UTAH POWER & LIGHT COMPANY
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P. O. BOX 899
SALT LAKE CITY, UTAH 84110

December 1, 1983

Ms. Shirley Lindsey
U. S. Department of the Interior
Office of Surface Mining
Reclamation and Enforcement
Brooks Towers
1020 15th Street
Denver, Colorado 80202

Re: Des-Bee-Dove Coal Mine Permit Application

Dear Ms. Lindsey:

Transmitted today under separate cover are seven sets of the Des-Bee-Dove application. This submitted material is to be inserted into the black covers of the original application and supersedes all previously submitted material.

Yours truly,

C E Shingleton

C. E. Shingleton
Director of Permitting,
Compliance & Services
Mining and Exploration

CES:BMCQ:bb:4164

cc: James Smith, Jr. (DOGM) w/enclosures

DES-BEE-DOVE MINE

VOLUME 3
APPENDICES

ADD SUBMITTED DATED TO APPENDIX II

REPLACE ORIGINAL APPENDIX V WITH SUBMITTED MATERIAL.

ADD SUBMITTED MAP TO APPENDIX VII.

ADD SUBMITTED PACKET TO APPENDIX X.

REPLACE ORIGINAL APPENDIX XII WITH SUBMITTED MATERIAL.

ALL OTHER APPENDICES REMAIN AS IS.

Volume 3

Appendices

Revised 11/21/83

APPENDIX II

SHRUB DENSITY

Site: Des-Bee-Dove Date: 4-14-82

Vegetation type: Pinyon Juniper Observers: Jerry + Marianne Barker

Page 1 of 3

Plot	Y_1* /Spp	Y_2 /Spp	Y_3 /Spp	Y_4 /Spp	ΣY_i	A_j
1	3.36 CELE	2.05 EPVI	4.60 CELE	5.41 CELE	15.42	14.86
2	6.20 CELE	6.89 EPVI	4.31 CELE	6.27 EPVI	23.67	35.02
3	5.92 CHVI	7.37 CELE	4.09 CELE	8.68 CELE	26.06	42.45
4	3.15 CELE	3.16 EPVI	4.59 CELE	1.97 EPVI	12.81	10.26
5	3.17 EPVI	4.84 CELE	2.94 CHVI	3.96 CELE	14.91	13.89
6	2.42 CELE	6.05 CELE	5.58 CELE	3.93 CELE	17.98	20.21
7	4.61 CELE	6.70 CELE	4.62 CELE	1.00 CELE	16.93	17.91
8	6.42 CELE	7.26 CELE	3.66 CELE	5.93 EPVI	23.27	33.84
9	3.57 CELE	9.01 CELE	5.67 CELE	5.27 CELE	23.52	34.57
10	4.62 EPVI	4.03 CELE	7.60 CELE	7.30 CELE	23.55	34.66
11	1.30 CELE	6.04 CELE	9.60 CELE	3.30 EPVI	20.24	25.60
12	9.60 CELE	5.05 CELE	4.89 CELE	5.14 CELE	24.68	38.07
13	1.40 EPVI	4.43 CELE	10.00 CELE	7.50 CELE	23.33	34.02
14	2.80 CELE	11.30 CELE	10.00 CELE	9.00 CELE	33.10	68.48
15	3.70 CELE	8.10 CELE	7.24 CELE	9.58 CELE	28.62	51.18
16	1.41 CELE	1.0 CELE	2.78 EPVI	5.30 CELE	10.49	6.88
17	2.26 EPVI	5.27 CELE	5.11 CELE	3.35 CELE	15.99	15.98
18	1.44 CELE	3.63 EPVI	12.15 EPVI	11.85 EPVI	29.07	52.82
19	1.40 EPVI	6.67 CELE	4.32 EPVI	10.24 EPVI	22.63	32.01
20	2.55 CELE	4.62 CELE	8.95 EPVI	9.34 CELE	25.46	40.51

*meters

CELE = *Cercocarpus ledifolius*
EPVI = *Ephedra viridis*
CHVI = *Chrysothamnus viscidiflorus*

Based on 20 samples

Maximum n= 42 $\bar{X}$= 31.16

Density = #/Hectare= s^2= 248.86

Site Des-Bee-Dove

Vegetation type PI

Date 4-14-82

Observers Barker

Plot	Y_1 /Spp	Y_2 /Spp	Y_3 /Spp	Y_4 /Spp	ΣY_i	A_j
21	1.03 CELE	2.10 CHUI	2.08 EPUI	5.60 CELE	10.81	7.30
22	6.10 CELE	9.60 CELE	7.60 EPUI	6.70 CELE	30.00	56.25
23	2.75 EPUI	7.82 CELE	7.50 EPUI	8.90 EPUI	27.00	45.56
24	5.50 EPUI	7.50 EPUI	6.89 EPUI	4.32 EPUI	24.21	36.63
25	1.92 CELE	3.67 CELE	6.77 CELE	5.98 EPUI	18.34	21.02
26	3.10 CELE	6.32 CELE	5.97 CELE	8.62 CELE	24.01	36.03
27	1.20 CELE	1.25 EPUI	2.45 CELE	2.50 EPUI	7.40	3.42
28	1.82 CELE	6.45 EPUI	4.90 CELE	11.10 EPUI	24.27	36.81
29	:80 CELE	5.68 CELE	6.0 CELE	5.26 EPUI	17.74	19.67
30	2.30 CELE	4.98 CELE	2.90 EPUI	9.30 EPUI	19.48	23.72
31	2.50 EPUI	4.89 CELE	1.77 EPUI	4.50 CELE	13.66	11.66
32	2.18 CELE	5.37 CELE	11.30 CELE	5.80 CELE	24.65	37.98
33	6.40 CELE	6.87 CELE	6.25 CELE	5.70 CELE	25.22	39.75
34	3.93 CELE	3.0 CELE	2.45 EPUI	15.00 CELE	24.38	37.15
35	1.01 EPUI	5.15 EPUI	4.00 CELE	4.73 EPUI	14.89	13.86
36	3.90 EPUI	2.12 CELE	3.35 CELE	2.20 CELE	11.57	8.37
37	2.75 CELE	1.24 EPUI	5.65 EPUI	7.52 EPUI	17.16	18.40
38	1.90 EPUI	1.60 CELE	4.82 EPUI	5.0 CELE	13.32	11.09
39	3.59 CHUI	6.92 EPUI	3.21 CHUI	2.95 CHUI	16.67	17.37
40	3.36 EPUI	5.56 CELE	3.39 CELE	9.39 CELE	21.70	29.43

Maximum n= $\bar{X}$=

Density = #/Hectare= s^2=

/

SHRUB DENSITY

Site Des-Bee-Dove

Date 4-14-82

Vegetation type PJ

Observers Barker

Page 3 of 3

Plot	Y_1 /Spp	Y_2 /Spp	Y_3 /Spp	Y_4 /Spp	ΣY_i	A_j
41	2.67 CELE	4.51 CELE	3.10 EPVI	3.36 EPVI	13.64	11.63
42	4.35 CELE	4.95 EPVI	6.35 EPVI	10.07 CELE	25.71	41.34
43	6.00 CELE	6.08 EPVI	7.04 CELE	11.34 CELE	30.46	57.99
44	2.11 CELE	1.43 EPVI	7.50 CELE	13.63 CELE	24.67	38.04
45	4.66 CHVI	5.46 CELE	1.00 EPVI	3.80 EPVI	14.91	13.91
46	3.02 EPVI	4.09 EPVI	3.49 CELE	2.41 EPVI	13.01	10.58
47	1.96 EPVI	6.21 EPVI	2.51 EPVI	1.75 EPVI	12.43	9.66
48	1.34 CELE	3.15 CELE	8.80 EPVI	9.50 CELE	22.79	32.46
49	1.10 CELE	5.22 EPVI	4.09 EPVI	7.00 EPVI	17.41	18.94
50	0.87 EPVI	0.50 EPVI	4.90 CELE	6.20 CELE	12.47	9.72

Species	Composition %	Density #/ha
CELE	61	221
EPVI	36	131
CHVI	3	11

Overall, based on 50 samples

Maximum n=

$\bar{X}$= 27.58

Density = #/Hectare= 363

s^2= 240.77

#/acre 147

SHRUB DENSITY

Site Des-Bee-Dove   Date 4-15-82

Vegetation type Salt Desert   Observers Jerry & Marianne Barber

Page 1 of 3

Plot	Y_1* /Spp		Y_2 /Spp		Y_3 /Spp		Y_4 /Spp		ΣY_i	A_j
1	1.05	ATCU	1.4	ATCO	1.85	ATCU	2.50	ATCU	6.80	2.89
2	0.93	ATCO	2.05	ATCU	1.90	ATCU	0.90	ATCO	5.78	2.09
3	0.25	ATCU	1.35	ATCU	1.83	ATCO	1.88	ATCU	5.31	1.76
4	1.28	ATCO	1.10	ATCO	2.22	ATCU	2.60	ATCU	7.17	3.24
5	1.66	ATCO	1.70	ATCU	2.05	ATCO	1.25	ATCU	6.66	2.77
6	1.87	ATCO	1.19	ATCO	1.45	ATCO	2.05	ATCO	6.56	2.69
7	2.00	ATCO	2.10	ATCO	2.00	ATCO	2.10	ATCO	8.20	4.20
8	0.53	ATCO	1.50	ATCO	2.30	ATCO	2.60	ATCO	6.93	3.00
9	0.95	ATCO	2.05	ATCO	2.06	ATCO	2.50	ATCO	7.56	3.57
10	1.48	ATCO	1.80	ATCO	1.20	ATCO	1.80	ATCU	6.27	2.46
11	0.50	ATCU	0.80	ATCU	0.43	ATCU	0.94	ATCU	2.68	0.45
12	0.53	ATCU	1.05	ATCU	2.56	ATCU	2.43	ATCU	6.57	2.70
13	0.71	ATCO	0.68	ATCO	0.79	ATCO	0.93	ATCO	3.11	0.60
14	1.25	ATCU	1.73	ATCU	1.07	ATCU	1.80	ATCU	5.85	2.14
15	1.79	ATCU	2.07	ATCU	1.35	ATCU	2.40	ATCU	7.61	3.62
16	1.10	ATCU	0.89	ATCU	1.25	ATCU	0.70	ATCO	3.94	0.97
17	0.66	ATCU	0.95	ATCU	1.68	ATCU	1.30	ATCU	4.60	1.32
18	0.25	ATCU	0.82	ATCU	0.70	ATCU	0.89	ATCU	2.65	0.44
19	0.50	ATCU	0.60	ATCU	0.66	ATCU	1.43	ATCU	3.20	0.64
20	0.97	ATCU	1.63	ATCU	2.05	ATCU	2.67	ATCU	7.32	3.35

*meters

ATCU = Atriplex cuneata
ATCO Atriplex confertifolia
SAVE = Sarcobatus vermiculatus

Based on 20 samples

Maximum n= 45 $\bar{X}$= 2.25

Density = #/Hectare= s^2 1.36

SHRUB DENSITY

Site Des-Bee-Dove Date 4-15-82

Vegetation type Salt Desert Observers Baker

Page 2 of 3

Plot	Y_1 /Spp	Y_2 /Spp	Y_3 /Spp	Y_4 /Spp	ΣY_i	A_j
21	0.95 ATCU	1.00 ATCU	0.95 ATCU	1.34 ATCU	4.23	1.12
22	1.34 ATCU.	1.27 ATCU	2.10 ATCU	4.60 ATCU	9.31	5.42
23	0.82 ATCU	1.30 ATCU	1.30 ATCO	0.96 ATCO	4.38	1.20
24	0.45 ATCO	1.23 SAVE	1.50 ATCO	3.26 ATCO	6.44	2.59
25	0.44 ATCU	0.75 ATCU	0.68 ATCU	1.03 ATCU	2.91	0.53
26	0.76 ATCU	0.70 ATCU	1.15 ATCU	2.87 ATCU	5.48	1.88
27	0.53 ATCO	1.71 ATCU	2.50 ATCU	2.10 ATCU	6.84	2.92
28	0.45 ATCO	0.38 ATCU	0.64 ATCU	1.08 ATCU	2.56	0.41
29	0.35 ATCU	0.30 ATCU	0.60 ATCU	0.83 ATCU	2.08	0.27
30	0.36 ATCU	0.53 ATCU	0.20 ATCU	0.71 ATCU	1.79	0.20
31	0.57 ATCU	0.62 ATCU	1.05 ATCU	0.59 ATCU	2.83	0.5
32	0.31 ATCU	0.40 ATCU	0.40 ATCU	0.62 ATCU	1.74	0.19
33	0.86 ATCU	0.63 ATCU	1.60 ATCU	1.33 ATCU	4.42	1.22
34	0.95 ATCU	1.12 ATCU	1.50 ATCO	1.82 ATCU	5.40	1.82
35	0.87 ATCU	0.60 ATCU	1.00 ATCU	1.20 ATCU	3.67	0.84
36	0.30 ATCU	0.56 ATCU	1.13 ATCU	1.49 ATCU	3.49	0.76
37	0.34 ATCU	0.58 ATCU	0.83 ATCU	0.83 ATCU	2.59	0.42
38	0.60 ATCU	0.71 ATCU	1.84 ATCU	1.35 ATCU	5.08	1.27
39	0.47 ATCU	0.68 ATCU	0.60 ATCU	0.87 ATCU	2.62	0.43
40	0.44 ATCU	0.59 ATCU	0.60 ATCU	0.64 ATCU	1.28	0.32

Maximum n= $\bar{X}$=

Density = #/Hectare= s^2=

SHRUB DENSITY

Site: Oes-Bee-Dove Date: 4-15-82

Vegetation type: Salt Desert Observers: Barker

Page 3 of 3

Plot	Y_1 /Spp	Y_2 /Spp	Y_3 /Spp	Y_4 /Spp	ΣY_i	A_j
41	0.64 ATCU	0.61 ATCU	0.61 ATCU	0.58 ATCU	2.43	0.37
42	0.90 ATCU	1.04 ATCU	1.20 ATCU	0.75 ATCU	3.90	0.95
43	0.29 ATCU	0.55 SAVE	0.43 ATCU	0.18 ATCU	1.44	0.13
44	0.46 ATCO	0.27 ATCO	0.47 ATCO	0.88 ATCO	2.08	0.27
45	0.45 ATCO	0.36 ATCU	0.38 ATCU	0.62 ATCU	1.79	0.20
46	1.52 ATCU	1.75 ATCU	1.77 ATCU	1.38 ATCU	6.42	2.58
47	0.37 ATCO	1.46 ATCO	0.54 ATCO	0.84 ATCO	3.20	0.64
48	0.58 ATCO	0.60 ATCU	0.94 SAVE	1.28 ATCO	3.39	0.72
49	1.40 ATCO	1.50 ATCO	1.33 ATCO	1.52 ATCO	5.75	2.07
50	0.76 ATCU	0.77 ATCU	1.24 ATCO	1.78 ATCO	4.54	1.29

Overall, based on 50 samples

Species	Composition %	Density #/ha
ATCU	70	4458
ATCO	29	1847
SAVE	1	64

Maximum n= $\bar{X}$= 1.57

Density = #/Hectare= 6369 s^2= 1.60

#/acre = 2578

APPENDIX V

WILBERG WASTE ROCK STORAGE SITE

Introduction

Waste rock generated from the Des-Bee-Dove and Wilberg Coal Mines has exceeded our original estimates to the point where additional storage areas are needed. In this application we propose to add a series of six additional interconnected storage sites to be utilized sequentially as waste rock is generated.

The concept of utilizing individual earthen containment structures is based on existing environmental regulations promulgated from Public Law 95-87.

Specifically, individual small structures to meet only present day needs and ongoing reclamation lessens soil, sediment and hydrological impacts associated with open faced rock disposal structures. Limiting the height of the fill structure assures the long-term structural safety factor stated in the regulations. By design, the containment structure also becomes a sediment structure capturing storm runoff waters and snow melt without discharge. Topsoil handling utilizes small storage piles or berms which are revegetated during use.

There are no long-term negative impacts associated with this type of rock storage disposal.

784.19 - Description

784.19 (b) (1) - Geology - The proposed waste rock storage site is an area of low relief paralleling the Wilberg Mine road with a gently sloping topography. The elevation of the site varies from 6890 feet in the northwest corner down to 6700 feet in the southeast. Grimes Wash, an intermittent stream, passes near the site cutting a steep sided channel along a portion of the NE boundary. Along these steeply cut banks, good exposures of the strata are found.

The site is situated upon colluvium ranging in thickness from approximately 50 feet in the northwest corner to 35 feet in the southeast and lying unconformably upon the Mancos Shale. Depths of colluvium are projected from outcrop in Grimes Wash nearby. The colluvium is conglomeratic consisting primarily of cobble sized sandstone material ranging down to pebble and cemented with a friable sandy mud. Boulders in excess of eight feet in diameter are randomly interspersed within the colluvium. The fabric and cementing material of the colluvium render it moderately permeable.

The colluvium weathers to a loose sandy soil, light brown in color with sand particles ranging from fine to medium grained. The soil tends to be low in compactability and of moderate permeability. The loose soil can be eroded during major precipitation events but the permeability of the soil counteracts this by allowing for the infiltration of runoff.

Soils at the proposed site were sampled on the north and south ends. Results of these analyses are shown in Table 1 and in the enclosed soil description.

TABLE I

WASTE ROCK DISPOSAL SITE

	North End	South End
pH	7.90	8.25
ECe (mmhos/cm)	.9	.85
SAR	1.85	1.76
Sand	20%	20%
Silt	60%	65%
Clay	20%	15%
Sodium	110	95
Calcium	210	150
Magnesium	34	42

784.19 (b) (2) - Hydrology - The hydrology of the site is limited to surface water. The natural drainages in the area (as shown on Drawing CM-10361-WB) trend NW/SE terminating into Grimes Wash. Rainfall projections for this area predict a 3.0 inch rainfall for the 100 year/24 hour precipitation event.

Geologic studies of the area (Hintze) identify the Ferron Sandstone as the first possible water bearing member in the Mancos Shale Formation. Oil and gas wells drilled in the area report no water when drilling through the Mancos Shale Formation. One well drilled on the proposed site encountered no water down to 4900 feet from the surface. Another well drilled three miles south of the site encountered no water drilling through the Mancos Shale down to 11,500 feet from the surface (GR elev. 6023'). These wells are the nearest to the proposed site on record. Records are on file at the Division of Oil, Gas and Mining.

817.71 (a) - Proposed Disposal Plan - The proposed disposal structures will utilize a maximum of 16 acres, including storage of excavated soils, and retaining berms.

The basic disposal plan is to remove the top layer of weathered materials and to form these materials into three connected berms as shown on CM-10361 and Figure 1. This will involve removing some one foot of material at each site which will be utilized to form the berms some 5.5 feet high at a 2 horizontal to 1 vertical slope.

The berm structure will be compacted and revegetated to minimize erosion.

The underground development waste will be stored in the excavation starting at the southeast end and progressing northwesterly.

The fill will be placed in a single horizontal lift, 4 feet high, and compacted, until placement is completed.

The interior berms will then be removed and the material will be used to cover the stored rock and the site will again be reseeded.

The final slope of the disposal pile will approximate the original contours and will be about 3.6 feet higher than the existing ground with 2:1 outslopes as shown in Figure 1.

Development of each new structure will require construction of two additional berms to form the containment site as shown on Drawing

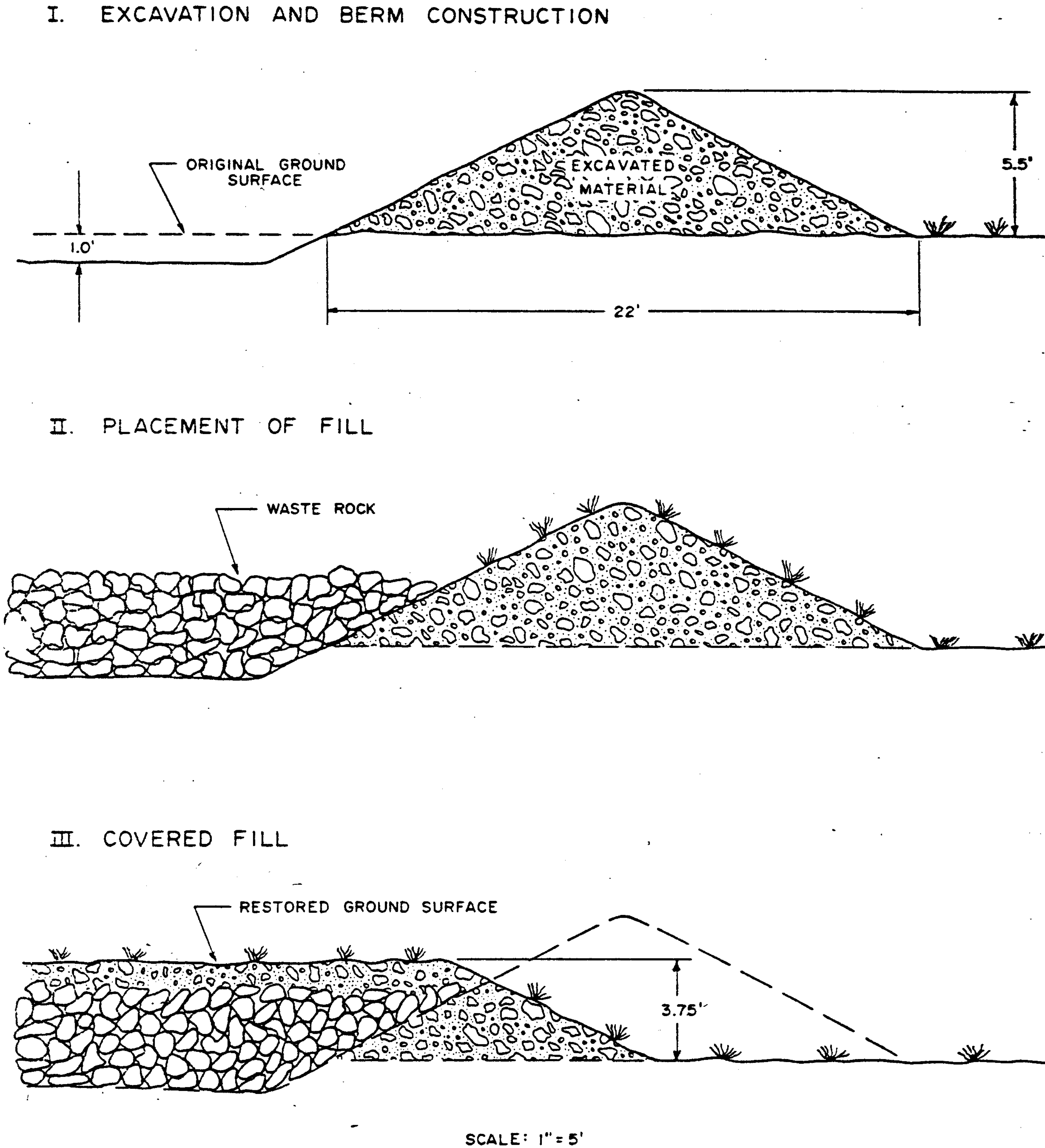

FIGURE 1

WASTE ROCK DISPOSAL: BERM DETAIL

CM-10361-WB and Figure 2. This material will be excavated as previously described.

Presently, two containment structures have been built. Extension of these structures requires construction of two additional berms which connect the new structure to the existing structure.

Construction of a typical 150 foot by 400 foot cell excavated one (1) foot deep will yield about 2,200 cubic yards of soil medium. The new berm construction will require about 1200 cubic yards (550 feet of berm x 62 cubic feet per linear foot ÷ 27 = 1,200 cubic yards of material. The remaining 1,000 cubic yards of excavated material will be placed over the adjacent earthen cell last filled. As individual cells are developed, reclamation of completed cells will take place. Soil medium will be approximately 12 inches deep.

Half of the required soil cover will come from the newly developed earthen structure and half from the no longer needed interior berms situated between old and new cells. On final reclamation, exterior berms will be removed and spread in areas lacking the 12 inch cover necessary to complete final grading and backfilling.

Topsoil, or substitute soil medium, will consist solely of the material excavated during construction of the earthen containment structures. Chemical and physical analysis of this soil medium are included in this text.

Physical configuration of the berms, which constitutes the soil storage sites during mining, is a triangular cross-section whose

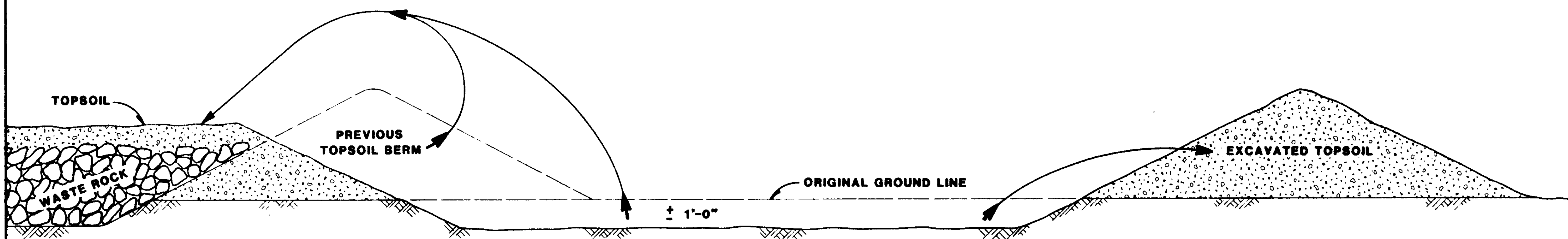

FIGURE 2

TOPSOIL HANDLING PLAN

base is 22 feet wide tapering to a peak which measures 5.5 feet high (see Waste Berm Design, Figure 1.

As the berms are constructed with a crawler tractor compaction is limited. It is desirable to compact the soil only to the point of resisting water migration or to the point of withstanding water impoundment. The earthen containment structures are designed to contain, without discharge, all storm runoff waters up to and including a 10 year 24 hour storm event. Berm compaction is necessary as they are required to hold residual waters. The worst condition would be an empty cell where storm waters would collect towards the southern or closed end of the cell.

Based on S.C.S. curve numbers an unvegetated pit with moderate to poor drainage characteristics would interpolate to be about a CN-80 which would yield a runoff of .44 inches from a 1.8 inch storm event (Figure 3).

Given these factors, and assuming the CN number is correct, the reservoir capacity of impounded waters is .05 acre feet or 2,200 cubic feet. Standing water would measure 18 inches deep, 150 feet long and 20 feet wide. As proven by similar structures, such as cattle watering tanks built throughout the area, it is reasonable to assume this structure is adequate, both structurally and hydrologically.

Final reclamation carries with it a much greater storm event. The N.O.A.A. atlas depicts for this area 3.0 inches as the precipitation expected for a 100 year storm.

10 YEAR / 24 HOUR HYDROLOGICAL CONDITIONS

1.8" PRECIPITATION EVENT

CN=80

RUNOFF .44

FORMULA

$$S = \frac{1000}{CN} - 10$$

$$Q = \frac{(P-.2S)^2}{(P+.8S)}$$

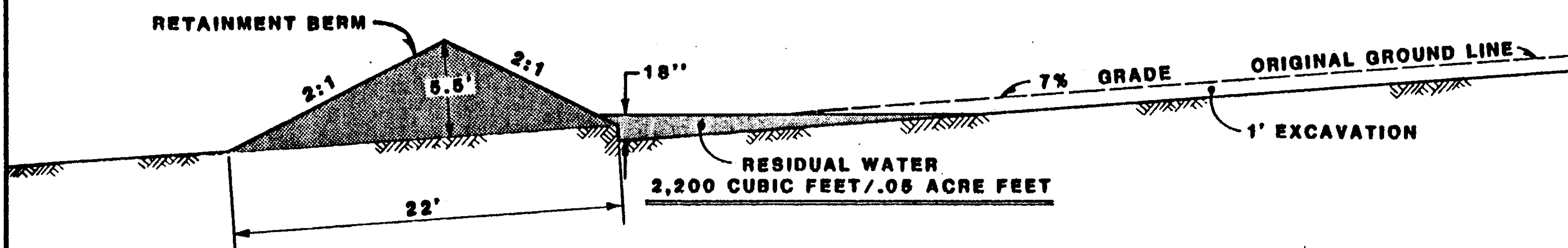

FIGURE 3

TYPICAL LONGITUDE CROSS-SECTION OF AN EMPTY EARTHEN CELL

Each completed waste rock containment structure consists of over four (4) feet of shot and crushed sandstone and mudstone rock. Though pushed and bladed by a crawler tractor during filling, it still is fairly loose in terms of compaction (Figure 4).

784.13 (b)(4) - Top Soil Handling Plan - As previously described, topsoil, or the substitute soil medium, will be the top 12 inches of the proposed containment structure. Of the excavated soils, half will be placed on finished cells or structures and will be placed in a topsoil configuration, together with native seeds, mulch and fertilizer. The other half will be used as containment berms forming the individual cells. Each berm will be compacted lightly to hold its shape and allow interim seeding on its exposed outer faces.

On completion of the individual cells (full of waste rock) interior berms will be bladed and removed. The removed berms will become surface soils for the cells last completed. Duration of the soil medium as a semi-compacted berm would depend on the amount of waste rock being generated.

Applicant does not anticipate any long-term storage of topsoil in berm form before its final disposition. Backfilling and grading of removed berms will loosen the soils for greater acceptance of mulch and water.

Final reclamation will incorporate soil spreading, scarifying, mulching and harrowing. The final cover will reflect a loose and deep cultivated mantle on which the nature plants can establish a deep root zone assuring draught resistant plants.

100 YEAR / 24 HOUR
HYDROLOGICAL CONDITIONS

3.0" PRECIPITATION EVENT

CN≠61

RUNOFF .11

FORMULA

$$S = \frac{1000}{CN} - 10$$

$$Q = \frac{(P-.2S)^2}{(P-.8S)}$$

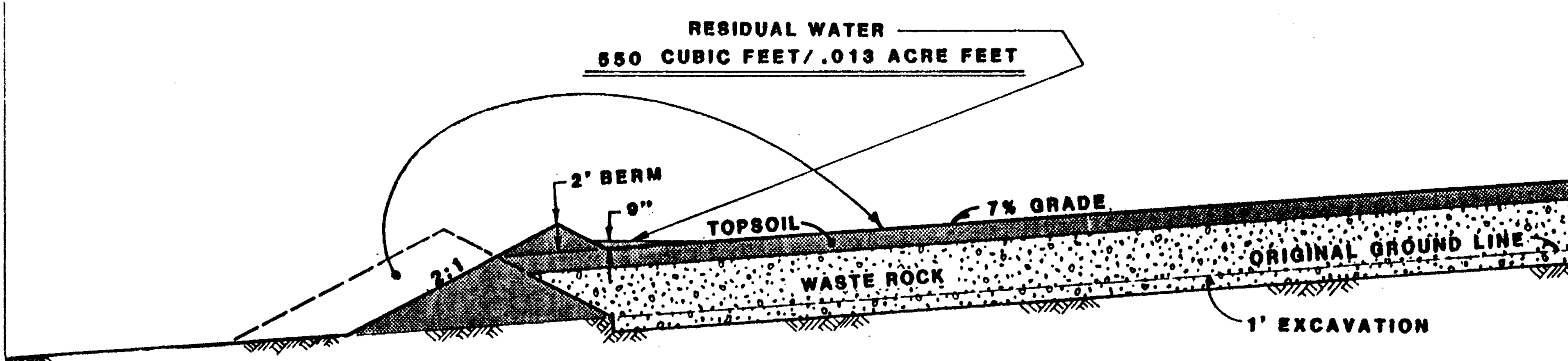

FIGURE 4

FINAL RECLAMATION
TYPICAL LONGITUDE CROSS-SECTION
OF A FILLED EARTHEN CELL

784.19 (a) 817.71 (b) - Disposal Structure - Drawing CM-10359-WB shows present topography and approximate excavation cross-sections.

The proposed excavation will be approximately 1 foot below the existing soil surface. The excavation will be banked on three sides by the excavated material. The open (unbanked) end of the excavation will be on the upslope side.

Construction of the disposal excavation and berms will be accomplished by standard earth construction practice.

Maintenance of the facility will involve annual inspections and required repair. Should the inspection identify a need for repairs, repairs will be made as requested by the inspector.

Waste rock will be transported from the mines and placed on the site by truck. Once disposal is complete and fill leveled, the surrounding berms will be pushed over the fill and graded. The approximate final slope is shown in the cross-sections of Drawing CM-10359-WB.

After replacement of the excavated material over the fill, the site will be reseeded to control erosion. The access road will be removed and interim revegetation completed.

817.73 (a) - Hydrologic Balance Protection - The proposed design includes procedures for protecting the hydrologic balance on the site. Drawing CM-10361-WB shows the berms proposed to be constructed.

Water within the waste dump site will be limited to rainfall. All rainfall within the dump and inslope of surrounding embankments will be retained until it evaporates or seeps into the subsurface. This could be as much as the 10 yr./24 hr. event of 1.8 inches.

817.71 (c) - Stockpiling of Excavated Material - The site proposed for waste disposal is covered with a very thin layer of topsoil. The proposed site was utilized for employee parking during construction of the Wilberg Mine facilities. The Wilberg facility was completed in late 1978. Some vegetation removed has since regenerated. Because the topsoil layer is so thin, segregation of topsoil and other soils is not practicable during excavation of the proposed waste structure. One foot of soil will be excavated and stored in the embankments bounding the excavation and serves two purposes: (1) Berms will contain mine development waste rock and waste water run-off during the operational life of the Des-Bee-Dove/Wilberg Mines, and (2) Berms are in effect soil storage piles.

817.71 (a) (2) - The soil storage berms will be constructed with inslopes and outslopes of one vertical to two horizontal. To hold the excavated material anticipated, the berms will be 5.5 feet high with a 22 foot base. The typical length of the berm surrounding each excavation is 400 feet. Typical berm calculations are included.

The berm stockpiles will be stabilized in tact until disposal is complete. The berms will be stabilized by compaction and temporary revegetation. Once waste rock is disposed as planned, the excavated soil stored in the berms will be used as cover for the deposited waste rock.

Background Information

817.71 (a) (1) - Composition of Fill Material - The underground development waste rock from Des-Bee-Dove Mine has been analyzed and shows the material to be non-toxic and non-acid forming. The results of the analyses are contained in Table 2.

The anticipated waste from Wilberg Mine will be generated from construction of a rock slope and excess rock developed during mining. The expected rock types encountered in the rock slope construction will be approximately 70% sandstone, 20% interbedded mudstone and siltstone, and 10% bony coal. Analyses of these materials taken from drill cores are contained in Table 3. This analysis indicates the materials to be non-toxic and non-acid forming.

The chemical and physical characteristics of the strata present in the lower Blackhawk Formation which includes rocks immediately above and below the Blind Canyon Seam has been identified by the analyses of over 130 samples (see the original Deer Creek Mine permit application under Overburden - Chemical Composition). These analyses have identified that the floor of the Blind Canyon Seam has a potentially high sodium absorption ratio and the Blind Canyon Seam roof is potentially high in pyrite/marcasite. No other abnormally high readings were identified.

A review of the data concerning the sodium absorption ratio of the Blind Canyon floor reveals that three out of four samples which

Table 2

Lithology	Number of Samples: Chemical Tests	Number of Samples: Physical Tests	Chemical Tests: Ca Meq/L	Mg Meq/L	Na Meq/L	SAR[1]	Fe ppm	Zn ppm	SO_4-S ppm	Mo ppm	B ppm	pH (Paste)	E.C.[2] mmhos/cm	Sat. %	Physical Tests: Pyrite FeS_2	Sand %	Silt %	Clay %	Text
lind Canyon oof	3	Mean	4.10	1.20	0.87	0.50	5,825	64.42	205.27	<0.1	0.33	7.7	0.83	32.27	8.15	--	--	--	--
		S.D.	1.30	0.56	0.21	0.17	2,528	56.32	61.31	0.00	0.20	0.25	0.25	5.17	10.82	--	--	--	--
lind Canyon plits	1	Mean	0.8	0.1	9.2	14.3	5,905	40.69	145.0	<0.1	0.94	8.9	1.1	20.9	0.2	--	--	--	--
		S.D.														--	--	--	--
lind Canyon loor	5	Mean	3.90	1.86	18.54	17.36	10,342	55.38	593.58	<0.1	0.55	8.34	2.22	26.46	1.50	--	--	--	--
		S.D.	4.02	1.72	25.43	25.14	4,263	43.90	454.96	0.00	0.60	0.64	2.11	6.57	1.41	--	--	--	--
Hiawatha Roof	3	Mean	4.57	4.30	3.43	1.83	10,925	184.93	198.07	<0.1	0.11	7.80	1.07	32.17	3.3	--	--	--	--
		S.D.	2.54	3.20	3.96	2.14	7,110	203.10	153.48	0.00	0.10	0.17	0.31	7.18	0.00	--	--	--	--
Hiawatha Split	1	Mean	4.9	2.3	1.3	0.7	7,841	69.88	246.1	<0.1	0.26	7.70	0.8	37.5	NA*	--	--	--	--
		S.D.														--	--	--	--
Hiawatha Floor	3	Mean	10.23	16.23	1.27	0.47	3,873	16.32	777.23	<0.1	0.04	5.87	3.03	29.07	NA*	--	--	--	--
		S.D.	1.50	12.53	0.70	0.21	1,594	14.08	313.16	0.00	0.05	2.24	0.90	4.48		--	--	--	--

*NA = Not Available

Table ___
WILBERG DRILL CORE - SOIL ANALYSES
SEPTEMBER, 1979

Sample #	pH (paste)	E.C. mmhos/cm	Sat. %	Ca meq/l	Mg meq/l	Na meq/l	SAR	Fe ppm	Zn ppm	SO_4-S ppm	Mo ppm	B ppm	Pyrite (FeS_2)	Sand %	Silt %	Clay %	Texture
EM-23C-14	8.2	0.9	21.5	2.3	3.5	1.4	0.9	24223	23.11	20.2	.1	.01		86	5	9	LS
EM-23C-15	8.1	0.6	23.1	1.9	1.6	1.5	1.1	15092	53.77	98.7	.1	0.06					
EM-23C-16	8.0	0.9	19.8	1.7	3.4	1.8	1.1	23064	34.37	148.1	.1	.01					
EM-23C-17	8.1	0.7	19.1	1.7	2.5	1.3	0.9	15423	23.47	67.7	.1	.01					
EM-23C-18	7.7	3.1	19.8	8.4	23.6	2.9	0.7	21730	74.49	1029.6	.1	0.02					
EM-23C-19	7.9	2.5	19.8	7.0	17.9	2.2	0.6	18272	9.17	863.5	.1	.01					
EM-23C-20	8.0	1.6	20.1	3.7	8.9	1.9	0.8	18463	17.49	548.6	.1	.01					
EM-23C-21	7.8	4.1	21.6	11.9	20.8	1.9	0.9	14607	22.38	1089.1	.1	.01					
EM-23C-22	8.0	3.1	25.6	11.8	17.5	2.4	0.6	3122	7.29	1089.1	.1	0.02					
EM-23C-23	8.1	1.6	20.7	4.2	8.2	2.2	0.9	6942	14.23	566.4	.1	0.06					
EM-23C-24	8.1	3.1	22.0	9.8	17.7	3.2	0.9	6527	8.08	999.8	.1	.01					
EM-23C-25	8.3	1.0	20.5	2.0	2.7	1.7	1.1	6085	23.47	204.5	.1	0.06					
EM-23C-26	8.3	0.6	19.9	1.4	0.7	1.3	1.3	572	23.84	79.7	.1	0.10					
EM-23C-27	8.1	1.4	20.3	3.8	6.7	1.5	0.7	10635	55.65	435.8	.1	0.48					
EM-23C-28	7.2	4.1	27.7	13.2	25.5	4.3	1.0	9788	62.40	1207.7	.1	0.55	0.9				
EM-23C-29	8.1	0.8	18.2	1.7	3.4	2.3	1.5	28237	17.16	139.2	.1	0.15					
EM-23C-30	8.3	1.0	16.2	1.2	5.8	2.6	1.4	23064	11.18	198.2	.1	.01					
EM-23C-31	8.1	0.5	33.9	1.4	0.9	1.9	1.8	18272	113.10	38.4	.1	0.40	4.2				
EM-23C-32	8.0	0.7	19.2	1.7	2.7	2.7	1.8	12219	20.95	20.2	.1	0.10					
EM-23C-33	8.3	1.2	18.6	1.4	5.0	3.5	1.9	6195	7.29	97.4	.1	0.06					
EM-23C-34	8.2	0.4	43.1	1.6	8.9	1.9	1.7	2275	13.08	39.8	.1	0.13					
EM-23C-35	8.3	0.5	26.0	1.3	1.0	3.0	2.9	7761	49.14	8.6	.1	0.36					
EM-23C-36	7.8	2.5	21.7	7.4	10.5	6.6	2.2	9788	29.55	798.2	.1	0.36					
EM-23C-37	8.2	1.2	23.8	2.4	8.0	3.4	1.5	11144	7.04	382.6	.1	.01					
AVERAGE	8.05	1.58	22.59	4.37	8.64	2.48	1.26	13062	30.07	423.7	.1	0.13					

FRL #79125

were taken of that zone, have values less than 5.0 (4.8, 1.5 and 1.3). One sample has a value of 60.4 which raised the sample mean to 17.36 and created a high standard deviation of 25.14. This indicates that in general the Blind Canyon floor rock will not pose a problem from its sodium absorption ratio but from time to time high concentrations will be encountered. These concentrations will be diluted by other rocks with low SAR values. Also the waste rock disposal fill is designed to bury leachable and acid forming substances.

Three samples of the Blind Canyon Seam roof and floor were tested for their pyrite/marcasite content. Two of these core samples are from drill hole B-124 and the other from EM-12C have a pyrite/marcasite content of 0.2% and 0.5% respectively. The third sample from drill hole EM-23C has a pyrite/marcasite value of 15.8%. This core contained vertical fractures which had secondary deposits of FeS_2. This sample is not representative of the Blind Canyon Seam roof pyrite/marcasite content as a whole but does show that localized high concentrations of iron-sulfides do occur. This periodic high content of pyrite should not pose a problem in reclamation of the waste rock disposal site.

Delivered waste rock, whose coal/rock ratio exceeds 25/75%, shall be placed with other rock to limit the coal concentration and will be buried with a minimum of two feet of non-coal fill. The coal/rock ratio shall not exceed 50/50%.

Sediment from periodic sedimentation pond cleaning at Wilberg and Des-Bee-Dove Mines will be deposited after a chemical and physical analyses of the material has been approved by the BLM and DOGM.

The analysis of the waste rock from Des-Bee-Dove and Wilberg Mines shows clearly that leachate and/or surface runoff from the fill should not degrade surface or ground waters. As a matter of fact, the alkaline nature of the soils in this region could benefit from introduction of acids, neutralizing the soil and making it more viable for support of vegetation.

784.19 (b) (1) - Geotechnical Investigation - The character of bedrock at the proposed waste rock disposal was obtained from outcrop exposures in Grimes Wash nearby. The bedrock is part of the Masuk Shale member of the Mancos Shale Formation. The composition consists of light to medium blue-gray sandy shale. It usually weathers readily forming debris covered slopes. This member of the formation is devoid of water.

784.19 (b) (2) - A survey of the proposed disposal area has shown the hydrology to be limited to surface runoff from snow melt and rainfall. As discussed in the description, the nearest possible aquifer, the Ferron Sandstone, is devoid of water at this location.

784.19 (b) (3) - No minable coal seams exist beneath the proposed disposal site. The nearest mining operations (past, present or future) are located more than a mile away. Subsidence will have no effect on the disposal site.

784.19 (b) (5) - An investigation of the site by a registered professional engineer was conducted to determine the stability of the site. The site slopes gradually (max. 7%) to the southeast. The site is stable. The minimal amount of surface relief change due to the proposed disposal of waste will not affect that stability. A statement of site investigation findings is attached.

Design of the facility is based upon efforts to minimize surface alteration and control surface runoff while maintaining the most stable possible disposal method feasible. The shallow excavation proposed minimizes the amount of surface relief alteration in a single-lift disposal pattern. The excavated material berms provide a means of controlling runoff in the disposal structure and covering the waste once the disposal is complete. The need to construct separate runoff controls is eliminated. Also, by design, hauling large amounts of topsoil and cover material is unnecessary.

The low profile nature of the proposed fill ensures its stability. By clearing the surface and placing the fill in a single four-foot lift, slope stability is assured.

817.71 (i) - Inspections - As required by the Division, inspections will be conducted at least quarterly throughout the construction period and will include monitoring to detect any increase in thermal activity. Inspections will also be conducted during the following critical construction periods in accordance with the proposed disposal plan: (1) removal of all organic material and soil, (2) final placement and leveling of fill materials, and (3) revegetation. Reports will be submitted to the Division within two weeks of inspection and a copy will be retained at Wilberg Mine.

Temporary Revegetation - Temporary vegetation to stabilize berm slopes and completed containment cells will utilize the permanent grass, forb and shrub species as specified in the permanent revegetation section with the exception of the containerized shrubs. The shrubs will be planted in seed form and will be augmented with containerized shrubs and additional grass and forb seedings during final reclamation as needed to establish the 90% ground cover of the reference area with an 80% confidence level.

Vegetation will be monitored yearly for dominance of various species to adjust the seed mix for final revegetation. This inspection will also determine if rills and gullies are forming. If so, measures will be taken to eliminate them as soon as possible.

Final Reclamation Costs - Reclamation consists of two major steps, (1) topsoil handling, and (2) revegetation.

Soil grading for the most part is accomplished during the construction of the individual earthen cells. For purposes of determining bonding amounts, applicant allows approximately fifty percent of soils disturbed to be regraded; i.e., on completion of mining and the use of this waste rock site the only topsoil grading necessary will be the exterior berms which will be pulled over the earthen cells.

FINAL RECLAMATION
ESTIMATE OF COST
BACKFILLING AND GRADING

Equipment

1. D-7 Crawler Tractor ------------------------------ $5,500/Month

2. 15 Cubic Yard Motor Scraper ---------------------- $6,053/Month

3. Farm Tractor & Implements ------------------------ $ 500/Month

Manpower

Manpower @ $100 per day ------------------------ $ 100/Day

Description	Equipment/ Manpower	Quantity	Unit Cost	Total Cost	Days
Exterior Berms of 16 Acre Site Near Wilberg	D-7 Crawler Tractor	8,900 cu. yds.	$825/Day	$4,125	5 Days
	Motor Grader (15 Yard)				
			TOTAL	$4,125	5 Days

FINAL RECLAMATION
ESTIMATE OF COST
REVEGETATION

Description	Equipment/ Manpower	Quantities	Unit Cost	Total Cost	Crew Days
Soil Testing	1-Man	16 Acres		$ 200	2 Days
Neutralization Fertilization	Tractor 2-Man Crew	16 Acres	$ 50/Ac	800	3 Days
Surface Preparation	Tractor Scarifier Disc 2-Man Crew	16 Acres		300	2 Days
Mulching	Tractor 2-Man Crew	16 Acres	$250/Day	750	3 Days
Seeding and Planting	Tractor 5-Man Crew	16 Acres	$550/Day	2,750	5 Days
Revegetation Monitoring	1-Man	16 Acres	$100/Day	200	2 Days
Weed and Pest Control	2-Man Crew	16 Acres	$200/Day	400	2 Days
				$5,400	19 Days

FINAL RECLAMATION
ESTIMATE OF COST
MATERIALS (1983 PRICES)

27,200 Ea. Containerized Plants @ $.70 -------------------------	$19,040
800 lbs. Ammonium Nitrate @ $15/100 lbs. -------------------------	120
800 lbs. Triple Superphosphate @ $20/100 lbs. ------------------	160
Seed (Grasses and Forbs) @ $182+75/Ac x 16 --------------------	4,112
Mulch 2 Ton/Acre @ $100/Ton x 16 ------------------------------	3,200
	$26,632

817.71 (d) - Vegetation Information

A pinyon-juniper vegetation type was identified within the permit area and adjacent areas and mapped. Field reconnaissance was utilized to construct the vegetation map. The vegetation of the area adjacent to the proposed storage site was used to infer what species composition and plant cover were before the disturbance occurred.

The reference area was located as close to the disturbed site as feasible. Differences in species composition, plant cover, slope, aspect, soil and geology were minimized. The reference area was marked in the field with metal T-posts and located on the vegetation map.

Vegetal analysis of the reference area consisted of developing a list of plant species by life form, measuring ground cover of plants less than one-meter tall, and determining woody plant density.

Cover of plants less than one-meter tall was measured with a one-half square meter (0.5x1.0 m) quadrat. Plant cover was measured for each species occurring within the quadrat. In addition, total plant cover, rock, litter and bare ground were measured. The location of each sampling point was randomly determined.

The point-center quadrat method was used to measure woody plant density. At each sampling point two perpendicular lines were inscribed to delineate four quarters centered over the sampling point. The distance from the nearest woody plant in each quarter to the sampling point was measured in meters and then the shrub or tree was identified. Woody plant density was determined by the following equations:

$$A_j = (Y_1 = Y_2 + Y_3 + Y_4/4)^2 \quad (1)$$

$$D = U/(\Sigma A_j/N) \quad (2)$$

where: Y_i = distance in meters from point to nearest woody plant in the ith quarter,

A_j = mean area per plant at the jTh point

N = sample size (49 observations points),

D = density, the number of woody plants per unit area (plants/acre),

U = unit area (4,047 M^2 = 1 acre)

Five sampling points were placed 15 paces apart along transects. The starting point and direction of each transect was randomly located.

Statistical adequacy for sample size for aerial plant cover and woody plant density was determined by the following formula:

$$N_{min} = t^2 s^2 / (d\bar{x})^2 \qquad (3)$$

where: N_{min} = minimum sample size,

t = t-value for a 2-tailed test,

s = standard deviation,

d = allowable change in sample mean,

$\bar{x}$ = sample mean.

Sample size for plant cover and woody plant density size was tested at the 80 percent confidence level ($t_{0.10,\infty}$=1.282) with 10 percent error of the mean (d=0.10). Adequacy for plant cover and plant density was calculated after 20 samples. Sample size for density was determined using mean area per plant. Table 1 gives the minimum sample size and observed sample size for the reference area. Data presented hereafter will be based on the observed sample number.

Woody plant composition based on density was determined as follows:

$$C = S_i / T \qquad (4)$$

$$T = \Sigma S_i \qquad (4a)$$

where: S_i = total individuals of the ith species,

T = total number of shrubs sampled,

C = shrub composition.

Jaccard's Community Coefficient was used to quantify the similarity in plant species between the reference and disturbed area. The equation is:

$$I.S. = (C/A+B-C)100\% \quad (5)$$

where:

I.S. = similarity index,

A = total species in community A,

B = total species in community B,

C = number of species common to both.

Data for plant cover and woody plant density were collected June 16, 1982 and analyzed June 23-25, 1982.

Bureau of Land Management and Utah Division of Wildlife Resources personnel, located in Price, Utah, were consulted on June 18, 1982 with regard to livestock and big game vegetal use within the permit area. Soil Conservation personnel, located in Price, were consulted with regard to soil classification, range site, and plant productivity of the reference area.

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Permit Area Vegetation

The permit for the Waste Rock Storage Site is 48.6 acres (Fig. 1, Vegetation Map). A pinyon-juniper vegetation was identified within the permit area. Common plants are pinyon-pine, Utah juniper, curlleaf mountain mahogany, and cutler ephedra. Grasses are rare within the permit area.

Disturbed Area

The disturbed area of the Waste Rock Storage Site is about 7.5 acres (Table 2). Elevation varies around 6,780 ft. The area has a six percent slope with a southern exposure. The previously disturbed vegetation was pinyon-juniper (Table 3). Pinyon-pine, Utah juniper, cutler ephedra, and curlleaf mountain mahogany were the important woody plants. Herbaceous plants included several mustards, sky rocket gilea, pensteman, wolly groundsel, Indian ricegrass and bottlebrush squirreltail. Total aerial plant cover varied around 35 to 40 percent. Soils probably belonged to the Kenilworth series of the loamy-skeletal, mixed, mesic, Xerollic Calciorthid. The range site was an Upland Stony Loam (Pinyon-Juniper).

Reference Area

A reference area was established to represent the disturbed pinyon-juniper vegetation type (Table 4). Differences between soils, geology, vegetation, etc. were minimized between the two sites.

The reference area (4800 m^2) has a southern exposure with an elevation of 6,810 ft. Slope varies around six percent. Common plants include pinyon pine, Utah juniper, cutler ephedra, curlleaf mountain mahogany and assorted forbs (Table 5). There is a paucity of grasses within the reference area. Total aerial plant cover is 35 percent. Total cover of plants less than one-meter tall is 3.3 percent (Table 6). Woody plant density is 1,495 plants per acre (Table 7). Pinyon-juniper has the greatest density while black sagebrush has the least. The soil belongs to the Kenilworth series of loamy-skeletal, mixed, mesic Xerollic Calciorthid. The range site is Upland Stony Loam (Pinyon-Juniper) in fair condition and producing 700 pounds of herbage per acre (see Soil Conservation letter in Appendix).

Livestock and Wildlife

The permit area is located within the West Grimes Grazing Allotment managed by the Bureau of Land Management. A range survey prior to 1966 indicated that Sections 34 and 35 had a carrying capacity of 9.7 and 18.2 animal unit months, respectively. Cattle grazing occurred from April 1 to June 10. However, for the past several years, there has not been any significant grazing due to the lack of water (see Bureau of Land Management letter in Appendix).

The area of the Waste Rock Storage Site is considered high-priority winter range for mule deer by the Division of Wildlife Resources (see Division of Wildlife Resources letter in Appendix).

Endangered or Threatened Plants

During the vegetal sampling, no endangered or threatened plant species were identified.

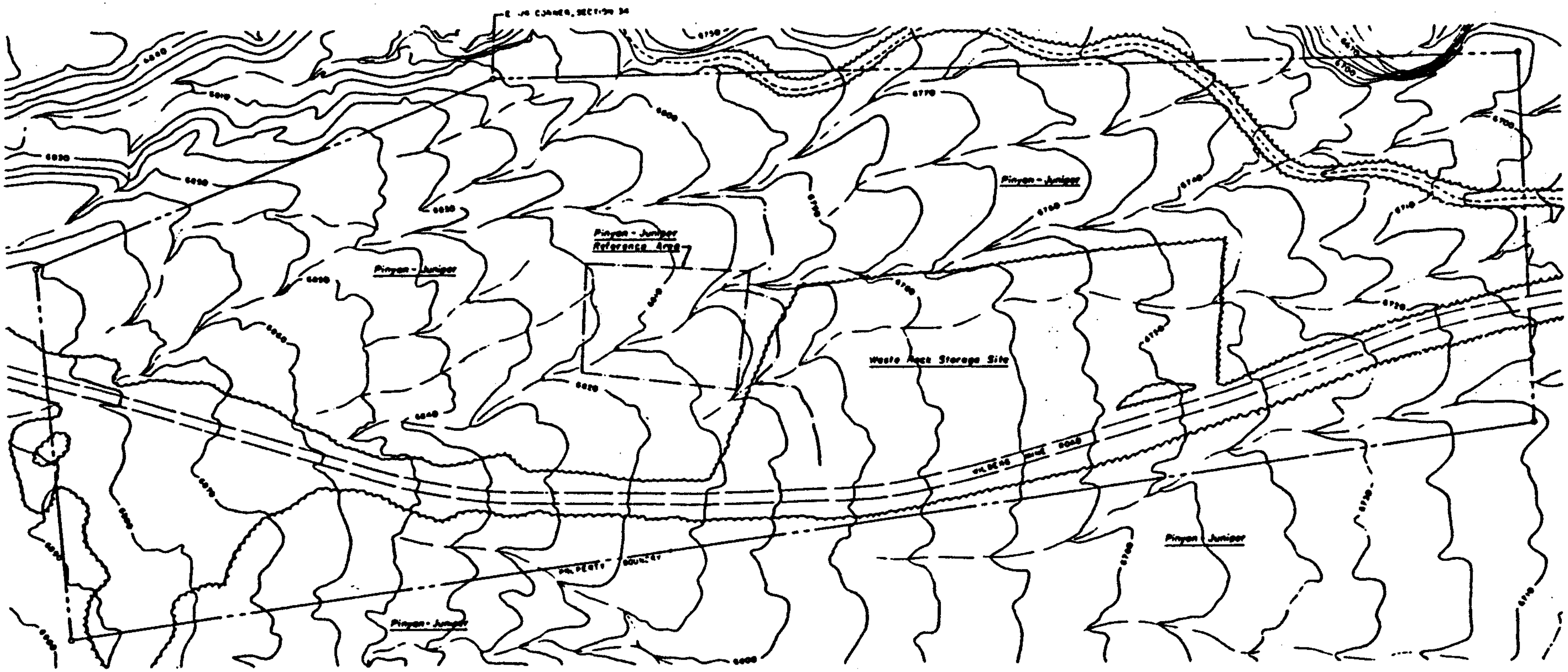


Fig. 1. Vegetation map for the Waste Rock Storage Site permit area (wavy line indicates existing vegetation).

BIO-RESOURCES, INC.

VEGETATION MAP

Utah Power & Light Company

D 820-1001

Table 1. Sample adequacy for total percent plant cover and mean distance (M) between woody plants for the pinyon-juniper reference area at Waste Rock Storage Site, Wilberg Coal Mine[1].

Reference Site	Parameter	N_{min}	$\bar{X}$	S.D.	$N_{obs.}$
Pinyon-juniper	Plant cover	142	3.3	3.07	49
	Mean Distance	17	2.7	0.87	25

Table 2. Vegetation type, acres disturbed, and percent of vegetation type at the Waste Rock Storage Site, Wilberg Coal Mine.

Vegetation Type	Area Disturbed	% of Vegetation Type
Pinyon-juniper	7.5	15.4

[1]The mean distance (M) squared equals the mean area (M^2) a single plant occupies. The inverse of the mean area equals the number of woody plants per square meter (density). Equation 2 is then used to convert to the number of plants per acre.

Table 3. Common plant species that were inferred to have grown within the disturbed portion of the pinyon-juniper vegetation type at the Waste Rock Storage Site, Wilberg Coal Mine.

Scientific Name	Common Name
Trees	
Juniperus osteosperma	Utah juniper
Pinus edulis	Pinyon pine
Shrubs	
Artemisia nova	Black sagebrush
Cercocarpus ledifolius	Curlleaf mountain mahogany
Eriogonum microthecum	Slenderbush eriogonum
Ephedra cutleri	Cutler ephedra
Opuntia polyacantha	Plains pricklypear
Xanthocephalum sarothrae	Broome snakeweed
Yucca harrimaniae	Harriman yucca
Forbs	
Bahia dissecta	Ragleaf bahia
Cryptantha flava	Yellow cryptantha
C. flavoculata	Roughseed cryptantha
Descurainia pinnata	Pinnate tansymustard
Erigeron sp.	Fleabane
Euphobia fendleri	Fendler euphobia
Ipomopsis aggregata	Sky rocket gilia
Lepidium montanum	Mountain pepperweed
Penstemon osterhoutii	Osterhout penstemon
Physaria australis	Twinpod
Senecio multilobatus	Lobeleaf groundsel
Streptanthus cordatus	Twistflower
Townsendia incana	Hoary townsendia
Grasses	
Oryzopsis hymenoides	Indian ricegrass
Sitanion hystrix	Bottlebrush squirreltail

Table 4. Similarity between the pinyon-juniper reference area and the disturbed site at the Waste Rock Storage Site, Wilberg Coal Mine.

Parameter	Reference	Disturbed
Cover, %[1]	3.3	3.0-5.0
Woody plant density, No/acre	1,495	-
Species composition, s[2]	26	24
Aspect	Southern	Southern
Slope, %	6	6
Elevation, ft.	6,810	6,780
Soil	Xerollic Calciorthid	Xerollic Calciorthid
Geology	Alluvium	Alluvium
Index of Similarity, %	78.6	

[1]Ground cover of plants less than one-meter tall.
[2]s=total plant species.

Table 5. Common plant species occurring within the pinyon-juniper reference area of the Waste Rock Storage Site, Wilberg Coal Mine.

Scientific Name	Common Name
Trees	
Juniperus osteosperma	Utah juniper
Pinus edulis	Pinyon pine
Shrubs	
Artemisia nova	Black sagebrush
Cercocarpus ledifolius	Curlleaf mountain mahogany
Eriogonum microthecum	Slenderbush eriogonum
Ephedra cutleri	Cutler ephedra
Opuntia polyacantha	Plains pricklypear
Xanthocephalum sarothrae	Broome snakeweed
Yucca harrimaniae	Harriman yucca
Forbs	
Arabis selbyi	Rockcress
Bahia dissecta	Ragleaf bahia
Cryptantha flava	Yellow cryptantha
C. flavoculta	Roughseed cryptantha
Descurainia pinnata	Pinnate tansymustard
Erigeron sp.	Fleabane
Eriogonum sp.	Buckwheat
Euphobia fendleri	Fendler euphorbia
Ipomopsis aggregata	Skyrocket gilia
Lepidium latifolium	Pepperweed
L. montanum	Mountain pepperweed
Penstemon osterhoutii	Osterhout penstemon
Physaria australis	Twinpod
Senecio multilobatus	Loableaf groundsel
Streptanthus cordatus	Twistflower
Thelesperma subnudum	Navajo-tea greenthread
Townsendia incana	Hoary townsendia
Grasses	
No grasses were found within the reference area.	

Table 6. Ground cover for the pinyon-juniper reference area at the Waste Rock Storage Site, Wilberg Coal Mine.

Parameter	Percent Cover	
Total plant cover[1]	3.3	
Woody plant		1.6
Forb		1.7
Litter	18.0	
Rock	9.2	
Bare ground	69.5	
	100	

[1]Ground cover of plants less than one-meter tall.

Table 7. Woody plant density and composition for the pinyon-juniper reference area for the Waste Rock Storage Area, Wilberg Coal Mine.

Species	Composition, %	Density, No/acre
Pinyon pine	46	687
Cutler ephedra	24	359
Utah juniper	16	239
Curlleaf mountain mahogany	8	120
Harriman yucca	5	75
Black sagebrush	1	15
	100	1495

Appendix

Letters from Governmental Agencies

United States Department of Agriculture

Soil Conservation Service

August 2, 1982

Mr. Jerry Barker
C/O Bio Resources
P. O. Box 3447
Logan, Utah 84321

Dear Mr. Barker:

You have requested site, condition and production on 48.62 acres in Sections 34 and 35 of T 17S and R 7E North and West of Orangeville, Utah. The site is an Upland Stony Loam (Pinyon Juniper) D-34. The ecological condition is fair and the site is producing about 700 pounds of herbage per acre.

George S. Cook

George S. Cook
Range Conservationist

United States Department of the Interior

IN REPLY REFER TO
4190/3400
(U-067)

BUREAU OF LAND MANAGEMENT
Moab District
San Rafael Resource Area
P. O. Drawer AB
Price, Utah 84501

June 24, 1982

Mr. Jerry Barker
c/o Bio Resources
P. O. Box 3447
Logan, Utah 84321

Dear Mr. Barker:

You have requested information concerning Sections 34 and 35 of T. 17 S., R. 7 E.

The two sections are made up of three range sites:

1. Waste - Comprised mainly of cliff and rock outcrop areas.

2. Pinyon-Juniper - Made up of varying amounts of pinyon-juniper, saltbush, bitterbrush, Morman tea, blacksage, mahogany and several grass species. Plant density is between 5-18% and plant vigor is considered weak for most forage species.

3. Desert saltbush - Made up of shadscale, mat saltbush, castle valley clover, Morman tea, blacksage, and seven grass species including curlygrass, sandsage, Indian ricegrass, bull grass, and blue gramma. Plant density is between 0 and 20%.

Range condition could be estimated between fair and good. Vegetative production is low due to range site characteristics. Presently we have no current production or condition figures. There has not been any significant livestock use in the area for the last few years, due to the lack of water.

Our range survey, which was prior to 1966 indicates that Section 34 comprises 640 acres and has a carrying capacity of 9.7 AUM's. Section 35 comprises 640 acres and has a carrying capacity of 18.2 AUM's.

We hope this is the information you need.

Sincerely yours,

Neil A. Simmons

Acting Area Manager

state of utah

DIVISION OF WILDLIFE RESOURCES

DOUGLAS F. DAY
Director
EQUAL OPPORTUNITY EMPLOYER
1596 West North Temple/Salt Lake City, Utah 84116/801-533-9333

July 19, 1982

Reply To SOUTHEASTERN REGIONAL OFFICE
455 West Railroad Avenue, Box 840, Price, Utah 84501
(801) 637-3310

Mr. Jerry Barker
Bio-Resources, Inc.
P.O. Box 3447
Logan, Utah 84321

RE: UP & L Wilberg Mine--Waste Rock Disposal Area

Dear Jerry:

In response to your request for wildlife information concerning the waste rock disposal area for Utah Power and Light Company near the Wilberg Mine, the site represents high-priority valued winter range for mule deer. The assessment of wildlife and recommended mitigation planning provided by the Division to Chris Shingleton (UPandL) on March 2, 1981 should be considered satisfactory for this site. It is anticipated that UPandL will develop an acceptable mitigation plan for their activities as they relate to the rock disposal area.

If the Division can be of further service, please coordinate with Larry Dalton (telephone 637-3310) as appropriate.

Sincerely,

John Livesay, Supervisor
Southeastern Region

JL:LBD:gp

cc: Darrell Nish
Chris Shingleton
Utah Division of Oil, Gas and Mining

Revegetation

Environment Conditions

The surrounding vegetation is a pinyon-juniper community. Important perennial understory species include curlleaf mountain mahogany, Cutler ephedra, black sagebrush, Harriman yucca, Indian ricegrass and bottlebrush squirreltail. Grasses are rare within this pinyon-juniper community.

The soil is a loamy-skeletal, mixed, mesic Xeralic Calciothid and belongs to the Kenilworth series. These soils have a pH of around 7.7 and an exchangeable sodium of 4 percent. Erosion potential is moderate.

The range site is a Semi-Desert Stony Loam (Pinyon-Juniper). Slopes vary from 3 to 5 percent. Annual precipitation is 8 to 10 inches with the majority being received during late summer. The frost-free season is 110 to 130 days. Elevation varies around 6800 ft. Present use of the area is rangeland. The post-mining use will also be rangeland.

A native plant mixture has been selected that is adapted to the site (Table 1). These species are perennial, drought resistant and fairly salinity resistant.

A fall planting will occur after September 1 when soil water and weather conditions are favorable. A grass and forb mixture will be direct seeded at a rate of 12 pounds of pure live seed per acre (Table 2). Container-grown shrubs will be transplanted immediately after seeding occurs at a density of 1700 seedlings per acre (Table 3).

Forbs and grasses will be direct seeded using a rangeland drill. Two passes over the area will be necessary to accomplish the seeding. On the first pass, only Indian ricegrass will be planted at a depth of one to two inches. The other grass and forb seed will be planted as a mixture on the second pass at a depth of about one-half inch.

Immediately after seeding straw will be used to mulch the area at a rate of two tons per acre. The straw will then be crimped into the soil.

The container-grown shrub seedlings will be transplanted after mulching. Standard transplanting procedures will be followed. Care will be taken to minimize root damage to the seedlings. If possible, seedlings will be irrigated immediately after transplanting. At the time of transplanting a slow release fertilizer such as Agriform Planting Tablets will be placed with each seedling.

Proper management is important following the revegetation process. Livestock and wildlife grazing will be prevented for at least two years. Also, all vehicle and foot traffic will be restricted from the area. Fencing the revegetated area will prevent livestock grazing and keep unwanted traffic away. If rodent, rabbit and deer damage is anticipated, Vexar plastic netting can be placed around individual shrub seedlings to minimize animal depredation.

Sources of seeds, container-grown shrubs:

Kroh Nurseries, Inc.
P.O. Box 536
Loveland, CO 80537
(303) 667-5466

Mountain West Environments, Inc.
P.O. Box 2107
Steamboat Springs, CO 80477
(303) 879-2313

Native Plants, Inc.
360 Wakara Way
Salt Lake City, UT 84108
(801) 582-0144

Wm. Roger Stewart & Sons
Box 724
Ephraim, UT 84627
(801) 283-4423

Source for the Vexar plastic netting and Agriform Planting Tablets:

International Reforestation Supplier
P.O. Box 5547
Eugene, OR 97405
(503) 345-0597

Table 1. Recommended native plant species for revegetating the Waste Rock Storage Site.

	Scientific Name	Common Name
Grasses	*Agropyron riparium*	Streambank wheatgrass
	A. smithii	Western wheatgrass
	Elymus cinereus	Great Basin wildrye
	Oryzopsis hymenoides	Indian ricegrass
	Stipa comata	Needle-and-Thread grass
Forbs	*Aster chilensis*	Pacific aster
	Hedysarum boreala[a]	Northern sweetvetch
	Penstemon palmeri	Palmer pensteman
	Sphaeralcea coccinea	Scarlet globemallow
Shrubs	*Artemisia nova*	Black sagebrush
	Atriplex canescens	Fourwing saltbush
	Cerocarpus ledifolius	Curlleaf mountain mahogany
	Ephedra cutleri	Cutler ephedra

[a]native legume

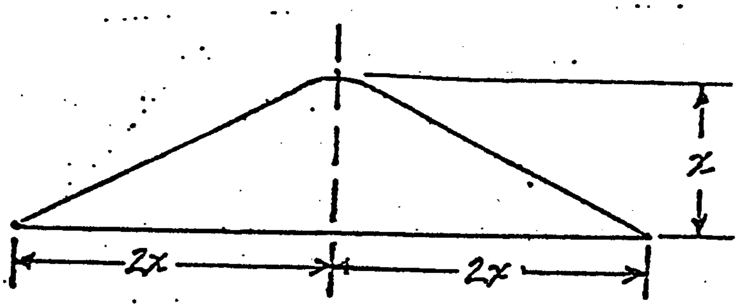
Table 2. Planting rate (pounds of pure live seed per acre) of grass and forb seeds.

	Species	Planting Rate
Grasses	Western wheatgrass	2.0
	Indian ricegrass	2.0
	Needle-and-thread grass	2.0
	Galleta	2.0
	Crested wheatgrass	1.0
		9.0
Forbs	Scarlet globemallow	1.0
	Yellow sweet clover	1.0
		2.0

Table 3. Planting rate of shrubs (pounds of pure live seed per acre).

Species	Planting Rate
Fourwing Saltbush	2.0
Curlleaf Mountain Mahogany	2.0
Ephedra Mormon Tea	4.0
Vasey Big Sagebrush	0.2
	8.2

Waste Dump Berm Design

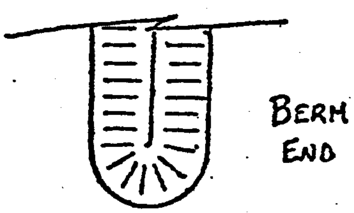


Excavate 200' x 300' x 1'

Volume Material = 60,000 Ft.^{3}

Assume: Negligible Swell

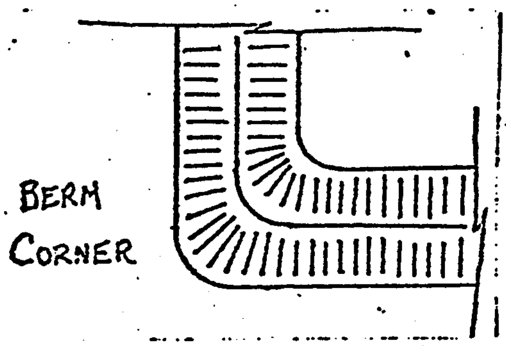
Berm Length = 160' + 375' + 375' + Ends + Corners



Volume Ends = 7 cone

$= 1/3\,\pi r^2 h$; $h = x$ $v = 2x$

$= 4/3\,\pi x^3$



Equivalent Length

$2x^2 L = 4/3\,\pi x^3$

$L = 2/3\,\pi x$; Assume x = 6

L = 12.6'

Equ. Length Corners = 2x + 2x + 2x + 2x

= 8x

= 42'

Total Berm Length = 970.6 use 970'

Volume of 2h : 1v berm per foot of length = $2x^2$

Waste Dump Volume Calculation

Anticipated Rock Tonnage = 11,000 Tons

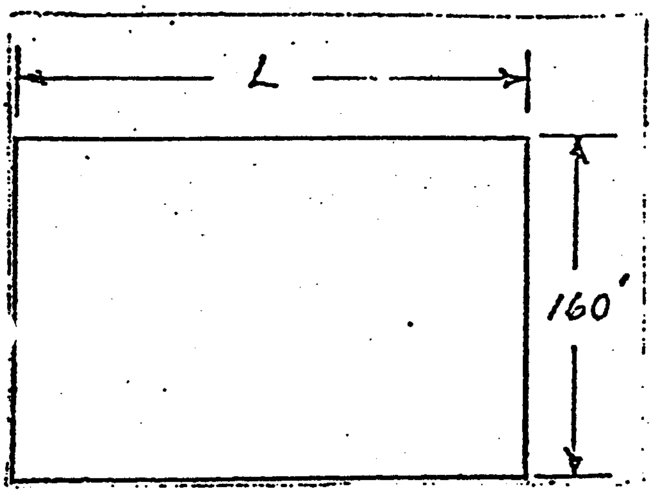
Assumed Loose Density = 2,500 lbs./cu. yd.

$= 1.25 \text{ tons/yd.}^3$

Volume Required $= \dfrac{11{,}000 \text{ Tons}}{1.25 \text{ Tons/yd.}^3}$

$= 8{,}800 \text{ yd.}^3$

$= 237{,}600 \text{ Ft.}^3$



- Length for 160' Wide Dump
- Placement in single 4' lift

$$L = \frac{237{,}600 \text{ ft.}^3}{4 \text{ ft.}} \div 160 \text{ ft.}$$

$= 371'$ use $375'$

Therefore, Proposed Storage Area = 160' x 375'

Waste Dump Berm Design (Continued)

Find Berm Height (x):

Volume Req. Per Foot of Berm $= \dfrac{60{,}000 \text{ Ft.}^3}{970 \text{ Ft.}}$

$= 62 \text{ Ft.}^3$

Therefore: $2x^2 = 62 \text{ Ft.}^2$

$x^2 = \dfrac{62 \text{ Ft.}^2}{2}$

$= 31 \text{ Ft.}^2$

$x = 5.6'$

(Assumption of x = 6' close enough)

Use 5.5' Berm Height

22' Base Width

WILBERG WASTE ROCK DUMP SITE

SOIL DESCRIPTION

JOSEPH M. JARVIS

WILBERG WASTE ROCK DUMP SITE

SITE: Portions of E½SE¼ S. 34 and W½ SW¼ S. 35 T. 17 S. R. 17 E. SLBM. 48.62 acres

PARENT MATERIAL: Alluvial outwash of Cretaceous sandstone and siltstone beds.

ASPECT: Southeast

SLOPE: 3%

ANNUAL PRECIPITATION: 12 inches

VEGETATION: Pinyon-Juniper Woodland

An open stunted type with a sparse shrub understory of Ephedra nevadensis, Cercocarpus montanus and Cowania mexicana.

LAND USE: Curently the site has a coal hauling road and is partially cleared of trees on about ten acres. Some deer winter use occurs here but the alluvial fan produces less browse than adjacent higher slopes.

PRODUCTIVITY: Low, 1,000 lbs/acre

SOIL: A young shallow alluvial derived soil, calcerous with a definite hardpan. Impervious layer influences plant growth so large rooted species predominate in the vegetation composition.

SOIL DESCRIPTION:

A_1	0-3"	Brown (10YR 5/3,moist) silt loam; gravelly with scattered rocks; granular, soft, loose, slightly sticky, slightly plastic; moderately calcerous, PH 8.2; few small and medium roots; boundary gradual.
A_2	3-18"	Pale brown (10YR 6/3,moist) loam, gravelly with scattered rocks; small angular blocky, friable, slightly sticky, slightly plastic; moderately calcerous; common small and medium roots, some large relic roots; some clay buildup at 14", cobble bed at 18-20".
C_{ca}	20"-	Light brownish gray (10YR 6/2,moist) caliche,rocky; massive, very hard, strongly calcerous; few medium roots; a cemented caliche layer.
C		Depth varies but consists mainly of bedded cobbles and rocks.

UTAH POWER & LIGHT COMPANY
1407 WEST NORTH TEMPLE STREET
P. O. BOX 899
SALT LAKE CITY, UTAH 84110

December 19, 1980

To Whom It May Concern:

Please be advised that I have visited the site proposed for waste rock storage by Utah Power & Light Company. My findings are that the site is gently sloping (7%), nearly level. In my professional opinion, the site is stable enough to accommodate the proposed structure without altering its sound condition.

Please be further advised that the writer, Willie J. Whitney, Jr., is registered as a Professional Engineer in the State of Utah (No. 4904).

Very truly yours,

Willie J. Whitney, Jr.
Project Engineer
Mining and Exploration

REGISTERED PROFESSIONAL ENGINEER
No. 4904
Willie J.
Whitney, Jr.
State of Utah

WJW:JBW:lw
GEN:2577:DAD:WW:BW

cc: J. B. Webster

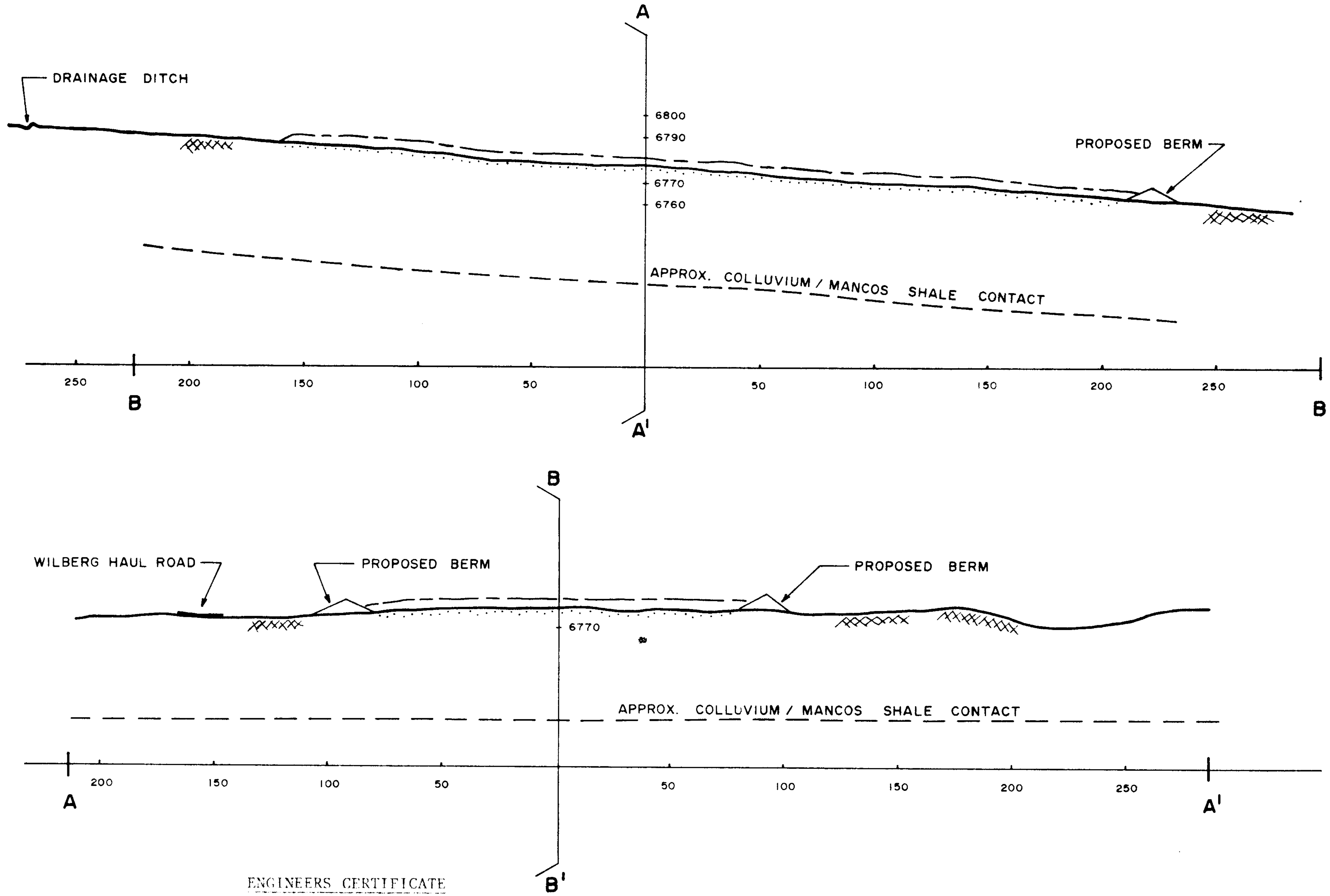
EXHIBIT IX

CERTIFICATION

STATE OF UTAH)
: ss.
County of Salt Lake)

Except as otherwise indicated thereon, all maps, plans, and cross sections submitted with this application have been prepared under the supervision of Don A. Dewey, a registered Professional Engineer of the State of Colorado, who hereby certifies to the correctness thereof.

Don A. Dewey, P.E.
(Professional Engineer #6522)



LEGEND

———	EXISTING SURFACE
········	SURFACE TO BE EXCAVATED
— — —	APPROX. FINAL SURFACE

ENGINEERS CERTIFICATE

I, W.J. WHITNEY Jr, hereby certify that I am a Registered Professional Engineer, licensed in the State of Utah, and that I hold Certificate No. 49[illegible], I also certify that the design shown has been prepared under my general direction and review and further, that it conforms to good engineering practice according to the best of my knowledge and belief.

REGISTERED PROFESSIONAL ENGINEER No. 4904 Willie J Whitney, Jr.

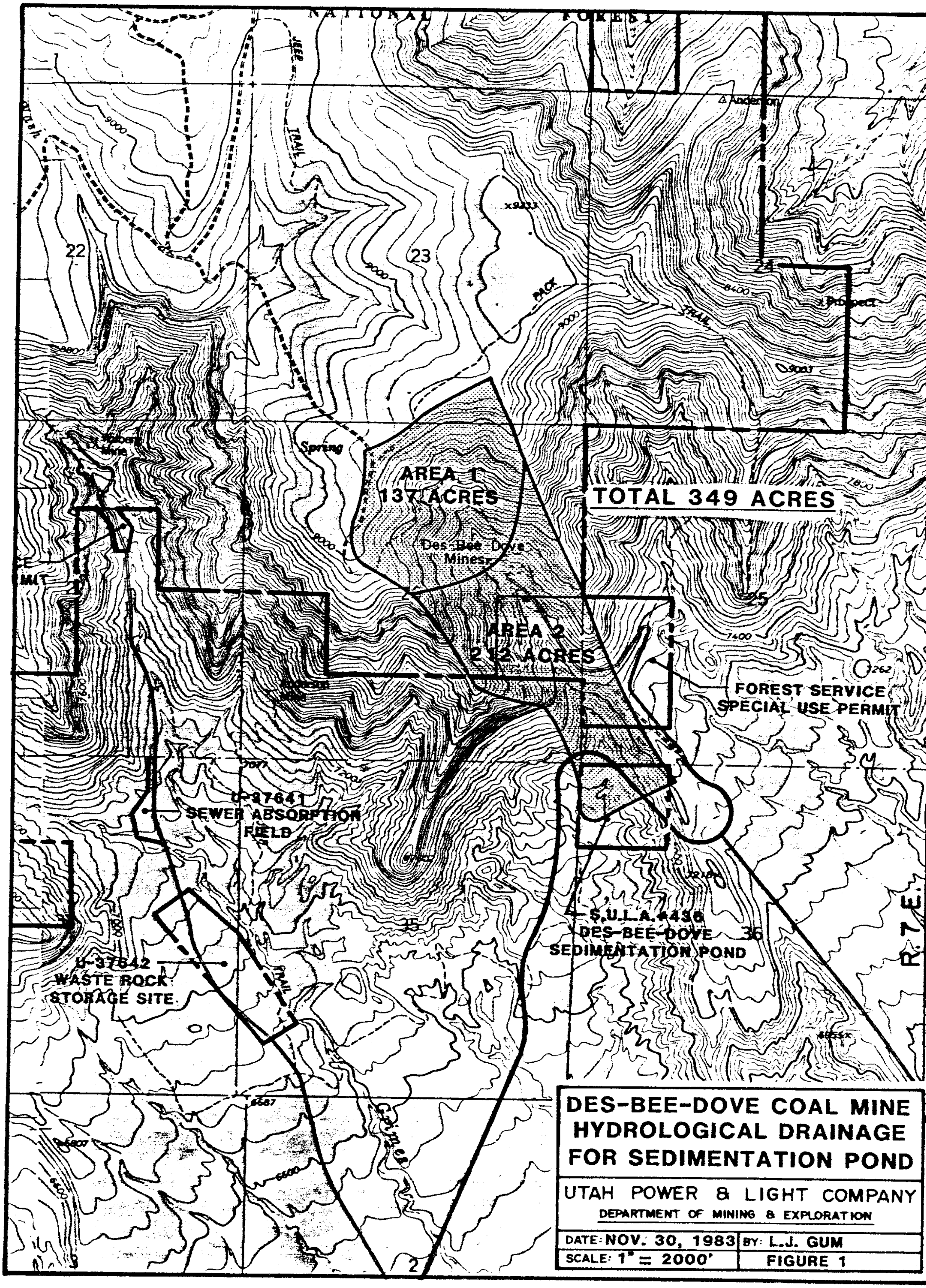
12/29/80
DATE

NAME

T. 17 S., R. 7 E. S.L.B. & M.

WILBERG & DES-BEE-DOVE MINES EMERY COUNTY, UTAH	
UNDERGROUND DEVELOPMENT WASTE DISPOSAL SITE CROSS SECTIONS	
UTAH POWER & LIGHT COMPANY DEPARTMENT OF MINING & EXPLORATION	
SCALE: V. & H. 1"=50' / DRAWN BY: B.A.S.	DRAWING NUMBER
DATE: DEC. 10, 1980 / CHECKED BY:	CM-10359-WB

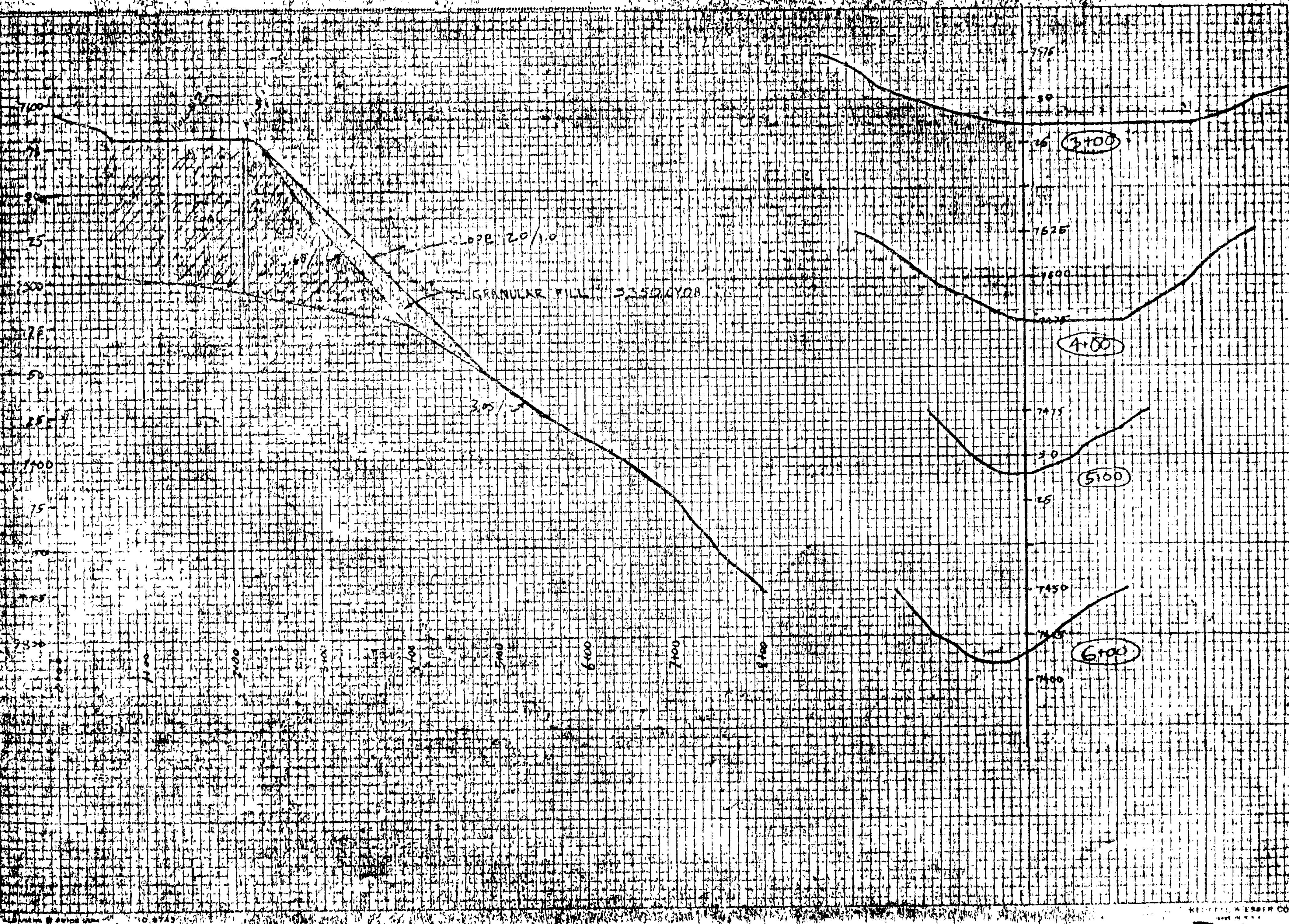
APPENDIX VII


NATIONAL FOREST
JEEP TRAIL
PACK TRAIL
Anderson
Prospect
x9233
22
23
24
25
35
36
2
Spring
AREA 1
137 ACRES
Des-Bee-Dove Mines
TOTAL 349 ACRES
AREA 2
212 ACRES
FOREST SERVICE
SPECIAL USE PERMIT
U-37641
SEWER ABSORPTION
FIELD
S.U.L.A. #436
DES-BEE-DOVE
SEDIMENTATION POND
U-37642
WASTE ROCK
STORAGE SITE.
R. 7 E.
DES-BEE-DOVE COAL MINE
HYDROLOGICAL DRAINAGE
FOR SEDIMENTATION POND
UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION
DATE: NOV. 30, 1983
BY: L.J. GUM
SCALE: 1" = 2000'
FIGURE 1

APPENDIX X

BY ___ DATE 11-22-83 SUBJECT DES BEE DOVE SHEET NO. ___ OF ___

BY ___ DATE ___ LOWER MATERIAL YARD JOB NO. ___



APPENDIX XII

METHODOLOGY

Peak Discharge

The runoff depth resulting from a given rainfall depth was determined using the runoff curve number technique, as defined by the USDA Soil Conservation Service (1972). According to the curve number methodology, the relationship between storm rainfall, soil moisture storage, and runoff can be expressed by the equations:

$$Q = \frac{(P - 0.2S)^2}{P + 0.8S} \qquad (1)$$

$$CN = \frac{1000}{10 + S} \qquad (2)$$

where:

Q = direct runoff depth, inches;

P = storm rainfall depth, inches;

S = maximum infiltration depth (defined as the maximum possible difference between P and Q), inches; and

CN = curve number, dimensionless

Determination of runoff from Equation 1 is valid only when $P \geq 0.2S$. Below this point, no runoff can occur.

Estimates of the peak discharge to be expected from various precipitation events were made using the unit hydrograph procedure developed by the USDA Soil Conservation Service (1972). Figure 1 shows a runoff hydrograph and the associated terminology.

Use of Equations 1 and 2 requires the selection of a curve number, which is a function of vegetative cover and the hydrologic soil groups. Curve numbers for the study area were taken when possible from previous studies supplied by Utah Power and Light Company. Modifications to, or additional curve numbers used were obtained according to information furnished by Utah Power and Light Company and the USDA Soil Conservation Service (1972). Vegetation information contained in the mine permit application indicates that vegetative type in the study area is Pinyon-Juniper with an approximate 40% ground cover density. Figure 2, obtained from the USDA Soil Conservation Service, (1972) illustrates the relationship of curve number to ground cover density for a Juniper-Grass complex.

Values of P were selected for the design return periods from Miller et al. (1973) based on a 24-hour storm. Rainfall return periods of 2, 10, and 100 years were used for design. Miller et. al. (1973) indicates the 2-year, 10-year, and 100-year 24-hour precipitation event for the Deer Creek study area to be on the order of 1.6, 2.3, and 3.5 inches respectively.

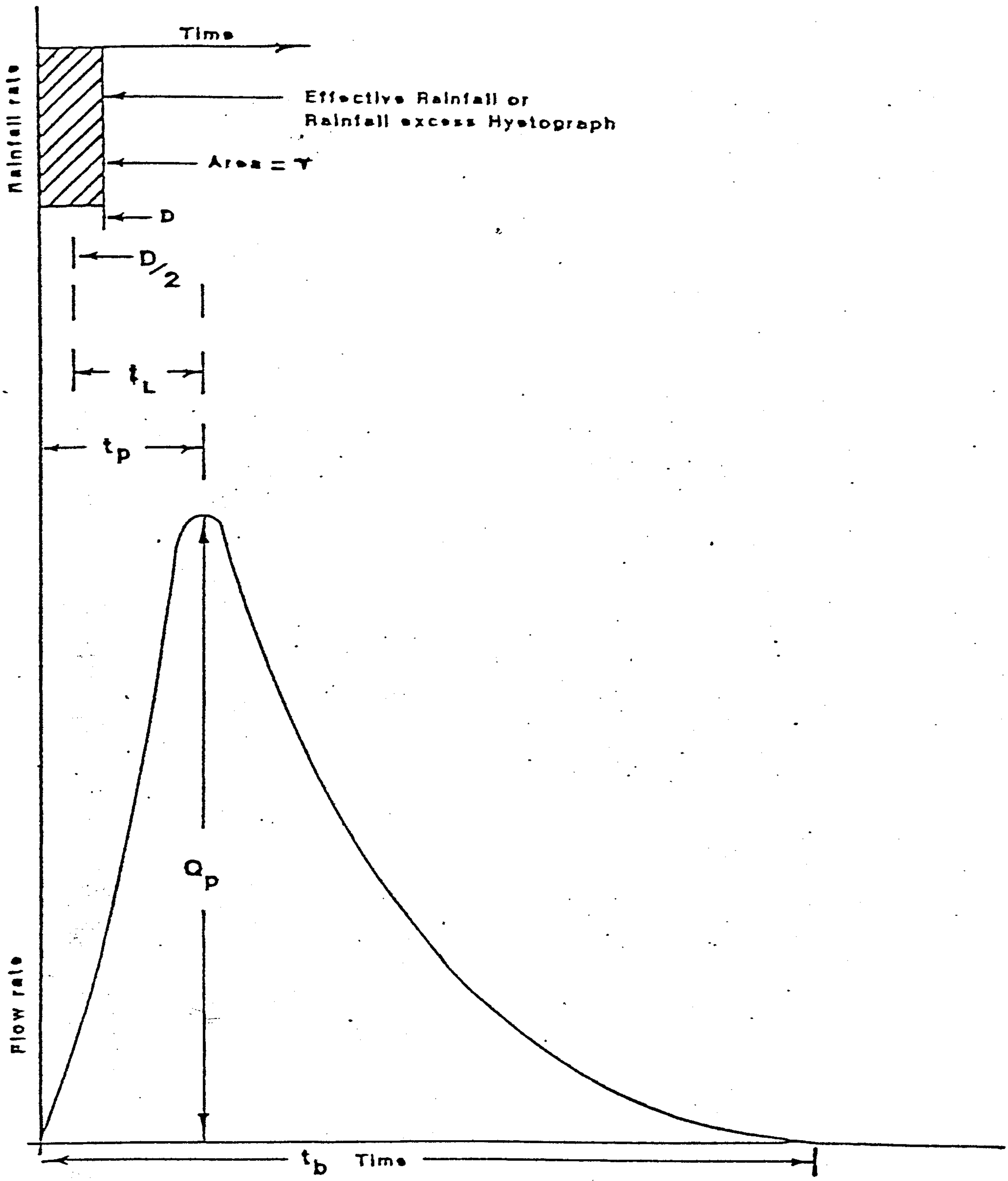


Figure 1. Unit hydrograph terminology.

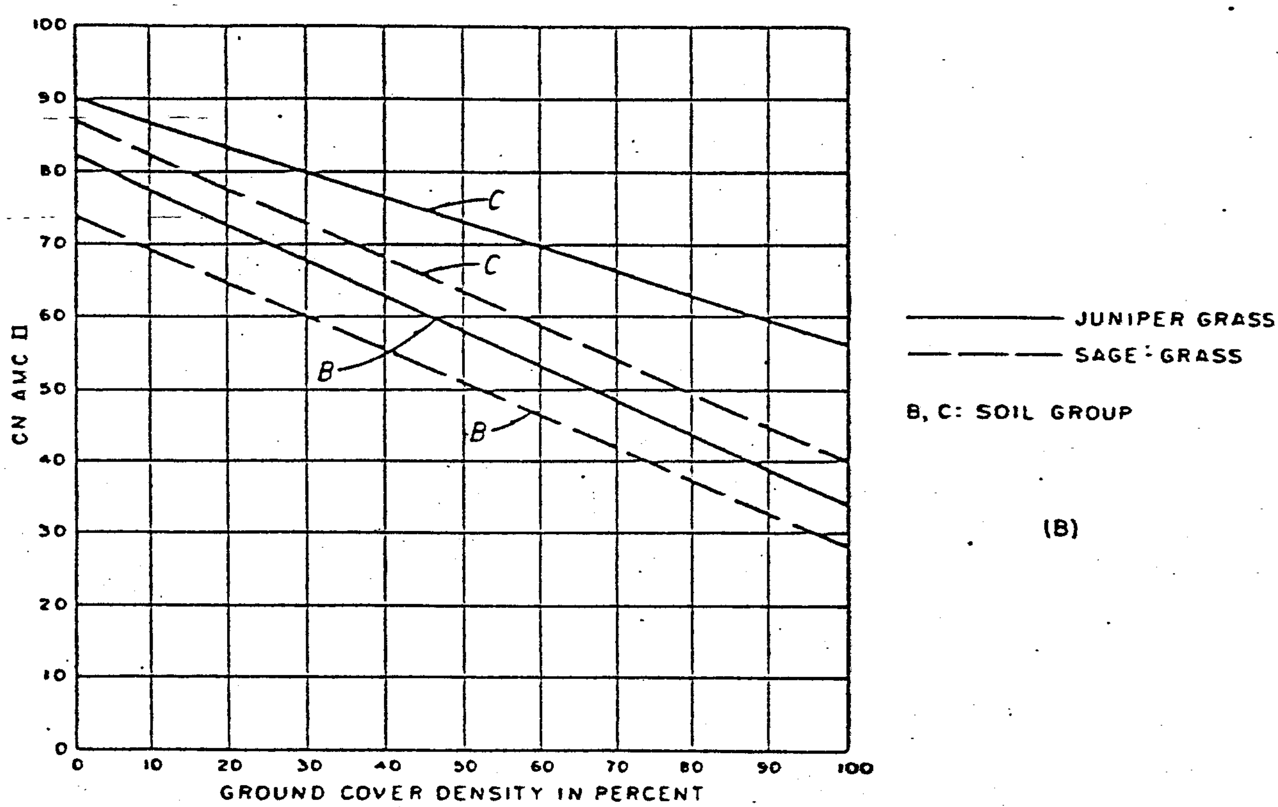


Figure 2. Variation of CN with ground cover density and hydrologic soil group for forest-range in the Western United States (taken from USDA Soil Conservation Service, 1972).

A hyetograph of a single block of rainfall excess with duration D is shown in the upper portion of Figure 1. The lower portion of the figure contains the resultant runoff hydrograph. For runoff from excess rainfall, the area under the hydrograph curve and the area enclosed by the rainfall hyetograph represent the same volume of water (Q). The peak flow rate for the hydrograph is represented by Q_p, while t_p represents the time to peak, which is defined as the flow from the start of the hydrograph to Q_p. The base time (t_b) is the duration of the hydrograph. The time from the center of mass of rainfall excess to the peak of the runoff hydrograph is the lag time (t_L).

The time of concentration (t_c), (not shown on Figure 1) is defined as the time required for flow from the hydraulically most remote point in a basin to reach the basin outlet.

The time to peak, t_p, is assumed to be a function of watershed lag (t_L) which is determined according to the equation:

$$t_L = \frac{(\ell)^{0.8} (S + 1)^{0.7}}{1900 Y^{0.5}} \qquad (3)$$

where:

t_L = watershed lag time, hours;

ℓ = Hydraulic length of the mainstream to the farthest divide, feet;

Y = Average watershed slope, percent;

and S is as previously defined. Values of Y were obtained by methods outlined in Craig and Rankl (1977). The hydraulic length was taken from an appropriate topographic map, while S was determined from Equation 2 once the runoff curve number had been estimated.

According to the USDA Soil Conservation Service (1972), the watershed lag time is equal to $0.6t_C$ and the time of concentration (t_C) is equal to $1.5t_p$. By combining these two expressions, it can be seen that:

$$t_p = 1.11\ t_L \qquad (4)$$

where both variables are as previously defined.

The peak discharge constant used in the dimensionless unit hydrograph method is determined according to the equation:

$$q_p = \frac{484\ A\ Q}{t_p} \qquad (5)$$

where:

q_p = unit hydrograph peak flow rate, cubic feet per second;

A = drainage area, square miles;

Q = runoff depth (as determined by Equation 1), inches;

484 = conversion factor;

and t_p is as previously defined in hours. The rainfall distribution for the 24-hour storm duration is generated from the theoretical NOAA Type II storm distribution shown in Figure 3.

Dimensionless unit hydrographs are developed by simulating many natural unit hydrographs using the time to peak and the peak discharge constant. Haan (1970) proposed a dimensionless unit hydrograph based on the gamma function:

$$\frac{q(t)}{q_p} = \left[\frac{t}{t_p} e^{(1-t/tp)}\right]^{C_3 t_p} \tag{6}$$

where:

$q(t)$ = hydrograph ordinate at time t, cubic feet per second;

the parameters q_p and t_p are as previously defined, and C_3 is a parameter defined by:

$$Q = q_p \, t_p \left[\frac{e}{C_3 t_p}\right]^{C_3 t_p} \Gamma(C_3 t_p) \tag{7}$$

where:

Q = runoff volume (one inch for a unit hydrograph),

Γ = gamma function,

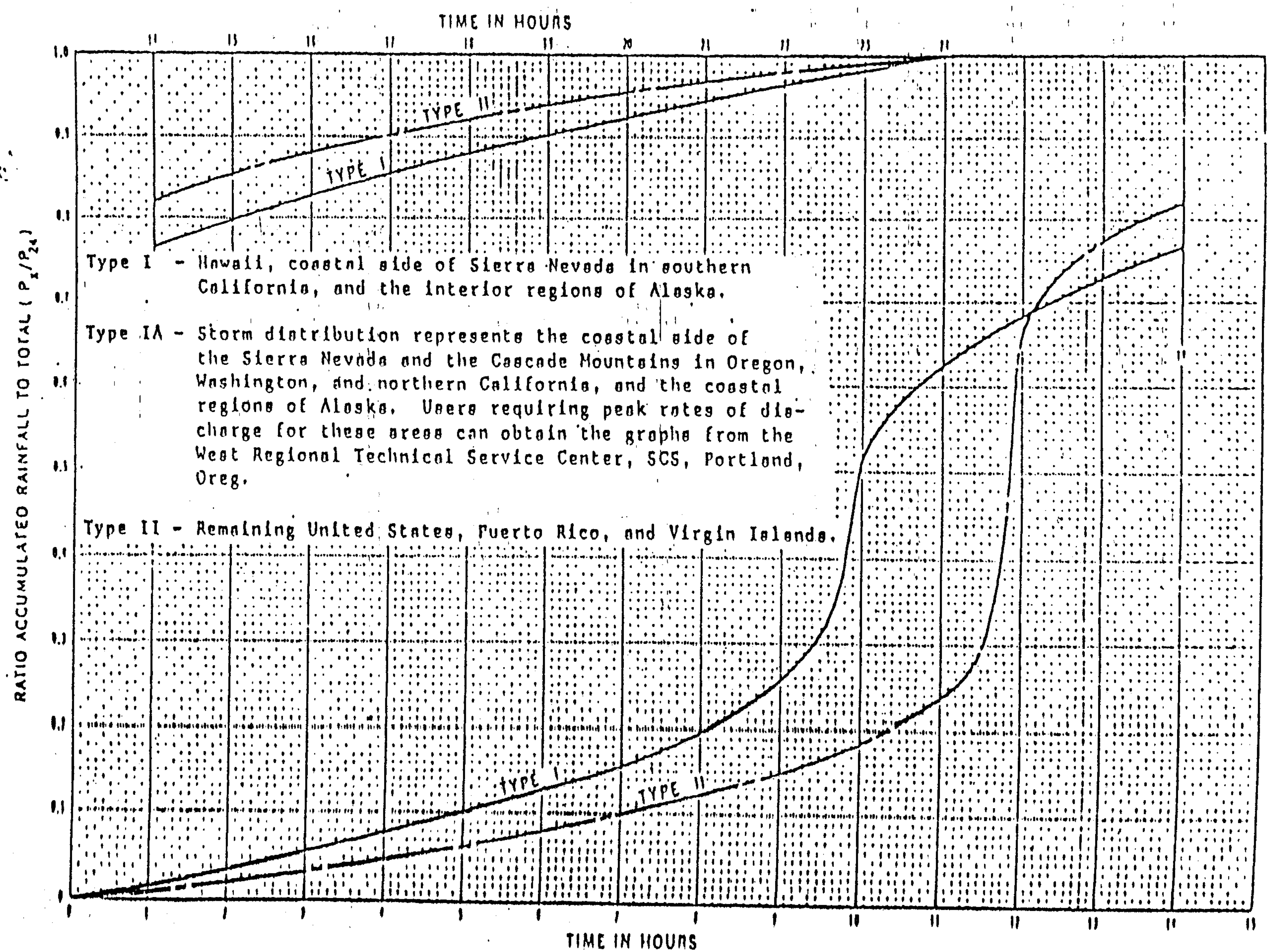


Figure 3. Twenty-four-hour rainfall distributions (from Kent, 1973).

and all other variables are as previously defined.

Figure 4 shows how shape of the hydrograph defined by Equation 6 changes as C_3t_p changes. The higher the value of C_3t_p, the sharper the peak of the hydrograph.

Estimates of the peak discharge to be expected from various precipitation events were made using the dimensionless hydrograph procedure illustrated on Figure 1. The dimensionless unit hydrograph method involves the development of a runoff hydrograph from a complex rainstorm. The storm is divided into blocks of uniform intensity of duration D and distributed in accordance with the 24-hour rainfall distribution illustrated on Figure 3. Values of D must be less than or equal to t_p. Practically, the selection of D as a multiple of t_p will ensure that the peak will be encountered.

Rainfall excess is generated from the rainfall depths of duration D, and the rainfall-runoff relationship expressed in Equation 1. The rainfall excess (runoff) from each time increment of duration D is then multiplied by the unit hydrograph ordinates to produce a component hydrograph. Each of the component hydrographs are then lagged by a time increment D and are consecutively summed to produce the synthetic runoff hydrograph.

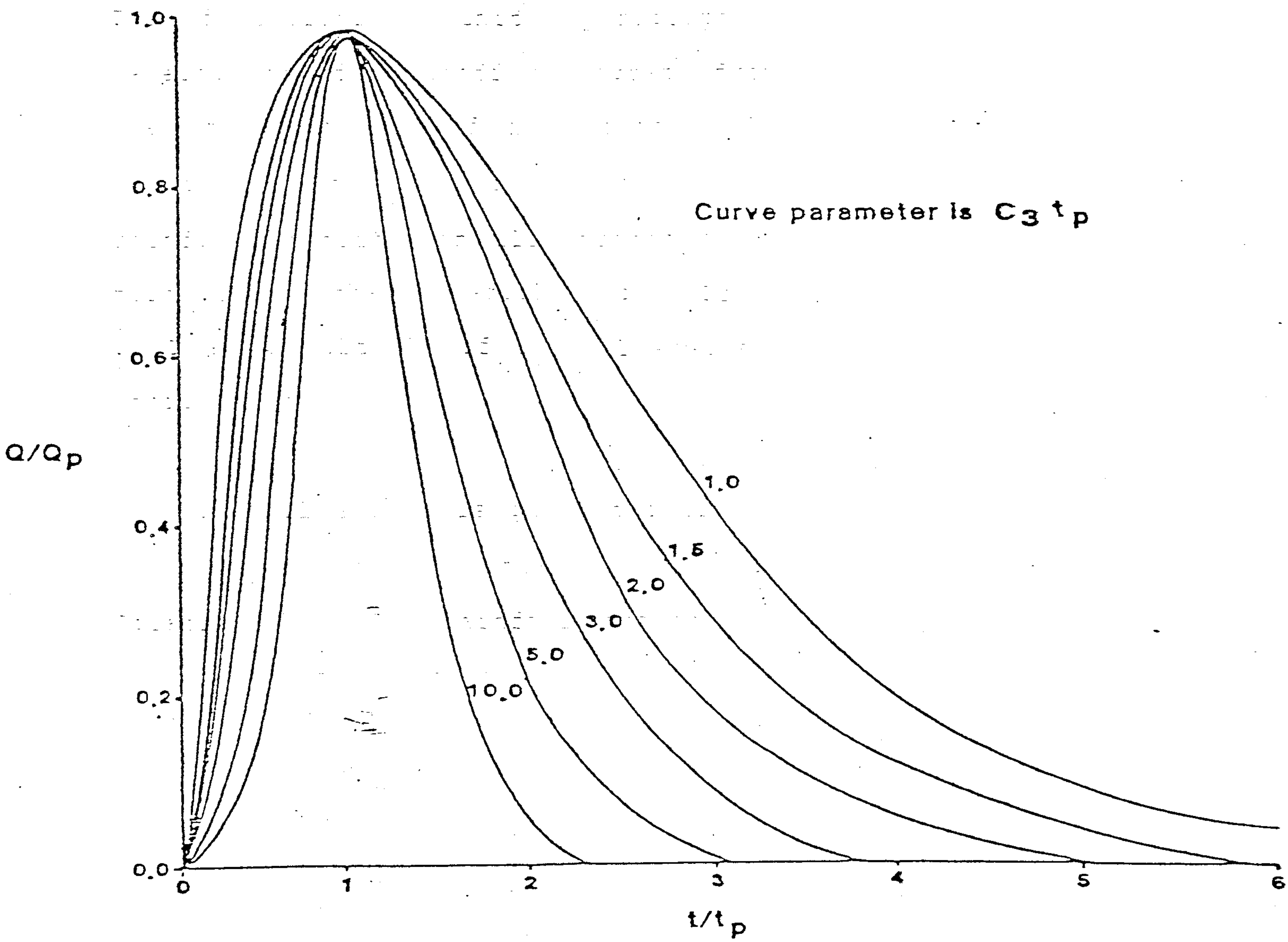


Figure 4. Variation in hydrograph shape with variation in C_3t_p (taken from Haan, 1970).

Culvert Design

Following the determination of a given peak discharge, design sizes for culverts used for road drainage were determined using nomographs derived by the U.S. Bureau of Public Roads as presented by the USDA Soil Conservation Service (1972) and illustrated in Figure 5. Inlet control and a headwater to diameter ratio (HW/D) of 1.0 have been assumed in all cases.

Open Channel Flow

Open channel flow velocities have been determined using the Manning equation. According to this equation,

$$V = \frac{1.486}{n} R^{0.67} S^{0.50} \tag{8}$$

where:

V = flow velocity, feet per second;

R = area/wetted perimeter, feet;

S = friction slope, dimensionless; and

n = Manning's roughness coefficient.

Diversion ditches with excess velocities will require a rock riprap lining to prevent excessive channel erosion. These channels were designed in accordance with methodologies presented by the U.S. Department of Transportation (1975). According to this methodology, the maximum permissible depth

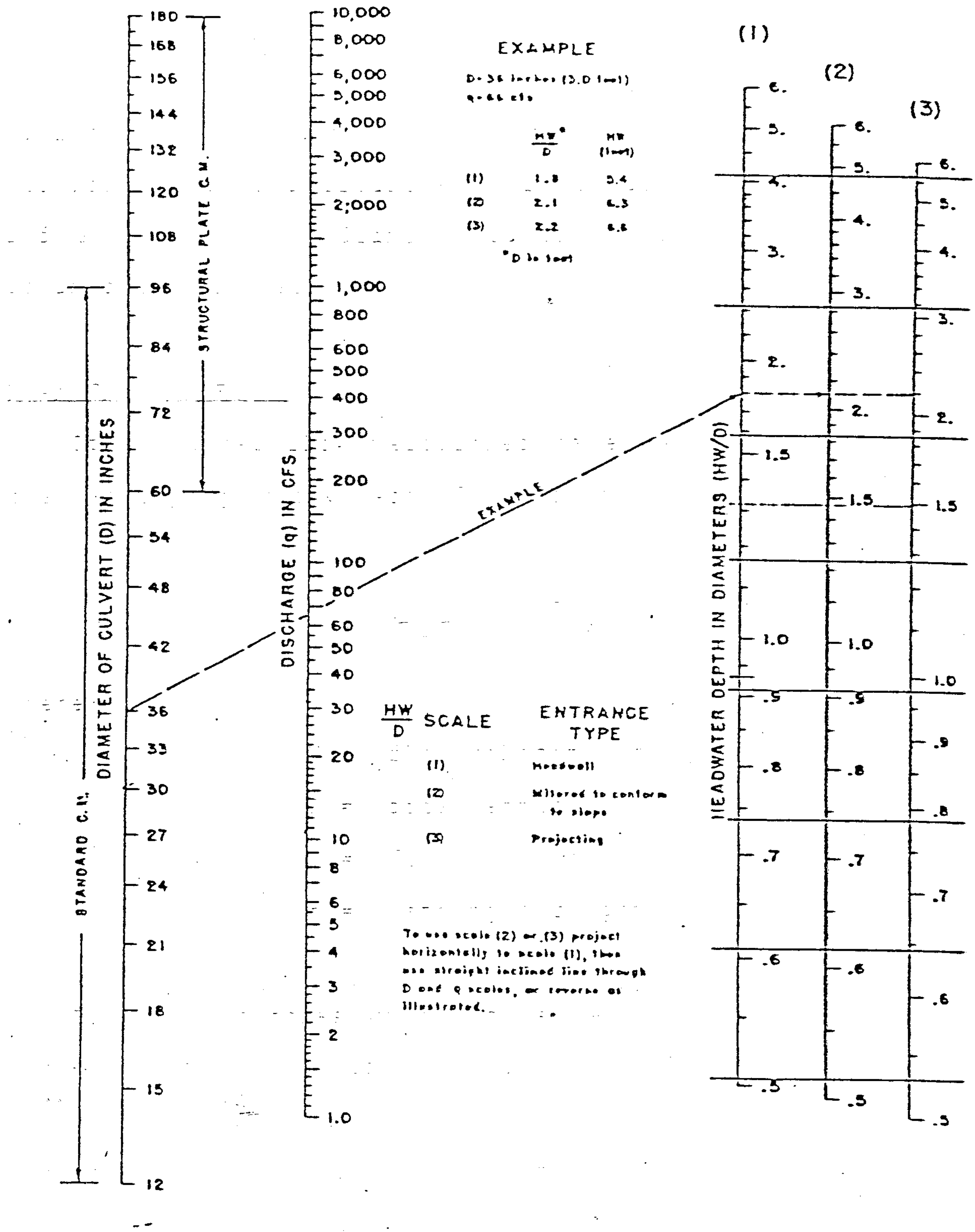


Figure 5. Headwater depth for corrugated metal pipe culverts with inlet control (U.S. Soil Conservation Service, 1972).

of flow for a channel lined with rock riprap is determined by:

$$d_{max} = \frac{5\ (D_{50})}{\gamma\ \ (S_o)} \qquad (9)$$

where:

d_{max} = maximum permissible depth of flow, in feet;

D_{50} = mean rock diameter (or the particle size gradation for which 50 percent of the mixture is finer by weight), in feet;

γ = unit weight of water, in pounds per cubic foot;

S_o = channel slope, in feet per foot.

The mean rock diameter (D_{50}) in each case was assumed, from which the maximum permissible depth was determined. The channel configuration was then determined such that the maximum permissible depth at the design flow would not be exceeded.

DES-BEE-DOVE DRAINAGE AREA IIIA

100-YEAR 24 HOUR PEAK DISCHARGE

AREA= 170.0 ACRES
AVERAGE BASIN SLOPE= 63.5 PERCENT
INCREMENT OF RAINFALL EXCESS= .0230 HOURS
CURVE NUMBER= 85.
DESIGN STORM= 3.50 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 4000. FEET

TP= .1139 HOURS QPCFS= 1129.00 CFS QPIN= 6.5861 INCHES C3= 32.4628
ITERATIONS= 8

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.87	1.9692	.7726	.0442	.0	298.54
11.89	2.0303	.8174	.0448	.0	305.05
11.91	2.0915	.8628	.0454	.0	311.07
11.94	2.1527	.9087	.0459	.0	316.69
11.96	2.2139	.9552	.0464	.0	321.96
11.98	2.2751	1.0021	.0469	.0	326.91
12.01	2.3235	1.0396	.0375	.0	331.00
12.03	2.3351	1.0486	.0090	.0	330.18
12.05	2.3467	1.0576	.0090	.0	316.44
12.07	2.3583	1.0667	.0090	.0	287.90
12.10	2.3698	1.0757	.0091	.0	249.83
12.12	2.3814	1.0848	.0091	.0	209.49
12.14	2.3930	1.0939	.0091	.0	172.54

HYDROGRAPH PEAK= 331.28 cfs
TIME TO PEAK= 12.01 Hours

DES-BEE-DOVE DRAINAGE AREA IIIB

100-YEAR 24-HOUR PEAK DISCHARGE

AREA= 11.7 ACRES
AVERAGE BASIN SLOPE= 166.0 PERCENT
INCREMENT OF RAINFALL EXCESS= .0152 HOURS
CURVE NUMBER= 85.
DESIGN STORM= 3.50 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 2330. FEET

TP= .0457 HOURS QPCFS= 193.58 CFS QPIN=16.4080 INCHES C3= 80.8751
ITERATIONS= 8

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.90	2.0586	.8383	.0299	.0	22.61
11.92	2.0990	.8684	.0301	.0	22.82
11.93	2.1395	.8987	.0303	.0	23.02
11.95	2.1799	.9293	.0306	.0	23.21
11.96	2.2203	.9601	.0308	.0	23.40
11.98	2.2607	.9911	.0310	.0	23.59
11.99	2.3012	1.0223	.0312	.0	23.76
12.01	2.3245	1.0404	.0181	.0	23.41
12.02	2.3322	1.0463	.0060	.0	21.13
12.04	2.3398	1.0523	.0060	.0	16.88
12.05	2.3475	1.0582	.0060	.0	12.43
12.07	2.3551	1.0642	.0060	.0	9.04
12.08	2.3628	1.0702	.0060	.0	6.90

HYDROGRAPH PEAK= 23.77 cfs
TIME TO PEAK= 11.99 Hours

DES-BEE-DOVE DRAINAGE AREA IIIC

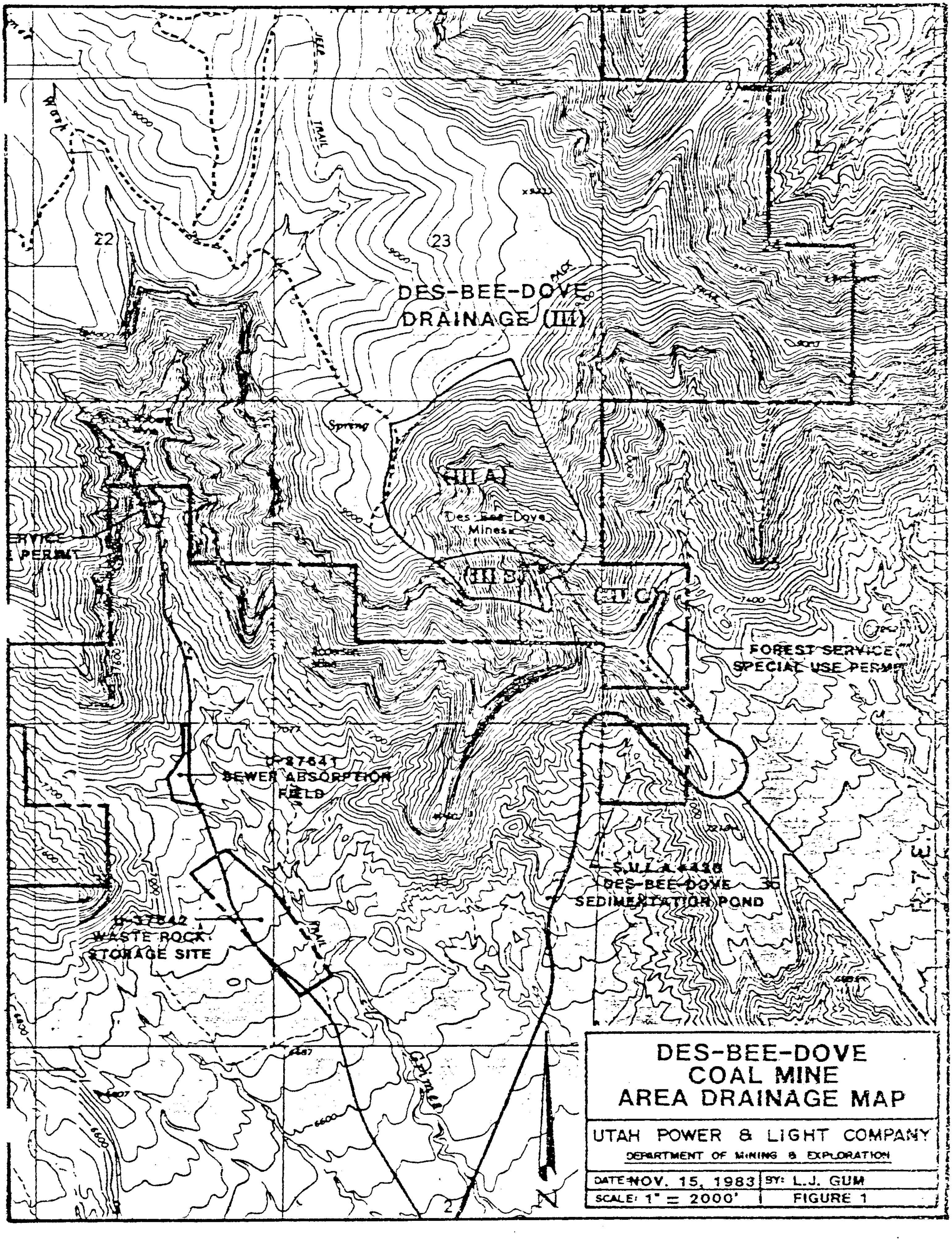
100-YEAR 24-HOUR PEAK DISCHARGE

AREA= 6.9 ACRES
AVERAGE BASIN SLOPE= 31.6 PERCENT
INCREMENT OF RAINFALL EXCESS= .0120 HOURS
CURVE NUMBER= 87.
DESIGN STORM= 3.50 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 980. FEET

TP= .0488 HOURS QPCFS= 107.03 CFS QPIN=15.3832 INCHES C3= 75.823
ITERATIONS= 8

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.93	2.1292	1.0077	.0254	.0	14.40
11.94	2.1611	1.0332	.0255	.0	14.49
11.95	2.1930	1.0588	.0257	.0	14.56
11.96	2.2249	1.0846	.0258	.0	14.64
11.98	2.2568	1.1105	.0259	.0	14.72
11.99	2.2888	1.1365	.0260	.0	14.79
12.00	2.3205	1.1625	.0260	.0	14.86
12.01	2.3266	1.1674	.0050	.0	14.71
12.02	2.3326	1.1724	.0050	.0	13.69
12.04	2.3387	1.1774	.0050	.0	11.80
12.05	2.3447	1.1823	.0050	.0	9.58
12.06	2.3508	1.1873	.0050	.0	7.53
12.07	2.3568	1.1923	.0050	.0	5.90

HYDROGRAPH PEAK= 14.86 cfs
TIME TO PEAK= 12.00 Hours


DES-BEE-DOVE
DRAINAGE (III)
(III A)
Des-Bee-Dove Mines
(III B)
(III C)
Spring
TRAIL
PACK TRAIL
22
23
FOREST SERVICE SPECIAL USE PERMIT
U-27641
SEWER ABSORPTION FIELD
U-37642
WASTE ROCK STORAGE SITE
S.U.L.A 4438
DES-BEE-DOVE
SEDIMENTATION POND
DES-BEE-DOVE
COAL MINE
AREA DRAINAGE MAP
UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION
DATE: NOV. 15, 1983
BY: L.J. GUM
SCALE: 1" = 2000'
FIGURE 1
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