CITY OF HOUSTON STORM SEWER CALCULATION FORM

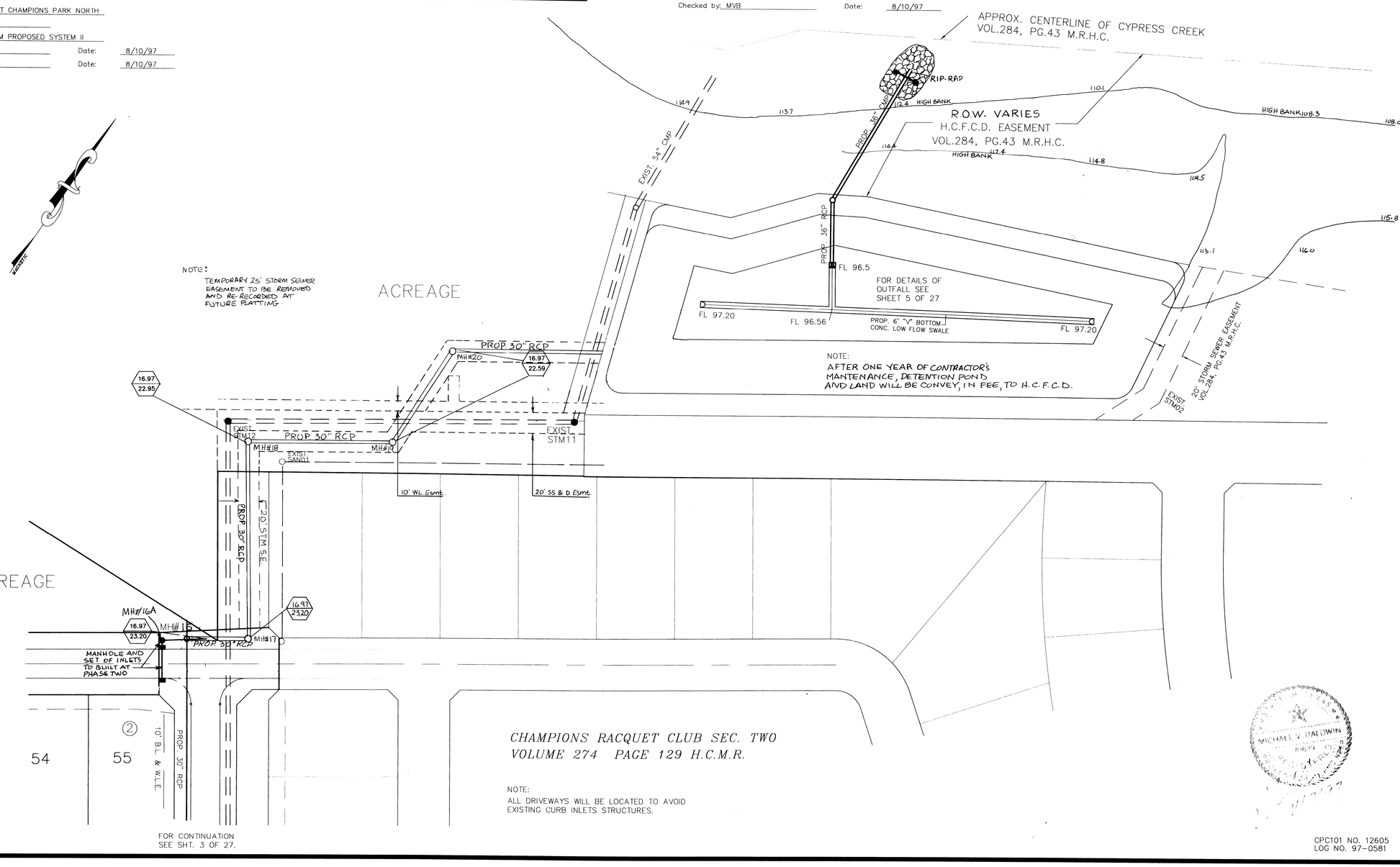
M.H. From	M.H. To	Area (acres)	Runoff Coefficient C	Sum of C * A	Intensity I (in/hr)	Sum of Flows (cfs)	Time of Conc. (minutes)	Reach Length (feet)	Diameter or Rise (inches)	Span (inches)	Slope %	Manning's ~n~	Design Capacity (cfs)	Design Velocity (ft/s)	Fall (feet)	Manhole Drop (feet)	Flowline Elevation Upstream (feet)	Flowline Elevation Downstream (feet)	Actual Velocity (ft/s)	Hydraulic Gradient %	Change in Head (feet)	Elevation of Hyd. Grad. Upstream (feet)	Elevation of Hyd. Grad. Downstream (feet)	Natural Ground Upstream (feet)	Natural Ground Downstream (feet)
I7	I6	2.96	0.45	1.33	3.27	4.39	27.11	24	24		0.24		12.22	3.6	0.07		119.95	119.88	1.76			121.40	121.39	125.00	
MH11	I7	2.62	0.45	2.51	3.25	8.24	26.85	7	24		0.24		12.09	3.6	0.02		119.88	119.86	3.58			121.25	121.24	125.00	
I10	I9	2.55	0.45	1.15	3.29	3.80	26.79	24	24		0.24		11.31	3.6	0.07		119.95	119.88	1.69			119.32	119.31	125.00	
I13	I12	2.41	0.45	1.08	3.30	3.60	26.68	23	24		0.24		11.55	3.6	0.07		119.64	119.57	1.62			119.30	119.30	125.00	
MH10	I5	0.43	0.45	0.19	3.50	0.68	23.62	50	24		0.24		11.08	3.6	0.11		119.91	119.80	2.23			119.84	119.66	125.00	
MH10	MH11	N/A	N/A	2.51	3.25	8.23	N/A	30	24		0.24		10.93	3.6	0.06		119.86	119.80	4.68			121.04	120.81	125.00	
MH13	I10	2.48	0.45	2.26	3.27	7.47	26.73	9	24		0.24		13.06	3.6	0.02		119.88	119.86	3.69			119.16	119.15	125.00	
I15	I14	0.50	0.60	0.30	3.49	1.05	23.85	22	24		0.24		10.78	3.6	0.07		120.36	120.29	1.43			119.55	119.54	125.00	
MH15	I13	2.46	0.45	2.19	3.28	7.25	26.71	8	24		0.24		16.00	3.6	0.02		119.57	119.55	3.56			119.15	119.15	125.00	
MH12	I8	0.52	0.45	0.23	3.48	0.82	23.91	51	24		0.24		12.27	3.6	0.11		119.91	119.80	1.66			118.38	118.35	125.00	
MH12	MH10	N/A	N/A	2.70	3.25	8.85	N/A	321	24		0.24		10.93	3.6	0.77		115.58	114.81	2.82			118.84	118.35	125.00	
MH12	MH13	N/A	N/A	2.26	3.27	7.46	N/A	30	24		0.24		11.68	3.6	0.06		119.86	119.80	4.57			119.01	118.80	125.00	
MH16A	I15	0.50	0.60	0.60	3.47	2.10	23.85	7	24		0.24		19.12	3.6	0.02		120.29	120.27	3.62			119.45	119.36	125.00	
MH14	I11	0.55	0.45	0.25	3.48	0.87	24.00	51	24		0.24		12.27	3.6	0.11		119.60	119.49	2.46			118.36	118.17	125.00	
MH14	MH15	N/A	N/A	2.19	3.28	7.24	N/A	30	24		0.24		13.06	3.6	0.06		119.55	119.49	4.62			118.95	118.76	125.00	
MH14	MH12	N/A	N/A	5.20	3.13	16.43	N/A	320	30		0.24		19.86	4.2	0.77		114.31	113.54	3.35			118.22	117.71	125.00	
MH16	MH16A	N/A	N/A	0.60	3.47	2.10	N/A	31	24		0.24		12.85	3.6	0.06		120.27	120.21	3.20			118.55	118.40	125.00	
MH16	MH14	N/A	N/A	7.64	3.04	23.45	N/A	175	30		0.24		20.80	4.2	0.42		113.54	113.12	4.85			117.42	116.92	125.00	
MH17	MH16	N/A	N/A	7.64	3.01	23.20	N/A	224	30		0.24		20.32	4.2	0.61		113.12	112.51	5.97			116.71	115.64	123.00	
MH18	MH17	N/A	N/A	7.64	2.98	22.95	N/A	337	30		0.24		22.34	4.2	0.81		112.51	111.70	6.03			115.06	113.63	120.00	
OUTLET	MH18	N/A	N/A	7.64	2.93	22.59	N/A	158	36		0.32		20.32	5.4	0.51		99.73	99.22	3.20			102.62	102.00	116.00	
N/A	N/A	N/A	N/A	7.64	2.89	N/A	N/A	N/A	N/A		N/A		N/A	N/A	N/A		N/A	N/A	N/A			N/A	N/A	N/A	

Project: ESTATES AT CHAMPIONS PARK NORTH
Job No. 470-U
System: 2YR. STORM PROPOSED SYSTEM II
By: MVB Date: 8/10/97
Checked by: MVB Date: 8/10/97

CITY OF HOUSTON STORM SEWER CALCULATION FORM

M.H. From	M.H. To	Area (acres)	Runoff Coefficient C	Sum of C * A	Intensity I (in/hr)	Sum of Flows (cfs)	Time of Conc. (minutes)	Reach Length (feet)	Diameter or Rise (inches)	Span (inches)	Slope %	Manning's ~n~	Design Capacity (cfs)	Design Velocity (ft/s)	Fall (feet)	Manhole Drop (feet)	Flowline Elevation Upstream (feet)	Flowline Elevation Downstream (feet)	Actual Velocity (ft/s)	Hydraulic Gradient %	Change in Head (feet)	Elevation of Hyd. Grad. Upstream (feet)	Elevation of Hyd. Grad. Downstream (feet)	Natural Ground Upstream (feet)	Natural Ground Downstream (feet)
I2	I1	0.32	0.45	0.14	3.54	0.51	23.18	29	24		0.24		11.88	3.6	0.08		119.85	119.77	0.16			123.14	123.14	126.00	125.00
MH2	MH1	2.23	0.65	1.45	3.31	4.83	26.52	62	24		0.24		10.75	3.6	0.14		120.50	120.36	1.54			124.66	124.63	125.10	125.10
I4	I3	2.03	0.45	0.91	3.32	3.06	26.33	23	24		0.24		11.55	3.6	0.06		119.73	119.67	0.97			122.47	122.46	124.00	124.00
MH3	I2	1.52	0.45	0.83	3.33	2.78	25.76	8	24		0.24		11.31	3.6	0.02		119.77	119.75	0.88			123.13	123.13	125.00	127.00
MH3	MH2	8.70	0.65	7.10	3.12	22.32	29.64	98	24		0.24		10.96	3.6	0.23		120.36	120.13	7.11			124.08	123.13	125.10	127.00
MH5	I4	2.03	0.45	1.83	3.29	6.06	26.33	8	24		0.24		11.31	3.6	0.02		119.67	119.65	1.93			122.43	122.43	124.00	124.00
MH4	MH3	N/A	N/A	7.93	3.10	24.82	N/A	149	30		0.24		19.88	4.2	0.35		119.13	118.78	5.06			122.89	122.35	127.00	127.00
MH4	MH5	N/A	N/A	1.83	3.29	6.06	N/A	61	24		0.24		11.22	3.6	0.15		119.65	119.50	1.93			122.39	122.35	124.00	127.00
MH6	MH4	N/A	N/A	9.76	3.08	30.27	N/A	19	36		0.24		30.60	4.6	0.04		118.78	118.74	4.28			122.15	122.11	127.00	124.00
MH6	INLET	3.09	0.45	1.39	3.26	4.57	27.20	6	24		0.24		35.77	3.6	0.15		119.60	119.45	1.46			122.11	122.11	124.00	124.00
MH7	MH6	N/A	N/A	11.15	3.07	34.54	N/A	100	36		0.24		31.99	4.6	0.23		118.74	118.51	4.89			121.85	121.58	124.00	124.00
MH8	MH7	N/A	N/A	11.15	3.05	34.34	N/A	83	36		0.24		31.91	4.6	0.19		118.51	118.32	4.92			121.39	121.20	124.00	125.00
MH9	MH8	N/A	0.45	11.15	3.04	34.18	N/A	72	36		0.24		31.44	4.6	0.16		118.32	118.16	5.14			120.99	120.82	125.00	124.00
MH20	MH9	N/A	N/A	11.15	3.03	34.06	N/A	58	36		0.24		33.92	4.6	0.15		118.00	117.85	5.19			120.61	120.48	124.00	125.00
N/A	N/A	N/A	N/A	11.15	3.02	N/A	N/A	N/A	N/A		N/A		N/A	N/A	N/A		N/A	N/A	N/A			N/A	N/A	N/A	N/A

Project: ESTATES AT CHAMPIONS PARK NORTH
Job No. 470-U
System: 2YR. STORM PROPOSED SYSTEM I
By: MVB Date: 8/10/97
Checked by: MVB Date: 8/10/97



BENCH MARK

BENCH MARK: NATIONAL GEODETIC SURVEY MARKER
Y1216, 1973 ADJ., ELEV = 125.994
Y1216, 1978 ADJ., ELEV = 125.406
Y1216, 1988 ADJ., ELEV = 123.94 ADJUSTMENT
USED FOR CUTTEN ROAD.

ELEVATIONS SHOWN HEREON ARE BASED ON 1973 ADJUSTMENT.

TBM#1: TOP OF CURB AT CENTERLINE INLET NORTH SIDE OF TOURNAMNET DRIVE AT CENTERLINE QUEENSCLUB DRIVE ELEV. = 114.69

LEGEND

- UNDERGROUND DISTRIBUTION CABLE
- TERMIAL POLE
- STREET LIGHT ON STEEL STANDARD
- UNDERGROUND STREET LIGHT CABLE
- Exist. Contours
- Exist. Water Line
- Exist. Gate Valve & Box
- Exist. Flushing Valve
- Exist. Plug & Blowoff
- Exist. Sanitary Sewer Line & Manhole
- Exist. Storm Sewer Line & Manhole
- Exist. Inlet
- R1-1 (STOP SIGN)
- SHEET 3 — SHEET REFERENCE
- PROP. STORM SEWER LINE & MANHOLE
- PROP. INLET
- DRAINAGE AREA DIVIDE
- 1.31 — AREA AT INLET IN ACRES
- 1.49 — RUNOFF AT INLET IN C.F.S.
- 19.21 — AREA CONTRIBUTION TO LINE IN ACRES
- 20.21 — RUNOFF CONTRIBUTING TO LINE IN C.F.S.

Rev.	Date	Description	App.

PRIVATE UTILITY LINES SHOWN

ENTEX, INC.

SOUTHWESTERN BELL TELEPHONE CO.
Valid for One Year Only

HOUSTON LIGHTING & POWER CO.
Approval Only for Crossing Underground Ductlines Unless Noted. Valid at Time of Review Only.

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS & ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING 12-9-97	TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 1-9-98	STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 1/15/98	CONSTRUCTION

OTHER DEPARTMENTS

PLANNING AND DEVELOPMENT	SPONSOR DEPARTMENT

CITY ENGINEER DATE 1/15/98

DIRECTOR OF PUBLIC WORKS AND ENGINEERING DATE 1-16-98

SUBMITTED:	DESIGNED BY: TIM
SCALE: V: 1" = 5' H: 1" = 50'	DRAWN BY: TIM
DATE: AUGUST 1997	SHEET NO. 3A OF 27 SHEETS
SURVEY BY:	
F B NO:	CITY DWG. NO:

STORM SEWER OUTFALL LAYOUT

PROVIDENT ENGINEERS, INC.
11241 RICHMOND, SUITE E107
HOUSTON, TEXAS 77082