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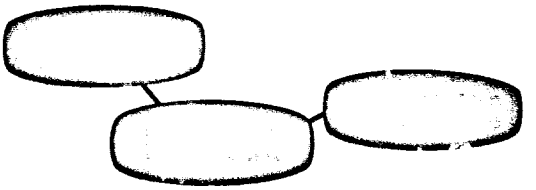
OCKRIMMON

MASTER DRAINAGE PLAN

FOR

GOLDEN CYCLE LAND CORPORATION

MARCH 1972



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March 21, 1972

Mr. DeWitt Miller
City Hall
P.O. Box 1575
Colorado Springs, Colorado

Subject: Rockrimmon Master Drainage Plan

Dear Deke:

Transmitted herewith is the master drainage plan for the Rockrimmon Development in Northeast Colorado Springs.

This plan is submitted for approval of several major changes in the Master Development Plan; the total land use has been changed and a major dam is proposed. It is, therefore, requested that this plan be submitted to the drainage board in their next scheduled meeting.

Please call me if you have any questions.

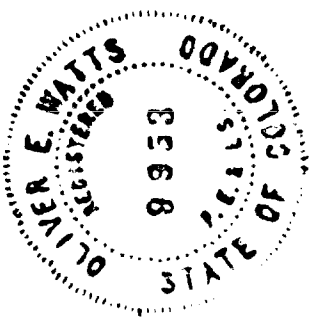
Respectfully submitted,

UNITED WESTERN ENGINEERS

O. E. Watts
Engineering Director

/cel

Enclosure



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I. Introduction:

The Rockrimmon Development is located in the Northeastern City limits of Colorado Springs, occupying portions of Sections 7, 18, and 19 of Township 13 South, Range 66 West and portions of Sections 11, 12, 13, and 14 of Township 13 South, Range 67 West of the 6th Principal Meridian as shown on Plate Number 1 in the appendix.

The development comprises approximately 2300 acres which is split among the major drainage basins within the area as follows:

Basin	Acreage
Woodmen Road*	122
Dry Creek	601
Monument Creek*	75
Rockrimmon North	988
Rockrimmon South	464
Popes Bluff	56
Total	2306 Acres

* Miscellaneous unstudied - Total 197 Acres

A master development plan was prepared several years ago by R. Keith Hook and Associates which was the basis of several master drainage plans prepared for the City of Colorado Springs as follows:

Date	Master Basins Studied	Firm Preparing Study
November, 1966	Dry Creek	R. Keith Hook & Assoc.
November, 1966	Popes Bluff	R. Keith Hook & Assoc.
March, 1967	Rockrimmon North & South	Karcich & Weber

The Rockrimmon Development has progressed through the majority of the Dry Creek Basin area and plats have been recorded for Raven Hills Filings 1 through 3 and Golden Hills Filing No. 1.

In late 1971, the Golden Cycle Land Corporation significantly modified the remaining portion of the master development plan and is now submitting for approval the revised plan, which has been prepared by this firm in association with Dave Sellon and Associates. The master plan has been significantly modified as follows:

A previously proposed golf course in the Rockrimmon North Basin is now being replaced with a 70-foot high dam and 52 acre reservoir. Major changes in land use throughout the development are now proposed, including revised street

alignments and sizing for which this firm has submitted a master traffic plan. The Greenbelt in the Rockrimmon South Basin is proposed as a linear park system having a series of small esthetic dams.

These changes require significant modification to the previously accepted master drainage studies. We, therefore, submit this report to the City Drainage Board for their approval.

II. Hydrology Parameters:

A. Method of Computations: The method of runoff development utilized in this report is commonly known as the Soil Conservation Service Synthetic Hydrograph method as modified by the Bureau of Reclamation as prescribed and accepted by the City of Colorado Springs. This method is thoroughly described in the master drainage report for the Windmill Gulch Basin prepared by this firm in October, 1971, and will not be thoroughly discussed here except to point out points of interest.

The major greenbelts are designed on the 50 year storm of two inches rainfall, duration one hour, as were the greenbelts in the previously approved reports referenced in Section I. We have made exception to this only in the spillway computations for the 70-foot high major dam, in which the facilities provided were as prescribed by state law, i.e., to provide for the "maximum probable" storm. The design storm 'staged' through the reservoir and the facilities provided as part of this report were based on the 100 year storm of 3.5 inches rainfall, duration one hour.

Complete hydrographs are developed for the master development planned runoff as discussed in later sections of this report and drainage facilities are designed on this basis.

B. Soil Types: The geologic formations encountered within the development are the Dawson Arcose, which outcrops at the Northern limits and the Laramie and Fox Hills Sandstones, which underlie the area and outcrop in the Southern limits.

The soil cover types are shown on Plate Number 2 and were compiled from maps of the Soil Conservation Service. The description and hydrologic classifications are taken from SCS studies, summarized as follows:

Soil Symbol	Name and Description	Hydrologic Grouping
RB-1	Stoney steep land of slopes from 6% to vertical cliffs. Loamy sand or sandy loam of a depth of 10 to 30 inches to sandstone or shale.	D
RB-2	Hilly gravelly land and Samsil soils of a depth of 20 inches or less to shale. Gravel and cobbly materials may extend to 30 feet over shale.	D

Soil Symbol	Name and Description	Hydrologic Grouping
R5-CD	Tructon Series of deep, dark soils of low plasticity.	B
R9-D	Bresser Series, sandy and clay loams of 60 inches or more depth, low to medium plasticity.	B
C1-CE	Samsil Series of very shallow, clayey soils of the upland slopes and breaks. Hard shale at 10 to 20 inches. High plasticity.	D
C3-CD	Razor series of well drained, clayey soils with underlying calcareous clays to shale at 20 to 40 inches. High plasticity.	D
C7-C and C7-DE	Cushman series of well drained loamy soils of low to medium plasticity overlying interbedded sandstone and shale at 20 to 40 inches.	C

C-R Runoff Coefficients: The curve numbers utilized for the various types of soil cover and development are as prescribed and accepted by the City as follows: Where C = Curve number and Q = Runoff, in inches, for the 50 year, 2-inch storm.

LAND USE	SOIL TYPE							
	A		B		C		D	
	C	Q	C	Q	C	Q	C	Q
Single Family	92	1.25	94	1.42	96	1.60	97	1.70
Multi Family	95	1.50	95	1.50	97	1.70	97	1.70
PUD/PBC/School	97	1.70	97	1.70	97	1.70	97	1.70
Developed Parks	19	0.01	50	0.02	65	0.12	70	0.25
Open Space or Natural Conditions	55	0.02	74	0.40	83	0.65	86	0.85

The above open space or natural undesturbed terrain assessment is made from field studies, investigating range covers and existing erosion. The range is considered to be in poor to fair condition. Considerable evidence of previous over grazing exists and several small erosion control/stock reservoirs full within the development, probably installed in an SCS program similar to the great plains reclomation programs.

It is our opinion that previous master drainage studies have incorrectly assessed the soil types and runoff parameters as discussed in detail later in this report.

III. Basin Descriptions:

A. Dry Creek Drainage Basin. The structures in this basin have been constructed to the greenbelt intersection with Rockrimmon Boulevard and the box culverts have been placed on Rockrimmon Boulevard and Dawson Drive. The remaining facilities to the outfall points on the Union Pacific tracks were approved as recommended in the R. Keith Hook report for Golden Hills Filing No. 1 on April 20, 1971.

We, therefore, consider the major engineering in this basin to the complete although future drainage reports will be provided as the platting requires. These will not require modification to the greenbelt designs.

B. Rockrimmon North Drainage Basin: This basin has been extensively modified from the original master drainage plan, a 52 acre reservoir being proposed near where the golf course was originally planned. This is the primary item requiring action by the drainage board.

We have reviewed the master drainage plan by Karcich and Weber and conclude that this composite curve number for the basin was approximately 76, resulting in flows of above one-third of those calculated as described previously. Since most of the basin has a° group D soil cover this curve number would not adequately fit a range land in good conditions, much less the increased runoff from developed conditions. Our composite curve number for this basin is 95.

Only a small portion of the basin lies above the development. The first hydrograph point analyzed is point Number 1, Figure 1 in the appendix, having a peak runoff of 146.4 CFS. This is near point 4Aa in the master study, showing a runoff of 107 CFS. Subsequent hydrographs are developed along the North fork of the basin until hydrograph Point 3 at the reservoir edge, having a peak runoff of 1035.6 CFS, compared with 348 CFS at Point 7Aa in the master plan.

The South fork of the basin originates well without the development. Inflows to the basin are shown on Plate 2. Hydrograph Point 4 was calculated at the development boundary on the assumption of full residential development within the basin. The resulting inflow is computed as 225.4 CFS. A hydrograph at Point 5, the termination of the South fork at the reservoir, was computed as having a peak runoff of 432.0 CFS; compared with like Point 2Ae in the master study with a runoff of 130 CFS.

Hydrograph Point 7 was computed at the dam location. Figure 6 shows the 50 year inflow to peak at 1846.1 CFS. The reservoir is assumed to be full at the design storm. As previously stated, the 100 year storm was utilized to size drainage facilities below the major spillway. The inflow to the reservoir is shown on Figure 7 to peak at 3631.5 CFS.

The source of water for the dam will be the abandoned Pikeview mine which underlies the development outside the dam limits. A well into the mine was tested for 16 hours a day for two weeks at a flow of 500 gpm. A report by Woodward, Clyde and Sherrard estimates a sustained flow from the mine at 300 gpm for 30 to 40 years. The dam should fill within two years and will be kept full with pumping from the mine, which is non-tributory to Fountain Creek.

A plan of the dam and spillway is shown on Figure 9. The maximum section and pertinate data are shown on Figure 10.

The major spillway for the dam is sized for the 'maximum probable' storm, computed by the Bureau of Reclamation modified SCS Method. A hydrograph of the inflow to the reservoir is shown on Figure 8, which peaks at 11,477 CFS. The spillway capacity chart, Figure 11, was computed utilizing water surface drawdown techniques.

Reservoir staging techniques were utilized to compute the flow over the major spillway for the 100 year storm. This shows on Figure 7 to peak at 2100 CFS. The drainage structure below the major spillway is sized to accomodate this flow, and will safely handle flows from water pumped into the reservoir and those caused by wave action within the reservoir.

Hydrograph Point Number 7, the outfall hydrograph from the development, was computed on several bases. Figure 12 shows the 50 year peak runoff, without the staging effects of the reservoir, to be 2053.6 CFS. This may be compared to Point 9Aa in the master study, which shows 611 CFS. Figure 13 shows the peak 50 year runoff, with staging accomplished by the reservoir, to be 1131.2 CFS. The computed hydrograph of the same point under existing, undeveloped, conditions is 1163.7 CFS. Therefore, the outflow from this basin will be less under the full proposed development than it is in the native state. This allows two major advantages to be realized.

First, the staging technique is in harmony with recent court decisions to obligate developers to the extent of damage caused downstream by increased flows due to their development.

Second, the natural drainage channels below the dam need only

minor improvements to accomodate runoff. We propose to provide velocity control structures in the way of gabions, shown on Figure 22, which will limit the velocity to an allowable four feet per second when placed at approximate 200-foot intervals. Because of the significant decrease in the cost of required facilities which are replaced by the dam, both those below the water surface and those below the dam, the cost savings in proposed facilities is requested as being acceptable as credit towards the total cost of the dam and spillway. These costs are itemized in Section IV.

C. Rockrimmon South Drainage Basin: A considerable portion of this basin lies outside the limits of the development. Inflows to the development are computed assuming full residential development within the basin.

Hydrograph Point 8, located at the development limits on the North Fork, is shown on Figure 14 to develope a peak runoff of 240.9 CFS, compared with Point 2Bb in the master study of 110 CFS. Hydrograph Point 9, just within the development on the South Fork is shown on Figure 15 to peak at 359.7 CFS, compared with point 6Ba in the master study of 158 CFS.

The greenbelt of this basin is proposed as a linear park system with a series of small dams located along it. The first of these is located at Point 9, two existing dams are located at Point 10, and two more are proposed at Points 11 and 12. The calculations performed do not consider staging which will occur through each of these facilities. Instead, the structures proposed are prepared on the basis of no reservoirs existing, as was the master basin plan. When detailed designs of the dams are prepared, full calculations will be made. At that time a request for credit toward the construction of the dams will be made on the basis of the savings in cost of drainage structures realized in their construction.

The hydrograph at Point 11 shows on Figure 17 to peak at 861.0 CFS, compared to 369 CFS in the master plan, (Point 9Ba). Point 12 (figure 18) will peak at 1099.7 CFS, compared to 478 CFS for Point 10Ba in the master plan. The computed runoff from the basin in its existing state is 724.6 CFS. Hopefully the reservoir staging techniques will hold the basin outflow to below this figure.

Our composite curve number for the basis is 92.6. From analysis of the K&W Master report, we conclude their composite curve number was 80. Since this basin lies entirely within a group D soil, it may be seen that an 80 curve represents Range Land in good condition but is not suitable for a fully developed basin.

D. Pones Bluff Drainage Basin: The area within the development is near the headwaters of the basin, shown as portions of drainage areas A1, A2, and B2 in the Master Report, totaling 54.7 acres.

The composite curve number for the development is computed as 93. The master plan shows a composite curve of 80, which would fit a range land in good condition. Since 28% of this area is in a 'B' soil and 72% is in a 'D' soil, we do not feel the master report accurately assesses the runoff from the proposed development. We have, therefore, increased the structure size accordingly.

A road with 60 foot right-of-way is shown on Plate 1 which is master planned to eventually tie into the existing Pones Bluff development road. The proposed storm sewer will follow this alignment.

E. Woodman Road: A small portion in the Northeast segment of the development has not been studied as a master basin, being the small drainage area along Woodmen Road. Most of this area has been previously designed and constructed as part of the Raven Hills Filings 1 and 2. The remainder lies in the far Northeast segment as shown on Plate number 1. This area will be provided with adequate drainage at the time of platting and does not warrant detailed investigation within this report.

F. Monument Creek: An area lying to the East of Monument Creek and West of Interstate 25 has not been previously considered in a basin study. It is anticipated that cross-lot drainage may be provided with control devices for preventing erosion on the creek banks when this area becomes platted. No major structures will be required and this area does not receive detailed studies at this point in time.

Monument Creek will be left in its natural state concerning drainage. In certain isolated areas the grading of the area to the East of the creek may create encroachment of fill into side channel areas. When detailed grading plans are prepared, these areas will be limited so as not to obstruct the flows in the creek, and the toes of encroaching fills will be protected with riprap, gabians, wire matresses, or other suitable means.

G. Other Basins: Three major inflows to the development originate East of Highway 25.

Cottonwood Creek enters with a peak flow of 4482.3 CFS. This creek will be left in its natural condition.

A minor channel just South of the Cottonwood Creek Basin and on the Northern Limits of the Pulpit Rock Basin crosses the development through an area presently zoned A-1. This inflow peaks at 154 CFS at the AT & SF Railroad tracks. It is anticipated that this channel will be lined and turned over to the City for maintenance past the limits of the existing 9.8 x 11.8 foot concrete box culvert under the interstate.

The main channel of the Pulpit Rock basin crosses the development South of an area now zoned C-6. The peak flow is 804 CFS, again at the AT & SF Railroad tracks. This flow is well contained in a 130 x 134 inch concrete culvert and a 94 x 142 inch concrete culvert under the I-25 to US 85-87 interchange. Beyond this point it is approximately 380 feet to the stream channel, and no structures are proposed.

IV. Cost Estimates:

A. Basis of Costs: The following unit costs are utilized for estimating the various facilities for which no unit cost is evident.

Item	Unit Cost
Concrete Ditch Lining	$8.00/SY
Riprap Slope Protection	5.00/SY
Concrete Toe Wall & Slab	15.00/LF
Gabian Units	60.00/LF
Structural Concrete	100.00/CY
Reinforcing Steel	0.30/Lb
Major Ditch Excavation	1.00/CY
Minor Ditch Excavation	2.00/CY

The cost estimates provided are for the primary storm drainage collection systems only. The secondary collector systems; such as storm sewers in minor streets, cross lot ditches, outfall structures, etc. can not be designed adequately prior to preparation of preliminary plats. For this reason an adjustment is made in the estimated total costs in certain areas, based on an estimated cost per acre of items which will be maintained by the City. In other areas these structures will be maintained by the home owners association and no estimate is provided; these areas being similar in terrain configuration to Golden Hills No. 1 and No. 2.

This estimated cost within the subdivision units should compare favorably with the $185.91 per acre collection system in the Windmill Gulch Master Drainage Report. In certain large blocks of development these interior structures might run as high as $570 per acre, which is what was experienced as an average in the Homestead and Vista Grande Terrace areas. Other smaller areas will average much less than that. We propose to use $200 per acre.

B. Dry Creek Drainage Basin:

Structure	Quantity	Unit Cost	Cost
Approved but not constructed items:			
16 x 4 type 3 Ditch	2520 LF	$ 25.79	$ 64990.80
Velocity Control Structures	100 LF	60.00	6000.00
Other Major Greenbelt items			
3 x 2 Type 1 Ditch	1800 LF	10.21	18378.00
Primary Collection System:			
21" RCP	80 LF	16.00	1280.00
24" RCP	240 LF	18.00	4320.00
27" RCP	650 LF	19.00	12350.00
30" RCP	710 LF	20.00	14200.00
36" RCP	330 LF	21.00	6930.00
8' Catch Basin	2 each	450.00	900.00
10' Catch Basin	6 each	600.00	3600.00
4 x 2 Type 2 Ditch	1000 LF	7.49	7490.00
4 x 3 Type 2 Ditch	1850 LF	9.68	17980.00
	Subtotal		$158418.80
	10% Engineering and Contingency:		15841.88
	TOTAL----------		$174260.68

No minor collection system items

C. Rockrimmon North Drainage Basin:

1. Proposed credit toward dam:

Structure	Quantity	Unit Cost	Cost
Without Dam:			
5 x 2 Type 2 Ditch	1300 LF	$ 8.08	$ 10504.00
8 x 4 Type 2 Ditch	910 LF	15.57	14168.70
8 x 5 Type 2 Ditch	3230 LF	18.54	59884.20
12 x 7 Type 2 Ditch	3890 LF	27.43	106702.70
12 x 8 Type 2 Ditch	450 LF	30.69	13810.50
Double 12 x 8 RCB	120 LF	276.70	33204.00
	10% Engr & Cont		$ 23827.41
	Subtotal		$262101.51
With Dam:			
Velocity Control Structure	375 LF	60.00	22500.00
4 x 4 Type 1 Ditch	430 LF	17.76	7639.96
Double 10 x 5 RCB	120 LF	210.80	25296.00
	10% Engr & Cont		$ 5543.30
	Subtotal		$ 60976.26

Savings Provided by Dam----------$201125.25

2. Total Estimated Basin Costs:

Structure	Quantity	Unit Cost	Cost
Primary Collection System:			
4 x 1.5 Type 2 Ditch	450 LF	$ 6.16	$ 2772.00
4 x 2.0 Type 2 Ditch	3950 LF	7.49	29585.50
4 x 3 Type 2 Ditch	1415 LF	10.24	14489.60
5 x 3 Type 2 Ditch	4335 LF	10.84	46991.40
6 x 3 Type 2 Ditch	1695 LF	11.46	19419.00
6 x 4 Type 2 Ditch	2020 LF	14.31	28906.20
8 x 5 Type 2 Ditch	4890 LF	18.54	90660.60
Velocity Control Structures	375 LF	60.00	22500.00
4 x 4 Type 1 Ditch	430 LF	17.76	7639.96
Double 10 x 5 RCB	120 LF	210.80	25296.00
21" RCP	300 LF	16.00	4800.00
24" RCP	120 LF	18.00	2160.00
27" RCP	80 LF	19.00	1520.00
30" RCP	320 LF	20.00	6400.00
36" RCP	80 LF	21.00	1680.00
42" RCP	200 LF	23.00	4600.00
12' Catch Basin	4 each	700.00	2800.00
4 x 2 Type 2 Ditch	600 LF	7.49	4494.00
2 x 1.5 Type 1 Ditch	1760 LF	7.75	13640.00
2 x 2 Type 1 Ditch	2090 LF	9.18	19186.20
2 x 2.5 Type 1 Ditch	1000 LF	10.73	10730.00
	Subtotal		$360270.46
Secondary Collection System:			
SF, MF, Interior Areas	459.3 Ac	200.00	91860.00
	Total		$452130.46
	10% Engr & Cont		45213.05
	Total		497343.51
	Credit for Reservoir Staging*		201125.25
	Balance		$698468.76

1972 Drainage Fees: 988 acres x $697.00----------$688,636.00

*This figure may require adjustment to $191292.49 to match the total of the drainage fees. However, as previously discussed, we feel the master report to be incorrect and, therefore, the drainage fees to be inaccurate.

D. Rockrimmon South:

Structure	Quantity	Unit Cost	Cost
Primary Collection System:			
5 x 3 Type 2 Ditch	600 LF	$ 10.84	$ 6504.00
8 x 3 Type 2 Ditch	1730 LF	12.68	21936.40
8 x 4 Type 2 Ditch	5040 LF	15.57	78472.80
10 x 5 Type 2 Ditch	500 LF	19.83	9915.00
10 x 6 Type 2 Ditch	4710 LF	22.91	107906.10
2 x 3 Type 1 Ditch	950 LF	12.21	11599.50
30" RCP	60 LF	21.00	1260.00
42" RCP	60 LF	23.00	1380.00
60" RCP	60 LF	40.00	2400.00
	Subtotal		$ 241373.80
Secondary Collection System:			
SF, MF Interior Areas	394.8 Acres	200.00	78960.00
	Total		$ 320333.80
	10% Engr & Cont		32033.38
	Total----------		$ 352367.18
1972 Drainage Fees:	464 Acres x $697.00----------		$323408.00
	8.9% Over-run		$ 28959.18

E. Popes Bluff Drainage Basin:

Item	Quantity	Unit Cost	Cost
3 x 2 Type 1 Ditch	600 LF	$ 10.21	$ 6126.00
3 x 3 Type 1 Ditch	600 LF	13.32	7992.00
SF, MF, Interior Areas	54.7 Acres	200.00	10940.00
	Subtotal		$ 25058.00
	10% Engr & Cont		2505.80
	TOTAL----------		$ 27563.80
1972 Drainage Fees 54.7 Acres x $513.00----------			$ 28061.10
	18% Under-run----------		497.30

F. Miscellaneous Areas:

Item	Quantity	Unit Cost	Cost
Woodmen Road Area:			
Interior Drainage	45.6 Acres	$ 200.00	$ 9120.00
Monument Creek Area:			
Interior Drainage	63.1 Acres	200.00	12620.00
3 x 3 Type 1 Ditch	1420 LF	13.32	18914.40
	Subtotal		$ 40654.40
	10% Engr & Cont		4065.44
	TOTAL----------		$ 44719.84
1972 Drainage Fees 108.7 Acres	@ $674.00----------		$ 73263.80
	39.0% Under-run---------		$ 28543.96

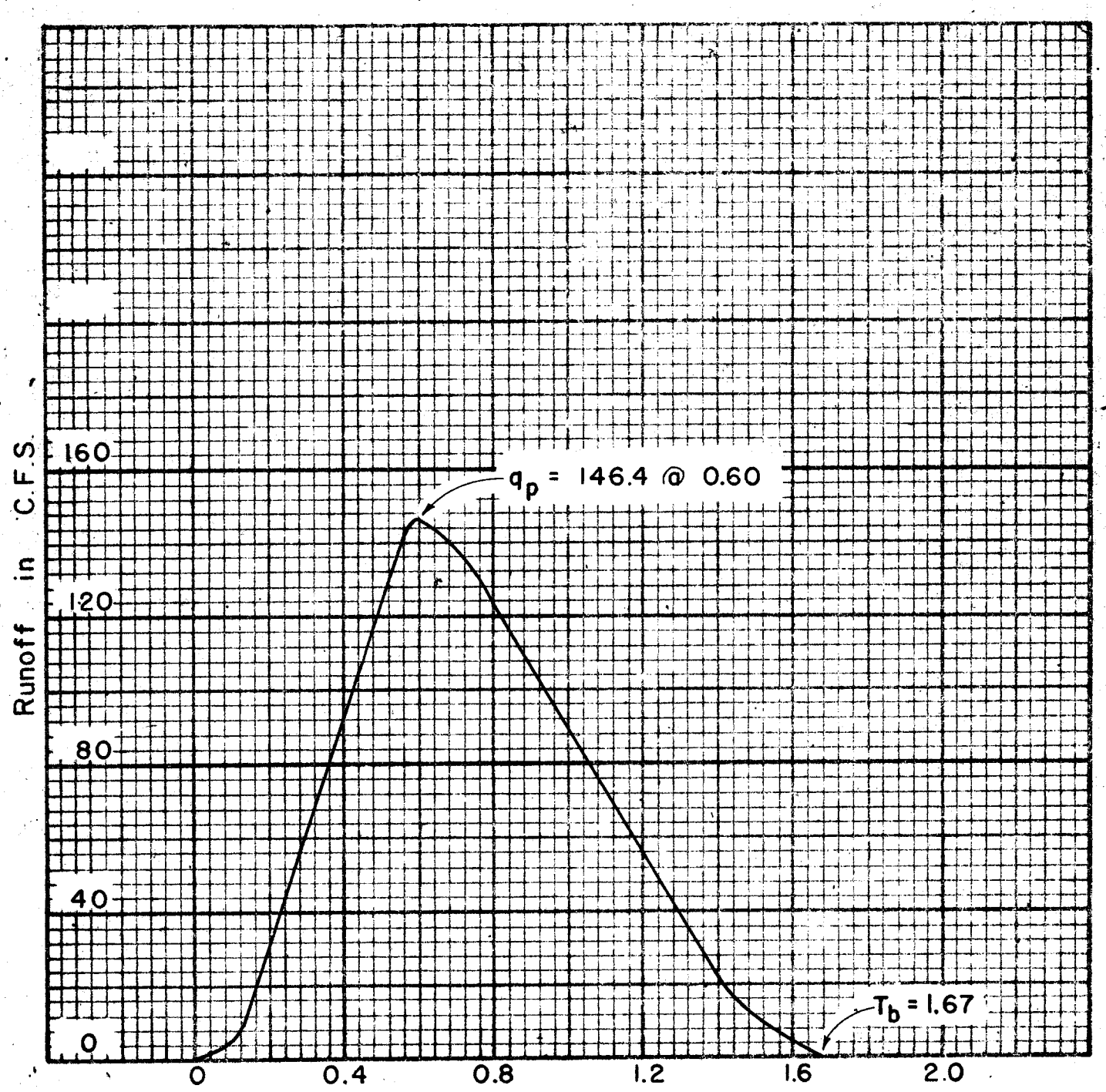
G. Cost Summary:

Basin	Total Estimate	Drainage Fees
Dry Creek	($174260.68)	N/A
Rockrimmon North	698468.76	$688636.00
Rockrimmon South	352367.18	323408.00
Popes Bluff	27563.80	28061.10
Miscellaneous	44719.84	72263.80
TOTALS	$1297380.26	$1112368.90

Net Overrun*: $28959.18
Underruns**: $28041.26

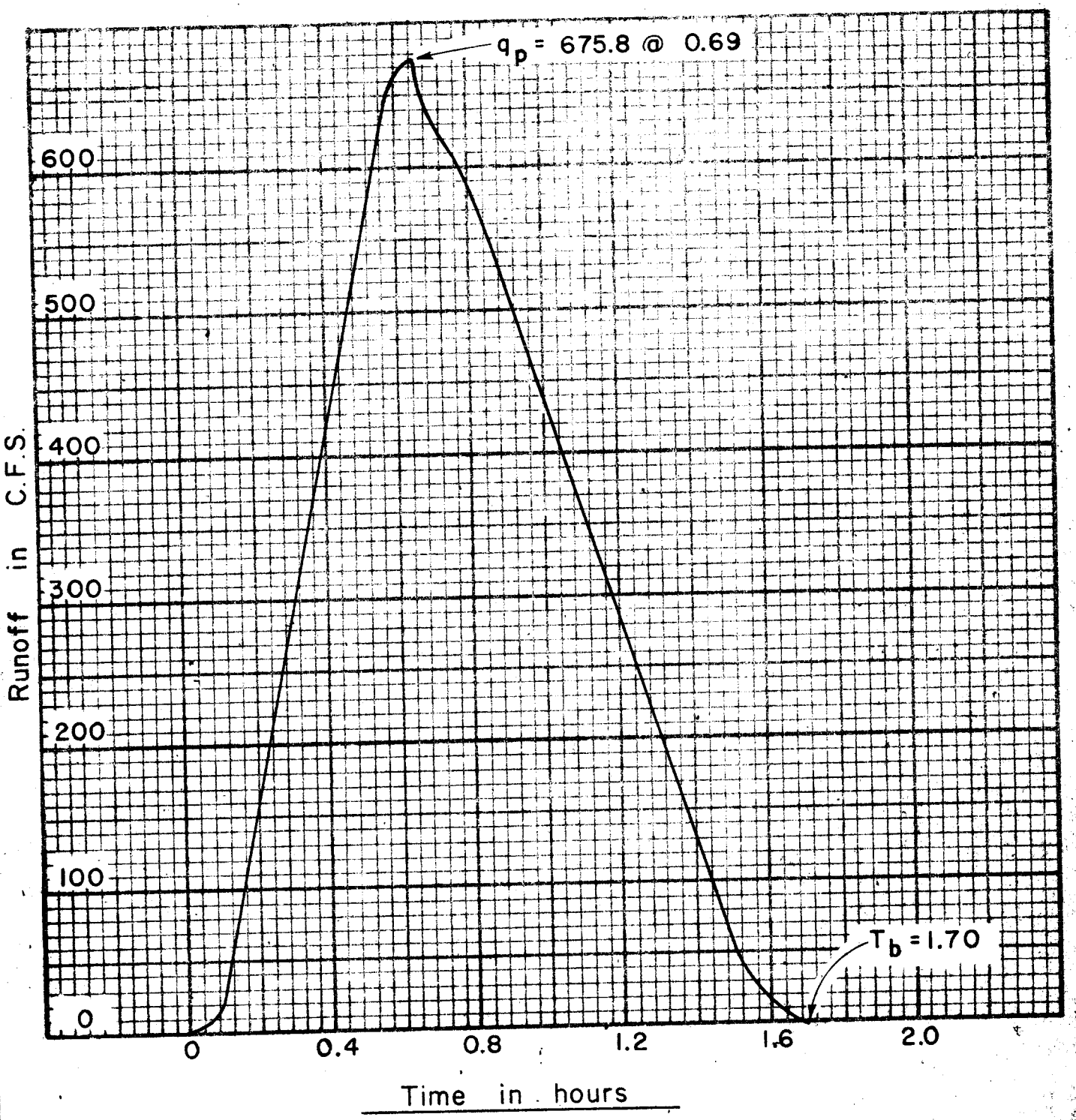
*Fees may not be transferred between basins.

**Must be put up in cash.



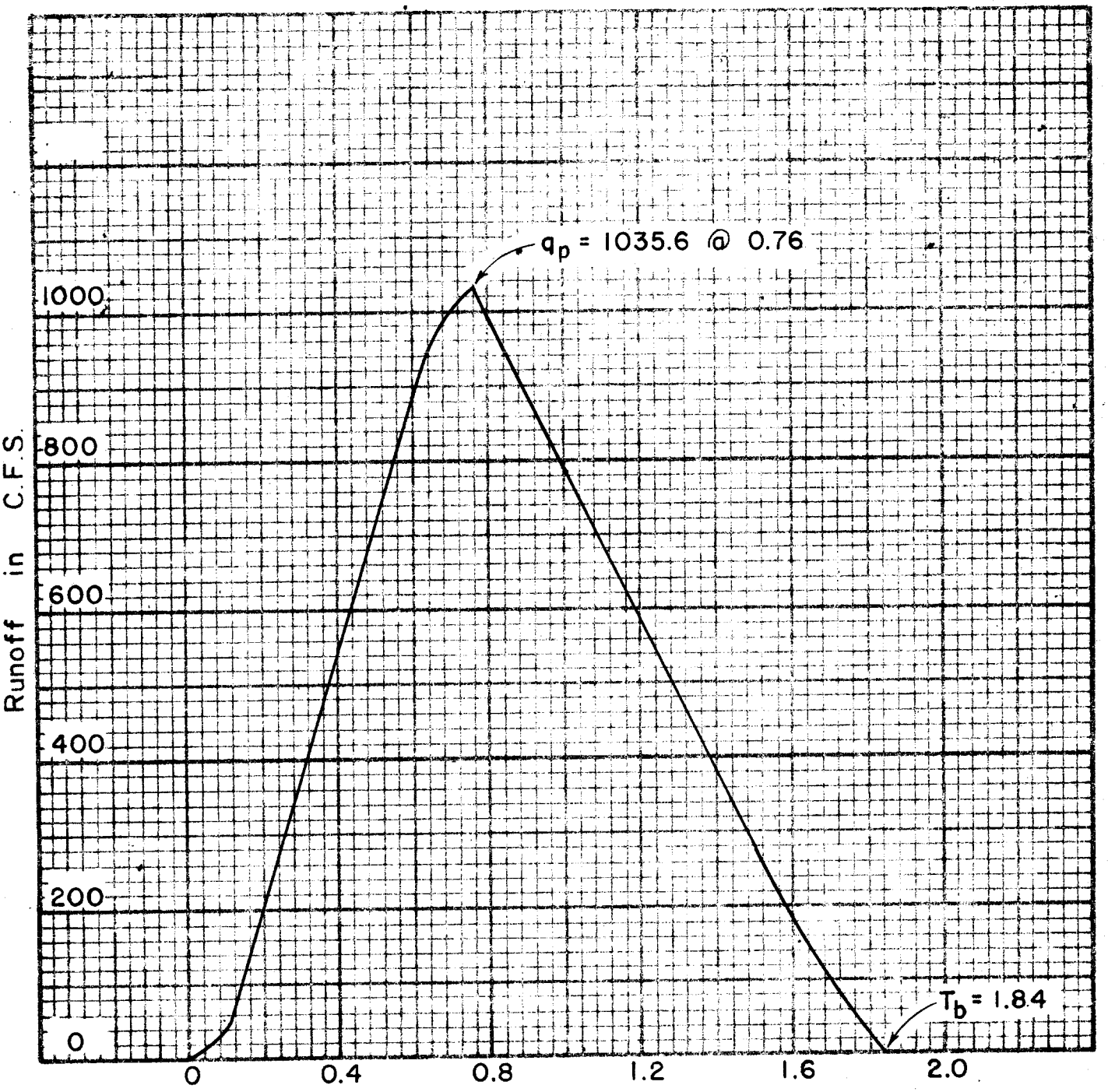
SOUTH FORK OF THE NORTH FORK OF ROCKRIMMON NORTH

ROCKRIMMON MASTER DRAINAGE POINT NUMBER 1	UNITED WESTERN ENGINEERS COLORADO SPRINGS, COLORADO	Fig. 1



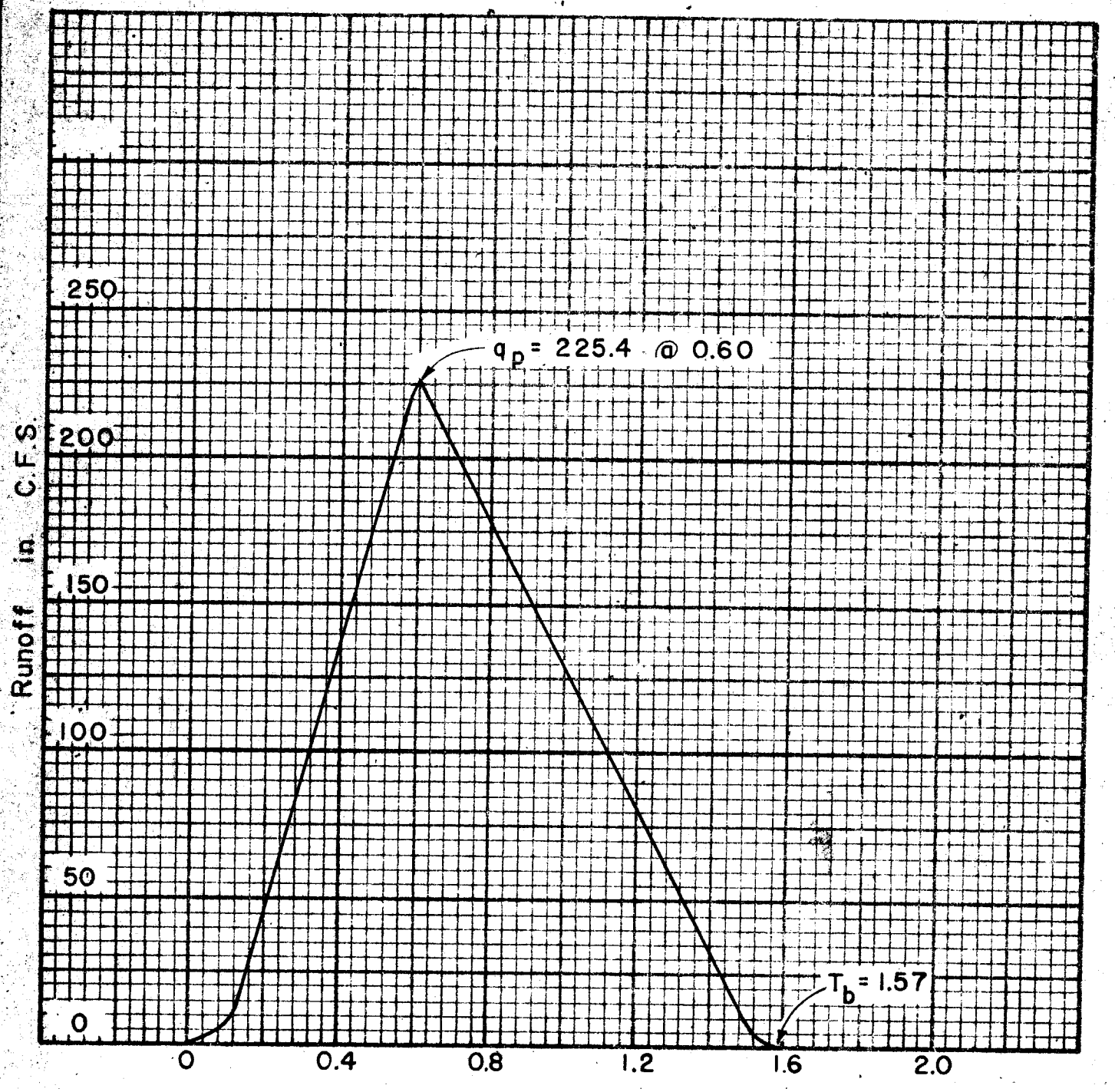
JUNCTURE OF NORTH AND SOUTH FORKS OF THE NORTH FORK OF ROCKRIMMON NORTH

ROCKRIMMON MASTER DRAINAGE POINT NUMBER 2	UNITED WESTERN ENGINEERS COLORADO SPRINGS, COLORADO	Fig. 2



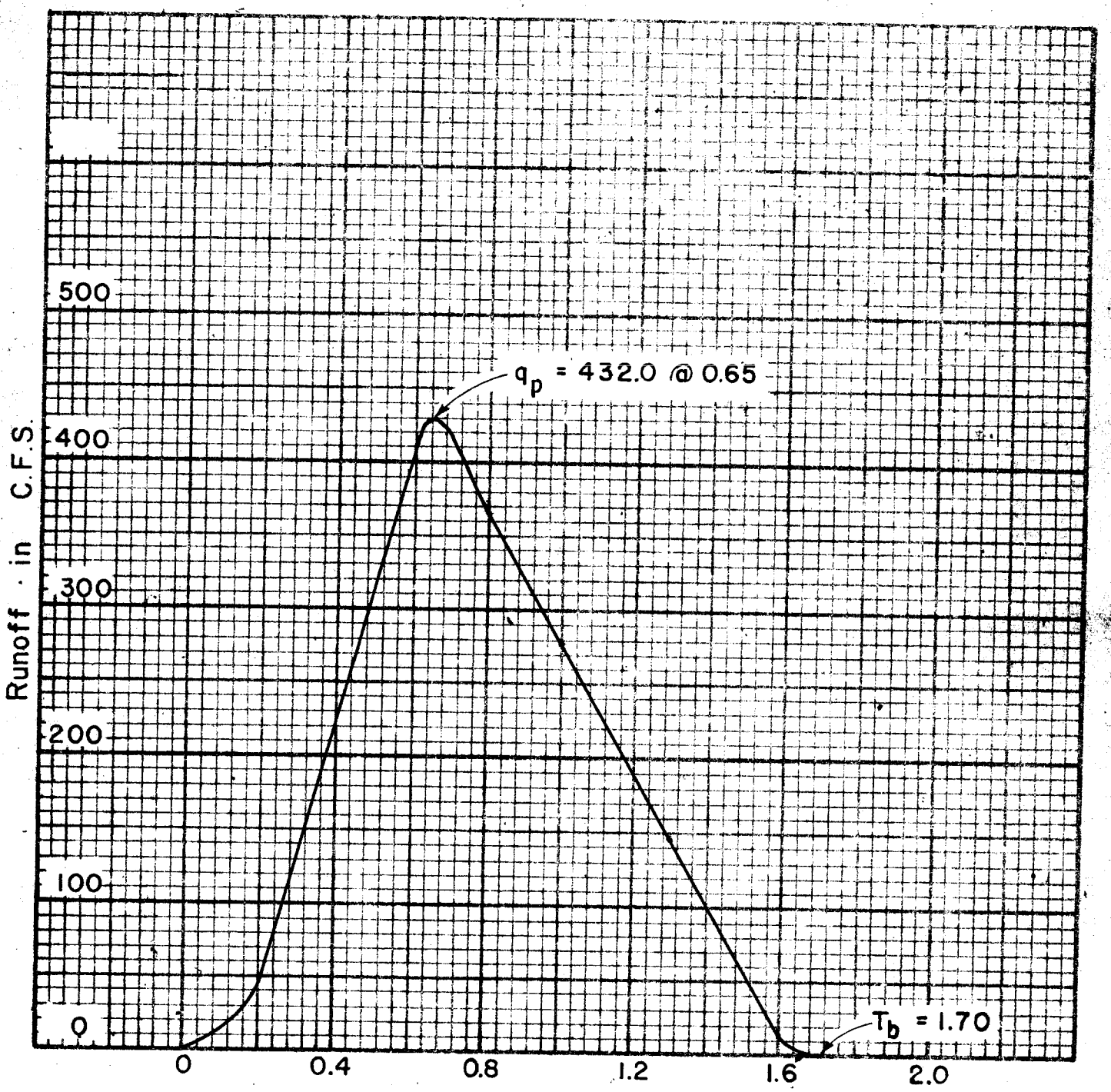
NORTH FORK OF ROCKRIMMON NORTH @ RESERVOIR LIMIT

ROCKRIMMON MASTER DRAINAGE POINT NUMBER 3	UNITED WESTERN ENGINEERS COLORADO SPRINGS, COLORADO	Fig. 3



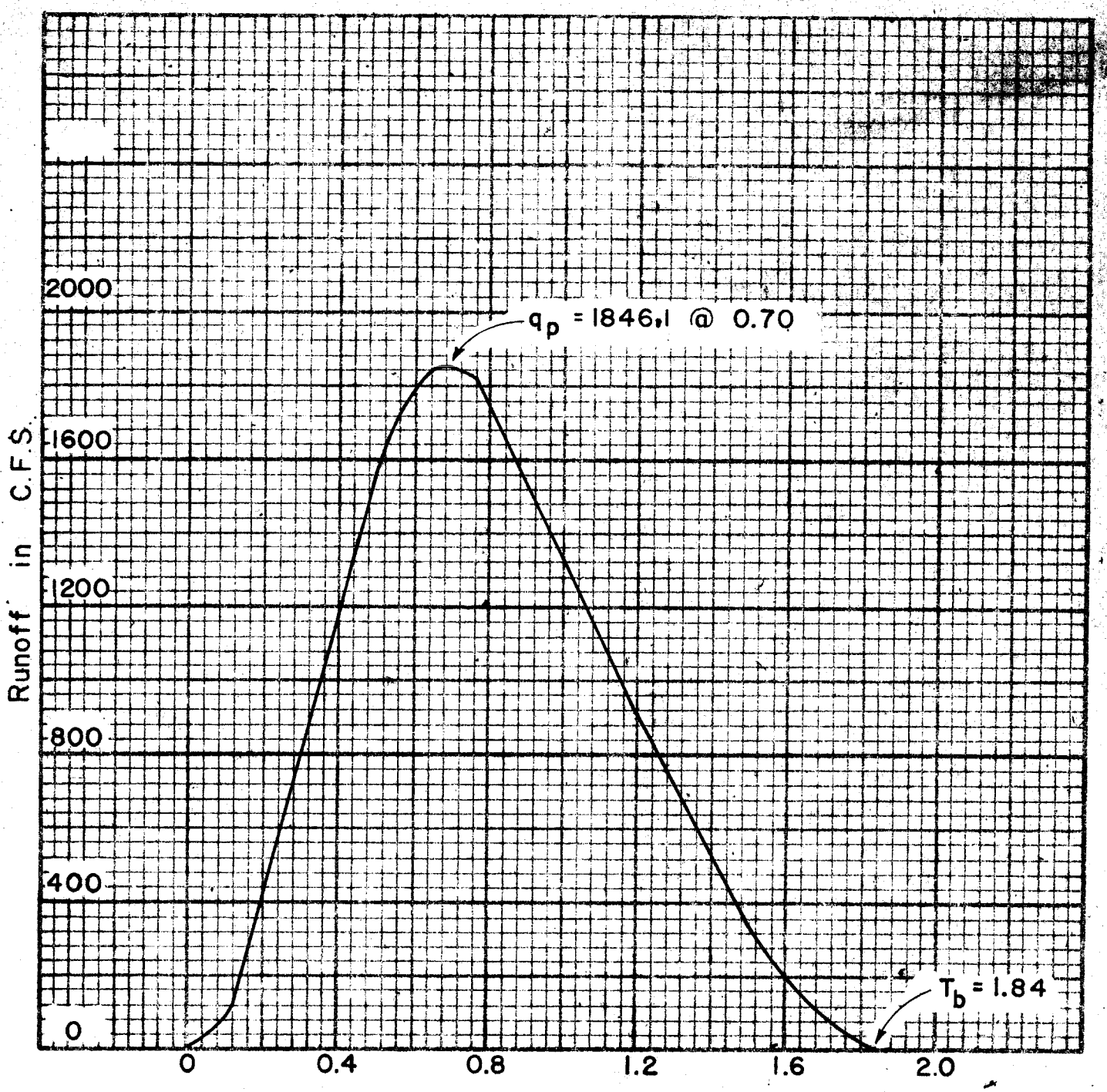
INFLOW HYDROGRAPH OF THE SOUTH FORK OF ROCKRIMMON NORTH

ROCKRIMMON MASTER DRAINAGE POINT NUMBER 4	UNITED WESTERN ENGINEERS COLORADO SPRINGS, COLORADO	Fig. 4



SOUTH FORK OF ROCKRIMMON NORTH @ RESERVOIR LIMITS

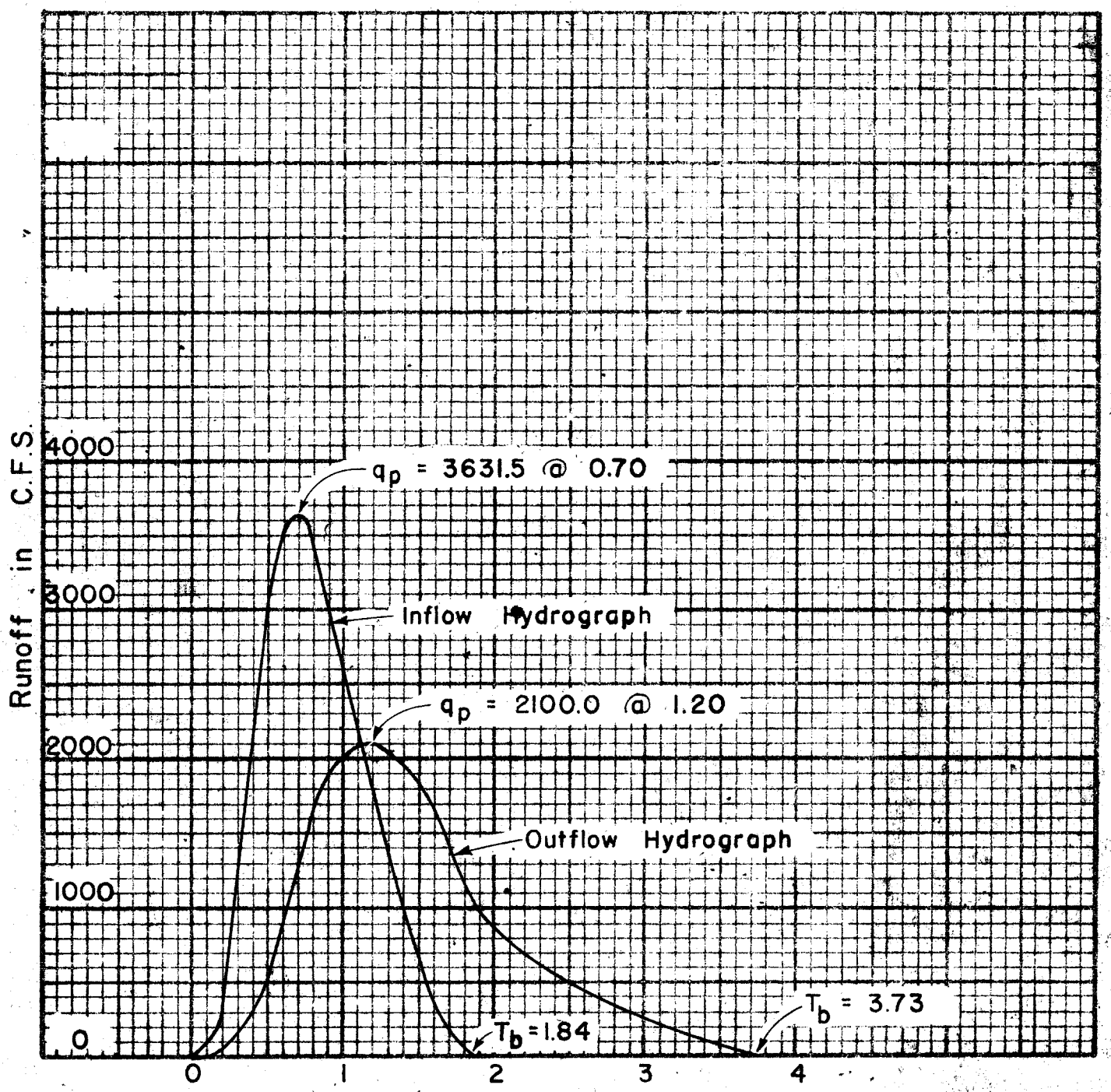
ROCKRIMMON MASTER DRAINAGE POINT NUMBER 5	UNITED WESTERN ENGINEERS COLORADO SPRINGS, COLORADO	Fig. 5



DAM INFLOW HYDROGRAPH

50 Year Storm

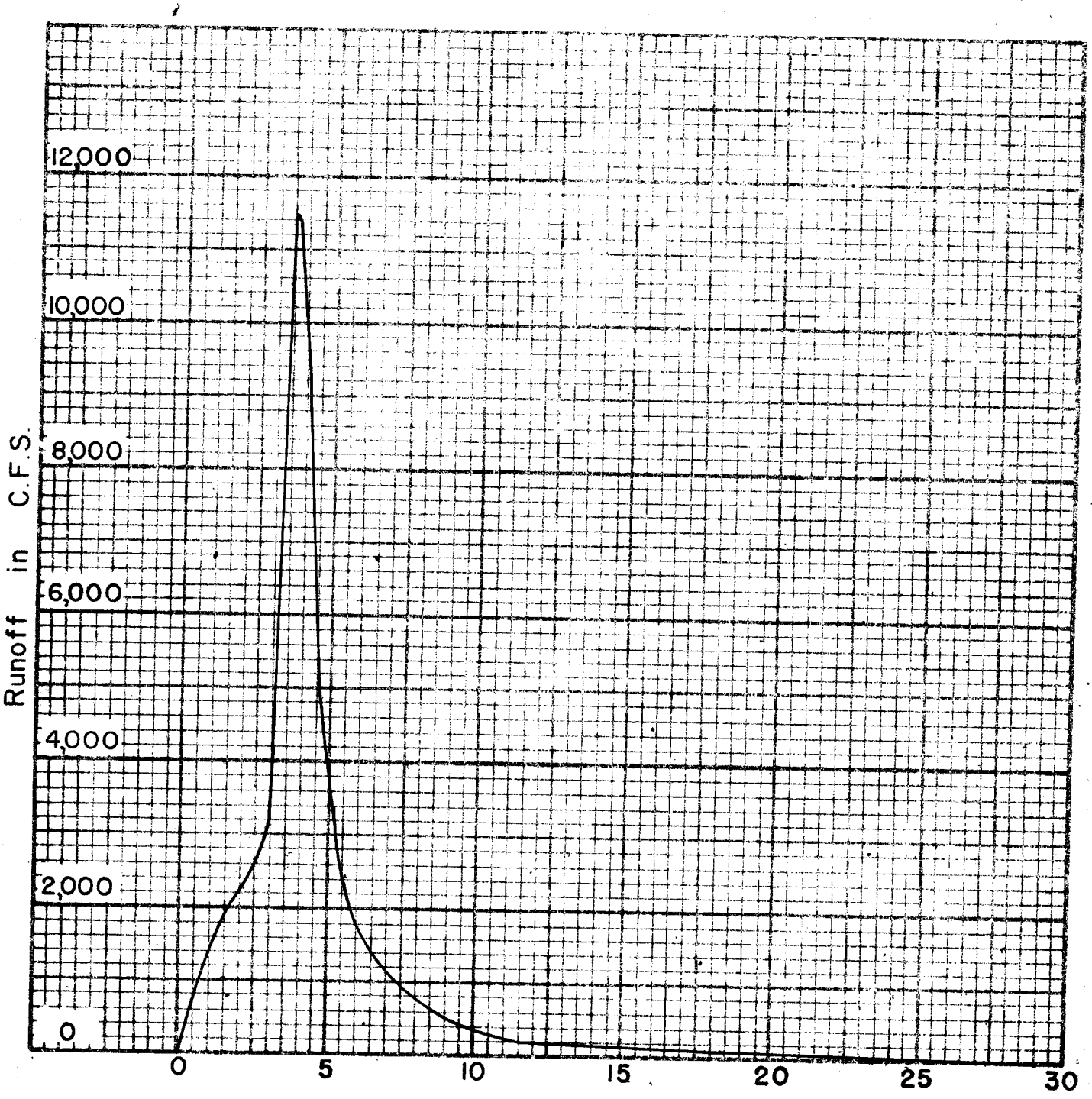
ROCKRIMMON MASTER DRAINAGE POINT NUMBER 6	UNITED WESTERN ENGINEERS COLORADO SPRINGS, COLORADO	Fig. 6



DAM HYDROGRAPHS

100 Year Storm

ROCKRIMMON MASTER DRAINAGE POINT NUMBER 6	UNITED WESTERN ENGINEERS COLORADO SPRINGS, COLORADO	Fig. 7

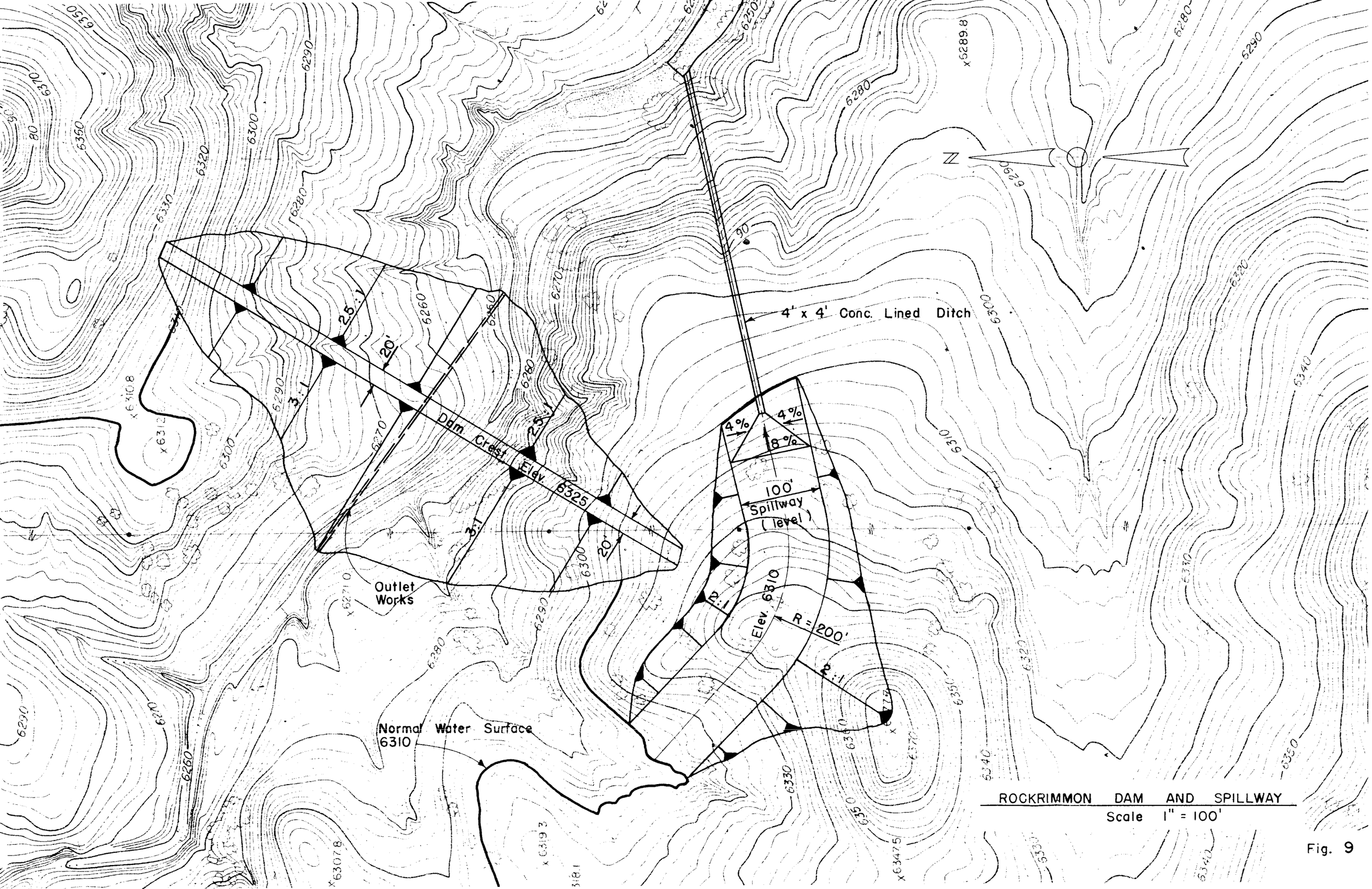


Rockrimmon Dam No. 1
Maximum Probable Flood Hydrograph

Data : Drainage Area = 1.546 S.M. = 989 Acres
6 hr., 10 S.M. precipitation = 22.8 inches
Composite Curve Number = 95.4

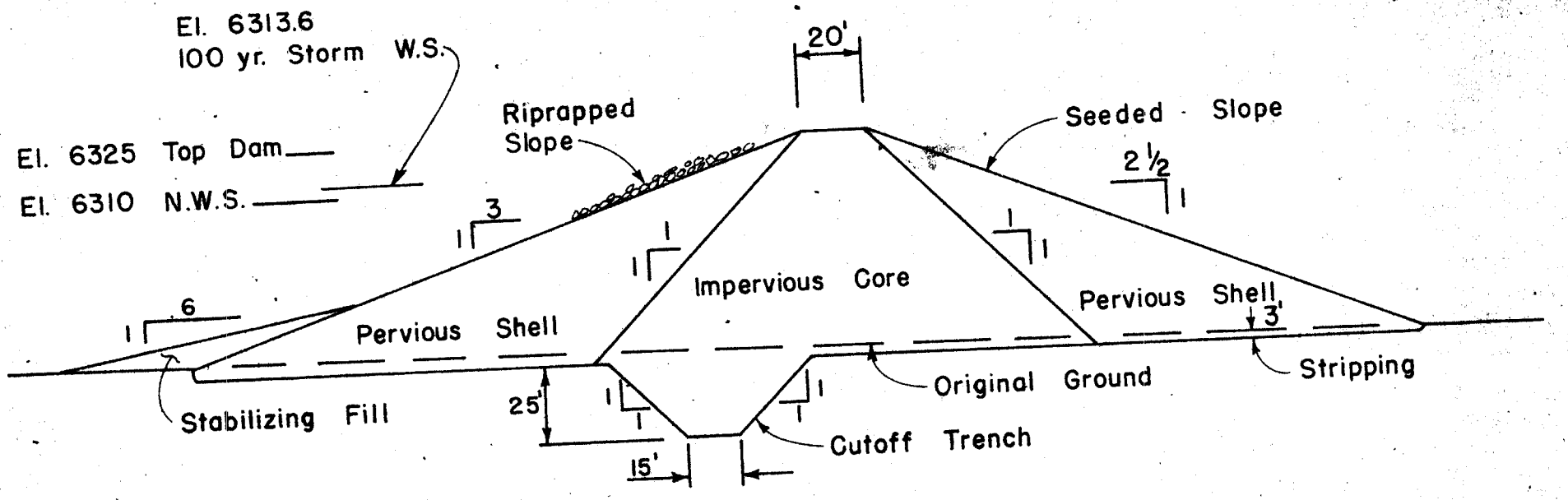
Q max = 11,477 C.F.S. @ T = 3.62 hrs.
T_b = 29.01 hrs.

ROCKRIMMON MASTER DRAINAGE POINT NUMBER 6	UNITED WESTERN ENGINEERS COLORADO SPRINGS, COLORADO	Fig. 8



ROCKRIMMON DAM AND SPILLWAY
Scale 1" = 100'

Fig. 9



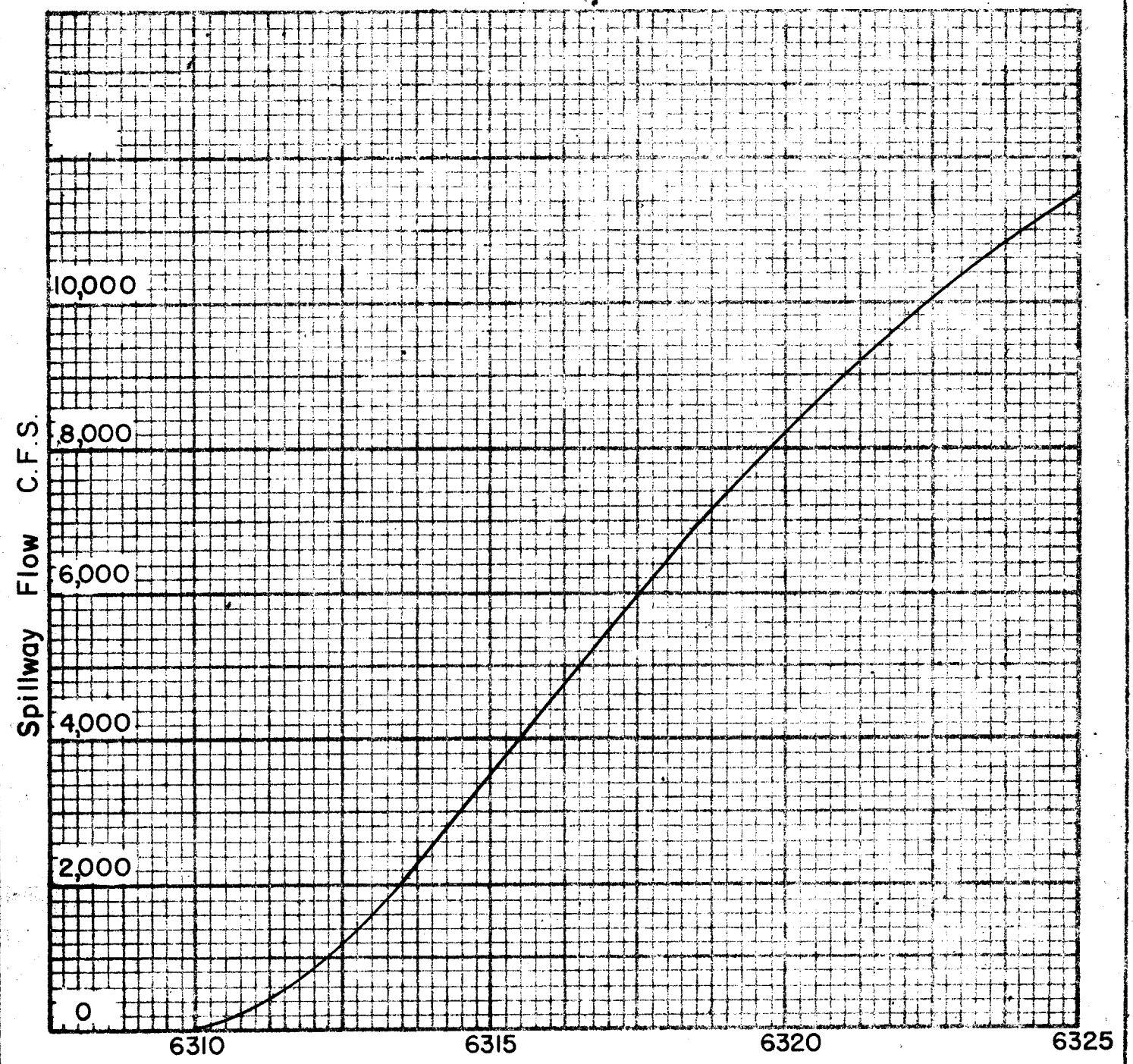
EARTHWORK - ROCKRIMMON DAM

Scale 1" = 50'

Imp. Emb. :	118,400 c.y.	Ht. of Fill a ℄ :	70'
Perv. Emb. :	79,800 c.y.	Max. Storage :	1230 A.F.
Tot. Emb. :	198,200 c.y.	Res. Area :	52.1 Ac.
Riprap :	5,605 c.y.	Shore Line :	3.06 Mi.
Seeding :	2.825 Ac.	Spillway Flood :	11,480 c.f.s.
Spillway Conc. :	459 c.y.	Drainage Area :	1.55 S.M. (990 Ac.)

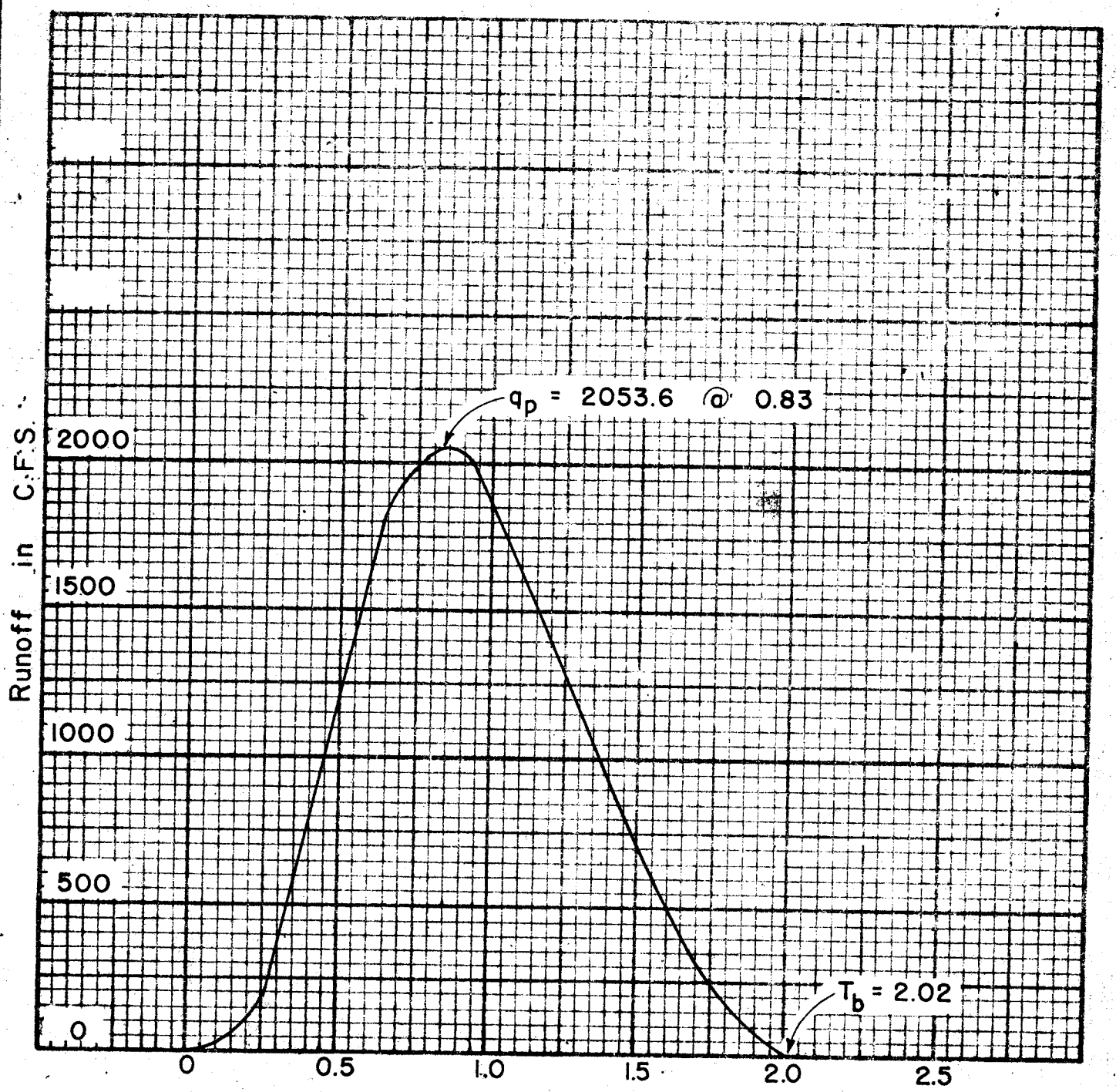
ROCKRIMMON DAM
MAXIMUM SECTION

Fig. 1C



DAM SPILLWAY CAPACITY CHART

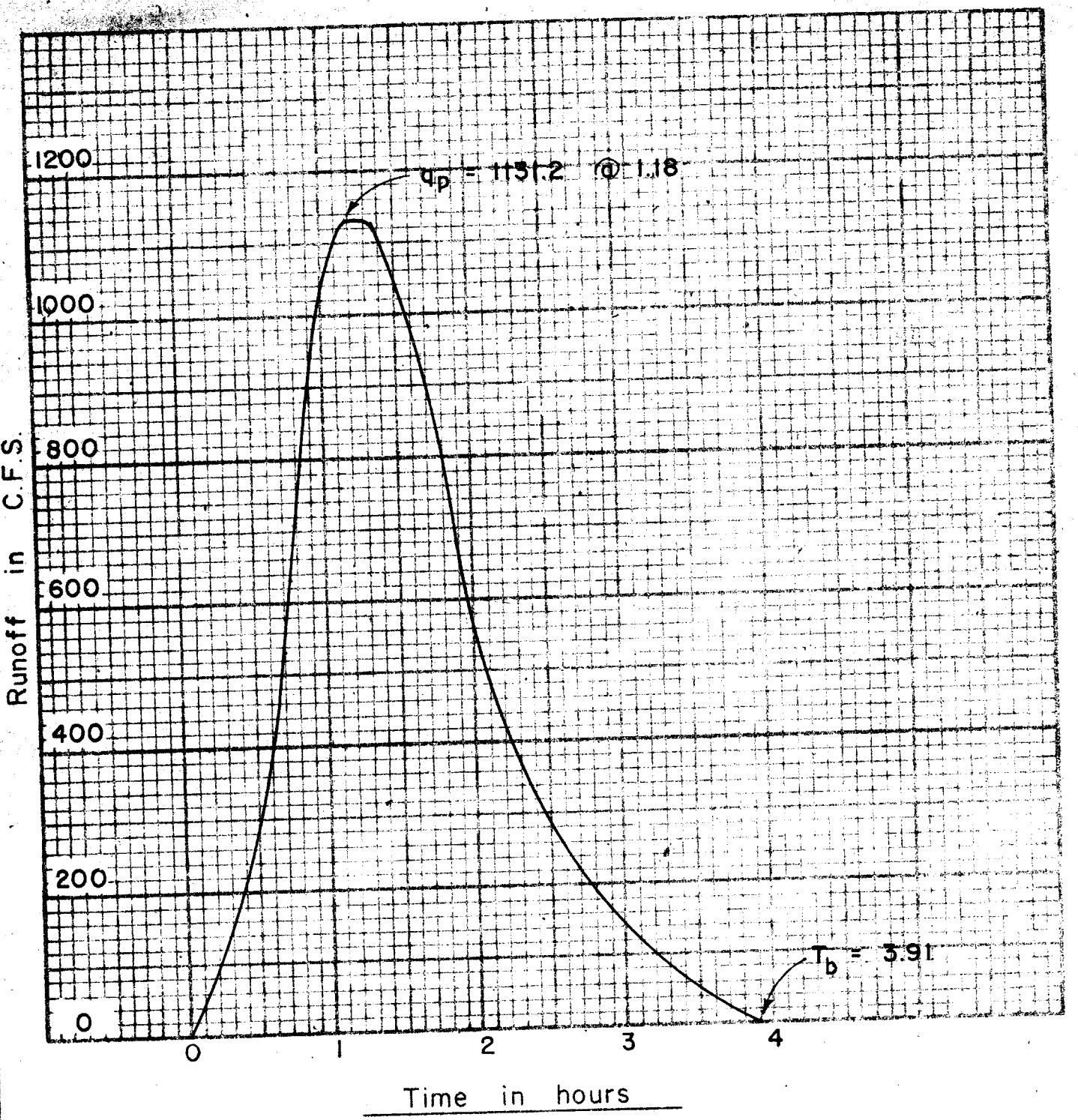
ROCKRIMMON MASTER DRAINAGE POINT NUMBER 6	UNITED WESTERN ENGINEERS COLORADO SPRINGS, COLORADO	Fig. 11.



50 Year Storm - Without Dam

OUTFLOW OF ROCKRIMMON NORTH

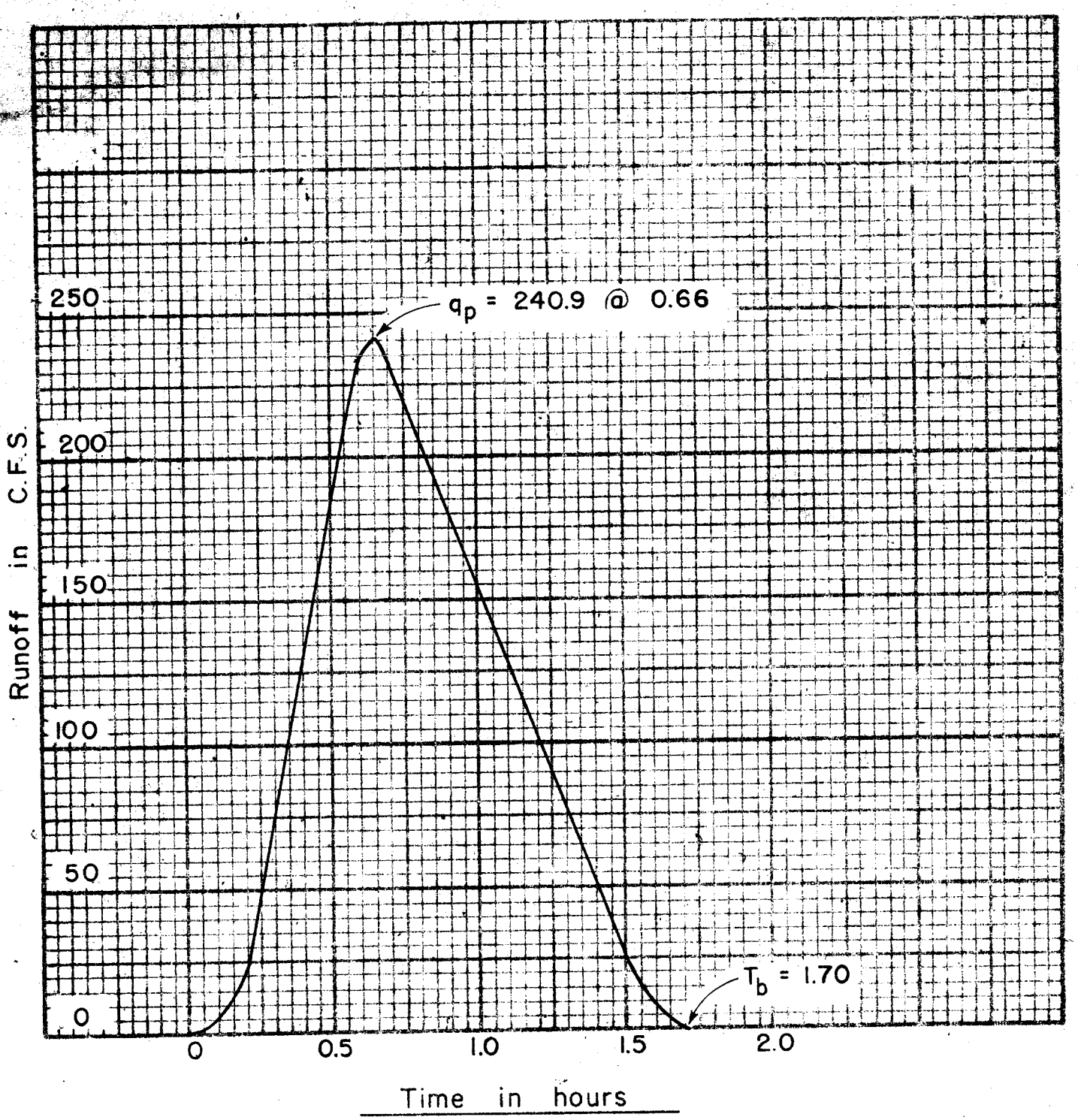
ROCKRIMMON MASTER DRAINAGE POINT NUMBER 7	UNITED WESTERN ENGINEERS COLORADO SPRINGS, COLORADO	Fig. 12



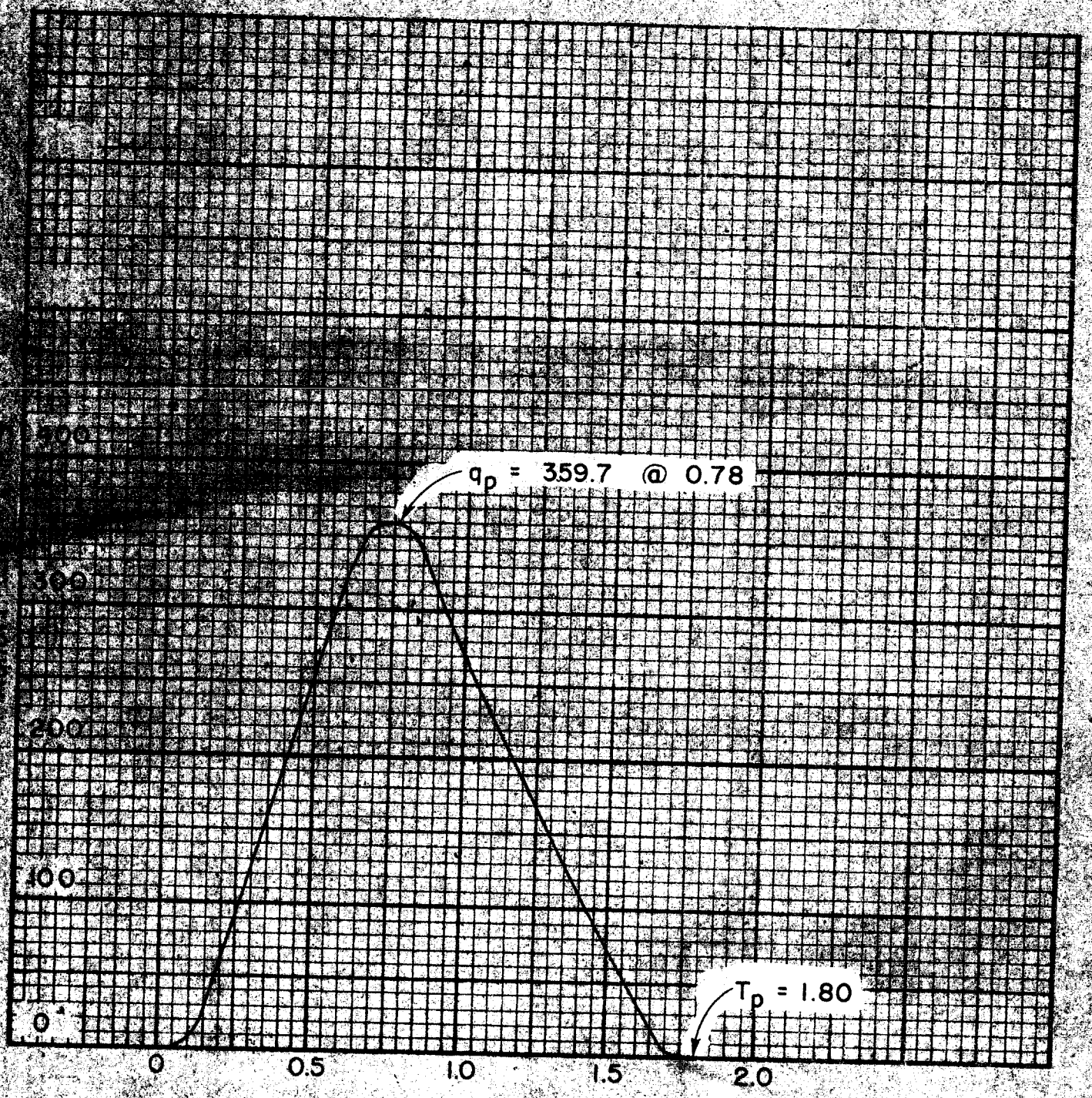
50 Year Storm - With Dam

OUTFLOW OF ROCKRIMMON NORTH

ROCKRIMMON MASTER DRAINAGE POINT NUMBER 7	UNITED WESTERN ENGINEERS COLORADO SPRINGS, COLORADO	Fig. 13



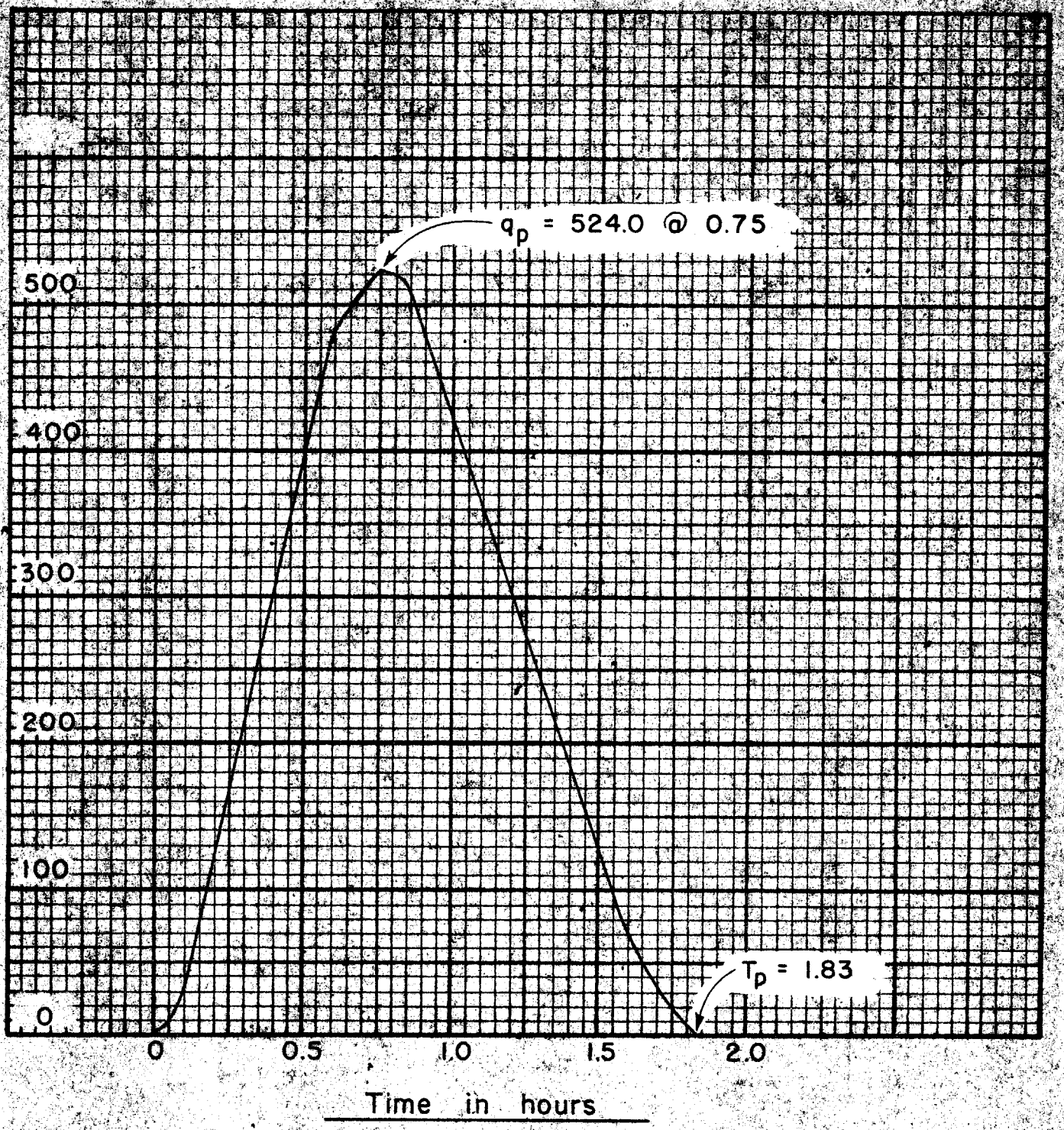
ROCKRIMMON MASTER DRAINAGE POINT NUMBER 8	UNITED WESTERN ENGINEERS COLORADO SPRINGS, COLORADO	Fig. 14



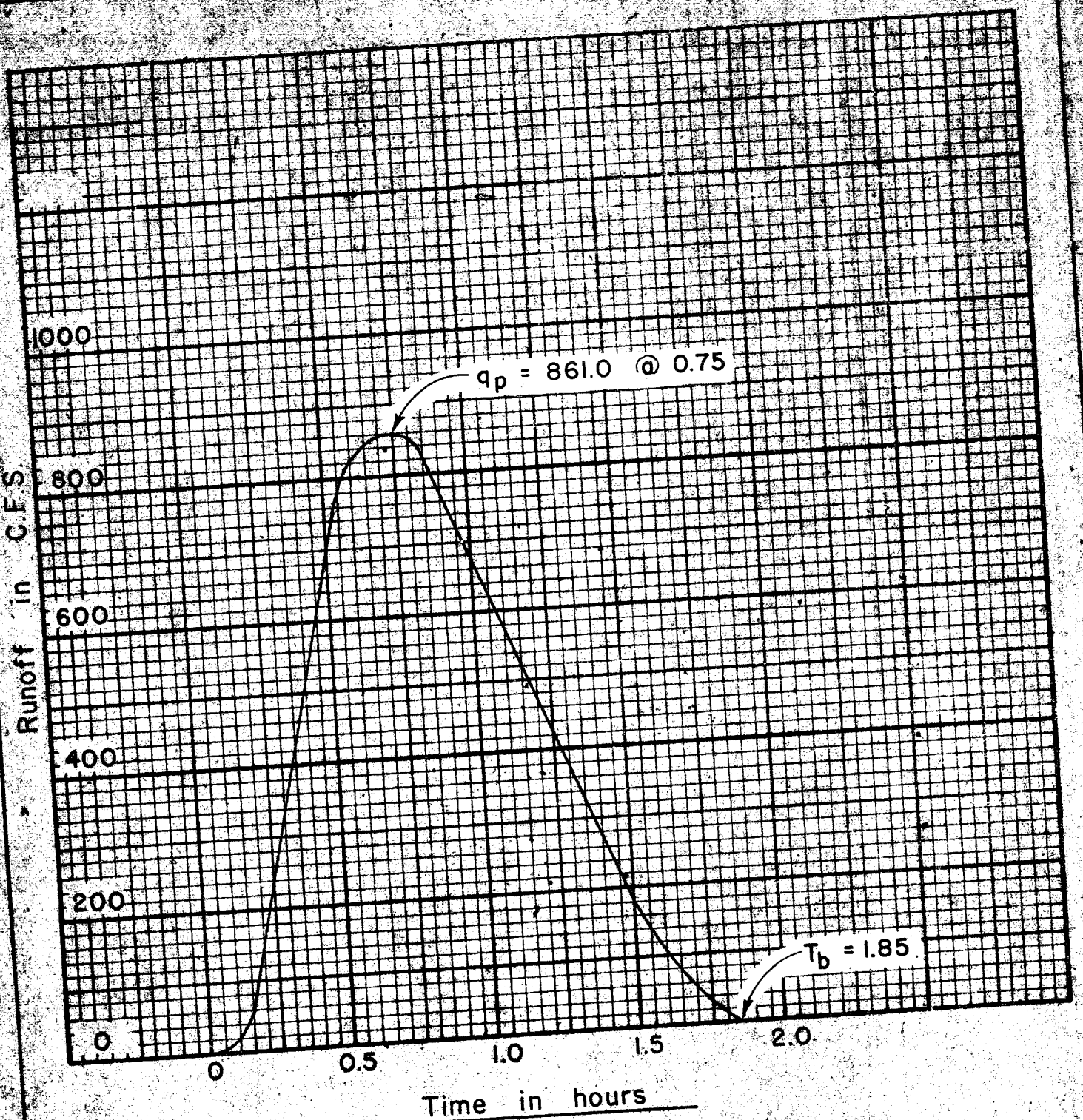
ROCKRIMMON MASTER DRAINAGE
POINT NUMBER 9

UNITED WESTERN ENGINEERS
COLORADO SPRINGS, COLORADO

Fig. 15



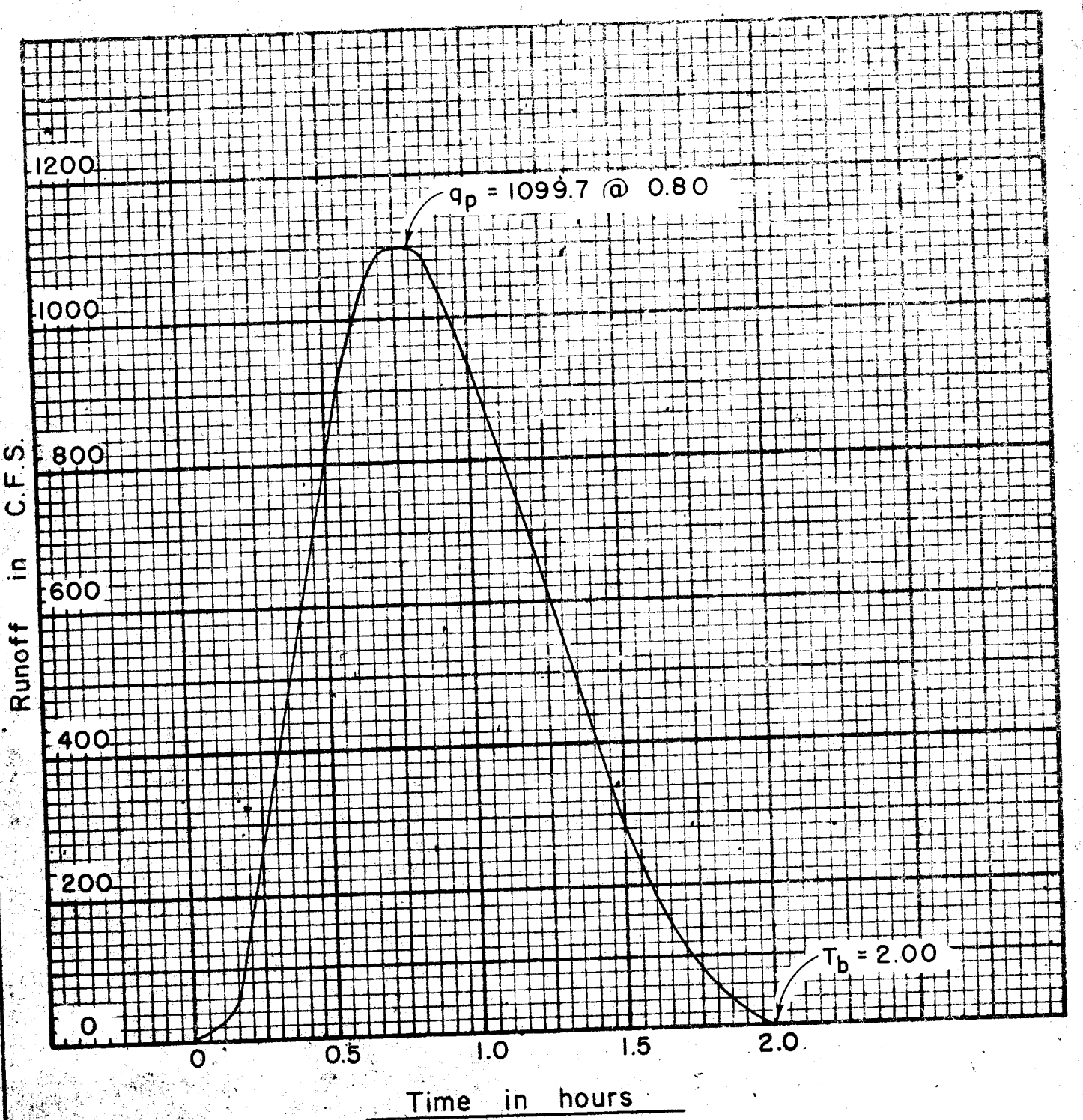
ROCKRIMMON MASTER DRAINAGE POINT NUMBER 10	UNITED WESTERN ENGINEERS COLORADO SPRINGS, COLORADO.	Fig. 16



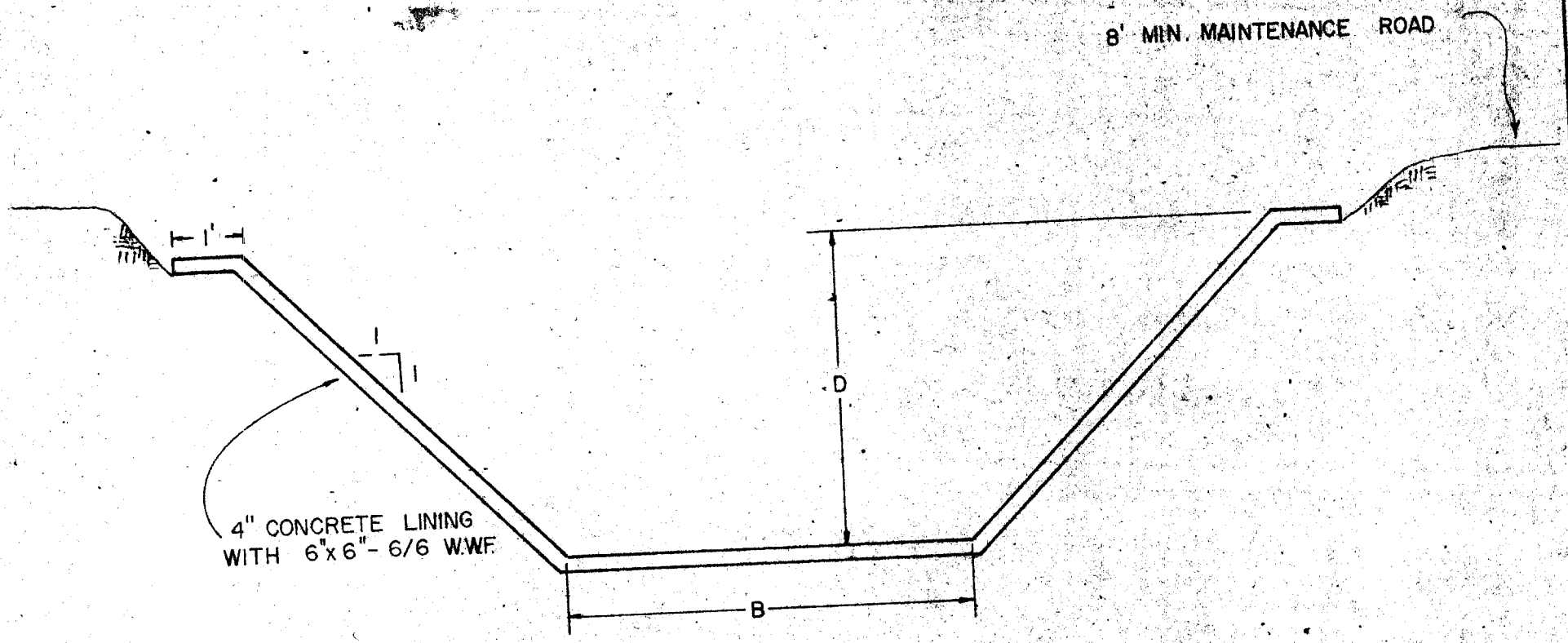
ROCKRIMMON MASTER DRAINAGE
POINT NUMBER 11

UNITED WESTERN ENGINEERS
COLORADO SPRINGS, COLORADO

Fig. 17



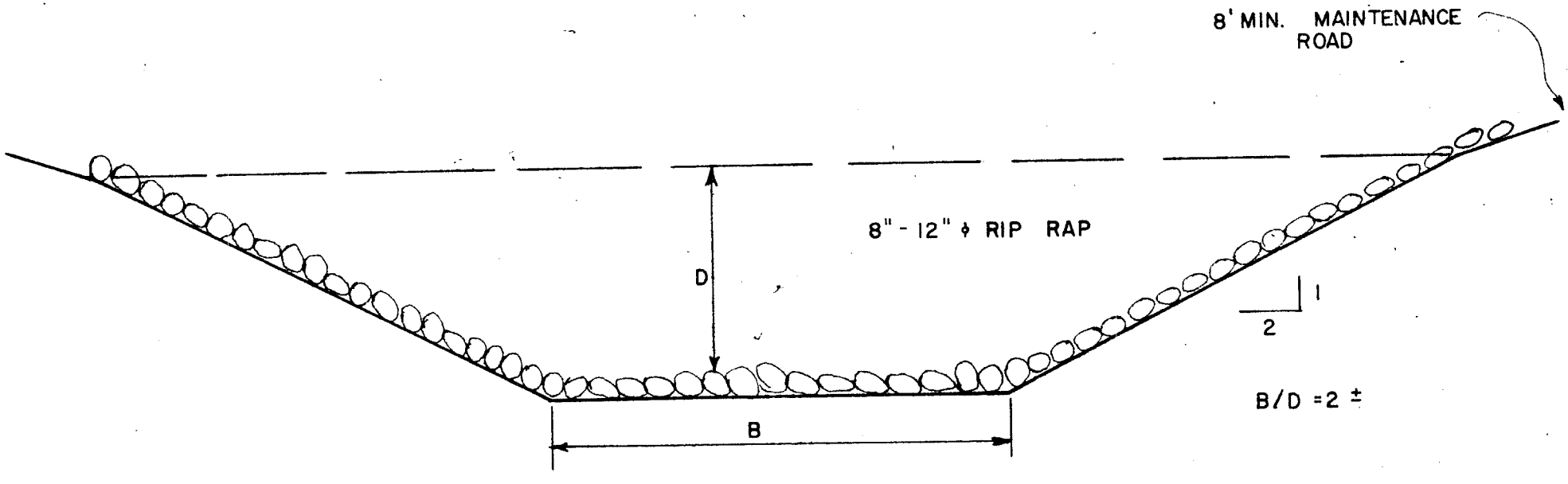
ROCKRIMMON MASTER DRAINAGE POINT NUMBER 12	UNITED WESTERN ENGINEERS COLORADO SPRINGS, COLORADO	Fig. 18



SECTION OF PROPOSED CONCRETE DITCH LINING

TYPE I DITCH

FIG. 19

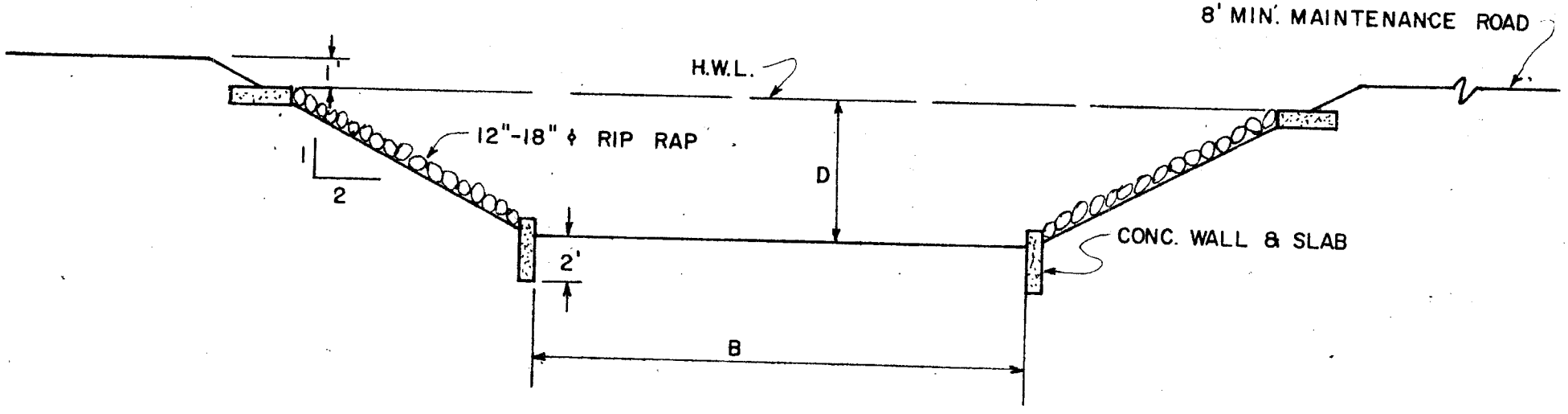


SECTION OF PROPOSED CONCRETE DITCH LINING

TYPE 2 DITCH

MAX. VELOCITY 7 F.P.S.

FIG. 20

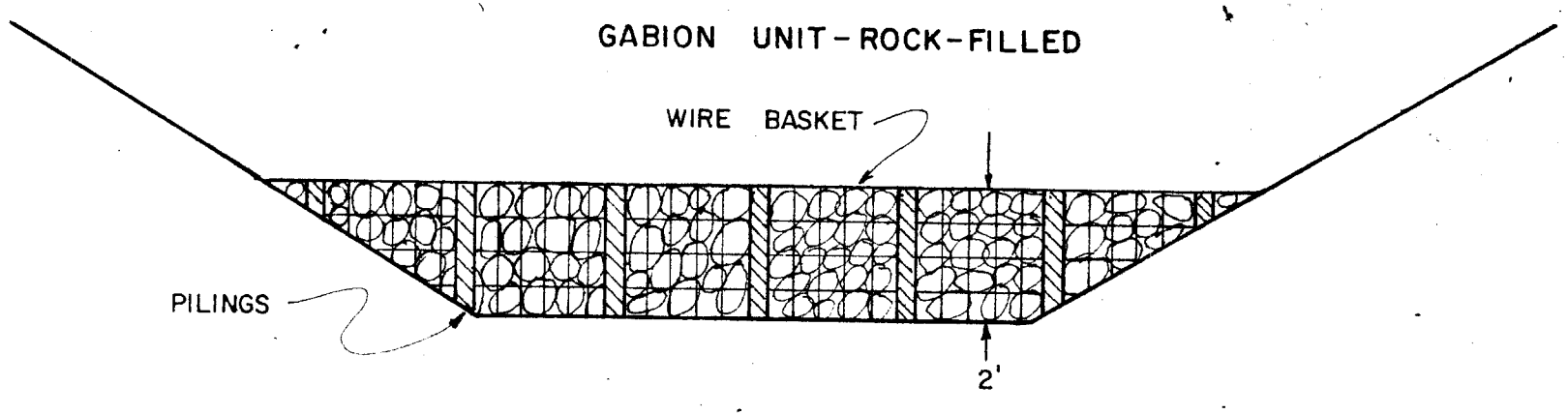


SECTION OF PROPOSED CONCRETE DITCH LINING

TYPE 3 DITCH

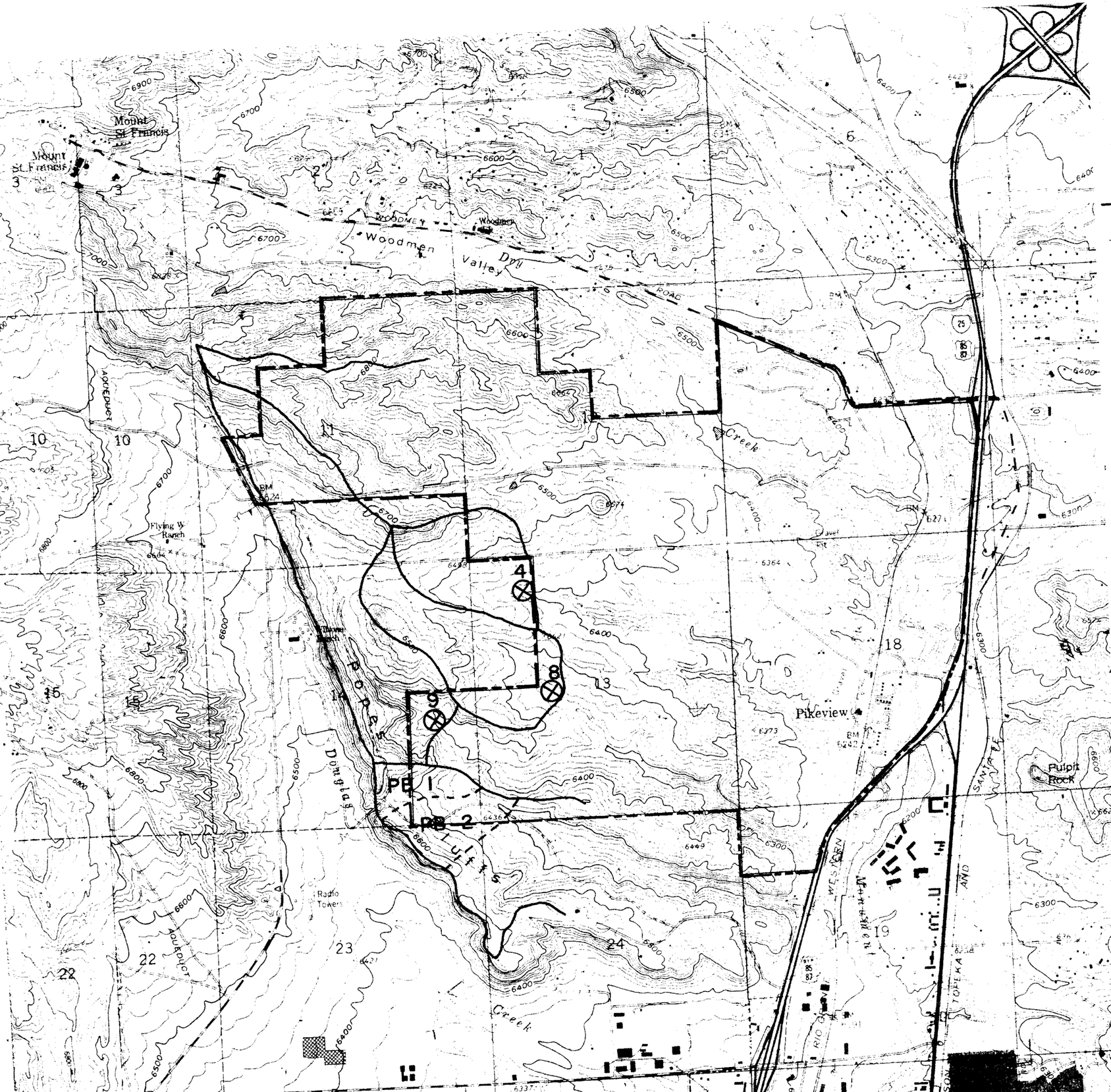
MAX. VELOCITY 4 F.P.S.

FIG. 21



VELOCITY CONTROL STRUCTURE

FIG. 22



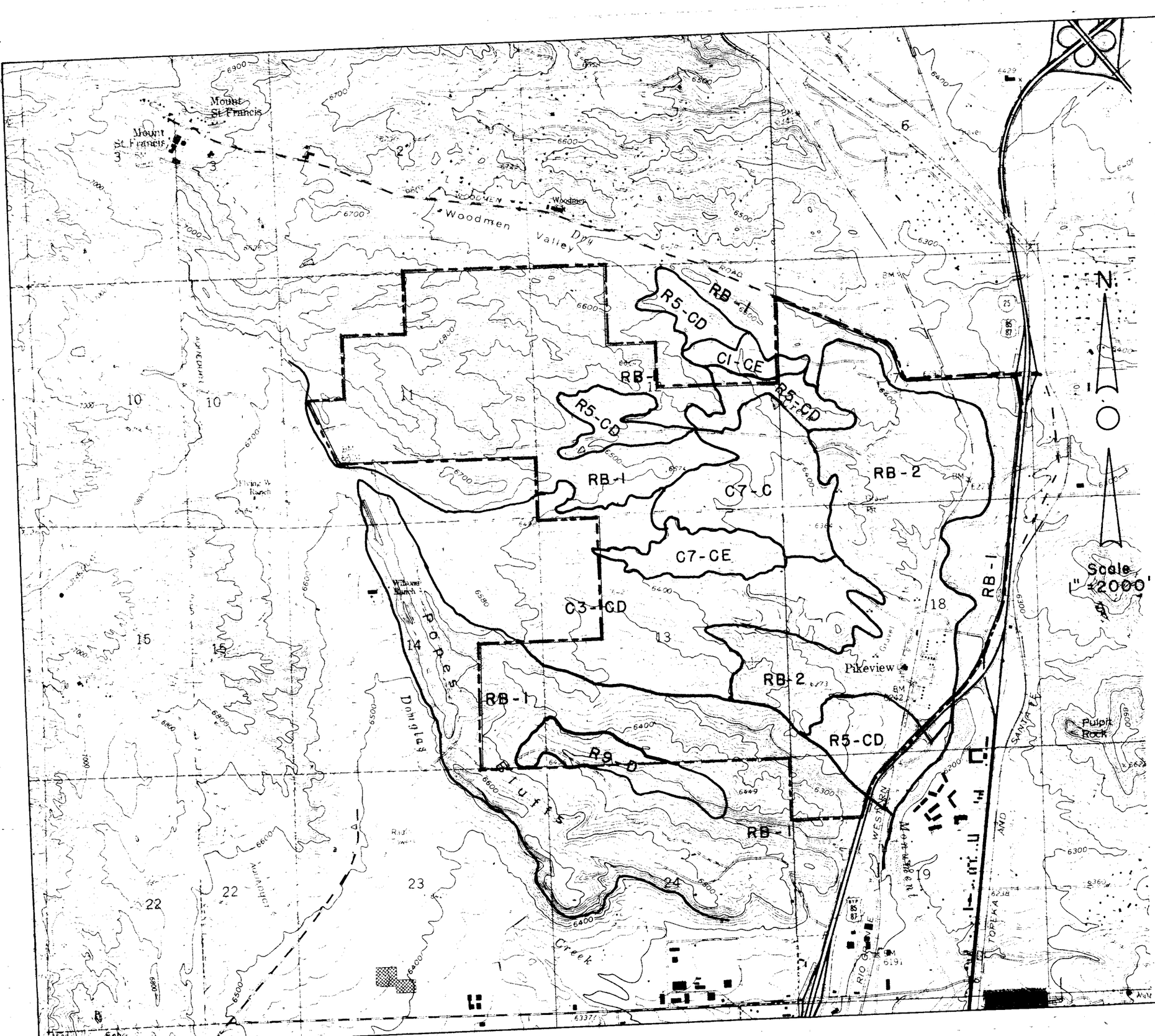
INFLOW HYDROGRAPH DRAINAGE AREAS

HYDROGRAPH POINT	DRAINAGE AREA
POINT 4	.1730 sq. mi.
POINT 5	.2276 sq. mi.
POINT 9	.4247 sq. mi.

POPES BLUFF DRAINAGE BASIN:

AREA	SQ. MI.
PB 1	.0573
PB 2	.0832

PLATE 2



ROCKRIMMON SOILS MAP

SOIL TYPES	HYDROLOGIC GROUP
CI - CE	D
C3 - CD	D
C7 - C	C
C7 - DE	C
RB - 1	D
RB - 2	D
R5 - CD	B
R5 - D	B

Plate 3

VI. Calculations

Culvert & Channel Calculations

$b^{8/3} = \frac{Qn}{0.649 \times S^{1/2}} = .0515 \frac{Q}{S^{1/2}}$

$A = b^2$

$V = Q/A$

$t = \frac{S}{v} = \frac{SA}{3600 Q}$

AREA	LOCATION & DISTANCE	ELEV & S%	S 1/2	Q50	b 8/3	b	S F AREA	USE DITCH	CULVERT ETC.	TIME HRS
I	Start Ditch 1A	6810		+18.8						
	[illegible]	3.38%	.2931	13.8	3.25	1.56	2.43	4-0 x 1-6 (12")		0
	1A	[illegible]		+21.7						
	[illegible]	[illegible]	.2327	40.5	8.97	2.28	5.19	4-0 x 2-0 (12")		.047
	1B	6693		+28.4						
	800	[illegible]%	.2179	68.9	16.30	2.85	8.12	[illegible]		.026
	1C	6660		+40.9						
	1000	4.2%	.2049	109.8	27.62	3.47	12.04	4'-0 x 3-0 (12")		.030
	1D	6618		+36.6						
	415	4.33%	.2033	146.4	36.22	3.85	14.82	4'-0 x 3-0 (12")		.011
	POINT 1	6600		146.4						Σ=.114
	270	3.33%	.1826	146.4	41.33	4.04	16.32	5'-0 x 3'-0 (12")		.008
	1F	6591		+42.3						
	350	3.71%	.1927	188.7	50.48	4.36	19.00	5'-0 x 3'-0 (10")		.009
	1E	6578		+13.5						
	410	3.23%	.196	202.2	53.18	4.44	19.71	5'-0 x 3'-0 (10")		.012
	1G	6560		+12.0						
	490	4.08%	.202	214.2	54.66	4.49	20.16	5'-0 x 3'-0 (10")		.012
	1H	6540		+62.4						
	315	4.76%	.2182	276.6	65.34	4.80	23.04	5'-0 x 3-0 (7")		.007
	1I	6525		+35.3						
	725	3.45%	.1857	311.9	86.58	5.33	28.41	6'-0 x 3'-0 (6")		.018
	1J	6500		+22.6						
	970	4.12%	.2031	334.5	84.89	5.29	27.98	6'-0 x 3'-0 (6")		.022
	Point 2	6460								
										Σ=.088 (Σ=.092)

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Project RRM DRAINAGE Page 1 of 9

Calc. by KFA date 3-13-72

Checked by ______ date ______

Culvert & Channel Calculations

$b^{8/3} = \frac{Qn}{.1679 S^{1/2}} = \frac{1.0515 Q}{S^{1/2}}$ $n = .035$

$t_c = \frac{5.A}{3600 Q}$ $A = b^2$

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AREA	LOCATION & DISTANCE	ELEV & S%	S 1/2	Q50	b 8/3	b	S F AREA	USE DITCH	CULVERT ETC.	TIME HRS
I	[illegible] IK	6650		0						
		5.58%	.2364	+54.3						
	580	6612		54.3	11.84	2.53	6.40	4'-0 x 2'-0 (12")		.022
	IM			+86.3						
	1140	4.82%	.2196	140.6	33.00	3.71	13.76	4'-0 x 2'-0 (5")		.071
	IN	6557		+50.7						
	760	4.62%	.2148	191.3	45.90	4.20	17.64	5'-0 x 3'-0 (12")		.049
	IO	6521		+10.7						
	380	5.28%	.2297	210.7	47.23	4.25	18.06	5'-0 x 3'-0 (12")		.046
	O/1X	6502		+67.6						
	900	4.67%	.2160	278.3	66.41	4.85	23.33	5'-0 x 3'-0 (7")		.081
	1X/S	6460		+68.8						
										(.124)
	T2	6460		675.8						
	530	3.18%	.1784	675.8	195.26	7.23	52.27	8'-0 x 5'-0 (18")		.019
	2/1O	6432		+46.3						
	570	3.10%	.1761	722.1	256.52	8.01	64.16	8'-0 x 5'-0 (12")		.015
	1X/1T	6419		+51.0						
	500	3.0%	.1732	773.1	230.08	7.69	59.14	8'-0 x 5'-0 (11")		.011
	IV/1U	6405		+32.0						
	550	2.72%	.1651	805.1	251.36	7.95	63.20	8'-0 x 5'-0 (12")		.012
	1II	6390		+15.2						
	550	2.72%	.1651	820.3	256.10	8.01	64.16	8'-0 x 5'-0 (12")		.012
	2C/1E	6375		+57.1						
	400	2.04%	.1429	877.4	316.10	8.67	75.17	8'-0 x 5'-0 (6")		.012
	1EE	6365		+17.5						
	340	4.41%	.210	891.9	213.66	7.56	57.15	8'-0 x 5'-0 (15")		.017
	1FF/1BB	6350		+46.3						
	660	2.27%	.1507	941.2	321.93	8.72	76.04	8'-0 x 5'-0 (6")		.015
	[illegible]	6335		+94.4						
	250	4.28%	.2070	1035.6	251.88	8.03	64.48	8'-0 x 5'-0 (17")		.007
	T3	6320								

E .109
(E .106)

Project _____ Page 2 of 2
Calc. by _____ date _____
Checked by _____ date _____

Culvert & Channel Calculations

$b^{8/3} = \frac{Qn}{0.679 S^{1/2}} = .0515\ Q/S^{1/2}$

$n = .035$

$A = b^2$

$t = \frac{SA}{3600 Q}$

AREA	LOCATION & DISTANCE	ELEV & S%	S 1/2	Q50	b 8/3	b	S F AREA	USE DITCH	CULVERT ETC.	TIME HRS
II	II A1	6500		+68.5						
	1150	5.21%	.2284	68.5	15.46	2.80	7.84	5'0×2'0(12")		.037
	II A2	6440		+136.5						
	1000	5.0%	.2236	[illegible]	47.26	4.25	18.06	5'0×3'0(12")		.025
	II C	6390		+20.4						
	—		—	225.4						
	PH 4	6390		225.4						Σ = .06[illegible]
	100	5%	.2236	225.4	51.96	4.40	19.36	5'0×5'0(10")		.002
	[illegible]	6385		+31.2						
	1100	2.72%	.1651	316.6	98.55	5.60	31.36	[illegible]×4' (4")		.030
	[illegible]	6355		+[illegible].4						
	920	3.80%	.1950	432.0	114.19	5.91	34.93	6'0×4'0(12")		.02[illegible]
	[illegible] (PH 5)	6330		432.0						[illegible]
II	II D	6400		+43.6						
	300	13%	.3651	43.6	6.16	1.98	3.92			
	II E	6360		+29.3				N/A		
	300	13%	.3651	72.9	10.29	2.40	5.76			
	[illegible] (PH 5)	6320		72.9						

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Project ____
Calc. by ____ date ____
Checked by ____ date ____

$b^{8/3} = \frac{Q}{0.679 S^{1/2}} = .0515\ Q/S^{1/2}$

$n = .035$

Culvert & Channel Calculations

$A = \frac{1}{2} z$

$z = \frac{A}{\frac{1}{2}}$

AREA	LOCATION & DISTANCE	ELEV & S%	S 1/2	Q50	b 8/3	b	S F AREA	USE DITCH	CULVERT ETC.	TIME HRS
III	IIIA1	6500		+58.0						
	1100	5.90%	.2431	58.0	12.30	2.99	6.60	4'-0 x 2'-0 (12")		.0355
	IIIA2	6435		+75.9						
	1700	4.41%	.2100	133.9	32.87	3.71	13.76	4'-0 x 3'-0 (12")		.0418
	IIIA3	6360		+107.0						
	600	3.33%	.1826	240.9	68.00	4.81	23.72	[illegible] x 7')		.0160
	PT 8	6340		240.9						
										.1133
IV	IVC1	6670		+18.2						
	1300	5.38%	.2320	18.2	4.04	1.69	3.86	4'-0 x 1'-0 (8")		.0560
	IVC2	6600		+126.4						
	2600	3.46%	.1861	144.6	40.05	3.09	15.92	5'-0 x 3'-0 (13")		.1079
	IVC3	6510		+99.9						
	1250	4.4%	.2108	244.5	59.79	4.64	21.53	5'-0 x 5'-0 (9")		.0514
	IVC4	6410		+115.1						
	1100	1.81%	.1349	359.6	137.41	6.34	40.20	8'-0 x		.0344
	PT 9	6390		359.6						
										Σ .1223

UNITED WESTERN ENGINEERS

Project _____

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Checked by _____ date _____

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Culvert & Channel Calculations

n = .035

AREA	LOCATION & DISTANCE	ELEV & S%	S 1/2	Q50	b 8/3	b	S F AREA	USE DITCH	CULVERT ETC.	TIME HRS
IV	PT. 9	6390		359.7						
	340	5.29%	.1799	359.7	103.06	5.69	32.38	8'-0 x 4'-0 (18")		.009
	DAM 2	6379		+0						
	90	2.2%	.1491	359.7	124.35	6.11	37.33	8'-0 x 4'-0 (15")		.005
	IV G	6377		+15.7						
	630	2.06%	.1424	375.4	135.89	6.31	35.82	8'-0 x 4'-0 (15")		.0178 .0152
	IV F/IV H	6363		+37.8						
	725	3.17%	.1781	413.2	119.59	6.02	31.24	8'-0 x 4'-0 (15")		.013
	IV J/IV I	6340		+36.9						
	1025	1.46%	.1209	450.1	191.90	7.18	51.55	8'-0 x 4'-0 (6")		.032
	IV K/IV L	6325		+74.0						
	450	3.33%	.1826	524.1	147.55	6.52	42.51	8'-0 x 4'-0 (12")		.023
	DAM 3/DAM 4	6320		+0						
	100	3.92%	.1982	524.1	136.30	6.32	39.94	8'-0 x 4'-0 (12")		.023
	DAM 5	6276		524.1						
III	PT. C	6340		240.9						
	150	6%	.2449	240.9	50.170	4.36	19.00	5'-0 x 3'-0 (6")		.003
	III B/III C	6331		+40.1						
	600	3.8%	.1958	281.0	74.00	5.03	25.30	8'-0 x 3'-0 (12")		.014
	III D/III E	6308		+62.4						
	560	2.32%	.1524	343.4	116.15	5.95	35.40	8'-0 x 3'-0 (6")		.016
	III F	6295		+17.0						
	570	3.33%	.1826	360.4	101.74	5.67	32.15	8'-0 x 3'-0 (6")		.014
	DAM 5	6276		360.4						

UNITED WESTERN ENGINEERS

Project

Calc. by date

Checked by date

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$b = \frac{}{.1679 S^{1/2}} = .0515\ ^{8}/_{3}$

$n = .035$

Culvert & Channel Calculations

$A = b^2$

AREA	LOCATION & DISTANCE	ELEV & S%	S 1/2	Q50	b 8/3	b	S F AREA	USE DITCH	CULVERT ETC.	TIME HRS
V	DAM 5	6276		861.0						
	300	2.3%	.1528	861.0	290.45	9.39	70.39	10'-0 x 5'-0 (12")		.007
	V A	6269		+45.1						
	460	1.3%	.1142	906.1	408.98	9.54	91.01	10'-0 x 6'-0 (12")		.013
	V B	6263		+54.5						
	400	5%	.2236	960.6	221.44	7.58	57.46	10'-0 x 5'-0 (18")		.007
	V F	6243		+16.8						
	310	1.3%	.1136	977.4	443.50	9.84	96.83	10'-0 x 6'-0 (12")		.009
	V C	6239		+22.8						
	660	1.5%	.1231	1000.2	418.82	9.63	92.74	10'-0 x 6'-0 (12")		.017
	V G	6229		+33.6						
	390	1.5%	.1240	1033.8	429.74	9.72	94.48	10'-0 x 6'-0 (12")		.010
	V D	6223		+21.3						
	810	1.5%	.1217	1055.1	446.89	9.86	97.22	10'-0 x 6'-0 (12")		.030
	V E	6211		+11.7						
	530	2%	.1414	1066.8	383.89	9.36	87.61	10'-0 x 6'-0 (18")		.007
	V J	6205		+37.9						
	960	1.3%	.1147	1099.7	494.20	10.24	104.86	10'-0 x 5'-0 (10")		.010
	DAM 6	6200								

UNITED WESTERN ENGINEERS

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Calc. by: _____ date _____

Checked by: _____ date _____

DITCHES REQD w/o DAM

Culvert & Channel Calculations

$b^{8/3} = \frac{Qn}{0.679 \times S^{1/2}} = .0515\ Q/S^{1/2}$

$n = 0.035$

$t = \frac{S}{V} = \frac{SA}{3600\ Q}$

AREA	LOCATION & DISTANCE	ELEV & S%	S 1/2	Q50	b 8/3	b	S F AREA	USE DITCH b × d (FB)	CULVERT ETC.	TIME HRS
II	PT 3	6320		1035.6						
	300	3.6%	.1897	1035.6	281.40	8.29	63.12	8'-0×5'-0 (6")		.009
	II J	6302		+19.3						
	300	3.37%	.1837	1054.9	296.00	8.45	71.40	8'-0×5'-0 (8")		.015
	II K	6275		+8.9						
	200	3.5%	.1871	1063.8	293.08	8.42	70.90	8'-0×5'-0 (8")		.011
	Pt 3a	6268		1063.8						
II	PT 5	6320		432.0						
	370	2.7%	.1644	432.0	135.45	6.31	39.82	8'-0×4'-0 (12")		.010
	II E	6310		+26.0						
	240	2.1%	.1443	458.0	163.61	6.77	45.83	8'-0×4'-0 (10")		.007
	[illegible]/II N	6305		+72.5						
	300	3.3%	.1826	530.5	149.75	6.55	42.90	8'-0×4'-0 (12")		.007
	II I	6295		+41.7						
	1730	1.6%	.1249	572.2	236.15	7.77	60.57	8'-0×5'-0 (12")		.050
	PT. 3a	6268		572.2						
II	II P/II Φ	6310		+57.1						
	270	5.55%	.2357	57.1	12.49	2.58	6.66	5'-0×2'-0		.009
	II R	6295		+14.1						
	280	1.8%	.1336	71.2	27.47	3.47	12.04	5'-0×2'-0		.013
	II M/II Q	6290		+41.0						
	750	3.33%	.1826	112.2	31.67	3.66	13.44	5'-0×2'-0		.025
	Pt 3b	6265		112.2						

FOR II [illegible] $t_c = .15$
Use L = 2570
H = [illegible] $T_{p} = .590$
$Q_p = 112.2$

Project ____
Calc. by ____ date ____
Checked by ____ date ____

DITCHES REQD w/o DAM

Culvert & Channel Calculations

$b^{8/3} = \frac{Qn}{0.679 \times S^{1/2}} = .0515$ $\Psi/S^{1/2}$

$n = .035$

$t = \frac{.5A}{3000}$

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AREA	LOCATION & DISTANCE	ELEV & S%	S 1/2	Q50	b 8/3	b	S F AREA	USE DITCH	CULVERT ETC.	TIME HRS
II	[illegible]	6268		1602.4						
	490	1.63%	.1278	1602.4	0463.0	11.33	128.37	12'-0x7'-0		0,011
	PT 5	6260		+92.7						
	0		—	1695.1						
	II Lake	6260		+117.6						
	530	1.9%	.1376	1812.7	679.05	11.54	133.17	12'-0x7'-0		.011
	II S	6250		+28.0						
	270	1.85%	.1361	1840.7	697.14	11.65	135.72	12'-0x7'-0		.006
	PT 6	6245								Σ=.017
				1846						

Project _____ Page 3 of 2

Calc. by _____ date _____

Checked by _____ date _____

DRY Creek Channel - NW Rockrimmon

Culvert & Channel Calculations

(Type I) Conc. $b^{8/3} = \frac{Q\,n}{1.5\,S^{1/2}}$

AREA	LOCATION & DISTANCE	ELEV & S%	S 1/2	Q50	b 8/3	b	S F AREA	USE DITCH	CULVERT ETC.	TIME HRS
Dry C.	Start Ditch 1800'	S=5%	.2236	68.0	2.36	1.38	3.81	3'-0x2'-0		
Pope Bluffs	Start Ditch 600	6424 3.16%	.1779	53.4	2.33	1.38	5.81	3'x2'-0		
	"B" Input 600	6405 2.83%	.1683	+104.50 157.9	7.29	2.11	8.90	3'-0x3'-0		
	RRM R	6388								

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Project: DRY Creek Page 9 of 9
Calc. by ____ date 3-__
Checked by ____ date ____

Culvert & Channel Calculations

Area Behind Dam if Dam Were Not There Riprap $b^{8/3} = \frac{Q \times 0.035}{0.079}$ $A = b^2$

AREA	LOCATION & DISTANCE	ELEV & S%	S 1/2	Q50	b 8/3	b	S F AREA	USE DITCH	CULVEPT ETC.	TIME HRS
VI main	Top Dam	6325								
	3330	2.07	0.1440	1846.1	660.8	11.42	130.42			0
	Dam	6255								
	770	1.02	0.1010	1846.1	942.2	13.09	170.09	12x7		0.023 (.059)
	VI E&K	6240								
	580	3.49	0.1859	1920.2	833.9	10.54	111.09	12x7		0.023 (.059)
	VI I&M	6220								
	550	1.81	0.1345	1984.2	760.9	12.03	144.72	12x7		0.028 (.011)
	VI H,J,L,N	6210								
	450	1.33	0.1153	2113.6	944.9	13.05	170.30	12x8		0.025 (.010) (.059)
	Point #7	6204								Σ=0.17

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Project RR Dam Drainage

Calc. by [illegible] date 3-19-72

Checked by [illegible] date [illegible]

Page 1 of 5

"MINOR STRUCTURES" - STORM SEWER

Street and Storm Sewer Calculations

STREET	LOCATION	DIST	ELEVATION & SLOPE	TOTAL RUNOFF	STREET FLOW CAPACITY	PIPE FLOW	TYPE PIPE, CATCH BASIN & SLOPE %
(Drainage only) Delmonico (80' Art)	RR Blvd			+8.2			
		500		8.2	8.2/30	0	
	CB @ DD		6386	+21.8		+30	2-10' CB w/27" CMPs (80LF)
		650	2%	30	30/30	30	30" CMP @ 2%
	CB @ GG		6373	+30	30/30	+30	2-10' CB w/27" CMPs (80LF)
		710	2.95%	60		60	36" CMP @ 3%
	CB @ Dam Inlet		6352	+20.7		+20.7	2-8' CB w/24" CMPs (80LF)
		330	3% min	80.7		80.7	36" RCP @ 3%
Close at	Green Belt @ Dam			80.7			
Delmonico (80' A.T.)	VI A Top			0			
		650		25.6	25.6/30		
	Channel Inlet			+25.6			2-10' CB w/21"
RR-N	VI J			+36.6			2-12' CB w/30" CMP (80LF)
		300'	5%	36.6			21" RCP @ 5%
	Channel						
Loop South (80' Row) (Open ditch)	IV L					Channel flow (See channel tables)	2-12' CB w/120 LF 30" RCP RR-N

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Project RM Drainage

Calc. by ______ date 3-22-72

Checked by ______ date ______

Page 1 of 2

Conc $b^3 = \frac{Q}{S^{1/2}} \cdot \frac{[illegible]}{1.33}$ $A = [illegible]b^2$

RipRap $b^{8/3} = 0.0515\ Q/S^{1/2}$ $A = b^2$

Culvert & Channel Calculations MINOR CHANNELS - 1 -

AREA	LOCATION & DISTANCE	ELEV & S%	S 1/2	Q50	b 8/3	b	S F AREA	USE DITCH	CULVERT ETC.	TIME HRS
IV D RR-S (conc 1:1)	[illegible] 950 FL	5.38%	.2320	124.0	4.15	1.71	5.85 C	2'-0×3'-0		
II D RR-N (Rip Rap 2:1)	Street 600 Lake	6400 13% 6320	.3651	72.9	10.29	2.40	5.76 R	4'-0×2'-0		
VI A-G (Rip Rap 2:1)	Delaware 1000	6328 4.3%	.2073	43.1	10.72	2.44	5.95 R	4'-0×2'-0		
C	VI F 1050	6285 3.8%	.1952	92.0	24.29	3.31	10.96 R	4'-0×3'-0		
	[illegible] 800 Mon. Creek	6245 4.4% 6210	.2092	121.8	30.01	3.59	12.89 R	4'-0×3'-0		
Mon. Cr Mon creek (Conc Ditch 1:1)	[illegible] 1420' Mon Creek	6270 3.9% 6215	.1968	175.0	6.91	2.07	8.60 C	3'-0×3'-0		
I-CC RR-N (Conc Ditch 1:1)	RRM Blvd 1000 [illegible]	6405 3% 6375	.1732	64.4	2.89	1.49	4.44 C	2'-0×2'-0		

FOR ADDITIONAL CHANNELS IN AREA VI SEE OEW CALCS

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Project [illegible] Page 2 of 2

Calc. by [illegible] date 3-2-72

Checked by ______ date ______

1"=200'

Land Use | Soil Type | Curve No %rCN

MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH LENGTH	DITCH SLOPE	N	TPO	FLOW Q	FLOW qp	Tb
I	A		.0416*	2600	200	.14	SF-50% Park 50%	D-97 D-86	92	.584	1.25	43.1	
	B		.027	1100	165	.056	SF-50% Park-50%	D-97 D-86	92	.534	1.25	30.2	
	C	17.0	.028	1200	145	.065	SF-50% Park-50%	D-97 D-86	92	.539	1.25	43.5	
	D	21.7	.031	1600	190	.080	SF-70% Park-30%	D-97 D-86	94	.548	1.42	39.0	
	E	7.7	.011	600	145	.030	SF-70% Park-30%	D-97 D-86	94	.518	1.42	14.6	
	F	21.	.031	1600	120	.10	SF	D	97	.560	1.7	45	
	G		.02	160	10	.12	SF	D	97	.572	1.7	1	
	H	5.2	.0052	2350	230	.12	80% SF 20% Park	D-97 D-86	95	.572	1.5	6.7	
	I	17.7	.025	1250	115	.075	SF	D	97	.545	1.7	38.3	
	J	13.5	.019	2000	80	.15	SF 50% Park 50%	B-97 B-97	96	.590	1.55	24.6	
	K	15.7	.022	1700	155	.095	SF-50 Park-50	97-D 86-D	92	.557	1.25	24.5	
	L	16.5	.023	1300	155	.070	20% SF Park-80%	97-D 86-D	95	.542	1.5	31.7	
	M	47.6	.068	1800	200	.090	SF-80 Park 20	97-D 86-D	95	.554	1.5	89.4	
	N	25.6	.037	1350	165	.070	SF-90 Park-10	97-D 86-D	96	.542	1.6	52.5	
	O	9.1	.013	850	75	.058	Pavement	B	97	.535	1.7	20.1	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: ROCKRIMMON MASTER DRAINAGE

By: KFA

Date: 3-7-72

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Page 4 of 8 Pages

LAND USE SOIL TYPE CH/9/10 XCN

MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	~~DITCH~~ LENGTH	~~DITCH~~ SLOPE	~~V~~	TPO	FLOW Q	FLOW qp	Tb
I	P	14.2	.0	1300	140,	.073,	SF	D	97.	.544	1.7	30.8	1.54
	Q	20.8	.0	1150	65	.085 .13	MF	B	95.578	.551	1.5	39.3	
	R	11.4	.016	1350	165	.070	SF	B	94	.542	1.42	20.7	
	S	18.0	.025	1700	70	.130	School Club SF	B B B	95	.578	1.50	32.4	
	T	18.3	.026	2150	90	.155	SF	D	97	.593	1.70	36.4	
	U	20.2	.029	1700	210	.083	SF-50 Park-50	D-97 D-86	92	.550	1.25	51.6	
	V	10.0	.013	1200	155	.065	SF	B	94	.539	1.42	18.5	
	W	[illegible]	.010	1400	[illegible]	.070	SF	B	94	.542	1.42	[illegible]	
	X	7.4	.010	1150	45	.10	SF 1.42 Park 74	B B	92	.560	1.25	11.5	
	Y	21.9	.031	1700	140	.10	SF	D	97	.560	1.70	46.1	
	Z	15.[illegible]	.02[illegible]	1150	50	.095	MF	C	97	.557	1.70	32.1	
	AA	3.7	.053	400	10	.055	MF	C	97	.533	1.70	8.2	
	BB	20.3	.0	1300	60	.10	School	C	97	.560	1.70	43.8	
	CC	15.1	.02	1000	50	.085	MF	C	97	.551	1.70	32.3	
	DD	23.9	[illegible]	1250	30	.13	MF	C	97	.578	1.70	43.7	
	EE	9.1	.01	[illegible]	45	.14	MF	C	97	.584	1.70	19.7	

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By: KFA

Date: 3-7-72

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Final Soil CH

MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH LENGTH	DITCH SLOPE	V	TPO	FLOW Q	FLOW qp	Tb
II	A1	1"=2000' 0.41	.0588										
	A2	1"=2000' 0.79	.1133										
			Σ = .1721										
	USE												
II	A1	0.41	.0588	1500	260	.066	SF/Park	D-97 D-86	(93) Use 60/40	.540	1.30	68.5	1.44
	A2	—	.073-A1 = .1142	2250	170	.125	SF/Park	D-97 D-86	(94) Use 70/30	.575	1.42	136.5	1.54

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MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH LENGTH	DITCH SLOPE	LAND USE / SOIL TYPE / C+1%xCN	V	TPO	FLOW Q	FLOW qp	Tb
I	F	11.3	.016	1950	50	.17	PORK		C	83	.602	0.65	8.5	
	G	12.2	.017	1250	80	.086	SF		C	96	.552	1.55	23.9	
	H	13.6	.019	1600	50	.14	SF		C	96	.584	1.55	25.1	
	I	8.5	.012	1500	50	.14	School		C	97	.584	1.70	17.2	
II	A	1.15 (2000' SF Road)	.5 + .173	3600	360	.16	SF				.596			
	B	46.0	.066	2000	105	.13	SF		D	97	.578	1.70	93.9	1.54
	C	10.1	.0144	1400	75	.10	SF-50% Comm-50%		D	97	.560	1.70	21.3	1.50
	K	19.9	.03	2500	170	.065	SF		D	97	.539	1.70	43.6	1.47
	L	15.4	.02	550	65	.11	SF		C	96	.566	1.55	23.5	1.51
	F	25.6	.037	1900	80	.14	SF		C	96	.584	1.55	47.2	1.56
	G	36.1	.052	2100	70	.16	SF		D	97	.596	1.70	71.5	1.53
	H	23.6	.033	1650	100	.11	SF-90% Comm-30%	C-155 C-17		96	.566	1.60	46.3	1.51
	I	25.6	.037	1600	80	.115	SF 90% Park-10%	C-155 D-080	64 8.6	96	.569	1.50	46.8	1.52
	J	13.3	.019	1600	60	.075	SF		C	96	.545	1.55	26.3	1.46
	K	11.4	.016	450	30	.035	Park		D	85	.521	0.80	12.1	1.30
	L	52 acres	.081	—	—	0	LAKE		—	100	.500	2.0	15.8	1.34

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117.6 3/15

LAND USE	SOIL TYPE	C# / %IMP

MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH LENGTH	DITCH SLOPE	V	TPO	FLOW Q	FLOW qp	Tb
II	M	1.6	.0102	350	42	.022	SF-80% P.C.-20%	D D	97/86	.513	1.50	14.3	1.37
		16.2	.023	900	100	.070	MF SF	D D	97	.542	1.70	35.3	1.45
		9.4	.013	1100	84	.075	SF	D	97	.545	1.70	20.5	1.46
	P	17.3	.02[illegible]	200	100	.090	SF MF	D D	97	.554	1.70	30.8	1.48
	Q	11.6	.017	650	120	.036	MF	D	97	.522	1.70	26.2	1.39
	R	6.2	.0088	550	85	.034	MF	D	97	.520	1.70	14.1	1.39
	S	12.3	.0176	650	110	.030	MF	D	97	0.518	1.70	28.0	1.38
III	A		.2276	5500	400	.25	SF	D	97	0.65	1.60	~~410~~ 271.2	
	B	9.6	.013	1350	75	.095	SF	D	97	.557	1.70	20.3	1.49
	C	11.8	.017	1300	85	.085	SF	D	97	.551	1.70	25.3	1.47
	D	21.5	.031	1700	130	.10	SF	D	97	.560	1.70	45.3	1.50
	E	12.6	.018	1300	100	.13	SF	D	97	.578	1.70	25.7	1.54
	F	9.2	.013	1600	130	.095	SF + School	D	97	.557	1.70	19.4	1.49

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MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH LENGTH	DITCH SLOPE	X	TPO	FLOW Q	FLOW qp	Tb
III	A1	1"=2000' 0.34	.0437	2000	200	.10	SF-70 Pvt-30	D-97 D-86	94	.560	1.42	53.3	1.50
	A2	0.54	.0775	3000	200	.165	SF-50 Pvt-50	D-97 D-86	92	.599	1.25	78.3	1.60
	A3	—	.0276+.0737 = .1013	2450	200	.130	SF-60 Pvt-30	D-97 D-86	93	.578	1.30	110.3	1.54
IV	E1(A)	—	.0214	2200	270	0.10	SF-30 Pvt-70	D-97 D-86	89	0.560	1.05	19.4	1.50
	E2	1"=2000' 0.91	.1305	3000	280	.145	SF-50 Pvt-50	D-97 D-86	92	.587	1.25	134.5	1.57
	E3	1"=2000' 0.65	.1040	3400	240	.185	SF-40 Pvt-60	D-97 D-86	90	.611	1.10	105.3	1.62
	E4	—	.0568+.0940 = .1508	2600	195	.140	SF-20 Pvt-80	D-97 D-86	88	.584	0.98	122.5	1.56

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LAND USE | SOIL TYPE | C# / %IMP

MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	~~DITCH~~ ~~LENGTH~~	~~SLOPE~~	V	TPO	FLOW Q	FLOW qp	Tb
IV.	A*		.0214	2200	270	.10	SF-30 Park-70	D-97 D-86	89	.560	1.05	13.0 ~~12.4~~	
	B	21.6	.033	1340	170	.067	SF 70% Park 30%	D 97 D 86	94	.540	1.42	39.4	
	C	13.6	.020	1400	55	.115	SF 50% Park 50%	D 97 D 86	92	.569	1.25	20.7	
	D	20.8	.030	1300	90	.085	SF	D	97	.551	1.7	44.5	
	E*		.4247*	9200	550	.40	SF	D	97	.740	1.7	~~135.8~~ ~~477.2~~	
	F	14.3	.021	1300	90	.085	SF 90% Park 10%	D 97 D 86	96	.551	1.60	28.8	1.47
	G	11.2	.016	1300	150	.070	SF-70 Park-30	D 97 D 86	94	.542	1.42	20.4	1.45
	H	11.2	.017	1300	110	.070	SF-70 Park-30	D97 D86	94	.542	1.42	20.4	1.45
		15.4	.022	1300	110	.075	SF-90 Park-10	D97 D86	96	.545	1.60	31.4	1.46
	J	8.3	.012	1250	85	.085	SF-90 Park-10	D97 D86	96	.551	1.60	16.7	1.47
	K	19.4	.028	2000	130	.125	SF-90 Park-10	D97 D86	96	.575	1.60	37.5	1.54
	L	30.8	.044	2350	160	.135	SF-90 Park-10	D97 D86	96	.581	1.60	58.9	1.55

HYDROLOGIC COMPUTATION -- BASIC DATA

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LAND USE SOIL TYPE % IMP / % SLOPE

MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH LENGTH	DITCH SLOPE	V	TPO	FLOW Q	FLOW qp	Tb
V		3.04 1"=2000'	.0046	1500	110	.095	SF/Sch-70 Park-30	D-97 D-80	94	.557	1.42	57.3	1.49
	B	0.34 1"=2000'	.048	1600	220	.077	SF-90% Park-10%	D-97 D-80	96	.546	1.60	65.2	1.46
	C	0.22 1"=2000'	.0324	2000	210	.094	MF-30% Park-70%	D-97 D-86	89	.556	1.05	28.7	1.48
	D	0.25 1"=2000'	.036	1700	150	.078	Park	D	86	.547	.85	27.0	1.46
	E	0.14 1"=2000'	.020	1300	210	.062	Park	D	86	.537	.85	14.9	1.43
	F	10.8 1"=2000'	.015	930	170	.049	SF-80% Park-20%	D-97 D-85	95	.529	1.50	21.3	1.41
	G	23.9 1"=2000'	.0334	1750	200	.086	SF-70% Park-30%	D-97 D-85	94	.552	1.42	42.7	1.47
	H	31.0 1"=2000'	.044	2450	140	.115	SF	D-97	97	.590	1.70	62.0	1.58
	I	22.0 1"=2000'	.0314	2000	130	.12	SF	D-97	97	.572	1.70	45.4	1.53
	J	2[illegible] 1"=2000'	.039	2000	190	.105	SF-50% Park-50%	97-D 86-D	92	.563	1.25	41.9	1.50
VI	A	12.5	.018	350	65	.070	SF	C	96	.542	1.60	25.6	1.45
	B	7.0	.010	325	50	.075	SF	D	97	.545	1.70	15.2	1.46
	C	7.2	.010	1000	60	.076	Park	D	70	.546	0.25	2.3	1.46
	D	9.2	.013	980	82	.11	SF	D	97	.566	1.70	19.2	1.51
→	I	19.7	.028	2300	80	.175	SF	D	97	.635	1.70	36.6	1.70

HYDROLOGIC COMPUTATION - BASIC DATA

PROJ:

By:

Date:

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LAND USE SOIL TYPE C% / % x C#

MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	~~DITCH~~ ~~LENGTH~~	~~DITCH~~ ~~SLOPE~~	V	TPO	FLOW Q	FLOW qp	Tb
XI	[illegible]	7.3	.010	1300	55	.105	SF	D	97	.563	1.70	15.3	1.50
	[illegible]	9.0	.03	1450	75	.105	Sch-60% Pub-40%	D 97 D 86	93	.563	1.30	14.4	1.50
	H	16.5	.024	1740	80	.130	Sch/PBC	D	97	.578	1.70	29.3	1.54
	I	17.4	.025	7200	150	.130	SF-70 Pub-30	D 97 D 86	94	.578	1.42	29.7	1.54
	J	17.5	.025	2100	70	.165	PBC		97	.599	1.70	34.5	1.60
		19.5	.028	2100	120	.130	MF-50% Pub-[illegible]	D 97 D 86	96	.578	1.60	37.5	1.54
	L	13.2	.026	1300	130	.075	MF/SF	D	97	.545	1.70	39.4	1.46
	[illegible]	11.8	.07	1940	160	.11	SF	D	97	.566	1.70	24.6	1.51
	N	8.7	.012	870	60	.065	MF	D	97	.539	1.70	19.0	1.44
	O	14.8	.021	1000	45	.085	PBC-90 Pub-10	D 97 D 86	96	.551	1.60	29.8	1.47
	[illegible]	20.5	.029	1250	50	.105	PBC-90 Pub-10	D 97 B-50	873 S 93	.563	1.30	32.8	1.50
	[illegible]	18.0	.026	1400	30	.15	PBC	D 97	97	.590	1.70	36.0	1.58
	XZ	13.6	0.019	1700	70	.13	PBC-90 Pub-10	D-97 B-50	93	.578	1.30	21.2	1.54
→	S	5.4	0.007	600	30	.056	SF	D	97	.534	1.70	11.9	1.43

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MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH LENGTH	DITCH SLOPE	V	TPO	FLOW Q	FLOW qp	Tb
BLUFF	A	0.90	.0573	2300	210	.12	SF-D 89	39%	90	.572	1.10	55.4	
		0.58	.0632	600	230	.13	Park-D 86	61%					
							SF-B 94	48%	95	.578	1.50	104.50	
							Park-D 97	52%					
	A2	3.94	.0226										
	B2	6.90	.0396										
	A2	4.05	.0232	600	70	.10	SF-B 94			.524	1.42	30.4	
		Σ=	0.0854 = 54.65 Ac. (ERR in Pages Bluff Basin)										
	A1	(A-A2)	.0541										
	B1	(B-B2)	.043										

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VII. References:

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