



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

May 5, 1999

Kevin Patton, P.E.
Bohannon-Huston
7500 Jefferson NE
Albuquerque, NM 87109-4335

Re: Engineer's Certification for Chaco Ridge at High Desert (Tract 9-B)
- (E-23/D-3N), Engineer's stamp dated April 13, 1999 (DRB 97-536)

Dear Mr. Patton:

The referenced grading certification required by the DRB is approved for the release of the SIA and financial guarantees.

If I can be of further assistance, please feel free to call me at 924-3980.

Sincerely,

Fred J. Aguirre, P.E.
City Hydrologist
Public Works Department

c: Andrew Garcia
Terri Martin
File ✓



March 9, 1998

Kevin Patton, P.E.
Bohannon-Huston, Inc.
7500 Jefferson NE
Albuquerque, New Mexico 87109

**RE: Drainage Report and Grading and Drainage Plan for Chaco Ridge at High Desert
(Tract 9B) (E23/D3N) Submitted for Preliminary Plat Approval, Engineer's Stamp
Dated 2/6/98.**

Dear Mr. Patton:

Based your letter of March 9, 1998, the above referenced Grading and Drainage plan for Chaco Ridge at High Desert is approved for Preliminary Plat action.

The Final Plat must show the private drainage easements in the back of the lots adjacent to Sunset Ridge and note that these easements are to be maintained by the Homeowners Association. The SIA must be in place prior to Final Plat sign-off.

The Grading and Drainage Certification is required prior to release of Financial Guarantees.

If you have any questions, or if I may be of further assistance to you, please call me.

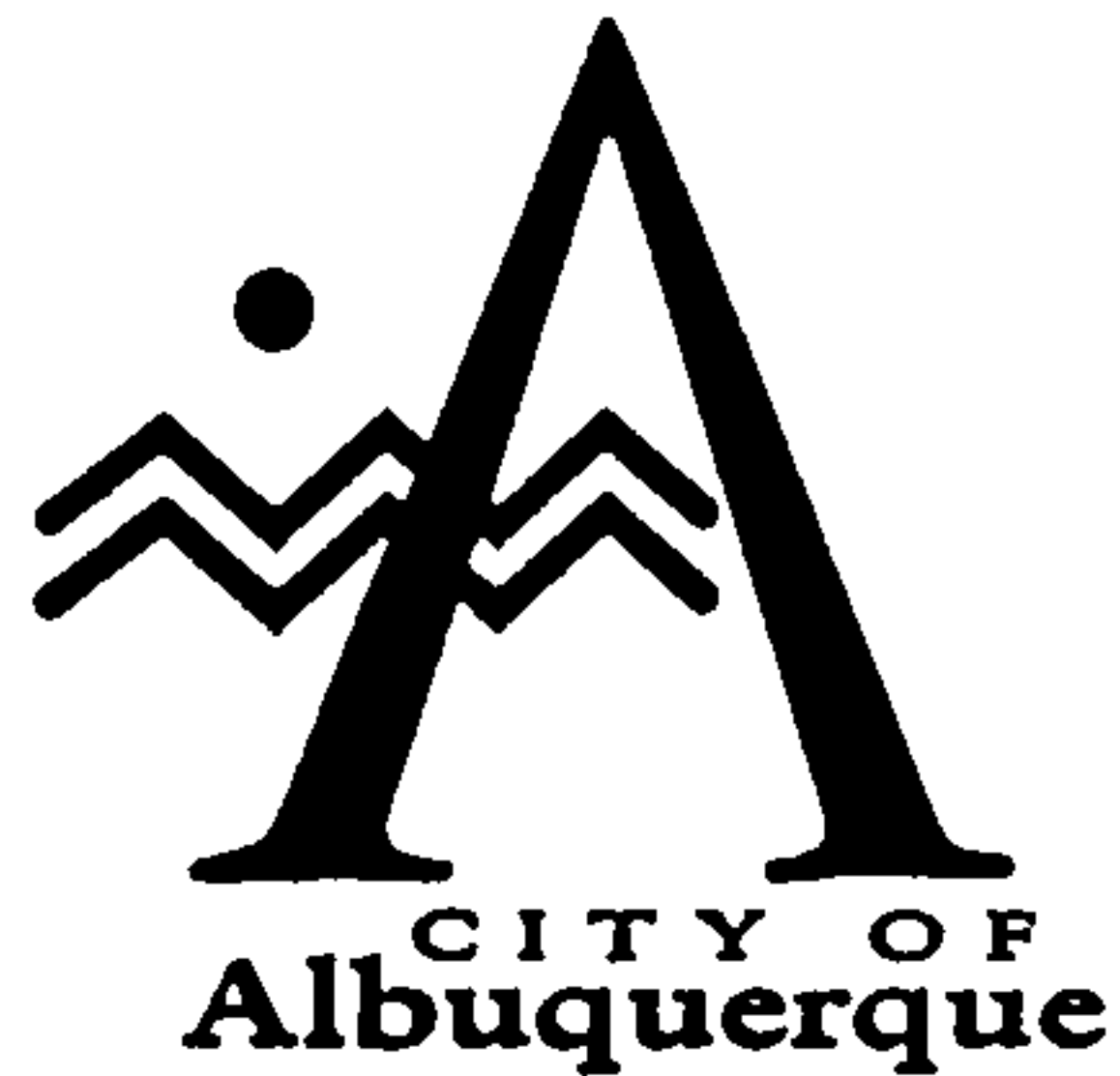
Sincerely,

Susan M. Calongne, P.E.
City/County Floodplain Administrator

c: John Clarke, Mesa Verde Development
File

Good for You, Albuquerque!





May 27, 1998

Kevin Patton, P.E.
Bohannon-Huston, Inc.
7500 Jefferson NE
Albuquerque, New Mexico 87109

RE: Revised Grading Plan for Chaco Ridge at High Desert, Tract 9B, (E23/D3N) Submitted for Final Plat Approval and Work Order Approval, Engineer's Stamp Dated 4/23/98.

Dear Mr. Patton:

Based your submittal of May 4, 1998, the above referenced Grading Plan for Chaco Ridge at High Desert is approved for Final Plat action and Work Order approval.

As you are aware, the Grading and Drainage Certification of the plan approved by the DRB is required prior to release of Financial Guarantees for this subdivision.

If you have any questions, or if I may be of further assistance to you, please call me at 924-3982.

Sincerely,

Susan M. Calongne, P.E.
City/County Floodplain Administrator

c: Fred Aguirre, DRB 97-536
John Clarke, Mesa Verde Development
File

Good for You, Albuquerque!



**DRAINAGE REPORT
FOR
CHACO RIDGE AT HIGH DESERT
(TRACT 9B)**

FEBRUARY 6, 1998

PREPARED BY:

BOHANNAN HUSTON

Courtyard One

7500 JEFFERSON NE

Albuquerque

NEW MEXICO 87109

voice 505.823.1000

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**BOHANNAN HUSTON
COURTYARD I, 7500 JEFFERSON STREET N.E.
ALBUQUERQUE, NM 87109**

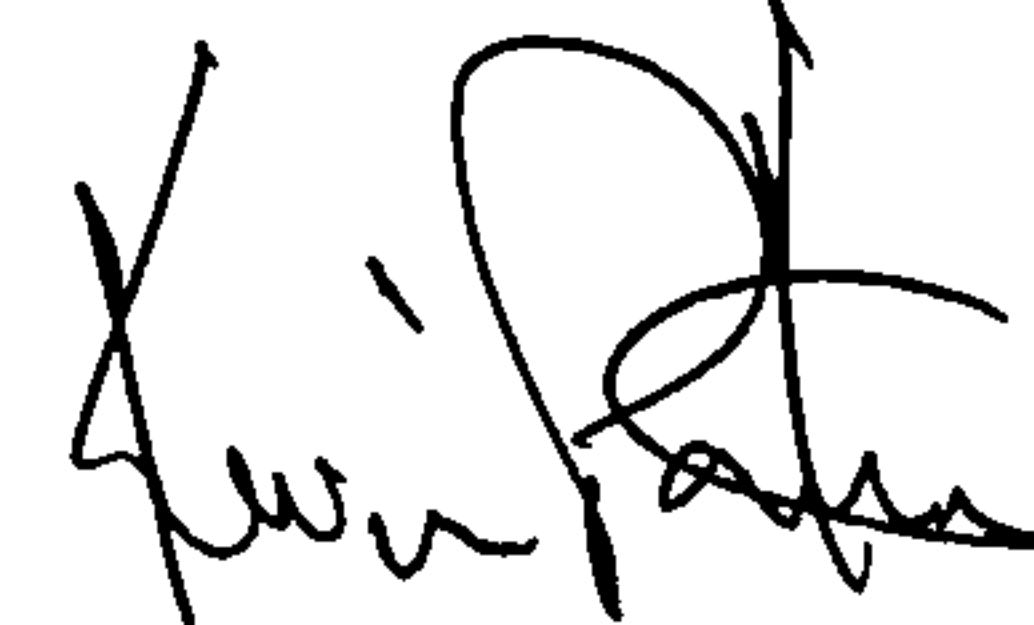
PREPARED FOR:

**Mesa Verde Development
6060 San Mateo Blvd. NE
ALBUQUERQUE, NM. 87109**

PREPARED BY:


Tim Gergen, E.I. 2/6/98
Date

UNDER THE SUPERVISION OF:


Kevin Patton, P.E.
Date



I. PURPOSE

The purpose of this report is to provide site-specific drainage analysis for existing and proposed conditions for the residential development of Tract 9B at High Desert, referred to as *Chaco Ridge at High Desert*. This plan is prepared and submitted to support rough grading, infrastructure design, preliminary and final plat approvals.

This report will reference the following City of Albuquerque and the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) approved studies prepared for the High Desert Development: 1) the High Desert Drainage Management Master Plan, dated December 1993; 2) the High Desert - Sunset Ridge, dated April 1997; 3) the High Desert Subdivision South Pino Tributary Storm Drain Design Analysis Report, dated May 1997; and 4) the High Desert - Tract 15D-1A (Unit 4 of the Highlands), revised date January 1998.

The High Desert Drainage Management Master Plan, dated December, 1993 (hereafter referred to as the HDDMMP), was prepared to support future drainage plans submitted for the development of individual land parcels within High Desert and to provide design guidance for the design of primary drainage infrastructure to be constructed by High Desert in advance of or simultaneously with individual parcel development.

The High Desert - Sunset Ridge, dated April 1997 was prepared to support rough grading, infrastructure design, preliminary and final plat approvals for the residential development of Tract 9A, known as *Sunset Ridge at High Desert*. The report establishes existing and proposed drainage conditions for the *Sunset Ridge* development which is located adjacent to Tract 9B. The proposed conditions for the land upstream of the *Sunset Ridge* development will be the existing conditions for the proposed development of Tract 9B.

The High Desert Subdivision South Pino Tributary Storm Drain Design Analysis Report, dated May 1997, was prepared to establish a conveyance system for the South Pino Tributary Arroyo from Imperata Street to Tramway Boulevard and to determine the required land area and potential grading for the desiltation pond immediately upstream of Imperata Street. This storm

drain system was designed to accept the fully developed flows generated by the proposed development of Tract 9B.

The High Desert - Tract 15D-1A (Unit 4 of the Highlands), revised date February 1998, also was prepared to support rough grading, infrastructure design, preliminary and final plat approvals for the residential development of *Unit 4 of the Highlands*. The report establishes existing and proposed drainage conditions for the development of *Unit 4 of the Highlands* which is located east of this development and will intercept upstream flows. This report is currently being reviewed by the city.

II. METHODOLOGIES

Please refer to the above referenced reports for the specific methodologies used in preparing those individual reports or plans.

Site conditions are analyzed for a 100-year, 6-hour storm events in accordance with the City of Albuquerque Drainage Ordinance and the Development Process Manual (DPM), Volume 2, Design Criteria, Section 22.2, Hydrology for the City of Albuquerque, January 1993.

The site, as describe in the 'Site Location and Characteristics' section below, is approximately 20.92 acres. Therefore, Part A of the DPM, Section 22.2, which provides a simplified procedure for projects with sub-basins smaller than 40 acres was used.

This report differs slightly from HDDMMP by shifting the drainage basin boundaries within Tract 9. Although the basin boundaries will be shifted in Tract 9, the amount of storm water flow intercepted by the two major storm drains located to the north (South Pino Tributary Storm Drain COA Project #571282) and south (Phase 1-B-1 Academy Storm Drain COA Project #4809.95) of Tract 9 will not change. The approved drainage report for High Desert - Sunset Ridge, dated April 1997, addresses the deviance from the HDDMMP. The existing development, *Sunset Ridge*, of Tract 9A mostly drains to the Academy Both storm and the proposed development of Tract 9B will

have approximately 95% of storm waters drain to the South Pino Tributary Storm drain. Both storm drains mentioned above connect with the Tramway Boulevard Storm Drain System and are public storm drains owned and maintained by the City of Albuquerque. Please refer to the proposed conditions section of this report for more information regarding the relocation of basin boundaries within Tract 9.

This report will also reference the Drainage Report for Sunset Ridge at High Desert, dated April 1997, which was also prepared for Mesa Verde Development Corporation, and approved by the City of Albuquerque. This report designed temporary detention ponds along the boundary between Tracts 9A and 9B which will be removed and replaced by a storm drain system.

III. SUMMARY OF THE RELATED PLATTING AND EASEMENTS

Tract 9 at High Desert is subdivided into four separate tracts, Tract 9A, 9B, 9C and 9D, via a recorded bulk land plat.

Tract 9C is adjacent to Academy Road and is totally encompassed by an existing drainage easement granted to the City of Albuquerque and the High Desert Residential Owners Association. Tract 9C contains the Bear Tributary Arroyo, which is a "dry" arroyo. This arroyo is dry due to the existing Bear Tributary Arroyo Diversion Dike located within Tract 15D, and the Phase 1-B-1 Storm Drain Project. Despite the dry condition of this arroyo, an existing FEMA Flood plain covers approximately 95% of Tract 9C. The Bear Tributary Arroyo is a part of the High Desert Open Space Concept, which is preserving the natural arroyos and implementing water harvesting techniques to enhance the natural vegetation.

LomR

Tract 9D is located within the South Pino Tributary Arroyo and adjacent to Blue Grama Road between Cortaderia and Imperata Street. This tract is also encompassed by an existing drainage easement granted to the City of Albuquerque and the High Desert Residential Owners Association. Tract 9D contains an active FEMA Flood Plain within 95% of its area but will be reduced with the construction of the South Pino Tributary Storm Drain.

Tract 9A lies between Tract 9C and 9D to the north and south and between Cortaderia Street and Tract 9B to the east and west. Tract 9A, known as *Sunset Ridge at High Desert*, is a developed subdivision with 91 lots and 7 public streets.

Tract 9B, known as Chaco Ridge at High Desert, lies between Tracts 9C and 9D to the north and south, and between Imperata Street and Tract 9A to the east and west. For the purposes of this report, the "Site" will be defined as Tract 9B. Chaco Ridge at High Desert will utilize approximately 20.92 acres, entirely within Tract 9B. The Final Plat for Chaco Ridge at High Desert will further subdivide Tract 9B into 91 lots and 7 public streets to be dedicated to the City of Albuquerque. It should be noted that all of the land within the FEMA flood plain of the Bear Tributary and South Pino Tributary Arroyos is completely encompassed by easements dedicated to the City of Albuquerque and the High Desert Residential Owners Association.

IV. SITE LOCATION AND CHARACTERISTICS

For location of the site, please refer to the vicinity map on the grading and drainage plan enclosed with this report.

Chaco Ridge at High Desert is located in the far northeast heights of Albuquerque, on Zone Atlas page E-23. The project is bounded on the west by Tract 9A, on the south by the Bear Tributary Arroyo, on the east by Imperata Street, and on the north by the South Pino Tributary Arroyo. Access to the site will be provided from Imperata Street. The site is currently zoned SU-2 HD/R-T and is approximately 20.92 acres in size.

Vegetation on the site consists primarily of prairie grasses and a few juniper trees. Slopes in the project site range from 2% to 15%, with the majority of the project sloping from east to west at 2% to 8%. The Soil Conservation Service has classified the soils on this site as Embudo Tijeras complex, Embudo gravely fine sandy loam, and Tijeras gravely fine sandy loam, all of which correspond to a common hydrological soil group classification of B.

V. EXISTING HYDROLOGIC AND SITE DRAINAGE CONDITIONS

The existing hydraulic and hydrologic conditions of this site adheres to the Drainage Report for Sunset Ridge at High Desert, dated April 1997, which was prepared for Mesa Verde Development and approved by the City of Albuquerque. The existing site consist of four drainage basins, labeled Basins 01-04. The existing basins mentioned above are referenced from the Drainage Report for Sunset Ridge at High Desert, Proposed Hydraulic and Hydrologic Conditions, Tract 9A Off-Site Basins.

Basin 01 (8.97 acres, $Q_{100}=19.73\text{cfs}$) and Basin 02 (4.40 acres, $Q_{100}=9.68\text{cfs}$) will drain via sheet flow and shallow concentrated flows (small existing natural arroyos) to temporary detention ponds located at the western edge of their respective basins. Basin 03 (1.22 acres, $Q_{100}=2.68\text{cfs}$) will be redirected to the detention pond within Basin 02 via a constructed swale and drop structure. The detention pond within Basin 02 has been sized to accept this flow. Basin 04 (15.93 acres, $Q_{100}=35.05\text{cfs}$) will drain via sheet flow and shallow concentrated flows (small existing natural arroyos) to an existing permanent detention pond located along the western boundary of Tract 9C. All temporary detention ponds and swales have been constructed as required by the Drainage Report for Sunset Ridge at High Desert. The permanent detention pond was constructed with the Cortaderia Street Improvements.

For additional assistance, please refer to the Existing Conditions Basin Map located in the Exhibit section of this report and the Drainage Report for Sunset Ridge at High Desert.

A. FEMA Flood Plain

Please reference the Preliminary Plat and the Bulk Land Plat located in the Exhibit section of this report for location information.

Currently, Bohannon-Huston Inc. is preparing a Letter of Map Revision (LOMR) to remove and revise flood plains within the High Desert subdivision. The portion of the LOMR that will affect this development includes the North Bear Tributary and the South

Pino Tributary. It is anticipated that the North Bear Tributary Desiltation Pond will remove the North Bear Tributary FEMA floodplain within the High Desert Development from east of Tramway Boulevard to Imperata Street. In accordance, the South Pino Tributary Desiltation Pond should remove the FEMA floodplain that extends from Tramway Boulevard east to Imperata Street. The submittal of this LOMR to FEMA is anticipated in the late summer of 1998.

VI. DEVELOPED HYDROLOGICAL AND HYDRAULIC CONDITIONS

For additional assistance throughout this section, please refer to the Grading and Drainage Plan, the Proposed Conditions Basin Map and a portion of the Ultimate Condition Map taken from the 1993 HDDMMP enclosed with the Exhibit section of this report.

The proposed site will be divided into one off-site basin, labeled Basin A, and eight on-site basins, labeled Basins B-I. A number of drainage/grading concepts have been utilized for this subdivision. These include ribbon channels and standard lot drainage to the adjacent street. Garden walls (18" maximum grade separation) between lots are also being utilized. However, spot elevations on the grading plan adjacent to side lot lines are at the bottom of the side yard swales, not at the top and bottom of the garden wall. A side lot line detail has been provided on the detail sheet located in the Exhibit section of this report.

Basin A (1.74 acres, $Q_{100}=6.57\text{cfs}$) is an off-site basin to the east of the entrance of our site. Discharge from this basin consists of a combination of residual flow and lot drainage from Unit 4 of the Highlands. A water block will be built to prevent all flows from Basin A to discharge through the entrance of our site. The runoff from Basin A will follow Imperata Street north until the pavement ends, where a temporary swale will carry the flow to the South Pino Tributary Arroyo. This was proposed and approved with the *High Desert - Unit 4 of the Highlands* drainage report.

Basin B (5.53 acres, $Q_{100}=23.33\text{cfs}$) consists of the backyards along the South Pino Tributary Arroyo. This basin will drain only the backyards of these lots to the arroyo. It is the intent

that the roofs of these lots drain to the public roadway and not to the arroyo. This will be accomplished by installing roof drains directing flows to the south. The developed flows will be directed into the streets and delivered via standard and rolled curb to proposed inlets. The flow from Basin C ($Q_{100}=17.54\text{cfs}$) will drain directly onto Basin B adding a combined 100-year flow of 40.87cfs. The inlets in Basin B have been designed to receive and accommodate these flows. In addition, an inlet in a sump condition has been placed at the boundary between Basin B and Basin D to drain all residual flows from Basins B, C and D ($Q_{100}=8.10\text{cfs}$). The flows captured by the inlets will be delivered to the South Pino Storm Drain by the proposed storm drain system within this site.

Basin C (3.90 acres, $Q_{100}=17.54\text{cfs}$) includes the "compound area", lots 70-91, within this site. The "compound area" will have public utilities with private streets and private cross-lot drainage easements. The flow will be captured in the private streets by rolled curb and ushered to Dawn View Drive in Basin B. As stated above, the inlets in Basin B have been sized to accept these flows.

Basin D (5.13 acres, $Q_{100}=22.81\text{cfs}$) consists of the backyards along the Bear Tributary Arroyo. This basin, similar to Basin B, will only drain the backyards to the arroyo. The rest of the developed flows will be directed into the streets and delivered to the proposed storm drain system. Likewise, the inlet in the sump condition will receive the residual flows ($Q_{100}=11.26\text{cfs}$). The inlet in the sump condition was sized for the 2x100-year, 6-hour storm ($Q_{2x100}=49.76\text{cfs}$).

Basin E (0.09 acres, $Q_{100}=0.34\text{cfs}$); Basin F (0.17 acres, $Q_{100}=0.63\text{cfs}$); Basin G (1.27 acres, $Q_{100}=5.69\text{cfs}$); and Basin H (0.17 acres, $Q_{100}=0.50\text{cfs}$) will be allowed to sheet flow directly onto the existing streets of the *Sunset Ridge* development. A total developed flow of 7.16 cfs will be delivered to existing downstream inlets that have been sized to accept this additional discharge. For more information on the additional flow, please reference the High Desert - Sunset Ridge, dated April 1997, drainage report.

Cross Lot
drainage?

Basin I (3.56 acres, $Q_{100}=15.18\text{cfs}$) consists of backyards along the South Pino Tributary Arroyo. Accordingly, only the backyards will drain to the arroyo and the rest of the developed flows

will discharge to the street. The proposed inlets and storm drain system will capture and deliver the flows to the South Pino Storm Drain. The residual flow from these inlets ($Q_{100}=6.21\text{cfs}$) will be allowed to continue down Sunrise Trail Place where downstream inlets have been designed to accept the additional flow.

Verification of basin flows, inlet and culvert capacities, and street capacities can be found in the Appendix of this report.

A. Comparison to the 1993 HDDMMP

As approved with the High Desert - Sunset Ridge drainage report, dated April 1997, the following information explains the deviation from the HDDMMP, dated December 1993. This is for information only.

The drainage basins established within Tract 9 for the Ultimate Developed Conditions in the 1993 HDDMMP are Basins 26, 27, 39 and 40.

The north half of Tract 9 contains two drainage basins from the 1993 report, Basin 39 and 40. Basin 39 encompasses Tract 9D located within the South Pino Tributary Arroyo. Tract 9D is known as the High Desert Open Space, which will remain undeveloped as a natural "dry" arroyo. Basin 40 encompasses the north half of proposed Tract 9B and the north half of developed Tract 9A, known as *Sunset Ridge*. The south half of Tract 9 contains two drainage basins from the 1993 report, Basin 26 and 27. Basin 27 encompasses Tract 9C located within the Bear Tributary Arroyo. Tract 9C is also a part of the High Desert Open Space which will remain undeveloped and as a natural "dry" arroyo. Basin 26 encompasses the south half of proposed Tract 9B and the south half of developed Tract 9A.

The 1993 HDDMMP report drained Basins 39 and 40 to the South Pino Storm Drain and drain Basins 26 and 27 to the Academy Storm Drain. The 1993 report ultimately drained the north half of Tract 9 to the South Pino Storm drain and the south half of Tract 9 to the Academy Storm Drain. Although, as proposed and accepted by the

High Desert -Sunset Ridge, dated April 1997, drainage report, Tract 9 will be divided into east and west drainage boundaries instead of north and south boundaries. The west half of Tract 9, known as *Sunset Ridge* (Tract 9A), will discharge to the Academy Storm Drain and the east half of Tract 9, known as proposed *Chaco Ridge* (Tract 9B), will discharge to the South Pino Storm Drain.

The following table compares the storm water runoff proposed in this report and those that were approved in the 1993 report for the discharge allowed to the South Pino Storm Drain.

1993 HDDMMP

Basin 40 (north ½) - $Q_{100} = 100$ cfs

1998 Tract 9B Report

Proposed Basins B, C, D and I - $Q_{100} = 78.86$ cfs

VII. CONCLUSION

This report has presented a comprehensive drainage management plan for the proposed residential subdivision. It has shown that the proposed drainage basins can be modified from the 1993 HDDMMP without compromising the amount of flow indicated in past reports. This report has also addressed the minor effects it will have on the adjacent arroyos located to the north and south of the proposed development.

This plan provides safe and adequate drainage protection for the proposed development. It is recommended that this plan be approved for rough grading, preliminary and final platting actions.

**EXISTING CONDITIONS FOR
CHACO RIDGE AT HIGH DESERT (TRACT 9B)
Jan-98**

BASIN ID	DISCHARGES TO	AREA (ACRES)	% LAND TREATMENT*				PEAK DISCHARGE - (CFS/ACRE)**				Q(100-YR) UNDEVELOPED (CFS)
			A	B	C	D	A	B	C	D	
O1	Temp. Detention Pond	8.97	100.00	0.00	0.00	0.00	2.20	2.92	3.73	5.25	19.73
O2	Temp. Detention Pond	4.40	100.00	0.00	0.00	0.00	2.20	2.92	3.73	5.25	9.68
O3	Temp. Detention Pond	1.22	100.00	0.00	0.00	0.00	2.20	2.92	3.73	5.25	2.68
O4	Perm. Detention Pond	15.93	100.00	0.00	0.00	0.00	2.20	2.92	3.73	5.25	35.05
TOTALS		30.52									67.14

NOTES:

1. Obtained from Section 22.2, Hydrology of the Development Process Manual, Volume 2, Design Criteria for the City of Albuquerque, January, 1993

* Table A-4

** Table A-9

**PROPOSED CONDITIONS FOR
CHACO RIDGE AT HIGH DESERT (TRACT 9B)
Jan-98**

BASIN ID	DISCHARGES TO	AREA (ACRES)	% LAND TREATMENT*				PEAK DISCHARGE - (CFS/ACRE)**				Q(100-YR) DEVELOPED (CFS)
			A	B	C	D	A	B	C	D	
A	Imperata Street	1.74	41.14	9.52	0.00	49.34	2.20	2.92	3.73	5.25	6.57
B	Proposed Storm Drain	5.53	0.00	22.36	33.55	44.09	2.20	2.92	3.73	5.25	23.33
C	Proposed Storm Drain	3.90	0.00	16.31	24.46	59.23	2.20	2.92	3.73	5.25	17.54
D	Proposed Storm Drain	5.13	0.00	17.42	26.13	56.45	2.20	2.92	3.73	5.25	22.81
E	Exist. Sunset Ridge	0.09	0.00	0.00	100.00	0.00	2.20	2.92	3.73	5.25	0.34
F	Exist. Sunset Ridge	0.17	0.00	0.00	100.00	0.00	2.20	2.92	3.73	5.25	0.63
G	Exist. Sunset Ridge	1.27	0.00	16.65	24.97	58.38	2.20	2.92	3.73	5.25	5.69
H	Exist. Sunset Ridge	0.17	0.00	100.00	0.00	0.00	2.20	2.92	3.73	5.25	0.50
I	Proposed Storm Drain	3.56	0.00	21.39	32.08	46.53	2.20	2.92	3.73	5.25	15.18
TOTALS		21.56									92.59

NOTES:

1. Obtained from Section 22.2, Hydrology of the Development Process Manual, Volume 2, Design Criteria for the City of Albuquerque, January, 1993

* Table A-4

** Table A-9

2. A water block will prevent flows from Basin A to discharge through the entrance of our site

SUMMARY OF THE ROADWAY CAPACITY ANALYSIS FOR CHACO RIDGE AT HIGH DESERT (TRACT 9B)

PINO CANYON PLACE - Drainage Basin B

Max Q (cfs)=0.93

Roadway Grade (%)	Roadway Cross-slope (%)	Percent of Basin (%)	Q(100 YR) in roadway (cfs)	Curb Type	Depth of water in roadway (ft)	Velocity of storm water in roadway (ft/s)	$V^2/2 \cdot G$	EGL	ROW Elevation (ft)	Comments
4.00	3.00	3.97	0.93	STD	0.19	3.09	0.15	0.34	1.00	OK

Note:

By observation, the product of the depth times the velocity is below 6.5 for the 100-year design storm, therefore for the 10-year design storm the product of the depth times the velocity will be well below the recommended value of 6.5.

ANASTAZIE DRIVE - Drainage Basins B & D

Max Q (cfs)=

Roadway Grade (%)	Roadway Cross-slope (%)	Percent of Basin (%)	Q(100 YR) in roadway (cfs)	Curb Type	Depth of water in roadway (ft)	Velocity of storm water in roadway (ft/s)	$V^2/2 \cdot G$	EGL	ROW Elevation (ft)	Comments
5.71	2.00	25.74 (D)	5.87	STD/ROLL	0.30	4.83	0.36	0.66	1.00	OK
2.80	2.00	11.09 (D)	2.53	STD/ROLL	0.26	3.00	0.14	0.40	1.00	OK
3.00	2.00	8.52 (B)	1.99	STD/ROLL	0.24	2.91	0.13	0.37	1.00	OK
2.30	2.00	26.29 (B)	6.13	STD/ROLL	0.35	3.49	0.19	0.54	1.00	OK
6.30	2.00	36.52 (B)	8.52	STD/ROLL	0.33	5.42	0.46	0.79	1.00	OK

Note:

By observation, the product of the depth times the velocity is below 6.5 for the 100-year design storm, therefore for the 10-year design storm the product of the depth times the velocity will be well below the recommended value of 6.5.

MORNING MIST AVENUE - Drainage Basin D

Max Q (cfs)=

Roadway Grade (%)	Roadway Cross-slope (%)	Percent of Basin (%)	Q(100 YR) in roadway (cfs)	Curb Type	Depth of water in roadway (ft)	Velocity of storm water in roadway (ft/s)	$V^2/2 \cdot G$	EGL	ROW Elevation (ft)	Comments
5.00	2.00 (crown)	38.88	8.87	ROLL	0.23	4.15	0.27	0.50	0.67	OK
3.83	2.00 (crown)	52.55	11.99	ROLL	0.27	4.09	0.26	0.53	0.67	OK
5.30	2.00 (crown)	64.53	14.72	ROLL	0.27	4.86	0.37	0.64	0.67	OK
4.80	2.00 (crown)	80.20	18.29	ROLL	0.30	4.90	0.37	0.67	0.67	OK
4.00	2.00 (crown)	100.00	22.81	STD	0.37	5.04	0.39	0.76	1.00	OK

Note:

By observation, the product of the depth times the velocity is below 6.5 for the 100-year design storm, therefore for the 10-year design storm the product of the depth times the velocity will be well below the recommended value of 6.5.

DAWN VIEW DRIVE - Drainage Basin B

Max Q (cfs)=

Roadway Grade (%)	Roadway Cross-slope (%)	Percent of Basin (%)	Q(100 YR) in roadway (cfs)	Curb Type	Depth of water in roadway (ft)	Velocity of storm water in roadway (ft/s)	$V^2/2 \cdot G$	EGL	ROW Elevation (ft)	Comments
2.62	2.00	75.50	4.56	STD	0.31	3.40	0.18	0.49	1.00	OK
1.00	2.00	100.00	20.34	STD	0.58	3.32	0.17	0.75	1.00	OK

Note:

By observation, the product of the depth times the velocity is below 6.5 for the 100-year design storm, therefore for the 10-year design storm the product of the depth times the velocity will be well below the recommended value of 6.5.

The calculations of the flow in the roadway take into account the residual flow of the upstream inlets and Basin C draining onto Dawn View Drive.

DESERT ROSE AVENUE - Drainage Basin B

Max Q (cfs)=

Roadway Grade (%)	Roadway Cross-slope (%)	Percent of Basin (%)	Q(100 YR) in roadway (cfs)	Curb Type	Depth of water in roadway (ft)	Velocity of storm water in roadway (ft/s)	V ² /2*G	EGL	ROW Elevation (ft)	Comments
3.93	2.00 (crown)	46.80	10.92	STD/ROLL	0.31	3.98	0.25	0.56	0.67	OK
3.74	2.00 (crown)	57.15	13.33	STD/ROLL	0.34	4.12	0.26	0.60	0.67	OK
3.74	2.00 (crown)	61.07	14.25	STD	0.33	4.20	0.27	0.60	1.00	OK

Note:

By observation, the product of the depth times the velocity is below 6.5 for the 100-year design storm, therefore for the 10-year design storm the product of the depth times the velocity will be well below the recommended value of 6.5.

MIDNIGHT STAR LANE - Drainage Basin C

Max Q (cfs)=

Roadway Grade (%)	Roadway Cross-slope (%)	Percent of Basin (%)	Q(100 YR) in roadway (cfs)	Curb Type	Depth of water in roadway (ft)	Velocity of storm water in roadway (ft/s)	V ² /2*G	EGL	ROW Elevation (ft)	Comments
1.44	2.00 (crown)	57.39	10.07	ROLL	0.30	2.70	0.11	0.41	0.67	OK
5.00	2.00 (crown)	50.72	8.90	ROLL	0.23	4.15	0.27	0.50	0.67	OK
2.00	2.00	8.89	1.56	STD/ROLL	0.24	2.40	0.09	0.33	0.67	OK

Note:

By observation, the product of the depth times the velocity is below 6.5 for the 100-year design storm, therefore for the 10-year design storm the product of the depth times the velocity will be well below the recommended value of 6.5.

CHACO CANYON LANE - Drainage Basin C

Max Q (cfs)=

Roadway Grade (%)	Roadway Cross-slope (%)	Percent of Basin (%)	Q(100 YR) in roadway (cfs)	Curb Type	Depth of water in roadway (ft)	Velocity of storm water in roadway (ft/s)	V ² /2*G	EGL	ROW Elevation (ft)	Comments
4.00	2.00 (crown)	42.61	7.47	ROLL	0.23	3.68	0.21	0.44	0.67	OK
5.50	2.00 (crown)	35.25	6.18	ROLL	0.20	3.96	0.24	0.44	0.67	OK
5.00	2.00 (crown)	27.40	4.81	ROLL	0.19	3.57	0.20	0.39	0.67	OK
4.00	2.00	10.66	1.87	STD/ROLL	0.23	3.21	0.16	0.39	0.67	OK

Note:

By observation, the product of the depth times the velocity is below 6.5 for the 100-year design storm, therefore for the 10-year design storm the product of the depth times the velocity will be well below the recommended value of 6.5.

KAAS TRAIL COURT - Drainage Basin G

Max Q (cfs)=

Roadway Grade (%)	Roadway Cross-slope (%)	Percent of Basin (%)	Q(100 YR) in roadway (cfs)	Curb Type	Depth of water in roadway (ft)	Velocity of storm water in roadway (ft/s)	V ² /2*G	EGL	ROW Elevation (ft)	Comments
3.50	2.00	44.80	2.55	ROLL	0.22	3.52	0.19	0.41	0.67	OK
0.75	3.00	100.00	5.69	STD/ROLL	0.44	2.45	0.09	0.53	1.00	OK

Note:

By observation, the product of the depth times the velocity is below 6.5 for the 100-year design storm, therefore for the 10-year design storm the product of the depth times the velocity will be well below the recommended value of 6.5.

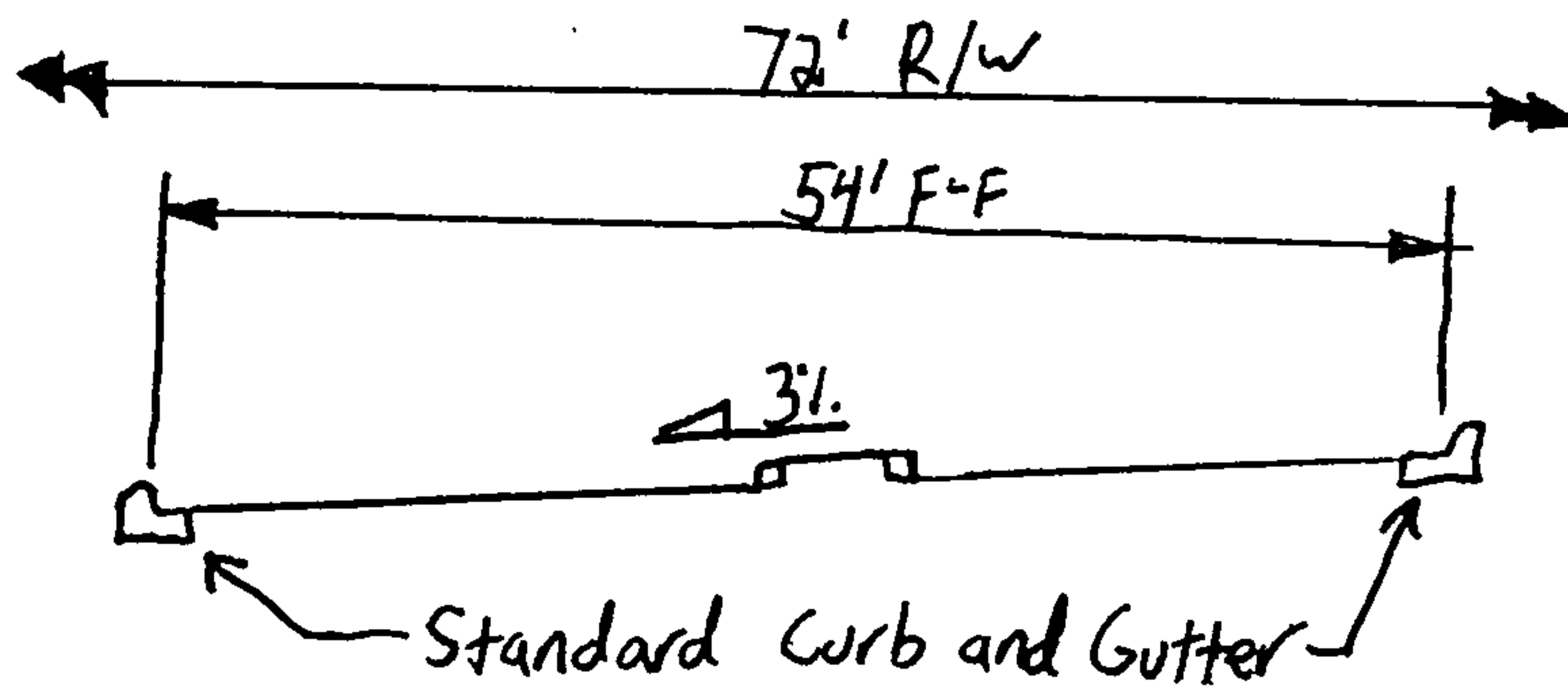
SUNRISE TRAIL PLACE - Drainage Basin I

Max Q (cfs)=

Roadway Grade (%)	Roadway Cross-slope (%)	Percent of Basin (%)	Q(100 YR) in roadway (cfs)	Curb Type	Depth of water in roadway (ft)	Velocity of storm water in roadway (ft/s)	V ² /2*G	EGL	ROW Elevation (ft)	Comments
4.00	2.00 (crown)	89.64	13.61	ROLL	0.28	4.28	0.28	0.56	0.67	OK
4.00	2.00 (crown)	100.00	15.18	STD	0.34	4.36	0.30	0.64	1.00	OK

Note:

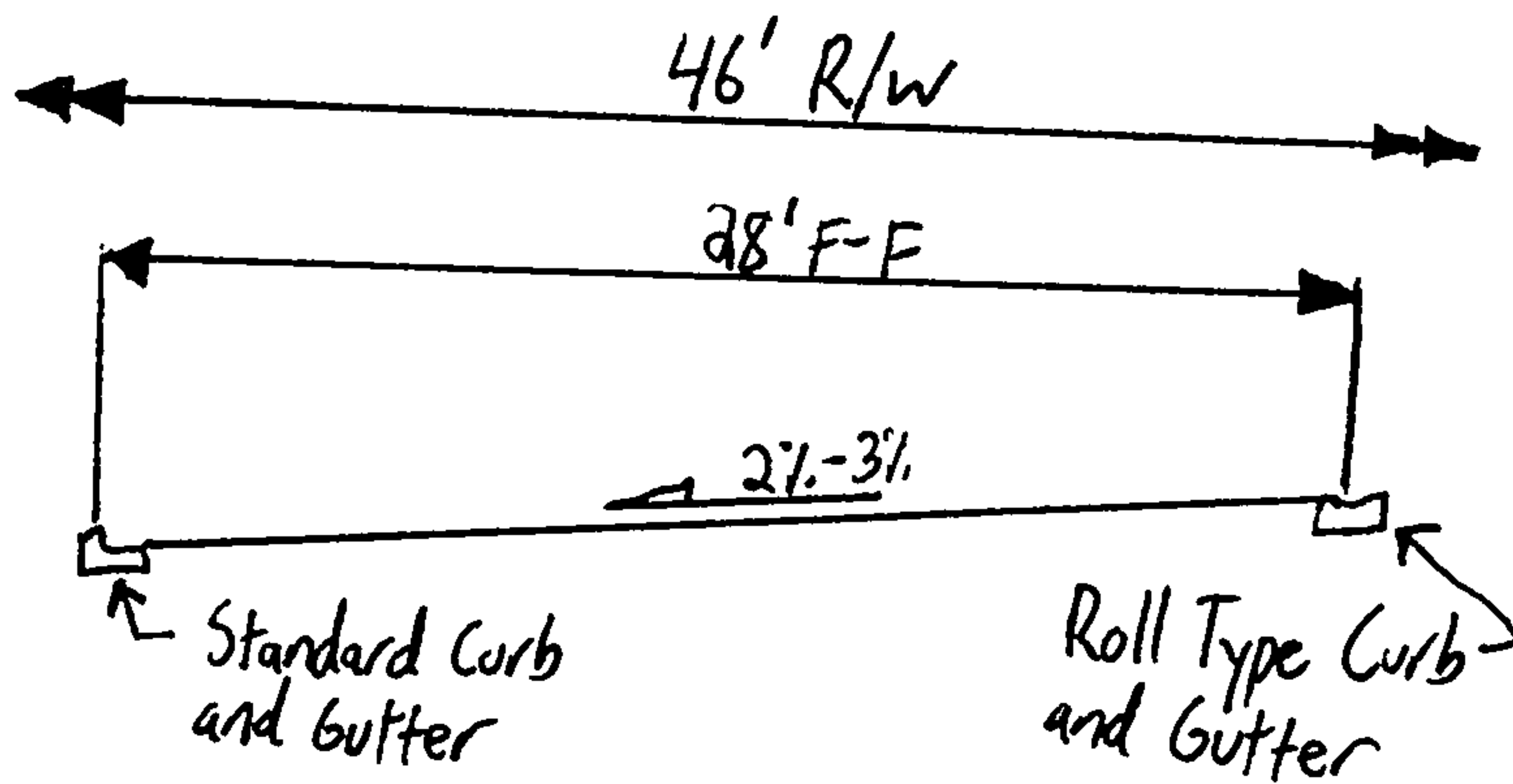
By observation, the product of the depth times the velocity is below 6.5 for the 100-year design storm, therefore for the 10-year design storm the product of the depth times the velocity will be well below the recommended value of 6.5.



SECTION

NTS

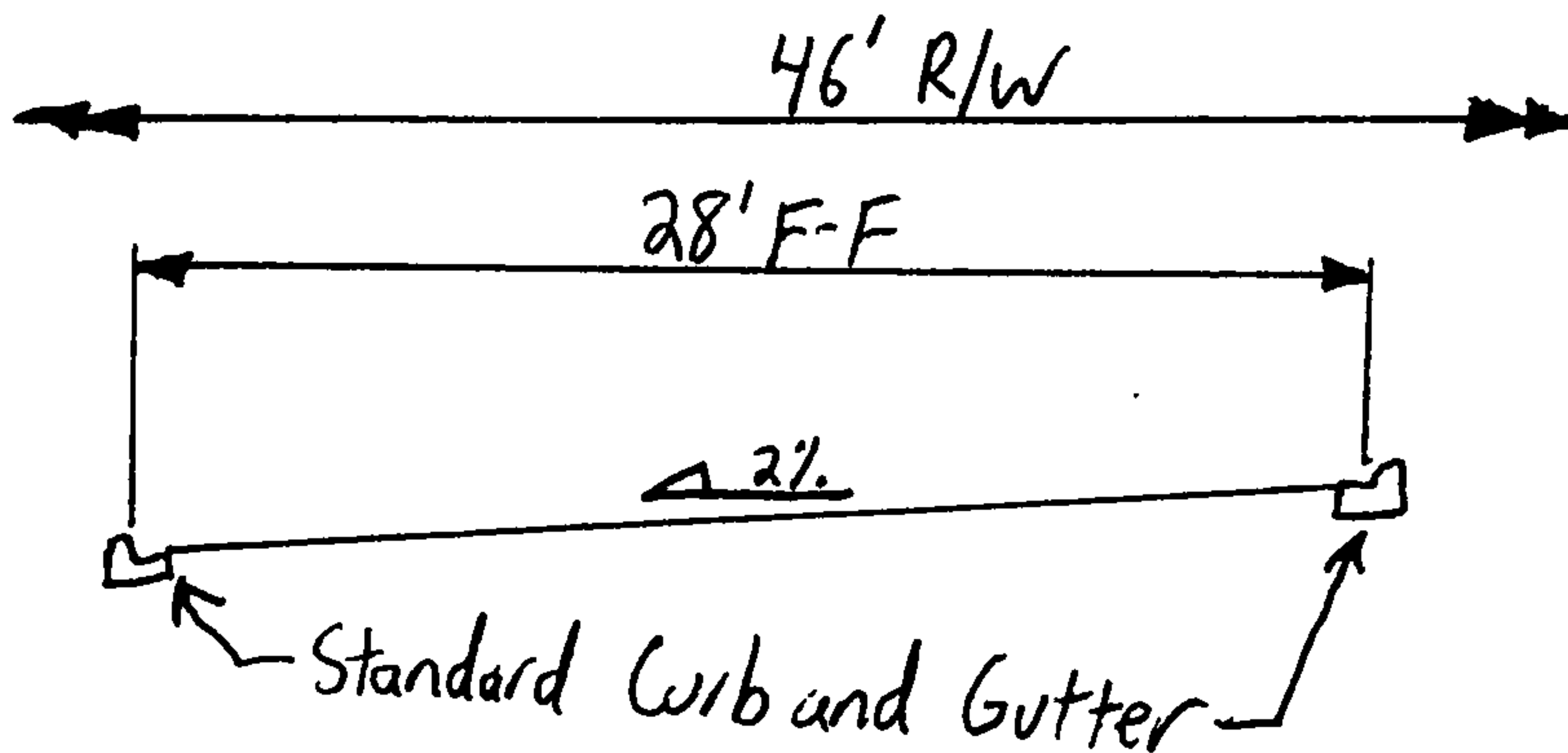
Pino Canyon Place



SECTION

NTS

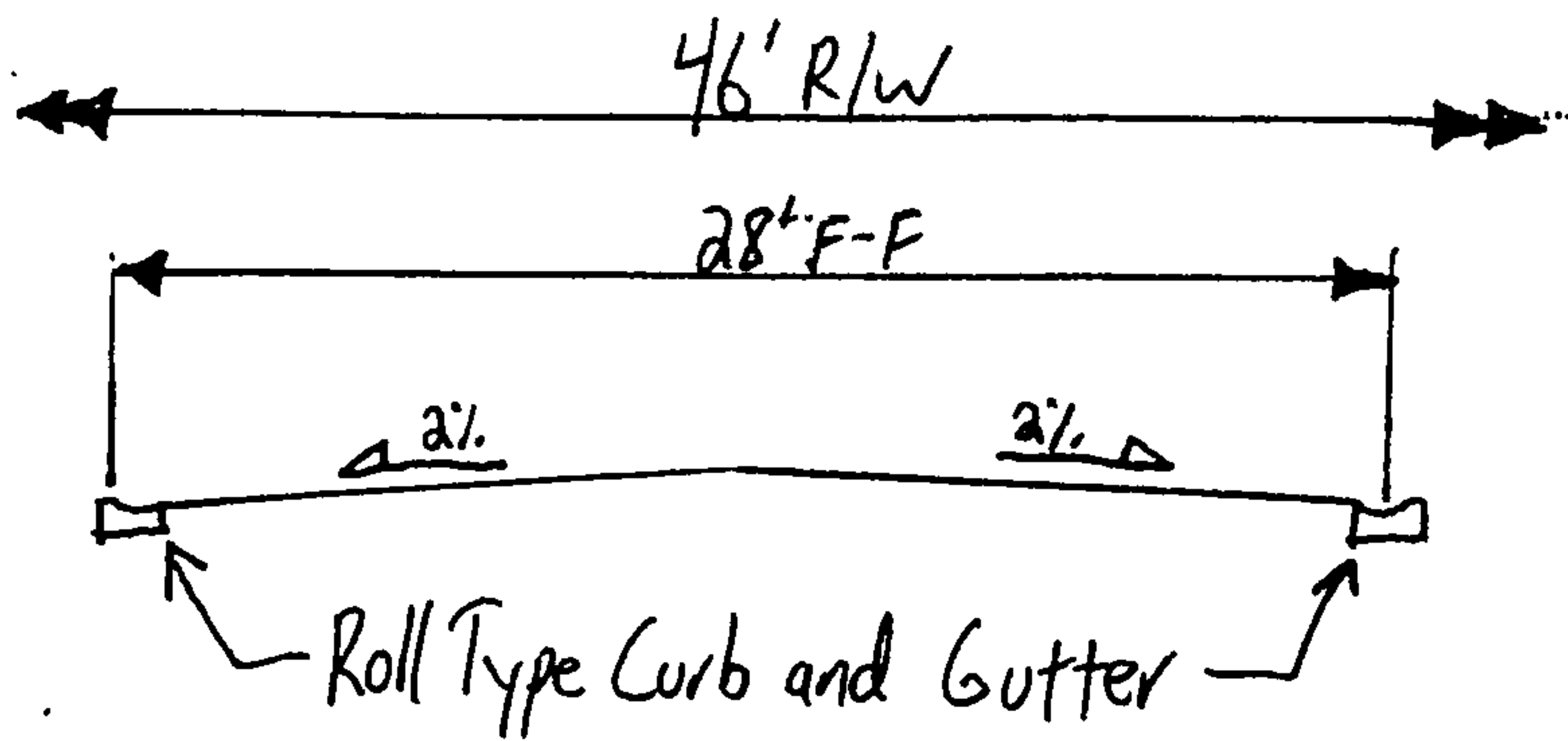
Anastazi Drive
Kaas Trail Court



SECTION

NTS

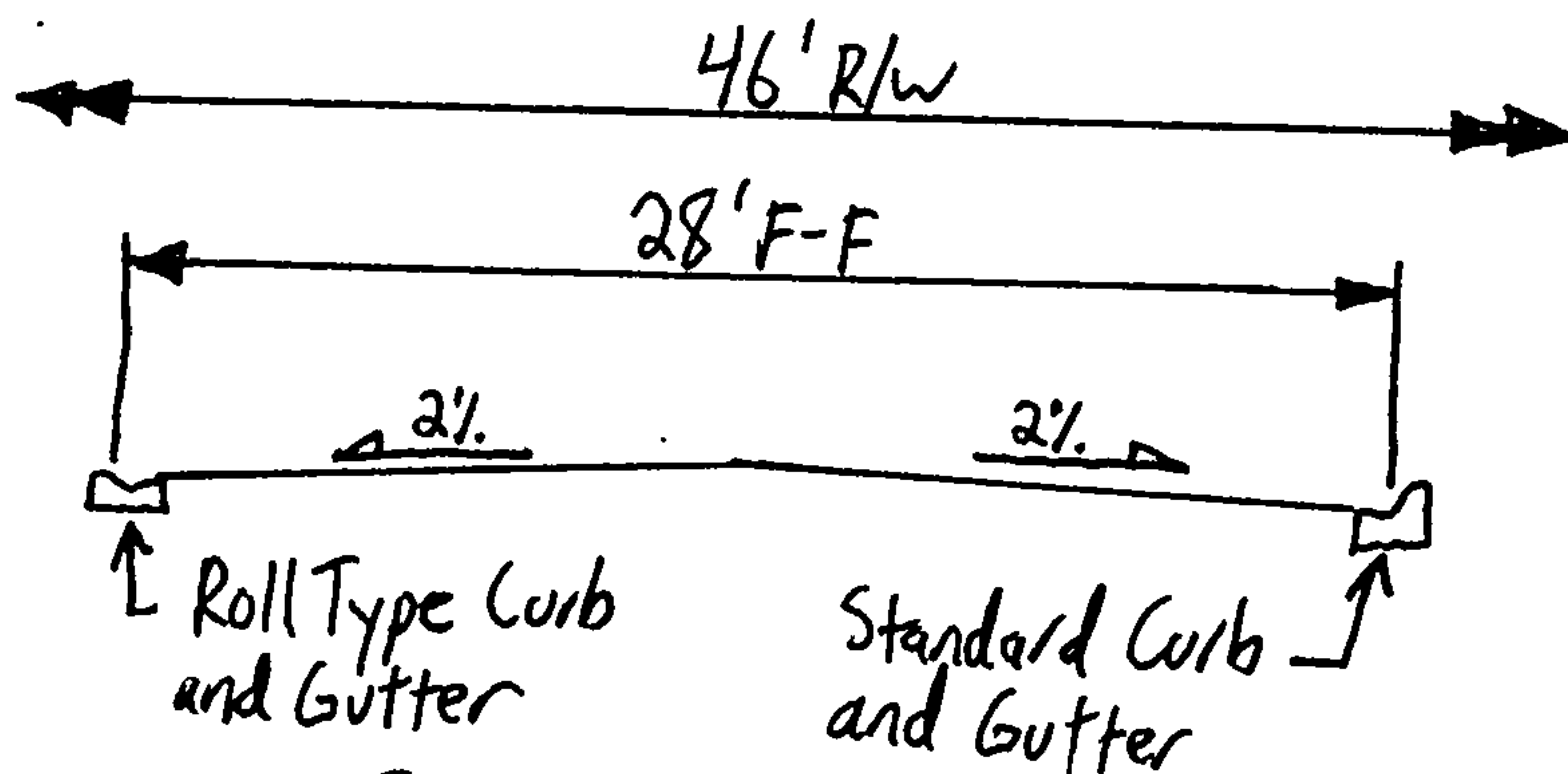
Dawn View Drive



SECTION

NTS

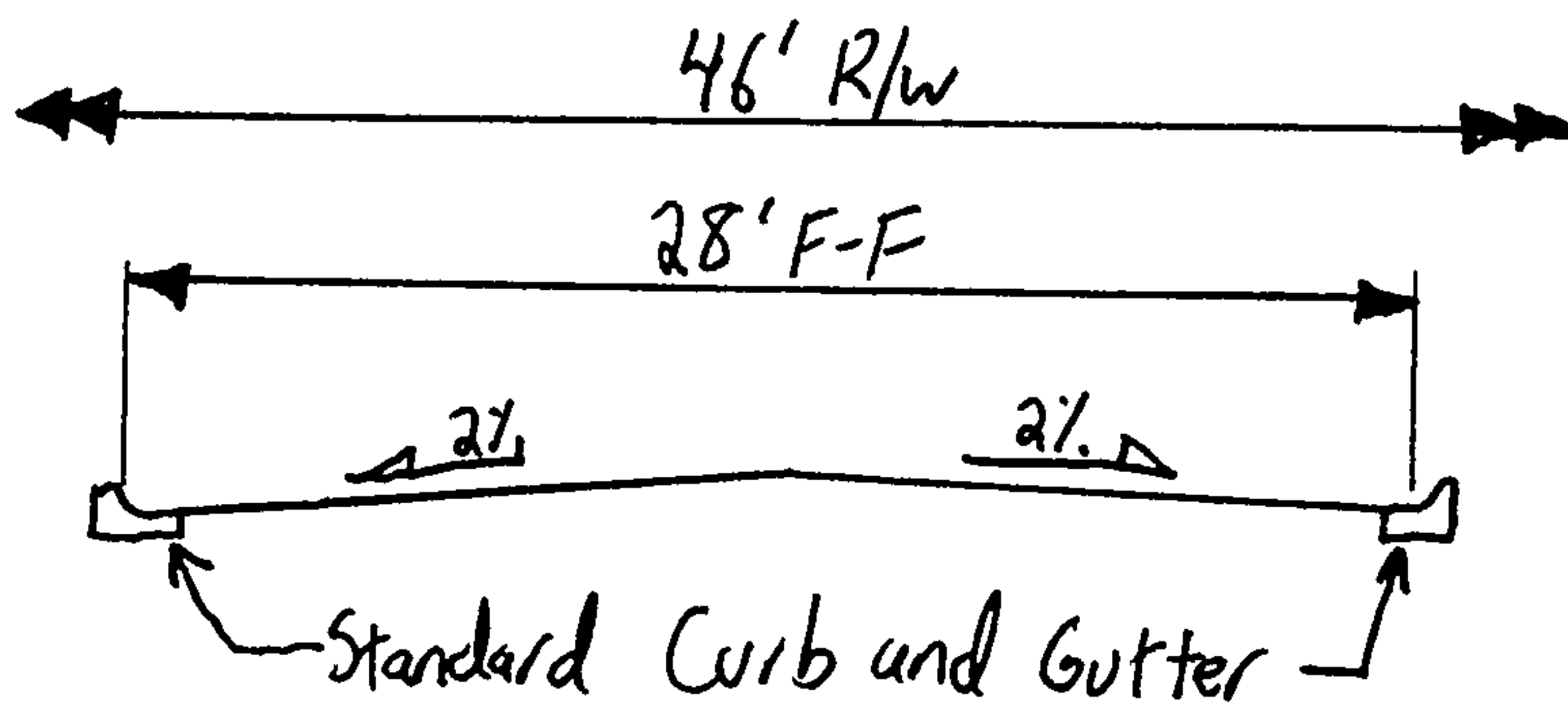
Morning Mist Avenue
 Sunrise Trail Place
 Midnight Star Lane
 Chaco Canyon Lane



SECTION

NTS

Desert Rose Avenue



SECTION

NTS

Sunrise Trail Place
 Desert Rose Avenue
 Morning Mist Avenue

**DEVELOPED CONDITIONS FOR INLETS IN
CHACO RIDGE AT HIGH DESERT (TRACT 9B)**

INLET	CONDITION	TYPE	CONTRIBUTING BASIN AND RESIDUAL INLET	FLOW TO INLET 100-YR (CFS)	STREET DEPTH (FT)	GRATE CAP. (CFS)	RESIDUAL FLOW (CFS)	TOP OF GRATE	INVERT
1	ON 4.00% GRADE	'A' DOUBLE GRATE	BASIN D	9.80	0.30	4.30	5.50	6117.78	6113.78
2	ON 4.00% GRADE	'A' DOUBLE GRATE	BASIN D	10.06	0.30	4.30	5.76	6119.38	6113.38
3	INLET IN SUMP CONDITION; SEE NEXT PAGE FOR ANALYSIS							6114.70	6110.17
4	ON 1.00% GRADE	'A' DOUBLE GRATE	BASINS B, C; INLET 5	17.72	0.55	8.80	8.92	6115.26	6110.02
4A	ON 1.00% GRADE	'C' SINGLE GRATE	FOR NUISANCE FLOWS ONLY					6115.80	6109.80
5	ON 1.00% GRADE	'A' DOUBLE GRATE	BASINS B, C; INLETS 7, 8	16.70	0.54	8.60	8.10	6116.68	6110.68
6	ON 3.74% GRADE	'A' DOUBLE GRATE	BASIN B	7.93	0.29	4.20	3.73	6124.66	6119.16
7	ON 2.62% GRADE	'C' DOUBLE GRATE	INLET 6	3.73	0.30	3.70	0.03	6122.57	6116.92
8	ON 2.62% GRADE	'A' DOUBLE GRATE	BASIN B	6.06	0.34	4.90	1.16	6122.46	6116.46
9	ON 4.00% GRADE	'A' SINGLE GRATE	BASIN I	6.59	0.26	2.80	3.79	6100.78	6094.78
10	ON 4.00% GRADE	'C' DOUBLE GRATE	BASIN I; INLET 9	4.62	0.24	2.55	2.07	6097.42	6091.42
11	ON 4.00% GRADE	'A' DOUBLE GRATE	BASIN I	7.74	0.28	3.60	4.14	6097.42	6090.42

CHACO RIDGE AT HIGH DESERT (TRACT 9B)
INLET 3

ANALYSIS OF AN INLET IN A SUMP CONDITION

INLET TYPE: Double Gate Type "D"

WEIR: $Q=C*L*H^{1.5}$

Grate opening

C=3.0

L(double grate)=[2(2.96')+2(1.54')]=9.00'

$Q=3.0(9.00)H^{1.5}=27.00*H^{1.5}$

ORIFICE: $Q=C*A*(2*G*H)^{0.5}$

Grate opening

C=0.6

A(double grate)=8.19 sf

$Q=4.914*(64.4*H)^{0.5}$

	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR DOUBLE GRATE	Q (CFS) ORIFICE DOUBLE GRATE	TOTAL Q (CFS)	COMMENTS:
~FL @ INLET	0.00	0.00	0.00	0.00	0.00	Flow at double "D"
	0.10	0.10	0.85	12.47	0.85	Weir controls on grate analysis
	0.20	0.20	2.41	17.64	2.41	
	0.30	0.30	4.44	21.60	4.44	
	0.40	0.40	6.83	24.94	6.83	
	0.50	0.50	9.55	27.88	9.55	
	0.60	0.60	12.55	30.55	12.55	
TOP OF CURB	0.70	0.70	15.81	32.99	15.81	Q ₁₀₀ =24.88 cfs from Basins B & D; Inlets 1, 2 & 4
	0.80	0.80	19.32	35.27	19.32	
	0.90	0.90	23.05	37.41	23.05	
ROW LIMIT	1.00	1.00	27.00	39.43	27.00	Q _{2X100} =49.76 cfs from Basins B & D; Inlets 1, 2 & 4

NOTE:

The total runoff intercepted by the inlet at the low point in Chaco Ridge at High Desert:

Q_{total} = the lesser of the weir or orifice amount taken by the double grate.

THE 100 YR STORM EVENT = 24.88 CFS at the sump condition

THE 2 x 100 YR STORM EVENT = 49.76 CFS at the sump condition

A residual flow of 11.26 cfs is assumed from Inlets 1 & 2 on Street B in the calculations.

A residual flow of 8.92 cfs is assumed from Inlet 4 on Street C in the calculations.

CHACO RIDGE AT HIGH DESERT - PINO CANYON PLACE

MANNING'S N = .0170

SLOPE = .0400

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	6	32.00	98.53	11	61.00	97.69
2	9.00	99.67	7	32.00	98.78	12	63.00	97.56
3	9.00	99.00	8	40.00	98.54	13	63.00	98.23
4	11.00	99.13	9	40.00	98.29	14	72.00	98.56
5	31.00	98.53	10	41.00	98.29			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
97.61	0.05	0.0	0.0	0.8	1.4	0.77
97.66	0.10	0.1	0.2	1.6	2.3	1.54
97.71	0.15	0.2	0.5	2.8	2.8	2.67
97.76	0.20	0.4	1.1	4.5	3.2	4.33
97.81	0.25	0.6	2.3	6.3	3.7	6.00
97.86	0.30	1.0	4.0	8.0	4.2	7.67
97.91	0.35	1.4	6.6	9.7	4.8	9.33
97.96	0.40	1.9	9.9	11.4	5.3	11.00
98.01	0.45	2.5	14.2	13.1	5.8	12.67
98.06	0.50	3.2	19.6	14.8	6.2	14.33
98.11	0.55	3.9	26.1	16.6	6.7	16.00
98.16	0.60	4.8	33.8	18.3	7.1	17.67
98.21	0.65	5.7	42.9	20.0	7.6	19.33
98.26	0.70	6.7	52.1	22.5	7.8	21.82
98.31	0.75	7.9	63.6	25.0	8.1	25.18
98.36	0.80	9.2	77.2	27.4	8.4	26.55
98.41	0.85	10.5	93.9	28.9	8.9	27.91
98.46	0.90	12.0	112.4	30.4	9.4	29.27
98.51	0.95	13.5	132.6	31.8	9.8	30.64
98.56	1.00	15.1	147.6	36.0	9.8	34.67

$Q_{100} = 0.93$

CHACO RIDGE AT HIGH DESERT - ANASTAZI DRIVE 1

MANNING'S N = .0170

SLOPE = .0571

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	37.00	99.45
2	9.00	99.67	5	35.00	98.91	8	46.00	99.78
3	9.97	99.33	6	37.00	98.78			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
98.83	0.05	0.0	0.0	0.8	1.7	0.77
98.88	0.10	0.1	0.2	1.6	2.7	1.54
98.93	0.15	0.2	0.6	3.2	3.1	3.00
98.98	0.20	0.4	1.4	5.7	3.5	5.50
99.03	0.25	0.7	3.0	8.3	4.1	8.00
99.08	0.30	1.2	5.7	10.8	4.8	10.50
99.13	0.35	1.8	9.7	13.4	5.4	13.00
99.18	0.40	2.5	15.1	15.9	6.1	15.50
99.23	0.45	3.3	22.2	18.5	6.7	18.00
99.28	0.50	4.3	31.1	21.0	7.2	20.50
99.33	0.55	5.4	42.0	23.6	7.8	23.00
99.38	0.60	6.6	54.0	27.1	8.2	26.50
99.43	0.65	8.0	72.1	28.0	9.0	27.32
99.48	0.70	9.4	91.9	29.0	9.8	28.28
99.53	0.75	10.8	112.9	30.6	10.4	29.78
99.58	0.80	12.3	136.1	32.1	11.0	31.29
99.63	0.85	13.9	161.6	33.7	11.6	32.80
99.68	0.90	15.6	188.6	35.5	12.1	34.55
99.73	0.95	17.4	215.0	38.3	12.4	37.27
99.78	1.00	19.3	244.6	41.1	12.6	40.00

$Q_{no} \approx 5.87$

CHACO RIDGE AT HIGH DESERT - ANASTAZI DRIVE 2

MANNING'S N = .0170

SLOPE = .0280

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	37.00	99.45
2	9.00	99.67	5	35.00	98.91	8	46.00	99.78
3	9.97	99.33	6	37.00	98.78			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
98.83	0.05	0.0	0.0	0.8	1.2	0.77
98.88	0.10	0.1	0.1	1.6	1.9	1.54
98.93	0.15	0.2	0.4	3.2	2.2	3.00
98.98	0.20	0.4	1.0	5.7	2.5	5.50
99.03	0.25	0.7	2.1	8.3	2.9	8.00
99.08	0.30	1.2	4.0	10.8	3.4	10.50
99.13	0.35	1.8	6.8	13.4	3.8	13.00
99.18	0.40	2.5	10.6	15.9	4.3	15.50
99.23	0.45	3.3	15.6	18.5	4.7	18.00
99.28	0.50	4.3	21.8	21.0	5.1	20.50
99.33	0.55	5.4	29.4	23.6	5.5	23.00
99.38	0.60	6.6	37.8	27.1	5.7	26.50
99.43	0.65	8.0	50.5	28.0	6.3	27.32
99.48	0.70	9.4	64.4	29.0	6.9	28.28
99.53	0.75	10.8	79.0	30.6	7.3	29.78
99.58	0.80	12.3	95.3	32.1	7.7	31.29
99.63	0.85	13.9	113.2	33.7	8.1	32.80
99.68	0.90	15.6	132.1	35.5	8.5	34.55
99.73	0.95	17.4	150.6	38.3	8.6	37.27
99.78	1.00	19.3	171.3	41.1	8.9	40.00

Q₁₀₀ = 2.53

CHACO RIDGE AT HIGH DESERT - ANASTAZI DRIVE 3

MANNING'S N = .0170

SLOPE = .0300

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	37.00	99.45
2	9.00	99.67	5	35.00	98.91	8	46.00	99.78
3	9.97	99.33	6	37.00	98.78			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
98.83	0.05	0.0	0.0	0.8	1.2	0.77
98.88	0.10	0.1	0.2	1.6	2.0	1.54
98.93	0.15	0.2	0.4	3.2	2.2	3.00
98.98	0.20	0.4	1.0	5.7	2.5	5.50
99.03	0.25	0.7	2.2	8.3	3.0	8.00
99.08	0.30	1.2	4.2	10.8	3.5	10.50
99.13	0.35	1.8	7.0	13.4	4.0	13.00
99.18	0.40	2.5	11.0	15.9	4.4	15.50
99.23	0.45	3.3	16.1	18.5	4.8	18.00
99.28	0.50	4.3	22.5	21.0	5.3	20.50
99.33	0.55	5.4	30.4	23.6	5.7	23.00
99.38	0.60	6.6	39.1	27.1	5.9	26.50
99.43	0.65	8.0	52.3	28.0	6.6	27.32
99.48	0.70	9.4	66.6	29.0	7.1	28.28
99.53	0.75	10.8	81.8	30.6	7.6	29.78
99.58	0.80	12.3	98.6	32.1	8.0	31.29
99.63	0.85	13.9	117.1	33.7	8.4	32.80
99.68	0.90	15.6	136.7	35.5	8.8	34.55
99.73	0.95	17.4	155.9	38.3	9.0	37.27
99.78	1.00	19.3	177.3	41.1	9.2	40.00

$Q_{100} = 1.99$

CHACO RIDGE AT HIGH DESERT - ANASTAZI DRIVE 4

MANNING'S N = .0170

SLOPE = .0230

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	37.00	99.45
2	9.00	99.67	5	35.00	98.91	8	46.00	99.78
3	9.97	99.33	6	37.00	98.78			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
98.83	0.05	0.0	0.0	0.8	1.1	0.77
98.88	0.10	0.1	0.1	1.6	1.7	1.54
98.93	0.15	0.2	0.4	3.2	2.0	3.00
98.98	0.20	0.4	0.9	5.7	2.2	5.50
99.03	0.25	0.7	1.9	8.3	2.6	8.00
99.08	0.30	1.2	3.6	10.8	3.0	10.50
99.13	0.35	1.8	6.2	13.4	3.5	13.00
99.18	0.40	2.5	9.6	15.9	3.9	15.50
99.23	0.45	3.3	14.1	18.5	4.2	18.00
99.28	0.50	4.3	19.7	21.0	4.6	20.50
99.33	0.55	5.4	26.6	23.6	5.0	23.00
99.38	0.60	6.6	34.3	27.1	5.2	26.50
99.43	0.65	8.0	45.8	28.0	5.7	27.32
99.48	0.70	9.4	58.3	29.0	6.2	28.28
99.53	0.75	10.8	71.6	30.6	6.6	29.78
99.58	0.80	12.3	86.4	32.1	7.0	31.29
99.63	0.85	13.9	102.6	33.7	7.4	32.80
99.68	0.90	15.6	119.7	35.5	7.7	34.55
99.73	0.95	17.4	136.5	38.3	7.8	37.27
99.78	1.00	19.3	155.2	41.1	8.0	40.00

$Q_{100} = 6.13$

CHACO RIDGE AT HIGH DESERT - ANASTAZI DRIVE 5

MANNING'S N = .0170

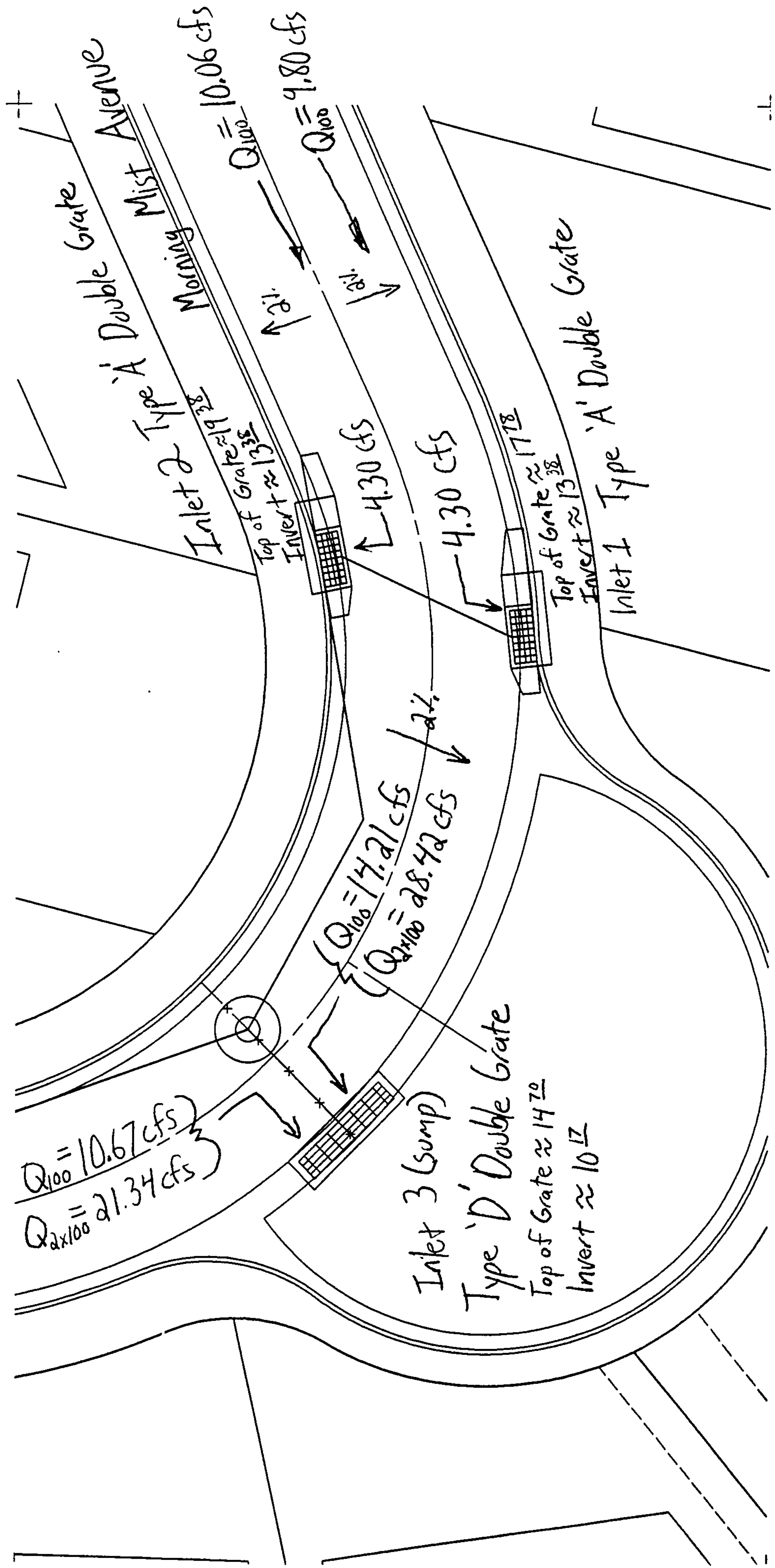
SLOPE = .0630

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	37.00	99.45
2	9.00	99.67	5	35.00	98.91	8	46.00	99.78
3	9.97	99.33	6	37.00	98.78			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
98.83	0.05	0.0	0.0	0.8	1.8	0.77
98.88	0.10	0.1	0.2	1.6	2.9	1.54
98.93	0.15	0.2	0.6	3.2	3.3	3.00
98.98	0.20	0.4	1.4	5.7	3.7	5.50
99.03	0.25	0.7	3.2	8.3	4.4	8.00
99.08	0.30	1.2	6.0	10.8	5.0	10.50
99.13	0.35	1.8	10.2	13.4	5.7	13.00
99.18	0.40	2.5	15.9	15.9	6.4	15.50
99.23	0.45	3.3	23.3	18.5	7.0	18.00
99.28	0.50	4.3	32.7	21.0	7.6	20.50
99.33	0.55	5.4	44.1	23.6	8.2	23.00
99.38	0.60	6.6	56.7	27.1	8.6	26.50
99.43	0.65	8.0	75.8	28.0	9.5	27.32
99.48	0.70	9.4	96.6	29.0	10.3	28.28
99.53	0.75	10.8	118.6	30.6	11.0	29.78
99.58	0.80	12.3	142.9	32.1	11.6	31.29
99.63	0.85	13.9	169.7	33.7	12.2	32.80
99.68	0.90	15.6	198.1	35.5	12.7	34.55
99.73	0.95	17.4	225.9	38.3	13.0	37.27
99.78	1.00	19.3	256.9	41.1	13.3	40.00

$Q_{100} = 8.52$

North

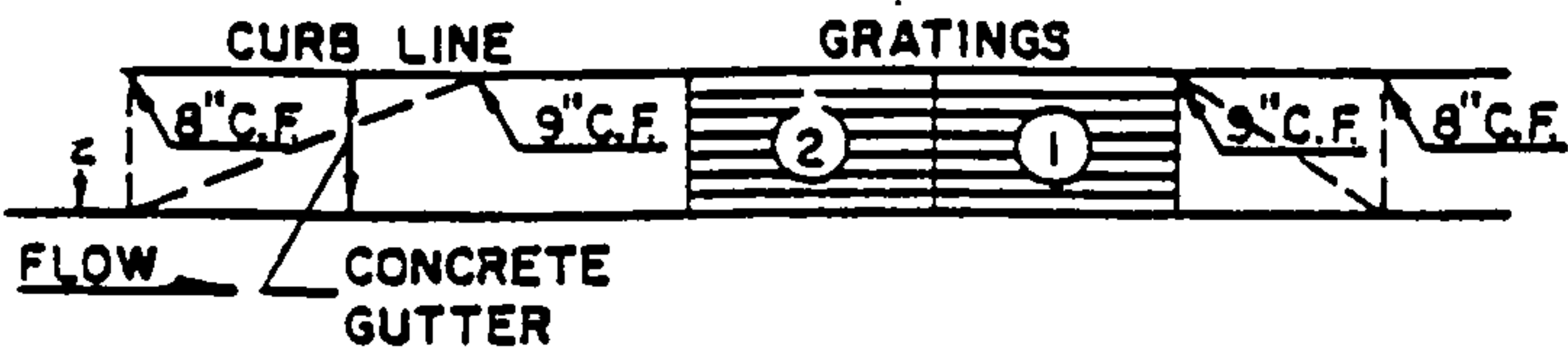


Morning Mist Avenue Inlets 1 & 2

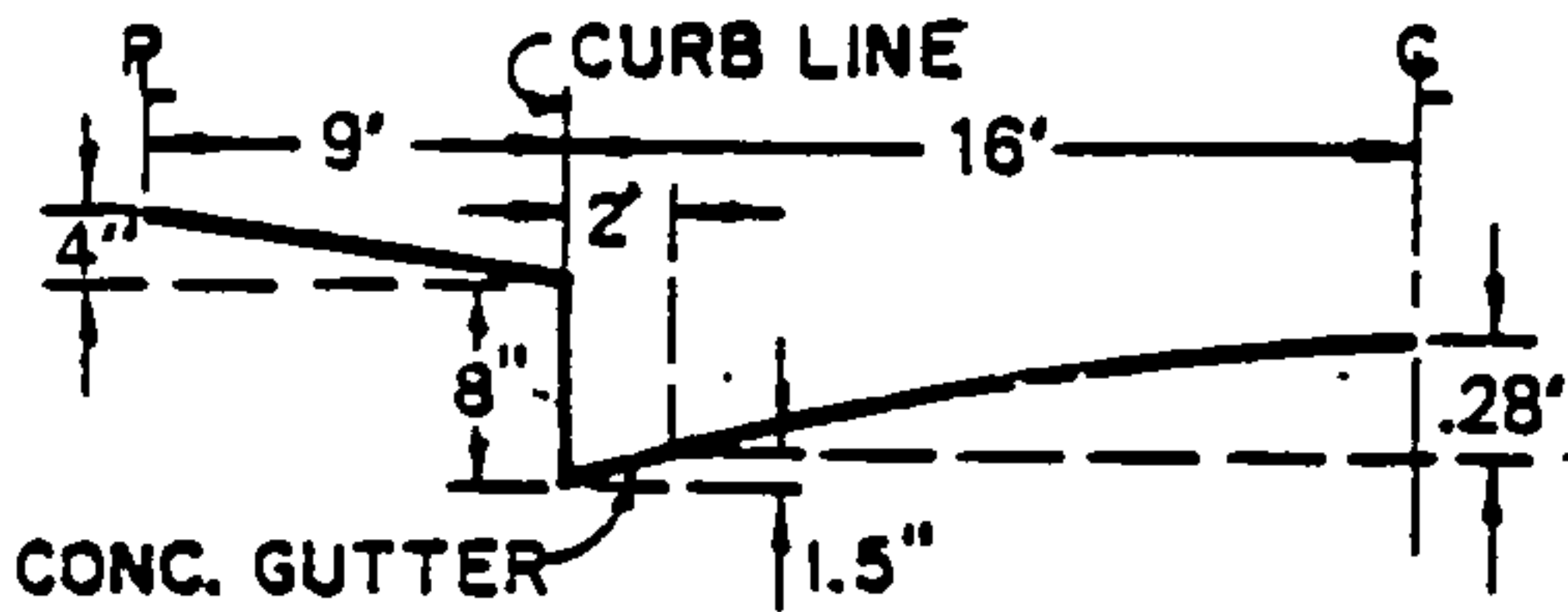
22.3

GRATING CAPACITIES FOR TYPE DOUBLE

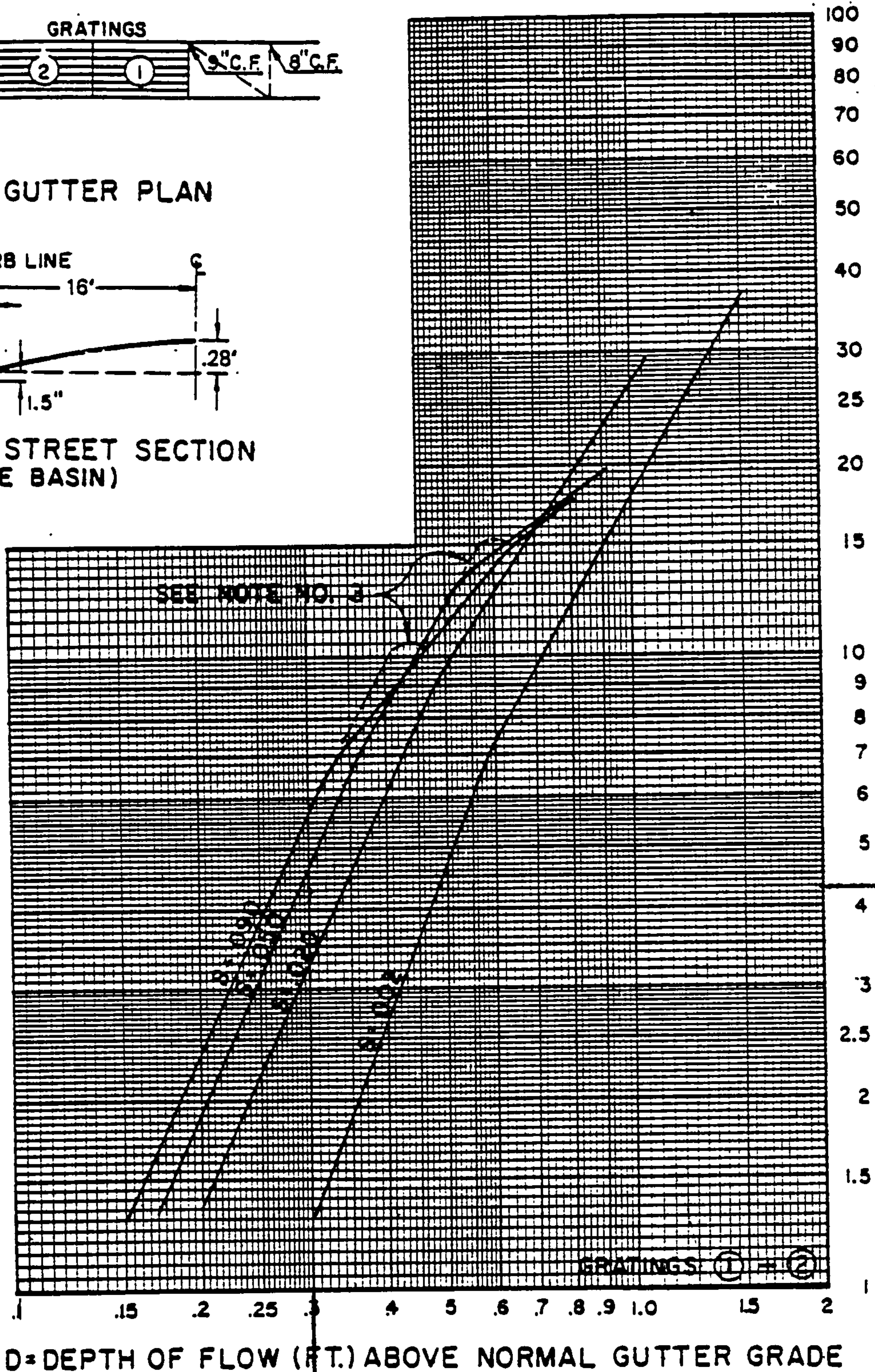
"C," AND "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)



Q (C.F.S.) IN GRATINGS

4.30 cfs

0.30 ft

Roadway Grade: 4.0%

Inlet 1: $Q_{100} = 9.80$ cfs

Inlet 2: $Q_{100} = 10.06$ cfs

REV. 3-83

CHACO RIDGE AT HIGH DESERT - MORNING MIST AVENUE 1

MANNING'S N = .0170

SLOPE = .0500

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	36.03	99.33
2	9.00	99.67	5	23.00	99.63	8	37.00	99.67
3	9.97	99.33	6	35.00	99.39	9	46.00	100.00

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
99.38	0.05	0.1	0.1	2.0	1.7	2.00
99.43	0.10	0.3	0.6	6.7	2.2	6.63
99.48	0.15	0.7	2.1	12.0	3.0	11.92
99.53	0.20	1.4	5.4	17.3	3.7	17.20
99.58	0.25	2.4	10.8	22.6	4.4	22.49
99.63	0.30	3.7	18.8	27.9	5.1	27.77
99.68	0.35	5.1	31.4	28.7	6.2	28.55
99.73	0.40	6.6	45.5	31.4	6.9	31.27
99.78	0.45	8.2	62.2	34.1	7.6	34.00
99.83	0.50	10.0	81.7	36.9	8.2	36.73
99.88	0.55	11.9	104.2	39.6	8.8	39.45
99.93	0.60	13.9	129.8	42.3	9.3	42.18
99.98	0.65	16.1	158.6	45.0	9.8	44.91
100.00	0.67	17.0	171.1	46.1	10.1	46.00

$Q_{100} = 8.87$

CHACO RIDGE AT HIGH DESERT - MORNING MIST AVENUE 2

MANNING'S N = .0170

SLOPE = .0383

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	36.03	99.33
2	9.00	99.67	5	23.00	99.63	8	37.00	99.67
3	9.97	99.33	6	35.00	99.39	9	46.00	100.00

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
99.38	0.05	0.1	0.1	2.0	1.5	2.00
99.43	0.10	0.3	0.5	6.7	1.9	6.63
99.48	0.15	0.7	1.9	12.0	2.6	11.92
99.53	0.20	1.4	4.7	17.3	3.3	17.20
99.58	0.25	2.4	9.4	22.6	3.9	22.49
99.63	0.30	3.7	16.4	27.9	4.4	27.77
99.68	0.35	5.1	27.5	28.7	5.4	28.55
99.73	0.40	6.6	39.8	31.4	6.0	31.27
99.78	0.45	8.2	54.4	34.1	6.6	34.00
99.83	0.50	10.0	71.5	36.9	7.2	36.73
99.88	0.55	11.9	91.2	39.6	7.7	39.45
99.93	0.60	13.9	113.6	42.3	8.2	42.18
99.98	0.65	16.1	138.8	45.0	8.6	44.91
100.00	0.67	17.0	149.7	46.1	8.8	46.00

Q₁₀₀ = 11.99

CHACO RIDGE AT HIGH DESERT - MORNING MIST AVENUE 3

MANNING'S N = .0170

SLOPE = .0530

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	36.03	99.33
2	9.00	99.67	5	23.00	99.63	8	37.00	99.67
3	9.97	99.33	6	35.00	99.39	9	46.00	100.00

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
99.38	0.05	0.1	0.1	2.0	1.7	2.00
99.43	0.10	0.3	0.6	6.7	2.3	6.63
99.48	0.15	0.7	2.2	12.0	3.1	11.92
99.53	0.20	1.4	5.6	17.3	3.8	17.20
99.58	0.25	2.4	11.1	22.6	4.6	22.49
99.63	0.30	3.7	19.3	27.9	5.2	27.77
99.68	0.35	5.1	32.4	28.7	6.4	28.55
99.73	0.40	6.6	46.8	31.4	7.1	31.27
99.78	0.45	8.2	64.0	34.1	7.8	34.00
99.83	0.50	10.0	84.2	36.9	8.4	36.73
99.88	0.55	11.9	107.3	39.6	9.0	39.45
99.93	0.60	13.9	133.7	42.3	9.6	42.18
99.98	0.65	16.1	163.3	45.0	10.1	44.91
100.00	0.67	17.0	176.1	46.1	10.4	46.00

$Q_{100} = 17.72$

CHACO RIDGE AT HIGH DESERT - MORNING MIST AVENUE 4

MANNING'S N = .0170

SLOPE = .0480

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	36.03	99.33
2	9.00	99.67	5	23.00	99.63	8	37.00	99.67
3	9.97	99.33	6	35.00	99.39	9	46.00	100.00

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
99.38	0.05	0.1	0.1	2.0	1.6	2.00
99.43	0.10	0.3	0.5	6.7	2.2	6.63
99.48	0.15	0.7	2.1	12.0	2.9	11.92
99.53	0.20	1.4	5.3	17.3	3.7	17.20
99.58	0.25	2.4	10.6	22.6	4.3	22.49
99.63	0.30	3.7	18.4	27.9	5.0	27.77
99.68	0.35	5.1	30.8	28.7	6.1	28.55
99.73	0.40	6.6	44.5	31.4	6.8	31.27
99.78	0.45	8.2	60.9	34.1	7.4	34.00
99.83	0.50	10.0	80.1	36.9	8.0	36.73
99.88	0.55	11.9	102.1	39.6	8.6	39.45
99.93	0.60	13.9	127.2	42.3	9.1	42.18
99.98	0.65	16.1	155.4	45.0	9.6	44.91
100.00	0.67	17.0	167.6	46.1	9.9	46.00

$Q_{100} = 18.29$

CHACO RIDGE AT HIGH DESERT - MORNING MIST AVENUE 5

MANNING'S N = .0170

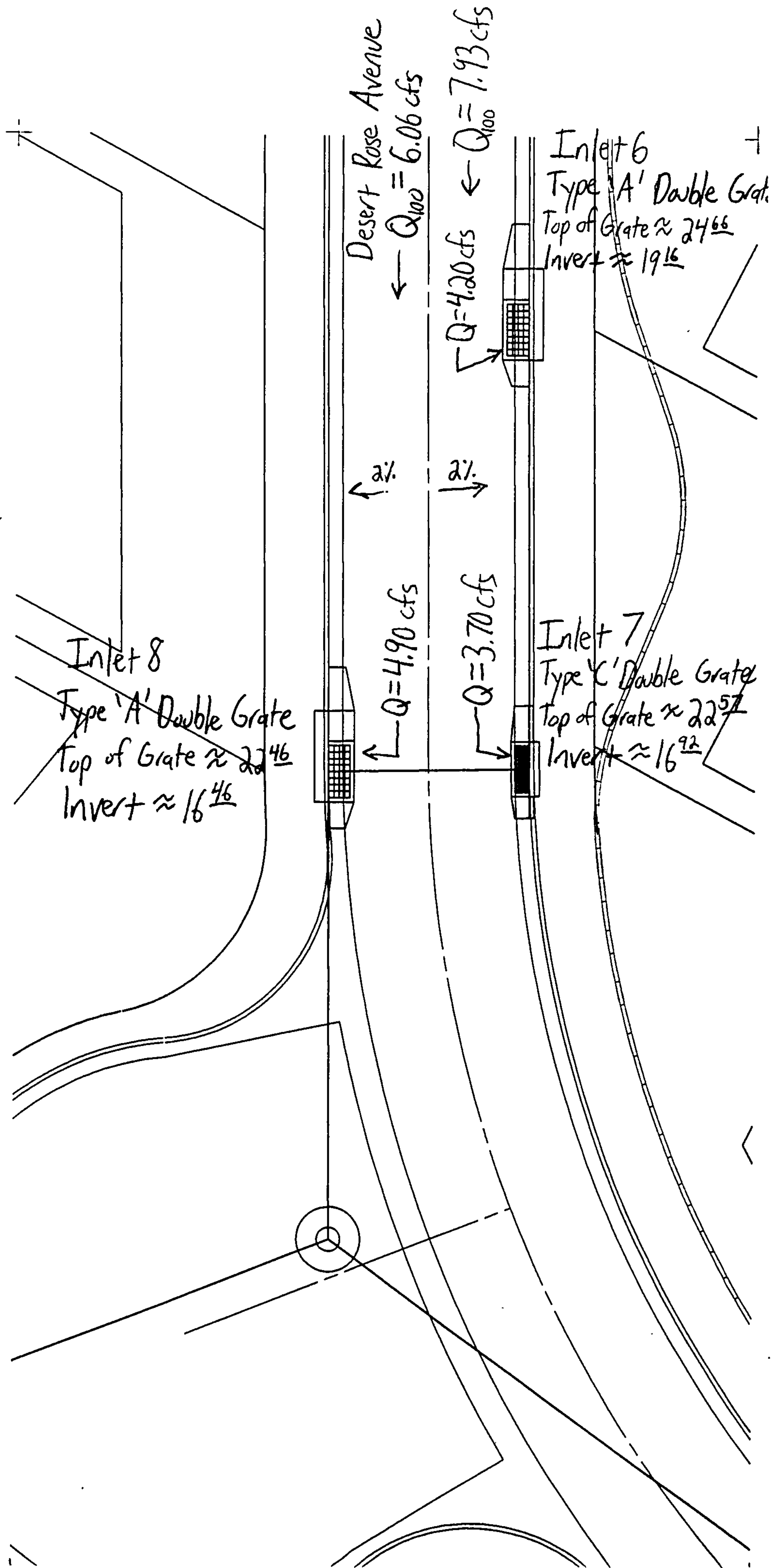
SLOPE = .0400

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.13	7	37.00	99.00
2	9.00	99.67	5	23.00	99.35	8	37.00	99.67
3	9.00	99.00	6	35.00	99.13	9	46.00	100.00

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
99.05	0.05	0.0	0.1	1.6	1.4	1.54
99.10	0.10	0.2	0.3	3.3	2.3	3.08
99.15	0.15	0.4	0.9	6.5	2.6	6.18
99.20	0.20	0.8	2.3	12.0	2.9	11.64
99.25	0.25	1.5	5.2	17.6	3.4	17.09
99.30	0.30	2.5	10.0	23.2	4.0	22.55
99.35	0.35	3.8	17.1	28.7	4.5	28.00
99.40	0.40	5.2	28.8	28.8	5.6	28.00
99.45	0.45	6.6	42.9	28.9	6.5	28.00
99.50	0.50	8.0	59.0	29.0	7.4	28.00
99.55	0.55	9.4	77.1	29.1	8.2	28.00
99.60	0.60	10.8	97.0	29.2	9.0	28.00
99.65	0.65	12.2	118.6	29.3	9.7	28.00
99.70	0.70	13.6	137.2	31.1	10.1	29.64
99.75	0.75	15.2	155.0	33.9	10.2	32.36
99.80	0.80	16.8	175.1	36.7	10.4	35.09
99.85	0.85	18.7	197.8	39.5	10.6	37.82
99.90	0.90	20.6	223.1	42.4	10.8	40.55
99.95	0.95	22.7	251.1	45.2	11.1	43.27
100.00	1.00	25.0	281.9	48.0	11.3	46.00

$Q = 22.81$

North

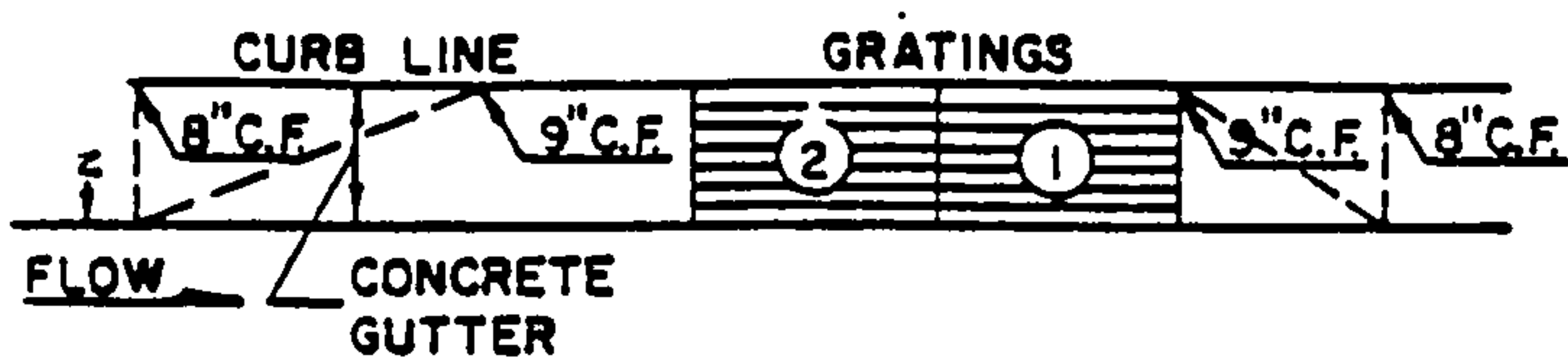


Desert Rose Avenue Inlet 6

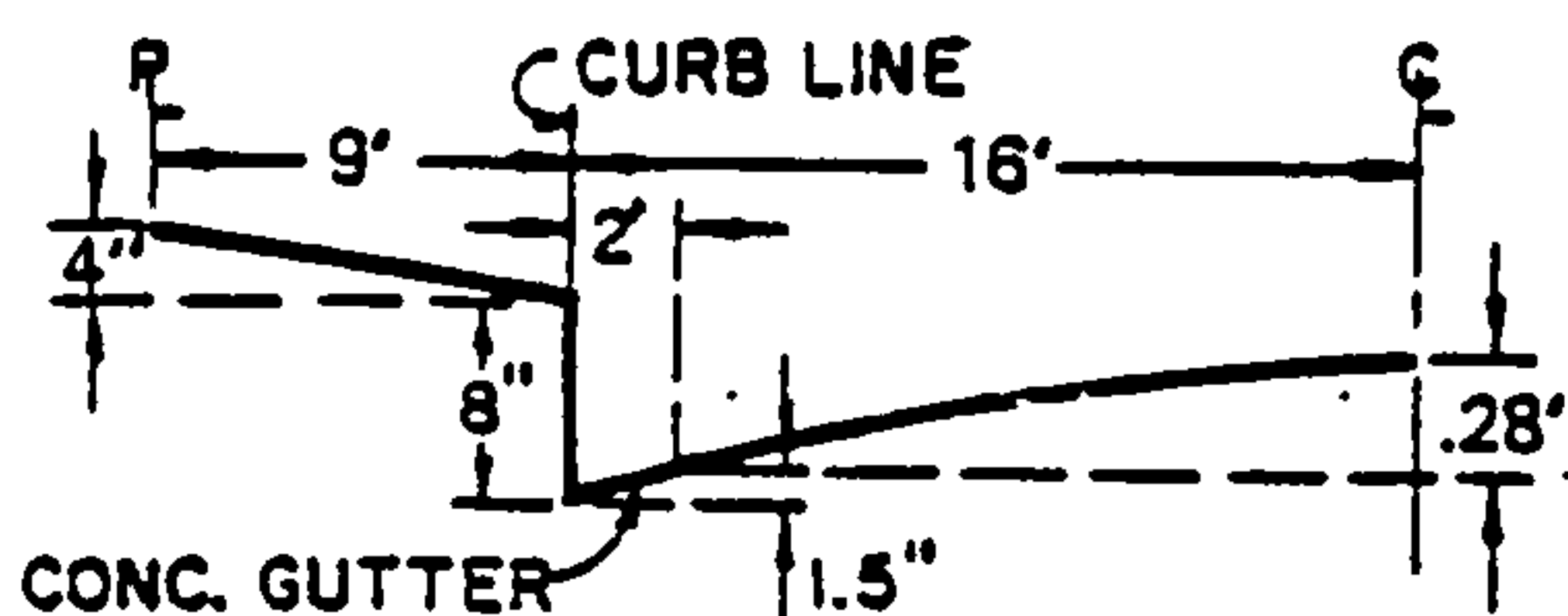
22.3

GRATING CAPACITIES FOR TYPE DOUBLE

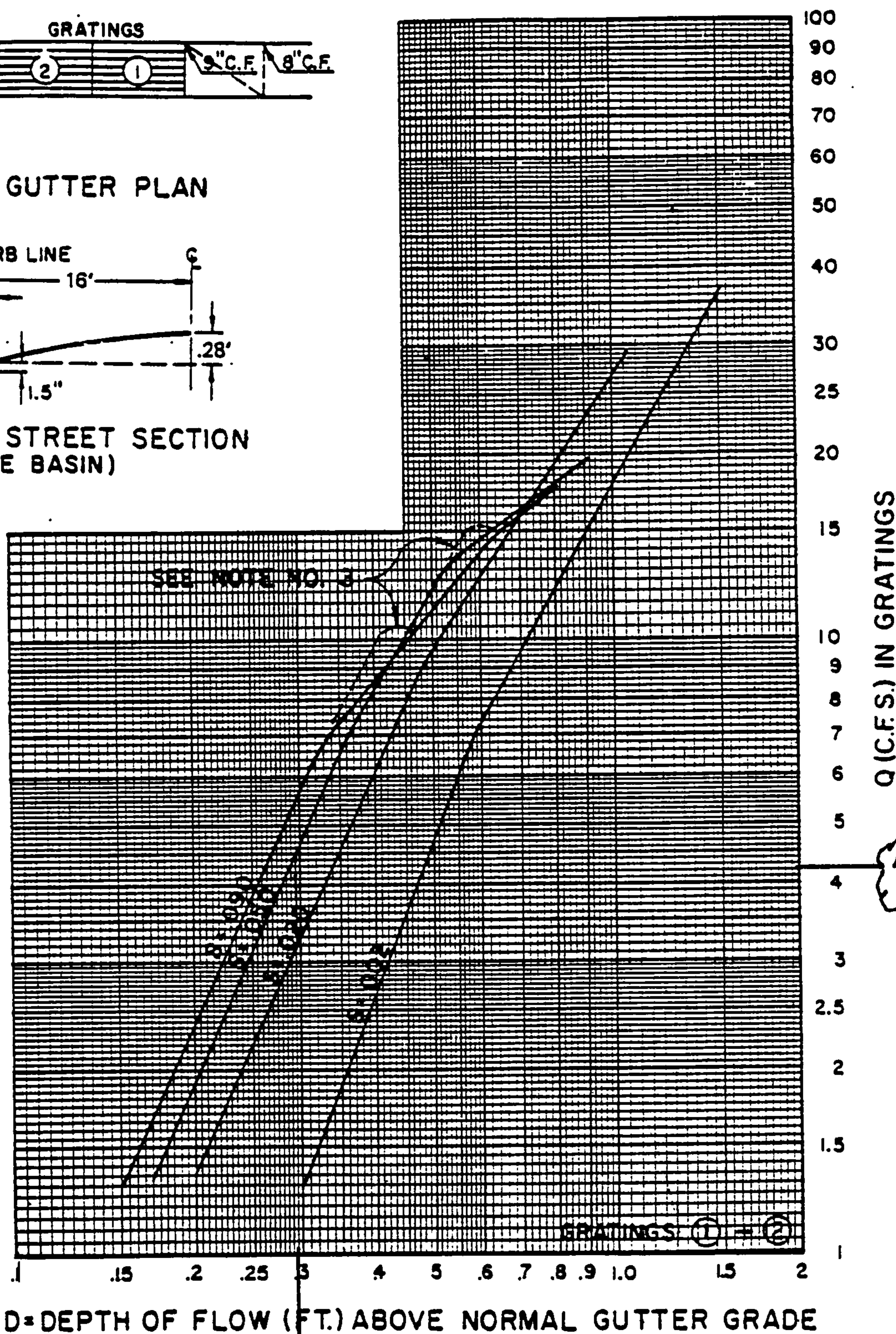
"C," AND "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)



Roadway Grade: 3.74%

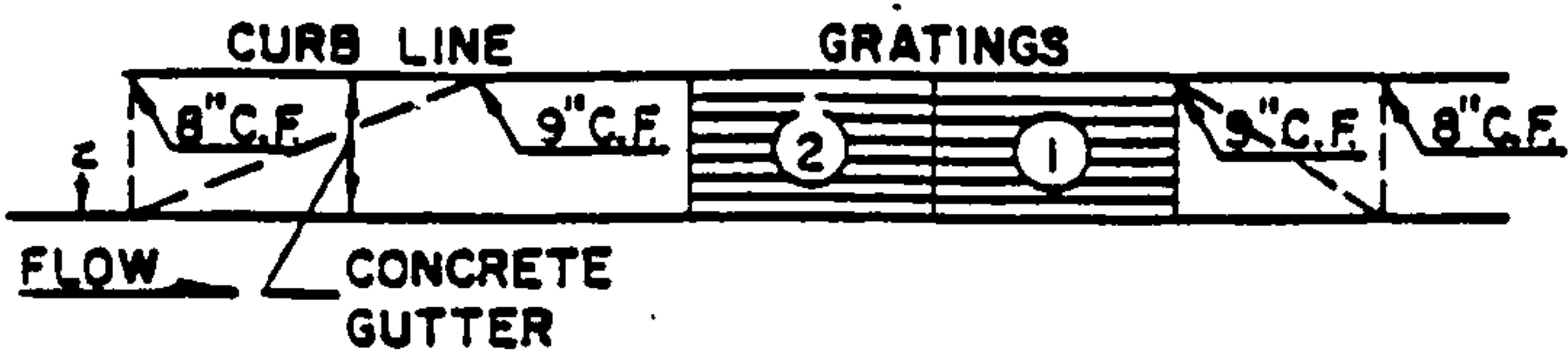
Inlet 6: $Q_{100} = 7.93$ cfs

Desert Rose Avenue Inlets 7 & 8

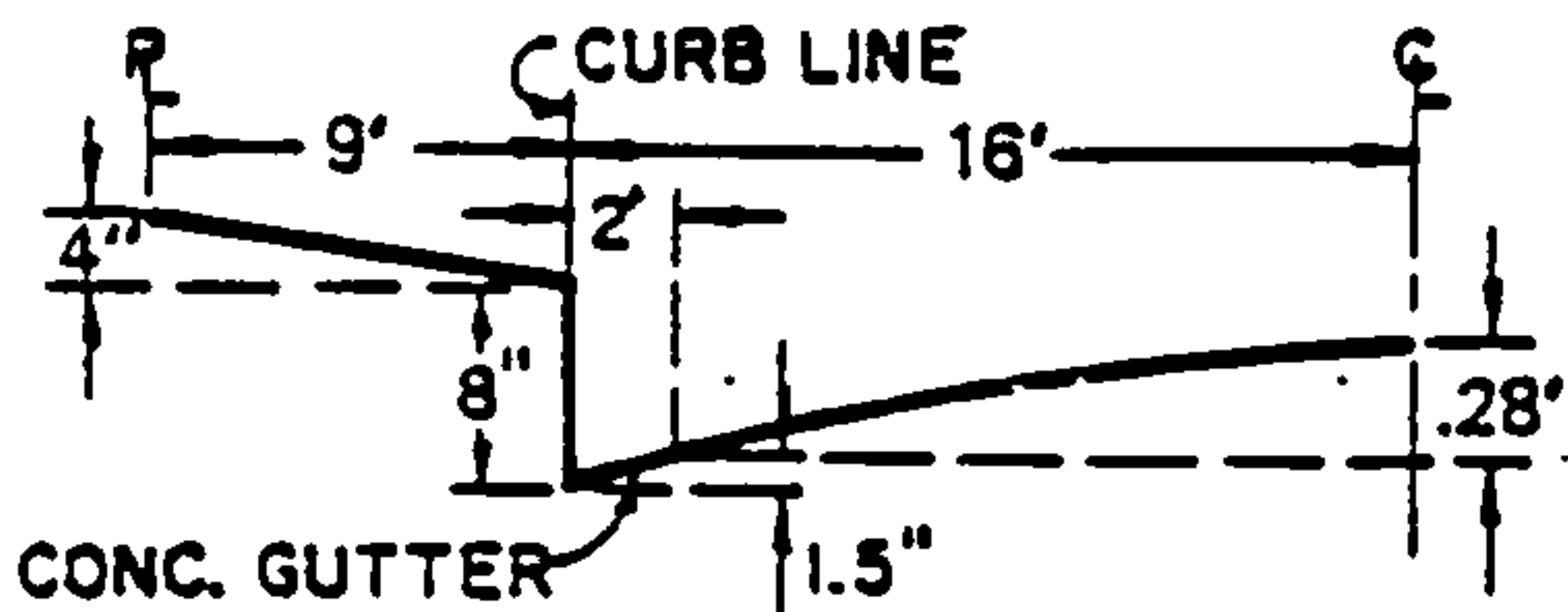
22.3

GRATING CAPACITIES FOR TYPE DOUBLE

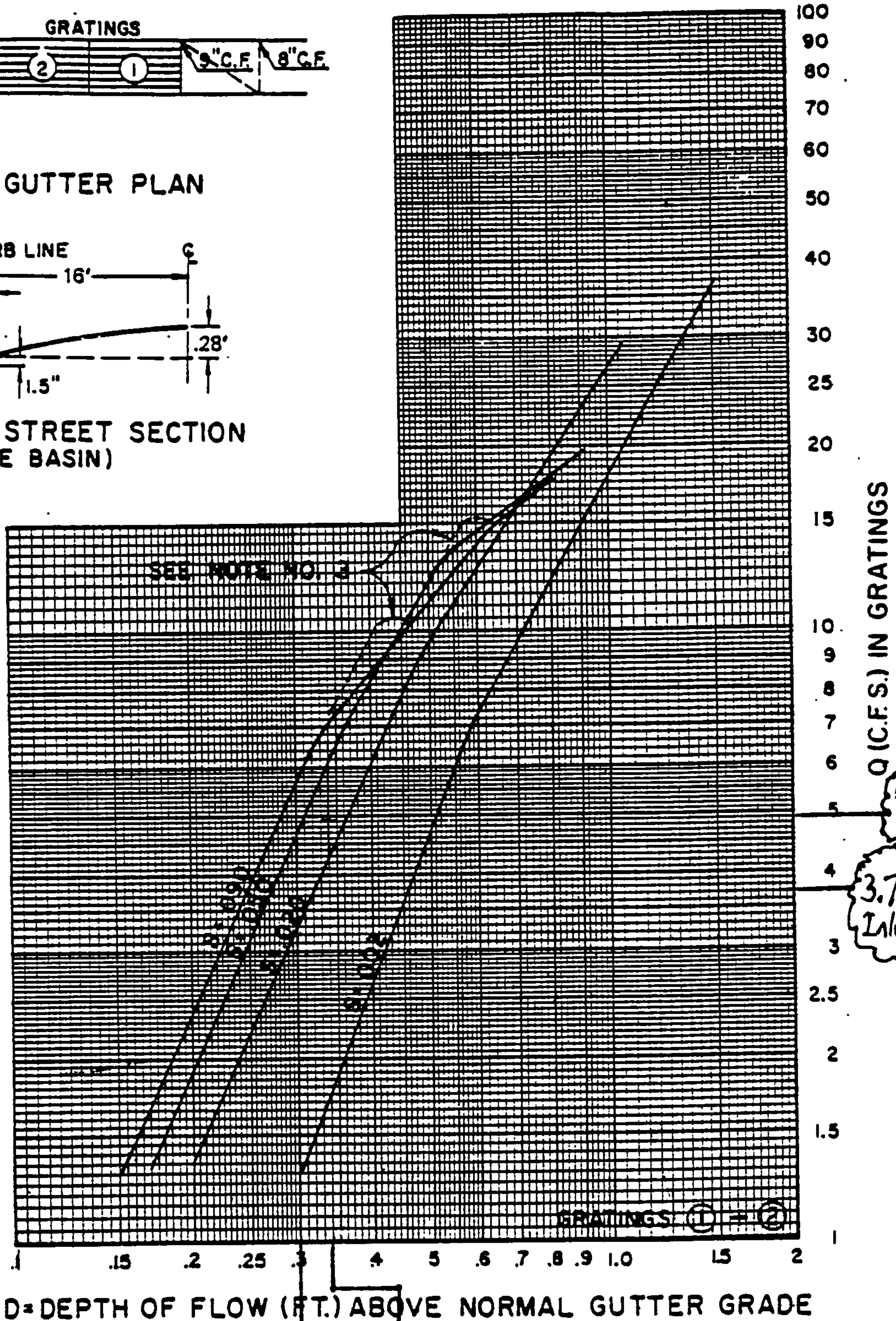
"C," AND "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)



Roadway Grade: 2.62%

Inlet 7: $Q_{100} = 3.73$ cfs

Inlet 8: $Q_{100} = 6.06$ cfs

REV 3-83

Inlet 7: Type 'C' Double Grate
Inlet 8: Type 'A' Double Grate
PLATE 22.3 D-6

CHACO RIDGE AT HIGH DESERT - DESERT ROSE AVENUE 1

MANNING'S N = .0170

SLOPE = .0393

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.13	7	36.03	99.07
2	9.00	99.67	5	23.00	99.35	8	37.00	99.41
3	9.00	99.00	6	35.00	99.13	9	46.00	99.74

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
99.05	0.05	0.0	0.0	0.8	1.4	0.77
99.10	0.10	0.1	0.2	2.2	2.0	2.14
99.15	0.15	0.3	0.6	5.6	2.2	5.44
99.20	0.20	0.7	1.7	11.3	2.6	11.04
99.25	0.25	1.4	4.4	16.9	3.2	16.63
99.30	0.30	2.3	8.9	22.6	3.8	22.23
99.35	0.35	3.6	15.7	28.2	4.4	27.83
99.40	0.40	5.0	27.0	28.4	5.4	27.97
99.45	0.45	6.4	39.9	29.6	6.2	29.09
99.50	0.50	7.9	54.8	31.0	7.0	30.45
99.55	0.55	9.4	71.9	32.4	7.6	31.82
99.60	0.60	11.1	91.0	33.9	8.2	33.18
99.65	0.65	12.8	112.3	35.3	8.8	34.55
99.70	0.70	14.5	133.9	37.5	9.2	36.73
99.74	0.74	16.0	151.9	39.7	9.5	38.91

$Q_{100} = 10.92$

CHACO RIDGE AT HIGH DESERT - DESERT ROSE AVENUE 2

MANNING'S N = .0170

SLOPE = .0374

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.13	7	36.03	99.07
2	9.00	99.67	5	23.00	99.35	8	37.00	99.41
3	9.00	99.00	6	35.00	99.13	9	46.00	99.74

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
99.05	0.05	0.0	0.0	0.8	1.4	0.77
99.10	0.10	0.1	0.2	2.2	1.9	2.14
99.15	0.15	0.3	0.5	5.6	2.1	5.44
99.20	0.20	0.7	1.7	11.3	2.6	11.04
99.25	0.25	1.4	4.3	16.9	3.1	16.63
99.30	0.30	2.3	8.7	22.6	3.7	22.23
99.35	0.35	3.6	15.3	28.2	4.3	27.83
99.40	0.40	5.0	26.3	28.4	5.3	27.97
99.45	0.45	6.4	38.9	29.6	6.1	29.09
99.50	0.50	7.9	53.5	31.0	6.8	30.45
99.55	0.55	9.4	70.1	32.4	7.4	31.82
99.60	0.60	11.1	88.8	33.9	8.0	33.18
99.65	0.65	12.8	109.5	35.3	8.6	34.55
99.70	0.70	14.5	130.6	37.5	9.0	36.73
99.74	0.74	16.0	148.2	39.7	9.2	38.91

$Q_{100} = 13.33$

CHACO RIDGE AT HIGH DESERT - DESERT ROSE AVENUE 2A

MANNING'S N = .0170

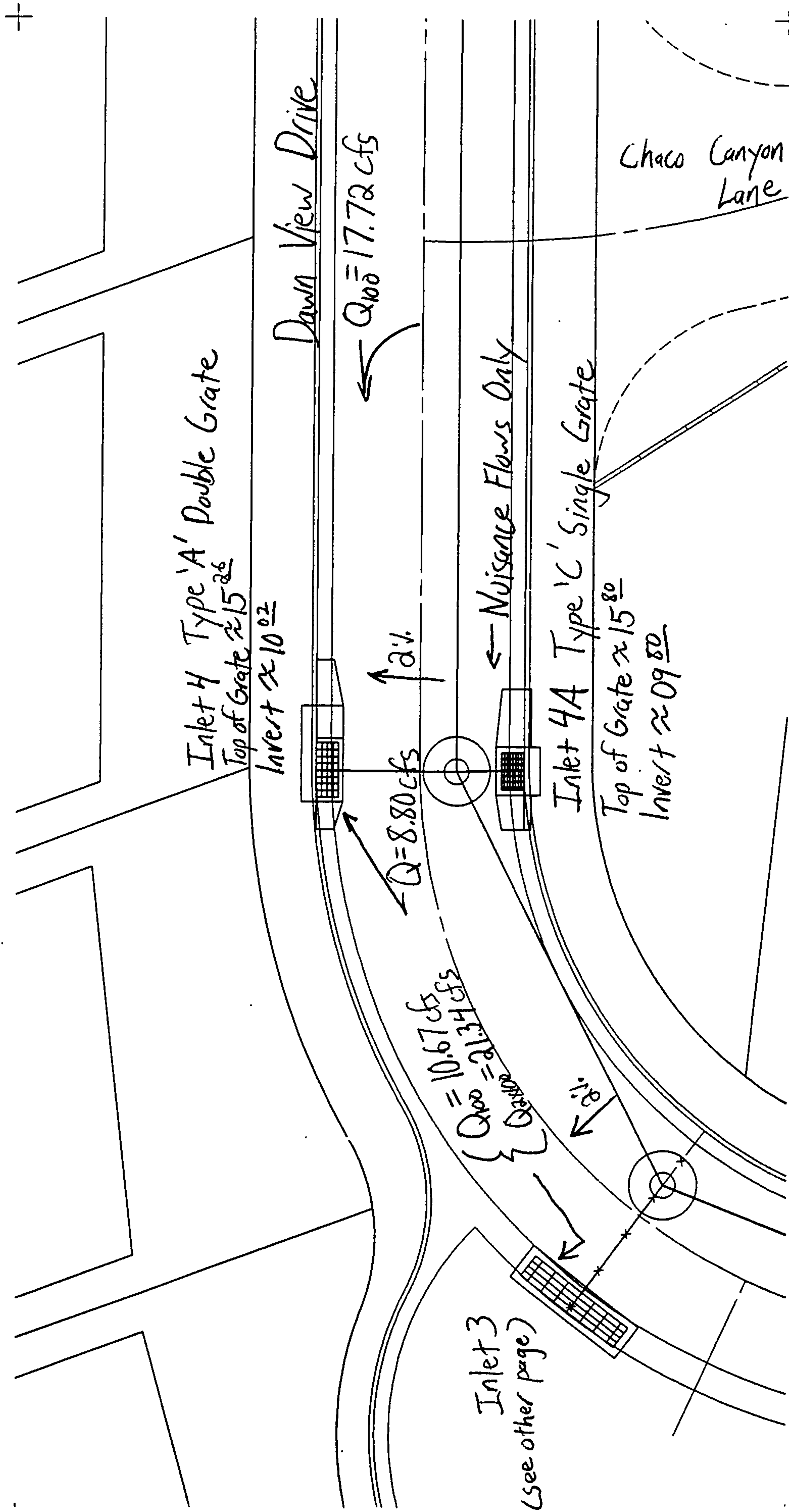
SLOPE = .0374

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.13	7	37.00	99.00
2	9.00	99.67	5	23.00	99.35	8	37.00	99.67
3	9.00	99.00	6	35.00	99.13	9	46.00	100.00

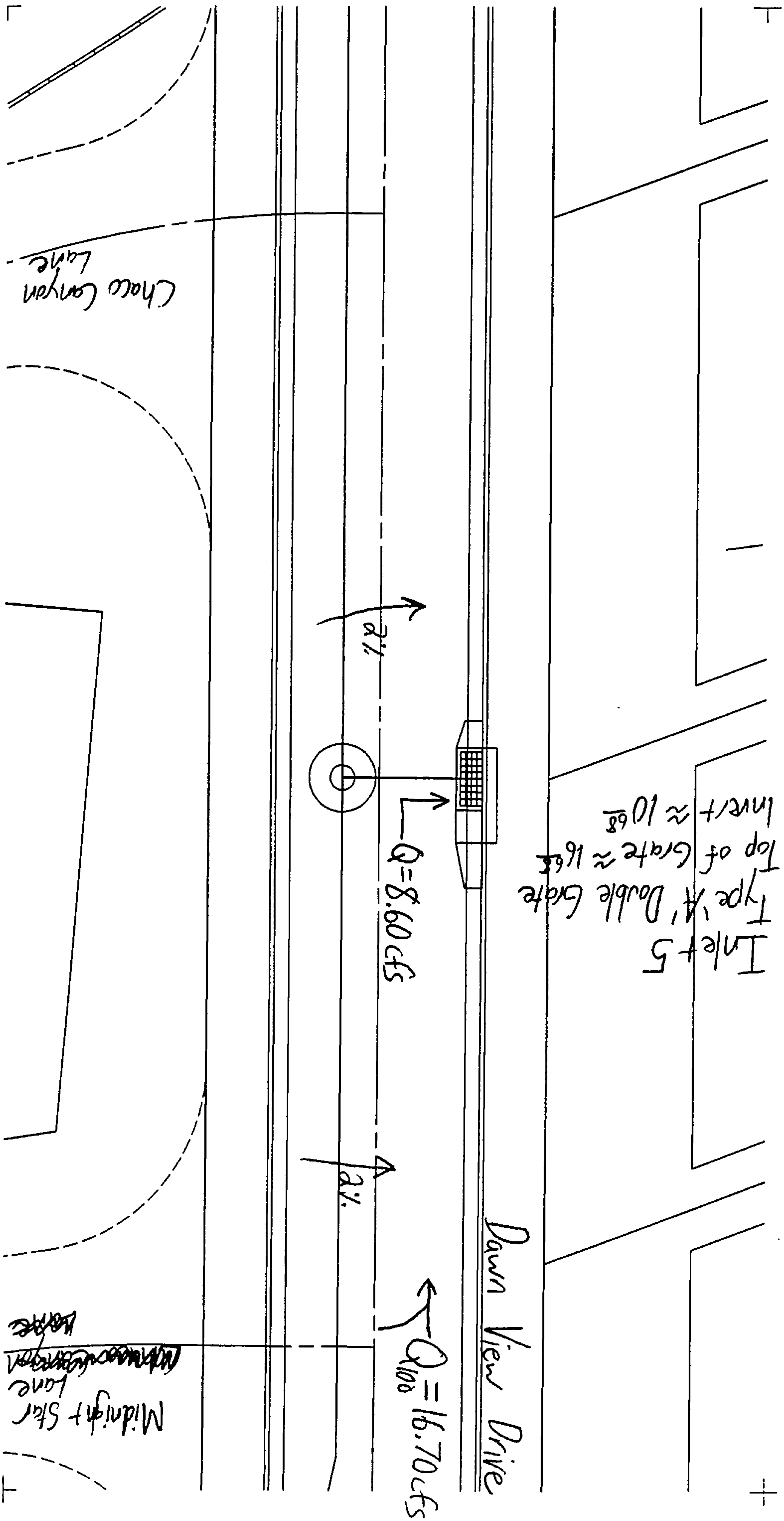
WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
99.05	0.05	0.0	0.1	1.6	1.4	1.54
99.10	0.10	0.2	0.3	3.3	2.2	3.08
99.15	0.15	0.4	0.9	6.5	2.5	6.18
99.20	0.20	0.8	2.3	12.0	2.8	11.64
99.25	0.25	1.5	5.1	17.6	3.3	17.09
99.30	0.30	2.5	9.7	23.2	3.8	22.55
99.35	0.35	3.8	16.5	28.7	4.4	28.00
99.40	0.40	5.2	27.9	28.8	5.4	28.00
99.45	0.45	6.6	41.5	28.9	6.3	28.00
99.50	0.50	8.0	57.1	29.0	7.1	28.00
99.55	0.55	9.4	74.5	29.1	7.9	28.00
99.60	0.60	10.8	93.8	29.2	8.7	28.00
99.65	0.65	12.2	114.7	29.3	9.4	28.00
99.70	0.70	13.6	132.7	31.1	9.8	29.64
99.75	0.75	15.2	149.8	33.9	9.9	32.36
99.80	0.80	16.8	169.3	36.7	10.1	35.09
99.85	0.85	18.7	191.3	39.5	10.2	37.82
99.90	0.90	20.6	215.7	42.4	10.5	40.55
99.95	0.95	22.7	242.8	45.2	10.7	43.27
100.00	1.00	25.0	272.6	48.0	10.9	46.00

$Q_{100} = 14.25$

~~North~~ North



North

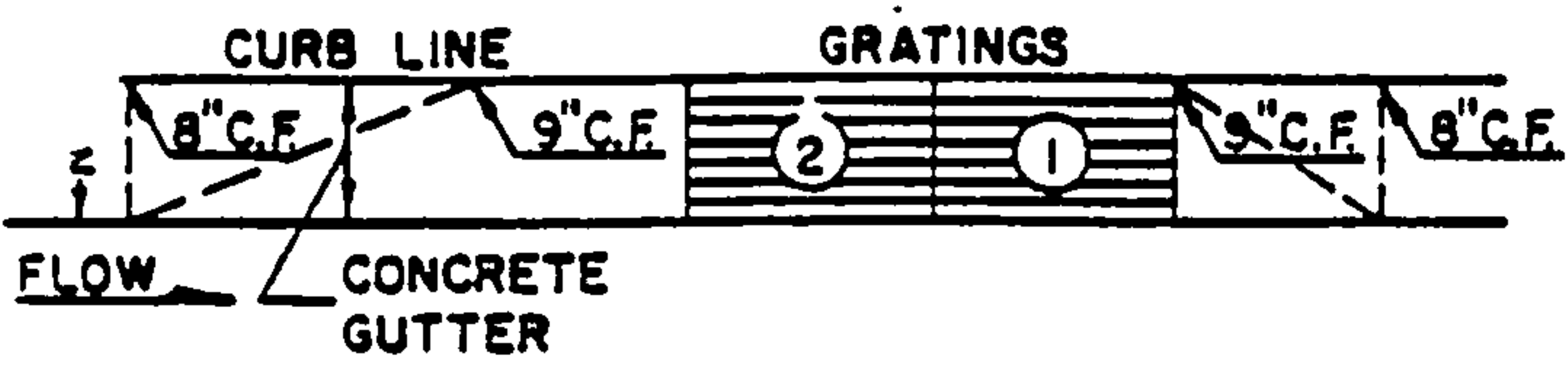


Dawn View Drive Inlets 4 & 5

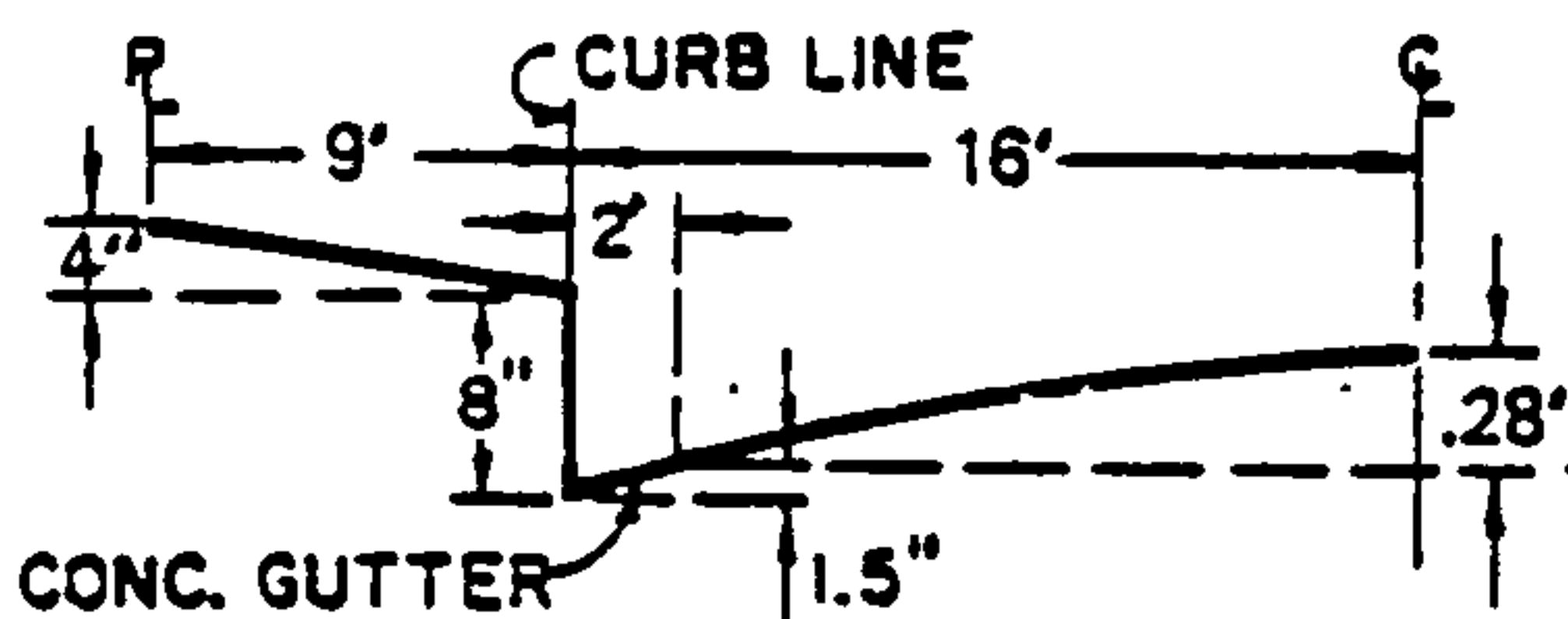
22.3

GRATING CAPACITIES FOR TYPE DOUBLE

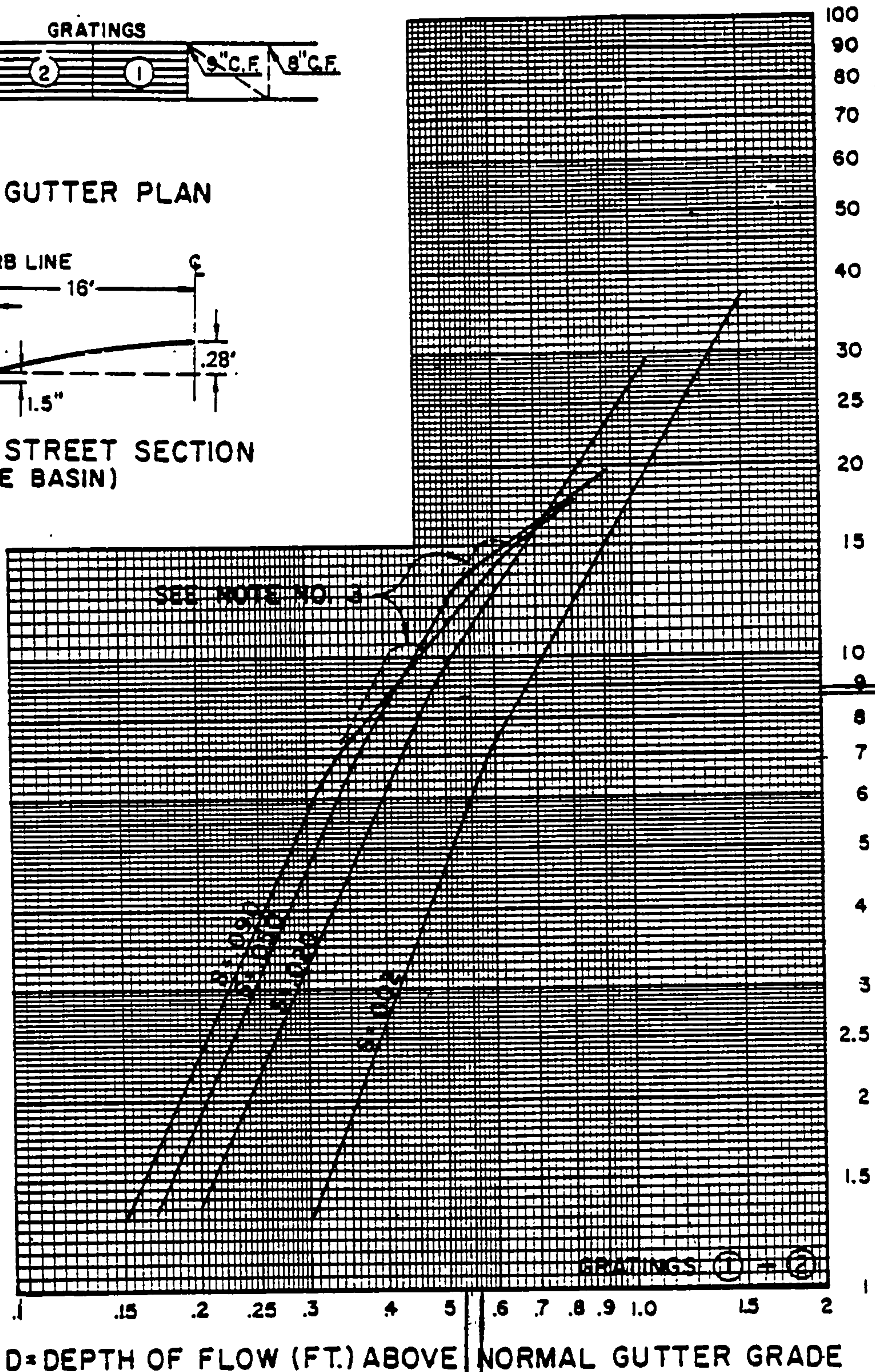
"C," AND "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)



CHACO RIDGE AT HIGH DESERT - DAWN VIEW DRIVE 1

MANNING'S N = .0170

SLOPE = .0262

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.13	7	37.00	99.19
2	9.00	99.67	5	35.00	98.65	8	46.00	99.52
3	9.00	99.00	6	37.00	98.52			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
98.57	0.05	0.0	0.0	0.8	1.2	0.77
98.62	0.10	0.1	0.1	1.6	1.8	1.54
98.67	0.15	0.2	0.4	3.2	2.1	3.00
98.72	0.20	0.4	0.9	5.7	2.4	5.50
98.77	0.25	0.7	2.0	8.3	2.8	8.00
98.82	0.30	1.2	3.9	10.8	3.3	10.50
98.87	0.35	1.8	6.6	13.4	3.7	13.00
98.92	0.40	2.5	10.2	15.9	4.1	15.50
98.97	0.45	3.3	15.0	18.5	4.5	18.00
99.02	0.50	4.3	20.9	21.3	4.9	20.81
99.07	0.55	5.4	27.9	24.7	5.1	24.08
99.12	0.60	6.7	36.5	28.1	5.4	27.35
99.17	0.65	8.1	49.2	28.8	6.1	28.00
99.22	0.70	9.5	62.9	29.8	6.6	28.82
99.27	0.75	11.0	77.5	31.2	7.1	30.18
99.32	0.80	12.5	93.6	32.7	7.5	31.55
99.37	0.85	14.1	111.2	34.1	7.9	32.91
99.42	0.90	15.8	130.3	35.6	8.2	34.27
99.47	0.95	17.6	151.1	37.1	8.6	35.64
99.52	1.00	19.4	173.5	38.5	8.9	37.00

$Q_{100} = 4.56$

CHACO RIDGE AT HIGH DESERT - DAWN VIEW DRIVE 2

MANNING'S N = .0170

SLOPE = .0100

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.13	7	37.00	99.19
2	9.00	99.67	5	35.00	98.65	8	46.00	99.52
3	9.00	99.00	6	37.00	98.52			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
98.57	0.05	0.0	0.0	0.8	0.7	0.77
98.62	0.10	0.1	0.1	1.6	1.1	1.54
98.67	0.15	0.2	0.2	3.2	1.3	3.00
98.72	0.20	0.4	0.6	5.7	1.5	5.50
98.77	0.25	0.7	1.3	8.3	1.7	8.00
98.82	0.30	1.2	2.4	10.8	2.0	10.50
98.87	0.35	1.8	4.1	13.4	2.3	13.00
98.92	0.40	2.5	6.3	15.9	2.5	15.50
98.97	0.45	3.3	9.3	18.5	2.8	18.00
99.02	0.50	4.3	12.9	21.3	3.0	20.81
99.07	0.55	5.4	17.2	24.7	3.2	24.08
99.12	0.60	6.7	22.5	28.1	3.4	27.35
99.17	0.65	8.1	30.4	28.8	3.7	28.00
99.22	0.70	9.5	38.9	29.8	4.1	28.82
99.27	0.75	11.0	47.9	31.2	4.4	30.18
99.32	0.80	12.5	57.8	32.7	4.6	31.55
99.37	0.85	14.1	68.7	34.1	4.9	32.91
99.42	0.90	15.8	80.5	35.6	5.1	34.27
99.47	0.95	17.6	93.3	37.1	5.3	35.64
99.52	1.00	19.4	107.2	38.5	5.5	37.00

$Q_{10\%} = 20.34$

CHACO RIDGE AT HIGH DESERT - MIDNIGHT STAR LANE 1

MANNING'S N = .0170

SLOPE = .0144

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	36.03	99.33
2	9.00	99.67	5	23.00	99.63	8	37.00	99.67
3	9.97	99.33	6	35.00	99.39	9	46.00	100.00

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
99.38	0.05	0.1	0.0	2.0	0.9	2.00
99.43	0.10	0.3	0.3	6.7	1.2	6.63
99.48	0.15	0.7	1.1	12.0	1.6	11.92
99.53	0.20	1.4	2.9	17.3	2.0	17.20
99.58	0.25	2.4	5.8	22.6	2.4	22.49
99.63	0.30	3.7	10.1	27.9	2.7	27.77
99.68	0.35	5.1	16.9	28.7	3.3	28.55
99.73	0.40	6.6	24.4	31.4	3.7	31.27
99.78	0.45	8.2	33.4	34.1	4.1	34.00
99.83	0.50	10.0	43.9	36.9	4.4	36.73
99.88	0.55	11.9	55.9	39.6	4.7	39.45
99.93	0.60	13.9	69.7	42.3	5.0	42.18
99.98	0.65	16.1	85.1	45.0	5.3	44.91
100.00	0.67	17.0	91.8	46.1	5.4	46.00

Q₁₀₀ = 10.07

CHACO RIDGE AT HIGH DESERT - MIDNIGHT STAR LANE 2

MANNING'S N = .0170

SLOPE = .0500

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	36.03	99.33
2	9.00	99.67	5	23.00	99.63	8	37.00	99.67
3	9.97	99.33	6	35.00	99.39	9	46.00	100.00

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
99.38	0.05	0.1	0.1	2.0	1.7	2.00
99.43	0.10	0.3	0.6	6.7	2.2	6.63
99.48	0.15	0.7	2.1	12.0	3.0	11.92
99.53	0.20	1.4	5.4	17.3	3.7	17.20
99.58	0.25	2.4	10.8	22.6	4.4	22.49
99.63	0.30	3.7	18.8	27.9	5.1	27.77
99.68	0.35	5.1	31.4	28.7	6.2	28.55
99.73	0.40	6.6	45.5	31.4	6.9	31.27
99.78	0.45	8.2	62.2	34.1	7.6	34.00
99.83	0.50	10.0	81.7	36.9	8.2	36.73
99.88	0.55	11.9	104.2	39.6	8.8	39.45
99.93	0.60	13.9	129.8	42.3	9.3	42.18
99.98	0.65	16.1	158.6	45.0	9.8	44.91
100.00	0.67	17.0	171.1	46.1	10.1	46.00

$Q_{100} = 8.90$

CHACO RIDGE AT HIGH DESERT - MIDNIGHT STAR LANE 3

MANNING'S N = .0170

SLOPE = .0200

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	37.00	99.45
2	9.00	99.67	5	35.00	98.91	8	46.00	99.78
3	9.97	99.33	6	37.00	98.78			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
98.83	0.05	0.0	0.0	0.8	1.0	0.77
98.88	0.10	0.1	0.1	1.6	1.6	1.54
98.93	0.15	0.2	0.3	3.2	1.8	3.00
98.98	0.20	0.4	0.8	5.7	2.1	5.50
99.03	0.25	0.7	1.8	8.3	2.5	8.00
99.08	0.30	1.2	3.4	10.8	2.8	10.50
99.13	0.35	1.8	5.7	13.4	3.2	13.00
99.18	0.40	2.5	9.0	15.9	3.6	15.50
99.23	0.45	3.3	13.1	18.5	3.9	18.00
99.28	0.50	4.3	18.4	21.0	4.3	20.50
99.33	0.55	5.4	24.8	23.6	4.6	23.00
99.38	0.60	6.6	31.9	27.1	4.8	26.50
99.43	0.65	8.0	42.7	28.0	5.4	27.32
99.48	0.70	9.4	54.4	29.0	5.8	28.28
99.53	0.75	10.8	66.8	30.6	6.2	29.78
99.58	0.80	12.3	80.5	32.1	6.5	31.29
99.63	0.85	13.9	95.6	33.7	6.9	32.80
99.68	0.90	15.6	111.6	35.5	7.1	34.55
99.73	0.95	17.4	127.3	38.3	7.3	37.27
99.78	1.00	19.3	144.7	41.1	7.5	40.00

$Q_{100} = 1.56$

CHACO RIDGE AT HIGH DESERT - CHACO CANYON LANE 1

MANNING'S N = .0170

SLOPE = .0400

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	36.03	99.33
2	9.00	99.67	5	23.00	99.63	8	37.00	99.67
3	9.97	99.33	6	35.00	99.39	9	46.00	100.00

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
99.38	0.05	0.1	0.1	2.0	1.5	2.00
99.43	0.10	0.3	0.5	6.7	2.0	6.63
99.48	0.15	0.7	1.9	12.0	2.7	11.92
99.53	0.20	1.4	4.8	17.3	3.3	17.20
99.58	0.25	2.4	9.7	22.6	4.0	22.49
99.63	0.30	3.7	16.8	27.9	4.5	27.77
99.68	0.35	5.1	28.1	28.7	5.5	28.55
99.73	0.40	6.6	40.7	31.4	6.2	31.27
99.78	0.45	8.2	55.6	34.1	6.8	34.00
99.83	0.50	10.0	73.1	36.9	7.3	36.73
99.88	0.55	11.9	93.2	39.6	7.8	39.45
99.93	0.60	13.9	116.1	42.3	8.3	42.18
99.98	0.65	16.1	141.9	45.0	8.8	44.91
100.00	0.67	17.0	153.0	46.1	9.0	46.00

$Q_{100} = 7.47$

CHACO RIDGE AT HIGH DESERT - CHACO CANYON LANE 2

MANNING'S N = .0170

SLOPE = .0550

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	36.03	99.33
2	9.00	99.67	5	23.00	99.63	8	37.00	99.67
3	9.97	99.33	6	35.00	99.39	9	46.00	100.00

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
99.38	0.05	0.1	0.1	2.0	1.7	2.00
99.43	0.10	0.3	0.6	6.7	2.3	6.63
99.48	0.15	0.7	2.2	12.0	3.1	11.92
99.53	0.20	1.4	5.7	17.3	3.9	17.20
99.58	0.25	2.4	11.3	22.6	4.6	22.49
99.63	0.30	3.7	19.7	27.9	5.3	27.77
99.68	0.35	5.1	33.0	28.7	6.5	28.55
99.73	0.40	6.6	47.7	31.4	7.2	31.27
99.78	0.45	8.2	65.2	34.1	7.9	34.00
99.83	0.50	10.0	85.7	36.9	8.6	36.73
99.88	0.55	11.9	109.3	39.6	9.2	39.45
99.93	0.60	13.9	136.2	42.3	9.8	42.18
99.98	0.65	16.1	166.4	45.0	10.3	44.91
100.00	0.67	17.0	179.4	46.1	10.5	46.00

$Q_{max} = 6.18$

CHACO RIDGE AT HIGH DESERT - CHACO CANYON LANE 3

MANNING'S N = .0170

SLOPE = .0500

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	36.03	99.33
2	9.00	99.67	5	23.00	99.63	8	37.00	99.67
3	9.97	99.33	6	35.00	99.39	9	46.00	100.00

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
99.38	0.05	0.1	0.1	2.0	1.7	2.00
99.43	0.10	0.3	0.6	6.7	2.2	6.63
99.48	0.15	0.7	2.1	12.0	3.0	11.92
99.53	0.20	1.4	5.4	17.3	3.7	17.20
99.58	0.25	2.4	10.8	22.6	4.4	22.49
99.63	0.30	3.7	18.8	27.9	5.1	27.77
99.68	0.35	5.1	31.4	28.7	6.2	28.55
99.73	0.40	6.6	45.5	31.4	6.9	31.27
99.78	0.45	8.2	62.2	34.1	7.6	34.00
99.83	0.50	10.0	81.7	36.9	8.2	36.73
99.88	0.55	11.9	104.2	39.6	8.8	39.45
99.93	0.60	13.9	129.8	42.3	9.3	42.18
99.98	0.65	16.1	158.6	45.0	9.8	44.91
100.00	0.67	17.0	171.1	46.1	10.1	46.00

Q_{obs} = 4.81

CHACO RIDGE AT HIGH DESERT - CHACO CANYON LANE 4

MANNING'S N = .0170

SLOPE = .0400

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	37.00	99.45
2	9.00	99.67	5	35.00	98.91	8	46.00	99.78
3	9.97	99.33	6	37.00	98.78			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
98.83	0.05	0.0	0.0	0.8	1.4	0.77
98.88	0.10	0.1	0.2	1.6	2.3	1.54
98.93	0.15	0.2	0.5	3.2	2.6	3.00
98.98	0.20	0.4	1.2	5.7	2.9	5.50
99.03	0.25	0.7	2.5	8.3	3.5	8.00
99.08	0.30	1.2	4.8	10.8	4.0	10.50
99.13	0.35	1.8	8.1	13.4	4.6	13.00
99.18	0.40	2.5	12.7	15.9	5.1	15.50
99.23	0.45	3.3	18.6	18.5	5.6	18.00
99.28	0.50	4.3	26.0	21.0	6.1	20.50
99.33	0.55	5.4	35.1	23.6	6.5	23.00
99.38	0.60	6.6	45.2	27.1	6.8	26.50
99.43	0.65	8.0	60.4	28.0	7.6	27.32
99.48	0.70	9.4	76.9	29.0	8.2	28.28
99.53	0.75	10.8	94.5	30.6	8.7	29.78
99.58	0.80	12.3	113.9	32.1	9.2	31.29
99.63	0.85	13.9	135.2	33.7	9.7	32.80
99.68	0.90	15.6	157.9	35.5	10.1	34.55
99.73	0.95	17.4	180.0	38.3	10.3	37.27
99.78	1.00	19.3	204.7	41.1	10.6	40.00

$Q_{100} = 1.87$

CHACO RIDGE AT HIGH DESERT - KAAS TRAIL COURT 1

MANNING'S N = .0170

SLOPE = .0350

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	37.00	98.95
2	9.00	99.67	5	35.00	98.67	8	46.00	99.25
3	9.97	99.33	6	36.03	98.61			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
98.66	0.05	0.0	0.0	1.0	1.4	1.00
98.71	0.10	0.1	0.2	2.7	2.0	2.65
98.76	0.15	0.3	0.8	4.5	2.6	4.46
98.81	0.20	0.6	1.8	6.3	3.3	6.27
98.86	0.25	0.9	3.5	8.1	3.8	8.08
98.91	0.30	1.4	6.0	9.9	4.4	9.89
98.96	0.35	1.9	9.1	12.0	4.8	11.97
99.01	0.40	2.6	13.0	15.2	5.0	15.13
99.06	0.45	3.4	18.2	18.4	5.3	18.30
99.11	0.50	4.4	25.1	21.5	5.7	21.47
99.16	0.55	5.6	33.7	24.7	6.1	24.63
99.21	0.60	6.9	44.3	27.9	6.4	27.80
99.25	0.64	8.0	54.2	30.4	6.7	30.33

$Q_{100} = 2.55$

CHACO RIDGE AT HIGH DESERT - KAAS TRAIL COURT 2

MANNING'S N = .0170

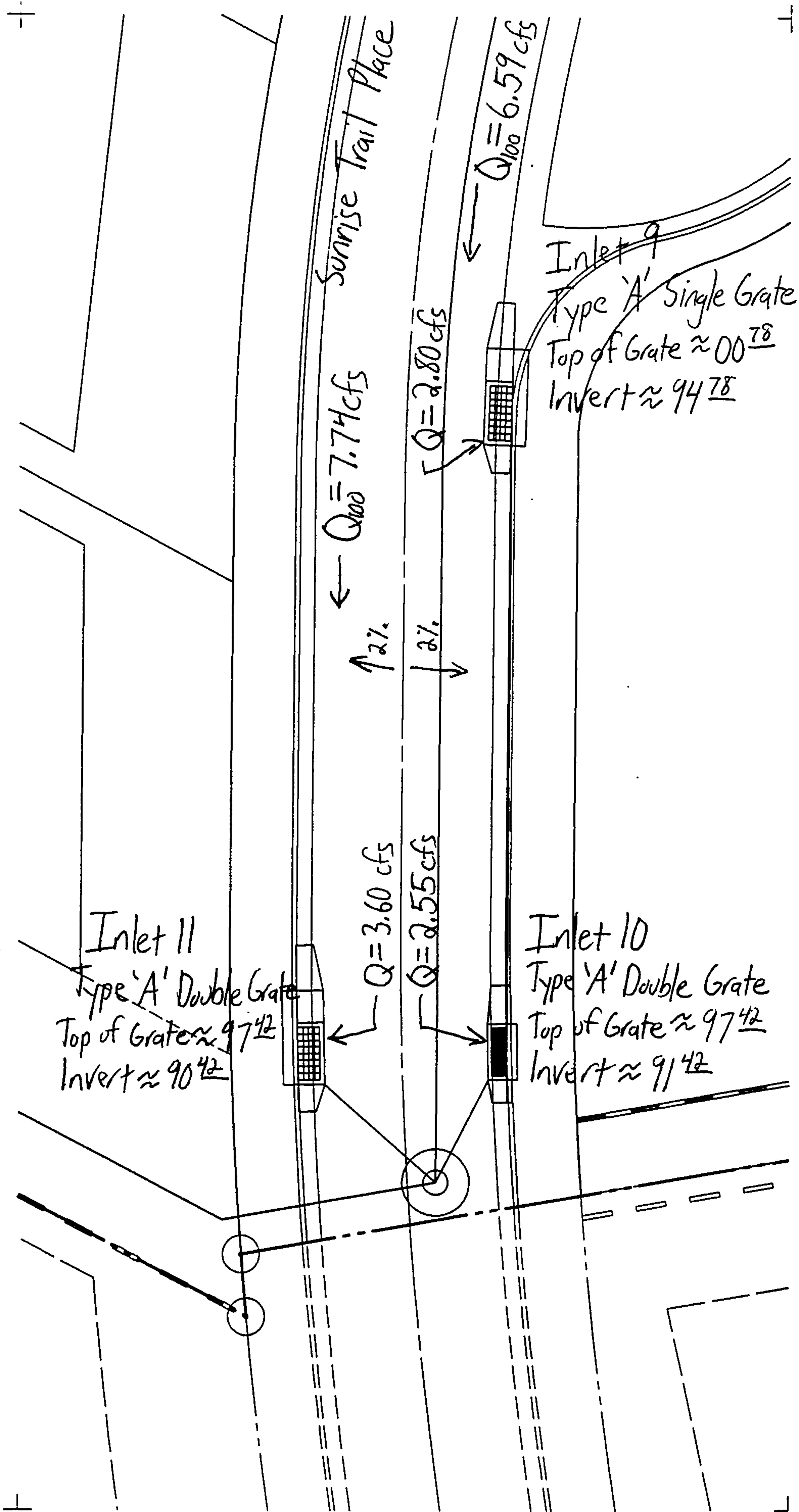
SLOPE = .0075

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	37.00	99.21
2	9.00	99.67	5	35.00	98.67	8	46.00	99.54
3	9.97	99.33	6	37.00	98.54			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
98.59	0.05	0.0	0.0	0.8	0.6	0.77
98.64	0.10	0.1	0.1	1.6	1.0	1.54
98.69	0.15	0.2	0.2	2.8	1.2	2.67
98.74	0.20	0.4	0.5	4.5	1.4	4.33
98.79	0.25	0.6	1.0	6.3	1.6	6.00
98.84	0.30	1.0	1.7	8.0	1.8	7.67
98.89	0.35	1.4	2.8	9.7	2.1	9.33
98.94	0.40	1.9	4.3	11.4	2.3	11.00
98.99	0.45	2.5	6.2	13.1	2.5	12.67
99.04	0.50	3.2	8.5	14.8	2.7	14.33
99.09	0.55	3.9	11.3	16.6	2.9	16.00
99.14	0.60	4.8	14.7	18.3	3.1	17.67
99.19	0.65	5.7	18.6	20.0	3.3	19.33
99.24	0.70	6.7	22.6	22.5	3.4	21.82
99.29	0.75	7.9	27.1	25.6	3.4	24.85
99.34	0.80	9.2	32.4	28.9	3.5	28.08
99.39	0.85	10.7	38.2	33.0	3.6	32.11
99.44	0.90	12.3	47.0	34.6	3.8	33.62
99.49	0.95	14.0	56.7	36.1	4.0	35.12
99.54	1.00	15.8	67.3	37.7	4.2	36.63

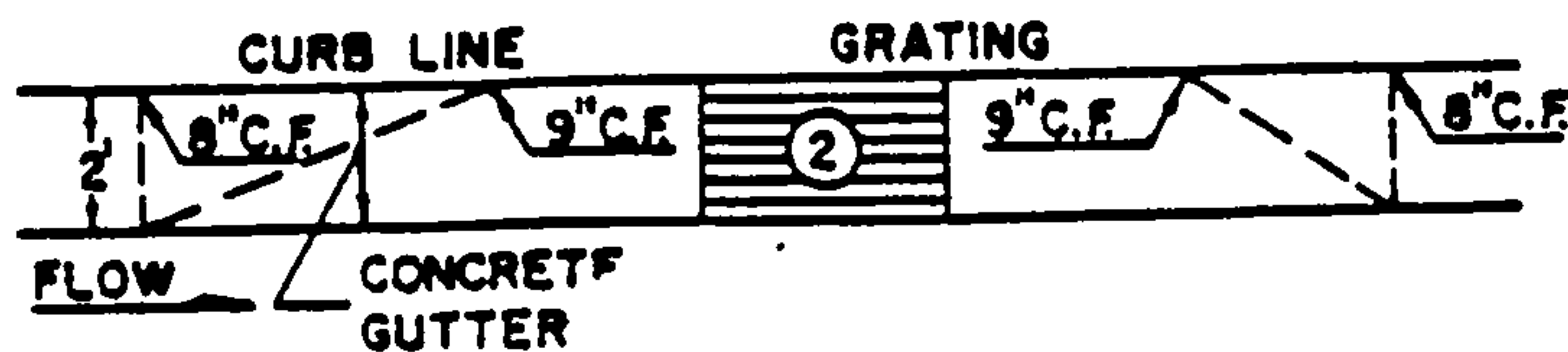
$Q_{100} = 5.69$

North

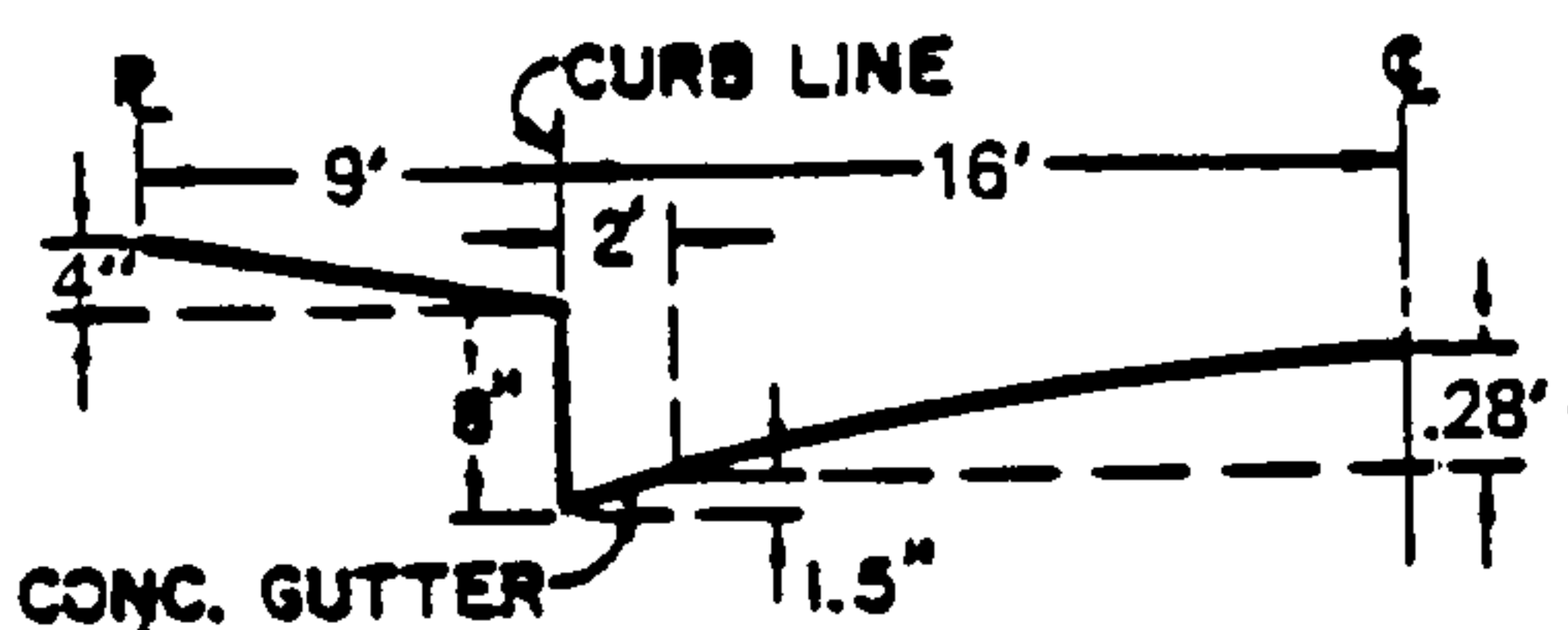


Inlet 9

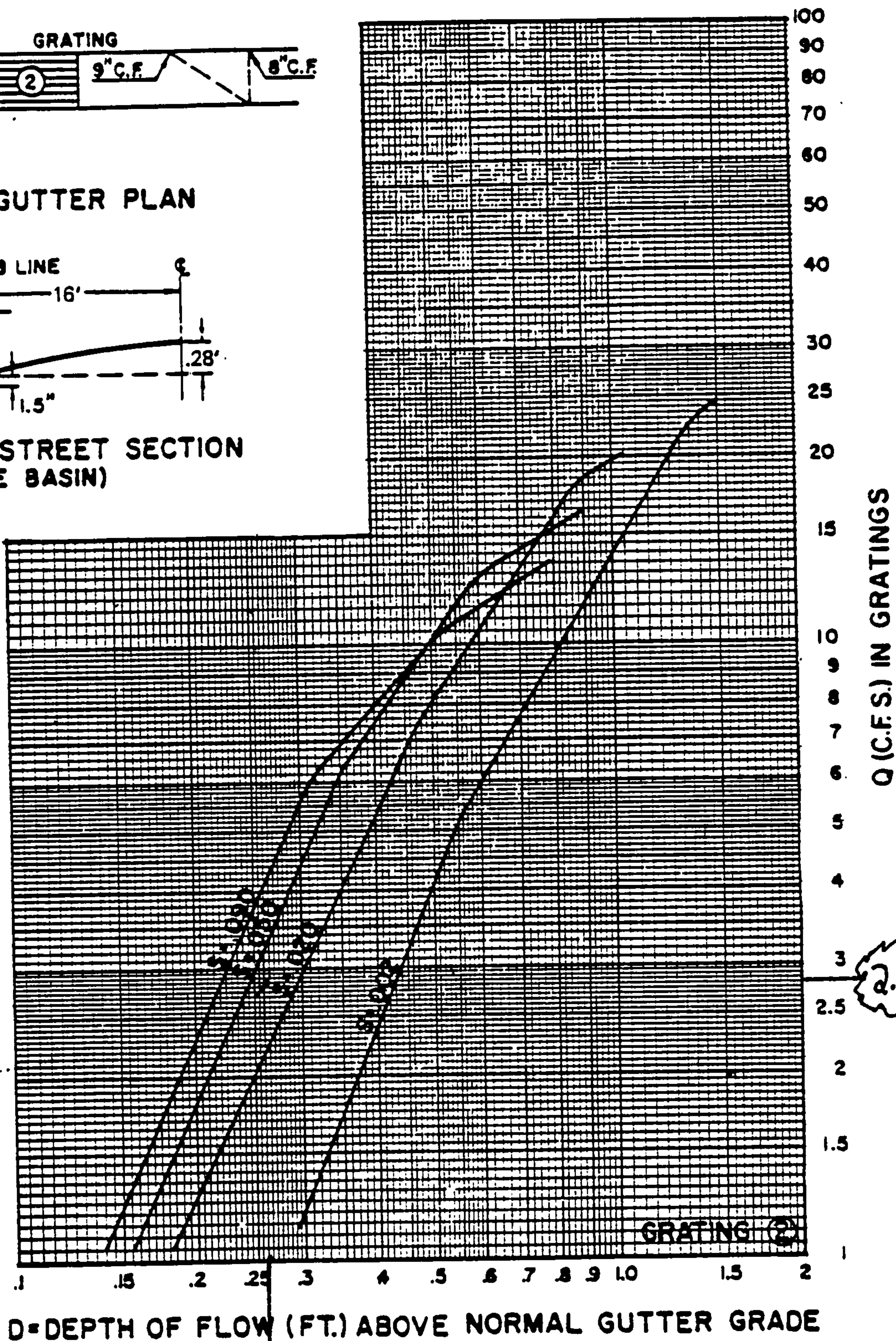
GRATING CAPACITIES FOR TYPE 'A', 'C' and 'D'



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)



Roadway Grade: 4.0%
Inlet 9: $Q_{100} = 6.59 \text{ cfs}$

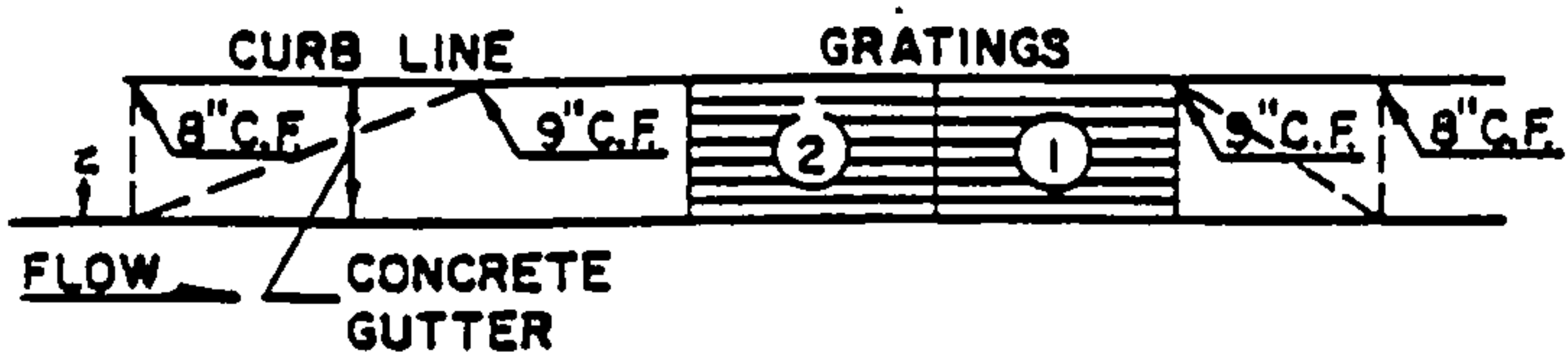
Sunrise Trail Place

Inlets 10 & 11

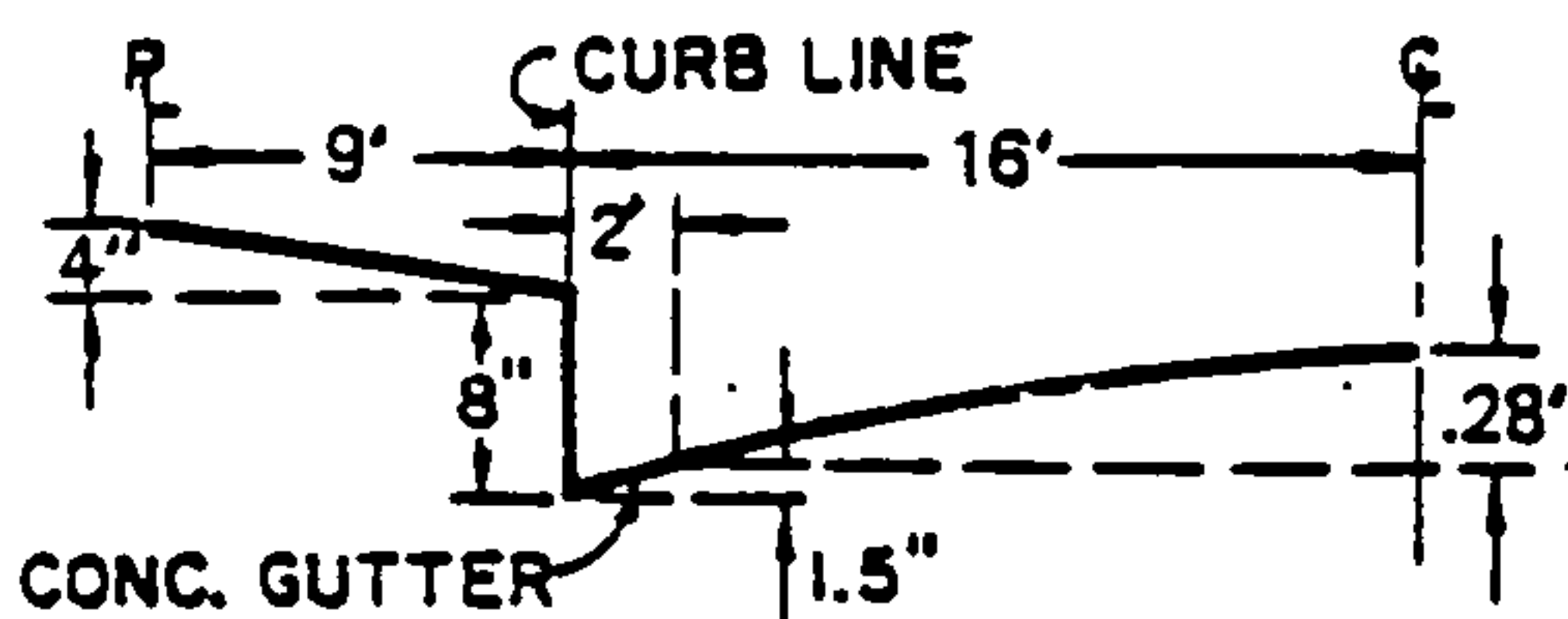
22.3

GRATING CAPACITIES FOR TYPE DOUBLE

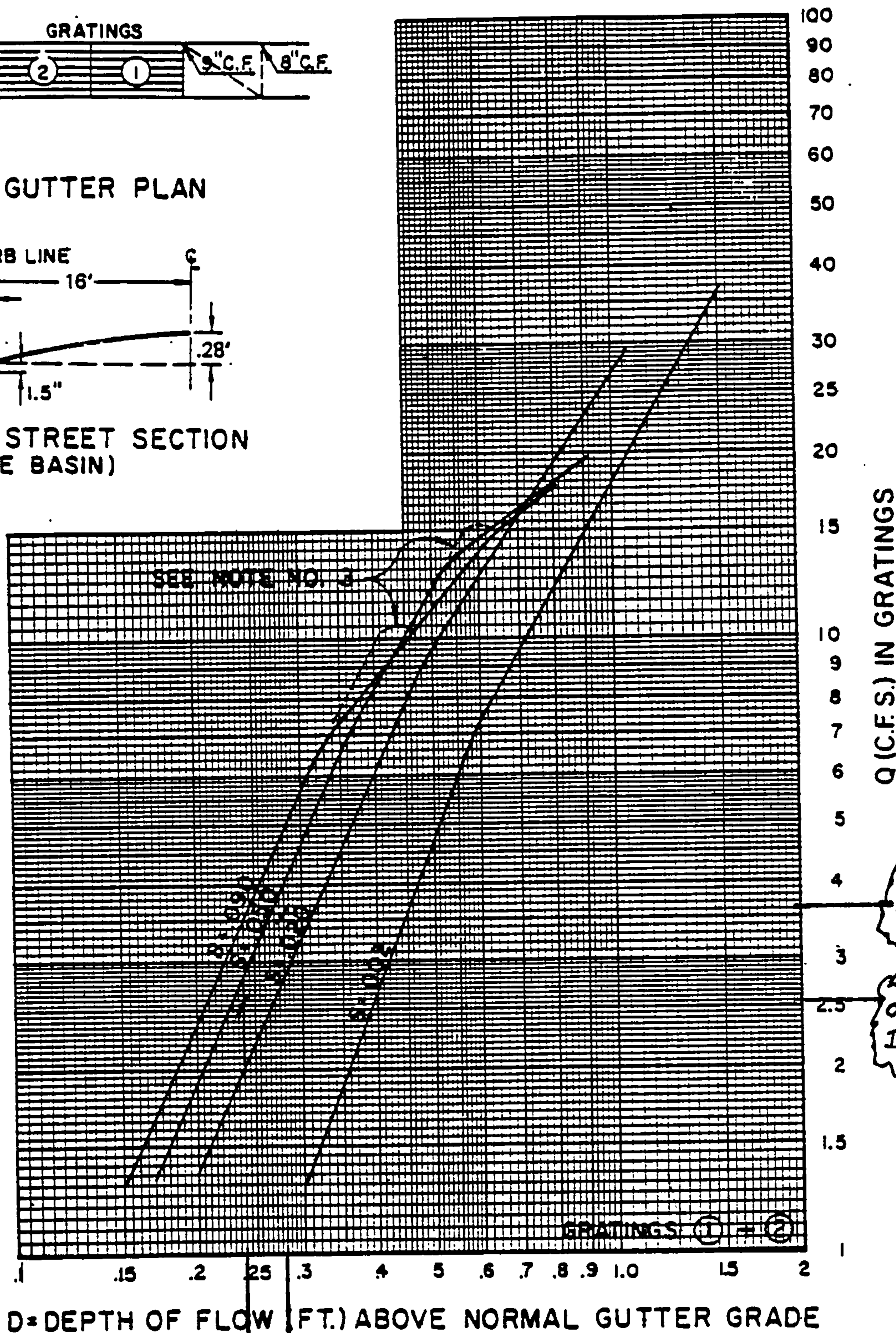
"C," AND "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)



Roadway Grade: 4.0%
Inlet 10: $Q_{100} = 4.62 \text{ cfs}$
Inlet 11: $Q_{100} = 7.74 \text{ cfs}$

REV. 3-83

Inlet 10: Type 'C' Double Grate
Inlet 11: Type 'A' Double Grate
PLATE 22.3 D-6

CHACO RIDGE AT HIGH DESERT - SUNRISE TRAIL PLACE 1

MANNING'S N = .0170

SLOPE = .0400

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.39	7	36.03	99.33
2	9.00	99.67	5	23.00	99.63	8	37.00	99.67
3	9.97	99.33	6	35.00	99.39	9	46.00	100.00

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
99.38	0.05	0.1	0.1	2.0	1.5	2.00
99.43	0.10	0.3	0.5	6.7	2.0	6.63
99.48	0.15	0.7	1.9	12.0	2.7	11.92
99.53	0.20	1.4	4.8	17.3	3.3	17.20
99.58	0.25	2.4	9.7	22.6	4.0	22.49
99.63	0.30	3.7	16.8	27.9	4.5	27.77
99.68	0.35	5.1	28.1	28.7	5.5	28.55
99.73	0.40	6.6	40.7	31.4	6.2	31.27
99.78	0.45	8.2	55.6	34.1	6.8	34.00
99.83	0.50	10.0	73.1	36.9	7.3	36.73
99.88	0.55	11.9	93.2	39.6	7.8	39.45
99.93	0.60	13.9	116.1	42.3	8.3	42.18
99.98	0.65	16.1	141.9	45.0	8.8	44.91
100.00	0.67	17.0	153.0	46.1	9.0	46.00

$Q_{100} = 13.61$

CHACO RIDGE AT HIGH DESERT - SUNRISE TRAIL PLACE 2

MANNING'S N = .0170

SLOPE = .0400

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	100.00	4	11.00	99.13	7	37.00	99.00
2	9.00	99.67	5	23.00	99.35	8	37.00	99.67
3	9.00	99.00	6	35.00	99.13	9	46.00	100.00

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
99.05	0.05	0.0	0.1	1.6	1.4	1.54
99.10	0.10	0.2	0.3	3.3	2.3	3.08
99.15	0.15	0.4	0.9	6.5	2.6	6.18
99.20	0.20	0.8	2.3	12.0	2.9	11.64
99.25	0.25	1.5	5.2	17.6	3.4	17.09
99.30	0.30	2.5	10.0	23.2	4.0	22.55
99.35	0.35	3.8	17.1	28.7	4.5	28.00
99.40	0.40	5.2	28.8	28.8	5.6	28.00
99.45	0.45	6.6	42.9	28.9	6.5	28.00
99.50	0.50	8.0	59.0	29.0	7.4	28.00
99.55	0.55	9.4	77.1	29.1	8.2	28.00
99.60	0.60	10.8	97.0	29.2	9.0	28.00
99.65	0.65	12.2	118.6	29.3	9.7	28.00
99.70	0.70	13.6	137.2	31.1	10.1	29.64
99.75	0.75	15.2	155.0	33.9	10.2	32.36
99.80	0.80	16.8	175.1	36.7	10.4	35.09
99.85	0.85	18.7	197.8	39.5	10.6	37.82
99.90	0.90	20.6	223.1	42.4	10.8	40.55
99.95	0.95	22.7	251.1	45.2	11.1	43.27
100.00	1.00	25.0	281.9	48.0	11.3	46.00

$Q_{100} = 15.18$

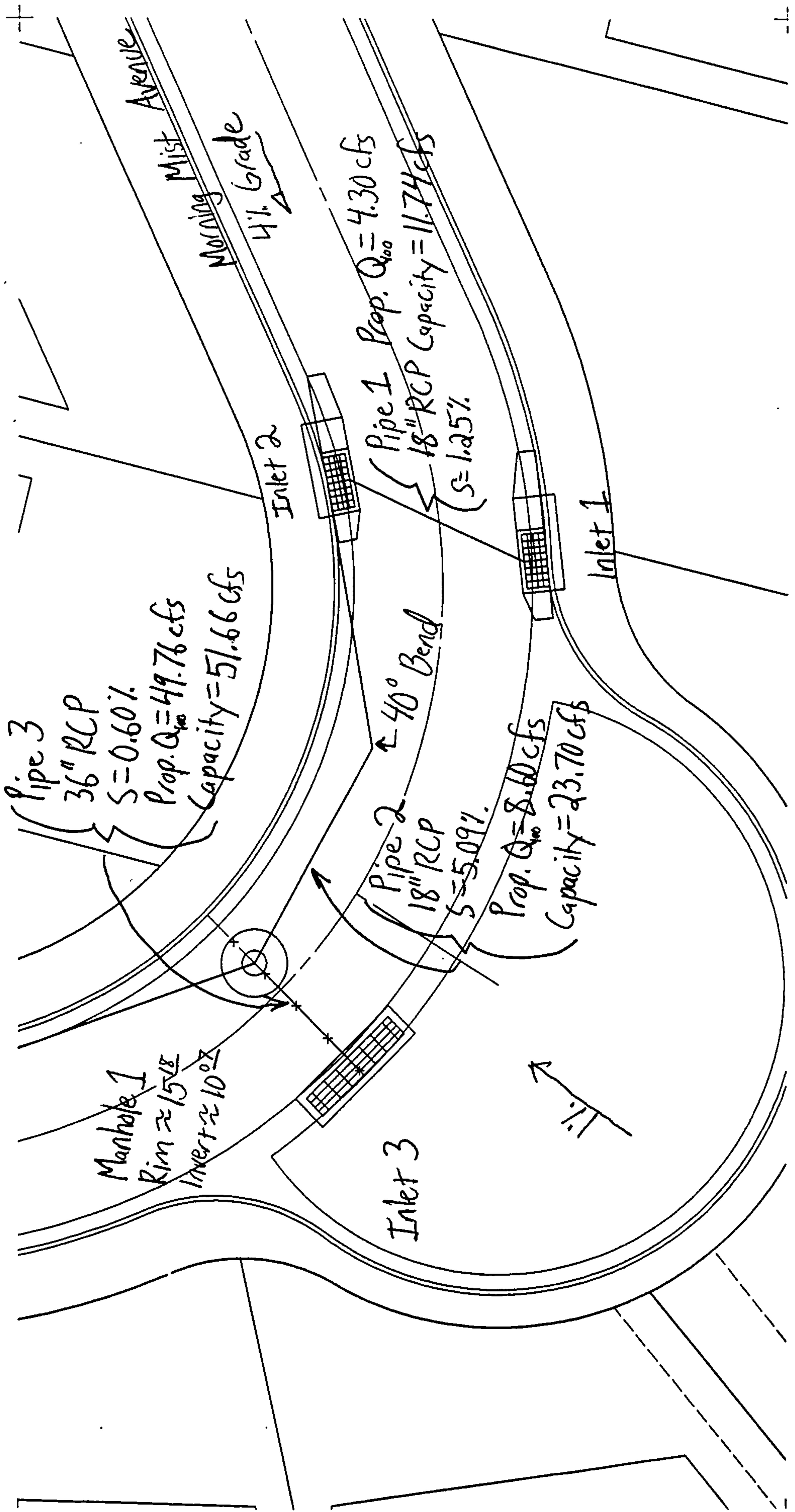
**CULVERT ANALYSIS FOR
CHACO RIDGE AT HIGH DESERT (TRACT 9B)**

PIPE NO.	PIPE LOCATION	SIZE/ TYPE	LENGTH (ft)	SLOPE (%)	PROPOSED Q (100-YR, CFS)	PIPE CAPACITY (100-YR, CFS)
1	INLET 1 TO INLET 2	18" RCP	32.00	1.25	4.30	11.74
2	INLET 2 TO MANHOLE 1	18" RCP	65.00	5.09	8.60	23.70
3	INLET 3 TO MANHOLE 1	36" RCP	17.00	0.60	49.76	51.66
4	MANHOLE 1 TO MANHOLE 2	36" RCP	60.00	0.77	58.36	58.53
5	INLET 4 TO MANHOLE 2	18" RCP	19.00	2.18	8.80	15.51
5A	INLET 4A TO MANHOLE 2	18" RCP	9.00	2.11	NUISANCE FLOWS ONLY	
6	MANHOLE 2 TO MANHOLE 3	36" RCP	143.00	1.02	67.16	67.36
7	INLET 5 TO MANHOLE 3	18" RCP	19.00	13.32	8.60	38.34
8	MANHOLE 3 TO MANHOLE 4	36" RCP	237.00	1.30	75.76	76.04
9	INLET 6 TO INLET 7	18" RCP	60.00	3.73	4.20	20.29
10	INLET 7 TO INLET 8	18" RCP	28.00	1.64	7.90	13.45
11	INLET 8 TO MANHOLE 4	18" RCP	60.00	19.32	12.80	45.76
12	MANHOLE 4 TO MANHOLE 5	36" RCP	213.00	1.77	88.56	88.74
13	MANHOLE 5 TO MANHOLE 6	36" RCP	212.00	2.20	63.68	98.93
14	MANHOLE 6 TO MANHOLE 7	36" RCP	235.00	6.48	63.68	169.79
15	INLET 9 TO INLET 10	18" RCP	60.00	5.60	2.80	24.86
16	INLET 10 TO MANHOLE 7	18" RCP	17.00	49.29	5.35	73.75
17	INLET 11 TO MANHOLE 7	18" RCP	24.00	30.75	3.60	58.25
18	MANHOLE 7 TO MANHOLE 8	48" RCP	168.00	0.26	72.63	73.24
19	MANHOLE 8 TO SOUTH PINO SD	48" RCP	185.00	0.26	72.63	73.24

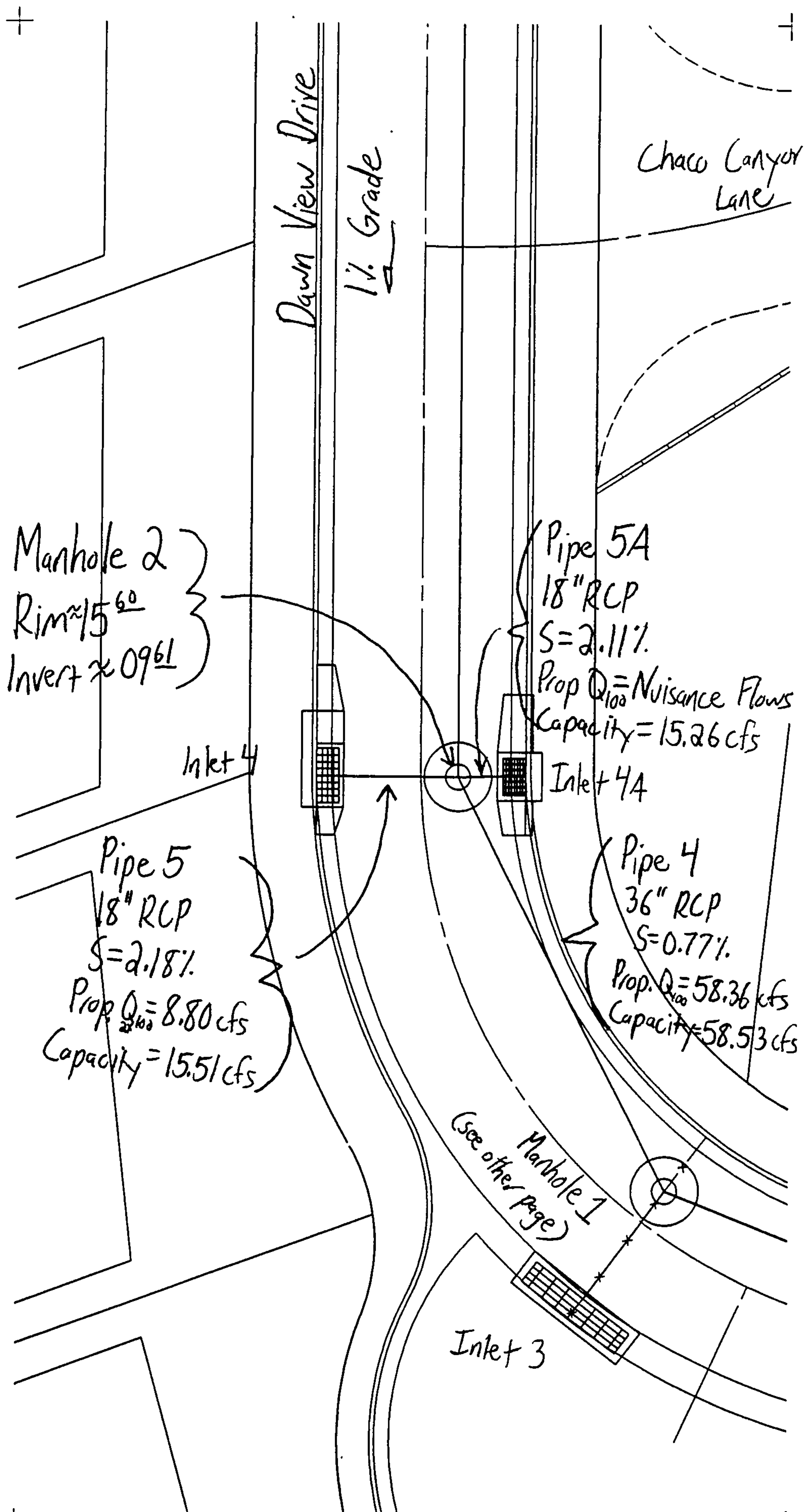
NOTE:

The 2x100-year storm flows were used in the storm drain system analysis from Inlet 3 (the sump inlet) to Manhole 5 located in the Sunrise Trail Place cul-de-sac.

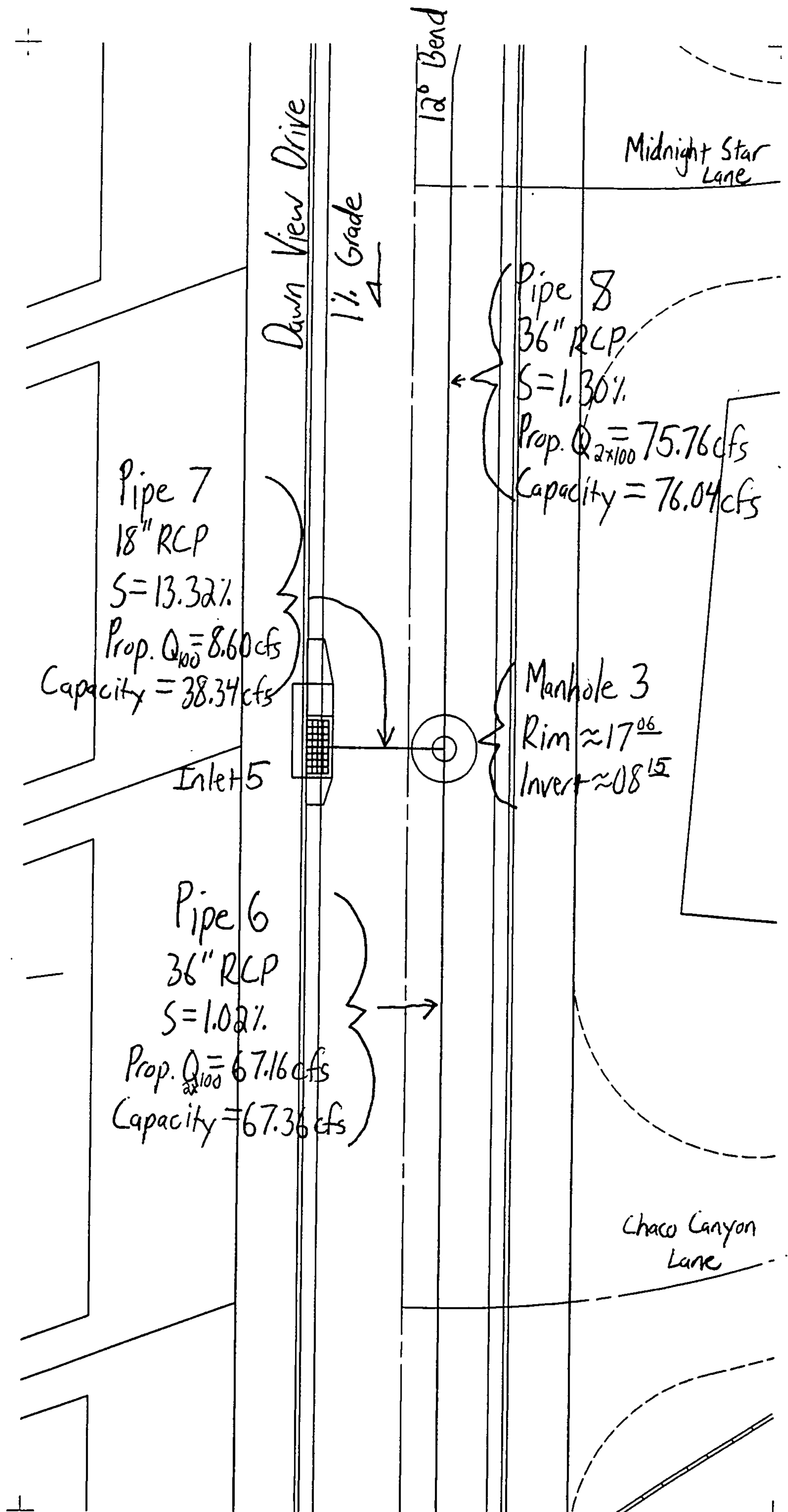
North



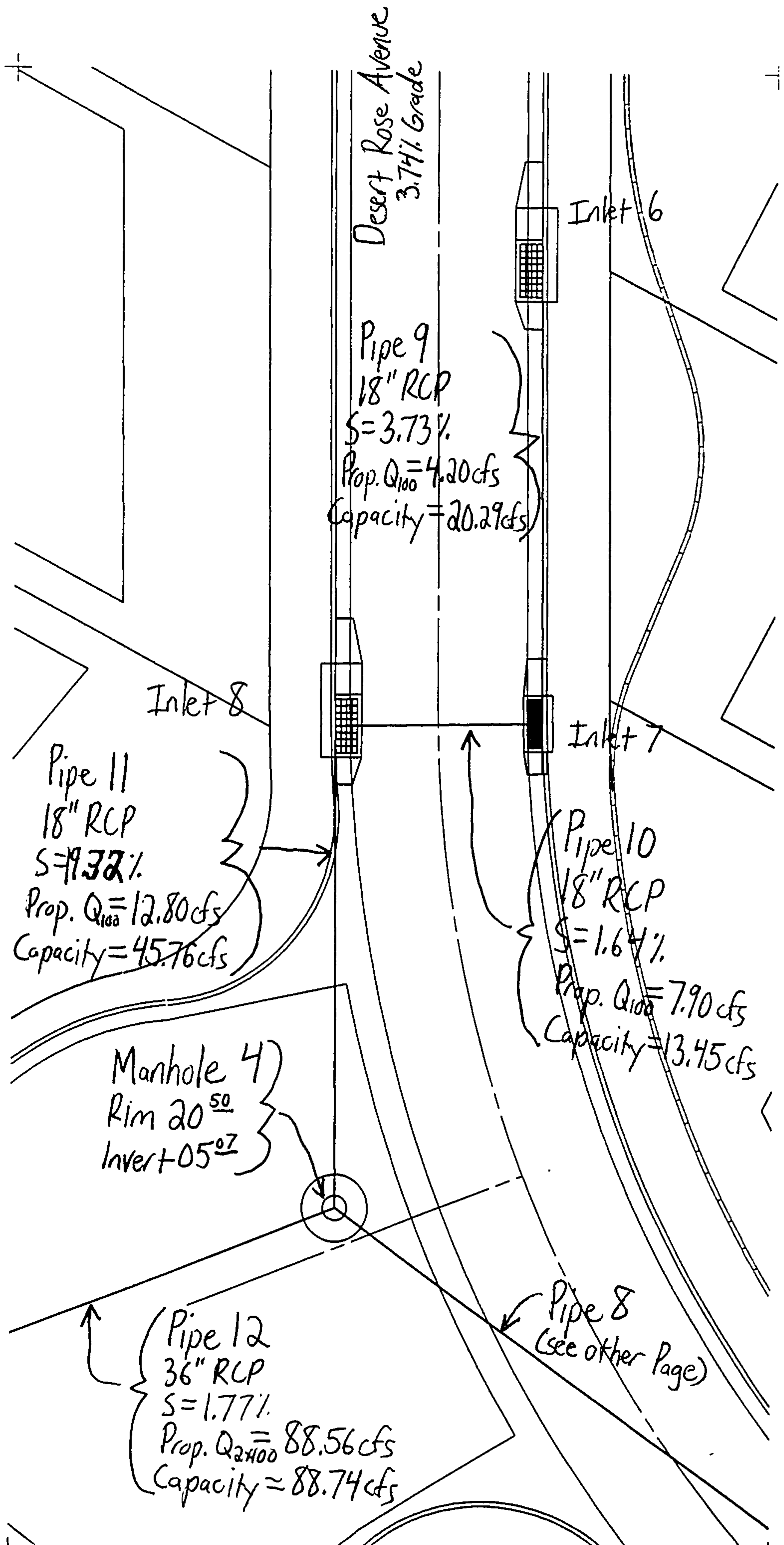
North.



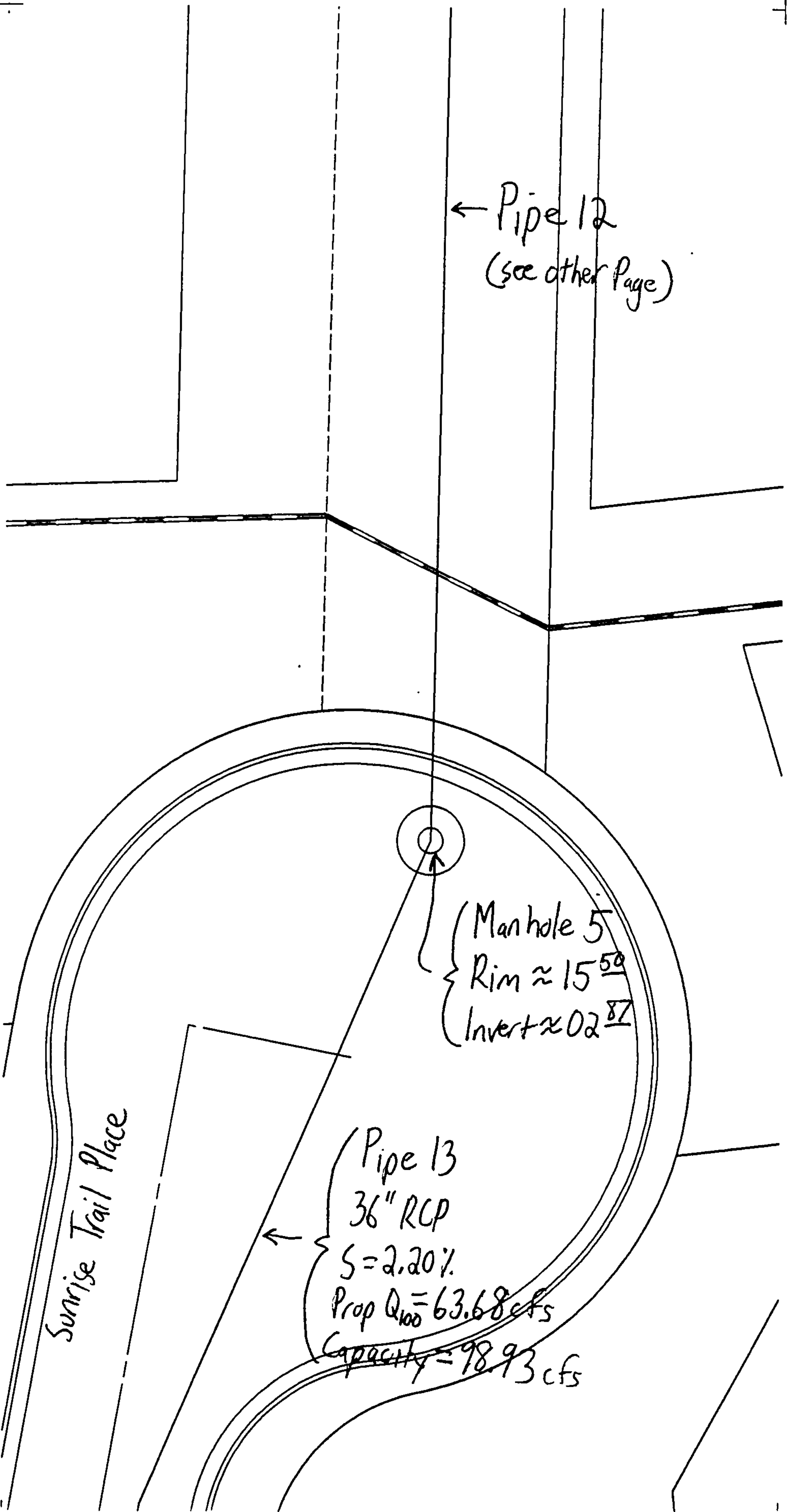
North



North



← North



North

Sunrise Trail Place
4% Grade

Pipe 13
(see other page)

Manhole 6
Rim ≈ 0621
Invert ≈ 9821

Pipe 14
36" RCP
 $S = 6.48\%$
Prop. $Q_{100} = 63.68 \text{ cfs}$
Capacity = 169.79 cfs

Pipe 14 →
(See other page)

Sunrise Trail Place
47' Grade

Inlet 9

(Pipe 15
18" RCP
S = 5.60%
Prop. $Q_{100} = 2.80$ cfs
Capacity = 24.86 cfs)

Pipe 17
18" RCP
S = 30.75%
Prop. $Q_{100} = 3.60$ cfs
Capacity = 58.25 cfs

Inlet 11

Inlet 10

(Pipe 16
18" RCP
S = 49.29%
Prop. $Q_{100} = 5.35$ cfs
Capacity = 73.75 cfs)

Pipe 18
48" RCP
S = 0.26%
Prop. $Q_{100} = 72.63$ cfs
Capacity = 73.24 cfs

38° Bend

(Manhole 7
Rim ≈ 96.86
Invert ≈ 83.04)