ROSWELL DRAINAGE AREA
Drainage Study

JUNE 1978

for the
CITY OF COLORADO SPRINGS

RETURN TO: Gary Haynes
City of Colorado Springs
Engineering Division

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BY
UNITED PLANNING & ENGINEERING CO.
916 NORTH WEBER
COLORADO SPRINGS, CO. 80903

ROSWELL DRAINAGE AREA

D R A I N A G E S T U D Y

JUNE, 1978

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BY:

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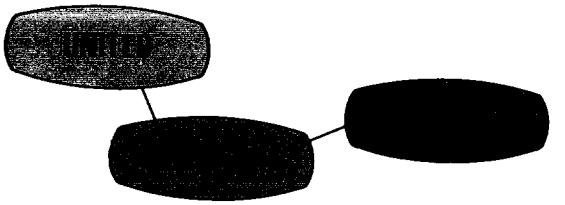
Colorado Springs, CO 80903



planners · consultants · engineers

916 North Weber
Colorado Springs, Colorado 80903
(303) 471-8222

June 22, 1978

Mr. Dewitt Miller
Director of Public Works
City of Colorado Springs
P. O. Box 1575
Colorado Springs, CO 80901

SUBJECT: Roswell Drainage Area
Master Drainage Study

Dear Deke:

Transmitted herewith is the master drainage study for the Roswell Area Drainage in Colorado Springs.

The study was prepared by me and under my direct supervision and complies with all applicable criteria and ordinances of the City of Colorado Springs.

Please do not hesitate to call on me if I may answer any questions concerning the study.

Respectfully submitted,

UNITED PLANNING & ENGINEERING CO.

Oliver E. Watts
PE-LS 9853
Partner

OEW:pq
Enclosure

MASTER DRAINAGE STUDY

ROSWELL AREA DRAINAGE

PREPARED FOR

THE CITY OF COLORADO SPRINGS, COLORADO

CITY COUNCIL MEMBERS

Lawrence B. Ochs	Mayor
Richard E. Dodge	Vice Mayor
Michael Bird	
Mary Kyer	
Margaret M. Vasquez	
Leon Young	
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Charles C. Brown	
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CITY ADMINISTRATION

George Fellows	Manager
Dewitt Miller	Public Works Director
Donnel Jeffries	City Engineer

JUNE, 1978

CONTENTS

MASTER DRAINAGE STUDY

ROSWELL AREA DRAINAGE

SECTION I - INTRODUCTION

A. Purpose and Scope

The purpose of this study is to provide a master plan that will best protect the developments and people within the area from the runoff of severe storms and to provide a legal means of enforcement to the City of Colorado Springs as required by ordinance.

This study prescribes the design values to be used for the drainage structures, the general type of structures to be used and their location. A collection system of minor structures is specified to serve undeveloped ground, based on anticipated future development. All computations are based on the assumed ultimate developed state of the area. Costs are assigned to the various structures based on the acreage of unplatted ground likely to occur within the future City limits.

B. Description of Basin

The Roswell Drainage Area is bounded on the West by Monument Creek, on the East by the abandoned Sante Fe Railroad Grade, on the North by the Pikeview Interchange and on the South by the Rock Island Railroad.

Much of this area has been included in previous basin studies and several basins traverse the area from the East and outfall on Monument Creek; namely, the Pulpit Rock, Templeton Gap, Lower Cragmor and Van Buren basins. In addition Monument Creek in this area is the outfall of several basins lying to the West; namely, Rockrimmon North, Rockrimmon South, Popes Bluff, Douglas Creek and the Mesa.

Soil mapping of the area has been prepared by the local office of the USDA - Soil Conservation Service. This mapping is simplified into their four major hydrologic groupings and is shown on Plate No. 1 in the appendix. These four soils groupings are as follows:

Group A: (Low Runoff Potential): Soils that have high infiltration rates even when wetted, consisting of deep, well to excessively well drained sands and gravel.

Group B: Soils having moderate infiltration rates when thoroughly wetted, consisting of moderately fine to moderately coarse textures soils.

Group C: Soils having slow infiltration rates when thoroughly wetted, consisting of moderately fine to fine textures soils or soils having a layer that impedes downward movement of water.

Group D: (High Runoff Potential): Soils having very slow infiltration rates when thoroughly wetted, consisting chiefly of high plasticity clays, a high groundwater table, a shallow clay or clay pan layer or shallow soils over nearly impervious bedrock.

The drainage area is 17,600 feet long and up to 3,700 feet wide, and is of low to moderate slope. Much of the area is developed, some of it dating back to the 1800's. The first incorporation into the City was in 1950 with the Roswell addition. For a time, most of the area was served by the North Suburban Sanitation District, and the abandoned treatment plan sits adjacent to the Creek North of Fillmore Street.

C. Proposed Development

All computations are based on the basin being in its ultimate state of development, which is projected to be as shown on Plate No. 2 in the appendix. By this means, all structures built to contain storm runoff should not require replacement due to some future development. Furthermore, the City has a legal right to insure that some future, unforeseen developer employ such flood control techniques necessary to protect downstream areas.

The City's land use plans and policies were compiled and all known existing and proposed developments are considered. These developments are categorized into general zoning types as shown on Plate No. 2, which shows our anticipated ultimate development condition. This Plate is simply a projection made by our judgment, but is a necessary part of the planning process. Variations from this projection which might substantially revise the quantity of runoff may require a restudy of the affected areas.

MASTER DRAINAGE STUDY

ROSWELL AREA DRAINAGE

SECTION II - HYDROLOGY

A. Description

The mean annual precipitation in the Roswell Area is fifteen inches per year and has ranged from less than 12 to over 30 inches in the period of record since 1931.

This area is in the zone of prevailing westerlies. The source of moist air in the winter is from the Pacific Ocean. Since most of the precipitation is on the western slopes of the Continental Divide, winter is the driest season of the year.

April through September is the wet season in the area. Precipitation is caused by frontal action and air mass thunderstorms that frequently occur during April and May, and less frequently from June through August. During October and November there is an increase in frontal activity, but a decrease in moisture from the Gulf of Mexico, which serves as a principal source of moisture during the flood season.

The floods are characterized by high peak flows, moderate volumes and short durations.

B. Design Parameters

1. Design Storms: As required by City criteria the following design floods were used: Minor Structures: 5 year, 6 hour precipitation (2.1 inches); Greenbelt Structures: 100 year, 6 hour precipitation (3.5 inches).

2. Curve Numbers: The following curve numbers were used in hydrologic computations:

DEVELOPMENT TYPES	SOIL GROUPS A	B	C	D
Industrial and Commercial Areas	81	88	91	93
Single Family Residential	61	75	83	87
Multi Family Residential	79	86	90	92
Mobile Home Parks	71	82	88	91

3. Time of Concentration: For overland flow the California formula was used:

$$Tc = \frac{(11.9L^3)^{0.385}}{(H)}$$

To the first inlet.

For structural flow, the full barrel velocity was used to the first hydrograph point.

For all storm sewer routings, the actual design velocity for the appropriate design runoff was used.

4. Simplified Hydrograph: The simplified runoff equation:

$$Qp = KAQ$$

was used for all computations in the area, which are included in the appendix, where:

Qp is peak runoff in C.F.S.
K is a design constant, based on the time of concentration, as published in City criteria.
A is the area of the basin in square miles, and
Q is the runoff for the design rainfall, based on the appropriate curve number.

Some inflow runoffs were taken from the September, 1977, Templeton Gap Study by Lincoln Devore. These inflows were combined with basin runoffs in this area to obtain outfall runoff volumes for the total sub-basins.

Design flows may be found on the appropriate computation forms in the appendix.

MASTER DRAINAGE STUDY

ROSWELL AREA DRAINAGE

SECTION III - HYDRAULICS

A. Criteria

Manning's equation was used for all hydraulic computations, using the following "n" value.

TYPE OF LINING	"n" VALUE
Concrete Pipe	0.013
CMP, 2 2/3"x1/2"	0.024
CMP, 3"x1"	0.027
Concrete Lining	0.013

Concrete channels are sized on a preliminary basis by optimum shape, where the depth equals bottom width with 1:1 side slopes. Detailed computations are enclosed.

The existing Pikeview Reservoir No. 2 is continued in use as a flood control reservoir, with the addition of an outlet works to prevent permanent storage.

B. Flood Plain Improvements

The existing 100 year flood plain is shown on the drainage plan, as determined by the Corps of Engineers in the flood hazard analysis of Monument Creek, May, 1971.

The creek bed along Monument Creek is fairly unstable, and is about five feet lower in grade along the southern limits of the area, as compared with six to seven years ago. In addition, much of the natural stream banks are weak and easily eroded. For these reasons, certain areas are shown to have bank protection and erosion control, or drop structures.

Areas are proposed along the creek where fringe areas may be filled to reclaim otherwise unuseable ground, in accordance with the flood plain ordinance. A floodway is designated that will accommodate the total runoff without endangering these fringe areas.

These shown creek improvements are to be considered general in nature only, and should be refined by detailed analysis based on specific development plans in certain areas. The cost estimates are also general and are for fee determination and guideline purposes only.

A major problem along Monument Creek is the continual dumping of construction waste materials. This dumping continually infringes

upon the floodway area and forms a bank that is very susceptable to erosion. The materials are easily transported downstream, where they become a hazard at bridge openings and other constrictions. An ordinance is necessary to provide guidelines to control such dumping adjacent to floodways so that these hazards can be prevented.

C. Analysis of Existing Structures

The great majority of existing drainage structures in the area are adequately sized to accommodate the design runoff in accordance with City criteria. The following is a summary of the hydraulic analysis:

SEE PAGE 10

ROSWELL AREA DRAINAGE STUDY
DRAINAGE PLAN

JUNE 1978

SCALE 1" = 500.00'

LEGEND

	EXISTING	PROPOSED
STORM SEWER	⟶	⟶
CONCRETE DITCH	═══	═══

I-B — DRAINAGE BASIN AND DESIGNATION

MILE MARKER

100 YEAR FLOOD PLAN FLOODWAY

FLOODWAY FRINGE

GRADE CONTROL STRUCTURE

RIPRAP

PHOTOGRAPHY BY MERRICK & CO.
JANUARY 25, 1977

UNITED PLANNING ENGINEERING

78-1092 PLATE NO. 3

DRAINAGE BASIN	STREET	LOCATION	EXISTING STRUCTURE	DESIGN RUNOFF -CFS-	CAPACITY -CFS-	
IA	Alley	Ditch	30" CMP Drop	10.9	33.8	
IB	Nevada	Bridge	18"x29" CMP @ 1%	6.5	10.1	
			30" CMP @ 1%	6.5	22.2	
IC	Nevada	Bridge	15" CMP @ 1%	13.0	3.5	(OK)
			36" CMP @ 1%	13.0	33.3	
IB +IC	Nevada	Ditch	30" CMP @ 1%	18.9	20.5	
ID	Alley	Ditch	30" CMP Drop	15.6	33.8	
IE	Tejon	Tyler	18" CMP @ 2%	10.8	8.0	(OK)
IF	North Cascade	Bridge	36" CMP Drop	3.6	48.8	
IG	Concord	Harrison	24" CMP @ 1%	8.3	12.2	
		Ditch	36" CMP @ 1%	8.3	33.3	
IH	Wood	Van Buren	24" RCP @ 1%	20.8	22.6	
		Ditch	36" CMP @ 2%	41.5	47.1	
II	Beacon	Bridge	2-18" CMP @ 2%	8.2	8.0	(OK)
IIA	Fillmore	Cascade	24" RCP @ 3.04%	4.0	39.4	
		Trailer Park	36" RCP @ 1.04%	22.5	68.0	
		Beacon	42" RCP @ 0.44%	29.2	66.7	
IIH	Commerce	Nevada	27" RCP @ 0.67%	15.9	25.3	
IIL	Cascade	Buchannan	18"x29" CMP @ 1%	17.1	10.1	(OK)
IIM	Buchannan	Cascade	42" RCP @ 0.69%	59.4	83.5	
		Beacon	42" RCP @ 1.83%	59.4	136	
		Beacon	18"x29" CMP @ 1%	14.4	10.1	(OK)
IIV	Winters Drive	Nevada	4'x3' RCB @ 1%	13.4	124	
		Nevada	24" CMP @ 2%	23.0	17.3	(OK)
		Cascade	42" CMP @ 1%	45.7	54.5	
IIII	Nevada	N. Garden Gods	2-48" CMP's @ 1%	42.0	155.6	
IIIJ	Nevada	N. Garden Gods	6'x2.5' RCB, 4.17%	677	322	(Replace)
IIIG	Nevada	N. Garden Gods	8'x10' RCB	481	OK	
IIIP	Nevada	N. Garden Gods	10'x12' RCB	1730	OK	
IIIT	Nevada	N. Garden Gods	10'x12' RCB	54	OK	

D. Summary of Proposed Structures

1. Collection System: The majority of the basin has an adequate storm sewer collection system. The following additional structures are recommended:

DRAINAGE BASIN	STREET	LOCATION	PROPOSED STRUCTURES CATCH BASIN	STORM SEWER	MIN. SLOPE	DESIGN RUNOFF -CFS-
IK	Van Buren	Creek	6' D-10R	18" RCP	0.85%	9.7
IM	Harrison	Creek	8' D-10R	18" RCP	1.58%	13.2
IN	Tyler	Creek	8' D-10R	18" RCP	3.27%	19.0
IO	Tayler	Creek	8' D-10R	18" RCP	2.81%	17.6
IP	Fillmore Place	Creek	6' D-10R	18" RCP	0.85%	9.7
IIK	Cascade	S of Commerce	4' D-10R	30" RCP	0.75%	35.5
IIP	Sunflower	W of Cascade	4-12' D-10R	30" RCP	1.03%	41.7
			2-10' D-10R	30" RCP	1.70%	53.5
IIO	Cascade Court	W of Cascade	4-8' D-10R	27" RCP	0.86%	28.7
IIR	Shangri-La	W of Cascade	2-4' D-10R	21" RCP	1.03%	16.1
IIT	Private	W of Cascade	4' D-10R	18" RCP	0.67%	8.6
IIX	Winters	W of Nevada	4' D-10R	24" RCP	1.03%	23.0
IIIM	Private	Trailer Park	12' D-10R	21" RCP	2.51%	25.1
IIIR	Private	Near Creek	14' D-10R	24" RCP	2.12%	32.9
IIIQ	Private	Near Creek	18' D-10R	27" RCP	1.69%	40.2
Ditches	listed as b x d, where z=1, see Plate No. 4.					
IIN	Buchannan	Near Creek	------	2'x2.2' ditch	4%	68.6
IIIG	Greenbelt	W of Nevada	------	4'x3.5' ditch	5.4%	481
IIII	Greenbelt	W of Nevada	------	2'x2.5' ditch	4.8%	105
IIIJ	Greenbelt	W of Nevada	------	5'x5.0' ditch	4.2%	770
IIIP	Greenbelt	W of Nevada	------	6'x6.0' ditch	2.5%	1730
IIIT	Greenbelt	W of Nevada	------	3'x3.2' ditch	1.2%	54

2. Creek Improvements: Various proposed creek improvements are shown on the enclosed plan and may be summarized as follows:

MILE MARKER	IMPROVEMENTS
3.00	Grade Control Structure
3.0 - 3.2	West bank needs riprapped to 16' over streambed to supplement existing concrete slabs, 950 CY.
3.2 - 3.42	Fringe on West bank as platted in Pearce Subdivision should be riprapped on face, avg. ht.=10', d=2', t=3', 1720 CY.
3.43	Polk Street Bridge should be replaced, 54' wide x 132' long, 22' clearance over streambed, one center pier with grade control structure.
3.43 - 3.68	West side fringe area, riprap on face 10' high, d=2', t=3', 1560 CY.
3.69	Grade Control Structure
3.69 - 4.00	Fringe area East bank, riprap 7' high, d=12", t=18", 420 CY.
4.00 - 4.10	East bank should have set back due to collapse hazard, minimum building 55' behind bank or 1 1/2:1 slope.
4.00 - 4.34	West bank fringe area, riprap 6' high, d=12", t=18", 600 CY.
4.20 - 4.40	East bank fringe area, riprap 4' high, d=12", t=18", 170 CY.
4.40	Grade Control Structure
4.8 - 5.0	West bank fringe area, riprap 7' high, d=12", t=18", 400 CY.
4.9	Grade Control Structure
4.9	Place 500 CY riprap, 5'Ø at Templeton Gap outlet.
5.01	Abandoned Cascade Avenue bridge should be removed.
5.03 - 5.30	Horrible trash pile on East bank, riprap 5' high, d=12", t=18", 220 CY.
5.33 - 5.50	East bank fringe area, riprap 9' high, d=2', t=3', 860 CY.
5.50	Horrible trash pile on East bank, appears to be above flood plain level.
5.73	Grade Control Structure
5.73 - 5.82	West bank riprap, 20' above bank, d=3', t=4.5', 1600 CY.
5.73 - 5.88	East bank fringe area possible, but without access may not be useable. 10' high, d=2', t=3', 870 CY.
5.82 - 6.20	Existing 3'Ø riprap on West bank is sufficient.
6.20	Grade Control Structure - can improve existing dam.
6.40 - 6.60	Riprap Cascade Boulevard fill on West bank to 12' over streambed, d=2', t=3', 1240 CY.

7.0 - 7.16	Possible fringe area East bank, but does not have apparent access - good potential park.
7.16	Grade Control Structure

MASTER DRAINAGE STUDY

ROSWELL AREA DRAINAGE

SECTION IV - COST ESTIMATE

A. Unit Prices and Acreage

1. Unit Prices: The following unit prices were used in the cost estimating for this study. All costs include a 10% engineering and contingency factor.

Channel Excavation	$ 2.00	per CY
Concrete Channel Lining	1.20	per SF
Riprap Channel Lining	30.00	per CY
Structure Excavation	3.20	per CY
Structure Backfill	3.80	per CY
Structure Concrete	160.00	per CY
Structure Steel	0.45	per LB
18-inch RCP	20.00	per FT
21-inch RCP	21.40	per FT
24-inch RCP	22.80	per FT
27-inch RCP	27.10	per FT
30-inch RCP	31.40	per FT
36-inch RCP	38.50	per FT
42-inch RCP	41.30	per FT
4-foot D-10R Catch Basin	1,100.00	each
6-foot D-10R Catch Basin	1,370.00	each
8-foot D-10R Catch Basin	1,570.00	each
10-foot D-10R Catch Basin	1,780.00	each
12-foot D-10R Catch Basin	2,000.00	each
14-foot D-10R Catch Basin	2,200.00	each
16-foot D-10R Catch Basin	2,420.00	each
18-foot D-10R Catch Basin	2,630.00	each
Bridge Structures (girder & pier)	27.00	per SF

2. Acreage: The following is the acreage summary of the area, broken out as to drainage basin:

LOCATION OF DRAINAGE OUTFALL	BASINS	AREA-ACRES DEVELOPED	UNDEVELOPED	TOTAL
Van Buren Drainage Channel	IA-IJ	120.5	0	120.5
Lower Monument Creek	IK-IP	56.9	0	56.9
Middle Monument Creek	IIA-IIZ	210.0	63.1	273.1
Templeton Gap Basin	IIIA-IIIT	174.1	89.4	263.5
TOTAL AREA...		561.5	152.5	714.0

B. Collection System

SYSTEM	LOCATION	STRUCTURE	COST	D=DEVELOPER O=OTHER
IK	Main/Van Buren	1-6' D-10R	$ 1,370.00	O
	To Creek	18" x 400' RCP	8,000.00	O
IM	Harrison	1-8' D-10R	1,570.00	O
	To Creek	18" x 50' RCP	1,000.00	O
IN	Tyler	1-8' D-10R	1,570.00	O
	To Creek	18" x 50' RCP	1,000.00	O
IO	Taylor	1-8' D-10R	1,570.00	O
	To Creek	18" x 50' RCP	1,000.00	O
IP	Fillmore Place	1-6' D-10R	1,370.00	O
	To Creek	18" x 50' RCP	1,000.00	O
IIK	Cascade	30" x 500' RCP	15,700.00	D
IIM	Buchannan	42" x 100' RCP	4,130.00	D
IIN	Buchannan	2'x2.2' I Ditch x 250'	3,240.00	D
IIP	Sunflower Road	4-12' D-10R	8,000.00	O
		30" x 1050' RCP	32,970.00	O
		2-10' D-10R	3,260.00	D
		30" x 500' RCP	15,700.00	D
IIO	Cascade Court	4-8' D-10R	6,280.00	D
		27" x 330' RCP	8,943.00	D
IIR	Shangri-La	2-4' D-10R	2,200.00	D
		21" x 650' RCP	13,910.00	D
IIS+T	Private Road	1-4' D-10R	1,100.00	D
		18" x 700' RCP	14,000.00	D
IIX	Winters Drive	1-4' D-10R	1,100.00	O
		24" x 780' RCP	17,784.00	O
IIZ	Pikeview #2	18" x 260' RCP	5,200.00	O
IIIM	Trailer Park	1-12' D-10R	2,000.00	O
		21" x 470' RCP	10,058.00	O
IIIR	Private Street	1-14' D-10R	2,200.00	O
		24" x 270' RCP	6,156.00	O
IIIQ	Private Street	1-18' D-10R	2,630.00	O
		27" x 80' RCP	2,168.00	O
IIIG	Nevada to Creek	4'x3.5' I Ditch x 840'	17,700.00	D
IIII	Nevada to Creek	2'x2.5' I Ditch x 420'	5,960.00	D
IIIJ	Nevada to Creek	6'x3'x250' RCB	27,700.00	O
		5'x5.0' I Ditch x 720'	20,900.00	D
IIIP	Nevada to Creek	6'x6.0' I Ditch x 2420'	85,400.00	D
IIIT	Nevada to Creek	3'x2.2' I Ditch x 800'	11,400.00	O
IIII	Austin Bluffs	3-8' D-10R	4,710.00	O
		1-10' D-10R	1,780.00	O
		36" x 450' RCP	17,325.00	O
		SUBTOTAL...	$391,054.00	
		Developer Cost...	$218,423.00	
		Other Cost...	$172,631.00	

C. CREEK IMPROVEMENTS

MILE MARKER	BANK	QUANTITY	UNIT COST	COST	D=DEVELOPER O=OTHER
3.0	Bottom	Grade Control Structure	$9,000.00	$ 9,000.00	O
3.0 - 3.2	West	950 CY Riprap	30.00	28,500.00	O
3.2 - 3.42	West	1720 CY Riprap	30.00	51,600.00	O
3.43	Bottom	Grade Control Structure	6,000.00	6,000.00	D
3.43 - 3.68	West	1560 CY Riprap	30.00	46,800.00	D
3.69	Bottom	Grade Control Structure	5,000.00	5,000.00	O
3.69 - 4.00	East	420 CY Riprap	30.00	12,600.00	O
4.00 - 4.34	West	600 CY Riprap	30.00	18,000.00	D
4.20 - 4.40	East	170 CY Riprap	30.00	5,100.00	D
4.40	Bottom	Grade Control Structure	7,000.00	7,000.00	D
4.80 - 5.00	West	400 CY Riprap	30.00	12,000.00	D
4.90	Bottom	Grade Control Structure	6,000.00	6,000.00	D
4.90	Templeton Gap	500 CY Riprap	30.00	15,000.00	O
5.01	Bottom	Remove bridge	8,000.00	8,000.00	O
5.03 - 5.30	East	220 CY Riprap	30.00	6,600.00	O
5.33 - 5.50	East	860 CY Riprap	30.00	25,800.00	D
5.73	Bottom	Grade Control Structure	6,000.00	6,000.00	O
5.73 - 5.82	West	1600 CY Riprap	30.00	48,000.00	D
5.73 - 5.88	East	870 CY Riprap	30.00	26,100.00	D
6.20	Bottom	Grade Control Structure	4,000.00	4,000.00	D
6.40 - 6.60	West	1240 CY Riprap	30.00	37,200.00	O
7.16	Bottom	Grade Control Structure	7,000.00	7,000.00	D
		SUBTOTAL...		$391,300.00	
		DEVELOPER COST...		$211,800.00	
		OTHER COST...		$179,500.00	

D. Bridge Improvements

Mile 3.43, Polk Street Bridge, 54' wide x 132' long, bottom of structure 22' over streambed, with center pier.

Remove existing bridge...	$12,000.00
Construct new bridge...	192,500.00
Subtotal...	$204,500.00

E. Total Costs

1. Drainage Cost:

	TOTAL COST	DEVELOPER COST	OTHER COST
Collection System	$391,054.00	$218,423.00	$172,631.00
Creek Improvements	391,300.00	211,800.00	179,500.00
TOTAL COST...	$782,354.00	$430,223.00	$352,131.00

$430,223.00 ÷ 152.5 acres = $2,821.13 per acre

2. Bridge Item:

Total Bridge Structures.....$204,500.00

Because of the excessive cost per acre, it is recommended that this area be developed under the miscellaneous drainage fee.

MASTER DRAINAGE STUDY

ROSWELL AREA DRAINAGE

SECTION V - CONCLUSIONS AND RECOMMENDATIONS

The Roswell Area lies between the abandoned Sante Fe Railroad and Monument Creek, between the Rock Island Railroad near Van Buren Street and the Pikeview Interchange, and occupies 714 acres, of which 152.5 acres remains to be developed.

This study is based on the area being developed to its anticipated highest state, which is shown on Plate No. 2 in the appendix. This is our judgment as to the area's development potential. This land use, coupled with the soils types (shown on Plate No. 1), determines the runoff from any given storm.

The majority of the area has storm sewer that will satisfy existing City criteria. This is particularly true along the Van Buren Channel and along Fillmore Street. The majority of proposed storm sewer structures will be necessary only when streets are improved by developers or by improvement districts. Improvements proposed are shown on Plate No. 3.

Fountain Creek is generally unstable - having erodable bottom and banks, and improvements are generally recommended to stabilize it. A major problem and hazard is the uncontrolled dumping of construction waste materials in the flood plain - resulting in extremely erodable banks and material which would be transported in a flood. An ordinance controlling this practice is sorely needed.

A number of storm sewer and creek improvements are proposed, which are shown on Plate No. 3. The total estimated cost of these facilities is $782,354.00 of which $430,223.00 would be provided by developers, resulting in a per acre cost of nearly $2,800.00.

The Polk Street Bridge is proposed to be replaced, at a total estimated cost of $204,500.00.

Because of the excessively high costs per acre, it is recommended that this area not be administered separately, and that the miscellaneous drainage fee remain in effect.

MAJOR BASIN	SUB BASIN	AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	K	SOIL GROUP	DEV. TYPE	CURVE NO.	FLOW Q	FLOW qp	
I	A	1.56	0.0140	1270	24	0.147	1160	A	Com	81	0.67	10.9	
	B	1.12	0.0100	2350	34	0.262	970	A	Com/ Ind	81	0.67	6.5	
	C	2.45	0.0220	3020	38	0.335	880	A	Com/ Ind	81	0.67	13.0	
	D	0.19						A	MF	79			
		2.44						A	Com/ Ind	81			
		2.63	0.0236	2300	36	0.250	990			81	0.67	15.6	
	E	1.40						A	MF	79			
		0.44						A	Com	81			
		0.28						A	SF	61			
		2.12	0.019	1360	24	0.159	1140			77	0.50	10.8	
	F	0.31						A	MF	79			
		0.36						A	Com	81			
		0.40						A	SF	61			
		1.07	0.0096	1800	22	0.228	1020			73	0.37	3.6	
	G	0.19						A	MF	79			
		0.08						A	SF	61			

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: ROSWELL AREA

By: O.E.Watts
Date: 6/8/78

UNITED PLANNING ENGINEERG
916 North Weber
Colorado Springs, Colo. 80902

MAJOR BASIN	SUB BASIN	AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	K	SOIL GROUP	DEV. TYPE	CURVE NO.	FLOW Q	FLOW qp	
I	G cont	0.62						B	MF	86			
		0.23						B	SF	75			
		1.12	0.0100	950	20	0.113	1240			81	0.67	8.3	
	H	0.42						A	SF	61			
		1.55						B	SF	75			
		3.14						D	SF	87			
		0.26						A	Com	81			
		0.26						B	Com	88			
		0.67						B	MF	79			
		0.49						D	MF	92			
		6.79	0.0609	2620	44	0.269	960			82	0.71	41.5	
	I	1.60	0.0143	1400	30	0.151	1150	D	SF	87	0.99	16.3	
	J	0.12						D	SF	87			
		0.42						C	SF	83			
		0.54	0.0048	400	20	0.042	1270			84	0.82	5.0	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: ROSWELL AREA

By O.E.Watts
Date: 6/8/78

UNITED PLANNING ENGINEERING
916 North Weber
Colorado Springs, Colo. 80902

MAJOR BASIN	SUB BASIN	AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	K	SOIL GROUP	DEV. TYPE	CURVE NO.	FLOW Q	FLOW qp	
I	K	0.24						D	SF	87			
		0.81						C	SF	83			
		1.05	0.0094	1070	30	0.111	1250			84	0.82	9.7	
	L	1.55	0.0139	400	14	0.048	1270	C	SF	83	0.76	13.4	
	M	1.73	0.0155	1720	42	0.168	1120	C	SF	83	0.76	13.2	
	N	2.56	0.0230	1760	36	0.184	1090	C	SF	83	0.76	19.0	
	O	0.24						C	Ind	91			
		1.75						C	SF	83			
		1.99	0.0178	1210	28	0.131	1200			84	0.82	17.6	
	P	0.08						C	Com	91			
		0.96						C	SF	83			
		1.04	0.0093	860	22	0.097	1270			84	0.82	9.7	
	B + C	3.57	0.0320			0.335	880			81	0.67	18.9	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: ROSWELL AREA

By O.E.Watts
Date: 6/8/78

UNITED ENGINEERING PLANNING
916 North Weber
Colorado Springs, Colo. 80902

MAJOR BASIN	SUB BASIN	AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	K	SOIL GROUP	DEV. TYPE	CURVE NO.	FLOW Q	FLOW qp	
II	A	0.37		550	14	0.069		A	Com	81			
		0.39		850	24"V=13.3 S=3.46%	0.018		B	MHP	71			
		0.76	0.0068			0.087	1270			76	0.47	4.0	
	B	1.98						B	MHP	82			
		0.21						D	MHP	91			
		2.19	0.0196	1300	24	0.151	1150			83	0.76	17.2	
	C	0.19						D	MHP	91			
		0.26						D	MF	92			
		0.03						C	Com	91			
		0.48	0.0043	370	12	0.046	1270			92	1.33	7.3	
	D	1.20	0.0108	1320	22	0.159	1140	C	Com/ Ind	91	1.25	15.3	
	E	0.38						C	Com	91			
		0.31						D	Com	93			

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: ROSWELL AREA

By O.E.Watts
Date: 6/9/78

UNITED PLANNING ENGINEERG
916 North Weber
Colorado Springs, Colo. 80902

MAJOR BASIN	SUB BASIN	AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	K	SOIL GROUP	DEV. TYPE	CURVE NO.	FLOW Q	FLOW qp	
II	E cont	0.72						D	MHP	91			
		1.41	0.0126	900	18	0.110	1250			91	1.25	19.8	
	F	0.24						D	MHP	91			
		0.52						D	Ind	93			
		0.76	0.0068	870	14	0.117	1230			92	1.33	11.1	
	G	0.53						D	Com/ Ind	93			
		0.67						C	Com/ Ind	91			
		1.20	0.0108	1080	48	0.093	1270			92	1.33	18.2	
	H	2.45	0.0220	1330	14	0.191	1080	A	Com/ Ind	81	0.67	15.9	
	I	1.94	0.0174	1630	12	0.256	980	A	Com/ Ind	81	0.67	11.4	
	J	1.83	0.0164	1540	48	0.141	1180	A	Ind	81	0.67	13.0	
	K	1.86						A	Ind	81			
		0.41						B	Ind	88			
		2.27	0.0204	1400	12	0.215	1030			82	0.71	14.9	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: ROSWELL AREA

By: O.E.Watts
Date: 6/9/78

UNITED PLANNING ENGINEERING
916 North Weber
Colorado Springs, Colo. 80902

MAJOR BASIN	SUB BASIN	AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	K	SOIL GROUP	DEV. TYPE	CURVE NO.	FLOW Q	FLOW qp
II	L	1.62						A	Com/ Ind	81		
		0.32						B	Com	88		
		0.32						B	MHP	82		
		2.26	0.0203	1300	32	0.135	1190			82	0.71	17.1
	M	1.12						B	MHP	82		
		0.51						D	MHP	91		
		1.63	0.0146	1480	26	0.165	1130			85	0.87	14.4
	N	1.59						B	Ind	88		
		1.02						D	Ind	93		
		2.61	0.0234	1450	38	0.144	1160			90	1.18	32.0
	O	0.82						B	MHP	82		
		1.10						D	MHP	91		
		0.70						D	Ind	93		
		2.62	0.0235	1340	18	0.175	1100			89	1.11	28.7
	P	3.88						A	Com/ Ind	81		
		2.16						B	Ind	88		

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: ROSWELL AREA

By: O.E.Watts
Date: 6/9/78

UNITED PLANNING ENGINEERING
916 North Weber
Colorado Springs, Colo. 80902

MAJOR BASIN	SUB BASIN	AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	K	SOIL GROUP	DEV. TYPE	CURVE NO.	FLOW Q	FLOW qp	
II	P cont	6.04	0.0542	2460	32	0.283	940			84	0.82	41.7	
	Q	1.20						B	MHP	82			
		0.75						D	MHP	91			
		1.95	0.0175	1430	16	0.197	1070			85	0.87	16.3	
	R	0.94						B	MHP	82			
		0.76						D	MHP	91			
		1.70	0.0152	1260	22	0.151	1150			86	0.92	16.1	
	S	0.59	0.0052	720	16	0.089	1270	B	MHP	82	0.71	4.8	
	T	0.47	0.0042	660	14	0.085	1270	B	MHP	82	0.71	3.8	
	U	3.19						B	MHP	82			
		0.69						D	MHP	91			
		3.88	0.0348	700	30	0.068	1270			84	0.82	36.2	
	V	0.41						A	Ind	81			
		1.03						B	Ind	88			
		1.44	0.0129	1520	32	0.162	1130			86	0.92	13.4	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: ROSWELL AREA

By: O.E.Watts
Date: 6/9/78

UNITED PLANNING ENGINEERG
916 North Weber
Colorado Springs, Colo. 80902

MAJOR BASIN	SUB BASIN	AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	K	SOIL GROUP	DEV. TYPE	CURVE NO.	FLOW Q	FLOW qp	
II	W	0.43						A	Com	81			
		0.60						B	Com	88			
		1.03	0.0092	1060	12	0.156	1140			85	0.87	9.2	
	X	0.37						A	Com	81			
		0.54						B	Com	88			
		2.37						B	MHP	82			
		3.28	0.0294	1800	34	0.193	1070			83	0.76	23.9	
	Y	2.29	0.0205	820	14	0.109	1250	B	MHP	82	0.71	18.2	
	Z	1.60	0.0143	1460	24	0.173	1100	B	Park	69	0.25	3.9	
II	A	0.76				0.087				76			
	+B	2.19		450	V=12.5	0.010				83			
	TOTAL	2.95	0.0265			0.097	1270			81	0.67	22.5	
	+C	0.48		450	V=9.6	0.013				92			
	TOTAL	3.43	0.0308			0.110	1250			83	0.76	29.2	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: ROSWELL AREA

By: O.E.Watts
Date: 6/9/78

UNITED PLANNING ENGINEERG
916 North Weber
Colorado Springs, Colo. 80902

MAJOR BASIN	SUB BASIN	AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	K	SOIL GROUP	DEV. TYPE	CURVE NO.	FLOW Q	FLOW qp	
II	+D	1.20		1200	V=6.9	0.048				91			
	TOTAL	4.63	0.0415			0.158	1140			85	0.87	41.2	
II	H	2.45				0.191				81			
	+I	1.94								81			
	TOTAL	4.39	0.0394	USE	I	0.256	980			81	0.67	25.8	
	+J	1.83		480	V=6.48	+0.021				81			
	TOTAL	6.22	0.0558			0.277	950			81	0.67	35.5	
	+K	2.27								82			
	+L	2.26		500	V=7.23	+0.019				82			
	TOTAL	10.75	0.0964			0.296	920			81	0.67	59.4	
	+M	1.63		1135	V=6.17	+0.051				85			
	TOTAL	12.38	0.110			0.347	870			82	0.71	68.6	
II	P	6.04				0.283				84			
	+Q	1.95		1050	V=8.49	+0.034				85			
	TOTAL	7.99	0.0717			0.317	910			84	0.82	53.5	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: ROSWELL AREA

By: O.E.Watts
Date: 6/9/78

UNITED PLANNING ENGINEERING

916 North Weber
Colorado Springs, Colo. 80902

MAJOR BASIN	SUB BASIN	AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	K	SOIL GROUP	DEV. TYPE	CURVE NO.	FLOW Q	FLOW qp	
II	S	0.59								82			
	+T	0.47								82			
	TOTAL	1.06	0.0095			<0.10	1270			82	0.71	8.6	
II	V	1.44				0.162	1130			86		13.4	
	+W	1.03								85			
	TOTAL	2.47	0.0221			0.162	1130			86	0.92	23.0	
	+X	3.28		780	V=7.61	+0.028				83			
	TOTAL	5.75	0.0516			0.190	1080			84	0.82	45.7	
	+Y	2.29								82			
	+Z	1.60		510	V=4.75	+0.030				69			
	TOTAL	9.64	0.0864			0.220	1030			81	0.67	59.7	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: ROSWELL AREA

By: O.E.Watts
Date: 6/12/78

UNITED PLANNING ENGINEERING
916 North Weber
Colorado Springs, Colo. 80902

MAJOR BASIN	SUB BASIN	AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	K	SOIL GROUP	DEV. TYPE	CURVE NO.	FLOW Q	FLOW qp	
III	A	0.64	0.0057	1650	20	0.214	1040	B	Com	88	1.05	6.3	
	B	0.08						A	Com	81			
		0.68						B	Com	88			
		0.76	0.0068	1270	15	0.176	1100			87	0.99	7.4	
	C	1.14	0.0102	1650	20	0.214	1040	B	Com	88	1.05	11.2	
	D	0.43						A	Com	81			
		0.22						B	Com	88			
		0.65	0.0058	1260	15	0.175	1100			83	0.76	4.9	
	E	0.84						B	Com	88			
		0.82						B	MF	86			
		2.98						B	Ind	88			
		0.46						D	Ind	93			
		5.10	0.0457	1480	75	0.113	1240			88	1.05	59.5	
	F	0.22						B	Com	88			
		1.47						B	MF	86			
		0.81						D	MF	92			

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: ROSWELL AREA

By: O.E.Watts
Date: 6/12/78

UNITED PLANNING ENGINEERING
916 North Weber
Colorado Springs, Colo. 80902

MAJOR BASIN	SUB BASIN	AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	K	SOIL GROUP	DEV. TYPE	CURVE NO.	FLOW Q	FLOW qp	
III	F cont	2.50	0.0224	1050	50	0.089	1270			88	1.05	29.9	
	G	0.67						A	Com	81			
		2.10						B	MF	86			
		2.77	0.0248	870	70	0.063	1270			85	0.87	27.4	
	H	0.36						A	Com	81			
		0.30						D	Com	93			
		0.40						B	MF	86			
		0.36						D	MF	92			
		1.42	0.0127	440	55		1270			88	1.05	17.0	
	I	1.70						D	Com	93			
		1.09						D	MF	92			
		2.79	0.0250	1330	35	0.134	1190			93	1.41	42.0	
	J	0.42						A	Com	81			
		0.58						D	Com	93			
		2.34						D	MF	92			
		3.34	0.0300	1220	80	0.088	1270			91	1.25	47.5	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: ROSWELL AREA

By: O.E.Watts
Date: 6/12/78

UNITED PLANNING ENGINEERING
916 North Weber
Colorado Springs, Colo. 80902

MAJOR BASIN	SUB BASIN	AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	K	SOIL GROUP	DEV. TYPE	CURVE NO.	FLOW Q	FLOW qp	
III	K	0.87	0.0078	1120	12	0.166	1130	A	Com	81	0.67	5.9	
	L	0.73	0.0065	1080	12	0.159	1140	A	Com	81	0.67	5.0	
	M	0.75						A	Com	81			
		0.62						A	MHP	71			
		1.22						D	MHP	91			
		0.87						A	MF	79			
		3.46	0.0310	1550	70	0.122	1210			65	0.67	25.1	
	N	1.19	0.0107	1460	20	0.186	1090	D	Com	93	1.41	16.4	
	O	0.33						D	Com	93			
		0.63						B	MF	86			
		0.96	0.0086	700	25	0.073	1270			88	1.05	11.5	
	P	2.47						A	Com	81			
		1.77						A	MF	79			
		4.54						B	MF	86			
		8.78	0.0787	2800	85	0.225	1020			83	0.76	61.0	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: ROSWELL AREA

By: O.E.Watts
Date: 6/12/78

UNITED PLANNING ENGINEERING
916 North Weber
Colorado Springs, Colo. 80902

MAJOR BASIN	SUB BASIN	AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	K	SOIL GROUP	DEV. TYPE	CURVE NO.	FLOW Q	FLOW qp
III	Q	1.53						D	Com	93		
		0.97						D	MF	92		
		0.26						B	MF	86		
		2.76	0.0248	1130	30	0.118	1220			92	1.33	40.2
	R	0.25						D	Com	93		
		3.12						B	MF	86		
		3.37	0.0302	2070	60	0.182	1100			87	0.99	32.9
	S	0.91	0.0081	350	20		1270	B	MF	86	0.92	9.5
	T	1.78	0.0160	1080	30	0.112	1240	D	Com	93	1.41	27.9
5 or 100 year	Design Data for Main Channels--See Lincoln Devore Report 10/26/77											
G	6		0.211			0.223				85		184 426
+III	G		0.025	840	V=35.1	0.006				85		
	TOTAL		0.236			0.230	1010			85	2.02	481
LD	PT #60		0.092			0.214				83		71 175
+III	I		0.025	420	V=26.1	+0.004				93		
	TOTAL		0.117			0.218	1030			85	0.87	105

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: ROSWELL AREA

By: O.E.Watts
Date: 6/12/78

UNITED ENGINEERING PLANNING
916 North Weber
Colorado Springs, Colo. 80902

MAJOR BASIN	SUB BASIN	AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	K	SOIL GROUP	DEV. TYPE	CURVE NO.	FLOW Q	FLOW qp	
LD	PT #59		0.331			0.168				83		677	
+III	J		0.030	720	V=33.7	+0.006				91			
	TOTAL		0.361			0.174	1100			84	1.94	770	
LD	PT #66		0.945			0.285				83		1600	
+III	P		0.079	2420	V=34.3	0.020				83			
	TOTAL		1.024			0.305	910			83	1.86	1730	
LD	PT #68		0.030			0.055				83			
+III	T		0.016							93			
	TOTAL		0.046			<0.010	1270			86	0.92	54	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: ROSWELL AREA

By: O.E.Watts
Date: 6/12/78

UNITED PLANNING ENGINEERING
916 North Weber
Colorado Springs, Colo. 80902

Street and Storm Sewer Calculations

UNITED PLANNING ENGINEERING

Project ROSWELL AREA Page 1 of 4

Calc. by O.E.Watts date 6/9/78

Checked by _____ date _____

STREET	LOCATION	DIST	ELEVATION & SLOPE	TOTAL RUNOFF	STREET FLOW CAPACITY	PIPE FLOW	TYPE PIPE, CATCH BASIN & SLOPE %
Alley	Basin I A			10.9		10.9	30" CMP drop Inlet
Nevada	Basin I B			6.5	6.5		6'x2.5' Grate
						6.5	18"x29" CMP @ 1%,Cap=10.1
							3'x3' Grate
						6.5	30" CMP @ 1%, Cap=22.2
	Basin I C			13.0	13.0		4'x2' Grate
						13.0	15" CMP @ 1%, Cap=3.5
							3'x3' Grate
							36" CMP @ 1%, Cap=33.3
	Basin I B + I C			18.9		18.9	30" CMP @ 1%, Cap=20.5
Alley	Basin I D			15.6		15.6	30" CMP down drain
N. Tejon	Basin I E			10.8	10.8		4' Inlet + 12' Grate
						10.8	18" CMP @ 2%, Cap=8.0
N. Cascade	Basin I F			3.6		3.6	36" CMP down drain
N Concord	Basin I G			8.3	8.3		6' D-10R
						8.3	24" CMP @ 1%, Cap=12.2
					-0-		6' D-10R
						8.3	36" CMP @ 1%, Cap=33.3
N.Wood	Basin I H			41.5	41.5		2-16' D-10R's
						2@20.8	24" RCP @ 1%, Cap=22.6
						41.5	36" CMP @ 2%, Cap=47.1
N. Beacon	Basin I I			16.3	16.3		2 Opening
						2@ 8.2	18" CMP @ 2%, Cap=8.0
Van Buren	Main (I K)						6' D-10R in Sump
		400'	1%	9.7		9.7	18" RCP, 0.85% min.
	Creek						
Harrison	End (I M)						8' D-10R in Sump
		50'		13.2		13.2	18" RCP, 1.58% min.
	Creek						
Tyler	End (I N)						8' D-10R in Sump
		50'		19.0		19.0	18" RCP, 3.27% min.
	Creek						

Page ____

Street and Storm Sewer Calculations

STREET	LOCATION	DIST	ELEVATION & SLOPE	TOTAL RUNOFF	STREET FLOW CAPACITY	PIPE FLOW	TYPE PIPE, CATCH BASIN & SLOPE %
Taylor	End (I O)						8' D-10R in Sump
		50'		17.6		17.6	18" RCP, 2.81% min.
	Creek						
Fillmore Pl.	End (I P)						6' D-10R in Sump
		50'		9.7		9.7	18" RCP, 0.85% min.
	Creek						
Cascade	Tractor Pk (III L)						
			1%	17.1	7.0	10.1	18"x29" CMP @ 1%, Cap=10.1
	Buchannan						
Buchannan	Cascade (II M)						
			1%	14.4	4.4	10.1	18"x29" CMP @ 1%, Cap=10.1
	Ditch						
Fillmore	Cascade (II A)			4.0	4.0		6' Curb Return
		560'				4.0	24" RCP @ 3.04%, Cap=39.4
	Trailer Ct.			22.5	16.5		3-8' & 1-16' D-10R's
		450'				22.5	36" RCP @ 1.04%, Cap=68.0
	Beacon			29.2	6.7		16' D-10R
		1200'				29.2	42" RCP @ 0.44%, Cap=66.7
	Creek			41.2			
Commerce	Nevada (II H)			15.9	15.9		4'x4' Grated Inlet, Sump
		620'				15.9	27" RCP, 0.67%, Cap=25.3
	N. Tejon				11.4		4'x4' Grate & 2'x2' Grate
		480'		25.8		25.8	27" RCP, 6.00%, Cap=75.8
Cascade	Cascade				13.0		4' D-10R
		500'	1%	35.5		35.5	Use 30" RCP, 0.75% min.
Buchannan	Buchannan			59.4	14.9	59.4	2-29"x39" CMP, Cap=61.2
		635'				59.4	42" RCP, S=0.69%, Cap=83.5
	Sta 5 + 00						
		500'				59.4	42" RCP, S=1.83%, Cap=136
	Beacon				14.4		Curb Outlet
		250'	4%	68.6		68.6	
	Creek Outfall						I Ditch

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Project ROSWELL AREA

Calc. by O.E.Watts date 6/9/78

Checked by date

Street and Storm Sewer Calculations

STREET	LOCATION	DIST.	ELEVATION & SLOPE	TOTAL RUNOFF	STREET FLOW CAPACITY	PIPE FLOW	TYPE PIPE, CATCH BASIN & SLOPE %
Sunflower Rd.	Cascade (II P)			41.7	41.7@1%		4-12' D-10R CB's
		1050	1%			41.7	30" RCP, S=1.03% min.
	End of Road				16.3		2-10' D-10R CB's
		500	1%	53.5		53.5	30" RCP, S=1.70% min.
	Creek						
Cascade Ct.	Basin II O						4-8' D-10R's
		330		28.7		28.7	27" RCP, 0.86% min.
	Creek						
Shangri-La	Basin II R						2-4' D-10R's
		650		16.1		16.1	21" RCP, 1.03% min.
	Creek						
Private	Basins II S+T						4" D-10R
		700		8.6		8.6	18" RCP, 0.67% min.
	Creek						
Winters Dr.	Nevada (II V)						Existing Inlet
				13.4		13.4	4'x3' RCB, 1% Cap = 123.8
	Westside Nevada			9.2			3'x3' Grate
				23.0	5.7	17.3	24" CMP, 2%, Cap=17.3
	Existing Outfall						
Winters Dr. cont.	Exist. Outfall				5.7		4' D-10R CB
		780		23.0		23.0	24" RCP, S=1.03% min.
	Cascade				23.9		8' D-10R & 10' Radius CB
		510		45.7		45.7	42" CMP, 1%, Cap=54.5
	Pikeview#2 Res.						
		260		59.7			18" RCP, 1% min., Cap=10.5
	Storage						
Basin III I	Nevada						
				42.0		42.0	2-48" CMP's, 1%, Cap=155.6
	End of Pipe						
Basin III J	Nevada						
		250		677		677	6'x2.5'RCB, 4.17%, Cap=322
	End of Pipe						Add 6'x3'

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Project ROSWELL AREA
Calc. by O.E. Watts date 6/12/78
Checked by date

Street and Storm Sewer Calculations

STREET	LOCATION	DIST.	ELEVATION & SLOPE	TOTAL RUNOFF	STREET FLOW CAPACITY	PIPE FLOW	TYPE PIPE, CATCH BASIN & SLOPE %
Basin III M	Trailer Park		6190				12' D-10R in Sump
		470	3.19%	25.1		25.1	21" RCP, 2.51% min
	Creek		6175				
Basin III R	Street						14' D-10R in Sump
		270	3.5%	32.9		32.9	24" RCP, 2.12% min
	Creek						
Basin III Q	Street						18' D-10R in Sump
		80	2%	40.2		40.2	27" RCP, 1.69% min.
	Creek						

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Culvert & Channel Calculations

AREA	LOCATION & DISTANCE	ELEV & S %	S 1/2	Q	b 8/3	b	S F AREA	USE DITCH	CULVERT ETC.	V FPS
II N	Buchannan								42" RCP	
	250'	4%		68.6	2.310	1.370	3.74	2'x2.2'		18.3
	Creek									
III G	Nevada Ave	6150							8'x10'RCB	
	840'	5.36%	0.2315	481	17.00	2.67	14.47	4'x3.5'		33.2
	Creek	6105								
III I	End 48"CMP	6160							2-48"CMP	
	420'	4.76%	0.2182	105	3.24	1.55	4.83	2'x2.5'		21.7
	Creek	6140								
III J	End 6'x25'RCB	6175							New RCB	
	720'	4.17%	0.2041	770	25.41	3.36	22.64	5'x5.0'		34.0
	Creek	6145								
III P	End 10'x12'RCB	6220							10'x12'RCB	
	2420	2.48%	0.1575	1730	73.99	5.02	50.45	6'x6.0'		34.3
	Creek	6160								
III T	Nevada	6245							10'x12'RCB	
	800	1.25%	0.1118	54	3.25	1.56	4.84	3'x2.2'		11.1
	Creek	6235								

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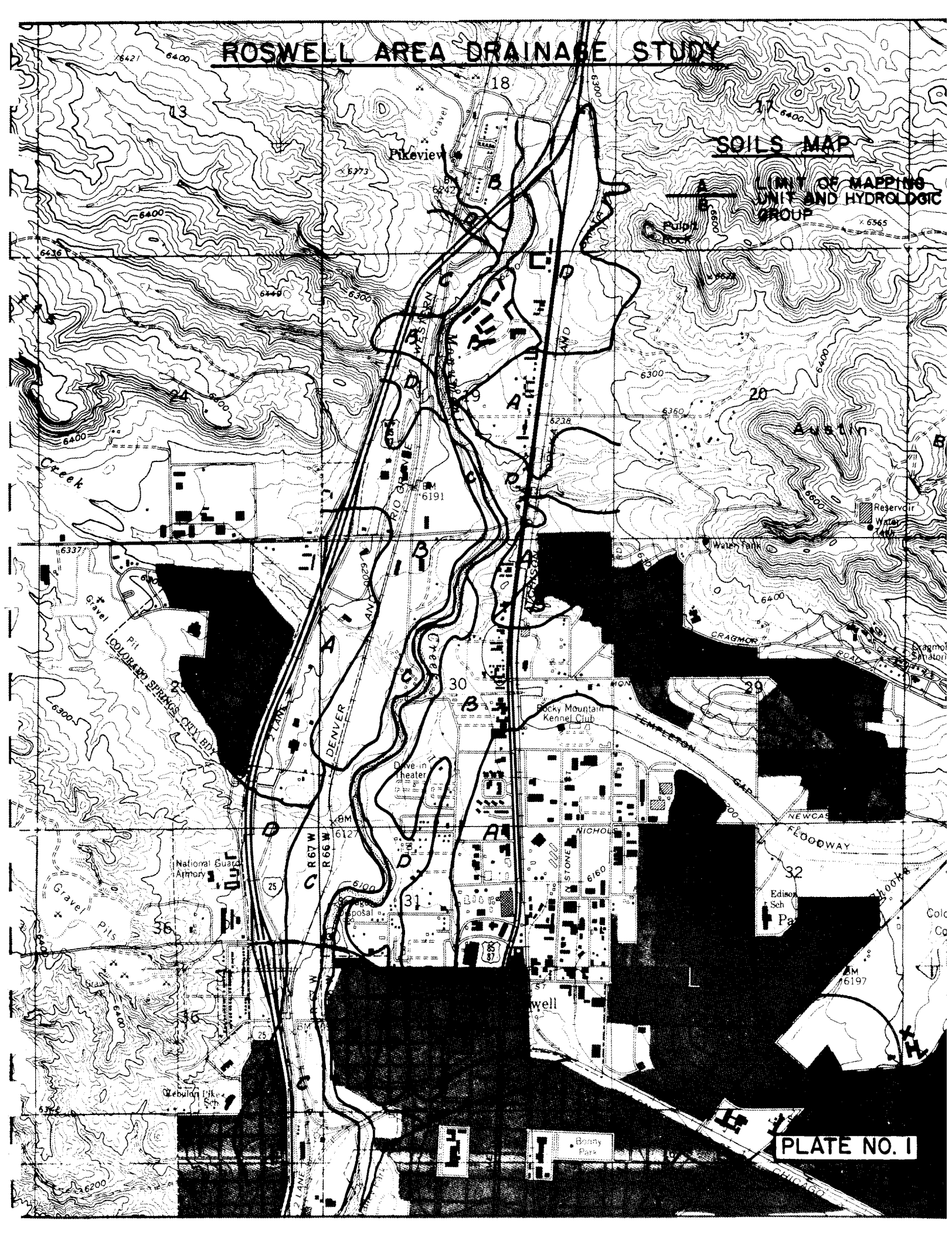
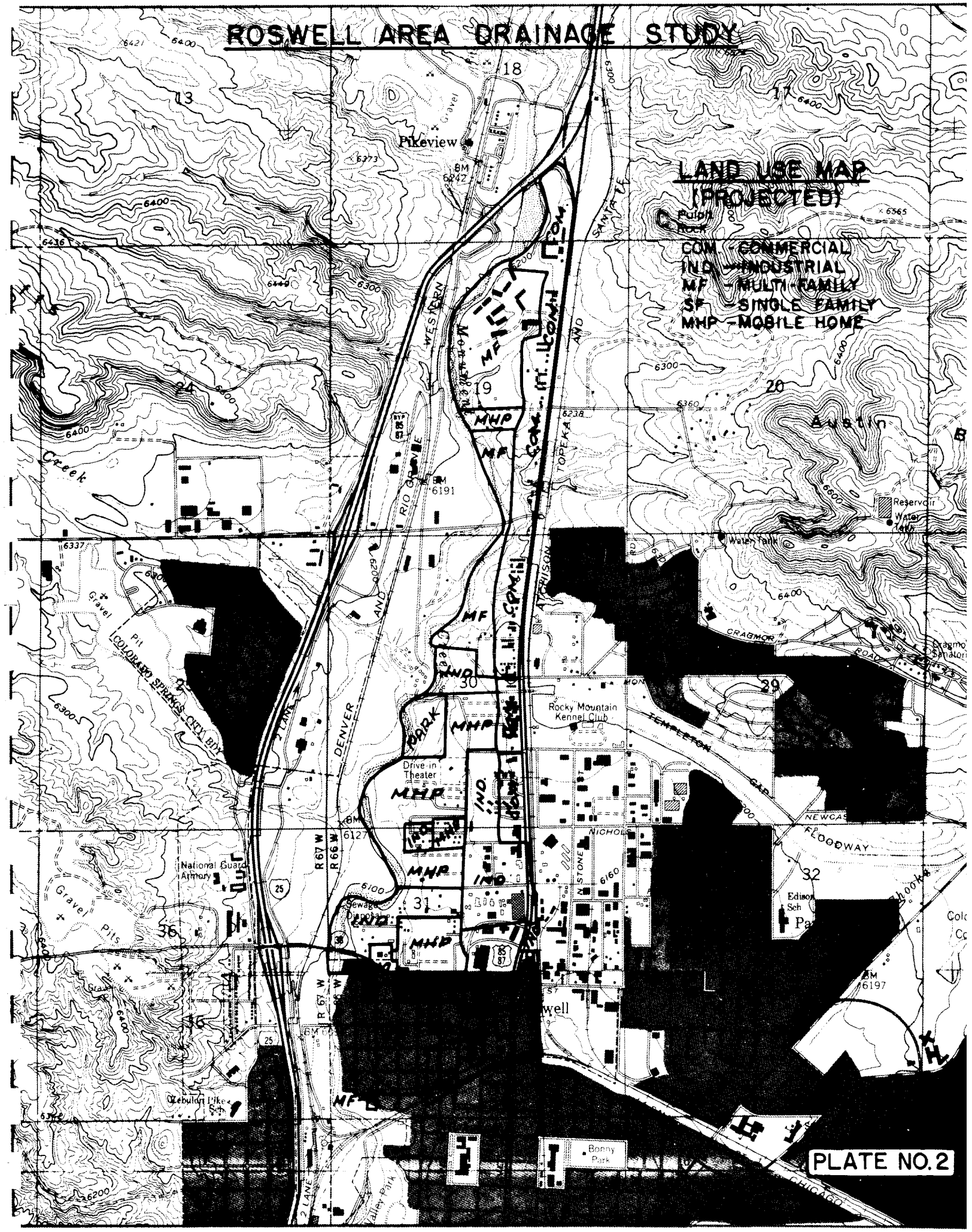
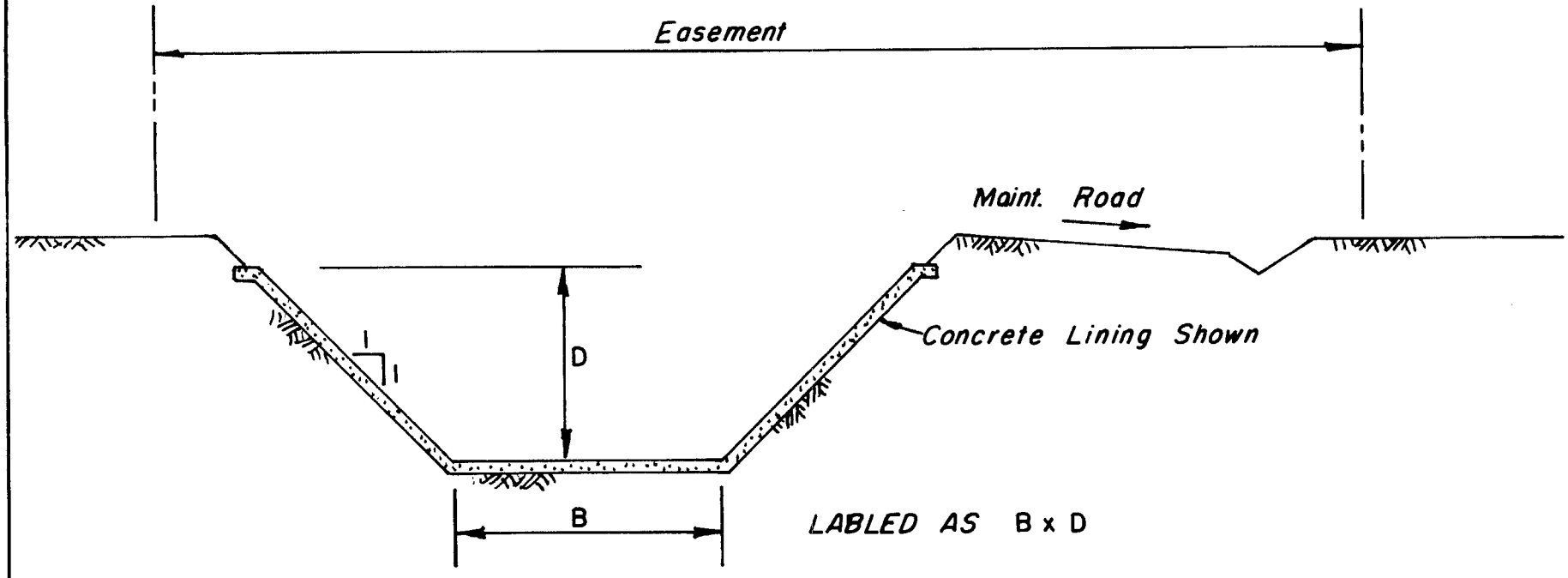

ROSWELL AREA DRAINAGE STUDY
SOILS MAP
LIMIT OF MAPPING UNIT AND HYDROLOGIC GROUP
PLATE NO. 1

ROSWELL AREA DRAINAGE STUDY





TYPICAL DRAINAGE CHANNEL
TYPE I

PLATE 4

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