Approved
Dec 10, 1976

MASTER DRAINAGE PLAN

FOR

VISTA GRANDE TERRACE

BAKER ADDITION

G. J. WEISS AND ASSOCIATES

CONSULTING ENGINEERS

COLORADO SPRINGS, COLORADO

MASTER DRAINAGE PLAN

FOR

VISTA GRANDE TERRACE

BAKER ADDITION

G. J. WEISS & ASSOCIATES CONSULTING ENGINEERS

1815 North Tejon Colorado Springs, Colo. 80907 (303) 634-0373

October 19, 1976

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

Dear Deke:

Transmitted herewith is a Master Drainage Plan for Vista Grande Terrace - Baker Addition. This site contains about 200 acres and lies west of Union Boulevard and north of Vickers Drive.

We have computed the flows to conform with the proposed development as shown on the approved preliminary plan for the site. Minor modifications will probably need to be made as final platting is made for the area.

All drainage in this site falls within the Cottonwood Creek Drainage Basin. Cost estimates for required facilities on the site have been made and are included in this report.

If you have any questions, please let me know.

Sincerely,

G. J. WEISS & ASSOCIATES

G. J. Weiss, PE-LS 4124

GJW/ksm
encls.

CERTIFICATIONS AND APPROVALS

Registered Engineer

I, Gerald J. Weiss, 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 specifications and criteria.

Gerald J. Weiss

Gerald J. Weiss P.E. - L.S. 4124

Developer

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

Col-Terra Inv Ltd

By J H Rockt

Title Vice Pres.

Approved

City of Colorado Springs, Department of Public Works.

Donell Jeffries

City Engineer

Dec. 10, 1976

Date

Comments:

SCOPE AND PURPOSE

It is the intent of this report to furnish the basis for an overall plan for placing storm sewer, catch basins and channel linings in Vista Grande Terrace - Baker Addition, as development occurs.

The study does not establish the exact design details of the storm sewers or drainage channels, but does establish the general location and required sizes in accordance with the planned development of the area. Minor modifications of this plan will be required when final platting has occured and when detailed designs are submitted.

BASIN DESCRIPTION

This proposed development contains about 200 acres and lies north of Vickers Drive, west of Union Boulevard and south of Dublin Boulevard. The topography varies with slopes from 2% up to 8%.

A well defined natural drainage channel flows through the south end of the development. Most of the drainage from this proposed development will enter the channel on the site or downstream from the site. All of the drainage from this area will ultimately enter Cottonwood Creek.

A Master Drainage Plan for Vista Grande Terrace Northwest was prepared by United Western Engineers dated March 23, 1972. This study covers the area south of our current study area. The drainage flows from the VGT Northwest study have been accepted as being correct. The cross gutter pans at Tomah Drive and Vickers Drive have been constructed north and south rather than east and west. However, the flow will still go west on Vickers Drive as shown on the approved drainage plan. The curb returns on the north side of this intersection will be removed since Tomah Drive

does not have any continuity going north from Vickers Drive under the preliminary plan for the Baker Addition.

A revised Master Drainage Plan for Vista Grande Terrace North was prepared by United Western Engineers dated March 28, 1972. This study covers the area east of our current study area. The VGT North study indicates a flow of 396.6 cfs at the outfall point on Union just north of Vickers Drive. The drainage plan for Vista Grande Terrace No. 25 indicates that 446 cfs is discharged from the 60" rcp and 29.1 cfs is discharged from the 21" rcp for a total of 475 cfs entering our study area.

STUDY CRITERIA

The method of computations utilized in this report is the SCS synthetic hydrograph method. The 50 year storm of 2 inches intensity, duration of one hour is used in accordance with criteria of the City of Colorado Springs.

The soil type within the entire study area is the Blakeland series (R7-BD) which consists of loamy course sand soil. This type falls in the "A" hydrologic group.

The single family portion of the development was calculated using curve No. 92 and a Q of 1.24, which would relate to about a 55% runoff factor. The multiple family and commercial areas were calculated using curve No. 95 and a Q of 1.48, which would relate to about a 72% runoff factor.

The City of Colorado Springs requires that major channels be designed for the 100 year storm when a flow of 500 cfs has been reached. A flow of 475 cfs enters our study area through the major drainage channel and we have multiplied this by a factor of 1.65 for conversion to the 100

year storm. The incoming flows through the study area are computed for the 50 year storm, but the major channel has been sized for the 100 year storm.

Runoff computation sheets are included in this report showing the runoff generated from each sub-basin.

The streets in the subdivision will be utilized to carry the storm water up to their limits of capacity. When the street can no longer carry the flow, the surplus will be carried in a storm sewer or ditch. A table is included in this report showing the grades, runoff flow and capacity of the street. The street capacities are calculated using charts furnished by the City Engineers Office.

COST ESTIMATE

100	l.f.	18" RCP	at	$ 15.00	=	$ 1,500.00
100	l.f.	24" RCP	at	20.00	=	2,000.00
230	l.f.	30" RCP	at	24.00	=	5,520.00
1,850	l.f.	36" RCP	at	27.00	=	49,950.00
200	l.f.	72" RCP	at	85.00	=	17,000.00
1,300	l.f.	5' x 5' conc. ditch	at	30.00	=	39,000.00
60	l.f.	5' x 10' C.B.C.	at	200.00	=	12,000.00
4	each	8' catch basins	at	1,000.00	=	4,000.00
1	each	10' catch basins	at	1,200.00	=	1,200.00
1	each	12' catch basins	at	1,500.00	=	1,500.00
2	each	16' catch basins	at	2,000.00	=	4,000.00
4	each	bridge inlets	at	500.00	=	2,000.00
400	S.F.	10' drainage pans	at	1.50	=	600.00
						$140,270.00
Add 10% Engineering						14,027.00
Add 15% Contingency						21,040.00
						$175,337.00

The 1976 drainage fee for the Cottonwood Basin is $896.00 per acre

The 200 acres in this proposed development would be charged a drainage fee of $179,200.00 less credits given for required facilities.

REV. 11-22-76

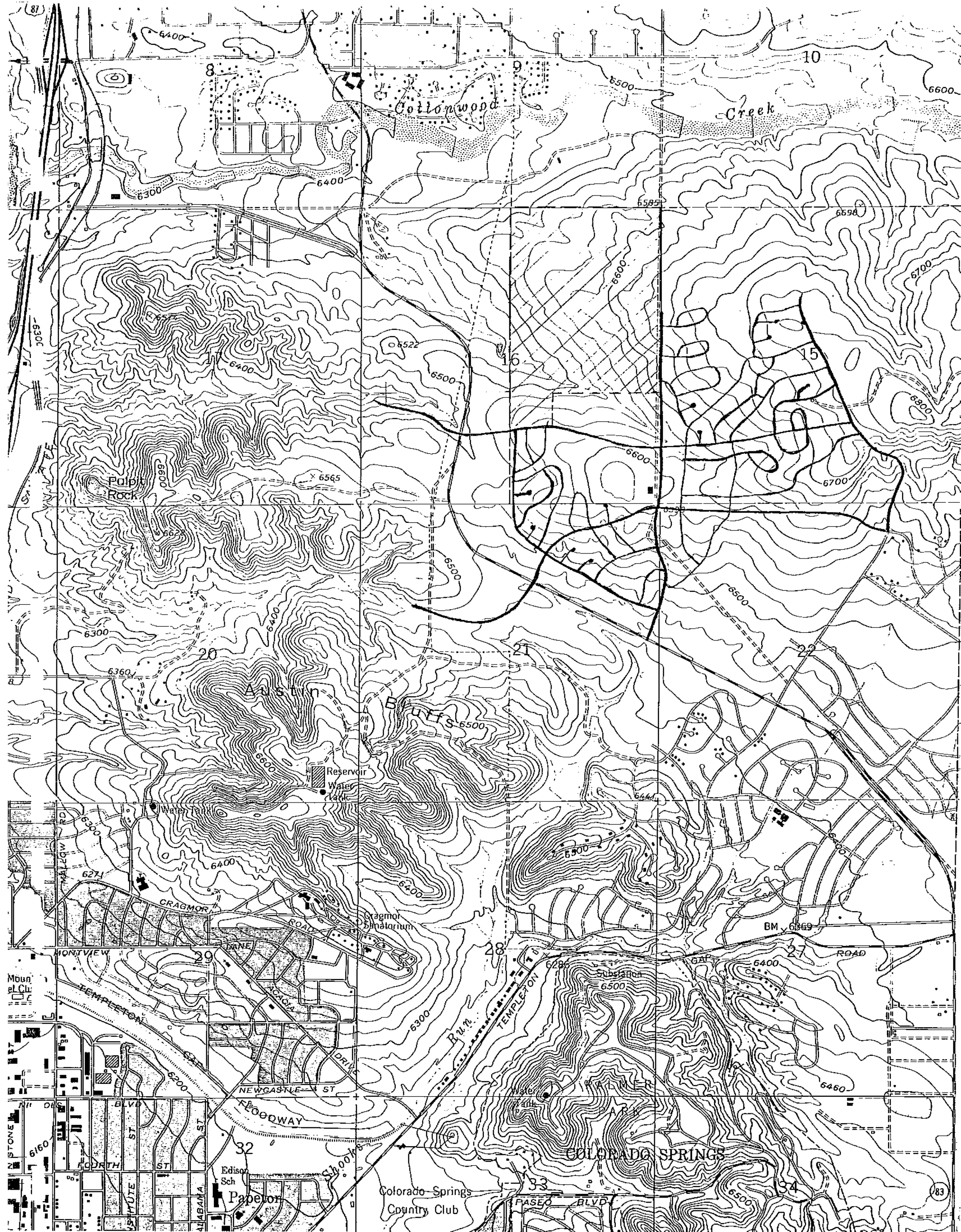
COST ESTIMATE

100	l.f.	18" RCP		15.00			1500.00
~~100~~ ~~230~~	l.f.	24" RCP	at	$ 20.00	=	$ ~~4,600.00~~	2000.00
~~230~~ ~~115~~	l.f.	30" RCP	at	24.00	=	~~2,760.00~~	5520.00
1,850	l.f.	36" RCP	at	27.00	=	49,950.00	
200	l.f.	72" RCP	at	85,00	=	17,000.00	
1,300	l.f.	5'x5' conc. Ditch	at	30.00	=	39,000.00	
60	l.f.	5'x10' C.B.C.	at	200.00	=	12,000.00	
~~1~~ 2 each		12' catch basins	at	1,500.00	=	~~3,000.00~~	1500.00
2 each		16' catch basins	at	2,000.00	=	4,000.00	
4 each		Bridge inlets	at	500.00	=	2,000.00	
~~1500~~ 400	S.F.	10' Drainage Pans	at	1.50	=	~~2,250.00~~	600.00
						$ 136,560.00	140,270
Add 10% Engineering						13,656.00	14,027
Add 15% Contingency						20,484.00	21,040
~~4~~ 4 each		8' catch drains	at	1,000		$ 170,700.00	175,337.00
1 each		10' catch drains	at	1,200		~~4,000.00~~ 12,000.00	

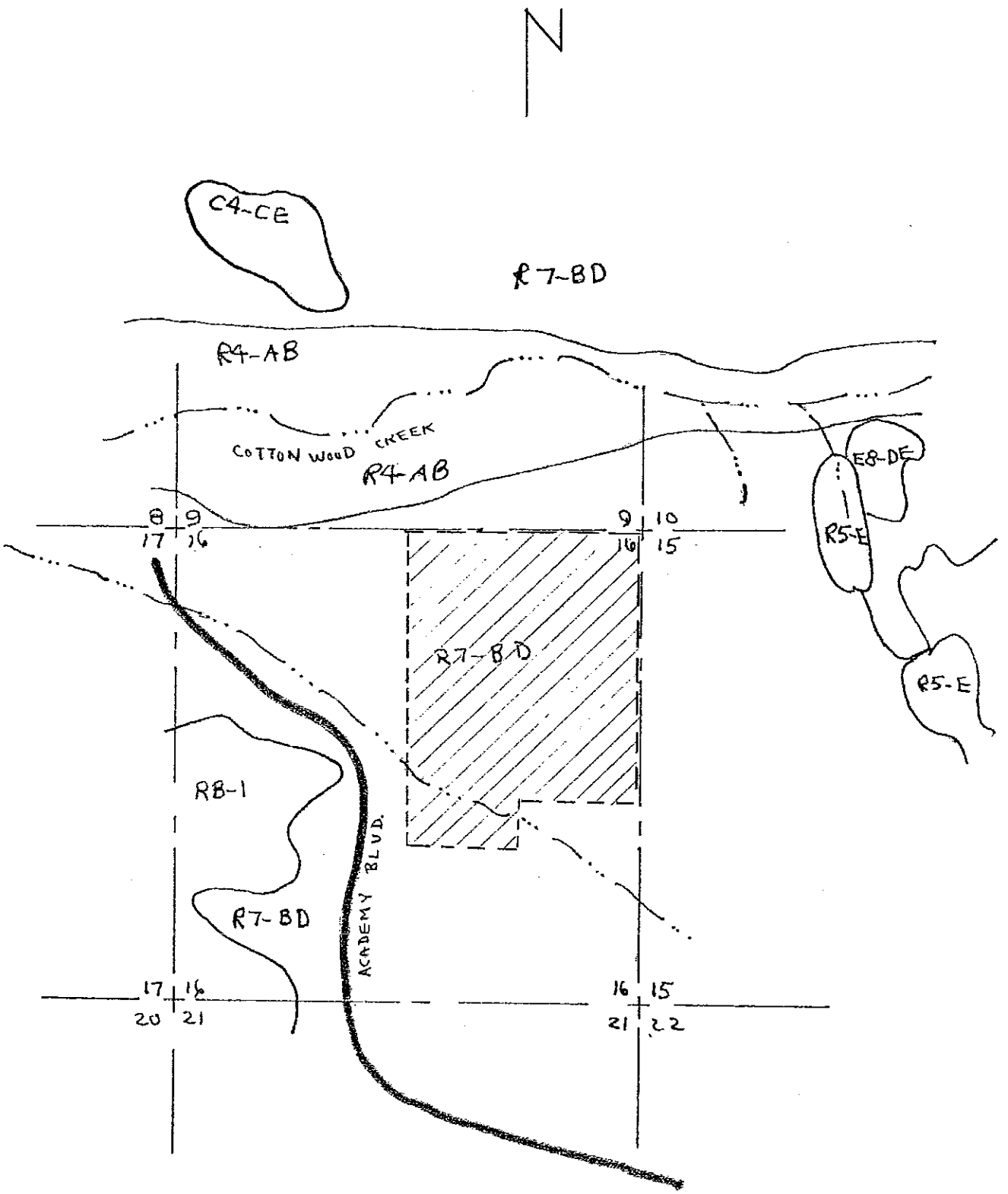
The 1976 drainage fee for the Cottonwood Basin is $896.00 per acre.

The 200 acres in this proposed development would be charged a drainage fee of $179,200.00 less credits given for required facilities.

REV. 11-22-76



8
9
10
Cottonwood
Creek
6400
6500
6600
6300
6585
6698
6700
6800
17
16
15
6522
Pulpit Rock
6565
6622
20
21
22
6360
Austin
Bluffs
Reservoir
Water Tank
6441
6271
CRAGMOR
ROAD
Cragmor Sanatorium
MONTVIEW
LANE
29
28
27
BM 6369
ROAD
GAP
6286
Substation
TEMPLETON
ACACIA
DRIVE
6200
NEWCASTLE ST
FLOODWAY
6160
FOURTH ST
32
Edison Sch
Papeton
Shooks Run
Colorado Springs Country Club
33
PASEO BLVD
PALMER PARK
COLORADO SPRINGS
34
6460



SCS SOILS MAP

BLAKELAND SERIES

MLRA(S): 49; 67
LL-RD. 12-72
TORRIORTHENTIC HAPLUSTOLLS. SANDY. MIXED. MESIC

BLAKELAND SOILS ARE DEEP, SOMEWHAT EXCESSIVELY-DRAINED SOILS. THEY FORMED IN ARKOSIC SANDS ON UPLANDS. IN A TYPICAL PROFILE, THE SURFACE LAYER IS A GRAYISH-BROWN LOAMY COARSE SAND, ABOUT 12 INCHES THICK. THE UNDERLYING LAYER IS A LIGHT YELLOWISH-BROWN, LOAMY COARSE SAND, THAT EXTENDS TO 60 INCHES OR MORE. AVERAGE ANNUAL PRECIPITATION IS ABOUT 15 INCHES, AND THE AVERAGE AIR TEMPERATURE IS 48 F. SLOPES ARE 2 TO 20 PERCENT.

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLASTICITY INDEX
0-~~12~~	LS, ~~LCOS~~	SM-SC	A-2	0	95-100	90-100	40-60	15-30	10-30	5-10
12-60	LS, LCOS, S	SP-SC, SM-SC	A-2	0	95-100	80-100	35-60	5-25	20-25	5-10

DEPTH (IN.)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	CORROSIVITY STEEL	CORROSIVITY CONCRETE	EROSION FACTORS K	EROSION FACTORS T	WIND EROD. GROUP
0-~~12~~	6.0-20	0.06-0.09	6.1-7.3	-	LOW	LOW	LOW	.10	5	2
12-~~60~~	6.0-20	0.05-0.08	6.6-7.3	-	LOW	LOW	LOW	.10		

FLOODING FREQUENCY	FLOODING DURATION	FLOODING MONTHS	HIGH WATER TABLE DEPTH (FT)	HIGH WATER TABLE KIND	HIGH WATER TABLE MONTHS	CEMENTED PAN DEPTH (IN)	CEMENTED PAN HARDNESS	BEDROCK DEPTH (IN)	BEDROCK HARDNESS	SUBSIDENCE INIT. (IN)	SUBSIDENCE TOTAL (IN)	HYD GRP	POTENTIAL FROST ACTION
NONE			>6.0			-		>60		-		A	LOW

SANITARY FACILITIES (A)

SEPTIC TANK ABSORPTION FIELDS	2-8%: SLIGHT 8-15%: MODERATE-SLOPE 15+%: SEVERE-SLOPE
SEWAGE LAGOON AREAS	2-7%: SEVERE-SEEPAGE 7+%: SEVERE-SEEPAGE,SLOPE
SANITARY LANDFILL (TRENCH)	SEVERE-SEEPAGE
SANITARY LANDFILL (AREA)	2-15%: SEVERE-SEEPAGE 15+%: SEVERE-SEEPAGE,SLOPE
DAILY COVER FOR LANDFILL	2-15%: FAIR-TOO SANDY 15+%: POOR-SLOPE

SOURCE MATERIAL

ROADFILL	2-15%: GOOD 15+%: FAIR-SLOPE
SAND	POOR-EXCESS FINES
GRAVEL	UNSUITED
TOPSOIL	POOR-TOO SANDY

WATER MANAGEMENT

POND RESERVOIR AREA	SEEPAGE,SLOPE
EMBANKMENTS DIKES AND LEVEES	PIPING
EXCAVATED PONDS AQUIFER FED	NO WATER
DRAINAGE	SLOPE
IRRIGATION	ERODES EASILY,SLOPE,DROUGHTY
TERRACES AND DIVERSIONS	2-6%: ERODES EASILY,PIPING 6+%: SLOPE,ERODES EASILY,PIPING
GRASSED WATERWAYS	2-3%: ERODES EASILY,DROUGHTY 3+%: SLOPE,ERODES EASILY,DROUGHTY

COMMUNITY DEVELOPMENT

SHALLOW EXCAVATIONS	2-8%: SLIGHT 8-15%: MODERATE-SLOPE 15+%: SEVERE-SLOPE
DWELLINGS WITHOUT BASEMENTS	2-8%: SLIGHT 8-15%: MODERATE-SLOPE 15+%: SEVERE-SLOPE
DWELLINGS WITH BASEMENTS	2-8%: SLIGHT 8-15%: MODERATE-SLOPE 15+%: SEVERE-SLOPE
SMALL COMMERCIAL BUILDINGS	2-4%: SLIGHT 4-8%: MODERATE-SLOPE 8+%: SEVERE-SLOPE
LOCAL ROADS AND STREETS	2-8%: SLIGHT 8-15%: MODERATE-SLOPE 15+%: SEVERE-SLOPE
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	

REGIONAL INTERPRETATIONS

Street and Storm Sewer Calculations

STREET	LOCATION	DIST	ELEVATION & SLOPE	TOTAL RUNOFF	STREET FLOW CAPACITY	PIPE FLOW	TYPE PIPE, CATCH BASIN & SLOPE %
INNSBRUCK 36'	VICKERS to DRAINAGE DITCH		2 % MIN	11.7	23.2		RAMP CURB
	to SUNBIRD		0.5 % MIN	29.2	29.5		8" VERT CURB
	to LEHMAN		6.6 %	4.5	42.1		RAMP CURB
	to SNOW BIRD		4.0 %	30.4	32.8		RAMP CURB
	to INNSBRUCK TRAIL		2.0 %	10.5	23.2		RAMP CURB
	to SITZMARK		0.5 %	9.9	11.6		RAMP CURB
	to LIONS HEAD		0.5 %	25.0	29.5		8" VERT CURB
MAROON BELLS	INNSBRUCK to EAGLES NEST		1.0 %	10.2	16.4		RAMP CURB
	to LITTLE JOHNNY		4.0 %	5.0	32.8		RAMP CURB
	to MACH-1		2.0 %	15.8	23.2		RAMP CURB
	to DOWNHIL		0.5 %	3.5	9.9		RAMP CURB
	To HOTDOG DRIVE		2.0 %	6.8	23.2		RAMP CURB
POWDERKEG	MAROON BELLS to END OF SAC		4.0 %	10.3	32.8		RAMP CURB
EAGLES NEST	MAROON BELLS to ROUNDTOP		4.0 %	38.4	93.4		8" VERT CURB THRU 4 % GRADE

Project MASTER DRAINAGE VGT - BAKER ADD. Page 1 of 2

Calc. by G. J. W. date 10-19-76

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 %
MACH - 1	MAROON BELLS to MAROON BELLS		4.0 GO	25.2	32.8		RAMP CURB
LITTLE JOHNNY	MAROON BELLS to MAROON BELLS		4.0 GO	13.8	32.8		RAMP CURB
VADLE LANE	INNSBRUCK to SUNBIRD		4.0 GO	9.5	32.8		RAMP CURB
SNOWBIRD	INNSBRUCK to SUNBIRD		1.0 GO	10.5	16.4		RAMP CURB
ROUND TOP	INNSBRUCK to SITZMARK		4.0 GO	10.5	32.8		RAMP CURB
INNSBRUCK TR.	INNSBRUCK AVE. to END OF SAC		4.0 GO	5.0	32.8		RAMP CURB
SITZMARK DR	INNSBRUCK to ROUND TOP		4.0 GO	41.7	83.4		8" VERT CURB to SITZMARK CT.
INNSBRUCK CT	INNSBRUCK AVE to END OF SAC		4.0 GO	7.4	32.8		RAMP CURB
LIONS HEAD	INNSBRUCK to MAROON BELLS		3.0 GO	17.9	28.4		RAMP CURB
HOTDOG DR	SITZMARK to MAROON BELLS		3.0 GO	14.3	28.4		RAMP CURB

Project MASTER DRAINAGE VGT - BAKER ADD
Calc. by GJW date 10-19-76
Checked by _____ date _____
Page 2 of 2

MAJOR BASIN	SUB BASIN	AREA Planim. Read.	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH LENGTH	DITCH SLOPE	V	TPO	FLOW Q	FLOW qp	Tb
A	1	6.244	.00976	1200	45	0.10				0.56	1.24	10.46	
	2	6.152	.00961	750	25	0.08				0.548	1.24	10.52	
	3	5.464	.00854	800	45	0.07				0.542	1.24	9.46	
	4	1.102	.00172	400	20	0.04				0.524	1.24	1.97	
B	1	2.525	.00395	500	40	0.045				0.527	1.24	4.50	
	2	8.792	.01374	1900	120	0.12				0.572	1.24	14.42	
	3	5.923	.00925	900	70	0.07				0.542	1.24	10.24	
	4	2.181	.00341	700	35	0.065				0.539	1.24	3.80	
C	1	5.785	.00904	700	40	0.06				0.536	1.24	10.12	
	2	4.339	.00678	700	30	0.07				0.542	1.24	7.51	
	3	7.989	.01248	800	60	0.06				0.536	1.24	13.97	
	4	3.834	.00599	600	50	0.045				0.527	1.24	6.82	
D	1	1.905	.00298	400	15	0.045				0.527	1.24	3.39	
	2	6.084	.00951	1000	80	0.07				0.542	1.24	10.53	
	3	6.600	.01031	1000	65	0.08				0.548	1.24	11.29	

HYDROLOGIC COMPUTATION – BASIC DATA

PROJ: MASTER DRAINAGE
VGT - BAKER ADDITION

By: JGW
Date: 10-15-76

MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH LENGTH	DITCH SLOPE	V	TPO	FLOW Q	FLOW qp	Tb
E	1	8.184	.01279	1300	90	0.095				0.557	1.24	13.78	
	2	8.999	.01406	1500	120	0.10				0.560	1.30	15.80	
	3	8.930	.01395	1450	110	0.10				0.560	1.40	16.88	
F	1	3.443	.00538	700	20	0.08				0.548	1.40	6.65	
	2	10.922	.01706	1150	65	0.09				0.554	1.48	22.06	
	3	5.739	.00897	950	60	0.08				0.548	1.48	11.73	
G	1	4.017	.00628	800	25	0.09				0.554	1.24	6.80	
	2	4.362	.00681	700	35	0.07				0.542	1.24	7.54	
	3	3.329	.00520	800	35	0.075				0.545	1.24	5.73	
	4	5.199	.00812	750	40	0.06				0.536	1.24	9.09	
	5	1.951	.00305	400	18	0.04				0.524	1.24	3.49	
	6	5.142	.00803	700	40	0.055				0.533	1.24	9.04	
	7	5.854	.00915	1000	40	0.095				0.557	1.24	9.86	
	8	10.79	.01686	1500	70	0.110				0.566	1.24	17.88	
	9	4.13	.00646	700	30	0.07				0.542	1.24	7.15	

HYDROLOGIC COMPUTATION — BASIC DATA

PROJ: MASTER DRAINAGE
VGT - BAKER ADDITION

By: [signature]
Date: 10-15-76

MAJOR BASIN	SUB BASIN	AREA Planim. Read	AREA MILE	BASIN LENGTH	BASIN HEIGHT	Tc	DITCH LENGTH	DITCH SLOPE	V	TPO	FLOW Q	FLOW qp	Tb
H	1	14.23	0.02223	1400	70	0.110				0.566	1.48	28.13	
I	1	2.75	.004297	400	15	0.045				0.527	1.20	4.74	
	2	5.60	.00875	600	25	0.06				0.536	1.20	9.48	
	3	10.70	.01672	800	35	0.075				0.545	1.00	14.85	
	4	9.50	.01484	1600	55	0.08				0.548	1.48	19.40	
								$T_p =$	$\frac{D}{2} + 0.6\,T_c$				$D = 1$ hr
								$Q_p =$	$\frac{484\ A\ Q}{T_p}$				

HYDROLOGIC COMPUTATION — BASIC DATA

PROJ: MASTER DRAINAGE VGT- BAKER ADDITION

By: ygw Date: 10-15-76