in a stable site within the permit area protected from erosion, compaction, or contamination. The stockpile will be stabilized by seeding.

As soon as operations are concluded in each disturbed area, the removed topsoil will be redistributed on the site in the manner required. Methods and techniques are detailed in Section 3.6.4.4, Soil Redistribution and Stabilization. (See Appendix 3-D Approved topsoil handling plan)

Backfill, Compaction and Grading

To the maximum extent practicable, disturbed surface areas will be backfilled, compacted and graded according to the approved time schedule. The purpose of these operations is to return disturbed areas to approximate original makeup and contour. Wherever possible, backfilling will return the various soil horizons to their original site and make them compatible with surrounding areas. Compaction will help the returned soils remain in place. Grading will restore the contour to as near the original state as possible; however, because of local conditions, large-scale backfilling, compaction and grading will not be possible in many areas.

STATE OF UTAH
NATURAL RESOURCES
Oil, Gas & Mining

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Scott M. Matheson, Governor
Temple A. Reynolds, Executive Director
Dr. G. A. (Jim) Shirazi, Division Director

August 17, 1983

Mr. Wendell J. Owen
Co-op Mining Company
P. O. Box 1245
Huntington, Utah 84528

RE: Approval for Consolidation of
Topsoil Stockpiles
Bear Creek Canyon Mine
ACT/015/025, Folder Nos. 4 & 7
Emery County, Utah

Dear Mr. Owen:

Following is the approval of the proposed plan for consolidation of the several topsoil stockpiles located at Bear Canyon. The approval lists the deadlines for completing the work and a change in the recommended seed mix.

Please be aware that failure to meet these deadlines will subject Co-op to a violation for failure to operate in accordance with an approved plan.

Division approval is hereby granted to consolidate the topsoil piles in Bear Creek Canyon and provide accurate topsoil volume calculations by August 31, 1983 as proposed in Co-op Mining Company's June 24, 1983 submittal. Approval to implement protection measures of topsoil stockpiles is granted with the exception of utilizing the seed mix proposed. The use of the seed mix listed in Attachment 2-A is not recommended for topsoil pile protection as the shrubs included, given 20-40 years of growth, would in all likelihood cause problems in the topsoil redistribution process. It is suggested that Co-op utilize an appropriate seed mix for topsoil protection which does not contain shrubs.

Since fall seeding would produce the most optimal success in germination and establishment of a vegetative cover, seeding my occur as late as October 14, 1983.

Since this mine produces no acid-forming or toxic-forming materials, backfilling required to cover such materials will be unnecessary. (See Laboratory test Appendix 3E)

Physical and Chemical Soil Stabilization

Soils will be stabilized by physical and chemical methods before planting. This may include placement of crushed heavy material at the toe of roadfill slopes, for example. Other approved and proven methods will be employed as necessary. Chemical stabilization may include the addition of neutralizing chemicals to soils shown to be excessively acidic or basic. Nutrients and soil amendments will be added in the amounts indicated by soil tests to assure that the surface soil layer can sustain the approved postmining land use.

Biological Soil Stabilization

Returned soils will be stabilized bio-

logically by revegetation of disturbed areas. This stabilization effect will be accomplished by the holding capacity of the root systems of the new vegetative cover, particularly small shrubs and trees. This aspect of soil stabilization will begin as soon as topsoil is redistributed. Section 3.6.5, Revegetation Plan, provides specific detail on this aspect of the reclamation plant.

3.5.5 Protection of Vegetative Resources

Co-op Mining Company has maintained a commitment to reclaim the unused disturbed areas to to the extent of the cover of the natural vegetation on the mine plan area. Chapter 9, Vegetative Resources, provides a preliminary report on the vegetative resources of the area.

3.5.5.1 Projected Impacts of Mining on Vegetative Resources

Since the Bear Canyon Mine is an under-

ground mine, the overall impact on surface vegetation is minor. The effects of surface operations on vegetative resources consist of removal of vegetation from new construction areas, on-site erosion and reduction of desirable plant species, which will reduce forage production and wildlife capacity.

3.5.5.2 Mitigating Measures to be Employed to Reduce Impacts on Vegetative Resources

All disturbed areas will be planted and revegetated during the first appropriate season following grading and redistribution of topsoil. This program will include any necessary addition of remedial treatments to the soil. A suitable, permanent and diverse vegetative cover selected on the basis of appropriate land management agency requirements will be established on all reclaimed areas. The schedule of the program is presented in

Section 3.6.6 What follows is an outline of the major aspects of the revegetation plan. The specific measures involved will be addressed on a site specific basis.

Seeding and Planting

All plants used to revegetate the disturbed. areas will be native or compatible species selected specifically for the vegetative community, as detailed in Section 9.3.2. The choice of dominant species will be determined by suitability for post-mine land use. Seed types will include wheatgrass, salina wildrye, sagebrush, pinyon and juniper. Wherever possible, seed will be drilled or disced into the ground. In steep slope areas, where such techniques are difficult or impossible, hydro-seedings or cyclone spreader seeding will be done.

Native shrubs will be used for shrub replanting. These will be potted seedlings, if available. Bare-root trees will be

used to tome extent.

Mulching and Moisture Retention

As required, all regraded and retopsoiled areas will be mulched or otherwise treated to promote germination of seeds and to retain moisture. Various moisture-retention products are available.

Maintenance

Should such procedures prove necessary to the success of the revegetation plan, protection of replanted areas from animals may be carried out. Such procedures, however, are unlikely to be needed because the species to be selected should not require continuous or considerable maintenance beyond replanting.

3.5.5.3 Monitoring Procedures

All revegetated areas will be monitored closely for at least 5 years after revegetation. Any maintenance indicated by the results of these inspections will be

carried out promptly.

Vegetation will be measured yearly on all revegetated plots for at least the first 5 years. If success is achieved, further measurements will be made at 5-year intervals. Any area not achieving success will be re-evaluated and revegetated again in light of the most recent findings.

3.5.6 Protection of Fish and Wildlife

Wildlife is present in the mine plan permit area. Due to the size of the total disturbance impacts on the various mammal, amphibian and reptile species should be minimal. In addition, Co-op Mining Company is commited to mitigating as much as possible the adverse effects of all new construction and maintaining the natural abundance and diversity of the area.

3.5.6.1 Projected Impacts of Mining on Fish and Wildlife

Mammals

The Bear Canyon Mine plan area is inhabited by 84 species of mammals, of which 25 species are considered of high interest and 14 of these are protected by state or federal law (see Table 10-1).

Elk that are thought by the Utah Division of Wildlife Resources (UDWR) to be stable and productive use portions of the mine plan area at various times of the year for such necessary activities as wintering and feeding. This use, however, is marginal and not crucial. The minimal disturbance caused by planned surface facilities will have no significant impact on the herd.

Mule deer utilize the whole permit area, taking advantage of various habitat at different times of the year. Browse in the wintering range within the permit area is in good shape and should facili-

Mammals

The Bear Canyon Mine plan area is inhabited by 53 species of mammals, of which 19 species are considered of high interest and 14 of these are protected by state or federal law (see Table 10-1).

Elk that are thought by the Utah Division of Wildlife Resources (UDWR) to be stable and productive use portions of the mine plan area at various times of the year for such necessary activities as wintering and feeding. This use, however, is marginal and not crucial. The minimal disturbance caused by planned surface facilities will have no significant impact on the herd.

Mule deer utilize the whole permit area, taking advantage of various habitat at different times of the year. Browse in the wintering range within the permit area is in good shape and should facili-

tate over-wintering of the herd. Projected impact from proposed surface operations is expected to be minimal. The range of cougars in the permit area is determined by the migration patterns of mule deer and by human disturbance. Since the cougar population is low and since their range is far greater than the areas of proposed construction, mining activities will have little impact on the species.

Black bear may inhabit the permit area but the area is small compared to the overall habitat area. Black bears are not numerous, nor are they likely to be disturbed during the most sensitive times of their annual cycle. Impact will be minor at most.

Cottontail rabbits are likely to be affected only by subsidence, which will be limited to relatively small areas thus causing little negative impact. Disturbance to vegetation resulting in

seral succession will actually improve the reproduction potential of the rabbits.

Impact on snowshoe hares will be minor since the species's habitat in conifer-aspen stands is limited in the permit area.

Furbearers using underground burrows may be affected by subsidence within limited portions of the permit area. However, such effects will be temporary and the species are widespread and adaptable to human activity. Long-term impact will be minimal.

Mining activity will have little effect on the habitat of small mammals. Subsidence damage to burrows could increase mortality and reduce reproductive success temporarily, but the effect would be temporary because of the continued survival of the breeding population in

contiguous areas and to the high densities of these species.

Birds

The list of bird species found in the mine permit area are listed in Tables 10-10 and 10-11.

Only two species found in the mine permit area are on the endangered species list: the bald eagle and the peregrine falcon. The bald eagle is a winter resident only and the peregrine falcon is not known to nest within the permit area.

Potential impact on bird species would be limited to the proposed new construction areas. Impacts, however, should be minor since the areas involved are small and since equivalent habitat is readily available close by. (See Raptor Survey UDWR - Appendix 10-A

Amphibians

The three amphibians occurring in the permit area (see Table 10-4) occupy similar habitats throughout the region and are unlikely to be affected in any major way by planned activities.

Reptiles

Reptiles found in the permit area are located in many other similar habitats and their populations will not be seriously impacted by planned activities. UDWR personnel will be notified if any denning sites are discovered during mining or construction.

Aquatic Wildlife

Since there are no perennial streams in the surface operation areas, little impact to aquatic wildlife is expected. Huntington Creek, the closest perennial stream to the permit boundary, is located a considerable distance from the surface operation, 1.5 miles. This high quality fishery is protected through Co-Op's Sediment Control Structures (see Chapter 7).

3.5.6.2 Mitigating Measures to be Employed To Protect Fish and Wildlife

To minimize habitat disturbance and loss, surface activity at the breakout and the ventilation shaft will be minimal. The proposed site is located at the mine portal at Trail Canyon, so no new disturbance will result. Construction will be scheduled to minimize conflict with deer and elk use periods.

The disturbed areas will be reseeded within the next growing season and the resulting seral succession will actually benefit deer and elk. Habitat loss due to construction is limited to the size of the disturbed area and will be small. All water in the permit area is ephemeral channels. Any water sources necessary to wildlife will be protected or an alternative source will be provided. In addition, riparian habitat will be enhanced. (See Section 10-D).

Structures that pose a barrier or hazard will be provided with passageways, buffers, fences, or other necessary protection, as directed by UDWR.

Co-Op is committed to reclaim all disturbed land and remove all support facilities upon completion of mining to prevent damage to fish, wildlife, and related environmental values.

The applicant will inform employees of the vulnerability of local wildlife and will admonish them to avoid all harassment or unnecessary activity. In addition the training film offered by the UDWR "Coal Mining and Wildlife" will be shown annually to all employees.

Any discovered wildlife impact not described here will be mitigated by Co-op Mining Company with methods agreed upon by UDWR.

Since no impacts are expected to the ephemeral waters of mine area in the near future, no special mitigation plan concerning Bear Creek is presented here.

3.5.6.3 Monitoring Procedures

Bear Creek does not warrant a biological or habitat monitoring effort in the area of the mine lands.

determined by consultation with UDWR.

The applicant will inform employees of the vulnerability of local wildlife and will admonish them to avoid all harassment or unnecessary activity. In addition the training film offered by the UDWR "Coal Mining and Wildlife" will be shown annually to all employees.

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Since no impacts are expected to the ephemeral waters of mine area in the near future, no special mitigation plan concerning Bear Creek is presented here.

3.5.6.3 Monitoring Procedures

Bear Creek does not warrant a biological or habitat monitoring effort in the area of the mine lands.

3.5.7 Protection of Air Quality

Co-op Mining Company will use the best mining technology available to maintain maximum utilization and conservation of coal while preserving environmental integrity. The operator will employ the best management practices for fugitive dust control. The National Ambient Air Quality Standard (NAAQS) will be well maintained.

3.5.7.1 Projected Impacts of Mining Operation on Air Quality

Particulates are the only pollutant which might impact air quality at the mine area. Increase in concentrations of other pollutants such as sulfur dioxide, nitrogen oxide, carbon monoxide and photochemical oxidants would be neglible. The main source of total suspended particulates (TSP) would be coal particles, which would settle out within short distances (1 mile or less) downwind. The mining operation would not be a "major source" under the Prevention of Significant

Deterioration (PSD) regulations because total annual controlled emissions of particulate matter are expected to be less than 250 ton/year.

The level of estimated impacts can be put in perspective by comparing the calculated pollutant ground-level concentration with the NAAQS established for protection of human health and welfare. The worst case analysis of impacts (Aero-Vironment, 1977) shows that the total ground-level concentration includeing an average background of 20 Hg/m^3 would be well under the federal secondary standard of 150 Hg/m^3.

During typical meteorological conditions, impacts in the region would be lower than quantities derived from the worst case analysis resulting from increased dispersion during the 24-hour period. The increased dispersion would be brought on by more normal wind speeds and more meander in the wind direction than considered in the worst case analysis.

The annual TSP concentrations (including background) would be 25 Hg/m^3, which is less than the NAAQS of 60 Hg/m^3. The greatest impact would be near Huntington Canyon and it would be caused by human activity.

The impacts of TSP concentrations from one sub-air basin to adjoining ones would be low because of mixing and fallout over the distances involved.

3.5.7.2 Mitigating Measures to be Employed to Control Air Pollutants

The main source of air pollutants would be dust from autos and trucks traveling on unpaved roads and from coal loading sites. Unpaved roads used in conjunction with the mining activities will be treated with water and/or non-toxic chemical dust suppressants.

Vehicular traffic will be restricted to authorized personnel and maximum vehicle speed will be limited to 20 miles per hour.

The speed restriction signs will be posted along the roads.

3.5.7.3 Air Quality Monitoring Plan

The mining operation would not be a "major" source" under the PSD regulations because total annual controlled emissions of particulate matter are expected to be less and 250 ton/year. Therefore, the requirement for air quality monitoring is not anticipated. (See Chapter 11, U. Health Approval letter).

3.5.8 Subsidence Control Plan

Co-op Mining Company will use the room and pillar method of mining. This method is outlined in detail in Section 3.4.1

Maximum extraction could result in surface subsidence over a long term. Subsidence will depend on the amount of cover over the coal seam, the amoumt of coal removed under the methods of mining and the stratigraphy of the formations above the coal seams. Partial extraction leaving the pillars in place

The speed restriction signs will be posted along the roads.

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The mining operation would not be a "major" source" under the PSD regulations because total annual controlled emissions of particulate matter are expected to be less and 250 ton/year. Therefore, the requirement for air quality monitoring is not anticipated.

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will reduce or eliminate subsidence, but is less desirable from a standpoint of maximum economic resource recovery.

There are no known anticipated effects from subsidence due to the amount of overburden and the strata above the coal seam. Surface fractures on the permit area have been minimal.

Necessary support pillars will be left in place to assure entries for the continuation of mining as per mine plan.

Barrier pillars will be left to protect the escarpments from mass failures. Rock formations are all sedimentary. They are composed of stratified layers of friable sandstone and soft silt and clay shales. The jointed, weathered nature of the rock, combined with the interlayering of the sandstone and shale contribute to frequent rockfalls and minor slope failures along the steep escarpment slopes.

Subsidence will have no effect on the surface facilities since no such structures are located over mined-out areas.

3.5.8.1 Projected Impacts of Subsidence

The surface of the area to be mined that might be impacted by subsidence is used primarily for cattle grazing and wildlife habitat. No known aquifer exists above the immediate coal zone. Buildings, conveyors, etc. for the mining operation are all located East of the coal field. In general the area is rugged with limited access and not readily accessible to the public. Subsidence is not expected to be significant at the depths involved in the new areas.

3.5.8.2 Control Measures to Mitigate Impacts

The impact of the observed subsidence will be evaluated and used as a guide in determining the need for control of subsidence and for mitigation. The need for subsidence control and for a specific mitigating measure will need to be site specific. The surface water supply will need to be protected or mitigating measures utilized if adverse impacts occur.

Subsidence control can be accomplished by several methods as needed, such as:

1) Not pulling pillars in selected sensitive areas (i.e. near outcrops).

2) Uniform extraction to minimize impacts.

Mitigating measures are limited in this relatively inaccessible area. Damage to any surface structures including fences and roads can be repaired. The mitigation of flow reductions or drying up of a water source must be site specific Flow from springs can be diverted or conveyed over a crack that might disrupt flow. Water can be supplied to the area if a critical need exists.

3.5.8.3 Subsidence Monitoring

A base map has been prepared showing contours and surface features that might be impacted by subsidence, such as surface structures and springs (Plate 3-3). The extent of

1

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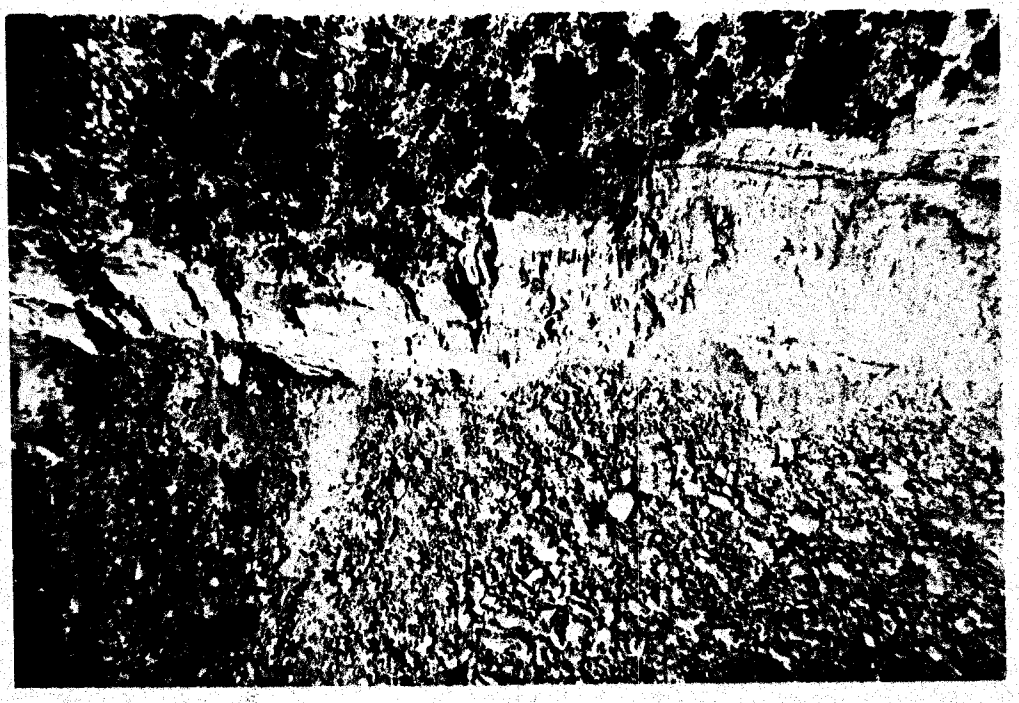

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mining is shown on Plate 3-4 and the area where pillars will be removed is indicated. This base map will be updated annually. Co-Op will notify adjacent porperty owners concerning subsidence potential prior to approaching their boundaries. Co-Op will conduct an annual survey to identify all evidence of subsidence. An annual field survey will be made to identify observable subsidence. Details are attached under Appendix 3-5-8A.

When subsidence is observed to adversely impact a surface structure or resource, the extent of the impact will be evaluated.

As pillars are pulled under the western portion of the mine plan area, impacts will be anticipated and hazards assessed on a site-specific basis. An overburden of approximately 1,000 feet or more in the western portion of the mine plan area should minimize surface impacts. Sandstone formations overlaying the Blackhawk coal bed should better distribute stresses and reduce the tendency for surface cracks and subsidence at the surface.

3.5.9 Waste Disposal Plans (Spoils, Coal Processing Wastes, Mine Development Wastes, Non-Coal Wastes, Removal, Handling and Storage.

Co-Op does not anticipate the handling of development waste

rock in its mining operation although a contingency plan has been developed if the need were to become critical in the effort to maximize coal removel. It is for the above purpose that Co-Op has designated a waste rock storage site in Trail Canyon. This area was used historically in this capacity and has the necessary hydrolic safeguards presently implemented. The waste would be handled in the same manner as coal and truck hauled to this area. This area would be addressed as a permit modification of New Permit Application. Co-Op will submit plans for the underground waste disposal site at least 90 days prior to anticipated need and will not use the site until such area is approved.

UMC 817.89 DISPOSAL OF NON-COAL WASTE

The Co-Op is presently undertaking a massive clean-up operation wherein large quantities of scrap have already been removed from the permit area. Once the operation is complete (September 1, 1983) the balance of the salvageable equipment will be stored in the designated area.

A plan for this type of storage yard was discussed with a number of the technical staff in July of 1983 and was generated and submitted to the Division for their review prior to implementation. It is discussed in Appendix 3.3.4.A Sec. 8 pages 3 through 125.

In the interim, the equipment which is not scrapped out will be temporarily stored on the disturbed sites in both Bear and Trail Canyon. These sites will be situated in such a manner to insure that whatever runoff results from the area will pass through designated sediment facilities. The non-coal waste (other than rock refuse) generated in the operation of the mine will be placed in metal dumpsters which are strategically located on the property. A local trash collector is contracted to replace these bins when they are approximately 80% full.

3.5.9.1 Projected Impacts of Disposal Areas and Methods on the Environment

Not Applicable

3.6 RECLAMATION PLAN

Co-op Mining Company, upon completion of mining on this permit area, will reclaim all disturbed surface areas as diligently and rapidly as possible, to restore the property to a variety of alternative uses.

The postmining land uses could be grazing, recreation, wildlife and mineral. Portals will be closed and concrete foundations will be buried with fill material.

Where physically possible, disturbed areas will be scarified, sloped, topsoiled and seeded or planted before the next growing season. The site will be revegetated with a mixture of grasses, forbs, brush and trees as agreed upon with the appropriate land management agencies. Reclaimed areas will be maintained until stable up to five years. Seed will be planted with the best techniques available at that time. (Seed List Attached under 3-F)

Proposed access roads, to the mine portals, will be reclaimed and revegetated. This will accomplish a dual purpose of controlling runoff and revegetating the hillsides with vegetation comparable to existing growth.

The initial step in the reclamation plan is to seal all large-diameter openings by backfilling these openings with non-combustible material. The seals

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Proposed access roads, to the mine portals, will be reclaimed and revegetated. This will accomplish a dual purpose of controlling runoff and revegetating the hillsides with vegetation comparable to existing growth.

The initial step in the reclamation plan is to seal all large-diameter openings by backfilling these openings with non-combustible material. The seals

will be designed such that mine drainage, if any, will not enter surface water bodies. For a more detailed description of the sealing of openings, see Section 3.6.3.1, Sealing of Mine Openings, Drill Holes, Wells, etc.

The next step in reclamation would be the removal of all surface structures, equipment and road blacktop. Once this has been accomplished, all solid waste generated in the abandonment operation will be collected and removed from the reclaiming areas. Additional information concerning this aspect of the reclamation plan is present in Section 3.6.3.2, Removal of Surface Structures.

Backfilling of the subterranean portion of the silos, holes and depressions will be the next reclamation activity. Once the backfilling is completed, the disturbed areas will be graded and recontoured. A detailed description of this reclamation phase is found in Section 3.6.4, Backfilling and Grading.

Reclamation Timetable

A suitably permanent and diverse vegetative cover

to benefit wildlife will be established on all affected areas of land.

Land reclamation will take place as soon as possible after surface disturbance. All cut and fill slopes resulting from construction of access roads and railroads will be stabilized and revegetated at the first seasonal opportunity. Areas occupied by support facilities such as roads, office buildings, shops, coal handling structures and conveyors will not be reclaimed until conclusion of the mining operations. Demolition and removal of structures should commence in March, April, 2033. Portal seals and grading should commence in June and be completed by September, 2033. Drill and hydroseeding and stream enhancement work should be completed by October 30th. The area should be monitored during July, 2034, and again during July, 2035. At this point shrub and tree density, as a result of planting, can be determined. When the vegetation standard is achieved, the sediment control structures will be removed.

3.6.1 Contemporaneous Reclamation

Interim reclamation (during operations) will occur in areas that are no longer needed or that

to benefit wildlife will be established on all affected areas of land.

Land reclamation will take place as soon as possible after surface disturbance. All cut and fill slopes resulting from construction of access roads and coal yards will be stabilized and revegetated at the first seasonal opportunity. Areas occupied by support facilities such as roads, office buildings, shops, coal handling structures and conveyors will not be reclaimed until conclusion of the mining operations. Demolition and removal of structures should commence in March, April, 2033. Portal seals and grading should commence in June and be completed by September, 2033. Drill and hydroseeding and stream enhancement work should be completed by October 30th. The area should be monitored during July, 2034, and again during July, 2035. At this point shrub and tree density, as a result of planting, can be determined. When the vegetation standard is achieved, the sediment control structures will be removed.

3.6.1 Contemporaneous Reclamation

Interim reclamation (during operations) will occur in areas that are no longer needed or that

require short-term stabilization. These areas will be seeded and mulched. Other areas may be reclaimed at different times during the operation as specific activities are concluded. (Appendix 3-C). This same procedure will apply to any area which becomes available during the life of the mine, and will be implemented upon the first available favorable season.

3.6.2 Soil Removal and Storage

To prevent suitable topsoil from being wasted or contaminated by spoil or other waste materials topsoil will be removed from any new construction areas as a separate operation. The topsoil will be stockpiled and protected from wind and water erosion and contamination which might lessen its capability to support vegetation. The following subsections deal specifically with the various phases of the topsoil and subsoil handling plan. There is approximately 2,600 cu. yds. of topsoil on site in Bear Canyon. The balance of 5,500 cu. yds. has been purchased from RACO Company and was tested to insure its compatibility. Sec. 8.6 pages 8-16 through 8-16D detail storage. (See Appendix 3-D).

require short-term stabilization. These areas will be seeded and mulched. Other areas may be reclaimed at different times during the operation as specific activities are concluded. (Appendix 3 - C)

3.6.2 Soil Removal and Storage

To prevent suitable topsoil from being wasted or contaminated by spoil or other waste materials topsoil will be removed from any new construction areas as a separate operation. The topsoil will be stockpiled and protected from wind and water erosion and contamination which might lessen its capability to support vegetation. The following subsections deal specifically with the various phases of the topsoil and subsoil handling plan. There is approximately 2,600 cu. yds. of topsoil on site in Bear Canyon. The balance of 2,500 cu. yds. has been optioned from RACO Company and is presently being tested to insure its compatability. If this material is satisfactory, it will be purchased stockpiled and revegetated at its present location (adjacent to CV Spur - Carbon County, Utah. (See Appendix 3-D)

Topsoil Removal

At the start of any construction phase, topsoil has been collected from the area where useable soil existed. Existing vegetation has been removed and the topsoil collected prior to excavation or other surface disturbance operations within the affected areas.

The depth of topsoil removal in each case depends on the amount of A and B horizon material as defined in OSM Regulation 30 CFR 783.21 and 783.22.

The topsoil removed in these areas consists of A horizon quality material and B horizon quality material. The C horizon material was not removed since it is not sufficiently capable of supporting diverse vegetation. Chapter 8 presents additional soil information.

The equipment used for topsoil removal consisted of bulldozers, front-end loaders and dump trucks. The use of bulldozers require pushing of the topsoil to a collection point for loading into

dump trucks or other means of transportation to the designated stockpile. Adequate supervisory personnel were present at the time of topsoil removal to instruct the equipment operators in the proper techniques of topsoil removal and to ensure that required horizons were removed and stored.

Topsoil Stockpile

During any stockpiling operation, unnecessary compaction was prevented by limiting the equipment traffic over the stockpile.
Plans involving topsoil storage can be labeled as "short term" or "long term" depending on completion of activities in each area and the reclamation schedule presented in Section 3.6.6.

o Short-Term Topsoil Storage Areas

Short-term stockpiles of topsoil will be for areas to be reclaimed almost immeadiately upon cutting and at final grade. Topsoil will be redistributed promptly to minimize natural degradation processes. (such as pipeline trenches, etc.)

Long-term Topsoil Storage Areas

During any new construction of areas that will be used for the duration of the mining operation within the permit area, topsoil will be collected and and stockpiled. The topsoil will be used later for postmining reclamation of the abandonment areas. Other long-term stockpiles will be established at the proposed loadout site.

Topsoil Protection

The short-term topsoil stockpile will be sprayed with water or temporarily vegetated to retard erosion. The long-term topsoil stockpile will be protected by the following operational steps:

- A stable surface will be provided in an area outside the influence of active operation.

- As a stockpile is completed, it will be left in a rough condition to minimize erosion.

- Stockpiles will be situated and protected to prevent water erosion and sprayed with a tacifying agent.

- Storage piles will be vegetated with quick-growing soil-stabilizing plants.

- Signs will be posted to protect the stockpiles from accidental use as fill or from other inadvertent material contamination.

- The establishment of noxious plant series will be prevented.

The stockpiled topsoil will not be removed or otherwise disturbed until required for the redistribution operation on a prepared, regraded disturbed area.

Topsoil Redistribution

Prior to topsoil redistribution, regraded land will be scarified by a ripper-equipped tractor. The ground surface will be ripped to a depth of 14" in order to reduce surface compaction, provide a

roughened surface to assure topsoil adherence and promote root penetration.

Within a ten day period prior to seeding, topsoil will be distributed on all areas to be reclaimed. During this time the topsoil will be allowed to settle and attain equilibrium with its natural environment. This procedure will be followed for all areas in which facilities such as roadbed, mine pads and building sites are to be abandoned.

Topsoil redistribution procedures will ensure approximate uniform thickness of 6" consistant with the proposed reclamation plan. Topsoil will be redistributed at a time of the year suitable for ? establishment of permanent vegetation.

To minimize compaction of the topsoil following redistribution, travel on reclaimed areas will be limited. After topsoil has been applied, surface compaction will be reduced by using a dryland chisel ? plow running at a suitable depth. This operation will also help prepare a proper seed bed and protect the redistributed topsoil from wind and water

erosion. Co-op Mining Company will exercise care to guard aganist erosion during and after application of topsoil and will employ the necessary measure outlined in Chapter 8, to ensure the stability of topsoil on graded slopes.

3.6.3 Final Abandonment

Co-op Mining Company anticipates that the postmining land uses of the permit area will be the same as the premining. State and local governments have not proposed any land use changes for the postminig period. This section delineates the abandonment and reclamation steps to be taken which will allow a return to the original land use once mining operations are complete. In general, disturbed portions of the mine plan area will be returned to their original wildlife/grazing habitat.

Method of Achieving and Supporting Postmining Land Uses

The following presents the abandonment steps and revegetation/reclamation activities which represent the method of achieving and supporting postmining land uses. The activities are organized in the ap-

proximate order of execution. These listed activities are also discussed in Chapter 4.

3.6.3.1 Sealing of Mine Openings, Drill Holes, Wells, etc.

Exploratory Holes, Bore Holes, and Wells

Upon abandonment of drilling operations, all drill holes are to be cemented with an approved slurry. The slurry mixture will consist of 5.2 - 5.5 gall. of water per bag of cement. Co-Op is committed to plugging all drill holes with 5 feet of cement as required by rule M3(5) UMLR Act of 1975.

Shafts

The shafts will be filled from bottom to collar with non-combustible material. A cap consisting of a 6 inch thick reinforced concrete slab will be used as a seal.

The cap will be equipped with a 2 inch diameter vent pipe and will extend for a distance of 15 feet below the surface of the shaft collar.

Mine Entries - UMC 817.13-15

Seals will be installed in all entries as soon as mining is completed and the mine is to be abandoned. The seals will be located at least 25 feet inside the portal mouth entry. Prior to installation, all loose material within 3 feet of the seal area will be removed from the roof, rib and floor. The mine entry seals will be made of solid concrete blocks (average minimum compressive strength of 1,800 lfb/in^2 tested in accordance with ASTM C140-70) and mortar (1 part cement, 3 parts sand and no more than 7 gallons of water per sack of cement) to form a wall two blocks thick.

Seals will be installed in the following manner: The seal will be recessed at least 16 inches deep into the rib and 12 inches deep into the floor. No recess will be made into the roof. The blocks will be at least 6 inches high, except in the top course and 8 inches wide. The

The blocks will be laid and mortared in a transverse pattern. In the bottom course, each block will be laid with its long axis parallel to the rib. The long axis in succeeding courses will be perpenducular to the long axis block in the preceding course. An interlaced pilaster will be constructed in the center. The seals will have a total thickness of 16 inches. Where conditions permit, the portal seals will be graded to conform with existing surface contours and planted. In those instances where izable highwalls established in preparing the portal site cannot be returned to original contours, the opening in front of the wall will be filled with non-combustible material as above and the portal and entire exposed seam on the highwall will be covered with 6 to 8 feet of non-combustible material, graded, covered with suitable material and seeded. For illustration of a typical seal, see Fig. 3-1 .

3.6.3.2 Removal of Surface Structures

Co-op Mining Company will restore disturbed land-surface areas to their approximate premining conditions, to the extent technologically and economically feasible.

The blocks will be laid and mortared in a transverse pattern. In the bottom course, each block will be laid with its long axis parallel to the rib. The long axis in succeeding courses will be perpendicular to the long axis block in the preceding course. An interlaced pilaster will be constructed in the center. The seals will have a total thickness of 16 inches. Where conditions permit, the portal seals will be graded to conform with existing surface contours and seeded. In those instances where sizable highwalls established in preparing the portal site cannot be returned to original contours, the opening in front of the wall will be filled with non-combustible material as above and the portal and entire exposed seam on the highwall will be covered with 6 to 8 feet of non-combustible material, graded, covered with suitable material and seeded. For illustration of a typical seal, see Fig. 3-1. Temporary seals are discussed in Appendix 3-F.

3.6.3.2 Removal of Surface Structures

Co-Op Mining Company will restore disturbed land-surface areas to their approximate premining conditions, to the extent technologically and economically feasible. All surface facilities including support facilities will be removed and restored to prevent damage to fish, wildlife, and associated environmental values.

Building Removal

Office, shop, storage, scale, buildings and bath house:

- Each structure will be removed.
- Foundations will be removed if they are close to the surface. Deeper foundations will be fractured and covered with at least 3 feet of dirt.

Road Abandonment

The access road and small support roads will be reclaimed. Culverts and blacktop surfacing material will be removed. Reclamation would then include recontouring, ripping, adding cross drains, water bars, topsoil and seed. See Appendix 3-G, Detailed Plan.

Mine Operational System Removal.

Systems such as domestic water will be phased out and removed or buried.

Area Cleanup

Building Removal

Office, shop, storage, scale, buildings and bath house:

- Each structure will be removed.
- Foundations will be removed if they are close to the surface. Deeper foundations will be fractured and covered with at least 3 feet of dirt.

Road Abandonment

The access road and small support roads will be reclaimed. Culverts and blacktop surfacing material will be removed. Reclamation would then include recontouring, ripping, adding cross drains, water bars, topsoil and seed.

Mine Operational System Removal

Systems such as domestic water will be phased out and removed or buried.

Area Cleanup

Solid waste generated in the abandonment operation will be collected and removed.

3.6.3.3 Disposition of Dams, Ponds and Diversions

After the disturbed areas are stabilized and runoff is comparable to the area's premining conditions without detention time, the site drainage system will be removed. The site drainage system areas will be backfilled and revegetated. All ponds will be drained and allowed to dry; thereafter they will be backfilled and revegetated.

Natural drainage patterns will be returned to a horizontal drainage pattern similar to the original.

3.6.4 Backfilling and Grading Plans

The objective of the proposed backfilling, soil stabilizing, compacting, contouring and grading process is to achieve a reclaimed surface which will

provide a variety of topographic features enhancing postmining land use.

Reclamation earthwork activities will be conducted as oulined in Section 4.5, Postmining Land Use and Section 3.6.6, Schedule of Reclamation. The steps to be taken in the backfill, soil stabilization, compaction, contouring and grading problems are described in the following subsections. Stability annalyses of backfilled areas are discussed in Appendix 3- F.

Backfilling operations, utilizing equipment such as rubber-tired srapers, front-end loaders and dump trucks, will be conducted in the portal and treatment facility areas. Holes or depressions will be filled when the mining operation is concluded. Compaction operations utilizing equipment such as sheeps-foot tampers, will be conducted to stabilize all filled holes and depressions. The portal fill material will be put in place with an LHD (load, haul, dump) unit to ensure proper backfilling.

In general, the backfilling and grading operation will take place in the following manner:

1. All mining portals will be sealed and backfilled as previously described.

2. Solid waste generated in the facilities removal will be collected and removed to an approved landfill.

3. A backhoe and dozer will work in conjunction to remove the outer edge of the operational benches and compact it against the highwall. This will be accomplished by the backhoe reaching over the edge of the bank approximately 20' pulling the material back. The dozer will then push and compact this material from the highwall outward to reach a bench slope of approximately IV:0.33h for drainage purposes.

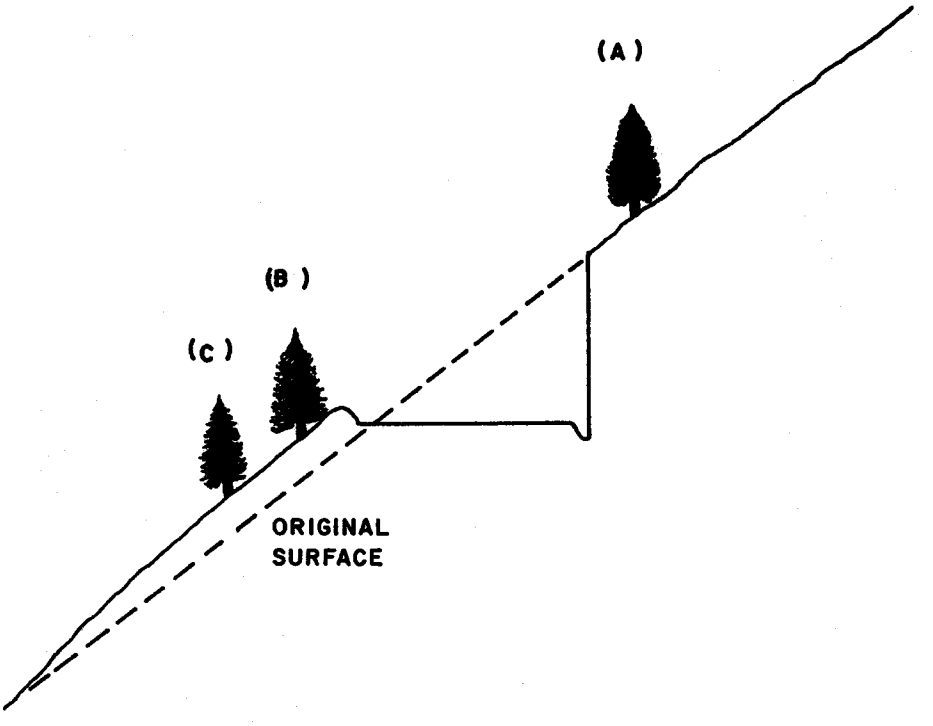
4. This operation will start on the upper bench and work accross the banch to the upper access road.

5. The backhoe and dozer will work in the same manner to eliminate the access road, working down to the lower pad. A typical cross-section of the reclaimed road cut is shown in Fig. 3.6.4-A.

6. The above procedure will continue on down the canyon reshaping the mine yard and disturbed area to the configuration shown on Plate 3-2, Postmining Topography.

7. As backfilling and grading is completed, operational areas will be scarified by ripping to a depth of 14" with a dozer where possible. Steep slopes will receive special ripping to create ledges, crevices, pockets and screes. This will reduce compaction and prevent topsoil slippage, and improve soil retention and vegetation establishment

EXISTING



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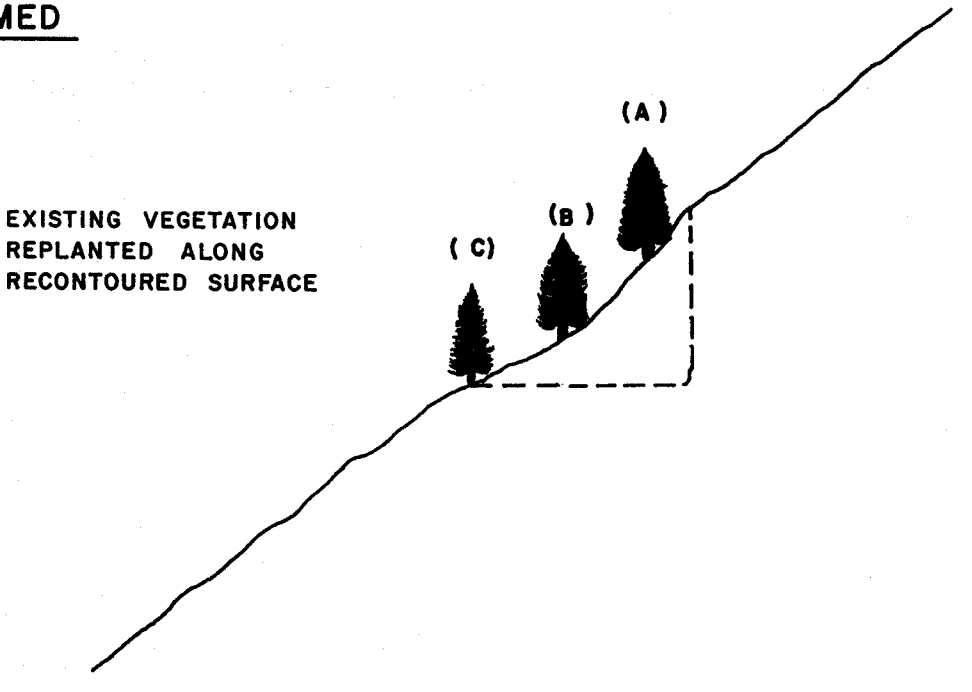


TYPICAL SLOPE RECLAMATION	ATTACHMENT 2	FIGURE NO. 3.6.4.-A

8. Topsoil will be spread over the disturbed areas after the grading and ripping is complete.

9. Upon completion of the above, the area will be reseeded as per the plan.

10. Material used for the recontouring will be taken from side slopes or other existing embankments within the disturbed area. In general, material to be compacted or used for fill will be taken from a side slope or embankment close enough to allow for pushing into place by a dozer, rather than loading and hauling by truck.

3.6.4.1 Recontouring

The cut slopes will be constructed in a manner which will achieve the necessary physical stability. This design will prevent slides and other related erosional damage. Upon abandonment, slopes will only be reduced to the amount physically possible. This amount will be limited to the reach of a back hoe, approximately 20'. Steep slopes and highwalls are inaccessible to conventional equipment, and thus, cannot be reduced or flattened qppreciably during reclamation. Stability analyses on these areas have confirmed that they have a factor of safety greater than 1.3 as they presently exist.

Stability and the designated post-mining land use can be achieved without extensive backfilling and return to the approximate original contour.

In February 1981, a slope stability analysis was performed by Dames & Moore on the Bear Canyon Mine access road. The purpose of this study was to analyze the static safety factor of the side-cast cut and fill slopes along this road. The conclusion of this study was that the slope stability had a safety factor ranging from a minimum of 1.43 to 2.15. This study was performed on the soil characteristics of the down-cast material which was not compacted. This is the same material that will be partially pulled back and compacted against the highwalls, increasing both the cohesion and unit weight of material and increasing the safety factor above the minimum of 1.43. This will result in a factor of safety well above the required 1.3. (Copies of the Dames & Moore report along with an earlier report are included in Appendix 3-F.)

3.6.4.2 Removal or Reduction of Highwall

Highwalls will be reduced to the extent practiceable to develope a static safety factor of at least 1.3.

Only those highwalls that can be lessened by reaching with a backhoe will be reduced. Highwalls greater than 20' in height will be left as shown on Plate 3-2, Postmining Topography; however, these highwalls are shown to have a stability safety of greater than 1.3 by the following analyses:

A 1981 slope stability study of the Bear Creek Mine Access Road by Dames and Moore indicated a static safety factor of 1.43 to 2.15. (Appendix 3-F). This study was performed to analyze the static safety factor of the side-cast cut and fill slopes along the Bear Creek Portal Access Road. The maximum static safety factor of 2.15 was achieved in the trial arc which included the highwall area. (Shown on Plate 2 of their report). As a furthur note on page 5 of their Feb. 20, 1981 report, they indicate, "It should be noted that the factor of safety of the trial arc which cuts deep into the slope does not consider the presence of bedrock, increasing strength of the natural soils with depth, or the effect of the calcium carbonate cementation in the soil. If the above were incorporated

into the analysis, the factor of safety would be significantly higher." Since the highwalls are commonly made up of varying layers of bedrock material, it is reasonable to assume their strength and stability will increase accordingly.

As a further check on the highwall stability, a separate analysis was performed using a different method. This analysis uses the Hock method, and is based on rock parameters typical of those contained in the Blackhawk Formation of the Wasatch Plateau. The safety factor is calculated using the following parameters:

Maximum Slope Height	100'
Slope Angle	80
Rock Mass Cohesion	65 psi
Rock Mass Friction Angle	31
Rock Mass Bulk Density	155 lbs/ft^3

Based on these parameters, and utilizing the Hock charts, included as Fig. 3.6.4.2.A and Fig. 3.6.4.2.B, the highwalls have a safety factor of 2.61 for dry conditions and 2.40 for saturated conditions.

Figure 3.6.4.2.A

(DRY CONDITIONS)

CIRCULAR FAILURE CHART NUMBER 1

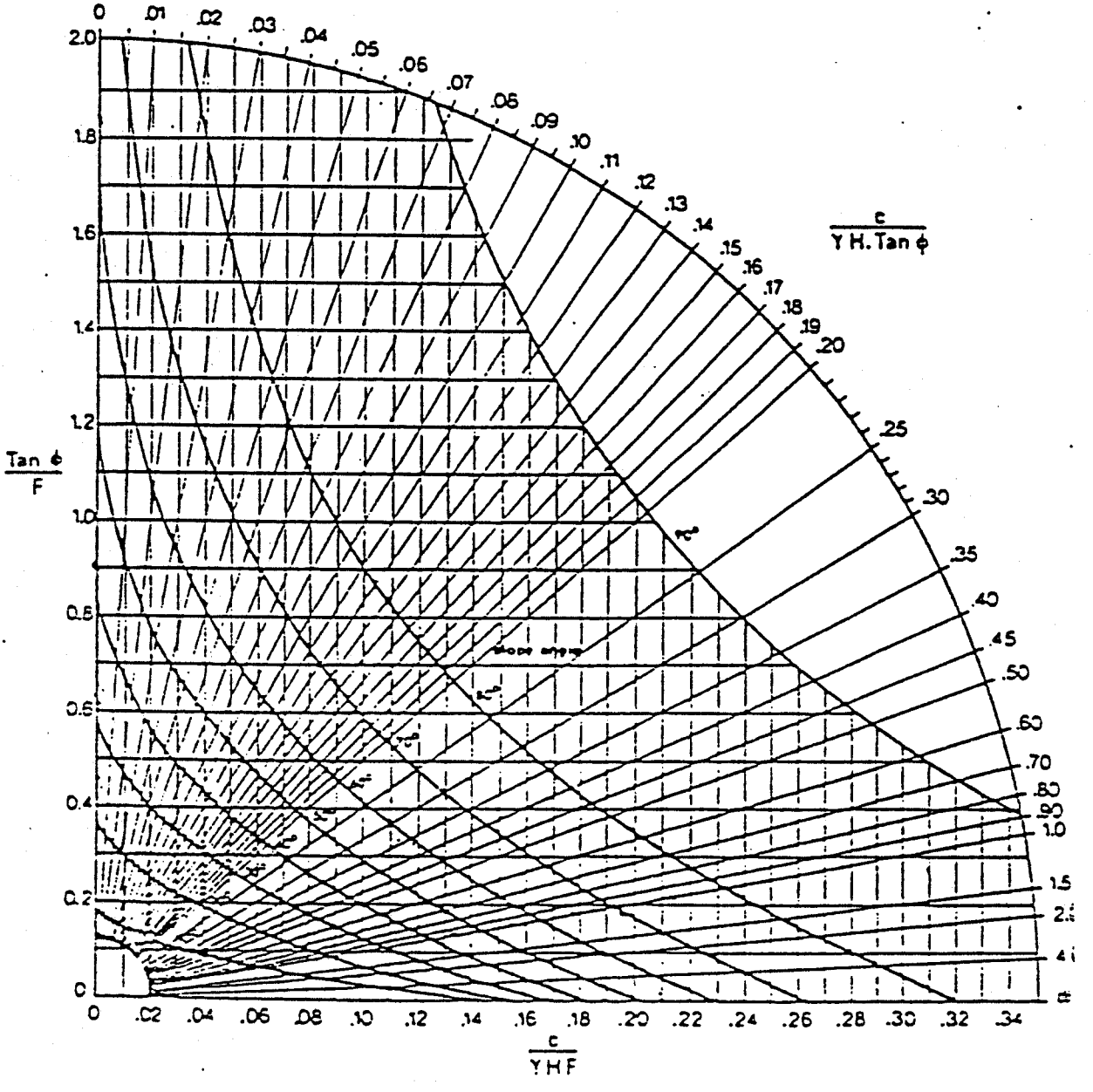
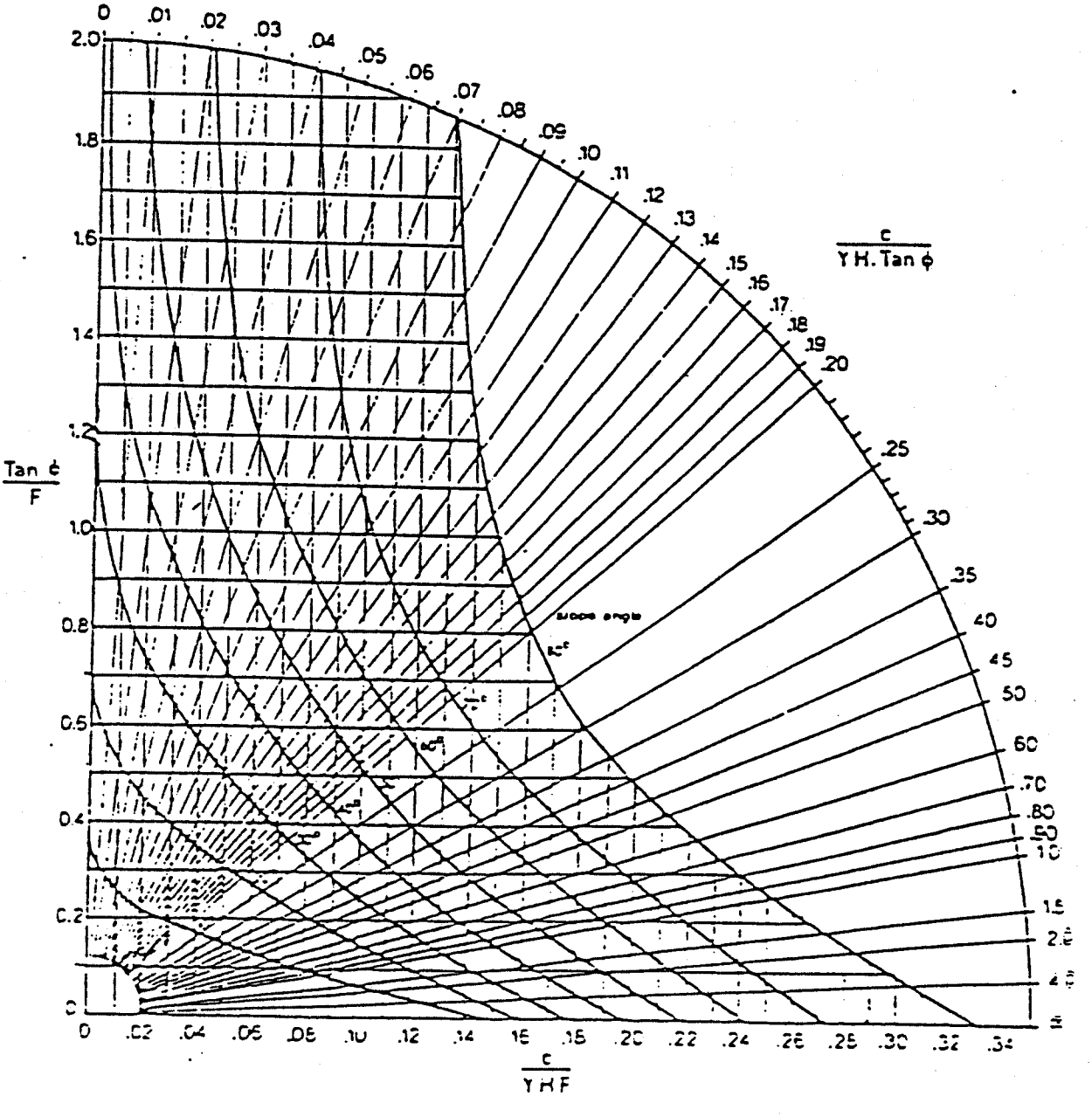


Figure 3.6.4.2.B

(SATURATED CONDITIONS)

CIRCULAR FAILURE CHART NUMBER 5



This agrees with the projections made in the Danes and Moore report, and furthur substantiates that the highwalls proposed to be left in place will have a static safety factor of greater than 1.3.

Retention of highwalls is therefore proposed based on the following:

1. The retained highwalls will not be significantly greater in height or length than the dimensions of existing cliffs in the surrounding area. Extensive, high cliffs are common in the Wasatch Plateau.

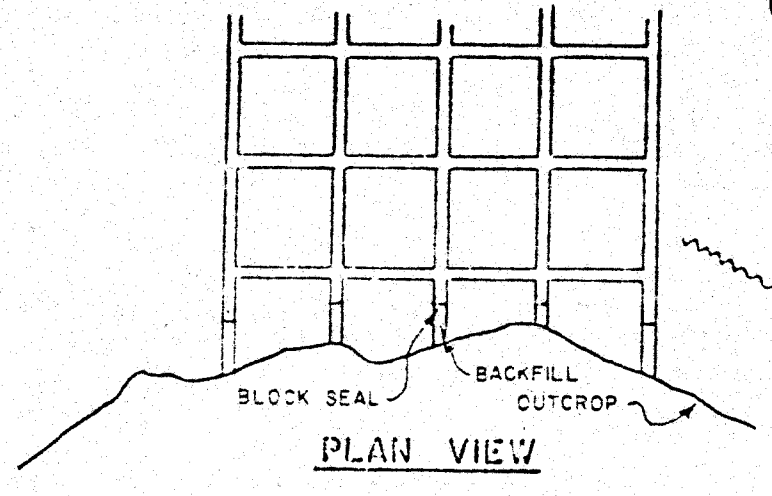
2. The residual highwall is similar in structural composition to the pre-existing cliffs in the surrounding area, and will be compatible with the visual attributes of the area. Highwalls are composed primarily of sandstones and sandy shales which are common in the natural cliffs of the area.

3. The residual highwall will have a static safety factor of greater than 1.3 and will be compatible with the geomorphic processes of the area. The rock types common in the highwall are very similar to those in surrounding vertical cliffs; therefore, the highwalls will react similarly to the geomorphic processes in this area.

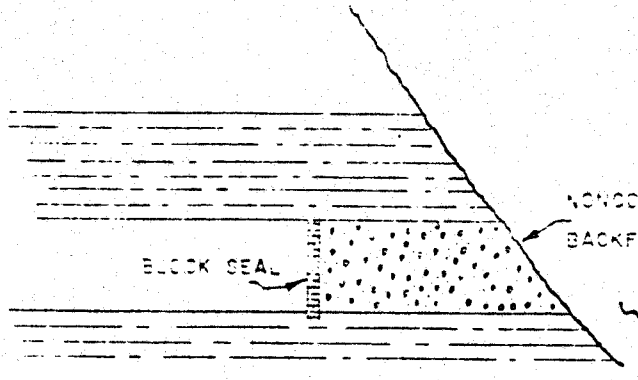
3.6.4.3 Terracing and Erosion Control

The need to terrace some of the steeper slopes within the mine plan area currently is not anticipated.

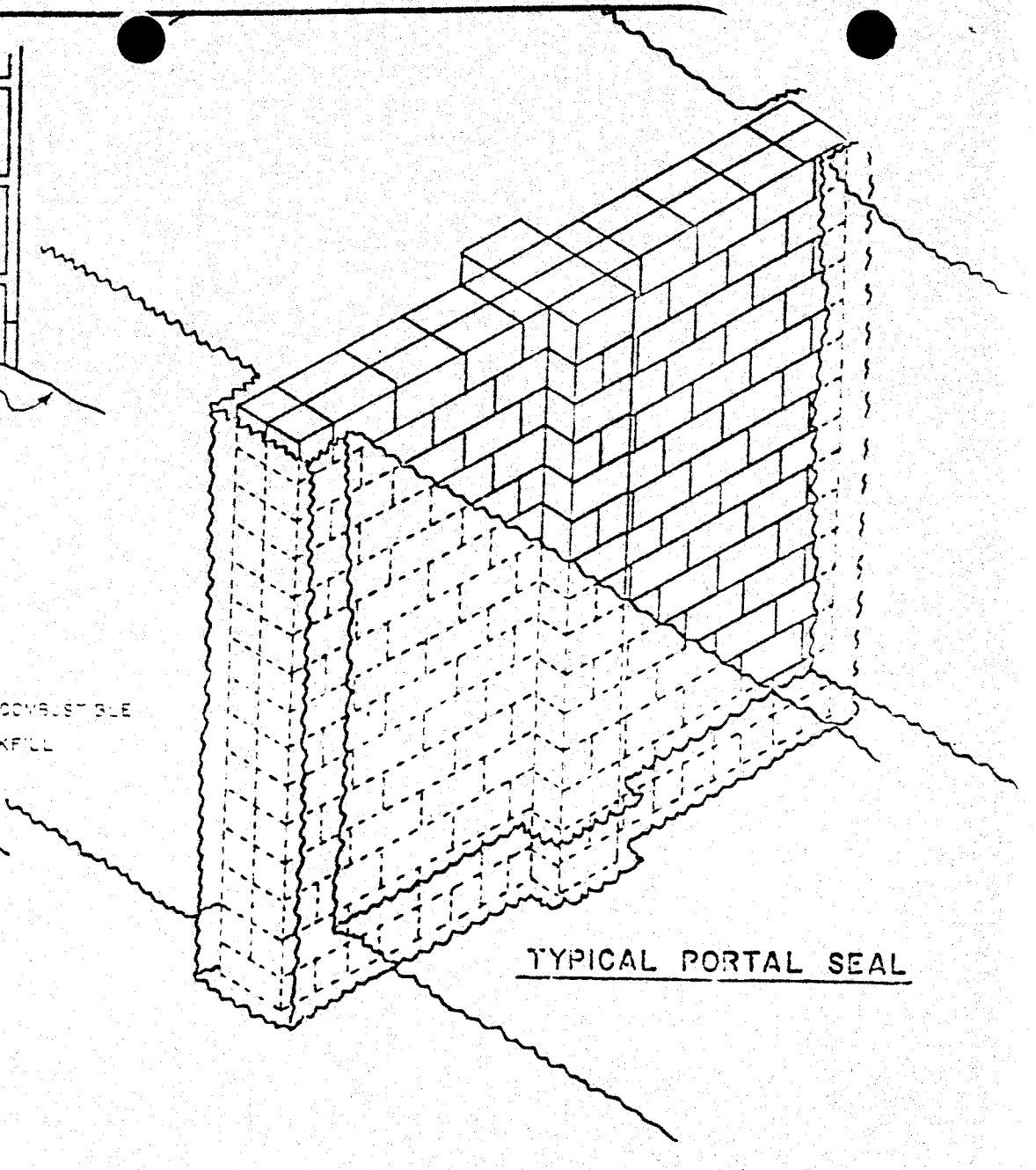
Erosion control measures which will be employed are specific to each situation. Mulching to reduce and limit rainfall impact will be a widely used erosion control practice.



PLAN VIEW



SECTION VIEW



TYPICAL PORTAL SEAL

PORTAL SEALS

Fig 3-1

3.6.4.4 Soil Redistribution and Stabilization

Prior to redistribution, the regraded land will be scarified by a ripper-equipped tractor. The ground will be ripped to a depth of 14" to reduce surface compaction, provide a roughened surface to assure topsoil adherence and promote vegetational root penetration.

Within a 10 days period prior to seeding, topsoil will be distributed on all areas to be reclaimed. During this time, the topsoil will be allowed to settle and attain equilibrium with its natural environment. This procedure will be followed for all areas in which facilities such as roadbeds, mine pads and building sites are to be abandoned.

Topsoil redistribution procedures will ensure an approximate 6" thickness consistent with the proposed reclamation plan. Topsoil will be redistributed in the fall of the year suitable for establishing permanent vegetation.

To minimize compaction of the redistributed topsoil, travel on reclaimed areas will be limited. After topsoil has been applied, surface compaction will be reduced with suitable equipment. This operation

will also help prepare a proper seedbed and protect the redistributed topsoil from wind and water erosion. Co-Op Mining Company will exercise care to guard against erosion during and after application of topsoil and will employ the necessary measures to ensure the stability of topsoil on graded slopes as outlined in Chapter 8 page 23.

In addition to the vegetative stabilization discussed in Section 3.6.5 Revegetation Plan, physical stabilization of the soil is also planned. The specific methods to be implemented are defined in Chapter 8 page 23. An example of the soil stabilization methodology that will be used includes the placement of

crushed and heavier material at the toe of road-fill slopes.

3.6.5 Revegetation Plan

All disturbed areas will be planted and revegetated during the first appropriate season following grading and topsoil redistribution procedures and will include, as necessary, the addition of remedial soil treatments. A suitable, permanent, diverse vegetative cover, selected on the basis of UDWR recommendations, will be established on all reclaimed areas. The proposed reclamation schedule is presented in Section 3.6.6, Schedule of Reclamation. The following subsections describe the major aspects of the proposed revegetation plan.

3.6.5.1 Soil Preparation

Scarifying Areas

Operational areas will be scarified to reduce compaction and to prevent topsoil slippage. Steep slope areas which must remain after abandonment will receive special ripping to create ledges, crevices, pickets and screes. This will allow better soil retention and

and vegetation establishment.

Fertilization and Neutralization - UMC 817.25

The topsoil will be tested before it is seeded to determine the type and amount of fertilizer or neutralizer required. Soil analyses will measure the following components:

- Micronutrients
- Potassium, calcium, magnesium
- Phosphorus
- Nitrogen
- Soil pH and salinity
- Soil texture

Chemical analyses for micronutrients may be conducted by testing soil extracts with DTPA solution and measured by use of an atomic absorption analyzer. Ammonium acetate may be used to extract potassium, calcium and magnesium for atomic absorption analysis. Phosphorus may be determined with sodium bicarbonate extraction and colorimteric analysis. The Kjeldahl method may be used for determination of total nitrogen. Soil texture may be determined by a Bouyoucus hydrometer method (solium herametaphosphate dis-

persing agent). Soil pH may be determined on a 1:1 soil/water mixture tested with an electrode pH meter. Salinity may be analyzed by using a Wheatstone conductivity cell on an extract of each soil sample.

All necessary fertilization or neutralization, as determined by soil testing will be done.

3.6.5.2 Seeding and Transplanting

Steep slopes will be seeded with a hydro-seeder. Gently sloping and flat areas will be seeded with a drill seeder. Many shrubs and all trees will be planted by hand setting to ensure a permanent plant cover.

3.6.5.2.1 Species and Amounts/Acre - Shrubs, Trees, Grasses and Forbs - Different Plans for Different Areas

With UDWR recommendations and the 1981 vegetation field study as a basis, a suitable permanent, effective and di-

verse vegetative cover of species native to the permit area, or appropriate substitutes, will be established on all affected areas.

Plants used to revegetate the disturbed sites will be selected specifically for the vegetative community to be established in the given area.

The dominant species used for each vegetative type will be chosen on the basis of premine diversity values (see Section 9.3.6), available seed source and enhancement of postming land use. Some of the native plants to be used for revegetation will be wheatgrass, salina wildrye, sagebrugh, pinyon and juniper.

The species ultimately selected for use and the numbers or amounts per acre will depend also on the steepness and exposure of the slopes to be revegetated. For south-facing and sunny slopes, a mixture of big sagebrush, rubber rabbitbrush, Saskatoon service-berry, pinyon pine and Utah juniper may be planted by hand-set-

ting or seeding on an appropriate schedule to produce the equivalent of 1-m (3.25 foot) intervals.

Further recommended species and seeding protocol can be found in Appendix 9C and 9D.

3.6.5.2.2 Methods Including Quantity and Spacing

Methods, quantity and spacing of seeding are covered above in Section 3.6.5.2 and 3.6.5.2.1

3.6.5.3 Mulching

On all reclaimed areas a wood fiber mulch will be used to enhance the moisture retention required for seed germination. Mulch will have tackifier to adhere to the soil. The steeper slopes will require a hydromulch of a more permanent nature and/or the addition of burlap or soil-retaining matting. Mulch with tacifying agent may be used on steep banks.

3.6.5.4 Irrigation

Since the species used for reclamation are known for their survival characteristics, it is felt that artificial application of additional water will not be required. Should lower than average precipitation or irregularities in distribution of precipitation occur following the initiation of reclamation procedures, irrigation may be used on a short-term basis. Otherwise, irrigation may be primarily used if initial revegetation attempts fail and if such irrigation is considered to be a major factor in achieving revegetation.

3.6.5.5 Management

Deer and rodent use of areas planted with tree and shrub species will be observed yearily. If heavy use of the planted trees and shrubs by deer appears probable, appropriate protection measures will be taken. Also, should significant rodent damage become likely, a control program may be developed in conjunction with UDWR and appropriate land management

3.6.5.4 Irrigation

Since the species used for reclamation are known for their survival characteristics, it is felt that artificial application of additional water will not be required. Should lower than average precipitation or irregularities in distribution of precipitation occur following the initiation of reclamation procedures which temporarily precludes vegetation establishment, a preferred course of action would be to replant problem areas.

3.6.5.5 Management

Deer and rodent use of areas planted with tree and shrub species will be observed yearily. If heavy use of the planted trees and shrubs by deer appears probable, appropriate protection measures will be taken. Also, should significant rodent damage become likely, a control program may be developed in conjunction with UDWR and appropriate land management

agencies.

3.6.5.6 Vegetative Monitoring, Revegetation Success, Assessment and Test Plots on Interum Revegetation

All interum seeded areas will be inspected at the end of each growing season to determine the success of the seeding program for a period of at least five years (reclamation years 1-5). Where success is apparent, as represented by achievement of 80% original cover during the 5-year period, monitoring will be immediately investigated to determine the possible failure cause(s), so that positive steps can be taken to establish the desired interum vegetation during the next seasonal opportunity. Planting and/or seeding will be implemented on a contemporaneous basis as soon as backfilling or grading are complete. This effort will ensure a temporary cover of small grains, grasses or legumes until a permanent cover can be established.

Standard methods, as outlined in Chapter 9, Vegetative Resources, will be applied to determine the degree of success for revegetation attempts.

3.6.5.7 Soil Testing Plan

The soil testing plan is discussed above in Section 3.6.5.1.

3.6.6 Schedule of Reclamation

The general timetable for completing the major steps in reclamation is:

2033-	Landfills and solid wastes will be regraded and seeded as they are completed.
2033-	Underground mine openings will be closed and sealed as they are abandoned.
2033-	Surface facilities will be removed as they become unnecessary.
2033-2034-	The completion of surface reclamation will be in as short a time as possible after operations cease.

3.6.6.1 Detailed Timetable for Completion of Each Major Step in Reclamation

The specific timetable for completing each major step or phase in reclamation is not applicable for all. Reclamation will commence upon abandonment (year 2033).

3.6.6.2 Reclamation Monitoring

Upon completion, the reclaimed area will be monitored to determine when bond release parameters are achieved. If the monitoring indicates inadequacies, and rills and/or gullies develope on reclaimed areas, the damage will be addressed in such a manner to allow re-application of seed and mulch and tack the next available growing season. Earth work will constitute; (1) the diversion of water concentrations away from eroded areas with small hand-made berms, (2) distribution of additional soil if necessary to fill gullies, (3) recontouring with equipment as warranted and, (4) re-application of seed, tack, mulch and fertilizer in the approved manner as outlined in Chapter 9.

If gullies constitute an overall change in drainage

pattern, a plan to stabilize and modify drainage pattern will be submitted to the Division for approval prior to implementation.

The monitoring procedures will be the same sampling methodologies which were incorporated in establishment of the reference areas. Starting in year 3 after reclamation, years 1 and 2 will be ocular estimates with the intent of identifying problem areas.

The success of the reclamation effort will be evaluated by detailed sampling of cover and production on reclaimed areas. The data from the reclaimed areas and the reference area will be collected during the same growing season. If there is no significant difference in cover and production between the reclaimed areas and the reference areas when tested at the 95 percent significance level using a one-tailed t-test, then the areas will be judged to be adequatly reclaimed relative to cover and production. Woody plant density will be determined by sampling each reference area prior to planting in order to establish a standard for each vegetation type.

Cover and production on reclaimed and reference areas will be measured using the same methods employed during the baseline studies. Cover will be estimated in randomly located 1.0 square meter quadrats. Production will be measured using a SCS methodology. Shrub density will be evaluated based on the procedure described above.

One of the greatest challenges of revegetation is to create reclaimed areas which have a large number of desireable species. Species diversity on the reclaimed areas will be encouraged by including a

variety of grasses, forbs, and shrubs in seeding and planting mixes. Species diversity will be judged adequate when the relative cover and percent distribution of biomass for the major life form groups approximates that which occurs in the reference areas. That is, if the relative cover by perennial grasses is 50 percent in the reference areas, then the relative cover by perennial grasses on the reclaimed areas should also be approximately 50 percent. This same relationship should also hold true for productivity. If most of the cover and production were being provided by annual forbs on the reclaimed areas and by perennial grasses on the reference areas, then the reclamation would be judged unsuccessful.

The purpose of the above procedures is to demonstrate that based on cover, production, woody plant density, and species diversity, the disturbed areas have been returned to stable plant communities capable of withstanding the intended post-mining land use.

3.6.7 Schedule of Reclamation for Co-Op Bear Canyon Mine

3.6.7.1 Detailed Timetable for Completion of Major Reclamation Processes

The following schedule of reclamation is proposed to be initiated within 90 days (weather permitting) of final abandonment of the mining operation:

		Acc. Time
1.	Seal Portal - 1 week	1 week
2.	Remove Structures - 2 weeks	3 weeks
3.	Soil Placement (backfilling & grading)	
	a. Upper Pad - 1 week (Including Road)	4 weeks
	b. Channel Restoration - 1 week	5 weeks
	c. Lower Pad & Diversion - 1 week (Including Road)	6 weeks
4.	Seedbed Material & Hindling - 1 week	7 weeks
5.	Reseeding & Fertilizing - .5 week	7.5 weeks
6.	Mulching - .5 week	8 weeks
7.	Protective Fencing - 2 weeks (concurrently)	
		8 weeks

The above reclamation tasks are therefore proposed to be completed within 8 weeks following the start of reclamation activities.