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COLORADO SPRINGS, COLO.

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MASTER DRAINAGE STUDY
FOR
PROMONTORY I DEVELOPMENT

PREPARED BY:

K L H ENGINEERING CONSULTANTS, INC.
206-208 Sutton Lane
Colorado Springs, CO 80907
J.N.: KLH 83 549 03

January, 1984

GENERAL:

The Promontory I Development area consists of approximately 37 acres. This development will accommodate single family dwelling units.

The study area falls completely within the Cottonwood Creek Drainage Basin. The reader is referred to "Engineering Study of Cottonwood Creek Drainage Basin" prepared by Lincoln DeVore in August of 1979. This drainage study is in compliance with the Cottonwood Creek Master Drainage Report. This development abuts Northwind Subdivision Filing Nos. 5, 6 and 7 to the West. The remaining boundary borders unplatted lands.

SOIL TYPES:

The U.S.D.A. Soil Conservation Service Soil Classes for this study area and for the exterior tributary drainage area consist of the following three types: 1.) Bresser Sandy Loam, 2.) Stapleton-Bernal Sandy Loam and 3.) Tassel Fine Sandy Loam. These soils are of the Hydrologic Soil Groups B, B and D respectively.

METHOD OF COMPUTATIONS:

Runoff quantities are calculated using the Modified SCS 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 the respective area percentages of streets, residential lots, P.U.D. area, school area and soil types.

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..

RUNOFF FLOWS:

Peak runoff flows calculated for both 5 year and 100 year storm events are shown on the Drainage Plan. This includes peak flows from the individual sub-basins, and accumulative flows, as the runoff proceeds downstream. Runoff calculations are included at the end of this report.

TRIBUTARY DRAINAGE:

Exterior runoff enters this development from sub-basins B-0, B-1, B-3 and B-10.

Sub-basin B-0 drains some 95.9 c.f.s. (5 year flow) from the existing Vickers Drive. This flow consists of 83 c.f.s. pipe flow and 13 c.f.s. street flow. These flows are based on a curve number for high density P.U.D. housing (conservative) for this sub-basin.

Sub-basins B-1 and B-10 drain to Vickers Drive as overland flow. Runoff from sub-basin B-3 will need to enter Vickers Drive mostly as pipe flow, at the location of the 30-inch stub, as shown on the Drainage Plan. These tributary sub-basins and land uses are based on existing topographic drainage and preliminary (in-house) development plans. Runoff from sub-basins B-1, B-3 and B-10 under undeveloped conditions will enter Vickers Drive as overland sheet flow and will not exceed the half street capacity of Vickers Drive.

PROPOSED DRAINAGE FACILITIES:

The proposed drainage facilities for Promontory I Development are shown on the attached Drainage Master Plan. Upon final platting (and preparation of final drainage reports) of specific parcels within this development area, it may be necessary to slightly alter the pipe sizes and/or inlets shown on the Drainage Plan, to accommodate final street grades, etc..

Vertical curb and gutter will be required at several locations to convey street flows. These locations are shown and described on the Drainage Plan. The exact extent and limits where vertical curb is required shall be determined in the final drainage reports for each specific filing.

Per City of Colorado Springs Criteria, drainage facilities along the entire length of Vickers Drive and Rangewood Drive have been sized to carry the bulk of the 5 year storm as pipe flow, with street flows being limited to the values given in the street capacity charts published in "City of Colorado Springs Determination of Storm Runoff Criteria". In all cases, the street flows will be well within these limits for the five year storm.

Runoff from Basin B will be collected in Vickers Drive and flow North in R.C.P. and outlet into its natural channel. Runoff from Basin A will flow to Montarbor Drive. Facilities in Montarbor Drive were proposed as part of previous subdivisions, and are sufficient to handle these flows. (Please refer to approved Drainage Report for Northwind Subdivision Filing Nos. 5, 6 and 7).

DRAINAGE FACILITIES COST ESTIMATE:

18" R.C.P.	65 L.F. @ \$ 23./L.F.	=	\$ 1,495.
24" R.C.P.	150 L.F. @ \$ 35./L.F.	=	\$ 5,250.
30" R.C.P.	410 L.F. @ \$ 42./L.F.	=	\$ 17,220.
36" R.C.P.	410 L.F. @ \$ 50./L.F.	=	\$ 20,500.
42" R.C.P.	530 L.F. @ \$ 63./L.F.	=	\$ 33,390.
48" R.C.P.	670 L.F. @ \$ 74./L.F.	=	\$ 49,580.
Manholes	6 Each @ \$1000./Ea.	=	\$ 6,000.
6' D-10R	4 Each @ \$1800./Ea.	=	\$ 7,200.
8' D-10R	4 Each @ \$2200./Ea.	=	\$ 8,800.
10' D-10R	1 Each @ \$2500./Ea.	=	\$ 2,500.
12' Sidewalk Culvert	1 Each @ \$3000./Ea.	=	\$ 3,000.
* 1' x 12' Conc. Chl.	50 L.F. @ \$ 49./L.F.	=	\$ 2,450.
42" Flaired End Section	1 Each @ \$1100./Ea.	=	\$ 1,100.
Rip-Rap	100 C.Y. @ \$ 50./C.Y.	=	\$ 5,000. 2500
	* 50		
TOTAL	* NO REIMBURSEMENT FOR DUAL SYSTEM =		\$ 163,485. 158,535 Q

DRAINAGE AND BRIDGE FEES:

The drainage and bridge fees required will be dependent upon the size of the specific parcels platted, and the date of platting. An estimate of the fees required is given below, applying the 1984 Cottonwood Creek drainage and bridge fees to the approximate acreage within the Promontory I Development.

Approximate Drainage Fee:

37 ac. @ \$2987. per ac. = \$110,519.

Approximate Bridge Fee:

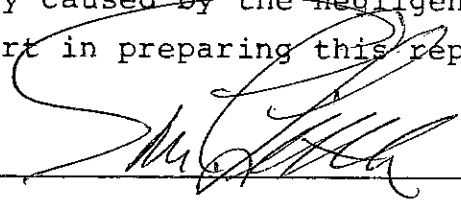
37 ac. @ \$ 137. per ac. = \$ 5,069.

DRAINAGE REPORT STATEMENTS

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



Developer's Statement:

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

Norwood Development Corp.
Business Name

By: Kent A. Petre

Title: Pres

Address: PO 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.

[Signature]
City Engineer

2/13/84
Date

Conditions: SEE COST ESTIMATE FOR REVISIONS

DRAINAGE CALCULATIONS

BASIN	ACREAGE	SQ. MI.	LAND USE (Soil)	%	CN	% x CN	RUNOFF Q (IN.)	L (FT.)	H (FT.)	FLOW TYPE	tc (hrs.)	qp CSM/In.	q (cfs)
A-1	2.5	.005	Res. (B)	78	78	6093.8		1550	7.8	Street	.108	1250	11.3(100)
	.7		S&W	22	98	2143.8	0.73(5yr)						
	3.2				100	8237.6	1.81(100yr)	1550	7.8		.108		
A-1,2	6.6	.013	Res. (B)	77	78	5986.0		400	22.2	Street	.009	1240	29.9
	.5		Res. (D)	6	89	517.4							
	1.5		S&W	17	98	1709.3	0.72						
	8.6			100	8212.7	1.79	1950	30.0		.117		12.0	
A-1, 2,3	9.3	.020	Res. (B)	74	78	5757.1		200	16.4	Street	.006	1220	43.5
	1.2		Res. (D)	10	89	847.6							
	2.1		S&W	16	98	1633.3	0.73						
	12.6			100	8238.0	1.81	2250	46.4		.123		17.6	
B-0	53.4	.102	P.U.D. (B)	82	85	6970		300	16	Overland	.052	940	212
	11.6		S&W	18	98	1762	1.00	1530	45	Street	.222		
	65.0			100	8732	2.21	440	24	Pipe Flow	.007	95.9		
							2270	85		.281			
B-0, 1,2	53.4	.107	P.U.D. (B)	78	85	6616.6						920	220
	1.2		Res. (B)	2	78	136.4		870	34	Pipe Flow	.014		
	14.0		S&W	20	98	2000.0	1.02						
	68.6			100	8753.0	2.23	3140	119		.295		100.	
B-4	3.7	.007	Res. (B)	86	78	6711.6		240	9	Overland	.048	1300	14.8
	.6		S&W	14	98	1367.4	.66	320	3	Street	.044		
	4.3			100	8079.0	1.69	560	12		.092			
B-4,5	8.8	.016	Res. (B)	85	78	6600.0		520	14	Street	.044	1200	33.4
	1.6		S&W	15	98	1507.7	.67						
	10.4			100	8107.7	1.71	1080	26		.136			

DRAINAGE CALCULATIONS

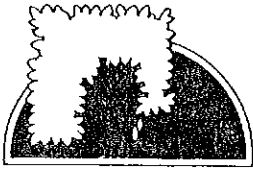
<u>BASIN</u>	<u>ACREAGE</u>	<u>SQ.MI.</u>	<u>LAND USE (Soil)</u>	<u>%</u>	<u>CN</u>	<u>% x CN</u>	<u>RUNOFF Q(IN.)</u>	<u>L (FT.)</u>	<u>H (FT.)</u>	<u>FLOW TYPE</u>	<u>tc (hrs.)</u>	<u>QP CSM/In.</u>	<u>q (cfs)</u>
B-4, 5,6, 7,8	1.4 18.5 3.3 <u>23.2</u>	.036	School (B) Res. (B) S&W	6 80 14 <u>100</u>	80 78 98	482.8 6219.8 1393.9 <u>8096.5</u>	.67(5yr) 1.71(100yr)	300 <u>1380</u>	8 34	Street	.025 <u>.161</u>	1130	27.3(5y) 69.9(10)
B-0 thru B-8	1.4 53.4 48.0 <u>22.3</u> 125.1	.196	School (B) P.U.D. (B) Res. (B) S&W	1 43 38 18 <u>100</u>	80 85 78 98	89.5 3628.3 2992.8 1746.9 <u>8457.5</u>	.85 1.98	<u>3140</u>	119		.295	920	152 356
B-0 thru B-10 1 1	8.3 53.4 57.4 <u>25.2</u> 144.3	.226	School (B) P.U.D. (B) Res. (B) S&W	6 37 40 17 <u>100</u>	80 85 78 98	460.2 3145.5 3102.7 1711.4 <u>8419.8</u>	.83 1.95	<u>3610</u>	131	Pipe Flow	.026 <u>.321</u>	900	167 396
B-0 thru B-11	53.4 57.4 8.3 <u>26.1</u> 145.2	.227	P.U.D. Res. (B) School S&W	37 39 6 18 <u>100</u>	85 78 80 98	3126.0 3083.5 457.3 1761.6 <u>8428.4</u>	.83 1.96	<u>4660</u>	250	Pipe Flow	.001 <u>.322</u>	900	170 400
A-1	2.5 .7 <u>3.2</u>	.005	Res. (B) S&W	78 22 <u>100</u>	78 98	6093.8 2143.7 <u>8237.6</u>	0.73 1.81	1550 <u>1550</u>	7.8 7.8	Street	.108 <u>.108</u>	1250	4.6 11.3
A-2	4.1 .5 .8 <u>5.4</u>	.008	Res. (B) Res. (D) S&W	76 9 15 <u>100</u>	78 89 98	5922.2 824.1 1451.9 <u>8198.2</u>	.71 1.78					1300	7.8 19.5

DRAINAGE CALCULATIONS

<u>BASIN</u>	<u>ACREAGE</u>	<u>SQ. MI.</u>	<u>LAND USE (Soil)</u>	<u>%</u>	<u>CN</u>	<u>% x CN</u>	<u>RUNOFF Q(IN.)</u>	<u>L (FT.)</u>	<u>H (FT.)</u>	<u>FLOW TYPE</u>	<u>tc (hrs.)</u>	<u>qP CSM/In.</u>	<u>q (cfs)</u>
A-3	2.7 .7 <u>.6</u> 4.0	.006	Res. (B) Res. (D) S&W	67 18 <u>15</u> 100	78 89 98	5265.0 1557.5 <u>1470.0</u> 8292.5	.76(5yr) 1.85(100yr)					1300	6.2(5) 15.1(10)
B-0	53.4 <u>11.6</u> 65.0	.102	P.U.D. (B) S&W	82 <u>18</u> 100	85 98	6970 <u>1762</u> 8732	1.00 2.21	300 1530 <u>440</u> 2270	16 45 <u>24</u> 85	Overland Street Pipe flow	.052 .222 <u>.007</u> .281	940	95.9 212
B-1	1.2 <u>1.2</u> 2.4	.004	Res. (B) S&W	50 <u>50</u> 100	78 98	3900.0 <u>4900.0</u> 8800.0	1.05 2.27					1300	5.1 11.1
B-2	<u>1.2</u> 1.2	.002	S&W	<u>100</u> 100	98	<u>9800</u> 9800	1.87 3.27					1300	4.6 8.0
B-3	28.3 <u>5.0</u> 33.3	.052	Res. (B) S&W	85 <u>15</u> 100	78 98	6628.8 <u>1471.5</u> 8100.3	.67 1.71	500 450	20 13	Overland Pipe flow	.099 <u>.010</u> .168	1130	39.3 101
B-4	3.7 <u>.6</u> 4.3	.007	Res. (B) S&W	86 <u>14</u> 100	78 98	6711.6 <u>1367.4</u> 8079.0	.66 1.69					1300	5.8 14.8
B-5	5.1 <u>1.0</u> 6.1	.010	Res. (B) S&W	84 <u>16</u> 100	78 98	6521.3 <u>1606.6</u> 8127.9	.68 1.73					1300	8.4 21.4
B-6	4.1 <u>.7</u> 4.8	.008	Res. (B) S&W	85 <u>15</u> 100	78 98	6662.5 <u>1429.2</u> 8091.7	.67 1.70					1300	6.5 16.6

DRAINAGE CALCULATIONS

<u>BASIN</u>	<u>ACREAGE</u>	<u>SQ. MI.</u>	<u>LAND USE (Soil)</u>	<u>%</u>	<u>CN</u>	<u>% x CN</u>	<u>RUNOFF Q (IN.)</u>	<u>L (FT.)</u>	<u>H (FT.)</u>	<u>FLOW TYPE</u>	<u>tc (hrs.)</u>	<u>qp CSM/In.</u>	<u>q (cfs)</u>
B-7	4.2 .7 <u>4.9</u>	.008	Res. (B) S&W	86 14 <u>100</u>	78 98	6685.7 1400.0 <u>8085.7</u>	.66 (5yr) 1.70 (100yr)					1300	6.6 (5) 16.9 (1)
B-8	1.4 1.4 .3 <u>3.1</u>	.005	School (B) Res. (B) S&W	45 45 10 <u>100</u>	80 78 98	3612.9 3522.6 948.4 <u>8083.9</u>	.66 1.70					1300	4.2 10.7
B-9	6.9 1.2 <u>8.1</u>	.013	School (B) S&W	85 15 <u>100</u>	80 98	6814.8 1451.6 <u>8266.4</u>	.75 1.83					1300	12.3 30.2
B-10	9.4 1.7 <u>11.1</u>	.107	Res. (B) S&W	85 15 <u>100</u>	78 98	6605.4 1500.9 <u>8106.3</u>	.67 1.71					1300	15.1 38.4
B-11	0.9 <u>0.9</u>	.001	S&W	100 <u>100</u>	98	9800 <u>9800</u>	1.87 3.27					1300	3.4 6.0



P.O. Box 552, Manitou Springs, Colorado 80829
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February 1, 1984

City of Colorado Springs
Department of Public Works
Engineering Division
30 South Nevada Avenue
Colorado Springs, CO 80903

Attention: Gary Haynes

This letter is written in reference to the Promontory I Development located in the Northeast part of the city at the west end of Vickers Drive.

Storm sewer runoff flows from this development will be carried to, and outfall into a natural channel which flows to Cottonwood Creek. The entire length of this natural channel, from the point of outfall proposed in the Master Drainage Report for Promontory I to Cottonwood Creek lies within property owned by Norwood Development Corporation. Development of the Promontory I Development will increase and concentrate the storm water runoff flowing through this natural channel. The Norwood Development Corporation will accept this increased runoff, which will flow across their undeveloped property in the existing natural channel.

Very truly yours,

Kent A. Petre, President
Norwood Development Corporation

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