

RETURN TO:
Land Development
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UNITED PLANNING & ENGINEERING COMPANY

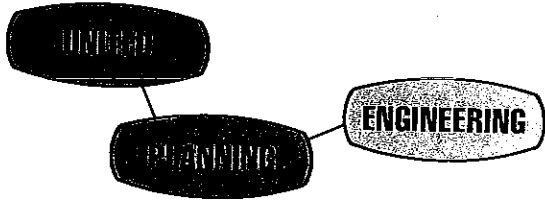
916 NORTH WEBER

COLORADO SPRINGS, COLORADO

MASTER DRAINAGE REPORT

NEWPORT DEVELOPMENT

NOVEMBER, 1976



planners · consultants · engineers

916 North Weber
Colorado Springs, Colorado 80902
(303) 471-8222

November 19, 1976

Mr. Dewitt Miller
Director of Public Works
City of Colorado Springs
Colorado Springs, Colorado

Subject: Master Drainage Report
Newport Development

Dear Deke:

Transmitted herewith is the master drainage report for the Newport Development for your review and approval.

Please contact me if I may answer any questions or provide further information.

Sincerely,

UNITED PLANNING &
ENGINEERING COMPANY

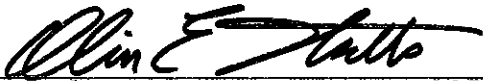
Oliver E. Watts
Partner

OEW/nb

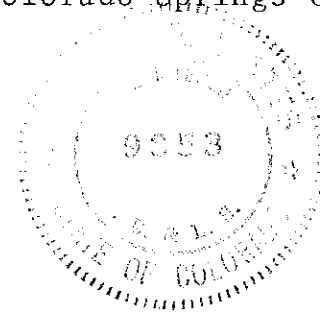
MASTER DRAINAGE PLAN
NEWPORT DEVELOPMENT
CERTIFICATIONS AND APPROVALS

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 specifications and criteria.



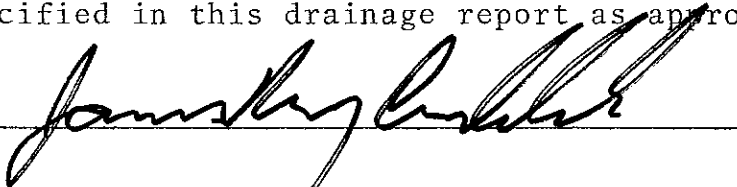
Colorado P.E.---L.S. No. 9853



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

owner

Approved:

City of Colorado Springs, Department of Public Works

City Engineer

Date

NOTE: Approval pertains to the general design concept only and does not extend to detailed design particulars or the sharing of costs.

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APPENDIX

Computations	11 Sheets
Annexation Agreement	8 Sheets
Drainage Plan--Newport North	
Drainage Plan--Newport South	

REFERENCED MAJOR REPORTS

1. Sand Creek Drainage Study	May 31, 1968
2. Sand Creek Cost Re-evaluation	February, 1973
3. Peterson Field Master Drainage Report	1975
4. Pikes Peak Panorama, Filing No. 1	November 2, 1971
5. Drainage Report Peterson Field	July, 1973

1. Description of Location

a. The Newport Development is located between the Colorado Springs Municipal Airport and Powers Boulevard, extending from Sand Creek on the north to about 3800 feet south of Fountain Boulevard. Two plans are included, being the portions north and south of Fountain Boulevard, respectively.

b. The total area enclosed by the development is 337.97 acres.

c. The northernmost 80.46 acres lies within the Sand Creek Drainage Basin, while the southernmost 257.51 acres lies within the Peterson Field Drainage Basin. This plan is in full compliance with the approved Sand Creek Master Study and the pending revised Peterson Field Study.

d. The natural drainage is defined by the topography shown on the enclosed drawings, generally draining from northeast to southwest across the development.

2. Method of Computation

a. The method of runoff computations used is the USDA-SCS synthetic hydrograph method as prescribed by the City. Interior drainage is designed for the "50 year" storm of 2-inch intensity, duration one hour. The main greenbelt south of Fountain Boulevard is designed for the "100 year" storm of 3-inch intensity, duration one hour as prescribed in the Peterson Field report.

b. Soil Types: As mapped by the local SCS office, the following soil types are encountered within the development.

The R7 Blakeland Series is a deep, dark textured soil primarily loamy sand and sandy in nature, falling within hydrologic group "A". It occupies the Sand Creek drainage north of Fountain Boulevard and a small inclusion south of Fountain as shown on that plan.

The remainder of the development is covered with the R5 Tructon series soil, which is a deep, dark sandy loam, of hydrologic group "B".

3. External Water Entering The Subdivision

a. Approximately 4600 CFS flows in Sand Creek along the north boundary. The 100 year flood plain, as defined by the SCS in July, 1973, is shown on the north plan.

All other inflows are taken from the Peterson Field Drainage Report by R. Keith Hook & Associates, dated July, 1973. The "fully developed" flows are used for the design, as follows:

b. 35 CFS will enter basin IC in a 27-inch by 350-foot RCP from a 12-foot catch basin. This is Hook's area "F".

c. 23.4 CFS will enter basin IIA (Hook's area G) from a 24-inch RCP.

d. 32.0 CFS will enter along the north side of old Fountain Boulevard (Hook's area Y) by a 27-inch RCP.

e. 113.0 CFS enters along the south side of old Fountain Boulevard (Hook's areas Z, B1, V & W) by a 48-inch RCP.

f. 56.3 CFS will enter at new Fountain Boulevard by a 48-inch RCP (Hook's areas J, D1 & C1).

g. 48.8 CFS will enter basin IIIA (Hook's area K) by a 36-inch RCP.

h. 38.8 CFS will enter the lower end of basin IIIA (Hook's area M) by a 30-inch RCP.

i. 54.0 CFS will enter basin IIIB (Hook's area H1) by a 30-inch RCP.

4. Flow Through the Subdivision

a. Sand Creek flows will be retained in an improved channel along the northern boundary.

b. The 35 CFS Sand Creek Inflow will be routed by storm sewer across Powers Boulevard to a point designated by Cox Surveying in the Pikes Peak Panorama Report, dated November 2, 1971.

c. The remaining Sand Creek interior drainage will be routed by surface streets to Powers Boulevard and then by storm sewer to a point designated by Cox.

d. All Peterson Field runoff will be routed by an interceptor storm sewer system southerly down Powers Boulevard as prescribed by the pending Peterson Field Master Report, and no runoff will be allowed to cross Powers in the natural westerly direction, except where 128 CFS was provided for by Cox, where 30 CFS will be directed.

e. All inflows from the airport are routed by a continuation of the storm sewer systems, following generally the proposed street alignments. An interceptor ditch is provided along most of Aviation Way.

f. Runoff north of Fountain Boulevard is routed by storm sewer to the existing culvert crossing near the Powers Interchange.

g. Runoff south of Fountain Boulevard is routed by storm sewer to the prescribed interceptor storm sewer along Powers Boulevard.

h. A private swale and storm sewer is provided along the southern boundary to contain all runoff originating within the development.

5. Outfall Points

a. The future 380 square foot bridge will provide the outfall point for the Sand Creek Channel and basin IA.

b. Basins IB and IC will outfall at a point on Powers Boulevard designated in the Pikes Peak Panorama report to accept 84.7 CFS. 78.3 CFS will be discharged in a 36-inch RCP, ditched to daylight.

c. Basins ID through IF will outfall out a point on Powers Boulevard where specified for Pikes Peak Panorama to accept 48.0 CFS. 67.1 CFS will be discharged in a 36-inch RCP, ditched to daylight.

d. Another outfall specified by Cox to accept 128 CFS will accept 30 CFS so as to eliminate a storm sewer system in Powers.

e. All of the Peterson Field Basin north of Fountain Boulevard will outfall through a culvert on Fountain Boulevard (Bridge Fee Item). 410 CFS (50 year flow) will be developed at this point, which is for above what the existing culvert will accomodate.

f. The outfall point for the entire Peterson Field portion, plus the airport inflows, will be a concrete lined channel adjacent to Powers Boulevard at the southern boundary. 1202 CFS (100 year flow) will be developed at this point.

6. Internal Design Computations

a. Streets: All interior streets are industrial, 44-foot curb to curb, except for the entrances, and all have vertical curbing. Other streets are major arterials. The following is a summary of surface flows.

<u>Location</u>	<u>Slope</u>	<u>Runoff-CFS-</u>	<u>Capacity-CFS-</u>
Interior			
IC	1.0%	21.1	42.6
ID	1.3%	37.8	48.6
IIA (north)	0.9%	20.5	49.4
IIA (west)	0.5%	27.9	30.1
IIB(upper)	1.6%	24.8	53.9
IIB(lower)	1.4%	49.6	50.4
IIIA	0.9% min.	40.4	49.4
IIIC(upper)	1.8%	57.2	57.2
IIIC(lower)	1.0%	42.2	42.6
IIIB	1.3%	33.3	48.6
Powers Boulevard			
IB	--	25.2	30.0
IE	--	22.4	30.0
IF	--	11.8	30.0
IIE(upper)	--	30.0	30.0

IIE (10wer)	--	29.2	30.0
IIIE	--	30.0	30.0
III I	--	30.0	30.0
Fountain Boulevard			
IIC	--	24.3	30.0

b. Channel Sections: A concrete lined trapezoidal channel, side slopes of 1:1, n=0.015, is provided along Powers Boulevard south of Fountain Boulevard, as follows: b=bottom width d=depth

Size, bxd	Design Flow	Slope	Flow Depth	Velocity	Freeboard
-ft-	-CFS-	%	-ft-	-fps-	-ft-
5x5	704	1.22	4.0	18.8	1.0
6x5	727	1.10	4.0	18.3	1.0
6x5.2	727	0.92	4.2	17.1	1.0
10x6 RCB	1095	1.00	5.2	21.3	0.8
7x6.3	1121	0.75	5.3	17.6	1.0
Other minor ditches will be provided as follows:					
4x2	48.8	1.45	0.9	10.3	1.1
4x2	52.0	0.88	1.1	8.7	0.9
2x2	23.4	1.19	1.0	8.0	1.0
3x3	142.8	1.37	1.0	13.2	1.0

c. Storm Sewer: Concrete pipe, Class II minimum with 1-foot minimum cover, n=0.013, is specified. The developer reserves the right to substitute CMP or other equivalent pipe in the final design. The following is a design summary.

Location	Diameter	Min. Slope	Design Flow	
	-in.-	%	-CFS-	
IC	30	0.72	35	
IB	30	1.7	52.5	
IB	36	1.38	78.3	
IF	36	0.78	58.4	
IF	36	1	67.1	
IIA	24	0.82	20.5	
IIB	36	0.87	62.3	
IIB	36	1.53	82.5	
IIC	54	0.774	173.0	
IIE	30	0.55	30.0	
Fountain Outfall	66+42	1.00	410.0	66 exists
Alternate	72	0.94	410.0	
Hook's H1	36	0.65	54.0	
IIIC	24	0.93	20.0	
IIIA	42	0.7	83.7	
IIIB	48	0.73	121.3	
IIIB	54	0.77	172.7	
IIIF	66	0.61	262.0	

7. Cost Estimates

A dispute exists over the attached annexation agreement, which may or may not require the city to pay for all storm sewer within Powers and Fountain Boulevards. Because of this, separate cost totals are given for information purposes.

a. Sand Creek Basin

Item	Quantities			Unit Cost
	Within Dev.	In Arterials	Total	
18-in. RCP	26 lf	78 lf	104 lf	14.00
21-in. RCP	26 lf	78 lf	104 lf	15.00
24-in. RCP	52 lf	-0-	52 lf	16.00
30-in. RCP	1930 lf	-0-	1930 lf	22.00
36-in. RCP	-0-	990 lf	990 lf	27.00
4' D10R C.B.	1 ea	3 ea	4 ea	800.00
6' D10R C.B.	1 ea	3 ea	4 ea	900.00
8' D10R C.B.	2 ea	-0-	2 ea	1000.00
6' Inlet	1 ea	-0-	1 ea	400.00
Sand Creek Channel	1070 lf	-0-	1070 lf	35.00
Construction Cost	\$85,596.00	\$34,092.00	\$119,688.00	
10% Engr. & Cont.	8,559.60	3,409.20	11,968.80	
Total Cost	\$94,155.60	\$37,501.20	\$131,656.80	
Cost per 80.46 acres	\$1,770.22	\$466.09	\$1,636.30	
1977 Drainage Fee:	\$1,705.00/Acre		\$137,184.30	
1977 Bridge Fee:	None			

b. Peterson Field Basin: Items in parenthesis are birdge fee items and are not in the total cost.

<u>Item</u>	<u>Within Dev.</u>	<u>In Arterials</u>	<u>Total</u>	<u>Unit Cost</u>
18" RCP	104 1f	104 1f	208 1f	14.00
21" RCP	104 1f	130 1f	234 1f	15.00
24" RCP	746 1f	-0-	746 1f	16.00
27" RCP	104 1f	-0-	104 1f	19.00
30" RCP	-0-	460 1f	460 1f	22.00
36" RCP	2970 1f	-0-	2970 1f	27.00
42" RCP	340 1f	(60)	340	29.00
48" RCP	820 1f	-0-	820	31.00
54" RCP	1510 1f	-0-	1510	38.00
66" RCP	540 1f	-0-	540	56.00
10x6 RCB	----	(60)	(60)	200.00
4' D10R C.B.	4 ea	4 ea	8 ea	800.00
6' D10R C.B.	4 ea	5 ea	9 ea	900.00
8' D10R C.B.	6 ea	-0-	6 ea	1000.00
10' D10R C.B.	4 ea	-0-	4 ea	1100.00
4'x2'Ditch	1560 1f	-0-	1560 1f	12.75
2'x2'Ditch	2020 1f	-0-	2020 1f	10.40
3'x3'Ditch	1390 1f	-0-	1390 1f	15.15
4'x4' Swale	-0-	750 1f	750 1f	12.00
5'x5' Swale	-0-	480 1f	480 1f	17.00
Gabion Drops	-0-	3 ea	3 ea	1000.00
5'x5'channel	-0-	980 1f	980 1f	25.75
6'x5'channel	-0-	1090 1f	1090 1f	27.25
6'x5.2'channel	-0-	650 1f	650 1f	28.00
7'x6.3'channel	-0-	1070 1f	1070 1f	34.75
24" Rd. crossing	4 ea	-0-	4 ea	750.00
48" Rd. crossing	4 ea	-0-	4 ea	1000.00
Construction Cost	\$306,174.50	\$151,706.00	\$457,880.50	
10% Engr. & Cont.	30,617.45	15,170.60	45,788.05	
Total Cost	<u>\$336,791.95</u>	<u>\$166,876.60</u>	<u>\$503,668.55</u>	

Cost per 257.51 acres
 \$ 1,307.88 \$ 648.04 # 1,955.92

1977 Drainage Fee----\$1,003.00/acre \$258,282.53
 1977 Bridge Fee-----\$ 106.00/acre \$ 27,296.06

8. Fees and Credits

- a. Sand Creek Basin: The drainage fee of \$1,705.00 per acre would be appropriate at the time of platting.
- b. Peterson Field Basin: Decisions on fees should be made at the time of platting.

1" = 200'

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

$$T_p = 0.5 + 0.6 T_c$$

$$Q_p = 484 A Q / T_p$$

$$I = 2"$$

$$D = 1 \text{ hr, } 50 \text{ year}$$

NORTH AREA

MAJOR BASIN	SUB BASIN	AREA		BASIN		Tc	DITCH		V	TPO	FLOW		Tb
		Planim. Read	MILE	LENGTH	HEIGHT		Soil Sp LENGTH	CM SLOPE			Q	qp	
I	A	12.48	0.0179	1160	16	0.155	A	94		0.593	1.40	20.5	
	B	15.69	0.0225	1660	34	0.175	↑	↑		0.605	↑	25.2	
	C	13.06	0.0187	1390	22	0.169				0.601		21.1	
	D	26.17	0.0375	2600	36	0.288				0.673		37.8	
	E	14.28	0.0205	1600	22	0.199				0.619	↓	22.4	
	F	6.93	9.94 ⁻³	860	14	0.115	A	94		0.569	1.40	11.8	
HOOKS	F		0.026			0.135		96			1.57	35	
	+IC		0.019	1390	V=7.13	+0.054		94					
	Total		0.045			0.189		95.2		0.613	1.48	52.5	
	+IB		0.023	540	V=10.70	+0.014		94					
Total	Outfall #1		0.068			0.203		95		0.622	1.48	78.3	
I	D+E		0.0580	Use longest which is "D"		0.288		94		0.673	1.40	58.4	
	Outfall #2 D+E+F		0.0679	650'	V=8.3	+0.022		94		0.686	1.40	67.1	
	G	10.89	0.0156	1440	22	0.176	A	94		0.606	1.40	17.5	
II	A	38.79	0.0557	2680	36	0.298	B	96		0.679	1.57	62.3	
	B	44.04	0.0632	2320	40	0.243	B	96		0.646	1.57	74.4	

HYDROLOGIC COMPUTATION - BASIC DATA

PROJ: Newport Master Drainage

By: DE WATTS
Date: 9-24-76



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Suite 200
4525 Northpark Drive
Colorado Springs, Colo. 80907

NORTH AREA

MAJOR BASIN	SUB BASIN	AREA		BASIN		Tc	DITCH		V	TPO	FLOW		Tb
		Planim. Reod.	MILE	LENGTH	HEIGHT		Soil Sp. LENGTH	Cu SLOPE			Q	qp	
II	C	13.91	0.0192	1310	19	0.167	B	96		0.600	1.57	24.3	
	D	31.33	0.0450	3640	38	0.416	↑	↑		0.750	↑	45.6	
	E	28.45	0.0408	3560	38	0.406	↓	↓		0.743	↓	41.7	
	F	14.03	0.0201	1040	18	0.131	B	96		0.578	1.57	26.4	
New Fountain Inflow	Hook J		0.011			0.111	.	100				18.9	
	Hook DI		0.042			0.169		100				20.1	
	Hook CI		0.015	Use Greatest →		0.181		94				17.3	
	Total		0.038	1260	16	+0.171 0.352		97.6		0.711	1.77	45.8	
Old Fountain Inflow	Hook Z		0.040			0.199		98				56.2	
	Hook BI		0.004			0.051		98				7.5	
	Hook V		0.016			0.226		100				23.7	
	Hook W		0.021	Use Great. →		0.252		96				25.6	
	Hook Y		0.016			0.226		100				23.7	
	Total		0.097			0.252		98.2		0.651	1.77	127.6	
Lower Powers	IG +		0.0156			0.176	A	94				17.5	
				750	8	+0.163							
	II E		0.0408	890	16.6 ft		B	96				41.7	

HYDROLOGIC COMPUTATION - BASIC DATA

PROJ: Newport Master

By: OEW
Date: 9-24



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Colorado Springs, Colo. 80907

MAJOR BASIN	SUB BASIN	Planim. Reed.	AREA		BASIN		Tc	DITCH		V	TPO	FLOW		Tb
			MILE	LENGTH	HEIGHT	Soil LENGTH		CN SLOPE	Q			qp		
INT DITCH	HOOKS G		0.020				0.267		96				23.4	
	+old Fountain		0.097	2020'	V=7.97		+0.070		98.2					
	Total		0.117				0.337		97.8		0.702	1.77	142.8	
	+New Fountain		0.038						97.6					
	+ $\frac{2}{3}$ II C		0.013	1390'	V=13.20		0.029	B	96					
	Total		0.168				0.386		97.6		0.720	1.77	200.0	
	To Entrance			760'	V=4.58		+0.046 0.412							
TRUNK LINE	II A		0.0557				0.298	B	96					
	+ $\frac{1}{2}$ II B		0.0211	1480'	V=8.81		+0.047	B	96					
	Total		0.0768				0.345		96		0.707	1.57	82.5	
	+ $\frac{2}{3}$ II B		0.0421	900'	V=11.67		0.021		96					
	Total		0.1189				0.366		96		0.720	1.57	125.5	
	+ $\frac{1}{5}$ II D + $\frac{1}{5}$ II C		0.0450						96					
	+INT +DITCH													
	Total		0.1639				0.366		96		0.720	1.57	173.0	
	+II F													

HYDROLOGIC COMPUTATION - BASIC DATA

PROJ: NEWPORT MASTER

By: DEWATT
Date: 2-7-77



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50YR
I = 2" D = 1 HR

100YR
I = 3" D = 1 HR See Peter Field Report p 5

MAJOR BASIN	SUB BASIN	AREA		BASIN		Tc	DITCH SOIL CP LENGTH	CN SLOPE	V	TPO	FLOW		Tb
		Planim. Read	MILE	LENGTH	HEIGHT						Q	qp	
Trunk Line -CONT-	+ IG + IE		0.056	490	V=11.24	+0.012		95.4					
TOTAL @ FOUNTAIN	-50YR		0.414 0.358			0.399		96.6		0.739	1.67	452.5	
TOTAL @ FOUNTAIN	-100YR		0.414 0.258			0.399		96.6		0.739	2.66	721	
III	A	23.69	0.0340	1860	23	0.233	B	96		0.640	1.57	40.4	
(50YR)	B	17.19 B 2.38 A	0.0281	1940	26	0.233	B+A	95.8		0.640	1.57	33.4	
	C	28.23 B 13.92 A	0.0605	2760	31	0.327	B+A	95.3		0.696	1.48	62.2	
	D	12.82 7.06 B	0.0184	1260	19	0.160	B	96		0.596	1.57	23.5	
	E	6.38 A	0.0193	870	10	0.133	B+A	95.1		0.580	1.48	23.8	
	F	9.55	0.0137	1140	14	0.160	A	94		0.596	1.40	15.6	
	G	24.15	0.0347	1760	24	0.215	B	96		0.629	1.57	41.9	
	H	9.75	0.0140	1580	20	0.203	B	96		0.622	1.57	17.1	
	I	16.80	0.0241	1680	¹⁸ 1680	0.227	A	94		0.636	1.40	25.7	
Upper Inflow	Hooks K		0.029			0.148		100				48.8	
	Hooks M		0.023	760'	V=10.32	+0.020		100				38.8	
	SubTotal		0.052			0.168		100		0.601	2.00	83.7	
	+ IIIA		0.034	340	V=8.70	+0.011	B	96					

SOUTH AREA

HYDROLOGIC COMPUTATION - BASIC DATA

PROJ: Newport Master

By: *ew*
Date: 9-28



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4525 Northpark Drive
Colorado Springs, Colo. 80907

SOUTH AREA

MAJOR BASIN	SUB BASIN	AREA		BASIN		Tc	DITCH SLOPE	V	TPO	FLOW		Tb
		Planim. Read.	MILE	LENGTH	HEIGHT					Q	qp	
Int. Storm Sewer	Subtotal		0.026			0.179	98.4		0.607	1.77	121.3	
	+ Hooks H I		0.032	820	V=9.65	+0.024	100					
	Subtotal		0.118			0.203	98.8		0.622	1.88	172.7	
	+ III B		0.028				95.8					
	+ III C		0.060	900	V=10.86	+0.023	95.3					
	Subtotal		0.206			0.226	97.4		0.636	1.67	262.0	
	+ III F Ditch OUTFALL		0.014	540	V=11.03	+0.014	94					
			0.220			0.240	97.2		0.644	1.67	276.2	
III	G		0.0347			0.215	96					
	H		0.0140	800	7	+0.039	96					
	Outfall Total		0.0487			0.354	96		0.712	1.57	52.0	
700 YR DESIGN FLOWS FOR INTERCEPTOR CHANNEL												
	FOUNTAIN TOTAL		0.414			0.399	96.6			2.66	721	
	+ III D		0.018			+0.019	96					
	Subtotal		0.432			0.413	96.6		0.748	2.66	744	
	+ III E		0.019			+0.016	95.1					

HYDROLOGIC COMPUTATION - BASIC DATA

PROJ: New Port Master

By: *sew*
Date: 9-28



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4525 Northpark Drive
Colorado Springs, Colo. 80907

MAJOR BASIN	SUB BASIN	AREA		BASIN		Tc	DITCH		V	TPO	FLOW		Tb
		Planim. Read.	MILE	LENGTH	HEIGHT		LENGTH	SLOPE			Q	qp	
100 yr	DESIGN FLOWS FOR INTERCEPTOR CHANNEL										I = 3"		
	FOUNTAIN KING		0.387			0.387		96.7				654	
	+ III D		4018	980	V=18.88	0.0144		96					
	SUBTOTAL		0.405			0.401		96.7		0.741	2.66	704	
	+ III E		0.019	1090	V=18.29	0.017		95.1					
	SUBT		0.424			0.418		96.6		0.751	2.66	727	
	INT + STS		0.220	650	V=17.42	0.011		97.2					
	SUBT		0.644			0.429		96.8		0.757	2.66	1095	
	+ III I		0.024	1070	V=17.63	0.017	A	94					
	SUBT		0.668			0.446		96.7		0.768	2.66	1121	
	+ heavy ch		0.049				B	96					
	<u>Total Outfall</u>		0.717			0.446		96.7		0.768	2.66	1202	

HYDROLOGIC COMPUTATION - BASIC DATA

PROJ:

By:
Date:



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Suite 200
4525 Northpark Drive
Colorado Springs, Colo. 80907

Street and Storm Sewer Calculations

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

STREET	LOCATION	DIST	ELEVATION & SLOPE	TOTAL RUNOFF	STREET FLOW CAPACITY	PIPE FLOW	TYPE PIPE, CATCH BASIN & SLOPE %
Sand Creek St. S. #1	Hooks E	550	6131 1.82%	35		35	30" RCP @ 0.72% min V=7.13
	Street	340	6121 1.07%	-	21.1/42.6	35	30" RCP @ 0.72% min
	Bottom IC	540	6112 2.22%	52.5		52.5	1-4', 1-6' D-10R 30" RCP 1.7% min V=10.70
	Powers Blvd	220	6100 1.36%	78.3	25.2/30.0	78.3	1-2', 2-6' D-10R's 36" RCP 1.38% min
	Outfall - Cox's		6097				
Lower Sand Creek	Interior Intersection	540'	6097 1.3%	37.8	37.8/48.6	-0-	2-8' D-10R's
	ID+IE Powers Blvd Int.	650	6090 1.23%	58.4	22.4/30.0	58.4	1-6', 1-4' D-10R' 36" RCP, 0.78% min, V=8.3
	ID+IE+IF Added Cox's Outfall	120	6082 1.67%	67.1	11.8/30.0	67.1	2-4' D-10R's 36" RCP, 1% min
	Cox's Outfall		6080				
	Hooks Outfall		6068				
New Fountain Inflow	Hooks Outfall	970	6068 1.44%	45.8	24.3/30	45.8	30" RCP, 1.39% min, V=9.33 2-6' D-10R's
Old Fountain Inflow	Hooks Outfall	430	6085 1.16%	127.6	-	127.6	48" RCP, 0.88% min, V=10.15
Lower Powers St. S.	Catch Basin IE	890'	6070 1.12%	30.0	30.0/30.0	30.0	2-6' D-10R's 30" RCP, 0.55% min, V=6.11
	Catch Basin IE	850	6060 1.33%	57.4		57.4	2-6' D-10R's 36" RCP, 0.83% min, V=8.12
	Fountain Outfall		6049				
Trunk Line St. Sewer	Hooks Outfall G	320	6109 0.94%	23.4		23.4	24" RCP, 1% min, V=7.45
	Street IA	530	6106 1.18%		20.5/49.4 (0.9%)	44.4	2-4' D-10R's 30" RCP, 1.18% min, V=9.05
	Intersection IA		6095		27.9/30.1 (0.5%)		10' D-10R

NORTH AREA

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WESTERN
ENGINEERS

Project Newport Master Drainage Page 8 of 10
 Calc. by DELBARTS date 9-24
 Checked by _____ date _____

Street and Storm Sewer Calculations

$$Q = \frac{0.463}{0.015} \Delta 8\frac{1}{2} S^{1/2}$$

STREET	LOCATION	DIST	ELEVATION & SLOPE	TOTAL RUNOFF	STREET FLOW CAPACITY	PIPE FLOW	TYPE PIPE, CATCH BASIN & SLOPE %
Trunkline STS	Area II A		6107		20.5 / 1.7%	-0-	2-4' w 18" D-10R
		300	0.67%			20.5	24" RCP, 0.82% min
	INT		6105		13.9 & 27.9		1-10' & 1-6' w 27" & 21" RCP
		1480	1.69%			62.3	36" RCP, 0.87% min
	Old Fountain		6080		24.8 / 53.6	1.6%	2-6' w 21" RCP
		900	2.22%			82.5	36" RCP, 1.53% min
Entrance Rd			6060		49.6 / 52.2	1.5%	2-10' w 27" 2-8' w 24"
		610	0.984%		45.6 / 55.6	1.7%	54" RCP, 0.774% min
	E. Trance		6054		8.1 / 30	-	1-4' w 18"
Fountain King	Top						335.7 CFS 79.3 CFS
	Bot		1%			410	1-66" RCP + 42" RCP added later

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WESTERN
ENGINEERS

Project Leupert Master
 Calc. by DEBARTS
 Checked by _____ date 2-7-72
 Page 9 of 11

Street and Storm Sewer Calculations

$$Q = \frac{0.463}{0.013} \approx 35.6 \text{ } \approx 3 \frac{1}{3} \text{ } \approx 1 \frac{1}{2}$$

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STREET	LOCATION	DIST	ELEVATION & SLOPE	TOTAL RUNOFF	STREET FLOW CAPACITY	PIPE FLOW	TYPE PIPE, CATCH BASIN & SLOPE %
Truck line Storm S. - Cont -	Intersection EA		6095		13.9/30.8 (0.5%)		6" D-10R
	Old Fountain Inflow	1470	1.02%		24.8/53.6 (1.6%)	34.4	42" RCP, 0.7% min, V=8.77
	Main Entrance	940	2.13%		49.6/52.2 (0.5%)	219.9	2-8" D-10R's 48" RCP, 2.35% min, V=13.83
	Fountain Blvd	640	0.94%		45.6/55.6 (1.7%)	313.5	2-10" D-10R's E; 2-8" D-10R's
	Upper outfall	490	1.02%		26.4/30.0	373.0	66" RCP, 0.87% min, V=13.20
	Lower outfall	120	1% min			456.5	72" RCP, 0.78% min, V=11.24 10' D-10R 72" RCP @ 1.14% min or 6'x5' RCB @ 1.15% min
Area III C	510' to Intersect.		6028				
	290' to Int.	220	1.8%	57.2	57.2/57.2	-0-	
	Intersection	290	1.0%	62.2	42.2/42.6	20.0	2-4' D-10R's Q=20 CFS 24" RCP, 0.93% min 2-8" D-10R's
South Interior Storm Sewer	Hooks Outfall H		6038				
	Street	590	0.85%	54.0	-	54.0	36" RCP, 0.65% min
	Hooks M+K		6048				
	Intersection III A	340	1.18%	83.7		83.7	42" RCP, 0.7% min, V=8.70 2-8" D-10R's
	St. Sewer Inlet	820	1.34%	121.3	40.9/40.9 (0.9%)	121.3	48" RCP, 0.73% min, V=9.65
	Area III C Intersect.	900	1.33%	206.1	33.9/48.6	172.7	54" RCP, 0.77% min, V=10.86
	Outfall Channel	540	0.93%	262.0		262.0	66" RCP, 0.61% min, V=11.03

Project Newport Master
 Calc. by WJD date 9-27
 Checked by _____ date _____

Culvert & Channel Calculations



$d/b = 1$ $z = 1$ $K = 1.93 = Q_n / b^{2/3} S^{1/2}$
 $n = 0.015$ conc

Note earth $n = 0.034$ $b^{2/3} = 0.008564$ $Q/S^{1/2}$
 grass lined $z = 3$, $K = 3.97$ $A = 4b^2$

$b^{2/3} = 0.007772$ $Q/S^{1/2}$ $A = 2b^2$

AREA	LOCATION & DISTANCE	ELEV & S%	S 1/2	Q50	b 8/3	b	S F AREA	USE DITCH	CULVERT ETC.	TIME HRS
HOOKS	@ Inflow	610.9								
	2020	1.19%	0.1090	23.4	1.668	1.212	2.936	2'x2'	24" RCP's	
	Old Fountain	6085								
	1390	1.37%	0.1169	142.8	9.493	2.326	10.82	3'x3'	48" RCP's	
	New Fountain	6066								
	750	0.5%		200.0	29.22	3.309	43.67	4'x4'	54" min. S = 1.04%	
	Main Entrance No	-								
	480	0.5%		366	44.32	4.145	68.71	5'x5'	-	
	Exist Xing	-								
HOOKS K	Furrow 36" RCP	6059								
	760'	1.45%	0.1203	48.8	3.15	1.54	4.73	4'x2'	V = 10.32	
	Req STS	6048						FB = 1.1'		
South Ditch	Bot III G	6015								
	800'	0.875%	0.0935	52.0	4.32	1.73	5.99	4'x2'	V = 8.67	
	Outfall D	6008						FB = 0.9'		
Outfall Ditch	Fountain Outfall	6099								
	900'	1.22%	0.1107	704	49.43	4.32	37.28	5'x5'	V = 18.88	
	III D Bot	6036								
	1090'	1.10%	0.1049	727	53.84	4.46	39.75	6'x5'	V = 18.29	
	III E Bot	6024								
	650'	0.92%	0.0961	727	58.80	4.61	42.47	6'x5.2'	V = 17.12	
	Top Astrogom	6018								
	60'	use 1%	0.100	1095*					10'x6' RCB	
	Astrogom	6016								
	1070	0.75%	0.0865	1124	100.72	5.64	63.59	7'x6.3'	V = 17.63	
	Outfall PT	6008								
RCB Design 10:10'		b	d	A	WP	R	R ^{2/3}	Q	V	
		10	5.0	50.0	20.0	2.500	1.842	1053		
			5.2	52.0	20.4	2.549	1.866	1109	21.3	

UNITED WESTERN ENGINEERS

Project: Newport Master
 Calc. by: OGDATTS
 Checked by: _____
 date: 2-7-77
 Page 10 of 11

QUANTITY SUMMARY

Use 26' RCP/CS $\text{Graveling} = 9/\text{SY}$ DITCH Exc = 2.50/CY $\text{Sub} = 12.20/\text{SF}$
 * = Bridge Fee ITEM - NOT IN TOTAL

ITEM	INSIDE DEVP	OUTSIDE DEVP IN FOUNDATION OR POWERS	TOTAL Q	UNIT PRICE	
SAND CREEK:					
18"	26	78	104	14	
21"	26	78	104	15	
24"	52	-	52	16	
27"	-	-	0	-	
30"	550 + 840 + 540	1930	-	1930	22
36"	-	220 + 650 + 120	990	990	27
4' D 10R	1	111	3	4	800
6'	1	111	3	4	900
8'	11	2	-	2	1000
6' Inl	1	1	-	1	400
Ch	1070'	-	-	1070'	35
PETE FIELD					
18"	104	104	208	14	
21"	104	120	224	15	
24"	300 + 290 + 156	746	-	746	16
27"	104	-	104	19	
30"	-	460	-	460	22
36"	1480 + 900 + 590	2970	-	2970	27
42"	340	340	60*	340 (60*)	29
48"	820	820	-	820	31
54"	610 + 900	1510	-	1510	38
66"	540	540	-	540	56
10x6 RCB	-	60*	60*	(60*)	200
4' D 10R	1111	4 1111	4	8	800
6'	1111	4 1111	5	9	900
8'	1111	6	-	6	1000
10'	1111	4	-	4	1100
4x2ch	760 + 800	1560	-	1560	3.50
5x5ch	-	-	980	980	25.75
6x5ch	-	-	1090	1090	27.25
6x5.2ch	-	-	650	650	28.00
7x6.3ch	-	-	1070	1070	34.75
24" Rd X	4	4	-	4	750
48" Rd X	4	4	-	4	1000
2x2ch	2020	-	-	2020	10.40
3x3ch	1390	-	-	1390	15.15
4x4ch	-	750	750	750	12.00
5x5ch	-	-	480	480	17.00
Gabin Dips	-	-	3	3	1000

12.75

SUPPLEMENTAL ANNEXATION AGREEMENT

THIS SUPPLEMENTAL ANNEXATION AGREEMENT, made this 17th day of October, 1971, by and between James Barry Craddock, d/b/a, ~~Colorado corporation~~, herein referred to as "Developer", and the City of Colorado Springs, a municipal corporation, herein referred to as "the City",

WITNESSETH:

WHEREAS, Developer is the owner of certain real property, specifically described in "Exhibit A", attached hereto and by reference made a part hereof, which it is willing to dedicate for public use in the manner and to the extent herein set out, and

WHEREAS, Developer has heretofore petitioned for annexation of certain property to the City, said property more specifically described in Ordinances Nos. 4221 and 4209, and

WHEREAS, the City has begun annexation proceedings in accordance with the terms and conditions set forth in Annexation Agreements executed by the Developer on the 17th day of March, 1971, and the 22nd day of March, 1971, and will proceed to complete both annexations in accordance with the terms and conditions of the said Annexation Agreements and the terms and conditions set forth in this Supplemental Agreement,

NOW, THEREFORE, in consideration of the mutual promises and covenants herein contained, the enhancement in value of the Developer's property, which is in the process of annexation, and in further consideration of benefits to the City and its citizens, the parties agree as follows:

1. Annexation: The City agrees to complete the aforesaid annexation proceedings.
2. Fountain Boulevard and Powers Boulevard:
 - (a) Use restriction: Developer covenants with the City that no buildings or other structures will be constructed upon the real property described as a strip of land 46 feet wide along each side of Fountain Boulevard and as shown in "Exhibit B", attached hereto and by reference made a part hereof, without the express approval of the City Planning Commission;

PROVIDED, HOWEVER, that said strips may be used by Developer for the purpose of automobile parking without City approval, when said strips are landscaped in accordance with a landscape design expressly approved by the City Planning Commission.

(b) Landscaping: Landscaping, in the areas designated as such in the parking design, shall be installed in accordance with Ordinance No. 3415, Cooperative Tree Planting Ordinance, Ordinance No. 3460, Hard Surfacing Ordinance, as if such areas were "Parking Strips" as defined therein; and Resolution No. 8927, Minimum Information to be Provided for Landscaping and Tree Planting Plans.

(c) Approval of Official Plan: The City will approve and adopt the plan for Fountain Boulevard, between Academy Boulevard and Peterson Field, and Powers Boulevard between the northerly line of Section 24, Township 14 South, Range 66 West of the 6th P.M. and the southerly line of Section 25, Township 14 South, Range 66 West of the 6th P.M., which plan is attached hereto, marked "Exhibit B".

(d) Dedication of Fountain Boulevard and Powers Boulevard Right-of-Way: Developer agrees to dedicate for the 148 foot right-of-way for Fountain Boulevard, for the 210 foot right-of-way for Powers Boulevard and for the grade separated interchange at the future intersection of Fountain Boulevard and Powers Boulevard all that land described in legal descriptions titled Tracts, A and B, attached hereto and by reference made a part hereof, and also shown on said "Exhibits A and B".

(e) Dedication of Land for Future Construction of Interchange on Fountain Boulevard: The Developer agrees to deed to the City all that property described in legal description titled Tract C, attached hereto and by reference made a part hereof and also shown on "Exhibits A and B" with the following restrictions. The City agrees to release said Deed for property to the Developer within a five year period, if the City determines that the additional right-of-way is not required for the proposed Powers Boulevard Fountain Boulevard interchange. The Deed will be held in escrow and not recorded until such time as the City determines that said property is required for the Powers Boulevard Fountain Boulevard interchange.

If the City does not, within the five year period, make a determination that this additional right-of-way is required, the Deed will revert to the Developer.

(f) Fountain Boulevard Median Cut: It is mutually agreed by the Developer and the City that the one median cut shown on "Exhibit B", located approximately midway between Powers Boulevard and Airport Road, will be permanent with the location to be determined upon final design of the grade separated interchange of Fountain Boulevard and Powers Boulevard. This median cut is to serve as the main entrance to the Developer's property from Fountain Boulevard, allowing access in both directions.

(g) Powers Boulevard Median Cuts: It is mutually agreed by the Developer and the City that the two median cuts shown on "Exhibit B", located at the future grade intersection of Powers Boulevard with Jet Wing Drive and the future grade intersection of Powers Boulevard with Astrozon Drive, will be permanent.

(h) Improvement of Fountain Boulevard Right-of-Way: The Developer and the City agree that in exchange for the dedication of additional right-of-way on Fountain Boulevard, the City will grant a waiver of certain requirements of the Subdivision Ordinance so that the Developer will be required to construct only a 24 foot wide paved street on Fountain Boulevard, which will be installed 12 feet on both sides of the centerline of Fountain Boulevard and built to City specifications, and the City will hold the Developer free of cost for the remaining and complete construction of Fountain Boulevard with its curb, gutter, pavement mat and median dividers.

(i) Improvement of Powers Boulevard Right-of-Way: The Developer and the City agree that in exchange for the dedication of additional right-of-way on Powers Boulevard, the City will grant a waiver of certain requirements of the Subdivision Ordinance so that the Developer will be required to construct only a 12 foot wide paved street on that section of Powers Boulevard, adjacent to his ownership, said pavement to be installed within the 12 foot area easterly of the centerline of Powers Boulevard and built to City specifications, and the City will hold the Developer free of cost for the remaining and complete construction of Powers Boulevard with its curb, gutter, pavement mat and median dividers. Pertaining to the required bridge structure where Powers Boulevard crosses the

proposed Sand Creek channelization, the parties shall share the cost of construction equally, it being expected that the Developer and the City will be reimbursed for the cost of said bridge through the drainage basin fund. It is further understood by both parties that the City will request the State Highway Department to place that portion of Fountain and Powers Boulevards shown on "Exhibit B" on the State Highway System, and therefore the parties will not commence construction of said bridge until such time as the State Highway Department officially refuses to place the two aforementioned Boulevards on the State system, or until the expiration of five years from date of this agreement, whichever is later.

(j) Access to Fountain Boulevard and Powers Boulevard: It is expressly understood between the parties that the City will adopt the access plan for Fountain Boulevard and Powers Boulevard, adjacent to the Developer's property, as shown on "Exhibit B"; that the approved access locations, without median cuts, will have proper acceleration and deceleration lanes generally as shown on "Exhibit B", which locations will be finally established and approved by the City upon final platting of the effected land adjacent to Fountain Boulevard and Powers Boulevard. Developer will construct access way to the 12 foot and the 24 foot paved streets described in the preceding paragraphs (h) and (i).

3. Time of the Essence: Time is of the essence of this Agreement. All properties which the Developer is required to dedicate to public use hereunder shall be so dedicated within thirty (30) days of the execution of this Agreement. All plans requiring the approval of the City under the terms of this Agreement shall be so approved within 30 days of the execution of this Agreement. The improvements on Fountain and Powers Boulevards hereby required to be made by the Developer shall be made at a time to be determined by the Developer or at such time as development commences on property adjacent to and/or directly opposite to the Developer's property, whichever event shall first occur.

4. Avigation Easement: Simultaneously with the execution of this Agreement, the Developer will execute the avigation easement hereto attached. The consideration running from the City to the Developer, which forms the basis of this present Agreement, is additional consideration for the exe-

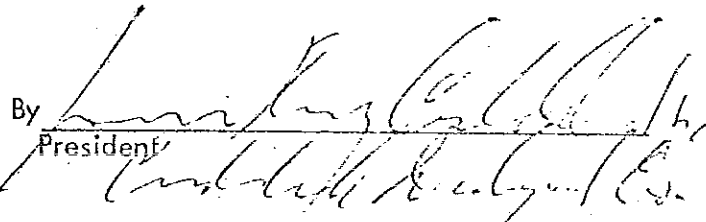
cution of the avigation easement.

5. Termination: Except for paragraphs 2a, 2b, and 2j, all provisions of this agreement not fully discharged by compliance herewith shall be terminated and of no further force and effect upon completion of improvements (including curb, gutter and paving) upon Powers Boulevard and Fountain Boulevard and upon development of a substantial majority of the land abutting upon Powers Boulevard between the northerly line of Section 24, Township 14 South, Range 66 West of the 6th P.M. and the southerly line of Section 25, Township 14 South, Range 66 West of the 6th P.M. and upon Fountain Boulevard between Academy Boulevard and Peterson Field, as shown on Exhibit "B" attached hereto. Such development shall be evidenced by City Planning Commission approval of subdivision plats.

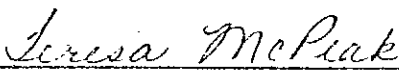
6. THIS AGREEMENT shall run with the land and be binding on the successors and assigns of the parties hereto.

IN WITNESS WHEREOF, the parties have executed this Agreement the day and year first mentioned above.

CRADDOCK DEVELOPMENT COMPANY

By 
President

ATTEST:


Secretary

THE CITY OF COLORADO SPRINGS

By _____
Mayor and President of the Council

ATTEST:

City Clerk

LEGAL DESCRIPTION

"TRACT A"

A tract of land in Sections 24 & 25, Township 14 South, Range 66 West of the 6th P.M., El Paso County, Colorado, more particularly described as follows:

Commencing at the Northeast corner of said Section 25; thence South $00^{\circ} 25' 13''$ East along the East line of said Section 25, 1301.26 feet; thence West 991.93 feet to the point of beginning; thence West 953.07 feet; thence North $67^{\circ} 54' 04''$ West 337.89 feet; thence North $45^{\circ} 00' 00''$ West 540.00 feet; thence North $15^{\circ} 30' 00''$ West 305.00 feet; thence North 2050 feet to a point of curvature, thence along a curve to the right having a central angle of $25^{\circ} 00' 00''$, a radius of 2759.79 feet, an arc length of 1204.18 feet; thence North $25^{\circ} 00' 00''$ East tangent to the last mentioned curve a distance of 1464.94 feet; thence North $53^{\circ} 39' 03''$ East, a distance of 120.27 feet; thence North $25^{\circ} 00' 00''$ East 70.00 feet; thence North $34^{\circ} 59' 01''$ East, 249.46 feet; thence North $83^{\circ} 00' 00''$ West 148.17 feet; thence South $25^{\circ} 00' 00''$ West 1840.39 feet to a point of curvature of a curve to the left; thence along said curve having a central angle of $25^{\circ} 00' 00''$, a radius of 2799.79 feet, an arc distance of 1221.64 feet; thence South tangent to the last mentioned curve, a distance of 2866.85 feet; thence East 1773.60 feet; thence North $00^{\circ} 25' 13''$ West 14.00 feet to the point of beginning and containing 11.16 acres more or less.

LEGAL DESCRIPTION

TRACT "B"

A tract of land in Section 25, Township 14 South, Range 66 West of the 6th P.M., situated in El Paso County, Colorado, more particularly described as follows:

Commencing at the Northeast corner of said Section 25; thence South $00^{\circ} 25' 13''$ East on the East line of said Section 25 1449.26 feet; thence West 991.93 feet to the point of beginning; thence continuing West along the last mentioned course 1734.58 feet; thence South 2529.74 feet; thence West 40.00 feet; thence North 2543.74 feet; thence East 1774.48 feet; thence South $00^{\circ} 25' 13''$ East 14.00 feet to the point of beginning and containing 2.89 acres more or less.

LEGAL DESCRIPTION

TRACT "C"

A tract of land in Section 25, Township 14 South, Range 66 West of the 6th P.M., situated in El Paso County, Colorado, more particularly described as follows:

Commencing at the Northeast corner of said Section 25; thence South $00^{\circ} 25' 13''$ East on the East line of said Section 25, 1449.26 feet; thence West 1950.08 feet to the point of beginning; thence continuing West 776.33 feet; thence South 810.00 feet; thence North $15^{\circ} 30' 00''$ East, 305.00 feet; thence North $45^{\circ} 00' 00''$ East, 540.00 feet; thence North $66^{\circ} 46' 55''$ East, 340.56 feet; to the point of beginning and containing 4.53 acres, more or less.