CHAPTER II ---- INDEX

SCOPE

The purpose of this chapter is to aquaint the reviewer with the operator(s), their right to mine in the mine plan area, and their permit and legal status. Also of the land owners of record and their agreement with the operator.

2.2 (782.13)

(a) (1) Applicant

CO-OP MINING CO.

53 West angelo Ave.
Salt Lake City, Utah 84115
Tel. 801-486-5047

(2) Land and coal owner

C O P Coal Development Co.
3140 South Main St.
Salt Lake City, Utah 84115

(3) Lease holder — Same as applicant.

(4) None.

(5) Operator — Same as applicant.

(6)

A V Gustafson
1798 South 9th East
Salt Lake City, Utah

(b) (1) Partnership

Wendell Owen	808 South 1800 West Woods Cross, Utah 84087
Ellery Kingston	140 East 30 South Sandy, Utah 84070
Elden Kingston	991 East 3825 South Salt Lake City, Utah 84106
Earl W. Stoddard	Box 300 Hunting, Utah 84528
Gerald Hansen	Box 300 Huntington, Utah 84528
John Gustafson	1815 South 1100 West Woods Cross, Utah 84087

(3) Same as (a) (1)

(c) same as (b)

(d) Act/015/021 Oil Gas and Mining Div.
ACT/015/025 " " " "

(e) Northwest Carbon
U S Forest Service

(f) MSHA #42-00081-0

(g) none

2.3 782.14 (a) (1) no

(2) no

(c) Violation 80-1-6-6 10/1/80 by Oil, Gas, and Mining

2.4 782.15 (a) Coal mining lease by and between Co-op Mining Co. and Peabody Coal Co., executed Dec. 1st, 1975

See Plate IV-1 area T16S, R7e, S L M
Sec. 14 SW¼
" 23 E½, E½ NW¼, E 1/2 SW 1/4, SW 1/4 SW 1/4.
" 24 all West of N-S fault
" 25 all West of N-S fault

The right to mine and remove from, and use for purposes incident to mining, including access roads, camp facilities, surface operations, storage of coal, and other activities. Also unrestricted use of all access roads leading to and from property. Lease is binding on the successors to the parties of the lease.

2.5 782.16 (a) Exempt

(b) Coal lease dated 12/1/75.

2.6 782.17 (a) Surface preparation work (access roads and surface water control facilities) is nearing completion at the present time. Construction of portals will begin on or about April 1, 1981, subject to the approval by the Division of the surface facilities. Anticipated date to begin production will be Aug. 1, 1981. Termination of mining activities will be when all coal reserves have been recovered, anticipated time frame, in excess of 50 years.

Surface area to be affected; 10 acres.
Horizontal extent; that portion of the lease that is occupied by the Blackhawk formation (Approx. 680 acres).
Vertical extent; the (3) coal seams shown in Plate VI-2

2.7 782.18 Insurance; State Insurance fund, Policy #C0652

2.8 Bond is current with permit #ACT/015/025 (Exhibit (b))

2.9 782.19 Permit #ACT/015/021 (also see exhibit c)

2.10 Copy of application filed; Emery County courthouse, Castle Dale, Utah

2.11 782.21 Advertised in the Emery County Progress, Castle Dale, Utah.

CHAPTER II Exibit 'c' Permits

Oil, Gas, and Mining	Permit # ACT/015/021
Oil, Gas, and Mining	" ACT/015/025
MSHA	" 42-00081-0
MSHA	" 42-01697
NPDES	" UT-0023612

CHAPTER III

Operation and Reclamation Plan (784.0)

CHPATER III

Table of contents (cont.)

CHAPTER III

Table of contents (cont).

SCOPE

It is the intent of this chapter to aquaint the reviewer with the type of operation; and with the general layout of the working area. Also to to discuss the possible impact on the environment of the operation, and proposed measures to minimize that impact, and the reclamation of the area when the mining operation is completed.

3.2 Surface facilities/ Construction Plans

3.2.1 Site has been selected and preparation is nearing completion under permit #ACT/015/025 (See Plate III-1-b, Plate III-2-b, Plate III-3-b, and Plate IV-1).

3.2.2 The mine is an old existing mine that will be reclaimed, but the present portal will be closed, and three new portals, fan, belt, and intake will be developed. (See Plate III-1-b).

3.2.3 Surface structures will consist of; a single building complex containing shops, parts warehouse, bath house, and mine offices; truck scales, weighman office, caretaker dwelling, mine run coal reciever bin, lump coal bin, crushing and sizing structure, truck load out bins, stockpile towers, and conveyors to carry coal to storage and load out sites. (See Plate III-1-b)

3.2.4 Coal carried from the mine by conveyor belt to a reciever bin, conveyed to the sizing and crushing plant, the lump removed and divirted to the lump bin, the rest of the oversize crushed, and the coal sized to meet the various requirements of the different costomers, then conveyed to the truck load out bins, or the stockpile area.

3.2.5 Power will be delivered by U P & L transmission lines at 12,500 V. direct to a substation (See PLate III-1-b), reduced to 4160 V. for the mine feeder line, and to 480 V. for tipple use, and to 240 V. for shop and other use.

3.2.6 Water for bath house and caretaker dwelling will be hauled from spring in Trail Canyon to fresh water storage tanks.

3.2.7 Individual septic tank system.

3.2.8 See 7.2

3.2.9 See 7.2

3.2.10 Roads etc. See Plate III-3-b

3.2.11 Total area disturbance; Approx. 10 acres.

3.2.12 No additional disturbance has been planned.

3.2.13 Construction of coal handling and processing facilities to begin on or about April 1, 1981, scheduled for completion by Aug. 1, 1981. Construction of truck scale and caretaker dwelling to begin on or about May 1, 1981, scheduled for completion by Sept. 1, 1981. Construction of shop complex to begin on or about May 15, 1981, scheduled for completion on or about Jan. 1, 1982. A copy of the architect drawings for the buildings will be forwarded to the Division when they are completed.

3.3 Operation plan

3.3.1 Mining plans; We are entering the first coal seam through an existing mine. MSHA has instructed us to rehabilitate the old workings before we submit the underground mining plans (roof control, ventilation, barrier pillar, and etc.) As soon as these are complete, we will also submit them to the Division under the heading Chapter III Exibit 'd'.

3.3.1.1 There are three seams in the Bear Canyon property, the Upper Bear, (upper), the Bear or Blind canyon seam (middle), and the Hiawatha (lower). The old existing mine is in the middle seam. Our projected plan is to begin mining in the existing mine, but only in the development stage of mining. Retreat mining will not take place in this seam untill after the upper seam has been mined.

3.3.1.2 through 6 Mining methods; see Exibit 'd'

3.3.2 Barrier Pillars

3.3.2.1 There are no oil or gas wells in or near the mine plan area.

3.3.2.2 There are no surface structures in or near the mine plan area. The formation in which the coal seams are located are well above any streams (also see Chapter 7).

3.3.2.3 The only place the coal seam is adjacent to a property bountry is to the North. There will be a 100 foot barrier pillar left at the property line at this point.

3.3.2.4 Whenever the mining operation approaches the surface where there is a coal outcropping, the coal becomes rusty and unsalable. This condition alerts us to the proximity of the surface, and the miningin that is discontinued. This happens at between 100 and200 feet of the surface, so a pillar of at least 100 feet is always left at that point.

3.3.2.5 A 100 foot barrier pillar is left at any major fault line.

3.3 (cont.)

3.3.3 Conservation of coal resource.

3.3.3.1 Projected maximum recovery; 60%. A study is underway to determine the feasability of longwall mining in certain areas of the mine plan area, in the lower seam. This would increase the percent recovery expected.

3.3.3.2 A 60% recovery is considered good recovery.

3.3.3.3 The horizontal extent of the coal seams are limited by the canyons. We mine everything as we go, leaving no reserves to need access to in the future.

3.3.4 See exibit 'e'. (equipment list)

3.3.5 Mine Safety, Fire Protection and Security; meets MSHA requirments.

3.3.5.1 A sign is in place at the access road leading to the permit area, showing company name, address, phone number, and permit numbers.

3.3.5.2 A gate is in place on the access road at the entrance to the permit area.

3.3.5.3 All stationary facilities, and all portable equipment are equipped with fire extinguishers, and coal transfer points have bagged rock dust nearby.
Coal stockpiles and refuse piles are monitored daily to control spontainious combustion fires.
All underground equipment is equiped with MSHA approved fire suppression devices and/or fire extinguishers, also coal dust suppression water sprays, methane monitors and etc. All entries are rock dusted, and bags of rock dust are placed at all coal transfer points. MSHA regulations are very complete and well enforced in reguard to fire protection.

3.3.5.4 Explosives; not used.

3.3.6 Operations schedule

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

3.3.6.2 Schedule; Three 8 hour shifts per day, 5 days per week.

3.3.6.3 Number of employees varies between 30 and 40 persons.

3.3.7 Mine permit area; same as mine plan area

3.3.7.1 No projection has been made

3.3.7.2 Acreage an delineation; See Plate IV-1

3.3.8 Mine plan area; See Chapter IV page 3

3.3.8.1 No projection has been made.

3.4 Environmental Protection

3.4.1 Preservation of land use

3.4.1.1 Historicly, land use in the mine plan area has consisted of mining, grazing, and seasonal hunting. These uses have remained the same in the forty years existance of this company, and no future impact is expected. The land is not suitable for other use. (See chapter IV 4.)

3.4.1.2 Limit disturbed area as much as possible.

3.4.2 There are no historical or cultural sites in the mine plan area.

3.4.3 Hydrologic Balance.

3.4.3.1 Effect of mining on hydrological balance will continue to be minimal. (See chapter VII for detailed data on hydrology.)

3.4.3.2 Compliance with surface water control measures to mitigate impacts on surface hydrology. (See 7.2 and plate III-2t) The mine has already been developed to the limits of the mine plan area, and we are currently retreat mining, so there is no need for control measures for ground hydrology.

3.4.3.3 See 7.1.6 and 7.2.6 (water monitoring plans)

3.4.4 Soil resources

3.4.4.1 No plans for expansion of disturbed area, no additional impact is projected.

3.4.4.2 Minimize disturbed area, and reseed disturbed areas to minimize wind and water erosion.

3.4.5 Vegitative resources.

3.4.5.1 No plans for expansion of disturbed area, no additional impact is projected.

3.4.5.2 Minimize disturbed area,and reseed disturbed areas

3.4.5.3 See chapter IX (vegitation survey)

3.4.6 Wildlife

3.4.6.1 No change is contemplated in mining method or expansion of surface facilities, so no impact is projected on fish and wildlife.

3.4.6.2 Water leaving disturbed area is being monitored so water harmful to fish will enter a fishing stream, power lines are properly spaced and designed to minimize danger to birds.

3.4 (cont.)

3.4.6 (cont.)

3.4.6.3 Water leaving disturbed area will be monitored once each month. Premises will be inspected periodically for potential danger to animal or bird life.

3.4.7 Air quality

3.4.7.1 The projected impact of the operation on air quality is a reduction from the present impact on air quality, due to better dust control measures than we have been using in the past.

3.4.7.2 Treatment and dust control practices on roads, water spraying of coal fines at transfer points and stockpile and loading areas. (See chapter XI)

3.4.7.3 Monitoring; Records will be obtained from UP&L reporting stations.

3.4.8 Subsidence

3.4.8.1 Impact minimal. No structured or renewable resourses exist within the permit area. Applicant requests negative determination as outlined in UMC 784.20

3.4.9 Waste disposal

3,4,9,1 Projected impact is less than the past impact due to improved methods. Future impacts will be minimal.

3.4.9.2 Mine waste rock will be placed in the area which has been designated and approved as a waste disposal area, which will later be covered with topsoil and reseeded. Refuse is now placed in dumpsters and picked up by a licensed refuse collector, waste oil is collected by an approved oil collector.

3.5 Reclamation Plan

3.5.1 Contemporaneous reclamation will consist of reseeding ditch banks, pond banks and other areas that have been disturbed during construction of sediment and surface water control structures. Also, reclaiming, contouring, and reseeding of areas previously disturbed that are no longer in use.

3.5.2 If a new area is to be disturbed, the surface material will first be removed and placed in stockpiles. Berms will be constructed around the bottom of the stockpile to catch any dirt that might be washed of from the pile, the pile will be reseeded to provide temporary vegitative cover to help prevent wind and water erosion. A sign will be placed on the pile to identify it.

3.5.3 Final abandonment

3.5.3.1 Upon completion of mining operation, the portal(s) shall be permanently sealed to prevent entry. Permanent seals will be designed to withstand any anticipated water pressure that may develop. (Plate III-5)

3.5.3.2 All machinery, equipment, and structures shall be removed from the permit area in not more than six months from the date of the completion of mining operations. (784.13 (b) (1)

3.5.3.3 Dams, ponds, and diversions will be regraded to the approximate original contour of the land; except if that diversion is a barrow pit adjacent to, or a part of a road or pack trail that is to be left as a permanent road or trail.

3.5.4 Backfilling and grading

3.5.4.1 Disturbed areas will be backfilled and graded in not more than six months from the date of completion of the removal of surface structures, snow depth and weather permitting, or six months from the date the work can begin.
Backfilled material shall be pleced to minimize adverse effects on ground water, minimize off-site effects, and to support the postmining use.

3.5.4.2 Highwalls will be removed or reduced except where the highwall is permanently stable and/or said removal will endanger the life of the machine operator attempting the removal.

Backfilled areas shall be restored to a contour that is compatible with the natural surroundings and is capable of supporting the post mining land use. Where practicable and appropriate, such contour shall the approximate original contour.

3.5.4.3 Cut and fill terraces will be used where required in order to conserve soil moisture, ensure stability, and control erosion on final graded slopes. Terraces will meet the requirements of UMC 817.101 (4) (i) thruogh (iv).

3.5.4.4 Redistribution of soil will include covering all debris, coal or other materials constituting a fire hazard, in a place and manner designed to prevent contamination of ground or surface water. Soil will be compacted or otherwis stabilized in preparation for reseeding.

3.5.5 Revegitation.

3.5.5.1 The soil that has been redistributed and compacted will be covered with the surface material from the stockpiles, or other soil that has been tested and found to be suitable and able to support vegitative cover. Soil will be prepared for seeding by harrowing or final grading.

3.5.5.2 Seeding and/or transplanting will be done during the season most favorable for planting, as determined from information supplied by area experiment stations, or by previous seeding experiences at the mine site. Seeding will be done by broadcasting with cyclone type seeders, followed by harrowing. (See exibit 'h' for seed mixture to be used.)

3.5.5.3 (See exibit 'h') (seed mixture)

3.5.5.4 SCS vegitation survey chart will be to compare the ground cover and productivity to measure the success of the revegitation operation. (Plate IX--1) When completed, ground cover ~~ground cover~~ will equal at least 90% of the cover listed on the survey chart, or if cover is determined to be adequate to control erosion.

3.5.5.5 Reseeded areas will be monitored one time each month during the first growing season after planting. Planting will be repeated when and where necessary. When the percent of cover has reached the required level, it will be checked for cover and productivity in comparison to the SCS survey chart for each of following two years.

3.5 (cont.)

3.5.6 Schedule of reclaimation.

3.5.6.1 At the time of completion of underground mining operations temporary barricades will be placed at each portal or other mine openings to prevent unauthorized entry. These will be replaced by permanent seals within 60 days of the mine closure or of approval of the seals.

Removal of mining machinery, equipment, and structures;

6 months from the date of permanent closure.

Backfilling, regrading, and highwall reduction;

6 months from the date of completion of the removal of mine structures, snow depth and weather permitting or 6 months from the date work can begin, or 6 non-consecutive months if the winter months occur during that period of time.

Reseeding;

the first following season favorable for planting after completion of backfilling and grading

3.5.6.2 Reseeded areas will be monitored and replanted if necessary or if erosion gullies should occur before ground cover is sufficient to prevent such erosion gullies, they will be filled, regraded, and reseeded. (also see 3.5.5.5)

3.5.7 Cost estimate of reclamation.
(See exibit 'i')

CHAPTER III _____-Exibit 'd'

We have been instructed by MSHA to open the portals and rehabilitate the existing mine before submitting the underground mine plan.

As soon as it is complete, we will also submit it to the Division to add in this position.

CHAPTER III Exibit 'e'

EQUIPMENT LIST

Underground

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

Surface

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

CHAPTER III _ Exibit 'h'

SEED MIXTURE

Crested wheat grass	6# per acre
Luna pubescent wheat grass	2# per acre
Russian wild rye	6# per acre
Yellow sweet clover	6# per acre
Ladac alfalfa	2# per acre
Small burnet	2# per acre
Sage brush	1/4# per acre
Rabbit brush	1/4# per acre
Four wing salt brush	1/4# per acre

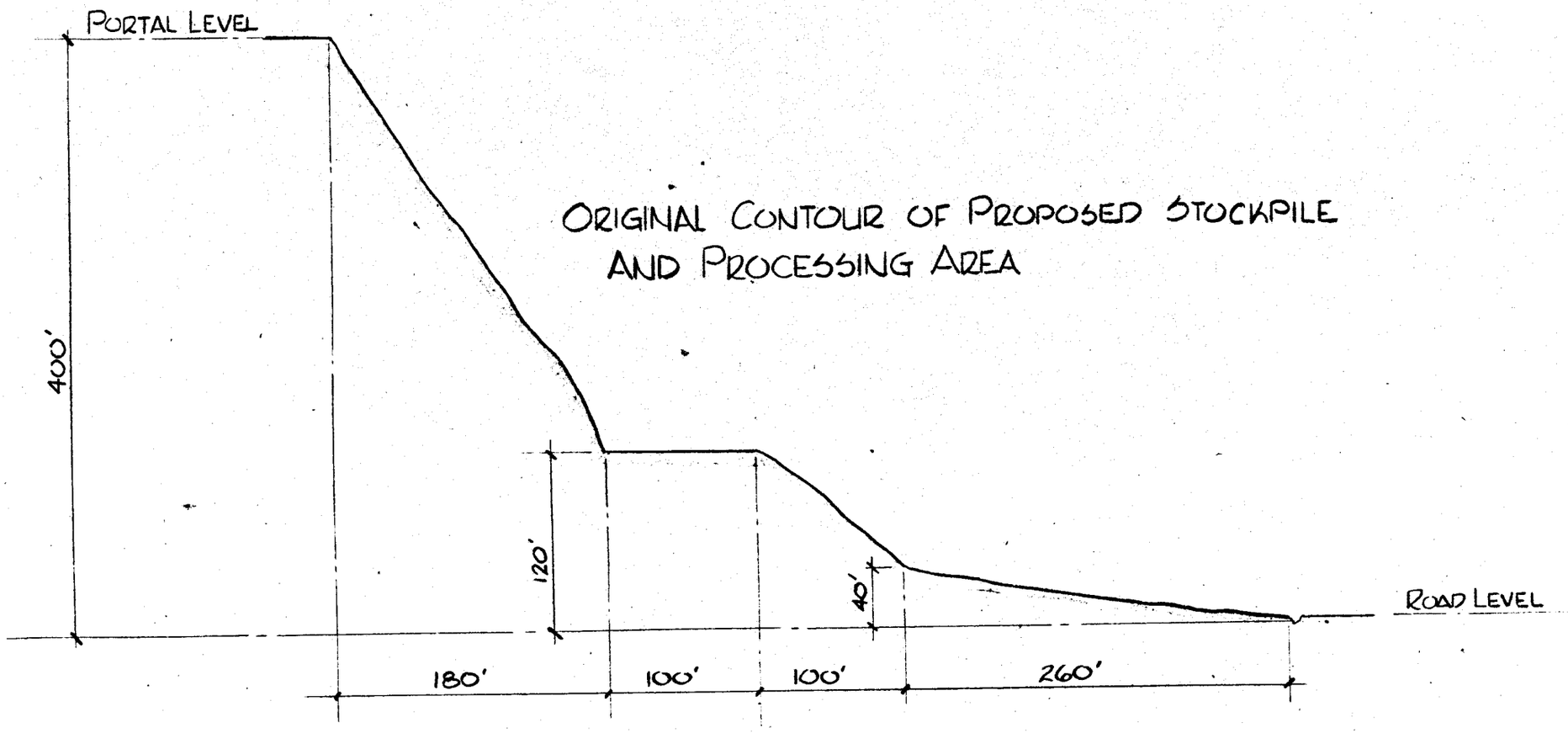
CHAPTER III-- Exibit 'i'

DIVISION OF OIL, GAS, AND MINING

BOND ESTIMATE

OPERATOR: Co-Op Mining Company
MINE NAME: Bear Creek Canyon Portal
LOCATION: Bear Creek Canyon
COUNTY: Emery County
DATE: July 28, 1980 Revised

	Operation	Amount	Rate	Cost
A.	CLEAN-UP			
	1. Removal of structures & equipment.	$3,000.00	Lump Sum	$ 3,000.00
	2. Removal of trash & debris.	$1,000.00	Lump Sum	$ 1,000.00
	3. Leveling of ancilliary facilities pads and access roads.	7200 yd^2	$0.25/$yd^2$	$ 1,800.00
B.	REGRADING & RECONTOURING			
	1. Earthwork including haulage and grading of spoils, waste and overburden.	6 Acres 2500 cy	$1.23/cy	$3,075.00
	2. Recontouring of highwalls and excavations.	1 Acre, 45,000ft^3-1666	$1.23/cy	$2,050.00
	3. Spreading of soil or surficial materials.	7 Acres 5182 yd^3 200'x1000'x1	$1.23/cy	$6,374.00
C.	STABILIZATION			
	1. Soil preparation, scarification, fertilization, etc.	10 Acres	$25.00/Acre	$ 250.00
	2. Seeding or planting.	10 Acres	$150/Acre	$ 1,500.00
	3. Construction of terraces, waterbars, etc.	N/A	N/A	N/A
D.	LABOR			
	1. Supervision.	30 Hours	$10.00/hour	$ 300.00
	2. Labor exclusive of bulldozer time.	Included above		
E.	SAFETY			
	1. Erection of fences, portal coverings, etc.	3 portal covers	$1,500 each	$4,500.00
	2. Removal or neutralization of explosive or hazardous materials.	N/A	N/A	N/A
F.	MONITORING			
	1. Continuing or periodic monitoring, sampling & testing deemed necessary.	10 Acres reseed if necessary	$175/Acre	$1,750.00
	OTHER		Subtotal	$25,599.00
	13% inflation for 5 years.		Inflation	21,566.00
			TOTAL	$47,165.00



CROSS SECTION A-A

SCALE: 1"=100'-0"

CHAPTER IV Land status, Land use

SCOPE

4.1 The purpose of this chapter is to discuss the status of the land both current and pre-mining, and possible effects of the operation on post-mining status.

4.2 Includes U S Forest Service range classification of the mine plan area, and a brief description of the pre-operation land use of the region.

4.3 Land status

4.3.1 Surface land status/ Mine plan area (See Plate IV-1)

4.3.1.1 COP Coal Development Co. (Chap II 2.2)

4.3.1.2 Surface managing authorities;
Owner
U S Forest Service

4.3.1.3 Utility corridors and other right of ways;
U P & L pole line (Plate IV-1)
Cattlman trail "

4.3.1.4 Special use permits and leases; none

4.3.2 Mineral ownership; same as land owner

4.3.2.1 Coal ownership; same as land owner

4.3.2.2 Coal lease; Co-op Mining Co.

4.3.2.3 same as 4.3.2

4.3.2.4 Mineral leases; none

4.3.2.5 Oil and gas ownership; same as land owner (no wells)

4.3.2.6 Oil and gas leases; none

4.4 Land use

4.4.1 Regional land use; land use in the region falls mainly in four categories;

Grazing-- although there is some grazing in the canyon areas, most of the summer cattle range is located in the upper plateau and high mountain valley regions of Gentry Mountain.

Coal Mining-- coal mining in the region dates back to about the year 1896, and due to the large quantity of high quality coal in the region, has continued since that time to be a major factor in the economic growth and development of the area.

Farming--- mainly in the lower valley floor. Due to the high alkalinity of the soil, farming is somewhat limited as compared to the total acreage of the region. The best farming areas are usually located at the canyon outlets and along the stream channels where the soil has been enriched from the silt and erosion from the mountain areas.

Recreation--- the region has long been used for deer and elk hunting and the main streams such as Huntington and Cottonwood Creeks for fishing.

4.4 (cont.)

4.4.2 The mine plan area is located in between the lower farming area, and the upper grazing area. It consists to a great extent of high rugged rocky ledges, which makes it unsuitable for either use. There are no fishing streams in the mine plan area. The range classification by the U S Forest Service indicates the mine plan area is predominantly Class 7, with small amounts of N-4, and 7T. (See Plate IV-2). These classifications are described as follows:

7---Heavy timber or other types--Includes those areas with an inherent lack of forage and contributes little or nothing to support of livestock or big game. Where natural forage production is less than 50 pounds per acre, it would be classified as 7. It is classed as non-range.

7T---Heavy timber typs which, in their pristine state, produce less than 50 pounds of available dry forage per acre to either domestic livestock or big game.

N--- Unsuitable range not used. Use of less than one cow day per acre will be classed in this category.

4--- Sage brush--Includes untimbered lands where sagebrush or rabbitbrush dominate the area.

4.4.3 Land-use during operations; same as 4.4.2

4.4.3.1 Affect of operation on land-use; the four uses listed in paragraph 4.4.1 have co-existed in this area for the greater part of a century with no apparent adverse effects on each other, and there is no justifiable reason that they will not continue to do so in the future. The operation, then, is expected to have no or minimal effect on land-use.

4.4.3.2 Mitigation---Limit the amount of area disturbed as much as possible.

4.5 Post-mining land use. Same as 4.4.2

4.6 Socioeconomic Considerations.

The Co-op Mining Co. is a small company and does not have much effect on either the social or the economic climate of the community.

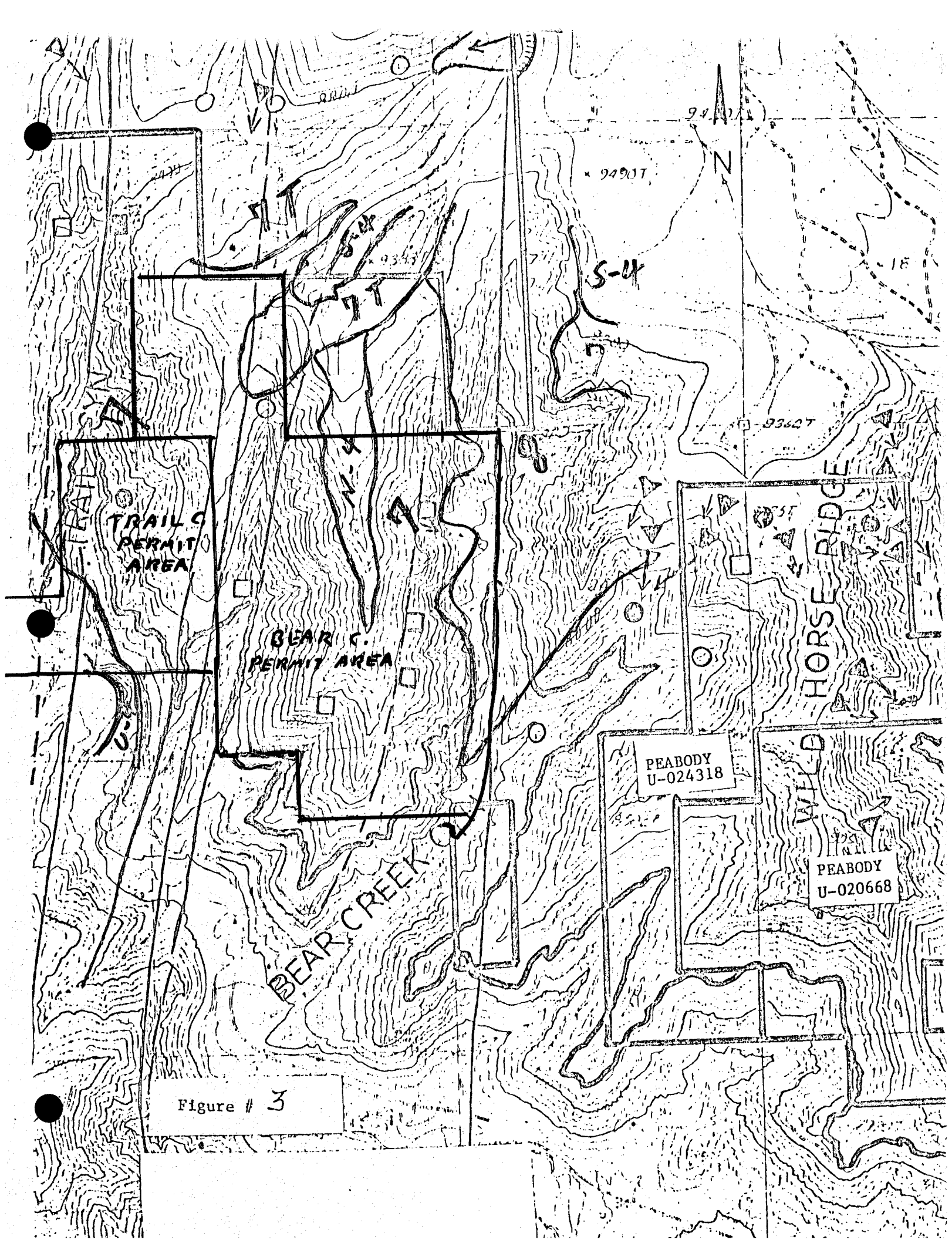

TRAIL C
PERMIT
AREA
BEAR C
PERMIT AREA
BEAR CREEK
PEABODY
U-024318
PEABODY
U-020668
HORSE
S-4
N

Figure # 3

Historical and Cultural Resources

None in the mine plan area.

Chapter VI

Geology

Table of Contents

Scope

The purpose of this chapter is to aquaint the reviewer with the geologic setting in which the mine plan area is located, and of the characteristic of the coal and of the rock in the underlying and overlaying layers.

6.2 We have used here, a geology report by Sanders Exploration, Limited, and excerpts from a Utah Geological and Mineralogical Book of the geology in the Central Utah Coal Fields. There has to date, been very little drilling in the area, and none in the immediate vicinity, but we expect to be able to aquire some data from Northwest Carbon Co. from some drilling they are currently undertaking, as soon as it is available. This will help in our overall knowledge of the area geology. This will be forwarded to the Division as soon as we recieve it.

6.3 Regional geologic framework; See exibit VI-a

6.4 Geology of project vicinity

6.4.1 Stratigraphy See exibit VI-b

6.4.2 Structure See exibit VI-b

6.5 Geology of coal bed and adjacent units

6.5.1 Exploration to date has been confined to locating coal seams at the various outcrop points. There has been no drilling in the mine plan area. There is currently some drilling being done by Northwest Carbon Co, in the proximity of the Co-op Mining Co. mine plan area. We will be able to obtain the data from this drilling, and will be submitted to the Division as Exibit VI-c to be inserted in this application folder.

6.5.2 See Exibit VI -'d' Stratighaphy

6.5.3 See Exibit VI-'d' Structure

6.5.4 See Exibit VI-'d' Cross sections

6.5.5 Coal reserves

6.5.5.1 Reserve calculations.

6.5.5.2 Coal quality. See Exibit VI-e

6.5.6 Adjacent units (Overburden)

6.5.6.1 Rock characteristics. See Exibit VI-d

6.6 Geologic Effects of Mining

6.6.1 Mining Hazards; mine plan area is in the Pleasent Valley fault zone, necessitating extra roof control and support procedures in many areas.

6.6.2 Surface hazards; mine plan area is extremely rugged, with many high rock ledges. In the event of any subsidence, or surface disturbence, the surface would not be any more hazardous that it is with its original configuration.

6.6.3 Impacts of mining; the coal seams are in a mountain between canyons at an elevation higher than the ground level in the adjacent canyons. This would tend to limit the goelogical impact of mining to the mountain in which the mine is contained.

E

Exibit VI a

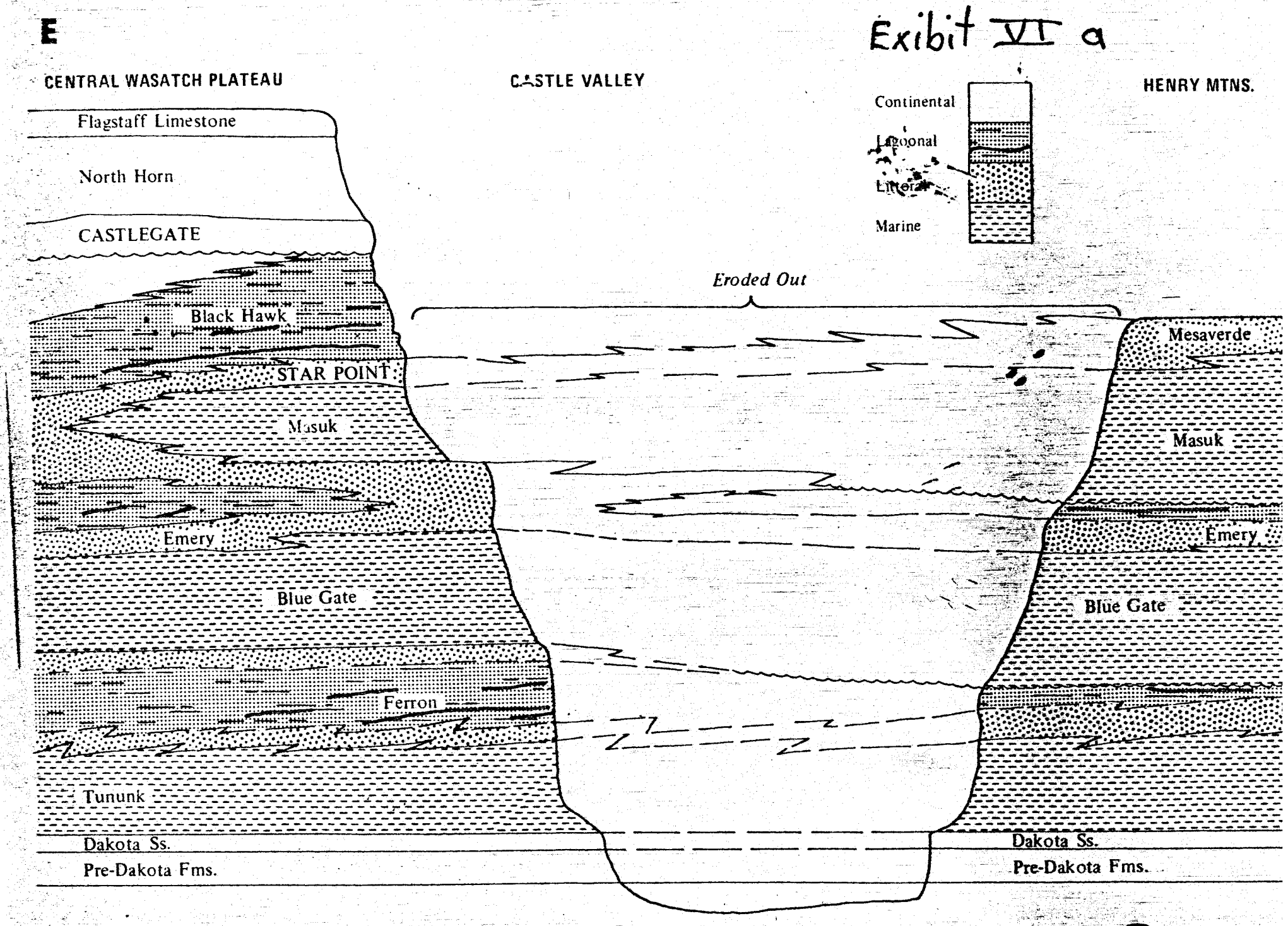


Figure 13. Stratigraphic correlation diagram from central Wasatch Plateau to the Henry Mountains.

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SCOPE OF PROJECT - SETTING

Field reconnaissance and mapping were performed in the Bear Creek Canyon area of lower Huntington Canyon during the month of June, 1980 in order to evaluate the mineability and coal resources of selected federal and fee coal leased lands. Figure 1 (following page) shows the general location of the project.

This report is a synthesis of existing published data and data gathered during field work by employees of Sanders Exploration, Limited. Work accomplished in the field included walking along the outcrop (where physically possible), hand trenching of the outcrop and measurement of the exposed coal sections. Elevation control of the coal horizon was determined by an altimeter calibrated daily with a map point of known elevation.

Bear Creek Canyon is located in Emery County, Utah approximately ten miles west northwest along State Highway 31 from the town of Huntington in the southeast portion of Township 16 South, Range 7 East, S.L.B. & M. The "site specific area" falls within the confines of the Wasatch Plateau Physiographic Province and is considered part of the Central Utah or Wasatch Plateau Coal Field.

The study area is composed of precipitous step-like terrain (cliffs alternating with steep slopes) which posed numerous, sometimes insurmountable access problems with regard to following the coal outcrop. Canyons visited during the reconnaissance (Bear Canyon and related drainage areas) are intermittent and perennial tributaries of Huntington Creek.

3

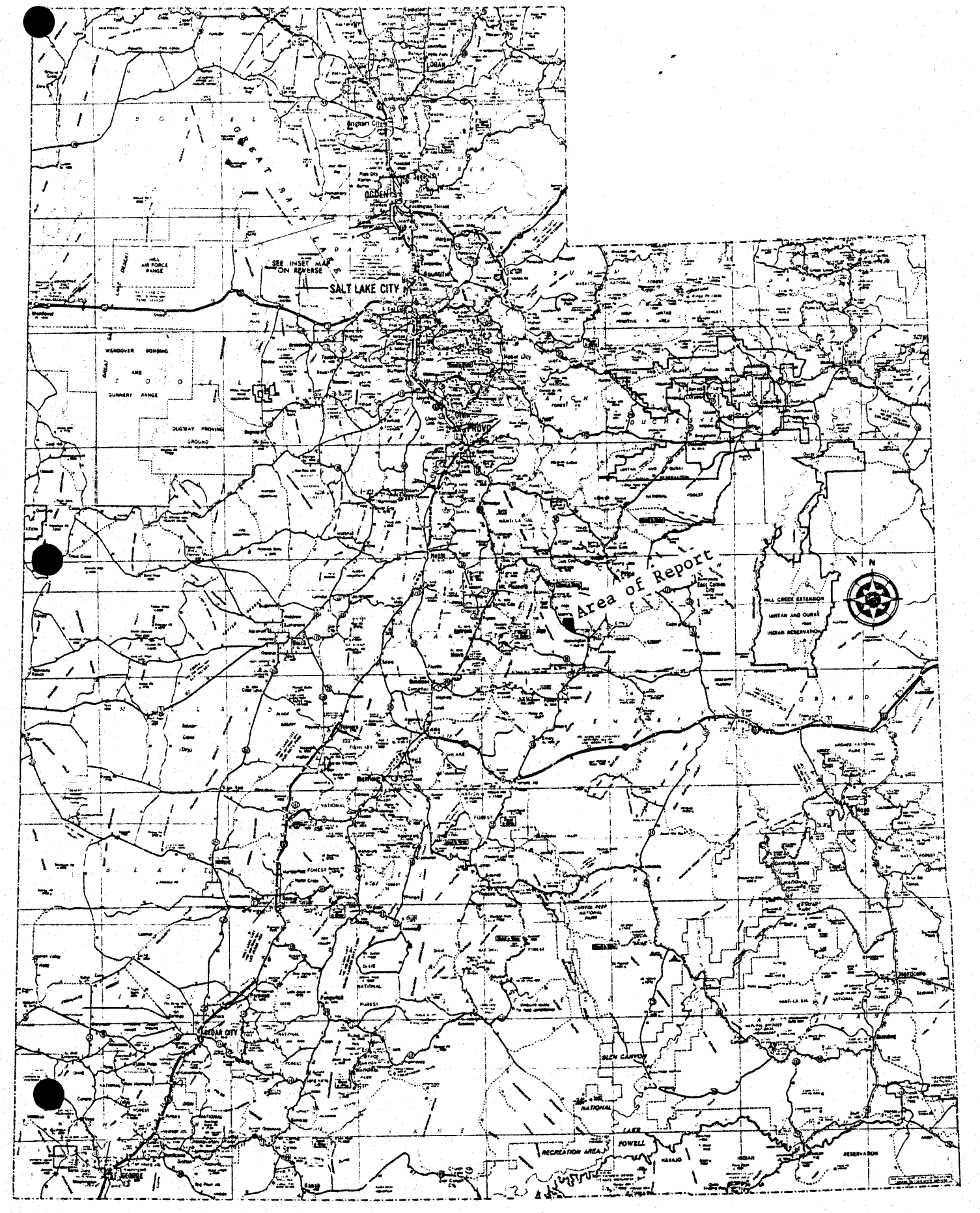
SALT LAKE CITY
OGDEN
PROVO
SEE INSET MAP ON REVERSE
Area of Report
CEDAR CITY
GLEN CANYON
LAKE POWELL
RECREATION AREA
N

Figure 1

The study area is relatively sparsely vegetated in most places and the climate is arid. The closest railhead is in Price, Utah approximately 35 miles by paved road. Elevations in the area range from 6,400 feet to 9,300 feet with an overall relief of 2,900 feet.

GEOLOGY

General Stratigraphy

The exposed geologic column, in ascending order, consists of the Mancos Shale, the Star Point Sandstone, the coal-bearing Blackhawk Formation and the Castlegate Sandstone Member of the Price River Formation. All of these geologic units are Cretaceous in age. The Star Point Sandstone through the Price River Formation composes the Mesaverde Group in this locality.

The Mancos Shale forms the initial steep slopes rising from the washes which in turn is overlain by the initial cliff-forming Star Point Sandstone ("....thick-bedded to massive beds separated by subordinate Mancos-like shale".)[1]

The Blackhawk Formation is composed of alternating sandstones, shales, mudstones and coal, representing marine, transitional and terrestrial varieties of sedimentation. Depositional environments of the Blackhawk Formation include littoral, lagoonal, estaurine and swamp type environments. The

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[1] 1972, Central Utah Coal Fields: Sevier-Sanpete, Wasatch Plateau, Book Cliffs and Emery, Monograph Series No. 3, U.G.M.S., H.H. Doelling.

Blackhawk outcrops to form a step and slope topography slightly less resistant than the Star Point below and the Castlegate above. Multiple coal seams are found within the lower 350 feet of the Blackhawk.

The Castlegate Member of the Price River Formation makes up a massive, resistent cliff-former above the Blackhawk.

Structure

The Bear Canyon fault, which is part of the north-south trending Pleasant Valley fault zone, is the only major structural feature in the study area which has any effect on the mineability and continuity of the coal. Displacement on this particular fault is estimated by the author to be 200'+ in the vicinity of Bear Creek Campground on the north side of State Highway 31 (Enclosure 1 and photograph in Appendix). The west side of the fault is down relative to the east side. In the vicinity of the Bear Canyon Mine, Section 24, Township 16 South, Range 7 East, the fault is buried by alluvium, however, the fault trace expresses itself in the falls in the NW¼, NW¼ of Section 24, Township 16 South, Range 7 East and displacement at this point is apparently less than five feet. Strata immediately bordering the fault is disturbed and inconsistent in spatial attitude with equivalent strata in the study area east of the Bear Canyon fault. This will no doubt have a limiting effect on the extent to which coal can be mined in the immediate vicinity of the fault. The Bear Canyon fault marks the western boundary of the study area.

6

Strata east of the fault are nearly horizontal in attitude providing excellent mining conditions. Coal outcrops slightly lower in elevation in the southern portion of the area than in the northern portion.

Small faults noted in the field along outcrop were interpreted to be largely of non-tectonic origin (e.g. landslide and slump) by the author. Other faults observed did not express displacement of sufficient magnitude to be prohibitive to mining.

Coal

Multiple coal seams are found in the lower 350 feet of the Blackhawk Formation as was previously mentioned. In ascending order the seams are as follows: Hiawatha, Blind Canyon, Bear Canyon and the upper beds,[1] (see Table 1 - following page).

None of the coal lies at depths of more than 1,800 in the study area. Depth should not be a limiting factor in mining.

It was noted in the field that strata situated at elevations consistent with the upper beds structural horizon were badly burned and not of economic importance.

The Blind Canyon and Bear Canyon seams were measured and observed at various points in the study area by the author, however, these seams were traceable only locally in Bear Canyon (Enclosure 1). Limited traceability of these two seams is attributed to the lenticular nature of the seams, the extent of slope debris acting as cover and/or depositional irregularities.[2]

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[2] 1931, The Wasatch Plateau Coal Field, Utah, U.S.G.S. Bulletin 819, E.M. Spieker.

LOWER HUNTINGTON CANYON	FEET
Upper beds	0-6
Interval	200
Bear Canyon bed	0-10
Interval	40-60
Blind Canyon bed	0-10
Interval	40-60
Hiawatha	5-8
Star Point Sandstone	

Author's Note: Hiawatha to Blind Canyon interval can be as great as 110 feet.

TABLE 1 (AFTER DOELLING, 1972)

H.H. Doelling indicates the Bear Canyon seam is present in Left Fork of Fish Creek Canyon, (east of Bear Creek Canyon) with a thickness of 6.5 feet, however, this measurement was not verified.(1) Doelling also has a 17.3 foot measurement in the Bear Canyon seam in Bear Creek Canyon that was not verified in the field possibly because this particular exposure has since been covered by slope debris.

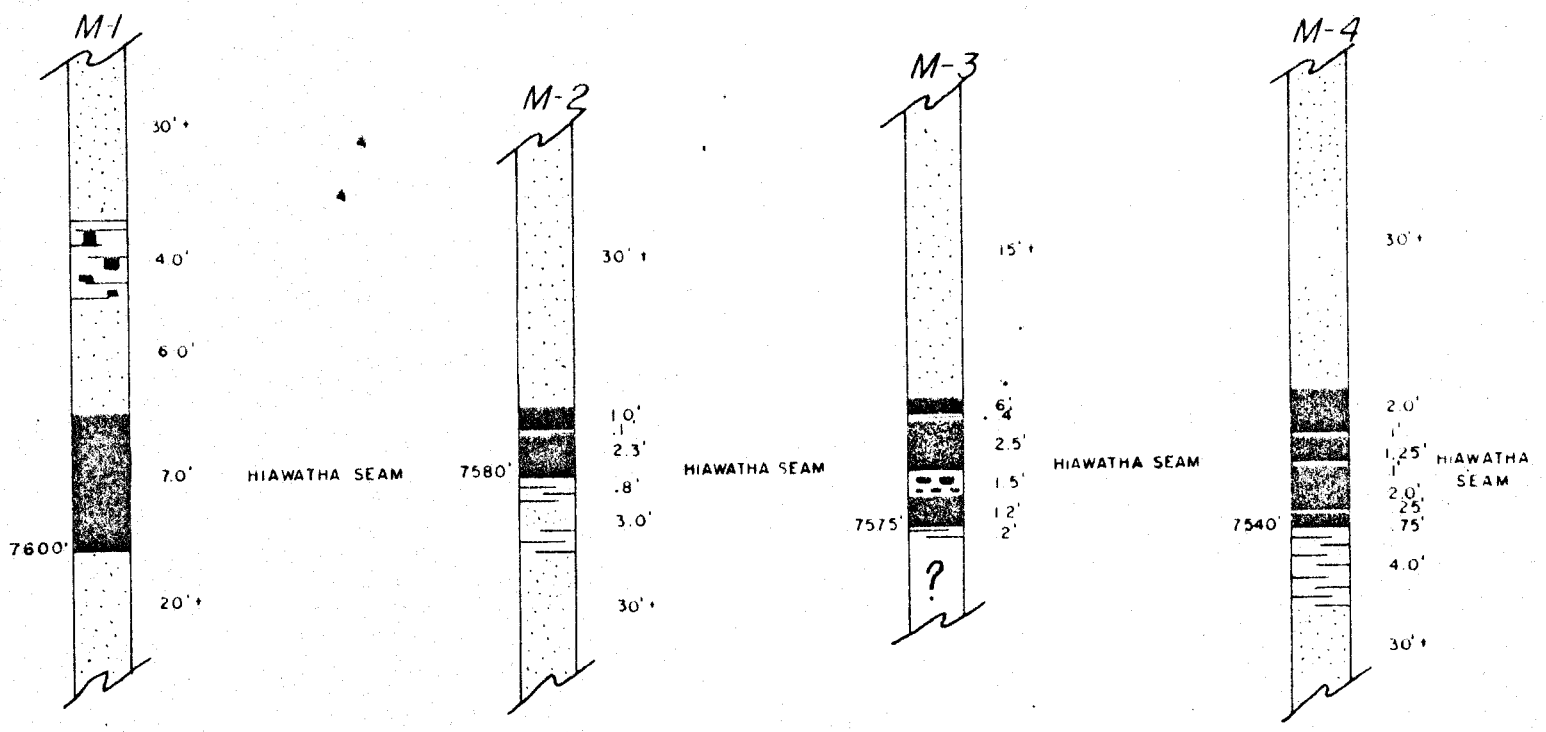
A small adit approximately 50 feet in length and interpreted as penetrating the Bear Canyon seam (measurement M-5) and a longer adit approximately 300 feet in length and interpreted as penetrating the Blind Canyon seam (measurement M-7), were discovered in Bear Creek Canyon, Section 24, Township 16 South, Range 7 East. The full extent and history of these workings is not known. The fact that these two seams are not traceable for any significant areal extent beyond these old workings indicates the subordinate nature of the Bear and Blind Canyon seams.

In the SW¼, SW¼ of Section 24, Township 16 South, Range 7 East the Bear Canyon Mine is located. Two seams were worked there, the upper of which is the Bear Canyon seam (elevation 7,420 feet) and the lower, of which is the Hiawatha seam (elevation 7,340 feet). This interpretation is based on the seams stratigraphic position above the Star Point Sandstone. The Blind Canyon seam apparently has pinched out or been replaced in this locality. The mine lies on the west side of the Bear Canyon fault. The presence of the Hiawatha and Bear

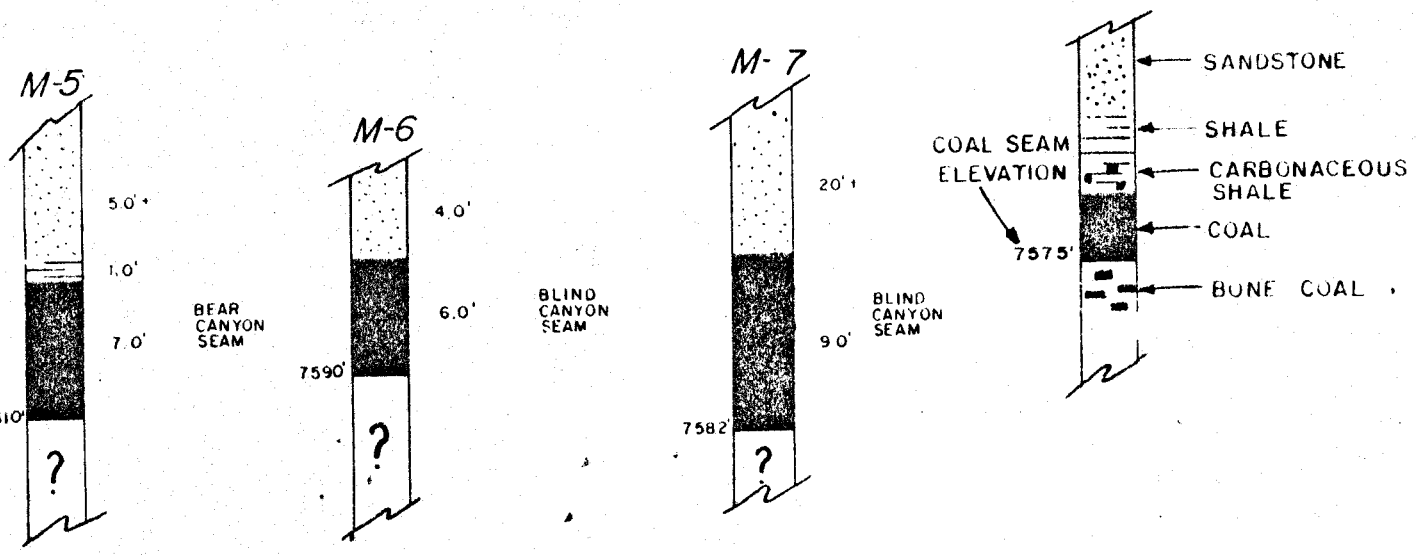
Canyon seams at the mine lend credence to the author's opinion that these seams are probably present across canyon to the east where they were not traceable nor measurable due to slope cover.

The Hiawatha seam was identified throughout the majority of the study area based on its stratigraphic relationship with the underlying Star Point Sandstone. The Star Point Sandstone is continuous and conspicuous within the area covered by this report. While the Hiawatha seam was not measured in Left Fork of Fish Creek Canyon by this author or previous investigators (i.e. E.M. Spieker, H.H. Doelling), the presence of the Reichert Mine (Hiawatha seam - after Doelling) in Section 20, Township 16 South, Range 8 East suggests the interstitial presence of the Hiawatha seam in Left Fork. Where identified and measured, the Hiawatha seam achieved mineable thickness in all but one instance (3.3 feet - measurement M-2). However, coal thickness at outcrop is invariably thinner than the subsurface thickness. The Hiawatha seam averages 5.96 feet in thickness in the area inspected. Specific work accomplished is shown on the geologic map (Enclosure 1) and columnar outcrop sections (Figure 2 - following pages).

Well consolidated sandstone forms the roof and floor of the Hiawatha seam in the majority of locations inspected along outcrop. This situation provides excellent mining conditions and high coal recovery percentages as is demonstrated by 90 to 96 percent recovery of the Hiawatha seam at the King Mine approximately five miles NNE of the study area.(1)



—EXPLANATION—

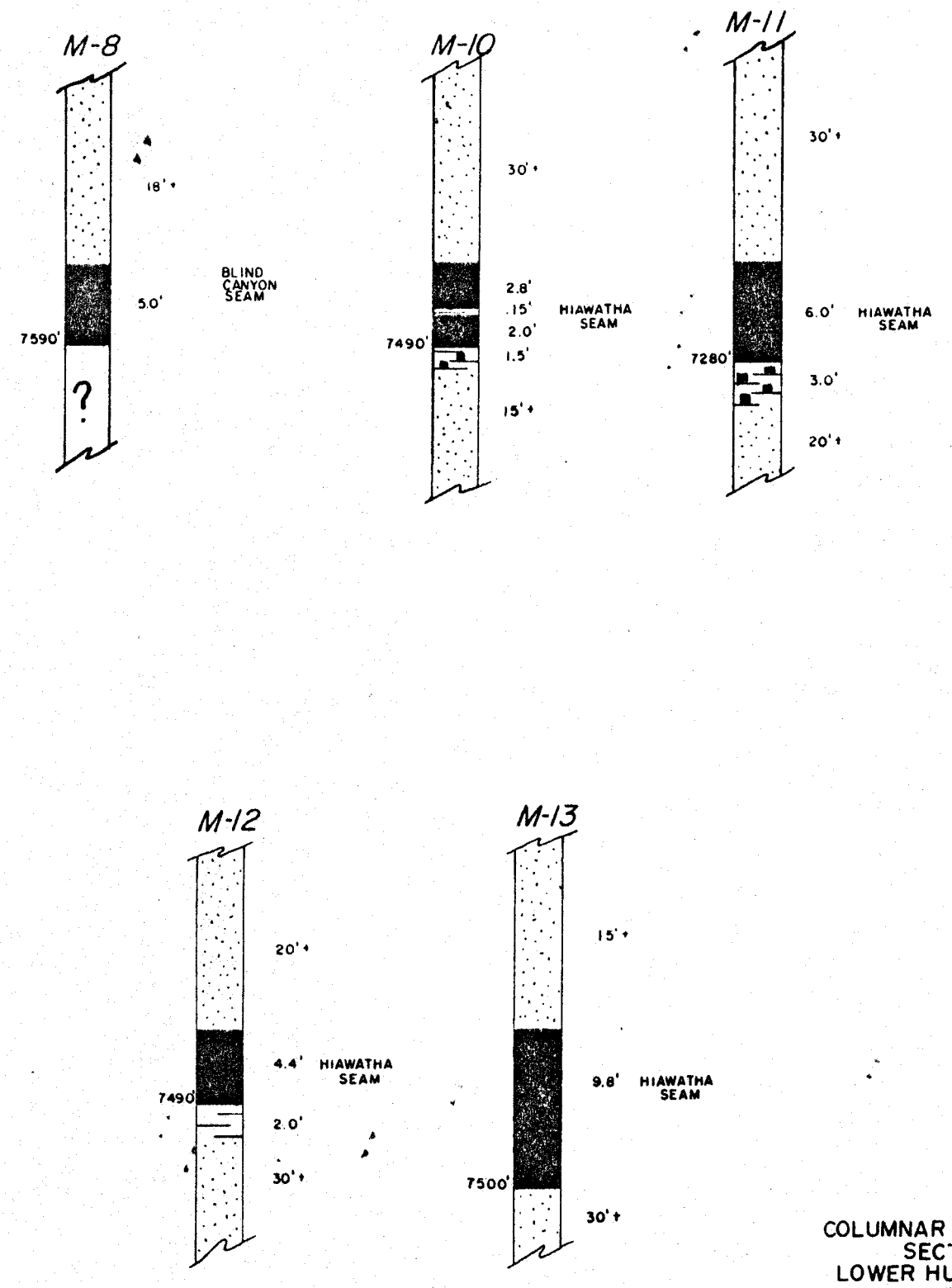


COLUMNAR OUTCROP SECTIONS LOWER HUNTINGTON CANYON EMERY COUNTY, UTAH

Figure 2

Vertical Scale 1"=10'

11

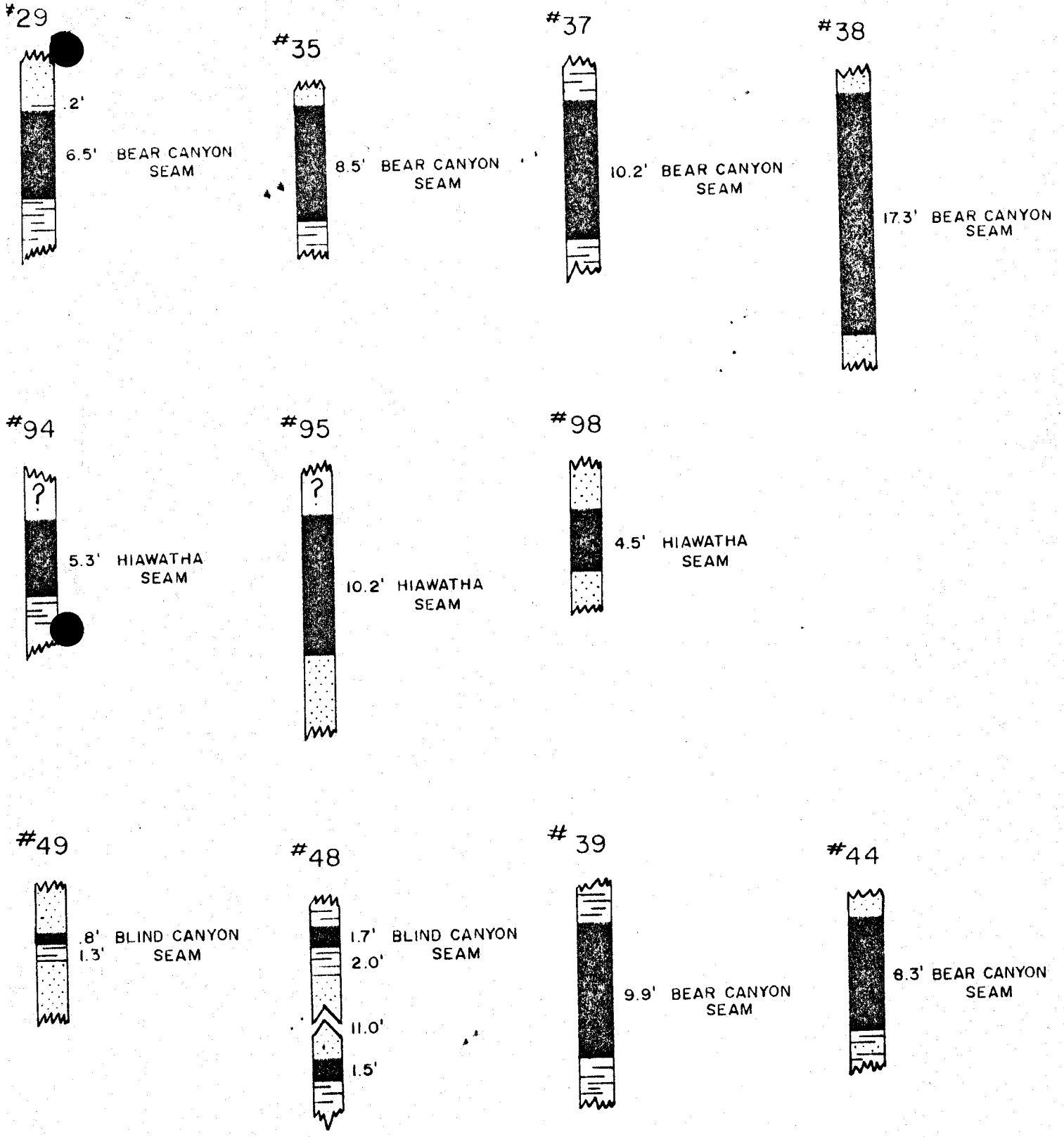


COLUMNAR OUTCROP SECTIONS LOWER HUNTINGTON CANYON EMERY COUNTY, UTAH

Figure 2

Vertical Scale 1"=10'

12



COLUMNAR OUTCROP SECTIONS
(after Doelling, 1972)
LOWER HUNTINGTON CANYON
EMERY COUNTY, UTAH

Figure 2

Doelling states that "extensive mining under Gentry Mountain (a short distance due north of Bear Creek Canyon) reveals that the Hiawatha is continuous in the anticipated thicknesses".(1)

Mining access to the Hiawatha seam appears the best in the SW¼ SE¼ of Section 24, Township 16 South, Range 7 East, Bear Creek Canyon. The continuity of this seam appears favorable for mining even though, as was the case in the majority of the area studied, slope cover reduced the number of possible measurements and this was further limited by access difficulties.

Burning of the coal is associated predominately with the upper beds. While burn was noted at the Hiawatha, Blind Canyon and Bear Canyon seams structural horizons at various locations, it is the author's opinion that these burns are discontinuous and localized in nature (Enclosure 1). There are no drill holes in the vicinity. This prohibits subsurface correlation beyond what can be gleaned from inspection of the outcrop.

Coal Quality

The following Table (after Doelling, 1972) provides some indication of the average coal quality of the three seams of consequence. Further, more detailed quality analyses can only be obtained through a drilling/coring program (see Conclusion-Recommendations). Average coal analyses (after Doelling) indicates that the coal present in the Hiawatha, Blind Canyon and Bear Canyon seams ranks high volatile C bituminous coal (1,800 short tons per acre foot).

AVERAGE COAL ANALYSES, HIAWATHA NE QUADRANGLE

	No. Analyses	As-received (percent)	
		Average	Range
BEAR CANYON BED			
Moisture	6	6.8	4.5-10.9
Volatile matter	6	43.8	37.4-46.0
Fixed carbon	6	45.7	44.9-46.0
Ash	6	4.5	3.8- 5.8
Sulfur	6	0.53	0.5- 0.6
Btu/lb	6	13,014	10,840-13,530
BLIND CANYON BED			
Moisture	10	4.8	3.8- 5.3
Volatile matter	9	41.7	40.2-44.7
Fixed carbon	9	44.3	39.2-48.3
Ash	10	8.9	5.8-12.4
Sulfur	8	0.58	0.5- 0.6
Btu/lb	9	12,492	11,700-13,080
HIAWATHA BED			
Moisture	370	5.6	0.7 -11.0
Volatile matter	357	42.3	36.3 -46.4
Fixed carbon	357	45.7	38.3 -52.7
Ash	359	6.2	3.3 -11.2
Sulfur	330	0.61	0.29- 1.1
Btu/lb	365	12,719	11,521-13,600

TABLE 2 (AFTER DOELLING, 1972)

RESERVES

Reserves were calculated in accordance with criteria established in Geological Survey Bulletin 1450-B, Coal Resource Classification System of the U.S. Bureau of Mines and U.S. Geological Survey and General Mining Order No. 1 (effective March 1, 1980). Coal thickness used to determine the reserves (Table 3), was averaged from the author's outcrop measurements and previously published outcrop measurements (after Doelling, 1972). Average seam thicknesses used to determine the reserves are as follows:

Hiawatha Seam 5.96 feet

Blind Canyon Seam 6.6 feet

Bear Canyon Seam 9.7 feet

Due to lack of data in the northern and eastern portions of the study area, an isopach determination of the reserves was not possible. See Coal Reserve Base Maps (Enclosures 2, 3 and 4).

RECOMMENDATIONS AND CONCLUSIONS

It is the author's opinion that the Hiawatha seam is mineable and continuous within the federal and fee coal leased lands embraced in this report and that through further investigation, a moderate sized mine of merit could be established.

A drilling program is recommended in order to further define coal quality and the subsurface nature of the Hiawatha seam, as well as the subsurface extent and nature of the

Bear Canyon and Blind Canyon seams. At present, not enough geologic data are available on the Bear and Blind Canyon seams in the study area to justify a conclusion concerning the mineability and continuity of these two seams.

Possible drill hole locations and proposed total depths are found on the geologic map (Enclosure 1). Access roads for the drill rig and support equipment would have to be built and must be a consideration in future cost analyses.

Exibit VI b page 1

System	Series	Stratigraphic Unit		Thickness (feet)	Description
TERTIARY	Eocene	Green River Formation		–	Chiefly greenish lacustrine shale and siltstone.
		Wasatch Group	Colton Formation	300-1,500	Varicolored shale with sandstone and limestone lenses, thickest to the north.
	Paleocene		Flagstaff Limestone	200-1,500	Dark yellow-gray to cream limestone, evenly bedded with minor amounts of sandstone, shale and volcanic ash, ledge former.
			North Horn Formation (Lower Wasatch)	500-2,500	Variegated shales with subordinate sandstone, conglomerate and freshwater limestone, thickens to north, slope former.
CRETACEOUS	?				
	Maestrichthian	Mesaverde Group	Price River Formation	600-1,000	Gray to white gritty sandstone interbedded with subordinate shale and conglomerate, ledge and slope former.
			Castlegate Sandstone	150- 500	White to gray, coarse-grained often conglomeratic sandstone, cliff former, weathers to shades of brown.
			Blackhawk Formation *MAJOR COAL SEAMS*	700-1,000	Yellow to gray, fine- to medium-grained sandstone, interbedded with subordinate gray and carbonaceous shale, several thick *coal* seams.
	Campanian		Star Point Sandstone	90-1,000	Yellow-gray massive cliff-forming sandstone, often in several tongues separated by Masuk Shale, thickens westward.
	Santonian	Mancos Shale	Masuk Shale	300-1,300	Yellow to blue-gray sandy shale, slope former, thick in north and central plateau area, thins southward.
			Emery Sandstone *COAL (?)*	50- 800	Yellow-gray friable sandstone tongue or tongues, cliff former, may contain *coal* (?) in south part of plateau if mapping is correct, thickens to west and south. *Coal* may be present in subsurface to west.
	Coniacian		Blue Gate Member	1,500-2,400	Pale blue-gray, nodular and irregularly bedded marine mudstone and siltstone with several arenaceous beds, weathers into low rolling hills and badlands, thickens northerly.
	Turonian		Ferron Sandstone Member *MAJOR COAL SEAMS*	50- 950	Alternating yellow-gray sandstone, sandy shale and gray shale with important *coal* beds of Emery coal field, resistant cliff former, thickens to the south.
	Cenomanian		Tununk Shale Member	400- 650	Blue-gray to black sandy marine slope forming mudstone.
	Albian	Dakota Sandstone *MINOR COAL*		0- 60	Variable assemblages of yellow-gray sandstone, conglomerate shale and *coal*. Beds lenticular and discontinuous.

Figure 5. Generalized section of rock formations, Wasatch Plateau coal field.

Exibit VI d

Blackhawk Formation

The Blackhawk in the Mesaverde Group of the Wasatch Plateau contains important coal seams in the lower half of the formation. The 700- to 1,000-foot unit, less resistant than the units that contain it, consists of alternating slope- and cliff-forming units (figure 6). The cliff-forming sandstones are generally yellow-gray or white-gray on fresh surfaces and weather to shades of tan, yellow or brown. In places they are reddened by the natural burning of nearby coal seams. Sands are fine- to medium-grained and cemented by either calcite or silica. In a few places they are argillaceous. Iron colors the cement. Occasionally the iron has been leached by organic acids from covering swamps and the sandstone is white.

Slopes of the formation are made of various types of shale and coal. The shales, continental in origin, consist of three kinds: clay shale–soft, granular, gray to green in color and the most common; carbonaceous shale in various shades of brown and black; and smoke gray shale usually associated with the coal.

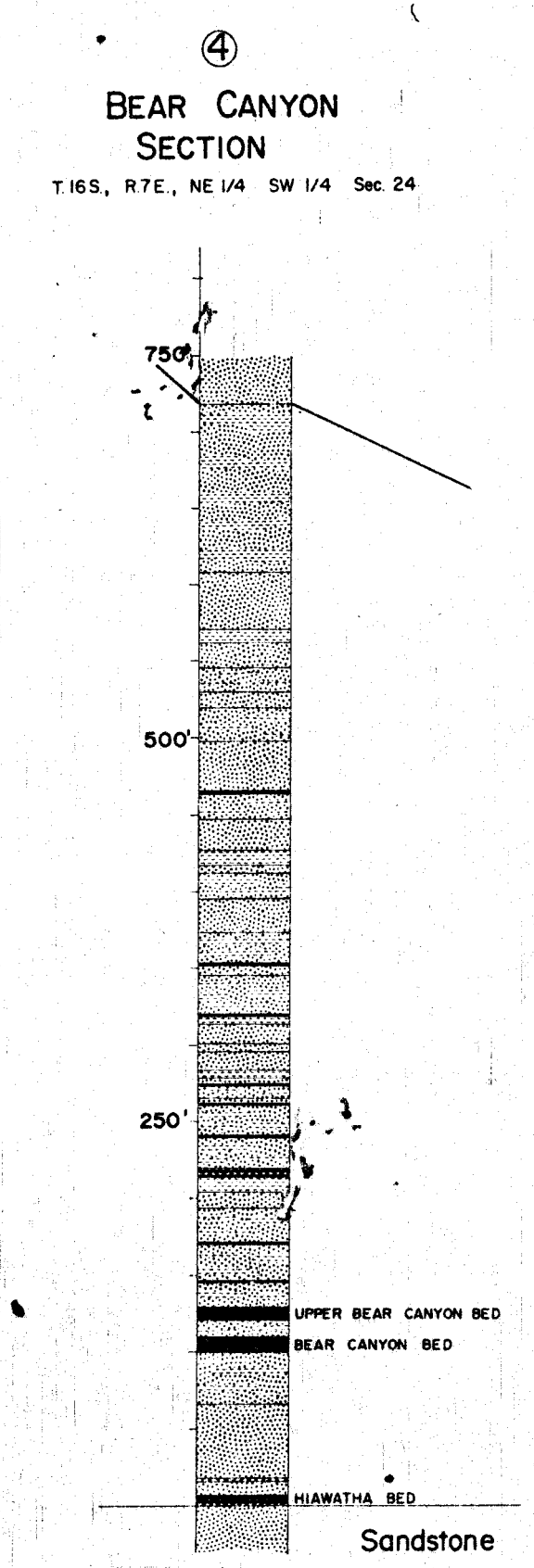
Other strata include friable shaley sandstones, usually thin and platy, that are cemented loosely by calcium carbonate. In some places the rock grades into an impure limestone.

The proportion of shale to sandstone is greater in the north part of the field as compared to the south, but total change in character of the formation is slight. In a section measured by Spieker (1931, p. 30-33) the unit consists of one-third shale and two-thirds sandstone. Key beds are local in extent and each area has its own grouping. An exception is the Aberdeen Sandstone Member. It underlies the Castlegate "A" coal bed and can be traced from the Gordon Creek area southward to Gentry Ridge near Wattis.

The lower contact of the Blackhawk was defined by Spieker (1931, p. 35) as "the clear-cut upper surface of the Star Point Sandstone," but Young (1955, p. 183) redefined the base as the bottom of the Spring Canyon Tongue. Young's work concentrated on the Book Cliffs coal field to the east, but his reports add to the understanding of the Blackhawk in the Wasatch Plateau field. Excerpts from his report follow:

> The redefined Blackhawk formation consists of some prominent littoral marine sandstone tongues and many lesser ones, all projecting eastward into the Mancos, where they lose their identity by grading into shale. Above each of them and below the next succeeding littoral marine sandstone, lagoonal deposits of sandstone, shale and coal were developed behind barrier bars, and where these deposits occur the underlying sandstone is almost everywhere white-capped. . .Division (of six members) is possible only where the basal littoral marine sandstones are developed at the extreme western end of the Book Cliffs at Storrs, Utah (simultaneously the northern end of the Wasatch Plateau field); only the basal sandstones of the Spring Canyon and Aberdeen members are present and between them is about 60 feet of coal-bearing rocks of the Spring Canyon Member. Above the basal sandstone of the Aberdeen Member are about 800 feet of undifferentiated coal measures of the Blackhawk, which are largely lagoonal but may include some inland floodplain deposits in the upper portion.

The commercial coal beds lie in the lower 250 to 350 feet of the formation; some thin units are in the upper part. Two of the more important coal beds are the Hiawatha and Castlegate "A" bed.



472.9537

Exibit VI E page 1

Sample No. WP-8-75 U.S.G.S. Serial No. D174679

Location Co-op Mine

Face channel Sample

Sec. 22, T. 16 S., R. 7 E.

Seam Bear Canyon Seam Formation Blackhawk

Thickness Sampled 7' Date Sampled May 8, 1975

Proximate Analysis

	AD	AR	Dry	MAF
M	4.4	6.1		
VM	45.6	44.8	47.7	50.8
FC	44.1	43.3	46.2	49.2
Ash	5.9	5.8	6.1	
Btu/lb.	13140	12910	13740	14640

Ultimate Analysis

	AD	AR	Dry	MAF
H	5.9	5.9	5.6	6.0
C	72.6	71.4	76.0	80.9
N	1.3	1.3	1.4	1.5
O	13.8	15.1	10.4	11.1
S	0.5	0.5	0.5	0.5

FORMS OF SULFUR:

	Sulfate	Pyritic	Organic
As-received	0.02	0.16	0.30
Moist.-free	0.02	0.17	0.32
M. and ash-free	0.02	0.18	0.35

Free-swelling index No. 2 1/2

TRACE ELEMENTS BY VARIOUS DETERMINATIONS (Coal as received)

As (ppm) 1 F (ppm) <20 Hg (ppm) 0.03 Sb (ppm) ~~0.1~~ Se (ppm) 1.3

TRACE ELEMENTS, MOSTLY ATOMIC ABSORPTION ON ASH

MgO % 2.33 Cu (ppm) 97 Zn (ppm) 19

Na_2O % 2.96 Li (ppm) 84 Mn (ppm) 200

[illegible] (ppm) <1 Pb (ppm) 25

DELAYED NEUTRON DETERMINATION OF URANIUM AND THORIUM

ppm Th 5.0247 ppm U

SEMIQUANTITATIVE 6-STEP SPECTROGRAPHIC ANALYSIS OF THE ASH

G=Greater than 10%; N=Not detected; L=Detected, but below limit of determination

Fe %	5.0	Be (ppm)	N	Pb (ppm)	30	W (ppm)	N	Re	N
Mg %	1.5	Bi	N	Pd	N	Y	30	Ta	N
Ca %	G	Cd	N	Pt	N	Zn	N	Th	N
Ti %	0.3	Co	10	Sb	N	Zr	200	Tl	N
Si %	---	Cr	70	Sc	15	Ce	N	Yb	3
Mn (ppm)	150	Cu	70	Sn	N	Ga	20	Ag	N

As (ppm)	N	La (ppm)	N	Sr (ppm)	500	Ge (ppm)	20	Al %	7.0
Au	N	Mo	15	Te	N	Hf	N	Na %	---
B	1500	Nb	L20	U	N	In	N	K %	N
Ba	1500	Ni	20	V	70	Li	N	P %	N

LOOKED FOR ONLY WHEN La OR Ce FOUND:

Pr		Fusibility of ash temp. °F.
Nd		Initial Deform. ------2190
Sm		Softening ----------2250
Eu	N	Fliud ----------2300

Ash composition

AL203 -------11.0%
SO3 ---------~~1.9%~~ 8.4%
CL ---------0.10%
CAO ---------24.0%
SIO2 --------~~25.0%~~ 24.0%
P205 --------0.74%
TIO2 --------0.71%
MnO --------0.020%
FE203 -------7.6%
K20 ---------0.17%

% Ash determined gravimetrically ashed at 525° C. -6.8%

CABLE ADDRESS COMTECO

COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434

PLEASE ADDRESS ALL CORRESPONDENCE TO:
10775 EAST 51st AVE., DENVER, COLO. 80239

OFFICE TEL. (303) 373-4772

CO-OP MINING COMPANY
53 West Angelo
Salt Lake City, Utah 84115

May 9, 1977

Sample Identification by

Co-op Mining Co.

One Bag Dry Coal

Kind of sample reported to us	Coal
Sample taken at	xxxxx
Sample taken by	Co-op Mining Co.
Date Sampled	4-20-77
Date Received	4-25-77

Analysis report no. 72-57043 Page 2

MINERAL ANALYSIS OF ASH	Percent Weight Ignited Basis
Silica, SiO_2	41.52
Alumina, Al_2O_3	19.42
Titania, TiO_2	0.92
Ferric oxide, Fe_2O_3	5.72
Lime, CaO	17.95
Magnesia, MgO	1.45
Potassium oxide, K_2O	0.96
Sodium oxide, Na_2O	2.44
Sulfur trioxide, SO_3	8.78
Phos. pentoxide, P_2O_5	0.17
Undetermined	0.67
	100.00

Alkalies as Na_2O, Dry Coal Basis	=	0.28
Silica Value	=	62.30
Base: Acid Ratio	=	0.46

ESTIMATED VISCOSITY at critical viscosity
Temperature of 2330 °F = 270 Poises
T_{250} Temperature = 2340 °F

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L.W. Taylor

L.W. TAYLOR, Western Division Manager

LWT/bn

Charter Member

F-464

Exibit VI-F page 1

COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434

WESTERN DIVISION MANAGER
LLOYD W. TAYLOR, JR.

PLEASE ADDRESS ALL CORRESPONDENCE TO:
10775 EAST 51st AVE., DENVER, COLO. 80239
OFFICE TEL. (303) 373-4772

CO-OP MINING COMPANY
Box No. 300
Huntington, Utah

June 25, 1979

Sample identification by

Kind of sample reported to us	Roof Rock	CO-OP Mining Co.
Sample taken at	xxxxx	Sample No. 57-2163 (CT&E Helper) CO-OP Mine No. 2 Huntington Canyon
Sample taken by	CO-OP Mining Co.	
Date sampled	xxxxx	
Date received	5-24-79	

Analysis report no. 72-82661

SOIL ANALYSIS

pH	8.7
Sodium	12.5
Calcium	.34
Magnesium	.76
Sodium Adsorption Ratio	16.9
Pyrite (as S-$CaCO_3$ eq t/1000T)	0.0
Sand %	
Silt %	?
Clay %	

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

G. D. PALMER, Manager, Denver Laboratory

GDP/vt

Charter Member

-464

COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434

2

WESTERN DIVISION MANAGER
LLOYD W. TAYLOR, JR.

PLEASE ADDRESS ALL CORRESPONDENCE TO:
10775 EAST 51st AVE., DENVER, COLO. 80239
OFFICE TEL. (303) 373-4772

CO-OP MINING COMPANY
Box No. 300
Huntington, Utah 84528

June 25, 1979

Sample identification by

Kind of sample reported to us	Floor Rock
Sample taken at	xxxxx
Sample taken by	CO-OP Mining Co.
Date sampled	xxxxx
Date received	5-24-79

what seam?

CO-OP Mining Co.

Sample No. 57-2162 (CT&E Helper)
CO-OP Mine No. 2
Huntington Canyon

Analysis report no. 72-82660

SOIL ANALYSIS

pH	8.4
Sodium	5.4
Calcium	.61
Mangesium	4.4
Sodium Adsorption Ratio	6.4
Pyrite (as S-$CaCO_3$ eq t/1000T	0.0
Sand %	65
Silt %	26
Clay %	9

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Gerald Palmer

G. D. PALMER, Manager, Denver Laboratory

CDP/vt

Exibit VI--'g'

Coal reserves Bear Canyon

388 Acres @ 20,900 T. per A.	@50% recovery	4,054,600	(Bear Canyon seam)
28 Acres @ 19122 T. per A.	@ 50% recovery	267,708	(Bear Canton seam)
456 Acres @ 10,450 T. per A.	@ 50% recovery	2,382,600	(Hiawatha seam)

(Survey not yet completed for upper Bear seam)

Total 6,704,908

7.0 Table of Contents

SCOPE

7.1 As there has been very little work done in the past on underground hydrology in the area of or near the mine plan area, it is very difficult to make an accurate appraisel. There are some springs in the area, but there has not been an accurate record kept of stream flow in order to determine recharge capacity of the aquifers, or of time lag between surface absorbsion and aquifer recharge. Records are being made at the present time for future use.

7.1.1 We have submitted here the report from a study of the area, including observations made underground in an old coal mine, and a study of surface faults and fractures, and of information otherwise available. This was made by Bruce N. Kaliser, Hydrologist.

7.1 Grounwater Hydrology (cont.)

7.1.2 Existing groundwater resources;

7.1.2.1 Consists of a spring near the mouth or Bear Canyon (not within the mine plan area) that is owned by the city of Huntington, the water from which is piped to that city; a spring just off from Huntington Canyon called Birch Spring; and two small springs in Trail Canyon (See Plate VII-1 for location of springs).

7.1.2.2 Mine plan area aquifers; See Exibit VII-a

7.1.3 Groundwater development and mine dewatering

7.1.3.1 Water supply; Co-op Mining Co. does not have a fresh water supply at the Bear Canyon site, Water for the bath house will be hauled in.

7.1.3.2 Mine dewatering; unnecessary. No water will be discharged from the mine.

7.1.4 Effects of mining operation on groundwater
See Exibit VII-a

7.1.5 Control plans.
In the event that mining operations at some time in the future should encounter water in sufficient quantities to need to be disgharged from the mine, it will be piped out of the mine and monitored for quantity and quality, Should this prove to have diminished the flow of the Hunting spring, the water will be delivered to their facilities.

7.1.6 Groundwater monitoring plans;
Hunting City monitors their own spring. Should at any time in the future, any underground water be encountered, it will be monitored according to an approved plan.

7.2 Surface water hydrology

7.2.0 The intent of this portion is to show the surface water characteristic of the watershed area in general, and of the mine plan area in particular, and the possible effects of the mining operation on the surface runoff. Also measures taken to control and minimize that effect.

7.2.1 Much of the information herein, is data from a report prepared by Mike Thompson, Hydrologist, regarding the surface hydrology of the mine plan area. Also plates to shoe location and specifications of control system and structures.

7.2.2 Existing surface water resources.

7.2.2.1 See Exibit VII-b Regional hydrology

7.2.2.2 The mine plan area is on the Huntington Creek ~~watershed,~~ but Huntington Creek does not pass through the mine plan area. Runoff from rainfall and snow melt pass through the area into Huntington Creek. There ~~are a few seeps or small springs~~ coming from the ledges at higher elevations that contribute water to Bear Creek during the early part of the season, or later during years of above normal precipitation, but flow is seldom observed in the winter months. (Also see Exibit VII-c).

7.2.3 Surface water development, control and diversions.

7.2.3.1 Water supply; none

7.2.3.2 Sedimentation control structures and diversions; See Exibit VII-e, and also Plate III-2-b

7.2.4 Effects of mining on surface water.

7.2.4.1 Effect on hydrological balance will be minimal because of the small amount of disturbed area.

7.2.5 Control plans include a sedimentation pond with drainage and diversion structures, and a monthly monitoring of water leaving the disturbed area.

7.2.6 Water samples will be collected one time each month (no less than 25 days apart) at the point where it leaves the mine plan area, and at a point immediatly above the disturbed area if there is any water there. Flow will be recorded, and samples will be analyzed for content of iron, manganese, and suspended solids, and for acidity (ph).

Exibit VII, a
page 1

Q Please give us your name and address and by whom you are employed?

A Bruce N. Kaliser, 2951 Nila Way, Salt Lake City. Employed by the State of Utah, Division of Utah Geological and Mineral Survey.

Q (By Mr. Feight) You have heard the testimony before the Board this morning and you have some comments to make relative to this and your own experience in the area?

A Yes. Briefly, my work consisted of examination of the literature, a field examination of the sites of the three springs; Bear Canyon, Little Bear Canyon, and Birch Spring in this vicinity in question.

Examination of the existing mine to which they will enter and expand and the geology in the vicinity of the field. This was done about a month ago at the request of Castle Valley Special Services District.

In brief, my conclusion is that it is highly unlikely that the mine plan as presented to me by the Co-op Company would interfere with the quantity or quality of any of those springs, particularly the one in question, the Bear Canyon

2

Spring.

Q What do you base this conclusion on?

A I base that on the hydrogeologic regime which I believe prevails in the vicinity. The source of the spring is the Star Point Sandstones. There is a very predominant northeast striking joint and fault system that they parallel. The water contributory to this spring exists in my opinion to the north of the mine in the area of the Gentry Mountain. I believe that faults are a guiding, a strong guiding influence to the migratory pattern of groundwater regime in this area. But in entering the mine that Co-op will be going into, it appears that the faults evident in that mine underground are tight, and water is only a distant near the canyon wells. In other words, near the entry, near the portal, not further in. There is no evidence of any water further in.

I don't believe that at that locality there is precipitation recharging the aquifer, and so I am of the opinion that the mining operation will not affect the discharge of the spring.

Now I do have other data. I've looked at the data. I believe what's been presented here

this morning I have not been given copies of what you have. I don't know for a fact that I have seen everything in identical fashion that you have been presented. But it's probably the same data that I have been provided by the improvement district and the mine.

Q Mr. Kaliser, if you look at Protestant's Exhibit No. 2, could you kind of draw a fault line for the Board and tell them where you think the faults are to the mining operation, and from what I understand, you are saying that the faults are so tight in the area of the mine that there is no migration of water through the fault system, am I correct?

A At the elevation of the mine, the fault gauge is sufficiently tight, and the relief, the runoff that would occur in the vicinity of the mine, I don't believe you would get a contribution at that point. I'm not saying that the faults--quite opposite--I'm not saying that the faults don't influence the groundwater pattern, but I'm saying that there is no evidence from what I see of the faults and in the mine that that is having any influence on the vertical migration of water down to the water table. There is no water table in

the mine.

Q Is the Star Point Formation which is I understand is the water formation in this area, is above or below the coal seam?

A Below the coal seam. The coal seam is in the Blackhawk, so the mine is in the Blackhawk. I do believe there is hydraulic connection there between most of those formations because of that very prominent joint pattern that exists in this part of the plateau. And, of course, this area, this vicinity that we are speaking of is right in the present valley fault zone, so there are individual fault strands. Some of which are identified on existing geologic maps and some of which are in the field. In other words, identified faults not heretofore mapped and some showing presently on maps.

Q Approximately how many faults are there in the vicinity of the mine?

A In the vicinity of the mine I would say there could be three.

MR. BOX: Could you put them on the exhibit?

THE WITNESS: This map is sufficiently small in scale. I could, with a little time, but

I don't know if you want me to take up that time.

This is the larger scale.

MR. McINTYRE: Are they running northeast?

THE WITNESS: They are about North 10 Degrees East. They are about vertical in attitude.

MR. McINTYRE: And what about displacement?

THE WITNESS: Displacement, we've measured in the mine displacements of two and a half feet, four feet two inches and one foot three inches in each case down to the east toward the canyon and the strikes that we measured varied from North 8 East to North 11 East. These were all taken in the mine underground.

The greatest fault appears to be at about 600 feet west of the mine portal, the existing mine portal.

Now if that fault maintains its strike, it would not strike into the spring and examination of the immediate vicinity of the spring reveals no trace of the fault, interestingly enough. It does show that the water is emerging from joints from this which are parallel to the fault, but I think interestingly enough, no fault is seen within the

immediate vicinity of the spring. You can see seepage being emitted from three distinct joints at the spring site. So it's quite an interesting situation.

I'm going to sketch on here some of the faults. I can do that, although the scale is such that you can't hold me to it. Birch Spring which is just around the corner, it's actually slightly northwest of Bear Canyon, but it is around the corner, cliffwise, and appears also to be emitted from a shear zone, a zone of closely shaped faults, but not distinct displacement. I can't observe any distinct fault displacements. It's an area that's highly deformed and has created this very prominent joint set, but you don't need displacement to create the channels, the secondary permeability roots.

MR. DANIELS: Can you hypothesize that this joint produces the actual charge into the spring is from horizontal movement through the joint at or in the Star Point from areas to the north or to the west?

THE WITNESS: I think what happens to the north where principally the snow accumulates on Gentry Mountain, there is a recharge that is

vertical down to the water table through the Blackhawk, and there is a recharge also from those channels which are from those drainages which are lying along the joint and the fault bed. That vertical migration then reaches the Star Point and travels laterally along shear zones, prominent joints or faults and emerges where the topography disects the formation. I think all this is happening well below the mine.

MR. DANIELS: Essentially what you're saying is the water is dropping down to the next formation below and falling in under the mine?

THE WITNESS: Right.

MR. McINTYRE: In your opinion is it highly probable that additional activity underground in the mine could actually increase the flow of water to the spring in question?

THE WITNESS: Depending upon the use of the water in the mine and how they go about mining. It's possible. I think it would have a negligible effect at this site. It might have a greater effect should they go up to the north.

MR. DANIELS: Have you got an opinion on subsidence of the mine whether actual subsidence of the root of the mine would affect the water flow

to the spring?

A I don't believe that subsidence would have an effect, because I think the runoff over the slopes above the mine--the rule is the greater the slope is -- and it is to the north, and I don't think it would make a difference.

There was one or two locations within the mine where there was roof collapse. No water was observed, however.

MR. DANIELS: Thank you.

MR. CHAIRMAN: Bruce, are you through?

THE WITNESS: Yes.

Exibit VII b
page 1

HORROCKS ENGINEERS
One West Main
P.O. Box 377
American Fork, Utah 84003
Telephone (801) 756-7628

Project Name Hidden Valley Date 2/18/80
Project No. 74 ~~Prospect~~ STA No. 139+00 Sample No. 80-30
Test For Soil Class +T-99

AS RECEIVED GRADATION					
Screen Size	Weight (a)	Percent Retained	Percent Passing		SPECS.
3"					
1½"					
1"					
¾"					
½"					
⅜"					
#4					
Wet Wt. -#4					
Dry Wt. -#4					
Total Wt. Dry					

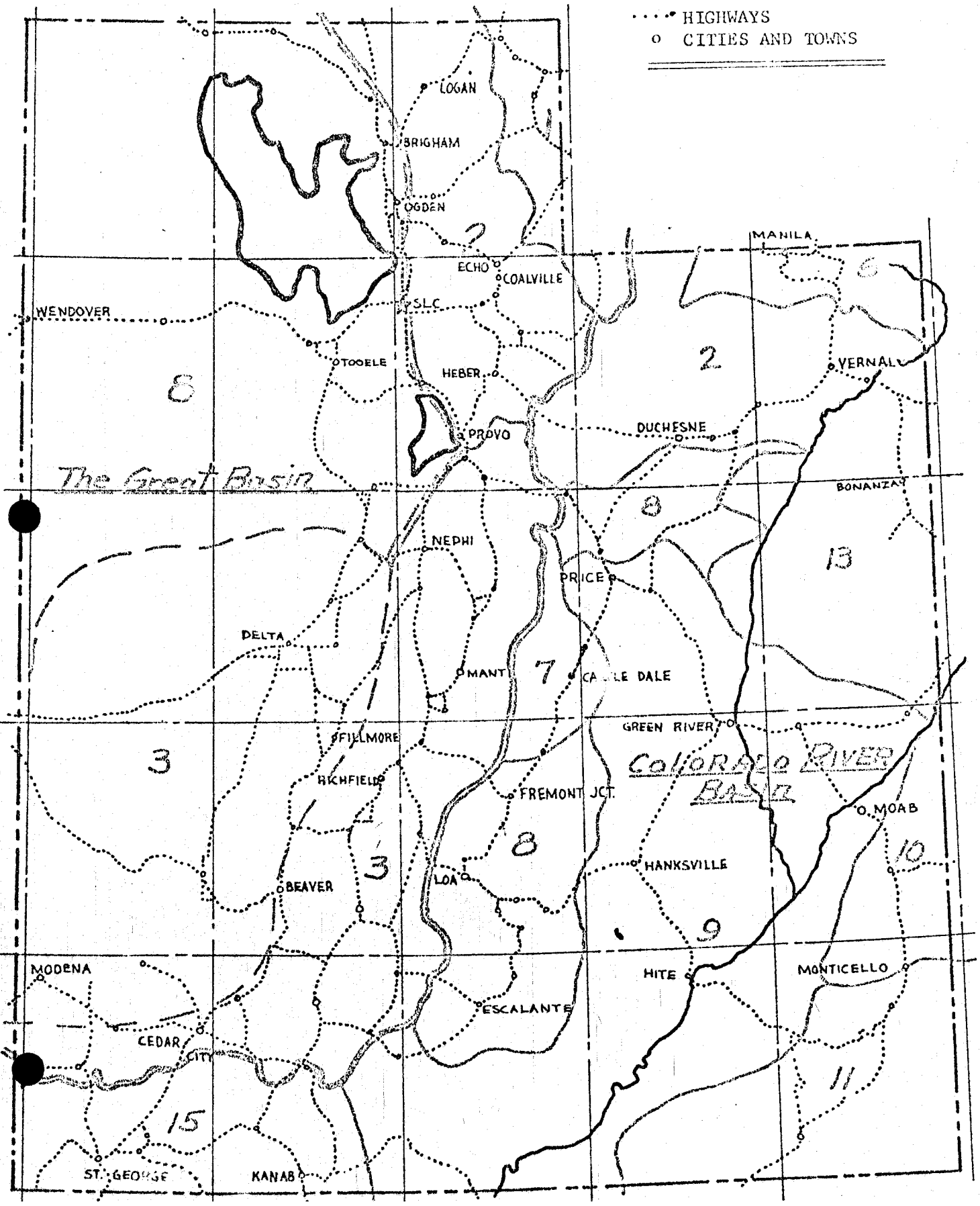
WASHED GRADATION AFTER CRUSHING (2500 Gm. Dry Recombined Sample)					
Screen Size	Weight Retained	Percent Retained	Percent Passing	Total % Passing	
1"					
¾"					
½"					
⅜"					
#4	18.4	3.7		96.3	
#8 #10	12.4	2.5		93.8	
#16					
#30 #50	77.0	15.6		78.2	
#200	253.4	51.3		26.9	
-#200	4.1	0.8			
Total Wt.	494.0				

349.1
516.6
494.0

L.L.	N/P	A.A.S.H.O. Classification
P.L.	N/P	A-2-4(0)
P.I.	N/P	

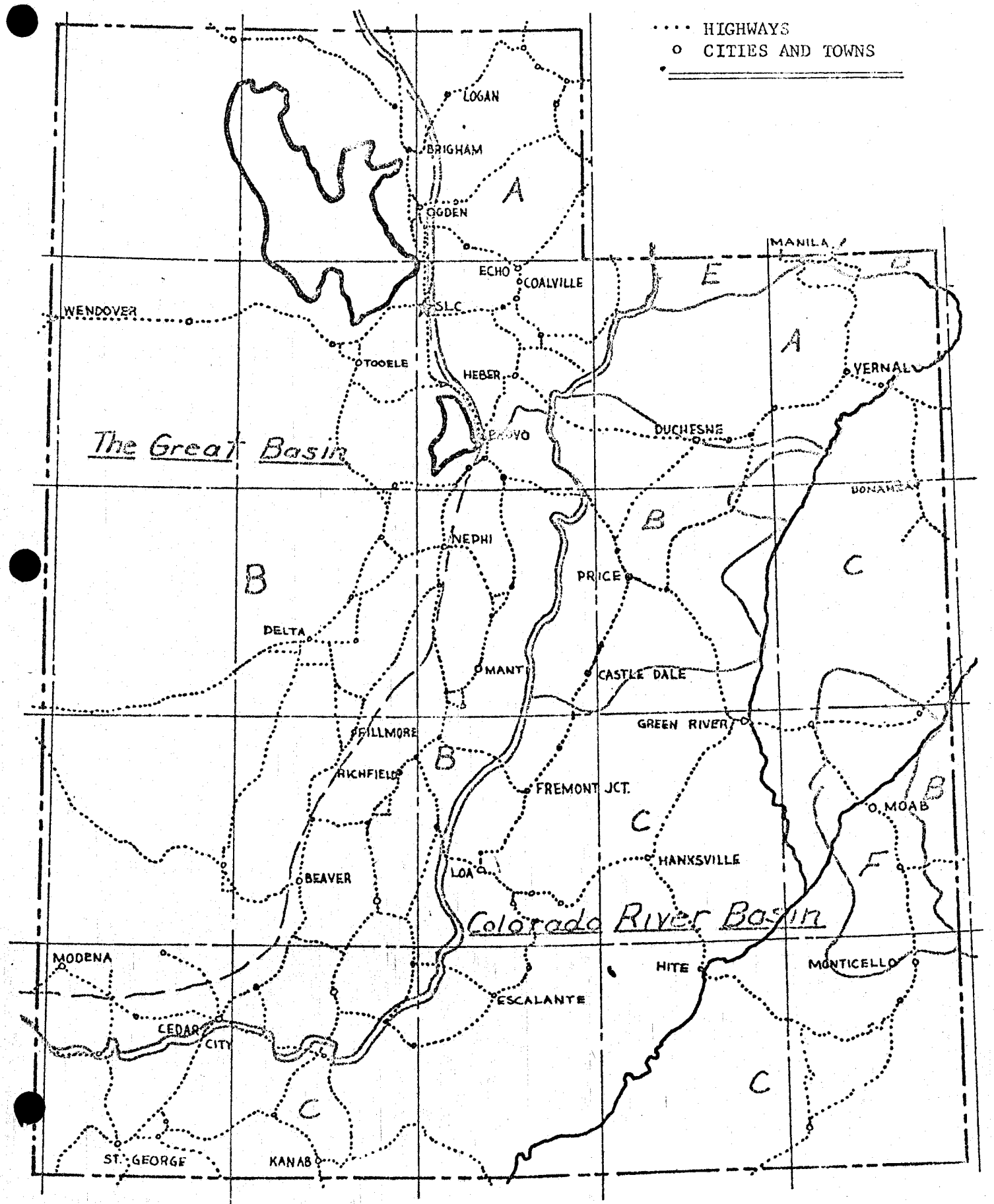
2

Chart 2-12: HYDROLOGIC AREAS



3

Chart 2-11: FLOOD REGIONS



4

CHART 2-22A: COMPOSITE FLOOD FREQUENCY CURVE FOR REGIONS A,B,& E
(COLORADO RIVER BASIN)

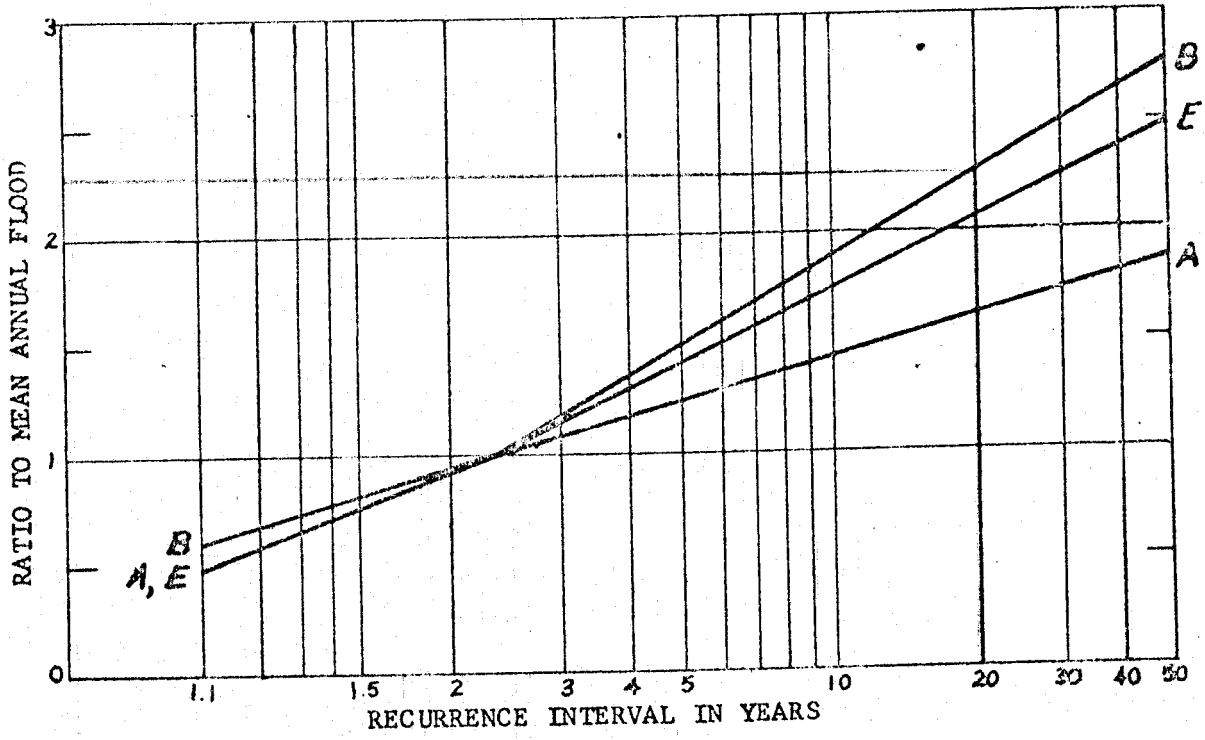
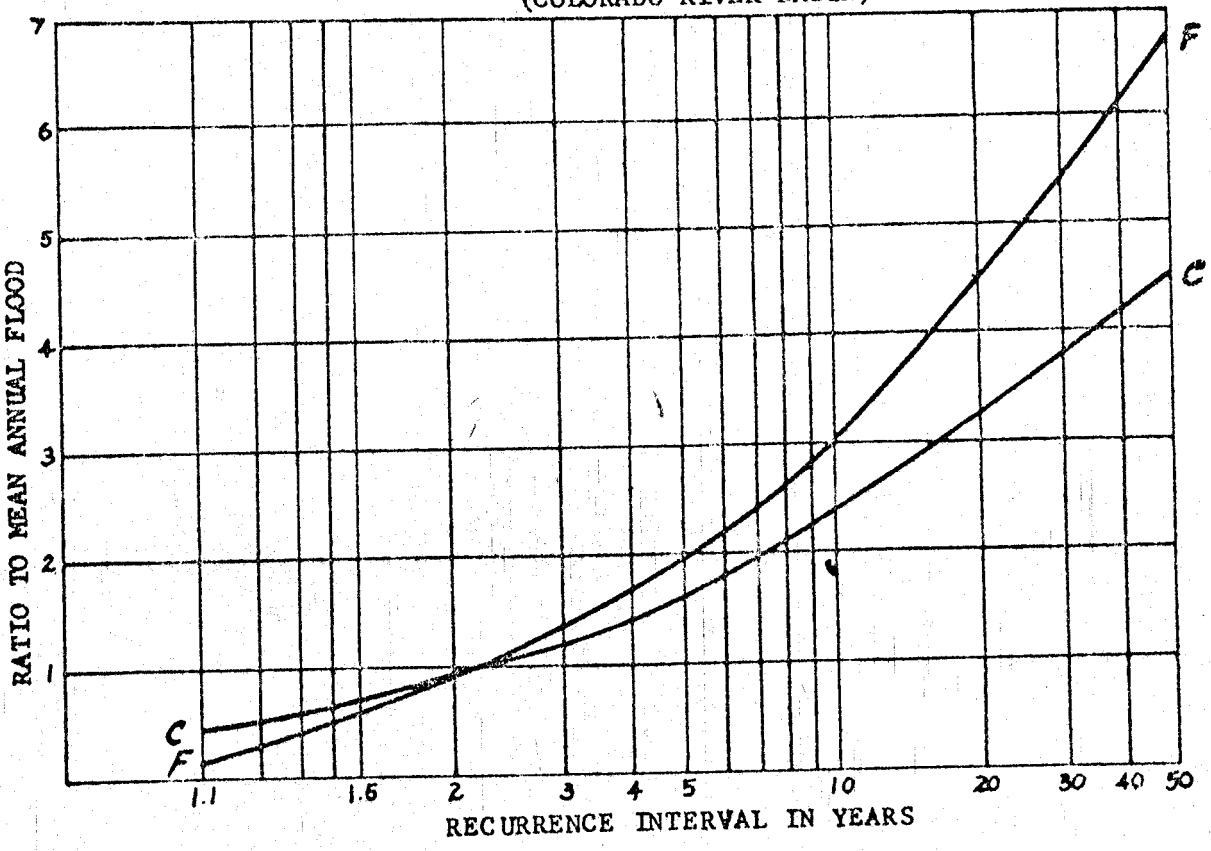


CHART 2-22B: COMPOSITE FLOOD FREQUENCY CURVES FOR REGIONS C & F
(COLORADO RIVER BASIN)



ESTIMATED RETURN PERIODS FOR SHORT DURATION PRECIPITATION
(inches)

Station: Clear Creek Summit
Latitude: 39° 39'

Elevation: 9630
Longitude: 111° 12'

RETURN PERIOD (years)	DURATION									
	5 Min	10 Min	15 Min	30 Min	1 Hr	2 Hr	3 Hr	6 Hr	12 Hr	24 Hr
1	.10	.16	.20	.28	.35	.46	.57	.84	1.08	1.33
2	.12	.19	.25	.34	.43	.57	.70	1.04	1.34	1.65
5	.16	.24	.31	.43	.54	.72	.90	1.34	1.73	2.14
10	.19	.29	.37	.51	.65	.86	1.06	1.55	1.99	2.45
25	.24	.38	.48	.66	.84	1.08	1.31	1.88	2.39	2.92
50	.25	.38	.48	.67	.85	1.13	1.40	2.07	2.67	3.29
100	.27	.42	.53	.73	.93	1.24	1.54	2.29	2.96	3.65

ESTIMATED RETURN PERIODS FOR SHORT DURATION PRECIPITATION
(inches)

Station: Hiawatha
Latitude: 39° 29'

Elevation: 7230
Longitude: 111° 01'

RETURN PERIOD (years)	DURATION									
	5 Min	10 Min	15 Min	30 Min	1 Hr	2 Hr	3 Hr	6 Hr	12 Hr	24 Hr
1	.03	.04	.05	.07	.09	.24	.39	.76	1.09	1.43
2	.07	.10	.13	.18	.23	.40	.55	.95	1.30	1.67
5	.13	.20	.25	.35	.44	.62	.79	1.22	1.60	2.00
10	.16	.25	.31	.43	.55	.75	.93	1.40	1.82	2.25
25	.23	.35	.44	.62	.78	.99	1.19	1.69	2.14	2.60
50	.26	.40	.50	.70	.88	1.11	1.33	1.89	2.38	2.90
100	.31	.48	.60	.84	1.06	1.30	1.54	2.12	2.64	3.18

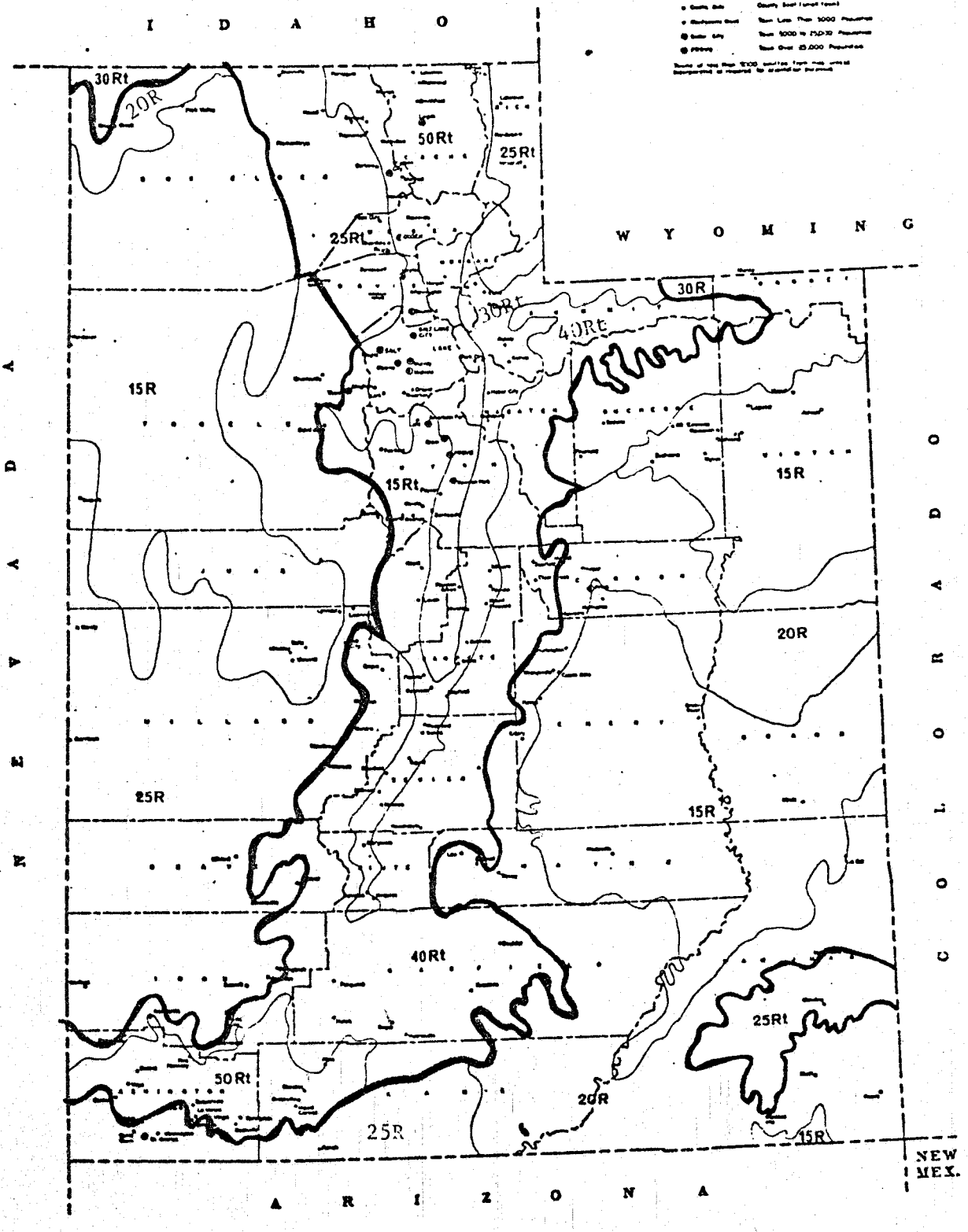
FIGURE 3

SOIL CONSERVATION SERVICE

UNIVERSAL SOIL LOSS EQUATION

AVERAGE ANNUAL VALUES FACTOR R and Rt

6

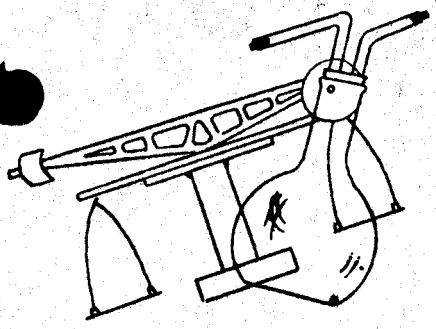


R - Rainfall Only
Rt - Rainfall and Snowmelt

UTAH

U.S. Department of Agriculture

Exibit VII d



Ford Chemical LABORATORY, INC.

Bacteriological and Chemical Analysis

40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

Date: December 5, 1978

Name Co-op Mining Company

Address 53 West Angelo Avenue

Salt Lake City, Utah 84115

CERTIFICATE OF ANALYSIS

78-1945

Underground water received November 16, 1978.

Analysis started on: November 16, 1978

Turbidity	1.50	NTU	Total Hardness as $CaCO_3$	382.0	mg/l
Conductivity	650.0	umhos/cm	Iron as Fe (Total)	0.078	mg/l
pH	7.85	Units	Iron as Fe (Filtered)	0.067	mg/l
Total Dissolved Solids at 180°C.	416.0	mg/l	Lead as Pb	<0.001	mg/l
Alkalinity as $CaCO_3$	346.0	mg/l	Magnesium as Mg	37.44	mg/l
Arsenic as As	<0.001	mg/l	Manganese as Mn	0.003	mg/l
Bicarbonate as HCO_3	422.12	mg/l	Mercury as Hg	<0.0002	mg/l
Barium as Ba	0.05	mg/l	Nickel as Ni	<0.001	mg/l
Boron as B	0.130	mg/l	Nitrate as NO_3-N	<0.02	mg/l
Cadmium as Cd	<0.001	mg/l	Nitrite as NO_2-N	<0.01	mg/l
Calcium as Ca	90.4	mg/l	Potassium as K	2.485	mg/l
Carbonate as CO_3	<0.01	mg/l	Selenium as Se	<0.001	mg/l
Chloride as Cl	4.0	mg/l	Silica as SiO_2	7.00	mg/l
Chromium as Cr (Total)	<0.001	mg/l	Silver as Ag	<0.001	mg/l
Chromium as Cr (Hex)	<0.001	mg/l	Sulfate as SO_4	69.0	mg/l
Copper as Cu	0.006	mg/l	Sodium as Na	15.12	mg/l
Surfactants MBAS	<0.05	mg/l	Zinc as Zn	0.049	mg/l
Fluoride as F	0.09	mg/l			

Ford Chemical Laboratory, Inc.

CULVERT ADEQUACY - BEAR CREEK MINE
* * * * * * * * * * * * * * * * * * * *

A. Stream Crossing

Given: Area = 2.65 mi^2
Curve Number estimate = 75

Find: Peak Flow 10 year-24 hour storm
Peak Flow 10 year- 6 hour storm

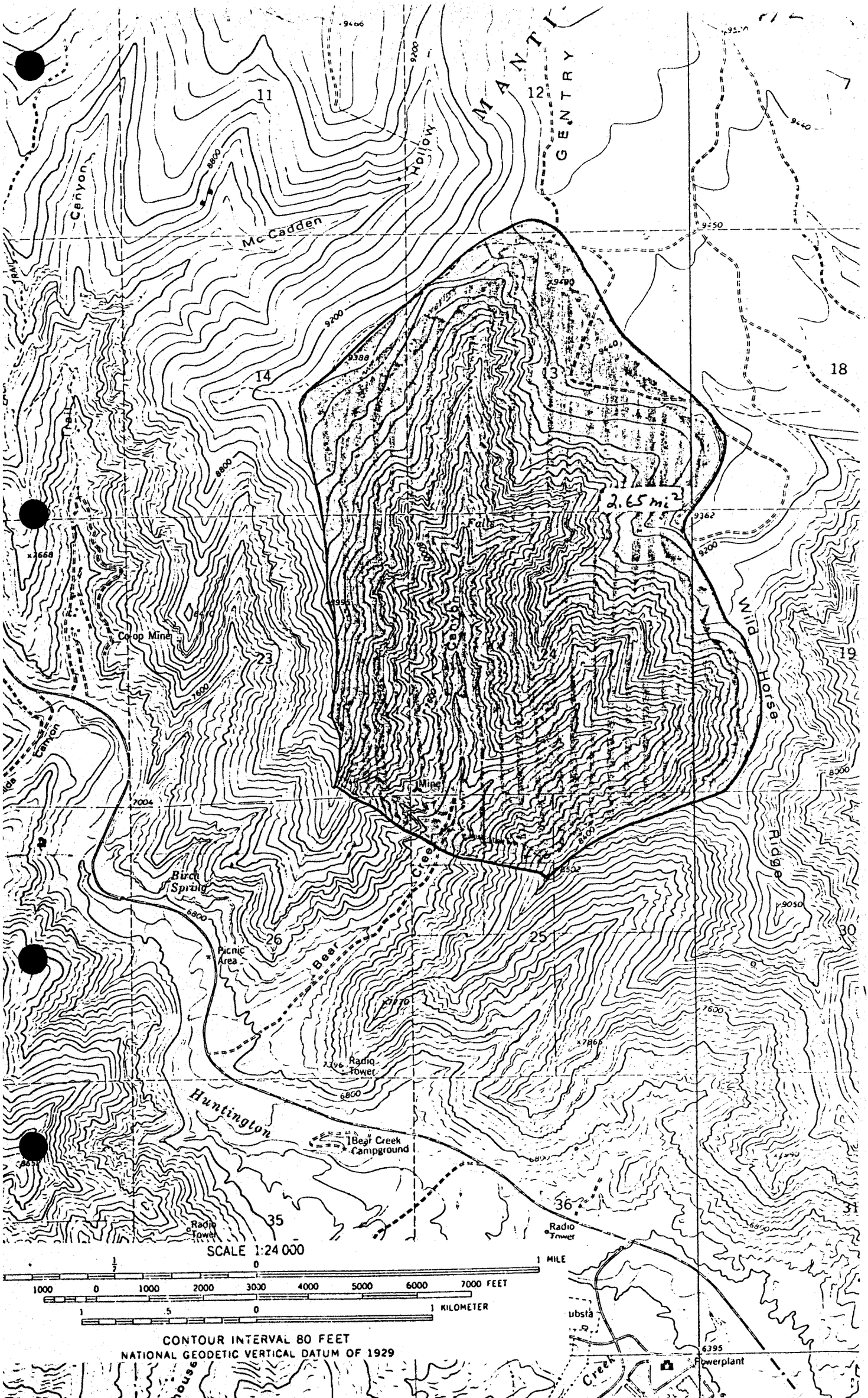
Solution:
Time of Concentration - Kent's Formula
Te = 0.405 hours
Peak Flow
10 year- 6 hour storm = 129 cfs.
10 year-24 hour storm = 87 cfs.

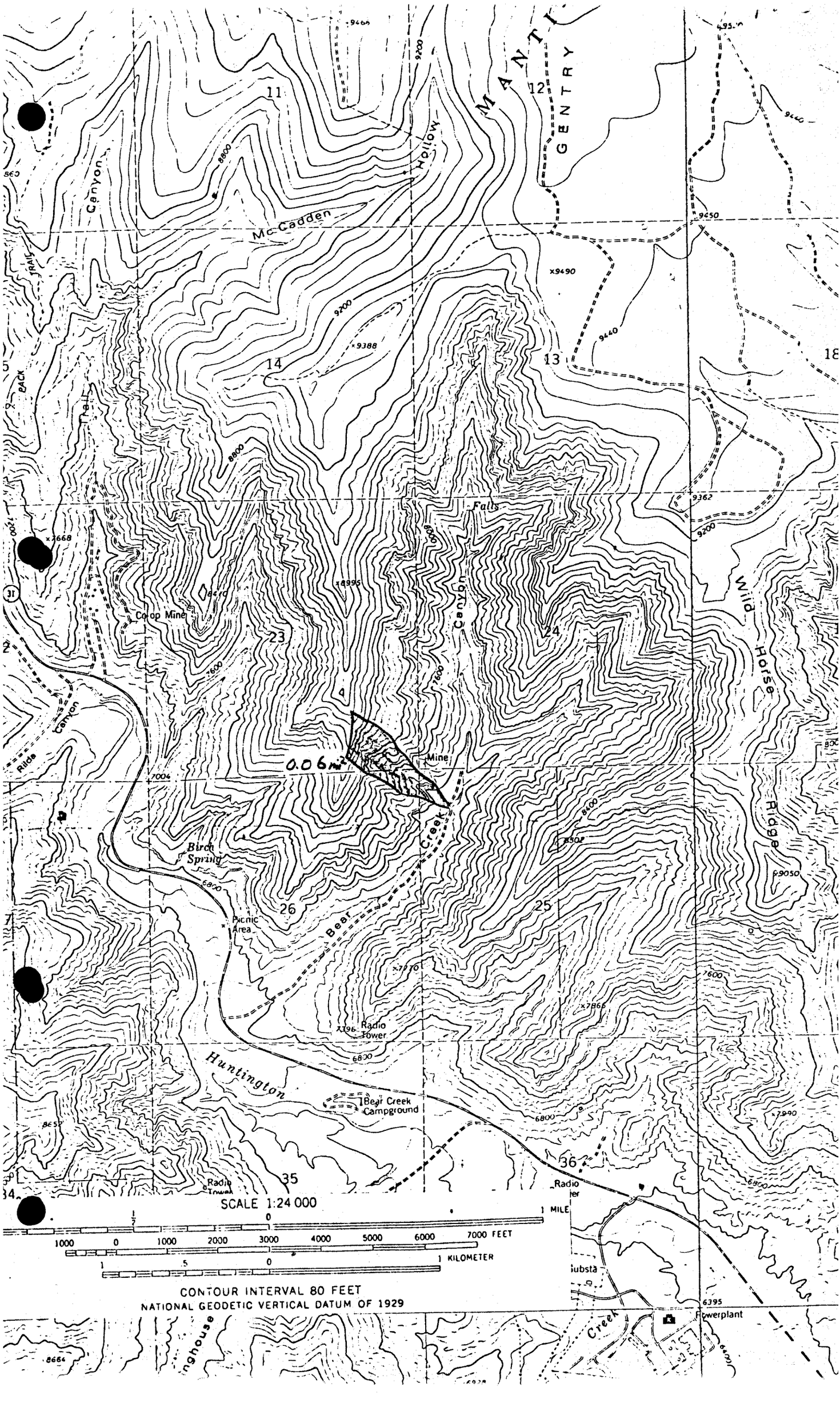
B. Wash adjacent to sediment pond

Given: Area = 0.06 mi^2
Curve Number estimate = 75

Find: Peak Flow 10 year-24 hour storm
Peak Flow 10 year- 6 hour storm

Solution:
Time of concentration - Kent's Formula
Te = 0.178 hours
Peak Flow
10 year- 6 hour storm = 3 cfs.
10 year-24 hour storm = 2 cfs.


MANTI
GENTRY
McCadden Canyon
Hollow
Wild Horse Ridge
Coop Mine
Mine
Falls
Creek
Birch Spring
Picnic Area
Bear Creek Campground
Huntington
Radio Tower
2.65 mi²
11
12
13
14
18
19
23
24
25
26
30
31
35
36
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 80 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929


MANTI
GENTRY
Hollow
McCadden
Canyon
Trail
Falls
Canyon
Wild Horse
Ridge
Co-op Mine
Mine
0.06 mi²
Creek
Bear
Birch Spring
Picnic Area
Radio Tower
Huntington
Bear Creek Campground
Radio Tower
Canyon
Ridge
Creek
Powerplant
11
12
13
14
23
24
25
26
35
36
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 80 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

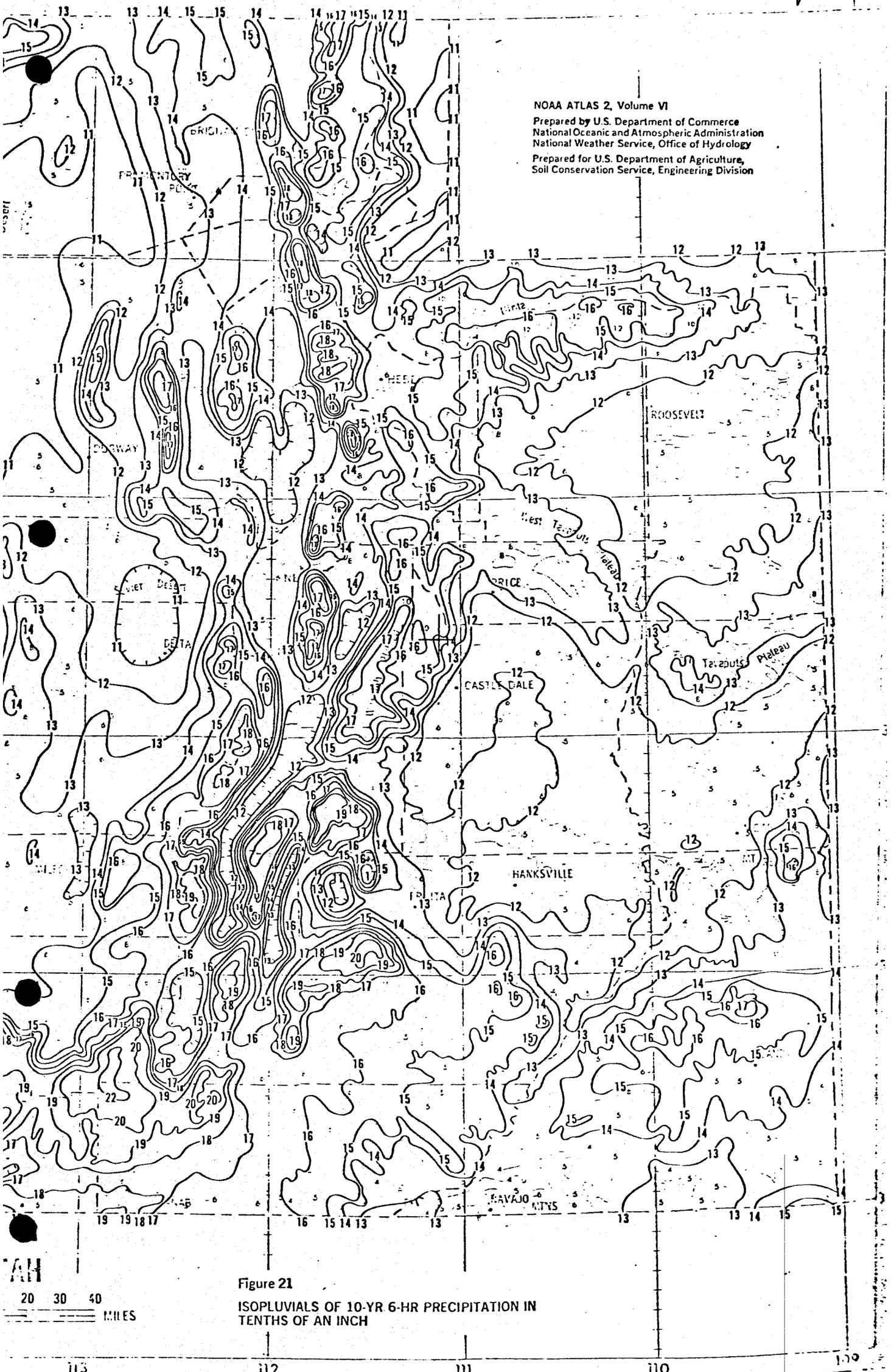
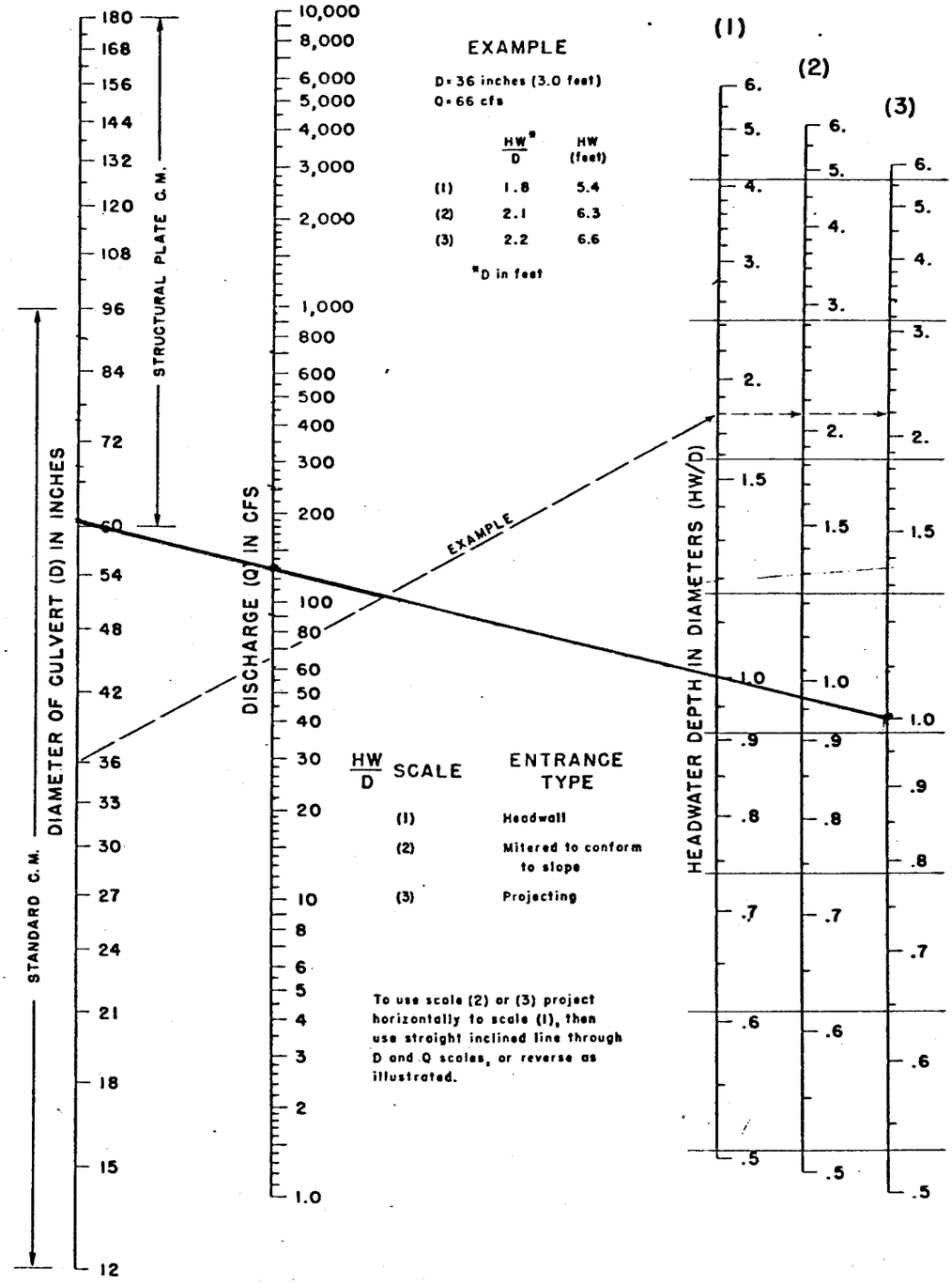


Figure 21

ISOPLUVIALS OF 10-YR 6-HR PRECIPITATION IN TENTHS OF AN INCH

If Multiple Culvert Design, Divide Q(cfs) equally between them & use Q for 1 pipe to determine culvert diameter.

Chart 2-53: HEADWATER DEPTH FOR C.M.P. CULVERTS WITH INLET CONTROL



BUREAU OF PUBLIC ROADS JAN. 1963

Culvert adequacy - Stream Crossing

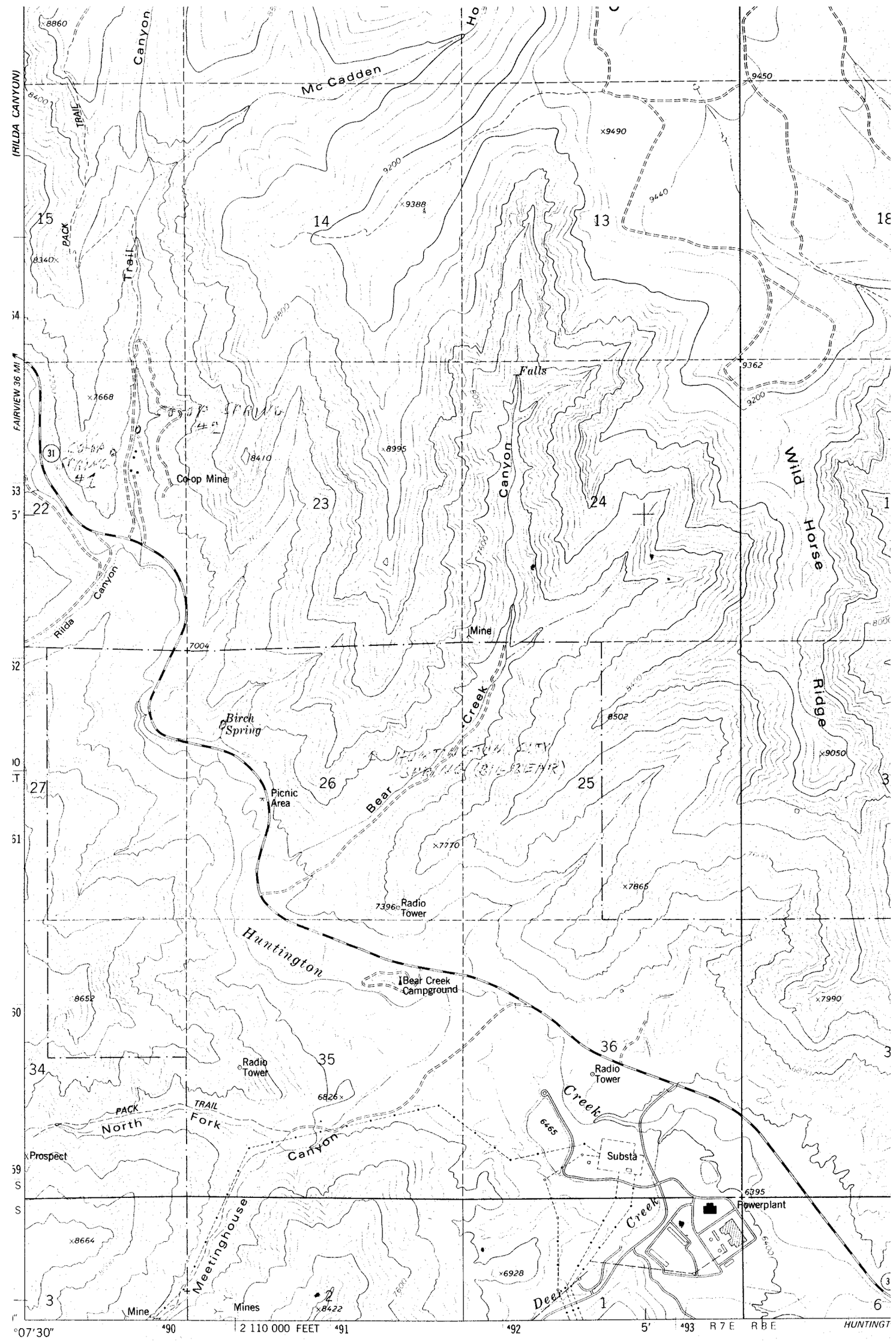
Design Peak Flow = 130 cfs

Design for headwater no higher than culvert

HW/D = 1

Assume - Culvert is not mitered to slope of embankment

Culvert diameter required = 60 inches



Mapped, edited, and published by the Geological Survey

Control by USGS, NOS/NOAA, and U.S. Forest Service

Topography by photogrammetric methods from aerial photographs taken 1970. Field checked 1974. Map edited 1978

Projection and 10,000-foot grid ticks: Utah

GN MN 15° 0°02' 1967 MIL

1 1/2 1000 0 1000 1 5

Chapter VIII

Soil Resources

Table of Contents

SCS Soil Survey _____ Exibit VII-'a'

Soil Res rces

8.1 SCOPE The purpose of this chapter is to enable the reviewer to determine the soil types, to what uses it is adapted, and what impact the mining operation may have on the soil resources. Also to establish guidelines for reclamation purposes.

8.2 The entire report consists of a soil survey made by the Soil Conservation Service.

8.3 Soil Information --- See Exibit VII-'a' SCS Survey

8.4 Prime Farmland --- None

8.5 Soil tests, etc. ---- See SCS Survey

8.6 Use of overburdon materials; Will not be used unless topsoil in stockpiles is insufficient in quantity for reclamation. If such is the case, it will first be tested for nutrients and other values, fertilizers added if necessary and plans submitted to the regulating authority for its use.

8.7 See Chapter III - page 7, Para. 3.5.2

8.8 See Chapter III - page 8, Para. 3.5.4.4 and Para. 3.5.5.1

8.9 Soil Nutrients Will be used if needed to support vegitation as comparable to pre mining productivity.

8.10 Effect of mining on soils ----This will be dertermined by comparing the soil survey made at this time to a survey made upon completion of mining operations.

8.11 Mitigation ----- Limiting disturbed are as much as possible, and by contemporaneous reclaimation practices (See Chapter III -page 7 Para. 3.5.1).

SOIL SURVEY AND INTERPRETATIONS -
VEGETATION SURVEY
for
CO-OP MINING CO.

At the request of Wendell Owen, representing CO-OP Mining Co., and the San Rafael Soil Conservation District, the Soil Conservation Service performed a soil and vegetation survey on proposed mine property in Huntington Canyon. The surveys were designed to comply with the March 1979 Permanent Regulatory Program Requirements of the office of Surface Mining Reclamation and Enforcement, Department of Interior.

The survey covers approximately 23 acres on Bear Creek in Huntington Canyon, Emery County, Section 25, T16S, R7E, SLBM. The soils are shown on the attached map. Each soil is identified with a three letter symbol, and the pattern and extent are shown by the soil boundary lines on the map. It should be noted that the entire survey area had been disturbed from previous mining activities. Therefore, the soil characteristics were projected from the surrounding areas. All areas having the same symbol are essentially the same kind of soils. There may be small areas of other soils included within the delineation that are slightly different. The soils are named but have not been correlated. When the overall county survey is completed, small areas may become inclusions in other map units. Some names may change also. Included at the end of the report are the engineering uses and interpretations of the soils. The soil horizonation symbols, procedures, and nomenclature are as defined in the Soil Survey Manual (Ag. Handbook No. 18), National Soil Handbook of the Soil Conservation Service, and Soil Taxonomy.

SCS range conservationist, George Cook, visited each described soil in the survey area in November and recorded present vegetation and productivity according to ecological site analysis methods of the Soil Conservation Service. Present vegetation was recorded by percentage air dry weight. Estimates were made of annual production and range condition for the 1980 growing season. These findings are included in this report and the ecological sites identified on the soil map accompanying the soil report.

Most of the soils in the survey area are used as rangeland and wildlife habitat except where mine disturbances have occurred. On areas that have similar climate and topography, the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between soils and vegetation and water.

In this survey area the soils are grouped into ecological sites. An ecological site is an area or areas of rangeland or woodland uniform enough in climate, soils, drainage, exposures and topography that it supports a definite plant community that will produce a specific amount of vegetation. The kind of vegetation is generally the combination of plants that grew on the site before the range or woodland was affected by grazing, cultivation or otherwise altered and is called the potential vegetation. Normally the potential vegetation is the most productive combination of range or woodland plants that a site can support. Potential plant communities for the Bear Creek Canyon area obtained from clipping data, is not yet available from the Bureau of Land Management. As climate is a major factor in determining the potential plant community different climatic regime have been defined to facilitate the grouping of soils into ecological sites and the naming of sites. In this survey area there are two climatic regimes used. These are defined generally as follows:

Upland Climatic Regime - The average annual precipitation is 12 to 16 inches. Approximately 35 to 40 percent comes during the summer months. The growing period usually begins about April 1 and lasts until the first of November until moisture is depleted or the plants mature. The freeze-free season is 100 to 130 days, and the mean annual temperature is 47° to 50° F.

Mountain Climatic Regime - The average annual precipitation is 16 to 20 inches. Approximately 35 percent comes during the summer months. The growing season begins in the later part of April and lasts until the middle of October or until moisture is depleted or the plants mature. The freeze-free season is 80 to 110 days and the mean annual temperature is 44° to 47° F.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the exisitng community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site.

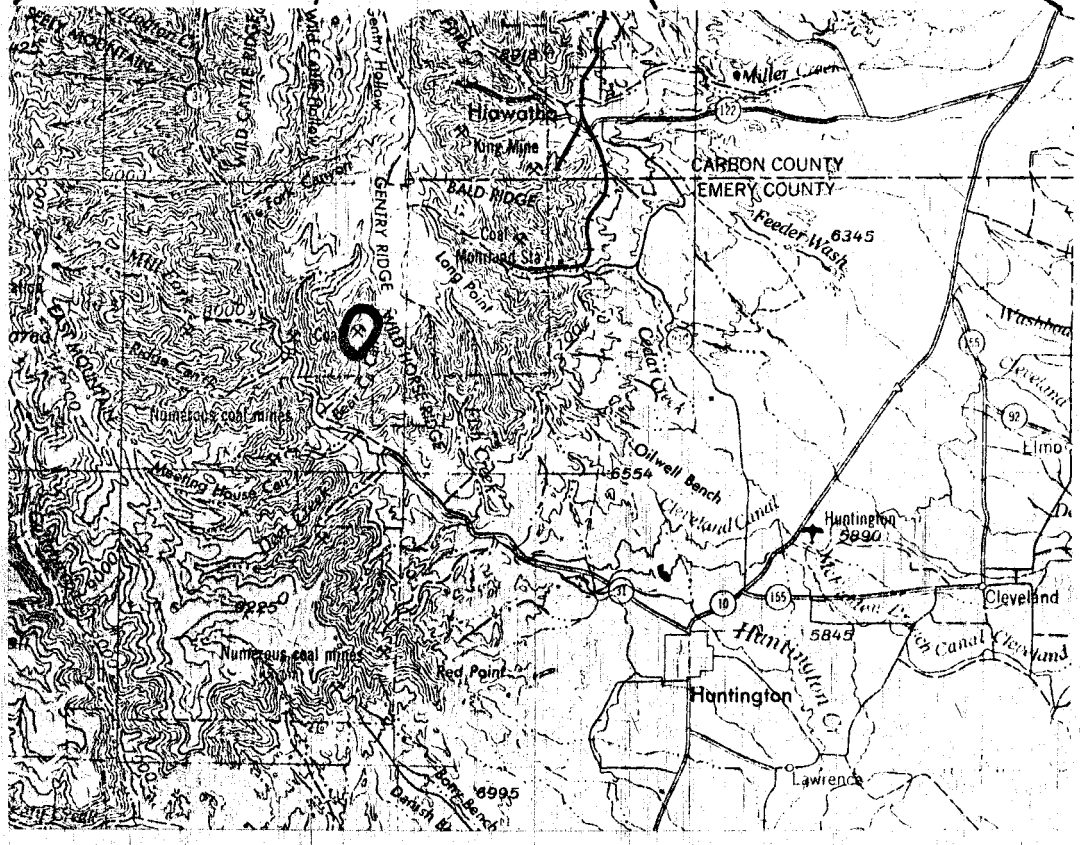
Such management generally results in the optimum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

More detailed information is available in the Price Field Office of the Soil Conservation Service.

LOCATION MAP
FOR
Soil Survey
of
CO-OP Mining Co.
Bear Canyon Area

State of Utah

Carbon & Emery Counties



Survey Area Circled

SOIL LEGEND

Soil Symbol	Soil Mapping Unit Name
D2E	Datino bouldery fine sandy loam, 5 to 20 percent slopes
D1G	Datino very stony fine sandy loam, 55 to 70 percent slopes

DESCRIPTION OF THE SOILS

D2E Datino bouldery fine sandy loam, 5 to 20 percent slopes.

This Datino soil is very deep and well drained. It occurs on moderately steep alluvial fans and some sloping flood plains at elevations of 7,100 to 7,140 feet (2,165 to 2,177 meters). This soil formed in alluvium and colluvium derived mainly from sandstone and shale. The average annual precipitation is 14 to 16 inches (36 to 41 centimeters). Mean annual air temperature is 42 to 45 degrees F. (5 to 7 degrees C.), mean annual soil temperature is 44 to 47 degrees F. (6 to 8 degrees C.), and the average freeze-free season is about 80 to 110 days.

Slopes are 5 to 20 percent and mostly east facing. They are short and concave-convex.

Vegetation is dominantly pinyon, Utah juniper, salina wildrye, squirreltail, big sagebrush, Douglas-fir, and Rocky Mountain juniper.

Included in mapping are small areas of a similar soil except with 20 percent gravel and cobbles in the surface layer.

In a typical profile the surface layer is brown, bouldery fine sandy loam and cobbly loam about 10 inches (25 centimeters) thick. The subsoil is light brown very stony loam about 28 inches (71 centimeters) thick. The substratum is light reddish brown cobbly fine sandy loam to a depth of 60 inches (1.5 meters) or more.

Permeability is moderate. Available water capacity is 6 inches (15 centimeters) to a depth of 60 inches (1.5 meters). Organic matter content in the surface layer is 4 percent. Effective rooting depth is about 60 inches (1.5 meters). Surface runoff is medium and erosion hazard is moderate under potential native vegetation and high if vegetation is removed and the soil is left bare. Erodibility is low. This soil is used for range, wildlife habitat, and mining operations.

Taxonomic classification is loamy-skeletal, mixed Typic Haploboralls.

A typical pedon of Datino bouldery fine sandy loam, 5 to 20 percent was described on the cut about 200 feet east and 1100 feet south of the NW corner of Section 25, T16S, R7E.

A11 -- 0 to 2 inches (0 to 5 centimeters) brown (10YR 5/3) bouldery fine sandy loam, dark brown (10YR 3/3) when moist; moderate fine granular structure; loose, very friable, slightly sticky, nonplastic; common very fine to medium, few coarse roots; 10 percent boulders, 10 percent stones, 5 percent cobbles, 10 percent gravel; slightly calcareous; moderately alkaline (8.0); abrupt smooth boundary.

A12 -- 2 to 10 inches (5 to 25 centimeters); brown (10YR 5/3) cobbly loam, dark brown (10YR 3/3) when moist; moderate medium granular structure; soft, friable, slightly sticky, slightly plastic; common very fine to medium, few coarse roots; 10 percent cobble and 10 percent gravel; moderately calcareous; moderately alkaline (ph 8.2); clear smooth boundary.

B2 -- 10 to 38 inches (25 to 96 centimeters); light brown 7.5YR 6/4) very stony loam, brown (7.5YR 4/4) when moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine to medium roots; 1 percent boulders, 30 percent stone, 10 percent cobbles, 20 percent gravel; moderately calcareous; strongly alkaline (ph 8.5); abrupt wavy boundary.

C1 -- 38 to 60 inches (96 to 152 centimeters) light reddish brown (5YR 6/4) cobbly fine sandy loam, reddish brown (5YR 4/4) when moist; massive; soft, very friable, slightly sticky, nonplastic; few very fine and fine roots; 10 percent cobbles, 5 percent gravel; strongly calcareous; strongly alkaline (ph 8.6).

D1G Datino - Rock outcrop complex, 55 to 70 percent slopes.

This map unit is on very steep canyon sideslopes. Slopes are short and concave-convex, Elevation is 7,140 to 7,600 feet (2,177 to 2,318 meters). The average annual precipitation is 14 to 16 inches (36 to 41 centimeters). Mean annual air temperature is 42 to 44 degrees F. (6 to 7 degrees C.) and the average frost-freeze season is 80 to 110 degrees.

This unit is 75 percent Datino very stony fine sandy loam, 55 to 70 percent slopes in single and concave areas and 15 percent rock outcrop on ridges.

Included in this unit is about 10 percent of a shallow soil that is about 6 to 15 inches in depth, associated with the Rock outcrop.

The Datino soil is very deep and well drained. This soil formed in colluvium derived mainly from sandstone and shale. Slopes are 55 to 70 percent and east facing. They are short and concave-convex. Vegetation is dominantly pinyon, Utah juniper, Rocky Mountain juniper, salina wildrye, Douglas-fir, curlleaf mountainmahogany.

In a typical profile the surface layer is brown or yellowish brown, very stony fine sandy loam about 16 inches (41 centimeters) thick. The subsoil is very pale brown, very stony sandy clay loam about 20 inches (51 centimeters) thick. The substratum is very pale brown, very stony silty clay loam to a depth of more than 60 inches (152 centimeters).

Permeability is moderate to 36 inches (91 centimeters) and moderately slow below 36 inches. Available water capacity is 6.5 inches (16 centimeters) to a depth of 60 inches (1.5 meters). Organic matter content in the surface layer is about 4 percent. Effective rooting depth is about 60 inches (1.5 meters). Surface runoff is rapid and erosion hazard is high under potential native vegetation and very high if vegetation is removed and the soil is left bare. Erodibility is low. This soil is used for range, wildlife habitat, and mining operation.

Taxonomic classification is loamy-skeletal, mixed Typic Haploboralls.

A typical pedon of Datino very stony fine sandy loam, 55 to 70 percent slopes was described on the bank about 150 feet north of the old mine portal about 300 feet north and 300 feet east of the SW corner of Section 24, T16S, R7E.

A11 -- 0 to 3 inches (0 to 8 centimeters); brown (10YR 5/3) very stony fine sandy loam, dark brown (10YR 3/3) when moist; moderate fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine, few medium and coarse roots; moderately calcareous; moderately alkaline (ph 8.4); abrupt smooth boundary.

A12 -- 3 to 16 inches (8 to 41 centimeters); yellowish brown (10YR 5/4) stony fine sandy loam, dark brown (10YR 3/3) when moist; weak medium granular structure; soft, friable, nonsticky, nonplastic; many very fine and fine, few medium and coarse roots; 2 percent boulders, 10 percent stones, 10 percent cobbles, 10 percent gravel; moderately calcareous; moderately alkaline (ph 8.4); clear smooth boundary.

B2 -- 16 to 36 inches (41 to 91 centimeters) very pale brown (10YR 7/3) very stony sandy clay loam, pale brown (10YR 6/3) when moist; weak medium subangular blocky structure; slightly hard, firm, slightly sticky, plastic; common very fine and fine roots; many fine pores; 2 percent boulders, 15 percent stones, 15 percent cobbles, 10 percent gravel; moderately calcareous; strongly alkaline (ph 8.6); abrupt wavy boundary.

C1 -- 36 to 60 inches (91 to 152 centimeters) very pale brown (10YR 8/4) stony silty clay loam, light yellowish brown (10YR 6/4) when moist; moderate medium and coarse subangular blocky structure; hard, firm, sticky plastic; few very fine and fine roots, common fine pores; 2 percent boulders, 10 percent stones, 10 percent cobbles, 5 percent gravel; strongly calcareous; strongly alkaline (ph 8.9).

SOIL INTERPRETATIONS

CO-OP Mining Co.

Use	D2E	D1G
Septic Tank Absorption Field	5-15% slopes; Moderate Percs slowly, large stones 15+% slopes: Severe--slope	Severe--Slope
Shallow Excavations	5-15% slopes: Moderate-- Large stones, slope 15+% slopes: Severe--Slope	Severe--Slope
Local Roads and Streets	5-15% slopes: Moderate-- slope, frost action, large stones 15+% slopes: Severe--Slope	Severe--Slope
Roadfill	Fair-- Large stones, slope	Poor--Slope
Sand and Gravel	Improbable source -- Excess fines	Improbable source -- Excess fines
Topsoil	Poor-- Large stones	Poor-- Large stones, slope
Pond Reservoir Area	5-8% slopes: Moderate seepage, slope 8+% slopes: Severe--Slope	Severe--Slope
Embankments, Dikes, and Levees	Severe--Piping, large stones	Severe--Large stones
Soil Reconstruction for Drastically Disturbed Areas	Poor--Excess lime, large stones	Poor--Excess lime, large stones

DESCRIPTION OF PRESENT VEGETATION

Upland Stony Loam (Pinyon-Juniper) Ecological Site

Two inventories of the Upland stony loam (P-J) ecological sites in the Bear Canyon area recorded the following vegetation as a percentage of air dry weight:

1) Pit 1, SW¼, Sec. 24, T16S, R7E. This site relates to the D1G soil.

2) Pit 2, NW¼, Sec. 25. T16S, R7E. This site relates to the D2E soil.

	Percent	
Grass and Grass-like Plants	Pit 1	Pit 2
Indian ricegrass	5	5
Salina wildrye	25	10
Squirreltail		10
Sedge		2
Needleandthread		2
Muttongrass	T	1
Forbs		
Buckwheat	1	
Mustard	1	2
Aster	1	2
Other	2	2
Crytantha		2
Stickseed		2
Trees and Shrubs		
Rubber rabbitbrush		5
White fir	5	
Douglas fir	5	5
Pinyon pine	30	25
Juniper	10	10
Rocky Mountain juniper	10	5
Curlleaf mountainmahogany	5	
Big sagebrush		5
Elderberry		5
Total annual Production (estimated in pounds/acre)	900	1500
Ecological rating	Good	Good

2

Notes: Inventories were completed in November, 1980, making forb identification very difficult. The vicinity of Pit 2 appeared to have been burned in early 1900's. These sites were in a transition zone between upland and mountain climates.

Climatology and Air Quality

11.1 The intent of this section is to show the possible effect the mining operation could have on the air environment, to what extent control measures will minimize that effect, and what control measures will be used.

11.2 Data on the existing environment will be taken from records from the State Climatologist at Logan, Utah, and from records of wind velocities from reporting stations of the Utah Power and Light Co. Data on amount of emmisions and control measures and their expected effect are from permit applications to the E P A Air Quality Division.

11.3 Existing Environment

11.3.1 Precipitation; Hiawatha reporting station

Annual Precipitation	Normal	13.18 in.
	1980	18.62 in.

11.3.2 Temperature

Daily maximum	Normal	56.3 deg.
	1980	55.8 deg.
Daily minimum	Normal	34.0 deg.
	1980	33.3 deg.
Month average	Normal	45.5 deg.
	1980	44.5 deg.

11.3.3 Evaporation

Pan evaporation; May through October 45.6

11.3.5 Wind

See exibit XI a

11.4 Effects of mining on Air Quality

See exibit XI b

Exibit XI-a-page 1

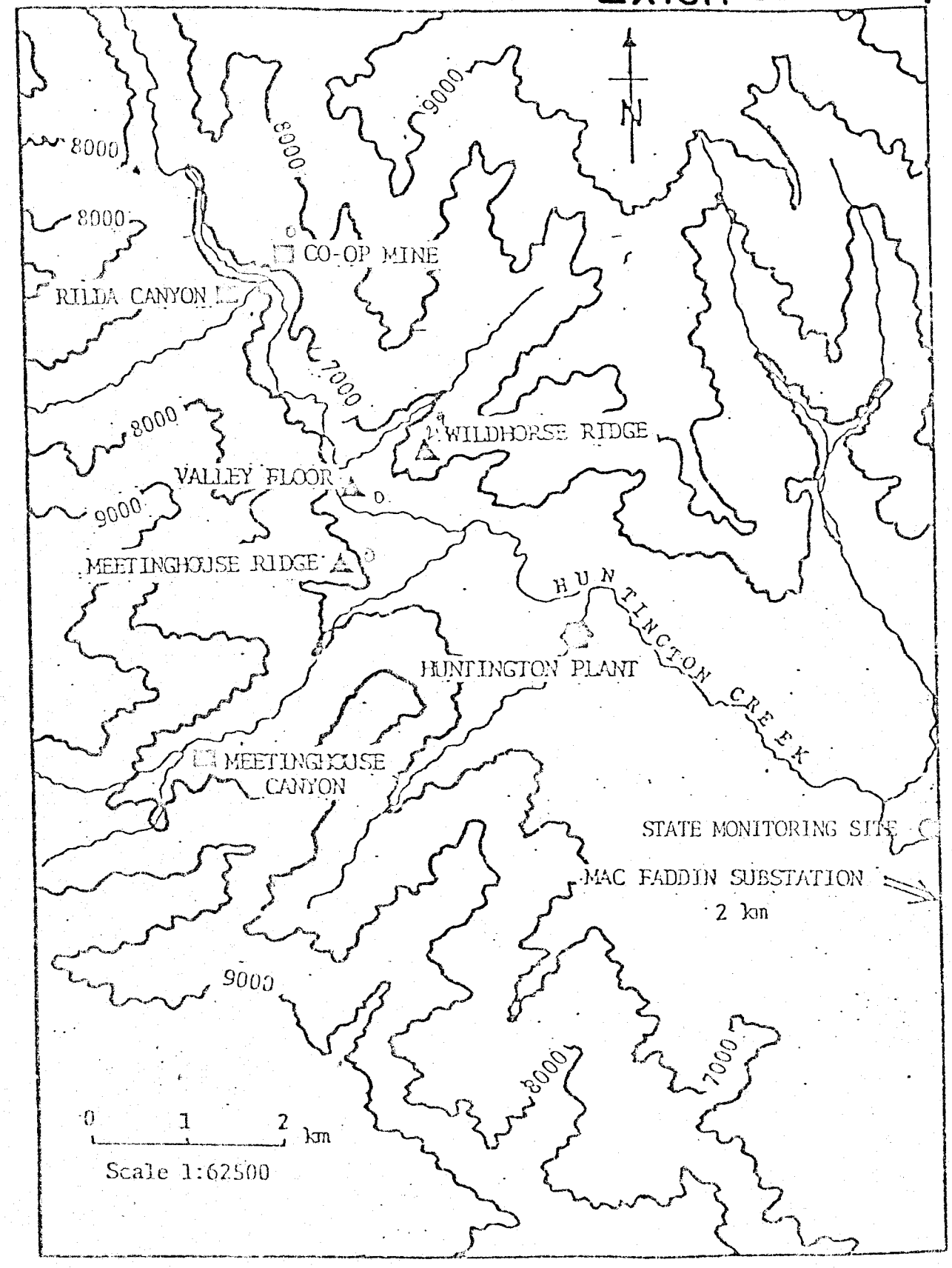
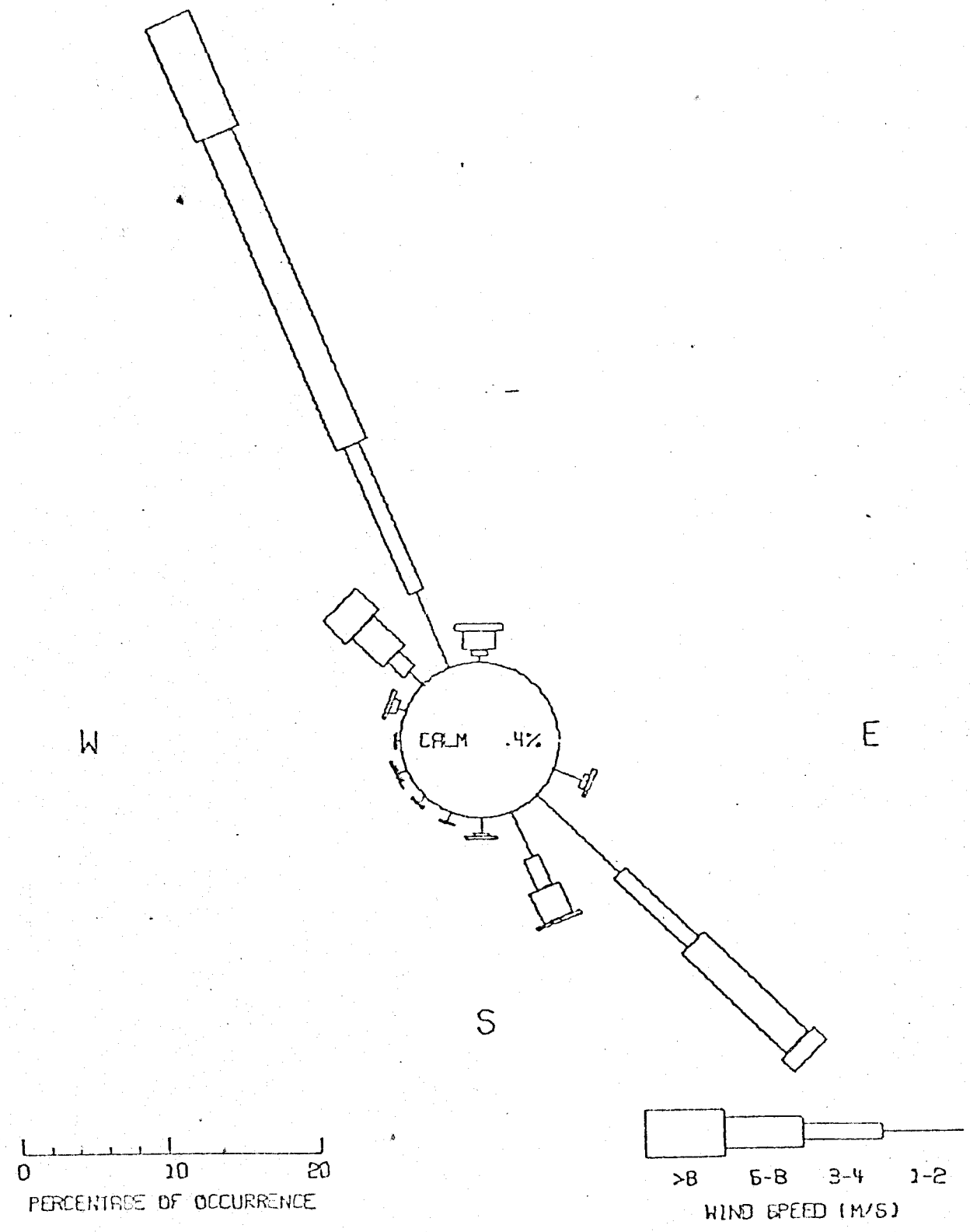


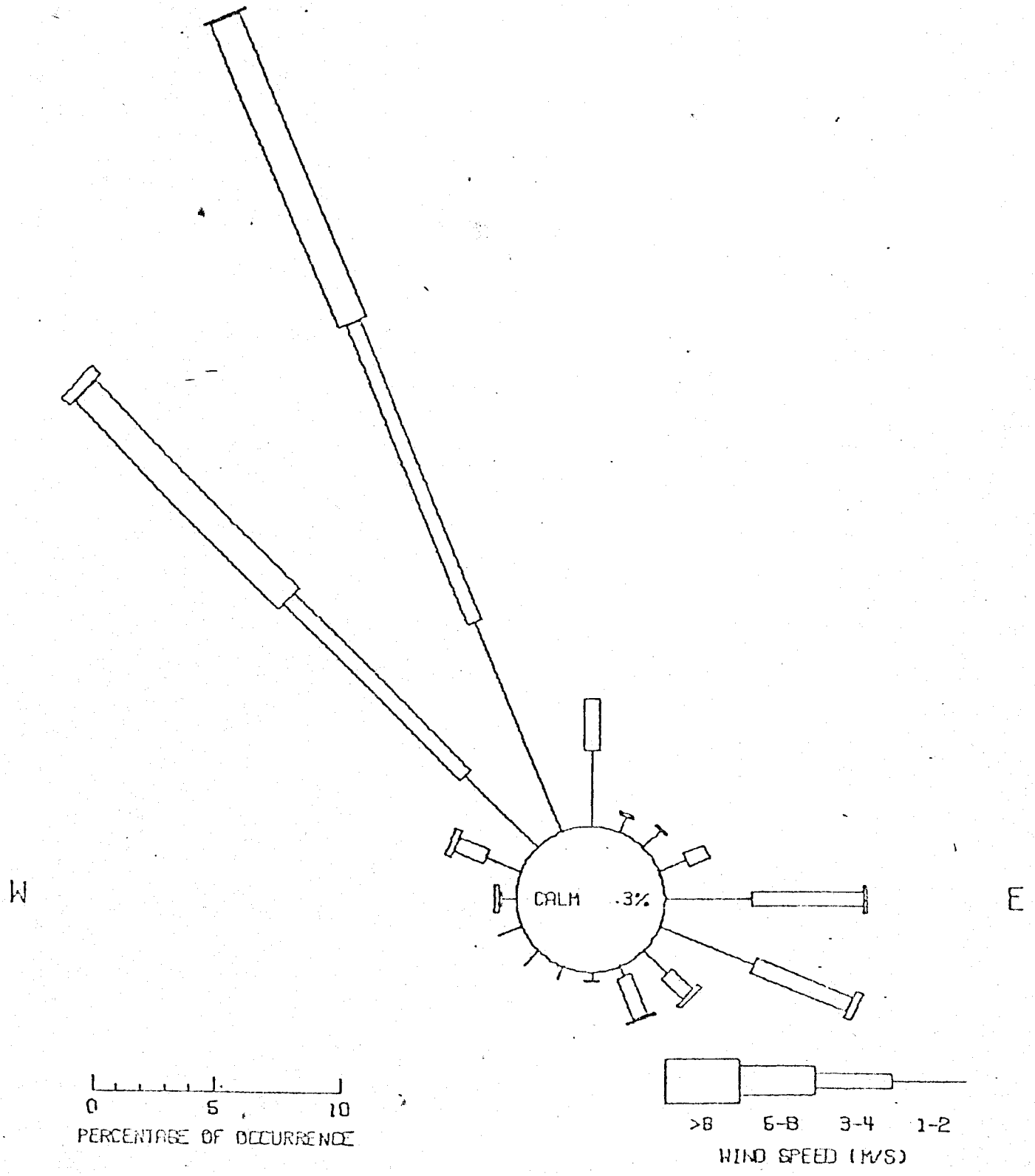
Figure 1.1 Map of Huntington Canyon, Utah, and the location of the plant site and air quality monitors.



WILD HORSE RIDGE OCT 1977 THROUGH APRIL 1978

ALL TIMES

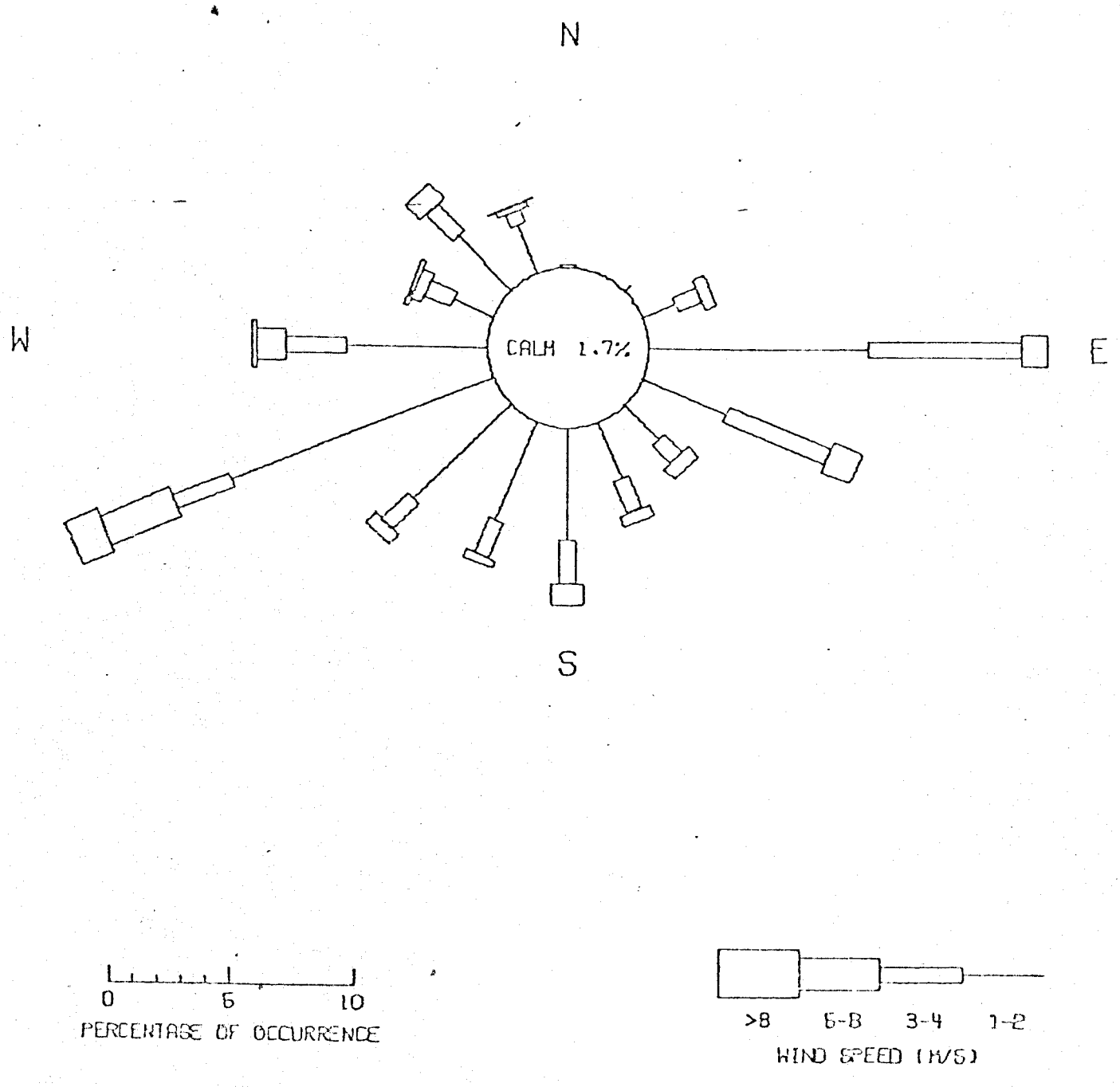
FIGURE 4.3



VALLEY FLOOR OCT 1977 THROUGH APRIL 1978

ALL TIMES

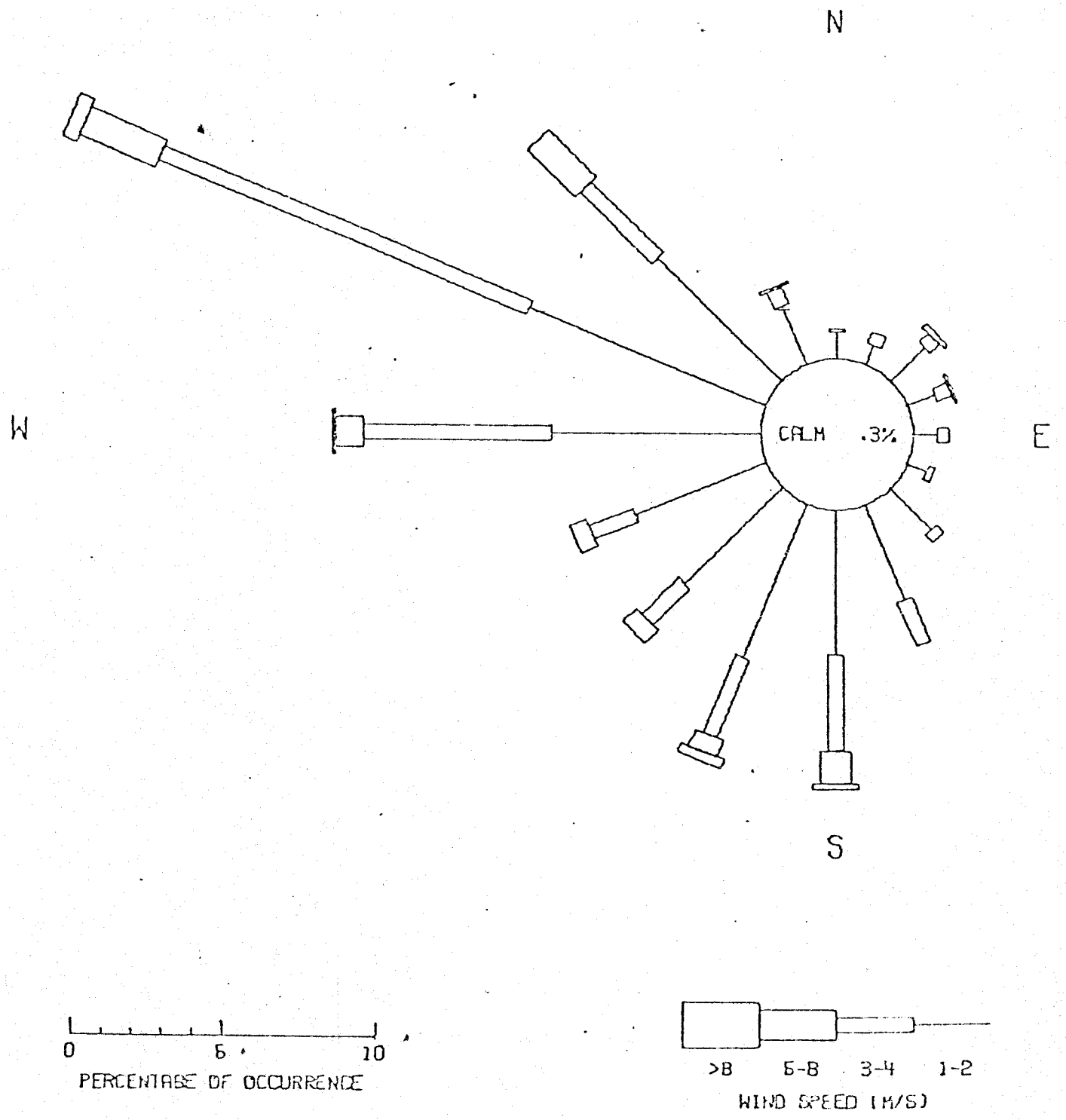
FIGURE 4.4



MEETING HOUSE OCT 1977 THROUGH APRIL 1978

ALL TIMES

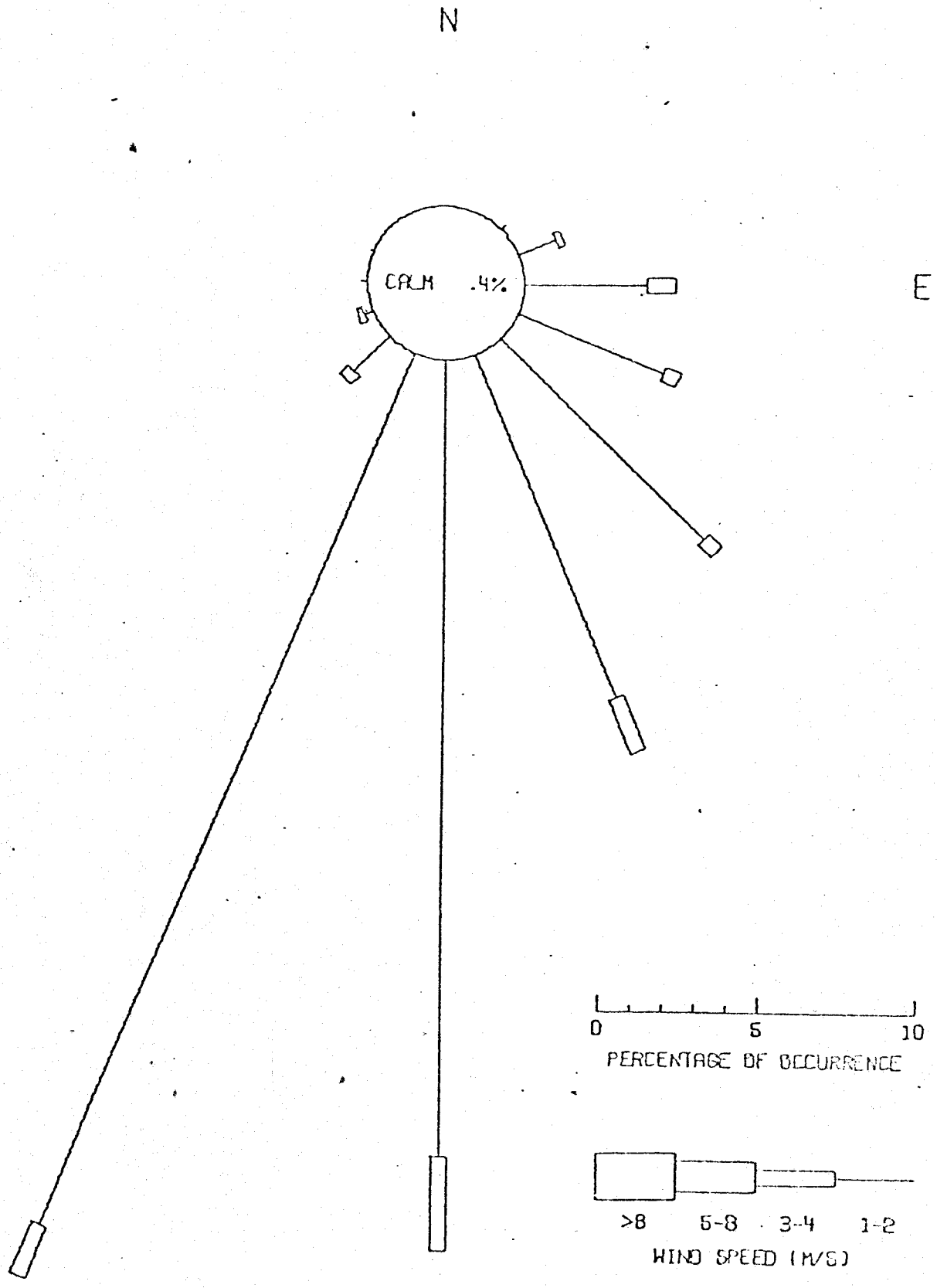
FIGURE 4.5



MACFADDIN DEC 1977 THROUGH APRIL 1978

ALL TIMES

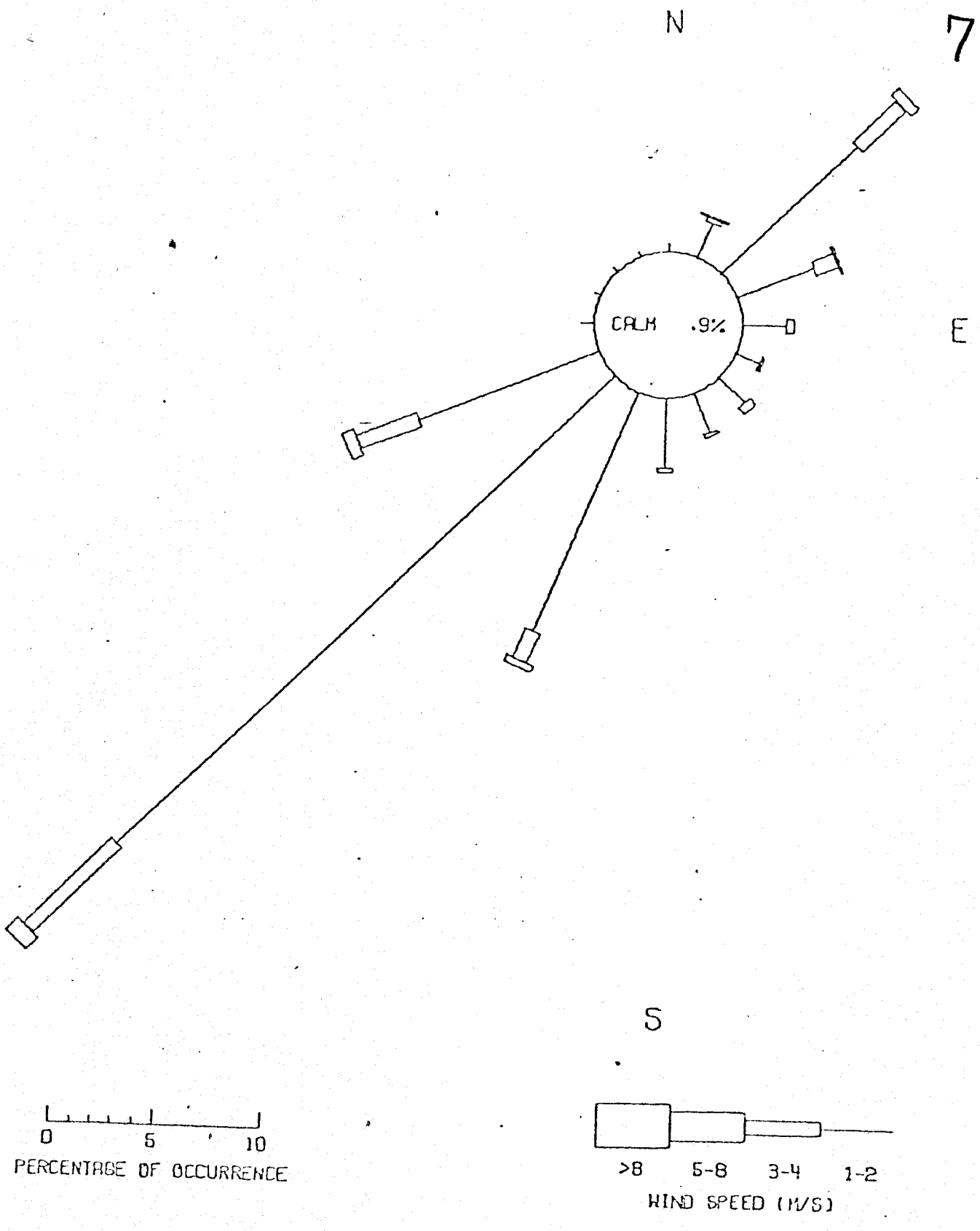
FIGURE 4.6



MEETINGHOUSE CANYON DEC 1977 THROUGH APRIL 1978

ALL TIMES

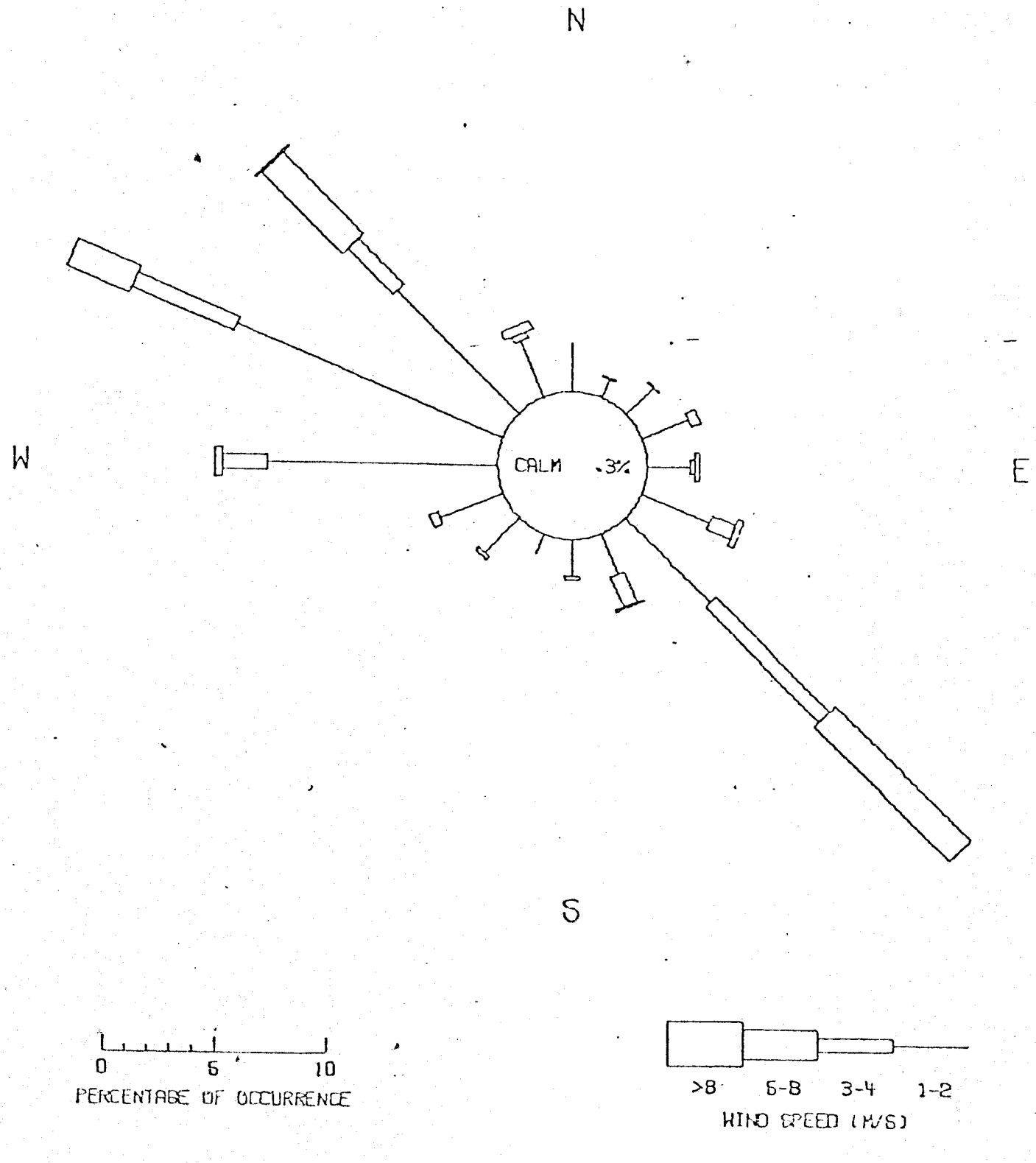
FIGURE 4.7



RILDA CANYON DEC 1977 THROUGH APRIL 1978

ALL TIMES

FIGURE 4.8



CO-OP MINE OCT 1977 THROUGH APRIL 1978

ALL TIMES

FIGURE 4.9

Exibit XI b
page 1

CO-OP MINING COMPANY _____DUST CONTROL (BEAR CANYON) . May 5, 1980

	UNCONTROLED		FACTOR	CONTROLED	
HAUL ROADS	23.17	T. PER YEAR	85%	3.476	T. PER YEAR
ACCESS ROADS	3.59	"	85%	.54	"
COAL STORAGE	5.25	"	50%	2.625	"
CONVEYORS	20	"	99%	.2	"
CRUSHER	2	"	99%	.02	"
SCREENS	10	"	99%	.1	"
PRODUCT REMOVAL	5	"	50%	2.5	"
TOTAL	69.01	"		9.461	"

** Note -- From Reference 13 Universal soil loss equation is $E = 0.025\ IKCLV$
where E = tons of suspended particulate per acre per year
I = soil erodibility factor
K = soil ridge roughness factor
C = localized climate factor
L = field width
V = vegetative cover

*** Note -- From Reference 12 $E = 0.6(0.81s)\left(\frac{S}{30}\right)\left(\frac{365-W}{365}\right) = \left(\frac{sS}{60}\right)^6\left(\frac{365-W}{365}\right)^{.43}$

where s = silt content of road in percent
S = vehicle speed in mph
W = mean annual (number of days with > 0.01 inches of rain)

Corrections may be applied for vehicle speed and number of vehicle tires.

An alternative method is to use the following:

$$E = 5.9\left(\frac{s}{12}\right)\left(\frac{S}{30}\right)\left(\frac{W}{3}\right)^{0.8}\left(\frac{d}{365}\right)$$ Reference 16

where E = #/VMT
s = silt content in percent
S = average vehicle speed, mph.
W = average vehicle weight, tons
d = dry days per year (number of days less than 0.01 inches of rain)

**** STORAGE PILES.

$$E = 0.05\left(\frac{s}{1.5}\right)\left(\frac{d}{235}\right)\left(\frac{f}{15}\right)\left(\frac{D}{90}\right)$$ #/ton Reference 16

where s = silt content in percent
d = dry days per year = .01 inch precipitation or snow cover
D = duration of material storage, days = through put of pile / size of pile (tons / tons)
f = % of time wind speed exceeds 12 mph.

DON GRAY UP&L 595-2235

CO-OP MINING COMPANY_____DUST CONTROL (BEAR CANYON) May 5, 1980

STORAGE PILE (COAL)

AVERAGE SIZE OF PILE 5,000 T. (10.000 T. CAP. — NORMALLY LESS THAN 1,000 T.)

THROUGH PUT 200,000 T. PER YEAR

D= 9.125

s = 20

d = 175 (HIAWATHA WEATHER STATION — 151 DAYS SNOW COVER —39 ADDITIONAL DAYS .01 IN. OR MORE OF RAINFALL)

$E = .05 \cdot \frac{20}{1.5} \cdot \frac{175}{235} \cdot \frac{15}{15} \cdot \frac{9.125}{90} = .0525 \cdot 200{,}000$ T. = 5.25 T. PER YEAR

CONTROL — COAL IS SPRAYED WITH WATER AS IT IS BEING MINED IN ORDER TO MEET UNDERGROUND DUST CONTROL REQUIREMENTS. ADDITIONAL SPRAY EQUIPMENT WILL BE INSTALLED AT THE STORAGE SITE TO USE IF NEEDED.

CRUSHING (PRIMARY ONLY) 200,000 T. • .02 = 4,000# = 2 T. PER YEAR

CONTROL — ENCLOSED AND VENT TO BAG HOUSE

SCREENING 200,000 T. • .1 = 20,000# = 10 T. PER YEAR

CONTROL — BAG HOUSE

CONVEYORS AND TRANSFER POINTS 200,000 T. • .2 = 40,000# = 20 T. PER YEAR

CONTROL — ENCLOSED AND VENT TO BAG HOUSE

ROADS (HAUL) — s = 15
S = 20
W = 190

E = 5 • .47945 = 2.39725 @ 19333.33 MILES PER YEAR = 23.17 T. PER YEAR

CONTROL — CHEMICAL STABLIZATION

ROADS (ACCESS) s = 15
S = 10
W = 190

E = 2.5 • .479452 = 1.1986 @ 6000 MILES PER YEAR = 3.59 T. PER YEAR

CONTROL — CHEMICAL STABILIZATION

PRODUCT REMOVAL 200,000 T. PER YEAR • .05 = 5 T. PER YEAR

CONTROL — WATER SPRAY