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**MASTER DEVELOPMENT  
DRAINAGE PLAN  
FOR  
NEW CROSSINGS SUBDIVISION**

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September, 1996

***Leigh  
& Whitehead  
Associates, Inc.***

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*CONSULTING CIVIL ENGINEERS & SURVEYORS  
2720 EAST YAMPA STREET, SUITE 1  
COLORADO SPRINGS, CO 80909-5061*

*LWA Project No. 96043.01*

RETURN WITHIN 2 WEEKS TO:  
CITY OF COLORADO SPRINGS  
STORM WATER & SUBDIVISION  
101 W. COSTILLA, SUITE 113  
COLORADO SPRINGS, CO 80903  
(719) 385-5979

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DRAINAGE PLAN (ENVELOPE)

September, 1996

City of Colorado Springs  
Stormwater and Subdivision  
Engineering Division  
101 W. Costilla, Suite 122  
Colorado Springs, CO 80903

**RE: New Crossings Subdivision  
Master Development Drainage Plan**

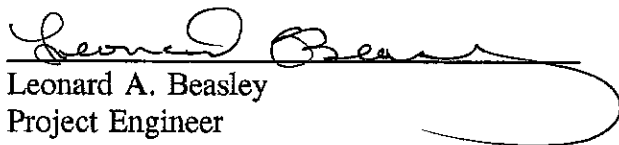
Dear Representative:

In accordance with the requirements of the City of Colorado Springs Subdivision Ordinance, a master development drainage plan has been prepared for the proposed New Crossings Subdivision.

This master development drainage plan has been prepared under the current City of Colorado Springs Drainage Criteria.

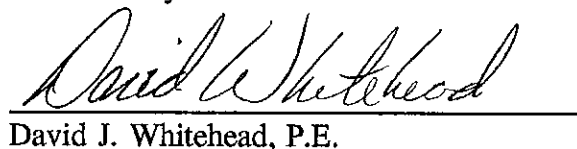
Seven (7) complete copies of the master development drainage plan are hereby transmitted for your review and approval. If there are any questions or comments concerning this report, please contact the undersigned.

Sincerely,

  
Leonard A. Beasley  
Project Engineer

9-13-96  
Date

Reviewed by:

  
David J. Whitehead, P.E.

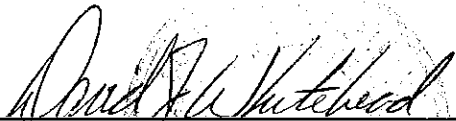
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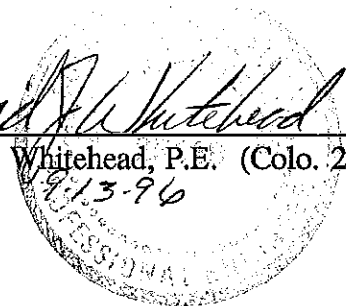
**SIGNATURES AND CERTIFICATIONS**

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**Engineer's Statement:**

The attached master development drainage plan was prepared under my direction and supervision and is correct to the best of my knowledge and belief. Said drainage plan has been prepared according to the criteria established by the City for drainage plans and said plan is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

  
\_\_\_\_\_  
David J. Whitehead, P.E. (Colo. 25118)



**Developer's Statement:**

The Developer has read and will comply with all the requirements specified in this drainage plan.

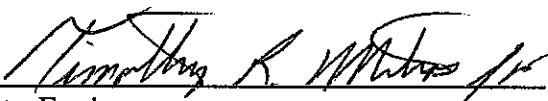
By:  \_\_\_\_\_

Address: 102 E. PIKES PEAK AVE

COLD SPRING, CO 80903

**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

September 13, 1996  
\_\_\_\_\_  
Date

**Conditions:** \_\_\_\_\_

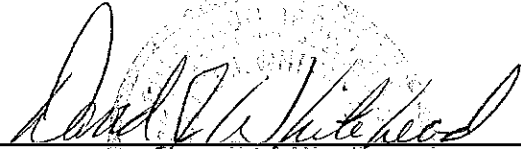
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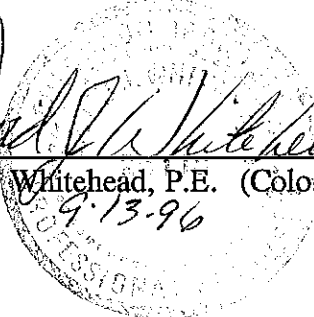
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## FLOODPLAIN STATEMENT

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To the best of my knowledge and belief, New Crossings Subdivision is not located in a F.E.M.A. designated 100-year floodplain, as shown on F.I.R.M. Panel No. 080060-0276C, dated September 30, 1992.

  
\_\_\_\_\_  
David J. Whitehead, P.E. (Colo. 25118)  
9-13-96



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## **DRAINAGE REPORT**

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### **Project Description:**

New Crossings Subdivision is located in the Southeast Quarter of Section 16, Township 13 South, Range 66 West of the 6th Principal Meridian. The property is bounded on the East by Union Boulevard, on the South by Vickers Drive, on the West by the Lynmar Racquet Club, and on the North by Lynmar Subdivision Filing No. 1 which is currently undeveloped.

This property is a replat of Lots 3 and 4 of Vista Grande Terrace Filing No. 25. These lots were vacated per Plat Book T-3, Page 16. The site is located within the Cottonwood Creek Drainage Basin. This area is zoned R-5 and contains 8.56 acres.

The planned improvements are for a senior assisted living facility and an apartment complex. Both types of development are allowed within the existing R-5 zone.

### **Existing Conditions:**

The property has a major drainage facility that exists along the northerly property line. These facilities consist of 60", 42" and 27" storm drain pipes. Above these pipes is a well defined, native grass-lined drainage ditch that flows in a northwesterly direction. The site has steep slopes, some in excess of 10% that direct surface runoff northerly to the aforementioned drainage ditch. The ground cover across the site is native grasses that range from moderate to average coverage. The soils consist of the Blakeland Loamy Sand, a somewhat excessively drained soil. The permeability of this soil is rapid which gives it the Hydrologic Group A rating. With the anticipated regrading, compaction and structures, the site was analyzed as a Type C soil. All of the upstream area was also analyzed using the Type C hydrologic soil group.

### **Offsite Condition:**

The drainage basin planning study for the Cottonwood Creek Drainage Basin prepared by U.R.S. Consultants, dated June 9, 1994, was used in preparing this report. To create continuity, the sub-basins in the URS study were also used in this report. Some discrepancies in basin areas were noted between the URS study and this report. These discrepancies were minor and had a negligible impact to the peak runoff. Basins Q1, Q2 and Q3, which coincide with the basins in the URS study, were divided into sub-basins to determine localized flows at catch basin and inlet locations.

These basins encompass an area totaling 241.8 acres. This is indicated on the attached plan

as Basin Q. The Vista Grande terrace area, upstream of this project, is almost completely developed with an extensive storm drain system. This system was evaluated and upgraded in 1990. The Cottonwood Creek Drainage Basin did not include this upgrade. An inventory was taken of the type and size of the existing inlets and storm drain and is shown on the attached drainage plan. As mentioned previously, these basins were divided into sub-basins to determine peak flows at the various catch basin/inlet locations. These catch basins and inlets were then analyzed to determine the interception capacity for each catch basin, and inlet for both the 5-year and 100-year storm. These catch basins and inlets intercept a substantial amount of flow. The carryover flow and runoff from each sub-basin is intercepted and conveyed to the existing storm system. The remaining runoff at the low point in Vickers Drive, East of Union Boulevard, has the capacity to intercept the remaining 5-year and 100-year flows and direct them to the existing storm system. From this information, it was determined how much runoff would be conveyed through the existing storm drain system and whether there would be a pressure flow problem during either storm. Peak flows for areas less than 100 acres were determined by using the rational method. For all areas that were greater than 100 acres, the SCS TR-55 hydrograph method was used. These peak flows are shown at pertinent locations. A comparison of flows between this report and the URS study was taken. The following is a table of those comparisons.

URS			LWA		
Basin	Area	Runoff	Basin	Area	Runoff
Q2	128.6 ac.	240.0 cfs	Q2	131.8 ac.	250.0 cfs
Q1 and Q2	193.7 ac.	390.0 cfs	DP-3	190.9 ac.	357.0 cfs
Q1, Q2, Q3	243.7 ac.	496.0 cfs	Q	241.8 ac.	452.0 cfs

As indicated in the table, the runoff quantities have some minor disparities which we feel have a negligible impact to the overall study. For this report, Leigh Whitehead & Associates runoff values were used. Based on these flows, a hydraulic analysis of the existing storm system was performed to determine any problems. The hydraulic analysis was based on flows developed by Leigh Whitehead & Associates. The existing storm system performs as it was designed. No problem areas were located, thus no overflow problems at the low point in Union Boulevard should be created. The downstream capacity of this system is approximately 540 cfs without any upstream bubbling problems. This data indicates that this system is capable of conveying the peak 100-year flows for runoff that was calculated by U.R.S. Their peak flow of 496 cfs is less than the systems capacity of 540 cfs. An area of concern is the existing inlet approximately 500' northwest of Union Boulevard. The H.G.L. at this location is approximately 10' below the proposed finish grade. Thus, a pressure relief or blowoff does not seem to be a problem.

**Proposed Improvements:**

Planned development for this site is anticipated to be a senior assisted living center indicated on the attached plan as Basin I, and an apartment complex indicated as Basin II. Both basins will require some extensive grading to allow access to the sites and for interior traffic movement. Runoff calculations were based on some basic assumptions for both sites. Flows should be directed away from the buildings to swales and to the interior parking areas. These flows should be routed to the existing storm drain system that runs through the property. This ditch should remain so surface flows are intercepted and conveyed northwesterly. Also, it can be used for an emergency overflow if the existing storm drain system plugs. If grading occurs within the ditch area, provisions should be made so the runoff can still be routed northwesterly. This type of detail should be discussed in the final drainage reports for these sites. Runoff quantities for the 5-year and 100-year flow are shown on the attached plan. Calculations for this site are in the back of this report.

**Facilities:**

No public facilities are required. Private facilities will be required. These will be shown on the final drainage report.

**Drainage Fees:**

New Crossings Subdivision lies within the Cottonwood Creek Drainage Basin. This property has been previously platted. Therefore, no fees are required.

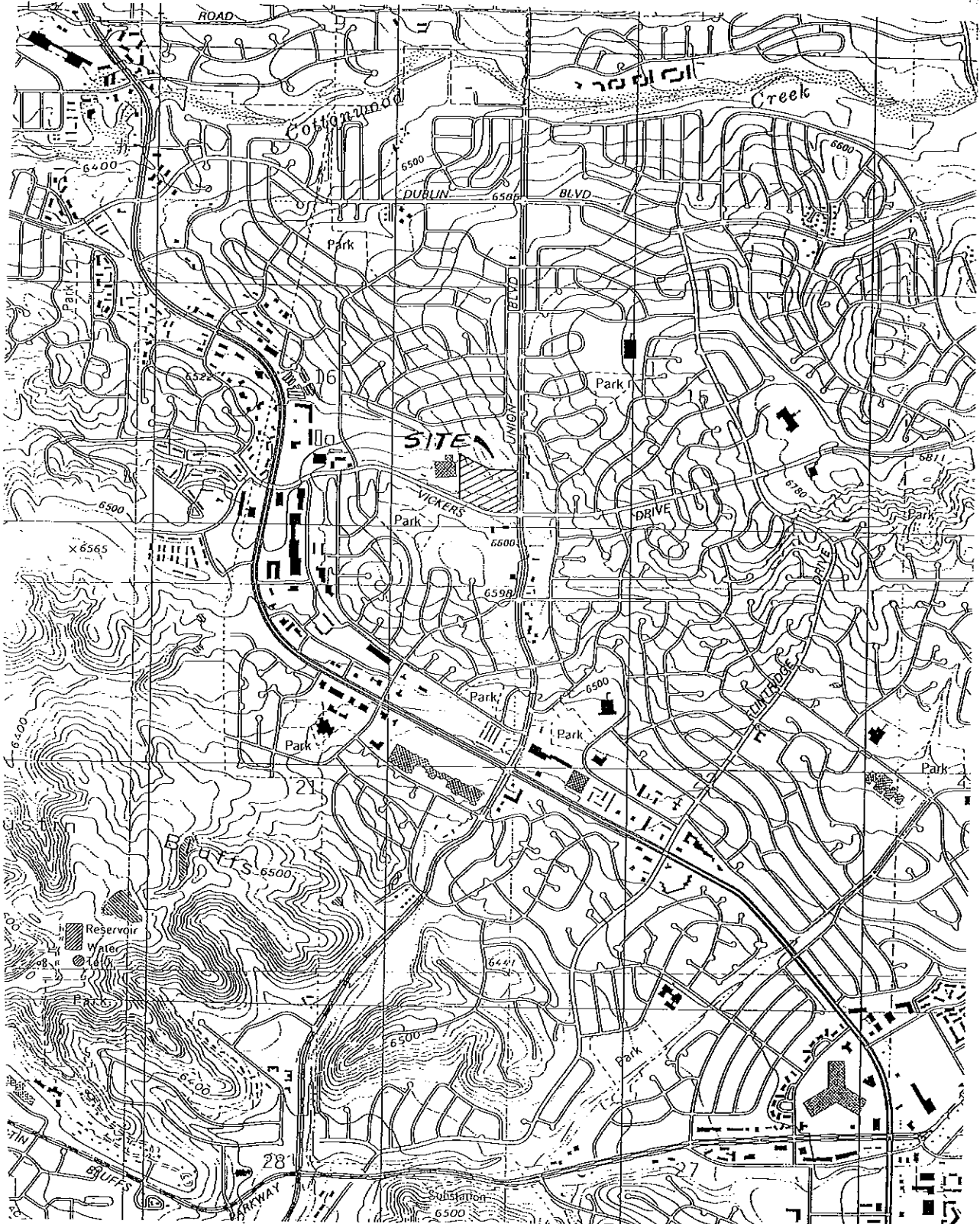


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**MAPS AND CALCULATIONS**

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NORTH

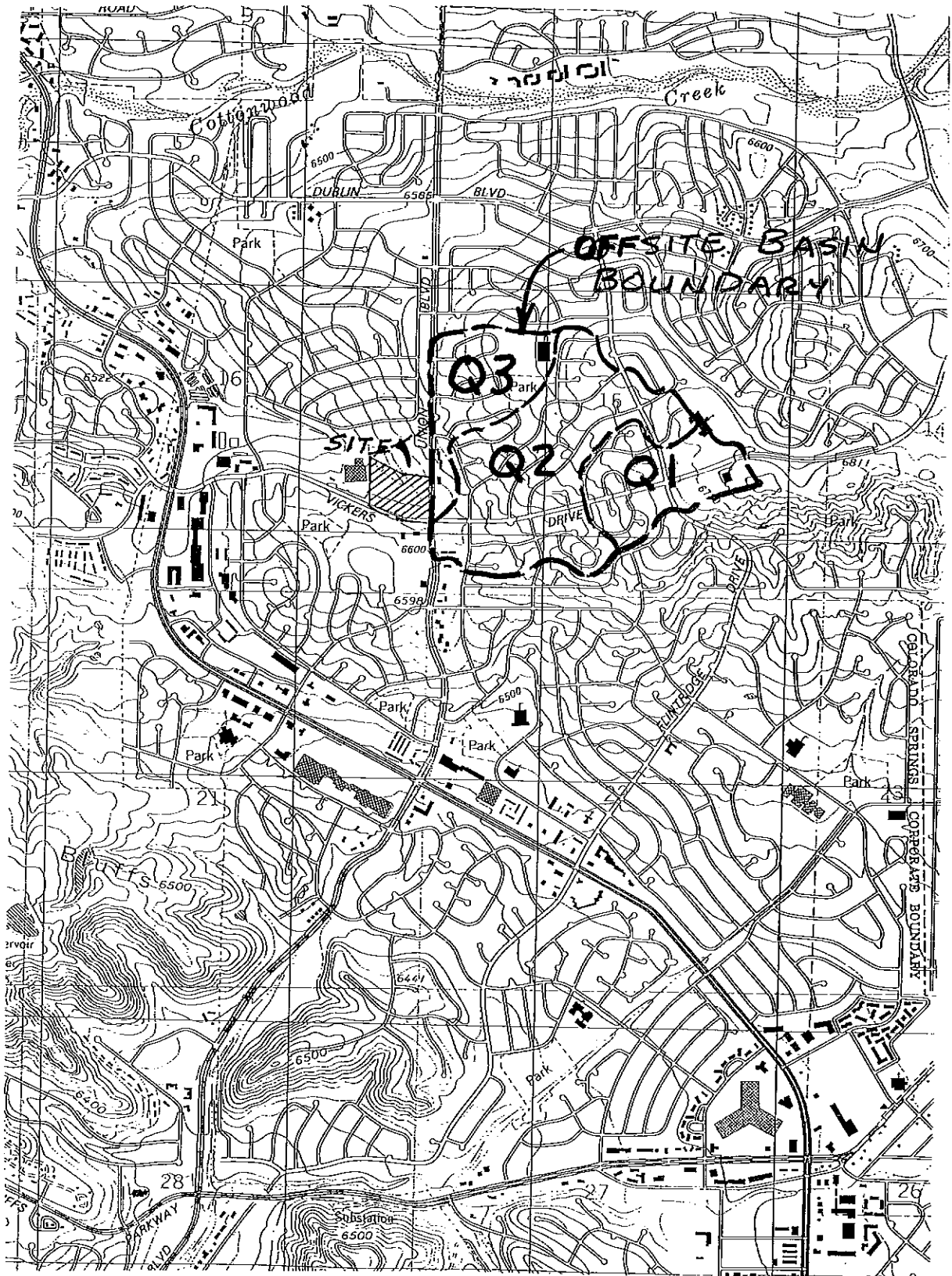


# LOCATION MAP

*Leigh  
& Whitehead  
Associates, Inc.*

CONSULTING CIVIL ENGINEERS & SURVEYORS  
2720 EAST YAMPA STREET, SUITE 1  
COLORADO SPRINGS, CO 80909-5061

NORTH

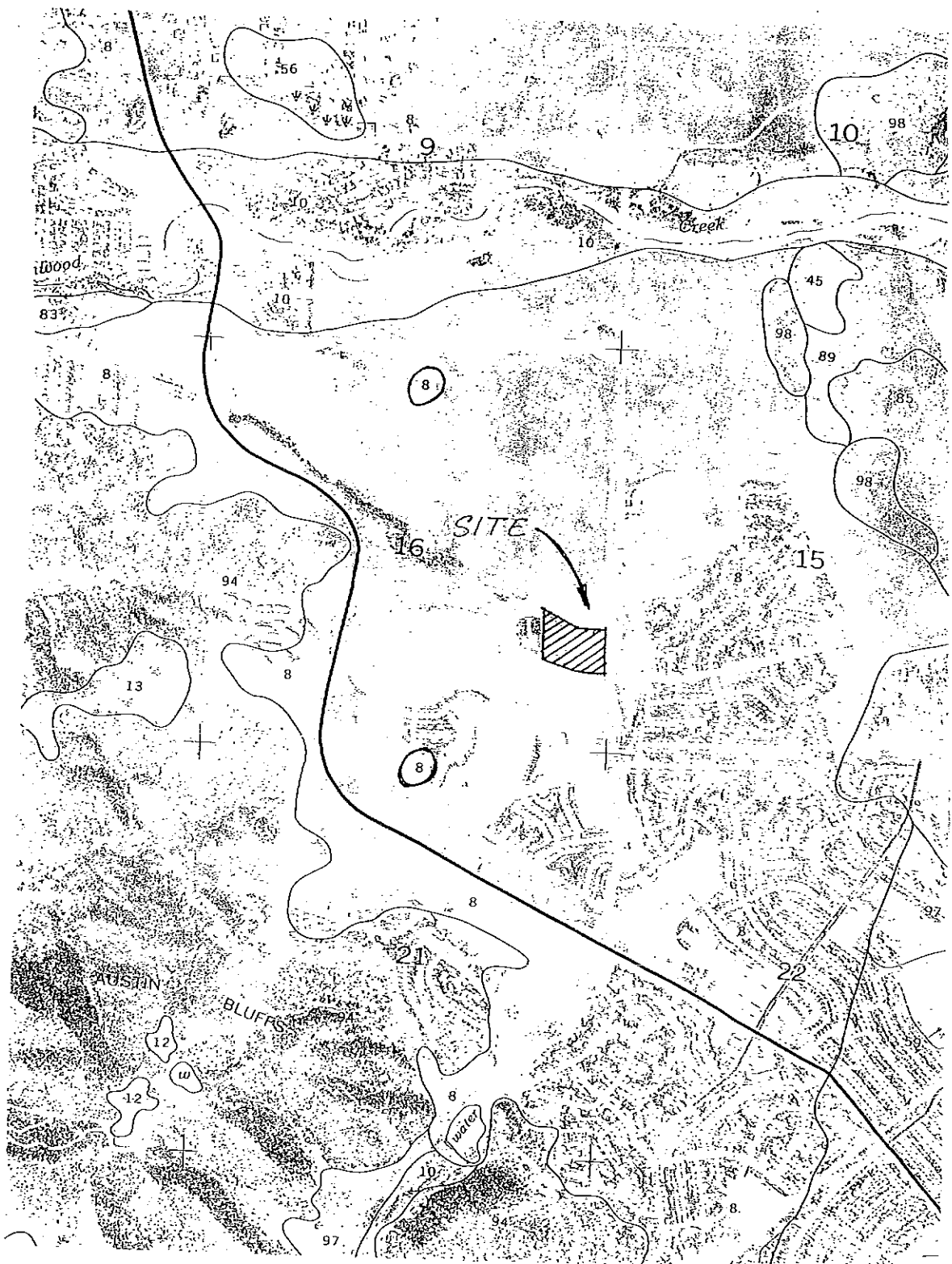


# OFFSITE DRAINAGE

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& Whitehead  
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2720 EAST YAMPA STREET, SUITE 1  
COLORADO SPRINGS, CO 80909-5061

NORTH



# SOILS MAP

Leigh  
& Whitehead  
& Associates, Inc.

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2720 EAST YAMPA STREET, SUITE 1  
COLORADO SPRINGS, CO 80909-5061

TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See "flooding" in Glossary for definition of terms as "rare," "brief," and "very brief." The symbol > means greater than]

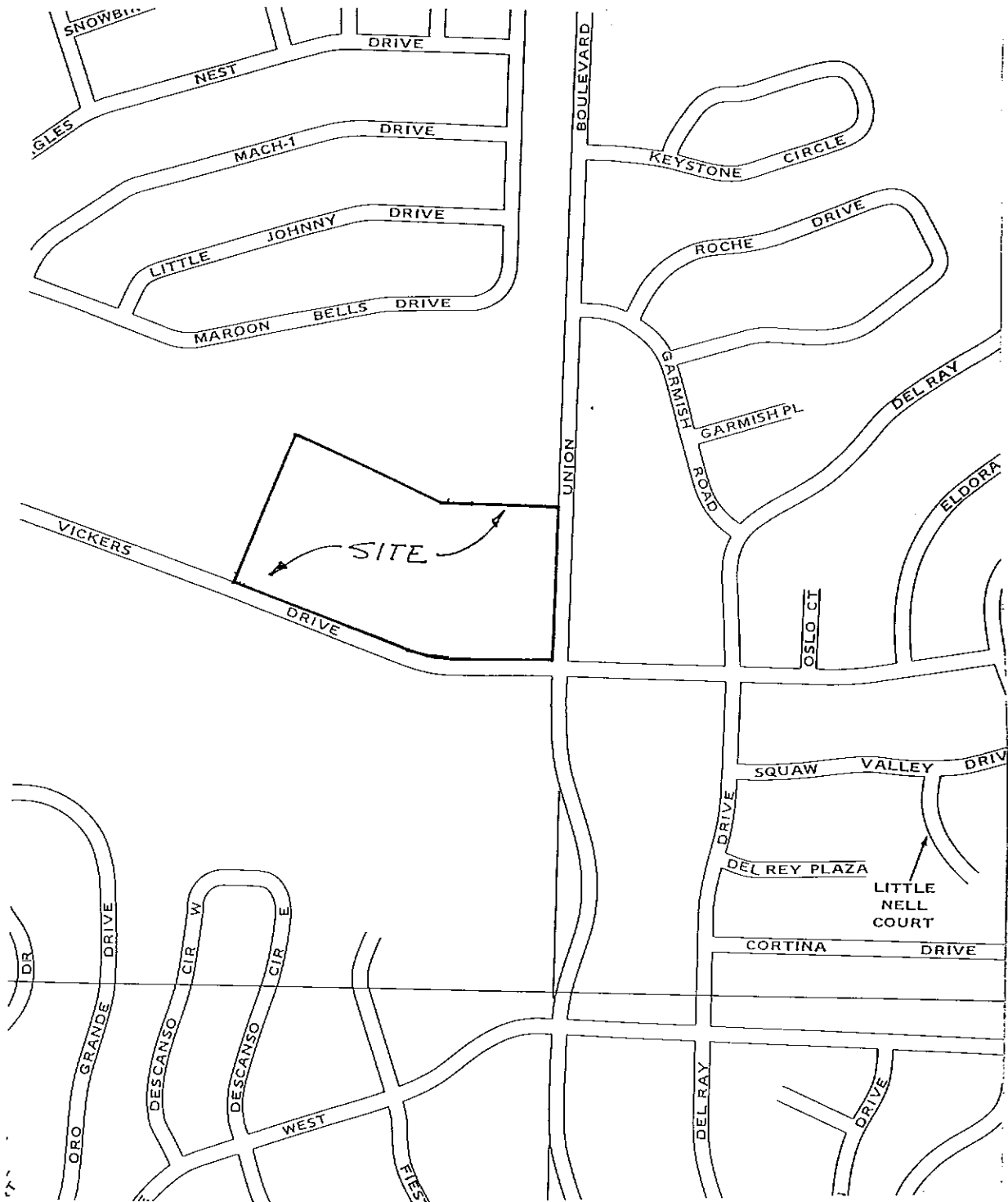
Soil name and map symbol	Hydro-logic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Hardness	
Alamosa: 1-----	C	Frequent-----	Brief-----	May-Jun	>60	---	High.
Ascalon: 2, 3-----	B	None-----	---	---	>60	---	Moderate.
Badland: 4-----	D	---	---	---	---	---	---
Bijou: 5, 6, 7-----	B	None-----	---	---	>60	---	Low.
Blakeland: 8-----	A	None-----	---	---	>60	---	Low.
19: Blakeland part-----	A	None-----	---	---	>60	---	Low.
Fluvaquentic Haplaquolls part-----	D	Common-----	Very brief-----	Mar-Aug	>60	---	High.
Blendon: 10-----	B	None-----	---	---	>60	---	Moderate.
Bresser: 11, 12, 13-----	B	None-----	---	---	>60	---	Low.
Brussett: 14, 15-----	B	None-----	---	---	>60	---	Moderate.
Chaseville: 16, 17-----	A	None-----	---	---	>60	---	Low.
118: Chaseville part-----	A	None-----	---	---	>60	---	Low.
Midway part-----	D	None-----	---	---	10-20	Rippable	Moderate.
Columbine: 19-----	A	None to rare	---	---	>60	---	Low.
Connerton: 120: Connerton part-----	B	None-----	---	---	>60	---	High.
Rock outcrop part-----	D	---	---	---	---	---	---
Cruckton: 21-----	B	None-----	---	---	>60	---	Moderate.
Cushman: 22, 23-----	C	None-----	---	---	20-40	Rippable	Moderate.
124: Cushman part-----	C	None-----	---	---	20-40	Rippable	Moderate.
Kutch part-----	C	None-----	---	---	20-40	Rippable	Moderate.
Elbeth: 25, 26-----	B	None-----	---	---	>60	---	Moderate.
127: Elbeth part-----	B	None-----	---	---	>60	---	Moderate.

See footnote at end of table.

*Leigh  
& Whitehead  
Associates, Inc.*

CONSULTING CIVIL ENGINEERS & SURVEYORS  
2720 EAST YAMPA STREET, SUITE 1  
COLORADO SPRINGS, CO 80909-5061

NORTH



# FEMA MAP

PLATE NO. 080060 0276 C

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Associates, Inc.*

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2720 EAST YAMPA STREET, SUITE 1  
COLORADO SPRINGS, CO 80909-5061

# LEGEND

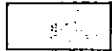


**SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD**

- ZONE A** No base flood elevations determined.
- ZONE AE** Base flood elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
- ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.



**FLOODWAY AREAS IN ZONE AE**



**OTHER FLOOD AREAS**

- ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

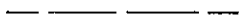


**OTHER AREAS**

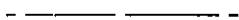
- ZONE X** Areas determined to be outside 500-year flood plain.
- ZONE D** Areas in which flood hazards are undetermined.



Flood Boundary



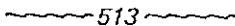
Floodway Boundary



Zone D Boundary



Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.



Base Flood Elevation Line; Elevation in Feet\*



Cross Section Line

(EL 987)

Base Flood Elevation in Feet Where Uniform Within Zone\*

RM7<sub>X</sub>

Elevation Reference Mark

\*Referenced to the National Geodetic Vertical Datum of 1929

# NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas.

Areas of special flood hazard (100-year flood) include Zones A, A1-30, AE, AH, AO, A99, V, V1-30 AND VE.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Floodway widths are provided in the Flood Insurance Study Report.

Coastal base flood elevations apply only landward of the shoreline.

Elevations reference marks are described in the Flood Insurance Study Report.

For adjoining map panels see separately printed Map Index

## MAP REPOSITORY

Colorado Springs

Planning Department, P.O. Box 1575,

30 South Nevada Avenue, Suite 301,

Colorado Springs, Colorado 80901

(Maps available for reference only, not for distribution.)

## INITIAL IDENTIFICATION:

FEBRUARY 1, 1974

## FLOOD HAZARD BOUNDARY MAP REVISIONS:

APRIL 4, 1978

## FLOOD INSURANCE RATE MAP EFFECTIVE:

DECEMBER 18, 1986

## FLOOD INSURANCE RATE MAP REVISIONS:

Map revised March 2, 1989 to change special flood hazard areas, base flood elevations, and to incorporate previously issued letters of map revision and map amendment.

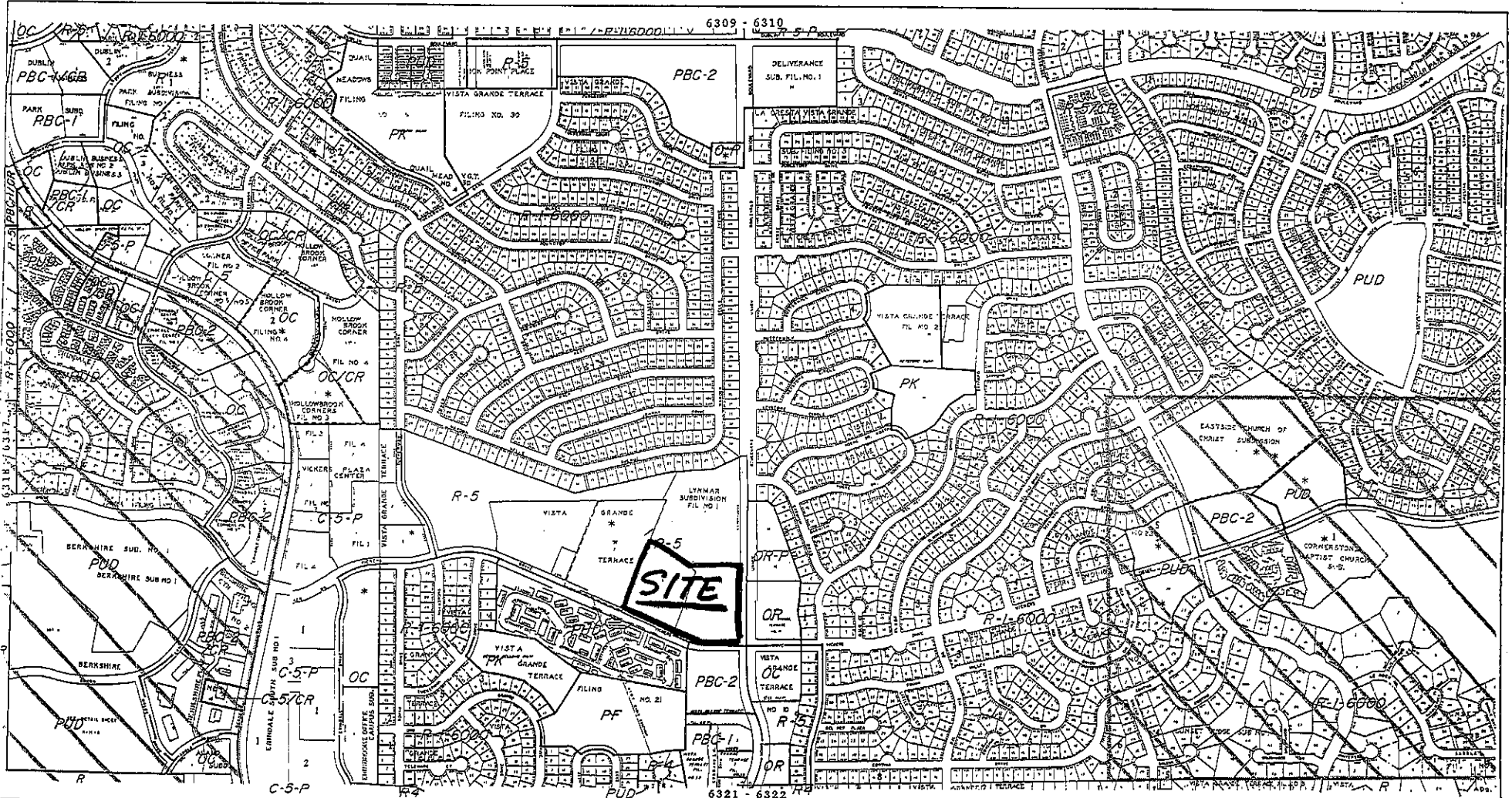
*Leigh  
& Whitehead  
& Associates, Inc.*

CONSULTING CIVIL ENGINEERS & SURVEYORS

2720 EAST YAMPA STREET, SUITE 1

COLORADO SPRINGS, CO 80909-5061

6309 - 6310



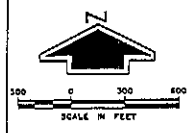
6321 - 6322

ZONING LEGEND		MHP	M-2	ICR
PUD	PLANNED UNIT DEVELOPMENT	MHS	HEAVY INDUSTRIAL	ZONE SUBJECT TO CONDITIONS OF RECORD
A	AGRICULTURAL	OR	APD	CITY LIMITS
R	ESTATE-SINGLE FAMILY RESIDENTIAL	OC	SU	PUBLIC PARK
R-1	9,000 SQ. FT. SINGLE FAMILY RESIDENTIAL	PBC	RVP	RECREATIONAL VEHICLE PARK
R-1	6,000 SQ. FT. SINGLE FAMILY RESIDENTIAL	C-5	PF	PUBLIC FACILITIES
R-2	TWO-FAMILY RESIDENTIAL	C-5/CR	*	USE VARIANCE
R-4	EIGHT-FAMILY RESIDENTIAL	PIP	C-6	GENERAL BUSINESS
R-5	FIFTEEN-FAMILY RESIDENTIAL	M-1	HR	INTERMEDIATE BUSINESS
			P	PLANNED BUSINESS CENTER NO. 1 AND 2
				PLANNED INDUSTRIAL
				CONDOMINIAL USE
				HIGH RISE
				PLANNED PROVISIONAL

**PLANNING, DEVELOPMENT AND FINANCE DEPARTMENT**  
**DEVELOPMENT SERVICES DIVISION**  
 POST OFFICE BOX 1575 COLORADO SPRINGS, COLORADO 80901

# ZONING MAP

NOTICE:  
 THE OFFICIAL ZONING MAP OF THE CITY IS MAINTAINED IN THE PLANNING DEPARTMENT AND IS AVAILABLE FOR INSPECTION DURING REGULAR BUSINESS HOURS. PLEASE BE ADVISED THAT ALL COPIES OF THE OFFICIAL ZONING MAP ARE HEREBY DENIED UNOFFICIAL SHOULD NOT BE RELIED UPON AND MAY NOT ACCURATELY REFLECT CURRENT ZONING DISTRICTS DUE TO SOME CHANGES AFTER THE EFFECTIVE DATE OF THE OFFICIAL ZONING MAP.



BASE MAP REVISION DATE:  
 JUNE 30, 1989

ZONING MAP REVISION DATE:  
 APRIL 30, 1992



6316 - 6315



RUNOFF COMPUTATIONS

96043-1.WX3

RATIONAL METHOD  
 MASTER DEVELOPMENT DRAINAGE PLAN  
 NEW CROSSING SENIOR LIVING CENTER  
 UNION BOULEVARD & VICKERS DRIVE  
 COLORADO SPRINGS, COLORADO

LEIGH WHITEHEAD & ASSOCIATES, INC.  
 Engineers, Surveyors & Planners  
 2720 EAST YAMPA STREET, SUITE 1  
 COLORADO SPRINGS, COLORADO  
 (719) 636-5179

TABLE A:  
 OFFSITE CONDITIONS

LWA # 96043

SHT. 1 of 4

13-Jun-96

BASIN	AREA	SOIL TYPE	GEOMETRY		Tt 5 Tt 100	V Tt	tc 5 tc 100	i 5 i 100	Q5	Q100	COMMENTS
			C 5 C 100	LENGTH SLOPE							
Q-1a	15.00	C	0.63	450.0	21.00	11.21	4.80	18.33	3.10	29.3	51.2
			0.63	4.67		11.21	7.12	18.33	5.41		
Q-1b	3.10	C	0.63	100.0	2.00	6.99	4.00	10.74	3.97	7.7	13.5
			0.63	2.00		6.99	3.75	10.74	6.92		
Q-1c	7.80	C	0.63	525.0	31.00	11.21	3.91	16.11	3.31	16.3	28.4
			0.63	5.90		11.21	4.90	16.11	5.77		
Q-1d	19.80	C	0.63	550.0	19.00	13.69	4.80	20.81	2.91	36.3	63.2
			0.63	3.45		13.69	7.12	20.81	5.07		
Q-1e	4.50	C	0.63	65.0	2.00	4.89	4.70	10.20	4.05	11.5	20.0
			0.63	3.08		4.89	5.31	10.20	7.06		
Q-1f	7.60	C	0.63	250.0	13.00	8.07	4.46	13.12	3.64	17.4	30.4
			0.63	5.20		8.07	5.05	13.12	6.35		
Q-1	59.10	C	0.63	550.0	19.00	13.69	4.80	20.81	2.91	108.3	188.8
			0.63	3.45		13.69	7.12	20.81	5.07		
Q-2a	2.00	C	0.61	60.0	3.00	4.17	2.90	9.63	4.14	5.1	8.8
			0.61	5.00		4.17	5.46	9.63	7.23		
Q-2b	10.60	C	0.61	200.0	10.00	7.62	4.52	14.63	3.47	22.4	39.1
			0.61	5.00		7.62	7.01	14.63	6.05		
Q-2c	11.20	C	0.61	100.0	6.00	5.07	4.59	11.97	3.79	25.9	45.2
			0.61	6.00		5.07	6.90	11.97	6.61		
Q-2d	3.30	C	0.61	270.0	14.00	8.75	3.00	13.19	3.63	7.3	12.8
			0.61	5.19		8.75	4.44	13.19	6.34		
Q-2e	2.00	C	0.61	50.0	1.00	5.15	6.28	6.88	4.66	5.7	9.9
			0.61	2.00		5.15	1.73	6.88	8.13		

RUNOFF COMPUTATIONS

96043-1.WK3

RATIONAL METHOD  
 MASTER DEVELOPMENT DRAINAGE PLAN  
 NEW CROSSING SENIOR LIVING CENTER  
 UNION BOULEVARD & VICKERS DRIVE  
 COLORADO SPRINGS, COLORADO

LEIGH WHITEHEAD & ASSOCIATES, INC.  
 Engineers, Surveyors & Planners  
 2720 EAST YAMPA STREET, SUITE 1  
 COLORADO SPRINGS, COLORADO  
 (719) 636-5179

TABLE A:  
 OFFSITE CONDITIONS

LWA # 96043

SHT. 2 of 4

13-Jun-96

BASIN	AREA	SOIL TYPE	GEOMETRY		Tt 5	V	tc 5	i 5	Q5	Q100	COMMENTS	
			C 5 C 100	LENGTH SLOPE								HEIGHT
Q-2f	2.40	C	0.61	380.0	12.00	12.22	2.65	15.81	3.34	4.9	8.5	
			0.61		3.16	12.22	3.59	15.81	5.83			
Q-2g	4.80	C	0.61	40.0	1.00	4.28	VARIES	7.27	4.58	13.4	23.4	
			0.61		2.50	4.28	2.98	7.27	7.99			
Q-2h	20.80	C	0.61	500.0	10.00	16.30	4.49	26.33	2.55	32.4	56.5	
			0.61		2.00	16.30	10.03	26.33	4.45			
Q-2i	13.40	C	0.61	50.0	1.00	5.15	VARIES	17.55	3.17	25.9	45.2	
			0.61		2.00	5.15	12.39	17.55	5.54			
Q-2j	4.40	C	0.61	50.0	1.00	5.15	4.69	10.13	4.06	10.9	19.0	
			0.61		2.00	5.15	4.97	10.13	7.08			
Q-2k	6.60	C	0.61	120.0	6.00	5.90	4.98	12.60	3.71	14.9	26.0	
			0.61		5.00	5.90	6.69	12.60	6.47			
Q-2l	13.70	C	0.61	50.0	1.00	5.15	4.70	16.15	3.31	27.6	48.2	
			0.61		2.00	5.15	11.00	16.15	5.77			
Q-2m	33.50	C	0.61	130.0	3.00	7.93	VARIES	22.80	2.77	56.5	98.6	
			0.61		2.31	7.93	14.87	22.80	4.83			
Q-2n	3.10	C	0.61	150.0	10.00	6.00	4.28	8.73	4.30	8.1	14.2	
			0.61		6.67	6.00	2.73	8.73	7.50			
Q-2	131.80	C	CN =	500.0	10.00	16.30	VARIES	30.66		91.0	250.0	SEE TR - 55 RUN
			79		2.00	16.30	14.36	30.66				
Q-3a	12.50	C	0.65	500.0	19.00	12.11	VARIES	20.52	2.93	23.8	41.5	
			0.65		3.80	12.11	8.41	20.52	5.11			
Q-3b	12.40	C	0.65	580.0	28.00	12.05	5.03	15.20	3.40	27.4	47.8	
			0.65		4.83	12.05	3.15	15.20	5.94			



RUNOFF COMPUTATIONS

96043-2.WK3

RATIONAL METHOD  
 MASTER DEVELOPMENT DRAINAGE PLAN  
 NEW CROSSING SENIOR LIVING CENTER  
 UNION BOULEVARD & VICKERS DRIVE  
 COLORADO SPRINGS, COLORADO

**LEIGH WHITEHEAD & ASSOCIATES, INC.**  
 Engineers, Surveyors & Planners  
 2720 EAST YAMPA STREET, SUITE 1  
 COLORADO SPRINGS, COLORADO  
 (719) 636-5179

TABLE B:  
 PROPOSED ONSITE CONDITIONS

LWA # 96043

SHT. 4 of 4

13-Jun-96

BASIN	AREA	SOIL TYPE	GEOMETRY		Tt 5	V	tc 5	i 5	Q5	Q100	COMMENTS	
			C 5 C 100	LENGTH SLOPE								HEGHT
I	4.00	C	0.45	300.0	11.00	13.71	1.63	17.38	3.19	5.7	13.4	
			0.56		3.67	11.39	3.66	15.06	5.96			
II	4.56	C	0.70	180.0	6.00	6.75	VARIES	9.70	4.13	13.2	28.2	
			0.80		3.33	5.06	2.95	8.01	7.73			
DP-5	255.75	C	CN =	500.0	10.00	15.97	VARIES	36.23		173.0	476.0	TOTAL PEAK FLOW SEE TR - 55 RUN
			79		2.00	15.97	20.26	36.23				
DP - 6	13.95	C	0.61	300.0	11.00	10.34	VARIES	17.63	3.17	26.9	53.6	BASINS I, II & PR-Q4a
			0.67		3.67	9.07	7.29	16.36	5.73			

RUNOFF COMPUTATIONS

TRAVEL TIME CALCULATIONS (TR-55)  
 MASTER DEVELOPMENT DRAINAGE PLAN  
 NEW CROSSING SENIOR LIVING CENTER  
 UNION BOULEVARD & VICKERS DRIVE  
 COLORADO SPRINGS, COLORADO

96043-1.WK3  
 LEIGH WHITEHEAD & ASSOCIATES, INC.  
 Engineers, Surveyors & Planners  
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OFFSITE CONDITIONS

LWA #98043

13-Jun-96

SHT. 1 of 2

BASIN	*K*	HIGH ELEV.	LOW ELEV.	LENGTH	HEIGHT	SLOPE	*V*	*TT*	COMMENTS
Q-1a	2.0	6800.0	6682.0	2050.0	118.0	5.76%	4.80	7.12	
Q-1b	2.0	6708.0	6672.0	800.0	36.0	4.00%	4.00	3.75	
Q-1c	2.0	6714.0	6670.0	1150.0	44.0	3.83%	3.91	4.90	
Q-1d	2.0	6800.0	6682.0	2050.0	118.0	5.76%	4.80	7.12	
Q-1e	2.0	6755.0	6672.0	1500.0	83.0	5.53%	4.70	5.31	
Q-1f	2.0	6737.0	6670.0	1350.0	67.0	4.96%	4.46	5.05	
Q-2a	2.0	6666.0	6646.0	950.0	20.0	2.11%	2.90	5.46	
Q-2b	2.0	6680.0	6583.0	1900.0	97.0	5.11%	4.52	7.01	
Q-2c	2.0	6684.0	6584.0	1900.0	100.0	5.26%	4.59	6.90	
Q-2d	2.0	6602.0	6584.0	800.0	18.0	2.25%	3.00	4.44	
Q-2e	2.0	6646.0	6582.0	650.0	64.0	9.85%	6.28	1.73	
Q-2f	2.0	6591.0	6581.0	570.0	10.0	1.75%	2.65	3.59	
Q-2g	2.0	6601.0	6569.0	460.0	32.0	6.96%	5.28	1.45	
	2.0	6569.0	6568.0	150.0	1.0	0.67%	1.63	1.53	
								2.96	*Q-2g* TOTAL
Q-2h	2.0	6764.0	6628.0	2700.0	136.0	5.04%	4.49	10.03	
Q-2i	2.0	6754.0	6746.0	550.0	8.0	1.45%	2.41	3.80	
	2.0	6746.0	6616.0	2400.0	130.0	5.42%	4.65	8.59	
								12.39	*Q-2* TOTAL
Q-2j	2.0	6693.0	6616.0	1400.0	77.0	5.50%	4.69	4.97	
Q-2k	2.0	6734.0	6610.0	2000.0	124.0	6.20%	4.98	6.69	
Q-2l	2.0	6754.0	6583.0	3100.0	171.0	5.52%	4.70	11.00	
Q-2m	2.0	6742.0	6724.0	500.0	18.0	3.60%	3.79	2.20	
	2.0	6724.0	6720.0	600.0	4.0	0.67%	1.63	6.12	
	2.0	6720.0	6600.0	1950.0	120.0	6.15%	4.96	6.55	
								14.87	*Q-2m* TOTAL
Q-2n	2.0	6600.0	6568.0	700.0	32.0	4.57%	4.28	2.73	
Q-2	2.0	6764.0	6628.0	2700.0	136.0	5.04%	4.49	10.03	
	2.0	6628.0	6568.0	1175.0	60.0	5.11%	4.52	4.33	
								14.36	*Q-2* TOTAL
	2.0	6667.5	6566.9	1950.0	100.6	5.16%	4.54	7.15	
Q-3a	2.0	6690.0	6662.0	700.0	28.0	4.00%	4.00	2.92	
	2.0	6682.0	6654.0	600.0	8.0	1.33%	2.31	4.33	
	2.0	6654.0	6630.0	360.0	24.0	6.67%	5.16	1.16	
								8.41	*Q-3a* TOTAL
Q-3b	2.0	6690.0	6630.0	950.0	60.0	6.32%	5.03	3.15	
Q-3c	2.0	6690.0	6630.0	1000.0	60.0	6.00%	4.90	3.40	
Q-3d	0.7	6714.0	6682.0	700.0	32.0	4.57%	1.50	7.80	
	2.0	6682.0	6564.0	2000.0	118.0	5.90%	4.86	6.86	
								14.66	*Q-3d* TOTAL
Q-3e	2.0	6656.0	6612.0	1150.0	44.0	3.83%	3.91	4.90	
	2.0	6612.0	6562.0	825.0	50.0	6.06%	4.92	2.79	
								7.69	*Q-3e* TOTAL
Q-3	0.7	6714.0	6682.0	700.0	32.0	4.57%	1.50	7.80	
	2.0	6682.0	6564.0	2000.0	118.0	5.90%	4.86	6.86	
								14.66	*Q-3* TOTAL
Q	2.0	6568.0	6561.0	470.0	7.0	1.49%	2.44	3.21	

RUNOFF COMPUTATIONS

96043-2.WK3

TRAVEL TIME CALCULATIONS (TR-55)  
 MASTER DEVELOPMENT DRAINAGE PLAN  
 NEW CROSSING SENIOR LIVING CENTER  
 UNION BOULEVARD & VICKERS DRIVE  
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PROPOSED ONSITE CONDITIONS

LWA #96043

13-Jun-96

SHT. 2 of 2

BASIN	"K"	HIGH ELEV.	LOW ELEV.	LENGTH	HEIGHT	SLOPE	"V"	"TT"	COMMENTS
I	1.5	6569.0	6567.0	170.0	2.0	1.18%	1.63	1.74	
	2.0	6567.0	6564.0	120.0	3.0	2.50%	3.16	0.63	
	1.5	6564.0	6544.0	300.0	20.0	6.67%	3.87	1.29	
								3.66	"I" TOTAL
II	2.0	6574.0	6540.0	605.0	34.0	5.62%	4.74	2.13	
	1.5	6540.0	6536.0	130.0	4.0	3.08%	2.63	0.82	
								2.95	"II" TOTAL
DP-5	0.7	6714.0	6682.0	700.0	32.0	4.57%	1.50	7.80	
	2.0	6682.0	6564.0	2000.0	118.0	5.90%	4.86	6.86	
	2.0	6564.0	6561.0	470.0	3.0	0.64%	1.60	4.90	
	60" PIPE	6545.0	6526.0	840.0	19.0	2.26%	19.95	0.70	
								20.26	"DP-5" TOTAL
DP-6	1.5	6569.0	6567.0	170.0	2.0	1.18%	1.63	1.74	
	2.0	6567.0	6564.0	120.0	3.0	2.50%	3.16	0.63	
	1.5	6564.0	6544.0	300.0	20.0	6.67%	3.87	1.29	
	1.5	6544.0	6536.0	440.0	8.0	1.82%	2.02	3.63	
								7.29	"DP-6" TOTAL

TABULAR HYDROGRAPH METHOD

Version 2.00

Project : NEW CROSSINGS  
 County : EL PASO  
 Subtitle: SUB BASIN PEAK FLOWS

State: CO

User: LAB  
 Checked: \_\_\_\_\_

Date: 06-13-96  
 Date: \_\_\_\_\_

Rainfall type: II      Frequency: 5 years

	----- Subareas -----					
	DP-1	DP-2	Q2	DP-3	Q	DP-5
Area(sq mi)	0.17	0.29	0.21	0.30	0.38	0.40
Rainfall(in)	2.6	2.6	2.6	2.6	2.6	2.6
Curve number	79	79	79	79	79	79
Runoff(in)	0.91	0.91	0.91	0.91	0.91	0.91
Tc (hrs)	0.44	0.47	0.51	0.51	0.57	0.60
(Used)	0.40	0.50	0.50	0.50	0.50	0.50
TimeToOutlet	0.00	0.00	0.00	0.00	0.00	0.00
Ia/P	0.20	0.20	0.20	0.20	0.20	0.20

Time (hr)	----- Subarea Contribution to Total Flow (cfs) -----					
	DP-1	DP-2	Q2	DP-3	Q	DP-5
11.0	1	2	2	2	3	3
11.3	2	3	2	3	4	4
11.6	3	4	3	4	5	5
11.9	6	7	5	8	10	10
12.0	12	13	10	14	17	18
12.1	29	29	21	30	37	39
12.2	58	60	44	62	79	83
12.3	82P	102	74	105	133	140
12.4	82	126P	91P	130P	165P	173P
12.5	65	124	90	128	162	171
12.6	46	102	74	106	134	141
12.7	35	78	57	81	102	108
12.8	27	61	44	63	80	84
13.0	18	39	29	41	52	54
13.2	14	28	20	29	37	39
13.4	11	22	16	23	29	31
13.6	10	19	13	19	24	26
13.8	9	16	12	17	21	22
14.0	8	15	11	15	19	20
14.3	7	13	9	13	17	18
14.6	6	11	8	12	15	16
15.0	6	10	7	11	13	14
15.5	5	9	7	10	12	13
16.0	5	8	6	9	11	12
16.5	4	8	6	8	10	10
17.0	4	7	5	7	9	9
17.5	4	7	5	7	9	9
18.0	4	6	5	7	8	9
19.0	3	6	4	6	7	8
20.0	3	5	3	5	6	7
22.0	2	4	3	4	6	6
26.0	0	0	0	0	0	0

P - Peak Flow

TABULAR HYDROGRAPH METHOD

Version 2.00

Project : NEW CROSSINGS  
 County : EL PASO  
 Subtitle: SUB BASIN PEAK FLOWS

State: CO

User: LAB  
 Checked: \_\_\_\_\_

Date: 06-13-96  
 Date: \_\_\_\_\_

	Rainfall type: II Frequency: 100 years					
	----- Subareas -----					
	DP-1	DP-2	Q2	DP-3	Q	DP-5
Area(sq mi)	0.17	0.29	0.21	0.30	0.38	0.40
Rainfall(in)	4.4	4.4	4.4	4.4	4.4	4.4
Curve number	79	79	79	79	79	79
Runoff(in)	2.29	2.29	2.29	2.29	2.29	2.29
Tc (hrs)	0.44	0.47	0.51	0.51	0.57	0.60
(Used)	0.40	0.50	0.50	0.50	0.50	0.50
TimeToOutlet	0.00	0.00	0.00	0.00	0.00	0.00
Ia/P	0.12	0.12	0.12	0.12	0.12	0.12

Time (hr)	----- Subarea Contribution to Total Flow (cfs) -----					
	DP-1	DP-2	Q2	DP-3	Q	DP-5
11.0	6	10	7	10	13	14
11.3	9	14	10	14	18	19
11.6	12	19	14	20	25	27
11.9	27	34	25	35	44	47
12.0	50	57	41	58	74	78
12.1	99	105	76	109	138	145
12.2	175	194	141	201	254	268
12.3	226P	300	217	310	393	414
12.4	221	345P	250P	357P	452P	476P
12.5	167	332	241	344	436	459
12.6	117	266	193	275	349	367
12.7	85	197	143	204	259	272
12.8	64	151	109	156	198	208
13.0	41	94	68	98	124	130
13.2	31	65	47	67	85	90
13.4	25	51	37	52	66	70
13.6	22	42	30	43	55	58
13.8	20	37	26	38	48	50
14.0	18	33	24	34	43	45
14.3	16	29	21	30	37	39
14.6	14	25	18	25	32	34
15.0	12	22	16	23	29	30
15.5	11	20	14	21	26	28
16.0	10	18	13	19	24	25
16.5	9	16	12	17	21	22
17.0	9	15	11	15	19	20
17.5	8	14	10	14	18	19
18.0	7	13	10	14	17	18
19.0	7	11	8	12	15	16
20.0	6	10	7	10	13	14
22.0	5	9	6	9	11	12
26.0	0	0	0	0	0	0

P - Peak Flow



HEC-1 100 YR.  
STA. PEAK  
FLOW

+		17	9837.	6.33	2456.	900.	867.	16.51
+	ROUTED TO	17-18	9670.	6.33	2458.	900.	867.	16.51
+	HYDROGRAPH AT	T4A	155.	6.08	19.	6.	6.	.09
+	ROUTED TO	T4A18A	152.	6.08	19.	6.	6.	.09
+	HYDROGRAPH AT	T1B	165.	6.08	20.	6.	6.	.13
+	2 COMBINED AT	18A	317.	6.08	39.	12.	12.	.22
+	HYDROGRAPH AT	S3	260.	6.08	33.	10.	10.	.18
+	3 COMBINED AT	18	10000.	6.33	2524.	922.	888.	16.91
+	ROUTED TO	18-19	9925.	6.42	2525.	922.	888.	16.91
+	HYDROGRAPH AT	Q1	165.	6.08	19.	6.	6.	.10
+	ROUTED TO	Q1-19A	161.	6.08	19.	6.	6.	.10
+	HYDROGRAPH AT	Q2	240.	6.17	32.	10.	10.	.20
+	2 COMBINED AT	19A	390.	6.17	51.	16.	15.	.30
+	HYDROGRAPH AT	Q3	104.	6.17	14.	4.	4.	.08
+	2 COMBINED AT	19B	495.	6.17	65.	20.	20.	.38
+	ROUTED TO	19B19C	491.	6.17	65.	20.	20.	.38
+	HYDROGRAPH AT	Q4	246.	6.08	31.	9.	9.	.13
+	2 COMBINED AT	19C	726.	6.17	96.	30.	28.	.51
+	HYDROGRAPH AT	Q5	167.	6.17	21.	7.	7.	.15

TR-55 = 250.0 cfs  
 .20 - LWA, M.D.P.P., BASIN "QZ" LWA AREA = 190.9 Ac.  
 TR-55 = 357.0 cfs  
 .30 - LWA, M.D.P.P. BASIN "DP-3" HEC-1 = 390.0 cfs.  
 URS AREA = 193.7 Ac.  
 LWA AREA = 241.8 Ac.  
 .38 - LWA, M.D.P.P. BASIN "Q" RATIONAL = 575.1 cfs  
 TR-55 = 433.0 cfs  
 URS HEC-1 = 495.0 cfs  
 URS AREA = 243.7 Ac.

COPIED FROM COTTONWOOD  
 CREEK D.B.P.S. BY U.R.S. CONSULT.  
 DATED JUNE 9, 1994 (APPENDIX B)

**COTTONWOOD CREEK DBPS - TABLE 1**  
**BASIN HYDROLOGY - SUMMARY OF PEAK FLOWS**  
**100-YEAR STORM** *BY U.R.S. CONSULTANTS*

BASIN	BASIN AREA (ACRES)	RATIONAL RUNOFF Q(CFS)	BASIN	BASIN AREA (ACRES)	RATIONAL RUNOFF Q(CFS)
H16	68.0	230.7	Q2	128.6	335.9
H17	65.0	214.4	Q3	50.0	135.3
H18	111.0	358.8	Q4	82.2	264.8
H19	75.2	218.5	Q5	98.2	255.2
H20	45.4	139.1	Q6	134.4	504.2
H21	51.7	214.5	Q7	116.4	348.4
H22	113.7	481.0	Q8	53.8	175.5
H23	67.0	214.6	R1	114.6	412.3
I1	129.7	343.4	R2	79.6	220.4
I2	64.7	163.2	R3	47.4	182.1
I3	85.4	222.0	R4	124.1	461.5
I4	111.2	240.3	R5	124.4	450.1
I5	157.2	374.1	R6	127.8	331.9
I6	175.1	620.9	R7	105.7	311.7
I7	95.7	323.6	S1	84.1	273.1
I8	68.2	216.6	S2	85.8	262.7
I9	29.4	84.5	S3	116.8	333.5
I10	109.7	333.2	T1A	56.9	202.4
J1	136.1	333.2	T1B	81.4	237.5
J2	54.2	196.1	T2	101.7	250.1
J3	84.6	369.3	T3	74.6	203.8
K1	108.0	300.5	T4A	60.7	182.4
K2	119.9	404.4	T4B	48.0	164.5
K3	62.8	216.4	U1	86.9	288.6
K4	93.8	290.9	U2	92.7	242.4
L1	92.7	287.6	U3	66.1	297.3
L2	94.0	211.7	U4A	53.4	150.2
M1	57.6	241.4	U4B	100.0	239.7
M2	130.9	391.9	V1	146.6	418.9
M3	102.1	290.8	V2	90.6	343.1
M4	146.5	344.3	W1	134.0	476.3
M5	65.1	182.0	W2	79.7	330.7
M6	64.6	189.0	W3	67.3	311.9
N1	98.1	358.2	X1A	30.6	83.5
N2	58.4	151.6	X1B	79.7	181.0
N3	162.4	422.9	X2	94.3	361.3
O1	72.0	226.5	X3	118.8	473.1
O2	77.8	243.0	X4	117.3	373.7
P1	77.8	236.0	X5	78.9	270.0
P2	53.7	131.8	Y1	79.6	228.0
P3	127.7	346.9	Y2	97.3	391.0
Q1	65.1	206.0			

SENIOR LIVING CENTER  
 UNION BLVD. & VICKERS DR.  
 COLORADO SPRINGS, COLORADO

CURB OPENING and CURB INLET COMPUTATIONS  
 CONTINUOUS GRADE 5 Year FLOW  
 LWA #96043

LEIGH WHITEHEAD & ASSOCIATES  
 ENGINEERS, SURVEYORS & PLANNERS  
 2720 EAST YAMPA STREET, SUITE 1  
 COLORADO SPRINGS, CO. 80909  
 (719) 636-5179

21-May-96

96043CB1.WK3

SHEET 1 of 4

NO.	GRATE SIZE	NET GRATE AREA (SF)	So	Sx	Q	T	Fw	FWT	L1 (0.770)	L2 (0.462)	L3 (1.65)	QI/Q	QI	Q2 (0.60)	LI (FT)		USE LI (ft.)	ACT. QI (cfs)	H	ACT. Q int (cfs)	Q-QI = Qc (cfs)
															QI<Q2 LI<L2	QI>Q2 LI>L2					
1	12' D-9	12.90	0.076	0.020	36.3	18.95	3.78											0.38	26.7	9.6	
2			0.076	0.020	9.6	11.51	3.43	39.48	30.40	18.26	65.14	0.53	5.1	5.8	16.00		16.0	5.1		4.6	
3	12' D-9	12.90	0.076	0.020	29.3	17.49	3.72											0.35	25.6	3.7	
4			0.076	0.020	3.7	8.05	3.18	25.59	19.71	11.83	42.23	0.68	2.5	2.2	16.00		16.0	2.5		1.2	
5			0.006	0.020	7.7	16.85	1.07	18.06	13.90	8.35	29.79	0.43	3.3	4.6	6.00		6.0	3.3		4.4	
6			0.006	0.020	16.3	22.32	1.13	25.21	19.41	11.66	41.59	0.31	5.0	9.8	6.00		6.0	5.0		11.3	
7	8' D-9	8.60	0.064	0.020	16.9	14.69	3.30											0.29	15.7	1.2	
8			0.040	0.020	11.5	13.89	2.58	35.86	27.61	16.58	59.17	0.29	3.3	6.9	8.00		8.0	3.3		8.2	
9			0.040	0.020	16.3	15.83	2.65	41.91	32.27	19.38	69.16	0.25	4.0	9.8	8.00		8.0	4.0		12.3	
10	12' D-9	12.90	0.064	0.020	25.1	17.04	3.40											0.34	25.1	0.0	
11			0.038	0.020	13.0	14.68	2.54	37.35	28.76	17.27	61.63	0.28	3.6	7.8	8.00		8.0	3.6		9.4	
12			0.087	0.020	16.2	13.65	3.79	51.81	39.89	23.96	85.48	0.20	3.2	9.7	8.00		8.0	3.2		13.0	
13			0.087	0.020	25.9	16.28	3.93	63.91	49.21	29.55	105.44	0.16	4.2	15.5	8.00		8.0	4.2		21.7	
14			0.029	0.020	21.7	18.77	2.31	43.39	33.41	20.06	71.59	0.24	5.2	13.0	8.00		8.0	5.2		16.5	
15			0.057	0.020	42.1	21.15	3.34	70.55	54.33	32.63	116.41	0.15	6.2	25.3	8.00		8.0	6.2		35.9	
16	8' D-9	8.60	0.057	0.020	6.3	10.37	2.91											0.21	6.3	0.0	
17			0.038	0.020	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00		8.0	0.0		0.0	
18			0.020	0.020	10.9	15.50	1.86	28.91	22.26	13.37	47.70	0.36	3.9	6.5	8.00		8.0	3.9		7.0	
19			0.033	0.020	14.9	15.87	2.41	38.18	29.40	17.66	62.99	0.27	4.1	8.9	8.00		8.0	4.1		10.8	
20	12' D-9	12.90	0.057	0.020	53.8	23.18	3.39											0.46	29.5	24.3	
21			0.008	0.020	25.9	25.47	1.29	32.93	25.36	15.23	54.34	0.61	15.9	15.5	16.00		16.0	15.9		10.0	
22			0.087	0.020	10.0	11.39	3.66	41.71	32.12	19.29	68.82	0.25	2.5	6.0	8.00		8.0	2.5		7.5	
23			0.008	0.020	22.4	24.12	1.28	30.88	23.78	14.28	50.95	0.63	14.1	13.4	16.00		16.0	14.1		8.3	
24			0.029	0.020	8.3	13.09	2.16	28.24	21.75	13.06	46.60	0.37	3.1	5.0	8.00		8.0	3.1		5.2	
25			0.005	0.020	4.9	14.90	0.93	13.78	10.61	6.37	22.74	0.75	3.7	2.9	8.00		8.0	3.7		1.2	

0.00  
0.00

QI/Q\*L1  
LI/L1\*Q

ERR  
ERR

ERR QI/Q^2.5\*L3  
ERR LI/L3^0.4\*Q

SENIOR LIVING CENTER  
 UNION BLVD. & VICKERS DR.  
 COLORADO SPRINGS, COLORADO

CURB OPENING and CURB INLET COMPUTATIONS  
 CONTINUOUS GRADE 5 Year FLOW  
 LWA #96043

LEIGH WHITEHEAD & ASSOCIATES  
 ENGINEERS, SURVEYORS & PLANNERS  
 2720 EAST YAMPA STREET, SUITE 1  
 COLORADO SPRINGS, CO, 80909  
 (719) 636-5179

28-May-96

96043CB2.WK3

SHEET 2 of 4

NO.	GRATE SIZE	NET GRATE AREA (SF)	So	Sx	Q	T	Fw	FWT	L1 (0.770)	L2 (0.462)	L3 (1.65)	Q1/Q	Q1	Q2 (0.60)	LI (FT)		USE LI (ft.)	ACT. Q1 (cfs)	H	ACT. Q Int (cfs)	Q-Q1 = Qc (cfs)
															Q1<Q2 LI<L2	Q1>Q2 LI>L2					
26	12' D-9	12.90	0.078	0.020	19.8	15.04	3.65												0.30	19.0	0.8
27	8' D-9	8.60	0.076	0.020	0.8	4.53	2.75												0.09	0.8	0.0
28			0.050	0.020	4.8	9.60	2.68	25.71	19.80	11.89	42.43	0.68	3.2	2.9		16.00	16.0	3.2			1.6
29			0.038	0.020	1.6	6.71	2.14	14.37	11.07	6.65	23.72	0.65	1.0	1.0		8.00	8.0	1.0			0.6
30			0.050	0.020	56.5	24.20	3.20	77.51	59.68	35.84	127.88	0.27	15.1	33.9		16.00	16.0	15.1			41.4
31	8' D-9	8.60	0.044	0.020	41.4	22.06	2.95												0.44	19.2	22.2
32			0.040	0.020	22.2	17.78	2.71	48.10	37.04	22.25	79.37	0.22	4.8	13.3		8.00	8.0	4.8			17.4
33			0.032	0.020	6.1	11.42	2.22	25.36	19.53	11.73	41.85	1.00	6.1	3.7		19.53	20.0	6.1			0.0
34	12' D10-R		0.000	0.020	2.0	22.17	0.14									SUMP	12.0		0.03	2.00	0.0
35			0.032	0.020	10.7	14.10	2.32	32.65	25.14	15.10	53.86	0.80	8.5	6.4		20.00	20.0	8.5			2.2
36	12' D10-R		0.000	0.020	4.9	31.02	0.15									SUMP	12.0		0.21	4.90	0.0

0.00  
0.00

Q1/Q\*L1    ERR    ERR Q1/Q^2.5\*L3  
 LI/L1\*Q    ERR    ERR LI/L3 ^0.4\*Q

SENIOR LIVING CENTER  
 UNION BLVD. & VICKERS DR.  
 COLORADO SPRINGS, COLORADO

LEIGH WHITEHEAD & ASSOCIATES  
 ENGINEERS, SURVEYORS & PLANNERS  
 2720 EAST YAMPA STREET, SUITE 1  
 COLORADO SPRINGS, CO. 80909  
 (719) 636-5179

CURB OPENING and CURB INLET COMPUTATIONS  
 CONTINUOUS GRADE 100 Year FLOW  
 LWA #96043

22-May-96

96043CB3.WKS

SHEET 3 of 4

NO.	GRATE SIZE	NET GRATE AREA (SF)	So	Sx	Q	T	Fw	FwT	L1 (0.770)	L2 (0.462)	L3 (1.65)	Q1/Q	Q1	Q2 (0.60)	Li (FT)		USE Li (ft.)	ACT. Q1 (cfs)	H	ACT. Q Int (cfs)	Q-Q1 = Qc (cfs)
															Q1 < Q2 Li < L2	Q1 > Q2 Li > L2					
1	12' D-9	12.90	0.076	0.020	63.2	23.33	3.92												0.47	29.6	33.6
2			0.076	0.020	33.6	18.41	3.75	69.13	53.23	31.97	114.06	0.30	10.1	20.2	16.00		16.0	10.1			23.5
3	12' D-9	12.90	0.076	0.020	51.2	21.56	3.87												0.43	28.5	22.7
4			0.076	0.020	22.7	15.90	3.65	58.08	44.72	26.86	95.83	0.36	8.1	13.6	16.00		16.0	8.1			14.6
5			0.006	0.020	13.5	20.80	1.11	23.18	17.85	10.72	38.25	0.34	4.5	8.1	6.00		6.0	4.5			9.0
6			0.006	0.020	28.4	27.49	1.17	32.23	24.82	14.91	53.19	0.24	6.9	17.0	6.00		6.0	6.9			21.5
7	8' D-9	8.60	0.064	0.020	45.1	21.23	3.54												0.42	18.8	26.3
8			0.040	0.020	20.0	17.09	2.69	45.92	35.36	21.24	75.77	0.23	4.5	12.0	8.00		8.0	4.5			15.5
9			0.040	0.020	30.4	20.00	2.77	55.33	42.60	25.59	91.29	0.19	5.7	18.2	8.00		8.0	5.7			24.7
10	12' D-9	12.90	0.064	0.020	63.7	24.17	3.62												0.48	30.1	33.6
11			0.038	0.020	23.9	18.45	2.66	49.01	37.74	22.66	80.87	0.21	5.1	14.3	8.00		8.0	5.1			18.8
12			0.087	0.020	28.3	16.83	3.95	66.48	51.19	30.74	109.70	0.16	4.4	17.0	8.00		8.0	4.4			23.9
13			0.087	0.020	45.2	20.06	4.08	81.89	63.06	37.87	135.12	0.13	5.7	27.1	8.00		8.0	5.7			39.5
14			0.029	0.020	39.5	23.50	2.41	56.61	43.59	26.18	93.41	0.18	7.2	23.7	8.00		8.0	7.2			32.3
15			0.057	0.020	79.9	26.89	3.49	93.72	72.17	43.34	154.64	0.11	8.9	47.9	8.00		8.0	8.9			71.0
16	8' D-9	8.60	0.057	0.020	35.1	19.75	3.29												0.40	18.2	16.9
17			0.057	0.020	16.9	15.02	3.13	46.98	36.18	21.73	77.52	0.22	3.7	10.1	8.00		8.0	3.7			13.2
18			0.020	0.020	19.0	19.10	1.94	37.03	28.52	17.13	61.10	0.28	5.3	11.4	8.00		8.0	5.3			13.7
19			0.033	0.020	26.0	19.55	2.50	48.93	37.67	22.63	80.73	0.21	5.5	15.6	8.00		8.0	5.5			20.5
20	12' D-9	12.90	0.057	0.020	69.3	25.49	3.45												0.51	31.0	38.3
21			0.008	0.020	45.2	31.38	1.34	42.13	32.44	19.48	69.51	0.49	22.3	27.1	16.00		16.0	22.3			22.9
22			0.029	0.020	22.9	19.10	2.34	44.61	34.35	20.63	73.61	0.23	5.3	13.7	8.00		8.0	5.3			17.6
23			0.008	0.020	39.1	29.72	1.33	39.51	30.43	18.27	65.20	0.53	20.6	23.5	16.00		16.0	20.6			18.5
24			0.029	0.020	18.5	17.68	2.29	40.41	31.12	18.69	66.68	0.26	4.8	11.1	8.00		8.0	4.8			13.7
25			0.005	0.020	8.5	18.31	0.96	17.62	13.57	8.15	29.08	0.59	5.0	5.1	8.00		8.0	5.0			3.5

0.00  
0.00

Q1/Q\*L1  
L1/L1\*Q

ERR  
ERR

ERR Q1/Q^2.5\*L3  
ERR L1/L3 ^0.4\*Q

SENIOR LIVING CENTER  
 UNION BLVD. & VICKERS DR.  
 COLORADO SPRINGS, COLORADO

CURB OPENING and CURB INLET COMPUTATIONS  
 CONTINUOUS GRADE 100 Year FLOW  
 LWA #96043

LEIGH WHITEHEAD & ASSOCIATES  
 ENGINEERS, SURVEYORS & PLANNERS  
 2720 EAST YAMPA STREET, SUITE 1  
 COLORADO SPRINGS, CO. 80909  
 (719) 636-5179

28-May-96

96043CB4.WK3

SHEET 4 of 4

NO.	GRATE SIZE	NET GRATE AREA (SF)	So	Sx	Q	T	Fw	FWT	L1 (0.770)	L2 (0.462)	L3 (1.66)	Q1/Q	Q1	Q2 (0.60)	LI (FT)		USE LI (ft.)	ACT. Qi (cfs)	H	ACT. Q int (cfs)	Q-Qi = Qc (cfs)
															Q1<Q2 LI<L2	Q1>Q2 LI>L2					
26	12' D-9	12.90	0.078	0.020	34.5	18.53	3.80												0.37	21.1	13.4
27	8' D-9	8.60	0.078	0.020	13.4	13.04	3.51												0.26	11.8	1.6
28			0.050	0.020	10.3	12.78	2.84	36.30	27.95	16.78	59.89	0.57	5.9	6.2	16.00		16.0	5.9			4.4
29			0.038	0.020	4.4	9.81	2.33	22.85	17.60	10.57	37.70	0.45	2.0	2.6	8.00		8.0	2.0			2.4
30			0.050	0.020	98.6	29.82	3.33	99.16	76.36	45.86	163.62	0.21	20.7	59.2	16.00		16.0	20.7			77.9
31	8' D-9	8.60	0.044	0.020	77.9	27.96	3.08												0.56	21.6	56.3
32			0.040	0.020	56.3	25.20	2.89	72.72	56.00	33.63	119.99	0.14	8.0	33.8	8.00		8.0	8.0			48.3
33			0.032	0.020	42.9	23.73	2.55	60.59	46.65	28.02	99.97	0.43	18.4	25.7	20.00		20.0	18.4			24.5
34	12' D10-R		0.000	0.020	28.8	60.27	0.17									SUMP	12.0		0.92	28.8	0.0
35			0.032	0.020	38.6	22.81	2.53	57.81	44.52	26.74	95.39	0.45	17.3	23.2	20.00		20.0	17.3			21.3
36	12' D10-R		0.000	0.020	30.9	61.88	0.17									SUMP	12.0		0.88	30.9	0.0

0.00  
0.00

Q1/Q\*L1    ERR    ERR Q1/Q^2.5\*L3  
 L1/L1\*Q    ERR    ERR L1/L3^0.4\*Q

SENIOR CENTER LIVING CENTER  
 UNION BLVD. & VICKERS DR.  
 COLORADO SPRINGS, COLORADO

LEIGH WHITEHEAD & ASSOCIATES, INC.  
 Engineers, Surveyors & Planners  
 2720 E. YAMPA STREET, SUITE 1  
 COLORADO SPRINGS, CO. 80903  
 (719)636-5179

CATCH BASIN SIZE CALCULATIONS  
 D10-R CATCH BASIN (SUMP CONDITION)

SHT. 1 of 1

LWA #96043

28-May-96

96043-IN.WK3

CATCH BASIN NO.	INLET SIZE	PERIMETER OF GRATE	CLEAR AREA OF GRATE	DEPTH	CLOG. FACTOR	INTERCEP. FLOW (WEIR)	INTERCEPT. FLOW (ORIFICE)	INTERCEPT. FLOW (CB OPENING)	TOTAL FLOW cfs	5 Yr. FLOW cfs	100 Yr. FLOW cfs	COMMENTS
34	12.0			0.03	1.25	2.0	ERR	2.0	2.0	2.0		EXIST. 12' D10-R
34	12.0			0.92	1.25	28.1	31.6	28.1	28.1		28.1	EXIST. 12' D10-R
36	12.0			0.21	1.25	4.9	12.2	4.9	4.9	4.9		EXIST. 12' D10-R
36	12.0			0.88	1.25	26.6	30.9	30.9	30.9		30.9	EXIST. 12' D10-R

ORIFICE: HAS DEPTH AT OR ABOVE 1.4' (GRATE) \*

\*

ERR  $3.6 * G28 * (M28 - 0.08) ^ 0.5$

ORIFICE: FOR DEPTHS > 0.94'

WEIR: HAS DEPTH LESS THAN 0.4' (GRATE) \*\*

\*\*

0.5  $((1.7 * F29) + 6.12) * (L29 + 0.25) ^ 1.85$

WEIR: FOR DEPTHS < 0.67'

HYDRAULIC REPORT FOR

SENIOR LIVING CENTER

UNION & VICKERS

COLORADO SPRINGS, COLO.

(96043)

5 YEAR STORM



LINE	Qact (cfs)	Qcap (cfs)	HT (in)	WID (in)	HGDN (ft)	HGUP (ft)	DNLN	INV DN (ft)	INV UP (ft)
1	165.0	603.5	72	72	6507.95	6512.70	0	6504.27	6509.00
2	165.0	344.6	60	60	6513.26	6516.57	1	6509.50	6512.80
3	165.0	444.6	60	60	6516.57	6529.39	2	6512.80	6525.62
4	165.0	416.9	60	60	6529.39	6534.77	3	6525.62	6531.00
5	165.0	417.2	60	60	6534.77	6537.72	4	6531.00	6533.95
6	165.0	822.2	77	77	6538.23	6549.91	5	6533.95	6546.28
7	130.0	537.1	60	60	6550.51	6550.91	6	6546.28	6547.47
8	130.0	582.3	60	60	6551.03	6556.53	7	6547.47	6553.09
9	130.0	443.8	60	60	6556.65	6559.84	8	6553.09	6556.40
10	130.0	520.9	60	60	6559.84	6560.84	9	6556.40	6557.40
11	126.0	452.8	60	60	6561.15	6570.39	10	6557.40	6567.07
12	126.0	447.0	48	48	6570.71	6584.91	11	6567.07	6581.50
13	126.0	212.9	48	48	6585.29	6602.42	12	6581.50	6599.01
14	126.0	215.1	48	48	6602.42	6607.72	13	6599.01	6604.31
15	126.0	215.3	48	48	6607.91	6610.24	14	6604.31	6606.83
16	126.0	215.3	48	48	6610.43	6612.41	15	6606.83	6609.00

Calc Option = 1

F.M.

Box

Circular

[PgDn]

[Esc] Menu

LINE	Qact (cfs)	Qcap (cfs)	HT (in)	WID (in)	HGDN (ft)	HGUP (ft)	DNLN	INV DN (ft)	INV UP (ft)
17	126.0	215.1	48	48	6612.60	6621.96	16	6609.00	6618.55
18	126.0	190.3	48	48	6621.96	6623.78	17	6618.55	6620.37
19	118.2	190.0	48	48	6623.97	6625.49	18	6620.37	6622.15
20	82.0	190.0	48	48	6625.66	6626.04	19	6622.15	6623.20
21	82.0	134.7	42	42	6631.62	6638.87	20	6628.70	6635.95
22	82.0	134.7	42	42	6639.01	6648.38	21	6635.95	6645.46
23	82.0	156.7	42	42	6648.38	6652.29	22	6645.46	6649.37
24	82.0	156.6	42	42	6652.43	6665.25	23	6649.37	6662.33
25	66.5	153.8	42	42	6665.39	6667.53	24	6662.33	6664.89
26	59.9	66.6	30	30	6667.81	6673.24	25	6664.89	6670.83
27	31.8	65.8	30	30	6673.47	6677.66	26	6670.83	6674.55

Calc Option = 1

F.M.

Box

Circular

[PgDn]

[Esc] Menu

HYDRAULIC REPORT FOR

SENIOR LIVING CENTER

UNION & VICKERS

COLORADO SPRINGS, COLO.

(96043A)

100 YEAR STORM

LINE	Qact (cfs)	Qcap (cfs)	HT (in)	WID (in)	HGDN (ft)	HGUP (ft)	DNLN	INV DN (ft)	INV UP (ft)
1	452.0	603.5	72	72	6509.91	6514.65	0	6504.27	6509.00
2	452.0	344.6	60	60	6515.90	6521.58	1	6509.50	6512.80
3	452.0	444.6	60	60	6521.58	6534.84	2	6512.80	6525.62
4	452.0	416.9	60	60	6534.84	6541.17	3	6525.62	6531.00
5	452.0	417.2	60	60	6541.17	6544.63	4	6531.00	6533.95
6	452.0	822.2	77	77	6545.46	6551.96	5	6533.95	6546.28
7	357.0	537.1	60	60	6553.00	6553.53	6	6546.28	6547.47
8	357.0	582.3	60	60	6553.53	6557.95	7	6547.47	6553.09
9	357.0	443.8	60	60	6557.95	6561.26	8	6553.09	6556.40
10	357.0	520.9	60	60	6561.26	6562.26	9	6556.40	6557.40
11	345.0	452.8	60	60	6563.56	6571.93	10	6557.40	6567.07
12	226.0	447.0	48	48	6573.15	6585.44	11	6567.07	6581.50
13	210.8	212.9	48	48	6586.45	6602.98	12	6581.50	6599.01
14	210.8	215.1	48	48	6602.98	6608.23	13	6599.01	6604.31
15	205.3	215.3	48	48	6608.67	6610.72	14	6604.31	6606.83
16	178.1	215.3	48	48	6611.14	6612.81	15	6606.83	6609.00

Calc Option = 1

F.M.

Box

Circular

[PgDn]

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LINE	Qact (cfs)	Qcap (cfs)	HT (in)	WID (in)	HGDN (ft)	HGUP (ft)	DNLN	INV DN (ft)	INV UP (ft)
17	169.2	215.1	48	48	6613.14	6622.32	16	6609.00	6618.55
18	169.2	190.3	48	48	6622.32	6624.14	17	6618.55	6620.37
19	151.9	190.0	48	48	6624.43	6625.82	18	6620.37	6622.15
20	146.8	190.0	48	48	6626.06	6626.81	19	6622.15	6623.20
21	146.8	134.7	42	42	6632.10	6640.26	20	6628.70	6635.95
22	146.8	134.7	42	42	6640.63	6651.92	21	6635.95	6645.46
23	146.8	156.7	42	42	6651.92	6655.35	22	6645.46	6649.37
24	146.8	156.6	42	42	6655.71	6667.11	23	6649.37	6662.33
25	85.3	153.8	42	42	6667.47	6668.12	24	6662.33	6664.89
26	76.3	66.6	30	30	6668.45	6676.23	25	6664.89	6670.83
27	39.7	65.8	30	30	6676.61	6679.23	26	6670.83	6674.55

Calc Option = 1

F.M.

Box

Circular

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