

FINAL DRAINAGE REPORT
FOR
CABAZON SUBDIVISION
RIO RANCHO, NEW MEXICO

Prepared for:

CONTOUR DEVELOPMENT, INC.
9595 Wilshire Building, Suite 1000
Beverly Hills, California 90212

Prepared by:

TETRA TECH RMC
1900 South Sunset Street, Suite 1-F
Longmont, Colorado 80501

Tetra Tech RMC Job No. 80-5101.001.00

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TETRA TECH RMC

CITY OF RIO RANCHO
DEPARTMENT OF
PUBLIC INFRASTRUCTURE
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INTRODUCTION

The 2002 "Black Arroyo Watershed Management Plan" (BAWMP) - (Ref.1) outlined a long-range regional plan for flood control within the Black Arroyo Watershed. Several upgrades of storage facilities and conveyances were anticipated for the area within the Cabezon Development (Unit 16 West). The portion of the plan that addresses the reach of West Branch between Unser Boulevard and the County Line is applicable to the Cabezon Tracts 13 and 14 project. The progressing degradation of the arroyo in this area is to be mitigated in conjunction with the development of Tracts 13 and 14.

The West Branch of Black Arroyo impacts a drainage basin extending both east and west of Unser Boulevard, and extending north well into the west mesa area. In compliance with the BAWMP intent, improvement of the arroyo without relocation is proposed as the first phase of the development of the 142-acre property.

Location

The Tract 13 and 14 project reach of the West Branch of Black Arroyo extends from Unser Blvd. on the west to the West Branch's crossing of the County line. The project site lies in Sections 35 and 36, Township 12 North, Range 2 East, Sandoval County, and State of New Mexico. A Vicinity Map / FIRMS Panel is shown on Figure 1 in Appendix A.

The project site is currently undeveloped, with existing terrain slopes ranging from 1 to 10 percent. The local soils were identified in the Cabezon Development Drainage Master Plan (Ref. 4) prepared by Wilson & Co. as Wink Series. The predominant sandy loams are considered deep, well-drained soils in hydrological group "B".

RELATED STUDIES

The effective floodplain was defined by the Federal Emergency Management Agency (FEMA) on Flood Insurance Rate Maps (FIRM), Community Panel number 35043C0894 C (Ref. 2). Corresponding peak flows were published in the Flood Insurance Studies for Sandoval County, New Mexico and Incorporated Areas dated July 16, 1996 (Ref.1, Exhibit E1 in Appendix D).

Black Arroyo Watershed Management Plan (BAWMP) prepared for Southern Sandoval County Arroyo Flood Control Authority (SSCAFCA) in August, 2002 evaluated existing conditions of the Black Arroyo watershed, investigated alternatives of drainage facilities' improvements based on the area anticipated development and selected an alternative ("Alternative B") that would provide for gradual implementation of the improvements (Ref.3).

Cabezon Communities Master Plan, (Ref.4) prepared for City of Rio Rancho in 2003 included a Cabezon Development Drainage Master Plan prepared by Wilson & Company, Engineers and Architects. The Drainage Master Plan analyzed the Black Arroyo watershed and provided an analysis of proposed drainage facilities whose installation would be in full compliance with the BAWMP.

DESIGN CRITERIA

In compliance with the Southern Sandoval County Arroyo Flood Control Authority (SSCAFCA) (Ref. 3) the hydrologic modeling of the study-area's sub-basins utilized the AHYMO software (Ref. 6) to determine storm-water runoff hydrographs.

Vertical Datum

The effective Flood Insurance Study (Ref.1) was based on National Geodetic Vertical Datum (NGVD 1929).

HYDROLOGIC MODELING

The Cabezon Development - Drainage Master Plan (Ref.4) was prepared for the entire Black Arroyo 900-acre watershed by Wilson & Co. The Master Drainage Plan followed the guidelines of the BAWMP, with a special emphasis on not compromising the Black Dam and on compliance with water quality/ sediment facilities' requirements.

The Drainage Master Plan redefined the sub-basins outlined in the BAWMP to account for the updated street layout. However, the presently proposed construction of Westside Boulevard will substantially revise the drainage area historically contributing to the West Branch (by 68 acres), effectively reducing the anticipated peak flows in the channel. (See below, "Peak Flow Comparison").

This Hydrology/Hydraulic Report revises the BAWMP with regard to the Cabezon Subdivision, Tracts 13 and 14 **only**. In other words, any offsite revisions to the BAWMP either upstream or west of Unser Boulevard are not included. The peak flows reflect only changes created by the Westside Boulevard construction. Offsite diversions would reduce the channel's peak flows even more, as shown in the Drainage Master Plan.

Comparison of the Drainage Master Plan's anticipated characteristics of future development such as Land Treatment, Sub-basins areas, etc. shows general conformance of the layout defined by the Amended Plat of Tracts 13 and 14 of the Cabezon Subdivision with the Master Drainage Plan's assumptions (Table 1).

Sub-basins Parameters

This report defines one drainage basin within the project site: Basin A on the attached Drainage Map. Basin A accounts for the development of the proposed Westside Boulevard. Westside Blvd. will be built in conjunction with Cabezon Subdivision, Tracts 13 and 14.

Peak Flows Comparison

Summary and comparison between the Black Arroyo Watershed Management Plan (BAWMP) and this report.

Flooding Source & Location (Station per FIS)	Peak Flows – 100-year (BAWMP)	Peak Flows – 100-year (This Drainage Report)	Drainage Area (BAWMP)	Drainage Area (This Drainage Plan)
At Unser Blvd., D.P. 159.2 (Sta.52+70)	5,161 cfs	5,161 cfs	4.822 sq.mi	4.822 sq.mi
At Confluence with Tributary E, D.P. 13.9, (This Report) (Sta. 20+00)	5,987 cfs	5,253 cfs	5.633 sq.mi	5.016 sq. mi.
At County Line , D.P. 650.99, (W) = 161.10 (M) (Sta. 0+00)	5,987 cfs	5,673 cfs	5.633 sq.mi	5.544 sq. mi.

DESIGN CHARACTERISTICS

This report accounts for the stormwater runoff for the proposed west half of Westside Boulevard only. Westside Blvd. will service the future Cabazon Subdivision, Tracts 13 and 14, as well as the future development of adjacent properties. Stormwater drainage for Tracts 13 and 14 will be accounted for with the final design of those properties.

Stormwater discharge for the proposed Westside Blvd. will be conveyed entirely within the street Right-Of-Way (R.O.W.). When street capacities approach the maximum allowable limits, catch basins will be placed to release the flows through temporary swales into the West Branch of the Black Arroyo. Temporary swales will serve in the interim until the Westside Blvd. drainage is incorporated into the storm drainage system for Cabazon Subdivision, Tracts 13 and 14.

CONCLUSION

Westside Boulevard will be constructed to service the future Cabazon Subdivision, Tracts 13 and 14, as well as the future development of adjacent properties. Improvements will be made to the West Branch of the Black Arroyo without relocation. Stormwater runoff for Westside Blvd. will be conveyed in the R.O.W. and released into the arroyo when street capacities are exceeded.

Design for Westside Boulevard has been prepared in accordance with all related studies and the proposed improvements will not adversely affect the existing drainage patterns surrounding the site.

REFERENCES

1. **Flood Insurance Study**, Sandoval County, New Mexico and Incorporated Areas, July 16, 1996
2. **Flood Insurance Rate Maps**, Sandoval County, New Mexico and incorporated areas, Panels No.35043C0894 C, Effective Date July 16, 1996
3. **Black Arroyo Watershed Management Plan**, Southern Sandoval County Arroyo Flood Control Authority, August 2002
4. **Cabazon Development Drainage Master Plan** prepared by Wilson & Company Engineers and Architects.
5. **HEC-RAS River Analysis System**, Version 3.1.1 Users Manual, U.S. Army Corps of Engineers Hydrologic Engineering Center, Davis, CA, May 2003
6. **Arid-lands Hydrological Model (AHYMO97)** by Anderson

APPENDIX A

Developed Runoff Calculations



Box Culverts - Unser Blvd.
Eroded Arroyo to be
regraded

TABLE 3

AREA CALCULATIONS

Ultimate Design

Design Point	Location	Station	Length	Width		Area		Area	
				paved	grass	(sq.ft)	paved	grass	(A)
						(sq.ft)	(D) (acres)	(A) (acres)	
1	Carmesa Dr.	20+65	1,000	56	27	56,000	1.29	0.62	
2	Trail Side Rd.	31+33	2,035	56	27	113,960	2.62	1.26	
3	Catch Basin 1 Sta.45+00	45+00	3,405	56	27	190,680	4.38	2.11	
	Westside Ct.	48+00	3,720	56	27	208,320	4.78	2.31	
4	Catch Basin 2 Sta.53+50	53+50	4,260	56	27	238,560	5.48	2.64	

Intermediate Design

Design Point	Location	Station	Length	Width		Area		Area	
				paved	grass	(sq.ft)	paved	grass	(A)
						(sq.ft)	(D) (acres)	(A) (acres)	
1	Carmesa Dr.	20+65	1,000	44	39	44,000	1.01	0.90	
2	Trail Side Rd.	31+33	2,035	44	39	89,540	2.06	1.82	
3	Catch Basin 1 Sta.45+00	45+00	3,405	44	39	149,820	3.44	3.05	
	Westside Ct.	48+00	3,720	44	39	163,680	3.76	3.33	
4	Catch Basin 2 Sta.53+50	53+50	4,260	44	39	187,440	4.30	3.81	

TABLE 4

PEAK FLOWS

Note: See attached Street Capacity Calculations

Ultimate Design

Design Point	Location	Land Treatment-Grass (acres)	Land Treatment-Pavement (acres)	10-year-Treatment (Peak Q) (cfs/acre)	100-year-Treatment (Peak Q) (cfs/acre)	10-year-Treatment (Peak Q) (cfs/acre)	100-year-Treatment (Peak Q) (cfs/acre)	10-year-Discharge (cfs)	100-year-Discharge (cfs)	Street Slope (%)	Street Capacity-10-year (cfs)	Street Capacity-100-year (cfs)	Street Capacity-100-year Note*)
1	Carmesa Dr.	0.62	1.29	1.45	2.92	3.57	5.25	4.7	8.9	0.88	11.3	29.0	
2	Trail Side Rd.	1.26	2.62	1.45	2.92	3.57	5.25	9.5	12.8	1.44	10.9	38.2	
3	Catch Basin 1 Sta.45+50	2.11	4.38	1.45	2.92	3.57	5.25	15.8	18.0	2.34	18.3	48.8	
	Westside Ct.	2.31	4.78	1.45	2.92	3.57	5.25	17.3	19.1	1.64	7.9	38.6	
4	Catch Basin 2 Sta.53+50	2.64	5.48	1.45	2.92	3.57	5.25	19.8	21.2	1.64	7.9	38.6	

Intermediate Design

Design Point	Treatment	Land Treatment-Grass (acres)	Land Treatment-Pavement (acres)	10-year-Treatment (Peak Q) (cfs/acre)	100-year-Treatment (Peak Q) (cfs/acre)	10-year-Treatment (Peak Q) (cfs/acre)	100-year-Treatment (Peak Q) (cfs/acre)	10-year-Discharge (cfs)	100-year-Discharge (cfs)	Street Slope (%)	Street Capacity-10-year (cfs)	Street Capacity-100-year (cfs)	Street Capacity-100-year Note*)
1	Carmesa Dr.	0.9	1.01	1.45	2.92	3.57	5.25	4.3	8.1	0.88	11.4	29.0	
2	Trail Side Rd.	1.82	2.06	1.45	2.92	3.57	5.25	8.7	11.2	1.44	15.4	38.2	
3	Catch Basin 1 Sta.45+50	3.05	3.44	1.45	2.92	3.57	5.25	14.5	15.2	2.34	18.4	48.8	
	Westside Ct.	3.33	3.76	1.45	2.92	3.57	5.25	15.8	16.2	1.64	15.3	38.6	
4	Catch Basin 2 Sta.53+50	3.81	4.3	1.45	2.92	3.57	5.25	18.1	17.7	1.64	15.3	38.6	

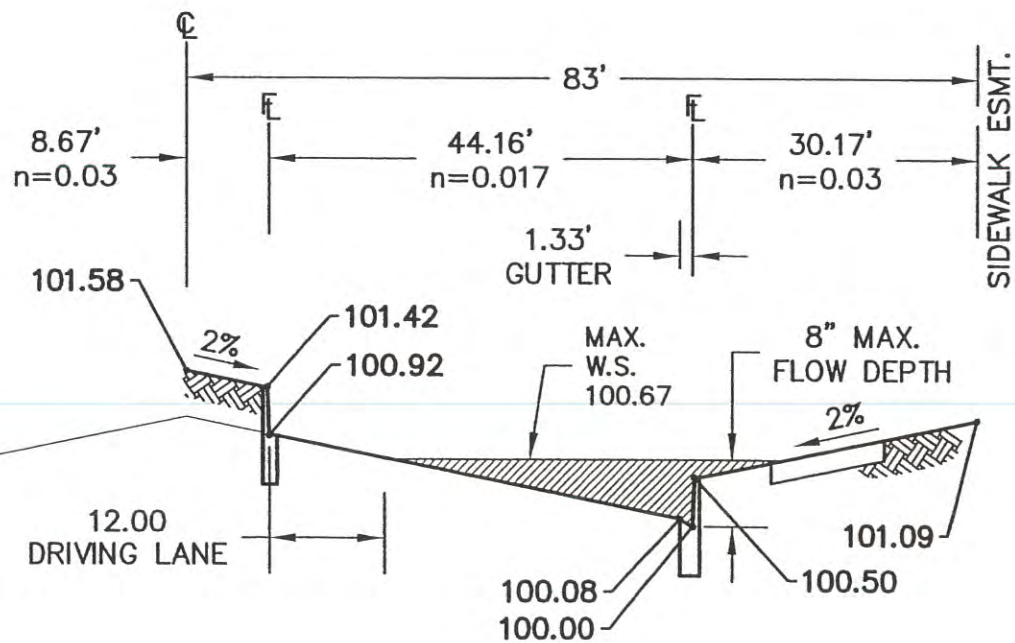
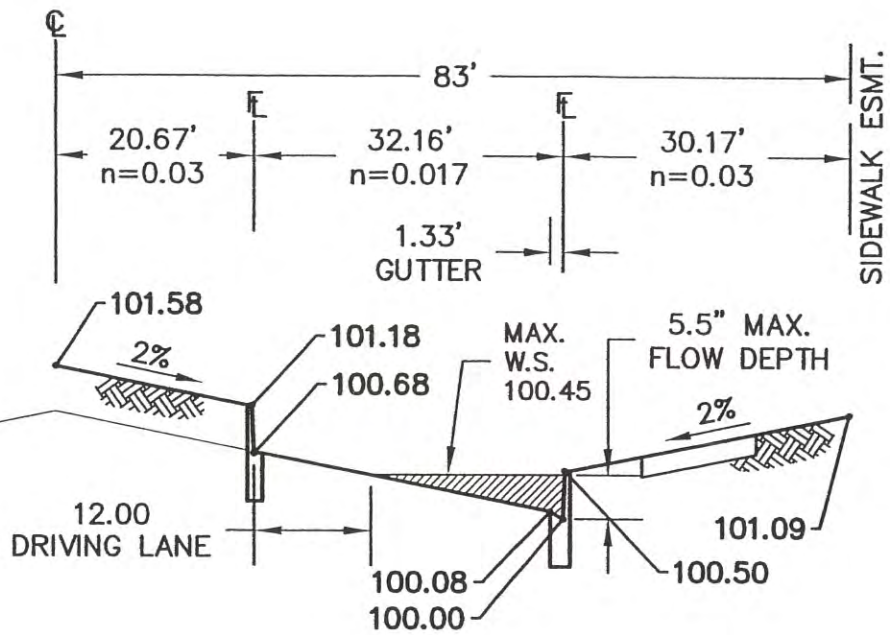
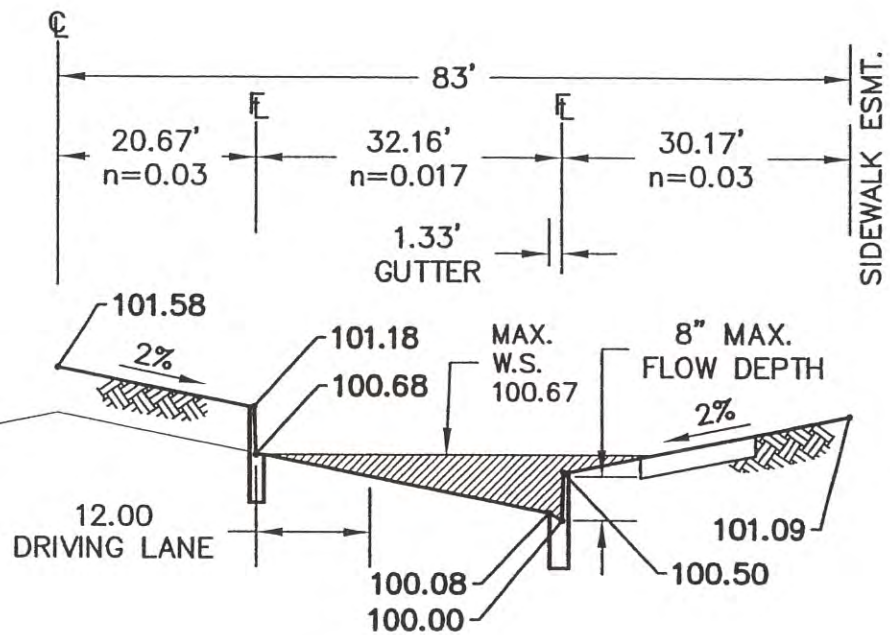
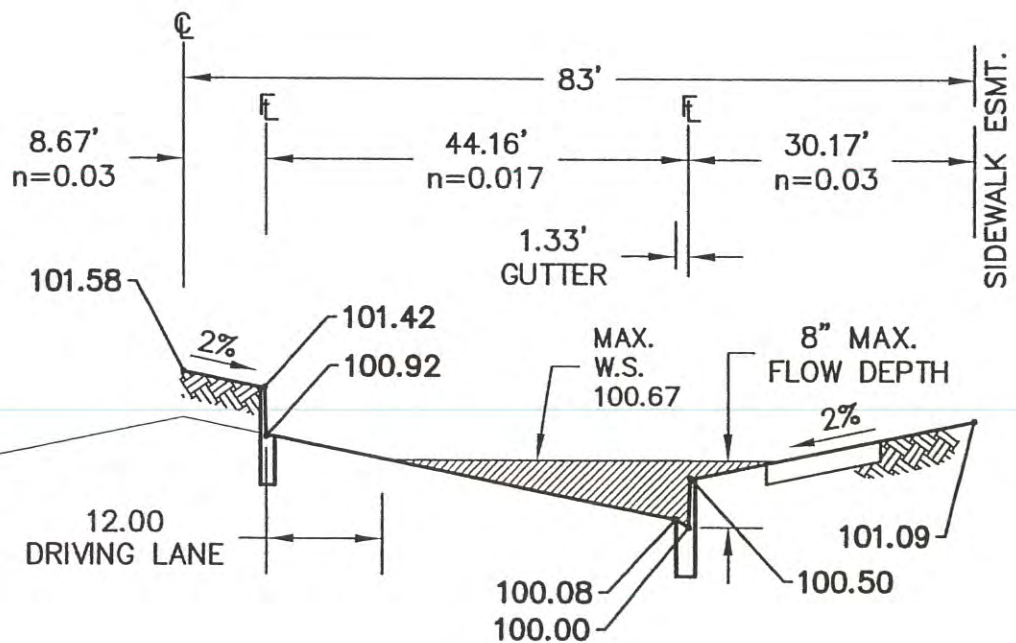


FIGURE 4a



SECTION PHASE 1
100 YR. STORM CONDITION



ULTIMATE SECTION
100 YR. STORM CONDITION

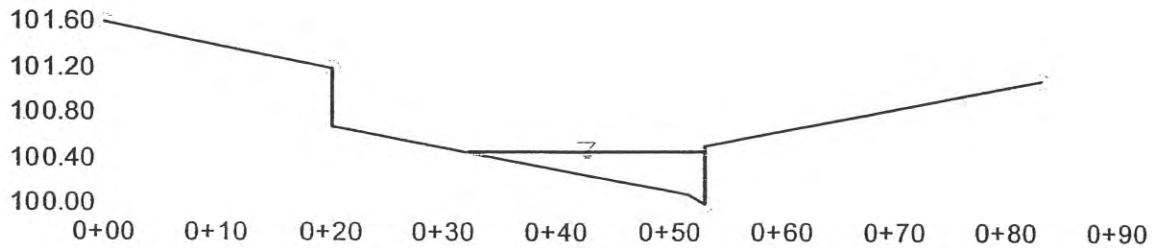
FIGURE 4b

**Cross Section
Cross Section for Irregular Channel**

Project Description	
Worksheet	Design Point 1
Flow Element	Irregular Channel
Method	Manning's Form
Solve For	Discharge

10yr
Interim

Section Data	
Mannings Coefficient	0.017
Slope	0.008800 ft/ft
Water Surface Elev	100.45 ft
Elevation Range	100.00 to 101.58
Discharge	11.43 cfs



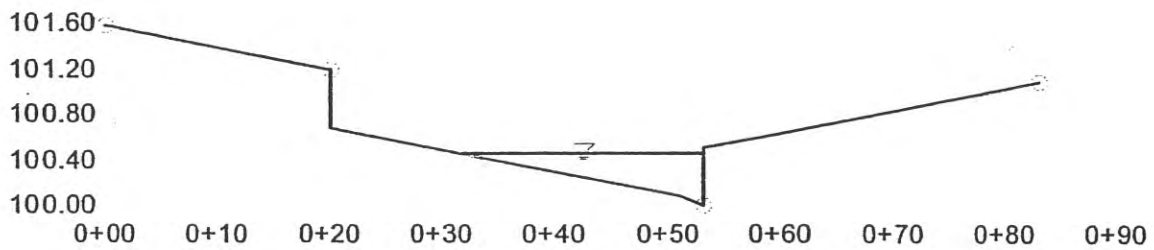
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Cross Section
Cross Section for Irregular Channel

*10 year
Interim*

Project Description	
Worksheet	Design Point 2
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Section Data	
Mannings Coefficient	0.017
Slope	0.014400 ft/ft
Water Surface Elev	100.45 ft
Elevation Range	100.00 to 101.58
Discharge	15.44 cfs



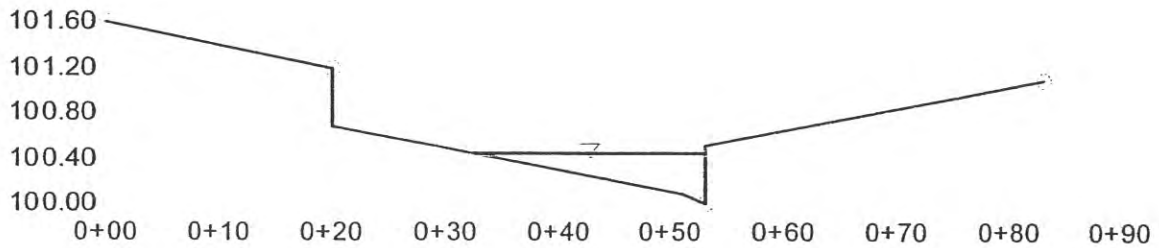
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Cross Section
Cross Section for Irregular Channel

*10-year
Interim*

Project Description	
Worksheet	Design Point 3
Flow Element	Irregular Channel
Method	Manning's Form
Solve For	Discharge

Section Data	
Mannings Coefficient	0.017
Slope	0.023400 ft/ft
Water Surface Elev	100.44 ft
Elevation Range	1.00 to 101.58
Discharge	18.44 cfs



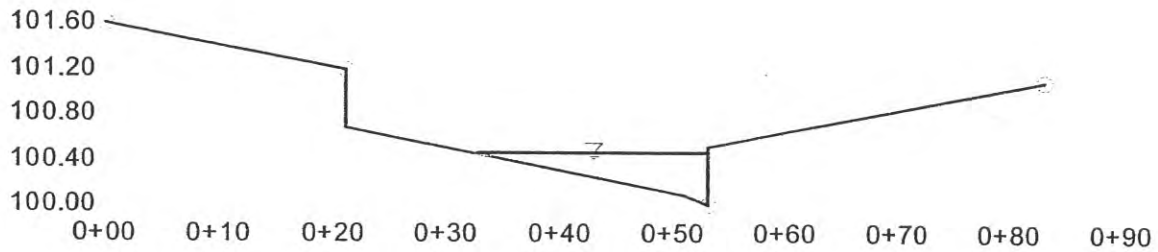
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**Cross Section
Cross Section for Irregular Channel**

Project Description	
Worksheet	Design Point 4
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Section Data	
Mannings Coefficient	0.017
Slope	0.016400 ft/ft
Water Surface Elev	100.45 ft
Elevation Range	100.00 to 101.58
Discharge	15.30 cfs

10year
Interim



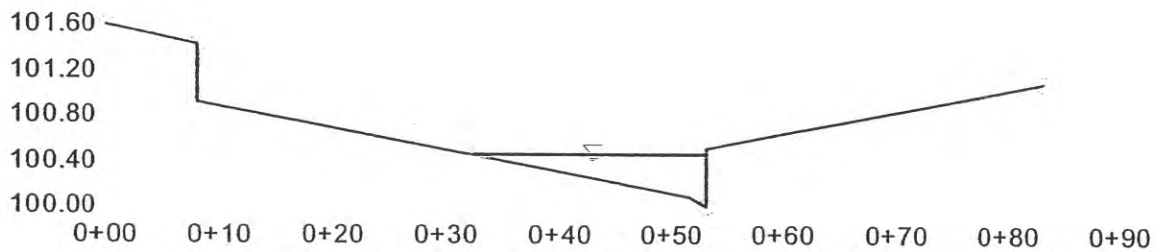
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Cross Section Cross Section for Irregular Channel

10 year Ultimate

Project Description	
Worksheet	Design Point 1
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Section Data	
Mannings Coefficient	0.017
Slope	0.008800 ft/ft
Water Surface Elev	100.45 ft
Elevation Range	100.00 to 101.58
Discharge	11.33 cfs



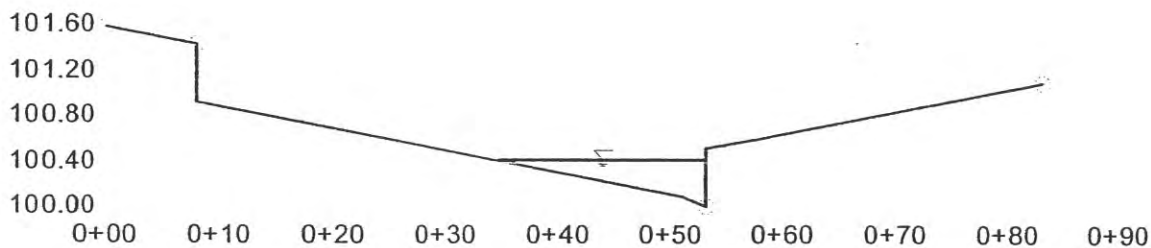
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Cross Section
Cross Section for Irregular Channel

10-year Ultimate

Project Description	
Worksheet	Design Point 2
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Section Data	
Mannings Coefficient	0.017
Slope	0.014400 ft/ft
Water Surface Elev	100.40 ft
Elevation Range	100.00 to 101.58
Discharge	10.88 cfs



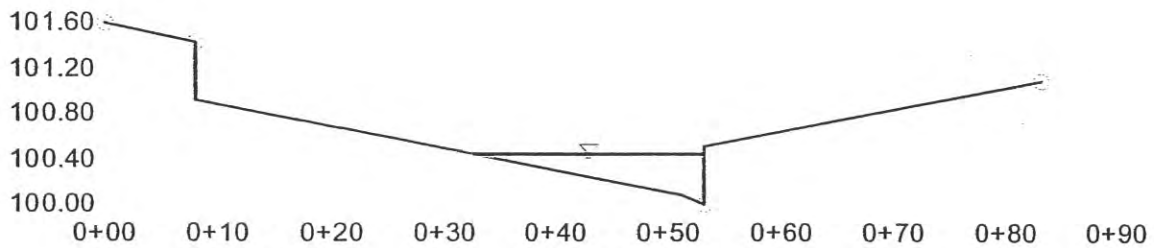
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Cross Section
Cross Section for Irregular Channel

*10yr-ultimate
catch Basin 1*

Project Description	
Worksheet	Design Point 3
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Section Data	
Mannings Coefficient	0.017
Slope	0.023400 ft/ft
Water Surface Elev	100.44 ft
Elevation Range	100.00 to 101.58
Discharge	18.31 cfs



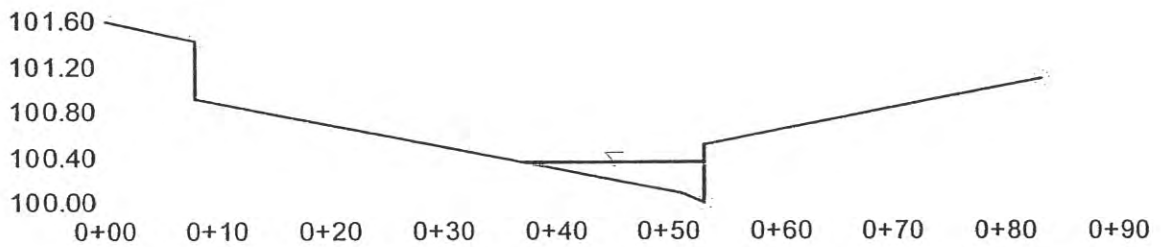
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NTS

Cross Section Cross Section for Irregular Channel

10 year - Ultimate

Project Description	
Worksheet	Design Point 4
Flow Element	Irregular Chanl
Method	Manning's For
Solve For	Discharge

Section Data	
Mannings Coefficient	0.017
Slope	0.016400 ft/ft
Water Surface Elev	100.36 ft
Elevation Range	100.00 to 101.58
Discharge	7.94 cfs



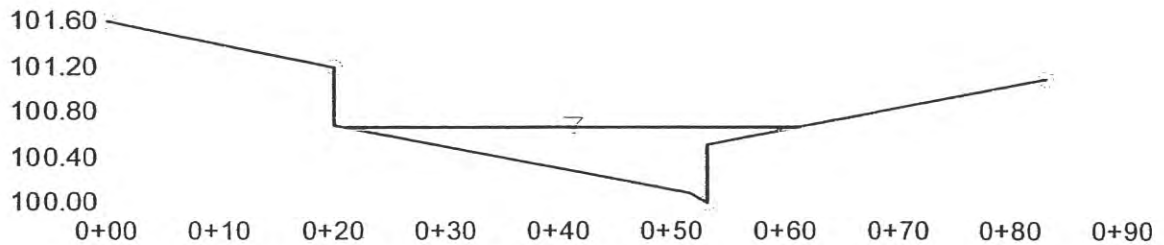
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Cross Section Cross Section for Irregular Channel

*100 year
Ultimate & Interim*

Project Description	
Worksheet	Design Point 1
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Channel Slope

Section Data	
Mannings Coefficient	0.020
Slope	0.008800 ft/ft
Water Surface Elev	100.66 ft
Elevation Range	100.00 to 101.58
Discharge	29.04 cfs



V:10.0
H:1
NTS

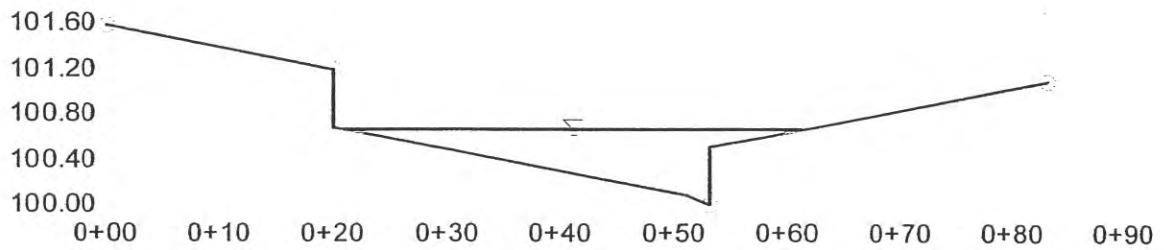
Cross Section

Cross Section for Irregular Channel

100yr

Project Description	
Worksheet	Design Point 2
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Section Data	
Mannings Coefficient	0.020
Slope	0.014400 ft/ft
Water Surface Elev	100.66 ft
Elevation Range	100.00 to 101.58
Discharge	38.32 cfs



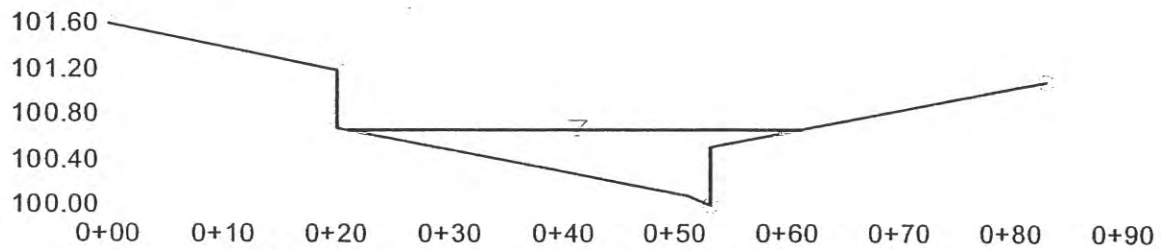
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Cross Section
Cross Section for Irregular Channel

100yr

Project Description	
Worksheet	Design Point 3
Flow Element	Irregular Chanl
Method	Manning's For
Solve For	Discharge

Section Data	
Mannings Coefficient	0.020
Slope	0.023400 ft/ft
Water Surface Elev	100.66 ft
Elevation Range	100.00 to 101.58
Discharge	48.81 cfs



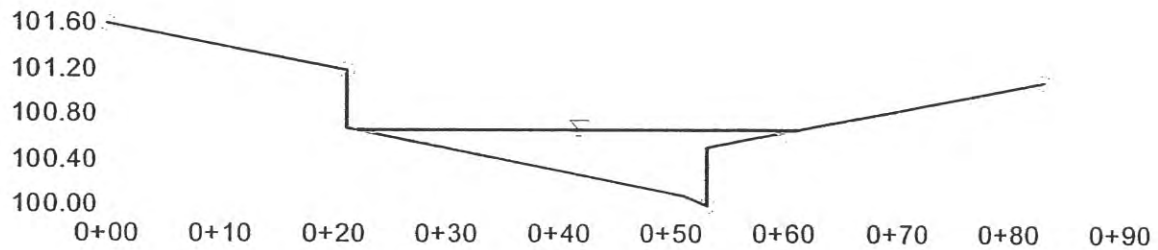
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Cross Section
Cross Section for Irregular Channel

100yr

Project Description	
Worksheet	Design Point 4
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Section Data	
Mannings Coefficient	0.020
Slope	0.016400 ft/ft
Water Surface Elev	100.66 ft
Elevation Range	100.00 to 101.58
Discharge	38.55 cfs



V:10.0
H:1
NTS

Worksheet for CATCH BASIN 1

Project Description

Flow Element: Combination Inlet On Grade
Solve For: Equal Opening Lengths

Input Data

Discharge:	18.00	←	ft ³ /s
Slope:	0.01660		ft/ft
Gutter Width:	1.50		ft
Gutter Cross Slope:	0.02		ft/ft
Road Cross Slope:	0.02		ft/ft
Manning Coefficient:	0.016		
Local Depression:	2.00		in
Local Depression Width:	5.00		ft
Efficiency:	70.00		%
Grate Width:	1.50		ft
Grate Type:	P-50 mm (P-1-7/8")		
Clogging:	50.00		%

Options

Calculation Option: Use Both
Grate Flow Option: Exclude None

Results

Curb Opening Length:	15.98		ft
Grate Length:	15.98		ft
Intercepted Flow:	12.60	←	ft ³ /s
Bypass Flow:	5.40	←	ft ³ /s
Spread:	19.38		ft
Depth:	0.39		ft
Flow Area:	3.75		ft ²
Gutter Depression:	0.00		ft
Total Depression:	0.17		ft
Velocity:	4.79		ft/s
Splash Over Velocity:	21.34		ft/s
Frontal Flow Factor:	1.00		
Side Flow Factor:	0.49		
Grate Flow Ratio:	0.55		
Equivalent Cross Slope:	0.02645		ft/ft
Active Grate Length:	7.99		ft
Length Factor:	0.13		

Worksheet for CATCH BASIN 1 OUTLET

Project Description

Flow Element:	Circular Pipe
Friction Method:	Manning Formula
Solve For:	Full Flow Slope

Input Data

Roughness Coefficient:	0.012	
Diameter:	1.50	ft
Discharge:	12.60	ft ³ /s

Results

Channel Slope:	0.01226	ft/ft
Normal Depth:	1.50	ft
Flow Area:	1.77	ft ²
Wetted Perimeter:	4.71	ft
Top Width:	0.00	ft
Critical Depth:	1.34	ft
Percent Full:	100.0	%
Critical Slope:	0.01088	ft/ft
Velocity:	7.13	ft/s
Velocity Head:	0.79	ft
Specific Energy:	2.29	ft
Froude Number:	0.00	
Maximum Discharge:	13.55	ft ³ /s
Discharge Full:	12.60	ft ³ /s
Slope Full:	0.01226	ft/ft
Flow Type:	SubCritical	

GVF Input Data

Downstream Depth:	0.00	ft
Length:	0.00	ft
Number Of Steps:	0	

GVF Output Data

Upstream Depth:	0.00	ft
Profile Description:	N/A	
Profile Headloss:	0.00	ft
Average End Depth Over Rise:	0.00	%
Normal Depth Over Rise:	0.00	%
Downstream Velocity:	0.00	ft/s

Worksheet for CATCH BASIN 1 OUTLET

Upstream Velocity:	0.00	ft/s
Normal Depth:	1.50	ft
Critical Depth:	1.34	ft
Channel Slope:	0.01226	ft/ft
Critical Slope:	0.01088	ft/ft

Worksheet for TEMP SWALE (A)

Project Description

Flow Element:	Triangular Channel
Friction Method:	Manning Formula
Solve For:	Normal Depth

Input Data

Roughness Coefficient:	0.030	
Channel Slope:	0.03000	ft/ft
Left Side Slope:	6.00	ft/ft (H:V)
Right Side Slope:	6.00	ft/ft (H:V)
Discharge:	12.60	ft ³ /s

Results

Normal Depth:	0.70	ft
Flow Area:	2.97	ft ²
Wetted Perimeter:	8.56	ft
Top Width:	8.44	ft
Critical Depth:	0.77	ft
Critical Slope:	0.01834	ft/ft
Velocity:	4.24	ft/s
Velocity Head:	0.28	ft
Specific Energy:	0.98	ft
Froude Number:	1.26	
Flow Type:	Supercritical	

GVF Input Data

Downstream Depth:	0.00	ft
Length:	0.00	ft
Number Of Steps:	0	

GVF Output Data

Upstream Depth:	0.00	ft
Profile Description:	N/A	
Profile Headloss:	0.00	ft
Downstream Velocity:	0.00	ft/s
Upstream Velocity:	0.00	ft/s
Normal Depth:	0.70	ft
Critical Depth:	0.77	ft
Channel Slope:	0.03000	ft/ft
Critical Slope:	0.01834	ft/ft

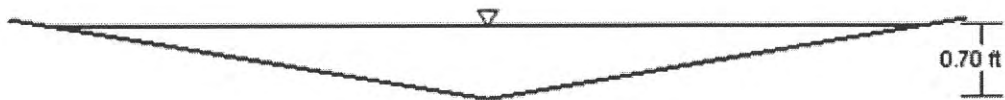
Cross Section for TEMP SWALE (A)

Project Description

Flow Element:	Triangular Channel
Friction Method:	Manning Formula
Solve For:	Normal Depth

Section Data

Roughness Coefficient:	0.030	
Channel Slope:	0.03000	ft/ft
Normal Depth:	0.70	ft
Left Side Slope:	6.00	ft/ft (H:V)
Right Side Slope:	6.00	ft/ft (H:V)
Discharge:	12.60	ft ³ /s



V: 1
H: 1

Worksheet for CATCH BASIN 2

Project Description

Flow Element: Combination Inlet On Grade
Solve For: Equal Opening Lengths

Input Data

Discharge:	8.60	ft ³ /s
Slope:	0.01660	ft/ft
Gutter Width:	1.50	ft
Gutter Cross Slope:	0.02	ft/ft
Road Cross Slope:	0.02	ft/ft
Manning Coefficient:	0.016	
Local Depression:	2.00	in
Local Depression Width:	5.00	ft
Efficiency:	70.00	%
Grate Width:	1.50	ft
Grate Type:	P-50 mm (P-1-7/8")	
Clogging:	50.00	%

Options

Calculation Option: Use Both
Grate Flow Option: Exclude None

Results

Curb Opening Length:	12.44	ft
Grate Length:	12.44	ft
Intercepted Flow:	6.02 ←	ft ³ /s
Bypass Flow:	2.58 ←	ft ³ /s
Spread:	14.69	ft
Depth:	0.29	ft
Flow Area:	2.16	ft ²
Gutter Depression:	0.00	ft
Total Depression:	0.17	ft
Velocity:	3.99	ft/s
Splash Over Velocity:	15.55	ft/s
Frontal Flow Factor:	1.00	
Side Flow Factor:	0.43	
Grate Flow Ratio:	0.67	
Equivalent Cross Slope:	0.02833	ft/ft
Active Grate Length:	6.22	ft
Length Factor:	0.14	

Worksheet for CATCH BASIN 2 OUTLET

Project Description

Flow Element:	Circular Pipe
Friction Method:	Manning Formula
Solve For:	Normal Depth

Input Data

Roughness Coefficient:	0.012	
Channel Slope:	0.01000	ft/ft
Diameter:	1.50	ft
Discharge:	6.02	ft ³ /s

Results

Normal Depth:	0.78	ft
Flow Area:	0.92	ft ²
Wetted Perimeter:	2.41	ft
Top Width:	1.50	ft
Critical Depth:	0.95	ft
Percent Full:	51.7	%
Critical Slope:	0.00531	ft/ft
Velocity:	6.53	ft/s
Velocity Head:	0.66	ft
Specific Energy:	1.44	ft
Froude Number:	1.47	
Maximum Discharge:	12.24	ft ³ /s
Discharge Full:	11.38	ft ³ /s
Slope Full:	0.00280	ft/ft
Flow Type:	SuperCritical	

GVF Input Data

Downstream Depth:	0.00	ft
Length:	0.00	ft
Number Of Steps:	0	

GVF Output Data

Upstream Depth:	0.00	ft
Profile Description:	N/A	
Profile Headloss:	0.00	ft
Average End Depth Over Rise:	0.00	%
Normal Depth Over Rise:	0.00	%
Downstream Velocity:	0.00	ft/s

Worksheet for CATCH BASIN 2 OUTLET

Upstream Velocity:	0.00	ft/s
Normal Depth:	0.78	ft
Critical Depth:	0.95	ft
Channel Slope:	0.01000	ft/ft
Critical Slope:	0.00531	ft/ft

Worksheet for TEMP SWALE (B)

Project Description

Flow Element:	Triangular Channel
Friction Method:	Manning Formula
Solve For:	Normal Depth

Input Data

Roughness Coefficient:	0.030	
Channel Slope:	0.06500	ft/ft
Left Side Slope:	6.00	ft/ft (H:V)
Right Side Slope:	6.00	ft/ft (H:V)
Discharge:	6.20	ft ³ /s

Results

Normal Depth:	0.47	ft
Flow Area:	1.31	ft ²
Wetted Perimeter:	5.68	ft
Top Width:	5.60	ft
Critical Depth:	0.58	ft
Critical Slope:	0.02016	ft/ft
Velocity:	4.74	ft/s
Velocity Head:	0.35	ft
Specific Energy:	0.82	ft
Froude Number:	1.73	
Flow Type:	Supercritical	

GVF Input Data

Downstream Depth:	0.00	ft
Length:	0.00	ft
Number Of Steps:	0	

GVF Output Data

Upstream Depth:	0.00	ft
Profile Description:	N/A	
Profile Headloss:	0.00	ft
Downstream Velocity:	0.00	ft/s
Upstream Velocity:	0.00	ft/s
Normal Depth:	0.47	ft
Critical Depth:	0.58	ft
Channel Slope:	0.06500	ft/ft
Critical Slope:	0.02016	ft/ft

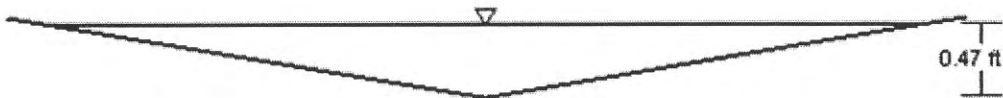
Cross Section for TEMP SWALE (B)

Project Description

Flow Element:	Triangular Channel
Friction Method:	Manning Formula
Solve For:	Normal Depth

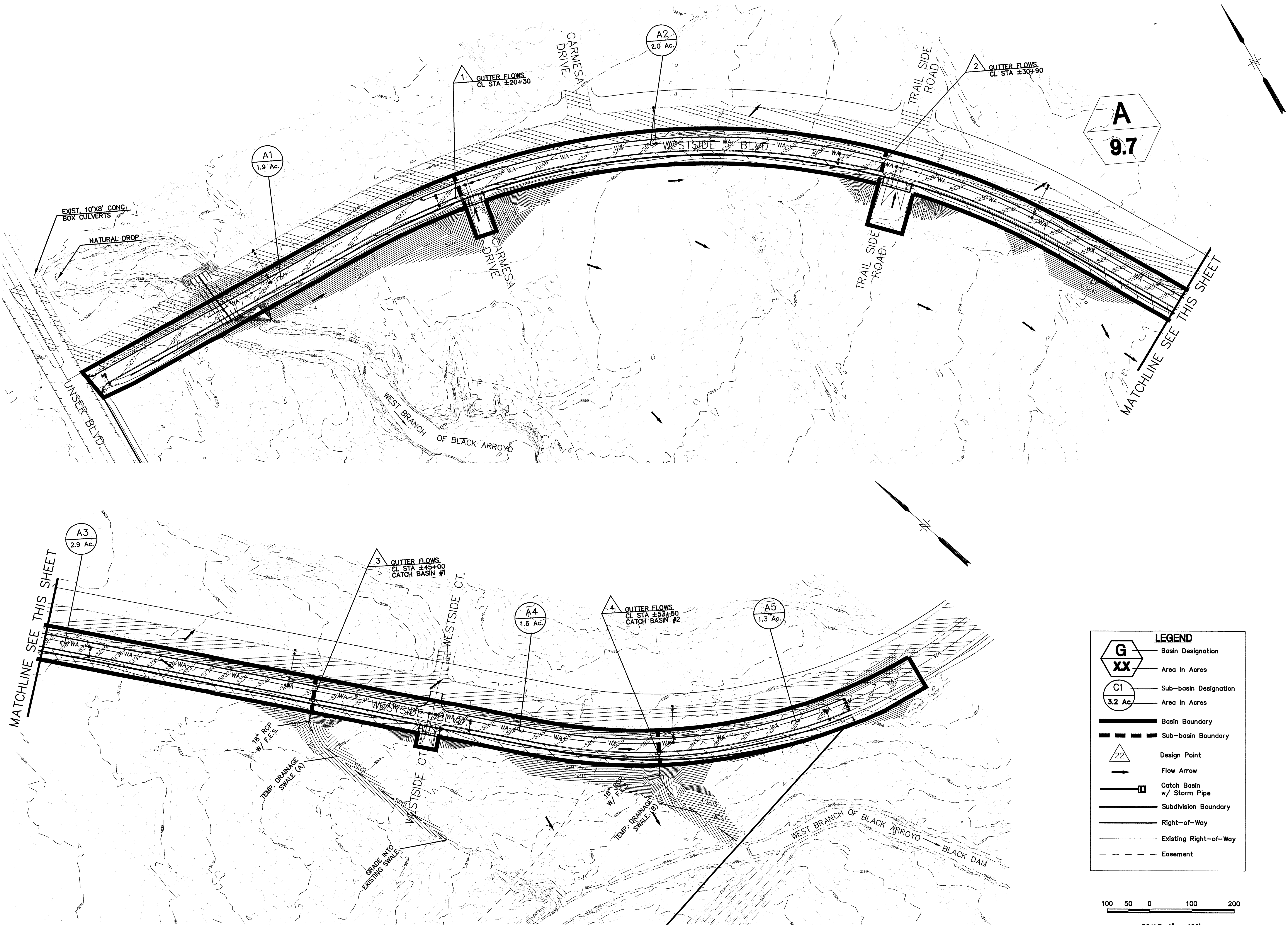
Section Data

Roughness Coefficient:	0.030	
Channel Slope:	0.06500	ft/ft
Normal Depth:	0.47	ft
Left Side Slope:	6.00	ft/ft (H:V)
Right Side Slope:	6.00	ft/ft (H:V)
Discharge:	6.20	ft ³ /s



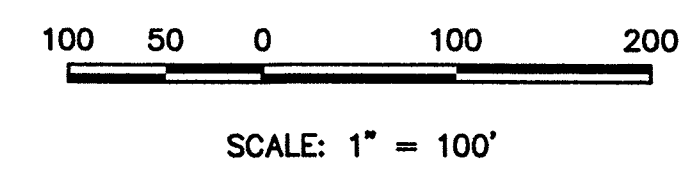
V: 1
H: 1

Thursday, June 22, 2006 10:37:48 AM DRAWING: R:\5101-001-001\Cabezon Subd. New Mexico\Gwg\CABEZON DRAINAGE.DWG LAYOUT: DRAINAGE MAP



LEGEND

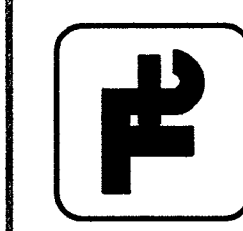
- G** Basin Designation
- xx** Area in Acres
- C1** Sub-basin Designation
- 3.2 Ac** Area in Acres
- Basin Boundary
- Sub-basin Boundary
- Design Point
- Flow Arrow
- Catch Basin w/ Storm Pipe
- Subdivision Boundary
- Right-of-Way
- Existing Right-of-Way
- Easement



CABEZON SUBDIVISION
CITY OF RIO RANCHO, STATE OF NEW MEXICO
DRAINAGE MAP

INITIAL PLAN
RELEASE: NOV 05
DESIGNED BY: VSS
DRAWN BY: NLD
CHECKED BY:
JOB NO.
22-5101-001-00
SHEET
3 OF 26

REVISIONS		DATE	BY
NO.	1		
	2		
	3		
	4		



TETRA TECH RMC
1900 SOUTH SUNSET STREET, SUITE 1-F LONGMONT, CO 80501
TEL 303.772.5282 METRO: 665.6283 FAX: 665.6959