HOLLAND PARK WEST

~~MASTER~~ & FILING NUMBER 1

DRAINAGE PLAN

JANUARY, 1978

PREPARED BY:

UNITED PLANNING & ENGINEERING COMPANY
916 North Weber
Colorado Springs, CO 80903

UNITED PLANNING & ENGINEERING

planners · consultants · engineers

916 North Weber
Colorado Springs, Colorado 80903
(303) 471-8222

January 30, 1978

Mr. Donell Jeffries
City Engineer
P. O. Box 1575
Colorado Springs, CO 80901

SUBJECT: Holland Park West Filing No. 1
Drainage Plan

Dear Don:

In accordance with your approval of subject drainage plan, the following revised cost estimate is submitted. This will include the total cost of the Holland Park Boulevard culvert and the riprapping of the bottom of the pilot channel.

Holland Park Culvert				=	$42,680.50
3548	CY	Riprap	@ 20.00	=	70,960.00
220	LF	18" RCP	@ 14.00	=	3,080.00
660	LF	21" RCP	@ 15.00	=	9,900.00
210	LF	24" RCP	@ 16.00	=	3,360.00
185	LF	27" RCP	@ 20.00	=	3,700.00
160	LF	30" RCP	@ 22.00	=	3,520.00
4	ea	4' D-10R's	@ 900.00	=	3,600.00
11	ea	6' D-10R's	@ 1,080.00	=	11,880.00
4	ea	8' D-10R's	@ 1,200.00	=	4,800.00
			SUBTOTAL	=	$157,480.50
			10% Eng. & Cont.	=	15,748.05
			TOTAL	=	$173,228.55

We understand that the approval is for this filing only, and that the City will recompute the bridge fee, making us eligible for a refund of any overage that we might pay at this time.

Sincerely,

UNITED PLANNING & ENGINEERING CO.

Oliver E. Watts
Partner

OEW:pq

File

Lincoln DeVore
1000 West Fillmore St.
Colorado Springs, Colorado 80907
(303) 632-3593
Home Office

June 9, 1978

Holland Park West Company
916 N. Weber
Colorado Springs, CO 80903

Re: Hveem-Carmany Testing
Holland Park West, Filing #1

Gentlemen:

In accordance with your request, we have completed Hveem-Carmany testing on three samples of material from the above referenced location. The areas of each soil type are indicated on the attached map. The results are shown below.

36' T=4.5 40' T=5.0
12" bore

TYPE I - R = 13 10" Bore
Average expansion pressure @ 300 psi = 0
Average displacement @ 300 psi = 3.7

TYPE II - R = 13
Average expansion pressure @ 300 psi = 14.1
Average displacement @ 300 psi = 3.79

TYPE III - R = less than 5
Average expansion pressure @ 300 psi = 20.5
Average displacement @ 300 psi = 3.39
Swell may be critical on this soil type.

36' T=4.5 12" bore 40' T=5.0 14" bore

Respectfully submitted,

LINCOLN-DeVORE TESTING LAB.

Use 6" bore + pitron

George D. Morris, P. E.

GDM/heh

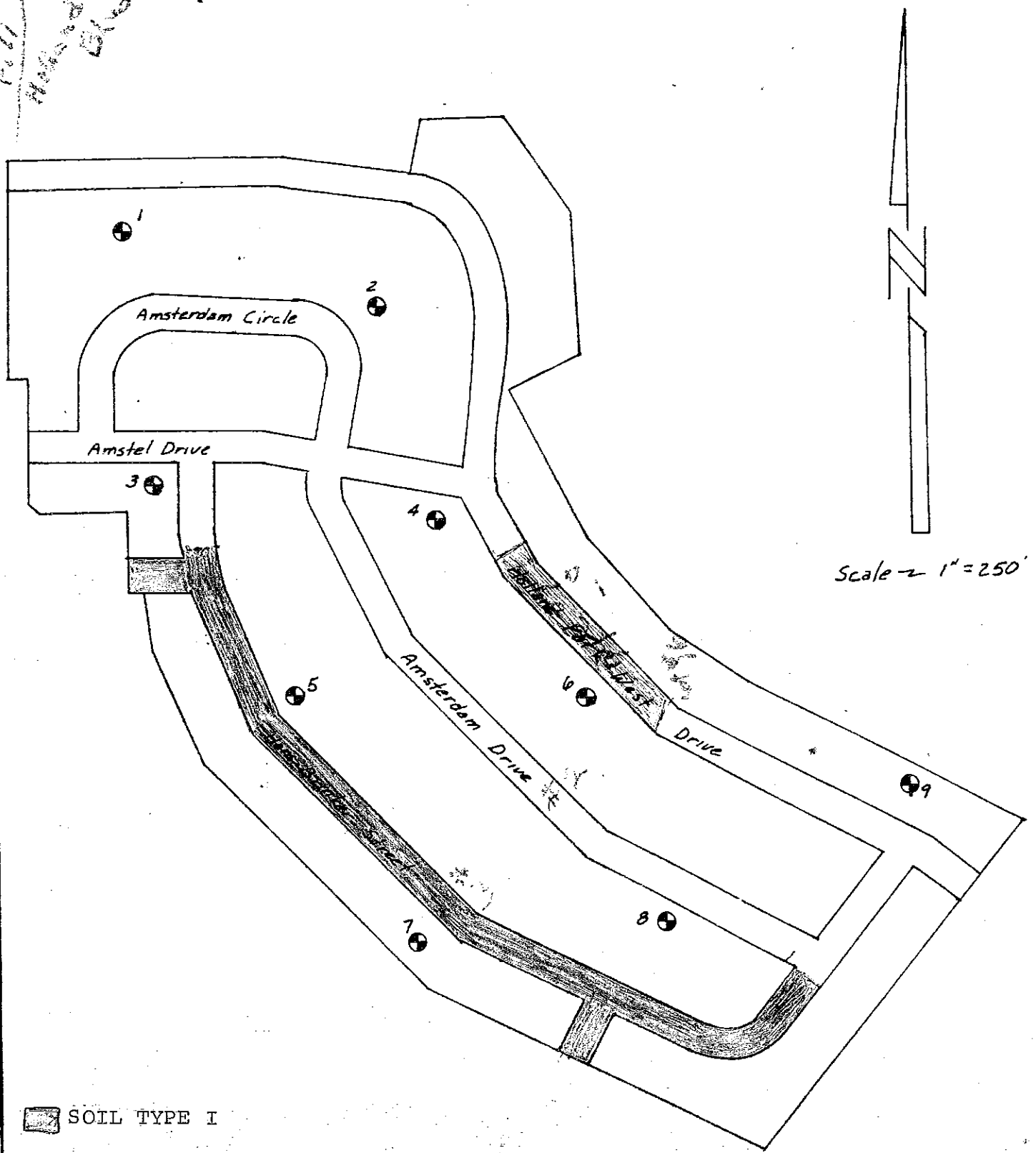
2700 Highway 50 West
Pueblo, Colo 81003
(303) 546-1150

P.O. Box 1427
Glenwood Springs, Colo 81601
(303) 945-6020

109 Rosemont Plaza
Montrose, Colo 81401
(303) 249-7838

P.O. Box 1882
Grand Junction, Colo 81501
(303) 242-8968

P.O. Box 1643
Rock Springs, Wyo 82901
(307) 382-2649



Test Boring Location Diagram
Holland Park West ~ Colorado Springs

THE LINCOLN-DeVORE TESTING LABORATORY
COLORADO: Colorado Springs, Pueblo, Glenwood Springs, Montrose, Gunnison. WYOMING: Rock Springs

UNITED PLANNING ENGINEERING

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916 North Weber
Colorado Springs, Colorado 80903
(303) 471-8222

January 16, 1978

Mr. Dewitt Miller
Director of Public Works
City of Colorado Springs
P. O. Box 1575
Colorado Springs, CO 80901

SUBJECT: Master Drainage Plan--Holland Park West and Drainage Plan, Filing Number One

Dear Deke:

Transmitted herewith for your review and approval is subject drainage plan.

Please contact me if I may answer any questions.

Respectfully submitted,

UNITED PLANNING & ENGINEERING CO.

Oliver E. Watts
Partner

OEW:pq
Enclosure

HOLLAND PARK WEST

MASTER & FILING NUMBER 1

DRAINAGE PLAN

CERTIFICATIONS AND APPROVALS

REGISTERED ENGINEER

I, Oliver E. Watts, a registered engineer in the State of Colorado, hereby certify that the attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. I further certify that said drainage report is in accordance with all City of Colorado Springs Ordinances and specification and criteria.

Oliver E. Watts

9853

Colorado P.E. - L.S. No. 9853

OWNER OR DEVELOPER OF THE SITE

"The developer has read and will comply with all of the requirements specified in this drainage report as approved by the City Engineer."

BY _____

TITLE V.P. N. Holland Park Inc.

APPROVED:

City of Colorado Springs, Department of Public Works

Donell Jeffries
CITY ENGINEER

Jan 27, 1978
DATE

subject to: (1) Riprap bottom of pilot channel
(2) Developer responsible for entire cost of Holland Park bridge
(3) Developer will be eligible for partial refund of bridge fee.
(4) Approval applies to Filing No. 1 only.

DRAINAGE PLAN

HOLLAND PARK WEST DEVELOPMENT

MASTER PLAN & FILING NUMBER 1

CONTENTS

APPENDIX

DRAWINGS

I. DESCRIPTION AND LOCATION

The Holland Park West Development lies west of Chestnut Street and south of the Garden of the Gods Road in the City of Colorado Springs, as shown on the drainage plan. The first filing is the eastern most portion of the development, and consists almost solely of single family dwellings.

The total master plan occupies 223.96 acres, lying wholly within the Douglas Creek drainage basin. The first filing occupies 45.442 acres.

II. METHOD

The method used for all computations is the USDA-SCS Synthetic Hydrograph Method as prescribed by the City of Colorado Springs. Computations are enclosed. All internal design is based on the runoff from the 5-year storm, having an intensity of 2.1 inches of rainfall during a 6-hour period.

All greenbelt flows and major inflows are taken from the Douglas Creek Drainage Study, June, 1974, as accepted and adapted by the City.

Soils mapping was performed by the local SCS Office and is shown on the enclosed general site plan, along with the pertinent hydrologic groupings.

III. GREENBELT DESIGN

The details of the preliminary greenbelt design are shown on the 3 plan and profile sheets and the cross section sheet. We have been working closely with the Holland Park Homeowners Association and the City Parks Department to determine the desires and needs of the local citizens with respect to the greenbelt design.

It has been emphasized again and again that the greenbelt area should be left as natural as possible so as to minimize the impact of the development and maintain an attractive park environment, consistent with the policies of the City and, above all, the safety of the public.

The upper greenbelt area consists of a wide, well grassed swale with no erosion. No development exists upstream for a considerable distance. For this reason, a natural flood plain area is proposed, with room for ponding above the Centennial Boulevard Crossing.

The Centennial Crossing was designed to provide a flood control benefit and will replace an existing stockwater pond. No permanent storage is needed, however, the available 16.4 acre feed of temporary ponding will lower the greenbelt flow from 2340 CFS to 2200 CFS. An extreme flood might overtop the road and cause erosion damage, but this will not increase the flood hazard downstream, or create a potential to loss of life. A 2 cell, 10'x7' concrete box culvert, 306 feet long, is proposed.

The greenbelt between the Centennial and Holland Park crossings has a natural eroded channel of sufficient size to contain the entire design flow, when improved without a major construction effort. For this reason, and to minimize the size of the Holland Park Boulevard culvert, a fully lined concrete channel is proposed.

The Holland Park Boulevard crossing is restricted to a minimal headwater depth, so an approach channel is required. A 2 cell, 10' x6' concrete box culvert, 104 feet long, is proposed.

Below Holland Park Boulevard for 2500 feet is a wide, well vegetated, gravelly stream bed with a small, slightly eroded pilot channel. The existing and proposed developments are situated well above the creek bed. In keeping with the existing flood plain ordinance, a pilot channel is provided to provide a permanent floodway with no erosion hazard. The design flood (upon eventual development of the upper basin) will be allowed to overtop the pilot channel up to three feet, and inundate fringe areas within the park without endangering the development areas. The velocities within these floodway fringe areas are not considered erosive, under existing soil and vegetation types.

At the termination of the greenbelt, the existing 96-inch culvert crossing of Chestnut Street constricts the flow and causes a considerable backwater condition. Fortunately, adequate room (46.55 acre feet) is available for this temporary ponding without endangering the existing or proposed developments.

Above this culvert, the greenbelt is left as natural as possible. Concrete cutoffs are placed laterally across the channel at 200 foot intervals to hold the channel gradient, and riprap is provided to protect the culvert approach and the encroachment of the non-potable water line.

IV. DESIGN INFLOWS

Numerous inflows to the development area exist as shown on the general site plan. All inflows are computed assuming the ultimate development potential of the basin, as follows:

117 CFS will enter the extreeme northern portion of the development from a future proposed storm sewer in the Garden of the Gods Road.

16.5 CFS will enter from the existing gravel pits and moving company yard in the northeast part of the development.

2.5 CFS will drain from the north down Holland Park Boulevard. Numerous other inflows from the Holland Park area will occur from existing structures.

Several inflows will occur from long gulleys reaching to the southwest to the mesa, as follows:

75.3 CFS from Basin 1A
33.9 CFS from Basin 2A
11.3 CFS from Basin 3H
64.4 CFS from Basin 3C
16.9 CFS from Basin 3B
19.9 CFS from Basin 3A
7.0 CFS from Basin 7A
3.6 CFS from Basin 7D

In addition, 16.6 CFS will drain into the access road to Chestnut Street from Basin 8A.

V. FLOW ROUTING

The flow routings are shown on the master drainage plan and the plan for Filing Number 1.

The northernmost inflow is routed to the greenbelt along the general alignment of the existing drainage path.

All runoff west of Centennial Boulevard south is routed to the greenbelt along Centennial Boulevard.

All other interior drainage is routed to the greenbelt along street alignments as the natural topography dictates. One storm sewer system is provided across the R-5 parcel (from Basin 2A) and two storm sewer outfalls are provided within Filing Number 1 at natural channel locations.

VI. INTERNAL DESIGN DETAILS

A. Streets

NAME	LOCATION	RUNOFF-CFS	CURB TYPE	WIDTH	MIN. SLOPE
Centennial Boulevard	South Boundary	19.9	Vertical	76'	0.5%
	Basin 3D	14.0	Vertical	76'	0.5%
	Basin 3E	4.9	Vertical	76'	0.5%
	Greenbelt	20.5	Vertical	76'	0.53%
	North	18.3	Vertical	76'	0.5%
FILING NUMBER ONE:					
Holland Park Blvd.	Greenbelt	15.9	Vertical	60'	0.5%
Amstell Drive	Basin 6C	11.0	Ramp	36'	
Amstell Drive	Basin 6D	12.8	Ramp	36'	
Hans Brinker	Basin 7H	13.8	Ramp	36'	
Amsterdam	Basin 7I	14.6	Ramp	36'	
Holland Park W Drive	Basin 6F	9.7	Ramp	40'	
Holland Park W Drive	Basin 7J	12.4	Ramp	40'	

B. Storm Sewer

RCP shown, N=0.013

LOCATION (BASINS)	DESIGN FLOW -CFS-	SIZE -IN-	MIN. SLOPE -%-
3C	64.4	27	4.33
3B	16.9	18	2.59
3B-C	76.3	36	1.31
3A-C	90.4	36	1.83
3A-D	106	36	2.52
	106	42	1.11
7A-G	21.2	21	1.79
7A-H	50.5	24	4.99
7A-I	59.2	27	3.66
7A-J	81.4	30	3.94
6A-F	24.6	18	5.49

LOCATION (BASINS)	DESIGN FLOW -CFS-	SIZE -IN-	MIN. SLOPE -%-
8A	16.6	21	1.10
2A	33.9	21	4.58
2A-B	46.4	24	4.21
9A	117	42	1.36

C. Catch Basins (All are D-10R)

LOCATION	TYPE	DESIGN FLOW -CFS-	SIZE-FT BxDxZ	FLOW DEPTH -FT-	VELOCITY -FPS-
Greenbelt	Concrete	2296	12x4.5	3.5	34.3
		2296	12x5.5	4.5	24.5
	Riprap	710	8x4.0	4.0	12.7
Area 9D	Concrete	147	4x3.0	1.96	12.9

VII. COST ESTIMATE

A. Master Plan

ITEM	QUANTITY	UNIT COST	COST CITY	COST DEVELOPER
Centennial Culvert:				
Concrete	364CY	$175.00	$53,707.84	$9,992.16
Steel	80,000 LB	0.40	26,980.39	5,019.60
Excavation	2935CY	2.50	6,186.52	1,150.98
Backfill	1350CY	3.50	3,983.82	741.18
SUBTOTAL:	306LF	Dev.Pays 48LF	$90,858.58	$16,903.92
Holland Park Culvert:				
Concrete	163CY	$175.00	$15,359.62	$13,165.38
Steel	29,000 LB	0.40	6,246.15	5,353.85
Excavation	381CY	2.50	512.88	439.62
Backfill	458CY	3.50	863.15	739.85
SUBTOTAL:	104LF	Dev.Pays 48LF	$22,981.81	$19.698.69

ITEM	QUANTITY	UNIT COST	COST CITY	COST DEVELOPER
Major Channel Concrete	36.783SF	$1.20		$44,139.60
Major Channel Riprap	2460CY	20.00		49,200.00
Major Channel Cutoffs	58CY	50.00		2,900.00
4'x3' concrete ditch	1260 LF	17.40		21,924.00
18-Inch RCP	860 LF	14.00		12,040.00
21-Inch RCP	1230 LF	15.00		18,450.00
24-Inch RCP	415 LF	16.00		6,640.00
27-Inch RCP	615 LF	20.00		12,300.00
30-Inch RCP	160 LF	22.00		3,520.00
36-Inch RCP	1520 LF	30.00		45,600.00
42-Inch RCP	2100 LF	38.00		79,800.00
4' D-10R	6 ea.	900.00		5,400.00
6' D-10R	11 ea.	1,080.00		11,880.00
8' D-10R	4 ea.	1,200.00		4,800.00
SUBTOTAL:			$113,840.39	$355,196.21
10% Engineering Cont:			11,384.04	35,519.62
TOTAL:			$125,224.43	$390,715.83
Cost per 225 Acres:				$1,736.51

B. Filing No. 1

Holland Park Culvert	-See Above-		$22,981.81 Developer	$19,698.69
Major Channel Riprap				~~150,000.00~~
Major Channel Cutoffs				2,880.00
18-Inch RCP	220 LF	14.00		3,080.00
21-Inch RCP	660 LF	15.00		9,900.00
24-Inch RCP	210 LF	16.00		3,360.00
27-Inch RCP	185 LF	20.00		3,700.00
30-Inch RCP	160 LF	22.00		3,520.00
4' D-10R	4 ea.	900.00		3,600.00
6' D-10R	6 ea.	1,080.00		6,480.00
8' D-10R	2 ea.	1,200.00		2,400.00
SUBTOTAL:				$218,278.69
10% Engineering Cont:				21,827.87
TOTAL:				$240,106.56

VIII. FEES

	UNIT FEES			FEES	
	ACRES	BRIDGE	DRAINAGE	BRIDGE	DRAINAGE
Master Plan	223.96	103	1617	$23,067.88	$362,143.32
Filing No. 1	~~45.442~~ 44.703	103	1617	~~4,680.52~~ 4604.40	73,479.71 72,284.75

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Page 1 of 2

Project Holland Park Channel

Calc. by Steed date 1-6-78

Checked by _____ date _____

ALIGNMENT OF GREENBELT

Sta	Defl Δ	Dist	Bear	Cos L	Sin T	Lat N	Dep E	R
POT #1A						13,695	6,500	
		576.60	S40.56896E	-		-438	+375	
PI #2A						13,257	6,875	
						+1	+125	
3+46.03		125.00	N89.59164E					
PI #3	28.49978			+99.91	253.97	13,258	7,000	1000
8+93.44								
8+91.50	28.49978	433.94	S61.95858E			-204	+383	
PI #4	7.54684			263.43	131.91	13,054	7,383	2000
11+54.93								
13+24.05		545.53	S69.50542E			-191	+511	
PI #5	27.47892			479.60	244.50	12,863	7,894	1000
PT 18+03.65								
		353.62	N83.01566E			+43	+351	
PI #6	17.59333			216.52	109.12	12,906	8,245	705.14
20+20.17						+177		
21+97.17	24.65.50	425.56	N65.92233E			13,083	+387	
PI #7	38.43606			268.33	139.44	13,083	8,632	400
23+26.00	24+65.50							
25+53.08	26+95.52	544.61	S76.11161E			-121	+531	
PI #8	38.60971			336.93	175.15	12,962	9,163	500
28+93.01	30+32.45							
30+32.32	31+71.76	380.83	S37.53190E			-302	+232	
PI #9	36.71636			128.16	66.37	12,660	9,395	200
31+60.48	32+99.92							
32+20.89	33+59.53	281.03	S0.81559E			-281	+4	
PI #10	95.84186			239.19	155.05	12,379	9,399	140
PT 34+54.28	35+93.72							
34+91.38	36+30.82	319.15	N83.39260E			+37	+317	
PI #11	69.82995			226.30	128.00	12,916	9,716	200
PT 37+17.68	38+57.12							
37+91.79	39+31.23	341.32	S31.82745E			-290	+180	
PI #12	31.32837			273.39	140.21	12,126	9,896	500
PT 40+65.18	42+04.62							
PC 42+76.18	44+15.62	574.02	S0.49908E			-574	+5	
PI #13	58.23719			406.57	222.81	11,552	9,901	400
PT 46+82.75	48+22.19						+896	
PC 53+82.57	55+21.71	1048.21	S58.73627E			-549	10,797	
PI #14	69.37459			224.71	125.88	11,008	10,797	200
PT 56+00.98	57+46.42						10,766	
PC 56+55.96	57+95.35	315.53	S05.63826E			-314	-31	
PI #15	70.26204			245.26	140.72	10,694	10,766	200

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Project HPC

Calc. by OGW date 1-6-78

Checked by _____ date _____

Sta	Defl Δ	Dist	Bear	Cos L	Sin T	Lat N	Dep E	R
PI #15						10,694	10,766	200
61+~~88.59~~ 62+48.03	60°40.61	452.68	S64°23'22"E			-194	+409	
POT #16						10,500	11,175	
PI #3						13,258	7,000	
		600.00	S89.5416 W			1"		
Begin						13,253.20	6,900.02	

UNITED ENGINEERS WESTERN

Project: Hollywood Park Master Drainage
Calc. by: [illegible] date: 1-7-78
Checked by: date:

GREENBELT DESIGN

INCOMING FLOOD PLAIN

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2} \qquad n = 0.040$$

$$S = \frac{8}{529} = 1.512\% \qquad Q = 2196$$

STa	WSEl	T	A	WP	R	$R^{2/3}$	Q	V
0+71	6290	9	0					
	92	37	46.00		2.296	1.741	1169.1	
	94	64	147.00	64	~~1.698~~	1.355	~~625~~	
	96	89	300.00	89	3.371	2.248	3081.2	
							2196	9.6
	95.07		228.9					
6+00	82	0	0					
	83	79	39.5					
	84	110	134.0	110	1.218	1.141	698.3	
	86	150	394.0	150	2.627	1.904	3426.7	
								7.9
	85.10		276.7					

CENTENNIAL BLVD XING

Potential Storage 1" = 100'

WSEl	PR in²	A ft²	V ft³	ΣV ft³	ΣV AF
				0	0
71.6	0	0			
			580		
72	0.29	2900		580	0.0133
			16,300		
74	1.34	13,400		16880	0.3875
			48,200		
76	3.48	34,800		65,080	1.494
			87,900		
78	5.31	53,100		152,980	3.512
			128,700		
6280	7.56	75,600		281,680	6.466
			199,300		
82	12.37	123,700		480,980	11.042
			260,200		
84	13.65	136,500		741,180	17.015

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Project Holland Park

Calc. by OEW date 1-7

Checked by _____ date _____

Incoming Hydrograph 100yr, I = 3", d = 1 hr (p13)

q_p = 2340 cfs (pA-5)

no Tp given

From Basin Boundary Map

$T_c = \left(\frac{11.9L^3}{H}\right)^{0.385}$ L = 16,900 = 3.201 M

H = 7900 − 6280 = 1620

= 0.578 hrs

T_p = D/2 + 0.6T_c = 0.5 + 0.6T_c = 0.85 hrs

T_b = 2.67 T_p = 2.26 hrs

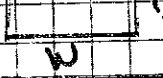
Use USBR, p 74 For hydrograph breakdown

Structure Trials Steep Slope - will flow under inlet control

See p435 USER $Q = C_d A \sqrt{2gH}$ Use RCB because of size

Max H = 84.8 − 71.6 = 13.2 $\sqrt{2gH}$ = 29.16

Try Max Q = 2000 cfs (seep3)



LF Well 45/48 Conc/LF

Try D	H/D	C_d	A	W	Possibly	Conc/LF	Conc/LF*1.50
6.0	2.2	0.533	128.68	21.9	2-11x6	68	CY/LF 2.33
8.0	1.65	0.504	136.08	17.0	2-9x8	60	2.12
7.0	1.89	0.516	132.92	18.99	2-10x7	61	2.13 ← Try
5.0	2.64	0.555	123.58	24.71	2-12x5?	63	2.50
9.0	1.47	0.492	139.40	15.48	2-8x9	59	—

2-10x7

2-10x7

$Q_{max} = 0.516 \times 140 \times 29.16 = 2106$ cfs

Capacity Check (overtopping) $Q = C_d \times 140 \times \sqrt{64.4}H$

H/D	C_d	H	Q	US Elev
0				71.6
1.2	0.478	8.4	1556	80.0
1.4	0.490	9.8	1723	81.4
1.6	0.500	11.2	1880	82.8
1.8	0.510	12.6	2054	84.2
1.89	0.516	13.2	2106	84.8

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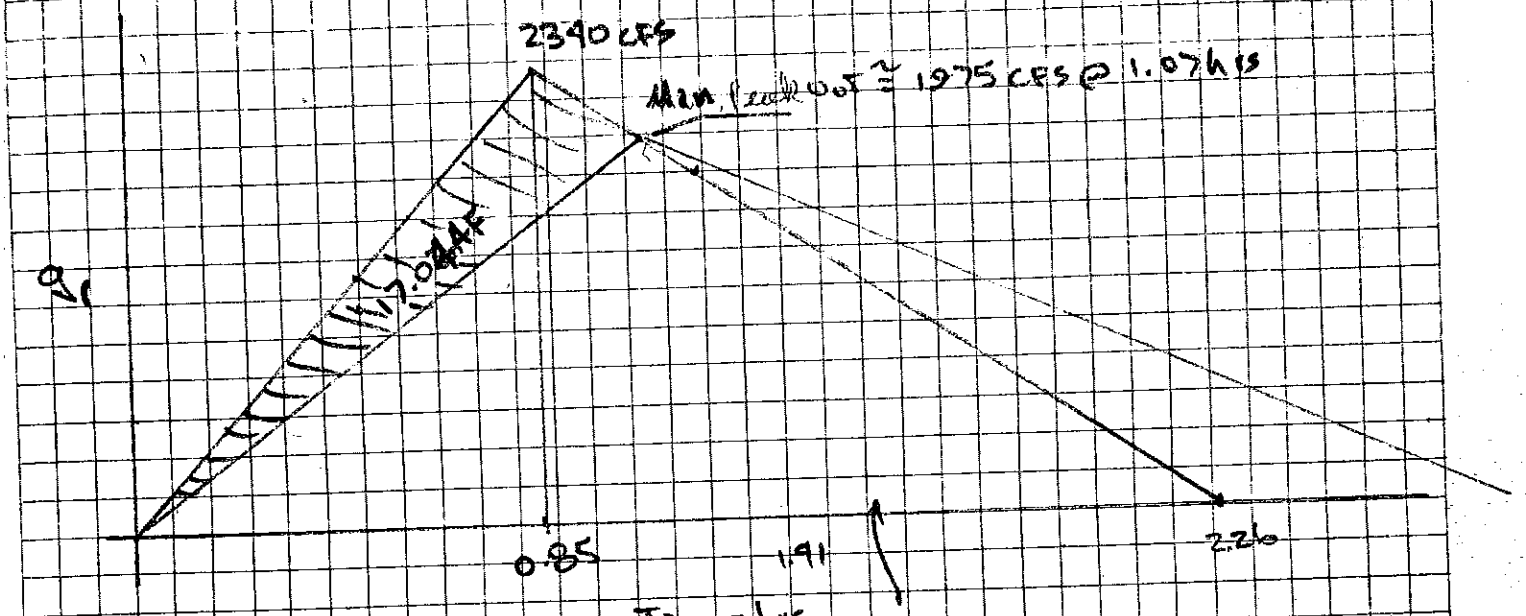
Project Holl PK

Calc. by [illegible] date 1-7

Checked by _____ date _____

Simplified hyd @ Centennial Con Storage 741,180 cf (17.02 AF)



$V = \frac{1800 \times 2.26 \times 2340}{43{,}560 \times 2} = 109.26\,AF$

For Maximum & Minimum Actual Peak Outflow

Peak Outflow	Time	Qpc 0.85	Storage AF	Water Surface Elevation: Pipe Cap.	Storage
1800	1.18	1302	25.31	82.09	over
1900	1.12	1498	20.64	82.98	over
2000	1.05	1612	15.80	83.89	83.59
			17.02±		
1925	1.10	1487	19.37	83.21	over
1975	1.07	1569	17.04	83.66	84.01
1988	1.06	1591	16.40	83.78	83.80
1989	1.06	1593	16.37	83.79	83.88

Min:

actual

Inflow = 2196 @ 0.85
Outflow = 1989 @ 1.06
Storage = 16.37 AF
Max WSEL = 83.79

207 CFS Storage

UNITED WESTERN ENGINEERS

Project Holland Park

Calc. by OEO date 1-9

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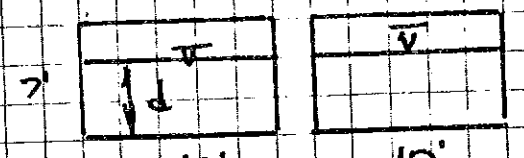
Culvert w/ Rated Level



$Q = 1989\ CFS = \frac{1.486}{n} A R^{2/3} S^{1/2}$ $n = 0.013$ $S = 0.0379$

d	A	WP	R	$R^{2/3}$	Q	V	
7.00	140.00	68.00	2.059	1.618	5009		(Inlet Control)
3.00	60.00	32.00	1.875	1.521	2016.8		
2.90	58.00	31.60	1.835	1.499	1922.1		
2.97	59.41				1989	33.5	←

Note: At time of Platting - Culvert Transition may be used.

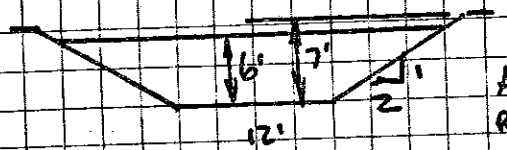
CHANNEL STA 14+54 TO HOLLAND PK BLVD

See Sec's 15+00's 21+97

$Q = 2503 - 207 = 2296\ CFS$

$= \frac{1.486}{n} A R^{2/3} S^{1/2}$

Basic Shape:



$A = 149.0$
$R = 3.71$

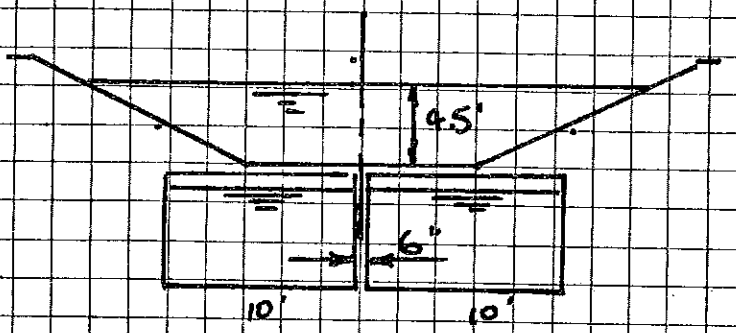
Material	Concrete	Riprap		Riprap ϕ
n	0.013	0.035		
QC S = 2.80%	6600	2451	V = 17.0	8'
Qe S = 1.09%	4118	1530	V = 10.6	2'

Use Concrete lining $b = 12'$ $z = 2$ ←

Sizing

S	d	A	R	$R^{2/3}$	Q	V	Fr	Use
2.80%	3.00	54.00	2.12	1.650	1704			
	4.00	80.00	2.68	1.929	2952			
	3.90	63.92	2.35	1.768	2161			
	3.5	66.50	2.905	1.795	2283	34.3	3.234	12x4.50
1.09%	4.00				1841			
	4.40	91.52	2.89	2.029	2216			
	4.5	94.50	2.942	2.053	2315	24.5	2.035	12x5.5

Holland Park RCB



Incoming V = Same as channel = 24.5 fps $\frac{V_1^2}{2g}$ = 9.321

A = 99.50

incoming d_1 = 4.72' $d_1/\frac{V_1^2}{2g}$ = 0.507

Pier Jump: See LA Manual DB-9.3

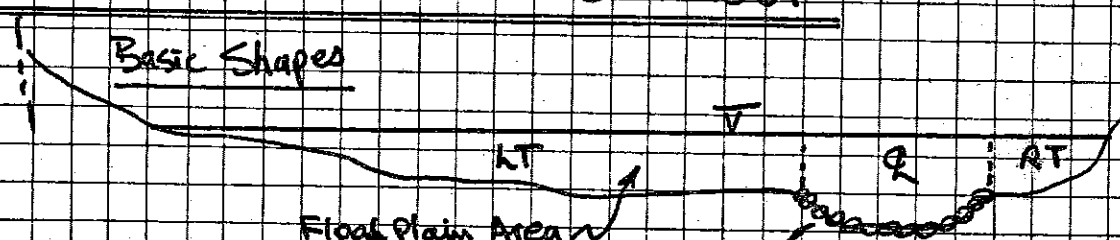
$n = b_2/b_1$ Pier width = 6" $n = \frac{20}{20.5} = 0.976$

$d_2/d_1 = 1.071$ $d_2 = 1.071 \times 4.72 = 5.06'$ V = 22.7 fps

Use 2 - 10' x 6' RCB ←

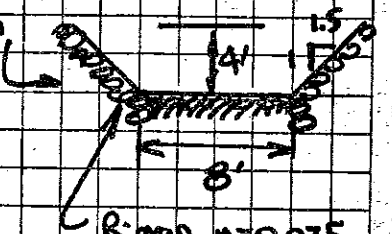
CHANNEL - HOLLAND PARK TO CHESTNUT

Basic Shapes



$Q = \left(\frac{1.486}{n} AR^{2/3}\right) S^{1/2} = K S^{1/2}$

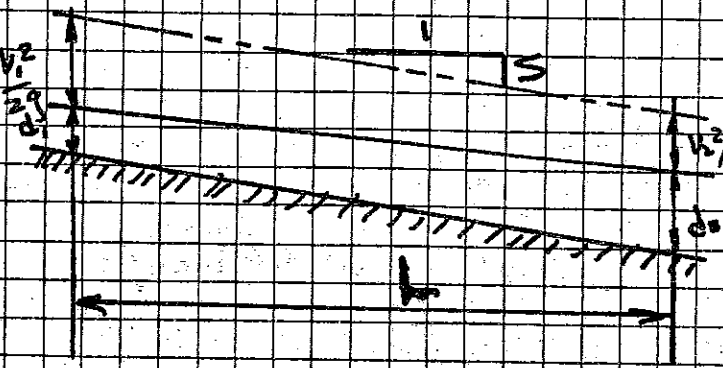
$K = \Sigma K = K_{LT} + K_{RT} + K_C$



R:prap, n=0.035
without bottom w cutoff

Max Q = $\frac{1.486}{0.035} 56 (2.50)^{2/3} (.00263)^{1/2}$

= 710.2 CFS



V_{max} = 12.7 fps

R:prap = 2.20 ft req'd

@ 1.5' mean

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Calc. by OEW date 1-9

Checked by _____ date _____

Section Data

Note, Sta 37+00 To 52+00, Mud Splits

T = 20

Station	WS Elev	LT A	LT WP	LT n	LT K	℄ A	℄ WP	℄ n	℄ K	RT A	RT WP	RT n	RT K	Total A	Total K
29+00	31.8	0			0	0	22.42	R.rap	0	0				0	0
	35.8	0			0	56.0	22.89 2.50	0.035	4379.6	0			0	56	4379.6
				Grass		44.0									
	38.0	24.75	15.0	0.045	1141.2	100.0	✓	0.035	11509.4	6.6	5.0	Grass 0.045	262.26	131.35	12,9078
		35.8			2785.8	40.0			8651.9	5.9			232.54	81.7	11,670.2
	40.0	60.55	22.0	✓	3927.0	140.0	✓	✓	20,156.3	12.0	8.6	✓	494.8	212.55	29578.0
35+00	19.0	0			0	0			0	0			0	0	0
	23.0	0			0	56.0	22.42	0.035	4379.6	0			0	56.0	4379.6
	1.7			Grass		34.0						Brush			
	24.7	20.65	14.3	0.045	871.34	90.0	✓	0.035	9651.6	11.9	8.6	0.075	292.8	122.55	10815.7
	1.1	33.55	33.0		1088.56	22.0			4244.5	9.9	2.4		388.7	75.95	5721.8
	25.8	54.20	47.3	✓	1959.9	112.0	✓	✓	13896.1	21.8	11.0	✓	681.5	188.00	16537.5
	1.2	82.20	43.2			24.0				13.56	3.1			113.76	9882.3
	27.0	136.40	90.5	✓	5921.0	136.0	✓	✓	19205.6	35.36	14.1	✓	1293.2	307.76	26419.8
41+85	07.1					0			0						
	11.1					56.0	22.42	0.035	4396.6						
	08.1	0		Trees Grass	0										
	0.9														
	09.0	25.65	57.2	0.060	372.2										
	1.0	71.75	30												
	10.0	97.4	82.2	✓	2596.9										
	1.5	149.75	22.7			8.0				(Does Not Split)					
	11.5	292.19	109.9	✓	10159.9	64.0	✓	✓	5468.0					304.15	15622.9
	2.2	298.6	8.9		21,136.6	44.0			7610.8			Brush		305.86	29092.7
	13.7	490.75	118.8	✓	31291.5	108.0	✓	✓	13078.8	13.26	8.8	0.075	345.3	612.01	44715.6
48+22	92.7	22.40	40.0	0.060	376.9	0			0				0	22.4	376.9
	4.0	201.00	23.2		12462.1									257.0	16841.7
	96.7	223.4	63.2	✓	12839.0	56.0	22.42	0.035	4379.6	↓			0	279.4	17218.6
	1.3	87.23	8.2			24.0								115.7	11582.9
	98.0	310.63	71.4	✓	20,502.6	82.0	✓	✓	8264.5	2.47	4.2	0.075	34.4	395.1	28801.5
54+03	80.0	0			0	0			0	0			0	0	0
	84.0	0			0	56.0	22.42	0.035	4379.6	0			0	56.0	4379.6
						40.0									
	86.0	38.5	21.8	0.045	1857.5	96.0	✓	✓	10747.6	10.6	8.5	0.045	405.5	145.1	13010.7
		48.1	5.3		4346.8	40.0			8457.9	23.0	7.2		1437.1	111.1	14241.7
	88.0	86.6	27.1	✓	6204.3	136.0	✓	✓	19205.5	53.6	15.7	✓	1842.6	256.2	27252.9

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Calc. by DEW date 1-9

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Flood Plain Profile — Design Flows: See June '24 Master Plan

$Q = KS^{1/2}$

Sta's 25+00 To 44+00 — Q_8: 2685 − 207 = 2478 CFS

Sta's 44+00 To 62+00 — Q_1: 2787 − 207 = 2580 CFS

@ Sta 29+00 S = S(Invert) Computed To nearest 0.01'

~~Note: Sta 32+00 to 52+00, Flows Split~~

Sta	S assume	K	WSEL	A	V	$V^2/2g$	HGL	L	S actual
29+00	0.0213	16,979.0	38.70	159.68	15.5	3.74	42.44 ←		0.0213
35+00	0.0213	16,979.0	25.85	193.35	12.82	2.55	28.40	600	0.023339
	0.02235	16,576.6	25.80	188.47	13.15	2.68	28.49		0.02325
	0.0230	16339.4	25.76	195.39	12.68	2.50	28.26		0.02363
	0.0236	16,130.4	25.72	192.63	12.86	2.57	28.29 ←		0.023581
41+85	0.0173 ℄	4379.6	Q_8 = 576.0			Q_{LT} = 1902 CFS			
	0.02534T	11957.8	(Does Not Split)						
	0.0173 ℄	18839.3	11.74	339.97	7.29	0.82	12.57	685	0.02295
	0.0220	16706.7	11.58	317.54	7.80	0.95	12.53		0.02301
	0.0230	16339.4	11.55	313.68	7.90	0.97	12.52 ←		0.02302
48+22	0.0230	17012.0	96.65	276.25	9.34	1.35	98.01	637	0.02278
	0.0228	17086.5	96.67	277.38	9.30	1.34	98.01 ←		0.02278
54+03	0.0220	17394.4	86.62	179.30	14.39	3.22	89.83	581	0.01908
	0.0150	21066.6	87.13	207.94	12.41	2.39	89.52		0.01461
	0.01465	21315.8	87.17	209.89	12.29	2.35	89.51 ←		0.01463

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Composite Velocities

$$\Sigma K = K_{LT} + K_C + K_{RT}$$

$$q_{LT} = \left(\frac{K_{LT}}{\Sigma K}\right) \Sigma q \qquad V_{LT} = \frac{q_{LT}}{A_{LT}} \text{ , etc.}$$

Sta	LT				C				RT				Total			
	K	q	A	V	K	q	A	V	K	q	A	V	K	q	A	V
29+00	2113.0	308.4	37.24	8.3	14522.7	2119.5	113.75	18.6	343.38	50.1	8.48	5.9	16,979.0	2478	159.68	15.5
35+00	1882.5	289.2	51.81	5.6	13554.1	2088.4 1955.9	110.43	18.9	653.8	100.4	21.10	4.8	16,130.4	2478	192.63	12.86
41+85	1065.5	1613.0	248.57	6.5	5665.5	857.7 ~~570.0~~	65.08 ~~56.0~~	13.2 ~~10.3~~	8.50	1.3 ~~1.1~~	0.33	3.9	16,339.4	2478	313.68	~~7.90~~ 12.52
48+22	1091.2	1973.9	221.82	8.7	4345.2	696.1	55.56	11.8	0	0	0	0	17086.5	2580	277.38	9.30
54+03	4392.3	5316	665.5	8.0	15699.8	1897.8	119.37	15.9	1243.5	150.5	24.01	6.3	21315.8	2580	209.89	12.29

CHESTNUT CROSSING

8'ϕ CMP x 174' S = 1.67%

2 2/3 x 1/2" Corrugations, n = 0.024

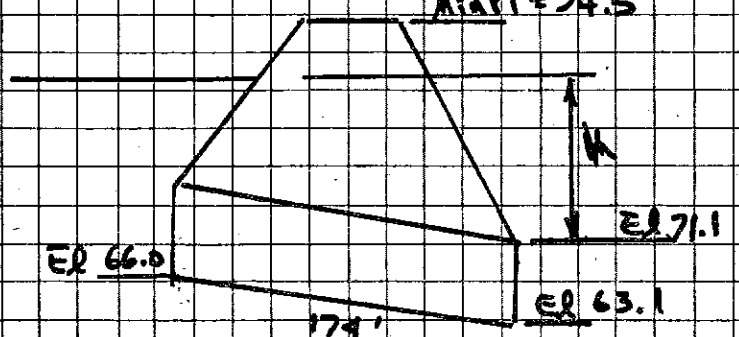
Q_f = 2580 cfs (see p 7)

Q @ Normal S = $\frac{0.463}{n} D^{8/3} S^{1/2}$ = 638.3 cfs

Operates under head with barrel full.

Iowa Formula

$$Q = \frac{A\sqrt{2gh}}{\sqrt{1+0.16D^{0.6}+\frac{0.1067}{D^{1.2}}}} = 229.93\sqrt{h}$$



A = 50.27 ft²
L = 174'
D = 8.00

$Q = 229.93\sqrt{h} = 2580$

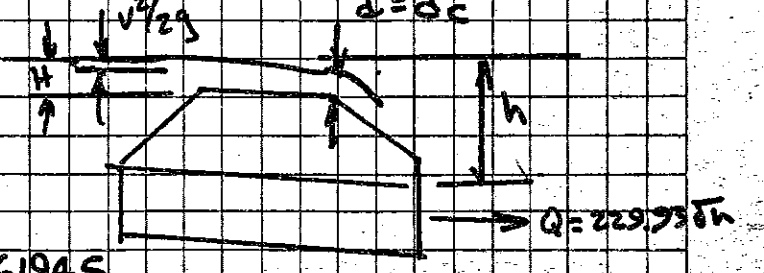
h = 125.90'

$\sqrt{h}$ = 11.22

Max Q: h_{max} = 94.5 - 71.1 = 23.4'

$Q_{max} = 229.93\sqrt{23.4} = 1112$ cfs ← Road Overtops

For overtopping of Road



Weir Flow + Pipe Flow = 2580 cfs

Weir Flow (p 5-24 King)

$Q = 3.087 L H^{3/2}$ H = WS - 6194.5

Pipe Flow

$Q = 229.93\sqrt{h}$ h = WS - 6171.1

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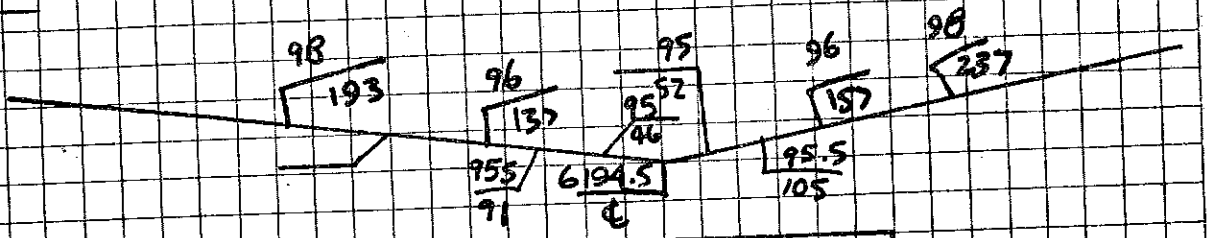
CHESTNUT Street



US Elev	Weir Flow			Pipe Flow		Total
	L	H	Q	h	Q	Q
94.5	0	1.5	0	23.4	1112	1112
96.0	294	294	1667.3	24.9	1197	2815
95.0	98	0.5	107.0	23.9	1124	1231
95.5	196	1.0	605	24.4	1136	1740
Int. 95.89						2580

See P 12 for actual Peak Outflow ~~from~~ by Workup

CHESTNUT STORAGE DATA

Elev	PR in²	A SF	V CF	ΣV CF	ΣV AF	
6166	0	0		0	0	
			500			
68	0.05	500		500	0.011	
			4000			
6170	0.35	3500		4500	0.103	
			9900			
72	0.64	6400		14400	0.331	
			21900			
74	1.55	15500		36300	0.833	
			41700			
76	2.62	26200		78000	1.791	
			60 600			
78	3.44	34400		138 600	3.182	
			78 800			
6180	4.44	44400		217400	4.991	
			100 400			
82	5.60	56000		317 800	7.296	
			125000			
84	6.90	69000		442 800	10.165	
			155 000			
86	8.60	86000		597 800	13.724	
			190 000			
88	10.40	104000		787 800	18.085	
			235 200			
6190	13.12	131200		1 023 000	23.485	
			296 100			
92	16.49	164900		1319 100	30.282	
			368 800			
94	20.39	203900		1687 900	38.749	
945					41.395	TOP
			461 000 (10.583)			
96	25.71	257 100		2148900	49.332	

INCOMING HYDROGRAPH

$$T_c = \left(\frac{11.9\,L^3}{H}\right)^{0.385}$$

L = 22,000' = 4.17 mi.

H = 7900 - 6170 = 1730'

T_c = 0.764 hrs

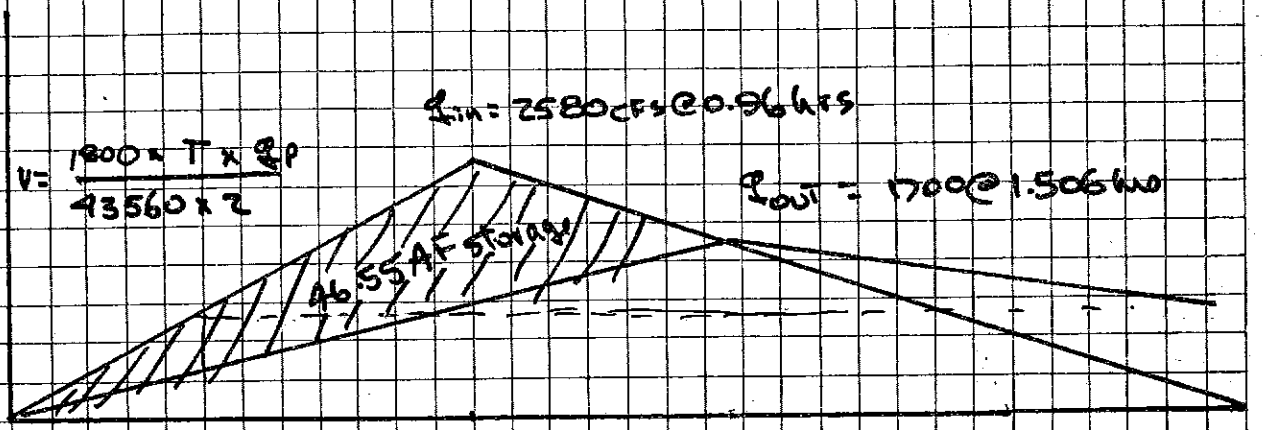
T_p = 0.5 + 0.6 T_c = 0.96 hrs T_b = 2.67 T_p = 2.56 hrs

Project Holland Park

Calc. by [illegible] date 1-11

Checked by _____ date _____

For Outflow Hydrograph $Q_{OUT} = 229.93\sqrt{h}$ $h = WSEL - 6171.1$



Peak Outflows	Time @ Peak	I×P 0.96	Storage AF	Water Surface Elevs		
				Pier h	Pier Elev	Storage
1112	1.87	571	77.63			
1740	1.98	1128	44.40		95.5	95.07
1234	1.80	668	71.99		95.0	
1600	1.57	980	51.91		95.36	
1700	1.506	1084	46.55		95.46	95.47

$Q_P = 1700$ → $El = 95.47$

$T_c = \left(\frac{11.9L^3}{H}\right)^{0.385}$

=400'

MAJOR BASIN	SUB BASIN	AREA Planim. Read (.0057)	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH SOIL TYPE	DITCH LENGTH	DITCH SLOPE	CN	FFO F	FLOW Q	FLOW qp	Tb
1	A	16.4	.093	2960	240	0.161	B		SF 3.5	74				
							D		SF 3.5	86				
										82	1140	0.71	75.3	
2	A	5.20	0.029	(0.20) 1080	180	0.055	~~B~~		~~3.5~~	~~74~~				
							D		3.5	86	1270	0.92	33.9	
3	A	3.0	0.017	(0.136) 720'	120	0.041	D		3.5	86	1270	0.92	19.9	
7	A	1.0	0.0056	(0.095) 500'	100	0.029	D		3.5	86	1270	0.92	7.0	
8	A	2.50	0.0142	(0.295) 1500'	180	0.086	D		3.5	86	1270	0.92	16.6	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: Holland Park West

By: DEW/CS

Date: 1-11-78

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planners · consultants · engineers
Suite 200
4525 Northpark Drive
Colorado Springs, Colo. 80907

$t_c = \frac{11.9L^3}{H}$

MAJOR BASIN	SUB BASIN	(0057) AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH SOIL TYP / LENGTH	DITCH DEV. SLOPE	* CN	TPO K	FLOW Q	FLOW qp	Tb
9	A		0.148 SEE DOUGLAS CRK STUDY Area D2			0.25	B/A	1nd	87	990	0.99	117 per	Mostly Plan
11	A	3.80	0.0217	(0.329) 1740'	90	0.007	A	4.0	61	1270	0.09	2.5	
3	B	2.70	0.0153	(0.227) 1200	110	0.077	B	3.5	74	1270			
							D	3.5	86				
									85		0.87	16.9	
3	H	1.7	0.0097	(0.227) 1200	150	0.068	D	3.5	86	1270	0.92	11.3	
3	C	12.7	0.072	(0.53) 3120	180	0.19	B	3.5	74	1090			
							D	3.5	86				
									84		0.82	64.4	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: Holland Park West

By: DEW/CS

Date: 1-11-78

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Colorado Springs, Colo. 80907

Tc (10.2 − 2) / 17

	MAJOR BASIN	SUB BASIN	AREA (.0057) Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH SOIL TYPE ~~LENGTH~~	DITCH DU/AC SLOPE	~~V~~ CN	~~TPO~~ K	FLOW Q	FLOW qp	Tb
INFLOWS	7	D	1.2	0.007	(0.106) 560	100	0.001	D	3.5	74	1270	0.40	3.6	
	9	C	10.9	0.062	(0.287) 1520	40	0.148	A	POOR RANGE	68	1160	0.23	16.5	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: Holland Park West

By: BWICS

Date: 1-11-78

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1"=100' $T_c = \left(\frac{11.9\,L^3}{H}\right)^{0.385}$

MAJOR BASIN	SUB BASIN	AREA (.001) Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH ~~SOIL TYPE~~ LENGTH	DITCH ~~DEV~~ SLOPE	CN ~~A~~	~~K~~ ~~I80~~	FLOW Q	FLOW qp	Tb
1	B	3.0	0.003	(0.163) 960'	32	0.084	B	8.0	85				
		5.8	0.006	(0.170) 900	60	0.069	D	8.0	92	1270	1.18	13.5	
		~~8.8~~	~~0.009~~	~~0.170~~	~~68~~	~~0.060~~			90				
2	B	5.35	0.005	(0.132) 700	30	0.068	B	8.0	85				
		5.35	0.005	(0.161) 850	60	0.065	D	8.0	92				
		10.70	.0107	0.284	82	0.111			85	1250	0.87	11.6	
3	I	4.8	0.0048	(0.095) 500	38	0.042	B	2 DU/AC	70				
		2.5	0.0025	(0.066) 350	14	0.041	D	2 DU/AC	85				
		7.3	0.0073	0.170	48	0.075			75	1270	0.43	4.0	
3	G	7.0	0.007	(0.170) 930	78	0.063	D	3.61	86				
		1.0	0.001	(0.028) 150'	6	0.020	B	3.61	74				
		8.0	0.008	0.237	84	0.089			85	1270	0.87	8.8	
3	F	1.7	0.002	(.072) 380	24	0.036	D	3.61	74	1270	0.40	1.0	
3	E	9.6	0.0096	(0.187) 990	72	0.072	D	3.61	74	1270	0.40	4.9	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: Holland Prk. West.

By: WCS

Date: 1/12/78

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1"=200' $T_c = \left(\frac{11.9 L^3}{H}\right)$

MAJOR BASIN	SUB BASIN	AREA (.001) Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH SOIL TYPE	DITCH DEV SLOPE	CN	K FPO	FLOW Q	FLOW qp	Tb
3	D	12.1	0.012	(0.161) 850'	60	0.065	D	3.61	86	1270	0.92	14.0	
10	A	8.6	0.009	(0.311) 1640	62	0.137	B	IND	88	1200	1.05	11.3	
9	E	17.0	0.017	(0.443) 2340	80	0.187	A	IND	81				
		4.90	0.005	(0.443) 2340	88	0.181	B	IND	88				
		21.9	0.0219	0.443	88	0.18			83	1100	0.76	18.3	
9	B	10.2	0.0102	(0.256) 1350	62	0.1098	A	IND	81	1250	0.67	8.5	
9	D	8.40	0.0084	(0.2083) 1100	54	0.0912	A	IND	81				
		3.70	0.0037	(0.170) 900	22	0.102	B	IND	88				
		3.10	0.0031	(0.104) 550	18	0.0162	D	IND	93				
		15.2	0.0152	(0.20)	52	0.088			85	1270	0.87	16.8	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: Holland Prk. West.

By: WCS

Date: 1/12/18

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Tc (1.1C / H)^.385

MAJOR BASIN	SUB BASIN	(.001) AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH SOIL TYPE LENGTH	DITCH DEV SLOPE	CN V	K TPO	FLOW Q	FLOW qp	Tb
4	C	1.3	.0013	(0.079) 420'	(34	0.036	B	8 DU/AC	85				
		3.3	0.0033	(0.100) 530	12	0.070	D	8 DU/AC	92				
		4.6	0.0046	0.15	46	0.066			90	1270	1.18	6.9	
4	B	4.5	0.0045	(0.170) 900'	36	0.084	B	8 DU/AC	85				
		1.5	0.0015	(0.076) 400	11	0.052	D	8 DU/AC	92				
		6.0	0.006	0.15	32	0.076			87	1270	0.99	7.5	
4	A	7.6	0.0076	(0.142) 750	38	0.067	B	8 DU/AC	85	1270	0.87	8.4	
6	B	1.8	0.0018	(.057) 300	30	0.026	B	3.61	74				
		1.3	0.0013	(.057 300	16	0.033	D	3.61	86				
		3.1	0.0031	0.076	22	0.04			79	1270	0.58	2.3	
6	A	2.7	0.0027	(0.0663) 350	24	0.033	D	3.61	86	1270	0.92	3.1	
7	G	12.7	0.0127	(0.379) 2000	166	0.162	D	3.61	86	1100	0.92	12.8	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: HOLLAND RRK. WST

By: WCS

Date: 1/12/78

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$T_c = \left(\frac{11.9L^3}{H}\right)^{0.385}$ $Q = KAIP_6$

MAJOR BASIN	SUB BASIN	AREA (0.00) Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH SOIL TYPE / LENGTH	DITCH DEV SLOPE	CN	K TPO	FLOW Q	FLOW qp	Tb
7	B	7.2	0.0072	(0.076) 400'	58	0.028	D	3.61	86	1270	0.92	8.4	
7	E	13.7	0.014	(0.189) 1000'	100	0.064	D	3.61	86	1270	0.92	16.3	
7	C	4.8	0.005	(0.151) 900'	24	0.086	D	3.61	86	1270	0.92	5.8	
7	F	2.3	0.0023	(0.066) 350	52	0.0245	D	3.61	86	1270	0.92	2.7	
7	H												

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: HOLLAND PARK. WEST.

By: WCS

Date: 1/12/78

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1"=100' $T_c = \left(\frac{11.9\,L}{H}\right)^{0.385}$ $q_p = K A Q$ I = 2.1" / 6 hr

MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH Soil GP LENGTH	DITCH DEV SLOPE	CN	TPO K	FLOW Q	FLOW qp	Tb
6	C	6.39					B	3.6 %/Ac	77				
		9.32					D	✓	87				
		15.71	0.0056	655	36	0.059			83	1270	0.76	5.4	
	D	9.05					B	3.6	77				
		1.99					D	✓	87				
		11.04	0.0040	730	38	0.065			79	1270	0.58	2.9	
	E	20.14	0.0072	780	38	0.070	B	3.6	77	1270	0.50	4.6	
	F	8.30					B	3.6	77				
		19.19					D	3.6	87				
		27.49	0.0099	1270	35	0.127			84	1200	0.82	9.7	
7	H	31.53	0.0113	1440	63	0.117	D	3.6	87	1230	0.99	13.8	
	I	33.68	0.0121	1490	68	0.119	D	3.6	87	1220	0.99	14.6	
	J	27.60	0.0099	1230	58	0.101	D	3.6	87	1270	0.99	12.4	
5	A	15.66	0.0056	590	24	0.061	D	Chuck	93	1270	1.41	10.1	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: Holland Park W F#1

By: DEW

Date: 1-12

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FLOOD ROUTING

$T_p = KAQ$ $I = 2.1"/6hr$

MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH LENGTH	DITCH SLOPE	% CN	IPO K	FLOW Q	FLOW qp	Tb
Master plan	D2		0.148			0.25			87				
North Ditch	+9C		0.062	1250	V=12.16	+0.029			68				
	Total		0.210 Total			0.279			81.4	1050	0.67	147	
	+9D		0.052	1260	V=15	+0.023			85				
	Total		0.225			0.302			84.7	920	0.71 ~~0.67~~	197 ~~139~~	
III	C		0.072			0.191			84				
	+B		0.015	430'	V=16.2	+0.007			85				
	Total		0.087			0.198			84.2	1070	0.82	76.3	
	+A		0.017	250'	V=10.79	+0.006			86				
	Total		0.104			0.204			84.5	1060	0.82	90.4	
	+D		0.012	270	V=12.79	+0.006			86				
	Total		0.116			0.210			84.7	1050	0.87	106.	
III	F		0.002						79				
	G		0.008						85				
	H		0.0097			0.068			86				
	I		0.0073	1100	22	+0.127			75				

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: Holland Pk West

By: EW

Date: 1-12

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MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH LENGTH	DITCH DEV SLOPE	✱ CN	TPO K	FLOW Q	FLOW qp	Tb
III	Total F-I		0.027			0.197 0.210			81.8	1070	0.71	20.5	
	+ A-D		0.116	+850	V=3.75	0.063			84.7				
	III Total		0.143			0.273			84.2	1060	0.82	124	
III	F-I		0.027						81.8				
+ 9	E		0.022						83				
	Total		0.049			0.197			82	1070	0.71	37.2	
7	A		0.006			0.029			86				
	+ B		0.0072	+830	56	0.065			86				
	Total		0.0132			0.094			86	1270	0.92	15.4	
	+ C		0.005	820	14	+0.109			86				
	Total		0.0182			0.203			86	1060	0.92	17.7	
	+ D		0.007						74				
	+ E		0.014						86				
	Total		0.0392			0.203			83.9	1060	0.82	34.1	
	+ F		0.0023	360	10	+0.048			86				
	Total		0.0415			0.251			84.0	980	0.82	33.3	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: Holland Pk area

By: OBO

Date: 1-12

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MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH SOIL LENGTH	DITCH DEO SLOPE	∧ CN	IPθ K	FLOW Q	FLOW qp	Tb
7	+ G		0.0127	250	25	+0.022			80				
	Total		0.0542			0.273			83.1	950	0.76	39.1	
7	+ H		0.0113	470	V= 8.81	+0.015			87				
	Total		0.0655			0.288			83.8	940	0.82	50.5	
	+ I		0.0121	210	V= 16.1	+0004			87				
	Total		0.0776			0.292			84.3	930	0.82	59.2	
	+ J		0.0099	185	V = 14.9	+0.003			87				
	Total		0.0875			0.295			84.6	920	0.87	70.0	
	+8A		0.0142						86				
	Total		0.1017			0.295			84.8	920	0.87	81.4	
6	B		0.0031			0.040			79				
	+ A		0.0027						86				
	~~Total~~		~~0.0058~~										
	+ C		0.0056	370	22	+0.037			83				
	Total		0.0119			0.077			82.6	1270	0.76	11.0	
	+ D		0.0040	420	7	+0.066			79				

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: Holland Pk W

By: [illegible]

Date: 1-12

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MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH ~~LENGTH~~	DITCH ~~SLOPE~~	# CN	~~TP~~ K	FLOW Q	FLOW qp	Tb
6	A-D		0.0154			0.143			81.7	1170	0.71	12.8	
6	E		0.0072	~~170~~	~~10~~				77				
	+F		0.0099			0.127			84	~~1200~~			
	Total		0.0171			0.127			81.0	1200	0.67	13.7	
	+A-D		0.0154	+170	10	0.143 +0.020			81.7				
6	Total		0.0325			0.163			81.3	1130	0.67	246	
4	A		0.0076			0.067			85				
	+B		0.0060	+660	0.5% 3.3	0.015			87				
	Total		0.0136			0.082			86	1270	0.92	15.9	
2	A		0.029			0.055			86				
	+B		0.0107	570'	V=4.1	+0.011			85				
	Total		0.0397			0.066			86	1270	0.92	46.4	
4	A+B		0.0136						86				
11	A		0.0217						61				
Total			0.0353			0.082			71	1276	0.31	14.0 Say 15.9	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: Hollow Pk W

By: ~~DEO~~

Date: 1-12

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Street and Storm Sewer Calculations

STREET	LOCATION	DIST	ELEVATION & SLOPE	TOTAL RUNOFF	STREET FLOW CAPACITY	PIPE FLOW	TYPE PIPE, CATCH BASIN & SLOPE %
Centennial Blvd (South)	III C&B ndry		6360				
		430	3.58%	64.4		64.4	27" RCP, min S = 4.33%
	Cul-de-Sac		6336				
		250	3.20%	76.3	19.9/49.0	76.3	36" RCP min S = 1.31%
	Centennial Int		6328	~~76.3~~			2-6' D-10R's w 18" RCP's @ 1% min
		270	2.96%	~~90.4~~	14.0/38.0	90.4	36" RCP min S = 1.83%
	Bottom III D		6320				2-6' D-10R's w 18" RCP @ 1% min
		1000	2.90%	106	4.9/38.0	106	36" RCP min S = 2.52%
	Bottom III E		6291				
		850	0.71%	124	20.5/24.2	106.0	42" RCP, min S = 1.11%
	Greenbelt		6285		37.2		2-8' outlets in Sump w 24" RCP's
Basin 7 rout.map	7A boundary		6340				
		350	7.19%	7.0	7.0/102.2	-0-	
	Street		6315				
		480	6.46%	15.4	15.4/102.2	-0-	
	Bottom 7B		6284				
		820	1.71%	17.7	17.7/51.1	-0-	
	Bottom 7C		6270				
		360	2.78%	39.3	39.3/66	-0-	
	Bottom 7F		6260				
		250	10% max	39.1	39.1/83.9 @ 4% min	-0-	Leave 17.9 in ST.
	Bottom 7G		6225/6246				2-6' D-10R's w 18" @ 9% min
		470	3.40%	50.5	31.7/78.0	21.2	21" RCP, 1.79% min
	Bot 7H		6230				2-8' D-10R's w 21" RCP's
		210	9.52%	59.2	19.6/83.4	50.5	24" RCP, 4.99% min
	Bot 7I		6210				2-6' D-10R's w 18" RCP's
		185	4.32%	70.0	12.4/83.4	59.2	27" RCP, 3.66% min
	Bot 7J		6202				2-4' D-10R's in Sump
		160	6.25%	81.4	-0-	81.4	~~27" RCP, 6.91% min~~
	Outfall		6192				30" RCP, 3.94% min

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Project Hallmark Park

Calc. by CBE date 1-12

Checked by _____ date _____

Street and Storm Sewer Calculations

STREET	LOCATION	DIST	ELEVATION & SLOPE	TOTAL RUNOFF	STREET FLOW CAPACITY	PIPE FLOW	TYPE PIPE, CATCH BASIN & SLOPE %
Basin 6 Routing	Top Amstel Dr	370	6279 5.95%	11.0	11.0/	-0-	
	Bottom 6C	420	6257 1.67%	12.8	12.8/	-0-	
	Bottom 6D	170	6250 Sump 6%	24.6	12.8/	-0-	
	Bottom 6F	80	6240 37.5%	24.6	-0-	24.6	2-6' D-10R's in Sump 18" RCP, 5.49% min
	Outfall		6210				
Holland Park W Dr	Basin 8A	190	6206 2.11%	16.6	-0-	16.6	2-4' D-10R's in Sump 21" RCP, 1.10% min
	Basin 7 Storm Sewer		6202				
Basin 11A	Boundary	570	6328 8.07%	33.9	—	33.9	21" RCP, 4.58% min
	Edge Greenbelt	100	6282 4.00%	46.4	11.6/LOT —	46.4	6' D-10R in Sump 24" RCP, 4.21% min
	Greenbelt		6278				
Holland PK Blvd	RCB				15.9		2-4' D-10R bott in RCB
Basin 3B	Edge Dev't	220	6380 20%	16.9	-0-	16.9	18" RCP, min S- 2.59%
	Curb Side		6336				

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Project Holland PK 6D

Calc. by CEC date 1-12

Checked by _____ date _____

Page 14 of 16

Culvert & Channel Calculations

Pipe RCP $Q = \frac{0.463}{0.013} D^{8/3} S^{1/2}$

Channel Conc $d/b = 1$ $n = 0.013$ $K = 1.93 = \frac{Qn}{b^{8/3} S^{1/2}}$ $b^{8/3} = 0.006736 \frac{Q}{S^{1/2}}$

AREA	LOCATION & DISTANCE	ELEV & S%	S 1/2	Q	b 8/3	b	S F AREA	USE DITCH	CULVERT ETC.	~~TIME~~ ~~HRS~~ V
North Ditch	Garden Gods 1250	6324 2.56%	0.16	117				min S = 1.36%	42" RCP	12.16
	Boundary	6284.92								
	Boundary 1260	6290 0.952%	0.0976	147	10.145 +508.	2.384	11.37	4'x3' d = 1.96'		V = 12.93
	Greenbelt	6278								
III B	Boundary 420	6380 10.4%	0.324	16.9				min S = 2.59%	18" RCP	
	Culde Sac	6336								

Project Holland Park Unit 1 Page 15 of 16

Calc. by D.E. Roberts date 1-12-78

Checked by _____ date _____

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Quantity Summary * = Filing #1

GREENBELT

Centennial Culvert:

Conc: 2cell 10'x7' "B" 1.15 x 306 = 351.9 cy + 12 Tr = 364 cy

Steel 244 x 306 = 74,700 # + 5000 Tr = 80,000 #

Exc: 259 x 306 / 27 = 2935 cy

BF: 119 x 306 / 27 = 1350 cy

Conc Channels:

Conc: (34.1246 x 371 + 38.1597 x 625) = 36,783 SF conc

Riprap channels:

~~[illegible]~~ 2 x 1.5 x 2447' / 27 = ~~[illegible]~~ 1960 cy

Misc Riprap Emb 500 cy

~~[illegible]~~ 2460 cy *

Conc Cutoffs @ 200'

6ea @ 30' x 2 x 3/27 = 40 cy *

10 @ 8' x 2 x 3/27 = 18 cy

* Holland Park Culvert: 2cell 10x6x104 'A'

Conc: 1.45 x 104 = 150.8 + 12 Tr = 162 cy *

steel: 238 x 104 + 24,752 # + 4000 Tr = 29,000 # *

Exc: 99 x 104 / 27 = 381 cy *

BF: 119 x 104 / 27 = 458 cy *

STORM SEWER, ETC.

RCP:	18"	140* + 80' + 420 + 220	(220)	640 860
	21"	470' + 190' + 570	(660)	1230
	24"	105 + 210' + 100	(210)	415
	27"	430 + 185'	(185)	615
	30"	160'	(160)	160
	36"	250 + 270 + 1000	(0)	1520
	42"	850 + 1250	(0)	2100
D-10RY	4'	MH 1 6 IIII 4		
	6'	MH MH 1 11 THL 1 6		
	8'	IIII 4 11 2		
4'x3' Ditch		1260'		