PRELIMINARY DRAINAGE REPORT

SILVER MOUNTAIN VILLAGE PLANNED UNIT DEVELOPMENT

(formerly SILVER RANCH ANNEXATION)
in
SILVERTHORNE, COLORADO

Prepared by

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SILVERTHORNE, COLORADO

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SILVERTHORNE, COLORADO

I. GENERAL LOCATION AND DESCRIPTION.

A. Location.

1. Section, Township, and Range---The Silver Mountain Village Subdivision is generally located within Section 1 & 2, Township 5 South, Range 75 West, of the 6th Principal Meridian, Summit County, Colorado.

2. General location in relationship to towns and roads--- Silver Mountian Village Subdivision is south of the Willow Creek Subdivision; west of and adjacent to Blue River Parkway (Colorado Highway 9). The property is bounded by large lot subdivision on the west (Ruby Ranch), single family oand commercial on the south, Highway (on the east and single family on the north (Willow Creek Subdivision). Access to the project will be off of ColoradoHighway 9 at the existing curb cuts located at the north and south ends of the project and off of the existing Ruby Ranch Road along the southern edge of the project.

3. Names of surrounding developments (all zoned R-3):

North---The Willow Creek Subdivisdion.

East—Colorado Highway 9.

West---Large lot subdivision (Ruby Ranch).

South---Single family and commercial.

B. Description of Property.

1. Area in acres---The entire Silver Mountain Village property under consideration in this Preliminary Drainage Report is comprised of 72.09 acres.

2. Soils--According to the "Master Drainage Plan for Shirley Ranch Annexation", which studied this site previously, the majority of the soils within the project are shown within area 8B, which is SCS Classification 'Handran - Hydrologic Group A'." (Costin Engineering, Sept. 5, 1997, JN 342.).

The site was part of a larger parcel subsequently studied by Michael W. West & Associates, in March of 1999. Their report classified the main geological group as being Qgo, "GLACIAL OUTWASH-Gravels, cobbly and bouldery; medium dense to dense; localy caped by silty, high platicity clay; linticular bedding; moderately-well to well-stratified." ("Engineering Geological Evaluation - Buffalo Mountain Ranch Project", by Michael W. West & Associates, Inc., March 24, 1999). Applicable extracts from this Evaluation are enclosed in this Report.

Existing slopes across the site vary from steeper slopes in the west of about 8.2%, to flat slopes in the east of around 1%. Proposed slopes are given for each drainage basin, when needed for calculations.

3. Ground cover---Existing ground cover consists of evergreens and aspen with the lower portion covered by natural grasses, sage, and scrub oak.

4. Major drainageways---The site lies within the major drainageway of the Blue River.

5. General Project Description---The project will be constructed in several phases. The commercial property is anticipated to be the first to be under construction. This is anticipated to be followed sequesntially by the parcels closest to C.H. 9.

6. Irrigation Facilities---There are 2 existing irrigation headgates that drain on or across this property, but both will be removed with this project, so preservation of existing irrigation facilities is not an issue.

7. **Proposed Land Use**. The anticipated development acreages are as follows:

Use	Acreage
Single-Family Homes	11.70
Multi-Family Residential	6.81
Town Homes	3.77
Right-of-Way	9.33
Total	31.61

Concurrrently with this submittal, the commerical property in the southeast corner of this site, is being designed and submitted by others (Curently, Kimley-Horn & Associates). Their site is approximately 11.70 acres, and currently planned to be anchored by a Safeway store and a bank. Other commercial occupants will be signed in the futre, in accordance with the City's planning and zoning regulations.

It is within the scope of this Preliminary Drainage Report to coordinate our design with them.

Ruby Ranch Road's drainage considerations up to and including the intersection with C.H. 9, will be addressed in this Report.

Also being designed with this Report are the preliminary drainage facilities for the School/Park Site. By "School/Park Site", in this Report, we mean the Play Areas, the Child Care Area, the proposed Elementary School, Detention Pond 2, and the area including and inside the Bus Loop. The acreage breakdown is as follows:

Use	Acreage
Open Space (incl's shools)	17.85
Park Site (incl's detention)	10.44
Child Care	1.07
Total	29.36

Again, these acreages are per the "Preliminary Site Plan" for Silver Mountain Village.

The facilities being designed for the School/Park Site incude detention, and storm drainage facilities in adjacent proposed rights-of-way for their use in the future. Onsite storm facilites for the School/Park Site will of necessity be future by others. The layout shown in this Report is Preliminary, and subject to change.

II. DRAINAGE BASINS AND SUB-BASINS.

A. Offsite Basin Description.

There is one offsite drainage basin which are tributary to the project and whose flows will be transported through the site. It is delineated on the attached offsite basin map and is denoted as Basin SC201. In addition, Basin SC101 affects Ruby Ranch Road, in that its runoff will be carried under it in a culvert, but this is part of the commercial site's drainage basin, and will be addressed by their engineers.

Basin SC101 boundary is basically the same as Basin 10 per McLaughlin Water Engineers' delineation within their Master Drainage Report, dated August 1983 for the Town of Silverthorne and is comprised of approximately 261 acres. The basin has been developed into a large lot subdivision of about 58 lots. The flow from Basin SC101 runs along the ditch south of Ruby Ranch Road. As

recommended in the Costin Study, it will cross the road bia a 30" CMP, and then be transported to their detention pond (hereafter Detention Pond 3), through the commercial site (To be designed by Kimley-Horn). This was previously recommended by Costin Engineering as Channel 1 in their Report, and this Report and Kimley-Horns will continue with their recommendation. The only change anticipated will be to move and/or replace the existing CMP to the east, in order to avoid their access drive.

The smaller of the two offsite basins, Basin SC201, lies just to the west of the northwest corner of the project and contains approximately 25.6 undeveloped acres. The offsite area will remain undeveloped because it is part of the Open Space in the Ruby Ranch Subdivision. Costin Engineering recommended a 24" CMP to catch this offsite flow and transport it to a detention pond. This recommendation has been followed in this Report (See Preliminary Drainage Plan, enclosed). This flow will be transported through Silver Mountain Village by extending this 24" CMP, and daylighting it into Detention Pond 1.

There are also small offsite drainage areas west and south of this Silver Mountain Village's southwest corner. Since these are small, they have been incorporated into the acreage of Basin 1 and 0-1.

B. Sub-Basin Description.

The entire residential and school sites fall into 4 major basins. A description of each follows:

A. Major Basin "A" are those areas that will be graded to Detention Pond 1.

B. Major Basin "B" are those areas that will be graded to Detention Pond 2. The outlet for this Pond will daylight in Willow Creek.

C. Major Basin "C" is actually a wetlands being preserved for this site.

D. Ruby Ranch Road will collect its local flows, and it and its adjacent properties become the last Major Basin. Since its Basins consist of one offsite basin and street flows, it is not called "Basin E".

For the purposed of this Report, street flows have been numbered sequentially throughout the project, as have Design Points. Sub-basins in Major Basins "A" and "B" have been numbered with their Major Basins.

III. DRAINAGE DESIGN CRITERIA.

A. Regulations. There are no exceptions from Town of Silverthorne Regulations.

B. Hydrological Criteria

1. Identify design rainfall—The 5- and 100-year storms for the minor and major runoff events, per Town of Silverthorne's "Drainage Design Criteria".

2. Identify runoff calculation methods—The rational method as outlined in the Town of Silverthorne's "Drainage Design Criteria" was used to determine runoff quantities. Storm intensities and runoff coefficients were taken from charts provided in the "Criteria."

A minimum time of concentraion of 5 minutes was used throughout.

3. Identify detention discharge and storage calculation method—The Town of Silverthorne's "Drainage Design Criteria" was followed in sizing the detention ponds.

Pond 1 is located in the Park/School site, and drains all the developed basins in this project above it (Major Basin "A"). Pond 2 does the same for the basins along Adams Avenue (Major Basin "B"). Pond 3 is being designed by Kimley-Horn, the commercial site's engineers, and the townhome basins (Major Basin "C" are included in their Report. Major Basin "D" is not required to have detention, as it is being left in its native wetlands state.

Both ponds have been designed for release, 100-year water surface, and berm or riser elevation. The top of berm for Pond 2 has been set at 1' above the 100-year water surface. Pond 1 has more than 1' of freeboard above the 100-year water surface, so it will be regulated by a riser set at the 100-year water surface.

Both ponds will be released at the 100-year historic level. The release orifixes and the overflow weirs will be designed with the Final Drainage Report.

4. Identify storm recurrence interval---See Item 1. Above.

5. Intensity/duration frequency curves if rational method is used---per Town of Silverthorne Figure 4.

C. Hydraulic Criteria

1. Identify capacity references used---Pipes and streets were checked utilizing the FlowMaster© computer model for the Manning's equation. A reduction factor for the capacity of streets and continuous grade inlets was factored in, per the "Drainage Design Criteria."

F. Stormwater Quality Criteria

1. Identify permanent and temporary stormwater quality measures taken---Per the Urban Drainage "Drainage Criteria Manual," Vol. 3. For the Final Drainage Plan, temporary sedimentation ponds will be designed for all ponds in accordance with this Manual.

G. Waivers from this Manual - None.

IV. DRAINAGE FACILITY DESIGN

A. General Concept

1. Typical drainage patterns---The historic patterns has been simulated insofar as possible. All grading has been designed to direct flow to Willow Creek, except for the townhomes, which will be directed in their historic course to the existing 24" CMP under C.H. 9.

2. Compliance with off-site considerations—Offsite flow will be conveyed across the site, in accordance with the existing pattern.

3. Discussions of charts, figures or drawings—All taken from the Manual, or the DCM, in accordance with Town of Silverthorne regulations.

B. Specific Details

1. Problems encountered—The existing wetlands will be preserved insofar as possible, and in accordance with the project's Wetland Mitigation Plan. This involves leaving Basin D natural, and conveying the runoff from the wetlands west of the site through the project unimpeded.

2. Water quality solutions—There are large overland flow areas on this site, which Volume 3 of UD&FCD's Drainage Criteria Manual maintains is of considerable value in improving stormwater quality. In addition, an Erosion Control and Sedimentation Plan in accordance with Volume 3 of UD&FCD's Drainage Criteria Manual will be filed with the Final Drainage Plan, to mitigate effects during construction. For the purposes of this Report, Pond 2 has been checked for capacity for a temporary sedimentation pond, since the entire project's stormwater passes through Pond 2. Calculations show the required volume is available, and the Final Drainage Report will provide calculattions for sediment control in accordance with with Volume 3 of UD&FCD's Drainage Criteria Manual.

3. Maintenance access—By Drainage Easements, in accordance with Town of Silverthorne regulations.

4. Easements and tracts for drainage purposes—Easements will not be required where drainage facilities are under public rights-of-way.

Tract "A" is the drainage tract for Pond 2.

A drainage tract (Tract "B") is proposed for the 24" CMP from the Costin Design Point 201. This appears necessary because this pipe's flared end section needs to be located north of the existing wetlands. If grades permit at final design, this pipe may be put in the street, negating the necessity for a tract.

Pond 1 is located within the land being dedicated for the school and park sites, so its storm facilities will be within 25' easements, centered on the facilities.

The storm system south of the inlet of Basin S-8 will be centered in a 10' drainage easement.

The storm system south of Basin S-7 will be centered in a 25' drainage easement.

5. Drainage Description.

A. Ruby Ranch Road.

The local basins impacting Ruby Ranch Road will drain to low points at Design Points 1 and 2. Here, they will be drained by inlets and 18" RCP's. Kimley-Horn and Associates are responsible for picking up the flow from the RCP from the inlet at Design Point 2, combining it with the existing 24" CMP's flow from the south, and continuing it through the commercial site.

Likewise, the flow from the 30" CMP placed as a result of Costin Engineering's Master Drainage Plan will be routed through the commercial site.

B. Basin A.

The pass-through flow from the wetlands to the west of this site was discussed in Section II.A., above.

Basins A-1, A-2, A-3 and A-4 combine in Plata Street. The capacity of the street is adequate to convey both design storms to Design Point 7, but continuous grades inlets will drain the streets at Design Points 7 and 8, in order to get as much flow into the larger pond, Pond 1, as possible.

The basins above these lowpoints are there for the same reason, and will be drained by the storm system originating at Design Point 3. These inlets and pipes have been designed for the Major Storm.

Major Basin B will be directed to Pond 2 via a storm sewer system in Adams Avenue. Inlets and pipes begin at Design Point 9, picks up the flow from Pond 1 at Design Point 11, then daylights in Pond 2. Pond 2 will be limited to the 100-year historical release into Willow Creek.

Adams Avenue will be constructed over Willow Creek with this project. The crossing will be a special-design arch culvert with an extra-width span to minimize the impact on fish habitat. The span shown in the cross-section (30' x 6'4 & 3/8"), is that provided by the supplier. The capacity check in the Hydraulics

section of this Report is for the closest mass-produced size available (8'5" x 5'10"). The capacity for the smaller-span arch is 533 cfs, while the flow for the crossing of Willow Creek at C.H. 9 is 421 cfs. In other words, the 30' span should provide more-then-enough capacity at the Willow Creek crossing with Adams Avenue. The Final Drainage Report should confirm this with final hydraulic numbers provided by the manufacturer.

Major Basin "C" contains those basins around the proposed east townhouses. The street flows in Plata Street have been turned south at the access drives in order to direct as much flow as possible to Detention Pond 3. Likewise, the 2 storm systems generated are designed for the 100-year storm. The basins and flows generated have been provided to Kimley-Horn, engineers for the commercial site, for incorporation into the design of Detention Pond 3.

Detention Pond 3 will outlet in the preserved wetlands southwest of the intersection of Plata Street and C.H. 9. The pass-through pipes in the storm system there have been designed for the 5-year storm, the City's requirement for commercial property.

V. CONCLUSIONS

A. Compliance with Manual—*Every effort has been taken to be in full compliance with the Manual.*

B. Effectiveness of Design to Control Drainage—*The plan as proposed will control drainage in accordance with Town of Silverthorne and Grand County regulations.*

This report was prepared by me in accordance with the Grand County Storm Drainage Design Manual and was designed to comply with the provisions thereof. I understand that Grand County does not and will not assume liability for drainage facilities designed by others.

_____
David L. Kotzebue
Colorado Registered Professional Engineer #14513

BIBLIOGRAPHY

"Engineering Geological Evaluation - Buffalo Mountain Ranch Project", by Michael W. West & Associates, Inc., March 24, 1999

"Drainage Design Criteria" , Town of Silverthorne, undated.

"Drainage Criteria Manual", Urban Drainage and Flood Control District, March, 1969.

"Master Drainage Plan for Shirley Ranch Annexation", Costin Engineering, Sept. 5, 1997, JN 342.

VI. APPENDICES

A. Hydrologic computations

eloped Analysis:

Runoff Coefficients:			Remarks				Remarks				Remarks
Onsite:	C_2 =	0.60	Table 2, "Neighborhood"	Streets:	C_2 =	0.87	Table 2, "Streets, Paved"	Offsite:	C_2 =	0.02	Table 2, "Undeveloped"
	C_{100} =	0.80	Table 2, "Neighborhood"		C_{100} =	0.93	Table 2, "Neighborhood"		C_{100} =	0.20	Table 2, "Undeveloped"

STREET	DESIGN POINT	AREA DESIGN.	AREA (Ac.)	"C" Coeff.	t_c (min's)	I (in./hr.)	AC	Q (cfs)	TOTAL RUNOFF	t_c (min's)	Sum(AC)	I (in./hr.)	Q (cfs)	STREET	Slope (%)	Street Cap'y (cfs)	PIPE (RCP)	Design Flow (cfs)	Min. Slope (%)	Pipe Dia.	TRAVEL TIME	Length (ft.)	Velocity (fps)	t_t (min.)	REMARKS
Ruby Ranch-NW		0-1	2.24	0.02	20.6	1.5	0.04	0.1							3.2	15.2						741	0.6	20.6	O.L. @ % 8.2%
Ruby Ranch-N.		S-1	1.65	0.87	5.0	2.70	1.44	3.9							4.13	10.5		6.5	0.4	18		1100		2.7	Avg. slope. Single inlet.
	1									23.2	1.44	1.15	1.65					6.5	0.4	18					Single inlet.
Ruby Ranch-S.		S-2	1.75	0.87	5.0	2.70	1.52	4.1							4.13	10.5						1350		3.3	Avg. slope. Single inlet.
	2									25.6	3.00	1.05	3.15					3.2	0.6	18					tc = Sum 0-1 & S-1.
Basin "A":																									
		A-1	7.75	0.60																		600	1.0	10.0	O.L. @ 15%
Plata-SW.		A-1			16.8	1.5	4.65	7.0							3.2	15.2						650	1.6	6.8	Street @ 3.2%-Street Cap'y OK.
Plata-SE.		A-2	0.70	0.60	5.4	2.65	0.42	1.1							3.2	15.2						520	1.6	5.4	Street Cap'y OK
		A-3	1.54	0.60	5.0	2.70	0.92	2.5							3.2	15.2						325	2.7	2.0	O.L. @ 6.2%
Plata-Mid W.	3									21.8	5.57	1.25	6.97		4.0	14.7									Sum Basins 1+3. Street Cap'y OK.
		A-4																				65	0.56	1.9	O.L. @ 1.5%
		A-4	0.95	0.60	8.1	2.1	0.57	1.2														314	0.9	6.2	Street @ 2.8%
Plata-Mid NW	4									27.9	7.59	1.15	8.73		2.8	15.5									tc=Sum D.P.2+Basin 4 Street tt.
																									Street Cap'y OK, but build double inlet
																									to detention.
Willow Run-NW		A-5	3.55	0.60	5.0	2.70	2.13	5.8							3.8	16.4		6.5	0.4	18		900	3.2	4.7	Street @ 3.8%-O.L. Flow Negl. Double inlet.
Willow Run-SW		S-3	0.28	0.87	5.0	2.70	0.24	0.7							3.8	16.4						600	3.2	3.1	Single inlet req'd, but install double (for 100-Yr.)
	5									5.00	2.37	2.70	6.41												Design for 100-Yr.
Alley		A-6	1.11	0.60	5.0	2.70	0.67	1.8							3.2	3.2						740	3.2	3.9	Min. tc. Single inlet.
	6									5.00	2.70	2.70	7.29					22.26	1.0	24					Negl. tt.
	7									5.00	10.29	2.70	27.78					72.14	1.0	24					Negl. tt. Design pipe for 100-Yr.
	8									5.00	10.53	2.70	28.44					73.54	1.3	36					Negl. tt.
		A-7																6.5	0.4	18		320	0.5	2.8	O.L. @ 0.6%
		A-7	8.63	0.60	7.3	2.2	5.18	11.4														822	1.6	4.5	For conc. trickle channel design.
Basin "B":																									
		S-4	0.01	0.87	5.0	2.70	0.01	0.0										6.5	0.4	18					Min. tt. 5' Single inlet.
		B-1	1.72	0.60	5.0	2.70	1.03	2.8										6.5	0.4	18					Min. tt. 5' Single inlet.
	9									5.00	6.22	2.70	16.79					6.5	0.4	18					Negl. tt.
		S-5	0.16	0.60	5.0	2.70	0.10	0.3										6.5	0.4	18					Street flow tt. 5' Single inlet.
		B-2	1.7	0.60	5.0	2.70	1.02	2.8														350	3.2	1.4	Street flow tt.
	10									12.62	7.33	2.15	15.77					6.5	0.4	18					Sum D.P. 8, Basins S-5 & 10.
Pond 1													19.66					29.0	0.5	30					Pass-Thru, limited to 100-Yr. (See Hist., below)
	11												35.43					47.2	0.5	36					Pipes from here designed for 100-Yr., w/pass-thru.
		B-3	0.89	0.60	5.0	2.70	0.53	1.4							3.8	16.4						900	3.2	4.7	Single inlet
	12												36.87					47.2	0.5	36					Negl. tt. Simple sum of Basin 11 & D.P. 11
		B-4	0.96	0.28	5.0	2.70	0.27	0.7																	Single inlet
Adams Av, NW		S-6	0.15	0.87	5.0	2.70	0.13	0.4										6.5	0.4	18					Single inlet
	13												37.95					47.2	0.5	36					Negl. tt. Simple sum.
		B-5	1.02	0.05	5.0	2.70	0.05	0.1																	C for Lawns. Flow to det. structure.
Pond 2													44.61					71.1	0.5	42					Release for Pond 2 (See Hist., below)

STREET	DESIGN POINT	AREA DESIGN	AREA (Ac.)	"C" Coeff.	t_c (min's)	I (in./hr.)	AC	Q (cfs)	TOTAL RUNOFF	t_c (min's)	Sum(AC)	I (in./hr.)	Q (cfs)	STREET	Slope (%)	Street Cap'y (cfs)	PIPE (RCP)	Design Flow (cfs)	Min. Slope (%)	Pipe Dia.	TRAVEL TIME	Length (ft.)	Velocity (fps)	t_c (min.)	REMARKS		
Basin "C":																									Min. tc. Single inlet, 18" RCP.		
		C-1	1.03	0.60	5.0	2.70	0.62	1.7										6.5	0.4	18					Negl. tt-street flow. Single inlet.		
		C-2	1.22	0.60	5.0	2.70	0.73	2.0										6.5	0.4	18					18" RCP into Pond.		
	14									5.00	1.35	2.70	3.65					6.5	0.4	18					Single Inlet		
		S-7	0.25	0.87	5.0	2.70	0.22	0.6										6.5	0.4	18					Negl. tt-street flow. Single inlet.		
		C-3	1.2	0.60	5.0	2.70	0.72	1.9										6.5	0.4	18					Single inlet.		
	15									5.00	0.94	2.70	2.53					6.5	0.4	18					Negl. tt-street flow. Single inlet.		
		C-4	1.92	0.60	5.0	2.70	1.15	3.1										6.5	0.4	18					Into pond.		
	16									5.00	2.09	2.70	5.64					19.2	0.8	24					Outlet of Pond 3-Per Kimley-Horne.		
	17									5.00			18.20					6.5	0.4	18					Min. tc. Single Inlet		
		S-8	0.21	0.87	5.0	2.70	0.18	0.5										19.2	0.4	18					Negl. tt-pipe flow.		
	18									5.00	0.18	2.70	18.69					6.5	0.4	18					Min. tc. Single Inlet		
		S-9	0.21	0.87	5.0	2.70	0.18	0.5										19.2	0.8	24					Negl. tt-pipe flow.		
	19									5.00	0.37	2.70	19.19					6.5	0.4	18					Min. tt. 6" HDPE for Wetlands Mitigation (By others).		
Major Basin "D":		D-1	0.95	0.40	5.0	2.7	0.38	1.0																			

	STREET	DESIGN POINT	AREA DESIGN	AREA (Ac.)	"C" Coeff.	t_i (min's)	I (in./hr.)	AC	Q (cfs)	TOTAL RUNOFF	t_c (min's)	Sum(AC)	I (in./hr.)	Q (cfs)	STREET	Slope (%)	Street Cap'y (cfs)	PIPE (RCP)	Design Flow (cfs)	Min. Slope (%)	Pipe Dia.	TRAVEL TIME	Length (ft.)	Velocity (fps)	t_t (min.)	REMARKS		
Yr.	Ruby Ranch-NW		0-1	2.24	0.20	20.6	1.5	0.45	0.7							3.2	15.2						741	0.6	20.6	O.L. @ % 8.2%		
Yr.	Ruby Ranch-N.		S-1	1.65	0.93	5.0	6.25	1.53	9.6							4.13	67.6		4.6	0.4	18		1100		2.7	Avg. slope. Single inlet.		
Yr.		1									20.6	6.91	1.15	7.95					6.5	0.4	18					Single inlet.		
Yr.	Ruby Ranch-S.		S-2	1.75	0.93	5.0	6.25	1.63	10.2							4.13	67.6						1350		3.3	Avg. slope. Single inlet.		
Yr.		2									5.0	3.16	6.25	19.76					3.15	0.6	18					Overflow = 16.61		
r Basin "A":																												
Yr.			A-1	7.75	0.80																		600	1.0	10.0	O.L. @ 15%		
Yr.	Plata-SW.		A-1			16.8	4.00	6.20	24.8							3.2	96.6						650	1.6	6.8	Street @ 3.2%-Street Cap'y OK.		
Yr.	Plata-SE.		A-2	0.70	0.80	5.4	6.20	0.56	3.47							3.2	96.6						520	1.6	5.4	Street Cap'y OK		
Yr.			A-3	1.54	0.80	6.3	5.60	1.23	6.90							3.2	96.6						325	2.7	2.0	O.L. @ 6.2%		
Yr.	Plata-Mid W.	3									21.8	7.43	3.25	24.15		4.0	104									Sum Basins 1+3. Street Cap'y OK		
Yr.			A-4																				65	0.56	1.9	O.L. @ 1.5%		
Yr.			A-4	0.95	0.80	8.1	5.6	0.76	4.26														314	0.9	6.2	Street @ 2.8%.		
Yr.	Plata-Mid NW	4									27.9	7.59	2.85	21.63		2.8	102									tc=Sum D.P.2+Basin 4 Street tt.		
																										Street Cap'y OK, but build double inlet		
																										to detention - Cap'y=	11.9	
Yr.	Willow Run-NW		A-5	3.55	0.80	5.0	6.25	2.84	17.8							3.8	98.6		6.5	0.4	18		900	3.2	4.7	Double inlet cap'y =	12.0	
Yr.	Willow Run-SW		S-3	0.28	0.80	5.0	6.25	0.22	1.4							3.8	98.6						600	3.2	3.1	Double inlet cap'y =	12.0	
Yr.		5									5.00	3.06	6.25	19.15					22.26	1.0	24							
Yr.	Alley		A-6	1.11	0.80	5.0	6.25	0.89	5.6							3.2	8.0						740	3.2	3.9	Min. tc. Single inlet.		
Yr.		6									5.00	3.95	6.25	24.70					24.70	1.6	24					Negl. tt.		
Yr.		7									5.00	11.54	6.25	72.14					72.14	1.3	36					Negl. tt.		
Yr.		8									5.00	11.77	6.25	73.54					73.54	1.4	36					Negl. tt.		
Yr.			A-7																6.5	0.4	18		320	0.5	2.8	O.L. @ 0.6%		
Yr.			A-7	8.63	0.80	7.3	5.7	6.90	39.01														822	1.6	4.5	Ditch avg. slope=0.7%. Grass-lined channel.		
Yr.				0.01	0.93	5.0	2.70	0.01	0.03										6.5	0.4	18					Min. tt. 5' Single inlet.		
Yr.			S-4	1.72	0.80	5.0	6.25	1.38	8.60										6.5	0.4	18					Min. tt. 5' Single inlet.		
r Basin "B":																												
Yr.			B-1								5.00	1.39	6.25	8.66					6.5	0.4	18					Negl. tt.		
Yr.		9		0.16	0.80	5.0	6.25	0.13	0.80										6.5	0.4	18					Street flow tt. 5' Single Inlet.		
Yr.			S-5	1.7	0.80	5.0	6.25	1.36	8.50														350	3.2	1.4	Street flow tt.		
Yr.			B-2								7.79	2.15	5.45	11.72					6.5	0.4	18					Sum D.P. 8, Basins S-5 & 10.		
Yr.		10												19.66					29.0	0.5	30					Pass-Thru, limited to 100-Yr. (See Hist., below)		
Yr.	Pond 1													31.37					47.2	0.5	36							
Yr.		11		0.89	0.80	5.0	6.25	0.71	4.45							3.8	16.4		6.5	0.4	18		900	3.2	4.7			
Yr.			B-3											35.82					47.2	0.5	36					Negl. tt. Simple sum of Basin 11 & D.P. 11		
Yr.		12		0.96	0.80	5.0	6.25	0.77	4.8																	Single Inlet		
Yr.			B-4	0.15	0.80	5.0	6.25	0.12	0.8										6.5	0.4	18					Single Inlet		
Yr.	Adams Av, NW		S-6											41.37					47.2	0.5	36					Negl. tt. Simple sum.		
Yr.		13		1.02	0.40	5.0	6.25	0.41	2.6																	C for Lawns. Flow to det. structure.		
Yr.	Pond 1													44.61					29.0	0.5	30					Release for Pond 2 (See Hist., below)		

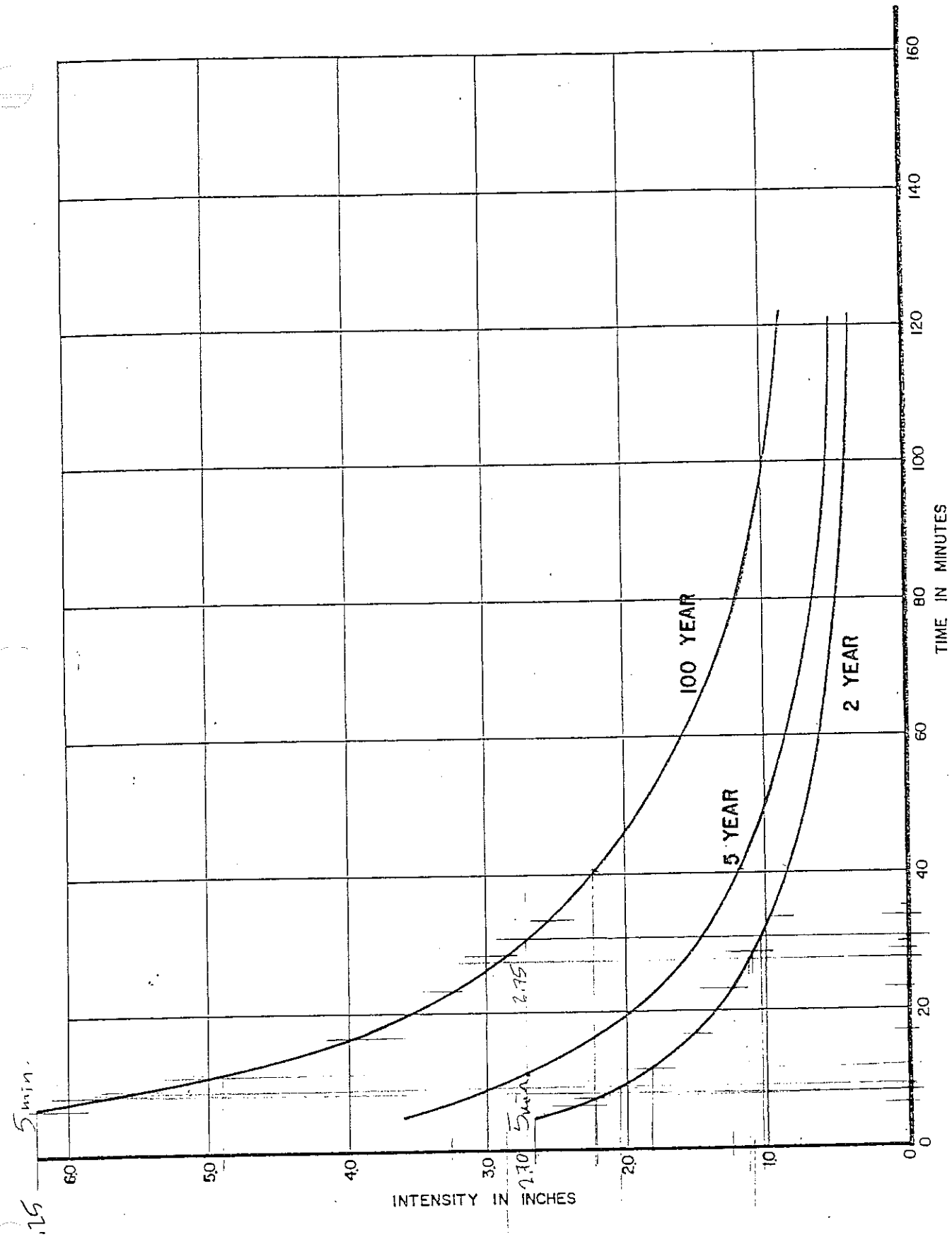
STREET	DESIGN POINT	AREA DESIGN	AREA (Ac.)	"C" Coeff.	t_c (min's)	I (in./hr.)	AC	Q (cfs)	TOTAL RUNOFF	t_c (min's)	Sum(AC)	I (in./hr.)	Q (cfs)	STREET	Slope (%)	Street Cap'y (cfs)	PIPE (RCP)	Design Flow (cfs)	Min. Slope (%)	Pipe Dia.	TRAVEL TIME	Length (ft.)	Velocity (fps)	t_t (min.)	REMARKS
Basin "C":																									
		C-1	1.03	0.80	5.0	6.25	0.82	5.2																	Min. tc. Single Inlet, 18" RCP.
		C-2	1.22	0.80	5.0	6.25	0.98	6.1										6.5	0.4	18					Negl. tt-street flow. Single inlet.
	14									5.00	1.80	6.25	11.25					6.5	0.4	18					18" RCP into Pond.
		S-7	0.25	0.80	5.0	2.70	0.20	0.5										6.5	0.4	18					Single Inlet
		C-3	1.2	0.80	5.0	6.25	0.96	6.0										6.5	0.4	18					Negl. tt-street flow. Single inlet.
	15									5.00	1.16	2.70	3.13					6.5	0.4	18					Single inlet.
		C-4	1.92	0.80	5.0	6.25	1.54	9.6										6.5	0.4	18					Negl. tt-street flow. Single inlet.
	16									5.00	2.70	2.70	7.28					6.5	0.4	18					Into pond.
	17									5.00			43.90					19.2	0.8	24					Outlet of Pond 3-Per Kimley-Horne. Back up into Pond 3.
		S-8	0.21	0.80	5.0	2.70	0.17	0.5										6.5	0.4	18					Min. tc. Single Inlet
	18									5.00	0.17	6.25	44.95					19.2	0.4	18					Negl. tt-pipe flow. Back up into Pond 3.
		S-9	0.21	0.80	5.0	2.70	0.17	0.5										6.5	0.4	18					Min. tc. Single Inlet
	19									5.00	0.34	6.25	46.00					19.2	0.8	24					Negl. tt-pipe flow. Back up into Pond 3.
Major Basin "D":		D-1	0.95	0.40	5.0	6.25	0.38	2.4										6.5	0.4	18					Min. tt. 6" HDPE for Wetlands Mitigation (By others).

oric Analysis:

	AREA	DESIGN POINT	AREA DESIGN	AREA (Ac.)	"C" Coeff.	t_c (min's)	I (in./hr.)	AC	Q (cfs)	TOTAL RUNOFF	t_c (min's)	Sum(AC)	I (in./hr.)	Q (cfs)	STREET	Slope (%)	Street Cap'y (cfs)	PIPE (RCP)	Design Flow (cfs)	Min. Slope (%)	Pipe Dia.	TRAVEL TIME	Length (ft.)	Velocity (fps)	t_t (min.)	REMARKS
Yr.	Offsite			25.60	0.20	21.4	3.25	5.12	16.6							3.2	15.2									tc from Costin study.
Yr.	Onsite			31.12	0.20			6.22								4.13	67.6		4.6	0.4	18		900	0.8	18.8	All basins w. of Adams Av. O.L. flow, S=3.3%
Yr.		H									40.2	11.34	2.20	24.96					6.5	0.4	18					Total Historical release, both ponds.

Prorate releases:					
Pond 1:	% onsite acreage:	78.8%	Prorated release rate:	19.66	
Pond 2:	% onsite acreage:	100%	Prorated release rate:	24.96	

Temp. Sed. Pond Sizing Check:								
Pond 2:								
	Tributary Area =		4.36	acres			Sum of both ponds.	
	Min. Vol. Req'd =		4.3568	x 1800 c.f.	7,842.2	c.f.	Vol. O.K.	



RAINFALL
TIME-INTENSITY-FREQUENCY GRAPH

SILVERTHORNE DRAINAGE

FIGURE 4

Table 2 lists the coefficients to be used for each application in Silverthorne. As with other aspects of this Manual, these coefficients are to be considered as the minimum required to undertake studies, and if conditions are encountered that are outside the range of values shown in the tables or in the figures, the more stringent of the conditions are to be applied by the Designer.

TABLE 2

RUNOFF COEFFICIENTS
FOR
RATIONAL METHOD
USING COEFFICIENTS FOR STORMS GREATER THAN 10-YEAR

	Coefficients				
	Percent	Frequency			
Land Use	Impervious	2	5	10	100
Business					
Commercial	95	.87	.87	.88	.89
Neighborhood	70	.60	.65	.70	.80
Lawns	0	.05	.10	.20	.40
Roofs	90	.80	.85	.90	.90
Streets					
Paved	100	.87	.88	.90	.93
Gravel	13	.15	.25	.35	.65
Drives and Walks	96	.87	.87	.88	.89
Undeveloped	0	.02	.05	.10	.20

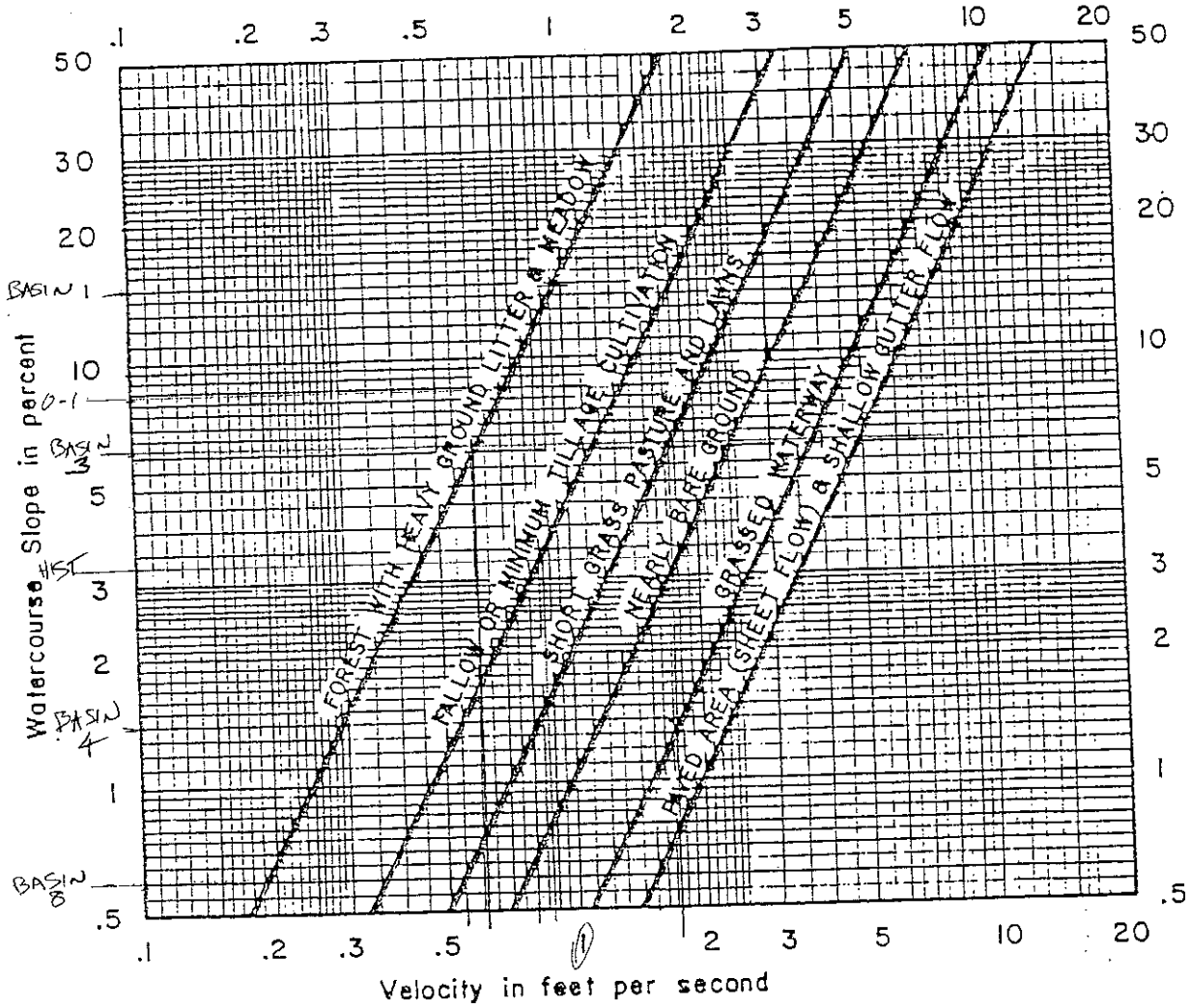
Time of Concentration.

Unless conditions exist for which Figure 5 does not apply, this figure is to be used for determination of the time of concentration, which is used to determine the rainfall intensity, "I", in the Rational Formula. It should be noted that this figure is only to be used with this method and is not to be applied to other methods used in this manual.

A further caution needs to be noted in the selection of roughness coefficients to be used with Figure 5. It is common that a designer will use the "C" value of the Rational Formula for the roughness coefficient, which is a grove error. The values described on the graph are self-explanatory and should be used.

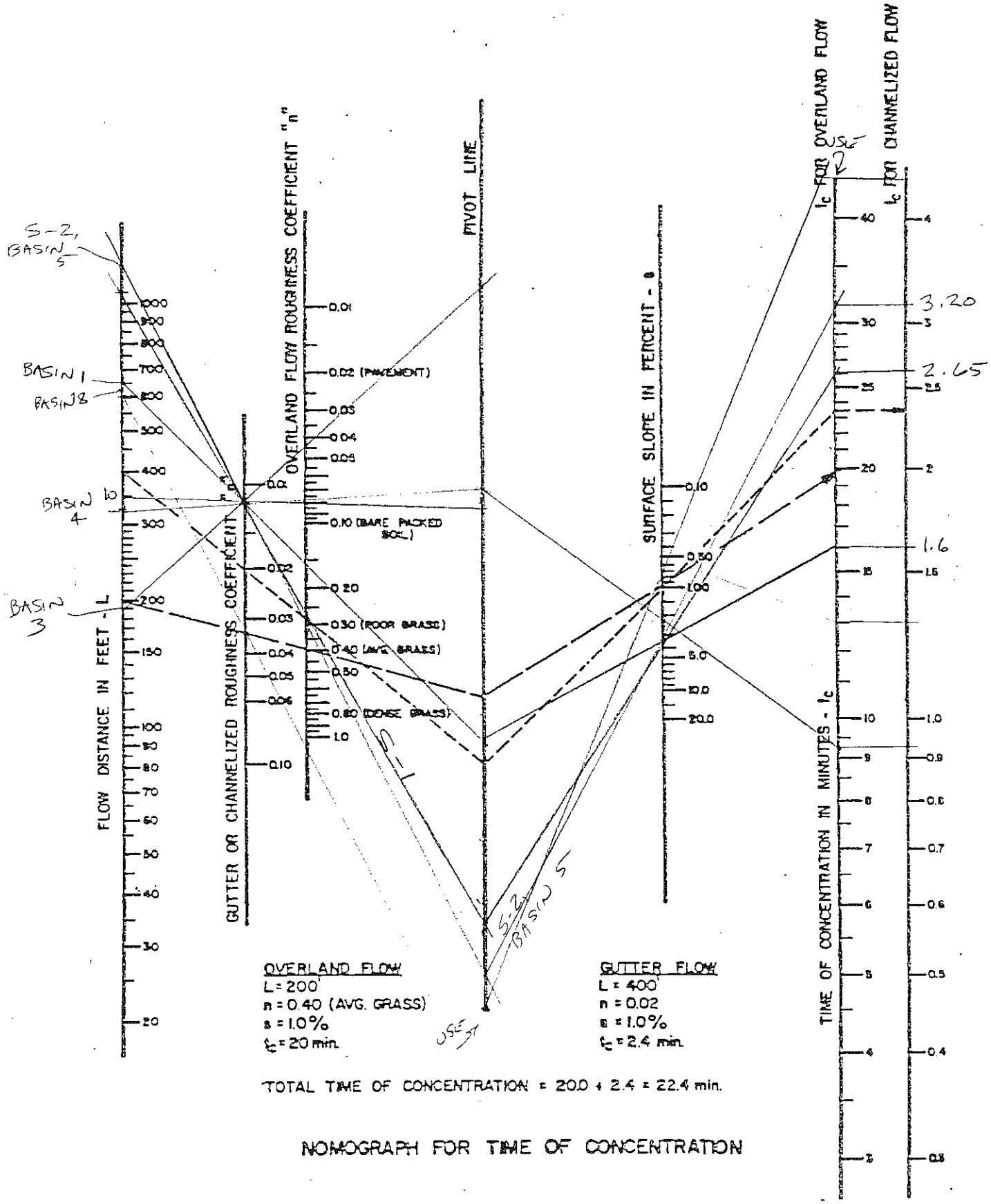
Limitations.

The use of the Rational Method is limited to developed areas under 40 acres in size and to undeveloped basins less than 10 acres in size, or when specifically permitted by the Town. Under no conditions is the Rational Method to be used



AVERAGE VELOCITIES FOR ESTIMATING TRAVEL TIME FOR OVERLAND FLOW

FIGURE 6



NOMOGRAPH FOR TIME OF CONCENTRATION

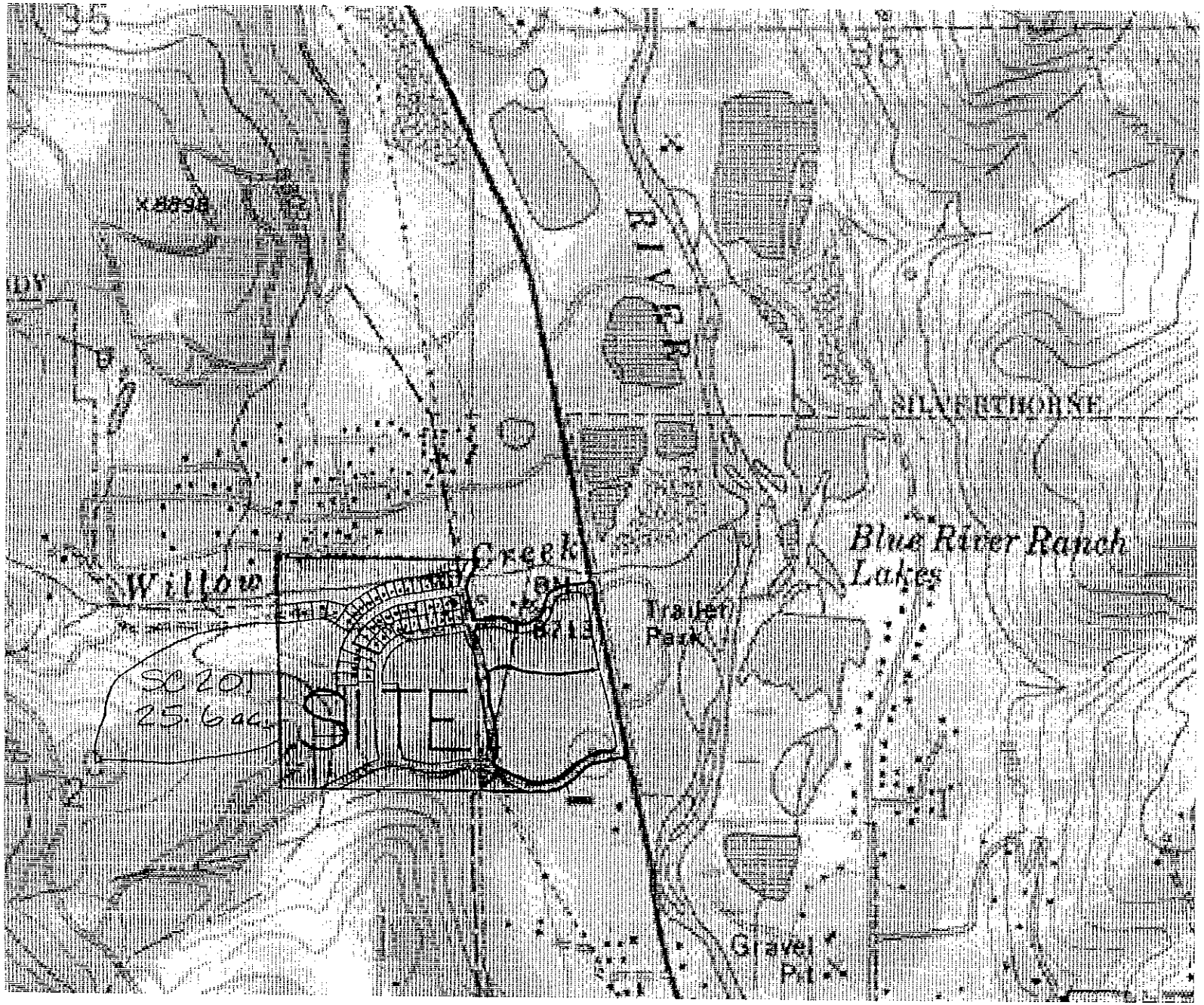
McLAUGHLIN WATER ENGINEERS

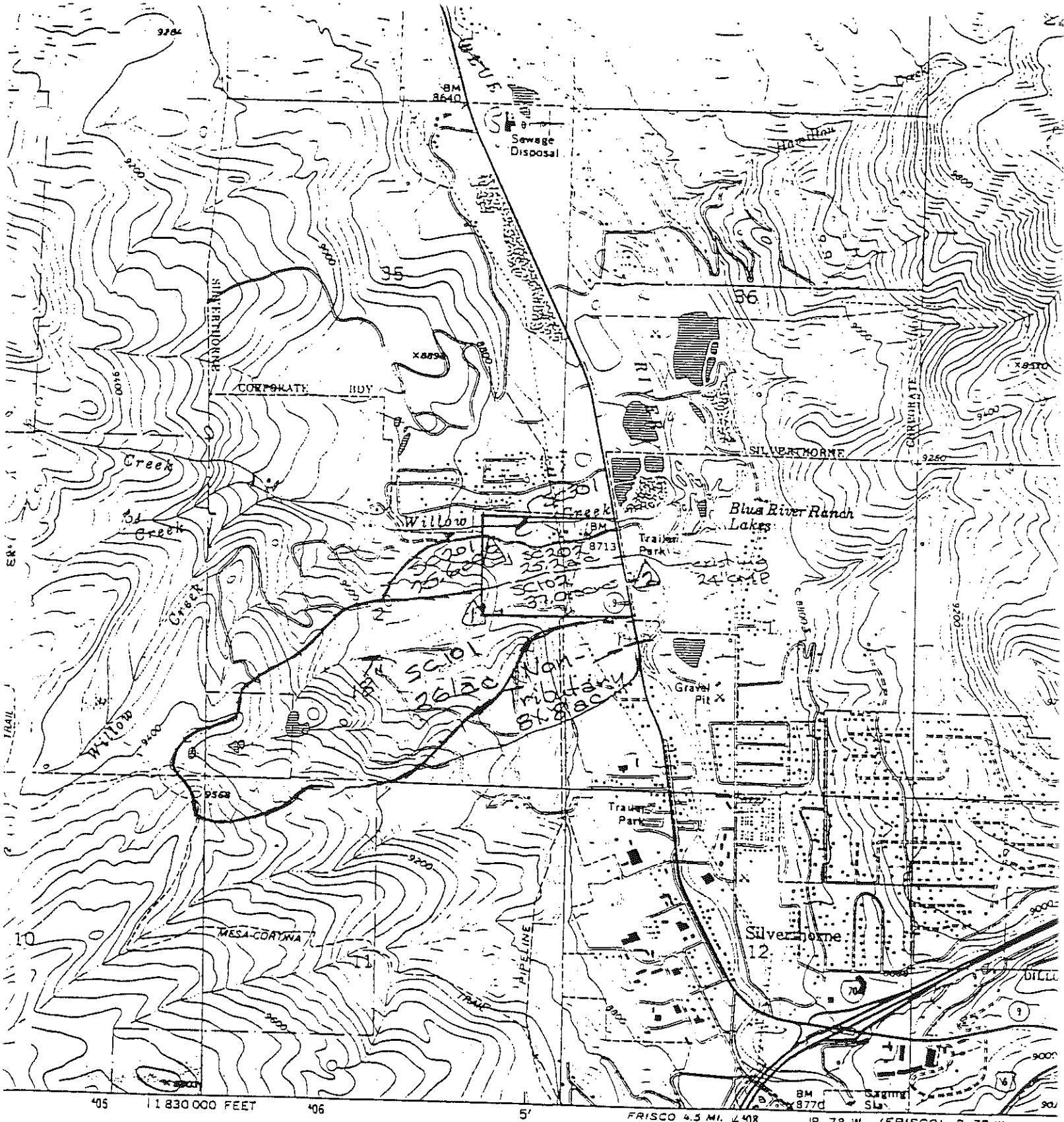
FIGURE 5

VICINITY & OFFSITE BASINS MAP

1" = 1000'

CONTOUR INTERVAL 40'





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Basin 10

Basin 10 lies to the north of Basins 3 and 6, with a drainage area of 0.46 square miles. This area is basically undeveloped. Vegetal cover consists of evergreens and aspen with the lower portion covered by natural grasses, sage, and scrub oak. The ground slope averages 15 percent.

The basin is drained by two swales. A slight amount of ponding occurs at the bottom portion of the basin. Runoff then flows to a 24-inch culvert at Highway 9 which drains into the Blue River.

The soils series found are mostly Cimarron, Quander, Historic Cryaquolls, Youga and Handran with lesser amounts of Frisco and Peeler.

Basin 11

Basin 11 lies to the north of Basins 10 and 3 and west of most of the drainage basins. This drainage basin comprises the Willow Creek Basin and has a drainage area of 13 square miles. This drainage basin is basically undeveloped with several creeks feeding into the Willow Creek which feeds into the Blue River. The vegetal cover for the majority of the basin consists of evergreens and aspen with the lower portion covered with natural grasses, sage and scrub oak. The ground slope averages 15 percent.

Some of the soil series found in this basin are: Frisco-Peeler, Hestic Cryaquolls, Handran, Youga and Muggins. Specific analysis of this basin has not been included in our scope of work.

Basin 12

Basin 12 lies to the north of Basin 11 with a drainage area of 320 acres. This basin originates in the mountainous region of the Arapahoe National Forest. It is characterized by steep slopes, rough terrain and medium to heavy ground cover. The upper area is covered with evergreens and aspen and the lower basin covered with natural grasses, scrub oak and sage brush. The soils in this drainage basin consist of Cryaquolls, Muggins and Youga from what can be determined from the soils mapping.

II. DRAINAGE BASINS AND SUB BASINS

A. Floodplain Information

As discussed within the project description of this report, Willow Creek traverses along the northern portion of the project. Willow Creek has been mapped a nd a copy of the floodplain information from FAD Study is included within the text of this report. As stated, the project will not encroach upon the floodplain except at the proposed road crossing.

B. Offsite Basin Description

West

There are two basins which are tributary to the project and whose flows will be transported through the site. They are delineated on the attached offsite basin map and are denoted as Basin SC101 and Basin SC201.

Basin SC101 boundary is basically the same as Basin 10 per McLaughlin Water Engineers delineation within their **Master Drainage Report**, dated August 1983 for the Town of Silverthorne and is comprised of approximately 261 acres. The basin has been developed into a large lot subdivision of about 58 lots. The flow from Basin SC101 enters the project at the southwest corner, south of Ruby Ranch Road and continues along the south side of Ruby Ranch Road to an existing headgate and culvert about 600' west of Highway 9. The flow then traverses northeasterly in a small irrigation ditch to the existing 24" CMP. After development the runoff is to remain on the south side of Ruby Ranch Road in its existing condition until it crosses the road where it will be transported to the detention pond in an engineered channel (Channel 1 in the Hydraulic Section of this report).

The smaller of the two offsite basins, Basin SC201, lies just to the west of the north west corner of the project and contains approximately 25.6 undeveloped acres. The offsite area will remain undeveloped because it is part of the open space in the Ruby Ranch Subdivision. Currently the runoff from this basin is caught in an irrigation ditch and routed through the fields to the existing 24" CMP. After development the runoff will be captured in a ditch along the west boundary line and transported to the proposed detention pond in an engineered channel (Channel 2 in the Hydraulic Section of this report).

(refer to drainage map for location)

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Engineering • Surveying • Construction Management
6801 S. Emporia St. • Suite 205 • Englewood, Colorado 80112
(303) 790-4969 • FAX (303) 790-4967

Project Shirley Ranch Job No. 342
Title Offsite Basin
By [illegible] date 9/3/97 Checked _____ date _____
Scale _____ Sht _____ of _____

OFF-SITE BASIN

Basin SC101 - 5 acre lots

Area = 261 acres = 0.408 sq. miles
Length = 5900' = 1.117 miles
Elevation Difference = 9658 - 8880 = 778'

$$T_c = \left(\frac{11.9L}{H}\right)^{(0.385)}$$

$$= \left(\frac{11.9(1.117)}{778}\right)^{(0.385)} = 0.209 \text{ hrs}$$

$T_{lag} = 0.6(0.209) = 0.125$ hrs
Use CN = 40
Initial Abstraction = 0.75"
Percent Impervious = 5.0%

Basin SC201

Area = 25.6 acres = 0.040 sq. miles
Length = 1800' = 0.341 miles
Elevation difference = 8960 - 8760 = 200'

$$T_c = \left(\frac{11.9L}{H}\right)^{0.385} = \left(\frac{11.9(0.341)}{200}\right)^{0.385} = 0.223 \text{ hrs}$$

$T_{lag} = 0.6(0.223) = 0.134$ hrs
Use CN = 40
Initial Abstraction = 0.75"
Percent Impervious = 1.0%

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Project Shirley Ranch Job No.
Title Onsite - Historic Basins
By [illegible] date 9/3/97 Checked date
Scale Sht. of

Basin SC 102

Area = 37.0 acres = 0.058 sq. miles

Length = 2300'

Basin is to be routed with SC101; additional time will be channel time from design point 1 to design point 2

Slope of Basin = 96/2300' = 4.2%

$T_{channel}$ ⇒ (grassed waterway) = 2300'/3.1 fps
= 12.4 min
= 0.206 hrs

$T = \left(\frac{11.9(0.436)}{9.6}\right)^{0.385} = 0.325 = 19.5$ min

$T_{lag} = 0.6(0.325) = 0.195$

Basin SC 202

Area = 25.2 acres = 0.0394 sq. miles

Length = 2300'

Basin is to be routed with SC201; additional time will be channel time from design point 3 to design point 2

Slope of Basin = 76/2300' = 3.3%

$T_{channel}$ (grassed waterway) = 2300/2.8 fps
= 13.7 min
= 0.228 min

$T = \left(\frac{11.9(.0394)}{7.6}\right)^{0.385} = 0.140$

$T_{lag} = 0.6(0.140) = 0.085$

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Project: Shirley Ranch Job No. _____
Title Onsite - Historic Basins
By [illegible] date 9/3/97 Checked _____ date _____
Scale _____ Sht. _____ of _____

Basin 5030

Area = 18.4 acres = 0.0288 sq miles

This basin will remain in historic conditions, no flows from this basin will be increased. The flows go directly into Willow Creek.

CULVERT DESIGN (1)

CULVERT No.	FLOW (cfs)			PIPE SIZE (IN)	HW/D		
	2	5	100		2	5	100
A	8	12	35	30"	0.6	0.7	1.7
* B	4	8	16	24"	0.5	0.7	1.3
* C	4	8	16	24"	0.5	0.7	1.3

(1) CULVERT DESIGN WAS CALCULATED UTILIZING A HW/D CHART FOR CORRUGATED METAL PIPE FROM "SMALL DAMS"

* FLOWS THROUGH CULVERTS B & C ARE APPROXIMATE, AND A MORE DETAILED ANALYSIS WILL BE COMPLETED WITH THE PRELIMINARY DRAINAGE STUDY.

PRELIMINARY RUNOFF SUMMATION

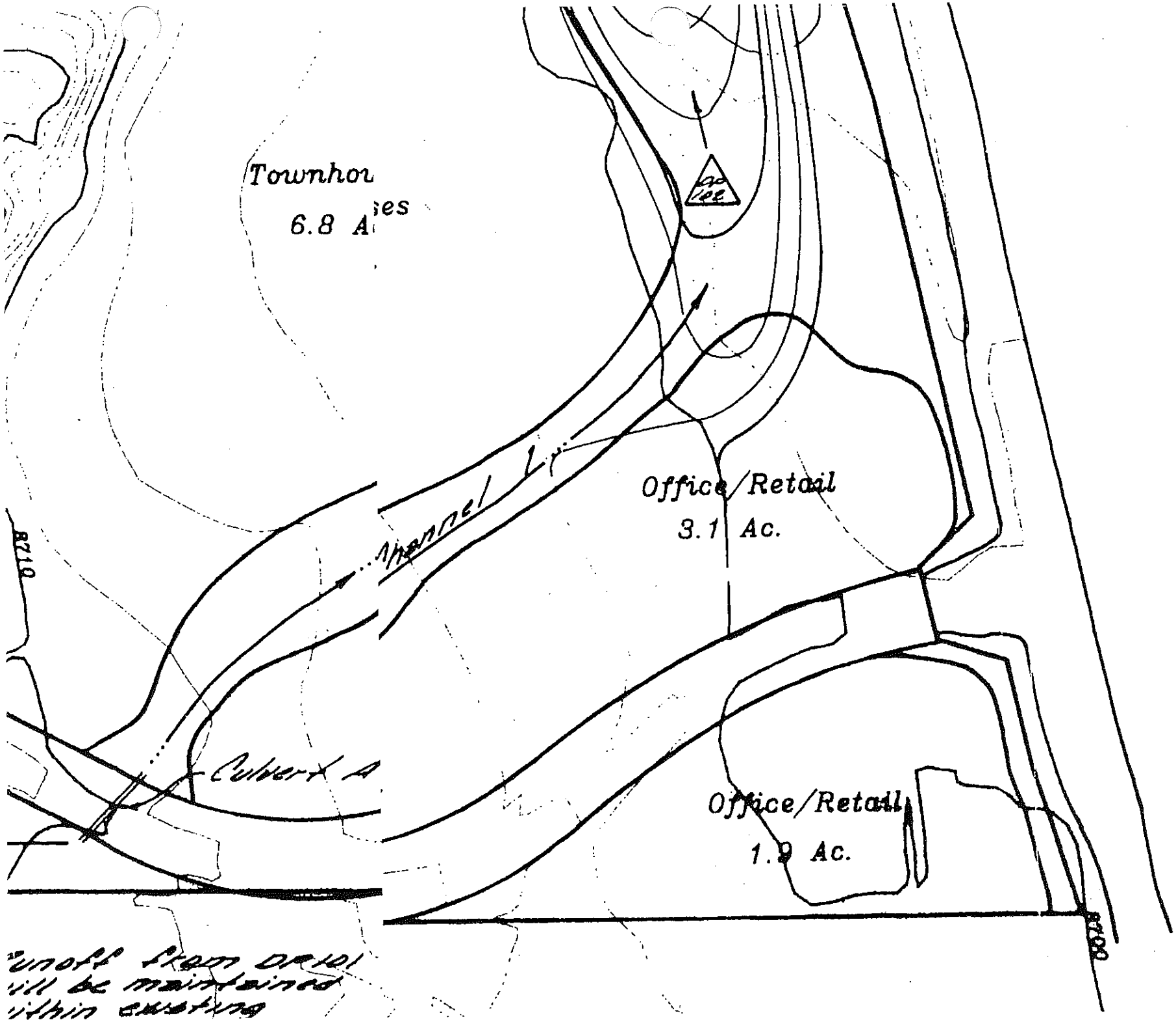
DESIGN POINT	HISTORIC (cfs)			DEVELOPED (cfs)		
	2	5	100	2	5	100
101	8	11	32	8	11	32
102	8	12	35	30	41	88
201	0	0	2	0	0	2
202	1	1	5	21	28	53
203	9	13	39	48	67	129
204	9	13	39	13	20	34

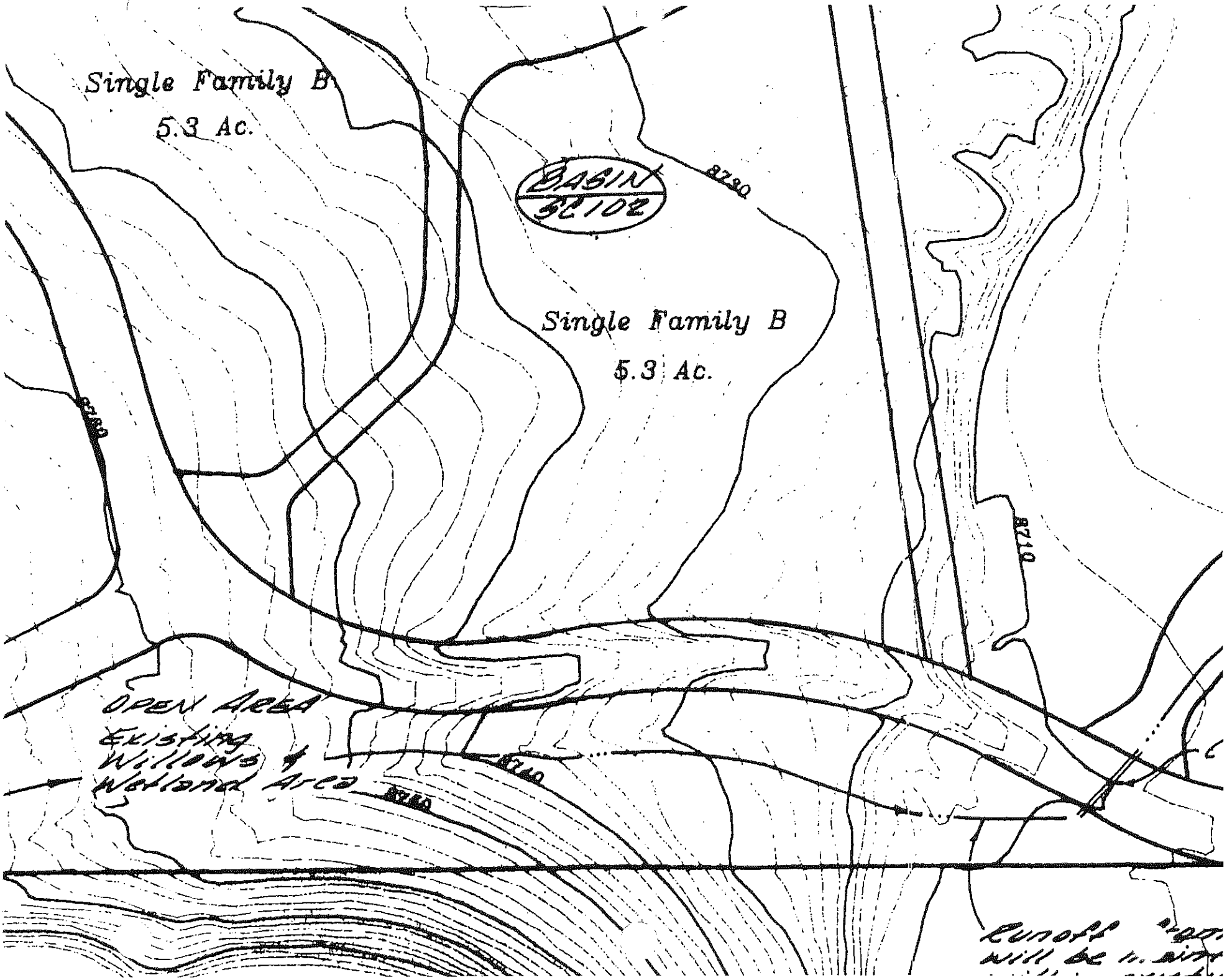
INV. 8696'±

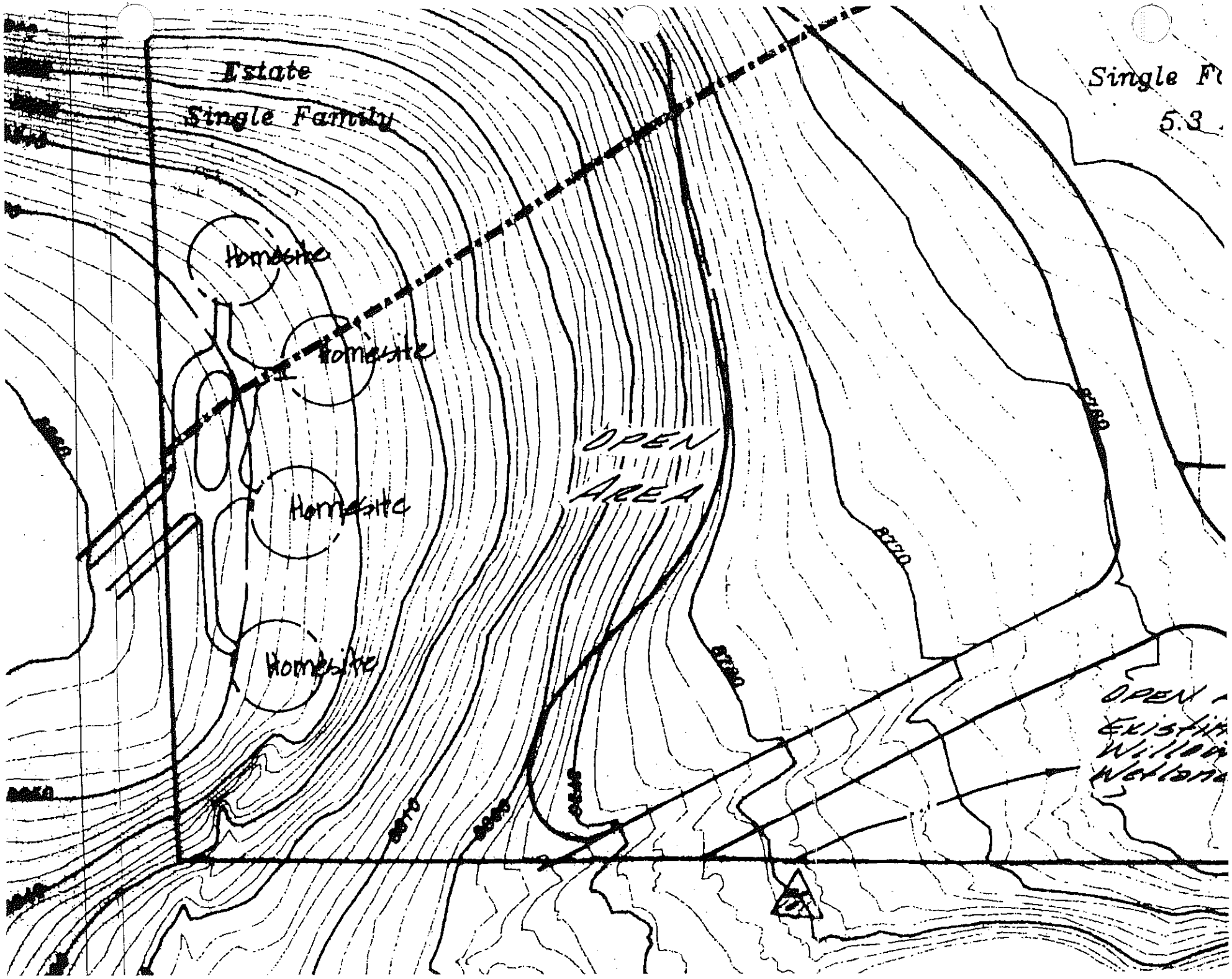
BUILDING 24" CMP

8 STREET 8700

CGP


Townhou
6.8 A
ies
Channel
Office/Retail
3.1 Ac.
Culvert
Office/Retail
1.9 Ac.
8710
8700
unoff from area
will be maintained
within existing


Single Family B
5.3 Ac.
BASIN
32102
8730
Single Family B
5.3 Ac.
8780
8710
OPEN AREA
Existing
Willows &
Wetland Area
8740
8740
Runoff
will be


Estate
Single Family
Single Fa
5.3
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Homesite
Homesite
OPEN
AREA
8280
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8280
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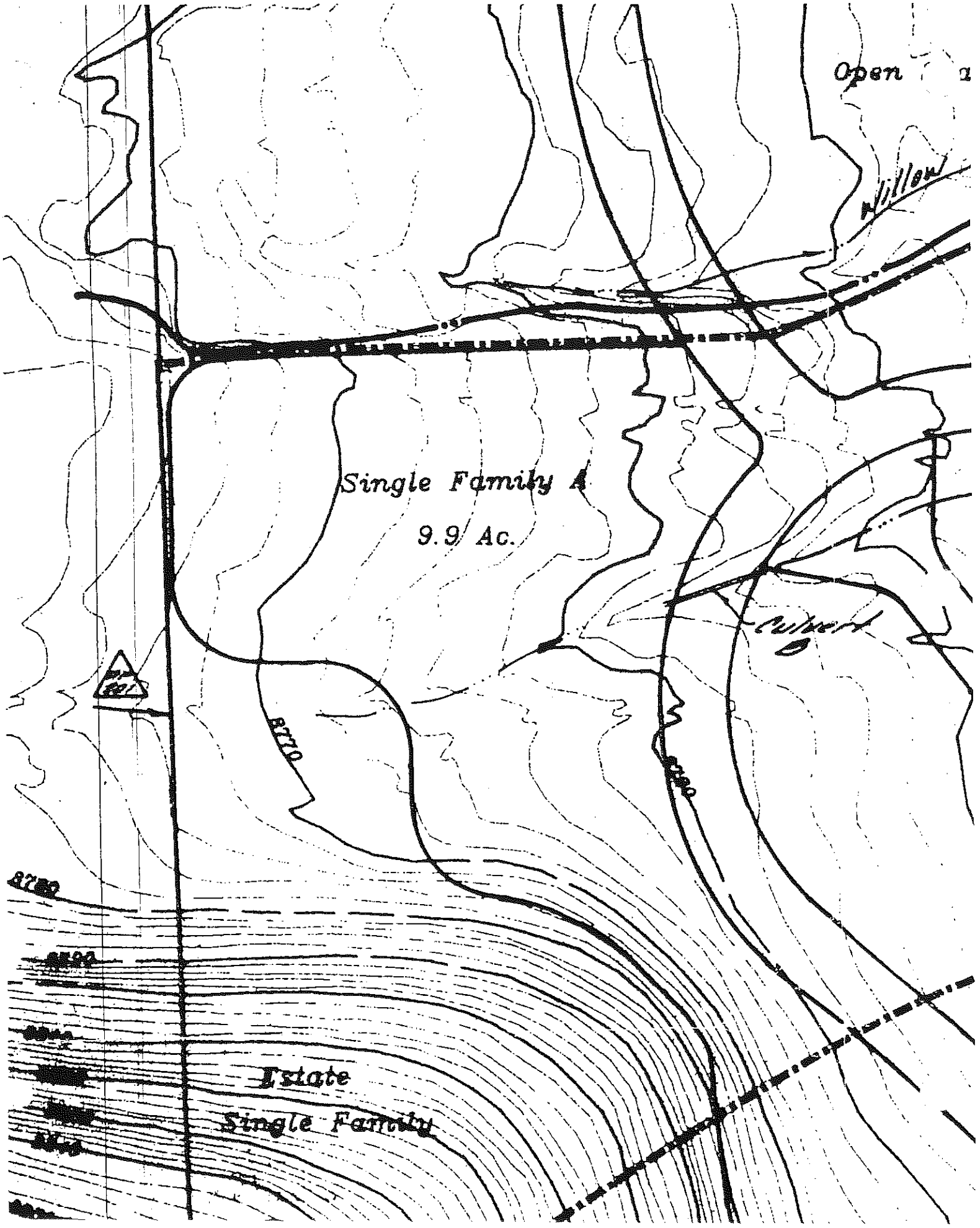
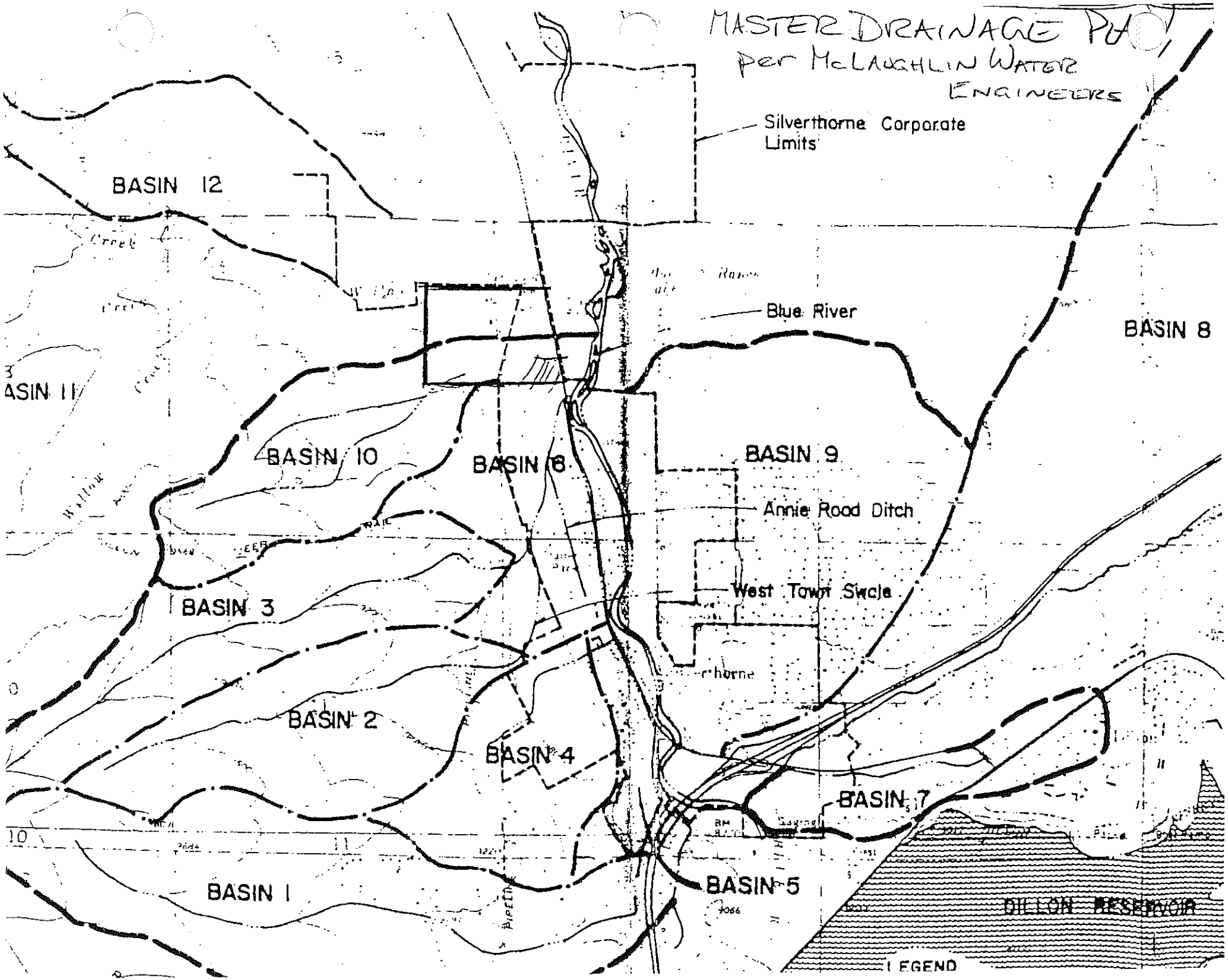
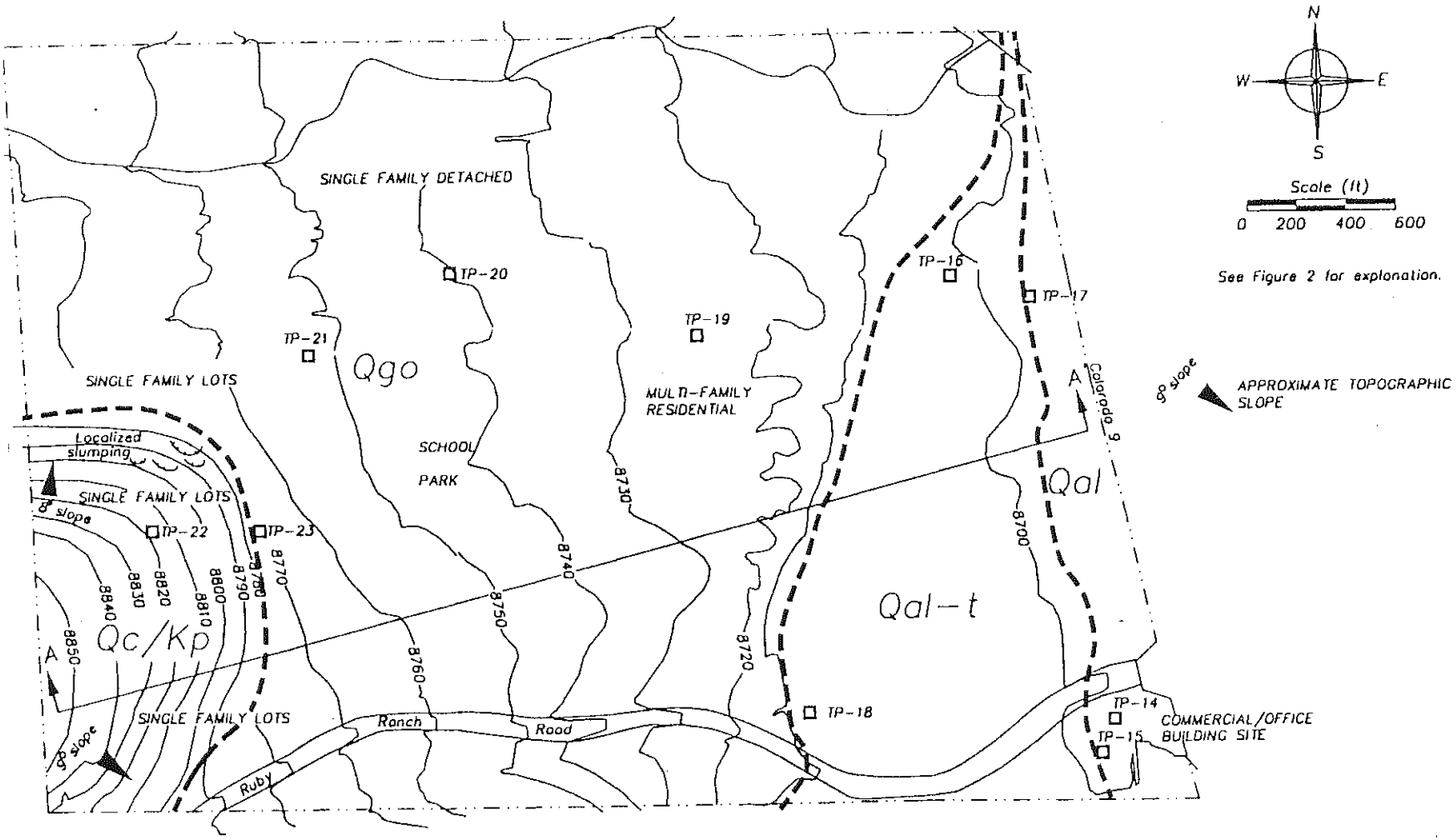
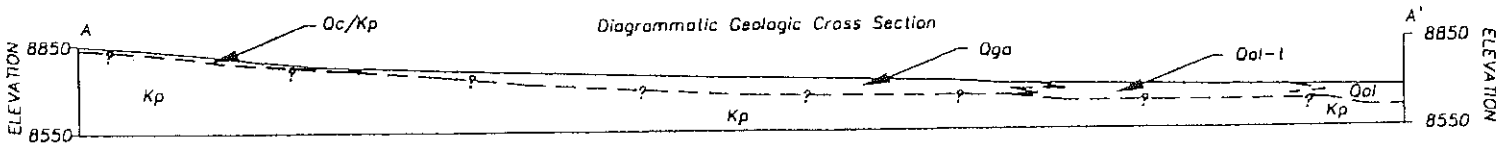
OPEN
EXISTIN
WILDE
NATIONA


Open
Willow
Single Family A
9.9 Ac.
Culvert
8770
8780
8790
8800
Estate
Single Family

MASTER DRAINAGE PLAN
per McLAUGHLIN WATER ENGINEERS







MICHAEL W. WEST & ASSOCIATES, INC.	Geologic Map and Geologic Cross Section A–A' Smith Ranch Pa el	BY: J.C. Moya PROJ: 98299 FIGURE: 5

EXPLANATION – GEOLOGIC MAPS AND GEOLOGIC CROSS SECTIONS

Qal — ALLUVIUM – Sands and gravels with scattered cobbles and boulders; medium dense to dense; lenses of silt and clay; lenticular bedding; moderately-well to well-stratified.

Qal-m — MARSH ALLUVIUM – Similar to alluvium (Qal) but contains organic soils and vegetative debris.

Qal-t — TERRACE ALLUVIUM – Sand and gravels, cobbly and bouldery; medium dense to dense; locally capped by silty, high plasticity clay; lenticalr bedding; moderately-well to well-stratified.

Qaf — ALLUVIAL FANS – Sands, gravels, and cobbles, variable density, loose to dense; lenticular; poorly sorted; moderately-well to poorly stratified; recent fan deposits (Qaf-1) may be prone to settlement or collapse.

Qgo — GLACIAL OUTWASH – Gravels, sandy to silty; cobbly to bouldery, medium dense to dense; contains lenses of clay derived from colluvium near valley slopes; poorly sorted; variably stratified.

Qls-b — BLOCK LANDSLIDE – Rotational and translational(?) landslides involving probable deep-seated failure of bedrock; moderate to high risk of future instability.

Qls-ef — EARTHFLOW – Active earthflow; slowly moving (inches per year); overriding , lobate toe; actively toppling trees.

Qls-cs — SURFICIAL CREEP AND SLUMP – Movement in unconsolidated surficial deposits and weathered bedrock primarily on steep, north-facing slopes.

Qt — TALUS – Angular gravel, cobble, and boulder-size material deposited by rockfalls; resides at or near angle of repose.

Qc-g — COLLUVIUM AND OLDER GRAVEL DEPOSITS (UNDIVIDED) – Sandy, gravelly and cobbly clays to clayey sands and gravels with scattered cobbles, non-sorted; non-stratified; precise origin unknown.

Qc/Kp — COLLUVIUM MANTLING PIERRE SHALE – Sandy to silty clays with scattred gravels and cobbles; non-sorted and non-stratified.

Qc/Kn — COLLUVIUM MANTLING NIOBRARA FORMATION – Mainly sandy clays and silts with scattered gravels and cobbles; non-sorted; non-stratified.

Qc/Kdbn — COLLUVIUM MANTLING DAKOTA, BENTON & NIOBRARA FORMATIONS (UNDIVIDED) – Sandy to silty clays, sandy clays, clayey silts, clayey to silty sands with scattered gravels and cobbles; non-sorted; non-stratified.

Qc/Kd — COLLUVIUM MANTLING DAKOTA GROUP – Clayey, silty sands to sandy clays with scatttered gravels and cobbles; non-sorted; non-stratified.

Kpl — LOWER PIERRE SHALE – Marine clay-shale, thinly-bedded to fissile; variable joint spacing; contains expansive clays and discrete highly expansive beds derived from volcanic ash; prone to landsliding.

Kn — NIOBRARA FORMATION – Calcareous shales and shaly limestone in upper part; blocky gray limestone in lower part; shales are very thin-bedded to fissile; variable joint spacing; contact with Pierre Shale is indistinct.

Kb — BENTON SHALE – Black to dark gray shales with interbedded sandstones and limestones near top; unit apparently does not outcrop in project area but is inferred to underlie colluvium in southeast part of project area.

Kd — DAKOTA GROUP – Upper quartzite, middle shale and lower quartzite units; upper quartzite is cross-bedded and contains carbonaceous shale; middle shale is carbonaceous with interbeds of quartzite; lower medium-grained quartzite contains thin shale interbeds; variable bedding and joint spacing.

Jm — MORRISON FORMATION – Calcareous claystones with medium-grained sandstones in lower part; does not outcrop in project area.

Geologic contact; approximately located; queried where uncertain

Fault; approximately located; queried where uncertain.

Landslide showing scarp and direction of movement.

TP-6 Test pit location and number.

Location and view direction of geologic cross section.

MICHAEL W. WEST & ASSOCIATES, INC.	Explanation for Geologic Maps and Geologic Cross Sections Buffalo Mountain Ranch	BY: J. Moya and M. West PROJ: 98299 FIGURE: 2

SAFEWAY AT SILVER MOUNTAIN VILLAGE
Silverthorne, CO

6/20/01
1:13 PM
Calculated by: DEK

SAFEWAY
Runoff Calculations
Time of Concentration

Watercourse Coefficient

Forest & Meadow	0.40	Short Grass Pasture & Lawns	0.87	Grassed Waterway	1.18
Fallow or Cultivation	0.65	Nearly Bare Ground	1.00	Paved Area & Shallow Gutter	1.30

SUB-BASIN DATA			INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DRAIN BASIN	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	min.
A1	1.14	0.36	200	15.0	7.6	140	2.0	1.30	2.8	0.8	8.4	340	11.9	8.4
A2	0.46	0.31	100	20.0	5.2	80	2.0	1.30	2.8	0.5	5.7	180	11.0	5.7
A3	0.07	0.85	40	20.0	1.0	10	20.0	1.30	8.9	0.0	5.0	50	10.3	5.0
A4	0.19	0.85	120	2.0	3.9	5	2.0	1.30	2.8	0.0	5.0	125	10.7	5.0
A5	0.14	0.85	100	2.0	3.6	5	2.0	1.30	2.8	0.0	5.0	105	10.6	5.0
A6	0.60	0.81	200	1.5	6.4	5	2.0	1.30	2.8	0.0	6.4	205	11.1	6.4
A7	0.52	0.48	120	2.0	9.7	60	2.0	1.30	2.8	0.4	10.1	180	11.0	10.1
A9	0.27	0.01	40	5.0	7.3	5	5.0	1.18	3.4	0.0	7.3	45	10.3	7.3
A10	0.27	0.81	45	2.0	2.8	40	1.5	1.30	2.4	0.3	5.0	85	10.5	5.0
A11	0.75	0.85	230	2.0	5.4	10	2.0	1.30	2.8	0.1	5.5	240	11.3	5.5
A12	0.05	0.88	80	2.5	2.6	10	2.0	1.30	2.8	0.1	5.0	90	10.5	5.0
A13	0.57	0.85	230	2.0	5.4	10	2.0	1.30	2.8	0.1	5.5	240	11.3	5.5
A14	0.47	0.24	40	3.0	6.8	100	2.0	1.30	2.8	0.6	7.4	140	10.8	7.4
A15	0.33	0.87	85	2.0	3.0	40	2.0	1.30	2.8	0.2	5.0	125	10.7	5.0
A16	0.55	0.85	180	2.0	4.8	5	2.0	1.30	2.8	0.0	5.0	185	11.0	5.0
A17	1.10	0.84	220	2.0	5.5	5	2.0	1.30	2.8	0.0	5.5	225	11.3	5.5
A18	0.50	0.87	135	2.0	3.8	5	2.0	1.30	2.8	0.0	5.0	140	10.8	5.0
A19	0.75	0.66	100	2.0	6.3	120	2.0	1.30	2.8	0.7	7.0	220	11.2	7.0
A22	0.76	0.66	150	2.0	7.7	100	2.8	1.30	3.3	0.5	8.2	250	11.4	8.2
A23	0.19	0.30	80	5.0	7.5	20	2.0	1.30	2.8	0.1	7.6	100	10.6	7.6
A24	0.36	0.87	80	2.0	2.9	5	2.0	1.30	2.8	0.0	5.0	85	10.5	5.0
A25	0.66	0.01	25	25.0	3.4	380	0.4	1.18	1.0	6.3	9.7	405	12.3	9.7
A26	0.05	0.24	50	2.0	8.7	20	2.0	1.30	2.8	0.1	8.8	70	10.4	8.8
A27	0.29	0.87	60	2.0	2.5	5	2.0	1.18	2.1	0.0	5.0	65	10.4	5.0
A28	0.58	0.05	180	33.0	7.9	5	3.0	1.18	2.6	0.0	7.9	185	11.0	7.9

SAFEWAY AT SILVER MOUNTAIN VILLAGE
Silverthorne, CO

6/20/01
1:13 PM
Calculated by: DEK

SAFEWAY

Runoff Calculations

Time of Concentration

Watercourse Coefficient

Forest & Meadow	0.40	Short Grass Pasture & Lawns	0.87	Grassed Waterway	1.18
Fallow or Cultivation	0.65	Nearly Bare Ground	1.00	Paved Area & Shallow Gutter	1.30

SUB-BASIN DATA			INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DRAIN BASIN	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	min.
B1	0.54	0.60	20	25.0	1.4	210	0.4	1.18	1.0	3.5	5.0	230	11.3	5.0
B2	1.94	0.60	100	2.5	6.6	240	1.4	1.30	2.4	1.7	8.3	340	11.9	8.3
B3	1.12	0.60	80	3.0	5.6	100	2.0	1.30	2.8	0.6	6.2	180	11.0	6.2
B4	1.52	0.60	280	6.0	8.3	110	2.5	1.30	3.2	0.6	8.9	390	12.2	8.9
B5	1.03	0.60	320	6.0	8.9	80	4.0	1.30	4.0	0.3	9.2	400	12.2	9.2
B6	0.32	0.87	40	33.0	0.8	5	5.0	1.18	3.4	0.0	5.0	45	10.3	5.0
B7	0.25	0.87	30	2.0	1.8	480	5.0	1.30	4.5	1.8	5.0	510	12.8	5.0
B8	1.11	0.60	40	5.0	3.3	5	3.0	1.18	2.6	0.0	5.0	45	10.3	5.0
B9	0.21	0.87	25	2.0	1.6	480	2.5	1.30	3.2	2.5	5.0	505	12.8	5.0
B10	0.21	0.87	25	2.0	1.6	400	2.5	1.30	3.2	2.1	5.0	425	12.4	5.0

SAFEWAY
Runoff Calculations
(Rational Method Procedure)
Design Storm 5 Year

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	SUM C x A	I in/hr	Q cfs	REMARKS
1	A1	1.14	0.36	8.4	0.41	3.09	1.3	8.4	1.53	3.09	4.7	I2+D1+D11+D5
2	A2	0.46	0.31	5.7	0.14	3.50	0.5	5.7	0.36	3.50	1.3	D2+D3+D4
3	A3	0.07	0.85	5.0	0.06	3.60	0.2					
4	A4	0.19	0.85	5.0	0.16	3.60	0.6					
5	A5	0.14	0.85	5.0	0.12	3.60	0.4					
6	A6	0.60	0.81	6.4	0.49	3.39	1.6	6.4	0.49	3.39	1.6	D8+D6
7	A7	0.52	0.48	10.1	0.25	2.84	0.7					
9	A9	0.27	0.01	7.3	0.00	3.26	0.0					
10	A10	0.27	0.81	5.0	0.22	3.60	0.8					
11	A11	0.75	0.85	5.5	0.64	3.53	2.2					
12	A12	0.05	0.88	5.0	0.04	3.60	0.2					
13	A13	0.57	0.85	5.5	0.48	3.53	1.7					
14	A14	0.47	0.24	7.4	0.11	3.24	0.4	7.4	2.17	3.24	7.0	I1+D14+D12+D13
15	A15	0.33	0.87	5.0	0.29	3.60	1.0	5.0	2.46	3.60	8.9	I14+D15
16	A16	0.55	0.85	5.0	0.47	3.60	1.7	5.0	1.88	3.60	6.8	I17+D16
17	A17	1.10	0.84	5.5	0.92	3.53	3.3	5.5	1.41	3.53	5.0	I6+D17
18	A18	0.50	0.87	5.0	0.44	3.60	1.6	5.0	0.65	3.60	2.4	D10+D18
19	A19	0.75	0.66	7.0	0.50	3.30	1.6	7.0	0.50	3.30	1.6	I24+D19+D20
22	A22	0.76	0.66	8.2	0.50	3.12	1.6					
23	A23	0.19	0.30	7.6	0.06	3.21	0.2					
24	A24	0.36	0.87	5.0	0.31	3.60	1.1					
25	A25	0.66	0.01	9.7	0.01	2.90	0.0					
26	A26	0.05	0.24	8.8	0.01	3.03	0.0					
27	A27	0.29	0.87	5.0	0.25	3.60	0.9					
28	A28	0.58	0.05	7.9	0.03	3.17	0.1					

SAFEWAY
Runoff Calculations
(Rational Method Procedure)
Design Storm 5 Year

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	SUM C x A	I in/hr	Q cfs	REMARKS
29	B1	0.54	0.65	5.0	0.35	3.60	1.3					
30	B2	1.94	0.65	8.3	1.26	3.11	3.9					
31	B3	1.12	0.65	6.2	0.73	3.42	2.5					
32	B4	1.52	0.65	8.9	0.99	3.02	3.0					
33	B5	1.03	0.65	9.2	0.67	2.97	2.0					
34	B6	0.32	0.88	5.0	0.28	3.60	1.0					
35	B7	0.25	0.88	5.0	0.22	3.60	0.8					
36	B8	1.11	0.65	5.0	0.72	3.60	2.6					
37	B9	0.21	0.88	5.0	0.18	3.60	0.7					
38	B10	0.21	0.88	5.0	0.18	3.60	0.7					

SAFEWAY
Runoff Calculations
(Rational Method Procedure)
Design Storm 100 Year

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	SUM C x A	I in/hr	Q cfs	REMARKS
1	A1	1.14	0.48	8.4	0.55	5.71	3.1	8.4	1.78	5.71	10.2	I2+D1+D11+D5
2	A2	0.46	0.44	5.7	0.20	6.58	1.3	5.7	0.44	6.58	2.9	D2+D3+D4
3	A3	0.07	0.90	5.0	0.06	6.80	0.4					
4	A4	0.19	0.90	5.0	0.17	6.80	1.2					
5	A5	0.14	0.90	5.0	0.13	6.80	0.9					
6	A6	0.60	0.84	6.4	0.50	6.35	3.2	6.4	0.50	6.35	3.2	D8+D6
7	A7	0.52	0.58	10.1	0.30	5.18	1.6					
9	A9	0.27	0.20	7.3	0.05	6.06	0.3					
10	A10	0.27	0.84	5.0	0.23	6.80	1.5					
11	A11	0.75	0.90	5.5	0.68	6.64	4.5					
12	A12	0.05	0.93	5.0	0.05	6.80	0.3					
13	A13	0.57	0.90	5.5	0.51	6.64	3.4					
14	A14	0.47	0.38	7.4	0.18	6.03	1.1	7.4	2.52	6.03	15.2	I1+D14+D12+D13
15	A15	0.33	0.89	5.0	0.29	6.80	2.0	5.0	2.82	6.80	19.2	I14+D15
16	A16	0.55	0.88	5.0	0.48	6.80	3.3	5.0	1.93	6.80	13.2	I17+D16
17	A17	1.10	0.86	5.5	0.95	6.64	6.3	5.5	1.45	6.64	9.6	I6+D17
18	A18	0.50	0.89	5.0	0.45	6.80	3.0	5.0	0.67	6.80	4.6	D10+D18
19	A19	0.75	0.72	7.0	0.54	6.16	3.3	7.0	0.54	6.16	3.3	I24+D19+D20
22	A22	0.76	0.72	8.2	0.55	5.78	3.2					
23	A23	0.19	0.43	7.6	0.08	5.97	0.5					
24	A24	0.36	0.89	5.0	0.32	6.80	2.2					
25	A25	0.66	0.20	9.7	0.13	5.30	0.7					
26	A26	0.05	0.38	8.8	0.02	5.58	0.1					
27	A27	0.29	0.89	5.0	0.26	6.80	1.8					
28	A28	0.58	0.20	7.9	0.12	5.87	0.7					

SAFEWAY
Runoff Calculations
(Rational Method Procedure)
Design Storm 100 Year

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	SUM C x A	I in/hr	Q cfs	REMARKS
29	B1	0.54	0.80	5.0	0.43	6.80	2.9					
30	B2	1.94	0.80	8.3	1.55	5.74	8.9					
31	B3	1.12	0.80	6.2	0.90	6.42	5.7					
32	B4	1.52	0.80	8.9	1.22	5.55	6.8					
33	B5	1.03	0.80	9.2	0.82	5.46	4.5					
34	B6	0.32	0.93	5.0	0.30	6.80	2.0					
35	B7	0.25	0.93	5.0	0.23	6.80	1.6					
36	B8	1.11	0.80	5.0	0.89	6.80	6.0					
37	B9	0.21	0.93	5.0	0.20	6.80	1.3					
38	B10	0.21	0.93	5.0	0.20	6.80	1.3					

SAFEWAY
Runoff Calculations
(Rational Method Procedure)

Design Storm 2 Year

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	SUM C x A	I in/hr	Q cfs	REMARKS
1	A1	1.14	0.36	8.4	0.41	2.16	0.9	8.4	1.47	2.16	3.2	I2+D1+D11+D5
2	A2	0.46	0.30	5.7	0.14	2.59	0.4	5.7	0.35	2.59	0.9	D2+D3+D4
3	A3	0.07	0.80	5.0	0.06	2.70	0.2					
4	A4	0.19	0.80	5.0	0.15	2.70	0.4					
5	A5	0.14	0.80	5.0	0.11	2.70	0.3					
6	A6	0.60	0.81	6.4	0.49	2.48	1.2	6.4	0.49	2.48	1.2	D8+D6
7	A7	0.52	0.48	10.1	0.25	1.90	0.5					
9	A9	0.27	0.23	7.3	0.06	2.33	0.1					
10	A10	0.27	0.81	5.0	0.22	2.70	0.6					
11	A11	0.75	0.80	5.5	0.60	2.62	1.6					
12	A12	0.05	0.87	5.0	0.04	2.70	0.1					
13	A13	0.57	0.80	5.5	0.46	2.62	1.2					
14	A14	0.47	0.23	7.4	0.11	2.32	0.3	7.4	2.08	2.32	4.8	I1+D14+D12+D13
15	A15	0.33	0.87	5.0	0.29	2.70	0.8	5.0	2.36	2.70	6.4	I14+D15
16	A16	0.55	0.85	5.0	0.47	2.70	1.3	5.0	1.88	2.70	5.1	I17+D16
17	A17	1.10	0.84	5.5	0.92	2.62	2.4	5.5	1.41	2.62	3.7	I6+D17
18	A18	0.50	0.87	5.0	0.44	2.70	1.2	5.0	0.65	2.70	1.8	D10+D18
19	A19	0.75	0.66	7.0	0.50	2.38	1.2	7.0	0.50	2.38	1.2	I24+D19+D20
22	A22	0.76	0.65	8.2	0.49	2.19	1.1					
23	A23	0.19	0.29	7.6	0.06	2.28	0.1					
24	A24	0.36	0.87	5.0	0.31	2.70	0.8					
25	A25	0.66	0.20	9.7	0.13	1.95	0.3					
26	A26	0.05	0.23	8.8	0.01	2.09	0.0					
27	A27	0.29	0.87	5.0	0.25	2.70	0.7					
28	A28	0.58	0.20	7.9	0.12	2.24	0.3					

SAFEWAY
Runoff Calculations
(Rational Method Procedure)
Design Storm 2 Year

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	SUM C x A	I in/hr	Q cfs	REMARKS
29	B1	0.54	0.60	5.0	0.32	2.70	0.9					
30	B2	1.94	0.60	8.3	1.16	2.17	2.5					
31	B3	1.12	0.60	6.2	0.67	2.51	1.7					
32	B4	1.52	0.60	8.9	0.91	2.08	1.9					
33	B5	1.03	0.60	9.2	0.62	2.03	1.3					
34	B6	0.32	0.87	5.0	0.28	2.70	0.8					
35	B7	0.25	0.87	5.0	0.22	2.70	0.6					
36	B8	1.11	0.60	5.0	0.67	2.70	1.8					
37	B9	0.21	0.87	5.0	0.18	2.70	0.5					
38	B10	0.21	0.87	5.0	0.18	2.70	0.5					

SAFEWAY AT SILVER MOUNTAIN VILLAGE
Silverthorne, CO

6/20/01
1:13 PM
Calculated by: DEK

Runoff Calculations

(Rational Method Procedure)

Design Storm 10 Year

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	SUM C x A	I in/hr	Q cfs	REMARKS
1	A1	1.14	0.39	8.4	0.44	3.24	1.4	8.4	1.64	3.24	5.3	I2+D1+D11+D5
2	A2	0.46	0.34	5.7	0.16	3.68	0.6	5.7	0.39	3.68	1.4	D2+D3+D4
3	A3	0.07	0.90	5.0	0.06	3.80	0.2					
4	A4	0.19	0.90	5.0	0.17	3.80	0.6					
5	A5	0.14	0.90	5.0	0.13	3.80	0.5					
6	A6	0.60	0.82	6.4	0.49	3.57	1.8	6.4	#REF!	3.57	#REF!	D8+D6
7	A7	0.52	0.51	10.1	0.27	2.96	0.8					
9	A9	0.27	0.05	7.3	0.01	3.42	0.0					
10	A10	0.27	0.82	5.0	0.22	3.80	0.8					
11	A11	0.75	0.90	5.5	0.68	3.72	2.5					
	A12	0.05	0.90	5.0	0.05	3.80	0.2					
13	A13	0.57	0.90	5.5	0.51	3.72	1.9					
14	A14	0.47	0.27	7.4	0.13	3.40	0.4	7.4	2.32	3.40	7.9	I1+D14+D12+D13
15	A15	0.33	0.88	5.0	0.29	3.80	1.1	5.0	2.61	3.80	9.9	I14+D15
16	A16	0.55	0.86	5.0	0.47	3.80	1.8	5.0	#REF!	3.80	#REF!	I17+D16
17	A17	1.10	0.85	5.5	0.94	3.72	3.5	5.5	#REF!	3.72	#REF!	I6+D17
18	A18	0.50	0.88	5.0	0.44	3.80	1.7	5.0	0.66	3.80	2.5	D10+D18
19	A19	0.75	0.68	7.0	0.51	3.47	1.8	7.0	0.51	3.47	1.8	I24+D19+D20
22	A22	0.76	0.67	8.2	0.51	3.27	1.7					
23	A23	0.19	0.33	7.6	0.06	3.37	0.2					
24	A24	0.36	0.87	5.0	0.31	3.80	1.2					
25	A25	0.66	0.05	9.7	0.03	3.02	0.1					
26	A26	0.05	0.27	8.8	0.01	3.17	0.0					
27	A27	0.29	0.88	5.0	0.26	3.80	1.0					
28	A28	0.58	0.01	7.9	0.00	3.32	0.0					

Runoff Calculations

(Rational Method Procedure)

Design Storm 10 Year

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	SUM C x A	I in/hr	Q cfs	REMARKS
29	B1	0.54	0.70	5.0	0.38	3.80	1.4					
30	B2	1.94	0.70	8.3	1.36	3.25	4.4					
31	B3	1.12	0.70	6.2	0.78	3.60	2.8					
32	B4	1.52	0.70	8.9	1.06	3.15	3.4					
33	B5	1.03	0.70	9.2	0.72	3.10	2.2					
34	B6	0.32	0.70	5.0	0.22	3.80	0.9					
35	B7	0.25	0.90	5.0	0.23	3.80	0.9					
36	B8	1.11	0.70	5.0	0.78	3.80	3.0					
37	B9	0.21	0.90	5.0	0.19	3.80	0.7					
38	B10	0.21	0.90	5.0	0.19	3.80	0.7					

SAFEWAY AT SIL MOUNTAIN VILLAGE
Silverthorne, CO

SAFEWAY
Runoff Calculations
Time of Concentration

Watercourse Coefficient

Forest & Meadow	0.40	Short Grass Pasture & Lawns	0.87
Fallow or Cultivation	0.65	Nearly Bare Ground	1.00
Grassed Waterway	1.18	Paved Area & Shallow Gutter	1.30

	SUB-BASIN DATA			INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DESIGN POINT	DRAIN BASIN	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	min.
1	A1	18.84	0.36	74	5.0	6.7	300	5.0	0.65	1.0	5.0	11.7	374	12.1	11.7

SAFEWAY AT SILVER MOUNTAIN VILLAGE
Silverthorne, CO

SAFEWAY
Runoff Calculations
(Rational Method Procedure)

Design Storm 5 Year

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	SUM C x A	I in/hr	Q cfs	REMARKS
I	A1	18.84	0.36	11.7	6.78	2.68	18.2					

SAFEWAY
Runoff Calculations
(Rational Method Procedure)

Design Storm 100 Year

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	SUM C x A	I in/hr	Q cfs	REMARKS
1	A1	18.84	0.48	11.7	9.04	4.86	43.9					

SAFEWAY AT SILVER MOUNTAIN VILLAGE
Silverthorne, CO

SAFEWAY
Runoff Calculations
(Rational Method Procedure)

Design Storm 2 Year

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	SUM C x A	I in/hr	Q cfs	REMARKS
1	A1	18.84	0.36	11.7	6.78	1.82	12.3					

Runoff Calculations

(Rational Method Procedure)

Design Storm 10 Year

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	SUM C x A	I in/hr	Q cfs	REMARKS
1	A1	18.84	0.39	11.7	7.35	2.81	20.6					

VI. APPENDICES

B. Hydraulic Computations

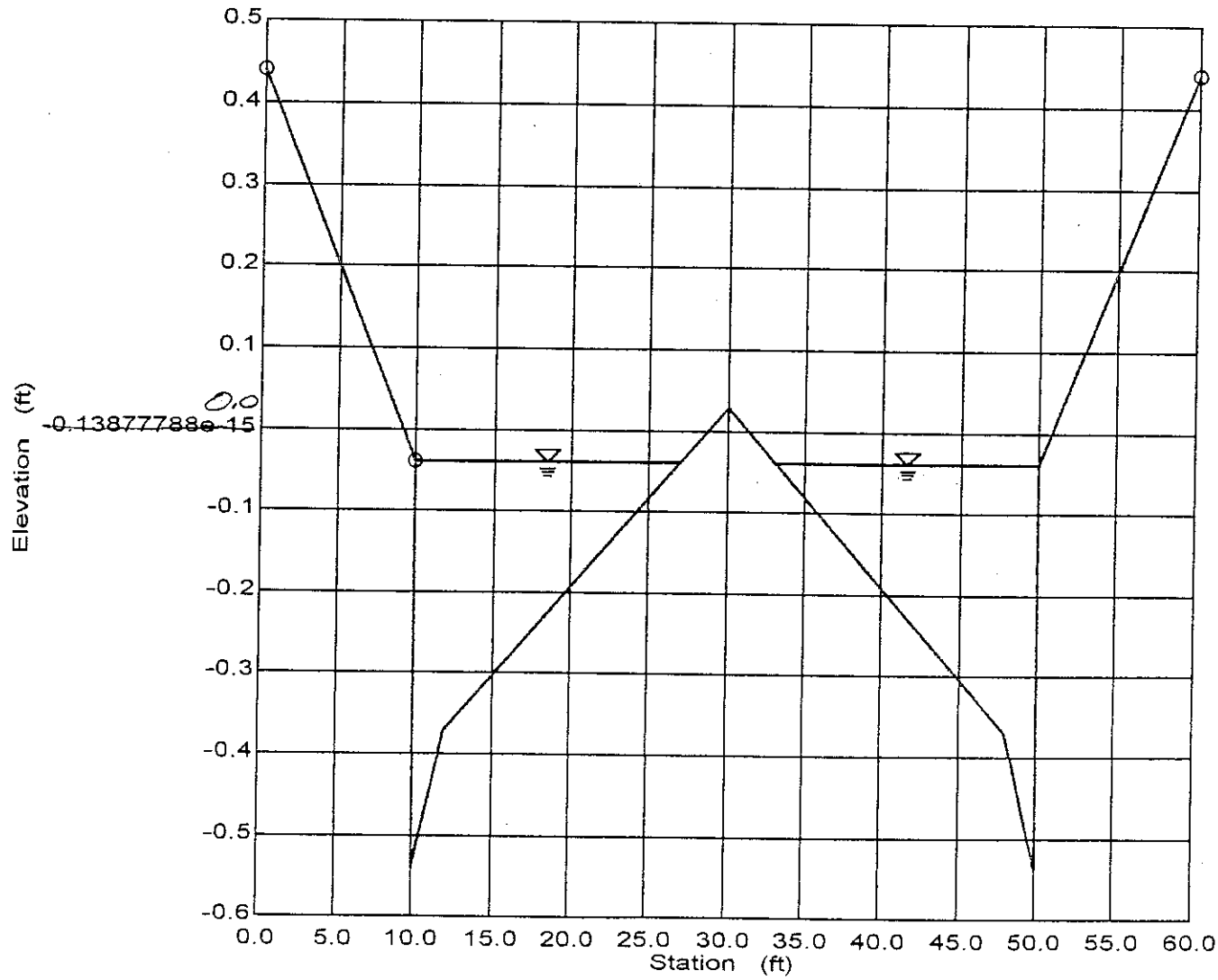
STREET CAPACITIES:

STREET	Q_2, Manning's	Q_{100}, Manning's	RED. FACTOR, FIG. 29	$Q_{2,DSN}$	$Q_{100,DSN}$
RUBY RANCH	50	322	0.42	21.0	135.2
HALF-SECTION				10.5	67.6
PLATA – SOUTH	44	280	0.69	30.4	193.2
HALF				15.2	96.6
PLATA – MID, W	49	345	0.60	29.4	207.0
HALF				14.7	103.5
PLATA – MID N.W.	42	275	0.74	31.1	203.5
HALF				15.5	101.8
WILLOW RUN	53	318	0.62	32.9	197.2
HALF				16.4	98.6
BADGER – N.	17.5	115	0.62	10.9	71.3
HALF				5.4	35.7

Silver Mtn Village
Cross Section for Irregular Channel

Project Description	
Project File	c:\sdsk8\proj\silvr-~1\project1.fm2
Worksheet	Street Capacity-Minor Storm
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	-0.04	ft
Discharge	17.46	cfs

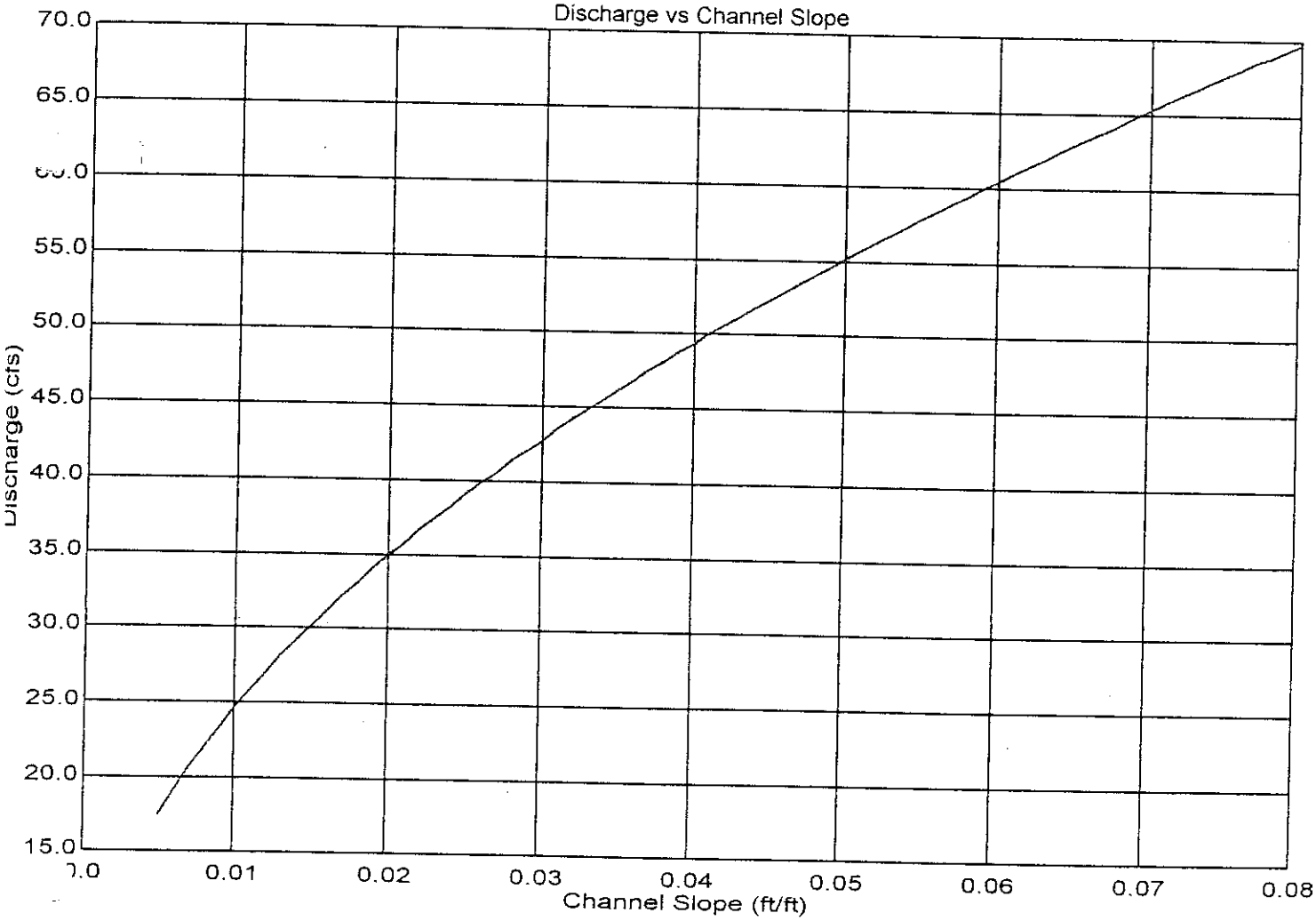


Curve
Plotted Curves for Irregular Channel

Project Description	
Project File	c:\sdsk8\proj\silvr-~1\project1.fm2
Worksheet	Street Capacity-Minor Storm
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Water Surface Elevation	-0.04 ft

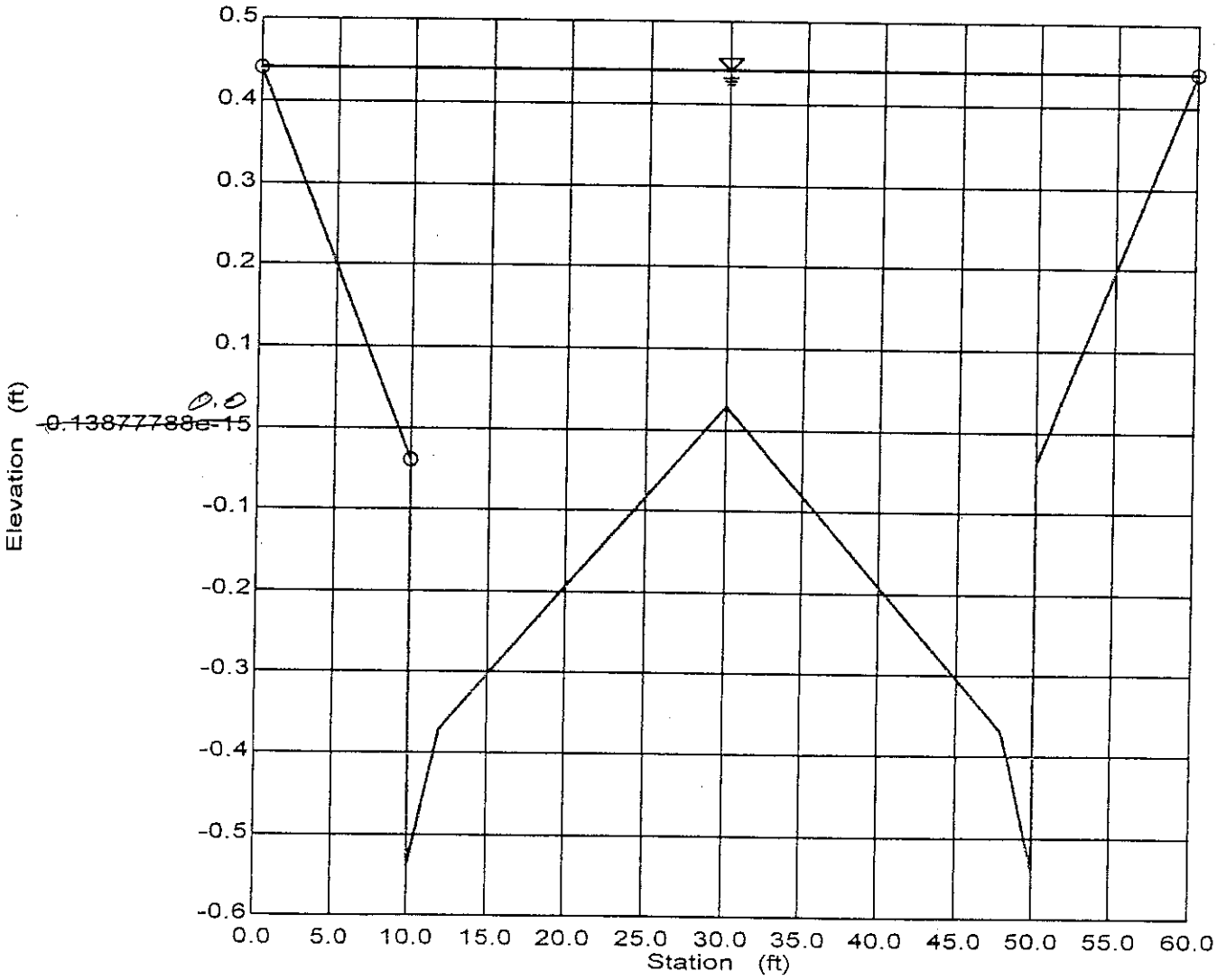
Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.005000	0.080000	0.001000 ft/ft



Cross Section
Cross Section for Irregular Channel

Project Description	
Project File	c:\sdsk8\proj\silvr-~1\project1.fm2
Worksheet	Street Capacity-Major Storm
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.017	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	0.44	ft
Discharge	114.36	cfs

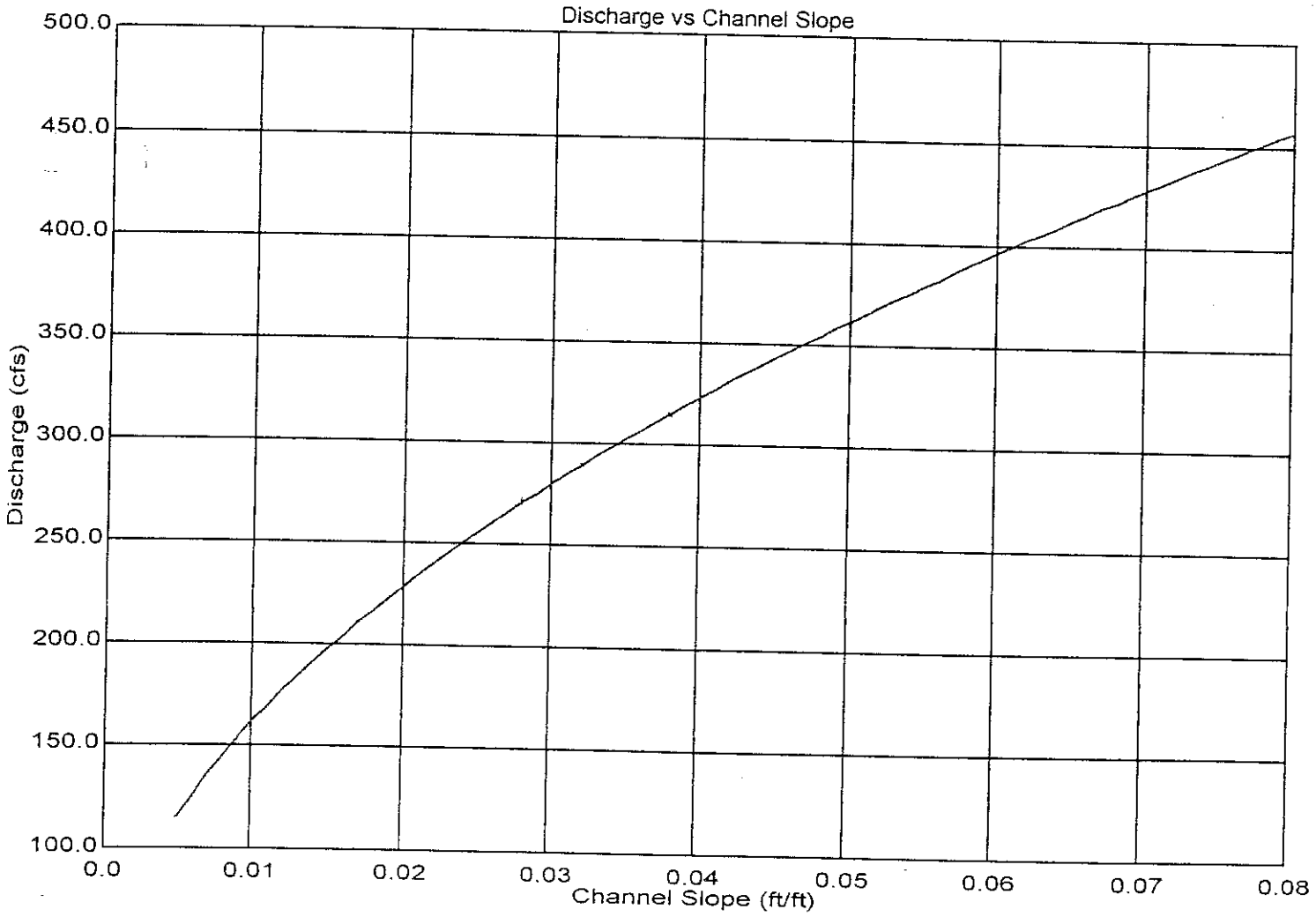


Curve
Plotted Curves for Irregular Channel

Project Description	
Project File	c:\sdsk8\proj\silvr-~1\project1.fm2
Worksheet	Street Capacity-Major Storm
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Water Surface Elevation	0.44 ft

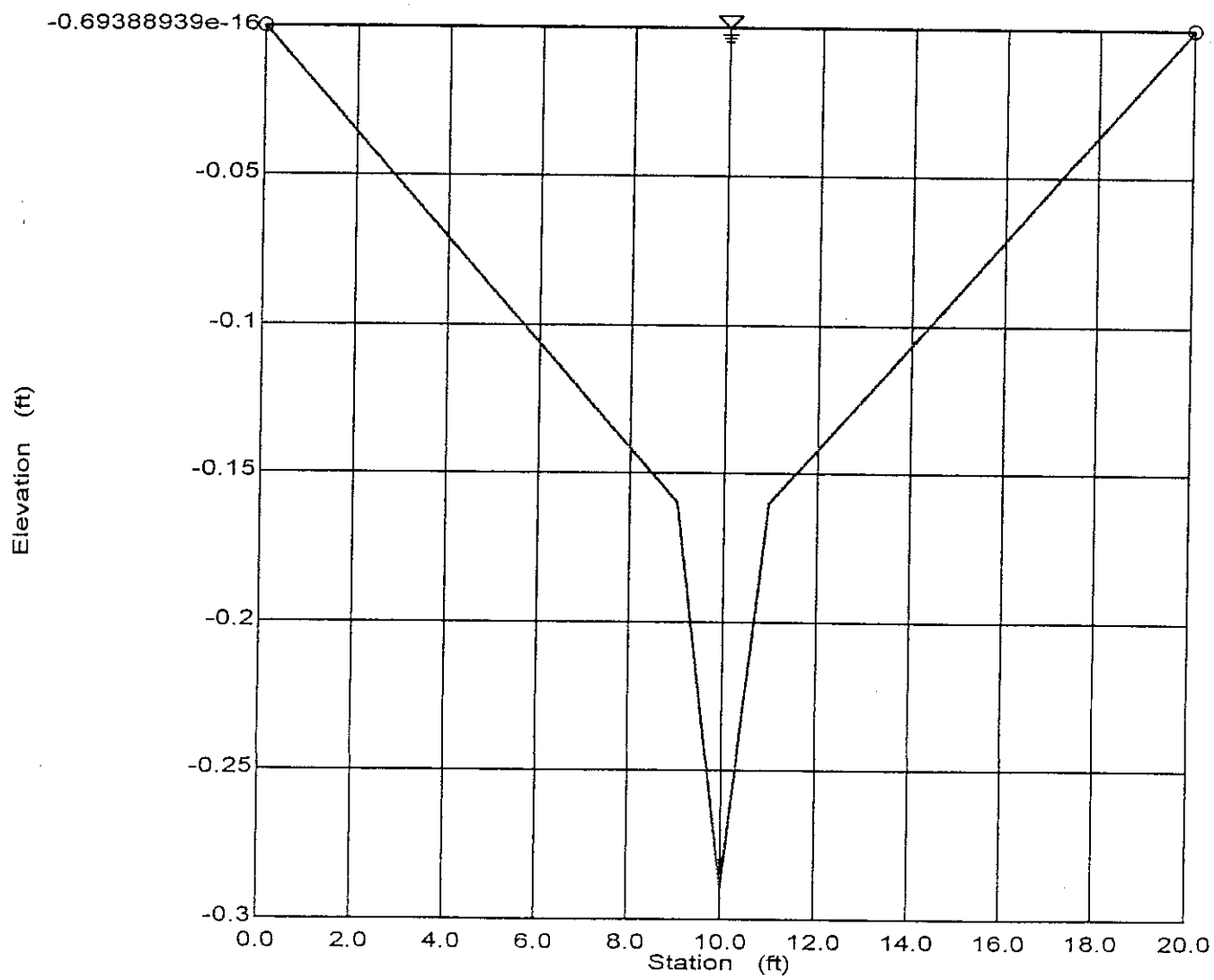
Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.005000	0.080000	0.001000 ft/ft



Silver Mtn Village
Cross Section for Irregular Channel

Project Description	
Project File	c:\sdsk8\proj\silvr-~1\project1.fm2
Worksheet	Major Storm Capacity-Alley
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Water Surface Elevation	0.00	ft
Discharge	3.17	cfs

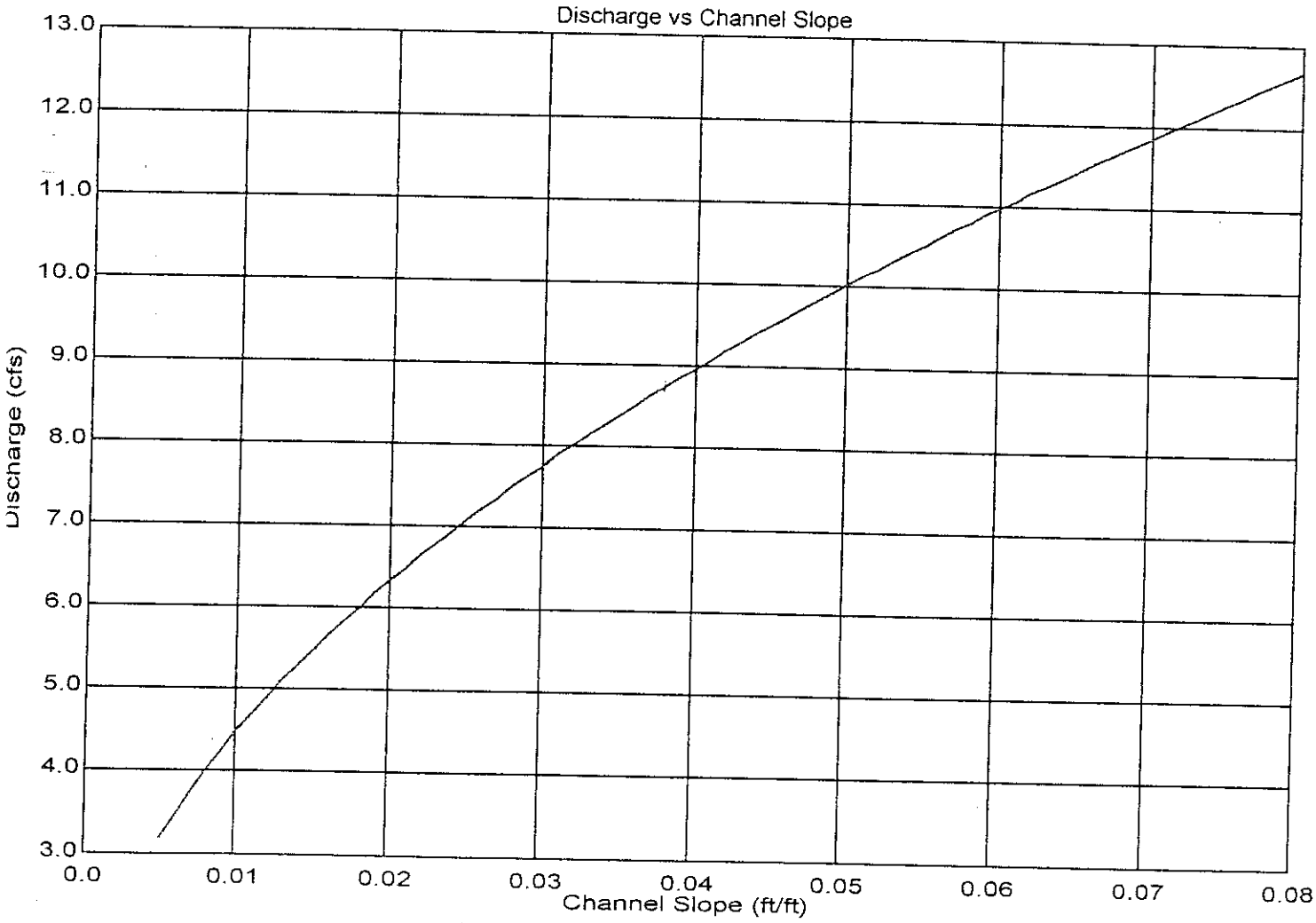


Curve
Plotted Curves for Irregular Channel

Project Description	
Project File	c:\sdsk8\proj\silvr-~1\project1.fm2
Worksheet	Major Storm Capacity-Alley
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Water Surface Elevation	0.00 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.005000	0.080000	0.001000 ft/ft

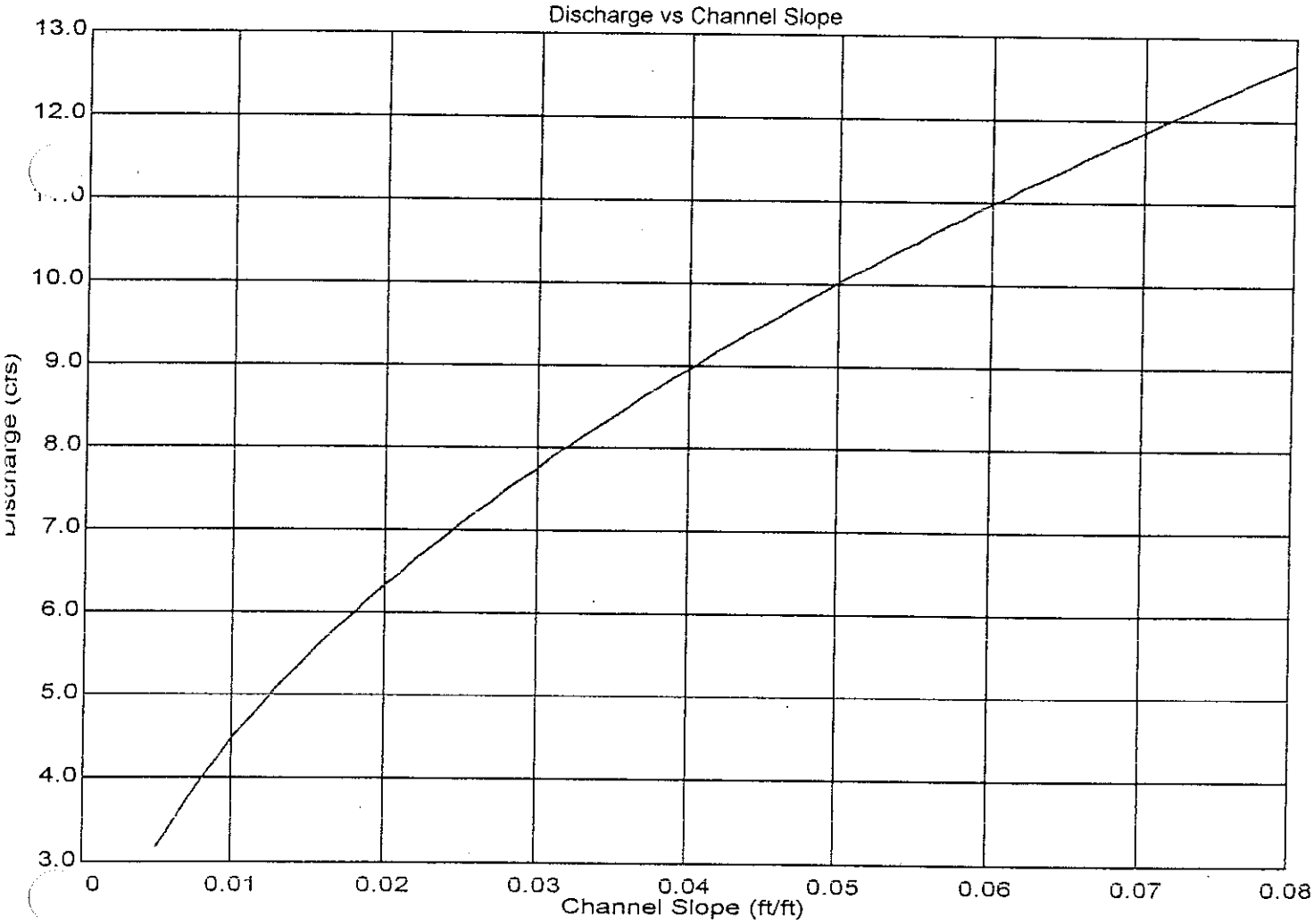


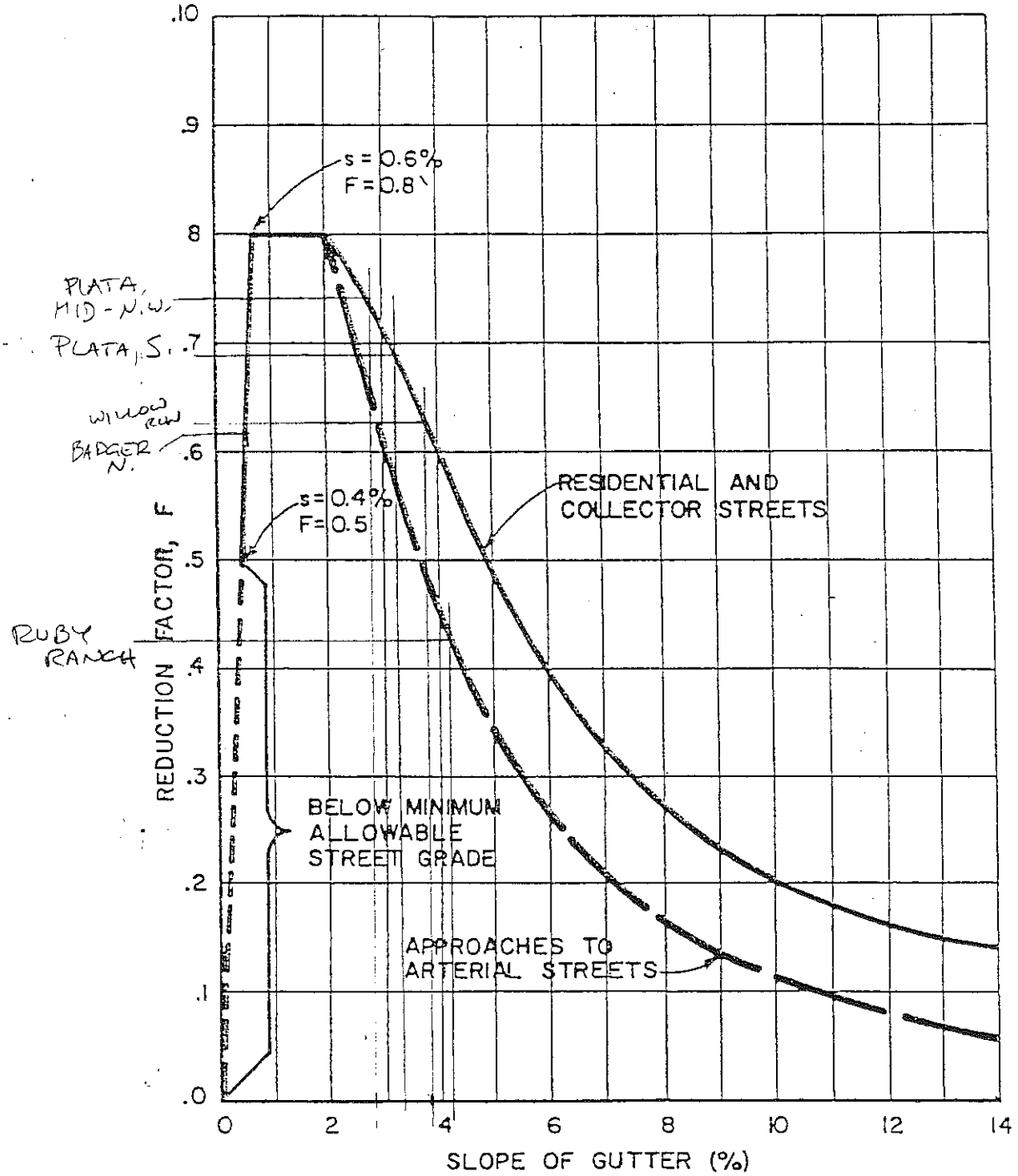
Curve
Plotted Curves for Irregular Channel

Project Description	
Project File	c:\sdsk8\proj\silvr-~1\project1.fm2
Worksheet	Minor Storm Capacity-Alley
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Water Surface Elevation	0.00 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.005000	0.080000	0.001000 ft/ft





Apply reduction factor for applicable slope to the theoretical gutter capacity to obtain allowable gutter capacity

REDUCTION FACTOR FOR ALLOWABLE GUTTER AND ROADSIDE DITCH CAPCITY

FIGURE 9

school-pond

(POND 1)

elev	area	vol-area	vol-conic	AVG.
8738.0000	0.0066	362916.8098	361735.5605	362,327
8737.5000	0.0059	275588.3641	274451.5178	
8737.0000	0.0050	199290.8577	198238.3732	198,765
8736.5000	0.0037	138350.6827	137528.3779	137,940
8736.0000	0.0023	96089.1300	95629.7143	
8735.5000	0.0017	67603.8097	67250.4523	
8735.0000	0.0012	46840.4017	46584.7355	
8734.5000	0.0010	31424.4312	31206.7583	
8734.0000	0.0007	19817.8479	19654.5019	
8733.5000	0.0005	11504.1498	11377.8398	
8733.0000	0.0003	5743.7103	5659.4267	
8732.5000	0.0002	2052.9206	2003.3898	
8732.0000	0.0001	0.0000	0.0000	

VOL. REQ'D. = 149,472 c.f.

$$100\text{-YR. W.S.} = 8736.5 + \left[\frac{149{,}472 - 137{,}940}{198765 - 137940}\right]/2$$

$$= \underline{\underline{8736.6}}$$

elev	area	vol-area	vol-conic	AVG.
8731.0000	0.0004	44023.6188	43917.6708	43,971
8730.5000	0.0004	38122.0378	38017.5078	38,070
8730.0000	0.0004	32660.3431	32557.2353	
8729.5000	0.0003	27622.1510	27520.4703	
8729.0000	0.0003	22991.0780	22890.8298	
8728.5000	0.0003	18750.7405	18651.9310	
8728.0000	0.0003	14884.7548	14787.3912	
8727.5000	0.0002	11376.7375	11280.8279	
8727.0000	0.0002	8210.3048	8115.8589	
8726.5000	0.0002	5369.0733	5276.1022	
8726.0000	0.0002	2873.0352	2782.3947	
8725.5000	0.0001	938.4162	859.9886	
8725.0000	0.0000	0.0000	0.0000	

VOL. REQ'D = 40,310 s.f.

$$100\text{-YR. W.S.} = 8730.5 + \left[\frac{43971 - 40310}{43971 - 38070}\right] / 2$$

$$= 8730.7$$

Table
Rating Table for Circular Channel

Project Description	
Project File	c:\sdsk8\proj\silvr-~1\project2.fm2
Worksheet	Capacities of RCP's at 0.5%
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Constant Data	
Mannings Coefficient	0.013
Channel Slope	0.005000 ft/ft

Input Data			
	Minimum	Maximum	Increment
Diameter	18.00	60.00	3.00 in

Rating Table

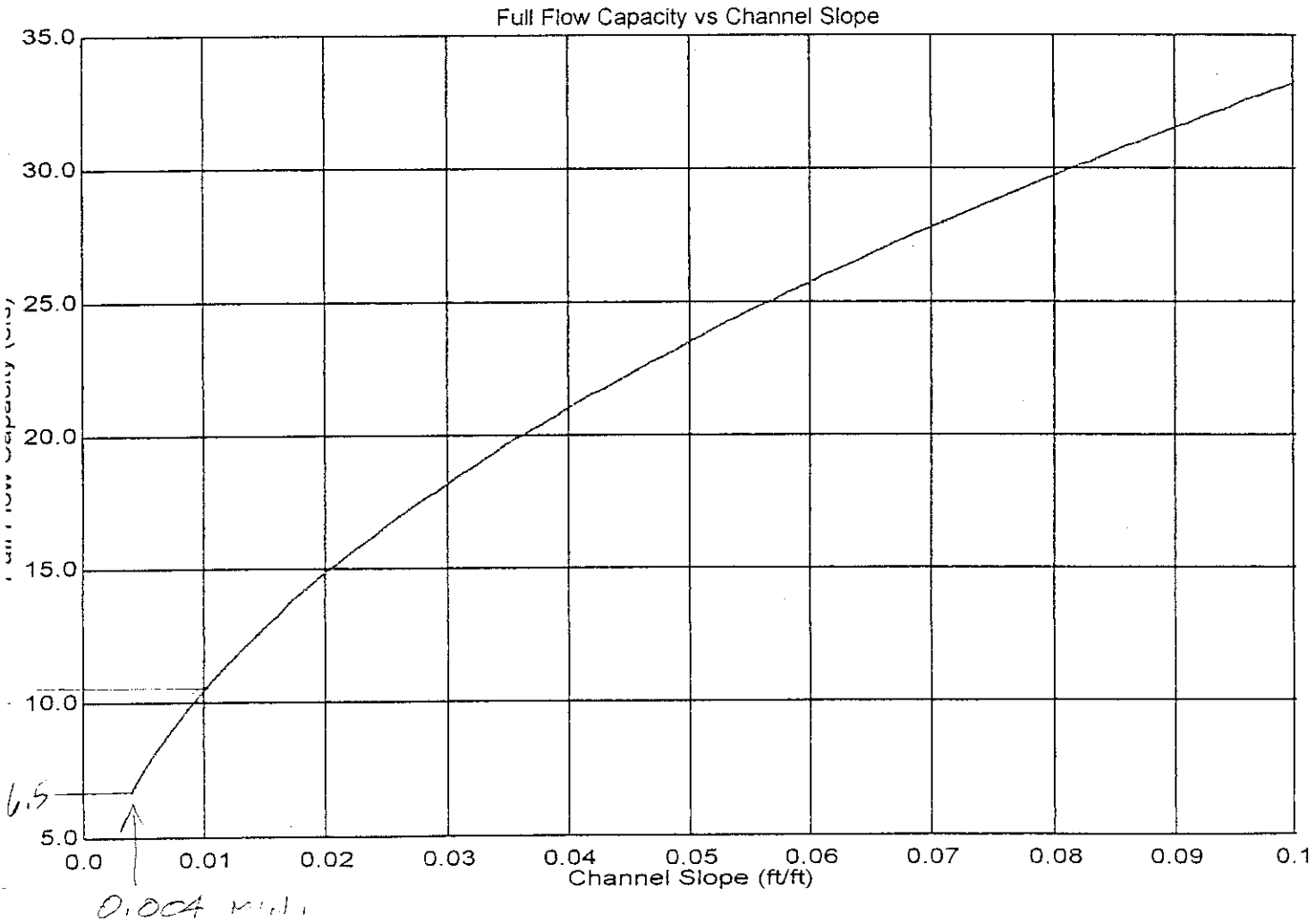
Diameter (in)	Depth (ft)	Discharge (cfs)	Velocity (ft/s)	
18.00	1.50	7.43	4.20	
21.00	1.75	11.20	4.66	
24.00	2.00	16.00	5.09	← POND 1 & 2
27.00	2.25	21.90	5.51	
30.00	2.50	29.00	5.91	
33.00	2.75	37.39	6.30	← D.P. 11
36.00	3.00	47.16	6.67	
39.00	3.25	58.38	7.04	
42.00	3.50	71.14	7.39	
45.00	3.75	85.51	7.74	
48.00	4.00	101.57	8.08	
51.00	4.25	119.39	8.42	
54.00	4.50	139.04	8.74	
57.00	4.75	160.61	9.06	
60.00	5.00	184.15	9.38	

Capacity vs. Slope - 18" RCP
Plotted Curves for Circular Channel

Project Description	
Project File	untitled.fm2
Worksheet	Capacities of 18" RCP
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Constant Data	
Mannings Coefficient	0.013
Diameter	18.00 in

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.004000	0.100000	0.001000 ft/ft

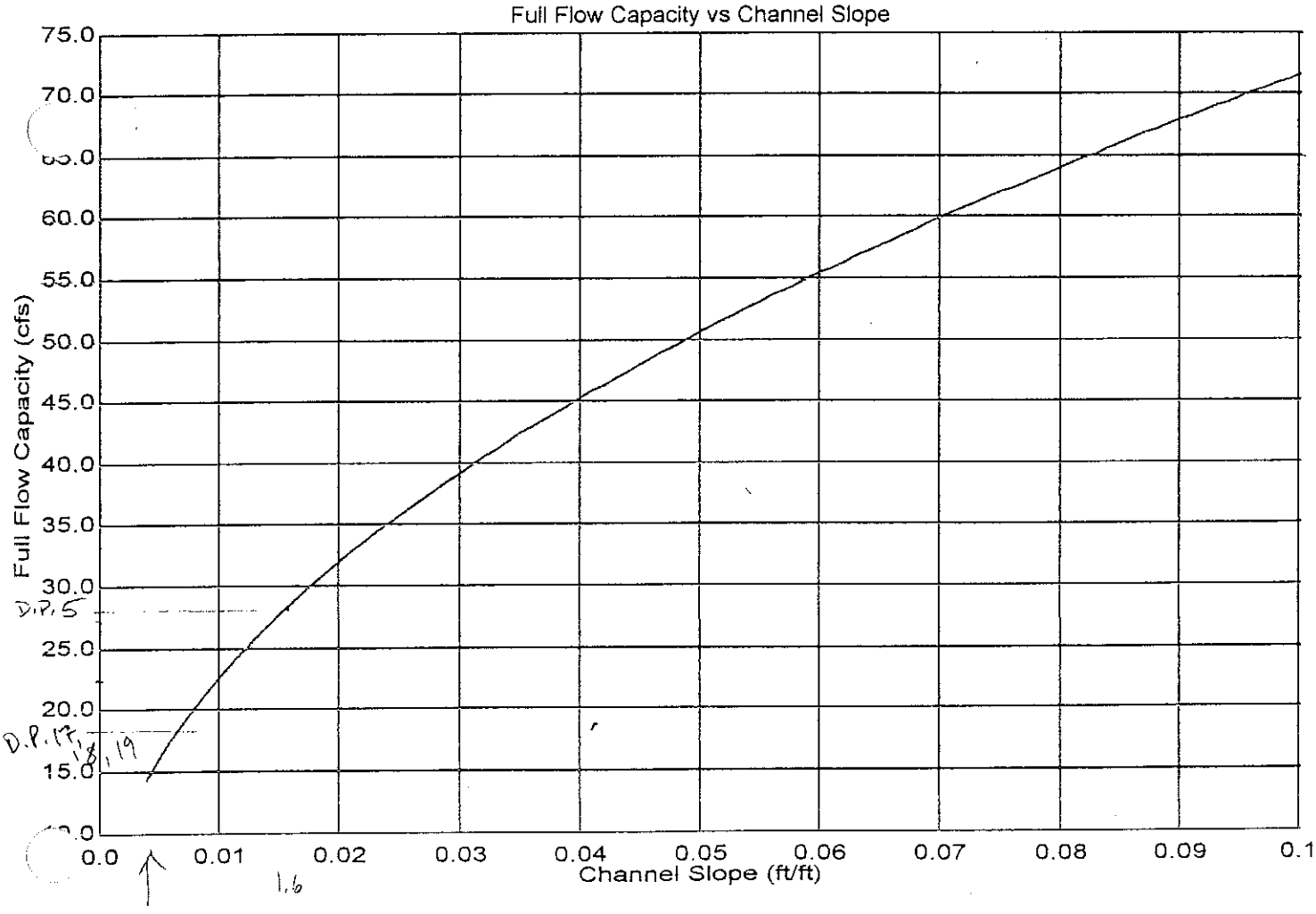


Capacity vs. Slope - 24" RCP
Plotted Curves for Circular Channel

Project Description	
Project File	untitled.fm2
Worksheet	Capacities of 24" RCP
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Constant Data	
Mannings Coefficient	0.013
Diameter	24.00 in

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.004000	0.100000	0.001000 ft/ft

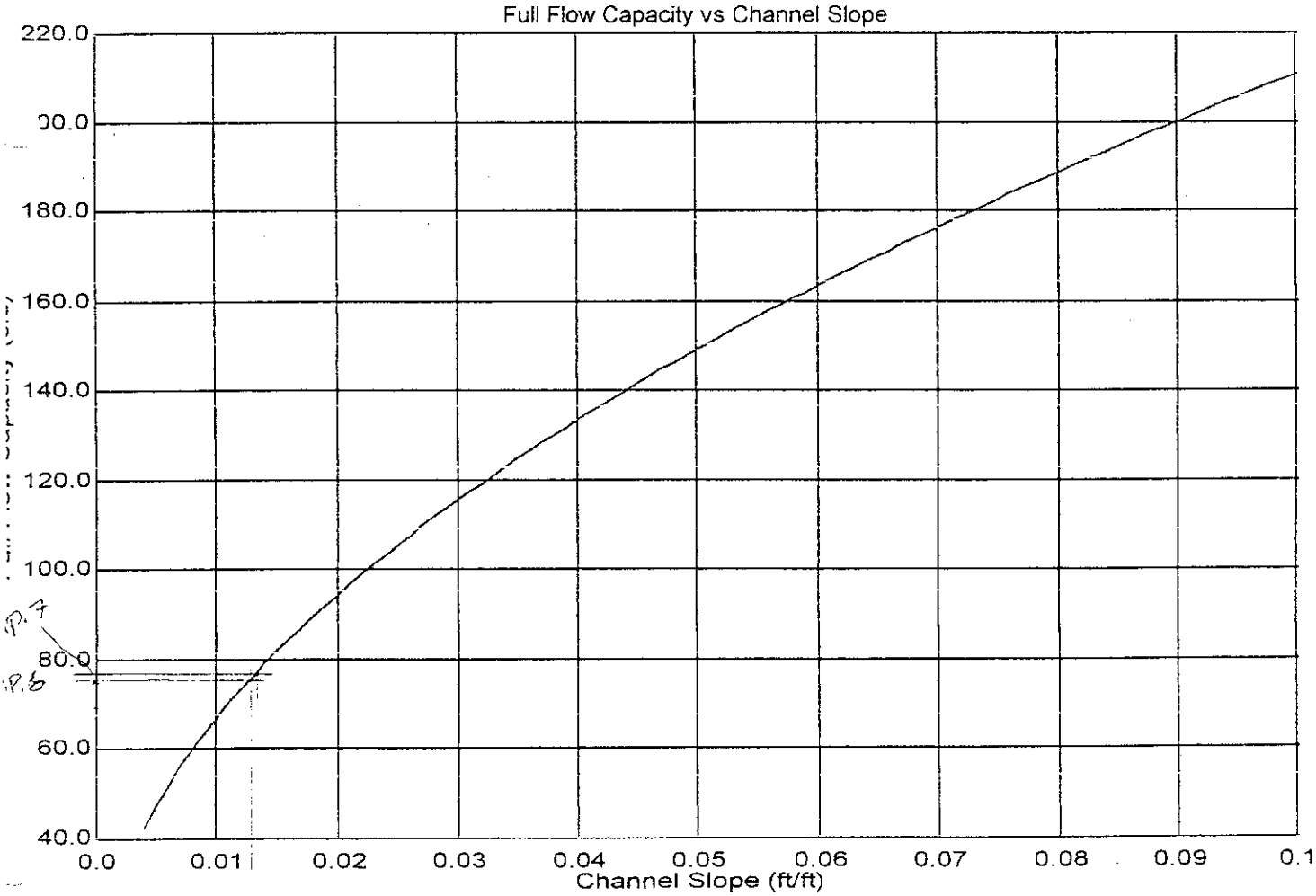


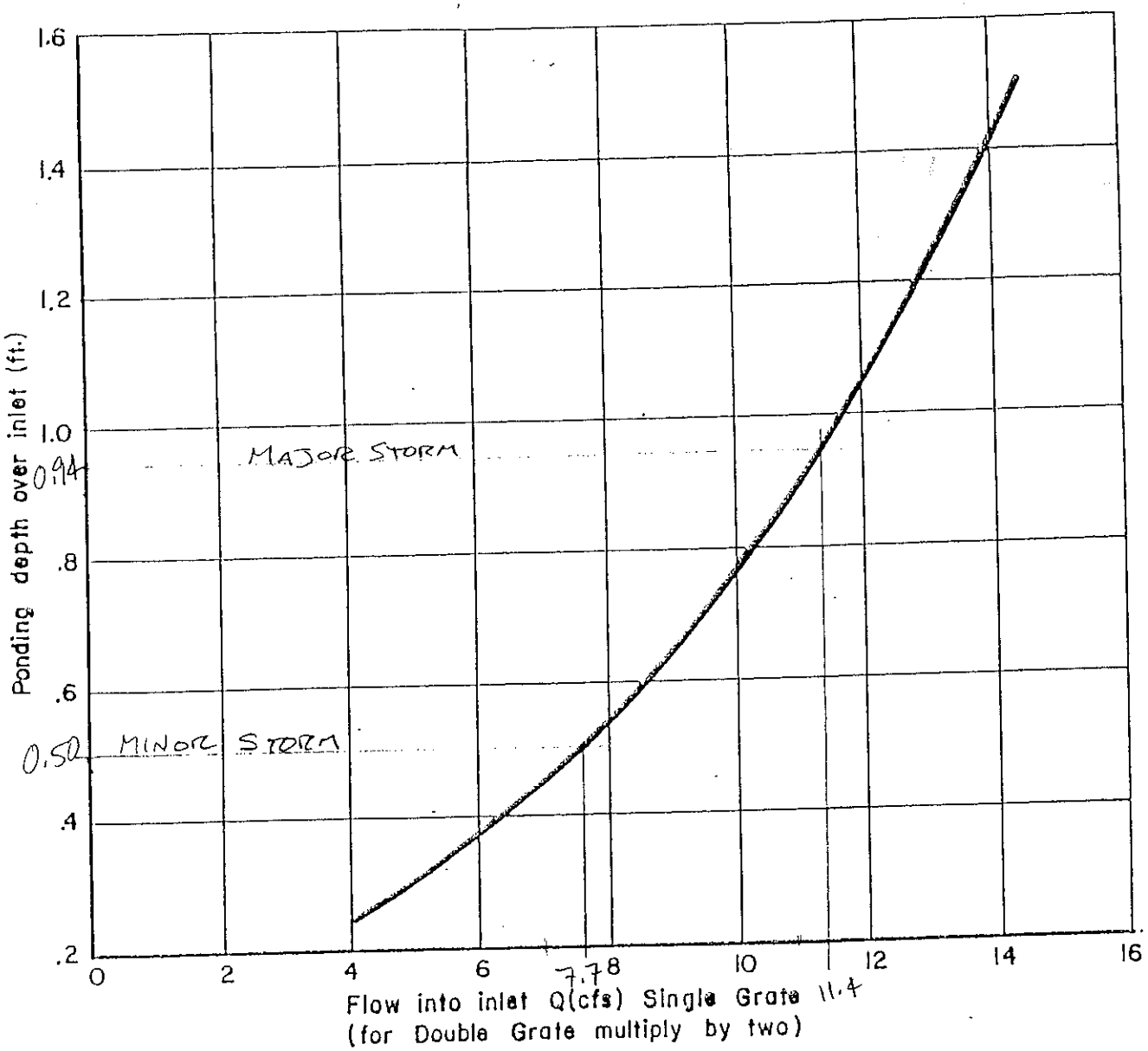
Capacity vs. Slope - 36" RCP
Plotted Curves for Circular Channel

Project Description	
Project File	untitled.fm2
Worksheet	Capacities of 36" RCP
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Constant Data	
Mannings Coefficient	0.013
Diameter	36.00 in

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.004000	0.100000	0.001000 ft/ft





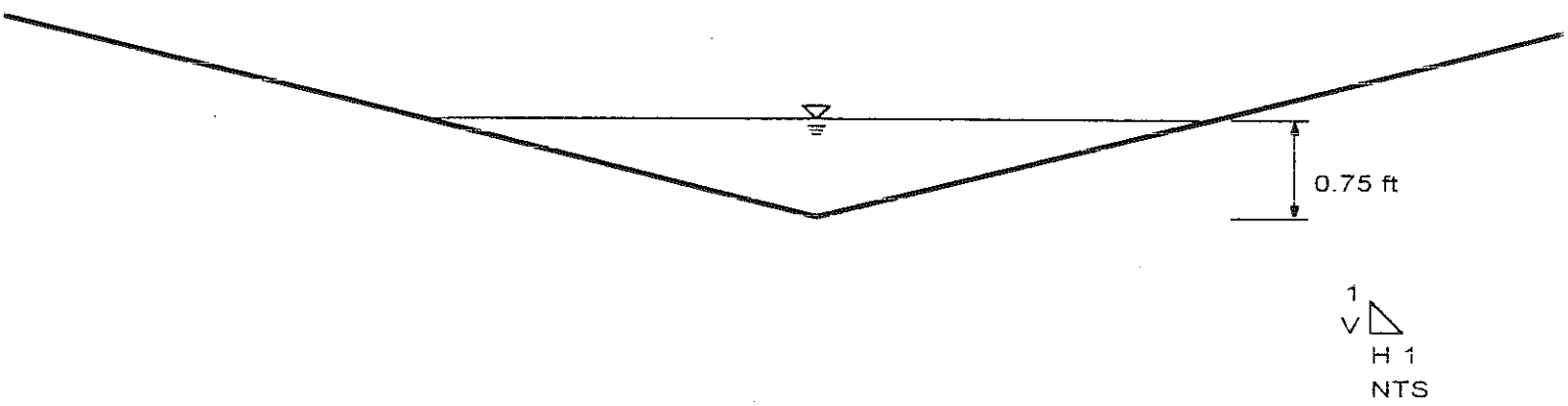
CAPACITY OF GRATED INLET IN SUMP

FIGURE 15

Cross Section
Cross Section for Triangular Channel

Project Description	
Project File	untitled.fm2
Worksheet	Trickle Channel thru balfields — BASIN 8
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

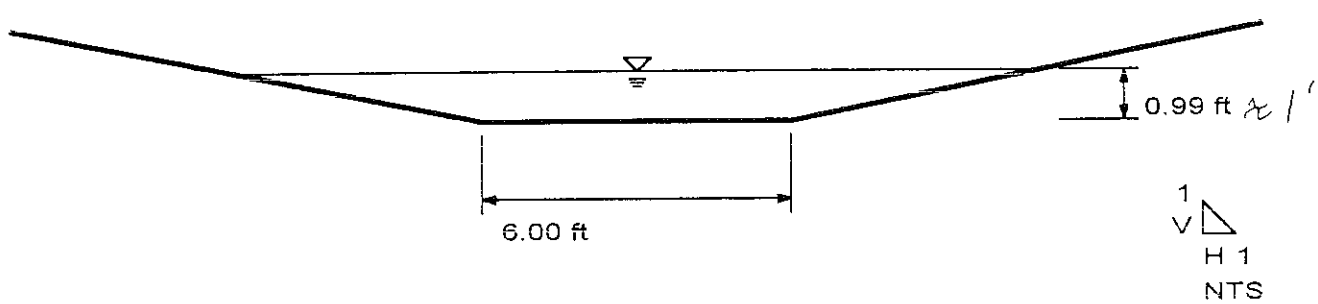
Section Data		
Mannings Coefficient	0.013	
Channel Slope	0.007300	ft/ft
Depth	0.75	ft
Left Side Slope	4.000000	H : V
Right Side Slope	4.000000	H : V
Discharge	11.39	cfs



Cross Section
Cross Section for Trapezoidal Channel

Project Description	
Project File	untitled.fm2
Worksheet	Major Storm Channel thru ballfields — BASIN 8
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.030	→ GRASS-LINED
Channel Slope	0.007300 ft/ft	
Depth	0.99 ft	
Left Side Slope	5.000000 H : V	
Right Side Slope	5.000000 H : V	
Bottom Width	6.00 ft	
Discharge	34.93 cfs	→ ΔQ b/w MAJOR & MINOR STORM



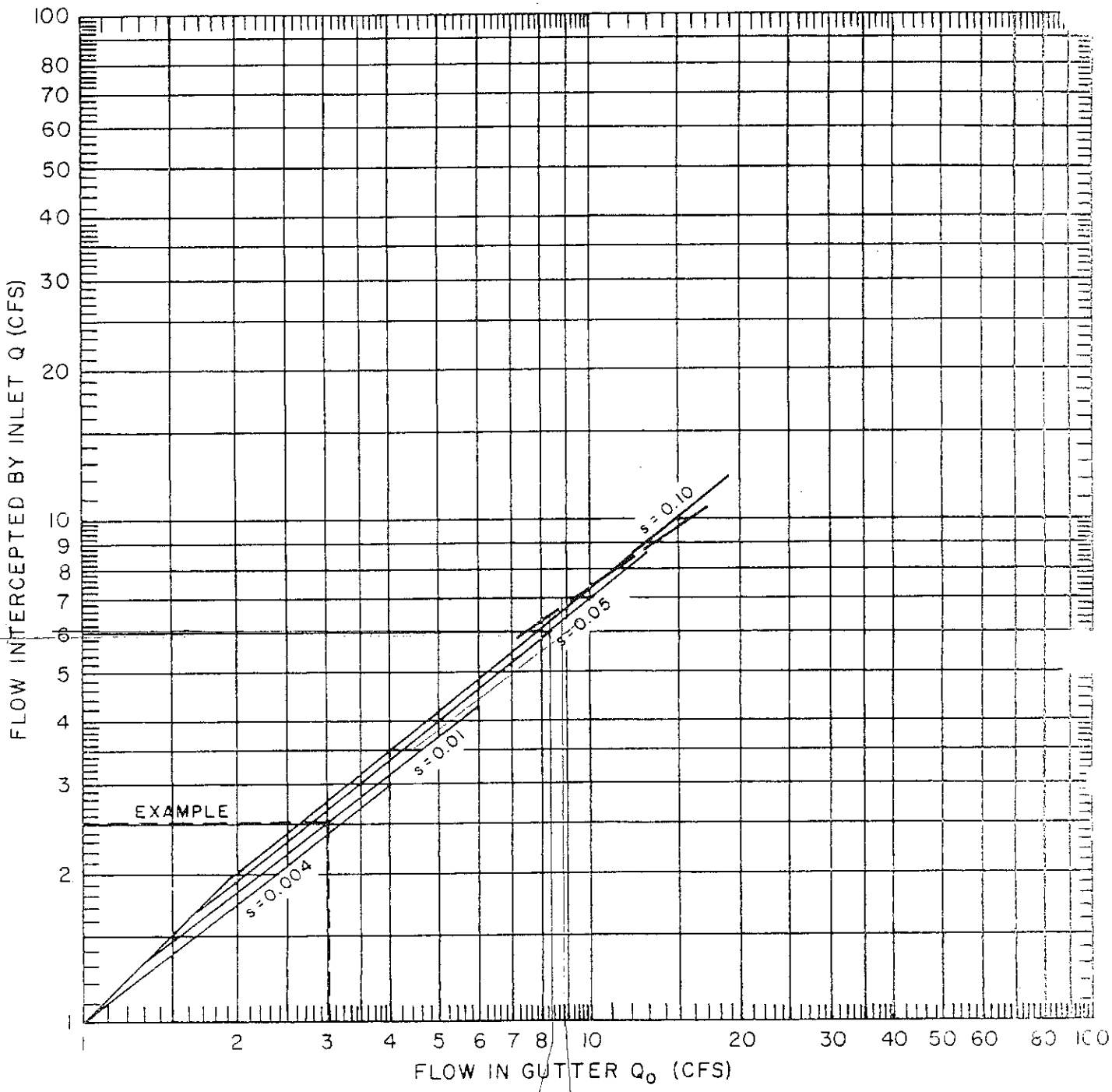


FIGURE 4-3. CAPACITY CHART, LONGITUDINAL BAR COMBINATION INLET
L = 3 FT., w = 2 FT., a = 2 IN., s_c = 0.02

Above dashed line, carryover occurs across surface of grate.

D.P.3

S-3

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