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DRY CREEK

DRAINAGE STUDY

for

**COLORADO SPRINGS
COLORADO**

NOVEMBER 1968

**R. KEITH HOOK & ASSOCIATES, INC.
ENGINEERS · PLANNERS · CONSULTANTS
2545 E. PLATTE AVE. COLORADO SPRINGS, COLO.**

*10/1/68
R. Keith Hook
10/1/68*

HYDROLOGIC ENGINEERING STUDY
of the
DRY CREEK
DRAINAGE BASIN

for

THE DEPARTMENT OF PUBLIC WORKS
COLORADO SPRINGS, COLORADO

November, 1966

R. Keith Hook & Associates, Inc.
Engineers-Planners-Consultants
Colorado Springs, Colorado

DRY CREEK DRAINAGE BASIN

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Existing Basin Map

Existing Basin Map with Improvements

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II. Calculations

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V. Cost Estimate

January 23, 1967

Director of Public Works
City Hall
Colorado Springs, Colorado

Dear Sir:

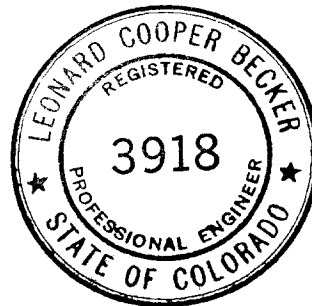
Enclosed herewith is the engineering study of Dry Creek
Drainage basin system.

This report describes precipitation run-off conditions
as affected by existing terrain and as will affect proposed
developed areas within the basin and methods of conveying
subject run off.

Very truly yours,

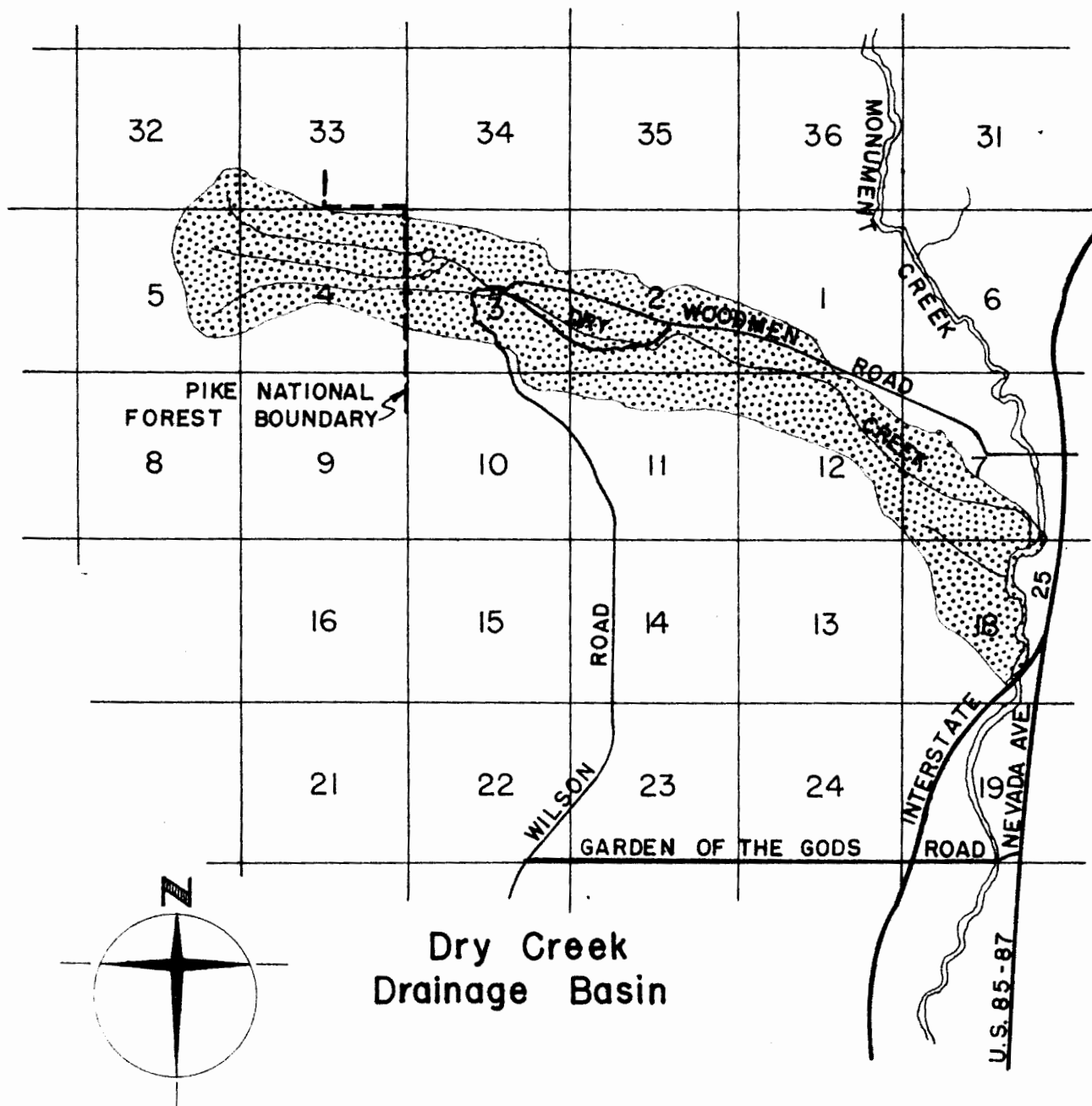
R. Keith Hook & Associates, Inc.

Leonard C Becker
Leonard C. Becker, P.E.



RANGE 67 WEST

TOWNSHIP 13 SOUTH



Dry Creek
Drainage Basin

SCALE 1" = 1 MILE

LOCATION MAP

DRAINAGE REPORT

Dry Creek Drainage Basin

I. DESCRIPTION

A. Scope and Purpose

This report establishes a drainage pattern criteria showing major and minor drainage systems that fall within the Dry Creek basin, and to its confluence with Monument Creek.

The subject drainage systems, as shown, and as described, will affect future land development with regard to proposed street systems, drainage structures and planned greenbelt systems, primarily within the Rockrimmon and Woodman Valley Subdivision areas.

It is the intent of this report to provide a guide to indicate areas of best suited roadway alignment; size and location of required drainage structures, roadways, reservoirs, or other drainage appurtenances.

Final subdivision of land may vary from guidelines, as established in this report; however, general requirements should be maintained.

B. Basin Description

The Dry Creek drainage basin covers approximately 3.9 square miles (2,494 Acres) lying within portions of Sections 32 and 33, Township 12 South, Range 67 West; Sections 1 through 5 and 10, 11, and 12, Township 13 South, Range 67 West and Sections 7 and 18, Township 13 South, Range 66 West. The area is located North and Northwesterly of Colorado Springs and bounds the the Woodmen Valley area and a portion of the Pikeview area.

Major surface run-off flows from within the Pike National Forest boundary at the Westerly portion of the basin; thence Southeasterly into Monument Creek. Approximately 1.17 square miles is located within the Pike National Forest.

The topography of the basin is mountainous in the Western portion, gradually diminishing to a meadowland valley type terrain toward the central and Easterly areas. In the central and Easterly portion, the land widens into general gradual slopes and in the Central area meadowland terrain is predominate and in the Easterly portion it is more foothill type terrain. At Pikeview, the land is quite gently sloped.

Several minor drainage basins contribute to the Dry Creek basin, as shown on the drainage plan.

I. (B.) continued.

All stream flow is intermittent throughout the basin.

The Westerly portion being mountainous creates a distinct channel system where surface flow is in narrow valleys creating small stream effect. Toward the central portion, no distinct channels exist, as this area of Woodman Valley is a wide basin and surface flow is contained in small roadside type ditches. Infiltration is high with low surface flow. In the Easterly portion, certain foothill terrain areas have distinct drainage channels, due to higher velocities in this area. Particular areas are as shown in the boundary of Rockrimmon Subdivision.

C. Geological Formation and Soils

The Western portion of the Dry Creek basin consists of disintegrated Pikes Peak granite though found in both the solid and decomposed state.

Infiltration is relative high and surface run-off low.

The area is steep and channels have little distinction.

In the Central area, formation resulted from front range faults creating hogback appearance. This area has been covered by mesa gravels consisting of disintegrated gravel. Infiltration is high and run-off low, though some clayey sand is contained in the soil composition. Bedrock areas consists of Dawson Arkose, the Laramie formation and Pierre Shale in that order of increasing age. Bluff's in this area are formed from the Laramie and Foxhills Sand which is predominately sandstone, with minor clays.

In the Easterly portion of the basin, surface soils are overburden material, generally sandy. The range classification of the soil however, is from a clay size to gravel and in most cases, is immediately below the alluvium.

Basic soil in lower formation is Pierre Shale.

Infiltration in this area is high enough to result in comparable low run-off. Where Pierre Shale is exposed, run-off is high.

D. Rainfall

U. S. Weather Bureau records indicate approximately 14.5 inches per year rainfall is average, with major precipitation occurring in the months of April, May, July and August, with peaks up to 8.2 inches. Average high being in July, measuring 2.94 inches. Maximum high recorded in May.

The intense storms last approximately two (2) hours and longer storms up to six (6) hours.

It is evident in this basin, the longer storms produce a high volume of surface run-off, but do not create flooding.

The shorter, higher intense storms have created flooding conditions in lower sections, though not damaging to waterway systems.

It can be expected, from past records, the Dry Creek basin will experience storms of 2-inch intensity for one (1) hour periods at approximately 3 to 3.5-year periods. However, a 50-year frequency, 1-hour duration, 2-inch intensity has been designated by the City of Colorado Springs for design purposes and has been used in calculations for this study and report.

E. Surface Flow Criteria

Dry Creek basin has been divided into major and minor basin areas, as shown on the master drainage plan.

At the outfall point of each minor basin, peak run-off has been computed showing quantity of surface flow at the minor basin and major basin.

These flows will give the quantity of each minor basin, the combined flow of the major basin, and finally the total flow of the entire basin.

From calculation tables and the drainage plan, surface flow can then be determined at any point in the basin.

All flows have been computed on a time element and the combined synthetic hydrographs were constructed for succeeding points as peak flow proceeds downstream. It will be shown that the peak time of the combined hydrograph increases as the crest flows downstream.

The hydrographs have been constructed in the absence of actual rainfall measurements and available data has been obtained from the Soil Conservation Service. When gaging has been instituted, adjustments to the hydrograph may be necessary.

I. (E.) continued

It is recommended a rain gaging station be provided at the outfall of Dry Creek basin.

The hydrograph construction assumes the major portion of the Dry Creek basin will be developed into rural type residential units, excluding the National Forest area.

At the present time, a portion of this basin has been subdivided and future subdivisions are being planned.

F. Greenbelt System

The proposed routing of the greenbelt system within the Dry Creek drainage basin will basically follow the natural drainage course to allow the best use of the land as subdivisions are developed.

In the central portion of the basin, that area being developed as a part of the Woodman Valley Complex, the demarcation of surface run-off is not definite, due to the wide basin and meadowland terrain.

In the Rockrimmon area, drainage channels are well defined. This greenbelt strip will be used for parks and in open space, as playgrounds. It is the intent of the developer in this area to leave the channels in their natural appearance and configuration and provide slope treatment and maintenance that will up-grade the present channels.

The required widths of the greenbelts Right of Way, as shown on the drainage plan, will provide sufficient channel width to maintain approximately 2.5 to 4.5 feet of water depth during design rainfall and run-off. Sixteen feet access will also be included in Right of Way requirements.

In the area of this basin where gullies have been cut by run-off and subsequently eroded, it is recommended greenbelt channels be protected by providing erosion control and velocity control measures to be determined prior to subdivision development. Riprap shall be provided at all bends in the channel.

As this basin area is mountainous with some relative steep grades, a major portion of the greenbelt system would then require erosion protection, particularly in areas where a flooding condition may occur or where continued erosion may endanger future development. To provide logical protection without causing high cost construction, it must be determined

I. (F.) continued

in future planning and development the type of land subdivision contemplated.

During the preparation of this report, the various areas were analyzed with regard to future subdivision type development. In the Central portion, the area is a wide basin, open meadowland, where home sites will be clustered on acreage tracts. In this area, distinct shaping and construction of the greenbelt system is necessary with erosion protection required. In the East Central, more wooded and rustic type terrain exists, and future planning will provide for large undeveloped areas adjoining the greenbelt systems. Construction of homes will be hundreds of feet from the channel alignment. It is the intent, of course, to allow natural setting in this area.

Erosion is evident, and the greenbelt system will require some alignment changes and erosion protection. However, whether actual concrete line sections in this area are actually required and the extent of these sections, will have to be studied during development. It may be necessary in lower greenbelt areas (Easterly sections) to provide velocity control structures. In establishing drainage costs to the greenbelt systems, the major portion of the greenbelts were considered as requiring erosion protection by concrete lining or riprapping.

G. RESERVOIRS

Within the basin, there is one (1) existing reservoir designed and constructed by the U. S. Soil Conservation District. This reservoir was provided to control erosion during high intensity storms. The dam is earthen fill and impounds 9.6 acre feet of water.

Subject reservoir is designated R-1 on the drainage plan. Under consideration of this drainage report and in compliance with the drainage board decision, this reservoir will not be maintained and a continuous channel will be indicated.

Existing lakes within this basin, as shown on the drainage plan, do not fall within the greenbelt channel and are therefore not considered in this report.

H. IMPROVEMENTS

The proposed improvements within the Dry Creek drainage basin consist of greenbelt channel systems, concrete drainage culverts, drainage piping, drainage roadway outlets, bridges and modification as described. All drainage appurtenances are so located as to best suit proposed development.

It is the intent of the improvements to provide a roadway and drainage systems network that will not create problems during fifty-year design

I. (H.) continued

storms. Sufficient drainage outlets and ditches have been provided to relieve street and roadway from conveying excess water. Surface flow will not be contained in major thoroughfare roadway systems.

No specific catch basin, curb opening or drainage outlets have been designed in this report, as these structures will be applicable only to final developed conditions and should be designed to meet the specific need.

In the construction of ditches, means shall be provided to prevent erosion, particularly when velocities exceed 7 f.p.s.

Relative to the location and slope of ditches, concrete lining, sod, or native grass should be provided as a lining. Costs for ditch construction are based on all ditches being concrete lined or riprapped

With respect to the design of greenbelt systems, it is recommended in gully regions, particularly in the Easterly portion, the channels be maintained in their present configuration. This is a somewhat narrower channel with approximate $1\frac{1}{2}:1$ slopes. Surface flow will be somewhat deeper than a more common greenbelt design but will better suit the surroundings.

It shall be noted in some cases roadway or street systems are not continuous. Where this occurs, the roadway or street system terminates at a cul de sac.

In the Rockrimmon boundary the roadway and drainage systems are designed to conform to the development pattern of the subdivision. At the Pikeview area, existing structures are to be removed and revised as shown.

In the Woodman Valley district West to Mt. St. Francis area, the development is in large tract type subdivision. The Woodman Valley Road is the only main access approach to the area; present and future development will not change the present alignment.

Where ditches or greenbelt systems are not lined, as shown on the drawings, velocities are such that erosion is not anticipated.

CALCULATIONS

Dry Creek Drainage Basin

[illegible]

Dry Creek Drainage Basin

Calculations - Sheet No. 2

Major Basin	Sub-Basin	Area		Basin				Runoff Flow	Peak Flow (CFS)
		Acres	Sq. Mi.	L(ft)	H(ft)	Tc(Hrs)	Tp(Hr.)	Q(in.)	Qp
G	1	94.19	0.147	4400	180	0.27	0.662	0.45	48.52
	2	72.38	0.113	3500	150	0.22	0.632	0.35	30.28
	3	78.82	0.123	5500	410	0.24	0.644	0.30	<u>27.73</u>
	Total, Basin G								106.53*
H	1	21.03	0.033	2300	220	0.12	0.572	0.30	8.38
	2	60.00	0.094	4400	310	0.21	0.626	0.30	21.81
	3	99.65	0.156	3700	230	0.20	0.620	0.30	36.53
	4	22.17	0.035	2200	240	0.11	0.566	0.30	<u>8.98</u>
	Total, Basin H								75.70*
J	1	87.44	0.137	5100	140	0.33	0.698	0.70	66.49
	2	36.90	0.058	2200	150	0.13	0.578	1.00	48.56
	3	85.02	0.133	4600	140	0.30	0.680	1.00	<u>94.66</u>
	Total, Basin J								209.71*
K	1	24.77	0.039	2100	110	0.14	0.584	1.40	45.26
	2	32.05	0.050	3100	150	0.19	0.614	1.40	55.17
	3	21.34	0.033	1100	40	0.10	0.560	1.40	39.93
	4	20.79	0.032	1200	100	0.075	0.543	1.40	39.79
	5	54.75	0.086	2600	170	0.15	0.590	1.40	<u>98.50</u>
	Total, Basin K								278.65*
L	1	63.93	0.100	5000	150	0.32	0.692	1.40	97.92
	2	20.37	0.032	1500	170	0.08	0.548	1.40	39.57
	3	24.59	0.038	1000	50	0.085	0.551	1.40	46.73
	4	19.92	0.031	2700	100	0.19	0.614	1.50	36.64
	5	51.26	0.080	2600	100	0.185	0.611	1.40	88.72
	6	38.95	0.061	1800	40	0.175	0.605	1.50	<u>73.20</u>
	Total, Basin L								382.78*

$$Q_p = \frac{484 A Q}{T_p}$$

$$Q = \frac{(P - .2S)^2}{P + .85}$$

$$\frac{D}{2} = 0.5$$

$$T_p = \frac{D}{2} 0.6 T_c$$

Q (inches run-off)

A Area in Sq. Miles

D Time excess rainfall

Tc Concentration Time in Hours

Tp Peak time of hydrograph

Dry Creek Drainage Basin

Calculations - Sheet No. 3

Line	Base Qp	Base Tp	Ditch L(ft)	S%	Time(Hr)	Point Tp(Hr)	Qp
1-3	167.83	0.590	2700	13.4	0.093	0.683	263.49
2-3	88.02	0.554	2000	10.0	0.050	0.604	115.23
3-4	378.72	0.578	4900	4.9	0.090	0.668	641.38
4-5	641.38	0.668	7000	2.6	0.183	0.843	978.46
5-6	978.46	0.843	4900	2.0	0.143	0.986	1133.31
6-7	1133.31	0.986	3500	2.9	0.067	1.053	1244.97
8-9	39.79	0.543	400	7.5	0.006	0.549	47.20
10-11	98.50	0.590	1000	3.0	0.018	0.608	104.77
12-13	39.57	0.548	500	6.0	0.006	0.554	62.57
14-15	134.56	0.692	1000	4.0	0.015	0.707	157.56
16-17	88.72	0.611	550	1.5	0.015	0.626	88.72
18-19	73.20	0.605	800	5.1	0.011	0.616	73.20

C A L C U L A T I O N S

Dry Creek Drainage Basin

Greenbelt System

Line	S%	Ditch Configuration				Unlined Velocities Ft/Sec	V(Riprap)Q		Q Actual CFS
		Concrete		Riprap			Ft/Sec	Cap.CFS	
		W(ft)	d(ft)	W(ft)	d(ft)				
1-3	13.4	3	3	6	3	10	30	630	263.49
2-3	10.0	3	3	6	3	8	30	540	115.23
3-4	4.9	3	4	8	3	18	27	800	641.38
4-5	2.6	3	5	10	3	18	23	1000	678.46
5-6	2.0	3	5.5	12	3	25	22	1150	1133.31
6-7	2.9	3	5.5	12	3	30	30	1400	1264.97
8-9	7.5	3	3	6	3	8	30	500	47.20
10-11	3.0	3	3	6	3	3	18	290	104.77
12-13	6.0	3	3	6	3	5	28	500	62.57
14-15	4.0	3	3	6	3	5	20	360	157.56
16-17	1.5	3	4	8	3	3	15	1500	88.72
18-19	5.1	3	3	6	3	5	24	430	73.20

*Side slope for ditch is assumed to be 1.5:1.

<u>Ditch Systems</u>	<u>S%</u>	<u>W(ft)D(ft)</u>		<u>Unlined Velocity Ft/Sec</u>	<u>Q Cap.CFS</u>	<u>Q Actual CFS</u>
1	4	4	3	10	120	88.00
2	8	3	1.5	10	35	28.00
3	5	4	3	12	140	68.00
4	3	3	1.5	4	20	10.00
5	8	3	1.5	9	35	15.00
6	7	3	1.5	8	32	15.00

*Ditch Systems, continued.

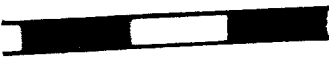




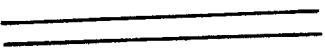

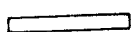







Dry Creek Drainage Basin

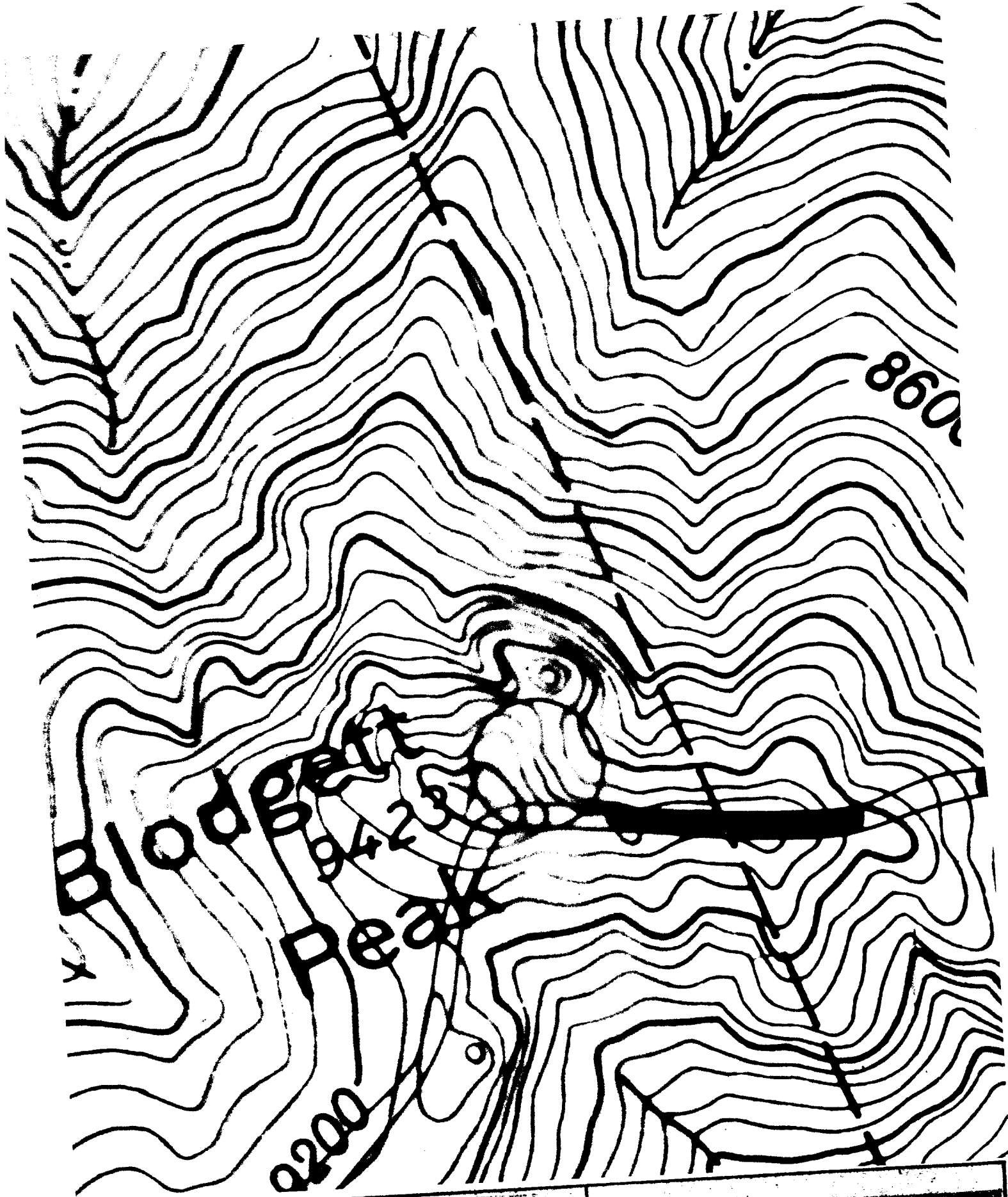
*Ditch Systems, continued.

<u>Ditch Systems</u>	<u>S%</u>	<u>W</u>	<u>D</u>	<u>Unlined Velocity Ft/Sec</u>	<u>Q Cap.CFS</u>	<u>Q Actual CFS</u>
7	5	3	1.5	6	28	20.00
8	6	3	1.5	7	30	22.00
9	6	3	2	8	50	35.00
10	6	3	2	8	50	35.00
11	4	3	1.5	5	25	12.00
12	6	3	1.5	7	30	15.00
13	8	3	1.5	9	35	13.00
14	10	3	1.5	11	38	14.00
15	5	3	1.5	6	28	18.00
16	6	3	1.5	7	30	14.00
17	4	3	1.5	5	25	16.00
18	4	3	1.5	5	25	20.00
19	4	3	1.5	5	25	21.00

*Side slope for ditch is assumed to be 1.5:1.

LEGEND

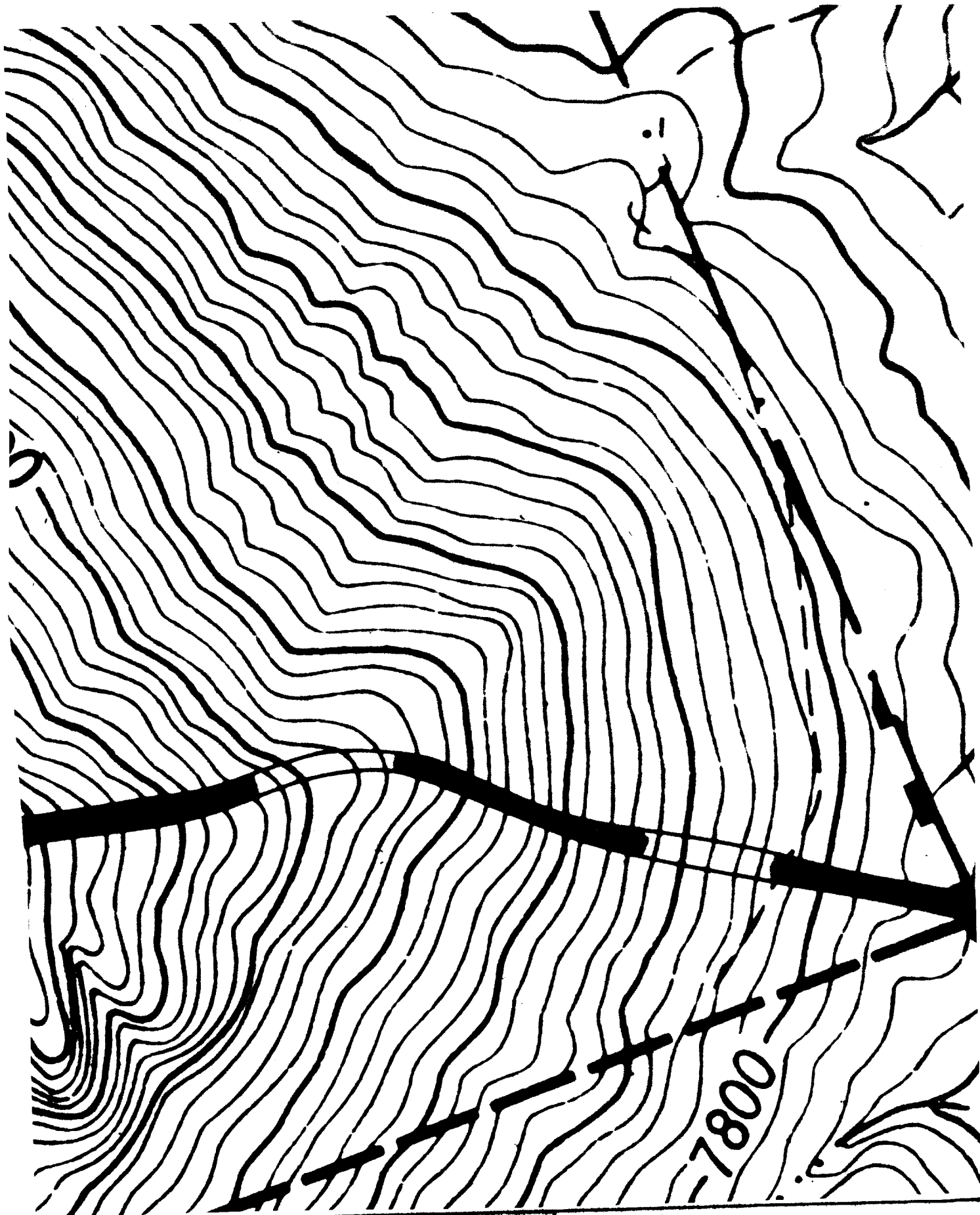
	BASIN	BOUNDARY	
	SUB-BASIN	BOUNDARY	
	MINOR	BASINS	
	MAJOR	COLLECTION	POINT
	MINOR	COLLECTION	POINT
	EXISTING	ROADWAY	
	EXISTING	BRIDGE	
	EXISTING	CULVERT	
	GREENBELT		
	RIPRAP		
	PROPOSED	DRAINAGE	STREET
	PROPOSED	DRAINAGE	STRUCTURES
	PROPOSED	STORM SEWER &	DRAINAGE OUTLET
	PROPOSED	DRAINAGE	DITCHES
	SPECIAL	INTERSECTION	DESIGN



DRY CREEK
DRAINAGE REPORT

DETAIL SHEET

D-1



DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-2

ENGINEERING, INC.
1000 10th Street, S.W., Atlanta, Georgia 30334

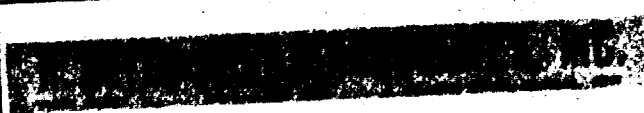


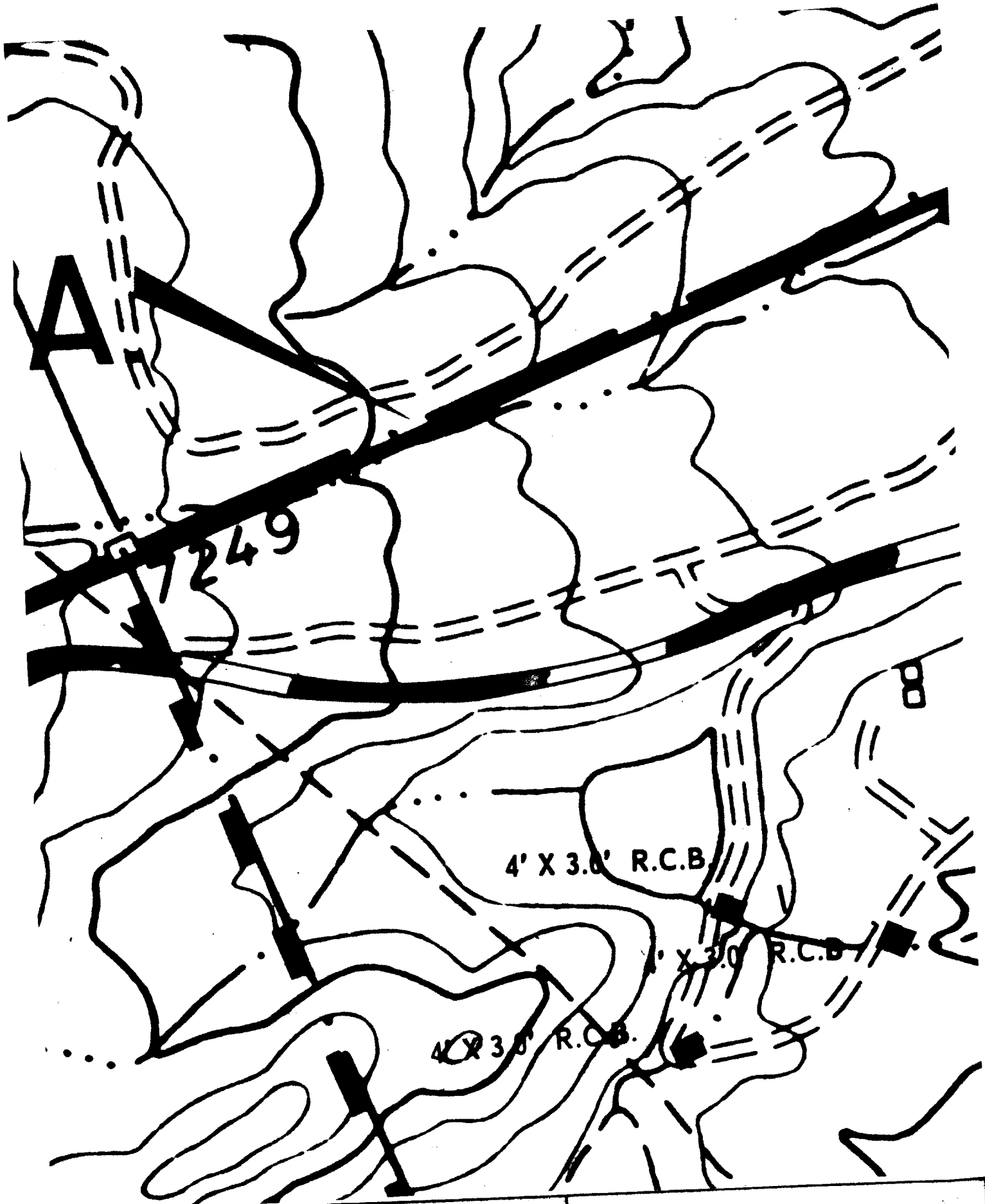
A topographic map showing the Dry Creek drainage area. The map features contour lines, a network of roads, and a prominent drainage path. The text 'U.S.A.F.' is printed in large, bold, sans-serif capital letters across the upper right portion of the map. A handwritten '80' is visible near the center of the map. The map is oriented with North at the top, indicated by a north arrow in the upper right corner.

U.S.A.F.

DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-3





DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-4

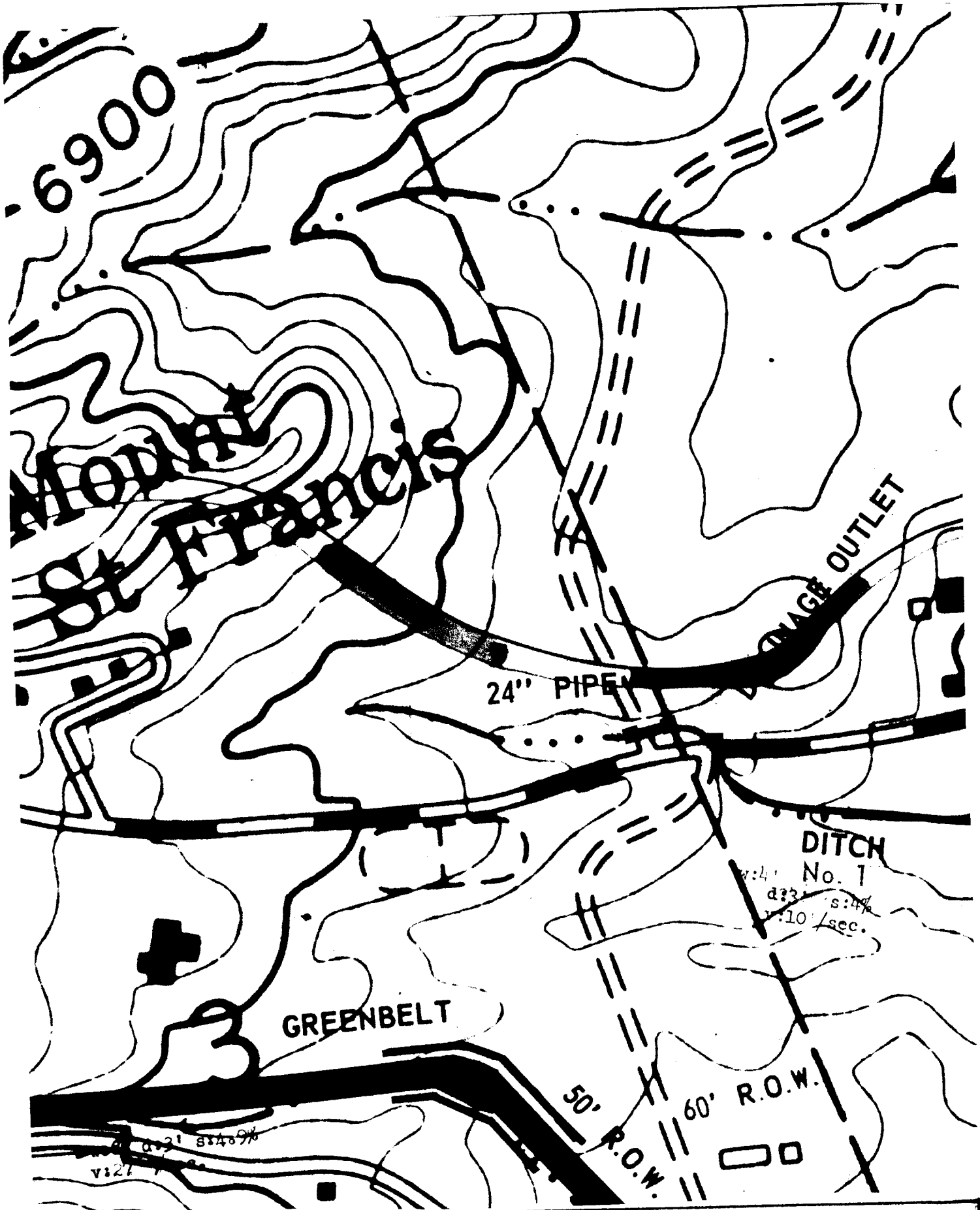
R. KEVIN HOOK & ASSOCIATES, INC.
P.O. BOX 10000
10000 N. 10TH AVE.
CHICAGO, ILLINOIS 60640-1000



DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-5

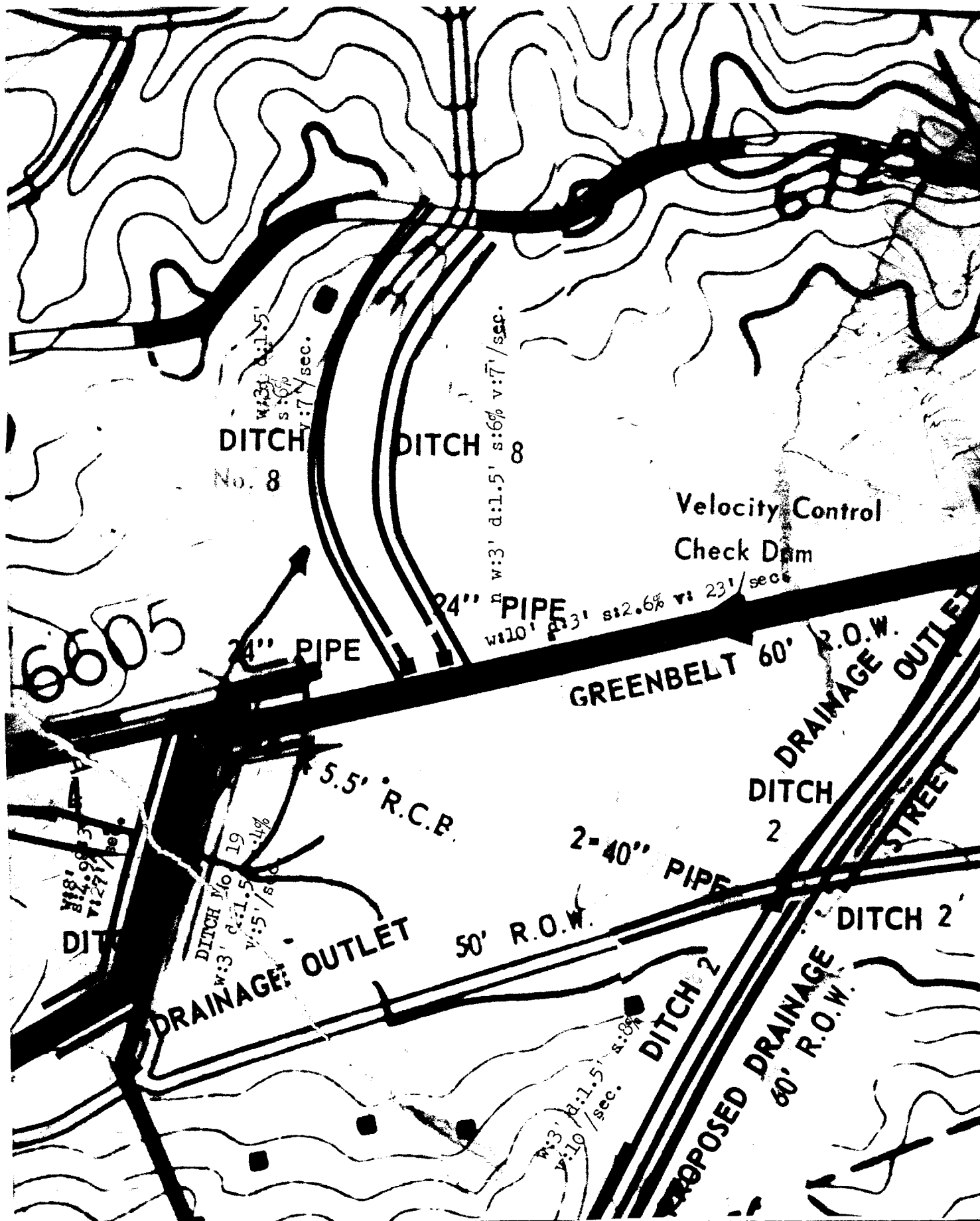
R. NEWMAN & ASSOCIATES, INC.
PHOTOGRAPHY, PLANNING, DESIGN, CONSTRUCTION

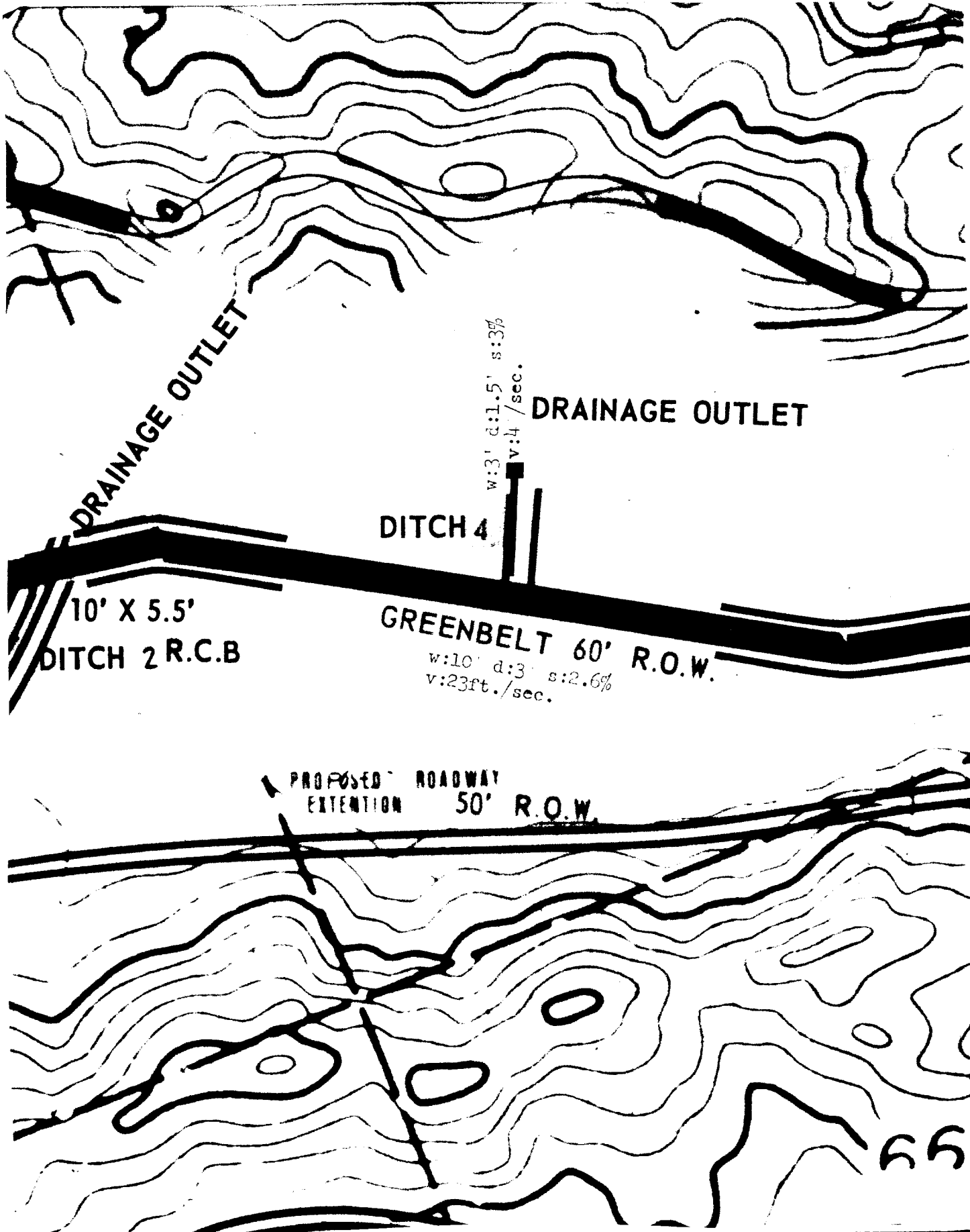


DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-6

R. KETTER HOOK & ASSOCIATES, INC.
PHONE 421-3333 3401 S. CLAYTON AVE. COLORADO SPRINGS, COLORADO 80909

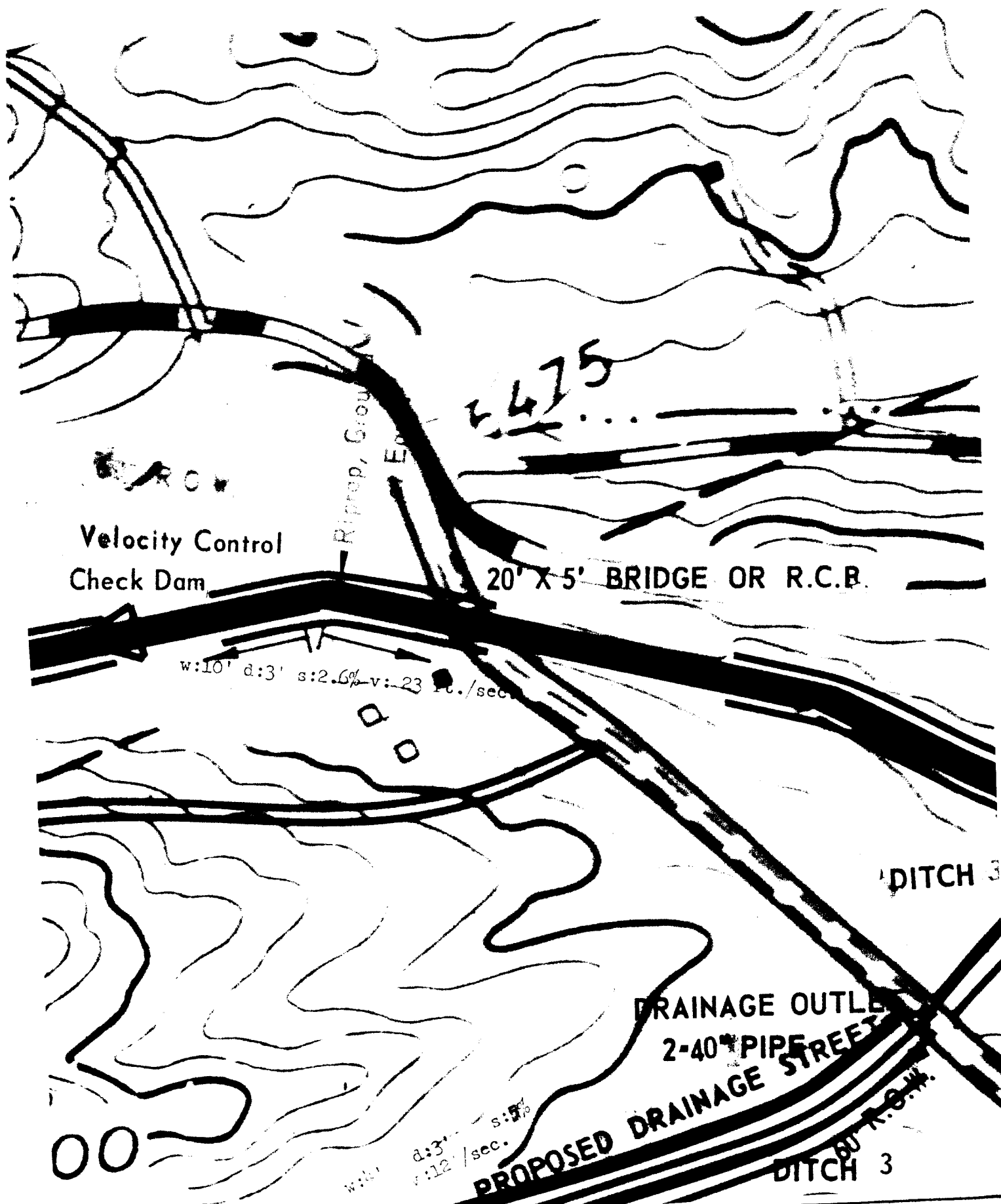




DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-9

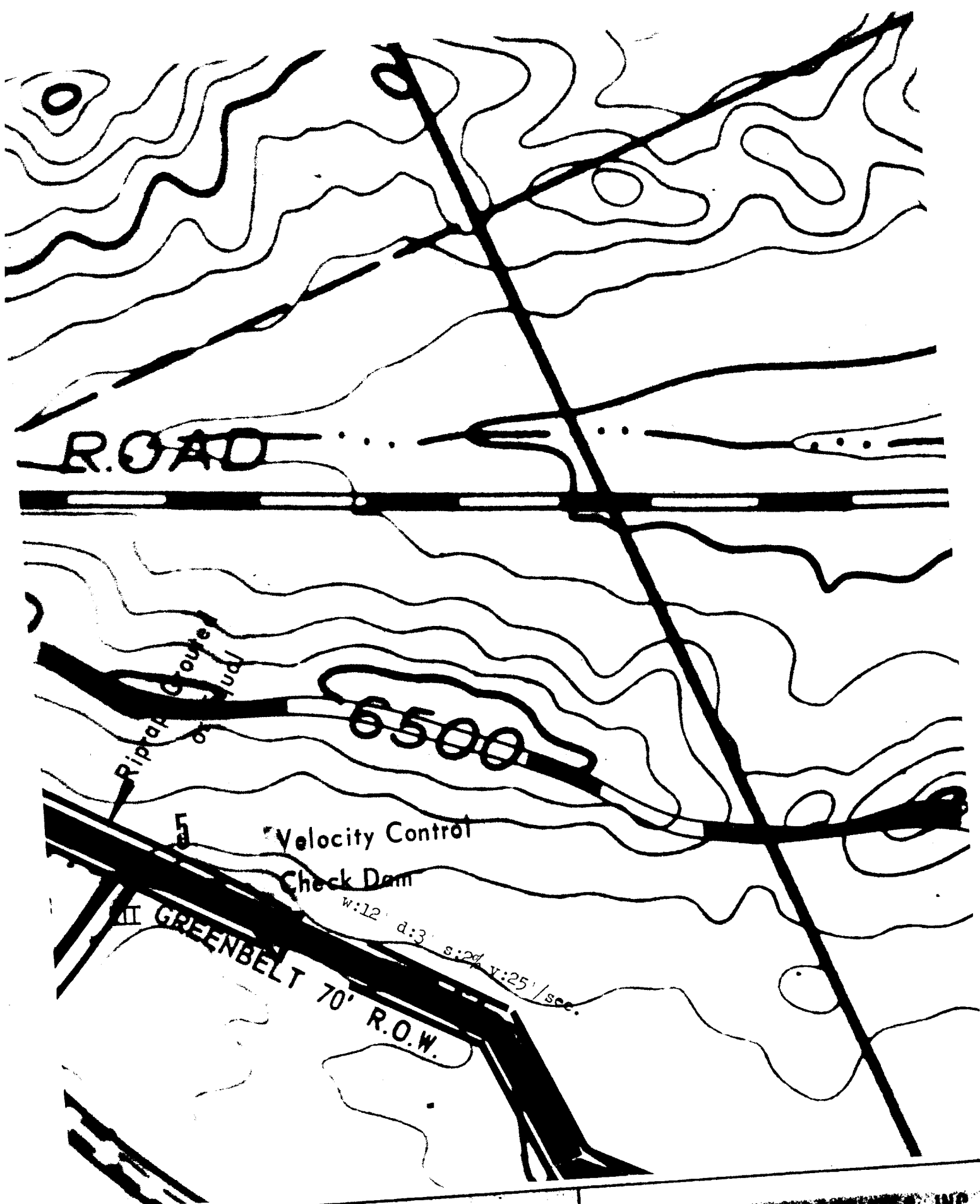
R. KEVIN ADAMS & ASSOCIATES, INC.
PHONE 454-4444 FAX 454-4444



DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-10

R. KETTER & ASSOCIATES, INC.
PHONE 634-1111 200 S. PLATEAU AVE. COLORADO SPRINGS, COLORADO 80909



DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-11

H. W. T. ENGINEERING, INC.
P.O. BOX 1000
1000 W. 10th St.
COLUMBIA, MISSOURI 65201

6309

7

630

PROPOSED DRAINAGE OUTLET

DRAINAGE STREET

60' R.O.W.

0' R.O.W.

DITCH No. 9

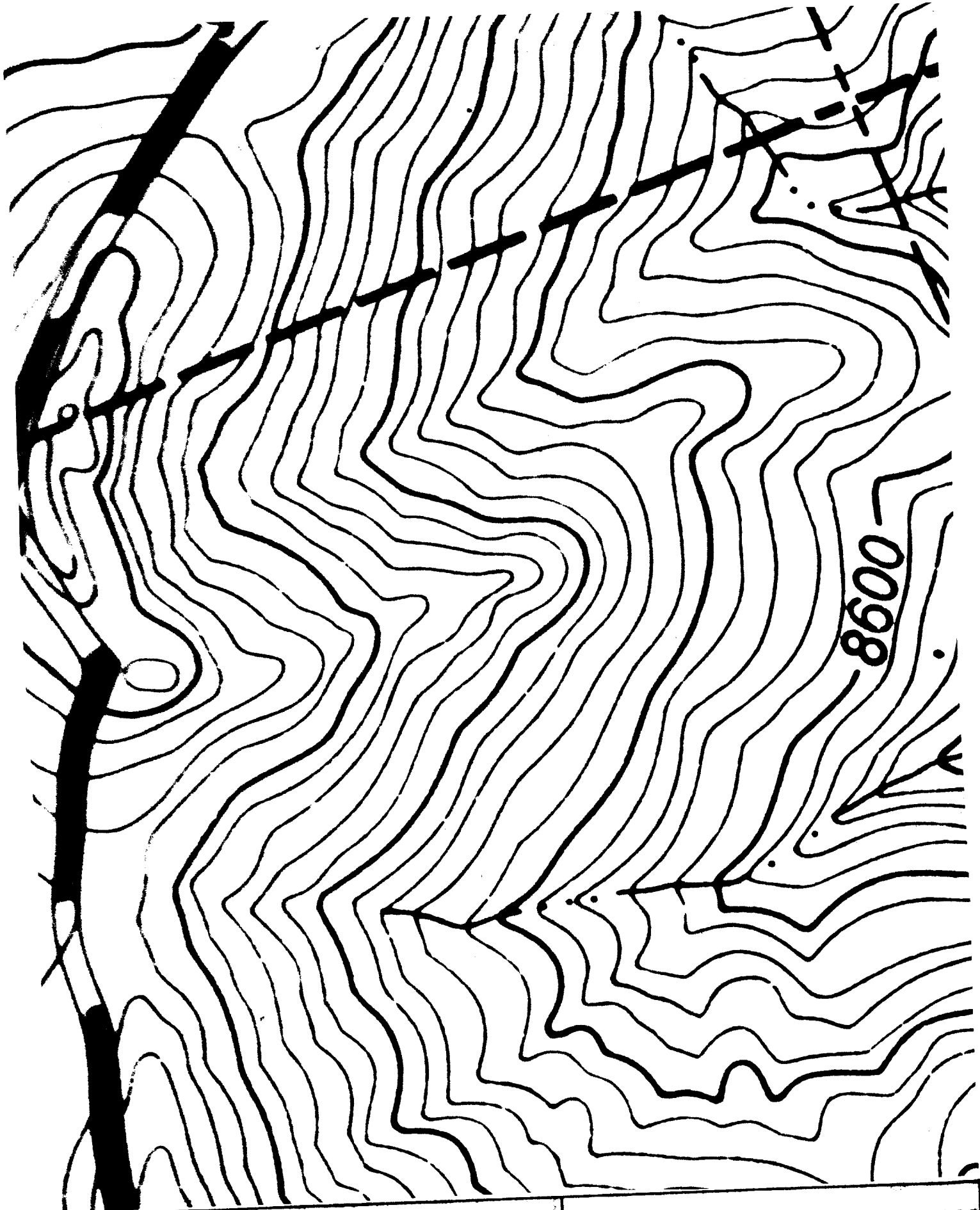
s:6% d:2' v:3' /sec

DRAINAGE OUTLET

s:6% d:2' v:3' /sec

DITCH No. 10

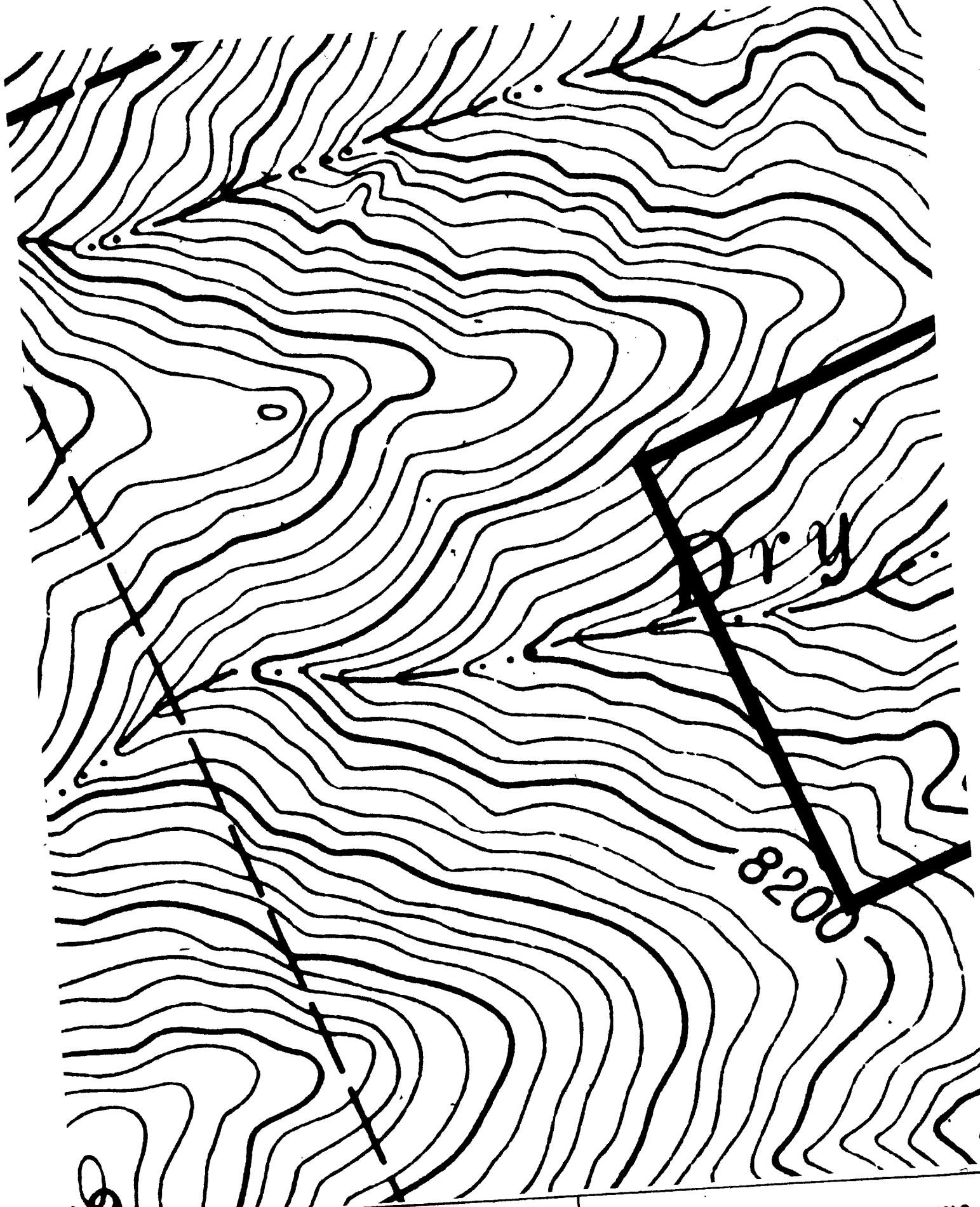
R. REED MOORE & ASSOCIATES, INC.
PHOTO 534-5555 2ND FL. PLT 55-1000 COLORADO SPRINGS, COLORADO 80909



DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-13

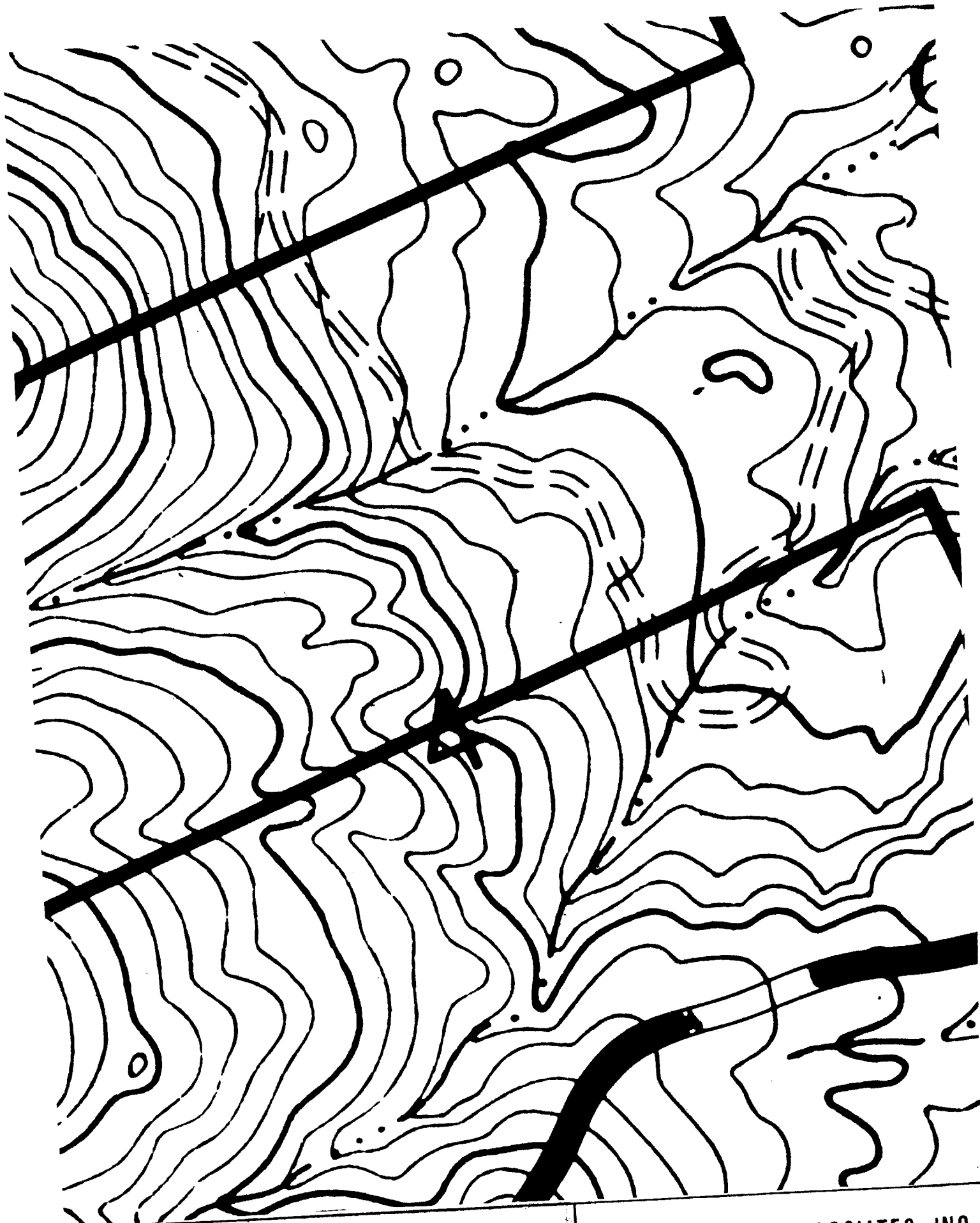
HYDROLOGIC ENGINEERING, INC.
P.O. BOX 1000, WILSON, N.C. 27157



DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-14

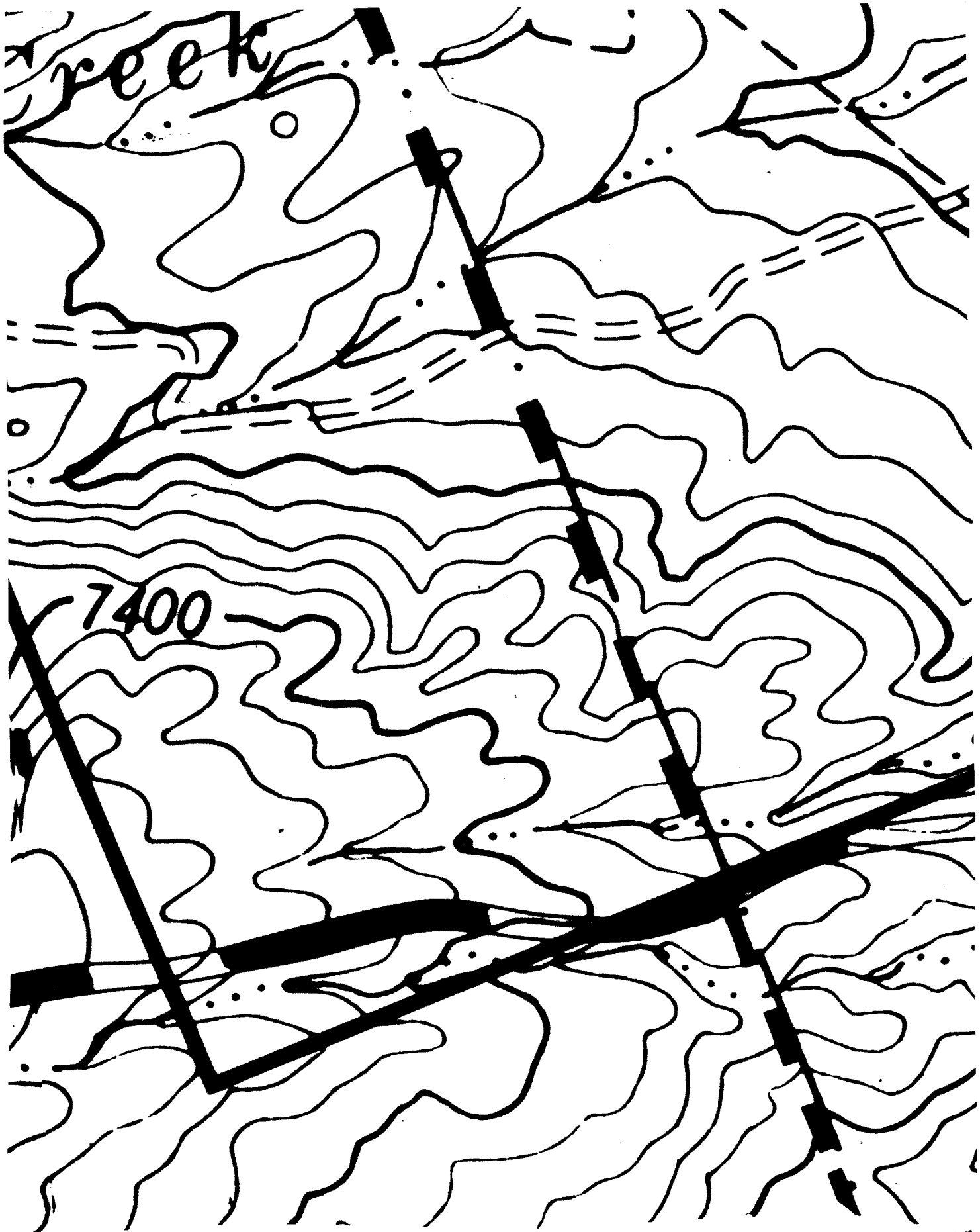
R. KEITH HOOK & ASSOCIATES, INC.
PHONE 433-2533 2501 N. PLATTE AVE. COLORADO SPRINGS, COLORADO 80910



DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-15

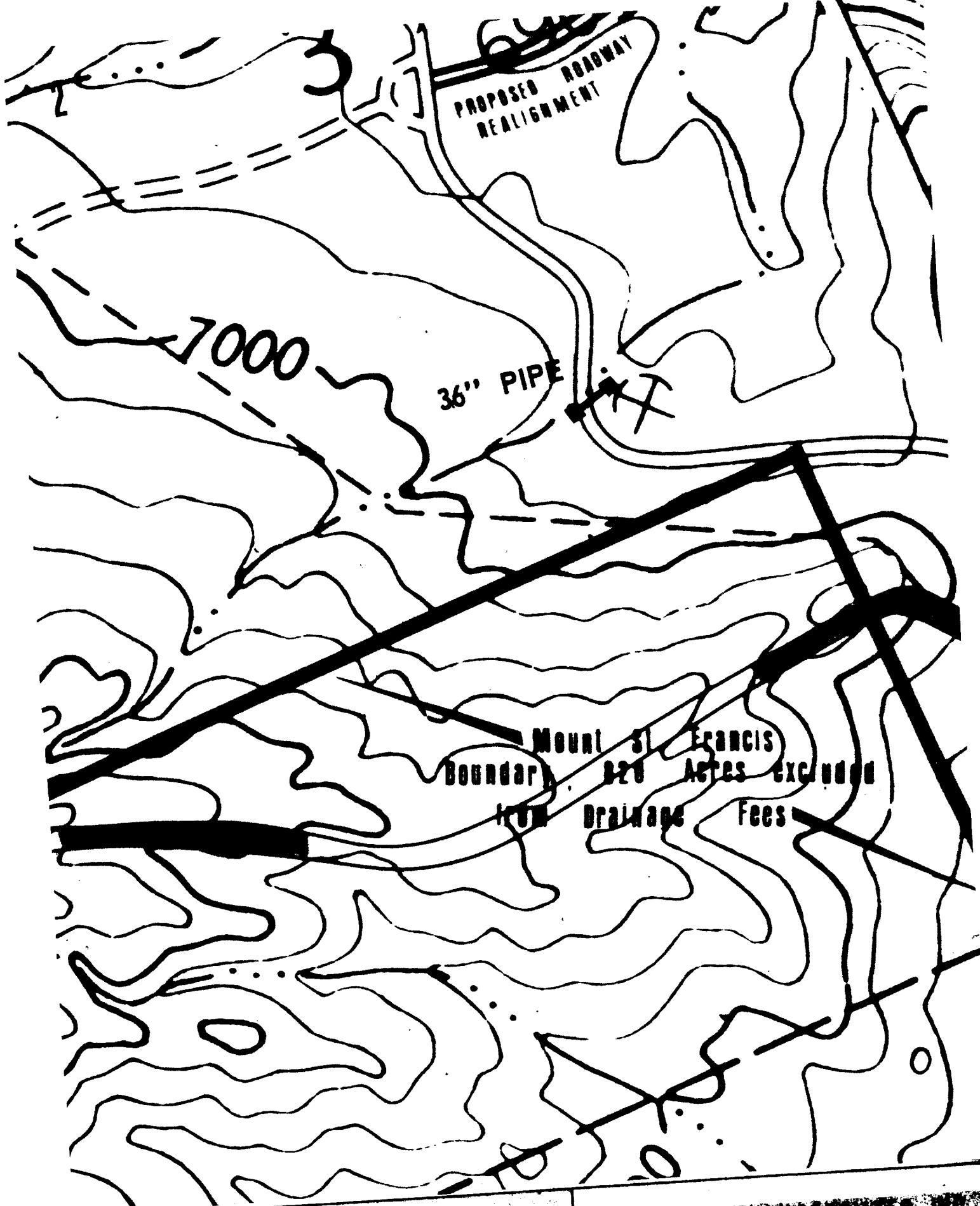
R. KEITH HOOK & ASSOCIATES, INC.
PHONE 432-2833 2145 E. PLATTE AVE. COLORADO SPRINGS, COLORADO 80905



DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-16

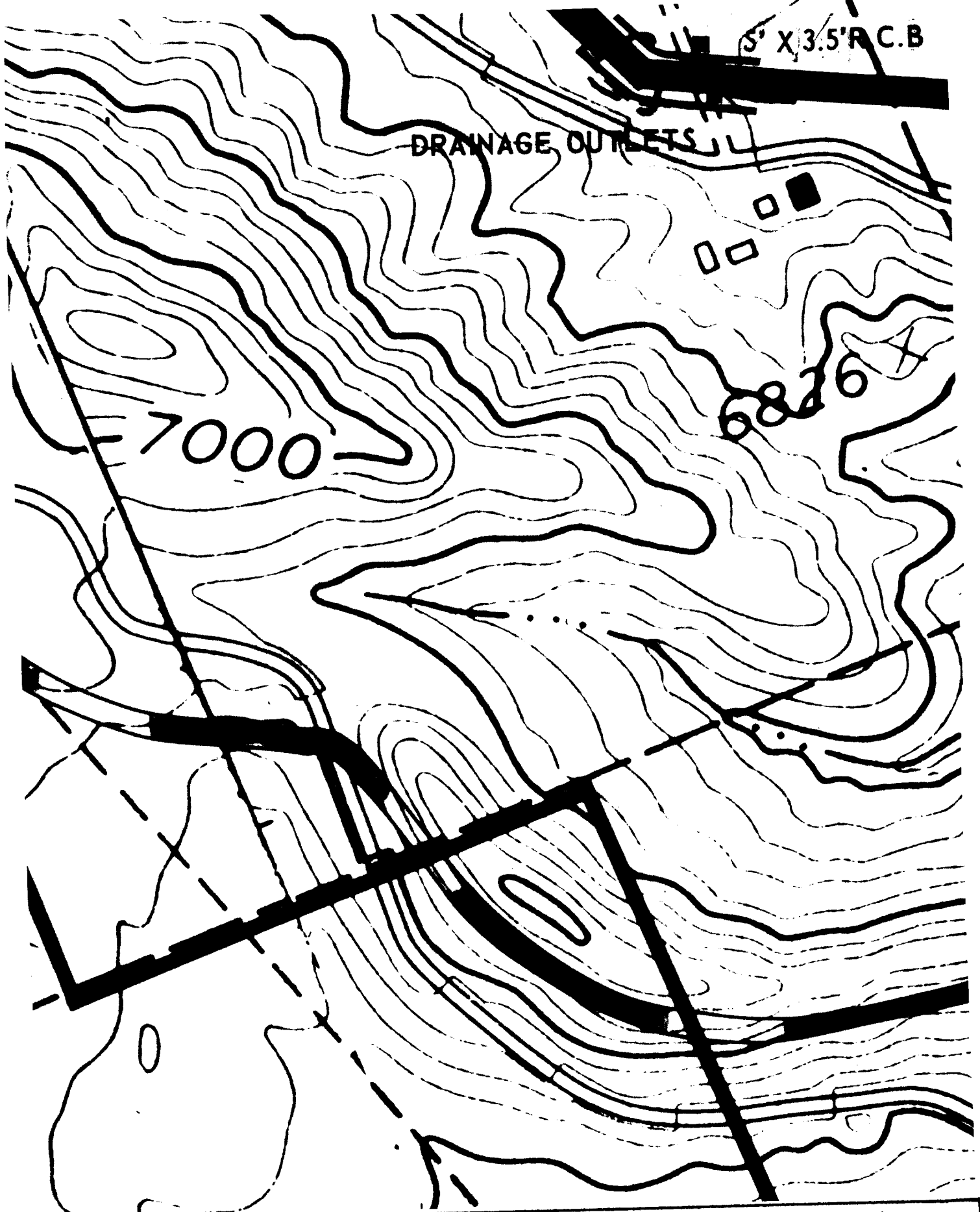
R. KEITH HOOK & ASSOCIATES, INC.
PHONE 433-2337 2301 E. PLATTE AVE. COLORADO SPRINGS, COLORADO 80904



DRY CREEK
DRAINAGE REPORT

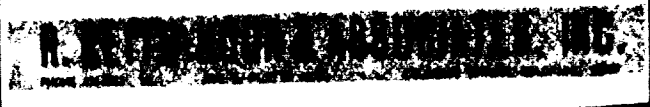
DETAIL SHEET
D-17

R. KETTER HOOK & ASSOCIATES, INC.
P.O. BOX 1000
100 S. 10TH ST.
CHICAGO, ILL. 60606



DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-18



Velocity Control
Check Dam

w:8' d:3' s:4.0%
v:27'/sec.

Riprap Grouted
to Equal

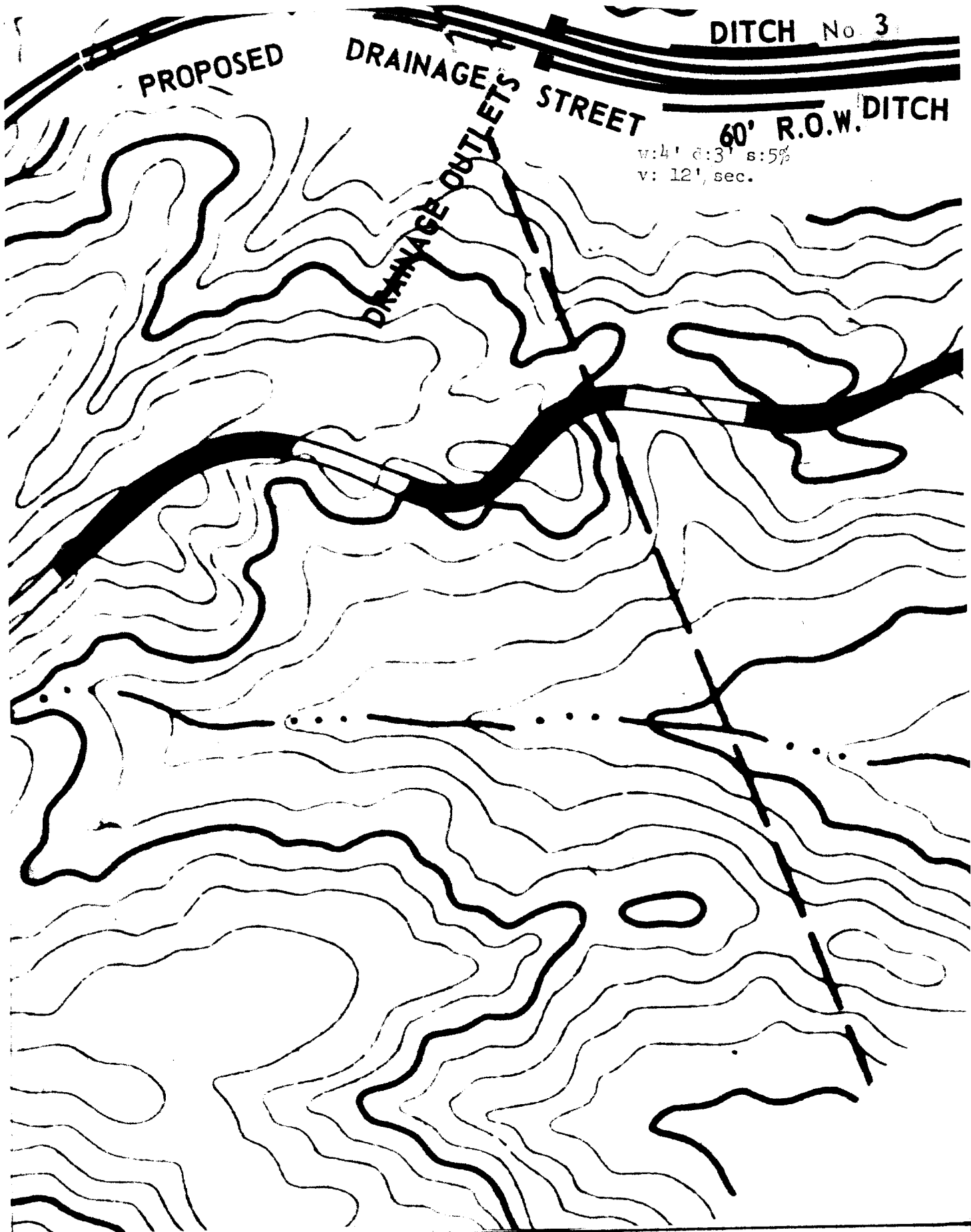
PROPOSED

DRAINAGE STREET

DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-19

H. W. H. & ASSOCIATES, INC.
P.O. BOX 1000, DENVER, COLORADO 80202



DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-21

R. KEITH HOOK & ASSOCIATES, INC.
PHOTO: G. B. H. CO. INC. 1967
1000 N. 10TH AVE. COLORED SPRING, COLORADO 81009

DITCH 3

DITCH 60' R.O.W.

W:4' D:3' s:5%
v:12'/sec.

Approp, Grouted
Equal

666

12

N

DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-22

R. W. H. & ASSOCIATES, INC.

PHONE 666-6666

200 N. 10TH ST.

COLORADO SPRINGS, COLORADO 80909

DITCH

5

EXISTING
RESERVOIR

Velocity Control
Check Dam

8.6' / sec.
v: 25 ft. / sec.

DRAINAGE OUTLET

W: 3' C: 1.5' S: 0.8' / sec.

DITCH 6
W: 3' C: 1.5' S: 0.8' / sec.

DITCH

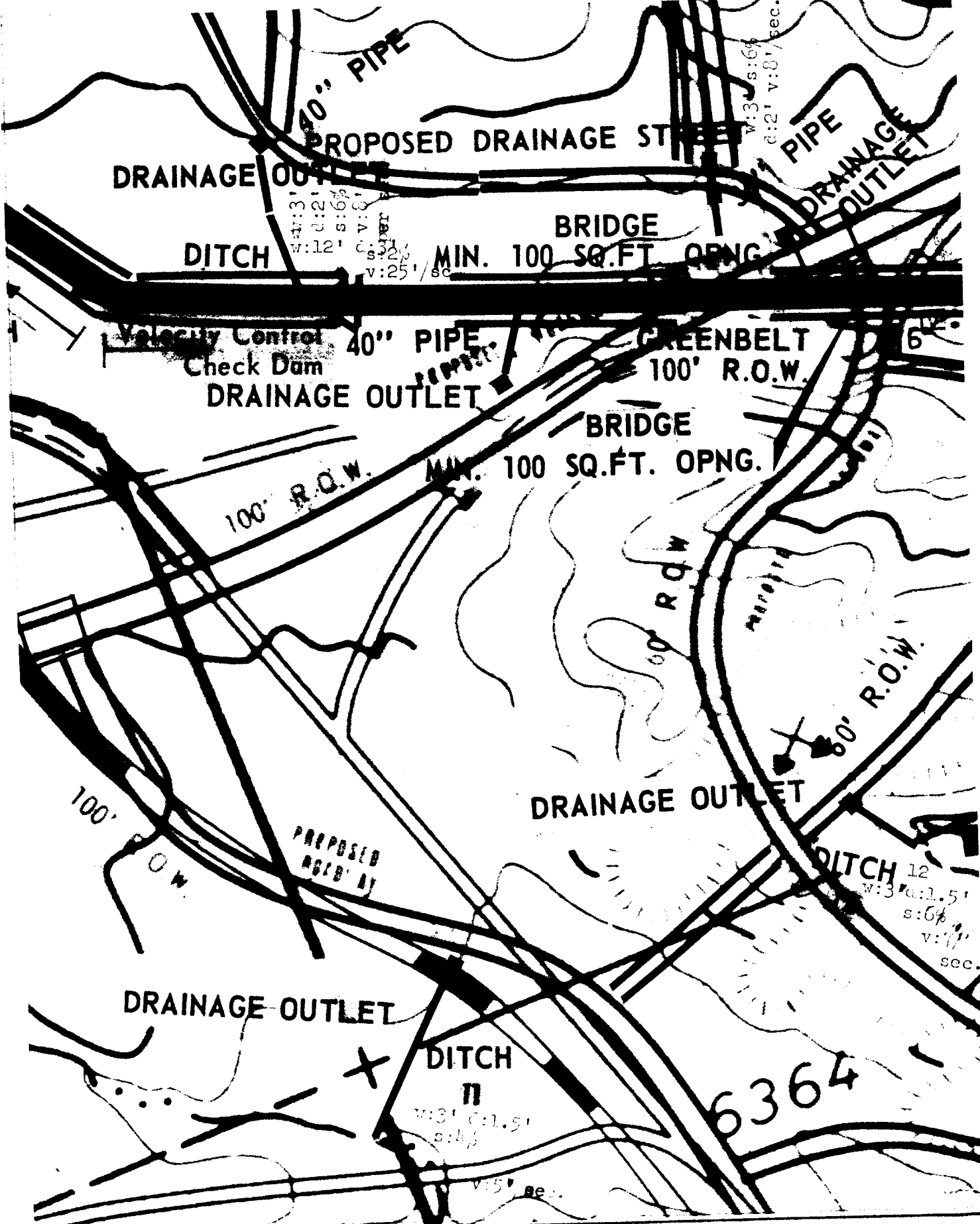
DRAINAGE OUTLET

8574

DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-23

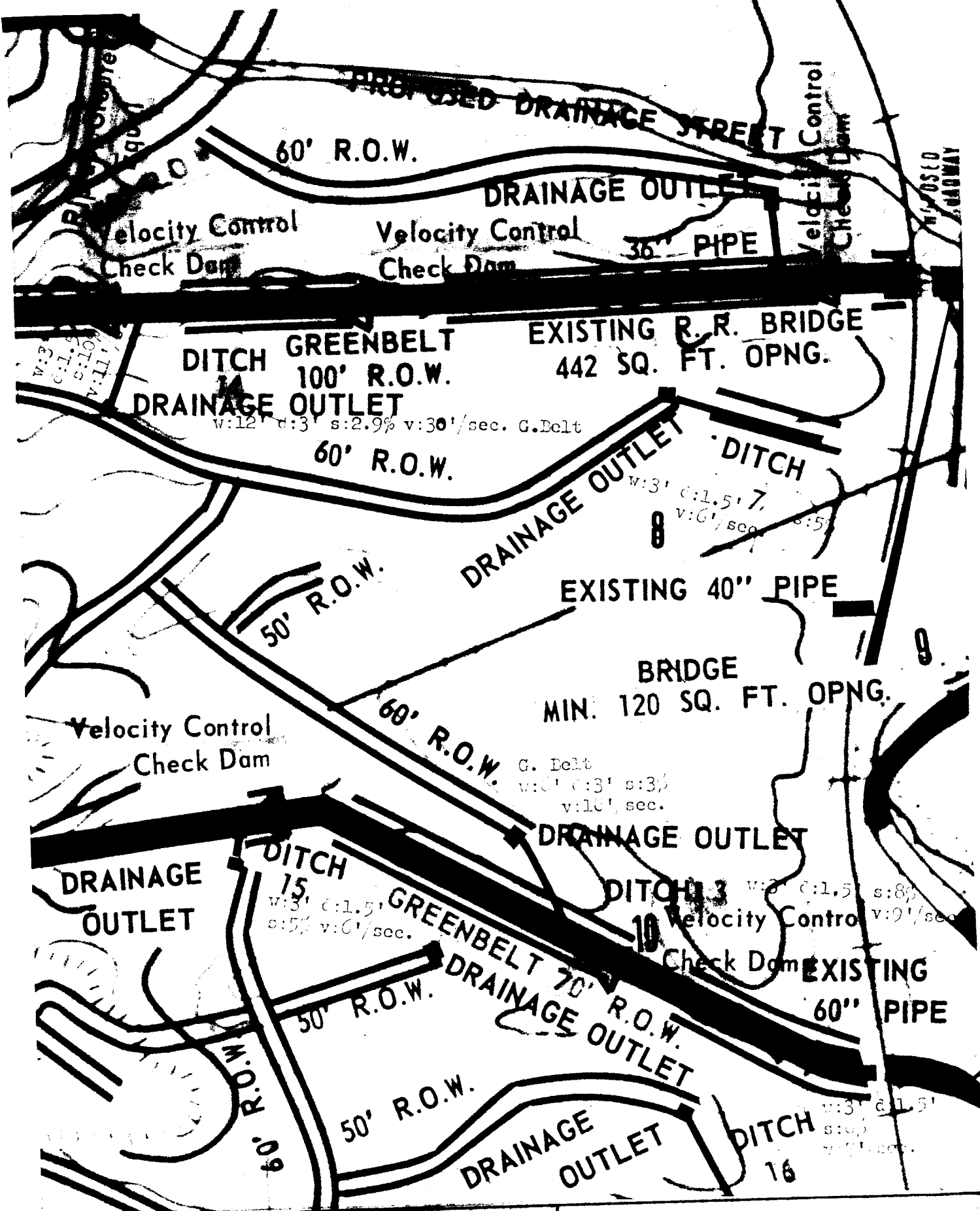
K. F. F. ENGINEERING, INC.

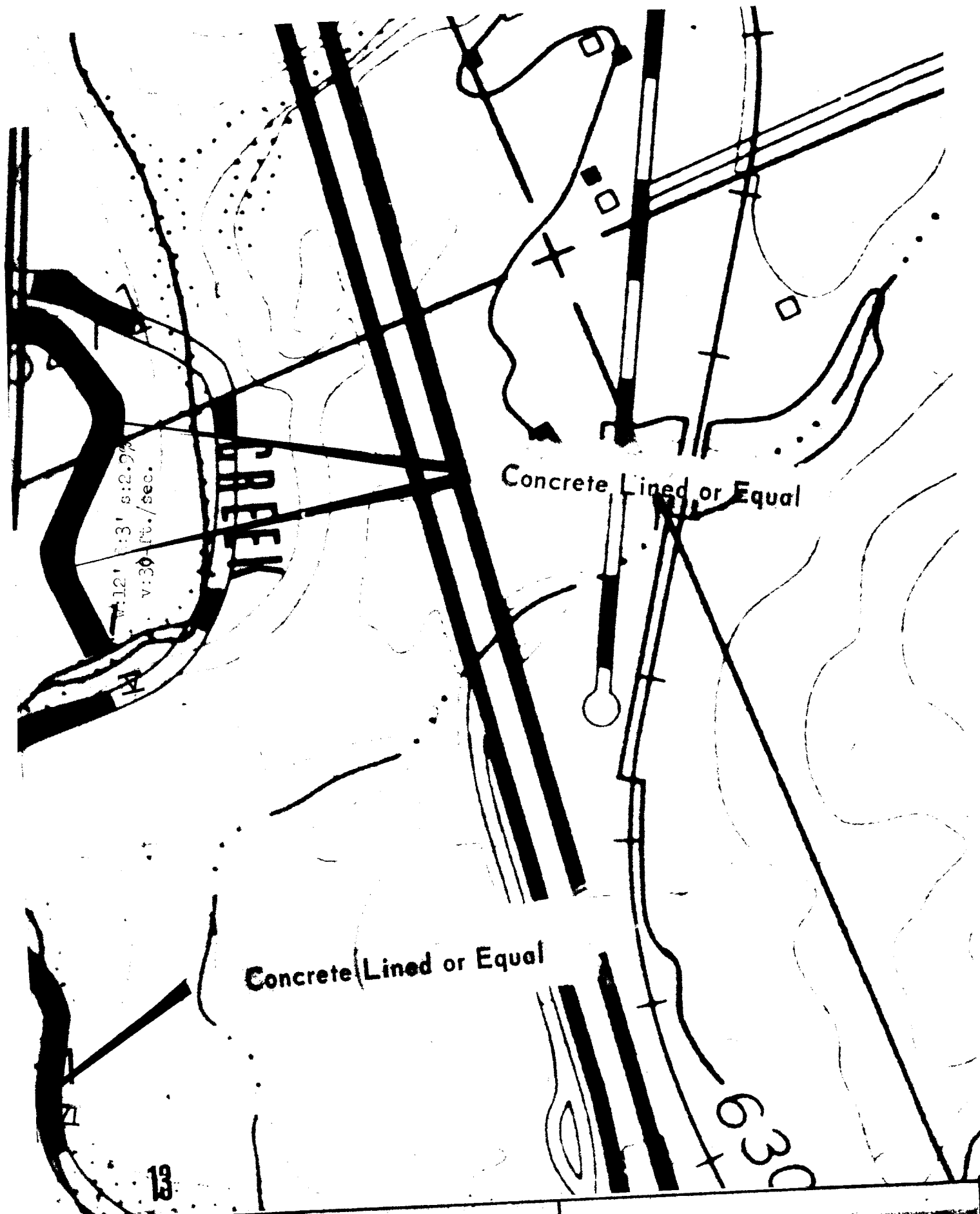


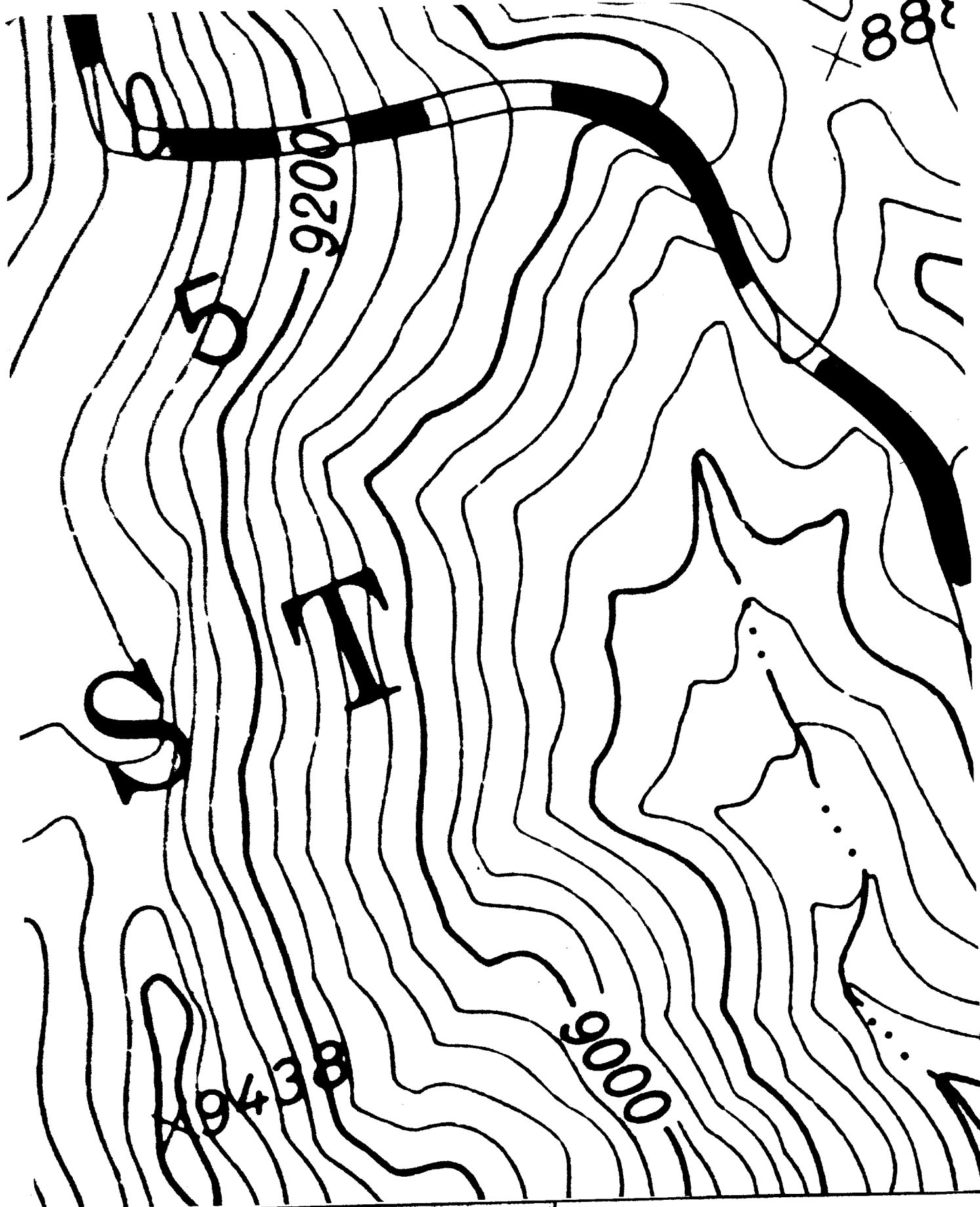
DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-24

R. KEITH HOON & ASSOCIATES, INC.
PHONE 436-8111 2401 E. PLATTE AVENUE
COLORADO SPRINGS, COLORADO 80901



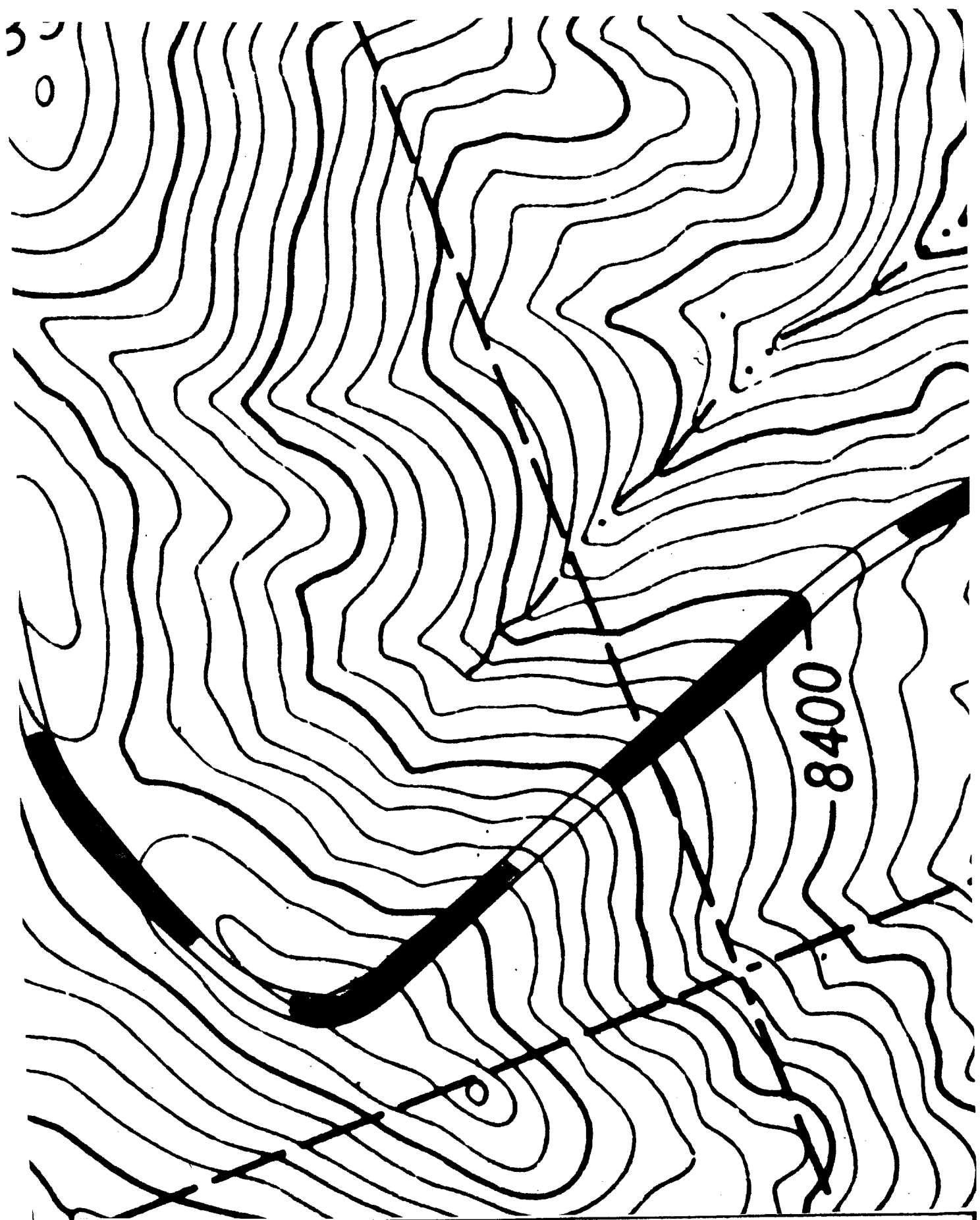




DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-27

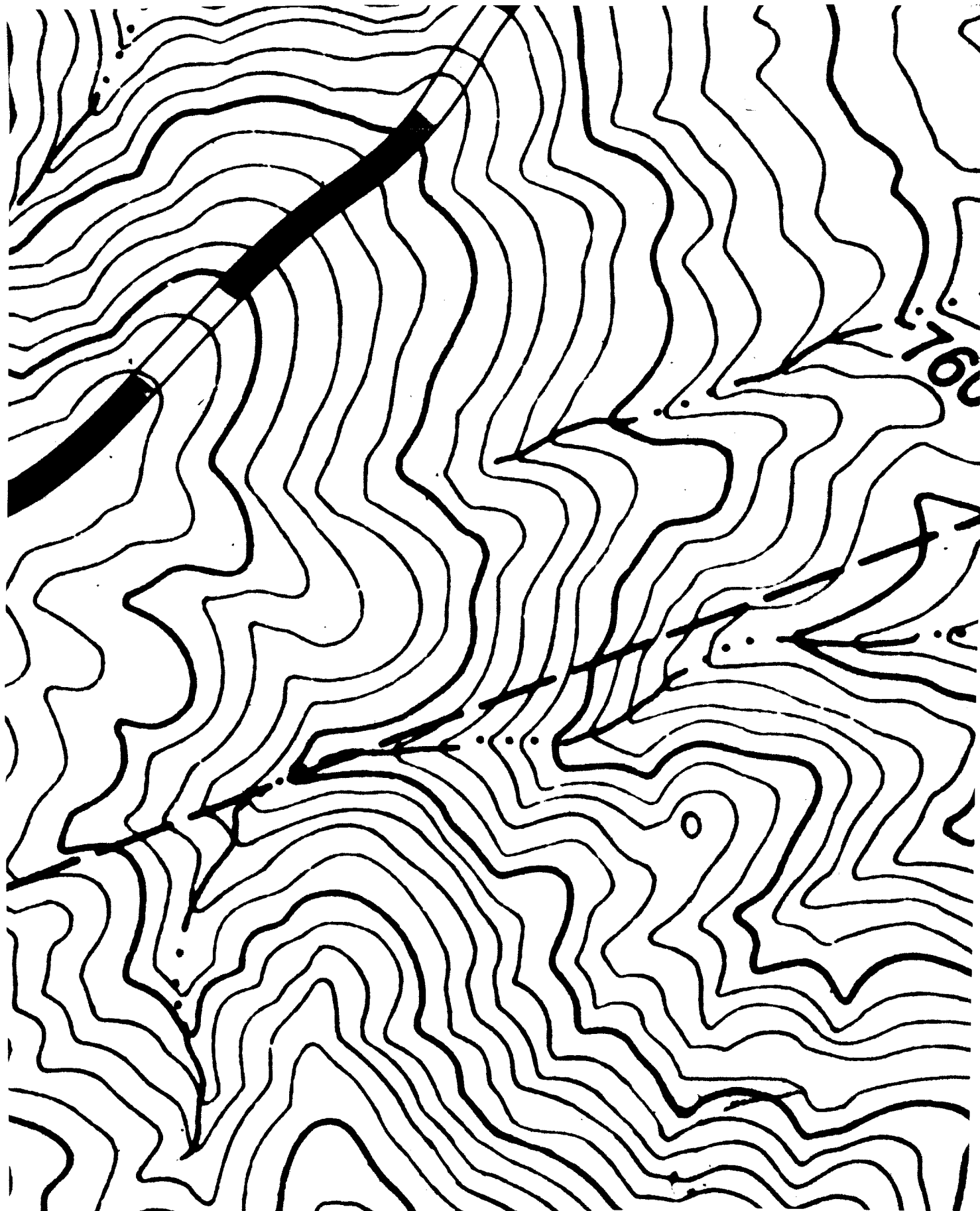
K. PETERSON & ASSOCIATES, INC.
P.O. BOX 10000 DENVER, COLORADO 80201



DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-28

R. KETTER HOOK & ASSOCIATES, INC.
PHONE 435-3441 1000 N. 14TH AVE. COLORED SPRING, COLORADO 80901



760

DRY CREEK
DRAINAGE REPORT

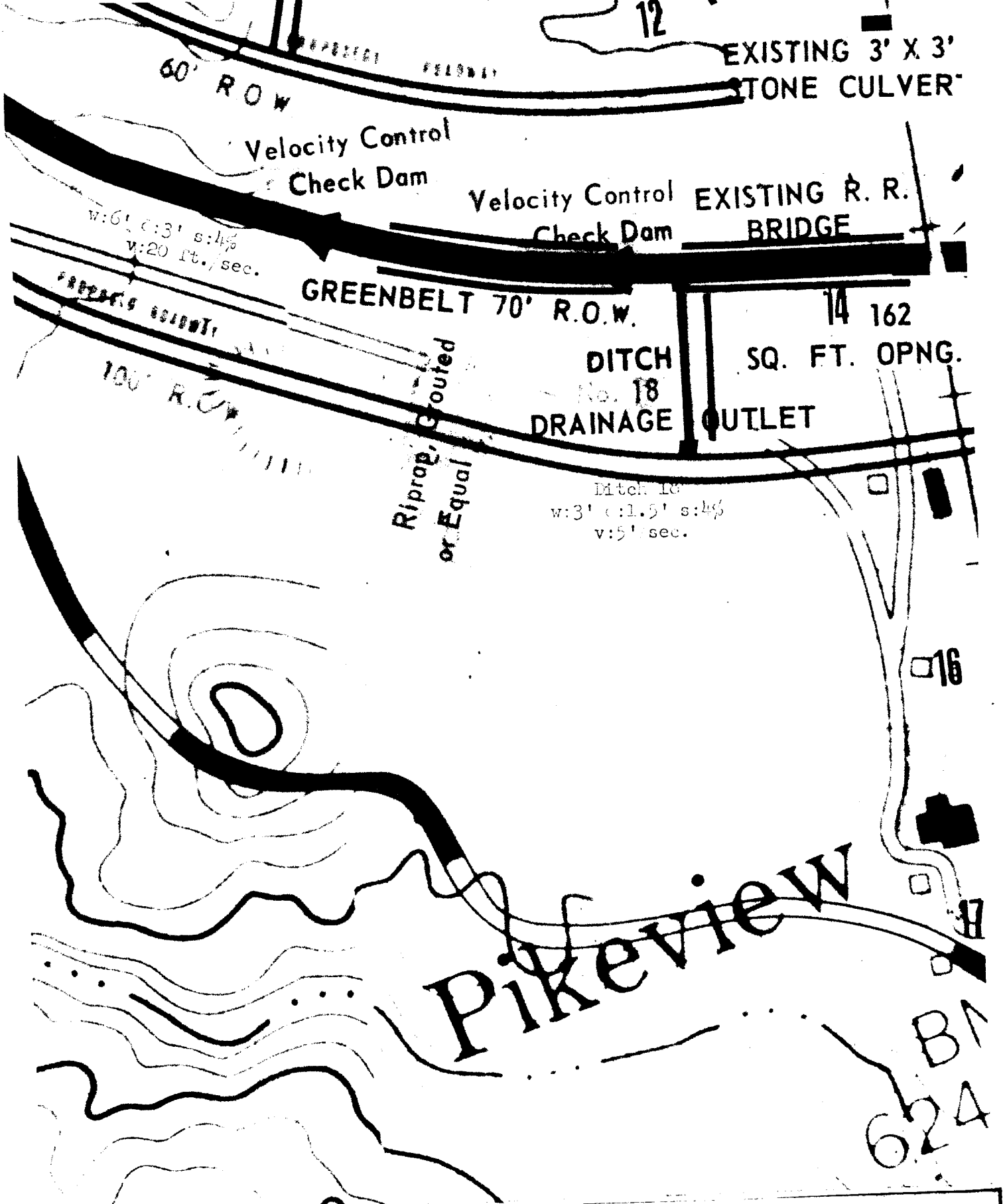
DETAIL SHEET
D-29

H. W. FENNELL & ASSOCIATES, INC.
PHONE 433-2211 200 E. PLATEAU AVE. COLORADO SPRINGS, COLORADO 80901

DITCH

DITCH 17
w: 3' c: 1.9' s: 1.4'
v: 9' sec.

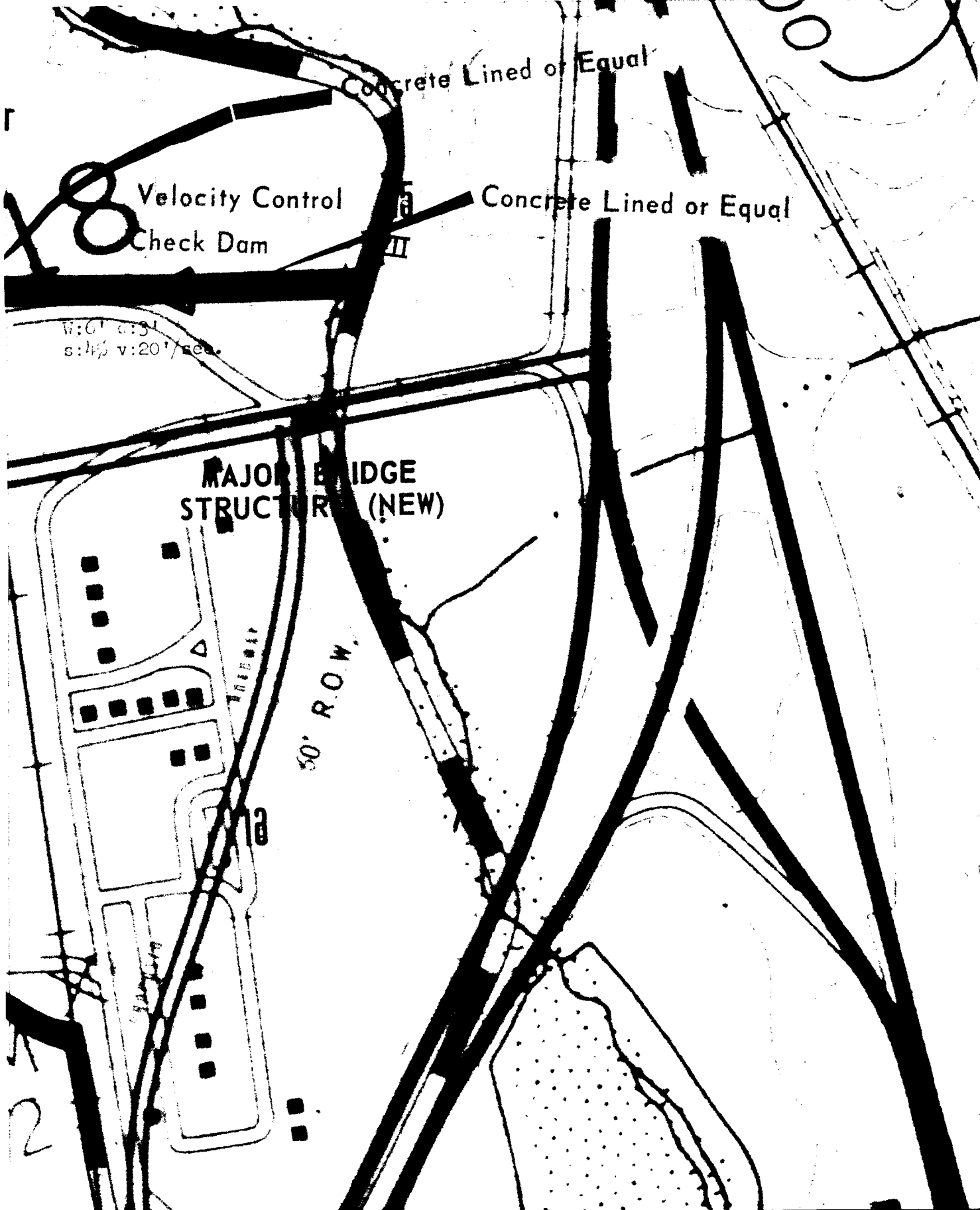
DRAINAGE OUTLET



DRY CREEK
DRAINAGE REPORT

DETAIL SHEET
D-31

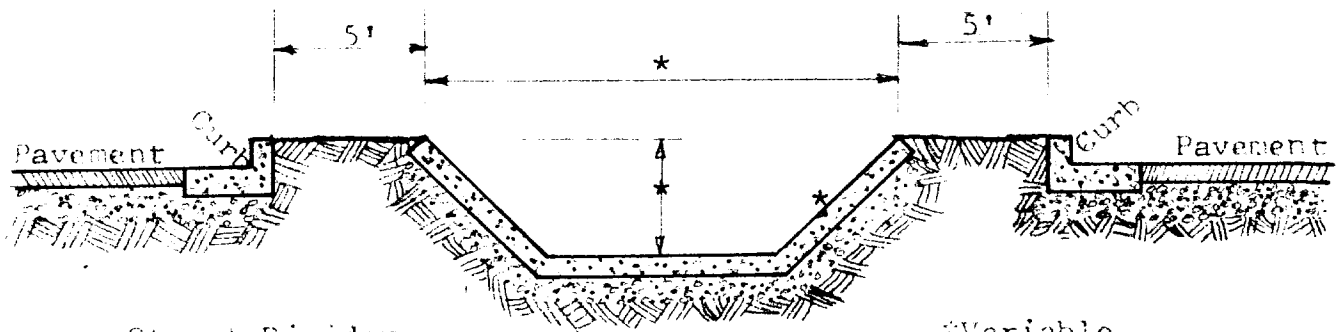
J. PETERSON & ASSOCIATES, INC.
ENGINEERS, ARCHITECTS, PLANNERS
1000 10TH AVENUE, SUITE 100, DENVER, CO 80202



DRY CREEK
DRAINAGE REPORT

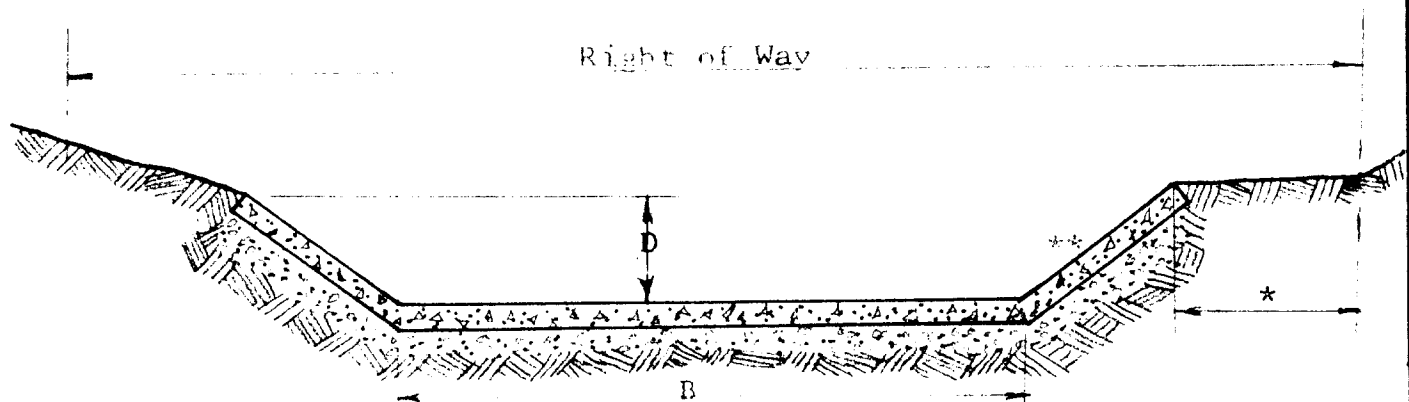
DETAIL SHEET
D-32

R. KETTER HOOK & ASSOCIATES, INC.
PHONE 434-8821 FAX 434-8822 1000 W. HAYES AVE. SUITE 100 COLUMBIA, MISSOURI 65201



For use as Street Divider

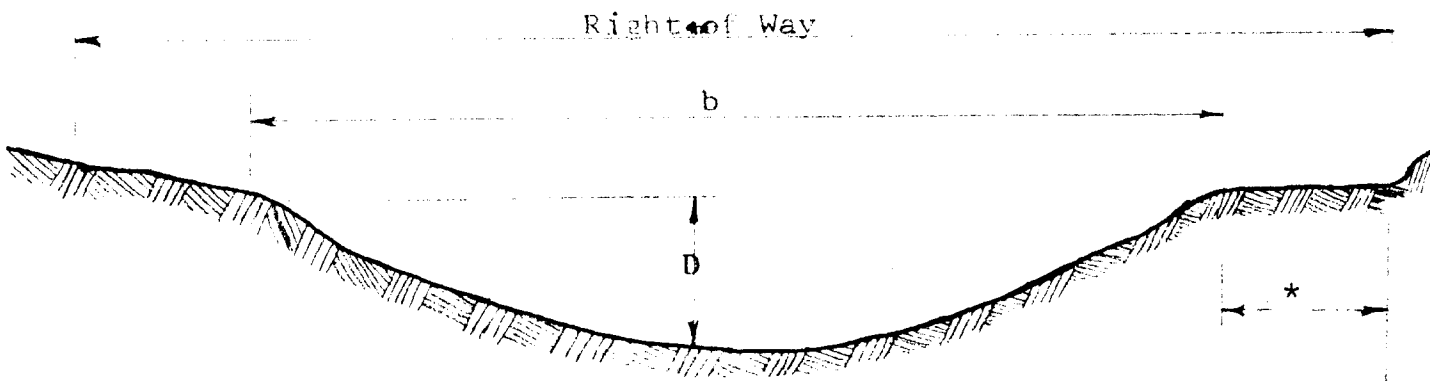
*Variable



For use as Street Divider or
High Capacity Ditch

*19' Roadway for
Maintenance

**Variable

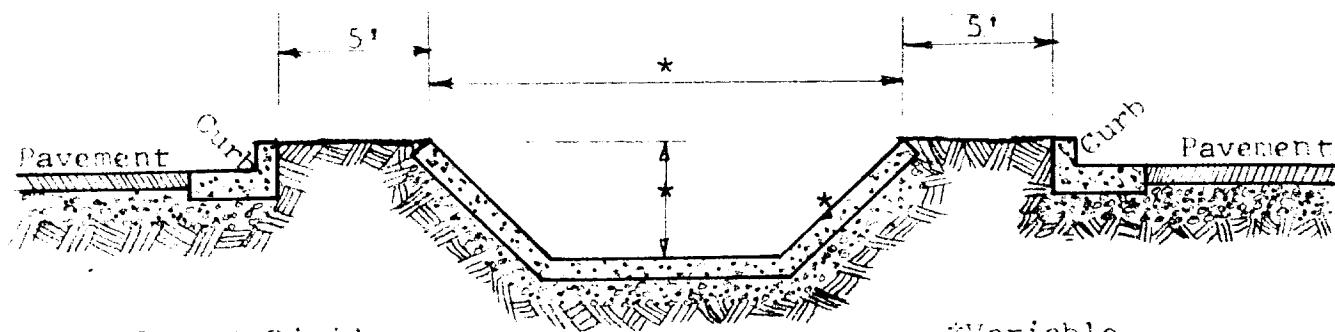


For use as Park Strip, Playground
Strip, or Low Capacity Residential
Ditch

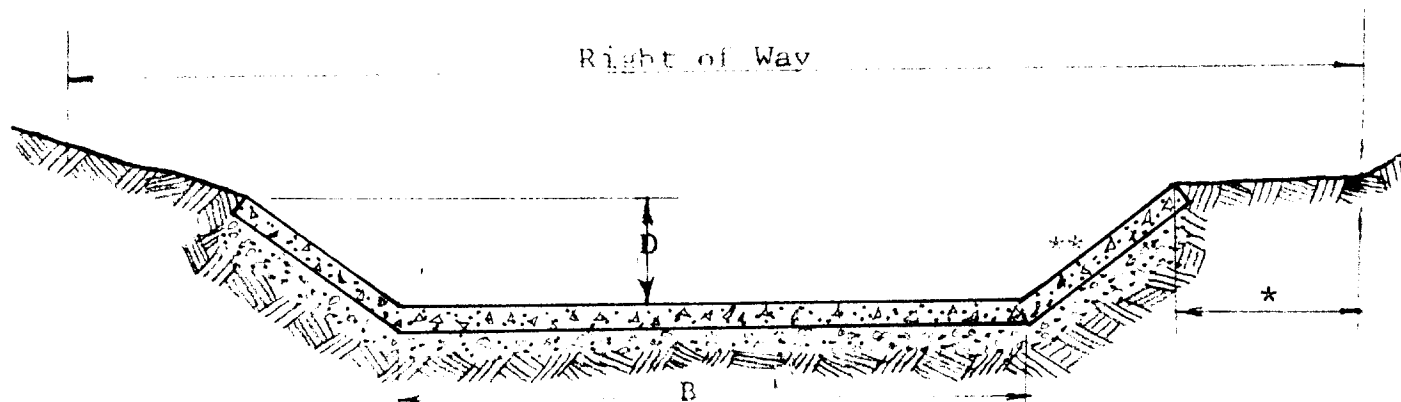
*16' roadway for
maintenance

TYPICAL DITCH SECTIONS





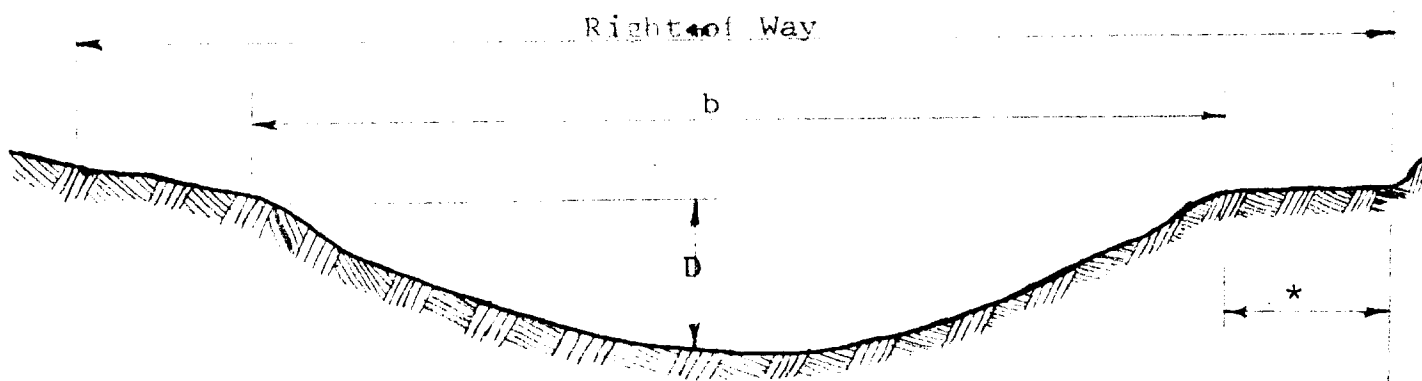
For use as Street Divider



For use as Street Divider or
High Capacity Ditch

16' Roadway for
Maintenance

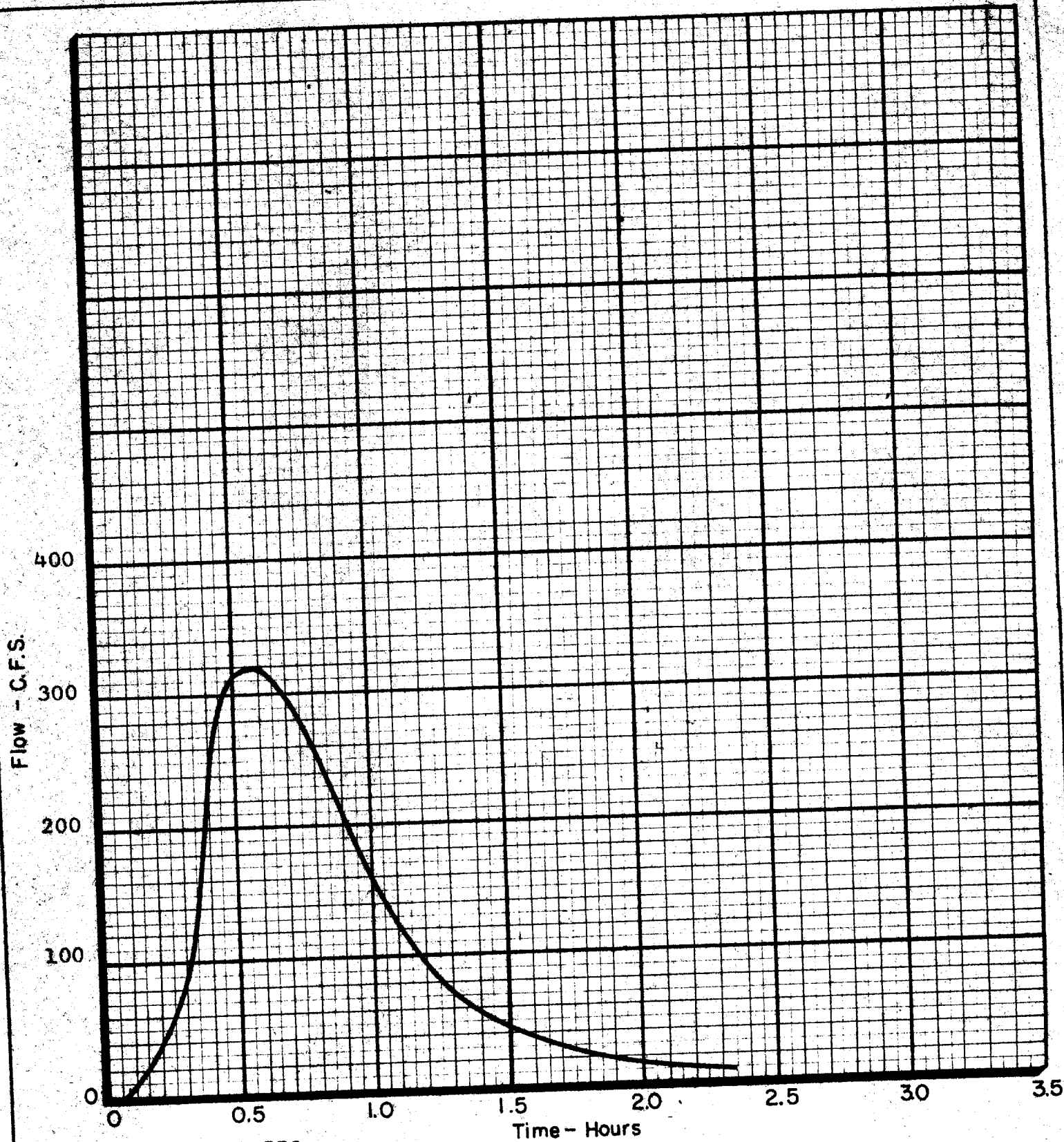
**Variable



For use as Park Strip, Playground
Strip, or Low Capacity Residential
Ditch

16' roadway for
Maintenance

TYPICAL DITCH SECTIONS

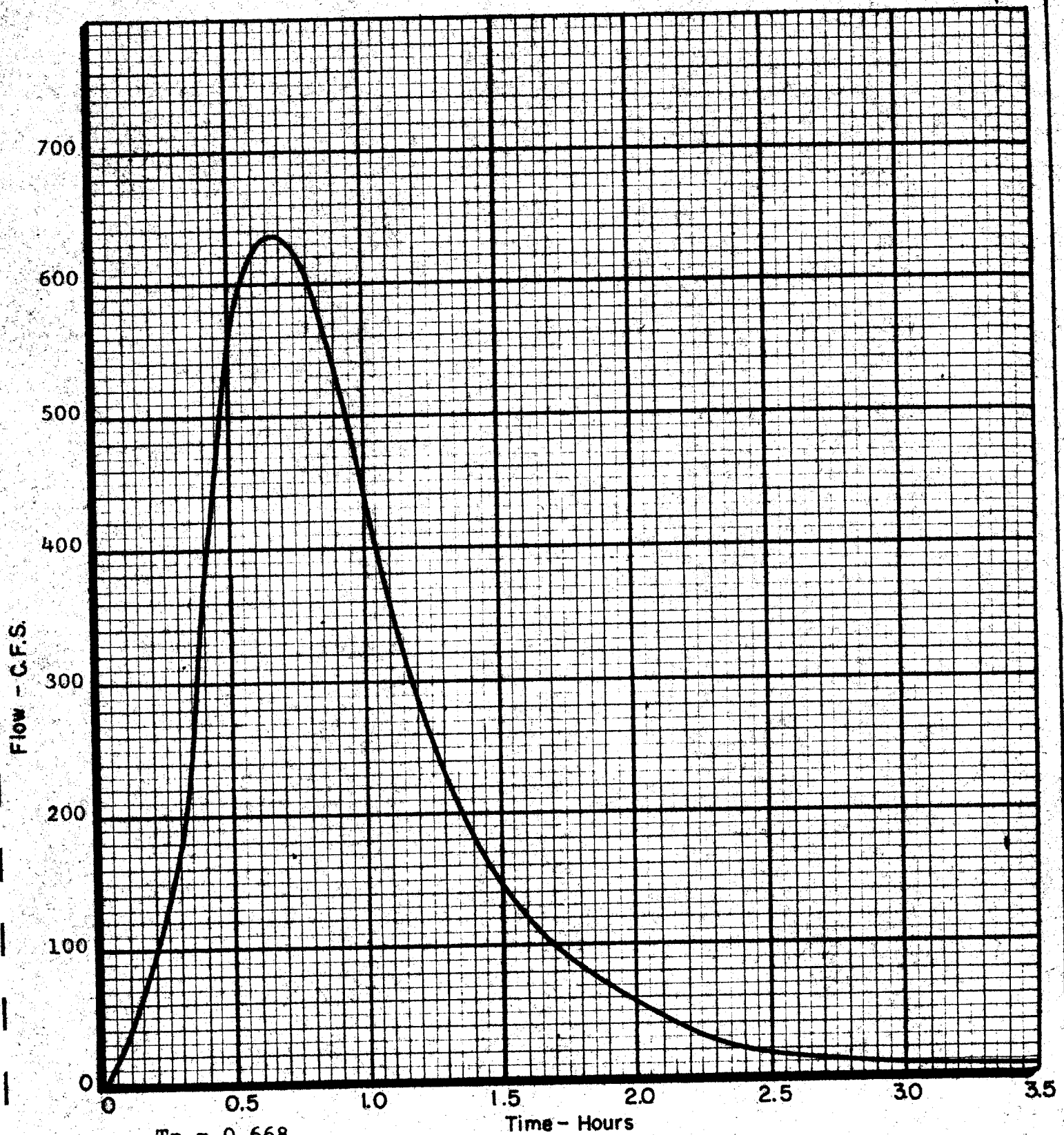


$T_p = 0.578$

$Q_p = 320 \text{ Cfs}$

POINT I

R. KEITH HOOK & ASSOCIATES, INC.
PHONE 415-2531 1540 N. PLATTE AVE. COLORADO SPRINGS, COLORADO 80905



$T_p = 0.668$

$Q_p = 641 \text{ Cfs}$

POINT II

R. KEITH HOOK & ASSOCIATES, INC.

Flow - C.F.S.

1200

1000

800

600

400

200

0

0

0.5

1.0

1.5

2.0

2.5

3.0

3.5

Time - Hours

$T_p = 0.986$

$Q_p = 1133$ cfs

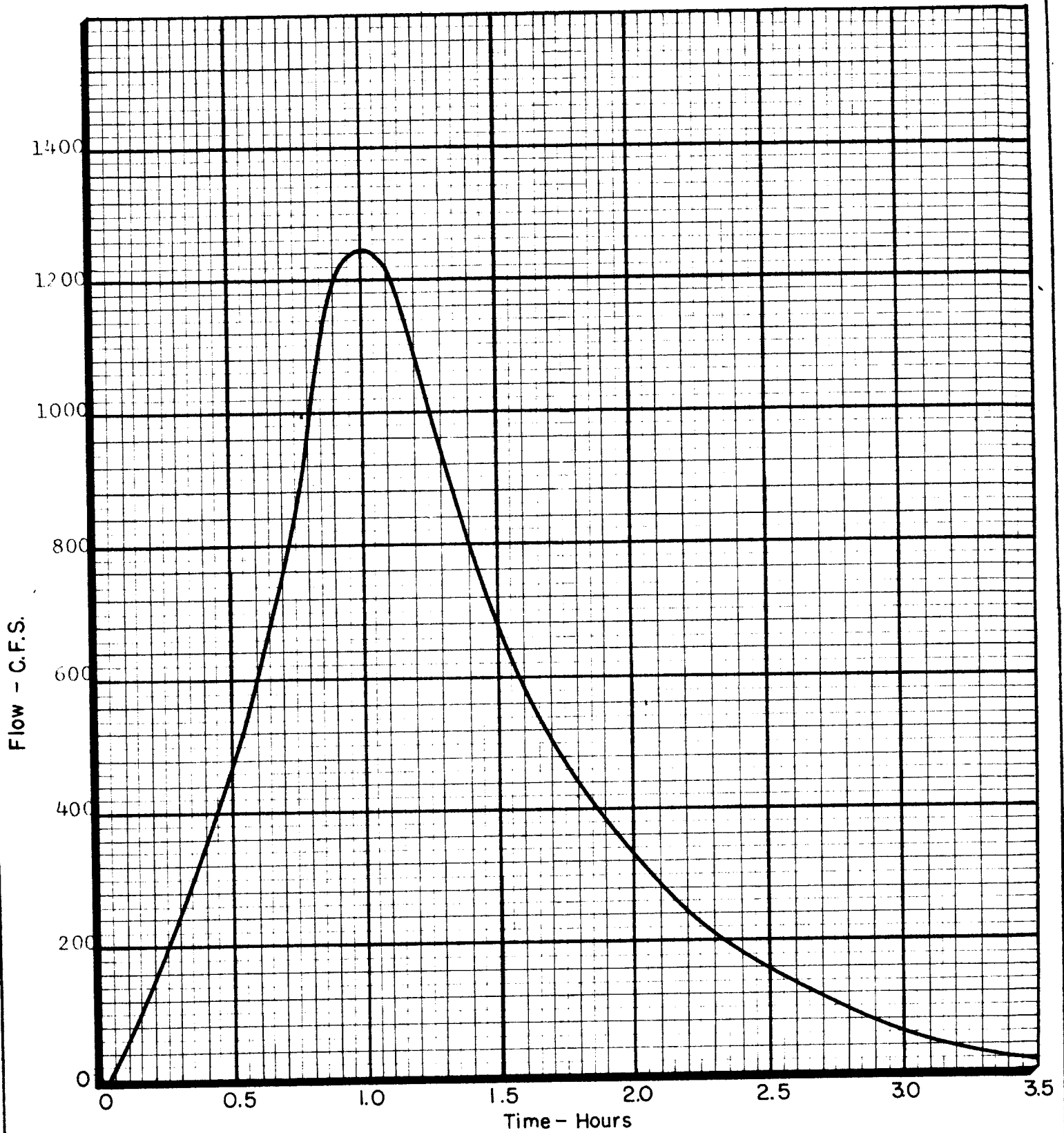
POINT IV

R. KEITH HOOK & ASSOCIATES, INC.

PHONE 635-2733

1465 E. PLATTE AVE

COLORADO SPRINGS, COLORADO 80909



$T_p = 1.05$

$Q_p = 1245 \text{ cfs}$

POINT V

R. KEITH HOOK & ASSOCIATES, INC.

PHONE 11-2753

2551 E. PLATTE AVE

COLORADO SPRINGS, COLORADO 80909

Flow - C.F.S.

200

100

0

0

0.5

1.0

1.5

2.0

2.5

3.0

3.5

Time - Hours

$T_p = 0.608$

$Q_p = 105 \text{ cfs}$

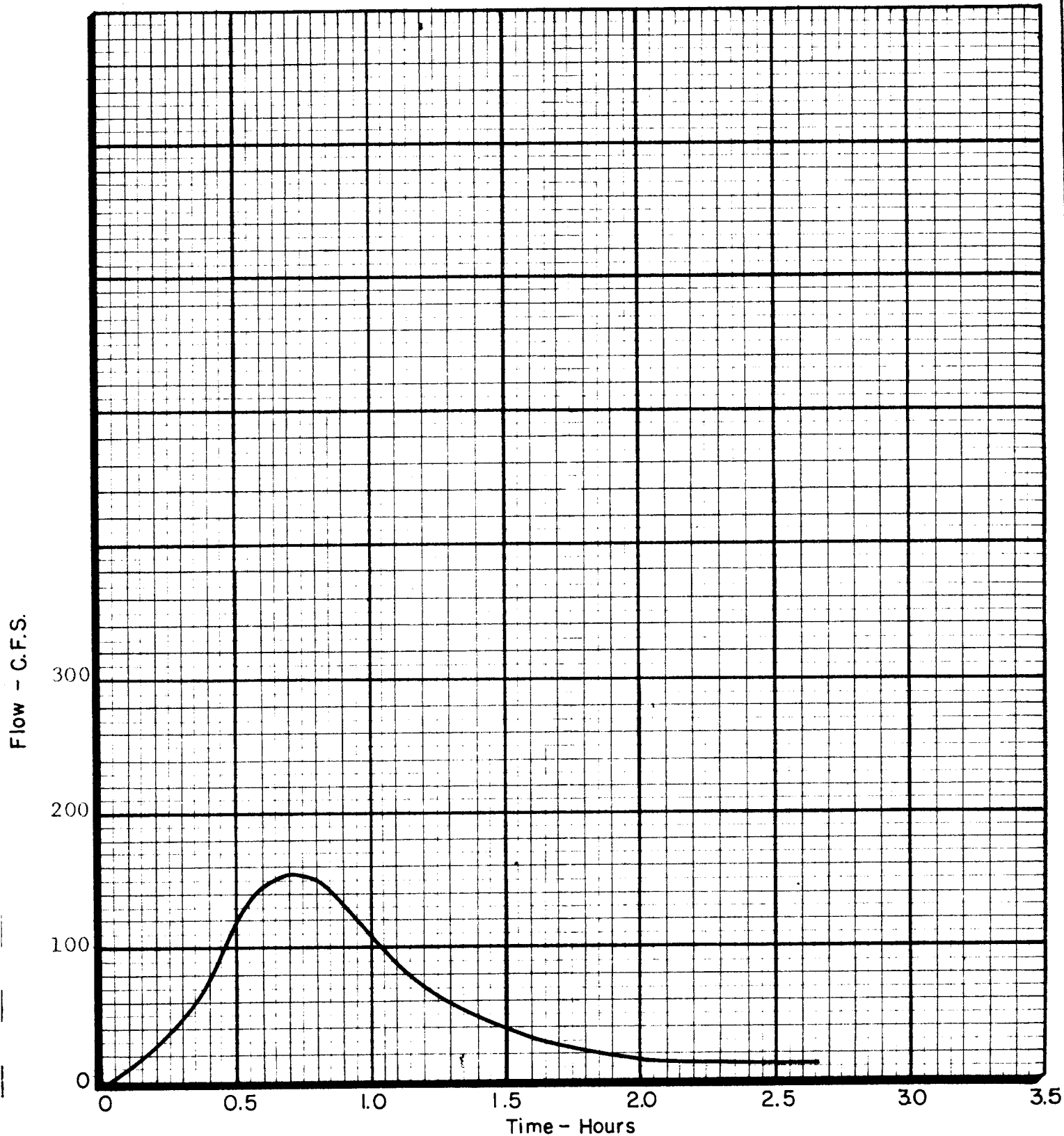
POINT VI

R. KEITH HOOK & ASSOCIATES, INC.

PHONE 523-1523

1541 E. TEALIN AVE.

COLORADO SPRINGS, COLORADO 80904



$T_p = 0.707$

$Q_p = 158 \text{ cfs}$

POINT VII

R. KEITH HOOK & ASSOCIATES, INC.

PHONE 215-1731

1445 E. PLATTE AVE

COLORADO SPRINGS, COLORADO 80909

ESTIMATE OF COST
FOR THE
DRY CREEK
DRAINAGE BASIN
(Cost in Place)

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>	<u>UNIT</u>	<u>UNIT COST</u>	<u>AMOUNT</u>
I.	STORM SEWER SYSTEM				
	(a) 24 " Plain concrete pipe	80	LF	10.00	800.00
	(b) 36 " Plain Concrete Pipe	250	LF	17.00	4,250.00
	(c) 40 " Plain Concrete Pipe	360	LF	22.00	7,920.00
	(d) Headwall, Concrete (Mesh Reinforced)	24	CY	40.00	960.00
	Total, ITEM NO. I.			\$13,930.00
II.	DRAINAGE DITCHES (Collector System)				
* 1.	DITCH NO. 1 -- W=4; D=3; S=1.5:1				
	a. Shaping	3300	LF	0.30	990.00
	b. Erosion Control:				
	1. Riprap (grouted)	1000	SY	5.00	5,000.00
	2. Concrete lined	----			
	3. Velocity Control, Check dam or equal	----			
2.	DITCH NO. 2 -- W=3; D=1.5; S=1.5:1				
	a. Shaping	5400	LF	0.15	810.00
	b. Erosion Control:				
	1. Riprap (grouted)	1000	SY	5.00	5,000.00
	2. Concrete lined	----			
	3. Velocity Control, Check dam or equal	----			
3.	DITCH NO. 3 -- W=4; D=3; S=1.5:1				
	a. Shaping	6600	LF	0.15	990.00
	b. Erosion Control:				
	1. Riprap (grouted)	1500	SY	5.00	7,500.00
	2. Concrete lined	----			
	3. Velocity Control, Check dam or equal	----			

4.	<u>DITCH NO. 4</u>	W=3; D=1.5; S=1.5:1			
	a. Shaping	200	LF	0.15	30.00
	b. Erosion control:				
	1. Riprap (grouted)	110	SY	5.00	550.00
	2. Concrete lined	---			
	3. Velocity Control,				
	check dam or equal	---			
5.	<u>DITCH NO. 5</u>	W= 3; D=1.5; S=1.5:1			
	a. Shaping	450	LF	0.15	67.50
	b. Erosion control:				
	1. Riprap (grouted)	250	SY	5.00	1,250.00
	2. Concrete lined	---			
	3. Velocity Control,				
	check dam or equal	---			
6.	<u>DITCH NO. 6</u>	W=3; D=1.5; S=1.5:1			
	a. Shaping	450	LF	0.15	67.50
	b. Erosion Control:				
	1. Riprap (grouted)	250	SY	5.00	1,250.00
	2. Concrete lined	---			
	3. Velocity Control,				
	check dam or equal	---			
7.	<u>DITCH NO. 7</u>	W=3; D=1.5; S=1.5:1			
	a. Shaping	400	LF	0.15	60.00
	b. Erosion Control:				
	1. Riprap (grouted)	220	SY	5.00	1,100.00
	2. Concrete lined	---			
	3. Velocity Control,				
	check dam or equal	---			
8.	<u>DITCH NO. 8</u>	W=3; D=1.5; S=1.5:1			
	a. Shaping	2400	LF	0.15	360.00
	b. Erosion Control:				
	1. Riprap (grouted)	840	SY	5.00	4,200.00
	2. Concrete lined	---			
	3. Velocity Control,				
	check dam or equal	---			
9.	<u>DITCH NO. 9</u>	W=3; D=2; S=1.5:1			
	a. Shaping	1500	LF	0.20	300.00
	b. Erosion Control:				
	1. Riprap (grouted)	400	SY	5.00	2,000.00
	2. Concrete lined	---			
	3. Velocity Control,				
	check dam or equal	---			

10.	<u>DITCH NO. 10</u>	W=3; D=2; S=1.5:1				
	a.	Shaping	1100	LF	0.20	220.00
	b.	Erosion Control:				
		1. Riprap (grouted)	400	SY	5.00	2,000.00
		2. Concrete lined	---			
		3. Velocity control, check dam or equal	---			
11.	<u>DITCH NO. 11</u>	W=3; D=1.5; S=1.5:1				
	a.	Shaping	400	LF	0.15	60.00
	b.	Erosion Control:				
		1. Riprap (grouted)	---			
		2. Concrete lined	---			
		3. Velocity Control, check dam or equal	---			
12.	<u>DITCH NO. 12</u>	W=3; D=1.5; S=1.5:1				
	a.	Shaping	200	LF	0.15	30.00
	b.	Erosion Control:				
		1. Riprap (grouted)	---			
		2. Concrete lined	---			
		3. Velocity Control, check dam or equal	---			
13.	<u>DITCH NO. 13</u>	W=3; D=1.5; S=1.5:1				
	a.	Shaping	250	LF	0.15	37.50
	b.	Erosion Control:				
		1. Riprap (grouted)	---			
		2. Concrete lined	---			
		3. Velocity Control, check dam or equal	---			
14.	<u>DITCH NO. 14</u>	W=3; D=1.5; S=1.5:1				
	a.	Shaping	250	LF	0.15	37.50
	b.	Erosion Control:				
		1. Riprap (grouted)	---			
		2. Concrete lined	---			
		3. Velocity Control, check dam or equal	---			
15.	<u>DITCH NO. 15</u>	W=3; D=1.5; S=1.5:1				
	a.	Shaping	80	LF	0.15	12.00
	b.	Erosion Control:				
		1. Riprap (grouted)	---			
		2. Concrete lined	---			
		3. Velocity Control, check dam or equal	---			

16.	<u>DITCH NO. 16</u>	W=3; D=1.5; S=1.5:1				
	a. Shaping	300	LF	0.15		45.00
	b. Erosion Control:					
	1. Riprap (grouted)	---				
	2. Concrete lined	---				
	3. Velocity Control, check dam or equal	---				
17.	<u>DITCH NO. 17</u>	W=3; D=1.5; S=1.5:1				
	a. Shaping	280	LF	0.15		42.00
	b. Erosion Control:					
	1. Riprap (grouted)	---				
	2. Concrete lined	---				
	3. Velocity Control, check dam or equal	---				
18.	<u>DITCH NO. 18</u>	W=3; D=1.5; S=1.5:1				
	a. Shaping	300	LF	0.15		45.00
	b. Erosion Control:					
	1. Riprap (grouted)	160	SY	5.00		800.00
	2. Concrete lined	---				
	3. Velocity Control, check dam or equal	---				
19.	<u>DITCH NO. 19</u>	W=3; D=1.5; S=1.5:1				
	a. Shaping	600	LF	0.15		<u>90.00</u>
	b. Erosion Control:					
	1. Riprap (grouted)	---				
	2. Concrete lined	---				
	3. Velocity Control, check dam or equal	---				
Total, ITEM NO. II.						\$28,954.00*
<u>*Cost for Ditch No. 1 not included</u>						

III.

DRAINAGE STRUCTURES

A. Box Culverts	10 ft. x 5.5 ft.	2	Ea.	4000.00		8,000.00
B. Drainage Outlet		25	Ea.	200.00		5,000.00
C. Special intersection						
Design curb outlet		3	Ea.	300.00		<u>900.00</u>
Total, ITEM NO. III.						\$13,900.00

IV.

GREENBELT CONSTRUCTION

A. Earthwork and Re-alignment

1. 60' ROW (4800 LF)	10,000	CY	0.30	3,000.00
2. 70' ROW (10,000 LF)	35,000	CY	0.30	10,500.00
3. 100' ROW (5,000 LF)	20,000	CY	0.30	6,000.00

B. Riprap (Grouted)

1. 60' ROW (1600 LF)	2,200	SY	5.00	11,000.00
2. 70' ROW (3,000 LF)	4,100	SY	5.00	20,500.00
3. 100' ROW (3,100 LF)	4,240	SY	5.00	21,200.00

C. Concrete Lined or Equal

1. 70' ROW (1,100 LF)	250	CY	60.00	15,000.00
2. 100' ROW (1,000 LF)	220	CY	60.00	13,200.00

D. Velocity Control Check dam	13	Ea.	1,000.00	13,000.00
Total, ITEM NO. IV.			<u>\$113,400.00</u>

V.

BRIDGES

A. 100 sq.ft. opening,

L=80 ft. 2-(5'x5')	3	Ea.	8,000.00	24,000.00
--------------------	---	-----	----------	-----------

B. 162 sq.ft. opening,

L=40 ft. 2-(6' x 5')	1	Ea.	12,000.00	12,000.00
----------------------	---	-----	-----------	-----------

C. Major Bridge,

Construction crossing Monument
Creek

1	Ea.	200,000.00	<u>200,000.00</u>
---	-----	------------	-------------------

Total, ITEM NO. V.	<u>\$236,000.00</u>
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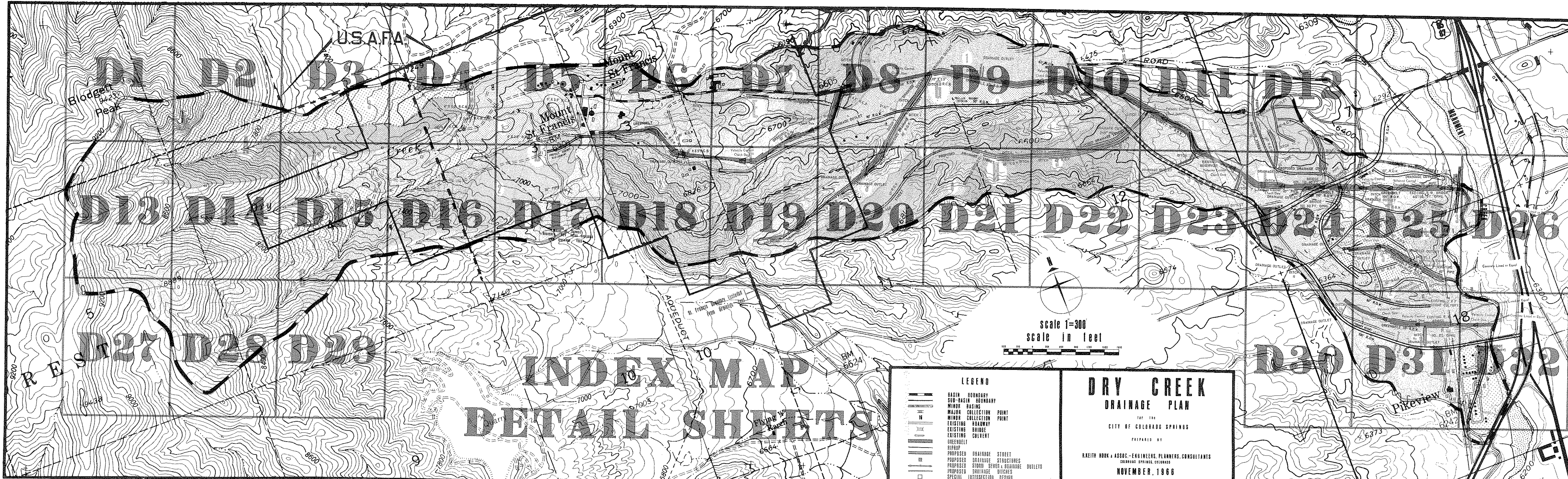
GRAND TOTAL (<u>*Not including Ditch No. 1</u>)	<u>\$406,184.00</u>
---	---------------------

TOTAL LAND AREA = 2,494 Acres

Less National Forest
Area -747 Acres**Less Mt. Francis
Property -820 AcresNET ACREAGE SUBJECT TO
DRAINAGE COST

927 Acres

<u>\$406,184.00</u>	-	\$438.17 per Acre
927		



INDEX MAP DETAIL SHEETS

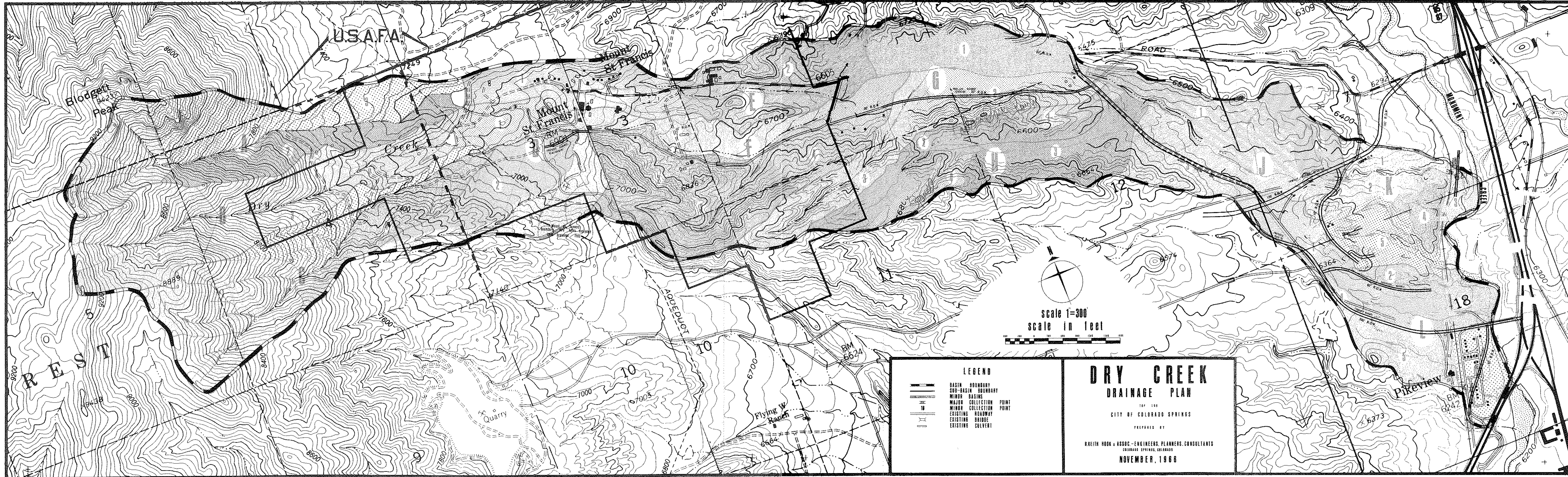
LEGEND	
	BASIN BOUNDARY
	SUB-BASIN BOUNDARY
	MINOR BASINS
	MAJOR COLLECTION POINT
	MINOR COLLECTION POINT
	EXISTING ROADWAY
	EXISTING BRIDGE
	EXISTING CULVERT
	GREENBELT
	RIPPRAP
	PROPOSED DRAINAGE STREET
	PROPOSED DRAINAGE STRUCTURES
	PROPOSED STORM SEWER & DRAINAGE OUTLETS
	PROPOSED DRAINAGE DITCHES
	SPECIAL INTERSECTION DESIGN

**DRY CREEK
DRAINAGE PLAN**

FOR THE
CITY OF COLORADO SPRINGS

PREPARED BY
R. KEITH HOOK & ASSOC. - ENGINEERS, PLANNERS, CONSULTANTS
COLORADO SPRINGS, COLORADO

NOVEMBER, 1966



USAF

Mount St. Francis

Mount St. Francis

Creek

Dry

AQUEDUCT

Flying W Ranch

Pikeview

LEGEND

- BASIN BOUNDARY
- SUB-BASIN BOUNDARY
- MINOR BASINS
- MAJOR COLLECTION POINT
- MINOR COLLECTION POINT
- EXISTING ROADWAY
- EXISTING BRIDGE
- EXISTING CULVERT

DRY CREEK DRAINAGE PLAN

CITY OF COLORADO SPRINGS

PREPARED BY
R. KEITH HOOK & ASSOC. - ENGINEERS, PLANNERS, CONSULTANTS
COLORADO SPRINGS, COLORADO
NOVEMBER, 1966