FINAL
LOWER CRAGMOR
MASTER DRAINAGE PLAN

OCTOBER 1988

Maps in Back:

1- Proposed Storm Sewer for Selected Alternative

2- Map 4 - SWMM Model Flow Chart

PREPARED FOR:

CITY OF COLORADO SPRINGS
DEPARTMENT OF PUBLIC WORKS
30 SOUTH NEVADA STREET
COLORADO SPRINGS, COLORADO 80903

PREPARED BY:

JR ENGINEERING, LTD.
6455 N. UNION BLVD., #202
COLORADO SPRINGS, COLORADO 80918
(303) 593-2593

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SUMMARY AND CONCLUSIONS

SUMMARY AND CONCLUSIONS

Results

This report represents the Basin Master Plan for the Lower Cragmor area of Colorado Springs, Colorado. The Master Plan was engineered following the design criteria within the City of Colorado Springs/El Paso County Drainage Criteria Manual (Draft HDR, November 1986). The existing basin was analyzed and modeled to identify basin flooding and facility inadequacies. Three alternative schemes for overall solution to the drainage problems were investigated. This report presents the results of the existing system analysis and the selected alternative solution. Detailed analysis on an inlet by inlet basis will be required during the final design process in order to fine tune the inlet and lateral sizes.

Hydrographs for the various sub-basins were calculated for developed land use conditions using UDSWM2-PC, a personal computer version of the Runoff Block of the Environmental Protection Agency's Storm Water Management Model (SWMM). The peaks of the hydrographs for developed land use were compared to the allowable capacity of the existing street/storm sewer system calculated using the Criteria Manual. Three alternatives were investigated and compared during the course of this study. This report presents the selected alternative solution, Alternative No. 2.

The subsequent sections of this report present detailed results of our study. Maps and tables referred to in each section are presented at the end of that or previous sections. Please refer to the table of contents for specific map and table locations.

LOWER CRAGMOR
PRELIMINARY COST ESTIMATE
ALTERNATE NO. 2

SUMMARY

LOCATION DESCRIPTION	Phase	ALT #2	Updated Cost Est.
STONE EASTERN OUTFALL (WINTERS TO STONE + NICHOLS TO STONE TO VAN BUREN VIA OPEN CHANNEL EAST OF RAILROAD RIGHT-OF-WAY AND PIPED UNDER RAILROAD SPUR)	Phase I	$1,532,772	$2,304,[illegible]
WEST BASIN (POLK TO VAN BUREN)	Phase IV - $54,804	35,256	88,000.
NICHOLS (PROSPECT TO EL PASO)		19,548	
4TH STREET (VIRGINIA TO PROSPECT)	PH.II - $1,661,136.	456,012	2,498,000.
PROSPECT (4TH TO VAN BUREN DITCH)		1,205,124	
LATERAL COLLECTOR (1ST TO PROSPECT)	Phase III $1,170,708.	107,436	1,[illegible]
HANCOCK (3RD TO CLINTON) + CLINTON TO VAN BUREN + PROSPECT (PENN TO ALLEY)		1,170,708	
PRELIMINARY COST ESTIMATE TOTAL		$ 4,526,856	

INTRODUCTION

INTRODUCTION

Basin Description

The Lower Cragmor study area is an 800-acre area located predominantly in Sections 29, 31, 32, and 33, Township 13 South, Range 66 West (Map 1). The study area is bordered by Nevada Avenue on the west, Templeton Gap Floodway on the north, Templeton Gap Road on the east, and the Chicago Rock Island and Pacific Railroad tracks along LaSalle Street on the south.

The study drainage basin is presently mostly developed and drains southerly towards the Van Buren Ditch (Map 1). Developed flows are conveyed within the basin by an existing street/storm sewer system. Flows originating upgradient of the site are intercepted by a trunk storm sewer which discharges at the Van Buren Ditch.

Soils in the study area are sandy loams and are predominantly Soil Conservation Service Hydrologic Series "B" (Map 2 and Table 1). The offsite basin is predominantly Soil Conservation Service Hydrologic Series "B" and "D".

The study area is not contained within any 100-year floodplains as defined by the Federal Emergency Management Agency's Flood Insurance Rate Panels 080060 0163B and 080060 0164B (December, 1986). The Templeton Gap Floodway borders the study area along the north, but does not encroach onto the study area.

Review of Existing Material

Existing drainage reports and construction plans related to the study area have been reviewed and evaluated as part of the drainage analysis.

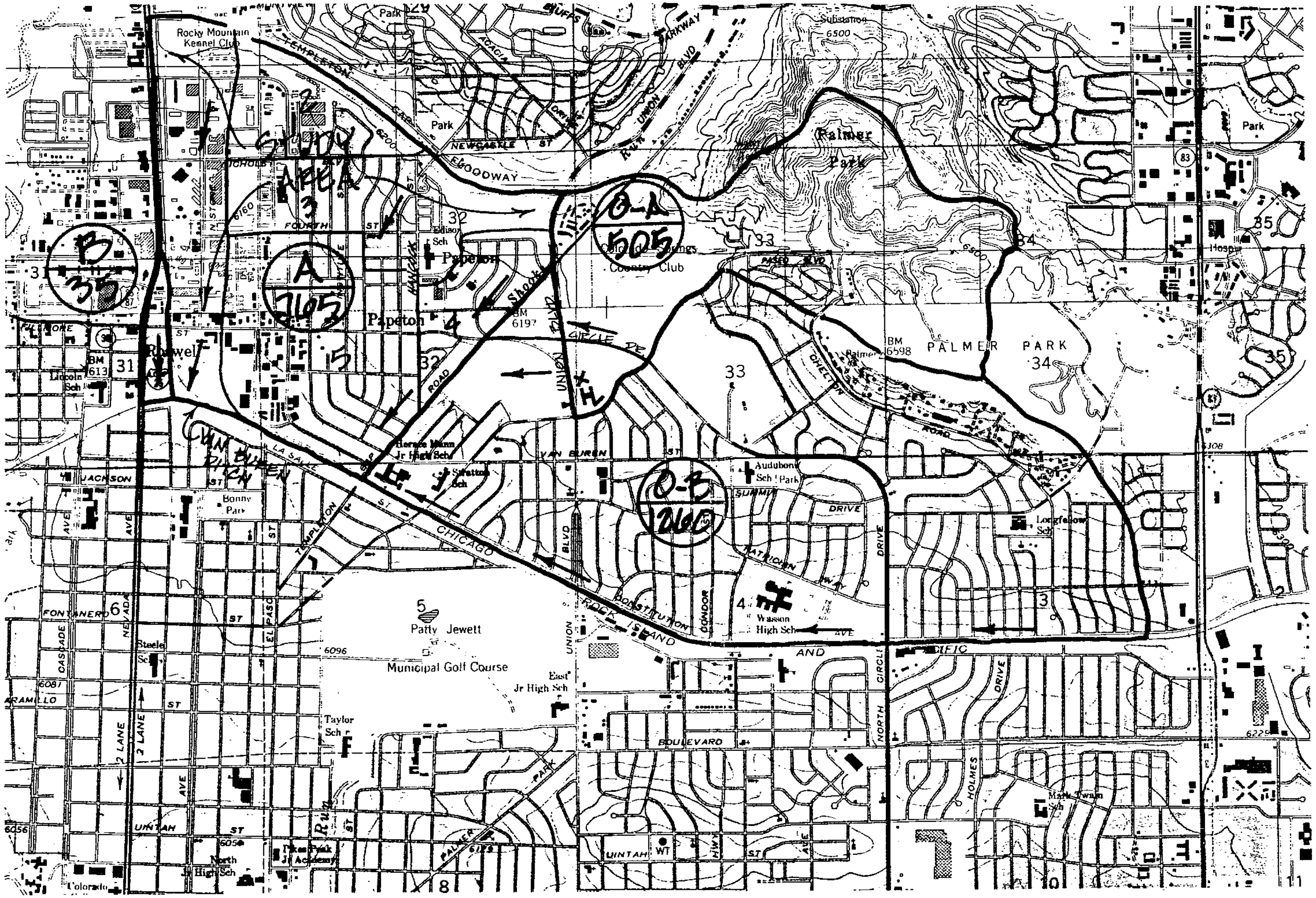
Available drainage reports were used for background information on the study area. The available information provided little usable design information for preparation of this study.

The available storm sewer construction plans for existing facilities were carefully reviewed and compiled. This information is summarized on Map 5, Existing Storm Sewer Under Existing Conditions, and shown at a larger scale on nine maps, 8A through 8I. The information shown on the maps reflect any known deviations from the plans. Construction plans were not available for the El Paso-Nichols storm sewer north of 4th Street and the Fillmore Street storm sewer from Stone Street to Nevada Avenue.

Field Investigation

All existing storm sewer pipes and structures were located and verified in the field. This field effort included horizontal and vertical measurements on existing structures and pipes at available access points. The field information gathered is summarized on Map 5 and shown on Maps 8A through 8I.

Types of street curb and gutter were identified in the field to determine street conveyance capacity. The curb and gutter information is shown on Data Summary Table 4 for the major streets.



MAP 1

MAJOR BASIN MAP

SCALE
1"=2000'

LEGEND

O-A ← BASIN DESIGNATION

505 ← BASIN ACREAGE

← DIRECTION OF FLOW

BASIN BOUNDARY

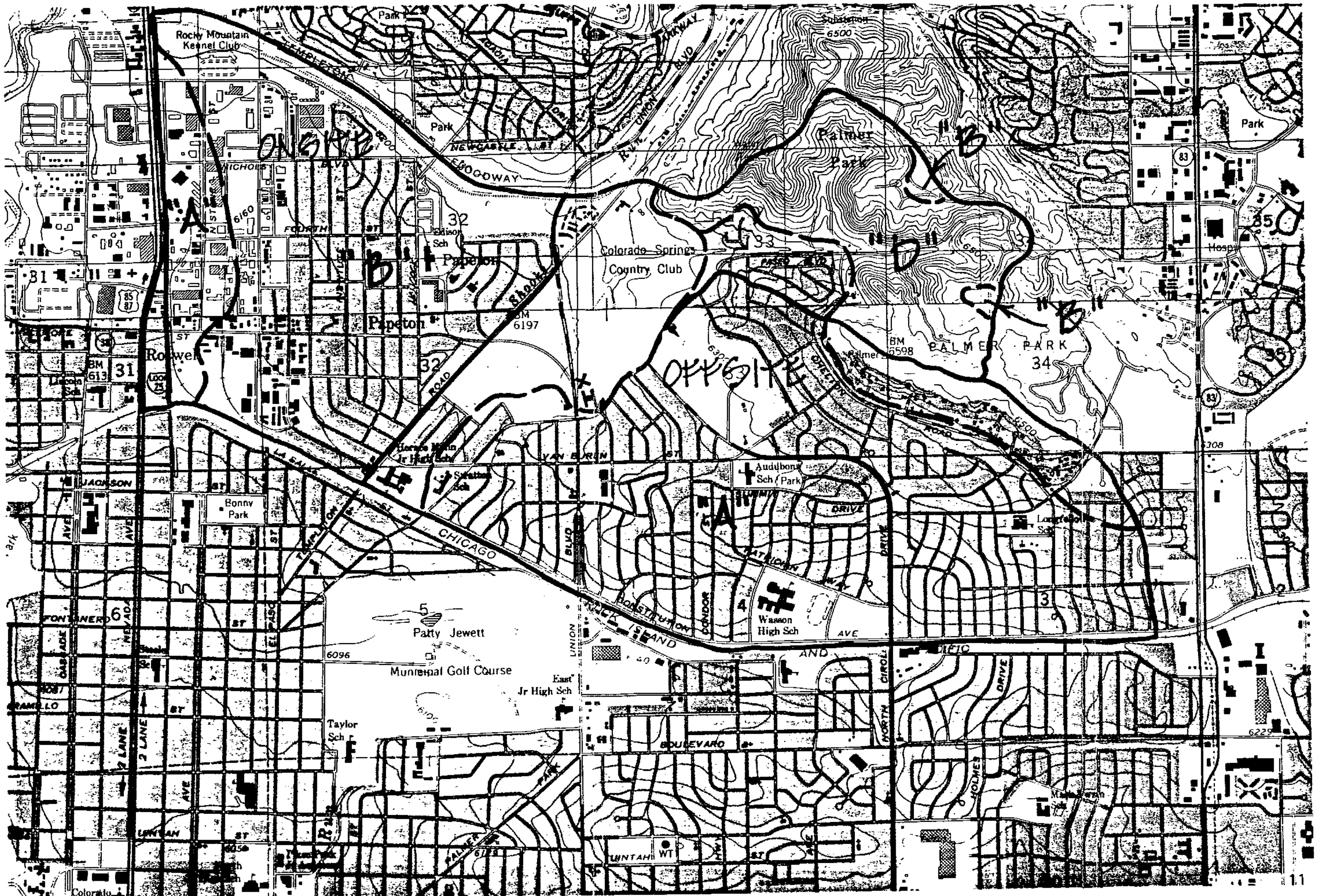
DESIGN BASIN

5 DESIGN BASIN DESIGNATION

Need break-out of area not tributary to Van Buren Ditch. All east of Union is taken South – not over to V.B. Ditch

MAP 1

SCALE
1" = 2000'



MAP 2

SOIL CONSERVATION SERVICE
HYDROLOGIC SOIL TYPES

LEGEND

BASIN BOUNDARY

SOIL GROUP BOUNDARY

MAP 2

TABLE 1

SOIL CONSERVATION SERVICE HYDROLOGIC SOIL TYPES

ONSITE

SOIL DESIGNATION	SOIL NAME	DESCRIPTION	HYDROLOGIC GROUP
10	BLENDON	SANDY LOAM	B
11	BRESSER	SANDY LOAM	B
16	CHOSEVILLE	SANDY LOAM	A
96	TRUCKTON	SANDY LOAM	B
97	TRUCKTON	SANDY LOAM	B

OFFSITE

SOIL DESIGNATION	SOIL NAME	DESCRIPTION	HYDROLOGIC GROUP
8	BLAKELAND	LOAMY SAND	A
10	BLENDON	SANDY LOAM	B
12	BRESSER	SANDY LOAM	B
94	TRAVESSILLAL	ROCK	D
97	ROCK OUTCROP		
	TRUCKTON	SANDY LOAM	B

TABLE 1

TABLE 4
EXISTING SYSTEM

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
BASIN B												
OVERLAND #108	EAST OF NEVADA	FILLMORE #307	NONE	0	0	15	25	N/A	N/A	0.4'	0.5'	
FILLMORE --	FILLMORE #307	CHANNEL #306	UNKNOWN STORM PIPE	15	25	0	0	5"	5"	0	0	PIPE FLOWS EAST
OVERLAND #110	FILLMORE #307	V.B. DITCH #390	NONE	0	0	21	37	N/A	N/A	0.4'	0.6'	
BASIN A-1												
CRAGMOR RD #101	FLOODWAY --	WINTERS #399	NONE	0	0	21	37			0.4'	0.7'	
WINTERS #102	FLOODWAY --	WINTERS #391	NONE	0	0	45	80			0.8'	1.1'	
ROBERTS RD #103	WINTERS #399	NICHOLS #305	NONE	0	0	85	154			0.8'	1.2'	
OVERLAND #105	NICHOLS #305	FILLMORE #306	NONE	0	0	93	176	N/A	N/A	1.1'	1.7'	
STONE #104	WINTERS --	NICHOLS #398	NONE	0	0	63	111			0.6'	1.0'	
STONE #106	NICHOLS #398	FOURTH #303	NONE	0	0	83	151	8"	8"	0.8'	1.2'	
STONE #107	FOURTH #303	FILLMORE #304	INLETS AT FILLMORE	0	0	150	282		8"	1.1'	1.7'	
FILLMORE --	STONE #304	CHANNEL #306				0	0		5"	0	0	
CHANNEL #109	FILLMORE #306	V.B. DITCH #392	PARTIAL LINED CHANNEL	0	0	196	370	N/A	N/A	1.7'	2.5'	

DATA SUMMARY - TABLE 4

EXISTING SYSTEM

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
BASIN A-2												
NICHOLS #321	HANCOCK --	CORBETT #205	NONE	0	0	23	41	8"	6"	0.2'	0.3'	
NICHOLS #322	CORBETT #205	INSTITUTE #124	NONE	0	0	22	40	8"	6"	0.2'	0.3'	
INSTITUTE #322	INSTITUTE --	NICHOLS #124	NONE	0	0	10	18			0.2'	0.2'	
NICHOLS #323	INSTITUTE #124	JON #125	INLETS AT JON ST.	0	0	15	28	8"	6"	0.2'	0.3'	
JON #323	FLOODWAY --	NICHOLS #125	INLETS AT NICHOLS	0	0	35	63			0.4'	0.5'	
NICHOLS #324	JON #125	ARCADIA #126	UNKNOWN STORM PIPE	32	45	9	22		6"	0.1'	0.2'	
ALLEY #324	FLOODWAY --	NICHOLS #126	NONE	0	0	18	32			0.4'	0.5'	
NICHOLS #325	ARCADIA #126	PROSPECT #127	UNKNOWN STORM PIPE	32	45	12	25		6"	0.2'	0.3'	
ALLEY #325	FLOODWAY --	NICHOLS #127	NONE	0	0	41	73			0.4'	0.6'	
NICHOLS #326	PROSPECT #127	ALLEY #206	UNKNOWN STORM PIPE	32	45	26	49		6"	0.6'	0.8'	
PROSPECT #326	FLOODWAY --	NICHOLS #206	INLETS AT NICHOLS	0	0	54	100	6"	6"	0.6'	0.8'	
EL PASO ST #327	FLOODWAY --	WINTERS #214	NONE	0	0	27	47			0.5'	0.7'	
EL PASO ST #328	WINTERS #214	NICHOLS #129	INLETS AT NICHOLS	0	0	79	144			0.7'	1.0'	
NICHOLS --	EL PASO ST #129	EL PASO PL #128	UNKNOWN STORM PIPE	85	135	13	42			0.3'	0.6'	
NICHOLS #326	EL PASO PL #128	ALLEY #206	UNKNOWN STORM PIPE	85	135	4	15			0.1'	0.3'	

EXISTING SYSTEM

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
BASIN A-3												
MARIGOLD #333	PRIMROSE --	THIRD #201	24" @ 1.2%	21	21	29	52			0.5'	0.6'	
HANCOCK #333	FOURTH #120	THIRD #201	36" @ 0.2%	28	28	33	75		8"	0.5'	0.9'	
THIRD #334	HANCOCK #201	PENN #122	24" PENN SYSTEM	35	35	60	142			0.7'	1.2'	
VIRGINIA #340	PENN #122	FOURTH #204	INLETS AT FOURTH	0	0	32	123			0.5'	1.2'	
FOURTH #300	UNION --	COUNTRY VIL #200	INLETS AT COUNTRY VIL	0	0	53	98			0.6'	0.8'	
FOURTH #301	COUNTRY VIL #200	HANCOCK #120	24" @ 1.3%	28	28	24	69	8"/6"	8"	0.3'	0.6'	
HANCOCK #301	FLOODWAY --	FOURTH #120	INLETS AT FOURTH	0	0	41	73	6"	8"	0.4'	0.6'	
FOURTH #302	HANCOCK #120	ILLINOIS #202	NONE	0	0	28	62	6"		0.3'	0.6'	
ILLINOIS #302	NICHOLS --	FOURTH #202	NONE	0	0	14	27			0.2'	0.3'	
FOURTH #335	ILLINOIS #202	PENN #203	INLETS AT PENN	0	0	40	87	6"	6"	0.5'	0.7'	
PENN #335	NICHOLS --	FOURTH #203	INLETS AT FOURTH	0	0	26	47			0.3'	0.4'	
FOURTH #336	PENN #203	VIRGINIA #204	24" @ 3.1%	35	35	63	130	6"		0.6'	0.9'	
VIRGINIA #336	NICHOLS --	FOURTH #204	NONE	0	0	23	44			0.3'	0.5'	
FOURTH #337	VIRGINIA #204	INSTITUTE #207	24" @ 0.6%	19	19	132	308	6"	6"	1.1'	1.8'	

EXISTING SYSTEM

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
INSTITUTE #345	INSTITUTE --	FOURTH #207	NONE	0	0	10	18			0.3'	0.4'	
INSTITUTE #337	NICHOLS #124	FOURTH #207	NONE	0	0	41	76			0.5'	0.7'	
FOURTH #338	INSTITUTE #207	JON #130	30" @ 1.0%	28	28	178	396	6"	6"	1.5'	2.3'	
JON #338	NICHOLS #125	FOURTH #130	NONE	0	0	26	55			0.4'	0.6'	
FOURTH #339	JON #130	ARCADIA #111	30" @ 1.0%	44	44	89	213	6"	6"	0.9'	1.5'	
ARCADIA #339	NICHOLS #126	FOURTH #111	INLETS AT FOURTH	0	0	34	64			0.4'	0.6'	
FOURTH #341	ARCADIA #111	PROSPECT #208	42" @ 0.6% 42" @ 1.0%	90	90	35	111	6"		0.6'	1.2'	
PROSPECT #341	NICHOLS #127	FOURTH #208	INLETS AT FOURTH	0	0	40	79	6"	6"	0.6'	0.9'	
FOURTH #342	PROSPECT #208	ALLEY #112	36" @ 2.1%	90	90	74	190	6"	6"	0.8'	1.4'	
ALLEY #342	NICHOLS #206	FOURTH #112	NONE	0	0	33	75			0.4'	0.7'	
FOURTH #343	ALLEY #112	EL PASO PL #113	36" @ 2.1%	90	90	53	132	5"	5"	0.7'	1.2'	
EL PASO PL #343	NICHOLS #128	FOURTH #113	INLETS AT FOURTH	0	0	29	61			0.5'	0.7'	
FOURTH #344	EL PASO PL #113	EL PASO ST #209	42" @ 0.7%	90	90	77	188	5"/8"	5"/8"	1.6'	2.6'	
EL PASO ST #344	NICHOLS #129	FOURTH #209	UNKNOWN STORM PIPE	135	195	55	120			0.6'	1.0'	

EXISTING SYSTEM

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
BASIN A-5												
EL PASO ST #352	FOURTH #209	CENTURY #213	78" @ 0.4% 78" @ 0.5%	293	356	83	275	8"	5"	0.9'	1.9'	
CENTURY #350	FOURTH --	EL PASO ST #213	33" @ 0.8% 33" @ 1.4%	67	67	33	63			0.6'	0.8'	
EL PASO ST #353	CENTURY #213	FILLMORE #220	78" @ 0.6%	367	437	37	251	8"	5"	0.5'	1.6'	
FILLMORE #353	PROSPECT #119	EL PASO ST #220	INLETS AT EL PASO ST	0	0	125	318	8"	8"	1.0'	1.8'	
EL PASO ST #361	FILLMORE #220	EL PASO ST #225	78" @ 0.8%	427	503	100	494	5"	5"	1.1'	2.7'	
OVERLAND #360	FILLMORE --	V.B. DITCH #226	NONE	0	0	42	81			0.6'	0.9'	
CHANNEL --	EL PASO ST #225	V.B. DITCH	78" @ %	427	503							
SECOND #357	HANCOCK --	INSTITUTE #210	NONE	0	0	45	83			0.6'	0.8'	
SECOND #355	INSTITUTE #210	JON #211	NONE	0	0	45	83			0.6'	0.9'	
JON #355	FOURTH #130	SECOND #211	NONE	0	0	97	235			1.2'	2.0'	
SECOND #355	JON #211	ARCADIA #212	NONE	0	0	134	308			1.1'	1.8'	
ARCADIA #355	FOURTH #111	SECOND #212	NONE	0	0	28	102			0.6'	1.3'	
ARCADIA #356	SECOND #212	FIRST #215	NONE	0	0	144	381			1.3'	2.3'	
FIRST #356	INSTITUTE --	ARCADIA #215	NONE	0	0	27	49			0.6'	0.9'	
ALLEY #356	ARCADIA #215	PROSPECT --	NONE	0	0	163	421			-	-	

EXISTING SYSTEM

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
FILLMORE #358	HANCOCK #115	INSTITUTE #118	NONE	0	0	52	112	8"/5"	8"/5"	0.5'	0.8'	
FILLMORE #356	INSTITUTE #118	ARCADIA #117	NONE	0	0	25	55	5"/8"	8"	0.3'	0.5'	
INSTITUTE #364	FILLMORE #118	ALLEY #221	NONE	0	0	55	113			0.6'	1.0'	
ALLEY #363	INSTITUTE #221	ARCADIA #222	NONE	0	0	54	112			0.8'	1.1'	
ARCADIA #363	FILLMORE #117	ALLEY #222	NONE	0	0	47	94			0.6'	0.8'	
ARCADIA #366	PENN --	ALLEY #222	NONE	0	0	23	43			0.5'	0.7'	
ALLEY #362	ARCADIA #222	PROSPECT #223	NONE	0	0	121	243			1.3'	1.9'	
FILLMORE --	ARCADIA #117	PROSPECT #119	NONE	0	0	12	27	5"	5"	0.2'	0.3'	
PROSPECT #354	FOURTH #112	FILLMORE #119	NONE	0	0	73	175	8"	6"	1.0'	1.6'	
PROSPECT #362	FILLMORE #119	ALLEY #223	NONE	0	0	137	345	5"	5"	1.1'	1.9'	
PENN #365	FILLMORE --	PROSPECT #224	NONE	0	0	70	133			0.7'	1.0'	
PROSPECT #367	PENN #224	ALLEY #223	NONE	0	0	63	125	8"	8"	0.8'	1.1'	
PROSPECT #367	T-GAP --	ALLEY #223	NONE	0	0	34	65	8"	8"	0.5'	0.8'	
CHANNEL --	PROSPECT #223	V.B. DITCH --	NONE	0	0							

EXISTING SYSTEM

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
BASIN A-4												
PRIMROSE #376	HOLLYHOCK --	MARIGOLD #240	INLETS AT MARIGOLD	0	0	27	54			0.4'	0.6'	
HANCOCK #380	MARIGOLD #240	COLUMBINE #248	48" @ 0.2%	66	69	30	67		8"	0.6'	0.9'	
T-GAP #375	FLOODWAY --	UNION #241	INLETS AT UNION	0	0	35	67	8"		0.5'	0.7'	
COLUMBINE #377	UNION #241	POINSETTA #242	30" @ 0.8% 42" @ 1.4%	23	28	32	57	8"/6"	5"	0.6'	0.8'	
POINSETTA #378	HOLLYHOCK --	COLUMBINE #242	NONE	0	0	34	61			0.5'	0.7'	
COLUMBINE #379	POINSETTA #242	MARIGOLD #243	36" @ 1.5%	64	88	21	56	6"	5"	0.3'	0.6'	
MARIGOLD #379	PRIMROSE #240	COLUMBINE #248	INLETS AT COLUMBINE	0	0	34	63			0.5'	0.7'	
COLUMBINE #380	MARIGOLD #343	HANCOCK #248	42" @ 1.1%	89	113	29	93	8"		0.4'	0.8'	
HANCOCK #383	COLUMBINE #248	FILLMORE #115	43x68 @ 0.2%	97	97	109	241	8"		1.3'	2.0'	
FILLMORE #383	T-GAP --	HANCOCK #115	INLETS AT HANCOCK	0	0	26	51	8"	8"	0.3'	0.5'	
HANCOCK #384	FILLMORE #115	T-GAP #246	48" @ 0.9% 48" @ 1.3%	124	124	118	287	8"	6"	1.0'	1.6'	
UNION --	CIRCLE #114	FILLMORE #245	36x65 76x48 @ 0.9%	-	266	0	0			0	0	
FILLMORE #382	UNION --	T-GAP #245	76x48 @ 0.9%	-	266	3	16	8"	8"	0.1'	0.2'	
T-GAP #384	FILLMORE #245	HANCOCK #246	60" @ 1.4%	-	331	3	15	8"	5"	0.1'	0.3'	
T-GAP #385	HANCOCK #246	V.B. DITCH #247	43x68 @ 1.5% 78" @ 0.8%	203	259	42	156	8"	8"	0.5'	1.1'	

BASIN MASTER PLAN MODEL

BASIN MASTER PLAN MODEL

Description of the Hydrologic Model

The flood peaks and hydrographs were calculated at the design points using a personal computer-based hydrologic simulation of the basin, the UDSWM2-PC. The UDSWM2-PC is the Runoff Block of the Environmental Protection Agency's Storm Water Management Model (SWMM).

The user of the UDSWM2-PC defines numerically the hydrologic characteristics of the sub-basins. A conveyance element is defined for each sub-basin to convey flows to the discharge point or node of the sub-basin. The model identifies the sub-basin hydrograph at its discharge point.

The design precipitation used for the analysis is shown in Table 2. This information was obtained from the Criteria Manual.

Developed land use discharges were identified at important design points within the study area for the 10-year and 100-year flood events. Design points were selected at street intersections where flows may split and at downstream discharge points.

Street intersections are simulated in the model using Type 3 nodes. The discharge at the node was split equally at most intersections for this study.

The purpose of splitting flows at intersections was to identify cumulative flooding effects that were caused by combining hydrographs from upgradient flows to those produced by local overland flow. Flows were split equally at most intersections within the study area. We based this upon field observations and preliminary hydraulic analysis of the intersections. Field observations and review of the topographic maps indicated an absence of clearly defined flow paths at most intersections, a lack of curb and gutter and cross pans, and no significant variations in slope of the two downstream receiving streets. In the final analysis, variations in the 50/50 ratio of the flow split will have little effect on the recommended design.

The developed land use is shown on Map 3. This information was obtained from City of Colorado Springs Zoning Maps. Uses shown were field verified.

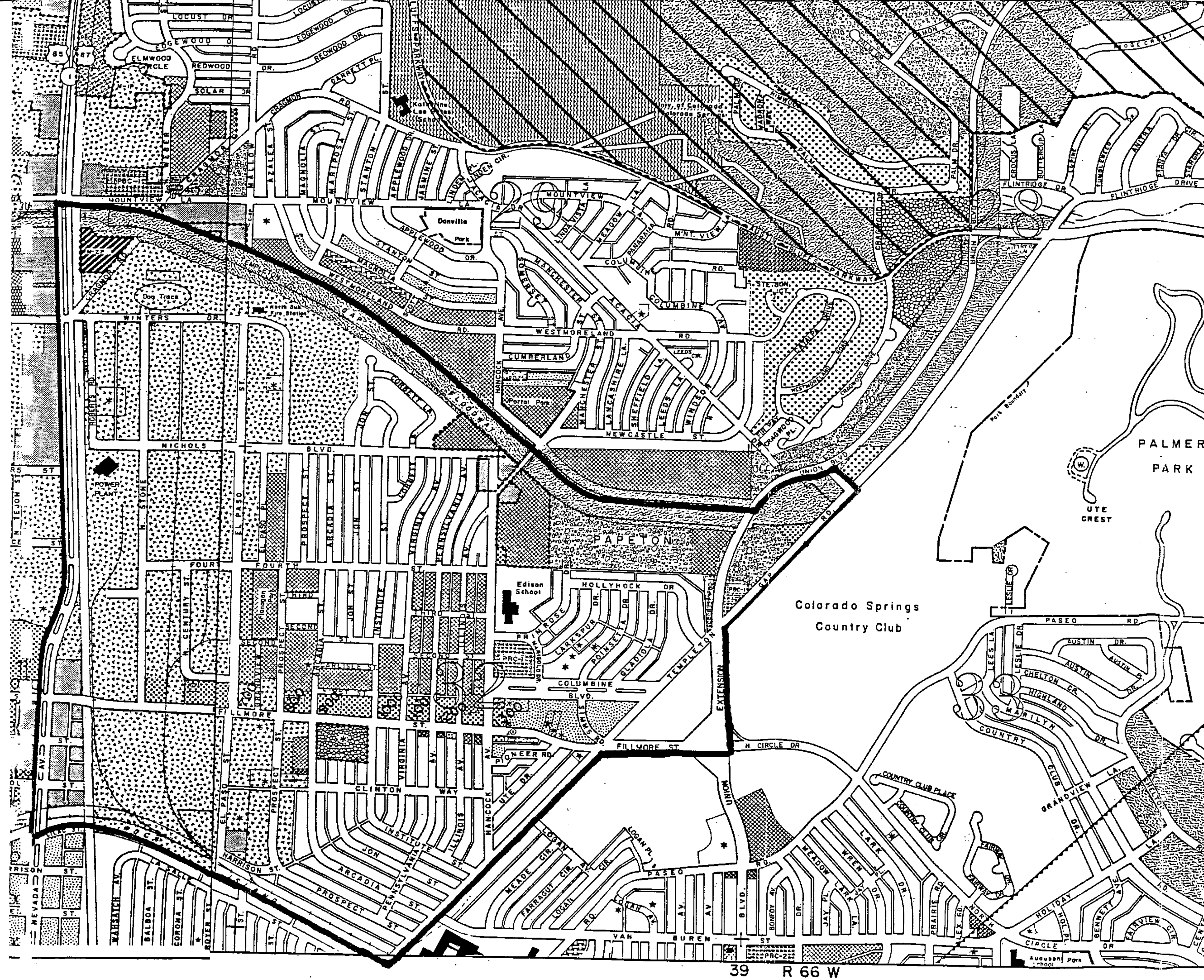
The flow charts identifying the Hydrologic Model are shown on Map 4 for developed land use. The existing system and the selected Alternative No. 2 are summarized on Tables 4 and 6, respectively. The UDSWM2-PC run for developed land use with the selected Alternative No. 2 is shown in Appendix 1.

Calibration Procedure

The hydrographs identified by the Runoff Block of the SWMM model have been calibrated to regional flood peak identification techniques to ensure reliable results.

The Rational Method as defined in the Criteria Manual was selected for calibration of the UDSWM2-PC. The sub-basins were well suited for Rational Method calibration as the sub-basins were less than 130 acres in size and mostly urbanized.

The UDSWM2-PC model was calibrated to the Rational Method by adjusting the Manning roughness coefficient of the conveyance elements within the study basin. The flood peaks identified by the adjusted UDSWM2-PC model at the selected design points compared favorably with the flood peaks identified by Rational Method (Table 3).



PUD	Planned Unit Development
A	Agricultural
R	Estate-Single-Family Residential
R-1	9,000 Sq. Ft. Single-Family Residential
R-1	6,000 Sq. Ft. Single-Family Residential
R-2	Two-Family-Residential
R-4	Eight-Family Residential
R-5	Multi-Family Residential
MHP	Mobile Home Park
MHS	Mobile Home Subdivision
O R	Office Residential
O C	Office Complex
PBC	Planned Business Center No. 1 and 2
C-5	Intermediate Business
C-6	General Business
PIP	Planned Industrial Park No. 1 and 2
M-1	Light Industrial
M-2	Heavy Industrial
APD	Airport Planned Development
S U	Special Use
RVP	Recreational Vehicle Park
SP	Special Permit
U V (*)	Use Variance
C U (*)	Conditional Use
(○)	Variance of a section of the Code (Special Permit)
HS	"Hillside Area (Overlay)"
P	Planned Provisional

City Limits

Zone Subject to Conditions of Record

High Rise Zone

Air Approach Zone

Navigation Preservation

CITY PLANNING DEPARTMENT

POST OFFICE BOX 1575 COLORADO SPRINGS, COLORADO

REVISION DATE
5-1-86

0 500 1000

DO NOT SCALE

MAP

TABLE 2

DESIGN PRECIPITATION

TIME (MIN.)	10 YEAR %	10 YEAR IN/HR	100 YEAR %	100 YEAR IN/HR
5	2.0	0.43	1.0	0.32
10	3.7	0.80	3.0	0.97
15	8.2	1.77	4.6	1.49
20	15.0	3.24	8.0	2.59
25	25.0	5.40	14.0	4.54
30	12.0	2.59	25.0	8.10
35	5.6	1.21	14.0	4.54
40	4.3	0.93	8.0	2.59
45	3.8	0.82	6.2	2.01
50	3.2	0.69	5.0	1.62
55	3.2	0.69	4.0	1.30
60	3.2	0.69	4.0	1.30
65	3.2	0.69	4.0	1.30
70	3.2	0.69	2.0	0.65
75	3.2	0.69	2.0	0.65
80	2.5	0.54	1.2	0.34
85	1.9	0.41	1.2	0.34
90	1.9	0.41	1.2	0.34
95	1.9	0.41	1.2	0.34
100	1.9	0.41	1.2	0.34
105	1.9	0.41	1.2	0.34
110	1.9	0.41	1.2	0.34
115	1.7	0.37	1.2	0.34
120	1.3	0.28	1.2	0.34

From: Fig. 5-5a, draft criteria, Colo. Springs, Co.

TABLE 2

TABLE 3

UDSWM2-PC CALIBRATION TO RATIONAL METHOD

DESIGN POINT	UDSWM NODE	AREA (AC)	FLOOD EVENT (YR)	RATIONAL C	RATIONAL I (IN/HR)	RATIONAL T_C MIN	RATIONAL DISCHARGE (CFS)	UDSWM DISCHARGE (CFS)
1	246	132	10	0.65	2.7	30	230	200
			100	0.80	4.1	30	430	390
2	100	38	10	0.65	3.25	22	80	90
			100	0.80	4.9	22	150	170
3	109	32	10	0.90	3.4	20	75	80
			100	0.90	5.1	20	145	145
4	110	134	10	0.65	2.85	28	250	320
			100	0.80	4.3	28	460	600

TABLE 3

TABLE 4
EXISTING SYSTEM

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
BASIN B												
OVERLAND #108	EAST OF NEVADA	FILLMORE #307	NONE	0	0	15	25	N/A	N/A	0.4'	0.5'	
FILLMORE --	FILLMORE #307	CHANNEL #306	UNKNOWN STORM PIPE	15	25	0	0	5"	5"	0	0	PIPE FLOWS EAST
OVERLAND #110	FILLMORE #307	V.B. DITCH #390	NONE	0	0	21	37	N/A	N/A	0.4'	0.6'	
BASIN A-1												
CRAGMOR RD #101	FLOODWAY --	WINTERS #399	NONE	0	0	21	37			0.4'	0.7'	
WINTERS #102	FLOODWAY --	WINTERS #391	NONE	0	0	45	80			0.8'	1.1'	
ROBERTS RD #103	WINTERS #399	NICHOLS #305	NONE	0	0	85	154			0.8'	1.2'	
OVERLAND #105	NICHOLS #305	FILLMORE #306	NONE	0	0	93	176	N/A	N/A	1.1'	1.7'	
STONE #104	WINTERS --	NICHOLS #398	NONE	0	0	63	111			0.6'	1.0'	
STONE #106	NICHOLS #398	FOURTH #303	NONE	0	0	83	151	8"	8"	0.8'	1.2'	
STONE #107	FOURTH #303	FILLMORE #304	INLETS AT FILLMORE	0	0	150	282		8"	1.1'	1.7'	
FILLMORE --	STONE #304	CHANNEL #306				0	0		5"	0	0	
CHANNEL #109	FILLMORE #306	V.B. DITCH #392	PARTIAL LINED CHANNEL	0	0	196	370	N/A	N/A	1.7'	2.5'	

TABLE 4

EXISTING SYSTEM

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
BASIN A-2												
NICHOLS #321	HANCOCK --	CORBETT #205	NONE	0	0	23	41	8"	6"	0.2'	0.3'	
NICHOLS #322	CORBETT #205	INSTITUTE #124	NONE	0	0	22	40	8"	6"	0.2'	0.3'	
INSTITUTE #322	INSTITUTE --	NICHOLS #124	NONE	0	0	10	18			0.2'	0.2'	
NICHOLS #323	INSTITUTE #124	JON #125	INLETS AT JON ST.	0	0	15	28	8"	6"	0.2'	0.3'	
JON #323	FLOODWAY --	NICHOLS #125	INLETS AT NICHOLS	0	0	35	63			0.4'	0.5'	
NICHOLS #324	JON #125	ARCADIA #126	UNKNOWN STORM PIPE	32	45	9	22		6"	0.1'	0.2'	
ALLEY #324	FLOODWAY --	NICHOLS #126	NONE	0	0	18	32			0.4'	0.5'	
NICHOLS #325	ARCADIA #126	PROSPECT #127	UNKNOWN STORM PIPE	32	45	12	25		6"	0.2'	0.3'	
ALLEY #325	FLOODWAY --	NICHOLS #127	NONE	0	0	41	73			0.4'	0.6'	
NICHOLS #326	PROSPECT #127	ALLEY #206	UNKNOWN STORM PIPE	32	45	26	49		6"	0.6'	0.8'	
PROSPECT #326	FLOODWAY --	NICHOLS #206	INLETS AT NICHOLS	0	0	54	100	6"	6"	0.6'	0.8'	
EL PASO ST #327	FLOODWAY --	WINTERS #214	NONE	0	0	27	47			0.5'	0.7'	
EL PASO ST #328	WINTERS #214	NICHOLS #129	INLETS AT NICHOLS	0	0	79	144			0.7'	1.0'	
NICHOLS --	EL PASO ST #129	EL PASO PL #128	UNKNOWN STORM PIPE	85	135	13	42			0.3'	0.6'	
NICHOLS #326	EL PASO PL #128	ALLEY #206	UNKNOWN STORM PIPE	85	135	4	15			0.1'	0.3'	

EXISTING SYSTEM

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
BASIN A-3												
MARIGOLD #333	PRIMROSE --	THIRD #201	24" @ 1.2%	21	21	29	52			0.5'	0.6'	
HANCOCK #333	FOURTH #120	THIRD #201	36" @ 0.2%	28	28	33	75		8"	0.5'	0.9'	
THIRD #334	HANCOCK #201	PENN #122	24" PENN SYSTEM	35	35	60	142			0.7'	1.2'	
VIRGINIA #340	PENN #122	FOURTH #204	INLETS AT FOURTH	0	0	32	123			0.5'	1.2'	
FOURTH #300	UNION --	COUNTRY VIL #200	INLETS AT COUNTRY VIL	0	0	53	98			0.6'	0.8'	
FOURTH #301	COUNTRY VIL #200	HANCOCK #120	24" @ 1.3%	28	28	24	69	8"/6"	8"	0.3'	0.6'	
HANCOCK #301	FLOODWAY --	FOURTH #120	INLETS AT FOURTH	0	0	41	73	6"	8"	0.4'	0.6'	
FOURTH #302	HANCOCK #120	ILLINOIS #202	NONE	0	0	28	62	6"		0.3'	0.6'	
ILLINOIS #302	NICHOLS --	FOURTH #202	NONE	0	0	14	27			0.2'	0.3'	
FOURTH #335	ILLINOIS #202	PENN #203	INLETS AT PENN	0	0	40	87	6"	6"	0.5'	0.7'	
PENN #335	NICHOLS --	FOURTH #203	INLETS AT FOURTH	0	0	26	47			0.3'	0.4'	
FOURTH #336	PENN #203	VIRGINIA #204	24" @ 3.1%	35	35	63	130	6"		0.6'	0.9'	
VIRGINIA #336	NICHOLS --	FOURTH #204	NONE	0	0	23	44			0.3'	0.5'	
FOURTH #337	VIRGINIA #204	INSTITUTE #207	24" @ 0.6%	19	19	132	308	6"	6"	1.1'	1.8'	

EXISTING SYSTEM

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
INSTITUTE #345	INSTITUTE --	FOURTH #207	NONE	0	0	10	18			0.3'	0.4'	
INSTITUTE #337	NICHOLS #124	FOURTH #207	NONE	0	0	41	76			0.5'	0.7'	
FOURTH #338	INSTITUTE #207	JON #130	30" @ 1.0%	28	28	178	396	6"	6"	1.5'	2.3'	
JON #338	NICHOLS #125	FOURTH #130	NONE	0	0	26	55			0.4'	0.6'	
FOURTH #339	JON #130	ARCADIA #111	30" @ 1.0%	44	44	89	213	6"	6"	0.9'	1.5'	
ARCADIA #339	NICHOLS #126	FOURTH #111	INLETS AT FOURTH	0	0	34	64			0.4'	0.6'	
FOURTH #341	ARCADIA #111	PROSPECT #208	42" @ 0.6% 42" @ 1.0%	90	90	35	111	6"		0.6'	1.2'	
PROSPECT #341	NICHOLS #127	FOURTH #208	INLETS AT FOURTH	0	0	40	79	6"	6"	0.6'	0.9'	
FOURTH #342	PROSPECT #208	ALLEY #112	36" @ 2.1%	90	90	74	190	6"	6"	0.8'	1.4'	
ALLEY #342	NICHOLS #206	FOURTH #112	NONE	0	0	33	75			0.4'	0.7'	
FOURTH #343	ALLEY #112	EL PASO PL #113	36" @ 2.1%	90	90	53	132	5"	5"	0.7'	1.2'	
EL PASO PL #343	NICHOLS #128	FOURTH #113	INLETS AT FOURTH	0	0	29	61			0.5'	0.7'	
FOURTH #344	EL PASO PL #113	EL PASO ST #209	42" @ 0.7%	90	90	77	188	5"/8"	5"/8"	1.6'	2.6'	
EL PASO ST #344	NICHOLS #129	FOURTH #209	UNKNOWN STORM PIPE	135	195	55	120			0.6'	1.0'	

EXISTING SYSTEM

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
BASIN A-5												
EL PASO ST #352	FOURTH #209	CENTURY #213	78" @ 0.4% 78" @ 0.5%	293	356	83	275	8"	5"	0.9'	1.9'	
CENTURY #350	FOURTH --	EL PASO ST #213	33" @ 0.8% 33" @ 1.4%	67	67	33	63			0.6'	0.8'	
EL PASO ST #353	CENTURY #213	FILLMORE #220	78" @ 0.6%	367	437	37	251	8"	5"	0.5'	1.6'	
FILLMORE #353	PROSPECT #119	EL PASO ST #220	INLETS AT EL PASO ST	0	0	125	318	8"	8"	1.0'	1.8'	
EL PASO ST #361	FILLMORE #220	EL PASO ST #225	78" @ 0.8%	427	503	100	494	5"	5"	1.1'	2.7'	
OVERLAND #360	FILLMORE --	V.B. DITCH #226	NONE	0	0	42	81			0.6'	0.9'	
CHANNEL --	EL PASO ST #225	V.B. DITCH	78" @ %	427	503							
SECOND #357	HANCOCK --	INSTITUTE #210	NONE	0	0	45	83			0.6'	0.8'	
SECOND #355	INSTITUTE #210	JON #211	NONE	0	0	45	83			0.6'	0.9'	
JON #355	FOURTH #130	SECOND #211	NONE	0	0	97	235			1.2'	2.0'	
SECOND #355	JON #211	ARCADIA #212	NONE	0	0	134	308			1.1'	1.8'	
ARCADIA #355	FOURTH #111	SECOND #212	NONE	0	0	28	102			0.6'	1.3'	
ARCADIA #356	SECOND #212	FIRST #215	NONE	0	0	144	381			1.3'	2.3'	
FIRST #356	INSTITUTE --	ARCADIA #215	NONE	0	0	27	49			0.6'	0.9'	
ALLEY #356	ARCADIA #215	PROSPECT --	NONE	0	0	163	421			-	-	

EXISTING SYSTEM

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
FILLMORE #358	HANCOCK #115	INSTITUTE #118	NONE	0	0	52	112	8"/5"	8"/5"	0.5'	0.8'	
FILLMORE #356	INSTITUTE #118	ARCADIA #117	NONE	0	0	25	55	5"/8"	8"	0.3'	0.5'	
INSTITUTE #364	FILLMORE #118	ALLEY #221	NONE	0	0	55	113			0.6'	1.0'	
ALLEY #363	INSTITUTE #221	ARCADIA #222	NONE	0	0	54	112			0.8'	1.1'	
ARCADIA #363	FILLMORE #117	ALLEY #222	NONE	0	0	47	94			0.6'	0.8'	
ARCADIA #366	PENN --	ALLEY #222	NONE	0	0	23	43			0.5'	0.7'	
ALLEY #362	ARCADIA #222	PROSPECT #223	NONE	0	0	121	243			1.3'	1.9'	
FILLMORE --	ARCADIA #117	PROSPECT #119	NONE	0	0	12	27	5"	5"	0.2'	0.3'	
PROSPECT #354	FOURTH #112	FILLMORE #119	NONE	0	0	73	175	8"	6"	1.0'	1.6'	
PROSPECT #362	FILLMORE #119	ALLEY #223	NONE	0	0	137	345	5"	5"	1.1'	1.9'	
PENN #365	FILLMORE --	PROSPECT #224	NONE	0	0	70	133			0.7'	1.0'	
PROSPECT #367	PENN #224	ALLEY #223	NONE	0	0	63	125	8"	8"	0.8'	1.1'	
PROSPECT #367	T-GAP --	ALLEY #223	NONE	0	0	34	65	8"	8"	0.5'	0.8'	
CHANNEL --	PROSPECT #223	V.B. DITCH --	NONE	0	0							

EXISTING SYSTEM

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	 Q_{100}	SURFACE FLOW Q_{10}	 Q_{100}	CURBING N/W	 S/E	FLOW DEPTH Q_{10}	 Q_{100}	COMMENTS
BASIN A-4												
PRIMROSE #376	HOLLYHOCK --	MARIGOLD #240	INLETS AT MARIGOLD	0	0	27	54			0.4'	0.6'	
HANCOCK #380	MARIGOLD #240	COLUMBINE #248	48" @ 0.2%	66	69	30	67		8"	0.6'	0.9'	
T-GAP #375	FLOODWAY --	UNION #241	INLETS AT UNION	0	0	35	67	8"		0.5'	0.7'	
COLUMBINE #377	UNION #241	POINSETTA #242	30" @ 0.8% 42" @ 1.4%	23	28	32	57	8"/6"	5"	0.6'	0.8'	
POINSETTA #378	HOLLYHOCK --	COLUMBINE #242	NONE	0	0	34	61			0.5'	0.7'	
COLUMBINE #379	POINSETTA #242	MARIGOLD #243	36" @ 1.5%	64	88	21	56	6"	5"	0.3'	0.6'	
MARIGOLD #379	PRIMROSE #240	COLUMBINE #248	INLETS AT COLUMBINE	0	0	34	63			0.5'	0.7'	
COLUMBINE #380	MARIGOLD #343	HANCOCK #248	42" @ 1.1%	89	113	29	93	8"		0.4'	0.8'	
HANCOCK #383	COLUMBINE #248	FILLMORE #115	43x68 @ 0.2%	97	97	109	241	8"		1.3'	2.0'	
FILLMORE #383	T-GAP --	HANCOCK #115	INLETS AT HANCOCK	0	0	26	51	8"	8"	0.3'	0.5'	
HANCOCK #384	FILLMORE #115	T-GAP #246	48" @ 0.9% 48" @ 1.3%	124	124	118	287	8"	6"	1.0'	1.6'	
UNION --	CIRCLE #114	FILLMORE #245	36x65 76x48 @ 0.9%	-	266	0	0			0	0	
FILLMORE #382	UNION --	T-GAP #245	76x48 @ 0.9%	-	266	3	16	8"	8"	0.1'	0.2'	
T-GAP #384	FILLMORE #245	HANCOCK #246	60" @ 1.4%	-	331	3	15	8"	5"	0.1'	0.3'	
T-GAP #385	HANCOCK #246	V.B. DITCH #247	43x68 @ 1.5% 78" @ 0.8%	203	259	42	156	8"	8"	0.5'	1.1'	

TABLE 6
ALTERNATE NO. 2

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
BASIN B												
OVERLAND #108	EAST OF NEVADA	FILLMORE #307	NONE	0	0	15	25	N/A	N/A	0.4'	0.5'	
FILLMORE --	FILLMORE #307	CHANNEL #306	UNKNOWN STORM PIPE	15	25	0	0	5"	5"	0	0	PIPE FLOWS EAST
OVERLAND #110	FILLMORE #307	V.B. DITCH #390	NONE	0	0	21	62	N/A	N/A	0.4'	1.0'	
BASIN A-1												
CRAGMOR RD #101	FLOODWAY --	WINTERS #399	NONE	0	0	21	37			0.4'	0.7'	
WINTERS #102	FLOODWAY --	WINTERS #391	NONE	0	0	45	80			0.8'	1.1'	
ROBERTS RD #103	WINTERS #391	NICHOLS #305	NONE (36" @ 0.9%)	51	65	30	88			0.5'	0.9'	(500' 36" IN WINTERS)
NICHOLS --	ROBERTS #305	STONE #303	(36" @ 1.0%)	26	69	0	0			0	0	(600' 36" IN NICHOLS)
OVERLAND #105	NICHOLS #305	FILLMORE #306	NONE	0	0	28	60	N/A	N/A	0.6'	1.0'	
STONE #104	WINTERS --	NICHOLS #398	NONE (36" @ 1.4%) (42" @ 0.6%)	51	65	63	111			0.6'	1.0'	(830' 36") (550' 42")
STONE #106	NICHOLS #398	FOURTH #303	NONE (42" @ 1.1%)	88	105	43	110	8"	8"	0.6'	1.0'	(1330' 42")
STONE #107	FOURTH #303	FILLMORE #304	INLETS AT FILLMORE (54" @ 1.2%) (60" @ 0.7%)	146	258	77	155		8"	0.8'	1.1'	(1080' 54") (500' 60")

NOTE: PROPOSED FACILITIES SHOWN AS (DIA." @ SLOPE %), TYPICAL

TABLE 6

ALTERNATE NO. 2

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
FILLMORE --	STONE #304	CHANNEL #306	(78" @ 0.5%)	215	377	8	35		5"	0.2'	0.5'	(430' 78")
CHANNEL #109	FILLMORE #306	V.B. DITCH #392	PARTIAL LINED CHANNEL (IMPROVED CONCRETE CHANNEL & OUTFALL PIPING)	215	377	55	150	N/A	N/A	N/A	N/A	(400' CHANNEL) (45' 84") (765' 66")

BASIN A-2

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
NICHOLS #321	HANCOCK --	CORBETT #205	NONE	0	0	23	41	8"	6"	0.2'	0.3'	
NICHOLS #322	CORBETT #205	INSTITUTE #124	NONE	0	0	22	40	8"	6"	0.2'	0.3'	
INSTITUTE #322	INSTITUTE --	NICHOLS #124	NONE	0	0	10	18			0.2'	0.2'	
NICHOLS #323	INSTITUTE #124	JON #125	INLETS AT JON ST.	0	0	15	28	8"	6"	0.2'	0.3'	
JON #323	FLOODWAY --	NICHOLS #125	INLETS AT NICHOLS	0	0	35	63			0.4'	0.5'	
NICHOLS #324	JON #125	ARCADIA #126	UNKNOWN STORM PIPE	0	0	25	45		6"	0.2'	0.5'	
ALLEY #324	FLOODWAY --	NICHOLS #126	NONE	0	0	18	32			0.4'	0.5'	
NICHOLS #325	ARCADIA #126	PROSPECT #127	UNKNOWN STORM PIPE	0	0	20	37		6"	0.3'	0.4'	
ALLEY #325	FLOODWAY --	NICHOLS #127	NONE	0	0	41	73			0.4'	0.6'	
NICHOLS #326	PROSPECT #127	ALLEY #206	UNKNOWN STORM PIPE	0	0	30	54		6"	0.6'	0.9'	
PROSPECT #326	FLOODWAY --	NICHOLS #206	INLETS AT NICHOLS	0	0	54	100	6"	6"	0.6'	0.8'	

ALTERNATE NO. 2

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
EL PASO ST #327	FLOODWAY --	WINTERS #214	NONE	0	0	27	47			0.5'	0.7'	
EL PASO ST #328	WINTERS #214	NICHOLS #129	INLETS AT NICHOLS	0	0	79	144			0.7'	1.0'	
NICHOLS --	EL PASO ST #129	EL PASO PL #128	UNKNOWN STORM PIPE	50	50	14	47			0.3'	0.7'	
NICHOLS #326	EL PASO PL #128	ALLEY #206	UNKNOWN STORM PIPE	50	50	3	17			0.1'	0.3'	
<u>BASIN A-3</u>												
MARIGOLD #333	PRIMROSE --	THIRD #201	24" @ 1.2%	21	21	29	52			0.5'	0.6'	
HANCOCK #333	FOURTH #120	THIRD #201	36" @ 0.2%	28	28	33	75		8"	0.5'	0.9'	
THIRD #334	HANCOCK #201	PENN #122	24" PENN SYSTEM	35	35	32	58			0.5'	0.7'	
VIRGINIA #340	PENN #122	FOURTH #204	INLETS AT FOURTH	35	35	13	42			0.3'	0.6'	
FOURTH #300	UNION --	COUNTRY VIL #200	INLETS AT COUNTRY VIL	0	0	53	98			0.6'	0.8'	
FOURTH #301	COUNTRY VIL #200	HANCOCK #120	24" @ 1.3%	28	28	24	69	8"/6"	8"	0.3'	0.6'	
HANCOCK #301	FLOODWAY --	FOURTH #120	INLETS AT FOURTH	0	0	41	73	6"	8"	0.4'	0.6'	
FOURTH #302	HANCOCK #120	ILLINOIS #202	NONE	0	0	28	62	6"		0.3'	0.6'	
ILLINOIS #302	NICHOLS --	FOURTH #202	NONE	0	0	14	27			0.2'	0.3'	

ALTERNATE NO. 2

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
FOURTH #335	ILLINOIS #202	PENN #203	INLETS AT PENN	0	0	40	87	6"	6"	0.5'	0.7'	
PENN #335	NICHOLS --	FOURTH #203	INLETS AT FOURTH	0	0	26	47			0.3'	0.4'	
FOURTH #336	PENN #203	VIRGINIA #204	24" @ 3.1%	35	35	63	130	6"		0.6'	0.9'	
VIRGINIA #336	NICHOLS --	FOURTH #204	NONE	0	0	23	44			0.3'	0.5'	
FOURTH #337	VIRGINIA #204	INSTITUTE #207	24" @ 0.6% (48" @ 0.7%)	113	129	15	119	6"	6"	0.3'	0.9'	(290' 48")
INSTITUTE #345	INSTITUTE --	FOURTH #207	NONE	0	0	10	18			0.3'	0.4'	
INSTITUTE #337	NICHOLS #124	FOURTH #207	NONE	0	0	41	76			0.5'	0.7'	
FOURTH #338	INSTITUTE #207	JON #130	30" @ 1.0% (60" @ 0.7%)	167	219	9	119	6"	6"	0.2'	1.0'	(270' 60")
JON #338	NICHOLS #125	FOURTH #130	NONE	0	0	40	76			0.5'	0.7'	
FOURTH #339	JON #130	ARCADIA #111	30" @ 1.0% (60" @ 0.7%)	208	294	3	59	6"	6"	0.1'	0.7'	(270' 60")
ARCADIA #339	NICHOLS #126	FOURTH #111	INLETS AT FOURTH	0	0	40	75			0.4'	0.6'	
FOURTH #341	ARCADIA #111	PROSPECT #208	42" @ 0.6% 42" @ 1.0% (66" @ 0.7%)	243	385	3	16	6"		0.1'	0.4'	(270' 66")
PROSPECT #341	NICHOLS #127	FOURTH #208	INLETS AT FOURTH	0	0	44	85	6"	6"	0.6'	0.9'	

ALTERNATE NO. 2

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
FOURTH #342	PROSPECT #208	ALLEY #112	36" @ 2.1% (66" @ 0.7%)	243	385	46	99	6"	6"	0.6'	0.9'	(150' 66")
ALLEY #342	NICHOLS #206	FOURTH #112	NONE	0	0	37	120			0.4'	0.9'	
FOURTH #343	ALLEY #112	EL PASO PL #113	36" @ 2.1% (36" @ 0.5%)	–	140	6	59	5"	5"	0.2'	0.7'	(260' 36")
EL PASO PL #343	NICHOLS #128	FOURTH #113	INLETS AT FOURTH	0	0	28	62			0.4'	0.7'	
FOURTH #344	EL PASO PL #113	EL PASO ST #209	42" @ 0.7%	90	90	5	66	5"/8"	5"/8"	0.2'	0.9'	
EL PASO ST #344	NICHOLS #129	FOURTH #209	UNKNOWN STORM PIPE	100	100	55	125			0.6'	1.0'	
BASIN A-5												
EL PASO ST #352	FOURTH #209	CENTURY #213	78" @ 0.4% 78" @ 0.5%	293	356	52	159	8"	5"	0.6'	1.1'	
CENTURY #350	FOURTH --	EL PASO ST #213	33" @ 0.8% 33" @ 1.4%	67	67	33	63			0.6'	0.8'	
EL PASO ST #353	CENTURY #213	FILLMORE #220	78" @ 0.6%	367	437	12	44	8"	5"	0.3'	0.6'	
FILLMORE #353	PROSPECT #119	EL PASO ST #220	INLETS AT EL PASO ST	0	0	16	55	8"	8"	0.3'	0.6'	
EL PASO ST #361	FILLMORE #220	EL PASO ST #225	78" @ 0.8%	427	503	38	73	5"	5"	0.6'	0.8'	
OVERLAND #360	FILLMORE --	V.B. DITCH #226	NONE	0	0	42	81			0.6'	0.9'	
CHANNEL --	EL PASO ST #225	V.B. DITCH		427	503							

ALTERNATE NO. 2

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
SECOND #357	HANCOCK --	INSTITUTE #210	NONE	0	0	45	83			0.6'	0.8'	
SECOND #355	INSTITUTE #210	JON #211	NONE	0	0	45	83			0.6'	0.9'	
JON #355	FOURTH #130	SECOND #211	NONE	0	0	25	84			0.5'	0.9'	
SECOND #355	JON #211	ARCADIA #212	NONE	0	0	68	158			0.6'	1.1'	
ARCADIA #355	FOURTH #111	SECOND #212	NONE	0	0	2	9			0.1'	0.3'	
ARCADIA #356	SECOND #212	FIRST #215	NONE	0	0	78	190			0.6'	1.1'	
FIRST #356	INSTITUTE --	ARCADIA #215	NONE	0	0	27	49			0.6'	0.9'	
ALLEY #356	ARCADIA #215	PROSPECT --	(48" @ 1.4%)	66	130	10	60			0.4'	0.9'	ELECTRICITY IN ALLEY (370' 48")
FILLMORE #358	HANCOCK #115	INSTITUTE #118	NONE	0	0	40	82	8"/5"	8"/5"	0.4'	0.7'	
FILLMORE #356	INSTITUTE #118	ARCADIA #117	NONE	0	0	19	40	5"/8"	8"	0.3'	0.4'	
INSTITUTE #364	FILLMORE #118	ALLEY #221	NONE	0	0	53	102			0.6'	0.9'	
CLINTON --	HANCOCK --	ALLEY #221	(60" @ 1.0%)	45	270	0	0			0	0	(1550' 60")
ALLEY #363	INSTITUTE #221	ARCADIA #222	NONE (60" @ 1.4%)	110	320	8	51			0.2'	0.9'	(660' 60")
ARCADIA #363	FILLMORE #117	ALLEY #222	NONE	0	0	47	91			0.6'	0.8'	
ARCADIA #366	PENN --	ALLEY #222	NONE	0	0	23	43			0.5'	0.7'	

ALTERNATE NO. 2

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
ALLEY	ARCADIA #222	PROSPECT #223	NONE (66" @ 1.5%)	110	450	11	50			0.3'	0.8'	SANITARY SEWER AND GAS IN ALLEY (440' 66")
FILLMORE --	ARCADIA #117	PROSPECT #119	NONE	0	0	9	19	5"	5"	0.2'	0.3'	
PROSPECT #354	FOURTH #112	FILLMORE #119	NONE (78" @ 0.6%)	312	445	37	105	8"	6"	0.5'	1.0'	(1650' 78")
PROSPECT #362	FILLMORE #119	ALLEY #223	NONE (78" @ 1.4%) (84" @ 0.9%)	475	660	48	99	5"	5"	0.6'	0.9'	(530' 78") (1100' 84")
PENN #365	FILLMORE --	PROSPECT #224	NONE	0	0	70	133			0.7'	1.0'	
PROSPECT #367	PENN #224	ALLEY #223	NONE (30" @ 0.8%)	40	40	22	83	8"	8"	0.4'	0.9'	(1000' 30")
PROSPECT #367	T-GAP --	ALLEY #223	NONE	0	0	34	65	8"	8"	0.5'	0.8'	
CHANNEL --	PROSPECT #223	V.B. DITCH --	NONE (84" @ 2.6%)	660	1100	109	223					(240' 84")
BASIN A-4												
PRIMROSE #376	HOLLYHOCK --	MARIGOLD #240	INLETS AT MARIGOLD	0	0	27	54			0.4'	0.6'	

ALTERNATE NO. 2

DESCRIPTION SUBBASIN #	FROM NODE #	TO NODE #	STORM FACILITY	FACILITY Q_{10}	FACILITY Q_{100}	SURFACE FLOW Q_{10}	SURFACE FLOW Q_{100}	CURBING N/W	CURBING S/E	FLOW DEPTH Q_{10}	FLOW DEPTH Q_{100}	COMMENTS
HANCOCK #380	MARIGOLD #240	COLUMBINE #248	48" @ 0.2% (48" @ 0.3%)	95	155	30	67		8"	0.6'	0.9'	(880' 48")
T-GAP #375	FLOODWAY --	UNION #241	INLETS AT UNION	0	0	35	67	8"		0.5'	0.7'	
COLUMBINE #377	UNION #241	POINSETTA #242	30" @ 0.8% 42" @ 1.4%	23	28	32	57	8"/6"	5"	0.6'	0.8'	
POINSETTA #378	HOLLYHOCK --	COLUMBINE #242	NONE	0	0	34	61			0.5'	0.7'	
COLUMBINE #379	POINSETTA #242	MARIGOLD #243	36" @ 1.5%	64	88	21	56	6"	5"	0.3'	0.6'	
MARIGOLD #379	PRIMROSE #240	COLUMBINE #248	INLETS AT COLUMBINE	0	0	34	63			0.5'	0.7'	
COLUMBINE #380	MARIGOLD #343	HANCOCK #248	42" @ 1.1%	89	113	29	93	8"		0.4'	0.8'	
HANCOCK #383	COLUMBINE #248	FILLMORE #115	43x68 @ 0.2% (54" @ 1.0%)	231	322	8	100	8"		0.2'	1.0'	(420' 54")
FILLMORE #383	T-GAP --	HANCOCK #115	INLETS AT HANCOCK	0	0	26	51	8"	8"	0.3'	0.5'	
HANCOCK #384	FILLMORE #115	T-GAP #246	48" @ 0.9% 48" @ 1.3% (54" @ 1.6%)	257	408	48	122	8"	6"	0.5'	0.8'	(720' 54")
UNION --	CIRCLE #114	FILLMORE #245	36x65 76x48 @ 0.9%	-	266	0	0			0	0	
FILLMORE #382	UNION --	T-GAP #245	76x48 @ 0.9%	-	266	3	16	8"	8"	0.1'	0.2'	
T-GAP #384	FILLMORE #245	HANCOCK #246	60" @ 1.4%	-	331	3	15	8"	5"	0.1'	0.3'	
T-GAP #385	HANCOCK #246	V.B. DITCH #247	43x68 @ 1.5% 78" @ 0.8%	156	206	25	57	8"	8"	0.4'	0.6'	

IDENTIFICATION OF FLOOD PRONE AREAS

IDENTIFICATION OF FLOOD PRONE AREAS

Street Conveyance

The street conveyance capacities in the Lower Cragmor area were evaluated using an equivalent rectangular section in the UDSWM2-PC Model to simulate street gutter flow. The approximate street flow depths from the Model have been summarized in Tables 4 and 6 to identify areas where the allowable street depths were exceeded.

Many of the streets in the study area from 4th Street south exceeded the street depths allowable in the Criterial Manual for the 10-year and 100-year flood events. Street curb and gutter types have been shown on the Data Summary Tables to assist in evaluation of potential damage due to the street design criteria being exceeded.

Storm Sewer Hydraulics

The hydraulic capacity of the existing collector storm sewer pipe system has been analyzed to evaluate its conveyance capability in the 10-year and 100-year flood events. The storm sewer pipe capacity was compared to the inlet interception rates in the 10-year and 100-year flood events.

The interception rates of the existing inlets have been evaluated in the 10-year and 100-year flood events. Since many of the street flow depths exceeded their allowable limits, the street flow depth was selected at 6-inches above flowline in the 10-year and 12-inches above flowline in the 100-year flood event to correspond to the Criteria Manual maximum allowable street flow depth. Under the conditions of street flooding above the crown of the street, it was determined that the design charts in the Criteria Manual do not apply by review of the chart parameters. The interception rates of the curb opening and grated inlets were estimated using the orifice equation since flow available greatly exceeds inlet capacity. Inlet interception capacities were compared to the capacity of the lateral pipe connecting to the inlet assuming pipe inlet control. Design calculations for inlet capacities are shown in Appendix 2.

The collector storm sewer hydraulic capacity was evaluated under open channel and pressure flow conditions. Open channel flow was determined assuming bend losses are negligible. This assumption was made since very few flow discontinuities exist in the main storm sewer. The pressure flow condition was evaluated assuming the hydraulic grade line at flowline. Bend losses were accounted for in the pressure flow analysis using the Criteria Manual. The hydraulic calculations for the storm sewer are shown in Appendix 2.

The open channel flow capacity of the storm sewer pipes was greater than the pressure flow pipe capacity in all except a few isolated sections of storm sewer. The open channel pipe flow capacity was used for storm sewer available capacity.

The inlet interception capacities in the 100-year storm exceeded the capacity of the collector storm sewers. This situation will cause many inlets to not function and some will return water back into the streets when the storm sewers surcharge.

Flood Prone Areas

Flood prone areas have been identified in the Lower Cragmor study area as areas where allowable street capacities were exceeded. The criteria used to define street capacities were 0.5 foot street depth in the 10-year flood event and 1.0 foot depth in the 100-year flood event. Arterial streets subjected to cross-street flow are also identified as flood prone areas.

The hydraulic effect of the existing system and selected Alternative No. 2 is summarized in Tables 4 and 6, respectively, with flood peaks and street flow depths identified by the Model. These street depths are approximate and consider the effects of the existing storm sewer conveyance capacity. The storm sewer conveyance capacity was subtracted from the flood peak and the remaining discharge in the street was compared to the capacity of the street section.

OTHER CONSIDERATIONS

OTHER CONSIDERATIONS

Offsite Areas

The 10-year and 100-year flood peaks have been computed for the offsite and site basins using the Soil Conservation Service Method (USDA, SCS, 1975). The flood peak calculations are shown in Appendix 3. Combining these offsite flows with the study area flows, a backwater analysis has been completed for the 100-year developed flood peak in Van Buren Ditch, the major drainageway for the Lower Cragmor area. The ditch is a concrete-lined channel built along the north side of the Chicago Rock Island and Pacific Railroad tracks. The channel discharges west of Nevada Avenue.

The contributing offsite area at the east side of the Lower Cragmor study area (at Templeton Gap Road) is 1,765 acres. The Lower Cragmor area contributes an additional 800 acres to the ditch before the west side of the study area (Nevada Avenue). The 100-year water surface for the Van Buren Ditch has been computed using HEC-2, a computer-based backwater analysis model. The analysis has assumed supercritical flow condition. Results show that the flow is contained within the concrete portion of the channel in the 100-year flood event under developed land use conditions (Appendix 3).

Traffic, Easement, & Soil Considerations

Consideration was given in the alternative analysis to the effect of construction of the improvements on the traffic in the Lower Cragmor area. The locations of the storm sewers were established by topography and available right-of-way. It was necessary in some cases for storm sewers to be constructed within the right-of-way of major streets because other alternatives are not available. We recommend in Phase II design that wherever possible, storm sewers be constructed in the area between the back of curb and the street right-of-way along the major streets.

Construction of the selected alternative storm drainage improvements will require that easements or rights-of-way be acquired. The areas where this will be required for construction of the improvements include the area south of Fillmore, west of Stone Avenue, for the proposed concrete channel and piped outfall to the Van Buren Ditch. Identification of easement widths required will be completed in the Phase II design.

The soil analysis of the area included variations of sandy loam with low concrete pipe corrosiveness and moderate steel pipe corrosiveness. Because of the uniformity of characteristics across the site, it is not anticipated that soils will be a significant factor in the design considerations.

DISCUSSION OF ALTERNATIVES

DISCUSSION OF ALTERNATIVES

Three alternative means to protect the Cragmor area from flooding were investigated. The analysis is complicated by the location of the existing utility infrastructure, the large volume of water that must be transported, the lack of clearly defined flow paths, and the transport of storm flows from one basin to another requiring a complete analysis of the entire system of each proposed improvement alone and in combination with others.

Analysis and cost estimates were used for purposes of comparison of one alternative to the other. The preliminary cost estimate of the selected Alternative No. 2 follows this section. Every effort has been made to accurately reflect costs in the analysis, however, in our experience the actual cost of retrofitting a stormwater infrastructure on a developed area can run considerably higher than those estimated in the preliminary analysis. This results from such elements as the actual costs of relocating utilities, unforeseen soil conditions, variable costs of material and labor, and delays in obtaining required right-of-way or approval from the public.

The major assumptions made in the analysis of the alternatives include:

1. The usable capacity of the existing storm sewer system must be maximized. This could include adding inlets or branch laterals or reducing hydraulic losses at manholes and junctions by smoothing existing transitions. The existing storm sewer system, as defined by this study, has been shown to operate most efficiently under open channel flow conditions. This section defines a hydraulic capacity for the existing trunk storm sewers based on the calculations in Appendix 2.

2. No credit was given to increased street capacities due to higher curbs along a portion of a street. There is considerable variation in street capacities along any given street and street flows will branch in two directions at many intersections. Street capacities were exceeded in this study when the depth of the 10-year exceeded 0.5 feet and when the 100-year discharge in the street exceeded about one foot.

3. Basin 4 must be hydraulically isolated from Basin 5 along Hancock and Fillmore south of Primrose to prevent flooding along the residential sections east of these streets.

4. Basin 1 must be hydraulically isolated from Basins 2, 3, and 5 to prevent additional flooding in those basins.

5. Additional storm sewers, channels, or basin storage must be provided when the capacity of the existing storm sewer and street system is exceeded.

6. Offsite basin flows do not affect the study area. To confirm this assumption, a Master Plan would be needed for the offsite basins to the east of the site which identifies the effect of storage from upgradient ponds on the hydrograph.

Alternative No. 1: Proposed Improvements

- Winters Drive collection discharging north to floodway, east of Nevada Avenue.
  - Benefit of mitigating localized flooding, plus smaller pipe costs in Stone Street system.
  - Negative of high cost for adverse grade construction and Templeton Gap floodway flume reconstruction.

  Nichols Boulevard collection discharging south in Stone Street collection system. Open channel outfall south of Fillmore east of railroad alignment, then piped under railroad spur lines.
  - Benefit of interception and collection of localized flooding south of Roberts within Stone, and within Fillmore at Stone.
  - Negative of high traffic and barricade costs in southern Stone and Fillmore; plus easement coordination south of Fillmore.

- Fourth Street collection discharging south in El Paso Street collector. First Street, Prospect, and Fillmore collection discharging south in El Paso. Outfall to Van Buren Ditch in El Paso collection system. Capacity added to existing system in Nichols.
  - Benefits of maximum interception and collection by collecting within sub-basin low routing.
  - Negative of parallel pipe alignment construction difficulty, plus high traffic and barricade costs within Fillmore.

- Alley collection discharging southwest from Institute to Prospect Street plus Prospect Street collection system discharging west to the common Van Buren Ditch outfall.
  - Benefits of maximum collection within sub-basin low routing.
  - Negative of narrow Alley width with parallel sanitary sewer and gas utility alignments.

- Hancock collection system running south on Hancock, southwest on Templeton Gap, and discharging directly into the Van Buren Ditch.
  - Benefits of hydraulically isolating Sub-basin 4 from adjacent sub-basins to the west by providing maximum interception and collection of flows within the sub-basin low routing.
  - Negative of parallel pipe alignment construction difficulty, plus high traffic barricade and adjacent utility costs within the Templeton Gap alignment.

<u>Alternative No. 2</u>: Proposed Improvements

- Winters Drive collection and Nichols Boulevard collection discharging south in Stone Street collection system. Open channel outfall south of Fillmore east of railroad alignment, then piped under railroad spur lines.
  - Benefit of interception and collection of localized flooding within Winters, south of Roberts, within Stone, and within Fillmore at Stone.
  - Negative of high traffic and barricade costs in southern Stone and Fillmore; plus easement coordination south of Fillmore.

- Fourth Street collection system discharging south in a Prospect Street collection system which also receives flows from Arcadia and First Street. Capacity added to existing system in Nichols.
  - Benefits include interception of Fourth Street flows and fewer construction conflicts within Prospect Street as compared with the El Paso Street discharge alignment of Alternative No. 1.
  - Negatives include the Prospect alignment acting as interceptor not located in the sub-basin low point as with Alternative No. 1.

- Hancock Street collection system from Third Street to Clinton Way discharging west on Clinton to Institute then south and southwest down the Alley to Prospect Street.
  - Benefits include hydraulically isolating Sub-basin 4 from adjacent sub-basins to the west, plus avoidance of high traffic and existing utility congestion within the Templeton Gap road alignment of Alternative No. 1.
  - Negatives include hydraulic losses through 90° bends as well as narrow Alley width and adjacent sanitary sewer and gas line congestion as the system outfalls southwesterly through the Alley alignment.

<u>Alternative No. 3</u>: Proposed Improvements — [illegible]

- Winters Drive collection and Nichols Boulevard collection discharging south in Stone Street collection system. Open channel outfall south of Fillmore east of railroad alignment, then piped under railroad spur lines.
  - Benefit of interception and collection of localized flooding within Winters, south of Roberts, within Stone, and within Fillmore at Stone.
  - Negative of high traffic and barricade costs in southern Stone and Fillmore; plus easement coordination south of Fillmore.

- Fourth Street collection system discharging south in a Prospect Street collection system which also receives flows from Arcadia and First Street. Capacity added to existing system in Nichols.
  - Benefits include interception of Fourth Street flows and fewer construction conflicts within Prospect Street as compared with the El Paso Street discharge alignment of Alternative No. 1.
  - Negatives include the Prospect alignment acting as interceptor not located in the sub-basin low point as with Alternative No. 1.

- Installation of an 8 acre foot detention facility east of the Edison School Building discharge piping will flow into the existing Marigold Street which connects to the existing Hancock outfall facilities. New Hancock collection systems are proposed at Columbine discharging south to Clinton Way, west on Clinton, then south and southwest through the alley from Institute to Prospect.
  - Benefits include hydraulically isolating Sub-basin 4 from the adjacent sub-basins to the west as well as reduced facility size requirements, both west of and south of the detention facility. Proper design of the detention facility would allow for the alternative use of the detention area as a sports field for the adjacent school building.
  - Negatives include the hydraulic losses of 90° bends through the Clinton diversion outfall routing as well as the narrow alley width and adjacent sanitary sewer and gas mains within the Alley outfall alignment.

LOWER CRAGMOR
PRELIMINARY COST ESTIMATE
ALTERNATE NO. 2

SUMMARY

LOCATION DESCRIPTION	ALT #2
STONE EASTERN OUTFALL (WINTERS TO STONE + NICHOLS TO STONE TO VAN BUREN VIA OPEN CHANNEL EAST OF RAILROAD RIGHT-OF-WAY AND PIPED UNDER RAILROAD SPUR)	$1,532,772
WEST BASIN (POLK TO VAN BUREN)	35,256
NICHOLS (PROSPECT TO EL PASO)	19,548
4TH STREET (VIRGINIA TO PROSPECT)	456,012
PROSPECT (4TH TO VAN BUREN DITCH)	1,205,124
LATERAL COLLECTOR (1ST TO PROSPECT)	107,436
HANCOCK (3RD TO CLINTON) + CLINTON TO VAN BUREN + PROSPECT (PENN TO ALLEY)	1,170,708
PRELIMINARY COST ESTIMATE TOTAL	$ 4,526,856

SELECTED ALTERNATIVE SOLUTION

PRELIMINARY COST ESTIMATE

LOWER CRAGMOOR
COST ESTIMATE SUMMARY

DESCRIPTION	UNIT COST
24" RCP	56.00 / L.F.
30" RCP	65.00 / L.F.
36" RCP	76.00 / L.F.
42" RCP	87.00 / L.F.
48" RCP	98.00 / L.F.
54" RCP	115.00 / L.F.
60" RCP	135.00 / L.F.
66" RCP	175.00 / L.F.
72" RCP	200.00 / L.F.
78" RCP	240.00 / L.F.
84" RCP	290.00 / L.F.
TRAFFIC CONTROL (ASSUMES 300'/DAY)	250.00 / DAY
CDOH BOX MANHOLE	2,500.00 / EA.
JUNCTION BOX MANHOLE	3,000.00 / EA.
CURB & GUTTER INLET TRANSITIONS	8.00 / L.F.
SIDEWALK REPLACEMENT	12.00 / L.F.
CROSSING LATERAL WATER	7,500.00 / EA.
CROSSING MAIN WATER	15,000.00 / EA.
10' D-10-R OR MODIFIED R	2,300.00 / EA.
15' D-10-R OR MODIFIED R	3,600.00 / EA.
20' D-10-R OR MODIFIED R	5,000.00 / EA.
25' D-10-R OR MODIFIED R	6,400.00 / EA.
PIPE TRANSITION RELEASE STRUCTURE	5,000.00 / EA.
ASPHALT PAVEMENT	8.00 / S.Y.
CONCRETE CHANNEL	250.00 / C.Y.
RIGHT-OF-WAY ACQUISITION	3.00 / S.F.
EASEMENT ACQUISITION	1.50 / S.F.

LOWER CRAGMOR

PRELIMINARY COST ESTIMATE

ALTERNATIVE NO. 2

QUANTITY		ITEM DESCRIPTION	UNIT COST	TOTAL COST
STONE EASTERN OUTFALL (WINTERS TO STONE + NICHOLS TO STONE TO VAN BUREN VIA OPEN CHANNEL EAST OF RAILROAD RIGHT-OF-WAY AND PIPED UNDER RAILROAD SPUR)				
690	FT	24" RCP (30'/INLET)	$ 56	$ 38,640
2310	FT	36" RCP	76	175,560
1880	FT	42" RCP	87	163,560
1080	FT	54" RCP	115	124,200
500	FT	60" RCP	135	67,500
670	FT	66" RCP	175	117,250
105	FT	66" RR JACKED PIPE	500	52,500
430	FT	78" RCP	240	103,200
45	FT	84" RCP	290	13,050
100	FT	6' X 8' BOX CULVERT	350	35,000
13	EA	10' TYPE R INLET	2,300	29,900
8	EA	15' TYPE R INLET	3,600	28,800
2	EA	20' TYPE R INLET	5,400	10,800
12	EA	BOX MANHOLE	2,500	30,000
4	EA	JUNCTION BOX	3,000	12,000
4	EA	WATER CROSSING (LATERAL)	7,500	30,000
1150	FT	50' CURB & GUTTER/INLET	8	9,200
23	DAY	TRAFFIC CONTROL	250	5,750
1500	CY	JACKING PIT EXC/BKFL	15	22,500
240	CY	CONCRETE CHANNEL	250	60,000
3	EA	CHANNEL AND PIPE TRANSITIONS	5,000	15,000
44300	SF	RIGHT-OF-WAY ACQUISITION	3	132,900
	SUBTOTAL			$1,277,310
	20% ENGINEERING & CONTINGENCY			255,462
	ESTIMATED TOTAL			$1,532,772

LOWER CRAGMOR

PRELIMINARY COST ESTIMATE

ALTERNATIVE NO. 2

QUANTITY		ITEM DESCRIPTION	UNIT COST	TOTAL COST
WEST BASIN IMPROVEMENTS (POLK TO VAN BUREN)				
2	EA	10' TYPE R INLET	$ 2,300	$ 4,600
60	LF	30' CURB & GUTTER/INLET	8	480
300	LF	24" RCP	56	16,800
1	EA	PIPE TRANSITION RELEASE STRUCTURE	5,000	5,000
1	EA	BOX MANHOLE	2,500	2,500
		SUBTOTAL		$ 29,380
		20% ENGINEERING & CONTINGENCY		5,876
		ESTIMATED TOTAL		$ 35,256

QUANTITY		ITEM DESCRIPTION	UNIT COST	TOTAL COST
NICHOLS (PROSPECT TO EL PASO)				
2	EA	15' TYPE R INLET	$ 3,600	$ 7,200
60	LF	30' CURB & GUTTER/INLET	8	480
2	EA	BOX MANHOLE	2,500	5,000
1	DAY	TRAFFIC CONTROL	250	250
60	FT	24" RCP (30'/INLET)	56	3,360
		SUBTOTAL		$ 16,290
		20% ENGINEERING & CONTINGENCY		3,258
		ESTIMATED TOTAL		$ 19,548

LOWER CRAGMOR

PRELIMINARY COST ESTIMATE

ALTERNATIVE NO. 2

QUANTITY	ITEM DESCRIPTION	UNIT COST	TOTAL COST
4TH STREET (VIRGINIA TO PROSPECT)			
480 FT	24" RCP (30'/INLET)	$ 56	$ 26,880
260 FT	36" RCP	76	19,760
290 FT	48" RCP	98	28,420
540 FT	60" RCP	135	72,900
420 FT	66" RCP	175	73,500
6 EA	10' TYPE R INLET	2,300	13,800
5 EA	15' TYPE R INLET	3,600	18,000
5 EA	20' TYPE R INLET	5,000	25,000
13 EA	JUNCTION BOX	3,000	39,000
800 LF	50' CURB & GUTTER/INLET	8	6,400
800 LF	50' SIDEWALK REPLACEMENT INLET	12	9,600
7 DAY	TRAFFIC CONTROL	250	1,750
6 EA	WATER CROSSING (LATERAL)	7,500	45,000
SUBTOTAL			$ 380,010
20% ENGINEERING & CONTINGENCY			76,002
ESTIMATED TOTAL			$ 456,012

LOWER CRAGMOR

PRELIMINARY COST ESTIMATE

ALTERNATIVE NO. 2

QUANTITY	ITEM DESCRIPTION	UNIT COST	TOTAL COST
PROSPECT (4TH STREET TO VAN BUREN DITCH)			
120 FT	24" RCP (30'/INLET)	$ 56	$ 6,720
2180 FT	78" RCP	240	523,200
1340 FT	84" RCP	290	388,600
1 EA	PIPE TRANSITION RELEASE STRUCTURE	5,000	5,000
4 EA	15' TYPE R INLET	3,600	14,400
200 LF	50' CURB & GUTTER/INLET	8	1,600
8 EA	JUNCTION BOX	3,000	24,000
13 DAY	TRAFFIC CONTROL	250	3,250
3 EA	WATER CROSSING (LATERAL)	7,500	22,500
1 EA	WATER CROSSING (MAIN)	15,000	15,000
	SUBTOTAL		$1,004,270
	20% ENGINEERING & CONTINGENCY		200,854
	ESTIMATED TOTAL		$1,205,124

LOWER CRAGMOR

PRELIMINARY COST ESTIMATE

ALTERNATIVE NO. 2

LATERAL COLLECTOR (FIRST TO PROSPECT IN ALLEY)

420	FT	24" RCP	$ 56	$ 23,520
370	FT	48" RCP	98	36,260
5	EA	15' TYPE R INLET	3,600	18,000
250	FT	50' CURB & GUTTER/INLET	8	2,000
250	FT	50' SIDEWALK REPLACEMENT/ INLET	12	3,000
3	DAY	TRAFFIC CONTROL	250	750
2	EA	JUNCTION BOX	3,000	6,000
	SUBTOTAL			$ 89,530
	20% ENGINEERING & CONTINGENCY			17,906
	ESTIMATED TOTAL			$ 107,436

LOWER CRAGMOR

PRELIMINARY COST ESTIMATE

ALTERNATIVE NO. 2

QUANTITY		ITEM DESCRIPTION	UNIT COST	TOTAL COST
HANCOCK (THIRD TO CLINTON) + CLINTON TO VAN BUREN + PROSPECT (PENN TO ALLEY)				
850	FT	24" RCP	$ 56	$ 47,600
1000	FT	30" RCP	65	65,000
880	FT	48" RCP	98	86,240
1140	FT	54" RCP	115	131,100
2210	FT	60" RCP	135	298,350
440	FT	66" RCP	175	77,000
800	FT	50' CURB & GUTTER/INLET	8	6,400
800	FT	50' SIDEWALK REPLACEMENT/INLET	12	9,600
3	EA	10' TYPE R INLET	2,300	6,900
5	EA	15' TYPE R INLET	3,600	18,000
6	EA	20' TYPE R INLET	5,000	30,000
2	EA	25' TYPE R INLET	6,400	12,800
9	EA	WATER CROSSING (LATERAL)	7,500	67,500
2	EA	WATER CROSSING (MAIN)	15,000	30,000
22	DAY	TRAFFIC CONTROL	250	5,500
1	EA	2" GAS RELOCATE (ALLEY)	5,000	5,000
2200	SY	REPAVE ALLEY	8	17,600
17	EA	JUNCTION BOX	3,000	51,000
4	EA	BOX MANHOLE	2,500	10,000
	SUBTOTAL			$ 975,590
	20% ENGINEERING & CONTINGENCY			195,118
	ESTIMATED TOTAL			$1,170,708

REFERENCES

REFERENCES

1. HDR Infrastructure, Inc., November, 1986; The City of Colorado Springs/El Paso County, Drainage Criteria Manual.

2. EPA, 1984; SWMM User's Manual, EPA-600/2-84-109a.

3. Urban Drainage and Flood Control District, 1985; Urban Storm Water Management Model, Personal Computer Version 2.

4. Corps of Engineers, U.S. Army, 1976; HEC-2, Water Surface Profiles, Users Manual.

5. United States Department of Agriculture, SCS, 1975; Urban Hydrology for Small Watersheds.

APPENDIX 1

UDSWM2-PC RUNS DEVELOPED LAND USE

BASIN 1, 10 YR

ENVIRONMENTAL PROTECTION AGENCY - STORM WATER MANAGEMENT MODEL - VERSION PC.1

DEVELOPED BY METCALF + EDDY, INC.

UNIVERSITY OF FLORIDA

WATER RESOURCES ENGINEEERS, INC. (SEPTEMBER 1970)

UPDATED BY UNIVERSITY OF FLORIDA (JUNE 1973)

HYDROLOGIC ENGINEERING CENTER, CORPS OF ENGINEERS

MISSOURI RIVER DIVISION, CORPS OF ENGINEERS (SEPTEMBER 1974)

BOYLE ENGINEERING CORPORATION (MARCH 1985, JULY 1985)

TAPE OR DISK ASSIGNMENTS

JIN(1)	JIN(2)	JIN(3)	JIN(4)	JIN(5)	JIN(6)	JIN(7)	JIN(8)	JIN(9)	JIN(10)
2	1	0	0	0	0	0	0	0	0

JOUT(1)	JOUT(2)	JOUT(3)	JOUT(4)	JOUT(5)	JOUT(6)	JOUT(7)	JOUT(8)	JOUT(9)	JOUT(10)
1	2	0	0	0	0	0	0	0	0

NSCRAT(1)	NSCRAT(2)	NSCRAT(3)	NSCRAT(4)	NSCRAT(5)
3	4	0	0	0

WATERSHED   PROGRAM CALLED

*** ENTRY MADE TO RUNOFF MODEL ***

Lower Cragmor Drainage Master Plan BASIN 1 \ 10YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

NUMBER OF TIME STEPS 120

INTEGRATION TIME INTERVAL (MINUTES)   1.00

10.0 PERCENT OF IMPERVIOUS AREA HAS ZERO DETENTION DEPTH

FOR   24 RAINFALL STEPS, THE TIME INTERVAL IS   5.00 MINUTES

FOR RAINGAGE NUMBER   1   RAINFALL HISTORY IN INCHES PER HOUR

.43	.80	1.77	3.24	5.40	2.59	1.21	.93	.82	.69
.69	.69	.69	.69	.69	.54	.41	.41	.41	.41
.41	.41	.37	.28						

Lower Cragmor Drainage Master Plan BASIN 1 \ 10YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

SUBAREA NUMBER	GUTTER OR MANHOLE	WIDTH (FT)	AREA (AC)	PERCENT IMPERV.	SLOPE (FT/FT)	RESISTANCE FACTOR IMPERV.	RESISTANCE FACTOR PERV.	SURFACE STORAGE(IN) IMPERV.	SURFACE STORAGE(IN) PERV.	INFILTRATION RATE(IN/HR) MAXIMUM	INFILTRATION RATE(IN/HR) MINIMUM	INFILTRATION RATE(IN/HR) DECAY RATE	GAGE NO
101	101	1020.	7.4	70.0	.0140	.020	.250	.100	.350	4.50	.60	.00180	1
102	102	1260.	17.2	70.0	.0170	.020	.250	.100	.350	4.50	.60	.00180	1
103	103	1584.	9.7	70.0	.0140	.020	.250	.100	.350	4.50	.60	.00180	1
104	104	1946.	22.7	70.0	.0330	.020	.250	.100	.350	4.50	.60	.00180	1
105	105	1946.	12.6	70.0	.0210	.020	.250	.100	.350	4.50	.60	.00180	1
106	106	1596.	10.1	70.0	.0330	.020	.250	.100	.350	4.50	.60	.00180	1
107	107	1580.	38.5	70.0	.0090	.020	.250	.100	.350	4.50	.60	.00180	1
108	108	560.	3.6	90.0	.0180	.020	.250	.100	.350	4.50	.60	.00180	1
109	109	1840.	25.3	70.0	.0100	.020	.250	.100	.350	4.50	.60	.00180	1
110	110	1150.	8.5	70.0	.0100	.020	.250	.100	.350	4.50	.60	.00180	1

TOTAL NUMBER OF SUBCATCHMENTS, 10

TOTAL TRIBUTARY AREA (ACRES),   155.60

Lower Cragmor Drainage Master Plan BASIN 1 \ 10YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

*** CONTINUITY CHECK FOR SUBCATCHMENT ROUTING IN UDSWM2-PC MODEL ***

WATERSHED AREA (ACRES)	155.600
TOTAL RAINFALL (INCHES)	2.082
TOTAL INFILTRATION (INCHES)	.372
TOTAL WATERSHED OUTFLOW (INCHES)	1.433
TOTAL SURFACE STORAGE AT END OF STROM (INCHES)	.269
ERROR IN CONTINUITY, PERCENTAGE OF RAINFALL	.367

Lower Cragmor Drainage Master Plan BASIN 1 \ 10YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

GUTTER NUMBER	GUTTER CONNECTION	NDP	NP		WIDTH OR DIAM (FT)	LENGTH (FT)	INVERT SLOPE (FT/FT)	SIDE SLOPES HORIZ TO VERT L	R	OVERBANK/SURCHARGE MANNING N	DEPTH (FT)	JK
-1					1.0	1.	1.0000	107.0	107.0	1.600	1.00	
101	399	0	1	CHANNEL	10.0	1020.	.0140	3.0	3.0	.026	10.00	0
399	391	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
102	391	0	1	CHANNEL	10.0	1050.	.0160	3.0	3.0	.032	10.00	0
391	103	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	265
		DIVERSION TO GUTTER NUMBER 265 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0 8.5	76.0	65.0	200.0	65.0				
103	305	0	1	CHANNEL	18.0	1320.	.0110	3.0	3.0	.026	10.00	0
305	105	4	1	CHANNEL	10.0	1.	.0010	3.0	3.0	.026	10.00	266
		DIVERSION TO GUTTER NUMBER 266 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0 8.5	82.0	70.0	200.0	70.0				
105	306	0	1	CHANNEL	10.0	2820.	.0110	3.0	3.0	.026	10.00	0
306	397	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
108	307	0	1	CHANNEL	10.0	400.	.0150	3.0	3.0	.026	10.00	0
307	110	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
110	390	0	1	CHANNEL	10.0	1150.	.0090	3.0	3.0	.026	10.00	0
390	396	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
104	398	0	1	CHANNEL	18.0	1390.	.0120	3.0	3.0	.026	10.00	0
398	106	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	269
		DIVERSION TO GUTTER NUMBER 269 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0 7.0	60.0	40.0	200.0	40.0				
106	303	0	1	CHANNEL	18.0	1330.	.0110	3.0	3.0	.026	10.00	0
303	107	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	267
		DIVERSION TO GUTTER NUMBER 267 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0 8.5	71.0	60.0	200.0	60.0				
107	304	0	1	CHANNEL	18.0	1580.	.0110	3.0	3.0	.026	10.00	0
304	109	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	268
		DIVERSION TO GUTTER NUMBER 268 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0 9.0	167.0	150.0	300.0	150.0				
109	392	0	1	CHANNEL	10.0	1150.	.0100	3.0	3.0	.026	10.00	0
392	397	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
-1					1.0	1.	1.0000	107.0	107.0	1.000	1.00	
265	269	0	2	PIPE	6.0	1970.	.0090	.0	.0	.013	6.00	0
269	267	0	2	PIPE	6.0	1330.	.0090	.0	.0	.013	6.00	0
266	267	0	2	PIPE	6.0	1250.	.0050	.0	.0	.013	6.00	0
267	268	0	2	PIPE	6.0	1580.	.0110	.0	.0	.013	6.00	0

TOTAL NUMBER OF GUTTERS/PIPES. 24

Lower Cragmor Drainage Master Plan BASIN 1 \ 10YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

ARRANGEMENT OF SUBCATCHMENTS AND GUTTERS/PIPES

GUTTER	TRIBUTARY GUTTER/PIPE										TRIBUTARY SUBAREA										D.A.(AC)
101	0	0	0	0	0	0	0	0	0	0	101	0	0	0	0	0	0	0	0	0	7.4
102	0	0	0	0	0	0	0	0	0	0	102	0	0	0	0	0	0	0	0	0	17.2
103	391	0	0	0	0	0	0	0	0	0	103	0	0	0	0	0	0	0	0	0	34.3
104	0	0	0	0	0	0	0	0	0	0	104	0	0	0	0	0	0	0	0	0	22.7
105	305	0	0	0	0	0	0	0	0	0	105	0	0	0	0	0	0	0	0	0	46.9
106	398	0	0	0	0	0	0	0	0	0	106	0	0	0	0	0	0	0	0	0	32.8
107	303	0	0	0	0	0	0	0	0	0	107	0	0	0	0	0	0	0	0	0	71.3
108	0	0	0	0	0	0	0	0	0	0	108	0	0	0	0	0	0	0	0	0	3.6
109	304	0	0	0	0	0	0	0	0	0	109	0	0	0	0	0	0	0	0	0	96.6
110	307	0	0	0	0	0	0	0	0	0	110	0	0	0	0	0	0	0	0	0	12.1
265	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
266	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
267	269	266	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
269	265	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
303	106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32.8
304	107	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71.3
305	103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34.3
306	105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	46.9
307	108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.6
390	110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12.1
391	399	102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24.6
392	109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96.6
398	104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22.7
399	101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.4

Lower Cragmor Drainage Master Plan BASIN 1 \ 10YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

*** PEAK FLOWS, STAGES AND STORAGES OF GUTTERS AND DETENSION DAMS ***

CONVEYANCE ELEMENT	PEAK (CFS)	STAGE (FT)	STORAGE (AC-FT)	TIME (HR/MIN)
104	61.	.7		0 27.
398	61.	1.4		0 27.
101	21.	.5		0 27.
106	43.	.6		0 30.
102	44.	.8		0 28.
399	21.	(DIRECT FLOW)		0 27.
303	43.	1.1		0 30.
391	65.	1.4		0 27.
107	77.	.9		0 32.
103	32.	.5		0 30.
108	15.	.4		0 26.
304	77.	1.6		0 32.
305	32.	1.3		0 30.
307	15.	(DIRECT FLOW)		0 26.
265	51.	1.4		0 31.
109	66.	1.0		0 30.
105	28.	.6		0 31.
110	35.	.7		0 28.
266	26.	1.2		0 32.
269	88.	1.9		0 31.
392	66.	(DIRECT FLOW)		0 30.
306	28.	(DIRECT FLOW)		0 31.
390	35.	(DIRECT FLOW)		0 28.
267	146.	2.4		0 33.
397	94.	(DIRECT FLOW)		0 30.
396	35.	(DIRECT FLOW)		0 28.
268	215.	(DIRECT FLOW)		0 32.

BASINS 2,3,5, 10 YR

ENVIRONMENTAL PROTECTION AGENCY - STORM WATER MANAGEMENT MODEL - VERSION PC.1

DEVELOPED BY METCALF + EDDY, INC.

UNIVERSITY OF FLORIDA

WATER RESOURCES ENGINEEERS, INC. (SEPTEMBER 1970)

UPDATED BY UNIVERSITY OF FLORIDA (JUNE 1973)

HYDROLOGIC ENGINEERING CENTER, CORPS OF ENGINEERS

MISSOURI RIVER DIVISION, CORPS OF ENGINEERS (SEPTEMBER 1974)

BOYLE ENGINEERING CORPORATION (MARCH 1985, JULY 1985)

TAPE OR DISK ASSIGNMENTS

JIN(1)	JIN(2)	JIN(3)	JIN(4)	JIN(5)	JIN(6)	JIN(7)	JIN(8)	JIN(9)	JIN(10)
2	1	0	0	0	0	0	0	0	0

JOUT(1)	JOUT(2)	JOUT(3)	JOUT(4)	JOUT(5)	JOUT(6)	JOUT(7)	JOUT(8)	JOUT(9)	JOUT(10)
1	2	0	0	0	0	0	0	0	0

NSCRAT(1)	NSCRAT(2)	NSCRAT(3)	NSCRAT(4)	NSCRAT(5)
3	4	0	0	0

WATERSHED   PROGRAM CALLED

*** ENTRY MADE TO RUNOFF MODEL ***

Lower Cragmor Drainage Master Plan BASINS 2,3,5 \ 10YR \ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

NUMBER OF TIME STEPS 120

INTEGRATION TIME INTERVAL (MINUTES)   1.00

10.0 PERCENT OF IMPERVIOUS AREA HAS ZERO DETENTION DEPTH

FOR   24 RAINFALL STEPS, THE TIME INTERVAL IS   5.00 MINUTES

FOR RAINGAGE NUMBER   1   RAINFALL HISTORY IN INCHES PER HOUR

.43	.80	1.77	3.24	5.40	2.59	1.21	.93	.82	.69
.69	.69	.69	.69	.69	.54	.41	.41	.41	.41
.41	.41	.37	.28						

Lower Cragmor Drainage Master Plan BASINS 2,3,5 \ 10YR \ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

SUBAREA NUMBER	GUTTER OR MANHOLE	WIDTH (FT)	AREA (AC)	PERCENT IMPERV.	SLOPE (FT/FT)	RESISTANCE FACTOR IMPERV.	RESISTANCE FACTOR PERV.	SURFACE STORAGE(IN) IMPERV.	SURFACE STORAGE(IN) PERV.	INFILTRATION RATE(IN/HR) MAXIMUM	INFILTRATION RATE(IN/HR) MINIMUM	INFILTRATION RATE(IN/HR) DECAY RATE	GAGE NO
300	300	2160.	22.6	65.0	.0200	.020	.250	.100	.350	4.50	.60	.00180	1
301	301	1250.	15.6	65.0	.0250	.020	.250	.100	.350	4.50	.60	.00180	1
302	302	2340.	4.8	65.0	.0200	.020	.250	.100	.350	4.50	.60	.00180	1
333	333	720.	11.2	65.0	.0240	.020	.250	.100	.350	4.50	.60	.00180	1
334	5	910.	9.7	65.0	.0200	.020	.250	.100	.350	4.50	.60	.00180	1
321	321	780.	7.8	65.0	.0400	.020	.250	.100	.350	4.50	.60	.00180	1
322	322	624.	3.2	65.0	.0140	.020	.250	.100	.350	4.50	.60	.00180	1
323	323	1200.	13.6	65.0	.0150	.020	.250	.100	.350	4.50	.60	.00180	1
324	324	1900.	5.1	68.0	.0360	.020	.250	.100	.350	4.50	.60	.00180	1
325	325	2700.	14.4	70.0	.0080	.020	.250	.100	.350	4.50	.60	.00180	1
326	326	3200.	21.8	70.0	.0070	.020	.250	.100	.350	4.50	.60	.00180	1
327	327	1780.	8.1	70.0	.0190	.020	.250	.100	.350	4.50	.60	.00180	1
328	328	1350.	23.7	70.0	.0150	.020	.250	.100	.350	4.50	.60	.00180	1
340	7	1000.	4.7	65.0	.0060	.020	.250	.100	.350	4.50	.60	.00180	1
335	335	1560.	9.2	65.0	.0260	.020	.250	.100	.350	4.50	.60	.00180	1
336	336	1560.	9.4	65.0	.0140	.020	.250	.100	.350	4.50	.60	.00180	1
337	337	1500.	11.2	65.0	.0170	.020	.250	.100	.350	4.50	.60	.00180	1
338	338	1750.	7.9	65.0	.0160	.020	.250	.100	.350	4.50	.60	.00180	1
339	339	1750.	7.9	65.0	.0170	.020	.250	.100	.350	4.50	.60	.00180	1
341	341	1750.	8.1	65.0	.0140	.020	.250	.100	.350	4.50	.60	.00180	1
342	342	1750.	3.8	65.0	.0200	.020	.250	.100	.350	4.50	.60	.00180	1
343	343	2500.	9.5	70.0	.0200	.020	.250	.100	.350	4.50	.60	.00180	1
344	344	1500.	21.9	70.0	.0040	.020	.250	.100	.350	4.50	.60	.00180	1
345	345	480.	3.3	65.0	.0230	.020	.250	.100	.350	4.50	.60	.00180	1
352	352	1280.	14.1	95.0	.0060	.020	.250	.100	.350	4.50	.60	.00180	1
354	354	1992.	17.7	65.0	.0130	.020	.250	.100	.350	4.50	.60	.00180	1
355	355	2160.	10.2	65.0	.0150	.020	.250	.100	.350	4.50	.60	.00180	1
356	356	880.	12.1	65.0	.0170	.020	.250	.100	.350	4.50	.60	.00180	1
357	30	2720.	17.3	65.0	.0190	.020	.250	.100	.350	4.50	.60	.00180	1
350	350	1600.	15.6	70.0	.0120	.020	.250	.100	.350	4.50	.60	.00180	1

TOTAL NUMBER OF SUBCATCHMENTS, 30

TOTAL TRIBUTARY AREA (ACRES), 345.56

Lower Cragmor Drainage Master Plan BASINS 2,3,5 \ 10YR \ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

*** CONTINUITY CHECK FOR SUBCATCHMENT ROUTING IN UDSWM2-PC MODEL ***

WATERSHED AREA (ACRES)	345.560
TOTAL RAINFALL (INCHES)	2.082
TOTAL INFILTRATION (INCHES)	.404
TOTAL WATERSHED OUTFLOW (INCHES)	1.421
TOTAL SURFACE STORAGE AT END OF STROM (INCHES)	.252
ERROR IN CONTINUITY, PERCENTAGE OF RAINFALL	.274

Lower Cragmor Drainage Master Plan BASINS 2,3,5 \ 10YR \ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

GUTTER NUMBER	GUTTER CONNECTION	NDP	NP		WIDTH OR DIAM (FT)	LENGTH (FT)	INVERT SLOPE (FT/FT)	SIDE SLOPES HORIZ TO VERT L	R	OVERBANK/SURCHARGE MANNING N	DEPTH (FT)	JK
-1					1.0	1.	1.0000	107.0	107.0	1.400	1.00	
300	200	0	1	CHANNEL	18.0	1750.	.0130	3.0	3.0	.022	10.00	0
200	1	3	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.022	10.00	306
		DIVERSION TO GUTTER NUMBER 306 - TOTAL Q VS DIVERTED Q IN CFS										
		.0 .0 42.0 28.0 500.0 28.0										
1	120	0	1	CHANNEL	18.0	550.	.0210	3.0	3.0	.022	10.00	0
301	120	0	1	CHANNEL	18.0	1250.	.0200	3.0	3.0	.022	10.00	0
120	2	2	1	CHANNEL	.0	1.	.0010	3.0	3.0	.022	10.00	4
		DIVERSION TO GUTTER NUMBER 4 - TOTAL Q VS DIVERTED Q IN CFS										
		.0 .0 400.0 220.0										
2	202	0	1	CHANNEL	18.0	300.	.0180	3.0	3.0	.022	10.00	0
4	201	0	1	CHANNEL	18.0	465.	.0060	3.0	3.0	.022	10.00	0
302	202	0	1	CHANNEL	18.0	1300.	.0230	3.0	3.0	.022	10.00	0
202	3	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
3	203	0	1	CHANNEL	18.0	305.	.0130	3.0	3.0	.022	10.00	0
203	8	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
335	203	0	1	CHANNEL	18.0	1300.	.0220	3.0	3.0	.022	10.00	0
8	204	0	1	CHANNEL	18.0	370.	.0170	3.0	3.0	.022	10.00	0
336	204	0	1	CHANNEL	18.0	1300.	.0130	3.0	3.0	.022	10.00	0
201	5	4	1	CHANNEL	15.0	1.	.0010	3.0	3.0	.022	10.00	307
		DIVERSION TO GUTTER NUMBER 307 - TOTAL Q VS DIVERTED Q IN CFS										
		.0 .0 10.0 8.5 123.0 110.0 500.0 110.0										
333	201	0	1	CHANNEL	15.0	720.	.0140	3.0	3.0	.025	10.00	0
5	122	0	1	CHANNEL	15.0	650.	.0100	3.0	3.0	.022	10.00	0
122	7	3	1	CHANNEL	15.0	1.	.0010	3.0	3.0	.022	10.00	308
		DIVERSION TO GUTTER NUMBER 308 - TOTAL Q VS DIVERTED Q IN CFS										
		.0 .0 35.0 35.0 500.0 35.0										
7	204	0	1	CHANNEL	15.0	650.	.0080	3.0	3.0	.022	10.00	0
204	9	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.022	10.00	320
		DIVERSION TO GUTTER NUMBER 320 - TOTAL Q VS DIVERTED Q IN CFS										
		.0 .0 10.0 8.5 111.0 94.0 500.0 94.0										
321	205	0	1	CHANNEL	30.0	780.	.0240	3.0	3.0	.022	10.00	0
205	11	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
11	124	0	1	CHANNEL	30.0	300.	.0190	3.0	3.0	.022	10.00	0
322	124	0	1	CHANNEL	18.0	520.	.0220	3.0	3.0	.022	10.00	0
124	12	2	1	CHANNEL	30.0	1.	.0010	3.0	3.0	.022	10.00	337
		DIVERSION TO GUTTER NUMBER 337 - TOTAL Q VS DIVERTED Q IN CFS										
		.0 .0 400.0 200.0										
12	125	0	1	CHANNEL	30.0	270.	.0150	3.0	3.0	.022	10.00	0
323	125	0	1	CHANNEL	18.0	1000.	.0210	3.0	3.0	.022	10.00	0
125	249	0	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.022	10.00	0
249	13	2	1	CHANNEL	30.0	1.	.0010	3.0	3.0	.022	10.00	338
		DIVERSION TO GUTTER NUMBER 338 - TOTAL Q VS DIVERTED Q IN CFS										
		.0 .0 400.0 200.0										
13	126	0	1	CHANNEL	30.0	275.	.0190	3.0	3.0	.022	10.00	0
126	339	2	1	CHANNEL	25.0	1.	.0010	3.0	3.0	.022	10.00	14
		DIVERSION TO GUTTER NUMBER 14 - TOTAL Q VS DIVERTED Q IN CFS										
		.0 .0 400.0 200.0										
324	126	0	1	CHANNEL	10.0	950.	.0210	3.0	3.0	.022	10.00	0
14	127	0	1	CHANNEL	25.0	280.	.0130	3.0	3.0	.022	10.00	0
127	341	2	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.022	10.00	15
		DIVERSION TO GUTTER NUMBER 15 - TOTAL Q VS DIVERTED Q IN CFS										

325	127	0	1	CHANNEL	18.0	1350.	.0200	3.0	3.0	.022	10.00	0
15	206	0	1	CHANNEL	18.0	155.	.0030	3.0	3.0	.022	10.00	0
206	342	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.022	10.00	304
		DIVERSION TO GUTTER NUMBER 304 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	59.0	50.0	500.0	50.0			
326	206	0	1	CHANNEL	18.0	1600.	.0110	3.0	3.0	.022	10.00	0
327	214	0	1	CHANNEL	10.0	890.	.0190	3.0	3.0	.028	10.00	0
214	328	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
328	129	0	1	CHANNEL	18.0	1350.	.0120	3.0	3.0	.022	10.00	0
129	250	4	1	CHANNEL	18.0	1.	.0110	3.0	3.0	.022	10.00	305
		DIVERSION TO GUTTER NUMBER 305 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	59.0	50.0	500.0	50.0			
250	344	2	1	CHANNEL	25.0	1.	.0030	3.0	3.0	.022	10.00	17
		DIVERSION TO GUTTER NUMBER 17 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	400.0	200.0							
17	128	0	1	CHANNEL	25.0	190.	.0030	3.0	3.0	.022	10.00	0
128	343	2	1	CHANNEL	18.0	1.	.0100	3.0	3.0	.022	10.00	16
		DIVERSION TO GUTTER NUMBER 16 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	400.0	200.0							
16	206	0	1	CHANNEL	18.0	1250.	.0100	3.0	3.0	.022	10.00	0
9	207	0	1	CHANNEL	25.0	285.	.0070	3.0	3.0	.022	10.00	0
-1					1.0	1.	1.0000	107.0	107.0	1.600	1.00	
337	207	0	1	CHANNEL	18.0	1250.	.0140	3.0	3.0	.026	10.00	0
338	130	0	1	CHANNEL	18.0	1250.	.0140	3.0	3.0	.026	10.00	0
339	111	0	1	CHANNEL	18.0	950.	.0210	3.0	3.0	.026	10.00	0
341	208	0	1	CHANNEL	18.0	1250.	.0080	3.0	3.0	.026	10.00	0
342	112	0	1	CHANNEL	18.0	1250.	.0200	3.0	3.0	.026	10.00	0
343	113	0	1	CHANNEL	18.0	1250.	.0100	3.0	3.0	.026	10.00	0
344	209	0	1	CHANNEL	18.0	1250.	.0110	3.0	3.0	.026	10.00	0
345	207	0	1	CHANNEL	20.0	300.	.0050	3.0	3.0	.026	10.00	0
207	20	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	296
		DIVERSION TO GUTTER NUMBER 296 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	106.0	90.0	600.0	90.0			
20	130	0	1	CHANNEL	25.0	280.	.0070	3.0	3.0	.026	10.00	0
130	251	4	1	CHANNEL	18.0	1.	.0080	3.0	3.0	.026	10.00	309
		DIVERSION TO GUTTER NUMBER 309 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	88.0	75.0	800.0	75.0			
251	21	2	1	CHANNEL	18.0	1.	.0080	3.0	3.0	.026	10.00	355
		DIVERSION TO GUTTER NUMBER 355 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	800.0	400.0							
21	111	0	1	CHANNEL	18.0	260.	.0080	3.0	3.0	.026	10.00	0
111	252	4	1	CHANNEL	18.0	1.	.0050	3.0	3.0	.026	10.00	310
		DIVERSION TO GUTTER NUMBER 310 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	107.0	91.0	500.0	91.0			
252	22	2	1	CHANNEL	18.0	1.	.0050	3.0	3.0	.026	10.00	33
		DIVERSION TO GUTTER NUMBER 33 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	800.0	400.0							
22	208	0	1	CHANNEL	18.0	280.	.0050	3.0	3.0	.026	10.00	0
208	23	0	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	0
23	112	0	1	CHANNEL	18.0	140.	.0100	3.0	3.0	.026	10.00	0
112	254	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	393
		DIVERSION TO GUTTER NUMBER 393 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	118.0	100.0	800.0	100.0			
254	354	2	1	CHANNEL	18.0	1.	.0080	3.0	3.0	.026	10.00	24
		DIVERSION TO GUTTER NUMBER 24 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	800.0	400.0							
24	113	0	1	CHANNEL	18.0	270.	.0080	3.0	3.0	.026	10.00	0
113	25	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	295
		DIVERSION TO GUTTER NUMBER 295 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	59.0	50.0	800.0	50.0			
25	209	0	1	CHANNEL	25.0	240.	.0030	3.0	3.0	.026	10.00	0
209	352	3	1	CHANNEL	18.0	1.	.0070	3.0	3.0	.026	10.00	311
		DIVERSION TO GUTTER NUMBER 311 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	106.0	71.0	800.0	71.0					
350	213	0	1	CHANNEL	18.0	1600.	.0060	3.0	3.0	.026	10.00	0

213	35	4	1	CHANNEL	18.0	1.	.0090	3.0	3.0	.026	10.00	312
		DIVERSION TO GUTTER NUMBER 312 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	201.0	171.0	800.0	171.0			
35	220	0	1	CHANNEL	18.0	320.	.0090	3.0	3.0	.026	10.00	0
354	116	0	1	CHANNEL	25.0	1660.	.0050	3.0	3.0	.026	10.00	0
30	210	0	1	CHANNEL	18.0	1360.	.0130	3.0	3.0	.026	10.00	0
210	31	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
355	211	0	1	CHANNEL	25.0	1080.	.0040	3.0	3.0	.026	10.00	0
31	211	0	1	CHANNEL	18.0	230.	.0090	3.0	3.0	.026	10.00	0
211	32	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
32	212	0	1	CHANNEL	25.0	320.	.0090	3.0	3.0	.026	10.00	0
33	212	0	1	CHANNEL	18.0	750.	.0030	3.0	3.0	.026	10.00	0
212	34	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
34	215	0	1	CHANNEL	25.0	1400.	.0070	3.0	3.0	.026	10.00	0
356	215	0	1	CHANNEL	18.0	800.	.0030	3.0	3.0	.026	10.00	0
215	116	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	386
		DIVERSION TO GUTTER NUMBER 386 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	153.0	130.0	800.0	130.0			
116	131	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	387
		DIVERSION TO GUTTER NUMBER 387 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	106.0	90.0	800.0	90.0			
-1					1.0	1.	1.0000	107.0	107.0	1.000	1.00	
306	307	0	2	PIPE	10.0	1015.	.0140	.0	.0	.013	10.00	0
307	0	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
308	320	0	2	PIPE	10.0	760.	.0200	.0	.0	.013	10.00	0
320	296	0	2	PIPE	10.0	285.	.0070	.0	.0	.013	10.00	0
296	309	0	2	PIPE	10.0	280.	.0070	.0	.0	.013	10.00	0
309	310	0	2	PIPE	10.0	260.	.0080	.0	.0	.013	10.00	0
310	393	0	2	PIPE	10.0	520.	.0070	.0	.0	.013	10.00	0
393	295	0	2	PIPE	10.0	270.	.0080	.0	.0	.013	10.00	0
295	311	0	2	PIPE	10.0	240.	.0050	.0	.0	.013	10.00	0
304	305	0	2	PIPE	10.0	640.	.0040	.0	.0	.013	10.00	0
305	311	0	2	PIPE	10.0	1250.	.0110	.0	.0	.013	10.00	0
311	312	0	2	PIPE	10.0	1280.	.0070	.0	.0	.013	10.00	0
312	0	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
386	387	0	2	PIPE	10.0	680.	.0070	.0	.0	.013	10.00	0
387	0	0	3		.0	1.	.0010	.0	.0	.001	10.00	0

TOTAL NUMBER OF GUTTERS/PIPES, 103

Lower Cragmor Drainage Master Plan BASINS 2,3,5 \ 10YR \ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

ARRANGEMENT OF SUBCATCHMENTS AND GUTTERS/PIPES

GUTTER	TRIBUTARY GUTTER/PIPE										TRIBUTARY SUBAREA										D.A.(AC)
1	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22.6
2	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38.2
3	202	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43.1
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
5	201	0	0	0	0	0	0	0	0	0	334	0	0	0	0	0	0	0	0	0	20.9
7	122	0	0	0	0	0	0	0	0	0	340	0	0	0	0	0	0	0	0	0	25.6
8	203	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52.3
9	204	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	87.3
11	205	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.8
12	124	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11.0
13	249	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24.6
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
20	207	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	101.8
21	251	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	109.7
22	252	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	147.3
23	208	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	169.8
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
25	113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9.5
30	0	0	0	0	0	0	0	0	0	0	357	0	0	0	0	0	0	0	0	0	17.3
31	210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17.3
32	211	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.5
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
34	212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.5

111	339	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	147.3
112	342	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	195.4
113	343	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9.5
116	354	215	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	252.7
120	1	301	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38.2
122	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20.9
124	11	322	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11.0
125	12	323	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24.6
126	13	324	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29.7
127	14	325	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14.4
128	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
129	328	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31.8
130	338	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	109.7
200	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22.6
201	4	333	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11.2
202	2	302	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43.1
203	3	335	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52.3
204	8	336	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	87.3
205	321	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.8
206	15	326	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21.8
207	9	337	345	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	101.8
208	341	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	169.8
209	344	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	63.2
210	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17.3
211	355	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.5
212	32	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.5
213	350	352	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	92.9
214	327	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8.1
215	34	356	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39.6
249	125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24.6
250	129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31.8
251	130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	109.7

254	112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	195.4
295	393	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
296	320	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
300	0	0	0	0	0	0	0	0	0	0	300	0	0	0	0	0	0	0	0	0	22.6
301	0	0	0	0	0	0	0	0	0	0	301	0	0	0	0	0	0	0	0	0	15.6
302	0	0	0	0	0	0	0	0	0	0	302	0	0	0	0	0	0	0	0	0	4.8
304	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
305	304	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
306	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
307	306	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
308	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
309	296	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
310	309	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
311	295	305	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
312	311	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
320	308	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
321	0	0	0	0	0	0	0	0	0	0	321	0	0	0	0	0	0	0	0	0	7.8
322	0	0	0	0	0	0	0	0	0	0	322	0	0	0	0	0	0	0	0	0	3.2
323	0	0	0	0	0	0	0	0	0	0	323	0	0	0	0	0	0	0	0	0	13.6
324	0	0	0	0	0	0	0	0	0	0	324	0	0	0	0	0	0	0	0	0	5.1
325	0	0	0	0	0	0	0	0	0	0	325	0	0	0	0	0	0	0	0	0	14.4
326	0	0	0	0	0	0	0	0	0	0	326	0	0	0	0	0	0	0	0	0	21.8
327	0	0	0	0	0	0	0	0	0	0	327	0	0	0	0	0	0	0	0	0	8.1
328	214	0	0	0	0	0	0	0	0	0	328	0	0	0	0	0	0	0	0	0	31.8
333	0	0	0	0	0	0	0	0	0	0	333	0	0	0	0	0	0	0	0	0	11.2
335	0	0	0	0	0	0	0	0	0	0	335	0	0	0	0	0	0	0	0	0	9.2
336	0	0	0	0	0	0	0	0	0	0	336	0	0	0	0	0	0	0	0	0	9.4
337	0	0	0	0	0	0	0	0	0	0	337	0	0	0	0	0	0	0	0	0	11.2
338	0	0	0	0	0	0	0	0	0	0	338	0	0	0	0	0	0	0	0	0	7.9
339	126	0	0	0	0	0	0	0	0	0	339	0	0	0	0	0	0	0	0	0	37.6
341	127	0	0	0	0	0	0	0	0	0	341	0	0	0	0	0	0	0	0	0	22.5
342	206	0	0	0	0	0	0	0	0	0	342	0	0	0	0	0	0	0	0	0	25.6
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

344	250	0	0	0	0	0	0	0	0	0	344	0	0	0	0	0	0	0	0	0	53.7
345	0	0	0	0	0	0	0	0	0	0	345	0	0	0	0	0	0	0	0	0	3.3
350	0	0	0	0	0	0	0	0	0	0	350	0	0	0	0	0	0	0	0	0	15.6
352	209	0	0	0	0	0	0	0	0	0	352	0	0	0	0	0	0	0	0	0	77.3
354	254	0	0	0	0	0	0	0	0	0	354	0	0	0	0	0	0	0	0	0	213.1
355	0	0	0	0	0	0	0	0	0	0	355	0	0	0	0	0	0	0	0	0	10.2
356	0	0	0	0	0	0	0	0	0	0	356	0	0	0	0	0	0	0	0	0	12.1
386	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
387	386	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
393	310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0

ORDER OF TREE STRUCTURE (NGUT VALUE) DECREASES THROUGH DIVERSION FROM GUTTER 5 TO GUTTER 4 COMP THROUGH DIVERSION WILL LAG ONE TIME
ORDER OF TREE STRUCTURE (NGUT VALUE) DECREASES THROUGH DIVERSION FROM GUTTER 40 TO GUTTER 14 COMP THROUGH DIVERSION WILL LAG ONE TIME
ORDER OF TREE STRUCTURE (NGUT VALUE) DECREASES THROUGH DIVERSION FROM GUTTER 50 TO GUTTER 16 COMP THROUGH DIVERSION WILL LAG ONE TIME
ORDER OF TREE STRUCTURE (NGUT VALUE) DECREASES THROUGH DIVERSION FROM GUTTER 53 TO GUTTER 33 COMP THROUGH DIVERSION WILL LAG ONE TIME
ORDER OF TREE STRUCTURE (NGUT VALUE) DECREASES THROUGH DIVERSION FROM GUTTER 54 TO GUTTER 15 COMP THROUGH DIVERSION WILL LAG ONE TIME
ORDER OF TREE STRUCTURE (NGUT VALUE) DECREASES THROUGH DIVERSION FROM GUTTER 68 TO GUTTER 17 COMP THROUGH DIVERSION WILL LAG ONE TIME
ORDER OF TREE STRUCTURE (NGUT VALUE) DECREASES THROUGH DIVERSION FROM GUTTER 88 TO GUTTER 24 COMP THROUGH DIVERSION WILL LAG ONE TIME

Lower Cragmor Drainage Master Plan BASINS 2,3,5 \ 10YR \ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

HYDROGRAPHS ARE LISTED FOR THE FOLLOWING   5 CONVEYANCE ELEMENTS

THE UPPER NUMBER IS DISCHARGE IN CFS
THE LOWER NUMBER IS ONE OF THE FOLLOWING CASES:
( ) DENOTES DEPTH ABOVE INVERT IN FEET
(S) DENOTES STORAGE IN AC-FT FOR DETENSION DAM. DISCHARGE INCLUDES SPILLWAY OUTFLOW.
(I) DENOTES GUTTER INFLOW IN CFS FROM SPECIFIED INFLOW HYDROGRAPH
(D) DENOTES DISCHARGE IN CFS DIVERTED FROM THIS GUTTER
(O) DENOTES STORAGE IN AC-FT FOR SURCHARGED GUTTER

TIME(HR/MIN)	307	131	35	312	387
0 1.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 2.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 3.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 4.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 5.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 6.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 7.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 8.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 9.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 10.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 11.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 12.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 13.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 14.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 15.	1.	0.	0.	0.	0.

0	16.	2.	0.	0.	1.	1.
		.0( )	.0( )	.0( )	.0( )	.0( )
0	17.	3.	0.	0.	2.	1.
		.0( )	.0( )	.0( )	.0( )	.0( )
0	18.	5.	0.	0.	4.	2.
		.0( )	.0( )	.0( )	.0( )	.0( )
0	19.	9.	1.	0.	9.	4.
		.0( )	.0( )	.0( )	.0( )	.0( )
0	20.	13.	1.	0.	17.	6.
		.0( )	.0( )	.0( )	.0( )	.0( )
0	21.	19.	1.	0.	33.	10.
		.0( )	.0( )	.0( )	.0( )	.0( )
0	22.	27.	2.	1.	60.	14.
		.0( )	.0( )	.1( )	.0( )	.0( )
0	23.	37.	2.	1.	102.	20.
		.0( )	.0( )	.1( )	.0( )	.0( )
0	24.	48.	3.	2.	158.	28.
		.0( )	.0( )	.1( )	.0( )	.0( )
0	25.	60.	4.	4.	228.	38.
		.0( )	.0( )	.1( )	.0( )	.0( )
0	26.	70.	5.	5.	306.	49.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	27.	75.	5.	7.	381.	60.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	28.	79.	6.	8.	444.	71.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	29.	80.	6.	9.	491.	80.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	30.	80.	7.	10.	522.	89.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	31.	80.	7.	11.	540.	96.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	32.	77.	7.	12.	546.	101.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	33.	75.	7.	12.	542.	104.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	34.	71.	7.	12.	531.	105.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	35.	68.	7.	12.	515.	105.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	36.	64.	7.	12.	495.	104.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	37.	60.	7.	12.	472.	102.
		.0( )	.0( )	.3( )	.0( )	.0( )

0	38.	56.	6.	11.	448.	99.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	39.	53.	6.	11.	424.	96.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	40.	49.	6.	10.	400.	92.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	41.	46.	6.	10.	378.	89.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	42.	44.	5.	10.	357.	85.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	43.	42.	5.	9.	337.	82.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	44.	39.	5.	9.	319.	79.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	45.	38.	5.	8.	303.	76.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	46.	36.	5.	8.	288.	72.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	47.	34.	4.	8.	275.	70.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	48.	33.	4.	7.	262.	67.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	49.	32.	4.	7.	251.	64.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	50.	30.	4.	7.	241.	62.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	51.	29.	4.	7.	231.	59.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	52.	28.	4.	6.	222.	57.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	53.	27.	4.	6.	214.	55.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	54.	26.	3.	6.	206.	53.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	55.	26.	3.	6.	199.	52.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	56.	25.	3.	6.	193.	50.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	57.	24.	3.	5.	187.	48.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	58.	24.	3.	5.	182.	47.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	59.	23.	3.	5.	177.	46.

1	0.	23.	3.	5.	173.	45.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	1.	22.	3.	5.	169.	43.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	2.	22.	3.	5.	165.	42.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	3.	22.	3.	5.	162.	41.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	4.	21.	3.	5.	159.	41.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	5.	21.	3.	4.	156.	40.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	6.	21.	3.	4.	154.	39.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	7.	21.	3.	4.	151.	38.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	8.	20.	3.	4.	149.	38.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	9.	20.	2.	4.	147.	37.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	10.	20.	2.	4.	146.	36.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	11.	20.	2.	4.	144.	36.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	12.	20.	2.	4.	143.	36.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	13.	20.	2.	4.	142.	35.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	14.	19.	2.	4.	140.	35.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	15.	19.	2.	4.	139.	34.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	16.	19.	2.	4.	138.	34.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	17.	19.	2.	4.	137.	34.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	18.	19.	2.	4.	136.	33.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	19.	19.	2.	4.	135.	33.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	20.	18.	2.	4.	134.	32.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	21.	18.	2.	4.	132.	32.
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

1	22.	18.	2.	4.	130.	32.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	23.	17.	2.	4.	129.	31.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	24.	17.	2.	3.	127.	31.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	25.	17.	2.	3.	124.	30.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	26.	16.	2.	3.	122.	30.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	27.	16.	2.	3.	120.	29.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	28.	16.	2.	3.	117.	29.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	29.	15.	2.	3.	115.	28.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	30.	15.	2.	3.	112.	28.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	31.	15.	2.	3.	110.	27.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	32.	14.	2.	3.	108.	27.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	33.	14.	2.	3.	105.	26.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	34.	14.	2.	3.	103.	26.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	35.	13.	2.	3.	101.	25.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	36.	13.	2.	3.	99.	25.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	37.	13.	2.	3.	97.	24.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	38.	13.	2.	3.	96.	24.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	39.	13.	2.	3.	94.	23.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	40.	12.	2.	3.	93.	23.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	41.	12.	1.	3.	91.	23.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	42.	12.	1.	3.	90.	22.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	43.	12.	1.	3.	89.	22.

1	44.	12.	1.	2.	88.	22.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	45.	12.	1.	2.	87.	21.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	46.	12.	1.	2.	86.	21.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	47.	12.	1.	2.	85.	21.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	48.	11.	1.	2.	84.	21.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	49.	11.	1.	2.	83.	20.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	50.	11.	1.	2.	82.	20.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	51.	11.	1.	2.	82.	20.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	52.	11.	1.	2.	81.	20.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	53.	11.	1.	2.	80.	20.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	54.	11.	1.	2.	80.	19.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	55.	11.	1.	2.	79.	19.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	56.	11.	1.	2.	78.	19.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	57.	11.	1.	2.	78.	19.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	58.	11.	1.	2.	77.	19.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	59.	10.	1.	2.	76.	18.
		.0( )	.0( )	.1( )	.0( )	.0( )
2	0.	10.	1.	2.	76.	18.
		.0( )	.0( )	.1( )	.0( )	.0( )

Lower Cragmor Drainage Master Plan BASINS 2,3,5 \ 10YR \ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

*** PEAK FLOWS, STAGES AND STORAGES OF GUTTERS AND DETENSION DAMS ***

CONVEYANCE ELEMENT	PEAK (CFS)	STAGE (FT)	STORAGE (AC-FT)	TIME (HR/MIN)
300	53.	.6		0 28.
200	53.	1.2		0 28.
301	41.	.4		0 27.
1	24.	.3		0 30.
120	62.	2.8		0 29.
333	29.	.5		0 27.
4	33.	.5		0 31.
302	14.	.2		0 26.
2	28.	.3		0 30.
201	59.	1.4		0 30.
202	40.	(DIRECT FLOW)		0 29.
5	32.	.5		0 27.
335	26.	.3		0 26.
3	40.	.5		0 30.
321	23.	.2		0 26.
122	32.	1.0		0 27.
203	63.	(DIRECT FLOW)		0 29.
205	23.	(DIRECT FLOW)		0 26.
7	13.	.3		0 27.
336	23.	.3		0 27.
8	63.	.6		0 30.
322	10.	.2		0 26.
11	22.	.2		0 27.
204	97.	1.7		0 29.
124	32.	.7		0 27.
345	10.	.3		0 26.
337	41.	.5		0 29.
9	15.	.3		0 31.
323	35.	.4		0 27.
12	15.	.2		0 28.
207	63.	1.4		0 29.
125	50.	1.1		0 27.
20	9.	.2		0 31.
338	40.	.5		0 30.
249	50.	.9		0 27.
130	49.	.7		0 31.
324	18.	.4		0 26.
13	25.	.2		0 28.
251	7.	.2		0 31.
126	40.	.8		0 27.
327	27.	.5		0 26.
21	3.	.1		0 33.
339	40.	.4		0 27.
17	14.	.3		0 31.
214	27.	(DIRECT FLOW)		0 26.
30	45.	.6		0 27.
111	42.	.7		0 28.
325	41.	.4		0 27.
14	20.	.3		0 28.
128	14.	.3		0 31.
328	79.	.7		0 29.

252	6.	.2	0	28.
127	60.	1.3	0	27.
308	31.	.8	0	28.
24	6.	.2	0	34.
343	28.	.4	0	30.
129	79.	.7	0	29.
31	45.	.6	0	28.
355	25.	.5	0	30.
22	3.	.1	0	32.
341	44.	.6	0	31.
16	3.	.1	0	37.
326	54.	.6	0	29.
15	30.	.6	0	28.
320	113.	1.9	0	29.
113	33.	1.0	0	31.
250	29.	.5	0	29.
211	69.	(DIRECT FLOW)	0	28.
208	46.	1.2	0	31.
206	84.	1.5	0	29.
296	167.	2.3	0	29.
25	5.	.2	0	34.
344	55.	.6	0	31.
33	2.	.1	0	38.
32	68.	.6	0	29.
23	46.	.6	0	31.
342	37.	.4	0	31.
309	208.	2.5	0	30.
209	59.	.8	0	31.
212	70.	(DIRECT FLOW)	0	30.
112	83.	1.6	0	31.
310	243.	2.8	0	30.
352	52.	.6	0	33.
350	33.	.6	0	31.
356	27.	.6	0	30.
34	56.	.6	0	36.
254	13.	.3	0	31.
304	50.	1.5	0	36.
393	312.	3.1	0	31.
213	83.	.9	0	32.
215	78.	1.6	0	34.
354	37.	.5	0	32.
305	100.	1.6	0	35.
295	340.	3.7	0	31.
35	12.	.3	0	34.
116	48.	1.2	0	33.
386	66.	1.5	0	35.
311	475.	4.0	0	32.
306	28.	.8	0	34.
220	12.	(DIRECT FLOW)	0	34.
131	7.	(DIRECT FLOW)	0	33.
387	105.	(DIRECT FLOW)	0	34.
312	546.	(DIRECT FLOW)	0	32.
307	80.	(DIRECT FLOW)	0	30.

BASINS 4, 5, 10 YR

ENVIRONMENTAL PROTECTION AGENCY - STORM WATER MANAGEMENT MODEL - VERSION PC.1

DEVELOPED BY METCALF + EDDY, INC.

UNIVERSITY OF FLORIDA

WATER RESOURCES ENGINEEERS, INC. (SEPTEMBER 1970)

UPDATED BY UNIVERSITY OF FLORIDA (JUNE 1973)

HYDROLOGIC ENGINEERING CENTER, CORPS OF ENGINEERS

MISSOURI RIVER DIVISION, CORPS OF ENGINEERS (SEPTEMBER 1974)

BOYLE ENGINEERING CORPORATION (MARCH 1985, JULY 1985)

TAPE OR DISK ASSIGNMENTS

JIN(1)	JIN(2)	JIN(3)	JIN(4)	JIN(5)	JIN(6)	JIN(7)	JIN(8)	JIN(9)	JIN(10)
2	1	0	0	0	0	0	0	0	0

JOUT(1)	JOUT(2)	JOUT(3)	JOUT(4)	JOUT(5)	JOUT(6)	JOUT(7)	JOUT(8)	JOUT(9)	JOUT(10)
1	2	0	0	0	0	0	0	0	0

NSCRAT(1)	NSCRAT(2)	NSCRAT(3)	NSCRAT(4)	NSCRAT(5)
3	4	0	0	0

WATERSHED   PROGRAM CALLED

*** ENTRY MADE TO RUNOFF MODEL ***

Lower Cragmor Drainage Master Plan BASINS 4,5 \ 10YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

NUMBER OF TIME STEPS 120

INTEGRATION TIME INTERVAL (MINUTES)   1.00

10.0 PERCENT OF IMPERVIOUS AREA HAS ZERO DETENTION DEPTH

FOR   24 RAINFALL STEPS, THE TIME INTERVAL IS   5.00 MINUTES

FOR RAINGAGE NUMBER   1   RAINFALL HISTORY IN INCHES PER HOUR

.43	.80	1.77	3.24	5.40	2.59	1.21	.93	.82	.69
.69	.69	.69	.69	.69	.54	.41	.41	.41	.41
.41	.41	.37	.28						

Lower Cragmor Drainage Master Plan BASINS 4,5 \ 10YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

SUBAREA NUMBER	GUTTER OR MANHOLE	WIDTH (FT)	AREA (AC)	PERCENT IMPERV.	SLOPE (FT/FT)	RESISTANCE FACTOR IMPERV.	RESISTANCE FACTOR PERV.	SURFACE STORAGE(IN) IMPERV.	SURFACE STORAGE(IN) PERV.	INFILTRATION RATE(IN/HR) MAXIMUM	INFILTRATION RATE(IN/HR) MINIMUM	INFILTRATION RATE(IN/HR) DECAY RATE	GAGE NO
353	43	480.	3.8	95.0	.0100	.020	.250	.100	.350	4.50	.60	.00180	1
358	40	1200.	16.7	95.0	.0040	.020	.250	.100	.350	4.50	.60	.00180	1
360	360	1470.	20.8	70.0	.0090	.020	.250	.100	.350	4.50	.60	.00180	1
361	361	2380.	15.2	70.0	.0140	.020	.250	.100	.350	4.50	.60	.00180	1
362	362	2656.	18.6	70.0	.0130	.020	.250	.100	.350	4.50	.60	.00180	1
363	363	1704.	18.7	65.0	.0150	.020	.250	.100	.350	4.50	.60	.00180	1
364	364	1260.	16.0	65.0	.0210	.020	.250	.100	.350	4.50	.60	.00180	1
365	365	2640.	32.9	65.0	.0210	.020	.250	.100	.350	4.50	.60	.00180	1
366	366	972.	9.7	65.0	.0150	.020	.250	.100	.350	4.50	.60	.00180	1
367	367	2960.	14.5	65.0	.0150	.020	.250	.100	.350	4.50	.60	.00180	1
376	376	2760.	13.1	65.0	.0160	.020	.250	.100	.350	4.50	.60	.00180	1
380	51	620.	6.8	95.0	.0180	.020	.250	.100	.350	4.50	.60	.00180	1
375	375	1680.	16.5	65.0	.0150	.020	.250	.100	.350	4.50	.60	.00180	1
377	55	564.	13.8	65.0	.0180	.020	.250	.100	.350	4.50	.60	.00180	1
378	378	1368.	13.9	65.0	.0150	.020	.250	.100	.350	4.50	.60	.00180	1
379	379	2720.	13.3	65.0	.0140	.020	.250	.100	.350	4.50	.60	.00180	1
382	382	1260.	18.5	2.0	.0140	.020	.250	.100	.350	4.50	.60	.00180	1
383	383	1120.	13.4	65.0	.0130	.020	.250	.100	.350	4.50	.60	.00180	1
384	53	1360.	22.6	65.0	.0100	.020	.250	.100	.350	4.50	.60	.00180	1
385	54	2800.	5.8	65.0	.0130	.020	.250	.100	.350	4.50	.60	.00180	1

TOTAL NUMBER OF SUBCATCHMENTS, 20

TOTAL TRIBUTARY AREA (ACRES),   304.60

Lower Cragmor Drainage Master Plan BASINS 4,5 \ 10YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

*** CONTINUITY CHECK FOR SUBCATCHMENT ROUTING IN UDSWM2-PC MODEL ***

WATERSHED AREA (ACRES)	304.600
TOTAL RAINFALL (INCHES)	2.082
TOTAL INFILTRATION (INCHES)	.444
TOTAL WATERSHED OUTFLOW (INCHES)	1.348
TOTAL SURFACE STORAGE AT END OF STROM (INCHES)	.284
ERROR IN CONTINUITY, PERCENTAGE OF RAINFALL	.304

Lower Cragmor Drainage Master Plan BASINS 4,5 \ 10YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

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                                             WIDTH            INVERT   SIDE SLOPES         OVERBANK/SURCHARGE
GUTTER   GUTTER      NDP      NP             OR DIAM   LENGTH  SLOPE   HORIZ TO VERT  MANNING    DEPTH     JK
NUMBER   CONNECTION                            (FT)     (FT)   (FT/FT)    L      R       N        (FT)

 312       394        10       2     PIPE       8.0     320.    .0090     .0    .0     .013      8.00      -1
                TIME IN HRS VS INFLOW IN CFS
                    .0    .0     .3   17.0     .4   228.0     .5   522.0      .6   515.0     .7   400.0
                    .8  303.0    .8  241.0     .9   199.0    1.0   173.0
 307       313        10       2     PIPE       7.0     330.    .0020     .0    .0     .013      7.00      -1
                TIME IN HRS VS INFLOW IN CFS
                    .0    .0     .3   15.0     .4    60.0     .5    80.0      .6    68.0     .7    49.0
                    .8   38.0    .8   30.0     .9    26.0    1.0    23.0
 387       384        10       2     PIPE      10.0     480.    .0110     .0    .0     .013     10.00      -1
                TIME IN HRS VS INFLOW IN CFS
                    .0    .0     .3    6.0     .4    38.0     .5    89.0      .6   105.0     .7    92.0
                    .8   76.0    .8   62.0     .9    52.0    1.0    23.0
  -1                                            1.0       1.   1.0000   107.0 107.0    1.600      1.00
 131       119        10       3                 .0       1.    .0010     .0    .0     .001     10.00      -1
                TIME IN HRS VS INFLOW IN CFS
                    .0    .0     .3    1.0     .4     4.0     .5     7.0      .6     7.0     .7     6.0
                    .8    5.0    .8    4.0     .9     3.0    1.0     3.0
  35       220        10       3                 .0       1.    .0010     .0    .0     .001     10.00      -1
                TIME IN HRS VS INFLOW IN CFS
                    .0    .0     .3     .0     .4     4.0     .5    10.0      .6    12.0     .7    10.0
                    .8    8.0    .8    7.0     .9     6.0    1.0     5.0
  40       118         0       1     CHANNEL   25.0    1200.    .0120    3.0   3.0     .026     10.00       0
 118       364         2       1     CHANNEL   25.0       1.    .0010    3.0   3.0     .026     10.00      41
                DIVERSION TO GUTTER NUMBER  41 - TOTAL Q VS DIVERTED Q IN CFS
                    .0    .0   1200.0  600.0
  41       117         0       1     CHANNEL   25.0     565.    .0110    3.0   3.0     .026     10.00       0
 117       363         2       1     CHANNEL     .0       1.    .0010    3.0   3.0     .026     10.00      42
                DIVERSION TO GUTTER NUMBER  42 - TOTAL Q VS DIVERTED Q IN CFS
                    .0    .0   1200.0  600.0
  42       119         0       1     CHANNEL   25.0     400.    .0150    3.0   3.0     .026     10.00       0
 119       362         2       1     CHANNEL   25.0       1.    .0010    3.0   3.0     .026     10.00      43
                DIVERSION TO GUTTER NUMBER  43 - TOTAL Q VS DIVERTED Q IN CFS
                    .0    .0   1200.0  600.0
  43       220         0       1     CHANNEL   18.0     480.    .0110    3.0   3.0     .026     10.00       0
 220       361         3       1     CHANNEL   18.0       1.    .0010    3.0   3.0     .026     10.00     394
                DIVERSION TO GUTTER NUMBER 394 - TOTAL Q VS DIVERTED Q IN CFS
                    .0    .0     85.0   72.0    800.0   72.0
 360       226         0       1     CHANNEL   18.0    1470.    .0070    3.0   3.0     .026     10.00       0
 361       225         0       1     CHANNEL   18.0    1700.    .0080    3.0   3.0     .026     10.00       0
 225       226         0       3                 .0       1.    .0010     .0    .0     .001     10.00       0
 226       227         0       3                 .0       1.    .0010     .0    .0     .001     10.00       0
 362       223         0       1     CHANNEL   18.0    1660.    .0110    3.0   3.0     .026     10.00       0
 363       222         0       1     CHANNEL   18.0    1420.    .0130    3.0   3.0     .026     10.00       0
 364       221         0       1     CHANNEL   18.0    1050.    .0120    3.0   3.0     .026     10.00       0
 365       224         0       1     CHANNEL   18.0    2200.    .0130    3.0   3.0     .026     10.00       0
 366       222         0       1     CHANNEL   18.0     810.    .0060    3.0   3.0     .026     10.00       0
 367       223         0       1     CHANNEL   18.0    1480.    .0080    3.0   3.0     .026     10.00       0
 221        45         4       1     CHANNEL   18.0       1.    .0010    3.0   3.0     .026     10.00     299
                DIVERSION TO GUTTER NUMBER 299 - TOTAL Q VS DIVERTED Q IN CFS
                    .0    .0     10.0    8.5     59.0   50.0    500.0   50.0
  45       222         0       1     CHANNEL   10.0     660.    .0190    3.0   3.0     .026     10.00       0
 222        46         4       1     CHANNEL   18.0       1.    .0010    3.0   3.0     .026     10.00     298
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		.0	.0	10.0 8.5	153.0	130.0	500.0	130.0				
46	223	0	1	CHANNEL	10.0	470.	.0130	3.0	3.0	.026	10.00	0
224	47	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	297
	DIVERSION TO GUTTER NUMBER 297 - TOTAL Q VS DIVERTED Q IN CFS											
		.0	.0	10.0 8.5	47.0	40.0	500.0	40.0				
47	223	0	1	CHANNEL	18.0	1120.	.0080	3.0	3.0	.026	10.00	0
223	227	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
227	0	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
376	240	0	1	CHANNEL	18.0	2300.	.0140	3.0	3.0	.026	10.00	0
240	51	3	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	313
	DIVERSION TO GUTTER NUMBER 313 - TOTAL Q VS DIVERTED Q IN CFS											
		.0	.0	31.0 21.0	500.0	21.0						
51	248	0	1	CHANNEL	18.0	620.	.0050	3.0	3.0	.026	10.00	0
378	242	0	1	CHANNEL	18.0	1140.	.0120	3.0	3.0	.026	10.00	0
375	241	0	1	CHANNEL	18.0	1680.	.0100	3.0	3.0	.026	10.00	0
55	242	0	1	CHANNEL	10.0	470.	.0150	3.0	3.0	.026	10.00	0
379	243	0	1	CHANNEL	18.0	1360.	.0130	3.0	3.0	.026	10.00	0
241	132	3	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	315
	DIVERSION TO GUTTER NUMBER 315 - TOTAL Q VS DIVERTED Q IN CFS											
		.0	.0	42.0 28.0	200.0	28.0						
242	56	3	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	316
	DIVERSION TO GUTTER NUMBER 316 - TOTAL Q VS DIVERTED Q IN CFS											
		.0	.0	90.0 60.0	500.0	60.0						
56	243	0	1	CHANNEL	18.0	400.	.0150	3.0	3.0	.026	10.00	0
243	57	3	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	317
	DIVERSION TO GUTTER NUMBER 317 - TOTAL Q VS DIVERTED Q IN CFS											
		.0	.0	37.0 25.0	500.0	25.0						
57	248	0	1	CHANNEL	18.0	400.	.0130	3.0	3.0	.026	10.00	0
248	52	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	314
	DIVERSION TO GUTTER NUMBER 314 - TOTAL Q VS DIVERTED Q IN CFS											
		.0	.0	10.0 8.5	65.0	55.0	500.0	55.0				
52	115	0	1	CHANNEL	25.0	400.	.0040	3.0	3.0	.026	10.00	0
115	253	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	318
	DIVERSION TO GUTTER NUMBER 318 - TOTAL Q VS DIVERTED Q IN CFS											
		.0	.0	10.0 8.5	102.0	87.0	500.0	87.0				
253	53	2	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	40
	DIVERSION TO GUTTER NUMBER 40 - TOTAL Q VS DIVERTED Q IN CFS											
		.0	.0	600.0 100.0								
383	115	0	1	CHANNEL	40.0	1120.	.0060	3.0	3.0	.026	10.00	0
114	58	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
58	245	0	1	CHANNEL	40.0	1260.	.0110	3.0	3.0	.026	10.00	0
245	59	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
382	245	0	1	CHANNEL	40.0	1260.	.0110	3.0	3.0	.026	10.00	0
59	246	0	1	CHANNEL	18.0	1700.	.0130	3.0	3.0	.026	10.00	0
53	246	0	1	CHANNEL	25.0	1360.	.0120	3.0	3.0	.026	10.00	0
246	54	3	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	319
	DIVERSION TO GUTTER NUMBER 319 - TOTAL Q VS DIVERTED Q IN CFS											
		.0	.0	201.0 135.0	800.0	135.0						
54	247	0	1	CHANNEL	18.0	1400.	.0130	3.0	3.0	.026	10.00	0
247	227	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
-1					1.0	1.	1.0000	107.0	107.0	1.000	1.00	
313	314	0	2	PIPE	10.0	620.	.0050	.0	.0	.013	10.00	0
315	316	0	2	PIPE	10.0	470.	.0150	.0	.0	.013	10.00	0
316	317	0	2	PIPE	10.0	400.	.0150	.0	.0	.013	10.00	0
317	314	0	2	PIPE	10.0	400.	.0130	.0	.0	.013	10.00	0
314	318	0	2	PIPE	10.0	400.	.0040	.0	.0	.013	10.00	0
318	319	0	2	PIPE	10.0	1360.	.0120	.0	.0	.013	10.00	0
299	298	0	2	PIPE	10.0	660.	.0190	.0	.0	.013	10.00	0

TOTAL NUMBER OF GUTTERS/PIPES, 64

Lower Cragmor Drainage Master Plan BASINS 4,5 \ 10YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

ARRANGEMENT OF SUBCATCHMENTS AND GUTTERS/PIPES

GUTTER	TRIBUTARY GUTTER/PIPE										TRIBUTARY SUBAREA										D.A.(AC)
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
40	0	0	0	0	0	0	0	0	0	0	358	0	0	0	0	0	0	0	0	0	16.7
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
43	0	0	0	0	0	0	0	0	0	0	353	0	0	0	0	0	0	0	0	0	3.8
45	221	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32.7
46	222	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61.1
47	224	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32.9
51	240	0	0	0	0	0	0	0	0	0	380	0	0	0	0	0	0	0	0	0	19.9
52	248	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60.9
53	253	0	0	0	0	0	0	0	0	0	384	0	0	0	0	0	0	0	0	0	96.9
54	246	0	0	0	0	0	0	0	0	0	385	0	0	0	0	0	0	0	0	0	121.2
55	0	0	0	0	0	0	0	0	0	0	377	0	0	0	0	0	0	0	0	0	13.8
56	242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.7
57	243	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41.0
58	114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
59	245	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18.5
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
115	52	383	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74.3
117	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
118	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16.7
119	131	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
131	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
220	35	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.8
221	364	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32.7
222	363	366	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61.1

224	365	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32.9
225	361	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19.0
226	360	225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39.8
227	226	223	247	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	288.1
240	376	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13.1
241	375	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16.5
242	378	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.7
243	379	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41.0
245	58	382	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18.5
246	59	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	115.4
247	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	121.2
248	51	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60.9
253	115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74.3
299	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
307	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
312	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
313	307	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
314	313	317	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
315	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
316	315	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
317	316	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
318	314	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
360	0	0	0	0	0	0	0	0	0	360	0	0	0	0	0	0	0	0	0	20.8
361	220	0	0	0	0	0	0	0	0	361	0	0	0	0	0	0	0	0	0	19.0
362	119	0	0	0	0	0	0	0	0	362	0	0	0	0	0	0	0	0	0	18.6
363	117	0	0	0	0	0	0	0	0	363	0	0	0	0	0	0	0	0	0	18.7
364	118	0	0	0	0	0	0	0	0	364	0	0	0	0	0	0	0	0	0	32.7
365	0	0	0	0	0	0	0	0	0	365	0	0	0	0	0	0	0	0	0	32.9
366	0	0	0	0	0	0	0	0	0	366	0	0	0	0	0	0	0	0	0	9.7
367	0	0	0	0	0	0	0	0	0	367	0	0	0	0	0	0	0	0	0	14.5
375	0	0	0	0	0	0	0	0	0	375	0	0	0	0	0	0	0	0	0	16.5
376	0	0	0	0	0	0	0	0	0	376	0	0	0	0	0	0	0	0	0	13.1

379	0	0	0	0	0	0	0	0	0	0	379	0	0	0	0	0	0	0	0	0	13.3
382	0	0	0	0	0	0	0	0	0	0	382	0	0	0	0	0	0	0	0	0	18.5
383	0	0	0	0	0	0	0	0	0	0	383	0	0	0	0	0	0	0	0	0	13.4
387	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0

ORDER OF TREE STRUCTURE (NGUT VALUE) DECREASES THROUGH DIVERSION FROM GUTTER 45 TO GUTTER 43 COMP THROUGH DIVERSION WILL LAG ONE TIME

Lower Cragmor Drainage Master Plan BASINS 4,5 \ 10YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

*** PEAK FLOWS, STAGES AND STORAGES OF GUTTERS AND DETENSION DAMS ***

CONVEYANCE ELEMENT	PEAK (CFS)	STAGE (FT)	STORAGE (AC-FT)	TIME (HR/MIN)
55	32.	.6		0 27.
378	34.	.5		0 28.
242	65.	1.4		0 27.
56	21.	.3		0 29.
379	34.	.5		0 27.
376	27.	.4		0 30.
243	55.	1.3		0 28.
240	27.	.9		0 30.
57	29.	.4		0 30.
51	30.	.6		0 29.
248	59.	1.3		0 30.
40	40.	.4		0 32.
383	26.	.3		0 31.
52	8.	.2		0 33.
114	0.	(DIRECT FLOW)		0 0.
118	40.	.9		0 32.
115	33.	1.0		0 32.
382	3.	.1		1 9.
58	0.	.0		0 0.
364	53.	.6		0 30.
41	19.	.3		0 35.
315	23.	.8		0 32.
253	5.	.3		0 32.
245	3.	(DIRECT FLOW)		1 9.
221	53.	1.3		0 30.
117	19.	1.9		0 35.
43	16.	.3		0 31.
35	12.	(DIRECT FLOW)		0 35.
316	64.	1.2		0 30.
307	79.	2.5		0 31.
53	48.	.5		0 31.
59	3.	.1		1 26.
365	70.	.7		0 30.
45	8.	.2		0 33.
366	23.	.5		0 28.
363	47.	.6		0 30.
42	9.	.2		0 38.
131	7.	(DIRECT FLOW)		0 31.
220	27.	.9		0 35.
317	89.	1.5		0 30.
313	95.	1.9		0 32.
246	48.	1.2		0 31.
224	70.	1.5		0 30.
222	77.	1.6		0 30.
119	16.	.5		0 37.
361	38.	.6		0 30.
314	231.	3.2		0 31.
375	35.	.5		0 30.
54	25.	.4		0 32.
47	22.	.4		0 34.
46	11.	.3		0 32.

362	48.	.6	0	30.
225	38.	(DIRECT FLOW)	0	30.
360	42.	.6	0	31.
312	526.	4.5	0	31.
387	104.	1.7	0	35.
318	257.	2.5	0	32.
299	45.	1.0	0	31.
241	35.	1.0	0	30.
247	25.	(DIRECT FLOW)	0	32.
223	109.	(DIRECT FLOW)	0	31.
226	80.	(DIRECT FLOW)	0	31.
394	549.	(DIRECT FLOW)	0	31.
384	104.	(DIRECT FLOW)	0	35.
319	289.	(DIRECT FLOW)	0	32.
298	110.	(DIRECT FLOW)	0	30.
132	12.	(DIRECT FLOW)	0	30.
227	214.	(DIRECT FLOW)	0	31.

BASIN 1, 100 YR

ENVIRONMENTAL PROTECTION AGENCY - STORM WATER MANAGEMENT MODEL - VERSION PC.1

DEVELOPED BY METCALF + EDDY, INC.

UNIVERSITY OF FLORIDA

WATER RESOURCES ENGINEEERS, INC. (SEPTEMBER 1970)

UPDATED BY UNIVERSITY OF FLORIDA (JUNE 1973)

HYDROLOGIC ENGINEERING CENTER, CORPS OF ENGINEERS

MISSOURI RIVER DIVISION, CORPS OF ENGINEERS (SEPTEMBER 1974)

BOYLE ENGINEERING CORPORATION (MARCH 1985, JULY 1985)

TAPE OR DISK ASSIGNMENTS

JIN(1)	JIN(2)	JIN(3)	JIN(4)	JIN(5)	JIN(6)	JIN(7)	JIN(8)	JIN(9)	JIN(10)
2	1	0	0	0	0	0	0	0	0

JOUT(1)	JOUT(2)	JOUT(3)	JOUT(4)	JOUT(5)	JOUT(6)	JOUT(7)	JOUT(8)	JOUT(9)	JOUT(10)
1	2	0	0	0	0	0	0	0	0

NSCRAT(1)	NSCRAT(2)	NSCRAT(3)	NSCRAT(4)	NSCRAT(5)
3	4	0	0	0

WATERSHED PROGRAM CALLED

*** ENTRY MADE TO RUNOFF MODEL ***

Lower Cragmor Drainage Master Plan BASIN 1 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

NUMBER OF TIME STEPS 120

INTEGRATION TIME INTERVAL (MINUTES) 1.00

10.0 PERCENT OF IMPERVIOUS AREA HAS ZERO DETENTION DEPTH

FOR 24 RAINFALL STEPS, THE TIME INTERVAL IS 5.00 MINUTES

FOR RAINGAGE NUMBER 1 RAINFALL HISTORY IN INCHES PER HOUR

.32	.97	1.49	2.59	4.54	8.10	4.54	2.59	2.01	1.62
1.30	1.30	1.30	.65	.39	.39	.39	.39	.39	.39
.39	.39	.39	.39						

Lower Cragmor Drainage Master Plan BASIN 1 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

SUBAREA NUMBER	GUTTER OR MANHOLE	WIDTH (FT)	AREA (AC)	PERCENT IMPERV.	SLOPE (FT/FT)	RESISTANCE FACTOR IMPERV.	RESISTANCE FACTOR PERV.	SURFACE STORAGE(IN) IMPERV.	SURFACE STORAGE(IN) PERV.	INFILTRATION RATE(IN/HR) MAXIMUM	INFILTRATION RATE(IN/HR) MINIMUM	INFILTRATION RATE(IN/HR) DECAY RATE	GAGE NO
101	101	1020.	7.4	70.0	.0140	.020	.250	.100	.350	4.50	.60	.00180	1
102	102	1260.	17.2	70.0	.0170	.020	.250	.100	.350	4.50	.60	.00180	1
103	103	1584.	9.7	70.0	.0140	.020	.250	.100	.350	4.50	.60	.00180	1
104	104	1946.	22.7	70.0	.0330	.020	.250	.100	.350	4.50	.60	.00180	1
105	105	1946.	12.6	70.0	.0210	.020	.250	.100	.350	4.50	.60	.00180	1
106	106	1596.	10.1	70.0	.0330	.020	.250	.100	.350	4.50	.60	.00180	1
107	107	1580.	38.5	70.0	.0090	.020	.250	.100	.350	4.50	.60	.00180	1
108	108	560.	3.6	90.0	.0180	.020	.250	.100	.350	4.50	.60	.00180	1
109	109	1840.	25.3	70.0	.0100	.020	.250	.100	.350	4.50	.60	.00180	1
110	110	1150.	8.5	70.0	.0100	.020	.250	.100	.350	4.50	.60	.00180	1

TOTAL NUMBER OF SUBCATCHMENTS, 10

TOTAL TRIBUTARY AREA (ACRES), 155.60

Lower Cragmor Drainage Master Plan BASIN 1 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

*** CONTINUITY CHECK FOR SUBCATCHMENT ROUTING IN UDSWM2-PC MODEL ***

WATERSHED AREA (ACRES)	155.600
TOTAL RAINFALL (INCHES)	3.102
TOTAL INFILTRATION (INCHES)	.362
TOTAL WATERSHED OUTFLOW (INCHES)	2.435
TOTAL SURFACE STORAGE AT END OF STROM (INCHES)	.297
ERROR IN CONTINUITY, PERCENTAGE OF RAINFALL	.261

Lower Cragmor Drainage Master Plan BASIN 1 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

GUTTER NUMBER	GUTTER CONNECTION	NDP	NP		WIDTH OR DIAM (FT)	LENGTH (FT)	INVERT SLOPE (FT/FT)	SIDE SLOPES HORIZ TO VERT L	R	OVERBANK/SURCHARGE MANNING N	DEPTH (FT)	JK
-1					1.0	1.	1.0000	107.0	107.0	1.600	1.00	
101	399	0	1	CHANNEL	10.0	1020.	.0140	3.0	3.0	.026	10.00	0
399	391	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
102	391	0	1	CHANNEL	10.0	1050.	.0160	3.0	3.0	.032	10.00	0
391	103	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	265
		DIVERSION TO GUTTER NUMBER 265 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0 8.5	76.0	65.0	200.0	65.0				
103	305	0	1	CHANNEL	18.0	1320.	.0110	3.0	3.0	.026	10.00	0
305	105	4	1	CHANNEL	10.0	1.	.0010	3.0	3.0	.026	10.00	266
		DIVERSION TO GUTTER NUMBER 266 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0 8.5	82.0	70.0	200.0	70.0				
105	306	0	1	CHANNEL	10.0	2820.	.0110	3.0	3.0	.026	10.00	0
306	397	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
108	307	0	1	CHANNEL	10.0	400.	.0150	3.0	3.0	.026	10.00	0
307	110	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
110	390	0	1	CHANNEL	10.0	1150.	.0090	3.0	3.0	.026	10.00	0
390	396	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
104	398	0	1	CHANNEL	18.0	1390.	.0120	3.0	3.0	.026	10.00	0
398	106	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	269
		DIVERSION TO GUTTER NUMBER 269 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0 7.0	60.0	40.0	200.0	40.0				
106	303	0	1	CHANNEL	18.0	1330.	.0110	3.0	3.0	.026	10.00	0
303	107	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	267
		DIVERSION TO GUTTER NUMBER 267 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0 8.5	71.0	60.0	200.0	60.0				
107	304	0	1	CHANNEL	18.0	1580.	.0110	3.0	3.0	.026	10.00	0
304	109	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	268
		DIVERSION TO GUTTER NUMBER 268 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0 9.0	167.0	150.0	300.0	150.0				
109	392	0	1	CHANNEL	10.0	1150.	.0100	3.0	3.0	.026	10.00	0
392	397	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
-1					1.0	1.	1.0000	107.0	107.0	1.000	1.00	
265	269	0	2	PIPE	6.0	1970.	.0090	.0	.0	.013	6.00	0
269	267	0	2	PIPE	6.0	1330.	.0090	.0	.0	.013	6.00	0
266	267	0	2	PIPE	6.0	1250.	.0050	.0	.0	.013	6.00	0
267	268	0	2	PIPE	6.0	1580.	.0110	.0	.0	.013	6.00	0

TOTAL NUMBER OF GUTTERS/PIPES, 24

Lower Cragmor Drainage Master Plan BASIN 1 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

ARRANGEMENT OF SUBCATCHMENTS AND GUTTERS/PIPES

GUTTER	TRIBUTARY GUTTER/PIPE										TRIBUTARY SUBAREA										D.A.(AC)
101	0	0	0	0	0	0	0	0	0	0	101	0	0	0	0	0	0	0	0	0	7.4
102	0	0	0	0	0	0	0	0	0	0	102	0	0	0	0	0	0	0	0	0	17.2
103	391	0	0	0	0	0	0	0	0	0	103	0	0	0	0	0	0	0	0	0	34.3
104	0	0	0	0	0	0	0	0	0	0	104	0	0	0	0	0	0	0	0	0	22.7
105	305	0	0	0	0	0	0	0	0	0	105	0	0	0	0	0	0	0	0	0	46.9
106	398	0	0	0	0	0	0	0	0	0	106	0	0	0	0	0	0	0	0	0	32.8
107	303	0	0	0	0	0	0	0	0	0	107	0	0	0	0	0	0	0	0	0	71.3
108	0	0	0	0	0	0	0	0	0	0	108	0	0	0	0	0	0	0	0	0	3.6
109	304	0	0	0	0	0	0	0	0	0	109	0	0	0	0	0	0	0	0	0	96.6
110	307	0	0	0	0	0	0	0	0	0	110	0	0	0	0	0	0	0	0	0	12.1
265	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
266	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
267	269	266	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
269	265	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
303	106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32.8
304	107	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71.3
305	103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34.3
306	105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	46.9
307	108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.6
390	110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12.1
391	399	102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24.6
392	109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96.6
398	104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22.7
399	101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.4

Lower Cragmor Drainage Master Plan BASIN 1 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

*** PEAK FLOWS, STAGES AND STORAGES OF GUTTERS AND DETENSION DAMS ***

CONVEYANCE ELEMENT	PEAK (CFS)	STAGE (FT)	STORAGE (AC-FT)	TIME (HR/MIN)
104	111.	1.0		0 32.
398	111.	1.9		0 32.
101	37.	.7		0 32.
106	110.	1.0		0 35.
102	80.	1.1		0 32.
399	37.	(DIRECT FLOW)		0 32.
303	110.	1.9		0 35.
391	117.	2.0		0 32.
107	180.	1.3		0 36.
103	88.	.9		0 35.
108	25.	.5		0 30.
304	180.	2.5		0 36.
305	88.	2.2		0 35.
307	25.	(DIRECT FLOW)		0 30.
265	65.	1.6		0 41.
109	126.	1.4		0 36.
105	60.	.9		0 36.
110	62.	1.0		0 33.
266	69.	2.0		0 37.
269	105.	2.1		0 41.
392	126.	(DIRECT FLOW)		0 36.
306	60.	(DIRECT FLOW)		0 36.
390	62.	(DIRECT FLOW)		0 33.
267	232.	3.1		0 39.
397	186.	(DIRECT FLOW)		0 36.
396	62.	(DIRECT FLOW)		0 33.
268	382.	(DIRECT FLOW)		0 39.

BASINS 2,3,5; 100 YR

ENVIRONMENTAL PROTECTION AGENCY - STORM WATER MANAGEMENT MODEL - VERSION PC.1

DEVELOPED BY METCALF + EDDY, INC.

UNIVERSITY OF FLORIDA

WATER RESOURCES ENGINEEERS, INC. (SEPTEMBER 1970)

UPDATED BY UNIVERSITY OF FLORIDA (JUNE 1973)

HYDROLOGIC ENGINEERING CENTER, CORPS OF ENGINEERS

MISSOURI RIVER DIVISION, CORPS OF ENGINEERS (SEPTEMBER 1974)

BOYLE ENGINEERING CORPORATION (MARCH 1985, JULY 1985)

TAPE OR DISK ASSIGNMENTS

JIN(1)	JIN(2)	JIN(3)	JIN(4)	JIN(5)	JIN(6)	JIN(7)	JIN(8)	JIN(9)	JIN(10)
2	1	0	0	0	0	0	0	0	0

JOUT(1)	JOUT(2)	JOUT(3)	JOUT(4)	JOUT(5)	JOUT(6)	JOUT(7)	JOUT(8)	JOUT(9)	JOUT(10)
1	2	0	0	0	0	0	0	0	0

NSCRAT(1)	NSCRAT(2)	NSCRAT(3)	NSCRAT(4)	NSCRAT(5)
3	4	0	0	0

WATERSHED   PROGRAM CALLED

*** ENTRY MADE TO RUNOFF MODEL ***

Lower Cragmor Drainage Master Plan BASINS 2,3,5 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

NUMBER OF TIME STEPS 120

INTEGRATION TIME INTERVAL (MINUTES)   1.00

10.0 PERCENT OF IMPERVIOUS AREA HAS ZERO DETENTION DEPTH

FOR   24 RAINFALL STEPS, THE TIME INTERVAL IS   5.00 MINUTES

FOR RAINGAGE NUMBER   1   RAINFALL HISTORY IN INCHES PER HOUR

.32	.97	1.49	2.59	4.54	8.10	4.54	2.59	2.01	1.62
1.30	1.30	1.30	.65	.65	.39	.39	.39	.39	.39
.39	.39	.39	.39						

Lower Cragmor Drainage Master Plan BASINS 2,3,5 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

SUBAREA NUMBER	GUTTER OR MANHOLE	WIDTH (FT)	AREA (AC)	PERCENT IMPERV.	SLOPE (FT/FT)	RESISTANCE FACTOR IMPERV.	RESISTANCE FACTOR PERV.	SURFACE STORAGE(IN) IMPERV.	SURFACE STORAGE(IN) PERV.	INFILTRATION RATE(IN/HR) MAXIMUM	INFILTRATION RATE(IN/HR) MINIMUM	INFILTRATION RATE(IN/HR) DECAY RATE	GAGE NO
300	300	2160.	22.6	65.0	.0200	.020	.250	.100	.350	4.50	.60	.00180	1
301	301	1250.	15.6	65.0	.0250	.020	.250	.100	.350	4.50	.60	.00180	1
302	302	2340.	4.8	65.0	.0200	.020	.250	.100	.350	4.50	.60	.00180	1
333	333	720.	11.2	65.0	.0240	.020	.250	.100	.350	4.50	.60	.00180	1
334	5	910.	9.7	65.0	.0200	.020	.250	.100	.350	4.50	.60	.00180	1
321	321	780.	7.8	65.0	.0400	.020	.250	.100	.350	4.50	.60	.00180	1
322	322	624.	3.2	65.0	.0140	.020	.250	.100	.350	4.50	.60	.00180	1
323	323	1200.	13.6	65.0	.0150	.020	.250	.100	.350	4.50	.60	.00180	1
324	324	1900.	5.1	68.0	.0360	.020	.250	.100	.350	4.50	.60	.00180	1
325	325	2700.	14.4	70.0	.0080	.020	.250	.100	.350	4.50	.60	.00180	1
326	326	3200.	21.8	70.0	.0070	.020	.250	.100	.350	4.50	.60	.00180	1
327	327	1780.	8.1	70.0	.0190	.020	.250	.100	.350	4.50	.60	.00180	1
328	328	1350.	23.7	70.0	.0150	.020	.250	.100	.350	4.50	.60	.00180	1
340	7	1000.	4.7	65.0	.0060	.020	.250	.100	.350	4.50	.60	.00180	1
335	335	1560.	9.2	65.0	.0260	.020	.250	.100	.350	4.50	.60	.00180	1
336	336	1560.	9.4	65.0	.0140	.020	.250	.100	.350	4.50	.60	.00180	1
337	337	1500.	11.2	65.0	.0170	.020	.250	.100	.350	4.50	.60	.00180	1
338	338	1750.	7.9	65.0	.0160	.020	.250	.100	.350	4.50	.60	.00180	1
339	339	1750.	7.9	65.0	.0170	.020	.250	.100	.350	4.50	.60	.00180	1
341	341	1750.	8.1	65.0	.0140	.020	.250	.100	.350	4.50	.60	.00180	1
342	342	1750.	3.8	65.0	.0200	.020	.250	.100	.350	4.50	.60	.00180	1
343	343	2500.	9.5	70.0	.0200	.020	.250	.100	.350	4.50	.60	.00180	1
344	344	1500.	21.9	70.0	.0040	.020	.250	.100	.350	4.50	.60	.00180	1
345	345	480.	3.3	65.0	.0230	.020	.250	.100	.350	4.50	.60	.00180	1
352	352	1280.	14.1	95.0	.0060	.020	.250	.100	.350	4.50	.60	.00180	1
354	354	1992.	17.7	65.0	.0130	.020	.250	.100	.350	4.50	.60	.00180	1
355	355	2160.	10.2	65.0	.0150	.020	.250	.100	.350	4.50	.60	.00180	1
356	356	880.	12.1	65.0	.0170	.020	.250	.100	.350	4.50	.60	.00180	1
357	30	2720.	17.3	65.0	.0190	.020	.250	.100	.350	4.50	.60	.00180	1
350	350	1600.	15.6	70.0	.0120	.020	.250	.100	.350	4.50	.60	.00180	1

TOTAL NUMBER OF SUBCATCHMENTS, 30

TOTAL TRIBUTARY AREA (ACRES), 345.56

Lower Cragmor Drainage Master Plan BASINS 2,3,5 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

*** CONTINUITY CHECK FOR SUBCATCHMENT ROUTING IN UDSWM2-PC MODEL ***

WATERSHED AREA (ACRES)	345.560
TOTAL RAINFALL (INCHES)	3.123
TOTAL INFILTRATION (INCHES)	.398
TOTAL WATERSHED OUTFLOW (INCHES)	2.449
TOTAL SURFACE STORAGE AT END OF STROM (INCHES)	.270
ERROR IN CONTINUITY, PERCENTAGE OF RAINFALL	.198

Lower Cragmor Drainage Master Plan BASINS 2,3,5 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

GUTTER NUMBER	GUTTER CONNECTION	NDP	NP		WIDTH OR DIAM (FT)	LENGTH (FT)	INVERT SLOPE (FT/FT)	SIDE SLOPES HORIZ TO VERT L	R	OVERBANK/SURCHARGE MANNING N	DEPTH (FT)	JK
-1					1.0	1.	1.0000	107.0	107.0	1.400	1.00	
300	200	0	1	CHANNEL	18.0	1750.	.0130	3.0	3.0	.022	10.00	0
200	1	3	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.022	10.00	306
DIVERSION TO GUTTER NUMBER 306 - TOTAL Q VS DIVERTED Q IN CFS												
		.0	.0	42.0	28.0	500.0	28.0					
1	120	0	1	CHANNEL	18.0	550.	.0210	3.0	3.0	.022	10.00	0
301	120	0	1	CHANNEL	18.0	1250.	.0200	3.0	3.0	.022	10.00	0
120	2	2	1	CHANNEL	.0	1.	.0010	3.0	3.0	.022	10.00	4
DIVERSION TO GUTTER NUMBER 4 - TOTAL Q VS DIVERTED Q IN CFS												
		.0	.0	400.0	220.0							
2	202	0	1	CHANNEL	18.0	300.	.0180	3.0	3.0	.022	10.00	0
4	201	0	1	CHANNEL	18.0	465.	.0060	3.0	3.0	.022	10.00	0
302	202	0	1	CHANNEL	18.0	1300.	.0230	3.0	3.0	.022	10.00	0
202	3	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
3	203	0	1	CHANNEL	18.0	305.	.0130	3.0	3.0	.022	10.00	0
203	8	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
335	203	0	1	CHANNEL	18.0	1300.	.0220	3.0	3.0	.022	10.00	0
8	204	0	1	CHANNEL	18.0	370.	.0170	3.0	3.0	.022	10.00	0
336	204	0	1	CHANNEL	18.0	1300.	.0130	3.0	3.0	.022	10.00	0
201	5	4	1	CHANNEL	15.0	1.	.0010	3.0	3.0	.022	10.00	307
DIVERSION TO GUTTER NUMBER 307 - TOTAL Q VS DIVERTED Q IN CFS												
		.0	.0	10.0	8.5	123.0	110.0	500.0	110.0			
333	201	0	1	CHANNEL	15.0	720.	.0140	3.0	3.0	.025	10.00	0
5	122	0	1	CHANNEL	15.0	650.	.0100	3.0	3.0	.022	10.00	0
122	7	3	1	CHANNEL	15.0	1.	.0010	3.0	3.0	.022	10.00	308
DIVERSION TO GUTTER NUMBER 308 - TOTAL Q VS DIVERTED Q IN CFS												
		.0	.0	35.0	35.0	500.0	35.0					
7	204	0	1	CHANNEL	15.0	650.	.0080	3.0	3.0	.022	10.00	0
204	9	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.022	10.00	320
DIVERSION TO GUTTER NUMBER 320 - TOTAL Q VS DIVERTED Q IN CFS												
		.0	.0	10.0	8.5	111.0	94.0	500.0	94.0			
321	205	0	1	CHANNEL	30.0	780.	.0240	3.0	3.0	.022	10.00	0
205	11	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
11	124	0	1	CHANNEL	30.0	300.	.0190	3.0	3.0	.022	10.00	0
322	124	0	1	CHANNEL	18.0	520.	.0220	3.0	3.0	.022	10.00	0
124	12	2	1	CHANNEL	30.0	1.	.0010	3.0	3.0	.022	10.00	337
DIVERSION TO GUTTER NUMBER 337 - TOTAL Q VS DIVERTED Q IN CFS												
		.0	.0	400.0	200.0							
12	125	0	1	CHANNEL	30.0	270.	.0150	3.0	3.0	.022	10.00	0
323	125	0	1	CHANNEL	18.0	1000.	.0210	3.0	3.0	.022	10.00	0
125	249	0	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.022	10.00	0
249	13	2	1	CHANNEL	30.0	1.	.0010	3.0	3.0	.022	10.00	338
DIVERSION TO GUTTER NUMBER 338 - TOTAL Q VS DIVERTED Q IN CFS												
		.0	.0	400.0	200.0							
13	126	0	1	CHANNEL	30.0	275.	.0190	3.0	3.0	.022	10.00	0
126	339	2	1	CHANNEL	25.0	1.	.0010	3.0	3.0	.022	10.00	14
DIVERSION TO GUTTER NUMBER 14 - TOTAL Q VS DIVERTED Q IN CFS												
		.0	.0	400.0	200.0							
324	126	0	1	CHANNEL	10.0	950.	.0210	3.0	3.0	.022	10.00	0
14	127	0	1	CHANNEL	25.0	280.	.0130	3.0	3.0	.022	10.00	0
127	341	2	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.022	10.00	15
DIVERSION TO GUTTER NUMBER 15 - TOTAL Q VS DIVERTED Q IN CFS												

325	127	0	1	CHANNEL	18.0	1350.	.0200	3.0	3.0	.022	10.00	0
15	206	0	1	CHANNEL	18.0	155.	.0030	3.0	3.0	.022	10.00	0
206	342	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.022	10.00	304
		DIVERSION TO GUTTER NUMBER 304 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	59.0	50.0	500.0	50.0			
326	206	0	1	CHANNEL	18.0	1600.	.0110	3.0	3.0	.022	10.00	0
327	214	0	1	CHANNEL	10.0	890.	.0190	3.0	3.0	.028	10.00	0
214	328	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
328	129	0	1	CHANNEL	18.0	1350.	.0120	3.0	3.0	.022	10.00	0
129	250	4	1	CHANNEL	18.0	1.	.0110	3.0	3.0	.022	10.00	305
		DIVERSION TO GUTTER NUMBER 305 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	59.0	50.0	500.0	50.0			
250	344	2	1	CHANNEL	25.0	1.	.0030	3.0	3.0	.022	10.00	17
		DIVERSION TO GUTTER NUMBER 17 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	400.0	200.0							
17	128	0	1	CHANNEL	25.0	190.	.0030	3.0	3.0	.022	10.00	0
128	343	2	1	CHANNEL	18.0	1.	.0100	3.0	3.0	.022	10.00	16
		DIVERSION TO GUTTER NUMBER 16 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	400.0	200.0							
16	206	0	1	CHANNEL	18.0	1250.	.0100	3.0	3.0	.022	10.00	0
9	207	0	1	CHANNEL	25.0	285.	.0070	3.0	3.0	.022	10.00	0
-1					1.0	1.	1.0000	107.0	107.0	1.600	1.00	
337	207	0	1	CHANNEL	18.0	1250.	.0140	3.0	3.0	.026	10.00	0
338	130	0	1	CHANNEL	18.0	1250.	.0140	3.0	3.0	.026	10.00	0
339	111	0	1	CHANNEL	18.0	950.	.0210	3.0	3.0	.026	10.00	0
341	208	0	1	CHANNEL	18.0	1250.	.0080	3.0	3.0	.026	10.00	0
342	112	0	1	CHANNEL	18.0	1250.	.0200	3.0	3.0	.026	10.00	0
343	113	0	1	CHANNEL	18.0	1250.	.0100	3.0	3.0	.026	10.00	0
344	209	0	1	CHANNEL	18.0	1250.	.0110	3.0	3.0	.026	10.00	0
345	207	0	1	CHANNEL	20.0	300.	.0050	3.0	3.0	.026	10.00	0
207	20	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	296
		DIVERSION TO GUTTER NUMBER 296 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	106.0	90.0	600.0	90.0			
20	130	0	1	CHANNEL	25.0	280.	.0070	3.0	3.0	.026	10.00	0
130	251	4	1	CHANNEL	18.0	1.	.0080	3.0	3.0	.026	10.00	309
		DIVERSION TO GUTTER NUMBER 309 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	88.0	75.0	800.0	75.0			
251	21	2	1	CHANNEL	18.0	1.	.0080	3.0	3.0	.026	10.00	355
		DIVERSION TO GUTTER NUMBER 355 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	800.0	400.0							
21	111	0	1	CHANNEL	18.0	260.	.0080	3.0	3.0	.026	10.00	0
111	252	4	1	CHANNEL	18.0	1.	.0050	3.0	3.0	.026	10.00	310
		DIVERSION TO GUTTER NUMBER 310 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	107.0	91.0	500.0	91.0			
252	22	2	1	CHANNEL	18.0	1.	.0050	3.0	3.0	.026	10.00	33
		DIVERSION TO GUTTER NUMBER 33 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	800.0	400.0							
22	208	0	1	CHANNEL	18.0	280.	.0050	3.0	3.0	.026	10.00	0
208	23	0	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	0
23	112	0	1	CHANNEL	18.0	140.	.0100	3.0	3.0	.026	10.00	0
112	254	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	393
		DIVERSION TO GUTTER NUMBER 393 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	118.0	100.0	800.0	100.0			
254	354	2	1	CHANNEL	18.0	1.	.0080	3.0	3.0	.026	10.00	24
		DIVERSION TO GUTTER NUMBER 24 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	800.0	400.0							
24	113	0	1	CHANNEL	18.0	270.	.0080	3.0	3.0	.026	10.00	0
113	25	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	295
		DIVERSION TO GUTTER NUMBER 295 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	59.0	50.0	800.0	50.0			
25	209	0	1	CHANNEL	25.0	240.	.0030	3.0	3.0	.026	10.00	0
209	352	3	1	CHANNEL	18.0	1.	.0070	3.0	3.0	.026	10.00	311
		DIVERSION TO GUTTER NUMBER 311 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	106.0	71.0	800.0	71.0					
350	213	0	1	CHANNEL	18.0	1600.	.0060	3.0	3.0	.026	10.00	0

213	35	4	1	CHANNEL	18.0	1.	.0090	3.0	3.0	.026	10.00	312
		DIVERSION TO GUTTER NUMBER 312 - TOTAL Q VS DIVERTED Q IN CFS										
		.0 .0 10.0 8.5 201.0 171.0 800.0 171.0										
35	220	0	1	CHANNEL	18.0	320.	.0090	3.0	3.0	.026	10.00	0
354	116	0	1	CHANNEL	25.0	1660.	.0050	3.0	3.0	.026	10.00	0
30	210	0	1	CHANNEL	18.0	1360.	.0130	3.0	3.0	.026	10.00	0
210	31	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
355	211	0	1	CHANNEL	25.0	1080.	.0040	3.0	3.0	.026	10.00	0
31	211	0	1	CHANNEL	18.0	230.	.0090	3.0	3.0	.026	10.00	0
211	32	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
32	212	0	1	CHANNEL	25.0	320.	.0090	3.0	3.0	.026	10.00	0
33	212	0	1	CHANNEL	18.0	750.	.0030	3.0	3.0	.026	10.00	0
212	34	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
34	215	0	1	CHANNEL	25.0	1400.	.0070	3.0	3.0	.026	10.00	0
356	215	0	1	CHANNEL	18.0	800.	.0030	3.0	3.0	.026	10.00	0
215	116	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	386
		DIVERSION TO GUTTER NUMBER 386 - TOTAL Q VS DIVERTED Q IN CFS										
		.0 .0 10.0 8.5 153.0 130.0 800.0 130.0										
116	131	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	387
		DIVERSION TO GUTTER NUMBER 387 - TOTAL Q VS DIVERTED Q IN CFS										
		.0 .0 10.0 8.5 106.0 90.0 800.0 90.0										
-1					1.0	1.	1.0000	107.0	107.0	1.000	1.00	
306	307	0	2	PIPE	10.0	1015.	.0140	.0	.0	.013	10.00	0
307	0	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
308	320	0	2	PIPE	10.0	760.	.0200	.0	.0	.013	10.00	0
320	296	0	2	PIPE	10.0	285.	.0070	.0	.0	.013	10.00	0
296	309	0	2	PIPE	10.0	280.	.0070	.0	.0	.013	10.00	0
309	310	0	2	PIPE	10.0	260.	.0080	.0	.0	.013	10.00	0
310	393	0	2	PIPE	10.0	520.	.0070	.0	.0	.013	10.00	0
393	295	0	2	PIPE	10.0	270.	.0080	.0	.0	.013	10.00	0
295	311	0	2	PIPE	10.0	240.	.0050	.0	.0	.013	10.00	0
304	305	0	2	PIPE	10.0	640.	.0040	.0	.0	.013	10.00	0
305	311	0	2	PIPE	10.0	1250.	.0110	.0	.0	.013	10.00	0
311	312	0	2	PIPE	10.0	1280.	.0070	.0	.0	.013	10.00	0
312	0	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
386	387	0	2	PIPE	10.0	680.	.0070	.0	.0	.013	10.00	0
387	0	0	3		.0	1.	.0010	.0	.0	.001	10.00	0

TOTAL NUMBER OF GUTTERS/PIPES, 103

Lower Cragmor Drainage Master Plan BASINS 2,3,5 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

ARRANGEMENT OF SUBCATCHMENTS AND GUTTERS/PIPES

GUTTER	TRIBUTARY GUTTER/PIPE										TRIBUTARY SUBAREA										D.A.(AC)
1	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22.6
2	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38.2
3	202	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43.1
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
5	201	0	0	0	0	0	0	0	0	0	334	0	0	0	0	0	0	0	0	0	20.9
7	122	0	0	0	0	0	0	0	0	0	340	0	0	0	0	0	0	0	0	0	25.6
8	203	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52.3
9	204	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	87.3
11	205	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.8
12	124	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11.0
13	249	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24.6
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
20	207	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	101.8
21	251	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	109.7
22	252	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	147.3
23	208	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	169.8
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
25	113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9.5
30	0	0	0	0	0	0	0	0	0	0	357	0	0	0	0	0	0	0	0	0	17.3
31	210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17.3
32	211	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.5
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
34	212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.5

111	339	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	147.3
112	342	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	195.4
113	343	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9.5
116	354	215	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	252.7
120	1	301	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38.2
122	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20.9
124	11	322	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11.0
125	12	323	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24.6
126	13	324	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29.7
127	14	325	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14.4
128	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
129	328	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31.8
130	338	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	109.7
200	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22.6
201	4	333	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11.2
202	2	302	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43.1
203	3	335	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52.3
204	8	336	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	87.3
205	321	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.8
206	15	326	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21.8
207	9	337	345	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	101.8
208	341	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	169.8
209	344	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	63.2
210	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17.3
211	355	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.5
212	32	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.5
213	350	352	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	92.9
214	327	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8.1
215	34	356	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39.6
249	125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24.6
250	129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31.8
251	130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	109.7
252	111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	147.3

254	112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	195.4
295	393	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
296	320	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
300	0	0	0	0	0	0	0	0	0	0	300	0	0	0	0	0	0	0	0	22.6
301	0	0	0	0	0	0	0	0	0	0	301	0	0	0	0	0	0	0	0	15.6
302	0	0	0	0	0	0	0	0	0	0	302	0	0	0	0	0	0	0	0	4.8
304	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
305	304	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
306	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
307	306	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
308	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
309	296	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
310	309	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
311	295	305	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
312	311	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
320	308	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
321	0	0	0	0	0	0	0	0	0	0	321	0	0	0	0	0	0	0	0	7.8
322	0	0	0	0	0	0	0	0	0	0	322	0	0	0	0	0	0	0	0	3.2
323	0	0	0	0	0	0	0	0	0	0	323	0	0	0	0	0	0	0	0	13.6
324	0	0	0	0	0	0	0	0	0	0	324	0	0	0	0	0	0	0	0	5.1
325	0	0	0	0	0	0	0	0	0	0	325	0	0	0	0	0	0	0	0	14.4
326	0	0	0	0	0	0	0	0	0	0	326	0	0	0	0	0	0	0	0	21.8
327	0	0	0	0	0	0	0	0	0	0	327	0	0	0	0	0	0	0	0	8.1
328	214	0	0	0	0	0	0	0	0	0	328	0	0	0	0	0	0	0	0	31.8
333	0	0	0	0	0	0	0	0	0	0	333	0	0	0	0	0	0	0	0	11.2
335	0	0	0	0	0	0	0	0	0	0	335	0	0	0	0	0	0	0	0	9.2
336	0	0	0	0	0	0	0	0	0	0	336	0	0	0	0	0	0	0	0	9.4
337	0	0	0	0	0	0	0	0	0	0	337	0	0	0	0	0	0	0	0	11.2
338	0	0	0	0	0	0	0	0	0	0	338	0	0	0	0	0	0	0	0	7.9
339	126	0	0	0	0	0	0	0	0	0	339	0	0	0	0	0	0	0	0	37.6
341	127	0	0	0	0	0	0	0	0	0	341	0	0	0	0	0	0	0	0	22.5
342	206	0	0	0	0	0	0	0	0	0	342	0	0	0	0	0	0	0	0	25.6
[illegible]	[illegible]	0	0	0	0	0	0	0	0	0	[illegible]	0	0	0	0	0	0	0	0	[illegible]

344	250	0	0	0	0	0	0	0	0	0	344	0	0	0	0	0	0	0	0	53.7
345	0	0	0	0	0	0	0	0	0	0	345	0	0	0	0	0	0	0	0	3.3
350	0	0	0	0	0	0	0	0	0	0	350	0	0	0	0	0	0	0	0	15.6
352	209	0	0	0	0	0	0	0	0	0	352	0	0	0	0	0	0	0	0	77.3
354	254	0	0	0	0	0	0	0	0	0	354	0	0	0	0	0	0	0	0	213.1
355	0	0	0	0	0	0	0	0	0	0	355	0	0	0	0	0	0	0	0	10.2
356	0	0	0	0	0	0	0	0	0	0	356	0	0	0	0	0	0	0	0	12.1
386	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
387	386	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
393	310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0

ORDER OF TREE STRUCTURE (NGUT VALUE) DECREASES THROUGH DIVERSION FROM GUTTER 5 TO GUTTER 4 COMP THROUGH DIVERSION WILL LAG ONE TIME
ORDER OF TREE STRUCTURE (NGUT VALUE) DECREASES THROUGH DIVERSION FROM GUTTER 40 TO GUTTER 14 COMP THROUGH DIVERSION WILL LAG ONE TIME
ORDER OF TREE STRUCTURE (NGUT VALUE) DECREASES THROUGH DIVERSION FROM GUTTER 50 TO GUTTER 16 COMP THROUGH DIVERSION WILL LAG ONE TIME
ORDER OF TREE STRUCTURE (NGUT VALUE) DECREASES THROUGH DIVERSION FROM GUTTER 53 TO GUTTER 33 COMP THROUGH DIVERSION WILL LAG ONE TIME
ORDER OF TREE STRUCTURE (NGUT VALUE) DECREASES THROUGH DIVERSION FROM GUTTER 54 TO GUTTER 15 COMP THROUGH DIVERSION WILL LAG ONE TIME
ORDER OF TREE STRUCTURE (NGUT VALUE) DECREASES THROUGH DIVERSION FROM GUTTER 68 TO GUTTER 17 COMP THROUGH DIVERSION WILL LAG ONE TIME
ORDER OF TREE STRUCTURE (NGUT VALUE) DECREASES THROUGH DIVERSION FROM GUTTER 88 TO GUTTER 24 COMP THROUGH DIVERSION WILL LAG ONE TIME

Lower Cragmor Drainage Master Plan BASINS 2,3,5 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

HYDROGRAPHS ARE LISTED FOR THE FOLLOWING   5 CONVEYANCE ELEMENTS

THE UPPER NUMBER IS DISCHARGE IN CFS
THE LOWER NUMBER IS ONE OF THE FOLLOWING CASES:
( ) DENOTES DEPTH ABOVE INVERT IN FEET
(S) DENOTES STORAGE IN AC-FT FOR DETENSION DAM. DISCHARGE INCLUDES SPILLWAY OUTFLOW.
(I) DENOTES GUTTER INFLOW IN CFS FROM SPECIFIED INFLOW HYDROGRAPH
(D) DENOTES DISCHARGE IN CFS DIVERTED FROM THIS GUTTER
(D) DENOTES STORAGE IN AC-FT FOR SURCHARGED GUTTER

TIME(HR/MIN)	307	131	35	312	387
0 1.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 2.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 3.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 4.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 5.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 6.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 7.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 8.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 9.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 10.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 11.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 12.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 13.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 14.	0.	0.	0.	0.	0.
	.0( )	.0( )	.0( )	.0( )	.0( )
0 15.	1.	0.	0.	0.	0.

0	16.	1.	0.	0.	1.	1.
		.0( )	.0( )	.0( )	.0( )	.0( )
0	17.	2.	0.	0.	1.	1.
		.0( )	.0( )	.0( )	.0( )	.0( )
0	18.	4.	0.	0.	3.	2.
		.0( )	.0( )	.0( )	.0( )	.0( )
0	19.	6.	0.	0.	6.	3.
		.0( )	.0( )	.0( )	.0( )	.0( )
0	20.	9.	1.	0.	11.	4.
		.0( )	.0( )	.0( )	.0( )	.0( )
0	21.	13.	1.	0.	20.	7.
		.0( )	.0( )	.0( )	.0( )	.0( )
0	22.	19.	1.	0.	37.	10.
		.0( )	.0( )	.0( )	.0( )	.0( )
0	23.	26.	2.	1.	63.	14.
		.0( )	.0( )	.1( )	.0( )	.0( )
0	24.	35.	2.	1.	101.	19.
		.0( )	.0( )	.1( )	.0( )	.0( )
0	25.	44.	3.	2.	150.	26.
		.0( )	.0( )	.1( )	.0( )	.0( )
0	26.	55.	4.	3.	211.	35.
		.0( )	.0( )	.1( )	.0( )	.0( )
0	27.	68.	5.	5.	285.	47.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	28.	82.	6.	7.	371.	63.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	29.	96.	8.	9.	472.	83.
		.0( )	.0( )	.2( )	.0( )	.0( )
0	30.	112.	9.	12.	582.	106.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	31.	124.	11.	15.	687.	131.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	32.	133.	13.	18.	764.	157.
		.0( )	.0( )	.4( )	.0( )	.0( )
0	33.	137.	15.	20.	809.	182.
		.0( )	.0( )	.4( )	.0( )	.0( )
0	34.	138.	18.	23.	839.	203.
		.0( )	.0( )	.4( )	.0( )	.0( )
0	35.	137.	33.	25.	861.	214.
		.0( )	.0( )	.4( )	.0( )	.0( )
0	36.	135.	51.	27.	875.	219.
		.0( )	.0( )	.5( )	.0( )	.0( )
0	37.	130.	64.	32.	877.	220.

0	38.	125.	72.	38.	877.	220.
		.0( )	.0( )	.6( )	.0( )	.0( )
0	39.	119.	75.	43.	876.	220.
		.0( )	.0( )	.6( )	.0( )	.0( )
0	40.	114.	73.	44.	873.	220.
		.0( )	.0( )	.6( )	.0( )	.0( )
0	41.	109.	68.	40.	865.	220.
		.0( )	.0( )	.6( )	.0( )	.0( )
0	42.	104.	58.	35.	852.	220.
		.0( )	.0( )	.5( )	.0( )	.0( )
0	43.	99.	47.	31.	832.	220.
		.0( )	.0( )	.5( )	.0( )	.0( )
0	44.	95.	34.	28.	808.	220.
		.0( )	.0( )	.5( )	.0( )	.0( )
0	45.	91.	20.	26.	780.	220.
		.0( )	.0( )	.4( )	.0( )	.0( )
0	46.	88.	15.	24.	747.	213.
		.0( )	.0( )	.4( )	.0( )	.0( )
0	47.	84.	14.	22.	712.	203.
		.0( )	.0( )	.4( )	.0( )	.0( )
0	48.	81.	13.	20.	676.	192.
		.0( )	.0( )	.4( )	.0( )	.0( )
0	49.	78.	12.	19.	640.	181.
		.0( )	.0( )	.4( )	.0( )	.0( )
0	50.	76.	12.	18.	607.	171.
		.0( )	.0( )	.4( )	.0( )	.0( )
0	51.	73.	11.	17.	577.	162.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	52.	71.	10.	16.	551.	153.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	53.	69.	10.	15.	527.	145.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	54.	66.	9.	14.	505.	138.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	55.	64.	9.	13.	484.	132.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	56.	62.	8.	13.	463.	125.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	57.	59.	8.	12.	445.	120.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	58.	57.	8.	12.	428.	115.
		.0( )	.0( )	.3( )	.0( )	.0( )
0	59.	56.	7.	11.	412.	110.

1	0.	54.	7.	11.	397.	106.
		.0( )	.0( )	.3( )	.0( )	.0( )
1	1.	53.	7.	10.	384.	102.
		.0( )	.0( )	.3( )	.0( )	.0( )
1	2.	52.	7.	10.	373.	99.
		.0( )	.0( )	.3( )	.0( )	.0( )
1	3.	50.	6.	10.	362.	96.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	4.	50.	6.	9.	353.	93.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	5.	49.	6.	9.	345.	90.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	6.	48.	6.	9.	337.	88.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	7.	47.	6.	9.	330.	85.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	8.	45.	6.	8.	322.	83.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	9.	43.	5.	8.	313.	80.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	10.	42.	5.	8.	304.	78.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	11.	40.	5.	8.	293.	75.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	12.	38.	5.	7.	283.	73.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	13.	37.	5.	7.	272.	70.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	14.	35.	4.	7.	261.	68.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	15.	34.	4.	7.	251.	65.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	16.	33.	4.	7.	241.	63.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	17.	31.	4.	6.	232.	61.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	18.	30.	4.	6.	223.	58.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	19.	29.	4.	6.	214.	56.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	20.	27.	4.	6.	205.	54.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	21.	26.	3.	5.	197.	52.
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

1	22.	25.	3.	5.	189.	50.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	23.	24.	3.	5.	181.	48.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	24.	23.	3.	5.	174.	46.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	25.	22.	3.	5.	167.	45.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	26.	21.	3.	5.	161.	43.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	27.	21.	3.	4.	155.	41.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	28.	20.	3.	4.	149.	40.
		.0( )	.0( )	.2( )	.0( )	.0( )
1	29.	19.	3.	4.	144.	39.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	30.	19.	2.	4.	139.	37.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	31.	18.	2.	4.	134.	36.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	32.	17.	2.	4.	130.	35.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	33.	17.	2.	4.	126.	34.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	34.	16.	2.	4.	122.	33.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	35.	16.	2.	3.	119.	32.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	36.	16.	2.	3.	116.	31.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	37.	15.	2.	3.	113.	30.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	38.	15.	2.	3.	110.	29.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	39.	15.	2.	3.	108.	28.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	40.	14.	2.	3.	106.	28.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	41.	14.	2.	3.	103.	27.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	42.	14.	2.	3.	101.	27.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	43.	14.	2.	3.	100.	26.

1	44.	13.	2.	3.	98.	25.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	45.	13.	2.	3.	96.	25.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	46.	13.	2.	3.	95.	24.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	47.	13.	2.	3.	93.	24.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	48.	13.	2.	3.	92.	24.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	49.	13.	2.	3.	91.	23.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	50.	12.	2.	3.	90.	23.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	51.	12.	2.	3.	88.	22.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	52.	12.	1.	2.	87.	22.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	53.	12.	1.	2.	87.	22.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	54.	12.	1.	2.	86.	21.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	55.	12.	1.	2.	85.	21.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	56.	12.	1.	2.	84.	21.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	57.	12.	1.	2.	83.	21.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	58.	12.	1.	2.	83.	20.
		.0( )	.0( )	.1( )	.0( )	.0( )
1	59.	12.	1.	2.	82.	20.
		.0( )	.0( )	.1( )	.0( )	.0( )
2	0.	11.	1.	2.	81.	20.
		.0( )	.0( )	.1( )	.0( )	.0( )

Lower Cragmor Drainage Master Plan BASINS 2,3,5 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

*** PEAK FLOWS, STAGES AND STORAGES OF GUTTERS AND DETENSION DAMS ***

CONVEYANCE ELEMENT	PEAK (CFS)	STAGE (FT)	STORAGE (AC-FT)	TIME (HR/MIN)
300	98.	.8		0 33.
200	98.	1.7		0 33.
301	73.	.6		0 32.
1	69.	.6		0 34.
120	139.	3.9		0 33.
333	52.	.6		0 31.
4	75.	.9		0 35.
302	27.	.3		0 31.
2	62.	.6		0 34.
201	123.	2.1		0 34.
202	87.	(DIRECT FLOW)		0 33.
5	58.	.7		0 31.
335	47.	.4		0 31.
3	87.	.7		0 34.
321	41.	.3		0 31.
122	58.	1.4		0 31.
203	131.	(DIRECT FLOW)		0 33.
205	41.	(DIRECT FLOW)		0 31.
7	42.	.6		0 33.
336	44.	.5		0 32.
8	130.	.9		0 34.
322	18.	.2		0 31.
11	40.	.3		0 32.
204	214.	2.6		0 34.
124	56.	.9		0 31.
345	18.	.4		0 31.
337	76.	.7		0 33.
9	119.	.9		0 34.
323	63.	.5		0 31.
12	28.	.3		0 33.
207	210.	2.7		0 34.
125	90.	1.6		0 32.
20	119.	1.0		0 35.
338	76.	.7		0 35.
249	90.	1.2		0 32.
130	195.	1.5		0 35.
324	32.	.5		0 31.
13	45.	.3		0 33.
251	120.	1.1		0 35.
126	74.	1.2		0 32.
327	47.	.7		0 31.
21	59.	.7		0 36.
339	75.	.6		0 32.
17	47.	.7		0 35.
214	47.	(DIRECT FLOW)		0 31.
30	83.	.8		0 32.
111	128.	1.3		0 35.
325	73.	.6		0 31.
14	37.	.4		0 33.
128	47.	.6		0 35.
328	144.	1.0		0 33.

252	37.	.6	0	35.
127	110.	1.8	0	32.
308	35.	.9	0	38.
24	59.	.7	0	38.
343	62.	.7	0	35.
129	144.	1.1	0	33.
31	83.	.9	0	32.
355	84.	.9	0	37.
22	16.	.4	0	37.
341	85.	.9	0	35.
16	17.	.3	0	41.
326	100.	.8	0	33.
15	54.	.9	0	33.
320	129.	2.1	0	37.
113	118.	2.0	0	37.
250	94.	1.0	0	33.
211	159.	(DIRECT FLOW)	0	36.
208	99.	1.8	0	36.
206	159.	2.2	0	34.
296	219.	2.7	0	31.
25	66.	.9	0	38.
344	125.	1.0	0	36.
33	9.	.3	0	38.
32	158.	1.1	0	37.
23	99.	.9	0	36.
342	120.	.9	0	36.
309	295.	3.0	0	32.
209	186.	1.5	0	37.
212	167.	(DIRECT FLOW)	0	37.
112	219.	2.8	0	36.
310	385.	3.6	0	34.
352	159.	1.1	0	39.
350	63.	.8	0	35.
356	49.	.9	0	34.
34	150.	1.1	0	40.
254	119.	1.1	0	36.
304	50.	1.5	0	41.
393	485.	3.9	0	35.
213	216.	1.5	0	39.
215	190.	2.6	0	39.
354	105.	1.0	0	38.
305	100.	1.6	0	43.
295	536.	4.8	0	35.
35	44.	.6	0	40.
116	165.	2.4	0	39.
386	130.	2.1	0	43.
311	706.	5.1	0	38.
306	28.	.8	0	43.
220	44.	(DIRECT FLOW)	0	40.
131	75.	(DIRECT FLOW)	0	39.
387	220.	(DIRECT FLOW)	0	43.
312	877.	(DIRECT FLOW)	0	38.
307	138.	(DIRECT FLOW)	0	34.

BASINS 4,5, 100YR

ENVIRONMENTAL PROTECTION AGENCY - STORM WATER MANAGEMENT MODEL - VERSION PC.1

DEVELOPED BY METCALF + EDDY, INC.

UNIVERSITY OF FLORIDA

WATER RESOURCES ENGINEEERS, INC. (SEPTEMBER 1970)

UPDATED BY UNIVERSITY OF FLORIDA (JUNE 1973)

HYDROLOGIC ENGINEERING CENTER, CORPS OF ENGINEERS

MISSOURI RIVER DIVISION, CORPS OF ENGINEERS (SEPTEMBER 1974)

BOYLE ENGINEERING CORPORATION (MARCH 1985, JULY 1985)

TAPE OR DISK ASSIGNMENTS

JIN(1)	JIN(2)	JIN(3)	JIN(4)	JIN(5)	JIN(6)	JIN(7)	JIN(8)	JIN(9)	JIN(10)
2	1	0	0	0	0	0	0	0	0

JOUT(1)	JOUT(2)	JOUT(3)	JOUT(4)	JOUT(5)	JOUT(6)	JOUT(7)	JOUT(8)	JOUT(9)	JOUT(10)
1	2	0	0	0	0	0	0	0	0

NSCRAT(1)	NSCRAT(2)	NSCRAT(3)	NSCRAT(4)	NSCRAT(5)
3	4	0	0	0

WATERSHED PROGRAM CALLED

*** ENTRY MADE TO RUNOFF MODEL ***

Lower Cragmor Drainage Master Plan BASINS 4,5 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

NUMBER OF TIME STEPS 120

INTEGRATION TIME INTERVAL (MINUTES) 1.00

10.0 PERCENT OF IMPERVIOUS AREA HAS ZERO DETENTION DEPTH

FOR 24 RAINFALL STEPS, THE TIME INTERVAL IS 5.00 MINUTES

FOR RAINGAGE NUMBER 1 RAINFALL HISTORY IN INCHES PER HOUR

.32	.97	1.49	2.59	4.54	8.10	4.54	2.59	2.01	1.62
1.30	1.30	1.30	.65	.65	.39	.39	.39	.39	.39
.39	.39	.39	.39						

Lower Cragmor Drainage Master Plan BASINS 4,5 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

SUBAREA	GUTTER	WIDTH	AREA	PERCENT	SLOPE	RESISTANCE FACTOR		SURFACE STORAGE(IN)		INFILTRATION RATE(IN/HR)			GAGE
NUMBER	OR MANHOLE	(FT)	(AC)	IMPERV.	(FT/FT)	IMPERV.	PERV.	IMPERV.	PERV.	MAXIMUM	MINIMUM	DECAY RATE	NO
353	43	480.	3.8	95.0	.0100	.020	.250	.100	.350	4.50	.60	.00180	1
358	40	1200.	16.7	95.0	.0040	.020	.250	.100	.350	4.50	.60	.00180	1
360	360	1470.	20.8	70.0	.0090	.020	.250	.100	.350	4.50	.60	.00180	1
361	361	2380.	15.2	70.0	.0140	.020	.250	.100	.350	4.50	.60	.00180	1
362	362	2656.	18.6	70.0	.0130	.020	.250	.100	.350	4.50	.60	.00180	1
363	363	1704.	18.7	65.0	.0150	.020	.250	.100	.350	4.50	.60	.00180	1
364	364	1260.	16.0	65.0	.0210	.020	.250	.100	.350	4.50	.60	.00180	1
365	365	2640.	32.9	65.0	.0210	.020	.250	.100	.350	4.50	.60	.00180	1
366	366	972.	9.7	65.0	.0150	.020	.250	.100	.350	4.50	.60	.00180	1
367	367	2960.	14.5	65.0	.0150	.020	.250	.100	.350	4.50	.60	.00180	1
376	376	2760.	13.1	65.0	.0160	.020	.250	.100	.350	4.50	.60	.00180	1
380	51	620.	6.8	95.0	.0180	.020	.250	.100	.350	4.50	.60	.00180	1
375	375	1680.	16.5	65.0	.0150	.020	.250	.100	.350	4.50	.60	.00180	1
377	55	564.	13.8	65.0	.0180	.020	.250	.100	.350	4.50	.60	.00180	1
378	378	1368.	13.9	65.0	.0150	.020	.250	.100	.350	4.50	.60	.00180	1
379	379	2720.	13.3	65.0	.0140	.020	.250	.100	.350	4.50	.60	.00180	1
382	382	1260.	18.5	2.0	.0140	.020	.250	.100	.350	4.50	.60	.00180	1
383	383	1120.	13.4	65.0	.0130	.020	.250	.100	.350	4.50	.60	.00180	1
384	53	1360.	22.6	65.0	.0100	.020	.250	.100	.350	4.50	.60	.00180	1
385	54	2800.	5.8	65.0	.0130	.020	.250	.100	.350	4.50	.60	.00180	1

TOTAL NUMBER OF SUBCATCHMENTS, 20

TOTAL TRIBUTARY AREA (ACRES), 304.60

Lower Cragmor Drainage Master Plan BASINS 4,5 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

*** CONTINUITY CHECK FOR SUBCATCHMENT ROUTING IN UDSWM2-PC MODEL ***

WATERSHED AREA (ACRES)	304.600
TOTAL RAINFALL (INCHES)	3.123
TOTAL INFILTRATION (INCHES)	.438
TOTAL WATERSHED OUTFLOW (INCHES)	2.355
TOTAL SURFACE STORAGE AT END OF STROM (INCHES)	.324
ERROR IN CONTINUITY, PERCENTAGE OF RAINFALL	.217

Lower Cragmor Drainage Master Plan BASINS 4,5 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

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                                                 WIDTH             INVERT    SIDE SLOPES          OVERBANK/SURCHARGE
GUTTER    GUTTER      NDP       NP               OR DIAM   LENGTH   SLOPE   HORIZ TO VERT  MANNING    DEPTH      JK
NUMBER   CONNECTION                               (FT)      (FT)   (FT/FT)     L     R       N        (FT)

 312       394        10        2     PIPE         8.0      320.    .0090      .0    .0     .013       8.00      -1
              TIME IN HRS VS INFLOW IN CFS
                   .0     .0      .3   11.0      .4   150.0      .5   582.0      .6   861.0      .7   873.0
                   .8  780.0      .8  607.0      .9   484.0     1.0   397.0
 307       313        10        2     PIPE         7.0      330.    .0020      .0    .0     .013       7.00      -1
              TIME IN HRS VS INFLOW IN CFS
                   .0     .0      .3    9.0      .4    44.0      .5   112.0      .6   137.0      .7   114.0
                   .8   91.0      .8   76.0      .9    64.0     1.0    54.0
 387       384        10        2     PIPE        10.0      480.    .0110      .0    .0     .013      10.00      -1
              TIME IN HRS VS INFLOW IN CFS
                   .0     .0      .3    4.0      .4    26.0      .5   106.0      .6   214.0      .7   220.0
                   .8  220.0      .8  171.0      .9   132.0     1.0   106.0
  -1                                               1.0        1.   1.0000   107.0 107.0    1.600       1.00
 131       119        10        3                   .0        1.    .0010      .0    .0     .001      10.00      -1
              TIME IN HRS VS INFLOW IN CFS
                   .0     .0      .3    1.0      .4     3.0      .5     9.0      .6    33.0      .7    73.0
                   .8   20.0      .8   12.0      .9     9.0     1.0     7.0
  35       220        10        3                   .0        1.    .0010      .0    .0     .001      10.00      -1
              TIME IN HRS VS INFLOW IN CFS
                   .0     .0      .3     .0      .4     2.0      .5    12.0      .6    25.0      .7    44.0
                   .8   26.0      .8   18.0      .9    13.0     1.0    11.0
  40       118         0        1     CHANNEL     25.0     1200.    .0120     3.0   3.0     .026      10.00       0
 118       364         2        1     CHANNEL     25.0        1.    .0010     3.0   3.0     .026      10.00      41
              DIVERSION TO GUTTER NUMBER  41 - TOTAL Q VS DIVERTED Q IN CFS
                   .0     .0   1200.0  600.0
  41       117         0        1     CHANNEL     25.0      565.    .0110     3.0   3.0     .026      10.00       0
 117       363         2        1     CHANNEL       .0        1.    .0010     3.0   3.0     .026      10.00      42
              DIVERSION TO GUTTER NUMBER  42 - TOTAL Q VS DIVERTED Q IN CFS
                   .0     .0   1200.0  600.0
  42       119         0        1     CHANNEL     25.0      400.    .0150     3.0   3.0     .026      10.00       0
 119       362         2        1     CHANNEL     25.0        1.    .0010     3.0   3.0     .026      10.00      43
              DIVERSION TO GUTTER NUMBER  43 - TOTAL Q VS DIVERTED Q IN CFS
                   .0     .0   1200.0  600.0
  43       220         0        1     CHANNEL     18.0      480.    .0110     3.0   3.0     .026      10.00       0
 220       361         3        1     CHANNEL     18.0        1.    .0010     3.0   3.0     .026      10.00     394
              DIVERSION TO GUTTER NUMBER 394 - TOTAL Q VS DIVERTED Q IN CFS
                   .0     .0     85.0   72.0    800.0   72.0
 360       226         0        1     CHANNEL     18.0     1470.    .0070     3.0   3.0     .026      10.00       0
 361       225         0        1     CHANNEL     18.0     1700.    .0080     3.0   3.0     .026      10.00       0
 225       226         0        3                   .0        1.    .0010      .0    .0     .001      10.00       0
 226       227         0        3                   .0        1.    .0010      .0    .0     .001      10.00       0
 362       223         0        1     CHANNEL     18.0     1660.    .0110     3.0   3.0     .026      10.00       0
 363       222         0        1     CHANNEL     18.0     1420.    .0130     3.0   3.0     .026      10.00       0
 364       221         0        1     CHANNEL     18.0     1050.    .0120     3.0   3.0     .026      10.00       0
 365       224         0        1     CHANNEL     18.0     2200.    .0130     3.0   3.0     .026      10.00       0
 366       222         0        1     CHANNEL     18.0      810.    .0060     3.0   3.0     .026      10.00       0
 367       223         0        1     CHANNEL     18.0     1480.    .0080     3.0   3.0     .026      10.00       0
 221        45         4        1     CHANNEL     18.0        1.    .0010     3.0   3.0     .026      10.00     299
              DIVERSION TO GUTTER NUMBER 299 - TOTAL Q VS DIVERTED Q IN CFS
                   .0     .0     10.0    8.5     59.0   50.0    500.0   50.0
  45       222         0        1     CHANNEL     10.0      660.    .0190     3.0   3.0     .026      10.00       0
 222        46         4        1     CHANNEL     18.0        1.    .0010     3.0   3.0     .026      10.00     298
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		.0	.0	10.0	8.5	153.0	130.0	500.0	130.0			
46	223	0	1	CHANNEL	10.0	470.	.0130	3.0	3.0	.026	10.00	0
224	47	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	297
		DIVERSION TO GUTTER NUMBER 297 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	47.0	40.0	500.0	40.0			
47	223	0	1	CHANNEL	18.0	1120.	.0080	3.0	3.0	.026	10.00	0
223	227	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
227	0	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
376	240	0	1	CHANNEL	18.0	2300.	.0140	3.0	3.0	.026	10.00	0
240	51	3	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	313
		DIVERSION TO GUTTER NUMBER 313 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	31.0	21.0	500.0	21.0					
51	248	0	1	CHANNEL	18.0	620.	.0050	3.0	3.0	.026	10.00	0
378	242	0	1	CHANNEL	18.0	1140.	.0120	3.0	3.0	.026	10.00	0
375	241	0	1	CHANNEL	18.0	1680.	.0100	3.0	3.0	.026	10.00	0
55	242	0	1	CHANNEL	10.0	470.	.0150	3.0	3.0	.026	10.00	0
379	243	0	1	CHANNEL	18.0	1360.	.0130	3.0	3.0	.026	10.00	0
241	132	3	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	315
		DIVERSION TO GUTTER NUMBER 315 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	42.0	28.0	200.0	28.0					
242	56	3	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	316
		DIVERSION TO GUTTER NUMBER 316 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	90.0	60.0	500.0	60.0					
56	243	0	1	CHANNEL	18.0	400.	.0150	3.0	3.0	.026	10.00	0
243	57	3	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	317
		DIVERSION TO GUTTER NUMBER 317 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	37.0	25.0	500.0	25.0					
57	248	0	1	CHANNEL	18.0	400.	.0130	3.0	3.0	.026	10.00	0
248	52	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	314
		DIVERSION TO GUTTER NUMBER 314 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	65.0	55.0	500.0	55.0			
52	115	0	1	CHANNEL	25.0	400.	.0040	3.0	3.0	.026	10.00	0
115	253	4	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	318
		DIVERSION TO GUTTER NUMBER 318 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	10.0	8.5	102.0	87.0	500.0	87.0			
253	53	2	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	40
		DIVERSION TO GUTTER NUMBER 40 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	600.0	100.0							
383	115	0	1	CHANNEL	40.0	1120.	.0060	3.0	3.0	.026	10.00	0
114	58	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
58	245	0	1	CHANNEL	40.0	1260.	.0110	3.0	3.0	.026	10.00	0
245	59	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
382	245	0	1	CHANNEL	40.0	1260.	.0110	3.0	3.0	.026	10.00	0
59	246	0	1	CHANNEL	18.0	1700.	.0130	3.0	3.0	.026	10.00	0
53	246	0	1	CHANNEL	25.0	1360.	.0120	3.0	3.0	.026	10.00	0
246	54	3	1	CHANNEL	18.0	1.	.0010	3.0	3.0	.026	10.00	319
		DIVERSION TO GUTTER NUMBER 319 - TOTAL Q VS DIVERTED Q IN CFS										
		.0	.0	201.0	135.0	800.0	135.0					
54	247	0	1	CHANNEL	18.0	1400.	.0130	3.0	3.0	.026	10.00	0
247	227	0	3		.0	1.	.0010	.0	.0	.001	10.00	0
-1					1.0	1.	1.0000	107.0	107.0	1.000	1.00	
313	314	0	2	PIPE	10.0	620.	.0050	.0	.0	.013	10.00	0
315	316	0	2	PIPE	10.0	470.	.0150	.0	.0	.013	10.00	0
316	317	0	2	PIPE	10.0	400.	.0150	.0	.0	.013	10.00	0
317	314	0	2	PIPE	10.0	400.	.0130	.0	.0	.013	10.00	0
314	318	0	2	PIPE	10.0	400.	.0040	.0	.0	.013	10.00	0
318	319	0	2	PIPE	10.0	1360.	.0120	.0	.0	.013	10.00	0
299	298	0	2	PIPE	10.0	660.	.0190	.0	.0	.013	10.00	0

TOTAL NUMBER OF GUTTERS/PIPES, 64

Lower Cragmor Drainage Master Plan BASINS 4,5 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

ARRANGEMENT OF SUBCATCHMENTS AND GUTTERS/PIPES

GUTTER	TRIBUTARY GUTTER/PIPE										TRIBUTARY SUBAREA										D.A.(AC)
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
40	0	0	0	0	0	0	0	0	0	0	358	0	0	0	0	0	0	0	0	0	16.7
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
43	0	0	0	0	0	0	0	0	0	0	353	0	0	0	0	0	0	0	0	0	3.8
45	221	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32.7
46	222	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61.1
47	224	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32.9
51	240	0	0	0	0	0	0	0	0	0	380	0	0	0	0	0	0	0	0	0	19.9
52	248	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60.9
53	253	0	0	0	0	0	0	0	0	0	384	0	0	0	0	0	0	0	0	0	96.9
54	246	0	0	0	0	0	0	0	0	0	385	0	0	0	0	0	0	0	0	0	121.2
55	0	0	0	0	0	0	0	0	0	0	377	0	0	0	0	0	0	0	0	0	13.8
56	242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.7
57	243	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41.0
58	114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
59	245	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18.5
114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
115	52	383	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74.3
117	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
118	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16.7
119	131	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
131	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
220	35	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.8
221	364	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32.7
222	363	366	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61.1

224	365	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32.9
225	361	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19.0
226	360	225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39.8
227	226	223	247	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	288.1
240	376	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13.1
241	375	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16.5
242	378	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.7
243	379	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41.0
245	58	382	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18.5
246	59	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	115.4
247	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	121.2
248	51	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60.9
253	115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74.3
299	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
307	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
312	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
313	307	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
314	313	317	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
315	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
316	315	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
317	316	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
318	314	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0
360	0	0	0	0	0	0	0	0	0	0	360	0	0	0	0	0	0	0	0	0	20.8
361	220	0	0	0	0	0	0	0	0	0	361	0	0	0	0	0	0	0	0	0	19.0
362	119	0	0	0	0	0	0	0	0	0	362	0	0	0	0	0	0	0	0	0	18.6
363	117	0	0	0	0	0	0	0	0	0	363	0	0	0	0	0	0	0	0	0	18.7
364	118	0	0	0	0	0	0	0	0	0	364	0	0	0	0	0	0	0	0	0	32.7
365	0	0	0	0	0	0	0	0	0	0	365	0	0	0	0	0	0	0	0	0	32.9
366	0	0	0	0	0	0	0	0	0	0	366	0	0	0	0	0	0	0	0	0	9.7
367	0	0	0	0	0	0	0	0	0	0	367	0	0	0	0	0	0	0	0	0	14.5
375	0	0	0	0	0	0	0	0	0	0	375	0	0	0	0	0	0	0	0	0	16.5
376	0	0	0	0	0	0	0	0	0	0	376	0	0	0	0	0	0	0	0	0	13.1

379	0	0	0	0	0	0	0	0	0	0	379	0	0	0	0	0	0	0	0	0	13.3
382	0	0	0	0	0	0	0	0	0	0	382	0	0	0	0	0	0	0	0	0	18.5
383	0	0	0	0	0	0	0	0	0	0	383	0	0	0	0	0	0	0	0	0	13.4
387	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.0

ORDER OF TREE STRUCTURE (NGUT VALUE) DECREASES THROUGH DIVERSION FROM GUTTER 45 TO GUTTER 43 COMP THROUGH DIVERSION WILL LAG ONE TIME

Lower Cragmor Drainage Master Plan BASINS 4,5 \ 100YR \ ALTERNATIVE 2
Direct flow hydrograph, calibrated to Rational Method

*** PEAK FLOWS, STAGES AND STORAGES OF GUTTERS AND DETENSION DAMS ***

CONVEYANCE ELEMENT	PEAK (CFS)	STAGE (FT)	STORAGE (AC-FT)	TIME (HR/MIN)
55	57.	.8		0 31.
378	61.	.7		0 32.
242	118.	2.0		0 32.
56	56.	.6		0 33.
379	63.	.7		0 32.
376	54.	.6		0 35.
243	119.	2.0		0 33.
240	54.	1.3		0 35.
57	93.	.8		0 34.
51	67.	.9		0 35.
248	159.	2.3		0 34.
40	82.	.7		0 37.
383	51.	.5		0 36.
52	100.	1.0		0 36.
114	0.	(DIRECT FLOW)		0 0.
118	82.	1.4		0 37.
115	150.	2.3		0 36.
382	16.	.2		1 0.
58	0.	.0		0 0.
364	102.	.9		0 35.
41	40.	.4		0 39.
315	28.	.8		0 36.
253	64.	1.4		0 36.
245	16.	(DIRECT FLOW)		1 0.
221	102.	1.8		0 35.
117	40.	2.5		0 39.
43	55.	.6		0 42.
35	43.	(DIRECT FLOW)		0 40.
316	88.	1.4		0 32.
307	135.	3.4		0 35.
53	122.	.8		0 37.
59	15.	.3		1 9.
365	133.	1.0		0 35.
45	51.	.7		0 36.
366	43.	.7		0 32.
363	91.	.8		0 35.
42	19.	.3		0 40.
131	72.	(DIRECT FLOW)		0 40.
220	96.	1.8		0 41.
317	113.	1.7		0 33.
313	155.	2.5		0 36.
246	123.	2.0		0 37.
224	133.	2.1		0 35.
222	182.	2.5		0 35.
119	91.	1.5		0 40.
361	73.	.8		0 35.
314	322.	3.8		0 37.
375	67.	.7		0 35.
54	57.	.6		0 38.
47	83.	.9		0 38.
46	50.	.8		0 36.
[illegible]	[illegible]	[illegible]		[illegible]

362	99.	.9	0	36.
225	73.	(DIRECT FLOW)	0	35.
360	81.	.9	0	36.
312	872.	6.6	0	40.
387	220.	2.4	0	41.
318	408.	3.2	0	37.
299	50.	1.0	0	35.
241	67.	1.4	0	35.
247	57.	(DIRECT FLOW)	0	38.
223	291.	(DIRECT FLOW)	0	36.
226	154.	(DIRECT FLOW)	0	35.
394	944.	(DIRECT FLOW)	0	40.
384	220.	(DIRECT FLOW)	0	41.
319	491.	(DIRECT FLOW)	0	37.
298	180.	(DIRECT FLOW)	0	35.
132	39.	(DIRECT FLOW)	0	35.
227	501.	(DIRECT FLOW)	0	36.

APPENDIX 2

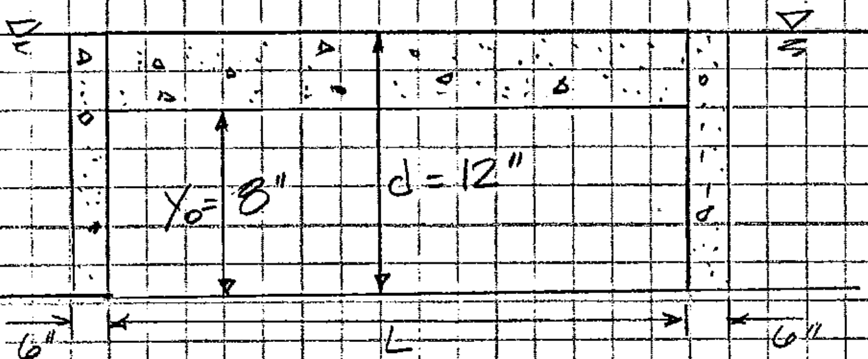
STORM SEWER HYDRAULIC CALCULATIONS

D-10-R Inlet Capacity

Find Q capacity for D-10-R as a function of inlet length

Assumptions for average case:

1.) $d = 12''$ (flow depth above flowline)
2.) $Y_o = 8''$ (curb opening height)
3.) Flow above TOC will bypass the inlet and not significantly affect the capacity.



Use Orifice Equation for approximate interception rate

$$Q = CA(2gH)^{0.5}$$

$C = 0.6$ (Square edge opening)

$A = 0.67\,L$ SF

$H = 1.0 - 0.33 = 0.67$ ft.

$$Q_I\,(\text{ave}) = 0.6\,(0.67L)\,[2(32.2)(0.67)]^{1/2}$$

$$Q_I\,(\text{ave}) = 2.6\,L \text{ cfs}$$

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CLIENT: C of C/S   JOB NO.: 8220

PROJECT: Lower Cragmor   BY: JPF   DATE: 5/13/87

SUBJECT: Inlet Capacities - Estimate   SHEET NO. 2 OF 4

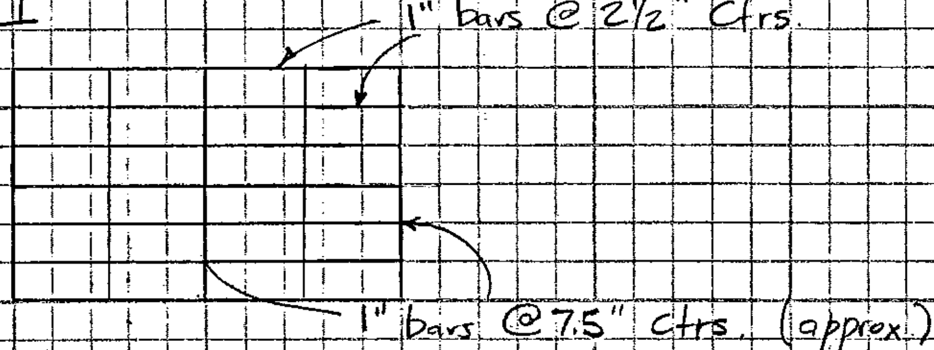
Grated inlets:

Assumptions:

1) Water is 12" above grate in 100-year
2) Use 50% Clogging factor

Find percentage of total area is open.

Type I



Take a square section 15" x 15"

Find open area:

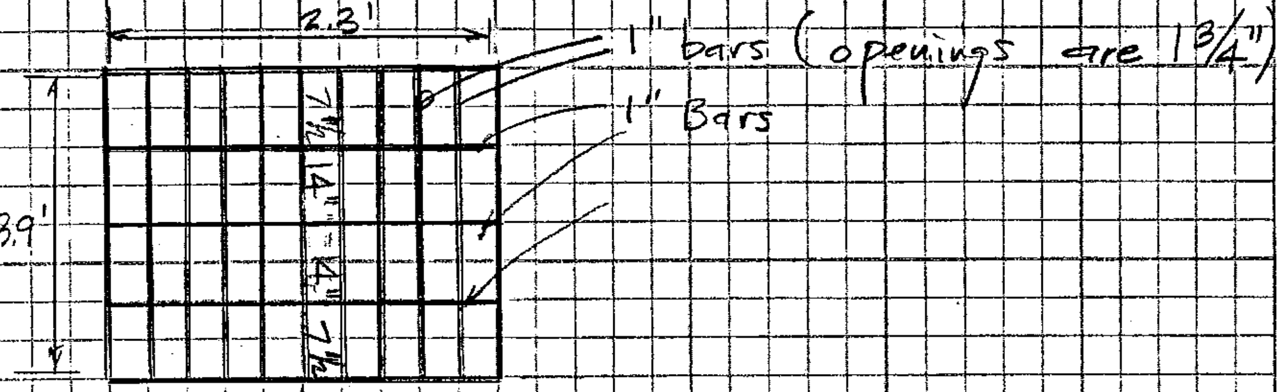
Total Area = 15" x 15" = 225 □"

Bar Area = 6(1" x 15") + 2(15-6)(1")

Bars: 90 + 18 = 108 □"

% Open Area = $\frac{225-108}{225}$ = 52%

Type II



Find open area %

Total Area = 2.3 x 3.9 = 9.0 □'

Open Area = (1.75)(7.5)(20) + 1.75(14)(20)

A = 752.5/144 = 5.2 □'

% Open = 5.2/9.0 = 58%

Find Capacity of typical grate for 6" & 12" depth above grate (per SF)

Assume grate is 50% open area to be conservative.

$Q = CA(2gH)^{0.5}(R.F.)$

Y = 12" $Q = 0.6(0.5)[2(32.2)(1.0)]^{0.5}(0.5) = 1.2 \frac{cfs}{SF}$

Y = 6" $Q = 0.6(0.5)[2(32.2)(0.5)]^{0.5}(0.5) = 0.8 \frac{cfs}{SF}$

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CLIENT C of C/S JOB NO. 8220
PROJECT Lower Cragmor BY JPF DATE 5/13/87
SUBJECT Inlet Capacities - Estimate SHEET NO. 4 OF 4

Check inlet control of inlet lateral pipes. Use orifice equation C=0.6

1) Assume 18" cover over pipes
2) Assume y=12" above grate

Typical laterals.

10" Lateral

$$Q = 0.6(.545)\left[2(32.2)(2.9)\right]^{0.5} = 4 \text{ cfs}$$

12" Lateral

$$Q = 0.6(.785)\left[2(32.2)(3.0)\right]^{0.5} = 7 \text{ cfs}$$

15" Lateral

$$Q = 0.6(1.227)\left[2(32.2)(3.1)\right]^{0.5} = 10 \text{ cfs}$$

18" Lateral

$$Q = 0.6(1.767\left[64.4(3.2)\right]^{0.5} = 15 \text{ cfs}$$

21" Lateral

$$Q = 0.6(2.405\left[64.4(3.4)\right]^{0.5} = 21 \text{ cfs}$$

24" Lateral

$$Q = 0.6(3.142)\left[64.4(3.5)\right]^{0.5} = 28 \text{ cfs}$$

27" Lateral

$$Q = 0.6(3.976)\left[64.4(3.6)\right]^{0.5} = 36 \text{ cfs}$$

30" Lateral

$$Q = 0.6(4.909\left[64.4(3.7)\right]^{0.5} = 46 \text{ cfs}$$

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CLIENT C of C/S JOB NO. 8220

PROJECT Lower Cragmor BY JPF DATE 5/14/87

SUBJECT Inlet Interception Rates. SHEET NO. 1 OF 6

Table

Inlet Designation	Inlet Type & Size	Inlet Interception (cfs)	Lateral Size (inches)	Pipe Inlet Control Capacity (cfs)	Controlling Inlet Capacity (cfs)
1.1	4' R	10	18	15	10
1.2	2.4'x10' Grate	29	30	46	29
1.3	4' R	10	24	28	10
1.4	8' R	21	24	28	21
1.5	4' R	10	18	15	10
1.6	4' R	10	18	15	10
1.7	4' R	10	18	15	10
2.1	2.4'x10' Grate	29	—	—	29
2.3	10' R	26	24	28	26
2.4.1	10' R	26	—	—	26
2.5	10' R	26	24	28	26
2.6	10' R	26	24	28	26
2.7	5' R	13	24	28	13
2.8	15' R	39	24	28	28
3.1	4' R	10	—	—	10
3.2	2.3'x3.9' Grate	11	18	15	11
3.3	5' R w/ 2.3'x5.8' Grate	18	18	15	15
3.4	4' R	10	18	15	10
3.5	1.3'x0.9' Grate	1	10	4	1

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CLIENT C of C/S JOB NO. 8220

PROJECT Lower Cragmor BY JPF DATE 5/14/87

SUBJECT Inlet Interception Rates. SHEET NO. 2 OF 6

Table ______

Inlet Designation	Inlet Type & Size	Inlet Interception (cfs)	Lateral Size (inches)	Pipe Inlet Control Capacity (cfs)	Controlling Inlet Capacity (cfs)
3.5.1	2.3 x 3.9 Grate	11	18	15	11
3.5.2	5.8' x 2.3' Grate	16	18	15	15
3.6	2.3 x 3.9 Grate	11	21	21	11
3.7	5.8' x 2.3' Grate	16	24	28	16
3.8	5.8' x 2.3' Grate	16	24	28	16
3.9	2.3' x 3.9 Grate	11	—	—	11
3.9.1	6' R	16	18	15	15
3.9.2	10' R	26	18	15	15
3.9.3	10' R	26	18	15	15
3.9.4	10' R	26	18	15	15
3.9.5	10' R	26	18	15	15
3.9.6	10' R	26	30	46	26
3.9.7	4.2 x 4.2 Grate	21	—	—	21
3.9.8	5' R	13	18	15	13
3.9.9	5' R	13	24	28	13
3.9.10	5' R	13	24	28	13
3.10	8.7 x 2.3 Grate	24	24	28	24
3.10.1	5.8 x 2.3 Grate	16	18	15	15
4.1	6' R	16	18	15	15

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CLIENT C of C/S JOB NO. 8220

PROJECT Lower Cragmor BY JPF DATE 5/14/87

SUBJECT Inlet Interception Rates. SHEET NO. 3 OF 6

Table ______

Inlet Designation	Inlet Type & Size	Inlet Interception (cfs)	Lateral Size (inches)	Pipe Inlet Control Capacity (cfs)	Controlling Inlet Capacity (cfs)
4.2	12'R	31	18	15	15
4.3	12'R	31	18	15	15
3.11	8'R	21	24	28	21
3.12	8'R	21	–	—	21
3.13	8'R	21	24	28	21
5.1	8'R	21	—	—	21
5.2	8'R	21	24	28	21
5.2.1	8'R	21	18	15	15
5.3	8'R	21	24	28	21
11.1	4'R	10	18	15	10
11.2	4'R	10	18	15	10
6.4.5	9.6 × 2.4 Grate	28			28
6.13	8.8 x 2.2 Grate	23			23

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CLIENT: C of C/S JOB NO. 8220
PROJECT: Lower Cragmor BY: JPF DATE: 5/14/87
SUBJECT: Inlet Interception Rates. SHEET NO. 4 OF 6

Table ______

Inlet Designation	Inlet Type & Size	Inlet Interception (cfs)	Lateral Size (inches)	Pipe Inlet Control Capacity (cfs)	Controlling Inlet Capacity (cfs)
6.1	10' R	26	24	28	26
6.2	10x2 Grate	24	24	28	24
6.3	10x2 Grate	24	24	28	24
6.4	10x2 Grate	24	24	28	24
6.5	10x2 Grate	24	27	36	24
6.6	10x2 Grate	24	24	28	24
6.7	10x2 Grate	24	27	36	24
6.8	10x2 Grate	24	27	36	24
6.9	1.3x1.8 Grate	3	10	4	3
6.9.1	12'x2' Grate	29	27	36	29
6.10	4'R w/ 4x2 Grate	20	18	15	15
6.11	1.5x1.5 Grate	3	12	7	3
6.12	12'x2' Grate	29	24	28	28
6.13	12' R w/ 12x2 Grate	60	24	28	28
7.1	6' R	16	21	21	16
7.2	6' R	16	21	21	16
7.3	24" FES	—	24	28	28
7.4	6' R	16	21	21	16
7.5	6' R	16	27	36	16

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CLIENT C of C/S JOB NO. 8220

PROJECT Lower Cragmor BY JPF DATE 5/14/87

SUBJECT Inlet Interception Rates. SHEET NO. 5 OF 6

Table ______

Inlet Designation	Inlet Type & Size	Inlet Interception (cfs)	Lateral Size (inches)	Pipe Inlet Control Capacity (cfs)	Controlling Inlet Capacity (cfs)
7.5.1	2.5x2 Grate	6	15	10	6
7.5.2	2.5x2 Grate	6	15	10	6
7.5.3	2.5x2 Grate	6	15	10	6
7.6	5x2 Grate	12	21	21	12
7.7	5x2 Grate	12	21	21	12
7.8	4'R w/ 4x2 Grate	20	21	21	20
8.1	15x2 Grate	36	18	15	15
8.2	4'R w/ 4x2 Grate	20	18	15	15
8.3	8'R w/ 8x2 Grate	40	30	46	40
8.4	4'R w/ 4x2 Grate	20	18	15	15
8.5	4'R w/ 4x2 Grate	20	24	28	20
8.6	5'R w/ 5x2 Grate	25	24	28	25
8.7	7'R w/ 7x2 grate	35	18	15	15
8.8	4'R w/ 4x2 Grate	20	18	15	15
8.9	4x2 Grate	10	24	28	10
8.10	4x2 Grate	10	18	15	10
8.11	4'R	10	18	15	10
8.12	4'R	10	18	15	10
8.13	6'R w/ 6x2 Grate	30	24	28	28

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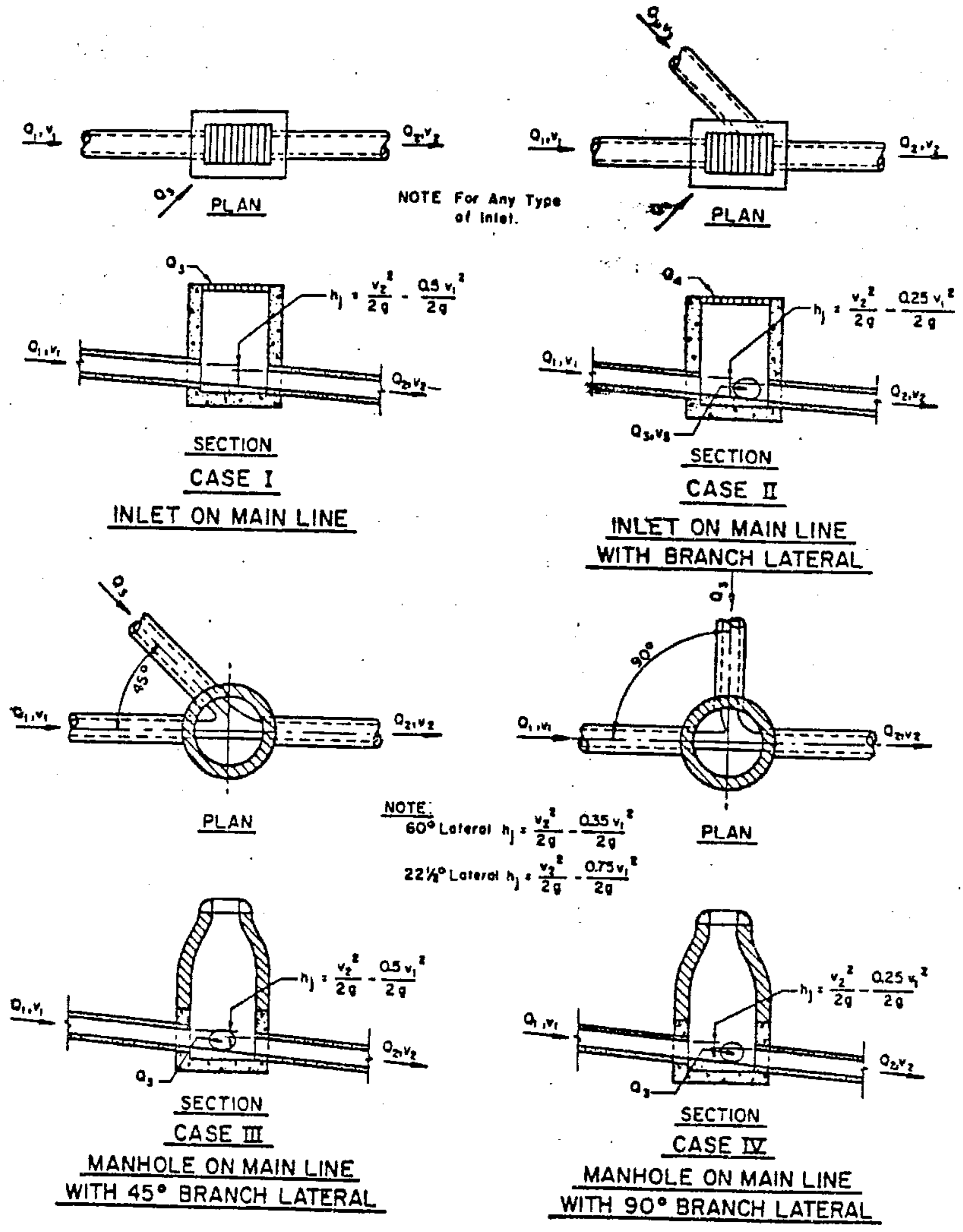
CLIENT C of C/S JOB NO. 8220

PROJECT Lower Cragmor BY JPF DATE 5/14/87

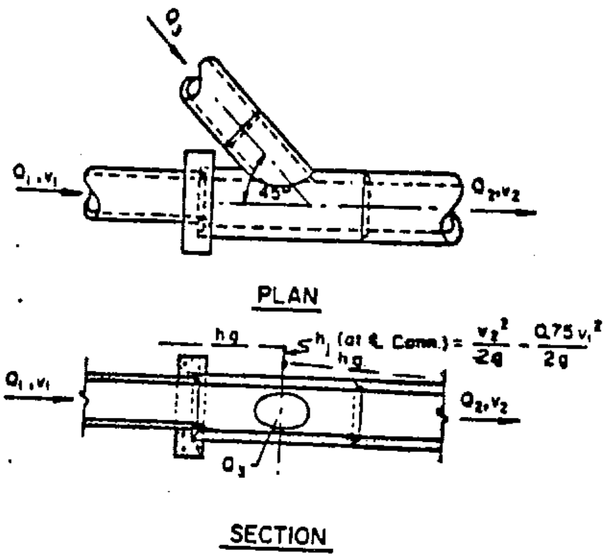
SUBJECT Inlet Interception Rates. SHEET NO. 6 OF 6

Table ______

Inlet Designation	Inlet Type & Size	Inlet Interception (cfs)	Lateral Size (inches)	Pipe Inlet Control Capacity (cfs)	Controlling Inlet Capacity (cfs)
8.14	10'x2' Grate	24	18	15	15
8.15	1.5x2' Grate	4	10	4	4
8.16	2x36.5' Grate	88	24	28	28

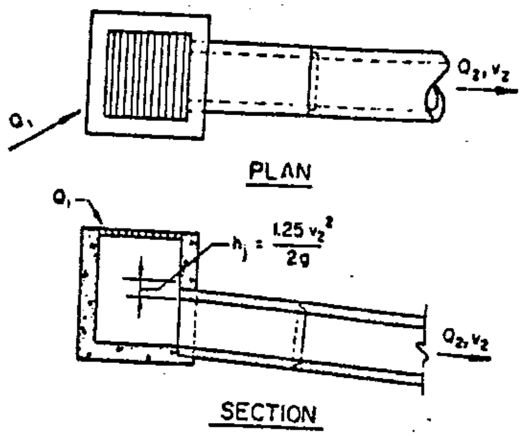


a Minor Head Losses Due to Turbulence at Structures



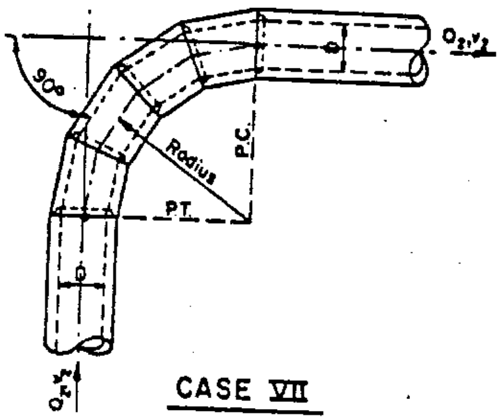
CASE V

45° WYE CONNECTION OR CUT IN



CASE VI

INLET OR MANHOLE AT BEGINNING OF LINE



CASE VII

CONDUIT ON 90° CURVES*

NOTE: Head loss applied at P.C. for length of curve.

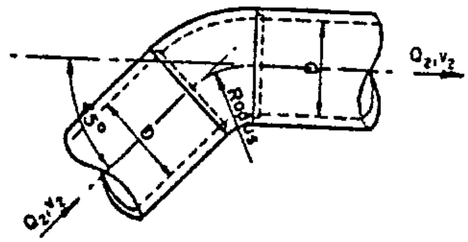
Radius = Dia. of Pipe $h_j = 0.50 \frac{v_2^2}{2g}$

Radius = (2-8) Dia. of Pipe $h_j = 0.25 \frac{v_2^2}{2g}$

Radius = (8-20) Dia. of Pipe $h_j = 0.40 \frac{v_2^2}{2g}$

Radius = Greater than 20 Dia. of Pipe $h_j = 0$

*When curves other than 90° are used, apply the following factors to 90° curves.
60° curve 85%
45° curve 70%
22 ½° curve 40%



CASE VIII

BENDS WHERE RADIUS IS EQUAL TO DIAMETER OF PIPE

NOTE: Head loss applied at begining of band

90° Bend $h_j = 0.50 \frac{v_2^2}{2g}$

60° Bend $h_j = 0.43 \frac{v_2^2}{2g}$

45° Bend $h_j = 0.35 \frac{v_2^2}{2g}$

22 ½° Bend $h_j = 0.20 \frac{v_2^2}{2g}$

Minor Head Losses Due To Turbulence at Structures

Equation for Pressure flow computations - Equate EGL

$$HGL_{D/S} + \frac{V^2}{2g} + Losses(V) = HGL_{U/S} + \frac{V^2}{2g}$$

(Set HGL at flowline of street)

$$Losses = Bend + Pipe$$
$$= \Sigma k_j\left(\frac{V^2}{2g}\right) + S_f L$$

Reach from Van Buren Ditch to 1st Manhole (T-Cap)

78" RCP · L = 380 ft.

k_j : Exit $k_j = 0.50$

45° Bend $k_j = 0.35$

10° Bend $k_j = 0.10$

Lateral $k_j = 0.25$ n = .013

MH $k_j = 0.50$ $\phi = \frac{29n^2}{2.21}$

$\Sigma = 1.70$ $R = r/2$

S_f : 78" RCP : $S_f = \frac{V^2}{2g}\left(\frac{\phi}{R^{4/3}}\right) = \left(\frac{.00492}{\left(\frac{3.25}{12}\right)^{4/3}}\right) = .0026$

$$S_f = \frac{V^2}{2g}(.0026)$$

$HGL_{D/S} = 37.4$ (At ditch culvert top)

$HGL_{U/S} = 42.2$ (At manhole)

$$37.4 + \frac{V^2}{2g} + 1.7\frac{V^2}{2g} + \overset{(S_fL)}{1.0\frac{V^2}{2g}} = 42.2 + \frac{V^2}{2g} \; ; \; V = 10.7 \text{ ft/s}$$

Q (pressure) = 355 cfs

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CLIENT: C of C/S JOB NO.: 8220

PROJECT: Lower Cragmor BY: JPF DATE: 5/13/87

SUBJECT: Storm Sewer Capacity · Pressure SHEET NO. 2 OF 14

From 1st MH to Grade Break in 43"x68" El.

54" RCP (equiv) L = 243' (T-Gap)

K_j :

Bend 10° $K_j = 0.10$

Lateral $K_j = 0.25$

$\Sigma K_j = 0.35$

S_f : 54" RCP $= \dfrac{.00492\, V^2}{\left(\frac{2.25}{2}\right)^{4/3} 2g} = 0.0042 \dfrac{V^2}{2g}$

$S_f = .0042(243)\dfrac{V^2}{2g} = 1.0 \dfrac{V^2}{2g}$

$HGL_{u/s} = 44.2$ (At flowline)

$HGL\,(D/S) = 42.2$ (From previous)

$42.2 + \dfrac{V^2}{2g} + 0.35\dfrac{V^2}{2g} + 1.0\dfrac{V^2}{2g} = 44.2 + \dfrac{V^2}{2g}$

$V^2 = \dfrac{2.0}{1.35}(32.2)(2)$ $V = 9.8$ ft/s

Q (pressure) = 155 cfs

From Grade Break to 1.7 (T-Gap)

54" RCP (equiv) L = 810 ft

K_j : 4 laterals $K_j = 1.0$

Bend 10° $K_j = 0.10$

MH $K_j = 0.50$

$\Sigma K_j = 1.6$

$$\text{Pipe Loss} = .0042\,(810)\frac{V^2}{2g} = 3.4\frac{V^2}{2g}$$

HGL (U/S) = 56.3 (At flowline)

$$44.2 + \frac{V^2}{2g} + 1.6\frac{V^2}{2g} + 3.4\frac{V^2}{2g} = 56.3 + \frac{V^2}{2g}$$

$$V^2 = \frac{12.1}{5.0}(32.2)(2); \quad V = 12.5 \text{ ft/s}$$

Q (pressure) = 199 cfs

From 1.7 to Pipe size change (Hancock)

48" RCP L = 1427

K_j : Inlet K = 0.5

Laterals (4) K = 1.0

$$\Sigma K_j = 1.1$$

$$S_f\,(48''\text{ RCP}) = \frac{.00492}{\left(\frac{2}{2}\right)^{4/3}}\frac{V^2}{2g} = 0.0049\frac{V^2}{2g}$$

$$\text{Pipe Loss} = .0049\,(1427) = 7.0\frac{V^2}{2g}$$

HGL (U/S) = 73.4

$$56.3 + \frac{V^2}{2g} + 1.1\frac{V^2}{2g} + 7.0\frac{V^2}{2g} = 73.4 + \frac{V^2}{2g}$$

$$V^2 = \frac{17.1}{8.1}(32.2)(2) \quad V = 11.7 \text{ ft/s}$$

Q (pressure) = 147 cfs

From Pipe Size Change to 3.9 (Hancock)

54" RCP (equiv.) L = 449'

K_j : Laterals (3) $K_j = 0.75$

Inlet $K_j = 0.5$

$\Sigma K_j = 1.25$

pipe loss = .0042 (449) = $1.9 \frac{V^2}{2g}$

HGL (U/S) = 74.3 (At flowline)

$73.4 + \frac{V^2}{2g} + 1.25\frac{V^2}{2g} + 1.9\frac{V^2}{2g} = 74.3 + \frac{V^2}{2g}$

$V^2 = \frac{0.9}{3.15}(32.2)(2)$ V = 4.3 ft/s

Q = 68 cfs (pressure)

From 3.9 to 3.11 (Hancock)

48" RCP L = 568'

K_j : MH $K_j = 0.50$

pipe Loss = 00492 (568) $\frac{V^2}{2g} = 2.8\frac{V^2}{2g}$

HGL (U/S) = 77.8 (At flowline)

$74.3 + \frac{V^2}{2g} + 0.5\frac{V^2}{2g} + 2.8\frac{V^2}{2g} = 77.8 + \frac{V^2}{2g}$

$V^2 = \frac{3.5}{3.3}(32.2)(2)$ V = 8.3 ft/s

Q (pressure) = 104 cfs

JR ENGINEERING, LTD. CLIENT: C of C/S JOB NO. 8220

PROJECT: Lower Cragmor BY: JPF DATE: 5/13/87

SUBJECT: Storm Sewer Capacity - Pressure SHEET NO. 5 OF 14

From 3.11 to 3.12 (Hancock)

42" RCP $L = 315'$

K_j : Lateral $K = 0.25$

Inlet $K = 0.5$

$\Sigma K_j = 0.75$

$$S_f = \frac{.00492}{\left(\frac{1.75}{2}\right)^{4/3}} \frac{V^2}{2g} = 0.0059 \frac{V^2}{2g}$$

$$\text{Pipe Loss} = .0059(315) = 1.9 \frac{V^2}{2g}$$

HGL (U/S) = 78.2

$$77.8 + \frac{V^2}{2g} + 0.75\frac{V^2}{2g} + 1.9\frac{V^2}{2g} = 77.8 + \frac{V^2}{2g}$$

$$V^2 = \frac{0.4}{2.65}(32.2)(2) \qquad V = 3.1 \text{ ft/s}$$

Q (pressure) = 30 cfs

From 3.12 to 3.13 (Hancock)

36" RCP $L = 420'$

K_j : 45° Bend $K_j = 0.35$

MH $K_j = 0.5$

$\Sigma K_j = 0.85$

$$S_f = \frac{.00492}{\left(\frac{1.5}{2}\right)^{4/3}} \frac{V^2}{2g} = .0072 \frac{V^2}{2g}$$

$$\text{Pipe loss} : 420(.0072)\frac{V^2}{2g} = 3.0\frac{V^2}{2g}$$

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CLIENT C of C/S JOB NO. 8220

PROJECT Lower Cragmor BY JPF DATE 5/13/87

SUBJECT Storm Sewer Capacity - Pressure SHEET NO. 6 OF 14

HGL (U/S) = 79.6 (Flowline)

$$77.8 + \frac{V^2}{2g} + 0.85\frac{V^2}{2g} + 3.0\frac{V^2}{2g} = 79.6 + \frac{V^2}{2g}$$

$$V^2 = \frac{1.8}{3.85}(32.2)(2) \qquad V = 5.5 \text{ ft/s}$$

Q = 39 cfs (pressure)

From 3.12 to 5.3 (4th)

24" RCP L = 487'

K_j : Inlet (2) $k_j = 1.0$

Lateral $K_j = 0.25$ $\Sigma K_j = 1.25$

$$S_f = \frac{.00492}{\left(\frac{1.0}{2.0}\right)^{4/3}}\frac{V^2}{2g} = .0124\frac{V^2}{2g}$$

$$\text{pipe loss} = .0124(487)\frac{V^2}{2g} = 6.0\frac{V^2}{2g}$$

HGL (U/S) = 90.2

$$79.6 + \frac{V^2}{2g} + 1.25\frac{V^2}{2g} + 6.0\frac{V^2}{2g} = 90.2 + \frac{V^2}{2g}$$

$$V^2 = \frac{10.6}{7.25}(32.2)(2) \qquad V = 9.7 \text{ ft/s}$$

Q (pressure) = 30 cfs

JR ENGINEERING, LTD. CLIENT C of C/S JOB NO. 8220

PROJECT Lower Cragmor BY JPF DATE 5/13/87

SUBJECT Storm Sewer Capacity - Pressure SHEET NO. 7 OF 14

From 3.11 to 4.3 (Primrose)

24" RCP L = 489'

K_j : Lateral $K_j = 0.25$

MH $K_j = 0.50$

$\Sigma K_j = 0.75$

$$\text{Pipe loss} = .0124(489)\frac{V^2}{2g} = 6.1\frac{V^2}{2g}$$

HGL (U/S) = 82.9

HGL (D/S) = 77.8 (Previous)

$$77.8 + \frac{V^2}{2g} + 0.75\frac{V^2}{2g} + 6.1\frac{V^2}{2g} = 82.9 + \frac{V^2}{2g}$$

$$V^2 = \frac{5.1}{6.85}(32.2)(2) \qquad V = 6.9 \text{ ft/s}$$

Q (pressure) = 22 cfs

From 3.9 to 3.9.1 Columbine

39" CMP (equiv.) L = 226'

$K_j = 0.5$ (Entrance) ($n = .024$ $\Phi = .0168$)

$$S_f = \frac{V^2}{2g}\frac{\phi}{R^{4/3}} = \frac{V^2}{2g}\left(\frac{.0168}{\left(\frac{1.63}{2}\right)^{4/3}}\right) = .0212\frac{V^2}{2g}$$

$$\text{Pipe Loss} = .0212(226)\frac{V^2}{2g} = 4.8\frac{V^2}{2g}$$

HGL (U/S) = 77.2 HGL (D/S) = 74.3

$$0.5\frac{V^2}{2g} + 74.3 + 4.8\frac{V^2}{2g} + \frac{V^2}{2g} = 77.2 + \frac{V^2}{2g} \qquad V^2 = \frac{2.8}{5.3}(32.2)(2)$$

$V = 5.8$ ft/s Q = 51 cfs

JR ENGINEERING, LTD.

CLIENT C of C/S JOB NO. 8220

PROJECT Lower Cragmor BY JPF DATE 5/13/87

SUBJECT Storm Sewer - Pressure SHEET NO. 8 OF 14

From 3.9.1 to 3.9.2 (Columbine)

42" RCP L = 316'

K_j : Lateral (2) $K_j = 0.5$

MH $K_j = 0.5$ $\Sigma K_j = 1.0$

HGL (u/s) = 80.6

Pipe loss : $(316 \times .0059) = 1.9 \frac{V^2}{2g}$

$$77.2 + \frac{V^2}{2g} + 1.0\frac{V^2}{2g} + 1.9\frac{V^2}{2g} = 80.6 + \frac{V^2}{2g}$$

$$V^2 = \frac{3.4}{2.9}(32.2)(2) \quad V = 8.7 \text{ ft/s}$$

Q = 84 cfs

From 3.9.2 to 3.9.4

36" RCP L = 685'

K_j : Lateral (2) $K_j = 0.5$

MH $K_j = 0.5$

$\Sigma K_j = 1.0$

pipe loss $= 685(.0072)\frac{V^2}{2g} = 4.9\frac{V^2}{2g}$

HGL (u/s) = 86.5

$$80.6 + \frac{V^2}{2g} + 1.0\frac{V^2}{2g} + 4.9\frac{V^2}{2g} = 86.5 + \frac{V^2}{2g}$$

$$V^2 = \frac{5.9}{5.9}(32.2)(2) \quad V = 8.0 \text{ ft/s} \quad Q = 57 \text{ cfs}$$

JR ENGINEERING, LTD. CLIENT C of C/S JOB NO. 8220

PROJECT Lower Cragmor BY JPF DATE 5/13/87

SUBJECT Storm Sewer Capacity - Pressure SHEET NO. 9 OF 14

From 3.9.4 to 3.9.6 Columbine

42" CMP $L = 440'$

K_j : laterals (2) $K_j = 0.50$

MH $K_j = 0.50$

$\Sigma K_j = 1.0$

Pipe losses $= .0201(440)\frac{V^2}{2g} = 8.8\frac{V^2}{2g}$

HGL (U/S) = 95.9

$$86.5 + \frac{V^2}{2g} + 1.0\frac{V^2}{2g} + 8.8\frac{V^2}{2g} = 95.9 + \frac{V^2}{2g}$$

$V^2 = 9.4/9.8(32.2)(2) = 7.9$ ft/s

Q = 76 cfs

From 3.9.6 to 3.9.7 Columbine

30" RCP $L = 847$

K_j : 0.50 (Inlet)

Pipe loss $= .0092(847) = 7.8\frac{V^2}{2g}$

HGL (U/S) = 104.0

$$95.9 + \frac{V^2}{2g} + 0.5\frac{V^2}{2g} + 7.8\frac{V^2}{2g} = 104.0 + \frac{V^2}{2g}$$

$V^2 = \frac{8.1}{8.3}(32.2)(2)$ $V = 7.9$ ft/s

Q (pressure) = 39 cfs

1st Manhole to 2.1 (T Gap Alley)

60" RCP (Equiv) L = 270'

$K_j = 0.50$ (Inlet)

$$S_f = \frac{.00492}{\left(\frac{2.5}{2}\right)^{4/3}} = .0037 \frac{V^2}{2g}$$

pipe loss = 270(.0037) = $1.0 \, V^2/2g$

HGL (U/S) = 43.5

HGL (D/S = 42.2 (Previous)

$$42.2 + \frac{V^2}{2g} + 0.5\frac{V^2}{2g} + 1.0\frac{V^2}{2g} = 43.5 + \frac{V^2}{2g}$$

$$V^2 = \frac{1.3}{1.5}(64.4) \qquad V = 7.5 \text{ ft/s}$$

Q = 147 cfs

From 2.1 to 2.8 (T-Gap to Fillmore)

60" RCP L = 3886'

K_j : Laterals (6) $K_j = 1.5$

MH & Inlets (4) $K_j = 2.0$

(2) 60° Bend $K_j = 0.9$

$\Sigma K_j = 4.4$

Pipe Loss = (.0037) 3886 = $14.3 \frac{V^2}{2g}$

HGL (U/S) = 93.9

$$43.5 + \frac{V^2}{2g} + 4.4\frac{V^2}{2g} + 14.3\frac{V^2}{2g} = 93.9 + \frac{V^2}{2g}$$

$V^2 = (50.4/18.7)(64.4)$ $V = 13.2$ ft/s $Q_P = 259$ cfs

JR ENGINEERING, LTD. CLIENT C of C/S JOB NO. 8220

PROJECT Lower Cragmor BY JPF DATE 5/13/87

SUBJECT Storm Sewer Capacity - Pressure SHEET NO. 11 OF 14

Outlet to Van Buren to Grade Break (El Paso)

78" RCP L = 1558'

K_j : Exit $K_j = 0.5$

45° Bend (2) $K_j = 0.70$ $\Sigma K_j = 1.2$

Pipe Loss = 1558(.0026) = $4.1 \frac{V^2}{2g}$

HGL (D/S) = 20.6 (Top of pipe)

HGL (U/S) = 36.1 (Flowline)

$$20.6 + \frac{V^2}{2g} + 1.2\frac{V^2}{2g} + 4.1\frac{V^2}{2g} = 36.1 + \frac{V^2}{2g}$$

$V^2 = (15.5/6.3)(64.4)$ $V = 12.6$ ft/s

Q (pressure) = 418 cfs

Grade Break to 6.12 (EL Paso)

78" RCP L = 1693

K_j : Laterals (13) $K_j = 3.25$

MH & Inlets (4) $K_j = 2.0$

45° Bends (2) $K_j = 0.70$ $\Sigma K_j = 6.0$

Pipe Loss = 1693(.0026) = $4.4 \frac{V^2}{2g}$

HGL (U/S) = 53.0

$$36.1 + \frac{V^2}{2g} + 4.4\frac{V^2}{2g} + 6.0\frac{V^2}{2g} = 53.0 + \frac{V^2}{2g}$$

$V^2 = \frac{16.9}{10.4}(64.4)$ $V = 10.2$ ft/s

Q (pressure) = 339 cfs

1st Street - El Paso to Century

33" RCP L = 683'

K_j : Laterals (3) $K_j = 0.75$

Bends (45°) 3 $K_j = 1.05$

$\Sigma K_j = 1.8$

$S_f = \frac{.00492}{\left(\frac{1.38}{2}\right)^{4/3}} = .0081$

Pipe Loss = .0081(683) = $5.5 \frac{V^2}{2g}$

HGL (D/S) = 44.2

HGL (U/S) = 45.2

$44.2 + \frac{V^2}{2g} + 1.8\frac{V^2}{2g} + 5.5\frac{V^2}{2g} = 45.2 + \frac{V^2}{2g}$

$V^2 = \frac{1.0}{7.3}(64.4)$. V = 3.0 ft/s Q = 17.6 cfs

Century north to 4th St.

27" RCP L = 758

K_j : Laterals (1) $K_j = 0.25$

MH $K_j = 0.50$

$\Sigma K_j = 0.75$

$S_f = \frac{.00492}{\left(\frac{1.13}{2}\right)^{4/3}} = .0106$

Pipe Loss = .0106 (758) = $8.0 \frac{V^2}{2g}$

HGL (U/S) = 51.0

$45.2 + \frac{V^2}{2g} + 0.75\frac{V^2}{2g} + 8.0\frac{V^2}{2g} = 51.0 + \frac{V^2}{2g}$

V = 6.5 ft/s Q = 26 cfs

JR ENGINEERING, LTD. CLIENT C of C/S JOB NO. 8220

PROJECT Lower Cragmor BY JPF DATE 5/13/87

SUBJECT Storm Sewer Capacity · Pressure SHEET NO. 13 OF 14

4th Street from EL Paso to reducer

42" RCP $L = 108'$

$K_j = 0.25$ (lateral)

Pipe loss = .0059 (108) = $0.6 \frac{V^2}{2g}$

HGL(U/S) = 52.9

HGL(D/S) = 52.3

$52.3 + \frac{V^2}{2g} + 0.25\frac{V^2}{2g} + 0.6\frac{V^2}{2g} = 52.9 + \frac{V^2}{2g}$

$V = 7.3$ ft/s $Q = 70$ cfs

36" RCP Section in 4th St.

$L = 377'$ K_j : 2 laterals $K_j = 0.5$

Pipe loss : 377 (.0072) = $2.7 \frac{V^2}{2g}$

HGL (U/S) = 55.2

$52.9 + 0.5\frac{V^2}{2g} + 2.7\frac{V^2}{2g} = 55.2$

$V = 6.8$ ft/s $Q = 48$ cfs

42" RCP Section east of 36" RCP (4th)

$L = 416'$ K_j : 3 laterals $K_j = 0.75$

HGL(U/S) = 58.4

Pipe Loss = .0059 (416) = $2.5 \frac{V^2}{2g}$

$55.2 + 0.75\frac{V^2}{2g} + 2.5\frac{V^2}{2g} = 58.4$

$V = 8.0$ ft/s $Q = 77$ cfs

30" RCP Section in 4th St.

L = 414' k_j : 2 laterals $k_j = 0.5$

Pipe loss = .0092(414) = $3.8 \frac{v^2}{2g}$

HGL (u/s) = 59.9

$58.4 + 0.5\frac{v^2}{2g} + 3.8\frac{v^2}{2g} = 59.9$

V = 4.7 ft/s Q = 23 cfs

27" RCP Section in 4th St.

L = 169' $k_j = 0$

pipe Loss = $\frac{.00492}{\left(\frac{1.13}{2}\right)^{4/3}}(169) = 1.8\frac{v^2}{2g}$

HGL (u/s) = 62.0

$59.9 + 1.8\frac{v^2}{2g} = 62.0$

V = 8.7 ft/s Q = 34 cfs

24" RCP Section in 4th St. & Pennsylvania

L = 736' k_j : Laterals (6) $k_j = 1.5$

Pipe loss = .0124(736) = $9.1\frac{v^2}{2g}$

HGL (u/s) = 66.5 (1 ft above slotted X PAN)

$62.0 + 1.5\frac{v^2}{2g} + 9.1\frac{v^2}{2g} = 66.5$

V = 5.2 ft/s Q = 16. cfs

24" RCP Section to F.E.S.

$k_j = 0.50$ (90° Bend) pipe loss = 300 (.0124) = 3.7

$66.5 + 0.5\frac{v^2}{2g} + 3.7\frac{v^2}{2g} = 70.3$ ← 4 ft above flowline

Q = 24 cfs

Find Interception Rates for Inlets in 10-year storm and subtract flow from total flow at intersections in SWMM model. Use diversion at Union - T-Gap as recommended in Master Plan.

Inlet 3.9.8 - 5' Type "R" Inlet :

Cont. Grade : $S = 0.8\%$

Q_{10} : $T_c = 5$ min. ; $I_{10} = 6.0$ in/hr

$C_{10} = 0.90$

$A = 60 \times 1100 \div 43560 = 1.5$ Acres

$Q_{10} = 8.1$ cfs

Use $T = 10$ ft. $W = 2$ ft $S_x = .02$

$H = 0.5$

Use Fig 7-9 $L = 5$ ft $Q_i/Q = 0.6$

$Q_I = 0.6(8.1) = 4.9$ cfs $Q_o = 3.2$

Inlet 3.9.7 4.5' x 4.5' Grate : $Y = 4"$

Use Calculations in inlet capacity estimates in Master Plan.

$Q_I = 0.6(0.5)\left[2(32.2)(0.33)\right]^{0.5}(0.5) = 0.7$ cfs/ft.

$Q_I = (4.5)^2(0.7) = 14$ cfs (capacity)

Q_{act} at inlet : $A = 50 \times 200 \div 43560 = 0.23$ Ac.

$Q_T = (.23)(6)(.9) + 3.2 = 4.4$ cfs

$\therefore Q_I$ (inlet) $= 4.4$ cfs

Inlet 3.9.6 10' D-10-R

Prorate total flow from Basin 377 by area and subtract flows in previous inlets to determine Q_{10} at the inlet. Area = 8.0 Acres

$$Q_{10} = 29\left(\frac{8.0}{13.8}\right) - 4.9 - 4.4 = 7.5 \text{ cfs}$$

Cont. Grade Inlet: $S_x = .02$ $S_o = .020$

$T = 10$ ft, $W = 2$ ft. $H = 0.5$

Use Fig 7-9 $L = 10$ ft $Q_I/Q = 0.7$

$$Q_I = 7.5(0.7) = 5.3 \text{ cfs}$$

Flow south of Columbine ℄ = $\frac{0.4}{13.8}(29) = 1.0$

Inlet 3.9.5 10' D-10-R

$$Q_{10} = 29 - 4.9 - 4.4 - 5.3 - 1.0 = 13.4 \text{ cfs}$$

$T = 12$ ft. $S_o = 0.013$

Fig 7-9 $L = 10'$ $Q_I/Q = 0.7$

$Q_I = 0.7(13.4) = 9.4$ cfs $Q_{co} = 4.0$ cfs

Q (Storm sewer @ Gladiola) = 24.7 cfs

Pipe Cap. (42" CMP @ 1.4%) = 64 cfs

Inlet 3.9.4 10' D-10-R

Prorate flow from 378 to find flow at inlet. Area to inlet = 4.0 Acres

$$Q_{10} = \frac{4.0}{13.9}(33) + 4.0 = 13.5 \text{ cfs}$$

Inlet 394 (Cont)

$L = 10$ ft $S_o = .021$ $T = 10$ ft.

Fig 7-9 $Q_I / Q = 0.65$

$Q_I = 13.5(0.65) = 8.8$ cfs

Pipe flow = 24.7 + 8.8 = 33.5 cfs

Inlet 393. 10' D-10-R Inlet

Flow in South gutter $= \frac{0.7}{13.9}(33) + 1.0 = 3$ cfs

Flow at inlet : $Q = 62 - 3 - 34 = 25$ cfs
(3 = south; 34 = pipe)

Flows combine from N. Gutter of Columbine and W. Gutter of Poinsetta @ Inlet

$S = 1.7\%$ Inlet will prevent flooding in Columbine west of Poinsetta

Use Fig 7-9 : $T = 10$ ft : $Q_I / Q_o = 0.7$

$Q_I = 25(0.7) = 18$ cfs

Check Orifice Capacity to Top of Opening

$Q = 0.6(10)(0.67)\sqrt{2(32.2)(0.33)} = 19$ cfs

$\therefore Q_I = 18$ cfs $Q_{co} = 7$ cfs $Q_{pipe} = 51.5$

Inlet 3.9.2 and 3.9.1 S = 1.2%

10' D-10-R and 6' D-10-R

Find Total flow to North gutter

$Q(\text{South}) = \frac{0.7}{13.3}(34) = 2$ cfs

$Q(\text{North}) = 32 + 7 = 39$ cfs

10' D-10-R, T = 10 ft, S = 1.2%

Inlet will flow max capacity : $Q_I = 19$ cfs
(from calcs for Inlet 3.9.3)

6' D-10-R : T = 10 ft S = 1.2%

$Q = 39 - 19 = 20$ cfs

Use Fig 7-9 : $Q_I / Q = 0.65$

$Q_I = 20(0.65) = 13$ cfs

Check Orifice Eq. : $Q = 0.6(0.67)(6)\sqrt{2g(.33)}$

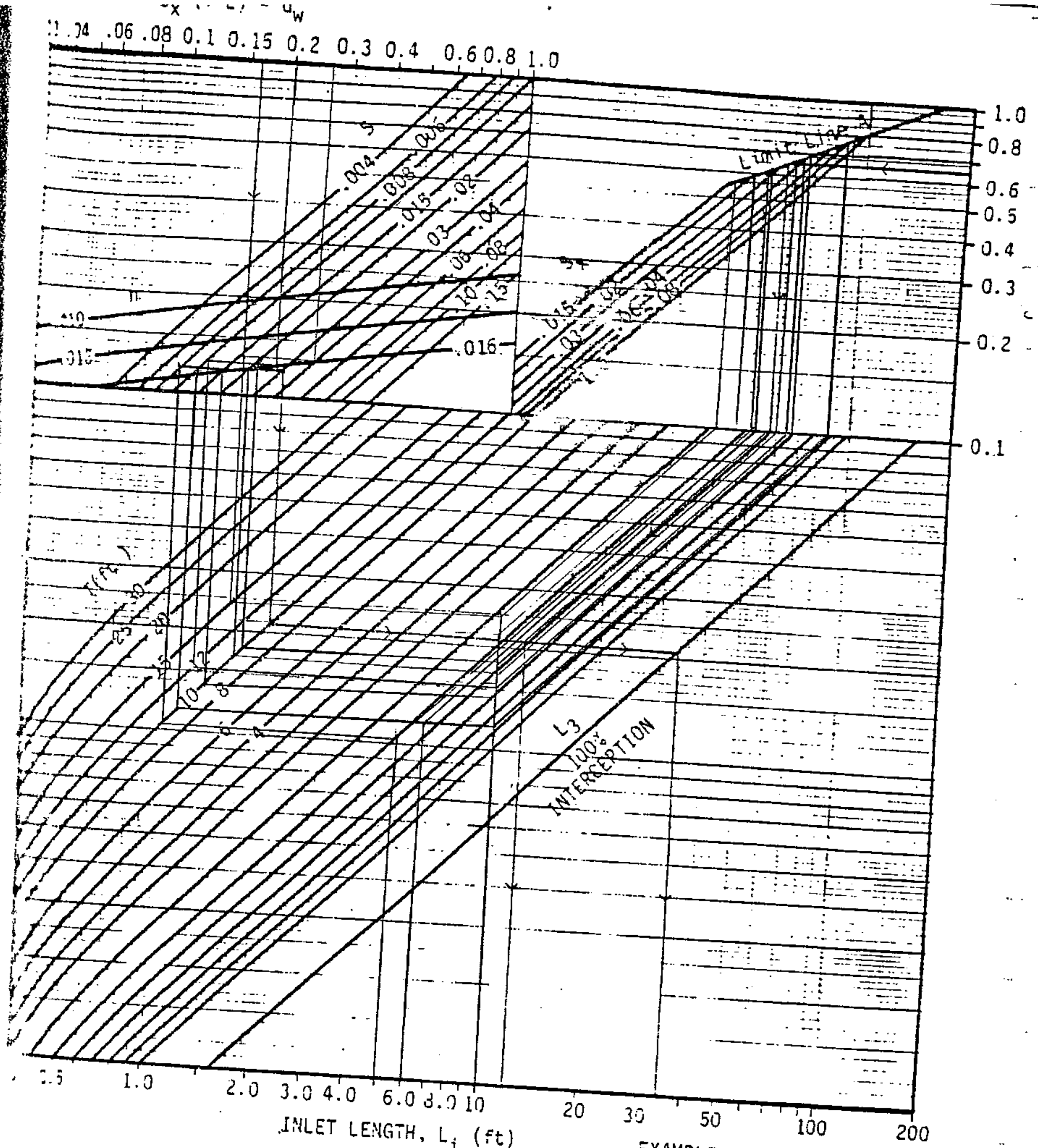
$Q_I = 11$ cfs

$\therefore Q_I = 11$ cfs $Q_{co} = 9$ cfs

$Q_{pipe} = 79.5$ cfs

Pipe Capacity (42" RCP @ 1.1%) = 105 cfs

Carryover (9 cfs) will flow towards Hancock and be picked up in large inlets proposed as part of Hancock Improvements.



EXAMPLE

Given — S_x = 0.02 ft/ft
T = 10 ft.
S = 0.03 ft/ft

Find — L_i = 11.8 ft L_i = 34 ft.
Q_i/Q= 0.65 Q_i/Q=1.0

This chart assumes, w=2 ft., a = 2" and h=6in.

Standard Curb-Opening Inlet Chart

The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Date

Figure
7 – 9

APPENDIX 3

OFFSITE BASIN ANALYSIS

JR ENGINEERING, LTD.

CLIENT C of C/S JOB NO. 8220

PROJECT Cragmor BY JPF DATE 5/15/87

SUBJECT SCS flow analysis SHEET NO. 1 OF 2

24 hr : 3.2 in/hr. 10-year
4.6 in./hr. 100-year

Basin	100-yr 24 hr. rainfall	CN	Area (SQMI)	t_c (hrs)	CSM/in	q_p (100)
A	2.6	87	1.2	0.46	540	1700
OA	1.8	75	0.79	0.48	540	800
OB	1.1	64	1.97	0.76	390	850

JR ENGINEERING, LTD.

CLIENT C of C/S JOB NO. 8220
PROJECT Cragmor BY DAS DATE 5/15/87
SUBJECT SCS flow SHEET NO. 2 OF 2

$t_p = \frac{D}{2} + 0.6\,t_c = 0.67\,t_c$ (where $0.133\,t_c = D$)

$t_p = 0.6666\,t_c$

Basin O-A

$$t_c = \left[\frac{11.9\,L^3}{H}\right]^{0.385}$$

CN = 87 $T_c'/T_c = 1.0$

L = 8400 ft = 1.59 mi
H = 330 ft

$$t_c = \left[\frac{11.9\,(1.59)^3}{330}\right]^{0.385} = 0.48 \text{ hrs}$$

$t_p = .3169$ hrs

Basin O-B

L = 8400 + 4500
H = 350

$$t_c = \left[\frac{11.9\,(2.44)^3}{350}\right]^{0.385} = 0.76$$

CN = 67 $T_c'/T_c = 1.52$

$t_p = 0.5081$

Basin A

L = 8300 = 1.57 mi
H = 45

$$t_c = \left(\frac{(11.9)(1.57)^3}{350}\right)^{0.385} = 0.4587 \text{ hr}$$

CN = 87

APPENDIX 3

OFFSITE BASIN ANALYSIS

THIS RUN EXECUTED 05/18/87 16:17:53

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************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
 ERROR CORR -  01,02,03,04,05,06
 MODIFICATION -  50,51,52,53,54,55,56
 IBM-PC-XT VERSION
************************************************
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T1 CITY OF COLORADO SPRINGS
T2 LOWER CRAGMOR MASTER DRAINAGE STUDY
T3 100-YEAR STORM

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0.	0.	0.	1.	.000000	.00	.0	3350.	102.660	.000

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	.000	.000	.000	.000	.000	.000	-1.000	.000	.000	.000

NC	.000	.000	.020	.100	.300	.000	.000	.000	.000	.000
X1	13.000	7.000	18.000	30.000	343.000	343.000	343.000	.000	.000	.000
GR	138.910	.000	132.450	12.000	128.730	18.000	128.750	24.000	128.760	30.000
GR	138.310	42.000	138.810	55.000	.000	.000	.000	.000	.000	.000
X1	12.000	8.000	16.000	28.000	445.000	445.000	445.000	.000	.000	.000
GR	135.110	.000	130.010	10.000	125.870	16.000	125.850	22.000	125.830	28.000
GR	129.990	34.000	134.610	43.000	135.810	63.000	.000	.000	.000	.000
X1	11.000	7.000	16.000	28.000	462.000	462.000	462.000	.000	.000	.000
GR	131.030	.000	126.170	10.000	122.030	16.000	122.010	22.000	122.000	28.000
GR	126.130	34.000	131.930	44.000	.000	.000	.000	.000	.000	.000
X1	10.000	8.000	18.000	30.000	389.000	389.000	389.000	.000	.000	.000
GR	128.830	.000	123.370	10.500	118.470	18.000	118.440	24.000	118.410	30.000
GR	123.390	37.500	128.630	48.000	130.030	74.000	.000	.000	.000	.000
X1	9.000	8.000	24.500	36.500	130.000	130.000	130.000	.000	.000	.000
GR	129.440	.000	119.760	17.000	115.430	24.500	115.340	30.500	115.250	36.500
GR	119.440	44.000	127.440	60.500	128.600	72.500	.000	.000	.000	.000
X1	8.000	8.000	17.500	29.500	387.000	387.000	387.000	.000	.000	.000
GR	126.740	.000	119.340	10.000	114.420	17.500	114.440	23.500	114.460	29.500
GR	119.700	37.000	126.440	50.500	126.840	73.500	.000	.000	.000	.000
X1	7.000	8.000	27.500	38.500	119.000	119.000	119.000	.000	.000	.000
GR	130.280	.000	118.510	17.500	111.760	27.500	111.760	33.000	111.760	38.500
GR	118.550	48.500	126.480	61.000	127.260	66.000	.000	.000	.000	.000

X1	6.000	7.000	55.500	66.500	341.000	341.000	341.000	.000	.000	.000
GR	121.820	.000	120.910	25.500	116.520	45.500	109.810	55.500	109.810	61.000
GR	109.810	66.500	116.610	76.500	.000	.000	.000	.000	.000	.000
X1	5.000	6.000	28.000	39.000	248.500	249.500	249.000	.000	.000	.000
GR	122.910	.000	114.010	18.000	107.500	28.000	107.490	33.500	107.470	39.000
GR	113.830	49.000	.000	.000	.000	.000	.000	.000	.000	.000
X1	4.000	8.000	7.500	19.100	209.500	208.500	209.000	.000	.000	.000
GR	113.000	.000	105.400	7.500	105.340	13.300	105.240	19.100	112.930	26.600
GR	116.140	36.300	116.540	51.300	117.010	56.300	.000	.000	.000	.000
X1	3.000	9.000	28.500	40.100	491.000	489.000	490.000	.000	.000	.000
GR	117.940	.000	113.040	10.000	111.770	21.000	103.610	28.500	103.510	34.300
GR	103.400	40.100	111.700	47.600	113.940	70.600	114.660	75.600	.000	.000
X1	2.000	7.000	32.500	44.100	480.000	482.000	481.000	.000	.000	.000
GR	108.770	.000	108.090	5.000	107.650	25.000	99.290	32.500	99.380	38.300
GR	99.470	44.100	107.470	51.600	.000	.000	.000	.000	.000	.000
X1	1.000	7.000	21.500	38.100	.000	.000	.000	.000	.000	.000
GR	104.900	.000	104.300	12.000	103.400	14.000	95.320	21.500	95.470	27.300
GR	95.620	33.100	108.970	50.600	.000	.000	.000	.000	.000	.000
EJ	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV= .100 CEHV= .300

*SECNO 13.000

13.00	5.00	133.73	140.96	102.66	271.02	137.29	.00	.00	128.73
3350.	2029.	5.	1316.	20.	60.	16.	0.	0.	128.76
.00	99.67	.08	84.79	.000	.020	.000	.000	128.73	9.62
.000000	0.	0.	0.	0	26	0	.00	26.62	36.25

*SECNO 12.000

3301 HV CHANGED MORE THAN HVINS

12.00	4.93	130.76	137.50	.00	270.75	139.99	.00	.27	125.87
3350.	1658.	5.	1687.	18.	59.	18.	1.	0.	125.83
.00	94.76	.08	95.26	.000	.020	.000	.000	125.83	8.52
.000000	343.	343.	343.	9	20	0	.00	26.99	35.51

*SECNO 11.000

3301 HV CHANGED MORE THAN HVINS

11.00	4.89	126.89	133.95	.00	270.40	143.51	.00	.35	122.03
3350.	1655.	5.	1690.	17.	59.	17.	2.	0.	122.00
.00	95.69	.08	96.71	.000	.020	.000	.000	122.00	8.51
.000000	445.	445.	445.	9	20	0	.00	26.81	35.32

*SECNO 10.000

3301 HV CHANGED MORE THAN HVINS

10.00	4.78	123.19	130.57	.00	270.06	146.87	.00	.34	118.47
3350.	1661.	5.	1684.	17.	57.	17.	3.	1.	118.41
.00	97.07	.09	97.58	.000	.020	.000	.000	118.41	10.76
.000000	462.	462.	462.	8	20	0	.00	26.45	37.21

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 9.000

3301 HV CHANGED MORE THAN HVINS

9.00	4.49	119.74	126.82	.00	269.75	150.02	.00	.31	115.43
3350.	1518.	4.	1828.	16.	53.	18.	3.	1.	115.25
.00	94.54	.08	101.42	.000	.020	.000	.000	115.25	17.04
.000000	389.	389.	389.	8	20	0	.00	27.57	44.61

*SECNO 8.000

8.00	4.81	119.23	127.28	.00	269.70	150.47	.00	.05	114.42
3350.	1755.	5.	1590.	18.	58.	16.	4.	1.	114.46
.01	99.39	.09	97.54	.000	.020	.000	.000	114.42	10.16
.000000	130.	130.	130.	12	23	0	.00	26.17	36.33

*SECNO 7.000

3301 HV CHANGED MORE THAN HVINS

7.00	4.77	116.53	124.32	.00	269.46	152.93	.00	.25	111.76
3350.	1679.	5.	1667.	17.	53.	17.	5.	1.	111.76
.01	99.57	.09	99.25	.000	.020	.000	.000	111.76	20.43
.000000	387.	387.	387.	9	20	0	.00	25.11	45.53

*SECNO 6.000

3301 HV CHANGED MORE THAN HVINS

6.00	4.76	114.57	122.43	.00	269.28	154.71	.00	.18	109.81
3350.	1686.	5.	1659.	17.	52.	17.	5.	1.	109.81
.01	100.03	.09	99.75	.000	.020	.000	.000	109.81	48.41
.000000	119.	119.	119.	9	25	0	.00	25.08	73.49

*SECNO 5.000

3301 HV CHANGED MORE THAN HVINS

3710 WSEL ASSUMED BASED ON MIN DIFF

5.00	4.64	112.11	120.02	.00	269.06	156.95	.00	.22	107.50
3350.	1635.	5.	1710.	16.	51.	17.	5.	2.	107.47
.01	100.15	.09	101.04	.000	.020	.000	.000	107.47	20.92
.000000	341.	341.	341.	10	20	0	.00	25.38	46.30

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 4.000

3301 HV CHANGED MORE THAN HVINS

4.00	5.89	111.13	119.02	.00	268.97	157.84	.00	.09	105.40
3350.	1623.	7.	1720.	16.	67.	17.	6.	2.	105.24
.01	100.18	.10	101.62	.000	.020	.900	.000	105.24	1.84
.000000	249.	249.	250.	13	23	0	.00	23.00	24.85

*SECNO 3.000

3301 HV CHANGED MORE THAN HVINS

3.00	6.12	109.52	116.21	.00	268.82	159.30	.00	.15	103.61
3350.	1613.	7.	1730.	16.	70.	17.	6.	2.	103.40
.01	100.50	.10	102.23	.000	.020	.000	.000	103.40	23.07
.000000	210.	209.	209.	10	20	0	.00	22.56	45.63

*SECNO 2.000

3301 HV CHANGED MORE THAN HVINS

2.00	6.05	105.34	112.16	.00	268.44	163.10	.00	.38	99.29
3350.	1689.	7.	1654.	16.	69.	16.	8.	2.	99.47
.01	102.81	.11	102.38	.000	.020	.000	.000	99.29	27.07
.000000	491.	490.	489.	9	20	0	.00	22.53	49.60

*SECNO 1.000

3301 HV CHANGED MORE THAN HVINS

1.00	2.43	97.75	105.72	.00	267.75	170.01	.00	.69	95.32
3350.	0.	0.	3350.	0.	0.	32.	8.	2.	154.90
.01	.00	.00	104.63	.000	.020	.000	.000	95.32	19.25
.000000	480.	481.	482.	11	14	0	.00	16.63	35.88

PROFILE FOR STREAM   100-YEAR STORM

PLOTTED POINTS (BY PRIORITY)-E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA

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ELEVATION    95.      100.      105.      110.      115.      120.      125.      130.      135.      140.
    SECNO   CUMDIS

    13.00     0.  .         .         .         .         .         .         .      IR .      W  .       M . C       E
             50.  .         .         .         .         .         .         .      I  .      W  .      M  .C        E
            100.  .         .         .         .         .         .         .     I   .     W   .    M    C         E
            150.  .         .         .         .         .         .         .    I    .    W    .   M    C.         E
            200.  .         .         .         .         .         .         .   I     .   W     .  M    C .         E
            250.  .         .         .         .         .         .         .  I      .  W      . M    C  .         E
            300.  .         .         .         .         .         .         . I       . W       .M    C   .         E
    12.00   350.  .         .         .         .         .         .         . I       . W       M    C    .         E
            400.  .         .         .         .         .         .         .I        .W      M.   C     .         E
            450.  .         .         .         .         .         .         I         W       M . C      .         E
            500.  .         .         .         .         .         .        I.        W.      M  .  C      .         E
            550.  .         .         .         .         .         .       I .       W .      M  . C       .         E
            600.  .         .         .         .         .         .      I  .      W  .     M   .C        .         E
            650.  .         .         .         .         .         .     IL  .     W   .    M    C         .         E
            700.  .         .         .         .         .         .     I   .    W    .   M    C.         .         E
            750.  .         .         .         .         .         .    I    .    W    .  M     C.         .         E
    11.00   800.  .         .         .         .         .         .   I     .   W     . M     C .         .         E
            850.  .         .         .         .         .         .  I      .  W      . M    C  .         .         E
            900.  .         .         .         .         .         . IL      . W       .M    C   .         .         E
            950.  .         .         .         .         .         . I       .W        .M    C   .         .         E
           1000.  .         .         .         .         .         .I        .W        M    C    .         .         E
           1050.  .         .         .         .         .         I         W         M   C     .         .         E
           1100.  .         .         .         .         .        I.        W.        M.   C     .         .         E
           1150.  .         .         .         .         .        I.       W .        M.  C      .         .         E
           1200.  .         .         .         .         .       I .      W  .       M . C       .         .         E
    10.00  1250.  .         .         .         .         .      I  .     W   .       M .C        .         .         E
           1300.  .         .         .         .         .     I   .     W   .       M C         .         .         E
           1350.  .         .         .         .         .    I    .    W    .      MC .         .         .         E
           1400.  .         .         .         .         .   IL    .   W     .     MC  .         .         .         E
           1450.  .         .         .         .         .   I     .  W      .      C  .         .         .         E
           1500.  .         .         .         .         .  I      . W       .     CM  .         .         .         E
           1550.  .         .         .         .         . I       .W        .    C M  .         .         .         E
           1600.  .         .         .         .         .I        W         .   C  M  .         .         .         E
     9.00  1650.  .         .         .         .         .I       W.         .   C  M  .         .         .         E
           1700.  .         .         .         .         I        W.         .   C M   .         .         .         E
           1750.  .         .         .         .        I.        W.         .   C     .         .         .         E
     8.00  1800.  .         .         .         .        I.       W .         .  M C    .         .         .         E
           1850.  .         .         .         .       I .       W .         .   C     .         .         .         E
           1900.  .         .         .         .      IR .      W  .         .  CM     .         .         .         E
           1950.  .         .         .         .      I  .     W   .         . C M     .         .         .         E
           2000.  .         .         .         .     I   .     W   .         . C M     .         .         .         E
           2050.  .         .         .         .    I    .    W    .         .C  M     .         .         .         E
           2100.  .         .         .         .    I    .   W     .         C   M     .         .         .         E
           2150.  .         .         .         .   I     .   W     .        C.   M     .         .         .         E
     7.00  2200.  .         .         .         .   I     .  W      .        C.    M    .         .         .         E
           2250.  .         .         .         . I       .W        .     MC  .         .         .         .         E
     6.00  2300.  .         .         .         I        W. M      .    C    .         .         .         .         E
           2350.  .         .         .        I.       W . M       .   C     .         .         .         .         E
           2400.  .         .         .       I .       W . M       .  C      .         .         .         .         E
           2450.  .         .         .       I .      W  .M        .  C      .         .         .         .         E
           2500.  .         .         .      I  .     W   M         . C       .         .         .         .         E
           2550.  .         .         .     I   .    W   M.        .C        .         .         .         .         E
           2600.  .         .         .     I   .    W  M .        .C        .         .         .         .         E
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      2700. .         .         .   I     .   W  M  .         C         .         .         .         .         E
      2750. .         .         .  I      .  W   M  .        C.         .         .         .         .         E
      2800. .         .         . I       .  W   M  .        C.         .         .         .         .         E
      2850. .         .         .IL       .  W  M   .       C .         .         .         .         .         E
4.00  2900. .         .         IL        . W   M   .       C .         .         .         .         .         E
      2950. .         .         I         .W     M  .      C  .         .         .         .         .         E
      3000. .         .        I.         .W      M .    C    .         .         .         .         .         E
      3050. .         .       I .         W       M .   C     .         .         .         .         .         E
3.00  3100. .         .      I  .        W.        M. C       .         .         .         .         .         E
      3150. .         .     I   .       W .       M . C       .         .         .         .         .         E
      3200. .         .    I    .      W  .     M   .C        .         .         .         .         .         E
      3250. .         .   IL    .     W   .    M    C         .         .         .         .         .         E
      3300. .         .  IL     .     W   .  M     C.         .         .         .         .         .         E
      3350. .         .  I      .    W    . M     C .         .         .         .         .         .         E
      3400. .         . I       .   W     .M     C  .         .         .         .         .         .         E
      3450. .         .I        .  W     M.      C  .         .         .         .         .         .         E
      3500. .         I         . W     M .     C   .         .         .         .         .         .         E
      3550. .        IR         .W    M   .    C    .         .         .         .         .         .         E
2.00  3600. .        I.         .W   M    .   C     .         .         .         .         .         .         E
      3650. .       I .        WR   M     .  C      .         .         .         .         .         .         E
      3700. .      I  .       W .   M     .C        .         .         .         .         .         .         E
      3750. .     I   .     W   .  M      C         .  .R     .         .         .         .         .         E
      3800. .    I    .   W     .  M     C.         .         .    R    .         .         .         .         E
      3850. .   I     .  W      . M     C .         .         .         .      R  .         .         .         E
      3900. .   I     .W        .M    C   .         .         .         .         .       R .         .         E
      3950. .  I      W         .M   C    .         .         .         .         .         .         R         E
      4000. . I     W .         .M  C     .         .         .         .         .         .         .         E
1.00  4050. .I   W    .         MC        .         .         .         .         .         .         .         E
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