GLEN COVE VILLAGE
MASTER DRAINAGE STUDY

SECTION A: MASTER DRAINAGE STUDY

SECTION B: FINAL DRAINAGE REPORT, CHELSEA GLEN FILING NO. 1

SECTION C: SOUTH DOUGLAS CREEK

PREPARED FOR:
GLEN COVE PARTNERSHIP
6920 SOUTH HOLLY CIRCLE
ENGLEWOOD, CO 80112

PREPARED BY:
HOLLAND WEST, INC.
6920 SOUTH HOLLY CIRCLE
ENGLEWOOD, CO 80112
MAY 1, 1987
APPENDICES AUGUST 21, 1987
AMENDED FEBRUARY 16, 1988
AMENDED APRIL 5, 1988

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HOLLAND WEST, INC.

February 26, 1988

Mr. Dave Lethridge
City of Colorado Springs
Department of Public Works
30 South Nevada Avenue
Colorado Springs, CO 80901

RE: Chelsea Glen (Glen Cove)

Dear Dave:

Enclosed are two copies of the Chelsea Glen Amended Drainage Study. This study has been revised from the approved version due to two major occurrences:

1. The overall development plan has been revised. This change, approved February 23, 1988, has resulted in a number of changes in land uses, which in turn affects the runoff anticipated from each parcel. Therefore, the Master Study for the Glen Cove Planned Development has been revised to reflect those changed land uses.

   As part of the change in land uses, the first filing in the development, Chelsea Glen Filing No. 1, has also been revised from that previously submitted. Changes that have occurred have resulted in a significantly smaller number of lots (66). this smaller submittal means that the drainage facilities associated with the subdivision are reduced, with a concomitant reduction in the drainage costs.

2. Since the original study was submitted and approved, the City of Colorado Springs and El Paso County have adopted a new Drainage Criteria Manual. These revised studies reflect the new criteria included in the Manual. Runoff quantities vary slightly from the previous submittal due to the use of new "C" values and new intensity-duration-frequency curves.

The variance is small, and typically has led to slightly higher 10 year and 100 year values. Sub-basin A-1 changes from 44.0 and 87.6 cfs in the 10 and 100 year events respectively to 45.2 and 88.4 cfs for example. In some cases the 10 year flow is higher, and the 100 year flow lower. In any case, both the Master Study and the final study for Filing No. 1 were redone, and no significant changes were experienced.

Please review these amended studies, and forward any comments at your convenience. We will start processing the plat as soon as possible, now that the overall zoning has been approved. Feel free to call at any time if you have any questions.

Sincerely,

HOLLAND WEST, INC.

Steven W. Murray

Steven W. Murray, P.E.
Director of Engineering

Enclosures

C-1596

CERTIFICATIONS

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 master plan of the drainage basin. I accept responsibility for any liability attributable directly to any negligent acts, errors, or omissions on my part in preparing this report.

STEVEN W. MURRAY REGISTERED PROFESSIONAL ENGINEER STATE OF COLORADO

Steven W. Murray

Steven W. Murray, P.E.
Registered Professional Engineer
State of Colorado #11498

Developer's Statement:

The developer and/or his representative has read and will comply with all the requirements specified in the drainage plan and report.

BY: _____

DATE: 2-29-88

TITLE: Manager

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

_____ _____

City Engineer Date 4/21/88

Conditions:

1. Reimbursement of the Box Culvert through the office site to be based upon equivalent open channel cost, see p. 4 of Section A.
2. No developed flow is allowed onto Centenniel Heights without their approval, see p. 3 & 4 of Section A.
3. A L.O.C. for the entire length of open channel from Mostek terminus to Centenniel Blvd. will be required with the first platting of any portion of the site adjacent to the channel.
4. Revised cost estimate for Filing 1 as noted in Section B.

SECTION: A

GENERAL DESCRIPTION

Glen Cove Village is located in the northwest quarter of Section 25 and in portions of all four quarters of Section 26, Township 13 South, Range 67 West of the Sixth Principal Meridian, City of Colorado Springs, Colorado.

The property is bounded on the north by Mostek Subdivision No. 2, on the east by Centennial Boulevard, on the southeast by Centennial Heights Subdivision Filing Nos. 2 and 3, and by unplatted land to the west and south. General terrain within the subdivision slopes to the north-northeast from elevation 6460 towards the south fork of Douglas Creek at elevation 6270. Three soils groups are present within the project site: 1. Kp-Pierre formation (predominately), 2. Qp-Piney Creek Alluvium, and 3.Qs-Slocum Allumium.

The approved Amended Planned Unit Development Plan for Glen Cove Village shows 26.33 acres of undeveloped open space and 65.75 acres of single-family, multi-family and commercial development.

EXISTING DRAINAGE CHARACTERISTICS

The Glen Cove Village site is currently bisected by a gully which has its source approximately 1700 feet south and west of the property. This gully falls at a steep grade to South Douglas Creek. Runoff from the middle portion of the site, designated basin F5 and containing 57.5 acres including the offsite drainage basin, is intercepted by the gully, which outfalls into a natural section of South Douglas Creek. The north and west 32 acres of the project (again, including offsite areas) is directly tributary to South Douglas Creek and is designated basin F4.

The eastern 28 acres, Basin F8, begins on a ridge south of the project's boundary. Runoff sheet flows across the site, through the developed street system of Centennial Heights, which discharges onto the Glen Cove property 450 feet away from the South Douglas Creek crossing at Centennial Boulevard. Flows then meander across Basin F8 to outfall into the Creek.

The west 1,500 feet of South Douglas Creek is an improved (concrete) channel; the east 1,600 feet is a natural channel. There is a dual 7' x 10' box culvert crossing Centennial Boulevard.

South Douglas Creek carries a FEMA floodplain on the existing channel. There is no overbank flow. Some building sites adjacent to the creek are within the existing 100-year floodplain, but will be removed from the floodplain by the proposed channel upgrading. A map revision will be processed with FEMA.

DEVELOPED DRAINAGE CHARACTERISTICS

The general existing drainage patterns will be maintained with development. The central gully will be piped, with an open overflow swale above it. The collector loop road will drain to the gully at the upper and lower crossings, where inlets and storm sewers will transfer the flows to the Creek. Other streets and cul-de-sacs will be graded towards the collector loop road except in the northwest portion of the project. Storm sewers will be installed in the streets, when each street's capacity is exceeded in a 10 year storm. The area north of the loop road will drain directly to South Douglas Creek.

Runoff in the southeast portion of the project will be directed to the existing Centennial Heights streets, with a private road connection from the north end of Michener Drive to the collector loop road. If developed discharge into the Centennial

Heights facilities exceeds the historic, permission will be obtained from the maintaining entity prior to that phase of construction.

The gully and collector loop road storm sewers have been designed with Filing No. 1 and the computations are included. South Douglas Creek will be improved with a concrete channel and a hydraulically-improved entrance to the existing box culvert. The channel upgrades have been designed and are included in Section C. A 250 foot extension of the existing box culvert is proposed across the office complex site, and is included in the construction plans, computations and cost estimates for the channel. The open channel cost equivalent of the box culvert will be the basis for the cost estimate of public drainage improvements. The construction cost of the necessary public drainage improvements is expected to equal or exceed the Drainage Basin Fee. A letter of credit will be provided with platting to guarantee the construction of the drainage facilities.

SUMMARY

This Master Drainage Study defines a storm water management system that complies with the new El Paso County/City of Colorado Springs Drainage Criteria. Final detailed drainage studies will be prepared for

subsequent filings of Glen Cove as platting occurs. The first final drainage study is Chelsea Glen Filing No. 1, and is included as Section B of this report. Improvements to the South Douglas Creek channel will be accomplished as the land adjacent to the channel is developed. The overall design of the improved channel is included for reference as Section C.

Construction of the drainage facilities as proposed in this study will serve to safely pass runoff from offsite and onsite areas through the development without creating a hazard for this project, or any adjacent site.

COST ESTIMATE

PROJ:CHELSEA GLEN MASTER DRAINAGE
DATE:UPDATED APRIL 5, 1988
BY :STEVEN MURRAY

NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENSION
1	5' TYPE R INLET	1.00	EA	1650.00	1650.00
2	10' TYPE R	4.00	EA	2100.00	8400.00
3	15' TYPE R	5.00	EA	2700.00	13500.00
4	20' TYPE R	1.00	EA	4200.00	4200.00
					0.00
5	48" MANHOLE (0-10')	1.00	EA	650.00	650.00
6	60" MANHOLE (0-10')	6.00	EA	770.00	4620.00
					0.00
7	18" RCP	378.00	LF	19.30	7295.40
8	24" RCP	480.00	LF	23.75	11400.00
9	30" RCP	0.00	LF	31.10	0.00
10	36" RCP	1473.00	LF	40.90	60245.70
11	42" RCP	62.00	LF	57.65	3574.30
					0.00
12	CONC CHANNEL:B=20',D=6'	1250.00	LF	136.50	170625.00
13	DUAL 7x10 CONC BOX CULV	250.00	LF	455.00	113750.00
14	HEADWALL IMPROVED ENT.	1215.00	FF	9.50	11542.50
					0.00
15	DUMPED RIP-RAP:D50=12"	100.00	TON	25.00	2500.00
					0.00
16	18" RCP FES	1.00	EA	260.00	260.00
17	24" RCP FES	1.00	EA	325.00	325.00
18	36" IMPROVED ENTRANCE	1.00	EA	5000.00	5000.00
					0.00
					0.00
			SUBTOTAL	$	419537.90
	CONTINGENCIES		%	$	0.00
			GRAND TOTAL	$	419537.90
19	PRIVATE DRAINAGE FACILITY CONSTRUCTION COST				79625.00*
					0.00
20	PUBLIC DRAINAGE FACILITY CONSTRUCTION COST				305787.90**
					0.00
21	BASIC DRAINAGE FEE	58.20	ACRE	4883.00	284190.60***
					0.00
22	DEVELOPER COSTS ELIGIBLE FOR REIMBURSEMENT				63986.70****
					0.00
23	BASIN BRIDGE FEE	58.20	ACRE	112.00	6518.40

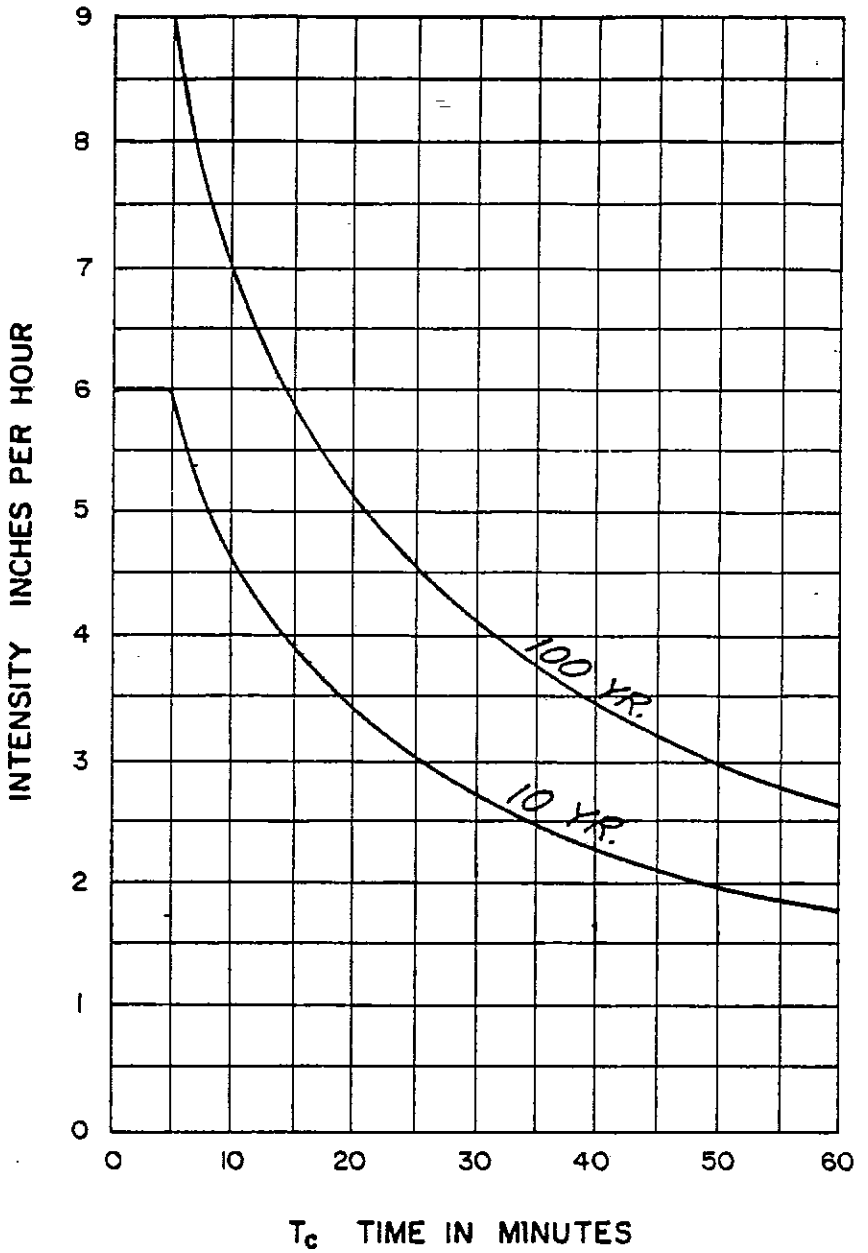
* Box Culvert-equivilent length of open channel

** Box Culvert length not included

*** 4 Acre Office parcel not included

**** Includesschannel equivilent of box culvert length

CALCULATIONS



RE: Based upon Pikes Peak area council of governments/ areawide urban runoff control manual.

HDR Infrastructure, Inc.
A Centerra Company

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

Storm Rainfall
Time Intensity-Frequency Curves

Date
OCT. 1987

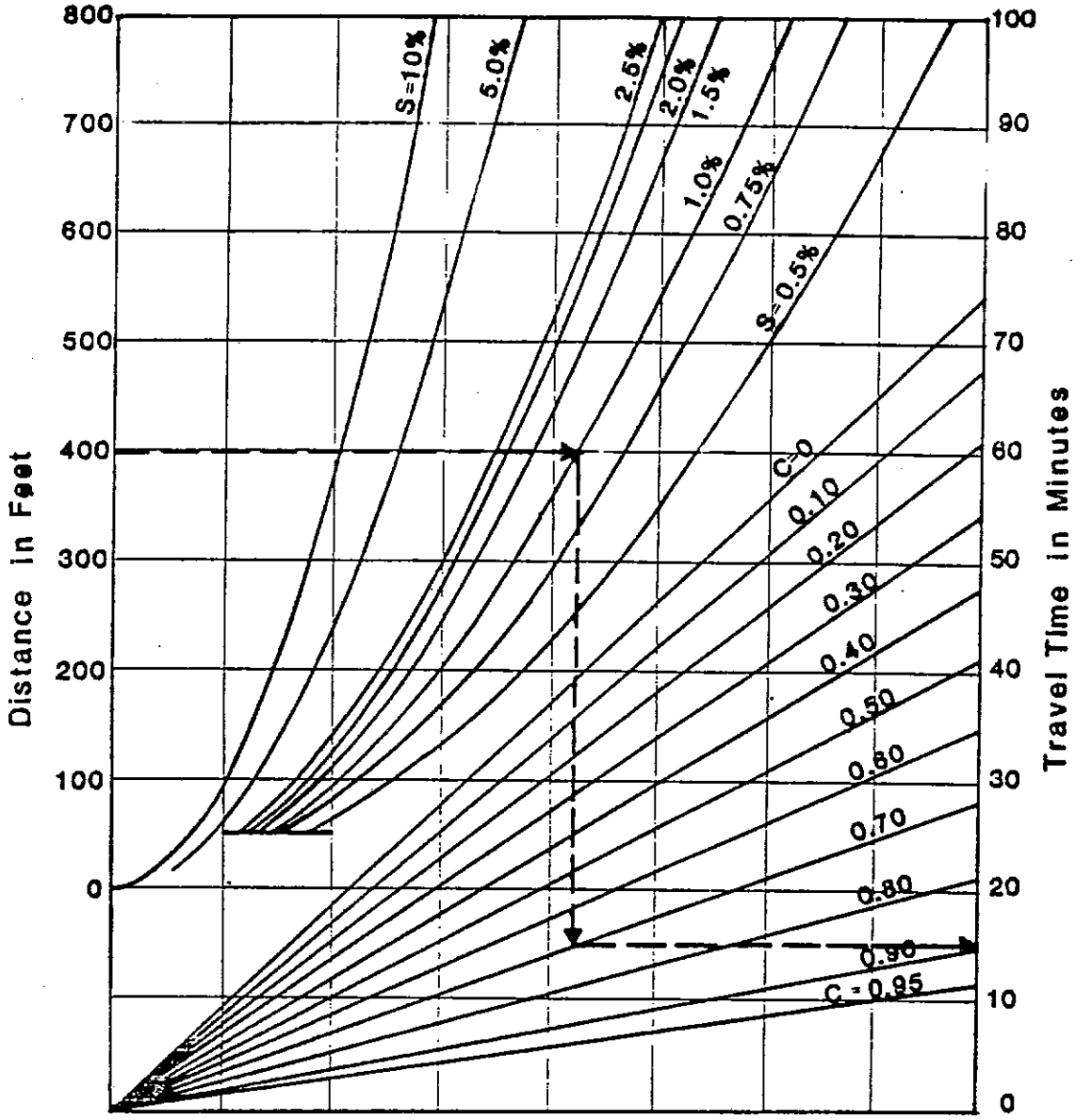
Figure
5 - 1

TABLE 5-1

RECOMMENDED AVERAGE RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	"C" FREQUENCY 10 A&B*	10 C&D*	100 A&B*	100 C&D*
Business					
Commercial Areas	95	0.90	0.90	0.90	0.90
Neighborhood Areas	70	0.75	0.75	0.80	0.80
Residential					
1/8 Acre or less	65	0.55	0.65	0.65	0.75
1/4 Acre	40	0.50	0.60	0.60	0.70
1/3 Acre	30	0.40	0.50	0.55	0.60
1/2 Acre	25	0.35	0.45	0.45	0.55
1 Acre	20	0.30	0.40	0.40	0.50
Industrial					
Light Areas	80	0.70	0.70	0.80	0.80
Heavy Areas	90	0.80	0.80	0.90	0.90
Parks and Cemeteries	7	0.30	0.35	0.55	0.60
Playgrounds	13	0.30	0.35	0.60	0.65
Railroad Yard Areas	40	0.50	0.55	0.60	0.65
Undeveloped Areas					
Historic Flow Analysis- Greenbelts, Agricultural	2	0.15	0.25	0.20	0.30
Pasture/Meadow	0	0.25	0.30	0.35	0.45
Forest	0	0.10	0.15	0.15	0.20
Exposed Rock	100	0.90	0.90	0.95	0.95
Offsite Flow Analysis (when land use not defined)	45	0.55	0.60	0.65	0.70
Streets					
Paved	100	0.90	0.90	0.95	0.95
Gravel	80	0.80	0.80	0.85	0.85
Drive and Walks	100	0.90	0.90	0.95	0.95
Roofs	90	0.90	0.90	0.95	0.95
Lawns	0	0.25	0.30	0.35	0.45

* Hydrologic Soil Group



REFERENCE : Wright – McLaughlin Engineers, Urban Storm Drainage Criteria Manual, Vol. 1, Denver Regional Council of Governments, Denver, Co. 1977

HDR Infrastructure, Inc.
A Centerra Company

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

Overland Flow Curves

Date: OCT. 1987

Figure: 5-2

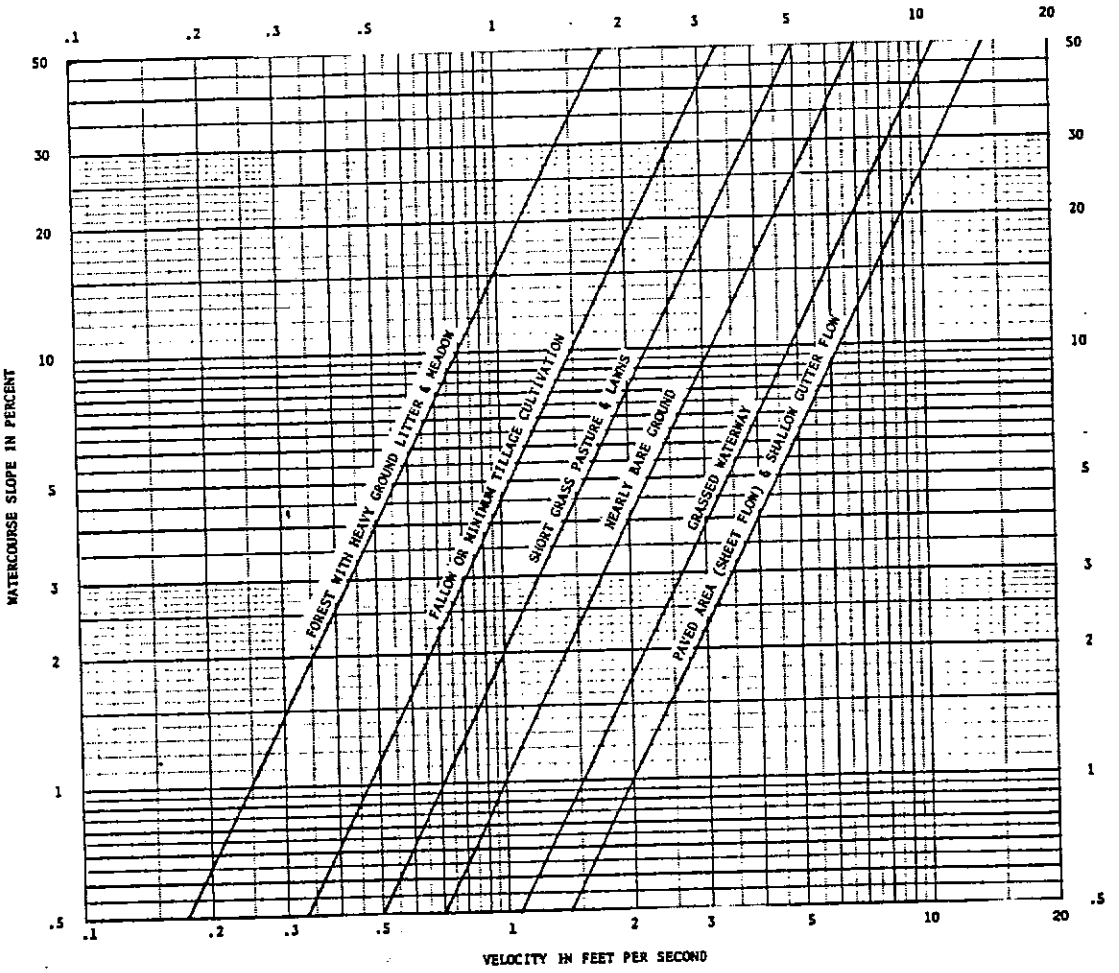

WATERCOURSE SLOPE IN PERCENT
VELOCITY IN FEET PER SECOND
FOREST WITH HEAVY GROUND LITTER & MEADOW
FALLOW OR MINIMUM TILLAGE CULTIVATION
SHORT GRASS PASTURE & LAWNS
NEARLY BARE GROUND
GRASSED WATERWAY
PAVED AREA (SHEET FLOW) & SHALLOW GUTTER FLOW

TABLE 3: FULL FLOW COEFFICIENT VALUES CIRCULAR CONCRETE PIPE

D Pipe Diameter (inches)	A Area (Square Feet)	R Hydraulic Radius (Feet)	Value of $C_1 = \frac{1.486}{n} \times A \times R^{2/3}$			
			n=0.010	n=0.011	n=0.012	n=0.013
8	0.349	0.167	15.8	14.3	13.1	12.1
10	0.545	0.208	28.4	25.8	23.6	21.8
12	0.785	0.250	46.4	42.1	38.6	35.7
15	1.227	0.312	84.1	76.5	70.1	64.7
18	1.767	0.375	137	124	114	105
21	2.405	0.437	206	187	172	158
24	3.142	0.500	294	267	245	226
27	3.976	0.562	402	366	335	310
30	4.909	0.625	533	485	444	410
33	5.940	0.688	686	624	574	530
36	7.069	0.750	867	788	722	666
42	9.621	0.875	1308	1189	1090	1006
48	12.566	1.000	1867	1698	1556	1436
54	15.904	1.125	2557	2325	2131	1967
60	19.635	1.250	3385	3077	2821	2604
66	23.758	1.375	4364	3967	3636	3357
72	28.274	1.500	5504	5004	4587	4234
78	33.183	1.625	6815	6195	5679	5242
84	38.485	1.750	8304	7549	6920	6388
90	44.170	1.875	9985	9078	8321	7681
96	50.266	2.000	11850	10780	9878	9119
102	56.745	2.125	13940	12670	11620	10720
108	63.617	2.250	16230	14760	13530	12490
114	70.882	2.375	18750	17040	15620	14420
120	78.540	2.500	21500	19540	17920	16540
126	86.590	2.625	24480	22260	20400	18830
132	95.033	2.750	27720	25200	23100	21330
138	103.870	2.875	31210	28370	26010	24010
144	113.100	3.000	34960	31780	29130	26890

HISTORIC CONDITIONS

HOLLAND WEST, INC.
6920 S. HOLLY CIRCLE
ENGLEWOOD, CO. 80112
(303) 773-0020

Project: GLEN COVE Job No. 340

Title HISTORIC T_c CALCS.

By VFM date 4-16-87 Checked _____ date _____

Scale _____ Sht. _____ of _____

(1) BASIN FS_A: 23 ACRES - $c = 0.30$ $T_c = 22$ min

by

OVERLAND: 700' @ 20% → $T_i = \frac{1.8(1.1-c)L^{1/2}}{S^{1/3}} = 1.4$ min

+

CHANNEL: 1450' @ 9% → $v = 3$ fps → $T_t = 8$ min

(2) BASIN FS_B: 16 ACRES - $c = 0.30$ $T_t = 5.5$ min

Channel time only from (1): 350' @ 7% → $v = 2.6$ fps

BASIN FS_C: 6.5 AC - $c = 0.30$ $T_c = 7$ min * not in progression to (3)

by

OVERLAND: 200' @ 40% → $T_i = \frac{1.8(1.1-c)L^{1/2}}{S^{1/3}} = 6$ min

+

CHANNEL: 350' @ 10% → $v = 4.5$ fps = 1.3 min

(3) BASIN FS_D: 12 AC - $c = 0.30$ $T_t = 6.7$ fps

Channel Time only from (2): 1050' @ 7% → $v = 2.6$ fps

BASIN F4 sheet flows to S. Douglas Creek with no defined channel. OVERLAND flow only.

850' @ 10% → $T_c = \frac{1.8(1.1-c)L^{1/2}}{S^{1/3}} = 19.5$ min

(4) BASIN FS_A: 7 AC - $c = 0.30$ Overland flow to Centennial Heights Sub.

500' @ 20% → $T_c = \frac{1.8(1.1-c)L^{1/2}}{S^{1/3}} = 12$ min.

(5) BASIN FS_B: T_t from Centennial Heights = 4 min. $c = 0.7$

BASIN FS_C: 17 AC $c = 0.30$

OVERLAND: 1500' @ 15% → $T_c = \frac{1.8(1.1-c)L^{1/2}}{S^{1/3}} = 22.5$ min

CALCULATED BY KFM
DATE 4-17-87
CHECKED BY _____

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

JOB NO 340
PROJECT GLEN COVE
DESIGN STORM 10 YR / 100 YR

HISTORIC COND.

STREET	DESIGN POINT	DIRECT RUNOFF: AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C·A (AC)	I IN/HR	Q (CFS)	TOTAL RUNOFF: t_c (MIN)	Σ(C·A) (AC)	I (IN/HR)	Q (CFS)	STREET: SLOPE (%)	STREET FLOW (CFS)	PIPE: DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	TRAVEL TIME: LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	INITIAL STORM																				
2	F4		32	0.2	19.5	6.4	3.55	22.7													
3	F5	3	57.5	0.2	34	11.5	2.55	29.2													
4	F8		28	0.36	22.5	10.08	3.3	33.3													
5	MAJOR STORM																				
6	F4		32	0.3	19.5	9.6	5.2	49.9													
7	F5	3	57.5	0.3	34	17.25	3.8	65.6													
8	F8		28	0.45	22.5	12.6	4.9	61.7													
9																					
10																					
11																					

DEVELOPED CONDITIONS

HOLLAND WEST, INC.
6920 SOUTH HOLLY CIRCLE
ENGLEWOOD, COLORADO 80112
PH (303) 773-0020
PLANNING
ENGINEERING
LAND SURVEYING
CONSTRUCTION MANAGEMENT
FF ES Inc
HOI IX. ARIZONA
ALI S/FT. WORTH, TEXAS

Project GLEN COVE Job No. 340

Title COMPOSITE "C" VALUES

By SWM date 2/23/88 Checked _____ date _____

Scale _____ Sht. _____ of _____

HYDROLOGIC SOIL CLASSIFICATION - CLAY SOILS over CLAYSTONE - C & D

			10 YEAR		100 YEAR	
BASIN A-1						
2,5 Acres	of Patio Homes	9 %	0,65	0,05	0,75	0,07
6,6 Acres	of Open Space	21 %	0,25	0,05	0,30	0,06
23,5 Acres	of offsite homes	70 %	0,40	0,27	0,50	0,35
				0,37		0,48
BASIN A-3						
4,0 Acres	of Open Space	100 %	0,25	0,25	0,30	0,30
BASIN A-4						
1,5 Acres	of Single Family	26 %	0,60	0,15	0,70	0,18
4,1 Acres	of Open Space	74 %	0,25	0,19	0,30	0,22
				0,34		0,40
BASIN A-5						
0,4 Acres	of Streets	52 %	0,90	0,47	0,95	0,50
0,3 Acres	of Single Family	48 %	0,60	0,29	0,70	0,33
				0,76		0,83
BASIN A-6						
1,7 Acres	of multi-family	44 %	0,65	0,29	0,75	0,33
1,5 Acres	of open space	38 %	0,25	0,10	0,30	0,11
0,7 Acres	of single family	18 %	0,60	0,10	0,70	0,13
				0,49		0,57
BASIN A-7, A-8, A-10, A-11						
18,6 Acres	of multi-family	100 %	0,65	0,65	0,75	0,75
BASIN A-9						
0,5 Acres	of single-family	50 %	0,60	0,30	0,70	0,35
0,5 Acres	of multi-family	5 %	0,65	0,33	0,75	0,38
				0,63		0,73

JLLAND WEST. INC.
6920 SOUTH HOLLY CIRCLE
ENGLEWOOD. COLORADO 80112
PH (303) 773-0020
PLANNING
ENGINEERING
LAND SURVEYING
CONSTRUCTION MANAGEMENT

Project GLEN COVE Job No. 340

Title COMPOSITE "C" VALUES

By SWM date 2/23/88 Checked _____ date _____

Scale _____ Sht. _____ of _____

		10 YEAR		100 YEAR	
BASIN B-1					
4.6 acres of Open Space	34%	0.20	0.07	0.30	0.10
8.9 acres of Single-family Estate	66%	0.50	0.33	0.60	0.40
			0.40		0.50
BASIN B-2					
3.5 acres of Townhomes	100%	0.65	0.65	0.75	0.75
BASIN B-3					
6.8 acres of Single-family	100%	0.60	0.60	0.70	0.70
BASIN C-1					
5.3 acres of multi-family	100%	0.65	0.65	0.75	0.75
BASIN C-2, C-3					
4.8 acres of Office	100%	0.75	0.75	0.80	0.80
BASIN D					
4.0 acres of Open Space	38%	0.20	0.08	0.30	0.11
6.6 acres of Patio Homes	62%	0.65	0.40	0.75	0.47
			0.48		0.58

STANDARD FORM SF-2

TIME OF CONCENTRATION

SUBDIVISION GLEN COVE

CALCULATED BY SWM DATE 2/23/88 $t_c = t_i + t_t$

SUB-BASIN DATA			INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)				t_c CHECK (URBANIZED BASINS)			FINAL t_c	REMARKS
DESIG: (1)	AREA Ac (2)	C_5 (3)	LENGTH Ft (4)	SLOPE % (5)	t_i Min (6)	LENGTH Ft (7)	SLOPE % (8)	VEL. FPS (9)	t_t Min (10)	COMP. t_c (11)	TOTAL LENGTH Ft (12)	$t_c = (L/180)+10$ Min (13)	Min (14)	
A_1	32.6	0.37	300	10	11	1400	2	9.8	2.4					
						1360	4	6.3	3.6	17	3060	27	17	
A_3	4.0	0.25	450	29	10	–	–	–	–	10	450	12.5	10	
A_4	5.6	0.34				400	3.42	17	½	17½			17½	Same for A_5
A_6	3.9	0.49				720	6.29	20	½	18			18	Same for A_9 & A_{11} & A_{10}
A_7	8.7	0.65	300	25	10	1100	10	6	3	13	1400	18	13	
B_1	13.5	0.50	400	28	10	650	4	4.5	2½	12½	1050	16	12½	
B_2	3.5	0.65				500	10	6	1½	15	1550	18½	15	Same for B_3
C_3	2.2	0.75				200	6	5	½	15½			15½	

STANDARD FORM SF-2

TIME OF CONCENTRATION

SUBDIVISION GLEN COVE

CALCULATED BY SWM DATE 2/23/88 $t_c = t_i + t_t$

SUB-BASIN DATA			INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)				t_c CHECK (URBANIZED BASINS)			FINAL t_c	REMARKS
DESIG: (1)	AREA Ac (2)	C_5 (3)	LENGTH Ft (4)	SLOPE % (5)	t_i Min (6)	LENGTH Ft (7)	SLOPE % (8)	VEL. FPS (9)	t_t Min (10)	COMP. t_c (11)	TOTAL LENGTH Ft (12)	t_c =(L/180)+10 Min (13)	Min (14)	
C_1	5.3	0.65	100	10	5	600	5	4.5	2	7	700	14	7	
C_2	2.6	0.75				600	4	4.0	2½	9½	1300	17	9½	
D	10.6	0.48	600	25	12	800	8	5.5	2½	14½	1400	18	14½	

Q = ACi
A - acres t - min
I - inches/hr. V - ft/sec
Q - cfs

10 YEAR
COMPUTATION FORM
DRAINAGE & STORM SEWER DESIGN
RATIONAL METHOD

Project CHELSEA GLEN
Comp. by SWM date 2/23/89
Ck by ____ date ____

LOCATION			A		C	TIME OF CONCENTRATION		i	Q	DESIGN					PROFILE				
STREET	FROM	TO	INCREMENT	TOTAL		TO INLET	PIPE OR CHANNEL			SIZE	SLOPE %	n	CAP. FULL	V	LENGTH FT.	FALL FT.	OTHER LOSSES	UPPER INV EL.	LOWER INV EL.
Offsite Gully		A_1	32.6		0.37	17		3.75	45.2	36"	3.42								
offsite Gully		A_3	4.0		0.25	10		4.60	4.6	18"	3.48								
Chesham Circle	A_1 & A_3	A_4	5.6		0.34	17½		3.65	7.0	INTO	10' INLET								
		A_5	0.7		0.76	17½		3.65	1.9	INTO	5' INLET								
Center Open Space	A_5	A_6	3.9		0.49	18		3.50	6.7	INTO	24" RCP								
Chesham Circle		A_8	5.2		0.65	17½		3.65	12.3	15'	INLET								
Chesham Circle	A_8	A_9	1.0		0.63	18		3.50	2.2	15'	INLET								
		A_{10}	1.5		0.65	18		3.50	3.4	15'	INLET								
So. Douglas Creek	A_{10}	A_{11}	3.2		0.65	18½		3.45	7.2										
Chesham Circle		A_7	8.7		0.65	13		4.10	23.2	15'	INLET								
Chesham Circle		B_1	13.5		0.40	12.5		4.25	23.0										
Chesham Circle	B_1	B_2	3.5		0.65	15		3.90	8.9										
	B_1	B_3	6.8		0.60	15		3.90	15.9										
Michener Drive		C_1	5.3		0.65	7		5.40	18.6										
Chesham Circle	C_1	C_2	2.6		0.75	9½		4.70	9.2										
So. Douglas Creek		C_3	2.2		0.75	15½		3.80	6.3										
So. Douglas Creek		D	10.6		0.48	14½		3.95	20.1										

Q = ACi
A - acres t - min
i - inches/hr. V - ft/sec
Q - cfs

100 YEAR
COMPUTATION FORM
DRAINAGE & STORM SEWER DESIGN
RATIONAL METHOD

Project CHELSEA GLEN
Comp. by SWM date 2/23/88
Ck by ____ date ____

LOCATION			A		C	TIME OF CONCENTRATION		i	Q	DESIGN					PROFILE				
STREET	FROM	TO	INCREMENT	TOTAL		TO INLET	PIPE OR CHANNEL			SIZE	SLOPE %	n	CAP. FULL	V	LENGTH FT.	FALL FT.	OTHER LOSSES	UPPER INV. EL.	LOWER INV. EL.
Offsite Gully		A_1	32.6		0.48	17		5.65	88.4										
Offsite Gully		A_3	4.0		0.30	10		7.00	8.4										
Chesham Circle	A_1 & A_3	A_4	5.6		0.40	17½		5.50	12.3										
		A_5	0.7		0.83	17½		5.50	3.2										
Center Open Space	A_5	A_6	3.9		0.57	18		5.30	11.8										
Chesham Circle		A_8	5.2		0.75	17½		5.50	21.5										
Chesham Circle	A_8	A_9	1.0		0.73	18		5.30	3.3										
		A_{10}	1.5		0.75	18		5.30	6.0										
So. Douglas Creek	A_{10}	A_{11}	3.2		0.75	18½		5.20	12.5										
Chesham Circle		A_7	8.7		0.75	13		6.10	40.0										
Chesham Circle		B_1	13.5		0.50	12.5		6.25	42.2										
Chesham Circle	B_1	B_2	3.5		0.75	15		5.80	15.2										
	B_1	B_3	6.8		0.70	15		5.80	27.6										
Michener Drive		C_1	5.3		0.75	7		8.20	32.6										
Chesham Circle	C_1	C_2	2.6		0.80	9½		7.10	14.8										
So. Douglas Cr		C_3	2.2		0.80	15½		5.75	10.1										
So. Douglas Cr.		D	10.6		0.58	14½		5.95	36.6										

HOLLAND WEST, INC.
6920 S. HOLLY CIRCLE
ENGLEWOOD, CO. 80112
(303) 773-0020

Project GLEN COVE Job No. 340

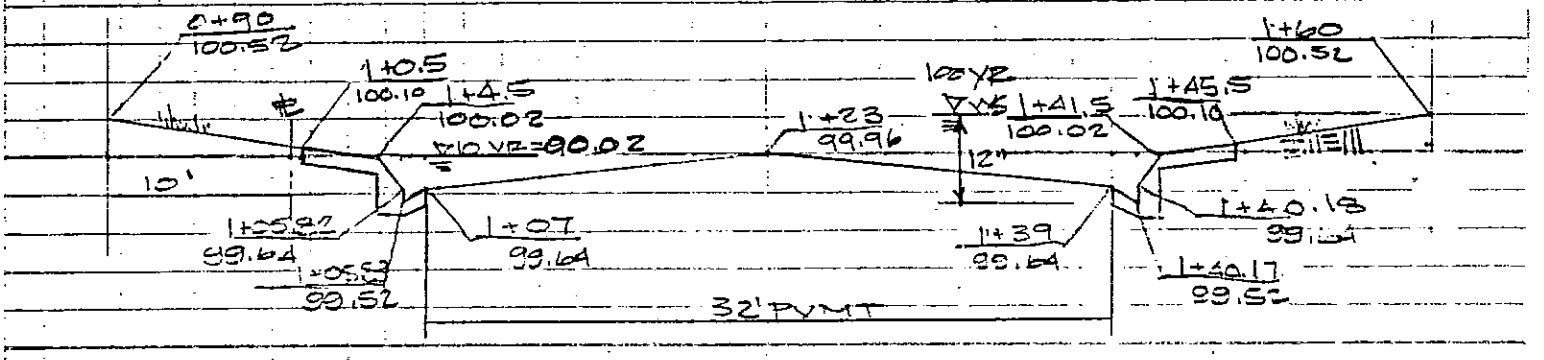
Title CURB CAPACITIES

By VM date 4-20-87 Checked _____ date _____

REV. 8-20-87 FOR 32' PUMT

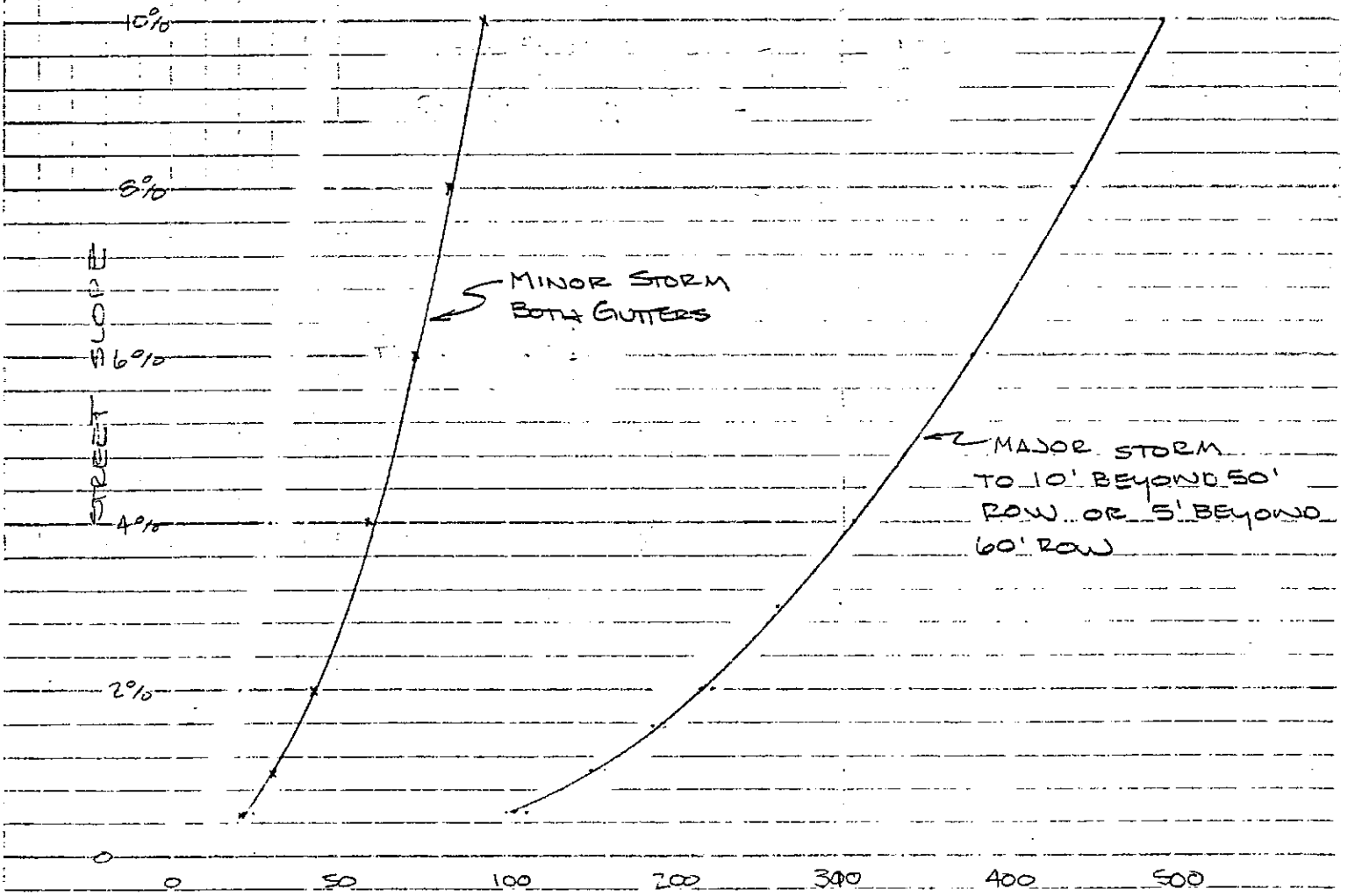
Scale _____ Sht. _____ of _____

LOCAL



CALCULATE MINOR & MAJOR STORMS BY MANNINGS

Composite "n" for major storm: $\frac{0.016(45) + 0.04(25)}{70} = 0.025$



HOLLAND WEST, INC.
6920 S. HOLLY CIRCLE
ENGLEWOOD, CO. 80112
(303) 773-0020

Project: GLEN COVE Job No. 340

Title CURB CAPACITIES

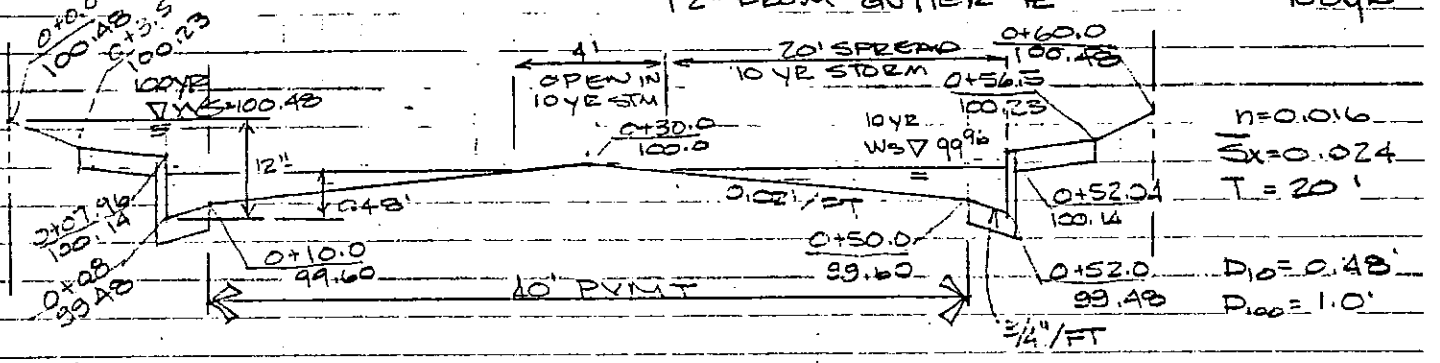
By KM date 4-20-87 Checked _____ date _____

REV 8-20-87 : 10 YR PONDING TO ℄

Scale _____ Sht. _____ of _____

COLLECTOR

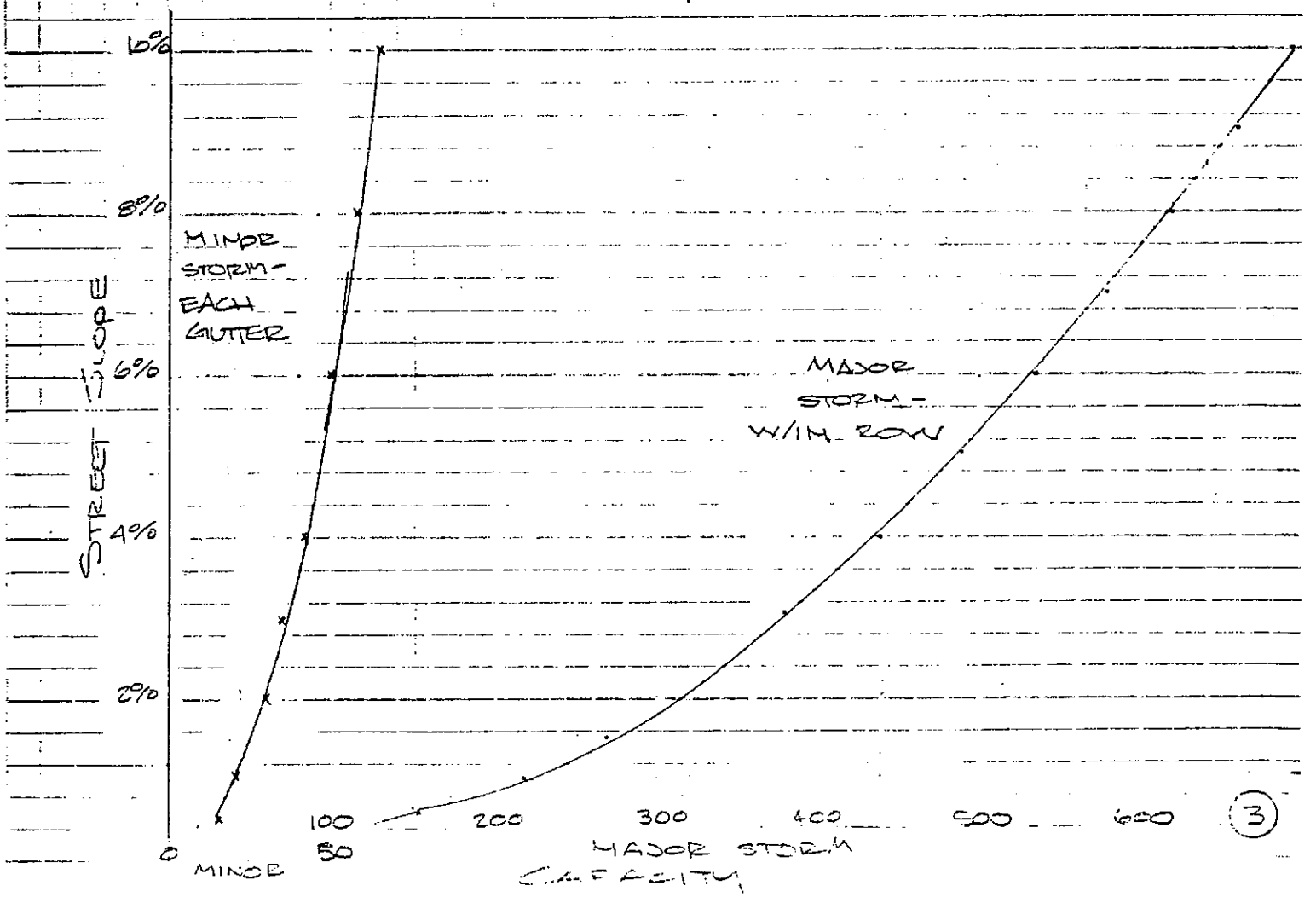
PONDING LIMITS: TOP OF CURB OR 20' SPREAD 10 YR
12" FROM GUTTER ℄ 100 YR



CALCULATE MINOR STORM CAPACITY BY FORMULA 6.2.2

$$Q = \frac{0.56}{n S_x} S^{1/2} (T S_x)^{2.67} \Rightarrow Q = 205.48\, S^{1/2}$$

CALCULATE MAJOR STORM BY MANNING'S



SECTION: B

FINAL DRAINAGE STUDY

CHELSEA GLEN FILING NO. 1

AUGUST 21, 1987

AMENDED FEBRUARY 16, 1988

AMENDED APRIL 5, 1988

JOB NO. 340

General

Chelsea Glen Filing No. 1 consists of 66 Single-family lots located on 12.9 acres within the overall Chelsea Glen PD. These lots are located along the Chesham Circle loop road (see map). In general, drainage flows will continue to follow the historic pattern and be directed northeasterly through the subdivision to South Douglas Creek, an unimproved channel 200 feet north of the subdivision boundary. Improvements exist immediately west (above) the project and downstream under Centennial Blvd.

Developed Drainage Basins

Two major sub-basins are created by the development of Chelsea Glen. They are designated by A and B from west to east on the drawing, with each major sub-basin being further segmented to allow analysis of flows at various design points.

The largest basin is designated "A", and consists of the west half of the Filing and considerable offsite areas. The major drainage feature in this sub-basin is the steep gully along the west edge that presently carries offsite and onsite flows to South Douglas Creek. As ultimate development will virtually eradicate the gully, a greenbelt is proposed over the gully area. A storm sewer system will convey the 100 year flows under the project to South Douglas Creek, with a 100 year emergency overflow section designed in the greenbelt. The greenbelt is normally intended to carry only local flows except in the ultimate emergency event.

The major design consideration of the storm sewer system was how to get flows from the major offsite sub-basin (A1) into the system, given the restrictions on headwater depth in the new Drainage Criteria Manual. This concern was addressed via an improved entrance as allowed for in the Criteria. Once the major flow was accommodated, flows from the various sub-basins were accumulated via inlets (primarily at design points A_4 and A_9).

Sub-basin B consists of the easterly lots, with the future multi-family and some open space areas. Generally, flows will travel easterly and northerly to design points B_2 and B_3 via Chesham Circle. At that intersection five inlets will intercept the flows and convey them to the South Douglas Creek Channel.

Future storm sewers have been shown on the map for reference. When these areas to the west of Filing No. 1 develop, runoff will be directed into those storm sewers as shown, with the excess impacting Filing 1 as shown in the calculations. Until that time, runoff to the gully will continue to flow in a swale to South Douglas Creek, and not impinge on Filing No. 1 at all.

South Douglas Creek

South Douglas Creek has been studied previously and an improved channel section designed (See Section C). Our design concept is to continue the existing concrete lined channel when the adjacent areas develop. A box culvert will be constructed easterly across the office area to match the existing box culvert under Centennial Blvd. Again, the major constraint in design of the culvert is the entry condition and headwater depth restrictions. The solution is the same as for the storm sewer in Basin A - an improved entrance. The open concrete-lined channel and the box culvert will safely convey the flows around the development. HEC-2 computer runs used in analysis and design are included in Section C.

It is anticipated that the channel/box culvert system will be constructed in stages, depending upon the timing of development of the various parcels. Should the office parcel develop first, the box culvert would be constructed first. However, should areas along the Creek channel be developed first, the open channel portion would be the next construction. In either case, ultimate development of this PD will result in an improved channel completely along the project.

As no part of this single-family filing lies adjacent to the Creek, no costs are included in the Filing No. 1 cost estimate for channel or box construction. When the multi-family or office areas are developed, the costs will be included in those filings.

Summary

Development of this parcel has presented some unique drainage challenges due to the steep slopes and major channel involved. Runoff during the existing, partially developed, and fully developed conditions has been analyzed to insure safe conveyance has been achieved. Construction of the facilities as proposed will meet the goal of a safe, efficient drainage system for the development, and address offsite problems currently existing.

COST ESTIMATE

PROJ: CHELSEA GLEN FILING NO. 1
DATE: UPDATED APRIL 5, 1988
BY : STEVEN W. MURRAY, PE

NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENSION
1	18" RCP CLASS III	395.00	LF	28.50	11257.50
2	24" RCP CLASS III	455.00	LF	38.00	17290.00
3	36" RCP CLASS III	1477.00	LF	48.85	72151.45
4	42" RCP CLASS III	62.00	LF	57.65	3574.30
5	18" FLARED END SECTION	1.00	EA	260.00	260.00
6	24" FLARED END SECTION	1.00	EA	325.00	325.00
7	36" IMPROVED INLET	1.00	EA	5000.00	5000.00
					0.00
8	4' DIAMETER MANHOLES	1.00	EA	1050.00	1050.00
9	5' DIAMETER MANHOLES	6.00	EA	1250.00	7500.00
					0.00
10	5' TYPE R INLETS	2.00	EA	1995.00	3990.00
11	10' TYPE R INLETS	3.00	EA	3050.00	9150.00
12	15' TYPE R INLETS	4.00	EA	3047.50	12190.00
13	20' TYPE R INLETS	1.00	EA	3625.00	3625.00
					0.00
13	TYPE L RIPRAP	50	CY	25.00	0.00
					0.00
14	EXTRA DEPTH, STORM SEWER		LS	4000.00	0.00
15	EXTRA DEPTH, INLETS		LS	3000.00	0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00

private cost #8250.00

	SUBTOTAL	$	147363.25
CONTINGENCIES	% 10%	$	0.00
	GRAND TOTAL	$	147363.25

BASIN DRAINAGE FEE	12.939	ACRES	4883.00/AC	$63,181.14
BASIN BRIDGE FEE	12.939	ACRES	112.00/AC	$ 1,449.17

COSTS PAID TO DATE FOR PHASE ONE CONSTRUCTION: $59,092.40

:030

Q = ACi
A - acres t - min
i - inches/hr. V - ft/sec
Q - cfs

10 YEAR

COMPUTATION FORM

DRAINAGE & STORM SEWER DESIGN
RATIONAL METHOD

Project CHELSEA GLEN #1
Comp. by SWM date 2/25/88
Ck by _____ date _____

LOCATION			A		C	TIME OF CONCENTRATION		i	Q	DESIGN					PROFILE				
STREET	FROM	TO	INCREMENT	TOTAL		TO INLET	PIPE OR CHANNEL			SIZE	SLOPE %	n	CAP. FULL	V	LENGTH FT.	FALL FT.	OTHER LOSSES	UPPER INV EL.	LOWER INV EL.
Offsite Gully		A_1	32.6		0.37	17		3.75	45.2										
Offsite Gully		A_3	4.0		0.25	10		4.60	4.6										
Chesham Circle	A_1 & A_3	A_4	5.6		0.34	17½		3.65	7.0										
		A_5	0.7		0.76	17½		3.65	1.9										
Center Open Space	A_5	A_6	3.9		0.49	18		3.50	6.7										
		A_9	1.0		0.63	18		3.50	2.2										
		A_{10}	0.17		0.90	18		3.50	0.5										
Single Family		B_1	13.5		0.40	12½		4.25	23.0										
Chesham Circle	B_1	B_2	3.5		0.65	15		3.90	8.9										
		B_{31}	5.2		0.60	15		3.90	12.2										
		B_{32}	1.6		0.60	15		3.90	3.7										
		B_4	0.5		0.90	15		3.90	1.8										

Q = ACi
A - acres t - min
I - inches/hr V - ft/sec
Q - cfs

100 YEAR
COMPUTATION FORM
DRAINAGE & STORM SEWER DESIGN
RATIONAL METHOD

Project CHELSEA GLEN #1
Comp. by SWM date 2/25/88
Ck by ____ date ____

LOCATION			A		C	TIME OF CONCENTRATION		i	Q	DESIGN					PROFILE				
STREET	FROM	TO	INCREMENT	TOTAL		TO INLET	PIPE OR CHANNEL			SIZE	SLOPE %	n	CAP. FULL	V	LENGTH FT.	FALL FT.	OTHER LOSSES	UPPER INV. EL.	LOWER INV. EL.
Offsite Gully		A_1	32.6		0.48	17		5.65	88.9										
Offsite Gully		A_3	4.0		0.30	10		7.00	8.4										
Chesham Circle	A_1 & A_3	A_4	5.6		0.40	17½		5.50	12.3										
		A_5	0.7		0.83	17½		5.50	3.2										
Center Open Space	A_5	A_6	3.9		0.57	18		5.30	11.8										
		A_9	1.0		0.73	18		5.30	3.9										
		A_{10}	0.17		0.95	18		5.30	0.9										
Single Family		B_1	13.5		0.50	12½		6.25	42.2										
Chesham Circle	B_1	B_2	3.5		0.75	15		5.80	15.2										
		B_{31}	5.2		0.70	15		5.80	21.1										
		B_{32}	1.6		0.70	15		5.80	6.5										
		B_4	0.5		0.95	15		5.80	2.8										

REF: HDS NO. 5

PROJECT: CHELSEA GLEN
OFFSITE RUNOFF

STATION: D.P. 1

SHEET 1 OF 1

TAPERED INLET DESIGN FORM

DESIGNER / DATE: JDF 9-25-87

REVIEWER / DATE: _____ / _____

DESIGN DATA:

Q = 88.4 cfs ; EL_{hi} = 372.5 ft

EL. THROAT INVERT 367.79 ft

EL. STREAM BED AT FACE — ft

FALL 3 ft TAPER 6:1 : 1 (4:1 TO 6:1)

STREAM SLOPE, S_o = VAR. ft/ft

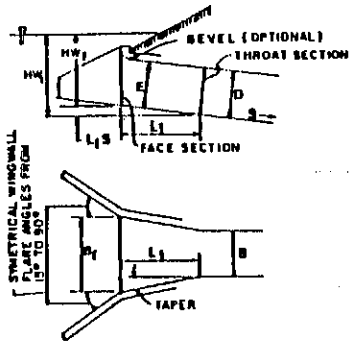
SLOPE OF BARREL, S = 0.0342 ft/ft

S_f 4 : 1 (2:1 TO 3:1)

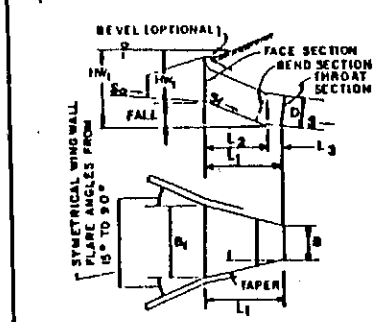
BARREL SHAPE AND MATERIAL: 36" RCP

N = 1, B = —, D = —

INLET EDGE DESCRIPTION SQ. EDGE SIDE TAPER



SIDE-TAPERED



SLOPE-TAPERED

COMMENTS

1. CDOH M-601-1 TO BE USED FOR HEADWALL & WING-WALL (30° FLARE)
2. 5' x 3' SQ EDGE HEADWALL TO TRANSITION TO 36" RCP
3. NOMOGRAPH (2) USED FROM CHART 5.3

Q (cfs)	EL_{hi}	EL. THROAT INVERT	EL. FACE INVERT (1)	HW_f (2)	HW_f/E (3)	Q/B_f (4)	MIN. B_f (5)	SELECTED B_f	SLOPE-TAPERED ONLY: MIN. L_3 (6)	L_2 (7)	CHECK L_2 (8)	ADJ. L_3 (9)	ADJ. TAPER (10)	L_1 (11)	SIDE-TAPERED W/ FALL: EL. CREST INV.	HW_c (12)	MIN. W (13)
88.4	372.5	367.79	368.0	4.5	1.29	21.9	4.0	5.0	—	—	—	—	—	6	371.0	1.5	16.7

(1) SIDE-TAPERED: EL. FACE INVERT = EL. THROAT INVERT + 1 ft (APPROX.)
SLOPE-TAPERED: EL. FACE INVERT = EL. STREAM BED AT FACE

(2) $HW_f = EL_{hi}$ - EL. FACE INVERT

(3) 1.1 D ≥ E ≥ D

(4) FROM DESIGN CHARTS

(5) MIN. $B_f = Q/(Q/B_f)$

(6) MIN. $L_3 = 0.5\,NB$

(7) $L_2 = (\text{EL. FACE INVERT} - \text{EL. THROAT INVERT})\,S_f$

(8) CHECK $L_2 = \left[\frac{B_f - NB}{2}\right] \cdot \text{TAPER} - L_3$

(9) IF (8)>(7), ADJ. $L_3 = \left[\frac{B_f - NB}{2}\right] \cdot \text{TAPER} - L_2$

(10) IF (7)>(8), ADJ. TAPER $= (L_2 + L_3) \Big/ \left[\frac{B_f - NB}{2}\right]$

(11) SIDE-TAPERED: $L = \left[\frac{B_f - NB}{2}\right] \cdot \text{TAPER}$
SLOPE-TAPERED: $L_1 = L_2 + L_3$

(12) $HW_c = EL_{hi}$ - EL. CREST INVERT

(13) MIN. $W = 0.35\,Q/HW_c^{1.5}$
= 16.7'

SELECTED DESIGN

B_f 5'

L_1 6'

L_2 —

L_3 —

BEVELS ANGLE 45°
b = 4" in; d = 4" in

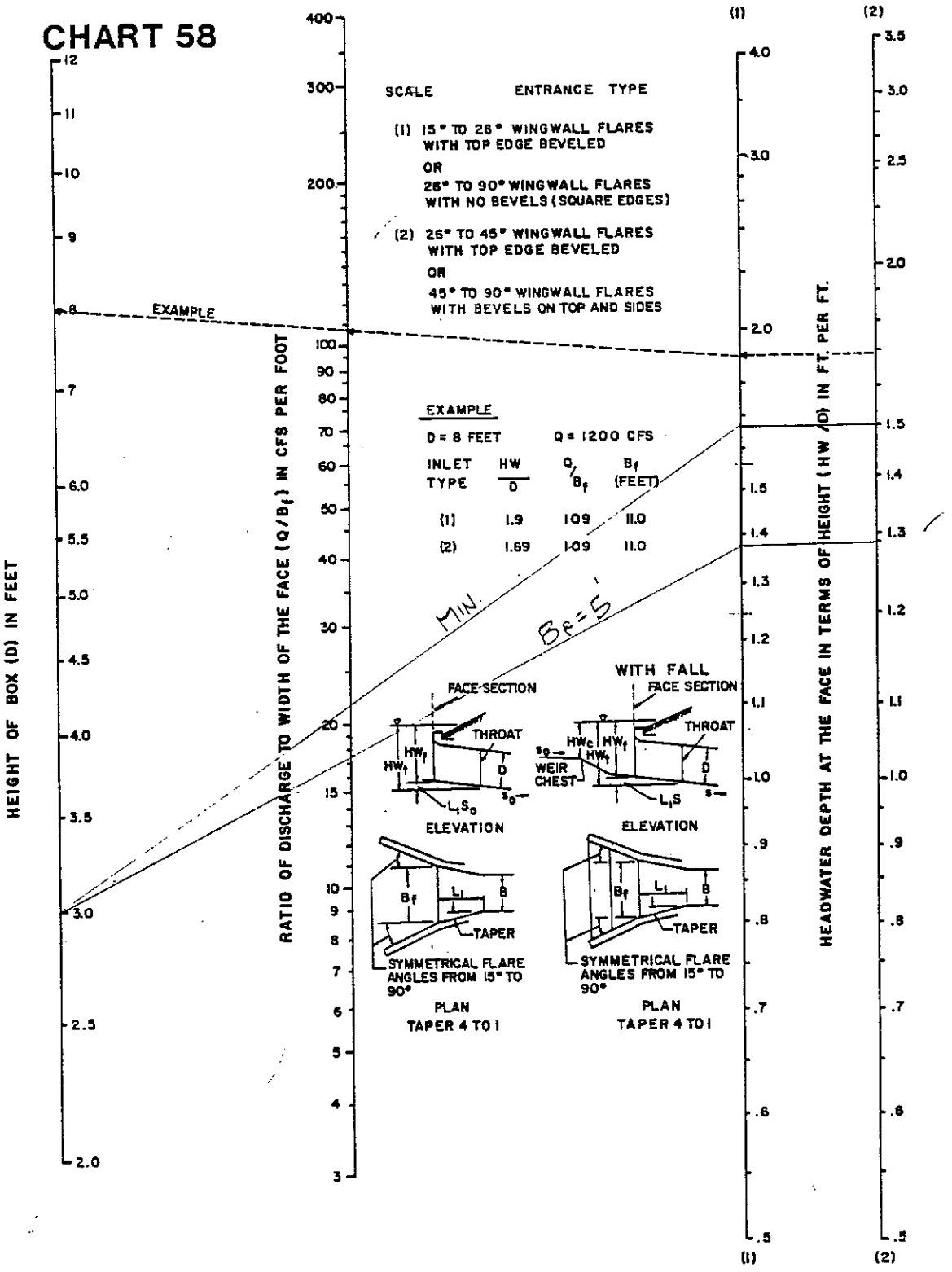
TAPER 6 : 1

S_f = 4 : 1

241

(3)

CHART 58



FACE CONTROL FOR BOX CULVERTS WITH SIDE TAPERED INLETS

REF: HDS NO. 5

HOLLAND WEST, INC.
6920 S. HOLLY CIRCLE
ENGLEWOOD, CO. 80112
(303) 773-0020

Project CHELSEA GLEN Job No. 340

Title STORM ENTRANCE

By VEM date 8-14 Checked _____ date _____

Scale _____ Sht. _____ of _____

$Q_{10} = 4.6$ CFS
$Q_{100} = 8.4$ CFS

DP 4

SIZE STORM TO CARRY 100 YEAR OFFSITE FLOW BY INLET CONTROL

18" RCP ⇒ HW/D = 1.4 ∴ HW = 2.1

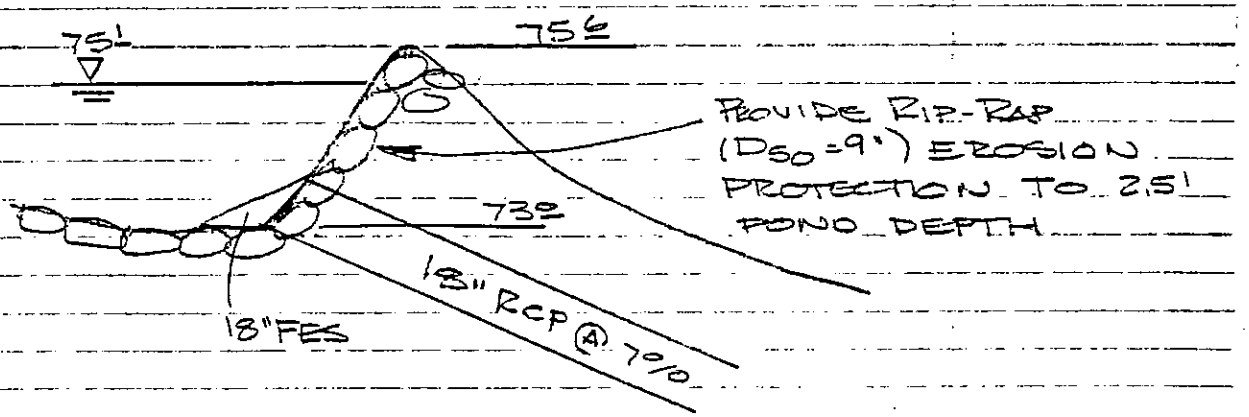
24" RCP ⇒ HW/D = 0.8 ∴ HW = 1.6

WHAT SIZE PIPE IS NEEDED TO CONVEY Q_{100} AT S = 7.0% & N = 0.013

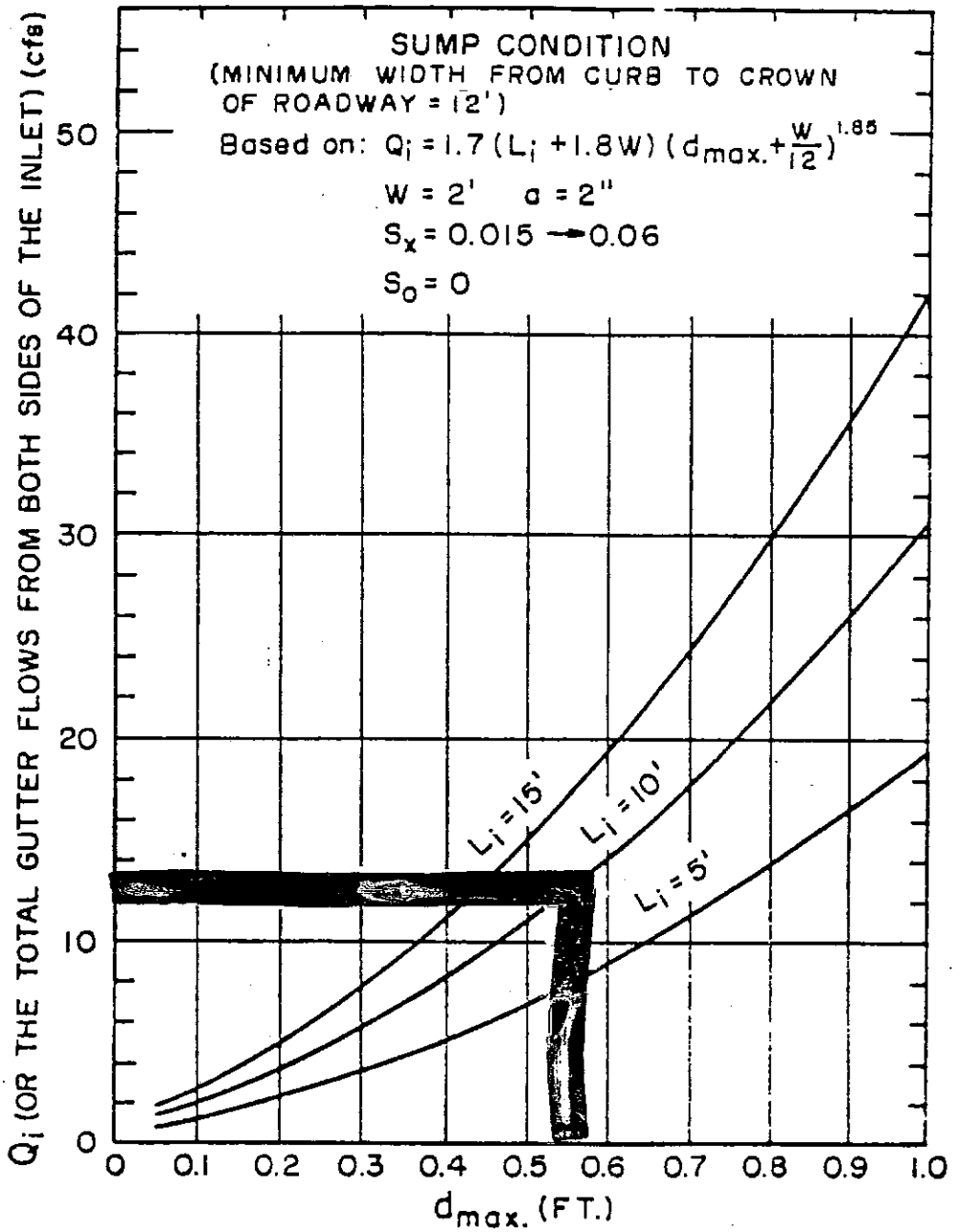
18" : Q_{CAP} = 27.8 CFS & V = 15.7 $Q/Q = 0.37$
$d/D = 0.42$ ∴ $d = 0.63$
$v/V = 0.9$ ∴ $v = 14$ FPS
$H_p = 3.1'$

FROM SMH 5 → SMH 4, S = 3.5%

18": Q_{CAP} = 19.64 & V = 11.12 FPS $Q/Q = 0.53$
$d/D = 0.53$ ∴ $d = 0.79$
$v/V = 1.03$ ∴ $v = 11.5$ FPS
∴ $H_p = 2.0'$



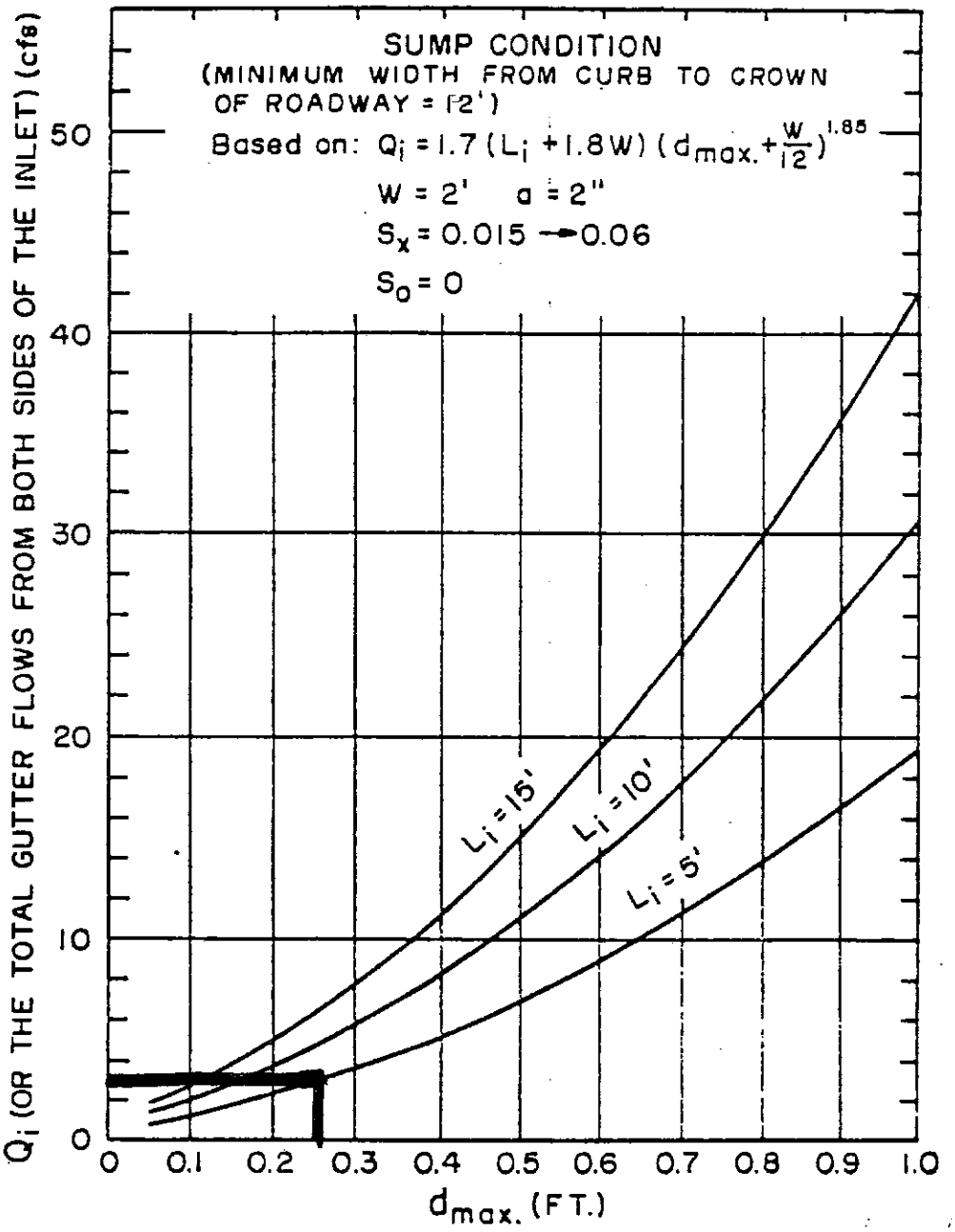
INLET AT DESIGN POINT A4
10' Curb Opening, Q100=12.3 cfs



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

Sump Capacity for Curb-opening Inlets

INLET AT DESIGN POINT AS
5' Curb Opening Inlet, $Q_{100} = 3.2$



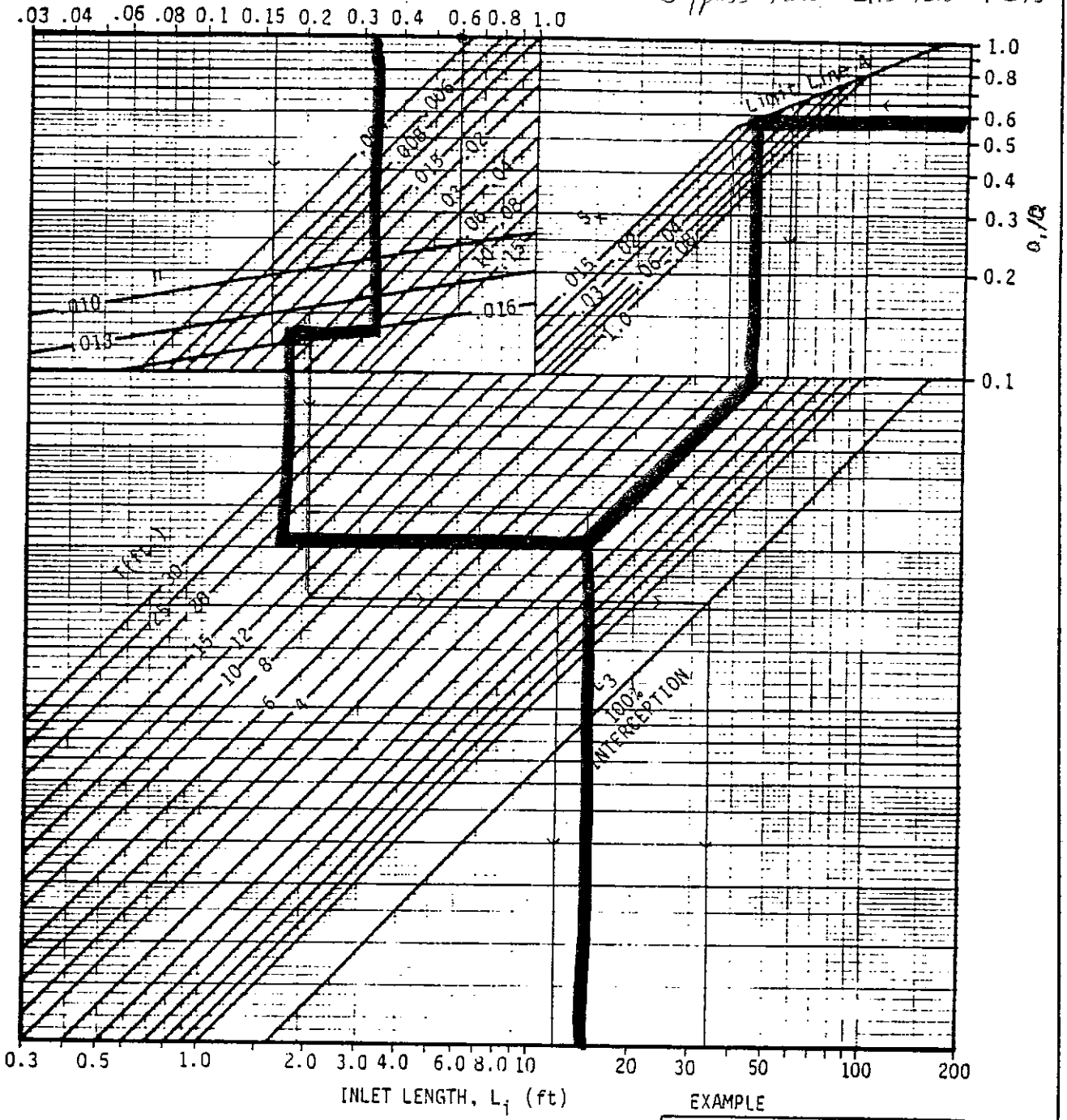
REFERENCE : Izzard, Carl. f., Report presented at the Annual Meeting of the National Transportation Board, January 1977; Simplified Method For Design of Curb-opening Inlets

Sump Capacity for Curb-opening Inlets

FUTURE INLET AT A8, $Q_{100} = 21.5$, $S = 2\%$, $L = 15'$

$Q_i/Q = 0.58$ $Q_i = .58(21.5) = 12.5$ cfs

Bypass flow = 21.5 − 12.5 = 9 cfs



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.; $Q_i/Q = 0.65$ $Q_i/Q = 1.0$

Standard Curb-Opening Inlet Chart

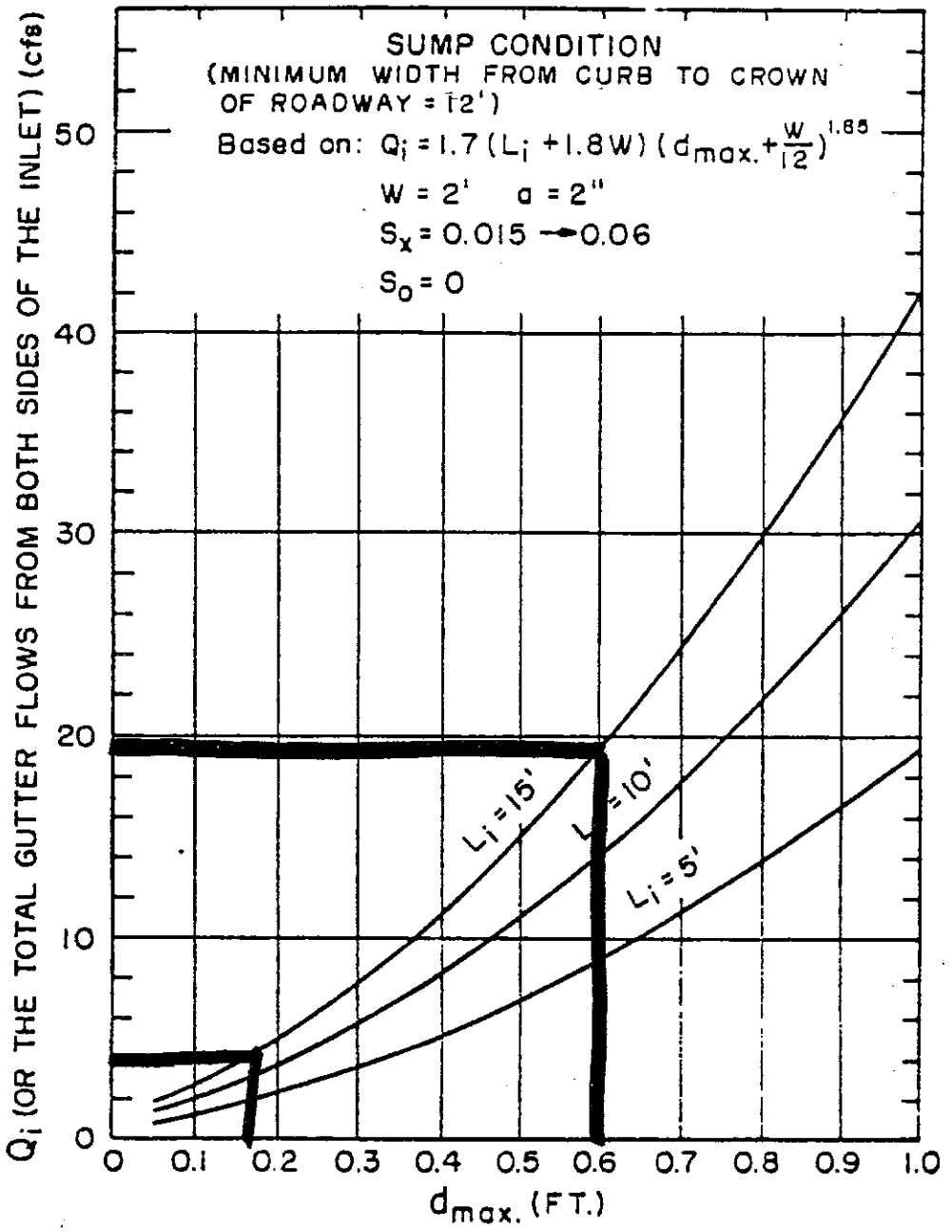
HDR Infrastructure, Inc.
A Centerra Company

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

Date: OCT. 1987

Figure: 7 - 9

INLET AT DESIGN POINT A9
15' Inlet, Q_{100} = 3.9 cfs (Future 9 cfs) Q_{100} = 12.9 cfs

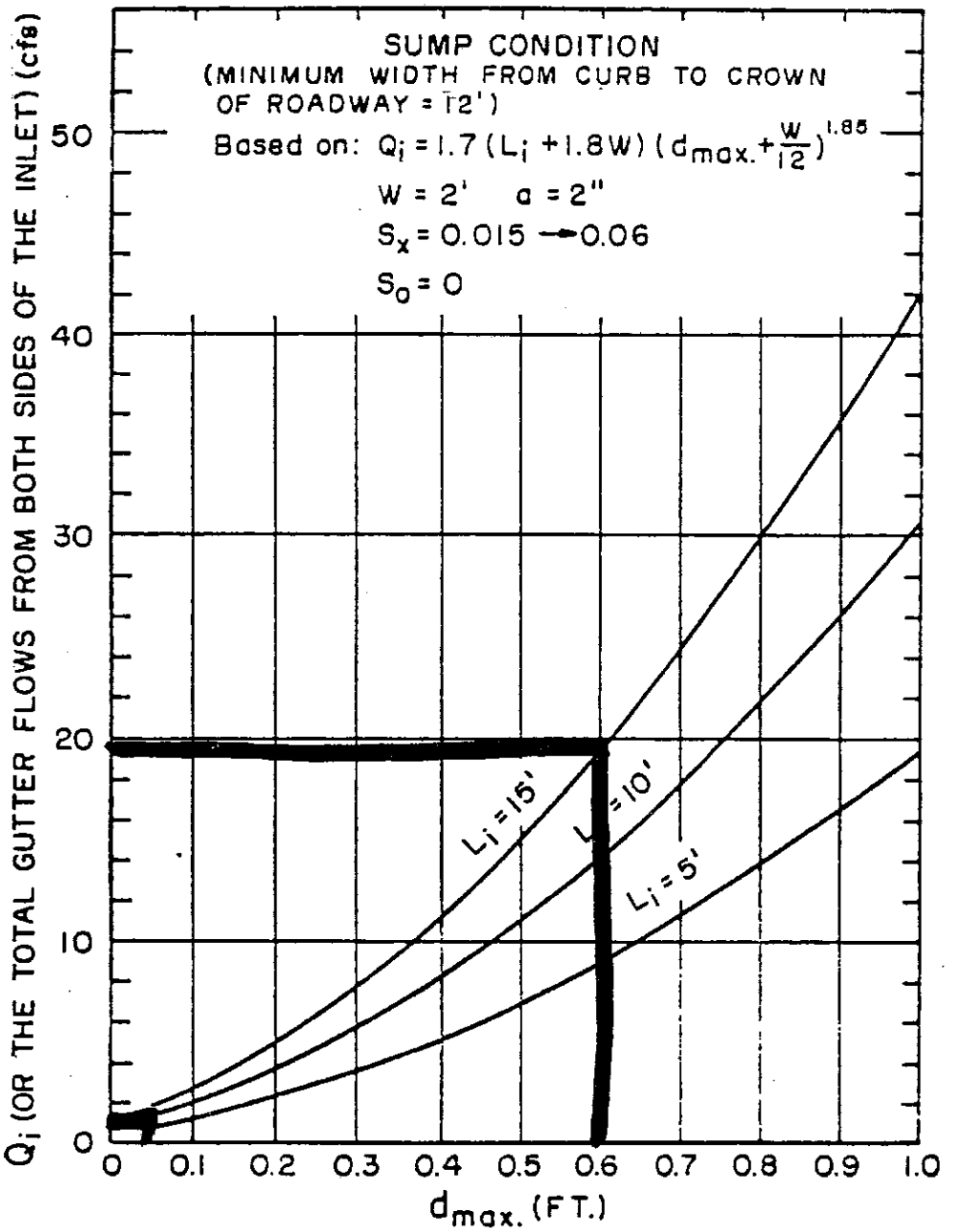


REFERENCE : Izzard, Carl. f., Report presented at the Annual Meeting of the National Transportation Board, January 1977; Simplified Method For Design of Curb-opening Inlets

Sump Capacity for Curb-opening Inlets

NOTE: ULTIMATE FLOWS INCLUDE BYPASS FLOWS FROM A8
Q_{100} = 19.5 cfs > 12.9

INLET AT DESIGN POINT A10
15' Curb Opening Inlet, Q_{100} = 0.9



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

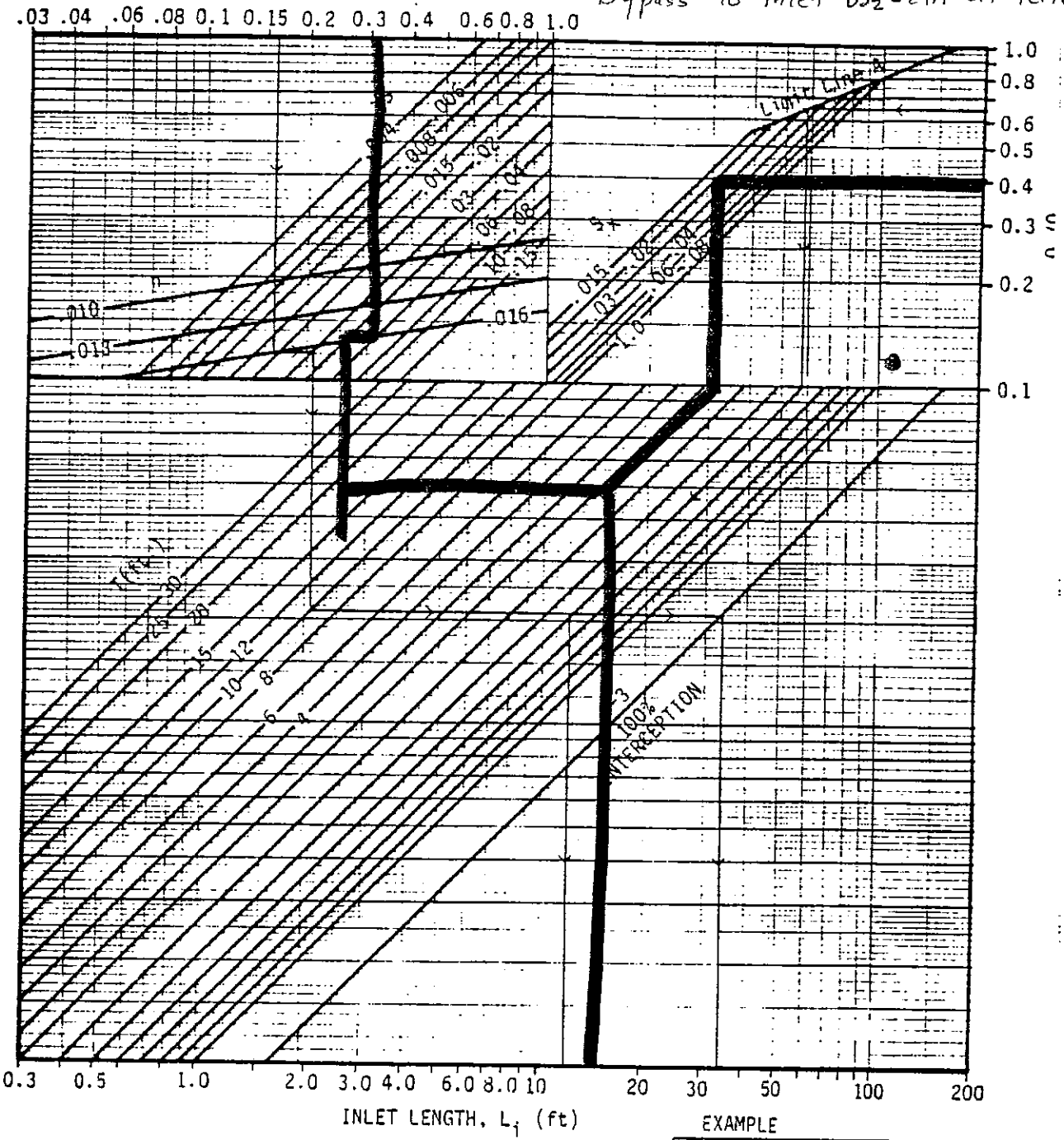
Sump Capacity for Curb-opening Inlets

NOTE: ULTIMATE FLOWS FROM BASINS A7 & A10 When developed
Q_{100} = 19.5 cfs (Capacity)

INLET AT B_{31}, Q_{100} = 21.1 cfs, S = 4%, $S_x(T-2)$ = .02(16) = .32, 15' Inlet

$\frac{Q_i}{Q}$ = 0.40 Q_i = 0.40(21.1) = 8.4 cfs

Bypass to inlet $B3_2$ = 21.1 − 8.4 = 12.7 cfs



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

Standard Curb-Opening Inlet Chart

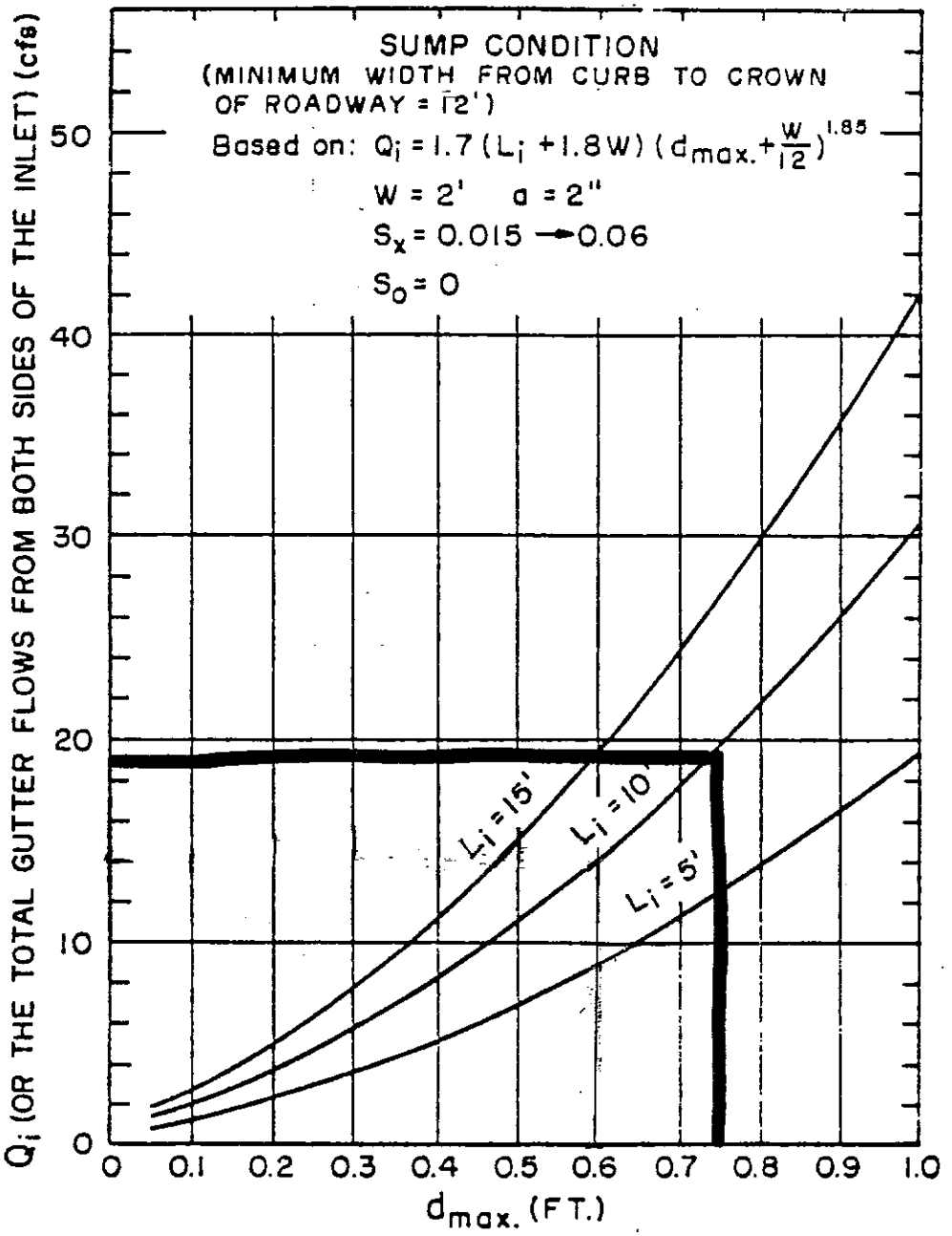
The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Date: OCT. 1987

Figure: 7 - 9

HDR Infrastructure, Inc.
A Centerra Company

INLET AT B32, 10' INLET, Q_{100} = 6.5 + 12.7 from B31 = 19.2 cfs



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

Sump Capacity for Curb-opening Inlets

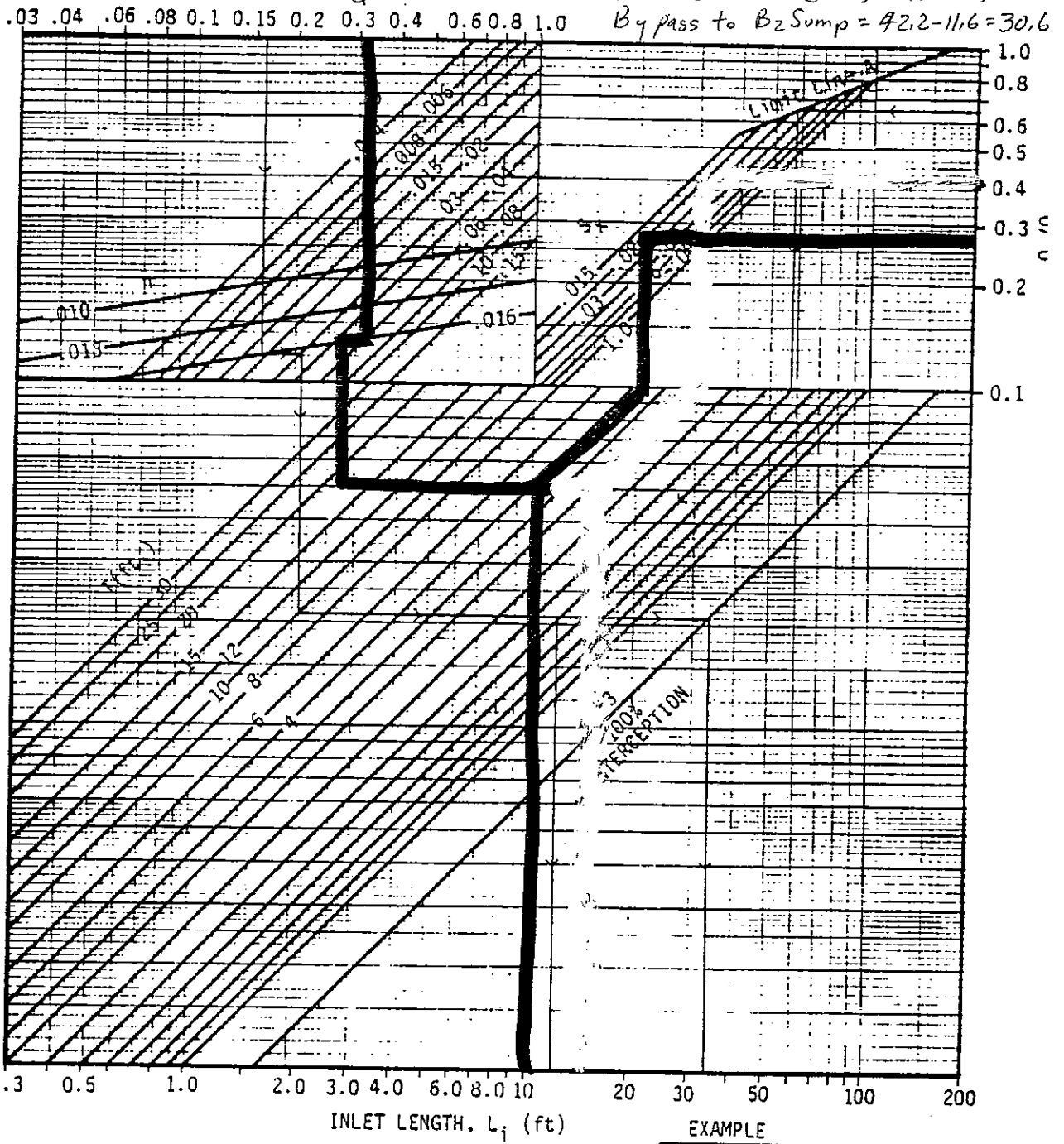
HDR Infrastructure, Inc.
A Centerra Company

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

Date
OCT. 1987

Figure
7 - 11

INLET AT B_2 (Upper), L = 10', S = 4%, Q_{100} = 42.2



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

Standard Curb-Opening Inlet Chart

HDR Infrastructure, Inc.
A Centerra Company

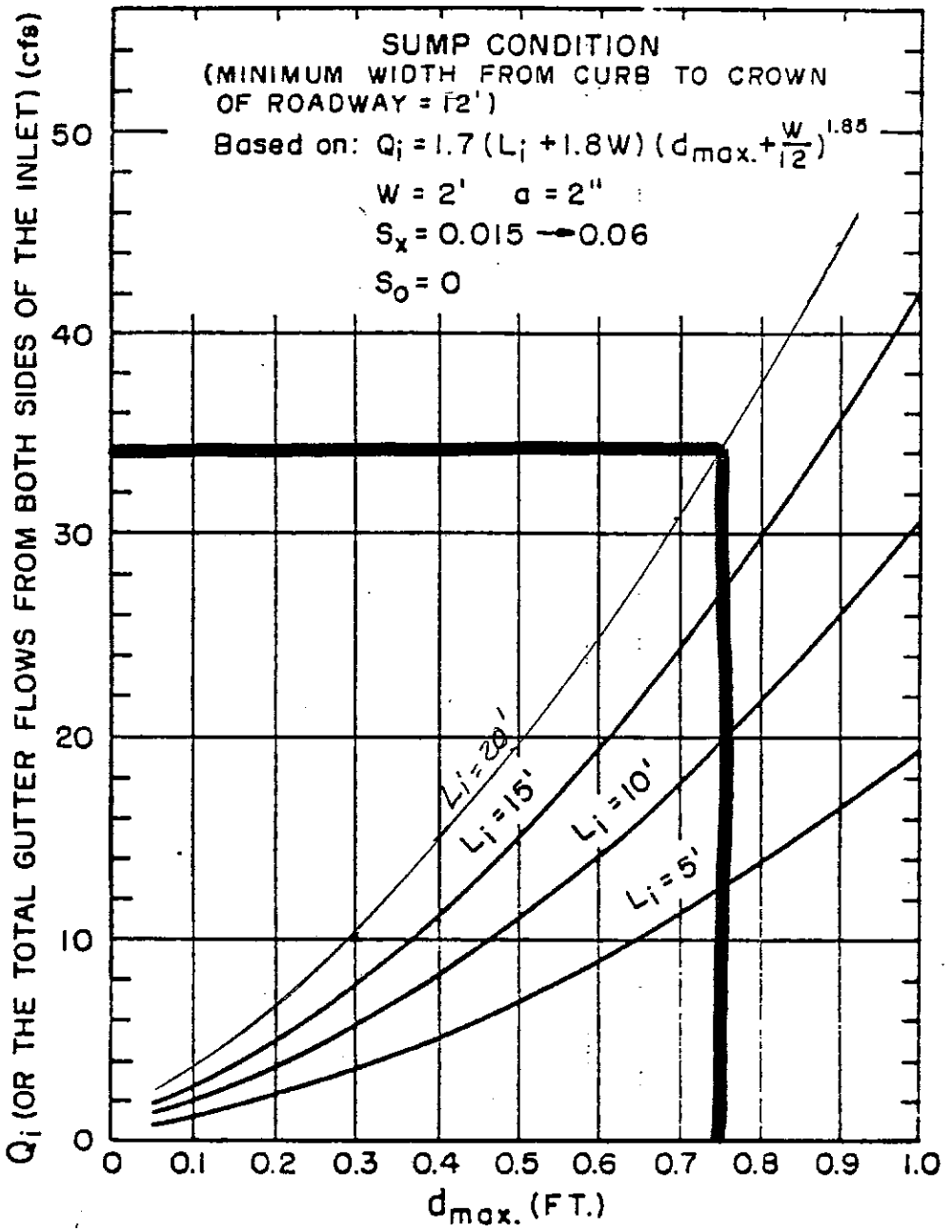
The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Date
OCT. 1987

Figure
7 - 9

SUMP AT B_2, $L = 20'$ $Q_{100} = 15.2 + 30.6(B_2) = 45.8$

$Q_{allow} = 34$ cfs Bypass to $B_4 = 45.8 - 34 = 11.8$ cfs



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

Sump Capacity for Curb-opening Inlets

HDR Infrastructure, Inc.
A Centerra Company

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

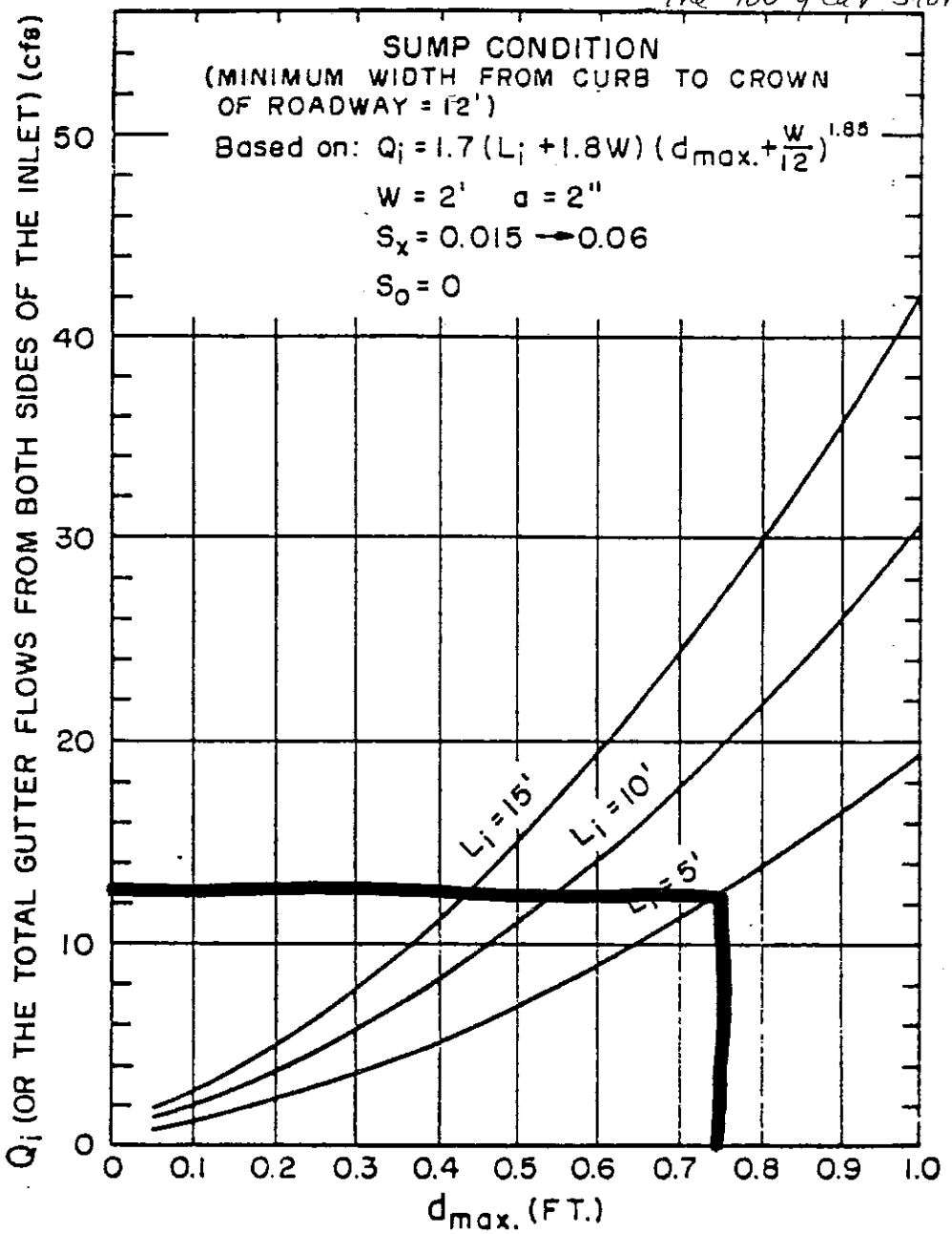
Date
OCT. 1987

Figure
7 - 11

INLET AT B4, 5' INLET, $Q_{100} = 2.8 + 11.8(B_2) = 14.6$

Allowable Capacity = 11.5 cfs

Therefore 14.6 - 11.5 = 3.1 cfs will spill over curb during the 100 year storm.



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

Sump Capacity for Curb-opening Inlets

SECTION: C

FIG NO.

LIST OF FIGURES:

PAGE NO.

LIST OF CALCULATIONS:

GLEN COVE CHANNEL ENGINEER'S ESTIMATE GC.CHAN.BIN

DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST	COMMENTS
CONC CHANNNEL;B=20',D=6'	L.F.	1240.00	$136.50	$169,260.00	ACTUAL LENGTH (TOTAL)
CHANNEL	L.F.	1508.00	$136.50	$205,842.00	PUBLIC BASIS (TOTAL)
DUAL 7x10 BOX CULVERT	L.F.	265.00	$455.25	$120,641.25	PRIVATE IMPROVEMENT
PRIVATE DRAINAGE FACILITY CONSTRUCTION COST				$120,641.25	
PUBLIC DRAINAGE FACILITY CONSTRUCTION COST				$169,260.00	
BASIN DRAINAGE FEE	ACRE	0.00	4741.00	$0.00	
DEVELOPER COSTS ELIGIBLE FOR REIMBURSEMENT				$205,842.00	

AA CONSTRUCTION COMPANY INCORPORATED
223 NORTH WAHSATCH • COLORADO SPRINGS, COLORADO 80903 • (303) 636-5041

THIS ESTIMATE IS THE BASIS FOR COSTS ON THE CHANNEL

September 24, 1987

Hyer Development Company
1490 West Fillmore
Colorado Springs, CO 80904

Attention: Mr. Bill Hyer

Re: Chelsea Glen Filing No. 1

Lump Sum to install a 1240 L.F. Concrete Channel, and 265 L.F. Double Tube Box Culvert as per Preliminary Plans dated 8-21-87.

Work to include all material, labor, excavation and backfill.

All dirt to be available on site.

Concrete lined channel	L.S.	$169,331.00/1240 LF = $136.56/F
Double tube box culvert	L.S.	120,644.00/265 LF = $455.26/F
Total		$289,975.00

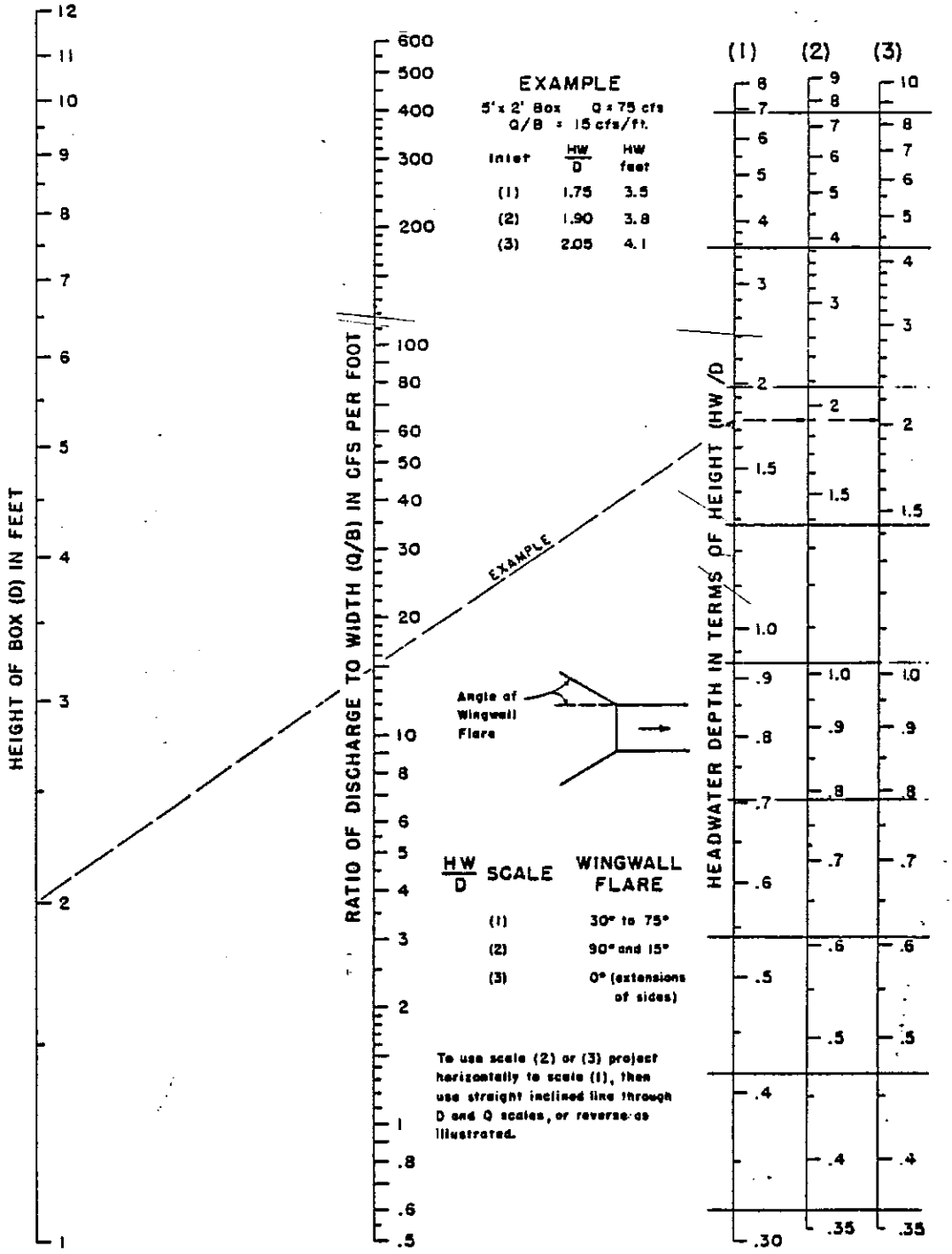
Price does not include:

Gravel Underdrain
Inlets and R.C.P.
Bond (If bond required, add 1.5%)

Ronald E. Herron

Ronald E. Herron, Vice President

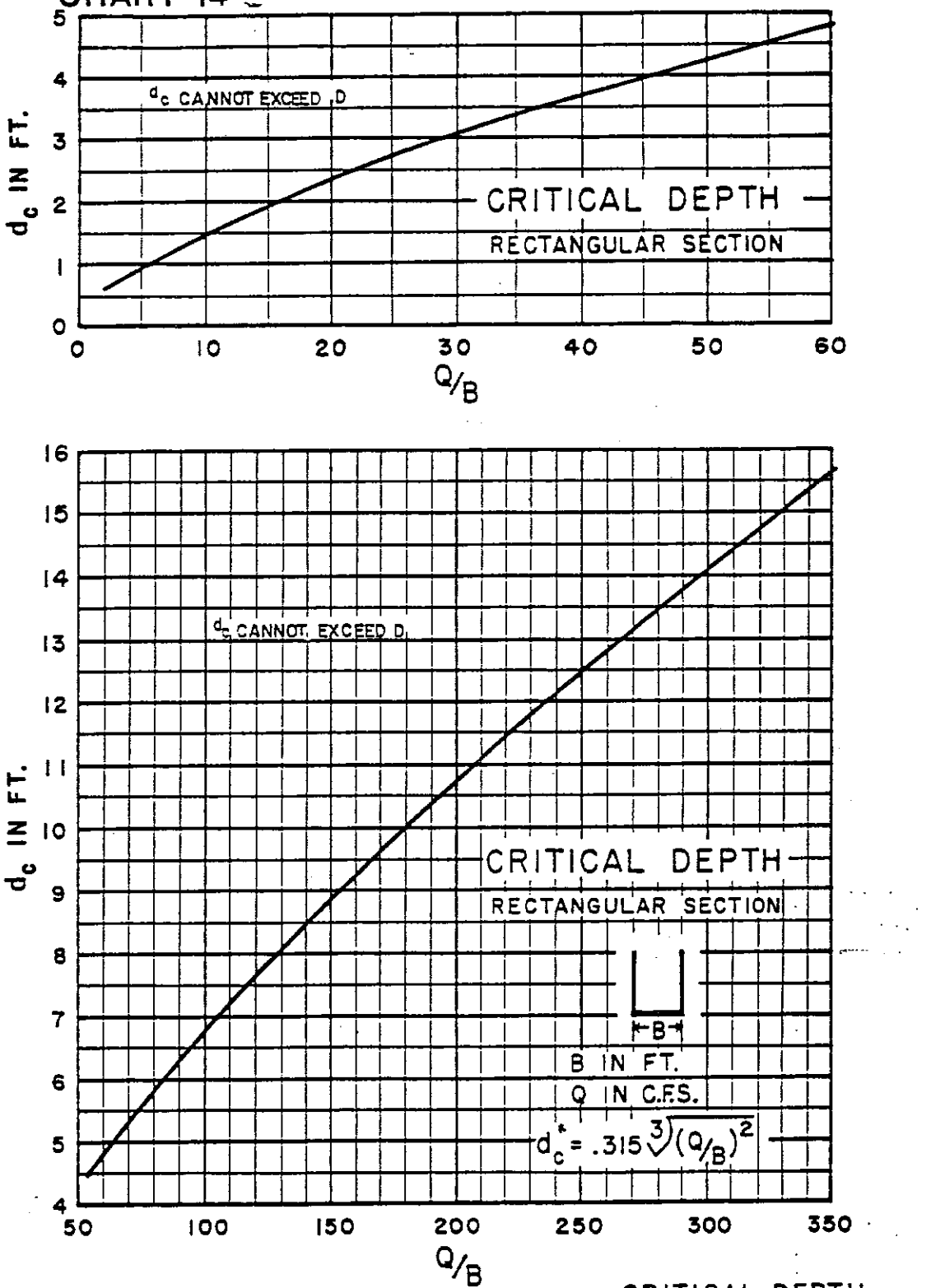
CHART 8



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

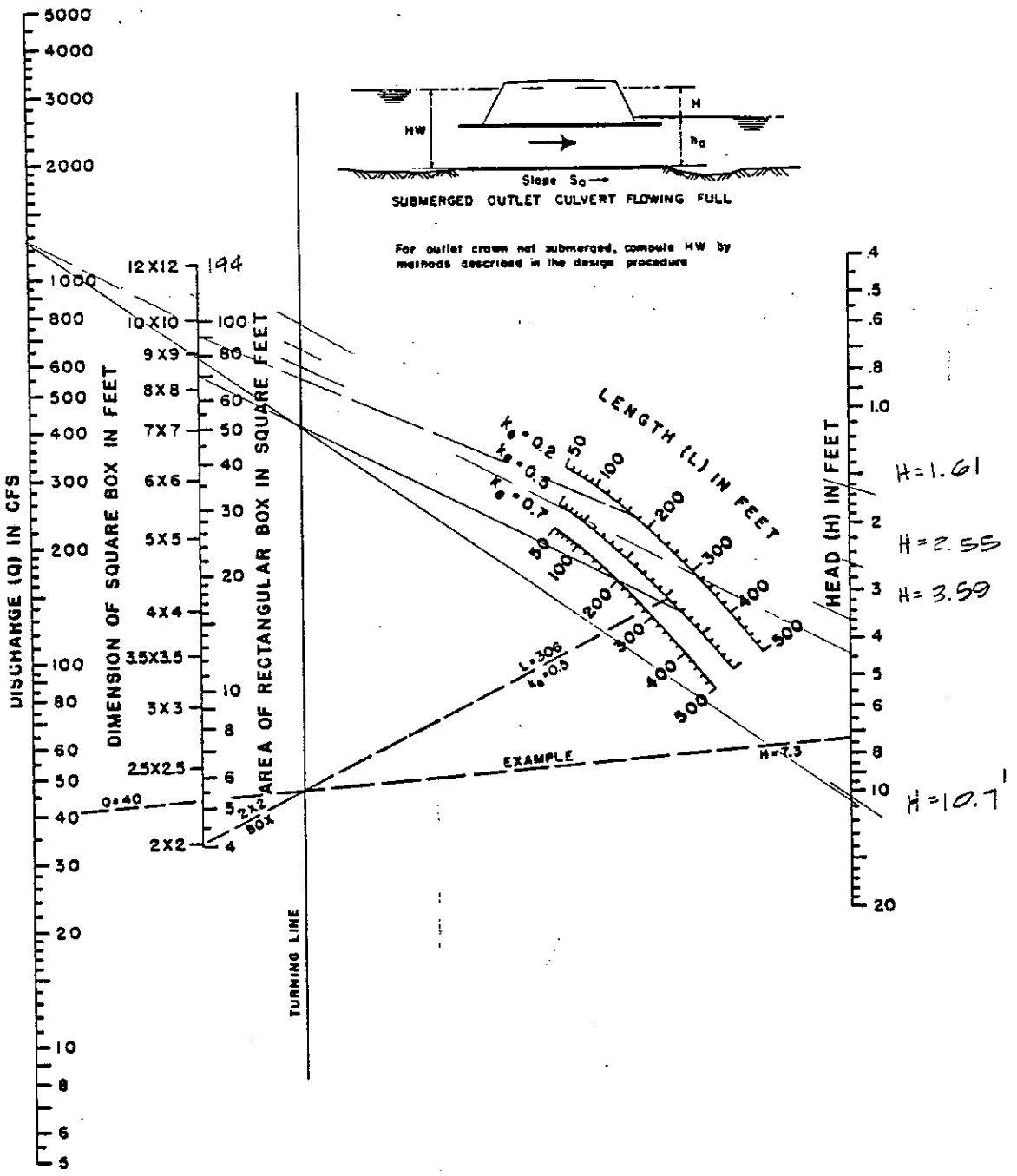
FIG. NO. 1



CRITICAL DEPTH
RECTANGULAR SECTION

FIG. NO. 2

CHART 15

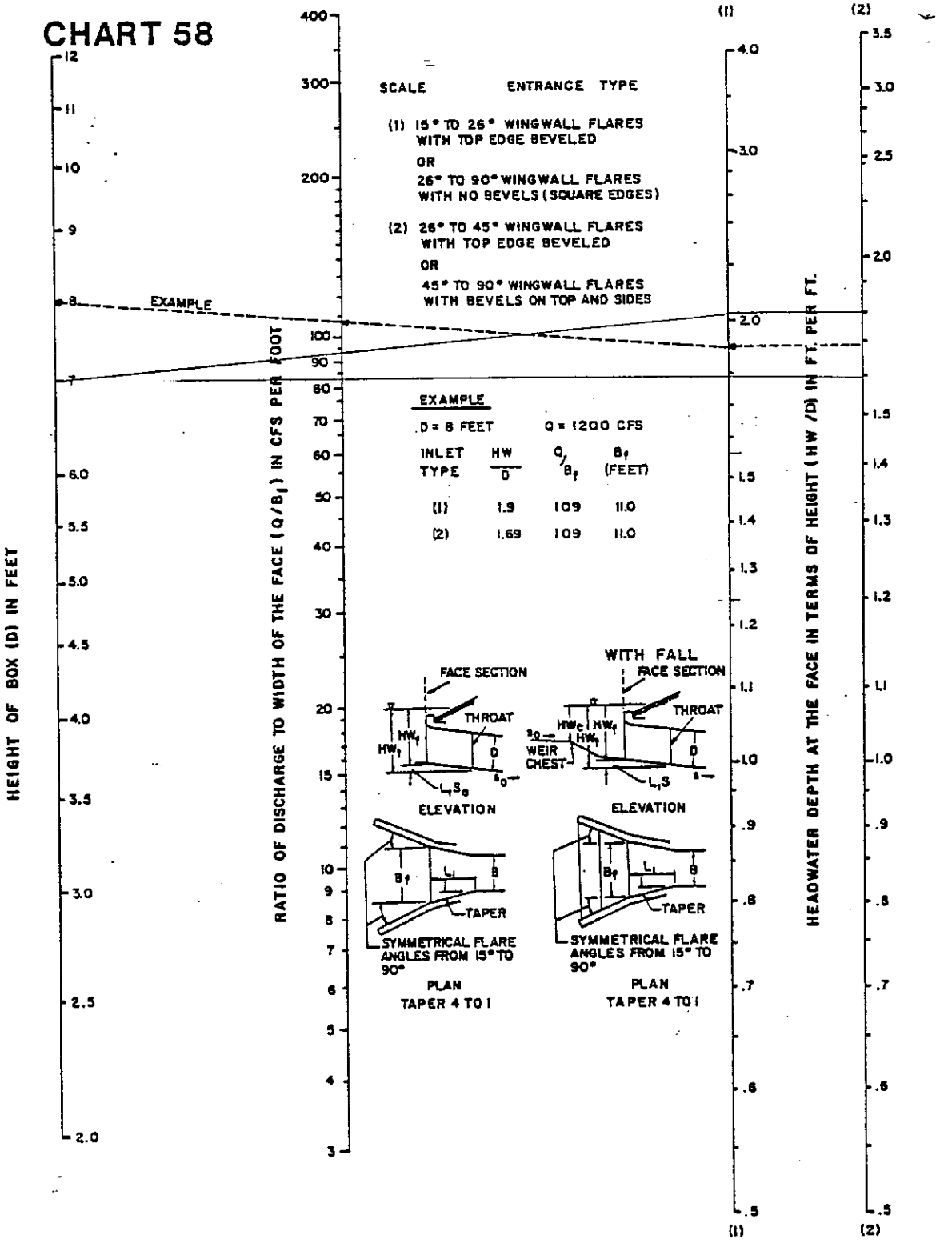


HEAD FOR
CONCRETE BOX CULVERTS
FLOWING FULL
n = 0.012

AU OF PUBLIC ROADS JAN. 1963

FIG. NO. 3

CHART 58



FACE CONTROL FOR BOX CULVERTS WITH SIDE TAPERED INLETS

FIG. NO. 4

PROJECT: GLEN COVE
DOUGLAS CREEK
EXISTING CONDITION

STATION: CENTENNIAL BLVD

SHEET 1 OF 2

CULVERT DESIGN FORM

DESIGNER / DATE: JRF / 1-30-97

REVIEWER / DATE: ____ / ____

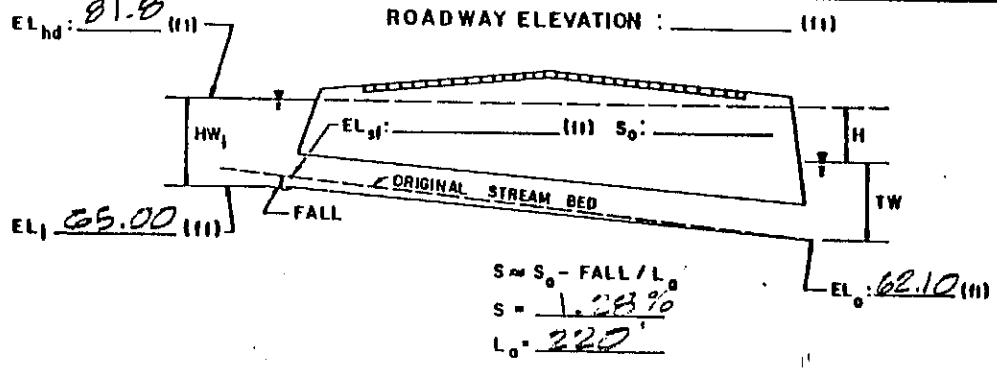
HYDROLOGICAL DATA

SEE ADD'L SHTS.

- ☐ METHOD: SCS
- ☐ DRAINAGE AREA: ____ ☐ STREAM SLOPE: ____
- ☐ CHANNEL SHAPE: ____
- ☐ ROUTING: ____ ☐ OTHER: ____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
	2528	



$S \approx S_o$ - FALL / L_o

S = 1.28%

L_o = 220'

CULVERT DESCRIPTION:

MATERIAL - SHAPE - SIZE - ENTRANCE

CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW i/D (2)	HW i	FALL (3)	EL hi (4)	OUTLET CONTROL TW (5)	d_c	$\frac{d_c + D}{2}$	h_o (6)	h_e	H (7)	EL ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY (FPS)	COMMENTS
L=B RE-ST. 2-12'x7' SQUARE EDGE EXIST. XING AT CENTENNIAL BLVD	2528	126	3.9	16.3	—	81.80	6.0	7.0	7.0	7.0	0.5	10.7	78.8	81.8	21.7	t_c = 7.93' INLET CONTROL

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) HW_i/D = HW /D OR HW_i/D FROM DESIGN CHARTS

(3) FALL = $HW_i - (EL_{hd} - EL_{sl})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) h_o = TW or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + k_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

$L_1 = L\left(\frac{0.015}{0.012}\right)^2$

$= 344'$

SUBSCRIPT DEFINITIONS:

- e. APPROXIMATE
- f. CULVERT FACE
- hd. DESIGN HEADWATER
- hi. HEADWATER IN INLET CONTROL
- ho. HEADWATER IN OUTLET CONTROL
- i. INLET CONTROL SECTION
- o. OUTLET
- sl. STREAMBED AT CULVERT FACE
- tw. TAILWATER

COMMENTS / DISCUSSION:

SEE EXB. 7b 1 OF 2 FOR DESIGN @ D.P. NO. 11-2F DOUGLAS CREEK STUDY & EXB. 7c 1 OF 1 Q = 2528 cfs

CULVERT BARREL SELECTED:

SIZE: ____

SHAPE: ____

MATERIAL: ____ n ____

ENTRANCE: ____

240

PROJECT: GLEN COVE
DOUGLAS CREEK
CHANNEL IMPROVEMENTS

STATION: EXTEND XING CENTENNIAL BLVD.

SHEET 2 OF 2

CULVERT DESIGN FORM

DESIGNER / DATE: JRF / 8-17-81

REVIEWER / DATE: / /

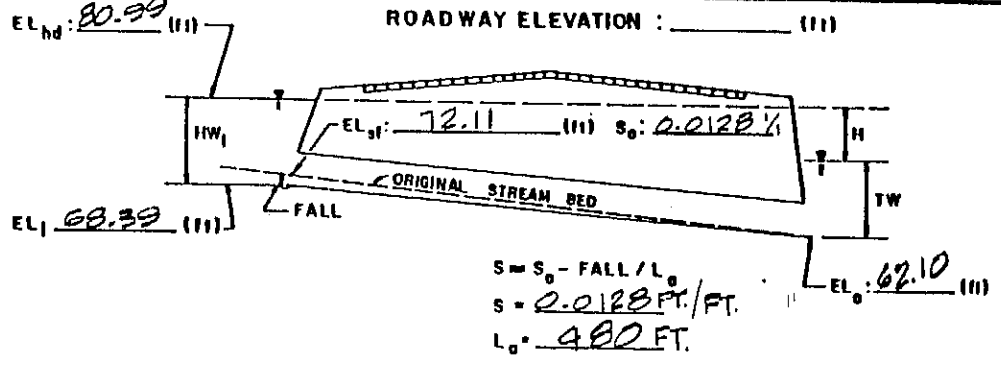
HYDROLOGICAL DATA

SEE ADD'L SHTS.

- ☐ METHOD: SCS HYDROGRAPH
- ☐ DRAINAGE AREA: ____ ☐ STREAM SLOPE: ____
- ☐ CHANNEL SHAPE: TRAPEZOIDAL
- ☐ ROUTING: ____ ☐ OTHER: ____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
	2528	



$S = S_o - FALL / L_o$

$S = 0.0128$ FT./FT.

$L_o = 480$ FT.

CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	HW_i	FALL (3)	EL_{hi} (4)	OUTLET CONTROL: TW (5)	d_c	$\frac{d_c + D}{2}$	h_o (6)	h_e	H (7)	EL_{ho} (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
RCB 2-10'x7' RECT, SIDE TAPERED BEVELED EDGE ON FACE	2528	1264	1.8	12.6	3.72	80.99	6.0	7.0	7.0	7.0	0.2	10.8	18.9	80.99	21.7	$d_c = 7.93$
														L		INLET CONTROL

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) HW_i/D = HW/D OR HW_i/D FROM DESIGN CHARTS

(3) FALL = $HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) EL_{hi} = HW_i + EL_i (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) h_o = TW or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + k_e + (29n^2 L)/R^{1.33}\right] v^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

$L_1 = L\left(\frac{0.015}{0.012}\right)^2$

$= 750$ USE: 500

SUBSCRIPT DEFINITIONS:

- a. APPROXIMATE
- f. CULVERT FACE
- hd. DESIGN HEADWATER
- hi. HEADWATER IN INLET CONTROL
- ho. HEADWATER IN OUTLET CONTROL
- i. INLET CONTROL SECTION
- o. OUTLET
- sf. STREAMBED AT CULVERT FACE
- tw. TAILWATER

COMMENTS / DISCUSSION:

SEE SIDE TAPERED ENTRANCE DESIGN FORM SHEET 1 OF 1

CULVERT BARREL SELECTED:

SIZE: 2 - 10' SPAN x 7' RISE

SHAPE: RECTANGULAR

MATERIAL: CONC. n 0.015

240

- 12 -

PROJECT: GLEN COVE
DOUGLAS CREEK
CHANNEL IMPROVEMENT

STATION: EXTEND EXISTING CULVERT

SHEET 1 OF 1

TAPERED INLET DESIGN FORM

DESIGNER / DATE: TPF 12-19-87

REVIEWER / DATE: ____ / ____

DESIGN DATA:

Q ____ = 2825 cfs ; EL_{hl} = 80.99 ft

EL. THROAT INVERT 68.21 ft

EL. STREAM BED AT FACE 72.11 ft

FALL 3.72 ft TAPER 4:1 : 1 (4:1 TO 6:1)

STREAM SLOPE, S_o = 0.015± ft/ft

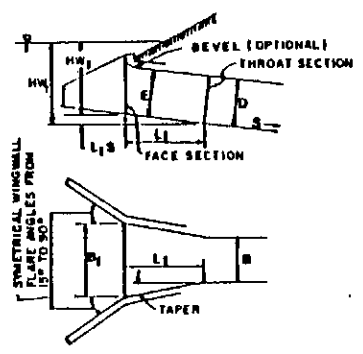
SLOPE OF BARREL, S = 0.0128 ft/ft

S_f 3:1 : 1 (2:1 TO 3:1)

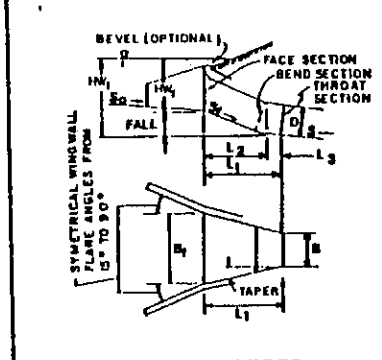
BARREL SHAPE AND MATERIAL: 20(5) x 7'(R)

N = 2(10'x7'), B = 20', D = 7'

INLET EDGE DESCRIPTION SIDE TAPER



SIDE-TAPERED



SLOPE-TAPERED

COMMENTS

Q (cfs)	EL_{hl}	EL. THROAT INVERT	EL. FACE INVERT (1)	HW_f (2)	HW_f/E (3)	Q/B_f (4)	MIN. B_f (5)	SELECTED B_f	SLOPE-TAPERED ONLY: MIN. L_3 (6)	L_2 (7)	CHECK L_2 (8)	ADJ. L_3 (9)	ADJ. TAPER (10)	L_1 (11)	SIDE-TAPERED W/ FALL: EL. CREST INV.	HW_c (12)	MIN. W (13)
2528	80.99	68.21	68.39	12.6	1.8	94	26.9	27	—	—	—	—	—	14	72.11	8.88	33.4

(1) SIDE-TAPERED: EL. FACE INVERT = EL. THROAT INVERT + 1 ft (APPROX.)
SLOPE-TAPERED: EL. FACE INVERT = EL. STREAM BED AT FACE

(2) $HW_f = EL_{hl}$ - EL. FACE INVERT

$T = HW_f - HW_c$
$= 3.72'$

(3) I.I D ≥ E ≥ D

(4) FROM DESIGN CHARTS

(5) MIN. $B_f = Q/(Q/B_f)$

(6) MIN. $L_3 = 0.5\,NB$

(7) $L_2 = (EL.\ FACE\ INVERT - EL.\ THROAT\ INVERT)\,S_f$

(8) CHECK $L_2 = \left[\frac{B_f - NB}{2}\right] \cdot TAPER - L_3$

(9) IF (8)>(7), ADJ. $L_3 = \left[\frac{B_f - NB}{2}\right] \cdot TAPER - L_2$

(10) IF (7)>(8), ADJ. TAPER $= (L_2 + L_3) \Big/ \left[\frac{B_f - NB}{2}\right]$

(11) SIDE-TAPERED: $L = \left[\frac{B_f - NB}{2}\right] \cdot TAPER$

SLOPE-TAPERED: $L_1 = L_2 + L_3$

(12) $HW_c = EL_{hl} - EL.\ CREST\ INVERT$

(13) MIN $W = 0.35\,Q/HW_c^{1.5}$

$= \frac{0.35(2528)}{8.88^{1.5}} = 33.4'$

SELECTED DESIGN

B_f 27'

L_1 14'

L_2 —

L_3 —

BEVELS ANGLE 45°

b = 4 in, d = 4 in

TAPER 4 : 1

S_f = 3 : 1

241

1-11-1

GLEN CAVE

HOLLAND CORPORATION
6535 S. DAYTON, SUITE #1600
ENGLEWOOD, COLORADO 80111
(303) 790-1082

Project S. DOUGLAS CREEK Job No. 0329
Title CHANNEL IMPROVEMENTS
By TPF date 8-17-87 Checked _____ date _____
Scale _____ Sht. 1 of 3

FIND: FREEBOARD AND SUPERELEVATION REQ'TS FOR 200' R AND 1000' R.

h = FREEBOARD IN FT
H = SUPERELEVATION HEIGHT IN ADDITION TO FREEBOARD ALONG OUTER EDGE OF CHANNEL ON CURVE.

GIVEN: STA. 7+00
R = 200' RADIUS

→ THE FOLLOWING IS BASED ON WATER SURFACE PROFILE CALCS (HEC-2)

Q = 2523 CFS

DEPTH = 3.62' = d
VEL = 27.45 FPS = V
TOP WIDTH = 30.90' = T

B = 20' BOTTOM WIDTH OF CHANNEL

$$h = 1.0 + 0.025 (V) d^{0.33}$$

$$= 1.0 + [0.025(27.45)](3.62)^{0.33}$$

h = 2.05 FREEBOARD

$$H = \frac{V^2}{2g} \left(\frac{T + B}{R}\right)$$

$$= 11.70 \left(\frac{30.90 + 20}{200}\right)$$

= 2.98' SUPERELEVATION HEIGHT FOR 200 R.

TOTAL CHANNEL DEPTH REQ'D:

D = d + h + H
= 3.62' + 2.05 + 2.98
= 8.65' MIN. DEPTH AT OUTSIDE EDGE OF CURVE

HOLLAND CORPORATION
6535 S. DAYTON, SUITE #1600
ENGLEWOOD, COLORADO 80111
(303) 790-1082

GLEN COVE
Project S. DOUGLAS CREEK Job No. 0340
Title CHANNEL IMPROVEMENTS
By TPF date 8-17-87 Checked _____ date _____
Scale _____ Sht. 2 of 3

FREEBOARD & SUPERELEVATION (CONT.)

GIVEN: STA. 12+00
R = 200' RADIUS

FROM HEC-2 WSP CALCS:

Q = 2523 CFS
DEPTH = d = 3.53'
VEL. = V = 25.67 FPS
TOP WIDTH = T = 31.52'
BOTT. WIDTH = B = 20'

$$h = 1.0 + [0.025\,V]\,d^{0.33}$$

$$= 1.0 + [0.025(25.67)]\,3.83^{0.33}$$

$$= 2.00'$$ FREEBOARD

$$H = \frac{V^2}{2g}\left(\frac{T+B}{R}\right)$$

$$= 10.24\left(\frac{31.52+20}{200}\right)$$

$$= 2.64'$$ SUPERELEVATION HEIGHT

TOTAL CHANNEL DEPTH REQ'D:

$$D = d + h + H$$

$$= 3.53 + 2.00 + 2.64$$

$$= 8.17'$$ MIN. DEPTH AT OUTSIDE EDGE OF CURVE

GLEN COVE

HOLLAND CORPORATION
6535 S. DAYTON, SUITE #1600
ENGLEWOOD, COLORADO 80111
(303) 790-1082

Project S. DOUGLAS CREEK Job No. 0340

Title CHANNEL IMPROVEMENTS

By TPF date 8-17-87 Checked _____ date _____

Scale _____ Sht. 3 of 3

GIVEN: STA. 15+00
R = 1000' RADIUS

FROM HEC-2 WSP CALCS:

Q = 3525 CFS
DEPTH = d = 4.25'
VEL = V = 22.55 FPS
TOP WIDTH = T = 32.79'
BOTT WIDTH = B = 20'

$$h = 1.0 + [0.025\,V]\,d^{0.33}$$

$$= 1.0 + [0.025(22.55)]\,4.25^{0.33}$$

$$= 1.91' \quad \text{FREEBOARD}$$

$$H = \frac{V^2}{2g}\left(\frac{T+B}{R}\right)$$

$$= 7.9\left(\frac{32.79 + 20}{1000}\right)$$

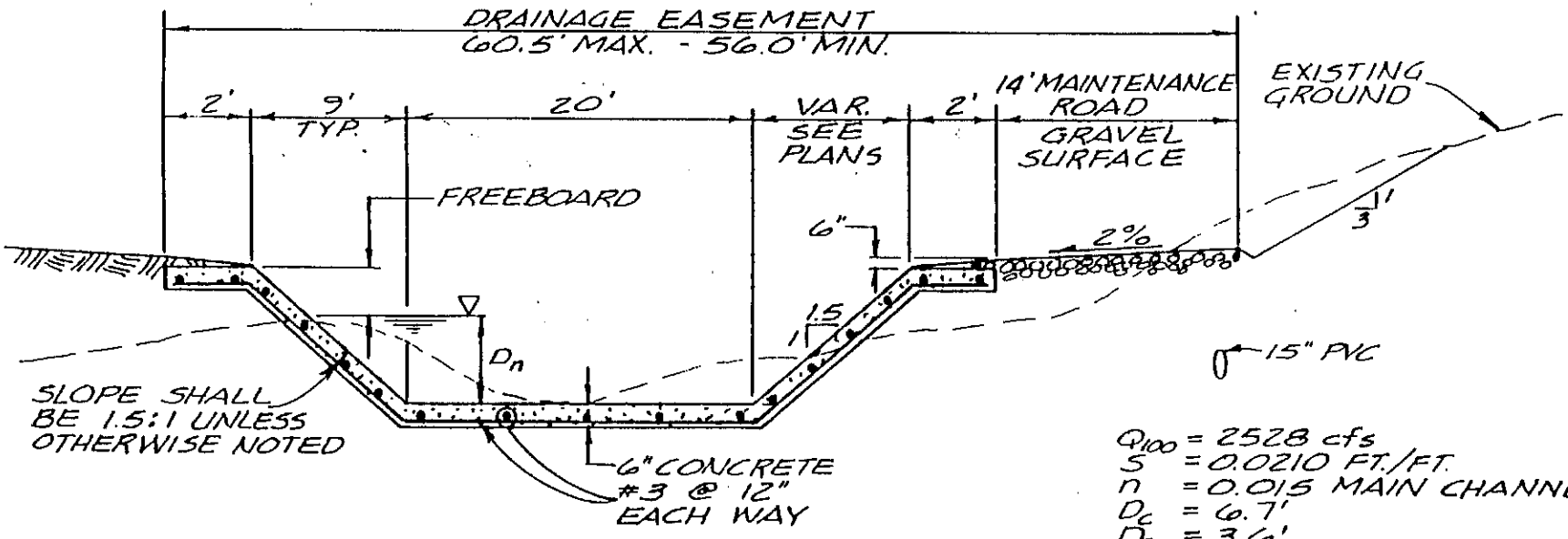
$$= 0.42' \quad \text{SUPERELEVATION HEIGHT}$$

TOTAL CHANNEL DEPTH REQ'D:

$$D = d + h + H$$

$$= 4.25 + 1.91 + 0.42$$

$$= 6.58' \quad \text{MIN. DEPTH AT OUTSIDE EDGE OF CURVE}$$



Q_{100} = 2528 cfs
S = 0.0210 FT./FT.
n = 0.015 MAIN CHANNEL
D_c = 6.7'
D_n = 3.6'

TYPICAL CHANNEL SECTION

NOT TO SCALE

NEW CONSTRUCTION
OPEN CHANNEL FLOW-PARAMETERS

	MIN.	STA.	MAX.	STA.
CHANNEL VELOCITY	20.6 FPS	16+00	27.52 FPS	6+50
CHANNEL DEPTH	3.62 FT.	6+50	4.55 FT.	16+00
BOX CULVERT VELOCITY	18.0 FPS	3+51	21.35 FPS	**
BOX CULVERT DEPTH	5.92 FT.	**	7.00 FT.	3+51

** DENOTES SECTION AT OUTLET OF EXISTING RCB UNDER CENTENNIAL BLVD. HEC2 SECTION NO. 11.

NOTES:

1. HEC2 CHANNEL CROSS-SECTIONS CORRESPOND TO ℄ OF CHANNEL STATIONING.
2. CRITICAL DEPTH "D_c" IS BASED ON SUB-CRITICAL WATER SURFACE PROFILE COMPUTER RUN
3. REFER TO DOUGLAS CREEK CHANNEL IMPROVEMENT PLANS FOR CHELSEA GLEN FILING NO. 1 BY HOLLAND WEST, INC., DATED 8-21-87.
4. ADDITIONAL FREEBOARD HEIGHT IS PROVIDED ALONG THE OUTSIDE EDGE OF ALL CHANNEL CURVES.

FIG. NO. 5

FILE: WSP2523.D

THIS RUN EXECUTED MON, SEP 14 1987 09:16:21

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**************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED MAR 1982
 ERROR CORR - 01,02,03,04,05
 MODIFICATION - 50,51,52,53,54,55
**************************************************

T1 GLEN COVE CHANNEL IMPROVEMENT - SUBCRITICAL RUN
T2 100-YEAR STORM
T3 DOUGLAS CREEK EL PASO COUNTY

J1 ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0.      2.       0.       0. 0.000000     0.00     0.0      0.  282.180   0.000

J2 NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

   1.000    0.000   -1.000    0.000    0.000    0.000   -1.000    0.000    0.000    0.000

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

 150.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000


NC     0.024    0.024    0.015    0.100    0.300    0.000    0.000    0.000    0.000    0.000
QT     6.000 2528.000 2528.000 2528.000 2528.000 2528.000 2528.000    0.000    0.000    0.000
X1   700.000    7.000  981.000 1019.000    0.000    0.000    0.000    0.000    0.000    0.000
GR   284.700  971.000  284.300  981.000  278.330  990.000  278.330 1010.000  287.300 1023.500
GR   287.800 1025.500  288.100 1039.500    0.000    0.000    0.000    0.000    0.000    0.000

X1   800.000    7.000  981.000 1021.400   98.000  102.000  100.000    0.000    0.000    0.000
GR   286.800  971.000  286.400  981.000  280.430  990.000  280.430 1010.000  288.000 1021.400
GR   288.500 1023.400  288.800 1037.400    0.000    0.000    0.000    0.000    0.000    0.000

X1   900.000    7.000  981.000 1019.000  100.000  100.000  100.000    0.000    0.000    0.000
GR   288.900  971.000  288.500  981.000  282.530  990.000  282.530 1010.000  288.500 1019.000
GR   289.000 1021.000  289.300 1035.000    0.000    0.000    0.000    0.000    0.000    0.000

X1  1000.000    7.000  981.000 1019.000  100.000  100.000  100.000    0.000    0.000    0.000
GR   291.000  971.000  290.600  981.000  284.630  990.000  284.630 1010.000  290.600 1019.000
GR   291.100 1021.000  291.400 1035.000    0.000    0.000    0.000    0.000    0.000    0.000

X1  1100.000    7.000  978.300 1019.000  100.000  100.000  100.000    0.000    0.000    0.000
GR   294.700  970.000  294.500  978.300  286.730  990.000  286.730 1010.000  292.700 1019.000
GR   293.200 1021.000  293.500 1035.000    0.000    0.000    0.000    0.000    0.000    0.000

X1  1200.000    7.000  976.500 1019.000   93.000  108.000  100.000    0.000    0.000    0.000
GR   298.200  966.500  297.800  976.500  288.830  990.000  288.830 1010.000  294.800 1019.000
GR   295.300 1021.000  295.600 1035.000    0.000    0.000    0.000    0.000    0.000    0.000
```

X1	1300.000	7.000	977.900	1019.000	93.000	109.000	100.000	0.000	0.000	0.000
GR	299.400	967.900	299.000	977.900	290.930	990.000	290.930	1010.000	296.900	1019.000
GR	297.400	1021.000	297.700	1035.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	1400.000	7.000	979.500	1020.500	100.000	100.000	100.000	0.000	0.000	0.000
GR	300.400	969.500	300.000	979.500	293.030	990.000	293.030	1010.000	300.000	1020.500
GR	300.500	1022.500	300.800	1036.500	0.000	0.000	0.000	0.000	0.000	0.000
X1	1500.000	7.000	979.500	1020.500	98.000	102.000	100.000	0.000	0.000	0.000
GR	302.500	969.500	302.100	979.500	295.130	990.000	295.130	1010.000	302.100	1020.500
GR	302.600	1022.500	302.900	1036.500	0.000	0.000	0.000	0.000	0.000	0.000
X1	1600.000	7.000	979.500	1020.500	98.000	102.000	100.000	0.000	0.000	0.000
GR	304.600	969.500	304.200	979.500	297.230	990.000	297.230	1010.000	304.200	1020.500
GR	304.700	1022.500	305.000	1036.500	0.000	0.000	0.000	0.000	0.000	0.000
X1	1700.000	7.000	978.000	1022.000	98.000	102.000	100.000	0.000	0.000	0.000
GR	308.900	968.000	306.400	978.000	299.140	989.000	298.870	1010.000	306.900	1022.000
GR	306.900	1023.000	309.400	1023.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	1800.000	7.000	978.100	1022.000	100.000	100.000	100.000	0.000	0.000	0.000
GR	309.500	968.000	307.000	978.100	299.690	989.000	299.160	1010.000	307.200	1022.000
GR	307.200	1023.000	309.700	1023.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	1900.000	7.000	978.100	1022.000	100.000	100.000	100.000	0.000	0.000	0.000
GR	310.300	968.000	307.800	978.100	300.470	989.000	299.720	1010.000	307.700	1022.000
GR	307.800	1023.000	310.300	1023.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	1950.000	7.000	978.100	1022.000	50.000	50.000	50.000	0.000	0.000	0.000
GR	310.500	968.000	308.000	978.100	300.710	989.000	300.460	1010.000	308.500	1022.000
GR	308.500	1023.000	311.000	1023.000	0.000	0.000	0.000	0.000	0.000	0.000
EJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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

*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV= 0.100 CEHV= 0.300
*SECNO 700.000
3280 CROSS SECTION 700.00 EXTENDED 0.44 FEET
3720 CRITICAL DEPTH ASSUMED

700.00	6.81	285.14	285.14	282.18	287.35	2.21	0.00	0.00	284.30
2528.	0.	0.	2528.	0.	0.	212.	0.	0.	334.70
0.00	0.00	0.00	11.92	0.024	0.015	0.024	0.000	278.33	971.00
0.004084	0.	0.	0.	0	13	0	0.00	49.25	1020.25

*SECNO 800.000
3280 CROSS SECTION 800.00 EXTENDED 0.32 FEET
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

800.00	6.69	287.12	287.12	0.00	289.55	2.43	0.28	0.07	286.40
2528.	9.	2519.	0.	5.	201.	0.	0.	0.	288.00
0.00	1.78	12.54	0.00	0.024	0.015	0.024	0.000	280.43	971.00
0.002043	98.	100.	102.	0	5	0	0.00	49.08	1020.08

*SECNO 900.000
3280 CROSS SECTION 900.00 EXTENDED 0.43 FEET
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

900.00	6.80	289.33	289.33	0.00	291.65	2.32	0.19	0.01	288.50
2528.	12.	2512.	4.	6.	205.	4.	1.	0.	288.50
0.00	1.90	12.27	1.15	0.024	0.015	0.024	0.000	282.53	971.00
0.001832	100.	100.	100.	0	5	0	0.00	64.00	1035.00

*SECNO 1000.000
3280 CROSS SECTION 1000.00 EXTENDED 0.44 FEET
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1000.00	6.81	291.44	291.44	0.00	293.75	2.31	0.18	0.00	290.60
2528.	12.	2511.	4.	6.	205.	4.	1.	0.	290.60
0.01	1.91	12.25	1.16	0.024	0.015	0.024	0.000	284.63	971.00
0.001823	100.	100.	100.	0	5	0	0.00	64.00	1035.00

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

*SECNO 1100.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1100.00	6.71	293.44	293.44	0.00	295.87	2.43	0.19	0.03	294.50
2528.	0.	2525.	3.	0.	202.	2.	2.	1.	292.70
0.01	0.00	12.52	1.11	0.024	0.015	0.024	0.000	286.73	979.89
0.002028	100.	100.	100.	0	5	0	0.00	52.48	1032.37

*SECNO 1200.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1200.00	6.71	295.54	295.54	0.00	297.97	2.44	0.20	0.00	297.80
2528.	0.	2525.	3.	0.	202.	2.	2.	1.	294.80
0.01	0.00	12.53	1.11	0.024	0.015	0.024	0.000	288.83	979.91
0.002036	93.	100.	108.	0	5	0	0.00	52.18	1032.08

*SECNO 1300.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1300.00	6.71	297.64	297.64	0.00	300.08	2.44	0.20	0.00	299.00
2528.	0.	2525.	3.	0.	201.	2.	3.	1.	296.90
0.01	0.00	12.54	1.11	0.024	0.015	0.024	0.000	290.93	979.94
0.002036	93.	100.	109.	0	5	0	0.00	52.22	1032.16

*SECNO 1400.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1400.00	6.60	299.63	299.63	0.00	302.17	2.54	0.21	0.03	300.00
2528.	0.	2528.	0.	0.	198.	0.	3.	1.	300.00
0.02	0.00	12.79	0.00	0.024	0.015	0.024	0.000	293.03	980.05
0.002238	100.	100.	100.	0	5	0	0.00	39.89	1019.95

*SECNO 1500.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1500.00	6.63	301.76	301.76	0.00	304.27	2.51	0.22	0.00	302.10
2528.	0.	2528.	0.	0.	199.	0.	4.	1.	302.10
0.02	0.00	12.70	0.00	0.024	0.015	0.024	0.000	295.13	980.01
0.002198	98.	100.	102.	0	5	0	0.00	39.99	1019.99

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

*SECNO 1600.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1600.00	6.63	303.86	303.86	0.00	306.37	2.51	0.22	0.00	304.20
2528.	0.	2528.	0.	0.	199.	0.	4.	1.	304.20
0.02	0.00	12.72	0.00	0.024	0.015	0.024	0.000	297.23	980.02
0.002207	98.	100.	102.	0	5	0	0.00	39.97	1019.98

*SECNO 1700.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1700.00	6.62	305.49	305.49	0.00	307.98	2.49	0.22	0.00	306.40
2528.	0.	2528.	0.	0.	200.	0.	5.	1.	306.90
0.02	0.00	12.67	0.00	0.024	0.015	0.024	0.000	298.87	979.37
0.002206	98.	100.	102.	0	5	0	0.00	40.52	1019.90

*SECNO 1800.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1800.00	6.78	305.94	305.94	0.00	308.41	2.47	0.22	0.00	307.00
2528.	0.	2528.	0.	0.	200.	0.	5.	1.	307.20
0.02	0.00	12.62	0.00	0.024	0.015	0.024	0.000	299.16	979.68
0.002178	100.	100.	100.	0	5	0	0.00	40.44	1020.12

*SECNO 1900.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1900.00	6.88	306.60	306.60	0.00	309.08	2.48	0.22	0.00	307.80
2528.	0.	2528.	0.	0.	200.	0.	6.	1.	307.70
0.03	0.00	12.64	0.00	0.024	0.015	0.024	0.000	299.72	979.89
0.002188	100.	100.	100.	0	5	0	0.00	40.45	1020.34

*SECNO 1950.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1950.00	6.64	307.10	307.10	0.00	309.57	2.48	0.11	0.00	308.00
2528.	0.	2528.	0.	0.	200.	0.	6.	1.	308.50
0.03	0.00	12.63	0.00	0.024	0.015	0.024	0.000	300.46	979.45
0.002185	50.	50.	50.	0	8	0	0.00	40.45	1019.90

FILE: WSP 2528.1

THIS RUN EXECUTED MON, SEP 14 1987 09:23:13

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**************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED MAR 1982
 ERROR CORR - 01,02,03,04,05
 MODIFICATION - 50,51,52,53,54,55
**************************************************

T1 GLEN COVE CHANNEL IMPROVEMENT - SUPERCRITICAL RUN
T2 100-YEAR STORM
T3 DOUGLAS CREEK EL PASO COUNTY

J1 ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

      0.       2.        0.        1.  0.000000      0.00      0.0       0.   305.000     0.000

J2 NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

   1.000     0.000    -1.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

   150.000   0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000


NC     0.024     0.024     0.015     0.100     0.300     0.000     0.000     0.000     0.000     0.000
QT     6.000  2528.000  2528.000  2528.000  2528.000  2528.000  2528.000     0.000     0.000     0.000
X1  1950.000     7.000   978.000  1021.900    50.000    50.000    50.000     0.000     0.000     0.000
GR   311.000   977.000   308.500   977.000   308.500   978.000   300.460   990.000   300.710  1011.000
GR   308.000  1021.900   310.500  1032.000     0.000     0.000     0.000     0.000     0.000     0.000

X1  1900.000     7.000   978.000  1021.900   100.000   100.000   100.000     0.000     0.000     0.000
GR   310.300   977.000   307.800   977.000   307.700   978.000   299.720   990.000   300.470  1011.000
GR   307.800  1021.900   310.300  1032.000     0.000     0.000     0.000     0.000     0.000     0.000

X1  1800.000     7.000   978.000  1021.900   100.000   100.000   100.000     0.000     0.000     0.000
GR   309.500   977.000   307.200   977.000   307.200   978.000   299.160   990.000   299.690  1011.000
GR   307.000  1021.900   309.500  1032.000     0.000     0.000     0.000     0.000     0.000     0.000

X1  1700.000     7.000   978.000  1022.000   102.000    98.000   100.000     0.000     0.000     0.000
GR   309.400   977.000   306.900   977.000   306.900   978.000   298.870   990.000   299.140  1011.000
GR   306.400  1022.000   308.900  1032.000     0.000     0.000     0.000     0.000     0.000     0.000

X1  1600.000     7.000   979.500  1020.500   102.000    98.000   100.000     0.000     0.000     0.000
GR   305.000   963.500   304.700   977.500   304.200   979.500   297.230   990.000   297.230  1010.000
GR   304.200  1020.500   304.600  1030.500     0.000     0.000     0.000     0.000     0.000     0.000

X1  1500.000     7.000   979.500  1020.500   101.000    99.000   100.000     0.000     0.000     0.000
GR   302.900   963.500   302.600   977.500   302.100   979.500   295.130   990.000   295.130  1010.000
GR   302.100  1020.500   302.500  1030.500     0.000     0.000     0.000     0.000     0.000     0.000
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X1	1400.000	7.000	979.500	1020.500	100.000	100.000	100.000	0.000	0.000	0.000
GR	300.800	963.500	300.500	977.500	300.000	979.500	293.030	990.000	293.030	1010.000
GR	300.000	1020.500	300.400	1030.500	0.000	0.000	0.000	0.000	0.000	0.000
X1	1300.000	7.000	977.200	1022.100	93.000	109.000	100.000	0.000	0.000	0.000
GR	297.700	965.000	297.400	979.000	296.900	981.000	290.930	990.000	290.930	1010.000
GR	299.000	1022.100	299.400	1032.100	0.000	0.000	0.000	0.000	0.000	0.000
X1	1200.000	7.000	976.500	1023.500	93.000	108.000	100.000	0.000	0.000	0.000
GR	295.600	965.000	295.300	979.000	294.800	981.000	288.830	990.000	288.830	1010.000
GR	297.800	1023.500	298.200	1033.500	0.000	0.000	0.000	0.000	0.000	0.000
X1	1100.000	7.000	978.000	1021.700	100.000	100.000	100.000	0.000	0.000	0.000
GR	293.500	965.000	293.200	979.000	292.700	981.000	286.730	990.000	286.730	1010.000
GR	294.500	1021.700	294.700	1030.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	1000.000	7.000	981.000	1019.000	100.000	100.000	100.000	0.000	0.000	0.000
GR	291.400	965.000	291.100	979.000	290.600	981.000	284.630	990.000	284.630	1010.000
GR	290.600	1019.000	291.000	1029.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	900.000	7.000	981.000	1019.000	100.000	100.000	100.000	0.000	0.000	0.000
GR	289.300	965.000	289.000	979.000	288.500	981.000	282.530	990.000	282.530	1010.000
GR	288.500	1019.000	288.900	1029.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	800.000	7.000	978.600	1019.000	107.000	94.000	100.000	0.000	0.000	0.000
GR	288.800	962.600	288.500	976.600	288.000	978.600	280.430	990.000	280.430	1010.000
GR	286.400	1019.000	286.800	1029.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	700.000	7.000	976.500	1019.000	55.000	46.000	50.000	0.000	0.000	0.000
GR	288.100	960.500	288.800	974.500	287.300	976.500	278.330	990.000	278.330	1010.000
GR	284.300	1019.000	284.700	1029.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	650.000	7.000	976.500	1019.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	287.100	960.500	286.800	974.500	286.300	976.500	277.280	990.000	277.280	1010.000
GR	283.300	1019.000	283.700	1029.000	0.000	0.000	0.000	0.000	0.000	0.000
EJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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

*PROF 1

CCHV= 0.100 CEHV= 0.300

*SECNO 1950.000

1950.00	4.54	305.00	307.10	305.00	311.68	6.68	0.00	0.00	308.50
2528.	0.	2528.	0.	0.	122.	0.	0.	0.	308.00
0.00	0.00	20.75	0.00	0.024	0.015	0.024	0.000	300.46	983.22
0.008909	0.	0.	0.	0	10	0	0.00	34.19	1017.41

*SECNO 1900.000

1900.00	4.76	304.48	306.57	0.00	311.23	6.75	0.45	0.01	307.70
2528.	0.	2528.	0.	0.	121.	0.	0.	0.	307.80
0.00	0.00	20.85	0.00	0.024	0.015	0.024	0.000	299.72	982.83
0.009035	50.	50.	50.	5	14	0	0.00	34.14	1016.97

*SECNO 1800.000

1800.00	4.80	303.96	305.93	0.00	310.23	6.27	0.86	0.14	307.20
2528.	0.	2528.	0.	0.	126.	0.	0.	0.	307.00
0.00	0.00	20.09	0.00	0.024	0.015	0.024	0.000	299.16	982.85
0.008126	100.	100.	100.	6	11	0	0.00	34.51	1017.36

*SECNO 1700.000

3301 HV CHANGED MORE THAN HVINS

1700.00	4.91	303.78	305.50	0.00	309.25	5.47	0.74	0.24	306.90
2528.	0.	2528.	0.	0.	135.	0.	1.	0.	306.40
0.00	0.00	18.77	0.00	0.024	0.015	0.024	0.000	298.87	982.66
0.006706	100.	100.	100.	6	11	0	0.00	35.37	1018.03

*SECNO 1600.000

3301 HV CHANGED MORE THAN HVINS

1600.00	4.55	301.78	303.86	0.00	308.38	6.60	0.76	0.11	304.20
2528.	0.	2528.	0.	0.	123.	0.	1.	0.	304.20
0.00	0.00	20.62	0.00	0.024	0.015	0.024	0.000	297.23	983.13
0.008606	102.	100.	98.	9	11	0	0.00	33.75	1016.87

SEE FIG NO. 5

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

'SECNO 1500.000

3301 HV CHANGED MORE THAN HVINS

1500.00	4.25	299.38	301.77	0.00	307.28	7.90	0.97	0.13	302.10
2528.	0.	2528.	0.	0.	112.	0.	1.	0.	302.10
0.01	0.00	22.55	0.00	0.024	0.015	0.024	0.000	295.13	983.60
0.011127	102.	100.	98.	11	11	0	0.00	32.79	1016.40

*SECNO 1400.000

J301 HV CHANGED MORE THAN HVINS

1400.00	4.04	297.07	299.65	0.00	305.97	8.89	1.21	0.10	300.00
2528.	0.	2528.	0.	0.	106.	0.	2.	0.	300.00
0.01	0.00	23.93	0.00	0.024	0.015	0.024	0.000	293.03	983.90
0.013197	101.	100.	99.	11	14	0	0.00	32.19	1016.10

'SECNO 1300.000

(301 HV CHANGED MORE THAN HVINS

1300.00	3.92	294.85	297.98	0.00	304.50	9.64	1.40	0.07	347.70
2528.	0.	2528.	0.	0.	101.	0.	2.	1.	299.00
0.01	0.00	24.92	0.00	0.024	0.015	0.024	0.000	290.93	984.09
0.014816	100.	100.	100.	9	18	0	0.00	31.78	1015.87

'SECNO 1200.000

3301 HV CHANGED MORE THAN HVINS

1200.00	3.83	292.66	295.81	0.00	302.89	10.24	1.55	0.06	345.60
2528.	0.	2528.	0.	0.	98.	0.	2.	1.	297.80
0.01	0.00	25.67	0.00	0.024	0.015	0.024	0.000	288.83	984.24
0.016157	93.	100.	109.	9	15	0	0.00	31.52	1015.75

*SECNO 1100.000

1100.00	3.75	290.48	293.73	0.00	301.18	10.69	1.67	0.05	343.50
2528.	0.	2528.	0.	0.	96.	0.	2.	1.	294.50
0.01	0.00	26.24	0.00	0.024	0.015	0.024	0.000	286.73	984.34
0.017212	93.	100.	108.	9	20	0	0.00	31.31	1015.65

:13

CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
:H	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
:H	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
288.34	291.44	0.00	299.38	11.05	1.76	0.04	290.60
2528.	0.	0.	95.	0.	2.	1.	290.60
26.67	0.00	0.024	0.015	0.024	0.000	284.63	984.42
100.	100.	13	14	0	0.00	31.17	1015.58
286.20	289.33	0.00	297.52	11.32	1.84	0.03	288.50
2528.	0.	0.	94.	0.	3.	1.	288.50
27.00	0.00	0.024	0.015	0.024	0.000	282.53	984.47
100.	100.	13	14	0	0.00	31.06	1015.53
284.07	287.14	0.00	295.60	11.53	1.89	0.02	288.00
2528.	0.	0.	93.	0.	3.	1.	286.40
27.25	0.00	0.024	0.015	0.024	0.000	280.43	984.52
100.	100.	12	14	0	0.00	30.97	1015.49
281.95	285.05	0.00	293.65	11.70	1.94	0.02	287.30
2528.	0.	0.	92.	0.	3.	1.	284.30
27.45	0.00	0.024	0.015	0.024	0.000	278.33	984.55
100.	94.	11	14	0	0.00	30.90	1015.46
280.90	284.01	0.00	292.66	11.76	0.98	0.01	286.30
2528.	0.	0.	92.	0.	3.	1.	283.30
27.52	0.00	0.024	0.015	0.024	0.000	277.28	984.59
50.	46.	10	14	0	0.00	30.82	1015.40

SEE FIG NO. 5

17 1987 02:53:13

FILE: WSP EXIST

THIS RUN EXECUTED MON, AUG 17 1987 02:53:13

****

RELEASE DATED NOV 76 UPDATED MAR 1982
- CORR - 01,02,03,04,05
CATION - 50,51,52,53,54,55
****

I COVE CHANNEL IMPROVEMENT - SUPERCRITICAL RUN
..-YEAR STORM EXISTING RCB AND CHANNEL DOWNSTREAM
)UGLAS CREEK EL PASO COUNTY

ECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
0.	2.	0.	1.	0.000000	0.00	0.0	0.	275.200	0.000

FKOF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
.000	0.000	-1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

'ARIABLE CODES FOR SUMMARY PRINTOUT

).000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

0.015	0.015	0.015	0.100	0.300	0.000	0.000	0.000	0.000	0.000
6.000	2528.000	2528.000	2528.000	2528.000	2528.000	2528.000	0.000	0.000	0.000
351.000	8.000	989.500	1010.500	69.000	71.000	70.000	0.000	0.000	0.000
275.200	989.500	268.200	989.500	268.200	999.500	275.200	999.500	275.200	1000.500
268.200	1000.500	268.200	1010.500	275.200	1010.500	0.000	0.000	0.000	0.000
281.000	8.000	989.500	1010.500	76.500	81.000	79.000	0.000	0.000	0.000
274.300	989.500	267.300	989.500	267.300	999.500	274.300	999.500	274.300	1000.500
267.300	1000.500	267.300	1010.500	274.300	1010.500	0.000	0.000	0.000	0.000
203.000	8.000	989.500	1010.500	102.000	104.000	103.000	0.000	0.000	0.000
273.300	989.500	266.300	989.500	266.300	999.500	273.300	999.500	273.300	1000.500
266.300	1000.500	266.300	1010.500	273.300	1010.500	0.000	0.000	0.000	0.000
100.000	8.000	989.500	1010.500	215.000	217.000	216.000	0.000	0.000	0.000
272.000	989.500	265.000	989.500	265.000	999.500	272.000	999.500	272.000	1000.500
265.000	1000.500	265.000	1010.500	272.000	1010.500	0.000	0.000	0.000	0.000
11.000	8.000	989.500	1010.500	30.000	30.000	30.000	0.000	0.000	0.000
269.100	989.500	262.100	989.500	262.100	999.500	269.100	999.500	269.100	1000.500
262.100	1000.500	262.100	1010.500	269.100	1010.500	0.000	0.000	0.000	0.000
0.040	0.040	0.035	0.100	0.300	0.000	0.000	0.000	0.000	0.000
10.000	5.000	992.000	1040.000	52.000	65.000	53.000	0.000	0.000	0.000
271.400	965.000	267.200	992.000	259.300	1000.000	281.300	1040.000	284.700	1057.000

X1	9.000	5.000	986.000	1009.000	50.000	46.000	47.000	0.000	0.000	0.000
GR	267.900	986.000	257.500	996.000	257.500	1004.000	263.300	1009.000	283.300	1045.000
X1	8.000	5.000	981.000	1008.000	49.000	48.000	48.000	0.000	0.000	0.000
GR	268.400	981.000	256.600	996.000	256.900	1005.000	262.100	1008.000	283.400	1053.000
X1	7.000	5.000	980.000	1007.000	50.000	46.000	51.000	0.000	0.000	0.000
GR	266.100	980.000	255.700	996.000	255.900	1004.000	261.400	1007.000	282.900	1053.000
X1	6.000	4.000	982.000	1019.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	265.400	982.000	255.100	996.000	255.000	1004.000	268.000	1019.000	0.000	0.000
EJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

WSELK	EG	HV	HL	OLOSS	BANK ELEV
LOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
NL	XNCH	XNR	WTN	ELMIN	SSTA
ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
275.20	280.26	5.06	0.00	0.00	275.20
0.	140.	0.	0.	0.	275.20
0.015	0.015	0.015	0.000	268.20	989.50
0	7	0	0.00	20.00	1010.50
0.00	279.60	5.71	0.60	0.07	274.30
0.	132.	0.	0.	0.	274.30
0.015	0.015	0.015	0.000	267.30	989.50
13	8	0	0.00	20.00	1010.50
0.00	278.79	6.12	0.77	0.04	273.30
0.	127.	0.	0.	0.	273.30
0.015	0.015	0.015	0.000	266.30	989.50
12	8	0	0.00	20.00	1010.50
0.00	277.66	6.49	1.09	0.04	272.00
0.	124.	0.	1.	0.	272.00
0.015	0.015	0.015	0.000	265.00	989.50
9	11	0	0.00	20.00	1010.50

SEE FIG. NO. 5

2-10' SPAN x 7' RISE RCB

WSELK	EG	HV	HL	OLOSS	BANK ELEV
OB	ACH	AROB	VOL	TWA	LEFT/RIGHT
L	XNCH	XNR	WTN	ELMIN	SSTA
ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
0.00	275.10	7.08	2.51	0.06	269.10
0.	118.	0.	1.	0.	269.10
0.015	0.015	0.015	0.000	262.10	989.50
5	11	0	0.00	20.00	1010.50
0.00	273.80	4.38	0.49	0.81	267.20
16.	143.	0.	1.	0.	281.30
0.040	0.035	0.040	0.000	259.30	977.71
6	17	0	0.00	40.69	1018.40
0.00	272.16	6.67	1.42	0.23	267.90
0.	120.	4.	2.	0.	263.30
0.040	0.035	0.040	0.000	257.50	988.32
9	5	0	0.00	24.62	1012.94
0.00	270.50	5.93	1.44	0.22	268.40
0.	126.	6.	2.	0.	262.10
0.040	0.035	0.040	0.000	256.60	985.86
7	11	0	0.00	27.37	1013.23

SEE FIG NO. 5
2-10 SPAN X 7 RISE RCB

WSELK	EG	HV	HL	OLOSS	BANK ELEV
.OB	ACH	AROB	VOL	TWA	LEFT/RIGHT
NL	XNCH	XNR	WTN	ELMIN	SSTA
ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
0.00	268.93	4.67	1.19	0.38	266.10
0.	141.	9.	2.	0.	261.40
0.040	0.035	0.040	0.000	255.70	982.82
9	11	0	0.00	30.32	1013.14
0.00	267.77	4.68	1.16	0.00	265.40
0.	146.	0.	2.	0.	268.00
0.040	0.035	0.040	0.000	255.00	985.13
9	8	0	0.00	28.21	1013.34

HOLLAND WEST, INC.

May 25, 1988

Mr. Dave Lethbridge
City of Colorado Springs Public Works
30 South Nevada Avenue
Colorado Springs, CO 80901

RE: Addendum to approved drainage study for Chelsea Glen Filing No. 1

Dear Dave:

In order to have the Filing No. 1 plat of Chelsea Glen more closely match what is actually being built, the Filing No. 1 plat is being revised to reflect only those lots and streets actually to be constructed in this phase. The drainage study is therefore being revised to reflect the actual plat boundaries, and this addendum can be attached to the approved study.

The addendum consists of removing seven (7) lots (13-17 Block 1 and 48 and 49 Block 2), two (2) tracts (C and D), and approximately 380 feet of street from the previously submitted plat. We understand that this plat change will be handled administratively, as the original plat is not yet recorded.

The enclosed text addendum, revised map, and revised cost estimate should be made a part of the approved study, once you have reviewed and approved them. Thank you very much for your kind assistance in aiding us in this difficult project.

Sincerely,

HOLLAND WEST, INC.

Steven W. Murray

Steven W. Murray, P.E.
Director of Engineering

A-280

6920 South Holly Circle, Englewood, Colorado 80112 (303) 773-0020
Planners • Engineers • Surveyors • Construction Managers
Denver • Phoenix • Ft. Worth

ADDENDUM TO APPROVED DRAINAGE STUDY
CHELSEA GLEN FILING NO. 1
MAY 23, 1988

The Chelsea Glen Filing no. 1 plat has been revised to eliminate several lots and tracts not proposed to be constructed with the remainder of the subdivision. The drainage study is therefore being amended by this addendum to reflect that changed condition.

The originally proposed 66 lots on 12.9 acres are being revised to 59 lots on 11.32 acres. No drainage patterns are being changed by this revision. The net effect of the revision will be to place a number of proposed drainage facilities into a future filing, and to remove them from the boundaries of the first filing. When the next filing to the west is developed, those facilities will be included as part of that development.

Two areas are affected: 1) the major area being the removal of seven lots and two tracts at the southwest corner of the subdivision, and 2) the removal of 70 feet of street at the northwest corner. Removing the lots at 1) will result in the proposed storm sewers serving basins A1, A3, A4, and A5 not being required until those lots are platted. Removing the street in 2) will result in the westerly storm sewer system not being required until the next plat in that area. The cost estimate for Filing No. 1 has been revised to reflect these changed conditions.

COST ESTIMATE

PROJ:CHELSEA GLEN FILING NO. 1
DATE:UPDATED JUNE 22, 1988
BY :STEVEN W. MURRAY, PE

NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENSION
1	18" RCP CLASS III	24.00	LF	28.50	684.00
2	24" RCP CLASS III	60.00	LF	38.00	2280.00
3	36" RCP CLASS III	648.00	LF	48.85	31654.80
4	42" RCP CLASS III	62.00	LF	57.65	3574.30
5	18" FLARED END SECTION	0.00	EA	260.00	0.00
6	24" FLARED END SECTION	0.00	EA	325.00	0.00
7	36" IMPROVED INLET	0.00	EA	5000.00	0.00
					0.00
8	4' DIAMETER MANHOLES	0.00	EA	1050.00	0.00
9	5' DIAMETER MANHOLES	3.00	EA	1250.00	3750.00
					0.00
10	5' TYPE R INLETS	1.00	EA	1995.00	1995.00
11	10' TYPE R INLETS	2.00	EA	3050.00	6100.00
12	15' TYPE R INLETS	1.00	EA	3047.50	3047.50
13	20' TYPE R INLETS	1.00	EA	3625.00	3625.00
					0.00
14	TYPE L RIPRAP	100.00	CY	25.00	0.00
				($2500.00)	0.00
15	EXTRA DEPTH, STORM SEWER	1.00	LS	4000.00	0.00
16	EXTRA DEPTH, INLETS	1.00	LS	3000.00	0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00
					0.00

Private L.O.C. needed $9500.00

SUBTOTAL		$	55710.60
CONTINGENCY (ENGINEERING)	10.00%	$	5671.06
GRAND TOTAL		$	62381.66

BASIN DRAINAGE FEE	11.321	ACRES	4883.00/AC	$ 55,280.44
BASIN BRIDGE FEE	11.321	ACRES	112.00/AC	$ 1,267.95

TOTAL ESTIMATE FOR PHASE I CONSTRUCTION: $62,381.66
BASIN DRAINAGE FEE: $55,280.44
AMOUNT ELIGIBLE FOR REIMBURSEMENT: $ 7,101.22

CERTIFICATIONS

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 master plan of the drainage basin. I accept responsibility for any liability attributable directly to any negligent acts, errors, or omissions on my part in preparing this report.

STEVEN W. MURRAY REGISTERED PROFESSIONAL ENGINEER STATE OF COLORADO

Steven W. Murray, P.E.
Registered Professional Engineer
State of Colorado #11498

Developer's Statement:

The developer and/or his representative has read and will comply with all the requirements specified in the drainage plan and report.

BY: _____

DATE: 5/26/88

TITLE: MANAGER

FILED:
Filed in accordance with Section 15-3-906 of the Code of the City of Colorado Springs, 1980, As Amended.

_____ 7/14/88
City Engineer Date