Route 4 COMMENTS
RETURN TO KMT BY APR. 6, 79
3/19

TJS 3/20

Let's have something worth reviewing
- specs on hydrology
- Sed. disposal plan
- Water Quality Monitoring plan

Agree with Mike's Comments

This is the prelim plan, I don't think we can expect a lot of detail now. But, where is the plan? 3/26 Ra

✓ p.36 – Time Required for Compliance
These estimates of time spans need to be placed within a time frame so that seeding occurs at the proper time, ie mid-Oct to mid-Feb.

✓ p.25 – In regards to the naturally revegetated area (Area B in Willow Creek Canyon, at least 3 of the species it is revegetated with are official weeds. Perhaps instead of completely dozing the area & reseeding it, methods such as

(OVER)

harrowing or interseeding by drilling should be employed. That way, since this area is along ~~the~~ creek, there won't be a gross erosion / sediment problem.

MAN

Comments Sowbelly Gulch

P14-15 1. Development of retention areas by constructing basin-shaped terraces & small retention basins for runoff from structures has a potential problem. Back-to-back 10-yr. 24 hr. storms may occur & impound considerable water & possibly overtop back.

P. 16 2. Allowing runoff from undisturbed areas to pass over cut banks before being diverted away from the disturbed area is allowable in some cases - where construction of diversion ditch above such cut is either dangerous or sediment load caused by water flowing over such cut is less than sediment picked up in a diversion ditch constructed above the cut. The advantage to this concept is that the amount of disturbed land is not increased by the construction of a new ditch. If the cut is in regolith the face must be revegetated.

P.16 Check out area to be regraded in field. Reveg. with previously mentioned seed mix?

P. 17 OSM cannot expect 100' barrier between disturbed area & stream for pre-existing structures. Propose reveg. area between rd. & stream.

P. 17 Time limit for sealing shaft & reclaim immediate area.

Map Covered culvert needed for entire length of diversion by bathouse

Map possible pond location on w. side of road across from unused shaft.

SEDIMENT DISPOSAL PLAN?

WATER MON. PLAN?

Time Schedule?

Comments - Hardscrabble Cyn.

P.18 Time schedule for work, phase out & interim rec. of plant site?

✓P.19 How can fines ~~to~~ from prep plant be placed underground & be in compliance with MSHA?

P.20 See area mentioned in last sentence in field inspection!

✓P.21 Some work (ie culverts, drainage, reveg.) can begin prior to removal of prep plant.

✓P.21 Where will 2' of soil cover come from?

✓P.22 Construction portion of diversion in refuse is acceptable.

✓P.22 Sediment control will be needed (required) for reclaimed processing plant area until revegetated. Sediment ponds are not the only alternative. Straw dikes, grading, netting etc. may be appropriate.

✓P.23 Retention area comment - see #1 of Sowbelly Gulch comments

✓map Construction design & hydrology for sed. pond by bathouse needed.

map need berm specs. for disturbed area adjacent stream

✓Sed. Disposal Plan?

✓Water Mon. Plan?

Comments - Willow Creek

✓ P.25 Natural reveg. with invading species is not in compliance. Must revegetate.

P.26 See unstable areas in field inspection.

✓ P.27 Must submit ~~[illegible]~~ Conveyor crossing design prior to constr. - possible spillage into creek.

✓ P.27 Areas H, B & C are not in a steep confined canyon bottom - There is room for sed. ponds. Therefore, sed. retention basins will not be accepted.

✓ P.28 Ponds, monitoring, reveg etc. should be required prior to any new construction

SED. DISPOSAL PLAN?
WATER MON. PLAN?
TIME SCHEDULE?

Comments - TRASH CYN. & UT. FUEL #1

~~P.31 - where will~~

Comments - CASTLE GATE

P.33 Are 3 ponds designed to handle plant water plus excess runoff?

P.34 Valley fill?

Map May possibly need more reveg. than what is shown

WATER MON. PLANS?

SED. DISPOSAL PLAN?

36.

Braztak

Sowbelly Gulch

- generally agree w/ Mike's comments
15 — what are they proposing to revegetate diversions or all disturbances? mulch? fertilizer? adequate seed rate?
16 — remove coal & refuse before regrading slope & covering with soil? where is soil coming from?
General Comment — what are they going to do w/ sed. from retention basins? these will require fairly frequent maint. if they are to be effective.

Hardscrabble Canyon

- same comments as Mike
- what is the BLM seed mix? rate of application? mulch type and rate? fertilization? soil analyses? method of reveg.?

adequate? p. 15

Willow Creek

See MAW's comms.

- reveg. disturbed areas having weeds
- agree w/ Mike's comments
- stream relocation needs to be looked at further.
- "possible" locations for facilities, etc. need to be more specific when detailed plans are submitted.

Trash Canyon & Utah Fuel #1

— OK, need time schedule

Castle Gate

- retention basins OK?
- sed pond for plant water too?
- waste in valley? final regs say no!
- need plans to show they will handle runoff as well

JWS
4-20-79

BRAZTAH CORPORATION
10880 WILSHIRE BOULEVARD, SUITE 1500 (213) 879-5252
LOS ANGELES, CALIFORNIA 90024

February 8, 1979

Department of Natural Resources
State of Utah
Division of Oil, Gas and Mining
1588 West North Temple
Salt Lake City, Utah 84116

RECEIVED
FEB 9 1979
STATE OF UTAH
Division of Oil, Gas & Mining

Attention: Cleon B. Feight
Director

Gentlemen:

Re: Braztah Corporation
Cause No. OSM-001

We submit herewith four copies of a report "Conceptual Design of Compliance Measures for Disturbed Surface Areas, Castlegate Area, Carbon County, Utah" prepared by Golder Associates, Consulting Mining and Geotechnical Engineers on behalf of Braztah Corporation.

The study was instituted in our effort to bring pre-existing non-conforming structures or facilities into compliance with the Surface Mining Control and Reclamation Act of 1977 and applicable regulations promulgated thereunder. The compliance measures discussed in the Golder report have been developed only in such detail to establish feasibility and to provide a basis for review by regulatory agencies concerned. Following review and any required modificatons, these will be used as a basis for developing working drawings and ultimate compliance.

Your attention is directed to the estimated cost of compliance at page 35 of the report. As you will no doubt agree, the $442,000 is a staggering sum of money considering that the operator does not have clear unambiguous final regulations to follow. We point out to you the great uncertainty in our mind as to what regulations we must follow, particularly in view of the uncertainties of the regulations currently being considered by the Utah Legislature in the form of House Bill 138 as it relates to said Act and regulations.

Should you have any questions regarding the aforementioned report, please do not hesitate to contact the undersigned.

Very truly yours,

BRAZTAH CORPORATION

Howard J. Bressler

Howard J. Bressler
Vice President

HJB/rsh
cc: Ron Daniels
Coordinator of Mined
Land Development

Office of Surface Mining
Denver, Colorado

Golder Associates

Consulting Mining and Geotechnical Engineers

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Golder Associates
CONSULTING MINING AND GEOTECHNICAL ENGINEERS

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FEB 9 1979
STATE OF UTAH
Division of Oil, Gas
& Mining

REPORT TO
BRAZTAH CORPORATION

CONCEPTUAL DESIGN OF COMPLIANCE MEASURES FOR DISTURBED SURFACE AREAS CASTLE GATE AREA CARBON COUNTY, UTAH

BRAZTAH CORPORATION P.O. B 01917

Distribution:

10 Copies - Braztah Corporation
Helper, Utah

2 Copies - Golder Associates
Seattle, Washington

S78253

January 1979

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1.0 INTRODUCTION

This report has been prepared in accordance with the terms of our proposal dated March 9, 1978 and accepted by Braztah Corporation Purchase Order No. B-01917. The work covered by the report included a review of current regulations governing the use of surface areas associated with underground coal mines, an investigation of areas currently or formerly in use by the Braztah Corporation in Carbon County, Utah near Castle Gate to determine the degree of compliance and noncompliance with current regulations and, where noncompliance was found, a conceptual design of measures to achieve compliance.

As discussed below in Section 2.0, the principal focus of the review of regulations was on those currently being promulgated by the Office of Surface Mining in response to the Federal Surface Mining Control and Reclamation Act of 1977. The surface areas studied were among those designated in an affidavit to the State of Utah on April 19, 1978 and include the following:

1. Braztah No. 5 Mine (Sowbelly Gulch)
2. Braztah No. 3 Mine (Hardscrabble Canyon)
3. Utah Fuel Portal No. 1
4. Castle Gate Coal Preparation Plant
5. Trash Canyon (Off Highway 50)
6. Braztah No. 6 and 6A Mine (Willow Creek)

Locations of these areas are shown on Figure 1. The areas were visited in July and again in August to define existing conditions and obtain information necessary to develop compliance measures, where required. Only those portions of the areas disturbed by Braztah operations have been considered; disturbance from the operations of previous owners has been excluded from consideration except where it is integrally linked with current operations.

Following a discussion of current OSM regulations and of hydrologic considerations, the report defines areas classifiable as disturbed at each of the locations and proposes conceptual measures to achieve compliance. Compliance measures are developed only in sufficient detail to establish feasibility and provide a basis for review by regulatory agencies concerned. Following review and any required modifications, these will be used as a basis for developing working drawings for execution and ultimate compliance.

2.0 DISCUSSION OF REGULATIONS

2.1 GENERAL

This report addresses primarily the regulations promulgated in response to the Federal Surface Mining Control and Reclamation Act of 1977. Initially our consideration was directed to the final Interim Regulations which were issued December 13, 1977 (Chapter VII of Title 30 Code of Federal Regulations, Subchapter B, Part 717). Part 717 is the section of the regulations dealing with general performance standards for underground mining and these are currently in force and will be in force until issuance of the Final Regulations, which is expected sometime in 1979. However, in late July 1978 the Office of Surface Mining (OSM) issued a draft of the Final Regulations, which have been reviewed and which are currently understood to be in the process of being finalized. We have reviewed the section of the Draft Final Regulations which corresponds to Part 717 (i.e., Part 817 of Title 30, Chapter VIII, Subchapter K) for Environmental Standards-Underground Mining and have found that for those items within our terms of reference the two are similar in most respects, except that the Draft Final Regulations are far more detailed in the requirements for some things (e.g., design of roads). By and large our approach in proposing compliance measures has been to try to satisfy both Part 717 and Part 817. Where there are differences between the two it has not been possible to get interpretations of Part 817 from OSM, because the review period ended in August and the regulations are currently being revised and/or finalized. Appropriate sections of the regulations are discussed below.

2.2 DEFINITIONS

The section of definitions in Part 817 is not complete, giving a definition only for disturbed areas. This is essentially the same as the definition of disturbed areas appearing in the Interim Regulations (Part 717). Disturbed areas are all "surface work areas and land affected by surface operations."

2.3 ROADS, ASSOCIATED STRUCTURES AND OTHER TRANSPORTATION FACILITIES

These facilities are covered under the section on protection of the hydrologic system in Part 717 but in Part 817 the regulations have been expanded considerably and given a separate section. The expansion has been in the form of more detailed specification of criteria for design, construction and maintenance. In most instances the two parts are compatible and compliance with both is readily achieved.

An exception is the culvert requirement in Part 817.14(b)(3)(ii) which specifies the spacing of ditch relief culverts as a function of road grade. Compliance with this section would require the installation of considerable new culverts on existing access roads. The specific nature of this portion of the regulations is under heavy attack by the industry, and it is conceivable that future versions of the regulations may be generalized to allow more flexibility of design. In the meantime, compliance with the present version is proposed; at the time of final decision this should be reviewed for the possibility of more economical compliance.

2.4 PROTECTION OF HYDROLOGIC BALANCE

This is the most stringent and far-reaching of both the Interim and Draft Final Regulations. With respect to water quality standards and effluent limitations, Part 717.16 requires that "all surface drainage from the disturbed area...shall be passed through a sedimentation pond or series of sedimentation ponds prior to leaving the permit area." Part 817.16 has been modified to read in part, "All drainage from the disturbed areas...shall be passed through a treatment facility, or a sedimentation pond...." In the absence of an interpretation we have assumed that the intent of the Final Regulations is that surface waters shall be controlled even though the word "surface" is omitted.

This is a very stringent requirement and difficult to achieve readily in the areas considered. Our approach to compliance has been, wherever possible, to propose that "disturbed areas" be graded to retain all precipitation on them and to divert surface flow from other areas away from them. Elsewhere, other measures such as regrading of present ground surface and revegetation are proposed to prevent or minimize pollution.

The criteria for the design of sedimentation ponds appears to be somewhat more flexible in the Draft Final Regulations than in the Interim Regulations. We have assumed that this is a reflection of the fact that these regulations (to the best of our knowledge at this time) are under injunction (Judge Flannery, U.S. District Court, Washington, D.C., May 3, 1978) and that the Draft Final Regulations, therefore, are a better indication of current OSM thinking.

remanded not enjoined

Another difficult criterion to meet is the requirement for a 100-foot buffer between streams and surface activity. How-

ever, OSM has been directed in a recent decision by Judge Flannery in U.S. District Court, Washington, D.C., to reconsider this requirement so that some modification to this may appear in future regulations.

2.5 COAL PROCESSING WASTE

Disposal of coal refuse is much more clearly and explicitly treated in the Draft Final Regulations (Part 817.20) and must be regarded as a better reflection of current OSM thinking. Valley and head-of-hollow fills, for example, are not prohibited, which was a point of confusion in the Interim Regulations. However, in a recent ruling (late August) by Judge Flannery in U.S. District Court, Washington, D.C., which generally upheld the Interim Regulations, the OSM was directed to reconsider regulations concerning disposal of spoil in valley or head-of-hollow fills, underdrain construction and spoil compaction in valley fills. This may lead to further revisions in coal refuse disposal regulations, but in this report we have considered the Draft Final Regulations to be the latest word.

2.6 BACKFILLING AND GRADING

Backfilling and grading requirements are essentially the same in both the Interim and Draft Final Regulations.

2.7 REVEGETATION

The rules for revegetation are also more detailed in the Draft Final Regulations and, thus, probably more indicative of present OSM thinking.

3.0 HYDROLOGICAL CONSIDERATIONS

3.1 GENERAL

As indicated above, the principal impact of the regulations on the areas of concern is received from the requirements for protection of the hydrological regime. Except for the proposed refuse dump at Castle Gate in Schoolhouse Canyon, which is covered in our report of January, 1978, geotechnical stability problems are covered in discussions of the particular areas. Presented below is a discussion of the background and criteria for the design of sediment control, diversion, drainage and other hydraulic structures.

3.2 REGIONAL HYDROLOGY

Average annual precipitation in the area is 10 inches, of which significant proportions can occur as severe summer thunderstorms. Snowfall averages 33 inches annually with accumulation usually less than 12 inches. Evaporation and infiltration rates in the area vary with vegetation, soil type, and time of year. Average annual potential evaporation in central Utah is 40 inches per year (Geraghty et al, 1973). Net infiltration rates for unfrozen soil under similar conditions to those found in the Helper area are around 0.50 inches per day (Gray, 1973).

Most stream channels in the watersheds considered contain no flowing water except during snow melt or heavy rains. Willow Creek and Price River, however, flow continuously. Watershed runoff during storm events carries heavy sediment load. Cloudburst floods are relatively common in the area with most occurring in the months of July and August (Butler & Marsell, 1972). Velocities in natural stream channels during 100 year floods were calculated for various representative stream

channels in the study area and found to range from 15 to 25 ft/sec. Reports and observations indicate sediment load during large storms is heavy with some evidence of transported material greater than 2-1/2 feet in diameter.

3.3 FLOW CALCULATIONS

Peak flows on the small watersheds in the study area were estimated using the Rational Method (Gray, 1973). This method is based on the criteria that for storms of uniform intensity, evenly distributed over the watershed, the maximum rate of runoff occurs when the entire watershed is contributing at the outlet and that this rate of runoff, or flow, is proportional to the rainfall intensity. The equation is:

$$Q = ciA \qquad (1)$$

where:

- c = runoff coefficient
- i = maximum rainfall intensity, in./hr, whose duration is equal to the time of concentration of the watershed
- A = area of watershed, acres
- Q = peak flow, cfs

Maximum rainfall intensities for specified return periods were calculated using precipitation data from a gaging station at Price, Utah, (Table I) with the duration equal to the time of concentration. No gaging stations are located closer to the Castle Gate area. However, regional precipitation data for six-hour and 24-hour events are available and are tabulated in Table II (NOAA Rainfall Frequency Atlas for Utah, 1974). Generally the precipitation at the Price station is about 94 percent of that in the Castle Gate area; thus, the Price data was considered applicable to the study area when increased by about six percent.

The time of concentration can be determined from (Gray, 1973):

$$t_c = 0.0078\ L^{0.77} . S^{-0.385}$$

where:

t_c = time of concentration, minutes

L = maximum length of travel of water, feet

S = slope, equal to H/L where H is the difference in elevation between the most remote point on the basin and the outlet (feet).

TABLE I

ESTIMATED RETURN PERIODS FOR SHORT DURATION PRECIPITATION (INCHES) - PRICE, UTAH*

Return Period (yrs)	Duration 5 Min	10 Min	15 Min	30 Min	1 Hr	2 Hr	3 Hr	6 Hr	12 Hr	24 Hr
1	.08	.13	.17	.23	.29	.37	.44	.62	.78	.95
2	.12	.18	.23	.32	.40	.49	.58	.80	1.00	1.20
5	.16	.25	.32	.44	.56	.68	.79	1.07	1.32	1.58
10	.20	.31	.39	.54	.68	.81	.94	1.25	1.53	1.82
25	.24	.37	.47	.65	.82	.98	1.13	1.50	1.83	2.18
50	.28	.43	.54	.75	.95	1.12	1.29	1.71	2.18	2.47
100	.31	.49	.62	.85	1.08	1.27	1.45	1.91	2.32	2.74

*Ref: Utah State University, 1971, Department of Soils and Biometeorology, Bulletin No. 1.

TABLE II

PRECIPITATION FOR CASTLE GATE AREA**

Storm	Precip (in)	Storm	Precip (in)
2 yr-6 hr	.92	2 yr-24 hr	1.30
5 yr-6 hr	1.20	5 yr-24 hr	1.65
10 yr-6 hr	1.32	10 yr-24 hr	1.90
25 yr-6 hr	1.65	25 yr-24 hr	2.30
50 yr-6 hr	1.85	50 yr-24 hr	2.70
100 yr-6 hr	2.05	100 yr-24 hr	2.90

**Ref: National Oceanic and Atmospheric Administration, 1974, NOAA Atlas 2, Vol. VI, Rainfall Frequency Maps of Utah.

For very small watersheds the Rational Method can result in unrealistically high intensities. True Therefore, when the 100-year storm intensity was greater than half of the probable maximum thunderstorm, the 1/2 PMTS value was used (i = 3.25 hr./inches per hour from USBR "Design of Small Dams," Figure 20).

The runoff coefficient in the Rational Method is dependent on the topography, soil type and vegetation of the watershed. Values for runoff coefficients can be found in Gray (1973), Table VIII.2. A conservative value of 0.80 was used for all flow calculations.

3.4 CHANNEL DESIGN

Diversion channels were conceptually designed using the Chezy-Manning equation:

$$Q = \frac{1.49}{n} A R_h^{2/3} S^{1/2}$$

CK

where:

- Q = flow, cfs
- n = Manning roughness coefficient
- A = cross-section area
- R_h = hydraulic radius equal to A/P
- P = wetted perimeter
- S = slope

The roughness coefficient ranges between 0.035 for channels with earth and rubble sides and 0.050 for channels with jagged rock sides (Gray 1973). A coefficient of 0.050 is used.

Channels were designed, where possible, to cause no increase in the sediment contribution to the hydrologic system over that of natural channels. This was accomplished by keeping the velocity below 15 feet per second through the use of wide

shallow channels. Where it was not possible to reduce velocities sufficiently, riprap will be provided to prevent erosion.

3.5 CULVERT DESIGN

Culverts are needed at some major road/stream intersections and to relieve road drainage ditches. They are designed to accommodate at least the 10-year storm as required by the regulations. In one critical case at Willow Creek, culverts were designed to accommodate the estimated 30-year flood, 30 years being the anticipated life of the mine. The culverts are to be corrugated metal pipe with headwall entrances and are to be buried to a depth of 1/2 of their diameter or one foot, whichever is greater. Culvert dimensions were determined using nomographs for inlet controlled culverts provided in the U.S. Soil Conservation Service National Engineering Handbook, Section 4, Hydrology, 1969.

provide additional head depth?

3.6 STORM RUNOFF

Runoff of the 10-year/24-hour storm from disturbed areas is required by the regulations to be retained or treated to reduce sediment. Rainfall from this storm is 1.93 inches (Table I). The U.S. Soil Conservation Service Handbook contains relationships between runoff volumes and precipitation amounts based on soil and vegetative conditions of the watershed. A curve number of 93, which is that used in the TRICO study, yields a runoff volume of 1.25 acre in./acre.

OK Conservative

The volume of runoff from snowmelt can be determined. Twelve inches of accumulated snow at 10 percent water content yields a runoff volume of 0.12 acre in./acre, which is much less than the 10 year-24 hour storm runoff. Therefore, structures for returning runoff were designed for a volume of 1.25 acre in./acre.

SECTION 3

REFERENCES

Butler, E., and Marsell, R.E., 1972. Cloudburst Floods in Utah, 1939-69, Cooperative Investigations Report Number 11, Utah Division of Water Resources and U.S. Geological Survey.

Geraghty, J.J., et al, 1973. Water Atlas of the United States, A Water Information Center Publication, New York.

Gray, D.M., 1973. Handbook on the Principles of Hydrology, Water Information Center, Inc., New York.

U.S. Department of the Interior, Bureau of Reclamation, 1977. Design of Small Dams; a Water Resources Technical Publication, Washington, D.C.

4.0 SOWBELLY GULCH

4.1 GENERAL

Sowbelly Gulch is tributary to Spring Canyon and lies approximately four miles west-northwest of the city of Helper (see Figure 1). Approximately 17 acres are currently or have been recently in use and are classifiable as "disturbed" under the terms of the Regulations. As shown on Figure 2, most of this area is used principally for storage and personnel access through Portal 5. This use is expected to continue in the future with the possible addition of permanent workshops, warehouse and bathhouse. No coal handling currently occurs in the area and none is anticipated in the future.

4.2 DESCRIPTION OF DISTURBED AREAS

The disturbed areas are defined on Figure 2 and representative photographs of conditions in these areas are shown on Figures 3 and 4. Referring to Figure 2, most of the disturbed area is located north (upstream) of Portal 5. A relatively wide and gently sloping area has been developed, apparently by cutting into the east wall of the valley and regrading with the materials derived from the cut. The resultant cut in the valley wall is an estimated maximum of 50 to 60 feet high with an intermediate catch bench at about mid-height. Estimated overall slope is about 50 degrees with intermediate slopes angles of about 65 degrees. The cut is predominantly in relatively flat-lying interbedded shales and sandstones with occasional thin coal seams (see Figure 3B). The graded area is used predominantly for parking and to a certain degree for storage. A temporary bathhouse complex is located in the southern portion of this area and a small area at the north end is used for rubbish disposal. The surface of the area is

untreated and exposed at surface and is a mixture of silt sand and gravel typical of the alluvial and colluvial materials occurring in the canyons of the area.

In the course of regrading the area the ephemeral stream in the gulch was permanently diverted to a course along the toe of the west valley wall. A typical view of this diversion is shown on Figure 3D. The diversion continues south of Portal 5 where it is taken under the access road in a 36-inch diameter culvert to the original stream bed along the east valley wall (see Figure 4D). The downstream end of the culvert is covered by debris from the roadway embankment (Figure 4E). Some coal or coal waste has in the past been dumped on the embankment slopes in this area. Also in this area is an unused mine shaft (Figure 4F).

The area around Portal 5 (Figures 3C and E) is used mainly for storage. A tributary ephemeral stream from the east has been rechanneled north of Portal 5 as shown in Figure 3C and is taken beneath the access road in a 30-inch culvert.

South of Portal 5 the mouth of a tributary from the west has also been enlarged and regraded by cutting down the slopes (Figure 4A) and is used to a minor degree for storage. Further to the west in this tributary, waste rock from a previous operation was dumped along the south wall of the valley (Figures 4B and C) and has revegetated naturally over the years. A minor amount of rubbish has also been discarded in this area.

There are other minor areas of disturbance associated with those described above. Two substations are in use, one just east of Portal 5 and the other about 2000 feet south along the access road (see Figures 2,3F and 3G). There is also a water tank located on the valley slope east of Portal 5.

The existing road to Portal 5 has an average grade of six percent and has recently been resurfaced. It is, therefore, generally in compliance with the OSM regulations, lacking only a small relief ditch along the cut side and relief culverts to accommodate sheet flow from the valley walls and a few tributary ephemeral streams.

4.3 COMPLIANCE MEASURES

Proposed compliance measures for the Sowbelly Gulch area are shown conceptually on Figure 5. These reflect our understanding of current plans regarding future use of the area during the mine life. Although the details of future use may change with further planning it is considered that the proposed concepts will still apply. As indicated on Figure 5, it is planned to relocate Portal 5 to eliminate a present dog leg at the entrance and install a rail haulage system with spurs to a storage area and shaft at the north end of the areas. Also planned is a permanent bathhouse and associated parking area.

Because of the relative lack of coal or coal waste present on the surface of the disturbed areas, the major problem of compliance at Sowbelly is the control of sediments from these areas. Also, given the relatively gentle grades over much of the area, it is considered that the most direct method of control of sediment is to divert stream and sheet flow from undisturbed areas and retain precipitation for the most part directly on the disturbed areas on which it falls, thus avoiding construction of one or more sedimentation basins in the limited usable space available. In parking and storage areas we propose the development of retention areas by constructing shallow basin-shaped terraces; these are shown schematically in Figure 6. The only disadvantage of this approach is that an inch or so

of water may cover much of the area for a short period following a precipitation event. Around structures, rail spurs and other facilities it will be necessary to construct retention basins to pick up the small amount of precipitation runoff from roofs and other surfaces where it cannot be retained directly. These basins will also have the disadvantage of perhaps having 3 or 4 inches retained in them for short periods. Location and size of these basins are shown schematically on Figure 5.

The existing diversion of the main stream through the area is adequate to pass the required maximum flow and no additional work other than revegetation is proposed. Tentatively we would propose that the revegetation employ the seeding mixture approved by BLM for drill site reclamation on the property. This mixture is as follows:

Common Name	Botanical Name	Rate of Pure Live Seed (pounds/acre)	
Fairway Crested Wheatgrass	Agropyron cristatum	1-1/2	4 lb grass
Intermediate Wheatgrass	Agropyron intermedium	1-1/2	
Russian Wildrye	Elymus junceus	1	
Ladak Alfalfa	Medicago sativa	1	1 lb legume
Bitterbrush	Purshia tridenta	2	4 lb shrub
Stansbury Cliffrose	Cowania mexicana stansburiana	1	
Curlleaf Mt. Mahogany	Cecocarpus ledifolius ledifolius	1/2	
Birchleaf Mt. Mahogany	Cecocarpus montanus montanus	1/2	
		9	

Method of application is worthy of more detailed consideration, but, because of the many sloping surfaces involved, hydroseeding may be most appropriate.

Although both the main stream diversion channel and that for the tributary east of Portal 5 are adequate, larger culverts are required to pass the specified design flow. Other culverts will also be required along the access road to accommodate flow from other small tributaries and to comply with presently proposed OSM regulations. The location and size of proposed culverts are shown on Figure 5.

Elsewhere, as shown on Figure 5, sheet flow from undisturbed areas is to be picked up by diversion ditches and conveyed to the main stream channels. In some cases as in the cuts in the east valley wall, the sheet flow passes over the cuts prior to entering the diversion ditches. It is considered that because these cuts represent relatively small areas and are composed principally of relatively fresh rock, no significant increase in sediment transport, if any, will result. The diversion ditches have generally been designed to have a maximum flow velocity of less than 15 feet per second to obviate the need for riprap or other sediment control features (natural channels found in this area can have maximum flow velocities greater than 15 ft/sec).

The embankment from the stream crossing down to the south substation is at a slope of 1-1/2 horizontal to 1 vertical. This is in noncompliance with the regulations, which require a slope of 2 to 1. There are no indications of instability, which is presumably the underlying reason for this regulation, but the slopes are covered with considerable coal or coal refuse which is also in noncompliance. Therefore, it is proposed that the slope be regraded to a shallower slope, covered with the two

feet of soil cover and revegetated. It is not anticipated that any modification of the stream channel will be required.

Regulations also require a 100-foot buffer between disturbed surface areas and stream channels. Provision of such a buffer in the area north of Portal 5 would remove much of the usable area in this restricted valley. However, the concept of retaining all precipitation on the disturbed area substantially reduces the possibility of sediment from this area reaching the stream. As added protection, the proposed road will serve as a barrier and its surface will be graded to drain to the retention areas.

A small shaft from previous operations exists about 800 feet south of Portal 5. It is understood that no future use is contemplated for this shaft and it will be permanently sealed and the surface area reclaimed.

Finally, a small area at the north end of the site is currently used for rubbish disposal. This area will be provided with a four-foot clay liner in accordance with the regulations for disposal of residual wastes.

5.0 HARDSCRABBLE CANYON

5.1 GENERAL

Hardscrabble Canyon is tributary to the Price River and lies approximately one mile northwest of the city of Helper (see Figure 1). Approximately 22 acres are currently or have been recently in use and are classifiable as "disturbed" under the terms of the regulations. As shown on Figures 7, 8 and 9, most of this area has been used for coal handling and preparation with underground access through Portals 3 and 4. When the coal preparation plant at Castle Gate begins operation, the plant in Hardscrabble Canyon will be abandoned and the area will be used principally for material storage, personnel access and repair facilities. It is anticipated that coal transportation from Portal 4 may continue until late 1979, at which time no further coal handling will be carried out in the area.

5.2 DESCRIPTION OF DISTURBED AREAS

The disturbed areas are defined on Figure 7, 8 and 9, and representative photographs of conditions in these areas are shown on Figures 10, 11 and 12. Referring to Figures 7, 8 and 9, most of the disturbed area is located north of Portal 3. A gently sloping area from 60 to 400 feet wide has been developed, apparently by cutting the valley walls and regrading with the materials derived from the cut. The resultant cut in the valley wall varies as to height and slope along the length of the disturbed area (see Figures 10, 11 and 12). The cut is predominantly in relatively flat-lying interbedded shales and sandstones.

At the north end of the disturbed area, refuse from the preparation plant has been dumped at the intersection of two

tributaries to the main ephemeral stream, blocking their flow paths (see Figure 7). The areal extent of the waste dump is about six acres. The waste does not include fines from the preparation plant, which have been placed underground. No instability of the dump slopes is apparent. Diversion channels for the tributaries have been partially constructed but are inadequate to contain the 100-year flood required for permanent stream diversions. At the south base of the dump is a culvert, about 280 feet long, whose entrance has been buried by waste. There is an access road along the east edge of the waste dump which leads to a substation and is used for infrequent drill access to the north end of the east tributary. Currently some parts of the waste dump and surrounding area are used for material storage. It is our understanding that storage here will cease in the future.

The canyon containing Portal 4 runs west from the main canyon (Figure 8). The portal is used as an underground access with coal transported by conveyor to a coal loading station at the canyon mouth. It is our understanding that future use of this canyon after late 1979 will be limited to infrequent access through Portal 4.

An ephemeral stream drops about 14 feet over a vertical sandstone cut into a small stilling basin by Portal 4. From there the flow is conducted in a channel along the south side of the conveyor (see Figure 11C). This channel is computed to be inadequate for containing the 10-year flood.

In the main canyon near the mouth of the Portal 4 canyon is located the coal preparation plant (Figure 9; 10G, 10I, 10J; 11F, 11E). It is understood that all of the buildings in this area, except for the warehouse and changehouse will be removed when the coal preparation plant at Castle Gate begins operation.

The valley floor in this area is mostly covered with coal or refuse due to spillage in various phases of the haulage preparation operations. It is expected that this spillage is only a surface cover on original alluvial and colluvial soils. Above the preparation facilities and to the east is a ~~warehouse~~ shop facility (Figure 9, 10H) with an access road. This ~~warehouse~~ shop facility is understood to remain in the future.

South of the coal preparation plant area is an additional warehouse and office surrounded by parking and storage area which will remain in the future (see Figure 9). The west corner of the warehouse is within about 15 feet of the existing stream channel.

Above these buildings and to the west is a gully containing a guardhouse and storage area. The buildings are on a rock bench about 50 feet above the main valley floor.

South of the parking area on the east side of the access road is Portal 3 (see Figure 9, 12B). Portal 3 is located on a bench above the valley floor along with other miscellaneous buildings and storage. The base of the bench is sandstone (Figure 12E), and the surface is a mixture of silt, sand and gravel. Above Portal 3 is a sandstone cut that is near vertical.

Northwest of Portal 3 and about halfway between the storage area on the valley floor the portal is an abandoned pumphouse. ~~It appears that currently some waste from the Portal 3 area is being pumped into a holding basin by the pumphouse~~ (Figure 12C).

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Across from Portal 3, west of the main valley, is a small canyon currently used for an explosives storage area. Several old portals exist further west in this canyon (Figure 12H), but there does not appear to have been any recent operations in this area.

Along the length of the main valley floor the stream channel has been disrupted by surface operations. It appears that in previous operations waste water and fines from the coal washing operations in the preparation plant was drained into the channel. In places waste has been pushed into the channel, sometimes completely blocking flow (Figure 11F, 11G). The channel will therefore need improvement in order to comply with OSM regulations.

5.3 COMPLIANCE MEASURES

Hardscrabble is the most difficult of the areas studied to design for compliance, because of the degree of disturbance caused by past and current operations, the restricted space available and the uncertain schedule of the phasing out of some of the current operations. A key to the start of meaningful corrective measures is the cessation of operation of the current preparation plant. At that point final reclamation of the waste dump and plant area can proceed.

As shown on Figure 13, it is proposed to regrade the waste dump, provide two feet of soil cover and revegetate. Two feet of cover is proposed rather than the four feet specified in the regulations because this would be sufficient to sustain vegetation and because the low sulfur content (0.5% volume) of the coal associated with the waste and low precipitation in the

area will together preclude the possibility of the dump becoming a significant source of pollution in the future. Slopes will be graded to an angle of 2:1 or flatter to ensure a minimum factor of safety for stability of 1.5 and minimize erosion. The surface of the pile will also be graded to a gentle slope of the order of 1/2 percent or less. Revegetation will be carried out using the BLM approved seed mixture (Section 4.3), mulched to minimize sediment pickup by surface runoff. By the combination of gentle slopes and mulching it is intended that the need for a sedimentation pond prior to the establishment of the vegetation will be eliminated.

It is proposed to provide permanent diversions of the two ephemeral streams entering the dump area as shown on Figure 13; as noted above, the present diversion channels are insufficient to pass the required flow. It is intended that the proposed channels be located partially in the refuse at the junction of the dump and the valley walls in order to avoid additional disturbance to the steep valley slopes. The provision of two feet of cover, including riprap, and control of gradients should prevent contamination of the stream by the waste. In the left fork diversion it is intended that the channel double as an infrequently used access road to the existing substation. Runoff from the undisturbed slopes above the dump to the north will be diverted from the dump surface by improvement of the existing ditch.

It is understood that coal handling operations at Portal 4 will continue into 1979. In the interim the measures shown on Figure 14 are proposed. These include a permanent diversion channel along the south wall of the canyon, which in the future will serve as an infrequently used access road to Portal 4.

The area west of the coal loading area will be regraded to form precipitation retention areas and surface runoff from undisturbed areas on the north canyon wall will be diverted with a small temporary ditch. The coal loading area will be regraded slightly to act as a retention basin. Upon completion of the coal handling operation existing facilities will be removed and the area regraded and revegetated.

Because of the restricted space available, little can be done in the preparation plant area until its operation ceases. An initial objective will be to improve the existing stream channel as indicated on Figure 15. Upon shutdown of the preparation plant the existing structures not necessary for continued operations will be removed. Accumulated coal and waste spills will be cleaned up and removed to the waste dump and the area regraded and revegetated. A small dump located near the preparation plant will also be regraded, provided with cover and revegetated. As in the case of the main dump, this area will be graded and mulched to eliminate the need for sedimentation ponds. The existing road and the workshop which will remain will be maintained. Other existing roads will be removed when coal handling from Portal 4 is terminated.

South of the preparation plant, operations will continue more or less as at present, except coal handling at Portal 3 will be terminated and the portal used only for access. It is proposed that this area be treated as Sowbelly, regrading the existing storage and parking facilities into retention areas. At Portal 3, however, this will not be practical, because the bathhouse and other facilities are located on a rock bench. Therefore, it is proposed to accommodate runoff from this area with a small sedimentation pond located as shown on Figure 15. The existing explosives storage area west of Portal 3 will be removed and the area revegetated.

6.0 WILLOW CREEK

6.1 GENERAL

Willow Creek is tributary to the Price River and the area of concern is located in the Willow Creek Valley approximately one mile northeast of Castle Gate (see Figure 1). Existing Portal 6A is located here and Portal 6 will be constructed in the future. The area is not currently in use, but approximately 28 acres is classifiable as "disturbed," much of this in preparation for future surface facilities. As shown on Figure 16, most of the disturbed area lies north of the present Willow Creek which, except for the Price River, is the only continuously flowing stream in the areas of concern.

6.2 DISCUSSION OF DISTURBED AREAS

Disturbed areas are indicated on Figure 16 and representative photographs are given on Figures 17 and 18. Aside from the stream channel itself, the site has three components, namely a small area south of Willow Creek associated with Portal 6A, the majority of the area across the creek to the north associated with the future Portal 6, and a third medium-sized area about 800 feet downstream on the south bank of the creek which has no intended future use. These areas are given the designations A, B and C, respectively, on Figure 16.

Area A occupies a strip about 100 feet wide and 1,000 feet long along Willow Creek. It is occupied by several buildings, including a disused bathhouse, which appear to have been built on a former refuse dump. The banks of the creek in this area are actively eroding and unstable (see Figures 18E and 18F).

Area B on the other hand, although technically "disturbed" in 1975 by regrading to prepare for facilities to be associated

with the future Portal 6, is presently probably very close to compliance. It is understood that the regrading included relocation and straightening of the Willow Creek channel, leveling of refuse dumps from previous operations and preparation of the slope at the north end of the area for the driving of Portal 6 (see Figure 17C). Consequently, in some areas, particularly along the creek, there is an obvious mixture of coal or refuse fragments from the dumps or from the cuts at the north end with inorganic soil and rock fragments. However, over the past three years volunteer vegetation has crept in and covered most of the area with the exception of eroded sections of the creek banks. A total of at least five plant types were identified including Russian Thistle, Ragweed, Summer Cypress, a legume and a grass. As indicated on the photographs of Figures 17 and 18, the density of cover is quite good. Even in areas composed predominantly of coal waste at the north and south ends of the area, there has been a considerable amount of revegetation. Most of the area has been graded to very gentle slopes of the order of 2.5 percent or less.

Area C has also been regraded to a fairly level condition, but little revegetation has occurred. There are minor coal or waste piles along the access road, and the surface of the area appears to be composed mainly of waste and inorganic soil and rock fragments. The area is occupied by a steel warehouse-type structure and several sheds used as a haul truck service facility. South of Area C are large accumulations of waste from previous operations. These are not included in the present study.

From the north to south end of Area B, the banks of the creek are composed largely of inorganic material except in the area opposite Area A where the lower portion of the banks appear to be mainly waste. The instability of the banks in Area A has already been noted. In Area B the banks are very steep (35 to

40 degrees) and there has been an obvious failure in the slope of a combination dike and roadway at the north end of the area. Tension cracks are also evident in the roadway adjacent to the failure, and although these do not appear to be active, it is evident that the slope must have a factor of safety very close to unity. It is understood that the failure took place at about the time of a thunderstorm- induced flood in July 1977. Evidence also exists of piping through the embankment by water impounded in the north end of Area B, and it is considered that this, possibly in combination with erosion at the toe by the creek, induced the failure. No other inherent source of instability was observed.

Tension cracks are also evident about 20 feet back from the crest in many other areas along the banks of Area B. None of these appear to be active and it is considered that they are also attributable to the 1977 storm where a combination of the steep slopes, erosion at the toe and, possibly, seepage from sheet flow combined to cause a temporary instability. As in the case of the roadway/dike discussed above, the banks in Area B must be considered marginally stable. It is presumed from the available evidence that the banks were originally placed or graded to a slope of 1-1/2 to 1, which is a commonly used slope in practice. However, subsequent erosion at the toe by the creek has oversteepened the slopes, thus accounting for their present state.

6.3 COMPLIANCE MEASURES

Proposed compliance measures for the Willow Creek area are shown on Figure 19. As in the case of Sowbelly and Hard-scrabble, these reflect our understanding of what is currently planned in the way of future use of the area. In Area A it is understood that Portal 6A may be relocated and a track con-

structed from the portal across the creek to Area B with a possible spur to a storage area. In Area B, Portal 6 would be driven and support facilities including a bathhouse, shop and warehouse and storage and parking areas would be constructed. In addition to trackage, a conveyor would be installed running south from Portal 6 to a crusher, which would also be the terminus for a conveyor from Portal 6A. From the crusher the conveyor would be extended down the Willow Creek valley to the preparation plant at Castle Gate utilizing an abandoned rail bed. Other facilities in Area B would include a substation and water tank on the western edge of the area. It is understood that no future use is planned for Area C.

In Area A, proposed compliance measures would include demolition and removal of existing buildings followed by regrading of the area to form retention basins. It is anticipated that this would be done as soon as possible with some minor regrading possibly necessary when future facilities are constructed. In addition, approximately 1,000 feet of the left bank of the creek in this area should be regraded to a slope of 1-1/2 to 1 and protected with riprap. The riprap, together with its protective filter, will provide appropriate cover for the presently exposed refuse.

In Area B as shown on Figure 19 a system is proposed of retention areas and retention basins similar to that proposed for Sowbelly Gulch. Runoff from undisturbed areas would be picked up by shallow diversion ditches and carried to Willow Creek.

Improvements proposed for the oversteepened bank of the creek channel in Area B would consist of regrading of the slopes to an angle of 1-1/2 to 1 and placement of riprap. Also, the existing culvert on the access road to Area B is inadequate and will require placement.

Because of its present condition of near-compliance with regulations, it is proposed that the work in Area B not be carried out until construction of the new facilities. It is considered that this would result in less disturbance to the hydrologic system than to carry out compliance measures now and then disrupt the area again with additional construction when the new facilities are needed. When Area C is abandoned it is proposed that the area be regraded and revegetated.

7.0 TRASH CANYON AND UTAH FUEL #1

7.1 GENERAL

Trash Canyon and the gully in which Utah Fuel #1 ~~is~~ located are tributaries to Price River lying west of the Castle Gate area (see Figure 1). A total of approximately three acres are currently or have recently been in use and are classifiable as "disturbed" under the terms of the regulations. Trash Canyon has been used as a dump for a small volume of waste rock and coal waste in the past. No additional dumping is envisaged in the future. The existing portal at Utah Fuel #1 will be used for a conveyor transporting the coal under Route 55 to the new preparation plant. Only infrequent access will be needed to the Utah Fuel #1 area for maintenance. Hwys 50 & 6

7.2 DESCRIPTION OF DISTURBED AREAS

The disturbed areas are defined on Figure 20 and representative photographs of conditions in these areas are shown on Figure 21. Referring to Figure 20, most of the disturbed area is located at the mouths of the canyons.

In Trash Canyon coal waste and waste rock have been dumped along the south wall of the canyon. The waste rock is composed of grey sandstone, irregular particles, about four inches in diameter. The coal waste appears to have been partially deposited over the waste rock at its western end. The waste rock has partially revegetated naturally in the period since it was deposited in December 1977 (see Figure 21B, TRASH CANYON).

The waste and rock have been deposited against the valley wall, leaving a road with a natural silt, sand and gravel base on the north side of the valley floor. This road acts as the

channel of an ephemeral stream and as an infrequent access to the west end of the canyon. At the mouth of the canyon the spoil has a slope of 22 degrees with the highway right-of-way at the toe. The total volume of material dumped is estimated to be approximately 8 to 10 thousand cubic yards.

The flow from Trash Canyon is conducted under Route 6/50 by a corrugated metal arch culvert, five feet by three feet.

Utah Fuel #1 is at the mouth of a small watershed (area 27 acres). In Utah Fuel #1 a hopper transfer station is being constructed at the gully mouth for transferring coal from the portal to a conveyor that runs under the highway to the coal preparation plant. The hopper is founded at highway level while the portal is on a bench about 20 to 30 feet above, as shown in Figure 21. There is a covered conveyor leading from the portal to the transfer station and the remainder of the bench is currently used for construction storage. Access from Route 6/50 leads up the north side of the gully to the portals and through the storage area (Figure 20).

7.3 COMPLIANCE MEASURES

Proposed compliance measures for Trash Canyon and Utah Fuel #1 reflect our understanding of current plans regarding future use of the area during mine life. No further use is planned for the Trash Canyon area. The regulations state that it is desirable to return the canyon to approximately the original contours. If this is not possible, gentler slopes are acceptable. It is proposed to regrade the waste in Trash Canyon up against the south wall of the canyon to form a constant slope to the existing access road. Since the future angle of slope will be less than that of the existing stable slopes, the future slopes should also be stable.

The regulations also require that abandoned coal waste must be covered with the "best available material." Therefore, it is proposed to regrade the waste rock to cover the coal waste. It is considered that this will provide a reasonable base for revegetation since growth is occurring naturally on the waste rock now. Tentatively, it is proposed to employ the seed mixture given in Section 4.3, probably in conjunction with a mulch. The existing access road will remain unchanged and will continue to act as the stream channel.

In Utah Fuel #1, maintenance access will be needed periodically. However, our current understanding is that the land use will not be great enough to preclude revegetation or increase the erodability of the area. It is proposed to recontour and revegetate the area to eliminate addition of sediment to the hydrologic system.

Where possible, the existing bench will be graded down to a gentle slope from Route 6/50 to the portal area. Since the bench outcrop indicates that it appears to be composed of colluvial material, soil cover for a revegetation base is probably not needed. The existing road will remain for access to the portals and will be graded to contain the flow from the gully. The recontoured area will be revegetated. Runoff from the disturbed area will not be retained because the disturbed area is small, further disturbance will be minimum, and the vegetation will stabilize the soil.

8.0 CASTLE GATE

8.1 GENERAL

The Castle Gate area is situated on the east bank of the Price River about two miles north of the city of Helper (see Figure 1). Approximately 57 acres will be in use during coal preparation operations and are classifiable as "disturbed" under the terms of the regulations. As shown in Figures 22 and 23, about 34 acres are under construction for the preparation plant and 23 acres are to be used as a coal waste dump.

8.2 DESCRIPTION OF DISTURBED AREAS

The disturbed areas are defined on Figures 22, 23, and representative photographs of the conditions in these areas under construction are shown on Figure 24. The preparation plant is being constructed on the site of the old town of Castle Gate. The area is relatively wide and gently sloping and appears to be covered to a large extent with refuse. Two tributaries to the Price River, Barn and Schoolhouse Canyons, intersect the preparation plant area. The proposed refuse dump is planned for Schoolhouse Canyon and associated facilities including the haul road, a stream diversion and sedimentation pond are currently under construction or nearing completion.

8.3 COMPLIANCE MEASURES

The design of the preparation plant was completed before the promulgation of current OSM regulations, and the design of the refuse dump was completed at about the time of issuance of the final Interim Regulations when it was not clear what the imposed design criteria would be. However, a review of the grading and drainage drawings for the preparation plant

(Drawings 1, 2 and 3; April 11, 1977) prepared by Martin Berkowitz Associates, indicates that the design largely complies with regulations governing protection of the hydrologic systems and that with relatively minor adjustments to the present design full compliance can be achieved. The design and required adjustments are indicated schematically on Figure 22 and discussed below.

In the preparation plant area, most areas are designed to contain their own runoff. Any runoff not contained is diverted around the disturbed area, if originating on undisturbed land, or is drained parallel to the access road and emptied into one of the three ponds in the preparation plant area.

It is understood that the north pond will be used for plant makeup water. The two south ponds will be used to clarify water used in the coal preparation process before returning it to the system. The larger settlement pond will also be used as an emergency holding pond for material from the thickener.

Areas of the current design which appear not to comply with the regulations are few and consist of a plateau in the mouth of Barn Canyon and other areas between the plateau and the main access road. These are apparently designed to drain into the Barn Canyon creek bed. It is proposed to regrade these areas as retention basins. Another plateau adjacent to the road is designed to drain to the slurry pond. It is also proposed to regrade this as a retention basin.

The refuse dump will be located as shown on Figure 23 and is currently designed for a capacity of about 3-1/2 million tons. As detailed in our report of January 1978 on the detailed design of the facility, it was designed to meet applicable

regulations of MESA (now MSHA), EPA, Utah Department of Natural Resources and Utah Division of Health. It was also designed to comply with OSM Interim Regulations to the extent possible at the time. Subsequent developments dictate that some modification to the design will be necessary.

In essence, the dump itself complies with regulations governing coal refuse disposal with respect to configuration, stability and method of construction. It is apparent now that some form of underdrain will be required although, as indicated in Section 2.0, the OSM has been ordered to review the regulations for this item so that the exact requirements are not presently known. It is considered, however, that by selective excavation a suitable drain could be constructed from material sidecast from excavations for the haul road and diversion ditch (see Figures 24E, 24F, 24G), as recommended in our report of January 1978.

Surface drainage from the refuse dump and associated disturbed areas is currently designed to be picked up by a sedimentation pond in compliance with current regulations. Similarly, drainage from the haul road and associated disturbed areas is run through the preparation plant pond system. Surface drainage from undisturbed areas above the refuse dump is being diverted into Barn Canyon in accordance with the regulations, but the draft Final Regulations specifically require measures to reduce sediment and erosion at the end of diversions, which has not been allowed for in the present design. Therefore, it is likely that a stilling pool will be required for the discharge of the diversion ditch into Barn Canyon.

9.0 ESTIMATED COST OF PROPOSED COMPLIANCE MEASURES

The cost of the compliance measured proposed for the study areas have been estimated and are summarized for each on Tables III to VII inclusive. The estimated total cost of compliance, as summarized on Table VIII, is $442,000. The reported estimates are solely those additional costs which will be incurred in direct response to the regulations and do not include such costs as removal of existing equipment or structures. Costs of engineering fees are also not included.

10.0 TIME REQUIRED FOR COMPLIANCE

The times estimated to carry out the proposed compliance measures are as follows:

Sowbelly Gulch	4 to 6 weeks
Hardscrabble Canyon	14 to 16 weeks
Willow Creek (Area C only)	1 to 2 weeks
Trash Canyon and Utah Fuel No. 1	2 to 3 weeks
Castle Gate Preparation Plant	In Process

These are times required only to carry out the work at the sites, and a time frame of about four months is indicated. To this must be added additional time for engineering design, preparation of construction documents, bidding and award of contracts. It is considered that this would add an additional three to five months to the overall time frame for compliance in the study areas.

Respectfully submitted,
GOLDER ASSOCIATES

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K.M. Roman

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TABLE III
SOWBELLY GULCH

	UNIT PRICE	QUANTITY	COST
Diversion Ditches			
Excavation - small ditch	2.00/cu yd	855 cu yd	$ 1,710
- compaction	1.00/cu yd	910 cu yd	910
Rip Rap	27.00/sq yd	1200 sq yd	33,000
Culverts			
48" Ø CMP, 8 ga	44.00/ft	144 ft	6,336
8'4"x12'10" SPP, 3 ga	245.00/ft	80 ft	19,600
36"x22" pipe arch, 12 ga	24.00/ft	75 ft	1,800
65"x40" pipe arch, 8 ga	55.00/ft	73 ft	4,015
25"x16" pipe arch, 16 ga	15.00/ft	581 ft	8,715
43"x27" pipe arch, 8 ga	37.00/ft	83 ft	3,071
Regrading			
Retention Areas	0.36/cu yd	972 cu yd	350
Retention Basins	0.36/cu yd	370 cu yd	133
Contouring	45.00/acre	2 acres	90
Roads	0.70/ft	1,500 ft	1,050
Revegetation			
Soil Cover	$5.00/cu yd	1,800 cu yds	9,000
Seeding & Mulching	480.00/acre	4 acres	1,920
Solid Waste Storage Lining	5.00/cu yd	1,430 cu yd	7,150
		TOTAL	$98,850

TABLE IV

HARDSCRABBLE CANYON

	UNIT PRICE	QUANTITY	COST
Diversion Ditches			
Excavation - small ditch	$2.00/cu.yd.	5,000 cu.yd.	$10,000
large ditch	0.55/cu.yd.	20,000 cu.yd.	$11,000
Rip Rap	27.00/sq.yd.	478 sq.yd.	$12,906
Culverts			
72"x44" pipe arch, 8 ga.	61.00/ft.	75 ft.	$ 4,575
36"x22" pipe arch, 12 ga.	24.00/ft.	30 ft.	$ 720
25"x16" pipe arch, 14 ga.	17.00/ft.	30 ft.	$ 510
18"Ø CMP, 12 ga.	14.00/ft.	50 ft.	$ 700
Regrading			
Retention Areas	$0.36/cu.yd.	570 cu.yd.	$ 205
Retention Basins	0.36/cu.yd.	190 cu.yd.	$ 68
Contouring	45.00/acre	14 acres	$ 630
Roads	0.70/ft.	1,100 ft.	770
Revegetation			
Soil Cover	5.00/cu.yd.	20,00 cu.yd.	$100,000
Seeding & Mulching	480.00/acre	14 acres	$ 6,720
Stilling Basin	4.00/sq.ft.	1250 sq.ft.	$ 5,000
Sedimentation Basin	1.00/cu.yd.	1100 cu.yd.	$ 1,100
		TOTAL	$154,904

TABLE V
WILLOW CREEK

	UNIT PRICE	QUANTITY	COST
Diversion Ditches			
Excavation	--	--	--
Rip Rap	27.00/sq yd	4,000 sq yd	$108,000*
Regrading			
Retention Areas	--	--	--
Retention Basins	0.36/cu yd	500 cu yd	180
Contouring	45.00/acre	2 acres	90
Roads	--	--	--
Revegetation			
Soil Cover	$5.00/cu yd	9,680 cu yds	48,400
Seeding & Mulching	480.00/acre	6 acres	2,880
		TOTAL	$159,550

*Includes only the left bank of Willow Creek in Area A. Area B work to be incorporated in construction of facilities for Portal 6.

TABLE VI

TRASH CANYON AND UTAH FUEL #1

	UNIT PRICE	QUANTITY	COST
Diversion Ditches			
Excavation	-	-	
Rip Rap	-	-	
Culverts	-	-	
Regrading			
Retention Areas	-	-	
Retention Basins	-	-	
Contouring	$0.36/cu. yd.	15,000 cu.yd.	$5,400
Roads	-	-	
Revegetation			
Soil Cover	-	-	
Seeding & Mulching	$480/acre	3 acres	$1,440
	-	-	
		TOTAL	$6,840

TABLE VII

CASTLE GATE

	UNIT PRICE	QUANTITY	COST
Diversion Ditches			
Excavation - small ditch	2.00/cu yd	22 cu yd	$ 44
- compaction	1.00/cu yd	30 cu yds	30
Rip Rap	--		--
Culverts			
15" Ø CMP, 14 ga.	10.00/ft	50 ft	500
24" Ø CMP, 12 ga.	18.00/ft	60 ft	1,080
58" x 36" pipe arch, 8 ga.	48.00/ft	40 ft	1,920
Regrading			
Retention Areas	--		--
Retention Basins	0.36/cu yd	420 cu yds	151
Contouring	--		--
Roads	0.70/ft	7000 ft	4,900
Revegetation			
Soil Cover			
Seeding & Mulching	480.00/acre	5 acres	2,400
Stilling Pools	4.00/sq ft	1250 sq ft	5,000
Refuse Dump Subsurface Drains	5.00/ft	1000 ft	5,000
		TOTAL	$21,025

TABLE VIII

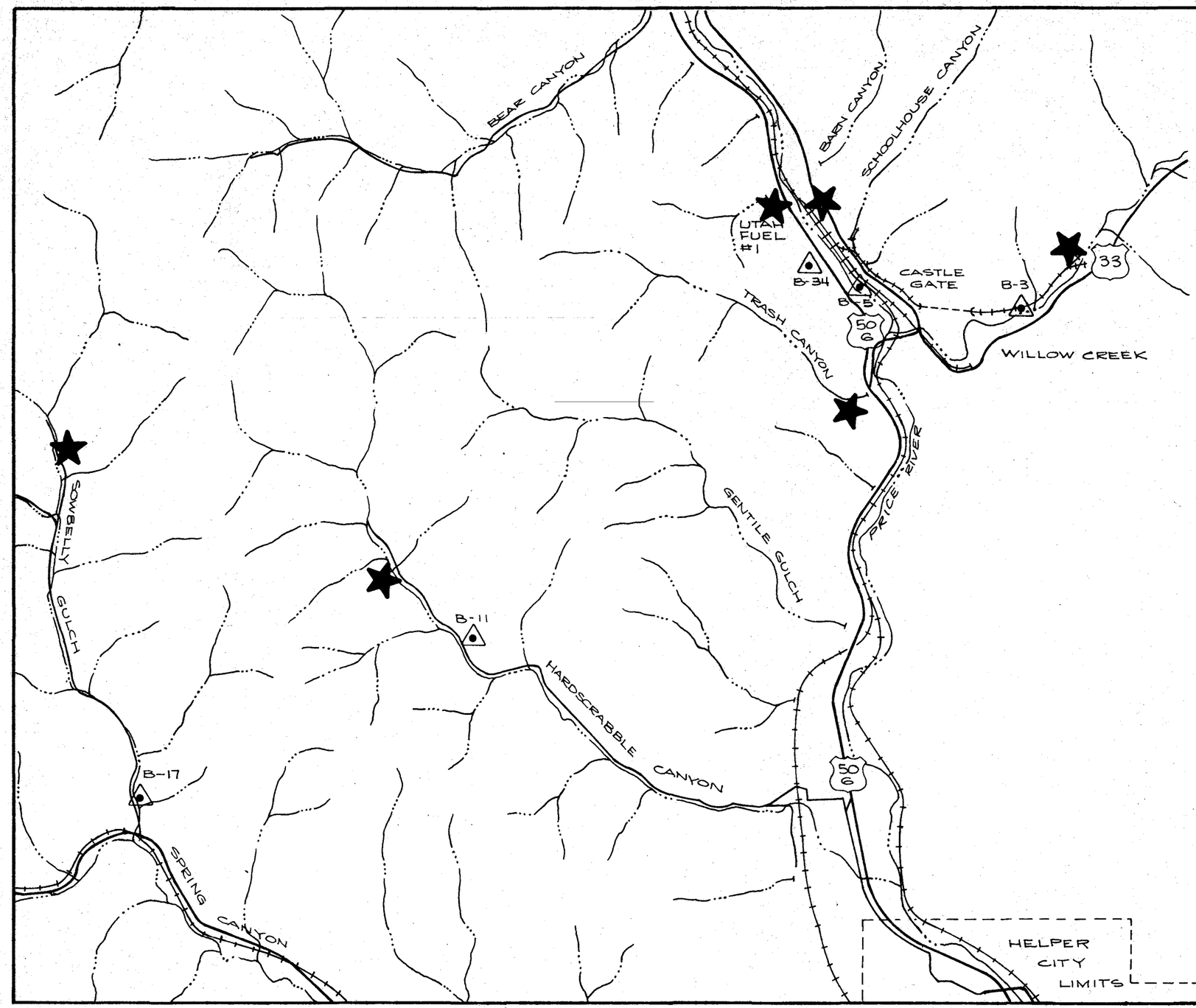
COST SUMMARY

SOWBELLY GULCH	$ 99,000
HARDSCRABBLE CANYON	155,000
WILLOW CREEK	160,000
TRASH CANYON AND UTAH FUEL #1	7,000
CASTLE GATE - COAL PREPARATION PLANT	21,000
TOTAL	$ 442,000

Figure 1

LOCATION PLAN
NEAR HELPER, UTAH

S78253 Golder Associates SEPT 1978



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N

Scale
1" = 2000'

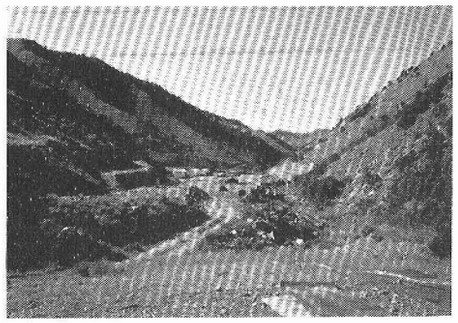
LEGEND

Water Monitoring Station

Study Locations

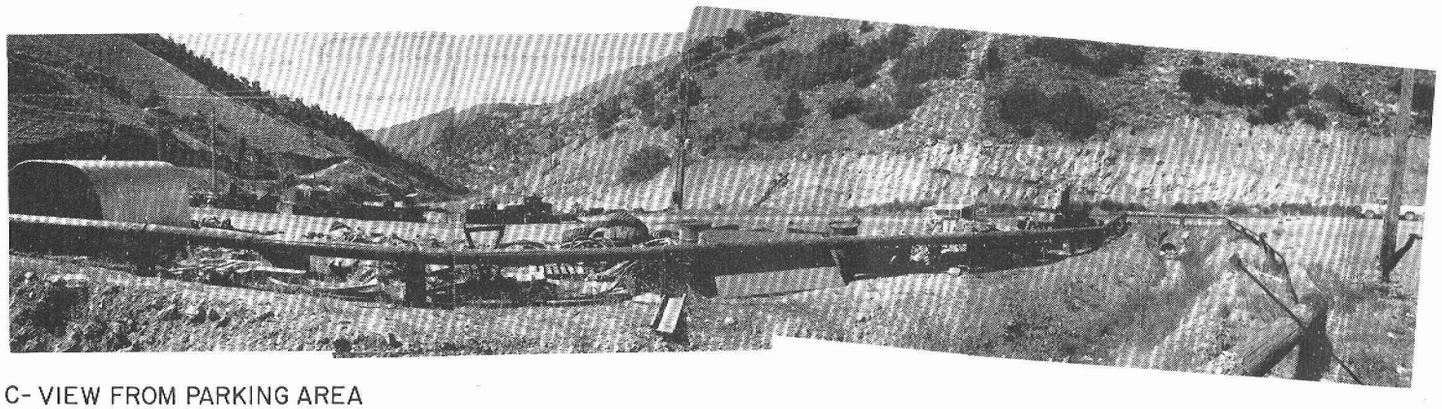
REF: This plan is taken from an untitled, undated plan supplied by Braztah Corporation.

Figure 3

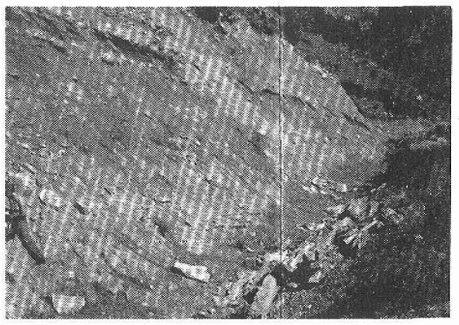


A- MAIN DISTURBED AREA
Looking South

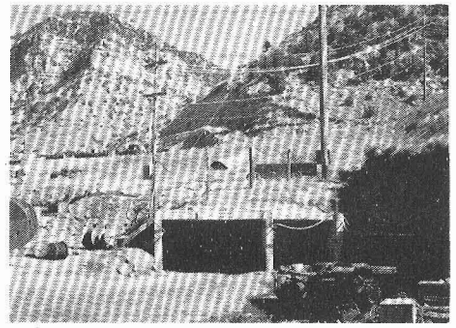
B- PARKING AREA
Looking East



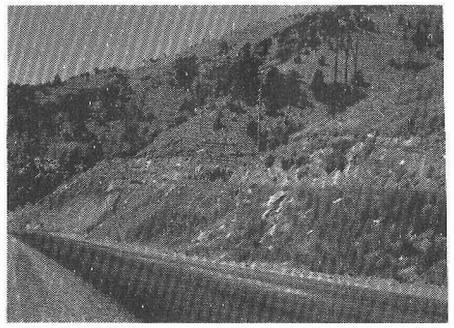
C- VIEW FROM PARKING AREA
Looking Southwest



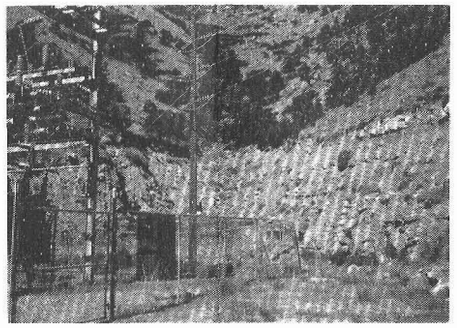
D- MAIN STREAM CHANNEL BY PARKING AREA



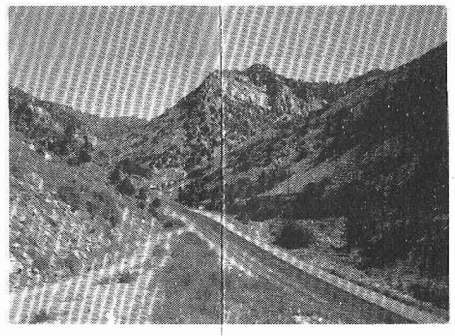
E-PORTAL #5



F-SOUTH SUBSTATION



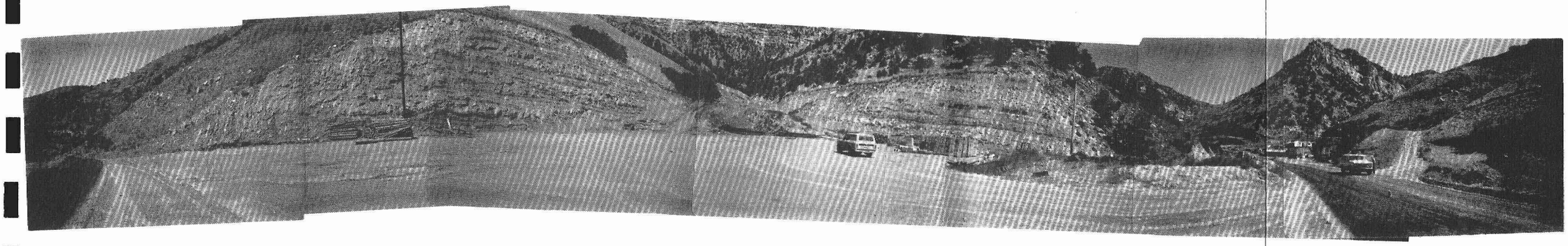
G-SOUTH SUBSTATION



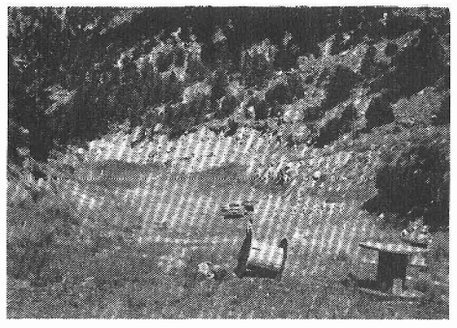
H-VIEW FROM SOUTH SUBSTATION
Looking North

SOWBELLY GULCH

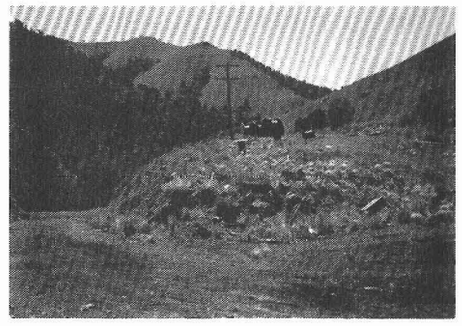
Figure 4



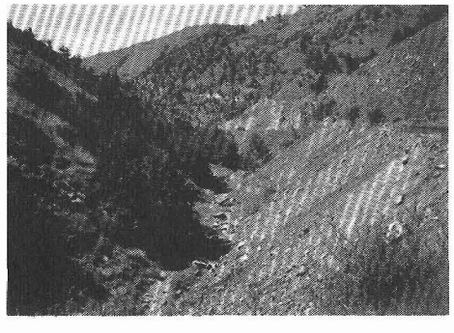
A- STORAGE AREA WEST OF MAIN ROAD
Looking West



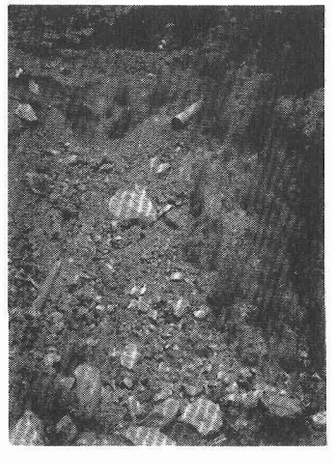
B- SAME GULLY AS "A", FURTHER IN
Looking West



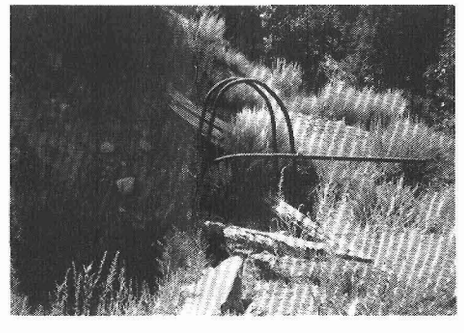
C- SAME GULLY AS "A", FURTHER IN
Looking East



D- MAIN STREAM CHANNEL NORTH
OF SOUTH SUBSTATION
Looking South



E- MAIN STREAM CHANNEL
BANK AT ROAD INTERSECTION

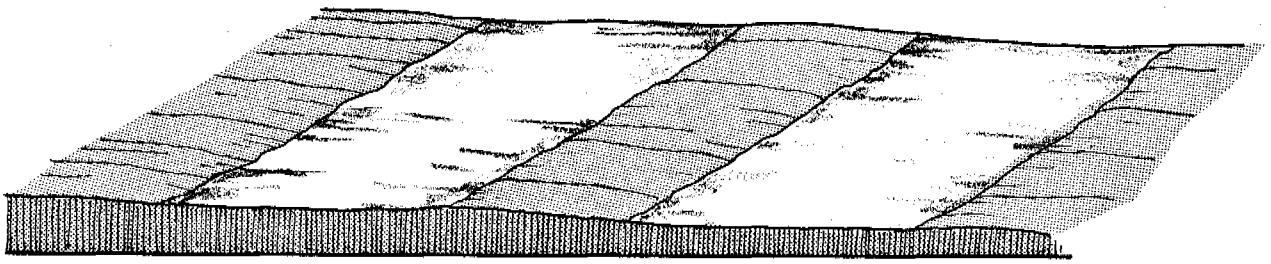


F- UNUSED OLD MINE SHAFT

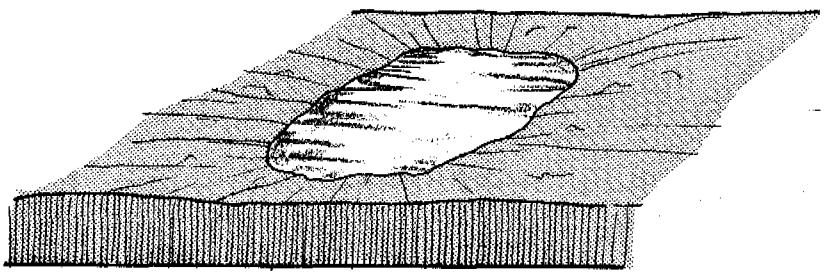
SOWBELLY GULCH

RUNOFF RETENTION STRUCTURES

Figure 6



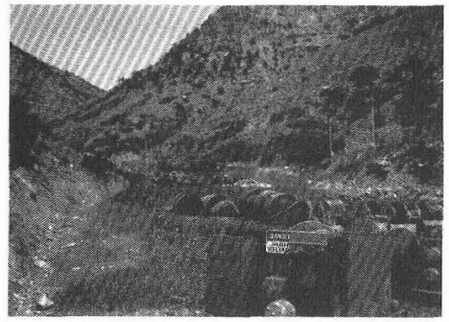
TYPICAL RETENTION AREA



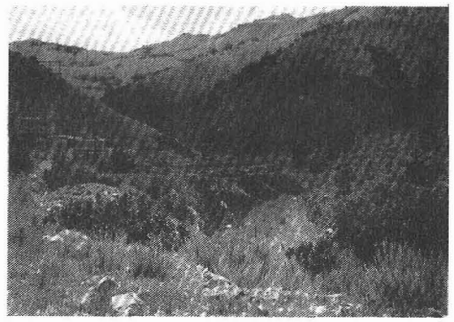
TYPICAL RETENTION BASIN

Project No. 782-53 Reviewed JMG Date 11-78

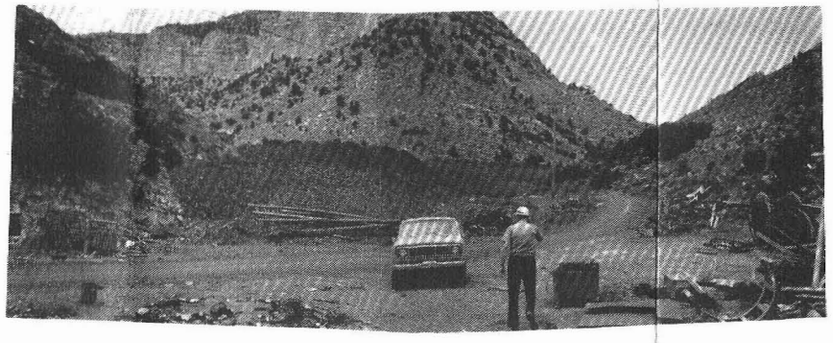
Figure 10



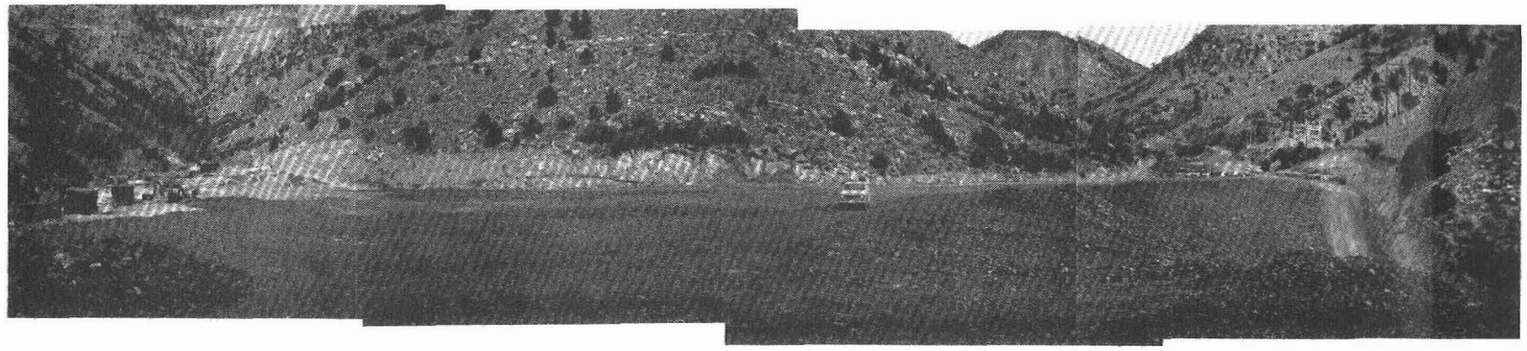
A-COAL WASTE DUMP
Looking North



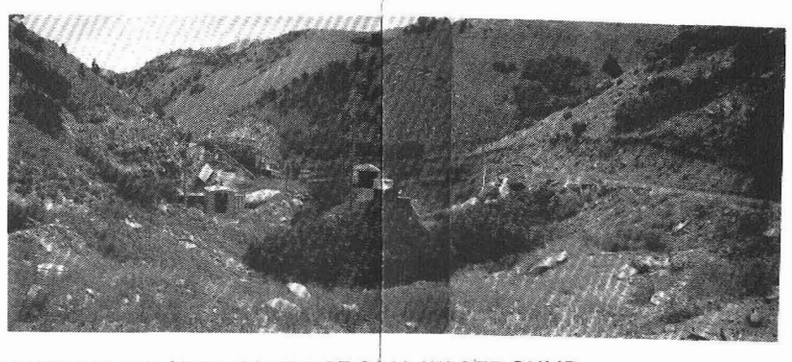
B-COAL WASTE DUMP
Looking South



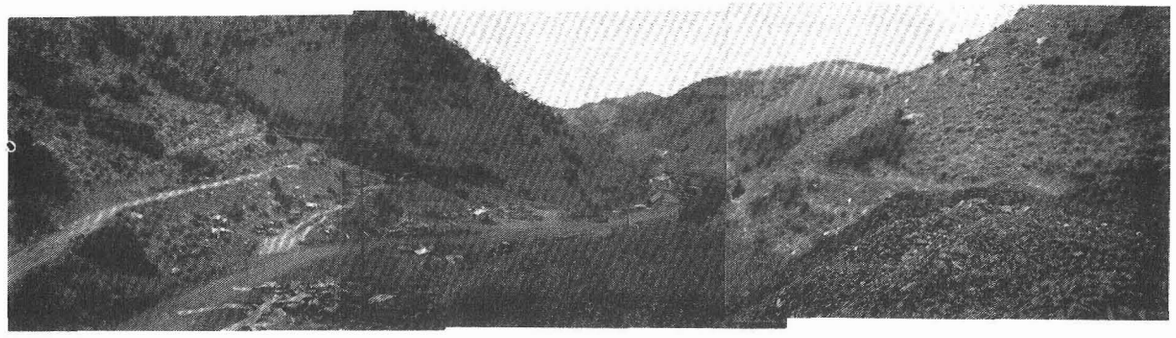
C-TOE OF COAL WASTE DUMP
Looking North



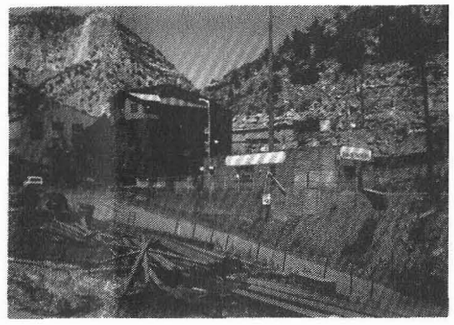
D-COAL WASTE DUMP
Looking North



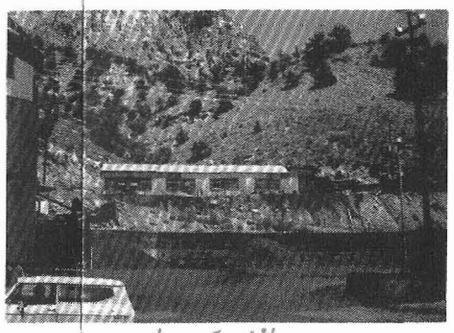
E-DISTURBED AREA SOUTH OF COAL WASTE DUMP
Looking South



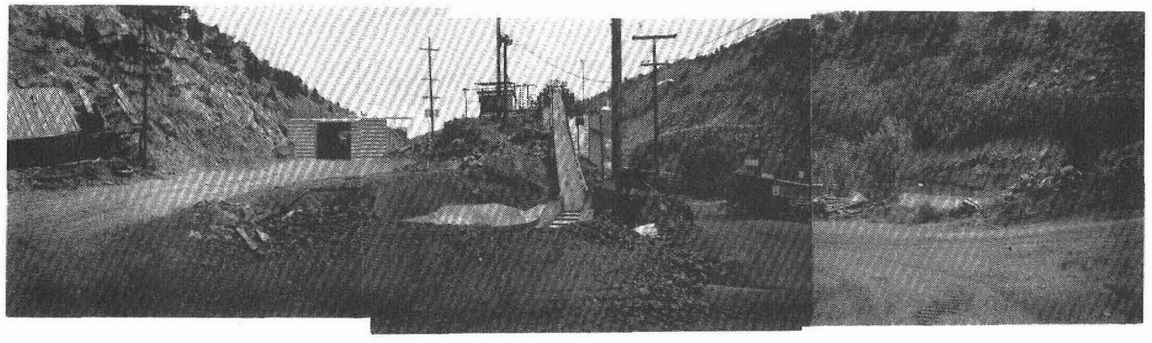
F-TOE OF COAL WASTE DUMP
Looking South



G-EXISTING COAL PREPARATION PLANT



H-EXISTING ~~WAREHOUSE~~ shop facility

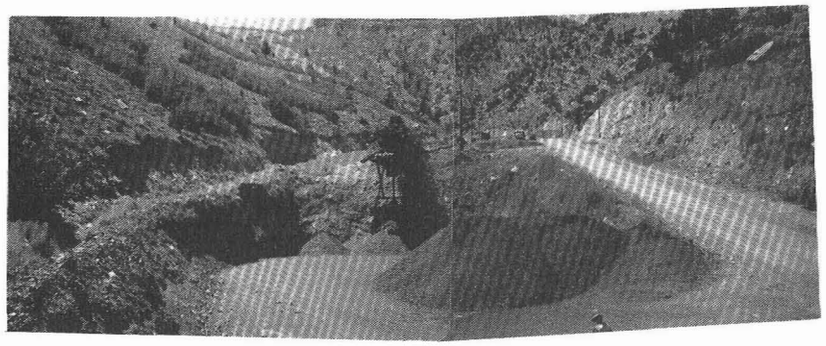


I-EXISTING COAL PREPARATION PLANT
Looking South

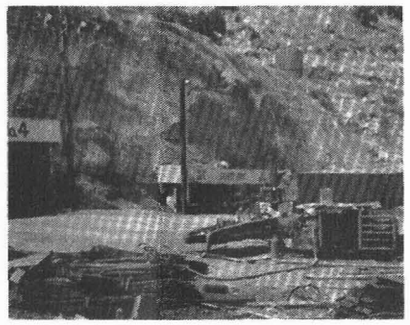
J-EXISTING COAL PREPARATION PLANT
Looking Southeast

HARDSCRABBLE CANYON

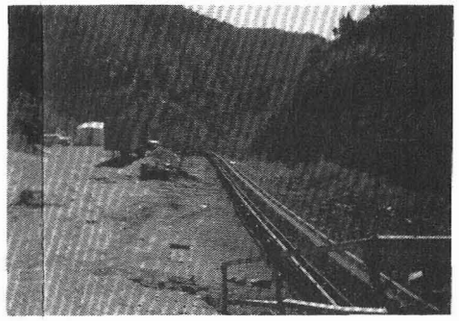
Figure 11



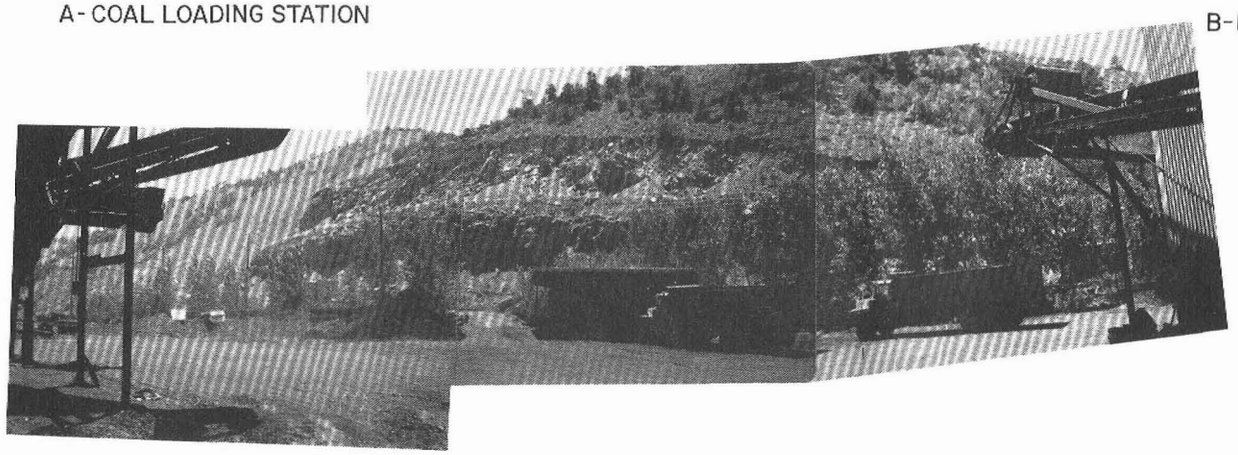
A-COAL LOADING STATION



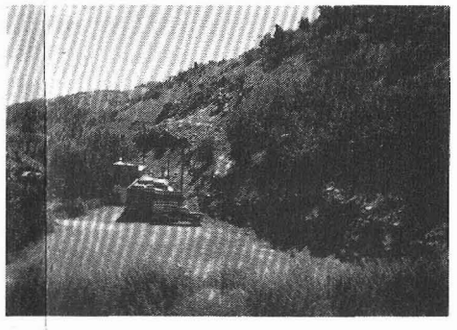
B-PORTAL #4 AREA



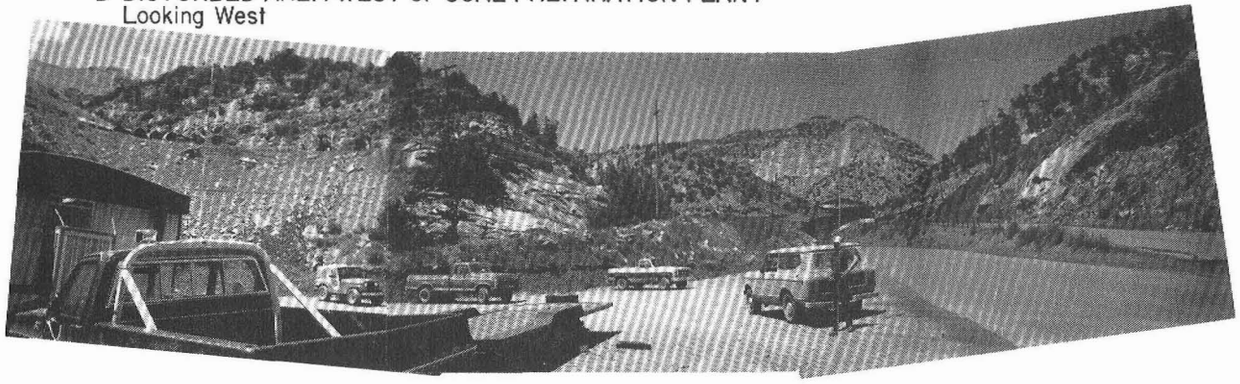
C-CONVEYOR FROM PORTAL #4
Looking East



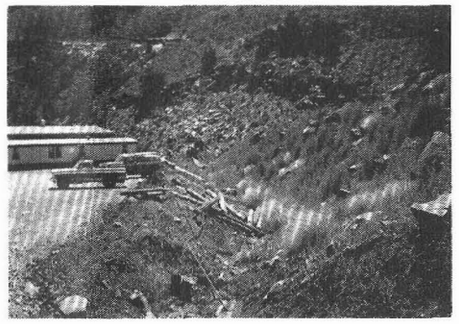
D-DISTURBED AREA WEST OF COAL PREPARATION PLANT
Looking West



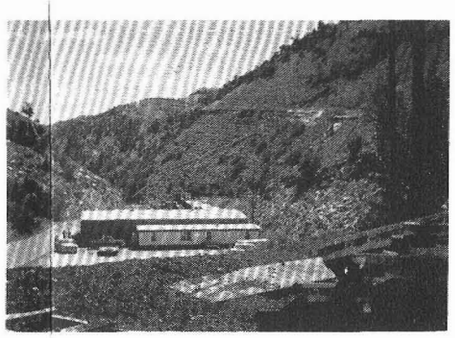
E-DISTURBED AREA WEST OF COAL PREPARATION PLANT
Looking South



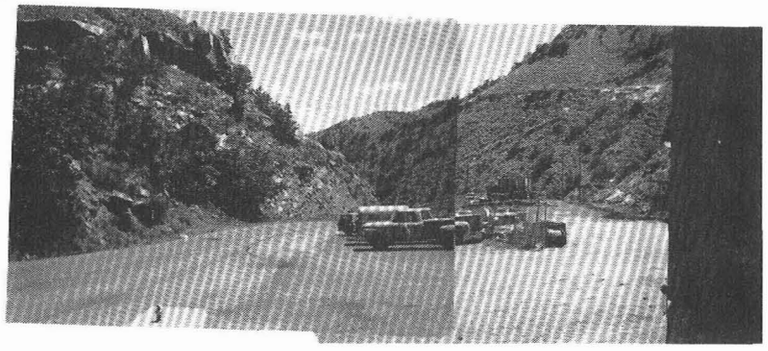
F-COAL PREPARATION PLANT
Looking North



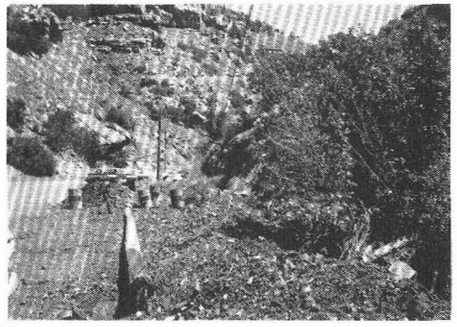
G-MAIN STREAM CHANNEL BY
EXISTING OFFICE AND WAREHOUSE



H-EXISTING OFFICE AND WAREHOUSE



I-FENCED STORAGE AREA
Looking South



J-PARKING AREA BELOW STORAGE AREA
Looking South

HARDSCRABBLE CANYON