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May 31, 1991

Mr. Ben Grimes
Plateau Mining Company
P.O. Drawer PMC
Price, Utah

RE: Refuse Pile Drainage Culvert Analysis.

Dear Ben:

Enclosed please find the calculations requested yesterday related to drainage from the coal refuse pile. The drainage pipe is designed based upon the following:

- A 100 Year, 6 Hour Precipitation event of 2.0 inches.
- A current surface area of the pile equalling 24.9 acres. As the pile is raised the surface area will decrease thereby making the calculations attached hereto conservative.
- A berm (consisting of refuse material) must be placed around the edge of the pile to contain runoff.
- Placement of refuse can be controlled such that surface runoff will be directed to the drainage culvert. It is understood that this may be extremely difficult to obtain, especially during winter periods.

The pipe may be placed on the surface or buried at your preference. We hope that this information will provide the design required to satisfy the State and Federal agencies involved. Should you have any questions, please call.

Sincerely,

David E. Hansen

David E. Hansen, Ph.D.,P.E.
Principal

DEH/dh

CHECK DESIGN CRITERIA FOR REFUSE PILE DRAINAGE CULVERT.

FROM MAY 1991 Refuse Pile Mapping:

Area = 24.9 acres
H_L = 1200 ft
CN = 90 (Refuse Material)
Slope = 5% (Long term average)
$P_{100yr-6hr}$ = 2.0 in

from "Hydro", Q = 24 cfs

CHECK PIPE HYDRAULICS - INLET CONDITIONS

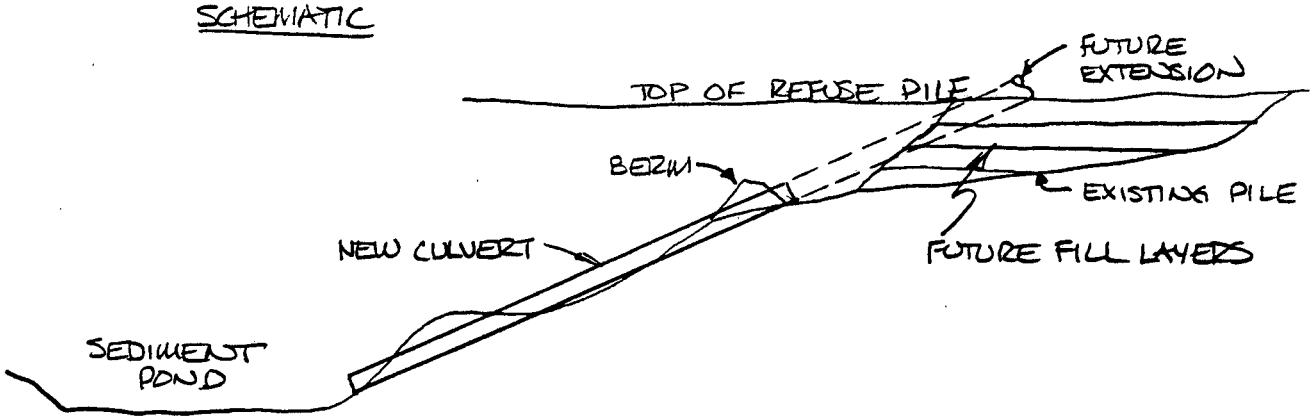
from Nomographs the following pipes can be used

PIPE SIZE	HW/D RATIO	FLOW (cfs)
33" CMP	1.0	26
27" CMP	1.5	24
43" x 27" CMP	1.0	26

This is the max size which will be required since the refuse pile surface area continues to decrease.

Recommend constructing refuse pile such that drainage is directed toward this single culvert. Fill in around culvert until culvert requires raising, then continue with refuse placement around culvert entrance.

SCHEMATIC

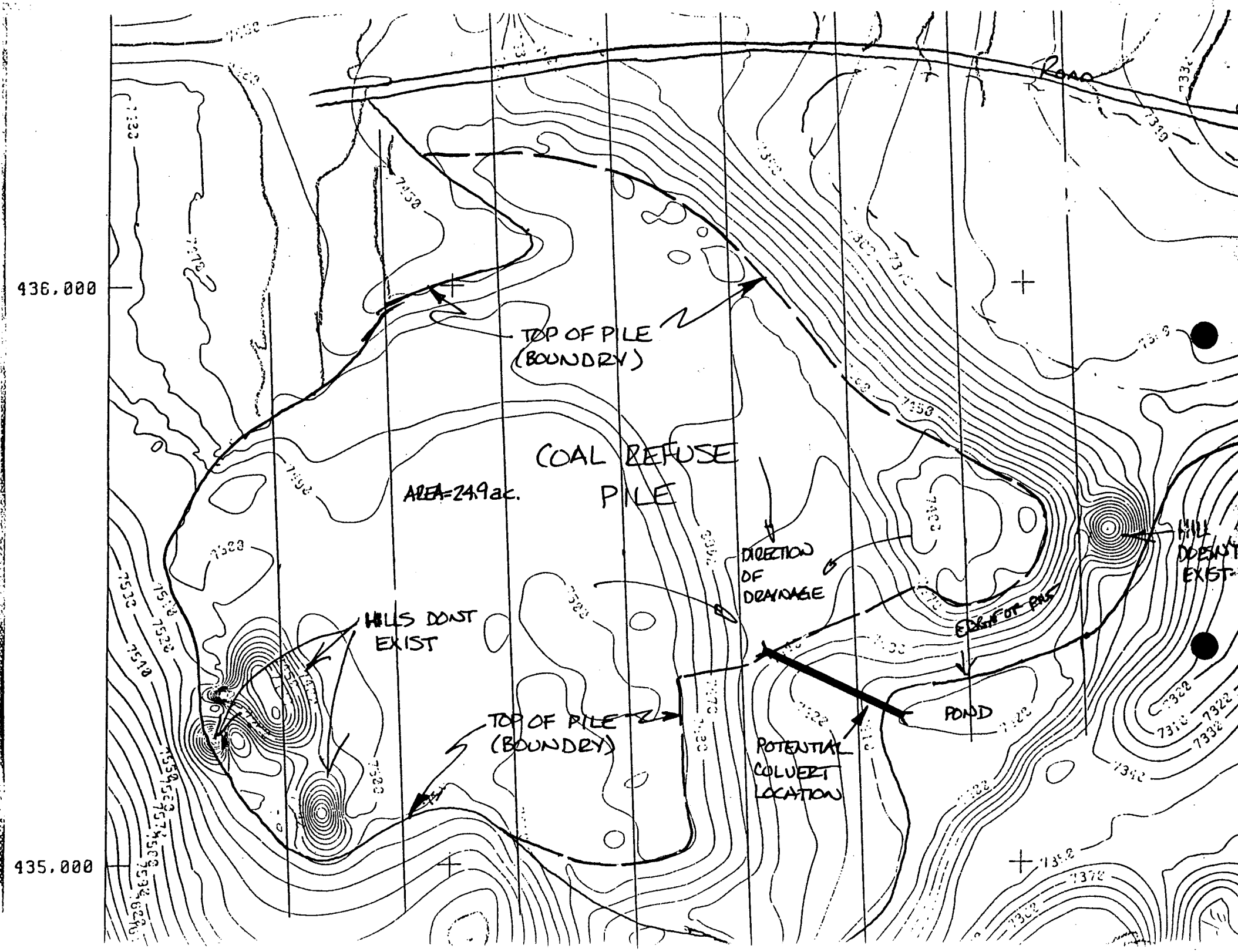


CHECK PIPEFLOW CONDITIONS

Use Mannings Equation with $n = 0.024$

$y = 2.25'$ (27") Full Pipe Flow
$D = 2.25'$
$S = 40/200 = 0.20$ (20%)

$Q = 75.0$ cfs >> 24 cfs Required ok


436.000
435.000
ROAD
TOP OF PILE
(BOUNDRY)
COAL REFUSE
PILE
AREA=24.9ac.
DIRECTION
OF
DRAINAGE
HILLS DONT
EXIST
HILL
DOESN'T
EXIST
POND
TOP OF PILE
(BOUNDRY)
POTENTIAL
COLUERT
LOCATION

PROJECT - Cyprus Plateau Mine - Refuse Pile Drainage Culvert Design

AREA= 24.9 ACRES
AVERAGE BASIN SLOPE= 5.0 PERCENT
CURVE NUMBER= 90.0
DESIGN STORM= 2.00 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1200. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .1282 HOURS QPCFS= 146.60 CFS QPIN= 5.8482 INCHES
CS= 28.8259 ITERATIONS= 8 SCS 6-hour

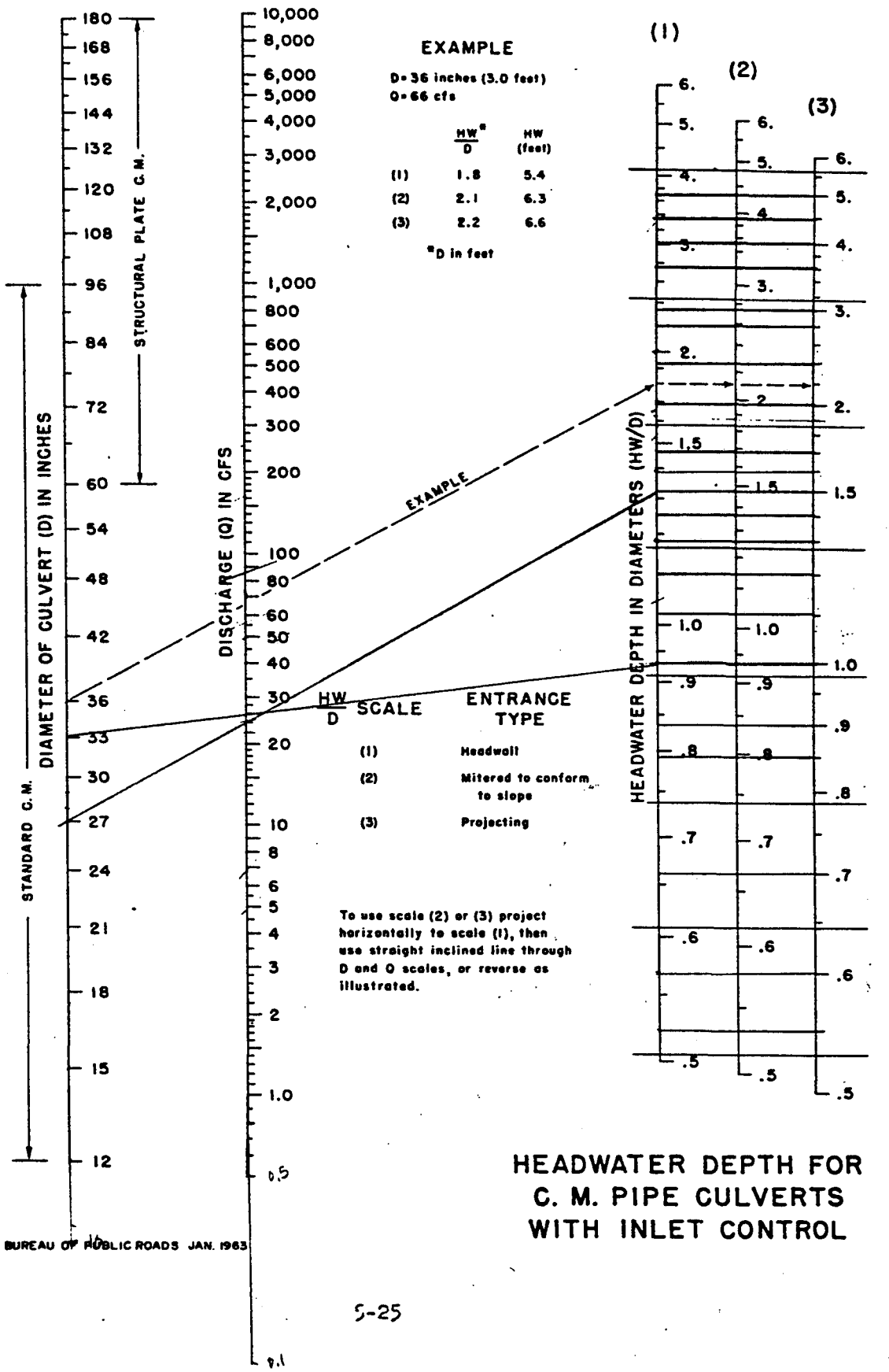
TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
1.28	.2221	.0000	.0000	.0	.00
1.31	.2278	.0000	.0000	7.4	.00
1.33	.2334	.0001	.0000	45.5	.00
1.36	.2391	.0003	.0001	97.3	.00
1.38	.2447	.0004	.0002	134.6	.02
1.41	.2503	.0007	.0002	146.6	.04
1.44	.2560	.0010	.0003	137.3	.07
1.46	.2616	.0013	.0004	115.9	.10
1.49	.2673	.0018	.0004	90.7	.14
1.51	.2750	.0024	.0006	66.9	.19
1.54	.2848	.0033	.0009	47.2	.24
1.56	.2945	.0044	.0011	32.0	.32
1.59	.3043	.0056	.0012	21.1	.42
1.62	.3140	.0070	.0014	13.5	.55
1.64	.3238	.0085	.0015	8.5	.69
1.67	.3335	.0101	.0016	5.2	.83
1.69	.3432	.0119	.0018	3.2	.97
1.72	.3530	.0138	.0019	1.9	1.12
1.74	.3627	.0158	.0020	1.1	1.26
1.77	.3725	.0179	.0021	.7	1.40
1.80	.3822	.0201	.0022	.4	1.53
1.82	.3920	.0225	.0024	.2	1.66
1.85	.4017	.0250	.0025	.1	1.78
1.87	.4115	.0275	.0026	.0	1.90
2.36	.9922	.3152	.0244	.0	20.13
2.39	1.0302	.3402	.0250	.0	20.92
2.41	1.0681	.3656	.0255	.0	21.65
2.44	1.1061	.3916	.0260	.0	22.32
2.46	1.1441	.4180	.0264	.0	22.95
2.49	1.1820	.4448	.0268	.0	23.53
2.51	1.2054	.4616	.0167	.0	24.01
2.54	1.2157	.4689	.0074	.0	23.97
2.56	1.2259	.4764	.0074	.0	22.99
2.59	1.2362	.4838	.0074	.0	21.07

PROJECT : Cyprus Pl[illegible]a Mine - Refuse Pile Drai[illegible]ge Culvert Design
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.62	1.2464	.4913	.0075	.0	18.60
2.64	1.2567	.4988	.0075	.0	16.05
2.67	1.2670	.5063	.0075	.0	13.75

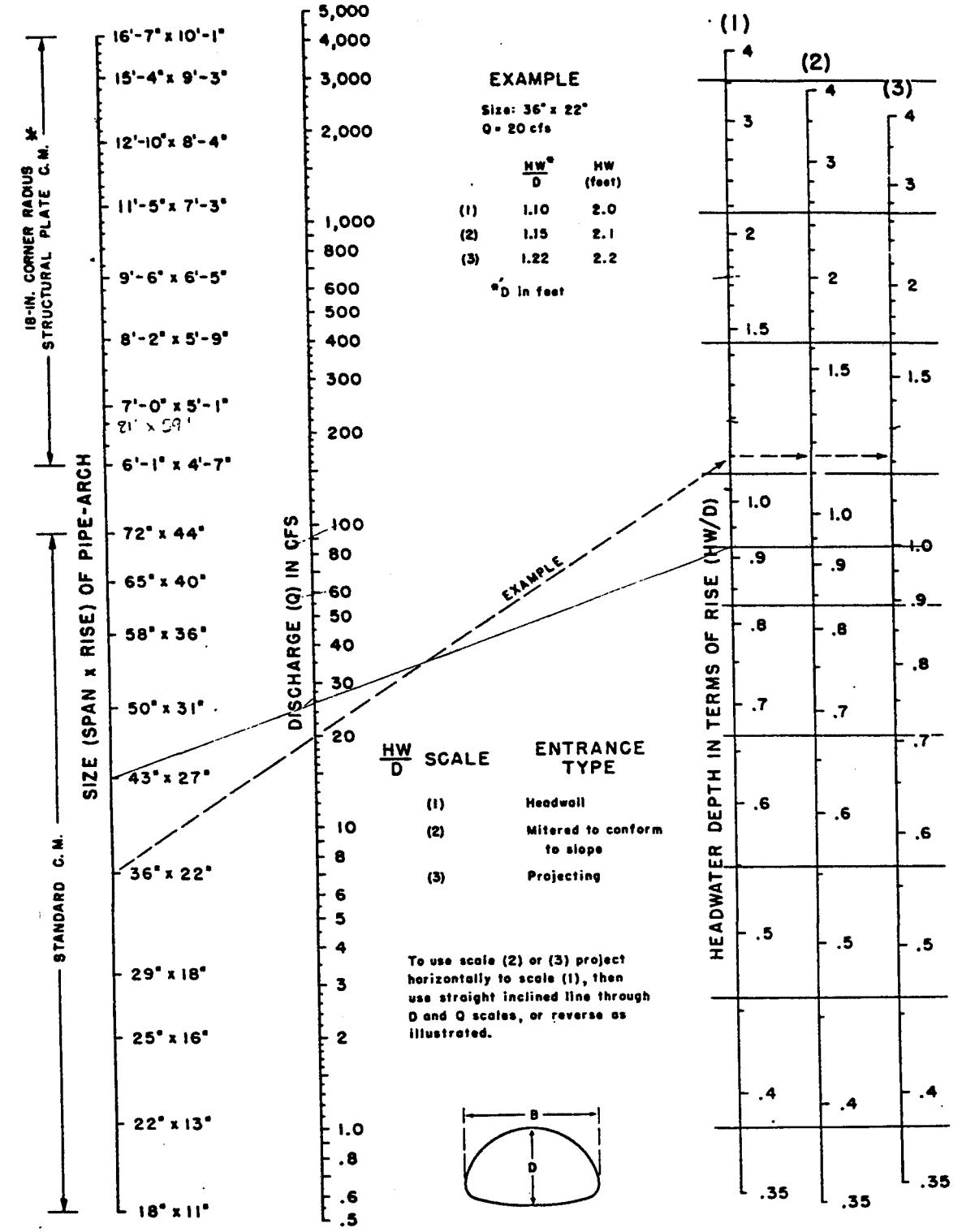
HYDROGRAPH PEAK= 24.01 cfs
TIME TO PEAK= 2.51 Hours
RUNOFF VOLUME= 2.26 Acre-Feet

CHART 5



HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

CHART 6



*ADDITIONAL SIZES NOT DIMENSIONED ARE LISTED IN FABRICATOR'S CATALOG.

BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR C. M. PIPE-ARCH CULVERTS WITH INLET CONTROL