

RETURN TO:
Land Development
101 West Costilla, Suite 122
Colorado Springs, CO 80903

DRAINAGE REPORT

FOR

AUSTIN BLUFFS PARKWAY
(From Dublin Boulevard to Woodmen Road)

PREPARED BY:

K L H ENGINEERING CONSULTANTS, INC.
206-208 Sutton Lane
Colorado Springs, CO 80907
J.N.: KLH 83 557 00

July, 1985

RECEIVED
PUBLIC WORKS/ENGINEERING
COLORADO SPRINGS, COLO.

AM DEC 05 1985 PM
7 8 9 10 11 12 1 2 3 4 5 6

4

GENERAL:

This Drainage Report is written for the 3,160 foot portion of Austin Bluffs Parkway from Dublin Boulevard to Woodmen Road. This report is written in conjunction with the construction of Austin Bluffs Parkway south of Woodmen. This portion of Austin Bluffs consists of 11.9 acres of Right-of-Way, and is presently surrounded by unplatted lands. The Right-of-Way width varies from 142 feet to 166 feet because of turn lanes. The street is considered as an arterial street and shall have vertical curb throughout.

This street is located on terrain with moderate slopes, dipping primarily from North to South. Soils located in the tributary drainage area are classified in the Hydrologic Soil Groups A and B. S.C.S. Soils Map numbers are shown on the Drainage Plan.

This portion of Austin Bluffs Parkway is in the Cottonwood Creek Drainage Basin and does not lie within the 100 year flood plain of Cottonwood Creek.

METHOD OF COMPUTATIONS:

Runoff quantities were calculated using the Modified S.C.S. Methodology as approved by the City of Colorado Springs Engineering Division. Runoff from both 5 year and 100 year storms were computed. A weighted curve number was utilized using respective percentages of area in the streets and on the lots, in calculating flows.

Per City of Colorado Springs Criteria, all drainage structures have been sized for the 5 year storm for peak 100 year flows less than 500 c.f.s., and for the 100 year storm for peak flows in excess of 500 c.f.s.

INTERIOR DRAINAGE:

The amount of runoff generated on the Right-of-Way for this street is small compared to flows tributary to the Right-of-Way. Therefore, interior drainage area will be discussed as part of the exterior drainage area.

EXTERIOR DRAINAGE AND DRAINAGE IMPROVEMENTS:

Drainage basin delineations for areas tributary to this portion of Austin Bluffs are based on preliminary street layouts and existing topography. Preliminary street layouts were used for the Amended Nor'wood Master Plan area and lands East to Powers Boulevard. See Figure 2 for tributary drainage areas. Land uses for tributary drainage areas are based on the Amended Nor'wood Master Plan with reasonable assumptions for lands further East. Land uses for each basin are summarized in the drainage computations in the back of this report.

Runoff from lands adjacent to Austin Bluffs Parkway will flow overland to streets, and down streets as gutter flow to catch basins in Austin Bluffs. Basins 1 thru 5 drain to a storm sewer system in Austin Bluffs, then flow South, offsite, to the Nor'wood East Drainageway approximately 700 feet South of Dublin. Pipe stubs are to be provided to Basins 1, 3 and 4 for partial onsite pickup.

Flows from Basin 6 will be collected in a storm sewer system (concrete lined channel assumed) and carried across Austin Bluffs in an 8' by 5' box culvert. Runoff from Basin 7 will flow North, across Woodmen Road, in existing twin 36-inch C.M.P. culverts. Basins 8 and 9 will flow to sumped catch basins at Woodmen and Austin Bluffs.

All runoff flows exiting this portion of roadway flow onto and across lands owned by Nor'wood Development Corporation. Nor'wood Development Corporation agrees to accept the increased developed flows.

Drainage facilities required for Woodmen Road are not addressed in this report. Drainage facilities for Dublin Boulevard and Austin Bluffs Parkway, to the South, are to be discussed in drainage reports for each individual segment of roadway.

FACILITIES COST ESTIMATE - PUBLIC AND REIMBURSEABLE:

6' D-10R	7 Each @ \$ 1,800./Ea.	= \$ 12,600.
8' D-10R	6 Each @ \$ 2,200./Ea.	= \$ 13,200.
18' Special Inlet	1 Each @ \$ 6,000./Ea.	= \$ 6,000.
20' Special Inlet	1 Each @ \$ 6,500./Ea.	= \$ 6,500.
Manholes	6 Each @ \$ 1,200./Ea.	= \$ 7,200.
18" R.C.P.	610 L.F. @ \$ 26./L.F.	= \$ 15,860.
24" R.C.P.	310 L.F. @ \$ 37./L.F.	= \$ 11,470.
42" R.C.P.	1290 L.F. @ \$ 65./L.F.	= \$ 83,850.
48" R.C.P.	510 L.F. @ \$ 74./L.F.	= \$ 37,740.
72" R.C.P.	130 L.F. @ \$ 170./L.F.	= \$ 22,100.
8'x 5' R.C.B.	160 L.F. @ \$ 317./L.F.	= \$ 50,720.
TOTAL		\$ 267,240.

FACILITIES COST ESTIMATE - PRIVATE AND NON-REIMBURSEABLE:

24" Rip-Rap 122 C.Y. @ \$ 35./C.Y. = \$ 4,270.00

DRAINAGE AND BRIDGE FEES:

Cottonwood Creek Drainage Basin

1985 Drainage Fee: 11.9 ac. @ \$3,136.00 per ac. = \$ 37,318.40
1985 Bridge Fee : 11.9 ac. @ \$ 144.00 per ac. = \$ 1,713.60

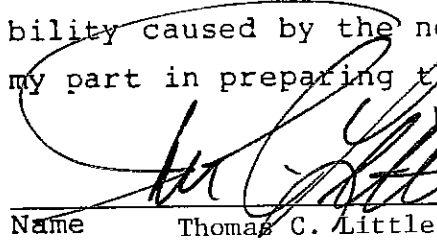
The Developer is providing the City of Colorado Springs with a Right-of-Way and Public Utility Easement to cover this street. The Developer will provide a letter of credit of an amount equal to the difference of the cost estimate and the drainage fee, to insure the construction of these facilities, at the time of platting.

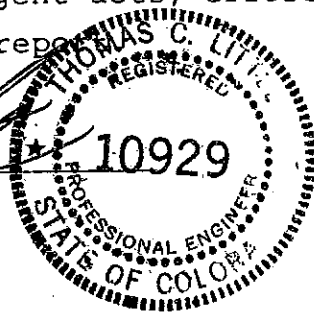
DRAINAGE REPORT STATEMENTS

AUSTIN BLUFFS PARKWAY - DUBLIN TO WOODMEN

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 caused by the negligent acts, errors or omissions on my part in preparing this report.

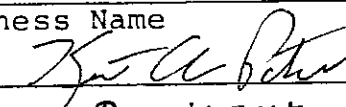

Name Thomas C. Little



Seal


Developer's Statement:

The developer has read and will comply with all of the requirements specified in this drainage report.

NOR'WOOD DEVELOPMENT CORP.
Business Name
By: 
Title: PRESIDENT
Address: P.O. Box 552
Manitou Springs, CO 80829

City of Colorado Springs:

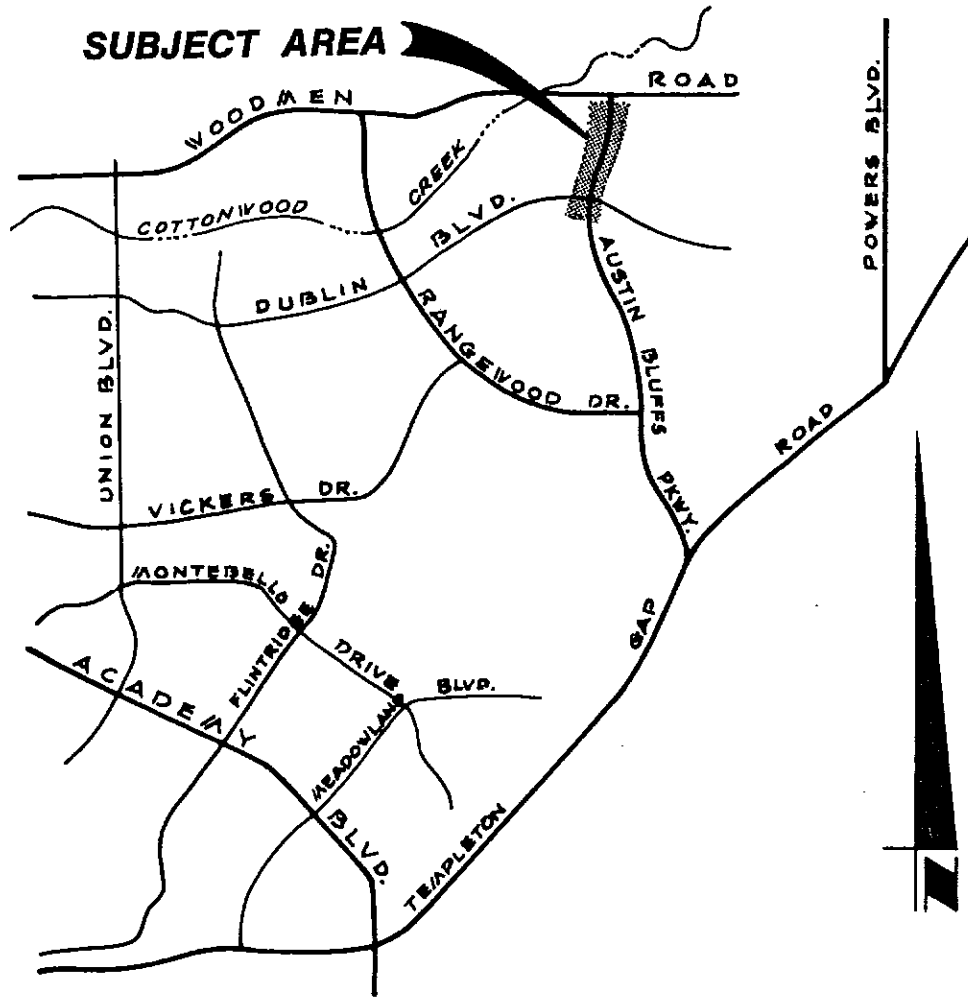
Filed in accordance with Section 15-3-906 of the Code of the City of Colorado Springs, 1980, as amended.


City Engineer

12/13/85
Date

Conditions:

FIGURE 1

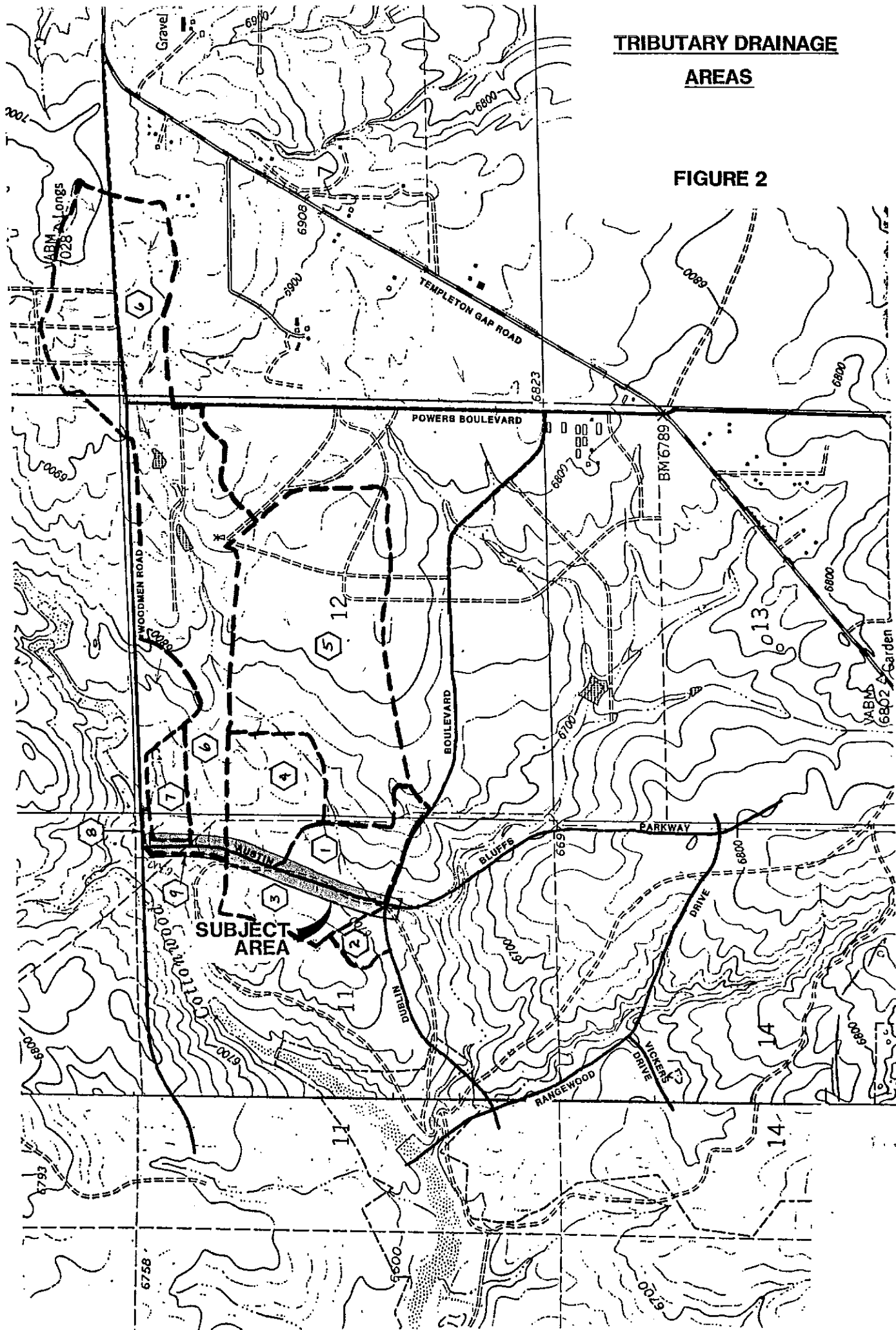


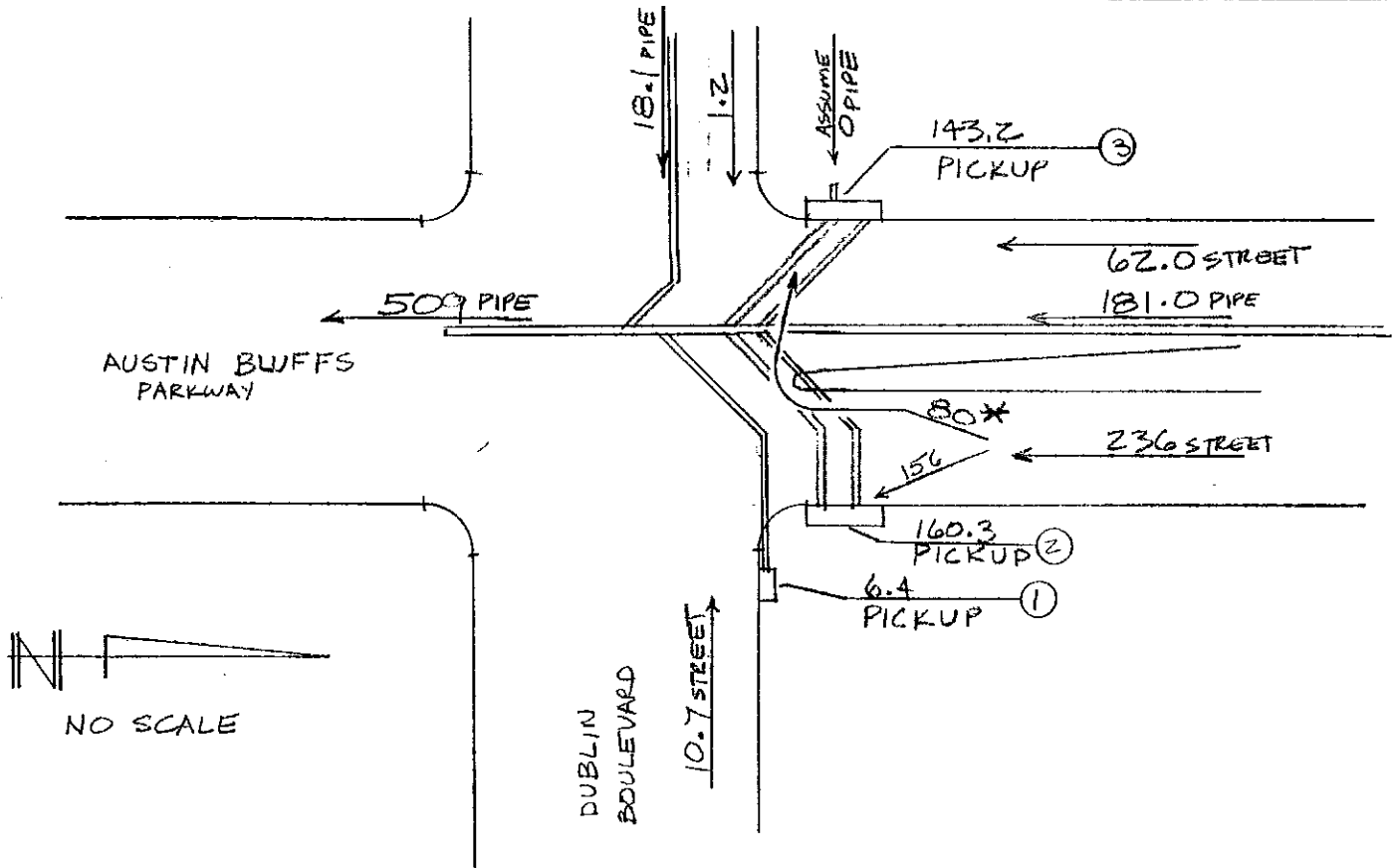
VICINITY MAP

NTS

**TRIBUTARY DRAINAGE
AREAS**

FIGURE 2





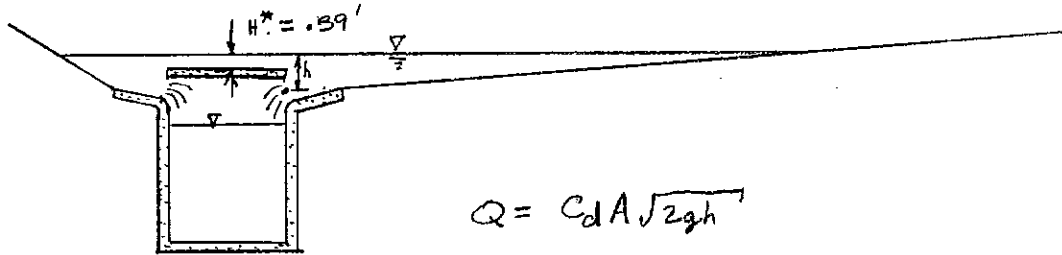
100 YEAR FLOW ROUTING
AUSTIN BLUFFS AND DUBLIN

* 80 CFS CROSSING MEDIAN BASED ON PROPORTIONAL WATER SURFACE ELEVATIONS AT INLET AND MEDIAN, ASSUMING 0.4' SURCHARGE OVER TOP OF EAST INLET

- ① 8'-DIOR INLET
- ② 2 SIDED INLET - 20', SE FOLLOWING PAGE
- ③



SPECIAL SUMPED INLET



$$Q = C_d A \sqrt{2gh}$$

$$C_d = .615 + .007(2)^{5-h} \quad (\text{CHATTERTON})$$

$$h = .67 + h^*$$

$$Q_{\text{EAST}} = 160.3 \text{ cfs}$$

$$Q_{\text{WEST}} = 143.2 \text{ cfs}$$

DOUBLE SIDED INLET REQUIRED

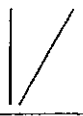
$$Q_{\text{PER SIDE}} = [.615 + .007(2)^{5-h}] [.67 L] [2(32.2)h]^{1/2}$$

Q	L	h	h*
160.3/2	18'	1.41	.74'
80.2	20'	1.06	.39'
80.2	22'	.83	.16'
143.2/2	16	1.42'	.75'
71.6	18	1.04	.37'
71.6	20	.80	.13'

←← CHOOSE 20' FOR EAST INLET

←← CHOOSE 18' FOR WEST INLET

INLETS TO BE BUILT ON THE NORTH SIDE OF INTERSECTION
OF AUSTIN BLUFFS PARKWAY AND DUBLIN BOULEVARD



LATERALS OUT OF DOUBLE SIDED INLETS

EAST INLET

$$Q_{IN} = 160.3 \text{ cfs}$$

2-LATERALS OUT $Q = 80.2 \text{ EACH}$

FROM CONCRETE PIPE DESIGN MANUAL

FOR 36" RCP $\frac{H_w}{D} = 2.4$

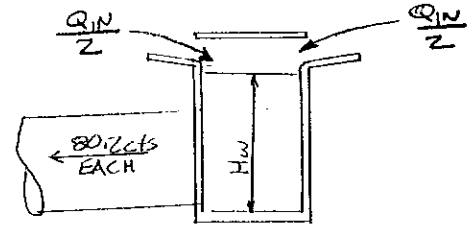
$$H_w = 7.2'$$

$$\text{DEPTH OF BOX} = 7.2 + 1.5 = 8.7'$$

FOR 42" RCP $\frac{H_w}{D} = 1.5$

$$H_w = 5.25'$$

$$\text{DEPTH OF BOX} = 5.25 + 1.5 = 6.75'$$



∴ CHOOSE TWIN 42" RCP

WEST INLET

$$Q_{IN} = 143.2 \text{ cfs}$$

2-LATERALS OUT $Q = 71.6 \text{ cfs EACH}$

FOR 36" RCP $\frac{H_w}{D} = 2.1$

$$H_w = 6.3'$$

$$\text{DEPTH OF BOX} = 6.3 + 1.5 = 7.8'$$

FOR 42" RCP $\frac{H_w}{D} = 1.32$

$$H_w = 4.62'$$

$$\text{DEPTH OF BOX} = 4.62 + 1.5 = 6.12' \therefore \text{CHOOSE TWIN 42" RCP}$$

AUSTIN BLUFFS PARKWAY - BETWEEN DUBLIN AND WOODMEN - 6/12/85

BASIN

AUSTBn- 1

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN
29.2		P.U.D.	A	77	89.3	6875.8
3.5		STREETS & WALKS	A	98	10.7	1048.9
32.7	.051				100.0	7924.8

WEIGHTED CN = 79.2

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
SHEET	640	20	.051			
STREET	1040	11	.072			
	1680	31	.123	.59	1210	36.6 (5yr FLOW)
				1.58		97.9 (100yr FLOW)

BASIN

AUSTBn- 2

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN
8.2		COMMERTIAL	A	89	89.1	7932.6
1.0		STREETS & WALKS	A	98	10.9	1065.2
9.2	.014				100.0	8997.8

WEIGHTED CN = 90.0

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
SHEET	500	34	.028			
STREET	800	10	.048			
	1300	44	.076	1.18	1300	22.0 (5yr FLOW)
				2.45		45.7 (100yr FLOW)

BASIN

AUSTBn- 3

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN
14.7		COMMERTIAL	A	89	50.7	4511.4
11.9		INDUSTRIAL	A	81	41.0	3323.8
2.4		STREETS & WALKS	A	98	8.3	811.0
29.0	.045				100.0	8646.2

WEIGHTED CN = 86.5

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
SHEET	500	20	.035			
STREET	2030	44	.105			
	2530	64	.140	.95	1170	50.5 (5yr FLOW)
				2.14		113.3 (100yr FLOW)

AUSTIN BLUFFS PARKWAY - BETWEEN DUBLIN AND WOODMEN - 6/12/85

BASIN

AUSTBn- 4

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN
27.0		INDUSTRIAL	A	B1	100.0	8100.0
27.0	.042				100.0	8100.0

WEIGHTED CN = 81.0

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
SHEET	760	20	.066			
STREET	1920	28	.076			
	2680	48	.142	.67	1170	33.0 (5yr FLOW)
				1.71		84.3 (100yr FLOW)

BASIN

AUSTBn- 5

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN
169.9		RES/COMM/IND/SCHL	A	74	100.0	7407.1
169.9	.265				100.0	7407.1

WEIGHTED CN = 74.1

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
SHEET	1000	10	.139			
STREET	1470	15	.109			
PIPE	3390	72	.075			
	5860	97	.323	.40	900	95.5 (5yr FLOW)
				1.24		297.3 (100yr FLOW)

BASIN

AUSTBn- 6

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN
11.7		INTERCHANGE	A	74	5.4	402.1
24.0		P.U.D.	A	77	11.1	858.3
106.8		COMMERCIAL	A/B	90	49.6	4466.0
72.8		INDUSTRIAL	A	81	33.8	2738.9
215.3	.336				100.0	8465.3

WEIGHTED CN = 84.7

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
SHEET	400	12	.032			
STREET	1200	28	.079			
CHANNEL	5420	168	.135			
	7020	208	.246	.85	990	283.2 (5yr FLOW)
				1.99		662.2 (100yr FLOW)

AUSTIN BLUFFS PARKWAY - BETWEEN DUBLIN AND WOODMEN - 6/12/85

BASIN

AUSTBn- 7

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN
9.7		COMMERTIAL	A	89	100.0	8900.0
9.7	.015				100.0	8900.0
						WEIGHTED CN = 89.0

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
SHEET	1100	20	.113			
	1100	20	.113	1.11	1230	20.7 (5yr FLOW)
				2.36		43.9 (100yr FLOW)

BASIN

AUSTBn- 8

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN
1.2		COMMERTIAL	A	89	60.0	5340.0
.8		STREETS & WALKS	A	98	40.0	3920.0
2.0	.003				100.0	9260.0
						WEIGHTED CN = 92.6

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
STREET	450	3	.069			
	450	3	.069	1.37	1300	5.6 (5yr FLOW)
				2.70		10.9 (100yr FLOW)

BASIN

AUSTBn- 9

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN
1.1		COMMERTIAL	A	89	52.4	4661.9
1.0		STREETS & WALKS	A	98	47.6	4666.7
2.1	.003				100.0	9328.6
						WEIGHTED CN = 93.3

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
STREET	1050	6	.162			
	1050	6	.162	1.43	1130	5.3 (5yr FLOW)
				2.76		10.2 (100yr FLOW)

AUSTIN BLUFFS PARKWAY - BETWEEN DUBLIN AND WOODMEN - 6/12/85

BASINS

AUSTBn- 4 ,5

ACREAGE SQ. MI.	LAND USE	SOIL	CN	%	% x CN
169.9	RES/COMM/IND/SCHL	A	74	86.3	6391.4
27.0	INDUSTRIAL	A	81	13.7	1110.7
196.9	.308			100.0	7502.1
WEIGHTED CN = 75.0					

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
SHEET	1000	10	.139			
STREET	1470	15	.109			
PIPE	4510	84	.108			
	6980	109	.356	.43	860	114.2 (5yr FLOW)
				1.30		344.8 (100yr FLOW)

BASINS

AUSTBn- 1 ,2 ,3 ,4 ,5

ACREAGE SQ. MI.	LAND USE	SOIL	CN	%	% x CN
169.9	RES/COMM/IND/SCHL	A	74	63.4	4699.3
29.2	P.U.D.	A	77	10.9	839.6
22.9	COMMERTIAL	A	89	8.6	761.1
38.9	INDUSTRIAL	A	81	14.5	1176.6
6.9	STREETS & WALKS	A	98	2.6	252.5
267.8	.418			100.0	7729.0
WEIGHTED CN = 77.3					

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
SHEET	1000	10	.139			
STREET	1470	15	.109			
PIPE	6090	146	.132			
	8560	171	.380	.51	840	180.6 (5yr FLOW)
				1.45		509.6 (100yr FLOW)

AUSTIN BLUFFS PARKWAY - BETWEEN DUBLIN AND WOODMEN - 6/12/85

BASINS

AUSTBn- 8,9

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN	
2.3		COMMERTIAL	A	89	56.1	4992.7	
1.8		STREETS & WALKS	A	9B	43.9	4302.4	
4.1	.006				100.0	9295.1	WEIGHTED CN = 93.0

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
STREET	1050	6	.162			
	1050	6	.162	1.40	1130	10.2 (5yr FLOW)
				2.73		19.8 (100yr FLOW)