CHARLOTTE PARKWAY STORM SEWER
DESIGN MEMO
COLORADO SPRINGS
EL PASO COUNTY, COLORADO

SEPTEMBER 18, 1998

PREPARED FOR:

Ridgeview Development
616 W. Monument
Colorado Springs, CO 80905

PREPARED BY:

URS Greiner, Inc.

8415 Explorer Drive,
SUITE 110
COLORADO SPRINGS, CO 80920

URSG PROJECT NO. 67-42271

Engineer's Statement:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the City for drainage reports and said report is in conformity with the Sand Creek Drainage Basin Planning Study. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

_____________________ 10/9/98

Charles K. Cothern, P.E. #24997 Date

Developer's Statement:

I, the developer have read and will comply with all of the requirements specified in this drainage report and plan.

Ridgeview Development, LLC
Business Name

By: _____________________

Title: DEV. MNGR.

Address: 616 W. Monument
Colorado Springs, CO 80906

City of Colorado Springs:

Filed in accordance with Section 15-3-906 of the Code of the City of Colorado Springs, 1980, as amended.

_____________________ 11/13/98

City Engineer Date

Conditions:

Charlotte Parkway Storm Sewer Design Memo

This design memo addresses the "core" storm sewer system proposed for Charlotte Parkway north of Stetson Hills Blvd. to La Plata Peak Drive. The area draining to this storm sewer is addressed in the Ridgeview Subdivision Master Development Drainage Plan. (Reference 1).

The 100-year design flow entering the system at Storm MH V-6 (at the intersection of La Plata Peak Drive and Uncompahgre) is 283 cfs. Based on the MDDP, the ultimate design flow is 324 cfs. The upstream end of the system is a 60" RCP storm sewer in Uncompahgre from La Plata Peak Drive to Charlotte Parkway. A 66" RCP storm sewer is used for the remainder of the system until it discharges to the proposed 8'x 10' RCB under Stetson Hills Boulevard (by others). The storm sewer is at supercritical slope, flowing partially full, therefore the Hydraulic Grade Line remains within the pipe except for some brief distances immediately upstream of manholes.

Inlet locations along the Charlotte Parkway "core" have been selected based upon basin delineation and design flows (rational method) as calculated by Nolte & Associates and submitted under separate cover as part of the Melody Homes subdivision submittal. Several inlets connect to the system as shown in Figure 1.

Inlets 1 and 2 are 20-ft radial inlets in the intersection of Charlotte Parkway and Stetson Hills Blvd. These sump inlets collect flow from both Charlotte and Stetson Hills. The east inlet will connect to the west inlet via a 36" RCP. The west inlet will connect directly to the 8' x 10' RCB via a 48" RCP.

Inlets 3, 4, 5 and 6 are 15-ft Type R inlets at the low points of Vermillion Bluffs and Summit Peak drive, just east of Charlotte Parkway. The 5-year design flow in the west side of Charlotte is expected to turn the corner into Summit Peak Drive and Vermillion Bluffs, but a portion of the 100-year storm was assumed to continue in Charlotte Parkway to the sumps at the intersection with Stetson Hills. Inlets 5 and 6 connect to the storm sewer trunk line at a manhole on the main trunk sewer via a 30" RCP in Summit Peak Drive. Inlets 3 and 4 connect to a manhole on the trunk via a 36" RCP in Vermillion Bluffs.

Inlets 7, 8 and 9 connect directly to the storm trunk line in Uncompahgre, northeast of Charlotte. These are proposed to be 15-ft Type R, on-grade inlets. Additional inlets are proposed at the intersection of Uncompahgre and Poudre Way (sump inlets), and at Poudre Way and Huerfano Drive, and are to be constructed by others.

The storm sewer trunk line has been designed to operate partially full for the 100-year event to avoid pressurizing the system. The hydraulic grade line was determined for the 100-year flow and is shown on the attached profile. The downstream starting point for the HGL was established from the plan set for the previously proposed 8' x 10' RCB across Stetson Hills Boulevard (Reference 2). Calculations for friction losses and junction losses were performed to establish the hydraulic grade line back upstream (see attachment).

The following cost estimate is for the construction of the "core" storm sewer system only. It includes the laterals, manholes and inlets in Vermillion Bluffs and Summit Peak. It does not include the sump inlets at Uncompahgre and La Plata Peak, or any additional lateral lines to be constructed by others.

RIDGEVIEW - CHARLOTTE PARKWAY

COST ESTIMATE - CHARLOTTE "CORE" STORM SEWER

FROM STETSON HILLS BLVD TO MH AT UNCOMPAHGRE AND LA PLATA PK

18-Sep-98

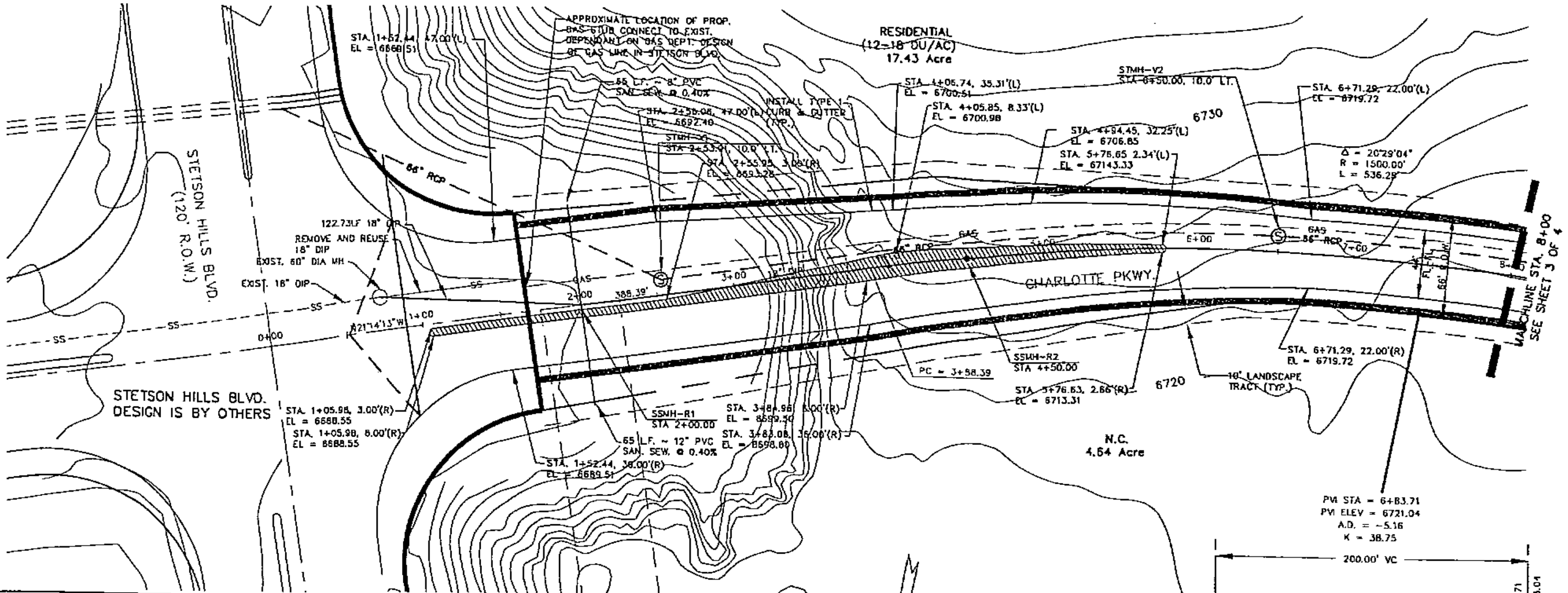
ITEM	QUANTITY	UNIT	UNIT COST	EXTENSION
15' Type "R" Inlet	7	EA	4,756	33,292
20' Radial Inlet	2	EA	4,600	9,200
5' Diam Manhole	2	EA	5,000	10,000
Manhole, Box Base - Special	9	EA	5,400	48,600
24" RCP	141	LF	54.00	7,614
30" RCP	34	LF	66.00	2,244
36" RCP	212	LF	76.00	16,111
48" RCP	44	LF	104.00	4,576
60" RCP	1,217	LF	152.08	185,021
66" RCP	1,910	LF	169.63	323,941
SUBTOTAL, CHARLOTTE STORM SEWER			$	640,600
ENGINEERING (10%)			$	64,060
CONTINGENCY (10%)				64,060
TOTAL, CHARLOTTE STORM SEWER				768,720

This cost estimate is based on time-honored practices within the construction industry. As such, the engineer does not control the cost of labor, materials, equipment or a contractor's method of determining prcies and competetive bidding practices or market conditions. This estimate represents our best judgement as design professionals using current infromation available at the time of preparation. The engineer cannot guarantee that proposals, bids, and/or construction costs will not vary from this cost estimate.

REFERENCES

Reference 1: "Master Development Drainage Plan For Ridgeview Subdivisionk Colorado Springs, El Paso County, Colorado" prepared by URS Greiner, Inc., Revised August 20, 1998.

Reference 2: "Stetson Hills Filing No. 1" Storm Sewer Plan and Profile Sheet 18A, prepared by Greiner Engineering, March, 1985.



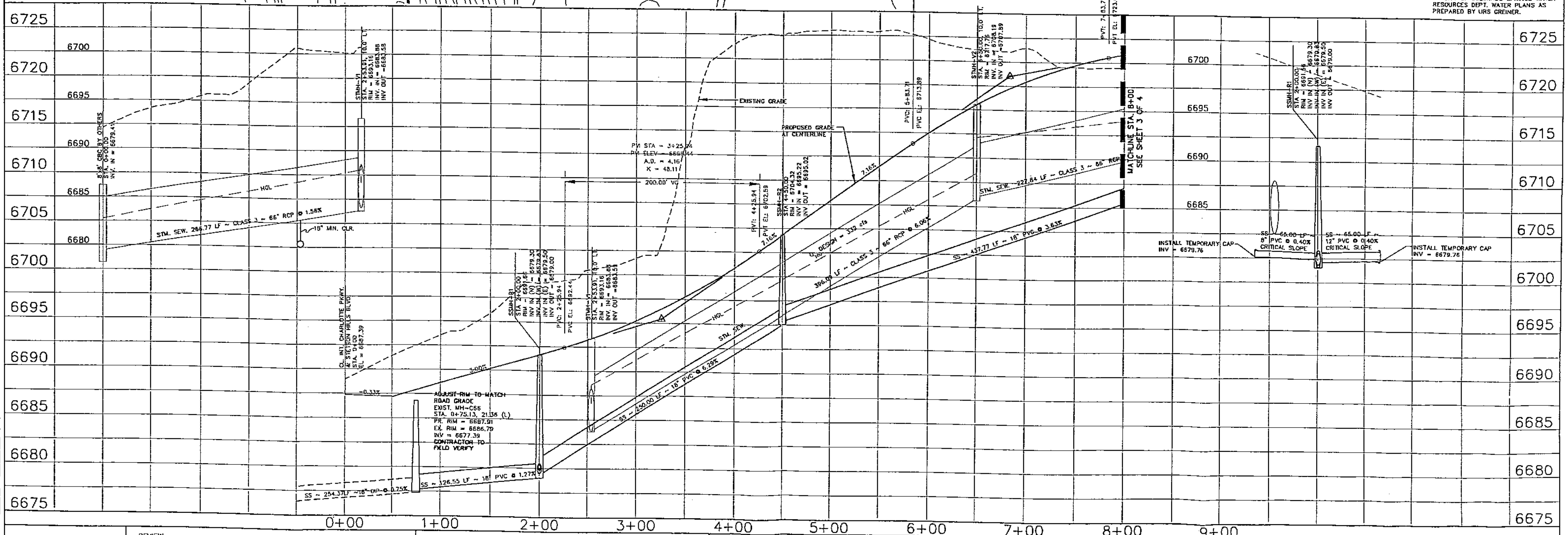
ANY CHANGES OR ALTERATIONS EFFECTING THE GRADE ALIGNMENT, ELEVATION, AND DEPTH OF COVER OF SEWERS AND APPURTENANCES SHOWN ON THESE DRAWINGS SHALL BE THE RESPONSIBILITY OF THE DEVELOPER.

OWNER _______________ DATE _______________

SCALE: 1" = 50'
N. T. S.

DESIGN SPEED = 35 MPH

FOR WATER MAIN CONSTRUCTION REFER TO CITY OF COLORADO SPRINGS WATER RESOURCES DEPT. WATER PLANS AS PREPARED BY URS GREINER.



REVIEW:		
STREET DESIGN:		
CURB & GUTTER REVIEW ____________	DATE: ________	
FINAL REVIEW ____________	DATE: ________	
DRAINAGE DESIGN:		

DESIGN DATA:

SIDEWALKS: WIDTH 5'
LOCATION: ATTACHED ▫
DETACHED, 6" FROM P/L ▪
CURB TYPE 1 ▪ 2 ▫ 3 ▫
R/W WIDTH 66' F/C-F/C 44'
STREET TYPE MAJ. RES. COLLECTOR
HVEEM ________

ASPHALT THICKNESS:
AC SURFACE 4.5"
AC BASE ________

AGGREGATE BASE THICKNESS:
CLASS 6 ________
CLASS 5 ________
CLASS 2 ________

SCALE: HORIZONTAL 1"=50' VERTICAL 1"=5'

BENCH MARK:

2" ALUMINUM FIMS CAP (PW02) ON THE NORTH CORNER OF ELECTRIC VAULT, NORTHWEST CORNER STETSON HILLS BOULEVARD AND POWERS BOULEVARD.

ELEV. = 6741.26

REVISIONS:

NO.	DESCRIPTION
1	ADDED PROFILE OF SS STUBS

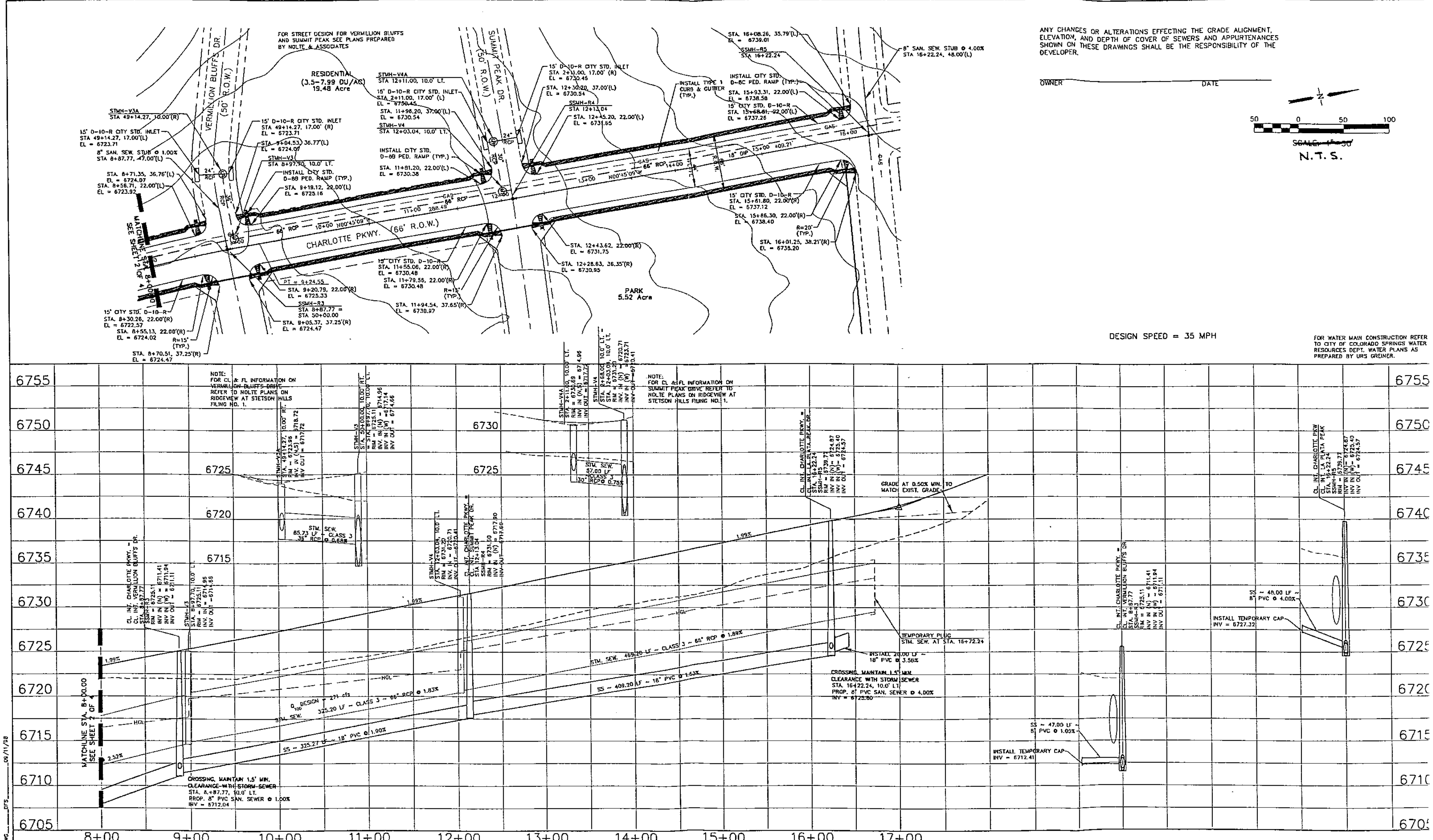
ENGINEER:

DESIGNED BY: DFS DATE: 05/01/98
DRAWN BY: DFS DATE: 05/01/98
CHECKED BY: CKC DATE: 05/21/98

URS Greiner
8415 EXPLORER DRIVE
COLORADO SPRINGS, CO
(719) 531-0001

PROJECT RIDGEVIEW
SHEET TITLE CHARLOTTE PARKWAY
FROM STA. 0+00.00 TO STA. 8+00.00
JOB NO. 6742271 SHEET 2 OF 4

6742271\CAD\ROADS\CHARL.DWG ____ DFS ____ 08/17/98



REVIEW:
STREET DESIGN:
CURB & GUTTER REVIEW ________ DATE: ________
FINAL REVIEW ________ DATE: ________
DRAINAGE DESIGN:

DESIGN DATA:
SIDEWALKS: WIDTH 5'
LOCATION: ATTACHED ○
DETACHED, 6" FROM P/L ■
CURB TYPE 1 ■ 2 □ 3 □
R/W WIDTH 66' F/C-F/C 44'
STREET TYPE MAJ. RES. COLLECTOR
HVEEM ________
ASPHALT THICKNESS:
AC SURFACE 4.5"
AC BASE ________
AGGREGATE BASE THICKNESS:
CLASS 6 ________
CLASS 5 ________
CLASS 2 ________

SCALE: HORIZONTAL 1"=50' VERTICAL 1"=5'
BENCH MARK:
2" ALUMINUM FIMS CAP (PWD2) ON THE NORTH CORNER OF ELECTRIC VAULT, NORTHWEST CORNER STETSON HILLS BOULEVARD AND POWERS BOULEVARD.
ELEV. = 6741.26

REVISIONS:

NO.	DESCRIPTION
1	LOWER SSMH-R5
2	ADDED PROFILE OF SS STUBS
3	CHANGED LOC. OF STMH V-3 / CSU
4	ADDED PROFILES OF STM SEW

ENGINEER:
DESIGNED BY: DFS DATE: 05/01/98
DRAWN BY: DFS DATE: 05/01/98
CHECKED BY: CKC DATE: 05/20/98

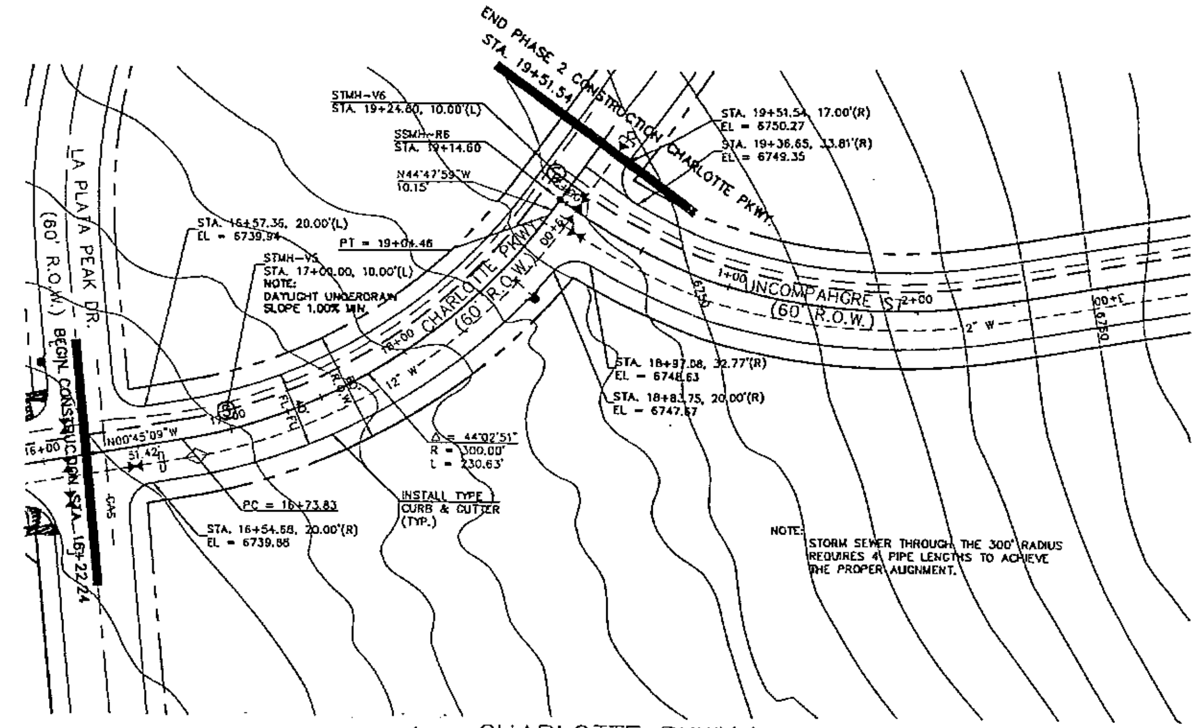
URS Greiner
8415 EXPLORER DRIVE
COLORADO SPRINGS, CO
(719) 531-0001

PROJECT RIDGEVIEW
SHEET TITLE CHARLOTTE PARKWAY
FROM STA. 8+00.00 TO STA. 16+22.24
JOB NO. 6742271 SHEET 3 OF 4

6742271\CAD\ROADS\CHAR2.DWG ____ DFS ____ 06/11/98

ANY CHANGES OR ALTERATIONS EFFECTING THE GRADE ALIGNMENT, ELEVATION, AND DEPTH OF COVER OF SEWERS AND APPURTENANCES SHOWN ON THESE DRAWINGS SHALL BE THE RESPONSIBILITY OF THE DEVELOPER.

OWNER ______________________ DATE ______

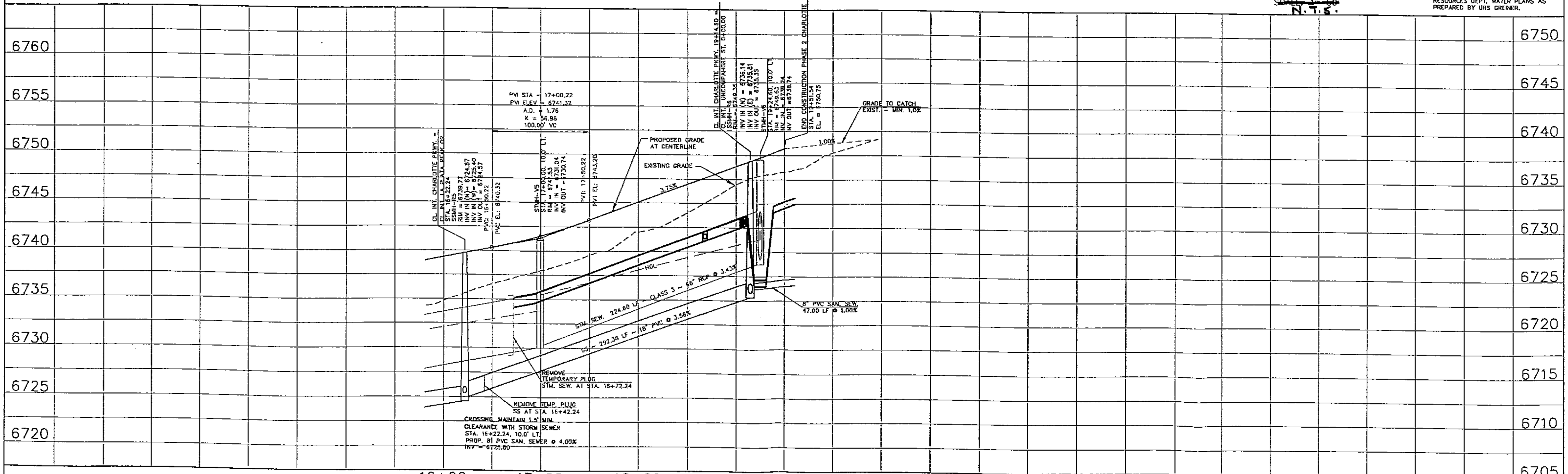


DESIGN SPEED = 35 MPH

FOR WATER MAIN CONSTRUCTION REFER TO CITY OF COLORADO SPRINGS WATER RESOURCES DEPT. WATER PLANS AS PREPARED BY URS GREINER.

SCALE: 1" = 50' N.T.S.

CHARLOTTE PKWY



REVIEW:
STREET DESIGN:
CURB & GUTTER REVIEW ____________ DATE: ________
FINAL REVIEW ____________ DATE: ________
DRAINAGE DESIGN:

DESIGN DATA:
SIDEWALKS: WIDTH 4'
LOCATION: ATTACHED □
DETACHED, 6" FROM P/L ■
CURB TYPE 1 ■ 2 □ 3 □
R/W WIDTH 60' F/C-F/C 40'
STREET TYPE MIN. RES. COLLECTOR
HVEEM ________

ASPHALT THICKNESS:
AC SURFACE 4.0"
AC BASE ________
AGGREGATE BASE THICKNESS:
CLASS 6 ________
CLASS 5 ________
CLASS 2 ________

SCALE: HORIZONTAL 1"=50' VERTICAL 1"=5'
BENCH MARK:
2" ALUMINUM FIMS CAP (PWD2) ON THE NORTH CORNER OF ELECTRIC VAULT, NORTHWEST CORNER STETSON HILLS BOULEVARD AND POWERS BOULEVARD.
ELEV. = 6741.26

REVISIONS:

NO.	DESCRIPTION

ENGINEER:

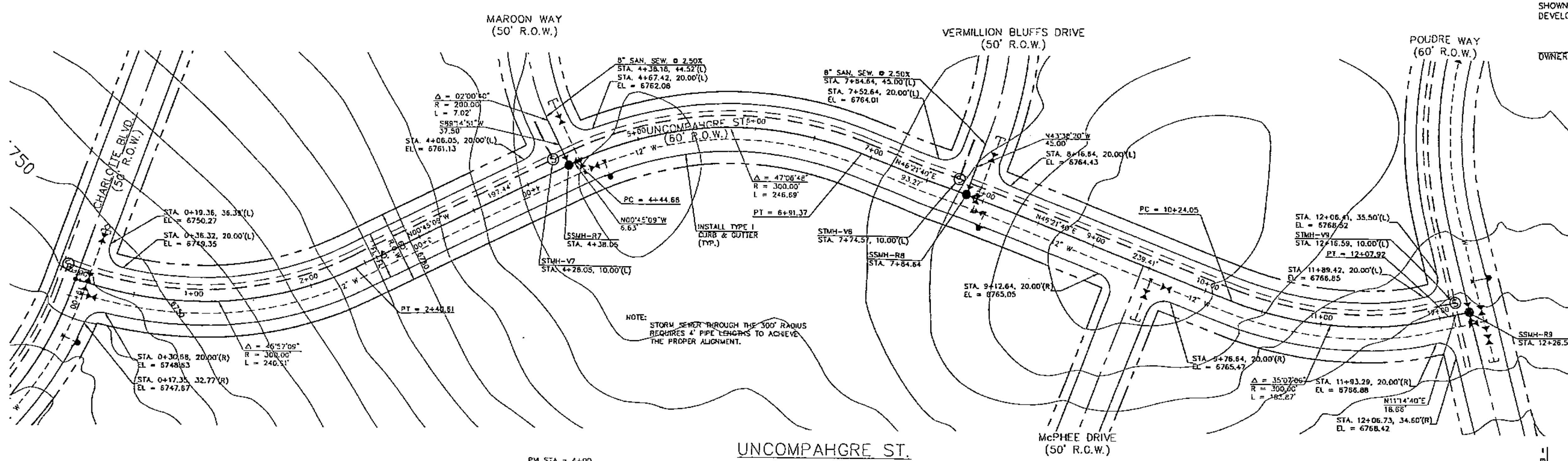
DESIGNED BY: DFS DATE: 08/12/98
DRAWN BY: DFS DATE: 08/12/98
CHECKED BY: CKC DATE: 08/13/98

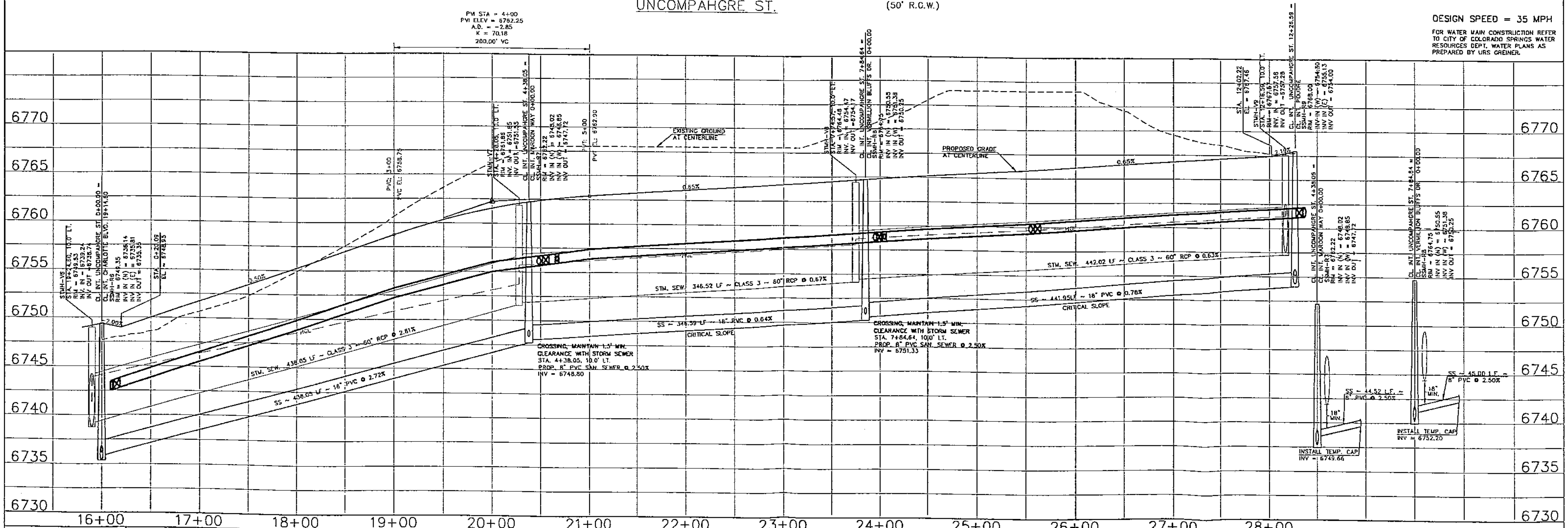
URS Greiner
8415 EXPLORER DRIVE
COLORADO SPRINGS, CO
(719) 531-0001

PROJECT RIDGEVIEW PHASE 2
SHEET TITLE CHARLOTTE PARKWAY
FROM STA. 16+22.24 TO STA. 19+51.54
JOB NO. 6742271 SHEET 2 OF 4

ANY CHANGES OR ALTERATIONS EFFECTING THE GRADE ALIGNMENT, ELEVATION, AND DEPTH OF COVER OF SEWERS AND APPURTENANCES SHOWN ON THESE DRAWINGS SHALL BE THE RESPONSIBILITY OF THE DEVELOPER.

OWNER ______________________ DATE ______





DESIGN SPEED = 35 MPH

FOR WATER MAIN CONSTRUCTION REFER TO CITY OF COLORADO SPRINGS WATER RESOURCES DEPT. WATER PLANS AS PREPARED BY URS GREINER.

REVIEW:
STREET DESIGN:
CURB & GUTTER REVIEW ______ DATE: ______
FINAL REVIEW ______ DATE: ______
DRAINAGE DESIGN:

DESIGN DATA:
SIDEWALKS: WIDTH 4'
LOCATION: ATTACHED □
DETACHED, 8" FROM P/L ■
CURB TYPE 1 ■ 2 □ 3 □
R/W WIDTH 60' F/C-F/C 40'
STREET TYPE MIN. RES. COLLECTOR
HVEEM ______

ASPHALT THICKNESS:
AC SURFACE 4.0"
AC BASE ______
AGGREGATE BASE THICKNESS:
CLASS 6 ______
CLASS 5 ______
CLASS 2 ______

SCALE: HORIZONTAL 1"=50' VERTICAL 1"=5'
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ELEV. = 6741.26

REVISIONS:

NO.	DESCRIPTION

ENGINEER:

DESIGNED BY: DFS DATE: 08/12/98
DRAWN BY: DFS DATE: 08/12/98
CHECKED BY: CKC DATE: 08/13/98

URS Greiner
8415 EXPLORER DRIVE
COLORADO SPRINGS, CO
(719) 531-0001

PROJECT RIDGEVIEW PHASE 2
SHEET TITLE UNCOMPAHGRE STREET
FROM STA. 0+00.00 TO STA. 12+26.59
JOB NO. 6742271 SHEET 3 OF 4

6742271\CAD\ROADS\CORE2.DWG DFS 08/12/98

APPENDICES

STORM SEWER PROFILE
HGL CALCS
(100-YEAR STORM)

HYDRAULIC GRADE LINE CALCS - CHARLOTTE STORM SEWER
RIDGEVIEW SUBDIVISION - URSG PROJECT 6742271
STORM SEWER HYDRAULIC CALCS

V=Q/A Full Flow V=1.49/n*(Rh^(2/3))*(S^0.5), partial flow
MANHOLE LOSS COEFFICIENT = 0.25
RCP n= 0.013
CONNECTS TO JUNCTION BOX TO 8'x8' RCBC UNDER STETSON HILLS BLVD AT MDDP DESIGN POINT 4

DESIGN FLOW (D/S END) =	324 cfs PER TR-20 MODEL DESIGN POINT 4 (TR-2) A =	0.22 sq mi		Stetson Hills Blvd. to first intersection
DESIGN FLOW (SECTION 2) =	283 cfs PER TR-20 MODEL DESIGN POINT 34A A =	0.20 sq mi		first intersection to Uncompahgre
DESIGN FLOW (SECTION 3) =	215 cfs PER TR-20 MODEL DESIGN POINT 34B A =	0.13 sq mi		Uncompahgre to Road "B"

NOTE 4' MINIMUM COVER OVER STORM SEWER

CHARLOTTE BLVD STORM SEWER : 66- AND 60- INCH PIPES (60 IN UNCOMPAGHRE)

START D/S HGL = 684.91 ft, Top of Pipe

FROM DP	TO DP	LENGTH (ft)	DESIGN Q (cfs)	PIPE D (ft)	FLOW DEPTH (ft)	DESIGN SLOPE ft/ft	V ft/s	Q cfs	Sf (ft/ft)	H_f (ft)	H_b (ft)	H_j (ft)	H_m (ft)	D/S END PIPE INVERT	TOP OF PIPE	WSEL OUT (ft)	HGL OUT (ft)	RIM EL	U/S END PIPE INVERT	TOP OF PIPE	WSEL IN (ft)	HGL IN (ft)	RIM EL
BOX	STMH V-1	266.77	324.00	5.5	3.62	0.0156	19.53	324.06	0.0157	4.19			1.48	679.41	684.91	684.91	684.91	714.90	683.57	689.07	687.19	687.19	693.16
STMH V-1	STMH V-2	396.09	324.00	5.5	2.39	0.0606	32.75	323.99	0.0610	24.14			4.16	683.87	689.37	686.26	688.67	693.16	707.87	713.37	710.26	710.26	717.76
STMH V-2	STMH V-3	227.84	324.00	5.5	3.04	0.0284	24.87	334.85	0.0286	6.51			2.40	708.17	713.67	711.21	714.43	717.76	714.65	720.15	717.68	717.68	725.11
STMH V-3	STMH V-4	325.20	283.00	5.5	3.16	0.0168	19.39	273.42	0.0169	5.50			1.46	714.95	720.45	718.10	720.08	725.11	720.41	725.91	723.56	723.56	731.20
STMH V-4	STMH V-5	469.20	283.00	5.5	3.11	0.0192	20.62	285.28	0.0193	9.06			1.65	720.71	726.21	723.82	725.02	731.20	730.74	736.24	733.85	733.85	741.53
STMH V-5	STMH V-6	224.60	283.00	5.5	2.60	0.0343	25.61	282.98	0.0345	7.75			2.55	731.04	736.54	733.64	735.60	741.53	738.74	744.24	741.34	741.34	749.53
STMH V-6	STMH V-7	428.05	215.00	5	2.47	0.0281	22.20	215.02	0.0283	12.10			1.91	739.24	744.24	741.72	743.89	749.53	751.27	756.27	753.75	753.75	761.86
STMH V-7	STMH V-8	346.52	215.00	5	4.13	0.0067	12.41	214.99	0.0067	2.34			0.60	751.57	756.57	755.70	755.71	761.86	753.89	758.89	758.02	758.02	764.48
STMH V-8	STMH V-9	442.02	215.00	5	4.29	0.0063	11.99	215.00	0.0063	2.80			0.56	754.19	759.19	758.48	758.62	764.48	756.98	761.98	761.27	761.27	767.57

INLET DESIGN
(5-YEAR STORM)

EXHIBIT 5.3-1
URS Greiner
CALCULATION COVER SHEET

Client: RDS   Project Name: Ridgeview - Charlotte

Project/Calculation Number: 0742271

Title: Inlet Spacing Calcs

Total number of pages (including cover sheet): ______

Total number of computer runs: ______

Prepared by: Adrienne Robberson   Date: 8-19-98

Checked by: DANNY ELSNER   Date: 9-8-98

Description and Purpose:

- determine location and size of inlets along Charlotte Blvd Core street.

Design bases/references/assumptions:

- calculations of flows provided by Nolte + Assoc.

Remarks/conclusions:

[illegible]
[illegible]
5-YEAR ONLY

Calculation Approved by: ______

Project Manager/Date

Revision No.:	Description of Revision:	Approved by:

Project Manager/Date

URS Greiner

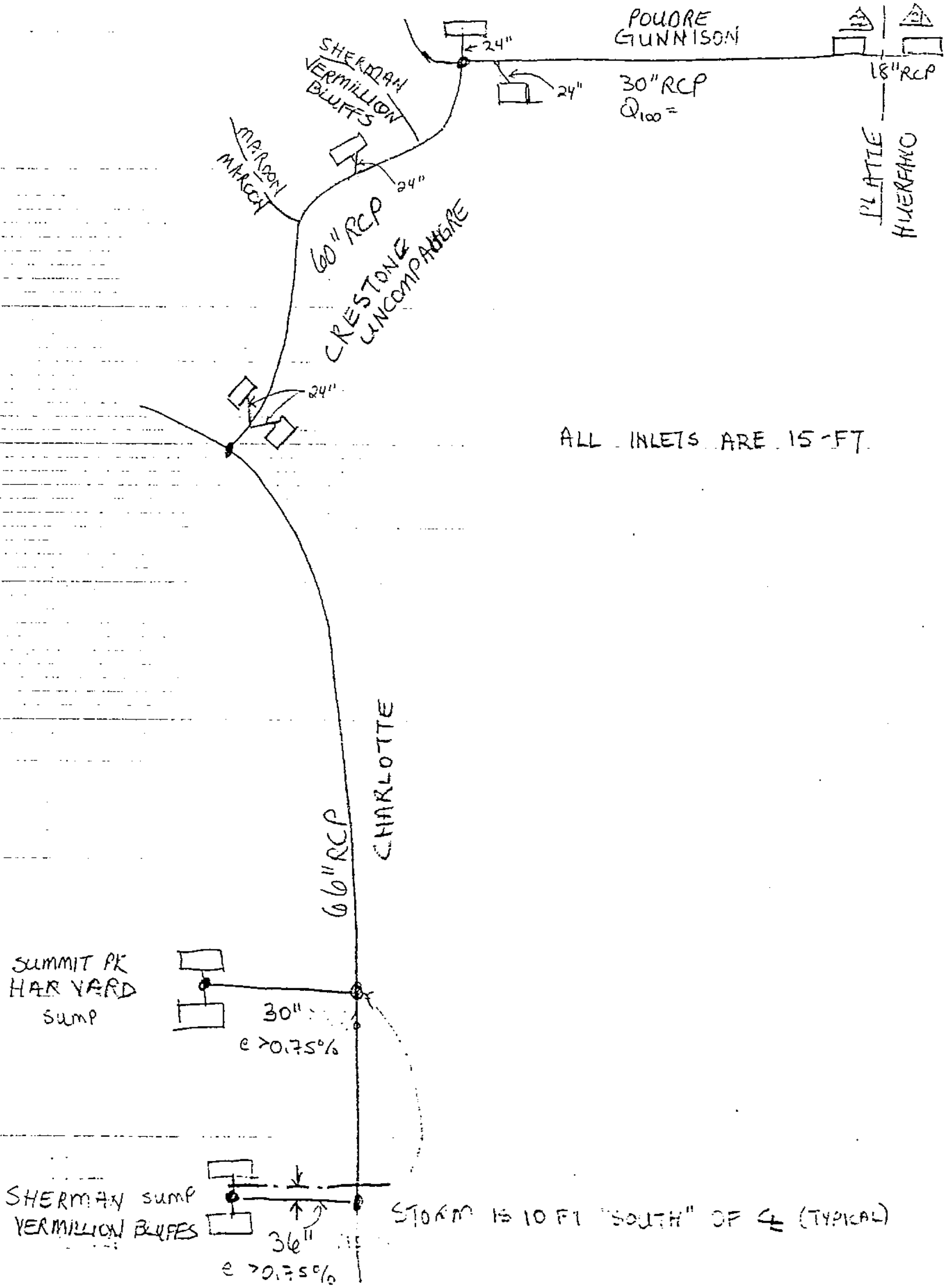
JOB NUMBER 0674227 PAGE ___ OF ___

DATE 8/27/98 BY ALR CHECKED BY ___ (date)

CLIENT ___

PROJECT ___

SUBJECT CONCEPTUAL PLAN OF INLETS TO CHARLOTTE - FYI



ALL INLETS ARE 15-FT

STORM IS 10 FT "SOUTH" OF ℄ (TYPICAL)

URS
CONSULTANTS, INC.

URS JOB NO. ____ PAGE ____ OF ____

DATE ____ BY ____ CHECKED BY ____ (date)

CLIENT ____

PROJECT ____

SUBJECT ____

INLET DESIGN

(5-YEAR STORM)

URS
CONSULTANTS, INC.

URS JOB NO. 6742271.04.0004 PAGE 1 OF ____
DATE 8/12/98 BY RLR CHECKED BY [illegible] (date)
CLIENT RDS
PROJECT RIDGEVIEW - CHARLOTTE STORM
SUBJECT CHARLOTTE STORM SEWER - DESIGN FLOWS

PROBLEM: ANALYZE CONTRIBUTING AREAS TO CHARLOTTE AND DETERMINE INLET SIZES AND LOCATIONS WHERE NECESSARY.

REFERENCE: NOLTE DESIGN FLOWS AND BASINS, PROFILE INFORMATION ON ADJACENT STREETS, RIDGEVIEW MDDP BY URSG

NOTE. BACKGROUND INFORMATION (DESIGN FLOWS, PROFILE INFORMATION) AND OTHER DATA HAVE BEEN FURNISHED TO URSGREINER BY NOLTE & ASSOCIATES, WHICH URS GREINER HAS USED IN PREPARING THESE CALCULATIONS. URS GREINER HAS RELIED ON THIS INFORMATION AS FURNISHED, AND IS NOT RESPONSIBLE FOR AND HAS NOT CONFIRMED THE ACCURACY OF THIS INFORMATION.

STREET SECTIONS: CHARLOTTE = 44 FT S. OF THE PARK, 40 FT N. OF THE PARK.
UNCOMPAGHRE ~~CRESTONE~~ = ASSUME 36 FT (POSSIBLY 40 FT)
REMAINING RESIDENTIAL = 34 FT.
TYPE I = 8" VERTICAL CURB

URS
CONSULTANTS, INC.

URS JOB NO. 6742271.04 PAGE 2 OF ____

DATE 8/12/98 BY AIR CHECKED BY [illegible] (date)

CLIENT RDS

PROJECT RIDGEVIEW

SUBJECT CHARLOTTE STORM

REFERENCE: NOLTE DWG "BASIN MAP" AND ASSOCIATED CALCS.

BYPASS FROM INLETS AT DP 21 AND 22 WILL GO TO CHARLOTTE

DP 22 N.W. SIDE GUNNISON AND PLATTE $Q_5 = 13.14$ cfs $Q_{100} = 26.77$

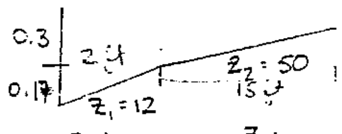
STREET SLOPE = 0.70 % (GRADE. DWG)

STREET CAPACITY – 5-YR $D_{max} = 2" + 0.30' = 0.47$ FT ✓

MAX T = 17 FT.

$Q_5 = \{(750, 0.47) - (750, 0.3) + (3125, 0.3)\}$

$= 4.5 - 1.4 + 5.5 = 8.6$ cfs ✓



A = 3.0 sf
V = 2.85 fps

CAPACITY EXCEEDED, SO PUT INLET ON N.E SIDE ALSO

TRIBUTARY AREA = BASIN 18g $Q_5 = 4.1$ $Q_{100} = 8.24$ → verify!

ON GRADE INLET S = 0.7%

$\therefore y \to 0.17 + \left(\frac{0.47 - 0.17}{8.6 - 0.3}\right) \times (8.24 - 0.3)$ $y = 0.46'$ so T = 16.5 ft ✓

$S_x (T-2) = .02 \times 14.5 = \underline{0.29}$ ✓

FROM FIG 7-9 10-FT INLET CAPTURES 65% ($Q_{100} = 5.3$ cfs) ✓

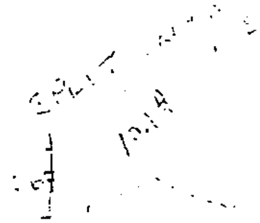
15-FT " " 79% ($Q_{100} = 6.5$ cfs) ✓

15-FT. TO MAXIMIZE CAPTURE

Q_{100} BYPASS = 1.74 cfs

D.P 22 $Q_{100} = 26.77$ cfs $- Q_{100}(18g) + Q_{100}$ BYPASS

$= 26.77 - 8.24 + 1.74 = 20.27$ cfs ✓



ON GRADE INLET S = 0.7 %

from above for Q = 8.6 cfs A = 3.0 sf → 2.85 fps

∴ req'd A = 20.27 ÷ 2.85 = 7.11 sf − 3.0 sf = 4.11 sf

[illegible]

4.11 ÷ 15 = 0.27 ft

[illegible]

y = 0.47 + 0.27 = 0.74 T = 17 ft

S_x (T−2) = 0.30

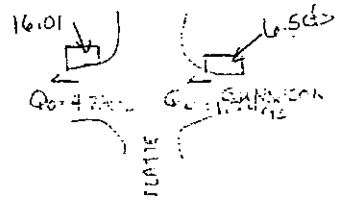
SUBJECT CHARLOTTE STORM

8.01

FROM FIG 7-9 A 15-FT INLET CAPTURES 79% → Q_c = ~~16.01~~ cfs
A 20-FT INLET CAPTURES 85% → Q_c = 17.23 cfs

∴ USE A 15-FT INLET (EXPENSE ISN'T WORTH THE SLIGHT DIFFERENCE TO ...

Q_{BYPASS} = 20.27 − ~~16.01~~ 8.01 = ~~4.26~~ 12.26 cfs
TO CHARLOTTE SYSTEM.



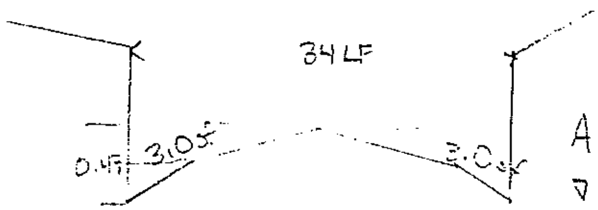
3.66 (N) 8.6 south

CRESTONE / GUNNISON INTERSECTION – NOLTE DESIGN PT 24
TRIBUTARY BASINS 18 A-G BUT DP 22 CONSIDERED 18 E, D, F & G

∴ DESIGN Q_{100} AT DP 24 = DP 24 — DP 22 + BYPASS

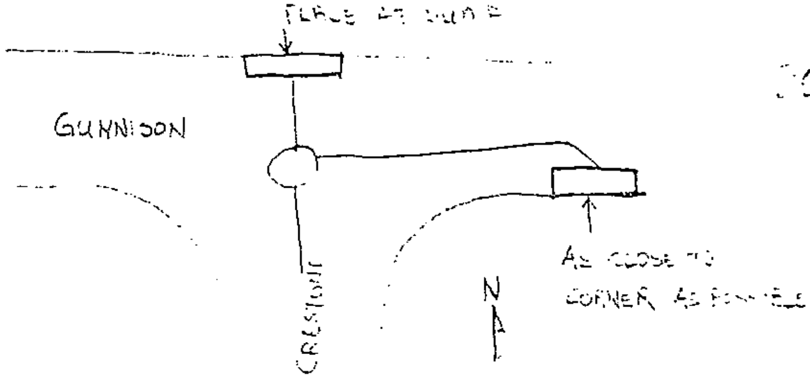
Q_{100} = 57.14 − 26.77 + 4.26 = 34.63 cfs

FLOW WILL TOP CROWN
MAX FLOW TO CROWN (@ 0.7%) = 8.6 cfs
ASSUME FLOW SPLIT BETWEEN 2 SIDES → 17.32 cfs each side
21.31



A to crown = 3.0 cfs × 2 = 6.0 cfs
V = 2.85 fps → A req'd = 12.15 sf
(12.15 − 6.0) ÷ 34 → 0.19 ft

total depth = 0.47 + 0.19 = 0.66 ft (... → OK)
FROM FIG 7-11, USE 15-FT INLETS



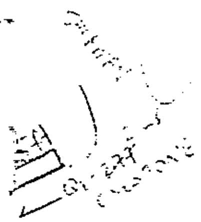
intercepts ... flow

CRESTONE ST. - 36 FT SECTION - UPPER (N. END) SLOPE = 0.65%
FROM NOLTE GRADE.DWG.

5-YEAR STREET CAPACITY d_{max} = crown = 2" + (16' x .02) = 0.49 ft
T_{max} = 18 ft

Q_5 = {(750, 0.49) - (750, 0.32) + (3125, 0.32)} @ 0.65%
Q_5 = {5 - 1.6 + 6.5} = 9.9 cfs ✓ Q @ 0.17' deep = 0.3 cfs

AT DP 8 (BASINS 12a and 12b) Q_5 = 6.78 cfs OK
BASIN 13 Q_5 = 8.1 cfs (TOTAL) → USE 1/3 BASIN 13 = 2.7 cfs
COMBINED Q_5 IN NW CRESTONE CURB = 6.78 + 2.7 = 9.48 ✓ OK BUT RIGHT
BELOW CAPACITY ∴ INLET NEEDED AT THIS LOCATION
ON GRADE INLET AT 0.65%, MAX FLOW S_x(T-2) = 0.32 ✓



FROM FIG 7-9 10 FT INLET CAPTURES 62% → 0.62 × 9.48 = 5.88 cfs
15-FT INLET CAPTURES 72% → 0.72 × 9.48 = 6.83 cfs
USE 15-FT INLET Q_c = ~~7.13~~ 6.83 cfs Q_B = ~~2.77~~ cfs
ADDITIONAL FLOW TO CRESTONE BEFORE REACHING MAROON WAY = 14.88 - ~~9.9~~ = 4.98
TOTAL FLOW IN NW CRESTONE N. OF MAROON WAY = ~~2.77~~ + 4.98 = 7.75 cfs
2.65

D.P. 7 IN MAROON WAY (3.0% SLOPE) BASINS 11A AND 11B
Q_5 = 6.05 cfs Q_{100} = 13.28 cfs

CONSIDER - ON GRADE INLETS IN MAROON WAY TO CAPTURE FLOW BEFORE
CRESTONE → MAY STILL NEED AN INLET IN CRESTONE FOR
BYPASS AND CARRYOVER, BUT INTERSECTION WOULD BE A LOT DRYER.
ON-GRADE INLETS IN MAROON WAY WOULD CAPTURE:

d_{max} = 0.17 + (15 x .02) = 0.47 ft T_{max} = 17 ft

Q_5 = {(750, 0.47) - (750, 0.30) + (3125, 0.30)} S = 3.0%
Q_5 = {9.5 - 3 + 12} = 18.5 cfs ✓ Q (0.17') = 0.60 cfs

BASIN 11 b (N. SIDE MAROON WAY) $Q_5 = 2.6$ cfs

BASIN 11 a (S. SIDE MAROON WAY) $Q_5 = 4.1$ cfs

ON GRADE INLET @ 3% $y = 0.17 + \left(\frac{0.47 - 0.17}{46.5 - 0.60}\right) \times (4.1 - 0.6) = 0.19$

$T = 3$ ft $S_x(T-2) = .02 \Rightarrow$ NOT ON CHART ✓

100% CAPTURE W/ 10'

∴ 10-FT INLETS ON EITHER SIDE OF MAROON WAY WILL CAPTURE ALL OF 5-YR Q

∴ FLOW IN CRESTONE $(Q_5) = 9.48$ cfs $+ 1/3(8.1) = 12.18$ cfs

VERTICAL CURVE ENDS AT 3.0%

CHECK STREET CAPACITY AT 1.5% AND 3.0%

CRESTONE CAPACITY @ 3.0% > MAROON WAY MARGINALLY, ∴ USE MAROON WAY (CONSERVATIVE) $Q_5 (3.0\%) \geq 18.5$ cfs

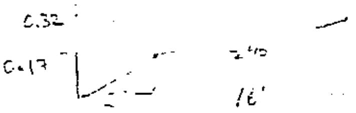
CRESTONE CAPACITY @ 1.5% $= \{(750, 0.49) - (750, 0.32) + (3125, 0.32)\}$
$= \{7.5 - 2.5 + 10\} = 15$ cfs ✓

OK THROUGH TRANSITION ⇒ **NO** INLETS AT MAROON WAY

DP 6 NW SIDE = CARRYOVER FROM INLET NEAR SHERMAN + REMAINDER BASIN 13 + BASINS 11A AND 11B ⇒ $Q_5 = 2.77 + 2/3(8.1) + 6.65 = 14.87$ OK

DP 6 SE SIDE = BASIN 14A $Q_5 = 6.4$ cfs

CRESTONE @ 3.5% AS IT APPROACHES CHARLOTTE ⇒ AT GRADE INLETS



Q_5 CAP $= \{(750, 0.49) - (750, 0.3) + (3125, 0.3)\}$
$= \{11 - 3 + 14\} = 22$ cfs

Q @ 0.17 = 0.4 cfs

$y(Q = 14.87 \text{ cfs}) = 0.17 + \left(\frac{0.47 - 0.17}{22 - 0.4}\right) \times (14.87 - 0.4) = 0.37$ ft

$T = 2 + 10 = 12$ ft $d_w = .02 \times 10 = 0.2$

from FIG 7.9 $Q_c = \underline{0.65} \times 14.87 = 9.67$ ✓ $Q_b = 5.2$ cfs

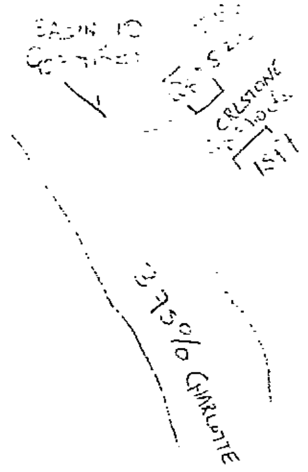
$y(Q = 6.4 \text{ cfs}) = 0.17 + \left(\frac{0.47 - 0.17}{22 - 0.4}\right) \times (6.4 - 0.4) = 0.25$ ft ✓

$T = 2 + 4 = 6$ $d_w = 0.08$

from FIG 7.9 $Q_c = \underline{0.85} \times 6.4 = 5.4$ cfs ✓ $Q_b = 1.0$ cfs ✓

URS
CONSULTANTS, INC.

URS JOB NO. 10742271 PAGE 6 OF ___
DATE 5/19/98 BY A.E CHECKED BY SDE 9-5 (date)
CLIENT RDS
PROJECT RIDGEVIEW
SUBJECT CHARLOTTE STORM - INLET SPACING



TOTAL Q_S IN E GUTTER CHARLOTTE S. OF CRESTONE

Q_S = 4.8 cfs + 5.7 cfs + 1.0 cfs = 11.5 cfs

BASIN 9 IN W GUTTER CHARLOTTE

Q_S = 6.2 cfs

BOTH < CAPACITY OF CHARLOTTE GUTTER

(CHARLOTTE @ 3.75% > CRESTONE @ 3.5%)

NO INLETS NEEDED ON CHARLOTTE

CHARLOTTE AT YAMPA: E GUTTER = 11.0 cfs + BASIN 14b (3.4 cfs) Q_S = 14.4 cfs

W. GUTTER = BASIN 9 = 6.2 cfs

IN YAMPA (N. SIDE) Q_S = BASIN 8B = 7.5 cfs
(S. SIDE) Q_S = BASIN 8A = 4.4 cfs

COMBINED W. SIDE = D.P 5 (BASIN 8A, 8B, 9) Q_S = 18.11 cfs ✓

CHARLOTTE CAPACITY @ 1.99% Q_S @ 1.99% = {(750, 0.57) − (750, 0.40) + (3125, 0.4)}

= {14 − 5 + 20} = 29 cfs ✓

0.4, .17, Z_2 20, Z_1/n = 750, Z_2/n = 3125

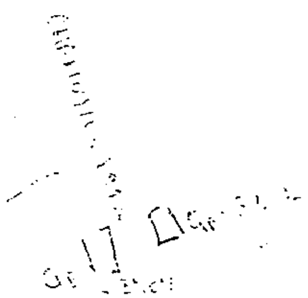
Q @ 0.17 = 2.2 cfs

INLETS S. OF YAMPA W. SIDE y = 0.17 ( ) × (18.11 − 2.2) = 0.41 ft ✓ T = 1

E SIDE y = 0.17 ( ) × (14.4 − 2.2) = 0.35 ft ✓ T = 11

W SIDE ⇒ 65% CAPTURE = Q_C = 11.77 cfs ✓ Q_B = 6.34 cfs ✓

E SIDE ⇒ 75% CAPTURE Q_C = 10.8 cfs Q_B = 3.6 cfs



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URS JOB NO. 6742271 PAGE 7 OF ____
DATE 8/19/98 BY ____ CHECKED BY ____ (date)
CLIENT RDS
PROJECT RIDGEVIEW
SUBJECT CHARLOTTE STORM - INLET SPACING

SUMP INLET @ HARVARD Q = 6.34 cfs (BYPASS) + BASIN 7 (16.8 cfs) = 23.14 cfs ✓

RES d_{max} = 0.17 + (15 × .02) = 0.47
FROM FIG 7-11 Q = 23.14 cfs → d_{max} ∴ WILL TOP CROWN

HOWEVER, A 15-FT SUMP INLET ON EITHER SIDE OF HARVARD WILL BE SUFFICIENT TO CAPTURE ALL THE FLOW
Q_{100} = 34.52 cfs

SUMP INLETS @ SHERMAN DP.3 (NOLTE) Q_5 = 26.44 cfs Q_{100} = 53.10 cfs

AS ABOVE, TWO 15-FT INLETS, ONE ON EITHER SIDE OF SHERMAN, WILL HAVE A COMBINED CAPACITY > 28 cfs ∴ OK.

DOWNSTREAM OF MELODY/NOLTE SITE

W SIDE - NO FLOW

E SIDE - BYPASS = 3.6 cfs

TO SUMP AT INTERSECTION OF STETSON HILLS BLVD & CHARLOTTE

FLOW TO CHARLOTTE EACH SIDE: A = 685 × 75 = 1.2 Ac C = (0.4 + 0.5)/2 = 0.
t_c = 11.5 min → i = 3.9 → Q_5 = 3.3 cfs ✓

FLOW IN SHB. WEST L = 450 ; 1 × 175 = 1.80 Ac C = (0.4 × 2 + 0.3)/3 = 0
(NORTH SIDE ONLY)
t_c = 5 min → i = 5.1 Q_5 = 6.4 cfs

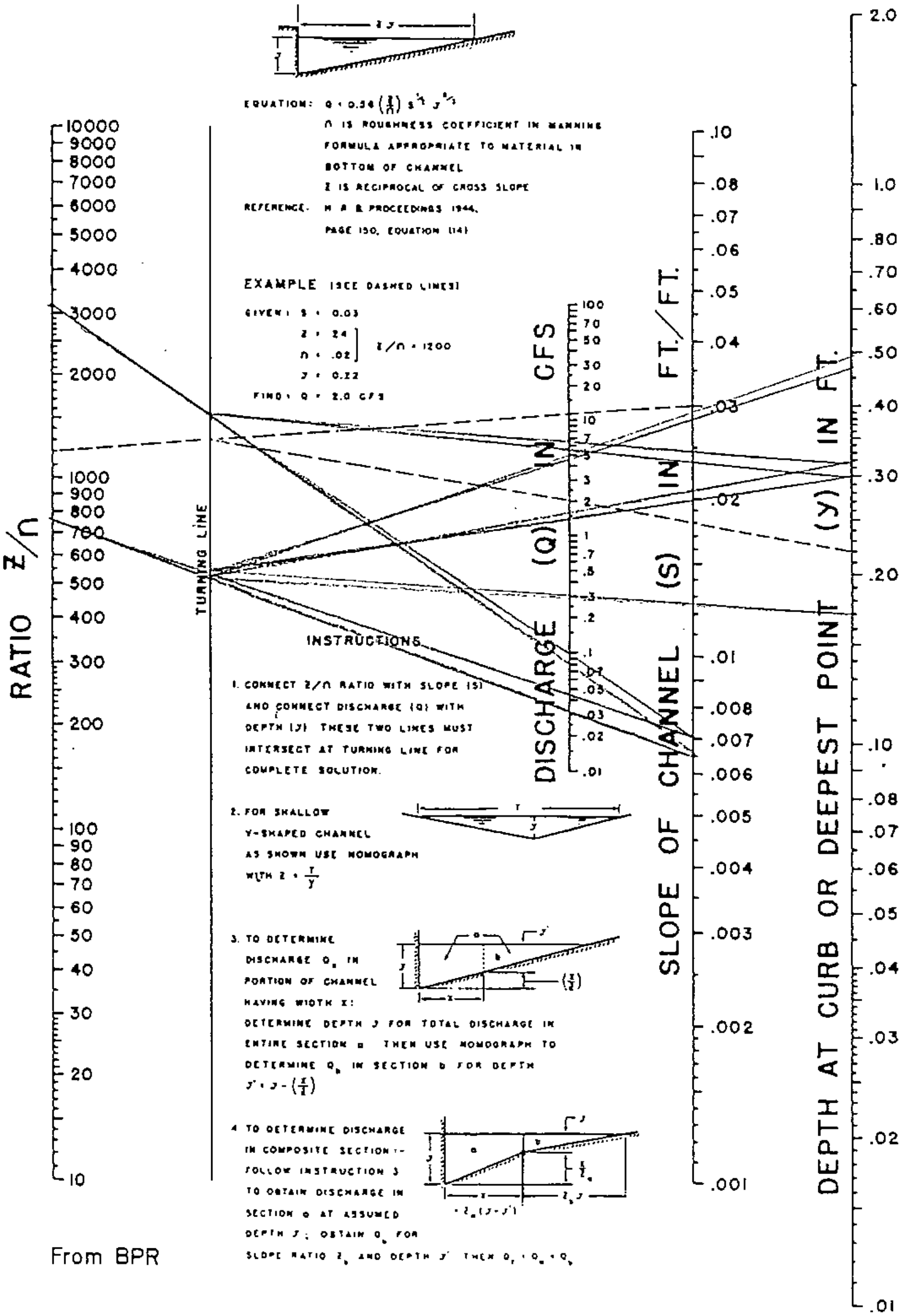
FLOW IN SHB EAST L = 675 × 175 = 2.7 Ac C = 0.7
t_c = 11 min → i_5 = 3.9 Q_5 = 7.4 cfs

∴ FLOW TO INTERSECTION ON W SIDE = 3.3 + 6.4 = 9.7 cfs ✓
E SIDE = 3.3 + 7.4 = 10.7 cfs ✓

d_{max} (CHARLOTTE) = 0.57 - FROM FIG 7-11 10 FT INLET OK

HOWEVER USE 15-FT INLETS TO ALLOW FOR CLOGGING AND 100-YR Q.

GUNNISON - S=0.7%
CRESTONE - S=0.65%



NONOGRAPH FOR FLOW IN TRIANGULAR GUTTERS
(From U.S. Dept. of Commerce, Bureau of Public Roads, 1965)

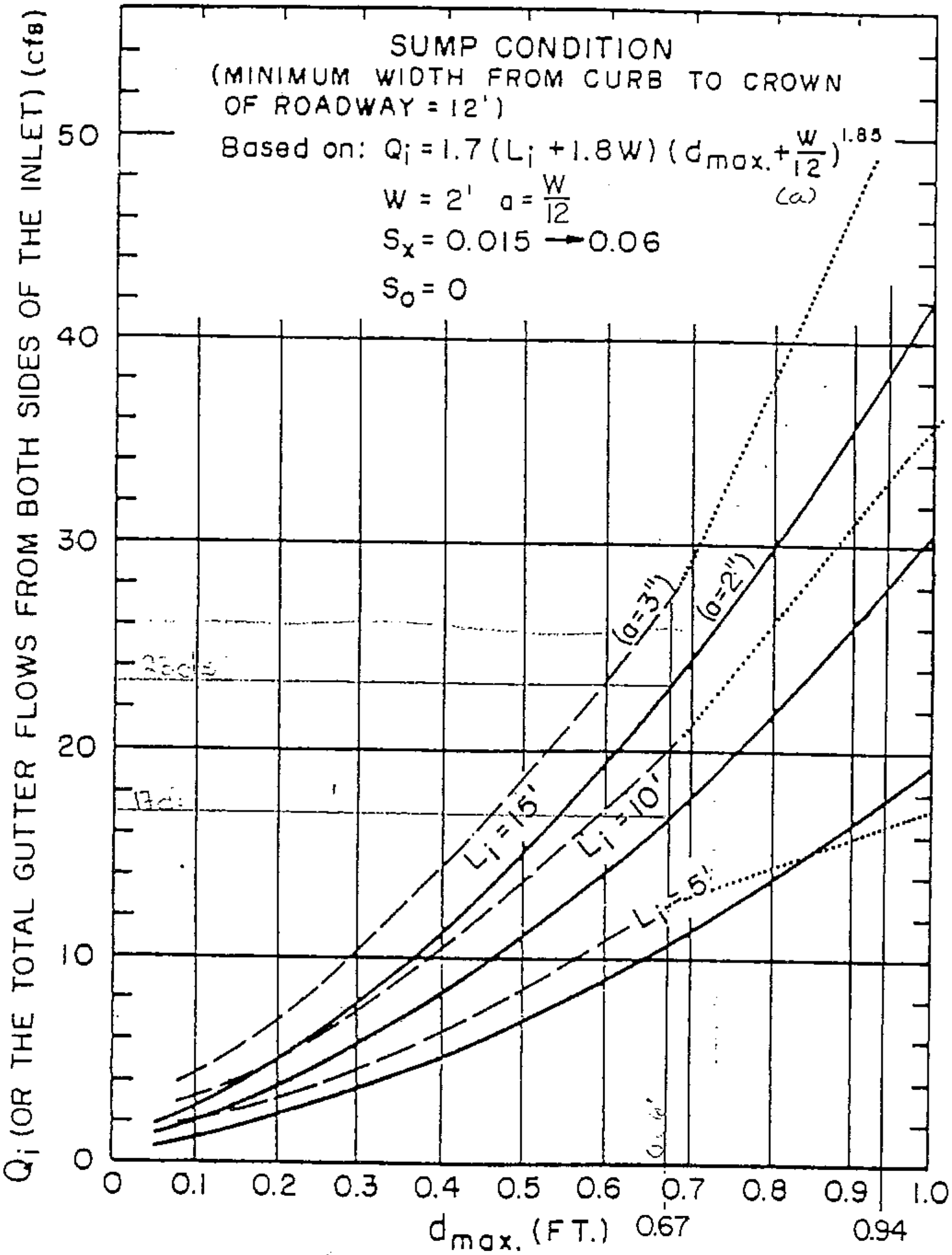
HDR Infrastructure, Inc.
A Centerra Company

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

Date
OCT. 1987

NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

Figure
7 - 2



REFERENCE : Izzard, Carl. f., Report presented at the Annual Meeting of the National Transportation Board, January 1977; Simplified Method For Design of Curb-opening Inlets

— — — (As Modified by El Paso County, per Type R Inlet)

Note: Depth of ponding measured at curb above depressed area ; a = 3", For d ≤ .67

$Q_i = (1.7 L_i + 6.12)(d_{max} + .25)^{1.85}$; $Q_i = 3.60 L_i (d - .08)^{.5}$ For d ≥ .94 ; Note : No Clogging Factor

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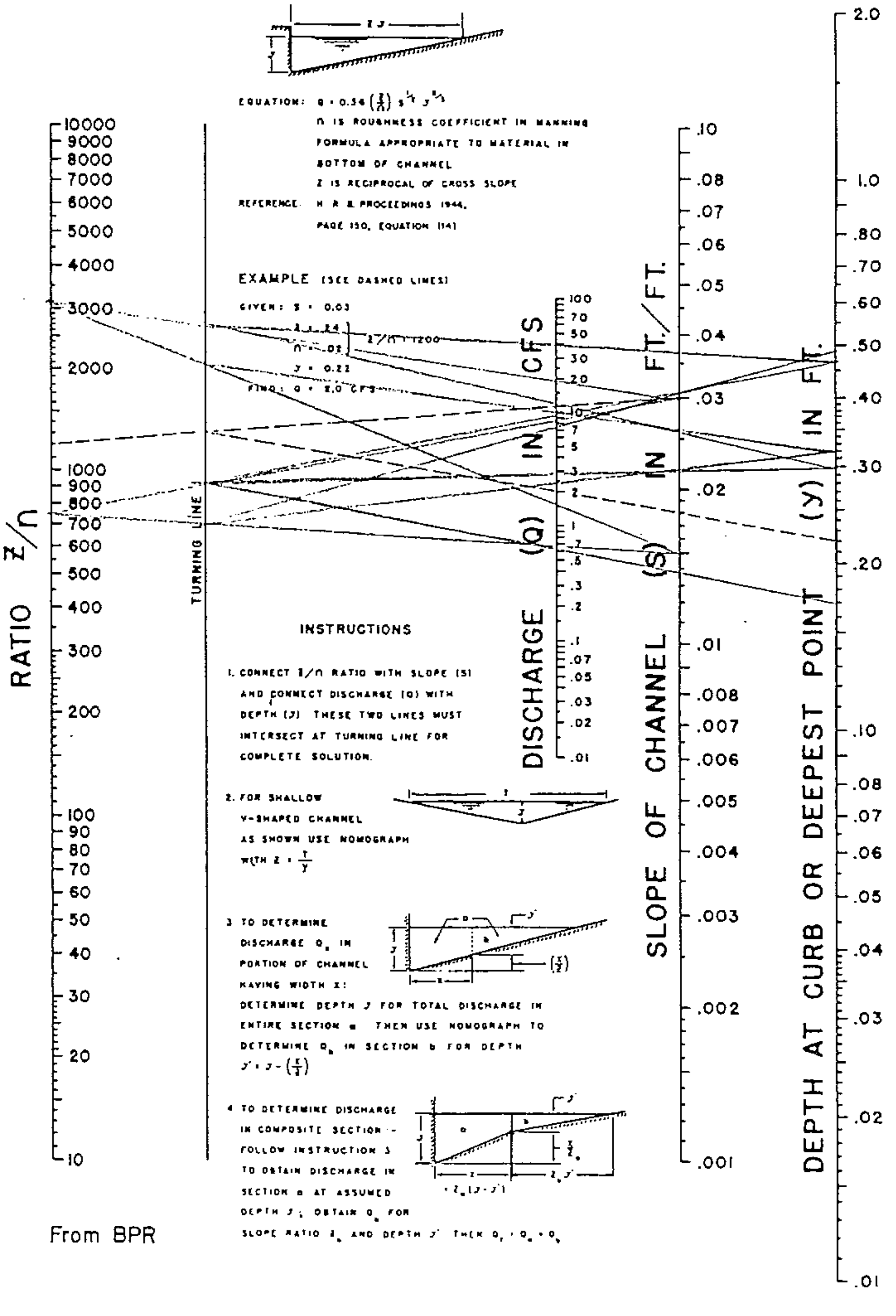
The City of Colorado Springs / El Paso County Drainage Criteria Manual	Date OCT. 1987
Sump Capacity for Curb-opening Inlets	Figure 7-11



NONOGRAPH FOR FLOW IN TRIANGULAR GUTTERS
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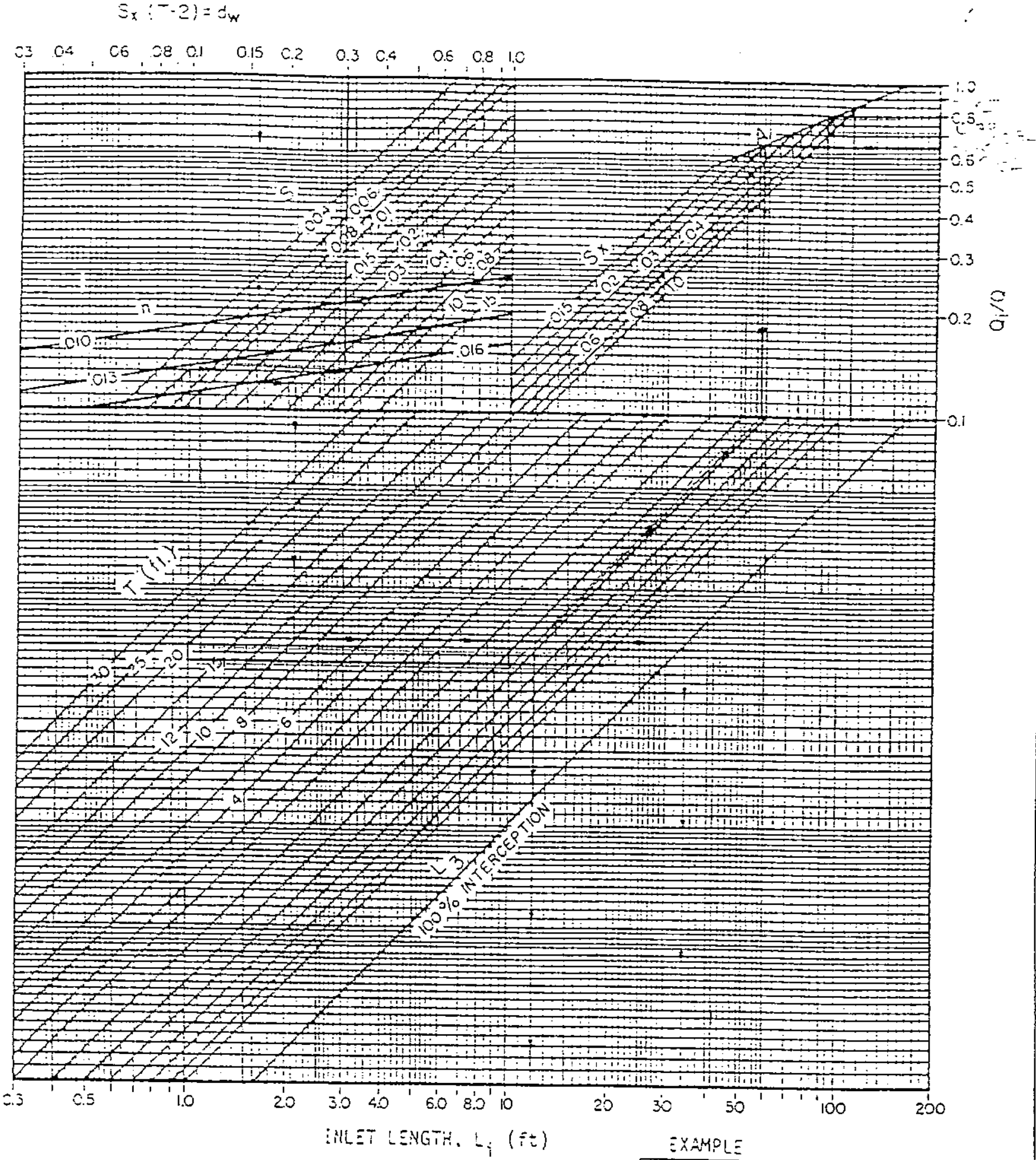
NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

Date: OCT. 1987

Figure 7 - 2



EXAMPLE

Given	S_x = 0.02 ft/ft T = 10 ft. S = 0.03 ft/ft
Find	L_i = 11.8 ft L_i = 34 ft. Q_i/Q= 0.55 Q_i/Q=1.0

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

REFERENCE :

Izzard, Carl. f., **Report presented at the Annual Meeting of the National Transportation Board, January 1977; Simplified Method For Design of Curb-opening Inlets**

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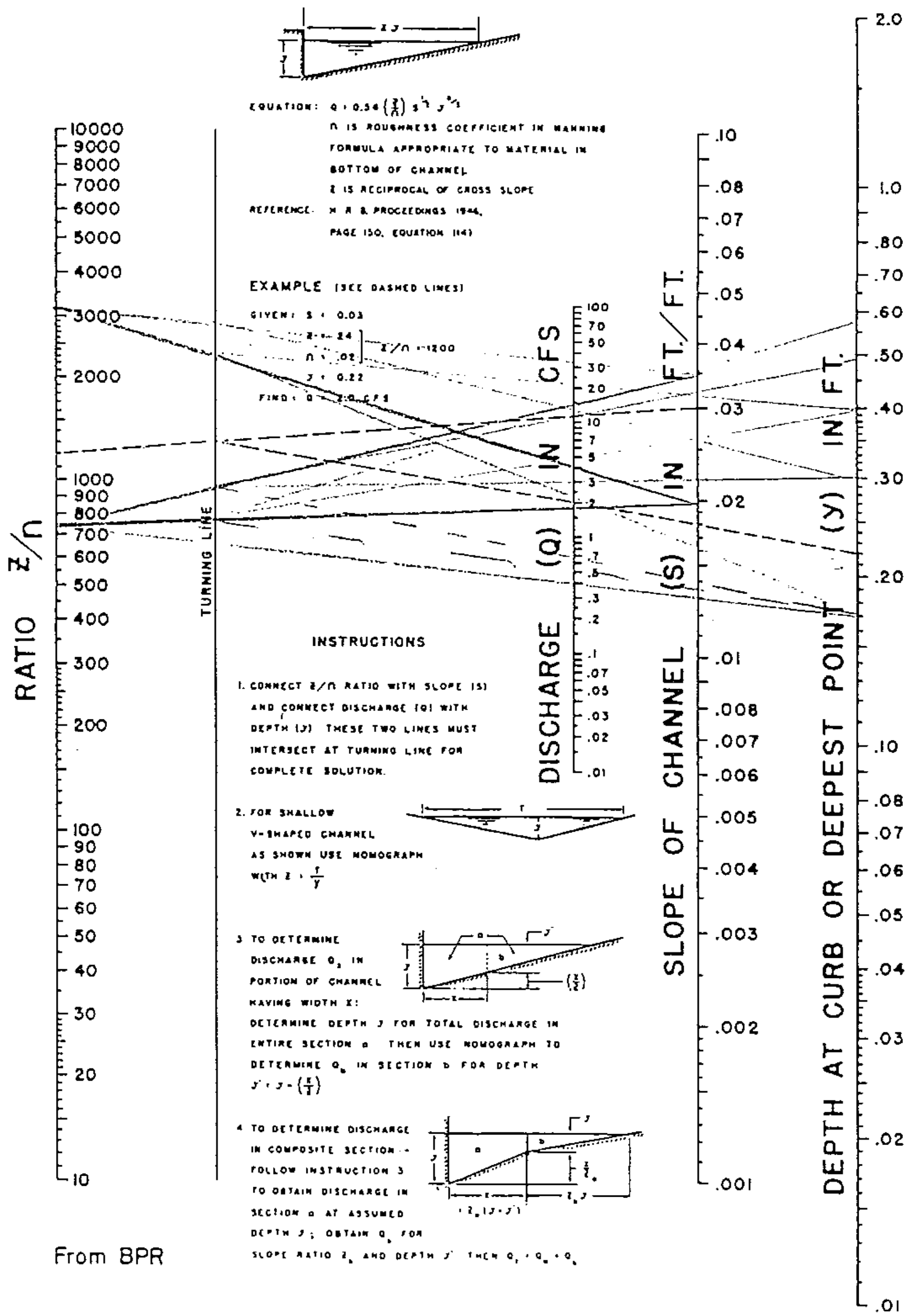
CONTINUOUS GRADE
Standard Curb-Opening Inlet Chart

Date: OCT. 1987

Figure 7-9



NONOGRAPH FOR FLOW IN TRIANGULAR GUTTERS
(From U.S. Dept. of Commerce, Bureau of Public Roads, 1965)

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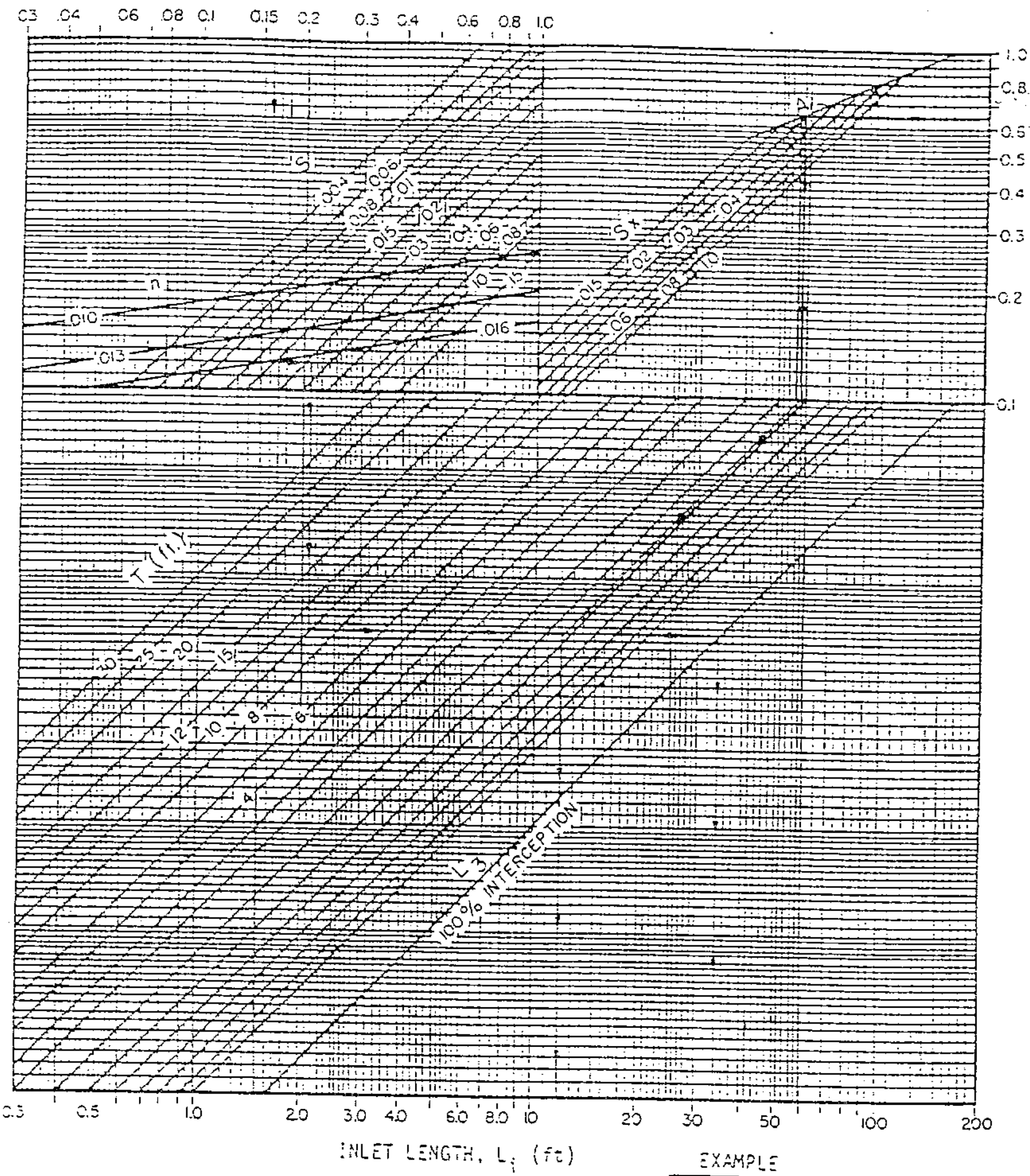
NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

Figure 7 - 2



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

EXAMPLE

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

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

REFERENCE :

Izzard, Carl. f., Report presented at the Annual Meeting of the National Transportation Board, January 1977; Simplified Method For Design of Curb-opening Inlets

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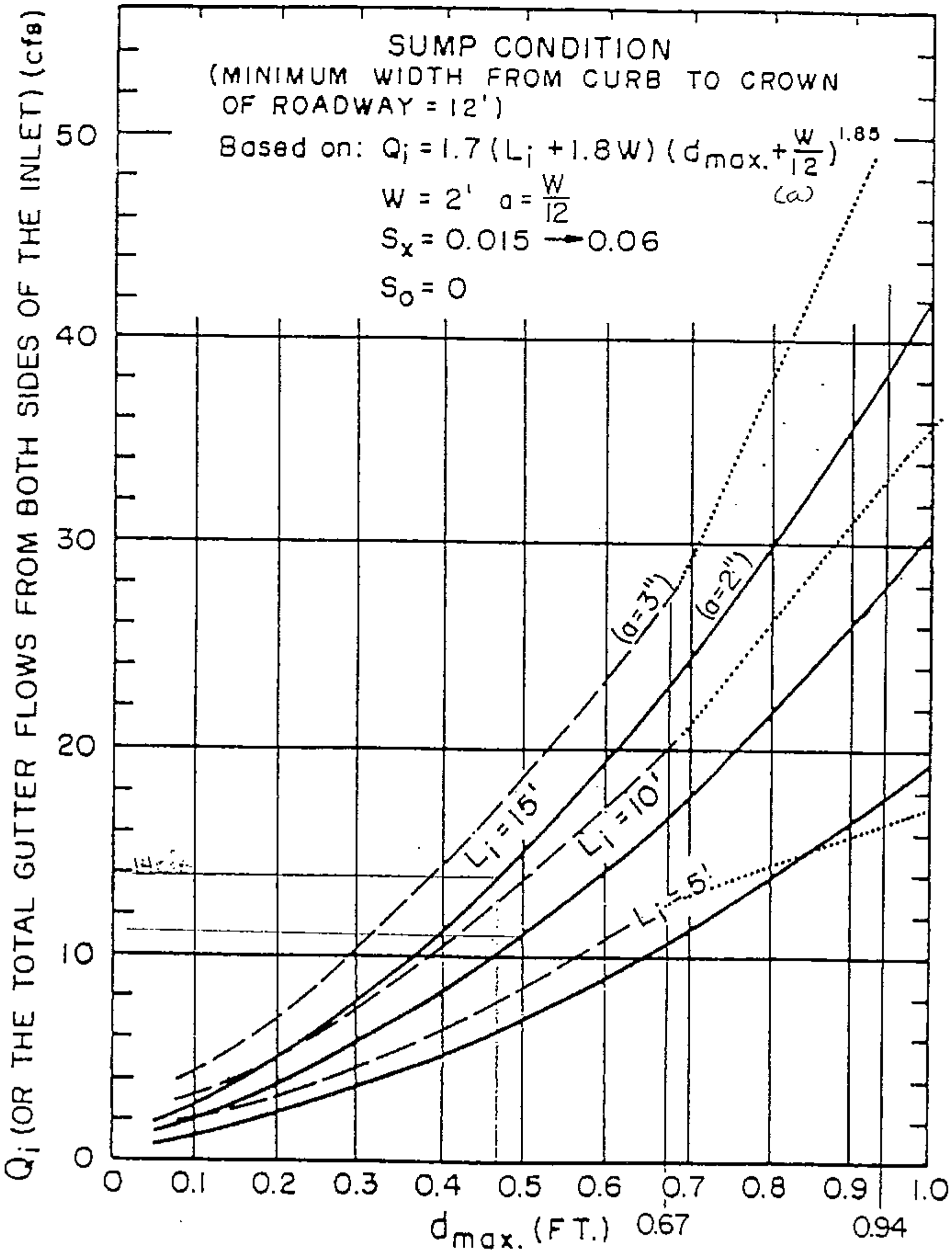
CONTINUOUS GRADE
Standard Curb-Opening Inlet Chart

Date OCT. 1987

Figure 7-9



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— — — (As Modified by El Paso County, per Type R Inlet)

Note: Depth of ponding measured at curb above depressed area ; a = 3", For d ≤ .67

$Q_i = (1.7 L_i + 6.12)(d_{max} + .25)^{1.85}$; $Q_i = 3.60\ L_i\ (d - .08)^{.5}$ For d ≥ .94 ; Note : No Clogging Factor

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The City of Colorado Springs / El Paso County Drainage Criteria Manual	Date OCT. 1987
Sump Capacity for Curb-opening Inlets	Figure 7-11

Ridgeview at Stetson Hills
Melody Homes
Colorado Springs

8/7/98
1:22 PM
Calculated by: GGS

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

DESIGN STORM: 5 YEAR

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				TRAVEL TIME				
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	Length ft	Slope %	Velocity fps	T(t) min	REMARKS
	1	1.45	0.50	9.4	0.73	4.20	3.0									
	2	1.85	0.50	9.0	0.93	4.29	4.0									
	3	0.40	0.65	11.3	0.26	3.9	1.0									
	4	1.00	0.50	14.7	0.50	3.4	1.7									
	5	3.75	0.60	13.9	2.24	3.5	7.8									
	6a	10.35	0.64	15.4	6.64	3.3	22.1									
	6b	2.10	0.62	11.3	1.31	3.9	5.0									
	7	8.70	0.58	15.5	5.07	3.3	16.8									
	8a	1.80	0.64	11.7	1.16	3.8	4.4									
	8b	3.45	0.59	12.3	2.03	3.7	7.5									
	9	2.85	0.58	12.0	1.65	3.7	6.2									
	10	2.15	0.57	11.3	1.24	3.9	4.8									
	11a	1.75	0.58	10.0	1.02	4.1	4.1									

Ridgeview at Stetson Hills
Melody Homes
Colorado Springs

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STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

DESIGN STORM: 5 YEAR

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				TRAVEL TIME				
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	Length ft	Slope %	Velocity fps	T(t) min	REMARKS
	11b	1.10	0.59	10.4	0.65	4.0	2.6									
	12a	2.90	0.56	15.0	1.63	3.4	5.5									
	12b	0.60	0.64	7.8	0.38	4.5	1.7									
	13	3.75	0.60	13.1	2.26	3.6	8.1									
	14a	3.10	0.66	17.4	2.05	3.1	6.4									
	14b	1.00	0.80	8.9	0.80	4.3	3.4									
	15a	7.90	0.56	14.0	4.41	3.5	15.4									
	15b	1.15	0.59	9.6	0.68	4.1	2.8									
	15c	2.35	0.59	12.0	1.40	3.7	5.2									
	15d	3.75	0.55	13.6	2.06	3.5	7.3									
	15e	2.35	0.59	9.5	1.40	4.1	5.8									
	15f	0.40	0.90	5.2	0.36	5.2	1.9									
	16a	2.90	0.60	11.6	1.73	3.8	6.6									

JOB NUMBER CS0268

Ridgeview at Stetson Hills
Melody Homes
Colorado Springs

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STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

DESIGN STORM: 5 YEAR

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				TRAVEL TIME				
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	Length ft	Slope %	Velocity fps	T(t) min	REMARKS
	16b	2.75	0.55	11.0	1.52	3.9	5.9									
	16c	2.25	0.57	13.9	1.29	3.5	4.5									
	16d	4.35	0.54	16.5	2.36	3.2	7.6									
	16e	1.90	0.61	11.0	1.15	3.9	4.5									
	16f	6.00	0.57	12.1	3.40	3.7	12.7									
	16g	1.15	0.63	7.0	0.72	4.7	3.4									
	16h	1.26	0.61	12.2	0.77	3.7	2.9									
	17	3.60	0.50	11.6	1.80	3.8	6.9									
	18a	2.95	0.76	11.4	2.26	3.8	8.7									
	18b	3.00	0.59	15.5	1.78	3.3	5.9									
	18c	2.25	0.62	11.2	1.39	3.9	5.4									
	18d	0.85	0.64	8.6	0.55	4.3	2.4									
	18e	2.20	0.57	12.8	1.26	3.6	4.6									

Ridgeview at Stetson Hills
Melody Homes
Colorado Springs

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STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

DESIGN STORM: 5 YEAR

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				TRAVEL TIME				
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	Length ft	Slope %	Velocity fps	T(t) min	REMARKS
	18f	1.00	0.60	12.2	0.60	3.7	2.2									
	18g	1.90	0.71	17.9	1.35	3.1	4.1									
	19a	5.90	0.59	14.6	3.47	3.4	11.9									
	19b	1.50	0.61	10.8	0.91	3.9	3.6									

JOB NUMBER CS0268

Ridgeview at Stetson Hills
Melody Homes
Colorado Springs

8/7/98
1:22 PM
Calculated by: GGS

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

DESIGN STORM: 100 YEAR

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				TRAVEL TIME				
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	Length ft	Slope %	Velocity fps	T(t) min	REMARKS
	1	1.45	0.60	9.4	0.87	7.2	6.24									
	2	1.85	0.60	9.0	1.11	7.3	8.09									
	3	0.40	0.73	11.3	0.29	6.7	1.96									
	4	1.00	0.60	14.7	0.60	6.0	3.62									
	5	3.75	0.68	13.9	2.57	6.2	15.85									
	6a	10.35	0.72	15.4	7.49	5.9	44.30									
	6b	2.10	0.71	11.3	1.49	6.7	9.98									
	7	8.70	0.67	15.5	5.85	5.9	34.52									
	8a	1.80	0.73	11.7	1.31	6.6	8.65									
	8b	3.45	0.68	12.3	2.33	6.5	15.14									
	9	2.85	0.67	12.0	1.90	6.6	12.47									
	10	2.15	0.67	11.3	1.43	6.7	9.59									
	11a	1.75	0.67	10.0	1.17	7.0	8.23									

JOB NUMBER CS0268

Ridgeview at Stetson Hills
Melody Homes
Colorado Springs

8/7/98
1:22 PM
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STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

DESIGN STORM: 100 YEAR

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				TRAVEL TIME				
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	Length ft	Slope %	Velocity fps	T(t) min	REMARKS
	11b	1.10	0.68	10.4	0.75	6.9	5.17									
	12a	2.90	0.65	15.0	1.89	6.0	11.33									
	12b	0.60	0.72	7.8	0.43	7.7	3.32									
	13	3.75	0.69	13.1	2.58	6.3	16.35									
	14a	3.10	0.74	17.4	2.30	5.6	12.88									
	14b	1.00	0.86	8.9	0.86	7.3	6.31									
	15a	7.90	0.65	14.0	5.14	6.2	31.68									
	15b	1.15	0.68	9.6	0.78	7.1	5.54									
	15c	2.35	0.68	12.0	1.60	6.6	10.50									
	15d	3.75	0.64	13.6	2.41	6.2	15.01									
	15e	2.35	0.68	9.5	1.60	7.1	11.46									
	15f	0.40	0.95	5.2	0.38	8.7	3.30									
	16a	2.90	0.68	11.6	1.99	6.6	13.18									

JOB NUMBER CS0268

Ridgeview at Stetson Hills
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STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

DESIGN STORM: 100 YEAR

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				TRAVEL TIME				
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	Length ft	Slope %	Velocity fps	T(t) min	REMARKS
	16b	2.75	0.64	11.0	1.77	6.8	12.01									
	16c	2.25	0.67	13.9	1.50	6.2	9.25									
	16d	4.35	0.64	16.5	2.77	5.7	15.93									
	16e	1.90	0.69	11.0	1.32	6.8	8.91									
	16f	6.00	0.66	12.1	3.95	6.5	25.78									
	16g	1.15	0.71	7.0	0.82	7.9	6.47									
	16h	1.26	0.70	12.2	0.88	6.5	5.72									
	17	3.60	0.60	11.6	2.16	6.6	14.34									
	18a	2.95	0.83	11.4	2.45	6.7	16.39									
	18b	3.00	0.68	15.5	2.05	5.9	12.07									
	18c	2.25	0.70	11.2	1.58	6.7	10.62									
	18d	0.85	0.72	8.6	0.62	7.4	4.55									
	18e	2.20	0.66	12.8	1.46	6.4	9.33									

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STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

DESIGN STORM: 100 YEAR

BASIN INFORMATON				DIRECT RUNOFF				TOTAL RUNOFF				TRAVEL TIME				
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	Length ft	Slope %	Velocity fps	T(t) min	REMARKS
	18f	1.00	0.69	12.2	0.69	6.5	4.48									
	18g	1.90	0.78	17.9	1.49	5.5	8.24									
	19a	5.90	0.68	14.6	4.00	6.1	24.18									
	19b	1.50	0.69	10.8	1.04	6.8	7.09									

Ridgeview at Stetson Hills
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STORM DRAINAGE SYSTEM DESIGN (BASIN ROUTING) DESIGN STORM:
(RATIONAL METHOD PROCEDURE) 5 YEAR

ROUTING INFORMATION			TOTAL RUNOFF				
Design Point	Area ac.	Runoff Coeff.	T(c) min	SUM C x A	I in/hr	Q cfs	BASIN REMARKS
DP-1	0.40	0.65	11.30	0.26	3.9	1.00	3
DP-2	3.75	0.60	13.90	2.24	3.5	7.83	5
DP-3	12.45	0.64	15.40	7.95	3.3	26.44	6a-6b
DP-4	8.70	0.58	15.50	5.07	3.3	16.82	7
DP-5	8.10	0.60	12.00	4.83	3.7	18.11	8a-8b,9
DP-6	9.00	0.62	17.40	5.54	3.1	17.29	10,13,14a
DP-7	2.85	0.58	10.40	1.67	4.0	6.65	11a-11b
DP-8	3.50	0.57	15.00	2.01	3.4	6.78	12a-12b
DP-9	6.10	0.57	13.60	3.45	3.5	12.21	15c-15d
DP-10	7.12	0.11	8.90	0.80	4.3	3.40	14b
DP-11	7.90	0.56	14.00	4.41	3.5	15.39	15a
DP-12	8.45	0.57	13.60	4.85	3.5	17.14	15c-e
DP-13	2.90	0.60	11.60	1.73	3.8	6.59	16a

JOB NUMBER CS0268

Ridgeview at Stetson Hills
Melody Homes
Colorado Springs

8/11/98
7:20 AM
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STORM DRAINAGE SYSTEM DESIGN (BASIN ROUTING) DESIGN STORM:
(RATIONAL METHOD PROCEDURE) 5 YEAR

ROUTING INFORMATION			TOTAL RUNOFF				
Design Point	Area ac.	Runoff Coeff.	T(c) min	SUM C x A	I in/hr	Q cfs	BASIN REMARKS
DP-14	6.00	0.57	12.10	3.40	3.7	12.69	16f
DP-15	10.05	0.34	12.10	3.46	3.7	12.92	FB DP13-14
DP-16	11.20	0.22	12.10	2.42	3.7	9.02	North 16-19
DP-17	2.25	0.57	13.90	1.29	3.5	4.53	16c
DP-18	6.25	0.56	16.50	3.51	3.2	11.28	16e-16d
DP-19	7.51	0.28	16.50	2.12	3.2	6.81	South 16-19
DP-20	4.35	0.54	16.50	2.36	3.2	7.59	16d
DP-21	2.90	0.67	17.90	1.95	3.1	5.99	18f-g
DP-22	7.65	0.56	17.90	4.28	3.1	13.14	18b,d,f,g
DP-23	8.95	0.62	17.90	5.54	3.1	17.01	18b, 18d-g
DP-24	14.15	0.65	17.90	9.18	3.1	28.20	18a-g
DP-25	7.40	0.59	14.60	4.38	3.4	14.97	19a-b

JOB NUMBER CS0268

8/11/98
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Ridgeview at Stetson Hills
Melody Homes
Colorado Springs

STORM DRAINAGE SYSTEM DESIGN (BASIN ROUTING) DESIGN STORM:
(RATIONAL METHOD PROCEDURE) 100 YEAR

ROUTING INFORMATION			TOTAL RUNOFF				
Design Point	Area ac.	Runoff Coeff.	T(c) min	SUM C x A	I in/hr	Q cfs	BASIN REMARKS
DP-1	0.40	0.73	11.30	0.29	6.7	1.96	3
DP-2	3.75	0.68	13.90	2.57	6.2	15.85	5
DP-3	12.45	0.72	15.40	8.98	5.9	53.10	6a-6b
DP-4	8.70	0.67	15.50	5.85	5.9	34.52	7
DP-5	8.10	0.68	12.00	5.54	6.6	36.32	8a-8b,9
DP-6	9.00	0.70	17.40	6.31	5.6	35.37	10,13,14a
DP-7	2.85	0.67	10.40	1.92	6.9	13.28	11a-11b
DP-8	3.50	0.67	15.00	2.33	6.0	13.93	12a-12b
DP-9	6.10	0.66	13.60	4.01	6.2	25.00	15c-15d
DP-10	7.12	0.12	8.90	0.86	7.3	6.31	14b
DP-11	7.90	0.65	14.00	5.14	6.2	31.68	15a
DP-12	8.45	0.66	13.60	5.61	6.2	34.99	15c-e
DP-13	2.90	0.68	11.60	1.99	6.6	13.18	16a

Ridgeview at Stetson Hills
Melody Homes
Colorado Springs

8/11/98
7:20 AM
Calculated by: GGS

STORM DRAINAGE SYSTEM DESIGN (BASIN ROUTING) DESIGN STORM:
(RATIONAL METHOD PROCEDURE) 100 YEAR

ROUTING INFORMATION			TOTAL RUNOFF				
Design Point	Area ac.	Runoff Coeff.	T(c) min	SUM C x A	I in/hr	Q cfs	BASIN REMARKS
DP-14	6.00	0.66	12.10	3.95	6.5	25.78	16f
DP-15	10.05	0.47	12.10	4.72	6.5	30.80	FB DP13-14
DP-16	11.20	0.35	12.10	3.89	6.5	25.39	North 16-19
DP-17	2.25	0.67	13.90	1.50	6.2	9.25	16c
DP-18	6.25	0.65	16.50	4.09	5.7	23.48	16e-16d
DP-19	7.51	0.41	16.50	3.07	5.7	17.62	South 16-19
DP-20	4.35	0.64	16.50	2.77	5.7	15.93	16d
DP-21	2.90	0.75	17.90	2.18	5.5	12.05	18f-g
DP-22	7.65	0.63	17.90	4.84	5.5	26.77	18b,d,f,g
DP-23	8.95	0.70	17.90	6.30	5.5	34.84	18b, 18d-g
DP-24	14.15	0.73	17.90	10.33	5.5	57.14	18a-g
DP-25	7.40	0.68	14.60	5.04	6.1	30.48	19a-b

INLET DESIGN
(100-YEAR STORM)

EXHIBIT 5.3-1
URS Consultants, Inc.
CALCULATION COVER SHEET

Client: RIDGEVIEW Project Name: RIDGEVIEW

Project/Calculation Number: 6742271

Title: CHARLOTTE STORM - 100-YR INLET DESIGN

Total number of pages (including cover sheet): 12

Total number of computer runs: ____

Prepared by: ADRIENNE ROBBERSON Date: 9/17/98

Checked by: [illegible] Date: 9/18/98

Description and Purpose:

- check street/inlet capacity for 100-year storm
- design inlets at intersection of Charlotte and Stetson Hills

Design bases/references/assumptions:

- Nolte drainage calcs "Preliminary & Final Drainage Rpt, Ridgeview Filing No. 1 and Preliminary Drainage Report, Ridgeview Filing No. 2 & 3" revised August 1998
- earlier inlet calcs for 5-year storm (QA file)
- CS Drainage Criteria Manual.

Remarks/conclusions:

- SUMP CONDITIONS ARE CONSERVATIVE. (GOOD)

Calculation Approved by: ____

Project Manager/Date

Revision No.:	Description of Revision:	Approved by:

Project Manager/Date

URS Greiner

JOB NUMBER [illegible] PAGE 1 OF 11

DATE [illegible] BY [illegible] CHECKED BY [illegible] (date)

CLIENT Ridgeview

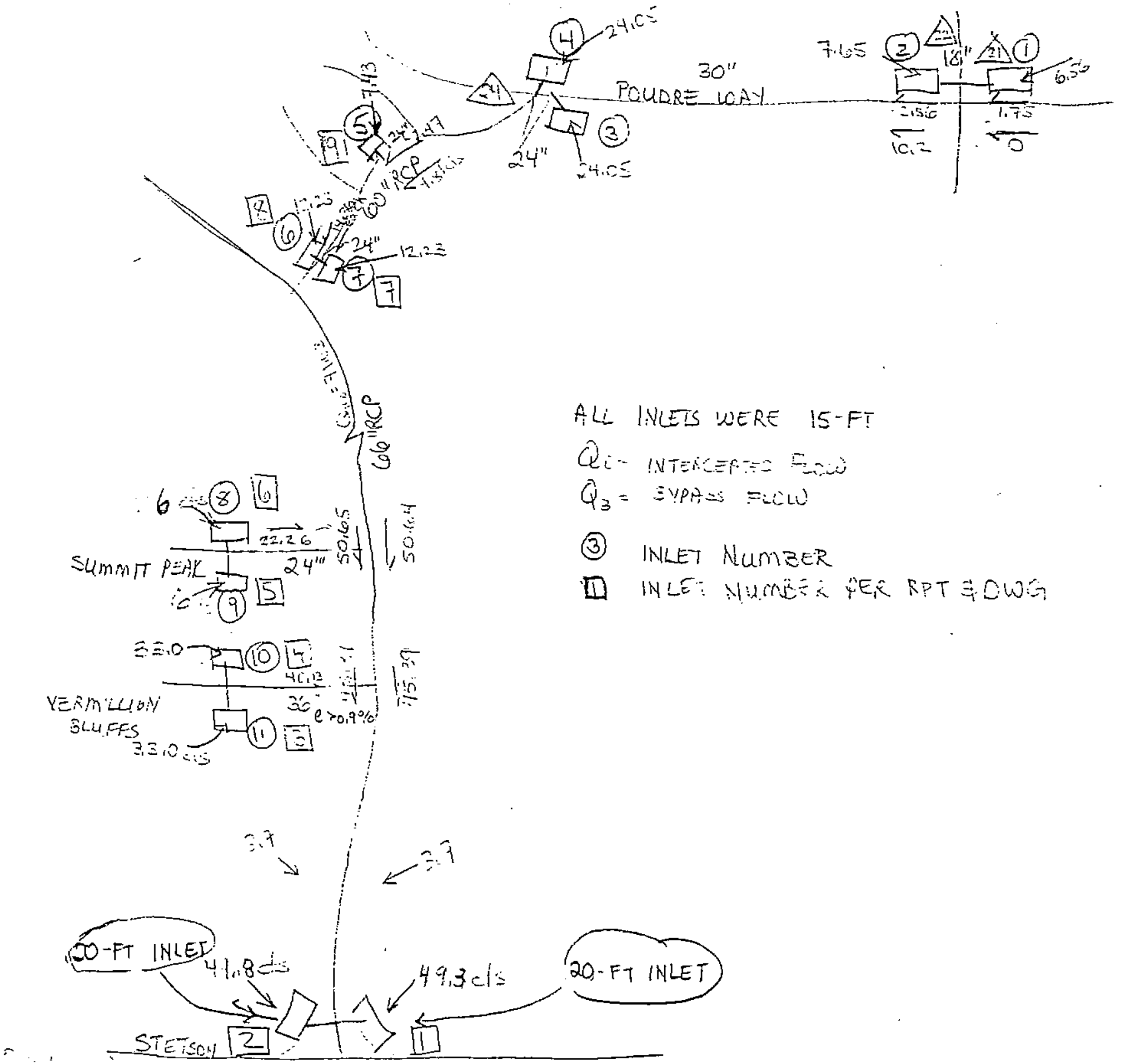
PROJECT Charlotte Storm

SUBJECT 100-YEAR FLOWS AND INLET DESIGN

REFERENCE: NOLTE DESIGN FLOWS AND BASINS
INCLUDED WITH PREVIOUS INLET SPACING CALCS FOR 5-YR STORM
DATED 8-19-98 (REV'D 9-8-98);
AND CS DRAINAGE CRITERIA MANUAL
AND NOLTE'S PRELIM/FNL DRNG RPT FOR FILING 1, PDR FLGS 2+3
AUGUST 1998

100-YEAR FLOWS:

FROM 5-YEAR CALCS, INLET SCHEMATIC IS AS FOLLOWS



ALL INLETS WERE 15-FT

Q_i = INTERCEPTED FLOW

Q_B = BYPASS FLOW

③ INLET NUMBER

⑪ INLET NUMBER PER RPT & DWG

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JOB NUMBER ________ PAGE 2 OF ____

DATE 9/14/98 BY ________ CHECKED BY ________ (date)

CLIENT ________

PROJECT ________

SUBJECT ________

INLET No. 1. TRIBUTARY AREA: NOLTE BASIN 18 G Q_{100} = 8.31 cfs

STREET SLOPE = 0.7%

STREET CAPACITY TO CROWN: D_{max} = 0.47 FT

FROM EARLIER CALCS, Q OF 8.6 cfs WILL NOT TOP CROWN,

15-FT INLET CAPTURES 79%

∴ Q_c = 0.79 × 8.31 = 6.56 cfs ;

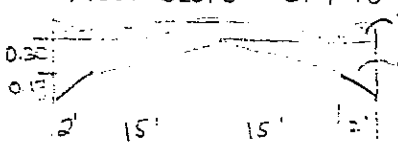
Q_B = 1.75 cfs ✓

INLET No. 2 TRIB AREA : NOLTE DESIGN POINT 22 = BASINS 18 D, F, G

DESIGN FLOW Q_{100} = Q_{100} @ DP 22 − Q_c @ INL 1

= 26.97 − 6.56 = 20.41 cfs ✓

STREET SLOPE = 0.7% → FLOW TOPS CROWN



8.6 cfs in A = ½ × 0.17 × 2 + 0.3 × 2 + ½ × 0.3 × 15 × 2

= 0.17 + 0.6 + 2.25 = 3.02 sf

V = 2.84 fps

FOR Q = 20.41 − (2 × 8.6) = 3.21 cfs ✓

3.21 cfs ÷ 2.84 fps = 1.13 sf ; 1.13 sf ÷ 34 LF = 0.03 ft

so total depth = 0.17 + 0.30 + 0.03 = 0.50 ft.

FROM FIG 7-9 S_x (T−2) = dw = 0.3 Q_c/Q = 0.75 ✓

so Q_c = 0.75 × (½ × 20.41) = 7.65 cfs ✓

Q_B (NORTH SIDE) = 2.56 ✓

Q_B (SOUTH SIDE) = 10.20 ✓

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JOB NUMBER ______ PAGE 3 OF ____
DATE 9.14.98 BY ______ CHECKED BY ____ (date)
CLIENT ______
PROJECT ______
SUBJECT ______

INLET No. 3 – TRIBUTARY AREA = 1/3 BASIN 14A (Q_{100} = 1/3 × 14.46 = 4.82)

INLET No. 4 – TRIB A = BASIN 13 A, B, C, D, E, F, G

HOWEVER, FLOW WILL TOP CROWN

TOTAL FLOW AT NOLTE DP 24 Q_{100} = 57.49 + 4.82 = 62.31

FLOW AT D.P. 24 LESS CAPTURE Q_{100} = 62.31 − 7.65 − 6.56

Q_{100} = 48.10 cfs ✓

INLETS 3 & 4 ARE SUMP INLETS

MOST FLOW WILL GO TO INLET 4

MAX ALLOWABLE DEPTH = 12" @ FLOWLINE

FROM FIG 7-11, FOR A 15' INLET Q_i @ d_{max} = 1.0 = 42 cfs

∴ THERE IS ADEQUATE CAPACITY IN THE 2 INLETS TO CAPTURE THE 100-YR FLOW

ASSUME 100% CAPTURE OF 100-YR STORM AT SUMP INLETS

INLET 5 – TRIBUTARY AREA = BASIN 12 A & B + 1/3 BASIN 13

Q_{100} = 11.24 + 3.32 + 1/3 × 15.45 = 19.71 cfs ✓

STREET SLOPE = 0.65%

FROM EARLIER CALCS, Q_{MAX} TO CROWN = 9.9 cfs

∴ FLOW OVERTOPS CROWN ⇒ (19.71 − 9.9) = 9.81 cfs ✓ to E. SIDE

FOR A 15 FT INLET, CAPTURE @ CROWN DEPTH (0.49 ft)

FROM FIG 7-9 d_w = .02 × 16 = .32 Q_i/Q = 0.75 ✓

Q_i = 7.43 cfs ✓ Q_b = 2.47 cfs ✓ $Q_{to\ EAST}$ = 9.81 cfs

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JOB NUMBER ______ PAGE 4 OF ____

DATE ______ BY ______ CHECKED BY [illegible] (date)

CLIENT ______

PROJECT ______

SUBJECT ______

INLETS 6 & 7 TRIB A = BASINS 11A,B, 12A,B, 13, 14A (2/3)

Q_{100} = 8.36 + 5.17 + 11.24 + 3.32 + [illegible] + (2/3 × [illegible]) = 53.18 cfs ✓

STREET SLOPE = 3.5 %

CAP TO CROWN = 22 cfs

AREA TO CROWN = [illegible] A = [illegible] = 3.57

V = 6.53 fps ✓

For Q = 53.18 cfs, A = 8.14 sf ✓

EXTRA DEPTH = [8.14 − (2×3.57)] ÷ 36 → 0.04 ft ✓

FROM FIG 7-9 d_w = 0.32 Q_i/Q = 0.46 ✓

∴ Q_i = 0.46 × (1/2 × 53.18) = 12.23 cfs ✓ EACH INLET.

Q_B = 14.36 cfs ✓ EACH INLET

FLOW IN CHARLOTTE APPROACHING SUMMIT PEAK DR

TRIB. AREA = NOLTE BASINS 8A & B, 9, 10, 2/3 × BASIN 14B + BYPASS FROM INL 6+7

Q_{100} = 8.86 + 13.27 + 14.84 + 9.11 + (2/3 × 6.31) + (2 × 14.36)

Q_{100} = 79.03 cfs ✓

STREET SLOPE = 1.99%

STREET CAPACITY — CROWN d_{max} = 0.57 ft

FROM FIG 7-2 Q_{CROWN} = {(750, 0.57) − (750, 0.4) + (3125, 0.4)} e 1.99

= {14 − 5 + 27} = 36 cfs ✓

So FLOW WILL OVERTOP CROWN BUT WILL NOT EXCEED 12" MAX DEPTH AT GUTTER FL.

FLOW TO INLETS 8+9 : TRIB AREA = BASIN 7 + 1/2 OF FLOW IN CHARLOTTE

Q_{100} = 34.26 + 39.52 = 73.78 cfs ✓

SUMP DEPTH = 0.14 ft LESS THAN CROWN DEPTH

ASSUME MOST OF CHARLOTTE FLOW WILL CONTINUE IN CHAR.

6 SUMP INLETS WILL CAPTURE ALL OF FLOW FROM BASIN 7;

THIS WOULD MEAN A DEPTH OF WATER OF ±0.54 ft. → TOO HIGH

ASSUME MAX DEPTH OF 0.24 FT → Q_i = 2×6 cfs = 12 cfs ✓

Q_B = 22.26 cfs TO CHARLOTTE

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JOB NUMBER ____ PAGE 5 OF ____
DATE ____ BY ____ CHECKED BY ____ (date)
CLIENT ____
PROJECT ____
SUBJECT ____

FLOW IN CHARLOTTE = 79.03 + (BASIN 7-12) = 79.03 + 22.26 = 101.29 ✓
FLOW TO INLETS 10 & 11 - TRIB AREA = ½ FLOW IN CHAR. + REMAINDER BASIN 14B + BASINS 6A & 3

Q_{100} = 50.65 + (⅓ × 6.31) + 43.57 + 9.81 = 106.13 cfs ✓

SUMP DEPTH = 0.74' → Q_{in} = 27 cfs

SLIGHTLY MORE THAN SUMP DEPTH WILL BE CAPTURED.
ASSUME MAX DEPTH = 0.85 → Q_{in} = 33 cfs ✓

∴ ASSUME BYPASS = 40.13 cfs in CHARLOTTE (W SIDE)
∴ TOTAL FLOW IN CHARLOTTE = 50.65 + 40.13 = 90.78 cfs ✓

ADDITIONAL FLOW TO CHARLOTTE D/S OF MELODY SITE

ASSUME 60' EITHER SIDE OF ℄ OF WHICH AN AVG. 32 FT IS IMPERVIOUS
REMAINDER IS GRASS (LANDSCAPE ; C =

L FROM VERMILLION BLUFFS TO STETSON HILLS BLVD = ±680 LF

$\bar{C} = \frac{((64 \times 0.9) + (56 \times 0.3))}{120} = 0.62$ ✓

A = 120 × 680 ÷ 43560 = 1.87 Ac ✓

$t_c = (1.87 \times (1.1-0.6) \times 300^{1/2} \times 3^{-1/3}) + [(680-300) \div 5 \div 60] = 10.78 + 1.2$

t_c = 12.05 i_5 = 3.74 i_{100} = 6.40

Q_5 = 0.62 × 3.74 × 1.87 = 4.3 cfs

Q_{100} = 0.62 × 6.40 × 1.87 = 7.4 cfs TOTAL ✓

FLOW TO INTERSECTION

CHARLOTTE: Q_{100} (W SIDE) = 45.39 (BYPASS FROM VERMILLION) + ½ × 7.4 = 49.09 cfs ✓

Q_{100} (E SIDE) = 45.39 + ½ × 7.4 = 49.09 cfs

CAPACITY ON E. SIDE ≥ 36 cfs BUT RAISED MEDIAN WILL KEEP FLOW SEPARATED

SH BLVD: Q_{100} (W SIDE) : 3 lanes + SHOULDER + 20 FT LANDSCAPE × 700 ft
N. SIDE

$\bar{C}$ = [(46 × 0.9) + (20 × 0.3)] ÷ 66 → $\bar{C}$ = 0.72

t_c = 5 min i_{100} = 9.0 A = 700 × 66 ÷ 43560 = 1.06 Ac

Q_{100} = 9 × .72 × 1.06 = 0.69 cfs

Q_{100} (E SIDE) : 5 LANES + SHLDR (10 FT) WALK + 20 FT LANDSCAPE × 475 F

$\bar{C}$ = 0.77 t_c = 5 min → i_{100} = 9.0   A = 475 × 90 → 0.98 Ac

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JOB NUMBER ______ PAGE __ OF __

DATE 2/15/99 BY __ CHECKED BY __ (date)

CLIENT ______

PROJECT Riverview

SUBJECT Charlotte Storm Sewer

FLOW TO SUMP INLETS AT INTERSECTION

W SIDE CHARLOTTE Q_{100} = 49.09 + 0.7 = 49.79 cfs

E SIDE CHARLOTTE Q_{100} = 49.09 + 0.7 = 49.79 cfs

DEPTH OF SUMP = ?

DESIGN CRITERIA MAX = 1.0 ft

A 20-FT INLET COULD CAPTURE 50 cfs @ d_{max} = 0.88 ✓

URS Greiner

JOB NUMBER 6742271 PAGE 7 OF ___
DATE 9/16/98 BY ALR CHECKED BY ___ (date)
CLIENT ___
PROJECT ___
SUBJECT CHARLOTTE STORM

– SUMP INLET CONNECTION TO TRUNK STORM SEWER.

FROM INL 1 TO INL 2 $Q_{100} = 49.8$ cfs
FROM INL 2 TO STORM TRUNK $Q_{100} = 49.8 \times 2 = 99.6$

Q_{100} (cfs)	Pipe Size	Min Slope
99.6	48"	0.5%
	42"	0.9%
	36"	2.0%
49.8	36"	0.5%
	30"	1.35%
	24"	4.3%

CHECK FOR UTILITY CONFLICTS

CONNECT TO TRUNK SEWER @ (STA 78.4 ft FROM CONNECTION TO BOX
INV OF 66" RCP = 679.41 + (78.4 × .0156) = 680.63
MATCH CROWN → 686.13

D FROM CONNECTION TO FL = 43.21
?, D FROM FL TO 16" SAN. SEWER = 49.91
D FROM FL TO 24" WATER = 89.12
D FROM FL TO FL = 126.26

SAN INV = 677.73 + (15.22 × 0.0127) = 677.92 TOP OF 16" PIPE = 679.26
WATER INV = 680.83 − (76.74 × .0419) = 677.61 TOP OF 24" PIPE = 679.61

SO UTILITIES WON'T BE A CONFLICT SINCE THEY'RE LOWER THAN THE D/S INV.
SO DESIGN CONSTRAINT IS MIN COVER OVER PIPE THROUGH INTERSECTION.
NEED SUMP ELEVATIONS

URS Greiner

JOB NUMBER ______ PAGE 3 OF ____
DATE 9/2/98 BY ______ CHECKED BY 9-3-98 (date)
CLIENT ______
PROJECT ______
SUBJECT Charlotte Storm

LP ON ROAD ℄ = 87.2

DISTANCE FROM ℄ LP TO E. FL SUMP = 170 FT

DISTANCE FROM ℄ LP TO W FL SUMP = 80 FT

* ALONG LINE FROM LP TO SUMP - NOTE MIN INV @ TRUNK = 80.63

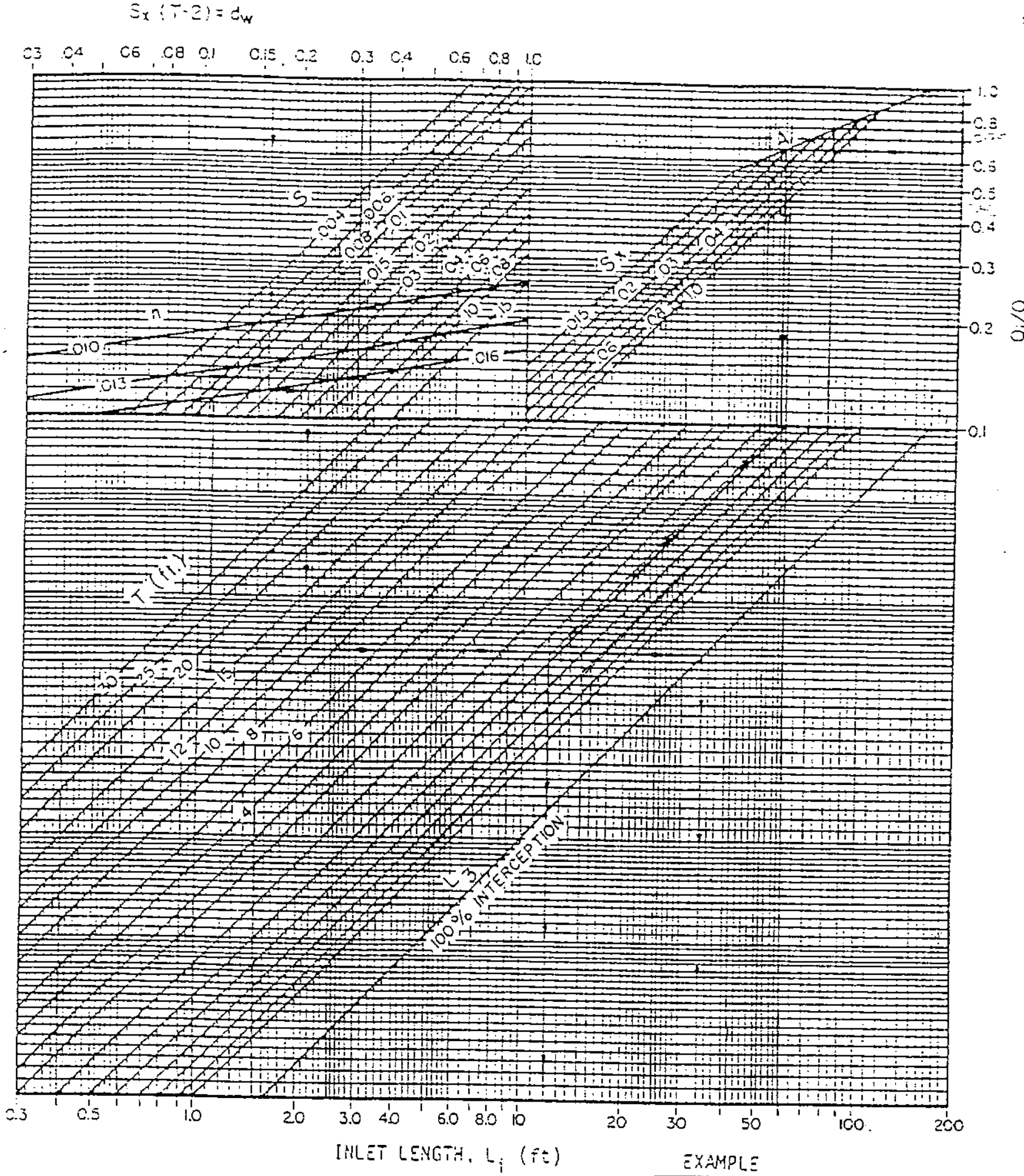
SLOPE*	W. SUMP FL	E SUMP FL	EL @ TRUNK USING MIN SLOPES**
.01	86.4	86.5	80.15 - TOO LOW
.0075	86.6	86.67	80.32 - TOO LOW
.005	86.8	86.85	80.50 - TOO LOW
✯ .0033	86.94	86.97	80.62 - CAN MAKE IT WORK REDUCE DROP @ INLET TO 0.5

** MIN SLOPE ⇒ DROP OF (43.21 × .005) + 1.0 + (126.26 × .005) = 1.35 FT. + 3' PIPE Ø + 1.5 FT MIN COVER = 6.35 FT

So USE A 48" RCP @ 0.5% FROM TRUNK TO INL ON W SIDE
36" RCP @ 0.5% FROM W. INLET TO E. INLET.

@ TRUNK INV IN = 80.65 @ WEST INLET INV OUT = 80.87
INV IN = 81.37 @ E INLET INV OUT = 82.00
CROWN = 85.00 + 0.33 thic
FL ≥ 86.83

So SLOPE FROM ℄ TO LP CAN RANGE BETWEEN 0.33% AND 0.5% IF THERE IS ONLY A 0.5' DROP THROUGH THE INLET.



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

REFERENCE :

Izzard, Carl. f., Report presented at the Annual Meeting of the National Transportation Board, January 1977; Simplified Method For Design of Curb-opening Inlets

EXAMPLE

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

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

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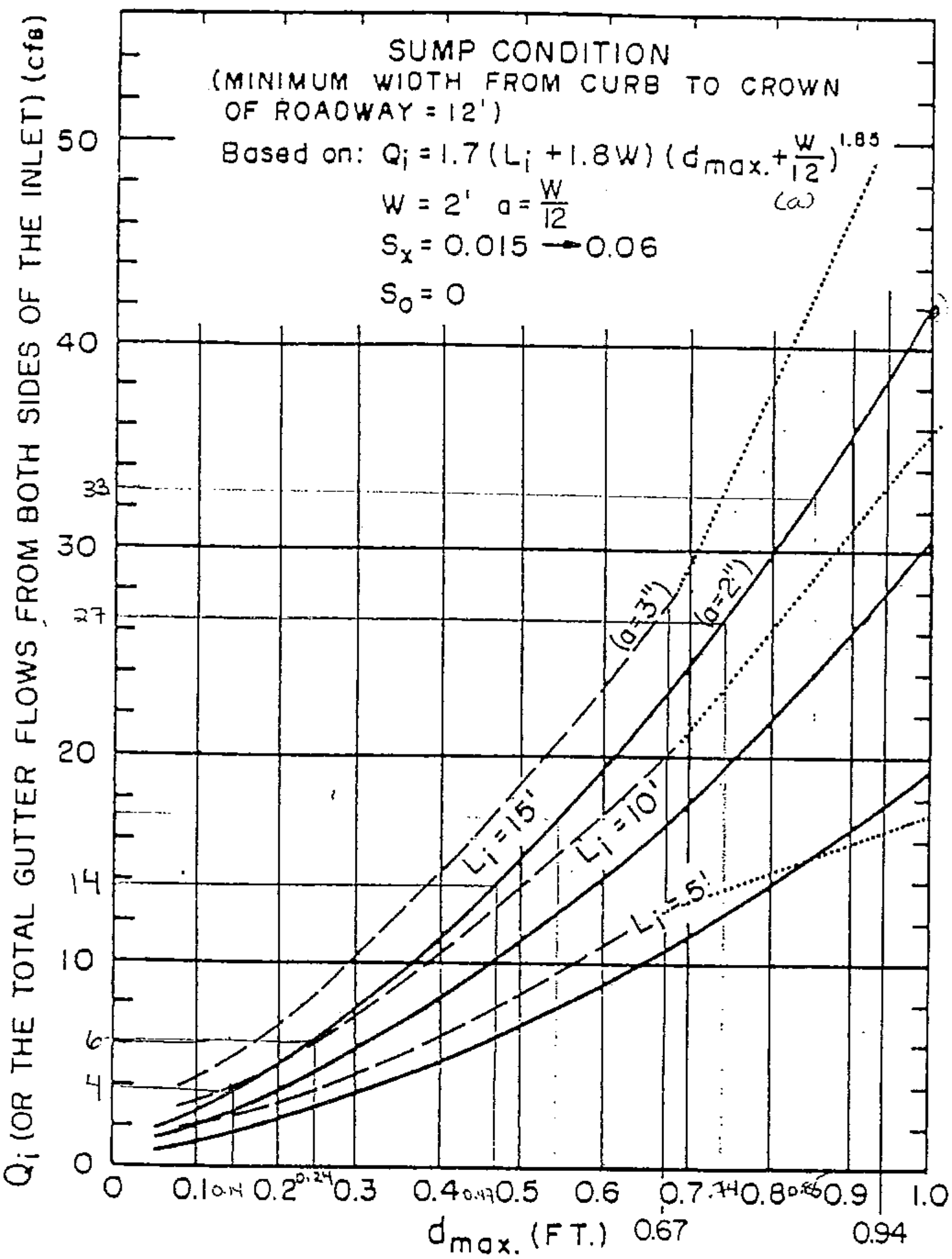
CONTINUOUS GRADE
Standard Curb-Opening Inlet Chart

Date OCT. 1987

Figure 7-9



REFERENCE : Izzard, Carl. f., Report presented at the Annual Meeting of the National Transportation Board, January 1977; Simplified Method For Design of Curb-opening Inlets

——— (As Modified by El Paso County, per Type R Inlet)

Note: Depth of ponding measured at curb above depressed area ; a = 3", For d ≤ .67

$Q_i = (1.7 L_i + 6.12)(d_{max} + .25)^{1.85}$; $Q_i = 3.60 L_i (d - .08)^{.5}$ For d ≥ .94 ; Note : No Clogging Factor

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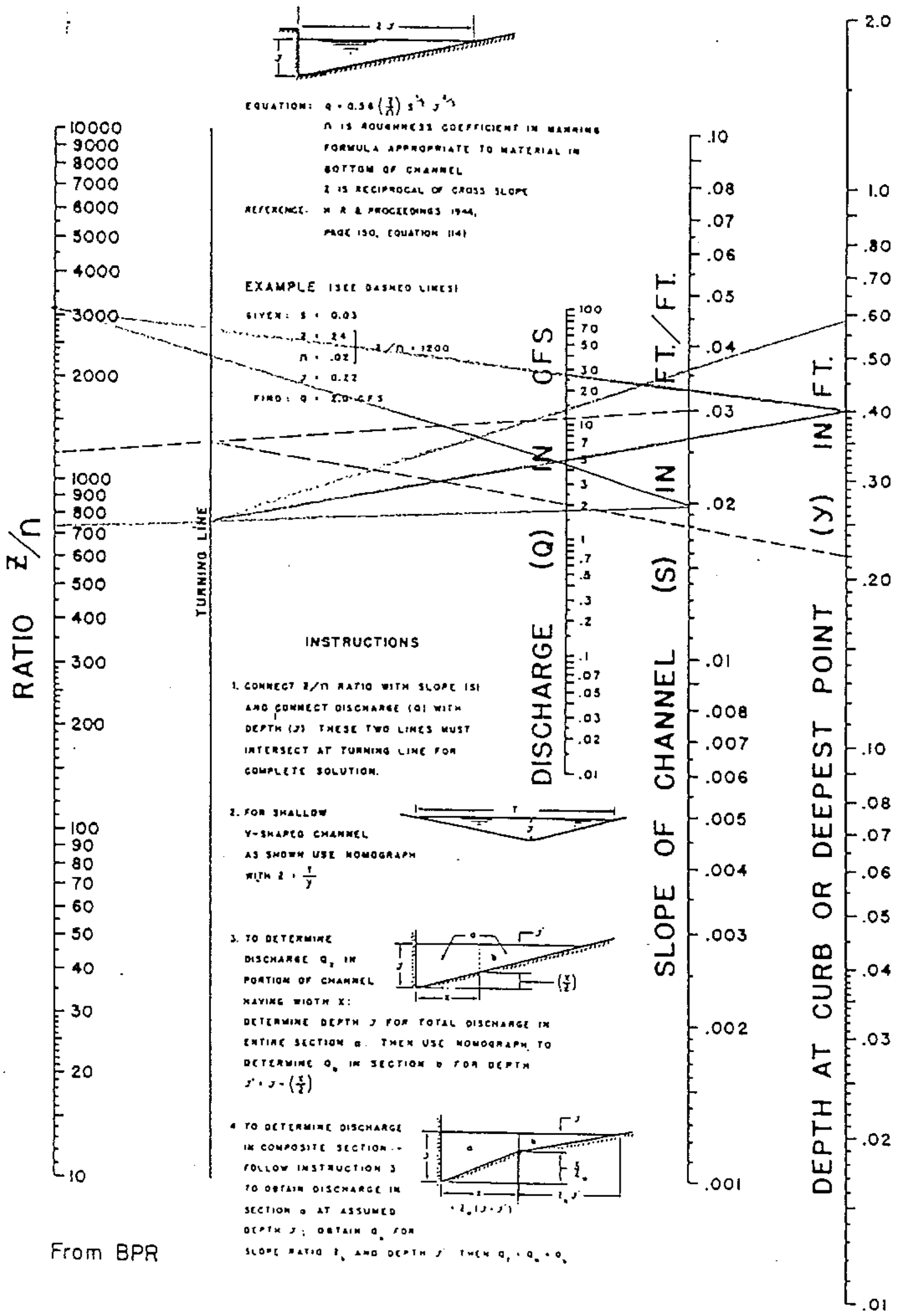
Sump Capacity for Curb-opening Inlets	Figure 7-11



NONOGRAPH FOR FLOW IN TRIANGULAR GUTTERS
(From U.S. Dept. of Commerce, Bureau of Public Roads, 1965)

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NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.	Figure 7 - 2

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